प्रगति प्रतिवेदन

PROGRESS REPORT 2020-21

फसल सुरक्षा
CROP PROTECTION

अखिल भारतीय समन्वित गेहूँ एवं जौ अनुसंधान परियोजना

AICRP on Wheat and Barley

भा.कृ.अनु.प.–भारतीय गेहूँ एवं जौ अनुसंधान संस्थान, करनाल

ICAR-Indian Institute of Wheat and Barley Research, Karnal

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ALL INDIA COORDINATED WHEAT AND BARLEY IMPROVEMENT PROJECT

PROGRESS REPORT
2020-21

CROP PROTECTION

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(Sudheer Kumar)
Principal Investigator
(Crop Protection Programme)

ICAR-IIWBR, Karnal
Dated: 3rd August 2021

C O N T E N T S

ANNEXURES

PROGRAMME OF WORK, 2020-21

The programme for the crop year 2020-21 discussed in detail in work plan finalization meeting held on 29.7.2020 through virtual platform and finalized in the 59th All India Wheat and Barley Research Workers Meet during August 24-25, 2020. The various activities to be executed at respective centers are given below:

PROGRAMME 1: Host resistance - IPPSN and PPSN

Adult Plant Resistance for rusts & other diseases

1. Initial Plant Pathological Screening Nursery (IPPSN)

Objectives

To evaluate breeding materials generated at various centers against rusts and foliar blights for promoting to coordinated multi-location trials. (Under artificial inoculated conditions)

(a) Rusts:

North:

Yellow Rust: Gurdaspur, Dhaulakuan, Malan, Karnal, Durgapura, Ludhiana, Hisar and Jammu (8)

Leaf Rust: Delhi, Karnal, Durgapura, Ludhiana, Faizabad, Kanpur (6)

South:

Stem Rust + Leaf Rust: Dharwad**,** Mahabaleshwar, Wellington, Powarkheda, Niphad and Indore (6)

(b) **Leaf Blight:** Faizabad, Pusa (Bihar), Varanasi, Kalyani, Sabour and Coochbehar (6)

2. Plant Pathological Screening Nursery (PPSN)

Objectives

Evaluation of breeding material for promotion of entries from one stage to the other in the coordinated trials and identification of varieties for release after AVT level on the basis of their level of disease resistance.

(a) Rusts:

North:

Stripe Rust: Dhaulakuan, Gurdaspur, Malan, Bajaura, Karnal, Delhi, Ludhiana, Pantnagar, Durgapura, Jammu, Kudwani and Hisar (12)

Leaf Rust: Delhi, Hisar, Jammu, Kanpur, Karnal, Ludhiana, Pantnagar, Durgapura, Faizabad (9)

South:

Leaf and Stem Rusts: Wellington, Mahabaleshwar, Niphad, Vijapur, Pune, Junagarh, Powarkheda, Dharwad and Indore (9)

(b) Leaf blight (NIVT 1A, 1B, 3A): Kalyani, Coochbehar, Pusa (Bihar), Faizabad, Varanasi, Sabour, Shillongani (7)

Note: The samples of leaves of AVT entries and varieties (checks) in PPSN showed resistance in the past but now showing rust severity of 40S or more at any centre, should be sent immediately to the Incharge, IIWBR Regional Station Flowerdale, Shimla for pathotype analysis, with information to P.I. (Crop Protection). The rusts have to be recorded every month.

For screening against rusts the mixture of following races will be used and be provided by RS, IIWBR, Flowerdale, Shimla

Rust	**Rust pathogen**	**Pathotypes**
Stem/Black	*Puccinia graminis tritici*	11, 40A, 117-6, 21A-2, 122
Stripe/Yellow	*P. striiformis*	238S119, 46S119, 110S119, 110S84, T
Leaf/Brown	*P. triticina*	77-9, 77-5, 104-2, 12-5, 77-1

3. Monitoring of PPSN

The teams of plant pathologists and breeders will be constituted for effective monitoring and data recording in PPSN at various locations in different zones. The Plant Pathologists and Breeders of other zones will monitor PPSN during Zonal monitoring tours.

4. AUDPC based identification of slow rusters in AVT material:

Leaf and Stripe rusts – Karnal, Ludhiana
Stem and leaf rusts -Mahabaleshwar
Leaf rust: Faizabad
Stem rust -Indore

PROGRAMME 2: Seedling rust resistance and rust gene postulation

1. Race specific and slow rusting

(a) Leaf rust: AVT entries of NWPZ, NHZ and NEPZ, along with the check entries of the respective zones (under glass house conditions).
Centres: New Delhi and Ludhiana under field conditions and Flowerdale, Shimla

(b) Stem rust: AVT of CZ and PZ, along with the check varieties of the respective zone.
Centres: Indore, Pune, Powarkheda and Mahabaleshwar

(c) Stripe rust: AVT entries of NWPZ and NHZ alongwith the checks of the respective zones.
Centres: Ludhiana and Delhi under field conditions and Flowerdale (under controlled condition),

Race inoculum to be supplied by RS, IIWBR, Flowerdale and races should be the same for all the respective centers as follows.

Rust	**Rust pathogen**	**Pathotypes**	
		Flowerdale	**Other Centres**
Stem/Black	*P. graminis tritici*	11, 40A, 117-6	11, 40A
Stripe/Yellow	*P. striiformis*	238S119, 46S119, 110S119	238S119, 46S119
Leaf/Brown	*P. triticina*	77-9, 77-5, 104-2	77-9, 77-5

2. Seedling Resistance Tests and postulation of Rust Resistance Genes

(a) Leaf, Stem and Yellow rusts (All races): IIWBR, Regional Station, Flowerdale, Shimla for AVT's (*T. aestivum*) entries. Flowerdale centre to generate data on rust resistance genes of all the AVT entries. Besides, this, identification of Rust Resistance genes to be done in selected entries of MDSN, MPSN and EPPSN.

(b) Stem and Leaf rusts: Mahabaleshwar for SRT on AVT entries of CZ, PZ and NIVT (durum entries).

PROGRAMME 3: Leaf Blight

Leaf Blight Screening Nursery (LBSN):

This nursery will consist of earlier identified resistant materials as well as the AVT's and NIVTs. It will have all the released varieties and material found resistant in preceding years. It will have entries sent to CIMMYT for screening against wheat blast also.

Centers: 18

NWPZ: Pantnagar, Ludhiana, Karnal and Hisar.
NEPZ: Varanasi, Faizabad, IARI Pusa, Coochbehar, Shillongani, Ranchi, Naini, Goria Karma Jharkhand and Kalyani
PZ: Dharwad, Wellington, Pune

PROGRAMME 4: Karnal Bunt

Karnal Bunt Screening Nursery (KBSN):

This nursery will consist of the earlier identified resistant materials, released varieties along with AVT entries under artificially inoculated conditions.

Centers: Ludhiana, New Delhi, Pantnagar, Hisar, Karnal and Jammu (6).

PROGRAMME 5: Loose Smut

Loose Smut Screening Nursery (LSSN): It will contain resistant materials identified in the past released varieties and AVT entries of NHZ, NWPZ and NEPZ

Centres: Ludhiana, Almora, Durgapura and Hisar (4)

PROGRAMME 6: Powdery Mildew

Powdery Mildew Screening Nursery (PMSN): All entries of AVT, previously identified resistant material and released varieties (NHZ, NWPZ)

Centres: Almora, Pantnagar, Shimla, Malan, Bajaura, Dhaulakuan, Wellington and Jammu (8)

PROGRAMME 7: Region specific diseases

1. **Flag Smut Screening Nursery:** Ludhiana, Hisar and Durgapura (AVT entries).
2. **Foot rot:** Dharwad (AVT entries)
3. **Head scab:** Delhi, Dhulakuan, Gurdaspur
4. **Hill bunt:** Malan, Bajaura and Almora (AVT entries NHZ).

PROGRAMME 8: Crop Health

1. **Pre- harvest crop health monitoring**

   Crop Health Monitoring: Pre harvest surveys

   - All the centres associated with crop protection programme will supply information fortnightly on crop health from the areas of their jurisdiction to P.I. Crop Protection starting from November 2020 till the harvest of crop.
   - Wheat Crop Health Newsletter will be issued on monthly basis by PI (CP) IIWBR, Karnal, during the crop season. Information on off season surveys will be included in first issue.

Monitoring of new virulences of yellow rusts in NWPZ by specially constituted teams:

Specially constituted teams will visit the areas as per the need for effective monitoring of crop health in general and appearance and spread of yellow rust in particular, along the areas near the western border and foothills / sub-mountainous areas in NWPZ. ***If, by the time the situation of COVID19 outspread will persist the visits will be very limited and will use mobile phone or whatsapp for monitoring.*** Teams will be constituted as per the need for survey.

Monitoring of wheat blast: The following teams are constituted to monitor wheat crop in West Bengal and Assam along the Indo-Bangladesh borders for the presence of wheat blast. ***If, by the time the situation of COVID19 outspread will persist the visits will be very limited and will use mobile phone or whatsapp for monitoring.*** Teams will be constituted as per the need for survey. If any suspected samples of wheat blast like disease found will be analyzed at Kalyani and Coochbehar centre.

Monitoring the pathotype distribution of rust pathogens: It will be undertaken by IIWBR, Regional Station, Flowerdale, Shimla (all three rusts from all zones) and Rust Research Station, Mahabaleshwar (brown and black rust from CZ and PZ). ***If, by the time the situation of COVID19 outspread will persist the visits will be very limited and will use mobile phone or whatsapp for monitoring.*** All the cooperating centers are required to send the rust infected samples (natural infection) for pathotype analysis to the concerned centres according to recommended protocol.

Wheat Disease Monitoring Nursery (To be co-ordinated by Flowerdale, Shimla): The nursery will be planted at 38 locations including Kudwani (Srinagar), Varanasi KVK, Rampur and Yamunanagar (Haryana). Samples from this nursery should be sent regularly to IIWBR, RS, Flowerdale, Shimla for virulence analysis and information. Information on rust appearance to be provided at monthly intervals, starting from end of December to the P.I. (Crop Protection).

Off-season Disease Monitoring Nursery (To be coordinated by IIWBR Reg. Station, Flowerdale): This nursery will be planted in Dalang Maidan, Kukumseri, Sangla, Sarahan (HP) and Leh (J&K). High altitude varieties and one hulless barley variety will also be included in this nursery. (Inclusion of PBW 757 in place of WL 711)

SAARC- Nursery (To be coordinated by Flowerdale, Shimla): Nursery will be planted at 15 Indian locations, *viz*., Ludhiana, Delhi, Dhaulakuan, Gurdaspur, Dera-Baba-Nanak, Abohar, Sri Ganganagar, Chattha, Kathua, Rajouri, Almora, Durgapura, Faizabad, Pantnagar and Wellington.

2. Post- harvest crop health monitoring

Monitoring of Karnal bunt and black point in harvested grains

Post harvest monitoring will be undertaken by cooperating centres by analysing samples from grain *mandies* in each district of their respective states. Centres from C.Z. (Indore, Sagar, Powarkheda, Junagarh, Vijapur) and PZ (Pune, Niphad and Dharwad) may also supply grain samples to PI (CP), IIWBR, Karnal for analysis.

PROGRAMME 9: Integrated disease management

1. **Elite Plant Pathological Screening Nursery (EPPSN):** The sources of resistance to three or two rusts identified in PPSN will be retested to confirm their resistance to rusts:
   North: Delhi, Malan, Karnal, Ludhiana, Pantnagar, Durgapura, Hisar, Jammu and Almora (9)
   South: Wellington, Mahabaleshwar, Dharwad Niphad, Pune and Indore (6).

2. **Multiple Disease Screening Nursery (MDSN):** It will have sources of resistance to rusts and other diseases found earlier and will revalidate their status to different diseases:
   DISEASES
   North:
   Stripe rust: Karnal, Ludhiana, Hisar, Dhaulakuon, Malan, Pantnagar, Durgapura
   Leaf rust: Karnal, Ludhiana, Delhi, Hisar, Durgapura
   Karnal Bunt: New Delhi, Karnal, Ludhiana, Dhaulakuan, Pantnagar
   Powdery mildew: Dhaulakuan, Almora, Pantnagar, Malan, Chattha
   Foliar blights: Faizabad, Varanasi, Coochbehar, Sabour, Hisar, Kalyani,
   Loose smut: Hisar, Durgapura, Ludhiana, Almora
   Flag smut: Hisar, Durgapura, Ludhiana
   Head scab: New Delhi, Dhulakuan, Gurdaspur
   South:
   Leaf and Stem rust: Mahabaleshwar, Indore Dharwad, Niphad, Pune and Wellington
   Nematodes (CCN) : Durgapura, Hisar, and Ludhiana

   The confirmed sources of resistance will be multiplied and seed will be shared with breeders along with passport data in NGSN.

3. **Management of diseases**

(a) Chemical management of stripe rust: New chemicals will be tested at Karnal, Hisar, Ludhiana, Durgapura, Pantnagar and Jammu. The chemicals will be tested are:

S. No.	Treatment	Doses
1	Picoxystrobin 7.05% + Propiconazole 11.7% SC,	@ 0.1%
2	Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE,	@ 0.1%
3	Tebuconazole 50% + Trifloxystrobin 25% WG,	@ 0.06%
4	Propiconazole	@ 0.1%
5	Tebuconazole	@ 0.1%
6	Control	-

The chemical will be evaluated under artificial inoculated condition and spray will be done on initiation of diseases and repeated once after 15 days. Design – RBD, Plot size – 6 rows of 3 meters, replications - 3.

(b) Chemical management of powdery mildew:

New chemicals will be tested at Pantnagar, Shimla, Malan, Bajaura, Dhaulakuan, Wellington and Jammu. The chemicals will be tested are:

S. No.	Treatment	Doses
1	Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC,	@ 0.1%
2	Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC,	@ 0.1%
3	Tebuconazole 50% + Trifloxystrobin 25% WG,	@ 0.06%
4	Propiconazole	@ 0.1%
5	Tebuconazole	@ 0.1%
6	Control	-

The chemical will be evaluated under artificial inoculated condition and spray will be done on initiation of diseases and repeated once after 15 days. Design – RBD, Plot size – 6 rows of 3 meters, replications - 3.

(c) Chemical management of head scab:

New chemicals will be tested at Gurdaspur, Ludhiana and Karnal

S. No.	Treatment	Doses
1	Picoxystrobin 7.05% + Propiconazole 11.7% SC,	@ 0.1%
2	Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE,	@ 0.1%
3	Tebuconazole 50% + Trifloxystrobin 25% WG,	@ 0.06%
4	Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC	@ 0.1%
5	Azoxystrobin 18.2% + Difenoconazole 11.4% w/w SC	@ 0.1%
6	Azoxystrobin 11% + Tebuconazole 18.3% w/w SC	@ 0.1%
7	Propiconazole	@ 0.1%
8	Tebuconazole	@ 0.1%
9	Control	-

The chemical will be evaluated under artificial inoculated condition and spray will be done at heading stage. Design – RBD, Plot size – 6 rows of 3 meters, replications - 3.

(d) Chemical management of leaf rust:

New chemicals will be tested at Jammu, Kanpur, Karnal, Ludhiana, Pantnagar, Durgapura, Faizabad, Coochbehar.

S. No.	Treatment	Doses
1	Picoxystrobin 7.05% + Propiconazole 11.7% SC,	@ 0.1%
2	Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE,	@ 0.1%
3	Tebuconazole 50% + Trifloxystrobin 25% WG,	@ 0.06%
4	Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC	@ 0.1%
5	Azoxystrobin 18.2% + Difenoconazole 11.4% w/w SC	@ 0.1%
6	Azoxystrobin 11% + Tebuconazole 18.3% w/w SC	@ 0.1%
7	Propiconazole	@ 0.1%
8	Tebuconazole	@ 0.1%
9	Control	-

The chemical will be evaluated under artificial inoculated condition and spray will be done on initiation of diseases and repeated once after 15 days. Design – RBD, Plot size – 6 rows of 3 meters, replications - 3.

(e) Chemical management of stem rust:*

New chemicals will be tested Dharwad, Mahabaleshwar, Wellington, Powarkheda, Niphad and Indore

S. No.	Treatment	Doses
1	Picoxystrobin 7.05% + Propiconazole 11.7% SC,	@ 0.1%
2	Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE,	@ 0.1%
3	Tebuconazole 50% + Trifloxystrobin 25% WG,	@ 0.06%
4	Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC	@ 0.1%
5	Azoxystrobin 18.2% + Difenoconazole 11.4% w/w SC	@ 0.1%
6	Azoxystrobin 11% + Tebuconazole 18.3% w/w SC	@ 0.1%
7	Propiconazole	@ 0.1%
8	Tebuconazole	@ 0.1%
9	Control	-

The chemical will be evaluated under artificial inoculated condition and spray will be done on initiation of diseases and repeated once after 15 days. Design – RBD, Plot size – 6 rows of 3 meters, replications - 3.

PROGRAMME 10. ENTOMOLOGY

1. **Host plant resistance:** Entomological screening nurseries (ESN), Multiple pest screening nurseries (MPSN), National initial varietal trial nurseries (NIVT) and special screening nurseries of promising entries identified during previous season

(a) Entomological screening nurseries (ESN)- In these nurseries, AVT entries along with those found resistant during previous years will be screened for

(i) Shoot fly (Centres: Dharwad, Ludhiana, Kanpur, Niphad)
(ii) Brown wheat mite (Centres: Durgapura and Ludhiana)
(iii) Wheat Aphids (Centres: Niphad, Ludhiana, Karnal, Shillongani and Kharibari)
(iv) Root aphid (Centres: Karnal and Ludhiana)

The NIVT entries will also be screened against foliar aphids at Niphad, Ludhiana and Karnal

(b) Multiple pest screening nurseries (MPSN)- In these nurseries, the germplasm having resistance to multiple diseases and insect-pests will be screened for

(i) Shoot fly (Centres: Dharwad, Ludhiana, Kanpur and Niphad)
(ii) Brown wheat mite (Centres: Durgapura and Ludhiana)
(iii) Foliar aphids (Centres: Niphad, Ludhiana, Karnal, Shillongani and Kharibari)
(iv) Root aphid (Centres: Karnal and Ludhiana)

2. **Integrated Pest Management**

(a) Survey and surveillance of insect-pests and their natural enemies in wheat and barley cropping systems *(All centres)*

Roving surveys will be carried out at fortnightly intervals during the cropping season in wheat and barley crops for insect-pests and their natural enemies. Population and damage levels of different insect-pests will be recorded and indicated as grades or percent damage inflicted to crop. The peak period of pest activity and its severity of damage will also be recorded.

(b) Influence of sowing time on the incidence and population build-up of major insect pest of wheat (Centres: Karnal, Ludhiana, Kharibari)

The effect of sowing time on the population build-up of major insect-pests of wheat will be studied at four geographical locations to better understand the insect-pest behaviour under different climatic conditions.

(c) Effect of effect of Zinc sulphate application on aphid incidence in wheat (**Centres:** Karnal, Ludhiana, Niphad)

Effect of zinc sulphate application in soil as well as foliar application will be tested to determine its effect on aphid abundance in wheat. Soil application rate of zinc sulphate will be kept as 25 kg/hand foliar application rate will be 0.5%. Observations will be recorded on population of aphids per plant, natural enemies (adult and grubs) per plot, yield per treatment and nutrient status of soil as well as of plants before the treatment and at the time of harvest.

(d) Basic studies for development of IPM strategies (**Centres:** Karnal, Niphad, Ludhiana, Kharibari)

The study will be conducted to generate region-wise data on population dynamics of major insect-pests of wheat and barley for developing pest-forcasting models. Weather parameters of a location will be correlated with insect population to determine the effect of climatic variations on the pest population dynamics under changing climate scenario.

(e) Zone specific IPM modules (**Centres:** Karnal, Ludhiana, Niphad, Kanpur)

The integrated pest module consisting of effective cultural, physical, biological and chemical components of integrated pest management will be formulated and tested against major pests of wheat viz., foliar aphids, shootfly and termites.

(f) Effect of organic treatments on the incidence of major insect-pests and natural enemies (**Centres:** Karnal and Ludhiana)

Keeping in view of the interest of farmers about zero budget farming, effect of organic treatments viz., Neemastra, Bramhastra, Agniastra, Deshparni, Fermented butter milk and Cow urine will be evaluated against major insect-pests of wheat and natural enemies.

(g) Management of aphids through foliar application of new chemical molecules (Centres: Karnal, Ludhiana, Niphad and Kharibari)

New chemicals molecules will be evaluated against foliar aphids in wheat. Insect population counts before and after the treatment will be recorded along with yield in each treatment.

(h) Management of lepidoterous pests (pink stem borer, army worm & cutworms) of wheat: With increasing incidence of lepidopterous insect-pests in rice-wheat cropping system, an experiment will be conducted on the management of these pests through, chemicals, biopesticides etc.

(i) Management of termites, aphids and seed borne diseases of wheat through seed treatment of chemical molecules combinations (**Centres:** Durgapura, Kanpur, Ludhiana and Vijapur)

Few selected insecticides and their combination with fungicides will be tested as seed treatment against termites. The observations on insect population counts before and after the treatment will be recorded along with yield in each treatment..

3. Stored Grain Pest Management

(a) Evaluation of different packaging bags for storage insect-pest infestation and its effect wheat seed quality (Centre: Karnal, Ludhiana, Kharibari, Niphad **)**

Different types of storage bags viz., jute bags, High density polyethylene bags (HDPE) and Biaxially Oriented Polypropylene (BOPP) bags will be evaluated for storage insect-pest infestation and its effect on wheat seed quality will be determined.

PROGRAMME 11. NEMATOLOGY

1. **Monitoring of Nematodes:** *Heterodera avenae, Anguina tritici, Meloidogyne graminicola* and other plant parasitic nematode: All centres of Nematology

2. **Evaluation of resistance against nematodes parasitizing wheat**
   (a) ***Heterodera avenae*:** Hisar, Durgapura, Ludhiana and New Delhi (AVT and MDSN lines)
   (b) ***Meloidogyne graminicola*:** Ludhiana and Hisar (AVT)
   (c) ***Heterodera filipjevi*:** Ludhiana (AVT)

3. **Evaluation of new chemical against cereal cyst nematode, *Heterodera avenae***
   Centers: Durgapura, Ludhiana, Hisar
   Treatments:
   T1 = Fluensulfone 2% GR @0.5 Kg a.i./ha at sowing (25 Kg formulation/ha)
   T2 = Fluensulfone 2% GR @1.0 Kg a.i./ha at sowing (50 Kg formulation/ha)
   T3 = Fluensulfone 2% GR @1.5 Kg a.i./ha at sowing (75 Kg formulation/ha)
   T4 = Fluensulfone 2% GR @2.0 Kg a.i./ha at sowing (100 Kg formulation/ha)
   T5 = Carbofuran @2 kg a.i/ ha at sowing
   T6 = Untreated Check

4. **Differentiation of CCN Pathotype by using International differential**
   Centre: Durgapura

List of Cooperators

PLANT PATHOLOGY PROGRAMME

NHZ

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MPKV, Mahabaleshwar
R. R. Perane,S.G. Sawashe, M.A.Gud

ARS, Niphad
B.M. Ilhe, B.C. Game

SHZ
ICAR-IARI, Regional Station, Wellington
P. Nallathambi

ENTOMOLOGY PROGRAMME

ICAR-IIWBR, Karnal
Poonam Jasrotia

PAU, Ludhiana
Beant Singh

RARS, Assam Agricultural University, Shillongani
K. K. Sarma

Wheat Research Station, Vijapur
Ms. Elangbam Premabati devi

ARS, Durgapura
A.S. Baloda

CSAUA&T, Kanpur
J. K. Singh

UAS, Dharwad
Gurudatt M. Hegde

ARS, Niphad
Bhalchandra Mhaske

Kharibari, WB
Wasim Reza

NEMATOLOGY PROGRAMME

PAU, Ludhiana
Ramanna Koulagi

ARS, Durgapura
S.P. Bishnoi

CCS HAU, Hisar
Priyanka Duggal, SarojYadav

Summary of trials and nurseries allotted and conducted at different cooperating centres during 2020-21 in Crop Protection Programme

S. No.	Name of Centre	Name of co-operators	No. nurseries/ trials allotted	Data not received	Data not considered
	Pathology				
1	Almora	DR.K.K.Mishra	6		1
2	Allahbad	DR.Sunil Zacharia	1		1
3	Bajaura	Dr Rakesh Devlash	4		1
4	Coochbehar	Dr. Satyajit Hembram	4		1
5	Delhi	Drs. V. K. Singh, M.S.Saharan	10		
7	Dharwad	Dr. Gurudatt.M.Hegde	7		4
8	Dhaulakuan	Dr.A.K.Singh	9	1	2
9	Durgapura	Dr. P.S. Shekhawat	10		1
10	Faizabad	Dr. Shiv Pratap Singh	6		1
11	Hisar	Dr Rajender Singh Beniwal	12		1
12	IARI Pusa (Bihar)	Dr. Ashish Kumar Gupta	3		
13	Indore	Mr. Prakasha T.L.	6		
14	Jammu	DR.M.K. Panday	8		
15	Junagarh	Dr. I. B. Kapadiya	1		1
16	Kalyani(Nadia)	Dr. Sunita Mahapatra	4		
17	Kanpur	Dr. Javed Bahar Khan	2		1
18	Kudwani	Drs.Nazir A.Bhat, Fayaz Mohdin	1		
19	Karnal	Drs.Sudheer Kumar, Prem Lal Kashyap, Ravindra Kumar	10		2
20	Ludhiana	DR.Jaspal Kaur, Ritu Bala	16		
21	Gurdaspur	DR. Jaspal Kaur,	5		
22	Mahabaleshwar	Dr. R. R. Perane, S.G. Sawashe, M. A. Gud	6		
23	Malan	Dr. Sachin Upmanyu	8		
24	Niphad	Dr. B. M. Ilhe, B.C. Game	5		
25	Pantnagar	Dr. Deepshikha	9		2
26	Powerkheda	Dr. K. K. Mishra	3	1	
27	Pune	Dr. Sudhir Navathe	3		
28	Ranchi	Dr. H. C. Lal	1		
29	Sabour	Dr. C.S. Azad	3		
30	Shillongani	Mrs. R. Chakravarty	2		
31	Shimla	Drs. S.C. Bhardwaj, O.P. Gangwar, Pramod Prasad	4		
32	Varanasi	Dr. S.S. Vaish	4		
33	Vijapur	Dr. S.I. Patel, Ms. Elangbam Premabati Devi	1		1
34	Wellington	Dr. P. Nallathambi	8		
35	Goria Karma	Dr. P.R. Kumar	1		
	Entomology				
1	Dharwad	Dr. Gurudatt M. Hegde	2		
2	Duragupra	Dr. A.S. Baloda	4		1
3	Kanpur	Dr. J.K.Singh	7		1
4	Karnal	Dr. Poonam Jasrotia	12		
5	Kharibari	Dr. Wasim Reza			
6	Ludhiana	Dr. Beant Singh	11		
7	Niphad	Dr. Bhalchandra Mhaske	10		
8	Shillongani	Dr. K.K.Samra	3		1
9	Vijapur	Dr. A.A. Patel	6		
10	Khudwani	Dr. Shabir Hussain Wani	2		
	Nematology				
1	Delhi	Dr. Pankaj	1	1	
2	Ludhiana	Dr. Ramanna Koulagi	4	1	
3	Durgapura	Dr. S.P.Bishnoi	3		
4	Hisar	Dr. Priyanka Duggal	3		
	Total		**251**	**4**	**23**

SUMMARY

The wheat crop yield is adversely affected by many biotic stresses. To avoid these losses crop protection programme continuously keeping strict surveillance, identification of new resistance sources, strategic deployment of resistant varieties and development of management strategies. Crop protection programme also worked in collaboration to wheat breeders to evaluate breeding material against major diseases and insect pests. Additionally, keep vigil on new pathotypes of rusts and occurrence of any exotic diseases, as well as status of Karnal bunt and other diseases and insect pests. Coordination and sharing of knowledge among different agencies like DAC & FW, ICAR, SAUs, State Agriculture Departments, KVKs, and Farmers etc. about the potent diseases and insect pests and their management through regular strategy planning meetings, trainings, field days, discussions and distributions of literature and using IT tools. The achievements during 2020-21 are summarised below:

PATHOLOGY

Survey and surveillance for diseases

During 2020-21, to monitor the wheat and barley crop health, regular surveys were conducted with major emphasis on occurrence of yellow rust in NWPZ and surveillance for wheat blast. The surveys were conducted by the wheat crop protection scientists of different cooperating centers including ICAR-IIWBR Karnal and information was share among through the *"Wheat Crop Health Newsletter"*, Vol. 26 (Issues 1 to 5) which was issued during the crop season and also uploaded on ICAR-IIWBR website (www.iiwbr.icar.gov.in). The first appearance of yellow rust of wheat is reported from village Pattii (Manakpur) block Sh. Anandpur Sahib, Rupnagar District of Punjab on 17.1.2021. During the crop season in February, 2021 there was sudden rise in the temperature which become uncongenial for rusts therefore the diseases severity and spread remain low thus minimal losses due to disease especially in NWPZ and NEPZ. So far, the exotic diseases and pathotypes like Ug99 race of stem rust and wheat blast were not reported from any part of the country. The overall crop health status was excellent in the country.

Host resistance

Advance breeding materials as well as pre coordinated entries were evaluated against disease and insect pests resistance at various hot spot locations under artificially inoculated conditions. The major nurseries were: Initial Plant Pathological Nursery (IPPSN), Plant Pathological Nursery (PPSN), Elite PPSN (EPPSN), Multiple Disease Screening Nursery (MDSN), and disease / insect pest specific nurseries. The numbers of entries tested under different plant pathological nurseries are as:

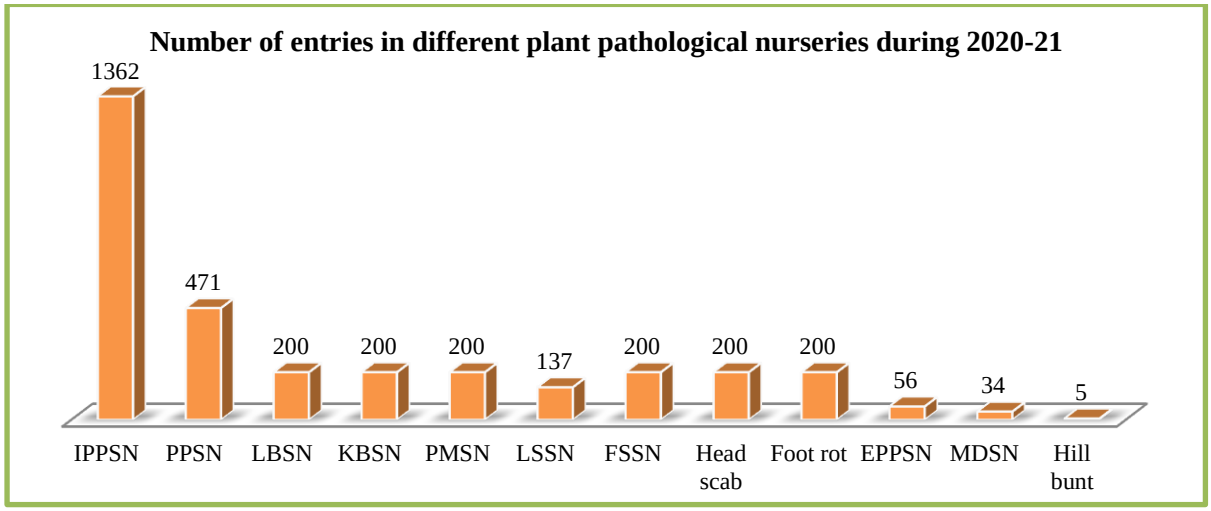

Fig. Constitution of different plant pathological nurseries during 2020-21

Entries and check varieties identified resistant against rusts in advance breeding lines:
Rust resistance materials in AVT entries (2020-21) with ACI upto 10.0 are given below:

Stem, Leaf and Stripe rusts
VL907 (C), PBW876[B], RAJ4548[#], PBW771 (C), DBW173 (C), HUW838[#]*, HI1654, DBW296*, HI1628 (C), HD3369, HD3249 (C), DBW187 (C), DBW318, UP3060, DBW316, HD3368[#], HI1654, HD3369[#], K1317 (C), UP3062, HI8833(d)[M], HI8832(d)[M], HI8713(d) (C), HD3407[M], DDW47(d) (C), DBW326, HI8627(d) (C), HI8830(d), WHD965(d), UAS428(d) (C), MACS4100(d), MACS3949(d) (C), NIDW1345(d), MACS4106(d), HI8828(d), HI8827(d), MP1358*, NIDW1149(d)(I)(C), UAS446(d) (C), DBW327*, HD3410, DBW187(I) (C), WH1270(I) (C), DBW303(I) (C), HD3413, PBW867, DBW318, DBW187(I) (C), PBW870

Stem and leaf rusts
VL2041, HD2967 (C), K1910, NIAW3170 (C), DBW39 (C), HD2967 (C), HI1563 (C), GW322 (C), MP3535, GW523, GW513*, HI1636*, MACS6768, HI1544 (C), HI1667[B], HI1650, HD2864 (C), HI8823(d)*, GW528, CG1036, HI1655, MP3288 (C), DDW55(d), HI8826(d), MACS6222 (C), HD3090 (C), HI1633(I) (C), HI1651, MACS6753, NIAW3170 (C), MACS5058, MACS6222(*a*) (C), DDK1029 (C), DDK1061, HW1098 (C), MACS5057, DDK1060, PBW872, WH1406, UP3096, WH1404, UP3095

Stem and Stripe rusts
HPW349 (C), HS507 (C), PBW826, PBW838, WH1142 (C), UP3062, PBW826[#], DBW317, PBW848[#]

Leaf and Stripe rusts
DBW187 (C), HD3349, WH1283, HD3368, PBW835, PBW833, UAS475(d), DDW53(d), NIDW1348(d), DDW48(d)(I) (C), DBW325, UAS3014, DBW328*, DBW370, WH1252*, PBW874, DBW332*, DBW375, DBW378, HD3405, DBW377, PBW869, PBW871, WH1407, DBW368, DBW363, K1805

Identification of multiple diseases resistant entries:
Based on rigorous screening of under Multiple Diseases Screening Nursery (MDSN) at multilocations the following genotypes have been identified as conformed source of resistance for multiple diseases:

A. Resistant to stem, leaf and stripe rusts +
Resistant to all three rust + KB + FS: NIDW 1158 (d), HI 8811b (d), GW 1348 (d), NDW 1149 (d), HI 8802, DBW 302, PBW 820
Resistant to all three Rust LB+ KB + FS: HI8805 (d)
Resistant to all three Rust + KB: HI 8807 (d)
Resistant to all three Rust + LB + FS: WH 1270, VL 3020
Resistant to all three Rust +FS: PBW 822, HI 8812 (d), HI 8808 (d), PBW 823, PBW 821, HPW 467

B. Resistant to Stem and Leaf rust +
Resistant to Stem and Leaf Rust + K B + FS: CG 1029, HI 1633, HI 1634, GW 509

C. Resistant to leaf and stripe rust +
Resistant to Leaf and Stripe Rust+ LB + KB+ FS: PBW 752, UP 3043
Resistant to Leaf and Stripe Rust + KB + FS: DDW 48 (d), DDW 47 (d), VL 3021, PBW 825, PBW 796, DBW 303
Resistant to Leaf and Stripe Rust + K B: PBW 771, HI 1628
Resistant to Leaf and Stripe Rust + F S: WHD 963 (d)

Utilization of resistance sources

Twenty one confirmed sources of high level of disease resistance lines were identified and shared among 16 breeding centers across different agro climatic zones of country which were utilized in the range of 0.0 – 43.75% by different breeding centers. The most utilized entries at many centers were DBW 246 and PBW 757. Junagarh center, utilized maximum 9 entries in their breeding programme followed by Indore.

Pathotype distribution of rust pathogens in India and Nepal during 2020-21

A total of 400 samples of three rusts of wheat and barley have been pathotyped so far from India and Nepal during the year.

Yellow or stripe rust of wheat and barley (*Puccinia striiformis*)

During this crop year, 118 samples of stripe rust of wheat and barley were analyzed from six Indian states and Nepal. Total six pathotypes {238S119, 110S119, 46S119, 110S84, 47S103 (T) and 6S0} of wheat and barley stripe rust pathogen were identified. The field population was avirulent to *Yr5*, *Yr10*, *Yr15*, and *Yr*Sp. During the cropping season frequency of pathotype 238S119 was maximum (49.57%) followed by 110S119 (29.41 %), first identified in 2013-14.

Black rust of wheat (*Puccinia graminis* f. sp. *tritici*)

A total of one hundred seventy three samples of wheat and barley stem (black) rust were received from six Indian states during the crop season. Eight pathotypes of *P. graminis tritici* were identified from the analysis of 91 samples. Population analyzed during the year had avirulence to *Sr26*, *Sr27*, *Sr31*, *Sr32*, *Sr35*, *Sr39*, *Sr40*, *Sr43*, *SrTt3* and *SrTmp*. Pathotype 11 (79G31=RRTSF), virulent on *Sr2*, *Sr5*, *Sr6*, *Sr7b Sr9a*, *Sr9b*,*Sr9c*, *Sr9d*, *Sr9f*, *Sr9g*, *Sr10*, *Sr13*, *Sr14*, *Sr15*, *Sr16*, *Sr17*, *Sr18*, *Sr19*, *Sr20*, *Sr21*, *Sr28*, *Sr29*, *Sr30*, *Sr34*, *Sr36*, *Sr38*, *Sr*McN was recorded in more than 50% of the samples analyzed during the season, which was followed by 40A (15.3 %) and 40-3 (14.28 %).

Brown rust of wheat (*Puccinia triticina*)

A total of 221 samples of wheat leaf rust were pathotyped from 12 states of India and neighboring country Nepal. Seventeen pathotypes were identified in these samples. Pathotype 77-9 (121R60-1) was the most widely distributed and occurred in 57% of the samples followed by 52-3 (121R60-1,7) in 20.3% samples. Pathotype 77-5 (121R63-1), which remained most predominant for more than 20 years was observed in 12.2% samples only.

Rust resistance genes in AVT lines (Gene postulation)

***Yr*-genes**

Among the 200 lines of AVT, *Yr* genes were characterized in 113 lines. *Yr* genes were postulated in lines where differential interactions were observed and in other cases tight linkage of *Yr* genes to other *Lr* and *Sr* genes also facilitated the inference for the presence of a resistance gene. Four *Yr* genes viz. *Yr2*, *Yr9*, *YrA* and *Yr18* contributed to yellow rust resistance in Indian wheat material. Among the postulated *Yr* genes *Yr2* was most common and characterized in 89 lines. *Yr9* and *YrA* were postulated in 15 and 11 entries, respectively, whereas *Yr18* was characterized only in HD2733(C).

***Lr*-genes**

Nine *Lr* genes viz. *Lr1*, *Lr3*, *Lr10*, *Lr13*, *Lr23*, *Lr24*, *Lr26*, *Lr28* and *Lr34* were characterized in 134 lines. *Lr13* was the most commonly occurring leaf rust resistance and was characterized in highest number of lines (66) followed by *Lr10* (49 lines), *Lr23* (45 lines) and *Lr1* (32 lines). *Lr24* was postulated in 14 entries. *Lr26* and *Lr3* were characterized in fifteen and eleven entries, respectively. *Lr34* and *Lr28* were postulated in HD2733 and PBW874 only. Majority of the genes occurred in combination and many of the lines have leaf rust resistance derived from 3 or more *Lr* genes.

***Sr*-genes**

Thirteen stem rust resistance genes (*Sr*2, *Sr5, Sr7b, Sr8a, Sr8b, Sr9b, Sr9e, Sr11, Sr13, Sr24, Sr28, Sr30* and *Sr31*) were characterized in 143 AVT lines (Table 3). The frequency of *Sr2* was maximum as it was postulated in 62 AVT entries followed by *Sr11*and *Sr7b*, which were characterized in 43 and 34 entries, respectively. *Sr31* linked with *Lr26* and *Yr9* and conferring resistance to all the known *Pgt* pathotypes in Indian subcontinent was postulated in 15 AVT entries, while *Sr24* linked to *Lr24* was characterized in 14 entries. Other *Sr* genes i.e. *Sr13, Sr8a, Sr5, Sr30, Sr9b, Sr28, Sr9e, Sr8b* were postulated in 19, 15, 14, 112, 5, 3, 2 and 1 entries, respectively. The *Sr* genes were characterized singly or in combination of up to four gens. Two entries KRL19 (C) and DBW252 (C) had combination of four *Sr* genes viz. *Sr8b+9b+11+2+* and *Sr8a+5+11+2+*, respectively.

Management of diseases through chemicals

For the management of yellow rust five different fungicides were evaluated during 2020-21 at four different locations indicated that all the fungicides were effective in managing the disease in comparison to unsprayed control check. Tebuconazole 50% + Trifloxystrobin 25% WG @ 0.06% is the best performing fungicide across the locations. No phytotoxicity was recorded with any of the tested concentrations of the fungicides on wheat plants. Similarly, the efficacy of different fungicides for the management of powdery mildew at four different locations i.e. Wellington, Jammu, Pantnagar and Malan was tested. Azoxystrobin 18.2% + Difenoconazole 11.4% w/w SC@ 0.1% is identified most effective fungicides in controlling the powdery mildew infection in wheat across the locations.
Besides these eight new fungicidal combinations were also evaluated against stem rust, leaf rust and Fusarium head scab diseases.

Strategy Planning Meetings

For the effective implementation of crop protection technologies strategy planning meetings was conducted on "Alternate crop plan to combat the wheat blast like disease" on 18.9.2020 through virtual platform. The meeting was chaired by the Agriculture Commissioner, DAC&FW, Govt. of India. From IIWBR the meeting was attended Director, PI Crop Improvement and PI Crop Protection. PI CP, made the presentation on work done in wheat blast project. It was discussed that resistant varieties need to be promoted in the disease prone areas. Five resistant varieties identified namely DBW 187, HD 3249 and HD 2967 (irrigated and timely sown) and DBW 252 and HD 3171 (restricted irrigation and timely sown) have been recommended to be grown in disease prone areas of West Bengal. It was suggested that continuous monitoring of wheat crop is required and if any suspected symptoms are observed, it should be reported to the IIWBR immediately.

Advisory for stripe rust management: During the current season the weather remained uncongenial for diseases and pest therefore the sporadic occurrence of yellow rust has been reported from NWPZ. Need based advisory for stripe rust management was issued. Awareness among farmers for stripe rust management especially in Punjab, Haryana and Jammu was created through mobile, internet, toll free number, newspapers, discussions and delivering lectures in farmers training programmes.

Preparedness to wheat blast

Survey were conducted in North and South West Bengal near Indo-Bangladesh boarder by team of scientist from UBKV, Cooch Behar, West Bengal and BCKV, Kalyani, Nadia, West Bengal and no wheat blast was observed. A strategy planning meetings was conducted on "Alternate crop plan to combat the wheat blast like disease" on 18.9.2020 through virtual platform attended by officials from DAC&FW, Govt. of India, ICAR-IIWBR, Karnal, SAUs and state agriculture department of West Bengal. It was discussed that more emphasis should be given to grow alternate crop like pulse, oil seed, vegetables etc. instead of wheat in blast prone areas. Wherever, wheat is grown use resistant

varieties identified and recommended in the wheat blast prone areas. It was suggested that continuous and strict monitoring of wheat crop is required. For identification of wheat blast resistant sources advance breeding lines and potential germplasm were screened at Jashore, Bangladesh and Quirassallis through CIMMYT. A total 350 entries sent in 2019 screened against blast at Jashore, Bangladesh at two different dates of sowing during 2019-20 and at two locations i.e. Jashore, Bangladesh and Quirassallis at two different dates of sowing during 2020-21. Out of these, across the locations and years, 29 entries found free from infection and 46 are categorised resistant on the basis of average disease upto 10% infection. Besides that 350 entries again sent in 2020 to screen against blast during 2020-21 at Jashore, Bangladesh at two different dates of sowing, and 71 entries found free from infection and 99 are categorised resistant on the basis of highest score upto 10% infection.
An anticipatory breeding programme has already initiated. Awareness was also created in farmers to take all preventive measures available against blast and to grow the resistant varieties identified.

Post-harvest surveys for Karnal bunt

A total of 6396 grain samples collected from various mandies in different zones were analyzed by cooperating centers. The overall 21.12% samples were found infected. The samples from Rajasthan showed maximum infection (37.67%). In general the Karnal bunt infection was less in comparison to previous year because of sudden rise of temperature in the month of February, when the crop was at the booting stages.

Training for human resource development

To bring more uniformity in disease creation and data recording a training was organized on "Creation of epiphytotics for disease and insect pests, uniform data recording and reporting in wheat and barley crop protection trials" from 28-30 January, 2021 through virtual mode at ICAR-IIWBR, Karnal for scientists working in crop protection under the coordinated system. The scientist and technical workers involved in disease and insect pest recording have been participated.

ENTOMOLOGY

Survey and surveillance for insect pests

- In Punjab, the aphid incidence during 2020-21 was above economic threshold level in some places viz. village Jodhan (Ludhiana) and Kattu Balian & Sangatpura (Sangrur) during the last week of February. The natural enemies viz. grubs and adults of coccinellid beetles, syrphid fly and chrysoperla were observed in some of the fields infested with aphids. Intensive surveys were carried out in the months of November-December in to monitor the pest prevalence in residue managed wheat fields. No serious infestation of pink stem borer or armyworm was observed during 2020-21 crop year except few minor infestations. Minor incidence of pink stem borer (less than 1 %) was also observed in one Happy Seeder sown wheat field in village Sanghera (Barnala).
- In Maharashtra state, survey was carried out in the villages of Nashik and adjoining district Ahemednagar, Aurangabad, Nandurbar and some part of Beed and Parbhani districts at different crop stages. Heavy incidence of aphids was recorded during the survey. The natural enemies such as *Coccinellid* & *Chrysoperla carnea* predator, grubs and beetles feeding on the aphid were also observed. The incidence of jassids was recorded in medium intensity.
- In Gujarat state, survey of wheat & barley fields was carried out during the Rabi 2020-21 crop season. The termite damage in wheat fields was negligible in the fields across the area surveyed. The incidence of aphid was observed moderate during ear head stage of the crop. The population of *H. armigera*, pink stem borer and surface grasshopper were not observed. Besides, in barley fields the aphid population was moderate to high. Among natural enemies, predators like coccinellid beetles, chrysoperla and syrphid fly were noticed predating on wheat and barley aphids.
- In Kanpur, survey was conducted in villages viz., Araul, Magharwara, Kundi, Devpura, Jahanabad and Daleep Nagar during 2020-21. Incidence of shootfly was recorded to be 1 per cent for wheat variety HD2967, K1006, and PBW343 while it was13.3% on PBW343 in village Daleep Nagar. The incidence of termite was observed 10 per cent wheat variety HD2967 of wheat in Magharwara, Kundi, Devpura and Jahanabad. Moderate infestation (20-35 aphid/tiller) of foliar aphid was on barley variety namely, 'Barley Local' while the shootfly infestation was observed

1.66% at the village Araul (Kanpur). The moderate incidence of pink stem borer was observed in irrigated crop one per cent in variety HD-2967.

- In Haryana, survey was conducted field season from December -March in Yamunanagar, Ambala, Kurukshetra, Kunjpura, Ladwa etc. This year incidence of aphids, termites, pink stem borer and army worm was reported to be lower side compared to 2019-20 season. Termites and root aphid was reported to be around 1-3% during November and December. Aphid infestation started appearing in the month of January and the population in the beginning was around 2-3 aphids/tiller but in February, higher infestation of aphids (25-55 aphids/tiller on an average) was observed in the fields. Natural enemies, wasps, spiders and the grubs and adults of coccinellid beetles were seen during February and March frequently in the fields.

Screening against major insect-pests

Shoot fly: Based on the average infestation of shoot fly at two locations, the lowest infestation index (2.07 %) of shoot fly entry was reported in HD3249 (C) and highest index of 8.75% in entry HD3403. At Ludhiana centre, maximum infestation index of 8.53 per cent was reported on HD3403 and minimum (3.95 per cent) on HD3249 (C). At Dharwad, entry HD3249 (C) had lowest infestation of 2.85% and highest infestation (10.91 %) in NIDW1149(d)(I) (C).

Brown wheat mite: At Ludhiana, two entries WH1406 and VL907 (C) recorded the minimum mite population of 4.7/10 cm^2 area while maximum mite population of 15.3 /10 cm^2 in entry DDW48 (d)(I). (C).This season incidence of mite was very low at Durgapura and Kanpur locations; therefore data of insect incidence was not included.

Foliar aphid: Based on the average score of aphids at four locations; Ludhiana, Karnal, Niphad and Khudwani, four entries; DBW313, DBW317, HI8830(d) and RAJ4083 (C) scored in moderately resistance category (grade 3) and rest of entries were found to be either in susceptible (grade 4) or highly susceptible (grade 5) category. The infestation of aphids at Vijapur, Durgapur and Shillongani was recorded to very low and therefore data was rejected.

Root aphid: Out of total 200 entries, four entries viz., WH1142 (C),PBW835, DBW110 (C) and WH1404 showed the moderately resistance (grade 3) reaction at Ludhiana.

Screening against multiple pests

The average infestation index of shootfly recorded at two locations was to be lowest (2.8%) in entry PBW 771 and the maximum score of 9.6% was recorded for GW 1346. The lowest population of 6.67 brown wheat mites/10 cm^2 was recorded in entry HI8812(d) while entry GW1346 had lowest population of 9.6 mites/10 cm^2 at Ludhiana.

Based on average score of four locations, 13 entries GW1348 (d), PBW822, DDW 48(d), DDW 47(d), DBW 303, DBW 302,GW 1346,MACS 5052,GW 1346, MACS 5052,DDK 1056,DDK 1057,DBW 304 showed moderately resistance (grade 3) to foliar aphid. At Ludhiana, one entry HI 1628 was found to be moderately resistant (grade 3) to root aphid.

Integrated pest management studies

- Influence of sowing time on the incidence and population build-up of major insect pests of wheat was studied. The termite damage recorded at seedling stage in different dates of sowing indicated that early sown crop (first week of Nov 2020) suffered more termite damage as compared to timely, late and very late sown crop. At earing stage, again termite damage was highest (2.93%) in early sown crop followed by timely (2.60%) and late sown (2.37%) and very late sown (2.25%) crop. The root aphid appeared in the early growing season and its attack was observed on 3-5 week old crop. Foliar aphid incidence first appeared in first week of January and the data indicated that the aphid incidence got delayed with the delay in sowing time. The peak of aphid incidence was recorded in 9th standard meteorological weeks (SMW) of 2021 in 1 Nov and 15 Nov. sown crops. However, it was 11th and 12th SMW for Dec.1 and Dec 15 sown crops. The pink stem borer damage was higher in early (0.62-2.28 %) and timely sown (0.46-1.73 %) crop as compared to late (0.24-1.22 %) and very late sown crop (0.09-0.62 %). Overall, the pink stem borer incidence was comparatively less as compared to previous crop year.

- The integrated pest modules were tested at four centres viz., Karnal, Ludhiana, Niphad, Kanpur against major pests of wheat viz., foliar aphids, shootfly, termites and pink stem borer revealed comparatively lower pest population in IPM module treatment as compared to the Farmer practice (FP). However, in FP treatment the population of natural enemies was little higher than IPM treatment.
- Effect of zinc sulphate as foliar application was investigated at two centres; Karnal and Ludhiana to determine its effect on aphid abundance and their coccinellid predators in wheat. The observations indicated that one or two foliar applications of ZnSo4 mixed with thiamethoxam effectively reduced the aphid population. Although some reduction in aphid control was observed when thiamethoxam was mixed with $ZnSo_4$ but statistically it was not different. It can be concluded that $ZnSo_4$ can also be mixed with propiconazole and thiamethoxam without any adverse effect on yield. Similarly, coccinellid population was also not adversely effected by application of one or two sprays of $ZnSo_4$ mixed with insecticides and fungicides at reproductive stages of crop. No visual symptoms of phyto-toxicity were observed in any treatment and the combination mixture appeared to be safe to wheat crop.
- Keeping in view of the interest of farmers about zero budget farming, effect of organic treatments viz., Neemastra, Bramhastra, Agniastra, Deshparni, Fermented butter milk and Cow urine were evaluated against major insect-pests of wheat and natural enemies at two centres: Karnal and Ludhiana. The data revealed that Bramastra @7.5% was found to be the most effective treatment as compared to other organic treatments recorded fewer aphids. The organic treatments were found safer to natural enemies and little effect was seen on their population as compared to check of insecticide spray with Thiamethoxam 25 WG.
- Efficacy of various insecticides and their combinations against foliar aphid was determined at various centres. Overall, treatment of Beta-Cyfluthrin 9%+ Imidacloprid 21% (Solomon) was more effective in checking aphid population. Besides, Lambda cyhalothrin 5% EC @ 500 ml/ha, Imidacloprid 17.8 SL @ 400 ml/ha and Beta-cyfluthrin 25 SC @ 1450 ml/ha were also found equally effective against it.
- In case of termite management through seed treatment, lowest termite damage was recorded in pre-mixed insecticide imidacloprid 18.5%+ hexaconazole 1.5% FS followed by tank mixture of Imidacloprid 600FS + Tebuconazole at Ludhina. However, at Vijapur, treatment of fipronil 5 SC @ 0.3 g a.i./kg seed was most effective followed by thiamethoxam 25 WG @ 0.8 g a.i./kg and thiamethoxam 30 FS @ 0.72 g a.i./kg.
- Population dynamics studies of foliar aphids on wheat and barley crops revealed comparatively higher population of aphid on barley as compared to wheat crop. The coccinellid beetle appeared after the peak period of aphid infestation on wheat and barley crop.

NEMATOLOGY

Resistance against *Heterodera avenae*

Two hundred entries of AVT were screened for resistance against *H. avenae* (CCN) at Ludhiana, Hisar and Durgapura centers. No entry found resistant or moderately resistant across all the centers however eight entries namely, PBW876^{B}, K1910, PBW835, HI8713(d) (C), HI8827(d), DBW370, HD3086 (C) and DBW366 have shown moderately resistant reaction at Ludhiana. Similarly, five entries namely HD3406^{M}, WH1124 (C), HI1653, HD3086 (C) and DDW53(d) showed moderately resistant reaction at Durgapura and five entries viz. DBW222 (C), DBW173 (C), HI1650, DDW48(d)(I) (C) and DBW327* were found moderately resistant at Hisar location.

Management of cereal cyst nematode

A new nematicide *viz* Fluensulfone 2% GR at different doses was tried for nematicidal properties against CCN at three locations namely Ludhiana, Hisar and Durgapura. Fluensulfone 2% GR @ 2.0 kg a.i./ha was found most effective in managing cereal cyst nematode.

PROGRAMME 1. HOST RESISTANCE: IPPSN AND PPSN

1.1 Initial Plant Pathological Screening Nursery (IPPSN)

Objectives
Evaluation of breeding materials generated at various centers against rusts and foliar blights for inclusion in the coordinated multilocational yield evaluation trials.

Size and Composition
No. of entries: 1362
No. of breeding centers: 34

Test Locations

Rusts:
North:
Yellow Rust: Gurdaspur, Dhaulakuan, Malan, Karnal, Durgapura, Ludhiana, Hisar and Jammu (8)
Leaf Rust: Delhi, Durgapura, Karnal, Faizabad, Kanpur and Ludhiana (6)
South:
Leaf Rust and Stem Rust: Dharwad, Mahabaleshwar, Wellington, Powarkheda, Niphad and Indore (6)

Leaf Blight: Faizabad, Pusa (Bihar), Varanasi, Kalyani, Sabour and Coochbehar (6)

Data of stem and leaf rust (S) from Dharwad, leaf rust (N) from Kanpur and Karnal, foliar blight from Coochbehar centers were not considered due to poor disease development.

Evaluation under artificial epiphytotics
Uniform procedure was adopted for evaluation of IPPSN at all the test centers. Rust inoculum represented by a wide spectrum of pathotypes, was used in artificial inoculation of IPPSN materials. Rust inocula were supplied by IIWBR Regional Station Flowerdale of all three rust and Mahabaleshwar centers of leaf and stem rusts. Following pathotypes were supplied for inoculation:

Rust	Rust pathogen	Pathotypes
Stem/Black	*Puccinia graminis tritici*	11, 40A, 117-6, 21A-2, 122
Stripe/Yellow	*P. striiformis*	238S119, 46S119, 110S119, 110S84, T
Leaf/Brown	*P. triticina*	77-9, 77-5, 104-2, 12-5, 77-1

The entriest found resistant (ACI<10) and qualify for promotion (ACI<20) to three rusts are given in Table 1.1. A total 1362 entries were screened for rusts at multilocation under artificially inoculated condition. Out of these, 532, 1011, 1162 and 643 entries found resistant against stem rust, leaf rust (S), leaf rust (N) and stripe rust, respectively (Fig. 1.1). The center wise per cent entries in each zone found resistant were represented by Fig. 1.2 to 1.8. The disease data of IPPSN entries were also uploaded on IIWBR website in third week of June 2021.

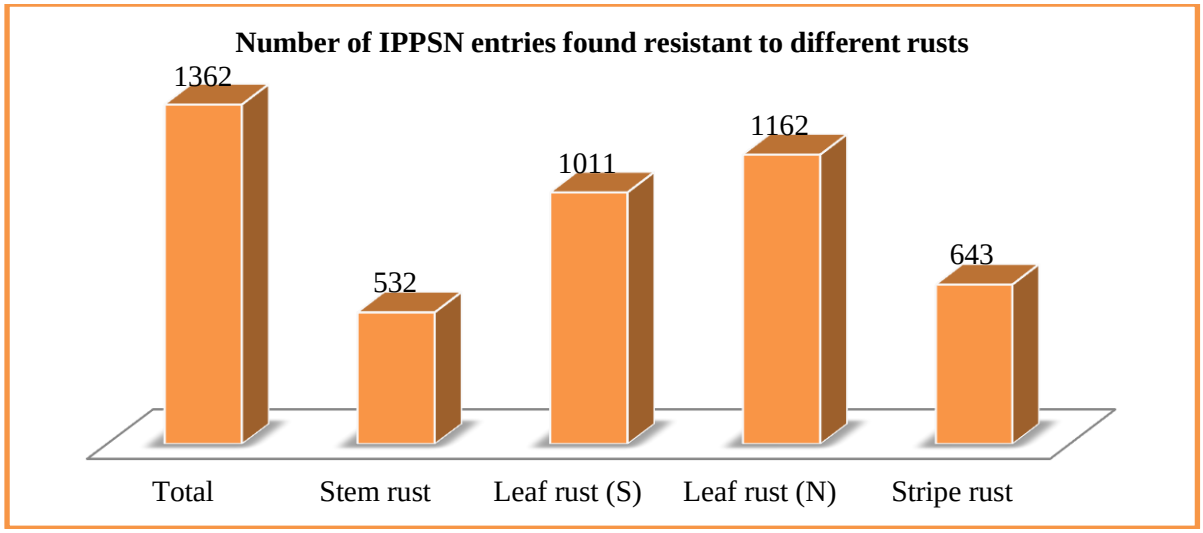

Fig. 1.1 Number of IPPSN entries found resistant to different rusts.

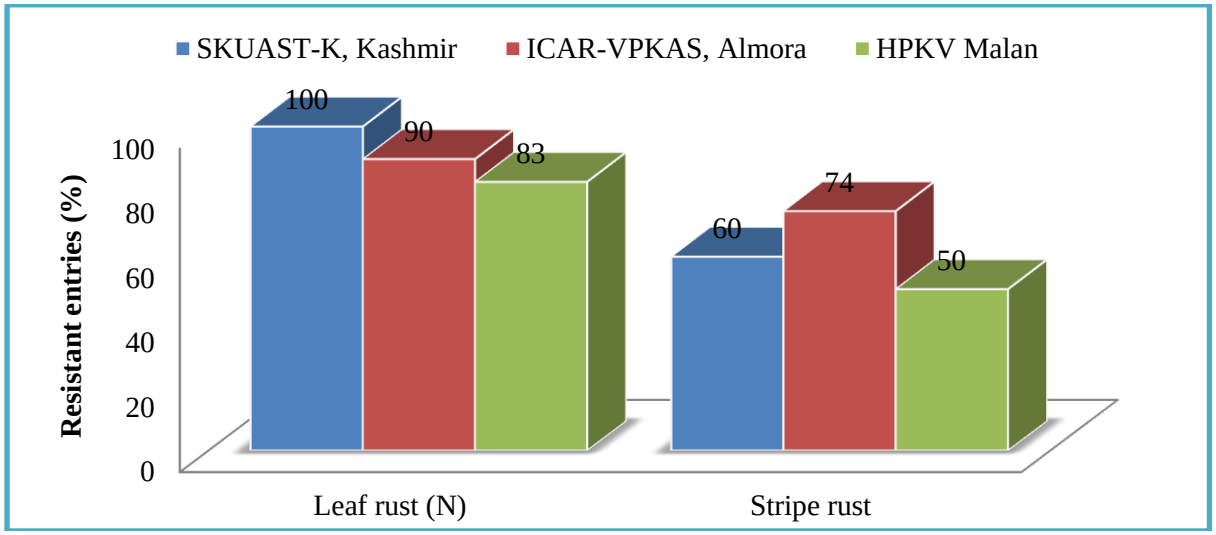

Fig. 1.2. Per cent of rust resistant entries in IPPSN slots belonging to cooperating centres of NHZ (Leaf (N) and Stripe rust)

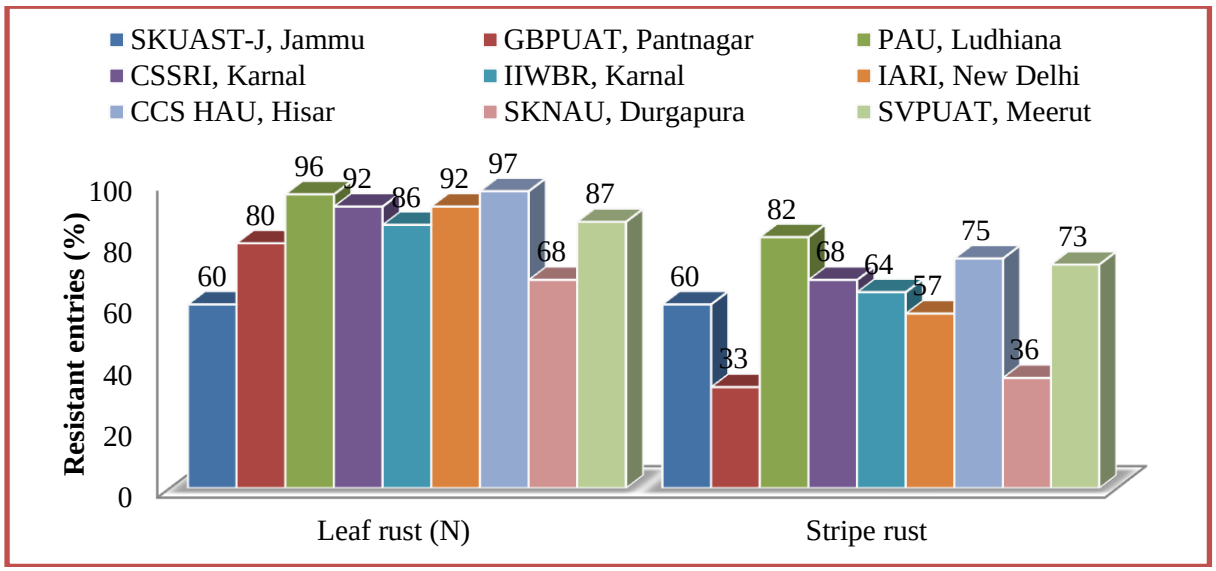

Fig. 1.3 Per cent of rust resistant entries in IPPSN slots belonging to cooperating centres of NWPZ (Leaf (N) and Stripe rust)

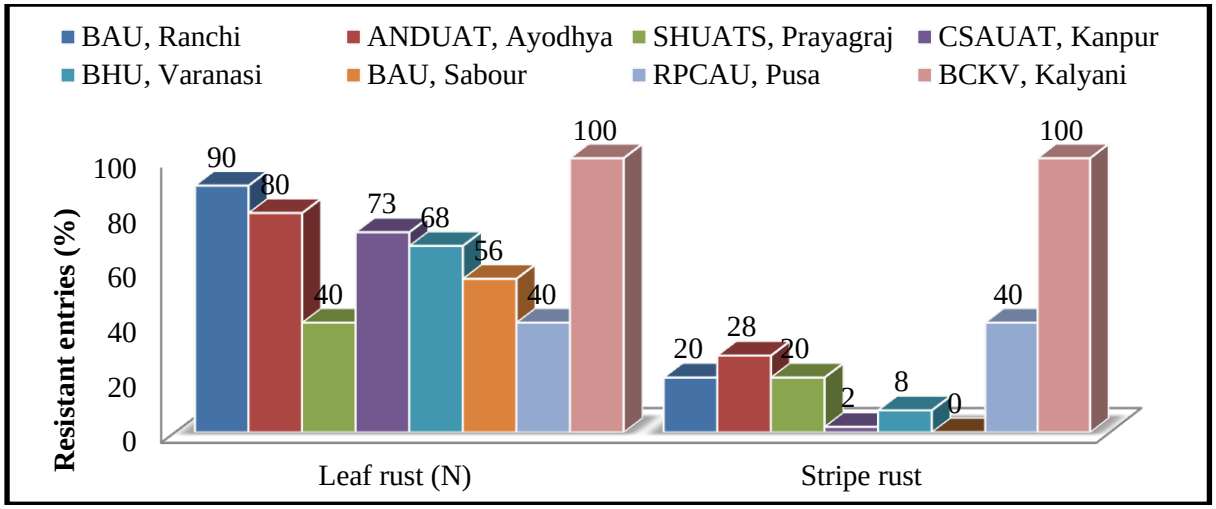

Fig. 1.4 Per cent of rust resistant entries in IPPSN slots belonging to cooperating centres of NEPZ (Leaf (N) and Stripe rust)

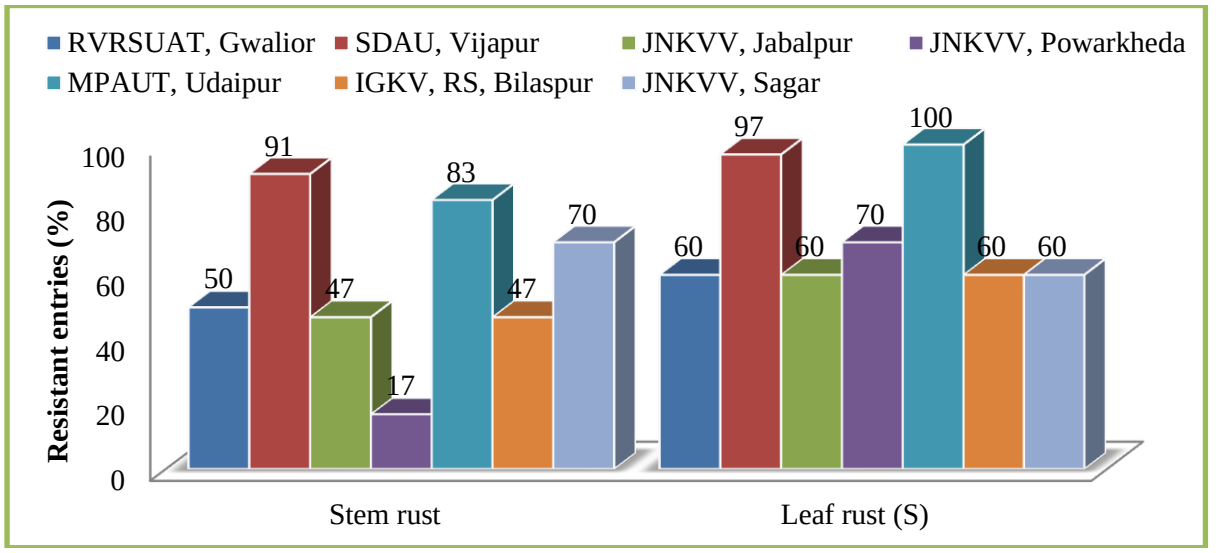

Fig. 1. 5. Per cent of rust resistant entries in IPPSN slots belonging to cooperating centres of CZ (Stem and Leaf rust)

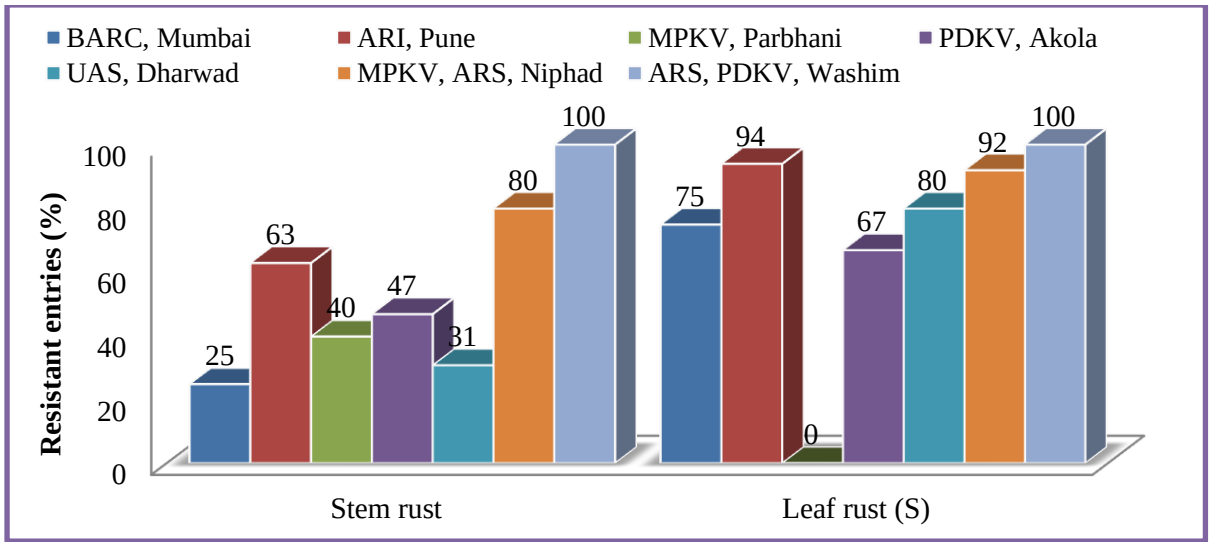

Fig. 1.6. Per cent of rust resistant entries in IPPSN slots belonging to cooperating centres of PZ (Stem and Leaf rust)

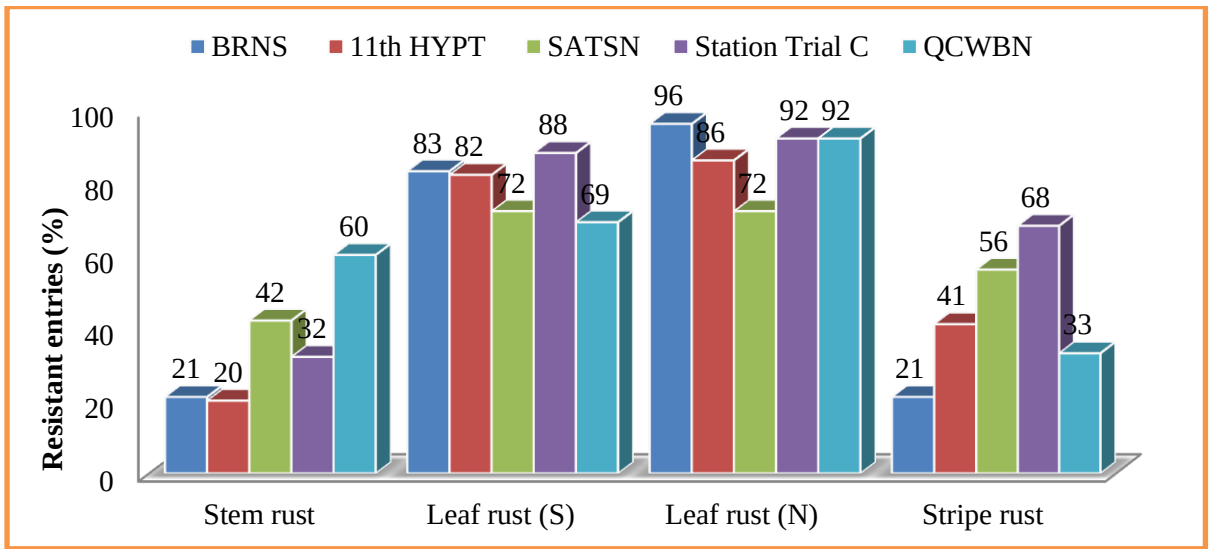

Fig. 1.7. Per cent of rust resistant entries in IPPSN slots belonging to different special trials (Stem, Leaf and stripe rust)

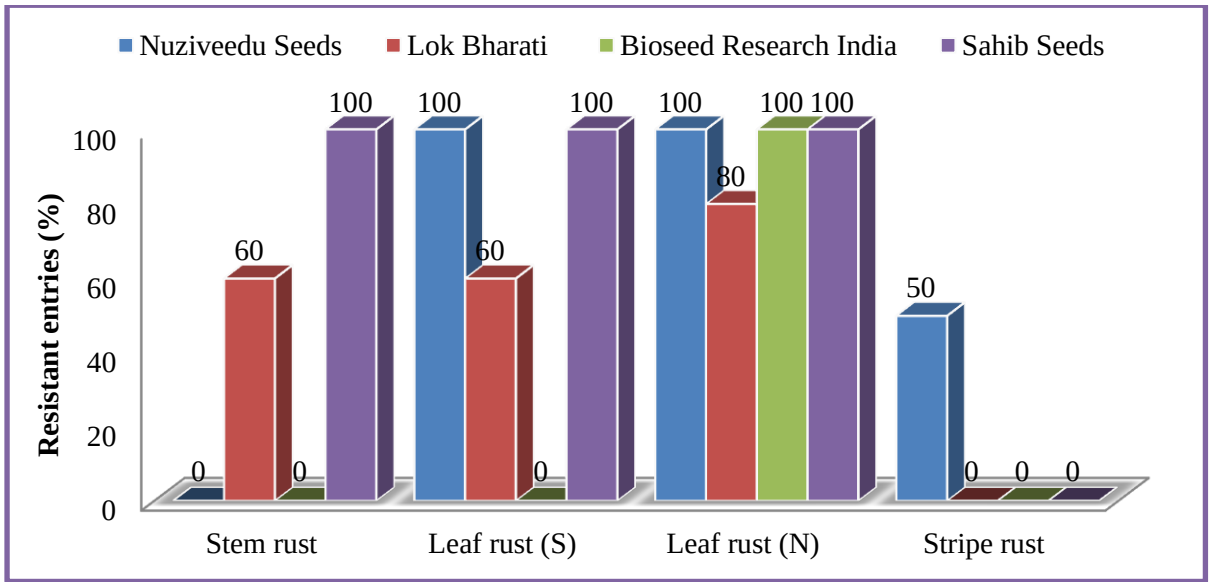

Fig. 1.8. Per cent of rust resistant entries in IPPSN slots belonging to different private seed companies (Stem, Leaf and stripe rust)

Table 1.1: Number to resistant entries (ACI<10) and entries qualify for promotion (ACI <20) in IPPSN slots of different centres during 2020-21.

Centers	Total Entries	Resistant entries (ACI<10)				Promotional entries (ACI<20)			
		Stem rust	Leaf rust		Stripe rust	Stem rust	Leaf rust		Stripe rust
			South	North			South	North	
NHZ									
SKUAST-K, Khudwani	5	0	5	5	3	3	5	5	5
ICAR-VPKAS, Almora	50	20	39	45	37	41	45	48	49
HPKV Malan	30	14	18	25	15	25	24	29	27
NWPZ									
SKUAST-J, Jammu	10	0	3	6	6	4	9	10	8
GBPUAT, Pantnagar	60	16	50	48	20	33	57	58	52
PAU, Ludhiana	170	75	143	163	139	121	164	169	164
CSSRI, Karnal	25	9	15	23	17	19	21	25	20
IIWBR, Karnal	114	34	82	98	73	70	105	111	105
IARI, New Delhi	175	64	142	161	99	126	171	170	151
CCS HAU, Hisar	60	20	54	58	45	48	58	60	58
SKNAU, Durgapura	50	24	30	34	18	32	45	49	41
SVPUAT, Meerut	15	7	14	13	11	10	15	15	15
NEPZ									
BAU, Ranchi	10	1	7	9	2	3	9	10	5
ANDUAT, Ayodhya	25	11	13	20	7	19	20	24	14
SHUATS, Prayagraj	5	0	1	2	1	1	4	5	2
CSAUAT, Kanpur	45	15	20	33	1	32	37	42	9
BHU, Varanasi	40	7	17	27	3	16	30	34	17
BAU, Sabour	25	9	11	14	0	15	18	19	5
RPCAU, Pusa	5	1	3	2	2	3	3	3	2
BCKV, Kalyani	2	0	2	2	2	0	2	2	2
CZ									
RVRSUAT, Gwalior	10	5	6	6	1	7	9	9	3
SDAU, Vijapur	35	32	34	32	5	35	35	35	9
JNKVV, Jabalpur	15	7	9	13	3	13	10	15	5
JNKVV, ZARS, Powarkheda	30	5	21	24	13	20	28	30	15
MPAUT, Udaipur	6	5	6	6	2	6	6	6	2
IGKV, RS, Bilaspur	15	7	9	10	2	13	13	15	2
JNKVV Sagar	10	7	6	5	1	10	9	10	3
PZ									
BARC, Mumbai	12	3	9	9	4	9	11	11	8
ARI, Pune	35	22	33	34	8	30	34	34	25
MPKV, Parbhani	5	2	0	0	0	5	1	4	0
PDKV, Akola	15	7	10	9	1	8	13	12	2
UAS, Dharwad	35	11	28	33	18	21	33	34	28
MPKV, ARS, Niphad	25	20	23	25	5	23	24	25	5
ARS, PDKV, Washim	1	1	1	1	0	1	1	1	0
Special trials									
BRNS	24	5	20	23	5	12	23	24	16
11th HYPT	49	10	40	42	20	35	48	48	41
SATSN	36	15	26	26	20	28	33	36	30
Station Trial C	25	8	22	23	17	15	25	25	24
QCWBN	48	29	33	44	16	38	45	47	32
Private companies									
Nuziveedu Seeds	2	0	2	2	1	2	2	2	1
Lok Bharati	5	3	3	4	0	4	3	5	1
Bioseed Research India	2	0	0	2	0	0	2	2	1
Sahib Seeds	1	1	1	1	0	1	1	1	0
Total	**1362**	**532**	**1011**	**1162**	**643**	**957**	**1251**	**1319**	**1004**

1.2 Plant Pathological Screening Nursery (PPSN)

Objective
Evaluation of entries for promotion from one stage to other in the coordinated trials and identification of varieties after AVT level on the basis of their level of disease resistance.

Size and Composition
PPSN have 471 entries that comprise AVT, NIVT and special trials including checks during 2020-21. The released / identified varieties as per respective trials, were used as checks and a mixture of susceptible varieties like Agra Local, A-9-30-1, WL-711, PBW 343, Sonalika, C-306, Kharchia 65, VL 804, K 8027, HD 2932, NI 5439, Cow(W) -1, GW 322, HD 2864, NIAW 1415, MACS 2496, MACS 2946, MP 4010 and Bijaga Yellow were used as infectors.

The PPSN was evaluated nationwide under artificially created epiphytotics at respective hot spot locations against three rusts. AVT entries were also evaluated against Karnal bunt, Foliar blight, Powdery mildew, Loose smut, Flag smut, Hill bunt, Head scab and Foot rot under respective disease screening nurseries (Fig. 1.9).

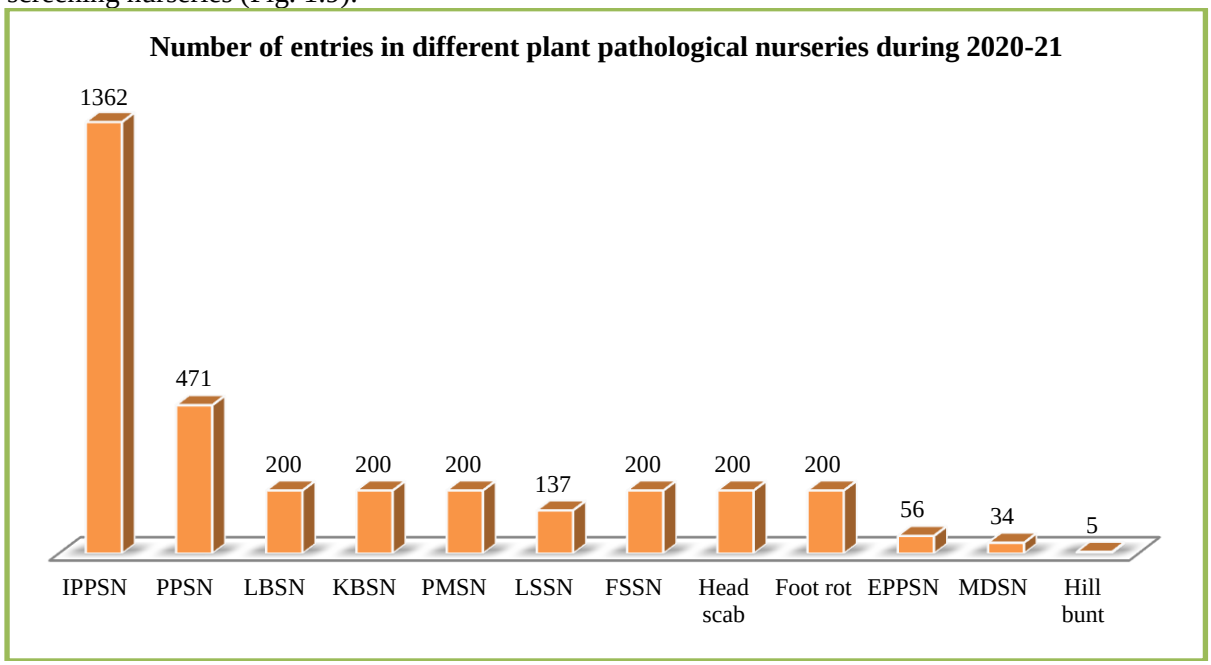

Fig. 1.9. Constitution of different plant pathological nurseries during 2020-21

Test Locations

North:
Yellow Rust: Dhaulakuan, Gurdaspur, Malan, Bajaura, Karnal, Delhi, Ludhiana, Pantnagar, Durgapura, Jammu, Hisar and Khudwani (12)
Leaf Rust: Delhi, Hisar, Jammu, Kanpur, Karnal, Ludhiana, Pantnagar, Durgapura and Faizabad (9)
South:
Leaf and Stem Rusts: Wellington, Mahabaleshwar, Niphad, Vijapur, Pune, Junagarh, Powarkheda, Dharwad and Indore (9)
Leaf blight (NIVT1A, 1B, 3A): Kalayani, Coochbehar, Pusa (Bihar), Faizabad, Varanasi, Sabour, Shillongani (7)

Data were not considered due to poor/erratic disease development from the following centres:
Stripe rust: Dhaulakuan, Pantnagar
Leaf rust: Vijapur, Durgapura, Karnal, Dharwad
Stem rust: Junagarh

Evaluation under artificial epiphytotics
Uniform procedure was adopted for scoring of PPSN at all the test centers. Rust inoculum represented by a wide spectrum of pathotypes, was used in artificial inoculation of PPSN materials. Inoculum of yellow, brown and black rusts was supplied by IIWBR Regional Research Station, Flowerdale, Shimla. Mahabaleshwar center also supplied the inoculum to centres in CZ and PZ. The mixture of pathotypes supplied by Flowerdale and Mahabaleshwar centres are given in IPPSN.

The data on rust severity and gene postulation of AVT material have been given in the Tables 1.2. The data on other then rust disease of AVT entries are given in Table 1.3. The performance of AVT final year entries with check for last three years has been given in Table 1.4. The reaction of NIVT entries against rusts are depicted in table 1.5.

Rust resistance materials in AVT (2020-21) with ACI upto 10.0 are given below:

Stem, Leaf and Stripe rusts
VL907 (C), PBW876[B], RAJ4548[#], PBW771 (C), DBW173 (C), HUW838[#]*, HI1654, DBW296*, HI1628 (C), HD3369, HD3249 (C), DBW187 (C), DBW318, UP3060, DBW316, HD3368[#], HI1654, HD3369[#], K1317 (C), UP3062, HI8833(d)[M], HI8832(d)[M], HI8713(d) (C), HD3407[M], DDW47(d) (C), DBW326, HI8627(d) (C), HI8830(d), WHD965(d), UAS428(d) (C), MACS4100(d), MACS3949(d) (C), NIDW1345(d), MACS4106(d), HI8828(d), HI8827(d), MP1358*, NIDW1149(d)(I)(C), UAS446(d) (C), DBW327*, HD3410, DBW187(I) (C), WH1270(I) (C), DBW303(I) (C), HD3413, PBW867, DBW318, DBW187(I) (C), PBW870

Stem and leaf rusts
VL2041, HD2967 (C), K1910, NIAW3170 (C), DBW39 (C), HD2967 (C), HI1563 (C), GW322 (C), MP3535, GW523, GW513*, HI1636*, MACS6768, HI1544 (C), HI1667[B], HI1650, HD2864 (C), HI8823(d)*, GW528, CG1036, HI1655, MP3288 (C), DDW55(d), HI8826(d), MACS6222 (C), HD3090 (C), HI1633(I) (C), HI1651, MACS6753, NIAW3170 (C), MACS5058, MACS6222(*a*) (C), DDK1029 (C), DDK1061, HW1098 (C), MACS5057, DDK1060, PBW872, WH1406, UP3096, WH1404, UP3095

Stem and Stripe rusts
HPW349 (C), HS507 (C), PBW826, PBW838, WH1142 (C), UP3062, PBW826[#], DBW317, PBW848[#]

Leaf and Stripe rusts
DBW187 (C), HD3349, WH1283, HD3368, PBW835, PBW833, UAS475(d), DDW53(d), NIDW1348(d), DDW48(d)(I) (C), DBW325, UAS3014, DBW328*, DBW370, WH1252*, PBW874, DBW332*, DBW375, DBW378, HD3405, DBW377, PBW869, PBW871, WH1407, DBW368, DBW363, K1805

Table 1.2. Adult plant response of AVT entries against three rusts under epiphytotic conditions at hot spot locations in field during 2020-21

S. No.	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		Postulated genes		
		ACI	HS	ACI	HS	ACI	HS	ACI	HS	*Sr*	*Lr*	*Yr*
North Hill Zone (NHZ)												
1	VL2041	5.8	20S	5.6	30S	9.3	30S	10.7	40S	*Sr30+5+11+*	-	*Yr2+*
2	HS562 (C)	14.5	40S	10.5	60MS	23.6	60S	11.4	60S	*Sr8a+9b+11+*	*Lr23+*	*YrA+*
3	HPW349 (C)	8.5	30MS	10.6	40S	11.1	20S	8.2	60S	*Sr7b+2+*	*Lr13+10+*	*Yr2+*
4	HS507 (C)	3.5	10MS	5.1	30S	15	60S	7	40S	*Sr31+5+*	*Lr26+1+*	*Yr9+*
5	VL907 (C)	3.4	15MS	4.8	20S	6.4	20S	8	20S	*Sr31+2+*	*Lr26+*	*Yr9+*
North Western Plain Zone (NWPZ)												
6	WH1105 (C)	9.5	30MS	7.8	20S	12.9	40S	16	40S	*Sr11+2+*	*Lr13+*	*Yr2+*
7	DBW187 (C)	12	40S	9.5	60S*	5.9	30S	3.2	10S	*Sr5+11+*	*Lr23+10+1+*	*Yr2+*
8	HD3349	13	40S	2.7	20MS	2.1	10S	5.2	40S	*Sr7b+*	R	*YrA+*
9	PBW876[B]	6.5	30S	4.0	30MS	4.3	20S	7.3	60S	*Sr13+*	*Lr23+10+*	*Yr2+*
10	HD3406[M]	27.3	80S	9.0	40S	3.9	20S	16	60S	*Sr13+*	*Lr23+10+1+*	*Yr2+*
11	DBW222 (C)	23.9	60S	5.8	40S	5.1	30S	20.2	60S	**	Seed?	Seed
12	DBW313[#]	12.4	40S	11.0	60S*	7.9	40S	12.9	40S	*Sr7b+*	*Lr13+10+*	*Yr2+*
13	HD2967 (C)	9	30S	5.8	40S	2.1	10S	35.6	60S	*Sr8a+11+2+*	*Lr23+*	*Yr2+*
14	PBW826	6.9	40MS	2.0	10S	12.3	40S	4.6	10MS	*Sr30+8a+*	*Lr23+*	*Yr2+*
15	RAJ4548[#]	6.3	20S	3.8	20S	7.2	20S	3.5	30MR	*Sr13+*	*Lr23+3+1+*	-
16	HD3354	15.3	40S	12.9	60S	5	20S	8.9	20S	*Sr13+11+2+*	R	*Yr2+*
17	WH1283	10.8	40MS	3.8	20MS	7.1	30S	4.5	60MR	*Sr13+*	*Lr23+10+*	*Yr2+*
18	HD3086 (C)	31.6	80S	19.6	60S	13.6	40S	8.7	40S	*Sr7b+2+*	*Lr23+10+3+*	*Yr2+*
19	JKW261	39.3	80S	8.3	40S	2.6	10MS	12.7	60S	*Sr11+*	*Lr23+13+*	-
20	WH1124 (C)	5	20MS	12.9	40S	13.7	40S	43.6	60S	-	*Lr13+10+3+*	*Yr2+*
20A	Infector	75	100S	82.9	100S	75.7	100S	67	90S			
21	PBW771 (C)	5.1	20MS	5.8	20S	3.6	10S	7.4	30S	*Sr31+2+*	*Lr26+23+1+*	*Yr9+*
22	HD3059 (C)	11	40MS	4.9	15MS	4	10S	26.3	60S	*Sr11+2+*	*Lr13+3+*	*Yr2+*
23	PBW834	16.3	40S	8.6	40S	8.6	40S	10.6	20S	*Sr30+11+*	*Lr13+1+*	*YrA+*
24	DBW173 (C)	3.8	10MS	3.4	20S	0.7	5S	2.8	10S	*Sr31+2+*	*Lr26+10+3+*	*Yr9+*
25	HUW838[#]*	9.1	40S	5.8	40S	1.6	5S	5.9	20S	R	*Lr13+10+3+*	*Yr2+*
26	NW7096	3.8	10S	11.0	40S	8	20S	14.1	60S	*Sr8a+5+*	*Lr23+*	*Yr2+*
27	DBW321	27.8	80S	18.0	60S	16.6	40S	7.7	60S	*Sr13+*	*Lr13+10+3+*	*YrA+*
28	K1910	6.1	40MR	5.4	30MS	4.6	10S	15.9	40S	R	*Lr13+1+*	*Yr2+*

S. No.	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		Postulated genes		
		ACI	HS	ACI	HS	ACI	HS	ACI	HS	*Sr*	*Lr*	*Yr*
29	HI1654	2.5	10MS	1.1	10MR	0.7	5S	4.1	20S	*Sr13+*	*Lr13+*	*Yr2+*
30	NIAW3170 (C)	3.6	10MS	3.5	10S	4.3	20S	19.5	40S	*Sr8a+2+*	*Lr13+10+1+*	-
31	PBW838	9.8	30S	6.7	20S	17.1	60S	6.7	40MS	*Sr11+*	*Lr13+10+*	*Yr2+*
32	DBW296*	3.8	20S	1.2	15MR	2.9	10S	2.4	20MR	*Sr13+*	*Lr23+13+10+*	-
33	HI1628 (C)	8	30MS	6.7	20S	2.9	20S	7.3	20S	*Sr2+*R	*Lr13+10+*	*Yr2+*
34	HD3369	6.3	20S	1.8	5S	3.6	20S	8.2	30S	*Sr13+*	*Lr13+*	-
35	WH1142 (C)	2.8	20MR	12.3	60S*	13.7	20S	6.7	20S	*Sr31+2+*	*Lr26+23+10+3+*	*Yr9+*
36	UP3062	5.5	60MR	11.7	60S*	7.1	20S	3.6	20S	*Sr31+*	*Lr26+10+3+*	*Yr9+*
37	HD3368	12.5	60S	6.6	40S	5.7	20S	2.2	10MS	*Sr7b+*	*Lr23+10+*	*Yr2+*
38	HD3043 (C)	5.8	20S	24.0	60S	22.6	60S	10.1	40S	*Sr31+2+*	*Lr26+23+*	*Yr9+A+*
39	PBW644 (C)	18.3	60S	23.1	80S	12.9	30S	8.9	20S	-	*Lr13+1+*	*Yr2+*
40	HI1653	13.5	60S	13.2	60S	5.9	20S	5.6	20S	*Sr7b+*	*Lr13+3+*	*Yr2+*
40A	Infector	77.5	100S	82.9	100S	74.3	100S	67	90S			
41	PBW848	11.8	60S	11.7	30S	12.9	60S	17.5	60S	*Sr9b+11+*	*Lr23+10+*	*Yr2+*
North Eastern Plain Zone (NEPZ)												
42	HD2733 (C)	4.8	10MS	16.9	30S	13.7	40S	40.6	60S	*Sr31+2+*	*Lr26+34+*	*Yr9+18+*
43	HD3249 (C)	9.1	40S	9.5	60S*	2.7	10S	7.3	30S	*Sr11+2+*	*Lr13+10+*	*Yr2+*
44	DBW187 (C)	6.2	20MS	6.7	30S	2.7	10S	4.7	20S	*Sr5+11+*	*Lr23+10+1+*	*Yr2+*
45	HD3406[M]	22	60S	6.7	30S	0.9	5S	15.5	60S	*Sr13+*	*Lr23+10+1+*	*Yr2+*
46	HD3411[M]	33.3	60S	14.5	30S	12.9	30S	11.6	40S	*Sr7b+*	*Lr13+*	*Yr2+*
47	DBW39 (C)	2.8	10S	8.6	50S*	2.9	20S	21.6	60S	*Sr31+2+*	*Lr26+23+10+*	*Yr9+*
48	HD2967 (C)	4.5	20S	4.3	20MS	2.2	5S	28	60S	*Sr8a+11+2+*	*Lr23+*	*Yr2+*
49	PBW826[#]	4.5	20MS	15.6	80S	5.8	30S	5	20MS	*Sr30+8a+*	*Lr23+*	*Yr2+*
50	HD3086 (C)	30.8	80S	21.3	60S	19.3	60S	9.5	40MS	*Sr7b+2+*	*Lr13+10+3+*	*Yr2+*
51	DBW317	6.3	20MS	20.0	60S	15	40S	7	40S	*Sr8a+5+*	*Lr13+10+1+*	-
52	DBW318	1.6	10MS	9.2	40S	4.3	20S	1.8	10S	R	*Lr23+*	*Yr2+*
53	PBW835	10.5	40MS	10.0	40S	3.4	15S	1	10S	R	R	Resistant
54	HI1563 (C)	2.1	20MR	2.4	20MS	4.3	20S	39.8	80S	*Sr24+2+*R	R + *Lr24+*	*Yr2+*
55	DBW107 (C)	2.1	10MS	10.6	60S	2.7	15S	13.4	60S	*Sr31+2+*	*Lr26+*	*Yr9+*
56	PBW834	13.8	60S	10.9	40S	5	20S	11.3	40S	*Sr30+11+*	*Lr13+1+*	*YrA+*
57	UP3060	0.8	5MS	1.5	15MR	3.5	15S	2.1	10S	*Sr13+7b+*	*Lr13+*	-
58	HD3118 (C)	24.9	60S	27.1	80S	24.3	60S	2.6	20S	*Sr9b+11+*	-	*Yr2+*

S. No.	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		Postulated genes		
		ACI	HS	ACI	HS	ACI	HS	ACI	HS	*Sr*	*Lr*	*Yr*
59	HI1621 (C)	14.6	40S	17.7	60S	12.3	40S	2.9	20S	*Sr28+*	-	*Yr2+*
60	DBW316	5.1	20MS	3.5	20S	5.1	20S	1.6	10MS	*Sr31+2+*	R+ *Lr26+*	*Yr9+A+*
60A	Infector	80	100S	77.1	100S	74.3	100S	67	90S			
61	PBW833	28.5	60S	6.2	20S	2.3	10S	6.4	40S	*Sr7b+*	R	*Yr2+*
62	HD3360	35.5	80S	21.5	60S	20	40S	5.9	20S	*Sr7b+*	*Lr13+10+3+*	*Yr2+*
63	HI1653	16	40S	12.6	60S	7.9	20S	6.3	20S	*Sr7b+*	*Lr13+3+*	*Yr2+*
64	DBW322	36.6	80S	21.3	80S	17.5	40S	15.2	40S	*Sr13+7b+*	*Lr13+1+*	*YrA+*
65	HI1612 (C)	22.8	60S	3.7	20MS	2.9	20S	12	40S	*Sr7b+2+*	*Lr23+*	*Yr2+*
66	DBW252 (C)	16.5	40S	4.4	20MS	5.9	20S	10.1	20S	*Sr8a+5+11+2+*	*Lr13+10+*	*Yr2+*
67	DBW321	26.3	80S	14.9	40S	16.7	40S	2.7	10S	*Sr13+*	*Lr13+10+3+*	*YrA+*
68	HD3368[#]	8.9	40MS	0.9	15MR	0.4	TS	3.3	10S	*Sr7b+*	*Lr23+10+*	*Yr2+*
69	HI1654	5.3	20MS	3.1	15MS	2.9	15S	3.6	20S	*Sr13+*	*Lr13+*	*Yr2+*
70	HD3293(I) (C)	18.3	60S	10.6	20S	10	40S	8.2	40S	*Sr13+2+*	*Lr13+10+*	*Yr2+*
71	WH1281	12.3	40S	8.9	40MS	15.7	60S	9	30S	*Sr8a+5+*	*Lr13+*	*Yr2+*
72	PBW848[#]	8	30MS	12.3	30MS	7.9	20S	9.5	40S	*Sr9b+11+*	*Lr23+10+*	*Yr2+*
73	HD3171 (C)	5.1	20MS	20.0	60S	14.3	60S	19.9	40S	*Sr11+7b+2+*	*Lr23+13+10+*	*Yr2+*
74	HD3369[#]	6.6	40S	3.2	40MR	6.1	40S	4.1	40MS	*Sr13+*	*Lr13+*	-
75	K1317 (C)	3.8	20MS	5.5	20MS	3	20S	8.1	40MS	R*	Seed?	seed
76	UP3062	4.6	10MS	9.5	20S	7.5	20S	5.2	40MS	*Sr31+*	*Lr26+10+3+*	*Yr9+*
Central Zone (CZ)												
77	HI8833(d)[M]	2.6	10MS	6.3	20S	2.9	10S	5.6	40S	R	*Lr23+*	-
78	GW322 (C)	8.3	30S	7.3	20MS	8.6	20S	36	60S	*Sr11+2+*	*Lr13+1+*	-
79	MP3535	3.1	20MS	4.9	20S	4.5	20S	44.7	60S	*Sr24+*	R+ *Lr24+*	*Yr2+*
80	GW523	9.3	60S*	4.0	20MS	5.1	20MS	37	60S	*Sr13+*	*Lr13+*	-
80A	Infector	82.5	100S	80.0	100S	72.9	100S	73	90S			
81	GW513*	3.3	10MS	3.2	20S	7.3	20S	52.5	80S	*Sr24+*	R+ *Lr24+*	-
82	HI1636*	3.3	10S	4.0	20MS	5.7	40S	40.8	60S	*Sr24+2+*	R+ *Lr24+*	-
83	HI8832(d)[M]	3.6	20S	4.5	20S	3.6	20MS	9.7	60S	*Sr30+8a+*	*Lr23+*	-
84	MACS6768	3.8	20MS	6.4	30S	4.1	20S	56	80S	*Sr31+*	R+ *Lr26+*	*Yr9+*
85	HI1544 (C)	5.3	30S	5.8	40MS	1.4	10S	53	80S	*Sr24+2+*	R+ *Lr24+*	-
86	HI1667[B]	4.5	20S	4.1	30MS	1.6	10S	56	80S	*Sr24+2+*	R+ *Lr24+*	-
87	HI8498(d) (C)	13.3	30S	14.0	60S	0.9	5S	2.4	10MS	*Sr11+2+*	*Lr23+*	-

S. No.	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		Postulated genes		
		ACI	HS	ACI	HS	ACI	HS	ACI	HS	*Sr*	*Lr*	*Yr*
88	HI8713(d) (C)	4.7	10S	6.8	20MS	1.4	10MS	6.4	40MS	*Sr9e+2+*	-	-
89	HI1650	2.8	10S	1.0	15MR	1.1	10MS	27.4	60S	R	R	-
90	MP4010 (C)	5.1	20S	15.8	80S	0.7	50S	44	60S	*Sr24+2+*	R+ *Lr24+*	*Yr2+*
91	HD2864 (C)	5.8	30MS	4.1	20MS	5	20S	43.6	60S	*Sr24+*	R+ *Lr24+*	*Yr2+*
92	MP3336 (C)	5.8	20S	11.7	40S	12.6	40S	39	60S	*Sr11+2+*	*Lr13+*	-
93	HD2932 (C)	8	20MS	24.9	40S	24.9	60S	40.8	60S	*Sr11+*	Seed?	*Yr2+*
94	HI1634(I) (C)	10.1	60S*	13.3	80S*	4	20S	35.6	60S	*Sr31+*	R+ *Lr26+*	*Yr9+*
95	HD3407^{M}	6	20MS	2.2	10MS	4	20S	1.6	10MS	R	R	Resistant
96	CG1029(I) (C)	2.8	10MS	0.5	5MR	16.7	60S	51.2	80S	*Sr24+2+*	R+ *Lr24+*	*Yr2+*
97	HI8823(d)*	3.5	15MS	0.9	10MR	2.1	5S	11.4	60S	*Sr11+2+*	-	-
98	GW528	1.8	10MS	3.2	20S	9.4	60S*	38.8	60S	R	R	*Yr2+*
99	DDW47(d) (C)	3.5	10S	7.7	30S	3.4	20S	3.8	15S	*Sr11+7b+2+*	R	-
100	DBW326	4.3	40MR	7.4	40S	2.1	5S	3.2	20MS	R	*Lr23+*	*Yr2+*
100A	Infector	77.5	100S	77.1	100S	77.1	100S	73	90S			
101	UAS475(d)	11.3	60S*	3.5	20MS	0.6	10MR	1.1	5MS	*Sr7b+*	R	*Yr2+*
102	HI8627(d) (C)	3.1	10MS	4.3	20S	0.5	5MR	9.1	60S	*Sr9e+2+*	*Lr13+*	-
103	NIAW3851	14.5	40S	4.1	20MS	0.4	5MR	10.8	40S	*Sr13+2+*	*Lr23+10+*	*Yr2+*
104	HI8830(d)	2.5	10MS	2.4	10S	2.3	10S	8.7	40MS	*Sr7b+2+*	-	-
105	CG1036	1.8	10MS	1.5	15MR	4.1	15S	51.5	60S	*Sr7b+*	-	-
106	HI1655	1.3	10MS	1.0	10MR	0	0	25.3	60S	R	*Lr13+10+1+*	*Yr2+*
107	DBW110 (C)	8.3	40MS	2.9	20MS	11.7	40S	24.8	60S	R	*Lr23+10+*	*Yr2+*
108	MP3288 (C)	2.8	20MR	2.7	20MS	2.1	10S	26	60S	*Sr24+2+*	R+ *Lr24+*	-
109	DDW55(d)	7.8	20S	1.8	20MR	0.4	5MR	17.4	60S	*Sr7b+2+*	R	-
Peninsular Zone (PZ)												
110	WHD965(d)	4.1	20MS	1.9	10MS	0.9	5MS	2.9	20MR	*Sr7b+2+*	R	-
111	UAS428(d) (C)	4.5	20S	7.1	40MS	4.1	20MS	2	5S	*Sr7b+2+*	*Lr23+*	*Yr2+*
112	HI8826(d)	2.1	10MS	6.0	20S	0.8	5S	11.6	60S	*Sr7b+2+*	-	-
113	MACS4100(d)	6.5	20S	5.7	30MS	0.2	TS	8.8	60S	-	-	-
114	MACS3949(d) (C)	7	20S	4.9	20S	0.5	5MR	2.7	20MR	*Sr7b+2+*	R	-
115	DDW53(d)	14	40S	5.3	20MS	1.2	10MS	2.5	20MR	*Sr7b+2+*	-	*Yr2+*
116	NIDW1345(d)	6.6	20MS	5.9	20S	3.9	10MS	3.1	20MR	*Sr7b+2+*	-	-
117	MACS6222 (C)	4.6	10MS	4.0	20MS	3.1	20S	18.7	60S	*Sr24+2+*	R+ *Lr24+*	*Yr2+*

S. No.	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		Postulated genes		
		ACI	HS	ACI	HS	ACI	HS	ACI	HS	*Sr*	*Lr*	*Yr*
118	MACS4106(d)	6	20MS	7.1	40MS	1.3	10MS	9.4	40S	*Sr7b+2+*	-	*Yr2+*
119	NIDW1348(d)	16.5	60S	5.3	20S	3	10S	9.7	40S	*Sr7b+2+*	-	-
120	HI8828(d)	3.1	10MS	2.5	20MR	0.9	5S	3.4	10S	-	*Lr23+*	*Yr2+*
120A	Infector	77.5	100S	80.0	100S	72.9	100S	67	90S			
121	GW322 (C)	9.3	40MS	5.7	20S	12.2	40S	36.4	60S	*Sr11+2+*	*Lr13+1+*	-
122	HI8827(d)	3.8	10MS	6.3	20S	1.3	5S	9.6	40S	-	*Lr23+*	-
123	DDW48(d)(I) (C)	13	40MS	3.9	10MS	3.1	15S	3.2	10S	*Sr7b+2+*	-	*Yr2+*
124	HD3090 (C)	4.8	10S	5.1	20S	3.3	15S	37.4	60S	*Sr31+2+*	R+ *Lr26+*	*Yr9+*
125	HI1633(I) (C)	1.9	10MS	1.0	15MR	0.2	TS	32.3	60S	*Sr31+*	R+ *Lr26+*	*Yr9+*
126	HD2932 (C)	14.3	60S	28.3	80S	18.6	60S	39.8	60S	*Sr11+*	Seed?	*Yr2+*
127	RAJ4083 (C)	6.3	30S	7.3	20MS	10.1	40S	20.8	60S	*Sr11+*	*Lr13+*	*Yr2+*
128	DBW320	13.8	60S	15.7	80S	13.1	40S	8.9	40S	*Sr30+8a+*	*Lr10+1+*	-
129	MACS6774	14.5	40S	8.7	40S	8.9	40S	37.6	60S	*Sr13+*	*Lr13+*	-
130	NWS2180[#]	17.8	60S	5.7	20S	0.8	5S	11.2	40S	*Sr13+2+*	*Lr13+10+1+*	-
131	HI1651	2.1	10MS	4.0	20S	3.6	10S	36.8	60S	*Sr24+*	R+ *Lr24+*	-
132	MP1358*	8.5	30MS	6.1	40S	1.7	10S	9.5	40S	*Sr11+*	*Lr23+10+*	-
133	MACS6755	7.3	40MS	10.5	60MS	4.5	10S	36.8	60S	R	R	-
134	HI1605 (C)	15.6	60S	20.3	80S	12.9	60S	17.4	40S	*Sr11+*	*Lr13+*	*Yr2+*
135	MACS6753	4.5	40MR	2.7	20MS	8.4	20S	40.6	80S	*Sr24+2+*	R+ *Lr24+*	-
136	AKDW2997-16(d)(C)	21.8	60S	11.5	60S	4.1	20S	7.9	40S	*Sr7b+2+*	*Lr23+*	-
137	NIDW1149(d)(I)(C)	4.8	20MS	3.2	20MS	0.7	5S	0.7	10MR	*Sr11+2+*	*Lr23+10+*	-
138	NIAW3170 (C)	5.7	20S	2.7	10MS	1.3	5S	20.3	60S	*Sr8a+2+*	*Lr13+10+1+*	-
139	UAS446(d) (C)	5.5	40MR	3.5	20MS	1.3	5S	1	10MR	-	R	-
140	DBW325	22.8	60S	1.5	20MR	1.6	5S	5.8	20S	*Sr13+11+*	*Lr23+1+*	*Yr2+*
140A	Infector	80	100S	77.1	100S	72.9	100S	69	90S			
141	UAS3014	18.3	40S	6.3	30MS	5	10S	8.2	20S	*Sr11+*	*Lr23+13+10+*	-
SPL – Dicoccum												
142	MACS5058	4.5	20MS	1.5	10MS	4	20S	23.7	60S	*Sr7b+*	-	*Yr2+*
143	MACS6222(*a*) (C)	3.2	10MS	4.3	20S	1.7	10S	16	60S	*Sr24+*	R+ *Lr24+*	*Yr2+*
144	DDK1029 (C)	3.3	20MS	5.8	40S	2.7	10S	18.5	60S	*Sr11+2+*	*Lr13+*	-
145	DDK1061	5.6	20S	2.9	20S	5.7	20S	25.2	60S	*Sr11+*	-	-
146	HW1098 (C)	4.4	30S	1.2	10MS	1.5	10S	18.8	60S	*Sr11+2+*	-	*Yr2+*

S. No.	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		Postulated genes		
		ACI	HS	ACI	HS	ACI	HS	ACI	HS	*Sr*	*Lr*	*Yr*
147	MACS5057	9.1	40S	2.4	20MS	3	10S	31.7	60S	*Sr11+*	-	*Yr2+*
148	DDK1060	7.3	30S	2.9	20S	2.9	10S	19.6	60S	*Sr11+*	-	-
SPL – HYPT												
149	DBW328*	12.2	40MS	5.5	20S	0.7	5S	6.1	40S	*Sr5+11+*	*Lr23+10+1+*	*Yr2+*
150	DBW372	19.8	60S	11.7	60S*	2.9	10S	13.3	40S	*Sr28+*	*Lr23+1+*	-
151	DBW370	36	80S	9.6	60S*	8.6	40S	6.3	20MS	*Sr7b+*	*Lr13+1+*	*Yr2+*
152	DBW327*	5.3	20MS	6.0	20MS	5.7	20S	10	60S	*Sr5+13+*	*Lr23+1+*	*Yr2+*
153	WH1252*	12.5	20S	4.7	30MS	2.9	10S	6.8	60S*	*Sr9e+7b+*	*Lr13+*	*Yr2+*
154	PBW874	23.3	60S	6.4	20S	2.4	10S	0.1	TS	*Sr30+8a+2+*	*Lr28+*	Resistant
155	HD3410	6.8	20S	0.9	15MR	1.1	10MS	1.8	5S	*Sr30+8a+2+*	R	*Yr2+*
156	DBW332*	20	60S	7.4	40S	1.6	10S	7.1	20S	*Sr30+8a+*	*Lr13+10+*	*YrA+*
157	PBW873	33.3	80S	15.8	80S	3.3	10S	5.1	40S	*Sr30+*	*Lr23+10+*	-
158	DBW371	26.5	80S	11.5	60S	0.7	5S	8.2	60S*	*Sr8a+5+*	*Lr23+1+*	*Yr2+*
159	HD3086 (C)	37	80S	18.6	60S	18.6	60S	8.7	60S*	*Sr7b+2+*	*Lr13+10+3+*	*Yr2+*
160	DBW333*	25.5	80S	12.9	60S	4.3	15S	7.3	60S*	*Sr28+11+2+*	*Lr13+10+1+*	*Yr2+*
160A	Infector	80	100S	80.0	100S	72.9	100S	69	90S			
161	PBW872	9.7	40MS	4.0	30MS	5.1	20S	14.7	60S	R	*Lr23+10+*	*Yr2+*
162	DBW187(I) (C)	8	20S	1.0	15MR	1.6	10S	5.9	40S	*Sr5+11+*	*Lr*23+10+1+	*Yr2+*
163	WH1270(I) (C)	4.3	20S	0.9	15MR	2.9	20S	2.1	10MS	*Sr13+*	*Lr23+*	*Yr2+*
164	DBW303(I) (C)	5.6	20MS	2.3	15MS	1.6	10S	4	20MS	R	*Lr13+*	*Yr2+*
SPL - CI – HYT												
165	HD3412	28.3	80S	14.4	60S	0.6	5MS	1.8	10MS	*Sr8a+5+*	*Lr23+10+*	Resistant
166	DBW375	22.5	60S	7.5	40S	1.4	10S	4.5	20MS	*Sr7b+*	R	*Yr2+*
167	DBW374	25.5	80S	20.9	80S	2.1	10S	5.4	40S	R	*Lr13+10+1+*	*Yr2+*
168	HD3403	14.3	40S	14.6	30S	15.7	60S	12.1	40S	*Sr8a+11+*	*Lr13+*	*Yr2+*
169	WH1406	8.1	40MS	7.3	40MS	5.8	20S	10.4	40S	R	*Lr13+1+*	*Yr2+*
170	HD3413	7.6	40MS	7.2	20S	4.3	20S	2	10S	R	-	Resistant
171	PBW867	6.5	20S	0.9	15MR	0.2	TS	0	R	R	R	Resistant
172	UP3096	7.1	20S	1.5	15MR	1	5S	11.4	40S	R	*Lr13+*	*YrA+*
173	WH1404	3	10MS	8.3	40MS	3.9	10S	20	60S	R	*Lr13+*	*Yr2+*
174	PBW868	4.5	20MS	10.9	20S	5.1	10S	11.4	20S	R	*Lr13+10+*	*Yr2+*
175	DBW318	5.1	40MS	6.4	40S	0	0	2	10MS	R	*Lr23+*	*Yr2+*

S. No.	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		Postulated genes		
		ACI	HS	ACI	HS	ACI	HS	ACI	HS	*Sr*	*Lr*	*Yr*
176	DBW378	16	60S	8.9	60S	0	0	6.5	20MS	R	*Lr23+1+*	*Yr2+*
177	WH1405	15.7	40S	18.0	60S	3	10S	1.1	5MS	*Sr11+*	*Lr13+10+*	*Yr2+*
178	HD3405	10.7	40MS	8.6	30MS	3.1	10S	5.6	20S	*Sr8a+5+*	*Lr13+1+*	*YrA+*
179	DBW377	11.5	40MS	4.3	30S	2.9	20S	3.1	20MR	R	*Lr23+1+*	*Yr2+*
180	PBW869	13.5	40S	4.7	40MS	0	TR	4.8	40S	*Sr8a+5+*	*R*	Resistant
180A	Infector	77.5	100S	77.1	100S	72.9	100S	69	90S			
181	PBW871	10.8	40MS	7.0	40S	6.1	20S	7.4	20MS	*Sr9b+11+*	*Lr13+1+*	*Yr2+*
182	HD3086 (C)	35.5	80S	17.7	60S	13.1	40S	7.6	40S	*Sr7b+2+*	*Lr13+10+3+*	*Yr2+*
183	DBW376	35	80S	17.7	60S	3	10S	2.3	10S	*Sr7b+*	*Lr13+10+*	Resistant
184	DBW373	20.9	60S	15.5	60S	13.6	60S	6.9	40S	*Sr11+*	*Lr13+*	*Yr2+*
185	HD3404	12.9	40MS	15.7	60S	5	20S	11.9	60S	*Sr30+*	*Lr13+10+*	-
186	DBW187(I) (C)	8.8	20S	5.3	40MS	0.8	5S	7.1	40S	*Sr5+11+*	*Lr23+10+1+*	*Yr2+*
187	WH1407	18.3	60S	4.6	50MR	4.3	20S	5.6	40S	*Sr8a+5+*	*Lr13+10+1+*	-
188	PBW870	4.4	20MS	3.8	20MS	2.6	10MS	1.9	10S	R	*Lr13+1+*	*Yr2+*
189	UP3095	2.8	10MS	2.9	50MR	2.2	15S	28.7	60S	*Sr24+2+*	R+ *Lr24+*	-
SPL – AST												
190	DBW368	10.5	40MS	2.3	10MS	0	TR	8	40MS	*Sr11+*	*Lr13+*	*Yr2+*
191	DBW363	17.6	60MS	8.6	40MS	0.7	5S	9.6	40S	*Sr30+8a+*	*Lr13+10+1+*	*Yr2+*
192	DBW369	17	40S	26.6	60S	6.4	40S	14.9	60S	*Sr8a+11+*	-	-
193	DBW367	13.3	60MS	25.5	80S	7.1	20S	26.8	60S	*Sr11+2+*	*Lr13+*	*Yr2+*
194	DBW364	8.6	40MS	15.2	60S	5	15S	14.6	40S	R	*Lr13+1+*	*Yr2+*
195	Kharchia 65 (C)	39	80S	54.0	80S	28.6	70S	65	80S	-	-	-
196	DBW366	27.4	60S	18.3	80S	4.3	10S	8.9	60S	*Sr30+8a+*	*R*	*YrA+*
197	KRL210 (C)	38.5	80S	24.6	80S	18	40S	6.9	60S*	*Sr7b+2+*	*Lr13+*	*Yr2+*
198	DBW365	27	80S	17.4	60S	5.7	40S	7.6	60S	*Sr8a+*	*Lr* 13+10+	*Yr2+*
199	K1805	12	40S	9.5	40MS	0.7	5S	2.4	20MS	*Sr8a+11+*	*Lr23+10+*	*Yr2+*
200	KRL19 (C)	16.9	80S	31.3	80S	13.2	40S	42.6	60S	*Sr8b+9b+11+2+*	*Lr13+*	-
200A	Infector	80	100S	82.9	100S	75.7	100S	69	90S			

Abbreviations: ACI = Average Coefficient of Infection, HS = Highest Score, Avg. = Mean, Leaf rust (S) = Leaf rust (South), Leaf rust (N) = Leaf rust (North), *Indicates high rust score (more than 40S) at one location only, *Sr* = Stem rust resistance genes, *Lr* = Leaf rust resistance genes, *Yr* = stem rust resistance genes.

