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All India Coordinated Research Project on Wheat and Barley

PROGRESS REPORT 2022-23

BARLEY IMPROVEMENT

Om Vir Singh
RPS Verma
Chuni Lal
Jogendra Singh
Lokendra Kumar
Dinesh Kumar
Rekha Malik
SK Bishnoi
AS Kharub
Sudheer Kumar
Poonam Jasrotia
Ravindra Kumar
OP Gangwar
Amit Kumar Sharma
Charan Singh
Randhir Singh
Ajay Verma
Gyanendra Singh

ICAR-Indian Institute of Wheat andBarley Research
P.O. BOX - 158, Agrasain Marg, Karnal -132001

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(Om Vir Singh)
Principal Investigator
Barley Improvement
ICAR-IIWBR, Karnal

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62nd All India Wheat and Barley Workers Meet (28-30 August, 2023)

RESEARCH HIGHLIGHTS OF BARLEY IMPROVEMENT

Barley is an important cereal and there is renewed interest in barley as it offers many health benefits because of presence of functional ingredients in its grain. Barley as a staple food provides a sustainable solution to many chronic diseases. Barley has commercial value also as it is used in malting industries. The area and production of barley increased during 2022-23 as compared to 2021-22 (Table 1.1). The crop growth conditions during *Rabi* season 2022-23 were very good and all experiments were in good shape throughout season. However, due to heavy rains in the second fortnight of March in NWPZ, the experiments faced some lodging at many locations but productivity was not affected adversely much. The third advance estimate of production for 2022-23 has indicated 1687.88 thousand tonnes production of barley grain in country against the target of 2250 thousand tonnes. According to 3rd advance estimates for *Rabi* 2022-23, barley was grown in 617.59 thousand hectare area with a productivity of 27.33 qtls./ha. Rajasthan state continued to be having largest area under barley cultivation (>54.0 % of total area) and highest production (>56.0 % of total production) of the country followed by Uttar Pradesh, Madhya Pradesh and Haryana Pradesh (Table 1.1). There is a significant increase in area and production of barley in Haryana, Rajasthan and M.P. during 2022-23 over the year 2021-22 (Table 1.1).

Table 1.1: Estimates of barley area, production and productivity in major barley growing states.

State/ Country	2021-22 (Final Estimates)			2022-23 (3rd Estimates)		
	Area (000'ha)	Production (000't)	Yield (kg/ha)	Area (000'ha)	Production (000't)	Yield (kg/ha)
Bihar	6.95	12.37	1779	7.32	12.33	1684
Chhattisgarh	1.17	0.96	818	0.86	0.63	728
Haryana	3.29	10.65	3237	15.3	53.34	3486
HP	18.11	31.39	1733	18.15	31.49	1735
J&K	7.14	4.67	654	-	-	-
MP	16.00	32.48	2030	24.00	48.84	2035
Punjab	5.00	15.48	3096	5.7	20.83	3655
Rajasthan	200.47	711.05	3547	336.68	947.75	2815
UP	165.00	500.61	3034	166	510.12	3073
Uttarakhand	20.00	29.28	1464	20	29.22	1461
WB	0.17	0.29	1659	0.2	0.34	1700
UT of Ladakh	9.97	21.94	2200	-	-	-
NCT Delhi	0.05	0.20	4000	-	-	-
All India	**453.32**	**1371.36**	**3025**	**617.59**	**1687.88**	**2733**

Source: DES, MoA & FW, India.

Though the area of barley during this year increased 36% over that of last year from 453.32 to 617.59 thousand hectare and production increased 23 % from 1371.36 thousand tonnes to 1687.88 tonnes in India. But this is not sufficient to meet the increasing demand of barley grain. There is a urgent need to increase area and production of barley. Area and production of barley can be increased by providing seeds of improved high yielding varieties and variety specific package of practices to the farmers. The government may provide support to barley growing farmers in terms of subsidies on seeds, fertilizers, and other essential inputs required for barley cultivation, especially in regions where it is not

traditionally grown. Farmers may be provided financial incentives that start barley cultivation in new areas that can be a motivating factor. Government must give credit at lower interest rate and flexible repayment options on priority and timely to the farmers looking for barley cultivation. Implementing crop insurance programs can mitigate the risks associated with barley cultivation. Farmers may be provided with a safety net in case of crop failure due to adverse weather conditions or other factors. At present minimum support price (MSP) of barley is less than that of wheat. Keeping in view the therapeutic properties of barley MSP must be double of barley especially of hulless barley must be more than double that of wheat. Also, government can establish market linkages and provide support in marketing and distribution of barley crop. This ensures that farmers have access to fair prices and a stable market for their barley produce. Barley cultivation may be integrated into existing government schemes and programs focused on agricultural development and diversification. Barley is the most salt tolerant crop and can tolerate upto 250 mM NaCl much higher than wheat and other cereal. Saline wasteland can be reclaimed for barley cultivation. Cultivation of barley may be promoted in such areas where land is kept fellow after harvest of rice. There is need to identify such areas and conduct experiments for successful cultivation of barley. Barley plant needs half of the water than wheat to complete its life cycle therefore, rainfed areas may be identified for barley cultivation. Collaboration with private companies and industries will create demand for barley and offers buy-back arrangements, contracts, or market assurance to farmers.

There is always a concern expressed at various platforms for barley area decline in India (Fig. 1a), however, in recent years, the area has more or less stabilized and there has been gain in productivity resulting in higher production (Fig. 1b). The possible reasons for the non-preference by farmers for barley could be the difficulties or lack of profit in selling the produce as per convenience. Though the MSP of barley is announced (much lower than wheat), but there is no procurement by government agencies, which makes it non-assured procurement of the crop and farmers are not willing to take such risk except in cases where better options are not available. Sometimes industries are taking care of limited procurement on premium price for malt barley either directly or through market people based on mandis. A few of such industries had also followed “contract farming” with malt type varieties to ensure regular supply of the raw material for their units. Hulless barley is good for diabetic and people suffering from high cholesterol and there is lot of demand of hulless barley. To meet the demand area under hulless barley needs to be increased and high yielding varieties to be developed. The MSP of hullless barley should be double than that of wheat as hulless barley offers therapeutic properties. Centre and state Government should encourage farmers to grow hulless barley and should buy hulless barley from farmers at the rate of double of the rate of wheat and must distribute to low to medium income groups, who are suffering from diabetes and high cholesterol at subsidized rates. This will give much needed impetuous to the barley cultivation under well managed conditions with rise in productivity levels at small holder farmers. The government has declared MSP of barley Rs. 1735/q, against the cost of cultivation of Rs. 1082 thereby, return is 60% over cost of cultivation. Whereas, MSP of wheat is Rs. 2125 against the cost of cultivation of 1065 and return is 100% over cost of cultivation. This needs to be rectified in favour of barley by the government.

This may help the cause of stabilizing/ increasing the area under barley in country. Also, imposing the import duty on barley will support indigenous production and procurement for good quality malting barley varieties, available in country. Another extremely important factor is the need for regular breeder seed indenting by the different states, private and public sector agencies, to assure the availability of quality seed to farmers, averting, an unplanned sudden demand from industry for huge

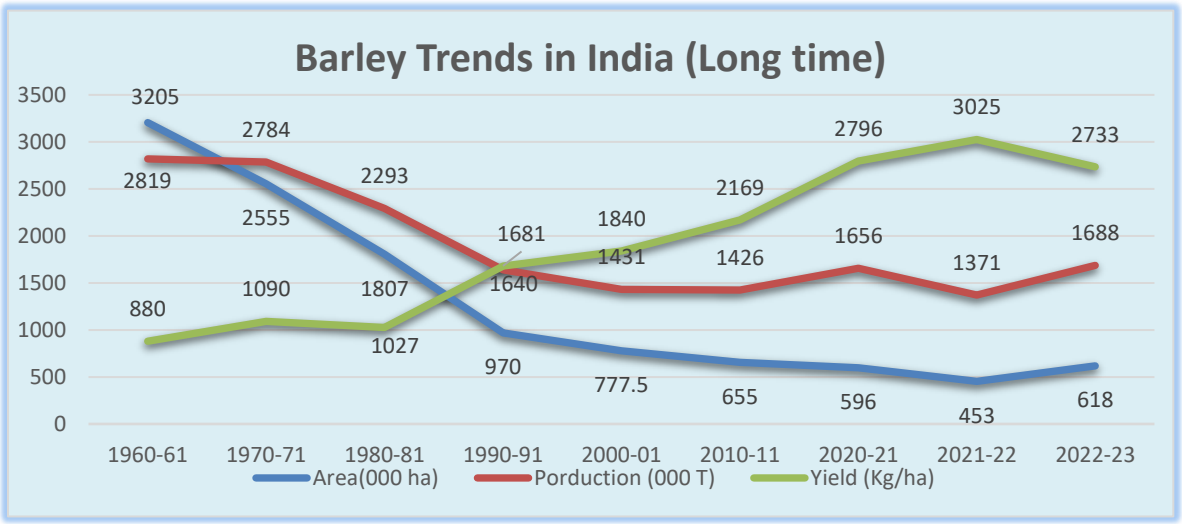


Fig. 1a: Long term trends of barley area, production and productivity in India (Source: DES, MoA &FW, India).

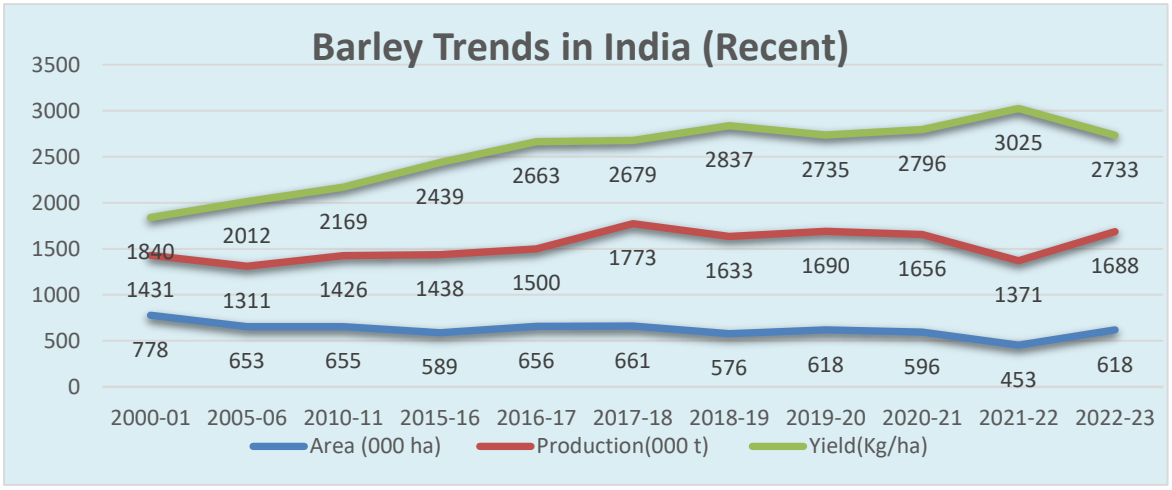


Fig. 1b: Short term trends of barley area, production and productivity in India (Source: DES, MoA &FW, India).

seed quantity, which cannot be met because of non-prior indenting. The recent trends of decreasing breeder seed indenting is a cause of great concern to the cultivation of the crop and availability of good quality seed to willing farmers. During the year some damage/losses in quantity and quality of the grain were observed due to lodging as a result of heavy rains and winds at the time of grain feeling and maturity in different areas of NWPZ. The monitoring teams during the surveys in the major barley growing areas during the season observed that the crop season was by and large a rust-free in major barley growing areas, with some incidence of aphids in the plains and more incidence of spot blotch in NEPZ. The smuts (mainly covered) were common in trials as well as in farmers' fields where the seed was not treated with correct fungicides.

Release of new barley varieties

HBL804 (Him Palam Jau 2), derived from a cross of DWRUB 74 x HBL 316, a six-row hulled dual (feed &forage) purpose barley variety developed by CSKHPKV, Palampur has been released by State Variety Release Committee of Himachal Pradesh state for timely sown rainfed and irrigated conditions of mid & low hills of Himachal Pradesh. The zonal mean grain yield of this variety in All India Coordinated Trials was 25.95q/ha and 50.9 q/ha, respectively under rainfed and irrigated conditions. The notification of this variety was made vide Govt. of India 's Gazette Notification No S.O. 4065(E) dated 31st October 2022 (Table 1.2).

Fig. 2: HBL804 (Him Palam Jau 2), six row barley variety released by SVRC for cultivation in North Hill Zone (Mid & low hills of HP).

Table 1.2: Barley variety released by SVRC during 2022-23.

SN	Variety	Parentage	Zone	Av. yield(q/ha)	Developedat	Production condition
1.	HBL804 (Him Palam Jau 2)	DWRUB 74/ HBL 316	North Hill Zone (Mid & low hills of HP)	25.95q/ha for rainfed and 50.9 q/ha for irrigated condition	CSKHPKV, Palampur	Rain fed & irrigated conditions

Registration of new barley genetic stocks

Fifteen genetic stocks namely DWRBG 7, DWRBG 8, DWRB 189, DWRBG-11, DWRBG 9, DWRBG 12, DWRBG 10, BHS 485 (BBM 839), BHS 486 (BBM 845), BHS 483 (BBM 833), DWRBG 2, IC0138120, DWRBG-13, BHS 479 (BBM 798), BHS 480 (BBM 803) (Table 1.3) have been registered with ICAR-NBPGR for their unique traits during the year 2022-23.

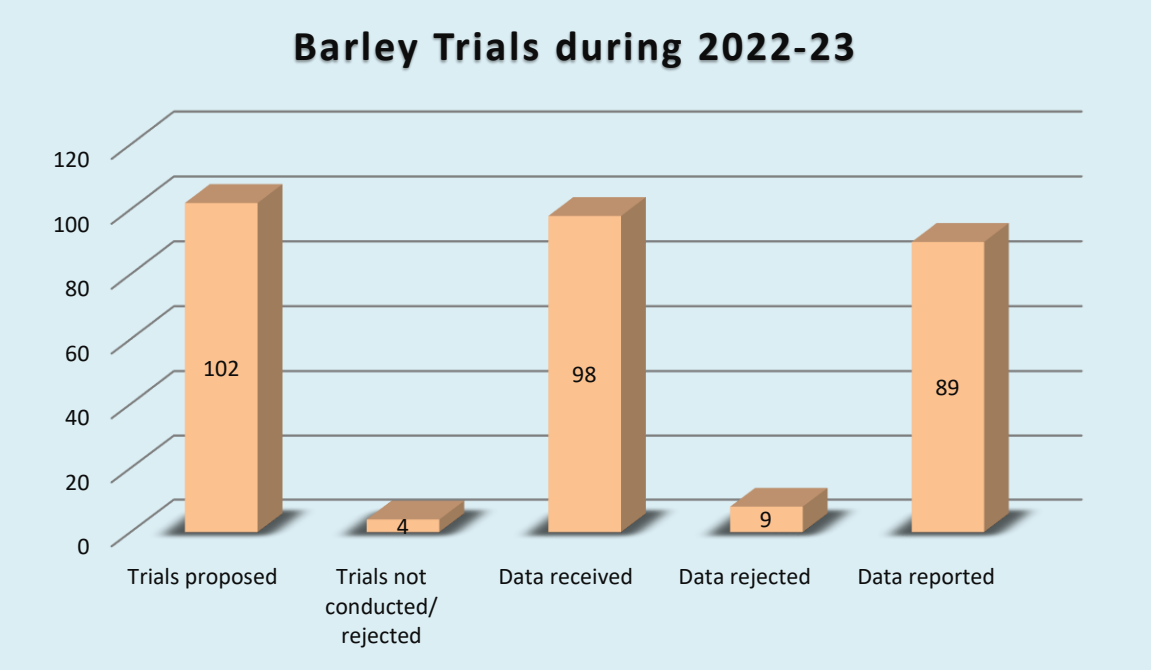
Table 1.3: Genetic stocks registered with ICAR-NBPGR New Delhi during 2022-23.

SN	Name	INGR No.	Parentage	Trait(s)	Institute
1	DWRBG 7	22074	DL456/EIBON17	High bold grain proportion in six rowed hulless barley as indicated with higher 1000 g weight and bold grains percentage.	ICAR-IIWBR, Karnal
2	DWRBG 8 (Tested as BCU 8028)	22075	Collection from Leh, Ladakh	Hulless barley with combination of high grain beta glucan (7%) and protein (16.6 %) content.	ICAR-IIWBR, Karnal
3	DWRB 189	22124	Selection from BH292 (BCU2336)	High anti-oxidant activity with unique black colour grains.	ICAR-IIWBR, Karnal
4	DWRBG-11 (Tested as BK 306)	22125	BK9811/DL472	Higher Wort Free Amino Nitrogen (FAN) Content with Higher Malt Diastatic Power (DP).	ICAR-IIWBR, Karnal
5	DWRBG 9 (tested as HLR-20)	22126	C0118689	Hulled land race with resistance to Corn Leaf Aphid.	ICAR-IIWBR, Karnal
6	DWRBG 12 (Tested as BCU 6315)	22127	INT-15, Sterile Floret	Six rowed barley with low grain protein content and high malt diastatic power.	ICAR-IIWBR, Karnal
7	DWRBG 10	22128	IC0356122	Hulless six-row land race with High ß-	ICAR-

	(tested as HLR-90)			glucan and starch.	IIWBR, Karnal
8	BHS 485 (BBM 839)	22129	HBL276/BHS369	Naked (hulless) barley, resistant to yellow rust and leaf rust at the adult plant stage, promising source of malt with protein and starch content weight).	ICAR-IARI RS, Shimla
9	BHS 486 (BBM 845)	22130	HBL276/BHS365	Possesses adult plant resistance to yellow rust and leaf rust. Resistant to all the pathotypes of brown rust at seedling stage except H4 race. Resistant to all pathotypes of yellow rust at seedling stage except for M and Q race whereby showing moderate susceptibility.	ICAR-IARI RS, Shimla
10	BHS 483 (BBM 833)	22131	BHS 352/ BHS 366	Naked (hulless) barley genotypes. Resistant to yellow rust & leaf rust at the adult plant stage, resistant to moderately resistant reaction to all pathotypes of yellow rust at seedling stage (except for 24 and Q race showing MS reaction).	ICAR-IARI RS, Shimla
11	DWRBG 2	21248	ICARDA 5 (PYT-2014-15 entry number-41) of ICARDA	Barley genotype with High hectoliter weight (66.7 kg/hl) coupled with higher protein content 13.0 % (dwb) and bold grains (>2.5 mm size).	ICAR-IIWBR, Karnal
12	IC0138120	2132	Selection from IBON (1991-92)-138-IC0138120	High test weight coupled with early maturity in two- rowed barley.	ICAR-NBPGR, , New Delhi
13	DWRBG-13 (Tested as ICARDA 11)	22771	SEN/5/LEGACY/4/ TOCTE//GOB/HU MAI10/3/ATAH92/ ALELI (PYT-15)	Higher malt beta glucanase activity (384 Units/kg malt). Lower wort beta glucan content (130 ppm).	ICAR-IIWBR, Karnal
14	BHS 479 (BBM 798)	22280	BBM556/BHS169// BHS369	Resistant to all the pathotypes of leaf rust and stripe rust at the seedling stage (except for race 24).	ICAR-IARI RS, Shimla
15	BHS 480 (BBM 803)	22279	BLG132/BHS369	Resistant to all pathotypes of leaf and stem rust at the seedling stage (except for race 11).	ICAR-IARI RS, Shimla

CROP IMPROVEMENT

Coordinated Yield Evaluation Trials



- In all 89 test entries contributed by 10 centres, were evaluated against 20 checks in the coordinated yield trials under rainfed (plains and hills), Irrigated (plains) and saline soils conditions. The new barley entries include malt, feed or dual purposes types and mostly werehulled type with a few hulless types in northern hills and plains.
- These trials were conducted at 11 main centres and 29 additional testing centres (including ICAR, SAUs and State Department of Agriculture) during *Rabi* 2022-23.
- Out of 102 yield evaluation trials proposed, 99 trials were conducted as Gwalior centre did not conduct three trials. At Berthin one trial was rejected by the monitoring team due to faulty layout. The data were received in time for 98 trials. After the analysis, only 89 trials (87.25% of proposed, 90.81% of received) were found good for reporting.

Promising entries in AVT/IVTs during 2022-23

Based upon the multilocation evaluation under different trials series, 7 entries were found promising (Table1.4), with significant superiority for the yield over the best check in the trial. Another set of 3 entries was numerically superior to the best check in different trials/ zones, however, based on the CD values these were at par. The promotion/ retention in the AICRP trials for next year will depend on the promotion criteria i.e. significantly superior or better than check with additional trait(s), monitoring reports for purity, disease/pest reactions and the quality traits (as applicable).

Table 1.4: Promising entries in different trials during 2022-23

SN	Trial name	Zone	Significantly superior	Superior (numerically)
1	AVT-IR-MB	NWPZ	DWRB219	-
2	IVT-IR-MB	NWPZ	DWRB235, DWRB238, RD3064	-
3	AVT-IR-TS-FB	NEPZ	UPB1106	-
4	AVT-IR-TS-NB	NWPZ	DWRB223	-
5	IVT-IRTS-NB	NWPZ	-	DWRB244
6	AVT-IR-TS-NB	CZ	DWRB223	-
7	IVT-IRTS-NB	CZ	-	DWRB244
8	AVT-SST	Plains	-	KB2031
9	IVT-SST	Plains	RD3080	KB2158
10.	IVT-RF-NHZ-NB	NHZ	BHS 497 (Forage)	BHS 497 (Grain)
11	IVT-RF-NHZ	NHZ	VLB 184 (Grain)	VL 184 (Forage)

Malt Barley Trials

AVT-MB-TS- NWPZ

- The AVT-MB-NWPZ was proposed at 11 locations and trial was conducted successfully at all locations.
- No serious disease/pest incidence was reported at any centre in the crop season .Over all the condition of the trialwas very good at all centres.
- The mean grain yield of the trial ranged from 39.47 q/ha (Hisar) to 73.22 q/ha (Sriganganagar) and the zonal mean was 50.40 q/ha.
- On the basis of zonal mean, the test entry DWRB219 ranked first and was significantly superior to all checks of the trial.

IVT-MB-TS- NWPZ

- The AVT-MB-NWPZ was proposed at 11 locations and trial was conducted successfully at all locations.
- No serious disease/pest incidence was reported at any centre in the crop season. Over all the condition of the trialwas very good at all centres.
- In case of grain yield, the trial mean value ranged from 35.37 q/ha (Hisar) to 64.80 q/ha (Bhatinda) with 50.37 q/ha over all mean of North Western Plain Zone.
- On the zonal mean basis DWRB137, the six-rowed feed barley check, stood at first rank (63.87 q/ha) but it will not be considered for comparison of the two-rowed malt barley entries. Among two-rowed genotypes, the test entry DWRB235 (56.29 q/ha) was on top rank followed by RD3064 (55.55 q/ha), DWRB238 (54.83q/ha), RD3067 (54.06q /ha), RD3065 (53.24q/ha) and two-rowed malt barley check RD2849 (53.13 /ha). Considering the CD value of the trial, the three genotypes namely DWRB235 (56.29 q/ha), RD3064 (55.55 q/ha), DWRB238 (54.83q/ha) were found significantly superior to the best two-rowed malt barley check RD2849 (53.13 /ha).

Feed Barley Trials

AVT-IR-TS-FB-NWPZ & NEPZ

- A combined trial was proposed at seven locations each in the NWPZ and NEPZ. The results of all the seven locations of NWPZ were included in zonal pooled analysis. However, in NEPZ the two locations Sabour and Ranchi were not considered for zonal pooled analysis as these locations had Low Station Means (LSM: Sabour, 19.1 q/ha; Ranchi, 26.2 q/ha). The remaining five locations of NEPZ were considered for zonal pooled analysis.
- The trial consisted of three entries and three checks, namely BH946 (check for NWPZ), DWRB137 (check for both NWPZ and NEPZ) and HUB113 (check for NEPZ).
- The Zonal monitoring teams visited the trials at Ludhiana and Durgapura locations of NWPZ, and Kanpur, Kumarganj and Varanasi locations of NEPZ. By both the teams the entry DWRB226 has been recommended for purification. High incidences of Leaf blight were observed in the check variety DWRB137at Kanpur (68), Kumarganj (68) and Varanasi (79) locations.
- In NWPZ, the location means for grain yield ranged from 36.3 q/ha (Karnal) to 66.0 q/ha (Tabiji) with 49.0 q/ha zonal mean across the centres of this zone. The check BH946 ranked first with 51.8 q/ha mean grain yield followed by a test entry UPB1106 which was at par with the check variety with a mean grain yield of 51.7 q/ha.
- In case of NEPZ the location means for grain yield ranged from 35.3 q/ha (Varanasi) to 48.6 q/ha (BISA, Samastipur) with 40.1 q/ha zonal mean across the locations of this zone. The test entry UPB1106 ranked first with a mean grain yield 44.0q/ha and found significantly superior to all check varieties

AVT-IR-TS-FB--CZ

- This trial was proposed at seven locations of CZ. The Gwalior centre did not conduct this trial. The data from all the remaining six locations of this zone were included in zonal pooled analysis.
- The trial consisted of six entries (RD3053, BH1045, KB2004, KB2015, PL937 and HUB281) in AVT 1styear and two check varieties, namely DWRB137 and RD2899.
- The Zonal monitoring team visited the trials at Vijapur location of CZ. In the entry KB2004 a mixture of plants with different plant heights, spike length, leaf size was observed and has been recommended for dropping from the trial by this team. In entries PL937 and HUB281, off types have been observed and need purification.
- No incidence of disease and insects' pests' infestation was observed in any of the entries of the trial.
- The location means for grain yield ranged from 38.6q/ha (Vijapur) to 57.5 q/ha (Banda) with 50.6 q/ha zonal mean across the centres of CZ. The check variety RD2899 ranked first with a mean grain yield 55.7q/ha.

IVT-IR-TS-FB (NWPZ, NEPZ, CZ)

- This trial was proposed at 20 locations scattered in NWPZ (7), NEPZ (7) and central zone (6) in northern plains. The results from all the seven locations were included for zonal pooled analysis in NWPZ. In NEPZ the data from Sabour location was not included in the zonal pooled analysis for low site mean for grain yield obtained at this location. Data from remaining six locations were considered for pooled analysis. In case of CZ, this trial was not conducted at Gwalior location. The data from reaming five locations of CZ were included in the zonal pooled analysis.
- The trial consisted of 21 test-entries and four checks, namely DWRB137 (NWPZ, NEPZ and CZ), BH 946(NWPZ), RD2899 (CZ), and HUB113 (NEPZ). The monitoring teams visited the locations in NWPZ (Ludhiana, Durgapura), NEPZ (Kanpur, Kumarganj and Varanasi) and CZ (Vijapur).
- The location means for grain yield ranged from 32.3q/ha (Karnal) to 32.3q/ha (Tabiji) with 47.4 q/ha zonal mean in NWPZ. The check varieties BH946 and DWRB137 ranked first and second giving 56.8 and 55.5 q/ha, respectively.
- In NEPZ, location means ranged from 35.3 q/ha (Varanasi) to43.5 q/ha (CAU, Pusa) with zonal mean 41.20 q/ha. The check variety HUB113 ranked first in grain yield (50.6 q/ha).
- In case of CZ, the location means ranged from 37.9 q/ha (Vijapur) to 72.9 q/ha (Tikamgarh) with 52.7 q/ha zonal mean. The checks RD2899 ranked first with a mean grain yield 60.5 q/ha.

IVT-RF-NHZ

- The AVT-RF-NH barley trial was proposed with two components merged for normal as well as dual purpose barley evaluation in one common trial. In this trial, four replications were propsoed (two replications as normal for grain purpose and remaining two replications as dual purpose i.e., grain as well as green fodder) for evaluation under rainfed conditions of northern hills. In dual purpose replications, the green fodder cutting was to be made 70 days after sowing of the trial. The trial was proposed at 9 locations across Himachal Pradesh, Uttarakhand, Jammu and Kashmir and was conducted by all centres. The trial consisted of a set of 24 entries and out of which 19 were the test entries while the rest five were the check varieties for grain (HBL113, BHS352, BHS400 and VLB118) and BHS 380 for dual purpose.
- The zonal monitoring of the trial was done at Gaza, Almora and Majhera, Shimla, Bajaura, Bertin and Malan during the crop season and few off types were recorded in test entries IVT-RF-NH-5, IVT-RF-NH-8, IVT-RF-NH-17 and IVT-RF-NH-21. The trial of Berthin was rejected due to faulty layout. Overall performance of the trial was very good at the monitored centres.

Performance in no cut replications (Normal)

- After location wise analysis, the data from Gaza was not considered for zonal mean analysis due to high CV. The results from rest 7 centres were in accordance and included in zonal pooled analysis. The location means for grain yield ranged from 12.5 q/ha)Shimla) to 41.3 q/ha (wadura) zonal mean across the centres. The check BHS380 ranked first with mean grain yield of 30.4 q/ha and check BHS400 ranked second with grain yield 28.9 q/ha in the first non significant group. No test entry was found superior over the checks in normal trial.

Performance in dual purpose trial (Cut replications)

(a) Grain yield performance: The trial for dual purpose was proposed at nine locations while it was conducted at eight centres in northen hills zone. After analysis, the data from Gaza (HCV) centre was excluded for zonal mean analysis. In this way, data from rest seven centres were considered for zonal pooled analysis for grain yield after regeneration

in cut treatment. The relevant data of accessory traits in cut replications are given in ancillary table (8***). The location means for grain yield ranged from 12.2 q/ha (Shimla) to 41 q/ha (Wadura) with 21.5 q/ha zonal mean across the centres. Amongst test entries, VLB184 ranked first with mean grain yield of 26.6 q/ha in the first non-significant group. However, dual purpose check BHS380 ranked second with mean grain yield of 24.5 q/ha.

(b) Green Forage yield performance: The cutting of green fodder was done after the 70 days sowing of the trial. The data from Almora, Gaza and Majhera were not included in zonal pooled analysis on account of their LSM (2.8 q/ha, 2.7 q/ha and 9.0 q/ha). The location means for green fodder yield ranged from 20.6 q/ha (Malan) to 69.8 (Wadura) with 45.4 q/ha zonal mean across the centres. Amongst test entries, the entry BHS497 ranked first with mean green fodder yield of 58.4 q/ha in Ist NSG. However, dual purpose check BHS380 ranked sixteen with mean fodder yield 42.6 q/ha.

Keeping in view of the overall performance for dual purpose i.e. grain and fodder yield together, a joint ranking of all the entries was developed and on the basis of this criteria, no entry was better performed in both traits grain and fodder yield in the trial.

AVT/IVT-SST- NWPZ & NEPZ

- The AVT/IVT-IR-TS-Sal/Alk trial was proposed at 7 locations and was conducted at all centres in plain. The trial was constituted by invoving 15 test entries and 3 checks (KB1425, RD2794 and RD2907). The test entries were contributed by 5 coordinating centres.
- The zonal monitoring team visited the trials at Kumarganj in NEPZ and IIWBR Hisar in NWPZ during the crop season. The trials were conducted in proper way and in good condition. The data from all centres were subjected in zonal pooled analysis. Dalipnagar and Fatehpur centres were not considered for zonal mean due to delay in sowing and unrealistic grain yield respectively.
- The location means for grain yield ranged from 22.95 q/ha (Ayodhya) to 38.07 q/ha (IIWBR Hisar I) with 32.2 q/ha over all mean across the centres. Test entry RD3080 ranked first with mean grain yield of 38.66 q/ha and it was significantly superior to the best check RD2794 (33.36 q/ha). In addition, two entries namely KB2031 (36.06 q/ha) and KB2158 (36.02 q/ha) were also found numerically superior to the best check.

IVT/AVT-IR-TS-NB-NWPZ, NEPZ, CZ

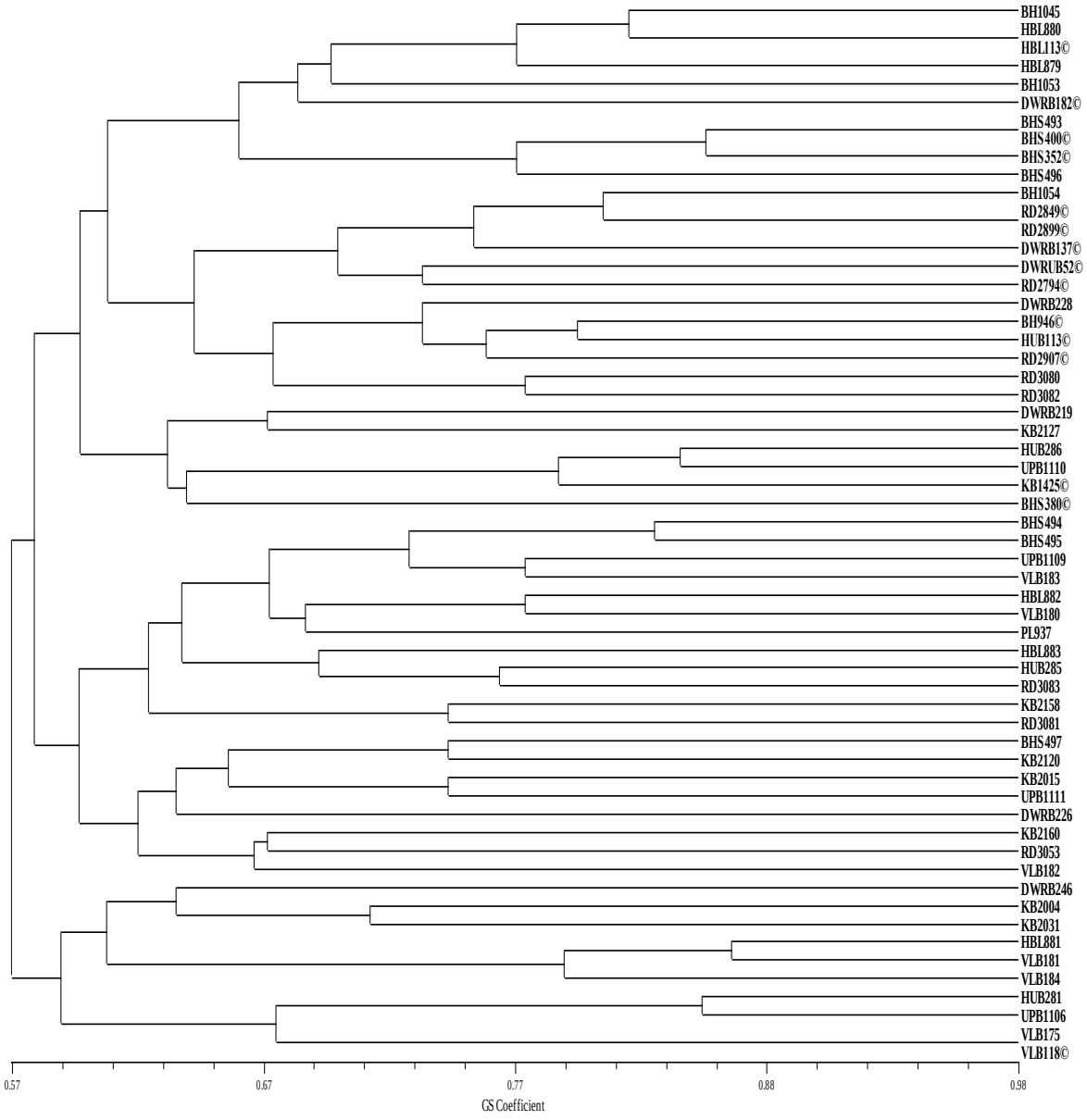
- The trial IVT/AVT-IRTS- naked barley was proposed at 15 locations scattered in NWPZ (6 locations), NEPZ (4 locations) and central zone (5 locations) in plains. All centres conducted the trial except Gwalior in Central zone. The trial consisted of 5 testng entries and 3 checks, namely Karan16, K1149 and PL891. The results were received from 14 locations.
- The monitoring team visited Hisar and Durgapura in NWPZ and Kanpur, Ayodhya and Varansi in NEPZ. Mixture was reported in entries PL891, UPB1104, K1149 while, in DWRB 245 and Karan16 off types plants were observed at Hisar and Dugapura centres. Monitoring team reported few off types in DWRB223 at Vijapur in central zone.
- The results from all the six locations were included for zonal pooled analysis in NWPZ. In NEPZ, data from Ranchi location were not included for zonal pooled analysis due to LSM. In case of central zone, the results were pooled for analysis of the four locations.
- The location means for grain yield ranged from 27.90 q/ha (Ludhiana) to 43.43 q/ha (Durgapura) with 35.32 q/ha zonal mean in NWPZ. The entry UPB1104 (Filler1) ranked

first with mean grain yield 41.68 q/ha followed by filler 2,UPB1113 (41.48 q/ha), K1149 (check) (36.94 q/ha), DWRB223 (36.18 q/ha), DWRB 244 (34.09 q/ha) and Karan16 (Check) (33.99 q/ha) in the first NSG. UPB1104 (Filler1) and UPB1113 (Filler2) were hulled barley entries and tested as filler not a test entry. This trial was combined for all the zones, hence K1149 (check) was included in the trial, other wise it exhibits highly susceptible to yellow rust (ACI=60 and HS=80S) disease. The test entry DWRB 223 ranked at fourth with mean grain yield (36.18 q/ha), which is significantly superior over both the NWPZ checks viz; Karan16 (33.99 q/ha) and PL891 (31.40 q/ha) for grain yield in first non significant group. However, test entry DWRB244 was numerical superior with mean grain (34.09 q/ha) in first non significant group over the both NWPZ checks Karan 16 (33.99 q/ha) and PL 891 (31.40 q/ha) for grain yield respectively.

- In NEPZ, location means for grain yield ranged from 30.58 q/ha (Varansi) to 32.96 q/ha (Kanpur) with zonal mean 31.78 q/ha. The entry UPB1113 (Filler2) ranked first with mean grain yield 39.14 q/ha followed by UPB1104 (Filler1) (36.26 q/ha), K1149 (check) (34.32 q/ha), DWRB244 (31.76 q/ha) and Karan16 (Check) (31.13 q/ha) in the first NSG.
- The central zone showed the range of location means from 30.50 q/ha (Vijapur) to 61.08 q/ha (Tikamgarh) with 41.16 q/ha zonal mean. In this zone, fillers UPB1113 (Filler2) ranked first with mean grain yield 50.64 q/ha followed by UPB1104 (Filler1) (49.47 q/ha) in first non significantgroup

Molecular Profiling of Barley Trials 2022-23

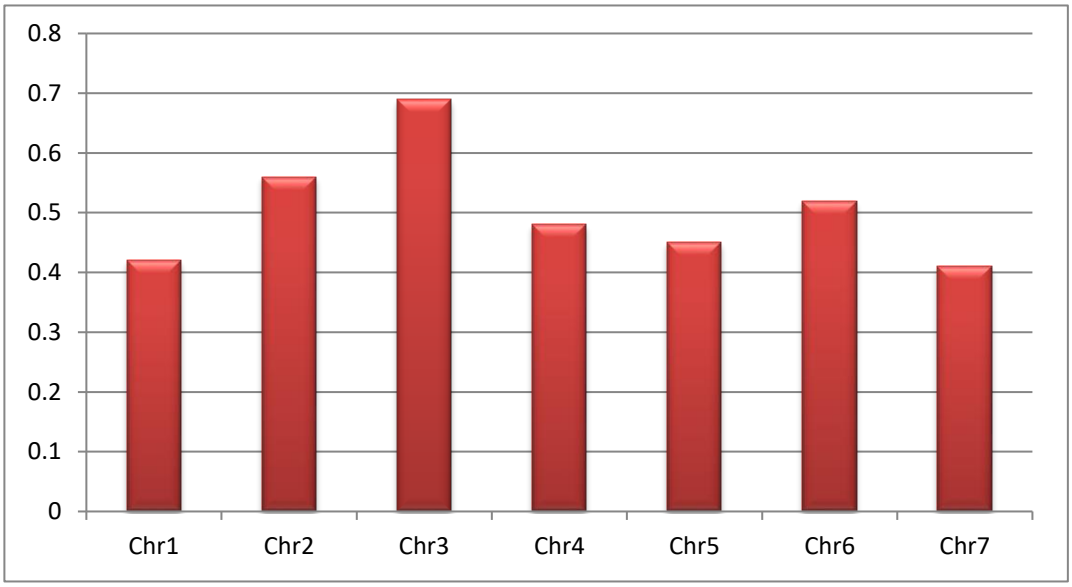
Molecular profiles were generated to distinguish entries with their respective checks for barley AVT trials 2022-23. A set of 46 SSR/STS markers covering all the seven linkage groups of barley was screened with 58 lines including entries and checks. During UPGMA clustering, these genotypes grouped within similarity coefficient (GS) value 0.57 to 0.98 and showed sufficient genetic variability at molecular level. In dendrogram, each entry is uniquely placed at separate node and is distinct from rest of entries and check lines, respectively. The eventual intend of this effort is to develop molecular markers-based amplification profiles for varietal characterization and to assess the level of genetic diversity in Indian barley.



UPGMA based clustering of entries and checks of AVT Barley Trials 2022-23

Average polymorphic information content (PIC) of AVT entries and checks varied from 0.41 to 0.69 across seven linkage groups of barley and chromosome chromosome 3H was found most variable. In barley AVT trials 2022-23, all the test entries could be distinguished using screened markers and generated unique profiles. Molecular statistics were comparable with previous crop

season trials suggesting that genetic variability in barley improvement programme have been maintained is sustained this year also.



Polymorphic information content (PIC) scored for seven linkage groups of barley genome Barley AVT trials during AICRP 2022-23

Breeder's Seed Production

A consolidated quantity of 511.15 qtls. of breeder seed indent of 25 varieties was received from Seed Division, DA&FW, New Delhi for its production during 2022-23 and supply during 2023-24. Seven states *viz*., Rajasthan, Uttar Pradesh, Punjab, Haryana, Himachal Pradesh, Madhya Pradesh, and Uttarakhand and five public sector agencies *viz.*, NSC, IFFDC, NAFED & KVSS and National Seed Association of India (NSAI) indented breeder seed. The highest breeder seed indent was placed by Rajasthan 200 qtls. (39%) followed by UP 120 qtls. (23%), NSAI (12%) and National Seed Corporation (8%). A total of 421.80 qtls. (i.e., 82.52%) breeder seed was indented for <10 years old varieties. Total of 510.85 qtls. of breeder seed of 24 varieties was allocated among 9 BSP centres. The indent of 0.30 qtls. of breeder seed of DWRUB 64 was not allocated in the BSP-1. Among all 28 varieties maximum breeder seed indent was received for the variety DWRB 137 (113.30 qtls.) followed by RD 2899 (112.00 qtls.) and RDHUB 113 (40.0 qtls.).

A total of 732.63 qtls. with a surplus of 221.78 qtls. over the total allocated quantity of breeder seed of 24 varieties was produced by 9 BSP centres during 2022-23. Among 9 breeder seed production centres, maximum breeder seed was reported from RARI, Durgapura (390.990 qtls.) followed by IIWBR, Karnal (110.00 qtls.). Top five breeder seed indented varieties contributed to the tune of 85.21% in total indent whereas, these varieties contribute 76.96% share in total breeder seed production during 2022-23. Total 46.20 qtls. nucleus seed of 24 varieties was produced against 34.50 qtls. allocation in BNS-1 with a surplus of 11.70 q seed during 2022-23.

Zonal Monitoring

The teams constituted for monitoring of Barley Yield Trials & Nurseries in Central zone, NWP and NEP Zone, visited different locations at the most appropriate stage of the crop and recorded observations about the varietal performance, conduct of trials, disease/ pest incidence and genetic purity of the test entries (Table 1.5). On the spot decisions were taken about the rejection of trials and purity of test entries. The proceedings of these team meetings have been circulated for necessary action by concerned breeders and other scientists and copies of the same is appended in the report for record.

Table 1.5: Zonal monitoring visits of the barley teams.

Zone	Date	Centres visited	Team Members
NEPZ Team I	10-14 March	Kanpur, Varanasi, Kumarganj, Saini	Dr CN Mishra, PK Gupta, HR Saharan, Harikrishna
NEPZ Team II	3-5 March	Ranchi, Sabour	Drs. Amit Sharma, Lokendra Kumar
CZ	13-16 Feb	Vijapur	Drs. UR Kamble, JM Patel, KH Dhabi, Dinesh Pandey, PL Kashyap, Jogendra Singh
NWPZ Team-I	2-6 March	Durgapura, Bawal, Sriganganagar,	Dr Hanif Khan, SK Bishnoi, Raj Kumar, PS Shekhawat, Bhagat Singh
NWPZ Team-II	15-16 March	Ludhiana, Bhatinda	Dr VS Sohu, Satish Kumar, PL Kashyap, Kiran Gayakwad, Simarjeet Kaur
NWPZ Team-III	20-22 March	Modipuram, Pantnagar	Dr BS Tyagi, Vikas Gupta, SC Gill, Lokendra Kumar, OP Gangwar
NHZ-I	17-20 April	Shimla, Bajaura, Malan, Berthin	Drs. Chunilal, DP Walia, Vijay Rana, Ravindra Kumar
NHZ-II	18-21 April	Gaza, Almora, Majhera	Drs.. CN Mishra, Jogendra Singh, Pramod Prasad

Germplasm Evaluation & Exchange

In order to facilitate the availability of promising new diversity in the national barley program, the All India Coordinated Wheat and Barley Improvement Program (AICWBIP) organizes the import and conduct of international trials and nurseries in country. During *Rabi* 2022-23, two international yield trials and one observation nurseries were received from ICARDA which included a total of 216 genotypes for different production conditions (Table 6). One set each of these nurseries and trials was also evaluated at ICAR-IIWBR, Karnal. Rest of the sets were evaluated at different locations as per the requirements.

To give opportunity to barley breeders of NARS to select material from these nurseries as to cater their local needs, a Field Day was organised on 16th March 2023 at IIWBR, Karnal. In addition, EIBGN (24 entries) was supplied to 12 different locations in NWPZ, NEPZ and NHZ as a set of 48 entries including six checks repeated four times at each location. Similarly, the NBGSN comprised of a set of 15 promising genetic stocks endowed with trait(s) of breeding value was supplied at 12-centres for utilization.

Table 1.6: International trials and nurseries evaluated during crop season 2022-23

SN.	Trials/Nurseries	Genotypes received	National Check	# Sets	Locations
1	2023 International Barley Yield Trial for Feed Forage and Malt in Favourable Environments (IBYT-FFM-23)	48	DWRB137	4	Durgapura, Hisar, Kanpur, Karnal
2	2023 International Barley Yield Trial for Arid and Semi-Arid regions (IBYT-ASA)	48	Lakhan	4	Pantnagar, Karnal Durgapura, Kanpur,
3	2023 International Barley Observation Nursery (IBON-23)	120	DWRB137	5	Hisar, Kanpur, Karnal, Ludhiana, Durgapura,

CROP PROTECTION

Status of barley diseases and insect pests at farmers' field

To know the health status of barley crop, the survey was conducted by the scientists from RARI, Durgapura on farmers' fields during Jan. 27- 28, 2023 and March 9-10, 2023 in the villages of Jaipur, Dausa and Tonk districts. Minor incidences of leaf rust (5S-10S) were recorded at two locations of district Tonk. The incidences of leaf stripe, net blotch, loose smut, covered smut and bacterial streak were noted at few locations. However, very severe infection (100%) of net blotch was noted at Todaraising village of district Tonk. In another Survey, aphid infestation on the barley crop was also found to be low to moderate at the Ludhiana, Kanpur, and Karnal locations throughout the crop season. Termite damage in barley fields stayed low to moderate. Predators including coccinellid beetles, chrysoperla, and syrphid flies were regularly observed preying on barley aphids.

Status of resistance in breeding lines and advanced entries:

A total of 585 breeding and advanced line in different nurseries i.e. IBDSN (437 entries), NBDSN (118 entries) and EBDSN (30 entries) were screened for diseases, aphids and CNN resistance at different cooperating centres. Seedling Resistance Test (SRT) for NBDSN and EBDSN entries was conducted at IIWBR, Regional station, Flowerdale, Shimla.

National Barley Disease Screening Nursery (NBDSN) 2022-23

The NBDSN entries were screened for stripe rust resistance at hot spot centres that include Durgapura, Ludhiana, Hisar, Almora, Bajaura, Jammu and Karnal. Leaf rust screening was done at Ludhiana and Jammu. The leaf blight screening was done at Ayodhya, Pantnagar, Dharwad, Kanpur and Varanasi. The data of Kanpur centre were not considered due to low severity of foliar blight. CCN screening was done at Durgapura and Hisar centres. For CCN, the number of nematode cysts / plants was counted and entries having 0-4 cysts/ plant in pot were considered as resistant whereas, those with cysts/plant 4.1-9.0 were moderately resistant. The entries with galls between 9.1 and 20.0 were treated as susceptible and the entries with more than 20.0 galls per plant were treated as highly susceptible. Results are presented in Table 7. Results of EBDSN are given in Table 8.

Table. 1.7: Resistant entries in IBDSN.

Yellow rust, ACI = 0, Entries – 10	BH 1049, DWRUB 52 (C), KB 2160, PL 941, PL 942, RD 2794 (C), RD 2907 (C), RD 3065, RD 3078 and VLB 183
Yellow rust, ACI > 0 to 10, Entries – 90	BH 1045, BH 1047, BH 1048, BH 1050, BH 1051, BH 1052, BH 1053, BH 1054, BH 946 (C), BHS 352 (C), BHS 380 (C), BHS 400, BHS 493, BHS 494, BHS 496, BHS 497, BHS 945, DWRB 137 (C), DWRB 182 (C), DWRB 219, DWRB 223, DWRB 226, DWRB 228, DWRB 235, DWRB 236, DWRB 237, DWRB 238, DWRB 239, DWRB 240, DWRB 241, DWRB 242, DWRB 243, DWRB 245, HBL 113, HBL 879, HBL 880, HBL 881, HBL 882, HBL 883, HUB 113 (C), HUB 281, HUB 283, HUB 284 (C), K 2133, KB 2031, KB 2127 (C), KB 2131, KB 2145, KB 2155, KB 2158, PL 891 (C), PL 937, PL 943, PL 945, PL 946, PL 947, PL 948, PL 950, PL 951, PL 952, RD 2849 (C), RD 2899, RD 3053, RD 3064, RD 3066, RD 3067, RD 3068, RD 3070, RD 3071, RD 3076, RD 3077, RD 3079, RD 3080, RD 3081, RD 3082, RD 3083, UPB 1104,

	UPB 1109, UPB 1110, UPB 1113, UPB 1114, UPB 1115, UPB 1116, UPB 1117, VLB 118 (C), VLB 175, VLB 180, VLB 181, VLB 182 and VLB 184.
Leaf blight, Avg. 14-35 with HS < 57, Entries – 19	BH 1048, BHS 497, DWRB 219, DWRB 239, DWRB 240, DWRB 243, DWRB 244, HBL 113, HBL 879, KB 2120, KB 2160, PL 891(C), PL 946, PL 952, RD 3070, RD 3083, UPB 1111, VLB 118(C) and VLB 175.

Table 1.8: Confirmed sources of resistance in EBDSN.

Yellow rust, ACI = 0, Entries – 6	BHS 488, RD 3037 (LB), RD3054, RD3055, RD3061 and DWRBG-6.
Yellow rust, ACI > 0 to 10, Entries – 14	BH1042, BH1045, BHS491, DWRB 226, DWRB228, KB2013, RD3034, RD3050, RD3051, RD3058, RD3059, RD3063, VLB175 (LB) and HLR-324.
Leaf blight, Avg. 14-35 with HS < 57, Entries – 2	RD 3058 and RD 3059.

- Based on the average score of three locations i.e. Ludhiana, Kanpur and Karnal, 12 entries *viz.*, BH 1050, BH 1051, DWRB 235, DWRB 236, DWRB 238, HUB 283, KB 2158, RD 3066, RD 3077, RD 3081, UPB 1110 and VLB 181 showed moderate (grade 3) resistance reaction to aphids.

Chemical control experiments on diseases and insects' pests

The experiments on chemical controls of foliar blight were also conducted at various locations to evaluate the efficacy of various fungicides.

- Among eight different fungicidal treatments, two sprays of viz., Tebuconazole 50% + Trifloxystrobin 25%, Picoxystrobin 7.05% + Propiconazole 11.7% and Propiconazole 25% were found most effective in management of foliar blight of barley.
- An experiment on management of aphids through foliar application of new bio-chemical molecules was conducted at three locations viz., Ludhiana, Kanpur and Karnal. Foliar spray of pymetrozine 50 WG @ 100 g/ha and 120 g/ha was found effective in reducing aphid population.

RESOURCE MANAGEMENT

- **AVT-malt barley** trials were conducted at Durgapura, Hisar, Karnal and Ludhiana. The test entry DWRB 219 and checks RD 2849 (two row) and DWRB137 (six row) were at par. However, DWRB 219 recorded highest yield (52.90 q ha-1) followed by check RD 2849 (51.39q/ha) with 120 kg N/ha and superior to checks. The genotypes DWRUB 52, RD 2849 and DWRB 219 responded up to 120 kg N/ha and rest of entries responded up to 90 kg N/ha.
- **Productivity and quality enhancement of barley through nitrogen and zinc scheduling** -The trial were conducted at five locations in NWPZ with nine treatments of N scheduling and in three treatments Zn was also added. The productivity was superior and at par in 4, 5 and 7 treatments (4-1/2 at basal+1/2 at tillering (35-40 DAS) +5.0% urea spray at anthesis stage (80-90DAS), 5- 1/2 at basal+1/2 at tillering (35-40 DAS) +5.0% urea + 0.5% ZnSO4.7H2O spray at anthesis stage (80-90 DAS) and 7-1/2 at basal+1/4 at tillering (35-40 DAS) +5.0% urea + 0.5% ZnSO4.7H2O spray at flag leaf (65-70 DAS) and 0.5% urea spray at anthesis stage (80-90DAS) treatments when nitrogen was split twice and also apply urea (5.0%) through foliar spray and/ or urea and Zn (0.5%) as foliar spray.

- **Enhancing nutrient use efficiency through nano fertiliser in barley -** The experiments were conducted at five locations in NWPZ, three in NEPZ, one in CZ and two in NHZ and different combinations of nano-fertilizer were used to optimise nano nitrogen dose for barley. The productivity of barley increased with increase in the level of nitrogen up to recommended level and the addition of nano nitrogen did not respond significantly. The productivity of recommended dose and recommended + Nano N were at par and significantly more than the other treatments in NWPZ and NEPZ. The productivity at 75% RDF + Nano fertiliser and RDF were at par in CZ and NHZ and 100% RDF + Nano fertiliser produced significantly more than all other treatments.
- **Sowing method and seed rate on barley productivity** - The trials were conducted at five locations in NWPZ (Agra, Hisar, Ludhiana, Karnal and Durgapura) in split plot design. Pooled results revealed that normal sowing and paired row were similar in productivity and 100 and 87.5 kg seed rate/ha were at par and superior to 75 kg seed rate /ha. The highest yield (46.57 q/ha) was obtained in paired row with 100 kg seed /ha. Centre wise results show that paired row sowing was better at Durgapura and Karnal, normal sowing was better at Agra and normal and paired sowing were similar at Hisar and Ludhiana

QUALITY EVALUATION

Malt barley trials

The Barley Improvement Unit conducted a comprehensive malting quality evaluation of grain samples from the Initial Varietal Trial (IVT) and Advanced Varietal Trial (AVT). These grain samples, each weighing 500 g, were collected from eight different locations (Hisar, Bathinda, Durgapura, Karnal, Ludhiana, Pantnagar, Modipuram, and Ajmer) for AVT and seven locations (Hisar, Bathinda, Durgapura, Karnal, Ludhiana, Pantnagar, and Modipuram) for IVT, respectively. In total, 215 coded samples were received and analyzed at the central facility. The man values were taken for identification of promising limes based on minimum standards determined by the NCGMBD for malt barley in the country. These standards are revised from time to time and latest revision was on 22.06 2020. Several genotypes were observed as good source of individual and malt quality traits (Table 9), though they may not have good values for other traits.

Table. 1.9: Promising entries for individual malting quality trait.

Trait	Promising entries
Hectoliter weight	BH1051, DWRB237,
Bold Grains	BH1050, BH1051, BH1052, DWRB235, DWRB236, DWRB237, DWRB238, DWRB239, DWRB240, KB2145, PL941, PL942, PL943, PL945, RD3064, RD3066, RD3067, UPB1116, UPB1117, DWRB137 ©*
**Husk Content	BH1050, BH1051, DWRB236, DWRB237, DWRB239, RD3064, RD3065, RD2849 ©
**Grain Beta Glucan	RD3066, DWRB182 ©
Malt Friability	DWRB235, DWRB240, KB2131, KB2145, PL945, RD3064, RD3065, RD3066, DWRUB52 ©, DWRB182 ©, RD2849 ©
Hot water	BH1051, BH1052, DWRB238, DWRB240, KB2131, DWRB137 ©*
Filtration Rate	BH1050, BH1051, DWRB237, DWRB240, KB2131, KB2145, PL943, PL945, RD3065, RD3066, RD3067, DWRB182 ©
Diastatic Power	BH1050, BH1051, BH1052, DWRB236, DWRB238, DWRB240, KB2131, KB2145, PL941, PL942, PL943, PL945, RD3066, RD3067, UPB1116, UPB1117, DWRB137 ©*, DWRB182 ©, RD2849 ©
FAN Content	BH1052, DWRB235, DWRB236, DWRB237, DWRB238,

	DWRB239, DWRB240, KB2131, KB2145, PL942, PL943, PL945, RD3064, RD3065, RD3066, UPB1116, DWRUB52 ©, DWRB182 ©, RD2849 ©
Wort β- glucan	BH1051, BH1052, DWRB235, DWRB236, DWRB237, DWRB240, KB2131, KB2145, PL943, PL945, RD3065, RD3066, UPB1116, UPB1117, DWRB182 ©, RD2849 ©
**Over all Malt Quality (weighted performance compared to best check)	BH1051, BH1052, DWRB238, DWRB240, KB2145, PL943, RD3066, DWRB182 ©

**Six rows; ** Compared to the best check.*

Barley quality screening nursery (BQSN):

The BQSN is conducted to find out source of better-quality traits for hulless and malt barley. The nursery was conducted at six locations i.e. Karnal, Hisar, Pantnagar, Durgapur, Ludhiana, and Kanpur. The nursery was sent under four categories i.e., protein content barley, naked/hulless barley, evaluation of beta glucan content and for higher anti-oxidant activities in entries contributed by malt barley and molecular breeding programme. The identified promising entries analyzed in the nursery are given below in table 10.

Table. 1.10: Promising entries from BQSN for different traits

Traits	Promising entries
Protein Content	BCU6369, BCU6315, BCU 6316, BCU 5924, DWRB137 ©
Starch Content	BCU 5957, BCU 6040, BCU 6306, BCU 6315, BCU 6316, DWRUB 52 ©
Higher Friability	BCU6369, BCU6315, DWRB137 ©
Higher Hot Water Extract	BCU6315, BCU6369, DWRB137 ©
Higher Diastatic Power	BCU6315, DWRB137 ©
Higher Free Amino Nitrogen	BCU6315, BCU6369, DWRB137 ©
Low beta glucan	BCU6369, BCU6315, DWRB137 © DWRUB64 ©

**At par or better than best check*

FEED AND FOOD BARLEY QUALITY EVALUATION

The feed and food grain samples from various trials grown at different locations were analyzed for physical parameters and protein content. Each centre was requested to provide a grain sample of 250 gm.

Hectoliter weight (test weight) was measured with ICAR-IIWBR Hectoliter Weight instrument. The crude protein content was estimated using FOSS NIR system and has been given on dry weight basis. The quality data has been presented trial wise. The entries having highest thousand grain weight, protein content and hectoliter weight have been listed in table 11.

Table 1.11: Entries having highest 1000-grain weight, protein content and hectoliter weight in respective trials.

Trial	Zone	1000- grain weight	Protein content	Hectoliter weight
IVT-IR-TS-FB	NWPZ	KB 2145	HUB 284	PL 947
	NEPZ	KB 2145	DWRB 242	DWRB 243
	CZ	RD 3068	DWRB 242	KB 2145
AVT-IR-TS-FB	NWPZ	DWRB 137 ©	DWRB 226	DWRB 137 ©
	NEPZ	KB 2004	UPB 1106	KB 2004
	CZ	RD 2899 ©	RD 3053	RD 3053

IVT-RF-TS-FB	NEPZ	PL 952	PL 952	HUB 282
	NHZ	VLB 183	VLB 182	HBL 113 ©
AVT-SST-FB	NWPZ/NEPZ	KB 2120	DWRB 246	KB 2120
IVT/AVT-IR-TS-NB	NWPZ/NEPZ/CZ	DWRB 245	DWRB 244	DWRB 244

Barley Frontline Demonstrations

During the *rabi* crop season 2022-23, 140 hectares Barley Frontline Demonstrations (BFLDs) were allotted to 37 cooperating centers all over India in eight states/UT namely, Himachal Pradesh, Uttar Pradesh, Bihar, Jammu & Kashmir, Punjab, Haryana, Rajasthan and Madhya Pradesh. Out of these, 134 BFLDs were conducted by 36 centers, covering 141.72 hectares area of 382 farmers. Improved barley varieties with complete package of practices (irrigation management, nutrient management, weed control, seed treatment etc.) were demonstrated. The highest gain in barley yield was recorded in Eastern UP (59.56%) followed by MP (47.63%), All UP (43.25%), HP (39.92%), UT of J&K (37.67%), Central UP (34.84%) and Rajasthan NWPZ (19.69%). The lowest gain in yield was reported in Haryana (9.26%) (Table 1.12).

Table 1.12: State wise yield gain during *rabi* 2022-23

State	BFLDs yield (q/ha)	Check yield (q/ha)	Gain (%)
HP	27.95	19.98	39.92***
Eastern UP	35.90	22.50	59.56***
Central UP	33.58	24.90	34.84***
Western UP	58.43	52.10	12.14***
All UP	37.68	26.30	43.25***
Bihar	42.18	36.40	15.87*
UT of J&K	30.70	22.30	37.67***
Punjab	47.58	40.38	17.83***
Haryana	42.20	38.63	09.26*
Rajasthan (NWPZ)	60.03	50.15	19.69***
Rajasthan (CZ)	42.20	36.10	16.90***
All Rajasthan	53.13	44.70	18.85***
MP	39.75	26.93	47.63***

**** Significant at 1 per cent level, ** Significant at 5 per cent level*

The yield gain due to improved varieties over check was highest in NEPZ (46.69%) followed by NHZ (39.92%), CZ (36.32%) and NWPZ (16.42%) (Table 1.13). Therefore, efforts should be made to increase barley yield in the NEPZ, CZ and NHZ by promoting recent barley production technologies in collaboration with the state department of agriculture.

Table 1.13: Zone wise productivity over check during *rabi* 2022-23

Zone	BFLDs yield (q/ha)	Check mean yield (q/ha)	Gain (%)
NHZ	27.95	19.98	39.92***
NEPZ	37.63	25.65	46.69***
NWPZ	47.85	41.10	16.42***
CZ	38.75	28.43	36.32***

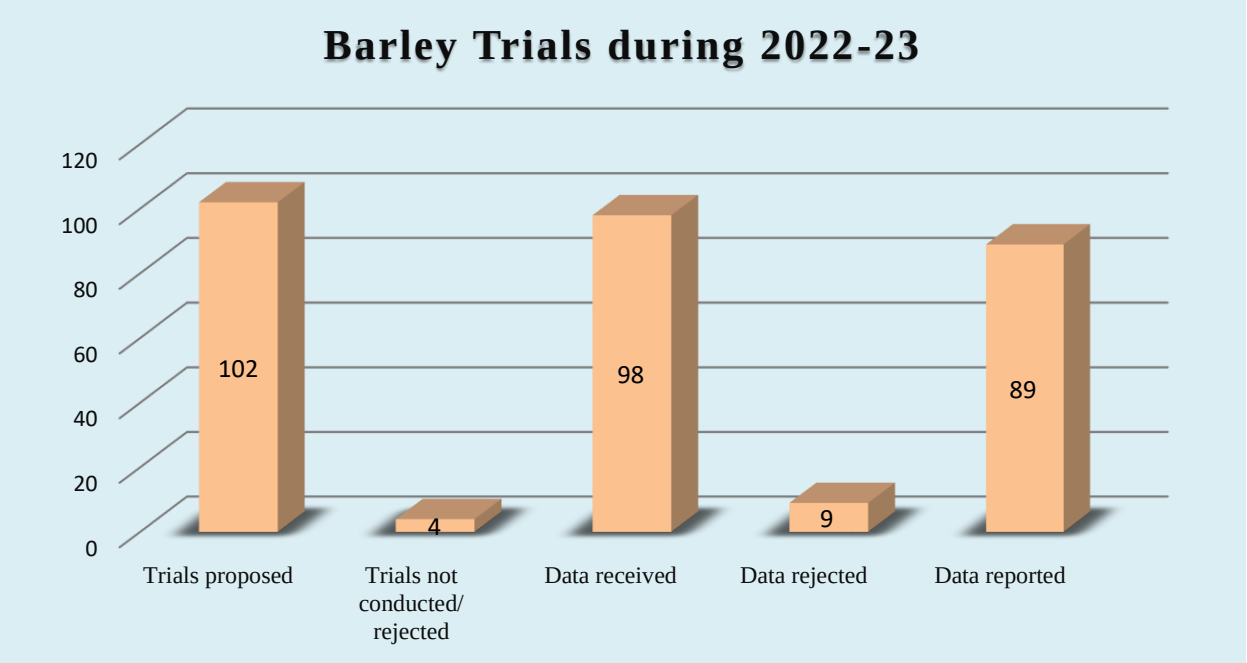
**** Significant at 1 per cent level, ** Significant at 5 per cent level, * Significant at 10 per cent level, NS is Non-significant*

Centre wise data analysis revealed that the yield gain under barley FLD was highest at center Rewa (142.40%) followed by Lalitpur (50.58%) in CZ; Mirzapur (115.29%) in NEPZ; Bajaura (44.75%) in NHZ and Mansa (38.93%) followed by Kathua (37.67%) in NWPZ. The yield gain was lowest at Muktsar (05.02%) in NWPZ.

BREAK UP OF BARLEY IMPROVEMENT YIELD TRIALS (*RABI* 022-23)

Trial Name	No. of centers				
	PR	NC/TF/ NR	Rec	Rejected	Rep
AVT-IR-MB-NWPZ	11	-	11	-	11
IVT-IR-MB-NWPZ	11	-	11	-	11
AVT-IR-FB-CZ	7	1 Gwalior-NC	6		6
AVT-IR-FB-NEPZ+NWPZ	14	-	14	2 (Sabour &Ranchi) LSM,	12
IVT-IR-FB-NWPZ/NEPZ/CZ	20	1 Gwalior-NC	19	1 (Sobour) LSM	18
IVT-RF-NEPZ	8	-	8	1 (Pusa CAU) LSM	7
IVT-IR-NB/HLS (NWPZ/NEPZ/CZ)	15	1 Gwalior (NC)	14	2 (Tikamgarh, Ranchi) LSM	12
AVT/IVT-SST-NWP/NEPZ	7	-	7	2 (Dilipnagar) Late Sowing, (Fatehpur) Unrealistic yield data	5
AVT/IVT-RF-NHZ ***(Grain)	9	1 Berthein (MTR)	8	1 (Gaza) LSM	7
AVT/IVT-RF-NHZ ***(Dual Purpose)	*** Same trial		8	Low Forage yield = 3 (Almora, Gaza, Majhera,)	5
TOTAL	102	4	98	9	89
			96%	87.25 % (P) 90.81% (R)	

*P= percent of proposed trials, R= percent of received trials *not included the total as it is part of AVT-RF-NHZ*



Performance of test sites during *Rabi* 2022-23

A. MAIN CENTRES

No.	Centres	No. of Trials			Trials Rejected		
		Allotted	Name	Conducted	No.	Name	Reason
1.	Almora	1	AVT/IVT-RF-NHZ	1	-	-	-
2.	Bajaura	1	AVT/IVT-RF-NHZ	1	-	-	-
3.	Durgapura	5	AVT-MB, IVT-IR-MB, IVT-IR-NB, IVT-IR-FB,AV-IR-FB	5	-	-	-
4.	Kumarganj	5	AVT-FB-NEPZ, IVT-IR-FB, IVT-RF-NEPZ, AVT/IVT-IR-NB, AVT/IVT-SST	5		-	
5	Hisar HAU	5	AVT-IR-MB-NWPZ, IVT-IR-MB-NWPZ, AVT/IVT-IR-NB, IVT-IR-FB, AVT-FB-NWPZ	5	-	-	-
6.	Kanpur	4	AVT-IR-FB-NEPZ, IVT-RF-NEPZ, IVT-IR-FB, AVT/IVT-IR-NB	4	-	-	-
7.	Karnal	5	AVT-IR-MB, IVT-IR-MB, AVT/IVT-IR-NB, IVT-IR-FB, AVT-IR-FB	5	-	-	-
8.	Ludhiana	5	AVT-IR-MB, IVT-IR-MB, AVT/IVT-IR-NB, IVT-IR-FB, AVT –FB-NWPZ	5	-	-	-
9.	Shimla	1	AVT-RF-NHZ	1	-	-	-
10	Varanasi	4	AVT-IR-FB, IVT-IR-FB, AVT/IVT IR-NB, IVT-RF-NEPZ,	4	-	-	-
11	Pantnagar	5	AVT-IR-MB, IVT-IR-MB, AVT/IVT-IR-NB, IVT-IR-FB, AVT-IR-FB	5	-	-	-
	Total (A)	41		41	-	-	-

Contd……..

B. TESTING CENTRES /SAU / DEPTT. OF AGRIC.

No.	Centres	Trials Allotted	Conducted	Trials Rejected		
				No.	Trial Name	Reason
1	Bawal	2	2	-	-	-
2	Banda	2	2			
3	Bathinda	2	2	-	-	
4	Berthein	1	1	1	IVT-RF-NHZ	RMT
5	Bhilwara	1	1	-	-	-
6	Bisa-Samastipur	2	2			
7	Chiyanki	1	1	-	-	-
8	Dalipnagar	1	1	1	AVT-SST	LS
9	Fatehpur	1	1	1	AVT-SST	UR
10	Gwalior	3	0	3	IVT-IR-FB, AVT-IR-FB, AVT/IVT-IR-NB	NC
11	Gaza	1	1	1	IVT-RF-NHZ	LSM
12	Hisar IIWBR	2	2			
13	Karnal, CSSRI	1	1			
14	Khudwani	1	1	-	-	-
15	Majhera	1	1	-	-	-
16	Malan	1	1	-	-	-
17	Modipuram	5	5	-	-	-
18	Morena	3	3	-	-	-
19	Navgaon	2	2			
20	Pusa, CAU	3	3	1	IVT/AVT-RF-NEPZ	LSM
21	Ranchi	4	4	2	AVT/IVT-IR-NB, AVT-IR-FB-NEPZ	LSM, HVC
22	Sabour	3	3	2	AVT-IR-FB-NEPZ, IIVT-IR-FB-NEPZ	LSM, HCV
23	Saini	1	1		-	-
24	Sriganganagar	2	2	-	-	-
25	Tabiji	4	4	-	-	-
26	Tikamgarh	3	3	1	AVT/IVT-IR-NB	UR
27	Udaipur	3	3			
28	Vijapur	3	3	-	-	-
29	Wadura	1	1	-	-	-
	Total	60	57	13	-----	

HCV =High CV, TF = Trial failed, UR- unrealistic data, LSM = Low site mean, RMT= rejected by monitoring team

Trial wise locations during *Rabi* 2022-23

SN	Trial Name	Locations	Total
1	AVT-IR-MB-NWPZ	Bawal, Hisar, Karnal, Ludhiana, Bathinda, Durgapura,Navgaon, Tabiji, Sriganganagar, Pantnagar, Modipuram	11
2	AVT-IR-FB-(NWPZ+NEPZ)	Hisar, Karnal, Ludhiana, Durgapura, Tabiji, Pantnagar, Modipuram, Kanpur, Varanasi, Kumarganj, Pusa (CAU), Sabour, BISA-Samastipur, Ranchi	14
3	IVT-IR-MB-NWPZ	Bawal, Hisar, Karnal, Ludhiana, Bathinda, Durgapura,Navgaon, Tabiji, SG Nagar, Pantnagar, Modipuram	11
4	IVT-IR-FB-NWPZ/ NEPZ/CZ	Hisar, Karnal, Ludhiana, Durgapura, Tabiji, Modipuram,Pantnagar, Udaipur, Morena, Gwalior, Tikamgarh, Vijapur, Kanpur, Varanasi, Kumarganj, Pusa (CAU), Banda, BISA-Samastipur, Sabour, Ranchi.	20
5	AVT/IVT-RF-NHZ	Bajaura, Berthein, Malan, Shimla, Almora, Gaza, Majhera, Khudwani, Wadura	9
6	AVT/IVT-IR-NB-NWPZ/NEPZ /CZ	Hisar, Karnal, Ludhiana, Durgapura, Pantnagar,Modipuram, Kanpur, Varanasi, Kumarganj, Tikamgarh, Morena,Gwalior, Udaipur, Vijapur, Ranchi	15
7	AVT/IVT-SST-NWPZ/NEPZ	CSSRI-Karnal, IIWBR-Hisar-I, IIWBR-Hisar-II, Bhilwara, Fatehpur, Dalipnagar, Kumarganj,	7
8	IVT-RF-NEPZ	Kanpur, Varanasi, Kumarganj, Saini, Pusa (CAU), Sabour,Ranchi, Chiyanki	8
	Total		95

PARENTAGE OF BARLEY STRAINS UNDER COORDINATED EVALUATION DURING *RABI* 2021-22

No.	CONTRIBUTING CENTRE	SYMBOLS	Entries contributed
1.	ALMORA, V.P.K.A.S.	VLB	5
2.	BAJAURA, R.R.S. (CSKHPKV)	HBL	5
3.	DURGAPURA, R.A.R.I. (SKRAU)	RD	20
4.	HISAR, C.C.S.H.A.U.	BH	7
5.	KANPUR, C.S.A.U.&T.	KB	9
6,	KARNAL, ICAR-I.I.W.B.R.	DWRB	12
7.	LUDHIANA, P.A.U.	PL	13
8.	PANTNAGAR, G.B.P.U.A.&T.	UPB	9
9.	SHIMLA, RS, I.A.R.I.	BHS	5
10.	VARANASI, B. H. U.	HUB	1
	Total (Entries + Checks)		89 + 20

SN	Entries	Parentage
ICAR-IARI, RS, Shimla		
1.	BHS 493	HBL704/UPB1008
2.	BHS 494	BBM556/BHS169//BHS369
3.	BHS 495	BLG132/HBL 113//IBON-HI (08-09)-52
4.	BHS 496	VLB110/BHS369//VLB115
5.	BHS 497	HBL276/BHS352
GBPUA&T, Pantnagar		
6.	UPB 1109	VLB130/BH902
7.	UPB 1110	VLB130/BH902
8.	UPB 1111	RD2918/DWRB101
9.	UPB 1112	ALISO/CI3909-2//FALCON-BAR/3/HIGO/4/Alanda-01//Gerbel/Harma/3/Gloria" S"/Celo" S"//Teran78
10.	UPB 1113	BCU 73 / UPB 1001 // BH1011
11.	UPB 1114	RD 2552/AUPB 1002
12.	UPB 1115	RD2552/P.STO/3/LBIRAN/UNA80//LIGNEEG40/4/BLLU/5...//RD2035
13.	UPB 1116	RD2891/BH1011
14.	UPB 1117	RD2917/BH965
ICAR-VPKAS, Almora		
15.	VLB 180	BISON 243.4/CANELA
16.	VLB 181	CANELA/CONLON
17.	VLB 182	CANELA//LIMON/BICHY2000
18.	VLB 183	CANELA//E.QUEBRACHO/W9338
19.	VLB 184	LBIRAN/UNA80//LIGNEE640/6/P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/ PETUNIA 1
CSKHPKV, RRS, Bajaura		
20.	HBL 879	Aths/Lifnee686/3/Diralla106//Sv.Asa/Attiki/4/24569/5/AWwBlack/Aths//Arar/3/9Cr27 907/Roho/4/CompCr229//As46/Pro/3/DeirAlla106//Dl71/Srain205
21.	HBL 880	HBL276 /HBL 739
22.	HBL 881	BHS400/VLB132
23.	HBL 882	HBL759 /BL739
24.	HBL 883	HBL 747/ BHS 419

BHU, Varanasi		
25.	HUB282	CAPUL/CABUYA//ICB_116134
26.	HUB283	RIHANE/BH902
27.	HUB284	XENA/CANELA/DEFRA
28.	HUB 285	CANELA/DIAMALT
29.	HUB 286	RD 2552/EIBGN-2010-04
CCSHAU, Hisar		
30.	BH1047	MBGSN 145 (NBGSN-2016)/BH 393
31.	BH1048	RD 2833/BH 965
32.	BH1049	DWRB 137/BH 902
33.	BH1050	UPB 1058/BH 959
34.	BH1051	UPB 1058/BH 946
35.	BH1052	UPB 1058/BH 902
36.	BH1053	DWRB 142/ BH 946
37.	BH1054	RD 2849/ BH 959
RARI, SKNAU, Durgapura		
38.	RD 3064	NBPGR 92 X RD 2668 X RD 2894
39.	RD 3065	DWR 105 X RD 2668 X VLB 130
40.	RD 3066	RD 2668 X RD 2895
41.	RD 3067	DWR 105 X RD 2668 X BH 965
42.	RD 3068	RD 2552 X RD 2715
43.	RD 3069	RD 2660 X RD 2035
44.	RD 3070	PL 902 X RD 2715
45.	RD 3071	BH 959 X RD 2035
46.	RD 3072	RD 2035 X RD 2715 X RD 2832
47.	RD 3073	VPB 1031 X RD 2592
48.	RD 3074	NBP 1561 X RD 2508 X BH 902
49.	RD 3075	RD 2035 X RD 2899
50.	RD 3076	RD 2552 x BH 902
51.	RD 3077	RD 2833 X RD 2715 X RD 2832
52.	RD 3078	RD 2503 X RD 2035
53.	RD 3079	BH 959 X RD 2715
54.	RD 3080	RD 2833 X RD 2715 X RD 2832
55.	RD 3081	RD 2035 X RD 2660 X RD 2833
56.	RD 3082	RD 2503 X RD 2715
57.	RD 3083	RD 2035 X RD 2794
PAU, Ludhiana		
58.	PL941	DWRB116 × PL172
59.	PL942	DWR62 × DWRUB76
60.	PL943	BH976 × PL807
61.	PL944	RD2849 × DWRUB52
62.	PL945	DWRUB52 × PL807
63.	PL946	DWR62 × DWRUB76
64.	PL947	BH976 × PL807
65.	PL948	DWRB101 × PL807
66.	PL949	DWRUB52 × PL807
67.	PL950	DWR62 × DWRUB76
68.	PL951	DWRB116 × PL172
69.	PL952	DWR62 × DWRUB76

70.	PL953	PL807 × BF7-59
CSAUA&T, Kanpur		
71.	KB 2120	DWR UB 52 / DWR B 102
72.	KB 2127	RD 2784 / Jyoti
73.	KB 2131	DWRUB 52 / KB 1362
74.	KB 2133	K 508 / KB 1367
75.	KB 2145	DWR UB 52 / IBYT (2013-14)-22
76.	KB2155	K 996 / K 508
77.	KB 2158	MANJULA / DWR UB 52
78.	KB 2159	IBON-MRA-(2011-12)-59 / K560
79.	KB 2160	K 560 / K 1149
ICAR-IIWBR, Karnal		
80.	DWRB235	DWR47/RD2035
81.	DWRB236	DWRB101/BH976
82.	DWRB237	DWRB101/DWRB123
83.	DWRB238	DWRB101/DWR28
84.	DWRB239	DWRB101/DWRB123
85.	DWRB240	DWRUB52/DWR81
86.	DWRB241	RD2035 × BCU5527
87.	DWRB242	BLLU//LEGACY/CHAMICO
88.	DWRB243	P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1/6/P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1
89.	DWRB244	LIGNEE527/GERBEL/3/BOY-B*2/SURB//CI12225.2D /4/BBSC/CONGONA
90.	DWRB245	NACKTA/HJAA33//FNC1
91.	DWRB246	RD2786/PL891
Checks (20)		
92.	BH946	BHMS22A/BH549//RD2552
93.	BHS352	HBL240/BHS504//VLB129
94.	BHS380	VOILET/MJA/7/ABN-B6/BA/GAL// FZA-B /5/DG/DC-B/ PT-BAR /3/RA-B/BA /3/4/TRYIGAL…
95.	BHS400	34th IBON-9009
96.	DWRUB52	DWR17/K551
97.	DWRB137	DWR28/DWRUB64
98.	DWRB182	DWRUB52/DWRB78
99.	HBL113	SELECTION FROM ZYPHYZE
100.	HUB113	KARAN280/C138
101.	K1149	K12/K572/10//EB410
102.	K603	K257/C138
103.	Karan16	AZAM (DWARF)1/EB7576
104.	KB1425	K508/NDB1295
105.	Lakhan	K12/IB226
106.	PL891	IBON 343/12th HSBN-176
107.	RD2794	RD2035/RD2683
108	RD2849	DWRUB52/PL705
109	RD2899	RD2592/RD2035//RD2715
110	RD2907	RD103/RD2518//RD2592
111	VLB118	14th EMBSN-9313

AICRP Baley Breeding Trials

Advanced Varietal Trial-Malt Barley-North Western Plain Zone (*Rabi* 2022-23)

The Advanced Varietal Trial of Malt Barley was proposed at 11 centres in North Western Plain Zone (NWPZ) of the country. The trial was conducted by all centres as per given lay out. All standard packages of practices were followed by all centres to raise the good experimental crop. The data on different parameters were recorded accordingly by all centres.

From number of entries point of view, this trial was very small and comprised just five genotypes. Out of these, only one genotype (DWRB219) was the test entry and rest four genotypes (DWRUB52, DWRB137, DWRB182, RD2849) were the suitable checks for this trial. Among all four checks, three (DWRUB52, DWRB182 and RD2849) were of malt barley while the fourth one (DWRB137) was of the feed barley. Due to very limited number of genotypes, the numbers of replications were kept five in this trial. The trial was conducted in randomized block design.

The monitoring of the trial was conducted at the optimum stage of crop development at all centres. All entries of this trial were observed homogenous and genetically pure hence no segregation or mixture was reported from anywhere. No serious insect-pests and disease were reported from any centre. Over all the status of the trial was fantastic at all locations.

In case of grain yield, the trial mean value ranged from 39.47 q/ha (Hisar) to 73.22 q/ha (Shriganganagar) with 50.40 q/ha over all mean of North Western Plain Zone.

On the basis of zonal mean of the grain yield, the test entry DWRB219 ranked first (55.8q /ha) followed by six-rowed feed barley check DWRB137 (53.5 q/ha), RD2849 (48.6q/ha), DWRUB52 (47.3q/ha) and DWRB182 (46.7q/ha). The yield level of this test entry (DWRB219) was significantly superior to all checks of trial.

AVT-IR-TS-MB-NWPZ (2022-23) **Grain Yield Data (q/ha)** **Rabi 2022-23**

Entry	Code	Karnal			Bawal			Hisar			Ludhiana			Bathinda			Navgaon		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
DWRB219	AVT-MB-4	59.07	2	1	48.53	3	0	37.97	3	0	54.17	1	1	56.68	4	0	60.34	1	1
DWRUB52 ©	AVT-MB-2	42.74	3	0	46.63	4	0	37.05	4	0	47.17	3	0	57.65	3	0	41.07	4	0
DWRB137 ©	AVT-MB-1	59.58	1	1	56.00	1	1	44.30	1	1	46.75	4	0	57.83	2	0	52.75	2	0
DWRB182 ©	AVT-MB-5	38.39	5	0	40.15	5	0	34.13	5	0	39.17	5	0	61.23	1	1	41.50	3	0
RD2849 ©	AVT-MB-3	42.27	4	0	50.55	2	0	43.92	2	1	49.83	2	0	53.67	5	0	40.49	5	0
G.M.		48.41			48.37			39.47			47.42			57.41			47.23		
S.E.(M)		1.28			1.80			1.22			1.23			1.35			1.03		
C.D.		3.16			4.45			3.01			3.05			3.33			2.55		
C.V.		5.91			8.33			6.90			5.82			5.26			4.89		
DOS		16.11.22			14.11.22			17.11.22			9.11.22			10.11.22			7.11.22		

Entry	Code	Durgapura			Tabiji			Shrigangnagar			Modipuram			Pantnagar			Zonal mean		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
DWRB219	AVT-MB-4	55.11	3	1	58.80	2	1	92.96	1	1	63.13	1	1	44.43	2	0	55.8	1	1
DWRUB52 ©	AVT-MB-2	52.23	4	0	46.96	4	0	70.30	3	0	53.83	4	0	34.57	5	0	**47.3**	**4**	**0**
DWRB137 ©	AVT-MB-1	57.54	1	1	62.89	1	1	57.38	5	0	62.68	2	1	40.22	3	0	**53.5**	**2**	**0**
DWRB182 ©	AVT-MB-5	57.20	2	1	49.67	3	0	81.28	2	0	44.23	5	0	39.01	4	0	**46.7**	**5**	**0**
RD2849 ©	AVT-MB-3	45.96	5	0	44.11	5	0	64.21	4	0	55.78	3	0	48.21	1	1	**48.6**	**3**	**0**
G.M.		53.61			52.48			73.22			55.93			41.29			**50.4**		
S.E.(M)		1.12			1.73			2.19			0.67			0.85			**0.395**		
C.D.		2.76			4.27			5.40			1.65			2.10			**0.9**		
C.V.		4.67			7.37			6.68			2.68			4.61					
DOS		10.11.22			14.11.22			5.11.22			18.11.22			11.11.22					

Summary of ancillary data (Mean & Range) **AVT-IR-TS-MB-NWPZ (2022-23)** **Rabi 2022-23**

Entries Name	Code No	Agronomic Traits						
		Days to heading	Days to maturity	Plant height (cm)	Spike length (cm)	Grains/spike	Tillers/meter	2R/6R
DWRB219	AVT-MB-4	90 (75-97)	134 (129-137)	98 (83-106)	8.3 (7.6-8.7)	32 (29-34)	164 (132-179)	2R
DWRUB52 ©	AVT-MB-2	92 (79-99)	133 (131-137)	100 (84-109)	7.5 (7.1-8.3)	30 (29-32)	142 (121-157)	2R
DWRB137 ©	AVT-MB-1	85 (78-98)	130 (128-138)	93 (78-106)	8.2 (7.8-8.7)	48 (38-57)	127 (98-129)	6R
DWRB182 ©	AVT-MB-5	90 (80-97)	132 (127-137)	90 (81-103)	8.2 (7.6-8.9)	30 (26-32)	169 (154-197)	2R
RD2849 ©	AVT-MB-3	91 (79-98)	134 (129-139)	97 (88-109)	8.5 (7.9-9.0)	31 (29-32)	151 (138-168)	2R

Entries Name	Code No	Grain Traits			Diseases					Insects
		1000-GW(g)	H/N	Grain color	YR	BR	PM	Smut	LB	Aphid
DWRB219	AVT-MB-4	49.2 (47.8-52.5)	Hulled	Pale Yellow	0	0	0	0	13	0
DWRUB52 ©	AVT-MB-2	48.3 (47.3-51.6)	Hulled	Pale Yellow	0	0	0	0	24	0
DWRB137 ©	AVT-MB-1	46.1 (41.3-48.6)	Hulled	Pale Yellow	0	0	0	0	34	0
DWRB182 ©	AVT-MB-5	45.6 (43.3-48.6)	Hulled	Pale Yellow	0	0	0	0	12	0
RD2849 ©	AVT-MB-3	48.4 (41.3-48.6)	Hulled	Pale Yellow	0	0	0	0	45	0

H/N: Hulled/Naked, YR: Yellow rust, BR: Brown rust, PM: Powdery mildew, LB: Leaf blight

Initial Varietal Trial-Malt Barley-North Western Plain Zone (*Rabi* 2022-23)

The Initial Varietal Trial of Malt Barley was proposed at 11 centres in North Western Plain Zone (NWPZ) of the country. The trial was conducted as per given lay out by all centres. All standard packages of practices were followed by all centres to raise the good experimental crop. The data on different parameters were recorded accordingly by all centres.

This trial comprised a total of twenty-five genotypes. Out of these, twenty-one genotypes were the test entry and rest four genotypes (DWRUB52, DWRB137, DWRB182, and RD2849) were the suitable checks for this trial. Among all four checks genotypes, the three (DWRUB52, DWRB182 and RD2849) were of malt barley and the fourth one (DWRB137) was of the feed barley. Among total twenty one test entries, three entries (BH1050, BH1051, BH1052) were contributed by CCSHAU Hisar, six entries (DWRB235, DWRB236, DWRB237, DWRB238, DWRB239, DWRB240) were contributed by ICAR-IIWBR, Karnal, two entries (KB2131, KB2145) were contributed by CSAUA&T Kanpur, four entries (PL941, PL942, PL943, PL945) by were contributed by PAU Ludhiana, four entries (RD3064, RD3065, RD3066, RD3067) were contributed by SKNAU ARS Durgapura and rest two entries (UPB1116, UPB1117) were contributed by GBPUA&T Pantnagar. Keeping in view the size of entries, this trial was conducted in Latin square design with two replications.

The monitoring of the trial was conducted during the proper stage of crop at all centres. The entire trial was homogenous and genetically pure hence no segregation or mixture was reported in any entry from anywhere. No serious insect-pests and disease were reported from any centre. Over all the status of the trial was superb at all locations.

In case of grain yield, the trial mean value ranged from 35.37 q/ha (Hisar) to 64.80 q/ha (Bhatinda) with 50.37 q/ha over all mean of North Western Plain Zone.

On the basis of zonal mean, the six-rowed feed barley check DWRB137 stood on first rank (63.87 q/ha) followed by two-rowed malt barley entries DWRB235 (56.29 q/ha), RD3064 (55.55 q/ha), DWRB238 (54.83q/ha), RD3067 (54.06q /ha), RD3065 (53.24q/ha) and two-rowed malt barley check RD2849 (53.13 /ha). Considering the CD value of the trial, the three genotypes namely DWRB235 (56.29 q/ha), RD3064 (55.55 q/ha), DWRB238 (54.83q/ha) were found significantly superior to the best two-rowed malt barley check genotype RD2849 (53.13 /ha).

