For official use only

All India Coordinated Wheat and Barley Improvement Project

PROGRESS REPORT
2014-2015

Vol. VI

BARLEY NETWORK

AS Kharub
Dinesh Kumar
Jogendra Singh
Lokendra Kumar
Vishnu Kumar
Anil Khippal
Sudheer Kumar
R Selva Kumar
SC Bhardwaj
Subhash Katare
Rekha Malik
Ajay Verma
Indu Sharma

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

Correct Citation:

Anonymous 2015. Progress Report of All India Coordinated Wheat & Barley Improvement Project 2014-15, Vol. VI. Barley Network. Eds: AS Kharub, Dinesh Kumar, Jogendra Singh, Lokendra Kumar, Vishnu Kumar, Anil Khippal, Sudheer Kumar, R. Selvakumar, SC Bhardwaj, Subhash Katare, Rekha Malik, Ajay Verma and Indu Sharma. ICAR-Indian Institute of Wheat and Barley Research, Karnal, India. P. 275.

Issued on the occasion of 54th All India Wheat & Barley Research Workers' Meet hosted by SDAU, Sardarkrushinagar during August, 21-24, 2015.

ACKNOWLEDGEMENTS

It gives me great pleasure to record my sincere gratitude to Dr. Jeet Singh Sandhu, D.D.G. (CS), for providing his constant guidance and encouragement to the barley network programme. I am highly grateful to Dr. I. S. Solanki, A.D.G. (FFC) for his full support in consolidation of various barley improvement activities under the AICW &BIP.

I wish to express my deep sense of gratitude to Dr. (Mrs.) Indu Sharma, Director, ICAR-IIWBR, Karnal for continuous encouragement and guidance in coordination of barley network activities under the AICW&BIP.

The cooperation received from the AICW&BIP as well as other testing centres for the successful conduct of barley network experiments is praiseworthy and all of them deserve special complements.

Dr. Ajay Verma, who helped in analyzing the voluminous data well in time deserve my special thanks.

I record my sincere acknowledgements for the useful help provided by my colleagues Dinesh Kumar, Lokendra Kumar, Jogendra Singh, Anil Khippal, Vishnu Kumar, Sudheer Kumar, R. Selvakumar, SC Bhardwaj, Subhash Katare and Rekha Malik in compilation and editing of this report as well as in coordinating research activities in their respective disciplines.

The useful help rendered by Sh. Madan Lal, Sh. Yogesh Kumar, Sh. Sant Kumar, Sh. Rajendra Kumar and Sh. Sunit Kumar, Ms Swati Verma and Sh. Vichitra Kumar in the laboratory for analytic work, field experimentation and data compilation is gratefully acknowledged.

The help extended for reproduction of adequate number of copies and binding of this report by Dr. Ajay Verma and his team consisting of Drs. Suman Lata, R. Sendhil, Lokendra Kumar, Rajkumar Sh. Suresh Kumar Sh. Bhim Sain and Sh. Ramu Shah is duly acknowledged.

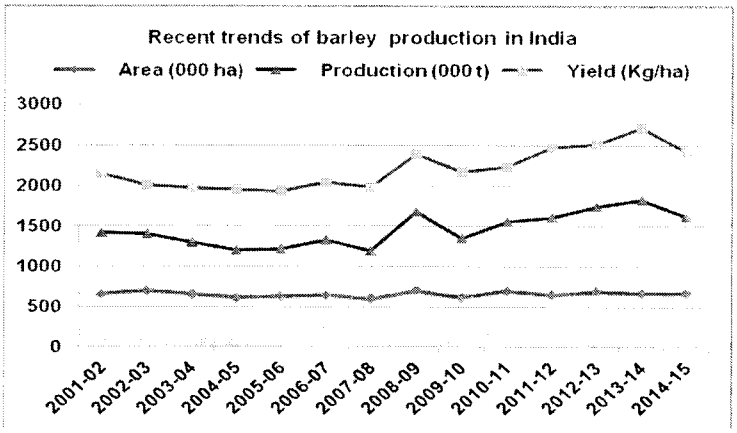
(A.S. Kharub)

CONTENTS

RESEARCH HIGHLIGHTS OF BARLEY NETWORK

CROP SITUATION

The crop season 2014-15 was not favorable for barley due to adverse climatic conditions of rains and strong wind at the time of crop maturity and probably led to the decline in the production and productivity (9.9%) over the previous year according to 3rd advance estimates for Rabi 2014-15. Estimates have indicated nearly 1626 thousand tons of barley production in 671.0 thousand ha area with a productivity of 24.2 q/ha. During the season damage due to lodging was observed due to rain at maturity stage in different regions. There was also aphid infestation in congenial atmosphere where not much winter rains occurred and caused damage in certain areas. There has been a concern raised at various platforms for area decline, however, in last more than 15 years, the area has stabilized and there has been gain in productivity resulting in higher production. Though the MSP of barley (Rs.1150/-) is much lower than wheat (Rs.1500/-), but during current season the market price of barley remained higher (up to Rs. 1300/q and in August it goes up to Rs 1500/q). The main reason of this was the demand of malting and brewing industry. Some of malt industries had also followed "contract farming" with malt type varieties to ensure regular supply of the good quality raw material for their units. This has given much needed impetuous to the barley cultivation under better managed conditions and we can expect further rise in productivity. Thus there is a need of support in terms of quality seed, assured procurement and price from industries/government side to increase its area, production and productivity.



The monitoring teams surveyed the major barley growing areas during the season in addition to visiting the experiments at coordinated centres. The observations indicated that the crop season was by and large a disease free year in major barley growing areas, with some incidence of yellow rust in foothills and mid hills. The incidence of leaf blights was observed in the eastern zone.

State wise situation shows that there is decrease in area in Madhya Pradesh and increase in Rajasthan and other states having almost the same area. Major decrease in production was noticed in Haryana and Madhya Pradesh mainly because of decrease in area and adverse climate.

Estimates of barley area, production and productivity in major barley growing states

State	Area (000 ha)			Production (000 T)			Yield (q/ ha)		
	2012-13	2013-14	2014-15*	2012-13	2013-14	2014-15*	2012-13	2013-14	2014-15*
Bihar	10.4	10.5	10.5	15.2	14.3	14.8	14.6	13.9	14.1
Haryana	48.0	39.0	33.0	167.0	153.0	99.0	34.8	39.2	30.0
H.P.	22.3	17.3	20.1	36.3	28.2	30.1	16.2	16.2	15.0
J&K	11.9	12.0	12.6	7.0	7.1	7.2	5.8	5.7	5.7
M.P.	84.9	86.7	43.0	144.9	153.0	54.0	17.1	17.3	12.6
Punjab	13.0	12.0	18.0	47.0	46.0	65.0	36.1	38.3	36.1
Rajasthan	307.9	309.3	340.7	852.6	942.0	840.9	27.7	30.4	24.7
U. P.	168.0	157.0	167.0	446.0	450.0	481.0	26.5	28.6	28.8
Uttrakhand	22.4	23.3	21.0	30.7	31.5	29.0	13.7	13.5	13.8
All India	695.1	674.0	67.2	1752.4	1830	1626.3	25.2	27.1	24.2

**Third advance estimates*

New initiatives were undertaken to improve plant type for lodging resistance and to enhance yield and quality of malt purpose barley through pre-breeding, churning germplasm and integration of molecular breeding, improving food purpose barley through screening of germplasm and pre-breeding and to popularize the health benefits of barley (higher beta glucan content). Linkages with national and international organisations, industries and farmers were also strengthened.

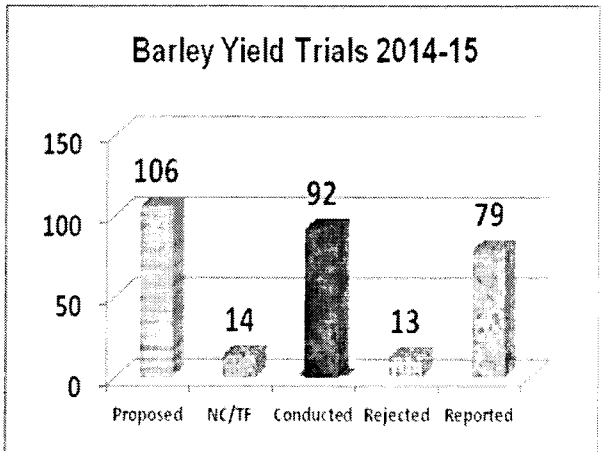
CROP IMPROVEMENT

NEW BARLEY VARIETIES RELEASED

Three new barley varieties namely viz. DWRB 101, BH 959, and RD 2849 were identified during 53nd AICW&B workers meet at JNKVV Jabalpur and subsequently in the meetings of Central Sub-Committee on Crop Standards, Notification and Release of Varieties for Agricultural Crops (CVRC), DWRB 101 and BH 959 were released/ notified for cultivation in different zones.

Variety	Parentage	Area of adaptation	Production conditions	Salient characteristics	Developed at
DWRB 101	DWR28/ BH581	NWP Zone	Irrigated timely sown	Two-row malt barley with good grain under timely sown conditions, resistant to stripe and leaf rusts	DWR Karnal
BH 959	BH393/ BH331	Central Zone	Irrigated timely sown	Six row feed barley with tolerance to yellow and brown rust	CCSHAU, Hisar
RD2849 (I)	DWRUB52 /PL705	NWP Zone	Irrigated timely sown	Two-row malt barley with good grain under timely sown conditions, resistant to stripe and leaf rusts	RARI, Durgapura

COORDINATED YIELD EVALUATION TRIALS



- Out of 106 yield evaluation trials proposed, 92 (86.8%) trials were conducted. Ten trials were either not conducted/failed and data were not received in time. After the analysis, only 79 trials (74.5% of proposed 85.9% of conducted) were found good for reporting.
- These trials were conducted at 12 main centres and 49 testing centres (including ICAR, SAUs and State Department of Agriculture) during *rabi* 2013-14.
- In all 109 test entries contributed by 12 centres, were evaluated against 26 checks in the coordinated yield trials under rainfed (plains and hills), Irrigated (plains) and saline soils conditions under timely/ late sown conditions. The new barley entries include malt, feed or dual purposes types and mostly were hulled type with a few hull-less types in northern hills zone.

Malt Barley Evaluation

Timely sown

The AVT-MB (IR-TS) was proposed at 13 centres in NWPZ. The trial consisted of 6 test entries and 5 checks viz. BH 902 (six-row) and DWRB92, DWRB101, DWRUB52 and RD2849 (two-row malt barley) making a total of 11 entries, where entries BH976 and PL874 were in the final year of evaluation. Entries BH 976, DWRB124 and RD2891 had few off types at some locations. The entry DWRB123 (47.5 q/ha) ranked first and was

numerically high to the best check DWRB101 (46.5 q/ha), while the final year entries BH976 and PL874 ranked third and fourth with 45.9 and 45.3 q/ha grain yield, respectively.