Table 1.3. Performance of AVTs entries against different diseases under multilocation testing during 2020-21

S. No.	Entry	LB (dd)		KB (%)		PM (0-9)		FS (%)		FHB (0-5)	FR (%)	LS (%)		HB (%)	
		AV	HS	AV	HS	AV	HS	AV	HS	HS	HS	AV	HS	AV	HS
North Hill Zone (NHZ)															
1	VL2041	23	57	8.3	19.4	3	7	2.1	6.3	4	35.0			11.1	20.0
2	HS562 (C)	24	47	11.1	32.3	4	9	1.8	5.5	4	55.0	26.5	35	11.4	16.4
3	HPW349 (C)	35	79	14.2	58.5	4	9	4.5	5.7	4	0.0	25.2	41.2	10.8	13.8
4	HS507 (C)	35	79	4.7	8.6	4	9	5.5	7.5	3	75.0	26.7	46.7	8.5	15.6
5	VL907 (C)	24	58	13.2	34.4	4	9	2.2	6.6	3	0.0	31.1	35	6.1	12.3
North Western Plain Zone (NWPZ)															
6	WH1105 (C)	46	79	12.9	32.1	4	9	1.9	5.8	4	0.0	48.8	85		
7	DBW187 (C)	46	78	11.1	38.9	3	9	6.1	7.6	5	35.0	27.9	38.2		
8	HD3349	46	78	11.0	28.8	3	7	13.7	20.0	4	0.0				
9	PBW876[B]	46	78	8.9	18.8	3	7	3.8	9.3	4	60.0				
10	HD3406[M]	35	57	5.4	10.0	3	7	3.3	10.0	3	35.0				
11	DBW222 (C)	35	58	5.3	9.5	4	9	6.0	9.6	4	60.0	19	76		
12	DBW313[#]	35	56	3.4	7.2	3	7	4.6	9.3	4	30.0				
13	HD2967 (C)	24	57	19.6	84.8	4	9	1.8	5.5	5	50.0	29.6	46.6		
14	PBW826	45	68	6.8	8.2	4	7	2.5	7.5	4	80.0				
15	RAJ4548[#]	46	78	11.7	37.0	5	9	5.5	8.3	4	55.0				
16	HD3354	46	78	7.7	10.8	4	9	4.3	9.6	4	45.0				
17	WH1283	45	78	4.4	11.1	4	9	3.7	11.1	5	25.0				
18	HD3086 (C)	46	79	7.6	18.8	4	7	17.5	25.0	4	50.0	18.3	73.3		
19	JKW261	35	67	5.2	11.4	5	7	7.8	11.1	4	90.0				
20	WH1124 (C)	45	78	8.0	12.2	4	9	4.2	12.5	4	70.0	10.7	42.7		
20A	Infector	68	99	16.1	19.3	8	9	35.0	45.3	5	-				
21	PBW771 (C)	46	89	9.3	19.4	6	9	17.7	28.6	4	10.0	20.9	45		
22	HD3059 (C)	36	89	8.5	21.6	5	9	3.8	8.3	4	40.0	24.3	35		
23	PBW834	35	57	3.4	5.6	5	7	3.2	9.6	4	50.0				
24	DBW173 (C)	46	89	6.0	9.0	5	9	4.8	6.7	4	30.0				
25	HUW838[#]*	46	89	4.1	7.1	4	7	2.2	6.6	4	31.3	19.4	28		
26	NW7096	35	67	7.4	15.7	5	9	3.2	8.3	4	30.0				
27	DBW321	36	69	3.4	9.3	5	9	3.2	9.6	4	50.0				
28	K1910	36	78	2.3	5.6	6	8	3.6	7.5	4	40.0				

S. No.	Entry	LB (dd)		KB (%)		PM (0-9)		FS (%)		FHB (0-5)	FR (%)	LS (%)		HB (%)	
		AV	HS	AV	HS	AV	HS	AV	HS	HS	HS	AV	HS	AV	HS
29	HI1654	36	89	3.5	6.6	5	9	3.1	9.3	5	12.5				
30	NIAW3170 (C)	45	77	4.4	9.3	5	7	5.4	8.3	5	40.0	44.5	70		
31	PBW838	36	78	3.0	7.2	5	9	3.7	11.1	4	40.0				
32	DBW296*	35	78	3.6	6.2	4	6	5.5	16.6	4	60.0	33.7	50		
33	HI1628 (C)	46	78	8.7	22.9	5	7	4.2	12.5	5	50.0	40.1	85.4		
34	HD3369	36	89	2.8	6.6	4	9	8.4	18.3	4	50.0				
35	WH1142 (C)	46	89	3.6	5.5	5	7	3.1	6.2	5	65.0	30.5	66.6		
36	UP3062	35	78	2.1	6.7	4	9	4.2	12.5	4	55.0				
37	HD3368	45	78	7.5	15.8	6	9	2.8	8.3	4	35.0				
38	HD3043 (C)	35	55	4.7	6.6	4	7	3.7	11.1	4	0.0	23.6	31.5		
39	PBW644 (C)	34	57	5.0	10.0	5	9	6.9	8.3	4	0.0	20.7	33.5		
40	HI1653	46	89	22.6	90.0	4	7	4.6	9.6	4	50.0				
40A	Infector	67	99	15.7	24.5	7	9	38.5	44.6	5	-				
41	PBW848	35	67	9.0	22.0	5	9	3.1	9.3	5	60.0				
North Eastern Plain Zone (NEPZ)															
42	HD2733 (C)	46	89	2.8	9.3	5	9	3.8	8.2	11	55.0	42.7	75		
43	HD3249 (C)	46	79	10.7	20.0	4	9	4.5	7.0	3	40.0	17.2	28.2		
44	DBW187 (C)	46	79	14.2	38.2	5	7	2.2	6.6	4	90.0	27.5	55		
45	HD3406[M]	35	57	4.9	8.9	4	9	5.8	6.9	3	75.0				
46	HD3411[M]	46	89	5.8	12.5	5	9	12.0	15.0	4	90.0				
47	DBW39 (C)	35	67	3.2	9.3	4	7	9.2	18.2	4	70.0	27.2	58.3		
48	HD2967 (C)	35	56	5.8	11.1	5	9	2.5	7.5	5	30.0	29.6	46.6		
49	PBW826[#]	36	78	14.1	25.4	5	9	7.0	8.3	4	30.0				
50	HD3086 (C)	46	89	5.0	12.1	5	9	2.8	5.0	5	85.0	18.3	73.3		
51	DBW317	35	67	3.7	10.0	4	7	2.2	6.6	5	35.0				
52	DBW318	35	67	8.8	13.4	4	7	4.4	8.3	5	85.0				
53	PBW835	56	99	10.4	28.7	5	9	11.6	14.2	4	50.0				
54	HI1563 (C)	57	99	12.2	32.1	6	9	18.6	28.6	5	75.0				
55	DBW107 (C)	46	89	14.5	58.6	6	9	4.1	8.3	4	55.0				
56	PBW834	35	68	4.7	12.9	5	9	3.7	11.1	4	85.0				
57	UP3060	45	78	2.6	9.3	5	7	4.5	11.1	5	45.0				
58	HD3118 (C)	46	78	3.2	10.0	5	9	2.8	8.3	4	45.0				

S. No.	Entry	LB (dd)		KB (%)		PM (0-9)		FS (%)		FHB (0-5)	FR (%)	LS (%)		HB (%)	
		AV	HS	AV	HS	AV	HS	AV	HS	HS	HS	AV	HS	AV	HS
59	HI1621 (C)	35	77	4.9	11.1	5	9	2.2	6.6	5	0.0				
60	DBW316	35	89	13.1	40.7	3	7	2.9	5.0	5	0.0				
60A	Infector	78	99	18.5	24.6	7	9	37.0	43.9	5	-				
61	PBW833	35	78	3.1	11.1	4	7	14.7	36.5	5	95.0				
62	HD3360	45	79	4.2	10.0	5	9	2.8	8.3	5	0.0				
63	HI1653	45	79	10.4	37.3	5	9	2.2	5.0	4	50.0				
64	DBW322	56	89	9.3	17.5	3	7	2.2	6.6	4	80.0				
65	HI1612 (C)	35	67	3.2	13.3	4	9	4.1	6.6	5	95.0	21.8	42.5		
66	DBW252 (C)	35	78	4.2	14.2	4	9	22.7	42.4	4	85.0	31.6	40		
67	DBW321	34	67	7.6	18.2	4	7	11.9	18.2	5	95.0				
68	HD3368[#]	35	68	10.3	38.9	4	9	8.9	14.3	5	55.0				
69	HI1654	35	78	4.1	8.2	4	9	7.7	9.0	4	60.0				
70	HD3293(I) (C)	35	78	8.3	21.8	4	9	2.5	7.5	5	60.0	27.1	35		
71	WH1281	46	68	5.7	14.1	5	9	4.1	8.6	5	70.0				
72	PBW848[#]	46	68	14.7	30.0	5	9	2.9	8.6	5	65.0				
73	HD3171 (C)	35	79	11.2	27.4	4	9	4.0	9.3	5	20.0	29.3	53.3		
74	HD3369[#]	46	89	4.1	7.5	3	9	2.9	8.6	4	20.0				
75	K1317 (C)	46	89	3.3	12.5	4	9	2.5	7.5	5	80.0	37.3	64.6		
76	UP3062	46	89	3.4	10.0	4	7	3.0	7.2	4	75.0				
Central Zone (CZ)															
77	HI8833(d)[M]	56	99	3.2	9.1	5	9	3.3	8.1	4	33.3				
78	GW322 (C)	46	79	4.8	8.5	6	9	8.6	9.7	5	35.0	14.3	22.2		
79	MP3535	46	68	6.2	8.3	6	9	4.0	9.3	5	40.0				
80	GW523	46	78	9.2	25.0	4	9	9.8	16.7	4	20.0				
80A	Infector	78	99	17.2	26.6	7	9	36.6	42.9	5	-				
81	GW513*	57	99	6.5	12.5	5	9	12.4	20.0	5	68.8				
82	HI1636*	46	89	14.7	29.2	6	9	9.1	12.5	4	33.3				
83	HI8832(d)[M]	46	78	6.6	11.1	5	9	1.3	3.8	5	75.0				
84	MACS6768	56	99	11.5	36.0	7	9	2.8	8.3	4	65.0				
85	HI1544 (C)	56	99	21.8	64.5	5	9	21.4	33.9	4	70.0	40.2	54.8		
86	HI1667[B]	46	79	17.5	42.0	6	9	15.3	22.2	4	35.0				
87	HI8498(d) (C)	46	68	3.8	11.1	5	9	0.0	0.0	5	60.0				

S. No.	Entry	LB (dd)		KB (%)		PM (0-9)		FS (%)		FHB (0-5)	FR (%)	LS (%)		HB (%)	
		AV	HS	AV	HS	AV	HS	AV	HS	HS	HS	AV	HS	AV	HS
88	HI8713(d) (C)	46	89	6.3	15.7	5	9	0.6	1.7	3	65.0				
89	HI1650	57	89	7.1	23.7	5	9	10.9	16.6	4	65.0				
90	MP4010 (C)	57	99	18.5	46.1	5	9	4.2	8.3	5	75.0				
91	HD2864 (C)	56	79	9.7	22.0	6	9	3.1	9.3	4	75.0				
92	MP3336 (C)	56	99	6.1	15.2	6	9	12.7	17.7	5	50.0	26.3	52.2		
93	HD2932 (C)	36	79	3.1	9.3	5	9	2.8	8.3	5	70.0	7.4	24		
94	HI1634(I) (C)	46	79	8.9	21.3	6	9	4.2	12.5	5	80.0	24.9	35		
95	HD3407^{M}	47	89	11.7	24.4	6	9	6.6	10.3	3	60.0				
96	CG1029(I) (C)	46	89	4.6	12.5	6	9	4.1	7.8	3	80.0	19.3	45		
97	HI8823(d)*	46	89	3.4	7.5	5	9	5.7	11.1	5	60.0				
98	GW528	46	89	7.4	17.3	5	9	1.5	4.5	4	60.0				
99	DDW47(d) (C)	46	99	3.2	8.0	4	7	1.4	4.3	4	58.3	11	22.2		
100	DBW326	56	99	7.7	12.5	5	7	3.3	10.0	3	70.0				
100A	Infector	67	99	17.5	24.0	7	9	35.7	45.6	5	-				
101	UAS475(d)	46	89	1.9	6.6	4	7	1.8	5.5	4	50.0				
102	HI8627(d) (C)	46	79	2.1	5.0	3	7	1.5	4.5	5	50.0	28.7	46.6		
103	NIAW3851	45	78	7.2	11.4	4	7	2.8	8.3	4	0.0				
104	HI8830(d)	46	79	4.6	11.7	6	9	0.4	1.1	4	18.8				
105	CG1036	46	89	4.9	8.7	5	9	5.2	12.5	5	25.0				
106	HI1655	46	79	7.2	17.7	5	9	11.4	16.1	3	55.0				
107	DBW110 (C)	46	79	4.0	10.0	4	9	3.9	7.3	3	65.0	18	43.8		
108	MP3288 (C)	46	78	6.5	10.8	4	7	7.3	9.1	4	10.0	7.2	26.6		
109	DDW55(d)	46	78	1.0	5.0	4	9	0.0	0.0	4	40.0				
Peninsular Zone (PZ)															
110	WHD965(d)	36	78	3.9	11.1	4	7	0.0	0.0	5	12.5				
111	UAS428(d) (C)	35	89	1.5	4.0	4	9	5.0	15.0	4	65.0				
112	HI8826(d)	46	89	1.3	4.2	6	9	0.0	0.0	4	70.0				
113	MACS4100(d)	46	78	2.3	8.0	4	7	0.0	0.0	3	70.0				
114	MACS3949(d) (C)	46	69	3.2	12.5	5	7	1.4	4.3	3	0.0	3.8	15		
115	DDW53(d)	35	89	2.9	11.1	6	9	1.2	3.5	5	20.0				
116	NIDW1345(d)	46	68	6.4	15.0	4	5	1.2	3.6	4	30.0				
117	MACS6222 (C)	45	78	6.0	13.3	7	9	1.9	5.6	4	85.0	4.4	16.6		

S. No.	Entry	LB (dd)		KB (%)		PM (0-9)		FS (%)		FHB (0-5)	FR (%)	LS (%)		HB (%)	
		AV	HS	AV	HS	AV	HS	AV	HS	HS	HS	AV	HS	AV	HS
118	MACS4106(d)	57	99	1.0	5.0	6	9	0.5	1.5	3	80.0				
119	NIDW1348(d)	46	89	3.3	6.7	5	7	0.4	1.3	5	0.0				
120	HI8828(d)	46	89	4.8	13.3	5	9	2.0	6.0	4	33.3				
120A	Infector	67	99	18.3	32.5	7	9	35.6	46.6	5	-				
121	GW322 (C)	45	78	9.2	18.2	6	9	9.7	14.9	5	66.7	14.4	22.2		
122	HI8827(d)	46	78	8.3	25.0	6	9	0.0	0.0	5	41.7				
123	DDW48(d)(I) (C)	35	78	3.0	7.5	6	9	0.0	0.0	5	83.3	15.1	34.1		
124	HD3090 (C)	46	79	20.6	94.4	5	9	5.9	8.3	5	33.3	3.7	11.1		
125	HI1633(I) (C)	46	78	9.1	25.1	5	9	3.4	7.5	5	16.7	18.4	42.7		
126	HD2932 (C)	46	89	2.4	5.0	4	9	7.5	8.3	4	0.0	7.4	24		
127	RAJ4083 (C)	46	89	16.7	54.5	5	9	2.2	6.6	5	20.0	6.3	12.5		
128	DBW320	45	89	8.1	19.2	6	9	2.8	8.3	4	66.7				
129	MACS6774	46	89	3.0	8.2	5	9	5.6	11.7	5	0.0				
130	NWS2180[#]	35	78	4.0	7.6	4	7	3.8	6.1	4	75.0				
131	HI1651	56	89	8.7	18.0	6	9	12.1	18.3	5	0.0				
132	MP1358*	46	89	10.4	26.2	4	7	6.2	12.5	4	0.0				
133	MACS6755	56	79	24.1	69.0	6	9	10.9	16.6	5	12.5				
134	HI1605 (C)	36	78	8.0	18.8	6	9	4.9	11.1	4	25.0	39.9	83.3		
135	MACS6753	46	89	6.3	16.4	7	9	4.2	12.5	4	45.0				
136	AKDW2997-16(d)(C)	57	89	4.2	11.1	5	9	2.8	8.3	4	45.0				
137	NIDW1149(d)(I)(C)	57	89	4.1	13.3	5	9	0.0	0.0	5	31.3	25.4	45.1		
138	NIAW3170 (C)	46	78	7.4	21.9	4	7	2.2	6.6	3	70.0	47.9	70		
139	UAS446(d) (C)	46	58	1.7	4.5	4	7	0.0	0.0	4	0.0	22.8	61.7		
140	DBW325	46	79	3.8	8.3	4	5	1.7	5.0	5	8.3				
140A	Infector	67	99	17.3	24.0	7	9	33.8	39.0	5	-				
141	UAS3014	46	78	5.3	11.1	5	9	3.4	6.6	4	75.0				
SPL – Dicoccum															
142	MACS5058	46	89	5.6	19.7	6	9	2.1	6.3	3	20.0				
143	MACS6222(*a*) (C)	46	78	11.4	28.4	6	9	2.4	5.0	3	90.0	23.8	53.3		
144	DDK1029 (C)	46	79	9.2	26.1	5	9	2.2	6.6	3	35.0	28.2	45		
145	DDK1061	35	78	12.8	32.0	5	9	1.3	4.0	3	35.0				
146	HW1098 (C)	35	79	9.9	37.1	4	9	1.3	4.0	3	0.0	20.1	44.5		

S. No.	Entry	LB (dd)		KB (%)		PM (0-9)		FS (%)		FHB (0-5)	FR (%)	LS (%)		HB (%)	
		AV	HS	AV	HS	AV	HS	AV	HS	HS	HS	AV	HS	AV	HS
147	MACS5057	35	77	5.4	16.9	5	9	1.7	5.0	1	0.0				
148	DDK1060	46	89	6.1	22.3	4	9	1.1	3.3	2	50.0				
SPL – HYPT															
149	DBW328*	45	78	16.1	59.1	5	9	1.3	4.0	4	80.0				
150	DBW372	35	79	4.9	9.5	3	7	4.6	5.0	4	85.0				
151	DBW370	46	79	6.0	11.9	3	7	1.1	3.3	3	58.3				
152	DBW327*	35	78	4.5	9.3	4	9	1.2	2.5	4	60.0				
153	WH1252*	46	68	5.3	12.6	3	7	1.7	5.0	4	20.0				
154	PBW874	46	78	5.8	14.2	2	5	7.0	8.0	4	0.0				
155	HD3410	46	68	3.3	10.0	4	7	1.7	2.7	4	12.5				
156	DBW332*	36	78	6.1	12.7	4	9	1.7	5.0	4	50.0				
157	PBW873	35	68	4.4	8.1	3	9	1.2	3.5	5	83.3				
158	DBW371	46	78	4.2	6.7	3	7	0.0	0.0	5	18.8				
159	HD3086 (C)	46	89	3.6	11.1	4	9	0.0	0.0	4	35.0	19.6	42.2		
160	DBW333*	45	79	9.7	23.4	5	9	3.3	5.8	5	70.0				
160A	Infector	78	99	16.6	22.2	7	9	35.4	42.4	5	-				
161	PBW872	36	89	6.3	13.5	5	9	1.2	3.5	4	95.0				
162	DBW187(I) (C)	46	89	7.8	21.5	4	9	0.0	0.0	4	90.0	27.9	38.2		
163	WH1270(I) (C)	35	67	8.2	23.8	4	9	3.9	5.1	5	80.0				
164	DBW303(I) (C)	35	78	10.7	34.2	4	9	0.8	2.5	4	85.0				
SPL - CI – HYT															
165	HD3412	35	78	4.8	11.1	5	9	1.2	3.5	4	50.0				
166	DBW375	35	78	7.1	22.1	3	7	1.3	2.2	4	95.0				
167	DBW374	34	56	3.9	14.2	3	5	2.0	3.5	5	50.0				
168	HD3403	46	78	6.5	20.2	4	9	0.5	1.5	4	75.0				
169	WH1406	35	78	3.6	14.2	3	9	2.2	6.6	4	80.0				
170	HD3413	45	89	3.5	8.3	4	9	12.8	28.3	5	80.0				
171	PBW867	46	77	3.5	8.2	3	9	12.7	29.6	5	80.0				
172	UP3096	46	78	2.2	11.1	4	7	1.9	3.4	4	45.0				
173	WH1404	56	89	2.4	10.0	4	7	0.8	2.5	4	55.0				
174	PBW868	46	89	3.6	12.5	2	5	6.3	7.0	4	45.0				
175	DBW318	35	89	5.4	17.0	4	7	3.2	5.0	4	60.0				

S. No.	Entry	LB (dd)		KB (%)		PM (0-9)		FS (%)		FHB (0-5)	FR (%)	LS (%)		HB (%)	
		AV	HS	AV	HS	AV	HS	AV	HS	HS	HS	AV	HS	AV	HS
176	DBW378	46	89	11.8	40.4	5	9	2.2	6.6	4	20.0				
177	WH1405	46	78	6.1	21.6	4	7	3.8	7.2	4	30.0				
178	HD3405	46	78	2.5	12.7	4	9	2.8	8.3	4	70.0				
179	DBW377	35	89	6.9	18.5	4	7	3.4	6.6	4	35.0				
180	PBW869	46	79	8.7	27.1	3	7	7.0	9.4	4	35.0				
180A	Infector	78	99	16.4	24.0	7	9	34.7	42.2	5	-				
181	PBW871	35	78	9.7	23.0	4	9	2.2	6.6	4	0.0				
182	HD3086 (C)	46	78	15.7	50.3	6	9	2.4	7.2	4	0.0	19.6	42.2		
183	DBW376	35	78	2.5	9.3	4	9	3.1	9.3	5	50.0				
184	DBW373	35	78	4.6	8.3	3	7	2.8	8.3	4	0.0				
185	HD3404	46	78	12.0	30.9	3	7	2.1	6.3	4	50.0				
186	DBW187(I) (C)	46	78	6.1	13.5	4	9	2.4	7.2	4	0.0				
187	WH1407	45	77	1.2	5.0	3	9	2.8	8.3	4	20.0				
188	PBW870	46	78	1.7	4.3	4	9	1.3	4.0	4	50.0				
189	UP3095	46	89	3.4	7.7	4	9	2.2	6.6	4	25.0				
SPL – AST															
190	DBW368	36	89	4.1	7.7	3	7	1.7	5.0	5	40.0				
191	DBW363	34	67	3.6	9.3	4	9	2.1	6.2	5	70.0				
192	DBW369	35	89	2.8	10.0	3	7	1.7	5.0	5	30.0				
193	DBW367	45	89	7.5	19.4	4	9	2.1	6.2	4	30.0				
194	DBW364	46	89	6.7	13.7	4	9	3.5	7.2	5	50.0				
195	Kharchia 65 (C)	46	89	11.0	37.5	6	9	11.0	17.0	4	0.0				
196	DBW366	46	89	3.0	12.2	5	9	5.2	6.6	4	70.0				
197	KRL210 (C)	45	78	6.7	14.2	4	9	4.0	4.2	4	80.0				
198	DBW365	45	78	7.2	12.5	5	9	1.1	3.3	4	0.0				
199	K1805	35	78	11.7	38.5	4	9	1.1	3.3	3	40.0				
200	KRL19 (C)	57	79	5.5	12.5	6	9	4.7	5.8	4	25.0				
200A	Infector	78	99	17.3	23.5	7	9	31.7	36.4	5	-				

Abbreviations: LB = Leaf blight, KB = Karnal bunt, PM = Powdery mildew, FS = Flag smut, FHB = Fusarium head blight, FR = Foot rot, LS = loose smut, HB = Hill bunt

Table 1.4: Status of disease resistance in AVT (Final year entries) and check varieties during 2018-19, 2019-20 and 2020-21

S. No.	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		LB (dd)		KB (%)		PM (0-9)		FS (%)		FHB (0-5)	FR (%)	LS (%)	
		ACI	HS	ACI	HS	ACI	HS	ACI	HS	AV	HS	AV	HS	AV	HS	AV	HS	HS	HS	AV	HS
North Western Plain Zone (NWPZ)																					
1	**HUW838[#]***																				
	2018-19	6	20S	2.1	10MS	2.3	15S	7.5	20S												
	2019-20	2.4	10MS	2.6	15MS	8.1	50S	11.1	40S	46	89	4.6	14.3	3	5	2.5	7.5	5	79.0		
	2020-21	9.1	40S	5.8	40S	1.6	5S	5.9	20S	46	89	4.1	7.1	4	7	2.2	6.6	4	31.3	19.4	28.0
	MEAN	5.8	40S	3.5	40S	4.0	50S	8.2	40S	46	89	4.3	14.3	4	7	2.4	7.5	5	79.0	19.4	28.0
2	**DBW296***																				
	2018-19	6.7	20S	3	20S	4.4	15S	2.4	10S												
	2019-20	4.4	10MS	5.4	20S	5.8	15S	10.3	40S	46	89	6.2	18.3	2	7	7.0	11.1	5	66.7		
	2020-21	3.8	20S	1.2	15MR	2.9	10S	2.4	20MR	35	78	3.6	6.2	4	6	5.5	16.6	4	60.0	33.7	50.0
	MEAN	5.0	20S	3.2	20S	4.4	15S	5.0	40S	36	89	4.9	18.3	3	7	6.3	16.6	5	66.7	33.7	50.0
3	**WH1105 (C)**																				
	2018-19	11.5	30S	7.5	40S	17	60S	12.4	40S	46	78	7.2	13.4	2	5	2.3	9.3	4	-	15.7	26.9
	2019-20	26	80S	15.9	80S	15.5	40S	9.4	30S	57	89	5.3	9	4	7	5.5	16.6	5	26.7		
	2020-21	9.5	30MS	7.8	20S	12.9	40S	16	40S	46	79	12.9	32.1	4	9	1.9	5.8	4	0.0	48.8	85.0
	MEAN	15.7	80S	10.4	80S	15.1	60S	12.6	40S	46	89	8.5	32.1	3	9	3.2	16.6	5	26.7	32.3	85.0
4	**DBW187 (C)**																				
	2018-19	10.2	30S	0.7	5S	5.4	15S	6.5	20MS	46	78	2.5	6.6	2	5	1.5	5.5	4	7.1	39.2	53.1
	2019-20	7.8	20S	6	30MS	4.9	20S	6.7	15S	45	89	5.5	12.5	2	6	3.1	5.6	4	45.0	13.0	21.3
	2020-21	12	40S	9.5	60S*	5.9	30S	3.2	10S	46	78	11.1	38.9	3	9	6.1	7.6	5	35.0	27.9	38.2
	MEAN	10.0	40S	5.4	60S	5.4	30S	5.5	15S	46	89	6.4	38.9	2	9	3.6	7.6	5	45.0	26.7	53.1
5	**DBW222 (C)**																				
	2018-19	20.7	40S	1.2	10MS	2.5	10S	14.6	60S	46	67	5.4	9.1	4	7	2.5	6.3	4	10.0	4.9	14.6
	2019-20	22.9	60S	4	20S	3.9	15S	14.2	60S	45	89	6.6	13.6	3	6	6.6	13.3	4	78.6	6.5	15.0
	2020-21	23.9	60S	5.8	40S	5.1	30S	20.2	60S	35	58	5.3	9.5	4	9	6.0	9.6	4	60.0	19.0	76.0
	MEAN	22.5	60S	3.7	40S	3.8	30S	16.3	60S	45	89	5.8	13.6	4	9	5.0	13.3	4	78.6	10.1	76.0
6	**HD2967 (C)**																				
	2018-19	8.7	30S	1.5	10MS	6.5	30S	37.5	80S	35	57	6.6	11.1	3	7	2.5	7.1	4	70.0	26.6	51.2
	2019-20	7.6	40S	4.1	20MS	13.9	40S	37.6	80S	35	78	3.7	10	4	6	8.0	8.3	5	0.0	32.8	86.7
	2020-21	9	30S	5.8	40S	2.1	10S	35.6	60S	24	57	19.6	84.8	4	9	1.8	5.5	5	50.0	29.6	46.6
	MEAN	8.4	40S	3.8	40S	7.5	40S	36.9	80S	35	78	10.0	84.8	4	9	4.1	8.3	5	70.0	29.7	86.7
7	**HD3086 (C)**																				
	2018-19	26.7	40S	10.8	60S	28.1	40S	10	40MS	46	78	5.7	9.9	2	5	2.2	7.8	5	-	7.6	17.8
	2019-20	31	60S	19.5	80S	22.5	50S	14.3	60S	46	89	3.2	8.3	4	5	5.6	14.2	5	20.0	3.6	12.5
	2020-21	31.6	80S	19.6	60S	13.6	40S	8.7	40S	46	79	7.6	18.8	4	7	17.5	25.0	4	50.0	18.3	73.3
	MEAN	29.8	80S	16.6	80S	21.4	50S	11.0	60S	46	89	5.5	18.8	3	7	8.4	25.0	5	50.0	9.8	73.3

8	**WH1124 (C)**																				
	2018-19	38.8	60S	9.6	60S	17.6	40S	6	20S	46	99	5	9.2	3	7	2.3	7.3	4	-	4.4	13.3
	2019-20	39	80S	19	80S	17	40S	20.9	60S	57	89	2.5	9.1	3	5	4.7	8.3	5	60.0	21.3	85.0
	2020-21	5	20MS	12.9	40S	13.7	40S	43.6	60S	45	78	8	12.2	4	9	4.2	12.5	4	70.0	10.7	42.7
	MEAN	27.6	80S	13.8	80S	16.1	40S	23.5	60S	46	99	5.2	12.2	3	9	3.7	12.5	5	70.0	12.1	85.0
9	**PBW771 (C)**																				
	2018-19	7.5	30S	0.4	10R	0.9	5S	2.4	10S	45	89	5.9	9	4	9	4.9	9.1	4	0.0	23.6	34.1
	2019-20	6.6	20MS	2.2	5S	3.4	10S	11.3	40S	46	89	4.8	8.3	6	9	10.5	16.7	4	23.5	43.8	83.3
	2020-21	5.1	20MS	5.8	20S	3.6	10S	7.4	30S	46	89	9.3	19.4	6	9	17.7	28.6	4	10.0	20.9	45.0
	MEAN	6.4	30S	2.8	20S	2.6	10S	7.0	30S	46	89	6.7	19.4	5	9	11.0	28.6	4	23.5	29.4	83.3
10	**HD3059 (C)**																				
	2018-19	11.0	30S	1.2	5MS	7.3	40S	35.8	80S	46	78	4.2	8.3	3	9	1.8	6.6	4	-	37.7	59.4
	2019-20	6.4	20MS	4.0	10S	3.3	10S	15.3	60S	46	89	3.3	8.3	4	6	6.4	11.1	5	5.0	27.7	81.1
	2020-21	11	40MS	4.9	15MS	4	10S	26.3	60S	36	89	8.5	21.6	5	9	3.8	8.3	4	40.0	24.3	35.0
	MEAN	9.5	30S	3.4	15MS	4.9	40S	25.8	80S	46	89	5.3	21.6	4	9	4.0	11.1	5	40.0	29.9	81.1
11	**DBW173 (C)**																				
	2018-19	2.6	10MS	3.1	20S	3.6	10S	19.3	60S	46	57	4.3	6.7	3	9	1.8	5.7	4	30.0	42.3	68.7
	2019-20	1.1	5MS	5.5	40MS	4.8	20S	11.5	40S	56	89	2.2	7.5	4	7	4.2	12.5	4	44.4	25.5	62.5
	2020-21	3.8	10MS	3.4	20S	0.7	5S	2.8	10S	46	89	6	9	5	9	4.8	6.7	4	30.0		
	MEAN	2.5	10MS	4.0	40MS	3.0	20S	11.2	60S	46	89	4.2	9	4	9	3.6	12.5	4	44.4	33.9	68.7
12	**NIAW3170 (C)**																				
	2018-19	3	10MS	1.6	5S	4.8	20S	17.4	60S	46	68	4.2	6.2	2	7	1.6	6.4	4	55.0	46.0	72.1
	2019-20	7	20MS	6	30S	1.5	5S	28.6	60S	46	89	1.8	8.3	4	5	2.2	6.6	5	42.1	40.8	72.0
	2020-21	3.6	10MS	3.5	10S	4.3	20S	19.5	40S	45	77	4.4	9.3	5	7	5.4	8.3	5	40.0	44.5	70.0
	MEAN	4.5	20MS	3.7	30S	3.5	20S	21.8	60S	46	89	3.5	9.3	4	7	3.1	8.3	5	55.0	43.8	72.1
13	**HI1628 (C)**																				
	2018-19	5.2	10MS	8.9	60S	5.8	20S	13.5	40S	46	99	8.5	12.1	3	7	2.6	9.8	5	30.0	46.9	62.3
	2019-20	6	20MS	8.5	40S	3.8	15S	18.4	40S	46	89	4.7	16.7	2	4	5.7	13.3	5	0.0	52.0	71.2
	2020-21	8	30MS	6.7	20S	2.9	20S	7.3	20S	46	78	8.7	22.9	5	7	4.2	12.5	5	50.0	40.1	85.4
	MEAN	6.4	30MS	8.0	60S	4.2	20S	13.1	40S	46	99	7.3	22.9	3	7	4.2	13.3	5	50.0	46.3	85.4
14	**WH1142 (C)**																				
	2018-19	7	30MS	11.6	60S*	11.8	50S	4.9	20S	36	79	3.4	6.5	3	7	4.7	11.3	4	45.0	24.4	52.2
	2019-20	39	80S	19	80S	17	40S	20.9	60S	46	89	5	15	3	5	6.3	13.5	5	0.0	46.6	99.2
	2020-21	2.8	20MR	12.3	60S*	13.7	20S	6.7	20S	46	89	3.6	5.5	5	7	3.1	6.2	5	65.0	30.5	66.6
	MEAN	16.3	80S	14.3	80S	14.2	50S	10.8	60S	46	89	4.0	6.5	4	7	4.7	13.5	5	65.0	33.8	99.2
15	**HD3043 (C)**																				
	2018-19	4.5	20MS	15.6	60S	28.1	100S	23	60MS	46	79	6.5	12.2	3	9	2.1	5.6	4	35.0	20.9	33.5
	2019-20	5.6	20MS	39.5	80S	41.9	80S	18.2	60S	45	89	4	13.3	3	6	2.7	6.6	5	10.0	38.0	87.1
	2020-21	5.8	20S	24	60S	22.6	60S	10.1	40S	35	55	4.7	6.6	4	7	3.7	11.1	4	0.0	23.6	31.5
	MEAN	5.3	20S	26.4	80S	30.9	100S	17.1	60S	45	89	5.1	13.3	3	9	2.8	11.1	5	35.0	27.5	87.1
16	**PBW644 (C)**																				

	2018-19	15.5	20S	1.3	10MS	10.3	50S	21.4	60MS	46	79	5.4	8.1	4	9	3.5	6.3	4	65.0	28.8	42.9
	2019-20	18	40S	17.8	60S	17.6	60S	33.2	60S	46	89	6	12.5	3	6	11.3	15.3	4	30.0	21.7	43.8
	2020-21	18.3	60S	23.1	80S	12.9	30S	8.9	20S	34	57	5	10	5	9	6.9	8.3	4	0.0	20.7	33.5
	MEAN	17.3	60S	14.1	80S	13.6	60S	21.2	60S	45	89	5.5	12.5	4	9	7.2	15.3	4	65.0	23.7	43.8
Central Zone (CZ)																					
17	**GW513***																				
	2018-19	4.3	20S	0	TR	4.8	20S	58	80S												
	2019-20	2.3	5MS	8.8	60S	5.8	20S	61.8	80S	56	89	5.6	14.3	5	9	3.7	11.1	5	10.0		
	2020-21	3.3	10MS	3.2	20S	7.3	20S	52.5	80S	57	99	6.5	12.5	5	9	12.4	20.0	5	68.8		
	MEAN	3.3	20S	4.0	60S	6.0	20S	57.4	80S	57	99	6.1	14.3	5	9	8.1	20.0	5	68.8		
18	**HI1636***																				
	2018-19	0.7	5MS	0.1	TMR	7.4	40S	60.9	80S												
	2019-20	0.3	5MR	3.1	20S	5.6	20S	49.5	80S	46	99	4.5	10	5	9	4.6	10.5	5	0.0		
	2020-21	3.3	10S	4	20MS	5.7	40S	40.8	60S	46	89	14.7	29.2	6	9	9.1	12.5	4	33.3		
	MEAN	1.4	10S	2.4	20S	6.2	40S	50.4	80S	46	99	9.6	29.2	6	9	6.9	12.5	5	33.3		
19	**HI8823(d)***																				
	2018-19	2	10MS	1.9	10MS	4	30S	6.5	30S												
	2019-20	1.2	5MS	2.3	10S	6.6	30S	7.1	20MS	46	89	2.1	8.3	4	7	0.0	0.0	4	0.0		
	2020-21	3.5	15MS	0.9	10MR	2.1	5S	11.4	60S	46	89	3.4	7.5	5	9	5.7	11.1	5	60.0		
	MEAN	2.2	15MS	1.7	10S	4.2	30S	8.3	60S	46	89	2.8	8.3	5	9	2.9	11.1	5	60.0		
20	**GW322 (C)**																				
	2018-19	12.6	40S	6.88	40S	23	80S	44.1	80S	57	89	5.9	8.3	5	9	2.6	6.2	5	45.0	33.4	60.9
	2019-20	15.8	40S	14.6	80S	22.4	50S	45.5	80S	47	89	5	15	4	9	4.6	7.5	4	0.0	43.9	66.5
	2020-21	8.3	30S	7.3	20MS	8.6	20S	36	60S	46	79	4.8	8.5	6	9	8.6	9.7	5	35.0	14.3	22.2
	MEAN	12.2	40S	9.6	80S	18.0	80S	41.9	80S	47	89	5.2	8.5	5	9	5.3	9.7	5	45.0	30.5	66.5
21	**HI1544 (C)**																				
	2018-19	1.4	10MS	0.3	10R	7.6	40S	62.7	100S	56	89	4.3	14.7	5	9	11.4	29.9	5	14.2	13.5	34.9
	2019-20	2.8	10S	5.1	40S	3.6	10S	54.1	80S	57	89	11.6	42.9	4	9	12.2	23.1	4	18.8	17.9	45.0
	2020-21	5.3	30S	5.8	40MS	1.4	10S	53	80S	56	99	21.8	64.5	5	9	21.4	33.9	4	70.0	40.2	54.8
	MEAN	3.2	30S	3.7	40MS	4.2	40S	56.6	100S	56	99	12.6	64.5	5	9	15.0	29.9	5	70.0	23.9	54.8
22	**HI8498(d) (C)**																				
	2018-19																				
	2019-20																				
	2020-21	13.3	30S	14	60S	0.9	5S	2.4	10MS	46	68	3.8	11.1	5	9	0.0	0.0	5	60.0		
	MEAN																				
23	**HI8713(d) (C)**																				
	2018-19	1.6	10MS	0.3	5MR	3.4	10S	3.9	20S	46	89	2.8	4.6	4	9	3.0	9.6	5	25.0		
	2019-20																				
	2020-21	4.7	10S	6.8	20MS	1.4	10MS	6.4	40MS	46	89	6.3	15.7	5	9	0.6	1.7	3	65.0		
	MEAN	3.2	10S	3.6	20MS	2.4	10S	5.2	40MS	46	89	4.6	15.7	4	9	1.8	9.6	4.0	65.0		
24	**MP4010 (C)**																				

	2018-19	2.2	10MS	0.7	5S	4.8	20S	60.2	100S	57	79	9	15.7	5	7	1.7	5.3	5	80.0		
	2019-20																				
	2020-21	5.1	20S	15.8	80S	0.7	50S	44	60S	57	99	18.5	46.1	5	9	4.2	8.3	5	75.0		
	MEAN	3.7	20S	8.3	80S	2.8	50S	52.1	100S	57	99	13.8	46.1	5.0	9	3.0	8.3	5.0	80.0		
25	**HD2864 (C)**																				
	2018-19	2.8	10S	6.5	40S	6	20S	61.8	100S	57	79	7.3	12.2	4	7	2.1	7.1	5	65.0	-	-
	2019-20	2.5	10S	7.6	60S*	5.6	20MS	57.7	80S	56	89	4	8.6	4	6	2.5	7.5	5	27.8	12.6	37.4
	2020-21	5.8	30MS	4.1	20MS	5	20S	43.6	60S	56	79	9.7	22	6	9	3.1	9.3	4	75.0	-	-
	MEAN	3.7	30MS	6.1	60S*	5.5	20S	54.4	100S	56	89	7.0	22	5	9	2.6	9.3	5	75.0	12.6	37.4
26	**MP3336 (C)**																				
	2018-19	15.3	40S	8.1	40S	19.3	40S	53	100S	57	99	4.2	10.1	5	7	2.0	6.6	5	65.0	-	-
	2019-20	9.4	30MS	26.5	80S	28.8	50S	51.8	80S	56	89	4.1	13.3	5	9	2.1	6.3	5	17.7	18.3	46.6
	2020-21	5.8	20S	11.7	40S	12.6	40S	39	60S	56	99	6.1	15.2	6	9	12.7	17.7	5	50.0	26.3	52.2
	MEAN	10.2	40S	15.4	80S	20.2	50S	47.9	100S	56	99	4.8	15.2	5	9	5.6	17.7	5	65.0	22.3	52.2
27	**HD2932 (C)**																				
	2018-19	8.4	20MS	19.4	40S	34.6	90S	55	80S	56	89	4.5	13.5	3	5	2.1	4.8	4	45.0		
	2019-20	11.3	20S	38.8	80S	35	70S	51.4	80S	46	89	3.6	10	4	9	2.5	7.5	5	47.4	-	-
	2020-21	8	20MS	24.9	40S	24.9	60S	40.8	60S	36	79	3.1	9.3	5	9	2.8	8.3	5	70.0	7.4	24.0
	MEAN	9.2	20S	27.7	80S	31.5	90S	49.1	80S	46	89	3.7	13.5	4	9	2.5	8.3	5	70.0	7.4	24.0
28	**HI1634(I) (C)**																				
	2018-19	1	5MS	1.4	10S	3.1	10S	46.6	100S	46	89	3.8	6.1	3	5	2.7	7.5	5	55.0		
	2019-20	0.3	5MR	3.1	20S	5.6	20S	49.5	80S	46	89	4.4	12.5	3	6	4.6	6.8	5	5.3	22.3	42.2
	2020-21	10.1	60S*	13.3	80S*	4	20S	35.6	60S	46	79	8.9	21.3	6	9	4.2	12.5	5	80.0	24.9	35.0
	MEAN	3.8	60S*	5.9	80S	4.2	20S	43.9	100S	46	89	5.7	21.3	4	9	3.8	12.5	5	80.0	23.6	42.2
29	**CG1029(I) (C)**																				
	2018-19	3	10MS	0.7	5S	2.5	10S	69.1	100S	46	89	7.4	14.1	5	9	9.9	26.1	5	80.0		
	2019-20	4.2	10MS	2.7	20MS	5	20S	62.7	80S	56	99	4.4	12.5	5	9	3.7	8.3	5	84.2	28.5	44.6
	2020-21	2.8	10MS	0.5	5MR	16.7	60S	51.2	80S	46	89	4.6	12.5	6	9	4.1	7.8	3	80.0	19.3	45.0
	MEAN	3.3	10MS	1.3	20MS	8.1	60S	61.0	100S	46	99	5.5	14.1	5	9	5.9	26.1	5	84.2	23.9	45.0
30	**DDW47(d) (C)**																				
	2018-19	5.8	40MR	1.4	5S	0.7	5S	1.1	10MS	35	57	4.6	10.3	2	3	2.2	8.3	4	7.1	1.3	5.0
	2019-20	1.9	5MS	1.2	10MR	5.8	20S	2.1	20MS	36	79	2.7	5.2	2	6	0.0	0.0	5	5.3	3.9	12.5
	2020-21	3.5	10S	7.7	30S	3.4	20S	3.8	15S	46	99	3.2	8	4	7	1.4	4.3	4	58.3	11.0	22.2
	MEAN	3.7	40MR	3.4	30S	3.3	20S	2.3	20MS	36	99	3.5	10.3	3	7	1.2	8.3	5	58.3	5.4	22.2
31	**HI8627(d) (C)**																				
	2018-19	6.5	30MS	3.3	20MS	4.7	10S	12.1	60S	36	67	3.6	8	3	7	0.3	1.1	5	10.0	2.5	10.0
	2019-20	2.2	40MR	1.6	5MS	2.6	10S	5.3	20MS	46	99	2.9	10	2	4	0.0	0.0	5	87.5	7.0	26.6
	2020-21	3.1	10MS	4.3	20S	0.5	5MR	9.1	60S	46	79	2.1	5	3	7	1.5	4.5	5	50.0	28.7	46.6
	MEAN	3.9	30MS	3.1	20S	2.6	10S	8.8	60S	46	99	2.9	10	3	7	0.6	4.5	5	87.5	12.7	46.6
32	**DBW110 (C)**																				
	2018-19	14.7	40MS	2.3	10MS	11.7	40S	41.6	80S	56	89	5.7	16.2	3	7	0.0	0.0	5	15.0	26.9	45.0

	2019-20	10	20S	10.3	40S	9.1	20S	34.5	80S	46	68	2.4	5	3	5	1.9	5.6	5	15.0	16.6	27.3
	2020-21	8.3	40MS	2.9	20MS	11.7	40S	24.8	60S	46	79	4	10	4	9	3.9	7.3	3	65.0	18.0	43.8
	MEAN	11.0	40MS	5.2	40S	10.8	40S	33.6	80S	46	89	4.0	16.2	3	9	1.9	7.3	5	65.0	20.5	45.0
33	**MP3288 (C)**																				
	2018-19	6	10MS	1.5	10MS	7.6	20S	35.9	80S	57	79	6.7	9.1	4	7	2.2	4.6	5	35.0		
	2019-20	5.9	20S	7.7	40S	8.4	40S	29.6	80S	46	89	3.7	6.3	4	7	2.7	8.1	4	20.0	20.5	48.0
	2020-21	2.8	20MR	2.7	20MS	2.1	10S	26	60S	46	78	6.5	10.8	4	7	7.3	9.1	4	10.0	7.2	26.6
	MEAN	4.9	20S	4.0	40S	6.0	40S	30.5	80S	46	89	5.6	10.8	4	7	4.1	9.1	5	35.0	13.9	48.0
Peninsular Zone (PZ)																					
34	**MP1358***																				
	2018-19	14.2	60S	2.4	10S	2.5	10S	3.2	10S												
	2019-20	4.1	15MS	3.3	20MS	2.4	10MS	5.7	15S	46	89	4.7	10.1	3	5	1.7	5.0	5	42.1		
	2020-21	8.5	30MS	6.1	40S	1.7	10S	9.5	40S	46	89	10.4	26.2	4	7	6.2	12.5	4	0.0		
	MEAN	8.9	60S	3.9	40S	2.2	10S	6.1	40S	46	89	7.6	26.2	4	7	4.0	12.5	5	42.1		
35	**UAS428(d) (C)**																				
	2018-19	4.8	30MS	2.3	20MR	1.9	10MS	3.6	10S	46	78	4.2	10	3	6	2.4	7.1	4	40.0	15.0	45.0
	2019-20	15	80S	8.8	40S	2.1	10S	3.5	20MS	35	99	1.8	5.5	4	7	0.0	0.0	5	35.7	3.2	11.1
	2020-21	4.5	20S	7.1	40MS	4.1	20MS	2	5S	35	89	1.5	4	4	9	5.0	15.0	4	65.0	9.1	45.0
	MEAN	8.1	80S	6.1	40S	2.7	20MS	3.0	20MS	36	99	2.5	10	4	9	2.5	15.0	5	65.0		
36	**MACS3949(d) (C)**																				
	2018-19	7.3	30S	5.2	20S	2.3	10S	3.7	20MS	46	99	1.6	2.9	4	7	2.4	5.3	4	35.0	5.1	6.1
	2019-20	9.8	40S	6.1	20MS	1.8	10MS	2.5	20S	56	99	1.4	5	4	9	0.0	0.0	4	16.7	10.4	16.6
	2020-21	7	20S	4.9	20S	0.5	5MR	2.7	20MR	46	69	3.2	12.5	5	7	1.4	4.3	3	0.0	3.8	15.0
	MEAN	8.0	40S	5.4	20S	1.5	10S	3.0	20S	46	99	2.1	12.5	4	9	1.3	5.3	4	35.0	6.4	16.6
37	**MACS6222 (C)**																				
	2018-19	3	10MS	0.7	5S	1.3	10S	27.4	80S	46	78	3.1	4.5	3	5	1.9	4.8	4	5.0	20.2	49.3
	2019-20	5	10S	7.2	40S	2	10S	28.3	80S	57	89	4.5	8.7	5	9	2.2	6.7	4	25.0	31.2	53.3
	2020-21	4.6	10MS	4	20MS	3.1	20S	18.7	60S	45	78	6	13.3	7	9	1.9	5.6	4	85.0	4.4	16.6
	MEAN	4.2	10S	4.0	40S	2.1	20S	24.8	80S	46	89	4.5	13.3	5	9	2.0	6.7	4	85.0	18.6	53.3
38	**GW322 (C)**																				
	2018-19	17	40S	4.3	20S	15.9	40S	46.1	80S	57	99	6.5	10	3	7	3.7	5.6	4	40.0		
	2019-20	20.5	60S	8.8	20S	14.5	40S	45.8	80S	47	89	5	15	4	9	4.6	7.5	4	0.0	43.9	66.5
	2020-21	9.3	40MS	5.7	20S	12.2	40S	36.4	60S	45	78	9.2	18.2	6	9	9.7	14.9	5	66.7	14.4	22.2
	MEAN	15.6	60S	6.3	20S	14.2	40S	42.8	80S	47	99	6.9	18.2	4		6.0	14.9	5	66.7	29.2	66.5
39	**DDW48(d)(I) (C)**																				
	2018-19	6.7	20S	2.6	20MS	2.4	15S	15	60S	35	56	1.9	4.3	3	7	2.2	6.1	4	0.0		
	2019-20	18.1	100S*	5.6	20MS	6.6	40S	8.7	40S	45	99	1.5	6.7	3	5	0.0	0.0	3	57.9	4.5	12.5
	2020-21	13	40MS	3.9	10MS	3.1	15S	3.2	10S	35	78	3	7.5	6	9	0.0	0.0	5	83.3	15.1	34.1
	MEAN	12.6	100S*	4.0	20MS	4.0	40S	9.0	60S	35	99	2.1	7.5	4	9	0.7	6.1	5	83.3	9.8	34.1
40	**HD3090 (C)**																				
	2018-19	5.7	40MR	0.1	TR	3.3	10S	48.4	100S	57	89	9.2	16.1	3	9	11.0	14.3	5	5.0	-	-

	2019-20	3.8	20MR	3.1	30MS	5.8	15S	47.7	80S	46	99	4.5	12.3	4	6	4.9	14.7	5	10.0	44.7	73.3
	2020-21	4.8	10S	5.1	20S	3.3	15S	37.4	60S	46	79	20.6	94.4	5	9	5.9	8.3	5	33.3	3.7	11.1
	MEAN	4.8	40MR	2.8	30MS	4.1	15S	44.5	100S	46	99	11.4	94.4	4	9	7.3	14.7	5	33.3	24.2	73.3
41	**HI1633(I) (C)**																				
	2018-19	1.7	10MS	1.7	10S	6.5	40S	44.3	80S	46	79	6.2	13.3	3	7	1.3	3.5	5	25.0	-	-
	2019-20	2	10S	10	80S*	7	20S	48.6	80S	56	89	3.2	11.2	5	9	2.9	8.7	5	0.0	24.8	40.9
	2020-21	1.9	10MS	1	15MR	0.2	TS	32.3	60S	46	78	9.1	25.1	5	9	3.4	7.5	5	16.7	18.4	42.7
	MEAN	1.9	10S	4.2	80S	4.6	40S	41.7	80S	46	89	6.2	25.1	4	9	2.5	8.7	5	25.0	21.6	42.7
42	**HD2932 (C)**																				
	2018-19	10.3	20S	16.7	60S	31.6	80S	51.6	100S	57	99	11	7.4	3	5	9.0	13.6	5	22.2		
	2019-20	15.8	40S	38.5	80S	32.8	60S	46.5	80S	57	89	3.5	14.2	4	9	4.2	12.5	5	0.0	30.9	42.2
	2020-21	14.3	60S	28.3	80S	18.6	60S	39.8	60S	46	89	2.4	5	4	9	7.5	8.3	4	0.0	7.4	24.0
	MEAN	13.5	60S	27.8	80S	27.7	80S	46.0	100S	57	99	5.6	14.2	4	9	6.9	13.6	5	22.2	19.2	42.2
43	**RAJ4083 (C)**																				
	2018-19	6	20MS	9.3	40S	11.5	40S	16.3	40S	57	99	6.6	12.2	3	5	1.9	7.6	5	25.0		
	2019-20	4.4	20S	16.6	80S	10.8	40S	35.5	80S	57	89	5.1	11.6	4	9	5.5	13.2	4	5.0	22.4	35.4
	2020-21	6.3	30S	7.3	20MS	10.1	40S	20.8	60S	46	89	16.7	54.5	5	9	2.2	6.6	5	20.0	6.3	12.5
	MEAN	5.6	30S	11.1	80S	10.8	40S	24.2	60S	57	99	9.5	54.5	4	9	3.2	13.6	5	25.0	14.4	35.4
44	**MACS6755**																				
	2018-19																				
	2019-20																				
	2020-21	7.3	40MS	10.5	60MS	4.5	10S	36.8	60S	56	79	24.1	69	6	9	10.9	16.6	5	12.5		
	MEAN																				
45	**HI1605 (C)**																				
	2018-19	7.6	20S	13.2	40S	16.5	40S	22.4	40S	56	79	5.2	8.3	3	7	2.5	8.3	5	44.4	39.0	68.3
	2019-20	5.3	20S	19	80S	5	20S	15.2	40MS	46	89	2.8	8.6	4	7	2.2	6.6	5	15.8	17.7	26.0
	2020-21	15.6	60S	20.3	80S	12.9	60S	17.4	40S	36	78	8	18.8	6	9	4.9	11.1	4	25.0	39.9	83.3
	MEAN	9.5	60S	17.5	80S	11.5	60S	18.3	40S	46	89	5.3	18.8	4	9	3.2	11.1	5	44.4	32.2	83.3
46	**AKDW2997-16(d) (C)**																				
	2018-19	14.3	40S	2.3	10MS	4.1	10S	8.8	30S	57	99	2.5	5	5	9	0.4	1.5	5	50.0	3.7	6.7
	2019-20	28.5	80S	10.6	60S	5.9	20S	12.1	60S	56	99	1.8	5.5	3	6	0.0	0.0	3	16.7	3.1	12.5
	2020-21	21.8	60S	11.5	60S	4.1	20S	7.9	40S	57	89	4.2	11.1	5	9	2.8	8.3	4	45.0	-	-
	MEAN	21.5	80S	8.1	60S	4.7	20S	9.6	60S	57	99	2.8	11.1	4	9	1.1	8.3	5	50.0	3.4	12.5
47	**NIDW1149(d)(I) (C)**																				
	2018-19	6	40MR	0.8	5MS	5.5	30MS	3	10S	56	89	2.4	4.1	3	7	1.0	4.1	4	66.6		
	2019-20	2.9	10MS	2.3	20MS	2.6	10S	4.6	10S	56	89	1.9	6.5	5	9	0.0	0.0	4	10.0	3.3	13.3
	2020-21	4.8	20MS	3.2	20MS	0.7	5S	0.7	10MR	57	89	4.1	13.3	5	9	0.0	0.0	5	31.3	25.4	45.1
	MEAN	4.6	20MS	2.1	20MS	2.9	30MS	2.8	10S	56	89	2.8	13.3	4	9	0.3	4.1	5	66.6	14.4	45.1
48	**NIAW3170 (C)**																				

	2018-19	4.3	10MS	2.5	10S	3.6	15S	14.9	40S	56	89	5.8	8.5	2	7	2.2	8.7	4	0.0		
	2019-20	13	60S	0.9	15MR	4.3	10S	26	60S	46	89	1.8	8.3	4	5	2.2	6.6	5	42.1	40.8	72.0
	2020-21	5.7	20S	2.7	10MS	1.3	5S	20.3	60S	46	89	7.4	21.9	4	7	2.2	6.6	3	70.0	47.9	70.0
	MEAN	7.7	60S	2.0	10S	3.1	15S	20.4	60S	46		5.0	21.9	3	7	2.2	8.7	5	70.0	44.4	72.0
49	**UAS446(d) (C)**																				
	2018-19	10.7	40S	1.6	10S	6	40S	13.4	60S	56	89	4	8.2	3	7	0.8	3.1	4	15.0	3.1	8.5
	2019-20	16.8	100S	5.1	20S	2.8	10S	2.8	10S	46	89	2.8	9.1	3	5	0.0	0.0	4	40.0	1.9	7.5
	2020-21	5.5	40MR	3.5	20MS	1.3	5S	1	10MR	46	58	1.7	4.5	4	7	0.0	0.0	4	0.0	22.8	61.7
	MEAN	11.0	100S	3.4	20S	3.4	40S	5.7	60S	46	89	2.8	9.1	3	7	0.3	3.1	4	40.0	9.3	61.7
SPL – HYPT																					
50	**DBW327***																				
	2018-19																				
	2019-20	15.3	40S	11	60S	11.3	50S	6.1	20MS	46	89	4.4	12.5	3	6	4.7	9.1	4	27.8		
	2020-21	5.3	20MS	6	20MS	5.7	20S	10	60S	35	78	4.5	9.3	4	9	1.2	2.5	4	60.0		
	MEAN	10.3	40S	8.5	60S	8.5	50S	8.1	60S	36	89	4.5	12.5	4	9	3.0	9.1	4	60.0		
51	**DBW328***																				
	2018-19																				
	2019-20	6.4	20MS	6	40S	3.6	15S	5.7	10S	35	89	3.5	9.1	3	5	4.2	12.5	5	5.0		
	2020-21	12.2	40MS	5.5	20S	0.7	5S	6.1	40S	45	78	16.1	59.1	5	9	1.3	4.0	4	80.0		
	MEAN	9.3	40MS	5.8	40S	2.2	15S	5.9	40S	35	89	9.8	59.1	4		2.8	12.5	5	80.0		
52	**DBW332***																				
	2018-19																				
	2019-20	16	40S	6.3	40S	10	30S	6.9	20S	45	89	4.7	13.3	4	6	3.3	10.0	5	36.8		
	2020-21	20	60S	7.4	40S	1.6	10S	7.1	20S	36	78	6.1	12.7	4	9	1.7	5.0	4	50.0		
53	**DBW333***									36	89	5.4	13.3	4	9	2.5	10.0	5	50.0		
	MEAN	18.0	60S	6.9	40S	5.8	30S	7.0	20S												
	2018-19																				
	2019-20	25	80S	9.8	60S	2.4	20MR	7.7	20S	45	89	4.4	14.3	3	6	4.9	8.3	5	16.7		
	2020-21	25.5	80S	12.9	60S	4.3	15S	7.3	60S*	45	79	9.7	23.4	5	9	3.3	5.8	5	70.0		
	MEAN	25.3	80S	11.4	60S	3.4	15S	7.5	60S	45	89	7.1	23.4	4	9	4.1	8.3	5	70.0		
54	**WH1252***																				
	2018-19																				
	2019-20	3.5	10MS	4.5	20MS	3.4	10S	4.9	10S	46	89	4.5	11.7	4	7	2.8	8.3	5	14.3		
	2020-21	12.5	20S	4.7	30MS	2.9	10S	6.8	60S*	46	68	5.3	12.6	3	7	1.7	5.0	4	20.0		
	MEAN	8.0	20S	4.6	30MS	3.2	10S	5.9	60S	46	89	4.9	12.6	4	7	2.3	8.3	5	20.0		
55	**HD3086 (C)**																				
	2018-19	28	60S	10.3	40S	16.9	60S	5.8	30S	46	89	4.2	11.5	2	5	1.8	5.2	4	30.0		
	2019-20	43	80S	17.4	80S	30	60S	21.4	60S	45	89	4.5	14.3	4	6	4.7	11.1	4	10.5	3.6	12.5
	2020-21	37	80S	18.6	60S	18.6	60S	8.7	60S*	46	78	15.7	50.3	6	9	2.4	7.2	4	0.0	19.6	42.2
	MEAN	36.0	80S	15.4	80S	21.8	60S	12.0	60S	46	89	8.1	50.3	4	9	3.0	11.1	4	30.0	11.6	42.2
56	**DBW187(I) (C)**																				

	2018-19	12.8	40MS	2.7	10MS	8.3	30S	6.9	30S	46	89	4.2	11.5	2	5	1.8	5.2	4	25.0		
	2019-20	10.8	40S	3.9	15MS	1.5	10S	12.9	60S*	45	89	5.5	12.5	2	6	3.1	5.6	4	45.0	13.0	21.3
	2020-21	8	20S	1	15MR	1.6	10S	5.9	40S	46	78	6.1	13.5	4	9	2.4	7.2	4	0.0	-	-
	MEAN	10.5	40S	2.5	15MS	3.8	30S	8.6	60S	46	89	5.3	13.5	3	9	2.4	7.2	4	45.0	13.0	21.3
57	**WH1270(I) (C)**																				
	2018-19	1	5S	3.4	20S	4.4	20S	4.5	30S	46	89	7.7	11.8	2	5	4.1	7.6	5	45.0		
	2019-20	12.5	40S	10.4	60S	3.5	10S	13.8	40S	46	89	4.6	13.3	3	6	4.2	8.6	5	15.0	-	-
	2020-21	4.3	20S	0.9	15MR	2.9	20S	2.1	10MS	35	67	8.2	23.8	4	9	3.9	5.1	5	80.0		
	MEAN	5.9	40S	4.9	60S	3.6	20S	6.8	40S	46	89	6.8	23.8	3	9	4.1	8.6	5	80.0		
58	**DBW303(I) (C)**																				
	2018-19	5.2	20MS	2.8	10MS	2.4	10S	9.5	20S												
	2019-20	7	20MS	1.6	10MS	0.6	10MR	6.7	20S	46	89	2.6	8.7	3	7	4.2	12.5	5	26.3	23.8	45.5
	2020-21	5.6	20MS	2.3	15MS	1.6	10S	4	20MS	35	78	10.7	34.2	4	9	0.8	2.5	4	85.0	-	-
	MEAN	5.9	20MS	2.2	15MS	1.5	10S	6.7	20S	46	89	6.7	34.2	4	9	2.5	12.5	5	26.3	23.8	45.5

Abbreviations: LB = Leaf blight, KB = Karnal bunt, PM = Powdery mildew, FS = Flag smut, FHB = Fusarium head blight, FR = Foot rot, LS = loose smut

Table 1.5: Adult plant respons of NIVT entries against rusts under disease epiphytotic conditions at hot spot locations in field during 2020-21

S. No.	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust	
		ACI	HS	ACI	HS	ACI	HS	ACI	HS
NIVT – 1A									
1	HD2967 (C)	7.3	20MS	8.3	40MS	5.9	20S	29.4	60S
2	HD3389	12.2	40MS	4.9	30S	0	TR	0.6	5S
3	DBW222 (C)	27.4	80S	5.3	20S	0.7	5S	13.8	40S
4	PBW850	5.3	40MR	10.3	20S	1.4	5S	0.2	TS
5	K2001	8.5	20S	2.9	50MR	0.7	5MS	11.6	40S
6	RAJ4555	1.8	10MS	4.9	40MS	0.1	5R	11.1	20S
7	DBW344	19.6	80S	11.9	60S	2.9	10S	8.5	60S*
8	PBW853	13.8	30S	11.6	40MS	11.7	30S	2.4	10MS
9	RAJ4556	3	10MS	9.3	20MS	4.9	10S	11.2	60S
10	DBW342	1.5	10MS	2.9	20MS	0	0	9.9	60S
11	UP3080	15.3	60S	5.8	40MS	3	20S	6.8	40MS
12	UP3082	17.3	60S	9.8	40MS	3.6	20S	21.6	40S
13	PBW852	8.8	40S	3.5	20MS	7.9	40S	7.6	20S
14	DBW362	7.6	20MS	9.5	40S	6.6	20S	6.3	20S
15	HD3386	4.5	20MS	3.9	20MS	3.6	20S	4.6	10S
16	PBW851	2.1	20MR	2.7	10S	1.5	5S	1.5	5S
17	DBW346	6.8	20MS	7.3	40S	1.4	5S	4	20S
18	DBW187 (C)	9.4	20MS	5.9	40MS	1.4	10S	2.5	20MS
19	DBW345	7.9	20S	3.5	20S	1.6	10S	3.4	10S
20	WH1294	14.1	40S	3.5	20MS	2.1	10S	12	40S
20A	Infector	82.5	100S	82.9	100S	77.1	100S	67	90S
21	HD3387	9	40MS	23.6	80S	3.5	10S	2.8	10S
22	UP3083	5.3	20MS	4.0	20MS	2.1	10S	4.1	20S
23	UP3081	12.9	40S	2.3	20MS	5.7	20S	11.3	60S
24	NW8012	9.4	40S	13.2	60S	9.3	40S	13.5	40MS
25	DBW343	6.6	40S	3.4	20MS	3.6	10S	5.9	40MS
26	KRL1914	6.6	20S	9.1	30S	2.2	10S	2.3	10S
27	HUW844	8	40MS	10.7	40S	3.7	20S	6.5	20S
28	WH1293	3.8	10S	9.9	40S	3.6	20S	4.3	30S
29	RAJ4557	15.5	40S	17.8	100S	3	20S	4.9	20S
30	WH1292	11.6	40MS	1.8	15MS	0.8	5S	1.6	10MS
31	JAUW691	7.4	20S	2.5	20MS	10	40S	8	20S
32	HD3388	11.1	40MS	3.3	15MS	2.2	10S	2	10MS
33	PBW849	14.8	40S	2.6	10MS	0	TR	0.2	5MR
34	TAW123	28	80S	18.5	50S	3.9	10S	0	R
35	HD3385	13.9	80S	1.5	10S	0.3	TS	3.8	15S
36	HD3086 (C)	24	80S	11.2	60S	17.1	40S	7.9	60S
NIVT – 1B									
37	KRL1912	1.6	10MS	6.1	20MS	1.5	10S	2	10S
38	K2005	12.3	40S	9.7	40S	4.3	20S	30.5	60S
39	DBW347	20.3	60S	6.4	40MS	1.3	5S	10.7	40S
40	RAJ4559	8.3	40MS	11.0	40MS	6.4	30S	12.2	40MS
40A	Infector	77.5	100S	74.3	100S	71.4	100S	69	90S
41	NW8017	18	60S	7.2	40MS	10.1	30S	7.9	40MS
42	TAW119	18	60S	6.6	20S	2.9	10S	1.2	10S
43	DBW222 (C)	18.9	60S	3.7	20S	0.7	5S	10.6	40S
44	NW8013	26.6	80S	0.7	10MR	1.4	10S	7.2	40MS

45	K2003	5.5	20MS	2.1	10MS	3.6	20S	4.4	20MS
46	UP3084	20.5	60S	5.9	40MS	2.9	20S	7.8	20S
47	DBW349	10.5	20S	7.5	40MS	4.3	30S	3.9	20MS
48	WH1295	14.5	60S	8.1	40S	1.7	10S	3.6	10S
49	PBW856	13.3	40S	9.9	40S	3.1	20S	1.8	10S
50	NW8019	3	10MS	6.4	40MS	6	20S	1.5	20MR
51	HD3390	8	40MS	12.6	40S	4.3	20S	0.2	5R
52	PBW854	4.4	60MR	2.4	20MR	0.3	5MR	0.9	10MR
53	WH1296	26.5	60S	13.0	60S	5.7	20S	2.2	10MS
54	JKW287	3.1	20S	6.7	40S	7.6	40S	13.9	40S
55	HD2967 (C)	4.6	40MS	3.5	20MS	2.3	10S	16.2	40S
56	RAJ4558	3.4	40MR	2.1	10MS	7.2	40S	21.1	60S
57	PBW855	14.5	40MS	23.0	60S	5.5	20S	7.9	20S
58	DBW187 (C)	6.3	20MS	8.7	40S	2	10MS	6.1	20S
59	HD3417	6.1	20S	4.7	40MS	7.9	30S	12.2	40S
60	HD3391	16.8	80S	13.1	60S	12.3	40S	14	40S
60A	Infector	80	100S	77.1	100S	78.6	100S	69	90S
61	DBW348	15.1	80S	16.4	80S	20.1	50S	6.8	20MS
62	BRW3902	13.3	60S	12.2	80S	2.9	10S	17.4	40S
63	JKW282	14.6	60S	0.9	15MR	2.7	15S	5.1	20S
64	HUW845	17.6	60S	9.7	60S	1.6	10S	12.9	40S
65	DBW350	24	80S	9.7	40S	4.3	20S	5.9	40S
66	HD3086 (C)	34	100S	13.0	60S	15	40S	12.7	60S
67	BRW3895	6.7	40MS	14.3	60S	11.4	40S	26	60S
68	AAI-W70	16.1	40S	6.1	40MS	1.6	10S	10.8	40S
69	HD3416	21.8	80S	18.3	60S	13.6	40S	0.6	5S
70	UP3085	11.5	40MS	5.5	40MS	0.7	5S	3.2	10MS
71	HUW846	15	60S	12.8	40S	5.7	20S	11.7	40S
72	K2004	13.8	80S	12.3	60S	8.1	30S	39.4	60S
NIVT – 2									
73	MACS6478 (C)	16.8	60S	11.0	40S	5.9	20S	41	80S
74	HI1657	5.5	40MS	2.9	20S	1	5S	48	60S
75	CG1038	8.9	40MS	4.1	20S	4.5	20S	43.2	60S
76	MACS6786	3.3	10S	5.8	40MS	4.3	20S	25	60S
77	WSM109-4	2.6	10MS	11.1	20MS	13.4	40S	45	60S
78	MP1378	5.9	40MR	4.7	10MS	3.6	15S	40.6	60S
79	HI1660	3.4	40MR	4.1	20S	5.4	20S	46.6	60S
80	RVW4348	2.1	10S	1.0	15MR	8.1	30S	15	40S
80A	Infector	77.5	100S	77.1	100S	75.7	100S	71	90S
81	NIAW3924	2.4	20MS	5.8	20S	2.9	15S	31.2	60S
82	NWS2194	8.3	40MS	6.6	40S	2.7	10S	34.6	60S
83	GW529	3.7	20MS	2.1	10MS	0.7	5S	28.4	60S
84	GW533	6.3	20MS	3.0	20S	3.6	10S	48	80S
85	MP3545	5	20S	4.1	10S	2.3	10S	6.8	20S
86	MACS6789	7.8	40MS	5.2	20S	2.9	20S	18.8	60S
87	HI1544 (C)	4.4	20S	4.1	20S	2.2	10S	46.6	80S
88	DBW351	10.6	60S	5.9	40MS	3.4	20S	6.3	40S
89	PWU6	9.3	60S*	5.8	20S	4.3	10S	45.1	60S
90	RAJ4560	4.9	20MS	3.8	40MS	1.6	5S	9.8	60S
91	UAS3016	18.2	60S	13.4	40S	7.1	40S	14.6	40S
92	UP3086	18.6	60S	9.8	60S*	1.4	5S	17.7	40S
93	MACS6785	4.9	20S	2.4	20MS	2.3	10S	25.3	60S

94	DBW352	17.5	60S	7.9	40MS	2.9	10S	26.7	60S
95	MACS6222 (C)	2.8	20MS	6.9	40MS	2.1	10MS	18	60S
96	PBW857	9.3	60S*	5.2	40MS	1.4	10S	5.8	40S
97	RVW4343	8.6	60MS	19.2	60S	6.4	20S	23.8	40S
98	MP1379	12.1	60S	6.3	40MS	6	30S	8.7	40S
99	HI1656	4.8	20S	4.8	40MS	3.3	20S	31.2	60S
100	HI1658	8	40MS	3.0	20S	2.9	20S	54	80S
100A	Infector	82.5	100S	77.1	100S	74.3	100S	71	90S
101	NIAW3950	1.1	20MR	2.9	20S	1.5	10S	38.6	80S
102	MACS6792	6.1	20S	8.4	30S	4.3	20S	23.6	60S
103	GW530	3	20MS	4.0	20S	3.5	10S	27.9	60S
104	MP3552	9.6	40S	5.2	20MS	11	40S	14.7	40S
105	GW322 (C)	9.9	40S	8.0	40MS	7.9	40S	30.5	60S
106	HI1659	2.3	10S	4.1	20S	2.9	20S	36.8	60S
107	WH1297	8.8	40MS	8.6	40S	2.1	10S	8.8	40S
108	UAS3015	20	60S	5.6	40MS	1.2	10MS	11.8	60S
NIVT – 3A									
109	BRW3897	14	60S	2.9	15MS	0.3	5MR	22	60S
110	NW8004	27.5	80S	8.7	60S*	0.4	5MR	13.5	40S
111	PBW858	11.1	60S	3.5	20S	1.4	10S	2	10S
112	RAJ4561	2.3	20MR	2.0	20MR	2.2	15S	18	40S
113	K2007	9.6	40MS	12.9	20S	17.9	60S	13.5	40S
114	HD3395	22.3	60S	13.0	80S*	6.5	40S	9.2	20S
115	HD3394	7	40MS	5.7	40MS	1.7	10S	12.8	40S
116	UP3087	11.6	40MS	5.9	40S	1.6	10S	9.8	60S
117	UP3089	3.8	20MS	10.6	40MS	3.1	20S	26	60S
118	PBW875	18.3	40S	9.7	40S	0.6	5MS	8.1	20MS
119	DBW357	20.8	60S	10.6	60S	20	60S	13.8	60S
120	DBW173 (C)	5.4	20S	7.3	40S	1.6	10S	8	40S
120A	Infector	75	100S	77.1	100S	71.4	100S	69	90S
121	DBW353	11.5	40S	12.3	60S	6.6	20S	8.9	40S
122	JKW285	12.6	40S	5.8	40MS	3.7	20S	9.1	20S
123	UP3094	15	40S	11.5	60S	1	5S	10.3	40S
124	WH1298	21.1	60S	7.5	40S	7.4	20S	4.8	40S
125	DBW355	15.3	40S	18.9	60S	1.4	10S	8.4	40S
126	NW8022	19.4	60S	6.1	40MS	2.3	15S	7.6	40S
127	RAJ4562	3.6	20S	6.9	20S	2.3	10S	15.5	40S
128	PBW861	3.8	20MS	8.0	60MS	2.9	20S	1.5	20MR
129	WH1300	9	40S	25.7	60S	8.7	40S	6.1	40S
130	DBW356	14.8	60S	10.7	40S	4.4	20S	3.2	20MS
131	PBW862	13.4	40S	4.7	20S	1.4	10S	6.5	20S
132	DBW107 (C)	7.1	20S	10.3	40S	0	0	11.7	40S
133	PBW859	19.3	60S	5.9	40S	1.6	10S	7.1	20S
134	HD3392	14.8	60S	16.9	80S	3.2	20S	1.5	10S
135	PBW860	20	60S	19.6	80S	2.9	20S	1.1	5S
136	HUW847	14.3	60S	12.1	60S	2.9	20S	27.4	60S
137	RAJ4563	4.1	20MS	5.6	20S	0.1	TS	11	40S
138	DBW354	1.4	10S	0.9	15MR	1.5	5S	4.1	20MS
139	HD3396	17.5	40S	16.0	60S	16.3	40S	9	40S
140	HI1563 (C)	3.1	10S	7.2	40S	2.3	15S	34.3	60S
140A	Infector	75	100S	77.1	100S	71.4	100S	71	90S
141	HD3393	23.4	60S	7.8	40S	9.5	60S	8.8	40S

142	UP3088	9.8	40MS	2.9	20S	0	TR	15.5	40S
143	HD3059 (C)	6.3	20S	3.7	20S	0.1	TS	22.1	60S
144	WH1299	18.8	60S	4.0	20S	0	0	18.9	40S
NIVT – 3B									
145	LOK78	3.9	10S	0.9	15MR	3.4	15S	28.2	60S
146	PBW863	3.4	40MR	2.0	10MS	2.3	10S	1.4	10MS
147	GW531	1.4	10MS	0.9	15MR	4	20S	37.8	60S
148	MACS6793	2.3	10MS	2.6	10MS	4.3	30S	46.5	60S
149	HD2864 (C)	3.5	20S	2.3	20MS	4.4	30S	48	60S
150	MP3541	2.3	10MS	6.7	20S	4.3	20S	43	60S
151	MP3542	7.1	20S	7.1	40S	2.3	10S	10.6	40S
152	UAS3018	10.6	20S	2.9	20S	2.1	10S	28.6	60S
153	MACS6784	1.5	10MR	5.8	20S	1.5	5S	12.6	60S
154	HI1664	3.8	20MS	6.9	40MS	1.6	5S	12.2	60S
155	DBW354	3.5	10S	2.4	20MS	1.7	10S	10.9	60S
156	HI1661	2.3	10MS	8.9	50MS	3.9	15S	47.6	80S
157	AKAW5349	3.3	10MS	9.2	40S	4.1	20S	49	80S
158	UAS3017	15.1	40S	10.2	40S	11.1	40S	28.6	60S
159	NIAW4028	3.5	10MS	1.4	20MR	9.1	60S*	46	80S
160	GW534	6.3	20S	5.2	40MS	3	10S	58	80S
160A	Infector	80	100S	77.1	100S	78.6	100S	75	80S
161	HI1663	5.5	20S	5.8	40S	4.5	20S	34.6	60S
162	MACS6779	3.5	40MR	7.2	40S	2.1	15S	18.8	60S
163	WH1401	13.1	40S	20.0	60S	9.3	40S	13.2	60S
164	HI1662	5.8	20S	7.2	40MS	4.4	20S	39	80S
165	CG1039	9.6	40MS	34.9	100S	32.1	60S	46.6	80S
166	NIAW3923	2.6	10MS	5.7	20S	12.9	60S	40.6	60S
167	MP1380	6.7	40S	4.9	20MS	2.9	20S	17.6	60S
168	HD2932 (C)	9.5	40MS	24.6	80S	31.4	60S	35.6	60S
169	GW535	8.1	20S	11.0	40S	16.5	60S	28.8	60S
NIVT – 4									
170	MACS3949 (C)	9.1	40S	5.2	20S	1.3	5S	1.8	5S
171	HI8835	3.7	20MS	2.9	20MS	0.7	10MR	1.7	5S
172	DDW57	4.1	20MS	3.2	20MR	2.1	10S	1	5MS
173	PDW361	11.5	20S	8.6	40MS	2.4	20MR	1.5	5S
174	MACS4111	9.1	20S	5.2	20MS	1.7	5S	2	5S
175	GW1357	6.3	20S	3.7	20MS	0.4	5MR	1.1	5MS
176	HI8737 (C)	2.3	10MS	3.7	20MS	1.1	5S	4.9	10S
177	HI8713 (C)	3.8	10S	1.5	15MR	2	5S	8	20S
178	MPO1383	2.6	10S	4.1	20S	3.3	10MS	1.9	5S
179	MPO1382	11.5	40MS	2.1	10MS	0.5	5MR	1.8	5S
180	NIDW1399	6.3	20S	2.5	20MS	7.3	50S*	3.9	15S
180A	Infector	77.5	100S	80.0	100S	77.1	100S	71	90S
181	NIDW1405	4.3	20MS	5.2	40MS	8.7	60S*	3.3	10S
182	PWU10	0.8	5MS	2.1	20MR	2.1	10S	2.6	10S
183	UAS476	1.2	10MS	3.5	20MS	1.5	10S	3.9	20S
184	MPO1381	4.9	20S	4.2	20S	2.9	10S	0.9	10MR
185	UAS477	11.2	40S	6.1	20S	2.4	10S	3.2	10S
186	WHD966	18.6	80S	3.8	20S	3.6	10S	2.2	5S
187	MACS4110	2.2	10S	2.3	20MR	3	20S	8.9	40S
188	HI8838	5.8	20MS	3.8	20S	0.7	5S	5.1	10S
189	HI8837	7	20S	7.5	40S	0.7	5S	3.3	10S

190	GW1358	11.3	60S	5.8	40MS	2	20MR	0.6	10MR
191	PBND1625-01	1.7	10MS	4.7	20MS	5.6	20S	2.3	10S
192	HI8834	8.4	20S	1.5	5MS	1	5S	3.8	20MS
193	HI8836	2.3	10MS	1.8	20MR	0.7	5S	2.4	20MS
194	DDW56	15.8	80S	4.1	15MS	2.1	10S	4.9	20MS
NIVT – 5A									
195	HD3398	18.1	60S	9.8	40MS	2.1	10S	10.9	40S
196	HI1612 (C)	28.1	80S	8.3	40S	0.7	5S	9.6	60S
197	DBW358	7.3	20S	20.6	80S	11.4	40S	10.7	40S
198	WH1402	4.6	20MS	3.7	20MR	0.7	5S	1.4	10MS
199	PBW864	5	40MR	8.7	40MS	17.1	60S	0.5	5MS
200	K1317 (C)	6.9	60MR	6.1	40MS	2.9	10S	7.4	40S
200A	Infector	80	100S	77.1	100S	72.9	100S	69	90S
201	DBW359	11.1	40MS	22.4	80S	9.7	50S	3.4	20MS
202	PBW866	10.1	30S	4.7	40MS	2.4	15S	13.7	40S
203	HUW848	14.1	60S	14.7	80S	7.1	20S	14.5	60S
204	PBW865	22.9	60S	10.9	40MS	2.6	15S	0.3	5MR
205	DBW360	12.1	40S	11.5	60S	2.5	10S	6.1	40S
206	BRW3901	6	20S	6.9	40S	2.7	10S	18.4	40S
207	UP3090	15.4	40S	2.4	20MS	5.6	30S	14.9	40S
208	HD3418	12.8	60S	1.5	15MR	6.3	40S	3	20MS
209	DBW361	6.6	40S	2.4	20MS	1	5S	1.9	20MR
210	JAUW694	3.5	10MS	3.2	20MS	1.4	10S	0.8	20MR
211	HD3400	5.1	20MS	3.8	20MS	2.9	10S	2.4	20MR
212	K2010	7.4	30MS	8.1	40MS	3.7	15S	8.7	40S
213	PBW644 (C)	8.5	40MS	5.0	20MS	3.6	20S	13	40S
214	UP3091	3	20MS	9.2	60S*	1.4	5S	10.6	40S
215	WH1403	5.3	40MR	3.5	10S	2.1	10S	0.3	5MR
216	HD3399	19.3	60S	4.9	40MS	1.4	5S	17	40S
217	WH1142 (C)	4.6	40MR	9.8	40S	4.3	15S	6	40S
218	NW8010	18	60S	2.9	20S	0.9	5S	5	20MS
219	HD3397	5	20MS	3.6	20S	3.6	15S	15.8	40S
NIVT – 5B									
220	UAS478(d)	11	40S	3.8	20MS	8.6	30S	3.1	10S
220A	Infector	77.5	100S	80.0	100S	74.3	100S	73	90S
221	HI1666	2.2	10MS	6.9	40MS	5	20S	41	80S
222	DBW358	5.6	20MS	18.2	60S	8.5	20S	10.4	40S
223	MPO1376(d)	2.8	10S	4.1	20S	2.7	10S	2.2	10MS
224	DDW58(d)	14.1	60S	1.1	15MR	0.7	5S	2	5S
225	GW532	1.8	10MS	1.5	15MR	2.9	10S	25.4	60S
226	MACS6795	6.9	20S	0.6	10MR	10	40S	45.6	80S
227	CG1040	11.3	40S	8.0	20S	9.9	40S	26.3	60S
228	AKAW5351	10.7	40S	8.1	20S	13.4	60S	24	60S
229	HI8839(d)	1.6	20MR	3.7	20MS	5.8	30S	1.9	10MS
230	MACS4107(d)	6.5	20S	3.8	20MS	4.1	20S	19.4	40S
231	DBW359	9	40MS	4.6	20S	1.6	10S	3.7	20MS
232	MP1377	11.4	40MS	15.5	60S	7.2	40S	22.6	60S
233	MP3544	4.8	10S	11.5	40MS	16.3	60S	23.8	60S
234	UAS446(d) (C)	6.1	20S	3.8	20MS	2.7	10S	2.4	20MS
235	NIAW3922	1.8	20MR	5.8	40MS	0.9	5MS	20.8	40S
236	DBW110 (C)	6.5	30MS	3.5	20MS	1.4	5S	19.6	60S
237	HI1665	1.6	10MS	3.5	10S	1.5	10S	41.8	80S

238	NIAW4028	2.6	10MS	0.9	15MR	5.9	20S	43	80S
239	HI1605 (C)	3.9	20MS	10.9	60S	15.7	40S	10	40S
240	HI8840(d)	3	10S	5.2	20MS	4	20S	7.3	40S
240A	Infector	77.5	100S	74.3	100S	74.3	100S	71	90S
241	UAS3019	17.5	80S	9.0	40MS	8.7	40S	16	40S
242	HD3401	6.6	20MS	6.3	40S	5.7	30S	21.4	60S
243	GW1359(d)	5	20MS	20.9	80S	11.1	60S	37.6	80S
244	HI8627(d) (C)	0.8	10MR	2.9	10MS	3	10S	4.8	20MS
IVT - NHZ									
245	HS685	2.1	10MS	1.7	10MS	0.7	5S	2.5	10MS
246	UP3093	17.4	60S	6.9	40MS	0.9	5S	5.6	20MS
247	VL3026	13	40S	7.0	60MS	2.1	10S	5.9	40S
248	HPW481	4.1	40MR	5.8	40MS	1.4	10S	2.7	20MS
249	HPW480	7.9	20S	6.9	40MS	0.7	5S	2.1	10S
250	HS686	0.6	5MR	7.2	40MS	0	TR	6.7	20S
251	VL3027	11.5	40S	4.7	40MS	5	30S	7.2	20S
252	VL892 (C)	3.8	20MS	9.2	40S	2.3	10S	15	40S
253	HS687	2.5	20MR	9.6	40MS	0.1	TS	12.3	60S
254	VL3025	7	20MS	4.6	20MS	0.7	5S	8.9	60S
255	HS490 (C)	11.8	40S	4.1	20S	3.6	20S	6.4	20MS
256	HS683	0.1	TR	5.5	20MS	0.1	TS	7.3	40S
257	HPW479	6	20S	4.6	40MS	7.4	40S	4.7	20MS
258	HS507 (C)	1.2	5MS	4.9	20S	6.4	30S	9.6	40S
259	HS682	9.3	40S	9.9	30S	11	30S	7.9	40S
260	HPW476	7	20S	3.0	20S	0.9	5S	5.8	20S
260A	Infector	80	100S	80.0	100S	78.6	100S	69	90S
261	HS562 (C)	30.3	80S	8.7	40S	9	40MS	14.6	60S
262	HPW477	13.3	60S	13.9	60S	3.6	20S	11.7	60S
263	HPW478	2.1	20MR	6.4	40MS	6.5	20S	7.2	40S
264	HD3402	7.1	40MS	12.3	60S	8.9	40S	4.2	40S
265	VL2044	11.3	40S	7.2	40MS	0.9	5S	1.5	10S
266	SKW358	12.5	40S	13.2	40S	3.7	15S	5.8	20S
267	HS684	2.6	10MS	3.5	20S	3.6	20S	5.9	40S
268	VL2045	7.1	40S	8.0	40S	1.6	5S	6.5	20S
269	UP3092	5.2	20S	4.7	40MS	10	30S	9.3	40S
270	VL2043	8	20MS	13.8	40S	8.6	40S	0.7	10MR
271	VL2046	3.3	20S	4.7	40MS	1.6	10S	3.9	20S

Abbreviations: ACI = Average Coefficient of Infection, HS = Highest Score, Avg. = Mean, Leaf rust (S) = Leaf rust (South), Leaf rust (N) = Leaf rust (North), *Indicates high rust score (more than 40S) at one location only.

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PROGRAMME 2. RUSTS: BROWN, YELLOW AND BLACK

2.1 RACE SPECIFIC APR

AVT entries were evaluated at specific locations for Race Specific Adult Plant Resistance (APR) to three rusts (brown, black and yellow).

Locations:
Yellow rust and brown rust (under controlled conditions): Flowerdale, Shimla (Table 2.1, 2.2, 2.3, 2.4)
Yellow rust – Ludhiana and New Delhi (Table 2.5)
Brown rust - New Delhi and Ludhiana (Table 2.5)
Black rust (under controlled conditions): Indore and Mahabaleshwar (Table 2.6)
Data not received from Powarkheda.

Race specific Adult Plant Resistance (APR) in AVT entries (2020-21) at IIWBR, RS, Shimla

To search for race specific adult plant resistance, the AVT lines of wheat for 2020-21 were screened against the most predominant and virulent pathotypes of *Puccinia triticina, P. striiformis* and *P. graminis tritici*. Three pathotypes of *P. triticina* (77-5, 77-9 and 104-2), two pathotypes each of *P. striiformis* (46S119 and 238S119) and *P. graminis* (11 and 40A) were used to evaluate APR. These evaluations were conducted under polyhouses equipped with temperature and light adjustments. Proper checks including differentials, resistance genes and seedlings of AVT lines were also. The diseases reaction to different races is given in Table 2.1.

Table 2.1: Race specific adult plant rust resistance of AVT entries at ICAR-IIWBR, RS, Shimla during 2020-21

AVT No.	Entry	APR response						
		Leaf Rust			Stripe rust		Stem Rust	
		77-5	77-9	104-2	46S119	238S119	11	40A
North Hill Zone (NHZ)								
1.	VL2041	0	0	0	10S	5S	30S	5S
2.	HS562 (C)	20MR	40MS	30MR	TS	0	30S	30S
3.	HPW349 (C)	20MR	20MR	5MR	0 1P	0	20S	20S
4.	HS507 (C)	0	10R	0	40S	10S	TS	0
5.	VL907 (C)	0	0	0	0	5S	0	0
North Western Plain Zone (NWPZ)								
6.	WH1105 (C)	0	0	0	20S	0	15S	0
7.	DBW187 (C)	0	10MR	5R	20MS	TS	15S	0
8.	HD3349	0	5R	5R	5S	5S	40S	TMS
9.	PBW876[B]	0	0	5R	TS	5S	0	0
10.	HD3406[M]	0	0	0	10S	TS	5S	TS
11.	DBW222 (C)	0	0	0	10S	TS	20S	0
12.	DBW313[#]	0	0	0	20S	5S	30S	0
13.	HD2967 (C)	0	40S	0	40S	10S	10MS	0
14.	PBW826	0	0	0	40S	0	20MS	TMS
15.	RAJ4548[#]	0	0	0	10S	-	10S	5S
16.	HD3354	0	0	0	40S	TMS	60S	20MS
17.	WH1283	0	0	0	TS	0	40S	10S
18.	HD3086 (C)	60S	40S	0	10S	10S	60S	20S
19.	JKW261	0	0	0	20S	20S	40S	10S
20.	WH1124 (C)	10MS	40MS	0	80S	40S	0	5S
21.	PBW771 (C)	0	0	0	TMS	0	40MS	TS
22.	HD3059 (C)	0	10MR	0	40S	-	30S	20S
23.	PBW834	0	0	0	60S	5S	30S	TS

24.	DBW173 (C)	0	5R	0	10S	5S	25MS	5MS
25.	HUW838#*	0	0	0	20MS	5S	0	5S
26.	NW7096	0	0	0	20S	10S	0	TMS
27.	DBW321	0	10MS	30MS	20S	TMS	30S	30S
28.	K1910	0	0	0	20S	10S	0	0
29.	HI1654	0	0	5R	20S	5S	5S	5S
30.	NIAW3170 (C)	30R	0	0	5S	TS	30S	0
31.	PBW838	0	0	0	TS	TS	30S	10S
32.	DBW296*	0	0	5R	5S	0	TR	5S
33.	HI1628 (C)	0	10S	0	20S	TR	30S	20S
34.	HD3369	0	0	5R	TS	10S	TR	20S
35.	WH1142 (C)	60MS	0	10MS	0	TR	20S	5M
36.	UP3062	10MS	10R	30MS	TS	5S	10S	0
37.	HD3368	0	0	0	5S	10S	30S	20S
38.	HD3043 (C)	40S	40MS	0	20S	5S	0	5MS
39.	PBW644 (C)	0	40S	0	20S	5S	30S	30S
40.	HI1653	5MR	5R	0	30MS	5S	30S	0
41.	PBW848	0	0	0	40S	5S	NG	0
North Eastern Plain Zone (NEPZ)								
42.	HD2733 (C)	0	20R	0	60S	5S	0	0
43.	HD3249 (C)	5R	0	5R	20S	TS	10MS	0
44.	DBW187 (C)	5MR	5R	5R	20S	5MS	10MS	TS
45.	HD3406M	0	0	0	20S	5S	20S	0
46.	HD3411M	0	0	0	40S	40S	40S	0
47.	DBW39 (C)	0	0	0	60S	40S	0	0
48.	HD2967 (C)	0	40S	0	60S	40S	10MR	0
49.	PBW826#	5R	5R	0	5S	0	30S	5S
50.	HD3086 (C)	60S	40S	0	TS	5S	30S	10MS
51.	DBW317	0	TS	0	TMS	TS	20S	5MS
52.	DBW318	0	0	0	TMS	0	10S	20S
53.	PBW835	5R	0	0	0	0	30S	30S
54.	HI1563 (C)	0	0	5R	60S	60S	0	5MR
55.	DBW107 (C)	0	0	10S	5MS	0	TR	10S
56.	PBW834	0	0	0	40S	TS	20M	5S
57.	UP3060	0	0	5R	TS	0	0	20S
58.	HD3118 (C)	5MS	5MR	0	0	0	5MS	10S
59.	HI1621 (C)	0	NG	0	TS	TMS	0	0
60.	DBW316	0	0	0	5S	TS	0	0
61.	PBW833	0	5R	5R	5S	TMS	60S	30S
62.	HD3360	5R	5R	5R	5S	TS	20S	NG
63.	HI1653	5MR	5R	NG	20SMS	20S	5MR	0
64.	DBW322	5MR	40S	5R	20S	TS	40S	TMS
65.	HI1612 (C)	0	5R	5R	TR	5MS	20S	0
66.	DBW252 (C)	0	5R	0	20S	5S	20S	10MS
67.	DBW321	0	10MS	30S	5S	TMS	30MS	60S
68.	HD3368#	TR	5R	0	TS	5S	30S	20S
69.	HI1654	0	0	0	10S	TMS	0	0
70.	HD3293(I) (C)	0	40MS	0	5R	0	20S	20S
71.	WH1281	10MS	5R	0	10S	0	5MS	20S
72.	PBW848#	0	0	0	-	10S	40S	10S
73.	HD3171 (C)	0	5R	5R	-	10MS	40S	10S
74.	HD3369#	NG	TS	5R	5S	5S	0	20S
75.	K1317 (C)	0	40MS	0R	10S	5MS	0	0

76.	UP3062	10MS	10R	30MS	TS	5S	5MS	0
Central Zone (CZ)								
77.	HI8833(d)[M]	0	0	0	10MS	0	5MR	0
78.	GW322 (C)	5MR	40S	0	40S	10S	30S	5S
79.	MP3535	0	0	0	60S	20S	0	0
80.	GW523	0	5R	0	40S	10S	10MS	5S
81.	GW513*	10MR	5R	5R	60S	60S	0	0
82.	HI1636*	0	0	0	80S	80S	0	0
83.	HI8832(d)[M]	0	0	0	40S	0	5MR	0
84.	MACS6768	0	5R	0	80S	100S	0	0
85.	HI1544 (C)	5MR	5R	0	60S	60S	TMR	0
86.	HI1667[B]	0	0	0	60S	60S	0	0
87.	HI8498(d) (C)	0	0	0	TMS	5MR	20S	TS
88.	HI8713(d) (C)	0	0	0	20MS	10MR	10R	0
89.	HI1650	10R	0	0	20S	20SMS	TMR	0
90.	MP4010 (C)	5R	0	0	-	60S	0	0
91.	HD2864 (C)	0	0	0	30S	60S	0	0
92.	MP3336 (C)	40S	0	5R	5S	60S	10MS	5S
93.	HD2932 (C)	20MS	40S	10S	60S	60S	20MS	10S
94.	HI1634(I) (C)	5R	0	0	20S	20S	0	0
95.	HD3407[M]	TR	0	0	0	0	TR	0
96.	CG1029(I) (C)	5R	5R	5R	60S	60S	0	0
97.	HI8823(d)*	0	0	0	40MS	TS	0	0
98.	GW528	5R	0	0	60S	20S	0	NG
99.	DDW47(d) (C)	0	0	0	40MS	5MR	0	0
100.	DBW326	0	0	0	20S	TMS	0	0
101.	UAS475(d)	0	10R	0	TS	0	0	0
102.	HI8627(d) (C)	0	5R	5R	5S	0	0	5MR
103.	NIAW3851	20R	10R	0	10S	TS	20MS	TS
104.	HI8830(d)	0	0	5R	20MS	10MS	TMS	0
105.	CG1036	5R	0	10MR	10S	10MS	0	0
106.	HI1655	5R	5R	0	40S	40S	NG	5MS
107.	DBW110 (C)	0	10MR	0	40S	20S	30M	10S
108.	MP3288 (C)	5R	5R	0	20S	40S	305	5R
109.	DDW55(d)	0	0	0	10S	20S	0	5S
Peninsular Zone (PZ)								
110.	WHD965(d)	0	0	5R	10MS	10MR	0	0
111.	UAS428(d) (C)	10R	5R	10MR	10MR	5MS	0	0
112.	HI8826(d)	0	0	5R	5MR	10MS	0	0
113.	MACS4100(d)	0	0	5R	20S	10MS	0	0
114.	MACS3949(d) (C)	0	0	0	-	TMR	NG	0
115.	DDW53(d)	0	0	0	-	TR	NG	TR
116.	NIDW1345(d)	0	0	0	5MS	5MS	NG	0
117.	MACS6222 (C)	0	5R	0	10S	20S	NG	0
118.	MACS4106(d)	5R	0	0	10MR	10MS	NG	0
119.	NIDW1348(d)	0	0	0	20S	20MS	NG	0
120.	HI8828(d)	0	5R	0	5MR	TMR	0	0
121.	GW322 (C)	5R	40S	0	20S	5S	5MR	5MS
122.	HI8827(d)	0	5R	0	5S	5MS	0	0
123.	DDW48(d)(I) (C)	0	0	0	10MS	5MR	0	0
124.	HD3090 (C)	5R	0	5R	40S	60S	0	5MS
125.	HI1633(I) (C)	0	5R	0	10S	40S	0	5R
126.	HD2932 (C)	20MS	40S	10S	60S	80S	0	30S

127.	RAJ4083 (C)	20MS	10S	5R	5S	TS	10MS	20S
128.	DBW320	NG	NG	0	0	0	TS	5S
129.	MACS6774	0	10MR	0	40S	30S	TMR	10S
130.	NWS2180#	0	0	0	10S	5S	0	0
131.	HI1651	10R	5R	0	40S	30S	0	0
132.	MP1358*	0	5R	0	5S	0	0	10S
133.	MACS6755	20R	5R	5R	10S	20S	0	0
134.	HI1605 (C)	0	5R	0	40S	10S	0	30S
135.	MACS6753	0	5R	5R	60S	40S	0	0
136.	AKDW2997-16(d) (C)	30R	20R	5R	10MS	10MS	0	0
137.	NIDW1149(d)(I) (C)	20R	5R	0	10MS	TS	0	0
138.	NIAW3170 (C)	30R	0	NG	TS	5S	0	TS
139.	UAS446(d) (C)	5R	0	0	5S	TR	0	0
140.	DBW325	5R	5R	0	TS	5MR	TS	10S
141.	UAS3014	5R	0	0	5S	10S	0	10S
SPL – Dicoccum								
142.	MACS5058	10R	5R	5R	60MS	30MS	TR	10MR
143.	MACS6222(*a*) (C)	0	0	0	40S	10S	0	0
144.	DDK1029 (C)	5MR	5R	40MR	60MS	10S	0	5MS
145.	DDK1061	5R	40R	5R	60S	20MS	30R	0
146.	HW1098 (C)	5R	20R	20MR	60MS	40S	0	0
147.	MACS5057	10MR	30MR	10R	40MS	10S	TR	15MR
148.	DDK1060	0	20R	20MR	40MS	40S	0	0
SPL – HYPT								
149.	DBW328*	0	0	0	0	30S	0	5MS
150.	DBW372	5R	0	0	10S	10S	TS	5S
151.	DBW370	5R	0	0	TMS	TS	10MS	0
152.	DBW327*	0	0	0	TS	10S	0	20S
153.	WH1252*	5R	0	0	0	0	0	TS
154.	PBW874	5R	0	0	0	0	TR	0
155.	HD3410	0	0	0	0	TMS	0	0
156.	DBW332*	0	0	0	5S	5S	0	5S
157.	PBW873	0	0	0	TMS	0	0	0
158.	DBW371	5R	0	0	10S	0	20S	10S
159.	HD3086 (C)	40S	40S	0R	5S	10S	0	5S
160.	DBW333*	10S	5R	0	5MS	0	5S	TS
161.	PBW872	0	NG	0	10S	5S	0	10S
162.	DBW187(I) (C)	0	10MR	5R	10S	10S	5S	10S
163.	WH1270(I) (C)	5R	0	5R	10S	0	0	20S
164.	DBW303(I) (C)	0	0	0	10MS	10MS	0	10S
SPL - CI – HYT								
165.	HD3412	5R	30MS	5MS	0	0	20MS	15S
166.	DBW375	0	0	0	0	0	10S	20S
167.	DBW374	0	0	0	5S	5S	5S	5S
168.	HD3403	0	0	0	TS	10S	TS	0
169.	WH1406	0	10S	0	5S	10S	0	0
170.	HD3413	5R	NG	5R	0	0	TR	30S
171.	PBW867	5R	10R	0	0	0	0	0
172.	UP3096	0	0	0	5S	40S	0	0
173.	WH1404	5R	0	0	TS	40S	0	0
174.	PBW868	5R	0	0	5S	60S	0	TS
175.	DBW318	0	0	0	5S	0	TR	0
176.	DBW378	0	0	0	10S	10S	10MS	5S

177.	WH1405	10S	20MR	0	5S	5S	5S	10M
178.	HD3405	0	0	0	10S	10S	5S	5S
179.	DBW377	0	0	0	10S	5S	10MS	5S
180.	PBW869	0	0	5R	0	0	5MS	40S
181.	PBW871	0	0	0	20S	10S	20S	10S
182.	HD3086 (C)	60S	40S	0	10S	TS	30S	10S
183.	DBW376	0	30S	0	5S	0	30S	10S
184.	DBW373	5R	0	0	40S	10S	20MS	5S
185.	HD3404	5R	0	0	40S	30S	20MS	0
186.	DBW187(I) (C)	5R	5R	5R	TMS	20S	TR	0
187.	WH1407	0	0	0	0	0	5MS	0
188.	PBW870	5R	0	0	0	5S	TR	0
189.	UP3095	5R	0	0	40S	40S	0	TMR
SPL – AST								
190.	DBW368	10R	10R	0	10S	40S	0	0
191.	DBW363	0	0	0	5S	60S	TS	5S
192.	DBW369	10MR	30S	NG	10MS	20MS	20S	TMS
193.	DBW367	20MS	30MS	0	60S	40S	20MS	10S
194.	DBW364	0	0	0	60S	60S	0	5S
195.	Kharchia 65 (C)	40S	60S	30S	80S	80S	15MS	60S
196.	DBW366	NG	NG	0	20SMS	20S	20MS	5S
197.	KRL210 (C)	0	40S	0	30S	5S	30S	20S
198.	DBW365	0	0	0	20S	5S	30S	10MS
199.	K1805	0	0	5R	5S	10S	30MS	5S
200.	KRL19 (C)	0	30MS	NG	80S	20S	50S	5S

None of the entry conferred APR to the major pathotypes of leaf, stripe and stem rust pathogens. WH1252 had APR to all three pathotypes of leaf rust and two pathotypes of stripe rust Table 2.2 and 2.3. Seven entries (DBW107, DBW296, DBW318, HD3293, UP3060, WH1270, and WH1283) conferred APR to all pathotypes of leaf rust pathogen and 238S119 of yellow rust pathogen. HD3118 had APR to both the pathotypes of stripe and 104-2 of leaf rust pathogen. HPW349 and WH1142 conferred APR to both the pathotypes of stripe and 77-5 & 104-2 pathotypes of leaf rust. GW322 conferred APR to both the pathotypes of stem rust and 77-5 of leaf rust, while GW322 had APR to both the pathotypes of stem rust and 77-5 and 104-2 of leaf rust (Table 2.4 and 2.2).

Leaf rust

Ninety five entries of AVT conferred APR to one or the other pathotypes of *P. triticina.* APR to all the pathotypes (77-5, 77-9 and 104-2) of leaf rust was observed in 16 entries. Twenty one entries had APR to 77-5 and 77-9, while six had APR to combination of 77-5 &104-2 and eight to 77-9 & 104-2. Individual APR to 77-5, 77-9 and 104-2 was recorded in 10, 22 and 12 entries of AVT (Table 2.2).

Table 2.2. Race specific adult plant resistance to the predominant and virulent pathotypes of *Puccinia triticina* in wheat lines of AVT during 2020-21

Pathotypes	No. of lines	Wheat Lines
All three pts. 77-5(121R63-1), 77-9 (121R60-1) and 104-2 (21R55)	16	DBW107, DBW296, DBW318, HD2733, HD3171, HD3360, HD3369, HD3411, HPW349, K1910, PBW876, RAJ4548, UP3060, WH1252, WH1270, WH1283
Both 77-5(121R63-1) and 77-9 (121R60-1)	21	DBW252, DBW313, DBW371, DBW372, DBW373, DBW378, GW523, HD3059, HD3404, HD3406, HI1653, HI1654, HUW838, MACS6774, NIAW3170, PBW826, PBW838, VL907, VL2041, WH1105, WH1404

Both 77-9 (121R60-1) and 104-2 (21R55)	8	HI1605, HI8713, HI8830, MACS4106, MP3336, NIDW1348, WH1281, WH1405
Both77-5(121R63-1) and 104-2 (21R55)	6	DBW322, HD3293, HD3413, HS562, KRL210, PBW644,
77-5(121R63-1)	10	DBW321, DBW369, GW322, HD2967, HI1621, HI1628, HS507, PBW871, PBW872, WH1406
77-9 (121R60-1)	22	DBW173, DBW187, DBW222, DBW327, DBW332, DBW364, DBW370, DBW374, DBW377, DDW48, DDW53, HD3249, HD3403, HD3405, NW7096, NWS2180, MP1358, PBW834, PBW873, UAS3014, UP3096, WH1407
104-2 (21R55)	12	CG1036, DBW365, HD3043, HD3086, HD3118, HI1612, HI8627, HI8826, K1317, K1805, NIDW1345, UAS428

Stripe rust

Twenty-eight lines exhibited APR to different pts. of stripe rust. Among these 7 lines viz. AKDW2997-16(d) (C), DBW375, HD3118 (C), HPW349 (C), WH1142 (C), WH1252, and WH1407 could confer APR to all two major pathotypes of *P. striiformis* in India. Nineteen lines conferred APR to two 238S119. Two other lines (DBW328 and HI1612) possessed APR to 110S119 (Table 2.3).

Table 2.3: Race specific adult plant resistance to the predominant and virulent pathotypes *Puccinia striiformis tritici* in wheat lines of AVT during 2020-21

Pathotypes	No. of lines	Detail
238S119 and 46S119	07	AKDW2997-16(d) (C), DBW375, HD3118 (C), HPW349 (C), WH1142 (C), WH1252, WH1407
238S119	19	HS562 (C), WH1105 (C), PBW826, WH1283, PBW771 (C), DBW296, HI1628 (C), PBW826, DBW318, DBW107 (C), UP3060, HD3293(I) (C), WH1281, DBW320, MP1358, PBW873, DBW333, WH1270(I) (C)
46S119	02	DBW328, HI1612
Total	28	

Stem rust

Eight entries of AVT conferred APR to the pathotypes of *P. graminis tritici.* APR to both the pathotypes (11, 40A) of stem rust was observed in two entries (GW322, WH1405). Five entries (DBW187, HD2932, HI1653, MACS5058, and MACS6774) had APR to pt. 11, while DBW369 conferred APR to pt. 40A (Table 2.4).

Table 2.4: Race specific adult plant resistance to the predominant and virulent pathotypes *Puccinia graminis tritici* in wheat lines of AVT during 2020-21

Pathotypes	No. of lines	Wheat Lines
Both 11 and 40A	02	GW322, WH1405
11	05	DBW187, HD2932, HI1653, MACS5058, MACS6774
40A	01	DBW369
Total	08	

Table 2.5: Race Specific APR in AVT entries (NHZ, NWPZ and NEPZ) against selective pathotypes of yellow and leaf rust at Ludhiana and Delhi centers during 2020-21.

AVT No.	Entries	Yellow rust pathotypes				Leaf rust pathotypes		
		238S119		46S119		77-5		77-9
		Ludhiana	Delhi	Ludhiana	Delhi	Ludhiana	Delhi	Ludhiana
North Hill Zone (NHZ)								
1	VL2041	TR	10S	10MR	0	0	0	0
2	HS562 (C)	0	TR	0	0	0	5S	0
3	HPW349 (C)	0	5MR	0	0	5S	5MR	10S
4	HS507 (C)	0	TR	5MS	0	10S	0	20S
5	VL907 (C)	5MR	0	5MS	5S	5S	0	20S
North Western Plain Zone (NWPZ)								
6	WH1105 (C)	5MS	5MR	10S	5S	0	10S	5S
7	DBW187 (C)	0	0	5S	TR	0	0	0
8	HD3349	0	TR	5S	0	0	0	0
9	PBW876[B]	0	0	0	0	0	TR	0
10	HD3406[M]	0	40S	5S	5S	0	5MR	0
11	DBW222 (C)	10S	20S	0	10S	0	0	0
12	DBW313[#]	0	TR	TS	0	0	5MS	0
13	HD2967 (C)	20S	60S	10S	40S	0	0	0
14	PBW826	0	TR	0	0	0	0	0
15	RAJ4548[#]	0	TR	0	10MS	0	0	0
16	HD3354	0	5MR	0	5MS	0	20S	0
17	WH1283	0	0	0	0	0	10S	0
18	HD3086 (C)	0	0	0	0	0	0	20S
19	JKW261	0	5MR	5S	5S	0	0	0
20	WH1124 (C)	20MS	30S	5S	10S	0	10MS	40S
21	PBW771 (C)	0	0	0	0	0	5MR	0
22	HD3059 (C)	10MS	0	5MS	10S	0	5MR	0
23	PBW834	0	5S	5S	5S	10S	10S	0
24	DBW173 (C)	0	5MS	5MS	0	0	0	0
25	HUW838[#]*	10S	5MR	10S	TR	0	0	0
26	NW7096	10MS	10S	5S	5MR	0	5S	0
27	DBW321	0	TR	5S	0	0	5MS	0
28	K1910	0	5S	0	TR	0	5MS	0
29	HI1654	0	0	5MS	0	0	0	0
30	NIAW3170 (C)	5MS	10S	5MS	TR	0	10S	0
31	PBW838	0	0	0	0	5S	0	5S
32	DBW296*	0	0	0	0	0	0	0
33	HI1628 (C)	0	0	5S	0	0	5MR	0
34	HD3369	0	0	0	0	0	0	10S
35	WH1142 (C)	0	0	0	0	0	5MR	5S
36	UP3062	0	0	0	0	20S	0	20S
37	HD3368	0	0	5MS	0	0	0	0
38	HD3043 (C)	TS	10S	20MS	10S	20S	30S	60S

39	PBW644 (C)	0	0	20MS	0	0	0	0
40	HI1653	0	0	0	0	0	0	0
41	PBW848	5S	5MS	5MS	0	0	0	10S
North Eastern Plain Zone (NEPZ)								
42	HD2733 (C)	60S	60S	40S	60S	0	20MS	40S
43	HD3249 (C)	0	0	0	10S	0	5MS	10S
44	DBW187 (C)	0	0	0	0	0	0	0
45	HD3406[M]	5S	40S	20S	5S	0	0	0
46	HD3411[M]	5S	5MR	0	10S	0	20S	0
47	DBW39 (C)	40S	5MR	40S	5S	0	0	0
48	HD2967 (C)	40S	60S	20S	40S	0	20S	0
49	PBW826[#]	0	0	0	5S	0	10S	0
50	HD3086 (C)	0	0	0	0	5S	0	20S
51	DBW317	0	TMS	5S	0	5S	0	40S
52	DBW318	0	0	0	0	0	TR	0
53	PBW835		0	0	0	0	0	0
54	HI1563 (C)	40S	60S	40S	10MS	0	5MR	0
55	DBW107 (C)	5MS	0	0	0	0	0	0
56	PBW834	TS	0	0	5S	10S	10S	0
57	UP3060	0	0	0	0	0	0	0
58	HD3118 (C)	0	0	0	0	10S	10S	40S
59	HI1621 (C)	0	0	0	0	5S	0	10S
60	DBW316	0	0	0	0	0	0	0
61	PBW833	0	0	0	0	0	5S	0
62	HD3360	0	0	0	0	10S	0	40S
63	HI1653	0	0	0	0	0	5S	0
64	DBW322	TS	0	0	0	10S	5S	40S
65	HI1612 (C)	TS	TR	0	0	0	5MS	0
66	DBW252 (C)	TS	TR	10S	0	0	5S	5S
67	DBW321	0	0	0	0	0	10MR	5S
68	HD3368[#]	0	0	5S	0	0	0	10S
69	HI1654	0	TR	0	0	0	0	0
70	HD3293(I) (C)	5MS	0	0	5S	5S	0	40S
71	WH1281	-	0	-	0	-	5MR	-
72	PBW848[#]	-	TR	-	0	-	0	-
73	HD3171 (C)	-	TR	-	0	-	0	-
74	HD3369[#]	-	0	-	0	-	5MR	-
75	K1317 (C)	-	0	-	0	-	5MS	-
76	UP3062	-	0	-	0	-	10S	-

Table 2.6: Race Specific APR in AVT entries (CZ and PZ) against selective pathotypes of stem rust at Indore and Mahabaleshwar centers during 2020-21.

AVT No.	Entries	Stem rust pathotypes					
		40A			117-6	11	
		Pune	Indore	Mahabaleshwar	Mahabaleshwar	Pune	Indore
Central Zone (CZ)							
77	HI8833(d)^{M}	TS	20MR	TR	TR	5R	10MR
78	GW322 (C)	5R	20S	TR	TR	TS	40MS
79	MP3535	5R	TS	TR	TR	TS	20MR
80	GW523	TS	20MS	10MS	TMS	TMS	40MS
81	GW513*	TMS	5R	TR	TR	10MS	10MR
82	HI1636*	5MR	20MR	TR	TR	10MS	5MR
83	HI8832(d)^{M}	5MS	5MR	TR	TR	15MR	10MR
84	MACS6768	TS	20MR	TR	TR	5MR	20MR
85	HI1544 (C)	TMR	20MR	TR	TR	5MR	20MR
86	HI1667^{B}	0	40MR	TR	TR	0	20MR
87	HI8498(d) (C)	5MS	10S	TR	TR	0	20MS
88	HI8713(d) (C)	5S	40MR	TMR	TR	15MS	20MR
89	HI1650	10MS	10MR	TMR	TR	20S	10MR
90	MP4010 (C)	10MR	40MR	TMR	TR	10MR	20MR
91	HD2864 (C)	20S	40MR	TR	TR	0	20MR
92	MP3336 (C)	20S	5MS	TR	TR	0	20MS
93	HD2932 (C)	15MS	20S	5MS	TMR	TMR	20MS
94	HI1634(I) (C)	10MS	10MR	TR	TR	TMR	20MR
95	HD3407^{M}	20S	20MR	TR	TMR	10MS	20S
96	CG1029(I) (C)	20MR	20MR	TR	TR	0	20MR
97	HI8823(d)*	20S	10MR	TR	TR	10MS	20MR
98	GW528	15MR	5R	TMR	TR	10S	10MR
99	DDW47(d) (C)	0	5MR	TR	TR	0	10MR
100	DBW326	10S	20MR	10MS	TMR	15MS	40MR
101	UAS475(d)	15S	10S	TR	TR	10MR	20MR
102	HI8627(d) (C)	15S	10MR	TR	TR	15MR	20MR
103	NIAW3851	0	10MS	TMS	TMR	15MR	30MS
104	HI8830(d)	0	10MR	TR	TR	5S	20MR
105	CG1036	0	20MR	TMR	TMR	10MS	20MR
106	HI1655	5MR	5MR	TR	TR	10S	10MR
107	DBW110 (C)	5MR	20MR	TR	TR	TS	20MR
108	MP3288 (C)	0	20MR	TR	TMR	TS	10MR
109	DDW55(d)	0	20S	TR	TMR	10MR	5MR
Peninsular Zone (PZ)							
110	WHD965(d)	0	5S	5MR	TMR	TS	10MR
111	UAS428(d) (C)	0	20MR	5MR	TR	0	20MR
112	HI8826(d)	0	10MR	TR	TMR	10MR	10MR
113	MACS4100(d)	5MS	10MS	TMR	TR	20S	10MR
114	MACS3949(d) (C)	0	5MS	TMR	TR	20S	20MR

115	DDW53(d)	10MR	20S	10MR	TMR	20S	20MR
116	NIDW1345(d)	0	20MR	TMR	TR	15MR	10MR
117	MACS6222 (C)	0	10MR	TR	TR	TMR	20MR
118	MACS4106(d)	0	20MR	TR	TR	0	20MR
119	NIDW1348(d)	0	40S	TR	TR	0	20MR
120	HI8828(d)	5S	5MR	TMR	TMR	10MR	5R
121	GW322 (C)	0	10S	TMS	TMS	10MS	20MS
122	HI8827(d)	0	20MR	TMS	TMR	10MR	10MR
123	DDW48(d)(I) (C)	10MR	10MS	TMR	5MR	0	20MR
124	HD3090 (C)	5S	20MR	TR	TMR	0	20MR
125	HI1633(I) (C)	0	10MR	TR	TR	0	20MR
126	HD2932 (C)	0	20MS	10S	5S	10S	20MS
127	RAJ4083 (C)	0	20MR	10S	10S	10MS	20MR
128	DBW320	TMR	20MR	TS	TMS	10MR	20MS
129	MACS6774	0	10MR	5MS	TMS	10MR	30MS
130	NWS2180[#]	0	10MS	5MR	TR	TS	40S
131	HI1651	5S	5R	TMS	TMS	0	20MR
132	MP1358*	0	10MR	10MS	TMR	5S	40S
133	MACS6755	0	20MR	TR	TR	5MR	40MR
134	HI1605 (C)	TS	10S	10MR	TMR	15MS	40MR
135	MACS6753	0	20MR	5MR	TMR	15MS	20MR
136	AKDW2997-16(d) (C)		20MS	10MR	5MR	0	40S
137	NIDW1149(d)(I) (C)	5S	10MR	TR	TR	20MS	20MR
138	NIAW3170 (C)	15MR	20MR	TR	TR	20MS	40MR
139	UAS446(d) (C)	0	20MR	10MR	TMR	20MS	40MR
140	DBW325	0	10S	TR	TR	0	40S
141	UAS3014	TMR	20MS	TR	TR	0	60S

2.2 Identification of slow ruster lines in AVT Material 2020-21

The delay in progress of epiphytotic development is attributed to several factors including latent period, number of uredosori per unit area, size of uredosori, rate of sporulation, etc. Chances of new variants or pathotypes are minimized due to reduced selection pressure. A convenient option of identifying slow ruster lines is the estimation of the Area Under Disease Progress Curve (AUDPC) which takes into account all the factors collectively leading to manifestation of slow rusting in a genotype.

0: It represents high level of resistance controlled by major genes. This type of resistance exerts a strong selection pressure on pathogen, compelling it to mutate, resulting in short field life of a cultivar. Genotypes possessing this kind of resistance should be particularly avoided in inoculum source areas, however, they can be satisfactorily grown in target areas to seek protection against specified pathotypes.

1 - 10: This type of resistance also represents strong vertical resistance as described in group 0. This category includes those entries on which disease initiated as traces of resistant pustules (TR infection type) not exceeding 10R as terminal reaction. It may also not impart a durable protection and is likely to be lost owing to adaptations in the pathogen.

11 – 100: The incipient reaction appears as pustules of moderately susceptible (MS) infection type. Subsequent progression of disease occurs at a quite slower rate as compared to the fast ruster check genotype. Such genotypes possess adult plant resistance (APR) genes in addition to the vertical resistance genes. Such genotypes may exhibit a better field durability than those possessing the vertical resistance genes only.

101 – 200: Genotypes falling in this range of AUDPC truly represent the slow rusters. Disease initiates in the form of susceptible (S) type pustules on these genotypes but subsequent progression remains slower than the fast ruster check. The terminal severity in these genotypes does not exceed 20S as compared to 80 – 100S in fast rusting genotypes. Genotypes belonging to this category carry a long lasting field resistance and must be preferred while breeding to develop cultivars possessing durable resistance.

Entries showing various ranges of AUDPC are shown below:

Stripe Rust

A. Ludhiana

AUDPC	Entries
0	PBW876[B], PBW838, PBW835, HI8833(d)[M], HI8823(d)*, HD3413, PBW867, HD3086 (C)
0.1 – 10	DBW296*, HI8498(d) (C), HD3407[M]. WH1252*, PBW874
10.1 – 100	PBW771 (C), HI1654, HD3369, DBW316, DBW321, HD3368[#], UP3062, HI8832(d)[M], DDW47(d) (C), UAS475(d), DDW53(d), NIDW1149(d)(I) (C), DBW333*, DBW374, DBW318, KRL210 (C)
100.1 - 200	HS562 (C), HPW349 (C), HS507 (C), RAJ4548[#], HD3354, WH1283, HD3086 (C), DBW173 (C), HI1628 (C), UP3062, UP3060, HD3118 (C), HI1621 (C), PBW833, HD3360, HI1654, HD3369[#], HI8713(d) (C), HI8627(d) (C), HI8830(d), UAS428(d) (C), HI8826(d), NIDW1345(d), MACS4106(d), HI8828(d), UAS446(d) (C), DDK1029 (C), HD3410, PBW873, DBW187(I) (C), WH1270(I) (C), HD3412, PBW869, DBW376, WH1407, PBW870, K1805

B. Gurdaspur

AUDPC	Entries
0	PBW876[B], PBW838, PBW835, HI1621 (C), NIAW3851, MACS3949(d) (C), DDW53(d), NIDW1345(d), PBW874, DBW187(I) (C), HD3412, HD3413, PBW867, PBW869, PBW870, KRL210 (C), K1805
0.1 – 10	PBW771 (C), HI1654, HD3368, DBW318, UP3060, HD3118 (C), PBW833, HD3368[#], HI1654, WH1281, HD3369[#], HI8833(d)[M], HI8832(d)[M], HD3407[M], DBW326, UAS475(d), AKDW2997-16(d) (C), NIDW1149(d)(I) (C), UAS446(d) (C), DBW370, DBW327*, HD3410, PBW873, DBW333*, PBW872, WH1270(I) (C), DBW303(I) (C), DBW375, DBW374, DBW318, WH1405, HD3086 (C), DBW187(I) (C), DBW366
10.1 – 100	HPW349 (C), BW187 (C), HD3349, PBW826, RAJ4548[#], HD3354, WH1283, HD3086 (C), DBW173 (C), HUW838[#]*, DBW321, DBW296*, HD3369, WH1142 (C), UP3062, HD3086 (C), DBW317, DBW316, HD3360, HI1653, HI1612 (C), HD3293(I) (C), UP3062, HI8498(d) (C), HI8823(d)*, DDW47(d) (C), HI8627(d) (C), HI8830(d), WHD965(d), UAS428(d) (C), HI8826(d), MACS6222 (C), MACS4106(d), HI8828(d), HI8827(d), DDW48(d)(I) (C), DBW320, MP1358*, DBW325, UAS3014, MACS6222(*a*) (C), DBW328*, DBW372, WH1252*, DBW371, HD3086 (C), WH1406, DBW378, HD3405, DBW377, WH1407, DBW369, DBW365
100.1 - 200	HS507 (C), VL907 (C), HI1628 (C), HD3043 (C), HD3249 (C), DBW187 (C), HD3406[M], PBW826[#], DBW322, DBW321, PBW848[#], HD3171 (C), K1317 (C), HI8713(d) (C), DDW55(d), MACS4100(d), WH1404, PBW868, DBW376, DBW373, DBW368, DBW364

Leaf Rust

A. Mahabaleshwar

AUDPC	Entries
0	Nil
0.1 – 10	WH1283, HUW838[#]*, HI1563 (C), DBW107 (C), HD3368[#], HI8833(d)[M], MP3535, GW513*, HI1544 (C), HI1667[B], HI1634(I) (C), HD3407[M], UAS475(d), MP3288 (C),

	UAS428(d) (C), HI8826(d), MACS3949(d) (C), NIDW1345(d), MACS6222 (C), HI8828(d), HI8827(d), HI1651, MACS6755, MACS6753, NIDW1149(d)(I) (C), UAS3014, MACS5058, MACS6222(*a*) (C), DDK1061, HW1098 (C), MACS5057, DDK1060, WH1252*, PBW874, HD3410, PBW873, DBW371, WH1270(I) (C), DBW375, PBW867, DBW318, DBW187(I) (C), PBW870
10.1 – 100	VL2041, HS562 (C), HPW349 (C), HS507 (C), VL907 (C), DBW187 (C), HD3349, PBW876[B], HD3406[M], DBW222 (C), DBW313[#], HD2967 (C), PBW826, RAJ4548[#], HD3354, JKW261, PBW771 (C), HD3059 (C), PBW834, DBW173 (C), NW7096, DBW321, K1910, HI1654, NIAW3170 (C), DBW296*, HI1628 (C), HD3369, WH1142 (C), UP3062, HD3368, HD3043 (C), PBW848, HD3249 (C), HD3406[M], DBW39 (C), HD2967 (C), PBW826[#], HD3086 (C), DBW318, PBW835, UP3060, DBW316, PBW833, HI1653, HI1612 (C), DBW252 (C), HI1654, WH1281, PBW848[#], HD3369[#], K1317 (C), UP3062, GW322 (C), HI1636*, HI8832(d)[M], MACS6768, HI8498(d) (C), HI8713(d) (C), HI1650, MP4010 (C), HD2864 (C), MP3336 (C), CG1029(I) (C), HI8823(d)*, GW528, DDW47(d) (C), DBW326, HI8627(d) (C), NIAW3851, HI8830(d), CG1036, HI1655, DBW110 (C), DDW55(d) , WHD965(d), MACS4100(d), DDW53(d), MACS4106(d), NIDW1348(d), GW322 (C), DDW48(d)(I) (C), HD3090 (C), HI1633(I) (C), RAJ4083 (C), DBW320, MACS6774, NWS2180[#], MP1358*, AKDW2997-16(d) (C), NIAW3170 (C), UAS446(d) (C), DBW325, DDK1029 (C), DBW328*, DBW372, DBW370, DBW327*, DBW332*, PBW872, DBW187(I) (C), DBW303(I) (C), HD3412, WH1406, UP3096, WH1404, DBW378, WH1405, DBW377, PBW869, PBW871, DBW376, WH1407, UP3095, DBW368, DBW363, DBW366, DBW365, K1805
100.1 - 200	WH1105 (C), HD3086 (C), WH1124 (C), PBW838, PBW644 (C), HI1653, DBW187 (C), HD3411[M], DBW317, PBW834, DBW321, HD3293(I) (C), HD3171 (C), GW523, HD2932 (C), HI1605 (C), HD3086 (C), DBW333*, DBW374, HD3413, PBW868, HD3086 (C), DBW373, DBW369, DBW367, DBW364, KRL210 (C), KRL19 (C)

Stem Rust

A. Indore

AUDPC	**Entries**
0	DBW318, UP3060, WH1270(I) (C), DBW318
0.1 – 10	HD3369[#], DDK1029 (C)
10.1 – 100	HS507 (C), VL907 (C), PBW876[B], DBW173 (C), HUW838[#]*, NW7096, HI1654, DBW296*, HD3369, HD2733 (C), DBW39 (C), HD2967 (C), PBW826[#], HI1563 (C), DBW107 (C), HI1654, UP3062, HI8833(d)[M], MP3535, GW513*, HI1636*, HI8832(d)[M], MACS6768, HI1544 (C), HI1667[B], HI8713(d) (C), HI1650, MP4010 (C), HD2864 (C), HI1634(I) (C), HD3407[M], CG1029(I) (C), HI8823(d)*, GW528, DDW47(d) (C), UAS475(d), HI8627(d) (C), HI8830(d), CG1036, HI1655, MP3288 (C), DDW55(d) , UAS428(d) (C), HI8826(d), MACS3949(d) (C), MACS6222 (C), MACS4106(d), HI8828(d), HI8827(d), HD3090 (C), HI1633(I) (C), RAJ4083 (C), HI1651, MP1358*, MACS6753, NIDW1149(d)(I) (C), MACS5058, MACS6222(*a*) (C), DDK1061, HW1098 (C), MACS5057, DDK1060, DBW327*, PBW872, DBW187(I) (C), DBW303(I) (C), WH1406, PBW867, UP3096, WH1404, UP3095, DBW367
100.1 - 200	VL2041, WH1105 (C), DBW187 (C), HD2967 (C), PBW771 (C), K1910, NIAW3170 (C), WH1142 (C), UP3062, HD3043 (C), HD3249 (C), DBW187 (C), DBW317, PBW835, DBW316, HI1653, WH1281, K1317 (C), HD2932 (C), DBW326, DBW110 (C), WHD965(d), DDW53(d), NIDW1345(d), NIDW1348(d), DDW48(d)(I) (C), HD2932 (C), MACS6774, MACS6755, NIAW3170 (C), UAS446(d) (C), UAS3014, DBW328*, WH1252*, HD3410, PBW868, DBW377, PBW869, DBW187(I) (C), PBW870, DBW368, DBW363, DBW364, K1805

B. Mahabaleshwar

AUDPC	Entries
0	Nil
0.1 – 10	HD3043 (C), MP3535, GW513*, HI8832(d)^{M}, HI1650, MP3336 (C), HI8823(d)*, UAS475(d), HI8830(d), CG1036, MACS4100(d), MACS4106(d), NIAW3170 (C), DDK1029 (C), DDK1061, HW1098 (C), MACS5057, DBW318
10.1 – 100	VL907 (C), PBW876^{B}, RAJ4548$^{\#}$, WH1124 (C), PBW771 (C), DBW173 (C), HUW838$^{\#}$*, NW7096, K1910, HI1654, NIAW3170 (C), PBW838, DBW296*, HI1628 (C), HD3369, WH1142 (C), UP3062, HD3368, PBW644 (C), HI1653, PBW848, HD2733 (C), HD3249 (C), DBW187 (C), DBW39 (C), HD2967 (C), HD3086 (C), DBW318, PBW835, HI1563 (C), DBW107 (C), UP3060, HD3118 (C), HI1621 (C), DBW316, PBW848$^{\#}$, HD3171 (C), HD3369$^{\#}$, K1317 (C), UP3062, HI8833(d)^{M}, GW523, HI1636*, MACS6768, HI1544 (C), HI1667^{B}, HI8713(d) (C), MP4010 (C), HD2864 (C), HD2932 (C), HI1634(I) (C), HD3407^{M}, CG1029(I) (C), GW528, DDW47(d) (C), DBW326, HI8627(d) (C), NIAW3851, HI1655, DBW110 (C), MP3288 (C), DDW55(d), WHD965(d), UAS428(d) (C), HI8826(d), MACS3949(d) (C), NIDW1345(d), MACS6222 (C), NIDW1348(d), HI8828(d), GW322 (C), HI8827(d), DDW48(d)(I) (C), HD3090 (C), HI1633(I) (C), HD2932 (C), RAJ4083 (C), DBW320, HI1651, MACS6755, HI1605 (C), MACS6753, AKDW2997-16(d) (C), NIDW1149(d)(I) (C), UAS446(d) (C), MACS5058, MACS6222(*a*) (C), DDK1060, DBW327*, HD3410, DBW333*, PBW872, WH1270(I) (C), WH1406, HD3413, PBW867, WH1404, PBW868, DBW378, HD3405, DBW377, PBW869, PBW871, DBW373, HD3404, PBW870, UP3095, DBW368, DBW367, DBW364, DBW365, K1805, KRL19 (C)
100.1 - 200	VL2041, HS562 (C), HS507 (C), DBW187 (C), HD3349, HD2967 (C), PBW826, HD3354, WH1283, HD3086 (C), HD3059 (C), PBW826$^{\#}$, DBW317, HI1653, DBW322, HD3368$^{\#}$, HI1654, WH1281, GW322 (C), DDW53(d), DBW370, WH1252*, DBW303(I) (C), HD3403, DBW369

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2.3 Seedling Resistance Test (SRT) against pathotypes of wheat rusts

A. Flowerdale, Shimla

a) Rust resistance

To know the rust resistance of wheat lines of AVTs at seedling stage, 62 pathotypes of three species of *Puccinia* on wheat were used for screening. Sixteen pathotypes of stripe rust, 23 each of stem and leaf rust pathogens, which are most virulent and predominant were used for evaluation. Detailed information on the genetics of rust resistance of the advanced wheat lines is given below:

Rust resistance in AVT lines

Three AVT entries *viz*. HD3407, PBW835 and PBW867 were resistant to all the pathotypes of *P. graminis tritici*, *P. triticina* and *P. striiformis*. Resistance to black and brown rusts was observed in 17 entries while resistance to brown & yellow, and black & yellow was recorded in PBW869 and HD3413, respectively. Eighteen lines were found resistant to leaf rust whereas 19 to stem rust pathotypes. Three entries (DBW376, PBW874, and HD3412) conferred resistance only to yellow rust pathotypes (Table 2.7).