IVT-IR-TS-MB-NWPZ Grain Yield Data (q/ha) Rabi 2022-23

Entries	Code	Karnal			Bawal			Hisar			Ludhiana			Bathinda			Navgaon		
		Yield	RK	G	Yield	RK	G	Yield	RK	G	Yield	RK	G	Yield	RK	G	Yield	RK	G
BH1050	IVT-MB-9	45.82	17	0	71.75	4	0	23.46	25	0	38.33	19	0	63.25	15	0	48.18	14	0
BH1051	IVT-MB-16	39.66	24	0	52.02	22	0	30.43	21	0	42.50	10	0	62.25	16	0	47.35	16	0
BH1052	IVT-MB-19	43.10	20	0	53.24	21	0	31.41	19	0	39.17	17	0	70.67	5	1	49.58	13	0
DWRB235	IVT-MB-5	60.38	1	1	69.02	6	0	44.96	2	1	38.33	18	0	77.58	1	1	63.23	2	1
DWRB236	IVT-MB-14	51.76	10	0	73.75	3	0	46.31	1	1	45.83	4	0	59.42	20	0	50.13	12	0
DWRB237	IVT-MB-15	56.08	6	0	68.16	7	0	38.23	7	0	41.25	13	0	68.50	9	0	61.58	4	0
DWRB238	IVT-MB-25	58.41	4	1	65.23	8	0	37.97	8	0	44.17	6	0	54.38	24	0	65.94	1	1
DWRB239	IVT-MB-7	58.46	3	1	54.56	19	0	40.84	4	0	36.67	20	0	68.75	8	0	61.55	5	0
DWRB240	IVT-MB-24	57.85	5	1	64.19	10	0	37.13	9	0	42.08	12	0	67.67	11	0	58.38	6	0
KB2131	IVT-MB-18	39.13	25	0	44.82	25	0	25.59	24	0	30.83	25	0	57.75	22	0	47.92	15	0
KB2145	IVT-MB-13	45.43	18	0	60.08	13	0	31.31	20	0	43.33	8	0	56.92	23	0	45.47	19	0
PL941	IVT-MB-3	49.33	14	0	48.07	24	0	33.89	17	0	44.58	5	0	71.08	4	1	44.52	20	0
PL942	IVT-MB-6	52.45	9	0	58.89	15	0	30.42	22	0	44.17	6	0	68.79	7	0	50.22	11	0
PL943	IVT-MB-2	42.08	23	0	53.98	20	0	36.90	10	0	46.67	3	1	58.58	21	0	43.92	21	0
PL945	IVT-MB-11	48.23	16	0	56.04	18	0	35.78	13	0	48.75	2	1	62.17	17	0	41.96	24	0
RD3064	IVT-MB-20	49.50	13	0	76.53	2	0	35.87	12	0	36.67	20	0	60.33	19	0	53.32	7	0
RD3065	IVT-MB-8	48.33	15	0	65.13	9	0	39.34	6	0	40.83	14	0	70.67	5	1	46.22	18	0
RD3066	IVT-MB-17	42.82	21	0	63.95	11	0	35.75	14	0	40.00	15	0	63.83	14	0	42.53	23	0
RD3067	IVT-MB-10	50.62	12	0	58.59	16	0	36.61	11	0	43.33	8	0	68.21	10	0	53.04	8	0
UPB1116	IVT-MB-4	45.26	19	0	61.02	12	0	39.39	5	0	32.50	23	0	73.83	2	1	50.30	10	0
UPB1117	IVT-MB-12	42.44	22	0	71.54	5	0	27.18	23	0	31.67	24	0	61.42	18	0	43.56	22	0
DWRUB52 ©	IVT-MB-22	50.88	11	0	59.15	14	0	35.45	15	0	50.83	1	1	67.54	12	0	39.86	25	0
DWRB137 ©	IVT-MB-21	58.77	2	1	84.44	1	1	41.03	3	0	35.83	22	0	73.83	2	1	62.87	3	1
DWRB182 ©	IVT-MB-23	52.83	8	0	56.51	17	0	35.32	16	0	42.50	10	0	45.68	25	0	46.72	17	0
RD2849 ©	IVT-MB-1	53.63	7	0	49.53	23	0	33.70	18	0	40.00	15	0	66.83	13	0	50.73	9	0
Mean =		49.73			61.61			35.37			40.83			64.80			50.76		
S.E.m =		1.89			2.26			2.13			2.44			3.54			1.57		
C.D. = (10%)		4.57			5.59			5.25			5.89			8.57			3.87		
C.V. =		5.37			5.20			8.50			8.43			7.73			4.37		
D.O.S. =		16.11.22			14.11.22			17.11.22			9.11.22			10.11.22			7.11.22		

IVT-IR-TS-MB-NWPZ Grain Yield Data (q/ha) **Rabi 2022-23**

Entries	Code	Durgapura			Tabiji			Shrigangnagar			Modipuram			Pantnagar			Zonal mean		
		Yield	RK	G	Yield	RK	G	Yield	RK	G	Yield	RK	G	Yield	RK	G	Yield	RK	G
BH1050	IVT-MB-9	53.61	12	0	38.19	22	0	58.77	3	0	59.21	16	0	52.50	7	0	**50.28**	**14**	**0**
BH1051	IVT-MB-16	41.53	22	0	34.86	25	0	37.74	15	0	60.29	14	0	32.00	22	0	**43.69**	**24**	**0**
BH1052	IVT-MB-19	48.47	15	0	49.44	12	0	28.50	24	0	73.33	2	1	39.39	18	0	**47.84**	**18**	**0**
DWRB235	IVT-MB-5	53.75	11	0	45.83	15	0	49.08	6	0	73.29	3	1	43.69	15	0	**56.29**	**2**	**0**
DWRB236	IVT-MB-14	50.21	14	0	37.78	23	0	47.09	9	0	64.38	9	0	46.21	12	0	**52.08**	**9**	**0**
DWRB237	IVT-MB-15	55.49	9	0	41.39	19	0	33.23	23	0	54.88	21	0	45.71	13	0	**51.32**	**11**	**0**
DWRB238	IVT-MB-25	57.99	8	0	52.50	9	0	45.79	11	0	65.71	7	0	55.01	5	0	**54.83**	**4**	**0**
DWRB239	IVT-MB-7	63.68	3	1	44.31	17	0	36.33	17	0	66.54	6	0	44.04	14	0	**52.34**	**8**	**0**
DWRB240	IVT-MB-24	60.97	5	0	50.00	11	0	33.32	22	0	62.63	12	0	35.93	20	0	**51.83**	**10**	**0**
KB2131	IVT-MB-18	38.75	24	0	55.28	8	0	35.15	19	0	55.88	19	0	29.39	24	0	**41.86**	**25**	**0**
KB2145	IVT-MB-13	54.24	10	0	43.33	18	0	35.35	18	0	62.67	11	0	29.79	23	0	**46.17**	**22**	**0**
PL941	IVT-MB-3	45.69	17	0	45.69	16	0	39.43	14	0	74.54	1	1	56.46	3	0	**50.30**	**13**	**0**
PL942	IVT-MB-6	44.44	19	0	37.64	24	0	28.35	25	0	54.75	22	0	38.21	19	0	**46.21**	**21**	**0**
PL943	IVT-MB-2	42.78	21	0	62.22	4	1	43.82	12	0	58.08	17	0	47.21	10	0	**48.75**	**15**	**0**
PL945	IVT-MB-11	43.19	20	0	48.89	13	0	33.89	21	0	63.75	10	0	34.32	21	0	**47.00**	**20**	**0**
RD3064	IVT-MB-20	66.04	2	1	71.25	1	1	34.64	20	0	69.46	5	0	57.50	2	1	**55.55**	**3**	**0**
RD3065	IVT-MB-8	60.35	6	0	57.50	7	0	48.50	7	0	61.04	13	0	47.71	9	0	**53.24**	**6**	**0**
RD3066	IVT-MB-17	33.26	25	0	38.47	20	0	37.37	16	0	56.38	18	0	27.06	25	0	**43.77**	**23**	**0**
RD3067	IVT-MB-10	67.22	1	1	64.72	3	1	47.35	8	0	64.46	8	0	40.47	17	0	**54.06**	**5**	**0**
UPB1116	IVT-MB-4	41.25	23	0	38.33	21	0	46.74	10	0	55.38	20	0	46.51	11	0	**48.23**	**17**	**0**
UPB1117	IVT-MB-12	47.92	16	0	57.64	6	0	40.76	13	0	53.21	23	0	55.28	4	0	**48.42**	**16**	**0**
DWRUB52 ©	IVT-MB-22	59.44	7	0	57.92	5	0	57.27	4	0	52.46	24	0	54.28	6	0	**53.13**	**7**	**0**
DWRB137 ©	IVT-MB-21	63.06	4	0	65.28	2	1	85.94	1	1	69.67	4	0	61.85	1	1	**63.87**	**1**	**1**
DWRB182 ©	IVT-MB-23	53.40	13	0	46.39	14	0	63.14	2	0	37.42	25	0	43.21	16	0	**47.56**	**19**	**0**
RD2849 ©	IVT-MB-1	45.56	18	0	51.94	10	0	54.83	5	0	59.33	15	0	50.69	8	0	**50.62**	**12**	**0**
Mean =		51.69			49.47			44.09			61.15			44.58			**50.37**		
S.E.m =		2.06			4.09			0.74			1.88			2.31			**0.73**		
C.D. = (10%)		4.99			9.89			1.82			4.54			5.59			**1.70**		
C.V. =		5.64			11.69			2.37			4.34			7.33					
D.O.S. =		10.11.22			14.11.22			5.11.22			18.11.22			11.11.22					

Summary of ancillary data (Mean & Range) IVT-IR-TS-MB-NWPZ (2022-23)

Entries Name	Agronomic Traits							Grain Traits			Diseases				Insect
	DH	DM	PH(cm)	SL(cm)	G/S	Tillers/m	2/6 R	TGW(g)	H/HL	GC	YR	BR	Smut	LB	Aphid
BH1050	91 (77-98)	135 (125-139)	104 (87-112)	8.3 (7.1-8.8)	29 (27-31)	132 (111-148)	2R	49.5 (47.3-52.2)	Hulled	LY	0	0	0	23	0
BH1051	91 (76-95)	132 (128-138)	105 (80-110)	8.2 (7.3-9.1)	28 (27-31)	128 (121-150)	2R	48.7 (45.3-51.2)	Hulled	LY	0	0	0	12	0
BH1052	93 (79-98)	134 (128-134)	99 (83-108)	8.0 (7.0-8.8)	27 (25-31)	152 (121-160)	2R	53.6 (47.3-55.1)	Hulled	LY	0	0	0	23	0
DWRB235	90 (79-96)	130 (123-135)	101 (82-106)	8.4 (7.4-9.1)	31(29-32)	159 (141-192)	2R	50.0 (47.2-52.2)	Hulled	LY	0	0	0	23	0
DWRB236	94 (81-93)	130 (125-134)	104 (86-113)	8.4 (7.4-9.2)	29 (27-30)	142 (126-167)	2R	51.8 (48.3-52.5)	Hulled	LY	0	0	0	12	0
DWRB237	90 (80-95)	133 (128-139)	104 (81-107)	8.1 (7.4-8.8)	30 (27-31)	141 (138-159)	2R	49.4 (46.3-54.0)	Hulled	LY	0	0	0	46	0
DWRB238	90 (79-99)	130 (125-134)	92 (82-113)	8.4 (7.8-8.7)	30 (27-31)	149 (135-179)	2R	52.2 (49.2-54.8)	Hulled	LY	0	0	0	13	0
DWRB239	92 (82-97)	131 (128-137)	104 (87-112)	9.1 (7.4-9.6)	32(27-31)	143 (119-164)	2R	49.5 (47.8-53.0)	Hulled	LY	0	0	0	35	0
DWRB240	91 (79-99)	133 (125-139)	105 (81-110)	8.1 (7.4-8.8)	28 (26-31)	139 (127-153)	2R	52.2 (48.6-53.8)	Hulled	LY	0	0	0	12	0
KB2131	90 (78-94)	132 (124-137)	102 (83-108)	10.2(8.8-11.1)	38 (35-41)	137 (109-149)	2R	49.0 (47.4-50.6)	Hulled	LY	0	0	0	24	0
KB2145	91 (77-97)	131 (126-135)	97 (82-106)	10.1 (8.3-10.9)	32 (29-31)	146 (137-164)	2R	50.2 (49.7-52.4)	Hulled	LY	0	0	0	45	0
PL941	89 (72-96)	132 (122-138)	98 (89-110)	10.6 (8.1-12)	33 (29-34)	116 (121-146)	2R	48.6 (45.7-49.8)	Hulled	LY	0	0	0	23	0
PL942	91 (78-99)	132 (126-137)	101 (85-105)	10.1 (8.8-11.1)	34 (32-36)	120 (113-143)	2R	48.2 (47.5-50.6)	Hulled	LY	0	0	0	12	0
PL943	92 (76-93)	130 (125-134)	104 (87-111)	8.4 (8.0-10.3)	29 (27-31)	145(126-158)	2R	48.2 (47.3-52.2)	Hulled	LY	0	0	0	12	0
PL945	91 (79-98)	134 (128-139)	104 (84-112)	8.1 (7.2-9.8)	28 (27-30)	153 (132-167)	2R	48.4 (46.3-51.2)	Hulled	LY	0	0	0	34	0
RD3065	89 (79-96)	131 (123-135)	103 (89-106)	7.4 (6.2-8.1)	27 (25-29)	141(126-155)	2R	48.8 (47.3-50.5)	Hulled	LY	0	0	0	34	0
RD3066	91 (73-98)	130 (125-134)	102 (83-107)	8.1 (7.2-10.3)	28 (27-31)	130 (121-140)	2R	52.2 (50.3-54.2)	Hulled	LY	0	0	0	24	0
RD3067	92 (77-98))	131 (128-134)	101 (79-106)	10.3 (8.1-11.1)	31(29-34)	115 (93-129)	2R	56.0 (51.5-59.6)	Hulled	LY	0	0	0	34	0
UPB1116	93 (79-99)	129 (123-135)	104 (86-108)	10.1 (8.7-10.9)	31 (27-33)	156 (131-167)	2R	53.4 (51.3-55.2)	Hulled	LY	0	0	0	34	0
UPB1117	92 (76-97)	130 (125-134)	102 (84-109)	9.0 (8.8-11.2)	32 (27-35)	134 (120-156)	2R	55.9(51.4.3-57.2)	Hulled	LY	0	0	0	23	0
RD3064	91 (74-98)	131 (129-138)	100 (92-106)	10.3 (8.1-10.8)	30 (28-31)	119 (110-139)	2R	60.2 (55.2-64.8)	Hulled	LY	0	0	0	13	0
DWRUB52 ©	92 (77-98)	133 (128-137)	104 (87-112)	8.4 (7.7-8.8)	29 (27-31)	139 (127-147)	2R	49.8 (47.3-52.2)	Hulled	LY	0	0	0	23	0
DWRB137 ©	89 (79-96)	128 (123-135)	99 (79-109)	8.2 (7.6-8.7)	46 (41-53)	121(107-139)	6R	42.7 (41.8-47.6)	Hulled	LY	0	0	0	13	0
DWRB182 ©	92 (76-93)	130 (125-134)	102 (87-108)	8.3 (7.8-8.8)	30 (29-31)	157(134-179)	2R	46.0 (43.5-49.1)	Hulled	LY	0	0	0	23	0
RD2849 ©	91 (76-96)	132 (126-137)	100 (81-109)	8.1 (7.4-8.8)	31 (28-32)	143(131-159)	2R	47.8 (45.3-48.6)	Hulled	LY	0	0	0	24	0

DH: Days to heading, DM: Days to maturity, PH: Plant height, SL: Spike length, G/S: Grain per spike, TGW: 1000- Grain wt, GC: Grain colour, LY: Light yellow, H/HL: Hulled/Hulless, YR: Yellow rust, BR: Brown rust, LB: Leaf blight

Advanced Varietal Trial-Irrigated-Timely Sown-Feed Barley-NWPZ & NEPZ (2022-23)

A combined trial was proposed at seven locations each in the NWPZ and NEPZ. The results of all the seven locations of NWPZ were included in zonal pooled analysis. However, in NEPZ the two locations Sabour and Ranchi were not considered for zonal pooled analysis as these locations had Low Station Means (LSM: Sabour, 19.1 q/ha; Ranchi, 26.2 q/ha). The remaining five locations of NEPZ were considered for zonal pooled analysis.

The trial consisted of three entries and three checks, namely BH946 (check for NWPZ), DWRB137 (check for both NWPZ and NEPZ) and HUB113 (check for NEPZ). Among the entries, KB2004 and UPB1106 are for NWPZ and DWRB226 for NEPZ in the AVT-IR-FB (1st year).

The Zonal monitoring teams visited the trials at Ludhiana and Durgapura locations of NWPZ, and Kanpur, Kumarganj and Varanasi locations of NEPZ. By both the teams the entry DWRB226 has been recommended for purification. High incidences of Leaf blight were observed in the check variety DWRB137at Kanpur (68), Kumarganj (68) and Varanasi (79) locations.

In NWPZ, the location means for grain yield ranged from 36.3 q/ha (Karnal) to 66.0 q/ha (Tabiji) with 49.0 q/ha zonal mean across the centres of this zone. The check BH946 ranked first with 51.8 q/ha mean grain yield followed by a test entry UPB1106 which was at par with the check variety with a mean grain yield of 51.7 q/ha.

In case of NEPZ the location means for grain yield ranged from 35.3 q/ha (Varanasi) to 48.6 q/ha (BISA, Samastipur) with 40.1 q/ha zonal mean across the locations of this zone. The test entry UPB1106 ranked first with a mean grain yield 44.0q/ha and found significantly superior to all check varieties.

AVT-IR-TS-FB-NWPZ (2022-23) **Grain Yield Data (q/ha)** **Rabi 2022-23**

Name of Entry	Entry Code	Hisar			Karnal			Ludhiana			Durgapura		
		Yield	R	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
DWRB226	AVT-IRTS-FB-4	39.2	4	0	36.6	4	0	45.8	1	1	51.1	5	0
KB2004	AVT-IRTS-FB-3	32.0	6	0	32.0	6	0	36.0	6	0	55.2	4	0
UPB1106	AVT-IRTS-FB-1	43.0	3	1	38.4	2	1	37.9	4	0	68.4	3	1
BH946 (C)	AVT-IRTS-FB-5	43.8	2	1	39.0	1	1	43.4	2	1	70.0	2	1
DWRB137(C)	AVT-IRTS-FB-6	35.1	5	0	36.8	3	0	37.9	4	0	70.4	1	1
HUB113 (C)	AVT-IRTS-FB-2	45.4	1	1	35.0	5	0	42.9	3	1	41.8	6	0
	G.M.	39.8			36.3			40.6			59.5		
	S.E.(M)	1.7			0.6			1.8			1.7		
	C.D. (10%)	4.2			1.4			4.5			4.2		
	C.V. (%)	8.4			3.1			9.0			5.7		
	DOS	17.11.22			17.11.22			9.11.22			10.11.22		

Name of Entry	Entry Code	Tabiji			Pantnagar			Modipuram			Zonal Mean		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
DWRB226	AVT-IRTS-FB-4	63.9	5	0	58.1	1	1	56.3	3	0	50.2	3	0
KB2004	AVT-IRTS-FB-3	51.4	6	0	36.7	6	0	49.3	6	0	41.8	6	0
UPB1106	AVT-IRTS-FB-1	66.3	4	0	55.3	2	1	52.5	5	0	51.7	2	1
BH946 (C)	AVT-IRTS-FB-5	69.2	3	1	43.9	3	0	53.6	4	0	51.8	1	1
DWRB137(C)	AVT-IRTS-FB-6	72.6	2	1	37.7	5	0	60.2	1	1	50.1	4	0
HUB113 (C)	AVT-IRTS-FB-2	72.7	1	1	41.1	4	0	58.9	2	1	48.3	5	0
	G.M.	66.0			45.5			55.1			49.0		
	S.E.(M)	1.9			1.3			0.9			0.659		
	C.D. (10%)	4.8			3.2			2.3			1.5		
	C.V. (%)	5.9			5.60			3.4					
	DOS	14.11.22			11.11.22			19.11.22					

(**Summary of ancillary and disease data)** AVT-**IR-TS-FB-NWPZ** **Rabi 2022-23**

Entry Name	**Entry Code**	**AGRONOMIC CHARACTERS**					
		Days to Heading	Days to Maturity	Plant height (cm)	Tillers/ meter	Two/ Six Row	Spike Length (cm)
DWRB226	AVT-IRTS-FB-4	84 (72-93)	124 (106-139)	110 (90-128)	106 (94-126)	6	8 (6-9)
KB2004	AVT-IRTS-FB-3	84 (76-91)	129 (121-141)	113 (94-130)	94 (83-117)	6	8 (7-10)
UPB1106	AVT-IRTS-FB-1	83 (66-93)	123 (108-141)	108 (84-122)	104 (73-127)	6	8 (7-10)
BH946 (C)	AVT-IRTS-FB-5	81 (65-91)	127 (117-141)	103 (89-115)	111 (69-140)	6	8 (7-10)
DWRB137 (C)	AVT-IRTS-FB-6	77 (64-84)	125 (116-140)	85 (66-106)	103 (85-132)	6	8 (6-10)
HUB113 (C)	AVT-IRTS-FB-2	84 (71-94)	129 (120-142)	101 (85-118)	122 (90-161)	6	7 (6-10)

Entry Name	**Entry Code**	**GRAIN CHARACTERISTICS**			**DISEASE REACTION**			
		Color	H/HL	TGW (g)	Yl	Br	LB	Smut
DWRB226	AVT-IRTS-FB-4	LY	H	42 (39-45)	0	0	46	-
KB2004	AVT-IRTS-FB-3	Y	H	46 (41-48)	0	0	23	-
UPB1106	AVT-IRTS-FB-1	Y	H	45 (41-53)	0	0	35	-
BH946 (C)	AVT-IRTS-FB-5	LY	H	43 (35-48)	0	0	35	-
DWRB137 (C)	AVT-IRTS-FB-6	Y	H	47 (39-59)	0	0	35	-
HUB113 (C)	AVT-IRTS-FB-2	LY	H	38 (29-43)	0	0	34	-

AVT-IR-TS-FB-NEPZ (2022-23) **Grain Yield Data (q/ha)** **Rabi 2022-23**

Name of Entry	Entry Code	**Kanpur**			**Varanasi**			**Kumarganj**			**Pusa (CAU),**		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
DWRB226	AVT-IRTS-FB-4	40.9	2	1	35.0	3	0	38.2	4	0	40.8	3	0
KB2004	AVT-IRTS-FB-3	43.1	1	1	33.7	5	0	39.3	3	0	35.5	4	0
UPB1106	AVT-IRTS-FB-1	32.6	6	0	41.5	1	1	45.2	1	1	45.5	2	1
BH946 (C)	AVT-IRTS-FB-5	40.9	2	1	33.8	4	0	40.8	2	0	35.3	5	0
DWRB137 (C)	AVT-IRTS-FB-6	35.9	5	0	26.9	6	0	35.6	6	0	45.8	1	1
HUB113 (C)	AVT-IRTS-FB-2	38.0	4	0	40.6	2	1	36.9	5	0	30.4	6	0
	G.M.	38.6			35.3			39.3			38.9		
	S.E.(M)	1.5			1.1			0.6			1.2		
	C.D. (10%)	3.8			2.7			1.5			2.9		
	C.V. (%)	8.0			6.2			3.1			6.1		
	DOS	12.11.22			15.11.22			14.11.22			18.11.2022		

Name of Entry	Entry Code	**BISA Samastipur**			**Zonal Mean**		
		Yield	Rk	G	Yield	Rk	G
DWRB226	AVT-IRTS-FB-4	44.3	5	0	39.9	4	0
KB2004	AVT-IRTS-FB-3	36.9	6	0	37.7	6	0
UPB1106	AVT-IRTS-FB-1	55.4	2	1	44.0	1	1
BH946 (C)	AVT-IRTS-FB-5	52.5	3	1	40.7	2	0
DWRB137 (C)	AVT-IRTS-FB-6	46.4	4	1	38.1	5	0
HUB113 (C)	AVT-IRTS-FB-2	56.3	1	1	40.4	3	0
	G.M.	48.6			40.1		
	S.E.(M)	4.4			0.997		
	C.D. (10%)	10.9			2.3		
	C.V. (%)	18.2					
	DOS	16.11.22					

(Summary of ancillary and disease data)

AVT-IR-TS-FB-NEPZ (2022-23) **Zone: NEPZ** **Rabi – 2022-23**

Entry Name	Entry Code	AGRONOMIC CHARACTERS					
		Days to Heading	Days to Maturity	Plant height (cm)	Tillers/ meter	2/6 Row	Spike Length (cm)
DWRB226	AVT-IRTS-FB-4	78 (64-87)	123 (113-146)	90 (72-111)	100 (74-173)	6	7 (6-9)
KB2004	AVT-IRTS-FB-3	79 (69-89)	123 (114-143)	90 (67-109)	106 (68-191)	6	8 (6-10)
UPB1106	AVT-IRTS-FB-1	76 (62-83)	119 (112-133)	85 (68-102)	95 (57-138)	6	8 (7-10)
BH946 (C)	AVT-IRTS-FB-5	76 (63-86)	121 (112-138)	93 (64-119)	89 (66-135)	6	8 (6-9)
DWRB137 (C)	AVT-IRTS-FB-6	75 (64-86)	119 (105-146)	74 (48-90)	109 (70-174)	6	7 (5-8)
HUB113 (C)	AVT-IRTS-FB-2	79 (73-85)	123 (113-142)	87 (67-107)	97 (71-163)	6	7 (5-9)

Entry Name	Entry Code	GRAIN CHARACTERISTICS			DISEASE REACTION			
		Color	(H/HL)	TGW(g)	Yr	Br	LB	Smut
DWRB226	AVT-IRTS-FB-4	Y	H	42 (37-49)	0	0	56	0
KB2004	AVT-IRTS-FB-3	LY	H	42 (37-52)	0	0	45	0
UPB1106	AVT-IRTS-FB-1	Y	H	43 (36-55)	0	0	45	0
BH946 (C)	AVT-IRTS-FB-5	Y	H	40 (36-47)	0	0	56	0
DWRB137 (C)	AVT-IRTS-FB-6	Y	H	44 (34-53)	0	0	56	0
HUB113 (C)	AVT-IRTS-FB-2	Y	H	40 (35-50)	0	0	56	0

Advanced Varietal Trial –Irrigated- Timely Sown- Feed Barley-CZ (2022-23)

This trial was proposed at seven locations of CZ. The Gwalior centre did not conduct this trial. The data from all the remaining six locations of this zone were included in zonal pooled analysis.

The trial consisted of six entries (RD3053, BH1045, KB2004, KB2015, PL937 and HUB281) in AVT 1styear and two check varieties, namely DWRB137 and RD2899.

The Zonal monitoring team visited the trials at Vijapur location of CZ. In the entry KB2004 a mixture of plants with different plant heights, spike length, leaf size was observed and has been recommended for dropping from the trial by this team. In entries PL937 and HUB281, off types have been observed and need purification.

No incidence of disease and insects pests' infestation was observed in any of the entries of the trial.

The location means for grain yield ranged from 38.6q/ha (Vijapur) to 57.5 q/ha (Banda) with 50.6 q/ha zonal mean across the centres of CZ. The check variety RD2899 ranked first with a mean grain yield 55.7 q/ha.

AVT-IR-TS-FB-CZ (2022-23)
Grain Yield Data (q/ha)

Name of Entry	Entry Code	Udaipur			Morena			Tikkamgarh			Vijapur		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BH1045	AVT-IRTS-FB-3	54.7	4	0	51.4	2	0	58.6	5	0	38.0	4	0
HUB281	AVT-IRTS-FB-8	58.6	2	1	46.1	6	0	60.8	3	1	37.9	5	0
KB2004	AVT-IRTS-FB-6	42.4	7	0	40.3	8	0	51.2	7	0	36.4	7	0
KB2015	AVT-IRTS-FB-5	40.9	8	0	47.6	5	0	57.5	6	0	41.8	2	1
PL937	AVT-IRTS-FB-2	57.3	3	1	49.6	3	0	61.1	2	1	39.3	3	1
RD3053	AVT-IRTS-FB-7	46.8	6	0	49.5	4	0	43.7	8	0	37.4	6	0
DWRB137 (C)	AVT-IRTS-FB-1	47.5	5	0	43.5	7	0	60.0	4	1	42.4	1	1
RD2899 (C)	AVT-IRTS-FB-4	61.0	1	1	62.0	1	1	62.3	1	1	35.7	8	0
	G.M.	51.1			48.8			56.9			38.6		
	S.E.(M)	2.3			2.6			1.3			1.3		
	C.D. (10%)	5.5			6.3			3.2			3.2		
	C.V. (%)	8.8			10.7			4.6			6.7		
	DOS	20.11.22			23.11.22			13.11.22			17.11.2022		

Name of Entry	Entry Code	Kota			Banda			Zonal Mean		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BH1045	AVT-IRTS-FB-3	50.2	5	0	58.7	2	1	51.9	3	0
HUB281	AVT-IRTS-FB-8	50.0	6	0	56.8	5	0	51.7	4	0
KB2004	AVT-IRTS-FB-6	56.2	1	1	53.8	8	0	46.7	8	0
KB2015	AVT-IRTS-FB-5	49.5	7	0	56.1	7	0	48.9	6	0
PL937	AVT-IRTS-FB-2	47.3	8	0	58.3	3	1	52.2	2	0
RD3053	AVT-IRTS-FB-7	50.5	4	0	56.7	6	0	47.4	7	0
DWRB137 (C	AVT-IRTS-FB-1	51.7	2	1	57.6	4	1	50.5	5	0
RD2899 (C)	AVT-IRTS-FB-4	50.7	3	0	62.2	1	1	55.7	1	1
	G.M.	50.8			57.5			50.6		
	S.E.(M)	1.9			1.9			0.795		
	C.D. (10%)	4.7			4.7			1.9		
	C.V. (%)	7.6			6.8					
	DOS	13.11.22			16.11.2022					

AVT-IR-TS-FB-CZ (2022-23)
(Summary of ancillary and disease data)

Entry Name	Entry Code	AGRONOMIC CHARACTERS					
		Days to Heading	Days to Maturity	Plant height (cm)	Tillers/ meter	2/6 Row	Spike Length (cm)
BH1045	AVT-IRTS-FB-3	76 (68-98)	121 (111-143)	93 (70-115)	104 (82-242)	6	9 (7-15)
KB2004	AVT-IRTS-FB-6	79 (67-100)	122 (110-144)	100 (86-112)	104 (72-274)	6	9 (7-14)
KB2015	AVT-IRTS-FB-5	72 (56-97)	119 (102-139)	87 (68-107)	105 (79-268)	6	9 (7-13)
PL937	AVT-IRTS-FB-2	77 (64-100)	122 (110-145)	87 (63-108)	105 (97-253)	6	8 (6-12)
RD3053	AVT-IRTS-FB-7	74 (54-102)	120 (103-148)	94 (73-112)	104 (75-291)	6	9 (6-16)
HUB281	AVT-IRTS-FB-8	78 (66-103)	124 (111-150)	93 (70-110)	111 (85-254)	6	8 (7-12)
DWRB137 (C)	AVT-IRTS-FB-1	76 (62-99)	120 (104-141)	81 (59-110)	94 (97-200)	6	8 (7-10)
RD2899 (C)	AVT-IRTS-FB-4	77 (64-101)	123 (106-147)	90 (73-110)	117 (88-300)	6	8 (6-12)

Entry Name	Entry Code	GRAIN CHARACTERISTICS			DISEASE REACTION			
		Color	(H/HL)	TGW (g)	Yr	Br	LB	Smut
BH1045	AVT-IRTS-FB-3	Y	H	41 (32-46)	-	-	-	-
KB2004	AVT-IRTS-FB-6	LY	H	45 (25-60)	-	-	-	-
KB2015	AVT-IRTS-FB-5	LY	H	42 (33-50)	-	-	-	-
PL937	AVT-IRTS-FB-2	LY	H	38 (33-45)	-	-	-	-
RD3053	AVT-IRTS-FB-7	Y	H	46 (32-55)	-	-	-	-
HUB281	AVT-IRTS-FB-8	LY	H	43 (31-60)	-	-	-	-
DWRB137 (C)	AVT-IRTS-FB-1	LY	H	47 (41-55)	-	-	-	-
RD2899 (C)	AVT-IRTS-FB-4	LY	H	46 (32-60)	-	-	-	-

Initial Varietal Trial-Irrigated- imely Sown -Feed Barley- NWPZ, NEPZ and CZ (2022-23)

This trial was proposed at 20 locations scattered in NWPZ (7), NEPZ (7) and central zone (6) in northern plains. The results from all the seven locations were included for zonal pooled analysis in NWPZ. In NEPZ the data from Sabour location was not included in the zonal pooled analysis for low site mean for grain yield obtained at this location. Data from remaining six locations were considered for pooled analysis. In case of CZ, this trial was not conducted at Gwalior location. The data from reaming five locations of CZ were included in the zonal pooled analysis.

The trial consisted of 21 test-entries and four checks, namely DWRB137 (NWPZ, NEPZ and CZ), BH 946(NWPZ), RD2899 (CZ), and HUB113 (NEPZ). The monitoring teams visited the locations in NWPZ (Ludhiana, Durgapura), NEPZ (Kanpur, Kumarganj and Varanasi) and CZ (Vijapur).

These teams have recommended purification of PL949, PL948 and BH1048 entries.

High scores (67 to 89) for leaf blight have been observed in the test entries DWRB241, RD3069, RD3071 and RD3068 entries at Kanpur, Kumarganj and Varanasi locations of NEPZ and Vijapur location of CZ.

The location means for grain yield ranged from 32.3q/ha (Karnal) to 32.3q/ha (Tabiji) with 47.4 q/ha zonal mean in NWPZ. The check varieties BH946 and DWRB137 ranked first and second giving 56.8 and 55.5 q/ha, respectively.

In NEPZ, location means ranged from 35.3 q/ha (Varanasi) to43.5 q/ha (CAU, Pusa) with zonal mean 41.20 q/ha. The check variety HUB113 ranked first in grain yield (50.6 q/ha).

In case of CZ, the location means ranged from 37.9 q/ha (Vijapur) to 72.9 q/ha (Tikamgarh) with 52.7 q/ha zonal mean. The checks RD2899 ranked first with a mean grain yield 60.5 q/ha.

IVT-IRTS-FB-NWPZ (2022-23) Grain Yield Data (q/ha) Rabi 2022-23

Name of Entry	Entry Code	Hisar			Karnal			Ludhiana			Durgapura		
		Yield	RK	G	Yield	RK	G	Yield	RK	G	Yield	RK	G
BH1047	IVT-IRTS-FB-11	39.9	13	0	35.8	9	0	42.2	13	0	66.6	9	0
BH1048	IVT-IRTS-FB-22	42.7	7	1	34.8	11	0	38.2	22	0	48.2	22	0
BH1049	IVT-IRTS-FB-2	48.4	1	1	42.2	4	0	48.9	4	1	66.1	10	0
DWRB241	IVT-IRTS-FB-12	31.6	22	0	11	24	0	43	11	0	35.8	25	0
DWRB242	IVT-IRTS-FB-3	33.7	19	0	25.9	20	0	39.1	20	0	52.6	19	0
DWRB243	IVT-IRTS-FB-10	25.5	25	0	31.4	17	0	49.7	3	1	56	15	0
HUB283	IVT-IRTS-FB-21	41	11	0	32.7	15	0	42.2	15	0	52.8	18	0
HUB284	IVT-IRTS-FB-5	33.3	20	0	29.8	18	0	40.6	18	0	43.5	23	0
KB2133	IVT-IRTS-FB-17	38.1	16	0	18.4	22	0	35.5	25	0	36.8	24	0
KB2127	IVT-IRTS-FB-25	40.7	12	0	35.5	10	0	36.9	23	0	57.8	12	0
KB2145	IVT-IRTS-FB-15	35.5	18	0	34.6	12	0	50.1	2	1	70.1	6	0
PL946	IVT-IRTS-FB-1	43	4	1	27.9	19	0	38.4	21	0	56.1	14	0
PL947	IVT-IRTS-FB-8	42.8	5	1	49.6	1	1	45	8	0	49.1	21	0
PL948	IVT-IRTS-FB-7	41.3	10	0	31.5	16	0	46.1	5	0	66.8	8	0
PL949	IVT-IRTS-FB-6	41.6	9	0	45.9	3	0	42.4	12	0	67.2	7	0
RD3068	IVT-IRTS-FB-23	28.7	23	0	11.9	23	0	36	24	0	82.3	1	1
RD3069	IVT-IRTS-FB-19	28.6	24	0	10.3	25	0	39.3	19	0	55.1	17	0
RD3070	IVT-IRTS-FB-14	31.7	21	0	39.1	8	0	42.2	14	0	72.6	4	0
RD3071	IVT-IRTS-FB-20	38.9	15	0	23.8	21	0	43.6	10	0	77	2	1
UPB1114	IVT-IRTS-FB-24	39.4	14	0	39.9	7	0	41.1	17	0	64.9	11	0
UPB1115	IVT-IRTS-FB-18	37	17	0	34	13	0	45.1	7	0	56.3	13	0
BH946 (C)	IVT-IRTS-FB-9	42.5	8	1	40.2	6	0	42.1	16	0	75.2	3	0
DWRB137 (C)	IVT-IRTS-FB-16	47	2	1	47.5	2	1	45.7	6	0	72.5	5	0
HUB113 (C)	IVT-IRTS-FB-13	42.7	6	1	41.4	5	0	44.8	9	0	55.7	16	0
RD2899 (C)	IVT-IRTS-FB-4	45.1	3	1	33.3	14	0	50.8	1	1	50.4	20	0
	G.M.	38.4			32.3			42.8			59.5		
	S.E.(M)	2.5			1.4			1.5			2.3		
	C.D. (10%)	6.1			3.5			3.6			5.7		
	C.V. (%)	9.3			6.3			4.9			5.4		
	DOS	17.11.22			17.11.22			9.11.22			10.11.22		

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IVT-IR-TS-FB-NWPZ **Grain Yield Data (q/ha)** **Rabi 2022-23**

Name of Entry	Entry Code	Tabiji			Pantnagar			Modipuram			Zonal Mean		
		Yield	RK	G	Yield	RK	G	Yield	RK	G	Yield	Rk	G
BH1047	IVT-IRTS-FB-11	75.4	3	1	36.7	18	0	63.3	1	1	51.4	6	0
BH1048	IVT-IRTS-FB-22	51	20	0	45.6	8	0	54.2	14	0	45	17	0
BH1049	IVT-IRTS-FB-2	62.1	13	0	41.5	12	0	62	2	1	53	4	0
DWRB241	IVT-IRTS-FB-12	58.9	15	0	26	25	0	34.7	25	0	34.4	25	0
DWRB242	IVT-IRTS-FB-3	53.9	17	0	31.6	22	0	45.7	24	0	40.3	22	0
DWRB243	IVT-IRTS-FB-10	63.8	11	0	32.6	21	0	47.6	23	0	43.8	19	0
HUB283	IVT-IRTS-FB-21	51	20	0	32.6	20	0	59.9	4	1	44.6	18	0
HUB284	IVT-IRTS-FB-5	46.9	23	0	27.8	23	0	57.5	9	1	39.9	23	0
KB2133	IVT-IRTS-FB-17	52.7	18	0	40.1	15	0	57.8	8	1	39.9	24	0
KB2127	IVT-IRTS-FB-25	73.9	5	1	42.5	10	0	49.6	19	0	48.1	12	0
KB2145	IVT-IRTS-FB-15	47.1	22	0	59.8	2	1	53.7	16	0	50.1	9	0
PL946	IVT-IRTS-FB-1	43.5	25	0	41.3	14	0	52.7	18	0	43.3	20	0
PL947	IVT-IRTS-FB-8	44.7	24	0	61.8	1	1	54.8	13	0	49.7	10	0
PL948	IVT-IRTS-FB-7	51.4	19	0	37	17	0	57.3	10	1	47.3	14	0
PL949	IVT-IRTS-FB-6	71	8	0	56.7	5	1	55.3	12	0	54.3	3	0
RD3068	IVT-IRTS-FB-23	85.7	1	1	27.7	24	0	49.6	19	0	46	16	0
RD3069	IVT-IRTS-FB-19	69.1	9	0	46.6	7	0	53.5	17	0	43.2	21	0
RD3070	IVT-IRTS-FB-14	63	12	0	55.8	6	0	61.6	3	1	52.3	5	0
RD3071	IVT-IRTS-FB-20	65.2	10	0	35.3	19	0	47.8	22	0	47.4	13	0
UPB1114	IVT-IRTS-FB-24	60.5	14	0	39	16	0	56.4	11	0	48.8	11	0
UPB1115	IVT-IRTS-FB-18	57.2	16	0	45	9	0	54.1	15	0	47	15	0
BH946 (C)	IVT-IRTS-FB-9	79.2	2	1	59.2	3	1	59.3	5	1	56.8	1	1
DWRB137 (C)	IVT-IRTS-FB-16	74.9	4	1	42.3	11	0	58.2	7	1	55.5	2	1
HUB113 (C)	IVT-IRTS-FB-13	73.9	5	1	41.3	13	0	59	6	1	51.2	7	0
RD2899 (C)	IVT-IRTS-FB-4	73.2	7	1	57	4	1	48	21	0	51.1	8	0
	G.M.	62.0			42.5			54.1			47.4		
	S.E.(M)	5.0			2.3			2.4			1.029		
	C.D. (10%)	12.1			5.7			5.8			2.4		
	C.V. (%)	11.4			7.7			6.3					
	DOS	14.11.22			11.11.22			18.11.22					

IVT-IR-TS-FB-NWPZ (2022-23)
(Summary of ancillary and disease data)

Name of Entry	Entry	Agronomic Characteristics					
		Days to Heading	Days to Maturity	Plant height (cm)	Tillers/ meter	Two/ Six Row	Spike length (cm)
BH1047	IVT-IRTS-FB-11	82 (68-91)	128 (120-138)	92 (75-108)	110 (86-169)	6	8 (7-9)
BH1048	IVT-IRTS-FB-22	89 (77-105)	130 (121-141)	97 (81-116)	101 (26-140)	6	7 (5-8)
BH1049	IVT-IRTS-FB-2	80 (63-89)	130 (120-141)	96 (87-106)	95 (24-123)	6	9 (7-10)
DWRB241	IVT-IRTS-FB-12	84 (69-95)	128 (119-140)	111 (93-123)	86 (42-117)	6	8 (7-9)
DWRB242	IVT-IRTS-FB-3	83 (68-94)	128 (120-140)	96 (84-112)	105 (24-193)	2	7 (4-9)
DWRB243	IVT-IRTS-FB-10	86 (71-97)	125 (106-138)	101 (86-112)	85 (19-159)	6	9 (7-10)
HUB283	IVT-IRTS-FB-21	88 (76-103)	130 (123-143)	104 (85-116)	78 (23-103)	6	8 (6-9)
HUB284	IVT-IRTS-FB-5	86 (69-96)	129 (121-142)	104 (90-120)	95 (47-115)	6	8 (6-9)
KB2133	IVT-IRTS-FB-17	97 (84-109)	128 (107-143)	98 (90-112)	117 (36-207)	6	7 (6-8)
KB2127	IVT-IRTS-FB-25	88 (71-101)	124 (105-142)	96 (87-108)	93 (24-171)	6	8 (6-9)
KB2145	IVT-IRTS-FB-15	80 (64-90)	128 (117-137)	95 (84-105)	122 (101-159)	2	10 (8-12)
PL946	IVT-IRTS-FB-1	88 (74-98)	131 (121-141)	96 (82-113)	92 (21-162)	6	7 (6-8)
PL947	IVT-IRTS-FB-8	79 (67-89)	128 (116-141)	91 (80-104)	84 (19-117)	6	7 (6-9)
PL948	IVT-IRTS-FB-7	86 (70-96)	130 (118-140)	95 (81-107)	116 (72-137)	6	8 (6-10)
PL949	IVT-IRTS-FB-6	77 (66-85)	125 (114-140)	90 (79-107)	110 (37-147)	6	8 (6-9)
RD3068	IVT-IRTS-FB-23	77 (61-86)	123 (118-131)	84 (73-97)	80 (21-133)	6	8 (6-9)
RD3069	IVT-IRTS-FB-19	80 (67-90)	124 (118-137)	102 (92-122)	87 (36-115)	6	8 (6-10)
RD3070	IVT-IRTS-FB-14	81 (67-91)	126 (118-139)	96 (88-114)	96 (23-152)	6	8 7-9)
RD3071	IVT-IRTS-FB-20	78 (61-88)	126 (119-139)	96 (83-108)	91 (23-132)	6	8 (7-9)
UPB1114	IVT-IRTS-FB-24	82 (64-91)	128 (119-139)	98 (87-110)	81 (18-115)	6	8 (6-9)
UPB1115	IVT-IRTS-FB-18	84 (71-92)	130 (121-139)	104 (93-118)	118 (94-170)	6	9 (7-11)
BH946 (C)	IVT-IRTS-FB-9	82 (68-94)	128 (120-140)	101 (86-116)	107 (33-132)	6	8 (7-9)
DWRB137 (C)	IVT-IRTS-FB-16	80 (65-97)	125 (116-141)	85 (76-103)	90 (34-120)	6	8 (6-9)
HUB113 (C)	IVT-IRTS-FB-13	86 (69-98)	129 (118-143)	97 (84-115)	104 (28-161)	6	7 (6-8)
RD2899 (C)	IVT-IRTS-FB-4	85 (67-97)	130 (120-140)	98 (85-115)	103 (44-145)	6	7 (6-8)

IVT-IR-TS-FB-NWPZ (2022-23)
(Summary of ancillary and disease data)

Name of Entry	Entry	Grain Characteristics			Disease Reactions			
		Color	(H/HL)	TGW (g)	Yr	Br	LB	Smut
BH1047	IVT-IRTS-FB-11	LY	H	42 (35-49)	-	-	-	Ts
BH1048	IVT-IRTS-FB-22	LY	H	35 (27-41)	-	-	-	R
BH1049	IVT-IRTS-FB-2	LY	H	45 (37-48)	-	-	-	R
DWRB241	IVT-IRTS-FB-12	LY	H	42 (40-47)	-	-	-	S
DWRB242	IVT-IRTS-FB-3	Y	H	46 (43-52)	-	-	-	S
DWRB243	IVT-IRTS-FB-10	Y	H	39 (32-45)	-	-	-	R
HUB283	IVT-IRTS-FB-21	LY	H	44 (39-47)	-	-	-	R
HUB284	IVT-IRTS-FB-5	LY	H	40 (37-43)	-	-	-	R
KB2133	IVT-IRTS-FB-17	LY	H	31 (26-37)	-	-	-	R
KB2127	IVT-IRTS-FB-25	LY	H	39 (33-41)	-	-	-	R
KB2145	IVT-IRTS-FB-15	Y	H	50 (39-58)	-	-	-	R
PL946	IVT-IRTS-FB-1	LY	H	37 (32-40)	-	-	-	R
PL947	IVT-IRTS-FB-8	LY	H	35 (32-41)	-	-	-	R
PL948	IVT-IRTS-FB-7	LY	H	36 (32-40)	-	-	-	R
PL949	IVT-IRTS-FB-6	LY	H	30 (21-36)	-	-	-	R
RD3068	IVT-IRTS-FB-23	Y	H	44 (37-58)	-	-	-	Ts
RD3069	IVT-IRTS-FB-19	LY	H	35 (28-49)	-	-	-	R
RD3070	IVT-IRTS-FB-14	Y	H	42 (35-52)	-	-	-	R
RD3071	IVT-IRTS-FB-20	LY	H	45 (37-55)	-	-	-	S
UPB1114	IVT-IRTS-FB-24	Y	H	43 (34-51)	-	-	-	R
UPB1115	IVT-IRTS-FB-18	Y	H	43 (37-48)	-	-	-	R
BH946 (C)	IVT-IRTS-FB-9	Y	H	43 (37-52)	-	-	-	R
DWRB137 (C)	IVT-IRTS-FB-16	Y	H	48 (44-55)	-	-	-	R
HUB113 (C)	IVT-IRTS-FB-13	LY	H	40 (33-45)	-	-	-	R
RD2899 (C)	IVT-IRTS-FB-4	LY	H	44 (39-46)	-	-	-	R

IVT-IR-TS-FB-NEPZ (2022-23)
Grain Yield Data (q/ha)

Name of Entry	Entry Code	Kanpur			Varanasi			Kumarganj			Pusa (CAU)		
		Yield	RK	G	Yield	RK	G	Yield	RK	G	Yield	RK	G
BH1047	IVT-IRTS-FB-11	42.2	13	0	28.3	22	0	35.6	18	0	48.7	7	1
BH1048	IVT-IRTS-FB-22	38.2	22	0	44.2	2	0	42.5	11	0	49.6	2	1
BH1049	IVT-IRTS-FB-2	48.9	4	1	37.3	9	0	39.4	13	0	48.1	8	1
DWRB241	IVT-IRTS-FB-12	43	11	0	30.9	20	0	32.2	22	0	40.6	16	0
DWRB242	IVT-IRTS-FB-3	39.1	20	0	30.9	19	0	43.2	9	0	41.3	15	0
DWRB243	IVT-IRTS-FB-10	49.7	3	1	31.6	17	0	52.5	1	1	40.3	17	0
HUB283	IVT-IRTS-FB-21	42.2	15	0	34.1	15	0	29.2	24	0	40	19	0
HUB284	IVT-IRTS-FB-5	40.6	18	0	50.1	1	1	42.6	10	0	38.4	22	0
KB2133	IVT-IRTS-FB-17	35.5	25	0	35.4	13	0	47.4	5	0	49.2	4	1
KB2127	IVT-IRTS-FB-25	36.9	23	0	37	10	0	44.2	7	0	44.9	13	1
KB2145	IVT-IRTS-FB-15	50.1	2	1	42.9	4	0	35.1	20	0	49	6	1
PL946	IVT-IRTS-FB-1	38.4	21	0	34.2	14	0	37.6	15	0	49	5	1
PL947	IVT-IRTS-FB-8	45	8	0	42.1	5	0	46.9	6	0	50.9	1	1
PL948	IVT-IRTS-FB-7	46.1	5	0	39.9	6	0	34.5	21	0	47.9	9	1
PL949	IVT-IRTS-FB-6	42.4	12	0	24.8	25	0	37	16	0	40.1	18	0
RD3068	IVT-IRTS-FB-23	36	24	0	26.8	24	0	29.3	23	0	33.2	24	0
RD3069	IVT-IRTS-FB-19	39.3	19	0	28.6	21	0	42.4	12	0	32.1	25	0
RD3070	IVT-IRTS-FB-14	42.2	14	0	31.6	18	0	36.7	17	0	45.8	11	1
RD3071	IVT-IRTS-FB-20	43.6	10	0	31.7	16	0	44.1	8	0	39.8	20	0
UPB1114	IVT-IRTS-FB-24	41.1	17	0	37.9	8	0	27.2	25	0	45.7	12	1
UPB1115	IVT-IRTS-FB-18	45.1	7	0	36.2	12	0	39	14	0	36.9	23	0
BH946 (C)	IVT-IRTS-FB-9	42.1	16	0	36.2	11	0	35.6	18	0	41.5	14	0
DWRB137 (C)	IVT-IRTS-FB-16	45.7	6	0	38.2	7	0	47.7	3	0	38.9	21	0
HUB113 (C)	IVT-IRTS-FB-13	44.8	9	0	43.7	3	0	47.6	4	0	47.2	10	1
RD2899 (C)	IVT-IRTS-FB-4	50.8	1	1	28.1	23	0	47.8	2	0	49.4	3	1
	G.M.	42.8			35.3			39.9			43.5		
	S.E.(M)	1.5			1.8			0.9			3.6		
	C.D. (10%)	3.6			4.3			2.1			9.0		
	C.V. (%)	4.9			7.0			3.1			11.8		
DOS		11.11.22			14.11.22			11.11.22			18.11.2022		

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IVT-IR-TS-FB-NEPZ (2022-23)
Grain Yield Data (q/ha)

Name of Entry	Entry Code	Ranchi			BISA, Samastipur			Zonal Mean		
		Yield	RK	G	Yield	RK	G	Yield	RK	G
BH1047	IVT-IRTS-FB-11	46.4	9	0	44.2	13	0	40.9	18	0
BH1048	IVT-IRTS-FB-22	46.4	8	0	31.8	20	0	42.1	10	0
BH1049	IVT-IRTS-FB-2	39.1	15	0	67.4	1	1	46.7	2	0
DWRB241	IVT-IRTS-FB-12	30.4	24	0	18.7	24	0	32.6	25	0
DWRB242	IVT-IRTS-FB-3	43.5	11	0	47.8	10	0	41	16	0
DWRB243	IVT-IRTS-FB-10	18.8	25	0	57	5	1	41.7	14	0
HUB283	IVT-IRTS-FB-21	31.2	23	0	42.2	15	0	36.5	22	0
HUB284	IVT-IRTS-FB-5	39.9	14	0	58.1	4	1	44.9	4	0
KB2133	IVT-IRTS-FB-17	36.2	19	0	62.5	2	1	44.4	5	0
KB2127	IVT-IRTS-FB-25	48.6	7	0	40.1	16	0	41.9	12	0
KB2145	IVT-IRTS-FB-15	37.7	16	0	35.7	18	0	41.7	13	0
PL946	IVT-IRTS-FB-1	37	18	0	55.6	6	1	42	11	0
PL947	IVT-IRTS-FB-8	35.9	21	0	43.5	14	0	44.1	7	0
PL948	IVT-IRTS-FB-7	37	17	0	24.5	22	0	38.3	20	0
PL949	IVT-IRTS-FB-6	53.6	6	0	49.6	9	0	41.3	15	0
RD3068	IVT-IRTS-FB-23	41.3	13	0	30.2	21	0	32.8	24	0
RD3069	IVT-IRTS-FB-19	56.5	2	0	39.3	17	0	39.7	19	0
RD3070	IVT-IRTS-FB-14	55.1	3	0	59.4	3	1	45.1	3	0
RD3071	IVT-IRTS-FB-20	42	12	0	19.7	23	0	36.8	21	0
UPB1114	IVT-IRTS-FB-24	44.9	10	0	12.1	25	0	34.8	23	0
UPB1115	IVT-IRTS-FB-18	55.1	3	0	44.7	12	0	42.8	8	0
BH946 (C)	IVT-IRTS-FB-9	35.1	22	0	54.9	8	1	40.9	17	0
DWRB137 (C)	IVT-IRTS-FB-16	36.2	19	0	46.3	11	0	42.2	9	0
HUB113 (C)	IVT-IRTS-FB-13	65.2	1	1	54.9	7	1	50.6	1	1
RD2899 (C)	IVT-IRTS-FB-4	54.3	5	0	35.4	19	0	44.3	6	0
	G.M.	42.7			43.0			41.2		
	S.E.(M)	3.4			7.2			1.515		
	C.D. (10%)	8.2			17.5			3.5		
	C.V. (%)	11.2			23.7					
	DOS	15.11.22			16.11.					

IVT-IRTS-FB-NEPZ (2022-23)
(Summary of ancillary and disease data)

Entry Name	Entry Code	Agronomic Characteristics					
		Days to Heading	Days to Maturity	Plant height (cm)	Tillers/ meter	2/6 Row	Spike length
BH1047	IVT-IRTS-FB-11	81(70-92)	122(117-137)	76(57-86)	91(45-125)	6	7(5-8)
BH1048	IVT-IRTS-FB-22	83(75-89)	123(112-142)	86(76-100)	99(65-155)	6	8(7-10)
BH1049	IVT-IRTS-FB-2	77(70-82)	119(111-135)	81(65-103)	98(36-187)	6	8(7-10)
DWRB241	IVT-IRTS-FB-12	76(67-85)	120(111-134)	91(78-108)	82(36-116)	6	9(7-10)
DWRB242	IVT-IRTS-FB-3	78(67-86)	123(116-140)	87(74-103)	109 (55-156)	2	8(6-10)
DWRB243	IVT-IRTS-FB-10	79(70-87)	122(112-142)	85(73-103)	101(46-141)	6	8(7-10)
HUB283	IVT-IRTS-FB-21	84(76-88)	123(113-137)	87(72-103)	101(46-155)	6	8(6-10)
HUB284	IVT-IRTS-FB-5	78(68-87)	121(114-143)	88(80-99)	90(38-155)	6	8(6-11)
KB2133	IVT-IRTS-FB-17	87(77-98)	124(111-141)	84(78-89)	110(38-155)	6	8(7-10)
KB2127	IVT-IRTS-FB-25	83(74-88)	123(117-141)	86(73-95)	90(52-142)	6	7(7-8)
KB2145	IVT-IRTS-FB-15	73(62-81)	119(112-131)	76(65-91)	98(36-157)	2	8(7-9)
PL946	IVT-IRTS-FB-1	82(73-87)	121(109-142)	82(72-98)	97(64-139)	6	7(5-8)
PL947	IVT-IRTS-FB-8	76(65-85)	120(113-137)	81(69-97)	97(67-145)	6	8(6-9)
PL948	IVT-IRTS-FB-7	78(66-88)	122(111-143)	85(71-104)	106(42-208)	6	8(6-9)
PL949	IVT-IRTS-FB-6	77(68-96)	118(104-131)	81(64-92)	105(38-195)	6	7(7-8)
RD3068	IVT-IRTS-FB-23	76(65-82)	117(102-126)	73(58-93)	88(34-150)	6	8(6-10)
RD3069	IVT-IRTS-FB-19	75(65-84)	116(104-131)	83(77-91)	88(36-155)	6	8(8-9)
RD3070	IVT-IRTS-FB-14	77(70-80)	118(112-131)	84(70-107)	97(52-150)	6	8(6-9)
RD3071	IVT-IRTS-FB-20	74(69-79)	118(101-139)	87(78-104)	84(42-122)	6	8(7-10)
UPB1114	IVT-IRTS-FB-24	78(66-84)	121(111-143)	78(62-98)	95(42-190)	6	8 (6-9)
UPB1115	IVT-IRTS-FB-18	81(76-86)	122(112-143)	90(80-112)	88(42-119)	6	8(7-9)
BH946 (C)	IVT-IRTS-FB-9	80(68-87)	123(113-141)	83(68-102)	93(59-148)	6	8(7-9)
DWRB137(C)	IVT-IRTS-FB-16	76(70-86)	119(108-137)	71(53-82)	106(52-162)	6	7(5-10)
HUB113 (C)	IVT-IRTS-FB-13	80(72-86)	121(117-133)	87(77-96)	113(48-163)	6	8(6-9)
RD2899 (C)	IVT-IRTS-FB-4	78(70-86)	121(111-139)	78(58-96)	115(26-197)	6	7(6-8)

IVT-IRTS-FB-NEPZ (2022-23)
(Summary of ancillary and disease data)

Entry Name	Entry Code	Grain Characteristics			Diseases Reactions			
		Color	H/HL	TGW (g)	Yr	Br	LB	Smut
BH1047	IVT-IRTS-FB-11	LY	H	40(32-53)	-	-	35	Ts
BH1048	IVT-IRTS-FB-22	LY	H	37(34-43)	-	-	23	R
BH1049	IVT-IRTS-FB-2	LY	H	40(35-52)	-	-	35	R
DWRB241	IVT-IRTS-FB-12	LY	H	39(35-52)	-	-	78	S
DWRB242	IVT-IRTS-FB-3	Y	H	42(34-55)	-	-	34	S
DWRB243	IVT-IRTS-FB-10	Y	H	41(36-52)	-	-	23	R
HUB283	IVT-IRTS-FB-21	LY	H	41(34-51)	-	-	23	R
HUB284	IVT-IRTS-FB-5	LY	H	41(36-48)	-	-	23	R
KB2133	IVT-IRTS-FB-17	LY	H	35(28-41)	-	-	35	R
KB2127	IVT-IRTS-FB-25	LY	H	39(32-48)	-	-	34	R
KB2145	IVT-IRTS-FB-15	Y	H	44(36-59)	-	-	57	R
PL946	IVT-IRTS-FB-1	LY	H	36(25-42)	-	-	35	R
PL947	IVT-IRTS-FB-8	LY	H	37(28-42)	-	-	34	R
PL948	IVT-IRTS-FB-7	LY	H	37(31-45)	-	-	34	R
PL949	IVT-IRTS-FB-6	LY	H	35(23-42)	-	-	23	R
RD3068	IVT-IRTS-FB-23	Y	H	39(29-58)	-	-	78	R
RD3069	IVT-IRTS-FB-19	LY	H	38(31-49)	-	-	78	R
RD3070	IVT-IRTS-FB-14	Y	H	41(35-48)	-	-	24	R
RD3071	IVT-IRTS-FB-20	LY	H	40(36-48)	-	-	67	R
UPB1114	IVT-IRTS-FB-24	Y	H	38(32-49)	-	-	34	R
UPB1115	IVT-IRTS-FB-18	Y	H	39(32-49)	-	-	45	R
BH946 (C)	IVT-IRTS-FB-9	Y	H	41(38-47)	-	-	35	R
DWRB137 (C)	IVT-IRTS-FB-16	Y	H	42(34-57)	-	-	46	R
HUB113 (C)	IVT-IRTS-FB-13	LY	H	40(34-52)	-	-	35	R
RD2899 (C)	IVT-IRTS-FB-4	LY	H	40(32-52)	-	-	34	R

IVT-IRTS-FB-CZ (2022-23)
Grain Yield Data (q/ha)

Name of Entry	Entry Code	Udaipur			Morena			Tikkamgarh		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BH1047	IVT-IRTS-FB-11	42.3	21	0	61.2	4	0	75.2	13	0
BH1048	IVT-IRTS-FB-22	45.8	17	0	48.0	20	0	81.6	6	0
BH1049	IVT-IRTS-FB-2	55.6	8	0	56.5	7	0	86.3	3	0
DWRB241	IVT-IRTS-FB-12	65.9	1	1	36.3	24	0	61.3	22	0
DWRB242	IVT-IRTS-FB-3	41.7	22	0	51.8	11	0	57.2	25	0
DWRB243	IVT-IRTS-FB-10	34.4	25	0	51.8	11	0	75.3	12	0
HUB283	IVT-IRTS-FB-21	44.1	19	0	54.1	8	0	59.4	23	0
HUB284	IVT-IRTS-FB-5	50.6	14	0	48.9	19	0	62.0	21	0
KB2133	IVT-IRTS-FB-17	56.3	6	0	53.6	9	0	66.2	17	0
KB2127	IVT-IRTS-FB-25	60.6	3	1	58.1	5	0	70.8	16	0
KB2145	IVT-IRTS-FB-15	54.4	9	0	36.6	23	0	79.3	7	0
PL946	IVT-IRTS-FB-1	45.1	18	0	50.4	15	0	64.8	18	0
PL947	IVT-IRTS-FB-8	37.3	23	0	50.4	15	0	76.0	11	0
PL948	IVT-IRTS-FB-7	61.0	2	1	43.1	22	0	63.0	20	0
PL949	IVT-IRTS-FB-6	51.4	11	0	50.7	14	0	87.0	2	1
RD3068	IVT-IRTS-FB-23	50.3	15	0	49.6	17	0	63.7	19	0
RD3069	IVT-IRTS-FB-19	56.3	7	0	52.7	10	0	90.7	1	1
RD3070	IVT-IRTS-FB-14	43.1	20	0	49.3	18	0	83.4	5	0
RD3071	IVT-IRTS-FB-20	58.0	4	0	61.6	3	0	77.8	9	0
UPB1114	IVT-IRTS-FB-24	53.3	10	0	51.6	13	0	57.7	24	0
UPB1115	IVT-IRTS-FB-18	50.9	12	0	69.6	2	1	76.7	10	0
BH946 (C)	IVT-IRTS-FB-9	50.2	16	0	44.9	21	0	83.6	4	0
DWRB137 (C)	IVT-IRTS-FB-16	34.7	24	0	33.4	25	0	73.7	14	0
HUB113 (C)	IVT-IRTS-FB-13	50.8	13	0	56.7	6	0	71.4	15	0
RD2899 (C)	IVT-IRTS-FB-4	57.3	5	0	69.9	1	1	79.1	8	0
	G.M.	50.1			51.6			72.9		
	S.E.(M)	3.1			3.1			1.8		
	C.D. (10%)	7.6			7.5			4.4		
	C.V. (%)	8.7			8.5			3.5		
	DOS	19.11.22			22.11.22			12.11.22		

IVT-IRTS-FB-CZ (2022-23)
Grain Yield Data (q/ha)

Name of Entry	Entry Code	Vijapur			Banda			Zonal Mean		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BH1047	IVT-IRTS-FB-11	34.8	17	0	81.3	1	1	56.9	6	0
BH1048	IVT-IRTS-FB-22	43.9	9	1	66.1	7	0	55.3	9	0
BH1049	IVT-IRTS-FB-2	43.9	10	1	61.5	13	0	57.2	5	0
DWRB241	IVT-IRTS-FB-12	22.7	24	0	61.1	15	0	46.3	24	0
DWRB242	IVT-IRTS-FB-3	34.4	18	0	63.4	8	0	48.7	20	0
DWRB243	IVT-IRTS-FB-10	29.7	20	0	62.0	12	0	45.3	25	0
HUB283	IVT-IRTS-FB-21	27.2	22	0	66.8	6	0	47.1	22	0
HUB284	IVT-IRTS-FB-5	30.9	19	0	56.4	19	0	48.1	21	0
KB2133	IVT-IRTS-FB-17	26.5	23	0	72.3	3	0	51.9	14	0
KB2127	IVT-IRTS-FB-25	42.4	11	1	59.3	16	0	56.7	7	0
KB2145	IVT-IRTS-FB-15	48.5	1	1	62.1	11	0	53.1	12	0
PL946	IVT-IRTS-FB-1	46.1	4	1	55.8	20	0	49.9	17	0
PL947	IVT-IRTS-FB-8	34.9	16	0	61.1	14	0	49.3	18	0
PL948	IVT-IRTS-FB-7	38.8	14	0	50.4	23	0	48.9	19	0
PL949	IVT-IRTS-FB-6	40.0	13	0	68.2	5	0	58.5	4	1
RD3068	IVT-IRTS-FB-23	47.5	3	1	52.1	22	0	50.8	15	0
RD3069	IVT-IRTS-FB-19	28.5	21	0	52.3	21	0	56.2	8	0
RD3070	IVT-IRTS-FB-14	45.6	5	1	44.0	24	0	53.4	11	0
RD3071	IVT-IRTS-FB-20	21.1	25	0	40.7	25	0	50.2	16	0
UPB1114	IVT-IRTS-FB-24	35.7	15	0	73.6	2	0	52.8	13	0
UPB1115	IVT-IRTS-FB-18	45.5	6	1	63.2	9	0	60.1	2	1
BH946 (C)	IVT-IRTS-FB-9	45.1	7	1	69.5	4	0	54.7	10	0
DWRB137 (C)	IVT-IRTS-FB-16	41.5	12	1	62.4	10	0	47.0	23	0
HUB113 (C)	IVT-IRTS-FB-13	48.4	2	1	58.6	17	0	58.5	3	1
RD2899 (C)	IVT-IRTS-FB-4	44.9	8	1	57.6	18	0	60.5	1	1
	G.M.	37.9			60.9			52.7		
	S.E.(M)	3.4			2.5			1.195		
	C.D. (10%)	8.4			6.0			2.8		
	C.V. (%)	12.6			5.8					
	DOS	17.11.2022			15.11.2022					

Summary of ancillary and disease data

IVT –IR-TS-FB-CZ **Rabi 2022-23**

Entry Name	Entry Code	Agronomic Characteristics					
		Days to Heading	Days to Maturity	Plant height (cm)	Tillers/ meter	2/6 Row	Spike length (cm)
PL946	IVT-IRTS-FB-1	76 (67-82)	118 (106-127)	95 (85-113)	134 (73-207)	6	8 (6-9)
BH1049	IVT-IRTS-FB-2	73 (63-80)	120 (107-127)	87 (78-109)	114 (55-184)	6	9 (8-10)
DWRB242	IVT-IRTS-FB-3	73 (65-80)	118 (110-124)	96 (77-107)	137 (109-88)	2	9 (7-12)
RD2899 (C)	IVT-IRTS-FB-4	72 (61-81)	117 (105-127)	91 (79-104)	137 (84-209)	6	8 (6-9)
HUB284	IVT-IRTS-FB-5	74 (60-81)	117 (103-127)	98 (87-114)	143 (82-180)	6	8(7-10)
PL949	IVT-IRTS-FB-6	71 (56-79)	114 (101-124)	86 (63-104)	147 (95-187)	6	8 (7-9)
PL948	IVT-IRTS-FB-7	72 (60-80)	116 (103-125)	94 (78-124)	127 (85-160)	6	8 (7-10)
PL947	IVT-IRTS-FB-8	70 (53-80)	114 (100-122)	85 (74-104)	113 (79-145)	6	8 (6-9)
BH946 (C)	IVT-IRTS-FB-9	70 (60-79)	116 (107-124)	94(80-112)	137 (75-205)	6	7 (5-10)
DWRB243	IVT-IRTS-FB-10	75 (64-85)	117 (106-125)	95 (83-104)	125 (80-186)	6	9 (8-10)
BH1047	IVT-IRTS-FB-11	70 (60-79)	116 (105-124)	88 (70-109)	115 (79-154)	6	8 (6-9)
DWRB241	IVT-IRTS-FB-12	73 (64-81)	118 (102-125)	105 (83-119)	112 (86-143)	6	9 (8-11)
HUB113 (C)	IVT-IRTS-FB-13	73 (65-80)	118 (107-124)	94 (83-110)	124 (82-193)	6	7 (6-10)
RD3070	IVT-IRTS-FB-14	73 (58-81)	116 (100-126)	93 (74-114)	124 (75-171)	6	8 (7-10)
KB2145	IVT-IRTS-FB-15	69 (55-78)	114 (101-122)	89 (73-109)	128 (98-172)	2	8 (7-10)
DWRB137 (C)	IVT-IRTS-FB-16	72 (63-82)	116 (103-123)	80 (66-105)	132 (77-188)	6	8 (6-9)
KB2133	IVT-IRTS-FB-17	80 (66-86)	121(111-127)	98 (84-119)	142(108-15)	6	9 (7-10)
UPB1115	IVT-IRTS-FB-18	76 (65-82)	119 (106-126)	101 (92-110)	126 (56-220)	6	9 (8-10)
RD3069	IVT-IRTS-FB-19	72 (57-83)	116 (103-124)	96 (83-115)	135 (73-185)	6	9 (7-10)
RD3071	IVT-IRTS-FB-20	69 (52-74)	116 (99-124)	99 (75-128)	119 (60-185)	6	9 (6-13)
HUB283	IVT-IRTS-FB-21	76 (69-81)	121 (111-127)	96 (84-108)	117 (71-176)	6	8 (7-11)
BH1048	IVT-IRTS-FB-22	71 (63-84)	116 (108-125)	89 (83-99)	142 (86-211)	6	8 (7-9)
RD3068	IVT-IRTS-FB-23	69 (61-75)	116 (106-122)	79(64-101)	120 (70-199)	6	9 (8-10)
UPB1114	IVT-IRTS-FB-24	70 (59-80)	117 (105-125)	91 (78-106)	124 (65-198)	6	8 (7-10)
KB2127	IVT-IRTS-FB-25	74 (67-81)	119 (110-126)	94 (82-111)	137 (84-201)	6	8(7-9)

Summary of ancillary and disease data

IVT –IR-TS-FB-CZ **Rabi 2022-23**

Entry Name	Entry Code	Grain Characteristics			Diseases Reactions			
		Color	H/HL	TGW(g)	Yr	Br	LB	Smut
PL946	IVT-IRTS-FB-1	LY	H	40 (33-48)	-	-	56	-
BH1049	IVT-IRTS-FB-2	LY	H	40 (30-49)	-	-	46	-
DWRB242	IVT-IRTS-FB-3	Y	H	41 (38-47)	-	-	35	-
RD2899 (C)	IVT-IRTS-FB-4	LY	H	41 (35-50)	-	-	46	-
HUB284	IVT-IRTS-FB-5	LY	H	39 (30-50)	-	-	46	-
PL949	IVT-IRTS-FB-6	LY	H	31 (28-35)	-	-	56	-
PL948	IVT-IRTS-FB-7	LY	H	37 (31-45)	-	-	46	-
PL947	IVT-IRTS-FB-8	LY	H	36 (32-45)	-	-	67	-
BH946 (C)	IVT-IRTS-FB-9	Y	H	41 (38-46)	-	-	46	-
DWRB243	IVT-IRTS-FB-10	Y	H	42 (38-46)	-	-	45	-
BH1047	IVT-IRTS-FB-11	LY	H	41 (30-46)	-	-	56	-
DWRB241	IVT-IRTS-FB-12	LY	H	40 (25-47)	-	-	67	-
HUB113 (C)	IVT-IRTS-FB-13	LY	H	43 (36-48)	-	-	45	-
RD3070	IVT-IRTS-FB-14	Y	H	41 (35-48)	-	-	45	-
KB2145	IVT-IRTS-FB-15	Y	H	45 (40-50)	-	-	46	-
DWRB137 (C)	IVT-IRTS-FB-16	Y	H	42 (34-52)	-	-	56	-
KB2133	IVT-IRTS-FB-17	LY	H	34 (28-39)	-	-	45	-
UPB1115	IVT-IRTS-FB-18	Y	H	40 (27-47)	-	-	45	-
RD3069	IVT-IRTS-FB-19	LY	H	35 (28-41)	-	-	67	-
RD3071	IVT-IRTS-FB-20	LY	H	43(30-50)	-	-	78	-
HUB283	IVT-IRTS-FB-21	LY	H	42 (35-50)	-	-	35	-
BH1048	IVT-IRTS-FB-22	LY	H	37 (27-43)	-	-	57	-
RD3068	IVT-IRTS-FB-23	Y	H	41 (25-52)	-	-	57	-
UPB1114	IVT-IRTS-FB-24	Y	H	44 (40-48)	-	-	45	-
KB2127	IVT-IRTS-FB-25	LY	H	43 (38-50)	-	-	45	-

Initial Varietal Trial-Feed Barley-Rainfed Condition-North Eastern Plain Zone (*Rabi* 2022-23)

The Initial Varietal Trial of Feed Barley for Rainfed condition was proposed at 8 centres in North Eastern Plain Zone (NEPZ) of the country. The trial was conducted by all centres as per given lay out. All standard packages of practices were followed by all centres to raise the good experimental crop. The data on different parameters were recorded accordingly by all centres.

This trial comprised a total of fifteen genotypes including two checks (K603 and Lakhan). Out of total thirteen test entries, one entry (HUB282) was contributed by BHU Varanasi, four entries (KB2155, KB2158, KB2159 and KB2160) were contributed by CSAUA&T Kanpur, four entries (PL950, PL951, PL952 and PL953) by PAU Ludhiana and rest four entries (RD3076, RD3077, RD3078 and RD3079) were contributed by SKNAU ARS Durgapura. The trial was conducted with four replications in randomized block design.

The monitoring of the trial was conducted at the optimum stage of crop development at all centres. All entries of this trial were observed homogenous and genetically pure hence no segregation or mixture was reported from anywhere. No serious insect-pests and disease were reported from any centre. Over all the status of the trial was fantastic at all locations.

In case of grain yield, the trial mean value ranged from 16.9 q/ha (Ranchi) to 26.9 q/ha (Saini) with 22.8 q/ha over all mean of North Western Plain Zone.

On the basis of zonal mean of the trial, the check genotype K603 (31.5 q/ha) ranked first followed by another check genotype Lakhan (31.5 q/ha) and test entry KB2155 (28.6q/ha). Because of the superiority of the checks to all test entries, no test entry is able to promote in this trial. The yield data of Pusa centre could not be considered due to its low site mean (8.7q/ha)

IVT-RF-NEPZ (2022-23) **Grain Yield Data (q/ha)** **Rabi 2022-23**

Entries	Code	Ayodhya			Kanpur			Saini			Varanasi			Sabour			Ranchi			Chiyanki			Zonal**		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
HUB282	IVT-RF- NEPZ-8	21.5	12	0	32.2	1	1	36.8	1	1	20.4	9	0	19.6	10	0	13.8	10	0	15.4	11	0	22.8	8	0
KB2155	IVT-RF- NEPZ-4	31.1	2	0	23.2	8	0	28.6	8	0	32.8	3	0	29.6	3	0	26.1	2	1	29.2	2	1	28.6	3	0
KB2158	IVT-RF- NEPZ-9	25.3	7	0	21.2	11	0	30.6	7	0	31.6	4	0	27.2	4	0	18.1	7	0	20.6	6	0	24.9	5	0
KB2159	IVT-RF- NEPZ-10	27.3	4	0	29.7	5	1	32.1	5	0	24.3	8	0	18.1	12	0	1.8	14	0	4.3	15	0	19.7	12	0
KB2160	IVT-RF- NEPZ-6	26.6	5	0	30.4	4	1	22.6	11	0	28.6	6	0	26.4	5	0	12.7	11	0	16.2	10	0	23.4	6	0
PL950	IVT-RF- NEPZ-13	21.6	11	0	28.4	7	0	26.1	10	0	15.3	11	0	16.2	14	0	4.7	13	0	8	14	0	17.2	13	0
PL951	IVT-RF- NEPZ-2	25.8	6	0	21.7	9	0	26.6	9	0	13.1	12	0	20.3	9	0	15.6	9	0	19	9	0	20.3	10	0
PL952	IVT-RF- NEPZ-3	21.8	10	0	17.2	15	0	35.3	2	1	12.4	15	0	25.3	6	0	22.8	4	0	26	4	0	23.0	7	0
PL953	IVT-RF- NEPZ-14	19.4	15	0	21.4	10	0	17.2	14	0	16	10	0	13.2	15	0	0.7	15	0	12.3	13	0	14.3	15	0
RD3076	IVT-RF- NEPZ-11	24.3	8	0	20.3	12	0	18.3	13	0	13.1	13	0	17.5	13	0	10.1	12	0	12.6	12	0	16.6	14	0
RD3077	IVT-RF- NEPZ-7	19.9	14	0	17.9	14	0	10.9	15	0	30.3	5	0	23.2	7	0	27.2	1	1	29.7	1	1	22.7	9	0
RD3078	IVT-RF- NEPZ-1	22	9	0	18.5	13	0	19.6	12	0	12.7	14	0	18.4	11	0	21.7	6	0	25.1	5	0	19.7	11	0
RD3079	IVT-RF- NEPZ-5	28.4	3	0	29.5	6	1	32.1	5	0	28.4	7	0	21.5	8	0	16.3	8	0	19.4	8	0	25.1	4	0
K603 ©	IVT-RF- NEPZ-15	34.3	1	1	32.2	1	1	33.5	3	1	33.1	2	0	45.6	1	1	21.7	5	0	20.3	7	0	31.5	1	1
Lakhan ©	IVT-RF- NEPZ-12	20.1	13	0	31.9	3	1	33.2	4	1	39.8	1	1	41.4	2	0	26.1	2	1	28.4	3	1	31.5	2	1
G.M.		24.6			25.1			26.9			23.5			24.2			16.0			19.1			22.8		
S.E.(M)		0.6			1.6			1.6			1			1.2			1.1			1.1			0.462		
C.D.		1.3			3.8			3.8			2.4			3			2.5			2.7			1.1		
C.V.		4.6			12.7			12			8.7			10.3			13.2			12					
DOS		1.11.22			8.11.22			10.11.22			9.11.22			6.11.22			7.11.22			9.11.22					

** Data of Pusa not included due to LSM

Summary of ancillary data (Mean & Range)

IVT-RF-NEPZ **Rabi 2022-23**

Genotype	Code No	Agronomic Traits					Grain Traits			Diseases				Insect
		DH	DM	PH (cm)	Tillers/m	2/6R	TGW (g)	H/HL	GC	YR	BR	Smut	LB	Aphid
HUB282	IVT-RF- NEPZ-8	75 (73-78)	135 (126-139)	78 (64-80)	79 (28-128)	6	41.6 (38.9-43.2)	H	LY	0	0	0	35	0
KB2155	IVT-RF- NEPZ-4	73 (67-78)	129 (124-139)	73 (63-82)	85 (39-127)	6	42.4(40.6-43.7)	H	LY	0	0	0	46	4
KB2158	IVT-RF- NEPZ-9	77 (72-82)	132 (129-138)	74 (70-85)	71 (37-110)	6	43.2 (42.4-45.6)	H	LY	0	0	0	56	0
KB2159	IVT-RF- NEPZ-10	77 (69-92)	134 (130-136)	72 (60-78)	78 (21-121)	6	42.4(40.2-44.8)	H	LY	0	0	0	35	0
KB2160	IVT-RF- NEPZ-6	76 (71-87)	132 (128-135)	66 (65-87)	79 (23-132)	6	39.2(36.3-42.7)	H	LY	0	0	0	0	0
PL950	IVT-RF- NEPZ-13	75 (64-82)	127 (123-136)	79 (60-87)	70 (27-113)	6	37.2(36.8-39.7)	H	LY	0	0	0	35	1
PL951	IVT-RF- NEPZ-2	74 (70-85)	126 (121-130)	75 (63-84)	83 (30-146)	2	50.8 (48.8-53.2)	H	LY	0	0	0	35	0
PL952	IVT-RF- NEPZ-3	71 (65-80)	129 (126-137)	65 (68-81)	87 (36-119)	2	52.8 (49.6-54.1)	H	LY	0	0	0	36	0
PL953	IVT-RF- NEPZ-14	77 (71-86)	124 (120-130)	73 (59-83)	84 (24-127)	6	35.4 (33.6-38.5)	H	LY	0	0	0	67	0
RD3076	IVT-RF- NEPZ-11	79 (73-88)	133 (129-138)	72 (55-86)	75 (29-123)	6	43.2 (42.5-44.9)	H	LY	0	0	0	89	2
RD3077	IVT-RF- NEPZ-7	72 (68-83)	129 (128-130)	69 (65-89)	81 (45-125)	6	44.8 (42.2-45.6)	H	LY	0	0	0	68	0
RD3078	IVT-RF- NEPZ-1	79 (66-90)	132 (127-138)	71 (54-79)	68 (38-130)	6	49.8 (48.6-52.7)	H	LY	0	0	0	68	4
RD3079	IVT-RF- NEPZ-5	81 (74-89)	132 (128-135)	70 (60-74)	89 (23-117)	6	48.8 (46.5-51.3)	H	LY	0	0	0	78	0
K603 ©	IVT-RF- NEPZ-15	74 (65-84)	128 (124-131)	72 (70-86)	84 (33-121)	6	36.4 (34.7-38.5)	H	LY	0	0	0	35	2
Lakhan ©	IVT-RF- NEPZ-12	75 (67-81)	130 (127-137)	78 (64-90)	85 (36-129)	6	46.8 (45.6-58.4)	H	LY	0	0	0	46	0

DH: Days to heading, DM: Days to maturity, PH: Plant height, SL: Spike length, G/S: Grain per spike, TGW: 1000- Grain wt, GC: Grain colour, LY: Light yellow, H/HL: Hulled/Hulless, YR: Yellow rust, BR: Brown rust, LB: Leaf blight

ADVANCED VARIETAL TRIAL / INITIAL VARIETAL TRIALS OF RAINFED NORTH HILLS ZONE (2022-23)

The AVT-RF-NH barley trial was proposed with some modifications as per the decisions of the last annual workshop having the two components merged for normal as well as dual purpose barley evaluation in one common trial. In this trial, four replications were propsoed (two replications as normal for grain purpose and remaining two replications as dual purpose i.e., grain as well as green fodder) for evaluation under rainfed conditions of northern hills. In dual purpose replications, the green fodder cutting was to be made 70 days after sowing of the trial. The trial was proposed at 9 locations across Himachal Pradesh, Uttarakhand, Jammu and Kashmir and was conducted by all centres except Berthein centre. The trial consisted of a set of 24 entries and out of which 19 were the test entries while the rest five were the check varieties for grain (HBL113, BHS352, BHS400 and VLB118) and BHS 380 for dual purpose.

The zonal monitoring of the trial was done at Gaza, Almora and Majhera during the crop season and few off types were recorded in test entries IVT-RF-NH-5, IVT-RF-NH-8, IVT-RF-NH-17 and IVT-RF-NH-21. Overall performance of the trial was very good at the monitored centres.

Performance in no cut replications (Normal)

After location wise analysis, the data from Gaza was not considered for zonal mean analysis due to high CV. The results from rest 7 centres were in accordance and included in zonal pooled analysis. The location means for grain yield ranged from 12.5 q/ha (shimla) to 41.3 q/ha (wadura) zonal mean across the centres. The check BHS380 ranked first with mean grain yield of 30.4 q/ha and check BHS400 ranked second with grain yield 28.9 q/ha in the first non significant group. No test entry was found superior over the checks in normal trial.

Performance in dual purpose trial (Cut replications)

Grain yield performance

The trial for dual purpose was proposed at nine locations while it was conducted at eight centres in northen hills zone. After analysis, the data from Gaza (HCV) centre was excluded for zonal mean analysis. In this way, data from rest seven centres were considered for zonal pooled analysis for grain yield after regeneration in cut treatment. The relevant data of accessory traits in cut replications are given in ancillary table. The location means for grain yield ranged from 12.2 q/ha (Shimla) to 41 q/ha (Wadura) with 21.5 q/ha zonal mean across the centres. Amongst test entry, VLB184 ranked first with mean grain yield of 26.6 q/ha in the first non-significant group. However, dual purpose check BHS380 ranked second with mean grain yield of 24.5 q/ha.

(b) Green Forage yield performance

The cutting of green fodder was done after the 70 days sowing of the trial. The data from Almora, Gaza and Majhera were not included in zonal pooled analysis on account of their LSM (2.8 q/ha, 2.7 q/ha and 9.0 q/ha). The location means for green fodder yield ranged from 20.6 q/ha (Malan) to 69.8 (Wadura) with 45.4 q/ha zonal mean across the centres. Amongst test entries, the entry BHS497 ranked first with mean green fodder yield of 58.4 q/ha in Ist NSG. However, dual purpose check BHS380 ranked sixteen with mean fodder yield 42.6 q/ha.

Keeping in view of the overall performance for dual purpose i.e. grain and fodder yield together, a joint ranking of all the entries was developed and on the basis of this criteria, no entry was better performed in both traits grain and fodder yield in the trial.