The IVT malt barley under timely sown condition was proposed at 10 locations in NWPZ, and was conducted at 9 centres, except Navgaon centre. The trial was proposed with 17 entries and 5 checks namely BH 902 (six-row) and DWRB92, DWRB101, DWRUB52 and RD2849 (two-row malt barley) for irrigated timely sown conditions of NWPZ. Entries BH 1000, BH1001 and KB 1322 were reported as mixtures/segregating, while entries *viz.* DWRB134, DWRB139, PL883 and RD2917 were having some off types and need purification. Yellow rust reaction of 15S was reported in the genotype BH1001, while the entries DWRB136, DWRB141, KB 1322 and RD 2918 showed 10S reaction for stripe rust. The trial mean ranged from 30.0 q/ha (Karnal) to 55.3 q/ha (Bhatinda), with 42.0 q/ha zonal mean. Entries RD2917 (47.2 q/ha) and DWRB136 (46.1 q/ha) were significantly superior to the best check RD2849 (43.8 q/ha) and both the entries were grouped in the first non-significant group.

Late sown

The IVT Malt Barley under late sown conditions was proposed at 7 locations in NWPZ and was conducted and reported from all the centres. The trial was proposed with 13 entries and 3 checks namely DWRB91 (two-row) and BH946 and DWRUB64 (both six-row). The entries namely BH 1000 and RD2918 were observed as mixture/segregating, while few off types were noticed in the entries *viz.* BH1001, BH1003 and RD2919. Yellow rust reaction of 40S was reported in the genotype RD2918 followed by BH1000 (15S) and 10S reaction was showed by the entries namely DWRB134, DWRB138 and check variety BH946. The trial mean yield ranged from 25.8 q/ha (Ludhiana) to 60.5 q/ha (Durgapura) with zonal mean of 38.3 q/ha. The genotype RD2917 ranked first with 43.2 q/ha grain yield followed by entry RD2919 (41.9 q/ha) in the first non-significant group.

Feed Barley Evaluation

Irrigated

The IVT (irrigated) trial comprising of 18 test entries and 7 checks was proposed to conduct at 20 locations in NWPZ (6), NEPZ (6) and Central zone (8). In NWPZ, test entry DWRB 137 (49.8 q/ha) ranked first and was in first non-significant group for grain yield. The check BH 946 ranked second with 49.7 q/ha mean grain yield in the first NSG. This entry was significantly superior over six checks viz., BH 902 (45.9 q/ha), HUB 113 (45.6 q/ha), RD 2552 (45.1 q/ha), BH 959 (44.1 q/ha), RD 2786 (39.4 q/ha) and Joyti (32.9 q/ha). In NEPZ, check BH 902 (39.2 q/ha) ranked first and was in first non-significant group for grain yield. In this zone, test entry DWRB 137 ranked second with 39.1 q/ha mean grain yield in the first NSG. In addition, two more test entries PL 883 (38.2 q/ha) and DWRB 142 (37.4 q/ha) ranked third and fifth and were in first non-significant group respectively. In Central zone, check BH 902 (46.3 q/ha) ranked first and was in first non-significant group for grain yield. The entries PL 883 (45.0 q/ha) and HUB 245 (44.8 q/ha) ranked second and third and were in first non-significant Group.

Rainfed Plains

The IVT (rainfed) trial consisted of 19 test entries and two checks (K 603 and Lakhan) was proposed at 8 locations U.P. (5), Bihar (2) and M.P(1) in NEPZ. The results revealed that entry KB 1323 ranked first with 29.20 q/ha mean grain yield and was followed by KB 1318 (29.2 q/ha), HUB 242 (28.8 q/ha) and PL 887 (28.2 q/ha) in the first non significant group.

Rainfed Hills

The AVT trial consisting of 15 entries and 4 checks (BHS 352, BHS 400, HBL 113 and VLB 118) was proposed at 13 locations in the NH zone (Uttrakhand, H.P. and J&K). The trial mean ranged from 14.39 q/ha (Katrain) to 29.27 q/ha (Almora). The results indicated that check variety BHS 400 (34.1 q/ha) showed rank first and was in the first non-significant group. However, entry UPB 1044 (27.4 q/ha) ranked second and was in the first non significant group in the zone for grain yield.

Salinity-alkalinity

A special alkalinity/salinity trial consisting of 16 test entries and 3 checks (NDB 1173, RD 2552 and RD 2794) was proposed at 8 locations. The overall results of grain yield indicated that test entry RD 2907 (34.5 q/ha) was ranked first and was in the first non significant group.

Dual purpose

The AVT dual purpose in NEPZ trial comprising of one entry (KB1369) and four checks (Azad, RD 2035, RD 2552 and RD 2715) was proposed at 6 locations under irrigated conditions in the NWP zone. The trial means for grain yield ranged from 20.16 q/ha (Bikaner) to 45.94 q/ha (Ludhiana). The check RD 2552 (36.7 q/ha) ranked first and was in first NSG for grain yield in the zone. Similarly check RD 2035 (149.10 q/ha) ranked first followed by another check RD 2552 (146.6 q/ha) and were in first NSG. Thus checks were superior over entry in this trial.

The AVT dual purpose in NHZ consisted of 15 entries and three checks (BHS 380, BHS 400 and HBL 276) was proposed at 5 locations under rainfed conditions of Uttarakhand and Himachal Pradesh in the NH zone. The check BHS 400 (27.1 q/ha) showed first rank and test entry VLB 144 (26.7 q/ha) was second in grain yield and were in first NSG for grain yield. For forage yield, entry VLB 141 (45.0 q/ha) ranked first followed by VLB 145 (44.6 q/ha) and were in first NSG.

The IVT trial consisting of 13 entries and 4 checks was proposed under irrigated conditions in NWPZ (5) and NEPZ (4) and CEN Zone (7) at 16 locations. In NWPZ, trial means for grain yield ranged from 17.59 q/ha (Bikaner) to 49.84 q/ha (Ludhiana). The entry KB 1319 ranked first in NWPZ and was in first non-significant group for grain yield. Although check RD 2035 showed rank first and was in first non-significant in NEP Zone. The test entries KB1325 (21.1 q/ha) and NDB1610 (21.0 q/ha) showed the second and third rank and was in first NSG. In case of central zone, entry NDB 1614 (45.00 q/ha) secured first rank followed by UPB 1046 (44.2 q/ha) and was in first non-significant group. However, check RD 2552 (44.10 q/ha) was ranked third for mean grain yield and was in first non-significant group. On national basis entry UPB 1046 (35.28 q/ha) was ranked first and was in first NSG for mean grain yield while check RD 2552 (35.04 q/ha) showed second rank and was in the first non-significant group.

For forage yield, a wide range of variation was observed from 88.80 q/ha (Bikaner) to 208.74 q/ha (Modipuram) in NWPZ. The test entry RD 2903 (183.9 q/ha) showed first rank followed by RD 2906 (181.4 q/ha) and was in first NSG. However, check RD 2715 (181.1 q/ha) ranked third and was in first non significant group in the zone. In NEPZ entry RD 2903 (159.0 q/ha) showed first rank followed by RD 2906 (158.8 q/ha) and was in first NSG. In this zone check RD 2715 (152.1 q/ha) was ranked third in non significant group for forage yield. In the central zone, check RD 2715 ranked first and was in first NSG for forage yield At national level, check RD 2715 (180.59 q/ha) showed first rank and was in NSG for forage yield. However, entry RD 2903 (176.90 q/ha) ranked second and was in first NSG.

ZONAL MONITORING

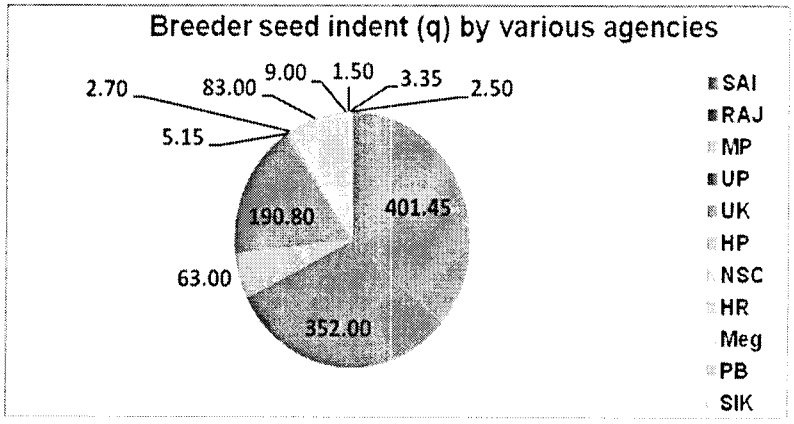
The teams constituted for monitoring of Barley Network Yield Trials & Nurseries in central zone, NWPZ, NEPZ and NH Zone, visited different locations of the three zones at the most appropriate stage of the crop and recorded observations about the varietal performance, conduct of trials, disease/ pest incidence and genetic purity of the test entries. The team in NHZ was common for wheat and barley crops, while in other two zones barley monitoring was done little earlier keeping the crop stage in mind. On the spot decisions were taken about the rejection of trials and purity of test entries through consensus. 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

Zone	Date	Centres visited
CZ	16-19 Feb., 2015	S K Nagar, Udaipur, Bansnwara, Kota
NEPZ	24-28 Feb., 2015	Kanpur, Dalipnagar,Faizabad, Varanasi, Mirzapur, Tissuhi
NWPZ I	03-06, March, 2015	Mathura, Morena and Gwalior
NWPZ II	07-12, March, 2015	Durgapura, Bawal, Rohtak, Hisar, Ludhiana,
NHZ I	14-16 April, 2015	Majhera, Almora, Dhaulakuan, Shimla
NHZ II	6-9 April, 2015	Una, Akrot, Kangra, Malan, Palampur, Bajaura, Katrain, Sundernagar, Berthein

BREEDER SEED PRODUCTION

To meet out the barley seed requirement of the country a consolidated indent of 1114.45 q breeder seed of 41 varieties was received DAC, Ministry of Agriculture, Govt. of India. The major portion of the indent was given by SAI (401.45q) followed by Rajasthan (352.0q), U.P (191.1q), N.S.C. (83.0q), M.P. (63.0q), Haryana (9.0q), Uttrakhand (4.85q), Punjab (3.35q), H.P. (2.70q), Sikkim (2.50q) and Meghalaya (1.50q). The purity of breeder seed was verified by conducting 'Grow out Test' at IIWBR, Karnal and other centers. With a surplus of 29.41q, a net production of 1141.16q breeder seed of different varieties was reported against the total allocated quantity of 1111.75q. The highest demand was for the variety RD2660 (238.0q) followed by DWRUB52 (105.0q) and PL426 (95.65q) while least demand was for outdated varieties namely Dolma (0.30q), HBL87 (0.40q) and BH75 (0.40q). On the production front, Rajasthan state occupied first position with a net production 522.0 q against the total allocation of 513.3 q breeder seed. Due to adverse climatic conditions especially during crop maturity (untimely heavy rainfall and winds), a deficit seed production was reported for the varieties DWRUB-52 (-45.44 q), DWRUB-64 (-3.80 q), DWRB-73 (-1.63 q), DWRB-91(-6.05 q), DWRB-92 (-3.12 q), JB-58(-8.60 q), RD-2660(-198.0 q), RD-2668(-6.00 q) and NDB-943(-30.70 q). On the other hand, surplus production was also reported in some varieties *viz.* PL-426 (41.5 q), RD-2052 (41.9 q), RD 2552 (57.2 q), RD-



2592 (16.0 q), RD-2624 (11.2 q), RD-2715 (23.0 q), RD-2786 (60.0 q), HUB-113 (36.8 q), NDB-940 (11.8 q) *etc.* A total of 61.35 q nucleus seed production was reported against the total allotment of 48.6 q. Except five very old varieties (BH75, Dolma, HBL-87, NDB-1020, PL-426 and PRB-502), the nucleus seed of all varieties was reported to be produced by the respective centers. The maximum nucleus seed production was reported for the RD2668 (8.0 q) followed by RD2668 (5.0 q), BH946 (4.0 q), K287 (3.5 q), RD2715 (2.8 q) etc. In addition, test stock multiplications for the varieties of DWRB101 (157.0 q), BH959 (90.0 q) and RD2849 (58.0 q) was also reported from National Seed Corporation Limited.