Table 2.7: Rust resistance in advanced wheat material (AVT: 2020-21)

Rusts	No. of lines	Detail of lines
Brown, Black and Yellow	03	HD3407, PBW835, PBW867
Brown and Black	17	CG1029, GW513, GW528, HD2864, HI1544, HI1563, HI1636, HI1650, HI1651, HI1667, MACS6222, MACS6753, MACS6755, MP3288, MP3535, MP4010, UP3095
Brown and Yellow	01	PBW869
Black and Yellow	01	HD3413
Brown only	18	DBW316, DBW366, DBW375, DDW47, DDW55, HD3090, HD3349, HD3354, HD3410, HI1633, HI1634, MACS3949, MACS6768, PBW833, PBW869, UAS446, UAS475, WHD965
Black only	19	DBW110, DBW303 (I) (C), DBW318, DBW326, DBW364, DBW374, DBW377, DBW378, HI1655, HI8833, HUW838, K1317, K1910, PBW868, PBW870, PBW872, UP3096, WH1404, WH1406
Yellow only	03	DBW376, PBW874, HD3412

b) Rust resistance genes in AVT lines (Gene postulation)

Wheat rust resistance genes (*Lr, Sr, Yr*) were characterized using gene matching technique. Rust resistance genes were characterized only in the lines where differential host-pathogen interaction was present. In addition, linked characters, morphological markers, characteristic infection types and pedigree also formed the basis for postulating rust resistance genes in absence of host-pathogen differential reactions.

***Yr*-genes**

Among the 200 lines of AVT, *Yr* genes were characterized in 113 lines. *Yr* genes were postulated in lines where differential interactions were observed and in other cases tight linkage of *Yr* genes to other *Lr* and *Sr* genes also facilitated the inference for the presence of a resistance gene. Four *Yr* genes viz. *Yr2*, *Yr9*, *YrA* and *Yr18* contributed to yellow rust resistance in Indian wheat material. Among the postulated *Yr* genes *Yr2* was most common and characterized in 89 lines. *Yr9* and *YrA* were postulated in 15 and 11 entries, respectively, whereas *Yr18* was characterized only in HD2733(C) (Table 2.8).

Table 2.8: *Yr-genes* in AVT entries during 2020-21

***Yr* gene's**	**No. of lines**	**Detail of lines**
Yr2+	89	CG1029 (I)(C), DBW110 (C), DBW187 (C), DBW252 (C), DBW303 (I),(C), DBW313, DBW318, DBW325, DBW326, DBW327, DBW328, DBW333, DBW363, DBW364, DBW365, DBW367, DBW368, DBW370, DBW371, DBW373, DBW374, DBW375, DBW377, DBW378, DDW48 (D)(I),(C), DDW53 (D), GW528, HD2864 (C), HD2932 (C), HD2967 (C), HD3059 (C), HD3086 (C), HD3118 (C), HD3171 (C), HD3249 (C), HD3293 (I)(C), HD3354, HD3360, HD3368, HD3403, HD3406, HD3410, HD3411, HI1563 (C), HI1605 (C), HI1612 (C), HI1621 (C), HI1628 (C), HI1653, HI1654, HI1655, HI8828 (D), HPW349 (C), HW1098 (C), HUW838, K1805, K1910, KRL210, MACS4106 (D), MACS5057, MACS5058, MACS6222 (C), MP3535, MP4010 (C), NIAW3851, NW7096, PBW644 (C), PBW826, PBW833, PBW838, PBW848, PBW868, PBW870, PBW871, PBW872, PBW876, RAJ4083 (C), UAS428 (D)(C), UAS475 (D), VL2041, WH1105 (C), WH1124 (C), WH1252, WH1270, WH1281, WH1283, WH1404, WH1405, WH1406
Yr9+	12	DBW39 (C), DBW107 (C), DBW173 (C), HD3090 (C), HI1633 (I)(C), HI1634 (I)(C), HS507 (C), MACS6768, PBW771 (C), UP3062, VL907 (C), WH1142 (C)
Yr9+18+	01	HD2733 (C)
Yr9+A+	02	DBW316, HD3043 (C)
YrA+	09	DBW321, DBW322, DBW332, DBW366, HD3349, HD3405, HS562 (C), PBW834, UP3096
Total	**113**	

***Lr*-genes**

Nine *Lr* genes viz. *Lr1*, *Lr3*, *Lr10*, *Lr13*, *Lr23*, *Lr24*, *Lr26*, *Lr28* and *Lr34* were characterized in 134 lines. *Lr13* was the most commonly occurring leaf rust resistance and was characterized in highest number of lines (66) followed by *Lr10* (49 lines), *Lr23* (45 lines) and *Lr1* (32 lines). *Lr24* was postulated in 14 entries. *Lr26* and *Lr3* were characterized in fifteen and eleven entries, respectively. *Lr34* and *Lr28* were postulated in HD2733 and PBW874 only. Majority of the genes occurred in combination and many of the lines have leaf rust resistance derived from 3 or more *Lr* genes (Table 2.9).

Table 2.9: *Lr-genes* in AVT entries during 2020-21

***Lr g*ene's**	**No. of lines**	**Detail of Lines**
*Lr*10+1+	1	DBW320
*Lr*13+	23	DBW303, DBW367, DBW368, DBW373, DDK1029, HD3369, HD3403, HD3411, HI1605, HI1654. HI8627, GW523, KRL210, KRL19, MACS6774, MP3336, RAJ4083,UP3060, UP3096, WH1105, WH1252, WH1281, WH1404
*Lr*13+1+	11	DBW322, DBW364, DBW370, GW322, HD3405, K1910,PBW644, PBW834, PBW870, PBW871,WH1406
*Lr*13+3+	2	HD3059, HI1653,
*Lr*13+10+	13	DBW252, DBW313, DBW332, DBW365, DBW376, HD3249, HD3293, HD3404, HI1628, HPW349, PBW838, PBW868, WH1405,
*Lr*13+10+1+	8	DBW374, DBW317, DBW333, DBW363, HI1655, NIAW3170, NWS2180, WH1407
*Lr*13+10+3+	5	DBW321,HD3086, HD3360, HUW838, WH1124

*Lr*23+	15	AKDW2997-16, DBW318, DBW326, HD2967, HI1612, HI8498, HI8827, HI8828, HI8832, HI8833, HS562, NW7096, PBW826, UAS428, WH1270,
*Lr*23+1+	6	DBW325, DBW327, DBW371, DBW372,DBW377, DBW378,
*Lr*23+3+1	1	Raj4548,
*Lr*23+10+	12	DBW110, HD3368, HD3412, K1805, MP1358, NIAW3851, NIDW1149, PBW848, PBW872, PBW873, PBW876, WH1283,
*Lr*23+10+1+	3	DBW187, DBW328, HD3406
*Lr*23+13+	1	JKW261
*Lr*23+13+10+	3	HD3171, DBW296, UAS3014
*Lr*24+	14	CG1029, GW513, HD2864, HI1544, HI1563, HI1636, HI1651, HI1667, MACS6222, MACS6753, MP3288, MP3535, MP4010, UP3095
*Lr*26+	7	DBW107,DBW316, HD3090, HI1633, HI1634, MACS6768, VL907,
*Lr*26+1+	1	HS507
*Lr*26+10+3+	2	DBW173, UP3062
*Lr*26+23+	1	HD3043,
*Lr*26+23+1+	1	PBW771,
*Lr*26+23+10+	1	DBW39
*Lr*26+23+10+ 3+	1	WH1142
*Lr*26+34+	1	HD2733
*Lr*28+	1	PBW874
Total	**134**	

***Sr*-genes**

Thirteen stem rust resistance genes (*Sr*2, *Sr5, Sr7b, Sr8a, Sr8b, Sr9b, Sr9e, Sr11, Sr13, Sr24, Sr28, Sr30* and *Sr31*) were characterized in 143 AVT lines (Table 3). The frequency of *Sr2* was maximum as it was postulated in 62 AVT entries followed by *Sr11*and *Sr7b*, which were characterized in 43 and 34 entries, respectively. *Sr31* linked with *Lr26* and *Yr9* and conferring resistance to all the known *Pgt* pathotypes in Indian subcontinent was postulated in 15 AVT entries, while *Sr24* linked to *Lr24* was characterized in 14 entries. Other *Sr* genes i.e. *Sr13, Sr8a, Sr5, Sr30, Sr9b, Sr28, Sr9e, Sr8b* were postulated in 19, 15, 14, 112, 5, 3, 2 and 1 entries, respectively. The *Sr* genes were characterized singly or in combination of up to four gens. Two entries KRL19 (C) and DBW252 (C) had combination of four *Sr* genes viz. *Sr8b+9b+11+2+* and *Sr8a+5+11+2+*, respectively (Table 2.10).

Table 2.10: *Sr genes* in AVT entries during 2020-21

Sr gene/s	**No. of lines**	**Detail of Lines**
Sr31+5+	01	HS507 (C)
Sr31+2+	10	DBW107 (C), DBW173 (C), DBW316, DBW39 (C), HD2733 (C), HD3043 (C), HD3090 (C), PBW771 (C), VL907 (C), WH1142 (C)
Sr31+	04	HI1633 (I) (C), HI1634 (I) (C),MACS6768, UP3062
Sr24+2+	10	CG1029 (I) (C), HI1544 (C), HI1563 (C), HI1636, HI1667, MACS6222 (C), MACS6753,MP3288 (C), MP4010 (C),UP3095
Sr24+	04	GW513,HD2864 (C),HI1651, MP3535
Sr30+8a+2+	02	HD3410, PBW874
Sr30+8a+	06	DBW320, DBW332, DBW363, DBW366, HI8832 (d), PBW826

Sr30+5+11+	01	VL2041
Sr30+11+	01	PBW834
Sr30+	02	HD3404, PBW873
Sr28+11+2+	01	DBW333
Sr28+	02	DBW372, HI1621 (C)
Sr8a+5+11+2+	01	DBW252 (C)
Sr8a+5+	08	DBW317, DBW371, HD3405, HD3412, NW7096, PBW869, WH1281, WH1407
Sr8a+9b+11+	01	HS562 (C)
Sr8a+11+2+	01	HD2967 (C)
Sr8a+11+	03	DBW369, HD3403, K1805
Sr8a+2+	01	NIAW3170 (C)
Sr8a+	01	DBW365
Sr8b+9b+11+2+	01	KRL19 (C)
Sr5+13+	01	DBW327
Sr5+11+	02	DBW187 (C), DBW328
Sr9e+7b+	01	WH1252
Sr9e+2+	01	HI8627 (d) (C)
Sr9b+11+	03	HD3118 (C), PBW848, PBW871
Sr13+11+2+	01	HD3354
Sr13+11+	01	DBW325
Sr13+7b+	02	DBW322, UP3060
Sr13+2+	03	HD3293 (I) (C), NIAW3851, NWS2180
Sr13+	11	DBW296, DBW321, GW523, HD3369, HD3406, HI1654, MACS6774, PBW876, RAJ4548,WH1270 (I) (C), WH1283
Sr11+7b+2+	02	DDW47 (d) (C), HD3171 (C)
Sr11+2+	11	DBW367, DDK1029 (C), GW322 (C), HD3059 (C), HD3249 (C), HI8498(d) (C), HI8823 (d), HW1098 (C), MP3336 (C), NIDW1149 (d) (I) (C), WH1105 (C)
Sr11+	13	DBW368, DBW373,DDK1060, DDK1061, HD2932 (C), HI1605 (C), JKW261, MACS5057, MP1358, PBW838, RAJ4083 (C),UAS3014, WH1405
Sr7b+2+	16	AKDW2997-16 (d) (C), DDW48 (d) (I) (C), DDW53 (d), DDW55 (d), HD3086 (C), HI1612 (C), HI8826 (d),HI8830 (d), HPW349 (C), KRL210 (C), MACS3949 (d) (C), MACS4106 (d), NIDW1345 (d),NIDW1348 (d), UAS428 (d) (C), WHD965 (d)
Sr7b+	13	CG1036,DBW313, DBW370,DBW375, DBW376, HD3349, HD3360, HD3368, HD3411, HI1653, MACS5058, PBW833, UAS475 (d)
Sr2+	01	HI1628 (C)
Total	**143**	

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AVT entries of CZ & PZ were tested against selective pathotypes of stem and leaf rusts under glass house condition. These were tested at seedling stage against 14 pathotypes of stem rust and 10 pathotypes of leaf rust. The entries found resistant in seedling resistance test are depicted in Table 2.11 as detailed below.

Pathotypes used:
Stem Rust: 11, 11A, 21, 21A1, 21A2, 24, 24A, 40A, 42B, 117, 117-2, 117-4, 122, 295.
Leaf Rust: 12-3, 12-4, 12-5, 77, 77-1, 77-3, 77-5, 77-9, 104A, 104-2.

Table 2.11: Resistant entries from AVT and NIVT trial against selective pathotypes at seedling stage under glass house condition.

	Stem rust	Leaf rust
AVT	MP3535, GW513*, HI1636*, HI1667^{B}, HI1650, MP4010 (C), HD2864 (C), HD3407^{M}, CG1029(I) (C), CG1036, HI1655, HI8827(d), HD3090 (C), HI1633(I) (C), HI1651, MP1358*, MACS6755	MP3535, GW513*, HI1636*, MACS6768, HI1544 (C), HI1667^{B}, HI8498(d) (C), HI8713(d) (C), HI1650, MP4010 (C), HD2864 (C), MP3336 (C), CG1029(I) (C), HI8823(d)*, GW528, DDW47(d) (C), UAS475(d), HI8627(d) (C), HI8830(d), CG1036, HI1655, MP3288 (C), DDW55(d), WHD965(d), UAS428(d) (C), HI8826(d), MACS4100(d), MACS3949(d) (C), MACS6222 (C), MACS4106(d), HI8828(d), HI8827(d), DDW48(d)(I) (C), HI1633(I) (C), MP1358*, MACS6755, MACS6753, NIDW1149(d)(I) (C), NIAW3170 (C), UAS446(d) (C)

PROGRAMME 3. LEAF BLIGHT

3.1. LEAF BLIGHT SCREENING NURSERY (LBSN), 2020-21

The disease is causing leaf spot on foliar parts and mainly prevalent in north eastern plains zone (NEPZ) and Peninsular zone (PZ). In recent years, the incidence in NWPZ is increasing as the temperature during crop season rises above 25^{o}C. The grain yield losses may vary from 10-50%. In addition to yield losses, the quality also deteriorates depending on the level of susceptibility of a cultivar against the pathogen. Since leaf blight occurs in all the wheat growing agro-climatic zones, deployment of resistant cultivars remains the most effective strategy for the management of disease.

This nursery was planted at 16 centres listed below:

Zone	Test locations
NWPZ	Karnal, Pantnagar, Ludhiana, Hisar (4)
NEPZ	Varanasi, Faizabad, IARI Pusa, Coochbehar, Shillongani, Ranchi, Naini, Goria Karma Jharkhand and Kalyani (9)
PZ	Dharwad, Wellington, Pune (3)

The nursery was planted at 16 centers cited as above, the data from Dharwad, Nauni and Goria Karma Jharkhand was not considered due to poor/ erratic disease development.

The entries were planted in one row each of 1m length and a row of a highly susceptible entry Raj 4015 was repeatedly planted after every 20 test entries. The inoculations of pathogens were done right from the month of January at 15 days intervals with frequent irrigations till development of disease. The recording of disease was done on 0-9 double digit scale at three stages, flowering, dough and hard dough stages to observe response of each entry against leaf blight at various stages. The first digit indicates the score of blight on flag leaf (F) and second digit represents the score of flag-1 leaf (F-1) and the disease score scale (0-9) was as follows:

0-No blight, **1**-Up to 10% leaf area blighted, **2**-11-20% leaf area blighted, **3**-21-30% leaf area blighted, **4**-31-40% leaf area blighted, **5**-41-50% leaf area blighted, **6**-51-60% leaf area blighted, **7**-61-70% leaf area blighted, **8**-71-80% leaf area blighted, **9**->80% leaf area blighted.

Amongst three stages, blight record at hard dough stage was most distinct in terms of giving clear comparison between resistant and susceptible stage and therefore data at hard dough stage was used for final categorization of resistance of test entries. The data of AVT entries is also presented in Table 1.3 of chapter 1. Center wise data of leaf blight score of different entries at hard dough growth stage is given in Table 3.1.

Source of resistance

The entries from AVTs which showed the moderate level of resistance within average score below 35 and HS below 57 are VL2041, HS562 (C), HD3406^{M}, DBW313$^{\#}$, HD2967 (C), PBW834, HD3043 (C), PBW644 (C), HD3406^{M}, HD2967 (C), DBW374. Besides these, the entries showed moderate level of resistance with average score below 35 are VL907 (C), DBW222 (C), NW7096, UP3062, PBW848, DBW39 (C), DBW317, HI1621 (C), DBW316, PBW833, HI1612 (C), DBW252 (C), DBW321, HD3368$^{\#}$, HI1654, HD3293(I) (C), HD3171 (C), DDW53(d), DBW303(I) (C), DBW318, PBW871, DBW363 but the highest score exceeded 57 due to high disease at one locations.

Table 3.1 Center wise leaf blight score of different entries at hard dough growth stage 2020-21

S.No.	Entries	Leaf Blight Score (0-9, dd) IIIrd (Hard dough) stage														
		Wellington	Pune	Varanasi	Faizabad	IARI Pusa	Coochbehar	Shillongani	Ranchi	Kalyani	Pantnagar	Ludhiana	Karnal	Hisar	AV.	HS
North Hill Zone (NHZ)																
1	VL2041	00	57	24	46	24	01	3	13	35	24	13	12	23	23	57
2	HS562 (C)	23	37	47	35	34	12	24	25	35	35	11	01	45	24	47
3	HPW349 (C)	23	79	46	78	23	12	36	36	35	24	24	02	57	35	79
4	HS507 (C)	45	79	67	57	34	03	46	24	45	26	11	01	36	35	79
5	VL907 (C)	23	58	12	46	35	02	35	14	45	35	11	02	56	24	58
North Western Plain Zone (NWPZ)																
6	WH1105 (C)	78	79	68	78	35	23	35	36	57	46	35	13	67	46	79
7	DBW187 (C)	78	58	78	57	35	25	36	14	45	25	57	12	46	46	78
8	HD3349	78	77	57	68	34	25	36	24	56	36	78	24	36	46	78
9	PBW876^{B}	67	56	67	46	35	13	46	13	57	14	78	24	47	46	78
10	HD3406^{M}	45	57	35	46	34	03	24	26	35	24	24	13	57	35	57
11	DBW222 (C)	23	58	36	57	45	23	25	26	35	47	57	13	45	35	58
12	DBW313$^{\#}$	00	35	46	46	34	23	36	26	45	56	23	35	56	35	56
13	HD2967 (C)	12	37	23	35	34	02	37	14	35	26	11	24	57	24	57
14	PBW826	23	58	23	67	35	35	36	13	45	45	68	35	57	45	68
15	RAJ4548$^{\#}$	78	77	68	46	45	56	36	13	45	36	37	24	67	46	78
16	HD3354	45	57	78	57	34	35	24	35	45	47	78	13	45	46	78
17	WH1283	78	77	67	57	34	25	24	34	56	25	35	13	46	45	78
18	HD3086 (C)	78	79	35	68	34	34	36	36	57	36	15	35	23	46	79
19	JKW261	67	57	67	67	34	23	24	24	35	45	01	24	35	35	67
20	WH1124 (C)	78	59	46	57	34	25	24	2	24	67	11	57	45	45	78
20A	Infector	45	99	78	78	45	56	79	57	78	78	89	57	89	68	99
21	PBW771 (C)	89	58	78	67	34	23	35	26	46	69	23	24	12	46	89
22	HD3059 (C)	89	59	57	46	34	24	24	15	45	36	25	35	23	36	89
23	PBW834	12	57	57	36	35	23	25	36	35	45	35	24	57	35	57
24	DBW173 (C)	89	78	67	46	35	24	36	37	57	37	35	24	67	46	89
25	HUW838$^{\#}$*	89	37	78	57	34	25	24	35	57	58	37	13	23	46	89
26	NW7096	34	57	57	36	35	35	24	24	67	57	25	24	12	35	67
27	DBW321	23	69	47	46	24	24	25	15	67	36	37	14	56	36	69
28	K1910	78	56	46	68	23	35	25	26	35	25	57	13	35	36	78
29	HI1654	89	39	57	57	34	36	25	23	35	47	37	02	24	36	89
30	NIAW3170 (C)	45	77	58	67	34	24	35	36	45	46	45	03	12	45	77
31	PBW838	78	47	46	58	34	35	25	36	46	57	37	03	23	36	78
32	DBW296*	78	47	67	46	34	25	25	24	23	36	57	13	35	35	78
33	HI1628 (C)	45	57	46	45	35	34	36	25	35	78	78	24	45	46	78
34	HD3369	89	47	47	57	34	23	37	24	35	24	27	14	56	36	89
35	WH1142 (C)	89	77	57	36	23	22	36	26	56	36	11	26	57	46	89
36	UP3062	23	57	78	35	34	35	57	24	45	47	11	24	35	35	78
37	HD3368	45	77	78	46	23	34	36	12	45	38	78	03	13	45	78
38	HD3043 (C)	23	55	47	36	34	24	36	13	35	46	47	24	12	35	55
39	PBW644 (C)	23	55	57	46	23	34	24	2	35	37	11	13	35	34	57
40	HI1653	89	47	46	57	23	25	36	12	35	46	68	24	45	46	89
40A	Infector	23	99	89	78	34	57	79	57	67	89	89	57	78	67	99
41	PBW848	23	55	67	57	23	34	36	25	35	37	16	46	23	35	67

North Eastern Plain Zone (NEPZ)																
42	HD2733 (C)	89	59	46	46	34	24	25	36	35	57	35	35	36	46	89
43	HD3249 (C)	67	59	78	79	34	35	35	46	57	68	16	24	45	46	79
44	DBW187 (C)	67	79	78	67	23	02	36	25	45	49	27	35	56	46	79
45	HD3406[M]	45	37	46	57	23	01	24	15	57	36	35	02	57	35	57
46	HD3411[M]	89	35	57	36	35	34	36	35	67	47	23	01	57	46	89
47	DBW39 (C)	23	36	67	57	34	01	35	46	56	47	22	35	45	35	67
48	HD2967 (C)	12	37	56	46	23	23	25	35	56	46	12	24	35	35	56
49	PBW826[#]	00	78	78	68	23	35	24	25	45	25	58	01	56	36	78
50	HD3086 (C)	89	79	78	78	23	35	47	23	45	48	11	24	12	46	89
51	DBW317	45	37	67	46	34	25	47	14	45	37	26	02	34	35	67
52	DBW318	23	59	67	67	34	25	35	14	56	46	47	15	23	35	67
53	PBW835	67	99	68	78	34	35	46	13	57	58	78	25	12	56	99
54	HI1563 (C)	89	77	99	78	35	25	46	35	57	57	89	46	45	57	99
55	DBW107 (C)	89	58	79	57	35	13	47	13	35	38	78	24	23	46	89
56	PBW834	00	35	68	68	35	35	47	36	45	47	11	02	34	35	68
57	UP3060	45	56	78	67	34	15	47	24	24	35	57	35	23	45	78
58	HD3118 (C)	45	57	78	68	34	14	47	24	45	45	68	13	24	46	78
59	HI1621 (C)	23	77	56	57	34	15	47	35	46	47	14	35	35	35	77
60	DBW316	89	55	57	46	34	14	47	13	57	56	11	02	23	35	89
60A	Infector	67	99	89	78	45	56	79	57	78	89	89	46	89	78	99
61	PBW833	00	56	57	57	34	13	24	13	35	47	78	02	24	35	78
62	HD3360	23	79	78	46	35	24	25	13	45	46	79	35	13	45	79
63	HI1653	23	79	68	45	35	35	46	13	57	36	68	24	12	45	79
64	DBW322	89	79	78	67	34	32	47	12	67	59	55	35	23	56	89
65	HI1612 (C)	67	35	57	46	23	14	47	25	35	37	35	02	34	35	67
66	DBW252 (C)	12	36	78	36	34	24	47	24	35	47	57	35	45	35	78
67	DBW321	12	55	47	67	23	25	46	36	45	36	11	02	23	34	67
68	HD3368[#]	34	58	68	57	34	35	24	25	57	47	24	13	35	35	68
69	HI1654	12	36	57	46	34	35	35	25	45	38	78	24	34	35	78
70	HD3293(I) (C)	12	35	36	35	34	35	36	35	35	58	78	01	57	35	78
71	WH1281	45	47	58	67	23	35	46	25	68	46	35	35	12	46	68
72	PBW848[#]	23	55	46	68	35	25	47	36	56	57	58	24	23	46	68
73	HD3171 (C)	12	79	57	57	35	35	24	35	45	36	25	13	12	35	79
74	HD3369[#]	89	79	78	58	35	23	46	46	35	47	35	24	23	46	89
75	K1317 (C)	89	37	78	68	35	33	47	36	35	26	68	24	35	46	89
76	UP3062	89	58	89	57	35	23	47	36	24	47	78	35	24	46	89
Central Zone (CZ)																
77	HI8833(d)[M]	23	79	99	79	45	35	47	36	35	48	78	46	23	56	99
78	GW322 (C)	34	37	67	57	35	26	57	46	56	26	79	57	45	46	79
79	MP3535	23	37	68	47	35	46	36	35	56	46	68	46	23	46	68
80	GW523	23	37	78	68	34	55	37	36	45	47	78	35	35	46	78
80A	Infector	45	99	99	78	46	68	79	57	78	78	89	**57**	89	78	99
81	GW513*	89	99	78	79	45	35	36	35	35	69	79	35	12	57	99
82	HI1636*	89	55	78	68	35	35	37	24	57	36	57	24	23	46	89
83	HI8832(d)[M]	45	77	78	78	45	24	46	36	56	47	78	35	12	46	78
84	MACS6768	45	79	99	68	35	36	47	23	78	37	78	35	13	56	99
85	HI1544 (C)	23	79	99	79	35	36	36	23	78	46	89	35	25	56	99
86	HI1667[B]	23	79	58	79	45	45	47	26	78	45	78	13	36	46	79
87	HI8498(d) (C)	67	39	57	68	45	38	36	26	56	38	57	02	34	46	68
88	HI8713(d) (C)	89	35	78	45	35	36	47	13	24	46	68	24	45	46	89
89	HI1650	89	79	68	46	35	57	47	36	45	47	78	35	56	57	89

90	MP4010 (C)	45	99	89	68	45	26	47	35	67	58	78	46	67	57	99
91	HD2864 (C)	45	79	78	57	45	23	47	36	57	68	78	24	56	56	79
92	MP3336 (C)	45	99	99	46	45	35	46	25	46	47	79	35	45	56	99
93	HD2932 (C)	23	69	57	35	35	25	36	13	35	58	79	24	35	36	79
94	HI1634(I) (C)	23	77	57	35	35	35	37	25	46	46	79	13	45	46	79
95	HD3407[M]	23	79	68	46	35	28	36	36	46	78	89	46	46	47	89
96	CG1029(I) (C)	23	79	78	35	35	28	36	26	35	68	89	14	12	46	89
97	HI8823(d)*	89	55	78	57	35	27	47	36	57	47	67	13	12	46	89
98	GW528	89	79	47	35	35	48	47	47	35	58	68	13	23	46	89
99	DDW47(d) (C)	99	35	68	57	35	26	46	24	46	36	57	02	34	46	99
100	DBW326	89	56	99	68	35	23	37	36	47	57	89	03	35	56	99
100A	Infector	23	99	78	78	46	56	79	57	68	89	89	57	78	67	99
101	UAS475(d)	89	36	46	46	35	03	36	24	46	59	78	24	23	46	89
102	HI8627(d) (C)	23	59	68	79	45	14	35	36	46	58	58	35	34	46	79
103	NIAW3851	23	77	47	78	34	02	36	24	57	47	78	35	12	45	78
104	HI8830(d)	78	36	57	57	45	34	36	13	78	56	79	24	46	46	79
105	CG1036	12	89	79	68	45	35	35	12	57	78	78	46	13	46	89
106	HI1655	12	79	78	57	35	26	36	24	35	38	78	24	24	46	79
107	DBW110 (C)	45	57	67	46	35	34	37	13	45	47	79	35	23	46	79
108	MP3288 (C)	67	77	78	68	34	24	36	36	35	58	68	13	47	46	78
109	DDW55(d)	23	57	78	46	45	35	37	24	23	68	78	24	46	46	78
Peninsular Zone (PZ)																
110	WHD965(d)	23	39	68	78	35	13	37	47	24	37	78	02	45	36	78
111	UAS428(d) (C)	89	39	67	35	35	13	37	24	24	46	23	03	12	35	89
112	HI8826(d)	89	39	67	78	35	01	36	25	56	58	78	13	24	46	89
113	MACS4100(d)	23	59	78	57	45	23	35	36	56	38	78	24	46	46	78
114	MACS3949(d) (C)	45	57	67	69	35	13	37	36	24	47	57	02	45	46	69
115	DDW53(d)	89	37	57	46	35	34	35	13	35	36	23	24	35	35	89
116	NIDW1345(d)	56	46	67	68	35	24	36	46	45	58	23	24	34	46	68
117	MACS6222 (C)	78	77	78	46	35	25	36	3	45	46	45	24	23	45	78
118	MACS4106(d)	89	55	99	79	35	36	36	46	78	48	78	13	24	57	99
119	NIDW1348(d)	89	47	89	46	35	24	36	26	24	37	78	24	12	46	89
120	HI8828(d)	23	57	89	79	35	35	37	24	35	46	78	24	24	46	89
120A	Infector	23	99	99	78	45	57	79	57	78	78	89	57	78	67	99
121	GW322 (C)	23	47	78	57	23	35	36	24	45	46	78	24	12	45	78
122	HI8827(d)	45	36	78	78	35	35	36	36	56	35	78	13	13	46	78
123	DDW48(d)(I)(C)	78	37	47	57	35	34	36	35	35	24	78	02	12	35	78
124	HD3090 (C)	78	59	78	58	23	25	36	37	46	36	79	46	12	46	79
125	HI1633(I) (C)	45	77	58	68	35	55	36	25	78	47	78	24	24	46	78
126	HD2932 (C)	45	79	68	35	35	36	37	36	46	36	89	35	12	46	89
127	RAJ4083 (C)	23	79	89	67	35	26	47	46	79	35	78	24	23	46	89
128	DBW320	23	56	89	46	23	36	36	36	35	46	78	13	24	45	89
129	MACS6774	89	57	78	57	34	26	47	35	46	37	78	24	35	46	89
130	NWS2180[#]	78	37	67	36	34	15	36	3	35	35	78	02	45	35	78
131	HI1651	23	79	78	78	45	23	46	24	67	26	89	35	56	56	89
132	MP1358*	89	37	47	68	34	25	36	35	24	47	78	24	12	46	89
133	MACS6755	78	79	78	57	23	26	47	13	57	68	78	13	56	56	79
134	HI1605 (C)	78	37	57	46	23	34	36	46	46	37	36	24	23	36	78
135	MACS6753	89	78	47	57	23	03	47	36	67	58	89	13	35	46	89
136	AKDW2997-16(d) (C)	89	77	79	79	35	23	47	35	34	68	89	35	45	57	89

137	NIDW1149(d)(I) (C)	23	79	89	79	35	24	47	25	68	59	78	24	46	57	89
138	NIAW3170 (C)	56	56	78	57	23	35	46	37	35	47	78	13	56	46	78
139	UAS446(d) (C)	56	39	57	57	34	36	36	26	35	58	57	24	45	46	58
140	DBW325	23	39	78	68	23	25	47	25	35	68	79	57	35	46	79
140A	Infector	12	99	99	78	46	47	79	57	89	89	89	24	78	67	99
141	UAS3014	45	37	57	78	23	35	36	36	57	47	78	46	23	46	78
SPL – Dicoccum																
142	MACS5058	89	89	37	46	34	25	24	24	45	36	78	24	35	46	89
143	MACS6222(*a*) (C)	23	78	46	57	34	14	36	35	57	47	58	35	12	46	78
144	DDK1029 (C)	45	79	67	57	34	34	47	23	45	46	79	35	23	46	79
145	DDK1061	23	69	56	46	34	15	25	23	35	25	78	24	45	35	78
146	HW1098 (C)	12	79	57	46	34	15	25	26	35	34	78	35	25	35	79
147	MACS5057	45	77	68	35	35	13	25	26	35	15	68	35	12	35	77
148	DDK1060	89	79	47	58	35	24	24	13	57	26	78	46	23	46	89
SPL – HYPT																
149	DBW328*	67	57	47	68	23	00	36	36	46	47	78	24	12	45	78
150	DBW372	23	59	36	57	34	23	36	24	23	36	79	01	13	35	79
151	DBW370	56	59	47	68	34	34	47	13	35	37	79	24	45	46	79
152	DBW327*	00	59	46	46	34	25	36	13	45	56	78	13	46	35	78
153	WH1252*	23	59	57	68	34	67	46	13	45	48	57	24	56	46	68
154	PBW874	78	58	58	35	34	34	47	25	56	35	68	01	23	46	78
155	HD3410	45	39	67	67	35	25	36	36	35	24	68	02	56	46	68
156	DBW332*	23	37	56	57	35	03	36	26	57	35	78	03	57	36	78
157	PBW873	00	58	47	67	35	23	36	36	45	37	68	02	56	35	68
158	DBW371	45	58	57	68	23	02	36	47	45	46	78	03	57	46	78
159	HD3086 (C)	89	57	78	78	34	04	36	24	35	59	78	13	56	46	89
160	DBW333*	00	67	78	57	34	13	46	36	35	37	79	24	45	45	79
160A	Infector	78	99	89	78	46	46	79	57	78	78	89	58	89	78	99
161	PBW872	78	39	48	58	35	03	36	24	24	35	89	02	34	36	89
162	DBW187(I) (C)	23	55	58	57	34	13	47	36	35	47	89	24	35	46	89
163	WH1270(I) (C)	12	55	57	67	34	35	47	24	35	46	67	13	23	35	67
164	DBW303(I) (C)	00	57	57	46	23	24	46	13	24	58	78	13	24	35	78
SPL - CI – HYT																
165	HD3412	23	59	67	35	34	25	36	12	24	25	78	02	23	35	78
166	DBW375	00	67	78	36	23	14	36	24	45	46	57	02	45	35	78
167	DBW374	12	56	56	46	34	34	36	13	36	47	11	13	24	34	56
168	HD3403	45	77	35	58	34	25	47	36	46	37	78	04	35	46	78
169	WH1406	00	56	67	36	34	23	36	46	24	46	78	24	46	35	78
170	HD3413	00	89	78	35	35	14	36	47	36	35	67	24	45	45	89
171	PBW867	45	77	68	57	35	15	36	24	24	47	47	24	36	46	77
172	UP3096	78	57	67	46	35	35	36	25	24	47	35	35	45	46	78
173	WH1404	89	77	57	78	45	25	37	36	56	46	68	35	35	56	89
174	PBW868	89	56	47	46	35	35	36	15	24	57	68	35	34	46	89
175	DBW318	00	57	47	36	35	35	47	13	24	35	89	24	23	35	89
176	DBW378	12	57	57	58	34	36	47	46	56	46	89	13	24	46	89
177	WH1405	23	67	47	78	34	27	47	3	35	24	78	35	23	46	78
178	HD3405	12	57	78	57	34	36	47	46	45	46	78	35	23	46	78
179	DBW377	00	59	47	46	23	03	36	26	56	36	89	24	45	35	89
180	PBW869	00	59	79	68	23	35	47	24	57	69	78	24	34	46	79
180A	Infector	23	99	99	78	46	56	79	57	89	78	89	68	89	78	99

181	PBW871	78	47	37	46	23	04	36	24	35	35	57	24	12	35	78
182	HD3086 (C)	56	77	58	68	34	24	36	36	35	38	78	35	24	46	78
183	DBW376	00	59	46	57	34	23	35	35	24	25	78	12	23	35	78
184	DBW373	23	67	47	47	23	13	36	24	25	46	78	46	34	35	78
185	HD3404	23	67	47	78	23	56	47	25	24	36	78	35	35	46	78
186	DBW187(I) (C)	23	67	57	58	34	34	47	36	57	36	78	35	24	46	78
187	WH1407	23	77	58	67	34	35	36	46	57	45	57	24	12	45	77
188	PBW870	45	47	46	68	23	25	36	57	57	36	78	24	13	46	78
189	UP3095	78	57	36	78	34	35	47	14	35	25	89	24	12	46	89
SPL – AST																
190	DBW368	67	59	56	57	35	04	36	35	24	37	89	13	13	36	89
191	DBW363	12	57	35	46	34	02	36	24	24	25	67	24	12	34	67
192	DBW369	23	57	67	57	34	03	36	35	24	46	89	24	23	35	89
193	DBW367	45	77	79	78	34	03	36	13	45	36	89	13	12	45	89
194	DBW364	45	57	78	35	23	34	36	46	45	69	89	24	24	46	89
195	Kharchia 65 (C)	89	79	37	68	45	25	36	36	24	47	89	13	35	46	89
196	DBW366	89	56	56	67	34	35	37	35	24	36	68	13	12	46	89
197	KRL210 (C)	00	77	78	57	34	34	37	25	46	46	78	02	35	45	78
198	DBW365	00	67	57	78	23	35	36	37	24	45	78	01	46	45	78
199	K1805	23	56	36	68	35	25	36	26	45	68	78	02	23	35	78
200	KRL19 (C)	45	79	79	79	35	56	47	25	57	78	78	35	45	57	79
200A	Infector	67	99	89	78	46	67	79	57	67	78	89	68	89	78	99

Area Under Disease progress Curve (AUDPC) of leaf blight for LBSN entries:

The disease progress may account for different resistance components like latent period, size of spots, number of spore per unit area etc. which are under the influence of prevailing weather conditions. A convenient option of identifying lines that allow slow disease development is the estimation of the Area Under Disease Progress Curve (AUDPC) which takes into account all the factors collectively leading to manifestation of disease progress in a genotype. The AUDPC was calculated and on the basis of mean, the entries score less than 100 may categories as resistant and from 101 to 500 may categories as moderately resistant. The entries are categories as follows:

AUDPC	**Entries**
Upto 100	Nil
101 - 500	VL2041, HD2967 (C), HS562 (C), PBW644 (C), WH1124 (C), HD2967 (C), HD3406^{M}, HD3043 (C), JKW261, VL907 (C), DDW53(d), HD3406^{M}

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PROGRAMME 4. KARNAL BUNT

4.1 KARNAL BUNT SCREENING NURSERY (KBSN) 2020-21

Wheat entries along with checks were evaluated for resistance to Karnal bunt at multilocations (Ludhiana, New Delhi, Hisar, Pantnagar, Karnal and Jammu) during 2020-21 crop season under artificially inoculated conditions. Data from Pantnagar has not been included because of low disease.
To determine the response of genotypes to Karnal bunt, earheads were injected with hypodermic syringe with adequate amount of inoculum (10,000 allantoids/ml water) at crop growth stage 49. The local isolates were used at all the test centres. Five earheads were inoculated in each entry during evening hours. After inoculation, high humidity was maintained for proper development of disease. The disease incidence in the earheads was recorded at crop maturity and was calculated by reckoning the infected and the total number of grains (both diseased and healthy) of 5 earheads per entry. Entries showing response of upto 5 per cent coefficient of infection (average) were rated as resistant. KB incidence of AVT entries and checks of all centres is given in Table 4.1 and average KB incidence of all centres is also given in Table 1.3. The resistant entries identified are listed below:

AVTs 2020-21
Free from infection: Nil

Resistant (average incidence upto 5%):
HS507 (C), DBW313[#], WH1283, PBW834, HUW838[#]*, DBW321, K1910, HI1654, NIAW3170 (C), PBW838, DBW296*, HD3369, WH1142 (C), UP3062, HD3043 (C), PBW644 (C), HD2733 (C), HD3406[M], DBW39 (C), HD3086 (C), DBW317, PBW834, UP3060, HD3118 (C), HI1621 (C), PBW833, HD3360, HI1612 (C), DBW252 (C), HI1654, HD3369[#], K1317 (C), UP3062, HI8833(d)[M], GW322 (C), HI8498(d) (C), HD2932 (C), CG1029(I) (C), HI8823(d)*, DDW47(d) (C), UAS475(d), HI8627(d) (C), HI8830(d), CG1036, DBW110 (C), DDW55(d) , WHD965(d), UAS428(d) (C), HI8826(d), MACS4100(d), MACS3949(d) (C), DDW53(d), MACS4106(d), NIDW1348(d), HI8828(d), DDW48(d)(I) (C), HD2932 (C), MACS6774, NWS2180[#], AKDW2997-16(d)(C), NIDW1149(d)(I) (C), UAS446(d) (C), DBW325, DBW372, DBW327*, HD3410, PBW873, DBW371, HD3086 (C), HD3412, DBW374, WH1406, HD3413, PBW867, UP3096, WH1404, PBW868, HD3405, DBW376, DBW373, WH1407, PBW870, UP3095, DBW368, DBW363, DBW369, DBW366

Table 4.1: Karnal bunt incidence in KBSN entries evaluated under artificially inoculated conditions at multilocations during 2020-21

S. No.	Entries	Karnal bunt incidence (%)						
		Hisar	Ludhiana	Karnal	Delhi	Jammu	AV.	HS
North Hill Zone (NHZ)								
1	VL2041	8.2	7.0	19.4	2.5	4.5	8.3	19.4
2	HS562 (C)	9.3	1.3	32.3	2.7	9.8	11.1	32.3
3	HPW349 (C)	6.6	0.0	58.5	2.0	4.1	14.2	58.5
4	HS507 (C)	7.2	5.0	0.0	2.5	8.6	4.7	8.6
5	VL907 (C)	10.0	4.0	34.4	9.5	8.2	13.2	34.4
North Western Plain Zone (NWPZ)								
6	WH1105 (C)	8.3	16.4	32.1	1.3	6.2	12.9	32.1
7	DBW187 (C)	7.2	2.8	38.9	6.7	0.0	11.1	38.9
8	HD3349	12.5	28.8	9.6	2.5	1.5	11.0	28.8
9	PBW876[B]	10.0	9.0	18.8	6.7	0.0	8.9	18.8
10	HD3406[M]	8.3	10.0	3.3	3.5	2.1	5.4	10.0
11	DBW222 (C)	6.6	1.9	2.6	5.7	9.5	5.3	9.5
12	DBW313[#]	7.2	0.0	2.7	2.8	4.4	3.4	7.2
13	HD2967 (C)	6.6	0.0	84.8	2.5	4.0	19.6	84.8
14	PBW826	8.2	7.2	4.9	5.7	8.2	6.8	8.2

15	RAJ4548#	9.3	37.0	5.1	4.3	3.1	11.7	37.0
16	HD3354	10.0	10.7	10.8	2.9	4.1	7.7	10.8
17	WH1283	11.1	2.0	0.0	5.5	3.3	4.4	11.1
18	HD3086 (C)	10.0	18.8	1.2	6.7	1.5	7.6	18.8
19	JKW261	8.2	1.4	1.0	11.4	4.2	5.2	11.4
20	WH1124 (C)	8.2	5.2	12.2	7.5	7.2	8.0	12.2
20A	HD 2967 (Check)	16.6	19.3	17.5	8.5	18.6	16.1	19.3
21	PBW771 (C)	10.0	19.4	6.5	4.2	6.6	9.3	19.4
22	HD3059 (C)	8.2	21.6	0.0	8.6	4.2	8.5	21.6
23	PBW834	5.6	3.0	3.4	5.0	0.0	3.4	5.6
24	DBW173 (C)	8.3	9.0	1.6	7.1	4.2	6.0	9.0
25	HUW838#*	5.0	1.8	2.4	4.5	7.1	4.1	7.1
26	NW7096	8.2	5.3	15.7	7.5	0.0	7.4	15.7
27	DBW321	9.3	0.0	0.0	3.3	4.2	3.4	9.3
28	K1910	5.6	1.6	0.0	4.3	0.0	2.3	5.6
29	HI1654	6.6	3.3	0.0	2.5	5.2	3.5	6.6
30	NIAW3170 (C)	9.3	5.8	0.0	6.7	0.0	4.4	9.3
31	PBW838	7.2	0.0	0.0	4.5	3.2	3.0	7.2
32	DBW296*	6.2	4.5	1.7	5.5	0.0	3.6	6.2
33	HI1628 (C)	5.0	2.0	22.9	6.7	7.1	8.7	22.9
34	HD3369	6.6	0.0	3.9	3.5	0.0	2.8	6.6
35	WH1142 (C)	5.0	4.0	0.0	3.3	5.5	3.6	5.5
36	UP3062	4.0	0.0	0.0	6.7	0.0	2.1	6.7
37	HD3368	8.1	0.0	15.8	9.5	4.1	7.5	15.8
38	HD3043 (C)	6.6	6.0	0.0	6.5	4.2	4.7	6.6
39	PBW644 (C)	10.0	0.0	1.7	7.0	6.1	5.0	10.0
40	HI1653	5.3	12.8	90.0	5.0	0.0	22.6	90.0
40A	HD 2967 (Check)	18.3	24.5	11.9	8.5	15.5	15.7	24.5
41	PBW848	8.2	5.9	22.0	2.5	6.6	9.0	22.0
North Eastern Plain Zone (NEPZ)								
42	HD2733 (C)	9.3	0.0	0.0	4.5	0.0	2.8	9.3
43	HD3249 (C)	10.0	16.0	20.0	3.3	4.4	10.7	20.0
44	DBW187 (C)	12.5	38.2	15.9	4.4	0.0	14.2	38.2
45	HD3406M	7.5	8.9	1.6	6.7	0.0	4.9	8.9
46	HD3411M	5.0	3.0	0.0	12.5	8.6	5.8	12.5
47	DBW39 (C)	9.3	0.0	0.0	4.2	2.3	3.2	9.3
48	HD2967 (C)	11.1	5.4	0.0	3.3	9.0	5.8	11.1
49	PBW826#	12.5	22.1	25.4	4.5	6.1	14.1	25.4
50	HD3086 (C)	7.5	12.1	0.0	3.3	2.0	5.0	12.1
51	DBW317	10.0	0.0	4.1	2.0	2.3	3.7	10.0
52	DBW318	13.3	7.5	13.4	4.5	5.3	8.8	13.4
53	PBW835	12.5	0.0	28.7	6.0	5.0	10.4	28.7
54	HI1563 (C)	11.1	10.3	32.1	7.5	0.0	12.2	32.1
55	DBW107 (C)	10.0	1.5	58.6	2.5	0.0	14.5	58.6
56	PBW834	8.3	0.0	12.9	0.0	2.1	4.7	12.9
57	UP3060	9.3	0.0	0.0	2.2	1.3	2.6	9.3
58	HD3118 (C)	10.0	0.0	3.6	2.5	0.0	3.2	10.0
59	HI1621 (C)	11.1	4.1	7.0	0.0	2.3	4.9	11.1
60	DBW316	12.5	1.4	40.7	6.7	4.4	13.1	40.7
60A	HD 2967 (Check)	18.6	24.6	20.4	10.5	18.2	18.5	24.6
61	PBW833	11.1	0.0	0.0	0.0	4.4	3.1	11.1
62	HD3360	10.0	0.0	2.7	0.0	8.1	4.2	10.0
63	HI1653	10.0	2.7	37.3	2.0	0.0	10.4	37.3

64	DBW322	12.5	16.3	17.5	0.0	0.0	9.3	17.5
65	HI1612 (C)	13.3	1.1	0.0	1.7	0.0	3.2	13.3
66	DBW252 (C)	14.2	4.3	0.0	0.0	2.3	4.2	14.2
67	DBW321	12.5	0.0	18.2	2.9	4.2	7.6	18.2
68	HD3368[#]	6.6	3.8	38.9	2.5	0.0	10.3	38.9
69	HI1654	8.2	0.0	3.2	5.0	4.1	4.1	8.2
70	HD3293(I) (C)	13.3	0.0	21.8	0.0	6.2	8.3	21.8
71	WH1281	12.5	0.0	14.1	2.0	0.0	5.7	14.1
72	PBW848[#]	10.0	30.0	28.9	4.5	0.0	14.7	30.0
73	HD3171 (C)	5.7	27.4	20.9	0.0	2.1	11.2	27.4
74	HD3369[#]	7.5	0.0	3.9	3.5	5.5	4.1	7.5
75	K1317 (C)	12.5	3.8	0.0	0.0	0.0	3.3	12.5
76	UP3062	10.0	0.0	0.0	2.8	4.1	3.4	10.0
Central Zone (CZ)								
77	HI8833(d)[M]	5.0	0.0	9.1	0.0	2.1	3.2	9.1
78	GW322 (C)	8.1	3.3	8.5	4.0	0.0	4.8	8.5
79	MP3535	7.5	8.3	4.9	7.0	3.5	6.2	8.3
80	GW523	8.3	25.0	12.5	0.0	0.0	9.2	25.0
80A	HD 2967 (Check)	26.6	24.3	14.3	6.7	14.1	17.2	26.6
81	GW513*	12.5	8.8	2.3	2.5	6.1	6.5	12.5
82	HI1636*	10.0	27.8	29.2	6.7	0.0	14.7	29.2
83	HI8832(d)[M]	9.3	5.3	11.1	3.3	4.3	6.6	11.1
84	MACS6768	6.6	8.4	36.0	0.0	6.5	11.5	36.0
85	HI1544 (C)	12.5	64.5	22.5	8.3	1.3	21.8	64.5
86	HI1667[B]	13.3	22.8	42.0	3.3	6.1	17.5	42.0
87	HI8498(d) (C)	11.1	0.0	4.9	1.0	2.1	3.8	11.1
88	HI8713(d) (C)	8.3	7.3	15.7	0.0	0.0	6.3	15.7
89	HI1650	7.3	0.0	23.7	4.6	0.0	7.1	23.7
90	MP4010 (C)	11.1	34.4	46.1	0.0	1.1	18.5	46.1
91	HD2864 (C)	12.5	22.0	7.2	2.5	4.1	9.7	22.0
92	MP3336 (C)	6.6	3.5	15.2	0.0	5.0	6.1	15.2
93	HD2932 (C)	9.3	0.0	6.1	0.0	0.0	3.1	9.3
94	HI1634(I) (C)	8.2	7.1	21.3	0.0	7.9	8.9	21.3
95	HD3407[M]	9.3	10.4	24.4	14.2	0.0	11.7	24.4
96	CG1029(I) (C)	12.5	0.0	10.7	0.0	0.0	4.6	12.5
97	HI8823(d)*	7.3	0.0	0.0	7.5	2.1	3.4	7.5
98	GW528	11.1	0.0	17.3	2.5	6.1	7.4	17.3
99	DDW47(d) (C)	6.6	0.0	1.2	0.0	8.0	3.2	8.0
100	DBW326	12.5	11.6	5.0	2.3	7.2	7.7	12.5
100A	HD 2967 (Check)	24.0	21.1	20.6	7.5	14.2	17.5	24.0
101	UAS475(d)	6.6	0.0	0.0	0.0	3.1	1.9	6.6
102	HI8627(d) (C)	5.0	0.0	2.2	3.3	0.0	2.1	5.0
103	NIAW3851	8.3	3.4	11.4	4.5	8.2	7.2	11.4
104	HI8830(d)	5.0	0.0	11.7	0.0	6.2	4.6	11.7
105	CG1036	6.6	2.0	8.7	0.0	7.2	4.9	8.7
106	HI1655	11.1	NG	17.7	0.0	0.0	7.2	17.7
107	DBW110 (C)	10.0	2.9	2.4	2.6	2.1	4.0	10.0
108	MP3288 (C)	9.3	1.0	10.8	3.3	8.2	6.5	10.8
109	DDW55(d)	5.0	0.0	0.0	0.0	0.0	1.0	5.0
Peninsular Zone (PZ)								
110	WHD965(d)	4.6	0.0	0.0	11.1	4.0	3.9	11.1
111	UAS428(d) (C)	4.0	0.0	0.0	0.0	3.3	1.5	4.0
112	HI8826(d)	4.2	0.0	2.1	0.0	0.0	1.3	4.2

113	MACS4100(d)	3.3	0.0	0.0	8.0	0.0	2.3	8.0
114	MACS3949(d) (C)	2.5	0.0	0.0	12.5	1.1	3.2	12.5
115	DDW53(d)	3.5	0.0	0.0	11.1	0.0	2.9	11.1
116	NIDW1345(d)	5.6	3.8	2.9	15.0	4.6	6.4	15.0
117	MACS6222 (C)	8.1	0.0	5.3	13.3	3.3	6.0	13.3
118	MACS4106(d)	5.0	0.0	0.0	0.0	0.0	1.0	5.0
119	NIDW1348(d)	5.3	0.5	1.6	6.7	2.3	3.3	6.7
120	HI8828(d)	6.6	0.0	0.0	13.3	4.1	4.8	13.3
120A	HD 2967 (Check)	23.3	32.5	15.5	6.7	13.6	18.3	32.5
121	GW322 (C)	10.0	18.2	12.3	5.7	0.0	9.2	18.2
122	HI8827(d)	6.5	0.0	25.0	5.7	4.1	8.3	25.0
123	DDW48(d)(I) (C)	4.5	0.0	2.9	7.5	0.0	3.0	7.5
124	HD3090 (C)	4.6	0.0	94.4	0.0	4.0	20.6	94.4
125	HI1633(I) (C)	6.5	2.5	25.1	6.7	4.6	9.1	25.1
126	HD2932 (C)	5.0	4.8	0.0	0.0	2.3	2.4	5.0
127	RAJ4083 (C)	6.6	3.2	54.5	12.5	6.6	16.7	54.5
128	DBW320	5.0	19.2	9.8	0.0	6.6	8.1	19.2
129	MACS6774	5.0	0.0	1.8	0.0	8.2	3.0	8.2
130	NWS2180#	7.6	5.0	5.2	2.5	0.0	4.0	7.6
131	HI1651	8.6	9.3	18.0	1.3	6.1	8.7	18.0
132	MP1358*	7.2	0.0	26.2	10.0	8.4	10.4	26.2
133	MACS6755	5.0	69.0	43.2	0.0	3.3	24.1	69.0
134	HI1605 (C)	8.3	1.7	18.8	4.8	6.6	8.0	18.8
135	MACS6753	10.0	1.0	16.4	2.8	1.3	6.3	16.4
136	AKDW2997-16(d)(C)	11.1	0.0	3.4	0.0	6.6	4.2	11.1
137	NIDW1149(d)(I) (C)	5.0	1.3	13.3	0.0	1.1	4.1	13.3
138	NIAW3170 (C)	4.5	10.7	21.9	0.0	0.0	7.4	21.9
139	UAS446(d) (C)	4.2	0.0	0.0	4.5	0.0	1.7	4.5
140	DBW325	8.3	0.0	5.7	5.0	0.0	3.8	8.3
140A	HD 2967 (Check)	24.0	21.7	17.3	7.3	16.3	17.3	24.0
141	UAS3014	10.0	11.1	0.0	4.4	1.1	5.3	11.1
SPL – Dicoccum								
142	MACS5058	8.3	19.7	0.0	0.0	0.0	5.6	19.7
143	MACS6222(*a*) (C)	9.3	28.4	14.9	0.0	4.5	11.4	28.4
144	DDK1029 (C)	12.2	7.6	26.1	0.0	0.0	9.2	26.1
145	DDK1061	11.1	11.9	32.0	0.0	9.1	12.8	32.0
146	HW1098 (C)	10.0	0.0	37.1	0.0	2.4	9.9	37.1
147	MACS5057	10.0	0.0	16.9	0.0	0.0	5.4	16.9
148	DDK1060	8.3	0.0	22.3	0.0	0.0	6.1	22.3
SPL – HYPT								
149	DBW328*	12.5	59.1	0.0	2.5	6.3	16.1	59.1
150	DBW372	9.5	6.0	0.0	0.0	9.1	4.9	9.5
151	DBW370	6.3	11.9	7.1	0.0	4.5	6.0	11.9
152	DBW327*	9.3	4.8	2.7	3.3	2.1	4.5	9.3
153	WH1252*	12.6	4.8	2.4	0.0	6.6	5.3	12.6
154	PBW874	14.2	0.0	5.9	6.7	2.1	5.8	14.2
155	HD3410	10.0	1.3	1.1	0.0	4.2	3.3	10.0
156	DBW332*	12.7	7.8	3.9	0.0	6.3	6.1	12.7
157	PBW873	8.1	4.1	5.0	4.7	0.0	4.4	8.1
158	DBW371	6.6	6.7	0.0	1.7	6.0	4.2	6.7
159	HD3086 (C)	11.1	2.4	0.0	0.0	4.4	3.6	11.1
160	DBW333*	10.0	23.4	5.2	2.0	8.1	9.7	23.4
160A	HD 2967 (Check)	22.2	16.7	14.2	10.5	19.2	16.6	22.2

161	PBW872	11.1	0.6	13.5	2.5	3.8	6.3	13.5
162	DBW187(I) (C)	9.6	21.5	0.0	0.0	8.1	7.8	21.5
163	WH1270(I) (C)	8.1	23.8	2.1	6.3	0.5	8.2	23.8
164	DBW303(I) (C)	9.3	34.2	3.7	0.0	6.1	10.7	34.2
SPL - CI – HYT								
165	HD3412	11.1	0.0	0.0	4.7	8.2	4.8	11.1
166	DBW375	8.6	0.0	22.1	0.0	4.6	7.1	22.1
167	DBW374	14.2	0.0	0.0	2.3	3.1	3.9	14.2
168	HD3403	12.5	20.2	0.0	0.0	0.0	6.5	20.2
169	WH1406	14.2	0.7	0.0	0.0	3.3	3.6	14.2
170	HD3413	8.3	0.0	0.0	2.8	6.2	3.5	8.3
171	PBW867	8.2	0.0	0.0	2.0	7.2	3.5	8.2
172	UP3096	11.1	0.0	0.0	0.0	0.0	2.2	11.1
173	WH1404	10.0	0.0	0.0	0.0	2.1	2.4	10.0
174	PBW868	12.5	0.0	0.0	1.3	4.4	3.6	12.5
175	DBW318	10.0	17.0	0.0	0.0	0.0	5.4	17.0
176	DBW378	12.2	40.4	0.0	2.7	4.0	11.8	40.4
177	WH1405	5.7	21.6	0.0	0.0	3.3	6.1	21.6
178	HD3405	12.7	0.0	0.0	0.0	0.0	2.5	12.7
179	DBW377	8.2	18.5	0.0	8.0	0.0	6.9	18.5
180	PBW869	12.2	27.1	0.0	3.3	1.1	8.7	27.1
180A	HD 2967 (Check)	24.0	23.5	13.9	6.3	14.2	16.4	24.0
181	PBW871	10.0	23.0	5.7	5.0	4.6	9.7	23.0
182	HD3086 (C)	8.2	50.3	11.8	5.0	3.3	15.7	50.3
183	DBW376	9.3	0.0	3.2	0.0	0.0	2.5	9.3
184	DBW373	8.3	0.0	6.8	5.5	2.3	4.6	8.3
185	HD3404	10.0	30.9	14.9	0.0	4.1	12.0	30.9
186	DBW187(I) (C)	5.0	0.8	13.5	7.5	3.6	6.1	13.5
187	WH1407	5.0	0.0	0.0	1.0	0.0	1.2	5.0
188	PBW870	4.3	0.0	0.0	0.0	4.1	1.7	4.3
189	UP3095	3.3	2.6	7.7	3.3	0.0	3.4	7.7
SPL – AST								
190	DBW368	6.6	0.0	7.7	2.0	4.0	4.1	7.7
191	DBW363	9.3	1.0	3.1	0.0	4.6	3.6	9.3
192	DBW369	10.0	0.0	2.4	1.7	0.0	2.8	10.0
193	DBW367	11.1	19.4	7.1	0.0	0.0	7.5	19.4
194	DBW364	12.5	13.7	0.0	7.1	0.0	6.7	13.7
195	Kharchia 65 (C)	13.3	0.0	37.5	0.0	4.2	11.0	37.5
196	DBW366	12.2	3.0	0.0	0.0	0.0	3.0	12.2
197	KRL210 (C)	14.2	NG	0.0	6.7	6.1	6.7	14.2
198	DBW365	12.5	5.0	10.1	0.0	8.4	7.2	12.5
199	K1805	14.7	38.5	3.1	0.0	2.3	11.7	38.5
200	KRL19 (C)	12.5	0.0	6.0	4.5	4.4	5.5	12.5
200A	HD 2967 (Check)	23.3	23.5	18.1	8.3	13.3	17.3	23.5

COOPERATORS:

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PROGRAMME 5. LOOSE SMUT

5.1 Evaluation of AVT material (2019-20) against *Ustilago segetum tritici*

Loose smut is an internally seed borne disease caused by *Ustilago segetum tritici* and mainly prevalent in northern hills and plains zone. Though the disease can be managed my seed treatment but resistant varieties are always preferred by the farmers to manage loose smut as it is economical and convenient. Keeping in view of higher preference of host resistance, the entries of AVTs (2019-20), were inoculated with local isolates of loose smut pathogen using 'Go go' method at hot spot locations like Ludhiana, Almora, Durgapura and Hisar. The inoculated seeds were sown again during 2020-21 crop season at these locations of NWPZ and NHZ for expression of disease. Both healthy as well as smutted tillers were counted and per cent infected tillers were calculated.
The variations were also observed amongst different genotypes at different locations under artificially inoculated conditions. The highest and average disease score was taken for each entry. The detailed data are presented in Table 5.1. The promising entries in AVTs are:

AVTs year, 2019-20

Free (No infection at any location): Nil

Resistant (Average score: 0.1-5.0 % infection):
HI8805(d)(I) (C), UAS 472(d), DDK1058

Table 5.1. Per cent loose smut infection in the entries of AVTs of year 2019-20 expressed during 2020-21 crop season

S. No.	Entry	Loose smut incidence (%)					
		Ludhiana	Durgapura	Hisar	Almora	AV.	HS
North Hill Zone (NHZ)							
1	HS 507 (C)	13.3	46.7	21.1	26.0	26.7	46.7
2	HS 562 (C)	29.6	16.4	25.0	35.0	26.5	35.0
3	HPW 349 (C)	18.8	17.5	23.3	41.2	25.2	41.2
4	HS 668	12.8	12.6	46.6	46.2	29.5	46.6
5	VL 907 (C)	29.0	35.0	35.0	25.6	31.1	35.0
6	VL 2036	15.7	14.6	65.0	44.5	35.0	65.0
7	HS 681	4.7	26.8	43.3	16.4	22.8	43.3
8	VL 3022	2.2	0.0	42.7	36.1	20.2	42.7
9	HS 680	1.0	32.1	45.0	0.0	19.5	45.0
10	VL 3023	19.3	19.4	56.6	22.1	29.3	56.6
11	HPW 474	21.7	30.9	83.3	26.4	40.6	83.3
12	UP 3069	27.3	NS	65.0	52.6	48.3	65.0
13	HPW 473	9.9	33.7	73.3	16.5	33.3	73.3
14	VL 892 (C)	16.7	28.2	85.0	25.9	39.0	85.0
15	VL 3024	7.4	7.2	86.6	15.5	29.2	86.6
16	HS 490 (C)	20.6	56.8	36.0	29.7	35.8	56.8
17	HS 679	3.7	12.7	55.5	47.7	29.9	55.5
North Western Plain Zone (NWPZ)							
18	DBW88 (C)	22.5	41.3	73.3	37.6	43.7	73.3
19	DBW187(I) (C)	15.4	30.5	38.2	27.4	27.9	38.2
20	HD2967 (C)	16.7	24.9	46.6	30.2	29.6	46.6
20A	Sonalika (Check)	19.8	42.8	86.6	30.0	44.8	86.6
21	WH1105 (C)	28.9	19.1	85.0	62.2	48.8	85.0
22	DBW222(I) (C)	0.0	0.0	76.0	0.0	19.0	76.0

23	HD3086 (C)	0.0	0.0	73.3	0.0	18.3	73.3
24	PBW840M	15.1	77.1	35.0	39.0	41.5	77.1
25	PBW803	26.3	37.3	37.1	13.7	28.6	37.3
26	PBW550 (C)	24.7	24.6	56.6	3.7	27.4	56.6
27	HD3334	21.7	26.8	18.5	10.1	19.3	26.8
28	HD3059 (C)	20.0	18.4	35.0	23.8	24.3	35.0
29	HD3332	9.4	12.0	43.3	4.3	17.3	43.3
30	DBW173 (C)	26.0	20.8	53.3	39.8	35.0	53.3
31	WH1021 (C)	14.5	28.8	45.0	45.1	33.4	45.1
32	PBW811	8.0	52.5	46.6	31.0	34.5	52.5
33	DBW291	4.8	NS	53.3	35.4	31.2	53.3
34	WH1264	23.6	17.0	56.2	62.9	39.9	62.9
35	PBW812	14.6	20.6	32.0	20.1	21.8	32.0
36	JKW261	12.8	42.6	43.3	24.7	30.9	43.3
37	DBW290	23.3	15.3	53.3	53.7	36.4	53.7
38	PBW771(I) (C)	9.3	10.4	45.0	18.9	20.9	45.0
39	PBW813	11.1	NS	83.3	26.5	40.3	83.3
40	HD3331	13.4	13.1	42.4	22.0	22.7	42.4
40A	Sonalika (Check)	19.6	42.4	85.0	31.0	44.5	85.0
41	HD3298*	8.8	22.1	33.3	30.8	23.7	33.3
42	WH1124 (C)	0.0	0.0	42.7	0.0	10.7	42.7
43	UP3033	3.4	34.3	23.3	55.0	29.0	55.0
44	HUW838	9.2	15.3	25.0	28.0	19.4	28.0
45	HD3043 (C)	5.1	31.5	28.7	29.0	23.6	31.5
46	PBW644 (C)	11.5	33.5	26.6	11.0	20.7	33.5
47	DBW296	0.0	38.4	46.6	50.0	33.7	50.0
48	HI1628(I) (C)	13.4	26.6	35.0	85.4	40.1	85.4
49	WH1080 (C)	10.7	30.5	56.6	58.7	39.1	58.7
50	JAUW672	10.0	22.1	53.3	25.8	27.8	53.3
51	WH1142 (C)	8.3	25.7	66.6	21.4	30.5	66.6
52	NIAW3170(I) (C)	13.7	30.6	70.0	63.7	44.5	70.0
North Eastern Plain Zone (NEPZ)							
53	PBW804	18.8	29.7	75.0	48.7	43.0	75.0
54	DBW187 (C)	23.6	26.6	55.0	4.9	27.5	55.0
55	K1006 (C)	0.0	26.2	43.3	27.0	24.1	43.3
56	DBW39 (C)	2.8	23.8	24.0	58.3	27.2	58.3
57	HD3249(I) (C)	5.5	11.1	28.2	24.1	17.2	28.2
58	HD2733 (C)	4.2	NG	75.0	48.9	42.7	75.0
59	HD3171 (C)	0.0	NG	53.3	34.7	29.3	53.3
60	HD2888 (C)	0.0	8.0	56.6	27.7	23.1	56.6
60A	Sonalika (Check)	24.5	44.6	83.3	21.6	43.5	83.3
61	HD3293*	10.8	31.6	35.0	31.1	27.1	35.0
62	K1317 (C)	18.4	32.9	33.3	64.6	37.3	64.6
63	HI1612 (C)	7.5	22.0	15.0	42.5	21.8	42.5
64	DBW252(I) (C)	38.0	40.0	16.6	31.9	31.6	40.0
Central Zone (CZ)							
65	TAW155	0.0	24.0	75.0	36.2	33.8	75.0
66	HI1636	55.0	25.2	70.0	41.2	47.9	70.0
67	MP1361	8.3	27.0	62.5	44.6	35.6	62.5
68	MACS6747	0.0	31.0	53.3	10.7	23.8	53.3
69	HD3377	2.1	37.6	45.0	28.2	28.2	45.0

70	HI1637	0.0	54.4	56.6	59.0	42.5	59.0
71	RAJ4541	13.5	30.6	16.6	37.6	24.6	37.6
72	GW513	13.5	0.0	22.2	44.5	20.1	44.5
73	GW322	18.2	8.1	18.3	39.0	20.9	39.0
74	HI1544	6.2	0.0	35.0	38.0	19.8	38.0
75	HI1634*	5.9	13.9	16.6	42.2	19.6	42.2
76	HD2932	0.0	10.1	12.5	21.8	11.1	21.8
77	MP3336	17.9	8.3	11.1	47.5	21.2	47.5
78	HD2864	0.0	22.2	13.3	28.9	16.1	28.9
79	CG1029*	4.4	35.0	14.2	56.8	27.6	56.8
80	MPO1357(d)	0.0	0.0	21.1	0.0	5.3	21.1
80A	Sonalika (Check)	25.7	41.5	83.3	31.3	45.4	83.3
81	HI8627(d)	0.0	7.1	24.0	0.0	7.8	24.0
82	UAS466(d)(I)	0.0	NS	35.0	0.0	11.7	35.0
83	UAS472(d)	0.0	50.0	24.0	0.7	18.7	50.0
84	DBW110	0.0	33.3	23.0	18.9	18.8	33.3
85	MP3288	0.0	18.4	25.0	58.2	25.4	58.2
86	HI 8823(d)	0.0	37.8	22.2	0.0	15.0	37.8
87	DDW47(d)(I)	0.0	41.2	20.0	0.7	15.5	41.2
Peninsular Zone (PZ)							
88	WHD964(d)	0.0	0.0	43.3	0.0	10.8	43.3
89	DDW48(d) *	0.0	0.0	22.2	6.5	7.2	22.2
90	MACS6222 (C)	21.4	21.3	14.2	50.0	26.7	50.0
91	MACS3949(d) (C)	0.0	11.3	16.6	28.6	14.1	28.6
92	HI8818(d)	0.0	0.0	18.3	2.1	5.1	18.3
93	UAS428(d) (C)	0.0	6.0	35.0	6.3	11.8	35.0
94	DDW49(d) *	0.0	0.0	20.0	21.2	10.3	21.2
95	GW322 (C)	0.0	8.5	56.6	26.3	22.8	56.6
96	GW519	6.4	8.2	45.0	55.6	28.8	55.6
97	HI1646	24.6	54.8	37.2	44.3	40.2	54.8
98	HD3090 (C)	16.7	26.7	35.0	21.2	24.9	35.0
99	RAJ4083 (C)	6.5	59.7	36.0	14.9	29.3	59.7
100	UAS3008	15.4	9.9	52.0	28.0	26.3	52.0
100A	Sonalika (Check)	26.5	50.3	86.6	30.9	48.6	86.6
101	MACS6749	7.4	32.8	56.6	31.7	32.1	56.6
102	HD2932 (C)	8.9	21.9	45.0	1.3	19.3	45.0
103	HI1641	0.0	0.0	46.6	28.8	18.9	46.6
104	HI1642	20.2	19.4	46.6	NG	28.7	46.6
105	HI1633*	7.7	37.8	53.3	44.9	35.9	53.3
106	MACS6752	4.3	23.7	22.2	26.0	19.0	26.0
107	NIDW 1149(d)*	0.0	4.0	24.0	43.8	18.0	43.8
108	UAS446(d) (C)	0.0	0.0	26.6	2.2	7.2	26.6
109	HI 1605 (C)	16.0	30.7	12.5	0.0	14.8	30.7
110	MACS 4087(d)	0.0	0.0	22.2	21.9	11.0	22.2
111	MP 1358	5.6	65.2	28.5	8.2	26.9	65.2
112	AKDW 2997-16(d) (C)	0.0	13.2	13.3	34.1	15.1	34.1
113	HI8805(d)(I) (C)	1.1	0.0	16.6	0.0	4.4	16.6
114	UAS 472(d)	0.0	0.0	15.0	0.0	3.8	15.0
115	MPO 1357(d)	0.0	11.1	24.0	0.0	8.8	24.0
116	NIAW3170(I) (C)	16.9	33.0	23.3	0.0	18.3	33.0
Special Trial (Dicoccum)							

117	MACS5055	0.0	NS	32.0	0.0	10.7	32.0
118	MACS6222 (aest.) (C)	1.1	NS	22.2	19.6	14.3	22.2
119	DDK1029 (C)	0.0	NS	23.3	0.0	7.8	23.3
120	MACS5054	7.7	NS	12.5	0.0	6.7	12.5
120A	Sonalika (Check)	30.9	57.3	83.3	54.3	56.5	83.3
121	DDK1058	0.0	NS	11.1	0.0	3.7	11.1
122	HW1098 (C)	0.0	NS	12.5	NG	6.3	12.5
123	DDK1059	0.0	NS	45.0	0.0	15.0	45.0
Special Trial (SPL-HYPT)							
124	DBW327	21.0	42.5	25.0	22.6	27.8	42.5
125	HD3086 (C)	0.0	5.4	24.0	0.0	7.4	24.0
126	DBW332	5.5	16.2	28.5	27.8	19.5	28.5
127	DBW303*	18.3	23.6	35.0	28.0	26.2	35.0
128	HD2967 (C)	3.8	16.4	42.7	10.9	18.4	42.7
129	DBW187*	0.0	16.4	33.3	23.0	18.2	33.3
130	DBW329	2.9	21.6	32.0	45.1	25.4	45.1
131	WH1252	2.4	3.3	24.0	61.7	22.8	61.7
132	HD3378	21.1	32.4	83.3	22.8	39.9	83.3
133	WH1270*	26.4	19.0	75.0	34.8	38.8	75.0
134	DBW333	3.1	17.4	46.6	39.7	26.7	46.6
135	DBW330	2.1	24.7	53.3	74.6	38.7	74.6
136	DBW328	25.8	37.1	56.6	42.8	40.6	56.6
137	DBW331	8.3	22.6	65.0	55.1	37.8	65.0

COOPERATORS:

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PROGRAMME 6. POWDERY MILDEW

6.1: POWDERY MILDEW SCREENING NURSERY (PMSN)

Powdery mildew caused by *Blumeria graminis* (DC.) Speer f. sp. *tritici* is emerging as an important disease of wheat in NWPZ and NHZ during cool years and may cause heavy losses in susceptible varieties. Keeping in view the importance of powdery mildew, during 2020-21 crop season, 200 entries of AVTs and promising entries were screened against powdery mildew at hot spot locations in NHZ and NWPZ *viz*., Almora, Pantnagar, Shimla, Bajaura, Dhaulakuan, Wellington, Jammu and Malan. The data from Bajaura was not considered due to no disease. Inoculations were done with the local isolate by dusting the inoculum on the test entries. Scoring was done at dough stage on 0-9 scale. The disease scores of AVT entries along with check varieties have been presented in Table 6.1. The entries found promising against powdery mildew are:

AVTs 2020-21

Resistant Entries (Av. score 0-3, highest score upto 5)**:**

PBW874, DBW374 and PBW868. Besides these entries the average score upto 3 are VL2041, DBW187 (C), PBW876[B], DBW313[#], DBW316, DBW322, HD3369[#], HI8627(d) (C), DBW372, DBW370, WH1252*, PBW873, DBW375, WH1406, PBW867, PBW869, DBW373, HD3404, WH1407, DBW368 and DBW369 but highest score exceeded above 5 at only one center.

Table 6.1 Powdery mildew severity in PMSN entries evaluated under artificially inoculated conditions at multilocations during 2020-21

PMSN No.	Entries	Powdery mildew Score (0-9)								
		Almora	Pantnagar	Shimla	Malan	Dhaulakuan	Wellington	Jammu	Avg.	HS
North Hill Zone (NHZ)										
1	VL2041	3	7	1	5	2	1	4	3	7
2	HS562 (C)	3	9	3	5	2	1	2	4	9
3	HPW349 (C)	3	9	3	4	2	5	5	4	9
4	HS507 (C)	1	9	3	4	6	1	6	4	9
5	VL907 (C)	1	9	5	5	2	3	2	4	9
North Western Plain Zone (NWPZ)										
6	WH1105 (C)	3	9	3	5	1	3	3	4	9
7	DBW187 (C)	1	9	1	5	2	0	3	3	9
8	HD3349	3	7	1	4	1	1	6	3	7
9	PBW876[B]	3	7	1	4	3	1	4	3	7
10	HD3406[M]	3	7	3	6	2	0	0	3	7
11	DBW222 (C)	5	9	3	4	1	0	3	4	9
12	DBW313[#]	1	7	1	5	3	1	4	3	7
13	HD2967 (C)	1	9	3	3	6	0	5	4	9
14	PBW826	3	7	3	4	2	0	7	4	7
15	RAJ4548[#]	5	7	3	4	2	9	6	5	9
16	HD3354	5	9	5	5	2	0	4	4	9
17	WH1283	5	9	3	5	2	0	1	4	9
18	HD3086 (C)	3	7	5	3	6	1	4	4	7
19	JKW261	3	7	7	6	6	2	4	5	7
20	WH1124 (C)	5	9	5	1	6	1	4	4	9
20A	PBW343 (Check)	5	9	7	7	9	7	9	8	9
21	PBW771 (C)	5	7	5	5	6	9	4	6	9

22	HD3059 (C)	5	9	7	4	6	0	1	5	9
23	PBW834	5	7	7	4	6	3	4	5	7
24	DBW173 (C)	3	5	5	5	9	2	4	5	9
25	HUW838[#]*	3	7	3	3	6	2	4	4	7
26	NW7096	1	7	5	3	9	3	6	5	9
27	DBW321	1	7	5	3	9	1	7	5	9
28	K1910	5	7	7	7	6	5	8	6	8
29	HI1654	1	7	7	6	9	2	4	5	9
30	NIAW3170 (C)	3	7	7	5	6	2	5	5	7
31	PBW838	3	7	5	4	9	3	4	5	9
32	DBW296*	3	5	5	4	6	3	5	4	6
33	HI1628 (C)	1	7	7	4	6	5	2	5	7
34	HD3369	1	9	5	5	6	1	3	4	9
35	WH1142 (C)	3	7	5	7	6	1	4	5	7
36	UP3062	3	9	5	5	6	0	0	4	9
37	HD3368	3	9	5	4	9	9	4	6	9
38	HD3043 (C)	3	7	5	3	6	0	2	4	7
39	PBW644 (C)	5	9	5	5	9	0	5	5	9
40	HI1653	3	7	5	5	6	0	4	4	7
40A	PBW343 (Check)	5	9	5	8	9	3	7	7	9
41	PBW848	3	9	5	5	9	1	0	5	9
North Eastern Plain Zone (NEPZ)										
42	HD2733 (C)	3	9	5	5	9	0	4	5	9
43	HD3249 (C)	1	9	3	5	9	2	2	4	9
44	DBW187 (C)	3	7	3	6	6	2	7	5	7
45	HD3406[M]	5	7	5	4	9	0	0	4	9
46	HD3411[M]	3	7	3	4	9	0	6	5	9
47	DBW39 (C)	3	7	3	5	6	0	4	4	7
48	HD2967 (C)	3	9	3	4	9	0	6	5	9
49	PBW826[#]	3	7	1	6	9	2	4	5	9
50	HD3086 (C)	5	7	3	5	9	2	6	5	9
51	DBW317	5	7	3	3	6	0	3	4	7
52	DBW318	3	7	3	4	6	0	3	4	7
53	PBW835	3	7	3	5	6	9	2	5	9
54	HI1563 (C)	3	9	3	6	9	9	3	6	9
55	DBW107 (C)	5	9	5	5	9	9	3	6	9
56	PBW834	3	7	3	6	9	6	3	5	9
57	UP3060	5	7	3	5	6	2	4	5	7
58	HD3118 (C)	5	7	5	4	6	9	0	5	9
59	HI1621 (C)	5	5	1	3	6	9	3	5	9
60	DBW316	3	7	3	2	4	0	4	3	7
60A	PBW343 (Check)	5	9	5	8	9	5	8	7	9
61	PBW833	3	7	3	4	4	5	3	4	7
62	HD3360	5	9	3	5	4	3	6	5	9
63	HI1653	3	9	1	6	6	5	4	5	9
64	DBW322	3	7	3	3	4	2	1	3	7
65	HI1612 (C)	3	7	3	4	9	1	4	4	9
66	DBW252 (C)	1	9	3	4	4	2	4	4	9
67	DBW321	3	7	3	5	4	2	4	4	7
68	HD3368[#]	5	9	1	5	4	3	3	4	9
69	HI1654	3	9	3	5	4	3	2	4	9
70	HD3293(I) (C)	3	9	3	4	9	1	2	4	9
71	WH1281	5	9	3	5	4	2	4	5	9

72	PBW848[#]	3	5	3	4	9	3	5	5	9
73	HD3171 (C)	3	7	1	5	9	1	4	4	9
74	HD3369[#]	3	9	3	3	4	0	2	3	9
75	K1317 (C)	1	9	1	4	4	3	3	4	9
76	UP3062	1	7	3	4	4	2	4	4	7
Central Zone (CZ)										
77	HI8833(d)[M]	3	7	3	6	4	9	3	5	9
78	GW322 (C)	3	9	1	4	9	9	6	6	9
79	MP3535	3	9	1	5	9	9	5	6	9
80	GW523	3	9	0	5	6	2	4	4	9
80A	PBW343 (Check)	5	9	5	8	9	7	9	7	9
81	GW513*	5	9	1	5	6	2	5	5	9
82	HI1636*	5	9	3	5	4	9	5	6	9
83	HI8832(d)[M]	3	9	3	6	6	5	4	5	9
84	MACS6768	5	9	3	7	9	9	4	7	9
85	HI1544 (C)	3	9	1	4	9	9	2	5	9
86	HI1667[B]	3	9	3	4	9	9	4	6	9
87	HI8498(d) (C)	5	7	1	6	9	9	0	5	9
88	HI8713(d) (C)	3	7	1	6	9	5	2	5	9
89	HI1650	3	9	1	5	6	9	5	5	9
90	MP4010 (C)	5	9	1	4	9	9	0	5	9
91	HD2864 (C)	5	9	1	4	9	9	3	6	9
92	MP3336 (C)	3	9	3	5	9	9	3	6	9
93	HD2932 (C)	3	9	3	5	6	9	1	5	9
94	HI1634(I) (C)	5	9	3	6	4	9	4	6	9
95	HD3407[M]	5	9	5	4	9	9	3	6	9
96	CG1029(I) (C)	5	7	7	3	9	9	5	6	9
97	HI8823(d)*	5	7	5	5	9	3	4	5	9
98	GW528	3	7	0	5	6	9	3	5	9
99	DDW47(d) (C)	3	7	5	6	2	2	4	4	7
100	DBW326	3	7	7	7	6	2	4	5	7
100A	PBW343 (Check)	5	9	5	9	9	6	9	7	9
101	UAS475(d)	5	7	7	4	2	1	5	4	7
102	HI8627(d) (C)	3	7	3	4	3	1	2	3	7
103	NIAW3851	3	7	5	3	6	2	4	4	7
104	HI8830(d)	5	7	3	5	9	9	2	6	9
105	CG1036	5	7	3	5	6	9	3	5	9
106	HI1655	5	9	5	6	4	9	0	5	9
107	DBW110 (C)	3	9	5	4	4	2	3	4	9
108	MP3288 (C)	5	7	5	5	3	1	2	4	7
109	DDW55(d)	5	9	3	5	5	2	2	4	9
Peninsular Zone (PZ)										
110	WHD965(d)	5	7	1	5	4	2	4	4	7
111	UAS428(d) (C)	5	-	1	5	6	9	0	4	9
112	HI8826(d)	5	9	1	3	9	9	5	6	9
113	MACS4100(d)	5	7	5	4	4	2	3	4	7
114	MACS3949(d) (C)	5	7	5	5	3	3	5	5	7
115	DDW53(d)	3	5	7	4	6	9	5	6	9
116	NIDW1345(d)	3	5	5	5	3	1	4	4	5
117	MACS6222 (C)	3	9	7	6	6	9	7	7	9
118	MACS4106(d)	5	9	7	5	6	9	3	6	9
119	NIDW1348(d)	5	7	7	5	6	2	5	5	7
120	HI8828(d)	5	9	7	6	4	3	2	5	9

120A	PBW343 (Check)	5	9	5	8	9	7	7	7	9
121	GW322 (C)	3	9	3	4	9	9	3	6	9
122	HI8827(d)	5	9	3	4	9	9	3	6	9
123	DDW48(d)(I) (C)	3	9	3	5	9	9	5	6	9
124	HD3090 (C)	3	9	5	5	6	5	2	5	9
125	HI1633(I) (C)	3	9	3	5	6	9	0	5	9
126	HD2932 (C)	3	9	3	3	6	2	3	4	9
127	RAJ4083 (C)	3	9	1	4	6	9	3	5	9
128	DBW320	1	9	3	5	9	9	4	6	9
129	MACS6774	1	9	1	6	9	1	6	5	9
130	NWS2180#	3	7	1	4	4	3	5	4	7
131	HI1651	5	9	1	5	9	9	4	6	9
132	MP1358*	3	7	1	5	6	1	4	4	7
133	MACS6755	5	9	1	5	9	9	6	6	9
134	HI1605 (C)	3	9	3	4	9	9	4	6	9
135	MACS6753	5	9	3	6	9	9	5	7	9
136	AKDW2997-16(d) (C)	5	5	3	6	4	9	3	5	9
137	NIDW1149(d)(I) (C)	3	9	1	6	3	9	3	5	9
138	NIAW3170 (C)	3	7	3	5	6	5	2	4	7
139	UAS446(d) (C)	5	7	0	4	6	1	4	4	7
140	DBW325	3	5	5	4	3	1	4	4	5
140A	PBW343 (Check)	5	9	7	7	9	7	8	7	9
141	UAS3014	5	9	1	4	9	2	4	5	9
SPL – Dicoccum										
142	MACS5058	7	9	3	4	9	9	1	6	9
143	MACS6222(*a*) (C)	7	9	3	4	9	9	2	6	9
144	DDK1029 (C)	5	9	0	5	4	9	0	5	9
145	DDK1061	5	7	1	6	3	9	3	5	9
146	HW1098 (C)	5	7	0	5	4	9	0	4	9
147	MACS5057	5	7	0	5	3	9	4	5	9
148	DDK1060	5	7	0	5	2	9	3	4	9
SPL – HYPT										
149	DBW328*	3	7	0	5	6	9	5	5	9
150	DBW372	3	7	0	4	2	1	4	3	7
151	DBW370	1	7	1	3	2	2	3	3	7
152	DBW327*	1	9	0	4	6	2	4	4	9
153	WH1252*	3	7	0	5	4	1	0	3	7
154	PBW874	1	5	0	5	4	0	2	2	5
155	HD3410	3	7	0	5	3	1	6	4	7
156	DBW332*	1	9	0	4	6	3	2	4	9
157	PBW873	1	9	1	4	4	1	1	3	9
158	DBW371	3	7	1	3	6	1	2	3	7
159	HD3086 (C)	3	9	0	4	9	0	3	4	9
160	DBW333*	3	9	0	4	9	9	4	5	9
160A	PBW343 (Check)	7	9	3	8	9	7	7	7	9
161	PBW872	3	9	3	4	6	2	6	5	9
162	DBW187(I) (C)	3	9	1	4	3	5	5	4	9
163	WH1270(I) (C)	1	9	3	5	4	3	0	4	9
164	DBW303(I) (C)	5	9	3	5	3	2	0	4	9
SPL - CI – HYT										
165	HD3412	3	9	3	5	6	1	5	5	9
166	DBW375	5	7	1	4	1	1	0	3	7
167	DBW374	5	5	3	3	4	0	4	3	5

168	HD3403	3	9	0	4	6	0	4	4	9
169	WH1406	1	9	3	4	1	1	2	3	9
170	HD3413	5	9	3	5	1	0	4	4	9
171	PBW867	5	9	3	3	4	0	0	3	9
172	UP3096	3	7	3	4	6	0	2	4	7
173	WH1404	3	7	1	4	6	1	5	4	7
174	PBW868	3	5	0	4	4	0	0	2	5
175	DBW318	5	7	3	5	3	0	3	4	7
176	DBW378	5	9	0	3	4	5	7	5	9
177	WH1405	5	7	3	4	3	2	5	4	7
178	HD3405	3	9	0	4	6	1	6	4	9
179	DBW377	3	7	1	5	6	7	1	4	7
180	PBW869	1	7	3	5	1	3	3	3	7
180A	PBW343 (Check)	5	9	5	7	9	7	9	7	9
181	PBW871	5	9	3	5	6	1	2	4	9
182	HD3086 (C)	5	9	3	5	9	4	6	6	9
183	DBW376	5	9	3	5	4	2	2	4	9
184	DBW373	5	7	0	4	3	1	4	3	7
185	HD3404	3	7	3	3	4	0	3	3	7
186	DBW187(I) (C)	3	9	3	3	6	0	3	4	9
187	WH1407	1	9	0	4	2	0	2	3	9
188	PBW870	1	7	3	4	9	1	3	4	9
189	UP3095	1	9	5	4	6	2	3	4	9
SPL – AST										
190	DBW368	3	7	1	5	4	0	3	3	7
191	DBW363	3	9	3	3	6	0	4	4	9
192	DBW369	1	7	5	3	4	0	0	3	7
193	DBW367	1	9	5	5	6	1	3	4	9
194	DBW364	3	9	3	5	4	0	4	4	9
195	Kharchia 65 (C)	5	9	5	7	6	2	5	6	9
196	DBW366	3	9	3	5	9	3	1	5	9
197	KRL210 (C)	3	9	3	4	6	0	4	4	9
198	DBW365	3	7	3	4	9	3	4	5	9
199	K1805	3	9	1	4	4	4	4	4	9
200	KRL19 (C)	3	9	5	5	6	9	4	6	9
200A	PBW343 (Check)	7	9	5	9	9	2	7	7	9

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PROGRAMME 7. REGION SPECIFIC DISEASES OF LIMITED IMPORTANCE

7.1 FUSARIUM HEAD BLIGHT (FHB) OR HEAD SCAB

AVT entries along with checks were evaluated under artificially inoculated conditions at Gurdaspur and Delhi. Disease scoring scale (0-5) has been used. A total 200 entries were evaluated and entry-wise reaction of AVTs entries (2020-21) has been given in Tables 7.1. On the basis of highest score, none of the genotype was found resistant or moderately resistant.

Table7.1. Performance of AVTs material against head scab (% incidence) under multilocational testing during 2020-21

S. No.	Entries	Disease score (0-5)		
		Gurdaspur	Delhi	HS
North Hill Zone (NHZ)				
1	VL2041	0	4	4
2	HS562 (C)	3	4	4
3	HPW349 (C)	3	4	4
4	HS507 (C)	2	3	3
5	VL907 (C)	1	3	3
North Western Plain Zone (NWPZ)				
6	WH1105 (C)	4	4	4
7	DBW187 (C)	5	4	5
8	HD3349	3	4	4
9	PBW876[B]	3	4	4
10	HD3406[M]	1	3	3
11	DBW222 (C)	4	4	4
12	DBW313[#]	0	4	4
13	HD2967 (C)	1	5	5
14	PBW826	4	4	4
15	RAJ4548[#]	4	4	4
16	HD3354	4	4	4
17	WH1283	4	5	5
18	HD3086 (C)	4	4	4
19	JKW261	1	4	4
20	WH1124 (C)	0	4	4
20A	WH147 (Check)	4	5	5
21	PBW771 (C)	3	4	4
22	HD3059 (C)	1	4	4
23	PBW834	4	4	4
24	DBW173 (C)	4	4	4
25	HUW838[#]*	4	4	4
26	NW7096	2	4	4
27	DBW321	3	4	4
28	K1910	2	4	4
29	HI1654	2	5	5
30	NIAW3170 (C)	2	5	5
31	PBW838	2	4	4
32	DBW296*	1	4	4
33	HI1628 (C)	1	5	5
34	HD3369	1	4	4
35	WH1142 (C)	1	5	5
36	UP3062	1	4	4
37	HD3368	1	4	4

38	HD3043 (C)	1	4	4
39	PBW644 (C)	1	4	4
40	HI1653	3	4	4
40A	WH147 (Check)	4	5	5
41	PBW848	2	5	5
North Eastern Plain Zone (NEPZ)				
42	HD2733 (C)	11	4	11
43	HD3249 (C)	1	3	3
44	DBW187 (C)	1	4	4
45	HD3406[M]	3	3	3
46	HD3411[M]	3	4	4
47	DBW39 (C)	2	4	4
48	HD2967 (C)	3	5	5
49	PBW826[#]	1	4	4
50	HD3086 (C)	3	5	5
51	DBW317	2	5	5
52	DBW318	4	5	5
53	PBW835	4	4	4
54	HI1563 (C)	4	5	5
55	DBW107 (C)	1	4	4
56	PBW834	1	4	4
57	UP3060	1	5	5
58	HD3118 (C)	1	4	4
59	HI1621 (C)	1	5	5
60	DBW316	1	5	5
60A	WH147 (Check)	4	5	5
61	PBW833	2	5	5
62	HD3360	1	5	5
63	HI1653	0	4	4
64	DBW322	1	4	4
65	HI1612 (C)	0	5	5
66	DBW252 (C)	1	4	4
67	DBW321	3	5	5
68	HD3368[#]	1	5	5
69	HI1654	1	4	4
70	HD3293(I) (C)	3	5	5
71	WH1281	1	5	5
72	PBW848[#]	3	5	5
73	HD3171 (C)	3	5	5
74	HD3369[#]	3	4	4
75	K1317 (C)	1	5	5
76	UP3062	3	4	4
Central Zone (CZ)				
77	HI8833(d)[M]	4	4	4
78	GW322 (C)	3	5	5
79	MP3535	3	5	5
80	GW523	3	4	4
80A	WH147 (Check)	4	5	5
81	GW513*	3	5	5
82	HI1636*	3	4	4
83	HI8832(d)[M]	2	5	5
84	MACS6768	2	4	4
85	HI1544 (C)	3	4	4

86	HI1667[B]	3	4	4
87	HI8498(d) (C)	3	5	5
88	HI8713(d) (C)	3	3	3
89	HI1650	2	4	4
90	MP4010 (C)	2	5	5
91	HD2864 (C)	2	4	4
92	MP3336 (C)	3	5	5
93	HD2932 (C)	0	5	5
94	HI1634(I) (C)	0	5	5
95	HD3407[M]	3	3	3
96	CG1029(I) (C)	3	3	3
97	HI8823(d)*	3	5	5
98	GW528	2	4	4
99	DDW47(d) (C)	2	4	4
100	DBW326	2	3	3
100A	WH147 (Check)	4	5	5
101	UAS475(d)	1	4	4
102	HI8627(d) (C)	2	5	5
103	NIAW3851	2	4	4
104	HI8830(d)	4	4	4
105	CG1036	4	5	5
106	HI1655	3	3	3
107	DBW110 (C)	1	3	3
108	MP3288 (C)	2	4	4
109	DDW55(d)	2	4	4
Peninsular Zone (PZ)				
110	WHD965(d)	1	5	5
111	UAS428(d) (C)	2	4	4
112	HI8826(d)	2	4	4
113	MACS4100(d)	2	3	3
114	MACS3949(d) (C)	2	3	3
115	DDW53(d)	2	5	5
116	NIDW1345(d)	4	4	4
117	MACS6222 (C)	1	4	4
118	MACS4106(d)	2	3	3
119	NIDW1348(d)	2	5	5
120	HI8828(d)	3	4	4
120A	WH147 (Check)	4	5	5
121	GW322 (C)	1	5	5
122	HI8827(d)	1	5	5
123	DDW48(d)(I) (C)	1	5	5
124	HD3090 (C)	1	5	5
125	HI1633(I) (C)	1	5	5
126	HD2932 (C)	1	4	4
127	RAJ4083 (C)	2	5	5
128	DBW320	1	4	4
129	MACS6774	1	5	5
130	NWS2180[#]	2	4	4
131	HI1651	3	5	5
132	MP1358*	2	4	4
133	MACS6755	2	5	5
134	HI1605 (C)	1	4	4
135	MACS6753	2	4	4

136	AKDW2997-16(d) (C)	2	4	4
137	NIDW1149(d)(I) (C)	3	5	5
138	NIAW3170 (C)	1	3	3
139	UAS446(d) (C)	1	4	4
140	DBW325	3	5	5
140A	WH147 (Check)	4	5	5
141	UAS3014	1	4	4
SPL – Dicoccum				
142	MACS5058	3	3	3
143	MACS6222(*a*) (C)	1	3	3
144	DDK1029 (C)	0	3	3
145	DDK1061	2	3	3
146	HW1098 (C)	1	3	3
147	MACS5057	1	NG	1
148	DDK1060	2	NG	2
SPL – HYPT				
149	DBW328*	1	4	4
150	DBW372	2	4	4
151	DBW370	2	3	3
152	DBW327*	2	4	4
153	WH1252*	2	4	4
154	PBW874	2	4	4
155	HD3410	0	4	4
156	DBW332*	1	4	4
157	PBW873	2	5	5
158	DBW371	3	5	5
159	HD3086 (C)	2	4	4
160	DBW333*	3	5	5
160A	WH147 (Check)	5	5	5
161	PBW872	3	4	4
162	DBW187(I) (C)	3	4	4
163	WH1270(I) (C)	1	5	5
164	DBW303(I) (C)	3	4	4
SPL - CI – HYT				
165	HD3412	2	4	4
166	DBW375	1	4	4
167	DBW374	1	5	5
168	HD3403	1	4	4
169	WH1406	1	4	4
170	HD3413	1	5	5
171	PBW867	1	5	5
172	UP3096	0	4	4
173	WH1404	2	4	4
174	PBW868	3	4	4
175	DBW318	2	4	4
176	DBW378	2	4	4
177	WH1405	4	4	4
178	HD3405	3	4	4
179	DBW377	1	4	4
180	PBW869	2	4	4
180A	WH147 (Check)	4	5	5
181	PBW871	2	4	4
182	HD3086 (C)	2	4	4

183	DBW376	2	5	5
184	DBW373	2	4	4
185	HD3404	1	4	4
186	DBW187(I) (C)	1	4	4
187	WH1407	1	4	4
188	PBW870	1	4	4
189	UP3095	2	4	4
SPL – AST				
190	DBW368	1	5	5
191	DBW363	2	5	5
192	DBW369	2	5	5
193	DBW367	3	4	4
194	DBW364	3	5	5
195	Kharchia 65 (C)	4	4	4
196	DBW366	1	4	4
197	KRL210 (C)	2	4	4
198	DBW365	1	4	4
199	K1805	1	3	3
200	KRL19 (C)	1	4	4
200A	WH147 (Check)	4	5	5

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7.2 FLAG SMUT, *Urocystis agropyri* (Preuss) Sch.

Test Locations: Hisar, Ludhiana and Durgapura

Flag smut is soil and externally seed bone disease caused by *Urocyctis agropyri*. The spores of the pathogen can survive for longer period in the soil. Disease development was low at all the centers. A total 200 entries were screened and entry-wise reaction of AVTs (2020-21) has been given in Table 7.2. Data for 2nd year entries has also been given in Table 1.3.

The entries HI8498(d) (C), DDW55(d), WHD965(d), HI8826(d), MACS4100(d), HI8827(d), DDW48(d)(I) (C), NIDW1149(d)(I) (C), UAS446(d) (C), DBW371, HD3086 (C), DBW187(I) (C) were found free at all the locations. The detail is given below:

Table 7.2. Performance of AVTs entries against flag smut (% incidence) under multilocational testing during 2020-21

FSSN No.	**Entries**	**Flag smut incidence (%)**				
		Hisar	**Durgapura**	**Ludhiana**	**AV**	**HS**
North Hill Zone (NHZ)						
1	VL2041	6.3	0.0	0.0	2.1	6.3
2	HS562 (C)	5.5	0.0	0.0	1.8	5.5
3	HPW349 (C)	5.7	4.2	3.5	4.5	5.7
4	HS507 (C)	7.5	4.9	4.2	5.5	7.5
5	VL907 (C)	6.6	0.0	0.0	2.2	6.6
North Western Plain Zone (NWPZ)						

6	WH1105 (C)	5.8	0.0	0.0	1.9	5.8
7	DBW187 (C)	7.6	6.7	4.0	6.1	7.6
8	HD3349	9.5	11.7	20.0	13.7	20.0
9	PBW876[B]	9.3	2.1	0.0	3.8	9.3
10	HD3406[M]	10.0	0.0	0.0	3.3	10.0
11	DBW222 (C)	9.6	4.5	3.8	6.0	9.6
12	DBW313[#]	9.3	2.5	2.2	4.6	9.3
13	HD2967 (C)	5.5	0.0	0.0	1.8	5.5
14	PBW826	7.5	0.0	0.0	2.5	7.5
15	RAJ4548[#]	8.3	7.0	1.1	5.5	8.3
16	HD3354	9.6	3.4	0.0	4.3	9.6
17	WH1283	11.1	0.0	0.0	3.7	11.1
18	HD3086 (C)	12.5	14.9	25.0	17.5	25.0
19	JKW261	11.1	4.5	7.7	7.8	11.1
20	WH1124 (C)	12.5	0.0	0.0	4.2	12.5
20A	PBW343 (Check)	28.2	45.3	31.6	35.0	45.3
21	PBW771 (C)	12.5	12.0	28.6	17.7	28.6
22	HD3059 (C)	8.3	3.0	0.0	3.8	8.3
23	PBW834	9.6	0.0	0.0	3.2	9.6
24	DBW173 (C)	5.0	6.7	2.6	4.8	6.7
25	HUW838[#]*	6.6	0.0	0.0	2.2	6.6
26	NW7096	8.3	1.3	0.0	3.2	8.3
27	DBW321	9.6	0.0	0.0	3.2	9.6
28	K1910	7.5	3.2	0.0	3.6	7.5
29	HI1654	9.3	0.0	0.0	3.1	9.3
30	NIAW3170 (C)	8.3	5.2	2.8	5.4	8.3
31	PBW838	11.1	0.0	0.0	3.7	11.1
32	DBW296*	16.6	0.0	0.0	5.5	16.6
33	HI1628 (C)	12.5	0.0	0.0	4.2	12.5
34	HD3369	18.3	7.0	0.0	8.4	18.3
35	WH1142 (C)	6.2	3.1	0.0	3.1	6.2
36	UP3062	12.5	0.0	0.0	4.2	12.5
37	HD3368	8.3	0.0	0.0	2.8	8.3
38	HD3043 (C)	11.1	0.0	0.0	3.7	11.1
39	PBW644 (C)	8.3	5.4	7.1	6.9	8.3
40	HI1653	9.6	4.2	0.0	4.6	9.6
40A	PBW343 (Check)	28.2	44.6	42.7	38.5	44.6
41	PBW848	9.3	0.0	0.0	3.1	9.3
North Eastern Plain Zone (NEPZ)						
42	HD2733 (C)	8.2	3.1	0.0	3.8	8.2
43	HD3249 (C)	6.6	7.0	0.0	4.5	7.0
44	DBW187 (C)	6.6	0.0	0.0	2.2	6.6
45	HD3406[M]	5.0	5.4	6.9	5.8	6.9
46	HD3411[M]	15.0	9.6	11.4	12.0	15.0
47	DBW39 (C)	5.0	4.3	18.2	9.2	18.2
48	HD2967 (C)	7.5	0.0	0.0	2.5	7.5
49	PBW826[#]	6.6	6.2	8.3	7.0	8.3
50	HD3086 (C)	5.0	3.3	0.0	2.8	5.0
51	DBW317	6.6	0.0	0.0	2.2	6.6
52	DBW318	8.3	5.0	0.0	4.4	8.3
53	PBW835	14.2	12.2	8.3	11.6	14.2
54	HI1563 (C)	7.5	19.7	28.6	18.6	28.6
55	DBW107 (C)	8.3	4.0	0.0	4.1	8.3

56	PBW834	11.1	0.0	0.0	3.7	11.1
57	UP3060	11.1	2.3	0.0	4.5	11.1
58	HD3118 (C)	8.3	0.0	0.0	2.8	8.3
59	HI1621 (C)	6.6	0.0	0.0	2.2	6.6
60	DBW316	5.0	3.6	0.0	2.9	5.0
60A	PBW343 (Check)	25.0	42.3	43.9	37.0	43.9
61	PBW833	7.6	0.0	36.5	14.7	36.5
62	HD3360	8.3	0.0	0.0	2.8	8.3
63	HI1653	5.0	1.5	0.0	2.2	5.0
64	DBW322	6.6	0.0	0.0	2.2	6.6
65	HI1612 (C)	6.6	5.6	0.0	4.1	6.6
66	DBW252 (C)	7.5	18.3	42.4	22.7	42.4
67	DBW321	8.3	9.1	18.2	11.9	18.2
68	HD3368#	8.3	4.2	14.3	8.9	14.3
69	HI1654	7.5	6.5	9.0	7.7	9.0
70	HD3293(I) (C)	7.5	0.0	0.0	2.5	7.5
71	WH1281	8.6	3.6	0.0	4.1	8.6
72	PBW848#	8.6	0.0	0.0	2.9	8.6
73	HD3171 (C)	9.3	2.7	0.0	4.0	9.3
74	HD3369#	8.6	0.0	0.0	2.9	8.6
75	K1317 (C)	7.5	0.0	0.0	2.5	7.5
76	UP3062	7.2	1.8	0.0	3.0	7.2
Central Zone (CZ)						
77	HI8833(d)M	8.1	1.8	0.0	3.3	8.1
78	GW322 (C)	8.3	9.7	7.7	8.6	9.7
79	MP3535	9.3	2.8	0.0	4.0	9.3
80	GW523	8.6	4.1	16.7	9.8	16.7
80A	PBW343 (Check)	26.6	40.3	42.9	36.6	42.9
81	GW513*	20.0	6.9	10.2	12.4	20.0
82	HI1636*	12.5	4.7	10.0	9.1	12.5
83	HI8832(d)M	0.0	3.8	0.0	1.3	3.8
84	MACS6768	8.3	0.0	0.0	2.8	8.3
85	HI1544 (C)	9.6	20.5	33.9	21.4	33.9
86	HI1667B	10.0	13.6	22.2	15.3	22.2
87	HI8498(d) (C)	0.0	0.0	0.0	0.0	0.0
88	HI8713(d) (C)	0.0	1.7	0.0	0.6	1.7
89	HI1650	16.6	6.9	9.1	10.9	16.6
90	MP4010 (C)	8.3	4.3	0.0	4.2	8.3
91	HD2864 (C)	9.3	0.0	0.0	3.1	9.3
92	MP3336 (C)	9.5	10.9	17.7	12.7	17.7
93	HD2932 (C)	8.3	0.0	0.0	2.8	8.3
94	HI1634(I) (C)	12.5	0.0	0.0	4.2	12.5
95	HD3407M	9.6	10.3	0.0	6.6	10.3
96	CG1029(I) (C)	4.5	7.8	0.0	4.1	7.8
97	HI8823(d)*	11.1	6.0	0.0	5.7	11.1
98	GW528	4.5	0.0	0.0	1.5	4.5
99	DDW47(d) (C)	4.3	0.0	0.0	1.4	4.3
100	DBW326	10.0	0.0	0.0	3.3	10.0
100A	PBW343 (Check)	25.0	36.4	45.6	35.7	45.6
101	UAS475(d)	5.5	0.0	0.0	1.8	5.5
102	HI8627(d) (C)	4.5	0.0	0.0	1.5	4.5
103	NIAW3851	8.3	0.0	0.0	2.8	8.3
104	HI8830(d)	1.1	0.0	0.0	0.4	1.1

105	CG1036	12.5	3.1	0.0	5.2	12.5
106	HI1655	6.6	11.6	16.1	11.4	16.1
107	DBW110 (C)	7.3	2.9	1.4	3.9	7.3
108	MP3288 (C)	5.6	9.1	7.4	7.3	9.1
109	DDW55(d)	0.0	0.0	0.0	0.0	0.0
Peninsular Zone (PZ)						
110	WHD965(d)	0.0	0.0	0.0	0.0	0.0
111	UAS428(d) (C)	15.0	0.0	0.0	5.0	15.0
112	HI8826(d)	0.0	0.0	0.0	0.0	0.0
113	MACS4100(d)	0.0	0.0	0.0	0.0	0.0
114	MACS3949(d) (C)	4.3	0.0	0.0	1.4	4.3
115	DDW53(d)	3.5	0.0	0.0	1.2	3.5
116	NIDW1345(d)	3.6	0.0	0.0	1.2	3.6
117	MACS6222 (C)	5.6	0.0	0.0	1.9	5.6
118	MACS4106(d)	1.5	0.0	0.0	0.5	1.5
119	NIDW1348(d)	1.3	0.0	0.0	0.4	1.3
120	HI8828(d)	6.0	0.0	0.0	2.0	6.0
120A	PBW343 (Check)	22.2	38.1	46.6	35.6	46.6
121	GW322 (C)	4.5	9.8	14.9	9.7	14.9
122	HI8827(d)	0.0	0.0	0.0	0.0	0.0
123	DDW48(d)(I) (C)	0.0	0.0	0.0	0.0	0.0
124	HD3090 (C)	2.5	7.0	8.3	5.9	8.3
125	HI1633(I) (C)	7.5	2.8	0.0	3.4	7.5
126	HD2932 (C)	8.3	6.0	8.3	7.5	8.3
127	RAJ4083 (C)	6.6	0.0	0.0	2.2	6.6
128	DBW320	8.3	0.0	0.0	2.8	8.3
129	MACS6774	5.0	11.7	0.0	5.6	11.7
130	NWS2180[#]	5.3	6.1	0.0	3.8	6.1
131	HI1651	18.3	8.0	10.0	12.1	18.3
132	MP1358*	12.5	6.1	0.0	6.2	12.5
133	MACS6755	16.6	4.5	11.6	10.9	16.6
134	HI1605 (C)	11.1	3.6	0.0	4.9	11.1
135	MACS6753	12.5	0.0	0.0	4.2	12.5
136	AKDW2997-16(d) (C)	8.3	0.0	0.0	2.8	8.3
137	NIDW1149(d)(I) (C)	0.0	0.0	0.0	0.0	0.0
138	NIAW3170 (C)	6.6	0.0	0.0	2.2	6.6
139	UAS446(d) (C)	0.0	0.0	0.0	0.0	0.0
140	DBW325	5.0	0.0	0.0	1.7	5.0
140A	PBW343 (Check)	24.0	39.0	38.5	33.8	39.0
141	UAS3014	6.6	3.5	0.0	3.4	6.6
SPL – Dicoccum						
142	MACS5058	6.3	0.0	0.0	2.1	6.3
143	MACS6222(*a*) (C)	5.0	2.1	0.0	2.4	5.0
144	DDK1029 (C)	6.6	0.0	0.0	2.2	6.6
145	DDK1061	4.0	0.0	0.0	1.3	4.0
146	HW1098 (C)	4.0	0.0	0.0	1.3	4.0
147	MACS5057	5.0	0.0	0.0	1.7	5.0
148	DDK1060	3.3	0.0	0.0	1.1	3.3
SPL – HYPT						
149	DBW328*	4.0	0.0	0.0	1.3	4.0
150	DBW372	5.0	4.2	4.6	4.6	5.0
151	DBW370	3.3	0.0	0.0	1.1	3.3
152	DBW327*	2.5	1.1	0.0	1.2	2.5

153	WH1252*	5.0	0.0	0.0	1.7	5.0
154	PBW874	6.6	6.4	8.0	7.0	8.0
155	HD3410	2.5	2.7	0.0	1.7	2.7
156	DBW332*	5.0	0.0	0.0	1.7	5.0
157	PBW873	0.0	3.5	0.0	1.2	3.5
158	DBW371	0.0	0.0	0.0	0.0	0.0
159	HD3086 (C)	0.0	0.0	0.0	0.0	0.0
160	DBW333*	4.0	5.8	0.0	3.3	5.8
160A	PBW343 (Check)	25.0	38.8	42.4	35.4	42.4
161	PBW872	0.0	3.5	0.0	1.2	3.5
162	DBW187(I) (C)	0.0	0.0	0.0	0.0	0.0
163	WH1270(I) (C)	1.6	5.1	4.8	3.9	5.1
164	DBW303(I) (C)	2.5	0.0	0.0	0.8	2.5
SPL - CI – HYT						
165	HD3412	3.5	0.0	0.0	1.2	3.5
166	DBW375	2.2	1.7	0.0	1.3	2.2
167	DBW374	2.4	3.5	0.0	2.0	3.5
168	HD3403	1.5	0.0	0.0	0.5	1.5
169	WH1406	6.6	0.0	0.0	2.2	6.6
170	HD3413	1.3	8.8	28.3	12.8	28.3
171	PBW867	0.0	8.4	29.6	12.7	29.6
172	UP3096	2.2	3.4	0.0	1.9	3.4
173	WH1404	2.5	0.0	0.0	0.8	2.5
174	PBW868	6.6	7.0	5.2	6.3	7.0
175	DBW318	5.0	4.5	0.0	3.2	5.0
176	DBW378	6.6	0.0	0.0	2.2	6.6
177	WH1405	7.2	4.3	0.0	3.8	7.2
178	HD3405	8.3	0.0	0.0	2.8	8.3
179	DBW377	6.6	3.5	0.0	3.4	6.6
180	PBW869	5.0	6.5	9.4	7.0	9.4
180A	PBW343 (Check)	22.2	42.2	39.6	34.7	42.2
181	PBW871	6.6	0.0	0.0	2.2	6.6
182	HD3086 (C)	7.2	0.0	0.0	2.4	7.2
183	DBW376	9.3	0.0	0.0	3.1	9.3
184	DBW373	8.3	0.0	0.0	2.8	8.3
185	HD3404	6.3	0.0	0.0	2.1	6.3
186	DBW187(I) (C)	7.2	0.0	0.0	2.4	7.2
187	WH1407	8.3	0.0	0.0	2.8	8.3
188	PBW870	4.0	0.0	0.0	1.3	4.0
189	UP3095	6.6	0.0	0.0	2.2	6.6
SPL – AST						
190	DBW368	5.0	0.0	0.0	1.7	5.0
191	DBW363	6.2	0.0	0.0	2.1	6.2
192	DBW369	5.0	0.0	0.0	1.7	5.0
193	DBW367	6.2	0.0	0.0	2.1	6.2
194	DBW364	7.2	3.4	0.0	3.5	7.2
195	Kharchia 65 (C)	5.0	11.0	17.0	11.0	17.0
196	DBW366	4.2	6.6	4.7	5.2	6.6
197	KRL210 (C)	4.2	3.9	4.1	4.0	4.2
198	DBW365	3.3	0.0	0.0	1.1	3.3
199	K1805	3.3	0.0	0.0	1.1	3.3
200	KRL19 (C)	4.2	5.8	4.1	4.7	5.8
200A	PBW343 (Check)	26.6	36.4	32.1	31.7	36.4

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7.3 FOOT ROT (*Sclerotium rolfsii*)

AVT entries were evaluated at Dharwad center. AVTs (2020-21) were evaluated against foot rot and entries wise reaction has been given in Tables 7.3. The entries showing upto 5 and 10.00 per cent incidence were categorized as highly resistant and resistant, respectively and are listed below:

AVTs Year 2020-21

Free

HPW349 (C), VL907 (C), WH1105 (C), HD3349, HD3043 (C), PBW644 (C), HI1621 (C), DBW316, HD3360, NIAW3851, MACS3949(d) (C), NIDW1348(d), HD2932 (C), MACS6774, HI1651, MP1358*, UAS446(d) (C), HW1098 (C), MACS5057, PBW874, PBW871, HD3086 (C), DBW373, DBW187(I) (C), Kharchia 65 (C), DBW365

Highly resistant (upto 5 % disease): Nil

Resistant (5-10 % disease):

PBW771 (C), MP3288 (C), DBW325

Table 7.3. Performance of AVTs material against foot rot (% incidence) at Dharwad during 2020-21

S. No.	Entries	Foot rot incidence (%)
		Dharwad
North Hill Zone (NHZ)		
1	VL2041	35.0
2	HS562 (C)	55.0
3	HPW349 (C)	0.0
4	HS507 (C)	75.0
5	VL907 (C)	0.0
North Western Plain Zone (NWPZ)		
6	WH1105 (C)	0.0
7	DBW187 (C)	35.0
8	HD3349	0.0
9	PBW876[B]	60.0
10	HD3406[M]	35.0
11	DBW222 (C)	60.0
12	DBW313[#]	30.0
13	HD2967 (C)	50.0
14	PBW826	80.0
15	RAJ4548[#]	55.0
16	HD3354	45.0
17	WH1283	25.0
18	HD3086 (C)	50.0
19	JKW261	90.0
20	WH1124 (C)	70.0
21	PBW771 (C)	10.0
22	HD3059 (C)	40.0
23	PBW834	50.0
24	DBW173 (C)	30.0
25	HUW838[#]*	31.3
26	NW7096	30.0
27	DBW321	50.0
28	K1910	40.0
29	HI1654	12.5
30	NIAW3170 (C)	40.0
31	PBW838	40.0
32	DBW296*	60.0
33	HI1628 (C)	50.0
34	HD3369	50.0
35	WH1142 (C)	65.0
36	UP3062	55.0
37	HD3368	35.0
38	HD3043 (C)	0.0
39	PBW644 (C)	0.0
40	HI1653	50.0
41	PBW848	60.0
North Eastern Plain Zone (NEPZ)		

42	HD2733 (C)	55.0
43	HD3249 (C)	40.0
44	DBW187 (C)	90.0
45	HD3406[M]	75.0
46	HD3411[M]	90.0
47	DBW39 (C)	70.0
48	HD2967 (C)	30.0
49	PBW826[#]	30.0
50	HD3086 (C)	85.0
51	DBW317	35.0
52	DBW318	85.0
53	PBW835	50.0
54	HI1563 (C)	75.0
55	DBW107 (C)	55.0
56	PBW834	85.0
57	UP3060	45.0
58	HD3118 (C)	45.0
59	HI1621 (C)	0.0
60	DBW316	0.0
61	PBW833	95.0
62	HD3360	0.0
63	HI1653	50.0
64	DBW322	80.0
65	HI1612 (C)	95.0
66	DBW252 (C)	85.0
67	DBW321	95.0
68	HD3368[#]	55.0
69	HI1654	60.0
70	HD3293(I) (C)	60.0
71	WH1281	70.0
72	PBW848[#]	65.0
73	HD3171 (C)	20.0
74	HD3369[#]	20.0
75	K1317 (C)	80.0
76	UP3062	75.0
Central Zone (CZ)		
77	HI8833(d)[M]	33.3
78	GW322 (C)	35.0
79	MP3535	40.0
80	GW523	20.0
81	GW513*	68.8
82	HI1636*	33.3
83	HI8832(d)[M]	75.0
84	MACS6768	65.0
85	HI1544 (C)	70.0
86	HI1667[B]	35.0
87	HI8498(d) (C)	60.0
88	HI8713(d) (C)	65.0
89	HI1650	65.0
90	MP4010 (C)	75.0
91	HD2864 (C)	75.0
92	MP3336 (C)	50.0
93	HD2932 (C)	70.0
94	HI1634(I) (C)	80.0
95	HD3407[M]	60.0
96	CG1029(I) (C)	80.0
97	HI8823(d)*	60.0
98	GW528	60.0
99	DDW47(d) (C)	58.3
100	DBW326	70.0
101	UAS475(d)	50.0
102	HI8627(d) (C)	50.0
103	NIAW3851	0.0
104	HI8830(d)	18.8
105	CG1036	25.0
106	HI1655	55.0
107	DBW110 (C)	65.0
108	MP3288 (C)	10.0
109	DDW55(d)	40.0
Peninsular Zone (PZ)		
110	WHD965(d)	12.5
111	UAS428(d) (C)	65.0
112	HI8826(d)	70.0
113	MACS4100(d)	70.0
114	MACS3949(d) (C)	0.0
115	DDW53(d)	20.0
116	NIDW1345(d)	30.0
117	MACS6222 (C)	85.0
118	MACS4106(d)	80.0
119	NIDW1348(d)	0.0
120	HI8828(d)	33.3
121	GW322 (C)	66.7
122	HI8827(d)	41.7
123	DDW48(d)(I) (C)	83.3
124	HD3090 (C)	33.3
125	HI1633(I) (C)	16.7
126	HD2932 (C)	0.0
127	RAJ4083 (C)	20.0
128	DBW320	66.7
129	MACS6774	0.0
130	NWS2180[#]	75.0
131	HI1651	0.0
132	MP1358*	0.0
133	MACS6755	12.5
134	HI1605 (C)	25.0
135	MACS6753	45.0
136	AKDW2997-16(d) (C)	45.0
137	NIDW1149(d)(I) (C)	31.3
138	NIAW3170 (C)	70.0
139	UAS446(d) (C)	0.0
140	DBW325	8.3
141	UAS3014	75.0
SPL – Dicoccum		
142	MACS5058	20.0
143	MACS6222(*a*) (C)	90.0
144	DDK1029 (C)	35.0

145	DDK1061	35.0
146	HW1098 (C)	0.0
147	MACS5057	0.0
148	DDK1060	50.0
SPL – HYPT		
149	DBW328*	80.0
150	DBW372	85.0
151	DBW370	58.3
152	DBW327*	60.0
153	WH1252*	20.0
154	PBW874	0.0
155	HD3410	12.5
156	DBW332*	50.0
157	PBW873	83.3
158	DBW371	18.8
159	HD3086 (C)	35.0
160	DBW333*	70.0
161	PBW872	95.0
162	DBW187(I) (C)	90.0
163	WH1270(I) (C)	80.0
164	DBW303(I) (C)	85.0
SPL - CI – HYT		
165	HD3412	50.0
166	DBW375	95.0
167	DBW374	50.0
168	HD3403	75.0
169	WH1406	80.0
170	HD3413	80.0
171	PBW867	80.0
172	UP3096	45.0
173	WH1404	55.0
174	PBW868	45.0
175	DBW318	60.0
176	DBW378	20.0
177	WH1405	30.0
178	HD3405	70.0
179	DBW377	35.0
180	PBW869	35.0
181	PBW871	0.0
182	HD3086 (C)	0.0
183	DBW376	50.0
184	DBW373	0.0
185	HD3404	50.0
186	DBW187(I) (C)	0.0
187	WH1407	20.0
188	PBW870	50.0
189	UP3095	25.0
SPL – AST		
190	DBW368	40.0
191	DBW363	70.0
192	DBW369	30.0
193	DBW367	30.0
194	DBW364	50.0
195	Kharchia 65 (C)	0.0
196	DBW366	70.0
197	KRL210 (C)	80.0
198	DBW365	0.0
199	K1805	40.0
200	KRL19 (C)	25.0

COOPERATOR

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7.4 HILL BUNT (*Tilletia foetida, T. caries*)

Test Locations: Almora, Bajoura and Malan

A total 5 AVT entries were evaluated at three locations. The data was taken by counting infected and healthy ear heads, for calculating per cent infected ear heads. There were differences in the disease incidence at both locations, the highest disease level as well as average was considered and has been given in Table 7.4.