AVT/IVT-DUAL PURPOSE BARLEY (RF-TS)-Uncut-NHZ (2022-23)
Location wise & Zonal means (Grain Yield in q/ha)

Varieties	Code	Almora			Bajaura			Khudwani			Majhera			Malan			Shimla			Wadura			Pooled		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BHS493	IVT-RF-NHZ-9	10.9	16	0	28.2	12	0	29.7	2	0	10.9	21	0	28.7	15	0	22.4	10	0	48.9	8	0	25.7	8	0
BHS494	IVT-RF-NHZ-3	11.8	13	0	20.7	20	0	16	24	0	15.5	5	1	47.6	2	1	21.3	22	0	35.4	15	0	24.1	16	0
BHS495	IVT-RF-NHZ-5	9.8	19	0	28.5	11	0	35.4	1	1	12.4	17	0	15.6	23	0	29	1	1	34.5	17	0	23.6	19	0
BHS496	IVT-RF-NHZ-20	16.4	3	1	33.9	4	0	25.4	11	0	16	4	1	47	3	1	21.6	17	0	28.7	22	0	27	5	0
BHS497	IVT-RF-NHZ-12	9.4	22	0	34.3	3	1	28	6	0	12.4	17	0	24.9	19	0	27.5	3	0	32.3	18	0	24.1	14	0
HBL879	IVT-RF-NHZ-23	14.8	8	1	33.2	5	0	24.2	12	0	14	11	0	28	17	0	21.7	16	0	30.8	20	0	23.8	17	0
HBL880	IVT-RF-NHZ-13	6.8	24	0	15.5	24	0	29.3	4	0	14.2	9	0	28.1	16	0	21.7	15	0	31.8	19	0	21.1	24	0
HBL881	IVT-RF-NHZ-6	13.6	9	0	29.4	8	0	27.2	9	0	15.5	5	1	32	12	0	22	12	0	53.1	4	0	27.6	4	0
HBL882	IVT-RF-NHZ-8	9.2	23	0	22.5	19	0	27.7	8	0	16.3	3	1	23.9	21	0	26.9	5	0	42.5	10	0	24.2	13	0
HBL883	IVT-RF-NHZ-15	11.1	15	0	19.4	21	0	29	5	0	13.2	14	0	24.1	20	0	21.4	20	0	57.2	2	1	25.1	9	0
UPB1109	IVT-RF-NHZ-1	15	6	1	26.3	14	0	21.8	15	0	14.2	9	0	30.6	13	0	20.2	24	0	42.2	11	0	24.3	12	0
UPB1110	IVT-RF-NHZ-18	9.5	21	0	17.4	23	0	27	10	0	14	11	0	14.8	24	0	21.6	18	0	52.5	5	0	22.4	22	0
UPB1111	IVT-RF-NHZ-22	12.9	10	0	35.5	2	1	19.4	22	0	10.9	21	0	16.3	22	0	21.6	18	0	41.6	12	0	22.6	21	0
VLB175	IVT-RF-NHZ-16	15.5	5	1	30.1	7	0	19.2	23	0	10.4	24	0	36.6	7	0	22	12	0	34.7	16	0	24.1	15	0
VLB180	IVT-RF-NHZ-21	11.3	14	0	25.5	15	0	22.1	14	0	15.3	7	1	33.1	10	0	27	4	0	49.3	6	0	26.2	7	0
VLB181	IVT-RF-NHZ-19	9.6	20	0	23.2	18	0	20.3	21	0	12.4	17	0	30.3	14	0	23.8	8	0	54.2	3	1	24.8	11	0
VLB182	IVT-RF-NHZ-11	10.4	18	0	23.6	16	0	22.3	13	0	14	11	0	40.4	6	0	23.8	8	0	30	21	0	23.5	20	0
VLB183	IVT-RF-NHZ-4	11.9	12	0	18.9	22	0	21.6	17	0	14.8	8	0	36.2	8	0	22.4	10	0	48.1	9	0	24.8	10	0
VLB184	IVT-RF-NHZ-7	15	6	1	27.6	13	0	27.8	7	0	17.6	2	1	36.1	9	0	26.2	7	0	49.3	6	0	28.5	3	0
HBL113 ©	IVT-RF-NHZ-14	16	4	1	37.3	1	1	21.1	18	0	12.9	16	0	41	5	1	26.7	6	0	28.7	22	0	26.3	6	0
BHS352 ©	IVT-RF-NHZ-10	10.5	17	0	23.3	17	0	21	19	0	10.6	23	0	32.4	11	0	27.6	2	0	39.9	14	0	23.6	18	0
BHS380 ©	IVT-RF-NHZ-2	12.4	11	0	30.8	6	0	29.6	3	0	13.2	14	0	44.8	4	1	21.3	22	0	60.7	1	1	30.4	1	1
BHS400 ©	IVT-RF-NHZ-24	18.7	1	1	29.4	8	0	20.7	20	0	20.7	1	1	50	1	1	22	12	0	40.4	13	0	28.9	2	1
VLB118 ©	IVT-RF-NHZ-17	16.4	2	1	29.1	10	0	21.7	16	0	12.4	17	0	26.4	18	0	21.4	20	0	23.4	24	0	21.6	23	0
G.M.		12.5			26.8			24.5			13.9			32.0			23.5			41.3			24.9		
S.E.(M)		0.8			1.3			2.1			1.1			2.9			0.5			3			0.7		
C.D.		1.9			3.1			5.2			2.6			7.1			1.2			7.4			1.7		
C.V.		9			6.8			12.3			11			13			2.9			10.4					
DOS		29.10.2022			07.11.2022			28.10.2022			01.11.2022			6.11.2022			10.11.2022			21.10.2022					

AVT/IVT-DUAL PURPOSE BARLEY (RF-TS)- CUT-NHZ (2022-23)
Location wise & zonal means (grain yield in q/ha)

Varieties	Code	Almora			Bajaura			Khudwani			Majhera			Malan			Shimla			Wadura			Zonal		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BHS493	IVT-RF-NHZ-9	10.4	16	0	25.8	15	0	12.6	12	0	14.8	5	1	23	12	0	19.1	11	0	52.3	4	1	22.6	7	0
BHS494	IVT-RF-NHZ-3	11.7	11	0	21.5	21	0	9.4	24	0	14	9	0	31.3	6	1	18.5	19	0	31.6	21	0	19.7	21	0
BHS495	IVT-RF-NHZ-5	10.2	17	0	27.2	13	0	23	1	1	12.4	14	0	8.2	24	0	26.6	1	1	33.9	17	0	20.2	16	0
BHS496	IVT-RF-NHZ-20	15.8	3	1	30.8	7	0	11.6	14	0	15	4	1	32.6	3	1	18.3	20	0	29.8	23	0	22	8	0
BHS497	IVT-RF-NHZ-12	9.4	20	0	31.8	5	1	17.2	3	0	10.9	20	0	16.1	21	0	24.2	2	0	30.1	22	0	20	19	0
HBL879	IVT-RF-NHZ-23	14.1	9	0	31.6	6	1	11.5	15	0	14	9	0	21.4	15	0	18.8	17	0	32.5	19	0	20.6	14	0
HBL880	IVT-RF-NHZ-13	7.4	24	0	12	24	0	18.2	2	0	17.6	2	1	24.6	11	0	18.9	12	0	40.3	11	0	19.9	20	0
HBL881	IVT-RF-NHZ-6	14.3	8	1	27.3	12	0	11.4	16	0	13.2	12	0	22.7	13	0	18.9	12	0	56.7	1	1	23.5	5	0
HBL882	IVT-RF-NHZ-8	9.2	22	0	24.9	16	0	13.2	8	0	11.6	16	0	21.3	16	0	23.4	6	0	39.2	13	0	20.4	15	0
HBL883	IVT-RF-NHZ-15	10.8	15	0	16.7	22	0	17	4	0	12.4	14	0	18.4	19	0	18.8	17	0	51.3	5	1	20.8	13	0
UPB1109	IVT-RF-NHZ-1	14.9	7	1	23.2	19	0	15.4	6	0	11.4	19	0	20.4	17	0	18.3	20	0	47.4	9	0	21.6	10	0
UPB1110	IVT-RF-NHZ-18	9.6	19	0	16.6	23	0	12.8	11	0	8.5	24	0	15	22	0	18	24	0	50.9	6	1	18.8	24	0
UPB1111	IVT-RF-NHZ-22	12.9	10	0	36.3	1	1	12.8	10	0	10.9	20	0	13.2	23	0	18.9	12	0	36.1	15	0	20.2	17	0
VLB175	IVT-RF-NHZ-16	15.1	6	1	32.7	4	1	9.9	21	0	9.8	23	0	31.4	4	1	18.9	12	0	35.1	16	0	21.8	9	0
VLB180	IVT-RF-NHZ-21	11.3	12	0	24.7	17	0	10.4	20	0	14.2	7	0	29.1	8	0	24.1	3	0	48	8	0	23.1	6	0
VLB181	IVT-RF-NHZ-19	9.3	21	0	26.6	14	0	9.5	23	0	11.6	16	0	19	18	0	20.8	8	0	49	7	1	20.8	12	0
VLB182	IVT-RF-NHZ-11	9.9	18	0	28.4	11	0	9.6	22	0	11.6	16	0	27.6	9	0	20.5	9	0	32.2	20	0	20	18	0
VLB183	IVT-RF-NHZ-4	10.9	14	0	22.2	20	0	11.6	13	0	14.8	5	1	25.7	10	0	19.4	10	0	45.7	10	0	21.5	11	0
VLB184	IVT-RF-NHZ-7	15.7	4	1	30.8	7	0	16.1	5	0	16.6	3	1	30.2	7	0	23	7	0	53.6	2	1	26.6	1	1
HBL113 ©	IVT-RF-NHZ-14	15.2	5	1	34.1	2	1	11.4	17	0	14.2	7	0	35.6	1	1	23.9	4	0	32.6	18	0	23.9	4	0
BHS352 ©	IVT-RF-NHZ-10	9.2	22	0	23.7	18	0	10.5	19	0	10.4	22	0	17.9	20	0	23.6	5	0	40.2	12	0	19.3	23	0
BHS380 ©	IVT-RF-NHZ-2	11.3	12	0	29.3	9	0	13.2	7	0	13.2	12	0	33.2	2	1	18.2	23	0	53.3	3	1	24.5	2	0
BHS400 ©	IVT-RF-NHZ-24	17.6	1	1	33.7	3	1	10.7	18	0	18.1	1	1	31.4	5	1	18.9	12	0	38.2	14	0	24.1	3	0
VLB118 ©	IVT-RF-NHZ-17	16.4	2	1	28.6	10	0	13.2	8	0	14	9	0	21.8	14	0	18.3	20	0	24.2	24	0	19.5	22	0
G.M.		12.2			26.7			13			13.1			23.8			20.4			41			21.5		
S.E.(M)		0.6			1.1			1.3			1.3			2			0.5			3.5			0.67		
C.D.		1.5			2.7			3.1			3.1			4.9			1.3			8.6			1.6		
C.V.		7.2			6			14			13.8			12.1			3.8			12.2					
DOS		29.10.2022			07.11.2022			28.10.2022			01.11.2022			6.11.2022			10.11.2022			21.10.2022					

AVT/IVT-DUAL PURPOSE BARLEY (RF-TS)- NHZ (2022-23)

Location wise & zonal means (forage yield in q/ha)

Varieties	Code	Bajaura			Khudwani			Malan			Shimla			Wadura			Zonal		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BHS493	IVT-RF-NHZ-9	47.6	2	0	53.1	11	0	18.7	15	0	46.1	13	0	83.9	5	1	49.9	7	0
BHS494	IVT-RF-NHZ-3	38.9	12	0	64.8	5	0	21.6	9	0	49.4	8	0	77.6	10	0	50.5	5	0
BHS495	IVT-RF-NHZ-5	31.2	16	0	60.4	8	0	14.0	20	0	57.6	1	1	91.1	1	1	50.9	4	0
BHS496	IVT-RF-NHZ-20	46.2	4	0	55.9	9	0	22.9	8	0	47.0	12	0	84.9	4	1	51.4	2	0
BHS497	IVT-RF-NHZ-12	47.0	3	0	75.8	1	1	34.2	1	1	54.2	3	1	80.7	7	0	58.4	1	1
HBL879	IVT-RF-NHZ-23	23.5	23	0	44.0	18	0	11.0	23	0	45.7	17	0	78.7	9	0	40.6	19	0
HBL880	IVT-RF-NHZ-13	26.5	20	0	44.6	17	0	19.2	13	0	42.9	22	0	70.4	12	0	40.7	18	0
HBL881	IVT-RF-NHZ-6	25.3	21	0	31.5	23	0	11.2	22	0	42.2	24	0	65.2	14	0	35.1	23	0
HBL882	IVT-RF-NHZ-8	30.7	17	0	50.7	14	0	18.6	16	0	45.7	16	0	52.8	21	0	39.7	20	0
HBL883	IVT-RF-NHZ-15	44.3	7	0	48.4	16	0	18.9	14	0	49.7	6	0	89.0	2	1	50.1	6	0
UPB1109	IVT-RF-NHZ-1	24.9	22	0	32.7	22	0	10.5	24	0	47.7	10	0	68.3	13	0	36.8	22	0
UPB1110	IVT-RF-NHZ-18	17.6	24	0	40.2	21	0	13.1	21	0	43.3	21	0	83.9	5	1	39.6	21	0
UPB1111	IVT-RF-NHZ-22	39.8	10	0	51.8	13	0	19.3	12	0	50.3	4	0	75.6	11	0	47.4	12	0
VLB175	IVT-RF-NHZ-16	36.9	14	0	52.3	12	0	25.0	7	0	43.8	19	0	89.0	2	1	49.4	8	0
VLB180	IVT-RF-NHZ-21	45.3	5	0	60.7	7	0	27.0	5	0	42.9	22	0	80.7	7	0	51.3	3	0
VLB181	IVT-RF-NHZ-19	39.8	11	0	53.8	10	0	30.1	4	1	47.7	10	0	56.9	20	0	45.7	13	0
VLB182	IVT-RF-NHZ-11	30.3	18	0	62.6	6	0	33.0	2	1	50.0	5	0	65.2	14	0	48.2	10	0
VLB183	IVT-RF-NHZ-4	32.4	15	0	42.9	19	0	30.2	3	1	43.5	20	0	61.1	17	0	42.0	17	0
VLB184	IVT-RF-NHZ-7	56.2	1	1	49.6	15	0	25.1	6	0	47.8	9	0	36.2	24	0	43.0	15	0
HBL113 ©	IVT-RF-NHZ-14	42.2	8	0	68.1	4	1	20.5	11	0	46.0	14	0	64.2	16	0	48.2	11	0
BHS352 ©	IVT-RF-NHZ-10	37.1	13	0	70.7	3	1	21.6	10	0	54.5	2	1	61.1	17	0	49.0	9	0
BHS380 ©	IVT-RF-NHZ-2	44.5	6	0	41.2	20	0	17.8	17	0	49.7	6	0	60.0	19	0	42.6	16	0
BHS400 ©	IVT-RF-NHZ-24	29.9	19	0	28.2	24	0	14.4	19	0	46.0	14	0	46.6	23	0	33.0	24	0
VLB118 ©	IVT-RF-NHZ-17	41.1	9	0	73.5	2	1	15.6	18	0	45.0	18	0	52.8	21	0	45.6	14	0
G.M.		36.6			52.4			20.6			47.4			69.8			45.4		
S.E.(M)		1.6			3.7			1.8			1.8			3.3			1.166		
C.D.		3.8			9.1			4.5			4.5			8.0			2.7		
C.V.		6.0			10.1			12.6			5.5			6.6					
DOS		07.11.2022			28.10.2022			6.11.2022			10.11.2022			21.10.2022					

Summary of ancillary data (Mean & Range)

AVT/IVT-DUAL PURPOSE BARLEY (RF-TS)- NHZ (2022-23) **Rabi 2022-23**

Varietry	Entry Code	AGRONOMIC CHARACTERS						GRAIN CHARACTERISTICS			DISEASE REACTION	
		H. days	M. days	Height (cm)	Tillers/ **meter**	2/6 row	Spike length (cm)	Grain colour	1000 grain weight (g)	H/HL	Rust	
											Yr	B r
BHS493	IVT-RF-NHZ-9	139 (118-209)	193 (168-235)	74.9 (58-93)	62 (47-78)	6	8.4 (6.5-9.7)	Y	46.2 (39.5-49.7)	H	0	0
BHS494	IVT-RF-NHZ-3	140 (112-230)	197 (163-258)	78.9 (55-102)	59 (54-74)	6	7.8 (5.8-9.4)	Y	47.2 (44.0-51.0)	H	0	0
BHS495	IVT-RF-NHZ-5	149 (123-219)	202 (174-248)	74.0 (59.4-101)	46 (26-61)	2	8.1 (6.0-10.1)	Y	53.5 (47.0-59.0)	H	0	0
BHS496	IVT-RF-NHZ-20	139 (114-215)	197 (163-242)	79.4 (63-105)	59 (49-72)	6	7.6 (5.8-9.0)	Y	48.2 (48.0-48.9)	H	0	0
BHS497	IVT-RF-NHZ-12	140 (114-206)	193 (164-232)	77.6 (60.6-99)	56 (53-63)	6	7.3 (6.0-9.7)	A	40.1 (35.2-53.0)	HL	TS	0
HBL879	IVT-RF-NHZ-23	138 (114-219)	194 (165-248)	72.3 (46.6-114)	71 (61-83)	6	7.0 (5.2-8.0)	Y	46.2 (43.8-48.0)	H	0	0
HBL880	IVT-RF-NHZ-13	132 (111-209)	189 (162-235)	66.9 (39.8-112)	47 (36-72)	6	6.4 (5.0-8.7)	Y	47.1 (39.0-53.0)	H	0	0
HBL881	IVT-RF-NHZ-6	135 (115-217)	193 (164-245)	81.6 (65-109)	59 (48-72)	6	6.8 (4.5-8.0)	Y	43.5 (35.9-49.0)	H	0	0
HBL882	IVT-RF-NHZ-8	129 (111-167)	186 (162-200)	71.2 (46-103)	58 (48-73)	6	6.1 (5.0-8.2)	Y	49.2 (44.0-58.0)	H	0	0
HBL883	IVT-RF-NHZ-15	137 (114-203)	191 (157-230)	78.8 (63.8-108)	53 (42-61)	6	8.0 (6.9-9.4)	Y	42.9 (38.6-50.0)	H	0	0
UPB1109	IVT-RF-NHZ-1	139 (113-219)	198 (168-250)	70.6 (42.2-97)	49 (42-60)	6	6.1 (5.2-8.2)	Y	48.6 (43.0-50.6)	H	TS	0
UPB1110	IVT-RF-NHZ-18	138 (113-223)	198 (166-251)	69.4 (50-84)	52 (43-63)	6	7.3 (5.1-8.7)	Y	45.5 (39.4-54.0)	H	TS	0
UPB1111	IVT-RF-NHZ-22	140 (114-220)	194 (164-245)	69.7 (45.4-106)	50 (45-54)	6	7.3 (6.3-8.3)	Y	44.0 (42.0-46.0)	H	5S	0

Continue on next page……

AVT/IVT-DUAL PURPOSE BARLEY (RF-TS)- NHZ (2022-23)

Summary of ancillary data (Mean & Range) **Rabi 2022-23**

Varietry	Entry Code	Agronomic characters						Grain characteristics			Disease reaction	
		H. days	M. days	Height (cm)	Tillers/ meter	2/6 row	Spike length (cm)	Grain colour	1000 grain weight (g)	H/HL	Rust	
											Yr	Br
VLB175	IVT-RF-NHZ-16	141 (116-223)	194 (166-245)	77.9 (65.8-118)	62 (52-90)	6	6.3 (5.9-6.8)	Y	43.5 (39.0-48.3)	H	0	0
VLB180	IVT-RF-NHZ-21	132 (107-213)	191 (157-240)	73.8 (55-110)	62 (28-92)	2	7.7 (6.6-9.0)	Y	49.3 (44.9-51.8)	H	0	0
VLB181	IVT-RF-NHZ-19	137 (112-232)	194 (156-258)	69.0 (59-91)	49 (20-90)	2	7.1 (6.0-8.8)	Y	50.6 (44.0-54.9)	H	5S	0
VLB182	IVT-RF-NHZ-11	131 (112-206)	187 (157-230)	70.6 (46-101)	58 (30-90)	2	6.8 (5.5-8.1)	Y	49.8 (41.3-53.0)	H	0	0
VLB183	IVT-RF-NHZ-4	137 (112-223)	194 (161-252)	68.8 (48-97)	52 (26-72)	2	7.6 (6.9-8.4)	Y	48.6 (38.0-52.0)	H	0	0
VLB184	IVT-RF-NHZ-7	140 (119-223)	193 (165-250)	73.1 (53-111)	58 (53-72)	6	6.4 (5.8-7.1)	Y	45.6 (42.0-50.0)	H	TS	0
HBL113 ©	IVT-RF-NHZ-14	145 (124-227)	201 (172-256)	76.4 (59-110)	58 (26-89)	2	9.6 (8.5-11.2)	Y	43.6 (40.7-48.0)	H	0	0
BHS352 ©	IVT-RF-NHZ-10	133 (109-223)	191 (163-252)	74.0 (58.6-101)	53 (45-72)	6	7.7 (6.0-9.4)	A	40.1 (33.0-43.0)	HL	0	0
BHS380 ©	IVT-RF-NHZ-2	136 (116-213)	193 (163-245)	74.6 (59.6-104)	55 (42-76)	6	6.1 (4.9-7.1)	Y	42.3 (39.0-44.0)	H	0	0
BHS400 ©	IVT-RF-NHZ-24	142 (120-213)	197 (169-240)	76.2 (61-95)	62 (54-83)	6	6.9 (4.8-10.0)	Y	48.2 (45.0-50.0)	H	0	0
VLB118 ©	IVT-RF-NHZ-17	135 (108-218)	193 (164-248)	67.6 (42.8-116)	60 (48-77)	6	6.6 (4.6-8.2)	Y	47.3 (40.5-50.00	H	0	0

ADVANCE / INITIAL VARIETAL TRIALS SOIL SALINITY TOLERANCE YIELD TRIAL (2022-23)

The IVT-IR-TS-Sal/Alk trial was proposed at 7 locations and was conducted at all centres in plain. The trial was constituted by invoving 15 test entries and 3 checks (KB1425, RD2794 and RD2907). The test entries were contributed by 5 coordinating centres.

The zonal monitoring team visited the trials at Kumarganj in NEPZ and IIWBR Hisar in NWPZ during the crop season. The trials were conducted in proper way and in good condition. The data from all centres were subjected in zonal pooled analysis. Dalipnagar and Fatehpur centres were not considered for zonal mean due to delay in sowing and realistic grain yield respectively.

The location means for grain yield ranged from 22.95 q/ha (Ayodhya) to 38.07 q/ha (IIWBR Hisar I) with 32.2 q/ha over all mean across the centres. Test entry RD3080 ranked first with mean grain yield of 38.66 q/ha followed by entries KB2031(36.06 q/ha), KB2158 (36.02 q/ha) in first non significant group. The check RD2794 ranked 4th with mean grain yield 33.36 q/ha in the first NSG.

AVT/IVT-SST (2022-23)

Location wise & Zonal means (grain Yield in q/ha)

Variety	Code	Ayodhya			Bhilwara			CSSRI, Karnal			IIWBR, Hisar-I			IIWBR, Hisar-II			Zonal Mean		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BH1053	**AVT-SST-10**	25.38	5	0	30.94	8	0	34.55	12	0	27.24	17	0	27.3	17	0	29.08	15	0
BH1054	**AVT-SST-5**	19.89	14	0	27.39	17	0	27.48	16	0	36.93	9	0	41.8	2	1	30.70	12	0
DWRB228	**AVT-SST-2**	17.66	16	0	28.62	15	0	34.51	13	0	43.60	2	0	27.5	16	0	30.39	13	0
DWRB246	**AVT-SST-12**	27.55	1	1	29.64	11	0	29.62	14	0	24.54	18	0	28.3	14	0	27.92	17	0
HUB285	**AVT-SST-13**	21.30	13	0	28.99	13	0	37.34	4	1	37.24	8	0	40.5	3	1	33.07	5	1
HUB286	**AVT-SST-16**	25.19	7	0	29.71	10	0	36.70	6	0	37.56	7	0	20.4	18	0	29.91	14	0
KB2031	**AVT-SST-4**	17.88	15	0	37.83	1	1	36.43	7	0	41.20	5	0	46.9	1	1	36.06	2	1
KB2120	**AVT-SST-9**	23.78	10	0	18.62	18	0	26.04	17	0	28.69	16	0	35.6	7	0	26.54	18	0
KB2127	**AVT-SST-8**	26.11	3	1	32.10	6	1	35.30	11	0	35.17	11	0	36.3	6	0	33.01	6	1
KB2158	**AVT-SST-6**	23.56	12	0	33.04	5	1	41.08	1	1	43.55	3	0	38.9	4	1	36.02	3	1
KB2160	**AVT-SST-7**	26.30	2	1	31.16	7	0	37.41	3	1	34.41	13	0	27.8	15	0	31.41	8	0
RD3080	**AVT-SST-18**	25.92	4	1	36.74	2	1	37.13	5	1	56.68	1	1	36.8	5	0	38.66	1	1
RD3081	**AVT-SST-1**	17.12	17	0	29.42	12	0	24.29	18	0	41.98	4	0	31.0	13	0	28.76	16	0
RD3082	**AVT-SST-14**	24.02	9	0	27.90	16	0	36.26	9	0	33.70	14	0	34.3	11	0	31.23	10	0
RD3083	**AVT-SST-15**	25.22	6	0	28.95	14	0	36.42	8	0	30.89	15	0	34.7	9	0	31.24	9	0
RD2794 (C)	**AVT-SST-11**	23.64	11	0	30.58	9	0	38.24	2	1	39.32	6	0	35.0	8	0	33.36	4	1
RD2907 (C)	**AVT-SST-3**	15.11	18	0	35.62	3	1	35.43	10	0	36.76	10	0	34.6	10	0	31.50	7	0
KB1425 (C)	**AVT-SST-17**	24.46	8	0	33.37	4	1	27.72	15	0	34.99	12	0	33.9	12	0	30.89	11	0
GM		22.95			31.16			34.49			38.07			34.32			32.20		
S.E.(M)		0.80			2.68			1.73			4.73			3.66			2.25		
C.D.		1.91			6.36			4.11			11.20			8.66			3.20		
C.V.		7.06			17.54			10.20			25.61			21.52					
DOS		25.11.2023			14.11.2023			15.11.2023			15.11.2022			15.11.2022					

Summary of ancillary data (Mean & Range)
AVT/IVT-SST (2022-23) Rabi 2022-23

Variety	Code	Agronomic characters						Grain characteristics			Disease reaction	
		H. days	M. days	Plant height (cm)	Tillers/ **meter**	2/6 row	Spike length (cm)	Grain colour	1000 grain weight (g)	H/HL	Rust	
											Yr	Br
BH1053	**AVT-SST-10**	78 (73-84)	122 (111-135)	80.8 (51.0-107.0)	73 (49-105)	6	8.0 (6.0-9.4)	Y	44.8 (44.3-49.0)	H	0	0
BH1054	**AVT-SST-5**	91 (81-97)	125 (115-140)	85.1 (59.0-102.5)	76 (67-92)	6	8.1 (7.0-9.5)	LY	40.5 (40.0-44.2)	H	0	0
DWRB228	**AVT-SST-2**	86 (79-94)	126 (116-140)	82.5 (58.0-109.7)	73 (59-92)	6	7.7 (5.8-11.7)	LY	39.4 (38.9-43.2)	H	0	0
DWRB246	**AVT-SST-12**	90 (78-97)	125 (116-134)	85.9 (57.0-112.0)	85 (75-91)	6	8.5 (7.3-10.1)	Y	42.5 (41.5-51.0)	H	0	0
HUB285	**AVT-SST-13**	84 (71-93)	123 (109-133)	78.9 (55.0-105.2)	73 (57-96)	6	7.7 (6.5-9.0)	LY	36.5 (36.1-39.5)	H	0	0
HUB286	**AVT-SST-16**	84 (73-94)	125 (111-135)	76.0 (53.0-99.0)	72 (62-90)	6	7.2 (5.8-9.0)	LY	42.4 (41.7-48.0)	H	0	0
KB2031	**AVT-SST-4**	94 (81-102)	131 (115-147)	92.1 (70.0-121.0)	88 (57-139)	6	7.4 (6.5-8.4)	LY	45.8 (45.2-50.0)	H	0	0
KB2120	**AVT-SST-9**	88 (82-97)	123 (113-132	88.9 (58.0-106.1)	71 (64-78)	2	8.4 (7.0-10.0)	Y	44.4 (43.7-50.1)	H	0	0
KB2127	**AVT-SST-8**	90 (81-97)	125 (116-133)	85.8 (54.0-112.0)	82 (63-110)	6	7.8 (6.0-10.0)	LY	39.5 (39.0-43.5)	H	0	0
KB2158	**AVT-SST-6**	92 (83-97)	127 (115-136)	82.3 (50.0-99.9)	83 (68-112)	6	8.5 (7.0-10.4)	LY	38.4 (37.8-42.5)	H	0	0
KB2160	**AVT-SST-7**	87 (75-93)	122 (110-132)	79.6 (50.0-100.7)	78 (60-108)	6	7.4 (5.8-9.6)	LY	38.9 (38.6-41.3)	H	0	0
RD3080	**AVT-SST-18**	78 (70-86)	123 (112-132)	80.8 (52.0-96.2)	88 (60-128)	6	9.4 (7.0-12.8)	Y	41.0 (40.2-47.0)	H	0	0
RD3081	**AVT-SST-1**	80 (70-88)	123 (114-130)	90.7 (58.0-119.6)	69 (55-95)	6	8.6 (7.0-10.0)	Y	40.8 (40.1-46.0)	H	0	0
RD3082	**AVT-SST-14**	85 (77-95)	124 (112-132)	83.2 (62.6-114.9)	76 (66-90)	6	8.5 (7.0-11.0)	Y	44.4 (43.3-53.0)	H	0	0
RD3083	**AVT-SST-15**	81 (71-89)	123 (108-132)	76.1 (55.0-95.4)	83 (70-92)	6	7.7 (7.0-9.0)	LY	38.9 (38.4-43.0)	H	0	0
RD2794 (C)	**AVT-SST-11**	84 (74-93)	125 (111-136)	91.7 (75.0-109.0)	81 (63-115)	6	8.2 (7.0-9.0)	Y	42.5 (42.2-45.0)	H	0	0
RD2907 (C)	**AVT-SST-3**	85 (81-91)	128 (114-141)	84.1 (69.0-102.9)	82 (56-126)	6	7.6 (7.0-8.6)	Y	44.9 (44.4-49.0)	H	0	0
KB1425 (C)	**AVT-SST-17**	89 (81-98)	128 (118-140)	83.9 (54.0-99.9)	83 (66-104)	6	8.1 (7.0-10.0)	LY	40.6 (40.4-42.5)	H	0	0

INITIAL VARIETAL TRIAL/ADVANCED VARIETAL TRIAL (IRRIGATED TIMELY SOWN) - NAKED BARLEY

(NWPZ, NEPZ and CEZ)

The trial IVT/AVT-IRTS- Naked barley was proposed at 15 locations scattered in NWPZ (6), NEPZ (4) and central zone (5) in plains. All centres conducted the trial except Gwalior in Central zone. The trial consisted of 5 testng entries and 3 checks, namely Karan16, K1149 and PL891. The results were received from 14 locations.

The monitoring team visited Hisar and Durgapura in NWPZ and Kanpur, Ayodhya and Varansi in NEP zone. In entries PL891, UPB1104, K1149 were reported mixture while in DWRB 245 and Karan16 were observed off types at Hisar and Dugapura centres. Monitoring team reported few off types in DWRB223 at Vijapur in central zone.

The results from all the six locations were included for zonal pooled analysis in NWPZ. In NEPZ, data from Ranchi location were not included for zonal pooled analysis due to LSM. In case of central zone, the results were pooled for analysis of three locations while Tikamgarh was excluded from zonal pooled analysis due to unrealistic grain yield.

The location means for grain yield ranged from 27.90 q/ha (Ludhiana) to 43.43 q/ha (Durgapura) with 35.32 q/ha zonal mean in NWPZ. The entry UPB1104 (Filler1) ranked first with mean grain yield 41.68 q/ha followed by UPB1113 (Filler 2) (41.48 q/ha), K1149 (check) (36.94 q/ha), DWRB223 (36.18 q/ha), DWRB 244 (34.09 q/ha) and Karan16 (Check) (33.99 q/ha) in the first NSG. UPB1104 (Filler1) and UPB1113 (Filler2) were hulled barley entries and tested as filler not a test entry. This trial was combined for all the zones, hence K1149 (check) was included in the trial, other wise it exhibits highly susceptible to yellow rust (ACI=60 and HS=80S) disease. The test entry DWRB 223 consisted of fourth rank with mean grain yield (36.18 q/ha), which is significantly superior over both the NWPZ checks viz; Karan16 (33.99 q/ha) and PL891 (31.40 q/ha) for grain yield in first non significant group. However, test entry DWRB244 was numerical superior with mean grain (34.09 q/ha) in first non significant group over the both NWPZ checks Karan 16 (33.99 q/ha) and PL 891 (31.40 q/ha) for grain yield respectively. This test entry consists of desirable quality traits like high protein, iron, zinc and test weight and resistance to yellow rust and also moderately resistance to leaf blight.

In NEPZ, location means for grain yield ranged from 30.58 q/ha (Varansi) to 32.96 q/ha)Kanpur) with zonal mean 31.78 q/ha. The entry UPB1113 (Filler2) ranked first with mean grain yield 39.14 q/ha followed by UPB1104 (Filler1) (36.26 q/ha), K1149 (check) (34.32 q/ha), DWRB244 (31.76 q/ha) and Karan16 (Check) (31.13 q/ha) in the first NSG.

In central zone, range of location means from 30.42 q/ha (Vijapur) to 42.67 q/ha (Udaipur) with 34.57 q/ha zonal mean. In this zone, fillers of hulled barley UPB1113 (Filler2) ranked first with mean grain yield 41.64 q/ha followed by UPB1104 (Filler1) (41.23 q/ha) in first non significant group. However, two test entries of hulless barley DWRB244 (36.62q/ha) and DWRB223 (34.52q/ha) showed numerically superior over the best check Karan16 (32.51q/ha)

AVT / IVT –IR-TS-NB-NWPZ (2022-23) **Grain Yield (q/ha)** **Rabi 2022-23**

Name of Entry	Entry Code	Durgapura			Hisar			Karnal			Ludhiana			Modipuram			Pantnagar			Zonal Mean		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
***DWRB223**	IVT-IR-NB-8	43.04	5	1	34.20	3	1	40.66	1	1	25.60	7	0	49.56	3	1	24.04	7	0	36.18	4	1
****DWRB244**	IVT-IR-NB-6	47.50	2	1	21.79	6	0	29.78	7	0	29.47	4	0	44.04	4	1	32.00	5	1	34.09	5	1
DWRB245	IVT-IR-NB-2	33.29	8	0	16.96	8	0	39.23	3	1	20.05	8	0	34.10	8	0	16.90	8	0	26.75	8	0
#UPB1104 (Filler 1)	IVT-IR-NB-4	45.65	3	1	36.76	2	1	38.63	4	1	31.64	1	1	52.38	2	1	45.02	2	1	41.68	1	1
#UPB1113 (Filler 2)	IVT-IR-NB-5	43.80	4	1	38.65	1	1	40.58	2	1	29.95	3	1	52.78	1	1	43.14	3	1	41.48	2	1
Karan16 (C)	IVT-IR-NB-3	48.43	1	1	31.64	5	1	31.65	6	1	26.57	6	0	38.29	6	1	27.35	6	0	33.99	6	1
@K1149 (C)	IVT-IR-NB-7	41.75	6	1	32.51	4	1	33.05	5	1	30.68	2	1	35.55	7	0	48.12	1	1	36.94	3	1
PL891(C)	IVT-IR-NB-1	35.51	7	0	20.82	7	0	27.65	8	0	29.23	5	1	40.78	5	1	34.40	4	1	31.40	7	0
G.M.		42.37			29.17			35.16			27.90			43.43			33.87			**35.32**		
S.E.(M)		1.55			1.80			1.70			0.99			1.70			1.95			0.67		
C.D. **(10%)**		4.71			5.45			5.17			3.00			5.15			5.92			1.58		
C.V. **(%)**		6.35			10.67			8.39			6.14			6.77			9.98					
DOS		10.11.2022			17.11.2022			17.11.2022			09.11.2022			19.11.2022			11.11.2022					

*Entry tested in AVT-1; ** numerically superior to Karan 16 (diseases susceptible check), highly resistant to diseases, lodging tolerance and grains contain high iron and zinc. # Fillers are hulled and will not be considered for comparison; @ This check is not released for NWPZ and highly susceprible to diseases so will not be considered for comparison.

AVT / IVT –IR-TS-NB-NEPZ (2022-23) **Grain Yield (q/ha)** **Rabi 2022-23**

Name of Entry	Entry Code	Ayodhya			Kanpur			Varanasi			Zonal Mean		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
DWRB223	IVT-IR-NB-8	26.53	6	0	29.00	6	0	27.67	7	1	27.73	7	0
DWRB244	IVT-IR-NB-6	25.97	7	0	38.33	3	1	31.00	4	1	31.76	4	1
DWRB245	IVT-IR-NB-2	30.79	4	0	17.33	8	0	26.00	8	1	24.71	8	0
UPB1104 (Filler 1)	IVT-IR-NB-4	29.79	5	0	45.00	1	1	34.00	2	1	36.26	2	1
UPB1113 (Filler 2)	IVT-IR-NB-5	39.75	1	1	42.33	2	1	35.33	1	1	39.14	1	1
Karan16 (C)	IVT-IR-NB-3	38.73	3	1	26.00	7	0	28.67	6	1	31.13	5	1
K1149 (C)	IVT-IR-NB-7	38.97	2	1	32.00	5	0	32.00	3	1	34.32	3	1
PL891(C)	IVT-IR-NB-1	23.75	8	0	33.67	4	0	30.00	5	1	29.14	6	0
G.M.		31.8			32.96			30.58			31.78		
S.E.(M)		0.94			2.68			1.8			1.10		
C.D. (10%)		2.88			8.21			5.52			2.62		
C.V. (%)		5.13			14.08			10.21					
DOS		15.11.2022			11.11.2022			10.11.2022					

AVT / IVT –IR-TS-NB-CZ (2022-23) **Grain Yield (q/ha)** **Rabi 2022-23**

Entry	Entry Code	Morena			Udaipur			Vijapur			Zonal		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
DWRB223	IVT-IR-NB-8	27.78	7	0	49.23	2	0	26.57	7	0	34.52	4	0
DWRB244	IVT-IR-NB-6	30.43	3	0	47.39	3	0	32.04	4	1	36.62	3	0
DWRB245	IVT-IR-NB-2	22.95	8	0	38.70	6	0	22.51	8	0	28.05	8	0
UPB1104 (Fillers)	IVT-IR-NB-4	39.61	1	1	46.47	4	0	37.60	1	1	41.23	2	1
UPB1113 (Fillers)	IVT-IR-NB-5	37.34	2	1	54.93	1	1	32.65	2	1	41.64	1	1
Karan16 (C)	IVT-IR-NB-3	29.47	4	0	39.76	5	0	28.30	6	0	32.51	5	0
K1149(C)	IVT-IR-NB-7	28.75	5	0	37.58	7	0	31.08	5	0	32.47	6	0
PL891 (C)	IVT-IR-NB-1	28.50	6	0	27.34	8	0	32.61	3	1	29.48	7	0
GM		30.60			42.67			30.42			34.57		
CD (10%)		2.87			5.57			5.61			4.86		
CV)%(		6.53			9.08			12.83			9.77		
		23.11.2022			20.11.2022			17.11.2022					

Summary of ancillary data (Mean & Range)

AVT/IVT–IR-TS-NB-NWPZ **Rabi 2022-23**

Name of Entry	Entry Code	Agronomic characters						Grain characteristics			Disease reaction	
		H. days	M. days	Height (cm)	Tillers/ meter	2/6 row	Spike length (cm)	Grain colour	1000 grain weight (g)	H/HL	Rust	
											Yr	Br
DWRB223	IVT-IR-NB-8	89 (73-97)	127 (114-137)	101.9 (96-112)	109 (83-132)	6	8 (7-10)	A	40 (36-44)	HL	-	-
DWRB244	IVT-IR-NB-6	90 (77-97)	128 (116-136)	98.0 (87-113)	110 (67-160)	6	8 (5-9)	A	40 (34-43)	HL	-	-
DWRB245	IVT-IR-NB-2	75 (58-86)	121 (111-133)	62.8 (56-72)	134 (92-175)	2	8 (6-9)	A	45 (34-55)	HL	-	-
UPB1104 (Filler 1)	IVT-IR-NB-4	88 (69-98)	126 (112-136)	111.9 (92-125)	94 (59-112)	6	9 (7-11)	LY	43 (38-46)	H	-	-
UPB1113 (Filler 2)	IVT-IR-NB-5	86 (73-92)	127 (116-137)	92.4 (74-107)	119 (100-135)	6	8 (6-9)	LY	38 (32-44)	H	-	-
Karan16 (C)	IVT-IR-NB-3	86 (67-95)	127 (118-137)	101.7 (89-113)	121 (94-156)	6	8 (7-10)	A	36 (30-41)	HL	-	-
K1149 (C)	IVT-IR-NB-7	85 (75-91)	128 (118-137)	99.2 (90-111)	113 (84-150)	6	7 (5-9)	A	35 (28-38)	HL	-	-
PL891(C)	IVT-IR-NB-1	96 (85-101)	131 (119-138)	108.2 (84-125)	128 (102-163)	2	10 (9-12)	A	45 (38-52)	HL	-	-

Summary of ancillary data (Mean & Range)

AVT/IVT–IR-TS-NB-NEPZ (2022-23) **Rabi 2022-23**

Variety	Entry Code	Agronomic characters						Grain characteristics			Disease reaction	
		H. days	M. days	Height (cm)	Tillers/ meter	2/6 row	Spike length (cm)	Grain colour	1000 grain weight (g)	H/HL	Rust	
											Yr	Br
DWRB223	IVT-IR-NB-8	76 (69-85)	119 (110-137)	79.8 (73.5-89.7)	77 (65-92)	6	8.5 (5.6-13.0)	A	36.7 (27.6-42.6)	N	-	-
DWRB244	IVT-IR-NB-6	80 (76-85)	119 (114-130)	73.7 (65-81.2)	83 (57-123)	6	9.0 (6.5-13.2)	A	36.9 (30.6-42.0)	N	-	-
DWRB245	IVT-IR-NB-2	71 (67-77)	111 (104-122)	63.2 (47.7-91.0)	99 (86-106)	2	7.0 (6.1-9.0)	A	41.3 (26.1-54.3)	N	-	-
UPB1104 (Filler 1)	IVT-IR-NB-4	78 (66-93)	119 (111-126)	78.7 (73-84.1)	71 (57-95)	6	8.1 (7.3-9.5)	LY	42.9 (39.5-48.0)	H	-	-
UPB1113 (Filler 2)	IVT-IR-NB-5	76 (73-79)	118 (109-137)	78.7 (68-100.7)	82 (65-104)	6	8.8 (6.5-10.0)	LY	34.8 (24.5-42.8)	H	-	-
Karan16 (C)	IVT-IR-NB-3	73 (67-78)	119 (110-140)	76.0 (63-81.2)	81 (63-98)	6	9.2 (7.1-13.2)	A	34.7 (24.3-40.8)	N	-	-
K1149 (C)	IVT-IR-NB-7	74 (69-78)	118 (110-134)	83.0 (71-94.0)	90 (80-102)	6	8.0 (6.3-9.0)	A	35.0 (27.9-40.0)	N	-	-
PL891(C)	IVT-IR-NB-1	85 (74-92)	124 (110-142)	90.1 (78-95.7)	95 (87-108)	2	8.6 (7.3-9.7)	A	44.3 (38.0-46.8)	N	-	-

Summary of ancillary data (Mean & Range)

AVT/IVT–IR-TS-NB-CZ (2022-23) **Rabi 2022-23**

Variety	Entry Code	Agronomic characters						Grain characteristics			Disease reaction	
		H. days	M. days	Height (cm)	Tillers/ meter	2/6 row	Spike length (cm)	Grain colour	1000 grain weight (g)	H/HL	Rust	
											Yr	Br
DWRB223	IVT-IR-NB-8	74 (64-82)	116 (108-128)	92.8 (83-99)	117 (85-184)	6	7 (7-7)	A	38.8 (34.0-44.1)	N	-	-
DWRB244	IVT-IR-NB-6	75 (67-81)	117 (110-122)	88.3 (77-95)	120 (84-193)	6	8 (7-9)	A	38.3 (35.0-43.1)	N	-	-
DWRB245	IVT-IR-NB-2	64 (53-74)	109 (101-114)	58.8 (55-61)	135 (105-203)	2	7 (5-9)	A	47.9 (42.0-55.0)	N	-	-
UPB1104 (Filler 1)	IVT-IR-NB-4	71 (59-81)	114 (102-124)	96.1 (76-108)	103 (61-160)	6	8 (8-9)	LY	42.2 (38.0-46.0)	H	-	-
UPB1113 (Filler 2)	IVT-IR-NB-5	73 (65-83)	117 (107-129)	88.7 (79-102)	121 (71-210)	6	8 (7-9)	LY	36.6 (33.0-40.3)	H	-	-
Karan16 (C)	IVT-IR-NB-3	70 (56-79)	115 (104-124)	88.4 (57-115)	130 (76-197)	6	9 (8-10)	A	34.1 (30.0-37.4)	N	-	-
K1149 (C)	IVT-IR-NB-7	70 (61-80)	117 (106-127)	92.0 (83-102)	117 (77-183)	6	8 (8-9)	A	36.2 (34.0-39.9)	N	-	-
PL891(C)	IVT-IR-NB-1	80 (79-81)	120 (111-127)	97.0 (80-115)	110 (86-163)	2	10 (9-11)	A	45.6 (38.0-52.4)	N	-	-

Trials rejected and reason for rejection
IVT-IR-TS-FB-NEPZ (2022-23)
Grain Yield Data (q/ha)

Name of Entry	Entry Code	Sabour		
		Yield	RK	G
BH1047	IVT-IRTS-FB-11	13.7	16	0
BH1048	IVT-IRTS-FB-22	16.4	8	0
BH1049	IVT-IRTS-FB-2	12.9	23	0
DWRB241	IVT-IRTS-FB-12	15.3	10	0
DWRB242	IVT-IRTS-FB-3	15	11	0
DWRB243	IVT-IRTS-FB-10	13.1	21	0
HUB283	IVT-IRTS-FB-21	13	22	0
HUB284	IVT-IRTS-FB-5	18.3	3	1
KB2133	IVT-IRTS-FB-17	12.7	24	0
KB2127	IVT-IRTS-FB-25	15.5	9	0
KB2145	IVT-IRTS-FB-15	19.2	2	1
PL946	IVT-IRTS-FB-1	12.3	25	0
PL947	IVT-IRTS-FB-8	16.5	7	0
PL948	IVT-IRTS-FB-7	18.3	4	1
PL949	IVT-IRTS-FB-6	14.5	12	0
RD3068	IVT-IRTS-FB-23	13.3	19	0
RD3069	IVT-IRTS-FB-19	20.1	1	1
RD3070	IVT-IRTS-FB-14	13.9	15	0
RD3071	IVT-IRTS-FB-20	14.4	13	0
UPB1114	IVT-IRTS-FB-24	14	14	0
UPB1115	IVT-IRTS-FB-18	17.6	5	0
BH946 (C)	IVT-IRTS-FB-9	17.1	6	0
DWRB137 (C)	IVT-IRTS-FB-16	13.2	20	0
HUB113 (C)	IVT-IRTS-FB-13	13.5	17	0
RD2899 (C)	IVT-IRTS-FB-4	13.4	18	0
	G.M.	15.1	Low Site Mean	
	S.E.(M)	0.8		
	C.D. (10%)	1.9		
	C.V. (%)	7.2		
	DOS	16.11.22		

Trials rejected and reason for rejection
AVT-IR-TS-FB-NEPZ (2022-23)
Grain Yield Data (q/ha)

Name of Entry	Entry Code	**Sabour**			**Ranchi**		
		Yield	Rk	G	Yield	Rk	G
DWRB226	AVT-IRTS-FB-4	25.7	2	1	34.4	1	1
KB2004	AVT-IRTS-FB-3	27.4	1	1	18.7	6	0
UPB1106	AVT-IRTS-FB-1	13.6	5	0	23.6	5	0
BH946 (C)	AVT-IRTS-FB-5	13.6	6	0	25.2	4	0
DWRB137 (C)	AVT-IRTS-FB-6	14.0	4	0	29.9	2	0
HUB113 (C)	AVT-IRTS-FB-2	20.4	3	0	25.4	3	0
	G.M.	19.1	Low site Mean		26.2	Low site Mean	
	S.E.(M)	1.2			1.5		
	C.D. (10%)	3.0			3.7		
	C.V. (%)	12.6			11.3		
	DOS	16.11.22			8.11.22		

Trials rejected and reason for rejection

AVT-SST **grain Yield in q/ha** **Rabi 2022-23**

Entry	Entry Code	Fatehpur			Dalipnagar		
		Yield (q/ha)	Rk	G	Yield (q/ha)	Rk	G
BH1053	AVT-SST-10	40.9	16	0	13.4	16	0
BH1054	AVT-SST-5	48.8	12	0	15.0	13	0
DWRB228	AVT-SST-2	51.3	10	0	17.4	10	0
DWRB246	AVT-SST-12	38.4	17	0	33.2	1	1
HUB285	AVT-SST-13	57.3	4	1	29.0	3	0
HUB286	AVT-SST-16	42.7	14	0	12.9	17	0
KB2031	AVT-SST-4	42.7	14	0	16.3	11	0
KB2120	AVT-SST-9	53.0	8	0	19.7	8	0
KB2127	AVT-SST-8	55.3	5	1	20.1	7	0
KB2158	AVT-SST-6	55.1	6	1	31.3	2	1
KB2160	AVT-SST-7	61.3	1	1	27.9	4	0
RD3080	AVT-SST-18	60.6	2	1	14.9	14	0
RD3081	AVT-SST-1	50.3	11	0	12.3	18	0
RD3082	AVT-SST-14	48.8	13	0	15.8	12	0
RD3083	AVT-SST-15	54.2	7	1	23.9	5	0
RD2794(C)	AVT-SST-11	52.8	9	0	14.5	15	0
RD2907 (C)	AVT-SST-3	36.6	18	0	19.7	8	0
KB1425(C)	AVT-SST-17	60.1	3	1	20.3	6	0
G.M.		50.6	Unrealistic data		19.9		
S.E.(M)		3.0			1.7		
C.D. (10%)		7.2			4.0		
C.V. (%)		12.02			17.0		
DOS		3.11.2022			30.11.2023		

- The yield data of the Fatehpur rejected due to unrealistic.
- The yield data of the Dalipnagar was rejected due to LSM.

Trials rejected and reason for rejection

IVT/AVT–IR-TS- NB-CZ Grain Yield (q/ha)

Name of Entry	Entry Code	Tikamgarh			Ranchi		
		Yield	Rk	G	Yield	Rk	G
DWRB223	IVT-IR-NB-8	50.33	6	0	10.14	7	1
DWRB244	IVT-IR-NB-6	48.67	7	0	18.84	3	1
DWRB245	IVT-IR-NB-2	51.33	5	0	7.73	8	1
UPB1104 (Filler 1)	IVT-IR-NB-4	74.33	3	1	13.04	4	1
UPB1113 (Filler 2)	IVT-IR-NB-5	78.00	1	1	19.32	2	1
Karan16 (C)	IVT-IR-NB-3	75.67	2	1	11.11	6	1
K1149 (C)	IVT-IR-NB-7	63.33	4	1	19.81	1	1
PL891(C)	IVT-IR-NB-1	47.00	8	0	12.80	5	1
G.M.		61.08	Unrealistic data		14.10	Low site mean & high CV	
S.E.(M)		2.59			5.62		
C.D. **(10%)**		7.93			14.00		
C.V. **(%)**		7.34			69.06		
DOS		14.11.2022			**12.11.2022**		

Trials rejected and reason for rejection

IVT/AVT-RF-NH (2022-23) for uncut and cut (q/ha)

Entry Name	Entry Code	Gaza (Uncut)			Gaza (Cut)		
		Yield	Rk	G	Yield	Rk	G
BHS493	IVT-RF-NHZ-9	20.6	7	1	15.2	10	1
BHS494	IVT-RF-NHZ-3	24.4	2	1	15.7	9	1
BHS495	IVT-RF-NHZ-5	14.0	15	0	13.0	14	1
BHS496	IVT-RF-NHZ-20	18.3	12	0	27.4	1	1
BHS497	IVT-RF-NHZ-12	16.8	13	0	8.6	22	1
HBL879	IVT-RF-NHZ-23	10.6	24	0	8.6	22	1
HBL880	IVT-RF-NHZ-13	11.9	19	0	11.6	18	1
HBL881	IVT-RF-NHZ-6	21.7	4	1	23.2	2	1
HBL882	IVT-RF-NHZ-8	11.0	22	0	18.7	8	1
HBL883	IVT-RF-NHZ-15	11.4	21	0	20.7	5	1
UPB1109	IVT-RF-NHZ-1	10.7	23	0	11.3	19	1
UPB1110	IVT-RF-NHZ-18	20.7	6	1	12.2	16	1
UPB1111	IVT-RF-NHZ-22	11.5	20	0	8.2	24	0
VLB175	IVT-RF-NHZ-16	19.4	9	1	23.1	3	1
VLB180	IVT-RF-NHZ-21	20.5	8	1	22.7	4	1
VLB181	IVT-RF-NHZ-19	12.8	18	0	10.7	20	1
VLB182	IVT-RF-NHZ-11	31.6	1	1	19.5	7	1
VLB183	IVT-RF-NHZ-4	23.8	3	1	11.7	17	1
VLB184	IVT-RF-NHZ-7	19.4	9	1	14.9	12	1
HBL113 ©	IVT-RF-NHZ-14	14.0	15	0	14.1	13	1
BHS352 ©	IVT-RF-NHZ-10	18.9	11	0	9.9	21	1
BHS380 ©	IVT-RF-NHZ-2	21.3	5	1	19.8	6	1
BHS400 ©	IVT-RF-NHZ-24	13.1	17	0	15.0	11	1
VLB118 ©	IVT-RF-NHZ-17	16.0	14	0	12.6	15	1
G.M.		17.3	High CV.		15.4	High CV.	
S.E.(M)		5.2			6.0		
C.D. (10%)		12.6			14.6		
C.V. (%)		42.6			55.6		
DOS		10.11.2022			10.11.2022		

Due to HCV

Trials rejected and reason for rejection

IVT/AVT-RF-NH (2022-23) for forage yield (q/ha)

Entry	Entry Code	Almora			Gaza			Majhera		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
UPB1109	IVT-RF-NHZ-1	1.79	23	0	2.55	14	0	11.39	6	0
BHS380 ©	IVT-RF-NHZ-2	2.56	15	0	4.04	4	1	10.87	8	0
BHS494	IVT-RF-NHZ-3	3.63	5	0	4.21	2	1	13.46	2	0
VLB183	IVT-RF-NHZ-4	2.68	10	0	1.66	18	0	12.42	5	0
BHS495	IVT-RF-NHZ-5	2.14	21	0	3.37	11	0	7.76	11	0
HBL881	IVT-RF-NHZ-6	2.38	17	0	0.78	23	0	5.18	21	0
VLB184	IVT-RF-NHZ-7	2.50	16	0	1.68	17	0	9.32	10	0
HBL882	IVT-RF-NHZ-8	2.38	17	0	3.98	5	1	6.21	20	0
BHS493	IVT-RF-NHZ-9	1.79	22	0	4.29	1	1	12.94	3	0
BHS352 ©	IVT-RF-NHZ-10	2.68	10	0	3.54	9	0	7.76	11	0
VLB182	IVT-RF-NHZ-11	4.17	1	1	2.54	15	0	7.25	18	0
BHS497	IVT-RF-NHZ-12	3.10	6	0	1.54	20	0	18.12	1	1
HBL880	IVT-RF-NHZ-13	2.68	10	0	3.41	10	0	12.94	3	0
HBL113 ©	IVT-RF-NHZ-14	4.17	1	1	2.41	16	0	7.76	11	0
HBL883	IVT-RF-NHZ-15	2.98	8	0	0.61	24	0	10.87	8	0
VLB175	IVT-RF-NHZ-16	2.68	10	0	3.66	6	0	3.62	24	0
VLB118 ©	IVT-RF-NHZ-17	2.98	8	0	1.12	22	0	6.73	19	0
UPB1110	IVT-RF-NHZ-18	1.31	24	0	1.43	21	0	4.14	23	0
VLB181	IVT-RF-NHZ-19	3.04	7	0	4.14	3	1	11.39	6	0
BHS496	IVT-RF-NHZ-20	2.38	17	0	3.61	8	0	7.76	11	0
VLB180	IVT-RF-NHZ-21	3.63	4	0	1.62	19	0	7.76	11	0
UPB1111	IVT-RF-NHZ-22	2.62	14	0	2.62	13	0	4.45	22	0
HBL879	IVT-RF-NHZ-23	2.26	20	0	3.03	12	0	7.76	11	0
BHS400 ©	IVT-RF-NHZ-24	4.05	3	1	3.64	7	0	7.76	11	0
G.M.		2.77	Low site means		2.73	Low site mean		8.98	Low site mean	
S.E.(M)		0.22			0.23			1.85		
C.D. (10%)		0.53			0.56			4.48		
C.V. (%)		11.24			11.96			29.09		
DOS		29.10.2022			10.11.2022			01.11.2022		

- Locations Almora, Gaza and Majhera were rejected due to LSM for forage yield.

Trials rejected and reason for rejection

Rejected IVT-RF-NEPZ (2022-23)

Varieties	*Pusa		
	Yield	Rk	G
IVT-RF- NEPZ-1	0.0	11	0
IVT-RF- NEPZ-2	12.6	5	0
IVT-RF- NEPZ-3	11.2	9	0
IVT-RF- NEPZ-4	13.2	4	0
IVT-RF- NEPZ-5	0.0	11	0
IVT-RF- NEPZ-6	11.9	7	0
IVT-RF- NEPZ-7	0.0	11	0
IVT-RF- NEPZ-8	14.2	3	0
IVT-RF- NEPZ-9	12.1	6	0
IVT-RF- NEPZ-10	11.4	8	0
IVT-RF- NEPZ-11	0.0	11	0
IVT-RF- NEPZ-12	17.8	1	1
IVT-RF- NEPZ-13	9.7	10	0
IVT-RF- NEPZ-14	0.0	11	0
IVT-RF- NEPZ-15	16.8	2	1
G.M.	8.7		
S.E.(M)	0.6		
C.D.	1.5	LoW SITE MEAN	
C.V.	14.7		
DOS	12.11.22		

International Trials and Nurseries

During *rabi* 2022-23 season two international trials and one international germplasm nurseries were received from ICARDA. Each trial (IBYT-FFM and IBYT-ASA) comprised of 21 test entries and 3 checks including one national check in each trial. The nursery IBON-2023 comprised each of 107 test entries and 3-checks (repeated 3-times each check) and one Indian check was (repeated 4 times) included locally. In total 149 testing genotypes were received from ICARDA. IBYT-ASA was evaluated at Durgapura, Hisar, Ludhiana, Kanpur and Karnal; IBYT-FFM was evaluated at Durgapura, Ludhiana, Hisar and Karnal whereas IBON was evaluated at Durgapura, Pantnagar, Kanpur and Karnal. Field Day was organized on 16. 3. 2023 to give opportunity to barley breeders of NARS to select material from these nurseries as to cater their local needs.

In addition, EIBGN was constituted with 24- entries and six released varieties (BH946, HUB113, BHS400, PL891, DWRB123 and DWRB137) as checks. These 24 promising germplasm lines were selected from different international trials and nurseries based on their performance in *rabi* 2021-22. A set of 48 entries including six checks repeated four times at each location was supplied to twelve locations in NWPZ (Chatha, Karnal, Hisar, Durgapura, Ludhiana, Pantnagar), NEPZ (Kanpur, Kumarganj, Varanasi) and NHZ (Khudwani, Shimla, Bajaura). Similarly, the NBGSN comprising of a set of 15 promising genetic stocks endowed with trait(s) of breeding value, received from different cooperating centres was supplied at 12-centres (Durgapura, Ludhiana, Karnal, Hisar, Chatha, Kumarganj, Varanasi, Pantnagar, Kanpur, Khudwani, Shimla and Bajaura) for utilization.

International trials and nurseries evaluated during crop season 2022-2023

Sr. No.	Trials/Nurseries	Genotypes received from ICARDA	National Check	# Sets	Locations
1	2023 International Barley Yield Trial for Feed Forage and Malt in Favourable Environments (IBYT-FFM-23)	21+3 checks	DWRB137	4	Durgapura, Ludhiana, Hisar,Karnal
2	2023 International Barley Yield Trial for Arid and Semi-Arid regions (IBYT-ASA-23)	21+3 checks	Lakhan	5	Durgapura, Ludhiana, Hisar, Kanpur, Karnal
3	2023 International Barley Observation Nursery (IBON-23)	107 + 3 checks	DWRB137	4	Durgapura, Pantnagar, Kanpur, Karnal

International Barley Yield Trial for Foodd, Feed and Malt in Favourable Environments (IBYT-FFM-23)

The IBYT- FFM comprised of 21 entries, one Indian local check variety DWRB137 (Entry IBYT-FFM-1), and two ICARDA checks Entry IBYT-10 (VMorales=C3) and Entry IBYTFFM-20 (Rihane-03= C2). The trial was evaluated in an Alpha-Lattice Design with two replications at four locations namely, Durgapura, Hisar, Ludhiana and Karnal of NWPZ under high input conditions. Data from all the locations were included in the national pooled analysis. The entry IBYT-FFM-17 ranked first with 4783 kg/ha, followed by IBYT-FFM-19 (4486 kg/ha), and IBYT-FFM-13 (4484 kg/ha) and six more entries in 1st NSG. The national check DWRB137 ranked 12th with 4103 kg/ha grain yield. The ICARDA checks ranked 7th (C1) and21st (C2), respectively.

Grain yield, ranking and grouping of barley genotypes in IBYT-FFM -23 in *rabi* 2022-2023.

Varieties	Durgapur			Hisar			Ludhiana			Karnal			National Mean		
	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
IBYT-FFM-1	5516	16	0	3716	10	0	4498	8	1	2550	12	0	4103	12	0
IBYT-FFM-2	5422	19	0	3278	16	0	4762	5	1	2116	20	0	3973	16	0
IBYT-FFM-3	5431	18	0	3121	21	0	4005	16	0	2008	21	0	3796	24	0
IBYT-FFM-4	5516	16	0	3267	17	0	4564	7	1	2994	7	1	4107	11	0
IBYT-FFM-5	6275	7	0	2598	24	0	5025	3	1	3063	6	1	4206	8	1
IBYT-FFM-6	6550	4	1	3208	18	0	5025	3	1	3491	5	1	4416	4	1
IBYT-FFM-7	6227	8	0	3072	22	0	4202	12	0	2611	11	0	4052	14	0
IBYT-FFM-8	6768	3	1	3301	15	0	3774	22	0	2172	18	0	4017	15	0
IBYT-FFM-9	5943	12	0	3135	20	0	3807	21	0	1922	22	0	3813	23	0
IBYT-FFM-10	5791	13	0	4364	2	1	4169	14	0	2774	9	0	4211	7	1
IBYT-FFM-11	5422	19	0	3806	7	1	3676	23	0	2444	14	0	3921	17	0
IBYT-FFM-12	5696	14	0	4458	1	1	4202	12	0	2708	10	0	4229	6	1
IBYT-FFM-13	6455	6	1	3608	12	0	4762	5	1	3812	4	1	4484	3	1
IBYT-FFM-14	5365	22	0	3876	5	1	4400	9	1	2824	8	0	4126	10	1
IBYT-FFM-15	5232	23	0	4271	3	1	4104	15	0	3959	2	1	4333	5	1
IBYT-FFM-16	5611	15	0	3490	14	0	3906	19	0	2205	17	0	3919	18	0
IBYT-FFM-17	7034	1	1	4052	4	1	5190	1	1	4038	1	1	4783	1	1
IBYT-FFM-18	6180	9	0	2886	23	0	3544	24	0	2484	13	0	3889	20	0
IBYT-FFM-19	6863	2	1	3676	11	0	4400	9	1	3826	3	1	4486	2	1
IBYT-FFM-20	5421	21	0	3766	8	0	3807	20	0	1839	23	0	3831	21	0
IBYT-FFM-21	6086	11	0	3538	13	0	4268	11	0	1470	24	0	3917	19	0
IBYT-FFM-22	6484	5	1	3849	6	1	3972	17	0	2232	16	0	4097	13	0
IBYT-FFM-23	5042	24	0	3719	9	0	3939	18	0	2154	19	0	3824	22	0
IBYT-FFM-24	6104	10	0	3145	19	0	5124	2	1	2419	15	0	4183	9	1
C.D.	709			665			904			1152			668		
C.V.	6			9			11			21			11		

Checks NC= DWRB137, C1= V Morales and C2= Rihane-03

Mean and Range for ancillary characters of IBYT-IBYT-FFM -23

Entry No	Rowtype	Days to heading	Plant height(cm)	Days to maturity	1000-grain weight (g)	Spike length (cm)
1 (NC)	6	100 (93-107)	134 (133-135)	69.5 (65-74)	46 (45-47)	9 (8-10)
2	2	96 (95-97)	134 (132-136)	97 (94-100)	51 (50-51)	10 (10-10)
3	2	107 (106-108)	134.5 (134-135)	95 (94-96)	46 (44-47)	11 (10-12)
4	2	102 (96-108)	131.5 (131-132)	93.5 (93-94)	44 (43-46)	10.5 (10-11)
5	2	98 (97-99)	134.5 (133-136)	87.5 (87-88)	48 (48-49)	9 (9-9)
6	6	96 (95-97)	133.5 (132-135)	95 (91-99)	32 (31-33)	7.5 (7-8)
7	6	96.5 (95-98)	133 (131-135)	96 (94-98)	40 (39-40)	11 (11-11)
8	6	96.5 (95-98)	135.5 (135-136)	75.5 (71-80)	32 (32-32)	9.5 (9-10)
9	6	102.5 (97-108)	134.5 (134-135)	93.5 (93-94)	57 (55-59)	9 (9-9)
10 (C1)	6	97 (97-97)	134 (134-134)	98 (97-99)	43 (43-44)	8 (7-9)
11	6	97.5 (97-98)	132 (131-133)	77.5 (67-88)	35 (35-36)	8.5 (7-10)
12	6	106.5 (106-107)	133.5 (133-134)	98.5 (98-99)	40 (40-40)	7.5 (7-8)
13	6	97 (97-97)	131.5 (131-132)	92 (90-94)	48 (48-49)	8.5 (8-9)
14	6	107.5 (106-109)	133.5 (132-135)	87.5 (85-90)	32 (29-35)	8.5 (8-9)
15	6	109.5 (108-111)	132 (129-135)	84.5 (82-87)	30 (30-30)	9 (9-9)
16	6	97 (97-97)	131.5 (131-132)	73.5 (72-75)	38 (38-38)	7 (7-7)
17	6	107.5 (106-109)	131.5 (130-133)	66.5 (57-76)	34 (33-35)	8.5 (8-9)
18	6	107 (107-107)	134 (132-136)	98 (96-100)	37 (35-39)	8.5 (8-9)
19	2	108.5 (107-110)	133 (132-134)	96.5 (95-98)	52 (51-54)	10 (9-11)
20 (C2)	6	111.5 (111-112)	134 (132-136)	93.5 (90-97)	44 (43-44)	7 (7-7)
21	2	110.5 (109-112)	135.5 (135-136)	91.5 (90-93)	55 (54-56)	9.5 (9-10)
22	2	109.5 (108-111)	131.5 (131-132)	81.5 (63-100)	55 (54-56)	10 (10-10)
23	2	97 (97-97)	132 (131-133)	80.5 (76-85)	43 (43-44)	9 (7-11)
24	6	111 (110-112)	134 (134-134)	95 (82-98)	42 (42-43)	9 (9-9)

International Barley Yield Trial-ASA-2023-(IBYT-ASA-2023)

The IBYT-ASA-2023 comprising of 24 entries including one Indian local check variety Lakhan (Entry IBYT-FFM-1), and two ICARDA checks Entry IBYT-10 (Rihane-03 =C1) and Entry IBYTFFM-20 (Furat-03= C2). The trial was evaluated in an Alpha-Lattice Design with two replications at four locations namely Durgapura, Karnal, Kanpur, Hisar and Ludhiana. Data from all the locations were included in the national pooled analysis. The entry IBYT-ASA-23 ranked first with 3952 kg/ha followed by IBYT- ASA-16 ranked second with 3803kg/ha, IBYT-ASA-6 ranked third with 3801 kg/ha, in all twenty-one entries including all three checks first non-significant group.

IBYT-ASA Grain Yield (q/ha) ***Rabi*-2022-23**

Varieties	Durgapura			Karnal			Kanpur			Hisar			Ludhiana			National Mean		
	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
IBYT-ASA-1	5870.83	2	1	3651.24	14	1	2290.54	19	0	3447.09	9	0	3918.97	8	1	3723.34	5	1
IBYT-ASA-2	4718.59	17	0	3904.45	6	1	2673.50	10	0	3544.33	8	0	3728.64	11	1	3681.19	9	1
IBYT-ASA-3	4334.20	21	0	3820.59	10	1	2690.80	9	0	3561.71	7	0	3930.00	7	1	3664.29	10	1
IBYT-ASA-4	4467.86	19	0	3690.38	13	1	3605.74	4	0	3050.32	15	0	4079.33	4	1	3695.55	6	1
IBYT-ASA-5	5030.62	13	0	3975.10	4	1	3363.45	5	0	2949.63	19	0	3145.52	17	0	3660.43	11	1
IBYT-ASA-6	5471.23	6	1	3641.10	15	1	3358.67	6	0	4241.04	1	1	3566.51	15	1	3800.88	3	1
IBYT-ASA-7	5205.30	10	0	4009.71	3	1	2310.84	17	0	4016.95	2	1	3661.35	13	1	3731.91	4	1
IBYT-ASA-8	3627.64	24	0	3410.20	18	0	2477.53	13	0	3638.76	6	1	2974.23	22	0	3482.99	23	0
IBYT-ASA-9	4283.04	22	0	3471.24	17	0	3261.50	8	0	2827.60	22	0	3686.57	12	1	3586.89	18	1
IBYT-ASA-10	5143.54	11	0	3831.76	8	1	2563.44	12	0	3803.25	4	1	3449.58	16	0	3691.17	8	1
IBYT-ASA-11	4743.94	16	0	3744.07	11	1	1546.20	23	0	3151.48	12	0	3080.78	19	0	3496.77	21	1
IBYT-ASA-12	5143.54	11	0	3235.52	21	0	2399.96	15	0	3441.17	10	0	3977.11	6	1	3645.72	14	1
IBYT-ASA-13	5020.94	14	0	3033.91	22	0	1993.18	21	0	3690.76	5	1	3763.88	10	1	3588.08	17	1
IBYT-ASA-14	4559.58	18	0	3530.59	16	0	2128.25	20	0	2841.79	21	0	4234.23	1	1	3582.56	19	1
IBYT-ASA-15	4426.84	20	0	2926.44	23	0	2438.58	14	0	3088.48	14	0	3568.20	14	1	3501.21	20	1
IBYT-ASA-16	5983.29	1	1	3951.18	5	1	3313.16	7	0	2956.11	18	0	4116.21	3	1	3803.39	2	1
IBYT-ASA-17	5399.80	7	0	3353.56	19	0	2580.33	11	0	3826.87	3	1	3125.49	18	0	3646.79	13	1
IBYT-ASA-18	5675.87	4	1	3837.50	7	1	1523.77	24	0	3139.35	13	0	4011.92	5	1	3652.12	12	1
IBYT-ASA-19	5276.74	9	0	3725.75	12	1	4534.58	2	1	2458.67	24	0	3063.39	20	0	3692.14	7	1

IBYT-ASA-20	5399.33	8	0	3820.68	9	1	1813.58	22	0	3045.60	16	0	3772.85	9	1	3619.79	15	1
IBYT-ASA-21	4784.96	15	0	2667.38	24	0	3621.80	3	0	2559.66	23	0	2855.41	23	0	3486.71	22	0
IBYT-ASA-22	5635.31	5	1	4188.86	2	1	2299.22	18	0	2850.83	20	0	2845.37	24	0	3612.08	16	1
IBYT-ASA-23	5717.35	3	1	4263.58	1	1	4946.77	1	1	3235.11	11	0	4162.41	2	1	3952.84	1	1
IBYT-ASA-24	4140.16	23	0	3291.80	20	0	2347.11	16	0	3033.95	17	0	3015.76	21	0	3451.91	24	0
CD	537.14			695.58			670.13			669.92			728.78			459.12		
CV	5.18			9.65			10.77			9.93			10.21			9.02		

IBYT-ASA ckecks NC= Lakhan, C1= Rihane-03 and C2=Furat-03

Mean and Range for ancillary characters of IBYT-ASA (2023) entries in *Rabi* (2022-23)

Entry Name	Row Type	Days to heading	Days to maturity	Plant height (cm)	1000-grain weight (g)	Spike length (cm)
1	6	100.5 (99-102)	133.5 (133-134)	101.5 (98-105)	37 (37-37)	12 (12-12)
2	2	102 (102-102)	133.5 (133-134)	98 (98-98)	46 (44-48)	10.5 (10-11)
3	2	104.5 (103-106)	130 (129-131)	93.5 (88-99)	38.5 (31-46)	9 (9-9)
4	6	103 (103-103)	133.5 (132-135)	87.5 (83-92)	45 (44-46)	7.5 (7-8)
5	2	103.5 (103-104)	132.5 (131-134)	92 (91-93)	39.5 (39-40)	10 (9-11)
6	6	101.5 (101-102)	134.5 (132-137)	94 (91-97)	31 (30-32)	8 (7-9)
7	6	102 (101-103)	134.5 (134-135)	101.5 (101-102)	35 (33-37)	8 (8-8)
8	6	102.5 (102-103)	133 (131-135)	93.5 (92-95)	31.5 (30-33)	9 (9-9)
9	6	107.5 (107-108)	133 (132-134)	97 (94-100)	33.5 (33-34)	10 (10-10)
10	6	107.5 (104-107)	133.5 (133-134)	101 (101-101)	41.5 (41-42)	7 (7-7)
11	2	105 (102-108)	132.5 (130-135)	97 (94-100)	48 (48-48)	9 (9-9)
12	2	106.5 (104-109)	134 (133-135)	97.5(95-100)	45 (41-49)	8.5 (8-9)
13	6	104.5 (103-106)	133 (131-135)	100.5 (100-101)	31.5 (31-34)	10.5 (10-11)
14	6	102 (10-101)	132.5 (132-133)	99 (98-100)	34.5 (34-35)	7.5 (7-8)
15	2	108.5 (108-109)	133.5 (132-134)	100.5 (99-102)	43 (41-45)	10.5 (10-11)
16	6	98 (98-98)	130.5 (103-131)	93.5 (87-100)	39.5(39-40)	7.5 (7-8)
17	6	101.5 (101-102)	130.5(130-131)	98 (97-99)	30.5(29-32)	10 (10-10)
18	6	98 (98-98)	131 (130-132)	94.5 (88-101)	35 (35-35)	9 (8-10)
19	6	105 (104-106)	133.5 (133-134)	93 (87-99)	31 (30-32)	8 (7-9)
20	2	104 (102-106)	132.5 (131-134)	83.5 (83-84)	41.5 (40-43)	10 (9-11)
21	2	106.5 (106-107)	133.5 (132-135)	97.5 (90-105)	25.5 (23-28)	9.5 (7-12)
22	6	102 (101-103)	135.5 (135-136)	97.5 (96-99)	40.5 (40-41)	8 (8-8)
23	6	100 (97-103)	135 (133-137)	91.5 (91-92)	32.5 (31-34)	7.5 (7-8)
24	2	100 (98-102)	133.5 (133-134)	95 (89-101)	36.5 (35-38)	10 (10-10)

International Barley Observation Nursery-High Input-2023 (IBON-HI-2023)

The IBON comprised of 107 test-entries and four checks (3-ICARDA checks- Rihane-03, Furat-03, VMorales and one local check, DWRB137 each check repeated 3-times. This nursery was raised at five locations namely, Durgapura, Kanpur, Pantnagar and Karnal during *rabi* 2022-2023. All the locations recorded the data. Grain yield was expressed in Kg/ha as computed from a plot yield of 1.5 m^2. The range and means for ancillary characters and grain yield are given in the table below. The local check DWRB137 recorded the highest grain yield among the 4-check varieties with a mean yield of 3713 kg/ha and a range of 1304-9333 kg/ha obtained across the locations. This check ranked at 19th position among all the test entries and checks. The top ten ranked test entries for grain yield are IBON-HI-2022 Nos. 18, 79, 64, 62, 54, 56, 39, 100, 89 and 66 with descending order of ranking.

Top ten entries from IBON-2021-22 on mean grain yield basis.

Entry No.	Parentage	GY (kg/ha)	Rank
108	Local Check	5554.19	1
21	SHYRI X LAUREL 5 (Both parents BYDV-RMV resistant)	5293.92	2
57	P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1/6/BRS180/7/P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1/6/CIRU	5204.66	3
15	MSEL / ND 22202	4993.725	4
55	P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1/6/BRS180/7/CIRU/BLLU	4709.728	5
14	MP30/UC1323	4700.713	6
3	29IBON20// COORS 393 / ND 22202-C	4667.585	7
13	MP103R/MP6	4586.933	8
8	Frontier/RD2668	4580.463	9
35	DWR28/RD2668	4535.698	10
27	Z068R05551 /CIMMYT 7862 (BUSCH AG CROSS)	4490.898	11
54	LEGACY/3/PETUNIA 1/CHEVRON-BAR//TOCTE/4/PENCO/CHEVRON-BAR/5/STANDER-BAR//CALI92/ROBUST/6/JACARANDA//ENCINO/TOCTE	4414.575	12
24	STANDER-BAR//CALI92/ROBUST/3/LOGAN-BAR/MSEL//AZAF	4398.068	13
51	22IBYT7 // UC 1116 / UC 1047	4385.778	14
40	Leb71/CBB37//Leb71/CBB29/3/Lignee527/Chn-01/6/WI2291/4/7028/2759/3/69-82//Ds/Apro/5/Zanbaka/3/ER/Apm//Lignee131	4311.758	15
83	Lignee527/NK1272//JLB70-063/3/IPA99/5/Arig8/Imperial//M7/3/Rt013/4/Alanda-01	4299.948	16

98	ISHI / 11HBSN44	4299.853	17
37	Gobernadora/Nawair-1	4280.503	18
20	ROLAND-BAR/RD2668	4225.875	19
23	STANDER-BAR//CALI92/ROBUST/3/ESTANZUELA JACARANDA/LOGAN-BAR//CANELA	4194.108	20

Entry	RT	Days to 75% heading	Plant height (cm)	Days to 75% maturity	1000-grains weight (g)	Spike length (cm)	Grain yield (Kg/ha)	Ranks based on mean yield
1	2	95 (81-104)	89 (68-104)	132 (123-136)	39 (33-43)	7 (6-8)	3384 (1739-4293)	78
2	6	89 (80-98)	93 (74-112)	130 (123-135)	33 (27-43)	9 (9-10)	3248 (1739-4333)	35
3	2	91 (76-109)	97 (83-105)	130 (121-138)	39 (32-47)	8 (7-9)	3497 (1739-4667)	62
4	2	84 (69-95)	96 (74-114)	127 (118-134)	40 (33-48)	7 (7-8)	4201 (1739-6467)	29
5	2	89 (76-100)	91 (75-109)	129 (121-136)	42 (32-49)	7 (6-8)	3384 (1739-4293)	54
6	2	94 (85-101)	94 (76-112)	131 (124-136)	41 (35-52)	7 (6-7)	3248 (1739-4333)	59
7	2	83 (64-93)	90 (75-104)	127 (119-134)	44 (40-48)	7 (6-7)	3497 (1739-4667)	42
8	2	85 (67-96)	93 (73-116)	127 (118-135)	42 (31-51)	7 (6-7)	4201 (1739-6467)	17
9	2	89 (78-97)	105 (97-112)	130 (123-136)	43 (35-56)	8 (7-8)	3384 (1739-4293)	15
10	2	93 (81-102)	100 (88-111)	131 (124-136)	39 (28-52)	8 (6-9)	3248 (1739-4333)	80
11	2	91 (77-102)	93 (78-113)	131 (124-136)	39 (31-49)	8 (7-9)	3497 (1739-4667)	91
12	2	91 (78-102)	99 (73-114)	131 (126-136)	42 (34-55)	9 (7-11)	4201 (1739-6467)	81
13	2	90 (80-97)	100 (80-113)	131 (124-135)	42 (33-57)	8 (7-9)	3384 (1739-4293)	96
14	2	88 (76-99)	102 (87-123)	130 (123-135)	51 (42-59)	8 (7-9)	3248 (1739-4333)	14
15	2	90 (76-102)	100 (78-114)	130 (122-136)	39 (20-53)	8 (8-9)	3497 (1739-4667)	75
16	6	93 (78-109)	100 (84-118)	131 (121-137)	38 (32-42)	6 (5-6)	4201 (1739-6467)	58
17	6	92 (80-105)	93 (72-106)	132 (122-137)	35 (28-43)	7 (6-7)	3384 (1739-4293)	45
18	6	90 (75-99)	94 (76-110)	130 (122-135)	34 (28-42)	7 (5-8)	3248 (1739-4333)	1
19	6	91 (76-104)	93 (72-104)	132 (123-138)	38 (35-46)	6 (4-7)	3497 (1739-4667)	43
20	6	88 (71-100)	102 (83-122)	130 (124-136)	38 (33-47)	7 (6-8)	4201 (1739-6467)	23
21	6	83 (67-92)	99 (78-117)	127 (123-132)	34 (29-42)	7 (5-8)	3384 (1739-4293)	76
22	6	98 (84-109)	98 (81-113)	132 (121-137)	35 (30-41)	6 (5-7)	3248 (1739-4333)	98
23	6	93 (83-104)	98 (73-117)	131 (122-137)	41 (35-48)	6 (5-7)	3497 (1739-4667)	71
24	6	89 (73-98)	100 (78-127)	131 (125-137)	41 (33-46)	6 (5-7)	4201 (1739-6467)	12
25	6	94 (83-101)	89 (71-104)	132 (123-138)	30 (20-46)	6 (6-7)	3384 (1739-4293)	97
26	6	90 (76-100)	93 (72-115)	131 (123-136)	35 (32-38)	7 (6-7)	3248 (1739-4333)	13
27	6	92 (81-100)	98 (75-113)	131 (125-135)	43 (35-51)	8 (6-10)	3497 (1739-4667)	73
28	6	88 (69-100)	95 (77-114)	131 (124-136)	40 (29-55)	6 (5-7)	4201 (1739-6467)	95
29	6	89 (73-100)	97 (80-114)	132 (123-137)	38 (23-48)	8 (6-9)	3384 (1739-4293)	90
30	6	98 (87-111)	106 (82-130)	134 (126-139)	40 (32-45)	8 (6-9)	3248 (1739-4333)	83
31	6	99 (89-109)	101 (83-114)	134 (127-139)	37 (26-47)	7 (6-9)	3497 (1739-4667)	100
32	6	87 (74-99)	94 (77-118)	130 (123-136)	35 (28-41)	8 (7-10)	4201 (1739-6467)	94
33	6	90 (76-102)	94 (76-115)	132 (124-136)	38 (29-51)	6 (5-8)	3384 (1739-4293)	89
34	6	92 (80-102)	99 (82-115)	131 (125-136)	37 (27-45)	7 (5-8)	3248 (1739-4333)	79
35	6	94 (83-103)	101 (82-119)	133 (128-136)	38 (31-51)	5 (4-7)	3497 (1739-4667)	67
36	6	95 (86-105)	110 (89-125)	133 (127-137)	38 (31-47)	6 (4-7)	4201 (1739-6467)	63
37	6	101 (94-109)	108 (89-124)	134 (125-137)	39 (31-50)	7 (6-8)	3384 (1739-4293)	53
38	6	87 (71-98)	98 (79-116)	130 (125-134)	41 (33-46)	6 (5-7)	3248 (1739-4333)	38
39	6	86 (73-93)	101 (86-114)	131 (126-138)	35 (24-40)	8 (7-8)	3497 (1739-4667)	7
40	6	92 (83-100)	101 (83-128)	131 (124-135)	39 (27-56)	6 (6-7)	4201 (1739-6467)	31
41	6	84 (70-94)	99 (84-111)	129 (123-134)	35 (25-43)	6 (5-7)	3384 (1739-4293)	87
42	2	84 (66-94)	102 (85-118)	129 (123-134)	38 (25-48)	8 (8-9)	3248 (1739-4333)	66
43	6	95 (86-107)	103 (87-124)	131 (122-136)	41 (31-50)	7 (5-9)	3497 (1739-4667)	20
44	6	97 (89-109)	105 (86-121)	132 (125-137)	36 (26-52)	7 (6-7)	4201 (1739-6467)	60
45	6	99 (90-109)	85 (77-93)	133 (125-139)	32 (21-54)	7 (7-8)	3384 (1739-4293)	84
46	6	103 (95-114)	89 (72-100)	134 (126-139)	35 (25-54)	6 (6-7)	3248 (1739-4333)	50

47	2	95 (84-103)	97 (76-114)	376 (123-1358)	39 (27-52)	8 (7-10)	3497 (1739-4667)	16
48	2	94 (76-103)	90 (63-109)	132 (123-138)	38 (29-45)	6 (6-7)	4201 (1739-6467)	41
49	2	87 (72-94)	91 (64-105)	128 (122-131)	37 (20-48)	6 (5-7)	3384 (1739-4293)	56
50	2	87 (71-110)	91 (74-109)	128 (121-137)	40 (27-47)	6 (6-7)	3248 (1739-4333)	70
51	2	87 (76-95)	93 (75-113)	130 (121-134)	38 (28-48)	7 (5-9)	3497 (1739-4667)	36
52	2	98 (86-102)	97 (82-109)	132 (123-137)	37 (30-41)	8 (7-10)	4201 (1739-6467)	24
53	2	99 (87-108)	88 (64-100)	132 (121-138)	36 (22-49)	8 (8-9)	3384 (1739-4293)	92
54	2	88 (71-102)	94 (75-110)	130 (123-136)	43 (27-53)	7 (6-8)	3248 (1739-4333)	5
55	2	92 (74-102)	88 (66-106)	131 (124-136)	40 (27-46)	7 (6-8)	3497 (1739-4667)	25
56	2	91 (77-100)	82 (60-103)	133 (127-139)	40 (26-56)	8 (7-8)	4201 (1739-6467)	6
57	2	103 (90-117)	94 (74-107)	134 (125-140)	40 (27-57)	8 (8-9)	3384 (1739-4293)	77
58	2	102 (89-117)	87 (71-109)	133 (123-139)	40 (31-54)	8 (5-9)	3248 (1739-4333)	101
59	2	104 (94-117)	82 (64-94)	134 (123-140)	35 (21-43)	8 (6-10)	3497 (1739-4667)	104
60	6	92 (76-104)	95 (78-113)	131 (125-136)	37 (26-51)	8 (7-9)	4201 (1739-6467)	21
61	6	87 (72-97)	89 (74-110)	129 (124-134)	33 (22-41)	6 (4-7)	3384 (1739-4293)	22
62	6	91 (75-102)	92 (70-110)	129 (124-134)	33 (27-42)	7 (7-8)	3248 (1739-4333)	4
63	6	90 (74-100)	97 (79-117)	129 (123-135)	41 (30-58)	7 (6-8)	3497 (1739-4667)	55
64	6	89 (78-100)	95 (75-114)	129 (123-136)	32 (25-39)	7 (6-8)	4201 (1739-6467)	3
65	6	88 (74-98)	87 (60-107)	129 (124-135)	31 (22-41)	7 (4-8)	3384 (1739-4293)	85
66	6	88 (72-99)	92 (67-112)	130 (122-136)	37 (26-47)	7 (5-8)	3248 (1739-4333)	10
67	*6*	*90 (74-101)*	*88 (68-110)*	*131 (126-136)*	*40 (26-56)*	*7 (4-9)*	*3497 (1739-4667)*	*64*
68	6	89 (73-99)	89 (65-111)	131 (124-135)	32 (25-40)	6 (4-8)	4201 (1739-6467)	52
69	6	93 (76-104)	95 (68-124)	130 (123-136)	32 (26-38)	7 (6-9)	3384 (1739-4293)	61
70	6	97 (82-109)	87 (69-102)	132 (127-137)	35 (28-44)	8 (7-8)	3248 (1739-4333)	72
71	6	93 (77-102)	94 (69-112)	131 (126-136)	37 (25-46)	7 (5-8)	3497 (1739-4667)	11
72	6	95 (79-109)	94 (74-113)	132 (125-138)	32 (25-37)	7 (5-9)	4201 (1739-6467)	46
73	6	97 (83-111)	88 (68-105)	134 (128-139)	33 (23-43)	6 (5-9)	3384 (1739-4293)	65
74	6	93 (76-107)	96 (77-112)	132 (127-136)	37 (24-46)	8 (8-10)	3248 (1739-4333)	47
75	2	93 (76-109)	92 (75-104)	132 (125-138)	42 (30-47)	6 (5-8)	3497 (1739-4667)	30
76	2	88 (71-100)	83 (69-93)	130 (123-135)	37 (24-45)	6 (5-7)	4201 (1739-6467)	32
77	2	105 (96-116)	87 (73-97)	134 (125-140)	35 (25-43)	8 (6-9)	3384 (1739-4293)	102
78	2	92 (78-101)	98 (77-122)	131 (125-136)	40 (30-49)	8 (7-10)	3248 (1739-4333)	48
79	6	99 (85-109)	101 (79-118)	133 (127-138)	36 (24-44)	7 (6-8)	3497 (1739-4667)	2
80	6	89 (73-99)	89 (74-111)	130 (125-135)	31 (21-44)	8 (6-9)	4201 (1739-6467)	26
81	6	87 (73-98)	91 (78-110)	130 (124-134)	32 (25-41)	7 (5-8)	3384 (1739-4293)	28
82	6	85 (67-98)	88 (68-108)	129 (123-134)	30 (25-40)	8 (5-10)	3248 (1739-4333)	103
83	6	90 (72-102)	90 (69-109)	130 (124-136)	29 (22-33)	8 (7-8)	3497 (1739-4667)	40
84	2	92 (78-100)	88 (73-110)	132 (126-136)	41 (35-47)	6 (5-6)	4201 (1739-6467)	88
85	2	93 (77-107)	92 (78-115)	132 (125-137)	45 (39-48)	8 (6-9)	3384 (1739-4293)	37
86	2	92 (81-107)	96 (79-112)	132 (123-137)	41 (31-48)	7 (6-7)	3248 (1739-4333)	68
87	2	89 (79-98)	94 (75-116)	131 (124-135)	42 (32-49)	9 (8-10)	3497 (1739-4667)	86
88	2	90 (78-100)	95 (79-116)	132 (125-136)	43 (28-60)	8 (6-9)	4201 (1739-6467)	33
89	2	90 (76-100)	97 (74-113)	132 (125-136)	41 (33-56)	8 (6-10)	3384 (1739-4293)	9
90	2	100 (91-109)	91 (77-101)	133 (124-137)	33 (22-44)	7 (7-9)	3248 (1739-4333)	99
91	2	91 (81-102)	94 (81-109)	131 (125-136)	43 (32-52)	8 (7-9)	3497 (1739-4667)	74
92	2	90 (74-102)	92 (73-114)	132 (125-136)	40 (29-52)	8 (7-9)	4201 (1739-6467)	51
93	2	87 (72-98)	99 (78-121)	130 (124-135)	44 (31-54)	8 (7-9)	3384 (1739-4293)	18
94	2	93 (78-102)	97 (84-106)	132 (124-137)	37 (24-44)	7 (6-8)	3248 (1739-4333)	82
95	2	86 (69-97)	102 (89-115)	130 (124-134)	44 (31-53)	7 (6-9)	3497 (1739-4667)	34

96	2	91 (76-102)	99 (83-114)	132 (127-135)	43 (32-51)	7 (7-8)	4201 (1739-6467)	93
97	2	89 (76-99)	103 (86-126)	131 (125-135)	49 (35-61)	8 (8-9)	3384 (1739-4293)	44
98	2	94 (79-109)	105 (92-117)	133 (128-138)	39 (26-48)	6 (5-8)	3248 (1739-4333)	57
99	6	95 (84-109)	97 (74-113)	133 (126-138)	37 (26-44)	5 (4-6)	3497 (1739-4667)	39
100	6	96 (85-109)	106 (80-128)	133 (129-138)	43 (35-51)	8 (6-9)	4201 (1739-6467)	8
DWRB 137	6	86 (69-100)	85 (51-118)	131 (123-136)	40 (27-51)	6 (4-8)	3713 (1304-7467)	19
Rihane-03 (102) 6R		100 (92-114)	103 (87-122)	127 (94-138)	36 (25-48)	6 (4-10)	3063 (870-4333)	69
Furat-03 (103) 6R		95 (82-107)	95 (77-112)	125 (97-137)	39 (31-52)	7 (6-8)	3336 (1300-5833)	49
VMorales (104) 6R		90 (73-103)	92 (74-114)	123 (79-136)	34 (22-49)	7 (5-8)	3636 (2174-6000)	27

**Averaged over the blocks*

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Elite International Barley Germplasm Nursery (EIBGN-2022-23)

EIBGN was constituted with 24-germplasm lines and six released varieties (BH946, HUB113, BHS400, PL891, DWRB123 and DWRB137) as checks. These 24 promising germplasm lines were selected from different international trials and nurseries based on their performance in *rabi* 2021-22. A set of 48 entries including six checks repeated four times at each location was supplied to twelve locations in NWPZ (Chatha, Karnal, Hisar, Durgapura, Ludhiana, Pantnagar), NEPZ (Kanpur, Kumarganj, Varanasi) and NHZ (Khudwani, Shimla, Bajaura). This nursery was conducted at all the locations. Each entry was sown in a plot of two rows each of 2.5 m length and spaced at 30 cm, except at Ludhiana centre where the plot size used was two rows of 2.5 m x 23 cm. The data for grain yield recorded in grams (g) per plot was converted into q/ha and analysed centre-wise and zone-wise and presented in the following tables. Similarly, data for ancillary characters is tabulated below trait-wise as mean and range for a character across all the 12-testing locations.

In NWPZ, highest location mean for grain yield was observed at Durgapura (692.15 q/ha) followed by Karnal (36.66 q/ha), Hisar (28.97 q/ha) and Pantnagar (28.96 q/ha) giving 35.4 q/ha as zonal mean for grain yield. Highest zonal mean for grain yield was recorded in the entry IBON-2022-62 (51.11 q/ha), the only test entry in the first NSG group. Surprisingly, HUB113, a variety recommended for NEPZ, was the best zonal check at 5 out of the 6 testing locations. Zonal pooled analysis revealed that no test entry outperformed this check.

In NEPZ, at two locations (Varanasi, 9.41 q/ha and Kumarganj, 13.47 q/ha) very low yield levels were obtained. The yield levels at Kanpur location were appreciable (43.75 q/ha location mean). There were 16-test entries in the first NSG at Kanpur location, and grain yields in these entries ranged from 41.14 q/ha in IBYT-FFM-2022-22 to 59.47 q/ha in IBYT-FFM-2022-13. BH946 gave the highest grain yield (60.83 q/ha) at Kanpur location. No test entry surpassed this check for grain yield.

In North Hill Zone highest location mean for grain yield was observed at Bajaura (32.37 q/ha) followed by Khudwani (22.04 q/ha) and Shimla (10.51 q/ha) with 21.64 q/ha as zonal mean. BHS400, DWRB123 and BH946 were found to be the best check at Shimla (13.42 q/ha), Bajaura (37.70 q/ha) and Khudwani (24.92 q/ha) locations, respectively. IBON-HI-2022-79 was the best test entry across the locations of this zone with 25.79 q/ha grain yield and there were eight more entries in this zone which were at par with this best entry for grain yield.

No test entry was found to give consistent grain yield across the zones. Information on utilization of EIBGN genotypes by breeders of different centres in their local barley improvements programmes is given in the following table.

National Barley Genetic Stock Nursery (NBGSN-2023)

This nursery comprising of a set of 15 promising genetic stocks endowed with trait(s) of breeding value, received from different cooperating centres was supplied at 12-centres for utilization (Durgapura, Ludhiana, Karnal, Hisar, Chatha, Kumarganj, Varanasi, Pantnagar, Kanpur, Khudwani, Shimla and Bajaura). At Ayodhya this nursery was vitiated. Details of the genetic stocks supplied and their utilization at different centres is given in the following tables.