GERMPLASM EVALUATION & EXCHANGE

An Elite International Barley Germplasm Nursery (EIBGN) constituted with 45 genotypes selected from international trials/nurseries was supplied for evaluation at all locations of Barley Network under AICW&BIP. A National Barley Genetic Stock Nursery (NBGSN) was constituted with promising entries and comprised of 22 entries endowed sources for malting quality traits, yield and its components and disease resistance. Germplasm accessions (495) from the IIWBR active collection were rejuvenated as regular maintenance activity and 100 accessions were evaluated for yield and its component traits at Hisar farm of IIWBR, Karnal. In addition, 330 barley germplasm lines collected from ICARDA, Morocco were evaluated at Hisar farm. This year 3 International trials and 3 nurseries including 472 germplasm lines, received from ICARDA were evaluated at different centres under barley network. In addition, 445 barley promising entries were selected by the breeders from these trials/nurseries during field day organized by IIWBR, Karnal.

International trials/nurseries conducted during crop season 2014-15

Sr. No.	Trial/Nursery	Origin	No. of Entries	Set No.	Location
1.	2nd GSBYT	ICARDA	25	4	Karnal, Faizabad, Rewa, Kanpur
2.	IBYT-HI	ICARDA	25	4	Karnal, Ludhiana, Hisar, Durgapura
3.	INBYT-HI	ICARDA	25	3	Karnal, Bajaura, Ludhiana
4.	2nd GSBSN	ICARDA	150	4	Karnal, Faizabad ,Durgapura, Kanpur
5.	IBON-HI	ICARDA	167	4	Karnal, Durgapura, Ludhiana, Hisar
6.	INBON	ICARDA	80	3	Karnl, Bajaura, Shimla

CROP PROTECTION

Barley Crop Health Report

During crop season 2014-15, stripe rust was observed in Punjab, Haryana, Uttarakhand, Himachal Pradesh, Jammu and Kashmir in few farmer's fields. There was no report of natural occurrence of black rust in barley from any of the barley growing areas of India except Wellington and Dharwar. Leaf blight and foliar aphids were present in few areas of Central India. Leaf blight severity was around 57 in the NEPZ area surveyed. Loose smut, covered smut and powdery mildew were also observed at low incidence.

Seedling Resistance Test (SRT)

Two hundred twenty lines of NBDSN (123) and EBDSN (97) were evaluated at seedling stage against three pathotypes of barley yellow rust viz. (0S0)57, 1S0 (M), 5S0 (Q) , mixture of *Puccinia striiformis* f. sp. *hordei* (Yellow/stripe rust), five pathotypes 79G31(11),62G29(40A) and 75G5 (21A-2), 37G19 (117-6), 7G43 (295) of *P. graminis* f. sp. *tritici* (Black/stem rust) and H4 isolate as well as mixture of five isolates of *P. hordei* (Brown/leaf rust) under controlled conditions. In NBDSN, nine lines (RD2035, RD2550, RD2552, RD2849, RD2900, RD2904, RD2909, RD2913, and RD2915) were resistant to all the three rusts of barley. Five lines were resistant to black &

brown rusts, 7 to brown & yellow rusts and 12 to yellow & black rusts. Eighteen lines were resistant only to yellow rust of barley.

Resistant to	EBDSN Lines
All the rusts (03)	BCU7719, BH972, BH983
Black and Brown rusts (06)	BCU7598, BCU7621, BCU7623, BCU7643, BCU7732, BCU7746
Brown and Yellow rusts (02)	HBL713, HUB237
Yellow and Black rusts (01)	BH981
Yellow rust (07)	BCU7615, BCU7616, DWRB127, KB1351, KB1367, UPB1040, UPB1042

In EBDSN, three lines viz. BCU7719, BH972 and BH983 were resistant to all the rusts. In addition 6 lines were resistant to black & brown, 2 to brown & yellow and 1 line to yellow & black rusts. Seven lines were resistant to yellow rust only.

Resistant to	NBDSN Lines
All the rusts 09 lines	RD2035, RD2550, RD2552, RD2849, RD2900, RD2904, RD2909, RD2913, RD2915
Black and Brown rusts 05lines	BH994, BH995, DWRB141, HUB242, RD2919
Brown and Yellow rusts 07lines	NDB1607, NDB1618, RD2550, RD2786, RD2901, RD2905, RD2907
Yellow and Black rusts 12lines	BH993, BH999, DWRB132, HUB113, HUB243, RD2035, RD2552, RD2891, RD2903, RD2908, RD2914, VPB1046
Yellow rust 18lines	BH1000, BH902, BH996, DWRB137, DWRB143, DWRB64, HUB240, HUB241, HUB242, HUB244, HUB245, JB301, JB303, KB1318, PL887, RD2715, RD2899, RD2910

Adult plant resistance (APR)

Out of 366 IBDSN entries tested, 42 entries were found free from yellow rust (ACI = 0) and 126 entries showed resistant reaction have ACI less than 10. In case of leaf blight screening, 6 entries were found between average score of 36-57 and the highest score of 69 against leaf blight.

Chemical control of barley foliar blight, stripe rust and barley aphid

Seed treatment with Vitavax @ 2g/Kg followed by spraying with Propiconazole 0.1% spray is effective for management of leaf blight. In all centres, seed treatment with Vitavax @ 2g/Kg recorded higher yield. Spraying with Propiconazole/Tebuconazole (Folicur) / Bayleton @ 0.1% recorded lower stripe rust severity and spraying with Imidacloprid 17.8 SL @ 20g a.i /ha or Clothianidin 50 WDG @ 15 g a.i./ha found effective against foliar aphid.

Screening of NBDSN barley entries against CCN and barley aphids

All the entries tested were categorized as susceptible (grade 4) or highly susceptible (grade 5) to barley aphid at all the locations. However entry DWRB142 found to be resistant and entry RD2918 found to be moderately resistant to foliar aphid in barley at Kanpur.

All the entries were found to be either S or HS to CCN and none of the entries shown resistance. However, the entries *viz.,* BH 959, DWRB 137,138,139,142,91,DWRUB64, RD 2903, 2918, 2035, KB1369, HUB 241, 242, and NDB 1609,1614 shown resistance against CCN at Hisar indicating the presence of different biotypes.

RESOURCE MANGEMENT

The evaluation of second year AVT entries was taken up in North Western Plains Zone. The irrigated, timely sown malt barley trials was conducted in different production conditions and fertilizer application treatments. Out of the 10 proposed trials, all were conducted and reported. In special trials (date of sowing, sprinkler irrigation, sulphur application, mulching, N doses and schedules, phosphorus and potash application and weed management), out of 38 proposed at different locations, 36 were reported.

EV ALUATION OF NEW GENOTYPES

Irrigated, timely sown malt barley at different N levels and date of sowing in NWPZ

On mean basis and at recommended N level, the test entries PL 874 and BH 976 were at par with the best check. All the test entries responded up to 90 kg N ha^{-1}w except BH 976 which responded up to 60 kg N ha^{-1}. Also under date of sowing, the test entries (BH 976 and PL 874) were at par with the best check but in normal sown conditions both the entries were superior to the best check.

REFINEMENT OF PRODUCTION TECHNOLOGIES

SPL 1 Fine tune the date of sowing under changing climatic conditions

Timely and late sown irrigated barley in NWPZ

Three year data revealed that the optimum date of sowing for all the varieties (BH 902, RD 2552, DWRUB 52 and RD 2668) tested was 6-15 November, although BH 902, a feed barley variety recorded similar yield between 25th of October to 25th of November. The varieties BH 902 and DWRBUB 52 were at par in all sowing dates and above the other two varieties. In late sown conditions, three year data showed that all the varieties (DWRUB64, DWRB 73, DWRB 91 RD 2508) recorded significantly higher grain yield up to 10th December sowing, and thereafter there was significant decrease in yield of all varieties as the sowing date advanced. The variety DWRUB 64 produced highest yield in late December and January sowing whereas DWRB 91 was on top in early December sowing.

Timely sown irrigated barley in NEPZ

Four varieties (RD 2552, K 508, K 551 and JB 1) evaluated against four dates of sowing (dates starting from second week of November to second week of December, 10 days interval) and three years data revealed that second date of sowing (15-24 November) was best for all the varieties after that there was significant reduction in yield.

Timely sown rainfed barley in NHZ

Four varieties (BHS 352, UPB 1008, VLB 118 and HBL 113) were evaluated against five dates of sowing (starting from 25th October to 25 December, at 15 days interval). Three year data revealed that second date of sowing (10 - 24 November) was better among all the date of sowing and for all the varieties. Among varieties, HBL 113 was ranked at first position and followed by UPB 1008 and VLB 118.

SPL 2 Effect of sprinkler irrigation on yield and quality of barley crop

The trial was conducted with four of sprinkler irrigation 20DAS + 15 days interval, 20DAS + 20 days interval, 20DAS + 25 days interval, 20DAS + 30 days interval and flood irrigation at Durgapura to evaluate the method of sprinkler irrigation for quality and productivity. Three data showed that sprinkler irrigation 20DAS and 25 days interval was best treatment except flood

irrigation which gave the highest yield. The variety DWRUB 52 was recorded best at 25 days sprinkler interval and BH 902 at 30 days interval.

SPL 3 Effect of S application on productivity and quality of barley

The trial was conducted with an objective to evaluate the effect of sulphur application on yield and quality of barley. Three year data revealed that the response of sulphur was up to 30 kg/ha but optimum dose of sulphur application was 20kg /ha as 20 and 30 kg S application were at par in yield.

SPL: 4 Effect of mulching and irrigation on yield of barley crop in NEPZ

The objective of the trial was to compare mulching and non mulching treatments in respect of productivity of barley and water saving with nine treatments (0, 4, 6 t mulch and zero, one and two irrigation combinations). Results showed that mulch application and irrigation increased the grain yield significantly. A significantly higher yield (36.1 q ha^{-1}) was attained with combination of mulching @ 6 t ha^{-1} and two irrigations. Residue load and irrigation resulted in significantly higher grain yield.

SPL-5 Effect of dose and time of nitrogen application on barley under rainfed condition in NHZ

The objective was to optimize dose and time of N application to increase the productivity of the crop. The trial with five doses of nitrogen (0, 20, 40, 60 and 80 kg/ha) with three schedule of application (Full basal, 1/2 at basal+1/2 after 1^{st} rain, 2/3 at basal+1/3 1^{st} rain) was conducted. The results revealed that higher yields were recorded in half basal + half after rain and ⅔ as basal+⅓ after 1st rain as compared to full basal on mean basis. Response of N was up to 60 kg/ha when N was applied as full basal but in splitting application, the response was up to 80 kg N/ha.