AVTs 2020-21
Resistant (1-10 % disease):
HS507 (C), VL907 (C)

Table 7.4. Performance of AVT material against hill bunt (% incidence) under multilocational testing during 2020-21

S. No.	Entries	Hill Bunt Incidence (%)				
		Almora	Malan	Bajaura	Avg.	HS
Northern Hill Zone						
1	VL2041	13.2	20.0	0.0	11.1	20.0
2	HS562 (C)	14.4	16.4	3.4	11.4	16.4
3	HPW349 (C)	10.9	13.8	7.8	10.8	13.8
4	HS507 (C)	15.6	10.0	0.0	8.5	15.6
5	VL907 (C)	6.0	12.3	0.0	6.1	12.3

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PROGRAMME 8. CROP HEALTH

8.1 Pre- Harvest Crop Health Monitoring

During 2020-21, to monitor the wheat and barley crop health, regular surveys were conducted with major emphasis on occurrence of yellow rust in NWPZ and surveillance for wheat blast. The surveys were conducted by the wheat crop protection scientists of different cooperating centers including ICAR-IIWBR Karnal and information was share among through the *"Wheat Crop Health Newsletter",* Vol. 26 (Issues 1 to 5) which was issued during the crop season and also uploaded on ICAR-IIWBR website (www.iiwbr.icar.gov.in). The first appearance of yellow rust of wheat is reported from village Pattii (Manakpur) block Sh. Anandpur Sahib, Rupnagar District of Punjab on 17.1.2021 on variety HD3226 and another report of yellow rust is from village Mangoli Jatan of Kurukshreta district in Haryana on variety HD 2967. During the crop season in February there was sudden raise in the temperature which become uncongenial for rusts therefore the diseases severity and spread remain low and there was minimal losses due to disease especially in NWPZ and NEPZ. So far, the exotic diseases and pathotypes like Ug99 race of stem rust and wheat blast were not reported from any part of the country. The overall crop health status was excellent in the country.

The yellow rust mainly appear in NWPZ and if occure in early stage may cause heavy losses but this year the yellow rust appeared very late in the season and remainded low during the crop season. The first appearance of yellow rust of wheat is reported from village Pattii (Manakpur) block Sh. Anandpur Sahib, Rupnagar District of Punjab on 17.1.2021 on variety HD3226 and another report of yellow rust is from village Mangoli Jatan of Kurukshreta district in Haryana on variety HD 2967. The first report of yellow rust in Himachal Pradesh was observed in a farmer's field in Lahasan area of Dehra block on a local variety with a severity of 80S on 17.02.2021. In Haryana, first report of yellow rust is from village Mangoli Jatan of Kurukshreta district in Haryana on variety HD 2967 on 17.1.2021. In Jammu, yellow rust was observed in two fields on 2-3 plants with very low severity (5S) on 25.2.2021.

Besides the yellow rust, leaf rust incidence was observed in traces in in few farmers field Punjab, Bihar and Maharashtra in the month of February. Serveys were also conducted in West Bengal and no wheat blast symptoms were observed. Other then rust the some incidence of foliar blight was observed in easters, central and peninsular India. Similarly minor sporadic incidence of loose smut, flag smut and foot rot was also reported.

Strategy Planning Meetings

For the effective implementation of crop protection technologies strategy planning meetings was conducted on "Alternate crop plan to combat the wheat blast like disease" on 18.9.2020 through virtual platform. The meeting was chaired by the Agriculture Commissioner, DAC&FW, Govt. of India. From IIWBR the meeting was attended by Dr. Gyanendra Pratap Singh, Director-IIWBR, Dr. Gyanendra Singh, PI, Crop Improvement and Dr. Sudheer Kumar, PI Crop Protection. Dr. Sudheer Kumar, PI CP, made the presentation on work done in wheat blast project. It was discussed that resistant varieties need to be promoted in the disease prone areas. Five resistant varieties identified namely DBW 187, HD 3249 and HD 2967 (irrigated and timely sown) and DBW 252 and HD 3171 (restricted irrigation and timely sown) have been recommended to be grown in disease prone areas of West Bengal. It was suggested that continuous monitoring of wheat crop is required and if any suspected symptoms are observed, it should be reported to the IIWBR immediately.

Training for human resource development

To bring more uniformity in disease creation and data recording a training was organized on "Creation of epiphytotics for disease and insect pests, uniform data recording and reporting in wheat and barley crop protection trials" from 28-30 January, 2021 through virtual mode at ICAR-IIWBR, Karnal for scientists working in crop protection under the coordinated system. The scientist and technical workers involved in disease and insect pest recording have been participated.

Advisory for stripe rust management:
During the current season the weather remained uncongenial for diseases and pest therefore the sporadic occurrence of yellow rust has been reported from NWPZ. Need based advisory for stripe rust management was issued. Awareness among farmers for stripe rust management was created through mobile, internet, toll free number, newspapers, discussions and delivering lectures in farmers training programmes.

Preparedness to wheat blast
Survey were conducted in North and South West Bengal near Indo-Bangladesh boarder by team of scientist from UBKV, Cooch Behar, West Bengal and BCKV, Kalyani, Nadia, West Bengal and no wheat blast was observed. A strategy planning meetings was conducted on "Alternate crop plan to combat the wheat blast like disease" on 18.9.2020 through virtual platform attended by officials from DAC&FW, Govt. of India, ICAR-IIWBR, Karnal, SAUs and state agriculture department of West Bengal. It was discussed that more emphasis should be given to grow alternate crop like pulse, oil seed, vegetables etc. instead of wheat in blast prone areas. Wherever, wheat is grown use resistant varieties identified and recommended in the wheat blast prone areas. It was suggested that continuous and strict monitoring of wheat crop is required. An anticipatory breeding programme has already initiated. Awareness was also created in farmers to take all preventive measures available against blast and to grow the resistant varieties identified.

For identification of wheat blast resistant sources advance breeding lines and potential germplasm were screened at Jashore, Bangladesh and Quirassallis through CIMMYT. A total 350 entries sent in 2019 screened against blast at Jashore, Bangladesh at two different dates of sowing during 2019-20 and at two locations i.e. Jashore, Bangladesh and Quirassallis at two different dates of sowing during 2020-21. Out of these, across the locations and years, 29 entries found free from infection and 46 are categorised resistant on the basis of average disease upto 10% infection. The details are given as below:

Free Entries - 27	HS680, VL3022, HD3334, MP1358, DBW308, RAJ4548, PBW826, NW7094, WH1274, K1903, NIAW3889, NWS2176, DBW316, DBW318, WH1276, DBW320, HI1653, DBW325, DBW187, DBW328, DBW329, DBW332, DBW333, WH1252, DBW222, DBW88, HI1605
Av. score upto 10% Enteries - 46	VL3024, HD3331, JKW261, HUW838, HD3293, HD3377B, HD3348, HD3349, DBW306, UP3054, WH1283, UP3055, UP3056, HD3359, RAJ4551, MP3526, MP3535, UP3058, HD3361, HD3363, DBW317, RAJ4552, PBW834, UP3061, UP3065, JKW270, HD3366, MP3529, NIAW3895, NWS2180, HD3368, HI1654, NW7096, PBW848, UP3063, HD3372, UAS3014, DBW303, DBW327, DBW331, DBW173, HD3043, HD3059, HD3171, HD3249, WH1105

Besides that 350 entries again sent in 2020 to screen against blast during 2020-21 at Jashore, Bangladesh at two different dates of sowing, and 71 entries found free from infection and 99 are categorised resistant on the basis of highest score upto 10% infection. The details are given as below:

Free Entries - 71	DBW342, DBW343, HD3386, PBW849, PBW853, UP3080, WH1292, BRW3902, DBW348, DBW350, HUW845, NW8013, NW8017, PBW856, UP3084, UP3085, WH1296, DBW352, MP1379, NWS2194, DBW357, HUW847, PBW859, PBW860, PBW875, UP3088, UP3094, MP1380, HD3400, NW8010, PBW866, UP3091, HD3401, DBW366, DBW371, DBW372, DBW373, DBW374, DBW375, DBW378, HD3405, PBW868, PBW871, WH1407, DWAP-B-2001, DWAP-B-2002, DWAP-B-2003, DWAP-B-2005, RWP1, RWP6, RWP8, RWP13, QYB-2002, QYB-2004, QYB-2005, QYB-2011, QYB-2014, QYB-2015, LBP-2019-1, LBP-2019-2, LBP-2019-7, LBP-2019-17, LBP-2019-18, LBP-2019-22, NEP 2020-1, NEP 2020-2, NEP 2020-3, PBS 1001, PBS 1002, PBS 1003, WH1215
HS upto	DBW344, DBW345, DBW346, DBW362, HD3385, HUW844, KRL1914, NW8012,

10% Entries - 99	PBW852, RAJ4555, TAW123, UP3082, UP3083, WH1293, BRW3895, DBW347, DBW349, HD3391, HP1971, HUW846, JKW287, KRL1912, NW8019, RAJ4559, TAW119, WH1295, DBW351, MP3545, MP3552, UAS3015, UP3086, BRW3897, DBW353, DBW354, DBW356, HD3393, HD3394, HD3395, NW8004, NW8022, PBW862, WH1299, HI1661, MP3541, MP3542, NIAW3923, NIAW4028, HI8835(d), BRW3901, DBW358, DBW359, DBW360, DBW361, HD3397, HD3398, HD3399, HP1973, HUW848, UP3090, MP1377, HD3406, DBW363, DBW364, DBW370, HD3410, PBW872, PBW873, DBW377, HD3403, HD3404, UP3096, WH1404, WH1406, DWAP-B-2006, DWAP-B-2010, DWAP-B-2014, DWAP-B-2015, RWP3, RWP5, RWP7, RWP15, QYB-2003, QYB-2006, QYB-2009, QYB-2010, QYB-2012, QYB-2013, LBP-2019-14, LBP-2019-15, LBP-2019-19, LBP-2019-24, PBS 1006, CB2005, CB2006, CB2007, EC609396, HI1562, QLD 112, IC 427824

8.2 Post Harvest Surveys

The post harvest grain analysis for presence of Karnal bunt and black point in grains of farmers' fields collected from grain mandies from different regions was done by different cooperating centres of All India Coordinated Research Project on Wheat and Barley. The detail report is given below:

Karnal Bunt (KB)

A total of 6396 grain samples collected from various mandies in different zones and were analyzed at cooperating centers (Table 8.1). This year very less samples have been collected due to restriction on movement the country during the harvesting time because of COVID-19 outspread. The overall 21.12% samples were found infected. The samples from Rajasthan showed maximum infection (37.67%). In general the Karnal bunt infection was less in comparison to previous year because of sudden rise of temperature in the month of February, when the crop is at the booting stages.

Table 8.1.Karnal bunt situation in the country during 2020-21 crop season.

State	Total Samples	Infected Samples	Infected samples (%)	Range of infection (%)
Punjab	2037	626	30.73	0.03 - 0.72
Haryana	1931	553	28.63	0.14 - 26.5
Delhi	109	0	0	0
Rajasthan	454	171	37.67	0.1 - 19.5
Uttrakhand	1518	1	0.07	0 - 0.25
Gujarat	159	0	0	0
Madhya Pradesh	120	0	0	0
Maharashtra	58	0	0	0
Karnataka	10	0	0	0
Total	**6396**	**1351**	**21.12**	**0 – 26.5**

Haryana

A total of 1267 samples collected by IIWBR from Haryana and analysed for presence of KB and foud that 20.4% samples were infected with KB and range of infection was 0 – 26.5% (Table 8.2). The KB infection was higher in this year coperivive to previous years because of raind at the time of booting.

Table 8.2. Status of Karnal bunt in Haryana during 2020-21 crop season.

Districts	Total samples	Infected samples	Infected samples %	Range of grain infection (%)
Kurukshetra	265	62	23.4	0.2-12.4
Karnal	321	98	30.5	0.2-9.2
Kaithal	151	56	37.1	0.2-2
Jind	187	54	28.9	02.-4.3

Panipat	107	23	21.5	0.4-2.7
Sonipat	39	8	20.5	0.6-5.9
Rohtak	37	6	16.2	0.4-1.5
Ambala	70	8	11.4	0.3-0.9
Yamunanagar	90	20	22.2	0.5-2.2
Total	**1267**	**335**	**26.4**	**0.2-74.5**

(IIWBR)

A total 665 grain samples were also collected from different districts of Haryana by cooprating center CCSHAU, Hisar. These sampales were analysed for Karnal bunt infection. Out of the 665 sample, 218 foud infected and the percentage of infected sampales was 32.8.
(R. S. Beniwal)

Rajasthan

To know the status of Karnal bunt and black point diseases in wheat, 454 wheat grain samples were collected from 13 grain mandies of Rajasthan during 2020-21. The samples were visually analysed for the Karnal bunt and black point diseases. The data revealed that 171 samples (37.67%) were found infected with Karnal bunt with infection range 0.1-19.5 percent being maximum found in a sample collected from Khertal (Alwar) mandi (Table 8.3). The highest KB infected samples were found in Bansur mandi (82.61%) followed by Alwar (81.25%), Mahua (75.76%), Kotputli (71.43%), Khertal (67.35%), Bandikui (61.11%), Lalsot (47.82%) Dausa (24.44%), Tonk (19.5%), Mandawari (12.9%), Chaksu (10.0%), Deoli (7.0%) and Bassi (3.22%) mandies. However, among the total KB infected samples 137 samples (30.18 %) were falling in the range of 0.1-1.0 percent disease incidence and 6.17 per cent samples were in the range of 1.1-5.0, whereas, 05 cent samples were showing >5-10.0 per cent KB incidence.While, only one sample collected from Khertal (Alwar) having 19.5 per cent KB infection.

Table 8.3: Status of Karnal bunt during Rabi, 2020-21 in Rajasthan

S. No.	Location	Number of samples showing different level of Karnal bunt per cent incidence					Total samples	Per cent infected samples	Percent range of incidence
		0	0.1-1.0	1.1-5.0	5.1-10	>10			
a	**District: Alwar**								
1	Alwar	06	22	02	02	00	32	81.25	0.1-6.1
2	Bansur	04	16	03	00	00	23	82.61	0.1-3.8
3	Khertal	16	28	04	00	01	49	67.35	0.1-19.5
	Total	**26**	**66**	**09**	**02**	**01**	**104**	**75.0**	**0.1-19.5**
b	**District: Dausa**								
1	Bandikui	07	11	00	00	00	18	61.11	0.1-0.9
2	Dausa	34	10	01	0	0	45	24.44	0.1-2.9
3	Lalsot	24	11	09	02	0	46	47.82	0.1-7.3
4	Mahua	09	19	05	00	00	33	75.76	0.1-3.2
5	Mandawari	27	03	01	0	0	31	12.9	0.4-4.6
	Total	**101**	**54**	**16**	**02**	**0**	**173**	**41.62**	**0.1-7.3**
c	**District: Jaipur**								
1	Bassi	30	01	0	0	0	31	3.22	0.2
2	Chaksu	36	03	01	0	0	40	10.00	0.2-1.1
3	Kotputli	02	05	00	00	00	07	71.43	0.3-0.8
	Total	**68**	**09**	**01**	**0**	**0**	**78**	**12.82**	**0.1-1.0**
d	**District: Tonk**								
1	Tonk	25	05	01	0	0	31	19.35	0.1-1.1
2	Deoli	63	03	02	01	0	68	7.35	0.1-5.0

Total	**88**	**08**	**03**	**01**	**0**	**99**	**12.12**	**0.1-5.0**
Grant Total	**283**	**137**	**28**	**05**	**01**	**454**	**37.67**	**0.1-19.5**
Per cent	**62.33**	**30.18**	**6.17**	**1.10**	**0.22**			

(Pradeep S. Shekhawat)

Punjab

The survey of 141 grain markets of the Punjab state during the months of April and May 2021 were conducted to collect the wheat grain samples for the analysis of various post harvest diseases of the wheat. A total of 2037 samples were collected and analyzed for the presence of Karnal bunt black point infected grains and also for shriveled grains. A total of 626 samples out of 2037 showed Karnal bunt infection i.e. 30.73 percent samples were found to be infected with KB (Table 8.4). District Amritsrar showed the maximum KB infected samples followed by Pathankot and Tarntaran. The range of per cent KB infected samples was 5.00 (Mohali) to 66.22 (Amritsar). As far as severity in concerned, the highest KB severity was in the Amritsar and Kapurthalla districts followed by Hoshiarpur. An overall infection in rest of the districts ranged between 0.03 to 0.77 with average infection in the state 0.289.

Table 8.4: Status of Karnal bunt in Punjab during 2020-21

S. No	District	Total Samples	Infected Samples	% infected samples	% Average infection
1	Amritsar	74	49	66.22	0.77
2	Barnala	44	19	43.18	0.11
3	Bathinda	83	26	31.33	0.10
4	Faridkot	76	17	22.37	0.08
5	Fatehgarh Sahib	35	10	28.57	0.12
6	Fazilka	139	13	9.35	0.06
7	Ferozepur	136	11	8.09	0.04
8	Gurdaspur	85	27	31.76	0.43
9	Hoshiarpur	139	46	33.09	0.67
10	Jallandhar	204	85	41.67	0.50
11	Kapurthala	82	33	40.24	0.72
12	Ludhiana	209	37	17.70	0.16
13	Mansa	67	19	28.36	0.03
14	Moga	68	25	36.76	0.07
15	Mohali	40	2	5.00	0.03
16	Muktsar	89	13	14.61	0.11
17	Nawanshar	58	26	44.83	0.53
18	Pathankot	35	23	65.71	0.44
19	Patiala	85	11	12.94	0.07
20	Ropar	76	37	48.68	0.32
21	Sangrur	72	19	26.39	0.13
22	Tarantarn	141	78	55.32	0.47
	Total	**2037**	**626**	**30.73**	**0.289**

(Jaspal Kaur, Ritu Bala)

Delhi

During 2020-21, grain markets were not visited due to lockdown during April 19 to May 29, 2021. However, 109 wheat grain samples were collected from IARI, New Delhi fields. In Agronomy fields (natural conditions), 9 samples were taken from conventional tillage, zero tillage and permanent

raised beds. One hundred wheat grain samples were also collected (natural condition) from indigenous germplasm planted at IARI. All samples were free from Karnal bunt disease.
(M.S. Saharan)

Uttarakhand
A total 1518 wheat samples were collected and analyzed, all the samples were found free from Karnal bunt infection except one sample from Pantnagar (Table 8.5). These samples were collected from the seed growers of three districts of Uttarakhand namely, Udham Singh Nagar, Nainital and Haridwar.

Table 8.5: Status of Karnal bunt in Uttarakhand during Rabi, 2020-21

Districts	Total samples	No. of infected samples	% infected Samples	No. of samples in different range of infection			
				Below 0.25%	0.26-1%	1.1-5%	5.1-10%
1.Udham Singh Nagar							
a) Pantnagar	158	1	0.63	1	-	-	-
b) Kichha	233	-	-	-	-	-	-
c) Gadarpur	384	-	-	-	-	-	-
d) Khatima	304	-	-	-	-	-	-
e) Rudurpur	236	-	-	-	-	-	-
2.Haridwar	111	-	-	-	-	-	-
3. Nainital (Kotabagh)	92	-	-	-	-	-	-
Total	1,518	-	-	-	-	-	-

(Deepshikha)

Madhya Pradesh
Due to COVID 19 situations, this year only120 wheat grain samples from 23 villages of 2 blocks across the Hoshangabad district were collected and examined for KB (Table 8.6). None of the grain samples have KB infection.

Table 8.6: Status of Karnal bunt during Rabi, 2020-21 in Madhya Pradesh

District	Blocks	No of villages	No of samples	Kb incidence	Varieties Scenario
Hoshangabad	Hoshangabad Sheonimalva	14 09	84 36	Free Free	GW322, GW366, MP1203, HI 1544, Sriram302, MP3382, Lok 1, HI 8759
Total		23	120		

(K.K. Mishra)

Gujarat
Due to prevailing pandemic situation of COVID 19, only seven marketing yards located in different wheat growing areas were surveyed for wheat seed health status. A total of 159 seed samples were examined. All the samples were free from karnal bunt incidence.
(S. I. Patel, Elangbam Premabati Devi)

Maharastra
Due to COVID 19 number of samples collected was less as compared to normal season. Only 58 samples collected Nashik, Niphad, Kopargaon and Dhuleand. All the samples are found free from Karnal bunt infection. Thirty samples were collected from the Pune and all are foud free from Karnal bunt.
(B.M. Ilhe, B.C. Game, P.P. Khandagale, S.V.Ghegade, Sudhir Navathe)

Karnataka

Due this season limited samples were collected due to prevailing pandemic situation of COVID 19, only ten samples were collected from Dharwad, Gadag and Belgaum. All the samples were free from Karnal bunt incidence.

(Gurudatt M. Hegde)

Black Point (BP) and Shriveled Grains (SG)

Rajasthan

Among the total 454 wheat grain samples, 244 (53.74 %) samples were infected with black point in the range of 0.1-22.6 per cent incidence being highest incidence (22.6%) was noticed in a sample collected from Chaksu (Jaipur) mandi. Highest BP infected samples (71.4%) were found in Kotputli (Jaipur) mandi, followed by Mahua (69.7%), Lalsot (69.6%), Tonk (61.3%), Khertal (61.2%), Alwar (59.4%), Chaksu (57.5%), Bansur (52.2%), Bandikui (50.0%), Deoli (47.1%), Dausa (46.7%), Mandawari (41.9%) and Bassi (19.35%) mandies (Table 8.7).

Table 8.7: Status of black point during Rabi, 2020-21 in Rajasthan

S. No.	Location	Total samples	Number of BP infected samples	Per cent infected samples	Range of incidence (%)
1	Alwar	32	19	59.38	0.2-3.4
2	Bansur	23	12	52.17	0.1-0.7
3	Khertal	49	30	61.22	0.1-1.1
4	Bandikui	18	09	50.0	0.2-0.8
5	Dausa	45	21	46.66	0.1-3.0
6	Lalsot	46	32	69.56	0.4-6.3
7	Mahua	33	23	69.7	0.1-1.8
8	Mandawari	31	13	41.94	0.4-6.3
9	Bassi	31	06	19.35	0.2-1.0
10	Chaksu	40	23	57.5	0.2-22.6
11	Kotputli	07	05	71.43	0.1-0.4
12	Tonk	31	19	61.29	0.1-8.3
13	Deoli	68	32	47.05	0.2-4.8
		454	**244**	**53.74**	**0.1-22.6**

(Pradeep S. Shekhawat)

Punjab

About 29.65 % samples collected from the grain markets of the Punjab were found to be infected with Black point infected while 30.98 percent samples had shriveled grains. An average infection of black point and shriveled grains was 0.114 and 0.112%, respectively (Table 8.8).

Table 8.8: Status of BP and SG in Punjab during 2020-21

S. No.	Districts	Black point		Shriveled grains	
		% infected samples	% Average infection	% infected samples	% Average infection
1	Amritsar	25.68	0.126	33.78	0.132
2	Barnala	9.09	0.030	11.36	0.016
3	Bathinda	14.46	0.035	16.87	0.047
4	Faridkot	36.84	0.111	22.37	0.107
5	Fatehgarh Sahib	31.43	0.129	42.86	0.206
6	Fazilka	26.62	0.104	28.06	0.133

7	Ferozepur	39.71	0.148	42.65	0.165
8	Gurdaspur	32.94	0.149	41.18	0.198
9	Hoshiarpur	32.37	0.158	38.13	0.206
10	Jallandhar	36.76	0.127	38.24	0.138
11	Kapurthala	26.83	0.151	28.05	0.100
12	Ludhiana	31.10	0.114	32.54	0.103
13	Mansa	13.43	0.031	14.93	0.036
14	Moga	41.18	0.135	44.12	0.107
15	Mohali	22.50	0.063	32.50	0.098
16	Muktsar	44.94	0.193	55.06	0.145
17	Nawanshar	27.59	0.110	18.97	0.041
18	Pathankot	22.86	0.074	28.57	0.123
19	Patiala	36.47	0.149	30.59	0.076
20	Ropar	9.21	0.028	2.63	0.007
21	Sangrur	22.22	0.067	27.78	0.065
22	Tarantarn	28.37	0.102	21.28	0.070
Total		**29.65**	**0.114**	30.98	**0.112**

(Jaspal Kaur, Ritu Bala)

Haryana

A total 1267 grain samples were collected from mandies of Haryana by IIWBR. Out of these 17% samples were foud black point (Table 8.9).

Table 8.9: Status of BP in Haryana during 2020-21

Districts	Total samples	Infected samples	Infected samples %	Range of grain infection (%)
Kurukshetra	265	79	29.8	0.2-6.3
Karnal	321	57	17.8	0.4-3.6
Kaithal	151	31	20.5	0.4-3.7
Jind	187	14	7.5	0.5-1.6
Panipat	107	12	11.2	0.3-1.4
Sonipat	39	7	17.9	0.4-0.8
Rohtak	37	7	18.9	0.3-1.5
Ambala	70	12	17.1	0.4-1.2
Yamunanagar	90	11	12.2	0.5-1.4
Total	**1267**	**230**	**17.0**	**0.2-6.3**

A total 665 samplea were analysed by CCSHAU for black point infection during 2020-21 and average infection was 0.44% and it infection range from 0.05 to 1.9% (Table 8.10)

Table 8.10: Status of BP in Haryana during 2020-21

Districts South west zone	Total samples	Range of infection (%)	Average infection (%)
Hisar	78	0.05-5.2	0.304
Rohtak	264	0.05-1.35	0.138
Bhiwani	133	0.05-0.70	0.178
Charkhi Dadri	147	0.05-0.85	0.167
Mahendergarh	118	0.05-0.35	0.177
Rewari	81	0.05-0.60	0.119
Jhajjar	115	0.05-0.60	0.264
Gurgaon	249	0.05-0.75	0.243
Nuh	92	0.05-1.25	0.208
Mean South west zone	440	0.05-1.90	0.39
North East Districts			

Kurukshetra	40	0.05-1.50	0.438
Panipat	53	0.05-0.65	0.190
Sonepat			
Palwal	72	0.05-0.90	0.244
Faridabad	75	0.05-1.00	0.274
Panchkula	37	0.05-1.5	0.52
Mean North East Zone	225	0.05-1.95	0.49
State Mean	665	0.05-1.45	0.44

(R.S. Beniwal)

Gujarat

Due to prevailing pandemic situation of COVID 19, only seven marketing yards located in different wheat growing areas were surveyed for wheat seed health status. A total of 159 seed samples were examined. The data indicated that per cent black point infection was ranged from 10.7 (Talod) to 18.2 (Himmatnagar) in different marketing yards (Table 8.11).

Table 8.11: Status of BP in Gujarat during 2020-21

S. No.	Market yard/ Farmers' fields	Total samples examined	N. of infected samples	Per cent infection	Range of infection
1	Himmatnagar	22	4	18.2	0.0-4.8
2	Mansa	20	3	15.0	0.0-6.5
3	Dehgam	23	3	13.0	0.0-6.8
4	Talod	28	3	10.7	0.0-5.3
5	Mehsana	17	2	11.8	0.0-5.5
6	Visnagar	25	3	12.0	0.0-6.6
7	Vijapur	24	4	16.7	0.0-4.6
	Total	**159**	**22**	**13.8**	**0.0-6.8**

Maharashtra

Due to COVID 19 number of samples collected was less as compared to normal season. Only 58 samples collected Nashik, Niphad, Kopargaon and Dhuleand. The average infection was 51.72% (Table 8.12).

Table 8.12: Status of BP in Maharashtra during 2020-21

S. No.	Tahasil	Total samples	Infected	Per cent infected samples	Range of infection (%)
1	Nashik	15	9	60.00	1.0-9.0
2	Niphad	12	6	50.00	1.0-11.0
3	Kopargaon	21	12	57.14	2.0-13.0
4	Dhule	10	3	30.00	1.0-3.0
	Total	**58**	**30**	**51.72**	**1.0-13.0**

(B.M. Ilhe, B.C. Game, P.P. Khandagale, S.V.Ghegade)

8.3 Pathotype distribution of rust pathogens in India and Nepal during 2020-21

Wheat crop health was monitored in different wheat growing areas by different monitoring teams during the crop season and advisories were issued by ICAR-IIWBR, Karnal, department of agriculture cooperation and farmers welfare, government of India and State Department of Agriculture to combat rusts, other diseases and insect pests of wheat and barley. First appearance of stripe (yellow) rust of wheat was reported on 17.1.2021 from village Pattii (Manakpur) block Sh. Anandpur Sahib, Rupnagar (Punjab) on variety HD3226 followed by in Mangoli Jatan village of Kurukshreta (Haryana) on 22.1.2021, where stripe rust appeared in about 4 square meter area on variety HD 2967. Subsequently, stripe rust was also reported from a few farmers field in Jammu and Himachal Pradesh at very low incidence. Other wheat growing areas of the country were stripe rust free. Likewise, leaf (brown) rust was reported during February and March from few farmers field in Bihar and Maharashtra only. There was no report of leaf rust from other areas and stem (black) rust from any of the wheat growing regions of the country.

More than 400 samples of three rusts of wheat, stripe and stem rusts of barley collected from thirteen Indian states, and Nepal were analyzed during 2020-21.

Yellow or stripe rust of wheat and barley (*Puccinia striiformis*)

During this crop year, 118 samples of stripe rust of wheat and barley were analyzed from six Indian states and Nepal. Total six pathotypes {238S119, 110S119, 46S119, 110S84, 47S103 (T) and 6S0} of wheat and barley stripe rust pathogen were identified. The field population was avirulent to *Yr5*, *Yr10*, *Yr15*, and *Yr*Sp. Most of the stripe rust samples of wheat were analyzed from Punjab (34) followed by Himachal Pradesh (31) and Haryana (23). During the cropping season frequency of pathotype 238S119 was maximum (49.57%) followed by 110S119 (29.41 %), first identified in 2013-14 (Table 1). The frequency of 46S119 (virulent on *Yr2*, *Yr3*, *Yr4*, *Yr6*, *Yr7*, *Yr8*, *Yr9*, *Yr17*, *Yr18*, *Yr19*, *Yr21*, *Yr22*, *Yr23*, *Yr25*,*Yr*A) was reduced to 15.12 %. Pathotypes 47S103, 110S84 and 6S0 were identified in 4, 2 and 1 samples, respectively (Table 8.13).

Table 8.13: Pathotype distribution of stripe rust (*Puccinia striiformis*) pathotypes on wheat and barley in India and Nepal during 2020-21

S. No.	Indian states /country	Analyzed samples	Pathotypes					
			238S119	110S119	46S119	110S84	47S103 (T)	6S0
1.	Himachal Pradesh	31	18	8	4	1	-	-
2.	Punjab	34	17	6	7	1	3	-
3.	Uttarakhand	02	1	1	-	-	-	-
4.	Haryana	23	7	12	4	-	-	-
5.	Rajasthan	08	4	4	-	-	-	-
6.	Uttar Pradesh	09	7	2	-	-	-	-
Other countries								
1.	Nepal	11	5	2	3	-	-	1
Total		**118**	**59**	**35**	**18**	**02**	**04**	**01**

Black rust of wheat (*Puccinia graminis* f. sp. *tritici*)

A total of one hundred seventy three samples of wheat and barley stem (black) rust were received from six Indian states during the crop season. Eight pathotypes of *P. graminis tritici* were identified from the analysis of 91 samples. Population analyzed during the year had avirulence to *Sr26, Sr27, Sr31, Sr32, Sr35, Sr39, Sr40, Sr43, SrTt3* and *SrTmp*. Maximum number of samples was received from Tamil Nadu (101) followed by Madhya Pradesh (46) and Karnataka (23) (Table 8.14). Pathotype 11 (79G31=RRTSF), virulent on *Sr2, Sr5, Sr6, Sr7b Sr9a, Sr9b,Sr9c, Sr9d, Sr9f, Sr9g, Sr10, Sr13, Sr14, Sr15, Sr16, Sr17, Sr18, Sr19, Sr20, Sr21, Sr28, Sr29, Sr30, Sr34, Sr36, Sr38, Sr*McN was

recorded in more than 50% of the samples analyzed during the season, which was followed by 40A (15.3 %) and 40-3 (14.28 %). Other pathotypes were observed in few samples only. Diversity of black rust pathogen was maximum in Tamil Nadu.

Table 8.14: Pathotype distribution of stem rust (*Puccinia graminis* f. sp. *tritici*) in India and Nepal during 2020-21

S. No.	States/ Countries	Samples Received	No. of isolates analyzed	Pathotypes identified*¥							
				11	15-1	21	21-1	21A-2	40A	40-2	40-3
1	Gujarat	01	01	01	-	-	-	-	-	-	-
2	Himachal Pradesh	01	00	-	-	-	-	-	-	-	-
3	Karnataka	23	05	01	-	03	01	-	-	-	-
4	Madhya Pradesh	46	45	45	-	-	-	-	-	-	-
5	Maharashtra	01	01	01	-	-	-	-	-	-	-
6	Tamil Nadu	101	39	-	6	-	-	02	14	04	13
Total		**173**	**91**	**48**	**6**	**3**	**1**	**2**	**14**	**4**	**13**

Indian binomial names ¥North American equivalents 11 (79G31; RRTSF¥), 15-1 (123G15; TKTSF), 21 (9G5; CHMSC), 21-1 (24G5; CKMSC),21A-2 (75G5; CHTSC), 40A (62G29; PTHSC), 40-2 (58G13-3; PKRSC), 40-3 (127G29; PTTSF) based on Jin *et al*., *Plant Dis.* 2008,92: 923-6.

Brown rust of wheat (*Puccinia triticina*)

A total of 221 samples of wheat leaf rust were pathotyped from 12 states of India and neighboring country Nepal. Seventeen pathotypes were identified in these samples. Pathotype 77-9 (121R60-1) was the most widely distributed and occurred in 57% of the samples followed by 52-3 (121R60-1,7) in 20.3% samples (Table 8.15). Pathotype 77-5 (121R63-1), which remained most predominant for more than 20 years was observed in 12.2% samples only. The remaining 14 pathotypes were identified in 11.5% samples only. In Nepal 10 pathotypes were observed in 49 samples. Predominance of pathotypes was almost like India with pts. 77-9 and 52-3 being the most predominant (Table 8.15).

Table 8.15 Pathotype distribution of leaf rust (*Puccinia triticina*) in India and Nepal during 2020-21

S. No.	State/ Country	No. of isolates Analyzed	Pathotypes identified																
			12-3 (49R37)	12-5 (29R45)	12-7 (93R45)	17 (61R24)	77-1 (109R63)	77-3 (125R55)	77-5 (121R63-1)	77-9 (121R60-1)	77-9+Raj1555 (121R60-1,7)	104(17R23)	104-2 (21R55)	104A (21R31)	108-1 (57R27)	162A (93R15)	162-5(61R47)	1 R31	57 R39
1.	Himachal Pradesh	29	-	-	-	-	-	-	1	21	6	-	-	1	-	-	-	-	-
2.	Punjab	13	-	-	-	-	-	-	7	3	2	-	-	-	-	-	-	1	-
3.	Haryana	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
4.	Uttar Pradesh	34	-	1	-	-	1	-	4	19	9	-	-	-	-	-	-	-	-
5.	Uttarakhand	20	-	-	-	-	-	-		19	1	-	-	-	-	-	-	-	-
6.	Madhya Pradesh	18	-	-	-	-	-	-	2	12	3	-	1	-	-	-	-	-	-
7.	Bihar	3	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-
8.	West Bangal	24	1	-	-	-	-	-	3	11	9	-	-	-	-	-	-	-	-
9.	Gujarat	2	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
10.	Maharashtra	15	1	-	-	-	-	-	2	9	3			-	-	-	-	-	-
11.	Karnataka	6	2	-	-	-	1	-	2	1	-	-	-	-	-	-	-	-	-
12.	Tamil Nadu	7	-	-	1	1	-	-	2	2	-	-	-	-	1	-	-	-	-
Other Countries																			
1.	Nepal	49	-	-	-	-	1	1	2	27	12	1	-	1	-	1	1	-	2
Total		**221**	**04**	**01**	**01**	**01**	**03**	**01**	**27**	**126**	**45**	**01**	**03**	**02**	**01**	**01**	**01**	**01**	**02**

8.4 53rd Wheat Disease Monitoring Nursery (WDMN) 2020-21

Wheat disease monitoring nursery (earlier trap plot nursery) is an effective tool for monitoring the occurrence of wheat diseases especially rusts across different wheat growing zones of India. In addition, it helps in knowing the seasonal progress of the diseases in all the zones. Samples analyzed from WDMN gives an overview of area wise distribution and load of different rust races. The nursery also helps in understanding the area wise progress of wheat diseases and the performance of different disease resistance genes. Like previous years, the 53rd wheat disease monitoring nursery was planted at 38 locations, covering all the major wheat growing areas in the country, as well as bordering areas to the neighboring countries. The data have been received from 33 locations (Table 8.16).

Table 8.16: Co-operators and locations where WDMN was planted during 2020-21

State	Co-operators	Location
Northern Hills and High Altitude Zone		
Himachal Pradesh	R. Devlash Head, ICAR-IIWBR, RS, Shimla Sachin Upmanyu Dharam Pal	Bajaura IIWBR, RS, Shimla Malan (Kangra) IARI, Tutikandi Facility, Shimla
Jammu & Kashmir	F. A. Mohiddin and NA Bhat	Khudwani
Uttarakhand	K.K. Mishra	Hawalbagh (Almora)
North Western Plains Zone		
Jammu & Kashmir	M.K. Pandey M.K. Pandey M. K. Pandey and Dr. Deepak Kumar	Kathua Jammu Rajouri
Haryana	Rajender Singh Beniwal	Hisar
Himachal Pradesh	Akhilesh Singh	Dhaulakuan
Rajasthan	P.S. Shekhawat	RARI, Durgapura, Jaipur
Punjab	Jaspal Kaur	SBS Nagar Gurdaspur Ludhiana Ropar
Uttarakhand	Deepshikha and Kanak Srivastava	Pantnagar
North Eastern Plains Zone		
Bihar	C. S. Azad K. K. Singh	Sabour Samastipur, Pusa
Jharkhand	H.C. Lal	Kanke , Ranchi
Uttar Pradesh	S.P. Singh and J. Verma J.B. Khan and C. Kanchan Shyam Saran Vaish	Faizabad Araul (Kanpur) B.H.U. Varanasi
Central Zone		
Chhattisgarh	S.K. Jain	ICAR-NIBSM, Raipur
Gujarat	S.I. Patel and Premabati Devi I.B. Kapadiya	Ladol (Vijapur) Mangrol (Junagadh)
Madhya Pradesh	Prakasha T.L. K. K. Mishra	Indore Khojanpur (Powarkheda)
Peninsular and Southern Hills Zone		
Maharashtra	Sudhir Navathe B.C. Game, B.M. Ilhe and P. P. Khandagale S. G. Bharad	A.R.S. Baner, Pune ARS, Niphad Wheat Research Unit. PDKV, Akola
Karnataka	Gurudatt M. Hegde, P. V. Patil and Mr. S. V. Kulkarni	Ugar Khurd (Dharwad)
Tamil Nadu	C. Manjunatha	IARI, Regional Station, Wellington

There were 20 entries in the WDMN however; one extra entry was added for northern hills and high altitude zone. Of the total entries first 15 constitute the common set for all zones, rest of the five (six in northern hills and high altitude zone) entries were zone specific varieties. Keeping into account the changed varietal situation some changes were made in the constitution of WDMN for NWPZ and NEPZ. The detailed constituent of WDMN for 2020-21 crop season is given below:

Common set of varieties for all zones
PBW752, HD2329, Agra Local, HD2160, Lal Bahadur, WL1562, HW2021 (*Lr24/Sr24*), HD2204, C306, WH147, HW2008 (*Lr24/Sr24*), Kharchia Mutant, HP1633, DL 784-3 and RNB1001

Zone specific varieties

i) North Western Plains Zone
WH1105, HD3086, HD3226, DPW621-50 and PBW757

ii) North Eastern Plains Zone
K8804, HD2888, DBW187, HUW468 and NW1014

iii) Central Zone
HI8663, HI1544, LOK-1, GW366 and GW322

iv) Peninsular and Southern Hills Zone
MACS2496, Bijaga Yellow, HW971, HD2501 and HW2022 (*Sr*24/*Lr*24)

v) Northern Hills and High Altitude Zone
HPW349, VL892, HS420, Sonalika, HS507 and Barley Local

Seeds of all the entries along with the sowing plan and procedures were sent to co-operators early in the season to ensure timely planting of the nursery. Each entry of the nursery was planted in two consecutive rows with two rows of Agra local as spreader row covering the periphery of nursery area. Observations on diseases were generally recorded five times during the crop season. The co-operators were advised to plant wheat disease monitoring nursery in time, in isolation and away from the inoculated fields. The disease situation was monitored at regular intervals and the rust disease samples from these nurseries were analyzed at ICAR-IIWBR, RS, Flowerdale, Shimla.

Disease incidence in WDMN
Information on wheat disease situation was received from Dhaulakuan, Malan (Kangra), Bajaura, IARI Tutikandi facility, Shimla and IIWBR, Shimla in Himachal Pradesh; Jammu, Kathua, Khudwani and Rajouri in Jammu and Kashmir; Pantnagar and Hawalbagh (Almora) in Uttarakhand; Hisar in Haryana; SBS Nagar, Ludhiana, Gurdaspur and Ropar in Punjab; RARI, Durgapura in Rajasthan, Sabaur and Pusa in Bihar; Kanke (Ranchi) in Jharkhand; Faizabad, Araul (Kanpur) and Varanasi in Uttar Pradesh; Ladol (Vijapur) and Mangrol (Junagarh) in Gujarat; Raipur in Chhattisgarh, Indore and Khojanpur (Powarkheda) in Madhya Pradesh; A.R.S. Baner (Pune), WRU, Akola and ARS Niphad in Maharashtra; Ugar Khurd (Dharwad) in Karnataka and Wellington in Tamil Nadu.

Rust diseases were not recorded on any of the entries of WDMN planted at Tutikandi, Shimla, Raipur, Ranchi, Vijapur, Junagarh, Indore, Powarkheda, Akola and Niphad. The yellow rust was noticed at all the locations of NHZ and NWPZ except at IIWBR, RS, Shimla and Tutikandi, Shimla where all the WDMN entries were yellow rust free. All the entries of WDMN in other zones were free from yellow rust except at Kanpur in NEPZ, where yellow rust appeared on two WDMN entries. Yellow rust was very severe at many locations at NWPZ and NHZ, with severity of more than 40S was reported on many entries. Brown rust was reported from Almora and Shimla in NHZ; and Kathua, Jammu, Hisar, Pantnagar, Gurdaspur, SBS Nagar and Ludhiana in NWPZ. Brown rust appeared at all the locations of NEPZ except Ranchi. All the WDMN entries were brown rust free at the locations in CZ. It also appeared at Pune and Dharwad in PZ, and Wellington in SHZ. Of the 32 locations of WDMNs, black rust was observed only at Pune and Dharwad in PZ and Wellington in SHZ. Leaf blight was reported from WDMN planted at Jammu, Kathua, and Rajouri in NWPZ; Sabaur, Pusa, Ranchi, Faizabad,

Kanpur, and Varanasi in NEPZ; and Niphad and Dharwad in PZ. Kathua, Dhaulakuan, Jammu and Almora were the only locations where powdery mildew was observed on WDMN entries.

Appearance of wheat rusts in WDMN

High altitude, Northern Hills Zone and North Western Plains Zone

The information on first appearance of rust diseases on WDMN entries was received from few locations. Of the received data yellow rust was first observed at Kathua (05.01.21) followed by Jammu (10.01.21), Almora and Dhaulakuan (28.02.21), Durgapura (05.03.21), Rajauri (06.03.21), Hisar (08.03.21), and Bajaura (20.03.21). Brown rust was first observed at Jammu (02.03.21) followed by Kathua (06.03.21), Hisar (29.03.21) and Almora (14.04.21). Black rust did not appear on any of the WDMN entries in these zones.

North Eastern Plains Zone, Central Zone, Peninsular Zone and Southern Hills Zone

Yellow rust was observed only at Kanpur in NEPZ, other locations in these zones were yellow rust free. Brown rust was first observed at Pusa (10.02.21) followed by Pune (14.02.21), Varanasi and Faizabad (01.03.21), Sabour (05.03.21), and Kanpur (21.03.21). Black rust appeared only at Pune (first appearance on 24.02.21) and Dharwad in PZ. All other locations in these zones were black rust free.

Varietal performance against wheat rusts

High Altitude and Northern Hills Zone (HA & NHZ)

In NHZ yellow rust (YR) was observed at all the locations except IARI, Tutikandi, and IIWBR, RS, Shimla. Maximum yellow rust severity was recorded at Khudwani, where 16 WDMN entries had more than 40S severity of yellow rust. However, WL711 was yellow rust free at Khudwani. PBW752 was yellow rust free at all the locations in HA & NHZs. Ten entries (PBW752, WL1562, C306, HP1633, DL784-3, HPW349, VL892, HS420, HS507, and Barley Local) were yellow rust free at Almora. Yellow rust severity was ranging from 60S to 80S at all the locations in HA & NHZs where yellow rust was observed. C306 was yellow rust free at Almora, Bajaura and Malan, whereas at Khudwani only 5R type of infection and severity was observed on it. Four entries (PBW752, C306, HPW349, VL 892) were yellow rust free at all the location in HA & NHZs except Khudwani. Brown rust appeared only at Almora and IIWBR, Shimla HA & NHZs. HD2204 was the only WDMN entry which was infected with brown rut at Almora. Brown rust severity was equal or more than 30S on eight WDMN entries (PBW752, HD2329, Agra Local, HD2160, Lal Bahadur, WL1562, HD2204, Sonalika) at Shimla. TR type of brown rust infection was perceived on RNB1001 and HW 2008 (*Lr24/Sr24*) at Shimla. Black rust was not detected on WDMN entries in this zone.

North Western Plains Zone (NWPZ)

Yellow rust was detected at all the locations of NWPZ. All the WDMN entries were showing yellow rust (YR) infection at Dhaulakuan. Kharchia Mutant had equal or more than 30S YR infection at all the locations of NWPZ except Rajouri, Dhaulakuan, Durgapura, and Ropar where 20S, 5S, 10S, and 20S YR severity, respectively, was observed. WDMN entry PBW752 was yellow rust free at all the locations except Kathua (20S), Jammu (TMS), Hisar (5S), Dhaulakuan (5S), and Rajouri (TMS). WDMN entries WH147 and Kharchia Mutant had 100S severity at Hisar. At Durgapura yellow rust appeared on Agra Local (10S), Lal Bahadur (10S), HW 2008 (5MS), Kharchia Mutant (10S), and HP1633 (5MR), remaining entries were YR free. Entry HD2204 was yellow rust free at all the locations except Hisar, Dhaulakuan, and Ludhiana, where 10S, 5S, and 5S severity of YR, respectively, was observed. PBW757 was YR free at all the locations except Jammu (TMR), Dhaulakuan (5S) and Rajouri (TMR).

Brown rust appeared only at Kathua, Hisar, Jammu, Ludhiana, SBS Nagar, Gurdaspur and Pantnagar in NWPZ. Maximum brown rust severity was recorded at Pantnagar where 13 entries (PBW752,

HD2329, Agra Local, HD2160, Lal Bahadur, WL1562, HD2204, C306, WH147, HW2008, HD3086, HD3226 and Kharchia Mutant) had equal or more than 30S brown rust severity. WDMN entries RNB1001 and PBW757 were brown rust free at all the locations of NWPZ. Similarly, HW2021 and DL 784-3 were free from brown rust infection at all the locations except Hisar, where 40S and TS severity of brown rust, respectively, was recorded on them. Defective recording or sowing could be the reason as both theses lines are resistant to brown rust. All the entries were brown rust free at Gurdaspur except HD2160 (TS). Black rust was not observed on any of the entries of WDMN in NWPZ.

North Eastern Plains Zone (NEPZ)

All the entries of WDMN were free from yellow rust infection in this zone except at Kanpur where only Kharchia Mutant (20S) and HD2888 (10S) were infected. Brown rust appeared at all the locations of NEPZ except Ranchi. At Varanasi brown rust was reported only on Kharchia Mutant (10S), whereas at Kanpur brown rust appeared only on Agra Local (20S), Lal Bahadur (10S) and Kharchia Mutant (10S). Six WDMN entries (C 306, HW 2008, HP1633, DL 784-3, RNB1001, and HUW468) were brown rust free at all the locations in NEPZ. All the entries were brown rust free at Sabour except for PBW752 (5S), HD2329 (5S), Agra Local (40S), Lal Bahadur (50S), HD2204 (5S), WH147 (5S), and HUW468 (10S).

Central Zone

Yellow, black and brown rusts did not appear at any of the locations of this zone.

Peninsular Zone and Southern Hills Zone

Yellow rust did not appear in these zones. Brown rust was observed only at Pune, Dharwad in PZ and Wellington in SHZ. At Pune only three entries *viz.* Agra Local (30S), Lal Bahadur (40S), and Bijaga Yellow (TS) had brown rust infection. Similarly six entries *viz.* Agra Local (10MS), Lal Bahadur (30S), HD2204 (10MS), C 306 (5MR), MACS 2496 (10MS) and Bijaga Yellow (5MS) had brown rust infection at Dharwad. At wellington brown rust was observed on thirteen entries {PBW752 (10S), HD2329 (40S), Agra Local (100S), HD2160 (10M), Lal Bahadur (80S), WL1562 (5MR), HD2204 (20M), C306 (5MR), WH147 (80S), Kharchia Mutant (20S), MACS2496 (5MR), HW971 (5MR), and HD2501 (5MR)}. Likewise, black rust appeared only at Pune, Dharwad in PZ and Wellington in SHZ. At Pune only three entries *viz.* Agra Local (20S), Lal Bahadur (20S), and Bijaga Yellow (TS) had black rust infection. Black rust was observed only on two entries {WH147 (5MS) and HW2022 (TMS)} at Dharwad. At wellington black rust was observed on all the entries except MACS2496 and HW2022. Ten WDMN entries {Agra Local (60S), HD2160 (20MS), Lal Bahadur (80S), HW2021 (5MR), HD2204 (20S), C306 (60S), WH147 (100S), Kharchia Mutant (20S), HP 1633 (60S), and DL784-3 (20MS)} had more than 20MS black rust infection at Wellington.

Other diseases

Blights

Information on foliar blights was received from 11 locations. Blight was absent in all the locations in Northern hills zone. In NWPZ leaf blight was reported only from Kathua, Jammu, Rajouri. All WDMN entries except RNB1001 were infected with leaf blight at Kathua. Eight entries at Jammu had leaf blight (LB) score equal to or more than 26. The highest LB score (62) in NWPZ was recorded on WDMN entry WL1562 at Kathua. In NEPZ all the entries were showing LB infection at Sabour, Pusa, Ranchi and Faizabad. However C306 at Varanasi and HD2329, Agra Local, HD2160, WL1562, HW2021, and C306 were LB free at Kanpur and remaining entries at both the locations had LB infection. There was no report of LB disease in any of the WDMN entries in CZ while in PZ disease appeared only at Niphad and Dharwad. At Niphad LB appeared only on Agra Local (02), WL1562 (13), HW2021 (02), and WH147 (01). Five WDMN entries PBW752, Agra Local, Lal Bahadur, C306 and Bijaga Yellow were LB free at Dharwad.

Powdery mildew

Powdery mildew (PM) was reported only from 4 locations *viz*. Almora (NHZ), Kathua, Jammu, and Dhaulakuan in Himachal Pradesh (NWPZ). All the entries of WDMN had powdery mildew infection at Almora and Dhaulakuan except Barley Local at Almora. Eight entries (HD2160, HW2021, WH147, WH2008, WH1105, HD3086, DPBW621-50, and PBW757) at Kathua and three entries (HW2008, HD3086 and HD3226) at Jammu were PM free. Maximum severity of PM was observed at Jammu with eleven entries showing PM severity of 4 or more.

Loose smut

There was no report of loose smut from any of the locations where WDMN was planted.

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8.5. SAARC Wheat Disease Monitoring Nursery (2020-21)

There is more than twenty million hectares area in SAARC countries having more or less similar conditions for cultivation of wheat. Under these circumstances, it becomes a common interest of the SAARC nations to combat wheat diseases jointly. Like the objectives of WDMN in India, an exercise on the understanding of the difference, spread and intensity of wheat diseases in SAARC nations is attempted through the SAARC-Wheat Disease Monitoring Nursery (SAARC-WDMN). During 2020-21, SAARC-WDMN was planted at 31 locations across the six SAARC countries (Table 8.17).

Table 8.17.Detail of SAARC-WDMN locations and contact persons.

S. No.	Country/ Locations	Contact person
1.	Nepal (9 sets)	CIMMYT, New Delhi, India*
2.	Bangladesh (3 sets)	-do-
3.	Pakistan (2 sets)	-do-
4.	Bhutan (1 set)	-do-
5.	Afghanistan (1set)	-do-
6.	India (15 sets)	Head, ICAR-IIWBR, RS, Flowerdale, Shimla
Total	**31 locations**	

*Coordinator: Dr. A.K. Joshi

Information on wheat diseases in SAARC Wheat Disease Monitoring Nursery has been received from 13 locations in India, Nepal and Bangladesh. Data from Afghanistan, Bhutan, and Pakistan is awaited. In India SAARC wheat disease monitoring nursery data have been received from 13 locations as listed in Table 8.18.

Table 8.18: Locations of SAARC wheat disease monitoringnursery in India

State	Co-operator	Locations
Himachal Pradesh	Akhilesh Singh	Dhaulakuan
Jammu & Kashmir	MK Pandey	Udhaywalla (Jammu)
	MK Pandey	Kathua
	MK Pandey and Deepak Kumar	Rajauri
Delhi	VK Singh and Koshal Kishor Sameriya	New Delhi
Punjab	Jaspal Kaur	Ludhiana
		SBS Nagar
Bihar	KK Singh	Pusa, Bihar
Rajasthan	PS Shekhawat	Durgapura (Jaipur)
Tamil Nadu	C. Manjunatha	Wellington
Uttar Pradesh	SP Singh	Faizabad
Uttarakhand	Deepshikha and Kanak Srivastava	Pantnagar
	KK Mishra	Almora

The SAARC wheat disease monitoring nursery comprised 20 lines contributed by four SAARC countries (Table 8.19).

Table 8.19: Composition of SAARC wheat disease monitoring nursery.

S. No.	Variety	S. No.	Variety
1.	Annapurna-1	11.	Punjab 85
2.	WL 1562	12.	Chakwal 86
3.	HD 2204	13.	Faisalabad 85
4.	PBW 343	14.	Inquilab 91
5.	HD 2687	15.	Faisalabad 83
6.	HD 2189	16.	Rawal 87
7.	HP 1633	17.	Kohsar
8.	RAJ 3765	18.	Bakhtawar 94
9.	PBW 660	19.	Gourab
10.	Pak 81	20.	Susceptible Check

Wheat Disease Situation in SAARC countries

Disease situation in India

Rusts

SAARC nursery was planted at one location of NHZ (Almora, Uttarakhand), 9 locations of NWPZ, Faizabad, Pusa and Wellington.Yellow rust was observed at all the SAARC nursery locations in NHZ and NWPZ. Yellow was not reported from Pusa, Faizabad and Wellington. First report of yellow rust on SAARC WDMN was from Kathua (10.01.21) followed by Jammu (10.02.21), Delhi (22.02.21), Durgapura (05.03.21), Rajouri (06.03.21) and Almora (01.04.21)(Table 4). At Durgapura yellow rust was observed only on PBW343 (5S), Faisalabad 85 (5S), Inquilab 91 (5S) and susceptible check (5S) other entries were yellow rust free. Similarly at Delhi yellow rust was observed only on PBW343 (40S), HD2687 (5S), Inquilab 91 (TR), Kohsar (5S) and susceptible check (60S). Maximum YR severity was observed at Rajouri in NWPZ, where equal to or more than 40S severity of yellow rust was observed on 9 entries. Two entries (HD2204 and Gourab) at Rajouri and PBW660 at Ludhiana were YR free, while remaining entries were infected with YR disease at both the locations.

Brown rust was observed at all the locations of SAARC-WDMN except Almora, Dhaulakuan, Durgapura, and Rajouri. The date of first appearance of brown rust was received from few locations, according to which the earliest appearance of brown rust was from Jammu and Kathua (15.02.21) followed by Faizabad (01.03.21), and Delhi (20.03.21)(Table 4). At Delhi brown rust was reported only on WL1562 (TR) and susceptible check (10S). Entry HP1633 was free from brown rust infection at all the locations while it appeared on PBW660 only at Pantnagar (TR) and Wellington (5MR). Brown rust severity was very high at Pantnagar with 15 entries showing equal to or more than 30S disease severity. Five entries (Annapurna, Pak81, Faisalabad85, Inquilab91 and susceptible check) had 100S brown rust severity at Pantnagar. All the entries except HP1633 at Pantnagar; HP1633 and Kohsar at Wellington; HP1633, PBW660, Punjab85 and Gaurab at SBS Nagar were infected with brown rust at these three locations. Black rust was observed only at Wellington whereas other locations were black rust free. At wellington all entries except Faisalabad85 and Kohsar had black rust infection (Table 8.20).

Blights

Leaf Blight (LB) of wheat was observed only at five locations (Jammu, Kathua, Faizabad, Rajouri and Pusa) of SAARC nursery. All the entries except HD2687, HD2189, HP1633, PBW660, Chakwal86, Faisalabad83, Rawal87 and Gourab at Rajouri were showing blight infection at all five locations. First

report of blight was from Faizabad (15.01.21) followed byJammuand Kathua (15.02.21) and Rajouri (24.02.21) (Table 8.21). Severity of leaf blight was maximum at Pusa, where minimum LB score was 45 on 10 entries and maximum score was 68 on Annapurna followed by LB score 57 on six entries and 56 on three entries. All entries except PBW 660, Chakwal86, and Bhaktawar94 had more than 35 severity of leaf blight.

Powdery mildew

Powdery mildew was observed only at four locations (Almora, Dhaulakuan, Jammu and Kathua) of SAARC-WDMN. First report of powdery mildew was from Kathua and and Jammu (15.02.21) followed by Almora (01.04.21). All the entries were infected with powdery mildew at all four locations (Table 8.22). Maximum severity of powdery mildew was observed at Dhaulakuan, where 12 entries were showing PM severity of 4 or more. Three entries *viz*. Kohsar, Bhaktawar94 and Gourab had powdery mildew score of 1 at Dhaulakuan. The severity of Powdery was the minimum in Almora, where maximum PM score was 3 on 7 entries remaining 13 entries had PM of 1. Similarly only five entries had PM score 4 or more at Kathua (Table 8.22).

Loose Smut

Like previous years there was no report of loose smut from any of the locations of SAARC-WDMN nursery during 2020-21.

Disease situation in Bangladesh

SAARC-WDMN was planted at three locations in Bangladesh (Jashore, Dinajpur and Jamalpur). Brown rust was observed only on two entries {Punjab85 (TMR) and Bakhtawar94 (TMR)} at Jashore while at Dinajpur all the entries had brown rust infection with 12 entries showing more than 20S severity (Table 8.23). Wheat blast was reported only from Jashore where all the entries had blast infection with disease severity ranging from 1.5 to 90. Leaf blight was observed at all the locations with maximum disease severity at Jashore, where all the entries had 86 or more LB severity. Similarly LB severity at Dinajpur and Jamalpur was equal or more than 65 and 54, respectively (Table 8.23).

Disease situation in Nepal

SAARC-WDMN was planted at nine locations (Bhairahawa, Rampur, Hardinath, Nawalpur, Tarahara, Lumle, Nepalgunj, Dolakha, and Khumaltar) in Nepal. Brown rust was observed at all the locations except Khumaltar. Brown rust appeared only on PBW343 (40MSS) at Lumle and on Raj3765 (TR) at Dolakha remaining entries were brown rust free at both the locations. Highest brown rust severity was observed at Nawalpur and Tarahara, where nine entries had 100MS or 100S severity of brown rust. Similarly at Nepalgunj ten entries had 90S severity of brown rust. Three SAARC-WDMN entries (WL1562, HD 2204, and Morocco) had 90S severity while PBW343 and HD2687 were brown rust free at Bhairahawa (Table 8.24). Yellow rust was observed only at two locations (Lumle and Khumaltar). All the SAARC-WDMN entries except HD2204 (30RMR) and PBW 343 (10R) at Lumle were yellow rust free. Yellow rust appeared on all the entries except HP1633 at Khumaltar (Table 8.24).

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Table 8.20: Incidence of rusts in SAARC Wheat Disease Monitoring Nursery in India during 2020-21

S. No.	Varieties	Yellow										Brown									Black
		ALM*	DEL	DKN	DUR	JAM	KAT	LUD	PAN	RAJ	SBS	DEL	FAZ	JAM	KAT	LUD	PAN	PUS	SBS	WEL	WEL
1	Annapurna-1	20S	0	40S	0	20S	20S	10S	0	40S	TS	0	60 S	5S	0	0	100S	0	40S	10MR	10S
2	WL1562	0	0	10S	0	0	5MS	TS	0	20S	TS	TR	0	5S	10S	0	40S	20S	10S	5MR	5MR
3	HD2204	0	0	10S	0	0	20S	10S	5S	0	TS	0	10 S	20S	40S	0	50S	10S	40S	20M	20S
4	PBW343	20S	40S	10S	5S	40S	40S	40S	5S	60S	40S	0	20 S	0	0	5S	60S	20S	10S	10MS	20MS
5	HD2687	0	5S	10S	0	20S	60S	20S	0	40S	40S	0	10 S	0	0	0	80S	10S	10S	10M	10M
6	HD2189	0	0	5S	0	5R	10MS	5S	5S	20S	5S	0	0	10S	20S	0	30S	0	10S	5MR	10MS
7	HP1633	10S	0	5S	0	20S	40S	20S	0	5S	20S	0	0	0	0	0	0	0	0	0	60S
8	RAJ3765	0	0	10S	0	10S	10S	10S	TR	20S	20S	0	10 S	20S	40S	0	70S	5S	5S	5M	10M
9	PBW660	0	0	10S	0	5MR	0	0	0	40S	5S	0	0	0	0	0	TR	0	0	5MR	5MR
10	PAK81	20S	0	10S	0	20S	10S	10S	0	40S	20S	0	60 S	0	0	0	100S	5S	10S	5MR	5MR
11	Punjab85	0	0	10S	0	0	10S	20S	15S	10S	20S	0	10 S	20S	20S	TS	50S	10S	0	10S	10S
12	Chakwal86	0	0	10S	0	TMR	0	10S	0	10S	20S	0	0	40S	10S	0	10S	0	5S	10MR	10S
13	Faisalabad85	10S	0	10S	5S	10MS	20S	10S	0	20S	60S	0	5 S	20S	0	0	100S	40S	10S	20S	0
14	Inquilab91	10S	TR	10S	5S	20S	10S	10S	5S	40S	20S	0	40 S	0	20MS	0	100S	20S	10S	40S	10S
15	Faisalabad83	0	0	10S	0	10S	0	20S	0	20MS	10S	0	TS	0	0	5S	15S	10S	10S	10MS	5MR
16	Rawal87	0	0	10S	0	5S	20S	5S	0	40S	5S	0	40 S	5S	20S	0	50S	20S	20S	5MR	5MR
17	Kohsar	0	5S	5S	0	40S	40S	5S	5S	5S	10S	0	10 S	0	0	0	80S	20S	10S	0	0
18	Bakhtawar94	0	0	5S	0	5S	10S	5S	0	60S	20S	0	0	10S	40S	0	15S	20S	5S	10S	10S
19	Gourab	0	0	10S	0	20S	20S	20S	0	0	10S	0	10 S	0	0	0	30S	0	0	5MR	10MR
20	Susceptible check	20S	60S	10S	5S	40S	40S	40S	15S	60S	40S	10S	70 S	20S	40S	TS	100S	0	40S	80S	80S
Date of firstAppearance		**01.04.21**	**22.02.21**	-	**05.03.21**	**10.02.21**	**10.01.21**	-	-	**06.03.21**	-	**20.03.21**	**01.03.21**	**15.02.21**	**15.02.21**	-	-	-	-	-	-

*ALM= Almora, DEL=New Delhi, DKN=Dhaulakuan, DUR=Durgapura, JAM=Jammu, KAT=Kathua, LUD=Ludhiana, PAN=Pantnagar, RAJ=Rajauri, SBS=SBS Nagar, FAZ= Faizabad, PUS= Pusa, WEL=Wellington

Table 8.21: Leaf blight in SAARC-Wheat Disease Monitoring Nursery in India during 2020-21

S. No.	Varieties	Leaf blight (dd)				
		Faizabad	Jammu	Kathua	Pusa	Rajouri
1	Annapurna-1	45	24	12	68	15
2	WL1562	57	46	36	57	12
3	HD 2204	58	36	36	57	10
4	PBW 343	46	18	12	45	16
5	HD 2687	46	23	24	45	0
6	HD 2189	57	23	24	45	0
7	HP 1633	58	23	24	57	0
8	Raj 3765	46	46	36	45	24
9	PBW 373	35	24	24	45	0
10	Pak 81	46	23	18	56	5
11	Punjab 85	57	18	11	56	30
12	Chakwal 86	35	12	18	45	0
13	Faisalabad 85	46	12	18	45	6
14	Inquilab 91	46	12	12	45	21
15	Faisalabad 83	57	24	18	57	0
16	Rawal 87	67	18	12	56	0
17	Kohsar	57	12	7	57	20
18	Bakhtawar 94	35	18	10	57	24
19	Gourab	57	15	15	45	0
20	Susceptible check	78	36	24	45	40
Date of first appearance		15.01.21	15.02.21	15.02.21	-	24.02.21

Table 8.22: Powdery mildew in SAARC-Wheat Disease Monitoring Nursery in India, 2020-21.

S.No.	Varieties	Powdery Mildew (0-5)			
		Almora	Dhaulakuan	Jammu	Kathua
1	Annapurna-1	3	2	1	2
2	WL1562	3	4	3	3
3	HD 2204	1	5	4	4
4	PBW 343	3	6	3	6
5	HD 2687	1	4	3	2
6	HD 2189	3	2	2	3
7	HP 1633	1	2	5	3
8	Raj 3765	1	6	4	3
9	PBW 373	1	9	2	2
10	Pak 81	3	5	2	3
11	Punjab 85	1	4	5	5
12	Chakwal 86	1	5	4	4
13	Faisalabad 85	1	6	3	1
14	Inquilab 91	1	4	5	2
15	Faisalabad 83	1	2	3	1
16	Rawal 87	1	2	3	3
17	Kohsar	3	1	2	2
18	Bakhtawar 94	1	1	2	3
19	Gourab	1	1	2	2
20	Susceptible check	3	4	5	6
Date of first appearance		01.04.21	-	15.02.21	15.02.21

Table 8.23: Incidence of wheat diseases in SAARC Wheat Disease Monitoring Nursery in Bangladesh during 2020-21.

S. No.	Varieties	Brown Rust			Blast			Leaf blight		
		Jashore	Dinajpur	Jamalpur	Jashore	Dinajpur	Jamalpur	Jashore	Dinajpur	Jamalpur
1	Annapurna-1	0	5S	0	1.5	0	0	87	75	74
2	WL1562	0	20S	0	48	0	0	87	85	75
3	HD 2204	0	5MS	0	2	0	0	87	87	75
4	PBW 343	0	20S	0	2	0	0	87	65	74
5	HD 2687	0	20S	0	10	0	0	86	87	74
6	HD 2189	0	10S	0	24	0	0	86	75	74
7	HP 1633	0	10S	0	4	0	0	86	87	75
8	Raj 3765	0	20S	0	64	0	0	86	86	75
9	PBW 373	0	30S	0	1	0	0	87	75	55
10	Pak 81	0	TMS	0	48	0	0	87	75	54
11	Punjab 85	TMR	20S	0	72	0	0	86	86	55
12	Chakwal 86	0	30S	0	64	0	0	86	87	74
13	Faisalabad 85	0	50S	0	56	0	0	86	75	55
14	Inquilab 91	0	10S	0	48	0	0	86	86	75
15	Faisalabad 83	0	20S	0	90	0	0	86	86	75
16	Rawal 87	0	50S	0	90	0	0	86	85	73
17	Kohsar	0	10S	0	90	0	0	86	85	75
18	Bakhtawar 94	TMR	20S	0	48	0	0	86	85	73
19	Gourab	0	TMR	0	30	0	0	86	86	73
20	Susceptible check	0	50S	0	30	0	0	87	86	74

Table 8.24:Incidence of wheat diseases in SAARC Wheat Disease Monitoring Nursery in Nepal during 2020-21

S. No.	Varieties	Brown Rust								Yellow Rust	
		Bhairahawa	Rampur	Hardinath	Nawalpur	Tarahara	Lumle	Nepalgunj	Dolakha	Lumle	Khumaltar
1	Annapurna-1	40MSS	30 S	10MS	40 MR	60MS	0	90S	0	0	10MR
2	WL1562	100S	20 MS	10MR	60 MS	20MR	0	90S	0	0	10MR
3	HD 2204	100S	10 MR	10MR	100 MS	10R	0	90S	0	30RMR	20M
4	PBW 343	0	TR	5R	100 MS	40MR	40MSS	60S	0	10R	40MS
5	HD 2687	0	TR	5R	60 MS	40MS	0	60S	0	0	30MR
6	HD 2189	10MS	20MRMS	10R	100 S	100S	0	90S	0	0	20MR
7	HP 1633	Trace	0	5R	100 S	100MS	0	40S	0	0	0
8	Raj 3765	10MS	20 MS	10MS	60 MR	100MS	0	90S	TR	0	10MR
9	PBW 373	20MS	20 MS	10MS	40 MR	60MR	0	60S	0	0	20MR
10	Pak 81	80S	60 S	30MS	100 MS	60MR	0	90S	0	0	20MR
11	Punjab 85	40S	20 MS	5MS	60 MS	100S	0	90S	0	0	40MS
12	Chakwal 86	Trace	20 MS	5MR	60 MS	100S	0	60S	0	0	30M
13	Faisalabad 85	Trace	TR	5R	60 MR	100S	0	30S	0	0	30M
14	Inquilab 91	Trace	TR	5R	60 MS	20R	0	30S	0	0	10MR
15	Faisalabad 83	Trace	TR	5MR	60 MS	100MS	0	60S	0	0	40MS
16	Rawal 87	Trace	10 MR	40MS	40 MR	60MS	0	80S	0	0	10MR
17	Kohsar	5S	30 MS	50S	100 S	60MR	0	90S	0	0	20MR
18	Bakhtawar 94	80S	80 S	60S	100 S	100MS	0	90S	0	0	40MS
19	Gourab	5MS	60 S	10MS	100 MS	100MS	0	60S	0	0	40MS
20	Morocco (S. check)	100S	80 S	10MS	100 S	100MS	0	90S	0	0	20MR

PROGRAMME 9. INTEGRATED PEST MANGEMENT IN WHEAT

9.1 HOST RESISTANCE AGAINST DISEASES

I. Elite Plant Pathological Screening Nursery (EPPSN), 2020-21

Biotic stresses are the major production constraints in wheat. Growing of resistant cultivars has been the most effective and easy way to minimize losses due to biotic stresses in wheat in India. However, to develop resistant cultivars, breeders are in need of new sources of resistance to incorporate these in the future cultivars to tackle the threat of evolving new virulence of pathogens as well as new biotypes in insects. The present chapter deals with identification and utilization of multiple disease and insect pests resistant genotypes.

Total entries: 56
Diseases: Stripe, Leaf and Stem rusts
Centres:
North: Karnal, Ludhiana, New Delhi, Pantnagar, Hisar, Durgapura, Almora, Jammu, Malan (9)
South: Wellington, Mahabaleshwar, Dharwad, Indore, Niphad (5)

The nursery was inoculated with most virulent and prevalent pathotypes of stripe, leaf and stem rusts as in case of PPSN. The highest score and ACI were calculated. Entries with ACI up to 10.0 were categorized as resistant (Table 9.1).

Resistant sources identified

Resistant To all three rusts: DDW47(d)(I), HI 8823(d), HI8627(d), HS 507 (C), HS 679, MPO 1357(d), PBW804, UAS 472(d), DDW49 (d)*, HUW838, NIAW3170(I) (C), VL 2036

Resistant to stem and leaf rusts: NIDW 1149(d)*, CG1029*, DDK1058, DDK1059, GW513, HD2864, HD3377, HI1544, HI1628(I) (C), HI1633*, HI1634*, HI1636, MACS5054, MACS6752, MP3288, PBW840, RAJ4541

Resistant to leaf and stripe rusts: DBW303*, HD3249(I) (C), HI8805(d)(I) (C), HI8818(d), MP 1358, MP1361, UAS466(d)(I), DDW48 (d)*, HS 680, JKW261, DBW329, MACS6747, PBW771(I) (C)

Resistant to stem and stripe rusts: HD3334, HS 681, VL 3024, DBW296, UP3033

Table 9.1: Entries tested in Elite Plant Pathological Screening Nursery, 2020-21

S. No.	Entries	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust	
		ACI	HS	ACI	HS	ACI	HS	ACI	HS
A. Resistant to all three rusts									
1	DBW303*	12.4	20S	8	40MS	3.9	15MS	3.7	20S
2	DBW328	28	60S	12	60MS	4	10S	2.6	10MS
3	DDW47(d)(I)	5.6	10S	2.5	15MR	8	40S	0.8	5S
4	HD3249(I) (C)	12	20S	7.6	40MS	8	30S	1.2	10MS
5	HD3334	5	10S	14.5	60S	7.9	15S	1.6	5S
6	HI 8823(d)	3.4	10MS	4.1	10MS	3.4	15S	7.1	20MS
7	HI8627(d)	8	20S	3.3	15MR	2.4	10S	4.6	20S
8	HI8805(d)(I) (C)	18	20S	4.9	40MR	5.4	15S	1.4	5MS
9	HI8818(d)	14.8	60S	5.9	20MS	8	30S	0.6	5S
10	HS 507 (C)	2.6	10MS	2.5	15MR	4.4	10S	3.8	10S
11	HS 679	2.6	10MS	4.4	10S	2	10S	1.9	10S

12	HS 681	2.7	10MS	10.6	40S	5	15S	0.9	5MS
13	MP 1358	32	80S	6.9	20MS	4.1	15S	5.9	20MS
14	MP1361	26.4	80S	7.3	20S	4.1	10S	6.6	20S
15	MPO 1357(d)	2.6	5MS	3.3	20MS	9	30S	1.4	5S
16	NIDW 1149(d)*	6.5	20S	3.3	40MR	4.4	20S	21.6	80S
17	PBW804	6.1	20S	2.4	15MR	4.6	15S	5.2	20S
18	TAW155	17.2	40S	13.2	40S	5	10S	10.4	40S
19	UAS 472(d)	5	10S	3.5	15MR	4.2	15S	5.2	10S
20	UAS466(d)(I)	21.3	60S	1.3	5MS	5	20S	1.4	5S
20A	INFECTOR	36.1	40S	55.4	80S	48.7	60S	60	60S
21	VL 3024	6.8	20S	16.8	60S	5	20S	1.3	5S
22	WH1252	11.6	40S	18.8	60S	5	15S	10.8	40S
B. Resistant to leaf and stripe rusts									
23	DBW332	34	60S	16.8	60S	19	40S	6.9	40S
24	DDW48 (d)*	12.1	20S	8.1	40MS	3.8	10S	3	10S
25	DDW49 (d)*	7.6	20S	7.7	20S	3	10S	1.4	5S
26	HS 680	18.4	60S	9.8	40S	3	15S	5.8	40S
27	JKW261	35.6	80S	7.4	40MS	2.4	10S	4.2	20S
28	VL 3022	19.2	60S	11.2	20S	4	10S	9.8	40S
29	WHD964(d)	12.1	40S	11.2	40S	5.4	15MS	3.3	10MS
C. Resistant to stem and leaf rusts:									
30	CG1029*	6.1	10MS	6.9	40MS	3	10S	32.9	60S
31	DBW296	5.9	20S	1.7	20MR	11.5	40S	7.2	15S
32	DBW329	11.2	20S	8	20S	5	10S	1.7	10S
33	DDK1058	2.1	5MS	0.1	TR	3	15S	20	40S
34	DDK1059	1.6	5MS	0.1	TR	4	20S	18	40S
35	GW513	3.3	10MS	0.9	5MS	4	20S	29.6	60S
36	GW519	11.2	20S	6.4	20MS	14	40S	22.2	60S
37	HD2864	4.1	10MS	2.9	15MS	6	20S	33.3	60S
38	HD3377	3.3	10MS	0.9	10MR	6	15S	14.5	40S
39	HI1544	3.7	10MS	8.9	40S	2	5S	28.9	60S
40	HI1628(I) (C)	6.8	10S	7.3	20S	3	10S	10.8	40S
40A	INFECTOR	28.7	40S	35	60S	45.9	60S	60	60S
41	HI1633*	2.8	10MS	2.7	20MR	4	20S	45.3	80S
42	HI1634*	2.7	5MS	6.4	40MS	4	15S	24.9	40S
43	HI1636	2.4	10MS	1.6	20MR	3.1	10S	14.1	40S
44	HUW838	1.4	5MS	2.4	15MR	2.6	10MS	5.7	20S
45	MACS5054	6	40MR	8.1	40S	9	40S	21.1	40S
46	MACS5055	27.2	80S	14.1	60S	5	20S	12.2	40S
47	MACS6747	17.8	60S	8.5	40MS	10	30S	8.9	60S
48	MACS6749	14.8	40MS	4.3	20MS	7	15S	17.6	40S
49	MACS6752	6.4	20S	8	40MS	2	5S	22.1	40S
50	MP3288	6.4	20S	4.1	20S	2	10S	18.9	40S
51	NIAW3170(I) (C)	5.3	20S	4.1	10MS	2.4	5S	7.3	20S
52	PBW771(I) (C)	21.6	80S	7.6	20MS	9	40S	2.9	20MS
53	PBW840	3.4	20MR	3.2	20MS	2.8	10S	13.6	40S
54	RAJ4541	2	5MS	2.4	15MR	3	10S	12.9	40S
55	UP3033	5.6	20S	10.4	40S	2.6	10MS	8.8	40S
56	VL 2036	4.5	10MS	2.5	15MR	3.2	10S	6.7	20MS

COOPERATORS:

NAME	CENTRE	RUSTS
JASPAL KAUR, RITU BALA	LUDHIANA	STRIPE
R.S. BENIWAL	HISAR	LEAF
DEEPSHIKHA	PANTNAGAR	STRIPE AND LEAF
P.S. SHEKHAWAT	DURGAPURA	STRIPE AND LEAF
GURUDATT M. HEGDE	DHARWAD	STEM AND LEAF
T.L. PRAKASHA	INDORE	STEM AND LEAF
R. R. PERANE, S.G. SAWASHE, M. A. GUD	MAHABALESHWAR	STEM AND LEAF
V.K. SINGH	NEW DELHI	LEAF
K K MISHRA	ALMORA	STRIPE
M.K. PANDEY	JAMMU	STRIPE
B. M. ILHE, B.C. GAME	NIPHAD	STEM AND LEAF
SACHIN UPMANYU	MALAN	STRIPE
P. NALLATHAMBI	WELLINGTON	STEM AND LEAF
SUDHEER KUMAR, PREM LAL KASHYAP AND RAVINDER KUMAR	KARNAL (CO-ORDINATING UNIT)	STRIPE AND LEAF

II. Multiple Disease Screening Nursery, 2020-21

Fourty resistant sources identified in EPPSN against rusts are cross checked for resistance to other diseases at hot spot multi-locations under artificially created conditions to reconfirm their resistance. Centers for stem rust: Mahabaleshwar, Indore, Dharwar, Niphad and Wellington; for stripe rust: Ludhiana, Pantnagar, Hisar, Dhaulakaun, Mallan, Almora and Karnal; for leaf rust (N): Delhi, Ludhiana, Hisar and Karnal; for leaf rust (S): Mahabaleshwar, Indore, Dharwar, Niphad and Wellington; for Karnal bunt: Delhi, Dhaulakaun, Pantnagar, and Ludhiana; for leaf blight: Faizabad, Varanasi, Coochbehar, Sabour, Hisar, and Kalyani; for Head scab: Delhi, Dhaulakuan, Gurdaspur; for flag smut: Hisar, Ludhiana and Durgapura; for powdery mildew: Dhaulakaun, Malan, Jammu, Pantnagar, and Mallan; and for cereal cyst nematode: Durgapura, Hisar and Ludhiana. The stem rust data of Niphad, Leaf rust (S) data of Dharwad and Leaf rust (N) data of Karnal was not considered due to erratic disease. Based on the rusts ACI up to 10.0, Karnal bunt up to 5.0%, Flag smut up to 5%, powdery mildew up to 3, head scab upto 2, and leaf blight up to Avg. score upto 35 and highest score upto 57 entries were categorized resistant (Table 9.2). Following entries were found to possess multiple disease resistance:

A. Resistant to stem, leaf and stripe rusts +
Resistant to all three rust + KB + FS: NIDW 1158 (d), HI 8811b (d), GW 1348 (d), NDW 1149 (d), HI 8802, DBW 302, PBW 820
Resistant to all three Rust LB+ KB + FS: HI8805 (d)
Resistant to all three Rust + KB: HI 8807 (d)
Resistant to all three Rust + LB + FS: WH 1270, VL 3020
Resistant to all three Rust +FS: PBW 822, HI 8812 (d), HI 8808 (d), PBW 823, PBW 821, HPW 467

B. Resistant to Stem and Leaf rust +
Resistant to Stem and Leaf Rust + K B + FS: CG 1029, HI 1633, HI 1634, GW 509

C. Resistant to leaf and stripe rust +
Resistant to Leaf and Stripe Rust+ LB + KB+ FS: PBW 752, UP 3043
Resistant to Leaf and Stripe Rust + KB + FS: DDW 48 (d), DDW 47 (d), VL 3021, PBW 825, PBW 796, DBW 303
Resistant to Leaf and Stripe Rust + K B: PBW 771, HI 1628
Resistant to Leaf and Stripe Rust + F S: WHD 963 (d)

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Table 9.2 Reactions of different entries of Multiple Diseases Screening Nursery 2020-21 against diseases and CCN

S. No.	Entries	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		LB (dd)		KB (%)		PM (%)		FS (%)		FHB (%)	CCN
		ACI	HS	ACI	HS	ACI	HS	ACI	HS	AV	HS	AV	HS	AV	HS	AV	HS	HS	HS
Sources : EPPSN 2019-20																			
A. Resistant to all three rusts																			
1	NIDW1158(d)	4.9	20S	2.1	15MR	0	0	0.6	5S	45	78	1.1	4.5	4	9	0	0	4	S
2	HI8811(d)	3.6	10S	3.4	20MS	0	0	0.2	TS	45	78	0.9	3.3	4	9	0	0	5	S
3	HI8812(d)	2.7	10S	2.1	15MR	1	5S	1.7	5S	35	68	5.4	14.7	4	9	0	0	5	HS
4	GW1348(d)	7.7	40S	1.4	5MS	0	0	3.2	10S	45	68	0.7	2.7	4	9	0	0	5	HS
5	PBW822	2.6	10S	2	15MR	0	0	1.7	10S	45	67	5.9	18.6	3	9	6.8	15	4	HS
6	DDW 48(d)	12.3	60S	5.4	20S	0	TR	2.8	10S	45	67	0.6	2.5	2	7	0	0	5	HS
7	DDW 47(d)	11.1	60S	5.4	20S	0	0	0.1	TR	45	57	1.6	6.4	2	7	0	0	5	S
8	HI8808(d)	5.7	20S	3.7	10MR	0	0	2	10S	56	78	4.2	11.1	4	9	1.5	4.5	5	HS
9	HI8807(d)	2.7	10S	2.7	20MS	0	0	1.7	5S	45	78	1.9	7.4	5	9	1.5	4.5	4	S
10	PBW823	5.7	20MS	5.3	10S	0	0	4.2	20S	45	57	3.7	10.5	5	7	2.5	6.6	4	HS
11	NIDW1149(d)	7.2	20S	5.4	20S	0	0	0.6	5S	56	78	2.9	8.3	4	9	0.2	0.5	5	HS
12	HI8802(d)	6.4	20MS	4.4	10S	0	0	0.8	5S	45	67	2.2	5	4	9	0	0	5	HS
13	WH1270	3.5	20S	2	10MS	0	0	0.7	5S	35	57	5.4	18.9	3	7	1.5	4.6	5	S
14	PWB 825	13.5	40S	8.7	40S	0	0	4.4	10S	45	67	2.8	7.5	3	7	2.1	6.3	4	S
15	VL 3020	4	20S	5.7	20S	0	TR	1	5S	35	57	4.4	11.9	4	9	3.3	6.6	5	S
16	VL 3021	14	80S	5.4	20S	2.4	10S	2.2	10S	46	67	2.1	6.3	3	7	4.2	4.6	4	HS
17	PBW 796	17.8	80S	4.8	20MS	3	10S	4.8	20MS	56	67	4.7	10	3	7	3.7	4.8	5	HS
18	PBW 820	3.7	10S	3.4	20S	0	0	2.8	10S	45	67	4.5	11.1	4	9	2.4	5	3	HS
B. Resistant to stem and leaf rusts:																			
19	HPW 467	8.7	40S	9.5	40S	0.1	TMR	4.2	20S	45	57	10.7	34.1	4	9	4.7	5.6	5	HS
20	PBW 771	16	60S	2.7	40MR	0	0	7.4	40S	56	67	4	11.1	6	9	5.2	6.6	5	S
20A	Infector (for rust)	35.1	80S	27.9	60S	18.7	40S	31.2	60S	56	78	12.2	12.5	5	5	-	-	-	-
20B	HD 2967(for KB)	-	-	-	-	-	-	-	-	46	58	6	12.5	4	4	-	-	-	-
20C	PBW 343(for PM)	-	-	-	-	-	-	-	-	35	46	17.5	24.2	4	4	-	-	-	-
20D	WH147 (for LB)	-	-	-	-	-	-	-	-	46	67	16.4	22.9	4	4	-	-	-	-
21	HD 3249	13.2	40S	9	40MS	6	20S	17	60S	45	56	18.3	24.2	6	9	2.5	7.5	5	S
22	DBW 303	10.7	40S	4	20MS	1.2	5S	5.4	20MS	45	67	1.4	5.5	4	7	1.8	5.5	4	S
23	DBW 302	2.7	10S	5.4	40MS	3	15S	6.2	20S	45	78	2.7	6.7	4	9	2	5.6	3	HS
24	PBW 550	27.7	60S	8.1	40S	0	0	20.6	60S	45	78	2.7	5.9	6	9	2.1	6.2	4	HS
25	HI 1628	11.8	40S	7.7	40S	0	TR	9.6	40S	45	78	3.4	8.5	5	9	8.4	17	4	S
26	DBW 277	22	80S	8.3	40MS	4	20S	13.9	40S	56	67	2.7	10	4	9	6.3	8	4	HS
27	CG 1029	5.5	20MS	9.1	40S	4.8	10S	36.7	60S	56	68	1.1	4.3	6	9	5.5	10		HS
28	HI 1633	3.7	10S	5.4	30MS	0	0	19.2	60S	56	57	3.6	10.3	5	9	6.6	7.3	4	HS
29	HI 1634	1.9	5S	2.3	10MS	0	0	23.4	60S	45	67	2.4	8.3	4	9	6.2	10	5	S
30	GW 509	2	10MR	4.1	30MS	0	0	21.8	60S	55	78	1.8	6	5	9	7.9	15.5	5	HS

31	GW 1346	2	10MS	20.1	80S	0.1	TR	19	40S	35	68	3.9	10.5	6	7	4.3	7.5		HS
32	MACS 5052	1.7	5MS	2.7	20MS	12	60S	21.1	40S	45	57	0.7	2	4	7	2.4	7.3	4	S
33	DDK 1056	0.2	TR	3.4	20S	12	60S	21.1	40S	45	57	1.1	4.5	3	7	2.2	6.5	4	HS
34	DDK 1057	2.5	5MS	0.7	10MR	12	60S	18.9	40S	35	47	1.6	6.5	4	5	1.9	5.6	5	HS
35	DBW 304	3.5	20MS	2.2	5S	9.2	40S	10.1	40S	56	78	2.1	6.7	4	9	1.5	4.5	4	HS
C. Resistant to leaf and stripe rusts																			
36	PBW 752	22.5	60S	7.7	20MS	4	20S	2.8	5S	34	46	2.7	5.5	4	9	1.5	4.6	3	HS
37	UP 3043	16.2	40S	1	5MS	5.2	20S	3	10S	35	36	1.8	7.3	5	7	2.9	4.5	4	HS
D. Resistant to stem and stripe rusts:																			
38	PBW 821	2.6	10S	2.4	10S	0	0	1.6	10S	45	67	4.6	13	6	9	2.3	4.3	5	HS
39	HI 8805(d)	1.2	10MR	0.1	TR	0	0	2.2	10S	35	47	2.1	8.5	5	7	0	0	4	S
40	WHD 963(d)	11.6	60S	1.4	5MS	0	0	4.5	20S	45	46	8.6	27.7	5	7	0	0	5	S
40A	Infector (for rust)	27.5	60S	24.3	40S	31.3	60S	43.7	80S	56	78	10.1	24.8	7	7	-	-	-	-
40B	HD 2967(for KB)	-	-	-	-	-	-	-	-	35	35	7.4	19.3	9	9	-	-	-	-
40C	PBW 343(for PM)	-	-	-	-	-	-	-	-	35	46	10.1	28.5	9	9	-	-	-	-
40D	WH147 (for LB)	-	-	-	-	-	-	-	-	46	67	10.1	23.5	9	9	-	-	-	-

III. Screening of MDSN 2019-20 entries against loose smut during 2020-21

Thirty four entries of MDSN 2019-20 were inoculated with loose smut during 2019-21 crop season and expression of loose smut was observed during 2020-21 season at Hisar, Durgapura and Ludhiana centres. The data of Hisar center were erratic so not considered. The smutted and healthy tillers were counted and per cent infected tillers were calculated. The entries showing 0-5% infection were resistant to loose smut (Table 9.3).

Table 9.3. Performance of Multiple Disease Screening Nursery, 2019-20, against loose smut during 2020-21 crop season.

MDSN No.	Entry	Loose smut (%)		
		Durgapura	Ludhiana	HS
Sources : EPPSN 2018-19				
A. Resistant to all three rusts				
Source: AVT year 2017-18				
1	GW1339	19.7	0.00	19.7
2	GW1346(d)	8.7	0.00	8.7
3	GW492	14.2	26.09	26.1
4	HPW441	19.4	2.20	19.4
5	HPW442	12.2	20.88	20.9
6	HPW450	44.4	0.00	44.4
7	HPW459	33.8	0.00	33.8
8	HS660	16.2	2.33	16.2
9	K 1601	15.9	18.27	18.3
10	MACS4059(d)	13.2	0.00	13.2
11	MACS5051	28.5	0.00	28.5
12	PBW800	32.5	11.63	32.5
13	UP3016	12.7	8.82	12.7
B. Resistant to Stem and Leaf rusts				
Source: AVT year 2017-18				
14	AKAW4924	16.4	12.90	16.4
15	DBW223	21.2	7.63	21.2
16	HI1625	24.3	0.00	24.3
17	HI1628	9.5	0.00	9.5
18	HI8800(d)	0.0	0.00	0.0
19	NIAW3170	49.2	0.00	49.2
20	PBW757	0.0	0.00	0.0
20A	Sonalika for L.S.(C)	48.5	24.43	48.5
21	UAS466(d)	9.2	0.00	9.2
22	WH1235	4.2	3.53	4.2
C. Resistant to Leaf and Stripe rusts				
Source: AVT year 2017-18				
23	DBW187	8.6	2.94	8.6
24	HS661	5.4	17.78	17.8
25	PBW797	19.4	26.03	26.0
26	PBW801	12.5	23.08	23.1
27	MPO 1336	19.2	0.00	19.2
28	DBW 237	9.4	4.11	9.4
D. Resistant to stem and stripe rusts				
Source: AVT year 2017-18				
29	DDK1054	0.0	1.12	1.1
30	GW491	2.4	25.00	25.0
31	HI1624	11.7	1.85	11.7

32	HPW451	18.5	0.00	18.5
33	PBW763	22.2	8.22	22.2
34	WH 1218	14.5	0.00	14.5
34A	Sonalika for L.S.(C)	52.6	26.25	52.6

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IV. National Genetic Stock Nursery (NGSN), 2020-21

The NGSN comprising 21 entries with confirmed sources of high level of disease resistance were shared with 16 breeding centers across different agro climatic zones of country for their utilization in breeding for resistance to biotic stresses. The 18 entries were utilized in the range of 0.0 – 43.75% by different breeding centers (Fig. 9.1). The most utilized entries at many centers were DBW 246 and PBW 757 (Table 9.4). Junagarh center, utilized maximum 9 entries in their breeding programme followed by Indore (Fig. 9.2).

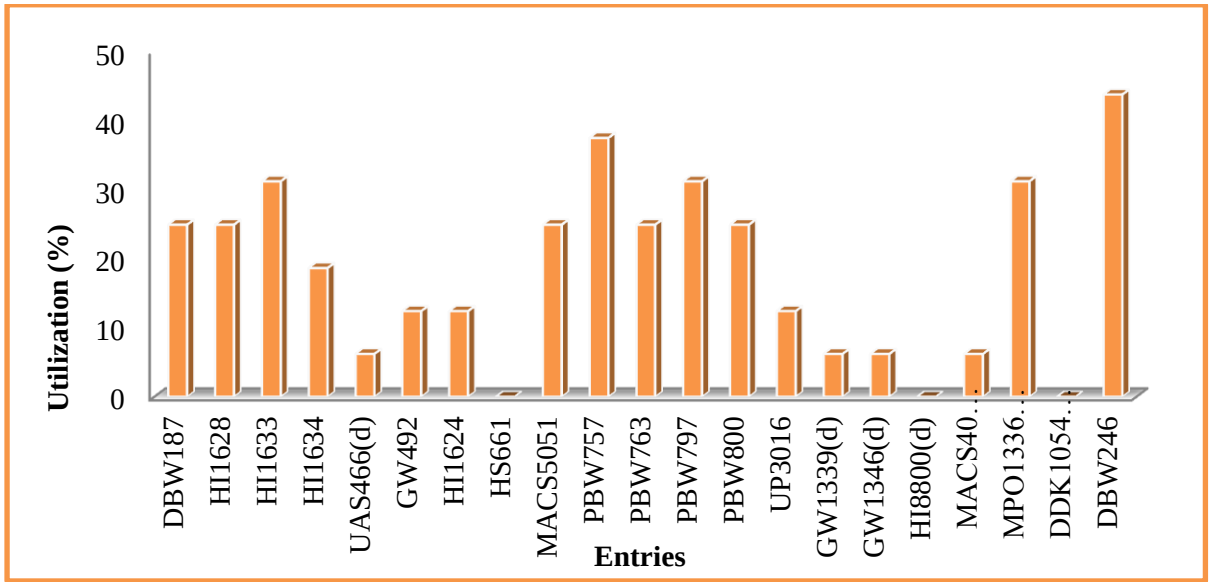

Fig. 9.1. Percent utilization of promising resistant genotypes at different breeding centres in NGSN, 2020-21

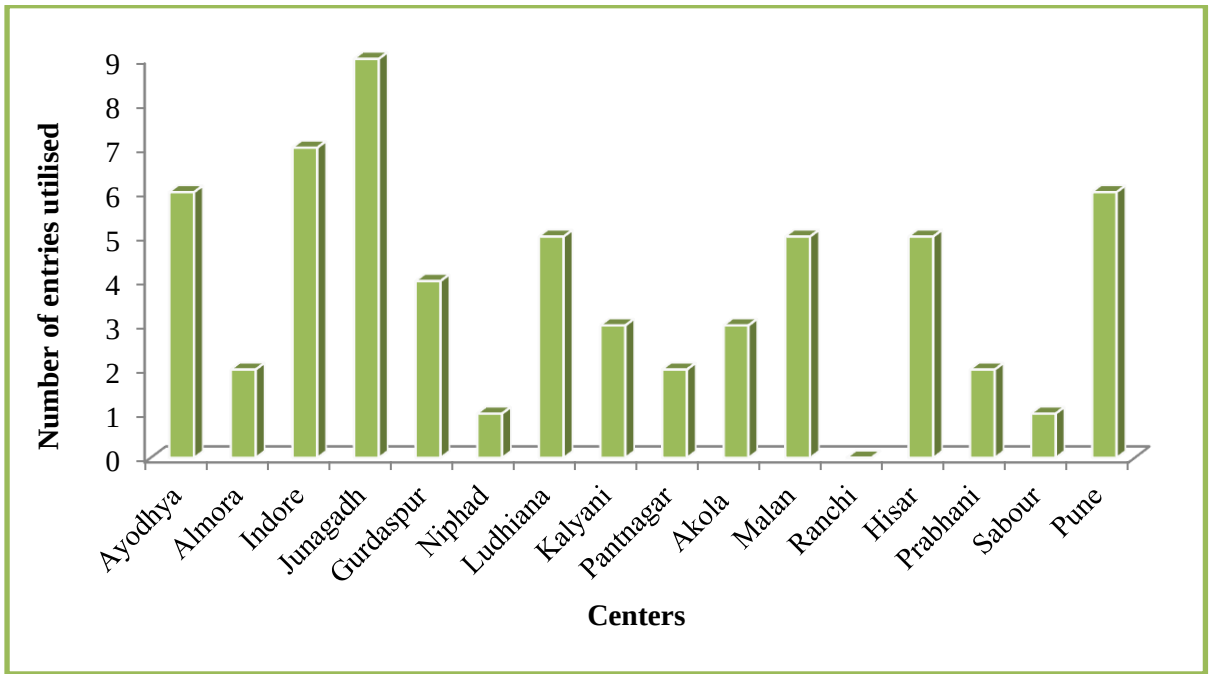

Fig. 9.2. Centre wise utilization of promising resistant genotypes from NGSN, 2020-21

Table 9.4. National genetic stock nursery (NGSN), 2020-21

S. No.	Entries	Ayodhya	Almora	Indore	Junagadh	Gurdaspur	Niphad	Ludhiana	Kalyani	Pantnagar	Akola	Malan	Ranchi	Hisar	Prabhani	Sabour	Pune	Total
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	
1	DBW 187		1					1	1					1				**4**
2	HI 1628	1		1	1					1								**4**
3	HI1633	1		1	1							1					1	**5**
4	HI1634			1								1					1	**3**
5	UAS 466(d)							1										**1**
6	GW 492				1										1			**2**
7	HI 1624											1			1			**2**
8	HS661																	**0**
9	MACS5051	1			1		1										1	**4**
10	PBW 757				1	1		1		1		1					1	**6**
11	PBW 763				1	1		1			1							**4**
12	PBW 797	1		1	1				1					1				**5**
13	PBW 800	1		1					1								1	**4**
14	UP3016											1		1				**2**
15	GW 1339(d)										1							**1**
16	GW 1346(d)			1														**1**
17	HI 8800(d)																	**0**
18	MACS4059(d)							1										**1**
19	MPO 1336(d)			1	1	1								1			1	**5**
20	DDK 1054(Dic)																	**0**
21	DBW 246	1	1		1	1					1			1		1		**7**
	Total	**6**	**2**	**7**	**9**	**4**	**1**	**5**	**3**	**2**	**3**	**5**	**0**	**5**	**2**	**1**	**6**	

Cooperators: Sudheer Kumar, P.L. Kashyap, Ravindra Kumar, S. K. Singh, A. K. Gupta

9.2 Management of Diseases: Chemical Control

Yellow Rust

A. Durgapura

Field evaluation of chemical fungicides *viz.*, Picoxystrobin 7.05% + Propiconazole 11.7% SC (0.1%), Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE (0.1%) and Tebuconazole 50% + Trifloxystrobin 25% WG (0.06%) along with standard recommended fungicide [Tebuconazole (0.1%) and Propiconazole (0.1%)] as foliar applications against yellow rust disease of wheat was performed in randomized block design with three replications. All the tested fungicides resulted in significantly less average coefficient of infection (ACI) in comparison to the unsprayed plot i.e. 88.33 (Table 9.5). Tebuconazole 50% + Trifloxystrobin 25% WG @ 0.06% provided significant higher level of disease protection in comparison to other tested fungicides. Moreover, Tebuconazole 50% + Trifloxystrobin 25% WG (0.06%) provided better level of protection than recommend standard fungicides [i.e. Tebuconazole (0.1%) and Propiconazole (0.1%], when applied at disease initiation followed by second spray at 14 days intervals on wheat foliage. It has been noticed that all the treatments resulted in significantly more yield and showed per cent yield gain (80.02 to 95.0) than the unsprayed control (Table 9.5). No phytotoxic symptoms were observed with any of the tested concentrations of the fungicides on wheat plants. Highest yield gain was recorded in the plot sprayed with Tebuconazole 50% + Trifloxystrobin 25% WG (0.06%) followed by Tebuconazole (0.1%).

Table 9.5: Chemical control of yellow rust of wheat at Durgapura during 2020-21

Treatment(s)	Description of treatments	Dose (%)	ACI	Grain yield (q ha^{-1})	Yield gain (%)
T1	Picoxystrobin 7.05% + Propiconazole 11.7% SC	0.1	12.33	41.11	85.01
T2	Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE	0.1	13.67	40.74	83.35
T3	Tebuconazole 50% + Trifloxystrobin 25% WG	0.06	3.83	44.03	98.17
T4	Propiconazole	0.1	17.50	40.00	80.02
T5	Tebuconazole	0.1	6.00	43.33	95.00
T6	Control (without chemicals)	-	88.33	22.22	-
	CD (P=0.05)		2.54	2.48	

B. Jammu

Three different chemical fungicides *viz.*, Picoxystrobin 7.05% + Propiconazole 11.7% SC (0.1%), Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE (0.1%) and Tebuconazole 50% + Trifloxystrobin 25% WG (0.06%) along with standard recommended fungicide [Tebuconazole (0.1%) and Propiconazole (0.1%)] were evaluated for the management of yellow rust disease of wheat under randomized block design with three replications (Table 9.6). All the three tested fungicides showed significantly low average coefficient of infection (ACI) in comparison to standard recommended fungicides [i.e. Tebuconazole (0.1%) and Propiconazole (0.1%] and unsprayed plot, when applied at disease initiation followed by second spray at 14 days intervals on wheat foliage. Tebuconazole 50% + Trifloxystrobin 25% WG @ 0.06% followed by Picoxystrobin 7.05% + Propiconazole 11.7% SC (0.1% and Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE (0.1%) provided significant higher level of disease protection in comparison to other tested fungicides as significant low ACI (< 5.0) is observed in the plots treated with this fungicides. Similar trends in the per cent yield gains were recorded in the plots treated with fungicides, when compared with unsprayed plots (Table 9.6). No phytotoxicity was recorded with any of the tested concentrations of the fungicides on wheat plants.

Table 9.6: Chemical control of yellow rust of wheat at Jammu during 2020-21

Treatment(s)	Description of treatments	Dose (%)	ACI	Grain yield (q ha^{-1})	Yield gain (%)

T1	Picoxystrobin 7.05% + Propiconazole 11.7% SC	0.1	1.33	46.06	89.38
T2	Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE	0.1	4.00	45.50	87.08
T3	Tebuconazole 50% + Trifloxystrobin 25% WG	0.06	1.00	46.54	91.38
T4	Propiconazole	0.1	5.33	45.20	85.86
T5	Tebuconazole	0.1	8.67	44.82	84.29
T6	Control (without chemicals)	-	73.33	24.32	-
	CD (P=0.05)		9.03	0.33	

C. Karnal

Field experiments were conducted to evaluate the efficacy of three different chemical fungicides *viz.*, Picoxystrobin 7.05% + Propiconazole 11.7% SC (0.1%), Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE (0.1%) and Tebuconazole 50% + Trifloxystrobin 25% WG (0.06%) along with standard recommended fungicide [Tebuconazole (0.1%) and Propiconazole (0.1)] for the management of yellow rust disease of wheat under randomized block design with three replications (Table 9.7). All the tested fungicides showed significantly low average coefficient of infection (ACI) in comparison to unsprayed plot, when applied at disease initiation followed by second spray at 14 days intervals on wheat foliage. Further, it has been noticed that Tebuconazole 50% + Trifloxystrobin 25% WG (0.06%) and Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE (0.1%) provided significant higher level of disease protection and better protection that standard recommended fungicides [Tebuconazole (0.1%) and Propiconazole (0.1)] and unsprayed plots, as significantly low ACI is recorded in the plots treated with these fungicides. No phytotoxicity was recorded with any of the tested concentrations of the fungicides on wheat plants. Significant gain in per cent yield was also recorded in the plots treated with fungicides, when compared with unsprayed control plots (Table 9.7).

Table 9.7: Chemical control of yellow rust of wheat at Karnal during 2020-21

Treatment(s)	Description of treatments	Dose (%)	ACI	Grain yield (q ha^{-1})	Yield gain (%)
T1	Picoxystrobin 7.05% + Propiconazole 11.7% SC	0.1	20.00	42.39	50.34
T2	Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE	0.1	10.00	41.19	46.07
T3	Tebuconazole 50% + Trifloxystrobin 25% WG	0.06	10.00	43.26	53.41
T4	Propiconazole	0.1	18.33	41.86	48.44
T5	Tebuconazole	0.1	18.33	39.35	39.56
T6	Control (without chemicals)	-	73.33	28.20	-
	CD (P=0.05)		10.77	8.26	

D. Ludhiana

The efficacy of three different chemical fungicides *viz.*, Picoxystrobin 7.05% + Propiconazole 11.7% SC (0.1%), Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE (0.1%) and Tebuconazole 50% + Trifloxystrobin 25% WG (0.06%) along with standard recommended fungicide [Tebuconazole (0.1%) and Propiconazole (0.1%)] were tested under field conditions for the management of yellow rust disease of wheat under randomized block design with three replications (Table 9.8). All the three tested fungicides showed significantly low ACI along with standard recommended fungicides [i.e. Tebuconazole (0.1%) and Propiconazole (0.1%], when compared with unsprayed plot. It has been noticed that application of fungicides at disease initiation followed by second spray at two weeks intervals on wheat foliage results in signgicant level of diseases reduction. Propiconazole (0.1%) followed by Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE, Tebuconazole (0.1%), Tebuconazole 50% + Trifloxystrobin 25% WG Trifloxystrobin 25% WG @ 0.06% and Picoxystrobin 7.05% + Propiconazole 11.7% SC @ 0.1% provided significant higher level of disease protection in

comparison to unsprayed check as significant low ACI (< 3.0) is observed in the plots treated with this fungicides. Similarly, per cent yield gains were recorded higher in the plots treated with fungicides in comparison to unsprayed plots (Table 9.8). No phytotoxicity was recorded with any of the tested concentrations of the fungicides on wheat plants.

Table 9.8: Chemical control of yellow rust of wheat at Ludhiana during 2020-21

Treatment(s)	Description of treatments	Dose (%)	ACI	Grain yield (q ha^{-1})	Yield gain (%)
T1	Picoxystrobin 7.05% + Propiconazole 11.7% SC	0.1	2.33	42.59	173.79
T2	Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE	0.1	0.40	44.82	188.08
T3	Tebuconazole 50% + Trifloxystrobin 25% WG	0.06	1.67	45.56	192.84
T4	Propiconazole	0.1	0.33	43.33	178.54
T5	Tebuconazole	0.1	0.67	41.48	166.63
T6	Control (without chemicals)	-	80.00	15.56	-
	CD (P=0.05)		2.22	8.46	

Field experimental trials for the evaluation of efficiency of three chemical fungicides *viz.*, Picoxystrobin 7.05% + Propiconazole 11.7% SC (0.1%), Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE (0.1%) and Tebuconazole 50% + Trifloxystrobin 25% WG (0.06%) along with standard recommended fungicide [Tebuconazole (0.1%) and Propiconazole (0.1%)] were performed in randomized block design with three replications for the management of yellow rust of wheat during the crop season 2020-21 at four different locations i.e. Durgapura, Jammu, Karnal and Ludhiana. Multiplication evaluations of the efficacy of the tested fungicides clearly highlighted that Tebuconazole 50% + Trifloxystrobin 25% WG @ 0.06% (T3) is the best performing fungicide across the locations. No phytotoxicity was recorded with any of the tested concentrations of the fungicides on wheat plants.

Leaf rust

A. Jammu

Field evaluation of six different fungicides *viz.*, Picoxystrobin 7.05% + Propiconazole 11.7% SC, Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE, Tebuconazole 50% + Trifloxystrobin 25% WG, Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC, Azoxystrobin 18.2% + Difenoconazole 11.4% w/w SC and Azoxystrobin 11% + Tebuconazole 18.3% w/w SC along with standard recommended fungicide [Tebuconazole (0.1%) and Propiconazole (0.1%)] was conducted for the management of leaf rust disease of wheat during the crop season 2020-21. The experiment was conducted in randomized block design with three replications. All the tested fungicides resulted in significantly less average coefficient of infection (ACI) in comparison to the unsprayed plot i.e. 60.0 (Table 9.9). Azoxystrobin 11% + Tebuconazole 18.3% w/w SC (0.1%) followed by Tebuconazole 50% + Trifloxystrobin 25% WG (0.06%) and Picoxystrobin 7.05% + Propiconazole 11.7% SC provided significant low ACI score in comparison to standard recommended fungicide (Propiconazole (0.1%). It has been recorded that Azoxystrobin 11% + Tebuconazole 18.3% w/w SC provided better level of protection as well again significant per cent gain yieldover control when compared with recommend standard fungicides [i.e. Tebuconazole (0.1%) and Propiconazole (0.1%)] and unsprayed check. Highest level of protection from leaf rust diseases was obtained with the foliar application of fungicides at disease initiation followed by second spray at 14 days intervals. Overall, all the fungicide treatments showed significant gain in per cent yield in comparison to the unsprayed control (Table 9.9). No phytotoxic symptoms were observed with any of the tested concentrations of the fungicides on wheat plants.

Table 9.9: Chemical control of leaf rust of wheat at Jammu during 2020-21

Treatment(s)	Description of treatments	Dose (%)	ACI	Grain yield (q ha^{-1})	Yield gain (%)
T1	Picoxystrobin 7.05% + Propiconazole 11.7% SC	0.1	6.67	42.69	23.18
T2	Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE	0.1	8.67	41.30	19.18
T3	Tebuconazole 50% + Trifloxystrobin 25% WG	0.06	2.33	42.73	23.29
T4	Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC	0.1	8.67	41.18	18.83
T5	Azoxystrobin 18.2% + Difenoconazole 11.4% w/w SC	0.1	12.00	40.51	16.88
T6	Azoxystrobin 11% + Tebuconazole 18.3% w/w SC	0.1	2.00	43.29	24.90
T7	Propiconazole	0.1	8.00	42.11	21.50
T8	Tebuconazole	0.1	16.67	40.39	16.54
T9	Control (without chemicals)	-	60.00	34.66	-
	CD (P=0.05)		4.18	0.57	

B. Ludhiana

The efficacy of six different fungicides *viz.*, Picoxystrobin 7.05% + Propiconazole 11.7% SC, Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE, Tebuconazole 50% + Trifloxystrobin 25% WG, Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC, Azoxystrobin 18.2% + Difenoconazole 11.4% w/w SC and Azoxystrobin 11% + Tebuconazole 18.3% w/w SC along with standard recommended fungicide [Tebuconazole (0.1%) and Propiconazole (0.1%)] was conducted for the management of leaf rust disease of wheat during the crop season 2020-21 under field conditions. The experiment was laid out in randomized block design with three replications. All the tested fungicides resulted in significantly low ACI (<5.0) in comparison to the unsprayed plot i.e. 60.0 (Table 9.10). Three fungicides viz., Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC, Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC and Picoxystrobin 7.05% + Propiconazole 11.7% SC at the concentration of 0.1% showed highest and better level of protection than standard recommended fungicide (Propiconazole @ 0.1%). It has been recorded that Picoxystrobin 7.05% + Propiconazole 11.7% SC followed by Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC showed significant per cent gain yield over control when compared with recommend standard fungicides [i.e. Tebuconazole (0.1%) and Propiconazole (0.1%)]. Highest level of protection from leaf rust diseases was obtained with the foliar application of fungicides at disease initiation followed by second spray at 14 days intervals. Overall, all the fungicide treatments showed significant level of protection from leaf rust infection as well as per cent yield gain in comparison to the unsprayed control (Table 9.10). No phytotoxic symptoms were observed with any of the tested concentrations of the fungicides on wheat plants.

Table 9.10: Chemical control of leaf rust of wheat at Ludhiana during 2020-21

Treatment(s)	Description of treatments	Dose (%)	ACI	Grain yield (q ha^{-1})	Yield gain (%)
T1	Picoxystrobin 7.05% + Propiconazole 11.7% SC	0.1	2.67	46.74	66.07
T2	Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE	0.1	1.73	42.96	52.64
T3	Tebuconazole 50% + Trifloxystrobin 25% WG	0.06	4.33	41.48	47.37
T4	Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC	0.1	1.73	45.92	63.15
T5	Azoxystrobin 18.2% +	0.1	4.33	44.44	57.90

	Difenoconazole 11.4% w/w SC				
T6	Azoxystrobin 11% + Tebuconazole 18.3% w/w SC	0.1	3.00	42.96	52.64
T7	Propiconazole	0.1	2.73	41.85	48.68
T8	Tebuconazole	0.1	4.00	43.33	53.94
T9	Control (without chemicals)	-	60.00	28.15	-
	CD (P=0.05)		4.01	7.13	

C. Pantnagar

Field trials were performed during the crop season 2020-21 to test the efficacy of six different fungicides *viz.*, Picoxystrobin 7.05% + Propiconazole 11.7% SC, Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE, Tebuconazole 50% + Trifloxystrobin 25% WG, Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC, Azoxystrobin 18.2% + Difenoconazole 11.4% w/w SC and Azoxystrobin 11% + Tebuconazole 18.3% w/w SC along with standard recommended fungicide [Tebuconazole (0.1%) and Propiconazole (0.1%)] towards leaf rust disease in wheat. The study was laid out in randomized block design with three replications. All the tested fungicides resulted in significantly low ACI (<4.0) in comparison to the unsprayed plot i.e. 50.0 (Table 9.11). Five fungicides *viz*., Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE (0.1%), Tebuconazole 50% + Trifloxystrobin 25% WG (0.06%), Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC (0.1%), Azoxystrobin 18.2% + Difenoconazole 11.4% w/w SC (0.1%) and Azoxystrobin 11% + Tebuconazole 18.3% w/w SC (0.1%) showed significantly superior plant growth and better level of protection than standard recommended fungicide [Propiconazole @ 0.1%]. It has been recorded that Picoxystrobin 7.05% + Propiconazole 11.7% SC (0.1%) and Tebuconazole (0.1%) showed similar level of ACI score (2.33), which although also at par with the other fungicidal treatments. Highest level of protection from leaf rust diseases was obtained with the foliar application of all the fungicides at disease initiation followed by second spray at 14 days intervals. No phytotoxic symptoms were noticed with any of the tested concentrations of the fungicides on wheat plants. The fungicidal treatments i.e. Tebuconazole 50% + Trifloxystrobin 25% WG @0.06 displayed highest level of protection from leaf rust diseases along with significant per cent yield gain over unsprayed check in comparison to the other fungicidal treatments (Table 9.11).

Table 9.11: Chemical control of leaf rust of wheat at Pantnagar during 2020-21

Treatment(s)	Description of treatments	Dose (%)	ACI	Grain yield (q ha^{-1})	Yield gain (%)
sT1	Picoxystrobin 7.05% + Propiconazole 11.7% SC	0.1	3.33	25.67	20.16
T2	Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE	0.1	2.33	27.25	27.57
T3	Tebuconazole 50% + Trifloxystrobin 25% WG	0.06	2.00	27.34	27.96
T4	Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC	0.1	2.10	27.15	27.10
T5	Azoxystrobin 18.2% + Difenoconazole 11.4% w/w SC	0.1	2.33	26.42	23.66
T6	Azoxystrobin 11% + Tebuconazole 18.3% w/w SC	0.1	2.10	26.97	26.26
T7	Propiconazole	0.1	2.43	26.99	26.34
T8	Tebuconazole	0.1	3.33	26.02	21.79
T9	Control (without chemicals)		50.00	21.36	-
	CD (P=0.05)		0.83	1.16	

Multi-location evaluation of six different fungicides *viz.*, Picoxystrobin 7.05% + Propiconazole 11.7% SC, Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE, Tebuconazole 50% + Trifloxystrobin 25% WG, Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC, Azoxystrobin 18.2% + Difenoconazole

11.4% w/w SC and Azoxystrobin 11% + Tebuconazole 18.3% w/w SC along with standard recommended fungicide [Tebuconazole (0.1%) and Propiconazole (0.1%)] for the management leaf rust disease in wheat has been conducted at three different locations i.e. Jammu, Ludhiana and Pantnagar during the cropping season 2020-21. Analysis of the results from different locations clearly revealed that all the fungicides are effective in controlling the leaf rust disease under field conditions with no major phytotoxic symptoms with tested concentrations of the fungicides on the wheat crop. Over all, on the basis of multi-location experimental results, foliar application of Azoxystrobin 11% + Tebuconazole 18.3% w/w SC @0.1% (T6) recorded as the most effective fungicidal treatments across the locations for the management of leaf rust of wheat under field conditions.

Stem Rust

A. Dharwad

Field experiments were performed during the crop season 2020-21 to test the effect of six different fungicides *viz.*, Picoxystrobin 7.05% + Propiconazole 11.7% SC, Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE, Tebuconazole 50% + Trifloxystrobin 25% WG, Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC, Azoxystrobin 18.2% + Difenoconazole 11.4% w/w SC and Azoxystrobin 11% + Tebuconazole 18.3% w/w SC along with standard recommended fungicide [Tebuconazole (0.1%) and Propiconazole (0.1%)] for the management of stem rust of wheat. The study was laid out in randomized block design with three replications. The results of the study demonstrated that all fungicide treatments resulted in significantly less ACI score in comparison to the unsprayed plot i.e. 46.67 (Table 9.8). Five fungicides *viz*., Picoxystrobin 7.05% + Propiconazole 11.7% SC (0.1%), Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE (0.1%), Tebuconazole 50% + Trifloxystrobin 25% WG (0.06%), Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC (0.1%) and Azoxystrobin 11% + Tebuconazole 18.3% w/w SC (0.1%) showed significantly higher level of protection than standard recommended fungicide (Propiconazole @ 0.1% and Tebuconazole @0.1%). It has been recorded that Azoxystrobin 18.2% + Difenoconazole 11.4% w/w SC @ 0.1% (T5) and Tebuconazole @ 0.1% (T8) showed similar level of ACI score (20.67). Highest level of protection from stem rust diseases was obtained with the foliar application of Tebuconazole 50% + Trifloxystrobin 25% WG @0.06 (T3) at disease initiation followed by second spray at 14 days intervals. No phytotoxic symptoms were noticed with any of the tested concentrations of the fungicides on wheat plants. The fungicidal treatments i.e. Tebuconazole 50% + Trifloxystrobin 25% WG @0.06 also displayed significant per cent yield gain over unsprayed check in comparison to the other fungicidal treatments (Table 9.12).

Table 9.12: Chemical control of stem rust of wheat at Dharwad during 2020-21

Treatment(s)	Description of treatments	Dose (%)	ACI	Grain yield (q ha^{-1})	Yield gain (%)
T1	Picoxystrobin 7.05% + Propiconazole 11.7% SC	0.1	16.00	30.78	22.90
T2	Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE	0.1	15.33	31.76	26.81
T3	Tebuconazole 50% + Trifloxystrobin 25% WG	0.06	12.00	32.96	31.63
T4	Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC	0.1	17.33	29.61	18.24
T5	Azoxystrobin 18.2% + Difenoconazole 11.4% w/w SC	0.1	20.67	27.77	10.88
T6	Azoxystrobin 11% + Tebuconazole 18.3% w/w SC	0.1	16.67	31.43	25.52
T7	Propiconazole	0.1	23.33	28.07	12.09
T8	Tebuconazole	0.1	20.67	29.16	16.43
T9	Control (without chemicals)	-	46.67	25.04	-
	CD (P=0.05)		11.78	4.32	

B. Wellington

Fungicide evaluations experiment was conducted to check the efficacy Picoxystrobin 7.05% + Propiconazole 11.7% SC, Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE, Tebuconazole 50% + Trifloxystrobin 25% WG, Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC, Azoxystrobin 18.2% + Difenoconazole 11.4% w/w SC and Azoxystrobin 11% + Tebuconazole 18.3% w/w SC along with standard recommended fungicide [Tebuconazole (0.1%) and Propiconazole (0.1%)] for the management of stem rust of wheat. The results of the study revealed that all the fungicide treatments are effective in checking the the stem rust infection in wheat plants in comparison to the unsprayed plants (Table 9.13). Further, it has been observed that Azoxystrobin 18.2% + Difenoconazole 11.4% w/w SC @0.1% (T5) followed by Tebuconazole 50% + Trifloxystrobin 25% WG (T3) showed highest level of protection in wheat plants from stem rust infection, when applied at disease initiation stage followed by two more sprays of fungicide at similar concentration at 14 days intervals. No phytotoxic symptoms were noticed with any of the tested concentrations of the fungicides on wheat plants.

Table 9.13: Chemical control of stem rust of wheat at Wellington during 2020-21

Treatment(s)	Description of treatments	Dose (%)	ACI
T1	Picoxystrobin 7.05% + Propiconazole 11.7% SC	0.1	18.6
T2	Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE	0.1	14.7
T3	Tebuconazole 50% + Trifloxystrobin 25% WG	0.06	14.2
T4	Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC	0.1	20.6
T5	Azoxystrobin 18.2% + Difenoconazole 11.4% w/w SC	0.1	11.1
T6	Azoxystrobin 11% + Tebuconazole 18.3% w/w SC	0.1	19.7
T7	Propiconazole	0.1	18.1
T8	Tebuconazole	0.1	20.0
T9	Control (without chemicals)	-	65.00
	CD (P=0.05)		12.78

The cumulative mean comparisons of data obtained from two different locations i.e. Wellington and Dharwad, regarding the efficacy of different fungicides *viz*., Picoxystrobin 7.05% + Propiconazole 11.7% SC, Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE, Tebuconazole 50% + Trifloxystrobin 25% WG, Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC, Azoxystrobin 18.2% + Difenoconazole 11.4% w/w SC and Azoxystrobin 11% + Tebuconazole 18.3% w/w SC along with standard recommended fungicide [Tebuconazole (0.1%) and Propiconazole (0.1%)] against stem rust of wheat identified Tebuconazole 50% + Trifloxystrobin 25% WG @0.06 (T3) as the effective fungicide in controlling the stem rust disease of wheat without any phytotoxicity.

