

## PROGRAMME OF WORK, 2019-2020

The programme for the crop year 2019-2020 will be discussed in the 58<sup>th</sup> All India Wheat and Barley Research Workers Meet will be held at IARI, RS, Indore during August 24-26, 2019. 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:

**Leaf Rust:** Delhi, Hisar, Karnal, Durgapura, Ludhiana, Faizabad, Kanpur (7)

**Yellow Rust:** Gurdaspur, Dhaulakuan, Malan, Karnal, Durgapura, Ludhiana and Jammu (7)

###### South:

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

###### (b) Leaf Blight: Faizabad, Pusa (Bihar), Varanasi, Murshidabad, Kalyani, Sabour and Coochbehar (7)

##### 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.

##### 3. Monitoring of PPSN

The teams of plant pathologists and breeders were constituted during the work-planning meeting for effective monitoring and data recording in PPSN at various locations in different zones. The team for monitoring will be finalized in workshop.

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 - IIWBR, Karnal

Stripe rust - 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 Flowerdale: Races should be the same for all the respective centres in North.

- (i) Leaf rust: 77-5, 77-9, 104-2, 12-5  
(ii) Yellow rust: 46S119, 110S119, 47S103, 110S84  
(iii) Stem rust: 40A,11,42 and 117-6

### **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:** 13

**NWPZ:** Pantnagar, Ludhiana, Karnal and Hisar.

**NEPZ:** Varanasi, Faizabad, IARI Pusa, Coochbehar, Shillongani, Ranchi, Kalyani and Murshidabad (W.B.)

**PZ:** Dharwad

## **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:** Dhaulakuan, Ludhiana, New Delhi, Pantnagar, Hisar, Karnal and Jammu (7).

## **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 and Jammu (8)

### **PROGRAMME 7: Region specific diseases**

- 1. Flag Smut Screening Nursery:** Ludhiana, Hisar, Karnal 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 2019 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.

##### **Tentative schedule and list is given below:**

**Team I (last week of Dec. 2019):** Drs. Sudheer Kumar, Vaibabh Kumar Singh, Jaspal Kaur, (Haryana and Punjab)

**Team II (second week of Jan. 2020):** Drs. P.L. Kashyap, O. P. Gangwar, M. K. Pandey (Haryana, Punjab and Jammu)

**Team III (last week of January, 2020):** Drs. Sudheer Kumar, P. Prasad, Akhilesh Singh (Haryana, Punjab and H.P.)

**Team IV (Second week of Feb. 2020):** Drs. P.L. Kashyap, R. S. Beniwal (Haryana, Punjab and Jammu)

**Team V (Fourth week of Feb., 2019):** Drs. O. P. Gangwar, Ritu Bala (Haryana, Punjab and West U. P.)

**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). 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 hullless barley variety will also be included in this nursery.

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

**Foliar and spike diseases monitoring nursery:** It will be planted adjoining at key locations of Indo-Bangladesh borders and different centres of NEPZ. This will help in monitoring of leaf blight, head blight / head scab and wheat blast.

**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.

**Team 1:** Drs. P.L. Kashyap, A.K. Sharma and Satyajit Hembram

**Team 2:** Drs. Sudheer Kumar, Charan Singh, Sunita Mahapatra

**Team 3:** Drs. P.L. Kashyap, Sunita Mahapatra and Dhiman Mukherjee

The samples of wheat blast like disease will be analyzed at Kalyani and Coochbehar centre.

## 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, and Indore (5).

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, Dhaulakuan, Malan, Pantnagar

**Leaf rust:** Karnal, Ludhiana, Delhi, Hisar

**Karnal Bunt:** New Delhi, Karnal, Ludhiana, Dhaulakuan, Pantnagar

**Powdery mildew:** Dhaulakuan, Almora, Pantnagar, Malan, Chattha

**Foliar blights:** Faizabad, Varanasi, Coochbehar, Sabour, Hisar, Kalyani, Mushidabad (W.B.)

**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 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. Chemical control

(a) **Chemical management of stripe rust:** New chemicals will be tested at Karnal, Hisar, Ludhiana and Jammu. The chemical will be finalized after discussion in workshop.

(b) **Chemical management of foliar blight:** This will be planted in NEPZ, the location and chemical will be finalized after discussion in workshop.

## **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

**(c) 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

**(d) 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) Evaluation of trapping efficiency of different type of insect-traps for aphids** (Centres: Niphad, Ludhiana, Karnal)

Different types of traps viz., tray-traps, sticky-traps and pheromone lures and their placement in the crop will be tested to determine the efficiency of traps to capture aphids in the field. The criterion of trap colour, material and cost of trap will be considered for selection of traps for the experiment. The population of alate (winged) and wingless forms of aphids captured in traps will be recorded during the season.

**(d) Effect of varied nitrogen fertilization on aphid and termite infestation in wheat (New trial)** (Centres: Karnal, Ludhiana, Niphad)

Impact of three different doses (low, medium & high) of nitrogen application on population abundance of foliar aphid and termites will be investigated in wheat. The nitrogen doses for NWPZ locations will be 0, 75,150 and 225 kg/ha while for PZ location, it will be 0, 60,120 and 180 kg/ha. Population of aphids per plant, natural enemies (adult and grubs) per plot, yield per treatment and nitrogen status of plants before the treatment and at the time of harvest will be recorded to determine the individual effect of each dose of Nitrogen application on aphid abundance. To know effect of nitrogen fertilization on termite infestation the observations on plant population per meter row length, per cent damaged shoots and effective tillers in each treatment will be taken at different stages of crop along with yield at harvest.

- (e) **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-forecasting 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.

- (f) **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.

- (g) **Eco friendly management of foliar aphid** (Centres: Karnal, Ludhiana, Niphad and Kharibari)

New bio-pesticides and new chemicals at lower doses 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) **Eco friendly management of termites** (Centres: Durgapura, Kanpur, Ludhiana and Vijapur)

Few selected new chemicals along with botanicals as seed treatment will be tested against termites. The observations on plant population per meter row length, per cent damaged shoots and effective tillers will be taken at different stages of crop.

### 3. Stored Grain Pest Management

- (a) Studies on the insecticidal treatments on seed viability during storage under ambient condition against store grain pests, *Trogoderma granarium* or *Rhizopertha dominica* (Centre: Karnal)

Plants having toxicity effects on insects will be tested as seed protectant to wheat seed/grains against major stored grain insect pests; *Sitophilus oryzae* or *Rhizopertha dominica*

## PROGRAMME 11. Nematology

1. **Monitoring of Nematodes:** *Anguina tritici*, *Tylenchus spp.* *Pretylenchus spp.* & *Heterodera avenae*: All centres of Nematology

2. **Evaluation of resistance against nematodes parasitizing wheat**

- (a) *Heterodera avenae*: Hisar, Durgapura and Delhi  
(b) *Heterodera filipjevi*: Ludhiana  
(c) *Meloidogyne graminicola*: Ludhiana and Hisar

3. **Eco-friendly management of CCN nematodes in wheat:**

- (a) **centres:** Durgapura, Hisar, Ludhiana and New Delhi  
(To be coordinated by Delhi centre)