SPL 6 Effect of doses of Phosphorus and Potash in barley (NHZ)

The trial was conducted with four doses of phosphorus (0, 20, 30, 40 kg/ha) and three doses of potash (0, 20, 40 kg/ha) to optimize doses of phosphorus and potash application. Three year data showed that the response of P and K application was up to 40 Kg/ha each.

SPL 7 Weed management in Barley (NEPZ)

The trial was conducted to manage the broad leaved weeds through herbicides. Eleven treatments of metsulfuron and carfetrazone in combination or alone, weedy check and weed free were practiced. The results revealed that the grain yield in Metsulfuron+ Carfentrazone 20g+ NIS 0.2% and Metsulfuron+Carfentrazone 25g+ NIS 0.2% treatments was statistically at par with grain yield in weed free treatment. The grain yield reduction due to weeds in weedy check was 22.3 % as compared to weed free conditions. Application of Metsulfuron+Carfentrazone 25g+ NIS 0.2% also resulted in maximum reduction in dry weight of weeds.

SPL 8 Weed management in Barley (NWPZ and NHZ)

Experiments conducted at Karnal, Ludhiana, Hisar, Durgapura locations in NWPZ and Bajaura and Malan in NHZ to manage the grasses and broad leaves weeds through herbicides with eleven treatments of pinoxaden and isoproturan in combination with metsulfuron /carfentrazone / 2,4 D or alone. Results revealed that Pinoxaden @ 40g ha^{-1} +Carfentrazone @ 20g ha^{-1} and Pinoxaden @ 40g ha^{-1} followed by Metsulfuron @ 4g ha^{-1} were statistically at par with weed free treatment in plains and Pinoxaden @ 40g ha^{-1} +Carfentrazone @ 20g ha^{-1}, Pinoxaden @ 40g ha^{-1} followed by Metsulfuron @ 4g ha^{-1}, Pinoxaden @ 40g ha^{-1} + Metsulfuron @ 4g ha^{-1}, Isoproturon @ 750g ha^{-1}+ Metsulfuron @ 4g ha^{-1}, Isoproturon @ 750g ha^{-1}+ 2,4-D @ 500g ha^{-1} and weed free treatments in the hills. The grain yield reduction due to weeds was 23.3 percent as compared to weed free conditions.

QUALITY EVALUATION

Malting Quality

The Barley Network Unit took up the evaluation of grain samples of Advanced Varietal Trial (AVT) and Initial Varietal Trial (IVT) on malt barley received from various test sites at its central facility for malting quality evaluation. The malt barley varietal trials were conducted in NWPZ during Rabi 2014-15, in two sowing dates as separate sets. The trial conducting centers were requested to provide about 500 gm grain sample of each genotype. The grain samples were received from seven locations (Hisar, Karnal, Bawal, Ludhiana, Bathinda, Durgapura and Pantnagar) in timely sown and from five locations (Hisar, Karnal, Ludhiana, Pantnagar and Durgapura,) in late sown conditions. This year a total of 311 coded entries were received. There were 22 test entries in IVT (TS) which were analyzed with five checks, while 16 test entries in IVT (LS) were evaluated with two checks. In case of AVT (TS), six entries (BH 976, DWRB 123, DWRB 124, DWRB 128, PL 874, and RD 2891) with five checks were analyzed.

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. Thus based on the ten important traits (a maximum possible score of 30), entries BH 976 and RD 2891 were having better overall malting quality score under timely sown conditions. In late sown trials BH 1001 and RD 2917 were found promising.

Promising entries* for individual malting quality trait

Traits	Promising entries	
	Timely sown	Late sown
Test Weight	PL 889	BH 1001, DWRB 136, DWRB 140, DWRB 141, RD 2917, RD 2919
Protein content	BH 976, PL 874, RD 2891	BH 946, DWRB 132
Thousand grain weight	BH 976, RD 2918	RD 2918
Husk Content	PL 883	BH 1001, DWRB 136, DWRB 138, DWRB 140, DWRB 141, RD 2917
Beta glucan	BH 976, DWRB 136, KB 1322, KB 1325, RD 2920	BH 1000, BH 1001, BH 946
Malt Friability	PL 874, RD 2891, BH1002, DWRB 141, RD 2919	BH 1000, BH 1003, DWRB 138, DWRB 140, RD 2917, RD 2920
Hot water extract	-	BH 1001, DWRB 141
Over all MQ (Overall score > best check)	BH 976, RD 2891	BH 1001, RD 2917

**Superior or at par to best check*

Barley Quality Screening Nursery

This year quality screening nursery consisted of two sets; one having four genotypes for higher diastatic power and another set having two genotypes for lower husk content. Genotypes were tested over four locations, but none of the genotypes tested was found to had higher diastatic power or lower husk content as compared to the checks.

Feed Barley

The feed grain samples from various trials and grown at different locations were analysed for few physical parameters and protein content. Each centre was requested to provide a grain sample of 250 g. The parameters analysed included grain crude protein content (%), test weight (kg/hl), thousand grain weight (g) and grain plumpness. A total of 738 samples were received

encompassing seven trials and grown over in their respective zones. The entries with highest value for each of the parameter analyzed are listed below:

No.	Trial	Test weight	Thousand grain weight	Bold grain (%)	Crude protein
1	AVT (Rainfed Barley) – NHZ	VLB 143	VPB 1043	HBL 722, VPB 1043	VLB 142
2	AVT (Irrigated Dual Purpose Barley) – NWPZ	RD 2552 ©	KB 1369	RD 2552 ©	RD 2715 ©
3	IVT (Irrigated Feed Barley) – NWPZ/NEPZ/CZ	BH 994	BH 994	BH 994	BH 995
4	IVT (Rainfed Feed Barley) –NEPZ	DWRB 145	KB 1323, PL 889	NDB 1602, PL 889	DWRB 145, RD 2914
5	AVT (SAL/ALK) – NWPZ/NEPZ	BH 997	BH 997	BH 997	KB 1302
6	IVT (Dual Purpose Barley) – NWPZ/NEPZ/CZ	KB 1319	KB 1325	KB 1319	KB 1319
7	AVT (Dual Purpose Barley) – NHZ	HBL 276 ©	HBL 722, HBL 738	HBL 722	VLB 142, HBL 738

Molecular Profiling of AVT Final Year Entries

Total 59 SSR markers covering all the seven chromosomes of barley were screened with two final year test entries (BH976 and PL874) and five check varieties (BH902, DWRUB52, DWRB92, DWRB101 and RD2849) to develop molecular profiles. Total 104 alleles were scored in selected genotypes for PCR based amplification profiles of AVT 2nd year entries. The number of alleles ranged from 1 to 4 with an average of 1.74 alleles per locus. The band fragment sizes varied from 109 bp to 800 bp with PIC values ranging from 0 to 0.736. Out of 59 molecular markers screened, 38 were found polymorphic for the entries and checks thus indicating sufficient coverage of barley genome during molecular screening. Molecular statistics of this year entries were comparable with previous crop season (2013-14) AVT final year trial entries. Chromosome 3H was found most variable followed by 2H and 6H chromosomes whereas chromosome 4H was observed least variable followed by 1H chromosomes for final year AVT this year when compared for PIC values of markers for individual chromosome. During UPGMA based clustering, seven genotypes grouped within similarity coefficient (GS) value from 0.55 to 1.0 and showed sufficient genetic variability. Cluster I grouped four genotypes including both test entries (BH976 and PL874) and two check lines and cluster II comprised rest of the three check lines developed for NWPZ sowing zone for similar end use i.e. malt barley.

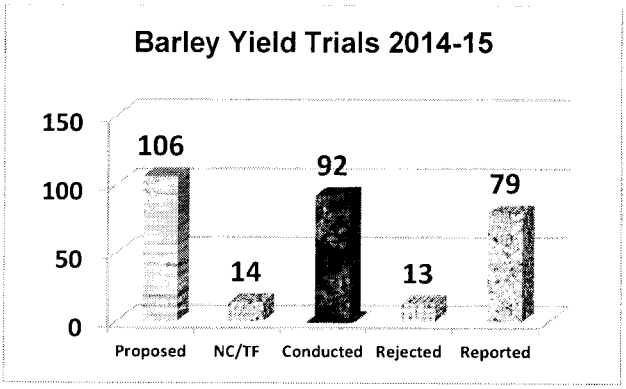
CROP IMPROVEMENT

BREAK UP OF BARLEY NETWORK YIELD TRIALS

(RABI 2014- 15)

S. No.	Trial Name	No. of Trials				
		Proposed	Not Conducted / Failed/ Not Received	Data Received	Data Rejected	Data Reported
1.	AVT (RF) Hills	13	4 (Chakrauta, Gagar, Ranichauri & Sundernagar)	9	1 (Berthin)	8
2.	AVT (IR-TS) Malt Barley	13	2 (Navgaon & Mathura)	11	2 (Durgapura & Rohtak)	9
3.	AVT-SST	8	-	8	1 (Rampura)	7
4.	AVT (Dual Type) Hills	5	-	5	1 (Almora)	4
5.	AVT (Dual Type) NWPZ	6	1 (DWR, Hisar)	5	-	5
6.	IVT (RF) NEPZ	8	1 (Mirzapur)	7	-	7
7.	IVT (IR) Plains	20	2 (Navgaon & Bhilwara)	18	4 (Karnal, Banswara, Pusa & Faizabad)	14
8.	IVT (IR-TS) Malt Barley	10	2 (Navgaon & Mathura)	8	1 (Durgapura)	7
9.	IVT (IR-LS) Malt Barley	7	-	7	-	7
10.	IVT (Dual Type) Plains	16	2 (Jalore& Banswara)	14	3 (Anand, Jhansi & Rewa)	11
	TOTAL	**106**	**14**	**92**	**13**	**79**
				86.8%	**14.1%**	**85.9%(R)** **74.5%(P)**

P= percent of proposed trials, R= percent of received trials



Performance of test sites during Rabi 2014-15

No.	Centres	No. of Trials		Trials Rejected		
		Allotted	Conducted	No.	Name	Reason
(A) MAIN CENTRES						
1.	Almora	2	2	1	AVT-DP-RF	LSM
2.	Bajaura	2	2	-	-	-
3.	Durgapura	6	6	2	AVT-MB-TS, IVT-MB-TS	UR
4.	Faizabad	5	5	1	IVT-FB	LSM
5	Hisar	7	7	-	-	-
6.	Kanpur	3	3	-	-	-
7.	Karnal	6	6	1	IVT-FB	LSM
8.	Ludhiana	6	6	-	-	-
9.	Rewa	3	3	1	IVT-DP	LSM
10.	Shimla	2	2	-	-	-
11.	Varanasi	3	3	-	-	-
12.	Pantnagar	4	4	-		
	Total (A)	**49**	**49**	**6**		

Contd....

Performance of test sites during Rabi 2014-15 (contd....)