Powdery mildew

A. Wellington

The efficacy of chemical fungicides *viz.*, Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC, Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC and Tebuconazole 50% + Trifloxystrobin 25% WG along with standard recommended fungicide [Tebuconazole (0.1%) and Propiconazole (0.1%)] as foliar applications against powdery mildew disease of wheat was studied in randomized block design with three replications during the crop season, 2020-21. All the tested fungicides showed low level of disease severity (<4.0) in comparison to the unsprayed plot i.e. 8.67 (Table 9.14). All the three fungicides i.e. Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC @0.1% (T1), Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC @0.1% (T2) and Azoxystrobin 11% + Tebuconazole 18.3% w/w SC @0.1% (T3) provided equal level of disease protection from powdery mildew infection when compared with other stand recommended fungicides and unsprayed check control (Table 9.14). Further, it has been observed that all the three treatment (T1, T2 and T3) provided better diseases control when applied at disease initiation followed by second spray at 14

days intervals on wheat foliage without any phytotoxic symptoms at tested concentrations on the wheat plants.

Table 9.14: Chemical control of powdery mildew of wheat at Wellington during 2020-21

Treatment(s)	Description of treatments	Dose (%)	Disease severity
T1	Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC	0.1	2.33
T2	Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC	0.1	2.33
T3	Azoxystrobin 11% + Tebuconazole 18.3% w/w SC	0.1	2.33
T4	Propiconazole	0.1	3.33
T5	Tebuconazole	0.1	3.67
T6	Control (without chemicals)	-	8.67
	CD (P=0.05)		1.15

B. Pantnagar

Field evaluation of chemical fungicides *viz.*, Picoxystrobin 7.05% + Propiconazole 11.7% SC (0.1%), Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE (0.1%) and Azoxystrobin 11% + Tebuconazole 18.3% w/w SC (0.1%) along with standard recommended fungicide [Tebuconazole (0.1%) and Propiconazole (0.1%)] was performed for the management of powdery mildew disease of wheat in randomized block design with three replications. All the tested fungicides resulted in significantly less diseases severity in comparison to the unsprayed plot i.e. 9.0 (Table 9.15). Azoxystrobin 18.2% + Difenoconazole 11.4% w/w SC @ 01% (T2) provided significant higher level of disease protection in comparison to other tested fungicides. Although, Azoxystrobin 18.2% w/w + Cyproconazole 7.3% @0.1% also noticed to provide better protection in comparison to recommended standard fungicides [i.e. Tebuconazole (0.1%) and Propiconazole (0.1%]. The complete protection of wheat plants from powdery mildew diseases can be attained when fungicide applied at disease initiation followed by two repeated sprays at 14 days intervals. Besides this, all the treatments resulted in significantly more yield and per cent yield gain over unsprayed control plot (Table 9.15). No phytotoxic symptoms were observed with any of the tested concentrations of the fungicides on wheat plants.

Table 9.15: Chemical control of powdery mildew of wheat at Pantnagar during 2020-21

Treatment(s)	Description of treatments	Dose (%)	Disease severity	Grain yield (q ha^{-1})	Yield gain (%)
T1	Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC	0.1	5.33	23.94	23.61
T2	Azoxystrobin 18.2% + Difenoconazole 11.4% w/w SC	0.1	4.00	26.41	36.37
T3	Azoxystrobin 11% + Tebuconazole 18.3% w/w SC	0.1	7.00	22.32	15.23
T4	Propiconazole	0.1	6.33	23.34	20.53
T5	Tebuconazole	0.1	7.00	21.24	9.66
T6	Control (without chemicals)	-	9.00	19.37	-
	CD (P=0.05)		1.15	1.39	

C. Jammu

Field experiments were conducted during the crop season 2020-21 at Jammu for the management of powdery mildew diseases of wheat by using a series of chemical fungicides *viz.*, Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC (0.1%), Azoxystrobin 18.2% (0.1%) + Difenoconazole 11.4% w/w SC (0.1%) and Azoxystrobin 11% + Tebuconazole 18.3% w/w SC (0.1%) along with standard recommended fungicide [Tebuconazole (0.1%) and Propiconazole (0.1%)] as a foliar spray. The experiments were planned in a randomized block design with three independent replications. All the tested fungicides resulted in significantly less diseases severity in comparison to the unsprayed plot i.e. 8.33 (Table 9.16). Azoxystrobin 11% + Tebuconazole 18.3% w/w SC @ 0.1% (T3) provided maximum level of protection of wheat plants from powdery mildew diseases followed by

Azoxystrobin 18.2% + Difenoconazole 11.4% w/w SC @0.1% (T2). Both these fungicidal treatments (T2 and T3) provided better level of protection than recommend standard fungicides [i.e. Tebuconazole (0.1%) and Propiconazole (0.1%], when applied at disease initiation followed by second spray at 14 days intervals on wheat plants. It has been noticed that all the treatments resulted in significantly more yield and showed significant per cent yield gain over unsprayed control (Table 9.16). No phytotoxic symptoms were observed with any of the tested concentrations of the fungicides on wheat plants. Highest per cent yield gain as well as per cent disease reduction was recorded in the plot sprayed with Azoxystrobin 11% + Tebuconazole 18.3% w/w SC @ 0.1% followed by Azoxystrobin 18.2% + Difenoconazole 11.4% w/w SC 0.1%.

Table 9.16: Chemical control of powdery mildew of wheat at Jammu during 2020-21

Treatment(s)	Description of treatments	Dose (%)	Disease severity	Grain yield (q ha^{-1})	Yield gain (%)
T1	Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC	0.1	3.33	44.13	19.34
T2	Azoxystrobin 18.2% + Difenoconazole 11.4% w/w SC	0.1	1.33	46.22	24.99
T3	Azoxystrobin 11% + Tebuconazole 18.3% w/w SC	0.1	0.67	46.36	25.37
T4	Propiconazole	0.1	3.00	44.46	20.25
T5	Tebuconazole	0.1	4.67	42.07	13.77
T6	Control (without chemicals)	-	8.33	36.98	-
	CD (P=0.05)		1.77	0.49	

D. Malan

The field efficacy of different chemical fungicides *viz.*, Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC, Azoxystrobin 18.2% + Difenoconazole 11.4% w/w SC and Azoxystrobin 11% + Tebuconazole 18.3% w/w SC at the concentration of 0.1% along with standard recommended fungicide [Tebuconazole (0.1%) and Propiconazole (0.1%)] were evaluated against powdery mildew disease of wheat during cropping session 2020-21. The experiments were executed in randomized block design with three replications. All the three fungicides i.e. Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC @0.1% (T1), Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC @0.1% (T2) and Azoxystrobin 11% + Tebuconazole 18.3% w/w SC @0.1% (T3) provided equal level of disease protection from powdery mildew infection when compared with other stand recommended fungicides and unsprayed check control (Table 9.17). Further, it has been observed that all the three treatment (T1, T2 and T3) provided better diseases control when applied at disease initiation followed by second spray at 14 days intervals on wheat plants without any phytotoxic symptoms. Moreover, significant increment in per cent yield gain was also observed in the plots treated with fungicides in comparison to unsprayed plot.

Table 9.17: Chemical control of powdery mildew of wheat at Malan during 2020-21

Treatment(s)	Description of treatments	Dose (%)	Disease severity	Grain yield (q ha^{-1})	Yield gain (%)
T1	Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC	0.1	3.67	32.50	41.82
T2	Azoxystrobin 18.2% + Difenoconazole 11.4% w/w SC	0.1	3.33	30.17	31.64
T3	Azoxystrobin 11% + Tebuconazole 18.3% w/w SC	0.1	4.33	28.75	25.45
T4	Propiconazole	0.1	4.67	25.92	13.09
T5	Tebuconazole	0.1	5.00	26.00	13.45
T6	Control (without chemicals)	-	7.67	22.92	-
	CD (P=0.05)		1.41	4.04	

Overall, data analysis of the efficacy of different fungicides at four different locations i.e. Wellington, Jammu, Pantnagar and Malan revealed that Azoxystrobin 18.2% + Difenoconazole 11.4% w/w SC@ 0.1% (T2) is the most effective fungicides in controlling the powdery mildew infection in wheat across the locations, when applied at disease initiation stage followed by second spray at 14 days interval.

Head Scab of Wheat

A. Ludhiana

Field efficacy of six different fungicides *viz.*, Picoxystrobin 7.05% + Propiconazole 11.7% SC, Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE, Tebuconazole 50% + Trifloxystrobin 25% WG, Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC, Azoxystrobin 18.2% + Difenoconazole 11.4% w/w SC and Azoxystrobin 11% + Tebuconazole 18.3% w/w SC along with standard recommended fungicide [Tebuconazole (0.1%) and Propiconazole (0.1%)] was tested in randomized block design with three replications evaluated conducted for the management of head scab disease of wheat during the crop season 2020-21. All the tested fungicides resulted in significantly less disease severity in comparison to the unsprayed plots as well as standard recommended fungicides (Table 9.18). It has been noticed that Tebuconazole 50% + Trifloxystrobin 25% WG @0.06%, Azoxystrobin 18.2% + Difenoconazole 11.4% w/w SC @0.1% and Azoxystrobin 11% + Tebuconazole 18.3% w/w SC @0.1% showed severity level of 1.0 in comparison to other fungicidal treatments and unsprayed check. Highest level of protection from head scab diseases was obtained with the foliar application of fungicides at disease initiation followed by one more spray at 14 days intervals. Overall, all the fungicide treatments showed significant gain in per cent yield in comparison to the unsprayed control (Table 9.18). No phytotoxic symptoms were observed with any of the tested concentrations of the fungicides on wheat plants.

Table 9.18: Chemical control of head scab of wheat at Ludhiana during 2020-21

Treatment(s)	Description of treatments	Dose (%)	Disease severity	Grain yield (q ha^{-1})	Yield gain (%)
T1	Picoxystrobin 7.05% + Propiconazole 11.7% SC	0.1	1.33	43.78	48.50
T2	Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE	0.1	1.33	44.07	49.50
T3	Tebuconazole 50% + Trifloxystrobin 25% WG	0.06	1.00	44.07	49.50
T4	Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC	0.1	1.33	42.93	45.61
T5	Azoxystrobin 18.2% + Difenoconazole 11.4% w/w SC	0.1	1.00	43.04	45.99
T6	Azoxystrobin 11% + Tebuconazole 18.3% w/w SC	0.1	1.00	42.59	44.48
T7	Propiconazole	0.1	2.00	45.18	53.27
T8	Tebuconazole	0.1	1.67	42.37	43.71
T9	Control (without chemicals)	-	4.00	29.48	-
	CD (P=0.05)		0.70	5.31	

B. Karnal

Field evaluation of six different fungicides *viz.*, Picoxystrobin 7.05% + Propiconazole 11.7% SC, Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE, Tebuconazole 50% + Trifloxystrobin 25% WG, Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC, Azoxystrobin 18.2% + Difenoconazole 11.4% w/w SC and Azoxystrobin 11% + Tebuconazole 18.3% w/w SC along with standard recommended fungicide [Tebuconazole (0.1%) and Propiconazole (0.1%)] was conducted for the management of head scab disease of wheat during the crop season 2020-21. The experiment was conducted in randomized block design with three replications. All the tested fungicides showed less

diseases severity of head scab disease in comparison to the unsprayed plot (Table 9.19). The results revealed that Tebuconazole 50% + Trifloxystrobin 25% WG @ 0.06% (T3) is the most effective fungicides in controlling the head scab diseases in, when applied at disease initiation stage followed by second spray at 14 days interval. However, three other fungicides *viz*., Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC@ 0.1 (T4) and Azoxystrobin 18.2% + Difenoconazole 11.4% w/w SC @ 0.1 (T5) and Azoxystrobin 11% + Tebuconazole 18.3% w/w SC @0.1 (T6) also showed better level of disease protection in comparison to standard recommended fungicide (Tebuconazole @0.1% and Propiconazole @ 0.1%) and unsprayed plots. Highest level of protection from head scab disease along with maximal increment in per cent yield gain over unsprayed check plot was observed, when Tebuconazole 50% + Trifloxystrobin 25% WG @ 0.06% was applied as foliar spray at the time of disease onset followed by another spray at 14 days interval.

Table 9.19: Chemical control of head scab of wheat at Karnal during 2020-21

Treatment(s)	Description of treatments	Dose (%)	Disease severity	Grain yield (q ha^{-1})	Yield gain (%)
T1	Picoxystrobin 7.05% + Propiconazole 11.7% SC	0.1	3.00	37.69	17.37
T2	Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE	0.1	2.33	39.54	23.15
T3	Tebuconazole 50% + Trifloxystrobin 25% WG	0.06	1.33	41.45	29.10
T4	Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC	0.1	1.67	34.94	8.80
T5	Azoxystrobin 18.2% + Difenoconazole 11.4% w/w SC	0.1	1.67	37.23	15.95
T6	Azoxystrobin 11% + Tebuconazole 18.3% w/w SC	0.1	1.67	42.21	31.45
T7	Propiconazole	0.1	2.00	40.80	27.06
T8	Tebuconazole	0.1	2.33	40.17	25.09
T9	Control (without chemicals)	-	7.67	32.11	-
	CD (P=0.05)		1.21	3.69	

Experimental trials conducted for the evaluation of different fungicides for the management of head scab disease of wheat during 2020-21 at two different locations i.e. Ludhiana and Karnal, indicated that all the fungicides at their respective dosages are effective in controlling the disease in comparison to unsprayed control check plot. Overall, among all the tested fungicides, Tebuconazole 50% + Trifloxystrobin 25% WG @ 0.06% is the most effective fungicides in controlling the head scab infection in wheat across the locations, when applied at disease initiation stage followed by second spray at 14 days interval.

PROGRAMME 10.

RESULTS OF COORDINATED ENTOMOLOGICAL EXPERIMENTS

Wheat entomology programme includes three aspects viz. host plant resistance, integrated pest management (IPM) and stored grain pest management. During 2020-21 crop season, the experiments were conducted on all above mentioned aspects of entomology. The host plant resistance included studies on pest screening nurseries against foliar and root aphids, shoot fly and brown wheat mite, and multiple pest screening nursery. The integrated pest management aspect covered survey and surveillance of insect-pests and their natural enemies, effect of zinc sulphate application and organic formulations on aphid and termite infestation in wheat. Besides, studies were also conducted on influence of sowing time on the incidence and population build-up of major insect pest of wheat and management of foliar aphid and termites through bio-pestcides and chemical insecticides. The salient findlings of the experiments conducted during 2020-21 at various AICRP centres are given below.

10.1(A) HOST PLANT RESISTANCE

The results are described here in the following paragraphs.

A1: Entomological Screening Nurseries (ESN)

AVT-Entries

(a) Shoot fly

Shoot fly: Amongst 200 AVT entries tested at three locations (Ludhiana, Kanpur and Dharwad during 2020-21. Kanpur (2020-21) data was not included because of very low or no infestations of shoot fly on majority of the screened entries. Based on the average infestation data of shoot fly at two locations, the lowest infestation index (2.07 %) of shoot fly entry was reported in HD3249 (C) and highest index of 8.75% in entry HD3403. At Ludhiana centre, maximum infestation index of 8.53 per cent was reported on HD3403 and minimum (3.95 per cent) on HD3249 (C). At Dharwad, entry HD3249 (C) had lowest infestation of 2.85% and highest infestation (10.91 %) in NIDW1149 (d)(I) (C) (Table A1-10.1a).

(b) Brown wheat mite

At Ludhiana, two entries WH1406 and VL907 (C) recorded the minimum mite population of 4.7/10 cm^2 area while maximum mite population of 15.3 /10 cm^2 in entry DDW48 (d)(I). (C).This season incidence of mite was very low at Durgapura and Kanpur locations; therefore data of insect incidence was not included in the report (Table A1-10.1a).

(c) Foliar wheat aphid and root aphid

Foliar aphid: The foliar wheat aphid screenings nursery consisting of 200 AVT genotypes was screened at seven locations *viz.* Ludhiana, Karnal, Niphad, Khudwani, Vijapur Durgapur and Shillongani. Aphid count/shoots were recorded at weekly interval from all these genotypes and grades were given according to 5 point system described below. The infestation of aphids at Vijapur, Durgapur and Shillongani was recorded to be very low and therefore data was rejected and not included in the report.

Grading and rating of foliar aphid and root aphid on the basis of population in wheat

Grade	Approx. numbers of aphids/shoot	Rating
1	0	Immune
2	1-5	Resistant
3	6-10	Moderately resistant
4	11-20	Susceptible
5	21 and above	Highly susceptible

Based on the average score of aphids at four locations; Ludhiana, Karnal, Niphad and Khudwani,four entries; DBW313, DBW317, HI8830(d) and RAJ4083 (C) scored in moderately resistance category (grade 3) and rest of entries were found to be either in susceptible (grade 4) or highly susceptible (grade 5) category.

At Ludhiana, amongst the tested AVT entries, HI8830(d), DBW317, MACS6774, PBW873 and DBW378 were found to be moderately resistant (grade 3) category while rest of the entries were either susceptible (grade 4) or highly susceptible (grade 5) to wheat aphid. At Niphad, eleven entries viz., DBW313#, PBW771(C), PBW826#, DBW110 (C),RAJ4083 (C),DBW325,PBW872,DBW373,DBW366,KRL210 (C) and KRL19 (C) were found to be moderately resistant (grade 3) category(Table A1-10.1b).

Root aphid: Out of total 200 entries, four entries viz., WH1142 (C),PBW835, DBW110 (C) and WH1404 showed the moderately resistance (grade 3) reaction at Ludhiana (Table A1-10.1b).

NIVT-Entries

(a) Foliar aphid:
NIVT entries were screened at three locations i.e. Ludhiana, Karnal and Niphad, all the entries were found to be either in moderately resistant (grade 3), susceptible (grade 4) or highly susceptible (grade 5) categories.Based on the average score ogf three locations, entries DBW313#,DBW317,HI8830(d), RAJ4083 (C) and MACS6774 were found to be moderately resistant category. At Ludhiana, most of the NIVT entries were susceptible or highly susceptible to wheat aphid except entry number AKAW5351 and HI1544 (C) were moderately resistant to foliar aphids (Table A1-10.1c).

(A2) Multiple pest screening nurseries (MPSN)

(a)Shoot fly: The average infestation index of shootfly recorded at two locations was to be lowest (2.8%) in entry PBW 771 and the maximum score of 9.6% was recorded for GW 1346(Table A2-10.1a).
(b)Brown wheat mite: The lowest population of 6.67 brown wheat mites/10 cm2 was recorded in entry HI8812 (d) while entry GW1346 had lowest population of 9.6 mites/10 cm2 at Ludhiana.(Table A2-10.1a).
(c) Foliar aphid: Based on average score of four locations, 13 entries GW1348 (d), PBW822, DDW 48(d), DDW 47(d), DBW 303, DBW 302,GW 1346,MACS 5052,GW 1346, MACS 5052,DDK 1056,DDK 1057,DBW 304 showed moderately resistance (grade 3) to foliar aphid (Table A2-10.1b).
(d)Root aphid: At Ludhiana, one entry HI 1628 was found to be moderately resistant (grade 3) to root aphid (Table A2-10.1b).

Table A1-10.1a: Screening of AVT lines against Shootfly and Brown Wheat mite (Year-2020-21)

AVT No.	Entry code	Entry	Shoot fly incidence (%)			No. of brown wheat mites/10 cm sq area
			Ludhiana	Dharwad	Average	Ludhiana
I. North Hill Zone (NHZ)						
1	NHRFZ 2001	VL2041	5.94	0.32	**3.13**	9.0
2	NHRFZ 2002	HS562 (C)	5.68	0.50	**3.09**	10.7
3	NHRFZ 2003	HPW349 (C)	6.43	0.77	**3.60**	8.0
4	NHRFZ 2004	HS507 (C)	7.4	0.50	**3.95**	6.7
5	NHRFZ 2005	VL907 (C)	5.87	3.32	**4.59**	4.7
II. North Western Plain Zone (NWPZ)						
6	NWTS 101	WH1105 (C)	6.81	3.56	**5.18**	9.0
7	NWTS 102	DBW187 (C)	5.92	1.09	**3.51**	9.0
8	NWTS 103	HD3349	6.71	4.37	**5.54**	10.0
9	NWTS 104	PBW876^{B}	8.09	4.79	**6.44**	11.3

10	NWTS 105	HD3406[M]	6.42	1.82	**4.12**	11.7
11	NWTS 106	DBW222 (C)	5.44	4.55	**4.99**	10.7
12	NWTS 107	DBW313[#]	6.7	2.84	**4.77**	9.3
13	NWTS 108	HD2967 (C)	6.3	0.93	**3.61**	9.7
14	NWTS 109	PBW826	6.34	0.51	**3.42**	10.3
15	NWTS 110	RAJ4548[#]	6.71	4.60	**5.65**	8.7
16	NWTS 111	HD3354	6.63	3.09	**4.86**	10.3
17	NWTS 112	WH1283	6.77	1.23	**4.00**	13.0
18	NWTS 113	HD3086 (C)	5.78	0.78	**3.28**	7.3
19	NWLS 201	JKW261	5.17	0.23	**2.70**	8.3
20	NWLS 202	WH1124 (C)	5.42	2.03	**3.72**	12.0
20A	**INFECTOR**	**INFECTOR**	**9.62**	**7.04**	**8.33**	15.0
21	NWLS 203	PBW771 (C)	5.66	1.00	**3.33**	9.0
22	NWLS 204	HD3059 (C)	6.79	1.20	**4.00**	11.3
23	NWLS 205	PBW834	5.91	0.89	**3.40**	9.3
24	NWLS 206	DBW173 (C)	6.63	0.80	**3.72**	10.3
25	NWRI 301	HUW838[#]*	6	2.22	**4.11**	10.7
26	NWRI 302	NW7096	4.88	0.40	**2.64**	13.0
27	NWRI 303	DBW321	5.75	0.20	**2.98**	12.3
28	NWRI 304	K1910	6.02	0.81	**3.41**	11.7
29	NWRI 305	HI1654	6.9	1.00	**3.95**	12.0
30	NWRI 306	NIAW3170 (C)	6.45	1.60	**4.03**	11.7
31	NWRI 307	PBW838	6.54	2.40	**4.47**	13.3
32	NWRI 308	DBW296*	5.86	1.28	**3.57**	8.3
33	NWRI 309	HI1628 (C)	6.76	0.21	**3.49**	8.7
34	NWRI 310	HD3369	6.85	0.59	**3.72**	11.3
35	NWRI 311	WH1142 (C)	4.54	0.21	**2.38**	12.0
36	NWRI 312	UP3062	6.13	0.25	**3.19**	11.0
37	NWRI 313	HD3368	6.26	0.21	**3.24**	11.7
38	NWRI 314	HD3043 (C)	5.01	0.30	**2.66**	9.3
39	NWRI 315	PBW644 (C)	7.14	0.22	**3.68**	11.0
40	NWRI 316	HI1653	6.11	6.11	**6.11**	12.3
40A	**INFECTOR**	**INFECTOR**	**10.27**	**9.33**	**9.80**	17.0
41	NWRI 317	PBW848	5.61	2.15	**3.88**	9.7
III. North Eastern Plain Zone (NEPZ)						
42	NETS 101	HD2733 (C)	5.52	2.66	**4.09**	11.7
43	NETS 102	HD3249 (C)	3.95	0.19	**2.07**	12.3
44	NETS 103	DBW187 (C)	7.87	1.05	**4.46**	9.3
45	NETS 104	HD3406[M]	4.85	3.74	**4.29**	12.0
46	NETS 105	HD3411[M]	5.51	1.41	**3.46**	10.3
47	NETS 106	DBW39 (C)	5.6	3.15	**4.37**	11.7
48	NETS 107	HD2967 (C)	5.16	1.48	**3.32**	8.0
49	NETS 108	PBW826[#]	5.53	4.80	**5.17**	13.0
50	NETS 109	HD3086 (C)	6.12	2.78	**4.45**	12.7
51	NELS 201	DBW317	6.84	4.17	**5.50**	11.0
52	NELS 202	DBW318	5.6	6.48	**6.04**	11.7
53	NELS 203	PBW835	6.67	1.33	**4.00**	12.3
54	NELS 204	HI1563 (C)	6.52	2.14	**4.33**	14.7
55	NELS 205	DBW107 (C)	6.38	7.69	**7.04**	11.3
56	NELS 206	PBW834	5.15	7.79	**6.47**	11.0
57	NELS 207	UP3060	6.37	2.38	**4.38**	9.0
58	NELS 208	HD3118 (C)	6.44	2.19	**4.31**	8.7
59	NELS 209	HI1621 (C)	7.53	0.45	**3.99**	12.7
60	NELS 210	DBW316	7.69	3.88	**5.79**	11.7
60A	**INFECTOR**	**INFECTOR**	**8.60**	**6.82**	**7.71**	17.7
61	NELS 211	PBW833	7.3	0.75	**4.02**	10.0
62	NELS 212	HD3360	6.07	7.30	**6.68**	9.7
63	NERI 301	HI1653	6.21	0.73	**3.47**	10.0

64	NERI 302	DBW322	5.91	4.55	**5.23**	9.0
65	NERI 303	HI1612 (C)	5.8	4.07	**4.93**	11.0
66	NERI 304	DBW252 (C)	6.4	1.46	**3.93**	10.0
67	NERI 305	DBW321	6.04	6.45	**6.25**	7.0
68	NERI 306	HD3368[#]	6.13	6.98	**6.55**	5.3
69	NERI 307	HI1654	6.5	3.16	**4.83**	10.0
70	NERI 308	HD3293(I) (C)	6.49	1.82	**4.15**	10.7
71	NERI 309	WH1281	5.9	6.62	**6.26**	10.7
72	NERI 310	PBW848[#]	7.9	8.60	**8.25**	10.0
73	NERI 311	HD3171 (C)	5.77	4.67	**5.22**	8.7
74	NERI 312	HD3369[#]	5.55	2.43	**3.99**	7.7
75	NERI 313	K1317 (C)	4.34	2.76	**3.55**	7.0
76	NERI 314	UP3062	6.61	0.93	**3.77**	10.7
IV. Central Zone (CZ)						
77	CZTS 101	HI8833(d)[M]	4.82	1.52	**3.17**	5.0
78	CZTS 102	GW322 (C)	6.95	0.44	**3.70**	11.3
79	CZTS 103	MP3535	5.28	0.36	**2.82**	13.3
80	CZTS 104	GW523	5.8	3.90	**4.85**	10.3
80A	**INFECTOR**	**INFECTOR**	**8.41**	**4.40**	**6.41**	17.67
81	CZTS 105	GW513*	5.82	5.31	**5.56**	12.0
82	CZTS 106	HI1636*	5.86	2.91	**4.39**	10.7
83	CZTS 107	HI8832(d)[M]	5.48	5.63	**5.56**	11.3
84	CZTS 108	MACS6768	7.26	8.55	**7.90**	10.7
85	CZTS 109	HI1544 (C)	5.21	5.22	**5.21**	11.0
86	CZTS 110	HI1667[B]	5.51	1.77	**3.64**	11.0
87	CZTS 111	HI8498(d) (C)	6.18	4.65	**5.42**	12.3
88	CZTS 112	HI8713(d) (C)	6.59	4.17	**5.38**	10.0
89	CZTS 113	HI1650	6.49	4.44	**5.47**	9.7
90	CZLS 201	MP4010 (C)	6.24	3.57	**4.91**	12.0
91	CZLS 202	HD2864 (C)	5.63	3.61	**4.62**	10.0
92	CZLS 203	MP3336 (C)	6.59	0.46	**3.53**	12.3
93	CZLS 204	HD2932 (C)	6.1	4.00	**5.05**	10.3
94	CZLS 205	HI1634(I) (C)	6.93	8.89	**7.91**	11.0
95	CZLS 206	HD3407[M]	6.01	3.21	**4.61**	13.3
96	CZLS 207	CG1029(I) (C)	6.84	5.85	**6.34**	6.7
97	CZRI 301	HI8823(d)*	5.38	2.38	**3.88**	8.0
98	CZRI 302	GW528	5.12	6.75	**5.93**	9.0
99	CZRI 303	DDW47(d) (C)	6.77	3.57	**5.17**	9.7
100	CZRI 304	DBW326	7.33	3.82	**5.57**	10.0
100A	**INFECTOR**	**INFECTOR**	**9.34**	**8.64**	**8.99**	15.67
101	CZRI 305	UAS475(d)	6.38	2.72	**4.55**	10.0
102	CZRI 306	HI8627(d) (C)	6.07	2.52	**4.30**	8.0
103	CZRI 307	NIAW3851	7.94	1.28	**4.61**	9.7
104	CZRI 308	HI8830(d)	7.43	2.60	**5.01**	10.3
105	CZRI 309	CG1036	5.77	0.24	**3.01**	11.7
106	CZRI 310	HI1655	5.98	2.81	**4.39**	10.7
107	CZRI 311	DBW110 (C)	6.67	1.36	**4.02**	9.0
108	CZRI 312	MP3288 (C)	6.3	1.57	**3.94**	11.0
109	CZRI 313	DDW55(d)	7.14	1.81	**4.47**	12.0
IV. Peninsular Zone (PZ)						
110	PZTS 101	WHD965(d)	5.47	3.01	**4.24**	10.3
111	PZTS 102	UAS428(d) (C)	5.53	6.98	**6.25**	11.7
112	PZTS 103	HI8826(d)	5.14	2.98	**4.06**	12.7
113	PZTS 104	MACS4100(d)	7.07	3.21	**5.14**	10.3
114	PZTS 105	MACS3949(d) (C)	4.65	2.02	**3.34**	13.3
115	PZTS 106	DDW53(d)	6.22	3.05	**4.64**	11.7
116	PZTS 107	NIDW1345(d)	5.76	1.05	**3.40**	10.3
117	PZTS 108	MACS6222 (C)	4.72	2.03	**3.37**	10.7

118	PZTS 109	MACS4106(d)	5.14	0.74	**2.94**	9.0
119	PZTS 110	NIDW1348(d)	5.07	0.64	**2.86**	12.7
120	PZTS 111	HI8828(d)	4.56	1.69	**3.13**	11.7
120A	**INFECTOR**	**INFECTOR**	**7.64**	**4.14**	**5.89**	18.3
121	PZTS 112	GW322 (C)	6.71	2.38	**4.55**	10.3
122	PZTS 113	HI8827(d)	4.77	2.44	**3.60**	10.3
123	PZTS 114	DDW48(d)(I) (C)	5.14	3.68	**4.41**	15.3
124	PZLS 201	HD3090 (C)	5.32	5.97	**5.65**	12.3
125	PZLS 202	HI1633(I) (C)	6.04	2.80	**4.42**	14.0
126	PZLS 203	HD2932 (C)	5.4	0.63	**3.01**	10.0
127	PZLS 204	RAJ4083 (C)	5.32	2.70	**4.01**	11.0
128	PZLS 205	DBW320	4.44	0.20	**2.32**	10.7
129	PZLS 206	MACS6774	6.11	0.34	**3.23**	9.3
130	PZLS 207	NWS2180[#]	6.67	4.85	**5.76**	11.3
131	PZLS 208	HI1651	4.69	3.20	**3.95**	10.7
132	PZRI 301	MP1358*	5.26	0.43	**2.84**	8.7
133	PZRI 302	MACS6755	5.41	1.38	**3.40**	9.7
134	PZRI 303	HI1605 (C)	7.03	7.87	**7.45**	9.3
135	PZRI 304	MACS6753	6.04	8.33	**7.19**	11.3
136	PZRI 305	AKDW2997-16(d) (C)	5.65	8.70	**7.17**	11.3
137	PZRI 306	NIDW1149(d)(I) (C)	5.31	10.91	**8.11**	9.0
138	PZRI 307	NIAW3170 (C)	5.56	5.42	**5.49**	8.7
139	PZRI 308	UAS446(d) (C)	5.44	4.02	**4.73**	7.0
140	PZRI 309	DBW325	6.41	7.84	**7.13**	8.3
140A	**INFECTOR**	**INFECTOR**	**9.02**	**4.29**	**6.66**	16.33
141	PZRI 310	UAS3014	7.95	0.85	**4.40**	11.0
V. Special Trial (Dicoccum)						
142	SPL-DIC 101	MACS5058	5.29	1.02	**3.15**	11.0
143	SPL-DIC 102	MACS6222(*a*) (C)	5.98	5.71	**5.85**	9.3
144	SPL-DIC 103	DDK1029 (C)	6.22	1.32	**3.77**	9.3
145	SPL-DIC 104	DDK1061	6.32	0.95	**3.64**	9.7
146	SPL-DIC 105	HW1098 (C)	7.09	2.15	**4.62**	7.7
147	SPL-DIC 106	MACS5057	6.98	1.63	**4.31**	6.0
148	SPL-DIC 107	DDK1060	6.96	0.80	**3.88**	9.3
VI. Special Trial (SPL-HYPT)						
149	SPL-HYPT 101	DBW328*	6.4	0.36	**3.38**	9.3
150	SPL-HYPT 102	DBW372	6.76	0.38	**3.57**	8.7
151	SPL-HYPT 103	DBW370	6.92	0.91	**3.91**	11.3
152	SPL-HYPT 104	DBW327*	6.28	0.87	**3.57**	12.3
153	SPL-HYPT 105	WH1252*	6.13	0.24	**3.19**	9.7
154	SPL-HYPT 106	PBW874	5.23	0.64	**2.94**	11.3
155	SPL-HYPT 107	HD3410	5.4	0.21	**2.81**	9.0
156	SPL-HYPT 108	DBW332*	6.13	4.20	**5.17**	9.3
157	SPL-HYPT 109	PBW873	5.85	0.21	**3.03**	10.0
158	SPL-HYPT 110	DBW371	5.58	1.33	**3.46**	9.3
159	SPL-HYPT 111	HD3086 (C)	6.29	0.57	**3.43**	11.0
160	SPL-HYPT 112	DBW333*	7.01	0.20	**3.61**	10.7
160A	**INFECTOR**	**INFECTOR**	8.35	**5.49**	**6.92**	17.0
161	SPL-HYPT 113	PBW872	5.2	2.91	**4.06**	13.0
162	SPL-HYPT 114	DBW187(I) (C)	6.14	5.00	**5.57**	11.3
163	SPL-HYPT 115	WH1270(I) (C)	5.99	8.39	**7.19**	11.3
164	SPL-HYPT 116	DBW303(I) (C)	5.14	10.43	**7.79**	10.0
VII. Special Trial (CI – HYT)						
165	HYT 201	HD3412	6.78	1.22	**4.00**	11.3
166	HYT 202	DBW375	7.17	8.00	**7.59**	6.7
167	HYT 203	DBW374	8.46	0.78	**4.62**	8.0
168	HYT 204	HD3403	8.53	8.97	**8.75**	13.3
169	HYT 205	WH1406	6.69	1.88	**4.28**	4.7

170	HYT 206	HD3413	6.32	4.62	**5.47**	12.0
171	HYT 207	PBW867	7.4	3.64	**5.52**	11.0
172	HYT 208	UP3096	6.38	2.27	**4.33**	12.0
173	HYT 209	WH1404	6.9	1.61	**4.26**	11.3
174	HYT 210	PBW868	6.34	2.73	**4.53**	12.0
175	HYT 211	DBW318	6.11	5.04	**5.58**	6.0
176	HYT 212	DBW378	7.4	4.60	**6.00**	10.7
177	HYT 213	WH1405	5.93	3.26	**4.60**	14.0
178	HYT 214	HD3405	4.9	2.26	**3.58**	10.3
179	HYT 215	DBW377	5.44	2.92	**4.18**	12.7
180	HYT 216	PBW869	7.4	2.63	**5.02**	7.7
180A	**INFECTOR**	**INFECTOR**	**9.04**	**3.68**	**6.36**	**14.7**
181	HYT 217	PBW871	6.8	0.00	**3.40**	11.7
182	HYT 218	HD3086 (C)	6.14	3.37	**4.76**	10.0
183	HYT 219	DBW376	5.29	0.77	**3.03**	11.7
184	HYT 220	DBW373	5.97	1.45	**3.71**	7.7
185	HYT 221	HD3404	6.46	2.58	**4.52**	8.0
186	HYT 222	DBW187(I) (C)	5.16	0.85	**3.01**	12.3
187	HYT 223	WH1407	6.46	3.85	**5.15**	12.0
188	HYT 224	PBW870	5.88	2.40	**4.14**	13.3
189	HYT 225	UP3095	6.54	0.20	**3.37**	12.3
VIII. Special Trial (AST – HYT)						
190	SPL-AST 101	DBW368	7.75	1.54	**4.64**	10.3
191	SPL-AST 102	DBW363	6.05	0.83	**3.44**	12.3
192	SPL-AST 103	DBW369	5.48	1.43	**3.45**	10.0
193	SPL-AST 104	DBW367	6.47	0.50	**3.48**	8.7
194	SPL-AST 105	DBW364	8.1	1.30	**4.70**	9.7
195	SPL-AST 106	Kharchia 65 (C)	5.93	2.72	**4.32**	11.7
196	SPL-AST 107	DBW366	5.35	2.38	**3.87**	13.3
197	SPL-AST 108	KRL210 (C)	6.38	1.63	**4.00**	10.7
198	SPL-AST 109	DBW365	6.03	2.26	**4.14**	12.0
199	SPL-AST 110	K1805	5.96	4.73	**5.35**	11.7
200	SPL-AST 111	KRL19 (C)	6.06	2.92	**4.49**	13.3
200A	**INFECTOR**	**INFECTOR**	**8.02**	**10.07**	**9.05**	**18.7**

*Kanpur Data rejected due to low/no infestation of Shootfly on majority of tested entries
*Durgapura (Jaipur) Data rejected due to low infestation of Brown wheat mite

Table A1-10.1b: Screening of AVT lines against foliar wheat aphid and root aphid (Year-2020-21)

AVT No.	Entry code	Entry	Foliar aphid score (1-5 scale)				Average score	Maximum Score	Root aphid (No./plant) Ludhiana Centre only
			Ludhiana	Karnal	Niphad	Khudwani			
I. North Hill Zone (NHZ)									
1	NHRFZ 2001	VL2041	5	5	4	4	**4.5**	**5**	5
2	NHRFZ 2002	HS562 (C)	5	5	4	5	**4.8**	**5**	4
3	NHRFZ 2003	HPW349 (C)	5	4	4	5	**4.5**	**5**	4
4	NHRFZ 2004	HS507 (C)	5	5	4	5	**4.8**	**5**	4
5	NHRFZ 2005	VL907 (C)	5	5	4	4	**4.5**	**5**	5
II. North Western Plain Zone (NWPZ)									
6	NWTS 101	WH1105 (C)	5	5	4	5	**4.8**	**5**	4
7	NWTS 102	DBW187 (C)	5	3	4	5	**4.3**	**5**	5
8	NWTS 103	HD3349	5	3	4	5	**4.3**	**5**	5
9	NWTS 104	PBW876[B]	5	3	4	4	**4.0**	**5**	4

10	NWTS 105	HD3406[M]	5	3	5	4	**4.3**	**5**	5
11	NWTS 106	DBW222 (C)	5	3	5	4	**4.3**	**5**	5
12	NWTS 107	DBW313[#]	4	3	3	4	**3.5**	**4**	5
13	NWTS 108	HD2967 (C)	5	5	4	4	**4.5**	**5**	4
14	NWTS 109	PBW826	5	4	3	4	**4.0**	**5**	5
15	NWTS 110	RAJ4548[#]	5	5	3	5	**4.5**	**5**	4
16	NWTS 111	HD3354	5	5	4	4	**4.5**	**5**	4
17	NWTS 112	WH1283	5	5	5	5	**5.0**	**5**	5
18	NWTS 113	HD3086 (C)	5	4	4	4	**4.3**	**5**	4
19	NWLS 201	JKW261	5	5	4	5	**4.8**	**5**	4
20	NWLS 202	WH1124 (C)	4	4	4	5	**4.3**	**5**	5
20A	**INFECTOR**		**5**	**5**	**4**	**5**	**4.8**	**5**	**5**
21	NWLS 203	PBW771 (C)	5	5	3	5	**4.5**	**5**	5
22	NWLS 204	HD3059 (C)	5	5	4	4	**4.5**	**5**	5
23	NWLS 205	PBW834	5	4	4	4	**4.3**	**5**	4
24	NWLS 206	DBW173 (C)	5	5	4	4	**4.5**	**5**	5
25	NWRI 301	HUW838[#]*	5	5	4	5	**4.8**	**5**	5
26	NWRI 302	NW7096	5	5	4	5	**4.8**	**5**	5
27	NWRI 303	DBW321	4	3	4	5	**4.0**	**5**	4
28	NWRI 304	K1910	5	4	4	5	**4.5**	**5**	5
29	NWRI 305	HI1654	5	4	4	5	**4.5**	**5**	4
30	NWRI 306	NIAW3170 (C)	4	4	4	5	**4.3**	**5**	5
31	NWRI 307	PBW838	5	4	4	5	**4.5**	**5**	4
32	NWRI 308	DBW296*	4	3	4	5	**4.0**	**5**	4
33	NWRI 309	HI1628 (C)	5	4	4	4	**4.3**	**5**	4
34	NWRI 310	HD3369	5	4	4	5	**4.5**	**5**	4
35	NWRI 311	WH1142 (C)	4	4	4	4	**4.0**	**4**	3
36	NWRI 312	UP3062	5	5	4	5	**4.8**	**5**	4
37	NWRI 313	HD3368	5	5	4	5	**4.8**	**5**	4
38	NWRI 314	HD3043 (C)	5	5	4	5	**4.8**	**5**	5
39	NWRI 315	PBW644 (C)	5	4	4	5	**4.5**	**5**	4
40	NWRI 316	HI1653	5	4	4	5	**4.5**	**5**	4
40A	**INFECTOR**		**5**	**5**	**5**	**5**	**5.0**	**5**	**5**
41	NWRI 317	PBW848	5	5	4	5	**4.8**	**5**	4
III. North Eastern Plain Zone (NEPZ)									
42	NETS 101	HD2733 (C)	4	5	4	5	**4.5**	**5**	5
43	NETS 102	HD3249 (C)	5	5	4	5	**4.8**	**5**	5
44	NETS 103	DBW187 (C)	5	4	4	5	**4.5**	**5**	4
45	NETS 104	HD3406[M]	5	4	4	5	**4.5**	**5**	5
46	NETS 105	HD3411[M]	5	5	5	5	**5.0**	**5**	5
47	NETS 106	DBW39 (C)	4	3	4	5	**4.0**	**5**	5
48	NETS 107	HD2967 (C)	5	5	4	5	**4.8**	**5**	5
49	NETS 108	PBW826[#]	4	4	3	5	**4.0**	**5**	4
50	NETS 109	HD3086 (C)	5	4	4	5	**4.5**	**5**	5
51	NELS 201	DBW317	3	3	4	5	**3.8**	**5**	4
52	NELS 202	DBW318	4	3	4	5	**4.0**	**5**	4
53	NELS 203	PBW835	5	5	4	5	**4.8**	**5**	3
54	NELS 204	HI1563 (C)	5	5	3	5	**4.5**	**5**	4
55	NELS 205	DBW107 (C)	5	5	4	5	**4.8**	**5**	4
56	NELS 206	PBW834	5	5	4	5	**4.8**	**5**	4
57	NELS 207	UP3060	5	5	4	5	**4.8**	**5**	5
58	NELS 208	HD3118 (C)	5	5	4	5	**4.8**	**5**	5
59	NELS 209	HI1621 (C)	5	5	4	5	**4.8**	**5**	4
60	NELS 210	DBW316	5	5	5	5	**5.0**	**5**	5
60A	**INFECTOR**		**5**	**5**	**4**	**5**	**4.8**	**5**	**5**
61	NELS 211	PBW833	5	5	3	5	**4.5**	**5**	5
62	NELS 212	HD3360	5	5	5	5	**5.0**	**5**	4
63	NERI 301	HI1653	5	5	4	5	**4.8**	**5**	4

64	NERI 302	DBW322	4	3	5	5	**4.3**	**5**	5
65	NERI 303	HI1612 (C)	5	5	5	5	**5.0**	**5**	5
66	NERI 304	DBW252 (C)	5	4	4	5	**4.5**	**5**	4
67	NERI 305	DBW321	5	3	5	5	**4.5**	**5**	5
68	NERI 306	HD3368[#]	5	4	5	5	**4.8**	**5**	5
69	NERI 307	HI1654	5	4	3	5	**4.3**	**5**	4
70	NERI 308	HD3293(I) (C)	5	4	4	5	**4.5**	**5**	4
71	NERI 309	WH1281	4	4	4	5	**4.3**	**5**	5
72	NERI 310	PBW848[#]	5	4	4	5	**4.5**	**5**	4
73	NERI 311	HD3171 (C)	5	5	4	5	**4.8**	**5**	4
74	NERI 312	HD3369[#]	5	5	4	5	**4.8**	**5**	4
75	NERI 313	K1317 (C)	5	4	4	5	**4.5**	**5**	5
76	NERI 314	UP3062	5	5	4	5	**4.8**	**5**	5
IV. Central Zone (CZ)									
77	CZTS 101	HI8833(d)[M]	5	5	5	4	**4.8**	**5**	5
78	CZTS 102	GW322 (C)	5	5	5	5	**5.0**	**5**	4
79	CZTS 103	MP3535	5	5	5	5	**5.0**	**5**	4
80	CZTS 104	GW523	5	4	5	5	**4.8**	**5**	5
80A	**INFECTOR**		**5**	**5**	**5**	**5**	**5.0**	**5**	**5**
81	CZTS 105	GW513*	5	4	5	5	**4.8**	**5**	5
82	CZTS 106	HI1636*	5	4	4	5	**4.5**	**5**	4
83	CZTS 107	HI8832(d)[M]	5	5	4	4	**4.5**	**5**	5
84	CZTS 108	MACS6768	4	5	4	5	**4.5**	**5**	5
85	CZTS 109	HI1544 (C)	5	5	4	5	**4.8**	**5**	4
86	CZTS 110	HI1667[B]	5	4	4	5	**4.5**	**5**	4
87	CZTS 111	HI8498(d) (C)	4	4	4	5	**4.3**	**5**	4
88	CZTS 112	HI8713(d) (C)	5	5	4	5	**4.8**	**5**	4
89	CZTS 113	HI1650	5	5	4	5	**4.8**	**5**	4
90	CZLS 201	MP4010 (C)	5	5	4	5	**4.8**	**5**	4
91	CZLS 202	HD2864 (C)	5	5	4	5	**4.8**	**5**	5
92	CZLS 203	MP3336 (C)	5	5	5	5	**5.0**	**5**	4
93	CZLS 204	HD2932 (C)	5	5	4	4	**4.5**	**5**	5
94	CZLS 205	HI1634(I) (C)	5	5	4	5	**4.8**	**5**	4
95	CZLS 206	HD3407[M]	5	5	5	4	**4.8**	**5**	4
96	CZLS 207	CG1029(I) (C)	5	5	4	4	**4.5**	**5**	4
97	CZRI 301	HI8823(d)*	5	5	5	4	**4.8**	**5**	4
98	CZRI 302	GW528	5	5	4	5	**4.8**	**5**	5
99	CZRI 303	DDW47(d) (C)	4	3	4	5	**4.0**	**5**	5
100	CZRI 304	DBW326	5	5	4	5	**4.8**	**5**	4
100A	**INFECTOR**		**5**	**5**	**4**	**4**	**4.5**	**5**	**5**
101	CZRI 305	UAS475(d)	5	4	4	5	**4.5**	**5**	4
102	CZRI 306	HI8627(d) (C)	5	4	4	5	**4.5**	**5**	5
103	CZRI 307	NIAW3851	5	4	4	5	**4.5**	**5**	4
104	CZRI 308	HI8830(d)	3	3	4	5	**3.8**	**5**	4
105	CZRI 309	CG1036	4	4	4	5	**4.3**	**5**	5
106	CZRI 310	HI1655	4	4	4	5	**4.3**	**5**	5
107	CZRI 311	DBW110 (C)	5	4	3	5	**4.3**	**5**	3
108	CZRI 312	MP3288 (C)	5	5	5	5	**5.0**	**5**	4
109	CZRI 313	DDW55(d)	5	5	4	5	**4.8**	**5**	4
IV. Peninsular Zone (PZ)									
110	PZTS 101	WHD965(d)	5	4	4	5	**4.5**	**5**	4
111	PZTS 102	UAS428(d) (C)	5	4	4	5	**4.5**	**5**	5
112	PZTS 103	HI8826(d)	5	5	4	5	**4.8**	**5**	5
113	PZTS 104	MACS4100(d)	5	4	5	5	**4.8**	**5**	5
114	PZTS 105	MACS3949(d) (C)	5	5	4	5	**4.8**	**5**	4
115	PZTS 106	DDW53(d)	4	5	4	5	**4.5**	**5**	5
116	PZTS 107	NIDW1345(d)	5	5	4	4	**4.5**	**5**	4
117	PZTS 108	MACS6222 (C)	5	5	4	4	**4.5**	**5**	4

118	PZTS 109	MACS4106(d)	4	5	5	5	**4.8**	**5**	4
119	PZTS 110	NIDW1348(d)	5	5	5	5	**5.0**	**5**	5
120	PZTS 111	HI8828(d)	5	5	4	5	**4.8**	**5**	5
120A	**INFECTOR**		**5**	**5**	**5**	**5**	**5.0**	**5**	**5**
121	PZTS 112	GW322 (C)	5	5	4	5	**4.8**	**5**	5
122	PZTS 113	HI8827(d)	5	5	4	5	**4.8**	**5**	5
123	PZTS 114	DDW48(d)(I) (C)	5	5	5	5	**5.0**	**5**	4
124	PZLS 201	HD3090 (C)	5	4	4	5	**4.5**	**5**	4
125	PZLS 202	HI1633(I) (C)	5	5	4	5	**4.8**	**5**	4
126	PZLS 203	HD2932 (C)	5	4	4	5	**4.5**	**5**	5
127	PZLS 204	RAJ4083 (C)	4	3	3	5	**3.8**	**5**	4
128	PZLS 205	DBW320	5	5	4	5	**4.8**	**5**	4
129	PZLS 206	MACS6774	3	3	4	5	**3.8**	**5**	4
130	PZLS 207	NWS2180[#]	5	5	4	5	**4.8**	**5**	5
131	PZLS 208	HI1651	5	5	4	5	**4.8**	**5**	4
132	PZRI 301	MP1358*	5	5	4	5	**4.8**	**5**	5
133	PZRI 302	MACS6755	5	5	4	5	**4.8**	**5**	5
134	PZRI 303	HI1605 (C)	5	5	4	5	**4.8**	**5**	4
135	PZRI 304	MACS6753	4	5	5	5	**4.8**	**5**	5
136	PZRI 305	AKDW2997-16(d) (C)	4	5	5	5	**4.8**	**5**	5
137	PZRI 306	NIDW1149(d)(I) (C)	5	5	5	5	**5.0**	**5**	5
138	PZRI 307	NIAW3170 (C)	4	5	4	5	**4.5**	**5**	4
139	PZRI 308	UAS446(d) (C)	5	5	4	5	**4.8**	**5**	4
140	PZRI 309	DBW325	5	5	3	5	**4.5**	**5**	4
140A	**INFECTOR**		**5**	**5**	**5**	**4**	**4.8**	**5**	**5**
141	PZRI 310	UAS3014	5	5		5	**5.0**	5	4
V. Special Trial (Dicoccum)									
142	SPL-DIC 101	MACS5058	5	5	4	5	**4.8**	**5**	5
143	SPL-DIC 102	MACS6222(*a*) (C)	5	5	4	5	**4.8**	**5**	5
144	SPL-DIC 103	DDK1029 (C)	5	5	5	5	**5.0**	**5**	5
145	SPL-DIC 104	DDK1061	5	5	5	5	**5.0**	**5**	5
146	SPL-DIC 105	HW1098 (C)	4	5	5	5	**4.8**	**5**	5
147	SPL-DIC 106	MACS5057	4	5	5	5	**4.8**	**5**	4
148	SPL-DIC 107	DDK1060	5	5	5	5	**5.0**	**5**	4
VII. Special Trial (SPL-HYPT)									
149	SPL-HYPT 101	DBW328*	5	3	4	4	**4.0**	**5**	4
150	SPL-HYPT 102	DBW372	5	4	5	5	**4.8**	**5**	5
151	SPL-HYPT 103	DBW370	5	4	5	5	**4.8**	**5**	5
152	SPL-HYPT 104	DBW327*	5	4	5	5	**4.8**	**5**	5
153	SPL-HYPT 105	WH1252*	5	5	5	5	**5.0**	**5**	5
154	SPL-HYPT 106	PBW874	5	5	4	5	**4.8**	**5**	5
155	SPL-HYPT 107	HD3410	4	5	4	5	**4.5**	**5**	5
156	SPL-HYPT 108	DBW332*	4	5	4	5	**4.5**	**5**	5
157	SPL-HYPT 109	PBW873	3	5	4	5	**4.3**	**5**	4
158	SPL-HYPT 110	DBW371	4	5	5	5	**4.8**	**5**	5
159	SPL-HYPT 111	HD3086 (C)	4	4	5	5	**4.5**	**5**	5
160	SPL-HYPT 112	DBW333*	5	4	4	4	**4.3**	**5**	5
160A	**INFECTOR**		**5**	**5**	**5**	**4**	**4.8**	**5**	**5**
161	SPL-HYPT 113	PBW872	5	4	3	5	**4.3**	**5**	5
162	SPL-HYPT 114	DBW187(I) (C)	5	4	4	5	**4.5**	**5**	4
163	SPL-HYPT 115	WH1270(I) (C)	4	4	5	5	**4.5**	**5**	5
164	SPL-HYPT 116	DBW303(I) (C)	5	4	5	5	**4.8**	**5**	5
VII. Special Trial (CI – HYT)									
165	HYT 201	HD3412	5	5	4	5	**4.8**	**5**	5
166	HYT 202	DBW375	5	4	5	5	**4.8**	**5**	5
167	HYT 203	DBW374	5	5	5	5	**5.0**	**5**	5
168	HYT 204	HD3403	5	4	5	5	**4.8**	**5**	5
169	HYT 205	WH1406	5	5	5	5	**5.0**	**5**	5

170	HYT 206	HD3413	5	5	4	4	**4.5**	**5**	5
171	HYT 207	PBW867	5	5	4	4	**4.5**	**5**	5
172	HYT 208	UP3096	5	5	5	4	**4.8**	**5**	5
173	HYT 209	WH1404	5	5	5	4	**4.8**	**5**	3
174	HYT 210	PBW868	4	4	4	4	**4.0**	**4**	5
175	HYT 211	DBW318	4	4	4	4	**4.0**	**4**	5
176	HYT 212	DBW378	3	4	5	4	**4.0**	**5**	5
177	HYT 213	WH1405	4	4	5	4	**4.3**	**5**	4
178	HYT 214	HD3405	5	4	4	5	**4.5**	**5**	5
179	HYT 215	DBW377	5	4	4	5	**4.5**	**5**	4
180	HYT 216	PBW869	5	5	5	5	**5.0**	**5**	5
180A	**INFECTOR**		**5**	**5**	**5**	**5**	**5.0**	**5**	**5**
181	HYT 217	PBW871	5	5	5	5	**5.0**	**5**	5
182	HYT 218	HD3086 (C)	5	4	5	5	**4.8**	**5**	5
183	HYT 219	DBW376	5	4	4	4	**4.3**	**5**	5
184	HYT 220	DBW373	5	4	3	4	**4.0**	**5**	5
185	HYT 221	HD3404	5	4	5	4	**4.5**	**5**	5
186	HYT 222	DBW187(I) (C)	5	4	4	4	**4.3**	**5**	4
187	HYT 223	WH1407	5	5	4	4	**4.5**	**5**	5
188	HYT 224	PBW870	5	5	4	4	**4.5**	**5**	5
189	HYT 225	UP3095	5	5	4	4	**4.5**	**5**	5
VIII. Special Trial (AST – HYT)									
190	SPL-AST 101	DBW368	4	3	4	5	**4.0**	**5**	5
191	SPL-AST 102	DBW363	4	3	4	5	**4.0**	**5**	5
192	SPL-AST 103	DBW369	5	3	4	5	**4.3**	**5**	5
193	SPL-AST 104	DBW367	5	3	5	5	**4.5**	**5**	4
194	SPL-AST 105	DBW364	5	3	5	5	**4.5**	**5**	5
195	SPL-AST 106	Kharchia 65 (C)	5	4	4	5	**4.5**	**5**	5
196	SPL-AST 107	DBW366	5	3	3	5	**4.0**	**5**	5
197	SPL-AST 108	KRL210 (C)	5	4	3	5	**4.3**	**5**	5
198	SPL-AST 109	DBW365	5	3	4	5	**4.3**	**5**	4
199	SPL-AST 110	K1805	5	4	4	5	**4.5**	**5**	5
200	SPL-AST 111	KRL19 (C)	5	4	3	5	**4.3**	**5**	5
200A	**INFECTOR**		**5**	**5**	**5**	**5**	**5.0**	**5**	**5**

Table A1-10.1c: Screening of NIVT lines against foliar wheat aphids (Year-2020-21)

NIVT No.	Entry code	Entry	Foliar aphid score (1-5 scale)				
			Ludhiana	Karnal	Niphad	Average Score	Highest Score
NIVT-1A							
1	N-101	HD2967 (C)	5	5	3	4.3	5
2	N-102	HD3389	5	4	3	4.0	5
3	N-103	DBW222 (C)	5	4	3	4.0	5
4	N-104	PBW850	5	4	3	4.0	5
5	N-105	K2001	5	4	3	4.0	5
6	N-106	RAJ4555	5	4	3	4.0	5
7	N-107	DBW344	5	3	3	3.7	5
8	N-108	PBW853	5	4	3	4.0	5
9	N-109	RAJ4556	5	4	3	4.0	5
10	N-110	DBW342	5	3	3	3.7	5
11	N-111	UP3080	5	5	3	4.3	5
12	N-112	UP3082	5	5	3	4.3	5
13	N-113	PBW852	4	4	3	3.7	4
14	N-114	DBW362	5	3	4	4.0	5
15	N-115	HD3386	5	5	4	4.7	5

16	N-116	PBW851	5	5	5	5.0	5
17	N-117	DBW346	5	4	5	4.7	5
18	N-118	DBW187 (C)	5	4	4	4.3	5
19	N-119	DBW345	5	4	4	4.3	5
20	N-120	WH1294	5	5	4	4.7	5
20A	**INFECTOR**	**INFECTOR**	**5**	**5**	**5**	**5.0**	**5**
21	N-121	HD3387	5	5	3	4.3	5
22	N-122	UP3083	5	5	3	4.3	5
23	N-123	UP3081	5	5	4	4.7	5
24	N-124	NW8012	5	5	4	4.7	5
25	N-125	DBW343	5	4	4	4.3	5
26	N-126	KRL1914	5	4	4	4.3	5
27	N-127	HUW844	5	4	4	4.3	5
28	N-128	WH1293	4	4	3	3.7	4
29	N-129	RAJ4557	4	4	3	3.7	4
30	N-130	WH1292	4	4	3	3.7	4
31	N-131	JAUW691	5	5	4	4.7	5
32	N-132	HD3388	5	5	4	4.7	5
33	N-133	PBW849	5	5	3	4.3	5
34	N-134	TAW123	5	5	3	4.3	5
35	N-135	HD3385	5	5	3	4.3	5
36	N-136	HD3086 (C)	5	5	3	4.3	5
NIVT-1B							
37	N-201	KRL1912	5	3	3	3.7	5
38	N-202	K2005	5	5	4	4.7	5
39	N-203	DBW347	5	3	5	4.3	5
40	N-204	RAJ4559	5	5	5	5.0	5
40A	**INFECTOR**	**INFECTOR**	**5**	**5**	**5**	**5.0**	**5**
41	N-205	NW8017	5	5	4	4.7	5
42	N-206	TAW119	5	5	4	4.7	5
43	N-207	DBW222 (C)	5	5	4	4.7	5
44	N-208	NW8013	4	5	4	4.3	5
45	N-209	K2003	5	5	4	4.7	5
46	N-210	UP3084	4	5	4	4.3	5
47	N-211	DBW349	5	3	4	4.0	5
48	N-212	WH1295	5	5	4	4.7	5
49	N-213	PBW856	5	5	3	4.3	5
50	N-214	NW8019	5	5	4	4.7	5
51	N-215	HD3390	5	4	4	4.3	5
52	N-216	PBW854	5	5	4	4.7	5
53	N-217	WH1296	5	5	3	4.3	5
54	N-218	JKW287	4	5	4	4.3	5
55	N-219	HD2967 (C)	5	5	4	4.7	5
56	N-220	RAJ4558	5	5	3	4.3	5
57	N-221	PBW855	5	5	3	4.3	5
58	N-222	DBW187 (C)	5	4	4	4.3	5
59	N-223	HD3417	5	4	4	4.3	5
60	N-224	HD3391	5	4	5	4.7	5
60A	**INFECTOR**	**INFECTOR**	**5**	**5**	**5**	**5.0**	**5**
61	N-225	DBW348	5	3	3	3.7	5
62	N-226	BRW3902	5	5	4	4.7	5
63	N-227	JKW282	5	5	3	4.3	5
64	N-228	HUW845	5	4	4	4.3	5
65	N-229	DBW350	4	3	4	3.7	4
66	N-230	HD3086 (C)	5	4	4	4.3	5
67	N-231	BRW3895	5	5	4	4.7	5
68	N-232	AAI-W70	4	5	4	4.3	5
69	N-233	HD3416	4	4	4	4.0	4

70	N-234	UP3085	5	5	4	4.7	5
71	N-235	HUW846	5	5	3	4.3	5
72	N-236	K2004	5	5	4	4.7	5
NIVT-2							
73	N-301	MACS6478 (C)	5	4	4	4.3	5
74	N-302	HI1657	5	5	4	4.7	5
75	N-303	CG1038	5	4	3	4.0	5
76	N-304	MACS6786	4	4	4	4.0	4
77	N-305	WSM109-4	4	5	4	4.3	5
78	N-306	MP1378	4	5	5	4.7	5
79	N-307	HI1660	5	5	4	4.7	5
80	N-308	RVW4348	5	5	4	4.7	5
80A	**INFECTOR**	**INFECTOR**	**5**	**5**	**5**	5.0	5
81	N-309	NIAW3924	5	4	4	4.3	5
82	N-310	NWS2194	5	3	3	3.7	5
83	N-311	GW529	4	5	3	4.0	5
84	N-312	GW533	4	5	3	4.0	5
85	N-313	MP3545	5	4	4	4.3	5
86	N-314	MACS6789	5	5	5	5.0	5
87	N-315	HI1544 (C)	3	3	4	3.3	4
88	N-316	DBW351	4	4	4	4.0	4
89	N-317	PWU6	5	4	4	4.3	5
90	N-318	RAJ4560	5	5	4	4.7	5
91	N-319	UAS3016	5	5	4	4.7	5
92	N-320	UP3086	5	5	3	4.3	5
93	N-321	MACS6785	5	5	4	4.7	5
94	N-322	DBW352	4	4	4	4.0	4
95	N-323	MACS6222 (C)	4	5	4	4.3	5
96	N-324	PBW857	5	5	4	4.7	5
97	N-325	RVW4343	5	5	4	4.7	5
98	N-326	MP1379	5	5	3	4.3	5
99	N-327	HI1656	5	4	4	4.3	5
100	N-328	HI1658	5	4	4	4.3	5
100A	**INFECTOR**	**INFECTOR**	**5**	**5**	**5**	**5.0**	**5**
101	N-329	NIAW3950	5	5	3	4.3	5
102	N-330	MACS6792	5	5	4	4.7	5
103	N-331	GW530	5	5	3	4.3	5
104	N-332	MP3552	5	5	4	4.7	5
105	N-333	GW322 (C)	5	5	4	4.7	5
106	N-334	HI1659	5	5	3	4.3	5
107	N-335	WH1297	4	5	3	4.0	5
108	N-336	UAS3015	5	5	4	4.7	5
NIVT-3A							
109	N-401	BRW3897	5	5	4	4.7	5
110	N-402	NW8004	5	5	4	4.7	5
111	N-403	PBW858	5	4	3	4.0	5
112	N-404	RAJ4561	4	4	4	4.0	4
113	N-405	K2007	4	4	4	4.0	4
114	N-406	HD3395	5	5	4	4.7	5
115	N-407	HD3394	5	4	3	4.0	5
116	N-408	UP3087	5	5	3	4.3	5
117	N-409	UP3089	5	5	3	4.3	5
118	N-410	PBW875	5	4	3	4.0	5
119	N-411	DBW357	5	4	4	4.3	5
120	N-412	DBW173 (C)	5	4	5	4.7	5
120A	**INFECTOR**	**INFECTOR**	**5**	**5**	**5**	**5.0**	**5**
121	N-413	DBW353	5	3	4	4.0	5
122	N-414	JKW285	5	4	4	4.3	5

123	N-415	UP3094	4	5	4	4.3	5
124	N-416	WH1298	4	5	4	4.3	5
125	N-417	DBW355	4	4	4	4.0	4
126	N-418	NW8022	5	4	4	4.3	5
127	N-419	RAJ4562	5	5	4	4.7	5
128	N-420	PBW861	5	5	4	4.7	5
129	N-421	WH1300	4	5	4	4.3	5
130	N-422	DBW356	5	3	4	4.0	5
131	N-423	PBW862	5	5	4	4.7	5
132	N-424	DBW107 (C)	5	4	3	4.0	5
133	N-425	PBW859	5	5	4	4.7	5
134	N-426	HD3392	5	4	3	4.0	5
135	N-427	PBW860	5	4	3	4.0	5
136	N-428	HUW847	4	5	3	4.0	5
137	N-429	RAJ4563	5	4	3	4.0	5
138	N-430	DBW354	5	4	3	4.0	5
139	N-431	HD3396	4	5	4	4.3	5
140	N-432	HI1563 (C)	5	5	4	4.7	5
140A	**INFECTOR**	**INFECTOR**	**5**	**5**	**5**	**5.0**	**5**
141	N-433	HD3393	5	4	4	4.3	5
142	N-434	UP3088	5	5	3	4.3	5
143	N-435	HD3059 (C)	5	5	4	4.7	5
144	N-436	WH1299	5	4	4	4.3	5
NIVT-3B							
145	N-501	LOK78	5	5	4	4.7	5
146	N-502	PBW863	5	5	3	4.3	5
147	N-503	GW531	5	5	3	4.3	5
148	N-504	MACS6793	5	5	3	4.3	5
149	N-505	HD2864 (C)	4	5	3	4.0	5
150	N-506	MP3541	5	4	4	4.3	5
151	N-507	MP3542	4	4	4	4.0	4
152	N-508	UAS3018	5	4	4	4.3	5
153	N-509	MACS6784	5	4	3	4.0	5
154	N-510	HI1664	4	4	3	3.7	4
155	N-511	DBW354	5	3	3	3.7	5
156	N-512	HI1661	5	4	3	4.0	5
157	N-513	AKAW5349	4	5	4	4.3	5
158	N-514	UAS3017	4	4	4	4.0	4
159	N-515	NIAW4028	5	5	4	4.7	5
160	N-516	GW534	5	4	4	4.3	5
160A	**INFECTOR**	**INFECTOR**	**5**	**5**	**5**	**5.0**	**5**
161	N-517	HI1663	5	4	4	4.3	5
162	N-518	MACS6779	5	5	3	4.3	5
163	N-519	WH1401	4	5	3	4.0	5
164	N-520	HI1662	4	4	3	3.7	4
165	N-521	CG1039	4	5	3	4.0	5
166	N-522	NIAW3923	5	5	3	4.3	5
167	N-523	MP1380	5	4	3	4.0	5
168	N-524	HD2932 (C)	5	5	4	4.7	5
169	N-525	GW535	5	5	3	4.3	5
NIVT-4							
170	N-601	MACS3949 (C)	5	4	4	4.3	5
171	N-602	HI8835	5	5	5	5.0	5
172	N-603	DDW57	5	3	5	4.3	5
173	N-604	PDW361	4	5	5	4.7	5
174	N-605	MACS4111	4	5	5	4.7	5
175	N-606	GW1357	4	5	5	4.7	5
176	N-607	HI8737 (C)	5	5	5	5.0	5

177	N-608	HI8713 (C)	5	5	4	4.7	5
178	N-609	MPO1383	5	4	4	4.3	5
179	N-610	MPO1382	5	4	4	4.3	5
180	N-611	NIDW1399	5	4	5	4.7	5
180A	**INFECTOR**	**INFECTOR**	**5**	**5**	**5**	**5.0**	**5**
181	N-612	NIDW1405	5	5	5	5.0	5
182	N-613	PWU10	5	5	5	5.0	5
183	N-614	UAS476	5	4	5	4.7	5
184	N-615	MPO1381	5	4	5	4.7	5
185	N-616	UAS477	5	5	5	5.0	5
186	N-617	WHD966	5	4	4	4.3	5
187	N-618	MACS4110	4	5	4	4.3	5
188	N-619	HI8838	4	4	3	3.7	4
189	N-620	HI8837	5	4	3	4.0	5
190	N-621	GW1358	4	4	3	3.7	4
191	N-622	PBND1625-01	5	4	3	4.0	5
192	N-623	HI8834	5	5	3	4.3	5
193	N-624	HI8836	5	5	3	4.3	5
194	N-625	DDW56	4	3	4	3.7	4
NIVT-5A							
195	N-701	HD3398	5	4	5	4.7	5
196	N-702	HI1612 (C)	4	4	4	4.0	4
197	N-703	DBW358	4	3	4	3.7	4
198	N-704	WH1402	5	4	3	4.0	5
199	N-705	PBW864	4	4	3	3.7	4
200	N-706	K1317 (C)	4	4	3	3.7	4
200A	**INFECTOR**	**INFECTOR**	**5**	**5**	**5**	**5.0**	**5**
201	N-707	DBW359	5	4	5	4.7	5
202	N-708	PBW866	5	4	4	4.3	5
203	N-709	HUW848	5	4	3	4.0	5
204	N-710	PBW865	5	5	4	4.7	5
205	N-711	DBW360	5	4	4	4.3	5
206	N-712	BRW3901	5	5	3	4.3	5
207	N-713	UP3090	5	5	4	4.7	5
208	N-714	HD3418	5	5	5	5.0	5
209	N-715	DBW361	4	4	4	4.0	4
210	N-716	JAUW694	4	4	4	4.0	4
211	N-717	HD3400	5	5	4	4.7	5
212	N-718	K2010	4	4	4	4.0	4
213	N-719	PBW644 (C)	4	4	5	4.3	5
214	N-720	UP3091	5	5	4	4.7	5
215	N-721	WH1403	4	5	3	4.0	5
216	N-722	HD3399	4	4	3	3.7	4
217	N-723	WH1142 (C)	5	5	3	4.3	5
218	N-724	NW8010	5	5	3	4.3	5
219	N-725	HD3397	5	5	4	4.7	5
NIVT-5B							
220	N-801	HI1666	5	4	4	4.3	5
220A	**INFECTOR**	**INFECTOR**	**5**	**5**	**5**	**5.0**	**5**
221	N-802	GW528	5	4	5	4.7	5
222	N-803	DBW358	5	4	5	4.7	5
223	N-804	MPO1376(d)	5	5	4	4.7	5
224	N-805	DDW58(d)	5	4	4	4.3	5
225	N-806	GW532	5	5	4	4.7	5
226	N-807	MACS6795	5	5	4	4.7	5
227	N-808	CG1040	4	4	3	3.7	4
228	N-809	AKAW5351	3	3	4	3.3	4
229	N-810	HI8839(d)	4	4	4	4.0	4

230	N-811	MACS4107(d)	5	5	3	4.3	5
231	N-812	DBW359	5	4	4	4.3	5
232	N-813	MP1377	5	5	5	5.0	5
233	N-814	MP3544	5	5	5	5.0	5
234	N-815	UAS446(d) (C)	4	4	4	4.0	4
235	N-816	NIAW3922	5	5	4	4.7	5
236	N-817	DBW110 (C)	4	3	4	3.7	4
237	N-818	HI1665	5	5	3	4.3	5
238	N-819	NIAW4028	4	4	3	3.7	4
239	N-820	HI1605 (C)	5	4	4	4.3	5
240	N-821	HI8840(d)	4	4	4	4.0	4
240A	**INFECTOR**	**INFECTOR**	**5**	**5**	**5**	**5.0**	**5**
241	N-822	UAS3019	5	4	4	4.3	5
242	N-823	HD3401	5	4	4	4.3	5
243	N-824	GW1359(d)	5	4	4	4.3	5
244	N-825	HI8627(d) (C)	5	4	4	4.3	5
IVT-NHZ							
245	NHLSZ 2001	HS685	4	4	3	3.7	4
246	NHLSZ 2002	UP3093	4	5	4	4.3	5
247	NHLSZ 2003	VL3026	5	3	3	3.7	5
248	NHLSZ 2004	HPW481	5	4	3	4.0	5
249	NHLSZ 2005	HPW480	5	4	4	4.3	5
250	NHLSZ 2006	HS686	4	4	4	4.0	4
251	NHLSZ 2007	VL3027	5	3	3	3.7	5
252	NHLSZ 2008	VL892 (C)	5	3	3	3.7	5
253	NHLSZ 2009	HS687	4	4	3	3.7	4
254	NHLSZ 2010	VL3025	4	3	3	3.3	4
255	NHLSZ 2011	HS490 (C)	4	4	3	3.7	4
256	NHIVT 2001	HS683	5	4	3	4.0	5
257	NHIVT 2002	HPW479	5	4	3	4.0	5
258	NHIVT 2003	HS507 (C)	5	4	3	4.0	5
259	NHIVT 2004	HS682	5	4	4	4.3	5
260	NHIVT 2005	HPW476	5	4	4	4.3	5
260A	**INFECTOR**	**INFECTOR**	**5**	**5**	**5**	**5.0**	**5**
261	NHIVT 2006	HS562 (C)	5	4	4	4.3	5
262	NHIVT 2007	HPW477	4	5	3	4.0	5
263	NHIVT 2008	HPW478	5	4	3	4.0	5
264	NHIVT 2009	HD3402	5	5	4	4.7	5
265	NHIVT 2010	VL2044	5	3	5	4.3	5
266	NHIVT 2011	SKW358	5	4	5	4.7	5
267	NHIVT 2012	HS684	5	5	4	4.7	5
268	NHIVT 2013	VL2045	5	3	4	4.0	5
269	NHIVT 2014	UP3092	5	5	4	4.7	5
270	NHIVT 2015	VL2043	4	3	4	3.7	4
271	NHIVT 2016	VL2046	5	3	4	4.0	5
271A	**INFECTOR**	**INFECTOR**	**5**	**5**	**5**	**5.0**	**5**

Table A2-10.1a: Screening of MPSN nursery against shoot fly and brown wheat mite (Year-2020-21)

MDSN No.	Entry	Shoot fly incidence (%)		Average score	No. of brown wheat mites/10 cm sq area
Sources : EPPSN 2019-20		Ludhiana	Dhardwad		Ludhiana
A. Resistant to all three rusts					
1	NIDW1158(d)	5.38	2.4	3.9	10.67
2	HI8811(d)	6.27	3.3	4.8	12
3	HI8812(d)	5.43	5.9	5.7	6.67
4	GW1348(d)	5.99	7.5	6.7	10.67
5	PBW822	6.48	3.3	4.9	12.33
6	DDW 48(d)	7.16	6.9	7.0	12
7	DDW 47(d)	6.22	1.7	4.0	11.67
8	HI8808(d)	6.69	2.5	4.6	12
9	HI8807(d)	7.01	1.4	4.2	12.33
10	PBW823	6.41	1.2	3.8	12.67
11	NIDW1149(d)	6.29	7.3	6.8	12.33
12	HI8802(d)	7.05	4.2	5.6	11.33
13	WH1270	5.24	0.5	2.9	12
14	PWB 825	4.37	2.4	3.4	8
15	VL 3020	6.37	1.4	3.9	13.33
16	VL 3021	5.33	1.7	3.5	13
17	PBW 796	6.12	3.4	4.8	10
18	PBW 820	6.23	0.7	3.5	11.67
B. Resistant to Stem and Leaf rusts					
19	HPW 467	5.85	1.3	3.6	12.67
20	PBW 771	4.77	0.0	2.4	11.67
20A	GW 173	x	9.3	9.3	x
20B	IWP 72	x	9.2	9.2	19.00
20C	Sonalika	8.08	5.2	6.6	x
20D	A-9-30-1	x	4.1	4.1	x
21	HD 3249	5.75	3.7	4.7	12.33
22	DBW 303	5.91	5.2	5.6	9.67
23	DBW 302	6.48	5.6	6.0	12.33
24	PBW 550	5.36	6.2	5.8	14
25	HI 1628	5.18	8.2	6.7	10
26	DBW 277	6.02	8.1	7.1	10.33
27	CG 1029	6.68	4.8	5.7	11.67
28	HI 1633	4.94	3.7	4.3	11
29	HI 1634	6.07	8.5	7.3	11.33
30	GW 509	5.94	7.5	6.7	11
31	GW 1346	5.31	13.9	9.6	9.33
32	MACS 5052	7.76	0.0	3.9	7.33
33	DDK 1056	6.25	0.0	3.1	10.33
34	DDK 1057	6.12	3.3	4.7	10
35	DBW 304	7.37	3.4	5.4	15
C. Resistant to Leaf and Stripe rusts					
36	PBW 752	6.83	8.0	7.4	9.67
37	UP 3043	6.46	2.5	4.5	12.33
RESISTANT TO STEM AND STRIPE RUSTS					
38	PBW 821	6.91	8.6	7.7	10.33
39	HI 8805(d)	5.88	4.7	5.3	12
40	WHD 963(d)	7.16	6.6	6.9	12

Table A2-10.1b: Screening of MPSN nursery against foliar aphid and root aphid (Year-2020-21)

MDSN No.	Entry	Foliar aphid score (1-5 scale)				Average score	Maximum Score	Root Aphid Score (1-5)
Sources : EPPSN 2019-20		**Ludhiana**	**Karnal**	**Vijapur**	**Niphad**			
A. Resistant to all three rusts								
1	NIDW1158(d)	5	5	4	5	4.8	5	4
2	HI8811(d)	5	4	3	5	4.3	5	5
3	HI8812(d)	5	4	5	4	4.5	5	4
4	GW1348(d)	5	3	3	4	3.8	5	5
5	PBW822	5	4	3	3	3.8	5	4
6	DDW 48(d)	4	3	4	4	3.8	4	5
7	DDW 47(d)	4	3	4	3	3.5	4	4
8	HI8808(d)	5	4	4	4	4.3	5	5
9	HI8807(d)	5	4	4	4	4.3	5	5
10	PBW823	5	5	4	4	4.5	5	5
11	NIDW1149(d)	5	4	4	5	4.5	5	5
12	HI8802(d)	5	5	4	4	4.5	5	5
13	WH1270	5	5	4	4	4.5	5	5
14	PWB 825	5	5	3	5	4.5	5	5
15	VL 3020	5	4	5	3	4.3	5	4
16	VL 3021	5	5	4	3	4.3	5	4
17	PBW 796	5	5	4	3	4.3	5	3
18	PBW 820	5	5	3	3	4.0	5	4
B. Resistant to Stem and Leaf rusts								
19	HPW 467	5	4	4	3	4.0	5	4
20	PBW 771	5	4	4	4	4.3	5	4
20A	GW 173	x	5	5	5	5.0	5	5
20B	IWP 72	x	5	5	5	5.0	5	x
20C	Sonalika	x	5	5	5	5.0	5	x
20D	A-9-30-1	5	5	4	5	4.8	5	x
21	HD 3249	5	4	4	3	4.0	5	5
22	DBW 303	5	3	3	4	3.8	5	5
23	DBW 302	4	3	4	4	3.8	4	5
24	PBW 550	4	3	5	4	4.0	5	4
25	HI 1628	5	4	4	4	4.3	5	3
26	DBW 277	5	3	4	4	4.0	5	4
27	CG 1029	5	4	2	3	3.5	5	4
28	HI 1633	5	4	4	3	4.0	5	4
29	HI 1634	5	5	4	4	4.5	5	4
30	GW 509	4	5	4	4	4.3	5	5
31	GW 1346	3	5	3	3	3.5	5	5
32	MACS 5052	5	3	3	3	3.5	5	5
33	DDK 1056	5	3	4	3	3.8	5	4
34	DDK 1057	5	3	4	3	3.8	5	4
35	DBW 304	5	3	3	3	3.5	5	4
C. Resistant to Leaf and Stripe rusts								
36	PBW 752	5	5	3	5	4.5	5	5
37	UP 3043	5	5	5	5	5.0	5	5
RESISTANT TO STEM AND STRIPE RUSTS							0	
38	PBW 821	5	4	4	3.0	4.0	5	4
39	HI 8805(d)	4	5	3	3.0	3.8	5	4
40	WHD 963(d)	5	5	4	3.0	4.3	5	5

10.2 (B) INTEGRATED PEST MANAGEMENT

B1: Survey and surveillance of insect-pests and their natural enemies in wheat and barley cropping systems *(All centres)*

Roving surveys wewre carried out at fortnightly intervals during the cropping season in wheat and barley crops for insect-pests and their natural enemies. Population and damage levels of different insect-pests was recorded and indicated as grades or percent damage inflicted to crop. The peak period of pest activity and its severity of damage were also recorded.

Centre: Ludhiana

In order to monitor the insect pest of wheat, survey of Punjab state were undertaken during 2020-21 crop season. The aphid incidence was above economic threshold level in some places viz. village Jodhan (Ludhiana) and Kattu Balian & Sangatpura (Sangrur) during the last week of February. The natural enemies viz. grubs and adults of coccinellid beetles, syrphid fly and chrysoperla were observed in some of the fields infested with aphids. Intensive surveys were carried out in the months of November-December in to monitor the pest prevalence in residue managed wheat fields. No serious infestation of pink stem borer or armyworm was observed during 2020-21 crop year except few minor infestations. Minor incidence of pink stem borer (less than 1 %) was also observed in one Happy Seeder sown wheat field in village Sanghera (Barnala).

Centre: Niphad

The data regarding survey of the pest infesting wheat and their natural enemies are presented in (Table B1-10.2a). Survey was carried out in the villages of Nashik and adjoining district Ahemednagar and Aurangabad also part of Beed and Parbhani Districts at different crop stages. Heavy incidence of aphids was recorded during the servey. The Coccinellid & Chrysoparla carnia predator, grubs and beetles feeding on the aphid were also observed. The incidence of jassids was recorded in medium intensity.

Centre: Vijapur

Survey of wheat & barley fields were carried out during the *Rabi* 2020-21 crop season. The termite damage in wheat fields was negligible in the fields across the area surveyed. The incidence of aphid was observed moderate during ear head stage of the crop. The population of *H. armigera*, pink stem borer and surface grasshopper were not observed. Besides, in barley fields the aphid population was moderate to high. Among natural enemies, predators like coccinellid beetles, chrysoperla and syrphid fly were noticed predating on wheat and barley aphids.

Centre: Kanpur

In Kanpur, survey was conducted in village viz., Araul, Magharwara, Kundi, Devpura, Jahanabad and Daleep Nagar during 2020-21. Incidence of shootfly was recorded to be 1 per cent for wheat variety HD2967, K1006, and PBW343 while it was13.3% on PBW343 in village Daleep Nagar. The incidence of termite was observed 10 per cent wheat variety HD2967 of wheat in Magharwara, Kundi, Devpura and Jahanabad. Moderate infestation (20-35 aphid/tiller) of foliar aphid was on barley variety namely, 'Barley Local' while the shootfly infestation was observed 1.66% at the village Araul (Kanpur). The moderate incidence of pink stem borer was observed in irrigated crop one per cent in variety HD-2967(Table B1-10.2b).

Centre: Karnal

In Haryana, survey was conducted field season from December -March in Yamunanagar, Ambala, Krushestra, Kunjpura, Ladwa etc. This year incidence of aphids, termites, pink stem borer and army worm was reported to be lower side as compared to 2019-20 season. Termites and root aphid was reported to be around 1-3% during November and December. Aphid infestation started appearing in the month of January and the population in the beginning was around 2-3 aphids/tiller but in February, higher infestation of aphids (25-55 aphids/tiller on an average) was observed in the fields. Natural enemies, wasps, spiders and the grubs and adults of coccinellid beetles were seen during February and March frequently in the fields.

Table B1-10.2a: Survey of wheat and barley pests and their natural enemies during 2020-21 (Centre: Niphad)

Locality and date of visit	Rainfed / Irrigated	No. of samples	Variety and stage of growth	Crop pest			Natural enemies	
				Name	Status	Intensity (Attack % damage or population)	Name	Stage Parastization / Predation
02/02/2021: Thengoda, Karanjal, Bhilwad, Mangi Tungi from Baglan tahasil of Nashik	Irrigated	5	LOK-1, Ajit 72 and Daptari from Private companies, Milking stages and Dough stage	Aphids Jassids, S. Borer	Major Minor Minor	Heavy Low very low	Coccinellids Beetles and *Chrysoperla carnea*	Adults, Larvae and Cacoons
03/02/2021: Karankheda, Rajapur, Nalave, Kolada, Sagaligaon(Khandbara) of Nandurbar District	Irrigated	6	GW 496, LOK-1, Ajit 72 CRI, Booting, flowering and Milking stages	Aphids Jassids, Stem Borer	Major Minor Minor	Heavy Low very low	Coccinellids Beetles and *Chrysoperla carnea*	Adults, Larvae and Cacoons
24/02/2021: Chinchakhed, Lokhandewadi, Jopul, Palkhed, Velkhed, Avankhed, Sagapada, Chausale, Chekhali, Sajola, Tirhal, Chankapur,, Abhona, Nanduri, Javakevani, Khedgaon, Mukhed, Anterveli from Tahasils, Niphad, Dindori and Surgana, Dist, Nashik	Irrigated	22	GW 496, Kedar Gold, Eagle, LOK-1, Ajit 72 and Daptari from Private companies, CRI, Booting, flowering and Milking stages	Aphids Jassids, Stem Borer	Major Minor Minor	Heavy Low very low	Coccinellids Beetles and *Chrysoperla carnea*	Adults, Larvae and Cacoons
02/03/2021: Rahatgaon(Tal. Paithan Dist.Aurangabad), Antarveli Sarathi, Bag Pimpalgaon, Ardhmasala, Sirasdevi (Tal. Gevarai Dist. Beed), Phule Pimpalgaon, Majalgaon, Ghalatvadi, Pathri, Mangrul(Tal. Majalgaon Dist. Beed)	Irrigated	14	GW 496, Kedar Gold, Eagle, LOK-1, Ajit 72 from Private companies, Booting, flowering, Milking and dough stages	Aphids Jassids, Stem Borer	Major Minor Minor	Heavy Low very low	Coccinellids Beetles and *Chrysoperla carnea*	Adults, Larvae and Cacoons
03/03/2021: Parbhani, Tamaswadi, Kumbharwadi, Madalmohi, Kharwandi from Parbhani, Beed and Ahmednagar dist.	Irrigated	5	GW 496, Kedar Gold, Eagle, LOK-1, Ajit 72 from Private companies, Milking and dough stages	Aphids Jassids, Stem Borer	Major Minor Minor	Heavy Low very low	Coccinellids Beetles and *Chrysoperla carnea*	Adults, Larvae and Cacoons

Table B1-10.2b: Survey of wheat and barley pests and their natural enemies during 2020-21 (Centre: Kanpur)

Locality and date of visit	Rainfed / Irrigated	No. of samples	Variety and stage of growth	Crop pest			Natural enemies	
				Name	Status	Intensity (Attack % damage or population)	Name	Stage Parastization / Predation
25.01.2021 Araul (Kanpur)	Irrigated	10	HD2967, K1006	Pink stem borer	Minor	1.0%	-	-
	Irrigated	10	HD2967, K1006	Shootfly	minor	1.66%	-	-
			Barley local	Barlay aphid	Major	35 aphids / p	*Coccinella-septumpuntata*	Adult
06.02.2021 Daleep Nagar (Kanpur Dehat)	Irrigated	10	PBW343 HUW 234	Termite	Major	13%	-	-
	Irrigated	10	HD2967,K1006	Pink stem borer	Minor	13.33%	-	-
			PBW343	Shootfly	Minor	13.33%	-	-
			K551	Barley aphid	Major	25-30 Aphids / p	*Coccinella-septumpuntata*	Adult
24.02.2021 Magharwara, Kundi,Devpura, Jahanabad	Irrigated	10	HD2967	Termite	Major	10%	-	-
	Irrigated	10	HD2967	Shootfly	Minor			
	Irrigated	10	K1055	Barley aphid	Major	1%	-	-
	Irrigated	10	HD2967	Pink stemborer	Minor	25-30 Aphids / p	*Coccinella-septumpuntata*	Adult
						1%		
25.01.2021 Araul (Kanpur)	Irrigated	10	HD2967, K1006	Pink stem borer	Minor	1.0%	-	-
	Irrigated	10	D2967,K1006 Barley local	Shootfly	minor	1.66%	-	-
				Barlay aphid	Major	35 aphids / p	*Coccinella-septumpuntata*	Adult

Table B1-10.2c: Survey of wheat insect- pests and their natural enemies during 2020-21 (Centre: Shillongani)

Locality, Variety and Sowing condition	Date	No. of samples	Stage of growth	Crop pest			Natural enemies	
				Name	Status	Intensity (Attack % damage or population)	Name	Stage of Parastization / Predation
L: Nambakalia, KarbiAnglong, Assam **V**: Var. Sonalika **C:** Irrigated	24.02.21	3	Vegetative	No severe pests	-	-	-	-
	17.03.21	3	Reproductive	Grain aphids Green stink bug	Negligible Negligible	< 5 aphid/shoot	*Micraspisdiscolor* *C. repanda*	Both aphid nymph and adults
	26.03.21	3	Reproductive	Grain aphid Stem borer Green stink bug Painted bug	Major Minor Minor Minor	> 21 aphids/shoot; around 12 % infestation 10-12% plant infested	*M. dicolor, C. repanda*	Both nymph and adults of aphid
L: Natunbasti, Karbi Anglong, Assam **V**: Var. Sonalika **C:** Irrigated	24.02.21	3	Vegetative	No major pests	-	-	-	-
	17.03.21	3	Reproductive	Grain aphid Stem borer	Minor Negligible	< 5 aphids/shoot	*M. discolor*, *C. repanda*	
	26.03.21	3	Reproductive	Grain aphid Painted bug Stem borer	Major Negligible Minor	> 21 aphids/plant; Around 15% plants infested 8% plant infested	*M. discolor, C. repanda*, Syrphid larvae	Both nymph and adults of aphids are eaten
L: Sampathar, Karbi Anglong, Assam **V**: Var. Sonalika **C:** Irrigated	24.02.21	3	Vegetative	No pest	-	-	-	-
	17.03.21	3	Reproductive	Stem borer Grain aphid	Minor Minor	Sporadic < 5 aphid/shoot		
	26.03.21	3	Reproductive	Grain aphid Stem borer Stink bug Painted bug	Major Major Minor Minor	> 21 aphid/plant; Around 15% plant infested 12% plants infested	*M. discolor, C. repanda, C. transversalis, C. septempunctata*, Syrphid larvae	All the predators feed on aphids' nymph and adult

Table B1-10.2d: Survey of wheat insect- pests and their natural enemies during 2020-21 (Centre: Durgapra)

Locality and date of visit	Rainfed / Irrigated	No. of samples	Variety and stage of growth	Crop pest			Natural enemies	
				Name	Status	Intensity (Attack % damage or population)	Name	Stage Parastization / Predation
Muhana, Teh. Sanganer 25.02.2021	Irrigated	10	Raj-3077 Ear Formation	Aphid	Nymph	8	Lady bird beetle	nymph/adult
				Mites	Adults	0	0	0
				Termite	Adult worker	2	0	0
Titariya,Teh.-Chaksu 05.03.2021	Irrigated	13	Raj-4037 Milky stage	Aphid	Nymph	4	Lady bird beetle	nymph/adult
				Mites	0	0	0	0
				Termite	Adult worker	8	0	Nil
Chandali, Teh.-Chaksu 13.03.2021	Irrigated	7	Raj-4037 dough stage	Aphid	0	0	Lady bird beetle	nymph/adult
				Mites	0	0	0	0
				Termite	Adult worker	5	0	0

B2. Influence of sowing time on the incidence and population build-up of major insect pest of wheat
(Centres: Ludhiana & Karnal)

Centre: Ludhiana: The field experiment on influence of sowing on insect pest incidence was conducted in the experimental area of Department of Plant Breeding and Genetics, PAU, Ludhiana. The PBW 725 variety was sown in Randomized Block Design at four different dates of sowing i.e. early (first fortnight of November), timely (second fortnight of November) and late (first fortnight of December) and very late (second fortnight of December) during 2020-21. Each treatment was replicated thrice. The data on major pest viz. foliage feeding aphids, termites and pink stem borer were recorded at peak period of activity of respective pest. The first incidence and population build of aphids were recorded by counting the number of aphids per tiller from randomly selected five tillers from each replicate during peak period of their activity in the months of February-March. The observation on termite damage was recorded by counting damaged and total tillers from one-meter row length. These observations were recorded from five different spots at weekly intervals from each plot at 3, 4 and 5 weeks after sowing (WAS). The relative abundance and damage of PSB in wheat was examined in a separate experiment and the crop was sown using Happy seeder. The observations on PSB damage was recorded by counting damaged and total tillers from one-meter row length. These observations were recorded from five different spots at weekly intervals from each plot starting from 3 weeks old crop.

1. **Termite damage**: The termite damage recorded at seedling stage in different dates of sowing indicated that early sown crop (first week of Nov 2020) suffered more termite damage as compared to timely, late and very late sown crop. At earing stage, again termite damage was highest (2.93%) in early sown crop followed by timely (2.60%) and late sown (2.37%) and very late sown (2.25%) crop.
2. **Aphid incidence**: The root aphid appeared in the early growing season and its attack was observed on 3-5 week old crop. Root aphid incidence in I, II, III and IV date of sowing crop ranged from 4.88-7.40, 3.52-5.68, 2.31-4.41 and 1.47-2.17 aphid/tiller. Foliar aphid incidence first appeared in first week of January in I, II, III sowing dates and second week of January in IV sowing time. The data recorded indicated that the aphid incidence got delayed with the delay in sowing time. The peak of aphid incidence was recorded in 9th standard meteorological weeks (SMW) of 2021 in I and II sowing date. However, it was 11th and 12th SMW for III and IV sowing time.
3. **Pink stem borer Damage**: The pink stem borer damage was higher in early (0.62-2.28 %) and timely sown (0.46-1.73 %) crop as compared to late (0.24-1.22 %) and very late sown crop (0.09-0.62 %). Overall, the pink stem borer incidence was comparatively less as compared to previous crop year.

Centre: Karnal: The experiment was conducted at Research farm of ICAR-IIWBR, Karnal under irrigated conditions.The wheat variety, HD 2967 was sown at four different dates of sowing at 15 days interval and no insecticide was applied for management of any insect-pest (Table B2-10.2b).

1. **Aphid incidence:** The data revealed indicated that the incidence of root aphids were first started appearing on wheat crop during 51st standard week. Root aphid incidence D1, D2, D3 and D4 date of sown crops ranged from 1.12-6.29, 2.41-4.57, 1.24-3.30 and 0.3-1.06 aphid/tiller. The incidence of foliar aphid first appeared in 5th standard week in D1, D2, & D3 sowing dates and during 6th standard week in D4 sowing time. The population reached to its peak during 9th Standard week on D1 (20.54 aphids/plant) and during 9th standard week on D2 sown crop (18.83 aphids/plant) in the month of February. In case of D3 (1st Dec.) and D4 (31 Dec.) sown crops, the aphid appeared during 5th and 6th standard weeks with incidence of 0.96 and 0.59 aphids/plant, respectively. The aphid population reached peaked during 11th & 12th standard weeks on D3 and D4 sown crops, respectively with aphid incidence as 19.64 and 18.95 aphids/plant, respectively (Table B2-11.2c).
2. **Termite damage:** The termite damage was first recorded at seedling stage on D1, D2, D3 and D4 sown crops with infestation of 3.14, 2.71, 2.4 and 1.92%, respectively during 51th standard week. The early sown crop (first week of Nov 2020) suffered more termite damage as compared to timely, late and very late sown crop.
3. **Pink stem borer damage:** The damage was first recorded at seedling stage 2.19, 1.64, 1.5 and 1.49% infesation on D1, D2, D3 and D4 date of sown crops, respectively during 51th standard week. The early sown crop (first week of Nov 2019) suffered more termite damage as compared to timely, late and very late sown crop Table B2-10.2b.

Table B2-10.2a: Effect of sowing dates on population build of major insect-pests in wheat during 2020-21 (Centre-Ludhiana)

Standard Weeks	Rain-fall (mm)	Temperature (^{0}C)		Relative humidity (%)		Mean Aphid incidence (Aphids/plant/tiller)				Termite damage (% affected tillers/meter row)				Pink stem borer damage (% affected tillers/meter row)			
		Max	Min	Max	Min	Ist DOS (1 Nov)	IInd DOS (16 Nov.)	IIIrd DOS (1Dec)	IVth DOS (16 Dec.)	Ist DOS (1 Nov)	IInd DOS (16 Nov.)	IIIrd DOS (1 Dec)	IVth DOS (16 Dec.)	Ist DOS (1 Nov)	IInd DOS (16 Nov.)	IIIrd DOS (1 Dec)	IVth DOS (16 Dec.)
50	4.2	90.0	64.0	17.4	9.3	-	-	-	-	-	-	-	-	-	-	-	-
51	0.0	91.0	39.0	18.6	3.5	7.40*	5.68*	4.41*	2.17*	4.21	3.82	3.55	3.03	2.28	1.73	1.00	0.60
52	18.0	96.0	63.0	15.8	4.2	6.29*	4.95*	2.64*	1.87*	3.89	3.66	3.28	2.99	-	-	-	-
1	11.0	91.0	75.0	17.6	10.0	4.88*	3.52*	2.31*	1.47*	3.46	3.20	2.85	2.47	1.76	1.44	1.22	0.62
2	0.0	93.0	71.0	14.0	6.8	0	0	0	0	-	-	-	-	-	-	-	-
3	0.0	96.0	70.0	16.6	6.9	0	0	0	0	-	-	-	-	0.62	0.46	0.24	0.09
4	0.0	93.0	55.0	17.9	6.4	0	0	0	0	-	-	-	-				
5	17.0	89.0	39.0	20.6	6.3	2.5	2	1.1	0	-	-	-	-				
6	0.0	95.0	58.0	21.3	7.3	5.6	4.2	2.4	1.7	-	-	-	-				
7	0.0	96.0	69.0	22.5	10.8	14.00	12.76	10.08	8.40	-	-	-	-				
8	0.0	96.0	47.0	26.8	11.6	14.62	12.59	10.82	9.80	2.93	2.60	2.37	2.25				
9	0.0	90.0	38.0	27.8	11.9	21.65	19.94	17.63	15.48	-	-	-	-				
10	0.0	80.0	42.0	29.7	15.3	15.22	19.27	17.32	13.00	-	-	-	-				
11	0	81.0	39.0	28.6	15.2	13.30	17.15	19.75	16.29	-	-	-	-				
12	5.0	84.0	35.0	29.1	15.2	11.57	14.14	16.10	20.06	-	-	-	-				
13	0.0	73.0	25.0	32.2	15.6	1.66	2.55	3.61	4.09	-	-	-	-				
14	3.0	55.0	16.0	32.2	14.6	0	0	0.7	1	-	-	-	-				

*** Root aphid/tiller**

Table B2-10.2b: Effect of sowing dates on population build of major insect-pests in wheat 2020-21 (Centre-Karnal)

Standard Weeks	Rain-fall (mm)	Temperature (^{0}C)		Relative humidity (%)		Mean Aphid incidence (Aphids/plant/tiller)				Termite damage (% affected tillers/meter row)				Pink stem borer damage (% affected tillers/meter row)			
		Max	Min	Max	Min	Ist DOS (1 Nov)	IInd DOS (16 Nov.)	IIIrd DOS (1Dec)	IVth DOS (16 Dec.)	Ist DOS (1 Nov)	IInd DOS (16 Nov.)	IIIrd DOS (1Dec)	IVth DOS (16 Dec.)	Ist DOS (1 Nov)	IInd DOS (16 Nov.)	IIIrd DOS (1 Dec)	IVth DOS (16 Dec.)
50	2.4	20.4	9.8	98.3	78.0	-	-	-	-	-	-	-	-	-	-	-	-
51	0.0	17.9	4.0	100.0	65.0	6.29*	4.57*	3.3*	1.06*	3.14	2.71	2.44	1.92	2.19	1.64	1.52	1.49
52	0.0	17.6	3.5	94.9	76.4	5.18*	3.84*	1.53*	0.76*	2.78	2.55	2.17	1.88	-	-	-	-
1	36.4	17.1	10.2	95.0	90.6	3.77*	2.41*	1.24*	0.36*	2.35	2.09	1.74	1.36	1.6	1.45	1.26	1.09
2	0.0	14.9	7.0	98.7	91.3	1.12*	0.00	0.00	0.00	3.23	2.71	2.44	1.92	0.78	0.67	0.45	0.28
3	0.0	16.7	7.7	99.6	88.1	0.00	0.00	0.00	0.00	-	-	-	-	-	-	-	-
4	0.0	17.4	6.2	100.0	92.4	0.00	0.00	0.00	0.00	-	-	-	-	-	-	-	-
5	14.0	20.1	6.0	97.4	62.3	1.39	0.89	0.96	0.00	-	-	-	-	-	-	-	-
6	5.4	20.7	6.5	100.0	68.0	4.49	3.09	1.29	0.59	-	-	-	-	-	-	-	-
7	0.0	22.7	9.1	100.0	69.7	12.89	11.65	8.97	7.29	1.82	1.49	1.26	1.14	-	-	-	-
8	0.0	25.4	10.8	100.0	69.7	13.51	11.48	9.71	8.69	2.56	2.45	2.85	2.29	-	-	-	-
9	4.4	27.7	12.0	95.0	73.4	20.54	18.83	16.52	14.37	-	-	-	-	-	-	-	-
10	2.0	29.2	14.0	97.9	64.4	14.11	18.16	16.21	11.89	-	-	-	-	-	-	-	-
11	1.0	29.6	13.2	94.6	59.0	12.19	16.04	18.64	15.18	-	-	-	-	-	-	-	-
12	1.0	29.3	14.7	89.4	63.3	10.46	13.03	14.99	18.95	-	-	-	-	-	-	-	-
13	0.0	32.7	14.3	84.3	35.0	0.55	1.44	2.53	2.98	-	-	-	-	-	-	-	-
14	0.0	34.8	14.2	56.7	21.9	0.00	0.00	0.85	0.00	-	-	-	-	-	-	-	-

*** Root aphid/till**

B3. Effect of zinc sulphate application alone or in combination with pesticides on aphid incidence in wheat (Centres: Ludhiana, Karnal & Niphad)

Treatment details:

S.N.	Treatments
1	RDF(Recommended date) of NPK
2	RDF(Recommended date) of NPK + One Foliar spray of $ZnSO_4$@0.5% at milk stage
3	RDF(Recommended date) of NPK + Two Foliar sprays of $ZnSO_4$@0.5% at flag leaf and milk stage
4	RDF(Recommended date) of NPK + One Foliar spray of $ZnSO_4$@0.5% at milk stage mixed with Actra 25 WG (thiamethxam) @ 50 g/ha
5	RDF(Recommended date) of NPK + Two Foliar sprays of $ZnSO_4$@0.5% at flag leaf and milk stage mixed with Actra 25 WG (thiamethoxam) @ 50 g/ha
6	RDF(Recommended date) of NPK + One Foliar spray of $ZnSO_4$@0.5% at milk stage mixed with Actra 25 WG (thiamethoxam) @ 50 g/ha and propiconazole @ 500 ml/ha
7	RDF(Recommended date) of NPK + Two Foliar sprays of $ZnSO_4$@0.5% at flag leaf and milk stage mixed with Actra 25 WG (thiamethoxam) @ 50 g/ha and propiconazole @ 500 ml/ha
8	Untreated control (No application)

Observations:

I	Aphid incidence at peak period of its activity
II	Nutrient status of soil before and after harvest
III	Nutrient status of plants and grains at harvest
IV	Yield attributes, Grain and biological yield

Centre: Ludhiana: Effect of soil as well as foliar application of zinc sulphate was tested to determine its effect on aphid abundance and their coccinellid predators in wheat. Soil application rate of zinc sulphate was kept as 25 kg/ha in all treatments. One and two foliar application of $ZnSO_4$ were made at flag leaf and milky grain stage @ 0.5% alone and in combination with thiamethoxam 25 WG @ 50 g/ha and propiconazole @ 500 ml/ha. Observations were recorded on population of aphids/tillers, coccinellid predators (adult and grubs) per plot and yield per treatment were recorded at the time of harvest. The observations indicated that one or two foliar applications of $ZnSo_4$ mixed with thiamethoxam effectively reduced the aphid population. Although some reduction in aphid control was observed when thiamethoxam was mixed with $ZnSo_4$ but statistically it was not different. Similarly, $ZnSo_4$ can also be mixed with propiconazole and thiamethoxam without any adverse affect on yield. Similarly, coccinellid population was also not adversely effected by application of one or two sprays of $ZnSo_4$ mixed with insecticides and fungicides at reproductive stages of crop. No visual symptoms of phyto-toxicity were observed in any treatment and it appears safe to wheat crop (Table B3-10.2a).

Centre: Karnal: The data revelaed that treatment of RDF of NPK + Two Foliar sprays of $ZnSO_4$@0.5% at flag leaf and milk stage mixed with thiamethoxam 25 WG @ 50 g/ha and propiconazole @ 500 ml/ha was most effective treatment in reducing the aphid population followed by treatment of RDF of NPK + one Foliar sprays of $ZnSO_4$@0.5% at flag leaf and milk stage mixed with thiamethoxam 25 WG @ 50 g/ha and propiconazole @ 500 ml/ha. Mixing $ZnSo_4$ can be done with propiconazole + thiamethoxam without any compatibility issues. No harmful effect was seen on the coccinellid predators by application of one or two sprays of $ZnSo_4$ mixed with insecticides and fungicides at reproductive stages of wheat crop. Higher yields were obtained from treatments of one or two sprays of ZnSo4 mixed with thiamethoxam (Table B3-10.2b).

Centre: Niphad: The data revealed that the application of recommended dose of fertilizer alone and of RDF with Zinc Sulphate foliar application also RDF with zinc sulphate mixed with systemic insecticide thiamethoxam 25 WG and fungicide propiconazole in wheat shows no significance on population of aphids at 30, 40 and 75 days after sowing but found significance over untreated control at 60 days after sowing, where all other treatments were found equally effective in controlling aphid population. The similar trend was observed in the cumulative average mean. The yield rage of 34.66 to 38.76 q/ha were recorded as compared to 33.07 q/ha in untreated control (Table B4-10.2c).

Table B3-10.2a: Effect of zinc sulphate application alone or in combination with pesticides on aphid incidence in wheat (Centre: Ludhiana)

T.no	Treatments	Number of aphids/ earhead				Number of coccinellids/m^2				Grain yield (q/ha)
		Before spray 1day	After spray			Before spray 1day	After spray			
			1 Day	2 Days	7 Days		1 Day	2 Days	7 Days	
1	RDF(Recommended date) of NPK	28.63	28.66	29.16	33.00	2.30	2.42	2.29	2.26	50.22
2	RDF (Recommended date) of NPK + One Foliar spray of $ZnSO_4$@0.5% at milk stage	27.43	28.41	29.83	32.63	2.35	2.28	2.26	2.38	50.89
3	RDF of NPK + Two Foliar sprays of $ZnSO_4$@0.5% at flag leaf and milk stage	28.20	28.26	29.73	33.16	2.37	2.26	2.24	2.32	50.38
4	RDF of NPK + One Foliar spray of $ZnSO_4$@0.5% at milk stage mixed with thiamethoxam 25 WG @ 50 g/ha	27.03	3.50	3.40	3.50	2.40	1.28	0.83	0.72	52.19
5	RDF of NPK + Two Foliar sprays of $ZnSO_4$@0.5% at flag leaf and milk stage mixed with thiamethoxam 25 WG @ 50 g/ha	27.70	2.76	2.76	2.86	2.47	1.03	0.35	0.40	52.37
6	RDF of NPK + One Foliar spray of $ZnSO_4$@0.5% at milk stage mixed with thiamethoxam 25 WG @ 50 g/ha and propiconazole @ 500 ml/ha	28.03	3.46	3.23	3.33	2.43	1.29	0.74	0.60	52.14
7	RDF of NPK + Two Foliar sprays of $ZnSO_4$@0.5% at flag leaf and milk stage mixed with thiamethoxam 25 WG @ 50 g/ha and propiconazole @ 500 ml/ha	28.60	2.86	2.70	2.73	2.53	0.98	0.25	0.21	52.60
8	Untreated control (Recommended NPK)	28.86	30.13	30.06	34.16	2.50	2.87	2.43	2.32	49.46
	CD (p =0.05)	NS	1.25	1.11	1.58	NS	0.20	0.23	0.28	1.28

Date of sowing : 25.11.2020
Date of harvest :29.04.2021
Replications : Three
Plot size : 7.5 m^2
Variety : PBW 725

Table B3-10.2b: Effect of zinc sulphate application alone or in combination with pesticides on aphid incidence in wheat (Centre: Karnal)

T.no	Treatments	Number of aphids/ earhead				Number of coccinellids/m^2				Grain yield (q/ha)
		Before spray	Days after spray			Before spray	After spray			
		1	1	2	7	1	1	2	7	
1	RDF(Recommended date) of NPK	27.01	27.85	28.99	33.69	2.28	2.45	2.12	2.05	49.09
2	RDF (Recommended date) of NPK + One Foliar spray of $ZnSO_4$@0.5% at milk stage	26.14	27.16	28.53	31.35	2.06	1.99	1.97	1.09	48.60
3	RDF of NPK + Two Foliar sprays of $ZnSO_4$@0.5% at flag leaf and milk stage	26.92	25.97	28.42	30.87	2.20	1.97	1.95	1.03	48.02
4	RDF of NPK + One Foliar spray of $ZnSO_4$@0.5% at milk stage mixed with thiamethoxam 25 WG @ 50 g/ha	26.43	1.57	1.46	1.49	2.22	0.88	0.87	0.67	51.31
5	RDF of NPK + Two Foliar sprays of $ZnSO_4$@0.5% at flag leaf and milk stage mixed with thiamethoxam 25 WG @ 50 g/ha	26.74	1.25	1.42	1.45	1.24	0.31	0.49	0.72	52.02
6	RDF of NPK + One Foliar spray of $ZnSO_4$@0.5% at milk stage mixed with thiamethoxam 25 WG @ 50 g/ha and propiconazole @ 500 ml/ha	27.32	1.48	1.49	2.05	2.18	0.81	0.74	0.89	52.08
7	RDF of NPK + Two Foliar sprays of $ZnSO_4$@0.5% at flag leaf and milk stage mixed with thiamethoxam 25 WG @ 50 g/ha and propiconazole @ 500 ml/ha	27.31	1.17	1.24	1.35	2.15	0.32	0.55	0.69	52.99
8	Untreated control (Recommended NPK)	27.57	28.84	28.77	32.87	1.21	1.58	1.18	1.07	48.17
	CD (p =0.05)	0.59	0.48	0.48	0.31	0.11	0.29	0.23	0.28	1.29

Date of sowing : 09.11.2020 Plot size : 7.5 m^2 Variety: HD 2967
Date of harvest : 12.04.2021 Replications : Three
Replications : Three

Table B3-10.2c: Effect of zinc sulphate application alone or in combination with pesticides on aphid incidence in wheat (Centre: Niphad)

T.N	Treatments	Av population of aphids/shoot					NE/ m^2	Yield q/ha
		30 DAS	40 DAS	60 DAS	75 DAS	Cum AV		
1	RDF(Recommended date) of NPK	30.53 (5.60)	28.40 (5.41)	19.27 (4.50)	7.73 (2.93)	21.48 (4.74)	2.78 (1.93)	34.66
2	RDF(Recommended date) of NPK + One Foliar spray of $ZnSO_4$@0.5% at milk stage	30.53 (5.61)	29.20 (5.49)	15.00 (3.99)	7.60 (2.90)	17.27 (4.27)	3.14 (2.03)	38.73
3	RDF(Recommended date) of NPK + Two Foliar sprays of $ZnSO_4$@0.5% at flag leaf and milk stage	28.20 (5.26)	22.13 (4.73)	19.07 (4.47)	6.13 (2.66)	15.78 (4.08)	3.19 (2.04)	36.13
4	RDF(Recommended date) of NPK + One Foliar spray of $ZnSO_4$@0.5% at milk stage mixed with Actra 25 WG (thiamethxam) @ 50 g/ha	28.13 (5.39)	27.00 (5.24)	18.93 (4.35)	8.67 (3.05)	18.20 (4.35)	3.19 (2.04)	35.02
5	RDF(Recommended date) of NPK + Two Foliar sprays of $ZnSO_4$@0.5% at flag leaf and milk stage mixed with Actra 25 WG (thiamethoxam) @ 50 g/ha	27.80 (5.36)	29.67 (5.53)	18.47 (4.41)	7.80 (2.94)	18.64 (4.42)	3.25 (2.05)	37.69
6	RDF(Recommended date) of NPK + One Foliar spray of $ZnSO_4$@0.5% at milk stage mixed with Actra 25 WG (thiamethoxam) @ 50 g/ha and propiconazole @ 500 ml/ha	26.20 (5.21)	27.27 (5.31)	18.60 (4.41)	6.67 (2.76)	17.51 (4.29)	3.42 (2.08)	35.37
7	RDF(Recommended date) of NPK + Two Foliar sprays of $ZnSO_4$@0.5% at flag leaf and milk stage mixed with Actra 25 WG (thiamethoxam) @ 50 g/ha and propiconazole @ 500 ml/ha	29.33 (5.49)	29.47 (5.50)	19.07 (4.48)	7.87 (2.95)	18.80 (4.44)	3.97 (2.19)	37.75
8	Untreated control (No application)	30.67 (5.63)	38.60 (6.29)	31.80 (5.72)	10.73 (3.39)	27.04 (5.30)	5.53 (2.54)	33.07
	SE+	**0.36**	**0.34**	**0.29**	**0.24**	**0.19**	**0.14**	**3.03**
	CD 0.5%	**1.08**	**1.03**	**0.87**	**0.71**	**0.57**	**0.42**	**9.18**
	CV%	**11.36**	**10.83**	**10.97**	**13.85**	**7.22**	**6.79**	**14.57**

DAS=Days after sowing Figures in parentheses indicate Vn+1 transformed value

B4. Basic studies for development of IPM strategies (Centres: Ludhiana, Niphad & Karnal)

The study was conducted to generate region-wise data on population dynamics of major insect-pests of wheat and barley for developing pest-forcasting models. Weather parameters of a location will be correlated with insect population to determine the effect of climatic variations on the pest population dynamics under changing climate scenario.

Centre: Ludhiana

The data on aphid incidence was recorded by randomly selecting ten individual tillers from 100 m^2 area while moving in a diagonal path in the field. The population of *Coccinella septempunctata* was recorded in 1 m^2 area around the individual plant. Weekly observations were recorded to study the first incidence and population build-up of aphid and coccinellid beetle.

Population dynamics of Wheat aphid: The aphid first appeared on 25.01.2021 on wheat crop and it started rising and reached its peak on 15.03.2021. Thereafter population of wheat aphid started declining and it drastically decreased after 05.04.2021. The population of Coccinellid beetle remained low up to 08.03.2021 and thereafter it started rising and reach its peak on 29.03.2021 (two weeks after the peak period of activity of wheat aphid) (Table B4-10.2a).

Population dynamics of barley aphid: The aphid population first appeared on 18.01.2021 on barley crop and it started rising and reached its peak on 15.03.2021. Thereafter aphid population started declining and became very low after 05.04.2021. The population of coccinellid beetles remained low up to 08.02.2021 and thereafter it stated rising and reached its peak on 22.03.2021 (Table B4-10.2b). Thus, it can be concluded from the data that coccinellid beetle appeared after the peak period of aphid infestation on wheat and barley crop.

Centre: Niphad

The weekly observations on wheat aphids were recorded along with different weather parameters. Data presented in Table B4-10.2c and Table B4-10.2d revealed that the maximum (21.8) number of aphids/shoot/plant were observed in 2nd Meteorological week when the maximum and minimum temperatures were 29.7 and 16.1 °C, respectively with relative humidity of 89 and 51 per cent at morning and evening, respectively. The maximum (1.7) natural enemies/m2 were also recorded in 2nd MW

Centre: Karnal

Population dynamics of Wheat aphid: The aphid first appeared on 04.1.2021 on wheat crop and it started rising and reached its peak (67.5 aphids/plant) on 08.03.2021 (Table B4-10.2e.). Thereafter population of wheat aphid started declining. The population of Coccinellid beetle started from 01-03-2021 and reaches its peak (11.1 beetles/m^2) on 01.03.2021.

Population dynamics of barley aphid: The aphid population was higher as compared to wheat during the whole crop season (Table B4-10.2f.). It first appeared on 4.01.2021 on barley crop and it started rising and reached its first peak 89.7 aphids/plant) on 08.03.2020. The population of coccinellid beetles remained low up to 18.01.2021 and thereafter it stated rising and reached its peak (12.5 beetles/m^2) on 15.03.2021. Thereafter its population started declining. Thus, it can be concluded from the data comparatively higher population of aphid appeared on barley as compared to wheat crop.