Parentage of Genotypes in EIBGN-2023

Genotypes	RT	H/N	Parentage
IBON-HI-2022-18	6	H	P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1/6/M9846//CCXX14.ARZ3/PACO/3/PALTON/7/PFC9214 //PENCO/CHEVRON-BAR
IBON-HI-2022-39	6	H	UC1135//UC1134/Lacey
IBON-HI-2022-54	2	N	MADRE SELVA/7/STANDER-BAR/API/6/P.STO/3/LBIRAN/UNA80 //LIGNEE640/4/BLLU/5/PETUNIA 1
IBON-HI-2022-56	2	N	LOGAN-BAR/MSEL//AZAF/4/PFC9215/3/ZHEDAR#1/SHYRI//OLMO
IBON-HI-2022-62	6	H	P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1/6/ZIGZIG/4/EGYPT4/TERAN78//P.STO/3/QUINA/8/M122
IBON-HI-2022-64	6	H	Ishi//Morales/221BYT7
IBON-HI-2022-66	6	H	P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1/6/CARDO/BRS180
IBON-HI-2022-79	6	H	P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1/6/GLORIA-BAR/COPAL//PM5/BEN/3/SEN/4/PETUNIA 1/5/PETUNIA 2//PENCO/CHEVRON-BAR/4/PETUNIA 2/3/CHAMICO/TOCTE//CONGONA
IBON-HI-2022-89	2	N	MSEL/LA MOLINA 95//SHAKIRA
IBON-HI-2022-100	6	H	P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1/6/GLORIA-BAR/COPAL//PM5/BEN/3/SEN/4/PETUNIA 1/5/PETUNIA 2//PENCO/CHEVRON-BAR/4/PETUNIA 2/3/CHAMICO/TOCTE//CONGONA
IBYT-FFM-2022-4	2	N	LIMON/BICHY2000/4/ALELI/3/ARUPO/K8755//MORA/5/MSEL/6/Sebastian
IBYT-FFM-2022-13	2	N	MAGALY//Canela
IBYT-FFM-2022-15	6	H	P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1/6/GLORIA-BAR/COPAL//PM5/BEN/3/SEN/4/PETUNIA 1/5/PETUNIA 2//PENCO/CHEVRON-BAR/4/PETUNIA 2/3/CHAMICO/TOCTE//CONGONA
IBYT-FFM-2022-16	6	H	P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1/6/BBSC/CONGONA/5/LEGACY/4/TOCTE//GOB/HUMAI10/3/ATAH92/ALELI
IBYT-FFM-2022-17	6	H	P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1/6/ZIGZIG/4/EGYPT4/TERAN78//P.STO/3/QUINA/7/ESMERALDA/3/SLLO/ROBUST//QUINA/4/M104
IBYT-FFM-2022-19	6	H	DOÑA JOSEFA/3/BREA/DL70//3*CABUYA
IBYT-FFM-2022-22	6	H	ATAHUALPA//M122
IBYT-FFM-2022-23	6	H	T12107 F3 13/030070
IBYT-ASA-2022-3	2	N	Soufara-02/3/RM1508/Por//WI2269/4/Hml-02/A*rabi*Abiad//ER/Apm /5/Harmal
IBYT-ASA-2022-4	2	N	CANELA//E.ACACIA/DEFRA/4/CLI18/E.QUEBRANCHO //E.QUEBRANCHO/NCL95109/3/CANELA
IBYT-ASA-2022-5	2	N	80.5162/MSEL//GLORIA-BAR/IAR.H.485/3/PETUNIA 2/M111
IBYT-ASA-2022-8	2	N	MADRE_SELVA//ER/Apm
IBYT-ASA-2022-9	2	N	Mo. B1337/WI2291//Moroc9-75/3/Keel/5/ChiCm/An57// Albert/3/Alger/Ceres.362-1-1/4/Arta
IBYT-ASA-2022-19	6	H	P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1/6/ZIGZIG/4/EGYPT4/TERAN78//P.STO/3/QUINA/7/PFC9214//PENCO/CHEVRON-BAR
BH 946	6	H	Check variety
HUB113	6	H	Check variety
BHS 400	6	H	Check variety
PL891	2	N	Check variety
DWRB 123	2	N	Check variety
DWRBG137	6	H	Check variety

Grain yield (q/ha) of barley genotypes evaluated under EIBGN-2023 at different locations of NWPZ in *rabi* 2022-2023 season

Genotypes	**Chatha**	**Rk**	**G**	**Durgapura**	**Rk**	**G**	**Ludhiana**	**Rk**	**G**	**Karnal**	**Rk**	**G**	**Pantnagar**	**Rk**	**G**	**Hisar**	**Rk**	**G**	**NWPZ**	**Rk**	**G**
IBON-HI-	47.00	1	1	75.68	3	1	38.96	1	1	18.91	23	0	34.26	7	0	48.53	1	1	43.89	2	0
IBON-HI-	16.67	24	0	34.34	24	0	25.63	12	0	45.17	5	0	14.86	22	0	16.53	24	0	25.53	24	0
IBON-HI-	34.33	7	0	74.14	5	1	18.96	19	0	56.37	2	1	42.73	2	1	33.19	8	0	43.29	3	0
IBON-HI-	36.00	6	0	49.68	20	0	27.29	11	0	38.91	11	0	31.66	11	0	35.86	6	0	36.57	9	0
IBON-HI-	45.00	2	1	75.28	4	1	37.29	4	1	57.11	1	1	46.13	1	1	45.86	2	1	51.11	1	1
IBON-HI-	31.33	9	0	78.68	2	1	18.96	19	0	47.71	4	1	34.06	8	0	31.19	9	0	40.32	5	0
IBON-HI-	20.00	21	0	79.31	1	1	30.35	10	1	42.94	7	0	31.30	12	0	21.19	21	0	37.51	8	0
IBON-HI-	29.33	11	0	56.24	15	0	33.68	7	1	31.14	18	0	35.23	6	0	29.19	12	0	35.80	10	0
IBON-HI-	29.00	12	0	47.98	22	0	15.35	23	0	44.14	6	0	39.50	3	1	29.86	11	0	34.30	14	0
IBON-HI-	22.33	18	0	54.64	17	0	32.01	8	1	20.67	22	0	21.83	19	0	23.19	17	0	29.11	21	0
IBYT-FFM-	23.00	16	0	48.64	21	0	23.68	15	0	32.14	16	0	31.03	13	0	23.86	16	0	30.39	19	0
IBYT-FFM-	22.33	18	0	52.38	18	0	22.01	17	0	37.74	12	0	39.03	5	1	23.19	17	0	32.78	16	0
IBYT-FFM-	37.61	3	0	72.14	10	1	33.68	6	1	34.35	14	0	24.02	16	0	37.97	3	0	39.96	6	0
IBYT-FFM-	24.28	14	0	73.08	7	1	25.35	13	0	31.68	17	0	14.29	23	0	24.64	14	0	32.22	17	0
IBYT-FFM-	33.61	8	0	68.14	12	1	38.68	2	1	48.88	3	1	19.29	20	0	33.97	7	0	40.43	4	0
IBYT-FFM-	18.94	22	0	60.48	13	0	17.01	22	0	34.48	13	0	22.42	17	0	19.31	22	0	28.77	23	0
IBYT-FFM-	17.61	23	0	72.61	9	1	32.01	9	1	29.68	19	0	31.82	10	0	17.97	23	0	33.62	15	0
IBYT-FFM-	30.28	10	0	72.81	8	1	23.68	14	0	16.42	24	0	39.49	4	1	30.64	10	0	35.55	11	0
IBYT-ASA-	36.72	4	0	54.87	16	0	18.68	21	0	42.54	8	0	22.15	18	0	36.97	4	0	35.32	13	0
IBYT-ASA-	21.39	20	0	73.87	6	1	15.35	23	0	25.61	21	0	26.22	15	0	21.64	20	0	30.68	18	0
IBYT-ASA-	26.72	13	0	50.20	19	0	22.01	17	0	33.01	15	0	13.89	24	0	26.97	13	0	28.80	22	0
IBYT-ASA-	22.72	17	0	69.93	11	1	38.68	3	1	39.61	10	0	19.29	21	0	22.97	19	0	35.53	12	0
IBYT-ASA-	24.06	15	0	36.60	23	0	37.01	5	1	28.54	20	0	28.09	14	0	24.31	15	0	29.77	20	0
IBYT-ASA-	36.06	5	0	59.87	14	0	23.68	15	0	42.14	9	0	32.35	9	0	36.31	5	0	38.40	7	0
GM	28.60			62.15			27.08			36.66			28.96			28.97			35.40		
CD (10%)	6.63			13.29			9.42			11.24			8.56			6.64			4.50		
Checks																					
BH 946	41.00			77.00			36.96			40.52			35.82			41.83			45.52		
HUB113	45.17			69.25			52.72			61.18			50.93			45.50			54.13		
BHS 400	22.83			69.75			35.33			30.73			40.57			22.83			37.01		
PL891	11.17			15.73			26.63			12.23			11.73			4.83			13.72		
DWRB 123	31.50			46.63			43.48			38.23			38.10			31.83			38.30		
DWRBG137	38.33			70.50			46.74			41.20			46.17			38.33			46.88		
DOS	25.11.22			10.11.22			10.11.222			18.11.22			11.11.22			18.11.22					

Grain yield (q/ha) of barley genotypes evaluated under EIBGN-2023 at different locations of NEPZ in *rabi* 2022-2023 season

Genotypes	**Kanpur**	**Rk**	**G**	**Kumarjang**	**Rk**	**G**	**Varanasi**	**Rk**	**G**	**NEPZ**	**Rk**	**G**
IBON-HI-2022-18	50.81	7	1	10.36	15	0	16.90	2	1	26.02	6	1
IBON-HI-2022-39	34.14	20	0	12.03	12	0	6.56	20	0	17.58	23	0
IBON-HI-2022-54	30.81	22	0	20.69	4	1	10.56	8	0	20.69	16	1
IBON-HI-2022-56	47.47	8	1	8.69	20	0	7.76	16	0	21.31	13	1
IBON-HI-2022-62	34.14	20	0	13.36	11	0	9.90	10	0	19.13	20	0
IBON-HI-2022-64	37.47	18	0	12.03	12	0	5.43	22	0	18.31	22	0
IBON-HI-2022-66	46.14	9	1	3.36	24	0	14.16	3	1	21.22	14	1
IBON-HI-2022-79	56.14	2	1	9.36	19	0	12.16	5	0	25.89	7	1
IBON-HI-2022-89	46.14	9	1	16.03	8	1	9.16	12	0	23.78	8	1
IBON-HI-2022-100	46.14	9	1	8.36	22	0	9.16	12	0	21.22	14	1
IBYT-FFM-2022-4	46.14	9	1	10.03	16	0	13.16	4	1	23.11	9	1
IBYT-FFM-2022-13	59.47	1	1	12.03	14	0	6.83	18	0	26.11	5	1
IBYT-FFM-2022-15	54.47	4	1	9.92	17	0	19.30	1	1	27.90	1	1
IBYT-FFM-2022-16	51.14	5	1	3.92	23	0	6.56	19	0	20.54	18	1
IBYT-FFM-2022-17	37.81	17	0	19.92	6	1	10.56	7	0	22.76	11	1
IBYT-FFM-2022-19	44.47	15	1	9.92	17	0	9.90	9	0	21.43	12	1
IBYT-FFM-2022-22	41.14	16	1	8.58	21	0	8.36	15	0	19.36	19	0
IBYT-FFM-2022-23	51.14	5	1	16.58	7	1	11.56	6	0	26.43	4	1
IBYT-ASA-2022-3	35.25	19	0	22.69	2	1	3.84	23	0	20.60	17	1
IBYT-ASA-2022-4	45.25	13	1	26.03	1	1	8.71	14	0	26.66	3	1
IBYT-ASA-2022-5	45.25	13	1	14.03	9	0	9.71	11	0	23.00	10	1
IBYT-ASA-2022-8	28.58	23	0	21.36	3	1	5.71	21	0	18.55	21	0
IBYT-ASA-2022-9	25.25	24	0	14.03	9	0	2.38	24	0	13.88	24	0
IBYT-ASA-2022-19	55.25	3	1	20.03	5	1	7.51	17	0	27.60	2	1
GM	43.75			13.47			9.41			22.21		
CD (10%)	18.73			10.58			7.07			7.64		
Checks												
BH 946	60.83			18.17			7.90			28.97		
HUB113	57.50			20.33			22.58			33.47		
BHS 400	52.50			14.67			11.25			26.14		
PL891	18.33			5.50			2.32			8.72		
DWRB 123	39.17			16.00			7.05			20.74		
DWRBG137	45.17			20.17			6.42			23.92		
DOS	12.11.22			17.11.22			15.11.222					

Grain yield (q/ha) of barley genotypes evaluated under EIBGN-2023 at different locations of NHZ in *rabi* 2022-2023 season

Genotypes	Shimla	Rk	G	Bajaura	Rk	G	Khudwani	Rk	G	**NHZ**	**Rk**	**G**
IBON-HI-2022-18	13.44	5	0	34.22	13	0	29.09	6	1	**25.58**	**3**	**1**
IBON-HI-2022-39	4.78	24	0	19.95	24	0	13.76	22	0	**12.83**	**24**	**0**
IBON-HI-2022-54	11.44	11	0	38.22	2	0	16.09	19	0	**21.92**	**12**	**0**
IBON-HI-2022-56	10.78	14	0	25.82	22	0	17.42	18	0	**18.01**	**21**	**0**
IBON-HI-2022-62	10.11	15	0	34.62	11	0	21.09	13	0	**21.94**	**11**	**0**
IBON-HI-2022-64	8.78	17	0	34.75	10	0	33.42	2	1	**25.65**	**2**	**1**
IBON-HI-2022-66	10.11	16	0	36.55	4	0	30.06	3	1	**25.57**	**4**	**1**
IBON-HI-2022-79	11.44	11	0	35.88	5	0	30.06	3	1	**25.79**	**1**	**1**
IBON-HI-2022-89	6.78	21	0	26.95	21	0	19.39	14	0	**17.71**	**23**	**0**
IBON-HI-2022-100	7.44	18	0	31.22	16	0	28.72	7	1	**22.46**	**10**	**1**
IBYT-FFM-2022-4	13.44	5	0	41.22	1	1	21.39	12	0	**25.35**	**6**	**1**
IBYT-FFM-2022-13	14.44	2	1	37.62	3	0	24.06	9	0	**25.37**	**5**	**1**
IBYT-FFM-2022-15	12.89	7	0	28.89	20	0	22.22	11	0	**21.34**	**14**	**0**
IBYT-FFM-2022-16	6.89	19	0	32.89	14	0	33.89	1	1	**24.56**	**7**	**1**
IBYT-FFM-2022-17	6.89	19	0	35.29	6	0	29.56	5	1	**23.91**	**8**	**1**
IBYT-FFM-2022-19	5.56	23	0	31.29	15	0	24.89	8	1	**20.58**	**16**	**0**
IBYT-FFM-2022-22	10.89	13	0	35.29	6	0	19.29	15	0	**21.82**	**13**	**0**
IBYT-FFM-2022-23	6.22	22	0	34.76	9	0	17.56	17	0	**19.51**	**19**	**0**
IBYT-ASA-2022-3	14.89	1	1	29.01	19	0	14.97	21	0	**19.62**	**18**	**0**
IBYT-ASA-2022-4	12.89	7	0	35.27	8	0	13.63	23	0	**20.60**	**15**	**0**
IBYT-ASA-2022-5	14.22	3	1	29.41	18	0	10.97	24	0	**18.20**	**20**	**0**
IBYT-ASA-2022-8	12.22	9	0	23.14	23	0	18.30	16	0	**17.89**	**22**	**0**
IBYT-ASA-2022-9	14.22	3	1	30.07	17	0	15.63	20	0	**19.98**	**17**	**0**
IBYT-ASA-2022-19	11.56	10	0	34.47	12	0	23.63	10	0	**23.22**	**9**	**1**
GM	10.51			32.37			22.04			21.64		
CD at 10%	0.82			2.95			9.43			**3.60**		
Checks												
BH 946	12.08			31.17			24.92			**22.72**		
HUB113	11.58			37.43			21.75			**23.59**		
BHS 400	13.42			37.02			23.83			**24.76**		
PL891	9.00			13.98			14.58			**12.52**		
DWRB 123	10.00			37.70			13.67			**20.46**		
DWRBG137	12.25			37.20			21.92			**23.79**		
DOS	27.11.22			8.11.22			24.10.22					

Mean and range (in parenthesis) across the 12-locations for ancillary characters of barley genotypes evaluated under EIBGN-(2023)

Genotype	**Days to heading (75%)**	**Days to maturity**	**Plant height (cm)**	**Tiller/meter**	**Spike Length**	**Grain /spike**	**1000 GW (g)**	**Yield (q/ha)**
IBON-HI-2022-18	100 (75-163)	144 (115-219)	88 (51-113)	109 (51-263)	8 (7-11)	60 (38-78)	88 (51-113)	35 (10-76)
IBON-HI-2022-39	100 (76-162)	146 (112-217)	83 (40-107)	71 (26-126)	9 (7-11)	64 (40-84)	83 (40-107)	20 (5-45)
IBON-HI-2022-54	98 (66-163)	143 (116-218)	100 (68-130)	130 (76-190)	9 (7-11)	28 (22-37)	100 (68-130)	32 (11-74)
IBON-HI-2022-56	101 (79-158)	144 (118-216)	88 (53-165)	147 (58-251)	8 (6-10)	25 (20-33)	88 (53-165)	28 (8-50)
IBON-HI-2022-62	101 (76-160)	144 (116-217)	91 (55-110)	110 (55-246)	8 (6-10)	59 (38-78)	91 (55-110)	36 (10-75)
IBON-HI-2022-64	101 (71-163)	146 (113-220)	89 (5 7-125)	110 (57-208)	8 (7-10)	57 (36-66)	89 (57-125)	31 (5-79)
IBON-HI-2022-66	98 (65-165)	142 (115-221)	87 (38-120)	99 (38-172)	8 (6-10)	62 (25-81)	87 (38-120)	30 (3-79)
IBON-HI-2022-79	104 (80-163)	147 (116-220)	90 (43-121)	94 (43-161)	8 (7-10)	61 (32-78)	90 (43-121)	31 (9-56)
IBON-HI-2022-89	99 (67-159)	144 (107-219)	107 (70-166)	133 (54-220)	9 (7-11)	28 (21-35)	107 (70-166)	28 (7-48)
IBON-HI-2022-100	104 (78-164)	148 (114-220)	91 (53-139)	105 (53-203)	8 (6-10)	57 (35-74)	91 (53-139)	25 (7-55)
IBYT-FFM-2022-4	103 (79-163)	146 (118-220)	102 (62-160)	148 (80-240)	8 (7-10)	28 (24-32)	102 (62-160)	27 (10-49)
IBYT-FFM-2022-13	103 (76-165)	146 (118-221)	103 (66-160)	155 (84-285)	9 (8-11)	44 (25-129)	103 (66-160)	29 (7-59)
IBYT-FFM-2022-15	104 (80-158)	148 (116-218)	96 (57-135)	112 (49-240)	9 (8-11)	63 (31-72)	96 (57-135)	32 (10-72)
IBYT-FFM-2022-16	99 (69-163)	144 (116-221)	82 (57-116)	105 (57-236)	8 (6-11)	58 (28-80)	82 (57-116)	27 (4-73)
IBYT-FFM-2022-17	101 (73-163)	143 (115-220)	92 (52-145)	121 (65-267)	8 (6-11)	58 (32-78)	92 (52-145)	32 (7-68)
IBYT-FFM-2022-19	100 (68-163)	143 (114-219)	91 (54-125)	114 (60-224)	8 (5-11)	61 (31-90)	91 (54-125)	25 (6-60)
IBYT-FFM-2022-22	99 (68-163)	142 (112-219)	92 (65-127)	107 (55-212)	8 (4-11)	63 (36-78)	92 (65-127)	27 (8-73)
IBYT-FFM-2022-23	99 (68-164)	143 (112-221)	91 (54-119)	115 (70-229)	8 (6-11)	62 (38-96)	91 (54-119)	29 (6-73)
IBYT-ASA-2022-3	101 (73-158)	146 (119-218)	104 (71-158)	147 (70-303)	8 (6-11)	28 (23-30)	104 (71-158)	28 (4-55)
IBYT-ASA-2022-4	100 (69-164)	143 (117-220)	103 (64-165)	135 (79-241)	8 (6-9)	26 (20-32)	103 (64-165)	27 (9-74)
IBYT-ASA-2022-5	98 (68-159)	143 (117-218)	100 (65-140)	138 (80-214)	8 (7-11)	29 (21-38)	100 (65-140)	25 (10-50)
IBYT-ASA-2022-8	95 (62-165)	142 (112-221)	98 (62-172)	135 (62-223)	7 (6-10)	30 (19-72)	98 (62-172)	27 (6-70)
IBYT-ASA-2022-9	102 (82-163)	145 (118-220)	97 (67-135)	123 (62-207)	9 (6-11)	28 (21-34)	97 (67-135)	23 (2-37)
IBYT-ASA-2022-19	98 (74-163)	144 (116-221)	93 (59-123)	114 (59-213)	8 (7-10)	57 (28-72)	93 (59-123)	32 (8-60)
Checks								
BH 946	99 (65-162)	144 (114-220)	91 (51-121)	111 (65-220)	8 (7-9)	61 (34-81)	91 (51-121)	36 (8-77)
HUB113	100 (74-160)	145 (113-218)	94 (60-138)	118 (72-202)	7 (5-9)	56 (31-71)	94 (60-138)	41 (12-69)
BHS 400	103 (75-163)	147 (112-220)	96 (73-124)	109 (73-237)	7 (6-9)	56 (32-69)	96 (73-124)	31 (11-70)
PL891	106 (81-162)	147 (116-220)	90 (41-116)	99 (41-243)	10 (7-12)	30 (22-36)	90 (41-116)	12 (2-27)
DWRB 123	97 (68-161)	144 (113-220)	92 (61-131)	124 (52-228)	8 (7-9)	28 (24-34)	92 (61-131)	29 (7-47)
DWRBG137	96 (63-160)	142 (114-218)	80 (52-102)	101 (59-181)	8 (6-10)	59 (30-79)	80 (52-102)	35 (6-71)

Utilization of genotypes of EIBGN-2023 at different locations

Genotypes	Shimla	Bajaura	Jammu	Durgapura	Ludhina	Karnal	Pantnager	Hisar	Kumarganj	Kanpur
IBON-HI-2022-18	SY		SY		SY	SY	H	H		SY
IBON-HI-2022-39	-					SY	H		H	SY
IBON-HI-2022-54	-	H	SE				H,SY		H	
IBON-HI-2022-56	-		ST				H	H		SY
IBON-HI-2022-62	-		SY		SY		H,SY	SY	SY	
IBON-HI-2022-64	-						H	H		
IBON-HI-2022-66	SY			H		SY	H			
IBON-HI-2022-79	SY				SY		H			SY
IBON-HI-2022-89	-			H			SY			
IBON-HI-2022-100	-				SY			SY		
IBYT-FFM-2022-4	-	H						H		
IBYT-FFM-2022-13	SY		ST				H			SY
IBYT-FFM-2022-15	S		SY	SY	SY	SY		SY		SY
IBYT-FFM-2022-16	-					SY	H	H		
IBYT-FFM-2022-17	-		SB		SY		H		H	
IBYT-FFM-2022-19	-								SY	
IBYT-FFM-2022-22	SY						H		SY	
IBYT-FFM-2022-23	-						H,SY		SY	SY
IBYT-ASA-2022-3	SY		SY						SY	
IBYT-ASA-2022-4	-						H		SY	
IBYT-ASA-2022-5	-									
IBYT-ASA-2022-8	-	H			SY				SY	
IBYT-ASA-2022-9	-				SY					
IBYT-ASA-2022-19	SY		SEY				H,SY	SY		SY

H=used in hybridization; S=selection; Y=yield; E=earliness; T= tillering; B=biological yield

Parentage of genotypes of NBGSN -2023

Name of genotype	H/ N	RT	Parentage	Specific traits
RD-3055	H	2	DWRB 92 X RD 2891	HR to YR and MR to LB
BH1042	H	2	BH 968/BH 946	HR to YR
BH1045	H	6	HUB 113/BH 946	HR to YR
KB2004	H	6	IBON-HI (11-12)-34 /K 141	HR to YR
KB2015	H	6	BH 949 / K 560	HR to YR
RD3034	H	6	RD 2035/RD 2660	HR to YR
UPB1105	H	6	BH 959 / SLB39-05/ 4/7028/2759/3/69-82//Ds/Apro [IBYT-LRA-C-(10-11)-12]	HR to YR
BH1040	H	2	BH 992/BH 946	HR to YR and MR to LB
BH1041	H	2	BH 987/BH 946	MR to LB
BHS488	H	6	BHS385/BHS369	HR to YR and MR to LB
DWRB229	H	2	DWR28/BH902	HR to yellow rust and MR to Leaf Blight
DWRB230	H	2	DWRUB52/BH885	HR to yellow rust and MR to Leaf Blight
DWRBG5	N	6	W260/BCU8	High TGW and, BGP
DWRBG7	N	6	DL456/IEBON17	High TGW and BGP
DWRB206	N	6	ZIGZIG/4/TOCTE/ /HIGO/LINO/ 3/PETUNIA1	Resistant to stripe rust at APR under artificial inoculation

HR=high resistance; MR=moderate resistance; YR = yellow rust; LB = leaf blight; TGW=1000-grains weight; BGP=-bold grains proportion

Utilization of genotypes of NBGSN-2023 at different locations

Name of genotype	Shimla	Durgapura	Hisar	Karnal	Pantnagar	Bajaura	Kumarjang	Ludhiana	Kanpur	Varanasi	Jammu	Khudwani
RD-3055	-	H			H	H	H	H	S		H	
BH1042	-				H	H			S			H
BH1045	-		H					H	S			
KB2004	-				H	S						
KB2015	-	H	H	H	H			H				H
RD3034	-	H							S			
UPB1105	-		H		H			H	S			
BH1040	-		H	H	H	H	H	H	S		H	
BH1041	-		H		H		H					
BHS488	H	H	H	H		H		H	S			
DWRB229	-			H	H	H	H	H	S		H	
DWRB230	-		H	H	H	H	H	H	S			
DWRBG5	-		H		H	H	H		S		H	
DWRBG7	-	H		H	H	H	H		S			
DWRB206	-	H			H		H		S			H

H=used in hybridization; S=selected for future us

Breeder and Nucleus Seed Production of Barley (2022-23)

Breeder Seed Indent

A consolidated quantity of 511.15q breeder seed indent of 25 varieties was received from Seed Division, DA&FW, New Delhi for its production during 2022-23 and supply during 2023-24. Seven states viz., Rajasthan, Uttar Pradesh, Punjab, Haryana, Himachal Pradesh, Madhya Pradesh, and Uttarakhand and five public sector agencies viz., National Seeds Corporation, IFFDC, NAFED & KVSS and National Seed Association of India (NSAI) indented breeder seed. The highest breeder seed indent was placed by Rajasthan 200q (39%) followed by UP 120q (23%), NSAI (12%) and National Seed Corporation (8%). A total of 421.80q (i.e., 82.52%) breeder seed was indented for <10years old varieties.

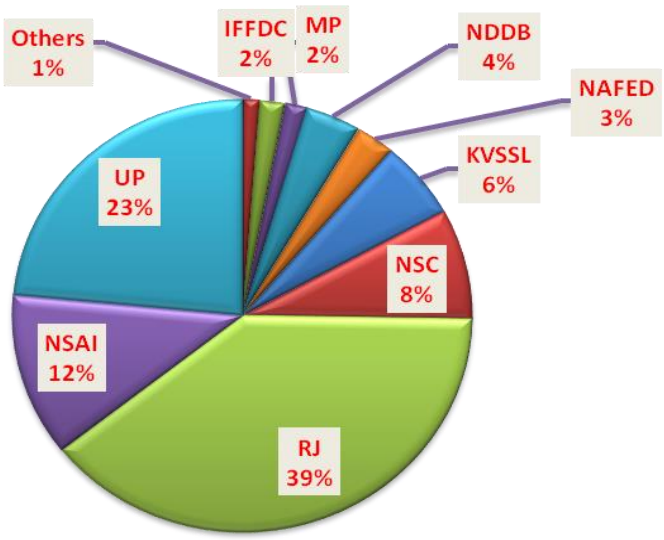


Fig: Per share of different BS indenting agencies

Breeder Seed Allocation and Production

Total 510.85q breeder seed of 24 varieties was allocated among 9 BSP centres. The indent of 0.30q breeder seed of DWRUB 64 was not allocated in the BSP-1. Among all 28 varieties maximum breeder seed indent was received for the variety DWRB 137 (113.30q) followed by RD 2899 (112.00q) and RD HUB 113 (40.0q).

A total of 732.63q with a surplus of 221.78q over the total allocated quantity of breeder seed of 24 varieties was produced by 9 BSP centres during 2022-23. Among 9 breeder seed production centres, maximum breeder seed was reported from RARI, Durgapura (390.990q) followed by IIWBR, Karnal (110.00q). Top five breeder seed indented varieties contribute to the tune of 85.21% in total indent whereas these varieties contribute 76.96% share in total breeder seed production during 2022-23. Total 46.20q nucleus seed of 24 varieties was produced against 34.50q allocation in BNS-1 with a surplus of 11.70q seed during 2022-23.

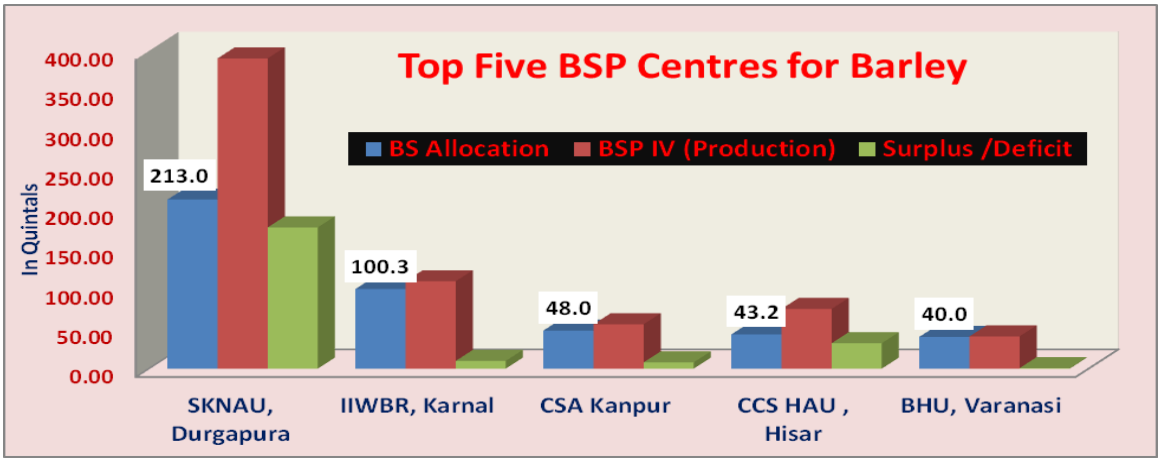


Table: Breeder and Nucleus Seed Indent & Production

S.No.	BSP Centre	BS Allocation	BSP IV (Production)	Surplus /Deficit	NS Allocation	BNS IV (Production)	Surplus /Deficit
1	SKNAU, Durgapura	213.00	390.99	177.99	12.50	24.00	11.50
2	IIWBR, Karnal	100.30	110.00	9.70	5.50	4.50	-1.00
3	CSA Kanpur	48.00	55.90	7.90	3.00	4.95	1.95
4	CCS HAU, Hisar	43.15	75.14	31.99	4.50	4.80	0.30
5	BHU, Varanasi	40.00	40.60	0.60	2.00	2.05	0.05
6	BUAT, Banda	40.00	17.00	-23.00	2.00	0.00	-2.00
7	PAU, Ludhiana	18.90	34.00	15.10	3.00	4.00	1.00
8	VPKAS, Almora	6.00	7.50	1.50	1.00	1.50	0.50
9	HPKV, Palampur	1.50	1.50	0.00	1.00	0.40	-0.60
	Total	510.85	732.63	221.78	34.50	46.20	11.70

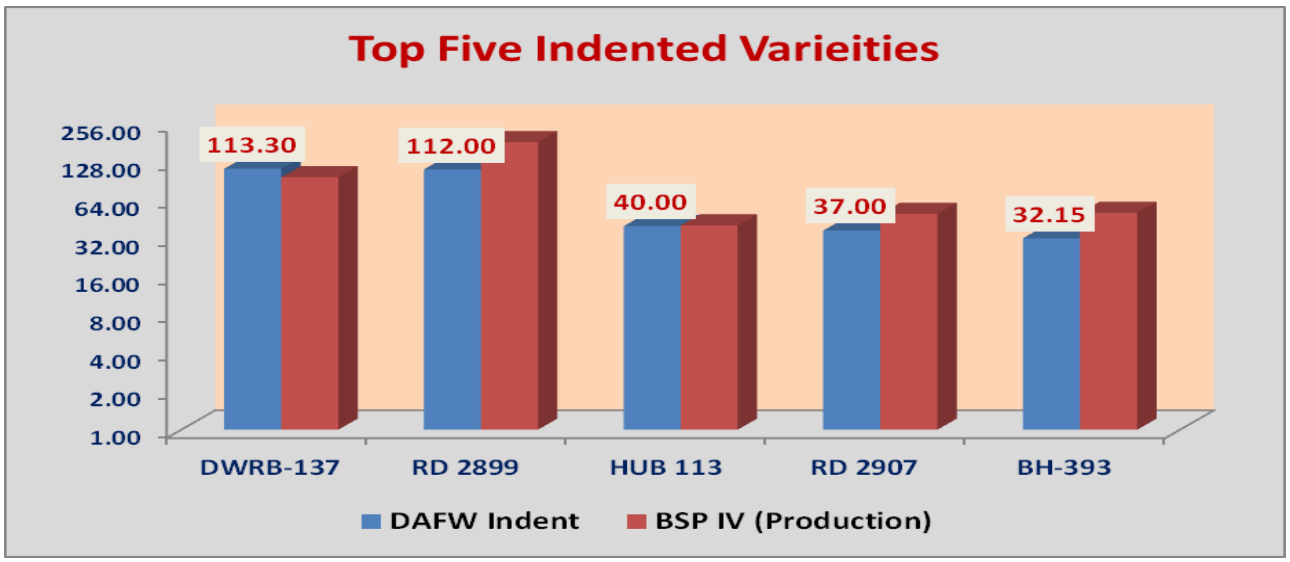


Fig. Breeder seed top five Indented varieties of barley

Table: Centre wise and variety wise Breeder and Nucleus Seed Production of Barley during 2022-23

S. No.	Production Centre	Variety	Year of release	DA&FW Indent	BS Allocation	BSP IV (Production)	Surplus /Deficit	NS Allocation	BNS IV (Production)	Surplus /Deficit
1	BHU, Varanasi	HUB 113	2014	40.00	40.00	40.60	0.60	2.00	2.05	0.05
			Total		40.00	40.60	0.60	2.00	2.05	0.05
2	CCSHAU, Hisar	BH 946	2014	2.00	2.00	7.14	5.14	0.50	2.00	1.50
		BH 959	2015	7.00	7.00	8.50	1.50	1.00	0.70	-0.30
		BH-393	2002	32.15	32.15	51.00	18.85	0.50	0.60	0.10
		BH-902	2010	2.00	2.00	8.50	6.50	2.50	1.50	-1.00
			Total	43.15	43.15	75.14	31.99	4.50	4.80	0.30
3	CSAUA&T Kanpur	K-1055 (Prakhar)	2018	26.00	26.00	22.50	-3.50	1.00	3.45	2.45
		KB- 1425	2021	22.00	22.00	33.40	11.40	2.00	1.50	-0.50
			Total	48.00	48.00	55.90	7.90	3.00	4.95	1.95
4	ICAR-IIWBR, Karnal	DWRB123	2017	8.00	8.00	5.00	-3.00	2.00	1.00	-1.00
		DWRB-137	2018	113.30	73.30	80.00	6.70	1.00	1.00	0.00
		DWRB 182	2021	7.00	7.00	10.00	3.00	1.50	1.50	0.00
		DWRB 160	2020	12.00	12.00	15.00	3.00	1.00	1.00	0.00
		Total			100.30	110.00	9.70	5.50	4.50	-1.00
5	BUAT, Banda	DWRB 137	2018	113.30	40.00	17.00	-23.00	2.00	0.00	-2.00
			Total		40.00	17.00	-23.00	2.00	0.00	-2.00
6	HPKV, Palampur	Him Palam Jau-1	2020	1.50	1.50	1.50	0.00	1.00	0.40	-0.60
			Total		1.50	1.50	0.00	1.00	0.40	-0.60
7	PAU, Ludhiana	PL 891	2020	5.00	5.00	12.00	7.00	1.00	2.00	1.00
		PL-426	1996	13.90	13.90	22.00	8.10	2.00	2.00	0.00
			Total		18.90	34.00	15.10	3.00	4.00	1.00
8	SKNAU, Durgapura	RD 2786	2013	3.00	3.00	26.19	23.19	3.00	2.00	-1.00
		RD 2899	2018	112.00	112.00	183.86	71.86	2.50	7.00	4.50
		RD 2907	2018	37.00	37.00	50.00	13.00	1.00	4.00	3.00
		RD 2035	1994	17.40	17.40	30.50	13.10	0.50	3.00	2.50
		RD 2052	1991	3.60	3.60	14.38	10.78	2.00	2.00	0.00
		RD 2715	2009	20.00	20.00	3.86	-16.14	1.00	2.00	1.00
		RD-2794	2016	16.00	16.00	51.10	35.10	1.00	2.00	1.00
		RD2849	2016	4.00	4.00	31.10	27.10	1.50	2.00	0.50
			Total		213.00	390.99	177.99	12.50	24.00	11.50
9	VPKAS, Almora	VL Jau 118	2014	5.00	5.00	6.50	1.50	0.50	1.00	0.50
		VLB 130	2019	1.00	1.00	1.00	0.00	0.50	0.50	0.00
			Total		6.00	7.50	1.50	1.00	1.50	0.50
		Grand Total			510.85	732.63	221.78	34.50	46.20	11.70

Molecular Report – Barley AVT Trials (2022-23)

Barley trials entries and checks were characterized at molecular level to analyze genetic variability in all India coordinated barley improvement programme during 2020-2. Total 58 genotypes including AVT entries and checks were screened with a set of 46 barley specific SSR/STS markers covering seven chromosomes to develop molecular profiles. Molecular weights for microsatellite products, in base pairs, were estimated and the summary statistics including the number of alleles per locus and polymorphism information content (PIC) were determined. Total 95 alleles were scored for PCR based amplification profiles for screened genotypes. The number of alleles ranged from 1 to 4 with an average of 1.74 alleles per locus. The band fragment size varied from 90 bp to 1500 bp with PIC values ranging from 0.0 to 0.69.

Allele molecular weight data of amplified profiles were converted to develop binary format (allele presence = "1" and allele absence = "0") for genetic diversity analysis with NTSYS-PC version 2.1. IVT and AVT trials were scored to develop two binary datasets and analyzed. The similarity matrixs developed were used to construct dendrograms using Sequential Agglomerative Hierarchical Nesting (SAHN) based Unweighted Pair Group Method of Arithmetic Means (UPGMA) to infer genetic relationships. For estimating the similarity matrix, null alleles were treated as missing data to reduce the biased genetic or similarity measures. These genotypes grouped within similarity coefficient (GS) value around 0.57 to 0.98 and showed sufficient genetic variability at molecular level. In dendrogram, AVT entries are placed at separate node thus distinguishing from their check lines, respectively.

The eventual intend of this effort is to develop molecular markers-based amplification profiles for varietal characterization and to assess the level of genetic diversity in Indian barley.

Molecular Profiles of AVT Entries and Checks (2022-23)

Marker	Chr	CCSHAU, Hisar			ICAR-IARI RS, Shimla				
		BH1045	BH1053	BH1054	BHS493	BHS494	BHS495	BHS496	BHS497
Bmac154	1H	110	140	140	110	130	110	130	130
Bmac213	1H	168	155	155	168	180	168	180	180
Bmag382	1H	109	109	109	109	109	109	109	109
Bmag579	1H	126	126	126	126	110	126	110	126
MGB402	1H	260	260	260	240	240	240	240	260
ScSSR10477	1H	140	200	200	200	200	150	200	150
HvHVA1	1H	136	136	136	136	136	136	136	136
Bmac175	2H	155	155	155	155	155	155	155	155
EBmac640	2H	176	190	190	176	190	190	190	176
Bmag15	2H	181	181	181	181	181	181	181	181
EBmac525	2H	149	149	149	125	125	125	125	125
EBmac623	2H	154	168	168	168	NULL	154	168	168
cMWG658	2H	580	600	600	580	600	580	600	600
Ebmatc39	2H	190	170	150	170	170	170	170	150
Bmag006	3H	274	274	274	274	274	274	274	274
Bmag603	3H	122	122	122	140	122	140	122	122
Bmag877	3H	153	153	153	153	165	153	165	153
Ebmac541	3H	140	106	106	140	140	140	140	140
MWG 847	3H	150	150	150	150	150	150	150	150
Bmag225	3H	185	185	140	165	165	165	165	165
HvLTPPB	3H	216	200	200	216	200	216	200	200
Bmag841	3H	125	115	115	115	125	115	125	NULL
ABG500	4H	189	189	189	189	189	189	189	189
HVM40	4H	150	160	160	160	150	160	150	160
HVM67	4H	126	136	136	126	126	136	126	126
HvMLOH1A	4H	175	185	185	175	185	175	185	185
Ksug10	4H	1300	1500	1300	1500	1500	1500	1500	1500
MWG634	4H	800	800	800	800	800	800	800	800
WG622	4H	161	161	161	161	161	161	161	161
Bmag353	4H	119	90	NULL	119	119	119	90	119
Bmag337	5H	165	145	165	145	145	145	145	165
Bmag751	5H	189	189	189	189	189	189	189	189
Bmag812	5H	147	147	167	167	167	157	167	167
GMS61	5H	145	135	135	135	135	145	145	135
Bmac303	5H	138	138	138	119	119	119	119	138
ABG458	6H	248	248	248	248	248	248	248	248
Bmac40	6H	180	236	210	236	220	180	220	220
Bmac500	6H	190	150	150	150	110	150	150	150
GBM1215	6H	240	200	240	240	240	240	240	240
HVM11	6H	150	175	185	150	185	185	185	175
MWG2029	6H	260	260	245	260	245	260	260	245
ABC15864	7H	NULL	167	167	167	167	167	167	167
Bmac64	7H	155	140	140	140	140	140	140	140
Bmac162	7H	187	187	187	187	187	187	187	200
Bmac167	7H	195	184	195	184	184	184	184	184
Bmag110	7H	145	160	135	145	135	160	145	145

Molecular weight of amplified fragments measured in base pairs and calibrated with 100 & 500 bp Ladder

Marker	Chr	ICAR-IIWBR, Karnal				CSKHPKV, RRS, Bajaura				
		DWRB219	DWRB226	DWRB 228	DWRB 246	HBL879	HBL880	HBL881	HBL882	HBL883
Bmac154	1H	130	NLL	140	110	NULL	140	140	110	130
Bmac213	1H	155	168	155	155	180	155	180	155	155
Bmag382	1H	109	109	109	109	109	109	109	109	109
Bmag579	1H	126	110	126	110	110	126	126	NULL	110
MGB402	1H	260	260	260	240	260	260	260	260	240
ScSSR10477	1H	140	150	150	160	150	150	200	160	160
HvHVA1	1H	136	136	136	136	136	136	136	136	136
Bmac175	2H	NULL	155	180	155	180	180	155	180	180
EBmac640	2H	176	190	190	176	190	190	190	176	190
Bmag15	2H	181	181	181	181	181	181	181	181	181
EBmac525	2H	125	149	149	125	125	125	125	125	125
EBmac623	2H	154	168	168	168	168	168	154	154	168
cMWG658	2H	600	580	600	600	600	600	600	580	580
Ebmatc39	2H	190	190	150	150	190	170	170	170	190
Bmag006	3H	274	274	274	274	274	274	274	274	274
Bmag603	3H	140	140	122	122	122	122	140	122	140
Bmag877	3H	153	153	153	153	165	165	165	153	165
Ebmac541	3H	140	106	106	140	120	140	106	106	120
MWG 847	3H	150	345	150	345	345	345	345	150	345
Bmag225	3H	140	165	140	185	165	165	140	140	165
HvLTPPB	3H	216	216	216	NULL	216	200	216	200	200
Bmag841	3H	125	115	125	115	115	225	115	115	125
ABG500	4H	189	189	189	189	189	189	189	189	189
HVM40	4H	160	150	160	160	150	160	150	150	160
HVM67	4H	126	126	126	126	126	126	136	126	136
HvMLOH1A	4H	185	175	185	175	185	185	185	175	185
Ksug10	4H	1300	1500	1500	1300	1500	NULL	1500	1500	1500
MWG634	4H	800	800	800	800	800	800	800	800	800
WG622	4H	161	161	161	161	161	161	161	161	161
Bmag353	4H	119	119	90	119	90	119	119	119	119
Bmag337	5H	165	145	165	165	145	165	165	145	145
Bmag751	5H	189	189	189	189	189	189	189	189	189
Bmag812	5H	157	147	157	157	167	167	167	157	157
GMS61	5H	135	145	135	145	135	135	135	135	145
Bmac303	5H	119	NULL	138	119	138	138	138	119	138
ABG458	6H	248	248	248	248	248	248	248	248	248
Bmac40	6H	236	236	220	236	210	220	236	220	236
Bmac500	6H	150	150	190	190	150	190	110	110	NULL
GBM1215	6H	200	240	240	240	240	240	240	200	200
HVM11	6H	185	175	175	150	175	185	175	175	175
MWG2029	6H	260	245	245	260	260	245	260	245	245
ABC15864	7H	167	167	167	167	167	167	167	167	167
Bmac64	7H	140	155	140	140	140	140	140	140	140
Bmac162	7H	200	187	187	187	200	187	187	187	200
Bmac167	7H	195	195	195	184	184	195	184	184	184
Bmag110	7H	135	135	NULL	160	160	135	135	160	135

Molecular weight of amplified fragments measured in base pairs and calibrated with 100 & 500 bp Ladder

Marker	Chr	BHU, Varanasi			CSAU&T, Kanpur						
		HUB281	HUB285	HUB286	KB2004	KB2015	KB2031	KB2120	KB2127	KB2158	KB2160
Bmac154	1H	110	130	110	110	110	130	140	110	110	NULL
Bmac213	1H	168	168	168	180	155	155	155	180	168	168
Bmag382	1H	109	109	109	109	109	109	109	NULL	109	109
Bmag579	1H	110	126	126	126	126	110	110	126	110	110
MGB402	1H	240	260	260	240	240	260	260	240	240	240
ScSSR10477	1H	NULL	140	150	150	160	150	160	140	200	130
HvHVA1	1H	136	136	136	136	136	136	136	136	136	136
Bmac175	2H	180	155	155	155	NULL	180	155	180	180	155
EBmac640	2H	176	190	190	190	176	176	176	190	190	176
Bmag15	2H	181	181	181	181	181	181	181	181	181	181
EBmac525	2H	125	125	149	125	125	149	125	125	125	125
EBmac623	2H	168	154	168	154	168	168	154	168	168	154
cMWG658	2H	580	580	580	600	580	600	580	580	600	580
Ebmatc39	2H	170	190	170	150	190	150	150	170	190	150
Bmag006	3H	274	274	274	274	274	274	274	274	274	274
Bmag603	3H	140	122	NULL	140	122	140	122	140	140	140
Bmag877	3H	165	165	165	153	153	165	NULL	153	165	153
Ebmac541	3H	140	140	120	140	140	140	140	140	140	140
MWG 847	3H	150	345	150	345	150	150	345	150	345	345
Bmag225	3H	165	140	165	165	140	185	165	140	185	185
HvLTPPB	3H	200	200	200	216	200	200	216	200	200	216
Bmag841	3H	115	225	115	115	125	115	125	125	125	115
ABG500	4H	189	189	189	189	189	189	189	189	189	189
HVM40	4H	160	160	150	160	160	150	160	160	150	160
HVM67	4H	136	126	136	126	126	126	136	136	136	126
HvMLOH1A	4H	175	185	185	175	185	185	175	175	185	185
Ksug10	4H	1500	1500	1500	1300	1300	1500	1500	1500	1500	1500
MWG634	4H	800	800	800	800	800	800	800	800	800	800
WG622	4H	161	161	161	161	161	161	161	161	161	161
Bmag353	4H	119	119	119	119	119	NULL	119	90	119	90
Bmag337	5H	145	165	165	165	165	145	145	165	165	145
Bmag751	5H	189	189	189	189	189	189	189	189	189	189
Bmag812	5H	167	167	167	157	157	157	157	157	157	167
GMS61	5H	135	135	135	145	135	135	145	135	145	135
Bmac303	5H	119	138	138	119	119	138	119	138	119	138
ABG458	6H	248	248	248	248	248	248	248	248	248	248
Bmac40	6H	236	220	236	NULL	220	220	210	210	NULL	210
Bmac500	6H	190	190	110	190	150	190	150	150	150	150
GBM1215	6H	200	240	240	240	200	240	200	240	240	240
HVM11	6H	150	185	185	175	185	175	175	150	185	175
MWG2029	6H	260	260	260	245	245	260	245	260	260	260
ABC15864	7H	167	167	167	167	167	167	167	167	167	167
Bmac64	7H	155	155	140	140	155	140	140	140	140	140
Bmac162	7H	200	187	200	187	187	NULL	200	187	187	187
Bmac167	7H	195	195	184	195	184	195	184	184	195	184
Bmag110	7H	145	145	160	160	135	145	145	160	135	NULL

Molecular weight of amplified fragments measured in base pairs and calibrated with 100 & 500 bp Ladder

Marker	Chr	PAU, Ludhiana	SKNAU, RARI, Durgapura					GBPUA&T, Pantnagar			
		PL937	RD3053	RD3080	RD3081	RD3082	RD3083	UPB1106	UPB1109	UPB1110	UPB1111
Bmac154	1H	NULL	110	130	140	130	110	130	140	110	110
Bmac213	1H	155	155	168	168	NULL	168	155	168	180	168
Bmag382	1H	109	109	109	109	109	109	109	109	109	109
Bmag579	1H	126	110	126	126	126	110	126	110	110	126
MGB402	1H	260	240	260	260	260	260	260	240	260	240
ScSSR10477	1H	140	200	NULL	200	150	140	NULL	160	150	160
HvHVA1	1H	136	136	136	136	136	136	136	136	136	136
Bmac175	2H	155	NULL	155	155	155	155	180	180	155	180
EBmac640	2H	190	176	190	190	190	176	190	176	190	176
Bmag15	2H	181	181	181	181	181	181	181	181	181	181
EBmac525	2H	125	125	149	125	149	149	149	125	125	149
EBmac623	2H	154	154	168	154	168	154	154	154	154	168
cMWG658	2H	600	600	580	580	580	580	580	580	600	580
Ebmatc39	2H	190	150	190	170	190	190	170	150	170	190
Bmag006	3H	274	274	274	274	274	274	274	274	274	274
Bmag603	3H	140	122	140	122	140	122	140	122	140	122
Bmag877	3H	153	153	165	165	165	153	153	165	165	165
Ebmac541	3H	140	NULL	120	106	120	140	106	120	140	140
MWG 847	3H	150	345	150	345	150	345	345	150	150	345
Bmag225	3H	140	185	165	NULL	165	165	185	185	185	165
HvLTPPB	3H	216	200	200	200	200	216	200	216	200	200
Bmag841	3H	125	115	115	115	115	125	125	125	225	115
ABG500	4H	189	189	189	189	189	189	189	189	189	189
HVM40	4H	160	160	150	160	150	NULL	160	160	160	150
HVM67	4H	126	NULL	136	136	136	126	126	136	126	126
HvMLOH1A	4H	185	175	175	175	175	175	175	185	185	175
Ksug10	4H	1300	1500	1300	1500	1300	1500	1300	1500	1500	1500
MWG634	4H	800	800	800	800	800	800	800	800	800	800
WG622	4H	161	161	161	161	161	161	161	161	161	161
Bmag353	4H	119	119	119	90	119	119	90	119	90	90
Bmag337	5H	165	165	165	145	165	165	145	145	165	165
Bmag751	5H	189	189	189	189	189	189	189	189	189	189
Bmag812	5H	157	157	147	167	167	167	157	157	167	167
GMS61	5H	145	135	135	135	145	135	135	NULL	145	145
Bmac303	5H	119	119	138	138	138	138	119	138	138	138
ABG458	6H	248	248	248	248	248	248	248	248	248	248
Bmac40	6H	236	236	180	210	236	236	210	236	210	210
Bmac500	6H	150	110	150	150	190	150	150	110	150	150
GBM1215	6H	200	200	240	240	240	240	200	240	240	240
HVM11	6H	185	175	150	150	175	175	175	150	185	185
MWG2029	6H	260	245	260	260	245	260	245	245	260	260
ABC15864	7H	167	167	167	167	167	167	167	167	167	167
Bmac64	7H	140	140	155	155	155	140	140	140	140	140
Bmac162	7H	200	200	187	200	187	200	187	200	NULL	200
Bmac167	7H	195	195	195	195	184	184	184	195	NULL	184
Bmag110	7H	135	160	145	160	135	160	135	145	135	135

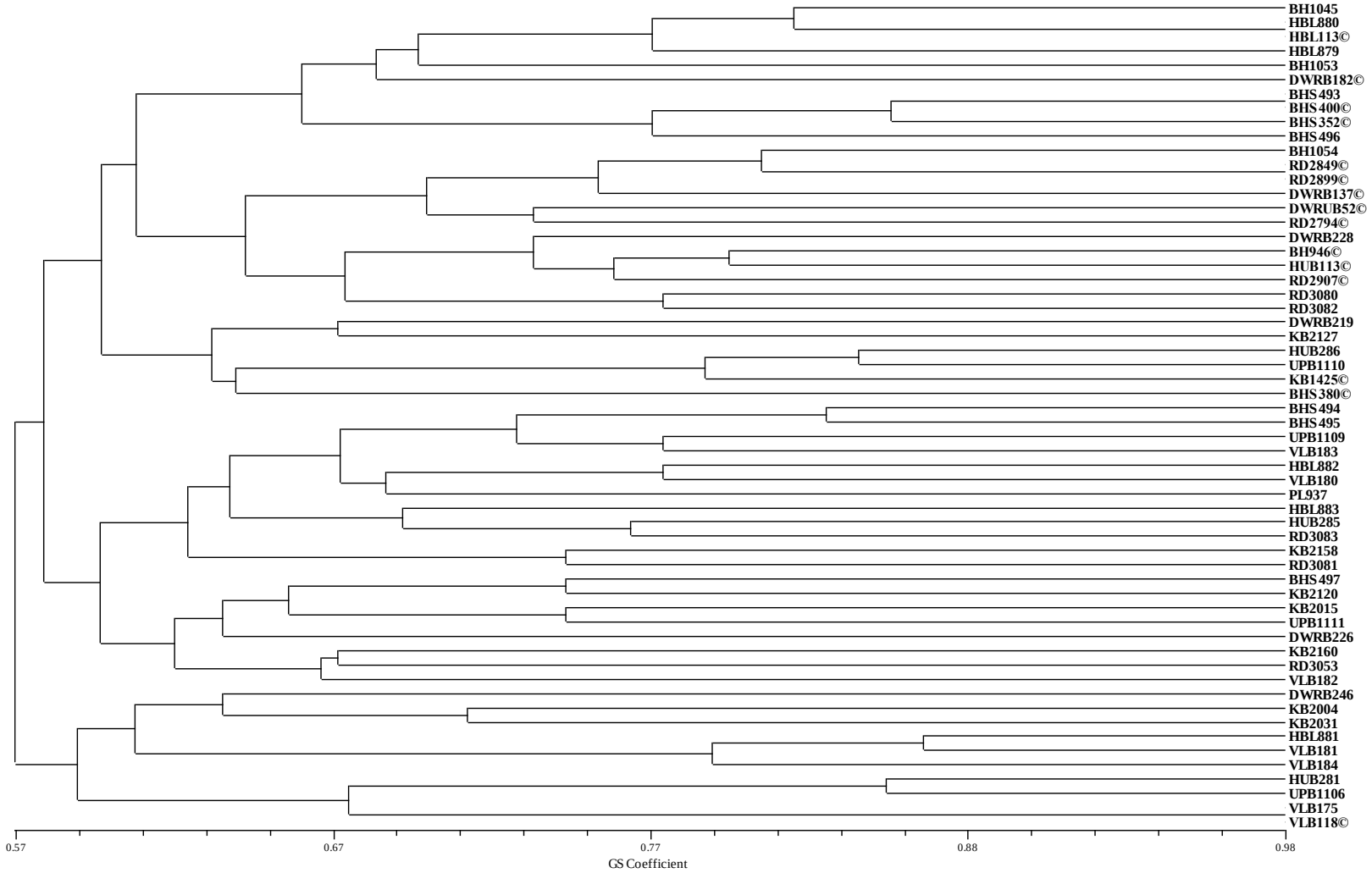
Molecular weight of amplified fragments measured in base pairs and calibrated with 100 & 500 bp Ladder

Marker	Chr	VPKAS, Almora						Checks			
		VLB 175	VLB 180	VLB 181	VLB 182	VLB 183	VLB 184	BH946	BHS352	BHS380	BHS400
Bmac154	1H	110	110	130	140	130	130	140	140	130	140
Bmac213	1H	155	155	168	180	155	180	180	168	180	168
Bmag382	1H	109	109	109	109	109	109	109	109	109	109
Bmag579	1H	110	110	110	126	110	110	126	126	126	126
MGB402	1H	240	240	260	260	260	240	260	240	240	240
ScSSR10477	1H	160	NULL	140	200	NULL	150	150	150	200	150
HvHVA1	1H	136	136	136	136	136	136	136	136	136	136
Bmac175	2H	180	180	155	155	180	155	180	180	155	180
EBmac640	2H	190	176	176	176	176	190	190	190	176	190
Bmag15	2H	181	181	181	181	181	181	181	181	181	181
EBmac525	2H	125	149	149	149	149	149	125	149	149	149
EBmac623	2H	168	168	168	154	168	168	168	168	154	154
cMWG658	2H	580	600	600	600	580	580	600	600	580	600
Ebmatc39	2H	170	170	170	170	150	190	170	170	170	170
Bmag006	3H	274	274	274	274	274	274	274	274	274	274
Bmag603	3H	122	140	122	140	140	122	122	140	140	140
Bmag877	3H	165	165	165	165	153	165	165	165	165	165
Ebmac541	3H	140	106	140	106	140	120	106	106	140	106
MWG 847	3H	150	345	345	150	345	345	345	345	150	345
Bmag225	3H	140	165	140	140	185	165	185	185	185	185
HvLTPPB	3H	216	216	216	200	200	200	216	216	216	216
Bmag841	3H	125	115	115	115	125	115	115	125	115	115
ABG500	4H	189	189	189	189	189	189	189	189	189	189
HVM40	4H	150	150	150	150	160	160	160	150	160	160
HVM67	4H	NULL	126	136	136	126	136	126	126	136	126
HvMLOH1A	4H	175	175	185	185	175	185	175	175	175	175
Ksug10	4H	1500	1300	1500	1500	1500	1500	1500	1500	1500	1500
MWG634	4H	800	800	800	800	800	800	800	800	800	800
WG622	4H	161	161	161	161	161	161	161	161	161	161
Bmag353	4H	119	90	90	90	119	90	119	119	90	119
Bmag337	5H	145	145	145	145	145	145	165	145	145	145
Bmag751	5H	189	189	189	189	189	189	189	189	189	189
Bmag812	5H	147	167	147	167	147	157	167	157	147	157
GMS61	5H	135	145	145	145	145	135	145	135	145	135
Bmac303	5H	138	119	138	138	119	138	119	119	138	138
ABG458	6H	248	248	248	248	248	248	248	248	248	248
Bmac40	6H	236	210	220	210	210	220	220	NULL	220	220
Bmac500	6H	150	110	110	NULL	150	150	190	150	190	150
GBM1215	6H	200	200	240	240	240	200	200	240	240	200
HVM11	6H	175	150	185	185	185	175	150	185	175	185
MWG2029	6H	260	260	245	260	245	260	245	245	260	245
ABC15864	7H	167	167	167	167	167	167	167	167	167	167
Bmac64	7H	140	140	155	155	140	155	155	155	155	155
Bmac162	7H	200	200	187	200	200	187	200	187	200	187
Bmac167	7H	184	184	195	184	195	195	184	184	195	184
Bmag110	7H	160	135	160	160	135	145	145	160	160	160

Molecular weight of amplified fragments measured in base pairs and calibrated with 100 & 500 bp Ladder

Marker	Chr	Checks										
		DWRUB 52	DWRB 137	DWRB 182	HBL 113	HUB 113	KB 1425	RD 2794	RD 2849	RD 2899	RD 2907	VLB 118
RDBmac154	1H	130	130	130	130	130	110	130	130	130	140/130	130
Bmac213	1H	180	168	155	168	155	168	180	180	168	180	168
Bmag382	1H	109	109	109	109	109	109	109	109	109	109	109
Bmag579	1H	126	126	126	126	126	126	126	126	126	126	126
MGB402	1H	260	260	260	260	260	260	260	260	240	240	240
ScSSR10477	1H	150	140	150	150	150	140	150	150	150	150	140
HvHVA1	1H	136	136	136	136	136	136	136	136	136	136	136
Bmac175	2H	180	180	180	180	155	155	180	180	180	180	155
EBmac640	2H	190	176	190	176	190	190	190	190	190	190	190
Bmag15	2H	181	181	181	181	181	181	181	181	181	181	181
EBmac525	2H	149	149	149	149	149	125	149	149	149	149	149
EBmac623	2H	168	154	154	154	168	168	154	154	154	168	154
cMWG658	2H	600	580	580	580	600	600	600	580	580	600	580
Ebmatc39	2H	150	150	170	190	190	190	150	150	150	150	170
Bmag006	3H	274	274	274	274	274	274	274	274	274	274	274
Bmag603	3H	122	122	140	140	140	122	122	122	140	140	140
Bmag877	3H	153	165	165	153	153	165	165	165	153	165	153
Ebmac541	3H	120	106	106	106	106	140	106	140	140	120	106
MWG 847	3H	345	345	345	345	345	345	345	345	345	345	345
Bmag225	3H	185	185	165	165	165	140	165	185	140	165	185
HvLTPPB	3H	216	216	200	216	216	200	216	216	216	216	216
Bmag841	3H	125	125	125	115	115	115	125	125	125	115	115
ABG500	4H	189	189	189	189	189	189	189	189	189	189	189
HVM40	4H	150	160	160	160	150	160	150	160	150	150	160
HVM67	4H	136	136	126	126	126	136	126	136	136	126	136
HvMLOH1A	4H	185	185	175	185	175	175	175	185	185	175	175
Ksug10	4H	1300	1500	1300	1500	1500	1300	1500	1300	1500	1300	1500
MWG634	4H	800	800	800	800	800	800	800	800	800	800	800
WG622	4H	161	161	161	161	161	161	161	161	161	161	161
Bmag353	4H	119	119	90	90	119	119	90	90	119	119	119
Bmag337	5H	165	145	145	145	145	165	145	145	165	145	145
Bmag751	5H	189	189	189	189	189	189	189	189	189	189	189
Bmag812	5H	157	167	157	157	147	167	147	167	167	167	167
GMS61	5H	145	145	135	135	145	145	145	145	145	145	145
Bmac303	5H	119	119	119	138	119	119	138	138	138	138	119
ABG458	6H	248	248	248	248	248	248	248	248	248	248	248
Bmac40	6H	210	236	210	236	236	236	210	236	210	210	180
Bmac500	6H	190	190	150	190	150	150	150	190	190	190	190
GBM1215	6H	200	240	200	240	240	200	200	200	240	240	200
HVM11	6H	150	150	175	175	175	185	175	175	150	150	185
MWG2029	6H	245	245	245	245	245	245	245	245	245	245	245
ABC15864	7H	167	167	167	167	167	167	167	167	167	167	167
Bmac64	7H	140	140	140	155	155	155	140	155	140	155	140
Bmac162	7H	200	200	187	187	200	200	200	200	200	200	200
Bmac167	7H	195	195	184	184	195	195	195	195	195	195	184
Bmag110	7H	145	184	135	135	135	145	135	145	135	135	160

Molecular weight of amplified fragments measured in base pairs and calibrated with 100 & 500 bp Ladder



UPGMA based clustering of entries and checks of AVT Barley Trials 2022-23

Molecular Markers Used for generating molecular profiles of Barley Trails (2022-23)

Sr No	Marker	Chr	Sequence of PCR Primer (5'-3')	Amplification Conditions
1.	Bmac154	1H	CTGGGTGATGAATAGAGTTTC	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @
			TATTCTTCAAAAGATGTTCTGC	58C, 30 secs @ 72C, 1 cycle of 5 mins @72C
2.	Bmac213	1H	ATGGATGCAAGACCAAAC	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @
			CTATGAGAGGTAGAGCAGCC	58C, 30 secs @ 72C, 1 cycle of 5 mins @72C
3.	Bmag382	1H	TGAAACCCATAGAGAGTGAGA	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @
			TCAAAAGTTTCGTTCCAAATA	58C, 30 secs @ 72C, 1 cycle of 5 mins @72C
4.	Bmag579	1H	CCTAGATAAGGAACATAGCCA	1 cycle of 1 min @ 94C, 1 min @ 55C, 1 min @ 72C, 30 cycles of 1 min @ 94C, 1 min @ 55C, 1
			CAAAGACCCTAACTCATGTTC	min @ 72C, 1 cycle of 5 mins @ 72C
5.	MGB402	1H	CAAGCAAGCAAGCAGAGAGA	1 cycle of 3 min @ 94C, 1 min @ 55C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @
			AACTTGTGGCTCTGCGACTC	58C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C.
6.	ScSSR10477	1H	CATGGGAGGGGACAACAC	1 cycle of 1 min @ 94C, 1 min @ 55C, 1 min @ 72C, 30 cycles of 1 min @ 94C, 1 min @ 55C, 1
			CGACCAAACACGACTAAAGGA	min @ 72C, 1 cycle of 5 mins @ 72C
7.	HvHVA1	1H	CATGGGAGGGGACAACAC	1 cycle of 1 min @ 94C, 1 min @ 55C, 1 min @ 72C, 30 cycles of 1 min @ 94C, 1 min @ 55C, 1
			CGACCAAACACGACTAAAGGA	min @ 72C, 1 cycle of 5 mins @ 72C
8.	Bmac175	2H	CTACACCCCTACCATATAAACA	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @
			CCTCCCCACATACCTTGT	58C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C.
9.	EBMAC640	2H	CTCAGTGCGTTACCAGTGC	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @
			CCTGTCATGCATAACCTATGG	58C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C.
10.	Bmag15	2H	TTGAGGGCTGAACACTTCG	Touchdown' PCR: 18 cycles of denaturing 1 min @94C and extension 1 min @72C, with
			GCCCACTGTCAAGGACAATT	annealing for 30s with temp decreased 1C every second cycel from 69C to 60C. Continue 20
				cycles for 1 min @94C, 1 min @55C, 1 min @72C. End with 5 min @72C.
11.	EBMAC525	2H	TGACAGTGTCTCCAGTAATGA	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @
			GTTTGTTCTTTTGATTTTGTTG	58C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C
12.	EBmac623	2H	CGAACATTGTCGTGTTAGTAA	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @
			CTGTCATGCATAACCTATGG'	58C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C
13.	cMWG658	2H	CCAAGAAGGCGAAGAAGGTCC	STS annealing temperature 62-65oC
			CTCACTGCCCAGAGAAACAGC	
14.	Ebmatc39	2H	TAGTCTCTTCATTTATACCATCACC	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @
			CATGCTGATCCCCCTTCT	58C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C
15.	Bmag6	3H	TTAAACCCCCCCCCTCTAG	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @
			TGCAGTTACTATCGCTGATTTAGC	58C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C
16.	Bmag603	3H	ATACCATGATACATCACATCG	1 cycle of 3 min @ 94C, 1 min @ 55C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @
			GGGGGTATGTACGACTAACTA	55C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C
17.	Bmag877	3H	AAAGCTCATGGTAGATCAAGA	1 cycle of 3 min @ 94C, 1 min @ 55C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @
			TAGTTTTCCCAAAAGCTTCTA	55C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C

18.	Ebmac541	3H	ACGGATCTACTTTAGCTAGCA AAACAACCCCACACAATC	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @ 58C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C.
19.	MWG847	3H	GTCTTGGCCAGCTACTCCCG CGCACCTGCACCAGAGGTC	STS annealing temperature 65-67C
20.	Bmag225	3H	AACACACCAAAAATATTACATCA CGAGTAGTTCCCATGTGAC	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @ 58C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C
21.	HvLTPPB	3H	TGCTGAGACGCTGAGTACGTTG CAAACTCACGATTCCTCTCAAAG	35 cycles of 1 min at 94 deg C; 1 min at 50 deg C; 2 min at 72 deg C; and a final extension step of 5 min at 72 deg C
22.	Bmag841	3H	GGAAAGTACTTCAAACCTGAA CTTACAAGATGATGAGAACGA	3 min 94C, 45 cycles of 1 min @94C, 1 min @55C, 2 min @72C, final extension of 10 min @72C. 25 microlitre reactions contained 125 nM of each primer.
23.	ABG500	4H	ATTAATCCGACCGTCACTGC ACGAACTCCTCGCTGCC	STS annealing temperature 58-60C
24.	HVM40	4H	CGATTCCCCTTTTCCCAC ATTCTCCGCCGTCCACTC	Annealing (30 s) temperatures were progressively decreased by 1oC every second cycle from 64C to 55C
25.	HVM67	4H	GTCGGGCTCCATTGCTCT CCGGTACCCAGTGACGAC	'Touchdown' PCR of 48 cycles of 94C for 1 min denaturing and 72C for 1 min extension. Annealing (30 s) temperatures were progressively decreased by 1C every second cycle from 64C to 55C. Annealing conditions of 1 min at 55C were maintained during the final 30 cycles. The reaction ended with a 5-min extension at 72C
26.	HvMLOH1A	4H	CCTCCCCTCTGATATGATAA GTACAGACGGTTTAATTGTCC	1 cycle of 1 min @ 94C, 1 min @ 55C, 1 min @ 72C, 30 cycles of 1 min @ 94C, 1 min @ 55C, 1 min @ 72C, 1 cycle of 5 mins @ 72C
27.	Ksug10	4H	GTCCAGCTTCAGCGAGTAC GTGTTGATGTCCTTGAGGCC	STS annealing temperature 60C
28.	MWG634	4H	GTGCTGGGTGGATTAAAAAAGAGGG GAACTAAAGATAGGCGGGAGTACTG	STS annealing temperature 60C
29.	WG622	4H	CTGCCTGTTGATTTTCCATG TTCACCTTGCCATGACGA	STS annealing temperature 60C
30.	Bmag353	4H	ACTAGTACCCACTATGCACGA ACGTTCATTAAAATCACAACTG	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @ 58C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C.
31.	Bmag337	5H	ACAAAGAGGGAGTAGTACGC GACCCATGATATATGAAGATCA	1 cycle of 3 min @ 94C, 1 min @ 55C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @ 55C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C
32.	Bmag751	5H	CACTGCAAATATTAAAATGGA GATCTACTGGTCCATAGTTGC	3 min 94C, 45 cycles of 1 min @94C, 1 min @55C, 2 min @72C, final extension of 10 min @72C.
33.	Bmag812	5H	ATAGTTCTTTCAGGACCAATG GTCATATGGATCTCCAAAGAG	3 min 94C, 45 cycles of 1 min @94C, 1 min @55C, 2 min @72C, final extension of 10 min @72C.
34.	GMS61	5H	CACCTGTTCCGTCCCGTC AACCTCTTTTTTATCCCTCGC	STS annealing temperature 60C
35.	Bmac303	5H	CCTCCAAGATTAGATCTCTCTC CCGTATATTTAAGAAATGGTGA	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @ 58C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C

36.	ABG458	6H	CCGGTCGGTGCAGAAGAG AAATGAAAGCTAAATGGGCGATAT	STS annealing temperature 55-58 C
37.	Bmac40	6H	AGCCCGATCAGATTTACG TTCTCCCTTTGGTCCTTG	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @ 58C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C.
38.	Bmag500	6H	GGGAACTTGCTAATGAAGAG AATGTAAGGGAGTGTCCATAG	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @ 58C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C.
39.	GBM1215	6H	ATGACCAGAAAACGCCTGTC GGATTCTGCACACACGAGAA	3 min at 94 deg C; 45 cycles with 30 sec at 94 deg C, 30 sec at 60 deg C (touchdown of 0.5 deg C / cycle for initial 10 cycles - final annealing of 55 deg C for remaining 35 cycles), 30 sec at 72 deg C; and a final extension step of 5 min at 72 deg C
40.	HVM11	6H	CCGGTCGGTGCAGAAGAG AAATGAAAGCTAAATGGGCGATAT	1 cycle of 3 min @ 94C, 1 min @ 55C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @ 55C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C
41.	MWG2029	6H	CCAGTTATCCGAATCCGGAA GTGGTCAGGTACATACGAAT	STS annealing temperature 60C
42.	ABC15864	7H	GCATAAACGGGTGTAAGAGC CATCCAGTTCAGAGGATAGAGC	STS annealing temperature 60C
43.	Bmac64	7H	CTGCAGGTTTCAGGAAGG AGATGCCCGCAAAGAGTT	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @ 58C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C.
44.	Bmac162		CATGTGTTGAAATCAGTTTTG CCCTCTCTCTCTCTCTCTC	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @ 58C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C.
45.	Bmac167	7H	CATTTCCACTTCAAAATATCC CCAAAGTTTGAGTGCAGAC	1 cycle of 1 min @ 94C, 1 min @ 55C, 1 min @ 72C, 30 cycles of 1 min @ 94C, 1 min @ 55C, 1 min @ 72C, 1 cycle of 5 mins @ 72C
46.	Bmag110	7H	ACGAGGAGGGACTAGTACAC CCAACTATATTAACAAGGCTCA	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @ 58C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C.

Protocol for developing Molecular profiles of Barley AVT Trials 2022-23

Development of Molecular profiles: An equal number of fresh, young leaves (ten days old) of five plants from each of AVT were bulked for DNA extraction. Total genomic DNA was isolated using the modified CTAB method (Saghai-Maroof *et al*, 1984). A set of 46 SSR/STS molecular markers covering whole genome of barley was used to develop amplification profiles of genotypes. PCR reaction was conducted in reaction volume of 10 ul containing 1X PCR buffer. 200 m M dNTPs, 0.25 uM of primer, 2Mm mgcl2, 1-unit Taq polymerase and 50 ng template DNA. PCR amplification was performed using thermocycler. PCR products were resolved by electrophoresis on 2 % agarose gels at 4v/cm in 0.5 X TBE buffer. Fragment sizes were approximately calculated by interpolation from the migration distance of marker fragments of 100 or 500 bpDNA ladder depending on the amplified fragments size and corroborated with the reported amplified fragment size of respective molecular marker. The occurrence of 'null' alleles was verified by re-amplification using the same primer pair in the same conditions. Gels were stained with ethidium bromide (0.5ug/ml). DNA banding patterns were visualized with UV light and recorded by imagining system.

CROP PROTECTION (Plant Pathology)

Summary

- Total 585 entries consisting 437, 118 and 30 entries in different nurseries *viz*., IBDSN, NBDSN and EBDSN, respectively, were screened for resistance against various diseases, aphid and CCN at different cooperating centers during the crop season 2022-23.
- Out of 437 entries in IBDSN from different breeding centers, 30 entries were found free from yellow rust (ACI = 0) and 206 entries showed resistant reaction having ACI less than 10.
- Total 118 entries evaluated in NBDSN, 10 were entries found free from yellow rust, 90 entries showed resistant reaction having ACI less than 10. In case of leaf blight screening, 19 entries showed moderate level of resistance with an average score (double digit) 14-35 and HS < 57.
- Among 30 EBDSN entries, 6 found free from yellow rust, whereas 14 shown resistant reaction. 2 entries also showed moderate level of resistance against leaf blight with an average score 14-35 and HS < 57.
- Among eight different fungicidal treatments, two spray of viz., Tebuconazole 50% + Trifloxystrobin 25%, Picoxystrobin 7.05% + Propiconazole 11.7% and Propiconazole 25% was found most effective in management of foliar blight of barley.

BARLEY PATHOLOGY

Status of barley diseases and insect pests

To know the health status of barley crop, the survey was conducted by the scientists from RARI, Durgapura on the farmers' fields during 27th to 28th January, 2023 in different villages of Jaipur district of Rajasthan. None of the rust was observed in barley crop. Surveys were also conducted by the scientists from RARI, Durgapura on 9th and 10th March, 2023 to know the health status of barley crop on farmers field in the areas of district Jaipur, Dausa and Tonk. The barley crop was at harvesting stage. Incidence of leaf rust (5S-10S) was noted in barley at two locations of district Tonk. The incidence of leaf stripe, net blotch, loose smut, covered smut and bacterial streak was noted at few locations. However, very severe infection of net blotch was noted at Todaraising of district Tonk, where the disease incidence was upto 100 percent. The incidence of powdery mildew was also noted at one location.

Observation of any new barley diseases/ insect pests

To observe the appearance of any quarantine pests on barley crop the nurseries were observed for any new symptoms during the crop season till the harvest. There was no report from any centre for presence of any of following quarantined pests (disease / insect pest) in their respective areas during the crop season 2022-23.

(a) Glume rot - Not reported by any centre
(b) Barley stripe mosaic - Not reported by any centre
(c) Ergot - Not reported by any centre

Status of resistance in breeding lines and advanced entries:

Adult plant resistance (APR)

A total 585 barley breeding lines were screened during the crop season 2022-23 under various nurseries (IBDSN, NBDSN and EBDSN) for resistance against various diseases, aphid and CCN at different cooperating centres. There were 437 entries under IBDSN, 118 were for NBDSN and 30 for EBDSN (Fig. 1). Seedling Resistance Test (SRT) for NBDSN and EBDSN entries was conducted at IIWBR, Regional station, Flowerdale, Shimla. Besides the screening of barley germplasm for disease

resistance, experiments on chemical control of foliar blight were conducted at various locations to evaluate the efficacy of various fungicides. NBDSN entries were also screened for aphid and CCN resistance.

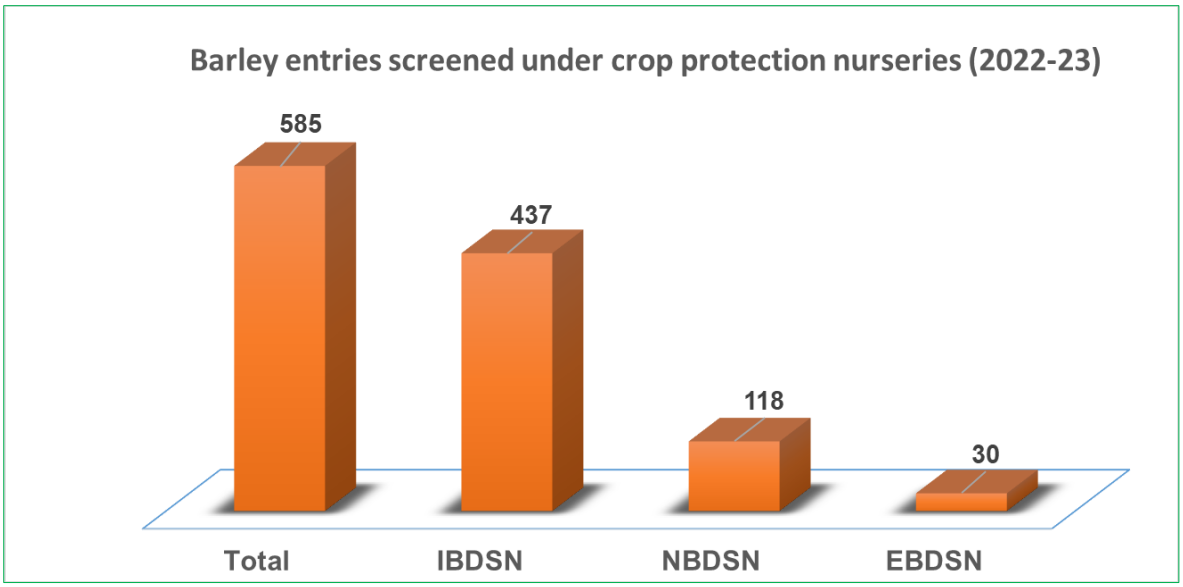


Fig.1: Barley entries screened under crop protection nurseries (2022-23)

Initial Barley Disease Screening Nursery (IBDSN) 2022-23

During the season 2022-23, total 437 entries contributed by 14 breeding centres under IBDSN were screened for resistance against major diseases *viz*., stripe rust and leaf blight at various coordinating centres. The screening of stripe rust was done at Bajaura, Ludhiana, Durgapura, Almora, Jammu and Karnal. The screening for leaf blight was done at Ayodhya, Pantnagar, Kanpur and Varanasi. The blight score at Varanasi centre was too high hence score at II dough stage was considered. Data of Almora (yellow rust) and Kanpur (leaf blight) centres are not considered due to low disease severity.

To create the epiphytotic condition for yellow rust the inocula were supplied by IIWBR Regional Station, Flowerdale, Shimla and multiplied in respective centres for creating epiphytotics in the main field from tillering to flag leaf stage. The scoring of disease was done based on response and severity. Leaf blight inoculum supplied by IIWBR, Karnal centre and inoculation by centres in the field was done and the scoring of blight disease was done at dough stage in double digit scale on flag leaf (F) and F-1 leaf. For stripe rust, average coefficient of infection (ACI) was calculated along with highest score. The entries showing ACI up to 10.00 for rusts were considered resistant (R). For leaf blight, average disease score in double digit system was calculated along with highest score, the genotypes showed an average score of 00-13 with highest score upto 35 at multilocation were considered resistant and genotypes with average score of 14-35 with HS 57 were considered moderately resistant (MR).

Among 437 entries evaluated during 2022-23 (Table 3.1), 30 entries were found free from yellow rust (ACI = 0) and 206 entries showed resistant reaction having ACI less than 10. In case of leaf blight screening, 32 entries were found moderately resistant against leaf blight with an average score (double digit) 14-35 and HS < 5.

Yellow rust, ACI = 0, Entries –30	BD 1972, PKB 2213, PKB 2236, PKB 2245, HB 2202, HB 2203, UPBM 18, UPBM 25, BH 2204, BH 2205, BH 2210, BH 2226, VB 2021-3, HUBL 2204, BBM 929, BBM 932, BBM 950, BBM 951, BBM 952, BBM 958, BL 2074, BL 2152, BK 2222, BK 2234, BK 2238, BK 2240, BK 2241, BK 2242, JHSBF 28, JHSBB 19
Yellow rust, ACI > 0 to 10,	BD 1962, BD 1963, BD 1964, BD 1965, BD 1967, BD 1970, BD 1971, BD 1975, BD 1976, BD 1982, BD 1983, BD 1984, BD 1987, BD 1988, BD

Entries – 206	1989, BD 1992, BD 1994, BD 1995, BD 1996, BD 1997, BD 1998, BD 1999, BD 2000, BD 2004, BD 2007, BD 2009, BD 2010, JAUB 6, JAUB 9, JAUB 10, PKB 2201, PKB 2202, PKB 2205, PKB 2207, PKB 2209, PKB 2210, PKB 2211, PKB 2212, PKB 2215, PKB 2216, PKB 2218, PKB 2223, PKB 2231, PKB 2234, PKB 2235, PKB 2237, PKB 2244, PKB 2247, PKB 2252, PKB 2253, PKB 2254, PKB 2255, PKB 2257, PKB 2258, PKB 2260, PKB 2261, PKB 2262, HB 2201, HB 2205, HB 2206, HB 2207, HB 2208, HB 2209, HB 2210, HB 2211, HB 2212, HB 2216, HB 2217, HB 2218, HB 2219, HB 2220, HB 2221, HB 2222, UPBM 1, UPBM 5, UPBM 7, UPBM 12, UPBM 13, UPBM 15, UPBM 16, UPBM 17, UPBM 19, UPBM 21, UPBM 22, UPBM 23, UPBM 24, UPBM 26, UPBM 27, BH 2201, BH 2202, BH 2206, BH 2207, BH 2208, BH 2209, BH 2211, BH 2212, BH 2213, BH 2216, BH 2217, BH 2218, BH 2219, BH 2221, BH 2222, BH 2223, BH 2224, BH 2225, VB 2021-1, VB 2021-2, HUBL 2205, HUBL 2209, HUBL 2216, BBM 930, BBM 931, BBM 933, BBM 936, BBM 939, BBM 940, BBM 941, BBM 942, BBM 944, BBM 945, BBM 946, BBM 948, BBM 949, BBM 954, BBM 955, BBM 959, BL 2081, BL 2088, BL 2107, BL 2113, BL 2114, BL 2115, BL 2117, BL 2119, BL 2121, BL 2127, BL 2130, BL 2133, BL 2134, BL 2136, BL 2141, BL 2156, BL 2158, BL 2160, BL 2176, BL 2177, BL 2187, BL 2182, BL 2183, BL 2193, BL 2197, BL 2206, BL 2209, BL 2210, BL 2211, BL 2214, BL 2220, BK 2213, BK 2214, BK 2215, BK 2216, BK 2217, BK 2223, BK 2226, BK 2227, BK 2235, BK 2236, BK 2239, BK 2243, BK 2244, BK 2248, BK 2249, VB 2202, VB 2203, VB 2204, VB 2205, VB 2206, VB 2207, VB 2208, VB 2209, VB 2210, VB 2212, VB 2213, VB 2214, VB 2215, VB 2217, VB 2218, VB 2219, VB 2220, VB 2222, VB 2226, VB 2227, VB 2228, VB 2229, VB 2230, NDB 1821, NDB 1823, NDB 1825, NDB 1829, NDB 1831, NDB 1833, JHSBD 22, JHSBF 21, JHSBD 11 and JHSBE 16.
Leaf blight, Avg. 14-35 with HS < 57, Entries – 32	BD 1969, BD 1973, BD 1998, BD 2000, JAUB 6, JAUB 7, JAUB 10, PKB 2201, PKB 2210, PKB 2214, PKB 2228, PKB 2238, HB 2209, HB 2212, HB 2215, BBM 954, BK 2210, BK 2213, BK 2219, BK 2224, BK 2228, BK 2238, BK 2247, VB 2209, VB 2215, VB 2221, VB 2230, NDB 1826, NDB 1828, NDB 1829, NDB 1831 and JHSBD 11.

Table 3.1: Reactions of different entries in Initial Barley Disease Screening Nursery 2022-23

IBDSN No.	**Entry**	**Yellow Rust**		**Leaf Blight**	
		ACI	**HS**	**Avg.**	**HS**
RARI, Durgapura					
1	BD 1961	27.4	60S	46	57
2	BD 1962	3.2	20MS	46	56
3	BD 1963	1.3	5S	47	58
4	BD 1964	1.6	10MS	56	78
5	BD 1965	4.8	20S	47	57
6	BD 1966	11.8	40S	57	67
7	BD 1967	3.2	20MS	47	57
8	BD 1968	12.4	60S*	46	47

9	BD 1969	24.0	60S*	35	57
10	BD 1970	0.8	5MS	46	68
11	BD 1971	1.6	10MS	47	57
12	BD 1972	0.0	0	47	68
13	BD 1973	25.2	60S	35	46
14	BD 1974	35.0	60S	57	68
15	BD 1975	4.2	20S	46	57
16	BD 1976	3.2	20MS	47	56
17	BD 1977	16.0	60S*	46	68
18	BD 1978	28.5	60S*	36	47
19	BD 1979	25.1	80S*	46	68
20	BD 1980	16.1	60S*	46	57
20A	Infector	76.0	100S	68	89
21	BD 1981	17.0	60S*	46	57
22	BD 1982	8.0	40S	46	68
23	BD 1983	0.1	TMR	78	79
24	BD 1984	1.2	5MS	58	78
25	BD 1985	16.0	40S	46	57
26	BD 1986	14.2	60S*	47	57
27	BD 1987	9.4	40S	57	78
28	BD 1988	3.0	10S	68	78
29	BD 1989	0.1	TMR	68	79
30	BD 1990	14.2	40S	46	68
31	BD 1991	11.4	40S	67	79
32	BD 1992	0.4	5MR	68	89
33	BD 1993	25.8	60S	57	67
34	BD 1994	3.0	10S	57	58
35	BD 1995	0.8	5MS	47	58
36	BD 1996	0.4	5MR	47	58
37	BD 1997	0.8	10MR	47	68

38	BD 1998	1.7	10MS	35	46
39	BD 1999	0.8	5MS	46	57
40	BD 2000	0.8	5MS	35	46
40A	Infector	76.0	80S	68	78
41	BD 2001	15.0	60S*	47	58
42	BD 2002	30.0	40S	46	58
43	BD 2003	30.0	80S*	46	78
44	BD 2004	1.0	5MS	57	57
45	BD 2005	25.2	80S*	78	89
46	BD 2006	26.0	80S*	57	67
47	BD 2007	0.8	5MS	79	89
48	BD 2008	26.0	60S*	57	68
49	BD 2009	0.1	TMR	56	78
50	BD 2010	1.2	10MR	68	78
SKUAST, Jammu					
51	JAUB 1	12.4	30S	36	57
52	JAUB 2	11.2	20S	46	57
53	JAUB 3	12.4	40S	46	58
54	JAUB 4	10.6	40S	46	47
55	JAUB 5	17.2	60S*	57	68
56	JAUB 6	0.1	TMR	35	46
57	JAUB 7	15.0	40S	35	57
58	JAUB 8	13.0	40S	46	57
59	JAUB 9	8.0	20S	45	68
60	JAUB 10	6.8	20S	35	46
60A	Infector	80.0	100S	68	89
CSAUAT, Kanpur					
61	PKB 2201	8.7	20S	35	46
62	PKB 2202	4.2	20S	46	57
63	PKB 2203	10.8	20S	57	58

64	PKB 2204	14.8	40S	46	68
65	PKB 2205	1.6	5S	36	58
66	PKB 2206	13.4	40S	57	68
67	PKB 2207	1.1	5S	45	57
68	PKB 2208	17.4	60S*	46	47
69	PKB 2209	0.2	TMS	57	78
70	PKB 2210	8.2	20S	34	35
71	PKB 2211	0.8	10MR	57	78
72	PKB 2212	0.8	5MS	47	68
73	PKB 2213	0.0	0	46	68
74	PKB 2214	28.8	40S	35	57
75	PKB 2215	1.1	5S	36	47
76	PKB 2216	3.0	10S	46	67
77	PKB 2217	14.2	40S	46	58
78	PKB 2218	0.9	10MR	57	79
79	PKB 2219	28.8	60S*	47	58
80	PKB 2220	28.0	80S*	46	57
80A	Infector	76.0	100S	68	89
81	PKB 2221	34.0	60S	46	68
82	PKB 2222	22.0	60S*	46	68
83	PKB 2223	7.0	20S	46	47
84	PKB 2224	13.6	40S	46	78
85	PKB 2225	32.0	60S*	47	68
86	PKB 2226	36.8	80S*	67	79
87	PKB 2227	16.8	60S*	45	57
88	PKB 2228	27.4	60S*	35	46
89	PKB 2229	18.0	60S*	47	58
90	PKB 2230	18.0	80S*	68	79
91	PKB 2231	0.2	TMS	57	58
92	PKB 2232	14.8	40S	46	58

93	PKB 2233	24.2	60S*	46	58
94	PKB 2234	0.3	TMS	46	58
95	PKB 2235	0.1	TMR	57	78
96	PKB 2236	0.0	0	46	57
97	PKB 2237	3.2	20MS	67	89
98	PKB 2238	13.4	20S	35	46
99	PKB 2239	60.0	80S	47	58
100	PKB 2240	34.0	80S*	46	58
100A	Infector	80.0	100S	78	89
101	PKB 2241	38.0	100S	57	78
102	PKB 2242	40.2	80S	57	58
103	PKB 2243	42.0	80S	67	78
104	PKB 2244	1.2	5MS	57	58
105	PKB 2245	0.0	0	47	58
106	PKB 2246	44.0	80S*	46	68
107	PKB 2247	3.2	20MS	57	89
108	PKB 2248	56.0	80S	47	57
109	PKB 2249	52.0	80S	46	58
110	PKB 2250	44.0	80S	46	68
111	PKB 2251	18.2	60S*	46	58
112	PKB 2252	0.8	5MS	46	78
113	PKB 2253	5.0	20S	46	47
114	PKB 2254	1.0	5S	67	89
115	PKB 2255	4.8	20MS	46	58
116	PKB 2256	19.6	60S*	57	78
117	PKB 2257	2.2	10S	46	57
118	PKB 2258	4.2	20MS	46	57
119	PKB 2259	38.2	100S*	46	57
120	PKB 2260	1.2	5S	57	79
120A	Infector	76.0	80S	68	89

121	PKB 2261	0.5	5MR	57	89
122	PKB 2262	1.2	5S	36	47
123	PKB 2263	40.0	80S	56	78
124	PKB 2264	15.0	40S	46	58
CSK HPKV, Bajaura					
125	HB 2201	8.2	20S	46	78
126	HB 2202	0.0	0	47	58
127	HB 2203	0.0	0	45	68
128	HB 2204	12.2	40S	57	78
129	HB 2205	2.0	10S	57	68
130	HB 2206	0.8	5MS	46	58
131	HB 2207	1.2	5MS	46	68
132	HB 2208	0.2	TS	46	57
133	HB 2209	7.2	20S	35	57
134	HB 2210	0.1	TMR	46	46
135	HB 2211	2.6	10MS	57	68
136	HB 2212	8.6	20S	35	57
137	HB 2213	19.0	60S*	57	68
138	HB 2214	32.0	40S	57	68
139	HB 2215	13.6	60S*	35	46
140	HB 2216	8.1	40S	45	46
140A	Infector	84.0	100S	78	89
141	HB 2217	8.0	20S	57	58
142	HB 2218	0.4	TS	57	78
143	HB 2219	0.4	5MR	46	68
144	HB 2220	0.4	5MR	46	57
145	HB 2221	4.4	20S	56	67
146	HB 2222	4.2	20MS	46	58
GBPUAT, Pantnagar					
147	UPBM 1	2.4	10MS	57	79

148	UPBM 2	16.0	60S*	46	47
149	UPBM 3	22.0	60S*	56	67
150	UPBM 4	15.6	60S*	46	58
151	UPBM 5	9.6	40S	57	78
152	UPBM 6	14.0	60S*	47	57
153	UPBM 7	8.0	40S	46	58
154	UPBM 8	28.4	40S	57	78
155	UPBM 9	11.8	40S	56	68
156	UPBM 10	12.8	60S*	46	58
157	UPBM 11	52.0	80S	46	58
158	UPBM 12	0.8	5MS	56	78
159	UPBM 13	3.2	20MS	46	57
160	UPBM 14	10.4	40S	57	68
160A	Infector	76.0	80S	68	89
161	UPBM 15	2.0	10S	46	57
162	UPBM 16	4.0	20S	57	68
163	UPBM 17	0.6	5MR	57	89
164	UPBM 18	0.0	0	57	78
165	UPBM 19	1.6	10MS	67	78
166	UPBM 20	26.0	60S*	46	68
167	UPBM 21	2.6	10MS	57	57
168	UPBM 22	2.2	5S	57	68
169	UPBM 23	3.2	10S	47	57
170	UPBM 24	7.0	20S	46	57
171	UPBM 25	0.0	0	57	68
172	UPBM 26	0.2	TMS	56	78
173	UPBM 27	8.2	40S	46	57
CCSHAU, Hisar					
174	BH 2201	0.8	5MS	46	68
175	BH 2202	10.0	40S	46	57

176	BH 2203	12.8	40S	57	58
177	BH 2204	0.0	0	47	58
178	BH 2205	0.0	0	46	67
179	BH 2206	0.2	TMS	36	58
180	BH 2207	0.4	5MR	36	58
180A	Infector	76.0	100S	78	89
181	BH 2208	4.0	20MS	47	58
182	BH 2209	0.2	TMS	57	68
183	BH 2210	0.0	0	56	78
184	BH 2211	5.0	10MS	46	68
185	BH 2212	5.2	20S	56	78
186	BH 2213	10.0	40S	46	68
187	BH 2214	37.0	60S	45	57
188	BH 2215	10.8	40S	46	78
189	BH 2216	0.2	TMS	46	47
190	BH 2217	1.6	10MS	57	68
191	BH 2218	2.5	10S	46	58
192	BH 2219	1.6	10MS	57	79
193	BH 2220	12.0	60S*	46	46
194	BH 2221	0.8	5MS	57	57
195	BH 2222	0.8	5MS	46	68
196	BH 2223	0.1	TMR	46	78
197	BH 2224	7.2	20S	47	68
198	BH 2225	0.8	5MS	46	58
199	BH 2226	0.0	0	57	67
Wheat Research Station, SDAU, Vijapur					
200	VB 2021-4	24.0	40S	67	78
200A	Infector	76.0	80S	67	79
201	VB 2021-3	0.0	0	68	78
202	VB 2021-1	4.2	10S	46	56

203	VB 2021-5	20.2	40S	57	67
204	VB 2021-2	0.2	TMS	57	78
BHU, Varanasi					
205	HUBL 2201	30.8	60S	48	58
206	HUBL 2202	12.0	40S	46	46
207	HUBL 2203	15.0	40S	47	58
208	HUBL 2204	0.0	0	46	57
209	HUBL 2205	4.0	20S	46	58
210	HUBL 2206	12.1	40S	47	68
211	HUBL 2207	21.0	60S*	57	68
212	HUBL 2208	48.0	80S	68	78
213	HUBL 2209	5.8	20S	57	68
214	HUBL 2210	22.1	40S	46	56
215	HUBL 2211	18.1	40S	57	67
216	HUBL 2212	32.0	80S	46	47
217	HUBL 2213	44.0	80S*	47	57
218	HUBL 2214	48.0	80S	57	58
219	HUBL 2215	34.0	80S*	46	58
220	HUBL 2216	8.0	40S	46	47
220A	Infector	76.0	100S	68	79
221	HUBL 2217	32.0	80S*	57	58
ICAR-IARI, RS, Shimla					
222	BBM 929	0.0	0	67	78
223	BBM 930	1.0	5S	57	68
224	BBM 931	0.8	5MS	46	57
225	BBM 932	0.0	0	57	68
226	BBM 933	2.4	10MS	46	57
227	BBM 934	15.6	40S	56	67
228	BBM 935	14.3	40S	56	68
229	BBM 936	4.1	20S	56	78

230	BBM 937	19.0	40S	46	57
231	BBM 938	14.0	40S	57	68
232	BBM 939	0.04	TR	56	57
233	BBM 940	1.2	10MR	45	46
234	BBM 941	0.8	5MR	46	57
235	BBM 942	2.8	10MS	46	68
236	BBM 943	35.2	60S	46	57
237	BBM 944	0.9	5MS	57	58
238	BBM 945	0.1	TMR	68	89
239	BBM 946	1.7	10MS	46	68
240	BBM 947	14.2	40S	47	57
240A	Infector	76.0	80S	67	89
241	BBM 948	1.6	10MS	46	57
242	BBM 949	1.4	5MS	47	58
243	BBM 950	0.0	0	57	58
244	BBM 951	0.0	0	46	58
245	BBM 952	0.0	0	57	78
246	BBM 953	12.4	20S	46	67
247	BBM 954	0.1	TMR	35	46
248	BBM 955	1.0	5S	56	78
249	BBM 956	10.2	20S	46	57
250	BBM 957	11.8	40S	46	78
251	BBM 958	0.0	0	57	79
252	BBM 959	2.1	10MS	46	58
253	BBM 960	11.0	20S	57	57
254	BBM 961	25.0	40S	47	58
255	BBM 962	19.8	40S	46	67
PAU, Ludhiana					
256	BL 2074	0.0	0	47	58
257	BL 2081	0.8	5MS	46	68

258	BL 2088	3.2	10MS	47	57
259	BL 2107	3.4	20MS	58	67
260	BL 2113	1.7	10MS	46	57
260A	Infector	84.0	100S	68	89
261	BL 2114	5.2	20S	57	68
262	BL 2115	2.0	10S	46	78
263	BL 2117	5.0	20S	46	57
264	BL 2119	0.6	5MR	46	57
265	BL 2121	2.0	10MS	57	78
266	BL 2123	18.8	40S	57	58
267	BL 2127	1.8	5S	57	68
268	BL 2130	5.0	20S	67	89
269	BL 2131	22.8	60S*	46	68
270	BL 2132	12.0	40S	46	57
271	BL 2133	7.0	20S	46	56
272	BL 2134	3.8	10S	47	57
273	BL 2136	0.6	5MR	46	57
274	BL 2138	40.4	80S	46	57
275	BL 2141	1.0	5S	46	57
276	BL 2143	17.0	60S*	56	68
277	BL 2145	23.0	60S*	46	57
278	BL 2146	10.4	40S	46	47
279	BL 2150	34.0	80S	46	56
280	BL 2151	32.0	80S	57	68
280A	Infector	80.0	100S	78	89
281	BL 2152	0.0	0	47	58
282	BL 2153	28.2	60S*	57	58
283	BL 2156	5.6	20S	57	68
284	BL 2158	1.0	5MS	68	89
285	BL 2160	7.0	20MS	46	57

286	BL 2176	2.0	10S	58	68
287	BL 2177	2.2	10S	58	67
288	BL 2187	0.6	5MR	57	68
289	BL 2182	0.4	5MR	56	78
290	BL 2183	4.8	20S	57	58
291	BL 2187	30.0	80S*	46	68
292	BL 2188	52.0	100S	57	67
293	BL 2190	18.0	60S*	46	68
294	BL 2193	4.4	10S	57	68
295	BL 2196	36.0	60S*	56	78
296	BL 2197	2.8	10MS	58	68
297	BL 2198	34.0	80S	46	48
298	BL 2199	40.0	80S	57	58
299	BL 2200	44.0	80S	56	78
300	BL 2201	34.0	80S	46	46
300A	Infector	84.0	100S	68	89
301	BL 2203	34.0	80S	56	78
302	BL2204	46.0	100S	46	68
303	BL2205	18.2	60S*	56	78
304	BL2206	4.8	20S	56	67
305	BL2207	30.0	60S	57	58
306	BL2208	36.2	60S	57	78
307	BL2209	4.8	20S	67	78
308	BL2210	1.8	10MS	47	56
309	BL2211	5.0	10S	46	57
310	BL2212	22.2	60S*	36	46
311	BL2213	18.0	60S*	57	57
312	BL2214	7.7	20S	47	58
313	BL2215	15.8	40S	57	57
314	BL2216	22.0	40S	47	68

315	BL2217	26.0	60S*	46	57
316	BL2218	19.8	60S*	46	68
317	BL 2219	20.0	60S*	46	58
318	BL 2220	4.0	10S	56	78
319	BL 2221	16.0	40S	47	68
320	BL 2222	29.2	60S	36	58
320A	Infector	80.0	100S	68	89
321	BL 2223	19.0	40S	46	57
ICAR-IIWBR, Karnal					
322	BK 2201	34.2	80S	46	47
323	BK 2202	30.2	80S	46	57
324	BK 2203	40.8	80S	47	57
325	BK 2204	34.0	80S	57	78
326	BK 2205	37.6	80S*	57	68
327	BK 2206	31.2	80S*	57	67
328	BK 2207	32.0	60S*	58	68
329	BK 2208	44.0	60S	47	58
330	BK 2209	34.0	80S	46	58
331	BK 2210	40.0	80S	35	46
332	BK 2211	44.0	80S	46	57
333	BK 2212	40.2	80S	56	78
334	BK 2213	7.4	20S	35	57
335	BK 2214	9.0	40S	46	47
336	BK 2215	6.8	20S	46	67
337	BK 2216	2.2	10S	57	68
338	BK 2217	5.4	10S	46	58
339	BK 2218	18.0	40S	47	57
340	BK 2219	11.4	40S	35	46
340A	Infector	76.0	80S	78	89
341	BK 2220	12.0	40S	46	57

342	BK 2221	14.8	40S	57	78
343	BK 2222	0.0	0	57	78
344	BK 2223	8.4	20S	46	57
345	BK 2224	14.4	40S	35	46
346	BK 2225	16.6	60S*	36	57
347	BK 2226	7.8	20S	46	57
348	BK 2227	7.0	20S	36	46
349	BK 2228	19.6	40S	35	57
350	BK 2229	17.6	40S	47	68
351	BK 2230	18.0	40S	36	46
352	BK 2231	17.0	60S*	57	78
353	BK 2232	26.2	60S*	47	58
354	BK 2233	25.2	60S*	57	78
355	BK 2234	0.0	0	56	68
356	BK 2235	1.4	5S	57	78
357	BK 2236	0.8	5MS	46	57
358	BK 2237	45.6	80S	47	57
359	BK 2238	0.0	0	35	46
360	BK 2239	2.0	10S	45	46
360A	Infector	76.0	100S	68	89
361	BK 2240	0.0	0	46	57
362	BK 2241	0.0	0	46	46
363	BK 2242	0.0	0	56	78
364	BK 2243	6.8	20S	57	68
365	BK 2244	0.2	TMS	46	57
366	BK 2245	15.6	40S	56	78
367	BK 2246	12.2	40S	56	68
368	BK 2247	12.0	60S*	35	57
369	BK 2248	0.8	5MS	46	56
370	BK 2249	2.2	10S	57	78

ICAR-VPKAS, Almora					
371	VB 2201	16.4	40S	47	57
372	VB 2202	2.0	5S	57	68
373	VB 2203	1.3	5S	46	57
374	VB 2204	1.0	5S	56	78
375	VB 2205	4.8	10S	45	67
376	VB 2206	4.0	10S	57	78
377	VB 2207	2.0	5S	57	67
378	VB 2208	3.0	10S	46	57
379	VB 2209	3.8	10S	35	46
380	VB 2210	6.2	20MS	36	57
380A	Infector	76.0	80S	78	89
381	VB 2211	15.6	60S*	56	78
382	VB 2212	4.6	10S	46	56
383	VB 2213	4.2	10S	46	78
384	VB 2214	2.4	10S	57	68
385	VB 2215	8.2	40S	35	46
386	VB 2216	20.0	40S	46	68
387	VB 2217	6.8	20MS	46	57
388	VB 2218	5.0	10S	46	68
389	VB 2219	1.7	10MS	46	78
390	VB 2220	3.2	20MS	46	57
391	VB 2221	10.1	20S	35	46
392	VB 2222	7.2	20S	46	58
393	VB 2223	11.0	40S	57	78
394	VB 2224	22.0	80S*	46	68
395	VB 2225	17.0	40S	46	57
396	VB 2226	9.2	20S	57	79
397	VB 2227	7.4	20S	47	58
398	VB 2228	4.4	10S	56	68

399	VB 2229	2.6	10MS	46	46
400	VB 2230	2.0	5S	35	46
400A	Infector	80.0	100S	68	89
ANDUAT, Ayodhya					
401	NDB 1819	32.2	60S*	56	68
402	NDB 1820	32.0	60S*	46	57
403	NDB 1821	3.0	10S	36	47
404	NDB 1822	15.6	40S	46	47
405	NDB 1823	2.6	10S	46	68
406	NDB 1824	10.8	20S	46	79
407	NDB 1825	9.6	40S	46	57
408	NDB 1826	28.0	40S	35	46
409	NDB 1827	19.0	40S	45	78
410	NDB 1828	24.0	60S*	35	57
411	NDB 1829	3.8	10S	35	56
412	NDB 1830	14.0	20S	46	57
413	NDB 1831	2.6	10MS	35	47
414	NDB 1832	16.0	40S	45	57
415	NDB 1833	4.0	10S	46	57
416	NDB 1834	26.2	80S*	46	57
ICAR-IGFRI, Jhansi					
417	JHSBA 41	30.2	80S*	46	57
418	JHSBC 38	32.0	80S*	46	47
419	JHSBD 8	30.4	80S*	35	58
420	JHSBD 22	3.6	10S	46	68
420A	Infector	80.0	100S	68	79
421	JHSBE 2	34.8	80S	46	57
422	JHSBF 21	0.2	TMS	46	58
423	JHSBI 24	56.0	80S	36	46
424	JHSBD 11	0.8	5MS	35	57

425	JHSBD 74	28.2	80S*	46	57
426	JHSBI 19	56.0	80S	46	46
427	JHSBF 28	0.0	0	45	57
428	JHSBC 37	48.0	80S	47	58
429	JHSBI 17	30.0	80S*	57	58
430	JHSBB 19	0.0	0	46	68
431	JHSBE 16	1.0	5S	56	67
432	JHSBC 18	52.2	80S	57	78
433	JHSBA 31	22.2	60S*	46	68
434	JHSBC 21	30.0	80S*	46	57
435	JHSBD 19	36.0	80S*	56	56
436	JHSBA 13	26.4	80S*	47	58
437	JHSBA 6	34.0	80S*	46	58
437A	Infector	80.0	100S	68	78

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

National Barley Disease Screening Nursery (NBDSN) 2022-23

The NBDSN entries were screened for stripe rust resistance at hot spot centres that include Durgapura, Ludhiana, Hisar, Almora, Bajaura, Jammu and Karnal. Leaf rust screening was done at Ludhiana and Jammu, so HS is reflected in table. The leaf blight screening was done at Ayodhya, Pantnagar, Dharwad, Kanpur and Varanasi. The data of Kanpur centre were not considered due to low severity of foliar blight. CCN screening was done at Durgapura and Hisar centres. For CCN, the number of nematode cysts / plants was counted and entries having 0-4 cysts/ plant in pot were considered as resistant (R) whereas those with cysts/plant 4.1- 9.0 were Moderately Resistant (MR). The entries with galls between 9.1 and 20.0 were treated as susceptible (S) and the entries with more than 20.0 galls per plant were treated as highly susceptible (HS).