No.	Centres	No. of Trials		Trials Rejected		
		Allotted	Conducted	No.	Name	Reason
(B)	TESTING CENTRES /SAU / DEPTT. OF AGRIC.					
1.	Anand	1	1	1	IVT-DP-IR-TS	HCV
2.	Banswara	2	1	1	IVT-IR-FB, IVT-DP	UR, RMT
3.	Bawal	3	3	-	-	-
4.	Bathinda	3	3	-	-	-
5.	Berthein	1	1	1	AVT-RF-NH	HCV
6.	Bhilwara	2	-	-	-	NC
7.	Bikaner	2	2	-	-	-
8.	Chakrauta	1	-	-	-	NC
9.	Dalipnagar	1	1	-	-	-
10.	Dhaulakuan	1	1	-		
11.	Gagar	1	-	-	-	NC
12.	Gwalior	1	1	-	-	-
13.	Jabalpur	1	1	-	-	-
14.	Jalore	1	-	-	IVT-DP-IR-TS	NC
15.	Jhansi	1	1	1	IVT-DP-IR-TS	LSM
16.	Kangra	1	1	-	-	-
17.	Katrain	1	1	-	-	-
18.	Kota	1	1	-	-	-
19.	Majhera	2	2	-	-	-
20.	Malan	1	1	-	-	-
21.	Mathura	2	-	-	AVT-IR-TS-MB, IVT-IR-TS-MB	RMT
22.	Mirzapur	1	-	-	IVT-RF-NEPZ	RMT
23.	Modipuram	5	5	-	-	-
24.	Morena	1	1	-	-	-
25.	Navgaon	3	-	-	AVT-IR-TS-MB, IVT-IR-TS-MB, IVT-FB	NC
26.	Palampur	1	1	-	-	-
27.	Pusa, IARI RS	2	2	1	IVT-FB	LSM
28.	Rajauri	1	1	-	-	-
29.	Rampura	1	1	1	AVT-SST	UR
30.	Ranichauri	1	-	-	-	NC
31.	Rohtak	1	1	1	AVT-IR-TS-MB	UR
32.	Sabour	2	2	-	-	-
33.	Sagar	1	1	-	-	-
34.	S.G. Nagar	1	1	-	-	-
35.	S.K. Nagar	1	1	-	-	-
36	Sunder Nagar	1	-	-	IVT-IR-TS-FB	
37	Tabiji	1	1	-	-	-
38	Tissuhi	1	1	-	-	-
39	Udaipur	2	2	-	-	-
	Total (B)	**57**	**43**	**7**		
	G.T. (A+B)	**106**	**92**	**13**		

RMT= rejected by monitoring team, TF= trial failed, LSM= low yield levels LS= late sowing, HCV= High CV, UR= Unrealistic yield, LR = Late receipt of results, ES = Early sowing than recommended dates LS= late sowing than recommended dates NC= Not conducted.

Trial wise locations during Rabi 2014-15

S no.	Trial Name	Locations	Total
1.	AVT (RF)-Hills	Bajaura, Berthein, Kangra, Katrain, Malan, Shimla, Sundernagar, Almora, Ranichauri, Majhera, Gagar, Chakrauta, Rajauri	13
2.	AVT (IR-DP)-NWPZ	Bikaner, Durgapura, Hisar, DWR Hisar, Modipuram Ludhiana,	6
3.	AVT (IR-TS) Malt Barley	Dhaulakuan, Hisar, Karnal, Bawal, Bathinda, Ludhiana, Navgaon, Durgapura, Modipuram, Mathura, Pantnagar, Sriganganagar, Rohtak	13
4.	IVT (RF)-NEPZ	Kanpur, Varanasi, Faizabad, Mirzapur, Tissuhi, Rewa, Pusa, Sabour	8
5	IVT (IR-TS) Feed Barley	Hisar, Karnal, Ludhiana, Durgapura, Tabiji, Banswara, Navgaon, Udaipur, Bhilwara, Pantnagar, Kanpur, Varanasi, Faizabad, Rewa, Morena, Gwalior, Sagar, S.K Nagar, Pusa, Sabour	20
6.	IVT (IR-TS) Malt Barley	Bawal, Hisar, Karnal, Ludhiana, Bathinda, Durgapura, Navgaon, Modipuram, Mathura, Pantnagar	10
7.	IVT (IR-LS) Malt Barley	Hisar, Karnal, Ludhiana, Bathinda, Durgapura, Modipuram, Pantnagar	7
8.	AVT-SST	Dalipnagar, Faizabad (2), Hisar, Bawal, DWR Hisar, Rampura, Bhilwara,	8
9.	IVT (Dual Type) Plains	Bikaner, Jalore, Durgapura, Kota, Udaipur, Banswara, Jabalpur, Rewa, Hisar, Ludhiana, Kanpur, Faizabad, Varanasi, Jhansi, Modipuram, Anand	16
10.	AVT (Dual Type) Hills	Shimla, Bajaura, Palampur, Almora, Majhera	5
	Total		**106**

Center wise Summary Rabi 2014-15

S No.	Centre	Trials proposed	Total
(A) MAIN CENTRES			
1.	Almora	AVT(RF)-NHZ, AVT(DUAL)	2
2.	Bajaura	AVT(RF)-NHZ, AVT(DUAL)	2
3.	Durgapura	AVT(M)TS, AVT(IR-DP)-NWPZ, IVT(M)TS, IVT(M) LS, IVT(IR), IVT (IR) Dual	6
4.	Faizabad	SST(2 SETS),), IVT(IR), IVT (DUAL), IVT(RF)	5
5	Hisar	AVT(M)TS, AVT-SST, AVT- (IR) Dual, IVT(M)TS, IVT(M) LS, IVT(IR), IVT(IR) Dual	7
6.	Kanpur	IVT(IR), IVT(IR) DUAL, IVT(RF)-NEPZ	3
7.	Karnal	AVT(M)TS, AVT-SST, AVT-(IR) Dual, IVT(M)TS, IVT(M)LS, IVT (IR)	6
8.	Ludhiana	AVT(M)TS, AVT(DUAL), IVT(M)TS, IVT(M) LS, IVT(IR), IVT(IR)Dual,	6
9.	Rewa	IVT(IR), IVT(IR) Dual, IVT(RF)-NEPZ	3
10.	Shimla	AVT(RF)-NHZ, AVT-RF(DUAL)-NHZ	2
11.	Varanasi	IVT(IR), IVT(DUAL), IVT(RF)-NEPZ	3
12.	Pantnagar	AVT(M)TS, IVT(M)TS, IVT(M) LS, IVT(IR)	4
		Sub Total	**49**
(B)TESTING CENTRES /SAU / DEPTT. OF AGRIC.			
S No.	Centre	Trials conducted	Total
1.	Anand	IVT(DUAL)TS	1
2.	Bawal	AVT(M)TS, AVT-SST, IVT(M)TS,	3
3.	Banswara	IVT(IR), IVT (IR) DUAL	2
4.	Bathinda	AVT(M)TS, IVT(M)TS, IVT (M) LS,	3
5.	Berthein	AVT(RF)NHZ	1
6.	Bhilwara	AVT-SST, IVT-FB	2
7.	Bikaner	IVT(DUAL)TS, AVT (IR) Dual	2
8.	Dalipnagar	AVT-SST	1
9.	Dhaulakuan	AVT(M)TS,	1
10.	Gagar	AVT(RF)NHZ	1
11.	Gwalior	IVT(IR)	1
12.	Jabalpur	IVT(DUAL)TS	1
13.	Jalore	IVT(DUAL)TS	1
14.	Jhansi	IVT(DUAL)TS	1
15.	Kangra	AVT(RF)NHZ	1
16.	Katrain	AVT(RF)NHZ	1
17.	Kota	IVT(DUAL)TS,	1
18.	Majhera	AVT(RF)NHZ, AVT(DUAL)	2
19.	Malan	AVT(RF)NHZ	1
20.	Mathura	AVT(M)TS, IVT(M)TS	2
21.	Mirzapur	IVT(RF) NEPZ	1
22.	Morena	IVT(IR)	1
23.	Modipuram	AVT(M)TS, AVT(Dual)TS, IVT(M)TS, IVT (M) LS, IVT-(Dual)-TS	5
24.	Chakrauta	AVT(RF)NHZ	1
25.	Navgaon	AVT(M)TS, IVT(M)TS, IVT (IR)	3
26.	Palampur	AVT(DUAL)	1
27.	Pusa, IARI RS	IVT(IR), IVT-(RF)-NEPZ	2
28	Rajauri	AVT-RF-NHZ	1
29	Rampura	AVT-SST	1
30	Ranichauri	AVT(RF)NHZ	1
31	Rohtak	AVT(TS)-MB	1
32	Sagar	IVT(IR)	1
33	S.K. Nagar	IVT(IR)	1
34	Sriganganagar	AVT(M)TS	1
35	Sunder Nagar	AVT(RF) NHZ	1
36	Tabiji	IVT(IR)	1
37	Tissuhi	IVT(RF)-NEPZ	1
38	Udaipur	IVT (IR), IVT(DUAL)TS	2
39	Sabour	IVT-IR, IVT-RF-NEPZ	2
		SUB TOTAL	**57**
		G TOTAL (A+B)	**106**

PARENTAGE OF BARLEY STRAINS UNDER COORDINATED EVALUATION DURING RABI 2014-15

No.	CONTRIBUTING CENTRE	SYMBOLS
1	ALMORA, V.P.K.A.S.	VLB
2	BAJAURA, R.R.S. (CSKHPKV)	HBL
3	DURGAPURA, A.R.S.(SKRAU)	RD
4	FAIZABAD, N.D.U.A&T.	NDB
5	HISAR, C.C.S.H.A.U.	BH
6	KANPUR, C.S.A.U.&T.	KB
7	KARNAL,D.W.R.	DWRB, DWRUB
8	LUDHIANA, P.A.U.	PL
9	PANTNAGAR, G.B.P.U.A.&T.	UPB
10	REWA, J.N.K.V.	JB
11	SHIMLA, RS, I.A.R.I	BHS
12	VARANASI, B. H. U.	HUB

S.No.	Entries	Parentage
ICAR-IARI, RS, Shimla		
1	BHS434	IBON-W-14 (2009-10)
2	BHS435	IBON-LRA-C-79 (2010-11)
3	BHS436	IBON-HI-49 (2009-10)
4	BHS437	IBON-HI-32 (2009-10)[ABN-B/KC-B//RAISA/3/ALELI/4/OPTIC]
5	BHS438	IBON-LRA-C-66 (2010-11)
6	BHS439	EIBGN-53 (2010-11) [IBON-LRA-M-37 Manal/3/Lignee527/NK1272/JLB70-63/4/Maknusa]
7	BHS440	IBON-LRA-C-50 (2010-11)
8	BHS441	IBYT-LRA-M-20 (2010-11) 26216/6/C101021/4/CM67/SASK.1800//PRO/CM67/3/DL70
9	BHS442	EIBGN-66 (2010-11) IBON-HI-14 BICHY2000/6/P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1
GBPUA&T, Pantnagar		
10	UPB1043	RD2503/UPB1003
11	UPB1044	IBYT-HI-1 (2011-12)
12	UPB1045	IBYT-HI-6 (2011-12)
13	UPB1046	RD2552/RD2676
ICAR-VPKAS, Almora		
14	VLB141	IBON-LRA-C-20 (2011-12)
15	VLB142	INBYT-17 (2011-12)
16	VLB143	INBON-64 (2011-12)
17	VLB144	IBON-LRA-M-63 (2011-12)
18	VLB145	IBYT-LRA-C-7 (2011-12)
CSKHPKV, RRS, Bajaura		
19	HBL722	IBYT-LRA-C-17 (2010-11)
20	HBL723	IBYT-LRA-C-18 (2010-11)
21	HBL736	IBYT-MRA-12 (2011-12)
22	HBL737	IBYT-MRA-13 (2011-12)
23	HBL738	IBON-HI -65 (2011-12)