Table B4-10.2a: Pest modeling for foliage aphids and their natural enemies during 2020-21 (Centre: Ludhiana)

Date	Plant No.(No. of aphids/tiller)											Collateral host (Barley)			
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	Avg.	P1	P2	P3	Avg.
04.01.2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
11.01.2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
18.01.2021	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.3
25.01.2020	0	0	1	0	0	0	0	0	0	1	0.2	1	1	2	1.3
01.02.2021	0	0	0	0	0	0	0	0	0	0	0	1	2	0	1.0
08.02.2021	0	1	1	0	0	2	0	0	2	0	0.6	1	0	0	0.3
15.02.2021	0	0	0	3	0	0	2	3	4	0	1.2	1	2	3	2.0
22.02.2021	3	5	6	0	4	6	2	1	1	1	2.9	5	6	7	6.0
01.03.2021	10	7	8	11	16	10	9	6	11	14	10.2	10	13	13	12.0
08.03.2021	12	11	15	17	18	15	20	11	19	18	15.6	22	23	24	23.0
15.03.2021	23	26	21	20	21	36	20	32	39	26	26.4	32	33	36	33.7
22.03.2021	21	24	11	16	16	19	20	16	22	16	18.1	16	16	22	18.0
29.03.2021	10	9	4	7	8	4	2	7	7	2	6	2	3	6	3.7
	Plant No.(Coccinellid beetle/sq m area)											Collateral host (Barley)			
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	Avg.	P1	P2	P3	Avg.
04.01.2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
11.01.2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
18.01.2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
25.01.2020	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
01.02.2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
08.02.2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
15.02.2021	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.3
22.02.2021	0	2	0	0	0	2	0	2	1	0	0.7	0	0	3	1.0
01.03.2021	2	1	0	2	2	0	0	1	0	3	1.1	0	0	0	0.0
08.03.2021	2	0	0	0	3	0	0	2	3	4	1.4	0	0	0	0.0
15.03.2021	1	2	3	1	0	2	4	0	1	3	1.7	2	4	6	4.0
22.03.2021	2	4	1	1	3	4	6	3	6	7	3.7	4	6	8	6.0
29.03.2021	4	2	4	5	8	5	6	2	4	9	4.9	1	6	8	5.0

Table B4-10.2b: Pest modeling for foliage aphids and their natural enemies during 2020-21 (Centre: Ludhiana)

Date	Plant No.(No. of aphids/tiller)											Collateral host (wheat)			
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	Avg.	P1	P2	P3	Avg.
04.01.2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
11.01.2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
18.01.2021	1	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0.0
25.01.2020	1	1	2	0	0	0	1	0	1	0	0.6	0	0	1	0.3
01.02.2021	1	2	0	0	1	2	3	0	0	0	0.9	0	0	0	0.0
08.02.2021	1	0	0	2	4	5	0	0	0	0	1.2	0	1	1	0.7
15.02.2021	1	2	3	1	1	2	5	0	0	5	2	0	0	0	0.0
22.02.2021	5	6	7	10	11	13	13	14	2	4	8.5	3	5	6	4.7
01.03.2021	10	13	13	15	20	22	14	21	22	18	16.8	10	7	8	8.3
08.03.2021	22	23	24	32	36	33	32	27	32	19	28	12	11	15	12.7
15.03.2021	32	33	36	41	23	34	22	31	36	20	30.8	23	26	21	23.3
22.03.2021	16	16	22	16	10	13	15	16	11	19	15.4	21	24	11	18.7
29.03.2021	2	3	6	7	2	0	0	2	5	7	3.4	10	9	4	7.7
Date	Plant No.(Coccinellid beetle/sq m area)											Collateral host (wheat)			
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	Avg.	P1	P2	P3	Avg.
04.01.2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
11.01.2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
18.01.2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
25.01.2020	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
01.02.2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
08.02.2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
15.02.2021	0	0	1	0	0	0	0	0	0	0	0.1	0	0	0	0.0
22.02.2021	0	0	3	0	0	0	3	0	3	0	0.9	0	2	0	0.7
01.03.2021	0	0	0	3	5	0	2	5	0	0	1.5	2	1	0	1.0
08.03.2021	0	0	0	0	2	4	6	2	4	0	1.8	2	0	0	0.7
15.03.2021	2	4	6	2	8	6	8	0	0	0	3.6	1	2	3	2.0
22.03.2021	4	6	8	9	2	4	6	8	9	6	6.2	2	4	1	2.3
29.03.2021	1	6	8	2	5	7	6	6	5	8	5.4	4	2	4	3.3

Table B4-10.2c: Population dynamics of wheat aphid during 2020-21 (Centre: Niphad)

Date of observation	MW	Plant No. (No. of aphids/tiller)											Collateral host				Rain fall (mm)	Temperature (^{0}C)		Humidity (%)	
		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	Avg.	P1	P2	P3	Avg.		Max	Min	Morn	Even
05/12/2020	49	8	0	3	2	3	0	5	2	2	0	**2.5**	0	0	0	**0.00**	0.0	29.5	10.6	87	44
12/12/2020	50	8	12	8	8	7	5	10	8	11	4	**8.1**	0	0	0	**0.00**	1.2	26.8	17.1	89	48
19/12/2020	51	12	5	12	5	11	15	9	7	6	5	**8.7**	0	0	0	**0.00**	0.0	27.7	11.6	91	44
26/12/2020	52	7	7	8	9	11	8	8	8	9	8	**8.3**	0	0	0	**0.00**	0.0	28.5	10.0	90	38
03/01/2021	1	16	14	16	12	16	18	18	18	17	18	**16.3**	0	0	0	**0.00**	0.0	29.1	16.1	89	51
10/01/2021	2	16	18	20	20	18	30	24	26	22	24	**21.8**	0	0	0	**0.00**	15.0	29.7	16.1	89	51
17/01/2021	3	4	16	18	16	18	10	15	18	10	15	**14**	0	0	0	**0.00**	0.0	30.7	13.7	92	46
24/01/2021	4	4	4	9	8	6	6	7	9	3	7	**6.3**	0	0	0	**0.00**	0.0	30.6	9.7	86	41
31/01/2021	5	9	0	16	8	2	6	6	8	8	9	**7.2**	0	0	0	**0.00**	0.0	29.1	8.9	86	39
07/02/2021	6	6	8	7	5	6	5	8	9	8	7	**6.9**	0	0	0	**0.00**	0.0	29.2	7.6	86	38
14/02/2021	7	3	2	2	2	2	2	1	3	2	2	**2.1**	0	0	0	**0.00**	0.0	30.1	9.7	88	43
21/02/2021	8	7	1	1	1	0	5	2	1	2	2	**2.2**	0	0	0	**0.00**	16.5	29.9	11.9	88	40
26/02/2021	9	2	2	0	0	4	0	0	0	0	0	**0.8**	0	0	0	**0.00**	0.0	34.4	11.8	89.6	30.6

Table B4-10.2d: Population dynamics of *coccinellid* beetle during 2020-21 (Centre: Niphad)

Date of observation	MW	Plant No. (No. of beetle/sq m area)											Collateral host				Rain fall (mm)	Temperature (^{0}C)		Humidity (%)	
		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	Avg.	P1	P2	P3	Avg.		Max	Min	Morn	Even
05/12/2020	49	1	1	0	0	0	0	0	1	0	0	**0.3**	0	0	0	**0.00**	0.0	29.5	10.6	87	44
12/12/2020	50	0	2	0	0	2	2	0	0	0	0	**0.6**	0	0	0	**0.00**	1.2	26.8	17.1	89	48
19/12/2020	51	0	0	0	2	1	1	0	1	0	0	**0.5**	0	0	0	**0.00**	0.0	27.7	11.6	91	44
26/12/2020	52	2	0	0	2	0	0	0	1	2	0	**0.7**	0	0	0	**0.00**	0.0	28.5	10.0	90	38
03/01/2021	1	3	1	2	3	2	1	1	1	0	2	**1.6**	0	0	0	**0.00**	0.0	29.1	16.1	89	51
10/01/2021	2	2	2	2	1	1	3	2	2	2	0	**1.7**	0	0	0	**0.00**	15.0	29.7	16.1	89	51
17/01/2021	3	2	2	2	1	0	1	1	2	2	2	**1.5**	0	0	0	**0.00**	0.0	30.7	13.7	92	46
24/01/2021	4	0	0	2	1	2	1	1	2	1	0	**1**	0	0	0	**0.00**	0.0	30.6	9.7	86	41
31/01/2021	5	1	1	1	0	1	0	1	0	1	0	**0.6**	0	0	0	**0.00**	0.0	29.1	8.9	86	39
07/02/2021	6	1	1	1	0	0	0	1	1	1	0	**0.6**	0	0	0	**0.00**	0.0	29.2	7.6	86	38
14/02/2021	7	0	0	1	0	0	1	1	1	0	0	**0.4**	0	0	0	**0.00**	0.0	30.1	9.7	88	43
21/02/2021	8	0	0	0	1	1	0	0	1	1	1	**0.5**	0	0	0	**0.00**	16.5	29.9	11.9	88	40
26/02/2021	9	0	0	0	0	0	0	0	0	0	0	**0**	0	0	0	**0.00**	0.0	34.4	11.8	89.6	30.6

Table B4-10.2e: Population dynamics of wheat aphid and Coccinellid beetle during 2020-21 (Location-Karnal)

Date of observation	Plant No.(No. of aphids/tiller) on wheat											Collateral host (Barley)			
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	Av.	P1	P2	P3	Av.
04.01.2021	3	6	3	2	4	3	4	5	7	3	4.0	10	18	11	11.0
11.01.2021	5	8	4	4	6	5	6	7	9	5	5.9	14	15	17	13.3
18.01.2021	9	6	6	13	11	8	11	9	10	12	9.5	19	30	24	22.3
25.01.2020	14	13	11	19	20	14	18	19	22	27	17.7	34	49	34	37.0
01.02.2021	16	29	24	16	15	21	19	7	13	18	17.8	40	40	48	40.7
08.02.2021	36	24	20	27	21	29	38	42	17	15	26.9	54	40	50	46.0
15.02.2021	28	42	26	30	30	41	48	31	28	31	33.5	71	53	49	55.7
22.02.2021	58	39	59	30	40	27	32	46	47	38	41.6	63	82	50	63.0
01.03.2021	69	36	60	19	80	50	68	60	52	68	56.2	93	72	120	93.0
08.03.2021	88	54	71	42	51	66	48	80	91	84	67.5	40	24	43	33.7
15.03.2021	66	39	41	30	49	53	30	52	19	71	45.0	17	32	17	20.0
22.03.2021	5	7	8	3	0	2	7	0	12	4	4.8	14	13	10	10.3
29.03.2021	3	6	5	3	0	0	2	0	0	0	1.9	7	9	5	5.0
Date of observation	Plant No.(Coccinellid beetle/sq m area)											Collateral host (Barley)			
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	Av.	P1	P2	P3	Av.
04.01.2021	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0	0.0
11.01.2021	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0	0.0
18.01.2021	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0	0.0
25.01.2020	0	0	0	0	0	0	0	0	0	0	0.0	6	5	6	5.0
01.02.2021	1	0	4	4	0	1	4	4	4	3	2.5	4	7	5	6.7
08.02.2021	7	4	3	4	1	5	8	11	4	4	5.1	6	5	2	6.3
15.02.2021	8	7	6	5	2	10	8	3	5	6	6.0	4	9	6	8.3
22.02.2021	26	3	16	10	3	5	9	4	4	8	8.8	6	8	16	12.0
01.03.2021	19	10	17	18	4	17	5	7	8	6	11.1	9	8	15	12.7
08.03.2021	14	7	15	9	5	7	14	15	13	7	10.6	13	18	8	15
15.03.2021	6	10	7	11	6	5	15	9	7	4	8.0	6	8	13	11
22.03.2021	3	1	4	0	7	5	3	4	1	0	2.8	3	6	7	5.4
29.03.2021	0	1	0	0	8	3	1	0	0	0	1.3	6	5	2	3.4

Table B4-10.2f: Population dynamics of barley aphid and Coccinellid beetle during 2020-21 (Location-Karnal)

Date of observation	Plant No.(No. of aphids/tiller)											Collateral host (wheat)			
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	Av.	P1	P2	P3	Av.
04.01.2021	4	2	3	5	4	5	4	2	4	6	3.9	2	1	0	1.0
11.01.2021	6	4	5	7	6	7	6	4	6	8	5.9	13	11	11	11.7
18.01.2021	14	9	11	9	24	19	29	24	14	14	16.7	30	15	20	21.7
25.01.2020	15	24	44	14	34	14	29	34	24	39	27.1	20	30	35	28.3
01.02.2021	39	34	49	59	34	64	48	39	34	44	44.4	40	55	50	48.3
08.02.2021	29	19	79	49	79	37	29	49	19	34	42.3	45	60	40	48.3
15.02.2021	31	21	81	51	81	39	31	51	21	36	44.3	50	80	70	66.7
22.02.2021	59	74	94	49	44	79	99	44	104	59	70.5	52	82	72	68.7
01.03.2021	59	69	99	39	79	84	49	74	64	99	71.5	80	66	85	77.0
08.03.2021	79	109	94	114	104	79	124	49	64	81	89.7	13	15	16	14.7
15.03.2021	12	10	24	9	13	11	19	29	14	24	16.5	1	3	5	3.0
22.03.2021	1	3	6	0	2	4	5	3	4	5	3.3	0	1	3	1.3
29.03.2021	0	0	0	0	0	0	0	0	0	0	0.0	0	1	3	1.3
Date of observation	Plant No.(Coccinellid beetle/sq m area)											Collateral host (wheat)			
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	Av.	P1	P2	P3	Av.
04.01.2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11.01.2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18.01.2021	0	0	0	0	0	0	0	0	0	0	0.0	8	8	8	8.0
25.01.2020	0	0	5	6	0	4	0	0	0	0	2.3	10	8	9	9.0
01.02.2021	5	0	6	7	0	5	5	5	5	0	3.8	14	8	9	10.3
08.02.2021	8	5	4	5	0	6	9	12	5	5	5.9	9	16	8	11.0
15.02.2021	9	8	7	6	8	11	9	4	6	7	7.5	11	12	14	12.3
22.02.2021	27	4	17	11	5	6	10	5	5	9	9.9	13	14	11	12.7
01.03.2021	15	8	16	10	5	8	15	16	14	8	11.5	12	13	15	13.3
08.03.2021	15	8	16	10	5	8	15	16	14	8	11.5	11	5	13	9.7
15.03.2021	20	11	18	19	9	18	6	8	9	7	12.5	3	2	0	1.7
22.03.2021	4	5	8	1	4	6	4	5	5	6	4.8	0	1	2	1.0
29.03.2021	5	0	6	7	0	5	5	5	5	0	3.8	8	8	8	8.0

B5. Zone specific IPM modules (Centres: Karnal, Ludhiana, Niphad, Kanpur)

The integrated pest modules consisting of effective cultural, physical, biological and chemical components of integrated pest management were formulated and tested against major pests of wheat viz., foliar aphids, shootfly and termites.

Centre: Ludhiana

The aphid & brown wheat mite incidence as well as termite & pink stem borer (PSB) damage between IPM module and farmer's practices were studied during 2020-21. The differences in IPM plot and farmer's practices were significant for all the pests. The termite damage varied 3.83-3.99 per cent in farmer's practices while it was only 0.24-0.47 per cent in IPM field. Similarly the PSB damage was 0.83-1.22 per cent in farmer's practice while it was 0.25-0.26 in IPM field. The aphid incidence remained below economic threshold level of 5 aphids per earhead in IPM field while it ranged from 9.86-16.06 aphids/tiller in farmer's practice. The insecticides were sprayed in IPM field when incidence of aphid was observed in the border strip of field which also prevented its further spread into the interiors of the field. The numbers of plants infested with aphids were also higher in farmer's practice. The coccinellid beetles/m^2 was found to significant higher in IPM field as compared to farmer's practice. The incidence of brown wheat mite was comparatively higher in farmer's practice as compared to IPM plots. (Table B5.10.2a)

Centre: Niphad

The data presentedrevealed that the IPM module recorded 15.90, 9.70 and 7.70 aphids/shoot/plant at 45, 60 and 75 days after sowingas against 37.80, 98.50 and 41.50 aphids/shoot/plant in farmer practice respectively. The population of jassids recorded very low in IPM plot 0.70, 0.40 and 0.40 per plant as against 7.80, 1.70 and 0.60 per plant in farmers practice plot at 45, 60 and 75 days after sowing respectively. Shoot fly infestation was not observed in IPM plot but was 4% and 6 % in non IPM at 30 and 45 days after sowing . The optimum population of natural enemies was recorded in both plot of IPM and farmer practices since 45 to 75 days after sowing. Incidence of termite and stem borer was not recorded in IPM treated as well as farmer practices plot. The highest grain yield of 64.58 q/ha was recorded in IPM treated plot as against38.06 q/ha in farmers practice plot, with considerable differences in plant height, ear head length number of spikelet per spike number of grains per spike and 1000 grain weight (Table B5-10.2b).

Centre: Karnal

The data indicated that population of aphids; termite and pink stem borer was comapartively lower in IPM treatment as compared to Farmer practice. However, in FP treatment the population of natural enemies was little higher than IPM treatment. The highest population of aphids was recored after 50 days i.e. 166.0 aphids/shoot in FP treatment, and even infestation of termites and pink stem borer was highest (7.74% & 5.78%, respectively) as compared to IPM treatment. The highest grain yield of 52.67 q/ha was recorded in IPM treated plot and lowest (46.65 q/ha) in farmers practice plot (Table B5-10.2c).

Centre: Durgapura

The data indicated that the population of insect-pests in IPM module treatment was higher than Farmer's practice treatment. The highest population of aphids was recored at maturity stage i.e. 4.67 aphids/shoot in FP treatment, and even infestation of termites and brown wheat mite was highest (10.33% & 6.33 mites/10 sq.cm, respectively) as compared to IPM treatment. The highest grain yield of 36.78 q/ha was recorded in IPM treated plot and lowest (33.66 q/ha) in farmers practice plot(Table B5-10.2d).

Table B5-10.2a: Effect of treatments of IPM modules on pests of wheat (Centre: Ludhiana)

S. No.	Days after sowing	Treatments	Avg. no. aphids/ shoot	Avg. lady bird beetle /m^2	Avg. termite infestation (%)	Avg. no. of mites/10 cm^2	Avg. stem borer infestation (%)
1.	Pre-count	IPM	0	0	0	0	0
		FP	0	0	0	0	0
		t value	-	-	-	-	-
2.	30	IPM	0	0	0.36 (3.60)*	-	0.63 (3.50)*
		FP	0	0	3.85 (11.31)*	-	2.86 (9.73)*
		t value	-	-	(1.27)	-	(1.64)
3.	45	IPM	0	0	0.71 (3.93)*	-	0.66 (3.40)*
		FP	0	0	3.76 (11.18)*	-	3.28 (10.41)*
		t value	-	-	(1.58)	-	(1.91)
4.	60	IPM	0	0	0	-	0
		FP	0	0	0	-	0
		t value	-	-		-	
5.	75	IPM	0	0	0	-	0
		FP	0-1	0	0	-	0
		t value					
6.	90	IPM	0	0	0	-	0
		FP	0-2	0	0	-	0
		t value					
7.	105	IPM	2.53 (1.74)	0	0	-	0
		FP	11.73 (3.48)	0	0	-	0
		t value	(0.64)	-	-	-	
8.	At earhead stage	IPM	1.80 (1.56)**	4.00 (2.12)**	0	3.20 (1.94)**	0
		FP	13.33 (3.77)**	1.46 (1.47)**	0	13.66 (3.80)**	0
		t value	(0.39)	(0.44)	-	(0.49)	-
9.	Yield (qt/ha)	IPM	57.35 (7.63)				
		FP	52.26 (7.29)				
		t value	(0.17)				

IPM = Integrated Pest Management; FP = Farmers Practice

* Figures in parentheses are arcsine transformed means ** Figures in parentheses are square root transformed means

Table B5-10.2b: Effect of treatments of IPM modules on pests of wheat (Centre: Niphad)

SN	Days after sowing	Treat Ments	% Shoot fly damage	Av. No. of aphids/ shoot/plant	Av. No. of jassids/ plant	Av. No. of natural enemies/ m^2	Termite Damage %	Stem borer % infested tillers
1.	**30**	**IPM**	9.10	1.10	0.60	9.10	1.10	0.60
		FP	28.30	2.80	0.90	28.30	2.80	0.90
2.	**45**	**IPM**	9.30	0.70	2.10	9.30	0.70	2.10
		FP	33.60	2.60	5.60	33.60	2.60	5.60
3.	**60**	**IPM**	5.20	0.90	2.80	5.20	0.90	2.80
		FP	30.50	2.70	3.40	30.50	2.70	3.40
4.	**75**	**IPM**	6.10	0.70	2.80	6.10	0.70	2.80
		FP	20.60	2.10	3.10	20.60	2.10	3.10
5.	**90**	**IPM**	5.10	0.70	1.40	5.10	0.70	1.40
		FP	18.50	2.00	2.30	18.50	2.00	2.30
6.	**At maturity**	**IPM**	3.50	0.40	0.60	3.50	0.40	0.60
		FP	16.40	1.20	0.90	16.40	1.20	0.90

Characters / Treatments	Yield q/ha	Plant height (cm)	Earhead length (cm)	No. of spikelet/spike	No. of grains/spike	1000 grain weight (g)
IPM	41.70	78.60	10.69	15.75	43.13	46.94
FPControl	37.90	67.60	8.68	13.60	36.50	41.10

IPM= Integrated Pest Management FP= Farmer's practice (Non IPM)

Table B5-10.2c: Effect of treatments of IPM modules on pests of wheat (Location: Karnal)

SN	Days	Treatments	No. of aphids/ shoot/ plant	No. of jassids /plant	No. of Brown wheat mite 10 cm^2 /leaves	No. of natural enemies/m^2	Termite damage %	Stem borer % infested tillers	Yield q/ha
1.	30	IPM	17	0.00	0.00	0.00	3.25	0.00	
		FP	25	0.00	0.00	0.00	4.29	2.20	
2.	40	IPM	77	0.00	0.00	1.11	5.47	1.19	IPM 52.67
		FP	128	0.00	0.00	2.33	7.09	4.09	
3.	50	IPM	83	0.00	0.00	1.98	3.32	0.87	
		FP	166	0.00	0.00	4.2	7.74	5.78	
4.	60	IPM	65	0.00	0.00	3.96	0.00	0.00	
		FP	81	0.00	0.00	13.33	0.00	0.00	FP (Non IPM) 46.65
5.	70	IPM	53	0.00	0.00	14.96	0.00	0.00	
		FP	61	0.00	0.00	13.98	0.00	0.00	
6.	80	IPM	11	0.00	0.00	7.96	0.00	0.00	
		FP	15	0.00	0.00	13.98	0.00	0.00	

IPM= Integrated Pest Management FP= Farmers practice (Non IPM)

Table B5-10.2d: Effect of IPM modules on incidence and infestation of major insect-pests of wheat 2020-21 (Centre- Durgapura)

S. No.	Time of Observation	Treatments	Mean no. of aphids/shoot	Mean no. of lady bird beetle/shoot	% termite infestation	Mean no. of Jassids/shoot	Mean no. of mites/ 10 cm^2 of leaf area	% pink stem borer infestation
1.	Pre-count	IPM	-	-		-	-	-
		FP	-	-		-	-	-
		t value						
2.	30	IPM	-	-	1.33	-	-	-
		FP	-	-	2.00	-	-	-
		t value			-			
3.	45	IPM	-	-	1.67	-	-	-
		FP	-	-	3.67	-	-	-
		t value			-			
4.	60	IPM	-	-	2.00	-	-	-
		FP	-	-	4.00	-	-	-
		t value			-			
5.	75	IPM		0.33	2.67	-	-	-
		FP		1.67	6.00	-	-	-
		t value			-			
6.	90	IPM	1.00	0.67	3.00	-	1.67	-
		FP	4.00	2.33	7.33	-	4.33	-
		t value						-
7.	At maturity	IPM	1.67	1.00	5.00	-	2.67	-
		FP	4.67	2.67	10.33	-	6.33	
		t value						
8.	Yield (q/ha)	IPM	36.78					
		FP	33.66					
		t value	-					

B6. Effect of organic treatments on the incidence of major insect-pests and natural enemies
(Centres: Ludhiana and Karnal)

Keeping in view of the interest of farmers about zero budget farming, effect of organic treatments viz., Neemastra, Bramhastra, Agniastra, Deshparni, Fermented butter milk and Cow urine were evaluated against major insect-pests of wheat and natural enemies.

Centre: Ludhiana

Keeping in view the interest of zero budget farming, organic treatments viz. Neemastra, Bramastra, Agniastra, Darshpani, Caw urine, buuter milk and neem based pesticide were tested in replicated trial at Experimental Area of Department of Plant Breeding and Genetics by growing wheat variety PBW 725 in the plots of 6 rows of 6 m length. For recording observations, five tillers were ear marked in each plot and from these plants observations were recorded one day before spray and then 1, 2 and 7 days after spray. Aphid population did not differ significantly among different treatments one day before spray. When observed one day after spray, Neem Seed Kernel powder @7.5% sprayed plots recorded minimum (10.54 aphids/earhead) and was at par all other organic treatments. The 7.5% dosage of NSKP was statistically at par with 5.0% dose but significantly inferior than 2.5% dosages. Similar trend was observed two and seven days after treatment. Highest Grain yield (q/ha) was also recorded in plots treated with Agniastra @5 litre/ac (Table B6-10.2a).

Centre: Karnal

Aphid population did not differ significantly among all treatments one day before spray. When observed one day after spray, among the tested organic treatments, treatment of Bramastra @7.5% sprayed plots recorded lowestest number of aphids 8.33 aphid/shoor followed by Agniastra @ 7.5% (8.62 aphid/shoot) and Neemastra @7.5% (8.74 aphids/shoot). Almost similar trends were observed two days, seven and fifteen days after spray. The best control of aphids was obtained through the treatment of Thiamethoxam 25 WG@ 50 g/ha.
Maximum Grain yield (q/ha) was recorded in plots treated with Bramastra @7.5% sprayed plots i.e. 59.14 q/ha However, all the applied treatments recorded higher than grain yield than untreated check (56.38 q/ha) (Table B6-10.2b).

B7. Management of aphids through foliar application of new chemical molecules
(**Centres:** Ludhiana, Karnal, Niphad and Vijapur)

Centre: Ludhiana

The wheat variety PBW 725 was grown on 25th Nov.2020 in the plots of 6 rows of 6 m length in a replicated trial sown under irrigated conditions at Experimental Area of Department of Plant Breeding and Genetics, PAU, Ludhiana. Seven different insecticides were sprayed when the aphid population exceeded 4-5 aphids/earhead and untreated check plot was kept for comparison. For recording observations, five tillers were ear marked in each plot and from these plants observations were recorded one day before spray and then 1, 2, 7 and 15 days after spray.
Aphid population did not differ significantly among different treatments one day before spray. When observed one day after spray, Beta-cyfluthrin 25 SC sprayed plots recorded minimum (1.80 aphids/earhead) and was at par all other treatments and significantly better than all other insecticidal treatments. Two days after spray, minimum aphid/tillers (1.05) were recorded in Beta-Cyfluthrin 9%+ Imidacloprid 21% (Solomon) which were at par with all other treatment. Beta-cyfluthrin 25 SC recorded minimum aphid population seven and fifteen days after treatment. Maximum Grain yield (q/ha) was recorded in plots treated with Sulfoxaflor (56.35) treated plots. However, all the insecticidal treatments recorded higher than grain yield than untreated check (53.02) (Table B7-10.2a).

Centre: Karnal

Aphid population did not differ significantly among all treatments one before spray. After day of spraing, treatment of Thiamethoxam 12.6% + Lambda cyhalothrin 9.5% ZC(Alika) @ 150 g/ha recorded minimum number of aphids(4.62 aphids/tiller) followed by treatment of Beta-Cyfluthrin 9%+ Imidacloprid 21% (Solomon) @ 400 ml/ha which recorded 4.65 aphids/tiller. After 2 days of spraing of Thiamethoxam 12.6% + Lambda cyhalothrin 9.5% ZC(Alika) @ 150 g/ha was most found be most effective followed by Sulfoxaflor 12% SC@250 ml/ha. Same trend was seen after 7 and 15 days of spraing. Overall three treatments were found be most effective in checking aphid population. These were Thiamethoxam 12.6% + Lambda cyhalothrin 9.5% ZC(Alika) @ 150 g/ha, Beta-Cyfluthrin 9%+ Imidacloprid 21% (Solomon) @ 400 ml/ha and Sulfoxaflor 12% SC@250 ml/ha

Though, the maximum grain yield recorded under treatment of Thiamethoxam 25% WG (59.38 q/ha) treated plots followed by the treatment of Sulfoxaflor 12% SC(59.29 q/ha).However, all the insecticidal treatments recorded higher than grain yield than untreated check (55.96 q/ha) (Table B7-10.2b)

Centre: Niphad

The data presented revealed that the average population of aphids survived at 1st day after spray showing no significance among the treatments. The data at 2 days after spray showed that the treatment with Beta-Cyfluthrin 9% + Imidacloprid 21% (Solomon) @ 150 ml/ha was found significantly superior but all other treatments were found at par with it .At 7th days after spray the treatment with Beta-Cyfluthrin 9%+ Imidacloprid 21% (Solomon) @ 400 ml/ha was found significantly superior over all the treatments while, the treatment with Lambda cyhalothrin 5% EC @ 500 ml/ha, Imidacloprid 17.8 SL @ 400 ml/ha and Beta-cyfluthrin 25 SC @ 1450 ml/ha were found equally effective with it. Similar trend was also observed at 15 days after spray. During the experiment the uniform population of *Coccinellids* predators was observed. Also no significance was observed in the wheat yield. The treatment with Beta-Cyfluthrin 9%+ Imidacloprid 21% (Solomon) recorded the highest yield of 40.08 q/ha as against 32.26 q/ha in untreated control (Table B7-10.2c).

Centre: Vijapur

An experiment on management of wheat aphid through foliar application of new bio-chemical molecules was conducted under irrigated condition. Aphid populations did not differ statistically among all treatments during 24 h before spraying. On 1st day after spray, overall decrease in number of aphids/shoots in all the treatments as compared to untreated check was observed. Significantly, the lowest number of aphids (5.4) were recorded in T6 i.e., Thiomethoxam 25 WG however, it was at par with T4, T5, T1 & T2. After 2nd day of spray, the minimum aphid population was also recorded in T6 (3.33) which was at par with T1 & T4. More or less similar trend was observed on 7th and 15th days after spray. The grain yield (q/ha) didn't differ significantly among the treatments (Table B7-10.2d).

Centre: Kanpur

An experiment on management of wheat aphid through foliar application of new chemicals was conducted under irrigated condition. Aphid populations did not differ statistically among all treatments 24 h before spraying. On 1st day after spray, overall decrease in number of aphids/shoots in all the treatments was recorded as compared to untreated check. After 1 day of spraying the lowest of aphids/shoot was recorded in Lambda cyhalothrin 5% EC (4.51 aphids/shoot) followed by Imidacloprid 17.8 EC (5.06 aphids/shoot) and Beta-cyfluthrin 25 SC (5.06 aphids/shoot). Similar trends were observed after 2 and 7 days after spraying. No aphids were recorded after 15 days of spraying except in control (6.11 aphids/shoot).

The grain yield was highest Lambda cyhalothrin 5% EC treated plots (40.43 q/ha) as compared to untreated control (24.07 q/ha) (Table B7-10.2e).

Table B6-10.2a: Effect of organic treatments on the incidence of major insect-pests and natural enemies dring 2020-21 (Centre: Ludhiana)

S. No.	Treatments	Dosage	Aphid population per earhead				Coccinellids/m^2 15 days after spray	Grain Yield (q/ha)
			Before spray	After spray				
			1 day	1 day	2 days	7 days		
1	Neemastra	5 litre/ac	14.20	10.72 (3.42)	10.11 (3.33)	11.73 (3.56)	2.30 (1.81)	51.42
2	Bramhastra	5 litre/ac	14.03	10.82 (3.43)	10.58 (3.40)	11.13 (3.48)	2.24 (1.80)	52.04
3	Agniastra	5 litre/ac	14.40	11.38 (3.51)	10.10 (3.33)	11.02 (3.46)	2.28 (1.81)	52.62
4	Deshparni	10 litre/ac	14.78	11.55 (3.54)	10.07 (3.32)	12.00 (3.60)	2.32 (1.82)	51.20
5	Fermented butter milk	10 litre/ac	14.27	11.28 (3.50)	10.01 (3.31)	11.92 (3.59)	2.10 (1.75)	52.40
6	Cow urine	10 litre/ac	14.72	11.46 (3.53)	9.96 (3.31)	11.53 (3.58)	2.23 (1.79)	52.48
7	Fermented butter milk + Cow urine	10 litre/ac + 10 litre/ac	14.64	11.13 (3.48)	10.53 (3.39)	11.96 (3.60)	2.10 (1.76)	50.80
8	Neem seed kernel powder (NSKP)	2.5 %	15.15	11.71 (3.57)	10.13 (3.33)	11.44 (3.52)	2.13 (1.77)	51.11
9	Neem seed kernel powder (NSKP)	5 %	15.02	11.00 (3.46)	10.07 (3.32)	11.61 (3.55)	2.10 (1.76)	52.10
10	Neem seed kernel powder (NSKP)	7.5 %	14.97	10.54 (3.39)	9.98 (3.26)	10.97 (3.45)	2.00 (1.73)	52.40
11	Thiamethoxam 25 WG	20 g/ac	14.54	1.76 (1.66)	1.37 (1.54)	1.93 (1.71)	1.04 (1.42)	54.71
12	Untreated control	-	14.70	15.68 (4.08)	16.16 (4.14)	15.99 (4.12)	2.52 (1.87)	50.04
CD (p=0.05)		-	NS	(0.17)	(0.09)	(0.16)	(0.12)	2.17

* Figures within parentheses are transformed means

Date of sowing : 25.11.2020
Date of insecticidal application : 02.03.2021
Date of harvest : 29. 04.2021
Plot size : 7.5 m^2
Variety : PBW 725
Replications : Three

Table B6-10.2b: Effect of organic treatments on the incidence of major insect-pests and natural enemies dring 2020-21 (Centre: Karnal)

S. No.	Treatments	Dose ml or g / ha	Aphid population per earhead				Coccinellids/m^2 15 days after spray	Grain Yield (q/ha)
			Before spray	After spray				
			1 day	1 day	2 days	7 days		
1	Neemastra	2.5%	11.93	10.89 (3.45)	10.76 (3.43)	12.93 (3.73)	3.18 (2.04)	57.76
2	Neemastra	5.0%	12.02	9.51 (3.24)	9.31 (3.21)	11.05 (3.47)	2.98 (1.99)	58.38
3	Neemastra	7.5%	11.71	8.74 (3.12)	8.76 (3.12)	9.95 (3.31)	3.06 (2.01)	58.96
4	Bramhastra	2.5%	11.57	10.87 (3.45)	10.3 (3.36)	11.89 (3.59)	3.15 (2.04)	57.54
5	Bramhastra	5.0%	11.73	9.15 (3.19)	9.34 (3.22)	10.57 (3.40)	2.98 (1.99)	58.74
6	Bramhastra	7.5%	11.68	8.33 (3.05)	8.01 (3.00)	9.31 (3.21)	3.03 (2.01)	59.14
7	Agniastra	2.5%	11.58	11.00 (3.46)	11.2 (3.49)	11.95 (3.60)	3.17 (2.04)	57.45
8	Agniastra	5.0%	11.71	9.84 (3.29)	9.82 (3.29)	10.65 (3.41)	2.98 (1.99)	58.47
9	Agniastra	7.5%	11.77	8.62 (3.10)	8.50 (3.08)	9.91 (3.30)	2.92 (1.98)	58.74
10	Deshparni	2.5%	11.79	10.81 (3.44)	11.00 (3.460	11.98 (3.60)	3.13 (2.03)	57.14
11	Deshparni	5.0%	11.68	9.34 (3.22)	9.52 (3.24)	10.71 (3.42)	2.97 (1.99)	58.11
12	Deshparni	7.5%	11.59	8.86 (3.14)	8.82 (3.13)	10.11 (3.33)	2.91 (1.98)	58.78
13	Thiamethoxam 25 WG	50 g/ha	11.64	3.14 (2.03)	2.42 (1.85)	2.54 (1.88)	1.94 (1.71)	61.05
14	Untreated control		11.63	13.64 (3.83)	13.46 (3.80)	14.26 (3.91)	3.31 (2.08)	56.38
CD (p=0.05)			NS	(0.14)	(0.13)	(0.17)	(0.07)	(2.29)

* Figures within parentheses arc transformed means

Date of sowing : 09.11.2020
Date of insecticidal application : 04.03.2021
Date of harvest : 12. 05.2021

Plot size : 7.5 m^2
Variety : HD 2967
Replications : Three

Table B7-10.2a: Efficacy of various insecticides and their combinations against foliar aphid during 2020-21 (Centre: Ludhiana)

S. No.	Treatments	Dose ml or g / ha	Aphid population per earhead					Grain Yield (q/ha)
			Before spray	After spray				
			1 day	1 day	2 days	7 days	15 days	
1	Thiamethoxam 12.6% + Lambda cyhalothrin 9.5% ZC(Alika)	150 ml	23.23	1.89 (1.70)	1.27 (1.50)	1.00 (1.41)	1.57 (1.60)	55.91
2	Thiamethoxam 25% WG	50	23.15	1.81 (1.67)	1.22 (1.49)	1.08 (1.44)	1.63 (1.62)	56.26
3	Lambda cyhalothrin 5% EC	500	23.19	1.91 (1.70)	1.15 (1.46)	1.07 (1.43)	1.51 (1.58)	56.04
4	Beta-Cyfluthrin 9%+ Imidacloprid 21% (Solomon)	400	22.92	1.96 (1.72)	1.05 (1.43)	1.08 (1.44)	1.50 (1.58)	55.73
5	Imidacloprid 17.8 SL	400	23.24	2.06 (1.76)	1.16 (1.47)	1.00 (1.41)	1.53 (1.59)	55.64
6	Beta-cyfluthrin 25 SC	1450	23.68	1.80 (1.67)	1.11 (1.45)	0.97 (1.40)	1.47 (1.57)	56.08
7	Sulfoxaflor 12% SC	250 ml	23.60	1.96 (1.72)	1.11 (1.45)	1.05 (1.43)	1.57 (1.60)	56.35
8	Untreated control	-	23.34	25.12 (5.11)	25.22 (5.12)	25.79 (5.17)	25.19 (5.11)	53.02
CD (p=0.05)			NS	(0.11)	(0.10)	(0.10)	(0.14)	(1.23)

* Figures within parentheses arc transformed means

Date of sowing	:	11.11.2020	Plot size	:	7.5 m^2
Date of insecticidal application	:	05.03.2021	Variety	:	PBW 725
Date of harvest	:	29. 05.2021	Replications	:	Three

Table B7-10.2b: Efficacy of various insecticides and their combinations against foliar aphid during 2020-21 (Centre: Karnal)

S. No.	Treatments	Dose ml or g / ha	Aphid population per earhead					Average	Grain Yield (q/ha)
			Before spray	After spray					
			1 day	1 day	2 days	7 days	15 days		
1	Thiamethoxam 12.6% + Lambda cyhalothrin 9.5% ZC(Alika)	150 ml	12.76	4.62 (2.37)	4.41 (2.33)	3.20 (2.05)	1.99 (1.73)	3.56 (2.13)	58.8
2	Thiamethoxam 25% WG	50	12.44	5.39 (2.53)	5.18 (2.49)	3.97 (2.23)	2.76 (1.94)	4.33 (2.31)	59.38
3	Lambda cyhalothrin 5% EC	500	12.74	5.72 (2.59)	5.51 (2.55)	4.30 (2.30)	3.09 (2.02)	4.66 (2.38)	58.98
4	Beta-Cyfluthrin 9%+ Imidacloprid 21% (Solomon)	400	12.67	4.65 (2.38)	4.47 (2.34)	3.26 (2.06)	2.05 (1.75)	3.62 (2.15)	58.54
5	Imidacloprid 17.8 SL	400	12.73	4.76 (2.40)	4.55 (2.36)	3.34 (2.08)	2.13 (1.77)	3.70 (2.17)	58.58
6	Beta-cyfluthrin 25 SC	1450	12.75	4.79 (2.41)	4.58 (2.36)	3.37 (2.09)	2.16 (1.78)	3.73 (2.17)	59.02
7	Sulfoxaflor 12% SC	250 ml	12.83	4.68 (2.38)	4.44 2.33)	3.23 (2.06)	2.02 (1.74)	3.59 (2.14)	59.29
8	Untreated control	-	12.7	17.76 (4.33)	17.55 (4.31)	17.34 (4.28)	17.13 (4.26)	17.45 (4.29)	55.96
CD (p=0.05)			**NS**	**(0.89)**	**(0.96)**	**(0.58)**	**(0.54)**	**(0.99)**	**1.20**

* Figures within parentheses arc transformed means

Date of sowing : 09.11.2020
Date of insecticidal application : 02.03.2021
Date of harvest : 12. 05.2021
Plot size : 7.5 m^2
Variety : HD2967
Replications : Three

Table B7-10.2c: Efficacy of various insecticides and their combinations against foliar aphid and natural enemies during 2020-21 (Centre: Niphad)

S.N	Treatments	Formal Dose g or ml/ha	Av population of aphids/shoot					NE/ m^2	Yield q/ha
			Pre count	1 DAS	2 DAS	7 DAS	15 DAS		
1	Thiamethoxam 12.6% + Lambda cyhalothrin 9.5% ZC(Alika)	150 ml	23.40 (4.94)	20.27 (4.59)	19.33 (4.51)	16.87 (4.22)	11.33 (3.50)	3.58 (2.05)	37.72
2	Thiamethoxam 25% WG	50 g	20.07 (4.50)	20.33 (4.61)	18.33 (4.40)	16.93 (4.23)	11.80 (3.58)	3.67 (2.07)	39.76
3	Lambda cyhalothrin 5% EC	500 ml	21.47 (4.73)	19.00 (4.47)	17.80 (4.33)	12.33 (3.65)	12.40 (3.54)	3.50 (2.02)	38.30
4	Beta-Cyfluthrin 9%+ Imidacloprid 21% (Solomon)	400 ml	21.73 (4.76)	19.73 (4.53)	16.33 (4.11)	10.53 (3.38)	7.13 (2.85)	3.50 (2.03)	40.08
5	Imidacloprid 17.8 SL	400 ml	21.53 (4.73)	20.40 (4.59)	18.00 (4.35)	12.80 (3.71)	7.80 (2.96)	3.50 (2.04)	38.49
6	Beta-cyfluthrin 25 SC	1450 ml	20.53 (4.62)	19.53 (4.53)	16.20 (4.14)	13.67 (3.81)	9.33 (3.21)	4.08 (2.17)	39.31
7	Sulfoxaflor 12% SC	250 ml	22.93 (4.86)	20.13 (4.58)	16.20 (4.12)	17.87 (4.34)	11.53 (3.52)	3.67 (2.07)	38.73
8	Untreated control	-	23.93 (4.98)	18.93 (4.45)	26.00 (5.16)	35.13 (5.97)	31.13 (5.66)	3.83 (2.08)	32.26
		SE+	**0.33**	**0.27**	**0.27**	**0.25**	**0.23**	**0.08**	**2.60**
		CD 0.5%	**NS**	**NS**	**0.80**	**0.75**	**0.71**	**NS**	**7.88**
		CV%	**12.16**	**10.24**	**10.47**	**10.35**	**11.22**	**5.95**	**11.84**

*Figures in parentheses indicate V_{n+1} transformed value.

Table B7-10.2d: Efficacy of various insecticides and biopesticides against foliar aphid during 2020-21 (CentreVijapur)

Sr. No.	Treatment	Doses g/10 l	Aphid population per shoot					Grain yield (q/ha)
			Before spray	Days After spray *				
				1 d	2 d	7 d	15 d	
1	*Lecanicillium lecanii* (1 X 10^9 cfu/g)	40	16.47	2.69 (7.33)	2.23(5.13)	1.93 (4.07)	0.95 (0.92)	36.9
2	*Metarrhizium anisopliae* (1 X 10^9 cfu/g)	40	16.93	2.77 (7.80)	2.71 7.40)	2.04 (4.33)	1.06 (1.13)	36.9
3	*Beauveria bassiana* (1 X 10^9 cfu/g)	40	19.27	3.22 (10.47)	2.50 6.47)	2.33 (5.60)	0.85 (0.73)	38.8
4	Azadirachtin 1500 ppm	50	15.60	2.62 (6.87)	2.26 5.13)	2.08 (4.33)	0.51 (0.27)	37.7
5	NSKS 5%	500	16.07	2.62 (6.87)	2.37 5.67)	2.13 (4.60)	0.96 (0.93)	40.0
6	Thiomethoxam 25WG (0.01%)	4	17.33	2.29 (5.40)	1.76 3.33)	1.19 (1.53)	0.40 (0.17)	38.6
7	Acetamiprid 20 SP (0.006%)	3	18.20	2.94 (8.67)	2.42 5.87)	1.50 (2.33)	0.51 (0.27)	36.5
8	Untreated Check	-	18.87	4.26 (18.13)	3.74 (14.00)	3.37 (11.40)	2.62 (6.87)	36.2
	C.D. (0.05) C.V. %		NS 17.1	0.52 10.2	0.52 11.8	0.67 18.3	0.20 11.3	NS 16.0

* Square root transformed values and in parentheses are original mean values.

Date of sowing : 25/11/2020 Design : R.B.D Replications : Three
Date of insecticide application : 11/01/2021 Spacing : 20 cm between row No. of rows / plot : 12
Date of harvesting : 24/03/2021 Condition : Irrigated
Variety : GW 322 Plot size : Gross: 6.0m x 2.40 m Net : 5.0m x 1.60 m

Table B7-10.2e: Efficacy of various insecticides and biopesticides against foliar aphid during 2020-21 (Centre: Kanpur)

S.No.	Treatments	Actual dose ml/g/ha	Aphid population per main shoot					Grain yield (q/ha)	Increase yield (q/ha) over untreated
			Before spray	After spray					
			1 day	1day	2 days	7 days	15 days		
1.	Thiamethoxam 12.6% + Lambda cyhalothrin 9.5% ZC(Alika)	150 ml.	14.44	8.62(17.05)	5.60(13.69)	1.40(6.80)	0	30.73	6.66
2.	Thiamethoxam 25% WG	50 g.	11.60	7.40(15.79)	4.02(11.54)	1.10(6.02)	0	32.07	8.00
3.	Lambda cyhalothrin 5% EC	500ml.	13.60	4.51(12.25)	2.24(8.53)	0.20(2.56)	0	40.43	16.36
4.	Beta-Cyfluthrin 9%+ Imidacloprid 21%	400ml.	11.40	6.40(14.65)	3.35(10.47)	0.46(3.89)	0	35.62	11.55
5.	Imidacloprid 17.8 EC	400ml.	11.75	7.06(15.34)	3.73(11.09)	1.00(5.74)	0	35.44	10.37
6.	Beta-cyfluthrin 25 SC	1450ml	12.60	5.66(13.69)	2.73(9.46)	0.43(3.63)	0	38.66	14.59
7.	Thiamethoxam 30% FS	100ml	10.60	5.06(12.92)	2.40(8.91)	0.40(3.63)	0	38.87	14.80
8.	Untreated control	-	12.40	13.55(21.56)	25.73(30.45)	30.76(33.65)	6.11	24.07	-
S.Em $\pm$		-	NS	0.681	0.959	0.775	-	0.406	-
CD 5%		-	NS	1.832	2.937	2.374	-	1.244	-

* Ttransformed values, Figures within parenthesis represent actual mean values; Figures with same alphabets are statistically at par

Date of sowing : 01.12.2020 Plot size Gross : 3 m x 5m = 15 Sqm
Date of insecticidal application : 29.01.2021 Design : R.B.D.
Date of harvest : 13.04.2021 Variety : K551
Irrigated/ Unirrigated : Unirrigated No. of rows/plot : 23 Replication : Three

B8. Management of lepidoterous pests (pink stem borer, army worm & cutworms) of wheat: (**Centres:** Ludhiana & Karnal)

Centre: Ludhiana

The trial was conducted in the Happy Seeder sown wheat field at B-Block experimental area, Dept. of Plant Breeding and Genetics, PAU Ludhiana. The wheat variety PBW 725 was sown on 17th Nov 2020. The treatments included foliar application of chlorantraniliprole 18.5 SC @ 100 & 150 ml/ha, flubendiamide 480 SC @ 40 & 60 ml/ha and *Bacillus thuringiensis* @ 1 & 1.5 lt/ha and soli applications fipronil 0.6% GR @7.5 and 10 kg/ha alongwith untreated check. Each treatment was replicated thrice. Pink stem borer (PSB) damage was recorded from five spots of 1 m row lengths in each plot byh counting damaged tiller and total tillers.

The data revealed that there was no difference in PSB damage among different treatments before insecticide application. However 3 days after treatment, the lowest PSB damage was recorded in chlorantraniliprole 18.5 SC @ 150 (0.89%) followed by fipronil 0.6% GR @10 kg/ha (0.90%). Seven days after treatment, the lowest PSB damage was recorded in fipronil 0.6% GR @10 kg/ha (0.77%) followed chlorantraniliprole 18.5 SC @ 150 (0.79%) and it was at par with of fipronil 0.6% GR @7.5 kg/ha (0.96%) and flubendiamide 480 SC @ 60 ml/ha. However *Bacillus thuringiensis* @ 1 & 1.5 lt/ha and lower dosage of flubendiamide 480 SC, chlorantraniliprole 18.5 SC were significantly inferior and were at par with untreated control (1.88%). Similar trend was recorded 15 days after treatment.

The grain yield (q/ha) obtained was maximum in plot treated with fipronil 0.6% GR @10 kg/ha (50.76) followed flubendiamide 480 SC @ 60 ml/ha (50.13) and it was at par with all treatment lower dosage of flubendiamide 480 SC, chlorantraniliprole 18.5 SC, *Bacillus thuringiensis* @ 1 & 1.5 lt/ha and the untreated check (47.63 q/ha)(Table B8-10.2a).

Centre: Karnal

No difference in PSB damage was observed among different tested treatments before insecticide application. After 3 days after treatment, the lowest PSB damage was recorded in chlorantraniliprole 18.5 SC @ 150 (0.22%) followed by fipronil 0.6% GR @10 kg/ha (0.23%). Seven days after treatment, the lowest PSB damage was recorded in fipronil 0.6% GR @10 kg/ha (0.15%) followed chlorantraniliprole 18.5 SC @ 150 (0.17%). However *Bacillus thuringiensis* @ 1 & 1.5 lt/ha and lower dosage of flubendiamide 480 SC, chlorantraniliprole 18.5 SC were significantly inferior and were at par with untreated control (2.38%). Similar trend was recorded 15 days after treatment.

The grain yield (q/ha) obtained was maximum in plot treated with fipronil 0.6% GR @10 kg/ha (50.09) followed flubendiamide 480 SC @ 60 ml/ha (49.46) and it was at par with all treatment lower dosage of flubendiamide 480 SC, chlorantraniliprole 18.5 SC, *Bacillus thuringiensis* @ 1 & 1.5 lt/ha and the untreated check (46.96 q/ha)(Table B8-10.2b).

Table B8-10.2a: Efficacy of various insecticides and biopesticides against lepidopterous pests pink stem borer, army worm & cutworms) of wheat during 2020-21 (Centre: Ludhiana)

S. No	Treatments	Dosage	Per cent damage before treatment	Per cent damaged tillers			Grain yield (q/ha)
				3	7	15	
1	Coragen 18.5 SC (chlorantraniliprole)	100 ml	2.69	1.75	1.61	1.76	48.20
2	Coragen 18.5 SC (chlorantraniliprole)	150 ml	2.71	0.89	0.79	1.01	49.93
3	Fame 480 SC (flubendiamide)	40 ml	2.77	1.85	1.63	1.72	48.73
4	Fame 480 SC (flubendiamide)	60 ml	2.70	1.08	0.81	0.88	50.13
5	Fipronil 0.6% GR	7.5 Kg	2.89	1.09	0.96	1.12	50.03
6	Fipronil 0.6% GR	10 Kg	2.76	0.90	0.77	0.94	50.76
7	Dipel (*Bacillus thuringiensis*)	1litre	2.90	1.70	1.87	1.95	48.56
8	Dipel (*Bacillus thuringiensis*)	1.5 litre	2.84	1.81	1.80	1.88	48.70
9	Untreated Control	-	2.79	2.05	1.88	1.81	47.63
CD (p=0.05)		-	NS	0.25	0.30	0.22	1.02

* Figures in parentheses are transformed means

Date of sowing	:	17-11-2020	Plot size	:	25 m^2
Date of insecticidal application	:	08-12-2020	Variety	:	PBW 725
Date of harvest	:	02-05-2021	Replications	:	Three

Table B8-10.2b: Efficacy of various insecticides and biopesticides against lepidopterous pests pink stem borer, army worm & cutworms) of wheat during 2020-21 (Centre: Karnal)

S. No	Treatments	Dosage	Per cent damage before treatment	Per cent damaged tillers			Grain yield (q/ha)
				3	7	15	
1	Coragen 18.5 SC (chlorantraniliprole)	100 ml	2.02	1.08	0.94	1.09	47.53
2	Coragen 18.5 SC (chlorantraniliprole)	150 ml	2.04	0.22	0.14	0.21	49.26
3	Fame 480 SC (flubendiamide)	40 ml	2.15	1.18	0.96	1.05	48.06
4	Fame 480 SC (flubendiamide)	60 ml	2.03	0.41	0.17	0.29	49.46
5	Fipronil 0.6% GR	7.5 Kg	2.22	0.42	0.29	0.45	49.36
6	Fipronil 0.6% GR	10 Kg	2.09	0.23	0.15	0.27	50.09
7	Dipel (*Bacillus thuringiensis*)	1litre	2.23	2.16	2.02	2.28	47.89
8	Dipel (*Bacillus thuringiensis*)	1.5 litre	2.17	2.03	2.13	2.21	48.03
9	Untreated Control	-	2.12	2.38	3.21	3.14	46.96
CD (p=0.05)		-	NS	0.21	0.19	0.23	1.24

* Figures in parentheses are transformed means

Date of sowing	:	09-11-2020	Plot size	:	25 m^2
Date of insecticidal application	:	11-12-2020	Variety	:	HD2967
Date of harvest	:	12-04-2021	Replications	:	Three

B9. Management of termites, aphids and seed borne diseases of wheat through seed treatment of chemical molecules combinations (Centres: Durgapura, Kanpur, Ludhiana and Vijapur)

B9a. Management of termites through seed treatment

Centre: Ludhiana

The trial was conducted in the rainfed fields at New experimental area, Dept. of Plant Breeding and Genetics, PAU Ludhiana. The wheat variety PBW 660 was sown on 6th Nov 2020. Before sowing, the seeds were treated with seven different insecticides separately by spraying on the spreaded layer of equal quantity of seed on polyethene sheet. The treated seed was dried overnight before sowing. The treatments included pre-mixed pesticides combination of imidacloprid 18.5%+ hexaconazole 1.5% FS and tank mixing Imidacloprid 600FS, thiamethoxam 25 WG, tebuconazole/hexaconazole alongwith untreated check. Each treatment was replicated thrice. For recording observations on the plant population and damage plants, five spots of 2 m row lengths each, were ear marked in each plot.

The data presented in Table B9 revealed that plant population/m row recorded after 3 weeks of germination was non-significant among all the treatments. Hence, none of treatment used, affected the seed germination. Per cent damaged effective tillers/m row after 3, 4 & 5 weeks of germination indicated that all treatments recorded significantly lower per cent damaged effective tillers/ m row except seed treatment of tebuconazole/hexaconazole and untreated check. However, the lowest termite damage was recorded in pre-mixed insecticide imidacloprid 18.5%+ hexaconazole 1.5% FS@ 2 ml/ac followed by Imidacloprid 600FS @ 2 ml/ac.

At ear head stage, the per cent damaged effective tillers per meter row (in marked spots) were minimum in the plot treated with pre-mixed insecticide imidacloprid 18.5%+ hexaconazole 1.5% FS (1.43 %) treated plots and it was on par with all the other treatments except seed treatment of tebuconazole/hexaconazole and untreated check. The numbers of damaged effective tillers/ha were also lowest in plots treated with pre-mixed insecticide imidacloprid 18.5%+ hexaconazole 1.5% FS @ 2mm/ac (10500). All these insecticides treated plots recorded significantly lower number of damaged tillers/ha as compare to untreated check except tebuconazole and hexaconazole treatments alone.

The grain yield (q/ha) obtained was maximum in plot treated with pre-mixed insecticide imidacloprid 18.5%+ hexaconazole 1.5% FS @ 2 ml/ac (52.01 q/ha) and it was at par with all treatment seed treatment with tebuconazole/hexaconazole (48.38) and the untreated check (47.74 q/ha) (**Table B8a-10.1a).**

Centre: Durgapura

The experiment for the control of termite through seed treatment was carried out at the Rajasthan Agriculture Research Institute, Durgapura under irrigated conditions during the *rabi* season 2020-21. The plant population / m row that was counted after 3 weeks of sowing revealed non-significant difference among the treatments. The observations on termite damage were taken during 3rd, 4th and 5th weeks after sowing in all the treatments. No termite infestation was observed after 3 weeks in treatment of Imidacloprid 600FS + Tebulconzole/Hexaconazole. After 4th weeks, the termite damage was lowest Imidacloprid 600FS + Tebulconzole/Hexaconazole (0.58%) followed by Thiamethoxam 25 WG+Tebuconazole/Hexaconazole (1.09%) and Neonix (Imidacloprid 18.5%+Hexaconazole 1.5% FS) (1.14%). The maximum grain yield (gm /m/row) was recorded in the plot treated with Imidacloprid 600FS+Tebulconzole/Hexaconazole(41.30 q/ha.) as compared to untreated check (28.36 q/ha) (Table B8a-10.2b).

Centre: Vijapur

This experiment was conducted under irrigated condition and the results are presented in table 1. The plant population/m row length was counted after 3 weeks of sowing and confirmative test on germination where the counted number of seeds were sown separately in small replicated trial for all the treatments under field conditions were also recorded. The data indicated non-significant differences for plant population as well as confirmative test for seed germination which indicated that none of the insecticidal treatments affected the seed germination. The results on per cent damaged shoots per meter row were recorded at 3rd, 4th, 5th week after sowing. The data revealed significant differences for per cent damaged shoots per meter row at 4thand 5th week after sowing. The shoot damage was not observed in T1, T2, T3, T5 and T6. However, 2.17 and 2.70 per cent damaged shoots were recorded in T4 i.e. Tebuconazole 2 DS while, 2.80 and 3.16 per cent was recorded in T7 i.e.

Hexaconazole 5 EC compared to 7.87 and 8.18 per cent at 4th and 5th week after sowing, respectively. The data further revealed that 3.27 and 3.93 per cent damaged effective tillers were also recorded in T4 and T7, respectively.

The results indicated that lowest aphid population of 1.33 per shoot was recorded in treatment of Thiamethoxam 25 WG + Tebuconazole 2 DS which was at par with Imidacloprid 600 FS + Tebuconazole 2 DS with aphid population of 1.87 per shoot. Same trend was also observed at 72 days after sowing with respective aphid population of 1.47 and 1.93, respectively. The aphis population in the untreated check was 5.20 and 5.67, respectively at 65 and 72 days after sowing.

During crop season, no incidence of seed borne disease was recorded. There were non-significant differences among all the treatment for wheat grain yield (q/ha) (Table B8a-10.1c).

Another experiment on eco-friendly management of termite through seed treatment was carried out under irrigated condition and the results are depicted in Table B8a-10.1d. The results pertaining to plant population/m row length counted after 3 weeks of sowing and confirmative test on germination found non-significant. In confirmative test on germination, the counted numbers of seeds of different treatments were sown separately in small replicated trial under field conditions. Thus, none of the insecticidal treatments affected the seed germination. The data further indicated that there was no termite damage observed during 3rd week after sowing. However, during 4th and 5th weeks after sowing, the shoot damage due to termite was observed in the treatments of bio-control agents as well as untreated check. The respective per cent shoot damage was observed 3.45 and 4.03 in T6 i.e. *B.* bassiana while it was 2.46 and 3.28 in T7 i.e. *M.* anisopliae compared to 5.54 and 6.67 in untreated check. The result of percent damaged effective tillers/m row revealed that 5.69 and 3.54 per cent was recorded in T6 and T7, respectively. The termite damage was not recorded in all the chemical seed treatments. There were non-significant differences among all the treatment for grain yield (q/ha). However, the maximum grain yield q/ha was obtained from Fipronil+Imidacloprid 40 % WG treated plot (Table B8a-10.1d).

Centre: Kanpur

The incidence of termite after 3 weeks of sowing was not seen in any of the treatments accept untreated plot i.e. 2.0 per cent. The incidence of termite after 4 weeks of sowing ranged from 0.52 to 0.85 per cent while in untreated plot it was 3.41 per cent. The incidence was lowest in treatment of Thiamethoxam 25 WG followed by Imidacloprid 600 FS + Tebuconazole and Thiamethoxam 25 WG + Tebuconazole. After 5 weeks of sowing, the incidence of termite ranges from 1.31 to 1.83 per cent, while in untreated plot it was 3.65 per cent.

All the insecticidal treatments showed, superiority over untreated checks in minimizing the per cent damaged effective tillers. The damaged number of effective tillers/ha in different treatments ranged from 3000.00 to 5833.33 while it was 22666.66 in untreated plots. Per cent damaged effective tillers/m row at crop maturity (1.38) and number of damaged effective tillers/ha (3000.00) at harvest was lowest in Thiamethoxam 25 WG. Grain yield q/ha was highest (20.11 q/ha) in Thiamethoxam 25 WG treated plots as compared to 13.08 q/ha in unitreated plots (Table B8a-10.2e).

Experiment B9b: Management of termites through broadcast application in standing crop

Centre: Vijapur: An experiment on eco-friendly management of termite through broadcast application in standing wheat crop was conducted under irrigated condition. The results are summarized in table 3. There was no termite damage observed in all the treatments after 3rd and 4thweek of sowing. However, after 5th weeks of sowing, significant differences in termite damage were recorded in different treatments. There was no termite damage recorded in the treatments of broadcasting of chemicals. The treatments of bio-agents also recorded significantly less percent damaged shoots per meter row than untreated check. Among the treatments of bio-agents,T9 i.e. application of *M. anisopliae* in furrow at sowing recorded significantly the lowest per cent damaged shoots per meter row of 1.36 followed by T8 i.e.*B. bassiana* in furrow at sowing with 1.88 per cent damaged shoots. The data on per cent damaged effective tillers per meter row also indicated the same trend. None of the insecticidal treatments significantly affected the grain yield (q/ha). However, maximum grain yield was recorded in the plot treated with Thiamethoxam 30FS (Table B9b-10.2a).

Table B9a-10.2a: Management of termites through seed treatment of chemical molecules combinations (Centre: Ludhiana)

S. No	Treatments	Dose g or ml / Kg seed	Plant population/m row	Per cent damaged shoots/m row			Per cent damaged tillers/m row at ear head stage	No. of damaged effective tillers/ha	Grain yield (q/ha)
				3 weeks	4 weeks	5 weeks			
1	Imidacloprid 600FS + Tebulconzole/Hexaconazole	4 ml + 2 ml	45.13	0.85 (6.67)	0.73 (6.35)	0.71 (6.30)	1.43 (7.97)	10666 (103.27)	51.14
2	Thiamethoxam 25 WG + Tebuconazole/Hexaconazole	3 g +2 ml	44.83	0.88 (6.74)	0.77 (6.47)	0.72 (6.35)	1.55 (8.24)	11083 (105.21)	50.55
3	Thiamethoxam 25WG	3 gm	45.16	0.67 (6.22)	0.79 (6.50)	0.73 (6.34)	1.60 (8.32)	11500 (107.20)	50.05
4	Tebuconazole/Hexaconazole	2 ml	44/93	3.72 (11.84)	3.72 (11.83)	3.55 (11.61)	3.55 (11.62)	23833 (154.36)	48.38
5	Imidacloprid 600 FS	2 ml	44.96	0.80 (6.55)	0.72 (6.33)	0.68 (6.24)	1.43 (7.99)	11500 (107.18)	50.04
6	Neonix (Imidacloprid 18.5%+ Hexaconazole 1.5% FS)	1.5 ml	45.03	0.87 (6.72)	0.75 (6.40)	0.68 (6.25)	1.45 (8.02)	11133 (106.35)	51.65
7	Neonix (Imidacloprid 18.5%+ Hexaconazole 1.5% FS)	2 ml	45.13	0.73 (6.35)	0.56 (5.92)	0.65 (6.15)	1.43 (8.01)	10500 (102.41)	52.01
8	Untreated control	-	44.96	3.86 (12.05)	3.74 (11.87)	3.56 (11.61)	3.64 (11.73)	24083 (155.17)	47.74
CD (p=0.05)			NS	(0.57)	(0.81)	(0.51)	(0.65)	(7.08)	1.34

* Figures in parentheses are transformed means

Date of sowing	:	05-11-2019	Plot size	:	40 m^2
Date of insecticidal application	:	04-11-2019	Variety	:	PBW 660
Date of harvest	:	01-05-2020	Replications	:	Three

Table B9a-10.2b: Management of termites through seed treatment of chemical molecules combinations (Centre: Durgapura)

S. No	Treatments	Dose g or ml / Kg seed	Plant population/m row	Per cent damaged shoots/m row			Per cent damaged tillers/m row at ear head stage	No. of damaged effective tillers/ha	Grain yield (q/ha)
				3 weeks	4 weeks	5 weeks			
1	Imidacloprid 600FS + Tebulconzole/Hexaconazole	4 ml + 2 ml	18.00	0.00	0.58	1.01	2.33	25143.33	41.30
2	Thiamethoxam 25 WG + Tebuconazole/Hexaconazole	3 g +2 ml	18.00	0.80	1.09	2.17	3.84	37456.67	37.11
3	Thiamethoxam 25WG	3 gm	19.00	1.09	1.33	2.33	3.71	36131.67	37.86
4	Tebuconazole/Hexaconazole	2 ml	18.33	2.68	4.08	6.06	8.23	76095.00	31.96
5	Imidacloprid 600 FS	2 ml	18.33	0.65	1.00	1.89	3.33	31635.00	39.28
6	Neonix (Imidacloprid 18.5%+ Hexaconazole 1.5% FS)	1.5 ml	19.00	1.36	1.58	2.88	4.66	44301.67	34.57
7	Neonix (Imidacloprid 18.5%+ Hexaconazole 1.5% FS)	2 ml	18.00	0.92	1.14	2.54	3.53	33533.33	38.26
8	Untreated control	-	19.00	4.47	6.49	8.94	12.76	121188.33	28.36

Table B9a-10.2c: Management of termites through seed treatment of chemical molecules combinations during 2020-21 (Location: Vijapur)

Sr. No.	Treatment	Dose ml or g /kg seed	Plant popul. /m row length	Confirm ative test for seed germinat ion	Per cent damaged shoots/m row after 3rd to 5th weeks afters owing	% Damaged effective tillers/m row	No. of damaged effective tillers/ha	Aphid population per shoot		Grain yield	
								65 DAS	72 DAS	g/m	q/ha
1.	Imidacloprid 600 FS + Tebuconazole 2 DS(2 % w/w- Raxil)	1 ml + 2 ml	58.3	84.3	0.00	4.05 (0.00)	4.05 (0.00)	4.05 (0.00)	1.36 (1.87)	1.38 (1.93)	29.2
2.	Thiamethoxam 25 WG + Tebuconazole 2 DS(2 % w/w- Raxil)	3 g + 2 ml	57.0	86.3	0.00	4.05 (0.00)	4.05 (0.00)	4.05 (0.00)	1.15 (1.33)	1.20 (1.47)	32.4
3.	Thiamethoxam 25 WG	3 g	56.0	86.0	0.00	4.05 (0.00)	4.05 (0.00)	4.05 (0.00)	1.68 (2.87)	1.75 (3.13)	38.7
4.	Tebuconazole 2 DS(2 % w/w- Raxil)	2 ml	56.3	86.7	0.00	8.48 (2.17)	9.44 (2.70)	10.39 (3.27)	1.98 (3.93)	1.99 (4.07)	30.6
5.	Imidacloprid 600 FS	2 ml	59.3	87.3	0.00	4.05 (0.00)	4.05 (0.00)	4.05 (0.00)	1.69 (2.87)	1.77 (3.13)	31.0
6.	Imidacloprid 18.5 % + Hexaconazole 1.5 % FS(Neonix)	4 ml	62.0	82.7	0.00	4.05 (0.00)	4.05 (0.00)	4.05 (0.00)	1.65 (2.73)	1.79 (3.27)	29.0
7.	Hexaconazole 5 % EC	2 ml	61.0	80.3	0.00	9.74 (2.80)	10.24 (3.16)	11.41 (3.93)	1.96 (3.87)	1.97 (3.93)	28.6
8.	Untreated Check	-	60.0	88.7	0.00	16.29 (7.87)	16.62 (8.18)	16.29 (7.87)	2.28 (5.20)	2.38 (5.67)	28.4
	S.Em.+ C.D. at 5% C.V.%		NS 7.03	NS 8.23	- -	0.71 5.90	0.61 4.90	0.80 6.20	0.23 7.60	0.29 9.30	NS 21.9

* Square root transformed values and in parentheses are actual mean values

** Arc sin transformed values and in parenthesis are actual mean values

Date of seed treatment : 24/11/2020 Date of sowing : 25/11/2020

Date of Plant population count : 14/12/2020 Date of harvesting : 24/03/2021

Design : R.B.D Replications: Three Spacing : 20 cm between row No. of rows / plot: 12

Plot size : Gross : 6.0 m x 2.40 m Net: 5.0 m x 1.60 m Variety: GW 496 Condition : Irrigated

Table B9a-10.2d: Management of termites through seed treatment of chemical molecules combinations during 2020-21 (Location: Vijapur)

Sr. No.	Treatment	Dose g a.i./ kg seed	Plant population /m row length	Confirmative test for seed germination	Per cent damaged shoots/m row after sowing (week)			% Damaged effective tillers/m row	Grain yield q/ha
					3rd	4th	5th		
1	Thiamethoxam 25 WG	0.80	56.7	81.0	0.00	4.05 (0.00)	4.05 (0.00)	4.05 (0.00)	28.7
2	Thiamethoxam 30 FS	0.72	62.7	83.0	0.00	4.05 (0.00)	4.05 (0.00)	4.05 (0.00)	28.9
3	Fipronil 5 SC	0.30	58.0	82.7	0.00	4.05 (0.00)	4.05 (0.00)	4.05 (0.00)	28.7
4	Imidacloprid 600 FS *	1.20	62.0	90.0	0.00	4.05 (0.00)	4.05 (0.00)	4.05 (0.00)	31.3
5	Clothianidin 50 WDG	0.75	57.7	84.7	0.00	4.05 (0.00)	4.05 (0.00)	4.05 (0.00)	31.2
6	*Beauveria bassiana* (g/kg seed)	5	63.3	84.3	0.00	10.68 (3.45)	11.58 (4.03)	13.79 (5.69)	28.6
7	*Metarhizium anisopliae* (g/kg seed)	3	64.3	86.7	0.00	8.78 (2.46)	10.42 (3.28)	10.85 (3.54)	28.8
8	Bifenthrin 10 EC	0.20	60.0	83.0	0.00	4.05 (0.00)	4.05 (0.00)	4.05 (0.00)	28.7
9.	Fipronil+Imidacloprid 40 % WG (Lacenta)	1.20	65.3	86.3	0.00	4.05 (0.00)	4.05 (0.00)	4.05 (0.00)	31.7
10.	Untreated Check	-	69.0	88.3	0.00	13.60 (5.54)	14.95 (6.67)	16.21 (7.80)	28.5
	S.Em.± C.D. at 5% C.V.%		NS 14.0	NS 9.2	--	1.45 13.7	0.50 4.50	0.60 5.04	NS 14.03

* Arcsin transformed values and in parentheses are actual mean values

Date of seed treatment : 24/11/2020 Date of sowing : 25/11/2020
Date of Plant population count : 14/12/2020 Date of harvesting : 24/03/2021
Design : R.B.D Replications: Three Spacing : 20 cm between row No. of rows / plot: 12
Plot size : Gross : 6.0 m x 2.40 m Net: 5.0 m x 1.60 m Variety: GW 496 Condition : Irrigated

Table B9a-10.2e Management of termites through seed treatment of chemical molecules combinations during 2020-21 (Location: (Centre: Kanpur)

S. No	Treatments	Actual Dose gm/ ml/kg of seed.	Plant population/m row	Per cent damaged shoots/m row after			Per cent damaged effective tillers/m row at crop maturity	No. of damaged effective tillers/ha at harvest	Grain yield	
				3 weeks	4 weeks	5 weeks			g/m row	q/ha
1.	Imidacloprid 600 FS + Tebuconazole	4ml+ 2ml	28.80	0	0.56 (4.29)	1.42 (6.80)	1.53 (7.04)	3416.66 (58.40)	72.88	18.90
2.	Thiamethoxam 25 WG + Tebuconazole	3.0g+ 2.0ml	28.13	0	0.60 (4.44)	1.52 (7.04)	1.61 (7.27)	4000.00 (63.25)	71.99	18.20
3.	Thiamethoxam 25 WG	3.0g+ 2.0ml	28.66	0	0.52 (4.13)	1.31 (6.55)	1.38 (6.55)	3000.00 (54.77)	73.99	20.11
4.	Tebuconazole	2.0ml	32.73	0	0.80 (5.13)	1.67 (7.27)	1.78 (7.49)	4166.66 (64.54)	56.35	15.75
5.	Imidacloprid 600 FS	2.0ml	30.33	0	0.67 (4.69)	1.54 (7.04)	1.67 (7.27)	3583.33 (59.86)	66.29	16.25
6.	Imidacloprid *18.5% + Hexaconazol*	4ml+ 2ml	30.20	0	0.84 (5.26)	1.75 (7.49)	1.83 (7.71)	4333.33 (65.83)	52.68	15.53
7.	*Hexaconazol 1.5% FS*	2.0ml	31.13	0	0.85 (5.29)	1.83 (7.71)	1.90 (7.92)	5833.33 (76.37)	51.35	15.25
8.	Control	-	29.53	2.0(8.13)	3.41 (10.63)	3.65 (10.94)	3.70 (11.09)	22666.66 (150.55)	55.39	13.08
	SEm+				0.150	0.185	0.124	2.624	1.688	0.4
	CD at 5%				0.460	0.568	0.379	8.035	5.169	1.361

* Ttransformed values, Figures within parenthesis represent actual mean values

Date of sowing : 01.12.2020
Date of insecticidal application : 30.11.2020
Date of plant population counts : 22.12.2020
Date of harvest : 16.04.2021
Irrigated/ Unirrigated : Unirrigated

Plot size Gross : 4 x 5m = 20 Sqm.
Design : R.B.D.
Variety : K1317
No. of rows/plot : 23
Replication : Three

Table B9b-10.2a: Management of termites through broadcast application in standing crop during 2020-21 (Location: Vijapur)

Sr. No.	Treatment	Dose g a.i./ ha	Per cent damaged shoots/m row after sowing (week) *			% Damaged effective tillers/ m row *	Grain yield (q/ha)
			3rd	4th	5th		
1.	Fipronil 5 SC	80	0.00	4.05 (0.00)	4.05 (0.00)	4.05 (0.00)	28.2
2.	Thiamethoxam 30FS	75	0.00	4.05 (0.00)	4.05 (0.00)	4.05 (0.00)	35.0
3.	Imidacloprid 600 FS	180	0.00	4.05 (0.00)	4.05 (0.00)	4.05 (0.00)	33.4
4.	Fipronil 0.3 G broadcast at the time of sowing	60	0.00	4.05 (0.00)	4.05 (0.00)	4.05 (0.00)	33.1
5.	Fipronil+Imidacloprid 40 % WG (Lacenta)	400	0.00	4.05 (0.00)	4.05 (0.00)	4.05 (0.00)	32.8
6.	*Beauveria bassiana* g/ha	500	0.00	4.05 (0.00)	10.37 (3.25)	14.50 (6.27)	31.8
7.	*Metarhizium anisopliae* g/ha	500	0.00	4.05 (0.00)	8.79 (2.37)	12.04 (4.38)	29.2
8.	*Beauveria bassiana*in furrow at sowing g/ha	500	0.00	4.05 (0.00)	7.84 (1.88)	10.75 (3.49)	33.5
9.	*Metarhizium anisopliae* in furrow at sowing g/ha	500	0.00	4.05 (0.00)	6.50 (1.36)	9.43 (2.71)	27.6
10.	Untreated Check	-	0.00	12.72 (4.86)	13.89 (5.76)	20.61 (12.46)	27.5
	C.D. (0.05) C.V.%		- -	0.24 2.80	1.27 10.90	1.53 10.20	NS 19.9

* Arcsin transformed values and in parentheses are actual mean values

Date of sowing : 25/11/2020 Date of insecticide application : 19/12/2020

Date of harvesting : 24/03/2021 Design: R.B D Replications : Three

Spacing : 20 cm between row No. of rows / plot : 12

Plot size: Gross: 6.0m x 2.40 m Net: 5.0 m x 1.60 m Variety: GW 496 Condition : Irrigated

C. STORED GRAIN PEST MANAGEMENT

C1. Evaluation of different packaging bags for storage insect-pest infestation and its effect wheat seed quality (Centre: Karnal)

The experiment was conducted at Karnal to evaluate the comapartive efficacy of storage bags against storage insect-pests infesatation. The infestation of *Sitophilus oryzae* and *Rhizopertha dominica* was recorded.The observation were taken after 1, 3, 4, 6 months of the storage. Avearge number of live insects after 6 months of storage ranged from 6.7 to 25.0 insects being highest in Jute bags and lowest in BOPP bags. Similarly, the % infesatation and % weight loss was also lowest in BOPP bags i.e. 2.5% and 0.9%, respectively. The next best baga were High Density Polyethylene Woven (HDPE) bags and recorded 11.9 insects, 4.4 per cent infesatation and 1.6 per cent weight loss. Quality parameters are yet to be determined for the samples (Table C-10.3a).

Table C-10.3a: Evaluation of different packaging bags for storage insect-pest infestation during 2020-21 (Location: Vijapur)

Type of bag	Number of live insects after					% infesation					% Weight loss				
	1 *	3	4	6	Av.	1	3	4	6	Av.	1	3	4	6	Av.
Cloth Bags	9.6	14.9	20.2	25.4	**17.5**	3.5	5.2	6.9	8.6	**6.1**	1.2	3.5	4.5	5.5	**3.7**
Jute bags	17.1	22.4	27.7	32.9	**25.0**	5.6	7.3	9.0	10.7	**8.2**	3.6	5.9	6.9	7.94	**6.1**
High Density Polyethylene Woven (HDPE) bags	4.2	9.2	14.5	19.8	**11.9**	1.8	3.5	5.2	6.9	**4.4**	0.2	1.1	2.1	3.1	**1.6**
Biaxially Oriented Polypropylene (BOPP) bags	1.2	3.2	8.5	13.8	**6.7**	0.0	1.6	3.3	5.0	**2.5**	0.0	0.2	1.2	2.2	**0.9**

*after different months of storage

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PROGRAMME 11: NEMATOLOGY

11.1 Crop Health Survey

Rajasthan

Survey was conducted in the different cultivator's fields of four districts of Rajasthan for studying the incidence and intensity of Cereal Cyst Nematode (CCN). Diseased fields were randomly selected on the basis of above ground symptoms of the crops. Symptoms of stunting, yellowing, patchy and poor growth were recorded during survey of each field. Roots samples were collected from the rhizospere of wheat and barley crops looking above ground symptoms alongwith composite soil sample. Root & soil sample were processed with standard technique of nematode identification. Presence of cereal cyst nematode was further confirmed by seeing the bushy roots with white cyst on it.

Cereal cyst nematode infestation was recorded in all four districts e.i. Dausa, Jaipur, Sikar and Tonk districts. A large number of infested fields were observed in Amber, Bassi, Chomu, Jamwa Ramgarh, Kotputli, Sahapura, Sanganer and Viratnagar tehsil of Jaipur district. Post-harvest survey was also conducted to observe the infestation of Ear Cockle disease in various grain market of Jaipur district. This year, ECN was not found in collected grain sample of wheat.

Haryana

Crop health monitoring survey for nematodes was done in Hisar and Jind, districts. Cereal cyst nematode was reported from Hisar district only. It was reported in samples of Jagaan, Asranwa, Mahalsara, Kohli, Khairampur, Sadalpur, Chuli, Adampur, Devaan, Mallapur, Data, Daroli, Kalwas, Gangwa, Siswal & Bhodiya bishnoiyan in Hisar (25/42). Number of cysts ranged from 2-57 per 200 cc soil. Other plant parasitic nematodes were reported from both districts. A total 70 soil samples were collected and analysed. Plant parasitic nematodes present in 200 cc soil samples were *Pratylenchus* sp. 14.28% (10/70); *Tylenchorhynchus* sp. 54.28% (38/70); *Hoplolaimus* sp. 24.28% (17/70) and *Helicotylenchus* sp. 57.14% (40/70) (Table 1.1). Wheat seed gall nematode (*Anguina tritici*) was not recorded from the state.

Table1.1: Community analysis of plant parasitic nematodes associated with wheat in Hisar and Jind districts

Nematode species	Frequency of occurrence % (Range in 200 cc sample)
Heterodera avenae	59.52% (2-57)
Tylenchorhynchus sp.	54.28% (15-300)
Pratylenchus sp	14.28% (5-40)
Helicotylenchus sp.	57.14% (2-20)
Hoplolaimus sp.	24.28% (2-35)

11.2. Studies of Pathotypes of *Heterodera avenae*:

The cereal cyst nematode pathotyping were carried out during the crop season 2020-21 against Jaipur population of cereal cyst nematode, *Heterodera avenae*. Out of 26 International differentials of wheat, barley and oat, twelve showed resistant reaction i.e. AUS-15854, AUS-7869, AUS-15895, Psathia, KVL-191, Harlan, Dalmitsche, Morocco, P-313221, Martin, Siri, La-estanzuella while rest showed susceptible reaction. Reaction on various test Assortment revealed that Jaipur Population of CCN is Pathotype Ha 21 (Table 11.2).

Table 11.2: Reaction of *Heterodera avenae* of Jaipur population on International differentials

S. No.	International Differentials	Reactions	S. No.	International Differentials	Reactions
1	AUS-15854	R	14	Ogrlitsche	S
2	AUS-15807	S	15	Dalmitsche	R
3	AUS-7869	R	16	Harta	S
4	AUS-15895	R	17	Emir	S
5	AUS-4930	S	18	Morocco	R
6	AUS-498	S	19	Gelliune	S
7	Loros	S	20	P-313221	R
8	IK2 Light	S	21	Martin	R
9	Psathia	R	22	Varda	S
10	Capa	S	23	Siri	R
11	Ortalan	S	24	La-estanzuella	R
12	KVL-191	R	26	L-62	S
13	Harlan	R	26	Nidar-2	S
Pathotype: Ha 21, Rating scale: 0 -5%= resistant; 6 -100% = susceptible					

11.3 Host resistance

Resistance against cereal cyst nematode (*Heterodera avenae*)

Two hundred entries of AVT were screened for resistance against *H. avenae* (CCN) under sick plot conditions or pot condition at Ludhiana, Hisar and Durgapura centers. No entry found resistant or moderately resistant across all the centers however some of the entries shown moderate level of resistance at particular centers. The detail given below:

Ludhiana Centre

Out of AVT none of the entry was found resistant. Only eight entries namely, PBW876^{B}, K1910, PBW835, HI8713(d) (C), HI8827(d), DBW370, HD3086 (C) and DBW366 have shown moderately resistant reaction rest of the entries were either susceptible or highly susceptible to CCN (Table 11.3).

Durgapura Centre

The AVT entries were screened in naturally sick field against cereal cyst nematode, *Heterodera avenae* (Pathotypes Ha 21) of RARI, Durgapura. Out of these, none of the entry showed resistant reaction however, five entries namely HD3406^{M}, WH1124 (C), HI1653, HD3086 (C) and DDW53(d) showed moderately resistant reaction (Table 11.3).

Hisar centre

AVT entries were screened against cereal cyst nematode, *Heterodera avenae* under screen house conditions using nematode infested soil, five entries viz. DBW222 (C), DBW173 (C), HI1650, DDW48(d)(I) (C) and DBW327* were found moderately resistant and remaining were either susceptible or highly susceptible (Table 11.3).

Table 11.3: Screening of AVT entries CCN during 2020-21 at different locations.

S. No.	Entries	Durgapura	Ludhiana	Hisar	Highest reaction
1	VL2041	HS	S	S	HS
2	HS562 (C)	HS	S	S	HS
3	HPW349 (C)	S	S	S	S
4	HS507 (C)	HS	S	S	HS
5	VL907 (C)	HS	S	HS	HS
6	WH1105 (C)	S	S	S	S
7	DBW187 (C)	S	S	S	S
8	HD3349	HS	S	HS	HS
9	PBW876^{B}	S	MR	S	S

10	HD3406[M]	MR	S	HS	HS
11	DBW222 (C)	HS	S	MR	HS
12	DBW313[#]	HS	S	HS	HS
13	HD2967 (C)	S	S	HS	HS
14	PBW826	HS	S	HS	HS
15	RAJ4548[#]	HS	S	S	HS
16	HD3354	S	S	HS	HS
17	WH1283	S	S	S	S
18	HD3086 (C)	S	S	HS	HS
19	JKW261	S	S	S	S
20	WH1124 (C)	MR	S	HS	HS
21	PBW771 (C)	S	S	HS	HS
22	HD3059 (C)	HS	S	S	HS
23	PBW834	S	S	S	HS
24	DBW173 (C)	S	S	MR	S
25	HUW838[#]*	HS	S	HS	HS
26	NW7096	HS	S	HS	HS
27	DBW321	S	S	HS	HS
28	K1910	S	MR	HS	HS
29	HI1654	S	S	HS	HS
30	NIAW3170 (C)	S	S	HS	HS
31	PBW838	S	S	HS	HS
32	DBW296*	HS	S	HS	HS
33	HI1628 (C)	HS	S	HS	HS
34	HD3369	HS	S	HS	HS
35	WH1142 (C)	HS	S	HS	HS
36	UP3062	HS	S	HS	HS
37	HD3368	S	S	HS	HS
38	HD3043 (C)	HS	S	HS	HS
39	PBW644 (C)	S	S	HS	HS
40	HI1653	MR	S	S	S
41	PBW848	S	S	S	S
42	HD2733 (C)	S	S	HS	HS
43	HD3249 (C)	S	S	HS	HS
44	DBW187 (C)	S	S	HS	HS
45	HD3406[M]	HS	S	HS	HS
46	HD3411[M]	S	S	HS	HS
47	DBW39 (C)	HS	S	HS	HS
48	HD2967 (C)	HS	S	HS	HS
49	PBW826[#]	HS	S	S	HS
50	HD3086 (C)	MR	S	S	S
51	DBW317	HS	S	HS	HS
52	DBW318	S	S	HS	HS
53	PBW835	HS	MR	HS	HS
54	HI1563 (C)	HS	S	HS	HS
55	DBW107 (C)	HS	S	S	HS
56	PBW834	HS	S	HS	HS
57	UP3060	HS	S	HS	HS
58	HD3118 (C)	HS	S	S	HS
59	HI1621 (C)	HS	S	S	HS
60	DBW316	S	S	S	S
61	PBW833	HS	S	HS	HS
62	HD3360	HS	S	HS	HS

63	HI1653	HS	S	HS	HS
64	DBW322	HS	S	HS	HS
65	HI1612 (C)	HS	S	HS	HS
66	DBW252 (C)	S	S	HS	HS
67	DBW321	HS	S	HS	HS
68	HD3368[#]	HS	S	HS	HS
69	HI1654	S	S	S	S
70	HD3293(I) (C)	HS	S	HS	HS
71	WH1281	S	S	HS	HS
72	PBW848[#]	HS	S	S	HS
73	HD3171 (C)	S	S	HS	HS
74	HD3369[#]	HS	S	HS	HS
75	K1317 (C)	S	S	HS	HS
76	UP3062	HS	S	HS	HS
77	HI8833(d)[M]	HS	S	HS	HS
78	GW322 (C)	S	S	HS	HS
79	MP3535	S	S	S	S
80	GW523	HS	S	HS	HS
81	GW513*	HS	S	HS	HS
82	HI1636*	S	S	HS	HS
83	HI8832(d)[M]	S	S	S	S
84	MACS6768	HS	S	HS	HS
85	HI1544 (C)	S	S	HS	HS
86	HI1667[B]	S	S	S	S
87	HI8498(d) (C)	S	S	S	S
88	HI8713(d) (C)	S	MR	HS	HS
89	HI1650	HS	S	MR	HS
90	MP4010 (C)	S	S	HS	HS
91	HD2864 (C)	HS	S	HS	HS
92	MP3336 (C)	HS	S	HS	HS
93	HD2932 (C)	HS	S	HS	HS
94	HI1634(I) (C)	HS	S	HS	HS
95	HD3407[M]	HS	S	HS	HS
96	CG1029(I) (C)	HS	S	HS	HS
97	HI8823(d)*	S	S	S	S
98	GW528	HS	S	HS	HS
99	DDW47(d) (C)	S	S	S	S
100	DBW326	HS	S	HS	HS
101	UAS475(d)	HS	S	S	HS
102	HI8627(d) (C)	HS	S	S	HS
103	NIAW3851	HS	S	HS	HS
104	HI8830(d)	HS	S	S	HS
105	CG1036	HS	S	S	HS
106	HI1655	HS	S	HS	HS
107	DBW110 (C)	HS	S	S	HS
108	MP3288 (C)	HS	S	S	HS
109	DDW55(d)	HS	S	S	HS
110	WHD965(d)	S	S	HS	HS
111	UAS428(d) (C)	HS	S	HS	HS
112	HI8826(d)	HS	S	S	HS
113	MACS4100(d)	HS	S	HS	HS
114	MACS3949(d) (C)	S	S	S	S
115	DDW53(d)	MR	S	HS	HS

116	NIDW1345(d)	S	S	HS	HS
117	MACS6222 (C)	HS	S	HS	HS
118	MACS4106(d)	HS	S	HS	HS
119	NIDW1348(d)	HS	S	HS	HS
120	HI8828(d)	S	S	HS	HS
121	GW322 (C)	HS	S	HS	HS
122	HI8827(d)	HS	MR	S	HS
123	DDW48(d)(I) (C)	HS	S	MR	HS
124	HD3090 (C)	HS	S	S	HS
125	HI1633(I) (C)	S	S	HS	HS
126	HD2932 (C)	S	S	S	S
127	RAJ4083 (C)	HS	S	S	HS
128	DBW320	HS	S	S	HS
129	MACS6774	S	S	HS	HS
130	NWS2180[#]	HS	S	HS	HS
131	HI1651	S	S	HS	HS
132	MP1358*	HS	S	HS	HS
133	MACS6755	HS	S	HS	HS
134	HI1605 (C)	HS	S	S	HS
135	MACS6753	HS	S	HS	HS
136	AKDW2997-16(d) (C)	S	S	S	S
137	NIDW1149(d)(I) (C)	HS	S	S	HS
138	NIAW3170 (C)	S	S	HS	HS
139	UAS446(d) (C)	S	S	S	S
140	DBW325	HS	S	S	HS
141	UAS3014	HS	S	S	HS
142	MACS5058	HS	S	HS	HS
143	MACS6222(*a*) (C)	HS	S	HS	HS
144	DDK1029 (C)	HS	S	HS	HS
145	DDK1061	HS	S	HS	HS
146	HW1098 (C)	HS	S	S	HS
147	MACS5057	HS	S	S	HS
148	DDK1060	HS	S	S	HS
149	DBW328*	HS	S	S	HS
150	DBW372	HS	S	HS	HS
151	DBW370	S	MR	S	S
152	DBW327*	HS	S	MR	HS
153	WH1252*	HS	S	S	HS
154	PBW874	HS	S	S	HS
155	HD3410	HS	S	S	HS
156	DBW332*	HS	S	S	HS
157	PBW873	HS	S	S	HS
158	DBW371	HS	S	S	HS
159	HD3086 (C)	HS	S	HS	HS
160	DBW333*	S	S	S	S
161	PBW872	S	S	S	S
162	DBW187(I) (C)	S	S	HS	HS
163	WH1270(I) (C)	HS	S	HS	HS
164	DBW303(I) (C)	HS	S	HS	HS
165	HD3412	S	S	HS	HS
166	DBW375	HS	S	HS	HS
167	DBW374	S	S	HS	HS
168	HD3403	S	S	S	S

169	WH1406	HS	S	HS	HS
170	HD3413	S	S	HS	HS
171	PBW867	S	S	HS	HS
172	UP3096	S	S	HS	HS
173	WH1404	HS	S	HS	HS
174	PBW868	HS	S	HS	HS
175	DBW318	HS	S	HS	HS
176	DBW378	HS	S	HS	HS
177	WH1405	HS	S	HS	HS
178	HD3405	HS	S	HS	HS
179	DBW377	S	S	HS	HS
180	PBW869	S	S	HS	HS
181	PBW871	HS	S	HS	HS
182	HD3086 (C)	HS	MR	HS	HS
183	DBW376	HS	S	HS	HS
184	DBW373	HS	S	HS	HS
185	HD3404	HS	S	HS	HS
186	DBW187(I) (C)	S	S	HS	HS
187	WH1407	HS	S	HS	HS
188	PBW870	HS	S	HS	HS
189	UP3095	S	S	HS	HS
190	DBW368	HS	S	HS	HS
191	DBW363	S	S	HS	HS
192	DBW369	S	S	HS	HS
193	DBW367	S	S	HS	HS
194	DBW364	S	S	HS	HS
195	Kharchia 65 (C)	HS	S	HS	HS
196	DBW366	HS	MR	HS	HS
197	KRL210 (C)	HS	-	HS	HS
198	DBW365	S	S	HS	HS
199	K1805	HS	S	HS	HS
200	KRL19 (C)	S	S	HS	HS

For Cereal Cyst Nematode, HS- Highly susceptible, S- Susceptible, MR- Moderately Resistant, R- Resistant,

11.4 Multiple Disease/ Pest Screening Nursery (MDSN)

Forty entries were screen against cereal cyst nematode at Durgapura, Ludhiana and Hisar. Out of these entries none of the entry showed high or moderately level of resistance, all the entries fall in susceptible or highly susceptible category. Only at Ludhiana three entries *viz.* NIDW1149(d), DDK 1057 and PBW 752 showed moderate level of resistance.

11.5 Management of Cereal Cyst Nematode (CCN)

Durgapura

An experiment was conducted at Rajasthan Agricultural Research Institute, Durgapura, Jaipur in sick field of Molya disease. Inoculums level was 4.2 larvae /g soil. The experiment consisted of six treatments *viz.*, Fluensulfone 2% GR @0.5 Kg a.i./ha at sowing (25 Kg formulation ha^{-1}), Fluensulfone 2% GR @1.0 Kg a.i./ha at sowing (50 Kg formulation ha^{-1}), Fluensulfone 2% GR @1.5 Kg a.i./ha at sowing (75 Kg formulation ha^{-1}), Fluensulfone 2% GR @ 2.0 Kg a.i./ha at sowing (100 Kg formulation ha^{-1}), Carbofuran @2 kg a.i/ ha at sowing and untreated check in a completely randomized block design with six replication. The crop was examined for count the white numbers of cyst $plant^{-1}$ in each treatment. The yield was taken at the time of harvesting of the crop in each

treatment block wise. The results revealed that treatment Fluensulfone 2% GR is effective in reducing the cysts population per plant and gave significant higher yield (45.0 q ha^{-1}) when applied at the concentration of 1.5 Kg a.i. ha^{-1} (75 Kg formulation ha^{-1}) at the time of sowing. The effect of higher dosage of the chemical is not able to increase yield of crop significantly. No Phyto-toxic effect was observed on any part of plant. Recommended dose of Fluensulfone 2% GR @0.5 Kg a.i./ha at sowing (25 Kg formulation ha^{-1}) gave higher yield in comparison to treated check (Table 11.4)

Table 11.4: Effects of Fluensulfone on cereal cyst nematode in wheat under artificially created sick plot during crop season 2020-21

Treatment(s)	Description of treatment(s)	Dosage (Kg a.i. ha^{-1})	Mean number of cysts $plant^{-1}$	Yield (q ha^{-1})
T1	Fluensulfone 2% GR	0.5	3.67	45.00
T2	Fluensulfone 2% GR	1.0	3.00	45.00
T3	Fluensulfone 2% GR	1.5	3.00	45.33
T4	Fluensulfone 2% GR	2.0	2.33	45.33
T5	Carbofuran	2.0	5.33	40.67
T6	Untreated Check		25.67	31.67
	CD (P=0.05)		4.83	3.21
	SE		2.19	1.42

Hisar

The experiment was done in screen house in earthen pots to manage cereal cyst nematode by using Fluensulfone 2% GR in wheat. Nematode-infested soil was filled after diluting the soil with dune sand to make the initial inoculum 25 cysts kg^{-1} soil. There were six treatments with four replications arranged in a completely randomized design. Chemicals were mixed in soil at the time of sowing in their respective treatments. Recommended dose of fertilizers and water were applied in pots as per need. Observation was recorded after harvesting. It was observed that Fluensulfone @ 2.0 Kg a.i. ha^{-1} provided highest level of protection followed by Carbofuran@2.0 Kg a.i. $ha^{-1.}$ All the treatments were found significantly effective in reducing the CCN population in comparison to untreated check (Table 11.5). No Phyto-toxic effect was observed on any part of plant.

Table 11.5: Effects of Fluensulfone on cereal cyst nematode in wheat under pot condition

Treatment(s)	Description of treatment(s)	Dosage (kg a.i. ha^{-1})	Mean number of cysts (per 200cc soil)
T1	Fluensulfone 2% GR	0.5	23.60
T2	Fluensulfone 2% GR	1.0	17.30
T3	Fluensulfone 2% GR	1.5	10.40
T4	Fluensulfone 2% GR	2.0	6.10
T5	Carbofuran	2.0	8.60
T6	Untreated Check		29.90
	CD (P=0.05)		2.32
	SE		1.09

Ludhiana

A field experiment was conducted to evaluate the Fluensulfone 2% GR (Nimitz) against Cereal Cyst Nematode in wheat during 2020-21 under sick plot. Initial inoculum level of 8 cysts per 200cc soil was kept. The experiment was laid with six treatments by using randomized block design. Three replication of each treatment was maintained. From each treatment, 200cc soil sample was collected at the crop maturity stage and number of cyst was recorded. The highest reduction of cyst was observed in Fluensulfone @ 2.0 Kg a.i. ha^{-1} as compared to untreated control (Table 11.6). No Phyto-toxic effect was observed on any part of plant.

Table 11.6: Effects of Fluensulfone on cereal cyst nematode in wheat under artificially created sick plots

Treatment(s)	Description of treatment(s)	Dosage (Kg a.i. ha^{-1})	Mean number of cysts (per 200cc soil)
T1	Fluensulfone 2% GR	0.5	27.00
T2	Fluensulfone 2% GR	1.0	21.00
T3	Fluensulfone 2% GR	1.5	19.00
T4	Fluensulfone 2% GR	2.0	16.00
T5	Carbofuran	2.0	14.00
T6	Untreated Check	-	38.00
	CD (P=0.05)		2.45
	SE		1.23

Cooperators:

Name	Center
Saroj Yadav	Hisar
S. P. Bisnoi	Durgapura
Ramanna Koulagi	Ludhiana
Sudheer Kumar, D.P. Singh, PL Kashyap	Karnal (Coordinating unit)

Annexure 1: Seedling response, *Sr* genes in AVTs against the pathotypes of *Puccinia graminis tritici* (wheat stem/black rust) during 2020-21 at ICAR-IIWBR, RS, Flowerdale, Shimla

S. No.	Variety/Line	PATHOTYPES																						Resistance/ *Sr* genes
		11	11A	15-1	21	21A-2	24A	34-1	40A	40-1	40-2	40-3	42B	117	117A	117A-1	117-1	117-2	117-3	117-6	122	184	184-1	295	
1	VL2041	S	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	R	R	R	R	R	*Sr30+5+11+*
2	HS562 (C)	R	R	R	R	R	R	R	S	MS	S	S	R	R	R	R	R	R	R	R	R	R	R	S	*Sr8a+9b+11+*
3	HPW349 (C)	R	R	R	R	R	R	R	MR	R	MR	S	R	R	R	R	R	R	R	R	R	R	R	R	*Sr7b+2+*
4	HS507 (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	*Sr31+5+*
5	VL907 (C)	R	R	NG	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	*Sr31+2+*
6	WH1105 (C)	MR	R	R	R	R	R	R	R	R	R	MS	R	R	R	R	R	R	R	R	R	R	R	R	*Sr11+2+*
7	DBW187 (C)	MR	R	R	R	R	R	R	R	R	R	S	MR	R	R	R	R	R	R	R	R	R	R	R	*Sr5+11+*
8	HD3349	S	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	MS	R	R	R	R	R	R	*Sr7b+*
9	PBW876[B]	R	R	R	R	R	R	R	MR	R	R	R	S	R	R	R	R	S	MS	R	R	R	R	R	*Sr13+*
10	HD3406[M]	S	S	R	R	R	R	R	R	R	MR	S	R	R	S	R	R	S	S	R	R	R	R	S	*Sr13+*
11	DBW222 (C)	S	R	R	R	R	R	R	R	R	R	S	R	R	S	R	R	S	R	R	R	R	R	R	**
12	DBW313[#]	S	MS	R	R	R	R	R	R	R	R	MR	R	R	R	R	R	S	R	R	R	R	R	R	*Sr7b+*
13	HD2967 (C)	R	R	R	R	R	R	R	R	S	R	MS	R	R	R	R	R	R	R	R	R	R	R	R	*Sr8a+11+2+*
14	PBW826	R	R	S	R	R	R	R	R	R	MS	S	R	R	R	R	R	R	R	R	R	R	R	MS	*Sr30+8a+*
15	RAJ4548[#]	S	S	R	R	R	R	R	R	R	MS	S	S	NG	R	MS	MR	S	R	R	R	MR	MR	MR	*Sr13+*
16	HD3354	MR	R	R	R	R	R	R	R	MR	R	MS	R	R	MR	R	R	R	R	R	R	R	R	R	*Sr13+11+2+*
17	WH1283	S	MR	R	R	MR	R	R	MR	R	MR	S	MR	R	R	R	R	S	R	MR	R	R	R	MR	*Sr13+*
18	HD3086 (C)	S	S	S	R	R	R	R	MR	MS	S	S	S	R	S	R	R	S	S	R	MS	MS	R	S	*Sr7b+2+*
19	JKW261	S	S	R	R	R	R	R	R	R	MR	S	R	R	S	MR	R	MS	S	R	R	R	MR	MR	*Sr11+*
20	WH1124 (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	-
21	PBW771 (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	*Sr31+2+*
22	HD3059 (C)	MR	R	R	R	R	R	R	R	R	R	MR	R	R	R	R	MR	R	R	R	R	R	MR	R	*Sr11+2+*
23	PBW834	MR	R	R	R	R	R	R	R	R	R	S	R	NG	R	R	R	R	R	R	R	R	R	R	*Sr30+11+*
24	DBW173 (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	R	R	*Sr31+2+*
25	HUW838[#]*	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
26	NW7096	R	R	S	R	R	R	R	R	R	S	S	R	R	R	R	R	R	R	R	R	R	R	R	*Sr8a+5+*
27	DBW321	MR	S	S	R	R	R	R	MR	MS	S	S	R	R	R	R	R	MS	R	R	R	R	R	S	*Sr13+*
28	K1910	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
29	HI1654	MS	R	R	R	R	R	R	R	R	S	MS	R	R	MR	MR	R	R	R	MR	R	R	R	MR	*Sr13+*
30	NIAW3170 (C)	R	R	R	R	R	R	R	R	R	MR	MS	R	R	R	R	R	R	R	R	R	R	R	R	*Sr8a+2+*
31	PBW838	S	R	R	R	R	R	R	R	R	R	S	S	R	R	R	R	MR	MR	R	S	MR	R	S	*Sr11+*
32	DBW296*	R	R	R	R	R	R	R	R	S	R	R	S	R	R	R	MS	MR	MS	MR	R	R	R	S	*Sr13+*
33	HI1628 (C)	MR	R	R	R	R	R	R	R	R	R	MR	R	R	R	R	R	R	R	R	R	R	R	R	*Sr2+*R
34	HD3369	R	R	R	R	R	R	R	R	S	R	MR	MR	R	R	MS	S	S	MR	MS	R	R	MR	S	*Sr13+*
35	WH1142 (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	*Sr31+2+*
36	UP3062	NG	R	NG	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	*Sr31+*
37	HD3368	S	S	S	R	R	R	R	R	MR	S	S	MR	R	MS	R	R	R	R	R	R	R	R	S	*Sr7b+*
38	HD3043 (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	*Sr31+2+*
39	PBW644 (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	-

40	HI1653	MR	R	R	R	R	R	R	R	R	MR	MR	R	R	R	R	R	MR	R	MR	R	R	R	R	*Sr7b+*
41	PBW848	S	R	R	R	R	R	R	R	R	MS	S	R	R	S	R	R	R	R	R	R	R	R	R	*Sr9b+11+*
42	HD2733 (C)	R	R	R	R	R	R	R	R	R	R	MR	R	R	R	R	R	R	R	R	R	R	R	R	*Sr31+2+*
43	HD3249 (C)	R	R	R	R	R	R	R	R	R	R	MS	R	R	R	R	R	R	R	R	R	R	R	R	*Sr11+2+*
44	DBW187 (C)	MR	R	R	R	R	R	R	R	R	R	MR	MR	R	R	R	R	R	R	R	R	R	R	R	*Sr5+11+*
45	HD3406[M]	MS	S	R	R	R	R	R	R	R	MR	MS	R	R	MS	R	R	S	MS	R	R	R	R	R	*Sr13+*
46	HD3411[M]	S	S	R	S	MS	R	R	MR	R	MR	S	S	S	R	S	S	S	S	R	R	MR	R	S	*Sr7b+*
47	DBW39 (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	*Sr31+2+*
48	HD2967 (C)	R	R	R	R	R	R	R	R	R	MR	S	R	R	R	R	R	R	R	R	R	R	R	R	*Sr8a+11+2+*
49	PBW826[#]	R	R	MR	R	R	R	R	R	R	R	S	R	R	R	R	R	R	MR	R	R	R	R	MS	*Sr30+8a+*
50	HD3086 (C)	S	S	MS	R	R	R	R	S	S	S	S	MS	R	MS	R	R	S	R	R	S	MS	R	S	*Sr7b+2+*
51	DBW317	R	R	R	R	R	R	R	R	R	S	MS	R	R	R	R	R	R	R	R	R	R	R	R	*Sr8a+5+*
52	DBW318	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	MR	MR	R	R	R	R	R	R
53	PBW835	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
54	HI1563 (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	*Sr24+2+*R
55	DBW107 (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	*Sr31+2+*
56	PBW834	MS	R	R	R	R	R	R	R	R	R	MS	R	R	R	R	R	R	R	R	R	R	R	R	*Sr30+11+*
57	UP3060	R	R	R	R	R	R	R	MR	R	R	MR	MS	R	NG	R	MR	MS	MR	R	MR	R	NG	S	*Sr13+7b+*
58	HD3118 (C)	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	R	R	R	R	R	*Sr9b+11+*
59	HI1621 (C)	R	R	R	R	R	R	R	R	R	S	MR	R	R	R	R	R	R	R	R	R	R	R	R	*Sr28+*
60	DBW316	R	R	R	R	R	NG	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	*Sr31+2+*
61	PBW833	S	R	R	R	R	R	R	R	MS	R	MS	R	R	R	R	R	S	R	R	R	MR	R	S	*Sr7b+*
62	HD3360	S	S	R	R	R	R	R	MR	S	R	S	MS	R	S	R	R	MS	S	R	MR	S	R	S	*Sr7b+*
63	HI1653	MR	R	R	R	R	R	R	R	R	MR	S	R	R	R	R	R	MR	R	MR	R	R	R	R	*Sr7b+*
64	DBW322	S	S	R	MR	R	R	R	R	S	S	S	S	R	R	R	R	S	MR	R	S	MR	R	S	*Sr13+7b+*
65	HI1612 (C)	S	S	R	R	MR	R	R	R	R	S	S	S	R	R	R	R	MS	MR	MR	MR	MR	R	R	*Sr7b+2+*
66	DBW252 (C)	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	R	R	R	R	R	*Sr8a+5+11+2+*
67	DBW321	S	S	MS	R	R	R	R	MR	S	S	S	R	R	R	R	R	MS	R	R	R	R	R	S	*Sr13+*
68	HD3368[#]	S	S	MS	R	R	R	R	R	MR	MS	S	MR	R	S	R	R	R	MR	MR	R	MR	R	S	*Sr7b+*
69	HI1654	MS	R	R	R	R	R	R	R	R	MR	MR	R	R	MR	MR	R	R	R	MR	R	R	R	MR	*Sr13+*
70	HD3293(I) (C)	S	S	R	R	R	R	R	R	R	R	S	R	R	MR	R	R	R	R	R	R	R	R	R	*Sr13+2+*
71	WH1281	R	R	R	R	R	R	R	R	MR	MR	S	R	R	R	R	R	R	R	R	R	R	R	R	*Sr8a+5+*
72	PBW848[#]	S	R	R	R	R	NG	R	R	R	S	S	R	R	R	R	R	R	R	R	R	R	NG	R	*Sr9b+11+*
73	HD3171 (C)	S	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	R	R	R	R	R	*Sr11+7b+2+*
74	HD3369[#]	R	S	R	R	R	R	R	R	MR	R	MR	S	R	R	MR	MS	S	S	MR	R	R	MR	S	*Sr13+*
75	K1317 (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R*
76	UP3062	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	*Sr31+*
77	HI8833(d)[M]	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	MR	R	R	R
78	GW322 (C)	S	R	R	R	R	R	R	MR	MR	R	MR	R	R	S	S	R	R	MR	R	R	R	R	MR	*Sr11+2+*
79	MP3535	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	*Sr24+*
80	GW523	S	R	R	R	R	R	R	R	R	R	MR	R	R	S	R	R	MR	R	R	R	R	MR	MR	*Sr13+*
81	GW513*	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	*Sr24+*
82	HI1636*	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	*Sr24+2+*
83	HI8832(d)[M]	R	R	R	R	R	R	R	R	R	R	MR	R	R	R	R	R	R	R	R	R	R	R	R	*Sr30+8a+*
84	MACS6768	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	*Sr31+*
85	HI1544 (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	*Sr24+2+*

86	HI1667[B]	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	*Sr24+2+*
87	HI8498(d) (C)	MR	MR	R	R	R	S	R	R	R	R	R	S	S	R	S	S	S	S	S	MR	R	R	MR	*Sr11+2+*
88	HI8713(d) (C)	R	R	R	R	R	NG	R	R	R	R	R	R	R	R	S	S	MR	S	MR	R	MR	R	R	*Sr9e+2+*
89	HI1650	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
90	MP4010 (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	*Sr24+2+*
91	HD2864 (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	*Sr24+*
92	MP3336 (C)	MS	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	MR	S	*Sr11+2+*
93	HD2932 (C)	R	R	R	R	R	R	R	MR	R	R	S	R	R	R	R	R	R	R	R	R	R	MR	R	*Sr11+*
94	HI1634(I) (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	*Sr31+*
95	HD3407[M]	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
96	CG1029(I) (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	MR	R	R	R	R	*Sr24+2+*
97	HI8823(d)*	R	R	R	R	R	S	R	R	R	R	MR	R	R	R	MR	R	S	R	S	R	S	R	R	*Sr11+2+*
98	GW528	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
99	DDW47(d) (C)	R	R	R	R	R	MS	R	R	R	MS	R	R	R	R	MR	S	R	NG	S	R	MS	R	R	*Sr11+7b+2+*
100	DBW326	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
101	UAS475(d)	R	R	R	R	R	MS	R	R	R	R	S	R	R	R	R	S	S	R	MS	R	R	R	R	*Sr7b+*
102	HI8627(d) (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	S	S	S	MR	R	R	MS	S	R	*Sr9e+2+*
103	NIAW3851	R	S	R	R	R	MR	R	R	R	R	S	R	R	R	R	R	MS	R	R	R	R	R	R	*Sr13+2+*
104	HI8830(d)	R	R	R	R	R	S	R	R	R	R	R	R	R	R	R	S	MS	R	MS	R	R	MS	R	*Sr7b+2+*
105	CG1036	R	R	R	R	R	S	R	R	MR	R	R	R	R	R	MS	S	MS	MR	MR	R	MR	S	R	*Sr7b+*
106	HI1655	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
107	DBW110 (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
108	MP3288 (C)	R	R	R	R	R	R	R	R	R	R	MS	R	R	R	R	R	R	R	R	R	R	R	R	*Sr24+2+*
109	DDW55(d)	R	R	R	R	R	S	R	S	R	S	MS	R	R	R	S	S	S	MS	S	R	S	R	R	*Sr7b+2+*
110	WHD965(d)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	MS	S	MR	R	S	R	MS	MR	R	*Sr7b+2+*
111	UAS428(d) (C)	R	R	R	R	R	R	R	S	R	R	R	R	R	R	S	S	S	MR	S	R	S	S	R	*Sr7b+2+*
112	HI8826(d)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	S	S	MR	R	S	R	MS	S	R	*Sr7b+2+*
113	MACS4100(d)	R	R	S	R	R	S	R	S	S	S	S	R	R	MS	S	S	S	S	S	R	S	S	R	-
114	MACS3949(d) (C)	R	R	R	R	R	S	R	MR	MR	R	R	R	R	R	S	S	S	S	S	R	S	MS	R	*Sr7b+2+*
115	DDW53(d)	R	R	S	R	R	MS	R	R	R	R	R	S	S	R	S	S	S	S	S	R	MR	S	MS	*Sr7b+2+*
116	NIDW1345(d)	R	R	R	R	R	MR	R	MR	R	R	R	R	R	R	S	S	S	MS	S	R	S	S	R	*Sr7b+2+*
117	MACS6222 (C)	R	R	R	R	R	R	R	R	MR	R	R	R	R	R	R	R	R	R	R	R	R	R	R	*Sr24+2+*
118	MACS4106(d)	R	R	R	R	R	R	R	R	R	R	R	S	R	R	S	S	S	S	S	R	R	R	MR	*Sr7b+2+*
119	NIDW1348(d)	R	R	R	R	R	S	R	S	R	S	S	R	R	R	S	S	S	S	S	R	S	S	R	*Sr7b+2+*
120	HI8828(d)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	MS	R	S	R	MS	R	R	-
121	GW322 (C)	MR	R	R	R	R	R	R	MR	R	R	MR	R	R	S	S	R	R	MR	R	R	R	R	MR	*Sr11+2+*
122	HI8827(d)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	S	MR	S	R	MS	R	R	R	MR	-
123	DDW48(d)(I) (C)	R	R	R	R	R	S	R	R	R	R	R	MR	S	R	S	R	MS	S	MS	MR	R	R	S	*Sr7b+2+*
124	HD3090 (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	*Sr31+2+*
125	HI1633(I) (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	*Sr31+*
126	HD2932 (C)	R	R	R	R	R	R	R	MR	R	R	S	R	R	R	R	R	R	R	R	R	R	MR	R	*Sr11+*
127	RAJ4083 (C)	R	R	R	R	R	R	R	R	MR	R	S	R	R	R	R	R	R	R	R	R	R	R	R	*Sr11+*
128	DBW320	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	R	R	R	R	R	*Sr30+8a+*
129	MACS6774	MR	R	R	R	R	R	R	R	R	R	S	R	R	R	R	MR	MS	MR	R	R	R	R	S	*Sr13+*
130	NWS2180[#]	MR	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	MR	R	R	R	R	R	R	*Sr13+2+*
131	HI1651	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	*Sr24+*

132	MP1358*	MS	R	R	R	R	R	R	R	R	R	S	MR	R	R	R	R	R	R	R	R	R	R	S	*Sr11+*
133	MACS6755	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
134	HI1605 (C)	MR	R	R	R	R	R	R	S	R	R	R	R	R	R	R	R	R	MR	R	R	R	S	R	*Sr11+*
135	MACS6753	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	*Sr24+2+*
136	AKDW299716(d)(C)	MS	S	R	R	S	S	R	MR	MS	S	S	MS	MR	S	S	MS	MR	S	MS	R	S	R	MS	*Sr7b+2+*
137	NIDW1149(d)(I)(C)	R	MR	R	R	R	R	R	R	R	R	R	MR	R	R	R	R	R	R	R	R	R	MR	MR	*Sr11+2+*
138	NIAW3170 (C)	R	R	R	R	R	R	R	R	R	MR	MR	R	R	R	R	R	R	R	R	R	R	R	R	*Sr8a+2+*
139	UAS446(d) (C)	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	S	S	S	S	R	S	R	R	-
140	DBW325	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	R	R	R	R	MR	*Sr13+11+*
141	UAS3014	R	NG	R	R	R	NG	R	R	R	R	MS	R	R	R	R	R	R	R	MR	R	R	R	R	*Sr11+*
142	MACS5058	MR	MS	R	R	R	S	R	R	R	R	MR	S	S	MS	S	MR	MS	R	MR	MR	S	R	MR	*Sr7b+*
143	MACS6222(*a*) (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	*Sr24+*
144	DDK1029 (C)	R	R	R	R	R	R	R	R	R	R	R	S	S	R	MR	R	MR	R	S	R	MR	R	MS	*Sr11+2+*
145	DDK1061	R	R	R	R	R	MS	R	R	R	R	MR	S	S	R	S	R	R	R	S	R	S	MR	R	*Sr11+*
146	HW1098 (C)	R	R	R	R	R	S	R	R	R	R	R	S	MS	R	MR	R	MR	R	R	R	R	R	S	*Sr11+2+*
147	MACS5057	R	R	R	R	R	S	R	R	R	R	R	S	MR	R	MR	R	R	R	MR	R	MS	R	R	*Sr11+*
148	DDK1060	R	R	R	R	R	S	R	R	R	R	R	MS	R	R	S	R	R	R	MR	R	S	R	R	*Sr11+*
149	DBW328*	MR	R	R	R	R	R	R	R	R	R	MR	R	R	R	R	R	R	R	R	R	R	R	R	*Sr5+11+*
150	DBW372	MR	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	*Sr28+*
151	DBW370	S	S	R	R	R	R	R	R	R	R	MR	R	R	S	R	R	R	R	R	R	R	R	MR	*Sr7b+*
152	DBW327*	MR	R	R	R	R	R	R	R	R	MR	MS	R	R	MR	R	R	R	R	R	MR	R	R	R	*Sr5+13+*
153	WH1252*	R	R	R	R	R	R	R	R	R	R	S	MS	R	S	R	R	MR	R	R	MR	R	R	MR	*Sr9e+7b+*
154	PBW874	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	R	R	R	R	R	*Sr30+8a+2+*
155	HD3410	R	R	S	R	R	R	R	R	R	R	MR	R	R	R	R	R	R	R	R	R	R	R	R	*Sr30+8a+2+*
156	DBW332*	R	R	R	R	R	R	R	R	R	R	MR	R	R	R	R	R	R	R	R	R	R	R	R	*Sr30+8a+*
157	PBW873	R	R	NG	R	R	NG	R	R	R	NG	MS	R	R	R	R	R	R	R	R	R	R	R	R	*Sr30+*
158	DBW371	R	R	R	R	R	R	R	R	R	S	MR	R	R	R	R	R	R	R	R	R	R	R	R	*Sr8a+5+*
159	HD3086 (C)	S	S	S	R	R	R	R	MR	MR	S	S	MR	R	MS	R	R	MS	S	R	S	MR	R	MS	*Sr7b+2+*
160	DBW333*	MR	R	R	R	R	R	R	R	R	R	S	MS	R	R	R	R	R	R	R	R	R	R	R	*Sr28+11+2+*
161	PBW872	R	R	R	R	R	R	R	R	R	R	NG	R	R	R	R	R	R	R	R	NG	R	MR	NG	R
162	DBW187(I) (C)	MR	R	R	R	R	R	R	R	R	R	S	MR	R	MR	R	R	R	R	R	R	R	R	R	*Sr5+11+*
163	WH1270(I) (C)	R	R	R	R	R	R	R	R	R	R	R	MR	R	R	R	R	MR	R	R	R	R	R	R	*Sr13+*
164	DBW303(I) (C)	R	R	R	R	R	R	R	R	R	R	MR	R	R	R	R	R	R	R	R	R	R	R	R	R
165	HD3412	R	R	R	R	R	R	R	MR	MR	R	S	R	R	R	R	R	R	R	R	R	R	R	R	*Sr8a+5+*
166	DBW375	S	S	R	R	R	R	R	R	R	S	S	MS	R	R	MR	MR	R	R	R	R	R	R	R	*Sr7b+*
167	DBW374	R	R	R	R	R	R	R	R	R	R	MR	R	R	R	R	R	R	R	R	R	R	R	R	R
168	HD3403	R	R	R	R	R	R	R	R	R	MR	R	R	R	R	R	R	R	R	R	R	R	MS	R	*Sr8a+11+*
169	WH1406	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
170	HD3413	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
171	PBW867	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	MR	R	R
172	UP3096	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
173	WH1404	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
174	PBW868	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
175	DBW318	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
176	DBW378	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
177	WH1405	S	S	R	R	R	R	R	MS	R	MR	S	MR	R	R	R	MS	R	R	R	R	R	MR	R	*Sr11+*

178	HD3405	S	R	S	R	R	R	R	R	R	R	MS	R	R	R	R	R	R	R	R	R	R	R	R	*Sr8a+5+*
179	DBW377	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
180	PBW869	R	R	R	R	R	R	R	S	MS	S	MS	R	R	R	R	R	R	R	R	R	R	R	R	*Sr8a+5+*
181	PBW871	MR	R	R	R	R	R	R	R	R	R	MR	R	R	R	R	R	R	MR	R	R	R	R	R	*Sr9b+11+*
182	HD3086 (C)	S	S	S	R	R	R	R	MR	MR	S	S	MR	R	MS	R	R	R	MS	R	MS	S	R	S	*Sr7b+2+*
183	DBW376	S	S	S	MR	R	R	R	S	S	S	S	S	R	R	MR	R	MS	S	R	R	S	MS	S	*Sr7b+*
184	DBW373	MS	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	R	R	R	MR	R	*Sr11+*
185	HD3404	MR	S	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	R	R	R	R	R	*Sr30+*
186	DBW187(I) (C)	MR	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	R	R	R	R	R	*Sr5+11+*
187	WH1407	R	R	S	R	R	R	R	S	R	R	S	R	R	R	R	R	R	R	R	R	R	R	R	*Sr8a+5+*
188	PBW870	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
189	UP3095	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	*Sr24+2+*
190	DBW368	S	R	R	R	R	R	R	R	S	S	R	MR	R	R	R	R	R	S	R	R	R	S	R	*Sr11+*
191	DBW363	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	R	R	R	R	R	*Sr30+8a+*
192	DBW369	R	R	R	R	R	R	R	MR	R	R	S	R	R	R	R	R	R	R	R	R	MR	R	R	*Sr8a+11+*
193	DBW367	R	R	R	R	R	R	R	R	R	R	MS	R	R	MR	R	R	R	R	R	R	R	R	R	*Sr11+2+*
194	DBW364	MR	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
195	Kharchia 65 (C)	MS	S	R	S	S	R	S	S	S	R	S	R	R	MS	S	S	MS	S	R	S	MR	S	S	-
196	DBW366	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	R	R	R	R	R	*Sr30+8a+*
197	KRL210 (C)	S	S	R	R	R	R	R	MR	S	MS	S	MS	R	MS	R	R	S	MR	R	MR	R	R	S	*Sr7b+2+*
198	DBW365	R	R	S	R	R	R	R	MR	R	S	S	R	R	R	R	R	R	R	R	R	R	MR	R	*Sr8a+*
199	K1805	R	R	R	R	R	R	R	R	MR	R	MR	R	R	R	R	R	R	R	R	R	R	R	R	*Sr8a+11+*
200	KRL19 (C)	R	R	R	R	R	R	R	MR	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	*Sr8b+9b+11+2+*

Annexure 2: Seedling response, *Lr* genes in AVTs against the pathotypes of *Puccinia triticina* (wheat leaf/ brown rust) during 2020-21 at ICAR-IIWBR, RS, Flowerdale, Shimla

S. No.	Variety/Line	PATHOTYPES																						Resistance/ *Lr* genes
		11	12-2	12-3	12-5	12-7	16-1	77	77-1	77-2	77-5	77-7	77-8	77-9	77-10	77A-1	104-1	104-2	104-4	106	107-1	108-1	162A	162-1	
1	VL2041	R	R	S	R	R	R	S	S	R	S	R	S	S	S	S	R	MX	S	R	R	S	R	NG	-
2	HS562 (C)	R	S	R	R	S	R	R	R	S	S	S	R	S	S	R	S	S	R	R	R	R	R	R	*Lr23+*
3	HPW349 (C)	R	S	R	R	S	R	R	S	S	S	R	R	S	S	R	S	S	S	R	R	R	R	R	*Lr13+10+*
4	HS507 (C)	R	R	R	R	R	R	R	S	R	S	S	R	R	R	R	R	R	R	R	R	R	R	R	*Lr26+1+*
5	VL907 (C)	R	R	R	R	MS	R	R	S	R	S	R	R	S	R	R	R	S	S	R	R	R	R	R	*Lr26+*
6	WH1105 (C)	R	R	R	R	S	R	S	S	MR	S	R	R	S	S	S	R	R	R	R	R	R	R	NG	*Lr13+*
7	DBW187 (C)	R	R	R	R	R	R	R	R	R	S	MS	R	S	NG	R	R	NG	R	R	R	R	R	R	*Lr23+10+1+*
8	HD3349	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
9	PBW876[B]	R	S	R	R	S	R	R	R	S	S	R	R	S	R	R	S	S	S	R	R	R	R	R	*Lr23+10+*
10	HD3406[M]	R	R	R	R	R	R	R	R	R	S	R	R	S	S	R	R	R	R	R	R	R	R	R	*Lr23+10+1+*
11	DBW222 (C)	R	R	R	R	R	R	R	R	R	R	R	R	S	S	R	R	MR	R	R	R	R	R	R	Seed?
12	DBW313[#]	R	R	R	R	S	R	R	S	R	S	R	R	S	R	R	R	R	R	R	R	R	R	R	*Lr13+10+*
13	HD2967 (C)	R	R	R	R	R	R	R	R	MS	S	R	R	S	S	R	R	R	MS	R	R	R	R	R	*Lr23+*
14	PBW826	R	R	R	R	R	R	R	R	S	S	S	R	S	MX	R	R	R	S	R	R	R	NG	R	*Lr23+*
15	RAJ4548[#]	R	R	R	R	R	NG	R	R	S	S	S	R	S	S	R	R	S	R	R	R	R	R	R	*Lr23+3+1+*
16	HD3354	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
17	WH1283	R	S	R	R	S	R	R	R	S	S	S	R	S	R	R	R	S	S	R	R	R	R	R	*Lr23+10+*
18	HD3086 (C)	R	S	R	R	S	R	R	S	S	S	S	R	S	S	R	S	S	R	R	R	R	R	M	*Lr23+10+3+*
19	JKW261	R	R	R	MS	S	R	R	R	R	R	R	R	R	R	R	R	S	S	R	R	R	R	R	*Lr23+13+*
20	WH1124 (C)	R	R	R	R	R	R	R	S	R	S	S	R	MS	MS	R	R	R	S	R	R	R	R	R	*Lr13+10+3+*
21	PBW771 (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	*Lr26+23+1+*
22	HD3059 (C)	R	R	R	R	S	R	R	S	MS	S	S	R	S	S	R	R	R	R	R	R	R	R	R	*Lr13+3+*
23	PBW834	R	R	R	R	R	R	R	S	R	R	R	R	S	R	MS	R	R	R	R	R	R	R	R	*Lr13+1+*
24	DBW173 (C)	R	R	R	R	R	R	R	MS	R	S	S	R	S	S	R	R	R	R	R	R	R	R	R	*Lr26+10+3+*
25	HUW838[#]*	R	R	R	R	R	R	R	NG	NG	S	NG	R	S	R	S	R	R	R	R	R	NG	R	R	*Lr13+10+3+*
26	NW7096	R	R	R	R	R	S	R	R	S	MS	S	R	S	S	S	R	R	S	R	R	R	R	R	*Lr23+*
27	DBW321	R	S	R	R	S	R	R	S	S	S	S	R	S	S	R	S	S	R	R	R	R	R	R	*Lr13+10+3+*
28	K1910	R	R	R	R	R	R	S	S	S	S	R	R	S	S	S	S	S	S	R	R	S	R	R	*Lr13+1+*
29	HI1654	R	R	R	S	R	R	S	S	S	S	R	R	S	S	S	R	S	S	R	R	R	R	R	*Lr13+*
30	NIAW3170 (C)	R	R	R	R	R	R	R	M	S	S	M	R	S	S	R	R	R	S	R	R	R	R	R	*Lr13+10+1+*
31	PBW838	R	MS	R	R	S	R	R	S	S	S	S	R	S	S	R	S	S	S	R	R	R	R	R	*Lr13+10+*
32	DBW296*	R	S	R	R	S	R	S	R	S	S	R	R	S	S	R	S	S	S	R	R	R	R	R	*Lr23+13+10+*
33	HI1628 (C)	R	S	M	R	S	R	S	S	S	S	R	R	S	S	S	S	S	S	R	R	R	R	R	*Lr13+10+*
34	HD3369	R	S	R	R	S	R	S	R	S	S	M	R	S	S	R	S	S	S	R	R	R	R	R	*Lr13+*
35	WH1142 (C)	R	R	R	R	S	R	R	R	R	S	S	R	R	R	R	R	S	R	R	R	R	R	S	*Lr26+23+10+3+*
36	UP3062	R	R	R	R	S	NG	R	S	R	S	NG	NG	NG	S	R	R	S	R	R	R	NG	R	NG	*Lr26+10+3+*
37	HD3368	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	S	S	R	R	R	R	R	*Lr23+10+*
38	HD3043 (C)	R	R	R	R	R	R	R	R	R	S	S	R	S	S	R	R	S	S	R	R	R	R	R	*Lr26+23+*
39	PBW644 (C)	R	R	R	R	R	R	NG	R	S	S	S	R	S	R	R	S	S	S	R	R	R	R	R	*Lr13+1+*