Out of 118 entries evaluated during 2022-23 (Table 3.2), 10 entries were found free from stripe rust, 90 entries showed resistant reaction having ACI less than 10. In case of leaf blight screening, 19 entries were found moderately resistant against leaf blight with an average score (double digit) 14-35 and HS less than 57. The centre wise responses are presented in Table 3.4. The resistant entries identified against yellow rust and blight are given below:

Yellow rust, ACI = 0, Entries – 10	BH 1049, DWRUB 52 (C), KB 2160, PL 941, PL 942, RD 2794 (C), RD 2907 (C), RD 3065, RD 3078 and VLB 183
Yellow rust, ACI > 0 to 10, Entries – 90	BH 1045, BH 1047, BH 1048, BH 1050, BH 1051, BH 1052, BH 1053, BH 1054, BH 946 (C), BHS 352 (C), BHS 380 (C), BHS 400, BHS 493, BHS 494, BHS 496, BHS 497, BHS 945, DWRB 137 (C), DWRB 182 (C), DWRB 219, DWRB 223, DWRB 226, DWRB 228, DWRB 235, DWRB 236, DWRB 237, DWRB 238, DWRB 239, DWRB 240, DWRB 241, DWRB 242, DWRB 243, DWRB 245, HBL 113, HBL 879, HBL 880, HBL 881, HBL 882, HBL 883, HUB

	113 (C), HUB 281, HUB 283, HUB 284 (C), K 2133, KB 2031, KB 2127 (C), KB 2131, KB 2145, KB 2155, KB 2158, PL 891 (C), PL 937, PL 943, PL 945, PL 946, PL 947, PL 948, PL 950, PL 951, PL 952, RD 2849 (C), RD 2899, RD 3053, RD 3064, RD 3066, RD 3067, RD 3068, RD 3070, RD 3071, RD 3076, RD 3077, RD 3079, RD 3080, RD 3081, RD 3082, RD 3083, UPB 1104, UPB 1109, UPB 1110, UPB 1113, UPB 1114, UPB 1115, UPB 1116, UPB 1117, VLB 118 (C), VLB 175, VLB 180, VLB 181, VLB 182 and VLB 184.
Leaf blight, Avg. 14-35 with HS < 57, Entries – 19	BH 1048, BHS 497, DWRB 219, DWRB 239, DWRB 240, DWRB 243, DWRB 244, HBL 113, HBL 879, KB 2120, KB 2160, PL 891(C), PL 946, PL 952, RD 3070, RD 3083, UPB 1111, VLB 118(C) and VLB 175.

Table 3.2: Reactions of different entries in National Barley Disease Screening Nursery 2022-23

S. N.	Entry	Yellow Rust		Leaf Rust	Leaf Blight		CCN
		ACI	HS	HS	Avg.	HS	HS
1	BH 1045	5.3	20S	5S	57	78	HS
2	BH 1047	9.1	60S*	0	46	67	HS
3	BH 1048	5.7	20S	0	34	46	HS
4	BH 1049	0.0	0	5MS	45	67	S
5	BH 1050	1.6	5S	5MS	46	68	S
6	BH 1051	6.6	40S	0	46	68	HS
7	BH 1052	3.4	10S	0	57	57	HS
8	BH 1053	0.8	5S	TMS	46	68	S
9	BH 1054	4.0	10S	0	45	68	S
10	BH 946 (C)	1.7	5S	0	45	57	S
11	BHS 352 (C)	1.4	5MS	5MS	46	67	S
12	BHS 380 (C)	0.3	5MR	0	46	68	HS
13	BHS 400	7.1	20S	5MS	46	68	S
14	BHS 493	0.1	TMR	0	47	68	S
15	BHS 494	0.7	10MR	TS	46	68	S
16	BHS 496	3.0	20S	TS	35	78	S
17	BHS 497	6.4	20S	0	35	57	S
18	BHS 945	1.4	10S	TMR	45	78	HS
19	DWRB 137 (C)	0.2	TS	0	46	68	S
20	DWRB 182 (C)	0.1	TS	10MS	46	68	HS
21	DWRB 219	0.1	5R	40S	35	46	S
22	DWRB 223	7.3	40S	0	45	78	NG
23	DWRB 226	0.9	5S	TMS	45	56	HS
24	DWRB 228	0.1	5R	TMR	57	68	S
25	DWRB 235	0.1	TMR	0	45	68	HS
26	DWRB 236	1.5	10S	10S	46	68	HS
27	DWRB 237	2.2	10S	TS	56	67	HS
28	DWRB 238	0.03	TR	TS	46	78	HS

29	DWRB 239	0.3	TS	5S	35	47	HS
30	DWRB 240	0.1	TMR	0	35	46	S
31	DWRB 241	5.7	20S	0	56	78	HS
32	DWRB 242	7.3	40S	0	46	68	S
33	DWRB 243	3.6	20S	5S	34	56	S
34	DWRB 244	13.7	40S	0	35	46	S
35	DWRB 245	3.8	10S	0	56	78	S
36	DWRB 246	21.0	60S*	0	57	67	HS
37	DWRUB 52 (C)	0.0	0	TMS	46	67	HS
38	HBL 113	0.3	5MR	0	35	57	S
39	HBL 879	2.7	10S	0	35	57	S
40	HBL 880	0.9	5S	5MS	46	57	S
41	HBL 881	1.3	5S	5MS	46	47	HS
42	HBL 882	0.7	5MS	5MR	46	58	HS
43	HBL 883	2.9	20MS	0	46	68	S
44	HUB 113 (C)	0.1	TMS	5S	56	78	HS
45	HUB 281	5.7	40S	TS	47	68	S
46	HUB 282	10.7	40S	5MR	36	47	S
47	HUB 283	2.1	5S	TS	35	68	HS
48	HUB 284 (C)	0.1	TMR	10MS	57	78	HS
49	HUB 285	21.6	60S*	5S	57	78	HS
50	HUB 286	37.1	80S	5S	46	78	S
51	K 1149 (C)	60.0	80S	5S	46	58	S
52	K 2133	5.9	20MS	TMS	35	67	S
53	K 603 (C)	45.7	80S	TMS	57	68	S
54	KARAN 16 (C)	25.7	60S*	10S	46	57	HS
55	KB 1425	51.4	80S	10MS	36	68	S
56	KB 2004 (C)	24.3	60S*	TMS	46	57	HS
57	KB 2015	15.1	40S	0	45	57	S
58	KB 2031	1.4	10S	0	46	46	HS
59	KB 2120	10.6	40S	0	35	47	S
60	KB 2127 (C)	0.3	TS	5S	46	68	HS
61	KB 2131	3.1	10MS	5MS	45	46	HS
62	KB 2145	2.1	10S	TMR	46	57	HS
63	KB 2155	6.7	40S	10S	46	68	S
64	KB 2158	8.6	40S	5MS	45	78	S
65	KB 2159	10.6	40S	0	46	58	HS
66	KB 2160	0.0	0	0	35	57	S
67	LAKHAN (C)	57.1	80S	5MS	46	57	HS
68	PL 891 (C)	3.0	10S	0	35	57	S
69	PL 937	9.9	40S	TMS	56	78	S
70	PL 941	0.0	0	TMS	46	68	HS
71	PL 942	0.0	0	10S	46	57	HS

72	PL 943	4.7	20MS	TMS	46	58	HS
73	PL 945	3.6	10S	TS	46	58	HS
74	PL 946	0.1	TS	0	35	57	HS
75	PL 947	4.6	10S	0	56	68	HS
76	PL 948	6.3	20S	5S	68	89	S
77	PL 949	14.4	40S	TMS	57	78	S
78	PL 950	6.0	40S	0	46	68	S
79	PL 951	0.3	5MR	0	46	56	HS
80	PL 952	0.6	5MS	5MS	35	47	HS
81	PL 953	13.1	60S*	TR	78	89	S
82	RD 2794 (C)	0.0	0	0	46	46	S
83	RD 2849 (C)	0.3	TS	40S	35	58	HS
84	RD 2899	0.7	5MS	0	45	78	HS
85	RD 2907 (C)	0.0	0	10MS	46	57	S
86	RD 3053	3.7	20S	TMS	46	57	S
87	RD 3064	8.1	40S	20MS	45	57	S
88	RD 3065	0.0	0	10S	46	58	S
89	RD 3066	0.8	5S	0	46	67	HS
90	RD 3067	1.0	5MS	0	46	56	S
91	RD 3068	0.3	TS	TMS	46	68	HS
92	RD 3070	6.1	20S	10S	35	47	HS
93	RD 3071	2.0	10S	0	57	68	HS
94	RD 3076	0.7	5S	0	68	78	S
95	RD 3077	0.6	5MS	0	46	58	S
96	RD 3078	0.0	0	5S	67	89	S
97	RD 3079	2.9	20S	0	46	68	S
98	RD 3080	7.1	20S	5MS	56	78	HS
99	RD 3081	1.9	10MS	TMR	67	89	HS
100	RD 3082	4.4	20S	0	46	79	S
101	RD 3083	5.9	20MS	0	35	57	HS
102	UPB 1104	4.7	10S	0	46	46	S
103	UPB 1106	10.7	20S	0	46	68	S
104	UPB 1109	6.4	20S	5MS	57	58	S
105	UPB 1110	0.5	5MR	5MS	35	68	HS
106	UPB 1111	22.3	60S*	10MS	35	46	S
107	UPB 1113	8.3	20S	10S	46	68	S
108	UPB 1114	6.1	40S	TMS	35	58	HS
109	UPB 1115	1.2	5S	10S	56	89	HS
110	UPB 1116	0.9	5S	0	46	57	HS
111	UPB 1117	4.1	20S	0	46	57	S
112	VLB 118 (C)	0.9	5S	5S	35	57	S
113	VLB 175	0.7	5S	TMS	35	46	S
114	VLB 180	3.3	10S	0	46	57	HS

115	VLB 181	2.1	10MS	0	35	58	HS
116	VLB 182	0.3	5MR	5S	57	78	HS
117	VLB 183	0.0	0	0	57	57	S
118	VLB 184	2.1	10S	TS	47	58	HS
	Infector	80.0	100	60	79	89	–

Out of 134 entries, few check varieties and entries were found place in many trials and only one check is retained in NBDSN thus resulting 118 entries under NBDSN.

Abbreviations: ACI- Average Coefficient of Infection; HS- Highest score, Avg. - Mean, CCN- Cereal Cyst Nematode, (C) - Released Checks, NG – Not germinated. *Indicates high rust score (more than 40S) at one location only. For CCN, HS- Highly susceptible, S- Susceptible, MR- Moderately Resistant, R- Resistant.

Area Under Disease Progress Curve (AUDPC) of leaf blight for NBDSN entries

The disease progress may account for different resistance components like latent period, size of spots, number of spores 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 with AUDPC score less than 100 are categorised as resistant and from 101 to 500 are categorised as moderately resistant. The AUDPC score-based categorization of NBDSN entries is as follows:

AUDPC	**Entries**
Up to 100	Nil
101 - 500	BH 1048, BHS 497, DWRB 240, DWRB 243, DWRB 244, HBL 113, K 2133, PL 946, PL 952, RD 2899, RD 3070, RD 3083, UPB 1111, VLB 118(C), VLB 175 and VLB 181.

Elite Barley Disease Screening Nursery (EBDSN, 2022-23)

The nursery was constituted with entries showing resistance to different disease in previous years in NBDSN and EBDSN. During the crop season 2022-23, total 30 entries were screened in EBDSN. The screening of stripe rust was done at Bajaura, Hisar, Ludhiana, Durgapura, Almora, Jammu and Karnal. Leaf rust screening was done at Ludhiana and Jammu. The leaf blight screening was done at Ayodhya, Pantnagar, Kanpur and Varanasi. Data of Kanpur centre was not considered due to low disease. CCN screening was done at Durgapura and Hisar centres.

Confirmed sources of resistance:

Out of 30 entries screened in EBDSN (Table 3.3), the following entries were confirmed for resistance against the particular disease under AICW&BIP. Six entries were found free from yellow rust, whereas 14 exhibited resistant reaction. Out of 30 entries screened for leaf blight, 2 entries also showed moderate level of resistance against leaf blight with an average score (double digit) 14-35 and HS < 57. The centre wise data are presented in Table 3.5. The resistant entries identified against yellow rust and blight are given below:

Yellow rust, ACI = 0, Entries – 6	BHS 488, RD 3037 (LB), RD3054, RD3055, RD3061 and DWRBG-6.
Yellow rust, ACI > 0 to 10, Entries – 14	BH1042, BH1045, BHS 491, DWRB 226, DWRB 228, KB 2013, RD 3034, RD 3050, RD 3051, RD 3058, RD 3059, RD 3063, VLB 175 (LB) and HLR-324.
Leaf blight, Avg. 14-35 with HS < 57, Entries – 2	RD 3058 and RD 3059.

Table 3.3: Reactions of different entries in Elite Barley Disease Screening Nursery 2022-23

S. N.	Entry	Yellow Rust		Leaf Rust	Leaf Blight		CCN
		ACI	HS	HS	Avg.	HS	HS
1	BH1042	4.0	10S	20S	57	78	S
2	BH1045	0.7	5S	TMS	57	68	S
3	BHS488	0.0	0	0	57	68	HS
4	BHS491	0.1	TMR	5MS	57	78	HS
5	DWRB226	2.9	20S	0	46	68	S
6	DWRB228	0.1	TR	0	46	67	S
7	KB2013	7.2	20S	TS	45	57	HS
8	RD3034	1.6	10S	0	46	79	S
9	RD3037 (LB)	0.0	0	20S	56	78	MR
10	RD3050	0.7	5S	0	46	57	S
11	RD3051	0.1	TMR	0	46	68	HS
12	RD3054	0.0	0	TMR	46	57	HS
13	RD3055	0.0	0	0	56	68	S
14	RD3058	1.9	10MS	TMS	35	57	HS
15	RD3059	3.5	20S	20S	35	57	HS
16	RD3061	0.0	0	0	46	57	S
17	RD3063	4.3	20S	0	46	47	HS
18	VLB175 (LB)	5.9	30S	0	35	68	S
19	HLR-93	31.6	80S	5MS	47	57	
20	HLR-139	12.1	40S	5S	47	58	
20A	Infector	74.3	100S	60S	56	56	
21	HLR-140	37.1	80S	0	46	68	
22	HLR-152	25.7	80S	40S	46	48	
23	HLR-164	21.6	60S	0	67	78	
24	HLR-181	29.4	80S	0	46	56	
25	HLR-250	35.0	80S	10MS	57	89	
26	HLR-283	24.3	80S	0	57	78	
27	HLR-284	22.9	80S	0	35	58	
28	HLR-324	1.6	10S	0	56	58	
29	DWRBG-6	0.0	0	5MS	46	46	
30	DWRB206	26.3	100S	0	46	57	
30A	Infector	77.1	100S	60S	68	89	

Abbreviations: ACI- Average Coefficient of Infection; HS- Highest score, Avg. - Mean, CCN- Cereal Cyst Nematode, (C) - Released Checks, NG – Not germinated. For CCN, HS- Highly susceptible, S- Susceptible, MR-Moderately Resistant, R- Resistant.

Table 3.4: **Centre wise reactions of different entries of barley in National Barley Disease Screening Nursery (NBDSN), 2022-23**

S. N.	Entry	Yellow Rust							Leaf Rust		Leaf blight				CCN	
		Bajaura	Hisar	Ludhiana	Durgapura	Almora	Karnal	Jammu	Ludhiana	Jammu	Ayodhya	Pantnagar	Dharwad	Varanasi	Durgapura	Hisar
1	BH 1045	20 S	0	0	TMS	0	20MS	0	TR	5S	78	57	24	47	S	HS
2	BH 1047	0	0	0	5MS	0	60S	0	0	0	57	24	67	35	HS	R
3	BH 1048	0	20S	0	5MS	0	20MS	0	0	0	46	0	24	35	S	HS
4	BH 1049	0	0	0	0	0	0	0	TR	5MS	67	23	34	46	S	S
5	BH 1050	0	0	0	0	5S	5MR	5MS	5MS	0	68	45	24	58	S	S
6	BH 1051	0	0	TS	5S	40S	0	0	0	0	68	36	34	47	S	HS
7	BH 1052	0	0	5MS	10S	10S	0	0	0	0	57	56	46	47	HS	HS
8	BH 1053	0	0	0	TMR	5S	0	0	0	TMS	68	56	34	35	S	MR
9	BH 1054	0	0	10S	10S	0	5MS	5MS	0	0	68	56	0	47	S	S
10	BH 946 (C)	0	0	5S	10MR	0	5MR	TMS	0	0	57	46	24	35	S	MR
11	BHS 352 (C)	0	0	0	5MS	TS	5MS	TMS	0	5MS	67	35	56	35	S	S
12	BHS 380 (C)	0	0	0	TMR	0	0	5MR	0	0	68	67	24	24	HS	S
13	BHS 400	20 S	0	0	0	20S	10S	0	5MS	0	68	35	34	46	S	S
14	BHS 493	0	0	0	TMR	0	0	TR	0	0	68	36	46	47	S	R
15	BHS 494	0	0	0	TMS	0	0	10MR	TS	0	68	24	46	35	S	S
16	BHS 496	0	0	0	TMS	20S	0	0	TS	0	78	35	12	24	S	MR
17	BHS 497	20 S	10S	5MS	TMS	10S	0	0	0	0	57	35	12	24	S	S
18	BHS 945	0	0	0	0	10S	0	0	TMR	0	78	24	34	35	HS	S
19	DWRB 137 (C)	0	0	TS	TR	0	0	TMR	0	0	68	36	46	35	S	MR
20	DWRB 182 (C)	0	0	0	TS	0	0	0	0	10MS	68	46	34	47	S	HS

21	DWRB 219	0	0	0	0	0	0	5R	0	40S	46	35	24	46	S	S
22	DWRB 223	0	0	5S	0	5S	40S	TMS	0	0	78	24	12	46	NG	NG
23	DWRB 226	0	TS	0	TMR	5S	0	0	TMS	0	46	56	24	35	HS	S
24	DWRB 228	0	0	0	0	0	0	5R	0	TMR	68	45	46	47	S	S
25	DWRB 235	0	0	0	0	0	0	TMR	0	0	68	0	34	58	S	HS
26	DWRB 236	0	10S	0	TMS	0	0	0	10S	0	68	24	34	47	S	HS
27	DWRB 237	0	10S	0	0	5S	0	TMR	TS	0	67	36	56	46	HS	S
28	DWRB 238	0	0	0	0	0	0	TR	TS	0	78	56	24	35	S	HS
29	DWRB 239	0	0	TS	0	TS	0	0	5S	5MS	46	24	34	47	S	HS
30	DWRB 240	0	0	0	0	0	0	TMR	0	0	46	34	24	35	S	S
31	DWRB 241	10 S	0	TR	10S	20S	0	0	0	0	78	45	12	78	S	HS
32	DWRB 242	0	0	0	TS	10S	40S	0	0	0	68	24	46	47	S	NG
33	DWRB 243	20 S	TS	0	TMR	0	0	5MS	5S	0	56	0	46	24	S	S
34	DWRB 244	20 S	TS	5S	10S	40S	20S	0	0	0	46	35	24	36	S	S
35	DWRB 245	0	10	0	TMS	10S	5MR	5MS	0	0	78	34	34	78	S	S
36	DWRB 246	60 S	TS	10S	20S	40S	20MS	0	0	0	57	24	67	58	S	HS
37	DWRUB 52 (C)	0	0	0	0	0	0	0	0	TMS	57	24	67	35	HS	HS
38	HBL 113	0	0	0	0	0	0	5MR	0	0	57	45	0	46	S	S
39	HBL 879	NG	0	0	TS	10S	5S	0	0	0	57	35	0	57	MR	S
40	HBL 880	0	0	TS	5S	0	0	0	5MS	0	57	56	34	47	S	S
41	HBL 881	0	0	0	0	5S	0	5MS	0	5MS	46	45	24	47	HS	HS
42	HBL 882	0	0	5MS	TMS	0	0	0	5MR	0	57	45	24	58	HS	HS
43	HBL 883	0	0	0	5MS	0	20MS	0	0	0	68	67	12	46	S	MR
44	HUB 113 (C)	0	0	0	0	0	0	TMS	5S	0	78	67	24	35	S	HS
45	HUB 281	0	0	0	0	0	0	40S	ts	0	68	35	46	47	S	S
46	HUB 282	40 S	0	5S	10S	20S	0	0	5MR	TMS	46	35	24	47	S	S
47	HUB 283	0	TS	5MS	5S	5S	0	0	TS	0	68	24	12	35	S	HS

48	HUB 284 (C)	0	0	0	TMR	0	0	0	5S	10MS	68	24	46	78	S	HS
49	HUB 285	60 S	TS	20S	20S	10S	20S	20S	5MS	5S	67	45	78	47	HS	HS
50	HUB 286	80 S	0	20S	60S	40S	40S	20S	5S	0	78	24	46	46	S	S
51	K 1149 (C)	80 S	60S	40S	60S	80S	40S	60S	5S	5MS	58	45	46	35	S	MR
52	K 2133	0	0	5S	10S	10S	20MS	0	0	TMS	67	45	12	24	S	HS
53	K 603 (C)	80 S	40S	20S	60S	60S	0	60S	0	TMS	68	35	67	46	S	NG
54	KARAN 16 (C)	60 S	20S	20S	40S	20S	20S	0	TS	10S	57	45	56	35	S	HS
55	KB 1425	80 S	40S	40S	60S	60S	40S	40S	0	10MS	68	25	24	35	S	S
56	KB 2004 (C)	60 S	0	10S	20S	20S	40S	20S	0	TMS	57	46	46	46	S	HS
57	KB 2015	40 S	20	10S	20S	0	10MS	10MS	0	0	57	45	12	47	S	R
58	KB 2031	0	0	0	0	10S	0	0	0	0	46	46	34	46	S	HS
59	KB 2120	20 S	TS	0	TS	10S	40S	5MR	0	0	35	45	24	47	R	S
60	KB 2127 (C)	0	TS	0	0	0	0	TMS	5S	0	68	36	24	47	S	HS
61	KB 2131	0	0	0	TS	5S	10MS	10MS	TMS	5MS	46	45	34	46	S	HS
62	KB 2145	0	0	5S	10S	0	0	0	0	TMR	57	35	56	35	S	HS
63	KB 2155	0	0	5S	5MR	0	0	40S	0	10S	68	45	34	47	S	S
64	KB 2158	0	0	0	0	20S	40S	0	0	5MS	78	24	12	47	S	NG
65	KB 2159	0	0	10S	20S	40S	5MR	5MR	0	0	46	56	24	58	S	HS
66	KB 2160	0	0	0	0	0	0	0	0	0	57	56	0	35	S	S
67	LAKHAN (C)	80 S	40S	20S	60S	80S	60S	60S	0	5MS	57	56	34	35	S	HS
68	PL 891 (C)	0	0	TS	5MS	10S	5MR	5MS	0	0	57	24	0	47	S	S
69	PL 937	40 S	0	5S	5MS	0	20S	0	0	TMS	78	46	24	57	S	S
70	PL 941	0	0	0	0	0	0	0	TMS	0	68	24	46	47	S	HS
71	PL 942	0	0	0	0	0	0	0	10S	0	57	56	24	46	HS	S
72	PL 943	0	0	10S	20MS	5S	5MR	0	0	TMS	58	23	34	58	S	HS
73	PL 945	0	0	5S	10S	10S	0	0	TS	TMS	58	45	24	58	S	HS
74	PL 946	0	TS	0	0	0	0	0	0	0	46	24	12	57	S	HS

75	PL 947	0	TS	TS	10S	10S	10S	0	0	0	68	24	67	46	HS	MR
76	PL 948	20 S	0	TS	10S	5S	10MS	0	5S	TMS	57	57	89	57	S	S
77	PL 949	0	10S	5S	20S	10S	20MS	40S	0	TMS	78	46	78	36	S	S
78	PL 950	0	40S	0	0	0	5MR	0	0	0	68	24	34	58	S	S
79	PL 951	0	0	0	0	0	0	5MR	0	0	56	36	56	35	S	HS
80	PL 952	0	0	0	0	0	0	5MS	5MS	0	47	25	34	35	S	HS
81	PL 953	20 S	TS	0	TS	10S	60S	0	TR	0	89	35	78	89	S	S
82	RD 2794 (C)	0	0	0	0	0	0	0	0	0	46	45	46	46	S	S
83	RD 2849 (C)	0	0	0	TS	Ts	0	0	5MS	40S	58	23	12	57	S	HS
84	RD 2899	0	TS	0	0	0	0	5MS	0	0	78	35	24	24	S	HS
85	RD 2907 (C)	0	0	0	0	0	0	0	10MS	0	57	34	34	47	S	S
86	RD 3053	0	TS	0	5S	20S	0	0	TMS	0	57	56	34	46	S	MR
87	RD 3064	0	0	5S	10S	40S	5MR	0	0	20MS	57	23	56	35	S	S
88	RD 3065	0	0	0	0	0	0	0	10S	0	57	23	46	58	S	MR
89	RD 3066	0	0	0	0	5S	0	TMR	0	0	57	23	67	35	S	HS
90	RD 3067	0	0	0	5MR	TS	5MS	0	0	0	NG	56	34	47	S	S
91	RD 3068	0	0	TS	TMS	0	0	0	0	TMS	46	46	34	68	S	HS
92	RD 3070	20 S	0	0	5S	10S	10MS	0	10S	0	46	23	34	47	S	HS
93	RD 3071	0	0	10S	0	0	0	5MS	0	0	58	56	24	68	HS	S
94	RD 3076	0	0	5S	0	0	0	0	0	0	78	78	46	78	S	MR
95	RD 3077	0	0	0	0	0	0	5MS	0	0	58	46	34	35	S	S
96	RD 3078	0	0	0	0	0	0	0	0	5S	89	57	67	46	S	S
97	RD 3079	0	0	0	TMR	0	20S	0	0	0	68	34	46	47	S	R
98	RD 3080	0	TS	5S	20MS	0	10MS	20S	5MS	0	57	46	24	78	HS	S
99	RD 3081	0	0	5S	10MS	0	0	TMR	0	TMR	89	56	24	78	S	HS
100	RD 3082	0	0	10S	20S	0	0	TMS	0	0	79	45	24	46	S	MR
101	RD 3083	0	0	10S	10S	5S	20MS	0	0	0	57	23	34	24	S	HS

102	UPB 1104	0	0	5S	10S	10S	10MS	0	0	0	46	46	46	46	S	S
103	UPB 1106	0	5S	10S	20S	20S	20S	0	0	0	68	57	24	35	S	S
104	UPB 1109	0	10S	5S	10S	20S	0	0	5MS	0	57	45	56	58	S	R
105	UPB 1110	0	TS	0	TMR	0	0	5MR	0	5MS	68	23	12	35	S	HS
106	UPB 1111	40 S	TS	5S	10S	60S	20S	20S	0	10MS	46	24	34	24	S	S
107	UPB 1113	20 S	0	0	0	20S	10S	10MS	10S	0	68	23	56	35	S	S
108	UPB 1114	40 S	TS	0	TMS	0	0	TMS	0	TMS	58	25	0	57	S	HS
109	UPB 1115	0		5S	0	0	0	5MR	10S	5MS	57	45	24	89	HS	HS
110	UPB 1116	0	0	0	TMS	5S	0	TR	0	0	57	25	46	47	S	HS
111	UPB 1117	0	0	0	5MS	20S	5MS	5R	0	0	57	35	46	35	S	S
112	VLB 118 (C)	0	0	0	TMS	5S	0	TMR	5S	TMS	57	34	34	24	S	R
113	VLB 175	0	0	0	0	5S	0	0	0	TMS	46	46	24	35	S	S
114	VLB 180	10 S	0	0	0	10S	5MR	TMS	0	0	57	45	24	57	S	HS
115	VLB 181	0	0	0	5MR	5S	10MS	0	0	0	58	23	24	24	S	HS
116	VLB 182	0	0	0	0	0	5MR	0	TS	5S	78	46	67	35	HS	HS
117	VLB 183	0	0	0	0	0	0	0	0	0	57	56	56	47	S	S
118	VLB 184	0	0	0	5S	10S	0	0	TS	0	57	35	46	58	S	HS
	Infector	100 S	80S	80S	80S	80S	80S	60S	60S	60S	79	68	89	58	-	-

Table 3.5: Centre wise reactions of different entries of barley in Elite Barley Disease Screening Nursery (EBDSN), 2022-23

S. No.	Entry	Yellow rust							Leaf rust		Foliar Blight			CCN	
		Bajaura	Hisar	Ludhiana	Durgapura	Almora	Karnal	Jammu	Ludhiana	Jammu	Ayodhya	Pantnagar	Varanasi	Durgapura	Hisar
1	BH1042	10 S	0	0	0	10S	0	10MS	10S	20S	57	35	78	S	S
2	BH1045	0	0	0	0	5S	0	0	0	TMS	68	46	68	S	S
3	BHS488	0	0	0	0	0	0	0	0	0	46	56	68	S	HS
4	BHS491	0	0	0	0	0	0	TMR	TS	5MS	57	46	78	S	HS
5	DWRB226	0	0	0	0	20S	0	0	0	0	68	24	57	S	S
6	DWRB228	0	0	TR	0	0	0	0	0	0	67	36	24	S	S
7	KB2013	20 S	0	0	0	20S	10S	TR	TS	TMS	57	45	24	S	HS
8	RD3034	10 S	0	0	TMR	0	0	5R	0	0	79	23	35	S	MR
9	RD3037 (LB)	0	0	0	0	0	0	0	0	20S	68	12	78	R	MR
10	RD3050	0	0	0	0	5S	0	0	0	0	57	35	47	R	S
11	RD3051	0	0	TMR	0	0	0	TMR	0	0	68	34	35	S	HS
12	RD3054	0	0	0	0	0	0	0	TMR	TR	57	56	36	MR	HS
13	RD3055	0	0	0	0	0	0	0	0	0	68	45	46	S	S
14	RD3058	0	5S	0	0	0	10MS	0	0	TMS	57	13	35	S	HS
15	RD3059	0	0	0	TMS	20S	0	TR	20S	5MS	46	13	57	S	HS
16	RD3061	0	0	0	0	0	0	0	0	0	57	46	46	S	S
17	RD3063	20 S	0	5S	5S	0	0	0	0	0	47	35	46	MR	HS
18	VLB175 (LB)	0	30S	5S	TMR	TS	0	0	0	0	68	12	35	S	NG
19	HLR-93	80 S	20S	5S	20S	60S	20MS	20S	0	5MS	57	46	47		
20	HLR-139	0	10S	5S	0	20S	40S	10S	0	5S	NG	36	58		
20A	Infector	100 S	80S	80S	80S	80S	40S	60S	60S	60S	NG	56	46		
21	HLR-140	0	0	20S	40S	80S	60S	60S	0	0	68	25	35		
22	HLR-152	80 S	20S	0	0	0	40S	40S	0	40S	46	34	48		
23	HLR-164	60 S	5S	10S	20S	40S	0	20MS	0	0	78	57	57		
24	HLR-181	80 S	40S	5S	TS	40S	40S	0	0	0	46	56	36		

25	HLR-250	40 S	TS	10S	20S	80S	40S	20S	0	10MS	89	45	47		
26	HLR-283	80 S	0	10S	20S	40S	20S	0	0	0	78	24	58		
27	HLR-284	80 S	0	0	0	60S	20S	TR	0	0	58	24	24		
28	HLR-324	0	0	0	0	10S	0	5R	0	0	58	54	47		
29	DWRBG-6	0	0	0	0	0	0	0	0	5MS	46	46	35		
30	DWRB206	60 S	100S	0	5MR	20S	0	0	0	0	57	35	36		
30A	Infector	80 S	100S	80S	80S	80S	60S	60S	60S	60S	89	67	47		

Management of foliar blight of barley through chemicals

The experiment was conducted in RBD with three replications at Ayodhya, Kanpur and Pantnagar. The fungicides were sprayed after first appearance of disease and observations were taken at various intervals. Field efficacy of eight fungicides viz., Tebuconazole 50% + Trifloxystrobin 25%, Propiconazole 13.9% + Difenconazole 13.9%, Azoxystrobin 12.5% + Tebuconazole 12.5%, Picoxystrobin 7.05% + Propiconazole 11.7%, Kresoxim Methyl 44.3% SC, Propiconazole 25%, Tebuconazole 25.9% and Mancozeb 75% was tested against leaf blight of barley in randomized block design with three replications (Table 3.10).

The maximum disease was created in the plots at tested locations with no fungicidal spray. At Ayodhya centre application of three fungicides *viz*., Tebuconazole 50% + Trifloxystrobin 25%, Picoxystrobin 7.05% + Propiconazole 11.7% and Propiconazole 25% resulted in maximum disease control of barley leaf blight with average disease score of 34, 35 and 35 respectively. Similar trend was observed at Kanpur and Pantnagar. At Kanpur Tebuconazole 50% + Trifloxystrobin 25%, Azoxystrobin 12.5% + Tebuconazole 12.5% and Picoxystrobin 7.05% + Propiconazole 11.7% were most effective in managing the disease resulting in maximum disease control of barley leaf blight with average disease score of 25, 35 and 36 respectively. Whereas at Pantnagar Tebuconazole 50% + Trifloxystrobin 25%, Propiconazole 13.9% + Difenconazole 13.9% and Propiconazole 25% resulted in maximum disease control of barley leaf blight with average disease score of 24, 34 and 35 respectively. Overall, at all three centres Tebuconazole 50% + Trifloxystrobin 25% was found best fungicide for management of the disease with average disease severity 24 and maximum average yield 42.16 q/ha.

Table 3.10: Chemical management of foliar blight of barley during 2022-23

Treatments	Dose (%)	Ayodhya		Kanpur		Pantnagar	
		DS	Yield (q/ha)	DS	Yield (q/ha)	DS	Yield (q/ha)
Tebuconazole 50% + Trifloxystrobin 25%,	0.10%	34	36.52	25	43.30	24	46.68
Propiconazole 13.9% + Difenconazole 13.9%	0.10%	45	35.72	46	30.00	34	42.87
Azoxystrobin 12.5% + Tebuconazole 12.5%	0.10%	58	33.85	35	38.80	57	38.58
Picoxystrobin 7.05% + Propiconazole 11.7%	0.10%	35	35.19	36	34.70	46	40.70
Kresoxim Methyl 44.3% SC	0.10%	79	31.45	47	33.30	78	30.52
Propiconazole 25%	0.10%	35	34.65	47	32.50	35	42.38
Tebuconazole 25.9%	0.10%	57	34.12	46	33.60	57	36.11
Mancozeb 75%	0.20%	68	31.72	46	33.30	67	32.22
Control	-	79	30.39	79	27.70	79	29.45
CD at 5%		9.647	2.937	10.304	3.37	9.546	3.077
SE(m)		3.19	0.971	3.408	1.114	3.157	1.018

*DS = Disease severity

NEMATOLOGY

A total 118 entries of NBDSN and 18 of EBDSN were screened against the Cereal Cyst Nematode (CCN) at two locations viz. Durgapura and Hisar. Most of the entries fall in the category of susceptible or highly susceptible. In NBDSN entries no entry could fall in resistant or moderately resistant across location, however, in EBDSN RD 3037(LB) was categorized as moderately resistant.

Plant Protection (Entomology)

- A total of 118 NBDSN entries were screened at seven locations viz., Ludhiana, Karnal, Kanpur, Khudwani, Vijapur, Dharwad, Durgapura to determine aphid resistance sources.
- Majority of the entries at all the locations harboured aphids in different range depending upon their incidence level except Khudwani, Vijapur, Dharwad and Durgapura locations where aphid infestation was recorded very low.
- Entries were found to be either found to be in susceptible (grade 4) or highly susceptible (grade 5) or moderately resistance (grade 3) or resistance (grade 2) category based on average score of three locations i.e. Ludhiana, Kanpur and Karnal.
- Based on the average score of three locations i.e. Ludhiana, Kanpur and Karnal, 12 entries viz., BH 1050, BH 1051, DWRB 235, DWRB 236, DWRB 238, HUB 283, KB 2158, RD 3066, RD 3077, RD 3081, UPB 1110 and VLB 181 showed moderately resistance (grade 3) reaction.
- An experiment on management of aphids through foliar application of new bio-chemical molecules was conducted at three locations viz., Ludhiana, Kanpur and Karnal. Foliar spray of pymetrozine 50 WG @ 100 g/ha and 120 g/ha was found effective in reducing aphid population.
- Survey conducted during 2022-23, aphid infestation on the barley crop was found to be low to moderate at the Ludhiana, Kanpur, and Karnal locations throughout the crop season. Termite damage in barley fields stayed low to moderate. Predators including coccinellid beetles, chrysoperla, and syrphid flies were regularly observed preying on barley aphids.

During the cropping season of 2022-23, following experiments were allotted for entomology discipline. These are listed as below: -

Experiment number	Title	Centres
1	Screening of NBDSN barley entries against foliar aphids	Ludhiana, Karnal, Kanpur, Khudwani, Vijapur, Dharwad, Durgapura
2.	Management of aphids through foliar application of new bio-chemical molecules	Ludhiana, Kanpur and Karnal
3.	Survey and surveillance of insect-pests and their natural enemies in barley	All centres

Experiment 1: Screening of NBDSN barley entries (2022-23) against foliar aphids

A total of one hundred and eighteen barley NBDSN entries (including checks and infector) were screened against aphids at seven locations viz., Ludhiana, Karnal, Durgapura, Kanpur, Khudwani, Vijapur and Dharwad during 2022-23. The seeds were supplied by IIWBR, Karnal. Aphid population per shoot was recorded at weekly interval from all these entries and grades were given according to 5-point system as described below.

Grade/ Score	**Approx. numbers of aphids/shoot**	**Rating**
1	0	Immune (I)
2	1-5	Resistant (R)
3	6-10	Moderately resistant (MR)
4	11-20	Susceptible (S)
5	21 and above	Highly susceptible (HS)

Majority of the entries at all the locations harboured aphids in different range depending upon their incidence level except Khudwani, Vijapur, Dharwad and Durgapura locations where aphid infestation was low. Hence, data from these locations were not included in the report. The number of aphids recorded per shoot was converted into scale of 1-5. Based on the scale, the entries were categorized either as immune (grade 1) or resistant (grade 2), or moderately resistant (grade 3) or either susceptible (grade 4) or highly susceptible (grade 5) to aphids.

Out of 118 tested entries, none of the entry showed the resistance (grade 2) reaction based on average score of three locations i.e. Ludhiana, Kanpur and Karnal. All entries were found to be either in susceptible (grade 4) or highly susceptible (grade 5) or moderately resistance (grade 3) category (Table 1). Based on the average score of three locations, 12 entries viz., BH 1050, BH 1051, DWRB 235, DWRB 236, DWRB 238, HUB 283, KB 2158, RD 3066, RD 3077, RD 3081, UPB 1110 and VLB 181 showed moderately resistance (grade 3) reaction.

At Kanpur centre, 6 entries viz., BH 1050, BH 1051, DWRB 236, DWRB 238, DWRB 240 and RD 3066 showed moderately resistance (grade 3) response against aphids however, five entries gave HUB 283, KB 2158, RD 3081, UPB 1110 and VLB 181 gave resistance (grade 2) reaction. Six entries viz., BH 1051, DWRB 235, DWRB 236, RD 3066, RD 3081and VLB 181 gave moderately resistance (grade 3) response at Karnal location. At Ludhiana centre, only one entry, HBL 880 showed moderately resistance (grade 3) response.

Table 1: Screening of National Barley Disease Screening Nursery (NBDSN) entries against foliar aphids during 2022-23

S.No.	Entry	Foliar aphid score (1-5 scale)			Average Score	Highest Score
		Ludhiana	Kanpur	Karnal		
1.	BH 1045	5	5	5	5.0	5
2.	BH 1047	4	5	5	4.7	5
3.	BH 1048	4	5	5	4.7	5
4.	BH 1049	4	5	5	4.7	5
5.	BH 1050	4	3	4	3.7	4
6.	BH 1051	4	3	3	3.3	4
7.	BH 1052	4	5	5	4.7	5
8.	BH 1053	5	5	5	5.0	5
9.	BH 1054	5	5	5	5.0	5
10.	BH 946 (C)	4	4	5	4.3	5
11.	BHS 352 (C)	4	5	5	4.7	5
12.	BHS 380 (C)	4	5	5	4.7	5
13.	BHS 400	4	4	5	4.3	5
14.	BHS 493	4	5	5	4.7	5
15.	BHS 494	4	5	5	4.7	5
16.	BHS 496	4	5	5	4.7	5
17.	BHS 497	4	5	5	4.7	5
18.	BHS 945	4	5	5	4.7	5
19.	DWRB 137 (C)	4	5	4	4.3	5
20.	DWRB 182 (C)	4	5	4	4.3	5
21.	DWRB 219	5	5	5	5.0	5
22.	DWRB 223	4	5	4	4.3	5
23.	DWRB 226	4	4	5	4.3	5
24.	DWRB 228	4	5	5	4.7	5
25.	DWRB 235	4	4	3	3.7	4
26.	DWRB 236	5	3	3	3.7	5
27.	DWRB 237	4	5	5	4.07	5
28.	DWRB 238	4	3	4	3.7	4
29.	DWRB 239	5	4	5	4.7	5
30.	DWRB 240	4	3	5	4.0	5
31.	DWRB 241	4	5	5	4.7	5
32.	DWRB 242	4	5	5	4.7	5
33.	DWRB 243	4	5	5	4.7	5
34.	DWRB 244	4	5	4	4.3	5
35.	DWRB 245	4	5	4	4.3	5
36.	DWRB 246	4	4	5	4.3	5
37.	DWRUB 52 (C)	5	5	5	5.0	5
38.	HBL 113	4	5	5	4.7	5
39.	HBL 879	5	5	5	5.0	5
40.	HBL 880	3	5	5	4.3	5

41.	HBL 881	4	5	5	4.7	5
42.	HBL 882	4	5	5	4.7	5
43.	HBL 883	4	5	5	4.7	5
44.	HUB 113 (C)	4	5	5	4.7	5
45.	HUB 281	4	4	4	4.0	4
46.	HUB 282	4	5	5	4.7	5
47.	HUB 283	4	2	3	3.0	4
48.	HUB 284 (C)	4	5	5	4.7	5
49.	HUB 285	4	5	5	4.7	5
50.	HUB 286	4	5	5	4.7	5
51.	K 1149 (C)	4	5	4	4.3	5
52.	K 2133	4	5	5	4.7	5
53.	K 603 (C)	4	5	5	4.7	5
54.	KARAN 16 (C)	4	5	5	4.7	5
55.	KB 1425	4	5	5	4.7	5
56.	KB 2004 (C)	5	4	5	4.7	5
57.	KB 2015	4	5	4	4.3	5
58.	KB 2031	4	4	5	4.3	5
59.	KB 2120	5	5	4	4.7	5
60.	KB 2127 (C)	5	4	4	4.3	5
61.	KB 2131	4	5	5	4.7	5
62.	KB 2145	4	4	5	4.3	5
63.	KB 2155	5	5	5	5.0	5
64.	KB 2158	4	2	5	3.7	5
65.	KB 2159	5	5	5	5.0	5
66.	KB 2160	5	5	5	5.0	5
67.	LAKHAN (C)	4	5	5	4.7	5
68.	PL 891 (C)	4	4	4	4.0	4
69.	PL 937	4	5	5	4.7	5
70.	PL 941	4	5	5	4.7	5
71.	PL 942	4	4	4	4.0	4
72.	PL 943	4	5	5	4.7	5
73.	PL 945	5	4	4	4.3	5
74.	PL 946	4	5	5	4.7	5
75.	PL 947	4	4	4	4.0	4
76.	PL 948	4	5	4	4.3	5
77.	PL 949	4	5	4	4.3	5
78.	PL 950	5	5	5	5.0	5
79.	PL 951	4	5	5	4.7	5
80.	PL 952	5	5	5	5.0	5
81.	PL 953	4	5	5	4.7	5
82.	RD 2794 (C)	5	5	5	5.0	5
83.	RD 2849 (C)	5	5	4	4.7	5
84.	RD 2899	4	5	5	4.7	5
85.	RD 2907 (C)	4	5	5	4.7	5
86.	RD 3053	4	5	5	4.7	5
87.	RD 3064	4	5	5	4.7	5
88.	RD 3065	5	5	5	5.0	5
89.	RD 3066	4	3	3	3.3	4

90.	RD 3067	5	5	5	5.0	5
91.	RD 3068	4	5	5	4.7	5
92.	RD 3070	4	5	4	4.3	5
93.	RD 3071	4	5	5	4.7	5
94.	RD 3076	5	5	5	5.0	5
95.	RD 3077	4	2	5	3.7	5
96.	RD 3078	4	5	5	4.7	5
97.	RD 3079	4	5	5	4.7	5
98.	RD 3080	4	5	5	4.7	5
99.	RD 3081	4	2	3	3.0	4
100.	RD 3082	4	4	5	4.3	5
101.	RD 3083	4	5	5	4.7	5
102.	UPB 1104	4	5	5	4.7	5
103.	UPB 1106	4	5	5	4.7	5
104.	UPB 1109	4	5	5	4.7	5
105.	UPB 1110	4	2	3	3.0	4
106.	UPB 1111	4	4	5	4.3	5
107.	UPB 1113	4	5	4	4.3	5
108.	UPB 1114	4	5	5	4.7	5
109.	UPB 1115	4	5	5	4.7	5
110.	UPB 1116	4	4	5	4.3	5
111.	UPB 1117	4	4	5	4.3	5
112.	VLB 118 (C)	5	5	5	5.0	5
113.	VLB 175	4	5	5	4.7	5
114.	VLB 180	4	5	5	4.7	5
115.	VLB 181	4	2	3	3.0	4
116.	VLB 182	4	5	5	4.7	5
117.	VLB 183	4	5	5	4.7	5
118.	VLB 184	5	5	5	5.0	5
118a	**Infector**	**5**	**5**	**5**	**5.0**	**5**

Out of 134 entries, few check varieties and entries were found place in many trials and only one check is retained in NBDSN thus resulting 118 entries under NBDSN. Aphid data from locations, Durgapura, Khudwani, Dharwad and Vijapur was rejected due to low incidence of aphids at these locations.

Experiment 2: Management of aphids through foliar spray of new chemical molecules

Objective: The objective of conducting this experiment is to test the new molecules against aphids infesting barley and to find out the most effective insecticide against the pest

Methodology: The experiment was conducted during 2022-23 field season at three locations; Ludhiana, Karnal and Kanpur with eight treatments.

Five tillers were tagged from each plot and the experiment was replicated three times. The aphids were counted from these tagged plants before spray and after spray to know the efficacy of each treatment. The grain yield was recorded to know the amount preventable losses by these treatments.

Location: Ludhiana

The studies were conducted under irrigated conditions at Plant Breeding Research Farm, PAU, Ludhiana. The wheat variety PL 807 was sown on 4th Nov.2022 in the plots of 6 rows of 6m long in a replicated trial. There were seven treatments including untreated check and each was replicated three times. For recording observations, five tillers were ear marked in each plot and from these plants' observations were recorded 1 day before spray and then 1, 3, 7 and 15 days after spray.

Aphid population did not differ significantly among all treatments one day before treatment (Table C1). When observed one day after spray, pymetrozine 50 WG @ 120 g/ha (1.80 aphids/tiller) recorded minimum aphid population and was at par with all other treatments and better than untreated control (18.53 aphids/tiller). Similar results were recorded 3 and 7 days after treatment however 15 days after treatment, acetamiprid recorded lowest aphid population (1.70 aphids/tiller).

Maximum Grain yield of 48.48 q/ha was recorded from pymetrozine 50 WG @ 120 g/ha treated plots and it is at par with all other pesticide treatments. However, all the foliar insecticidal treatments recorded higher grain yield than untreated check (44.75 q/ha) (Table 2).

Location: Karnal

An experiment on management of aphids through foliar application of new bio-chemical molecules was conducted at Research farm of ICAR-IIWBR Karnal under irrigated condition. There were seven treatments including untreated check and each was replicated three times. For recording observations, five tillers were ear marked in each plot and from these plants' observations were recorded 1 day before spray and then 1, 3, 7 and 15 days after spray.

Aphid population did not differ significantly among all treatments one day before treatment. When observed one day after spray, pymetrozine 50 WG @ 120 g/ha (3.05 aphids/tiller) recorded minimum aphids/tiller followed by Acetamiprid 20SP (3.12 aphids/tiller) and was at par with all other treatments and better than untreated control (19.78 aphids/tiller). Similar results were recorded thereafter with lowest population being recorded in pymetrozine 50 WG @ 120 g/ha of 2.75, 2.62 and 2.54 aphids/tiller after 3, 7 and 15 days after treatment

Grain yield (q/ha) obtained was maximum (46.25 q/ha) from pymetrozine 50 WG @ 120 g/ha treated plots followed by pymetrozine 50 WG @ 100 g/ha (45.94 q/ha) treated plots. However, all the foliar insecticidal treatments recorded higher grain yield than untreated check (44.75 q/ha) (Table 3).

Location: Kanpur

The experiment was conducted under irrigated condition at research farm Nawabganj C.S.A. Univ., Kanpur. The barley variety K 551 was sown on 24.11.2022 in plot of 20 rows of 3m length. These were total of 7 treatments including untreated check and each was replicated thrice. For recording the observation, five shoots were randomly selected in each plot and observation were recorded 24 hr before spray and thereafter at 1, 3, 7- and 15-days interval on these plants.

The number of aphids recorded 24 hours before spray did not differ significantly but after one day of application of insecticides, it was observed that pymetrozine 50 WG @ 120 g/ha

and pymetrozine 50 WG @ 100 g/ha spray after one day recorded 6.00 and 7.76 aphid population, respectively. After 3 days these insecticides recorded the lowest population of 4.99 and 5.76 aphids/tiller. After 15 days after spray there were no aphids recorded in all tested treatments except control (13.26 aphids/tiller).

Grain yield q/ha was maximum (29.30 q/ha) is recorded in treatment of pymetrozine 50 WG @ 120 g/ha as compared to untreated control which recorded the lowest yield of 17.29 q/ha (Table 4).

Location: Vijapur

The number of aphids recorded 24 hours before spray did not differ significantly but after one day of application of insecticides, it was observed that Acetamiprid 20SP @100 gm recorded lowest aphids per tiller (1.70). Even after 3, 7 and 15 days, Acetamiprid 20SP @100 gm recorded lowest number of aphids i.e.1.0, 0.5 and 0.20 aphids/tiller, respectively.

Grain yield q/ha was maximum (34.76 q/ha) is recorded in treatment of pymetrozine 50 WG @ 120 g/ha as compared to untreated control which recorded the lowest yield of 21.16 q/ha (Table 5).

Experiment 3: Survey and surveillance of insect-pests and their natural enemies in barley

A survey was conducted during 2022–2023 to find out the incidence of insect pests and their natural enemies on the barley crop. Aphid infestation on the barley crop was found to be low to moderate at the Ludhiana, Kanpur, and Karnal locations throughout the crop season. The aphid population on barley started to increase in January and reached its peak in March. After that, the aphid population continued to drop and was extremely low by last week of March. In several of the aphid-infested crops, natural enemies such syrphid flies, chrysoperla, and the grubs and adults of coccinellid beetles were visible. Coccinellid beetle populations were low until the first week of February, following which they started to increase and peaked in the middle of March. Throughout the crop season at Vijapur, termite damage in barley fields stayed low to moderate. In addition, the aphid population was moderate to high in barley fields. Predators including coccinellid beetles, chrysoperla, and syrphid flies were regularly observed preying on barley aphids.

Table 2: Management of aphids through foliar application of new chemical molecules in barley during 2022-23 (Location: 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	3 days	7 days	15 days	
1	Pymetrozine 50% WG	80 g	18.46	1.94 (1.71)	1.71 (1.64)	1.59 (1.61)	1.87 (1.69)	47.77
2	Pymetrozine 50% WG	100 g	18.44	1.90 (1.70)	1.64 (1.62)	1.48 (1.57)	1.83 (1.68)	48.17
3	Pymetrozine 50% WG	120 g	18.54	1.80 (1.67)	1.63 (1.62)	1.46 (1.56)	1.78 (1.66)	48.48
4	Thiamethoxam 25% WG	12.5 g	18.64	1.88 (1.69)	1.73 (1.65)	1.50 (1.58)	1.73 (1.65)	47.20
5	Imidacloprid 17.8 SL	100 ml	18.28	1.89 (1.70)	1.69 (1.65)	1.55 (1.59)	1.79 (1.67)	47.95
6	Acetamiprid 20SP	100 g	18.58	1.87 (1.69)	1.73 (1.65)	1.59 (1.61)	1.70 (1.64)	47.51
7	Untreated control	80 g	18.46	18.53 (4.41)	19.09 (4.48)	18.54 (4.46)	19.70 (4.54)	44.75
CD (p=0.05)			NS	(0.07)	(0.06)	(0.07)	(0.08)	1.79

*Figures within parentheses arc transformed means

Date of sowing	:	04.11.2022	Plot size	:	7.5 m^2
Date of insecticidal application	:	24.02.2023	Variety	:	PL 807
Date of harvest	:	19.04.2023	Replications	:	Three

Table 3: Management of aphids through foliar application of new chemical molecules during 2022-23 (Location: Karnal)

S. No.	Treatments	Dose ml or g / ha	Aphid population per earhead					Grain Yield (q/ha)
			Before spray	After spray				
				1 day	3 days	7 days	15 days	
1	Pymetrozine 50% WG	80 g	16.45	3.19 (2.05)	2.96 (1.99)	2.84 (1.96)	3.12 (2.03)	45.54
2	Pymetrozine 50% WG	100 g	15.99	3.15 (2.04)	2.89 (1.97)	2.73 (1.93)	3.08 (2.02)	45.94
3	Pymetrozine 50% WG	120 g	16.20	3.05 (2.01)	2.75 (1.94)	2.62 (1.90)	2.54 (1.88)	46.25
4	Thiamethoxam 25% WG	12.5 g	16.11	3.13 (2.03)	2.98 (1.99)	2.75 (1.94)	2.98 (1.99)	44.97
5	Imidacloprid 17.8 SL	100 ml	15.29	3.14 (2.03)	2.94 (1.98)	2.80 (1.95)	2.90 (1.97)	45.72
6	Acetamiprid 20SP	100 g	16.29	3.12 (2.03)	2.98 (1.99)	2.84 (1.96)	2.95 (1.99)	45.28
7	Untreated control	80 g	15.27	19.78 (4.56)	20.34 (4.62)	19.79 (4.56)	20.95 (4.69)	42.52
CD (p=0.05)			NS	(0.89)	(0.99)	(0.85)	(0.88)	(1.99)

*Figures within parentheses arc transformed means

Date of sowing : 17-11-2022 Plot size : Six row of six meter length at 25 cm spacing

Date of insecticide application : 27-02-2023 Variety : DWRUB64

Date of harvest : 18-04-2023 Replication : Three

Table 4: Management of aphids through foliar application of new bio-chemical molecules during 2022-23 (Location: Kanpur)

S.No.	Treatments	Actual dose ml/g/ha	Aphid population per main shoot					Grain yield (q/ha)
			Before spray	After spray				
			1 day	1 day	3 days	7 days	15 days	
1.	Pymetrozine 50% WG	80gm.	10.80	8.00 (16.43)	7.00 (15.34)	4.20 (11.83)	00	22.33
2.	Pymetrozine 50% WG	100gm.	10.46	7.76 (16.11)	5.76 (13.81)	3.16 (10.14)	00	25.33
3.	Pymetrozine 50% WG	120gm.	11.36	6.00 (14.18)	4.99 (12.79)	2.10 (8.33)	00	29.30
4.	Thiamethoxam 25% WG	12.5gm.	11.30	8.16 (16.54)	7.33 (15.68)	4.23 (11.83)	00	22.20
5.	Imidacloprid 17.8% SL	100ml.	11.10	7.8 (15.12)	6.00 (14.18)	4.10 (11.68)	00	22.99
6.	Acetamiprid *20 SP*	100gm.	10.70	7.23 (15.56)	5.66 (13.69)	2.46 (8.91)	00	27.50
7.	Control		11.30	20.46 (26.85)	39.89 (39.11)	54.88 (47.75)	13.26 (21.30)	17.29
S.Em ±				0.369	0.421	0.535	--	0.294
CD 5%			NS	1.149	1.312	1.677	--	0.915

Date of sowing : 24.11.2022

Date of insecticidal application : 31.01.2023

Date of harvest : 20.04.2023

Design : R.B.D.

Plot size : 4 m x 4.5m = 18 Sqm

Variety : K1055 (Prakhar)

No. of rows/plot : 20

Replication : Three

Table 5: Management of aphids through foliar application of new chemical molecules during 2022-23 (Location: Vijapur)

Sr. No.	Treatments	Doses g or ml / ha	Aphid population per shoot					Grain yield q/ha
			Before spray	After spray				
				1 day	3 day	7 day	15 day	
1.	Pymetrozine 50% WG	160 g	16.1	3.2	2.0	1.1	0.7	30.76
2.	Pymetrozine 50% WG	200 g	14.9	2.8	2.0	1.0	0.5	32.33
3.	Pymetrozine 50% WG	240 g	11.7	1.8	1.1	0.6	0.3	34.76
4.	Thiamethoxam 25% WG	50 g	11.5	2.6	1.9	1.0	0.6	31.58
5.	Imidacloprid 17.8 SL	560 ml	11.5	2.6	1.8	1.0	0.7	28.91
6.	Acetamiprid 20SP	500 g	13.1	1.7	1.0	0.5	0.2	35.49
7.	Untreated Check	-	12.5	11.6	10	8.1	6.1	21.16
	C.D. at 5% C.V.%		0.57 8.53	0.63 9.35	0.57 11.3	0.34 9.86	0.22 9.67	2.61 4.78

List of Entomology Cooperators in Barley Crop Protection (2022-23)

Entomology		
No.	**Scientist (s)**	**Centre**
1.	Dr. Poonam Jasrotia	**Coordinating unit, IIWBR, Karnal**
2.	Dr. Beant Singh	Ludhiana
3.	Dr. J. Kumar	Kanpur
4.	Mr. R. V. Thakkar	Vijapur
5.	Dr. Shabir Hussain Wani	Khudwani, Srinagar
6.	Dr. Gurudatt M. Hegde	UAS, Dhardwad
7.	Dr. B.N.Sharma	Durgapura

BARLEY RESOURCE MANAGEMENT

Summary

- **AVT-malt barley** trial was conducted at Durgapura, Hisar, Karnal and Ludhiana. The test entry DWRB219 and checks RD 2849 (two row) and DWRB137 (six row) were at par. However, DWRB 219 recorded highest yield (52.90 q ha-1) followed by check RD2849 (51.39q/ha) with 120 kg N/ha and superior to checks. The genotypes DWRUB52, RD 2849 and DWRB 219 responded up to 120 kg N/ha and rest of entries responded up to 90 kg N/ha.
- **Productivity and quality enhancement of barley through Nitrogen and Zinc scheduling -**The trial was conducted at five locations in NWPZ with nine treatments of N scheduling and in three treatments Zn was also added. The productivity was superior and at par in 4,5 and 7 treatments (4-1/2 at basal+1/2 at tillering (35-40 DAS) +5.0% urea spray at anthesis stage (80-90DAS), 5- 1/2 at basal+1/2 at tillering (35-40 DAS) +5.0% urea + 0.5% ZnSO4.7H2O spray at anthesis stage (80-90DAS) and 7-1/2 at basal+1/4 at tillering (35-40 DAS) +5.0% urea + 0.5% ZnSO4.7H2O spray at flag leaf (65-70DAS) and 0.5% urea spray at anthesis stage (80-90DAS) treatments when nitrogen was splitted twice and also apply urea (5.0%)through foliar spray and/ or urea and Zn (0.5%) as foliar spray.
- **Enhancing nutrient use efficiency through nano fertiliser in barley -** The experiment was conducted at five locations in NWPZ, three in NEPZ, one in CZ and two in NHZ and different combinations of nanofertilizer were used to optimise nano nitrogen dose for barley. The productivity of barley increased with increase in the level of nitrogen up to recommended level and the addition of nano nitrogen did not effect significantly. The productivity of recommended dose and recommended + Nano N were at par and significantly more than the other treatments in NWPZ and NEPZ. The productivity at 75% RDF + nanofertiliser and RDF were at par in CZ and NHZ and 100% RDF + nanofertiliser produced significantly more than all other treatments.
- **Sowing method and seed rate on barley productivity** - The trial was conducted at five locations in NWPZ (Agra, Hisar, Ludhiana, Karnal and Durgapura) in split plot design. Pooled results revealed that normal sowing and paired row were similar in productivity and 100 and 87.5 kg seed rate/ha were at par and superior to 75 kg seed rate /ha. The highest yield (46.57 q/ha) was obtained in paired row with 100 kg seed /ha. Centre wise results show that paired row sowing was better at Durgapura and Karnal, normal sowing was better at Agra and normal and paired sowing were similar at Hisar and Ludhiana.

  Resource Management group of AICRP Wheat and Barley are engaged in agronomic evaluation of new genotypes and for updating the package and practices under different agro climatic conditions. Input management *viz.* Nutrients and water under resource scarce conditions, sowing timings in different zones under changing climatic conditions, micro nutrient supply, nano fertiliser application and other crop management practices for yield maximisation are the priority researchable areas in barley agronomy. In spite of the fact that the crop is being grown mostly on fringe and problematic lands, the productivity increased during recent years and the newly developed improved technologies contributes in the increased productivity.

  The details of the trials (proposed and conducted) are reported in Table 1. A total of 25 trials were proposed and conducted at different locations and all were reported.

Details of barley trials proposed and conducted during 2022-23

Trial Name	Number of trials			
	Proposed locations	Not conducted/ Failed	Data Received	Data Reported
AVT trials				
Nitrogen Levels x Varieties (NWPZ)	4	-	4	4
Special trials				
N and Zn scheduling (NWPZ)	5	-	5	5
Nano fertiliser application (NWPZ,NEPZ,CZ,NHZ)	11	-	11	11
Method of sowing x Seed rate (NWPZ)	5	-	5	5
Total	25	-	25	25

Response of new barley genotypes to different N levels (NWPZ)

The trial was conducted at Durgapura, Hisar, Karnal and Ludhiana. The test entry DWRB219 and checks RD 2849 and DWRB137 (six row) were at par. However, DWRB 219 recorded highest yield (52.90 q ha-1) followed by check RD2849 (51.39 q/ha) with 120 kg N/ha and superior to other checks (Table 1). The genotypes DWRUB52, RD 2849 and DWRB 219 responded up to 120 kg N/ha and rest of entries responded up to 90 kg N/ha. 1000 grains wt and grains/earhead were better in new genotype DWRB219 compared to other two row checks.

Table 1 **AVT (Malt) NWPZ** **POOLED** **2022-23**

N levels x Varieties

Code/Varieties	N ($Kg\ ha^{-1}$)							
	N60		N 90		N120		Mean	
	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.
			Yield, q/ha					
V1DWRUB52	45.21	3	48.80	4	50.75	3	48.25	4
V2DWRB219	45.96	2	49.53	3	52.90	1	49.46	1
V3 RD2849	45.21	4	49.63	2	51.39	2	48.74	3
V4DWRB137	46.42	1	49.68	1	50.21	4	48.77	2
V5 DWRB182	44.30	5	48.41	5	47.28	5	46.66	5
MEAN	45.42		49.21		50.51		48.38	
CD (0.05)	N(A)		Varieties (B)		B within A		A within B	
	0.85		0.91		1.58		1.64	
			Earhead/ m^2					
V1DWRUB52	391	2	412	3	419	3	407	3
V2DWRB219	380	4	388	4	404	4	391	4
V3 RD2849	390	3	428	1	438	1	419	2

V4DWRB137	367	5	380	5	385	5	377	5
V5 DWRB182	413	1	421	2	428	2	421	1
MEAN	388		406		415		403	
CD (0.05)	N(A)		Varieties (B)		B within A		A within B	
	6.73		7.29		12.6		13.1	
			Grains/Earhead					
V1DWRUB52	27.56	4	28.73	4	28.41	4	28.24	4
V2DWRB219	28.85	2	29.38	2	29.84	2	29.36	2
V3 RD2849	28.59	3	27.55	5	26.98	5	27.71	5
V4DWRB137	40.55	1	41.47	1	42.61	1	41.54	1
V5 DWRB182	27.56	5	29.25	3	29.14	3	28.65	3
MEAN	30.62		31.28		31.40		31.10	
CD (0.05)	N (A)		Varieties (B)		B within A		A within B	
	NS		0.81		NS		1.69	
			1000 Grain Weight, g					
V1DWRUB52	49.46	3	49.65	3	50.57	3	49.90	3
V2DWRB219	51.97	1	53.39	1	53.62	1	52.99	1
V3 RD2849	49.53	2	50.13	2	51.55	2	50.40	2
V4DWRB137	48.53	4	49.25	4	48.37	4	48.72	4
V5 DWRB182	46.05	5	47.25	5	46.69	5	46.66	5
MEAN	49.11		49.94		50.16		49.73	
CD (0.05)	N (A)		Varieties (B)		B within A		A within B	
	NS		1.04		NS		1.97	

Centres: Durgapura, Hisar, Karnal Ludhiana

Table 1.1 Response of new genotypes to Nitrogen levels **Durgapura**

N Levels, kg/ha								
Varieties	60	Rank	90	Rank	120	Rank	Mean	Rank
V1DWRUB52	47.17	5	53.85	5	55.24	4	52.09	5
V2DWRB219	54.23	1	59.9	1	64.23	1	59.46	1
V3 RD2849	47.27	4	58.70	2	56.36	3	54.11	2

V4DWRB137	47.87	3	55.89	3	57.01	2	53.59	3
V5DWRB182	51.35	2	54.84	4	52.63	5	52.94	4
MEAN	49.58		56.64		57.09		54.44	
	F. Test		S.E.m		C.D.		C.V. (%)	
N levels (A)	**		0.77		3.04		5.51	
Varieties(B)	**		0.88		2.56		4.83	
B within A	N.S.		1.52		4.43			
A within B			1.56		4.56			

Hisar

Varieties	60	Rank	90	Rank	120	Rank	Mean	Rank
V1DWRUB52	44.06	3	49.38	1	49.21	2	47.55	2
V2DWRB219	45.13	2	48.60	2	50.51	1	48.08	1
V3 RD2849	41.95	4	47.72	4	47.92	3	45.86	4
V4DWRB137	46.67	1	48.22	3	47.38	4	47.42	3
V5DWRB182	41.83	5	46.16	5	45.72	5	44.57	5
MEAN	43.93		48.02		48.15		46.70	
	F. Test		S.E.m		C.D.		C.V. (%)	
N levels (A)	*		0.61		2.39		5.05	
Varieties(B)	*		0.82		2.40		5.28	
B within A	N.S.		1.42		4.16			
A within B			1.41		4.12			

Karnal

Varieties	60	Rank	90	Rank	120	Rank	Mean	Rank
V1DWRUB52	52.24	2	50.80	4	54.30	4	52.45	2
V2DWRB219	48.88	4	51.00	2	54.46	3	51.45	4
V3 RD2849	50.75	3	50.89	3	55.06	2	52.23	3
V4DWRB137	59.54	1	56.41	1	55.55	1	57.17	1
V5DWRB182	47.30	5	45.78	5	42.23	5	45.10	5
MEAN	51.74		50.98		52.32		51.68	
	F. Test		S.E.m		C.D.		C.V.(%)	
N levels (A)	N.S.		0.59		2.30		4.39	

Varieties(B)	**		0.58		1.68		3.35	
B within A	**		1.00		2.91			
A within B			1.07		3.12			

Ludhiana

Varieties	60	Rank	90	Rank	120	Rank	Mean	Rank
V1DWRUB52	37.38	2	41.14	3	44.26	3	40.93	3
V2DWRB219	35.60	4	38.59	4	42.40	4	38.87	4
V3 RD2849	40.88	1	41.19	2	46.22	2	42.76	2
V4DWRB137	31.59	5	38.19	5	40.90	5	36.89	5
V5DWRB182	36.72	3	46.85	1	48.55	1	44.04	1
MEAN	36.44		41.19		44.46		40.70	

	F. Test	S.E.m	C.D.	C.V. (%)
N levels (A)	**	0.75	2.96	7.17
Varieties(B)	**	0.81	2.35	5.94
B within A	N.S.	1.40	4.08	
A within B		1.46	4.26	

Updation of Package of Practices

To increase the production, productivity and profitability of the barley growing farmers, updating of package of practices of barley crop is continuous process and the need of the hour. Three special trials were conducted in different zones to achieve this objective. The results from these trials are presented below.

SPL 1: Productivity and quality enhancement of barley through Nitrogen and Zinc scheduling

Objective: To enhance quality and productivity of barley through different N and Zinc scheduling

The trial was conducted at five locations in NWPZ with nine treatments of N scheduling and in three treatments Zn was also added. The productivity was superior and at par in 4, 5 and 7 treatments when nitrogen was splitted twice and also apply urea or urea and Zn through foliar spray and as foliar spray (Table 2). Three-year average data also resulted similar findings.

Table 2 NORTH WESTERN PLAIN ZONE DWRB 160 2022-23

N and Zn Scheduling

	Earhead/ m^2	Grains/Earhead	1000 Gr. Wt, g	Yield, q/ha	3 yr Av. yield

T1	361	30.14	52.93	46.96	46.92
T2	362	31.34	53.47	46.48	47.70
T3	366	31.28	53.16	46.65	48.59
T4	375	31.18	54.96	49.88	49.87
T5	385	31.64	55.12	51.38	51.42
T6	357	31.38	53.02	46.68	47.30
T7	371	31.52	54.53	50.38	50.96
T8	354	30.22	52.56	44.73	46.57
T9	357	31.42	53.41	47.36	48.88
Mean	365	31.13	53.69	47.83	48.69
S.E.(M)	4.36	0.79	0.66	0.66	0.45
C.D.	10.3	1.9	1.6	1.5	1.37

1. 1/2 at basal+1/2 at tillering (35-40 DAS)
2. 1/2 at basal+1/4 at tillering (35-40 DAS) +1/4 at anthesis stage (80-90DAS)
3. 1/3 at basal+1/3 at tillering (35-40 DAS) +1/3 at flag leaf stage (65-70DAS)
4. 1/2 at basal+1/2 at tillering (35-40 DAS) +5.0% urea spray at anthesis stage (80-90DAS)
5. 1/2 at basal+1/2 at tillering (35-40 DAS) +5.0% urea + 0.5% ZnSO4.7H2O spray at anthesis stage (80-90DAS)
6. 1/2 at basal+1/4 at tillering (35-40 DAS) +5.0% urea spray at anthesis stage (65-70DAS)
7. 1/2 at basal+1/4 at tillering (35-40 DAS) +5.0% urea + 0.5% ZnSO4.7H2O spray at flag leaf (65-70DAS) and 0.5% urea spray at anthesis stage (80-90DAS)
8. 1/3 at basal+1/3 at tillering (35-40 DAS) +5.0% spray at flag leaf stage (80-90DAS)
9. 1/3 at basal+1/3 at tillering (35-40 DAS) +5.0% Urea + 0.5% ZnSO4.7H2O spray at anthesis (80-90DAS)

Table 2.1 **NORTH WESTERN PLAIN ZONE** **2022-23**

N and Zn Scheduling Yield, q/ha

	Agra	**Durgapura**	**Hisar**	**Karnal**	**Ludhiana**
T1	39.45	58.43	38.64	51.96	46.29
T2	39.77	55.17	43.78	49.50	44.17
T3	40.43	57.67	43.08	48.90	43.16
T4	43.70	62.90	42.62	53.85	46.31
T5	49.78	65.20	44.12	51.44	46.37
T6	43.07	58.23	38.92	51.74	41.45
T7	51.26	63.17	42.01	54.75	40.71
T8	42.20	54.50	39.84	50.46	36.67
T9	48.35	57.83	41.64	51.43	37.54
Mean	44.22	59.23	41.63	51.56	42.52
S.E.(M)	1.12	2.04	1.21	1.60	1.15
C.D.	3.37	6.10	3.63	4.79	3.44
C.V.	4.40	5.95	5.04	5.37	4.68

SPL2: Enhancing nutrient use efficiency through nano fertiliser in barley

Objective: To optimise dose of nano fertiliser in barley and to enhance the nutrient use efficiency.

The experiment was conducted at five locations in NWPZ, three in NEPZ, one in CZ and two in NHZ and different combinations of nanofertilizer were used to optimise nano nitrogen dose for barley. The productivity of barley increased with increase in the level of nitrogen up to recommended level and the addition of nano nitrogen did not effect significantly. The productivity of recommended dose and recommended + Nano N were at par and significantly more than the other treatments in NWPZ and NEPZ (Table 3 and 3a). The productivity at 75% RDF + nanofertiliser and RDF were at par in CZ (Table 3a.1) and NHZ (Table 3b) and 100% RDF + nanofertiliser produced significantly more than all other treatments.

Table 3 NORTH WESTERN PLAIN ZONE 2022-23 Pooled

Nano Fertiliser

Treatments	Earhead/ m^2	Grains/Earhead	1000 Gr. Wt, g	Yield, q/ha	3 yr Av. yield
T1	263	42.34	40.31	29.68	28.81
T2	293	43.16	41.17	36.93	36.33
T3	312	46.93	41.80	43.39	41.82
T4	323	46.54	42.51	45.56	44.07
T5	342	47.97	43.64	49.93	47.65
T6	350	47.65	43.73	51.19	49.03
T7	359	48.08	44.55	53.69	51.10
T8	366	48.16	44.36	53.58	51.21
T9	360	48.44	43.90	54.62	52.08
Mean	330	46.59	42.89	46.51	44.68
S.E.(M)	3.91	0.75	0.43	0.85	0.60
C.D.	9.2	1.8	1.0	2.0	1.82

T1 Control (P+K only)

T2 Control (P+K only) +1000 ml NN/ha at 30-35 DAS+1000ml/ha at 60-65 DAS

T3 50% RDN + 500ml NN/ha at 30-35 DAS+500ml/ha at 60-65 DAS

T4 50% RDN + 1000 NN/ha at 30-35 DAS+1000ml/ha at 60-65 DAS

T5 75% RDN +500ml NN at 30-35 DAS+500ml NN at 60-65 DAS

T6 75% RDN + 1000ml NN at 30-35 DAS+1000ml NN at 60-65 DAS

T7 RDN + 500ml NN/ha at 30-35 DAS+500ml/ha at 60-65 DAS

T8 RDN + 1000ml NN/ha at 30-35 DAS+1000ml/ha at 60-65

T9 Recommended doses of Nitrogen (RDN)

Table 3.1 **NORTH WESTERN PLAIN ZONE** **2022-23**

Nano Fertiliser Yield, q/ha

Treatments	Agra	Durgapura	Hisar	Karnal	Ludhiana
T1	34.50	33.50	15.68	45.40	19.33
T2	39.80	48.90	20.16	55.99	19.78
T3	43.15	56.40	32.63	56.37	28.40
T4	46.08	62.67	34.17	56.25	28.66
T5	48.50	66.17	38.90	57.90	38.18
T6	51.40	67.67	40.11	58.02	38.73
T7	53.79	63.67	44.62	58.84	47.53
T8	56.66	59.67	45.08	59.03	47.45
T9	56.88	64.33	46.56	57.80	47.54
Mean	47.86	58.11	35.32	56.18	35.07
S.E.(M)	3.22	1.89	1.04	1.23	1.22
C.D.	9.67	5.68	3.13	3.68	3.66
C.V.	11.67	5.65	5.12	3.78	6.02

Table 3a **NORTH EASTERN PLAIN ZONE** **2022-23**

Nano Fertiliser **Pooled**

Treatments	Earhead/ m^2	Grains/Earhead	1000 Gr. Wt, g	Yield, q/ha
T1	247	30.87	40.71	26.16
T2	258	32.26	40.93	27.51
T3	296	33.56	41.05	32.47
T4	301	33.01	41.67	33.75
T5	308	35.51	40.65	38.33
T6	314	36.69	41.11	38.99
T7	336	35.51	41.06	40.22
T8	336	36.42	41.44	42.20
T9	336	36.22	43.36	42.23
Mean	304	34.45	41.33	35.76

S.E.(M)	2.21	0.60	0.46	1.47
C.D.	5.2	1.4	1.1	3.5

Table 3a.1 NORTH EASTERN and CENTRAL PLAIN ZONE 2022-23

Nano Fertiliser Yield, q/ha

Treatments	Ayodhya	Kanpur	Varanasi	CZ Udaipur
T1	22.68	38.80	17.00	42.97
T2	23.29	42.44	16.80	39.48
T3	26.58	41.70	29.13	39.23
T4	27.12	42.49	31.63	43.58
T5	29.86	42.78	42.37	43.72
T6	30.25	43.56	43.17	48.63
T7	33.25	42.90	44.50	45.92
T8	33.84	44.09	48.67	40.32
T9	33.00	45.66	48.03	46.37
Mean	28.87	42.71	35.70	43.36
S.E.(M)	0.52	0.57	4.35	1.95
C.D.	1.55	1.69	13.04	5.83
C.V.	3.11	2.29	21.10	7.77

Table 3b NORTHERN Hill ZONE Pooled 2022-23

Nano Fertiliser

Treatments	Earhead/ m^2	Grains/Earhead	1000 Gr. Wt, g	Yield, q/ha
T1	235	28.00	37.04	20.10
T2	245	28.56	37.28	23.28
T3	272	30.22	38.92	30.54
T4	282	29.94	38.96	31.90
T5	296	30.54	39.43	34.46
T6	317	32.21	39.67	38.50
T7	329	31.41	39.97	38.61
T8	333	31.61	39.74	39.09
T9	322	30.55	39.83	35.69

Mean	292	30.34	38.98	32.46
S.E.(M)	5.65	0.76	0.34	1.11
C.D.	13.5	1.8	0.8	2.7

Table 3b.1 **NORTHERN Hill ZONE** **2022-23**

Nano Fertiliser Yield, q/ha

Treatments	Bajaura	Malan
T1	18.70	21.50
T2	19.33	27.23
T3	28.41	32.68
T4	28.33	35.46
T5	31.42	37.49
T6	35.48	41.51
T7	36.19	41.03
T8	36.44	41.73
T9	35.48	35.89
Mean	29.98	34.95
S.E.(M)	2.08	0.75
C.D.	6.24	2.26
C.V.	12.0	3.74

SPL 3: Effect of sowing method and seed rate on barley productivity

The objective was to evaluate the effect of sowing method and seed rate on barley productivity. The trial was conducted at five locations in NWPZ (Agra, Hisar, Ludhiana, Karnal and Durgapura) in split plot design having sowing method (2 treatments) in main plot and seed rate (3 levels) in sub plot. Pooled results revealed that normal sowing and paired row were similar in productivity and 100 and 87.5 kg seed rate/ha were at par and superior to 75 kg seed rate /ha. The highest yield (46.57 q/ha) was obtained in paired row with 100 kg seed /ha (Table 4). Centre wise results show that paired row sowing was better at Durgapura and Karnal, normal sowing was better at Agra and normal and paired sowing were similar at Hisar and Ludhiana. Two-year data also revealed the similar results.

Table 4 Effect of Sowing Method and seed rate on barley productivity 2022-23

Pooled

	Method of Sowing					
Seed rate, kg/ha	Normal	Rank	Paired row	Rank	Mean	Rank

			Yield, q/ha			
75	41.87	3	42.00	3	41.94	3
87.5	43.95	2	44.84	2	44.40	2
100	44.70	1	46.57	1	45.63	1
MEAN	43.51		44.47		43.99	
CD (0.05)	SM(A) NS		SR(B)0.88	B within A NS	A within B 1.57	
			Earhead/ m^2			
75	286	3	286	3	286	3
87.5	301	2	305	2	303	2
100	313	1	320	1	316	1
MEAN	300		304		302	
CD (0.05)	SM(A) 5.94	SR(B) NS	B within A NS	A within B 11.8		
			Grains/Earhead			
75	38.51	1	39.42	1	38.96	1
87.5	38.45	2	38.63	2	38.54	2
100	37.35	3	38.48	3	37.91	3
MEAN	38.10		38.84		38.47	
CD (0.05)	SM(A) NS	SR(B) NS	B within A NS	A within B NS		
			1000 Grains wt, g			
75	38.52	1	39.59	1	39.06	1
87.5	38.51	2	38.97	2	38.74	2
100	37.54	3	38.70	3	38.12	3
MEAN	38.19		39.09		38.64	
CD (0.05)	SM(A) NS	SR(B) 0.65	B within A NS	A within B 1.12		
			2-year Av. Yield, q/ha			
75	40.40	1	40.15	1	40.27	1
87.5	42.05	2	42.83	2	42.44	2
100	42.59	3	44.55	3	43.57	3
MEAN	41.68		42.51		42.10	
CD (0.05)	SM(A) 0.33	SR(B) 0.35	B within A 0.54	A within B 0.49		

Centers: Agra, Hisar, Ludhiana, Karnal, Durgapura

Table SPL 4.1 Effect of Sowing Method and seed rate on barley productivity

Agra

	Method of Sowing					
Seed rate, kg/ha	Normal	Rank	Paired row	Rank	Mean	Rank
75	52.63	3	41.76	3	47.195	3
87.5	54.25	2	44.79	2	49.52	2
100	57.12	1	47.68	1	52.4	1
MEAN	54.67		44.74		49.71	
		F. Test	S.E.m	C.D.	C.V. (%)	
Sowing Method	(A)	*	1.05	4.32	6.31	
Seed rate	(B)	**	0.79	2.09	3.92	
B within A		N.S.	1.12	2.96		
A within B			1.39	3.66		

Durgapura

	Method of Sowing					
Seed rate, kg/ha	Normal	Rank	Paired row	Rank	Mean	Rank
75	54.50	3	58.46	3	56.48	3
87.5	58.17	1	64.37	2	61.27	2
100	56.33	2	69.37	1	62.86	1
MEAN	56.33		64.07		60.20	
		F. Test	S.E.m	C.D.	C.V. (%)	
Sowing Method	(A)	N.S.	1.36	5.63	6.79	
Seed rate	(B)	**	0.88	2.32	3.59	
B within A		*	1.25	3.28		
A within B			1.70	4.48		

Hisar

	Method of Sowing					
Seed rate, kg/ha	Normal	Rank	Paired row	Rank	Mean	Rank
75	48.61	3	49.96	3	49.29	3
87.5	51.15	2	52.78	2	51.97	2

100	52.50	1	53.57	1	53.04	1
MEAN	50.75		52.10		51.43	
		F. Test	S.E.m	C.D.	C.V. (%)	
Sowing Method	(A)	N.S.	1.32	5.46	7.71	
Seed rate	(B)	*	0.78	2.06	3.73	
B within A		N.S.	1.11	2.91		
A within B			1.60	4.21		

Karnal

			Method of Sowing			
Seed rate, kg/ha	Normal	Rank	Paired row	Rank	Mean	Rank
75	54.33	3	60.58	3	57.45	3
87.5	54.78	2	60.63	2	57.70	2
100	55.11	1	61.44	1	58.27	1
MEAN	54.74		60.88		57.81	
		F. Test	S.E.m	C.D.	C.V. (%)	
Sowing Method	(A)	**	0.31	1.27	1.60	
Seed rate	(B)	N.S.	0.72	1.90	3.05	
B within A		N.S.	1.02	2.68		
A within B			0.89	2.33		

Ludhiana

			Method of Sowing			
Seed rate, kg/ha	Normal	Rank	Paired row	Rank	Mean	Rank
75	41.15	3	41.26	3	41.20	3
87.5	45.38	2	46.45	2	45.92	2
100	47.13	1	47.34	1	47.23	1
MEAN	44.56		45.01		44.79	
		F. Test	S.E.m	C.D.	C.V. (%)	
Sowing Method	(A)	N.S.	0.95	3.91	6.35	
Seed rate	(B)	**	0.92	2.42	5.04	
B within A		N.S.	1.30	3.43		
A within B			1.43	3.75		

MALTING QUALITY EVALUATION

The Barley Improvement Unit conducted a comprehensive malting quality evaluation of grain samples from the Initial Varietal Trial (IVT) and Advanced Varietal Trial (AVT). These grain samples, each weighing 500 g, were collected from eight different locations (Hisar, Bathinda, Durgapura, Karnal, Ludhiana, Pantnagar, Modipuram, and Ajmer) for AVT and seven locations (Hisar, Bathinda, Durgapura, Karnal, Ludhiana, Pantnagar, and Modipuram) for IVT, respectively. In total, 215 coded samples were received and analyzed at the central facility.