CCSHAU, Hisar		
24	BH976	K792/RD2668
25	BH993	EIBGN-55(2009)/BH902
26	BH994	33rd IBON-200/BH393
27	BH995	EIBGN-9(2009)/BH902
28	BH996	13th EMBSN14/RD2683
29	BH997	EIBGN-13(2007)/BH393
30	BH998	NDB1289/JB42
31	BH999	NDB1289/BH393
32	BH1000	EIBGN-4(2006)/DWRUB52
33	BH1001	29th EIBGN-22/DWRUB52
34	BH1002	29th EIBGN-4/BH674
35	BH1003	EIBGN-40(2007) /RD2668
BHU, Varanasi		
36	HUB240	JYOTI/KARAN-4
37	HUB241	22nd IBYT-5-2/RD2552
38	HUB242	22nd IBYT-5-2/RD2552
39	HUB243	22nd IBYT-5-2/RD2552
40	HUB244	(C138/RD2508)/RD2508
41	HUB245	JYOTI/KARAN-4
JNKVV, Rewa		
42	JB301	NDB1187/RD2552
43	JB303	RD2552/JB1
44	JB307	RD2592/RD2571
45	JB308	BH674/32th IBON - 5
46	JB312	32th IBON 29/BH393
SKNAU, RARI, Durgapura		
47	RD2891	CLIPPER/DWR46//RD2615
48	RD2899	RD2592/RD2035//RD2715
49	RD2900	RD2592/RD2503//RD2696
50	RD2901	RD2052/NDB1245
51	RD2903	BH393/RD2508//RD2035
52	RD2904	RD2508/BLLU//CONGANE
53	RD2905	RD2552/RD2743
54	RD2906	PL843/RD2715/RD2670
55	RD2907	RD103/RD2518//RD2592
56	RD2908	RD2618/RD2552//RD2707
57	RD2909	PL830/DL472//RD2696
58	RD2910	DL472/BH902//RD2035
59	RD2913	NDB207/AD3230//DWR64
60	RD2914	RD2552/PL419//RD2508
61	RD2915	PL843/RD2715//RD2670
62	RD2916	RD2615/RD2552
63	RD2917	PL705/RD2668//DWR46
64	RD2918	DL88/DWR28//RD2651
65	RD2919	RD2668/DWR46//ALELI
66	RD2920	RD2615/BCU73
PAU, Ludhiana		
67	PL874	IBON-LRA-C-120 (2008-09) (Harmal)
68	PL883	IBON-LRA-C-110 (2008-09)
69	PL884	JB17/RD2627
70	PL887	RD2552/BCU546
71	PL889	DWR28/PL751

CSAUA&T, Kanpur		
72	KB1302	AZAD/RD2683
73	KB1311	JAGRITI/RD2552
74	KB1313	K560/K551
75	KB1318	LAKHAN/JB137
76	KB1319	K560/NDB1173
77	KB1320	K551/NDB1295
78	KB1322	MSEL/FNC1
79	KB1323	MERIT.B/CLE194//AZAF
80	KB1325	CANELLA/CONLON
81	KB1326	CONDOR/3/PATTY.B/RUDRA//ALELI/4/ALELI//5/CHERI
82	KB1369	Jagriti/K169
NDUA&T, Faizabad		
83	NDB1602	IBON-HI-40 (2010-11)
84	NDB1607	EIBGN-42 (2010-11)
85	NDB1608	IBON-HI-25 (2010-11)
86	NDB1609	IBON-HI-26 (2010-11)
87	NDB1610	IBON-HI-13 (2010-11)
88	NDB1614	IBON-9030/NB-3
89	NDB1618	IBON-HI-12 (2010-11)
90	NDB1621	EIBGN-7 (2010-11)
91	NDB1622	EIBGN-64 (2010-11)
92	NDB1623	IBON-987/NB-3
ICAR-IIWBR, Karnal		
93	DWRB123	DWRUB54/DWR51
94	DWRB124	DWRUB54/DWRUB64
95	DWRB128	DWRUB54/DWRUB75
96	DWRB132	DWR45/DWR46
97	DWRB133	DWR28/DWRUB75
98	DWRB134	DWR28/DWR77
99	DWRB135	DWRB73/PL751
100	DWRB136	DWRUB54/XANADU
101	DWRB137	DWR28/DWRUB64
102	DWRB138	DWRUB78/DWRUB64
103	DWRB139	DWRUB78/DWRUB64
104	DWRB140	DWRUB52/DWRUB78
105	DWRB141	DWRUB52/DWRUB78
106	DWRB142	DWRUB62/DWRUB64
107	DWRB143	DWRB73/DWR83
108	DWRB144	IBYT-HI-11 (2011-12)
109	DWRB145	IBYT-HI-14 (2011-12)
Checks		
1	AZAD	K12/K19
2	BH902	BH495/RD2552
3	BH946	BHMS22A/BH549//RD2552
4	BH959	BH393/BH331
5	BHS352	HBL240/BHS504//VLB129
6	BHS380	VOILET/MJA/7/ABN-B6/BA/GAL//FZA-B/5/DG/DC-B/PT-BAR/3/RA-B/BA/3/4/TRYIGAL
7	BHS400	34th IBON-9009
8	DWRB91	DWR46/RD2552
9	DWRB92	DWR28/DWR45
10	DWRB101	DWR28/BH581
11	DWRUB52	DWR17/K551

12	DWRUB64	DL472/PL705
13	HBL113	SELECTION FROM/ZYPHYZE
14	HBL276	HBL233/HBL238
15	HUB113	KARAN280/C138
16	JYOTI	K 12/C 251
17	K603	K257/C138
18	Lakhan	K12/IB226
19	NDB1173	BYTLRA 3-(1994-95)/NDB217
20	RD2035	RD103/PL101
21	RD2552	RD2035/DL472
22	RD2715	RD387/BH602//RD2035
23	RD2786	RD2634/NDB1020//K425
24	RD2794	RD2035/RD2683
25	RD2849	ISEBON-128 (08-09)/PL705
26	VLB118	14th EMBSN-9313

RAINFED

TRIALS

INITIAL VARIETAL TRIAL (RAINFED) – NEPZ

The IVT (rainfed) for north-eastern plains zone was proposed at eight locations including five in U.P, two in Bihar and one in M.P. The trials were conducted at all locations. The trial data from seven centres were considered for zonal mean. The trial consisted of 19 test entries and two checks, namely Lakhan and K 603. The monitoring team monitored this trial during the crop season at Kanpur, Faizabad, Varanasi, Mirzapur and Tissuhi in NEPZ. Monitoring team rejected this trial at Mirzapur location. Entries HUB241, HUB242, JB307, KB 1313, KB 1318, NDB 1602, NDB 1607 and PL 889 were having off types, which needs purification.

No serious disease/pest problems were observed in the trials. However, moderate to high leaf blight incidence was recorded in few entries like RD 2913, RD 2914, and RD 2915. Monitoring team also recorded the loose and covered smut in few entries PL 887, KB 1318, KB 1320 and NDB 1602, NDB 1607, DWRB 143 and K 603, respectively. At all locations, no rust disease was observed in any trial.

The location means ranged from 21.51 q/ha (Sabour) to 30.16 q/ha (Faizabad) was observed in grain yield.

The results from seven locations revealed that at zonal level, the testing entries KB 1323 ranked first with 29.2 q/ha mean grain yield and was followed by KB1318 (29.2 q/ha), HUB242 (28.8 q/ha) and PL 887 (28.2 q/ha) in the first non-significant group.

IVT-RF-TS-NEPZ

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

Varieties	Codes	Pusa			Varanasi			Kanpur			Tissuhi			Faizabad			Rewa			Sabour			NEPZ*		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
DWRB143	IVTRFNEP-15	22.64	13	0	28.23	7	0	16.30	20	0	34.42	3	1	34.00	7	0	24.72	1	1	17.51	18	0	25.4	10	0
DWRB145	IVTRFNEP-1	13.95	18	0	28.65	5	0	27.17	7	0	6.04	20	0	23.55	18	0	22.86	15	1	20.53	12	0	20.4	19	0
HUB240	IVTRFNEP-14	38.26	1	1	31.13	2	0	26.09	11	0	21.14	11	0	32.00	8	0	23.88	5	1	20.05	14	0	27.5	7	0
HUB241	IVTRFNEP-11	28.41	6	0	27.90	9	0	21.92	16	0	34.72	2	1	30.50	9	0	21.78	19	0	19.14	16	0	26.3	8	0
HUB242	IVTRFNEP-8	29.57	4	0	28.20	8	0	30.80	5	0	32.61	5	1	28.68	12	0	23.64	8	1	28.08	2	1	28.8	3	1
JB307	IVTRFNEP-17	26.23	10	0	25.66	17	0	27.17	6	0	9.06	19	0	30.50	10	0	23.22	12	1	22.77	8	0	23.5	14	0
JB308	IVTRFNEP-5	25.40	12	0	26.88	16	0	14.49	21	0	18.12	13	0	44.38	1	1	22.56	16	1	21.44	9	0	24.8	12	0
KB1313	IVTRFNEP-7	17.39	16	0	23.34	20	0	25.36	13	0	15.40	16	0	28.08	14	0	24.72	2	1	20.71	11	0	22.1	16	0
KB1318	IVTRFNEP-6	31.45	2	0	25.51	18	0	35.51	1	1	27.17	7	0	35.81	5	0	24.18	4	1	24.58	5	0	29.2	2	1
KB1320	IVTRFNEP-13	14.24	17	0	22.79	21	0	26.45	10	0	18.12	13	0	35.21	6	0	24.54	3	1	24.15	7	0	23.6	13	0
KB1323	IVTRFNEP-20	29.38	5	0	27.81	10	0	33.33	2	1	32.31	6	1	40.16	2	1	20.22	20	0	21.32	10	0	29.2	1	1
PL887	IVTRFNEP-3	28.30	7	0	27.27	14	0	25.72	12	0	25.36	9	0	39.86	3	1	23.52	10	1	27.54	3	0	28.2	4	1
PL889	IVTRFNEP-4	18.59	15	0	27.29	13	0	18.48	18	0	3.02	21	0	23.55	18	0	19.56	21	0	19.87	15	0	18.6	21	0
NDB1602	IVTRFNEP-9	27.97	8	0	27.69	12	0	27.17	7	0	12.08	17	0	24.46	16	0	23.88	6	1	17.09	19	0	22.9	15	0
NDB1607	IVTRFNEP-12	25.54	11	0	32.14	1	1	31.52	4	1	12.08	17	0	24.15	17	0	23.70	7	1	24.58	5	0	24.8	11	0
RD2913	IVTRFNEP-21	10.04	20	0	24.69	19	0	19.93	17	0	33.51	4	1	17.75	21	0	23.52	9	1	17.81	17	0	21.0	17	0
RD2914	IVTRFNEP-10	6.12	21	0	27.09	15	0	23.19	15	0	21.14	11	0	19.63	20	0	23.22	12	1	13.29	20	0	19.1	20	0
RD2915	IVTRFNEP-18	11.34	19	0	27.74	11	0	17.21	19	0	27.17	7	0	26.27	15	0	23.46	11	1	13.16	21	0	20.9	18	0
RD2916	IVTRFNEP-19	27.72	9	0	29.11	3	0	23.55	14	0	24.15	10	0	30.19	11	0	22.98	14	1	20.35	13	0	25.4	9	0
LAKHAN ©	IVTRFNEP-2	30.51	3	0	28.60	6	0	26.81	9	0	18.12	13	0	35.99	4	0	22.50	17	1	32.00	1	1	27.8	6	0
K603 ©	IVTRFNEP-16	22.50	14	0	29.08	4	0	31.70	3	1	35.63	1	1	28.56	13	0	22.50	17	1	25.85	4	0	28.0	5	1
G.M.		23.12			27.47			25.23			21.97			30.16			23.10			21.51			24.7		
S.E.(M)		0.65			0.31			1.41			1.45			1.95			0.85			1.55			0.48		
C.D.		1.84			0.87			3.99			4.09			5.51			2.40			4.39			1.34		
C.V.		5.62			2.24			11.18			13.17			12.92			7.34			14.44					
DOS		08-11-2014			06-11-2014			10-11-2014			09-11-2014			01-11-2014			09-11-2014			07-11-2014					