40	HI1653	R	R	R	R	R	R	S	S	MS	S	R	R	S	R	S	R	R	R	R	R	R	R	R	*Lr13+3+*
41	PBW848	R	R	R	R	NG	R	R	R	R	R	R	NG	R	R	R	M	R	R	R	NG	R	R	R	*Lr23+10+*
42	HD2733 (C)	R	R	R	S	S	R	R	S	R	S	R	R	S	S	R	R	S	S	R	R	R	R	R	*Lr26+34+*
43	HD3249 (C)	R	R	R	R	R	R	R	S	MR	S	R	R	S	S	R	R	R	R	R	R	R	R	R	*Lr13+10+*
44	DBW187 (C)	R	R	R	R	R	R	R	R	R	S	MS	R	NG	R	R	R	R	R	R	R	R	R	R	*Lr23+10+1+*
45	HD3406[M]	R	R	R	R	R	R	R	R	R	S	R	R	S	S	R	R	R	R	R	R	R	R	R	*Lr23+10+1+*
46	HD3411[M]	R	S	R	S	S	R	R	S	S	S	R	S	S	S	S	S	S	S	R	R	R	S	R	*Lr13+*
47	DBW39 (C)	R	R	R	R	R	R	R	R	R	S	S	R	R	R	R	R	R	R	R	R	R	R	R	*Lr26+23+10+*
48	HD2967 (C)	R	R	R	R	R	R	R	R	R	S	R	R	S	S	R	R	R	S	R	R	R	R	R	*Lr23+*
49	PBW826[#]	R	R	R	R	R	R	R	R	MS	S	MS	R	S	R	R	R	R	S	R	R	R	R	R	*Lr23+*
50	HD3086 (C)	R	R	R	R	S	R	R	S	S	S	S	R	S	S	R	S	S	R	R	R	R	R	R	*Lr13+10+3+*
51	DBW317	R	R	R	R	R	R	R	S	R	MS	R	R	S	S	R	R	R	S	R	R	R	R	R	*Lr13+10+1+*
52	DBW318	R	S	R	MS	S	R	R	R	S	S	R	R	S	S	R	S	S	S	R	R	R	R	R	*Lr23+*
53	PBW835	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
54	HI1563 (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R + *Lr24+*
55	DBW107 (C)	R	R	R	S	S	R	R	S	R	S	S	R	S	R	R	S	S	R	R	R	R	R	S	*Lr26+*
56	PBW834	R	R	R	R	R	R	R	S	R	R	R	R	S	R	MS	R	R	R	R	R	R	R	R	*Lr13+1+*
57	UP3060	R	MS	R	S	S	R	R	S	S	S	M	R	S	S	R	R	S	S	R	R	R	R	R	*Lr13+*
58	HD3118 (C)	R	S	S	S	S	R	S	S	S	S	S	R	S	S	S	S	S	S	R	MR	S	R	R	-
59	HI1621 (C)	R	S	R	S	MS	R	S	S	S	S	M	R	S	M	S	R	S	S	R	R	R	R	R	-
60	DBW316	NG	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	NG	R	R	R+ *Lr26+*
61	PBW833	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
62	HD3360	R	MS	R	R	S	R	R	S	S	S	S	R	S	R	R	MS	S	R	R	R	R	S	R	*Lr13+10+3+*
63	HI1653	R	R	R	R	R	R	S	S	MS	S	R	R	S	R	S	R	R	R	R	R	R	R	R	*Lr13+3+*
64	DBW322	R	MS	R	S	S	R	R	S	S	S	S	R	S	S	R	S	S	R	R	R	R	S	R	*Lr13+1+*
65	HI1612 (C)	R	S	R	S	S	R	R	R	R	R	R	R	R	R	R	S	S	S	R	R	R	R	R	*Lr23+*
66	DBW252 (C)	R	R	R	R	R	R	R	S	S	S	R	R	S	S	R	R	MS	R	R	R	R	NG	R	*Lr13+10+*
67	DBW321	R	S	R	R	S	R	R	S	S	S	M	R	S	S	R	S	S	R	R	R	R	R	R	*Lr13+10+3+*
68	HD3368[#]	R	R	R	R	MS	R	R	R	R	R	R	R	R	R	R	R	S	S	R	R	R	R	R	*Lr23+10+*
69	HI1654	R	R	R	S	R	R	S	S	S	S	R	R	S	S	S	R	S	S	R	R	R	R	R	*Lr13+*
70	HD3293(I) (C)	R	R	R	R	R	R	R	S	R	S	R	R	S	S	S	R	S	S	R	R	R	R	R	*Lr13+10+*
71	WH1281	R	R	M	S	S	R	S	S	S	S	M	R	S	S	S	MS	S	R	R	R	R	R	R	*Lr13+*
72	PBW848[#]	R	R	R	R	NG	R	R	R	R	R	R	NG	R	R	R	M	R	R	R	NG	R	R	R	*Lr23+10+*
73	HD3171 (C)	R	S	R	R	S	R	R	R	S	S	M	R	S	S	R	S	S	S	R	R	R	R	R	*Lr23+13+10+*
74	HD3369[#]	R	S	R	R	S	R	S	R	S	S	M	R	S	S	R	S	S	S	R	R	R	R	R	*Lr13+*
75	K1317 (C)	R	R	R	R	R	R	S	S	S	S	R	R	S	S	S	S	S	S	R	R	R	R	R	Seed?
76	UP3062	R	R	R	R	S	NG	R	S	R	S	NG	NG	NG	S	R	R	S	R	R	R	NG	R	NG	*Lr26+10+3+*
77	HI8833(d)[M]	R	R	R	S	MS	S	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	*Lr23+*
78	GW322 (C)	R	R	R	R	R	R	S	MS	S	S	S	R	S	S	R	R	R	S	R	R	R	R	R	*Lr13+1+*
79	MP3535	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R+ *Lr24+*
80	GW523	R	R	R	R	R	R	S	S	S	S	S	R	S	S	R	R	S	S	R	R	R	R	R	*Lr13+*
81	GW513*	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R+ *Lr24+*
82	HI1636*	R	R	R	R	R	R	R	R	R	R	R	R	NG	R	R	R	R	R	R	R	R	R	R	R+ *Lr24+*
83	HI8832(d)[M]	MR	R	R	S	R	S	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	*Lr23+*
84	MACS6768	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R+ *Lr26+*
85	HI1544 (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R+ *Lr24+*

86	HI1667[B]	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R+ *Lr24+*
87	HI8498(d) (C)	R	MR	R	S	MS	S	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	*Lr23+*
88	HI8713(d) (C)	S	S	MS	S	S	S	R	R	R	R	R	R	S	R	R	R	S	MS	S	R	R	R	R	-
89	HI1650	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
90	MP4010 (C)	R	R	R	R	R	R	R	R	R	R	R	R	NG	R	R	R	R	R	R	NG	R	NG	NG	R+ *Lr24+*
91	HD2864 (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R+ *Lr24+*
92	MP3336 (C)	R	S	R	S	S	R	S	S	S	S	S	R	S	S	R	S	S	S	R	R	R	R	R	*Lr13+*
93	HD2932 (C)	R	S	S	S	S	R	S	S	S	S	S	S	S	S	S	S	S	S	R	S	S	S	S	Seed?
94	HI1634(I) (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R+ *Lr26+*
95	HD3407[M]	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
96	CG1029(I) (C)	R	R	R	R	R	R	R	R	R	NG	R	R	R	R	R	R	R	R	R	R	R	R	R	R+ *Lr24+*
97	HI8823(d)*	S	S	S	S	S	S	R	R	S	R	R	R	S	R	R	S	S	S	R	R	R	R	S	-
98	GW528	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
99	DDW47(d) (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	NG	R	R	R	R	R	R
100	DBW326	R	S	R	MR	R	R	R	R	R	R	R	R	NG	NG	R	R	S	R	R	R	R	R	M	*Lr23+*
101	UAS475(d)	R	R	R	R	R	R	R	R	R	R	R	NG	R	R	R	R	R	R	R	R	R	R	R	R
102	HI8627(d) (C)	S	S	R	S	S	S	R	R	R	R	R	R	R	R	R	S	S	S	MR	R	R	R	R	*Lr13+*
103	NIAW3851	R	M	R	R	S	R	R	R	R	R	R	R	R	M	R	R	R	R	R	R	R	R	R	*Lr23+10+*
104	HI8830(d)	S	S	R	S	S	S	R	R	R	R	R	R	S	MS	R	R	S	S	R	R	R	R	R	-
105	CG1036	S	S	R	S	S	S	R	R	R	R	R	R	R	R	R	MR	S	S	R	R	R	R	R	-
106	HI1655	NG	R	R	R	R	R	R	S	R	R	NG	NG	NG	MR	R	R	M	R	R	R	R	R	R	*Lr13+10+1+*
107	DBW110 (C)	R	MS	MS	M	S	R	R	S	MS	S	S	R	R	NG	S	R	S	S	R	MR	NG	R	R	*Lr23+10+*
108	MP3288 (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R+ *Lr24+*
109	DDW55(d)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
110	WHD965(d)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	NG	R	R	R
111	UAS428(d) (C)	R	S	R	S	S	S	R	R	R	R	R	R	S	R	R	MS	S	S	R	R	R	R	R	*Lr23+*
112	HI8826(d)	S	S	R	S	S	S	R	R	R	R	R	R	MS	R	R	MS	S	S	R	R	R	R	R	-
113	MACS4100(d)	S	R	R	S	R	R	R	R	R	R	R	R	R	R	R	R	MS	R	MS	S	R	R	R	-
114	MACS3949(d) (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
115	DDW53(d)	S	S	R	R	R	R	R	R	R	R	R	R	S	S	R	R	S	MS	R	R	R	R	R	-
116	NIDW1345(d)	S	S	R	S	S	S	R	R	R	R	R	R	R	R	R	S	S	R	S	R	R	MS	R	-
117	MACS6222 (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R+ *Lr24+*
118	MACS4106(d)	S	S	R	S	S	R	R	R	R	R	R	R	S	R	R	R	S	S	R	R	R	R	R	-
119	NIDW1348(d)	S	S	MS	S	S	S	R	R	R	R	R	R	S	R	R	S	S	S	S	R	R	MS	S	-
120	HI8828(d)	R	R	R	S	S	S	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	*Lr23+*
121	GW322 (C)	R	R	R	R	R	R	S	MS	S	S	S	R	S	S	R	R	R	S	R	R	R	R	R	*Lr13+1+*
122	HI8827(d)	R	R	R	R	S	S	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	*Lr23+*
123	DDW48(d)(I) (C)	S	MR	R	R	R	R	R	R	S	R	R	R	S	S	R	R	R	R	R	R	R	R	R	-
124	HD3090 (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R+ *Lr26+*
125	HI1633(I) (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	NG	R	R	R	R	R+ *Lr26+*
126	HD2932 (C)	R	S	S	S	S	R	S	S	S	S	S	S	S	S	S	S	S	S	R	S	S	S	S	Seed?
127	RAJ4083 (C)	NG	R	R	R	S	R	R	S	S	S	S	R	S	S	R	MR	S	S	R	R	R	R	R	*Lr13+*
128	DBW320	R	R	R	R	R	R	R	S	MS	S	S	R	S	S	R	R	R	R	R	R	R	R	R	*Lr10+1+*
129	MACS6774	R	R	S	S	S	R	S	S	S	S	R	S	S	S	S	R	R	S	R	S	R	R	M	*Lr13+*
130	NWS2180[#]	R	R	R	R	R	R	R	R	R	R	R	R	S	R	MS	R	R	R	R	R	R	R	R	*Lr13+10+1+*
131	HI1651	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R+ *Lr24+*

132	MP1358*	R	R	R	R	R	R	R	R	R	S	R	R	S	R	R	R	R	R	R	R	R	R	R	*Lr23+10+*
133	MACS6755	NG	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
134	HI1605 (C)	R	S	S	S	S	R	S	S	R	S	R	R	S	S	S	MS	S	S	R	MS	S	R	S	*Lr13+*
135	MACS6753	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R+ *Lr24+*
136	AKDW299716(d)(C)	R	MR	R	S	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	NG	R	*Lr23+*
137	NIDW1149(d)(I) (C)	R	S	R	R	R	R	R	R	R	R	R	R	R	NG	R	R	S	R	R	NG	NG	NG	NG	*Lr23+10+*
138	NIAW3170 (C)	R	MS	R	R	R	R	R	R	S	S	R	R	S	S	R	R	R	S	R	R	R	R	R	*Lr13+10+1+*
139	UAS446(d) (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
140	DBW325	R	R	R	R	R	R	R	R	R	S	R	R	MS	S	R	R	R	R	R	R	R	R	R	*Lr23+1+*
141	UAS3014	NG	S	R	R	R	R	R	R	R	S	R	R	NG	R	R	S	S	S	NG	NG	R	R	R	*Lr23+13+10+*
142	MACS5058	S	R	R	R	R	R	R	R	R	R	R	R	MS	R	R	R	S	R	MS	R	R	R	R	-
143	MACS6222(*a*) (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R+ *Lr24+*
144	DDK1029 (C)	S	R	R	R	R	S	R	R	R	R	R	R	R	R	R	R	S	S	MS	R	R	R	R	*Lr13+*
145	DDK1061	MS	R	R	MR	R	S	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	-
146	HW1098 (C)	S	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	-
147	MACS5057	S	R	R	R	R	R	R	R	R	S	R	R	S	R	R	R	MS	R	R	R	R	R	R	-
148	DDK1060	S	R	R	R	R	S	R	R	R	R	R	R	R	R	R	R	MS	R	S	R	R	R	R	-
149	DBW328*	R	R	M	R	R	R	R	R	R	S	R	R	R	R	R	R	R	R	R	R	R	R	R	*Lr23+10+1+*
150	DBW372	R	R	R	R	R	R	R	R	MS	S	R	R	S	MS	R	R	MR	R	R	R	R	R	R	*Lr23+1+*
151	DBW370	R	R	R	R	R	R	MS	S	R	S	S	R	S	S	S	R	S	R	R	R	R	R	R	*Lr13+1+*
152	DBW327*	R	R	R	R	R	R	R	R	S	S	R	R	S	S	R	R	R	S	R	NG	R	R	R	*Lr23+1+*
153	WH1252*	R	S	R	R	M	R	R	MS	S	S	S	R	S	R	R	MR	S	S	R	NG	R	R	R	*Lr13+*
154	PBW874	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	R	NG	*Lr28+*
155	HD3410	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
156	DBW332*	R	R	R	R	R	R	R	MR	R	S	R	R	S	R	S	R	R	R	R	R	R	R	R	*Lr13+10+*
157	PBW873	NG	R	NG	R	R	NG	R	R	R	R	R	R	S	NG	R	R	R	S	R	NG	NG	NG	R	*Lr23+10+*
158	DBW371	R	R	R	R	R	R	R	R	R	S	R	NG	S	MS	R	R	R	R	R	R	R	R	R	*Lr23+1+*
159	HD3086 (C)	R	R	R	R	S	R	R	S	S	S	S	R	S	S	R	S	S	R	R	R	R	R	R	*Lr13+10+3+*
160	DBW333*	R	R	R	R	R	R	R	S	R	S	R	NG	R	R	S	R	R	R	R	R	R	R	R	*Lr13+10+1+*
161	PBW872	R	R	R	R	M	NG	R	R	MS	S	R	R	NG	S	NG	NG	R	S	R	R	NG	NG	NG	*Lr23+10+*
162	DBW187(I) (C)	R	R	R	R	R	R	NG	R	R	S	S	R	S	R	R	R	R	R	R	R	R	R	R	*Lr*23+10+1+
163	WH1270(I) (C)	R	S	R	S	S	R	R	S	S	S	R	R	S	S	S	S	S	S	R	R	R	R	R	*Lr23+*
164	DBW303(I) (C)	R	R	S	R	MS	R	MR	S	R	S	R	R	R	R	S	R	R	R	R	R	R	R	R	*Lr13+*
165	HD3412	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	S	R	R	R	R	R	*Lr23+10+*
166	DBW375	R	R	R	R	R	R	R	R	R	R	R	R	NG	R	R	R	R	R	R	R	R	R	R	R
167	DBW374	R	R	R	R	R	R	R	S	R	S	R	R	S	S	R	R	R	R	R	R	R	R	R	*Lr13+10+1+*
168	HD3403	R	R	R	R	R	R	S	S	MR	S	R	R	S	S	S	R	R	R	R	R	R	R	R	*Lr13+*
169	WH1406	R	R	R	R	R	R	R	S	S	S	S	R	S	S	R	R	R	S	R	R	R	R	R	*Lr13+1+*
170	HD3413	R	S	S	S	S	R	S	S	S	S	S	R	S	S	S	S	S	S	R	S	S	S	S	-
171	PBW867	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
172	UP3096	R	R	R	R	MS	R	S	S	S	S	R	R	MS	R	S	R	R	R	R	R	R	R	R	*Lr13+*
173	WH1404	R	R	M	R	R	R	R	S	S	S	S	MS	S	S	S	S	S	S	R	R	R	R	R	*Lr13+*
174	PBW868	R	R	R	R	MR	R	R	S	R	S	R	R	S	NG	R	MS	R	R	R	R	R	R	R	*Lr13+10+*
175	DBW318	R	S	R	MS	S	R	R	R	S	S	R	R	S	S	R	S	S	S	R	R	R	R	R	*Lr23+*
176	DBW378	R	R	R	R	R	R	R	R	R	S	R	R	S	S	R	R	R	R	R	R	R	R	R	*Lr23+1+*
177	WH1405	R	R	R	R	S	R	R	S	S	S	R	S	S	MS	S	R	S	S	R	R	NG	R	S	*Lr13+10+*

178	HD3405	R	R	R	R	R	R	R	S	R	S	S	S	S	M	R	R	R	R	R	R	R	R	R	*Lr13+1+*
179	DBW377	R	R	R	R	R	R	R	R	R	S	R	R	S	MS	R	R	R	R	R	R	R	R	R	*Lr23+1+*
180	PBW869	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	*R*
181	PBW871	R	R	R	R	R	R	S	S	R	S	MS	R	MS	R	S	R	R	R	R	R	R	R	R	*Lr13+1+*
182	HD3086 (C)	R	R	R	R	S	R	R	S	S	S	S	R	S	S	R	S	S	R	R	R	R	R	R	*Lr13+10+3+*
183	DBW376	R	M	R	R	S	R	S	R	R	R	R	R	S	S	R	MS	S	S	R	R	R	R	M	*Lr13+10+*
184	DBW373	R	R	R	R	R	R	MS	S	R	S	R	R	S	S	S	R	R	R	R	R	R	R	R	*Lr13+*
185	HD3404	R	R	R	R	MS	R	S	S	R	S	R	S	S	S	S	R	R	R	R	R	R	R	R	*Lr13+10+*
186	DBW187(I) (C)	R	R	R	R	R	R	R	R	R	S	MS	R	NG	R	R	R	R	R	R	R	R	R	R	*Lr23+10+1+*
187	WH1407	R	R	R	R	R	R	R	R	R	S	R	R	S	NG	S	R	R	R	R	R	R	R	R	*Lr13+10+1+*
188	PBW870	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	S	MS	R	R	R	R	M	*Lr13+1+*
189	UP3095	R	R	R	R	R	R	NG	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R+ *Lr24+*
190	DBW368	R	R	R	R	S	R	MS	R	R	S	R	R	MS	R	R	R	R	R	R	R	R	R	R	*Lr13+*
191	DBW363	R	R	R	R	R	R	R	S	R	MS	R	R	MS	R	S	R	R	R	R	R	R	R	R	*Lr13+10+1+*
192	DBW369	R	S	S	R	S	R	R	S	S	S	R	S	S	S	MS	S	S	S	R	R	R	R	S	-
193	DBW367	R	R	M	S	MS	R	R	S	S	S	S	S	S	S	S	R	R	S	R	S	R	R	MS	*Lr13+*
194	DBW364	R	R	R	R	R	R	R	R	R	MR	R	R	S	S	S	R	R	S	R	R	R	R	R	*Lr13+1+*
195	Kharchia 65 (C)	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	-
196	DBW366	NG	R	R	R	R	R	NG	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	*R*
197	KRL210 (C)	R	S	R	R	S	R	R	S	S	S	S	R	S	S	R	MS	S	R	R	R	R	MS	R	*Lr13+*
198	DBW365	R	S	R	R	S	R	R	R	R	R	R	R	R	MS	R	S	S	S	R	R	R	R	R	*Lr* 13+10+
199	K1805	R	S	R	R	R	R	R	R	R	S	R	R	MS	R	R	MS	S	S	R	R	R	R	R	*Lr23+10+*
200	KRL19 (C)	R	S	S	S	S	R	S	S	S	S	S	R	S	S	S	S	S	S	R	R	R	S	R	*Lr13+*

Annexure 3: Seedling response, *Yr* genes in AVTs against the pathotypes of *Puccinia striiformis* (wheat stripe/ yellow rust) during 2020-21 at ICAR-IIWBR, RS, Flowerdale, Shimla

S. No.	Variety/line	PATHOTYPES																Resistance/ *Yr* genes
		46S119	110S119	238S119	110S247	78S84	110S84	T	P	111S68	79S68	79S4	14S64	6S0	7S0	K	L	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
1	VL2041	R	S	MS	R	R	R	MS	R	R	R	R	R	R	R	R	R	*Yr2+*
2	HS562 (C)	S	S	MS	S	R	R	S	S	R	R	R	R	R	R	S	R	*YrA+*
3	HPW349 (C)	S	S	S	S	R	R	S	S	R	R	R	R	R	R	S	S	*Yr2+*
4	HS507 (C)	R	R	MS	R	R	R	R	R	R	R	R	R	R	R	R	R	*Yr9+*
5	VL907 (C)	R	S	S	R	R	R	R	R	R	R	R	R	NG	R	R	R	*Yr9+*
6	WH1105 (C)	R	MS	S	R	R	R	R	R	R	R	R	R	R	R	R	R	*Yr2+*
7	DBW187 (C)	R	S	S	S	R	MS	S	S	S	R	R	R	R	R	S	MS	*Yr2+*
8	HD3349	R	S	S	R	R	R	MR	R	R	R	R	R	R	R	R	R	*YrA+*
9	PBW876[B]	R	S	S	S	R	MS	MS	S	R	R	R	R	R	R	S	S	*Yr2+*
10	HD3406[M]	R	S	S	S	R	MS	S	MR	R	R	R	R	R	R	MS	R	*Yr2+*
11	DBW222 (C)	R	S	S	R	R	S	R	R	MS	R	R	R	R	R	R	R	Seed
12	DBW313[#]	R	S	MS	R	R	R	R	R	R	R	R	R	R	R	R	R	*Yr2+*
13	HD2967 (C)	R	S	S	S	R	MS	S	MS	MS	S	R	R	R	R	S	S	*Yr2+*
14	PBW826	R	S	S	S	R	MS	R	S	R	R	NG	R	NG	R	MS	R	*Yr2+*
15	RAJ4548[#]	MS	S	S	S	MS	S	S	S	MS	S	S	R	R	R	S	S	-
16	HD3354	S	S	S	S	MS	S	S	R	R	MS	S	R	R	R	S	R	*Yr2+*
17	WH1283	S	S	S	S	R	R	S	S	R	R	R	R	R	R	S	S	*Yr2+*
18	HD3086 (C)	MS	MS	MS	S	MR	R	S	MS	R	R	MX	R	R	R	S	S	*Yr2+*
19	JKW261	R	S	S	MR	MS	MS	R	R	R	R	R	S	S	S	S	S	-
20	WH1124 (C)	R	S	R	R	S	MR	R	R	S	R	R	R	R	R	R	R	*Yr2+*
21	PBW771 (C)	R	S	MR	R	MS	R	R	R	R	R	R	R	R	R	R	R	*Yr9+*
22	HD3059 (C)	R	S	S	R	R	R	R	R	MS	R	R	R	R	R	MS	R	*Yr2+*
23	PBW834	S	MS	S	R	R	R	MS	R	R	R	R	R	R	R	S	R	*YrA+*
24	DBW173 (C)	R	S	S	R	R	R	R	R	R	R	R	R	R	R	R	R	*Yr9+*
25	HUW838[#]*	NG	S	NG	R	R	R	MS	R	R	NG	R	R	R	NG	MS	R	*Yr2+*
26	NW7096	R	S	S	S	R	R	R	R	R	R	R	R	R	R	R	R	*Yr2+*
27	DBW321	MS	S	S	MS	R	R	MS	MR	R	R	R	R	R	R	S	R	*YrA+*
28	K1910	MS	MS	S	S	R	R	MS	R	S	R	R	R	R	R	R	R	*Yr2+*
29	HI1654	MR	S	S	S	R	MS	S	MS	MS	R	R	R	R	R	S	S	*Yr2+*
30	NIAW3170 (C)	S	S	S	S	S	S	S	MS	S	MS	S	S	S	MS	S	S	-
31	PBW838	S	S	S	S	R	R	S	MR	R	S	R	R	R	R	S	S	*Yr2+*
32	DBW296*	S	S	S	S	MR	R	S	MS	R	R	R	R	S	MS	S	S	-

33	HI1628 (C)	S	S	S	S	S	MS	S	S	R	S	R	S	R	R	S	S	*Yr2+*
34	HD3369	MS	S	S	S	MR	MS	S	S	MS	MS	R	S	S	R	S	S	-
35	WH1142 (C)	S	S	MS	S	MR	R	R	R	R	R	R	R	R	R	R	R	*Yr9+*
36	UP3062	S	S	S	R	NG	MS	R	R	R	R	R	R	R	R	R	R	*Yr9+*
37	HD3368	S	S	S	S	R	S	S	S	S	S	R	R	R	R	S	S	*Yr2+*
38	HD3043 (C)	R	S	S	R	R	R	R	R	R	R	R	R	R	R	R	R	*Yr9+A+*
39	PBW644 (C)	R	MS	R	R	R	MS	R	R	MR	MS	MX	R	R	R	R	S	*Yr2+*
40	HI1653	S	S	S	S	MS	MS	S	MS	MS	R	R	R	R	R	S	S	*Yr2+*
41	PBW848	R	S	S	S	R	S	S	MS	MS	R	R	R	R	R	S	R	*Yr2+*
42	HD2733 (C)	S	S	S	R	S	S	R	R	S	R	R	R	R	R	R	R	*Yr9+18+*
43	HD3249 (C)	MR	S	S	S	MR	MS	S	S	R	MS	R	R	R	R	S	S	*Yr2+*
44	DBW187 (C)	R	S	S	S	R	MS	MS	S	MS	R	R	R	R	R	MS	MS	*Yr2+*
45	HD3406[M]	R	S	S	S	R	MS	S	MR	R	R	R	R	R	R	MS	R	*Yr2+*
46	HD3411[M]	S	S	S	S	S	S	S	MS	MR	R	R	R	R	R	MS	R	*Yr2+*
47	DBW39 (C)	R	S	S	R	R	S	R	R	R	R	R	R	R	R	R	R	*Yr9+*
48	HD2967 (C)	S	S	S	S	R	S	S	S	MS	S	R	R	R	R	S	S	*Yr2+*
49	PBW826[#]	R	S	S	S	R	MS	R	MS	R	R	R	R	R	R	MS	R	*Yr2+*
50	HD3086 (C)	MS	S	S	S	MR	R	S	MS	R	R	R	R	R	R	S	S	*Yr2+*
51	DBW317	R	MS	R	R	R	R	R	R	R	R	R	R	R	R	R	R	-
52	DBW318	S	S	S	MS	MR	S	S	MS	MS	MS	R	R	R	R	R	S	*Yr2+*
53	PBW835	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	Resistant
54	HI1563 (C)	R	S	S	R	MR	MS	R	R	MS	R	R	S	R	R	MR	MR	*Yr2+*
55	DBW107 (C)	S	S	S	R	R	MS	R	R	R	R	R	R	R	R	R	R	*Yr9+*
56	PBW834	S	S	S	R	R	R	MS	R	R	R	R	R	R	R	S	R	*YrA+*
57	UP3060	R	S	S	S	R	S	S	S	S	R	R	R	MX	R	S	MX	-
58	HD3118 (C)	S	S	S	S	S	MS	S	S	R	R	S	R	R	R	S	R	*Yr2+*
59	HI1621 (C)	S	S	S	S	S	S	S	S	MS	MR	R	S	R	R	S	R	*Yr2+*
60	DBW316	R	MS	S	R	R	R	R	R	R	R	R	R	R	R	R	R	*Yr9+A+*
61	PBW833	MR	S	S	R	R	MS	MR	R	MS	R	R	R	R	R	MR	R	*Yr2+*
62	HD3360	S	S	S	S	R	R	MS	S	MS	R	R	R	R	R	S	R	*Yr2+*
63	HI1653	S	S	S	S	MS	MS	MS	S	MS	R	R	R	R	R	S	S	*Yr2+*
64	DBW322	S	S	S	S	R	R	MS	S	R	R	R	R	R	R	S	S	*YrA+*
65	HI1612 (C)	S	S	S	S	MR	MS	S	MS	R	MS	R	R	R	R	S	R	*Yr2+*
66	DBW252 (C)	R	S	S	R	R	R	R	MS	R	R	R	R	R	R	S	R	*Yr2+*
67	DBW321	S	S	MS	S	R	R	S	MR	R	R	R	R	R	R	S	R	*YrA+*
68	HD3368[#]	S	S	S	S	R	S	S	S	S	S	R	R	R	R	S	MS	*Yr2+*
69	HI1654	MS	S	S	S	R	S	MS	S	S	R	R	R	R	R	S	S	*Yr2+*
70	HD3293(I) (C)	R	S	MS	R	R	MS	R	R	R	R	R	R	R	R	R	S	*Yr2+*
71	WH1281	MS	S	S	S	R	MS	S	S	S	S	S	R	R	R	S	R	*Yr2+*
72	PBW848[#]	R	S	S	S	R	MS	S	MR	S	R	R	R	R	R	S	R	*Yr2+*
73	HD3171 (C)	R	MS	R	R	R	R	R	R	R	R	R	R	R	R	MR	R	*Yr2+*

74	HD3369[#]	S	S	S	S	MR	S	S	S	S	MS	R	S	S	R	S	S	-
75	K1317 (C)	R	S	MS	MS	R	R	MR	R	R	R	R	R	R	R		R	seed
76	UP3062	S	S	MS	R	MS	MS	R	R	R	R	R	R	R	R	R	R	*Yr9+*
77	HI8833(d)[M]	S	S	R	R	R	MS	R	R	R	MS	MX	R	S	R	R	R	-
78	GW322 (C)	MS	S	S	S	S	S	S	S	MS	MS	S	MS	S	MS	S	S	-
79	MP3535	R	S	S	R	R	S	MR	R	S	R	R	R	R	R	S	R	*Yr2+*
80	GW523	MS	S	S	S	S	S	S	S	MS	MS	S	MS	S	MS	S	S	-
81	GW513*	MR	S	S	R	MS	S	R	R	MS	MS	S	S	R	MR	R	S	-
82	HI1636*	S	S	S	S	MS	S	S	MS	MS	MS	S	S	R	MS	S	S	-
83	HI8832(d)[M]	S	S	MR	S	R	MS	R	MS	R	R	R	R	S	S	S	MR	-
84	MACS6768	S	S	S	S	S	S	R	R	R	R	R	R	R	R	R	R	*Yr9+*
85	HI1544 (C)	MS	S	S	S	MR	S	S	S	MS	S	S	S	S	MS	MS	MR	-
86	HI1667[B]	MS	S	S	S	S	S	S	MS	S	S	S	MS	R	S	MS	MS	-
87	HI8498(d) (C)	S	S	R	MR	MS	MS	R	R	R	R	S	R	S	R	MS	MR	-
88	HI8713(d) (C)	S	S	MS	S	S	S	R	MS	S	R	S	S	S	NG	MS	R	-
89	HI1650	MS	S	S	R	S	S	R	R	MS	R	R	R	R	R	R	R	-
90	MP4010 (C)	S	S	S	S	S	S	S	S	S	MS	S	S	R	R	S	S	*Yr2+*
91	HD2864 (C)	S	S	S	S	S	S	S	MR	S	S	R	S	R	R	S	S	*Yr2+*
92	MP3336 (C)	MR	S	S	MS	R	S	S	R	MR	MS	R	S	MR	R	R	MS	-
93	HD2932 (C)	S	S	S	S	S	S	S	MS	S	MS	S	R	R	R	S	S	*Yr2+*
94	HI1634(I) (C)	S	S	S	R	S	S	R	R	R	R	R	R	R	R	R	R	*Yr9+*
95	HD3407[M]	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	Resistant
96	CG1029(I) (C)	S	S	S	S	MS	S	S	S	S	R	R	S	R	R	S	S	*Yr2+*
97	HI8823(d)*	S	S	MS	MS	R	MS	MS	S	R	R	R	S	S	R	MR	R	-
98	GW528	MR	S	S	R	R	S	R	R	R	MS	R	R	R	R	R	R	*Yr2+*
99	DDW47(d) (C)	S	S	S	R	R	S	R	MS	R	R	R	S	R	S	R	R	-
100	DBW326	R	R	R	S	R	R	MS	R	R	R	R	R	R	R	R	R	*Yr2+*
101	UAS475(d)	R	MS	MR	R	R	R	R	R	R	R	R	S	R	R	R	R	*Yr2+*
102	HI8627(d) (C)	S	MS	R	R	S	MS	R	R	R	R	R	S	S	R	MR	R	-
103	NIAW3851	R	R	S	R	MR	R	S	S	R	R	R	S	R	R	S	R	*Yr2+*
104	HI8830(d)	R	S	S	MS	S	S	R	S	S	R	R	MS	S	S	R	S	-
105	CG1036	R	S	MS	R	S	S	R	S	MS	R	R	S	R	R	MS	MS	-
106	HI1655	R	S	S	S	S	S	MS	S	S	R	R	S	R	R	S	R	*Yr2+*
107	DBW110 (C)	R	S	S	S	R	S	S	S	MS	MS	NG	S	R	R	S	S	*Yr2+*
108	MP3288 (C)	MS	S	S	MS	S	S	S	MS	S	MS	R	S	R	S	S	R	-
109	DDW55(d)	S	S	S	S	S	S	S	MS	S	S	S	S	S	R	S	S	-
110	WHD965(d)	S	S	S	R	S	MS	MS	S	R	R	R	S	MR	R	R	R	-
111	UAS428(d) (C)	S	S	S	S	S	S	S	MS	S	MS	S	S	R	R	S	S	*Yr2+*
112	HI8826(d)	S	S	MS	S	S	S	R	MS	R	R	R	S	S	S	R	S	-
113	MACS4100(d)	S	MS	S	S	S	S	S	S	S	MS	S	S	S	R	S	S	-
114	MACS3949(d) (C)	S	S	MR	R	S	MR	MS	R	R	R	R	S	S	R	R	R	-

115	DDW53(d)	MS	S	MS	MS	S	S	R	R	S	S	MR	S	R	R	R	S	*Yr2+*
116	NIDW1345(d)	MS	S	S	MS	S	MS	R	R	MS	R	MS	S	R	R	MS	S	-
117	MACS6222 (C)	S	S	S	R	S	S	R	R	R	MS	R	R	R	R	R	R	*Yr2+*
118	MACS4106(d)	MS	S	S	MS	MR	MS	R	R	R	R	R	S	R	R	R	S	*Yr2+*
119	NIDW1348(d)	MS	S	S	S	S	S	S	S	MS	R	R	S	S	R	MS	S	-
120	HI8828(d)	MS	S	R	R	MS	S	MS	R	R	R	R	S	R	R	R	R	*Yr2+*
121	GW322 (C)	S	S	S	S	S	S	S	S	MS	MS	S	S	S	MS	S	S	-
122	HI8827(d)	S	S	MS	S	S	S	R	S	R	R	R	S	S	S	MR	S	-
123	DDW48(d)(I) (C)	MS	S	S	R	R	S	R	R	R	R	R	S	R	R	MS	MS	*Yr2+*
124	HD3090 (C)	S	S	S	R	S	S	R	R	R	R	R	R	R	R	R	R	*Yr9+*
125	HI1633(I) (C)	MS	S	S	R	S	S	R	R	R	R	R	R	R	R	R	R	*Yr9+*
126	HD2932 (C)	MS	S	S	MS	S	S	S	MS	S	MS	S	R	R	R	MS	S	*Yr2+*
127	RAJ4083 (C)	MS	S	S	MS	S	S	S	R	MS	R	R	R	R	R	S	MS	*Yr2+*
128	DBW320	MR	S	S	S	R	R	S	R	MS	R	R	R	R	S	S	MS	-
129	MACS6774	MS	S	S	MS	MS	MS	S	R	S	R	R	R	S	MS	S	S	-
130	NWS2180[#]	R	S	S	MS	R	MS	S	R	S	R	R	R	R	R	S	R	-
131	HI1651	MR	S	S	R	R	MS	MS	R	MS	S	S	S	S	R	S	MS	-
132	MP1358*	R	S	S	S	R	S	S	R	MS	MX	S	R	S	R	S	R	-
133	MACS6755	MS	S	S	S	S	S	S	S	S	MS	S	S	S	S	S	S	-
134	HI1605 (C)	R	S	S	R	R	S	R	R	MS	R	R	R	R	R	MS	R	*Yr2+*
135	MACS6753	S	S	S	S	S	S	S	S	S	S	S	S	S	R	S	S	-
136	AKDW2997-16(d) (C)	S	S	S	S	S	S	S	S	S	MS	R	S	S	R	S	S	-
137	NIDW1149(d)(I) (C)	R	S	S	S	S	S	R	R	R	MS	R	S	S	R	R	NG	-
138	NIAW3170 (C)	S	S	S	S	S	S	S	S	MS	S	S	S	S	MS	S	S	-
139	UAS446(d) (C)	MS	S	S	S	R	R	MS	MS	R	R	R	S	S	R	R	MS	-
140	DBW325	S	S	S	S	MS	S	S	R	MS	S	S	R	R	R	S	S	*Yr2+*
141	UAS3014	S	S	S	S	S	S	S	S	S	S	S	R	S	S	S	R	-
142	MACS5058	MR	MS	S	MS	MS	S	MS	MR	S	R	R	S	R	R	MR	MR	*Yr2+*
143	MACS6222(*a*) (C)	S	S	S	R	S	S	R	R	R	MS	R	R	R	R	R	R	*Yr2+*
144	DDK1029 (C)	S	MS	S	S	MS	S	MS	MS	MS	MS	R	S	R	R	MS	R	-
145	DDK1061	S	S	S	S	MS	S	S	S	S	S	S	S	S	S	MS	S	-
146	HW1098 (C)	MR	MS	S	R	MS	MS	R	R	R	R	R	MR	R	R	R	R	*Yr2+*
147	MACS5057	MS	MS	S	MS	MS	S	MS	R	MS	R	R	S	R	R	MS	MS	*Yr2+*
148	DDK1060	S	MS	S	S	MS	S	MS	MS	MS	MS	R	S	S	S	MS	MS	-
149	DBW328*	S	S	S	S	R	R	S	MS	R	R	R	R	R	R	S	S	*Yr2+*
150	DBW372	MS	S	S	MS	S	MR	S	R	MS	MS	R	R	MR	R	S	S	-
151	DBW370	S	S	S	MS	R	R	S	R	R	R	R	R	R	R	MS	R	*Yr2+*
152	DBW327*	S	S	S	R	R	R	S	R	R	R	R	R	R	R	S	R	*Yr2+*
153	WH1252*	MS	S	S	S	R	MR	S	S	R	R	R	R	R	R	S	S	*Yr2+*
154	PBW874	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	Resistant
155	HD3410	R	S	S	R	MR	MS	S	S	S	R	R	R	R	R	S	MS	*Yr2+*

156	DBW332*	R	S	S	MS	R	R	S	R	R	R	R	R	R	R	S	R	*YrA+*
157	PBW873	R	MS	S	NG	R	R	R	R	R	R	R	R	R	R	MR	R	-
158	DBW371	R	S	S	S	R	S	S	S	MS	R	R	R	NG	R	S	MS	*Yr2+*
159	HD3086 (C)	S	S	S	S	MR	R	S	S	R	R	R	R	R	R	S	S	*Yr2+*
160	DBW333*	R	S	S	S	R	R	S	MS	R	R	R	R	R	R	S	S	*Yr2+*
161	PBW872	MS	S	S	R	R	R	S	MS	R	R	NG	R	R	R	S	R	*Yr2+*
162	DBW187(I) (C)	R	S	S	MS	R	MS	S	S	MS	R	R	R	NG	NG	S	S	*Yr2+*
163	WH1270(I) (C)	R	S	S	S	R	MS	S	S	S	MS	R	R	R	R	S	R	*Yr2+*
164	DBW303(I) (C)	R	S	S	MS	R	MS	MS	R	R	R	R	R	R	R	MS	R	*Yr2+*
165	HD3412	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	Resistant
166	DBW375	S	S	S	S	R	S	S	S	MS	MS	R	R	R	R	S	S	*Yr2+*
167	DBW374	R	S	S	S	R	MS	S	R	R	R	R	R	R	R	S	R	*Yr2+*
168	HD3403	MS	MS	S	R	R	S	R	R	R	R	R	R	R	R	R	R	*Yr2+*
169	WH1406	R	S	S	R	R	MS	MS	R	R	R	R	R	R	R	MS	R	*Yr2+*
170	HD3413	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	Resistant
171	PBW867	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	Resistant
172	UP3096	R	MS	S	R	R	R	S	R	R	R	NG	R	R	R	R	R	*YrA+*
173	WH1404	R	S	S	R	MS	S	R	R	MS	R	R	R	R	R	R	R	*Yr2+*
174	PBW868	R	S	S	R	R	S	S	MS	R	R	NG	R	R	R	S	R	*Yr2+*
175	DBW318	S	S	S	MS	MR	S	S	MS	MS	MS	R	R	R	R	R	S	*Yr2+*
176	DBW378	R	S	S	S	R	R	S	S	R	R	R	R	R	R	S	R	*Yr2+*
177	WH1405	S	S	S	S	S	S	S	S	R	R	S	S	R	R	S	S	*Yr2+*
178	HD3405	R	S	S	R	R	R	MS	R	R	R	R	R	R	R	MS	R	*YrA+*
179	DBW377	MR	S	S	S	R	S	S	R	R	R	R	R	R	R	MS	MS	*Yr2+*
180	PBW869	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	Resistant
181	PBW871	R	S	S	R	MR	MS	R	R	R	R	R	R	R	R	S	S	*Yr2+*
182	HD3086 (C)	S	S	S	S	MR	R	S	S	R	MS	R	R	R	R	S	S	*Yr2+*
183	DBW376	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	Resistant
184	DBW373	R	R	MS	R	R	MS	R	R	R	R	R	R	R	R	R	R	*Yr2+*
185	HD3404	R	R	S	R	R	R	R	R	R	R	R	R	R	R	R	R	-
186	DBW187(I) (C)	R	S	S	S	R	MS	S	S	MS	R	R	R	R	R	MS	MS	*Yr2+*
187	WH1407	S	S	S	S	R	S	S	R	R	R	S	MS	S	NG	S	S	-
188	PBW870	R	S	MS	R	R	R	R	R	R	R	R	S	R	R	R	R	*Yr2+*
189	UP3095	MR	S	R	S	MS	MR	R	S	MS	MS	S	S	MX	R	S	S	-
190	DBW368	MR	S	S	R	MR	R	MS	R	S	R	R	R	NG	R	S	R	*Yr2+*
191	DBW363	R	S	S	R	R	MS	MS	MS	MS	R	R	R	R	R	R	S	*Yr2+*
192	DBW369	S	S	S	S	S	S	S	S	S	S	S	S	S	R	S	S	-
193	DBW367	S	S	S	S	S	MS	R	R	R	R	R	R	R	R	MS	MS	*Yr2+*
194	DBW364	R	S	S	MR	R	MS	S	S	S	R	R	R	R	R	S	R	*Yr2+*
195	Kharchia 65 (C)	S	S	S	S	S	S	S	S	S	S	S	S	R	R	S	S	-
196	DBW366	S	S	S	S	R	R	S	S	R	R	R	R	R	R	S	S	*YrA+*

197	KRL210 (C)	S	S	S	S	R	MR	S	MS	R	MS	R	R	R	R	S	S	*Yr2+*
198	DBW365	S	S	S	S	R	MS	S	S	R	MS	R	R	R	R	S	S	*Yr2+*
199	K1805	S	S	S	S	S	MS	S	R	S	R	R	S	R	R	MS	MX	*Yr2+*
200	KRL19 (C)	S	S	S	S	R	S	S	S	S	R	S	MS	S	S	MS	MS	-

Annexure 4: Reaction of AVT wheat genotypes at seedling stage against pathotypes of *Puccinia graminis tritici* (wheat stem/black rust) during 2020-21 at Mahabaleshwar

AVT No.	Entries	PATHOTYPES													
		11-	11A	21-	21A1	21A2	24	24A	40A	42B	117	117-2	117-4	122	295
Central Zone (CZ)															
77	HI8833(d)^{M}	R	R	S	S	R	R	R	R	S	R	R	S	R	R
78	GW322 (C)	S	S	S	R	R	R	R	S	S	S	S	S	R	R
79	MP3535	R	R	R	R	R	R	R	R	R	R	R	R	R	R
80	GW523	S	S	R	S	R	S	S	S	S	S	S	S	R	R
81	GW513*	R	R	R	R	R	R	R	R	R	R	R	R	R	R
82	HI1636*	R	R	R	R	R	R	R	R	R	R	R	R	R	R
83	HI8832(d)^{M}	R	R	S	R	R	S	R	R	S	R	S	S	R	R
84	MACS6768	R	R	R	R	R	R	R	R	S	R	R	R	R	R
85	HI1544 (C)	R	R	R	R	R	R	R	R	S	R	R	R	R	R
86	HI1667^{B}	R	R	R	R	R	R	R	R	R	R	R	R	R	R
87	HI8498(d) (C)	S	R	S	R	S	R	R	S	S	S	S	S	R	R
88	HI8713(d) (C)	S	S	R	R	S	S	R	R	S	S	S	S	R	R
89	HI1650	R	R	R	R	R	R	R	R	R	R	R	R	R	R
90	MP4010 (C)	R	R	R	R	R	R	R	R	NG	R	R	R	R	R
91	HD2864 (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R
92	MP3336 (C)	S	R	R	R	R	S	R	R	S	S	S	R	S	S
93	HD2932 (C)	R	R	S	R	S	S	R	S	S	S	S	S	R	S
94	HI1634(I) (C)	R	R	R	R	R	S	R	R	R	R	R	R	R	S
95	HD3407^{M}	R	R	R	R	R	R	R	R	R	R	R	R	R	R
96	CG1029(I) (C)	R	R	NG	R	NG	R	R	R	R	NG	R	R	R	NG
97	HI8823(d)*	R	R	R	R	R	R	R	R	R	R	S	R	R	R
98	GW528	R	R	R	R	R	R	R	R	R	R	R	S	R	R
99	DDW47(d) (C)	NG	S	R	R	R	R	R	R	R	S	S	S	R	R
100	DBW326	R	R	R	R	R	S	R	S	S	S	S	S	S	S
101	UAS475(d)	R	R	S	R	R	R	R	R	R	R	S	R	R	NG
102	HI8627(d) (C)	R	R	S	R	R	R	R	R	R	R	S	S	R	S
103	NIAW3851	S	R	S	R	S	S	R	S	S	S	S	S	S	S
104	HI8830(d)	R	R	R	R	R	R	R	R	R	R	R	R	R	S
105	CG1036	R	R	R	R	R	R	R	R	NG	NG	R	R	R	NG
106	HI1655	R	R	R	R	R	R	R	R	R	R	R	R	R	R
107	DBW110 (C)	R	R	R	R	S	R	R	S	S	R	R	R	S	S
108	MP3288 (C)	R	R	R	R	R	R	R	S	R	R	S	R	R	R

109	DDW55(d)	R	S	R	R	R	S	S	S	S	S	S	S	R	R
Peninsular Zone (PZ)															
110	WHD965(d)	R	R	R	R	R	NG	S	R	S	S	S	R	R	R
111	UAS428(d) (C)	R	R	R	R	R	S	R	R	R	R	R	R	R	R
112	HI8826(d)	R	R	S	R	R	R	R	R	R	R	R	R	R	R
113	MACS4100(d)	R	S	S	R	R	S	S	R	S	S	S	S	R	R
114	MACS3949(d) (C)	R	R	R	R	R	S	R	R	R	S	S	R	R	R
115	DDW53(d)	R	R	S	R	R	R	R	R	R	R	R	R	S	R
116	NIDW1345(d)	R	R	S	R	S	R	R	R	R	S	S	S	R	R
117	MACS6222 (C)	R	R	R	R	R	S	R	R	R	R	R	R	R	R
118	MACS4106(d)	R	R	R	S	S	R	R	R	R	R	R	S	R	R
119	NIDW1348(d)	R	S	S	S	S	S	S	S	S	S	S	S	NG	S
120	HI8828(d)	R	S	R	S	R	R	R	R	R	R	R	R	R	R
121	GW322 (C)	S	R	R	R	R	S	R	S	R	R	R	S	R	R
122	HI8827(d)	R	R	R	R	R	R	R	R	R	R	R	R	R	R
123	DDW48(d)(I) (C)	R	R	R	R	R	NG	S	R	R	R	R	R	S	R
124	HD3090 (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R
125	HI1633(I) (C)	R	R	R	R	R	R	R	R	R	R	R	R	R	R
126	HD2932 (C)	R	S	R	R	S	R	S	S	S	S	S	S	S	S
127	RAJ4083 (C)	R	S	S	R	R	R	R	S	S	S	S	R	S	R
128	DBW320	R	R	S	R	R	R	S	S	S	S	S	R	S	R
129	MACS6774	S	S	S	S	S	S	S	R	S	S	S	R	R	R
130	NWS2180[#]	S	S	S	R	R	S	S	R	S	S	S	S	R	R
131	HI1651	R	R	R	R	R	R	R	R	R	R	R	R	R	R
132	MP1358*	R	R	R	R	R	R	R	R	R	R	R	R	R	R
133	MACS6755	R	R	R	R	R	R	R	R	R	R	R	R	R	R
134	HI1605 (C)	S	R	R	S	R	S	R	S	R	S	S	R	R	S
135	MACS6753	R	R	R	R	R	R	R	S	R	R	S	R	R	R
136	AKDW2997-16(d) (C)	R	R	S	R	S	R	R	S	R	S	S	S	R	R
137	NIDW1149(d)(I) (C)	R	R	R	R	R	NG	NG	R	S	S	S	S	R	NG
138	NIAW3170 (C)	R	R	S	R	R	S	R	S	S	S	S	S	R	R
139	UAS446(d) (C)	R	S	R	R	R	S	R	R	S	R	R	R	R	R
140	DBW325	S	S	R	R	R	R	R	S	S	S	S	R	R	R
141	UAS3014	R	S	NG	R	R	R	R	S	R	S	S	R	R	NG

Annexure 5: Reaction of AVT wheat genotypes at seedling stage against pathotypes of *Puccinia triticina* (wheat leaf/ brown rust) during 2020-21 at Mahabaleshwar

AVT No.	Code	PATHOTYPES									
		12 --3	12--4	12 --5	77	77-1	77-3	77-5	77-9	104A	104-2
Central Zone (CZ)											
77	HI8833(d)^{M}	S	R	R	R	S	R	S	R	R	R
78	GW322 (C)	R	R	R	S	S	S	S	S	R	S
79	MP3535	R	R	R	R	R	R	R	R	R	R
80	GW523	R	R	R	R	R	R	S	R	R	R
81	GW513*	R	R	R	R	R	R	R	R	R	R
82	HI1636*	R	R	R	R	R	R	R	R	R	R
83	HI8832(d)^{M}	R	S	R	R	R	R	R	R	R	S
84	MACS6768	R	R	R	R	R	R	R	R	R	R
85	HI1544 (C)	R	R	R	R	R	R	R	R	R	R
86	HI1667^{B}	R	R	R	R	R	R	R	R	R	R
87	HI8498(d) (C)	R	R	R	R	R	R	R	R	R	R
88	HI8713(d) (C)	R	R	R	R	R	R	R	R	R	R
89	HI1650	R	R	R	R	R	R	R	R	R	R
90	MP4010 (C)	R	R	R	R	R	R	R	R	R	R
91	HD2864 (C)	R	R	R	R	R	R	R	R	R	R
92	MP3336 (C)	R	R	R	R	R	R	R	R	R	R
93	HD2932 (C)	S	S	S	S	S	S	S	S	S	S
94	HI1634(I) (C)	R	R	R	R	R	R	S	R	R	R
95	HD3407^{M}	R	R	R	R	R	S	R	R	R	R
96	CG1029(I) (C)	R	R	R	R	R	R	R	R	R	R
97	HI8823(d)*	R	R	R	R	R	R	R	R	R	R
98	GW528	R	R	R	R	R	R	R	R	R	R
99	DDW47(d) (C)	R	R	R	R	R	R	R	R	R	R
100	DBW326	S	R	S	S	NG	S	S	S	S	S
101	UAS475(d)	R	R	R	R	R	R	R	R	R	R
102	HI8627(d) (C)	R	R	R	R	R	R	R	R	R	R
103	NIAW3851	S	R	S	S	S	S	S	S	R	R
104	HI8830(d)	R	R	R	R	R	R	R	R	R	R
105	CG1036	R	R	R	R	R	R	R	R	R	R
106	HI1655	R	R	R	R	R	R	R	R	R	R
107	DBW110 (C)	S	R	S	S	R	S	S	S	S	S
108	MP3288 (C)	R	R	R	R	R	R	R	R	R	R

109	DDW55(d)	R	R	R	R	R	R	R	R	R	R
Peninsular Zone (PZ)											
110	WHD965(d)	R	R	R	R	R	R	R	R	R	R
111	UAS428(d) (C)	R	R	R	R	R	R	R	R	R	R
112	HI8826(d)	R	R	R	R	R	R	R	R	R	R
113	MACS4100(d)	R	R	R	R	R	R	R	R	R	R
114	MACS3949(d) (C)	R	R	R	R	R	R	R	R	R	R
115	DDW53(d)	R	R	R	R	S	R	S	S	R	R
116	NIDW1345(d)	R	R	R	R	S	R	R	R	R	S
117	MACS6222 (C)	R	R	R	R	R	R	R	R	R	R
118	MACS4106(d)	R	R	R	R	R	R	R	R	R	R
119	NIDW1348(d)	S	S	S	R	S	R	S	R	S	S
120	HI8828(d)	R	R	R	R	R	R	R	R	R	R
121	GW322 (C)	R	R	R	R	R	S	S	R	R	R
122	HI8827(d)	R	R	R	R	R	R	R	R	R	R
123	DDW48(d)(I) (C)	R	R	R	R	R	R	R	R	R	R
124	HD3090 (C)	R	R	R	R	S	R	R	R	R	R
125	HI1633(I) (C)	R	R	R	R	R	R	R	R	R	R
126	HD2932 (C)	S	S	S	S	S	S	S	S	S	S
127	RAJ4083 (C)	R	R	S	R	R	S	S	R	R	R
128	DBW320	R	R	R	NG	S	S	S	S	R	R
129	MACS6774	S	R	S	S	S	S	S	S	S	R
130	NWS2180[#]	R	R	R	R	S	R	S	R	R	R
131	HI1651	R	R	R	R	R	R	S	R	R	R
132	MP1358*	R	R	R	R	R	R	R	R	R	R
133	MACS6755	R	R	R	R	R	R	R	R	R	R
134	HI1605 (C)	S	S	S	R	R	R	R	R	R	R
135	MACS6753	R	R	R	R	R	R	R	R	R	R
136	AKDW2997-16(d) (C)	R	S	S	R	R	R	R	R	R	S
137	NIDW1149(d)(I) (C)	R	R	R	R	R	R	R	R	R	R
138	NIAW3170 (C)	R	R	R	R	R	R	S	R	R	R
139	UAS446(d) (C)	R	R	R	R	R	R	R	R	R	R
140	DBW325	R	R	R	R	R	R	S	S	R	R
141	UAS3014	S	S	S	S	S	S	S	S	S	S

Annexure 6: Disease response of IPPSN entries during 2020-21

No.	Entry code	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		Foliar blight	
			ACI	HS	ACI	HS	ACI	HS	ACI	HS	Avg.	HS
PAU, Ludhiana												
1	IPPSN2020-1	BWL7720	2.5	20MR	7.3	20S	2.8	10S	2	15S	24	35
2	IPPSN2020-2	BWL7721	1.8	20MR	2.2	10S	2.8	10S	5.1	20S	34	46
3	IPPSN2020-3	BWL7722	10.6	20S	1	5S	0	0	0.6	5S	24	47
4	IPPSN2020-4	BWL7723	9.2	20S	1.8	10MS	0.3	TS	1.4	10S	35	46
5	IPPSN2020-5	BWL7724	9.8	20S	2.6	10MS	0	0	0	0	34	35
6	IPPSN2020-6	BWL7725	4.2	20MS	2.6	10MS	0.1	TR	0.3	5MR	35	46
7	IPPSN2020-7	BWL7726	4.1	20MS	2.2	10S	3.8	5S	0.2	TS	35	47
8	IPPSN2020-8	BWL7727	14.6	40S	6.6	10S	6.3	10S	5.4	20S	35	36
9	IPPSN2020-9	BWL7728	19.6	60S	4	10S	8.8	20S	4.9	15S	35	47
10	IPPSN2020-10	BWL7729	21.6	40S	4.4	10MS	5.1	20S	6.6	20S	35	46
11	IPPSN2020-11	BWL7730	23	40S	9.4	20MS	5	20S	7.5	30S	35	58
12	IPPSN2020-12	BWL7731	12.8	40S	6.8	20MS	0.3	TS	6.1	20S	35	67
13	IPPSN2020-13	BWL7732	14	40S	5.2	10MS	3.3	5S	4.1	20MS	35	68
14	IPPSN2020-14	BWL7733	27.6	60MS	10	40S	5	10S	4.1	20S	35	46
15	IPPSN2020-15	BWL7734	9.2	20S	2.6	5MS	0.3	TS	2.4	15S	35	47
16	IPPSN2020-16	BWL7735	30	60S	9.8	20MS	3.8	10S	3.8	30S	45	67
17	IPPSN2020-17	BWL7736	5	20MS	0.1	TMR	8.5	30S	16.6	40S	23	36
18	IPPSN2020-18	BWL7737	5.3	20MS	0.4	5MR	2.5	10S	2.5	15S	35	57
19	IPPSN2020-19	BWL7738	8.9	20S	0.1	TR	1.3	5S	4.5	20S	46	68
20	IPPSN2020-20	BWL7739	5.3	20MS	5.3	20MS	0.1	TR	5.1	20S	45	67
20A	INFECTOR		76	100S	76	100S	55	80S	65	80S	67	79
21	IPPSN2020-21	BWL7740	7	20MS	7.2	20S	0.3	TS	5	20S	46	79
22	IPPSN2020-22	BWL7741	11.6	40MS	0	TR	0	0	4.1	15S	46	78
23	IPPSN2020-23	BWL7742	1.8	20MR	1.1	5S	2.5	5S	3	10S	35	78
24	IPPSN2020-24	BWL7743	0.9	10MR	0.9	10MR	1.3	5S	7.5	20S	45	68
25	IPPSN2020-25	BWL7744	6.4	20MS	1.7	5MS	2.7	10S	5.3	30S	45	78
26	IPPSN2020-26	BWL7745	1.7	10MS	5.6	10S	4.8	10S	4.9	30S	56	78
27	IPPSN2020-27	BWL7746	17	40S	7.7	20S	2.8	10S	4.4	20S	56	67
28	IPPSN2020-28	BWL7747	14	40S	2.1	10S	2.5	10S	2.7	20S	35	57
29	IPPSN2020-29	BWL7748	14.2	40S	1.1	5S	6.3	20S	11.3	60S	46	68
30	IPPSN2020-30	BWL7749	5.7	20S	3	10S	0.8	5MR	2.5	15S	46	78
31	IPPSN2020-31	BWL7750	34.8	100S	8.4	20S	1.3	5MS	3.9	20MS	46	68
32	IPPSN2020-32	BWL7751	36.8	100S	10	20S	5	10S	1.9	15S	56	78
33	IPPSN2020-33	BWL7752	22.4	80S	1.7	20MR	1.3	5S	1.9	15S	46	69
34	IPPSN2020-34	BWL7753	1.1	5S	3.6	20MS	0	0	0.3	5MR	45	67
35	IPPSN2020-35	BWL7754	1.5	5S	0.2	TMR	1.5	5S	0	0	46	78
36	IPPSN2020-36	BWL7755	8.9	40MS	0.1	TR	0.1	TR	3.7	15S	35	57
37	IPPSN2020-37	BWL7756	15.6	40MS	2.9	10S	1.3	5S	3.5	20S	35	46
38	IPPSN2020-38	BWL7757	8.4	20MS	0.1	TR	0	0	2.5	15S	45	67
39	IPPSN2020-39	BWL7758	7.7	20S	10.4	20S	0.3	TS	2.5	20S	35	57
40	IPPSN2020-40	BWL 7466	8.1	20S	5.3	20S	0.3	TS	19.4	40S	35	47
40A	INFECTOR		80	100S	88	100S	55	80S	67.5	80S	68	79
41	IPPSN2020-41	BWL 8231	15.4	20S	3.1	10MS	1.3	5S	3.8	30S	35	47
42	IPPSN2020-42	BWL 8846	7.8	20MS	5.9	20S	0.3	TS	2.4	15S	45	57
43	IPPSN2020-43	BWL 8878	17.2	60S	1.2	5S	5.3	10S	6.5	20S	45	46
44	IPPSN2020-44	BWL 8946	3.7	10S	7.4	20MS	0.3	TS	3.4	15S	45	67
45	IPPSN2020-45	BWL 8965	0	TR	2.1	5MS	1.5	5S	12.8	40S	35	57
46	IPPSN2020-46	BWL 9042	0.5	5MR	0.1	TR	0.3	TS	2.4	15S	45	67
47	IPPSN2020-47	BWL 9074	9	20S	3.3	10MS	1.4	5S	4.4	15S	34	46
48	IPPSN2020-48	BWL 9107	26	40S	17.2	40S	3.5	5S	2.5	20S	35	57
49	IPPSN2020-49	BWL 9168	11.3	40S	8.9	20S	2	10MS	5	40S	45	67
50	IPPSN2020-50	BWL 9183	21.6	40S	3.6	10S	0	0	2.5	20S	35	58
51	IPPSN2020-51	BWL 9187	15.2	40S	8.6	20S	0.5	5MR	4.4	20S	34	78

No.	Entry code	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		Foliar blight	
			ACI	HS	ACI	HS	ACI	HS	ACI	HS	Avg.	HS
52	IPPSN2020-52	BWL 9228	1.3	10MR	0.2	TMR	0	0	2.5	15S	35	57
53	IPPSN2020-53	BWL 9242	1.7	20MR	1.8	10MS	0.8	5MR	3.1	20S	45	78
54	IPPSN2020-54	BWL 9244	8.4	20MS	14.8	30MS	6.8	10S	5	20S	46	67
55	IPPSN2020-55	BWL 9264	34	60S	3.7	10S	1.4	5S	5.5	40S	46	57
56	IPPSN2020-56	BWL 9297	21.6	60S	2.8	10MS	0	0	5.5	40S	45	78
57	IPPSN2020-57	BWL 9304	17.6	40S	6	20MS	0.1	TR	5.5	40S	35	57
58	IPPSN2020-58	BWL 9307	3.3	20MS	0.1	TR	0	0	4.1	20S	35	68
59	IPPSN2020-59	BWL 9312	1.7	10MS	1.6	10MS	0	0	6.3	40S	45	67
60	IPPSN2020-60	BWL 9330	15.6	40S	4.1	20S	0	0	4.8	20S	46	78
60A	INFECTOR		80	100S	88	100S	60	80S	65	80S	67	79
61	IPPSN2020-61	BWL 9344	3.4	10MS	3.4	10MS	1	5MS	6.3	30S	34	57
62	IPPSN2020-62	BWL 9421	28	60S	7.2	20MS	11	20S	2.5	20S	35	46
63	IPPSN2020-63	BWL 9437	0.4	5MR	0.1	TR	0	0	6.3	40S	35	67
64	IPPSN2020-64	BWL 9440	13.2	40S	4.8	10S	2.3	5S	2.5	20S	34	46
65	IPPSN2020-65	BWL 9449	11.1	40S	0.1	TR	0	0	2.5	20S	35	56
66	IPPSN2020-66	BWL 9453	4.4	20MS	5.8	20MS	3.3	10MS	3	20S	45	57
67	IPPSN2020-67	BWL 9455	13.6	40S	5.4	10S	3.6	10S	7.3	40S	35	46
68	IPPSN2020-68	BWL 9461	2.7	10MS	11	20S	3.8	10S	5	40S	34	45
69	IPPSN2020-69	BWL 9472	1.7	10MS	4.9	20S	2.5	5S	4.4	15S	35	57
70	IPPSN2020-70	BWL 9499	19.6	40S	0.1	TMR	0.3	TS	10.6	40S	35	57
71	IPPSN2020-71	BWL 9505	19.2	40S	4.1	20S	0.1	TMR	14.1	40S	35	46
72	IPPSN2020-72	BWL 9508	24	60S	2	10S	2.5	5S	2.4	15S	34	67
73	IPPSN2020-73	BWL 9509	12.6	40S	4.1	10S	5.5	10S	2.4	15S	34	46
74	IPPSN2020-74	BWL 9512	29	60S	3.3	20MS	2.5	5S	5.6	30S	24	36
75	IPPSN2020-75	BWL 9520	2.9	10S	6.7	20S	5	10S	4.9	30S	35	46
76	IPPSN2020-76	BWL 9525	17.6	40S	12.1	40S	6	20S	5	30S	45	67
77	IPPSN2020-77	BWL 9749	5.3	20MS	4.9	20S	2.5	10S	12.8	40S	45	68
78	IPPSN2020-78	BWL 9752	12.3	40S	16.2	80S*	1.3	5S	9.6	30S	35	57
79	IPPSN2020-79	BWL 9755	1.4	10MR	1.8	10MS	2.6	10S	8.5	30S	34	45
80	IPPSN2020-80	BWL 9758	8.6	20MS	8.8	20S	2.3	5S	7.4	30S	45	68
80A	INFECTOR		80	100S	76	100S	60	80S	67.5	80S	68	79
81	IPPSN2020-81	BWL 9762	1.7	10MR	12.1	60S*	3.5	10S	22.3	40S	46	57
82	IPPSN2020-82	BWL 9799	12	40S	4	20MS	1.3	5S	3.8	20S	35	46
83	IPPSN2020-83	BWL 9800	9.3	20S	4.2	20S	0.1	TMR	7.1	20S	35	57
84	IPPSN2020-84	BWL 9805	8	20MS	8.8	20MS	1.3	5S	16	40S	35	47
85	IPPSN2020-85	BWL 9851	16.2	40S	8.4	20MS	1.3	5S	4.9	30S	34	57
86	IPPSN2020-86	BWL 9869	1.9	5S	1.9	5S	1.3	5S	15.3	40S	34	35
87	IPPSN2020-87	BWL 9889	18.2	60S	4.2	20S	0	0	7	40S	35	46
88	IPPSN2020-88	BWL 9914	16.4	40S	1.6	10MS	5	20S	22.8	60S	35	46
89	IPPSN2020-89	BWL 9915	12.2	40MS	3.4	5S	0	0	19	40S	45	57
90	IPPSN2020-90	BWL 9916	20.4	60S	10.6	20S	8.8	20S	31.9	60S	45	46
91	IPPSN2020-91	BWL 9921	5.6	20S	0.1	TR	1.3	5S	6.1	40S	35	45
92	IPPSN2020-92	BWL 9922	8.1	20S	4.4	10S	0.8	5MR	5.5	40S	34	47
93	IPPSN2020-93	BWL 9923	7.3	20S	0.5	5MR	0	0	6.4	40S	35	57
94	IPPSN2020-94	BWL 9924	4.9	20S	8.1	40S	1.3	5S	10	40S	35	57
95	IPPSN2020-95	BWL 9925	10.6	40S	12.9	40S	0.3	TS	12.8	40S	35	36
96	IPPSN2020-96	BWL 9926	0.9	10MR	3.1	10MS	2.5	5S	2	15S	35	46
97	IPPSN2020-97	BWL 9927	36	100S	9.8	20S	1.3	5S	3.2	15S	35	36
98	IPPSN2020-98	BWL 9928	20.6	60S	6	20MS	0.3	TS	10.4	20S	35	46
99	IPPSN2020-99	BWL 9929	6.9	30MS	2.7	10MS	5.1	20S	3.1	20S	35	47
100	IPPSN2020-100	BWL 9930	17.2	60S	1.8	5S	8	20S	5.3	20S	35	46
100A	INFECTOR		84	100S	88	100S	60	80S	65	80S	67	79
101	IPPSN2020-101	BWL 9931	24.8	60S	1.9	5S	5.5	20S	3.5	20S	35	46
102	IPPSN2020-102	BWL 9932	13.8	60S*	1.7	10MS	1.3	5S	4.4	20S	46	67
103	IPPSN2020-103	BWL 9933	8.5	20MS	16.2	80S*	15	50S	7.4	20S	45	57
104	IPPSN2020-104	BWL 9934	18.5	80S*	17.6	60S	7.8	20S	3.8	30S	45	56

No.	Entry code	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		Foliar blight	
			ACI	HS	ACI	HS	ACI	HS	ACI	HS	Avg.	HS
105	IPPSN2020-105	BWL 9935	54	100S	14.4	20S	7.8	20S	2.5	20S	35	46
106	IPPSN2020-106	BWL 9936	58	100S	19.2	40S	6.3	20S	10.5	40S	45	57
107	IPPSN2020-107	BWL 9937	7.3	40MS	2.5	20MR	2.3	10MS	2.5	20S	35	47
108	IPPSN2020-108	BWL 9938	7.3	20S	22.4	80S	3.5	10S	16	40S	35	46
109	IPPSN2020-109	BWL 9939	22.4	100S*	5.6	20S	0.3	TS	5.1	20S	46	57
110	IPPSN2020-110	BWL 9940	23.2	100S	6.9	20S	2.3	10MS	4	20S	35	57
111	IPPSN2020-111	BWL 9941	25.3	80S	4.4	10S	2.5	10S	13.9	30S	45	57
112	IPPSN2020-112	BWL 9942	16.5	60S	7.2	20S	6.3	20S	6.5	20S	45	47
113	IPPSN2020-113	BWL 9945	9.2	20S	4	20S	0.3	TS	16.3	40S	34	36
114	IPPSN2020-114	BWL 9946	14.2	40S	4	10S	7.5	20S	15.5	60S	35	46
115	IPPSN2020-115	BWL 9948	12.9	40S	5.6	20S	3.3	10S	9.8	40S	35	46
116	IPPSN2020-116	BWL 9949	11.8	40S	0.2	TMS	1.3	5S	10	20S	45	57
117	IPPSN2020-117	BWL 9951	11	20MS	0.9	5MS	0.3	TS	22.8	60S	35	56
118	IPPSN2020-118	BWL 9954	3.8	10S	3.3	20MS	5.1	20S	23	40S	35	57
119	IPPSN2020-119	BWL 9958	2.1	10S	2	10S	0.3	TS	5.4	20S	35	46
120	IPPSN2020-120	BWL 9960	30	80S	32	80S	20	60S	7	20S	46	67
120A	INFECTOR		84	100S	80	100S	50	80S	65	80S	68	79
121	IPPSN2020-121	BWL 9962	14.2	40S	6.1	20S	1.3	5S	3	15S	45	67
122	IPPSN2020-122	BWL 9965	13.2	40S	4.9	20S	2.3	5S	2.9	15S	35	46
123	IPPSN2020-123	BWL 9966	21.2	40S	7	15MS	1.3	5S	3.4	15S	35	46
124	IPPSN2020-124	BWL9967	34	60S	5.1	20S	5.5	10S	3.9	15S	35	37
125	IPPSN2020-125	BWL9968	5.3	10S	0.6	5MR	7.5	30S	0	0	35	57
126	IPPSN2020-126	BWL9969	24.8	40S	0.9	10MR	0.3	TS	6.5	20	35	36
127	IPPSN2020-127	BWL9970	9.3	20S	5.1	15MS	0.3	TS	17.5	40S	45	46
128	IPPSN2020-128	BWL9971	38	80S	6	20S	2.8	10S	3.3	20S	34	36
129	IPPSN2020-129	BWL9972	39.2	80S	3.6	20MS	1.3	5S	5	20S	24	36
130	IPPSN2020-130	BWL9973	35.2	80S	9.2	40S	7.5	20S	5.5	20S	35	47
131	IPPSN2020-131	BWL9974	13.7	60MS	6.7	20S	3.8	10S	7.5	30S	46	47
132	IPPSN2020-132	BWL9975	14.8	40S	5.8	20MS	5.1	20S	6	30S	35	45
133	IPPSN2020-133	BWL9976	40	60S	5.8	20MS	9.8	20S	5	20S	35	47
134	IPPSN2020-134	BWL9977	5	20MS	1.7	5MS	1.4	5S	4.1	20S	34	46
135	IPPSN2020-135	BWL9978	24	60S	2.5	5MS	3.8	10S	6.8	20S	45	46
136	IPPSN2020-136	BWL9979	25.6	80S	28	60S	21.3	40S	2.1	15S	35	57
137	IPPSN2020-137	WG2107	4.2	20MS	7.4	20MS	4	10S	3.8	20S	24	24
138	IPPSN2020-138	WG2112	0.8	5MS	18.8	80S	2.5	10S	12.5	30S	34	35
139	IPPSN2020-139	WG2113	21.6	40S	4.4	10S	2	5S	2.8	20S	35	46
140	IPPSN2020-140	WG2115	11.2	20S	15.3	60S	2.5	10S	2.5	20S	45	57
140A	INFECTOR		84	100S	80	100S	60	80S	67.5	80S	68	79
141	IPPSN2020-141	WG2120	20.2	40S	3.1	10S	1.3	5S	11.9	20S	35	57
142	IPPSN2020-142	WG2121	28.1	60S	3.4	20MS	2.5	10S	3.6	15S	34	45
143	IPPSN2020-143	WG2130	5.2	10S	6.4	20S	1.5	5S	4.5	20S	35	47
144	IPPSN2020-144	WG2133	3.7	10MS	2	20MR	0.3	TS	11.9	60S	35	56
145	IPPSN2020-145	WG2152	13.1	40S	12.8	20S	13.5	20S	21	40S	46	46
146	IPPSN2020-146	WG2157	9.8	40S	1.1	5S	1.3	5S	5.3	20S	45	56
147	IPPSN2020-147	WG2173	42.6	80S	17.6	80S*	4.3	10S	9	40S	35	46
148	IPPSN2020-148	WG2176	22.6	60S	37	80S	15.3	60S*	8.4	40S	35	46
149	IPPSN2020-149	WG2194	3	10S	20	80S	6.4	20S	17	40S	35	45
150	IPPSN2020-150	WG2195	7.3	40MS	9.6	40S	3.5	10S	2.8	20S	35	46
151	IPPSN2020-151	WG2205	5.6	20MS	14.8	60S*	3.5	10S	2.5	20S	24	35
152	IPPSN2020-152	WG2206	3.3	20MS	0.4	5MR	0.3	TS	6.5	20S	24	37
153	IPPSN2020-153	WG2207	18	60S	26	40S	18.8	40S	7.5	60S	35	37
154	IPPSN2020-154	WG2220	8.2	40S	2.4	10MS	6	10S	13	60S	34	46
155	IPPSN2020-155	WG2233	4.1	10S	11.3	40S	2.8	10S	8.3	20S	34	46
156	IPPSN2020-156	WG2248	9.1	40S	16.8	60S	5.5	10S	12.9	60S	35	57
157	IPPSN2020-157	WG2251	8.2	40S	6.8	20S	8.5	20S	11.3	40S	36	68
158	IPPSN2020-158	WG2296	11.1	40S	8.8	40S	1.3	5S	3.6	20S	25	36

No.	Entry code	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		Foliar blight	
			ACI	HS	ACI	HS	ACI	HS	ACI	HS	Avg.	HS
159	IPPSN2020-159	WG2297	22.1	80S	4.2	20MS	0	0	4.2	20S	35	46
160	IPPSN2020-160	DWG2339	21.6	100S*	8.9	20S	7.3	20S	2.8	20S	35	46
160A	INFECTOR		84	100S	80	100S	60	80S	67.5	80S	67	79
161	IPPSN2020-161	DWG2352	28.9	80S	3.3	20MS	1.4	5S	1.3	10S	35	56
162	IPPSN2020-162	DWG2358	27.2	100S	2.7	10MS	8.5	30S	1.3	10S	35	37
163	IPPSN2020-163	DW574	2.5	20MR	4.9	20MS	8	30S	7.8	60S*	35	45
164	IPPSN2020-164	DW575	29.6	100S	9.3	20S	8	20S	7.7	60S*	45	67
165	IPPSN2020-165	DW576	36	100S	23.3	100S	3.5	10S	3.4	20S	45	67
166	IPPSN2020-166	DW577	22.4	100S*	5.3	20MS	3.5	10S	5.1	40S	45	67
167	IPPSN2020-167	DW578	22.4	100S*	4.1	20S	6.3	20MS	3.5	20S	34	36
168	IPPSN2020-168	DW579	24.1	100S	2.5	20MR	6.5	20S	2.8	15S	35	46
169	IPPSN2020-169	DW580	22.4	100S*	4.1	20MS	4.5	10S	2.4	15S	35	37
170	IPPSN2020-170	DW581	22.4	100S*	1.7	10MS	1.8	5S	8.5	40S	45	57
SKUAST - K, Khudwani												
171	IPPSN2020-171	SKW-361	20	80S*	8	20MS	7.3	20S	6.3	40S	46	67
172	IPPSN2020-172	SKW-362	33.6	80S	10	40S	4.3	10S	4.7	15S	46	57
173	IPPSN2020-173	SKW-363	27.4	80S	5	20S	2.4	5S	15.1	60S	45	57
174	IPPSN2020-174	SKW-364	19.4	80S	6.4	10S	9.3	20S	11.6	60S	35	57
175	IPPSN2020-175	SKW-365	10.7	40S	6.4	20S	8.9	30S	3.7	10MS	45	67
Nuziveedu Seeds												
176	IPPSN2020-176	NWS2214	15.3	40S	6.8	20MS	2.5	10S	4.3	20S	46	67
177	IPPSN2020-177	NWS2222	14.5	40S	6.8	20MS	5	10S	25.5	60S	46	67
SDAU, Vijapur												
178	IPPSN2020-178	VA 2019-14	13.7	40S	4.2	20MS	5	20S	32.4	80S	45	67
179	IPPSN2020-179	VA 2019-06	8.9	20S	1.9	5S	1.3	5S	55	80S	46	67
180	IPPSN2020-180	VA 2019-03	1.8	5MS	1.7	20MR	2.5	10S	51	80S	46	67
180A	INFECTOR		72	100S	80	100S	60	80S	70	100S	68	79
181	IPPSN2020-181	VA 2019-15	0.8	10MR	1.6	10MS	0.3	TS	20.8	40S	45	57
182	IPPSN2020-182	VA 2019-02	1.7	10MR	1.7	20MR	1.8	5S	26	60S	46	67
183	IPPSN2020-183	VA 2019-10	0.8	10MR	4.3	20MS	12.5	40S	43.5	60S	46	78
184	IPPSN2020-184	VA 2019-31	0.9	10MR	2.1	10S	1.3	5S	45	60S	56	78
185	IPPSN2020-185	VA 2019-09	0.9	10MR	4	20S	0.1	TR	50.5	60S	57	78
186	IPPSN2020-186	VA 2019-37	0.4	5MR	0.4	5MR	1.3	5S	38.5	60S	56	78
187	IPPSN2020-187	VA 2019-34	0.2	5R	0.1	TR	2.5	10S	43.3	60S	46	57
188	IPPSN2020-188	VA 2019-28	1.2	10MR	1.6	10MS	0.3	TS	49.5	60S	56	78
189	IPPSN2020-189	VA 2019-22	4.8	20S	1.6	10MS	2.5	10S	22.5	40S	56	78
190	IPPSN2020-190	VA 2019-24	0	TR	3.7	20MS	1.5	5S	47	80S	56	78
191	IPPSN2020-191	VA 2019-21	0.8	10MR	0.9	10MR	0.3	TS	19	40S	56	78
192	IPPSN2020-192	VA 2019-17	0	TR	1.7	20MR	1.3	5S	27.3	40S	46	57
193	IPPSN2020-193	VA 2019-20	0.4	10R	2	10S	2.5	10S	32.6	60S	46	78
194	IPPSN2020-194	VA 2019-23	1.6	10MR	7.6	20S	12.3	40S	32.5	60S	56	78
195	IPPSN2020-195	VA 2019-16	14.2	40MS	11.2	40S	7.5	20S	34.5	60S	46	67
196	IPPSN2020-196	VD 2019-2	0.1	TMR	0.1	TR	7.5	30S	12	20S	45	67
197	IPPSN2020-197	VD 2019-4	0.1	TMR	2.1	10MS	1.8	5S	6.7	40S	35	45
198	IPPSN2020-198	VD 2019-5	0.9	10MR	1.7	20MR	2.5	10S	6.3	40S	46	68
199	IPPSN2020-199	VD 2019-3	1.9	10MR	1.7	10MS	1.3	5S	4.4	15S	56	78
200	IPPSN2020-200	VD 2019-8	5.6	20S	0.2	TMR	0.8	5MR	1.9	15S	46	68
200A	INFECTOR		84	100S	80	100S	60	80S	67.5	80S	67	79
201	IPPSN2020-201	VD 2019-1	10	40MS	4.9	20S	1.8	5S	10.5	60S*	46	78
202	IPPSN2020-202	J 19-35	10	40MS	3.8	10S	6.4	20S	29.8	60S	56	67
203	IPPSN2020-203	J 19-36	4.3	20MS	0.8	10MR	2.5	10S	21.5	60S	46	67
204	IPPSN2020-204	J 19-29	1.9	5S	4.8	20S	10	20S	28	60S	46	78
205	IPPSN2020-205	J 19-20	4.4	20MS	8.1	40S	6.3	20S	44.5	80S	35	67
206	IPPSN2020-206	J 19-19	2.6	10MS	4.1	20S	10.3	40S	45	80S	45	57
207	IPPSN2020-207	J 19-33	0.3	5R	0.1	TR	0.3	TS	38.5	80S	46	68
208	IPPSN2020-208	J 19-03	2.5	10S	1.7	20MR	4	10S	19.1	40S	45	57

No.	Entry code	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		Foliar blight	
			ACI	HS	ACI	HS	ACI	HS	ACI	HS	Avg.	HS
209	IPPSN2020-209	JD 19-08	12.9	40S	6	10S	2.3	5S	8.3	40S	45	68
210	IPPSN2020-210	GW 1353	2.8	10S	1.7	10MS	1.3	5S	50	80S	56	78
211	IPPSN2020-211	DR-19-28	4	20MS	3.3	20MS	3.8	10S	43.5	80S	56	78
212	IPPSN2020-212	DR-19-38	9.3	40S	5.6	20S	7.5	20S	40	60S	56	78
JNKVV Powarkheda												
213	IPPSN2020-213	IPPSN-21-01	5.3	20MS	16.8	60S	5	10S	6.5	15S	46	67
214	IPPSN2020-214	IPPSN-21-02	12.1	60S*	2.1	20MR	1.3	5S	3.4	15S	35	47
215	IPPSN2020-215	IPPSN-21-03	5.4	20MS	18	80S*	3	10S	23.5	40S	35	46
216	IPPSN2020-216	IPPSN-21-04	19.3	80S*	3.7	10MS	1.3	5S	8.3	40S	36	57
217	IPPSN2020-217	IPPSN-21-05	15.8	40S	2.4	5S	3.5	10S	9.4	40S	35	67
218	IPPSN2020-218	IPPSN-21-06	23.3	100S*	3.2	10MS	2.5	10S	2.4	15S	35	78
219	IPPSN2020-219	IPPSN-21-07	19	40S	23.2	100S	2.5	10S	21.5	40S	35	46
220	IPPSN2020-220	IPPSN-21-08	11.2	20MS	9.6	30S	7.3	20S	65	80S	45	67
220A	INFECTOR		80	100S	80	100S	60	80S	72.5	80S	68	79
221	IPPSN2020-221	IPPSN-21-09	1.8	5S	1.6	10MR	2.6	10S	37.5	60S	35	46
222	IPPSN2020-222	IPPSN-21-10	17.8	80S*	7.2	20MS	11.3	40S	3.5	15S	36	57
223	IPPSN2020-223	IPPSN-21-11	17.1	80S*	2	20MR	2.5	10S	36.8	60S	35	47
224	IPPSN2020-224	IPPSN-21-12	20.1	60S	13.7	60S*	3.5	5S	34.8	60S	35	46
225	IPPSN2020-225	IPPSN-21-13	27.3	100S	3.2	10MS	0.5	5MR	6.9	20S	45	68
226	IPPSN2020-226	IPPSN-21-14	36.8	100S	4	20MS	1.3	10MR	2	15S	35	57
227	IPPSN2020-227	IPPSN-21-15	24.8	80S	12.1	40S	7.3	20S	5.5	20MS	35	47
228	IPPSN2020-228	IPPSN-21-16	41.2	80S	15.3	4S	13.3	40S	4.5	20S	45	57
229	IPPSN2020-229	IPPSN-21-17	7.3	20MS	12.9	40S	7.6	20S	34.4	60S	46	67
230	IPPSN2020-230	IPPSN-21-18	17.9	80S*	3.2	20MS	0.3	TS	29.5	40S	46	78
231	IPPSN2020-231	IPPSN-21-19	16.8	60S	9.8	40S	18.8	60S	21.3	60S	46	67
232	IPPSN2020-232	IPPSN-21-20	26.8	100S	25.2	60S	20	40S	51.3	60S	35	46
233	IPPSN2020-233	IPPSN-21-21	17.7	80S*	3.3	20MS	0.1	TMR	34	60S	35	57
234	IPPSN2020-234	IPPSN-21-22	18.5	60S	2.9	10S	2.3	5S	4	30S	46	78
235	IPPSN2020-235	IPPSN-21-23	29	80S	6.4	20S	4	10S	2.8	20S	46	67
236	IPPSN2020-236	IPPSN-21-24	9.7	40S	3.3	10MS	3.3	5S	2.5	15S	46	67
237	IPPSN2020-237	IPPSN-21-25	19.3	80S	6	10S	12.8	40S	46.3	60S	46	78
238	IPPSN2020-238	IPPSN-21-26	15.3	60S	8	20S	6.3	20S	52	80S	46	78
239	IPPSN2020-239	IPPSN-21-27	24	80S	10.4	20MS	18.5	60S	59.5	80S	46	57
240	IPPSN2020-240	IPPSN-21-28	28	80S	7.3	20S	7.5	10S	14.5	80S	35	68
240A	INFECTOR		80	100S	80	100S	60	80S	70	100S	67	79
241	IPPSN2020-241	IPPSN-21-29	20	40S	1	5S	2.5	10S	37	60S	45	57
242	IPPSN2020-242	IPPSN-21-30	16	40S	3	10S	7.7	20S	17	40S	35	46
CSA Kanpur												
243	IPPSN2020-243	KA 2001	11.2	20S	3.3	10MS	2.7	10S	13.3	60S	35	46
244	IPPSN2020-244	KA 2002	17.2	40S	35	100S	22.5	60S	54.3	80S	45	57
245	IPPSN2020-245	KA 2003	18	40S	11.6	30MS	15	40S	18.1	40S	36	58
246	IPPSN2020-246	KA 2004	2.9	10S	11.2	20S	8.3	20S	47.5	60S	46	68
247	IPPSN2020-247	KA 2005	1.9	5S	5.7	20S	1.4	5S	40.8	60S	35	47
248	IPPSN2020-248	KA 2006	2.3	10MR	20.8	80S	2.5	5S	42	60S	45	57
249	IPPSN2020-249	KA 2007	43.4	80S	28	80S	16.3	40S	50	60S	35	46
250	IPPSN2020-250	KA 2008	19.6	40S	5.2	10S	2.8	10S	28.3	60S	35	57
251	IPPSN2020-251	KA 2009	28	60S	5.7	20S	12.5	40S	49.5	60S	46	67
252	IPPSN2020-252	KA 2010	31.2	80S	12.2	20S	27.5	40S	29.5	60S	45	57
253	IPPSN2020-253	KA 2011	2.5	10MS	0.5	5MR	1.3	5S	30.5	60S	45	57
254	IPPSN2020-254	KA 2012	17.6	40S	12.2	40S	5	20S	44.5	60S	46	67
255	IPPSN2020-255	KA 2013	40	80S	17.2	30S	22.5	60S	50	80S	46	67
256	IPPSN2020-256	KA 2014	10.4	20S	21.1	100S*	1.3	5S	42.3	60S	35	57
257	IPPSN2020-257	KA 2015	16	20S	10	40MS	2.5	10S	32	60S	45	68
258	IPPSN2020-258	KA 2016	4.9	20S	5.4	15MS	7	20S	32.3	60S	45	67
259	IPPSN2020-259	KA 2017	4.9	20S	17.6	60S	13.5	40S	15.8	60S	45	56
260	IPPSN2020-260	KA 2018	13.8	40S	5.6	20S	7.5	20S	28.1	60S	56	78

No.	Entry code	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		Foliar blight	
			ACI	HS	ACI	HS	ACI	HS	ACI	HS	Avg.	HS
260A	INFECTOR		80	100S	84	100S	60	80S	72.5	100S	68	89
261	IPPSN2020-261	KA 2019	11.6	40S	5.8	20MS	11.5	40S	14.8	40S	45	67
262	IPPSN2020-262	KA 2020	20.8	40S	10.4	20S	10	40S	22	40S	46	89
263	IPPSN2020-263	KA 2021	8.5	40MS	17.7	80S*	12.5	40S	35	60S	35	45
264	IPPSN2020-264	KA 2022	15.6	20S	11.2	30S	7.7	20S	39.5	60S	35	46
265	IPPSN2020-265	KA 2023	26.4	80S	24	60S	11.3	20S	37	60S	45	57
266	IPPSN2020-266	KA 2024	15.2	60S	16.5	80S*	0.3	TS	15.3	40S	45	57
267	IPPSN2020-267	KA 2025	19.6	60S	24	80S	6.3	10S	13.3	20S	45	57
268	IPPSN2020-268	KA 2026	13.2	40S	3.3	20MS	1.3	5S	25	40S	56	89
269	IPPSN2020-269	KA 2027	6.9	40MS	4.9	20MS	2.5	5S	9.4	20S	56	68
270	IPPSN2020-270	KA 2028	21.2	60S	9.2	20S	0.4	TS	28.2	60S	35	57
271	IPPSN2020-271	KA 2029	26.5	80S	16.8	40S	4	10S	42.3	80S	45	56
272	IPPSN2020-272	KA 2030	0.1	TR	1.7	10MS	1.3	5S	11.3	20S	46	57
273	IPPSN2020-273	KA 2031	3.3	20MS	4.9	20S	1.3	5MS	18.5	40S	46	78
274	IPPSN2020-274	KA 2032	14.5	40S	9.6	20S	13.8	40S	34.5	60S	36	46
275	IPPSN2020-275	KA 2033	7.7	20S	19.3	80S	3.1	10S	36.6	60S	35	68
276	IPPSN2020-276	KA 2034	11.6	40MS	1.6	20MR	0.1	TR	33.1	60S	45	78
277	IPPSN2020-277	KA 2035	3.7	10S	4.2	10MS	5	20S	35.8	60S	46	78
278	IPPSN2020-278	KA 2036	6.5	20S	6	20S	4	10S	34.8	60S	35	57
279	IPPSN2020-279	KA 2037	16.1	40S	20	80S	8.8	20S	33.5	60S	35	36
280	IPPSN2020-280	KA 2038	4.8	20S	22.4	100S*	2.8	10S	36	60S	46	78
280A	INFECTOR		76	100S	84	100S	60	80S	70	100S	67	79
281	IPPSN2020-281	KA 2039	12.1	40S	15.2	60S*	0.4	TS	44	60S	35	46
282	IPPSN2020-282	KA 2040	8.6	40S	21	80S	1.5	5S	35.8	60S	35	35
283	IPPSN2020-283	KA 2041	23	80S	1.6	10MR	2.5	10S	29.5	40S	35	57
284	IPPSN2020-284	KA 2042	22.7	100S*	13	60S*	0	0	40.8	60S	35	46
285	IPPSN2020-285	KA 2043	20.9	100S*	18	80S	0	0	34.5	60S	35	46
286	IPPSN2020-286	KA 2044	28.6	80S	5.8	20S	0	0	24.3	60S	35	57
287	IPPSN2020-287	KA 2045	39.2	80S	14	40S	12.8	40S	38	60S	46	78
SHUATS, Prayagraj												
288	IPPSN2020-288	AAI-W43	20.4	60S	14.4	40S	12.5	40S	35.3	80S	46	57
289	IPPSN2020-289	AAI-W49	37.2	100S	27.2	100S	14.8	40S	14.1	40S	46	67
290	IPPSN2020-290	AAI-W52	16	40S	7.2	20S	0.3	TS	55	80S	45	67
291	IPPSN2020-291	AAI-W47	61.6	100S	16.8	40S	20	40S	57.5	80S	34	46
292	IPPSN2020-292	AAI-W42 (KSM)	49.2	80S	14.6	40S	7.5	30S	9.5	40S	34	57
BAU, Ranchi												
293	IPPSN2020-293	JKW 290	46	80S	25	40S	10	40S	42	60S	23	36
294	IPPSN2020-294	JKW 291	36	60S	13.6	40S	2.5	10S	42.5	60S	35	45
295	IPPSN2020-295	JKW 292	12.9	40S	8.8	20MS	6.3	20	37	60S	34	45
296	IPPSN2020-296	JKW 293	40.8	80S	10.4	20MS	1.3	5S	3.8	15S	35	57
297	IPPSN2020-297	JKW 294	43.2	80S	3	20MR	0.3	TS	33.8	60S	34	46
298	IPPSN2020-298	JKW 295	36	80S	3.6	10S	10.1	40S	10.8	40S	35	46
299	IPPSN2020-299	JKW 296	51.6	100S	3.6	20MS	0.5	TS	6.3	20S	35	36
300	IPPSN2020-300	JKW 297	4.9	20S	4	20MR	2.5	10S	16.8	40S	45	78
300A	INFECTOR		88	100S	84	100S	62.5	80S	65	80S	68	89
301	IPPSN2020-301	JKW 298	13.2	40S	6.8	20MS	2.5	10S	15.4	40S	46	78
302	IPPSN2020-302	JKW 299	21.2	60S	8	20S	2.5	10S	22.1	40S	34	57
SKUAST, Jammu												
303	IPPSN2020-303	JAUW 695	17.6	40S	15	40S	8.8	20S	3.9	15S	35	46
304	IPPSN2020-304	JAUW 696	26.4	60S	15.6	40S	11.3	40S	26.9	60S	35	46
305	IPPSN2020-305	JAUW 697	47.2	80S	17.6	20S	12.8	40S	8.4	20S	35	46
306	IPPSN2020-306	JAUW 698	26.4	60S	17.6	20S	13.3	40S	17.1	40S	36	57
307	IPPSN2020-307	JAUW 699	21.2	40S	20.8	40S	3.5	10MS	12.5	40S	34	45
308	IPPSN2020-308	JAUW 700	16.8	60S	7.6	20MS	5	10S	20.6	40S	35	46
309	IPPSN2020-309	JAUW 701	27.6	80S	14	40S	3.8	10S	6	20S	35	45
310	IPPSN2020-310	JAUW 702	13.2	40S	6.2	30MR	0.5	TS	6.7	10S	35	46

No.	Entry code	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		Foliar blight	
			ACI	HS	ACI	HS	ACI	HS	ACI	HS	Avg.	HS
311	IPPSN2020-311	JAUW 703	30	60S	5.6	20S	1.4	5S	5.3	20S	35	47
312	IPPSN2020-312	JAUW 704	14.8	40S	19.2	40S	14.5	40S	3.3	15S	35	46
BAU, Sabour												
313	IPPSN2020-313	BRW 3903	7.6	20S	17.2	40S	12.3	40S	33.1	60S	35	46
314	IPPSN2020-314	BRW 3904	26.1	80S	24	40S	23.5	40S	51.9	60S	35	46
315	IPPSN2020-315	BRW 3905	21.2	40S	13.6	20S	26.5	50S	37.5	60S	35	57
316	IPPSN2020-316	BRW 3906	48	100S	19.2	20S	35	60S	37.9	60S	35	45
317	IPPSN2020-317	BRW 3907	53	80S	29.2	40S	32.5	60S	48.9	60S	35	47
318	IPPSN2020-318	BRW 3908	16.8	40S	49.2	100S	31.3	60S	48.3	60S	35	56
319	IPPSN2020-319	BRW 3909	5.3	20MS	10.4	20MS	9.5	20S	38.5	60S	24	36
320	IPPSN2020-320	BRW 3910	4.1	20MS	4.2	20S	1	5MS	21.8	60S	34	45
320A	INFECTOR		80	100S	84	100S	62.5	80S	70	100S	67	79
321	IPPSN2020-321	BRW 3911	1.3	10MR	18.1	80S*	11.4	40S	30.7	60S	35	57
322	IPPSN2020-322	BRW 3912	10.4	20S	6.4	20S	0.5	5MR	25	60S	35	46
323	IPPSN2020-323	BRW 3913	4.9	20MS	5.3	20MS	7.5	20S	36	60S	35	36
324	IPPSN2020-324	BRW 3914	4.8	20S	8.1	40S	0	0	28.8	60S	34	36
325	IPPSN2020-325	BRW 3915	11.6	40MS	17.2	80S*	1.4	5S	30	60S	35	45
326	IPPSN2020-326	BRW 3916	44	60S	21.8	60S	17.5	40S	52.5	60S	23	34
327	IPPSN2020-327	BRW 3917	10.4	40S	27.6	80S	18.9	40S	46.3	60S	35	57
328	IPPSN2020-328	BRW 3918	34	60S	35.2	80S	27.8	60S	36.4	60S	34	46
329	IPPSN2020-329	BRW 3919	25.6	60S	13.6	40S	0.3	TS	37.3	60S	24	35
330	IPPSN2020-330	BRW 3920	42	80S	6.4	20MS	4.3	10S	40	60S	45	57
331	IPPSN2020-331	BRW 3921	12	40S	3.7	10S	2.5	10S	11.7	40S	35	67
332	IPPSN2020-332	BRW 3922	24.8	60S	6.4	20S	2	10MS	20	60S	35	57
333	IPPSN2020-333	BRW 3923	6	20S	1.6	20MR	1.3	5S	17.7	40S	35	58
334	IPPSN2020-334	BRW 3924	18	40S	8.4	20MS	0.3	TS	17.9	40S	35	46
335	IPPSN2020-335	BRW 3925	23.2	60S	20.8	60S	16.3	60S*	22.6	40S	45	57
336	IPPSN2020-336	BRW 3926	0.4	5MR	4	20MS	0	0	19.3	40S	35	56
337	IPPSN2020-337	BRW 3927	6.5	20MS	7.3	20S	1	5MS	31	40S	46	67
Lok Bharthi												
338	IPPSN2020-338	LOK 2020- 1	38.4	80S	20.2	40S	16	60S*	47.5	60S	46	68
339	IPPSN2020-339	LOK 2020- 2	14	40S	27.6	60S	3.5	10S	24.4	40S	46	67
340	IPPSN2020-340	LOK 2020- 3	3.7	10S	2	10MS	1.3	5S	52.5	80S	56	78
340A	INFECTOR		80	100S	80	100S	62.5	80S	70	80S	67	79
341	IPPSN2020-341	LOK 2020- 4	2.5	20MR	0.1	TR	1.3	5S	51.3	80S	56	78
342	IPPSN2020-342	LOK 2020- 5	1.7	20MR	0	TR	0.3	TS	20	40S	46	78
VPKAS, Almora												
343	IPPSN2020-343	VW2001	31.6	60S	5.2	20MS	1.4	5S	9.2	40S	46	67
344	IPPSN2020-344	VW2002	0.1	TR	0.5	5MR	0.3	TS	10.3	40S	46	47
345	IPPSN2020-345	VW2003	26	60S	9.4	20MS	3.3	10MS	14.8	30S	46	58
346	IPPSN2020-346	VW2004	10.2	40MS	8.9	30MS	6.7	20MS	11.1	40S	35	56
347	IPPSN2020-347	VW2005	25.6	60S	13.2	20S	22.3	60S	10.5	20S	35	47
348	IPPSN2020-348	VW2006	10.5	40S	4.2	10MS	2.5	5S	6.5	20S	45	67
349	IPPSN2020-349	VW2007	13.2	40S	17.6	80S*	2.5	10S	13.2	60S	45	78
350	IPPSN2020-350	VW2008	13.3	40S	3.2	20MR	3	10S	7.6	20S	36	57
351	IPPSN2020-351	VW2009	16	40S	0.6	5MR	1.3	5S	7.8	40S	35	57
352	IPPSN2020-352	VW2011	21	40S	5.2	20MS	0	0	7.5	40S	45	67
353	IPPSN2020-353	VW2012	13	60S*	0.5	5MR	5	20S	8.8	20S	45	67
354	IPPSN2020-354	VW2014	1.7	10MR	3.7	10S	1.4	5S	3.2	15S	35	56
355	IPPSN2020-355	VW2015	13.7	60S*	3.2	10MS	0	0	4.6	20S	35	47
356	IPPSN2020-356	VW2016	6.1	20S	8.4	20MS	3.8	10S	7.3	20S	35	46
357	IPPSN2020-357	VW2017	11	40S	5.7	20S	11.3	40S	7.2	20MS	35	35
358	IPPSN2020-358	VW2018	12.1	40S	22.4	80S	4.6	10S	4.5	20MS	35	46
359	IPPSN2020-359	VW2020	13.2	20S	4.8	20MS	2.5	10S	5.9	20MS	24	45
360	IPPSN2020-360	VW2021	9	40S	14	60S*	1.3	5S	4.3	20MS	35	45
360A	INFECTOR		84	100S	84	100S	62.5	80S	60	80S	67	79

No.	Entry code	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		Foliar blight	
			ACI	HS	ACI	HS	ACI	HS	ACI	HS	Avg.	HS
361	IPPSN2020-361	VW2022	12	40S	3.7	20MS	2.5	5S	3	15S	46	78
362	IPPSN2020-362	VW2023	0.1	TMR	2.2	10S	2.5	5S	7.9	20S	35	45
363	IPPSN2020-363	VW2024	19.8	40S	2.4	20MR	3.9	10S	3.5	15S	35	45
364	IPPSN2020-364	VW2025	4.9	20MS	0.5	5MR	0.3	TS	6.8	20S	45	78
365	IPPSN2020-365	VW2026	13.4	40MS	1.6	20MR	1.3	5S	7.6	30S	35	46
366	IPPSN2020-366	VW2027	6.8	20S	3.6	10S	2.5	10S	4.2	30S	24	35
367	IPPSN2020-367	VW2028	0.1	TR	7.3	20S	0.8	5MR	11.6	40S	35	45
368	IPPSN2020-368	VW2030	13	40S	1.8	10MS	5	20S	5.6	30S	35	46
369	IPPSN2020-369	VW2031	19.3	40S	0.2	TMR	1.3	5S	3	20S	35	57
370	IPPSN2020-370	VW2032	14.4	40MS	23.2	100S*	7.6	20S	4	20S	35	46
371	IPPSN2020-371	VW2033	3.3	20MS	4.8	20MS	5.3	20S	9.4	15S	45	57
372	IPPSN2020-372	VW2034	11.4	60MS	9.2	20S	8.9	30S	15.4	20S	45	57
373	IPPSN2020-373	VW2035	3.3	20MS	18.6	60S	17.6	40S	15.1	40S	35	57
374	IPPSN2020-374	VW2036	13.4	40S	3.3	20MS	7.5	20S	5.9	30S	45	68
375	IPPSN2020-375	VW2038	4.8	20MS	1.6	10MS	1.8	5S	3.8	20S	35	46
376	IPPSN2020-376	VW2040	2.1	10MS	8.1	40S	2.8	10S	21.8	60S	45	78
377	IPPSN2020-377	VW2041	8	20MS	8.8	20S	5	20S	4.6	10S	46	78
378	IPPSN2020-378	VW2042	3.2	10MS	7.2	20S	0.3	TS	13.9	40S	35	57
379	IPPSN2020-379	VW2043	22.6	80S	4	20MS	1.3	5S	7.9	20S	35	57
380	IPPSN2020-380	VW2045	4.1	20MS	2.4	10MS	2.5	10S	4.4	20S	35	57
380A	INFECTOR		76	100S	92	100S	62.5	80S	65	80S	68	79
381	IPPSN2020-381	VW2046	14.4	60MR	1.6	10MR	0.3	TS	5.1	30S	35	57
382	IPPSN2020-382	VW2048	29.2	80S	12.9	40S	3	10S	5.7	20S	35	57
383	IPPSN2020-383	VW2050	9	20S	4.2	20S	1.4	5S	13.4	40S	46	78
384	IPPSN2020-384	VW2051	20	40S	45.2	100S	22.5	40S	19.3	60S	45	57
385	IPPSN2020-385	VW2052	19.4	40S	12.8	40S	2.8	10S	6.6	40S	46	78
386	IPPSN2020-386	VW2053	24.2	60S	1.5	5S	0.3	TS	3.1	20S	46	57
387	IPPSN2020-387	VW2039	6.6	20MS	0	TR	8	20S	8.3	20S	45	78
388	IPPSN2020-388	VW2029	31.2	60S	1.6	20MR	1.3	5S	4.6	20S	35	46
389	IPPSN2020-389	VW2037	8.9	40S	21	100S*	2.3	5MS	4.3	20S	45	78
390	IPPSN2020-390	VW2010	32	80S	7.6	20S	5.8	10S	4	20S	45	46
391	IPPSN2020-391	VW2047	1.6	10MR	5.3	20MS	3.8	10S	7.5	20S	46	67
392	IPPSN2020-392	VW2013	2.5	10MS	24	80S	16.8	40S	11.6	60S	46	56
ARS Niphad												
393	IPPSN2020-393	NIAW 4053	3.3	20MS	5.2	10S	10	20S	50.6	80S	56	78
394	IPPSN2020-394	NIAW 4054	1.6	10MS	4.1	20MS	0	0	65	80S	67	78
395	IPPSN2020-395	NIAW 4052	4.9	20MS	0.9	5MS	2.5	10S	62.9	80S	56	78
396	IPPSN2020-396	NIAW 4113	4.1	20MR	0	TR	0.3	TS	57.5	80S	46	57
397	IPPSN2020-397	NIAW 4130	1.7	10MR	0.2	TMS	2.3	5S	57.5	60S	56	78
398	IPPSN2020-398	NIAW 4165	5.1	20MS	2.5	10MS	3.5	10S	62.5	80S	46	78
399	IPPSN2020-399	NIAW 4118	3.2	10MS	1.5	5S	1	5MS	57.5	80S	56	78
400	IPPSN2020-400	NIAW 4190	0.1	TMR	0.1	TR	2.5	10S	47.5	60S	46	68
400A	INFECTOR		80	100S	84	100S	62.5	80S	72.5	100S	67	89
401	IPPSN2020-401	NIAW 4172	1.7	10MR	1.7	10MS	0.3	TS	57.5	80S	57	78
402	IPPSN2020-402	NIAW 4178	1.7	20MR	0.5	5MR	0.3	TS	65	80S	46	67
403	IPPSN2020-403	NIAW 4197	0.9	10MR	0.1	TR	0	0	26.9	60S	46	78
404	IPPSN2020-404	NIAW 4179	2.5	20MR	2.2	10S	0.3	TS	57.5	80S	46	67
405	IPPSN2020-405	NIAW 4120	1.7	20MR	1	5MS	0	0	56.3	80S	56	68
406	IPPSN2020-406	NIAW 4114	3.3	10MS	3.3	20MS	0	0	54.5	80S	46	67
407	IPPSN2020-407	NIAW 4153	0.9	10MR	3.3	10MS	1	5MS	48.8	60S	46	58
408	IPPSN2020-408	NIAW 4040	3.3	20MS	3.4	20MS	2.5	5S	37.3	60S	35	57
409	IPPSN2020-409	NIAW 4174	2	10MR	0	TR	2.5	10S	52	80S	55	78
410	IPPSN2020-410	NIAW 4183	2.4	10MR	1.9	5S	1.3	5MS	57.5	80S	45	67
411	IPPSN2020-411	NIAW 4134	2.5	20MR	0.8	5MS	1.3	5MS	46.3	80S	56	78
412	IPPSN2020-412	NIAW 4154	1.7	10MR	2.2	5S	0.5	TS	44.5	60S	46	78
413	IPPSN2020-413	NIDW 1467	26.2	60S	9.1	40S	1.5	5MS	5.7	40S	45	57

No.	Entry code	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		Foliar blight	
			ACI	HS	ACI	HS	ACI	HS	ACI	HS	Avg.	HS
414	IPPSN2020-414	NIDW 1485	13.7	40S	4.9	20MS	1	5MS	2.3	10MS	45	67
415	IPPSN2020-415	NIDW 1476	19.3	40S	6.4	20S	2.1	10MS	2.9	10MS	45	57
416	IPPSN2020-416	NIDW 1491	36	80S	16.1	40S	7.5	30S	1	5MS	45	78
417	IPPSN2020-417	NIDW 1455	14.2	40S	28.8	100S	2.7	10S	2.9	10S	45	78
HPKV Malan												
418	IPPSN2020-418	PW 2001	2.5	10MS	32.8	100S	5	20S	9.4	40S	35	46
419	IPPSN2020-419	PW 2002	0.1	TR	3.3	20MS	5.5	20S	5.6	20MS	24	36
420	IPPSN2020-420	PW 2003	8.8	40MS	0.2	TMR	1.3	5S	10.3	40S	45	57
420A	INFECTOR		80	100S	88	100S	62.5	80S	67.5	80S	67	79
421	IPPSN2020-421	PW 2004	2.1	10MS	2.1	10S	0	0	14	40S	46	67
422	IPPSN2020-422	PW 2005	10.4	40MS	13.6	60S*	1.3	5S	20	40S	46	57
423	IPPSN2020-423	PW 2006	4.9	20MS	4	20S	0	0	4.2	15S	46	57
424	IPPSN2020-424	PW 2007	8	20S	9.6	40S	0.3	TS	7.3	15S	35	57
425	IPPSN2020-425	PW 2008	4.1	20MS	16	60S	10.3	40S	11.9	40MS	46	58
426	IPPSN2020-426	PW 2009	12.2	40MS	24	80S	11.3	40S	23.4	60S	34	45
427	IPPSN2020-427	PW 2010	29.2	60S	24.8	100S	0	0	11.3	40S	35	46
428	IPPSN2020-428	PW 2011	28	80S	12.5	60S*	0.3	TS	7.4	20S	24	36
429	IPPSN2020-429	PW 2012	24.8	60S	5	20MS	2.5	10S	5.3	20S	35	57
430	IPPSN2020-430	PW 2013	44	80S	6.8	20S	1.3	5S	4.8	20S	35	45
431	IPPSN2020-431	PW 2014	18.4	40S	11.6	40S	15.1	40S	7.4	20S	35	57
432	IPPSN2020-432	PW 2015	9.3	20S	5.6	20S	2.5	10S	16.1	60S	35	46
433	IPPSN2020-433	PW 2016	12.6	40S	4.1	10S	20	40S	32	60S	23	24
434	IPPSN2020-434	PW 2017	12.8	40S	12.8	40S	1.4	5S	7.4	20S	34	35
435	IPPSN2020-435	PW 2018	3	10S	22.1	100S*	10	40S	13.8	40S	35	46
436	IPPSN2020-436	PW 2019	22.8	60S	22.4	80S	5.4	20S	14.3	40S	45	57
437	IPPSN2020-437	DW 271	11.2	40S	8	20S	20.1	40S	3	20S	35	57
438	IPPSN2020-438	DW 272	0.2	TMR	0.1	TR	1.3	5S	4.9	20S	34	57
439	IPPSN2020-439	DW 273	2.4	10S	1	5S	2.5	10S	4.4	15S	35	58
440	IPPSN2020-440	DW 276	13.7	60S*	10.4	20S	3	10S	3.3	15S	35	56
440A	INFECTOR		76	100S	92	100S	62.5	80S	67.5	80S	68	79
441	IPPSN2020-441	DW 277	12	40MS	9.6	20MS	5.5	10S	32	60S	45	56
442	IPPSN2020-442	DW 278	13.8	40S	4.9	20MS	1.3	5S	12.9	40S	45	57
443	IPPSN2020-443	BW 282	16.5	40S	7	20MS	7	20S	8.8	30S	45	45
444	IPPSN2020-444	BW 283	14.7	20MS	26	60S	10	20S	12.5	40S	34	56
445	IPPSN2020-445	BW 287	10	20MS	0.1	TR	7.5	20S	8.6	20S	45	57
446	IPPSN2020-446	BW 288	1.1	10MR	0.1	TR	0.2	TMS	19.1	40S	35	46
447	IPPSN2020-447	BW 289	4.9	20MS	8.1	40S	3	10S	13.4	30S	46	68
IGKV, Bilaspur												
448	IPPSN2020-448	CG2001	10	40MS	8.9	40S	12.5	40S	29.3	60S	56	78
449	IPPSN2020-449	CG2002	15.8	60S*	10.4	20S	12.7	40S	31.3	60S	46	78
450	IPPSN2020-450	CG2003	15.8	60S*	12	40S	13.8	40S	29.8	60S	46	57
451	IPPSN2020-451	CG2004	9.1	40MS	8.4	20S	11.3	40S	32.5	60S	46	68
452	IPPSN2020-452	CG2005	20.2	40S	21.1	100S*	6.3	20S	31	60S	35	57
453	IPPSN2020-453	CG2006	44.4	80S	25.2	100S	10	40S	52	60S	35	46
454	IPPSN2020-454	CG2007	4.6	10S	13	40S	2.5	10S	45.8	60S	35	46
455	IPPSN2020-455	CG2008	3.2	20MS	0.1	TR	0.3	TS	43.8	60S	45	78
456	IPPSN2020-456	CG2009	1.7	10MS	0.1	TR	1.3	5S	50	60S	46	78
457	IPPSN2020-457	CG2010	10.9	40S	4.2	20S	2.8	10S	50	60S	35	68
458	IPPSN2020-458	CG2011	4.3	20MS	8.5	40S	2.5	10S	46.3	80S	45	67
459	IPPSN2020-459	CG2012	10.9	30S	14.5	60S	10.3	40S	47.5	60S	46	78
460	IPPSN2020-460	CG2013	12.6	40S	0.1	TMR	10	40S	20.8	40S	46	68
460A	INFECTOR		80	100S	88	100S	62.5	80S	67.5	80S	67	79
461	IPPSN2020-461	CG2014	4.9	20MS	6.4	20MS	2.5	10S	9.6	40S	35	68
462	IPPSN2020-462	CG2015	12.8	40S	7.2	20S	1.3	5S	8.4	20S	46	57
UAS, Dharwad												
463	IPPSN2020-463	UASD-2001	36	80S	13	40S	0	0	21.1	40S	45	47

No.	Entry code	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		Foliar blight	
			ACI	HS	ACI	HS	ACI	HS	ACI	HS	Avg.	HS
464	IPPSN2020-464	UASD-2002	42	80S	10.1	20S	1.3	5S	16	40S	35	46
465	IPPSN2020-465	UASD-2003	42	80S	11.8	20S	3.8	10S	23.3	40S	34	57
466	IPPSN2020-466	UASD-2004	38.4	80S	13.6	40S	0.3	TS	36.3	60S	24	35
467	IPPSN2020-467	UASD-2005	27.2	80S	5	20MS	1.3	5S	40	60S	35	46
468	IPPSN2020-468	UASD-2006	11.4	40MS	0.1	TR	6.3	20S	10.5	20S	46	67
469	IPPSN2020-469	UASD-2007	11.4	40MS	4.1	20S	3	10S	9.9	40S	35	57
470	IPPSN2020-470	UASD-2008	28.1	60S	15.2	60S*	1.3	5MS	15.4	40S	45	68
471	IPPSN2020-471	UASD-2009	20.4	60S	4.8	20MS	2.5	10S	13.3	40S	46	78
472	IPPSN2020-472	UASD-2010	17.6	80S*	1.7	10MS	1.8	5S	0.6	5S	56	78
473	IPPSN2020-473	UASD-2011	20.8	100S*	1.1	5S	4.5	10S	2.6	15S	46	78
474	IPPSN2020-474	UASD-2012	22.4	100S*	1.7	10MR	3	10S	3.6	15S	35	67
475	IPPSN2020-475	UASD-2013	23.3	100S	1.7	10MS	6.5	20S	9.4	40S	35	58
476	IPPSN2020-476	UASD-2014	21.7	100S*	4.9	20MS	8.5	20S	0.1	TS	45	57
477	IPPSN2020-477	UASD-2015	17.7	80S*	0.9	5MS	2.6	5S	1.3	5S	35	57
478	IPPSN2020-478	UASD-2016	23.3	100S	0.1	TR	1.3	5S	3.6	10S	35	67
479	IPPSN2020-479	UASD-2017	18.4	80S*	3.3	20MS	3.8	10MS	3.3	15S	45	78
480	IPPSN2020-480	UASD-2018	18.4	80S*	3.3	20MS	5.5	10S	2.5	15S	45	78
480A	INFECTOR		88	100S	84	100S	62.5	80S	62.5	80S	68	89
481	IPPSN2020-481	UASD-2019	8	40MS	3.7	20MS	1.8	5S	21.6	60S	45	67
482	IPPSN2020-482	UASD-2020	2.4	10S	3.7	10S	0.8	5MR	2.6	10S	46	78
483	IPPSN2020-483	UASD-2021	9	40S	2.5	10MS	1.2	5MS	6.3	20S	35	46
484	IPPSN2020-484	UASD-2022	2.5	10MS	0.3	5R	2.6	10S	29	40S	35	67
485	IPPSN2020-485	UASD-2023	10.8	40S	2.1	10S	3.8	10S	7	20S	45	57
486	IPPSN2020-486	UASD-2024	9.4	40MS	7.6	20MS	3.8	5S	11.8	30S	35	46
487	IPPSN2020-487	UASD-2025	9.4	40MS	6.4	20MS	2.5	5S	13.5	40S	46	68
488	IPPSN2020-488	UASD-2026	10.8	40MS	23.6	80S	2.5	10S	12.6	40S	35	57
489	IPPSN2020-489	UASD-2027	6.4	20S	1.6	5MS	2.5	10S	5.8	20MS	46	78
490	IPPSN2020-490	UASD-2028	9.6	20S	5.7	20S	10.1	20S	3.7	15S	45	78
491	IPPSN2020-491	UASD-2029	16.2	40S	4.9	20S	1.3	5S	11	40S	35	57
492	IPPSN2020-492	UASD-2030	22.8	60S	2.1	10S	2.5	10S	2	10S	35	46
493	IPPSN2020-493	UASD-2031	14	40S	0.2	TMS	5	20S	3.8	10S	34	35
494	IPPSN2020-494	UASD-2032	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
495	IPPSN2020-495	UASD-2033	9.6	40MR	4.4	10MS	1.8	5S	7.3	40S	46	68
496	IPPSN2020-496	UASD-2034	2	20MR	0.1	TR	0	0	19.8	40S	35	57
497	IPPSN2020-497	UASD-2035	1.7	10MS	0.1	TR	1.3	5S	14.6	60S	35	47
Parbhani												
498	IPPSN2020-498	PBN 4881	8.8	20MS	22.6	80S	17.5	60S	21.9	40S	46	67
499	IPPSN2020-499	PBN 4357	15	60S	25.6	100S	17.8	60S	27.9	40S	45	67
500	IPPSN2020-500	PBN 4905	7.8	20S	20.1	80S	11.5	40S	27.6	40S	56	68
500A	INFECTOR		76	100S	88	100S	62.5	80S	65	80S	67	79
501	IPPSN2020-501	PBN 4888	12.8	20S	17.6	60S	27.5	60S	23.6	60S	46	78
502	IPPSN2020-502	PBN 4876-2	18.4	40S	21.6	60S	13.5	40S	25.8	40S	56	68
JNKVV, Jabalpur												
503	IPPSN2020-503	MP 3553	12	40MS	25.6	40S	20	60S	34.4	80S	46	78
504	IPPSN2020-504	MP 3554	7.3	20S	24.5	80S	7.6	20S	8.6	30S	46	68
505	IPPSN2020-505	MP 3555	30	80S	20.4	60S	12.5	40S	35.1	80S	46	78
506	IPPSN2020-506	MP 3556	12.6	40S	3.3	20MR	3.8	10S	10.4	60S	45	67
507	IPPSN2020-507	MP 3557	6.4	40MR	5.2	10S	1.3	5S	20.5	60S	45	67
508	IPPSN2020-508	MP 3558	4.1	40MR	2	10S	0.8	5MR	37.3	60S	45	57
509	IPPSN2020-509	MP 3559	4.5	20S	0	TR	0.3	TS	33.8	60S	46	78
510	IPPSN2020-510	MP 3560	22.6	40S	5.6	20MS	2.5	10S	43.8	60S	56	78
511	IPPSN2020-511	MP 3561	19	40S	12.8	60S*	0	0	32.3	60S	46	78
512	IPPSN2020-512	MP 3562	16.8	40S	7.6	20MS	6.8	20S	7.7	20S	45	57
513	IPPSN2020-513	MP 3563	13.7	60S*	24.8	100S	8	20S	16.5	40S	45	68
514	IPPSN2020-514	MP 3564	1.6	5MS	8	40S	1.3	5S	6.2	20S	45	68
515	IPPSN2020-515	MP 3565	18	60S	8	20S	3.8	10S	45.6	60S	45	57

No.	Entry code	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		Foliar blight	
			ACI	HS	ACI	HS	ACI	HS	ACI	HS	Avg.	HS
516	IPPSN2020-516	MP 3566	4.8	20MS	24.8	100S	6	20S	28.3	60S	46	58
517	IPPSN2020-517	MP 3567	3.6	10S	4.8	20S	2.5	5S	22.3	60S	45	68
ANDUAT, Ayodhya												
518	IPPSN2020-518	NW-8028	5.1	20S	0.8	10MR	2.7	5S	8.5	20S	45	67
519	IPPSN2020-519	NW-8029	11	40S	1.7	10MS	0	0	18.1	40S	35	57
520	IPPSN2020-520	NW-8030	16	40S	22.6	100S*	15	60S	32	60S	45	78
520A	INFECTOR		76	100S	92	100S	62.5	80S	67.5	80S	67	79
521	IPPSN2020-521	NW-8031	7.4	20S	8.2	20S	5	20S	22.8	60S	24	36
522	IPPSN2020-522	NW-8032	9	40MS	11.6	40S	5.1	10S	10.9	40S	35	57
523	IPPSN2020-523	NW-8033	14	40S	8.8	20MS	1.5	5S	28.9	60S	45	57
524	IPPSN2020-524	NW-8034	1.8	5S	6	20S	0.3	TS	8.2	20S	35	46
525	IPPSN2020-525	NW-8035	8.9	20S	8.4	30MS	1.4	5S	3.6	15S	36	47
526	IPPSN2020-526	NW-8036	3.3	10MS	4.9	20S	2.5	10S	8.3	20MS	35	45
527	IPPSN2020-527	NW-8037	1.7	10MS	0.9	10MR	0	0	11.9	20S	35	36
528	IPPSN2020-528	NW-8038	20	60S	4.4	20MS	6.3	20S	19.6	40S	24	46
529	IPPSN2020-529	NW-8039	27.6	60S	28.4	100S	2.8	10S	25.4	40S	45	68
530	IPPSN2020-530	NW-8040	11.2	40S	19.3	80S*	2.8	10S	16.8	40S	45	57
531	IPPSN2020-531	NW-8041	31.8	80S	36.8	80S	33.8	60S	37.5	60S	46	68
532	IPPSN2020-532	NW-8042	21.6	40S	21.4	80S	13	40S	40	60S	45	57
533	IPPSN2020-533	NW-8043	3.3	20MS	0.8	5MS	0	0	20.1	40S	35	45
534	IPPSN2020-534	NW-8044	20.4	80S	20	80S	2.5	10S	5.4	20MS	45	67
535	IPPSN2020-535	NW-8045	10.4	40MS	0.1	TMR	3.8	10S	19.3	40S	46	67
536	IPPSN2020-536	NW-8046	20.4	60S	8	20S	2.6	5S	9.6	20S	35	56
537	IPPSN2020-537	NW-8047	5.2	20MS	18.5	80S	0.3	TS	32.5	60S	35	46
538	IPPSN2020-538	NW-8048	0	TR	0.9	10MR	0	0	12.9	40S	24	36
539	IPPSN2020-539	NW-8049	19.6	40S	12.1	60S*	0.2	TMS	7.4	20MS	35	46
540	IPPSN2020-540	NW-8050	20.1	60S	12.2	60S*	10	40S	33.8	60S	35	46
540A	INFECTOR		80	100S	92	100S	62.5	80S	62.5	80S	67	79
541	IPPSN2020-541	NW-8051	11.6	40S	12.5	40S	14.8	40S	26.4	60S	45	57
542	IPPSN2020-542	NW-8052	4.9	20MS	20.5	80S	17.8	60S	33.3	40S	46	58
CSSRI, Karnal												
543	IPPSN2020-543	KRL 2002	6.5	20MS	4.9	20S	5.5	10S	10.6	20S	35	57
544	IPPSN2020-544	KRL 2003	15.6	40S	0.1	TR	2.5	10S	4.1	15S	35	46
545	IPPSN2020-545	KRL 2004	5.6	20MS	3.2	10MS	2.5	5S	7.9	10S	35	46
546	IPPSN2020-546	KRL 2005	8.8	60MR	0.1	TR	0.3	TS	5.6	20S	25	36
547	IPPSN2020-547	KRL 2007	5	20MS	3.2	10MS	3.7	10S	4.7	10MS	35	37
548	IPPSN2020-548	KRL 2008	21.2	60S	24	80S	6.4	20S	3.9	10S	35	57
549	IPPSN2020-549	KRL 2009	17.2	40S	17.6	80S*	5	20S	1.6	10S	46	68
550	IPPSN2020-550	KRL 2010	23.6	80S	1.7	10MS	3.5	10S	2	10S	35	57
551	IPPSN2020-551	KRL 2011	13.2	40S	8.1	40S	1.3	5S	4.6	20S	35	58
552	IPPSN2020-552	KRL 2014	28.8	60S	16.1	80S*	3	10S	4	15S	35	46
553	IPPSN2020-553	KRL 2015	19.2	60S	16	80S*	0	0	4.3	15S	35	57
554	IPPSN2020-554	KRL 2016	5.8	20MS	5.3	10S	1.9	5S	2.8	10S	45	68
555	IPPSN2020-555	KRL 2019	23	60S	12.1	60S*	10.8	40S	24.5	40S	34	46
556	IPPSN2020-556	KRL 2020	13	40MS	2.4	10S	0	0	9.6	20S	46	57
557	IPPSN2020-557	KRL 2023	26	60S	4.5	15MS	3.5	10S	40.8	80S	56	68
558	IPPSN2020-558	KRL 2024	8.5	40MS	0.1	TR	1.3	5S	28.3	40S	35	37
559	IPPSN2020-559	KRL 2026	18.4	60S	4	10MS	5	10S	19.5	60S	34	46
560	IPPSN2020-560	KRL 2027	20	60S	0.2	TMR	5.1	10S	19.9	60S	35	47
560A	INFECTOR		80	100S	88	100S	62.5	80S	65	80S	67	79
561	IPPSN2020-561	KRL 2030	4.2	30S	16.8	60S	3.8	10S	20.7	40S	46	67
562	IPPSN2020-562	KRL 2033	6.6	20S	3.6	10MS	1.4	5S	4.2	15S	24	36
563	IPPSN2020-563	KRL 2034	3.2	10MS	21.2	80S	5.3	20S	5.6	15S	35	46
564	IPPSN2020-564	KRL 2035	13.6	40S	21.6	80S	1.3	5S	20.9	40S	45	57
565	IPPSN2020-565	KRL 2036	25.4	60S	25.2	80S	17.5	20S	7.6	20S	35	58
566	IPPSN2020-566	KRL 2037	14.4	40MS	7.3	20MS	7.5	20S	2.2	20MS	35	46