Table 5.1: Details of grain samples received and analyzed for malting quality

State	Location	Trial	No. of Samples
Haryana	Hisar	IVT	25
		AVT	5
	Karnal	IVT	25
		AVT	5
Punjab	Ludhiana	IVT	25
		AVT	5
	Bathinda	IVT	25
		AVT	5
Rajasthan	Ajmer	AVT	5
	Durgapura	IVT	25
		AVT	5
Uttarakhand	Pantnagar	IVT	25
		AVT	5
Uttar Pradesh	Modipuram	IVT	25
		AVT	5
Total			**215**

Table 5.2. Malting quality traits analyzed

Grain Quality	Malt Quality
- 1000 Grain Weight (g)	- Malt Friability (%)
- Test Weight (kg/hl)	- Malt Homogeneity (%)
- Germination (at 72 hrs) (%)	- Hot Water Extract % (F.g.d.b.)
- Husk Content (%)	- Diastatic Power (^{0}L)
- Protein Content (%)	- Wort Filtration Rate (ml/hr)
- Beta-Glucan (%)	- Kolbach Index
- Kernel Plumpness (%)	- Wort pH
- Proportion of Bold Grain (retained on 2.5 mm and 2.8 mm sieve)	- Saccharification Rate (minutes)
- Proportion of Thin G (passed through 2.2 mm sieve)	- Wort β-Glucan Content (ppm)
- Grain Starch Content	- Wort FAN Content (ppm)
- Grain Moisture Content	

The grain samples underwent a comprehensive analysis to assess their physical and biochemical parameters crucial for malting, following approved guidelines and procedures. Various traits such as test weight, bold/thin proportion, germinative energy, 1000 grain weight, and husk content were assessed based on the EBC approved protocols. The grain's crude protein content, starch content, and moisture content were predicted using the FOSS NIR system.

For the micro-malting process, the processed grain samples (with thin grains removed) were utilized, taking 100 grams from each genotype. The micro-malting was conducted using the "Joe White Micro-Malting System" and involved three main phases: steeping, germination, and kilning. Steeping was carried out in

three stages with specific durations and temperatures: first, a wet stage lasting 8 hours at 18°C; then, an air rest stage for 16 hours at 18°C; and finally, another wet stage lasting 8 hours at 18°C, summing up to a total duration of 32 hours. Germination occurred in two stages, with a total duration of 48 hours, comprising 24 hours at 18°C followed by 24 hours at 16°C. Kilning, the final phase, lasted for 30 hours and commenced at 30°C, gradually reaching a final temperature of 80°C. By following this scientifically rigorous approach, the micro-malting process provided valuable insights into the malting characteristics of the grain samples, enabling a more thorough understanding of their potential for brewing purposes.

The evaluation of new barley genotypes followed the Analytical Guidelines for Barley Breeders in India (Annexure-1), which were approved by the "National Core Group on Malt Barley Development" (NCGMBD). The minimum standards for physical and biochemical properties of barley grain and malt were adhered to during the assessment. For the determination of various quality parameters, the analytical methods outlined in EBC (Analytica EBC, 2003) were employed. The analysis of diastatic power (D.P.) of malt was done as per the IOB method and expressed in ºLinter value as described in Farzaneh et al. (2017). The impact of germination time on some selected parameters through malting process. *International Journal of Biological Macromolecules*, **94:** 663–668.

The following important points may be considered during interpretation of the results.

- *Protein content, Kolbach index, starch content and moisture content has been estimated using NIR system on dry weight basis.*
- *Grain & Wort β- glucan content, malt friability & homogeneity was done in samples of few location/s only.*
- *Husk content analysis was done by Sodium hypo-chlorite method (dry basis) as per EBC procedure.*
- *The wort was filtered through Whatman folded filter papers (2555 1/2, (diameter 320 mm) to determine filtration rate and subsequent analysis of wort.*
- *The DP was done by the method as described above results should be inferred under this light.*
- *Hot water extract and other malt quality values should be interpreted in the light that only 100g sample was micro-malted for each genotype and each location. This gives a relative picture in comparison to checks only and therefore industrial values for bulk processing, may differ.*
- *The kilning time was 30 hours starting from 30°C to preserve polysaccharide degradative activity to the maximum.*
- *The maturity period of grain has to bear the varying weather conditions during this year; IVT & AVT entries have different plot size & replications, therefore results of AVT & IVT may be interpreted in that perspective*

Since the dormancy of grain also affects its performance during malting, the details of malting cycles have been given below:

S. No.	Cycle start date	Locations
1	05.06.2023	Karnal, Durgapura
2	12.06.2023	Ludhiana, Durgapura
3	19.06.2023	Bathinda, Hisar, Pantnagar
4	10.07.2023	Modipuram, Ajmer

Various genotypes have been identified as excellent sources for specific grain and malt quality traits, as shown in Table 5.3. However, it should be noted that these genotypes may not exhibit favorable values for all other traits under consideration. The zonal performance of the AVT and IVT entries concerning grain and malt quality traits has been recorded in Tables 5.4a, 5.4b, 5.5a, and 5.5b. Detailed location-wise data for each physical and biochemical grain/malt quality parameter can be found in Annexure 2. To identify promising lines, mean values were used, and these lines were compared against the minimum standards established by the 'NCGMBD' (National Committee on Genetic Manipulation and Biotechnology for Development) for malt barley in the country. These standards are subject to periodic revisions, with the latest revision as of 22.06.2020 being considered.

Since many of the grain and malt quality traits are negatively correlated and we have to look for the balanced optimal combination for these traits. There were several entries observed promising for individual traits, after the detailed analysis across locations in the NWP Zone. This was done by the system of scoring giving due weightage to important traits. (Table 5.6 & 5.7). Thus, based on the twelve important traits (a maximum possible score of 36), entries were identified as promising.

Table 5.3: Promising entries for individual malting quality trait

Trait	**Promising entries**
Hectoliter weight (>65 for two rows; >62 for 6 row)	BH1051, DWRB237,
Bold Grains (>90% for two rows; >80% for 6 row)	BH1050, BH1051, BH1052, DWRB235, DWRB236, DWRB237, DWRB238, DWRB239, DWRB240, KB2145, PL941, PL942, PL943, PL945, RD3064, RD3066, RD3067, UPB1116, UPB1117, DWRB137 ©*
**Husk Content (<11% for both types)	BH1050, BH1051, DWRB236, DWRB237, DWRB239, RD3064, RD3065, RD2849 ©
**Grain Beta Glucan (<4% for both types)	RD3066, DWRB182 ©
Malt Friability (>70% for two rows; >65% for 6 row)	DWRB235, DWRB240, KB2131, KB2145, PL945, RD3064, RD3065, RD3066, DWRUB52 ©, DWRB182 ©, RD2849 ©
Hot water extract (>80% for both types)	BH1051, BH1052, DWRB238, DWRB240, KB2131, DWRB137 ©*
Filtration Rate (>250 min. for both types)	BH1050, BH1051, DWRB237, DWRB240, KB2131, KB2145, PL943, PL945, RD3065, RD3066, RD3067, DWRB182 ©
Diastatic Power (>90 ^{0}L for both types)	BH1050, BH1051, BH1052, DWRB236, DWRB238, DWRB240, KB2131, KB2145, PL941, PL942, PL943, PL945, RD3066, RD3067, UPB1116, UPB1117, DWRB137 ©*, DWRB182 ©, RD2849 ©
FAN Content (>150 ppm for both types)	BH1052, DWRB235, DWRB236, DWRB237, DWRB238, DWRB239, DWRB240, KB2131, KB2145, PL942, PL943, PL945, RD3064, RD3065, RD3066, UPB1116, DWRUB52 ©, DWRB182 ©, RD2849 ©
Wort β- glucan (<300 ppm for both types)	BH1051, BH1052, DWRB235, DWRB236, DWRB237, DWRB240, KB2131, KB2145, PL943, PL945, RD3065, RD3066, UPB1116, UPB1117, DWRB182 ©, RD2849 ©
**Over all Malt Quality (weighted performance compared to best check)	BH1051, BH1052, DWRB238, DWRB240, KB2145, PL943, RD3066, DWRB182 ©

**Six rows; ** Compared to the best check*

Table 5.4a: Variability in grain quality of AVT malt barley entries

S.N.	Code	Genotype	TGW (g)	Test Wt. (kg/hl)	Bold (%)	Thin (%)	GER (%)	Protein (%)	Husk (%)	BG (%)	Moisture %	Starch %
1	**AVT-MB-NWPZ-4**	**DWRB 219**	53 (46-59)	62 (57-66)	95.6 (89.1-98.2)	0.6 (0.2-1.5)	99.4 (98-100)	11.6 (10.3-13.3)	14.2 (12.4-17.0)	5.6 (5.3-5.9)	10.8 (9.3-13.2)	61 (59.4-62.1)
2	**AVT-MB-NWPZ-2**	**DWRUB 52 ©**	46 (37-51)	63 (59-67)	88.1 (65.5-96.5)	2.1 (0.3-9.1)	99.4 (98-100)	11.6 (10.2-12.0)	13.9 (12.0-16.5)	5.4 (4.9-5.9)	10.8 (9.5-13.4)	61.3 (60.4-62.6)
3	**AVT-MB-NWPZ-1**	**DWRB 137 ©***	47 (40-53)	60 (57-64)	90.7 (79.4-96.5)	1.8 (0.6-4.4)	99.3 (97-100)	10.8 (9.8-11.3)	14.1 (11.8-17.9)	5.6 (5.5-5.9)	11.0 (9.6-13.4)	61.1 (60.4-61.5)
4	**AVT-MB-NWPZ-5**	**DWRB 182 ©**	43 (34-53)	60 (53-65)	85.1 (64.2-97.5)	3.3 (0.3-9.3)	99.9 (99-100)	12.1 (10.0-14.9)	15.2 (13.1-17.2)	4.5 (4.3-4.7)	10.9 (9.5-13.1)	60.5 (58.5-61.7)
5	**AVT-MB-NWPZ-3**	**RD 2849 ©**	48 (43-52)	64 (58-67)	91.0 (80.0-98.5)	1.3 (0.4-3.1)	99.8 (99-100)	11.3 (10.2-12.7)	13.9 (11.9-17.2)	5.5 (5.2-5.7)	10.7 (9.4-12.9)	61.4 (60.2-61.9)
Overall			**47.4 (34-59)**	**61.8 (53-67)**	**90.1 (64.2-98.5)**	**1.82 (0.2-9.3)**	**99.56 (97-100)**	**11.48 (9.8-14.9)**	**14.26 (11.8-17.9)**	**5.32 (4.3-5.9)**	**10.84 (9.3-13.4)**	**61.06 (58.5-62.6)**

**Six row barley; values are mean across the locations; range in brackets; (TGW: Thousand Grain Weight; Bold: Bold Grain; Thin: Thin Grain; GER: Germinative Energy; BG: Beta Glucan)*

Table 5.4b: Variability in malt quality of AVT malt barley entries

S.N.	Code	Genotype	MY (%)	Friab (%)	Homo (%)	HWE (% fgdb)	FR (ml/hr.)	DP (0L)	SR (min.)	W- pH	KI (%)	W- FAN	W- BG**
1	**AVT-MB-NWPZ-4**	**DWRB 219**	85.4 (83.2-86.7)	59.7 (41.3-75.9)	91.8 (78.3-97.4)	78.3 (72.4-83.3)	221.3 (165-305)	87.4 (65.8-106.4)	6.3 (5-10)	6.0 (5.9-6.0)	39.3 (37.3-40.9)	151.1 (121.4-199.1)	279.9
2	**AVT-MB-NWPZ-2**	**DWRUB 52 ©**	85.0 (83.0-86.2)	67.7 (51.7-83.2)	94.4 (81.7-99.0)	79.1 (74.2-83.1)	242.5 (150-305)	85.0 (70.4-108.7)	6.3 (5-10)	6.0 (5.9-6.1)	39.8 (36.6-42.6)	171.7 (148.9-196.2)	25.9
3	**AVT-MB-NWPZ-1**	**DWRB 137 ©***	84.0 (78.9-86.2)	64.8 (48.2-83.8)	89.4 (74.4-98.2)	77.9 (74.7-82.7)	235.6 (80-300)	106.5 (89.3-113.6)	6.3 (5-10)	6.2 (5.9-6.9)	38.9 (38.1-40.0)	153.6 (127.7-192.0)	267.4
4	**AVT-MB-NWPZ-5**	**DWRB 182 ©**	84.9 (82.8-87.0)	65.8 (57.6-76.3)	91.0 (82.5-97.8)	78.6 (71.1-85.8)	257.5 (185-300)	104.5 (87.7-111.1)	6.3 (5-10)	6.1 (6.0-6.1)	38.8 (35.0-41.2)	158.1 (135.9-187.9)	92.2
5	**AVT-MB-NWPZ-3**	**RD 2849 ©**	85.0 (83.8-87.2)	68.0 (54.2-82.9)	95.2 (88.5-98.8)	79.5 (74.4-82.5)	238.8 (145-305)	83.8 (65.8-104.2)	6.3 (5-10)	6.0 (5.9-6.1)	38.6 (37.1-41.3)	175.9 (152.7-198.2)	193.4
Overall			**84.36 (78.9-87.2)**	**65.2 (41.3-83.8)**	**92.36 (74.4-98.8)**	**78.68 (71.1-85.8)**	**239.14 (80-305)**	**93.44 (65.8-113.6)**	**6.3 (5-10)**	**6.06 (5.9-6.9)**	**39.08 (35.0-42.6)**	**162.08 (121.4-199.1)**	**216.8**

**Six row barley; **Single location only; range in brackets; (MY: Malt Yield; Fraib: Friability; Homo: Homogeneity; HWE: Hot Water Extract; DP: Diastatic Power; SR: Saccharification Rate; W—pH: Wort pH; KI: Kolbach Index; W-FAN: Wort Free Amino Nitrogen; W-BG: Wort Beta Glucan)*

Table 5.5a: Variability in grain quality of IVT malt barley entries

S.N.	Code	Genotype	TGW (g)	Test Wt. (kg/hl)	Bold (%)	Thin (%)	GER (%)	Protein (%)	Husk (%)	Moisture %	Starch %
1	**IVT-MB-NWPZ-9**	**BH 1050**	48.9 (44.8-51.3)	64.7 (58.2-69.2)	97.0 (93.2-99.1)	0.6 (0.2-1.3)	99.7 (98-100)	12.7 (11.2-13.8)	12.6 (10.1-15.5)	10.2 (8.6-12.3)	61.2 (59.7-62.0)
2	**IVT-MB-NWPZ-16**	**BH 1051**	49.1 (45.7-51.4)	65.0 (60.3-69.2)	96.9 (93.1-99.4)	0.6 (0.2-1.5)	100 (100)	12.1 (10.4-13.8)	12.4 (10.4-14.5)	10.4 (8.8-12.5)	61.4 (60.0-62.9)
3	**IVT-MB-NWPZ-19**	**BH 1052**	55.9 (49.8-60.2)	63.0 (58.6-66.8)	97.0 (91.4-98.9)	0.6 (0.2-2.0)	98.9 (97-100)	12.8 (11.0-14.5)	13.6 (11.4-16.4)	10.2 (8.7-12.3)	60.4 (59.6-61.4)
4	**IVT-MB-NWPZ-5**	**DWRB 235**	49.0 (41.8-53.7	63.5 (57.5-66.4)	92.8 (82.9-97.8)	1.2 (0.3-3.1)	98.4 (97-100)	11.8 (9.9-12.5)	14.2 (12.7-17.7)	10.7 (9.1-13.4)	61.1 (59.9-60.9)
5	**IVT-MB-NWPZ-14**	**DWRB 236**	52.3 (47.1-63.5)	64.3 (59.1-68.8)	95.0 (92.3-98.2)	0.7 (0.2-1.4)	99.1 (97-100)	11.6 (10.0-13.2)	13.4 (11.2-16.3)	10.4 (9.3-12.3)	61.4 (60.6-61.7)
6	**IVT-MB-NWPZ-15**	**DWRB 237**	48.2 (41.8-52.3)	65.6 (57.1-69.6)	94.6 (88.1-97.7)	0.8 (0.3-1.6)	99.4 (99-100)	11.9 (10.7-12.9)	12.9 (11.7-14.6)	10.1 (8.8-12.3)	61.6 (59.7-62.6)
7	**IVT-MB-NWPZ-25**	**DWRB 238**	54.3 (47.7-68.5)	62.4 (56.9-66.9)	96.7 (92.3-99.2)	0.6 (0.2-1.4)	97.4 (83-100)	11.7 (10.4-12.6)	14.5 (11.1-19.7)	10.5 (9.4-12.2)	61.0 (59.6-61.9)
8	**IVT-MB-NWPZ-7**	**DWRB 239**	48.8 (43.9-54.3)	64.0 (58.1-68.3)	90.2 (83.1-97.5)	1.8 (0.3-4.0)	99.9 (99-100)	11.9 (10.3-13.6)	13.5 (11.3-16.2)	10.2 (9.2-12.2)	61.1 (60.2-61.9)
9	**IVT-MB-NWPZ-24**	**DWRB 240**	52.3 (47.0-57.3)	62.3 (56.0-66.4)	98.4 (96.0-99.9)	0.4 (0.2-0.7)	99.7 (99-100)	11.0 (9.6-12.8)	13.8 (11.5-16.7)	10.2 (8.7-12.3)	61.4 (60.2-62.2)
10	**IVT-MB-NWPZ-18**	**KB 2131**	45.6 (37.9-51.8)	57.1 (53.5-61.9)	69.7 (33.9-86.7)	6.7 (0.9-22.9)	99.9 (99-100)	13.3 (10.5-19.9)	15.0 (12.7-18.3)	10.4 (9.1-12.5)	60.9 (59.3-63.1)
11	**IVT-MB-NWPZ-13**	**KB 2145**	51.8 (46.0-58.7)	62.1 (57.9-65.4)	90.9 (82.5-95.1)	1.5 (0.5-3.4)	99.6 (98-100)	11.1 (9.8-12.3)	14.3 (12.1-16.2)	10.4 (9.3-12.6)	61.8 (60.8-62.8)
12	**IVT-MB-NWPZ-3**	**PL 941**	53.8 (48.5-57.0)	63.1 (58.1-67.1)	94.0 (90.7-97.7)	0.9 (0.3-1.5)	98.1 (94-100)	12.4 (11.8-13.6)	13.7 (11.8-16.5)	10.5 (9.4-12.5)	60.8 (60.4-62.0)
13	**IVT-MB-NWPZ-6**	**PL 942**	51.3 (49.2-53.2)	62.4 (57.2-66.5)	92.5 (83.8-97.7)	0.9 (0.2-2.6)	99.0 (95-100)	12.3 (10.8-13.4)	14.7 (12.7-18.0)	10.2 (8.7-12.0)	60.8 (59.8-62.4)
14	**IVT-MB-NWPZ-2**	**PL 943**	46.9 (44.1-49.2)	62.5 (55.3-68.7)	90.4 (84.5-97.0)	1.2 (0.4-2.9)	99.6 (98-100)	13.1 (11.5-14.8)	13.8 (11.0-15.8)	10.1 (8.8-11.6)	60.9 (59.4-62.9)
15	**IVT-MB-NWPZ-11**	**PL 945**	48.2 (45.0-51.1)	61.0 (54.4-65.1)	90.5 (82.2-96.8)	1.3 (0.3-3.1)	99.3 (98-100)	12.6 (10.6-14.9)	15.3 (12.4-17.3)	10.4 (9.4-12.9)	60.7 (59.4-61.9)
16	**IVT-MB-NWPZ-20**	**RD 3064**	57.7 (52.5-63.0	61.2 (55.0-66.9)	95.4 (90.1-98.4)	0.8 (0.2-1.6)	99.3 (96-100)	12.5 (10.5-15.3)	13.5 (11.5-17.4)	10.3 (8.7-12.1)	60.6 (59.1-61.5)
17	**IVT-MB-NWPZ-8**	**RD 3065**	47.6 (43.5-51.5)	63.6 (57.7-67.7)	87.6 (85.6-95.8)	1.6 (0.5-4.0)	99.6 (99-100)	11.4 (9.1-13.2)	13.1 (12.6-15.6)	10.5 (9.5-11.8)	61.6 (60.4-62.7)
18	**IVT-MB-NWPZ-17**	**RD 3066**	53.2 (47.4-58.4)	63.9 (60.3-67.2)	97.2 (95.4-99.1)	0.5 (0.2-1.4)	98.9 (97-100)	12.7 (11.3-15.3)	13.5 (12.0-17.1)	10.0 (8.8-12.1)	60.7 (59.7-61.5)
19	**IVT-MB-NWPZ-10**	**RD 3067**	57.8 (50.5-67.3)	61.6 (52.3-67.0)	94.5 (90.5-98.3)	0.8 (0.3-1.5)	98.9 (95-100)	11.7 (10.4-13.4)	13.6 (11.4-16.6)	10.4 (9.2-12.5)	61.4 (59.5-62.3)
20	**IVT-MB-NWPZ-4**	**UPB 1116**	53.8 (45.7-59.5)	62.2 (59.4-64.4)	92.9 (84.1-98.9)	1.3 (0.1-2.1)	99.1 (97-100)	12.6 (10.8-14.8)	13.8 (12.1-17.4)	10.5 (9.5-12.6)	60.7 (59.7-61.5)
21	**IVT-MB-NWPZ-12**	**UPB 1117**	54.2 (46.8-57.9)	61.1 (56.7-65.5)	92.4 (84.4-96.8)	1.6 (0.5-3.9)	98.9 (97-100)	11.9 (10.0-13.8)	14.6 (12.9-17.4)	10.4 (9.4-12.4)	60.4 (59.5-60.9)
22	**IVT-MB-NWPZ-22**	**DWRUB 52 ©**	47.3 (43.1-51.0)	63.4 (60.0-66.2)	88.1 (81.1-96.3)	1.8 (0.2-3.8)	99.3 (97-100)	11.6 (10.3-13.6)	13.7 (11.5-17.5)	10.2 (8.6-12.4)	61.5 (60.2-63.0)
23	**IVT-MB-NWPZ-21**	**DWRB 137 ©***	46.4 (37.5-55.4)	59.5 (55.9-61.9)	90.8 (73.7-96.0)	2.1 (1.0-7.0)	97.7 (94-100)	10.7 (9.2-12.3)	15.3 (13.4-18.4)	10.4 (8.8-11.9)	61.1 (59.9-62.7)
24	**IVT-MB-NWPZ-23**	**DWRB 182 ©**	42.7 (36.2-47.3)	59.7 (53.0-64.9)	85.2 (71.8-95.4)	3.3 (0.5-8.1)	99.3 (97-100)	12.3 (9.9-14.8)	15.2 (13.2-18.9)	10.6 (9.2-12.1)	60.4 (59.2-62.0)
25	**IVT-MB-NWPZ-1**	**RD 2849 ©**	47.9 (40.7-51.8)	62.9 (57.1-67.8)	88.9 (71.1-97.0)	2.0 (0.3-7.5)	99.4 (99-100)	12.2 (10.3-14.9)	13.5 (11.4-15.4)	10.4 (8.9-12.7)	60.9 (59.5-62.2)
Overall			**50.6 (36.2-68.5)**	**62.5 (52.3-69.2)**	**92.0 (33.9-99.9)**	**1.4 (0.1-7.0)**	**99.1 (83-100)**	**12.1 (9.1-15.3)**	**13.9 (10.1-19.7)**	**10.3 (8.6-12.7)**	**61.0 (59.1-63.1)**

**Six row barley; values are mean across the locations; range in brackets; (TGW: Thousand Grain Weight; Bold : Bold Grain; Thin: Thin Grain; GER: Germinative Energy; BG: Beta Glucan)*

Table 5.5b: Variability in malt quality of IVT malt barley entries

S.N.	Code	Genotype	MY (%)	Friab (%)	Homo (%)	HWE (% fgdb)	FR (ml/hr.)	DP (0L)	SR (min.)	W- pH	W- FAN
1	**IVT-MB-NWPZ-9**	**BH 1050**	86.7 (84.8-88.7)	62.0 (55.9-71.8)	85.5 (78.4-93.4	79.5 (76.6-81.9)	318.3 (315-325)	106.2 (98-116.3)	6.7 (5-10)	6.0 (5.9-6.1)	136.7 (114.7-176.9)
2	**IVT-MB-NWPZ-16**	**BH 1051**	86.3 (85.4-87.3)	66.8 (58.7-76.8)	88.6 (81.9-94.5)	80.5 (75.6-85.4)	320 (315-325)	108 (104.2-111.1)	5.0 (5-5)	6.0 (6.0-6.1)	147.8 (123.2-186.8)
3	**IVT-MB-NWPZ-19**	**BH 1052**	85.4 (84.9-86.2)	68.0 (51.3-80.7)	92.4 (84.9-97.3)	80.5 (79.1-85.2)	248.3 (195-280)	104.2 (96.2-111.1)	6.7 (5-10)	5.9 (5.9-6.0)	172 (157.1-188.7)
4	**IVT-MB-NWPZ-5**	**DWRB 235**	85.7 (84.8-86.2)	70.3 (59.5-80.0)	95.9 (92.6-98.0)	75.3 (74.2-76.1)	230 (180-300)	82.7 (69.4-104.2)	10 (10-10)	6.0 (5.9-6.1)	155.9 (137.8-178.7)
5	**IVT-MB-NWPZ-14**	**DWRB 236**	86.1 (85.4-86.5)	66.6 (57.5-73.7)	94.8 (92.8-96.2)	79.4 (78.5-80.3)	233.3 (140-305)	90.2 (70.4-104.2)	6.7 (5-10)	6.0 (5.9-6.1)	171.5 (126.6-197.3)
6	**IVT-MB-NWPZ-15**	**DWRB 237**	85.1 (84.6-85.8)	69.9 (58.5-75.9)	94.8 (90.1-97.7)	79.7 (78.5-81.7)	263.3 (200-305)	89.2 (83.3-98.0)	6.7 (5-10)	6.0 (5.9-6.1)	160.8 (149.3-183.7)
7	**IVT-MB-NWPZ-25**	**DWRB 238**	85.5 (84.0-86.5)	67.4 (59.3-72.5)	94.7 (92.9-97.7)	80.6 (77.4-82.4)	210.0 (160-270)	92.2 (69.4-111.1)	6.7 (5-10)	6.0 (5.9-6.0)	161.8 (134.8-180.5)
8	**IVT-MB-NWPZ-7**	**DWRB 239**	88.4 (87.8-91.2)	59.2 (48.8-70.3)	89.0 (85.4-95.7)	76.1 (74.6-77.6)	223.3 (170-275)	89.9 (73.5-100)	8.3 (5-10)	6.0 (5.9-6.1)	155.7 (140.3-185.5)
9	**IVT-MB-NWPZ-24**	**DWRB 240**	84.8 (84.5-85.1)	78.8 (75.0-85.7)	98.0 (97.2-99.2)	80.6 (79.0-81.8)	256.7 (200-300)	99.4 (80.6-111.1)	5.0 (5-5)	6.0 (5.9-6.0)	185.0 (172.3-198.6)
10	**IVT-MB-NWPZ-18**	**KB 2131**	84.6 (84.5-84.7)	75.4 (73.8-78.4)	96.5 (94.7-97.7)	81.2 (78.1-85.2)	283.3 (250-300)	102.2 (98-108.7)	6.7 (5-10)	6.0 (6.0-6.1)	158.2 (138.6-177.8)
11	**IVT-MB-NWPZ-13**	**KB 2145**	86.8 (86.4-87.1)	79.5 (74.2-87.4)	98.0 (96.9-99.3)	79.1 (77.1-81.9)	290.0 (255-315)	100.7 (98-104.2)	5.0 (5-5)	6.0 (5.9-6.1)	163.7 (134.8-199.5)
12	**IVT-MB-NWPZ-3**	**PL 941**	88.0 (87.5-89.0)	63.1 (55.9-67.8)	92.9 (90.9-96.7)	77.0 (73.0-83.2)	186.7 (155-215)	111.3 (106.4-116.3)	8.3 (5-10)	6.0 (5.9-6.1)	125.2 108.7-150.6)
13	**IVT-MB-NWPZ-6**	**PL 942**	86.0 (83.9-89.7)	61.0 (58.8-64.9)	91.3 (84.2-96.6)	76.9 (74.0-80.6)	208.3 (175-260)	99.9 (89.3-106.4)	5.0 (5-5)	6.0 (5.9-6.0)	163.0 (131.8-200.5)
14	**IVT-MB-NWPZ-2**	**PL 943**	84.6 (83.9-86.0)	63.9 (60.5-67.7)	91.7 (90.2-94.2)	77.2 (73.4-85.1)	250.0 (200-285)	109.6 (104.2-113.6)	5.0 (5-5)	(6.0 (5.8-6.1)	163.8 (139.4-182.3)
15	**IVT-MB-NWPZ-11**	**PL 945**	84.8 (84.8-84.9)	72.2 (62.5-77.3)	96.7 (93.9-98.2)	77.7 (77.1-82.3)	255 (180-325)	108.7 (108.7-108.7	6.7 (5-10)	6.0 (5.8-6.1)	178.7 (149.8-198.2)
16	**IVT-MB-NWPZ-20**	**RD 3064**	84.8 (83.7-85.4)	70.5 (61.5-83.0)	93.8 (89.3-98.5)	77.7 (74.0-81.9)	240.0 (175-290)	81.3 (60.2-94.3)	8.3 (5-10)	6.0 (5.9-6.0)	172.3 (131.8-198.3)
17	**IVT-MB-NWPZ-8**	**RD 3065**	86.2 (85.7-86.6)	75.9 (73.7-78.0)	98.1 (97.2-99.0)	79.3 (77.0-81.5)	265 (195-300)	84.3 (75.8-89.3)	6.7 (5-10)	5.9 (5.9-6.0)	180 (166.5-196.4)
18	**IVT-MB-NWPZ-17**	**RD 3066**	86.0 (85.1-86.7)	70.3 (55.3-79.4)	98.2 (96.5-99.5)	79.2 (76.5-82.6)	253.3 (180-315)	95.8 (76.9-106.4)	6.7 (5-10)	5.9 (5.9-6.0)	180.7 (165.5-196.8)
19	**IVT-MB-NWPZ-10**	**RD 3067**	86.8 (85.3-88.7)	64.8 (59.0-69.2)	88.7 (80.7-93.0)	74.4 (63.2-80.4)	255 (220-285)	116.3 (116.3-116.3)	5.0 (5.0-5.0)	6.0 (5.8-6.1)	129.3 (113.0-158.7)
20	**IVT-MB-NWPZ-4**	**UPB 1116**	86.1 (85.5-86.8)	67.5 (55.6-81.9)	95.0 (94.1-96.5)	76.5 (75.5-78.4)	213.3 (105-275)	97.5 (94.3-100)	6.7 (5-10)	5.9 (5.8-5.9)	198.3 (183.4-221.3)
21	**IVT-MB-NWPZ-12**	**UPB 1117**	84.7 (82.4-86.3)	63.5 (45.1-83.0)	89.1 (81.2-98.7)	79.5 (74.4-82.3)	246.7 (155-305)	106.4 (106.4-106.4)	5.0 (5.0-5.0)	6.0 (5.9-6.1)	145.7 (125.3-171.9)
22	**IVT-MB-NWPZ-22**	**DWRUB 52 ©**	85.6 (84.9-86.1)	72.9 (62.4-83.4)	97.1 (95.8-99.6)	79.4 (77.5-82.4)	241.7 (180-305)	78.8 (68.5-94.3)	8.3 (5-10)	5.9 (5.9-6.0)	178.5 (168.4-184.6)
23	**IVT-MB-NWPZ-21**	**DWRB 137 ©***	84.9 (83.6-86.1)	56.9 (48.0-70.2)	82.2 (73.3-93.8)	80.9 (76.9-87.7)	233.3 (210-260)	109.6 (106.4-113.6)	5.0 (5.0-5.0)	6.1 (6.0-6.1)	147.5 (126.7-169.6)
24	**IVT-MB-NWPZ-23**	**DWRB 182 ©**	85.3 (85.1-85.4)	77.0 (74.3-81.7)	97.1 (95.6-98.6)	79.4 (77.4-83.2)	255 (225-280)	92.9 (80.6-106.4)	5.0 (5.0-5.0)	6.0 (6.0-6.0)	163.8 (162.5-165.7)
25	**IVT-MB-NWPZ-1**	**RD 2849 ©**	86.6 (86.1-86.9)	72.5 (57.1-84.7)	95.6 (92.4-99.1)	78.2 (75.3-81.7)	241.7 (160-300)	91.6 (80.6-106.4)	5.0 (5.0-5.0)	6.0 (6.0-6.0)	160.6 (133.0-188.2)
Overall			**85.8 (82.4-91.2)**	**68.6 (45.1-87.4)**	**93.4 (73.3-99.6)**	**78.6 (63.2-87.7)**	**248.9 (105-325)**	**98.0 (60.2-116.3)**	**6.4 (5-10)**	**6.0 (5.8-6.1)**	**162.3 (108.7-221.3)**

**Six row barley; range in brackets; (MY: Malt Yield; Fraib: Friability; Homo: Homogeneity; HWE: Hot Water Extract; DP: Diastatic Power; SR: Saccharification Rate; W—pH: Wort pH; W-FAN: Wort Free Amino Nitrogen; W-BG: Wort Beta Glucan)*

Table 5.6: Weighted performances of AVT entries for malting quality

S.N.	Code	Genotype	TW	Bold	Husk	Pro	BG	Fria	HWE	FR	DP	KI	FAN	WBG**	Total (36)
1	**AVT-MB-NWPZ-4**	**DWRB 219**	1	3	0	2	0	0	1	2	2	2	3	3	**19**
2	**AVT-MB-NWPZ-2**	**DWRUB 52 ©**	1	2	0	2	0	2	2	2	2	2	3	3	**21**
3	**AVT-MB-NWPZ-1**	**DWRB 137 ©***	0	3	0	2	0	1	1	2	3	2	3	3	**20**
4	**AVT-MB-NWPZ-5**	**DWRB 182 ©**	0	1	0	3	2	1	1	3	3	2	3	3	**22**
5	**AVT-MB-NWPZ-3**	**RD 2849 ©**	2	3	0	2	0	2	2	2	2	2	3	3	**23**

*Six row; **Single location only

Score range

HW	(Two Row): <61=0, 61.0- 63=1, 64.0-65.0=2, >65.0=3	(Six Row): <60=0, 60.0- 62.0=1, 63.0-64.0.0=2, >64.0=3
Bold	(Two-Row): >90.0=3, 88.0-90.0=2, 85.0-87.0=1, <85.0=0	(Six-row): >80= 3, 78.0-80.0=2, 76.0-77.0=1, <76=0
Husk	<10.5=3, 10.6-11.5=2, 11.6-12.5=1, >12.5=0	
Protein	<10.0=1, 10.0-11.0=2, 12-13=3 14=2, >14.0=1	
B. glucan	<3.5=3, 3.5 - 4.5.0=2,4.6-5.0=1,>5.0=0	
Friability	>70=3, 66-70=2, 60-65=1, <60=0	
HWE	Two-row: >80.0=3, 79-80=2, 76-78=1, <76=0	Six-row: >78=3, 77-78=2, 74-76=1, <74=0
FR	>250=3, 201-250=2, 150-200=1, <150=0	
DP	>90=3, 81-90=2, 70-80=1, <70=0	
KI	40-45 = 3, 38-39 & 46-48=2, 35-37=1, <35 & >48=0	
WBG	<300=3, 301-350=2, 351-400=1, >400=0	
FAN	>150=3, 126-150=2, 100-125=1, <100=0	

TW= Hectoliter Weight/Test weight, Bold= Bold grain, Husk= Husk (%), Pro= Protein % dwb, BG= B-glucan, HWE= Hot water extract (%), FR= Filtration rate (ml/hr.), DP= Diastatic power (^{0}L), KI= Kolbach index (%), WBG=Wort Beta Glucan, FAN=Free Amino Nitrogen

Table 5.7: Weighted performances of IVT entries for malting quality

S.N.	Code	Genotype	TW	Bold	Husk	Pro	Fria	HWE	FR	DP	FAN	Total (36)
1	**IVT-MB-NWPZ-9**	**BH 1050**	2	3	0	3	1	2	3	3	2	**19**
2	**IVT-MB-NWPZ-16**	**BH 1051**	3	3	1	3	2	3	3	3	2	**23**
3	**IVT-MB-NWPZ-19**	**BH 1052**	1	3	0	3	2	3	2	3	3	**20**
4	**IVT-MB-NWPZ-5**	**DWRB 235**	1	3	0	2	3	1	2	2	3	**17**
5	**IVT-MB-NWPZ-14**	**DWRB 236**	2	3	0	2	2	2	2	3	3	**19**
6	**IVT-MB-NWPZ-15**	**DWRB 237**	3	3	0	2	2	2	3	2	3	**20**
7	**IVT-MB-NWPZ-25**	**DWRB 238**	1	3	0	2	2	3	2	3	3	**19**
8	**IVT-MB-NWPZ-7**	**DWRB 239**	2	3	0	2	0	1	2	2	3	**15**
9	**IVT-MB-NWPZ-24**	**DWRB 240**	1	3	0	2	3	3	3	3	3	**21**
10	**IVT-MB-NWPZ-18**	**KB 2131**	0	0	0	3	3	3	3	3	3	**18**
11	**IVT-MB-NWPZ-13**	**KB 2145**	1	3	0	2	3	2	3	3	3	**20**
12	**IVT-MB-NWPZ-3**	**PL 941**	1	3	0	3	1	1	1	3	2	**15**
13	**IVT-MB-NWPZ-6**	**PL 942**	1	3	0	3	1	1	2	3	3	**17**
14	**IVT-MB-NWPZ-2**	**PL 943**	1	3	0	3	1	1	3	3	3	**18**
15	**IVT-MB-NWPZ-11**	**PL 945**	1	3	0	3	3	1	3	3	3	**20**
16	**IVT-MB-NWPZ-20**	**RD 3064**	1	3	0	3	3	1	2	2	3	**18**
17	**IVT-MB-NWPZ-8**	**RD 3065**	1	1	0	2	3	2	3	2	3	**17**
18	**IVT-MB-NWPZ-17**	**RD 3066**	2	3	0	3	3	2	3	3	3	**22**
19	**IVT-MB-NWPZ-10**	**RD 3067**	1	3	0	2	1	0	3	3	2	**15**
20	**IVT-MB-NWPZ-4**	**UPB 1116**	1	3	0	3	2	1	2	3	3	**18**
21	**IVT-MB-NWPZ-12**	**UPB 1117**	1	3	0	3	1	2	2	3	2	**17**
22	**IVT-MB-NWPZ-22**	**DWRUB 52 ©**	1	2	0	2	3	2	2	1	3	**16**
23	**IVT-MB-NWPZ-21**	**DWRB 137 ©***	0	3	0	2	0	3	2	3	2	**15**
24	**IVT-MB-NWPZ-23**	**DWRB 182 ©**	0	1	0	3	3	2	3	3	3	**18**
25	**IVT-MB-NWPZ-1**	**RD 2849 ©**	1	2	0	3	3	1	2	3	3	**18**

*= six- row barley

Score range

HW	(Two Row): <61=0, 61.0- 63=1, 64.0-65.0=2, >65.0=3	(Six Row): <60=0, 60.0- 62.0=1, 63.0-64.0.0=2, >64.0=3
Bold	(Two-Row): >90.0=3, 88.0-90.0=2, 85.0-87.0=1, <85.0=0	(Six-row): >80= 3, 78.0-80.0=2, 76.0-77.0=1, <76=0
Husk	<10.5=3, 10.6-11.5=2, 11.6-12.5=1, >12.5=0	
Protein	<10.0=1, 10.0-11.0=2, 12-13=3 14=2, >14.0=1	
Berta glucan	<3.5=3, 3.5 - 4.5.0=2,4.6-5.0=1,>5.0=0	
Friability	>70=3, 66-70=2, 60-65=1, <60=0	
HWE	Two-row: >80.0=3, 79-80=2, 76-78=1, <76=0	Six-row: >78=3, 77-78=2, 74-76=1, <74=0
FR	>250=3, 201-250=2, 150-200=1, <150=0	
DP	>90=3, 81-90=2, 70-80=1, <70=0	
KI	40-45 = 3, 38-39 & 46-48=2, 35-37=1, <35 & >48=0	
WBG	<300=3, 301-350=2, 351-400=1, >400=0	
FAN	>150=3, 126-150=2, 100-125=1, <100=0	

TW= Hectoliter Weight/Test weight, Bold= Bold grain, Husk= Husk (%), Pro= Protein % dwb, BG= B- glucan, HWE= Hot water extract (%), FR= Filtration rate (ml/hr.), DP= Diastatic power (^{0}L), KI= Kolbach index (%), WBG=Wort Beta Glucan, FAN=Free Amino Nitrogen

Annexure - 1

ANALYTICAL GUIDELINES FOR BARLEY BREEDERS IN INDIA (Revised on 22.06.2020)

S.N.	Parameter	Desirable Values	
		Two Row	**Six Row**
	GRAIN PARAMETERS		
1	**Moisture (%)**	<12.0	<12.0
2	**Hectoliter Weight (kg/hl)**	> 65.0	> 62.0
3	**Kernel Size** **Bold (On 2.5 mm)** **Thin (Through 2.2mm)**	Uniform plump >90% <3%	Uniform plump >80% <5%
4	**1000 grain weight(g)**	42-46	40-46
5	**Husk Content**	<11.0%	<11.0%
6	**Protein Content (dry weight basis)**	9.0-13%	9.0-13%
7	**Germination Capacity (%)**	>96%	>96%
8	**Germinative Energy (72hrs) (%)**	>96%	>96%
9	**β-glucan (dry weight basis)**	<4.0%	<4.0%
	MALT PARAMETERS		
7.	**Malt Homogeneity**	>90%	>90%
8.	**Malt Friability**	>70.0	>65.0
9.	**Total Protein (dry weight basis)**	4-5 %	4-5 %
10.	**Soluble/ total Protein (S/T) Ratio (Kolbach Index)**	40-45%	40-45%
11.	**Malt Extract (minimum) (fgdb)**	>80.0%	>78.0
12.	**Wort Viscosity**	<1.500 mPas	<1.500 mPas
13.	**Wort turbidity**	Clear	Clear
14.	**Diastatic Power (^{0}L)**	>90	>90
15.	**Wort β-glucan (ppm)**	<300 ppm	<300 ppm
16.	**FAN (ppm)**	>150 ppm	>150 ppm

PARAMETERS & WEIGHTAGE/SCORE FOR SELECTION OF PROMISING MALT BARLEY GENOTYPES (BOTH SIX & TWO ROW Type) IN INDIA (Revised on 22.06.2020)

S. No.	Parameter	Range (Score/ weight age)	
		Two Row	**Six Row**
GRAIN PARAMETERS			
1.	**Test weight / Hectoliter weight (kg/hl)**	<61=0 61.0- 63.0=1 64.0-65.0=2, >65.0=3	<60=0 60.0- 62.0=1 63.0-64.0.0=2, >64.0=3
2	**Bold grains (%)** **Grains retained on 2.5 mm screen**	>90.0=3 88.0-90.0=2 85.0-87.0=1 <85.0=0	>80= 3 78.0-80.0=2 76.0-77.0=1 <76=0
3.	**Protein content (% dwb)**	<10.0=1 10.0-11.0=2 12-13=3 14=2 >14.0=1	<10.0=1 10.0-11.0=2 12-13=3 14=2 >14.0=1
4.	**Husk content (%dwtb)**	<10.5=3 10.6-11.5=2 11.6-12.5=1 >12.5=0	<10.5=3 10.6-11.5=2 11.6-12.5=1 >12.5=0
5.	**Grain β- glucan content (%dwtb)**	<3.5=3 3.5 - 4.5.0=2 4.6-5.0=1 >5.0=0	<3.5=3 3.5 - 4.5.0=2 4.6-5.0=1 >5.0=0
MALT PARAMETERS			
6.	**Malt Friability (%)**	>70=3 66-70=2 60-65=1 <60=0	>70=3 65-70=2 60-66=1 <60=0
7.	**Filtration rate (ml/hr)**	>250=3 201-250=2 150-200=1 <150=0	>250=3 201-250=2 150-200=1 <150=0
8.	**Hot Water Extract (fine grind dry weight basis)**	>80.0=3 79-80=2 76-78=1, <76=0	>78=3 77-78=2 74-76=1 <74=0
9.	**Diastatic Power(ºL)**	>90=3 81-90=2 70-80=1 <70=0	>90=3 81-90=2 70-80=1 <70=0
10.	**Wort β- glucan content (ppm)**	<300 = 3 300-350= 2 351-400 = 1 >400 = 0	<300 = 3 300-350= 2 351-400 = 1 >400 = 0
11.	**Free Amino Nitrogen (FAN content in ppm)**	>150 = 3 126-150 = 2 100-125 = 1 < 100 = 0	>150 = 3 126-150 = 2 100-125 = 1 < 100 = 0
12.	**Wort Viscosity (mPas)**	<1.500 = 3 1.501-1.550 =2 1.550-1.600 = 1 >1.600=0	<1.500 = 3 1.501-1.550 =2 1.550-1.600 = 1 >1.600=0
13.	**Kolbach index (%)**	40-45 = 3 38-39 & 46-48=2 35-37=1 <35 & >48=0	40-45 = 3 38-39 & 46-48=2 35-37=1 <35 & >48=0

** Finalized in first meeting of the "NATIONAL CORE GROUP ON MALT BARLEY DEVELOPMENT" at DWR, Karnal on 12 Dec., 1995 and revised during the annual workshop at IARI, New Delhi in August 2004 and further on 05.03.2016 at ICAR-IIWBR, Karnal. Latest revision on 22.06.2020.*

Annexure 2: AVT-TS-NWPZ-MALT BARLEY

GRAIN PARAMETERS

Table 5.2.1: Thousand grain weight of AVT entries from different locations

S.N	Code	Genotype	Hisar	Bathinda	Durgapura	Karnal	Ludhiana	Pantnagar	Modipuram	Ajmer	Mean
1	AVT-MB-NWPZ-4	DWRB 219	53	50	56	54	46	53	52	59	53
2	AVT-MB-NWPZ-2	DWRUB 52 ©	47	43	51	49	37	47	45	50	46
3	AVT-MB-NWPZ-1	DWRB 137 ©*	44	45	53	48	40	43	50	51	47
4	AVT-MB-NWPZ-5	DWRB 182 ©	38	34	49	43	36	46	46	53	43
5	AVT-MB-NWPZ-3	RD 2849 ©	46	44	52	47	43	50	51	51	48
Average			46	43	52	48	40	48	49	53	47

*= 6 row barley

Table 5.2.2: Test weight (kg/hl) of AVT entries from different locations

S.N	Code	Genotype	Hisar	Bathinda	Durgapura	Karnal	Ludhiana	Pantnagar	Modipuram	Ajmer	Mean
1	AVT-MB-NWPZ-4	DWRB 219	59	57	65	65	66	63	59	59	62
2	AVT-MB-NWPZ-2	DWRUB 52 ©	59	60	67	67	66	61	62	62	63
3	AVT-MB-NWPZ-1	DWRB 137 ©*	59	58	63	64	63	59	59	57	60
4	AVT-MB-NWPZ-5	DWRB 182 ©	56	53	65	63	62	61	60	61	60
5	AVT-MB-NWPZ-3	RD 2849 ©	58	61	67	67	67	66	61	63	64
Average			58	58	65	65	65	62	60	61	62

*= 6 row barley

Table 5.2.3: Proportion of bold grains (%) of AVT entries from different locations

S.N	Code	Genotype	Hisar	Bathinda	Durgapura	Karnal	Ludhiana	Pantnagar	Modipuram	Ajmer	Mean
1	AVT-MB-NWPZ-4	DWRB 219	95.2	95.5	98.2	97.4	89.1	98.2	94.5	97.0	95.6
2	AVT-MB-NWPZ-2	DWRUB 52 ©	91.3	78.0	96.5	93.9	65.5	94.2	91.5	93.8	88.1
3	AVT-MB-NWPZ-1	DWRB 137 ©*	91.6	85.0	96.5	95.7	79.4	87.4	95.6	94.6	90.7
4	AVT-MB-NWPZ-5	DWRB 182 ©	75.4	64.2	97.5	88.7	71.4	96.0	90.6	97.1	85.1
5	AVT-MB-NWPZ-3	RD 2849 ©	88.3	80.0	98.5	93.2	82.1	95.5	94.4	95.6	91.0
Average			88.4	80.5	97.4	93.8	77.5	94.3	93.3	95.6	90.1

*= 6 row barley

Table 5.2.4: Proportion of thin grains (%) of AVT entries from different locations

S. N	Code	Genotype	Hisar	Bathinda	Durgapura	Karnal	Ludhiana	Pantnagar	Modipuram	Ajmer	Mean
1	AVT-MB-NWPZ-4	DWRB 219	0.7	0.8	0.2	0.2	1.5	0.2	0.9	0.6	0.6
2	AVT-MB-NWPZ-2	DWRUB 52 ©	1.1	3.6	0.3	0.8	9.1	0.6	0.9	0.4	2.1
3	AVT-MB-NWPZ-1	DWRB 137 ©*	1.3	2.9	0.8	0.6	4.4	2.6	0.8	1.0	1.8
4	AVT-MB-NWPZ-5	DWRB 182 ©	5.1	9.3	0.3	2.6	6.8	0.6	1.5	0.3	3.3
5	AVT-MB-NWPZ-3	RD 2849 ©	1.4	3.1	0.4	1.0	2.7	0.6	0.8	0.5	1.3
Average			1.9	3.9	0.4	1.0	4.9	0.9	1.0	0.6	1.8

*= 6 row barley

Table 5.2.5: Germinative energy (% 72hrs) of AVT entries from different locations

S.N	Code	Genotype	Hisar	Bathinda	Durgapura	Karnal	Ludhiana	Pantnagar	Modipuram	Ajmer	Mean
1	AVT-MB-NWPZ-4	DWRB 219	100.0	100.0	100.0	100.0	98.0	100.0	98.0	99	99.4
2	AVT-MB-NWPZ-2	DWRUB 52 ©	98.0	100.0	99.0	100.0	100.0	100.0	98.0	100	99.4
3	AVT-MB-NWPZ-1	DWRB 137 ©*	100.0	99.0	100.0	100.0	99.0	100.0	97.0	99	99.3
4	AVT-MB-NWPZ-5	DWRB 182 ©	100.0	100.0	100.0	100.0	100.0	100.0	99.0	100	99.9
5	AVT-MB-NWPZ-3	RD 2849 ©	100.0	100.0	100.0	99.0	100.0	99.0	100.0	100	99.8
Average			99.6	99.8	99.8	99.8	99.4	99.8	98.4	99.6	99.5

*= 6 row barley

Table 5.2.6: Protein content (%) # of AVT entries from different locations

S.N	Code	Genotype	Hisar	Bathinda	Durgapura	Karnal	Ludhiana	Pantnagar	Modipuram	Ajmer	Mean
1	AVT-MB-NWPZ-4	DWRB 219	11.5	11.5	10.3	11.7	12.2	10.4	12.0	13.3	11.6
2	AVT-MB-NWPZ-2	DWRUB 52 ©	10.6	12.7	10.8	11.6	13.4	10.2	12.0	11.5	11.6
3	AVT-MB-NWPZ-1	DWRB 137 ©*	10.9	11.6	10.3	11.1	11.3	9.8	10.4	11.1	10.8
4	AVT-MB-NWPZ-5	DWRB 182 ©	11.6	14.9	10.8	12.3	13.1	10.0	11.3	12.6	12.1
5	AVT-MB-NWPZ-3	RD 2849 ©	10.2	12.7	10.4	11.1	12.3	10.9	11.2	11.8	11.3
Average			11.0	12.7	10.5	11.6	12.5	10.3	11.4	12.1	11.5

*= 6 row barley # Predicted values through NIR

Table 5.2.7: Husk content (%) of AVT entries from different locations

S. N	Code	Genotype	Hisar	Bathinda	Durgapura	Karnal	Ludhiana	Pantnagar	Modipuram	Ajmer	Mean
1	AVT-MB-NWPZ-4	DWRB 219	14.0	13.2	13.2	13.5	12.4	14.4	17.0	16.0	14.2
2	AVT-MB-NWPZ-2	DWRUB 52 ©	13.7	13.5	12.0	13.1	12.8	13.6	16.5	15.9	13.9
3	AVT-MB-NWPZ-1	DWRB 137 ©*	14.4	13.5	13.2	11.8	12.1	14.2	15.4	17.9	14.1
4	AVT-MB-NWPZ-5	DWRB 182 ©	15.8	17.2	13.2	13.1	14.3	14.7	16.1	17.1	15.2
5	AVT-MB-NWPZ-3	RD 2849 ©	13.6	13.8	11.9	12.6	12.4	13.9	15.5	17.2	13.9
Average			14.3	14.2	12.7	12.8	12.8	14.2	16.1	16.8	14.2

*= 6 row barley

Table 5.2.8: β--glucan content (% dwb) of AVT entries from different locations

S.N	Code	Genotype	Hisar	Bathinda	Ludhiana	Mean
1	AVT-MB-NWPZ-4	DWRB 219	5.9	5.3	5.6	5.6
2	AVT-MB-NWPZ-2	DWRUB 52 ©	5.3	5.9	4.9	5.4
3	AVT-MB-NWPZ-1	DWRB 137 ©*	5.6	5.9	5.5	5.6
4	AVT-MB-NWPZ-5	DWRB 182 ©	4.6	4.3	4.7	4.5
5	AVT-MB-NWPZ-3	RD 2849 ©	5.2	5.6	5.7	5.5
Average			5.3	5.4	5.3	5.3

*= 6 row barley

Table 5.2.9: Moisture content in grains (%) # of AVT entries from different locations

S. N	Code	Genotype	Hisar	Bathinda	Durgapura	Karnal	Ludhiana	Pantnagar	Modipuram	Ajmer	Mean
1	AVT-MB-NWPZ-4	DWRB 219	9.3	10.2	9.7	9.7	9.7	11.5	13.2	12.8	10.8
2	AVT-MB-NWPZ-2	DWRUB 52 ©	9.5	9.5	9.7	9.7	10.5	11.7	13.4	12.1	10.8
3	AVT-MB-NWPZ-1	DWRB 137 ©*	9.9	9.6	10.5	9.8	9.6	11.6	13.4	13.4	11.0
4	AVT-MB-NWPZ-5	DWRB 182 ©	9.8	9.8	9.5	10.8	9.8	11.5	12.9	13.1	10.9
5	AVT-MB-NWPZ-3	RD 2849 ©	9.4	10.5	9.5	9.7	9.8	11.3	12.6	12.9	10.7
Average			9.6	9.9	9.8	9.9	9.9	11.5	13.1	12.9	10.8

*= 6 row barley # Predicted values through NIR

Table 5.2.10: Starch content in grains (%dwt basis) # of AVT entries from different locations

S. N	Code	Genotype	Hisar	Bathinda	Durgapura	Karnal	Ludhiana	Pantnagar	Modipuram	Ajmer	Mean
1	AVT-MB-NWPZ-4	DWRB 219	61.0	60.1	60.8	62.1	61.9	61.5	60.9	59.4	61.0
2	AVT-MB-NWPZ-2	DWRUB 52 ©	61.7	60.9	61.6	62.6	60.6	60.4	61.6	60.9	61.3
3	AVT-MB-NWPZ-1	DWRB 137 ©*	61.2	60.6	60.4	61.5	61.3	61.1	61.7	61.0	61.1
4	AVT-MB-NWPZ-5	DWRB 182 ©	60.4	58.5	61.7	60.3	59.9	61.5	61.3	60.1	60.5
5	AVT-MB-NWPZ-3	RD 2849 ©	61.5	60.2	61.9	62.0	61.6	61.4	61.5	61.0	61.4
Average			61.2	60.1	61.3	61.7	61.1	61.2	61.4	60.5	61.0

*= 6 row barley # Predicted values through NIR

MALT PARAMETERS

Table 5.2.11: Malt yield (%) of AVT entries from different locations

S.N	Code	Genotype	Hisar	Bathinda	Durgapura	Karnal	Ludhiana	Pantnagar	Modipuram	Ajmer	Mean
1	AVT-MB-NWPZ-4	DWRB 219	85.9	84.8	83.2	85.3	85.7	85.1	86.7	86.7	85.4
2	AVT-MB-NWPZ-2	DWRUB 52 ©	86.1	84.7	83.0	84.5	86.2	83.8	85.7	86.2	85.0
3	AVT-MB-NWPZ-1	DWRB 137 ©*	85.2	78.9	83.9	85.1	86.2	83.9	84.1	85.0	84.0
4	AVT-MB-NWPZ-5	DWRB 182 ©	86.8	82.8	84.0	87.0	84.4	84.0	84.5	85.5	84.9
5	AVT-MB-NWPZ-3	RD 2849 ©	87.2	84.3	83.8	85.0	85.3	84.1	84.4	86.2	85.0
Average			86.2	83.1	83.6	85.4	85.5	84.2	85.1	85.9	84.9

*= 6 row barley

Table 5.2.12: Malt friability (%) of AVT entries from different locations

S.N	Code	Genotype	Hisar	Bathinda	Durgapura	Karnal	Ludhiana	Pantnagar	Modipuram	Ajmer	Mean
1	AVT-MB-NWPZ-4	DWRB 219	50.9	75.1	75.9	74.2	53.4	64.5	42.6	41.3	59.7
2	AVT-MB-NWPZ-2	DWRUB 52 ©	67.2	62.5	82.8	80.9	51.7	83.2	52.9	60.8	67.7
3	AVT-MB-NWPZ-1	DWRB 137 ©*	59.6	70.4	83.8	78.9	48.2	68.3	56.9	52.7	64.8
4	AVT-MB-NWPZ-5	DWRB 182 ©	72.1	61.9	72.8	58.4	67.7	76.3	59.4	57.6	65.8
5	AVT-MB-NWPZ-3	RD 2849 ©	75.2	64.8	82.9	79.3	60.8	71.7	54.9	54.2	68.0
Average			65.0	66.9	79.6	74.3	56.4	72.8	53.3	53.3	65.2

*= 6 row barley

Table 5.2.13: Malt homogeneity (%) of AVT entries from different locations

S.N	Code	Genotype	Hisar	Bathinda	Durgapura	Karnal	Ludhiana	Pantnagar	Modipuram	Ajmer	Mean
1	AVT-MB-NWPZ-4	DWRB 219	89.3	97.6	95.5	97.2	86.6	97.4	78.3	92.5	91.8
2	AVT-MB-NWPZ-2	DWRUB 52 ©	97.1	94.0	98.0	98.1	90.2	99.0	81.7	97.2	94.4
3	AVT-MB-NWPZ-1	DWRB 137 ©*	87.5	95.6	98.0	98.2	74.4	94.5	82.3	84.9	89.4
4	AVT-MB-NWPZ-5	DWRB 182 ©	96.8	88.9	97.8	86.6	94.2	96.9	84.6	82.5	91.0
5	AVT-MB-NWPZ-3	RD 2849 ©	98.1	94.3	97.8	97.0	92.0	98.8	88.5	95.0	95.2
Average			93.8	94.1	97.4	95.4	87.5	97.3	83.1	90.4	92.4

*= 6 row barley

Table 5.2.14: Hot water extract (% fgdb) of AVT entries from different locations

S. N	Code	Genotype	Hisar	Bathinda	Durgapura	Karnal	Ludhiana	Pantnagar	Modipuram	Ajmer	Mean
1	AVT-MB-NWPZ-4	DWRB 219	77.3	78.6	83.3	72.4	80.4	79.0	77.0	78.2	78.3
2	AVT-MB-NWPZ-2	DWRUB 52 ©	76.6	74.2	83.0	81.5	83.1	77.1	76.5	80.6	79.1
3	AVT-MB-NWPZ-1	DWRB 137 ©*	74.7	78.9	81.4	79.1	82.8	74.9	74.5	76.6	77.9
4	AVT-MB-NWPZ-5	DWRB 182 ©	79.9	77.3	85.8	71.1	82.6	79.9	78.0	74.4	78.6
5	AVT-MB-NWPZ-3	RD 2849 ©	77.4	76.2	87.6	74.4	82.5	78.2	79.6	80.6	79.5
Average			77.2	77.0	84.2	75.7	82.3	77.8	77.1	78.1	78.7

*= 6 row barley

Table 5.2.15: Wort filtration rate (ml/hr) of AVT entries from different locations

S.N	Code	Genotype	Hisar	Bathinda	Durgapura	Karnal	Ludhiana	Pantnagar	Modipuram	Ajmer	Mean
1	AVT-MB-NWPZ-4	DWRB 219	305	305	195	220	180	200	200	165	221.3
2	AVT-MB-NWPZ-2	DWRUB 52 ©	290	305	295	250	150	265	155	230	242.5
3	AVT-MB-NWPZ-1	DWRB 137 ©*	300	265	280	280	180	300	80	200	235.6
4	AVT-MB-NWPZ-5	DWRB 182 ©	300	250	255	280	185	290	200	300	257.5
5	AVT-MB-NWPZ-3	RD 2849 ©	305	300	270	295	165	250	145	180	238.8
Average			300.0	285.0	259.0	265.0	172.0	261.0	156.0	215.0	239.1

*= 6 row barley

Table 5.2.16: Diastatic power (^{0}L) of AVT entries from different locations

S.N	Code	Genotype	Hisar	Bathinda	Durgapura	Karnal	Ludhiana	Pantnagar	Modipuram	Ajmer	Mean
1	AVT-MB-NWPZ-4	DWRB 219	98.0	106.4	100.0	89.3	80.6	75.8	65.8	83.3	87.4
2	AVT-MB-NWPZ-2	DWRUB 52 ©	82.0	96.2	108.7	96.2	75.8	70.4	76.9	73.5	85.0
3	AVT-MB-NWPZ-1	DWRB 137 ©*	111.1	111.1	108.7	108.7	111.1	113.6	98.0	89.3	106.5
4	AVT-MB-NWPZ-5	DWRB 182 ©	108.7	111.1	108.7	106.4	98.0	108.7	87.7	106.4	104.5
5	AVT-MB-NWPZ-3	RD 2849 ©	89.3	94.3	104.2	104.2	65.8	75.8	70.4	66.7	83.8
Average			97.8	103.8	106.1	100.9	86.3	88.9	79.8	83.8	93.4

*= 6 row barley

Table 5.2.17: Saccharification rate (minutes) of AVT entries from different locations

S.N	Code	Genotype	Hisar	Bathinda	Durgapura	Karnal	Ludhiana	Pantnagar	Modipuram	Ajmer	Mean
1	AVT-MB-NWPZ-4	DWRB 219	5	10	5	5	5	5	10	5	6.3
2	AVT-MB-NWPZ-2	DWRUB 52 ©	5	5	5	10	5	5	10	5	6.3
3	AVT-MB-NWPZ-1	DWRB 137 ©*	5	10	10	5	5	5	5	5	6.3
4	AVT-MB-NWPZ-5	DWRB 182 ©	5	10	5	5	10	5	5	5.0	6.3
5	AVT-MB-NWPZ-3	RD 2849 ©	10	5	5	5	5	5	5	10	6.3
Average			6.0	8.0	6.0	6.0	6.0	5.0	7.0	6.0	6.3

*= 6 row barley

Table 5.2.18: Wort pH of AVT entries from different locations

S.N	Code	Genotype	Hisar	Bathinda	Durgapura	Karnal	Ludhiana	Pantnagar	Modipuram	Ajmer	Mean
1	AVT-MB-NWPZ-4	DWRB 219	6.0	5.9	6.0	6.1	5.9	6.0	6.0	6.0	6.0
2	AVT-MB-NWPZ-2	DWRUB 52 ©	5.9	5.9	6.1	5.9	5.9	6.0	6.0	6.1	6.0
3	AVT-MB-NWPZ-1	DWRB 137 ©*	6.0	5.9	6.0	6.9	6.1	6.1	6.1	6.2	6.2
4	AVT-MB-NWPZ-5	DWRB 182 ©	6.0	6.0	6.0	6.1	6.0	6.1	6.1	6.1	6.1
5	AVT-MB-NWPZ-3	RD 2849 ©	5.9	5.9	6.0	6.0	5.9	5.9	6.0	6.1	6.0
Average			6.0	5.9	6.0	6.2	5.9	6.0	6.0	6.1	6.0

*= 6 row barley

Table 5.2.19: Kolbach Index (KI) of AVT entries from different locations

S.N	Code	Genotype	Hisar	Bathinda	Durgapura	Karnal	Ludhiana	Pantnagar	Modipuram	Ajmer	Mean
1	AVT-MB-NWPZ-4	DWRB 219	38.9	40.9	NA	NA	NA	39.6	37.3	39.8	39.3
2	AVT-MB-NWPZ-2	DWRUB 52 ©	39.6	NA	NA	NA	NA	42.6	36.6	40.4	39.8
3	AVT-MB-NWPZ-1	DWRB 137 ©*	39.1	NA	NA	NA	NA	38.1	40.0	38.4	38.9
4	AVT-MB-NWPZ-5	DWRB 182 ©	35.0	41.2	NA	NA	NA	39.1	38.5	40.4	38.8
5	AVT-MB-NWPZ-3	RD 2849 ©	38.7	37.1	NA	NA	NA	41.3	38.8	37.1	38.6
Average			38.3	39.7	NA	NA	NA	40.2	38.2	39.2	39.1

*= 6 row barley

Table 5. 2.20: Wort FAN content (ppm) of AVT entries from different locations

S.N	Code	Genotype	Hisar	Bathinda	Durgapura	Karnal	Ludhiana	Pantnagar	Modipuram	Ajmer	Mean
1	AVT-MB-NWPZ-4	DWRB 219	133.0	199.1	150.6	145.8	169.6	147.8	121.4	141.8	151.1
2	AVT-MB-NWPZ-2	DWRUB 52 ©	165.2	193.3	148.9	196.2	183.7	168.8	154.5	162.7	171.7
3	AVT-MB-NWPZ-1	DWRB 137 ©*	142.9	192.0	147.2	182.1	152.8	143.3	140.9	127.7	153.6
4	AVT-MB-NWPZ-5	DWRB 182 ©	156.7	187.9	181.5	137.3	186.4	137.1	142.3	135.9	158.1
5	AVT-MB-NWPZ-3	RD 2849 ©	166.5	198.2	188.0	176.5	196.8	172.8	155.9	152.7	175.9
Average			152.9	194.1	163.3	167.6	177.9	153.9	143.0	144.2	162.1

*= 6 row barley

Table 5.2.21: Wort β--Glucan Content (ppm) of AVT entries at one location

S.N	Code	Genotype	Bathinda	Mean
1	AVT-MB-NWPZ-4	DWRB 219	279.9	279.9
2	AVT-MB-NWPZ-2	DWRUB 52 ©	250.9	250.9
3	AVT-MB-NWPZ-1	DWRB 137 ©*	267.4	267.4
4	AVT-MB-NWPZ-5	DWRB 182 ©	92.2	92.2
5	AVT-MB-NWPZ-3	RD 2849 ©	193.4	193.4
Average			216.8	216.8

*= 6 row barley

Annexure 3: IVT-TS-MALT BARLEY

GRAIN PARAMETERS

Table 5.3.1: Thousand grain weight (g) of IVT entries from different locations

S.N	Code	Genotype	Hisar	Bathinda	Durgapura	Karnal	Ludhiana	Pantnagar	Modipuram	Mean
1	IVT-MB-NWPZ-9	BH 1050	48.6	45.7	50.5	50.7	44.8	51.3	50.9	48.9
2	IVT-MB-NWPZ-16	BH 1051	48.4	45.7	51.4	49.7	45.7	51.3	51.1	49.1
3	IVT-MB-NWPZ-19	BH 1052	55.3	54.9	59.6	54.6	49.8	57.0	60.2	55.9
4	IVT-MB-NWPZ-5	DWRB 235	49.1	41.8	53.7	49.1	46.0	52.2	51.3	49.0
5	IVT-MB-NWPZ-14	DWRB 236	50.7	47.1	63.5	51.0	47.5	51.1	54.8	52.3
6	IVT-MB-NWPZ-15	DWRB 237	48.3	45.1	51.1	48.3	41.8	50.7	52.3	48.2
7	IVT-MB-NWPZ-25	DWRB 238	52.4	47.7	68.5	54.2	48.9	54.2	54.3	54.3
8	IVT-MB-NWPZ-7	DWRB 239	48.2	43.9	54.3	49.1	45.0	51.7	49.4	48.8
9	IVT-MB-NWPZ-24	DWRB 240	50.7	50.1	54.8	52.1	47.0	53.6	57.3	52.3
10	IVT-MB-NWPZ-18	KB 2131	43.7	49.9	37.9	49.4	38.1	48.4	51.8	45.6
11	IVT-MB-NWPZ-13	KB 2145	48.2	49.7	52.7	51.1	46.0	55.9	58.7	51.8
12	IVT-MB-NWPZ-3	PL 941	52.5	51.0	56.7	55.1	48.5	55.5	57.0	53.8
13	IVT-MB-NWPZ-6	PL 942	51.0	49.7	53.2	52.2	49.2	52.0	51.6	51.3
14	IVT-MB-NWPZ-2	PL 943	46.8	44.1	48.9	46.2	44.6	48.3	49.2	46.9
15	IVT-MB-NWPZ-11	PL 945	48.2	50.2	51.1	46.2	45.0	47.9	48.8	48.2
16	IVT-MB-NWPZ-20	RD 3064	58.9	52.5	53.4	61.7	53.1	63.0	61.1	57.7
17	IVT-MB-NWPZ-8	RD 3065	46.9	44.0	49.5	48.3	43.5	51.5	49.8	47.6
18	IVT-MB-NWPZ-17	RD 3066	52.4	50.9	50.7	54.3	47.4	58.4	58.2	53.2
19	IVT-MB-NWPZ-10	RD 3067	56.1	53.4	67.3	56.8	50.5	58.8	61.4	57.8
20	IVT-MB-NWPZ-4	UPB 1116	55.2	47.3	58.7	54.9	45.7	59.5	55.3	53.8
21	IVT-MB-NWPZ-12	UPB 1117	55.7	51.6	57.9	57.5	46.8	53.8	56.3	54.2
22	IVT-MB-NWPZ-22	DWRUB 52 ©	45.9	43.1	51.0	47.2	45.7	49.0	48.9	47.3
23	IVT-MB-NWPZ-21	DWRB 137 ©*	44.5	44.3	55.4	45.8	37.5	48.4	48.6	46.4
24	IVT-MB-NWPZ-23	DWRB 182 ©	44.3	36.2	47.3	42.3	37.3	45.3	46.3	42.7
25	IVT-MB-NWPZ-1	RD 2849 ©	47.2	45.9	51.8	48.6	40.7	50.9	50.4	47.9
Average			50.0	47.4	54.0	51.1	45.4	52.8	53.4	50.6

**= 6 row barley*

Table 5.3.2: Test weight (kg/hl) of IVT entries from different locations

S.N	Code	Genotype	Hisar	Bathinda	Durgapura	Karnal	Ludhiana	Pantnagar	Modipuram	Mean
1	IVT-MB-NWPZ-9	BH 1050	63.6	58.2	67.1	69.2	67.9	63.7	63.3	64.7
2	IVT-MB-NWPZ-16	BH 1051	63.9	60.3	65.6	69.1	69.2	63.6	63.2	65.0
3	IVT-MB-NWPZ-19	BH 1052	59.8	58.6	65.9	65.6	66.8	61.6	62.6	63.0
4	IVT-MB-NWPZ-5	DWRB 235	62.6	57.5	66.1	66.4	66.1	63.3	62.4	63.5
5	IVT-MB-NWPZ-14	DWRB 236	62.2	59.1	66.9	68.8	67.4	62.5	63.3	64.3
6	IVT-MB-NWPZ-15	DWRB 237	64.7	57.1	67.7	68.9	69.6	67.1	64.0	65.6
7	IVT-MB-NWPZ-25	DWRB 238	59.0	56.9	64.7	65.8	66.9	62.4	61.1	62.4
8	IVT-MB-NWPZ-7	DWRB 239	61.1	58.1	68.3	67.2	66.5	62.5	64.3	64.0
9	IVT-MB-NWPZ-24	DWRB 240	62.2	56.0	66.4	65.3	64.8	61.3	60.2	62.3
10	IVT-MB-NWPZ-18	KB 2131	53.5	53.9	57.4	61.9	58.7	58.6	55.9	57.1
11	IVT-MB-NWPZ-13	KB 2145	59.0	57.9	65.4	64.8	63.8	62.4	61.2	62.1
12	IVT-MB-NWPZ-3	PL 941	60.4	58.1	64.3	66.8	67.1	63.7	61.1	63.1
13	IVT-MB-NWPZ-6	PL 942	61.2	57.2	63.8	66.4	66.5	61.5	60.5	62.4
14	IVT-MB-NWPZ-2	PL 943	57.9	55.3	66.4	65.1	68.7	64.1	60.0	62.5
15	IVT-MB-NWPZ-11	PL 945	58.9	54.4	64.6	64.3	65.1	61.1	58.7	61.0
16	IVT-MB-NWPZ-20	RD 3064	62.1	55.0	66.9	65.1	59.7	60.7	59.2	61.2
17	IVT-MB-NWPZ-8	RD 3065	59.8	57.7	67.7	66.2	66.1	65.5	62.0	63.6
18	IVT-MB-NWPZ-17	RD 3066	63.1	60.3	65.5	65.4	67.2	60.7	65.2	63.9
19	IVT-MB-NWPZ-10	RD 3067	60.2	52.2	67.0	66.2	65.3	61.8	58.5	61.6
20	IVT-MB-NWPZ-4	UPB 1116	59.4	60.6	63.7	64.6	64.1	62.1	60.8	62.2
21	IVT-MB-NWPZ-12	UPB 1117	59.7	58.1	63.8	64.6	65.5	59.0	56.7	61.1
22	IVT-MB-NWPZ-22	DWRUB 52 ©	62.6	60.5	66.2	66.0	66.1	62.1	60.0	63.4
23	IVT-MB-NWPZ-21	DWRB 137 ©*	59.4	55.9	61.9	61.8	57.1	61.2	59.2	59.5
24	IVT-MB-NWPZ-23	DWRB 182 ©	56.3	53.0	64.9	63.9	61.9	60.2	57.9	59.7
25	IVT-MB-NWPZ-1	RD 2849 ©	61.9	57.1	66.0	67.8	63.8	62.9	60.9	62.9
Average			60.6	57.1	65.4	65.9	65.3	62.2	60.9	62.5

**= 6 row barley*

Table 5.3.3: Proportion of bold grains (%) of IVT entries from different locations

S.N	Code	Genotype	Hisar	Bathinda	Durgapura	Karnal	Ludhiana	Pantnagar	Modipuram	Mean
1	IVT-MB-NWPZ-9	BH 1050	97.4	98.0	99.0	99.1	93.2	98.0	94.6	97.0
2	IVT-MB-NWPZ-16	BH 1051	96.8	93.1	99.4	99.0	95.8	98.7	95.3	96.9
3	IVT-MB-NWPZ-19	BH 1052	96.5	97.3	98.9	98.5	91.4	98.7	97.8	97.0
4	IVT-MB-NWPZ-5	DWRB 235	93.4	82.9	96.2	95.0	89.1	97.8	95.3	92.8
5	IVT-MB-NWPZ-14	DWRB 236	93.2	93.0	98.2	94.5	92.3	97.0	96.5	95.0
6	IVT-MB-NWPZ-15	DWRB 237	94.8	95.3	97.7	96.9	88.1	97.4	92.2	94.6
7	IVT-MB-NWPZ-25	DWRB 238	97.1	92.3	97.7	98.9	95.1	99.2	96.3	96.7
8	IVT-MB-NWPZ-7	DWRB 239	90.9	83.1	97.1	92.7	86.8	97.5	83.4	90.2
9	IVT-MB-NWPZ-24	DWRB 240	98.7	96.0	99.9	98.6	96.9	99.4	99.0	98.4
10	IVT-MB-NWPZ-18	KB 2131	75.5	80.8	33.9	75.7	62.4	86.7	72.5	69.7
11	IVT-MB-NWPZ-13	KB 2145	82.5	89.7	95.0	95.1	84.5	94.9	94.8	90.9
12	IVT-MB-NWPZ-3	PL 941	90.7	92.9	95.7	97.7	91.3	96.9	92.9	94.0
13	IVT-MB-NWPZ-6	PL 942	89.3	90.5	97.7	95.8	93.5	96.9	83.8	92.5
14	IVT-MB-NWPZ-2	PL 943	88.6	85.9	93.2	93.5	90.5	97.0	84.5	90.4
15	IVT-MB-NWPZ-11	PL 945	88.8	93.6	96.8	90.5	84.9	96.7	82.2	90.5
16	IVT-MB-NWPZ-20	RD 3064	96.5	90.1	98.4	98.1	92.2	98.4	94.0	95.4
17	IVT-MB-NWPZ-8	RD 3065	87.9	85.6	90.5	90.9	74.8	95.8	87.7	87.6
18	IVT-MB-NWPZ-17	RD 3066	96.8	95.8	99.1	98.4	95.4	98.1	96.6	97.2
19	IVT-MB-NWPZ-10	RD 3067	93.5	92.8	98.3	96.9	90.5	95.0	94.7	94.5
20	IVT-MB-NWPZ-4	UPB 1116	93.7	89.4	98.9	96.7	84.1	97.4	89.8	92.9
21	IVT-MB-NWPZ-12	UPB 1117	94.2	91.8	96.3	96.8	84.4	94.1	89.1	92.4
22	IVT-MB-NWPZ-22	DWRUB 52 ©	86.0	81.1	96.3	91.5	85.8	94.3	81.7	88.1
23	IVT-MB-NWPZ-21	DWRB 137 ©*	94.7	91.7	96.0	93.9	73.7	95.7	89.8	90.8
24	IVT-MB-NWPZ-23	DWRB 182 ©	88.1	71.8	95.4	87.7	78.2	94.9	80.7	85.2
25	IVT-MB-NWPZ-1	RD 2849 ©	85.2	90.1	97.0	93.3	71.1	96.0	89.3	88.9
Average			91.6	89.8	94.5	94.6	86.6	96.5	90.2	92.0

**= 6 row barley*

Table 5.3.4: Proportion of thin grains (%) of IVT entries from different locations

S.N	Code	Genotype	Hisar	Bathinda	Durgapura	Karnal	Ludhiana	Pantnagar	Modipuram	Mean
1	IVT-MB-NWPZ-9	BH 1050	0.5	0.4	0.4	0.2	1.3	0.3	1.1	0.6
2	IVT-MB-NWPZ-16	BH 1051	0.3	1.5	0.2	0.3	0.6	0.2	0.9	0.6
3	IVT-MB-NWPZ-19	BH 1052	0.5	0.5	0.3	0.4	2.0	0.2	0.3	0.6
4	IVT-MB-NWPZ-5	DWRB 235	1.0	3.1	0.6	0.6	2.1	0.3	0.6	1.2
5	IVT-MB-NWPZ-14	DWRB 236	0.7	1.2	0.2	0.6	1.4	0.4	0.4	0.7
6	IVT-MB-NWPZ-15	DWRB 237	0.6	0.6	0.4	0.3	1.6	0.3	1.5	0.8
7	IVT-MB-NWPZ-25	DWRB 238	0.5	1.4	0.4	0.2	0.6	0.2	0.6	0.6
8	IVT-MB-NWPZ-7	DWRB 239	1.1	3.1	0.3	1.3	2.3	0.3	4.0	1.8
9	IVT-MB-NWPZ-24	DWRB 240	0.4	0.7	0.2	0.4	0.7	0.2	0.5	0.4
10	IVT-MB-NWPZ-18	KB 2131	3.1	2.7	22.9	5.1	6.1	0.9	6.3	6.7
11	IVT-MB-NWPZ-13	KB 2145	2.6	1.7	0.6	0.8	3.4	0.5	0.9	1.5
12	IVT-MB-NWPZ-3	PL 941	1.4	1.5	0.7	0.3	1.1	0.7	0.9	0.9
13	IVT-MB-NWPZ-6	PL 942	0.8	1.0	0.2	0.4	1.1	0.3	2.6	0.9
14	IVT-MB-NWPZ-2	PL 943	0.7	2.9	0.6	0.7	1.1	0.4	2.2	1.2
15	IVT-MB-NWPZ-11	PL 945	1.3	0.7	0.3	1.3	2.1	0.4	3.1	1.3
16	IVT-MB-NWPZ-20	RD 3064	0.4	1.5	0.2	0.4	1.6	0.3	1.0	0.8
17	IVT-MB-NWPZ-8	RD 3065	1.0	2.2	1.1	0.9	4.0	0.5	1.7	1.6
18	IVT-MB-NWPZ-17	RD 3066	0.6	0.8	0.2	0.5	1.4	0.2	0.2	0.5
19	IVT-MB-NWPZ-10	RD 3067	0.5	1.5	0.3	0.6	1.5	0.6	0.8	0.8
20	IVT-MB-NWPZ-4	UPB 1116	0.9	1.8	0.1	0.5	3.1	0.4	2.1	1.3
21	IVT-MB-NWPZ-12	UPB 1117	1.0	1.3	0.5	0.5	3.9	1.1	2.5	1.6
22	IVT-MB-NWPZ-22	DWRUB 52 ©	1.9	2.8	0.2	0.9	2.3	0.7	3.8	1.8
23	IVT-MB-NWPZ-21	DWRB 137 ©*	1.3	1.5	1.0	1.2	7.0	1.0	1.9	2.1
24	IVT-MB-NWPZ-23	DWRB 182 ©	1.5	8.1	0.5	3.1	4.8	0.8	4.5	3.3
25	IVT-MB-NWPZ-1	RD 2849 ©	1.6	1.5	0.3	0.9	7.5	0.6	1.7	2.0
Average			1.0	1.8	1.3	0.9	2.6	0.5	1.8	1.4

**= 6 row barley*

Table 5.3.5: Germinative energy (% 72hrs) of IVT entries from different locations

S.N	Code	Genotype	Hisar	Bathinda	Durgapura	Karnal	Ludhiana	Pantnagar	Modipuram	Mean
1	IVT-MB-NWPZ-9	BH 1050	100	100	100	100	100	100	98	99.7
2	IVT-MB-NWPZ-16	BH 1051	100	100	100	100	100	100	100	100.0
3	IVT-MB-NWPZ-19	BH 1052	100	98	97	100	99	99	99	98.9
4	IVT-MB-NWPZ-5	DWRB 235	99	97	100	99	98	98	98	98.4
5	IVT-MB-NWPZ-14	DWRB 236	99	100	98	100	100	97	100	99.1
6	IVT-MB-NWPZ-15	DWRB 237	100	100	99	99	100	99	99	99.4
7	IVT-MB-NWPZ-25	DWRB 238	100	100	100	100	100	83	99	97.4
8	IVT-MB-NWPZ-7	DWRB 239	100	100	100	100	100	99	100	99.9
9	IVT-MB-NWPZ-24	DWRB 240	100	100	100	100	100	99	99	99.7
10	IVT-MB-NWPZ-18	KB 2131	99	100	100	100	100	100	100	99.9
11	IVT-MB-NWPZ-13	KB 2145	100	100	100	100	100	98	99	99.6
12	IVT-MB-NWPZ-3	PL 941	98	99	94	100	100	100	96	98.1
13	IVT-MB-NWPZ-6	PL 942	100	95	100	100	100	98	100	99.0
14	IVT-MB-NWPZ-2	PL 943	100	100	100	99	100	98	100	99.6
15	IVT-MB-NWPZ-11	PL 945	100	100	98	99	100	100	98	99.3
16	IVT-MB-NWPZ-20	RD 3064	100	100	96	100	100	100	99	99.3
17	IVT-MB-NWPZ-8	RD 3065	99	100	99	100	100	100	99	99.6
18	IVT-MB-NWPZ-17	RD 3066	100	100	98	98	100	99	97	98.9
19	IVT-MB-NWPZ-10	RD 3067	100	100	95	100	98	100	99	98.9
20	IVT-MB-NWPZ-4	UPB 1116	100	100	98	97	99	100	100	99.1
21	IVT-MB-NWPZ-12	UPB 1117	98	99	99	100	100	99	97	98.9
22	IVT-MB-NWPZ-22	DWRUB 52 ©	100	100	98	100	97	100	100	99.3
23	IVT-MB-NWPZ-21	DWRB 137 ©*	100	100	94	98	98	98	96	97.7
24	IVT-MB-NWPZ-23	DWRB 182 ©	100	100	99	100	100	99	97	99.3
25	IVT-MB-NWPZ-1	RD 2849 ©	99	100	100	100	99	99	99	99.4
Average			99.6	99.5	98.5	99.6	99.5	98.5	98.7	99.1

**= 6 row barley*

Table 5.3.6: Protein content (%) # of IVT entries from different locations

S.N	Code	Genotype	Hisar	Bathinda	Durgapura	Karnal	Ludhiana	Pantnagar	Modipuram	Mean
1	IVT-MB-NWPZ-9	BH 1050	11.8	12.4	11.2	13.8	13.7	12.3	13.6	12.7
2	IVT-MB-NWPZ-16	BH 1051	10.9	13.2	10.8	13.3	12.1	10.4	13.8	12.1
3	IVT-MB-NWPZ-19	BH 1052	11.0	12.4	12.2	13.7	14.5	11.9	13.7	12.8
4	IVT-MB-NWPZ-5	DWRB 235	11.5	12.5	12.4	12.4	11.2	9.9	12.4	11.8
5	IVT-MB-NWPZ-14	DWRB 236	11.3	11.5	10.0	13.2	12.1	10.2	13.0	11.6
6	IVT-MB-NWPZ-15	DWRB 237	11.0	12.9	12.1	11.9	12.1	10.7	12.7	11.9
7	IVT-MB-NWPZ-25	DWRB 238	10.4	12.1	12.1	12.6	11.6	10.6	12.6	11.7
8	IVT-MB-NWPZ-7	DWRB 239	10.9	13.2	11.4	12.3	11.9	10.3	13.6	11.9
9	IVT-MB-NWPZ-24	DWRB 240	9.6	12.1	10.7	12.8	11.0	9.7	11.0	11.0
10	IVT-MB-NWPZ-18	KB 2131	10.5	19.9	13.6	12.8	10.8	10.6	15.0	13.3
11	IVT-MB-NWPZ-13	KB 2145	10.2	12.3	10.6	11.7	11.9	9.8	11.4	11.1
12	IVT-MB-NWPZ-3	PL 941	12.5	13.6	11.9	12.5	12.2	11.8	12.3	12.4
13	IVT-MB-NWPZ-6	PL 942	12.7	13.4	12.1	12.7	11.1	10.8	13.0	12.3
14	IVT-MB-NWPZ-2	PL 943	12.4	14.0	14.0	13.6	11.5	11.5	14.8	13.1
15	IVT-MB-NWPZ-11	PL 945	11.8	12.9	11.7	13.3	12.8	10.6	14.9	12.6
16	IVT-MB-NWPZ-20	RD 3064	11.7	14.3	10.5	13.0	11.9	10.8	15.3	12.5
17	IVT-MB-NWPZ-8	RD 3065	9.1	12.5	11.7	12.4	10.9	9.7	13.2	11.4
18	IVT-MB-NWPZ-17	RD 3066	11.3	12.3	11.4	12.3	15.3	12.6	14.0	12.7
19	IVT-MB-NWPZ-10	RD 3067	11.0	13.4	11.1	12.8	11.2	10.4	12.0	11.7
20	IVT-MB-NWPZ-4	UPB 1116	11.5	13.7	10.8	12.6	14.8	11.7	12.9	12.6
21	IVT-MB-NWPZ-12	UPB 1117	10.0	12.4	10.9	12.8	13.8	10.1	13.4	11.9
22	IVT-MB-NWPZ-22	DWRUB 52 ©	10.3	12.4	10.8	12.2	11.0	10.6	13.6	11.6
23	IVT-MB-NWPZ-21	DWRB 137 ©*	9.4	11.3	9.9	11.9	10.9	9.2	12.3	10.7
24	IVT-MB-NWPZ-23	DWRB 182 ©	10.1	13.9	11.6	12.6	13.4	9.9	14.8	12.3
25	IVT-MB-NWPZ-1	RD 2849 ©	10.3	12.4	10.6	13.3	14.9	11.9	11.7	12.2
Average			10.9	13.1	11.4	12.7	12.3	10.7	13.2	12.1

*= 6 row barley # Predicted values through NIR

Table 5.3.7: Husk content (%) of IVT entries from different locations

S.N	Code	Genotype	Hisar	Bathinda	Durgapura	Karnal	Ludhiana	Pantnagar	Modipuram	Mean
1	IVT-MB-NWPZ-9	BH 1050	10.1	12.5	12.9	12.3	12.2	12.9	15.5	12.6
2	IVT-MB-NWPZ-16	BH 1051	10.4	13.0	11.6	11.6	12.1	13.4	14.5	12.4
3	IVT-MB-NWPZ-19	BH 1052	12.6	16.4	13.1	12.8	11.4	13.8	15.4	13.6
4	IVT-MB-NWPZ-5	DWRB 235	12.7	15.3	13.2	13.8	12.9	13.7	17.7	14.2
5	IVT-MB-NWPZ-14	DWRB 236	12.8	14.8	11.9	11.2	12.4	13.9	16.3	13.4
6	IVT-MB-NWPZ-15	DWRB 237	12.8	14.2	11.7	12.1	11.7	13.2	14.6	12.9
7	IVT-MB-NWPZ-25	DWRB 238	15.6	19.7	12.8	12.3	11.1	13.3	16.2	14.5
8	IVT-MB-NWPZ-7	DWRB 239	13.9	15.2	11.3	12.4	12.4	13.2	16.2	13.5
9	IVT-MB-NWPZ-24	DWRB 240	14.6	14.2	11.5	12.6	12.5	14.2	16.7	13.8
10	IVT-MB-NWPZ-18	KB 2131	15.1	15.5	15.1	12.7	13.7	14.2	18.3	15.0
11	IVT-MB-NWPZ-13	KB 2145	15.1	16.2	12.1	13.1	13.4	14.4	15.8	14.3
12	IVT-MB-NWPZ-3	PL 941	14.6	13.5	13.2	12.1	11.8	14.3	16.5	13.7
13	IVT-MB-NWPZ-6	PL 942	15.2	14.9	13.7	13.0	12.7	15.0	18.0	14.7
14	IVT-MB-NWPZ-2	PL 943	14.5	15.6	12.2	13.7	11.0	13.4	15.8	13.8
15	IVT-MB-NWPZ-11	PL 945	14.4	16.4	12.4	14.6	16.0	15.7	17.3	15.3
16	IVT-MB-NWPZ-20	RD 3064	12.1	14.5	11.5	12.3	13.6	13.3	17.4	13.5
17	IVT-MB-NWPZ-8	RD 3065	13.1	12.6	11.4	13.0	13.1	12.6	15.6	13.1
18	IVT-MB-NWPZ-17	RD 3066	12.5	13.5	12.2	13.4	12.0	14.0	17.1	13.5
19	IVT-MB-NWPZ-10	RD 3067	13.7	14.2	12.1	11.4	14.5	12.7	16.6	13.6
20	IVT-MB-NWPZ-4	UPB 1116	12.1	14.6	12.2	13.1	13.6	13.9	17.4	13.8
21	IVT-MB-NWPZ-12	UPB 1117	14.9	15.3	12.9	13.6	13.1	15.1	17.4	14.6
22	IVT-MB-NWPZ-22	DWRUB 52 ©	12.8	12.9	11.5	14.9	12.1	14.2	17.5	13.7
23	IVT-MB-NWPZ-21	DWRB 137 ©*	13.8	14.8	14.3	13.4	17.1	15.1	18.4	15.3
24	IVT-MB-NWPZ-23	DWRB 182 ©	14.8	16.4	13.5	13.2	14.3	14.9	18.9	15.2
25	IVT-MB-NWPZ-1	RD 2849 ©	13.1	14.8	11.4	14.1	12.9	12.8	15.4	13.5
Average			13.5	14.8	12.5	12.9	13.0	13.9	16.7	13.9

*= 6 row barley

Table 5.3.8: Moisture content in grains (%) # of IVT (MB) entries from different locations