INITIAL VARIETAL TRIAL-(RF)

Summary of ancillary and disease data

ZONE: NEPZ

RABI-2014-15

Sr. No.	Entry	AGRONOMIC CHARACTERS						GRAIN CHARACTERISTICS			DISEASE REACTION							
		H. days Mean & Range	M. days Mean & Range	Height Mean & Range (cm)	Tillering per meter Mean & Range	Str. Stn. Mean & Range	Two/ Six row	Colour	1000 gw Mean & Range	H/N	RUST			SMUT		Hel. Disease		Aphid (1-5)
											YL	BR	BL	L (%)	C (%)	Spot Leaf	Leaf Blight	
1	DWRB143	72 (64-88)	115 (106-125)	77 (61-93)	134 (56-307)	4 (1-5)	6	LY	36 (31-41)	H					0.01	41	62	
2	DWRB145	86 (70-105)	123 (110-136)	76 (52-103)	154 (49-379)	3 (1-5)	6	LY	39 (34-43)	H					0.01	24	35	
3	HUB240	74 (58-95)	117 (101-126)	80 (60-105)	142 (65-311)	3 (1-5)	6	LY	37 (33-42)	H						46	62	
4	HUB241	78 (67-95)	119 (108-129)	82 (65-102)	154 (56-398)	4 (1-5)	6	LY	38 (32-46)	H						41	57	
5	HUB242	81 (66-93)	121 (116-132)	85 (66-99)	143 (49-347)	4 (2-5)	6	LY	36 (30-40)	H						46	42	
6	JB307	86 (66-103)	121 (113-133)	78 (68-100)	130 (48-297)	4 (1-6)	6	LY	35 (29-42)	H						52	41	
7	JB308	55 (66-90)	121 (113-135)	80 (70-99)	118 (41-249)	3 (1-5)	6	LY	35 (30-39)	H						35	52	
8	KB1313	86 (70-101)	121 (110-130)	82 (63-101)	132 (73-264)	3 (2-5)	6	LY	31 (25-40)	H				5		52	63	
9	KB1318	85 (68-96)	117 (107-126)	79 (62-101)	148 (59-337)	4 (3-5)	6	LY	37 (31-43)	H					0.01	52	46	
10	KB1320	87 (65-104)	124 (113-135)	88 (70-104)	121 (58-234)	3 (1-4)	6	LY	35 (24-47)	H				0.01		40	41	
11	KB1323	83 (76-93)	119 (110-130)	85 (69-102)	174 (94-432)	3 (1-3)	2	LY	44 (40-53)	H				5	0.01	19	51	
12	PL887	86 (70-94)	122 (114-133)	80 (63-110)	160 (67-430)	4 (3-5)	6	LY	35 (28-38)	H				5		56	41	
13	PL889	88 (60-107)	127 (114-134)	79 (63-100)	115 (64-248)	3 (1-5)	2	LY	44 (37-51)	H						29	46	
14	NDB1602	82 (68-102)	121 (113-136)	79 (62-91)	106 (44-245)	3 (1-5)	6	LY	41 (36-44)	H					0.01	24	41	
15	NDB1607	88 (69-107)	125 (116-135)	84 (62-103)	131 (52-331)	4 (3-5)	6	LY	37 (33-42)	H					0.01	29	41	
16	RD2913	72 (61-91)	112 (103-121)	75 (63-88)	94 (32-183)	4 (2-5)	6	LY	36 (28-42)	H						99	84	
17	RD2914	78 (66-90)	114 (109-120)	79 (67-97)	122 (54-202)	5 (4-5)	6	LY	34 (20-40)	H						94	89	
18	RD2915	74 (62-92)	112 (100-120)	81 (60-99)	117 (45-243)	3 (1-5)	6	LY	32 (25-39)	H						99	89	
19	RD2916	75 (64-93)	118 (105-134)	73 (50-102)	135 (55-268)	3 (2-4)	6	LY	41 (35-44)	H						29	41	
20	LAKHAN (C)	80 (67-95)	120 (109-131)	94 (96-110)	130 (61-303)	4 (3-4)	6	LY	39 (34-44)	H						35	57	
21	K603 (C)	80 (67-93)	120 (114-127)	92 (69-113)	140 (33-279)	3 (1-4)	6	LY	38 (31-43)	H						52	62	

ADVANCED VARIETAL TRIAL (RAINFED) – NH ZONE

The AVT and IVT of NH zone under rainfed conditions have been merged together to have one common AVT and the entries to be tested for three years consecutively for qualifying for identification proposal. The trial was proposed at 13 locations in the NH Zone comprising of Uttrakhand, H.P. and J&K hills. Trial was conducted at all the centres except at Sundernagar. The results from ten locations are reported for zonal means. The trial consisted of 15 testing entries and four checks namely, HBL 113, BHS 352, BHS 400 and VLB 118.

The zonal monitoring team visited the trials in Uttarakhand as well as Himachal Pradesh at many centres along with wheat group. In general, trial was in good condition. In case of varietal purity, entries VLB 141, VLB 118 and BHS 437were recommended for purification by the team. However, entry UPB 1045 was recommended to be dropped for further testing. Yellow rust more than 20S was reported in entry BHS 436 at Malan.

The trial means of the locations considered for reporting, ranged from 14.39 q/ha (Katrain) to 29.27 q/ha (Almora). In general the crop situation was very good in zone. The check variety BHS 400 (27.5 q/ha) ranks first in the first non-significant group while testing entry UPB 1044 (27.4 q/ha) showed second rank in the first non-significant group in the zone.

AVT-RF-TS-NH ZONE
Location wise means in q/ha

Varieties	Codes	Majhera			Malan			Almora			Shimla		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BHS434	NHGBZ 12	17.49	16	0	29.62	8	0	30.65	7	0	21.84	5	0
BHS435	NHGBZ 5	25.48	5	1	27.71	9	0	28.26	11	0	9.74	18	0
BHS436	NHGBZ 9	27.34	1	1	32.84	6	0	28.42	10	0	27.29	3	1
BHS437	NHGBZ 20	24.18	6	1	30.66	7	0	31.96	5	0	17.63	8	0
HBL 722	NHGBZ 6	23.44	9	1	24.26	15	0	25.49	17	0	14.59	12	0
HBL 723	NHGBZ 15	18.42	15	0	20.80	19	0	24.35	19	0	7.07	20	0
HBL 736	NHGBZ 13	26.41	3	1	26.25	12	0	27.01	12	0	12.83	15	0
HBL 737	NHGBZ 16	16.74	18	0	22.99	17	0	28.80	9	0	13.49	14	0
UPB 1043	NHGBZ 14	22.69	10	1	25.14	14	0	23.86	20	0	14.72	11	0
UPB 1044	NHGBZ 17	26.41	4	1	36.87	3	1	33.48	3	0	27.46	2	1
UPB 1045	NHGBZ 8	17.30	17	0	36.73	4	1	32.72	4	0	20.83	6	0
VLB 141	NHGBZ 7	23.81	7	1	26.56	11	0	25.71	16	0	11.40	17	0
VLB 142	NHGBZ 10	16.56	19	0	21.06	18	0	26.09	14	0	7.59	19	0
VLB 143	NHGBZ 18	22.14	11	1	17.47	20	0	26.96	13	0	14.28	13	0
VLB 144	NHGBZ 2	23.62	8	1	26.98	10	0	25.76	15	0	15.83	9	0
BHS 352 ©	NHGBZ 4	12.28	20	0	23.23	16	0	25.27	18	0	18.07	7	0
BHS 400©	NHGBZ 1	26.79	2	1	37.10	2	1	39.08	2	1	22.54	4	0
HBL 113 ©	NHGBZ 19	21.95	12	1	37.96	1	1	29.95	8	0	29.58	1	1
VLB 118 ©	NHGBZ 11	19.68	14	0	34.96	5	1	40.43	1	1	12.78	16	0
G.M.		21.65			28.25			29.27			16.76		
S.E.(M)		2.24			1.17			1.07			1.12		
C.D.		6.35			3.33			3.03			3.17		
C.V.		20.71			8.31			7.13			13.34		
D.O.S		7-11-2014			7-11-2014			28-11-2014			5-11-2014		

Location wise means in q/ha

Varieties	Codes	Bajaura			Rajouri			Kangra			Katrain			NHZ*		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BHS434	NHGBZ 12	30.23	5	0	13.72	14	0	28.10	11	0	23.43	1	1	24.4	8	0
BHS435	NHGBZ 5	38.25	1	1	16.80	6	0	31.91	8	0	21.14	2	1	24.9	7	0
BHS436	NHGBZ 9	30.91	4	0	20.79	3	1	33.07	5	0	10.14	17	0	26.4	5	1
BHS437	NHGBZ 20	27.31	13	0	15.67	7	0	31.59	9	0	13.41	11	0	24.1	9	0
HBL 722	NHGBZ 6	24.66	15	0	17.44	5	0	26.65	13	0	16.30	8	0	21.6	13	0
HBL 723	NHGBZ 15	21.26	18	0	12.12	18	0	22.91	16	0	6.64	20	0	16.7	20	0
HBL 736	NHGBZ 13	18.41	20	0	11.78	19	0	22.28	19	0	10.75	16	0	19.5	15	0
HBL 737	NHGBZ 16	19.77	19	0	12.41	16	0	23.06	15	0	11.23	15	0	18.6	18	0
UPB 1043	NHGBZ 14	22.76	16	0	19.77	4	0	24.62	14	0	9.54	18	0	20.4	14	0
UPB 1044	NHGBZ 17	28.60	9	0	14.95	11	0	32.32	7	0	18.72	3	0	27.4	2	1
UPB 1045	NHGBZ 8	29.89	7	0	21.42	2	1	37.84	1	1	15.34	10	0	26.5	4	1
VLB 141	NHGBZ 7	30.23	5	0	14.99	9	0	32.61	6	0	12.80	13	0	22.3	11	0
VLB 142	NHGBZ 10	27.38	12	0	14.97	10	0	29.94	10	0	11.71	14	0	19.4	16	0
VLB 143	NHGBZ 18	22.42	17	0	15.63	8	0	22.43	17	0	8.33	19	0	18.7	17	0
VLB 144	NHGBZ 2	27.72	11	0	12.39	17	0	35.07	3	1	17.15	6	0	23.1	10	0
BHS 352 ©	NHGBZ 4	25.00	14	0	13.72	13	0	12.72	20	0	13.29	12	0	17.9	19	0
BHS 400©	NHGBZ 1	31.18	3	0	13.54	15	0	33.29	4	0	16.67	7	0	27.5	1	1
HBL 113 ©	NHGBZ 19	29.89	7	0	13.86	12	0	22.36	18	0	18.00	4	0	25.4	6	0
VLB 118 ©	NHGBZ 11	33.76	2	0	21.56	1	1	35.71	2	1	17.27	5	0	27.0	3	1
G.M.		27.39			15.44			28.30			14.39					
S.E (M)		1.07			0.33			0.99			0.89					
C.D.		3.03			0.93			2.83			2.55					
C.V.		7.82			4.27			6.05			10.70					
DOS		31-10-2014			06-11-2014			21-11-2014			10-11-2014					