No.	Entry code	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		Foliar blight	
			ACI	HS	ACI	HS	ACI	HS	ACI	HS	Avg.	HS
567	IPPSN2020-567	KRL 2038	19	40S	13.6	60S*	2.5	10S	3.4	15S	36	46
11th HYPT												
568	IPPSN2020-568	11th HPYT 402	16	40S	4.8	15MS	6.3	20S	5.7	20S	45	57
569	IPPSN2020-569	11th HPYT 403	8.8	40MS	2.2	10S	0.3	TS	18.5	40S	46	68
570	IPPSN2020-570	11th HPYT 404	15	40S	19.2	60S	21	60S	10.6	20S	35	46
571	IPPSN2020-571	11th HPYT 405	13.6	40S	0.1	TR	0	0	11	20S	46	67
572	IPPSN2020-572	11th HPYT 406	5.4	20MS	7.6	20S	5.5	10S	16.3	40S	46	67
573	IPPSN2020-573	11th HPYT 407	13.2	40S	0.4	5MR	1.8	5S	5.4	20S	45	67
574	IPPSN2020-574	11th HPYT 408	11.2	40MS	0.1	TR	5	20S	7.8	60S*	46	57
575	IPPSN2020-575	11th HPYT 409	21.6	60S	2.2	10S	15	30S	7.5	30S	35	46
576	IPPSN2020-576	11th HPYT 410	14.6	40S	9.6	20S	2.5	10S	13.4	40S	46	57
577	IPPSN2020-577	11th HPYT 411	19.6	60S	7.6	20S	10	40S	23.1	40S	35	57
578	IPPSN2020-578	11th HPYT 412	11.2	40MS	8.8	20S	11.3	40S	11	30S	45	57
579	IPPSN2020-579	11th HPYT 413	23.8	60S	2.4	20MR	2.5	10S	10.7	20S	46	68
580	IPPSN2020-580	11th HPYT 414	37.6	80S	4.1	15MS	2.5	10S	9.1	20S	35	57
580A	INFECTOR		80	100S	88	100S	52.5	80S	65	80S	67	79
581	IPPSN2020-581	11th HPYT 415	13.4	40MS	3.3	20MR	0	0	4.3	15S	35	57
582	IPPSN2020-582	11th HPYT 416	13.6	40S	9.2	20S	2.5	5S	16.5	40S	45	57
583	IPPSN2020-583	11th HPYT 417	6.6	10S	1.8	10MS	0	0	11.3	20S	35	57
584	IPPSN2020-584	11th HPYT 418	10	40MS	4	10MS	0	0	15.7	40S	45	67
585	IPPSN2020-585	11th HPYT 419	11.2	40MS	8.8	20MS	1	5MS	7.9	20MS	35	57
586	IPPSN2020-586	11th HPYT 420	17.6	40S	16.2	60S*	14.8	40S	21.1	40S	35	46
587	IPPSN2020-587	11th HPYT 421	6.8	20MS	3.2	20MS	2.5	10S	14.9	40S	46	67
588	IPPSN2020-588	11th HPYT 422	14.2	40S	3.1	10S	10	20S	13.1	20S	35	56
589	IPPSN2020-589	11th HPYT 423	11.2	20S	1.6	20MR	0.8	5MR	20.1	40S	46	78
590	IPPSN2020-590	11th HPYT 424	18.4	40MS	5.6	20MS	0.3	TS	8.9	20S	35	36
591	IPPSN2020-591	11th HPYT 425	11	40MS	4	10MS	1.3	5S	21.8	60S	46	57
592	IPPSN2020-592	11th HPYT 426	25.6	60S	8	20S	7.5	20S	5.3	15S	45	57
593	IPPSN2020-593	11th HPYT 427	16.4	40S	10	40S	11.3	40S	8.5	30S	46	58
594	IPPSN2020-594	11th HPYT 428	29.6	60S	3.3	20MS	5	10S	23.9	40S	35	45
595	IPPSN2020-595	11th HPYT 429	24.6	60S	1.7	20MR	2.8	10S	24.4	60S	35	46
596	IPPSN2020-596	11th HPYT 430	19.2	40S	1.2	5MS	2.6	10S	23.6	60S	45	57
597	IPPSN2020-597	11th HPYT 431	13.6	40S	7.6	15MS	3.8	10S	14.9	40S	35	57
598	IPPSN2020-598	11th HPYT 432	23.2	60S	23.2	40S	12.5	40S	14.9	40S	45	56
599	IPPSN2020-599	11th HPYT 433	15.6	60S	18.8	60S	4.8	10S	8.1	30S	35	57
600	IPPSN2020-600	11th HPYT 434	16.8	60S	8.1	20S	0.3	TS	8.6	20S	45	67
600A	INFECTOR		80	100S	88	100S	62.5	80S	67.5	80S	67	79
601	IPPSN2020-601	11th HPYT 435	7.5	40MS	2.4	20MR	0	0	4.9	20S	45	57
602	IPPSN2020-602	11th HPYT 436	5.3	20MS	0.1	TMR	0.5	TS	15.9	40S	56	67
603	IPPSN2020-603	11th HPYT 437	10	40MS	1.7	20MR	0.3	TS	9.6	20S	24	36
604	IPPSN2020-604	11th HPYT 438	2.1	10S	0.1	TR	0	0	9.7	20S	45	67
605	IPPSN2020-605	11th HPYT 439	29.6	60S	9.6	40S	7.5	20S	15.3	40S	35	46
606	IPPSN2020-606	11th HPYT 440	42	80S	18.5	60S	3.9	10S	30.8	60S	24	36
607	IPPSN2020-607	11th HPYT 441	22	60S	6.8	20S	5	10S	7	30S	35	56
608	IPPSN2020-608	11th HPYT 442	28.8	60S	12.6	40S	2.8	10S	9.4	20S	35	57
609	IPPSN2020-609	11th HPYT 443	24	60S	8	20S	5	10S	5.5	20S	56	67
610	IPPSN2020-610	11th HPYT 444	32	60S	8.4	20MS	4.3	10S	3.5	20S	35	57
611	IPPSN2020-611	11th HPYT 445	14.6	40S	15.2	60S*	1.5	5S	11	40S	35	57
612	IPPSN2020-612	11th HPYT 446	14.6	40S	2	10S	0.3	TS	10	20S	35	68
613	IPPSN2020-613	11th HPYT 447	23.2	60S	16.4	60S	8.8	20S	13.8	20S	35	46
614	IPPSN2020-614	11th HPYT 448	17.6	60S	5.6	20MS	7.5	30S	12.8	60S	35	57
615	IPPSN2020-615	11th HPYT 449	7.2	20MS	4	10S	2.5	10S	15	60S	35	57
616	IPPSN2020-616	11th HPYT 450	13.6	40S	10.6	20MS	12.3	40S	16.6	40S	35	58
ARI, Pune												
617	IPPSN2020-617	MACS 6797	13.7	60S*	3.3	20MS	2.5	10S	10.9	30S	46	68
618	IPPSN2020-618	MACS 6798	16.9	80S*	1.7	5MS	1	5MS	10.7	30S	46	57

No.	Entry code	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		Foliar blight	
			ACI	HS	ACI	HS	ACI	HS	ACI	HS	Avg.	HS
619	IPPSN2020-619	MACS 6799	27.2	80S	8.1	40S*	2.5	10S	12.3	60S	34	46
620	IPPSN2020-620	MACS 6800	23	80S	26.4	60S	20.3	40S	38.3	60S	46	57
620A	INFECTOR		72	100S	88	100S	62.5	80S	67.5	80S	68	79
621	IPPSN2020-621	MACS 6801	12	40S	5.6	20S	0	0	28.9	60S	46	67
622	IPPSN2020-622	MACS 6802	4.2	40MR	4.2	20MS	1.3	5S	15	40S	46	78
623	IPPSN2020-623	MACS 6803	3.4	20MR	3.2	20MS	1.3	5S	17.1	40S	56	78
624	IPPSN2020-624	MACS 6804	4.1	40MR	4.8	20MS	2.5	10S	14.9	40S	46	67
625	IPPSN2020-625	MACS 6805	5	20MS	3.2	20MS	2.5	10S	12.8	40S	46	78
626	IPPSN2020-626	MACS 6806	8	20MS	2.7	10MS	6.3	20S	15.5	40S	56	78
627	IPPSN2020-627	MACS 6807	1.8	10MS	1.4	5MS	3.8	10S	16.8	40S	56	78
628	IPPSN2020-628	MACS 6808	3.3	10MS	1.7	20MR	2.5	10S	31.3	60S	45	78
629	IPPSN2020-629	MACS 6809	8.1	40MS	0.1	TR	0	0	32	60S	57	78
630	IPPSN2020-630	MACS 6810	22.2	60S	7.6	20S	2.5	10S	12.3	30S	46	78
631	IPPSN2020-631	MACS 6811	18.2	40S	7.2	20MS	1.3	5S	15.3	40S	35	57
632	IPPSN2020-632	MACS 6812	30.8	60S	2.7	10MS	3.8	10S	9.4	20S	35	67
633	IPPSN2020-633	MACS 6813	19.6	60S	7.6	20S	5	10S	12.8	30S	45	57
634	IPPSN2020-634	MACS 6814	7.2	20MS	5.6	20S	5.3	20S	16	40S	35	68
635	IPPSN2020-635	MACS 6815	4.2	20MS	3.2	20MS	0	5S	41.9	80S	45	78
636	IPPSN2020-636	MACS 6816	4.1	20MS	1.7	10MS	0.3	TS	35.8	60S	45	78
637	IPPSN2020-637	MACS 6817	0.9	10MR	4	10MS	2.5	5S	25.9	60S	46	68
638	IPPSN2020-638	MACS 6818	3.3	20MS	2.1	20MR	1.3	5S	39.5	80S	56	68
639	IPPSN2020-639	MACS 6819	7.4	40MS	0.9	10MR	2.5	10S	14.9	40S	45	57
640	IPPSN2020-640	MACS 6820	18	60S	12	20S	1.3	5S	30.1	60S	45	78
640A	INFECTOR		80	100S	88	100S	60	80S	67.5	80S	67	79
641	IPPSN2020-641	MACS 4117	9.4	20MS	6.4	20MS	3.3	10MS	12.4	40S	56	78
642	IPPSN2020-642	MACS 4118	10.4	20S	3.6	20MS	0.5	5MR	2.9	15S	46	68
643	IPPSN2020-643	MACS 4119	9.2	20S	3.7	10MS	2.4	5S	0.7	15S	45	67
644	IPPSN2020-644	MACS 4120	10.4	20S	2.5	20MR	2	5MS	2.2	5S	46	78
645	IPPSN2020-645	MACS 4121	5.7	20S	3.3	10MS	2	5MS	1.4	15S	46	78
646	IPPSN2020-646	MACS 4122	7.6	20S	0.9	5MS	1	5MS	2.3	5S	46	68
647	IPPSN2020-647	MACS 4123	22.4	60S	1.7	10MS	2.8	5S	0	10S	46	78
648	IPPSN2020-648	MACS 4124	4.5	10S	0.9	10MR	1.8	5S	7.8	60S*	46	78
649	IPPSN2020-649	MACS 5059	1.6	10MR	0.1	TR	0.3	TS	24.8	60S	46	78
650	IPPSN2020-650	MACS 5060	1.6	10MR	2	10MS	0.3	TS	18.1	40S	35	68
651	IPPSN2020-651	MACS 5061	1.7	10MR	1.2	10MR	1.3	5S	14.9	40S	35	47
PDKV, Akola												
652	IPPSN2020-652	AKAW 4662	13	40S	9.6	20S	10.2	20S	34.5	60S	46	78
653	IPPSN2020-653	AKAW 4682	26	80S	7.7	20S	7.5	10S	19.3	40S	56	78
654	IPPSN2020-654	AKAW 4684	8	20MS	4.4	10S	0	0	37.3	60S	56	78
655	IPPSN2020-655	AKDW 4773	4.1	40MR	4.8	20MS	0	0	9.4	60S	45	67
656	IPPSN2020-656	AKAW 5080	8.4	40MS	2	5S	1.5	5S	44.5	60S	46	68
657	IPPSN2020-657	AKAW 5100	0.6	5MR	14.8	60S	1.3	5S	25.8	40S	45	57
658	IPPSN2020-658	AKAW 5104	3.3	20MS	7.3	20S	2.5	10S	38.9	80S	56	78
659	IPPSN2020-659	AKAW 5314	9.5	40MS	8.4	20MS	4.5	10S	42	60S	46	68
660	IPPSN2020-660	AKAW 5317	22.1	60S	6.4	20S	6.3	20S	33.3	60S	46	78
660A	INFECTOR		80	100S	92	100S	62.5	80S	65	80S	67	79
661	IPPSN2020-661	AKAW 5353	45	80S	22.4	40S	22	60S	38.5	80S	35	57
662	IPPSN2020-662	AKAW 5354	38.6	80S	40	80S	35	60S	39.5	80S	35	58
663	IPPSN2020-663	AKAW 5438	30.8	60S	16	40S	12.5	50S*	46.3	80S	35	56
664	IPPSN2020-664	AKAW 5441	20.2	40S	7.6	20S	0.5	5MR	44.8	80S	45	57
665	IPPSN2020-665	AKAW 5444	27	80S	18.4	40S	20.3	40S	27.3	40S	45	58
666	IPPSN2020-666	AKAW 5445	4.4	20MS	6.8	20MS	11	40S	25	40S	46	68
Gwalior												
667	IPPSN2020-667	RVW 4350	1.7	20MR	0.6	5MR	0	0	5.7	20S	45	78
668	IPPSN2020-668	RVW 4351	2.4	20MR	0.1	TR	0	0	26.1	60S	35	57
669	IPPSN2020-669	RVW 4352	16.4	40MS	9	40MS	1	5MR	33.8	60S	35	67

No.	Entry code	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		Foliar blight	
			ACI	HS	ACI	HS	ACI	HS	ACI	HS	Avg.	HS
670	IPPSN2020-670	RVW 4353	4.8	20MS	12.5	60S*	0.5	5MR	10.4	40S	35	57
671	IPPSN2020-671	RVW 4354	21.2	40MS	4.8	20MS	15	40S	20.6	60S	35	46
672	IPPSN2020-672	RVW 4355	3.4	40MR	8.4	20S	18.5	40S	18.6	40S	45	46
673	IPPSN2020-673	RVW 4356	20	40S	26.4	40S	35	60S	45	60S	45	57
674	IPPSN2020-674	RVW 4357	34	80S	12.4	20S	15.8	40S	45	60S	35	57
675	IPPSN2020-675	RVW 4358	8	40MS	2.4	10MS	10	40S	44.5	80S	46	68
676	IPPSN2020-676	RVW 4359	40	80S	18	60S	1	5MS	30	40S	34	57
GBPUAT, Pantnagar												
677	IPPSN2020-677	1	29.6	80S	5.2	10S	1.3	5S	16.3	40S	35	57
678	IPPSN2020-678	2	13.6	40S	1	10MR	1.3	5S	6.1	15S	35	46
679	IPPSN2020-679	3	12	40MS	0.1	TR	12.5	50S	10.4	30S	24	36
680	IPPSN2020-680	4	12.4	20S	0.1	TR	0	0	6.6	20S	35	46
680A	INFECTOR		80	100S	80	100S	62.5	80S	65	80S	67	79
681	IPPSN2020-681	5	8	40MS	1.7	10MS	5	20S	18.5	40S	35	57
682	IPPSN2020-682	6	2.4	10MS	3.2	20MS	2.5	10S	18.4	40S	34	68
683	IPPSN2020-683	7	34	100S	5.6	20S	1.3	5S	17.9	40S	35	46
684	IPPSN2020-684	8	10	40S	1.6	20MR	0	0	17.4	40S	45	57
685	IPPSN2020-685	9	43	100S	0.4	5MR	0.3	TS	13.7	30S	46	68
686	IPPSN2020-686	10	12	40S	7.2	20S	12.7	40S	12.5	20S	35	46
687	IPPSN2020-687	11	10.6	20S	29.2	100S	2.5	10S	5.2	10S	35	36
688	IPPSN2020-688	12	28	60S	1.7	10MS	0	0	15.8	40S	46	57
689	IPPSN2020-689	13	0.1	TMR	0.4	5MR	7.3	20S	21.6	40S	35	46
690	IPPSN2020-690	14	9.6	40MS	11.2	20S	11.4	40S	17	40S	45	57
691	IPPSN2020-691	15	12.4	40MS	16.2	60S	12.6	40S	22.5	40S	35	46
692	IPPSN2020-692	16	5.8	20MS	8	40S	12.3	40S	13.1	20S	34	46
693	IPPSN2020-693	17	5.2	10S	8.1	40S	1.3	5S	23.2	40S	24	45
694	IPPSN2020-694	18	12.6	40S	0.1	TR	1.3	5S	21.3	40S	35	56
695	IPPSN2020-695	19	23.6	40S	0.1	TR	0.3	TS	3.3	15S	46	57
696	IPPSN2020-696	20	26	60S	6	20S	10.5	40S	18.3	40S	35	46
697	IPPSN2020-697	21	10	20S	5.6	20S	2.5	10S	16	40S	35	36
698	IPPSN2020-698	22	18	40S	4	15MS	0.3	TS	11.7	40S	24	35
699	IPPSN2020-699	23	28	60S	0.1	TR	1.8	5S	14	40S	23	24
700	IPPSN2020-700	24	21.2	60S	0.2	TMR	0.4	TS	9.8	40S	24	46
700A	INFECTOR		84	100S	84	100S	62.5	80S	67.5	80S	67	79
701	IPPSN2020-701	25	21	60S	8.4	40S	12.5	50S*	13	40S	24	45
702	IPPSN2020-702	26	11.4	40S	4	20MS	12.5	50S*	11.1	40S	36	68
703	IPPSN2020-703	27	6.5	20MS	7.5	20MS	3.3	10S	9.9	20S	25	36
704	IPPSN2020-704	28	20	60S	10.4	40S	3.7	10S	15.7	40S	23	24
705	IPPSN2020-705	29	1.7	10MR	1.6	20MR	0.3	TS	11.4	20S	24	46
706	IPPSN2020-706	30	12.8	40S	0.4	5MR	0	0	16.9	40S	24	34
707	IPPSN2020-707	31	7.2	20S	3.8	10S	8	20S	10	20S	35	36
708	IPPSN2020-708	32	21.3	60S	0.1	TR	10	20S	12.3	40S	46	46
709	IPPSN2020-709	33	30.1	80S	0.1	TR	0.1	TMR	17.6	40S	46	57
710	IPPSN2020-710	34	42	80S	8.8	40S	3.9	10S	25.2	60S	35	46
711	IPPSN2020-711	35	2.4	10MS	3.3	20MS	6.3	20S	22.1	60S	35	57
712	IPPSN2020-712	36	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
713	IPPSN2020-713	37	40	100S	0.1	TR	0	0	13.8	20S	35	68
714	IPPSN2020-714	38	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
715	IPPSN2020-715	39	5.6	20S	4.8	20S	1.3	5S	5.9	20S	34	46
716	IPPSN2020-716	40	14	40S	6.4	20MS	12.6	40S	16.8	40S	45	57
717	IPPSN2020-717	41	37	60S	7.2	20S	1.3	5S	4.4	15S	46	78
718	IPPSN2020-718	42	18.4	40S	3.3	20MS	0	0	11.3	20S	45	68
719	IPPSN2020-719	43	6.4	20S	3.2	20MS	0	0	8.8	20S	24	35
720	IPPSN2020-720	44	20.8	40S	2.4	10S	1.3	5S	12.4	40S	35	57
720A	INFECTOR		84	100S	88	100S	57.5	80S	67.5	80S	67	79
721	IPPSN2020-721	45	36	80S	11.3	40S	3.3	10S	14.9	40S	46	67

No.	Entry code	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		Foliar blight	
			ACI	HS	ACI	HS	ACI	HS	ACI	HS	Avg.	HS
722	IPPSN2020-722	46	14.8	40S	8	40S	0	0	4.9	15S	45	67
723	IPPSN2020-723	47	30	60S	5.1	20S	2.5	5S	11.9	20S	46	57
724	IPPSN2020-724	48	16.1	60S	4.8	20MS	1.5	5S	9	20S	45	46
725	IPPSN2020-725	49	8.9	20S	17.6	40S	4	10S	11	40S	46	78
726	IPPSN2020-726	50	13.6	60S*	1.7	10MS	2.5	10S	17.5	40S	34	46
727	IPPSN2020-727	51	18	40S	18.1	80S*	3	5S	7.5	20S	46	57
728	IPPSN2020-728	52	28.1	60S	9.3	20MS	11.9	40S	4.2	15S	45	67
729	IPPSN2020-729	53	3.4	20MS	4.8	10MS	0.8	5MR	6.3	15S	35	58
730	IPPSN2020-730	54	20.8	60S	15.3	60S	2.5	10S	6.1	20S	35	46
731	IPPSN2020-731	55	24.2	60S	2.5	10S	0.3	TS	2.7	5S	45	67
732	IPPSN2020-732	56	31.6	60S	9.7	40S	3.8	10S	19.4	40S	46	57
733	IPPSN2020-733	57	35.2	80S	9	40MS	1.3	5S	2.6	15S	35	57
734	IPPSN2020-734	58	20.8	40S	0.5	5MR	1.3	5S	11.9	40MS	46	67
735	IPPSN2020-735	59	42.4	60S	6.4	20MS	5.3	20S	7.4	20S	35	57
736	IPPSN2020-736	60	27.2	80S	0.4	5MR	0.1	TR	6.1	15S	35	57
SVPUAT, Meerut												
737	IPPSN2020-737	SVPWL01	31.2	80S	0.8	5MS	2.5	10S	11.9	40S	35	46
738	IPPSN2020-738	SVPWL02	25.6	80S	0.1	TR	1.3	5S	10.5	40S	45	67
739	IPPSN2020-739	SVPWL03	2.4	20MR	0.1	TR	2.5	10S	4.5	20S	35	57
740	IPPSN2020-740	SVPWL04	30	80S	9.6	40S	10.2	20S	16.6	40S	46	78
740A	INFECTOR		84	100S	88	100S	62.5	80S	67.5	80S	67	79
741	IPPSN2020-741	SVPWL05	3.5	20MR	6.4	20MS	0	0	4.9	20S	35	68
742	IPPSN2020-742	SVPWL06	7.6	20S	0.9	10MR	1.5	5S	7.9	20MS	35	46
743	IPPSN2020-743	SVPWL07	12.6	40MS	2.9	10S	2.3	5S	3.6	10S	35	57
744	IPPSN2020-744	SVPWL08	39.6	80S	11.3	20S	12.8	40S	4.1	10S	35	57
745	IPPSN2020-745	SVPWL09	4.3	10MS	7.3	40MS	6.4	20S	2.4	10S	35	47
746	IPPSN2020-746	SVPWL10	7.6	20MS	2	10S	1.3	5S	1.3	10S	35	46
747	IPPSN2020-747	SVPWL11	17.2	40S	3.2	20MS	1.3	5S	0.8	5MS	24	36
748	IPPSN2020-748	SVPWL12	5.3	20MS	8	20S	2.8	10S	0.7	5MS	35	46
749	IPPSN2020-749	SVPWL13	4.1	20S	1.6	20MR	0.3	TS	3.1	5MS	34	46
750	IPPSN2020-750	SVPWL14	33.2	60S	3.2	10S	2.9	10S	17.3	60S	34	46
751	IPPSN2020-751	SVPWL15	14	40S	4.8	20MS	3.8	10S	4.1	10S	35	57
IARI New Delhi												
752	IPPSN2020-752	IARI 20-1	15	40S	4	10MS	5	10S	6.3	20S	46	56
753	IPPSN2020-753	IARI 20-2	12.2	40S	28.8	80S	32.5	40S	4.1	15S	45	57
754	IPPSN2020-754	IARI 20-3	12.9	20S	12.8	40S	23.8	50S	13.1	40S	35	57
755	IPPSN2020-755	IARI 20-4	31.6	80S	7.2	20MS	6.3	20S	8.1	40S	35	46
756	IPPSN2020-756	IARI 20-5	6.1	30S	6.4	20S	2.5	10S	14.4	60S	34	56
757	IPPSN2020-757	IARI 20-6	34	80S	5.2	10S	11.5	40S	6.9	20S	35	57
758	IPPSN2020-758	IARI 20-7	13.6	20S	10.5	40S	8	20S	1.9	15S	34	46
759	IPPSN2020-759	IARI 20-8	4.8	10S	0.1	TMR	2.8	10S	4.4	30S	34	35
760	IPPSN2020-760	IARI 20-9	32.4	60S	2.5	1S	1.3	5S	18.6	60S	35	45
760A	INFECTOR		84	100S	84	100S	62.5	80S	65	80S	57	79
761	IPPSN2020-761	IARI 20-10	16.4	40S	3	10MS	0	0	5.9	20S	45	57
762	IPPSN2020-762	IARI 20-11	8	20S	5.4	20MS	8	20S	29.1	60S	45	68
763	IPPSN2020-763	IARI 20-12	6.4	20S	6.8	20MS	4.8	10S	10.7	40S	34	57
764	IPPSN2020-764	IARI 20-13	20.8	60S	2.4	10MS	0	0	4.5	20MS	24	46
765	IPPSN2020-765	IARI 20-14	5	20MS	0	TR	0.3	TS	4.4	15S	35	57
766	IPPSN2020-766	IARI 20-15	9	40S	10.8	20S	21	60S	16.3	60S	45	78
767	IPPSN2020-767	IARI 20-16	8	20MS	2.4	20MR	1.2	10MR	5.8	20S	34	46
768	IPPSN2020-768	IARI 20-17	18	40S	0.1	TMR	5	20S	13.8	40S	24	35
769	IPPSN2020-769	IARI 20-18	4.2	20MS	1.4	10MR	0.3	TS	6.1	20S	45	57
770	IPPSN2020-770	IARI 20-19	2.4	10MS	5.2	10S	2.3	5S	5.4	30S	35	57
771	IPPSN2020-771	IARI 20-20	16	60S	15.2	60S	5	10S	12.8	60S	35	78
772	IPPSN2020-772	IARI 20-21	35.2	80S	22.5	80S	15	40S	18.1	40S	34	35
773	IPPSN2020-773	IARI 20-22	0.8	10MR	7.6	20MS	11.5	40S	3.1	15S	34	46

No.	Entry code	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		Foliar blight	
			ACI	HS	ACI	HS	ACI	HS	ACI	HS	Avg.	HS
774	IPPSN2020-774	IARI 20-23	15.5	40MS	4.8	10S	0.8	5MR	5.6	15S	45	57
775	IPPSN2020-775	IARI 20-24	49	80S	8.1	20S	0.3	TS	4.9	15S	45	46
776	IPPSN2020-776	IARI 20-25	47.4	80S	16.8	40S	3	5S	15	60S	45	57
777	IPPSN2020-777	IARI 20-26	19	60S	1.1	5S	7.5	20S	14.6	40S	24	35
778	IPPSN2020-778	IARI 20-27	15	40S	1.2	10MR	3	10S	5.7	20S	35	57
779	IPPSN2020-779	IARI 20-28	20.6	60S	6.4	40S	1.4	5S	4.9	15S	45	68
780	IPPSN2020-780	IARI 20-29	17	40S	3.7	10MS	2.6	10S	4.4	15S	35	57
780A	INFECTOR		84	100S	84	100S	62.5	80S	65	80S	67	79
781	IPPSN2020-781	IARI 20-30	26.4	80S	3.8	10S	0.3	TS	12.6	60S	35	57
782	IPPSN2020-782	IARI 20-31	13.2	40S	3.6	10S	1.3	5S	18.3	60S	45	78
783	IPPSN2020-783	IARI 20-32	16.4	40MS	2.7	20MR	2.5	10S	8.8	40S	45	57
784	IPPSN2020-784	IARI 20-33	22	40S	4	20MS	6	20S	12.9	40S	35	58
785	IPPSN2020-785	IARI 20-34	46.4	80S	12.1	40MS	7.8	20S	9	40S	35	46
786	IPPSN2020-786	IARI 20-35	12.4	40MS	4.8	20MS	5	20S	15.9	60S	35	57
787	IPPSN2020-787	IARI 20-36	16	40S	11.2	20S	5.8	20S	10.5	40S	35	57
788	IPPSN2020-788	IARI 20-37	3.6	5S	2.5	15MS	7.5	20S	5.8	20S	35	68
789	IPPSN2020-789	IARI 20-38	14.4	40S	12.4	40MS	7.5	20S	5.8	20MS	24	35
790	IPPSN2020-790	IARI 20-39	0.8	10MR	1.3	5MS	0.8	5MR	53.9	80S	46	68
791	IPPSN2020-791	IARI 20-40	2	20MR	1	5MS	0.5	5MR	55.6	80S	46	78
792	IPPSN2020-792	IARI 20-41	0.9	5MR	0.1	TR	0	0	36	80S	56	78
793	IPPSN2020-793	IARI 20-42	3.7	10S	1.7	15MR	0.3	TS	46.9	80S	46	78
794	IPPSN2020-794	IARI 20-43	2.8	10S	0.1	TR	0	0	24.5	60S	56	67
795	IPPSN2020-795	IARI 20-44	2.5	20MR	3.2	10MS	2.3	10MS	44.9	80S	56	78
796	IPPSN2020-796	IARI 20-45	27	60S	7.2	20S	2.3	10MS	14.6	40S	45	78
797	IPPSN2020-797	IARI 20-46	16.8	40S	22.8	40S	20.3	60S	28.8	60S	35	68
798	IPPSN2020-798	IARI 20-47	15.6	20S	8.9	40S	3.1	10S	11.9	40S	35	68
799	IPPSN2020-799	IARI 20-48	6.6	10S	1.5	5S	1.8	5S	16.6	40S	35	57
800	IPPSN2020-800	IARI 20-49	2.6	5S	8.1	40S	2.5	10S	14.8	60S	35	78
800A	INFECTOR		80	100S	76	100S	62.5	80S	65	80S	68	89
801	IPPSN2020-801	IARI 20-50	25.6	60S	1.7	20MR	0	0	8.8	40S	45	57
802	IPPSN2020-802	IARI 20-51	27.6	60S	2.5	5S	1.3	5S	18.4	60S	45	68
803	IPPSN2020-803	IARI 20-52	14.8	20S	3.6	10MS	1.5	5S	15	60S	35	57
804	IPPSN2020-804	IARI 20-53	19.6	40S	8	20MS	1	10MR	9.7	40S	45	68
805	IPPSN2020-805	IARI 20-54	3.6	10S	0.4	5MR	1.4	5S	11.7	40S	35	57
806	IPPSN2020-806	IARI 20-55	13.2	40S	4.8	20MS	5.4	20S	10.7	60S	46	68
807	IPPSN2020-807	IARI 20-56	3.2	20MR	3.3	20MS	2.5	10S	26.8	80S	45	57
808	IPPSN2020-808	IARI 20-57	18.6	40S	6.4	20MS	0.5	5MR	25.7	60S	45	67
809	IPPSN2020-809	IARI 20-58	15.2	40MS	3.3	20MS	0.3	TS	15.4	60S	35	67
810	IPPSN2020-810	IARI 20-59	12.4	40MS	1.7	20MR	0	0	5.4	20MS	35	46
811	IPPSN2020-811	IARI 20-60	18.2	40MS	3.6	10MS	2.3	5S	15	40S	35	57
812	IPPSN2020-812	IARI 20-61	14	20S	5.6	20MS	1	5MR	9.8	60S	35	46
813	IPPSN2020-813	IARI 20-62	28.8	40S	8.2	20S	0.3	TS	5.7	30S	35	57
814	IPPSN2020-814	IARI 20-63	27.2	60S	14	40S	5.3	10S	11.3	40S	24	35
815	IPPSN2020-815	IARI 20-64	5.6	20MS	3	10S	5.3	20S	8.1	30S	35	57
816	IPPSN2020-816	IARI 20-65	1.7	10MS	0.1	TR	1.3	5MS	12	40MS	35	46
817	IPPSN2020-817	IARI 20-66	13	40MS	4.4	20MS	20.5	60S	2.7	15S	35	57
818	IPPSN2020-818	IARI 20-67	26	60S	19.2	40S	10.1	20S	2.4	15S	24	37
819	IPPSN2020-819	IARI 20-68	12.2	20S	2.8	20MR	1.8	5S	3.8	15S	35	46
820	IPPSN2020-820	IARI 20-69	18.8	40MS	7.2	10S	3.9	10S	5.3	20S	56	67
820A	INFECTOR		84	100S	84	100S	62.5	80S	65	80S	68	79
821	IPPSN2020-821	IARI 20-70	25.6	40S	4.3	20S	8.5	20S	16.3	40S	46	68
822	IPPSN2020-822	IARI 20-71	1.6	10MR	0.1	TR	0.3	TS	43.5	80S	56	78
823	IPPSN2020-823	IARI 20-72	2.4	10MR	0.1	TR	1.3	5S	50.8	80S	57	78
824	IPPSN2020-824	IARI 20-73	0.3	5R	0.1	TR	2.5	10S	29.5	60S	56	78
825	IPPSN2020-825	IARI 20-74	1.6	5MS	0.1	TR	0.3	TS	33.5	60S	56	78
826	IPPSN2020-826	IARI 20-75	2.4	20MR	0.1	TR	2.5	10S	44.5	80S	56	78

No.	Entry code	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		Foliar blight	
			ACI	HS	ACI	HS	ACI	HS	ACI	HS	Avg.	HS
827	IPPSN2020-827	IARI 20-76	0.1	TR	0.1	TR	2.5	10S	23.5	60S	46	67
828	IPPSN2020-828	IARI 20-77	0.9	10MR	1.6	10MR	5	20S	7.4	20S	45	57
829	IPPSN2020-829	IARI 20-78	22	60S	6.6	20MS	3.8	10S	5.4	30S	45	67
830	IPPSN2020-830	IARI 20-79	12.2	40MS	11.2	40S	5.3	20S	3.5	20S	35	56
831	IPPSN2020-831	IARI 20-80	14.2	40MS	12.4	40S	13	40S	3.4	20S	45	46
832	IPPSN2020-832	IARI 20-81	16	40S	5.8	20S	5.1	10S	10	40S	46	57
833	IPPSN2020-833	IARI 20-82	2.4	5MS	1.7	10MS	3.5	10S	3	5MS	45	68
834	IPPSN2020-834	IARI 20-83	0.9	5MS	0.9	10MR	1.4	5S	1.8	10MS	46	78
835	IPPSN2020-835	IARI 20-84	3.7	10S	5.1	20S	4.3	10S	1.8	10MS	45	78
836	IPPSN2020-836	IARI 20-85	5.6	10S	10.7	40S	1.3	5MR	2	5MS	56	78
837	IPPSN2020-837	IARI 20-86	10.5	20S	4.9	20MS	3.4	10MS	2.5	10MS	46	78
838	IPPSN2020-838	IARI 20-87	9.6	20S	1.8	10MS	3	10S	0.9	5MS	46	78
839	IPPSN2020-839	IARI 20-88	3.4	10MS	7.3	20S	2.3	10MS	1.8	5MS	46	78
840	IPPSN2020-840	IARI 20-89	9.6	40S	2.5	10MS	3.3	10MS	1.2	5MS	45	67
840A	INFECTOR		84	100S	80	100S	62.5	80S	67.5	80S	67	79
841	IPPSN2020-841	IARI 20-90	25	100S	3.3	20MS	1.8	5S	1.8	5MS	45	78
842	IPPSN2020-842	IARI 20-91	13.7	60S*	2.5	10MS	1.8	5S	3.3	15S	35	58
843	IPPSN2020-843	IARI 20-92	12	40S	3.2	20MR	1.5	5S	2.8	15S	46	67
844	IPPSN2020-844	IARI 20-93	27.2	80S	0.9	10MR	0.4	TS	0.9	5MS	56	78
845	IPPSN2020-845	IARI 20-94	26	60S	8.4	30S	7.5	30S	4.8	20S	35	57
846	IPPSN2020-846	IARI 20-95	25	60S	12	40S	7.5	30S	12.7	40S	45	57
847	IPPSN2020-847	IARI 20-96	19.2	60S	12.8	20S	12.8	40S	5.1	20MS	35	57
848	IPPSN2020-848	IARI 20-97	33.8	80S	3	10S	6.8	20S	3.8	15S	35	57
849	IPPSN2020-849	IARI 20-98	12.4	40MS	8.4	20S	1.3	5S	12	40S	46	57
850	IPPSN2020-850	IARI 20-99	14.4	40S	5.2	20MS	1.5	5S	17.1	40S	24	46
851	IPPSN2020-851	IARI 20-100	14	40S	17.2	60S	3.8	10S	11.4	40S	35	57
852	IPPSN2020-852	IARI 20-101	7.3	20MS	7.2	20S	2.5	10S	16.9	40S	35	46
853	IPPSN2020-853	IARI 20-102	24	80S	12	40S	7.5	20S	12.3	40S	24	36
854	IPPSN2020-854	IARI 20-103	16.6	60S	10	40S	3.5	10S	3.8	15S	46	67
855	IPPSN2020-855	IARI 20-104	28.6	60S	3.6	10S	2.5	10S	12.3	40S	46	68
856	IPPSN2020-856	IARI 20-105	32.4	80S	8.4	20MS	2.8	10S	7.9	15S	35	67
857	IPPSN2020-857	IARI 20-106	33.2	80S	4.2	10MS	0	0	7	30S	45	67
858	IPPSN2020-858	IARI 20-107	42.6	80S	12	40S	2.8	10MS	8.8	40S	45	46
859	IPPSN2020-859	IARI 20-108	27.2	60S	4.1	20S	0	0	8.1	40S	35	47
860	IPPSN2020-860	IARI 20-109	19.2	60S	1.7	20MR	1.4	5S	3.8	20S	24	46
860A	INFECTOR		84	100S	80	100S	62.5	80S	60	80S	67	79
861	IPPSN2020-861	IARI 20-110	5.2	20S	1.6	10MS	2.5	10S	39.6	80S	45	78
862	IPPSN2020-862	IARI 20-111	3.6	10MS	0.9	10MR	2.5	10S	39.8	80S	46	78
863	IPPSN2020-863	IARI 20-112	0.5	10R	0.1	TR	1.3	5S	41.8	80S	45	67
864	IPPSN2020-864	IARI 20-113	4.4	10S	4	10MS	6	20S	42.8	80S	67	78
865	IPPSN2020-865	IARI 20-114	3.2	10MS	2.4	10MS	3.5	10S	51	80S	46	78
866	IPPSN2020-866	IARI 20-115	16	60S*	4.1	20MS	1.4	5MS	2.9	15S	56	78
867	IPPSN2020-867	IARI 20-116	4.9	20S	2.3	5S	0.4	TS	3.9	15S	45	78
868	IPPSN2020-868	IARI 20-117	6.4	20MS	3.3	10MS	2.1	10MS	1.3	5MS	56	67
869	IPPSN2020-869	IARI 20-118	6.9	20MS	3.4	20MS	1.5	10MR	3.4	15S	45	78
870	IPPSN2020-870	IARI 20-119	0	TR	0.1	TR	1.3	5S	26.3	60S	46	57
871	IPPSN2020-871	IARI 20-120	19.2	40MS	5.8	20S	5	20S	15.4	60S	46	58
872	IPPSN2020-872	IARI 20-121	1.9	5MS	2.4	10S	11.4	40S	4.9	15S	46	78
873	IPPSN2020-873	IARI 20-122	12	20S	4.8	20MS	3.5	10S	12.8	40S	34	57
874	IPPSN2020-874	IARI 20-123	9	20S	10.4	20S	5	10S	10.8	20S	24	37
875	IPPSN2020-875	IARI 20-124	0	TR	2.1	10S	0.8	5MR	12.9	40S	35	57
876	IPPSN2020-876	IARI 20-125	29	60S	14.4	40S	6.5	20MS	15.8	40S	46	57
877	IPPSN2020-877	IARI 20-126	12.4	40S	12.9	40S	10.3	20S	17.4	60S	35	36
878	IPPSN2020-878	IARI 20-127	10.2	20S	20.8	80S	5	10S	3.3	20S	24	46
879	IPPSN2020-879	IARI 20-128	0.8	5MS	4.1	20S	2	10MS	3.5	15S	34	57
880	IPPSN2020-880	IARI 20-129	8	20S	12.1	60S*	3.3	10S	3	20S	45	78

No.	Entry code	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		Foliar blight	
			ACI	HS	ACI	HS	ACI	HS	ACI	HS	Avg.	HS
880A	INFECTOR		80	100S	84	100S	62.5	80S	65	80S	67	79
881	IPPSN2020-881	IARI 20-130	14.6	40S	16.9	80S*	3.8	10S	2.5	20S	46	68
882	IPPSN2020-882	IARI 20-131	22.6	60S	6.4	20MS	5.5	10S	0.6	5S	45	57
883	IPPSN2020-883	IARI 20-132	6	20MS	5.2	10S	5	10S	5.3	20S	45	57
884	IPPSN2020-884	IARI 20-133	13.2	40MS	6.4	20S	6.4	20S	7.5	20S	35	46
885	IPPSN2020-885	IARI 20-134	27.2	80S	10.4	40S	1.3	5S	12.5	40S	35	46
886	IPPSN2020-886	IARI 20-135	0.5	5MR	4.1	20MS	3	10S	39.4	60S	46	67
887	IPPSN2020-887	IARI 20-136	26	40S	6	20S	0.1	TMR	3.6	15S	35	57
888	IPPSN2020-888	IARI 20-137	27.2	80S	16	30MS	11.3	20S	12.3	40S	35	47
889	IPPSN2020-889	IARI 20-138	11.5	40S	1.8	10S	2.5	5S	10	40S	36	47
890	IPPSN2020-890	IARI 20-139	24.8	100S	9.7	40S	6	10S	17.8	60S	35	57
891	IPPSN2020-891	IARI 20-140	29.8	80S	12	20S	9.4	20S	12	40S	35	57
892	IPPSN2020-892	IARI 20-141	27.4	80S	2.1	10MS	4	10S	7.5	20S	35	57
893	IPPSN2020-893	IARI 20-142	26.6	60S	6.4	20MS	4.7	10S	14	40S	35	57
894	IPPSN2020-894	IARI 20-143	23.6	80S	5.8	10MS	4.8	10S	6.1	20MS	45	78
895	IPPSN2020-895	IARI 20-144	18.4	80S*	0.6	5MR	2.7	10S	2	15S	35	46
896	IPPSN2020-896	IARI 20-145	23.4	60S	2.8	10MS	3.8	10S	4.4	15S	35	57
897	IPPSN2020-897	IARI 20-146	10	20S	1.6	10MS	1.3	5S	3.5	15S	35	36
898	IPPSN2020-898	IARI 20-147	15.2	40MS	0.2	TMR	1.3	5S	7.1	20S	35	57
899	IPPSN2020-899	IARI 20-148	12.4	20S	16.1	80S*	3.8	10S	3.9	20S	35	46
900	IPPSN2020-900	IARI 20-149	13	40S	1.2	5S	5.2	10S	5.1	20S	46	99
900A	INFECTOR		76	100S	84	100S	62.5	80S	65	80S	67	79
901	IPPSN2020-901	IARI 20-150	10.4	40S	0.2	TMR	0	0	4.5	20S	46	78
902	IPPSN2020-902	IARI 20-151	1.3	5S	3.6	20MS	0	0	6.3	20S	35	57
903	IPPSN2020-903	IARI 20-152	2	10MS	8.1	40S	0.3	TS	3.3	15S	35	46
904	IPPSN2020-904	IARI 20-153	16.1	60S	3.6	10S	3.8	10S	1.8	10S	35	57
905	IPPSN2020-905	IARI 20-154	10	40MS	3.3	20MS	0.3	TS	1.9	10S	35	46
906	IPPSN2020-906	IARI 20-155	23.4	60S	3.2	10MS	2.5	5S	2.8	10MS	34	57
907	IPPSN2020-907	IARI 20-156	14.4	40S	8.2	40S	0.1	TMR	2.3	10S	35	57
908	IPPSN2020-908	IARI 20-157	23.2	40S	14.4	20S	5	10S	3.2	20S	35	36
909	IPPSN2020-909	IARI 20-158	27.4	80S	16.8	80S*	3.8	10S	16.6	40S	35	57
910	IPPSN2020-910	IARI 20-159	23.2	60S	3.7	10S	0	0	6.9	20S	46	57
911	IPPSN2020-911	IARI 20-160	2	10MR	3.3	20MS	4	10S	2.5	10MS	46	78
912	IPPSN2020-912	IARI 20-161	1.3	10MR	2.5	10MS	1.8	5MS	4.3	20S	45	78
913	IPPSN2020-913	IARI 20-162	10.4	40S	4.8	10S	5.9	10S	7.9	40S	35	57
914	IPPSN2020-914	IARI 20-163	15.2	40S	6.4	15MS	5.5	10S	4.4	15S	35	57
915	IPPSN2020-915	IARI 20-164	46	100S	3.2	20MS	0.3	TS	4.9	15S	24	34
916	IPPSN2020-916	IARI 20-165	14.8	20S	8	40S	0	0	3.2	15S	34	46
917	IPPSN2020-917	IARI 20-166	6	20MS	7.6	20MS	3.8	10S	18.2	40S	34	57
918	IPPSN2020-918	IARI 20-167	7.4	20S	8.4	20MS	5.3	20S	16.9	40S	35	68
919	IPPSN2020-919	IARI 20-168	9.6	20S	0.1	TR	2.5	10S	5	15S	45	67
920	IPPSN2020-920	IARI 20-169	19.2	40S	3.6	10S	5	10S	27	60S	46	57
920A	INFECTOR		84	100S	80	100S	62.5	80S	65	80S	67	79
921	IPPSN2020-921	IARI 20-170	13.6	40S	1	10MR	5	20S	14.8	40S	35	46
922	IPPSN2020-922	IARI 20-171	22.4	40S	6	20MS	3.8	10S	18	60S	35	36
923	IPPSN2020-923	IARI 20-172	25.8	80S	3.8	10S	0	0	4.4	15S	35	46
924	IPPSN2020-924	IARI 20-173	13.6	40S	0.1	TR	1.3	5S	4.1	15S	24	36
925	IPPSN2020-925	IARI 20-174	6.4	20S	1	5S	0	0	11.9	40S	24	36
926	IPPSN2020-926	IARI 20-175	21.2	60S	5	15MS	0	0	5	20S	35	36
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927	IPPSN2020-927	P 13582	27.6	60S	1.6	10MS	2.3	10MS	22.4	60S	35	57
928	IPPSN2020-928	P 13590	11.3	40S	2.8	10S	1.3	5S	6.3	20S	35	57
929	IPPSN2020-929	P 13633	17	60S	3.2	20MS	0.3	TS	16.5	40S	45	67
930	IPPSN2020-930	P 13644	32.6	80S	9.4	20S	2	10MS	5.9	20S	46	57
931	IPPSN2020-931	P 13645	11.2	20S	2.1	10S	2.5	5S	3.1	10S	45	68
932	IPPSN2020-932	P 13673	16.4	40S	0.1	TR	0	0	0.9	5MS	46	57

No.	Entry code	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		Foliar blight	
			ACI	HS	ACI	HS	ACI	HS	ACI	HS	Avg.	HS
933	IPPSN2020-933	P 13733	31.2	80S	3.6	10S	5	20S	4.4	15S	46	57
934	IPPSN2020-934	P 13757	10.4	20S	7.2	20S	13	40S	8	40S	45	67
935	IPPSN2020-935	P 13769	9.9	40S	2.9	10S	1.8	5S	12.4	60S	45	68
936	IPPSN2020-936	P 13775	17.2	40S	2.2	10S	1.4	5S	5.3	20S	35	46
937	IPPSN2020-937	P 13793	14.4	40MS	2.2	10S	0	0	2.8	15S	35	46
938	IPPSN2020-938	P 13810	21.2	60S	0.9	5MS	3.9	10S	4	15S	35	67
939	IPPSN2020-939	P 13816	20	40S	4	15MS	1.3	5S	5.6	10S	35	67
940	IPPSN2020-940	P 13818	8.4	10S	5.8	20S	10	40S	3.8	10S	35	46
940A	INFECTOR		76	100S	80	100S	62.5	80S	67.5	80S	67	79
941	IPPSN2020-941	P 13822	16.4	60S	1.1	5S	1.3	5S	7.6	40S	45	57
942	IPPSN2020-942	P 13829	15.2	20S	4.8	20S	0.5	5R	6.4	30S	35	46
943	IPPSN2020-943	P 13839	21.6	40S	1.8	10MS	2.5	10S	10.9	40S	46	68
944	IPPSN2020-944	P 13869	12	40S	6.8	20S	5.3	20S	8.4	20S	46	78
945	IPPSN2020-945	P 13888	2.8	10S	0.5	5MR	0	0	16.7	40S	35	68
946	IPPSN2020-946	P 13900	14.8	40S	0.5	5MR	0	0	8.1	20S	35	57
947	IPPSN2020-947	P 13901	11.8	40S	2.4	10MS	6.3	20S	5.9	20S	46	68
948	IPPSN2020-948	P 13905	18	40S	7.4	20MS	2.5	10S	4	20S	45	46
949	IPPSN2020-949	P 13908	19.2	40S	5	20MS	1.3	5S	13.3	40S	45	68
950	IPPSN2020-950	P 13919	19.2	40S	5.2	20MS	4	10S	11.4	20S	45	67
951	IPPSN2020-951	P 13929	16.1	40S	28	60S	5.3	10S	6	15S	56	78
952	IPPSN2020-952	P 13932	16.2	40S	7.2	30MS	3.8	10S	9.3	20S	46	57
953	IPPSN2020-953	P 13934	6	20S	2.4	10MS	5.1	10S	15.5	40S	45	57
954	IPPSN2020-954	P 13938	10.8	30MS	0.1	TR	0.8	5MR	8.5	30S	45	68
955	IPPSN2020-955	P 13939	13.3	40S	3.6	10S	3.9	10S	11.9	40S	35	46
956	IPPSN2020-956	P 13940	10.4	20S	5.6	20S	1.3	5S	5.8	20S	35	57
957	IPPSN2020-957	P 13941	6.3	20S	1.3	5S	5	10S	8.1	20S	35	57
958	IPPSN2020-958	P 13942	6.7	20S	4	15MS	8.5	20S	14.3	40S	35	57
959	IPPSN2020-959	P 13946	13.6	60S*	12.8	40S	3.9	10S	21.9	60S	35	57
960	IPPSN2020-960	P 13967	19.2	80S*	9.6	40S	2.9	10S	3.5	20S	46	67
960A	INFECTOR		80	100S	88	100S	62.5	80S	67.5	80S	67	79
961	IPPSN2020-961	P 13973	6.6	10S	2.1	20MR	2.8	10S	18.5	40S	45	56
962	IPPSN2020-962	P 13974	6.5	20S	4.9	20MS	8.5	30S	4.3	15S	35	57
963	IPPSN2020-963	P 13977	10.8	40S	9.2	20S	7.7	20S	5.8	15S	35	57
964	IPPSN2020-964	P 13979	4.4	10S	12	60S*	1.3	5MS	4.9	15S	35	46
965	IPPSN2020-965	P 13980	3.2	10S	19.2	80S*	2.7	10S	2.8	10S	35	57
966	IPPSN2020-966	P 13981	2.1	10MS	27.2	80S	7.7	20S	9.3	20S	35	46
967	IPPSN2020-967	P 13982	3.6	10S	4.4	20S	7.8	30S	5.6	15S	35	57
968	IPPSN2020-968	P 13988	1.6	10MR	2.4	10MS	1.8	5S	0.9	5MS	35	57
969	IPPSN2020-969	P 13993	0.4	5MR	0	TR	0.3	TS	6.9	15S	35	68
970	IPPSN2020-970	P 13994	0.2	TS	5.2	15MS	1.3	5S	6.1	10S	35	68
971	IPPSN2020-971	P 13999	0.8	10MR	1.7	10MS	0	0	6.9	20S	25	36
972	IPPSN2020-972	P 14000	8.1	40S	0.9	5MS	2.6	10S	1.5	5S	35	57
973	IPPSN2020-973	P 14022	8.2	20MS	7.4	20MS	10.3	40S	8.4	20S	46	68
974	IPPSN2020-974	P 14034	12	20S	3.4	10MS	5	20S	17.9	40S	35	57
975	IPPSN2020-975	P 14041	5.2	10S	8	20MS	8.8	30S	6.3	15S	35	68
976	IPPSN2020-976	P 14048	11.2	40S	6.8	20MS	5.3	20S	4.5	10S	46	57
977	IPPSN2020-977	P 14061	15.6	40S	2.8	5S	0.2	TMS	6.2	10S	46	68
978	IPPSN2020-978	P 14090	21.8	60S	1.8	10MS	0	0	3.6	15S	35	57
979	IPPSN2020-979	P 14103	5.2	20MS	3.3	10MS	3.8	10S	11	20S	46	58
980	IPPSN2020-980	P 14114	19.6	40S	3.8	20MS	2.5	10S	18	40S	46	68
980A	INFECTOR		84	100S	80	100S	57.5	80S	65	80S	67	79
981	IPPSN2020-981	P 14115	24.8	80S	0.1	TR	2.5	10S	6.4	15S	45	57
982	IPPSN2020-982	P 14225	20.1	80S	12.1	60S*	1.4	5S	4.6	15S	35	46
983	IPPSN2020-983	P 8127	24.8	100S	7.7	20S	1.5	10MR	1.8	5MS	45	67
984	IPPSN2020-984	P 8228	24	100S	8.1	40MS	2	5S	3.2	20MS	46	78
985	IPPSN2020-985	P 8229	25.2	100S	8.9	40S	1.3	5MS	1.8	5S	35	78

No.	Entry code	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		Foliar blight	
			ACI	HS	ACI	HS	ACI	HS	ACI	HS	Avg.	HS
986	IPPSN2020-986	P 8241	27.2	80S	6.9	20S	2.3	5S	0.3	5MR	45	68
Udaipur												
987	IPPSN2020-987	PWU 14	13.6	60S*	5.9	20MS	2.5	10S	42	80S	46	78
988	IPPSN2020-988	PWU-15	1.6	10MR	6	20S	3	10S	53.5	80S	46	78
989	IPPSN2020-989	PWU-16	3.3	10MS	1.3	5MS	3.5	10S	42.5	60S	45	68
990	IPPSN2020-990	PWU-17	8.4	20S	1.1	5S	0	0	21.5	40S	46	78
991	IPPSN2020-991	PWU-18	4.4	10S	0.5	5MR	2	5MS	8.6	40S	46	78
992	IPPSN2020-992	PWU-19	4	20MS	0.1	TR	2.5	10S	4.3	15S	46	78
Kalyani												
993	IPPSN2020-993	BCW 12	24.8	80S	2.8	20MR	1.5	5MS	5.6	20S	34	46
994	IPPSN2020-994	BCW 18	26.8	80S	1.7	10MS	0.3	TS	7.5	20S	35	57
IIWBR, Karnal												
995	IPPSN2020-995	RWP-TS-15	17.6	60S	1.4	5S	1.3	5MS	3.3	15S	46	57
996	IPPSN2020-996	RWP-TS-27	40.8	80S	6.4	20S	3.8	10S	3.4	10S	35	36
997	IPPSN2020-997	RWP-TS-24	18.4	60S	0.5	5MR	0	0	2.7	10S	34	46
998	IPPSN2020-998	RWP-TS-26	12	40MS	0.9	10MR	0.3	TS	3.8	15S	45	68
999	IPPSN2020-999	RWP-TS-23	20.8	80S	0.9	10MR	0.3	TS	2.5	10S	34	57
1000	IPPSN2020-1000	RWP-TS-17	21.2	60S	18.6	40S	10.3	40S	1.8	10MS	35	47
1000A	INFECTOR		76	100S	84	100S	62.5	80S	67.5	80S	57	79
1001	IPPSN2020-1001	RWP-TS-33	19	40S	1.6	5MS	0	0	6.3	15S	46	57
1002	IPPSN2020-1002	RWP-TS-16	27.2	80S	6.6	20S	15.3	40S	11.4	40S	46	68
1003	IPPSN2020-1003	RWP-TS-11	2	10MS	3	10S	1.4	5S	1.9	5S	35	47
1004	IPPSN2020-1004	RWP-TS-13	13.6	40S	16.1	80S*	0.5	5MR	3.6	20S	35	46
1005	IPPSN2020-1005	RWP-TS-28	32	40S	9.1	40S	2.8	10S	4	15S	35	57
1006	IPPSN2020-1006	RWP-TS-01	1.7	10MS	4.3	20S	2.3	5S	4.4	20S	35	46
1007	IPPSN2020-1007	NEP-TS-14	15.2	40S	2.5	10S	3.8	10S	6.3	30S	35	57
1008	IPPSN2020-1008	NEP-TS-4	26	60S	0.9	5MS	2.7	10S	4	15S	35	57
1009	IPPSN2020-1009	NEP-TS-7	8.8	20MS	6.4	20MS	0.3	TS	12.9	40S	34	35
1010	IPPSN2020-1010	NEP-TS-1	7.2	20S	2.1	10MS	1.8	5S	6.3	30S	35	46
1011	IPPSN2020-1011	NEP-TS-18	34	80S	14.4	40S	11	40S	4.4	20S	46	67
1012	IPPSN2020-1012	DWAP-TS-14	24.8	60S	21.2	40S	14	40S	10.7	40S	35	68
1013	IPPSN2020-1013	DWAP-TS-13	16	40S	0.8	10MR	1.8	5S	11.9	40S	45	78
1014	IPPSN2020-1014	DWAP-TS-21	16	40S	6.1	20S	6.3	20S	16.1	40S	45	67
1015	IPPSN2020-1015	DWAP-TS-22	27.4	80S	28	60S	26	40S	4.3	15S	45	67
1016	IPPSN2020-1016	BST-A-TS-20	5.8	20MS	5.1	20S	0.3	TS	6	20S	45	57
1017	IPPSN2020-1017	BST-A-TS-05	24.8	40S	0.9	10MR	0.3	TS	6.3	20S	35	46
1018	IPPSN2020-1018	BST-A-TS-09	16.8	40S	5.4	10S	1.3	5S	5.3	20S	46	78
1019	IPPSN2020-1019	BST-A-TS-07	22.4	40S	6.8	20MS	5.9	10S	15	40S	45	67
1020	IPPSN2020-1020	BST-A-TS-10	8.8	20S	5	15MS	2.5	10S	11.3	20S	46	67
1020A	INFECTOR		72	100S	84	100S	62.5	80S	65	80S	67	79
1021	IPPSN2020-1021	BST-A-TS-19	5.2	20MS	1	5S	1.3	5S	23	40S	46	57
1022	IPPSN2020-1022	BST-A-TS-04	11	20S	1.6	20MR	2.5	10S	10.9	20S	24	45
1023	IPPSN2020-1023	QYT-TS-15	0.9	10MR	0.1	TR	5	20S	11.8	40S	35	58
1024	IPPSN2020-1024	QYT-TS-12	6	10S	17	80S*	3.8	10S	7.3	15S	34	46
1025	IPPSN2020-1025	QYT-TS-08	1.8	20MR	9	40S	11.5	40S	14.2	40S	45	57
1026	IPPSN2020-1026	QYT-TS-14	5.6	20S	14.8	40S	6.5	20MS	16.5	40S	45	58
1027	IPPSN2020-1027	QYT-TS-06	1.7	10MS	4	20S	0	0	5	20S	34	57
1028	IPPSN2020-1028	QYT-TS-03	8.1	40S	0	TR	2.6	5S	3.9	15S	45	67
1029	IPPSN2020-1029	GRU/2019-20/12	5.2	10S	2.7	10MS	1.3	5S	4.5	20S	24	35
1030	IPPSN2020-1030	RWP-TS-29	30.8	60S	12	20S	7.5	20S	22.3	60S	35	46
1031	IPPSN2020-1031	RWP-TS-19	27.6	60S	4.2	20MS	1.5	5S	10.1	20S	24	35
1032	IPPSN2020-1032	RWP-TS-03	15.2	40MS	4.1	10MS	4	10S	5.3	15S	35	46
1033	IPPSN2020-1033	RWP-TS-35	18	60S	12	40S	0.3	TS	4.4	10S	35	57
1034	IPPSN2020-1034	RWP-TS-36	16.8	40S	3.2	20MS	0.3	TS	16.9	40S	35	46
1035	IPPSN2020-1035	RWP-TS-22	46	80S	8.2	20S	2.8	10S	6.9	20S	34	46
1036	IPPSN2020-1036	RWP-TS-38	8.8	20MS	5.2	20S	1.3	5S	3.1	20S	35	57

No.	Entry code	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		Foliar blight	
			ACI	HS	ACI	HS	ACI	HS	ACI	HS	Avg.	HS
1037	IPPSN2020-1037	RWP-TS-25	34	40S	4.4	20MS	1.8	5S	5.5	15S	35	46
1038	IPPSN2020-1038	NEP-TS-23	5.8	20S	1.6	5MS	1.4	5S	12	40S	46	57
1039	IPPSN2020-1039	DWAP-TS-04	14	20S	26	80S	17.5	40S	13.8	40S	35	46
1040	IPPSN2020-1040	DWAP-TS-29	29.6	60S	2	5S	1.3	5S	3.6	15S	45	67
1040A	INFECTOR		84	100S	88	100S	62.5	80S	65	80S	67	79
1041	IPPSN2020-1041	DWAP-TS-07	14.2	40S	9	40S	2.7	10S	24	60S	35	67
1042	IPPSN2020-1042	DWAP-TS-26	18	40S	2.7	10MS	1.3	5S	12.9	40S	34	67
1043	IPPSN2020-1043	DWAP-TS-28	20.4	40S	1.6	5MS	2.3	5S	4.8	15S	34	67
1044	IPPSN2020-1044	BST-D-TS-04	10.1	40S	0.9	10MR	2.8	10S	4.9	20S	35	57
1045	IPPSN2020-1045	BST-A-TS-25	8	20MS	1.2	5MS	2.5	10S	17	40S	45	57
1046	IPPSN2020-1046	BST-A-TS-15	59.2	100S	9.2	20MS	6.5	20S	3.8	20S	45	78
1047	IPPSN2020-1047	BST-A-TS-26	48.8	100S	16	20S	18.8	40S	9.2	40S	56	78
1048	IPPSN2020-1048	BST-A-TS-17	36	80S	13.2	20S	8.8	10S	16.9	40S	46	78
1049	IPPSN2020-1049	BST-A-TS-14	21.6	40S	12.2	20S	10	20S	11.9	40S	45	78
1050	IPPSN2020-1050	QYT-TS-20	4.8	20S	9.6	40S	5.3	20S	8	40MS	34	57
1051	IPPSN2020-1051	QYT-TS-02	25.6	40S	4.5	10S	1.8	5S	7.3	20MS	35	78
1052	IPPSN2020-1052	QYT-TS-25	30	60S	8.8	20S	1.3	5S	7.5	40S	35	58
1053	IPPSN2020-1053	PYT-TS-SR-15	5.2	10S	1.6	10MS	1.3	5S	21.1	60S	46	68
1054	IPPSN2020-1054	RWP-IR-LS-13	52.8	80S	21.6	60S	0.4	TS	4.4	15S	45	68
1055	IPPSN2020-1055	RWP-IR-LS-07	32.8	80S	19.3	80S	8.8	20S	3	15S	35	57
1056	IPPSN2020-1056	RWP-IR-LS-12	7.2	20S	0.1	TR	3.8	10S	2	5S	24	36
1057	IPPSN2020-1057	RWP-IR-LS-05	45.6	80S	15.2	40S	16	20S	1.4	5S	45	68
1058	IPPSN2020-1058	RWP-IR-LS-10	7.2	20S	8	20S	3.3	10MS	5.6	20S	34	46
1059	IPPSN2020-1059	RWP-IR-LS-04	32.4	80S	6	20MS	22.5	40S	3.9	15S	34	46
1060	IPPSN2020-1060	RWP-IR-LS-02	16.9	60S	4.9	20S	1.3	5S	4.3	20S	45	57
1060A	INFECTOR		80	100S	84	100S	62.5	80S	65	80S	68	79
1061	IPPSN2020-1061	RWP-IR-LS-06	30.8	80S	18.4	80S*	5.3	20S	4.6	20S	45	57
1062	IPPSN2020-1062	NEPZ-LS-24	16	60S*	6.5	20S	2.5	10S	1.3	5S	35	46
1063	IPPSN2020-1063	NEPZ-LS-25	48	80S	21.6	40S	15	20S	3.1	10S	35	57
1064	IPPSN2020-1064	NEPZ-LS-08	7.6	20S	13.6	40S	7.5	20S	8.6	40S	45	67
1065	IPPSN2020-1065	NEPZ-LS-17	20	40S	5.6	20S	3.9	10S	6.3	20S	46	58
1066	IPPSN2020-1066	NEPZ-LS-04	17.3	80S*	4.9	20S	0.4	TS	2.9	10S	35	57
1067	IPPSN2020-1067	NEPZ-LS-12	13.6	40S	0.9	5MS	1.3	5S	4.3	10S	35	57
1068	IPPSN2020-1068	NEPZ-LS-09	48	100S	21.8	80S	12.5	40S	3.2	10S	34	46
1069	IPPSN2020-1069	DWAP-LS-06	19.2	40S	14.4	60S*	2.5	5S	3.2	10S	35	46
1070	IPPSN2020-1070	DWAP-LS-07	37.6	60S	21.2	40S	5.3	10S	11.3	40S	35	57
1071	IPPSN2020-1071	DWAP-LS-11	6.4	20MS	4.8	20MS	3.8	10S	15.8	40S	35	58
1072	IPPSN2020-1072	DWAP-LS-08	18	40S	10.8	30MS	8.5	20S	10.5	40S	45	57
1073	IPPSN2020-1073	DWAP-LS-13	23.3	60S	2.1	5MS	4.5	10S	4.1	10S	45	67
1074	IPPSN2020-1074	DWAP-LS-16	16.6	40S	3.2	10MS	1.3	5S	3	10S	35	57
1075	IPPSN2020-1075	DWAP-LS-19	3.2	20MS	1.7	10MS	0.3	TS	16.8	60S	45	67
1076	IPPSN2020-1076	DWAP-LS-14	11.2	20S	6.8	20S	11.3	40S	10.8	40S	24	35
1077	IPPSN2020-1077	BST-A-LS-01	16	40S	0.9	10MR	1.8	5S	5	20S	34	46
1078	IPPSN2020-1078	BST-A-LS-10	14	40S	6.4	20MS	0.2	TMS	17.4	60S	35	46
1079	IPPSN2020-1079	BST-A-LS-02	3.8	10S	4.9	20S	0.3	TS	4	15S	35	78
1080	IPPSN2020-1080	BST-A-LS-07	2.4	10MR	19.2	80S	5	20S	4.4	15S	34	46
1080A	INFECTOR		84	100S	84	100S	62.5	80S	62.5	80S	67	79
1081	IPPSN2020-1081	BST-A-LS-03	15.6	40S	14	20S	5.3	10S	16.4	40S	46	67
1082	IPPSN2020-1082	QYT-LS-1944	18	40S	8	20S	2.5	10S	12.1	40S	35	57
1083	IPPSN2020-1083	QYT-LS-1950	15	40S	6	20S	2.3	5S	6.9	20S	35	57
1084	IPPSN2020-1084	QYT-LS-1943	26	60S	5.6	20S	0.3	TS	3.1	15S	34	46
1085	IPPSN2020-1085	QYT-LS-1958	3.3	20MS	1.6	20MR	0.3	TS	5.5	15S	34	57
1086	IPPSN2020-1086	GRU/2019-20/13	19.6	40S	8.9	40S	1	5MS	3.8	10S	34	57
1087	IPPSN2020-1087	RWP-RI-14	14.4	40MS	14.4	40S	1.3	5S	31.3	60S	45	67
1088	IPPSN2020-1088	RWP-RI-16	31.2	60S	16.8	60S	0.5	5MR	5.4	15S	45	67
1089	IPPSN2020-1089	RWP-RI-02	1.3	10MR	4.1	20S	2.5	10S	3.5	15S	45	68

No.	Entry code	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		Foliar blight	
			ACI	HS	ACI	HS	ACI	HS	ACI	HS	Avg.	HS
1090	IPPSN2020-1090	RWP-RI-06	3.2	10MS	2.4	10MS	0.1	TMR	13	40S	35	57
1091	IPPSN2020-1091	RWP-RI-17	10.8	30MS	7.6	20MS	0.3	TS	4.9	15S	45	67
1092	IPPSN2020-1092	RWP-RI-07	48	80S	19.2	40S	4	10S	4	15S	45	68
1093	IPPSN2020-1093	RWP-RI-15	25.6	60S	7.6	20MS	1.4	5S	7	20S	45	78
1094	IPPSN2020-1094	RWP-RI-19	20.8	60S	4.4	20MS	0.3	TS	3.3	15S	35	68
1095	IPPSN2020-1095	NEPZ-RI-15	50	100S	36.8	80S	27.5	40S	4.9	15S	24	46
1096	IPPSN2020-1096	NEPZ-RI-06	56	100S	16.1	40S	12.8	20S	3.9	15S	34	46
1097	IPPSN2020-1097	NEPZ-RI-03	8	20S	0.9	5MS	1.5	5S	20.5	60S	35	46
1098	IPPSN2020-1098	NEPZ-RI-14	23.2	80S	4.5	20S	7.3	20S	4.5	15S	35	57
1099	IPPSN2020-1099	DWAP-10	23.4	80S	1.7	10MS	2.6	10S	3.7	15S	35	46
1100	IPPSN2020-1100	DWAP-04	8.4	40MS	4.1	20S	2.8	10S	22.5	60S	45	67
1100A	INFECTOR		76	100S	88	100S	62.5	80S	70	80S	67	79
1101	IPPSN2020-1101	DWAP-19	4.5	10S	8.5	20S	7.5	20S	24.5	60S	35	67
1102	IPPSN2020-1102	DWAP-06	16.3	40S	5.2	10S	3.5	10S	13.9	40S	45	67
1103	IPPSN2020-1103	BST-A-RI-1905	28.8	80S	28.8	40S	12.3	40S	6.8	20S	46	68
1104	IPPSN2020-1104	BST-A-RI-1904	13.6	40S	4.2	10MS	0.3	TS	24.4	60S	35	57
1105	IPPSN2020-1105	BST-A-RI-1907	40.6	80S	14.5	20S	5	20S	4.8	10S	45	78
1106	IPPSN2020-1106	QYT-RI-1926	2.7	10MS	2.1	10S	6.3	20S	15.5	40S	45	57
1107	IPPSN2020-1107	QYT-RI-1941	20.8	40S	6.8	20MS	1.4	5S	17.1	60S	35	57
1108	IPPSN2020-1108	GRU/2019-20/14	6.1	20S	1	5S	1.5	5S	13.3	40S	35	46
BHU, Varanasi												
1109	IPPSN2020-1109	HUWL2001	29	60S	20.8	40S	11.5	40S	20.4	60S	34	57
1110	IPPSN2020-1110	HUWL2002	9	20S	4.5	10S	2	10MS	35.9	60S	24	46
1111	IPPSN2020-1111	HUWL2003	14	40S	5.2	10S	5.3	20S	36	60S	35	57
1112	IPPSN2020-1112	HUWL2004	16.2	40S	4.9	20MS	2.5	10S	37	60S	24	35
1113	IPPSN2020-1113	HUWL2005	26.4	40S	17.6	80S*	3.3	10S	29.6	60S	35	57
1114	IPPSN2020-1114	HUWL2006	1.3	10MR	13.6	40S	11.3	40S	54.5	80S	35	46
1115	IPPSN2020-1115	HUWL2007	27.2	80S	1.6	10MR	4.3	10S	33.8	60S	35	57
1116	IPPSN2020-1116	HUWL2008	39.2	80S	13.6	20S	16.3	60S*	35.8	60S	35	57
1117	IPPSN2020-1117	HUWL2009	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
1118	IPPSN2020-1118	HUWL2010	52	80S	24.4	60S	28.5	60S	23.5	60S	45	67
1119	IPPSN2020-1119	HUWL2011	11.1	40S	20.1	80S*	0	0	19.7	40S	45	45
1120	IPPSN2020-1120	HUWL2012	11.2	20S	0.8	10MR	6.3	10S	27	60S	24	35
1120A	INFECTOR		84	100S	84	100S	62.5	80S	67.5	80S	67	79
1121	IPPSN2020-1121	HUWL2013	1.2	10MR	3.5	20MS	0	0	18	40S	45	67
1122	IPPSN2020-1122	HUWL2014	30	60S	2.8	10S	4.3	10S	32.5	60S	45	57
1123	IPPSN2020-1123	HUWL2015	5.6	20S	2.1	10MS	2.5	10S	17	40S	45	67
1124	IPPSN2020-1124	HUWL2016	10.4	40S	3.6	20MS	0.1	TMR	26.8	60S	46	78
1125	IPPSN2020-1125	HUWL2017	32	80S	11.2	40S	7.3	20S	30.9	60S	45	57
1126	IPPSN2020-1126	HUWL2018	23.2	80S	25.6	60S	13.6	40S	29.1	60S	45	67
1127	IPPSN2020-1127	HUWL2019	32	60S	14.8	40S	7.3	20S	12	40S	35	48
1128	IPPSN2020-1128	HUWL2020	21.8	40S	6	20MS	1.3	5S	20.1	60S	45	46
1129	IPPSN2020-1129	HUWL2021	39	80S	20	60S	7.3	20S	12.1	40S	45	68
1130	IPPSN2020-1130	HUWL2022	27.2	60S	10.4	20S	12.7	40S	17.8	40S	45	68
1131	IPPSN2020-1131	HUWL2023	24.8	60S	9.6	20MS	6	20S	21.4	40S	46	78
1132	IPPSN2020-1132	HUWL2024	32.2	60S	11.6	40S	5	20S	24.4	40S	35	57
1133	IPPSN2020-1133	HUWL2025	43.2	100S	10	20S	10	20S	8.8	20S	35	57
1134	IPPSN2020-1134	HUWL2026	39.6	80S	6	20S	3.8	10S	16.8	40S	35	46
1135	IPPSN2020-1135	HUWL2027	25.4	60S	5.2	20S	3.8	10S	15.4	40S	35	46
1136	IPPSN2020-1136	HUWL2028	24	60S	11.2	40S	0.1	TMR	12.3	40S	35	46
1137	IPPSN2020-1137	HUWL2029	32	60S	4.4	10S	1.4	5S	23.3	40S	36	57
1138	IPPSN2020-1138	HUWL2030	11.2	20S	9.2	20S	5.8	20S	6.4	20S	35	58
1139	IPPSN2020-1139	HUWL2031	3	10S	12.8	40S	2.3	5S	11	20S	35	57
1140	IPPSN2020-1140	HUWL2032	29.6	60S	7.7	20S	3.8	10S	16.3	40S	45	68
1140A	INFECTOR		80	100S	88	100S	62.5	80S	67.5	80S	67	79
1141	IPPSN2020-1141	HUWL2033	4.8	10MS	39.6	80S	26.3	60S	22.9	40S	46	68

No.	Entry code	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		Foliar blight	
			ACI	HS	ACI	HS	ACI	HS	ACI	HS	Avg.	HS
1142	IPPSN2020-1142	HUWL2034	11.2	20S	12.8	60S*	3.8	10S	12.8	40S	35	46
1143	IPPSN2020-1143	HUWL2035	32.1	80S	35.2	80S	22.8	40S	27.8	60S	56	78
1144	IPPSN2020-1144	HUWL2036	24	80S	24.8	60S	15.5	40S	10.2	20S	56	68
1145	IPPSN2020-1145	HUWL2037	20	60S	14.4	40S	4.8	10S	6.4	20MS	45	67
1146	IPPSN2020-1146	HUWL2038	17.6	40S	11.2	20S	10.3	20S	11.4	40S	45	68
1147	IPPSN2020-1147	HUWL2039	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
1148	IPPSN2020-1148	HUWL2040	6.8	20MS	27.2	60S	27.5	60S	26.5	40S	46	68
Bioseed Research India												
1149	IPPSN2020-1149	BW17R2038	32.8	60S	16.8	40S	2.3	5S	27.5	60S	46	57
1150	IPPSN2020-1150	BW17R6045	33.6	80S	12.8	20S	5.3	20S	18.8	60S	46	68
Sahib Seeds												
1151	IPPSN2020-1151	Sahib 2603	2.4	10MS	1.2	5MS	1.3	5S	27	60S	35	57
JNKVV Sagar												
1152	IPPSN2020-1152	920(d)	2.9	10S	1.3	10MR	11.3	40S	3.6	20S	56	78
1153	IPPSN2020-1153	926	16.4	40S	49.6	80S	20	60S	48.5	80S	35	57
1154	IPPSN2020-1154	946	0.1	TMR	5.2	15MS	6.8	20S	16.5	60S	46	68
1155	IPPSN2020-1155	948	2.8	10MS	8.8	20MS	4.3	10S	29	80S	46	67
1156	IPPSN2020-1156	1006	3.6	10MS	0.1	TR	11.3	40S	30.3	80S	46	78
1157	IPPSN2020-1157	1013	14.8	40S	19.2	40S	3.8	10S	39.5	80S	46	68
1158	IPPSN2020-1158	1117	0.5	5MR	0.1	TR	2	5S	11.6	30S	46	67
1159	IPPSN2020-1159	1119	2.4	10MS	2.1	10S	10.3	40S	20.3	60S	35	57
1160	IPPSN2020-1160	1216	2.8	10MS	11.2	40S	16.3	40S	28.5	60S	35	57
1160A	INFECTOR		84	100S	72	100S	62.5	80S	65	80S	68	79
1161	IPPSN2020-1161	1322	13.6	40S	18.4	60S	3.7	10S	24.4	80S	34	45
RPCAU, Pusa												
1162	IPPSN2020-1162	RAUW 11	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
1163	IPPSN2020-1163	RAUW 12	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
1164	IPPSN2020-1164	RAUW 13	7.6	20S	0.1	TR	3	10S	22.9	60S	45	57
1165	IPPSN2020-1165	RAUW 14	13.3	20S	2	5MS	0.3	TS	1.3	5S	46	56
1166	IPPSN2020-1166	RAUW 15	10.8	20S	4.8	20MS	11.3	40S	3.5	15S	35	57
RARI, Durgapura												
1167	IPPSN2020-1167	WR 2065	8	20S	12.4	30MS	3	10S	22.7	60S	46	67
1168	IPPSN2020-1168	WR 2066	3.6	10S	1.7	10MS	1.8	5S	21.4	60S	46	68
1169	IPPSN2020-1169	WR 2067	6	20MS	4.9	20S	7.5	20S	11.9	40S	46	78
1170	IPPSN2020-1170	WR 2068	1.3	5MS	11.2	40S	8.8	20S	12.3	60S	46	78
1171	IPPSN2020-1171	WR 2069	1.1	10MR	8	20S	3.8	10S	7.9	40S	45	78
1172	IPPSN2020-1172	WR 2070	4.1	20S	12.8	40S	12.5	40S	11.3	60S	45	78
1173	IPPSN2020-1173	WR 2071	37.6	80S	16	40S	20	40S	10.6	40S	45	68
1174	IPPSN2020-1174	WR 2072	36.8	80S	32	40S	21.3	40S	26.2	60S	35	57
1175	IPPSN2020-1175	WR 2073	40	100S	10.4	20S	7.8	10S	7.5	20S	35	57
1176	IPPSN2020-1176	WR 2074	41.6	100S	11.2	20S	4.5	10S	5.2	20S	46	58
1177	IPPSN2020-1177	WR 2075	25	60S	7.2	20MS	11.3	40S	7.9	20S	46	57
1178	IPPSN2020-1178	WR 2076	36	80S	29.2	60S	17.5	40S	13.2	60S	45	67
1179	IPPSN2020-1179	WR 2077	64	80S	30	40S	15.2	40S	11.5	40S	45	67
1180	IPPSN2020-1180	WR 2078	64	80S	22	40S	13.8	20S	14.8	40S	57	78
1180A	INFECTOR		84	100S	84	100S	62.5	80S	65	80S	68	79
1181	IPPSN2020-1181	WR 2079	29.6	100S	13	40S	10.3	40S	5.3	20S	45	57
1182	IPPSN2020-1182	WR 2080	2	20MR	2.4	20MR	3.8	10S	24.4	40S	46	68
1183	IPPSN2020-1183	WR 2081	20.8	60S	8.4	20MS	4	10S	17.5	40S	45	57
1184	IPPSN2020-1184	WR 2082	1.3	10MR	6	15MS	6.3	20S	19.7	60S	35	57
1185	IPPSN2020-1185	WR 2083	15.4	40MS	4.4	15MS	13	40S	13.9	40S	35	46
1186	IPPSN2020-1186	WR 2084	37.6	80S	12	20S	10	10S	11.6	40S	35	57
1187	IPPSN2020-1187	WR 2085	1.6	10MR	0.9	5MS	2.5	10S	19.8	60S	45	57
1188	IPPSN2020-1188	WR 2086	4	10MS	6	20MS	12	40S	4.9	20MS	45	57
1189	IPPSN2020-1189	WR 2087	35.2	80S	15.6	40S	16.3	40S	5.8	20S	45	67
1190	IPPSN2020-1190	WR 2088	27.3	80S	23.5	60S	2.5	10S	4.4	15S	45	67

No.	Entry code	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		Foliar blight	
			ACI	HS	ACI	HS	ACI	HS	ACI	HS	Avg.	HS
1191	IPPSN2020-1191	WR 2089	2.5	10MS	0.6	5MR	12	40S	6.9	20S	45	57
1192	IPPSN2020-1192	WR 2090	3.6	10S	8.9	40S	2.5	10S	19.8	60S	35	46
1193	IPPSN2020-1193	WR 2091	2	20MR	13.8	40S	7.5	20S	10.1	40S	46	57
1194	IPPSN2020-1194	WR 2092	1.6	10MS	15.3	60S	0.8	5MR	12.9	40S	35	57
1195	IPPSN2020-1195	WR 2093	0	TR	8	40S	6.3	20S	10.7	40S	35	57
1196	IPPSN2020-1196	WR 2094	0.4	5MR	5.6	20S	5	20S	11.1	40S	45	68
1197	IPPSN2020-1197	WR 2095	1.6	10MR	3.6	10S	5.3	20S	9.6	40S	45	78
1198	IPPSN2020-1198	WR 2096	26	80S	11.4	40S	13.8	40S	2.5	10S	35	46
1199	IPPSN2020-1199	WR 2097	16.8	60S	11.6	40S	13.8	40S	3.5	15S	46	57
1200	IPPSN2020-1200	WR 2098	24	80S	7.6	20S	15	40S	8.9	20S	46	57
1200A	INFECTOR		84	100S	88	100S	62.5	80S	65	80S	68	79
1201	IPPSN2020-1201	WR 2099	17.2	40MS	15.2	60S*	3.8	10S	23.7	60S	46	57
1202	IPPSN2020-1202	WR 2100	8.4	20MS	6	10S	2.5	10S	5.9	20S	35	58
1203	IPPSN2020-1203	WR 2101	23.2	60S	5	20MS	2.5	10S	18.8	40S	34	36
1204	IPPSN2020-1204	WR 2102	26.8	60S	2.4	10MR	1.3	5S	5.8	20S	35	57
1205	IPPSN2020-1205	WR 2103	18	60S	0.2	TMR	0.3	TS	6.9	20S	34	46
1206	IPPSN2020-1206	WR 2104	1.6	10MS	0	TR	0.3	TS	20.6	40S	25	37
1207	IPPSN2020-1207	WR 2105	3.2	20MS	0	TR	2.5	10S	11.3	20S	35	57
1208	IPPSN2020-1208	WR 2106	11.3	40S	4.8	10MS	3.8	10S	18.3	60S	45	67
1209	IPPSN2020-1209	WR 2107	23.6	80S	0	TR	1.3	5S	11.1	20S	35	57
1210	IPPSN2020-1210	WR 2108	4.1	20S	1	5S	12.7	40S	24.5	60S	24	35
1211	IPPSN2020-1211	WR 2109	7.6	20S	12.8	60S*	1.3	5S	26.8	40S	35	58
1212	IPPSN2020-1212	WR 2110	15	40S	1.6	5MS	3.8	10S	6.9	20MS	35	57
1213	IPPSN2020-1213	WR 2111	14.4	40S	4.4	10S	10	20S	28	60S	35	57
1214	IPPSN2020-1214	WR 2112	14	40S	8.8	20S	5	10S	16.4	40S	45	57
1215	IPPSN2020-1215	WR 2113	8.5	40S	5.6	20S	2.5	10S	13.5	40S	34	46
1216	IPPSN2020-1216	WR 2114	3.6	20MS	4.4	20MS	2.5	10S	8.3	20S	46	67
BARC, Mumbai												
1217	IPPSN2020-1217	TAW40	24	60S	2.8	10S	1.3	5S	32.4	80S	24	35
1218	IPPSN2020-1218	TAW41	8.4	40MS	3.7	20MS	0.3	TS	28	40S	35	46
1219	IPPSN2020-1219	TAW66	15	40S	4.4	15MS	0.3	TS	12.3	30S	34	57
1220	IPPSN2020-1220	TAW90	11.2	40S	4.1	20S	6.3	20S	19.1	40S	45	57
1220A	INFECTOR		76	100S	84	100S	62.5	80S	70	80S	68	79
1221	IPPSN2020-1221	TAW99	15.2	40S	8.1	40S	0.3	TS	18.3	40S	35	46
1222	IPPSN2020-1222	TAW100	16.2	40S	4.8	20S	0.3	TS	30.1	60S	35	57
1223	IPPSN2020-1223	TAW101	2.8	20MR	22.4	60S	21.5	40S	37.4	80S	45	58
1224	IPPSN2020-1224	TAW76	19.6	60S	5.6	15MS	12	40S	9.3	20S	45	67
1225	IPPSN2020-1225	TAW77	32	60S	18.4	40S	13.3	40S	2.8	10S	56	68
1226	IPPSN2020-1226	TAW121	25.6	80S	12.2	60S*	10	40S	13.9	40S	35	57
1227	IPPSN2020-1227	TAW133	1.2	10MR	5.7	20S	7.5	20S	5.4	20S	35	68
1228	IPPSN2020-1228	TAW142	19.2	60S	1.4	5S	2.5	5S	6.2	15S	34	57
QCWBN												
1229	IPPSN2020-1229	BWL 6801	26	40S	1.7	10MS	1.5	5S	8.8	40S	35	57
1230	IPPSN2020-1230	BNSR-6	20	60S	4.2	10MS	7.5	20S	19.5	40S	46	57
1231	IPPSN2020-1231	UP 3101	2.8	20MR	5.2	20S	3	5S	10.8	40S	35	67
1232	IPPSN2020-1232	IND 573	3.2	20MR	0.5	5MR	2.5	10S	56.9	100S	45	78
1233	IPPSN2020-1233	MACS 6823	9.6	40S	3.4	10MS	2.5	10S	14.7	40S	46	57
1234	IPPSN2020-1234	QLD 117	14	20S	8.1	20MS	0.1	TMR	4.7	10S	35	46
1235	IPPSN2020-1235	MACS 6821	46	60S	4.4	20MS	0.3	TS	41.9	60S	45	57
1236	IPPSN2020-1236	NEQ-2020-2	54	100S	10.5	20S	16.3	40S	7.4	20S	34	46
1237	IPPSN2020-1237	BWL 9986	32	80S	14.8	40S	10	20S	11	20S	24	36
1238	IPPSN2020-1238	UASQ 331	17.7	80S	8.5	40MS	5.3	20S	1.5	10S	46	67
1239	IPPSN2020-1239	CG 2021	18.4	60S	13.6	60S*	1.3	5S	41.4	80S	45	78
1240	IPPSN2020-1240	MACS 6822	8.8	20S	0.9	10MR	1.3	5S	10.5	20S	45	68
1240A	INFECTOR		76	100S	88	100S	62.5	80S	67.5	80S	67	79
1241	IPPSN2020-1241	QLD 120	3.6	10MS	6	20MS	2.6	10S	6.4	20S	45	57

No.	Entry code	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		Foliar blight	
			ACI	HS	ACI	HS	ACI	HS	ACI	HS	Avg.	HS
1242	IPPSN2020-1242	UP 3104	1.2	10MR	12.1	60S*	3.5	5S	8	40S	35	46
1243	IPPSN2020-1243	GW-A-2020-999	9.6	40S	4.1	20S	5	20S	40	80S	46	68
1244	IPPSN2020-1244	DWAP-2026	6.4	20MS	14.5	60S	2.8	10S	37.5	80S	35	57
1245	IPPSN2020-1245	ID 2017	16.4	80S	0.1	TR	1.3	5S	2.3	10S	46	67
1246	IPPSN2020-1246	DWAP 1926	21.8	100S	16.1	80S*	0.3	TS	5.7	40S	46	57
1247	IPPSN2020-1247	BWL 9981	6.8	20MS	2.5	10MS	1.5	5S	14.5	40S	35	36
1248	IPPSN2020-1248	MACS 6824	0	TR	0.5	5MR	0.3	TS	10.3	40S	46	57
1249	IPPSN2020-1249	QLD 119	2	10MS	16.1	80S*	0	0	25.7	60S	45	57
1250	IPPSN2020-1250	IND 572	1.2	10MR	0	TR	1.3	5S	31.9	60S	46	68
1251	IPPSN2020-1251	QLD 121	1.8	5S	5.2	20S	3.5	10S	11.7	40S	35	35
1252	IPPSN2020-1252	QBI-19 - 09	8	20S	2.1	20MR	2.5	10S	13.1	40S	35	47
1253	IPPSN2020-1253	QLD 118	30	60S	12.2	40S	6	10S	10.8	40S	35	56
1254	IPPSN2020-1254	GW - A- 2019-955	2.4	10MS	2.1	10MS	0.3	TS	16.7	40S	36	47
1255	IPPSN2020-1255	QBI 19-27	3.6	40MR	10.4	30MS	1.3	5S	23.4	40S	45	57
1256	IPPSN2020-1256	QBP-18-15	25.6	60S	11.2	40S	2.8	10S	19.5	40S	45	68
1257	IPPSN2020-1257	RWP 1002	7.4	20MS	4	20S	0.3	TS	4	10S	35	57
1258	IPPSN2020-1258	QBI-20-20	2	10MS	17.6	80S*	0.3	TS	13.3	40S	46	57
1259	IPPSN2020-1259	GW-A-2020-1002	4.8	40MR	8.2	20MS	2.4	5S	37	80S	45	67
1260	IPPSN2020-1260	QLD 122	3.2	20MR	4.9	20S	2.7	10S	4.9	10S	35	46
1260A	INFECTOR		84	100S	88	100S	62.5	80S	67.5	80S	57	79
1261	IPPSN2020-1261	CG 2023	41.2	80S	26.4	80S	17.5	60S	50	80S	35	57
1262	IPPSN2020-1262	DWAP 1925	1.6	10MR	10.4	40S	1.3	10S	18	40S	45	68
1263	IPPSN2020-1263	QBI-20-14	3.6	10S	1.7	10MS	2.5	10S	3.9	10MS	35	57
1264	IPPSN2020-1264	QBI 19-24	26	80S	5	20S	7.5	20S	20.6	60S	35	57
1265	IPPSN2020-1265	GW-A-2020-998	2	20MR	0.2	TMS	1.3	5S	25.8	60S	46	68
1266	IPPSN2020-1266	QLD 123	6.8	20MS	2.4	10MS	0.4	TS	6.1	20S	35	57
1267	IPPSN2020-1267	RWP 1146	20	60S	23.6	60S	22.5	40S	5.1	20S	35	57
1268	IPPSN2020-1268	DWAP-2025	34	80S	20.8	40S	6.3	20S	9.6	20S	46	67
1269	IPPSN2020-1269	QBI-20-9	19.2	40S	7.6	20S	16	20S	21.9	60S	46	68
1270	IPPSN2020-1270	BNSR-7	4.8	20S	0.1	TMR	3.8	10S	26.8	60S	35	57
1271	IPPSN2020-1271	HTW 2019-21	13.6	60S	1.7	5MS	6.5	20S	35.5	80S	45	67
1272	IPPSN2020-1272	GW-A-2019-957	0.4	5MR	2.4	5MS	2.5	10S	18.9	40S	56	78
1273	IPPSN2020-1273	QBI-19 - 15	0.8	5MS	1.9	5S	1.3	5S	28.8	60S	35	57
1274	IPPSN2020-1274	GW - (d)- 2019-987	9.6	20S	1.7	10MS	0.3	TS	3	10MS	46	78
1275	IPPSN2020-1275	UASQ 330	17.6	80S	0.1	TR	0.3	TS	11.2	40S	45	67
1276	IPPSN2020-1276	NEQ-2020-1	4.4	20S	0	TR	1.3	5S	9.6	40S	35	78
BRNS												
1277	IPPSN2020-1277	DBW88-1	19	60S	0	TR	2.5	10S	12.3	40S	24	57
1278	IPPSN2020-1278	DBW88-2	12.8	40S	2.6	10MS	1.3	5S	28.9	60S	24	57
1279	IPPSN2020-1279	DBW88-3	6.4	40MR	1.1	5S	0.3	TS	11.9	40S	34	46
1280	IPPSN2020-1280	DBW88-4	26	60S	2.1	10S	2.5	10S	16.4	60S	35	58
1280A	INFECTOR		76	100S	88	100S	62.5	80S	70	80S	68	79
1281	IPPSN2020-1281	DBW88-5	23.6	60S	1.6	5MS	1.5	5S	18.9	60S	24	35
1282	IPPSN2020-1282	DBW88-6	11.6	20S	5.8	20S	2.5	10S	27.5	60S	24	36
1283	IPPSN2020-1283	DBW88-7	24.6	60S	8.4	40S	0.3	TS	15.1	60S	24	46
1284	IPPSN2020-1284	DBW88-8	9.2	20MS	6.8	20MS	1.3	5MS	7.3	40S	34	57
1285	IPPSN2020-1285	DBW88-9	25.6	80S	20.8	80S	7.3	20S	14.2	40S	24	36
1286	IPPSN2020-1286	DBW88-10	32	60S	12	40S	2.5	10S	17	40S	24	46
1287	IPPSN2020-1287	DBW88-11	27.2	80S	15.3	40S	5.3	20S	18.9	40S	35	57
1288	IPPSN2020-1288	DBW88-12	26	80S	6	10S	3.8	10S	21.4	40S	24	46
1289	IPPSN2020-1289	DBW88-13	22	60S	18.4	40S	12.3	40S	26.4	60S	24	35
1290	IPPSN2020-1290	DBW88-14	20.4	40S	5.6	20S	0.3	TS	28.6	60S	35	57
1291	IPPSN2020-1291	DBW88-15	8.4	20MS	2.5	10MS	1.4	5S	13.6	40S	35	46
1292	IPPSN2020-1292	DBW88-16	21.6	40S	1.7	10MS	2.5	10S	9.3	40S	35	57
1293	IPPSN2020-1293	DBW88-17	18.6	40S	1.7	10MS	2.6	10S	6.1	20S	35	46
1294	IPPSN2020-1294	DBW88-18	22.6	60S	2.6	20,MR	5	20S	5.6	20S	35	68

No.	Entry code	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		Foliar blight	
			ACI	HS	ACI	HS	ACI	HS	ACI	HS	Avg.	HS
1295	IPPSN2020-1295	DBW88-19	8.8	20S	7.2	20MS	0.1	TMR	11.3	40S	24	46
1296	IPPSN2020-1296	DBW88-20	19	60S	0.8	10MR	2.5	10S	26.4	40S	24	57
1297	IPPSN2020-1297	DBW88-21	16	60S	8	15MS	3.9	10S	19.3	60S	35	36
1298	IPPSN2020-1298	DBW88-22	6.2	20MS	7.4	20S	1.4	5S	24.9	60S	35	57
1299	IPPSN2020-1299	DBW88-23	28	80S	6.8	20S	3.9	10S	7.3	20S	45	68
1300	IPPSN2020-1300	DBW88-24	19.2	60S	2.8	20MR	1.3	5S	25.2	60S	24	57
1300A	INFECTOR		80	100S	84	100S	62.5	80S	65	80S	68	79
SATSN												
1301	IPPSN2020-1301	KRL-2001	40	80S	26	60S	11.5	40S	17.4	40S	35	57
1302	IPPSN2020-1302	KRL-2006	29	80S	6.2	20MS	0.3	TS	11.8	40S	34	45
1303	IPPSN2020-1303	KRL-2009	0.1	TMR	0.8	10MR	0	0	9.9	40S	34	57
1304	IPPSN2020-1304	KRL-2011	0.4	5MR	4.6	20MS	0	0	8.8	20S	45	68
1305	IPPSN2020-1305	KRL-2012	4.5	10S	1.7	10MS	0	0	3.5	15S	34	57
1306	IPPSN2020-1306	KRL-2017	3	10MS	4.8	20MS	1.3	5S	8.6	20S	45	68
1307	IPPSN2020-1307	KRL-2018	42	80S	3.2	10MS	3.8	10S	24.5	60S	45	57
1308	IPPSN2020-1308	KRL-2023	10.4	40MS	16.8	60S	0.3	TS	16.5	40S	46	78
1309	IPPSN2020-1309	KRL-2026	8.8	20S	7.2	20MS	1.3	5S	4.6	20MS	35	78
1310	IPPSN2020-1310	KRL-2027	11.4	40S	2	10S	0	0	4.8	10S	46	68
1311	IPPSN2020-1311	RWP1116	12	40S	2.9	10S	0.3	TS	4.2	20S	35	57
1312	IPPSN2020-1312	RWP1119	1.4	5S	9	40S	12.5	40S	13.6	40S	45	58
1313	IPPSN2020-1313	LBP-2019-14	6.2	20MS	8.8	20S	2.5	10S	22.4	60S	35	67
1314	IPPSN2020-1314	LBP-2019-21	6.4	15MS	6.2	20MS	2.5	10S	19.6	60S	35	68
1315	IPPSN2020-1315	LBP-2019-31	47.2	80S	16.4	60S	11.5	40S	2.3	10S	35	46
1316	IPPSN2020-1316	DWAP2022	12	40S	3.2	10MS	2.5	10S	7.1	20S	35	68
1317	IPPSN2020-1317	DWAP2023	14	40S	1.6	10MS	1.3	5S	5.5	20S	24	36
1318	IPPSN2020-1318	DWAP2024	8.4	20S	4	10S	0.3	TS	25.6	60S	35	57
1319	IPPSN2020-1319	SANSR-8	15.2	40S	7.2	20MS	5	10S	30.1	60S	35	58
1320	IPPSN2020-1320	SANSR-9	3.6	10S	9.2	20S	5	20S	22.4	40S	35	67
1320A	INFECTOR		88	100S	88	100S	62.5	80S	67.5	80S	68	79
1321	IPPSN2020-1321	HD3414	20.2	60S	13.2	40S	16.3	60S*	11.6	40S	35	78
1322	IPPSN2020-1322	HD3415	19.2	40S	5.2	10S	0.5	5MR	12.3	20S	34	45
1323	IPPSN2020-1323	K1901	13.4	40MS	17.8	80S*	16.3	60S*	2.5	15S	34	46
1324	IPPSN2020-1324	K1905	12.4	40MS	16.8	80S*	0	0	18.1	40S	45	57
1325	IPPSN2020-1325	NW-8003	9.2	20S	17.6	80S*	5	20S	10.9	40S	46	68
1326	IPPSN2020-1326	NW-8005	8.3	20S	19.4	60S	11.3	40S	5.4	10S	35	68
1327	IPPSN2020-1327	WH1278	5.3	40MR	4.5	20MS	1.3	5S	7.1	20S	45	78
1328	IPPSN2020-1328	WH1283	7.2	20MS	0.1	TR	1.3	5S	3.4	20MS	46	57
1329	IPPSN2020-1329	BWL5179	10	20MS	1.7	10MS	4.5	10S	0.5	5MS	34	46
1330	IPPSN2020-1330	BWL6851	19	60S	8	20MS	3	5S	2.6	10MS	46	67
1331	IPPSN2020-1331	RAJ4564	24	40S	26	80S	14.5	40S	4.1	20S	46	68
1332	IPPSN2020-1332	RAJ4565	19	60S	6.5	20S	10.5	20S	6.8	20S	45	67
1333	IPPSN2020-1333	UASS300	24	80S	3.4	10MS	2	10MS	3.9	10S	35	57
1334	IPPSN2020-1334	UASS310	17	40S	4.1	20S	0	0	13.8	40S	24	46
1335	IPPSN2020-1335	KRL210 ©	34	80S	6.4	20S	13.5	40S	5.7	20MS	46	67
1336	IPPSN2020-1336	KRL19 ©	12.6	40S	28	60S	18.8	60S	39.9	80S	46	68
Station Trial (C)												
1337	IPPSN2020-1337	CST-1	16	60S	10	40S	13.3	4S	3	15S	45	57
1338	IPPSN2020-1338	CST-2	9.6	40MS	7.2	20S	0	0	12.6	40S	35	46
1339	IPPSN2020-1339	CST-3	9.4	40MS	10	40S	0.7	5MR	18.1	40S	35	46
1340	IPPSN2020-1340	CST-4	9.6	40MS	1.6	20MR	0	0	7	20MS	34	57
1340A	INFECTOR		84	100S	76	100S	66.7	80S	67.5	80S	67	79
1341	IPPSN2020-1341	CST-5	16	60S	2.2	10S	3.3	10S	7.5	20S	46	57
1342	IPPSN2020-1342	CST-6	16	40S	1.9	5S	0	0	5	20MS	35	46
1343	IPPSN2020-1343	CST-7	29	60S	10.8	40S	6.7	20S	8.7	40S	45	67
1344	IPPSN2020-1344	CST-8	32	60S	6.4	20S	1.3	5MS	2.4	10MS	45	67

No.	Entry code	Entry	Stem rust		Leaf rust (S)		Leaf rust (N)		Stripe rust		Foliar blight	
			ACI	HS	ACI	HS	ACI	HS	ACI	HS	Avg.	HS
1345	IPPSN2020-1345	CST-9	28	60S	11.2	40S	16.7	40S	24.9	60S	45	67
1346	IPPSN2020-1346	CST-10	22.8	60S	1.1	5S	0	0	8.1	20MS	35	46
1347	IPPSN2020-1347	CST-11	15	40S	0.8	10MR	0.3	TMS	13	40S	35	57
1348	IPPSN2020-1348	CST-12	7	20S	0.1	TMR	0.1	TMR	4.9	10S	35	46
1349	IPPSN2020-1349	CST-13	21	60S	0	TR	0.7	5MR	4.4	20S	35	57
1350	IPPSN2020-1350	CST-14	10	40MS	1.6	20MR	0	0	7	20MS	34	46
1351	IPPSN2020-1351	CST-15	26	80S	7.2	20S	1.7	5S	4.5	20MS	35	46
1352	IPPSN2020-1352	CST-16	36	80S	8.9	20S	0.7	5MR	2.4	5S	35	46
1353	IPPSN2020-1353	CST-17	50	80S	7.6	20S	0	0	5.1	10S	34	46
1354	IPPSN2020-1354	CST-18	22	80S	10.8	20S	5	10S	4.5	10MS	35	57
1355	IPPSN2020-1355	CST-19	10	40MS	4.8	20S	0	0	5.5	20S	35	57
1356	IPPSN2020-1356	CST-20	1	5S	0.1	TR	1.7	5S	15.3	40S	35	36
1357	IPPSN2020-1357	CST-21	1.8	5S	2.8	10S	1.7	5S	19.9	40S	35	46
1358	IPPSN2020-1358	CST-22	11.2	40MS	5.9	20MS	0.1	TR	8.8	20S	35	46
1359	IPPSN2020-1359	CST-23	17	40S	5.7	20S	0	0	14.4	40S	35	57
1360	IPPSN2020-1360	CST-24	18	60S	1.7	5MS	0	0	14.6	40S	35	46
1360A	INFECTOR		80	100S	88	100S	66.7	80S	67.5	80S	68	79
1361	IPPSN2020-1361	CST-25	24.4	40S	5.6	20S	1.7	5S	4.9	20S	35	46
ARS, PDKV, Washim												
1362	IPPSN2020-1362	WSM 138	6	20MS	1.7	20MR	0.1	TR	21.9	60S	46	57

Abbreviations: ACI = Average Coefficient of Infection, HS = Highest Score, Avg. = Mean, *Indicates high rust score (more than 40S) at one location only.

Annexure 7: Performance of the entries screened against wheat blast at Jashore, Bangladesh during 2019-20 and at two locations i.e. Jashore, Bangladesh and Quirassallis during 2020-21.

S. No.	Entries	Avg.	HS
1	HPW473	27.9	48.0
2	HPW474	61.2	100.0
3	HS679	50.9	100.0
4	HS680	0.0	0.0
5	HS681	15.0	80.0
6	VL3022	0.0	0.0
7	VL3023	18.4	64.4
8	VL3024	1.7	10.0
9	UP3069	43.6	97.0
10	HS675	45.8	100.0
11	HS676	54.8	97.8
12	HS677	47.6	100.0
13	HS678	44.3	87.5
14	HPW469	46.4	100.0
15	HPW470	52.6	100.0
16	HPW471	50.1	93.7
17	HPW472	47.4	100.0
18	VL2039	38.9	98.0
19	VL2040	60.4	100.0
20	VL2041	15.0	90.0
21	VL2042	68.4	100.0
22	UP3064	51.8	100.0
23	SKW 356	37.8	78.9
24	PBW803	43.0	100.0
25	PBW840	61.5	100.0
26	PBW811	53.7	89.5
27	PBW813	77.7	100.0
28	PBW812	41.5	80.8
29	DBW290	51.0	90.0
30	DBW291	41.6	72.9
31	HD3334	0.0	0.0
32	HD3332	40.7	92.4
33	HD3331	5.0	20.0
34	HD3298	50.1	96.7
35	WH1264	16.1	29.9
36	UP3033	56.9	100.0
37	JKW261	1.7	10.0
38	DBW296	30.2	80.0
39	HUW838	1.7	10.0
40	JAUW672	52.9	82.7
41	PBW804	39.1	90.0
42	HD3293	1.7	10.0
43	TAW155	18.1	100.0
44	HI1636	41.1	89.6
45	MP1361	27.8	65.9
46	MACS6747	48.3	95.4
47	HD3377B	1.7	10.0
48	HI1637	44.2	95.0
49	RAJ4541B	48.9	94.6
50	GW513	45.3	100.0
51	GW322 (C)	69.5	100.0
52	HI1544 (C)	48.3	87.5
53	HI1634Q*	62.3	100.0

S. No.	Entries	Avg.	HS
54	HD2932 (C)	50.5	95.2
55	MP3336 (C)	50.8	96.5
56	HD2864 (C)	42.9	88.9
57	CG1029*	45.4	95.3
58	MPO1357(d)	32.0	97.9
59	HI8627(d) (C)	46.9	100.0
60	UAS466(d)(I) (C)	48.5	87.9
61	UAS472(d)	50.3	91.8
62	DBW110 (C)	46.5	91.9
63	MP3288 (C)	68.1	97.9
64	HI 8823(d)	47.3	100.0
65	DDW47(d)(I) (C)	41.1	100.0
66	DDW48	64.4	100.0
67	DDW49	81.0	90.0
68	WHD964	83.6	100.0
69	HI8818	44.6	77.6
70	UAS3008	51.5	100.0
71	HI1633	72.9	100.0
72	HI1641	42.4	79.8
73	HI1642	50.0	82.4
74	HI1646	35.0	100.0
75	MACS6752	56.2	92.9
76	MACS6749	68.7	100.0
77	GW519	60.8	100.0
78	MACS4087	22.0	80.0
79	NIDW1149	29.0	75.8
80	MP1358	0.0	0.0
81	MPO1357	60.0	100.0
82	UAS472	62.3	100.0
83	HD3348	3.3	10.0
84	HD3349	1.7	10.0
85	HD3350	49.1	100.0
86	HD3351	47.3	98.9
87	HD3352	32.6	90.0
88	HD3353	67.0	100.0
89	DBW306	3.3	10.0
90	DBW307	40.9	90.0
91	DBW308	0.0	0.0
92	DBW309	51.6	90.9
93	DBW334	46.7	100.0
94	RAJ4546	39.3	100.0
95	RAJ4547	59.5	95.2
96	RAJ4548	0.0	0.0
97	NW7079	50.4	87.3
98	WH1284	32.7	89.0
99	WH1271	24.2	76.8
100	WH1272	53.2	100.0
101	WH1273	78.6	100.0
102	K1901	47.8	88.1
103	PBW826	0.0	0.0
104	PBW827	64.4	100.0
105	PBW828	57.1	100.0
106	PBW829	55.5	100.0

S. No.	Entries	Avg.	HS
107	PBW841	15.0	90.0
108	UP3051	63.2	100.0
109	UP3052	61.4	100.0
110	UP3053	31.7	100.0
111	UP3054	3.3	10.0
112	AAI-W29	52.0	100.0
113	HUW839	44.5	87.9
114	KRL1810	62.8	100.0
115	HD3354	32.0	64.7
116	HD3355	47.8	90.0
117	HD3356	51.8	100.0
118	HD3357	44.0	100.0
119	DBW310	45.9	100.0
120	DBW311	43.4	96.4
121	DBW312	58.7	100.0
122	DBW313	16.7	100.0
123	KRL1803	55.0	91.5
124	KRL1808	59.2	100.0
125	RAJ4549	44.2	91.7
126	RAJ4550	54.7	100.0
127	NW7088	41.4	98.2
128	NW7093	42.9	95.9
129	NW7094	0.0	0.0
130	WH1274	0.0	0.0
131	WH1283	8.3	40.0
132	K1903	0.0	0.0
133	K1904	44.1	100.0
134	K1905	61.8	100.0
135	PBW830	63.1	100.0
136	PBW831	54.4	100.0
137	UP3055	1.7	10.0
138	UP3056	3.3	10.0
139	UP3057	26.1	96.2
140	JKW275	29.8	85.0
141	JKW277	43.3	100.0
142	BRW3869	44.5	100.0
143	BRW3877	43.6	92.8
144	HUW840	73.1	100.0
145	HUW841	23.3	100.0
146	AAI-W22	26.4	78.1
147	HI1647	56.5	98.1
148	HI1648	54.6	93.0
149	HI1649	52.1	93.8
150	HI1650	49.8	96.9
151	HD3359	3.3	10.0
152	HD3376	75.3	100.0
153	DBW314	52.1	91.7
154	DBW315	15.0	80.0
155	CG1034	41.6	92.4
156	UAS3011	25.2	54.6
157	UAS3012	55.6	97.2
158	RAJ4551	1.7	10.0
159	RVW4301	50.0	99.0
160	RVW4304	53.4	95.7
161	WH1275	37.5	90.0
162	MP3526	1.7	10.0
163	MP3535	0.8	4.7

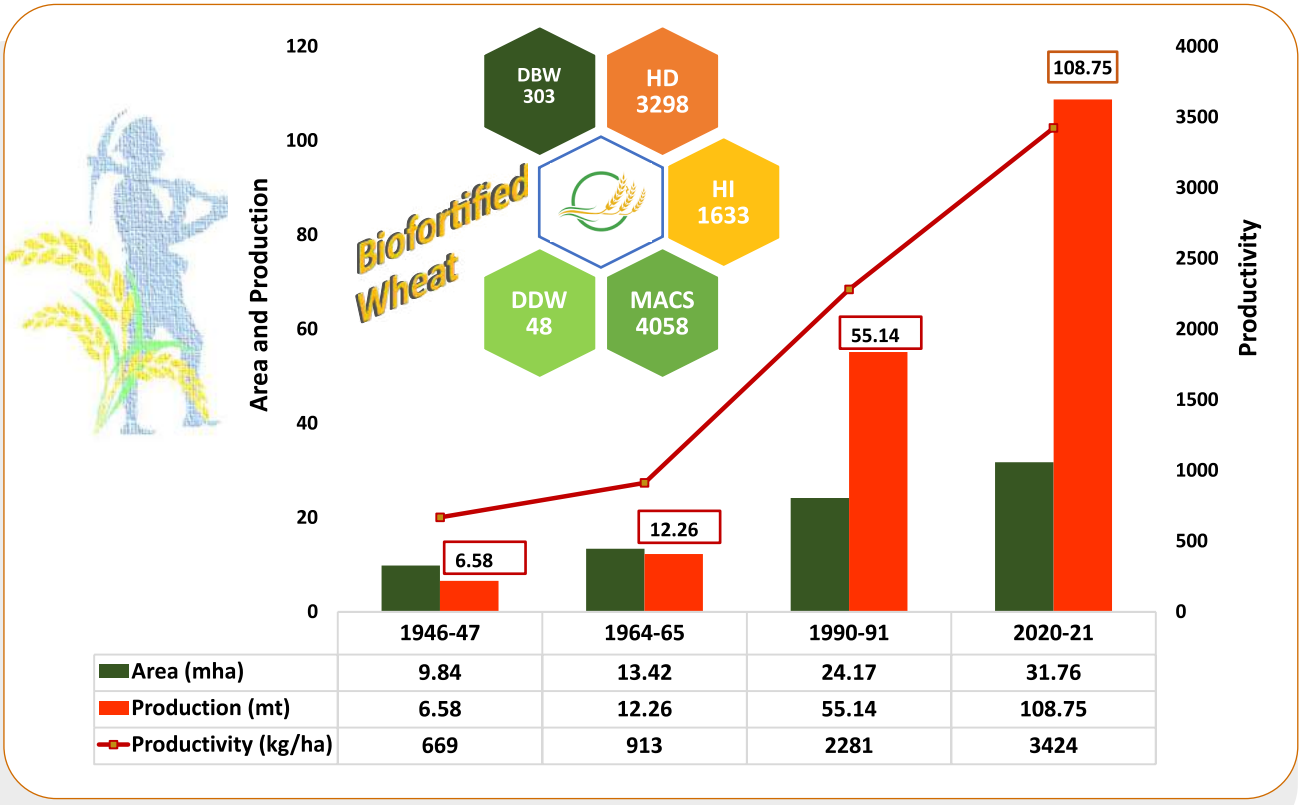
S. No.	Entries	Avg.	HS
164	PBW832	55.8	95.3
165	NIAW3882	46.7	98.4
166	NIAW3889	0.0	0.0
167	UP3058	10.0	50.0
168	MP1369	51.0	100.0
169	MP1370	53.2	98.0
170	MP1371	45.6	100.0
171	MACS6764	42.0	81.4
172	MACS6765	57.0	94.9
173	MACS6768	45.7	100.0
174	AKAW5099	67.0	100.0
175	GW521	56.6	97.8
176	GW522	47.2	90.4
177	GW523	60.6	99.4
178	NWS2176	0.0	0.0
179	HD3360	38.0	100.0
180	HD3361	3.3	10.0
181	HD3362	52.3	100.0
182	HD3363	1.7	10.0
183	HD3364	49.1	91.8
184	HD3365	40.5	85.6
185	DBW316	0.0	0.0
186	DBW317	1.7	10.0
187	DBW318	0.0	0.0
188	DBW319	35.2	88.1
189	DBW335	34.1	97.4
190	RAJ4552	8.3	30.0
191	RAJ4553	56.0	94.2
192	Raj4554	41.8	100.0
193	NW7092	47.7	91.6
194	NW8000	50.7	90.0
195	WH1276	0.0	0.0
196	WH1277	37.9	85.1
197	WH1278	53.3	100.0
198	K1907	29.5	72.4
199	K1908	50.5	100.0
200	PBW833	74.8	100.0
201	PBW834	2.9	10.0
202	PBW835	53.8	100.0
203	PBW836	48.7	83.2
204	UP3059	16.3	98.0
205	UP3060	28.4	60.0
206	UP3061	1.7	10.0
207	UP3065	1.7	10.0
208	JKW270	9.2	27.7
209	JKW278	23.6	79.7
210	HUW842	57.6	83.9
211	HD3366	1.7	10.0
212	HD3367	20.6	50.0
213	HI1651	45.6	78.6
214	HI1652	55.9	100.0
215	DBW320	0.0	0.0
216	AKAW5080	61.6	98.6
217	CG1035	64.4	100.0
218	CG1037	70.9	100.0
219	UAS3013	63.3	94.3
220	RVW4309	70.4	100.0

S. No.	Entries	Avg.	HS
221	WH1279	41.8	90.0
222	MP3527	48.3	100.0
223	MP3529	3.0	10.0
224	GW527	55.4	99.4
225	LOK77	46.1	100.0
226	PBW837	50.5	100.0
227	NIAW3895	3.3	10.0
228	NIAW3898	54.6	98.4
229	MP1372	45.4	90.2
230	MACS6774	16.7	100.0
231	MACS6769	54.4	98.8
232	GW525	44.8	98.9
233	NWS2180	9.7	30.1
234	HI8825	45.9	97.8
235	HI8826	57.1	100.0
236	HI8827	46.9	98.9
237	HI8828	55.9	97.9
238	HI8829	65.5	100.0
239	DDW53	58.0	100.0
240	DDW54	51.0	100.0
241	UAS473	53.4	100.0
242	UAS474	38.8	70.0
243	WHD965	46.2	100.0
244	PDW360	56.0	100.0
245	NIDW1345	49.6	100.0
246	NIDW1348	59.8	100.0
247	MPO1373	64.8	100.0
248	MPO1374	57.9	96.7
249	MPO1375	58.2	100.0
250	MACS4100	52.7	100.0
251	MACS4106	53.9	100.0
252	GW1354	53.2	100.0
253	GW1355	39.8	100.0
254	PWU5	45.0	100.0
255	PBND4812	53.8	100.0
256	HD3368	1.7	10.0
257	HD3369	39.3	100.0
258	HI1653	0.0	0.0
259	HI1654	1.7	10.0
260	DBW321	50.2	100.0
261	DBW322	40.9	100.0
262	DBW323	53.7	100.0
263	DBW324	55.0	100.0
264	NW7096	3.3	10.0
265	WH1280	53.0	100.0
266	WH1281	15.0	90.0
267	JAUW683	44.3	100.0
268	K1910	40.4	90.0
269	PBW838	39.7	100.0
270	PBW839	47.7	100.0
271	PBW848	1.7	10.0
272	UP3062	37.5	100.0
273	UP3063	1.7	10.0
274	BRW3863	45.9	100.0
275	HUW843	38.9	95.6
276	BCW5	50.1	100.0
277	HD3371	40.6	100.0

S. No.	Entries	Avg.	HS
278	HD3372	5.0	20.0
279	HI1655	46.8	96.4
280	HI8830	48.1	100.0
281	HI8831	61.9	100.0
282	DBW325	0.0	0.0
283	DBW326	43.5	98.9
284	DDW55	45.3	98.9
285	AKAW5088	53.0	93.5
286	CG1036	58.8	100.0
287	UAS3014	3.3	10.0
288	UAS475	71.0	98.9
289	MP3523	27.4	100.0
290	NIAW3851	36.6	100.0
291	NIAW3855	38.3	100.0
292	MP1367	39.9	100.0
293	MP1368	43.4	100.0
294	MACS6755	35.1	100.0
295	MACS6753	43.3	100.0
296	GW528	62.7	100.0
297	GW1356	27.5	100.0
298	HD 3378	64.7	100.0
299	DBW187	0.0	0.0
300	DBW303	5.0	30.0
301	DBW327	1.7	10.0
302	DBW328	0.0	0.0
303	DBW329	0.0	0.0
304	DBW330	49.1	95.7
305	DBW331	1.7	10.0
306	DBW332	0.0	0.0
307	DBW333	0.0	0.0
308	WH1270	32.9	80.0
309	WH1252	0.0	0.0
310	AKDW2997-16	45.4	100.0
311	DBW 187	0.0	0.0
312	DBW107	64.4	100.0
313	DBW173	1.7	10.0
314	DBW187	0.0	0.0
315	DBW222	0.0	0.0
316	DBW39	33.7	70.0
317	DBW88	0.0	0.0
318	HD2733	69.5	100.0
319	HD2967	18.1	100.0
320	HD3043	5.0	30.0
321	HD3059	1.7	10.0
322	HD3086	50.0	100.0
323	HD3090	68.2	100.0
324	HD3171	1.7	10.0
325	HD3249	1.7	10.0
326	HI1563	46.7	100.0
327	HI1605	0.0	0.0
328	HI1628	57.3	96.3
329	HI8713	71.0	100.0
330	HI8737	59.6	100.0
331	HI8805	40.9	100.0
332	HS490	58.3	97.3
333	HS507	16.7	80.0
334	HS562	77.7	100.0

S. No.	Entries	Avg.	HS
335	K1006	50.1	100.0
336	K1317	58.3	100.0
337	MACS3949	79.3	90.0
338	MACS6222	73.0	100.0
339	MACS6478	39.7	76.1
340	NIAW3170	62.5	89.5
341	PBW644	66.5	100.0
342	PBW771	94.1	100.0
343	Raj4083	60.6	99.0

S. No.	Entries	Avg.	HS
344	UAS428	90.2	100.0
345	VL892	65.3	98.9
346	WH1021	47.3	86.8
347	WH1080	75.5	97.9
348	WH1105	3.2	19.3
349	WH1124	61.7	96.6
350	WH1142	65.2	100.0
351	BARI Gom 33	0.0	0.0
352	BARI Gom 26	77.5	99.0



	1946-47	1964-65	1990-91	2020-21
Area (mha)	9.84	13.42	24.17	31.76
Production (mt)	6.58	12.26	55.14	108.75
Productivity (kg/ha)	669	913	2281	3424

60th All India Wheat & Barley Research Workers' Meet
(August 23-24, 2021)

60वीं अखिल भारतीय गेहूँ एवं जौ अनुसंधान कार्यशाला
में आयोजित गोष्ठी के दौरान जारी किया गया