S.N	Code	Genotype	Hisar	Bathinda	Durgapura	Karnal	Ludhiana	Pantnagar	Modipuram	Mean
1	IVT-MB-NWPZ-9	BH 1050	8.6	9.7	9.7	9.5	9.9	11.6	12.3	10.2
2	IVT-MB-NWPZ-16	BH 1051	8.8	9.6	9.4	10.9	9.9	11.9	12.5	10.4
3	IVT-MB-NWPZ-19	BH 1052	8.7	9.8	9.5	9.6	9.7	12.3	11.8	10.2
4	IVT-MB-NWPZ-5	DWRB 235	9.1	10.1	10.1	9.6	10.2	13.4	12.7	10.7
5	IVT-MB-NWPZ-14	DWRB 236	9.3	10.0	10.2	9.9	10.1	11.3	12.3	10.4
6	IVT-MB-NWPZ-15	DWRB 237	8.8	9.2	9.4	9.7	9.6	11.6	12.3	10.1
7	IVT-MB-NWPZ-25	DWRB 238	9.5	11.1	9.4	9.5	10.0	11.5	12.2	10.5
8	IVT-MB-NWPZ-7	DWRB 239	9.2	9.8	9.6	9.8	9.8	11.3	12.2	10.2
9	IVT-MB-NWPZ-24	DWRB 240	8.7	10.1	9.4	9.8	9.9	11.4	12.3	10.2
10	IVT-MB-NWPZ-18	KB 2131	9.1	9.8	9.2	9.7	10.0	12.2	12.5	10.4
11	IVT-MB-NWPZ-13	KB 2145	9.4	11.0	9.3	9.4	9.8	11.6	12.6	10.4
12	IVT-MB-NWPZ-3	PL 941	9.6	9.4	10.5	10.4	9.8	11.4	12.5	10.5
13	IVT-MB-NWPZ-6	PL 942	8.7	9.8	9.7	9.5	9.8	11.8	12.0	10.2
14	IVT-MB-NWPZ-2	PL 943	8.8	9.5	9.6	9.9	9.8	11.4	11.6	10.1
15	IVT-MB-NWPZ-11	PL 945	9.4	10.1	9.4	9.7	9.7	11.4	12.9	10.4
16	IVT-MB-NWPZ-20	RD 3064	8.7	9.3	9.1	10.6	10.2	12.0	12.1	10.3
17	IVT-MB-NWPZ-8	RD 3065	9.6	11.0	9.5	9.8	10.5	11.6	11.8	10.5
18	IVT-MB-NWPZ-17	RD 3066	8.8	9.6	9.0	9.7	9.7	11.3	12.1	10.0
19	IVT-MB-NWPZ-10	RD 3067	9.2	9.3	9.5	9.5	10.9	11.6	12.5	10.4
20	IVT-MB-NWPZ-4	UPB 1116	9.8	9.6	9.8	9.5	9.7	12.6	12.3	10.5
21	IVT-MB-NWPZ-12	UPB 1117	9.4	9.5	9.4	9.7	10.1	12.0	12.4	10.4
22	IVT-MB-NWPZ-22	DWRUB 52 ©	8.6	9.4	9.2	9.9	9.8	11.8	12.4	10.2
23	IVT-MB-NWPZ-21	DWRB 137 ©*	8.8	9.7	10.1	9.9	10.5	11.9	11.9	10.4
24	IVT-MB-NWPZ-23	DWRB 182 ©	9.2	10.9	10.3	9.9	10	11.7	12.1	10.6
25	IVT-MB-NWPZ-1	RD 2849 ©	8.9	9.8	9.4	10.0	10.0	12.7	12.1	10.4
Average			9.1	9.9	9.6	9.8	10.0	11.8	12.3	10.3

*= 6 row barley # Predicted values through NIR

Table 5.3.9: Starch content in grains (%dwt basis) # of IVT entries from different locations

S.N	Code	Genotype	Hisar	Bathinda	Durgapura	Karnal	Ludhiana	Pantnagar	Modipuram	Mean
1	IVT-MB-NWPZ-9	BH 1050	62	59.7	61.8	61.4	61.6	61.1	60.8	61.2
2	IVT-MB-NWPZ-16	BH 1051	61.9	60.0	61.4	61.1	62.9	61.7	60.7	61.4
3	IVT-MB-NWPZ-19	BH 1052	61.4	59.9	59.6	60.5	60.5	60.5	60.1	60.4
4	IVT-MB-NWPZ-5	DWRB 235	61.1	60.5	59.9	61.7	61.9	61.3	61.2	61.1
5	IVT-MB-NWPZ-14	DWRB 236	61.7	60.6	61.6	61.5	61.5	61.4	61.2	61.4
6	IVT-MB-NWPZ-15	DWRB 237	62.4	59.7	61.0	62.1	62.6	62.4	61.0	61.6
7	IVT-MB-NWPZ-25	DWRB 238	61.3	59.6	60.8	61.4	61.9	61.3	60.4	61.0
8	IVT-MB-NWPZ-7	DWRB 239	61.4	60.2	61.1	61.6	61.9	60.9	60.8	61.1
9	IVT-MB-NWPZ-24	DWRB 240	62.1	60.2	61.6	61.3	62.2	61.5	61.2	61.4
10	IVT-MB-NWPZ-18	KB 2131	61.3	60.5	60.0	61.0	63.1	61.3	59.3	60.9
11	IVT-MB-NWPZ-13	KB 2145	61.1	60.8	62.0	62.3	62.2	62.8	61.7	61.8
12	IVT-MB-NWPZ-3	PL 941	60.9	59.6	60.4	60.8	62.0	60.9	61.3	60.8
13	IVT-MB-NWPZ-6	PL 942	61.0	59.8	59.9	61.4	62.4	60.8	60.1	60.8
14	IVT-MB-NWPZ-2	PL 943	61.1	59.4	60.4	61.0	62.9	61.7	60.1	60.9
15	IVT-MB-NWPZ-11	PL 945	61.1	59.0	61.3	60.9	61.9	61.2	59.4	60.7
16	IVT-MB-NWPZ-20	RD 3064	61.5	59.1	61.9	61.0	61.1	60.4	59.3	60.6
17	IVT-MB-NWPZ-8	RD 3065	61.4	60.4	61.4	62.3	61.7	62.7	61.6	61.6
18	IVT-MB-NWPZ-17	RD 3066	61.5	60.4	60.8	61.5	60.3	60.4	59.7	60.7
19	IVT-MB-NWPZ-10	RD 3067	62.3	59.5	61.5	61.8	62.2	61.7	60.9	61.4
20	IVT-MB-NWPZ-4	UPB 1116	60.9	59.7	60.6	61.5	60.0	61.0	61.0	60.7
21	IVT-MB-NWPZ-12	UPB 1117	60.4	59.5	60.7	60.7	60.7	60.9	59.6	60.4
22	IVT-MB-NWPZ-22	DWRUB 52 ©	62.0	60.8	61.1	61.9	63.0	61.7	60.2	61.5
23	IVT-MB-NWPZ-21	DWRB 137 ©*	62.7	59.9	61.1	61.0	60.9	61.5	60.6	61.1
24	IVT-MB-NWPZ-23	DWRB 182 ©	62.0	59.2	60.6	61.1	60.1	60.5	59.2	60.4
25	IVT-MB-NWPZ-1	RD 2849 ©	62.2	60.3	61.7	61.0	59.5	60.7	61.2	60.9
Average			61.5	59.9	61.0	61.4	61.6	61.3	60.5	61.0

*= 6 row barley # Predicted values through NIR

MALT PARAMETERS

Table 5.3.10: Malt yield (%) of IVT entries from different locations

S.N	Code	Genotype	Karnal	Durgapura	Ludhiana	Mean
1	IVT-MB-NWPZ-9	BH 1050	88.7	86.7	84.8	86.7
2	IVT-MB-NWPZ-16	BH 1051	87.3	86.2	85.4	86.3
3	IVT-MB-NWPZ-19	BH 1052	84.9	85.2	86.2	85.4
4	IVT-MB-NWPZ-5	DWRB 235	84.8	86.2	86.1	85.7
5	IVT-MB-NWPZ-14	DWRB 236	85.4	86.4	86.5	86.1
6	IVT-MB-NWPZ-15	DWRB 237	85.0	85.8	84.6	85.1
7	IVT-MB-NWPZ-25	DWRB 238	84.0	86.0	86.5	85.5
8	IVT-MB-NWPZ-7	DWRB 239	91.2	86.2	87.8	88.4
9	IVT-MB-NWPZ-24	DWRB 240	84.9	85.1	84.5	84.8
10	IVT-MB-NWPZ-18	KB 2131	84.5	84.7	84.6	84.6
11	IVT-MB-NWPZ-13	KB 2145	87.1	86.8	86.4	86.8
12	IVT-MB-NWPZ-3	PL 941	87.5	87.5	89.0	88.0
13	IVT-MB-NWPZ-6	PL 942	89.7	83.9	84.3	86.0
14	IVT-MB-NWPZ-2	PL 943	86.0	83.9	83.9	84.6
15	IVT-MB-NWPZ-11	PL 945	84.9	84.9	84.8	84.8
16	IVT-MB-NWPZ-20	RD 3064	85.4	83.7	85.3	84.8
17	IVT-MB-NWPZ-8	RD 3065	86.6	86.2	85.7	86.2
18	IVT-MB-NWPZ-17	RD 3066	85.1	86.7	86.1	86.0
19	IVT-MB-NWPZ-10	RD 3067	88.7	86.2	85.3	86.8
20	IVT-MB-NWPZ-4	UPB 1116	86.8	85.5	85.9	86.1
21	IVT-MB-NWPZ-12	UPB 1117	86.3	82.4	85.4	84.7
22	IVT-MB-NWPZ-22	DWRUB 52 ©	86.1	84.9	85.9	85.6
23	IVT-MB-NWPZ-21	DWRB 137 ©*	86.1	83.6	85.1	84.9
24	IVT-MB-NWPZ-23	DWRB 182 ©	85.2	85.4	85.1	85.3
25	IVT-MB-NWPZ-1	RD 2849 ©	86.9	86.1	86.8	86.6
Average			86.4	85.4	85.7	85.8

*= 6 row barley

Table 5.3.11: Malt friability (%) of IVT entries from different locations

S.N	Code	Genotype	Karnal	Durgapura	Ludhiana	Mean
1	IVT-MB-NWPZ-9	BH 1050	58.2	71.8	55.9	62.0
2	IVT-MB-NWPZ-16	BH 1051	58.7	76.8	64.9	66.8
3	IVT-MB-NWPZ-19	BH 1052	72.1	80.7	51.3	68.0
4	IVT-MB-NWPZ-5	DWRB 235	80.0	71.5	59.5	70.3
5	IVT-MB-NWPZ-14	DWRB 236	73.7	68.5	57.5	66.6
6	IVT-MB-NWPZ-15	DWRB 237	75.9	75.3	58.5	69.9
7	IVT-MB-NWPZ-25	DWRB 238	70.5	72.5	59.3	67.4
8	IVT-MB-NWPZ-7	DWRB 239	58.6	70.3	48.8	59.2
9	IVT-MB-NWPZ-24	DWRB 240	75.0	85.7	75.7	78.8
10	IVT-MB-NWPZ-18	KB 2131	73.8	74.0	78.4	75.4
11	IVT-MB-NWPZ-13	KB 2145	77.0	87.4	74.2	79.5
12	IVT-MB-NWPZ-3	PL 941	65.6	67.8	55.9	63.1
13	IVT-MB-NWPZ-6	PL 942	59.2	64.9	58.8	61.0
14	IVT-MB-NWPZ-2	PL 943	63.6	67.7	60.5	63.9
15	IVT-MB-NWPZ-11	PL 945	76.7	77.3	62.8	72.2
16	IVT-MB-NWPZ-20	RD 3064	66.9	83.0	61.5	70.5
17	IVT-MB-NWPZ-8	RD 3065	75.9	78.0	73.7	75.9
18	IVT-MB-NWPZ-17	RD 3066	79.4	76.3	55.3	70.3
19	IVT-MB-NWPZ-10	RD 3067	59.0	69.2	66.3	64.8
20	IVT-MB-NWPZ-4	UPB 1116	64.9	81.9	55.6	67.5
21	IVT-MB-NWPZ-12	UPB 1117	62.3	83.0	45.1	63.5
22	IVT-MB-NWPZ-22	DWRUB 52 ©	73.0	83.4	62.4	72.9
23	IVT-MB-NWPZ-21	DWRB 137 ©*	52.5	70.2	48.0	56.9
24	IVT-MB-NWPZ-23	DWRB 182 ©	74.3	81.7	74.8	77.0
25	IVT-MB-NWPZ-1	RD 2849 ©	75.7	84.7	57.1	72.5
Average			68.9	76.1	60.9	68.6

*= 6 row barley

Table 5.3.12: Malt homogeneity (%) of IVT entries from different locations

S.N	Code	Genotype	Karnal	Durgapura	Ludhiana	Mean
1	IVT-MB-NWPZ-9	BH 1050	78.4	93.4	84.8	85.5
2	IVT-MB-NWPZ-16	BH 1051	81.9	94.5	89.4	88.6
3	IVT-MB-NWPZ-19	BH 1052	95.1	97.3	84.9	92.4
4	IVT-MB-NWPZ-5	DWRB 235	97.1	98.0	92.6	95.9
5	IVT-MB-NWPZ-14	DWRB 236	95.3	96.2	92.8	94.8
6	IVT-MB-NWPZ-15	DWRB 237	96.5	97.7	90.1	94.8
7	IVT-MB-NWPZ-25	DWRB 238	92.9	97.7	93.4	94.7
8	IVT-MB-NWPZ-7	DWRB 239	86.0	95.7	85.4	89.0
9	IVT-MB-NWPZ-24	DWRB 240	97.2	99.2	97.7	98.0
10	IVT-MB-NWPZ-18	KB 2131	94.7	97.7	97.0	96.5
11	IVT-MB-NWPZ-13	KB 2145	96.9	99.3	97.9	98.0
12	IVT-MB-NWPZ-3	PL 941	91.1	96.7	90.9	92.9
13	IVT-MB-NWPZ-6	PL 942	84.2	96.6	92.9	91.3
14	IVT-MB-NWPZ-2	PL 943	90.8	94.2	90.2	91.7
15	IVT-MB-NWPZ-11	PL 945	98.1	98.2	93.9	96.7
16	IVT-MB-NWPZ-20	RD 3064	93.5	98.5	89.3	93.8
17	IVT-MB-NWPZ-8	RD 3065	97.2	99.0	98.2	98.1
18	IVT-MB-NWPZ-17	RD 3066	98.7	99.5	96.5	98.2
19	IVT-MB-NWPZ-10	RD 3067	80.7	92.4	93.0	88.7
20	IVT-MB-NWPZ-4	UPB 1116	94.1	96.5	94.5	95.0
21	IVT-MB-NWPZ-12	UPB 1117	87.5	98.7	81.2	89.1
22	IVT-MB-NWPZ-22	DWRUB 52 ©	95.9	99.6	95.8	97.1
23	IVT-MB-NWPZ-21	DWRB 137 ©*	73.3	93.8	79.5	82.2
24	IVT-MB-NWPZ-23	DWRB 182 ©	95.6	98.6	97.1	97.1
25	IVT-MB-NWPZ-1	RD 2849 ©	95.4	99.1	92.4	95.6
Average			91.5	97.1	91.7	93.4

*= 6 row barley

Table 5.3.13: Hot water extract (% fgdb) of IVT entries from different locations

S.N	Code	Genotype	Karnal	Durgapura	Ludhiana	Mean
1	IVT-MB-NWPZ-9	BH 1050	76.6	81.9	80.0	79.5
2	IVT-MB-NWPZ-16	BH 1051	75.6	85.4	80.6	80.5
3	IVT-MB-NWPZ-19	BH 1052	77.0	85.2	79.1	80.5
4	IVT-MB-NWPZ-5	DWRB 235	75.4	74.2	76.1	75.3
5	IVT-MB-NWPZ-14	DWRB 236	80.3	78.5	79.4	79.4
6	IVT-MB-NWPZ-15	DWRB 237	78.5	78.9	81.7	79.7
7	IVT-MB-NWPZ-25	DWRB 238	77.4	82.4	82.1	80.6
8	IVT-MB-NWPZ-7	DWRB 239	74.6	76.0	77.6	76.1
9	IVT-MB-NWPZ-24	DWRB 240	79.0	80.9	81.8	80.6
10	IVT-MB-NWPZ-18	KB 2131	78.1	85.2	80.3	81.2
11	IVT-MB-NWPZ-13	KB 2145	78.4	81.9	77.1	79.1
12	IVT-MB-NWPZ-3	PL 941	73.0	74.8	83.2	77.0
13	IVT-MB-NWPZ-6	PL 942	76.0	74.0	80.6	76.9
14	IVT-MB-NWPZ-2	PL 943	73.1	73.4	85.1	77.2
15	IVT-MB-NWPZ-11	PL 945	73.6	82.3	77.1	77.7
16	IVT-MB-NWPZ-20	RD 3064	74.0	81.9	77.3	77.7
17	IVT-MB-NWPZ-8	RD 3065	77.0	79.3	81.5	79.3
18	IVT-MB-NWPZ-17	RD 3066	76.5	82.6	78.4	79.2
19	IVT-MB-NWPZ-10	RD 3067	63.2	80.4	79.6	74.4
20	IVT-MB-NWPZ-4	UPB 1116	75.5	75.7	78.4	76.5
21	IVT-MB-NWPZ-12	UPB 1117	74.4	81.7	82.3	79.5
22	IVT-MB-NWPZ-22	DWRUB 52 ©	77.5	78.3	82.4	79.4
23	IVT-MB-NWPZ-21	DWRB 137 ©*	76.9	87.7	78.0	80.9
24	IVT-MB-NWPZ-23	DWRB 182 ©	77.4	83.2	77.6	79.4
25	IVT-MB-NWPZ-1	RD 2849 ©	77.6	75.3	81.7	78.2
Average			75.9	80.0	80.0	78.6

*= 6 row barley

Table 5.3.14: Wort filtration rate (ml/hr.) of IVT entries from different locations

S.N	Code	Genotype	Karnal	Durgapura	Ludhiana	Mean
1	IVT-MB-NWPZ-9	BH 1050	315	325	315	318.3
2	IVT-MB-NWPZ-16	BH 1051	320	315	325	320.0
3	IVT-MB-NWPZ-19	BH 1052	270	280	195	248.3
4	IVT-MB-NWPZ-5	DWRB 235	300	210	180	230.0
5	IVT-MB-NWPZ-14	DWRB 236	305	255	140	233.3
6	IVT-MB-NWPZ-15	DWRB 237	305	285	200	263.3
7	IVT-MB-NWPZ-25	DWRB 238	270	200	160	210.0
8	IVT-MB-NWPZ-7	DWRB 239	275	225	170	223.3
9	IVT-MB-NWPZ-24	DWRB 240	270	300	200	256.7
10	IVT-MB-NWPZ-18	KB 2131	300	300	250	283.3
11	IVT-MB-NWPZ-13	KB 2145	315	300	255	290.0
12	IVT-MB-NWPZ-3	PL 941	215	190	155	186.7
13	IVT-MB-NWPZ-6	PL 942	190	260	175	208.3
14	IVT-MB-NWPZ-2	PL 943	265	285	200	250.0
15	IVT-MB-NWPZ-11	PL 945	325	260	180	255.0
16	IVT-MB-NWPZ-20	RD 3064	255	290	175	240.0
17	IVT-MB-NWPZ-8	RD 3065	300	300	195	265.0
18	IVT-MB-NWPZ-17	RD 3066	315	265	180	253.3
19	IVT-MB-NWPZ-10	RD 3067	285	260	220	255.0
20	IVT-MB-NWPZ-4	UPB 1116	275	260	105	213.3
21	IVT-MB-NWPZ-12	UPB 1117	305	280	155	246.7
22	IVT-MB-NWPZ-22	DWRUB 52 ©	240	305	180	241.7
23	IVT-MB-NWPZ-21	DWRB 137 ©*	230	260	210	233.3
24	IVT-MB-NWPZ-23	DWRB 182 ©	280	260	225	255.0
25	IVT-MB-NWPZ-1	RD 2849 ©	300	265	160	241.7
Average			281.0	269.4	196.2	248.9

*= 6 row barley

Table 5.3.15: Diastatic power (^{0}L) of IVT entries from different locations

S.N	Code	Genotype	Karnal	Durgapura	Ludhiana	Mean
1	IVT-MB-NWPZ-9	BH 1050	98.0	116.3	104.2	106.2
2	IVT-MB-NWPZ-16	BH 1051	104.2	111.1	108.7	108.0
3	IVT-MB-NWPZ-19	BH 1052	96.2	106.4	111.1	104.5
4	IVT-MB-NWPZ-5	DWRB 235	104.2	69.4	74.6	82.7
5	IVT-MB-NWPZ-14	DWRB 236	96.2	104.2	70.4	90.2
6	IVT-MB-NWPZ-15	DWRB 237	83.3	86.2	98.0	89.2
7	IVT-MB-NWPZ-25	DWRB 238	111.1	69.4	96.2	92.2
8	IVT-MB-NWPZ-7	DWRB 239	100.0	73.5	96.2	89.9
9	IVT-MB-NWPZ-24	DWRB 240	111.1	80.6	106.4	99.4
10	IVT-MB-NWPZ-18	KB 2131	98.0	108.7	100.0	102.2
11	IVT-MB-NWPZ-13	KB 2145	98.0	104.2	100.0	100.7
12	IVT-MB-NWPZ-3	PL 941	116.3	111.1	106.4	111.3
13	IVT-MB-NWPZ-6	PL 942	89.3	104.2	106.4	99.9
14	IVT-MB-NWPZ-2	PL 943	104.2	113.6	111.1	109.6
15	IVT-MB-NWPZ-11	PL 945	108.7	108.7	108.7	108.7
16	IVT-MB-NWPZ-20	RD 3064	94.3	60.2	89.3	81.3
17	IVT-MB-NWPZ-8	RD 3065	89.3	75.8	87.7	84.3
18	IVT-MB-NWPZ-17	RD 3066	106.4	76.9	104.2	95.8
19	IVT-MB-NWPZ-10	RD 3067	116.3	116.3	116.3	116.3
20	IVT-MB-NWPZ-4	UPB 1116	100.0	98.0	94.3	97.5
21	IVT-MB-NWPZ-12	UPB 1117	106.4	106.4	106.4	106.4
22	IVT-MB-NWPZ-22	DWRUB 52 ©	94.3	73.5	68.5	78.8
23	IVT-MB-NWPZ-21	DWRB 137 ©*	106.4	113.6	108.7	109.6
24	IVT-MB-NWPZ-23	DWRB 182 ©	98.0	80.6	100.0	92.9
25	IVT-MB-NWPZ-1	RD 2849 ©	106.4	80.6	87.7	91.6
Average			101.5	94.0	98.5	98.0

*= 6 row barley

Table 5.3.16: Saccharification rate (minutes) of IVT entries from different locations

S.N	Code	Genotype	Karnal	Durgapura	Ludhiana	Mean
1	IVT-MB-NWPZ-9	BH 1050	10	5	5	6.7
2	IVT-MB-NWPZ-16	BH 1051	5	5	5	5.0
3	IVT-MB-NWPZ-19	BH 1052	5	10	5	6.7
4	IVT-MB-NWPZ-5	DWRB 235	10	10	10	10.0
5	IVT-MB-NWPZ-14	DWRB 236	10	5	5	6.7
6	IVT-MB-NWPZ-15	DWRB 237	5	10	5	6.7
7	IVT-MB-NWPZ-25	DWRB 238	10	5	5	6.7
8	IVT-MB-NWPZ-7	DWRB 239	5	10	10	8.3
9	IVT-MB-NWPZ-24	DWRB 240	5	5	5	5.0
10	IVT-MB-NWPZ-18	KB 2131	5	10	5	6.7
11	IVT-MB-NWPZ-13	KB 2145	5	5	5	5.0
12	IVT-MB-NWPZ-3	PL 941	5	10	10	8.3
13	IVT-MB-NWPZ-6	PL 942	5	5	5	5.0
14	IVT-MB-NWPZ-2	PL 943	5	5	5	5.0
15	IVT-MB-NWPZ-11	PL 945	10	5	5	6.7
16	IVT-MB-NWPZ-20	RD 3064	10	5	10	8.3
17	IVT-MB-NWPZ-8	RD 3065	5	10	5	6.7
18	IVT-MB-NWPZ-17	RD 3066	10	5	5	6.7
19	IVT-MB-NWPZ-10	RD 3067	5	5	5	5.0
20	IVT-MB-NWPZ-4	UPB 1116	10	5	5	6.7
21	IVT-MB-NWPZ-12	UPB 1117	5	5	5	5.0
22	IVT-MB-NWPZ-22	DWRUB 52 ©	10	5	10	8.3
23	IVT-MB-NWPZ-21	DWRB 137 ©*	5	5	5	5.0
24	IVT-MB-NWPZ-23	DWRB 182 ©	5	5	5	5.0
25	IVT-MB-NWPZ-1	RD 2849 ©	5	5	5	5.0
Average			6.8	6.4	6.0	6.4

*= 6 row barley

Table 5.3.17: Wort pH of IVT entries from different locations

S.N	Code	Genotype	Karnal	Durgapura	Ludhiana	Mean
1	IVT-MB-NWPZ-9	BH 1050	6.0	6.1	5.9	6.0
2	IVT-MB-NWPZ-16	BH 1051	6.0	6.1	6.0	6.0
3	IVT-MB-NWPZ-19	BH 1052	5.9	6.0	5.9	5.9
4	IVT-MB-NWPZ-5	DWRB 235	6.0	6.1	5.9	6.0
5	IVT-MB-NWPZ-14	DWRB 236	6.0	6.1	5.9	6.0
6	IVT-MB-NWPZ-15	DWRB 237	6.1	6.0	5.9	6.0
7	IVT-MB-NWPZ-25	DWRB 238	6.0	6.0	5.9	6.0
8	IVT-MB-NWPZ-7	DWRB 239	6.1	6.0	5.9	6.0
9	IVT-MB-NWPZ-24	DWRB 240	6.0	5.9	5.9	6.0
10	IVT-MB-NWPZ-18	KB 2131	6.1	6.0	6.0	6.0
11	IVT-MB-NWPZ-13	KB 2145	6.0	6.1	5.9	6.0
12	IVT-MB-NWPZ-3	PL 941	6.0	6.1	5.9	6.0
13	IVT-MB-NWPZ-6	PL 942	6.0	6.0	5.9	6.0
14	IVT-MB-NWPZ-2	PL 943	6.0	6.0	5.9	6.0
15	IVT-MB-NWPZ-11	PL 945	6.0	6.1	5.8	6.0
16	IVT-MB-NWPZ-20	RD 3064	6.0	5.9	6.0	6.0
17	IVT-MB-NWPZ-8	RD 3065	6.0	6.0	5.9	5.9
18	IVT-MB-NWPZ-17	RD 3066	6.0	5.9	5.9	5.9
19	IVT-MB-NWPZ-10	RD 3067	6.1	6.0	5.8	6.0
20	IVT-MB-NWPZ-4	UPB 1116	5.9	5.9	5.8	5.9
21	IVT-MB-NWPZ-12	UPB 1117	6.1	6.0	5.9	6.0
22	IVT-MB-NWPZ-22	DWRUB 52 ©	5.9	6.0	5.9	5.9
23	IVT-MB-NWPZ-21	DWRB 137 ©*	6.1	6.0	6.1	6.1
24	IVT-MB-NWPZ-23	DWRB 182 ©	6.0	6.0	6.0	6.0
25	IVT-MB-NWPZ-1	RD 2849 ©	6.0	6.0	5.9	6.0
Average			6.0	6.0	5.9	6.0

*= 6 row barley

Table 5.3.18: Wort FAN content (ppm) of IVT entries from different locations

S.N	Code	Genotype	Karnal	Durgapura	Ludhiana	Mean
1	IVT-MB-NWPZ-9	BH 1050	114.7	118.5	176.9	136.7
2	IVT-MB-NWPZ-16	BH 1051	133.5	123.2	186.8	147.8
3	IVT-MB-NWPZ-19	BH 1052	170.1	157.1	188.7	172.0
4	IVT-MB-NWPZ-5	DWRB 235	151.4	137.8	178.7	155.9
5	IVT-MB-NWPZ-14	DWRB 236	190.6	126.6	197.3	171.5
6	IVT-MB-NWPZ-15	DWRB 237	149.3	149.4	183.7	160.8
7	IVT-MB-NWPZ-25	DWRB 238	170.1	134.8	180.5	161.8
8	IVT-MB-NWPZ-7	DWRB 239	140.3	141.2	185.5	155.7
9	IVT-MB-NWPZ-24	DWRB 240	172.3	184.1	198.6	185.0
10	IVT-MB-NWPZ-18	KB 2131	158.2	138.6	177.8	158.2
11	IVT-MB-NWPZ-13	KB 2145	156.9	134.8	199.5	163.7
12	IVT-MB-NWPZ-3	PL 941	108.7	116.3	150.6	125.2
13	IVT-MB-NWPZ-6	PL 942	131.8	156.7	200.5	163.0
14	IVT-MB-NWPZ-2	PL 943	139.4	169.5	182.3	163.8
15	IVT-MB-NWPZ-11	PL 945	188.1	149.8	198.2	178.7
16	IVT-MB-NWPZ-20	RD 3064	131.8	198.3	186.8	172.3
17	IVT-MB-NWPZ-8	RD 3065	177.0	166.5	196.4	180.0
18	IVT-MB-NWPZ-17	RD 3066	186.8	163.5	191.8	180.7
19	IVT-MB-NWPZ-10	RD 3067	113.0	116.3	158.7	129.3
20	IVT-MB-NWPZ-4	UPB 1116	183.4	190.1	221.3	198.3
21	IVT-MB-NWPZ-12	UPB 1117	139.9	125.3	171.9	145.7
22	IVT-MB-NWPZ-22	DWRUB 52 ©	168.4	182.4	184.6	178.5
23	IVT-MB-NWPZ-21	DWRB 137 ©*	126.7	146.4	169.6	147.5
24	IVT-MB-NWPZ-23	DWRB 182 ©	162.5	165.7	163.3	163.8
25	IVT-MB-NWPZ-1	RD 2849 ©	133.0	160.5	188.2	160.6
Average			151.9	150.1	184.7	162.3

*= 6 row barley

BARLEY QUALITY SCREENING NURSERY (BQSN)

The *Barley Quality Screening Nursery* (BQSN) was conducted for finding better sources of hulless and malt barley for different quality traits. The Nursery was conducted at six locations i.e., Hisar, Durgapura, Karnal, Ludhiana, Pantnagar, and Kanpur. The nursery was sent under two categories i.e., low protein barley (BQSN 1), and naked/hulless barley (BQSN 2) comprising 60 and 42 entries, respectively. BQSN 1 entries were evaluated for grain parameters (thousand grain weight, hectoliter weight, bold grain, thin grain, germinative energy, protein content, moisture, starch, and beta glucan) and malt parameters (malt yield, malt friability, malt homogeneity, hot water extraction, wort filtration rate, diastatic power, saccharification rate, wort pH, wort FAN, and wort beta glucan). All BQSN 2 entries were evaluated for grain parameters and few selected entries were also evaluated for grain beta glucan content. The promising genotypes from the both the nurseries are given in following tables

BQSN 1: (Low Protein Genotypes)

Table 5.4.1: Promising sources for different traits*

Traits	Promising entries
Low Protein Content	BCU6369, BCU6315, BCU 6316, BCU 5924, DWRB137 ©
Higher Starch Content	BCU 5957, BCU 6040, BCU 6306, BCU 6315, BCU 6316, DWRUB 52 ©
Higher Friability	BCU6369, BCU6315, DWRB137 ©
Higher Hot Water Extract	BCU6315, BCU6369, DWRB137 ©
Higher Diastatic Power	BCU6315, DWRB137 ©
Higher Free Amino Nitrogen	BCU6315, BCU6369, DWRB137 ©
Low beta glucan	BCU6369, BCU6315, DWRB137 © DWRUB64 ©

**At par or better than best check*

BQSN 2: Hulless/Naked Genotypes

Table 5.4.2: Promising sources for different traits*

Traits	Promising entries
Higher Beta Glucan Content	INBON-HI-(2016)-69, INBON-HI-(2016)-73, DWRFB-40 ©
Higher Protein Content	HLR34, HLR64, HLR136, HLR153, HLR196, HLR310, KNB-20-11, KNB-20-6, BCU8032, BCU8031, INBON-HI-(2016)-67, INBON-HI-(2016)-69, INBON-HI-(2016)-68, INBON-HI-(2016)-71, INBON-HI-(2016)-72, INBON-HI-(2016)-73, DWRFB-58 ©
Higher Starch Content	HLR322, KNB-20-8, DWRB191 ©
Higher Bold Grain Percentage	INBON-HI-(2016)-67, INBON-HI-(2016)-68, INBON-HI-(2016)-69, INBON-HI-(2016)-73, INBON-HI-(2015)-67, DWRFB-40 ©
Higher Thousand grain weight	KNB-20-11, INBON-HI-(2016)-73, INBON-HI-(2016)-69, DWRFB-58 ©

**At par or better than best check*

BQSN 1: (Low Protein Genotypes)-Grain Parameters

Table 5.4.3: Protein content (% dwb) in different genotypes at different locations#*

Code	Genotype	Hisar	Durgapura	Karnal	Ludhiana	Pantnagar	Kanpur	Mean
LP-1	BCU 5732	10.3	12.5	15.0	10.5	9.1	10.4	**11.3**
LP-2	BCU 5915	11.5	NA	NA	NA	NA	NA	**11.5**
LP-3	BCU 5924	9.8	10.2	11.0	9.7	7.9	8.3	**9.5**
LP-4	BCU 5936	10.4	10.2	11.6	10.1	9.2	9.4	**10.1**
LP-5	BCU 5957	12.4	12.8	14.7	12.2	10.8	11.1	**12.3**
LP-6	BCU 6040	12.3	11.7	12.7	11.4	10.0	11.2	**11.5**
LP-7	BCU 6304	13.0	NA	NA	NA	NA	NA	**13.0**
LP-8	BCU 6306	10.7	11.4	12.3	11.7	11.3	10.9	**11.4**
LP-9	BCU 6315	9.1	9.0	9.9	10.2	8.2	9.0	**9.3**
LP-10	BCU 6316	8.6	10.1	10.7	9.7	8.2	9.1	**9.4**
LP-11	BCU 6369	8.0	9.8	8.9	10.7	8.3	9.8	**9.3**
LP-12	BK 1127	13.1	13.5	16.0	13.8	12.7	13.0	**13.7**
LP-13	DWRB 137 ©	9.5	10.2	11.2	10.4	8.9	9.4	**9.9**
LP-14	DWRB 101 ©	10.9	11.6	12.7	11.7	10.5	10.4	**11.3**
LP-15	DWRUB 52 ©	11.1	11.4	13.2	11.6	9.8	10.8	**11.3**
LP-16	DWRUB 64 ©	10.2	10.6	11.5	11.7	8.9	9.8	**10.5**
LP-17	DWRB 92 ©	12.9	13.2	14.7	13.5	11.4	11.3	**12.8**
LP-18	DWRB 91 ©	11.9	11.9	12.1	11.0	10.6	9.8	**11.2**
LP-19	DWRB 182 ©	10.3	11.4	13.3	11.9	10.0	10.3	**11.2**
LP-20	DWRB 160 ©	11.1	11.1	12.4	11.3	10.4	9.9	**11.0**
Average		**10.9**	**11.3**	**12.4**	**11.3**	**9.8**	**10.2**	**11.0**

*#Predicted values through Near Infrared Reflectance Instrument; *Average of three replications*

Table 5.4.4: Starch content (% dwb) in different genotypes at different locations#*

Code	Genotype	Hisar	Durgapura	Karnal	Ludhiana	Pantnagar	Kanpur	Mean
LP-1	BCU 5732	59.5	59.8	59.0	59.5	60.0	59.5	**59.6**
LP-2	BCU 5915	60.9	NA	NA	NA	NA	NA	**60.9**
LP-3	BCU 5924	61.3	61.9	60.9	60.6	61.5	61.0	**61.2**
LP-4	BCU 5936	60.8	61.2	60.8	60.2	60.6	60.5	**60.7**
LP-5	BCU 5957	61.2	61.3	61.3	61.9	61.8	60.7	**61.4**
LP-6	BCU 6040	60.9	61.6	63.1	61.7	61.5	60.8	**61.6**
LP-7	BCU 6304	59.9	NA	NA	NA	NA	NA	**59.9**
LP-8	BCU 6306	61.9	62.0	62.1	61.7	61.4	60.9	**61.7**
LP-9	BCU 6315	61.4	63.4	62.4	61.9	61.8	60.6	**61.9**
LP-10	BCU 6316	61.6	62.7	61.5	62.0	62.4	60.9	**61.9**
LP-11	BCU 6369	61.1	61.4	62.3	59.8	60.8	59.3	**60.8**
LP-12	BK 1127	59.7	59.7	59.8	60.3	59.9	59.2	**59.8**
LP-13	DWRB 137 ©	61.3	61.8	61.3	60.9	60.7	60.8	**61.1**
LP-14	DWRB 101 ©	61.1	62.1	61.8	60.8	61.7	60.3	**61.3**
LP-15	DWRUB 52 ©	61.3	62.4	61.9	61.1	61.3	60.3	**61.4**
LP-16	DWRUB 64 ©	60.6	61.4	61.3	60.4	60.8	60.5	**60.8**
LP-17	DWRB 92 ©	60.6	61.2	61.6	59.9	60.7	60.4	**60.8**
LP-18	DWRB 91 ©	60.2	61.0	62.0	61.4	61.2	61.0	**61.1**
LP-19	DWRB 182 ©	61.4	62.4	61.7	59.8	61.0	60.7	**61.2**
LP-20	DWRB 160 ©	60.6	61.6	61.1	60.3	61.4	60.6	**60.9**
Average		**60.9**	**61.6**	**61.4**	**60.8**	**61.1**	**60.5**	**61.0**

*#Predicted values through Near Infrared Reflectance Instrument; * Average of three replications*

Table 5.4.5: Thousand grain weight in different genotypes at different locations*

Code	Genotype	Hisar	Durgapura	Karnal	Ludhiana	Pantnagar	Kanpur	Mean
LP-1	BCU 5732	51.4	46.8	45.5	43.1	49.3	47.7	**47.3**
LP-2	BCU 5915	45.4	45.4	44.5	42.0	44.7	46.4	**44.7**
LP-3	BCU 5924	38.1	44.1	34.7	31.4	40.9	39.6	**38.1**
LP-4	BCU 5936	41.7	42.7	38.0	36.0	40.0	38.6	**39.5**
LP-5	BCU 5957	45.7	56.9	50.9	47.1	34.5	48.9	**47.3**
LP-6	BCU 6040	43.8	46.7	44.4	36.9	41.6	42.4	**42.6**
LP-7	BCU 6304	46.4	53.4	51.4	44.8	50.5	48.9	**49.2**
LP-8	BCU 6306	55.1	54.0	50.6	44.3	56.2	53.0	**52.2**
LP-9	BCU 6315	36.0	41.9	31.8	31.8	40.0	39.5	**36.8**
LP-10	BCU 6316	35.3	43.4	33.3	32.7	41.4	40.1	**37.7**
LP-11	BCU 6369	35.9	40.1	35.6	31.0	36.5	41.6	**36.8**
LP-12	BK 1127	71.4	70.5	70.2	62.8	62.7	65.2	**67.1**
LP-13	DWRB 137 ©	48.9	52.6	45.9	39.9	47.0	48.0	**47.0**
LP-14	DWRB 101 ©	52.2	51.7	49.4	41.8	49.3	51.3	**49.3**
LP-15	DWRUB 52 ©	52.2	52.3	48.4	42.6	50.1	47.9	**48.9**
LP-16	DWRUB 64 ©	50.7	49.0	47.3	40.9	48.7	50.5	**47.9**
LP-17	DWRB 92 ©	63.5	62.0	57.4	49.9	56.6	57.6	**57.8**
LP-18	DWRB 91 ©	67.8	68.3	56.0	56.1	60.8	58.4	**61.2**
LP-19	DWRB 182 ©	49.7	48.2	51.4	36.0	46.1	47.3	**46.4**
LP-20	DWRB 160 ©	70.8	73.3	56.6	54.0	65.8	61.1	**63.6**
Average		**50.1**	**52.2**	**47.2**	**42.2**	**48.1**	**48.7**	**48.1**

** Average of three replications*

Table 5.4.6: Hectoliter weight (Test weight in kg/hl) of genotypes from different locations*

Code	Genotype	Hisar	Durgapura	Karnal	Ludhiana	Pantnagar	Kanpur	Mean
LP-1	BCU 5732	52.5	59.3	58.9	53.4	56.4	54.7	**55.9**
LP-2	BCU 5915	59.4	63.7	65.6	59.5	60.2	62.5	**61.8**
LP-3	BCU 5924	54.6	63.5	59.5	54.2	57.1	52.3	**56.9**
LP-4	BCU 5936	56.2	60.3	60.5	55.9	56.3	51.7	**56.8**
LP-5	BCU 5957	61.3	65.3	66.6	61.8	61.7	56.9	**62.3**
LP-6	BCU 6040	58.7	67.0	67.8	62.0	62.5	59.0	**62.8**
LP-7	BCU 6304	55.0	65.5	66.4	59.6	60.4	55.8	**60.4**
LP-8	BCU 6306	60.7	67.5	66.8	62.6	63.8	58.5	**63.3**
LP-9	BCU 6315	55.6	65.4	61.4	59.7	60.2	56.9	**59.8**
LP-10	BCU 6316	57.0	65.0	62.4	59.8	61.3	55.6	**60.2**
LP-11	BCU 6369	51.9	61.1	60.3	53.0	55.9	50.8	**55.5**
LP-12	BK 1127	58.4	64.2	66.4	63.2	59.9	53.7	**61.0**
LP-13	DWRB 137 ©	56.3	62.9	62.8	57.4	58.3	55.2	**58.8**
LP-14	DWRB 101 ©	61.7	68.5	67.7	63.9	64.8	56.3	**63.8**
LP-15	DWRUB 52 ©	60.4	68.7	68.4	64.2	63.1	58.3	**63.8**
LP-16	DWRUB 64 ©	53.3	62.2	62.7	57.9	59.3	55.5	**58.5**
LP-17	DWRB 92 ©	59.4	66.6	66.8	61.5	60.6	58.0	**62.2**
LP-18	DWRB 91 ©	57.5	65.8	65.6	63.0	62.4	56.3	**61.8**
LP-19	DWRB 182 ©	58.2	66.4	65.2	57.6	60.9	56.3	**60.8**
LP-20	DWRB 160 ©	56.0	65.7	62.5	55.9	59.9	53.8	**59.0**
Average		**57.2**	**64.7**	**64.2**	**59.3**	**60.2**	**55.9**	**60.3**

** Average of three replications*

Table 5.4.7: Bold grain percentage of genotypes from different locations*

Code	Genotype	Hisar	Durgapura	Karnal	Ludhiana	Pantnagar	Kanpur	Mean
LP-1	BCU 5732	95.3	86.4	83.6	87.6	95.6	93.9	**90.4**
LP-2	BCU 5915	86.9	85.7	84.2	85.0	91.6	89.2	**87.1**
LP-3	BCU 5924	77.1	84.1	66.5	54.3	89.5	83.6	**75.9**
LP-4	BCU 5936	87.1	83.6	74.3	66.9	82.8	70.8	**77.6**
LP-5	BCU 5957	97.0	97.5	95.5	90.7	96.2	93.6	**95.1**
LP-6	BCU 6040	86.4	93.1	86.1	72.0	88.2	82.0	**84.6**
LP-7	BCU 6304	96.3	95.4	93.6	84.8	96.5	88.9	**92.6**
LP-8	BCU 6306	95.9	93.6	87.5	79.4	97.1	93.2	**91.1**
LP-9	BCU 6315	61.4	85.1	52.3	51.0	82.7	77.1	**68.3**
LP-10	BCU 6316	62.0	89.7	60.3	50.8	88.7	81.5	**72.2**
LP-11	BCU 6369	72.7	86.2	67.2	49.0	81.6	88.7	**74.2**
LP-12	BK 1127	98.9	99.3	99.0	97.0	97.2	98.2	**98.3**
LP-13	DWRB 137 ©	95.6	95.3	94.9	81.4	95.1	93.7	**92.7**
LP-14	DWRB 101 ©	96.0	94.1	94.6	78.5	96.0	97.1	**92.7**
LP-15	DWRUB 52 ©	95.9	93.5	90.9	81.7	96.8	93.0	**92.0**
LP-16	DWRUB 64 ©	95.9	94.9	96.6	85.2	97.3	96.8	**94.4**
LP-17	DWRB 92 ©	99.6	98.7	98.7	87.9	98.8	98.9	**97.1**
LP-18	DWRB 91 ©	99.3	98.4	96.7	95.1	97.8	98.2	**97.6**
LP-19	DWRB 182 ©	94.6	93.5	93.5	61.4	93.6	94.0	**88.4**
LP-20	DWRB 160 ©	99.3	98.6	94.7	91.7	98.8	97.4	**96.7**
Average		**89.7**	**92.3**	**85.5**	**76.6**	**93.1**	**90.5**	**87.9**

** Average of three replications*

Table 5.4.8: Thin grain percentage of genotypes from different locations*

Code	Genotype	Hisar	Durgapura	Karnal	Ludhiana	Pantnagar	Kanpur	Mean
LP-1	BCU 5732	0.7	3.0	3.9	2.7	1.0	0.8	**2.0**
LP-2	BCU 5915	1.9	3.1	3.4	2.5	1.1	1.5	**2.3**
LP-3	BCU 5924	3.3	3.6	8.1	14.4	5.0	2.9	**6.2**
LP-4	BCU 5936	1.7	3.2	5.7	7.0	2.9	5.6	**4.3**
LP-5	BCU 5957	0.5	0.6	0.8	1.4	0.7	0.7	**0.8**
LP-6	BCU 6040	2.2	1.1	2.9	6.5	2.0	3.3	**3.0**
LP-7	BCU 6304	0.5	1.0	0.9	2.9	0.6	1.3	**1.2**
LP-8	BCU 6306	0.7	1.5	2.9	4.7	0.5	1.3	**1.9**
LP-9	BCU 6315	6.1	10.9	11.8	13.9	2.1	3.5	**8.1**
LP-10	BCU 6316	5.1	1.8	10.5	13.7	1.4	2.0	**5.7**
LP-11	BCU 6369	3.4	2.5	5.9	14.4	3.0	1.6	**5.1**
LP-12	BK 1127	0.2	0.3	0.3	0.5	0.6	0.4	**0.4**
LP-13	DWRB 137 ©	0.8	1.3	1.0	3.7	1.2	1.3	**1.5**
LP-14	DWRB 101 ©	0.4	0.9	0.8	3.6	0.7	0.4	**1.1**
LP-15	DWRUB 52 ©	0.4	1.2	1.5	3.6	0.5	0.7	**1.3**
LP-16	DWRUB 64 ©	0.9	1.1	0.7	3.0	0.6	0.5	**1.1**
LP-17	DWRB 92 ©	0.2	0.3	0.3	0.8	0.3	0.3	**0.4**
LP-18	DWRB 91 ©	0.3	0.7	0.6	1.1	0.7	0.5	**0.6**
LP-19	DWRB 182 ©	0.8	1.4	1.7	9.1	0.9	0.5	**2.4**
LP-20	DWRB 160 ©	0.2	0.2	0.8	1.5	0.4	0.5	**0.6**
Average		**1.5**	**2.0**	**3.2**	**5.5**	**1.3**	**1.5**	**2.5**

** Average of three replications*

Table 5.4.9: Moisture content in grains (%) of genotypes from different locations*

Code	Genotype	Hisar	Durgapura	Karnal	Ludhiana	Pantnagar	Kanpur	Mean
LP-1	BCU 5732	10.6	9.6	8.8	10.5	10.6	9.4	**9.9**
LP-2	BCU 5915	10.4	NA	NA	NA	NA	NA	**10.4**
LP-3	BCU 5924	10.5	10.2	9.0	10.8	11.0	9.8	**10.2**
LP-4	BCU 5936	10.2	10.0	9.1	11.1	10.8	9.7	**10.1**
LP-5	BCU 5957	10.2	10.0	8.7	10.8	10.7	9.7	**10.0**
LP-6	BCU 6040	10.3	9.6	8.6	10.5	10.4	9.7	**9.9**
LP-7	BCU 6304	13.9	NA	NA	NA	NA	NA	**13.9**
LP-8	BCU 6306	9.9	9.6	9.2	10.6	10.4	9.6	**9.9**
LP-9	BCU 6315	10.1	9.8	8.7	10.3	10.5	9.6	**9.8**
LP-10	BCU 6316	11.0	9.8	9.5	10.4	10.5	9.7	**10.1**
LP-11	BCU 6369	10.4	9.7	8.9	11.0	10.4	10.0	**10.1**
LP-12	BK 1127	10.4	10.4	8.8	10.9	10.7	10.3	**10.3**
LP-13	DWRB 137 ©	10.6	9.8	9.0	11.2	10.8	10.0	**10.2**
LP-14	DWRB 101 ©	10.5	9.6	8.7	11.0	10.4	9.8	**10.0**
LP-15	DWRUB 52 ©	10.5	9.6	8.6	10.7	10.7	10.0	**10.0**
LP-16	DWRUB 64 ©	10.9	10.0	9.1	11.4	11.2	10.0	**10.4**
LP-17	DWRB 92 ©	11.3	9.8	8.9	11.3	10.5	9.7	**10.2**
LP-18	DWRB 91 ©	11.1	9.8	8.7	10.9	11.1	11.1	**10.5**
LP-19	DWRB 182 ©	10.3	9.7	9.5	11.1	10.7	10.2	**10.2**
LP-20	DWRB 160 ©	11.3	9.8	9.5	11.4	11.4	10.3	**10.6**
Average		**10.7**	**9.8**	**9.0**	**10.9**	**10.7**	**9.9**	**10.2**

** Average of three replications*

Table 5.4.10: Grain beta glucan content (% dwb) in selected genotypes at different locations*

Code	Genotype	Hisar	Durgapura	Karnal	Ludhiana	Pantnagar	Kanpur	Mean
LP-9	BCU 6315	4.3	5.4	4.1	4.1	4.8	5.1	**4.6**
LP-11	BCU 6369	4.9	7.0	5.5	5.1	5.3	5.7	**5.6**
LP-13	DWRB 137 ©	6.9	7.5	6.6	5.3	6.2	5.8	**6.4**
LP-16	DWRUB 64 ©	6.8	6.7	5.8	6.2	6.5	6.4	**6.4**
Average		**5.7**	**6.6**	**5.5**	**5.2**	**5.7**	**5.7**	**5.7**

** Average of three replications*

Malt Parameters

Table 5.4.11: Malt yield (%) in selected genotypes at different locations*

Code	Genotype	Hisar	Durgapura	Karnal	Ludhiana	Pantnagar	Kanpur	Mean
LP-9	BCU 6315	86.9	87.0	87.3	82.8	86.1	86.7	**86.1**
LP-11	BCU 6369	90.1	88.5	88.1	86.4	85.4	89.4	**88.0**
LP-13	DWRB 137 ©	89.1	85.6	86.4	84.4	86.3	86.9	**86.5**
LP-16	DWRUB 64 ©	90.4	88.6	88.7	87.4	87.9	89.7	**88.8**
Average		**89.1**	**87.4**	**87.6**	**85.2**	**86.4**	**88.2**	**87.3**

** Average of three replications*

Table 5.4.12: Malt friability (%) in selected genotypes at different locations*

Code	Genotype	Hisar	Durgapura	Karnal	Ludhiana	Pantnagar	Kanpur	Mean
LP-9	BCU 6315	93.2	84.9	85.9	94.7	95.6	88.8	**90.5**
LP-11	BCU 6369	84.6	76.7	80.7	90.6	89.1	76.4	**83.0**
LP-13	DWRB 137 ©	57.5	52.9	48.8	65.5	75.4	61.6	**60.3**
LP-16	DWRUB 64 ©	44.3	44.6	47.1	44.4	62.0	49.2	**48.6**
Average		**69.9**	**64.8**	**65.6**	**73.8**	**80.5**	**69.0**	**70.6**

** Average of three replications*

Table 5.4.13: Malt homogeneity (%) in selected genotypes at different locations*

Code	Genotype	Hisar	Durgapura	Karnal	Ludhiana	Pantnagar	Kanpur	Mean
LP-9	BCU 6315	99.4	97.8	99.3	99.5	99.5	99.3	**99.1**
LP-11	BCU 6369	99.0	98.1	98.9	99.1	99.2	98.1	**98.7**
LP-13	DWRB 137 ©	77.7	79.4	79.6	90.2	94.8	89.1	**85.1**
LP-16	DWRUB 64 ©	59.2	63.5	69.9	63.7	81.7	69.6	**67.9**
Average		**83.8**	**84.7**	**86.9**	**88.1**	**93.8**	**89.0**	**87.7**

** Average of three replications*

Table 5.4.14: Wort filtration rate (ml/hr.) in selected genotypes at different locations*

Code	Genotype	Hisar	Durgapura	Karnal	Ludhiana	Pantnagar	Kanpur	Mean
LP-9	BCU 6315	321.7	280.0	320.0	310.0	261.7	265.0	**293.1**
LP-11	BCU 6369	263.3	208.3	296.7	185.0	118.3	151.7	**203.9**
LP-13	DWRB 137 ©	231.7	175.0	240.0	211.7	135.0	215.0	**201.4**
LP-16	DWRUB 64 ©	178.3	175.0	201.7	208.3	121.7	191.7	**179.4**
Average		**248.8**	**209.6**	**264.6**	**228.8**	**159.2**	**205.8**	**219.4**

** Average of three replications*

Table 5.4.15: Malt Diastatic power (ºL) in selected genotypes at different locations*

Code	Genotype	Hisar	Durgapura	Karnal	Ludhiana	Pantnagar	Kanpur	Mean
LP-9	BCU 6315	114.5	112.9	108.1	112.3	110.4	107.3	**110.9**
LP-11	BCU 6369	111.2	105.8	112.0	109.7	107.2	104.2	**108.4**
LP-13	DWRB 137 ©	115.5	108.8	106.4	114.5	112.8	108.8	**111.1**
LP-16	DWRUB 64 ©	113.2	103.1	106.6	112.2	110.6	108.7	**109.1**
Average		**113.6**	**107.6**	**108.3**	**112.2**	**110.2**	**107.2**	**109.9**

** Average of three replications*

Table 5.4.16: Hot water extract (%fgdw) in selected genotypes at different locations*

Code	Genotype	Hisar	Durgapura	Karnal	Ludhiana	Pantnagar	Kanpur	Mean
LP-9	BCU 6315	83.9	81.5	80.4	79.6	80.5	82.6	**81.4**
LP-11	BCU 6369	81.5	78.9	81.5	78.4	53.4	82.0	**75.9**
LP-13	DWRB 137 ©	77.2	77.8	77.2	89.8	50.4	80.5	**75.5**
LP-16	DWRUB 64 ©	75.8	76.6	77.2	75.5	50.8	79.3	**72.5**
Average		**79.6**	**78.7**	**79.1**	**80.8**	**58.8**	**81.1**	**76.3**

** Average of three replications*

Table 5.4.17: Wort free amino nitrogen (ppm) in selected genotypes at different locations*

Code	Genotype	Hisar	Durgapura	Karnal	Ludhiana	Pantnagar	Kanpur	Mean
LP-9	BCU 6315	176.1	162.4	174.1	196.2	170.7	172.3	**175.3**
LP-11	BCU 6369	161.7	184.8	176.5	198.8	94.6	129.0	**157.6**
LP-13	DWRB 137 ©	128.8	141.8	152.3	154.8	81.9	133.7	**132.2**
LP-16	DWRUB 64 ©	96.9	70.1	125.6	105.9	70.4	99.0	**94.7**
Average		**140.9**	**139.8**	**157.1**	**164.0**	**104.4**	**133.5**	**139.9**

** Average of three replications*

Table 5.4.18: Wort pH in selected genotypes at different locations*

Code	Genotype	Hisar	Durgapura	Karnal	Ludhiana	Pantnagar	Kanpur	Mean
LP-9	BCU 6315	6.1	6.2	6.1	6.1	6.1	6.1	**6.1**
LP-11	BCU 6369	6.1	6.1	6.0	6.0	6.2	6.1	**6.1**
LP-13	DWRB 137 ©	6.2	6.2	6.1	6.2	6.2	6.1	**6.2**
LP-16	DWRUB 64 ©	6.2	6.3	6.1	6.2	6.2	6.2	**6.2**
Average		**6.1**	**6.2**	**6.1**	**6.1**	**6.2**	**6.1**	**6.1**

** Average of three replications*

Table 5.4.19: Wort saccharification rate in selected genotypes at different locations*

Code	Genotype	Hisar	Durgapura	Karnal	Ludhiana	Pantnagar	Kanpur	Mean
LP-9	BCU 6315	5	5	6.7	10	8.3	8.3	**7.2**
LP-11	BCU 6369	10	10	6.7	5	5.0	5	**6.9**
LP-13	DWRB 137 ©	5	5	6.7	6.7	6.7	5	**5.8**
LP-16	DWRUB 64 ©	5	5	5	5	5.0	5	**5.0**
Average		**6.3**	**6.3**	**6.3**	**6.7**	**6.3**	**5.8**	**6.3**

** Average of three replications*

Table 5.4.20: Kolbach Index (KI) of AVT entries from different locations*

Code	Genotype	Hisar	Durgapura	Karnal	Ludhiana	Pantnagar	Kanpur	Mean
LP-9	BCU 6315	40.9	43.7	39.9	41.5	43.6	39.9	**41.6**
LP-11	BCU 6369	39.5	42.3	41.5	39.7	41.3	41.3	**40.9**
LP-13	DWRB 137 ©	38.4	40.5	39.4	41.0	38.6	42.0	**40.0**
LP-16	DWRUB 64 ©	40.8	37.4	39.8	40.2	39.8	39.4	**39.6**
Average		**39.9**	**41.0**	**40.2**	**40.6**	**40.8**	**40.6**	**40.5**

** Average of three replications*

Table 5.4.21: Wort beta glucan in selected genotypes at two locations*

Code	Genotype	Durgapura	Karnal	Mean
LP-9	BCU 6315	128.3	116.6	**122.5**
LP-11	BCU 6369	142.2	115.7	**128.9**
LP-13	DWRB 137 ©	370.2	305.3	**337.8**
LP-16	DWRUB 64 ©	642.0	734.0	**688.0**
Average		**320.7**	**317.9**	**319.3**

** Average of three replications*

BQSN 2: (Hulless genotypes)-Grain Parameters

Table 5.4.22: Thousand grain weight in different genotypes at different locations

Code	Genotype	Hisar	D. Pura	Karnal	Ludhiana	P. Nagar	Kanpur	Mean
NB-1	HLR 10	40.4	36.3	34.7	31.0	36.6	33.2	**35.4**
NB-2	HLR 24	37.5	32.3	29.7	29.0	33.3	36.0	**33.0**
NB-3	HLR 34	39.2	27.9	24.5	36.0	28.5	29.9	**31.0**
NB-4	HLR 64	28.8	30.0	26.2	27.4	33.0	33.9	**29.9**
NB-5	HLR 125	40.5	27.7	31.5	29.2	39.9	45.5	**35.7**
NB-6	HLR-136	36.0	32.4	33.8	32.6	33.5	39.3	**34.6**
NB-7	HLR 153	31.7	21.0	27.9	21.5	32.0	32.4	**27.8**
NB-8	HLR 196	19.5	23.0	20.7	20.7	25.1	25.9	**22.5**
NB-9	HLR 310	30.5	28.5	30.5	20.6	29.5	32.2	**28.6**
NB-10	HLR 355	35.9	31.0	36.2	24.8	26.6	29.9	**30.7**
NB-11	DWRNB-17	39.3	37.7	30.6	29.1	36.9	34.2	**34.6**
NB-12	INBON-HI-(2016)-24	35.7	31.0	30.1	26.1	34.5	38.1	**32.6**
NB-13	INBON-HI-(2016)-69	51.9	49.8	46.4	43.0	NA	48.0	**47.8**
NB-14	INBON-HI-(2016)-73	60.9	57.6	57.4	49.9	49.2	NA	**55.0**
NB-15	INBON-HI-(2016)-72	44.7	48.8	45.6	43.9	NA	45.2	**45.7**
NB-16	INBON-HI-(2015)-67	47.5	49.2	48.1	41.2	44.9	49.7	**46.7**
NB-17	INBON-HI-(2016)-68	49.2	50.0	40.9	44.2	NA	46.5	**46.1**
NB-18	INBON-HI-(2016)-67	47.4	46.4	45.0	38.9	46.5	43.2	**44.6**
NB-19	INBON-HI-(2016)-71	55.7	50.1	47.1	33.9	NA	42.1	**45.8**
NB-20	BCU-91(Karan 246)	39.3	40.0	40.1	25.5	37.8	42.3	**37.5**
NB-21	BCU 7998	51.8	52.9	46.1	33.3	45.9	44.0	**45.7**
NB-22	BCU 8032	35.1	37.0	26.6	29.6	NA	42.5	**34.2**
NB-23	BCU 8031	37.9	36.8	30.8	31.2	37.4	NA	**34.8**
NB-24	DWR 62	42.3	37.9	35.1	29.8	37.2	36.9	**36.5**
NB-25	DWR80	41.1	39.6	37.8	32.2	39.1	38.0	**38.0**
NB-26	KNB-20-3	35.7	36.2	37.7	29.5	31.9	37.1	**34.7**
NB-27	KNB-20-4	43.7	41.3	37.5	29.9	33.4	37.8	**37.3**
NB-28	KNB-20-5	36.3	40.0	33.4	26.2	44.2	42.2	**37.1**
NB-29	KNB20-6	35.0	34.5	33.4	27.6	36.9	37.5	**34.1**
NB-30	KNB-20-8	49.4	43.3	42.9	28.2	35.7	41.0	**40.1**
NB-31	KNB-20-10	42.2	50.8	45.9	44.8	33.3	50.9	**44.7**
NB-32	KNB-20-11	60.7	51.2	54.4	45.6	NA	52.2	**52.8**
NB-33	DWRB 192 ©	NA	NA	NA	30.5	NA	NA	**NA**
NB-34	DWRB 191 ©	NA	36.0	46.9	32.1	NA	NA	**38.4**
NB-35	DWRFB-40 ©	40.1	42.5	48.3	41.4	48.1	47.0	**44.6**
NB-36	DWRFB-58 ©	49.8	51.6	45.1	42.2	NA	51.4	**48.0**
NB-37	BCU 8028 ©	55.0	41.8	40.8	30.9	41.5	39.1	**41.5**
NB-38	Karan 16 ©	37.5	38.2	38.3	28.6	31.3	38.3	**35.4**
NB-39	NDB 943 ©	38.7	36.8	39.0	28.4	32.6	37.0	**35.4**
NB-40	PL891 ©	57.7	46.2	47.6	40.4	45.8	47.5	**47.5**
NB-41	BHS 352 ©	34.6	37.5	26.3	25.7	29.1	31.2	**30.7**
NB-42	HLR 322	41.5	34.8	28.9	26.2	34.2	35.2	**33.5**
Average		**41.9**	**39.5**	**37.8**	**32.5**	**36.5**	**39.8**	**38.0**

D. Pura: Durgapura; P. Nagar: Pantnagar

Table 5.4.23: Bold grain percentage (≥ 2.5 mm) in different genotypes at different locations

Code	Genotype	Hisar	D. Pura	Karnal	Ludhiana	P. Nagar	Kanpur	Mean
NB-1	HLR 10	48.9	51.0	36.2	26.6	NA	60.6	**44.7**
NB-2	HLR 24	50.5	16.1	21.9	57.0	35.9	54.8	**39.4**
NB-3	HLR 34	NA	6.7	6.8	NA	NA	NA	**6.7**
NB-4	HLR 64	NA	2.7	3.0	7.2	NA	10.9	**5.9**
NB-5	HLR 125	37.4	15.5	23.7	NA	NA	77.1	**38.4**
NB-6	HLR-136	NA	25.3	22.3	NA	NA	NA	**23.8**
NB-7	HLR 153	4.6	1.7	5.3	4.0	2.2	5.5	**3.9**
NB-8	HLR 196	NA	2.6	3.2	NA	NA	NA	**2.9**
NB-9	HLR 310	NA	3.2	2.9	6.3	2.3	NA	**3.7**
NB-10	HLR 355	25.4	17.4	25.4	11.7	NA	NA	**20.0**
NB-11	DWRNB-17	69.3	62.0	40.1	28.8	66.7	NA	**53.4**
NB-12	INBON-HI-(2016)-24	63.6	25.4	24.7	20.7	67.2	66.6	**44.7**
NB-13	INBON-HI-(2016)-69	91.0	91.7	85.0	84.8	NA	88.5	**88.2**
NB-14	INBON-HI-(2016)-73	92.8	93.5	89.4	87.0	NA	NA	**90.7**
NB-15	INBON-HI-(2016)-72	NA	93.6	76.4	67.6	NA	77.6	**78.8**
NB-16	INBON-HI-(2015)-67	84.4	88.9	89.3	82.9	NA	90.5	**87.2**
NB-17	INBON-HI-(2016)-68	NA	92.1	NA	NA	NA	NA	**92.1**
NB-18	INBON-HI-(2016)-67	NA	91.3	85.6	NA	NA	NA	**88.4**
NB-19	INBON-HI-(2016)-71	80.7	72.3	59.4	NA	NA	NA	**70.8**
NB-20	BCU-91(Karan 246)	81.3	71.9	58.8	24.5	70.3	76.4	**63.9**
NB-21	BCU 7998	87.28	85.26	82	NA	71.98	71.13	**79.5**
NB-22	BCU 8032	NA	24.57	NA	NA	NA	NA	**24.6**
NB-23	BCU 8031	NA	38.66	35.2	NA	NA	NA	**36.9**
NB-24	DWR 62	79.03	72.5	60.71	46.78	78.38	78.17	**69.3**
NB-25	DWR80	84.29	78.1	71.18	45.75	85.16	74.99	**73.2**
NB-26	KNB-20-3	72.93	47.63	61.24	21.25	NA	62.71	**53.2**
NB-27	KNB-20-4	71.1	46.19	46.78	27.19	49.58	59.08	**50.0**
NB-28	KNB-20-5	66.57	73.35	48.73	35.28	83.18	76.75	**64.0**
NB-29	KNB20-6	NA	31.8	30.66	12.77	NA	NA	**25.1**
NB-30	KNB-20-8	74.84	50.8	49.5	NA	NA	42.16	**54.3**
NB-31	KNB-20-10	84.9	44.63	60.06	50.14	NA	48.21	**57.6**
NB-32	KNB-20-11	77.85	70.74	76.17	61.04	NA	49.96	**67.2**
NB-33	DWRB 192 ©	NA	NA	NA	NA	NA	NA	**NA**
NB-34	DWRB 191 ©	NA	32.99	88.73	NA	NA	NA	**60.9**
NB-35	DWRFB-40 ©	90.14	83.4	79.03	83.92	93.07	93.17	**87.1**
NB-36	DWRFB-58 ©	77.56	86.59	57.11	77.2	NA	NA	**74.6**
NB-37	BCU 8028 ©	71.57	84.88	66.38	46.76	NA	72.46	**68.4**
NB-38	Karan 16 ©	69.31	55.59	56.83	35.72	NA	77.67	**59.0**
NB-39	NDB 943 ©	73.93	50.58	62.79	27.61	NA	63.48	**55.7**
NB-40	PL891 ©	79.89	58.2	68.45	59.6	NA	63.44	**65.9**
NB-41	BHS 352 ©	12.34	38.57	4.89	7.8	13.82	NA	**15.5**
NB-42	HLR 322	48.19	26.89	20.1	11.62	26.87	27.96	**26.9**
Average		**67.3**	**51.4**	**48.4**	**40.0**	**53.3**	**62.8**	**53.9**

D. Pura: Durgapura; P. Nagar: Pantnagar

Table 5.4.24: Thin grain percentage (≤ 2.2 mm) in different genotypes at different locations

Code	Genotype	Hisar	D. Pura	Karnal	Ludhiana	P. Nagar	Kanpur	Mean
NB-1	HLR 10	12.3	17.1	18.6	23.5	NA	9.4	**16.2**
NB-2	HLR 24	17.8	38.0	36.4	18.3	25.3	10.9	**24.4**
NB-3	HLR 34	NA	41.9	54.6	NA	NA	NA	**48.2**
NB-4	HLR 64	NA	45.5	62.0	54.2	NA	20.2	**45.5**
NB-5	HLR 125	12.8	44.2	27.9	NA	NA	3.4	**22.1**
NB-6	HLR-136	NA	26.9	33.4	NA	NA	NA	**30.1**
NB-7	HLR 153	68.2	86.0	63.6	84.8	57.5	49.5	**68.3**
NB-8	HLR 196	NA	68.8	72.9	NA	NA	NA	**70.8**
NB-9	HLR 310	NA	65.2	62.5	82.0	62.6	NA	**68.1**
NB-10	HLR 355	31.5	49.3	39.3	66.9	NA	NA	**46.7**
NB-11	DWRNB-17	4.4	4.9	19.4	32.2	5.0	NA	**13.2**
NB-12	INBON-HI-(2016)-24	7.4	23.5	35.1	42.8	7.7	8.4	**20.8**
NB-13	INBON-HI-(2016)-69	0.6	1.8	2.3	1.6	NA	1.4	**1.5**
NB-14	INBON-HI-(2016)-73	0.9	0.6	0.5	1.3	NA	NA	**0.8**
NB-15	INBON-HI-(2016)-72	NA	1.9	2.6	1.3	NA	2.8	**2.1**
NB-16	INBON-HI-(2015)-67	5.1	3.2	2.0	4.4	NA	3.1	**3.5**
NB-17	INBON-HI-(2016)-68	NA	2.2	NA	NA	NA	NA	**2.2**
NB-18	INBON-HI-(2016)-67	NA	1.7	2.9	NA	NA	NA	**2.3**
NB-19	INBON-HI-(2016)-71	0.8	5.3	5.9	NA	NA	NA	**4.0**
NB-20	BCU-91(Karan 246)	2.2	4.7	6.1	30.6	5.6	2.3	**8.6**
NB-21	BCU 7998	2.21	2.35	3.57	NA	9.16	4.81	**4.4**
NB-22	BCU 8032	NA	29.08	NA	NA	NA	NA	**29.1**
NB-23	BCU 8031	NA	20.85	26.2	NA	NA	NA	**23.5**
NB-24	DWR 62	3.29	4.45	6.82	13.29	3.13	3.78	**5.8**
NB-25	DWR80	1.93	2.82	5.64	11.9	2.08	3.91	**4.7**
NB-26	KNB-20-3	4.61	11.54	5.91	23.92	NA	7.48	**10.7**
NB-27	KNB-20-4	4.77	9.93	11.31	30.03	16.23	6.09	**13.1**
NB-28	KNB-20-5	5.48	3.09	12.84	21.57	1.94	2.67	**7.9**
NB-29	KNB20-6	NA	13.49	17.22	22.03	NA	NA	**17.6**
NB-30	KNB-20-8	1.63	6.34	8.96	NA	NA	6.97	**6.0**
NB-31	KNB-20-10	1.64	3.9	6.53	5.55	NA	5.72	**4.7**
NB-32	KNB-20-11	1.47	4.13	3.74	5.85	NA	5.9	**4.2**
NB-33	DWRB 192 ©	NA	NA	NA	NA	NA	NA	**NA**
NB-34	DWRB 191 ©	NA	21.02	2.54	NA	NA	NA	**11.8**
NB-35	DWRFB-40 ©	1.09	3.25	4.93	3.6	2.12	1.24	**2.7**
NB-36	DWRFB-58 ©	3.14	2.08	5.29	3.86	NA	NA	**3.6**
NB-37	BCU 8028 ©	2.63	2.19	2.06	20.57	NA	4.63	**6.4**
NB-38	Karan 16 ©	4.1	7.2	11.38	24.15	NA	3.1	**10.0**
NB-39	NDB 943 ©	3.94	9.92	4.11	25.99	NA	5.82	**10.0**
NB-40	PL891 ©	1.73	4.26	3.68	6.56	NA	4.26	**4.1**
NB-41	BHS 352 ©	45.64	22.24	68.35	59.21	48.07	NA	**48.7**
NB-42	HLR 322	14.06	16.35	43.83	47.92	14.69	23.13	**26.7**
Average		**9.2**	**17.9**	**20.6**	**26.5**	**18.7**	**8.0**	**16.8**

D. Pura: Durgapura; P. Nagar: Pantnagar

Table 5.4.25: Hectoliter weight (kg/hl) in different genotypes at different locations

Code	Genotype	Hisar	D. Pura	Karnal	Ludhiana	P. Nagar	Kanpur	Mean
NB-1	HLR 10	61.6	69.1	72.4	59.6	NA	52.5	**63.0**
NB-2	HLR 24	56.9	72.0	63.3	62.5	67.5	60.0	**63.7**
NB-3	HLR 34	NA	71.7	68.0	NA	NA	NA	**69.9**
NB-4	HLR 64	NA	73.4	69.8	70.9	NA	73.1	**71.8**
NB-5	HLR 125	74.7	72.8	74.8	NA	NA	74.4	**74.2**
NB-6	HLR-136	NA	71.4	70.1	NA	NA	NA	**70.8**
NB-7	HLR 153	68.4	64.2	70.6	61.8	71.7	68.9	**67.6**
NB-8	HLR 196	NA	68.9	69.6	NA	NA	NA	**69.3**
NB-9	HLR 310	NA	68.7	70.6	60.3	71.0	NA	**67.7**
NB-10	HLR 355	71.3	72.9	73.9	70.2	NA	NA	**72.1**
NB-11	DWRNB-17	48.5	56.8	49.5	61.4	55.3	NA	**54.3**
NB-12	INBON-HI-(2016)-24	51.7	63.6	61.6	60.3	51.2	53.6	**57.0**
NB-13	INBON-HI-(2016)-69	62.3	71.5	74.5	74.9	NA	65.7	**69.8**
NB-14	INBON-HI-(2016)-73	63.3	68.9	64.0	72.4	NA	NA	**67.1**
NB-15	INBON-HI-(2016)-72	NA	72.6	68.8	74.6	NA	69.6	**71.4**
NB-16	INBON-HI-(2015)-67	55.8	66.7	62.5	63.8	NA	57.8	**61.3**
NB-17	INBON-HI-(2016)-68	NA	74.7	NA	NA	NA	NA	**74.7**
NB-18	INBON-HI-(2016)-67	NA	73.9	68.0	NA	NA	NA	**71.0**
NB-19	INBON-HI-(2016)-71	57.7	73.0	70.8	NA	NA	NA	**67.1**
NB-20	BCU-91(Karan 246)	53.4	65.7	68.2	60.3	62.1	57.1	**61.1**
NB-21	BCU 7998	51.58	70.22	55.9	NA	55.4	55.34	**57.7**
NB-22	BCU 8032	NA	69.47	NA	NA	NA	NA	**69.5**
NB-23	BCU 8031	NA	70.11	69.32	NA	NA	NA	**69.7**
NB-24	DWR 62	52.17	71.31	69.2	69.41	60.59	54.97	**62.9**
NB-25	DWR80	50.65	68.36	55.54	66.45	60.27	53.75	**59.2**
NB-26	KNB-20-3	52.61	67.54	67.5	70.53	NA	56.21	**62.9**
NB-27	KNB-20-4	51.24	74.71	64.71	68.31	60.86	56.76	**62.8**
NB-28	KNB-20-5	53.39	67.79	64.23	65.36	71.84	62.39	**64.2**
NB-29	KNB20-6	NA	73.48	68.23	68.51	NA	NA	**70.1**
NB-30	KNB-20-8	52.12	73.11	68.01	NA	NA	61.75	**63.7**
NB-31	KNB-20-10	56.01	72.4	69.05	72.48	NA	60.71	**66.1**
NB-32	KNB-20-11	59.11	73.39	68.76	71.23	NA	58.36	**66.2**
NB-33	DWRB 192 ©	NA	NA	NA	NA	NA	NA	**NA**
NB-34	DWRB 191 ©	NA	68.02	71.76	NA	NA	NA	**69.9**
NB-35	DWRFB-40 ©	52.91	68.13	73.06	67	67.14	60.34	**64.8**
NB-36	DWRFB-58 ©	73.86	71.51	74.98	73.13	NA	NA	**73.4**
NB-37	BCU 8028 ©	57.7	65.06	74.74	63.45	NA	62.23	**64.6**
NB-38	Karan 16 ©	53.28	71.71	62.23	60.72	NA	51.69	**59.9**
NB-39	NDB 943 ©	51.28	72.69	64.44	70.01	NA	56.57	**63.0**
NB-40	PL891 ©	53.9	69.84	67.49	54.73	NA	54.28	**60.0**
NB-41	BHS 352 ©	68.17	71.51	68.08	67.78	70.26	NA	**69.2**
NB-42	HLR 322	74.95	75.85	73.23	74.01	75.38	70.18	**73.9**
Average		**58.3**	**70.2**	**67.7**	**66.8**	**64.3**	**60.3**	**64.6**

D. Pura: Durgapura; P. Nagar: Pantnagar

Table 5.4.26: Protein content (% dwb) in different genotypes at different locations#

Code	Genotype	Hisar	D. Pura	Karnal	Ludhiana	P. Nagar	Kanpur	Mean
NB-1	HLR 10	10.9	11.9	16.2	12.2	12.0	12.7	**12.7**
NB-2	HLR 24	10.6	11.9	14.8	13.0	12.5	11.6	**12.4**
NB-3	HLR 34	12.4	13.5	15.6	14.0	NA	12.5	**13.6**
NB-4	HLR 64	13.1	13.6	15.9	15.7	NA	13.5	**14.4**
NB-5	HLR 125	10.6	12.7	14.2	12.7	NA	12.7	**12.6**
NB-6	HLR-136	13.1	18.6	19.5	15.1	NA	NA	**16.6**
NB-7	HLR 153	11.8	15.1	17.6	17.4	12.1	14.5	**14.8**
NB-8	HLR 196	NA	16.4	16.9	15.2	NA	NA	**16.2**
NB-9	HLR 310	11.2	12.0	17.5	17.7	12.4	14.8	**14.3**
NB-10	HLR 355	10.8	11.4	14.6	15.6	NA	NA	**13.1**
NB-11	DWRNB-17	10.7	12.9	15.7	14.5	11.6	NA	**13.1**
NB-12	INBON-HI-(2016)-24	11.1	12.5	13.0	12.3	11.7	13.0	**12.3**
NB-13	INBON-HI-(2016)-69	NA	16.1	15.4	14.9	NA	13.6	**15.0**
NB-14	INBON-HI-(2016)-73	16.7	15.4	16.5	15.6	NA	NA	**16.1**
NB-15	INBON-HI-(2016)-72	NA	16.3	17.1	16.6	NA	15.3	**16.3**
NB-16	INBON-HI-(2015)-67	11.8	12.4	14.7	14.2	NA	11.3	**12.9**
NB-17	INBON-HI-(2016)-68	13.2	15.0	16.8	13.9	NA	NA	**14.7**
NB-18	INBON-HI-(2016)-67	NA	15.8	16.2	13.3	13.1	12.3	**14.1**
NB-19	INBON-HI-(2016)-71	12.7	14.6	16.0	13.6	NA	NA	**14.2**
NB-20	BCU-91(Karan 246)	11.8	12.0	12.3	12.2	10.5	10.3	**11.5**
NB-21	BCU 7998	12.7	12.1	13.2	12.4	11.9	12.2	**12.4**
NB-22	BCU 8032	NA	13.7	19.1	13.5	NA	NA	**15.4**
NB-23	BCU 8031	NA	15.5	17.4	NA	NA	NA	**16.5**
NB-24	DWR 62	12.9	12.2	13.8	12.6	11.1	11.2	**12.3**
NB-25	DWR80	10.8	12	14.6	12.4	11.9	11	**12.1**
NB-26	KNB-20-3	11.9	12.2	14.7	11.6	NA	12.3	**12.5**
NB-27	KNB-20-4	11.7	11.9	14.9	11.9	9.9	11.2	**11.9**
NB-28	KNB-20-5	10.8	11.3	14.1	13.1	11.3	11.2	**12.0**
NB-29	KNB20-6	12	13	17.3	13.2	NA	13.9	**13.9**
NB-30	KNB-20-8	10.3	10.6	13.5	12.1	NA	10.5	**11.4**
NB-31	KNB-20-10	9.9	13.2	15.4	11.8	NA	13.3	**12.7**
NB-32	KNB-20-11	14.3	14.8	14.9	12	NA	13.9	**14.0**
NB-33	DWRB 192 ©	NA	NA	NA	NA	NA	NA	**NA**
NB-34	DWRB 191 ©	NA	13.9	13.7	12.5	NA	NA	**13.4**
NB-35	DWRFB-40 ©	11	11.2	14.5	12	11.4	11.4	**11.9**
NB-36	DWRFB-58 ©	11.9	12.6	16.2	14	NA	12.9	**13.5**
NB-37	BCU 8028 ©	13	10.8	17.5	13.2	NA	11.4	**13.2**
NB-38	Karan 16 ©	10.7	10.2	12.4	11.6	NA	9.6	**10.9**
NB-39	NDB 943 ©	11.7	12.1	14.9	14.4	NA	11.2	**12.9**
NB-40	PL891 ©	11.9	12.6	13.9	12.2	NA	12.2	**12.6**
NB-41	BHS 352 ©	12.5	11.7	17.6	12	NA	12.3	**13.2**
NB-42	HLR 322	13	11.9	16	13	11.3	12.7	**13.0**
Average		**11.9**	**13.2**	**15.5**	**13.5**	**11.6**	**12.3**	**14.6**

#Predicted values through Near Infrared Reflectance Instrument; D. Pura: Durgapura; P. Nagar: Pantnagar

Table 5.4.27: Moisture content (%) in different genotypes at different locations#

Code	Genotype	Hisar	D. Pura	Karnal	Ludhiana	P. Nagar	Kanpur	Mean
NB-1	HLR 10	9.7	9.8	8.8	11.0	10.8	10.2	**10.1**
NB-2	HLR 24	10.0	9.4	9.5	10.9	15.1	9.3	**10.7**
NB-3	HLR 34	9.7	10.0	9.1	10.9	NA	9.2	**9.8**
NB-4	HLR 64	9.7	9.7	10.3	11.1	NA	9.1	**10.0**
NB-5	HLR 125	9.6	9.6	10.0	10.9	NA	9.1	**9.8**
NB-6	HLR-136	9.3	9.5	10.5	11.0	NA	NA	**10.1**
NB-7	HLR 153	9.9	9.9	9.4	10.8	11.0	9.0	**10.0**
NB-8	HLR 196	NA	9.6	10.8	11.1	NA	NA	**10.5**
NB-9	HLR 310	9.6	10.0	9.6	10.7	10.9	9.2	**10.0**
NB-10	HLR 355	9.8	10.5	10.4	11.0	NA	NA	**10.4**
NB-11	DWRNB-17	10.2	9.7	10.3	11.0	11.1	NA	**10.5**
NB-12	INBON-HI-(2016)-24	10.6	9.6	9.9	11.0	12.0	9.4	**10.4**
NB-13	INBON-HI-(2016)-69	NA	9.6	10.1	10.9	NA	9.6	**10.1**
NB-14	INBON-HI-(2016)-73	10.1	9.5	9.3	10.9	NA	NA	**10.0**
NB-15	INBON-HI-(2016)-72	NA	10.1	9.9	11.0	NA	9.3	**10.1**
NB-16	INBON-HI-(2015)-67	10.6	10.3	9.2	11.0	NA	9.3	**10.1**
NB-17	INBON-HI-(2016)-68	11.7	9.9	9.1	11.1	NA	NA	**10.5**
NB-18	INBON-HI-(2016)-67	NA	9.6	9.8	11.1	11.1	9.3	**10.2**
NB-19	INBON-HI-(2016)-71	11.0	9.9	10.3	11.0	NA	NA	**10.6**
NB-20	BCU-91(Karan 246)	11.7	9.8	10.1	10.8	11.0	9.1	**10.4**
NB-21	BCU 7998	10.3	9.7	9.7	11	10.8	9.4	**10.2**
NB-22	BCU 8032	NA	10.1	10.3	11	NA	NA	**10.5**
NB-23	BCU 8031	NA	10.1	9.4	NA	NA	NA	**9.8**
NB-24	DWR 62	10.1	10.2	9.2	11.2	10.8	9.3	**10.1**
NB-25	DWR80	9.7	10.2	10.5	11	10.9	9.4	**10.3**
NB-26	KNB-20-3	10.1	9.6	10.5	11	NA	9.2	**10.1**
NB-27	KNB-20-4	10.6	10.2	10.2	11.3	11.4	9.4	**10.5**
NB-28	KNB-20-5	9.6	10	9.9	10.9	10.8	9.2	**10.1**
NB-29	KNB20-6	9.8	10.1	10.2	11.1	NA	9.2	**10.1**
NB-30	KNB-20-8	11.4	9.5	10.1	10.9	NA	9.3	**10.2**
NB-31	KNB-20-10	11	9.8	10.2	11.2	NA	9.3	**10.3**
NB-32	KNB-20-11	11.1	9.8	9.2	11.1	NA	9.3	**10.1**
NB-33	DWRB 192 ©	NA	NA	NA	NA	NA	NA	**NA**
NB-34	DWRB 191 ©	NA	9.6	9.4	11	NA	NA	**10.0**
NB-35	DWRFB-40 ©	11.5	9.6	9.9	11.1	10.9	10	**10.5**
NB-36	DWRFB-58 ©	9.5	9.6	9.1	10.7	NA	9.1	**9.6**
NB-37	BCU 8028 ©	10.8	9.6	9.1	11	NA	9.3	**10.0**
NB-38	Karan 16 ©	10.4	9.8	9.5	10.9	NA	9.3	**10.0**
NB-39	NDB 943 ©	10.1	9.9	10.8	11.3	NA	9.3	**10.3**
NB-40	PL891 ©	10.4	9.3	10.1	11.2	NA	9.3	**10.1**
NB-41	BHS 352 ©	10.2	10.1	8.8	11	NA	9.3	**9.9**
NB-42	HLR 322	9.6	9.9	10.2	11.9	10.9	9.1	**10.3**
Average		**10.3**	**9.8**	**9.8**	**11.0**	**11.3**	**9.3**	**10.3**

#Predicted values through Near Infrared Reflectance Instrument; D. Pura: Durgapura; P. Nagar: Pantnagar

Table 5.4.28: Starch content (%) in different genotypes at different locations#

Code	Genotype	Hisar	D. Pura	Karnal	Ludhiana	P. Nagar	Kanpur	Mean
NB-1	HLR 10	61.9	62.7	61.8	62.8	61.8	60.4	**61.9**
NB-2	HLR 24	60.9	64.3	61.3	61.6	64.0	61.0	**62.2**
NB-3	HLR 34	61.0	62.9	61.8	61.4	NA	64.0	**62.2**
NB-4	HLR 64	64.1	62.9	61.6	61.7	NA	63.8	**62.8**
NB-5	HLR 125	63.7	63.5	61.8	64.0	NA	62.7	**63.1**
NB-6	HLR-136	58.5	55.7	53.5	57.7	NA	NA	**56.4**
NB-7	HLR 153	63.6	61.1	59.9	60.1	63.1	62.2	**61.7**
NB-8	HLR 196	NA	60.6	61.3	62.4	NA	NA	**61.4**
NB-9	HLR 310	62.4	63.3	59.8	59.3	63.2	62.9	**61.8**
NB-10	HLR 355	64.0	65.0	61.7	60.8	NA	NA	**62.9**
NB-11	DWRNB-17	60.0	60.6	58.7	60.5	59.8	NA	**59.9**
NB-12	INBON-HI-(2016)-24	60.4	62.0	61.7	60.9	59.8	59.6	**60.7**
NB-13	INBON-HI-(2016)-69	NA	60.8	61.5	62.6	NA	61.4	**61.6**
NB-14	INBON-HI-(2016)-73	58.7	60.3	59.7	61.5	NA	NA	**60.1**
NB-15	INBON-HI-(2016)-72	NA	60.1	60.6	61.3	NA	61.5	**60.9**
NB-16	INBON-HI-(2015)-67	59.7	60.9	59.8	59.3	NA	60.3	**60.0**
NB-17	INBON-HI-(2016)-68	59.7	60.8	61.0	63.9	NA	NA	**61.4**
NB-18	INBON-HI-(2016)-67	NA	61.2	60.6	64.6	61.7	63.7	**62.4**
NB-19	INBON-HI-(2016)-71	59.5	61.6	60.9	61.3	NA	NA	**60.8**
NB-20	BCU-91(Karan 246)	60.1	62.4	61.9	61.9	62.0	61.9	**61.7**
NB-21	BCU 7998	60.4	61.9	60.1	60.4	61.4	60.9	**60.9**
NB-22	BCU 8032	NA	61.3	57.8	61.9	NA	NA	**60.3**
NB-23	BCU 8031	NA	61	60	NA	NA	NA	**60.5**
NB-24	DWR 62	60.2	64.1	63.4	65	62.2	62	**62.8**
NB-25	DWR80	60.8	63.2	60.4	63.4	61.8	61.3	**61.8**
NB-26	KNB-20-3	59.9	63.6	61.1	65.9	NA	60.9	**62.3**
NB-27	KNB-20-4	60.6	65.1	60.7	64.2	61.8	61.2	**62.3**
NB-28	KNB-20-5	61.5	61.9	61.2	61.5	62.8	60.8	**61.6**
NB-29	KNB20-6	64.8	64.2	60.3	63.5	NA	63.6	**63.3**
NB-30	KNB-20-8	62	65.4	62.6	65	NA	63.2	**63.6**
NB-31	KNB-20-10	64.4	63	60.6	63.9	NA	61.2	**62.6**
NB-32	KNB-20-11	60.3	61.4	61.2	64.1	NA	60.1	**61.4**
NB-33	DWRB 192 ©	NA	NA	NA	NA	NA	NA	NA
NB-34	DWRB 191 ©	NA	61.9	62.4	66	NA	NA	**63.4**
NB-35	DWRFB-40 ©	60.6	63.4	61.4	63.4	61.8	60.2	**61.8**
NB-36	DWRFB-58 ©	63.7	62.9	62.1	62	NA	62.8	**62.7**
NB-37	BCU 8028 ©	59.8	63	60.1	61.8	NA	63.2	**61.6**
NB-38	Karan 16 ©	60.2	63.3	61.5	62.5	NA	60.7	**61.6**
NB-39	NDB 943 ©	60	64.1	60.6	63	NA	61.8	**61.9**
NB-40	PL891 ©	60.1	63	62.1	63.2	NA	60.3	**61.7**
NB-41	BHS 352 ©	63	64	60.3	63.3	NA	65	**63.1**
NB-42	HLR 322	62.8	64.5	61.2	63.8	64.5	63.3	**63.4**
Average		**61.3**	**62.4**	**60.8**	**62.4**	**62.1**	**61.9**	**61.8**

#Predicted values through Near Infrared Reflectance Instrument; D. Pura: Durgapura; P. Nagar: Pantnagar

Table 5.4.29: Grain beta glucan content (% dwb) in selected genotypes at different locations

Code	Genotype	Hisar	D. Pura	Karnal	Ludhiana	P. Nagar	Kanpur	Mean
NB-13	INBON-HI-(2016)-69	6.9	7.2	7.5	7.5	NA	6.7	**7.2**
NB-14	INBON-HI-(2016)-73	8.0	8.4	7.8	7.9	8.1	NA	**8.0**
NB-35	DWRFB-40 ©	7.4	6.9	5.6	8.5	6.9	7.2	**7.0**
NB-36	DWRFB-58 ©	6.2	6.5	5.8	6.8	NA	6.1	**6.3**
Average		**7.1**	**7.2**	**6.7**	**7.7**	**7.5**	**6.6**	**7.1**

D. Pura: Durgapura; P. Nagar: Pantnagar

Table 5.4.30: Antioxidant activity (% discoloration) using DPPH assay in selected genotypes at different locations

Code	Genotype	Hisar	D. Pura	Karnal	Ludhiana	P. Nagar	Kanpur	Mean
NB-11	DWRNB-17	75.07	56.33	57.27	63.55	57.98	52.33	**60.42**
NB-38	Karan 16 ©	47.60	39.96	39.73	47.52	42.92	34.20	**41.99**
NB-39	NDB 943 ©	50.27	45.25	42.27	45.12	44.43	44.80	**45.36**
NB-40	PL891 ©	43.40	32.94	40.53	43.67	40.17	26.93	**37.94**
NB-41	BHS 352 ©	42.93	40.30	37.73	43.88	40.72	40.13	**40.95**
Average		**51.85**	**42.96**	**43.51**	**48.75**	**45.24**	**39.68**	**44.0**

D. Pura: Durgapura; P. Nagar: Pantnagar

Table 5.4.31: Total phenolic content (mg/g GAE) in selected genotypes at different locations

Code	Genotype	Hisar	D. Pura	Karnal	Ludhiana	P. Nagar	Kanpur	Mean
NB-11	DWRNB-17	2.30	2.28	2.11	1.66	1.80	1.84	**2.00**
NB-38	Karan 16 ©	1.36	1.54	1.28	1.34	1.36	1.32	**1.37**
NB-39	NDB 943 ©	1.66	1.43	1.23	1.25	1.24	1.32	**1.36**
NB-40	PL891 ©	1.36	1.36	1.26	1.36	1.22	0.94	**1.25**
NB-41	BHS 352 ©	1.34	1.64	1.16	1.60	1.53	1.31	**1.43**
Average		**1.60**	**1.65**	**1.41**	**1.44**	**1.43**	**1.35**	**1.5**

D. Pura: Durgapura; P. Nagar: Pantnagar

FEED AND FOOD BARLEY QUALITY EVALUATION

The feed and food grain samples from various trials grown at different locations were analyzed for physical parameters and protein content. Each centre was requested to provide a grain sample of 250 g. The details of samples received are as under:

Table 5.5.1: Details of grain samples analyzed for quality

Trial	Zone	Locations	Total No. of Samples
Feed Barley			
IVT-IR-TS	NWPZ	Karnal, Hisar, Durgapura, Pantnagar, Ludhiana	125
	NEPZ	Sabour, Kanpur, Varanasi	75
	CZ	Vijapur, Udaipur	50
AVT-IR-TS	NWPZ	Karnal, Hisar, Durgapura, Pantnagar, Ludhiana	30
	NEPZ	Sabour, Kanpur, Varanasi	18
	CZ	Vijapur, Udaipur	16
IVT-RF-TS	NEPZ	Sabour, Kanpur, Saini Farm, Varanasi	60
IVT-RF-TS	NHZ	Shimla, Malan, Almora	72
AVT-SST	NWPZ/NEPZ	Fatehpur, Daleepnagar	36
Food/Hulless Barley			
IVT/AVT-IR-TS	NWPZ/NEPZ/CZ	Hisar, Durgapura, Pantnagar, Ludhiana, Vijapur, Udaipur, Kanpur, Varanasi, Modipuram	72
		TOTAL	**554**

Hectoliter weight (test weight) was measured with ICAR-IIWBR Hectoliter Weight instrument. The crude protein content was estimated using FOSS NIR system and has been given on dry weight basis. The quality data has been presented trial wise (Annexure 1). The entries having highest thousand grain weight, protein content and hectoliter weight have been listed in table no. 5.5.2.

Table 5.5.2: Entries having highest thousand grain weight, protein content and hectoliter weight in respective trials

Trial	Zone	Thousand grain weight	Protein content	Hectoliter weight
Feed Barley				
IVT-IR-TS	NWPZ	KB 2145	HUB 284	PL 947
	NEPZ	KB 2145	DWRB 242	DWRB 243
	CZ	RD 3068	DWRB 242	KB 2145
AVT-IR-TS	NWPZ	DWRB 137 ©	DWRB 226	DWRB 137 ©
	NEPZ	KB 2004	UPB 1106	KB 2004
	CZ	RD 2899 ©	RD 3053	RD 3053
IVT-RF-TS	NEPZ	PL 952	PL 952	HUB 282
	NHZ	VLB 183	VLB 182	HBL 113 ©
AVT-SST	NWPZ/NEPZ	KB 2120	DWRB 246	KB 2120
Food/Hulless Barley				
IVT/AVT-IR-TS	NWPZ/NEPZ/CZ	DWRB 245	DWRB 244	DWRB 244

Annexure -1

AVT-IR-TS-NWPZ/NEPZ

Table 5.5.3: Thousand grain weight (g) of different entries

S.N	Code	Genotype	NWPZ						NEPZ				Overall Mean
			Hisar	D. Pura	Karnal	Ludhiana	P. Nagar	Mean	Kanpur	Sabour	Varanasi	Mean	
1	AVT-IR-FB-NW/NEPZ-4	DWRB 226	39.9	42.4	42.7	36.8	39.0	**40.2**	40.4	23.2	32.3	**31.9**	**36.0**
2	AVT-IR-FB-NW/NEPZ-3	KB 2004	46.9	46.5	48.5	41.2	45.3	**45.7**	41.1	33.4	40.7	**38.4**	**42.0**
3	AVT-IR-FB-NW/NEPZ-1	UPB 1106	40.6	49.8	43.6	39.2	42.8	**43.2**	42.3	22.0	33.4	**32.5**	**37.9**
4	AVT-IR-FB-NW/NEPZ-5	BH 946 ©	41.1	45.5	48.5	34.2	40.7	**42.0**	37.8	22.7	32.6	**31.0**	**36.5**
5	AVT-IR-FB-NW/NEPZ-6	DWRB 137 ©	46.2	54.8	46.3	40.0	44.6	**46.4**	40.2	18.5	35.3	**31.3**	**38.9**
6	AVT-IR-FB-NW/NEPZ-2	HUB 113 ©	36.3	36.5	43.4	30.9	38.2	**37.1**	36.5	19.8	28.5	**28.3**	**32.7**
Average			**41.8**	**45.9**	**45.5**	**37.0**	**41.8**	**42.4**	**39.7**	**23.2**	**36.8**	**33.3**	**37.8**

D. Pura: Durgapura; P. Nagar: Pantnagar

Table 5.5.4: Protein content (% dwb) different entries

S.N	Code	Genotype	NWPZ						NEPZ				Overall Mean
			Hisar	D. Pura	Karnal	Ludhiana	P. Nagar	Mean	Kanpur	Sabour	Varanasi	Mean	
1	AVT-IR-FB-NW/NEPZ-4	DWRB 226	13.0	12.3	11.9	12.2	10.0	**11.9**	10.5	13.5	11.2	**11.7**	**11.8**
2	AVT-IR-FB-NW/NEPZ-3	KB 2004	11.6	10.8	10.5	12.5	10.5	**11.2**	11.6	13.0	12.4	**12.3**	**11.8**
3	AVT-IR-FB-NW/NEPZ-1	UPB 1106	13.2	11.1	10.7	12.5	10.1	**11.5**	12.0	15.3	13.6	**13.6**	**12.6**
4	AVT-IR-FB-NW/NEPZ-5	BH 946 ©	11.1	10.6	11.9	13.8	8.8	**11.2**	11.5	13.6	11.2	**12.1**	**11.7**
5	AVT-IR-FB-NW/NEPZ-6	DWRB 137 ©	9.2	10.0	11.9	10.7	8.2	**10.0**	9.9	15.2	10.6	**11.9**	**11.0**
6	AVT-IR-FB-NW/NEPZ-2	HUB 113 ©	11.5	12.3	10.1	13.6	10.1	**11.5**	10.7	13.1	12.8	**12.2**	**11.9**
Average			**11.6**	**11.2**	**11.2**	**12.6**	**9.6**	**11.2**	**11.0**	**14.0**	**11.7**	**12.2**	**11.7**

D. Pura: Durgapura; P. Nagar: Pantnagar

Table 5.5.5: Hectoliter weight/Test weight (kg/hl) different entries

S.N	Code	Genotype	NWPZ						NEPZ				Overall Mean
			Hisar	D. Pura	Karnal	Ludhiana	P. Nagar	Mean	Kanpur	Sabour	Varanasi	Mean	
1	AVT-IR-FB-NW/NEPZ-4	DWRB 226	56.3	61.8	58.6	61.0	55.6	**58.6**	55.8	44.2	49.4	**49.8**	**54.2**
2	AVT-IR-FB-NW/NEPZ-3	KB 2004	56.2	62.8	60.5	59.3	57.1	**59.2**	56.5	48.4	51.3	**52.1**	**55.6**
3	AVT-IR-FB-NW/NEPZ-1	UPB 1106	49.7	59.5	54.1	55.6	55.6	**54.9**	52.3	40.9	42.1	**45.1**	**50.0**
4	AVT-IR-FB-NW/NEPZ-5	BH 946 ©	53.4	59.8	59.4	58.2	54.1	**57.0**	52.0	38.3	45.5	**45.2**	**51.1**
5	AVT-IR-FB-NW/NEPZ-6	DWRB 137 ©	58.3	63.1	63.5	63.6	58.3	**61.3**	56.3	38.7	49.7	**48.2**	**54.8**
6	AVT-IR-FB-NW/NEPZ-2	HUB 113 ©	49.9	59.9	58.5	58.4	56.8	**56.7**	54.7	40.1	46.3	**47.0**	**51.9**
Average			**54.0**	**61.1**	**59.1**	**59.3**	**56.2**	**58.0**	**54.6**	**41.8**	**54.0**	**50.1**	**54.0**

AVT-IR-TS-CZ

Table 5.5.6: Hectoliter weight/Test weight (kg/hl), Thousand grain weight (g), Protein content (% dwb) of different entries

S.N	Code	Genotype	Hectoliter weight			Thousand grain weight			Protein content		
			Vijapur	Udaipur	Mean	Vijapur	Udaipur	Mean	Vijapur	Udaipur	Mean
1	AVT-IR-FB-CZ-3	BH 1045	52.0	56.8	**54.4**	37.6	42.1	**39.9**	11.1	10.5	**10.8**
2	AVT-IR-FB-CZ-8	HUB 281	59.2	60.9	**60.0**	40.0	39.2	**39.6**	10.2	10.6	**10.4**
3	AVT-IR-FB-CZ-5	KB 2015	57.8	60.6	**59.2**	34.6	32.7	**33.7**	11.8	12.7	**12.3**
4	AVT-IR-FB-CZ-6	KB 2004	55.9	60.3	**58.1**	45.3	44.4	**44.9**	11.7	12.4	**12.1**
5	AVT-IR-FB-CZ-7	RD 3053	61.5	62.2	**61.9**	43.0	43.0	**43.0**	13.5	14.7	**14.1**
6	AVT-IR-FB-CZ-2	PL 937	54.8	62.1	**58.4**	30.2	33.2	**31.8**	12	11.7	**11.9**
7	AVT-IR-FB-CZ-1	DWRB 137 ©	58.3	62.5	**60.4**	46.1	44.2	**45.1**	13.1	11.3	**12.2**
8	AVT-IR-FB-CZ-4	RD 2899 ©	54.5	62.7	**58.6**	49.1	43.6	**46.4**	11.7	11.6	**11.7**
Average			**56.8**	**61.0**	**58.9**	**40.8**	**40.3**	**40.5**	**11.9**	**11.9**	**11.9**

IVT-IR-TS-NWPZ/NEPZ/CZ

Table 5.5.7: Thousand grain weight (g) of different entries

Code	Genotype	NWPZ						NEPZ				CZ			Over All Mean
		Hisar	D. Pura	Karnal	Ludhiana	P. Nagar	Mean	Kanpur	Sabour	Varanasi	Mean	Vijapur	Udaipur	Mean	
IVT-IR-FB-2	BH 1049	44.1	45.8	44.5	36.9	45.8	**43.4**	38.0	17.6	32.4	**29.3**	36.9	42.1	**39.5**	**37.4**
IVT-IR-FB-11	BH 1047	42.5	43.9	41.3	37.0	43.0	**41.6**	38.2	17.0	33.5	**29.6**	45.2	39.7	**42.5**	**37.9**
IVT-IR-FB-22	BH 1048	37.8	29.9	36.2	33.0	39.1	**35.2**	34.5	16.1	31.4	**27.4**	36.5	33.5	**35.0**	**32.5**
IVT-IR-FB-3	DWRB 242	47.1	44.5	51.5	41.2	44.5	**45.7**	38.3	24.7	34.0	**32.4**	44.5	41.8	**43.1**	**40.4**
IVT-IR-FB-10	DWRB 243	38.7	39.4	40.2	29.7	41.8	**38.0**	41.4	20.3	38.4	**33.4**	41.9	35.9	**38.9**	**36.8**
IVT-IR-FB-12	DWRB241	40.9	41.3	39.7	37.3	41.3	**40.1**	41.5	20.0	37.5	**33.0**	32.2	41.7	**36.9**	**36.7**
IVT-IR-FB-5	HUB 284	39.0	37.8	37.4	34.2	38.8	**37.5**	38.7	23.1	37.0	**32.9**	32.1	35.5	**33.8**	**34.7**
IVT-IR-FB-19	HUB 284	32.5	43.9	28.3	32.9	29.3	**33.4**	27.7	15.7	35.4	**26.2**	34.5	35.7	**35.1**	**31.6**
IVT-IR-FB-21	HUB 283	40.2	41.3	47.5	42.2	40.1	**42.3**	40.7	25.2	34.5	**33.4**	44.7	41.2	**42.9**	**39.5**
IVT-IR-FB-15	KB 2145	46.3	54.8	55.3	43.8	49.9	**50.0**	45.1	27.8	39.0	**37.3**	48.2	42.8	**45.5**	**44.3**
IVT-IR-FB-17	K 2133	31.9	22.4	26.4	27.9	31.1	**27.9**	37.7	26.1	22.5	**28.8**	28.1	29.6	**28.9**	**28.5**
IVT-IR-FB-25	KB 2127	39.8	39.7	41.4	35.6	36.8	**38.6**	36.1	23.1	32.5	**30.6**	41.7	38.3	**40.0**	**36.4**
IVT-IR-FB-14	RD 3070	36.8	43.2	41.8	32.9	42.0	**39.3**	39.2	17.8	35.2	**30.7**	44.4	37.2	**40.8**	**37.0**
IVT-IR-FB-20	RD 3071	41.9	46.0	44.1	35.8	43.2	**42.2**	40.9	21.9	34.6	**32.5**	46.0	46.6	**46.3**	**40.3**
IVT-IR-FB-23	RD 3068	53.6	49.9	41.2	32.3	37.8	**43.0**	37.2	19.5	35.0	**30.6**	49.0	47.0	**48.0**	**40.5**
IVT-IR-FB-1	PL 946	37.9	35.3	36.4	32.8	34.5	**35.4**	34.6	14.0	27.4	**25.3**	36.9	32.8	**34.8**	**31.9**
IVT-IR-FB-6	PL 949	30.3	33.7	29.3	24.6	32.0	**30.0**	31.3	15.1	23.4	**23.3**	30.7	28.0	**29.3**	**27.5**
IVT-IR-FB-7	PL 948	36.0	37.5	36.7	33.1	34.6	**35.6**	32.8	19.5	33.0	**28.4**	35.7	31.6	**33.7**	**32.6**
IVT-IR-FB-8	PL 947	36.5	37.2	36.5	30.6	34.9	**35.1**	34.0	24.0	31.0	**29.6**	33.3	32.2	**32.7**	**32.5**
IVT-IR-FB-18	UPB 1115	43.7	38.6	47.8	36.4	42.1	**41.7**	43.6	20.5	33.6	**32.6**	44.0	41.2	**42.6**	**38.9**
IVT-IR-FB-24	UPB 1114	42.2	42.6	43.7	38.0	40.2	**41.3**	40.8	20.2	30.8	**30.6**	44.7	41.4	**43.0**	**38.3**
IVT-IR-FB-9	BH 946 ©	44.5	46.8	46.6	38.6	37.6	**42.8**	40.7	23.5	34.7	**33.0**	43.4	38.9	**41.1**	**39.0**
IVT-IR-FB-16	DWRB 137 ©	48.6	51.6	48.9	39.4	43.1	**46.3**	45.0	20.7	36.2	**34.0**	52.0	34.6	**43.3**	**41.2**
IVT-IR-FB-13	HUB 113 ©	41.2	33.7	44.1	31.9	42.9	**38.8**	35.7	14.0	32.8	**27.5**	40.9	39.9	**40.4**	**35.6**
IVT-IR-FB-4	RD 2899 ©	47.4	42.1	44.3	38.3	42.1	**42.8**	41.3	19.2	35.7	**32.1**	47.1	42.5	**44.8**	**39.9**
Average		**40.9**	**40.9**	**41.2**	**35.1**	**39.5**	**39.5**	**38.2**	**20.3**	**33.3**	**30.6**	**40.6**	**38.1**	**39.3**	**36.5**

D. Pura: Durgapura; P. Nagar: Pantnagar

Table 5.5.8: Protein content (% dwb) different entries

Code	Genotype	NWPZ						NEPZ				CZ			Over All Mean
		Hisar	D. Pura	Karnal	Ludhiana	P. Nagar	Mean	Kanpur	Sabour	Varanasi	Mean	Vijapur	Udaipur	Mean	
IVT-IR-FB-2	BH 1049	10.2	9.2	NA	12.3	9.4	**10.3**	11.9	NA	12.7	**12.3**	11.2	12.1	**11.7**	**11.4**
IVT-IR-FB-11	BH 1047	10.0	10.8	NA	11.4	8.9	**10.3**	11.6	NA	12.2	**11.9**	12.3	10.9	**11.6**	**11.3**
IVT-IR-FB-22	BH 1048	9.1	13.6	NA	10.3	8.5	**10.4**	11.3	17.0	10.5	**12.9**	9.1	12.0	**10.6**	**11.3**
IVT-IR-FB-3	DWRB 242	10.9	10.8	NA	12.4	11.0	**11.3**	12.5	19.1	13.7	**15.1**	12.1	13.7	**12.9**	**13.1**
IVT-IR-FB-10	DWRB 243	9.7	10.0	NA	13.9	9.3	**10.7**	12.2	NA	12.6	**12.4**	11.5	12.6	**12.1**	**11.7**
IVT-IR-FB-12	DWRB241	11.2	11.5	NA	13.4	10.3	**11.6**	12.7	17.0	13.0	**14.2**	12.7	12.2	**12.5**	**12.8**
IVT-IR-FB-5	HUB 284	11.2	12.0	NA	15.4	8.9	**11.9**	12.9	16.3	10.8	**13.3**	12.4	11.3	**11.9**	**12.4**
IVT-IR-FB-19	HUB 284	9.1	9.2	NA	12.5	10.7	**10.4**	11.8	16.1	13.9	**13.9**	11.5	11.8	**11.7**	**12.0**
IVT-IR-FB-21	HUB 283	11.9	9.5	NA	11.6	10.2	**10.8**	13.2	18.0	12.7	**14.6**	12.0	11.9	**12.0**	**12.5**
IVT-IR-FB-15	KB 2145	11.3	10.7	NA	10.1	10.0	**10.5**	10.9	16.2	12.1	**13.1**	10.2	11.5	**10.9**	**11.5**
IVT-IR-FB-17	K 2133	9.1	13.3	NA	12.8	8.6	**11.0**	12.2	NA	13.3	**12.8**	12.3	11.7	**12.0**	**11.9**
IVT-IR-FB-25	KB 2127	9.9	9.9	NA	12.1	9.5	**10.4**	12.3	17.0	11.3	**13.5**	11.7	11.5	**11.6**	**11.8**
IVT-IR-FB-14	RD 3070	9.1	9.9	NA	12.1	8.9	**10.0**	11.0	NA	14.1	**12.6**	9.5	9.7	**9.6**	**10.7**
IVT-IR-FB-20	RD 3071	10.4	9.3	NA	11.7	9.4	**10.2**	11.1	16.0	12.8	**13.3**	10.8	12.1	**11.5**	**11.7**
IVT-IR-FB-23	RD 3068	10.8	9.8	NA	12.7	11.6	**11.2**	11.5	NA	13.3	**12.4**	10.7	10.5	**10.6**	**11.4**
IVT-IR-FB-1	PL 946	10.5	11.4	NA	12.2	11.8	**11.5**	10.5	NA	12.5	**11.5**	10.7	11.9	**11.3**	**11.4**
IVT-IR-FB-6	PL 949	9.2	10.2	NA	12.7	9.3	**10.4**	11.7	17.2	12.3	**13.7**	11.0	11.6	**11.3**	**11.8**
IVT-IR-FB-7	PL 948	10.6	8.4	NA	10.7	11.2	**10.2**	12.9	18.7	12.3	**14.6**	10.4	11.6	**11.0**	**12.0**
IVT-IR-FB-8	PL 947	10.7	8.7	NA	12.2	11.3	**10.7**	11.5	17.3	12.0	**13.6**	11.6	12.5	**12.1**	**12.1**
IVT-IR-FB-18	UPB 1115	10.5	11.1	NA	11.8	9.8	**10.8**	10.3	15.7	12.4	**12.8**	10.3	12.6	**11.5**	**11.7**
IVT-IR-FB-24	UPB 1114	9.3	10.4	NA	10.2	8.8	**9.7**	11.8	16.3	11.2	**13.1**	11.9	12.0	**12.0**	**11.6**
IVT-IR-FB-9	BH 946 ©	10.7	9.8	NA	12.2	11.8	**11.1**	11.1	17.0	11.5	**13.2**	10.4	11.8	11.1	**11.8**
IVT-IR-FB-16	DWRB 137 ©	9.5	10.1	NA	11.9	8.3	**10.0**	10.2	NA	11.6	**10.9**	11.6	11.6	**11.6**	**10.8**
IVT-IR-FB-13	HUB 113 ©	9.3	11.2	NA	12.9	10.0	**10.9**	11.1	NA	10.6	**10.9**	10.2	12.2	**11.2**	**11.0**
IVT-IR-FB-4	RD 2899 ©	10.0	10.7	NA	11.8	9.8	**10.6**	11.1	18.2	12.0	**13.8**	10.3	12.2	**11.3**	**11.9**
Average		**10.2**	**10.5**	NA	NA	**9.9**	**10.7**	**11.7**	**17.1**	**12.3**	**13.7**	**11.1**	**11.8**	**11.5**	**11.9**

D. Pura: Durgapura; P. Nagar: Pantnagar

Table 5.5.9: Hectoliter weight/Test weight (kg/hl) different entries

Code	Genotype	NWPZ						NEPZ				CZ			Over All Mean
		Hisar	D. Pura	Karnal	Ludhiana	P. Nagar	Mean	Kanpur	Sabour	Varanasi	Mean	Vijapur	Udaipur	Mean	
IVT-IR-FB-2	BH 1049	57.9	61.0	59.5	59.0	58.3	**59.1**	54.9	37.8	48.0	**46.9**	57.5	62.4	**59.9**	**55.3**
IVT-IR-FB-11	BH 1047	59.0	60.4	59.2	60.3	55.8	**58.9**	54.5	NA	47.2	**50.9**	60.0	60.4	**60.2**	**56.7**
IVT-IR-FB-22	BH 1048	53.7	54.3	54.1	61.4	57.2	**56.1**	54.4	35.9	46.2	**45.5**	55.3	57.4	**56.3**	**52.7**
IVT-IR-FB-3	DWRB 242	57.9	62.5	63.8	61.7	60.4	**61.2**	57.4	46.1	45.6	**49.7**	59.8	63.2	**61.5**	**57.5**
IVT-IR-FB-10	DWRB 243	59.9	61.4	62.5	57.1	61.5	**60.4**	58.6	NA	52.5	**55.6**	60.1	59.5	**59.8**	**58.6**
IVT-IR-FB-12	DWRB241	56.5	60.4	55.6	58.5	58.1	**57.8**	56.8	41.9	48.5	**49.1**	53.1	62.5	**57.8**	**54.9**
IVT-IR-FB-5	HUB 284	56.1	61.1	55.3	60.5	56.7	**57.9**	57.3	42.6	49.1	**49.7**	58.7	58.1	**58.4**	**55.3**
IVT-IR-FB-19	HUB 284	49.4	56.5	48.7	55.6	49.9	**52.0**	53.1	30.5	43.7	**42.4**	50.7	56.4	**53.6**	**49.3**
IVT-IR-FB-21	HUB 283	56.6	62.1	60.1	62.7	57.3	**59.8**	57.5	43.8	48.5	**49.9**	61.2	58.4	**59.8**	**56.5**
IVT-IR-FB-15	KB 2145	59.0	66.5	65.3	62.3	60.4	**62.7**	57.9	45.5	49.8	**51.1**	64.6	62.9	**63.7**	**59.2**
IVT-IR-FB-17	K 2133	52.8	50.0	51.8	53.5	55.3	**52.7**	51.5	NA	42.3	**46.9**	54.7	56.7	**55.7**	**51.8**
IVT-IR-FB-25	KB 2127	56.3	62.2	58.5	60.0	55.2	**58.4**	56.7	46.1	46.0	**49.6**	58.7	58.8	**58.8**	**55.6**
IVT-IR-FB-14	RD 3070	58.3	61.4	62.4	62.9	56.0	**60.2**	55.5	36.7	48.6	**47.0**	62.6	62.1	**62.3**	**56.5**
IVT-IR-FB-20	RD 3071	56.7	60.7	58.5	62.2	55.8	**58.7**	55.2	40.5	48.6	**48.1**	59.7	62.1	**60.9**	**55.9**
IVT-IR-FB-23	RD 3068	57.4	61.7	59.9	54.8	52.4	**57.2**	49.9	NA	47.1	**48.5**	60.1	63.6	**61.9**	**55.9**
IVT-IR-FB-1	PL 946	62.4	62.7	62.9	63.8	59.5	**62.3**	57.2	NA	47.2	**52.2**	60.4	60.6	**60.5**	**58.3**
IVT-IR-FB-6	PL 949	60.8	62.0	57.8	55.8	60.6	**59.4**	56.5	41.4	46.8	**48.2**	60.1	60.4	**60.2**	**55.9**
IVT-IR-FB-7	PL 948	62.7	63.7	62.3	63.8	59.1	**62.3**	58.0	34.9	51.9	**48.3**	58.8	59.1	**59.0**	**56.5**
IVT-IR-FB-8	PL 947	59.9	64.1	66.3	64.1	63.2	**63.5**	59.9	50.6	54.6	**55.0**	64.1	61.9	**63.0**	**60.5**
IVT-IR-FB-18	UPB 1115	54.4	59.8	60.9	59.0	58.6	**58.6**	56.4	37.5	45.3	**46.4**	59.6	60.4	**60.0**	**55.0**
IVT-IR-FB-24	UPB 1114	56.4	60.6	60.1	59.3	53.5	**58.0**	53.7	35.4	45.9	**45.0**	59.1	60.8	**60.0**	**54.3**
IVT-IR-FB-9	BH 946 ©	54.0	58.9	58.1	59.6	54.0	**56.9**	55.0	49.5	45.4	**50.0**	58.2	58.6	**58.4**	**55.1**
IVT-IR-FB-16	DWRB 137 ©	59.5	61.9	61.7	61.3	58.4	**60.5**	56.8	36.4	49.3	**47.5**	62.6	55.6	**59.1**	**55.7**
IVT-IR-FB-13	HUB 113 ©	55.3	56.5	58.9	57.5	56.3	**56.9**	54.7		43.4	**49.0**	58.5	59.4	**59.0**	**55.0**
IVT-IR-FB-4	RD 2899 ©	56.8	56.9	56.9	57.9	56.4	**57.0**	54.8	33.7	45.8	**44.7**	56.9	60.0	**58.5**	**53.4**
Average		**56.2**	**59.9**	**57.9**	**59.4**	**57.2**	**57.0**	**55.9**	**41.1**	**47.3**	**44.7**	**57.9**	**59.7**	**58.5**	**53.4**

D. Pura: Durgapura; P. Nagar: Pantnagar

IVT-RF-TS-NEPZ

Table 5.5.10: Thousand grain weight (g) of different entries

S.N	Code	Genotype	Kanpur	Sabour	Saini (Kanpur)	Varanasi	Mean
1	IVT-RF-NEPZ-8	HUB 282	38.2	33.6	36.9	34.4	**35.8**
2	IVT-RF-NEPZ-4	KB 2155	41.8	29.5	38.8	34.6	**36.2**
3	IVT-RF-NEPZ-6	KB 2160	37.5	26.5	35.4	32.7	**33.0**
4	IVT-RF-NEPZ-9	KB 2158	40.8	30.5	38.9	36.1	**36.6**
5	IVT-RF-NEPZ-10	KB 2159	42.3	31.3	39.1	35.0	**36.9**
6	IVT-RF-NEPZ-2	PL 951	47.1	38.4	41.3	38.8	**41.4**
7	IVT-RF-NEPZ-3	PL 952	51.1	45.6	50.1	44.8	**47.9**
8	IVT-RF-NEPZ-13	PL 950	34.8	30.6	39.1	32.9	**34.3**
9	IVT-RF-NEPZ-14	PL 953	33.5	31.2	37.5	33.3	**33.9**
10	IVT-RF-NEPZ-1	RD 3078	50.1	26.8	40.1	41.3	**39.6**
11	IVT-RF-NEPZ-5	RD 3079	45.8	26.0	36.9	34.1	**35.7**
12	IVT-RF-NEPZ-7	RD 3077	42.7	28.4	36.4	36.8	**36.1**
13	IVT-RF-NEPZ-11	RD 3076	46.7	30.5	43.7	40.1	**40.3**
14	IVT-RF-NEPZ-15	K 603 ©	43.9	35.8	41.6	41.0	**40.6**
15	IVT-RF-NEPZ-12	LAKHAN ©	44.2	34.9	41.7	40.3	**40.3**
Average			**42.7**	**32.0**	**39.8**	**37.1**	**37.9**

Table 5.5.11: Crude protein content (% dry weight) of different entries

S.N	Code	Genotype	Kanpur	Sabour	Saini (Kanpur)	Varanasi	Mean
1	IVT-RF-NEPZ-8	HUB 282	11.5	12.2	11.0	11.4	**11.5**
2	IVT-RF-NEPZ-4	KB 2155	12.2	11.6	11.6	10.5	**11.5**
3	IVT-RF-NEPZ-6	KB 2160	10.6	11.4	12.0	10.0	**11.0**
4	IVT-RF-NEPZ-9	KB 2158	10.7	12.3	11.9	10.6	**11.4**
5	IVT-RF-NEPZ-10	KB 2159	10.6	13	11.4	10.9	**11.5**
6	IVT-RF-NEPZ-2	PL 951	11.7	11.3	11.2	10.5	**11.2**
7	IVT-RF-NEPZ-3	PL 952	13.4	13.7	13.5	10.6	**12.8**
8	IVT-RF-NEPZ-13	PL 950	12.3	12.7	11.9	9.4	**11.6**
9	IVT-RF-NEPZ-14	PL 953	12	13.7	13.1	11.6	**12.6**
10	IVT-RF-NEPZ-1	RD 3078	11.8	14.2	11.1	10.6	**11.9**
11	IVT-RF-NEPZ-5	RD 3079	11.5	12.7	11.1	10.5	**11.5**
12	IVT-RF-NEPZ-7	RD 3077	12.2	12.6	10.5	10.4	**11.4**
13	IVT-RF-NEPZ-11	RD 3076	12.4	13.3	11.3	11.6	**12.2**
14	IVT-RF-NEPZ-15	K 603 ©	11.1	12.0	10.0	9.7	**10.7**
15	IVT-RF-NEPZ-12	LAKHAN ©	10.8	13.4	11.4	9.7	**11.3**
Average			**11.7**	**12.7**	**11.5**	**10.5**	**11.6**

Table 5.5.12: Hectoliter weight (kg/hl) in different entries

S.N	Code	Genotype	Kanpur	Sabour	Saini (Kanpur)	Varanasi	Mean
1	IVT-RF-NEPZ-8	HUB 282	83.6	48.8	54.8	45.1	**58.0**
2	IVT-RF-NEPZ-4	KB 2155	52.8	46.9	57.4	44.8	**50.5**
3	IVT-RF-NEPZ-6	KB 2160	54.4	49.5	56.6	45.0	**51.4**
4	IVT-RF-NEPZ-9	KB 2158	50.8	47.2	53.8	44.4	**49.0**
5	IVT-RF-NEPZ-10	KB 2159	54.1	50.0	56.4	49.1	**52.4**
6	IVT-RF-NEPZ-2	PL 951	57.9	54.9	63.2	49.8	**56.5**
7	IVT-RF-NEPZ-3	PL 952	57.6	55.7	58.8	49.9	**55.5**
8	IVT-RF-NEPZ-13	PL 950	59.0	54.6	58.9	51.0	**55.9**
9	IVT-RF-NEPZ-14	PL 953	53.4	51.6	54.8	47.3	**51.8**
10	IVT-RF-NEPZ-1	RD 3078	53.8	48.7	56.8	49.3	**52.1**
11	IVT-RF-NEPZ-5	RD 3079	50.2	43.8	54.8	41.3	**47.5**
12	IVT-RF-NEPZ-7	RD 3077	51.2	45.1	54.0	44.8	**48.8**
13	IVT-RF-NEPZ-11	RD 3076	53.4	45.5	55.2	45.4	**49.8**
14	IVT-RF-NEPZ-15	K 603 ©	55.6	53.4	58.2	52.3	**54.9**
15	IVT-RF-NEPZ-12	LAKHAN ©	55.2	53.0	57.3	49.5	**53.7**
Average			**56.2**	**49.9**	**56.7**	**47.3**	**52.5**

IVT-RF-TS-NHZ

Table 5.5.13: Thousand grain weight (g) of different entries

S.N	Code	Genotype	Malan	Shimla	Almora	Mean
1	AVT-RF-NHZ-3	BHS 494	43.6	42.8	43.6	**43.3**
2	AVT-RF-NHZ-5	BHS 945	39.8	54.3	48.4	**47.5**
3	AVT-RF-NHZ-9	BHS 493	43.3	50.0	43.7	**45.6**
4	AVT-RF-NHZ-12	BHS 497	27.9	30.1	35.6	**31.2**
5	AVT-RF-NHZ-20	BHS 496	44.8	45.1	46.0	**45.3**
6	AVT-RF-NHZ-6	HBL 881	39.4	41.7	44.1	**41.7**
7	AVT-RF-NHZ-8	HBL 882	43.6	42.2	41.0	**42.3**
8	AVT-RF-NHZ-13	HBL 880	37.7	39.6	39.6	**38.9**
9	AVT-RF-NHZ-15	HBL 883	37.4	35.8	40.6	**37.9**
10	AVT-RF-NHZ-23	HBL 879	37.4	47.0	44.1	**42.8**
11	AVT-RF-NHZ-1	UPB 1109	43.1	46.2	46.6	**45.3**
12	AVT-RF-NHZ-18	UPB 1110	39.8	45.2	38.3	**41.1**
13	AVT-RF-NHZ-22	UPB 1111	38.4	43.4	45.0	**42.3**
14	AVT-RF-NHZ-4	VLB 183	52.0	49.8	48.0	**49.9**
15	AVT-RF-NHZ-7	VLB 184	41.7	44.3	40.3	**42.1**
16	AVT-RF-NHZ-11	VLB 182	49.9	52.3	46.7	**49.6**
17	AVT-RF-NHZ-16	VLB 175	39.9	33.1	40.2	**37.7**
18	AVT-RF-NHZ-19	VLB 181	51.4	51.6	46.3	**49.8**
19	AVT-RF-NHZ-21	VLB 180	49.6	46.1	46.2	**47.3**
20	AVT-RF-NHZ-2	BHS 380 ©	41.9	35.6	39.7	**39.1**
21	AVT-RF-NHZ-10	BHS 352 ©	33.7	33.2	38.1	**35.0**
22	AVT-RF-NHZ-24	BHS 400 ©	45.8	43.2	47.4	**45.5**
23	AVT-RF-NHZ-14	HBL 113 ©	41.7	40.0	39.9	**40.5**
24	AVT-RF-NHZ-17	VLB 118 ©	41.5	45.5	47.2	**44.8**
Average			**41.9**	**43.3**	**43.2**	**42.8**

Table 5.5.14: Crude protein content (% dry weight) of different entries

S.N	Code	Genotype	Malan	Shimla	Almora	Mean
1	AVT-RF-NHZ-3	BHS 494	10.6	11.5	14.8	**12.3**
2	AVT-RF-NHZ-5	BHS 945	14.2	10.2	13.4	**12.6**
3	AVT-RF-NHZ-9	BHS 493	10.9	11.7	14.9	**12.5**
4	AVT-RF-NHZ-12	BHS 497	11.5	10.9	15.1	**12.5**
5	AVT-RF-NHZ-20	BHS 496	11.7	11.0	13.8	**12.2**
6	AVT-RF-NHZ-6	HBL 881	12.4	10.7	14.0	**12.4**
7	AVT-RF-NHZ-8	HBL 882	11.3	8.4	14.3	**11.3**
8	AVT-RF-NHZ-13	HBL 880	11.7	11.4	13.9	**12.3**
9	AVT-RF-NHZ-15	HBL 883	12.4	9.4	16.2	**12.7**
10	AVT-RF-NHZ-23	HBL 879	12.3	11.0	13.5	**12.3**
11	AVT-RF-NHZ-1	UPB 1109	11.7	11.3	12.9	**12.0**
12	AVT-RF-NHZ-18	UPB 1110	12.2	10.5	11.8	**11.5**
13	AVT-RF-NHZ-22	UPB 1111	14.2	11.6	13.3	**13.0**
14	AVT-RF-NHZ-4	VLB 183	12.0	11.6	14.6	**12.7**
15	AVT-RF-NHZ-7	VLB 184	10.1	8.5	14.3	**11.0**
16	AVT-RF-NHZ-11	VLB 182	13.4	11.6	14.5	**13.2**
17	AVT-RF-NHZ-16	VLB 175	10.7	10.6	13.9	**11.7**
18	AVT-RF-NHZ-19	VLB 181	11.3	11.0	15.1	**12.5**
19	AVT-RF-NHZ-21	VLB 180	11.9	10.6	15.0	**12.5**
20	AVT-RF-NHZ-2	BHS 380 ©	10.2	11.1	13.9	**11.7**
21	AVT-RF-NHZ-10	BHS 352 ©	13.1	10.3	15.6	**13.0**
22	AVT-RF-NHZ-24	BHS 400 ©	10.2	10.6	13.9	**11.6**
23	AVT-RF-NHZ-14	HBL 113 ©	11.4	9.1	11.5	**10.7**
24	AVT-RF-NHZ-17	VLB 118 ©	12.3	10.0	14.6	**12.3**
Average			**11.8**	**10.6**	**14.1**	**12.2**

Table 5.5.15: Hectoliter weight (kg/hl) in different entries

S.N	Code	Genotype	Malan	Shimla	Almora	Mean
1	AVT-RF-NHZ-3	BHS 494	62.8	61.0	59.6	**61.1**
2	AVT-RF-NHZ-5	BHS 945	58.3	62.7	60.9	**60.6**
3	AVT-RF-NHZ-9	BHS 493	53.0	57.6	54.2	**55.0**
4	AVT-RF-NHZ-12	BHS 497	70.1	74.3	70.4	**71.6**
5	AVT-RF-NHZ-20	BHS 496	57.0	57.3	59.3	**57.9**
6	AVT-RF-NHZ-6	HBL 881	61.6	65.1	61.6	**62.8**
7	AVT-RF-NHZ-8	HBL 882	57.7	56.3	55.6	**56.5**
8	AVT-RF-NHZ-13	HBL 880	54.7	59.0	58.1	**57.2**
9	AVT-RF-NHZ-15	HBL 883	57.8	62.2	59.2	**59.7**
10	AVT-RF-NHZ-23	HBL 879	52.6	60.8	57.0	**56.8**
11	AVT-RF-NHZ-1	UPB 1109	57.2	58.4	56.7	**57.5**
12	AVT-RF-NHZ-18	UPB 1110	57.3	58.4	58.9	**58.2**
13	AVT-RF-NHZ-22	UPB 1111	57.0	NA	59.2	**58.1**
14	AVT-RF-NHZ-4	VLB 183	63.1	64.3	60.9	**62.8**
15	AVT-RF-NHZ-7	VLB 184	61.0	64.5	61.6	**62.4**
16	AVT-RF-NHZ-11	VLB 182	61.5	67.7	61.7	**63.6**
17	AVT-RF-NHZ-16	VLB 175	61.7	56.9	60.3	**59.6**
18	AVT-RF-NHZ-19	VLB 181	64.8	66.6	60.3	**63.9**
19	AVT-RF-NHZ-21	VLB 180	63.0	63.3	62.9	**63.1**

20	AVT-RF-NHZ-2	BHS 380 ©	61.7	57.6	59.5	**59.6**
21	AVT-RF-NHZ-10	BHS 352 ©	69.0	73.4	73.8	**72.1**
22	AVT-RF-NHZ-24	BHS 400 ©	59.6	54.3	56.7	**56.9**
23	AVT-RF-NHZ-14	HBL 113 ©	63.2	63.8	65.6	**64.2**
24	AVT-RF-NHZ-17	VLB 118 ©	57.0	58.5	57.6	**57.7**
Average			**60.1**	**61.9**	**60.5**	**60.8**

Table 5.5.16: Hectoliter weight (kg/hl), thousand grain weight and protein content in different entries

S.N.	Code	Genotype	Hectoliter weight			Thousand grain weight			Crude protein content		
			Daleepnagar	Fatehpur	Mean	Daleepnagar	Fatehpur	Mean	Daleepnagar	Fatehpur	Mean
1	AVT-SAL/ALK-5	BH 1054	52.2	55.4	**53.8**	37.3	38.2	**37.8**	12.2	13.6	**12.9**
2	AVT-SAL/ALK-10	BH 1053	52.3	53.8	**53.0**	39.4	45.7	**42.5**	11.0	13.5	**12.3**
3	AVT-SAL/ALK-2	DWRB 228	57.6	52.3	**54.9**	39.7	39.2	**39.4**	10.5	13.8	**12.2**
4	AVT-SAL/ALK-12	DWRB 246	50.3	49.5	**49.9**	42.7	41.0	**41.8**	12.4	15.5	**14.0**
5	AVT-SAL/ALK-13	HUB 285	48.6	54.3	**51.4**	28.9	40.5	**34.7**	12.5	13.4	**13.0**
6	AVT-SAL/ALK-16	HUB 286	50.6	52.2	**51.4**	39.3	49.5	**44.4**	12.0	13.2	**12.6**
7	AVT-SAL/ALK-4	KB 2031	50.8	53.4	**52.1**	45.7	48.6	**47.2**	14.0	13.6	**13.8**
8	AVT-SAL/ALK-6	KB 2158	51.2	50.8	**51.0**	39.5	45.1	**42.3**	12.1	13.4	**12.8**
9	AVT-SAL/ALK-7	KB 2160	56.0	52.3	**54.1**	39.1	41.8	**40.4**	13.6	13.2	**13.4**
10	AVT-SAL/ALK-8	KB 2127	53.1	52.5	**52.8**	35.6	41.1	**38.4**	12.2	13.4	**12.8**
11	AVT-SAL/ALK-9	KB 2120	55.7	54.6	**55.1**	40.9	48.6	**44.8**	12.4	13.1	**12.8**
12	AVT-SAL/ALK-1	RD 3081	49.9	54.5	**52.2**	36.8	43.6	**40.2**	11.7	14.7	**13.2**
13	AVT-SAL/ALK-14	RD 3082	50.8	51.9	**51.4**	39.0	38.6	**38.8**	14.7	14.5	**14.6**
14	AVT-SAL/ALK-15	RD 3083	52.6	51.6	**52.1**	37.1	35.5	**36.3**	13.3	14.3	**13.8**
15	AVT-SAL/ALK-18	RD 3080	48.3	47.3	**47.8**	37.4	37.0	**37.2**	12.0	12.7	**12.4**
16	AVT-SAL/ALK-17	KB 1425 ©	55.7	50.7	**53.2**	41.2	42.4	**41.8**	12.3	14.2	**13.3**
17	AVT-SAL/ALK-3	RD 2907 ©	52.4	51.1	**51.7**	44.0	44.0	**44.0**	12.1	14.1	**13.1**
18	AVT-SAL/ALK-11	RD 2794 ©	52.6	51.9	**52.2**	38.8	37.6	**38.2**	9.8	13.6	**11.7**
Average			**52.2**	**52.2**	**52.2**	**39.0**	**42.1**	**40.6**	**12.3**	**13.8**	**13.0**

Hulless Barley/Naked Barley

Table 5.5.17: Thousand grain weight (g) of different entries

Code	Genotype	NWPZ						NEPZ			CZ			Over all Mean
		Hisar	D. Pura	Ludhiana	P. Nagar	M. Puram	Mean	Varanasi	Kanpur	Mean	Vijapur	Udaipur	Mean	
IVT-IR-NB-2	DWRB 245	40.5	46.0	34.7	46.0	45.3	**42.5**	25.9	40.1	**33.0**	42.9	41.4	**42.2**	**39.2**
IVT-IR-NB-8	DWRB 223	35.8	35.2	32.9	39.0	34.9	**35.6**	30.7	34.3	**32.5**	35.1	30.7	**32.9**	**33.7**
IVT-IR-NB-6	DWRB 244	37.8	38.6	32.6	39.6	33.8	**36.5**	30.6	36.0	**33.3**	34.7	31.8	**33.2**	**34.3**
IVT-IR-NB-1	PL 891	50.1	39.7	40.0	46.2	39.3	**43.1**	24.7	44.1	**34.4**	36.1	42.2	**39.2**	**38.9**
IVT-IR-NB-4	UPB 1104 (FILLER)	37.1	42.8	36.4	43.0	39.0	**39.7**	24.3	39.6	**31.9**	43.9	39.6	**41.7**	**37.8**
IVT-IR-NB-5	UPB 1113 (FILLER)	34.2	34.4	29.7	36.8	32.4	**33.5**	23.4	34.8	**29.1**	34.7	34.7	**34.7**	**32.4**
IVT-IR-NB-3	KARAN 16 ©	34.8	34.2	29.9	33.0	33.6	**33.1**	35.7	34.1	**34.9**	32.6	31.9	**32.3**	**33.4**
IVT-IR-NB-7	K 1149 ©	33.4	33.3	26.2	32.8	31.1	**31.4**	23.2	32.5	**27.9**	34.4	33.8	**34.1**	**31.1**
Average		**38.0**	**38.0**	**32.8**	**39.6**	**36.2**	**36.9**	**27.3**	**36.9**	**32.1**	**36.8**	**35.7**	**36.3**	**35.1**

D. Pura: Durgapura; P. Nagar: Pantnagar

Table 5.5.18: Protein content (% dwb) of different entries

Code	Genotype	NWPZ						NEPZ			CZ			Over all Mean
		Hisar	D. Pura	Ludhiana	P. Nagar	M. Puram	Mean	Varanasi	Kanpur	Mean	Vijapur	Udaipur	Mean	
IVT-IR-NB-2	DWRB 245	12.8	11.9	12.5	10.5	12.9	**12.1**	13.9	13.0	**13.5**	13.6	13.2	**13.4**	**13.0**
IVT-IR-NB-8	DWRB 223	10.6	11.2	10.7	13.4	17.5	**12.7**	13.1	14.2	**13.7**	13.8	15.2	**14.5**	**13.6**
IVT-IR-NB-6	DWRB 244	12.2	12.2	13.3	12.5	14.9	**13.0**	15.0	14.4	**14.7**	13.9	14.5	**14.2**	**14.0**
IVT-IR-NB-1	PL 891	12.7	14.6	14.0	12.9	14.3	**13.7**	13.1	12.9	**13.0**	14.2	14.0	**14.1**	**13.6**
IVT-IR-NB-4	UPB 1104 (FILLER)	10.7	11.5	12.3	11.0	14.1	**11.9**	15.1	13.9	**14.5**	13.6	12.2	**12.9**	**13.1**
IVT-IR-NB-5	UPB 1113 (FILLER)	10.7	11.3	11.8	8.3	15.1	**11.4**	14.0	12.0	**13.0**	12.8	11.9	**12.4**	**12.3**
IVT-IR-NB-3	KARAN 16 ©	10.4	11.9	12.2	10.8	13.3	**11.7**	15.0	13.9	**14.5**	13.3	14.2	**13.8**	**13.3**
IVT-IR-NB-7	K 1149 ©	11.9	13.1	15.4	11.6	15.1	**13.4**	14.7	13.6	**14.2**	13.2	13.6	**13.4**	**13.7**
Average		**11.5**	**12.2**	**12.8**	**11.4**	**14.7**	**12.5**	**14.2**	**13.5**	**13.9**	**13.6**	**13.6**	**13.6**	**13.3**

D. Pura: Durgapura; P. Nagar: Pantnagar

Table 5.5.19: Hectoliter weight (kg/hl) of different entries

Code	Genotype	NWPZ						NEPZ			CZ			Over all Mean
		Hisar	D. Pura	Ludhiana	P. Nagar	M. Puram	Mean	Varanasi	Kanpur	Mean	Vijapur	Udaipur	Mean	
IVT-IR-NB-2	DWRB 245	65.7	74.0	73.3	62.7	76.3	**70.4**	34.2	55.2	**44.7**	68.9	75.1	**72.0**	**62.4**
IVT-IR-NB-8	DWRB 223	65.0	73.2	76.6	71.6	76.2	**72.5**	48.5	69.9	**59.2**	73.0	73.7	**73.4**	**68.4**
IVT-IR-NB-6	DWRB 244	63.3	69.3	75.3	59.7	76.6	**68.8**	51.3	59.0	**55.2**	64.7	75.3	**70.0**	**64.7**
IVT-IR-NB-1	PL 891	65.0	65.9	73.5	66.7	74.6	**69.1**	40.4	57.9	**49.1**	67.4	74.5	**71.0**	**63.1**
IVT-IR-NB-4	UPB 1104 (FILLER)	58.3	65.3	68.2	57.7	61.3	**62.1**	52.3	56.6	**54.5**	60.6	59.7	**60.2**	**58.9**
IVT-IR-NB-5	UPB 1113 (FILLER)	56.9	67.0	68.8	57.5	64.8	**63.0**	41.2	54.8	**48.0**	56.9	54.3	**55.6**	**55.5**
IVT-IR-NB-3	KARAN 16 ©	66.8	73.3	75.9	64.8	77.0	**71.6**	46.9	58.8	**52.8**	66.0	75.8	**70.9**	**65.1**
IVT-IR-NB-7	K 1149 ©	66.3	69.2	69.9	65.7	72.9	**68.8**	49.1	66.6	**57.9**	66.6	67.3	**66.9**	**64.5**
Average		**63.4**	**69.7**	**72.7**	**63.3**	**72.5**	**68.3**	**45.5**	**59.9**	**52.7**	**65.5**	**69.5**	**67.5**	**62.8**

D. Pura: Durgapura; P. Nagar: Pantnagar

Table 5.5.20: Plump grain percentage (>2.5 mm) of different entries

Code	Genotype	NWPZ						NEPZ			CZ			Over all Mean
		Hisar	D. Pura	Ludhiana	P. Nagar	M. Puram	Mean	Varanasi	Kanpur	Mean	Vijapur	Udaipur	Mean	
IVT-IR-NB-2	DWRB 245	37.7	84.7	32.1	75.2	53.9	**56.7**	37.1	64.4	**50.7**	59.7	24.3	**42.0**	**49.8**
IVT-IR-NB-8	DWRB 223	45.5	54.9	49.6	70.3	43.3	**52.7**	39.2	33.8	**36.5**	52.6	14.7	**33.7**	**40.9**
IVT-IR-NB-6	DWRB 244	38.6	45.9	10.4	64.5	12.3	**34.3**	36.2	39.4	**37.8**	27.5	5.0	**16.3**	**29.5**
IVT-IR-NB-1	PL 891	57.6	34.8	55.7	63.5	16.2	**45.5**	28.3	50.8	**39.5**	17.2	18.2	**17.7**	**34.2**
IVT-IR-NB-4	UPB 1104 (FILLER)	59.2	83.0	54.5	84.5	67.3	**69.7**	22.8	69.6	**46.2**	81.9	69.2	**75.5**	**63.8**
IVT-IR-NB-5	UPB 1113 (FILLER)	54.7	44.5	27.9	72.0	40.3	**47.9**	20.8	49.4	**35.1**	49.6	64.5	**57.1**	**46.7**
IVT-IR-NB-3	KARAN 16 ©	35.3	34.4	18.8	37.6	30.6	**31.3**	66.6	37.0	**51.8**	28.5	15.9	**22.2**	**35.1**
IVT-IR-NB-7	K 1149 ©	27.6	24.5	16.5	39.9	19.2	**25.5**	23.8	19.3	**21.6**	25.7	29.1	**27.4**	**24.8**
Average		**44.5**	**50.8**	**33.2**	**63.4**	**35.4**	**45.5**	**34.3**	**45.4**	**39.9**	**42.8**	**30.1**	**36.5**	**40.6**

D. Pura: Durgapura; P. Nagar: Pantnagar

Barley Frontline Demonstrations (2022-23)

During the *rabi* crop season 2022-23, 140 hectares Barley Frontline Demonstrations (BFLDs) were allotted to 37 cooperating centers all over India in eight states/UT namely, Himachal Pradesh, Uttar Pradesh, Bihar, Jammu & Kashmir, Punjab, Haryana, Rajasthan and Madhya Pradesh. Out of these, 134.4 BFLDs were conducted by 36 centers, covering 141.72 hectares area of 382 farmers (Table1). Improved barley varieties with complete package of practices (irrigation management, nutrient management, weed control, seed treatment etc.) were demonstrated.

Table 1: Centre wise distribution of barley FLDs during rabi *2022*-23 (in hectares)

S.No.	Zone and Centre	BFLDs Allotted	BFLDs Conducted	Area sown (Hectares)	No. of farmers / locations
Northern Hills Zone (NHZ)					
1.	CSKHPKV, HAREC, Bajaura, Kullu (HP)	4.8	4.8	4.8	12
2.	ICAR-IARI, RS, Amartara Cottage, Shimla (HP)	2	1.2	1.32	19
North Eastern Plains Zone (NEPZ)					
3.	NDUA&T, Kumarganj, Ayodhya (UP)	4	4	4	10
4.	KVK (IAS-BHU), Barkachha, Mirzapur (UP)	4	4	5.2*	13
5.	CSAUA&T, Kanpur (UP)	4	4	4	10
6.	BHU, Varanasi (UP)	4.8			
7.	KVK, Gorakhpur-2, (Guru Gorakshnath Seva Sansthan), Chauk Mafi (Peppeganj), Jangal Kaudiya, Gorakhpur (UP)	4	4	4	10
8.	KVK (NDUA&T) Basti, Katiya, Banjariaya Farm, Basti (UP)	4	4	4	15
9.	KVK (Dr. RPCAU, Pusa, Samastipur), Begusarai (Bihar)	2	2	2	5
10.	KVK (BAU, Bhagalpur), Agwanpur, Barh, Patna (Bihar)	2	2	2	5
11.	KVK, Samastipur-1 (Dr. RPCAU, Pusa, Samastipur), Birauli, Samastipur (Bihar)	2	2	2	5

12.	KVK, Samastipur-2 (Dr. RPCAU, Pusa, Samastipur), Lada, Singhia, Samastipur (Bihar)	2	2	2	5
North Western Plains Zone (NWPZ)					
13.	KVK (SKUAST-Jammu), Rajhani, Kathua (J&K)	4	4	4	17
14.	PAU, Ludhiana (Punjab)	3.2	3.2	3.2	8
15.	KVK, (PAU), Khokhar Khurd, Mansa (Punjab)	4	4	5.2*	13
16.	KVK (PAU), Kheri, Patran Road, Sangrur (Punjab)	4	4	5.2*	13
17.	KVK (PAU), Goneana, Muktsar (Punjab)	4	4	4	10
18.	KVK (PAU), Dabwali Road, Near Kheti Bhawan, Bathinda (Punjab)	4	4	5.2*	13
19.	CCSHAU, Hisar (Haryana)	4	4	4	10
20.	KVK (BB Ashram), Rampura, Rewari (Haryana)	4	4	4	8
21.	KVK (CCSHAU), Bhiwani (Haryana)	4	4	5.2*	13
22.	ICAR-IIWBR, Karnal (Haryana)	2.8	2.8	2.8	7
23.	RARI (SKNAU), Durgapura, Jaipur (Rajasthan)	4	4	4	10
24.	KVK (Pragati Trust), Chomu, Jaipur (Rajasthan)	3.2	3.2	3.2	10
25.	KVK (AU-Kota), Akorashi, Dhindora, Hindauncity, Karauli (Rajasthan)	4	4	5.2*	13
26.	KVK, Alwar-1 (SKNAU-Jobner), Navgaon, District-Alwar (Rajasthan)	2	2	2	5
27.	ACES, Amity University Uttar Pradesh, Noida (UP)	4	4	4	10
28.	KVK (SVPUA&T, Modipuram, Meerut), RRS, Nagina, Bijnor (UP)	2	2	2	5
Central Zone (CZ)					
29.	RCOA (MPUA&T), Udaipur (Rajasthan)	4.8	4.8	4.8	12
30.	KVK (MPUA&T), Dhoinda, Rajasmand (Rajasthan)	4.8	4.8	4.8	12

31.	KVK (JNKVV), Kuthulia Farm, Rewa (MP)	4.8	4.8	4.8	12
32.	KVK (JNKVV), Purushottampur, Panna (MP)	4.8	4.8	4.8	12
33.	KVK (JNKVV), Tikamgarh (MP)	4.8	4.8	4.8	12
34.	KVK (RVSKVV), Biaora, Kothi Bagh, Rajgarh (MP)	4.8	4.8	4.8	12
35.	COA (JNKVV), Ganj Basoda, Vidisha (MP)	4.8	4.8	4.8	12
36.	KVK (BUA&T-Banda), Lalitpur (UP)	4.8	4.8	4.8	12
37.	KVK (BUA&T-Banda), Bharari, Bhojla, Jhansi (UP)	4.8	4.8	4.8	12
TOTAL		**140**	**134.4**	**141.72***	**382**

** Area covered more than allotted which is restricted to area equal to allotted FLDs.*

Table 2: State wise yield gain during *rabi* 2022-23

State	BFLDs yield (q/ha)	Check yield (q/ha)	Gain (%)
HP	27.95	19.98	39.92***
Eastern UP	35.90	22.50	59.56***
Central UP	33.58	24.90	34.84***
Western UP	58.43	52.10	12.14***
All UP	37.68	26.30	43.25***
Bihar	42.18	36.40	15.87*
UT of J&K	30.70	22.30	37.67***
Punjab	47.58	40.38	17.83***
Haryana	42.20	38.63	09.26*
Rajasthan (NWPZ)	60.03	50.15	19.69***
Rajasthan (CZ)	42.20	36.10	16.90***
All Rajasthan	53.13	44.70	18.85***
MP	39.75	26.93	47.63***

**** Significant at 1 per cent level, ** Significant at 5 per cent level*

The highest gain in barley yield was recorded in Eastern UP (59.56%) followed by MP (47.63%), All UP (43.25%), HP (39.92%), UT of J&K (37.67%), Central UP (34.84%) and Rajasthan NWPZ (19.69%). The lowest gain in yield was reported in Haryana (9.26%) (Table 2).

Table 3: Zone wise productivity over check during rabi 2022-23

Zone	BFLDs yield (q/ha)	Check mean yield (q/ha)	Gain (%)
NHZ	27.95	19.98	39.92***
NEPZ	37.63	25.65	46.69***
NWPZ	47.85	41.10	16.42***
CZ	38.75	28.43	36.32***

**** Significant at 1 per cent level, ** Significant at 5 per cent level, * Significant at 10 per cent level, NS is Non-significant*

The yield gain due to improved varieties over check was highest in NEPZ (46.69%) followed by NHZ (39.92%), CZ (36.32%) and NWPZ (16.42%) (Table 3). Therefore, efforts should be made to increase barley yield in the NEPZ, CZ and NHZ by promoting recent barley production technologies in collaboration with the state department of agriculture.

Centre wise data analysis revealed that the yield gain under barley FLD was highest at center Rewa (142.40%) followed by Lalitpur (50.58%) in CZ; Mirzapur (115.29%) in NEPZ; Bajaura (44.75%) in NHZ and Mansa (38.93%) followed by Kathua (37.67%) in NWPZ. The yield gain was lowest at Muktsar (05.02%) in NWPZ.

Table 4: Variety wise performance of improved barley varieties during *rabi* 2022-23

Zone and Centre	Improved variety	Average yield (q/ha)	Check variety	Average yield (q/ha)	Yield gain over check (%)
NHZ					
Bajaura	HBL 713	28.75	Local	19.18	49.93***
Bajaura	HBL 804	29.18	Local	20.83	40.10***
Shimla	BHS 400	25.75	BHS 352	19.88	29.56 NS
Shimla	BHS 380	20.25	BHS 352	19.75	2.53 NS
NEPZ					
Ayodhya	DWRB 137	32.70	Azad	25.83	26.62***
Ayodhya	DWRB 137	33.75	Local	20.00	68.75 NS
Ayodhya	DWRB 137	34.70	Narendra Jau -2	30.63	13.31 NS
Ayodhya	RD 2907	37.50	Local	20.95	79.00**
Ayodhya	RD 2907	36.25	Narendra Jau -2	30.95	17.12 NS
Mirzapur	DWRB 137	43.33	Amber K71	20.58	110.57***

Zone and Centre	Improved variety	Average yield (q/ha)	Check variety	Average yield (q/ha)	Yield gain over check (%)
Mirzapur	RD 2907	42.50	Amber K71	19.23	121.07***
Kanpur	RD 2907	21.50	Azad	16.50	30.30**
Kanpur	DWRB 137	32.00	K 508	19.00	68.42***
Gorakhpur	DWRB 137	42.80	RD 2660	33.05	29.50***
Gorakhpur	RD 2907	42.70	RD 2660	32.30	32.20***
Basti	RD 2907	34.13	Local	18.08	88.80***
Basti	DWRB 137	30.68	Narendra Jau -2	18.48	66.04***
Basti	RD 2907	32.13	Narendra Jau -2	19.25	66.88***
Begusarai	DWRB 137	41.53	BR 32	35.13	18.22**
Barh Patna	DWRB 137	56.33	Local	46.65	20.74***
Birauli Samastipur-1	RD 2907	36.18			
Lada Samstipur-2	DWRB 137	29.05	Local	23.30	24.68***
NWPZ					
Kathua	DWRB 137	31.95	Local	21.93	45.72***
Kathua	RD 2907	29.33	Local	22.73	29.04***
Ludhiana	DWRB 137	55.33	PL 807	47.50	16.47*
Mansa	DWRB 137	48.33	PL 426	35.20	37.29***
Mansa	DWRB 182	62.50	PL 426	40.00	56.25 ^{NS}
Sangrur	DWRB 137	48.10	PL 807	45.78	5.08*
Sangrur	DWRB 182	45.00	PL 807	37.50	20.00 ^{NS}
Muktsar	DWRB 137	46.25	PL 426	43.75	5.71 ^{NS}
Muktsar	DWRB 137	49.60	DWRB 123	47.40	4.64*
Muktsar	DWRB 182	50.00	DWRB 123	48.00	4.17 ^{NS}
Bathinda	DWRB 137	42.70	Local	38.45	11.05**
Bathinda	DWRB 182	52.50	Local	40.00	31.25 ^{NS}
Hisar	DWRB 137	45.93	BH 946	42.93	6.99 ^{NS}
Hisar	DWRB 182	45.00	BH 946	38.00	18.42 ^{NS}
Rewari	DWRB 137	50.83	BH 393	45.00	12.94***
Bhiwani	DWRB 137	30.50	BH 393	29.28	4.18**
Bhiwani	DWRB 182	35.00	BH 393	30.00	16.67 ^{NS}
Karnal	DWRB 137	45.43	BH 393	41.05	10.66***
Karnal	DWRB 182	45.00	BH 393	40.00	12.50 ^{NS}
Durgapura	DWRB 137	57.93	RD 2052	49.58	16.84***

Zone and Centre	Improved variety	Average yield (q/ha)	Check variety	Average yield (q/ha)	Yield gain over check (%)
Durgapura	RD 2907	63.75	RD 2052	51.25	24.39***
Chomu	DWRB 137	53.83	RD 2035	45.28	18.88***
Chomu	RD 2907	55.75	RD 2035	45.30	23.07*
Chomu	RD 2907	56.83	RD 2052	48.43	17.35***
Karauli	DWRB 137	68.50	RD 2035	56.10	22.10***
Karauli	RD 2907	65.70	RD 2035	55.73	17.90***
Alwar	DWRB 137	50.43	RD 2552	43.00	17.27***
Alwar	RD 2907	53.88	RD 2552	42.88	25.66*
Noida	DWRB 137	57.83	BH 393	51.88	11.47*
Noida	DWRB 137	59.33	Local	52.45	13.11**
Nagina Bijnor	DWRB 137	38.88			
CZ					
Udaipur	DWRB 137	44.28	RD 2552	38.88	13.89***
Rajsamand	DWRB 137	40.75	Local	32.13	26.85*
Rajsamand	DWRB 137	40.78	RD 2660	33.70	20.99***
Rajsamand	DWRB 137	37.00	RD 2786	33.00	12.12 ^{NS}
Rewa	DWRB 137	45.45	JB 58	18.75	142.40***
Panna	DWRB 137	30.95	JB 58	24.08	28.56***
Panna	DWRB 137	31.25	Local	23.75	31.58***
Tikamgarh	DWRB 137	28.88	JB 58	21.55	33.99***
Rajgarh	DWRB 137	47.58	JB 58	36.18	31.51***
Vidisha	DWRB 137	46.90	Local	35.75	31.19***
Lalitpur	DWRB 137	35.58	Munda	23.63	50.58***
Jhansi	DWRB 137	31.10	Munda	26.45	17.58***

**** Significant at 1 per cent level ** Significant at 5 per cent level, * Significant at 10 per cent level, NS is Non-significant*

The varieties HBL 804 (29.18 q/ha) at Bajaura centre in NHZ; DWRB 137 (56.33 q/ha) at Barh Patna in NEPZ, RD 2907 (63.75 q/ha) at Durgapura Jaipur in NWPZ and DWRB 137 (47.58 q/ha) at Rajgarh in CZ were the highest average yielding (Table 4). It is evident fromTable 8 that recent varieties outperformed old/check varieties at all the locations. The yield gain due to varietal intervention ranged from 4.18 % at Bhiwani center in Haryana to 142.40% at Rewa center in MP.

Table 5: Yield potential of barley varieties in different zones during rabi 2022-23

Zone	Centre	Variety	Yield(q/ha)
NHZ	Bajaura Kullu	HBL 713	35.00
NEPZ	Barh Patna	DWRB 137	58.50
NWPZ	Karauli	DWRB 137	69.50
CZ	Rajgarh	DWRB 137	51.00

It is evident from Table 5 that varieties HBL 713 (35.00 q/ha), DWRB 137 (58.50 q/ha), DWRB 137 (69.50 q/ha) and DWRB 137 (51.00 q/ha) performed better than other varieties at Bajaura Kullu, Barh Patna, Karauli and Rajgarh centres in the NHZ, NEPZ, NWPZ and CZ, respectively.

Table 6: Barley varieties grown in different zones during rabi 2022-23

Zone	Improved varieties	Check varieties	Popular varieties in the region
NHZ	HBL 713, HBL 804, BHS 400, BHS 380	BHS 352, Local	Sonu, Dolma, HBL 276, Gopi (HBL 316), Local
NEPZ	DWRB 137, RD 2907	Narendra Jau-2, K 125 (Azad), Local, K 508, Amber (K 71), RD 2660, BR 32	Narendra Jau-2, Lakhan, Jyoti, Jagriti, Amber (K 71), K 125 (Azad), K 409, K 508, K 551, RD 2660, RD 2794, Local, Manjula, Prakhar, Narendra Barley-4, DL 36, BR 32
NWPZ	**DWRB 137,** **DWRB 182,** **RD 2907**	**PL 807, PL 426, BH 393, BH 946, RD 2035,** **RD 2052, RD 2552, DWRB 123, Local**	RD 2907, PL 807, PL 426, PL 891, DWRB 123, DWRUB 52, BH 393, BH 946, RD 2035, RD 2052, RD 2552, RD 2660, RD 2715, RD 2786, RD 2794, RD 2899, Local
CZ	**DWRB 137**	**RD 2552, RD 2660, RD 2786, JB 58, Munda, Local**	RD 2035, RD 2552, RD 2660, RD 2715, RD 2786, RD 2899, JB 58, Munda, Local

Zonal Monitoring Reports

The teams constituted for monitoring of Barley Yield Trials & Nurseries in Central zone, NWP and NEP Zone, visited different locations at the most appropriate stage of the crop and recorded observations about the varietal performance, conduct of trials, disease/ pest incidence and genetic purity of the test entries (Table 1.5). On the spot decisions were taken about the rejection of trials and purity of test entries. The proceedings of these team meetings have been circulated for necessary action by concerned breeders and other scientists and copies of the same is appended in the report for record.

Zonal monitoring visits of the barley teams

Zone	Date	Centres visited	Team Members
NEPZ Team I	10-14 March	Kanpur, Varanasi, Kumarganj, Saini	Dr CN Mishra, PK Gupta, HR Saharan, Harikrishna
NEPZ Team II	3-5 March	Ranchi, Sabour	Drs. Amit Sharma, Lokendra Kumar
CZ	13-16 Feb	Vijapur	Drs. UR Kamble, JM Patel, KH Dhabi, Dinesh Pandey, PL Kashyap, Jogendra Singh
NWPZ Team-I	2-6 March	Durgapura, Bawal, Sriganganagar,	Dr Hanif Khan, SK Bishnoi, Raj Kumar, PS Shekhawat, Bhagat Singh
NWPZ Team-II	15-16 March	Ludhiana, Bhatinda	Dr VS Sohu, Satish Kumar, PL Kashyap, Kiran Gayakwad, Simarjeet Kaur
NWPZ Team-III	20-22 March	Modipuram, Pantnagar	Dr BS Tyagi, Vikas Gupta, SC Gill, Lokendra Kumar, OP Gangwar
NHZ-I	17-20 April	Shimla, Bajaura, Malan, Berthin	Drs. Chunilal, DP Walia, Vijay Rana, Ravindra Kumar
NHZ-II	18-21 April	Gaza, Almora, Majhera	Drs. CN Mishra, Jogendra Singh, Pramod Prasad

Team-II		
Period	Team	Centres visited
10-14th March, 2023	Drs CN Mishra, HR Saharan, PK Gupta and Dr Hari Krishna	Kanpur, Saini, Naini, Varanasi and Ayodhya

Breeding trials allocated & monitored:

Centre	Trial	Remark
Kanpur	NIVT1A, NIVT1B, NIVT3A, NIVT 5A and AVT-IR-TS-TAS, AVT-RI-TS-TAS,	**Good except NIVT3A,**
Naini	NIVT1B, AVT-IRTS and AVT RI TS	**Good, Except Rep-1 of AVT-IR-TS**
Varanasi	NIVT1A, NIVT1B, NIVT3A, NIVT 5A and AVT-IR-TS-TAS, AVT-RI-TS-TAS,	**Good**
Ayodhya	NIVT1A, NIVT1B, NIVT3A, and AVT-IR-TS-TAS,	**Good**

Trials not conducted/rejected by monitoring team:All trials were conducted

Centre	Breeding Trial	Remark
Centre	Agronomy Trial	Remark
Ayodhya	SPL-3	Conducted under irrigated conditions

Entries showing promising performance in breeding trials:

Trial	Entry
AVT-IR-TS-TAS,	NE-TS-104 and 110
AVT-RI-TS-TAS	NE-RI-303
NIVT1A	N-126; N-128
NIVT1B	N-221; N-223
NIVT3A	N-409; N-410
NIVT5A	N-708; N-715

Entries recommended for purification

Trial	Entry	Remarks
NIVT-1A	N-113 and N-120,	Mixture/ off types /variationin plant height
NIVT-1B	N-202, N-203, N-212, N-216, N-227,	
NIVT-3A	N-415, N-420, N-422	
NIVT-5A	N-704, N-706, N-718, N-723 and N-724	
AVT-IR-TS	NETS103	
AVT-RI-TS	NERI304, NERI305	

Entries recommended to be dropped from further testing:

Trial	Entry	Remarks
NIVT-1A	N-122 and N-135	Segregation for plant height / ear type/ maturity
NIVT-1B	N-211, N-218 and N-225	
NIVT-3A	N-403, N-423, N-424 and N-434	
NIVT-5A	N-701, N-716 and N-725	

Entries showing high disease incidence in breeding trials

Trial	Entry	Kanpur	Varanasi	Ayodhya	Naini
AVT-RI-TS	**NERI302**				40S
NIVT1A	**N-112**	40S			
NIVT1B	**N-236**	40S	40S	20S	20S
NIVT5A	**N-702**	40S	20S		
	N-717	60S	20S		
SPL ASN	**SPL-ASN07**			40S	

Report on Agronomical Trials:

1. All the allotted agronomic trials were conducted as per the work plan except SPL-3at Ayodhya center (rejected) and the performance was satisfactory.

Report on Pathological Nurseries:

Centre	Nursery	Remarks
Kanpur	IPPSN, PPSN	Nursery was conducted well and brown rust developmentwas observed in few entries (AVT13, 36, 43, 56, 57, 130) and infectors
Varanasi	IPPSN, LBSN	Nursery was conducted well and heavy incidence of blight was observed in infector rows
Ayodhya	IPPSN.PPSN and LBSN	Nursery was conducted well rust and foliar blight development was observed in few entries and checks

Special comments, if any

1. Since wheat and barley trials phonological stages are different separate monitoringteams should be constituted for each crop.
2. The team also visited the breeding programmes at different centers.
3. In agronomical trials the choice of varieties should be in consultation with thebreeding group.
4. Since Ayodhya center is conducting all pathological nurseries for brown rust andblight in wheat and barley the priority of the center may be finalized.

Signature of the monitoring team

CN Mishra	HR Saharan	PK Gupta	Hari Krishna
(ICAR-IIWBR, Karnal)	(PAU Ludhiana)	(CSAUAT Kanpur)	(ICAR-IARI New Delhi)

Zonal Monitoring Report (2022-23)
Zone: NEPZ-Team-I

Period of visit: 3-5 March 2023

Name of tem members	Centres visited
Dr Amit Sharma, Dr Lokendra Kumar	Ranchi, Sabour

Summary of breeding trials allocated & monitored:

Centre	Trial (s) Allotted	Trials not conducted/ Rejected	Remarks
Ranchi	AVT-IR-FB-NEPZ	Conducted successfully	Very good & satisfactory
	IVT-IR-FB-NEPZ	Conducted successfully	Very good & satisfactory
	IVT-RF-NEPZ	Conducted successfully	Very good & satisfactory
Sabour	AVT-IR-FB-NEPZ	Conducted successfully	Very good & satisfactory
	IVT-IR-FB-NEPZ	Conducted successfully	Very good & satisfactory
	IVT-RF-NEPZ	Conducted successfully	Satisfactory

- Evaluate trials as very good, good, average and poor on the basis of conduction

Entries showing promising performance in breeding trial across centres

Trial	Entry (s)	Remarks
AVT-IR-FB-NEPZ	AVT-IR-FB-5	Observations are based on phenotypic appearance and plant stand etc.
IVT-IR-FB-NEPZ	IVT-IR-FB-9, IVT-IR-FB-16	
IVT-RF-NEPZ	IVT-RF- NEPZ-12, IVT-RF- NEPZ-15	

Entries recommended for purification

Trial	Entry (s)	Remarks
AVT-IR-FB-NEPZ	Nil	Nil
IVT-IR-FB-NEPZ	Nil	
IVT-RF-NEPZ	Nil	

Entries recommended to be dropped from further testing

Trial	Entry (s)	Remarks
AVT-IR-FB-NEPZ	Nil	Nil
IVT-IR-FB-NEPZ	Nil	
IVT-RF-NEPZ	Nil	

Entries exhibiting higher incidence of disease /insect infestation

Trial	Entry (s)	Remarks
AVT-IR-FB-NEPZ	Nil	Nil
IVT-IR-FB-NEPZ	Nil	
IVT-RF-NEPZ	Nil	

Special comments, if any (2-3 bullet points only):

*At Sabour centre very severe incidence of leaf blight was observed in IVT-RF-NEPZ trial, indicating this centre may be utilized as the hot spot for screening of barley genotypes for rainfed condition.

Signatures:

(AK Sharma)

5/3/2023

(Lokendra Kumar)

Barley Network (AICW&BIP)

Monitoring Report of Central Zone

Duration: 13-16 February, 2023

Location visited: Vijapur

Team Members

- Dr. Umesh Ravindra Kamble , Senior Scientist, Crop Improvement, IIWBR, Karnal
- Dr. J.M. Patel, Wheat Breeder, Research Station, S.D. Agricultural University, Vijapur (Gujarat)
- Dr. K.H. Dhabi, Wheat Breeder, Junagarh Agricultural University, Junagarh
- Dr Dinesh Pandey, Agronomist, Research Station, Indira Gandhi Agricultural University, Bilaspur (Chhatishgarh)
- Dr P.L. Kashyap, Senior Scientist, Crop Protection, IIWBR, Karnal
- Dr. Jogendra Singh, Principal Scientist, Barley Improvement, ICAR-IIWBR, Karnal

The team constituted by the Director, IIWBR, Karnal for monitoring of the Wheat and Barley trials in Central Zone, assembled at S.D. Agricultural University, S.K. Nagar on 13th February, 2023 and visited the different locations as per schedule.

(i) BREEDING TRIALS:

A. <u>Location wise observations:</u>

Vijapur

Three breeding trials viz; IVT-IR-FB, IVT/AVT-IR-Food Barley-(Hulless) and AVT-IR-FB-CZ were monitored at Vijapur on 14th February, 2023. The trials were planted as per technical programmme and found in good conditions. However, lodging was observed in few entries in IVT-IR-TS-FB trial.

B. Disease / pest incidence:

There was no incidence of rusts observed in any trial during the season at Vijapur. Although, leaf spot was observed in the entries IVT-IR-FB-12 (67), IVT-IR-FB-19 (79), IVT-IR-FB-20 (89) and IVT-IR-FB-23 (68) at Vijapur. Minor incidence of loose and covered smut were observed in few entries at this centre.

C. Trials rejected: Nil

D: Entries observed as segregating/mixtures:

The following entries were noticed to have significant amount of segregation/mixture in various trials. However, few entries were showing off type plants.

Trial Name	Entries with	
	Segregation/ mixtures	Off types
IVT-IR-FB	-	IVT-IR-FB-3 and IVT-IR-FB-7
IVT/AVT-IR-FB-Hulless	-	IVT/AVT-IR-FB-8
AVT- IR-FB	AVT-IR-FB-6	AVT-IR-FB-2 and AVT-IR-FB-8

(ii) ENTOMOLOGY TRIAL:

Only one entomological trial entitled *"Management of aphids through foliar application of new bio-chemical molecules"* was conducted at Vijapur centre as per technical programme. Different treatment effects were clearly observed.

Dr. Umesh Ravindra Kamble
Senior Scientist
Crop Improvement
ICAR-IIWBR, Karnal (Haryana)

Dr. J.M Patel
Wheat Breeder
Wheat Research Station
S,D. Agricultural University,
Vijapur (Guj).

Dr. K.H. Dhabi
Wheat Breeder,
J.A. U. Junagarh (Guj.)

Dr P.L. Kashyap 22.2.23
Senior Scientist
Crop Protection,
ICAR-IIWBR, Karnal (Haryana)

Dr Dinesh Pandey
Agronomist,
Research Station, I.G.A.U, Bilaspur
(Chhatishgarh)

22/2/2023
Dr. Jogendra Singh
Principal Scientist
Barley Improvement
ICAR-IIWBR, Karnal (Haryana)

Barley Network (AICW&BIP)
Monitoring Report of NWPZ

Duration: 2-5 March, 2023

Location visited: ARS Sri Ganganagar (SKRAU, Bikaner), RARI Durgapura (SKNAU, Jobner), CCSHAU Regional Station, Bawal

Team Members

Dr Hanif Khan, Sr. Scientist, ICAR-IIWBR Karnal
Dr Santosh Kumar Bishnoi, Scientist, ICAR-IIWBR, RS Hisar
Dr P.S. Shekhawat, Associate Prof. Plant Pathology, RARI Durgapura
Dr Bhagat Singh, Agronomist, CCS-HAU, Hisar (Did Not Join the Monitoring)

The team constituted by the Director, IIWBR, Karnal for monitoring of Barley Network Trials & Nurseries in NWPZ, assembled at ARS Sri Ganganagar on 2nd March, 2023 and visited the different locations as per schedule.

A: Location wise observations

Sriganganagar

Two trials viz. AVT-MB and IVT-MB were monitored at Sriganganagar and were found in good condition.

Durgapura

Five trials viz. AVT-MB-NWPZ, IVT-MB-NWPZ, AVT-IR-Feed Barley, IVT-IR-Feed Barley and IVT/AVT-IR-NB were monitored. All the trials were in good condition and planted as per the technical programme.

Besides these, 7 nurseries *viz.* IBON, NBGSN, EIBGN, BQSN1, BQSN2, IBYT-ASA, IBYT-FFM and 2 DUS trials were also monitored at Durgapura centre and all were found very good.

Bawal

Two trials viz. AVT-MB and IVT-MB were monitored at Bawal were found in good condition.

B: Disease / pest incidence.

None of the rust was noticed, except yellow rust was observed in few entries only at Durgapura centre. Incidence of loose smut, covered smut, leaf stripe and bacterial streak diseases were observed in some entries at Durgapura, Shri Ganganagar and Bawal centers.

C: Trials rejected: Nil

D: Entries observed as segregating/mixtures

The following entries were noticed to have significant amount of segregation/mixture in various trials, though there were other entries also with few off types.

Trial Name	Entries with	
	Segregation / mixtures	Off types
AVT-MB-NWPZ	AVT-MB-1	AVT-MB-2, AVT-MB-3
IVT-MB-NWPZ	IVT-MB-12, IVT-MB-15, IVT-MB-16, IVT-MB-19, IVT-MB-21, IVT-MB-23	IVT-MB-6, IVT-MB-11, IVT-MB-13, IVT-MB-14,
IVT/AVT/IRTS-Food barley	IVT/AVT-IR-NB-1, IVT/AVT-IR-NB-4, IVT/AVT-IR-NB-7	IVT/AVT-IR-NB-2, IVT/AVT-IR-NB-3
IVT-IR-Feed Barley-(2022-23)	IVT-IR-FB-3, IVT-IR-FB-5, IVT-IR-FB-7, IVT-IR-FB-8, IVT-IR-FB-11, IVT-IR-FB-12, IVT-IR-FB-15, IVT-IR-FB-18, IVT-IR-FB-19, IVT-IR-FB-21,	IVT-IR-FB-6, IVT-IR-FB-10, IVT-IR-FB-22
AVT-IR-Feed barley-(2022-23)		AVT-IR-FB-4

E. Disease / pest screening

Excellent artificial yellow rust epiphytotic condition was created at Durgapura centre for screening of different barley disease screening nurseries. Similarly, there was a good sick field developed for screening of CCN.

F. Agronomy Trials

Among the stations visited, Agronomy trials (4) were being conducted at Durgapura station. All the allotted trials have been executed with proper layout, replications, treatment allocation and were managed well.

(Santosh Kumar Bishnoi) **(P.S. Shekhawat)** **(Hanif Khan)**

Zonal Monitoring Report 2022-23
Zone: NWPZ - II

Period of visit: 15-16 March, 2023

Name of team members:	Centres Visited:
Dr VS Sohu, PAU,Ludhiana	Ludhiana, Bathinda
Dr Satish Kumar, ICAR-IIWBR, Karnal	
Dr Prem Lal Kashyap, ICAR-IIWBR, Karnal	
Dr Kiran Gaikward, IARI, New Delhi	
Dr Simatjit Kaur, PAU, Ludhiana	

Summary of breeding trials allocated & monitored:

Centre	Trial(s) Allotted	Trials Not Conducted / Rejected	Reason/ Remark
Ludhiana	AVT-MB, AVT-FB IVT-MB, IVT-FB, AVT/IVT-HL	All trials were Conducted nicely	Very Good
Bhatinda	AVT-MB, IVT-MB	All trials were Conducted nicely	Very Good

Entries showing promising performance in breeding trials across centres:

Trial	Entry	Remarks
AVT-Malt	E3	Over all good appearance
AVT-Feed	E2	Over all good appearance
IVT - Malt	E2, E6, E21	Over all good appearance
IVT-Feed	E8, E17	Over all good appearance
IVT/AVT - HL	E8	Over all good appearance

Entries recommended for purification:

Trial	Entry	Remarks
AVT-MB	E4	Off types
AVT-Feed	E4	Off types
IVT-MB	E1,E4, E8, E10, E11, E14, E15, E16, E19, E22, E23	Off types
IVT-FB	E1, E6, E7, E11, E15, E21, E22, E25	Off types
IVT/AVT-HL	E3, E5, E6	Off types

Entries recommended to be dropped from further testing:

Trial	Entry	Remarks
IVT - Malt	E12, E19	E12 has mixture of 6 row and 2 row spikes E19 has mixture of green and waxy spikes.
IVT - Feed	E3, E5, E24	E3 has mixture of 2 row and 6 row spikes, E5 has early and late spikes E24 has variation in spike shape and size

Entries exhibiting higher diseases incidence / insect infestation:

Centrre	Entry	Remarks
Ludhiana	AVT/IVT-HL - E2 AVT-Malt- E1	E2 has 70% spikes infected with covered smut Spot blotch incidence 58
Bhatinda	AVT-Malt - E3, E5	E3 and E5 had leaf rust 60S

Report on Agronomical Trials:

Centrre	Trial	Remarks
Ludhiana	SPL-1 to 3 and response of new barley genotypes to different N levels	All trials were conducted as per technical programme and were very good. In experiment of response of new malt barley genotypes to different N levels, difference of higher N levels were quite visible in different genotypes.In SPL-1of N and Zn scheduling, phenotypically not much difference was visible. In SPL-2, nutrient use efficiency of nano fertilizer, effect of nano urea was not visible on growth. In SPL-3, experiment on sowing method and seeding rate was conducted. Overall, the experiments were very good and layout was proper.

Report on Pathological Nurseries:

Centre	Trial	Remarks
Ludhiana	NBDSN, EBDSN, IBDSN	All the nurseries were sown and the infector disease was up to 60S for rust disease.

Special comments, if any (2-3 bullet points only)

-

Signature(s)

Zonal Monitoring Report (2022-23)
Zone: NWPZ-Team-I

Period of visit: 20-22 March 2023

Name of team members	Centres visited
Dr BS Tyagi, Dr Vikas Gupta, Dr SC Gill, Dr Lokendra Kumar, Dr OP Gangwar	Modipuram, Pantnagar

Summary of breeding trials allocated & monitored:

Centre	Trial (s) Allotted	Trials not conducted/ Rejected	Remarks
Modipuram	AVT-IR-FB-NWPZ	Conducted successfully	Very good & satisfactory
	IVT-IR-FB-NWPZ	Conducted successfully	Very good & satisfactory
	IVT-IR-NB-NWPZ	Conducted successfully	Very good & satisfactory
	AVT-IR-MB-NWPZ	Conducted successfully	Very good & satisfactory
	IVT-IR-MB-NWPZ	Conducted successfully	Very good & satisfactory
Pantnagar	AVT-IR-FB-NWPZ	Conducted successfully	Very good & satisfactory
	IVT-IR-FB-NWPZ	Conducted successfully	Very good & satisfactory
	IVT-IR-NB-NWPZ	Conducted successfully	Very good & satisfactory
	AVT-IR-MB-NWPZ	Conducted successfully	Very good & satisfactory
	IVT-IR-MB-NWPZ	Conducted successfully	Very good & satisfactory

- Evaluate trials as very good, good, average and poor on the basis of conduction

Entries showing promising performance in breeding trial across centres

Trial	Entry (s)	Remarks
AVT-IR-FB-NWPZ	AVT-IR-FB- 5	Observations are based on phenotypic appearance and plant stand etc.
IVT-IR-FB-NWPZ	IVT-IR-FB-9, IVT-IR-FB-16	
IVT-IR-NB-NWPZ	IVT-IR-NB-7	
AVT-IR-MB-NWPZ	AVT-MB-1, AVT-MB-4	
IVT-IR-MB-NWPZ	IVT-MB-5, IVT-MB-20, IVT-MB-24	

Entries recommended for purification

Trial	Entry (s)	Remarks
AVT-IR-FB-NWPZ	Nil	Nil
IVT-IR-FB-NWPZ	Nil	
IVT-IR-NB-NWPZ	Nil	
AVT-IR-MB-NWPZ	Nil	
IVT-IR-MB-NWPZ	Nil	

Entries recommended to be dropped from further testing

Trial	Entry (s)	Remarks
AVT-IR-FB-NWPZ	Nil	Nil
IVT-IR-FB-NWPZ	Nil	
IVT-IR-NB-NWPZ	Nil	
AVT-IR-MB-NWPZ	Nil	
IVT-IR-MB-NWPZ	Nil	

Entries exhibiting higher incidence of disease /insect infestation

Trial	Entry (s)	Remarks
AVT-IR-FB-NWPZ	Nil	Nil
IVT-IR-FB-NWPZ	Nil	
IVT-IR-NB-NWPZ	Nil	
AVT-IR-MB-NWPZ	Nil	
IVT-IR-MB-NWPZ	Nil	

Report on pathological nurseries:

Centre	Nurseries	Remarks
Pantnagar	IBDSN, NIBDSN, EBDSN	Nurseries were conducted nicely

Special comments, if any (2-3 bullet points only): Nil

Signatures:

(BS Tyagi) (SC Gill) (Lokendra Kumar) (Vikas Gupta) (OP Gangwar)

Zonal Monitoring Report 2022-23

Zone: NHZ – Team 1

Period of visit: 17.04.2023 to 20.04.2023

Name of team members:	Centres Visited:
Drs. Chuni Lal, DP Walia, Vijay Rana and Ravindra Kumar	Shimla, Berthin, Bajaura and Malan

Summary of Breeding trials allocated & monitored:

Centre	Trial(s) Allotted	Trials Not Conducted / Rejected	Reason/Remark*
Shimla	IVT-RF-NH-Zone (2022-23)	Conducted successfully	Very Good & Satisfactory
Bajaura	IVT-RF-NH-Zone (2022-23)	Conducted successfully	Very Good & Satisfactory
Malan	IVT-RF-NH-Zone (2022-23)	Conducted successfully	Very Good & Satisfactory
Berthin*	IVT-RF-NH-Zone (2022-23)	Rejected	Trial was conducted, but proper layout was not followed as randomization was not as per the technical programme.

**Evaluate trials as very good, good, average and poor based on conduction*

Entries showing promising performance in breeding trials across centres:

Trial	Entry	Remarks
IVT-RF-NH-Zone (2022-23)	Grain: IVT-RF-NHZ -9, IVT-RF-NHZ-12, IVT-RF-NHZ-18, IVT-RF-NHZ-24 Dual Purpose: IVT-RF-NHZ-12, IVT-RF-NHZ-3, IVT-RF-NHZ-16, IVT-RF-NHZ-7, IVT-RF-NHZ-24	Observations are based on appearance of the genotype and plant stand etc.

Entries recommended for purification:

Trial	Entry	Remark
IVT-RF-NH-Zone (2022-23)	IVT-RF-NHZ-14, IVT-RF-NHZ-19, IVT-RF-NHZ-20, IVT-RF-NHZ-23	Variation in row type, plant height and droopy/non-droopy spikes were observed which needs purification

Entries recommended to be dropped from further testing: IVT-RF-NHZ-17*
*This entry was found to segregate for ear attitude (droopy/ erect), plant height and maturity at all the centres.

Entries exhibiting higher diseases incidence / insect infestation: IVT-RF-NHZ-22 (20S)

Report on Agronomical Trials:

Centre	Trial	Trials Not Conducted / Rejected	Remark
Bajaura	SPL-2	Conducted successfully	Treatments effects were seen. However, effects of nano urea treatments were not apparent
Malan	SPL-2	Conducted successfully	

Report on Pathological Nurseries:

Centre	Nursery	Remark
Bajaura	IBDSN, NBDSN, EBDSN	Nurseries were conducted satisfactorily. In NBDSN, yellow rust severity in infectors ranged from 60S to 80S.

Report on EIBGN and NBGSN:

Centre	Conducted/ Non-conducted	Remark
Bajaura	Conducted	Nurseries were conducted satisfactorily
Shimla	Conducted	

Special comments, if any (2-3 bullet points only)

- **Powdery mildew expression was observed at Malan, indicating for screening against powdery mildew as hot spot.**

Signature(s):

20/4/23
(Dharam Pal)

Vijay Rana 20/04/23
(Vijay Rana)

Ravindra Kumar. 20/04/23
(Ravindra Kumar)

Chuni Lal 20/4/2023
(Chuni Lal)

Proforma for Zonal Monitoring Report 2022-23

Zone:North Hills Zone (NHZ)

Team-II

Period	Team	Centres visited
18-21st April 2023	Drs CN Mishra, Jogendra Singh and Pramod Prasad	Dehradun (NWPZ), Gaza, Almora, Majhera,Pantnagar

Breeding trials allocated & monitored:

Centre	Trial	Remark
Gaza	**IVT-RF-NH**	**Good**
Almora	**IVT-RF-NH**	**Good**
Majhera	**IVT-RF-NH**	**Good**

Entries showing promising performance in breeding trials:

Trial	Entry
IVT- RF -NH	IVT- RF –NH-6, IVT- RF –NH-7, IVT- RF –NH-10, IVT- RF –NH-16, IVT- RF –NH-20.

Entries recommended for purification

Trial	Entry	Remarks
IVT- RF -NH	IVT- RF –NH-5, IVT- RF –NH-8, IVT- RF –NH-17, IVT- RF –NH-21,	off types **were observed**

Entries recommended to be dropped from further testing:NIL

Entries showing high disease incidence in breeding trials

There was no incidence of rusts observed in any trial at all the locations namely, Gaja, Almora and Majhera except yellow rust recorded as 10MS and 5MS at Gaja location in genotypes IVT- RF –NH-12 and IVT- RF –NH-22, respectively.

Special comments, if any

1. Since wheat and barley trials phonological stages are different separate monitoring teams should be constituted for each crop.
2. The team also visited the breeding programmes at VPKAS Almora and GBPUAT Pantnagar..
3. Pathological nurseries may also be allotted to Gaza center.

Signature of the monitoring team

CN Mishra
(ICAR-IIWBR, Karnal)

Jogendra Singh
(ICAR-IIWBR, Karnal)

Pramod Prasad
(IIWBR RS-Shimla)