**Data from Berthin are not included in zonal means due to high CV of location.*

ADVANCE VARIETAL TRIAL (RF) Hills

ZONE: NHZ

Summary of ancillary and disease data

RABI-2014-15

Sr. No.	Entry	AGRONOMIC CHARACTERS						GRAIN CHARACTERISTICS			DISEASE REACTION							
		H. days Mean & Range	M. days Mean & Range	Height Mean & Range (cm)	Tillering per meter Mean & Range	Str. Stn. Mean & Range	Two/ Six row	Colour	1000 gw Mean & Range	H/N	RUST			SMUT		Hel. Disease		Aphid (1-5)
											YL	BR	BL	L (%)	C (%)	Spot Leaf	Leaf Blight	
1	BHS434	130 (99-158)	179 (153-193)	102 (82-121)	164 (83-378)	3 (1-4)	6	Y	36 (28-52)	H								
2	BHS435	103 (74-133)	175 (151-193)	85 (72-105)	145 (58-345)	3 (1-4)	6	Y	43 (28-50)	H								
3	BHS436	124 (104-150)	174 (151-193)	91 (66-112)	167 (77-480)	3 (1-4)	2	Y	48 (38-55)	H						12		
4	BHS437	122 (102-149)	173 (151-191)	89 (74-105)	138 (45-317)	3 (1-4)	6	Y	44 (35-49)	H								
5	HBL 722	118 (95-147)	171 (144-189)	89 (74-108)	168 (67-392)	3 (1-3)	2	Y	48 (44-50)	H								
6	HBL 723	117 (95-143)	172 (148-190)	75 (43-105)	141 (45-339)	3 (1-4)	6	Y	46 (42-50)	H						46		
7	HBL 736	120 (100-150)	173 (149-191)	85 (47-109)	125 (66-290)	3 (1-5)	6	Y	37 (26-41)	H						57		
8	HBL 737	127 (105-159)	176 (153-192)	88 (48-115)	138 (54-359)	3 (1-4)	6	Y	37 (27-47)	H						46		
9	UPB 1043	125 (107-153)	173 (151-192)	84 (51-108)	173 (60-467)	3 (1-4)	2	Y	49 (46-52)	H								
10	UPB 1044	126 (105-164)	175 (151-208)	104 (77-120)	167 (64-394)	3 (1-4)	2	Y	41 (28-50)	H								
11	UPB 1045	127 (105-154)	174 (151-199)	100 (53-130)	155 (54-326)	3 (1-4)	2	Y	46 (43-50)	H								
12	VLB 141	122 (102-155)	175 (151-207)	85 (72-102)	142 (68-376)	3 (1-4)	6	Y	40 (26-48)	H						36		
13	VLB 142	120 (99-151)	170 (144-192)	86 (49-109)	120 (42-295)	3 (1-3)	6	Y	36 (33-40)	H								
14	VLB 143	125 (107-155)	174 (149-203)	86 (50-109)	133 (44-311)	3 (1-5)	6	Y	39 (29-44)	HL						15		
15	VLB 144	121 (102-146)	169 (144-187)	87 (56-113)	165 (64-430)	3 (1-4)	2	Y	42 (39-44)	H								
16	BHS 352 ©	121 (102-146)	169 (144-185)	92 (75-112)	122 (55-316)	3 (1-4)	6	Y	35 (22-42)	HL						23		
17	BHS 400 ©	130 (104 -163)	177 (151-207)	93 (58-118)	149 (57-357)	3 (1-4)	6	Y	41 (36-46)	H								
18	HBL 113 ©	130 (110-165)	176 (147-207)	87 (59-109)	187 (75-445)	3 (1-4)	2	Y	34 (28-40)	H						78		
19	VLB 118 ©	122 (104-152)	172 (150-192)	91 (52-115)	129 (70-273)	3 (1-4)	6	Y	44 (40-50)	H	5S							

IRRIGATED TRIALS (FEED)

INITIAL VARIETAL TRIAL (IRRIGATED) FEED BARLEY

The IVT feed barley was proposed at 20 locations comprising of NWPZ (6), NEPZ (6) and central zone (8) in northern and central plains. The trial was conducted at all the locations except Bhilwara and Navgaon. In NWPZ, the results from six locations were pooled for zonal compilation, as data from Karnal (LSM) were not included in zonal means. In case of NEPZ, six locations data were included in zonal means. However, data of Faizabad and Pusa locations could not be included in zonal means due to LSM. In central zone, yield data of all locations were pooled for zonal means except Banswara due to unrealistic yield.

The trial consisted of 18 testing entries and 7 checks, namely BH902, BH 946, HUB 113, Jyoti, RD 2552, RD 2786 and BH 959. The trial was monitored during the crop season in NWPZ (Hisar, Durgapura and Ludhiana), NEPZ (Kanpur, Faizabad and Varanasi) and central zone (SK Nagar, Udaipur, Banswara and Kota) by the zonal monitoring teams. In NWPZ, entry PL 884 showed mixtures while off types were found in entries PL 883, BH 993 and BH 994. In case of Central zone, entry PL 884 was observed as segregating/mixtures, while entries BH 993, BH 994, BH 946, BH 959, BH 995, DWRB 137, DWRB 142, JB 303, KB 1311, KB 1318, NDB 1608, NDB 1609, PL 883, RD 2786, RD 2900 were having off types.

In NWPZ, Yellow rust and leaf blight were observed in the trials. Yellow rust was reported in entries NDB 1609 and Jyoti and leaf blight was observed RD 2900 and RD 2786. In case of NEPZ, leaf blight was reported in the entries RD 2900 and RD 2786. In CEN zone, in general there was no incidence of yellow rust although leaf blight and aphid was sporadically in the trial.

In case of grain yield, in NWPZ, testing entry DWRB 137 (49.8 q/ha) ranked first and was in first non-significant group. The check BH 946 ranked second with 49.7 q/ha mean grain yield in the first NSG. This entry was significantly superior over six checks viz., BH 902 (45.9 q/ha), HUB 113 (45.6 q/ha), RD 2552 (45.1 q/ha), BH 959 (44.1 q/ha), RD 2786 (39.4 q/ha) and JOYTI (32.9 q/ha). In NEPZ, check BH 902 (39.2 q/ha) ranked first and was in first non-significant group. The testing entry DWRB 137 ranked second with 39.1 q/ha mean grain yield in the first NSG. In addition, two more testing entries PL 883 (38.2 q/ha) and DWRB 142 (37.4 q/ha) ranked third and fifth and was in first non-significant group respectively. However, check RD 2552 ranked fourth with mean grain yield (37.7 q/ha) and was in first non-significant group. In case of central zone, check BH 902 (46.3 q/ha) ranked first and was in first Non-Significant Group. The testing entries PL 883 (45.0 q/ha) and HUB 245 (44.8 q/ha) ranked second and third and was in first non-significant Group.

On national basis the check variety BH902 ranked first with 43.8 q/ha grain yield followed by entry DWRB137 (43.7 q/ha) and PL883 (43.3 q/ha).

IVT-IR-TS-FB

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

Varieties	Codes	Durgapura			Hisar			Ludhiana			Tabiji			Pantnagar			NWPZ*		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BH993	IVTIRFB-10	45.59	24	0	50.85	3	0	36.23	7	0	44.38	12	0	28.12	8	0	41.0	15	0
BH994	IVTIRFB-14	62.50	17	0	48.79	9	0	36.96	6	0	30.80	25	0	24.44	18	0	40.7	16	0
BH995	IVTIRFB-11	67.63	9	0	40.22	17	0	31.88	16	0	42.87	13	0	27.18	12	0	42.0	13	0
DWRB137	IVTIRFB-17	64.61	13	0	60.43	1	1	36.23	7	0	62.50	1	1	25.32	17	0	49.8	1	1
DWRB142	IVTIRFB-4	67.93	7	0	43.78	14	0	33.33	14	0	35.02	23	0	27.88	11	0	41.6	14	0
HUB243	IVTIRFB-8	63.41	15	0	49.49	6	0	26.45	20	0	60.69	2	1	26.87	14	0	45.4	7	0
HUB245	IVTIRFB-7	51.93	21	0	37.41	21	0	21.38	24	0	39.86	17	0	27.18	12	0	35.6	22	0
JB301	IVTIRFB-15	67.03	10	0	35.24	22	0	34.06	12	0	40.16	16	0	24.22	19	0	40.1	17	0
JB303	IVTIRFB-16	75.18	2	1	38.26	19	0	32.25	15	0	53.44	6	0	26.61	15	0	45.1	8	0
KB1311	IVTIRFB-5	50.12	22	0	30.13	25	0	18.12	25	0	49.21	7	0	27.91	10	0	35.1	23	0
KB1318	IVTIRFB-12	64.61	13	0	40.46	16	0	35.14	10	0	35.33	21	0	21.78	23	0	39.5	19	0
NDB1608	IVTIRFB-13	48.61	23	0	44.32	13	0	22.10	23	0	34.42	24	0	23.43	21	0	34.6	24	0
NDB1609	IVTIRFB-9	54.95	19	0	50.12	4	0	33.70	13	0	40.76	15	0	20.46	24	0	40.0	18	0
PL883	IVTIRFB-3	69.14	5	0	49.09	7	0	40.58	4	1	45.59	11	0	28.41	7	0	46.6	4	0
PL884	IVTIRFB-2	63.10	16	0	47.95	11	0	40.22	5	1	54.05	4	0	32.54	3	1	47.6	3	1
RD2899	IVTIRFB-18	53.74	20	0	49.58	5	0	42.03	3	1	39.55	18	0	29.95	4	0	43.0	11	0
RD2900	IVTIRFB-19	67.03	10	0	41.49	15	0	26.09	21	0	35.33	21	0	18.30	25	0	37.6	21	0
RD2901	IVTIRFB-1	76.39	1	1	38.71	18	0	27.17	18	0	36.23	19	0	33.16	2	1	42.3	12	0
BH902 ©	IVTIRFB-6	72.46	4	1	46.44	12	0	35.14	10	0	48.91	8	0	26.30	16	0	45.9	5	0
BH946 ©	IVTIRFB-20	67.93	7	0	55.67	2	1	42.75	1	1	53.74	5	0	28.56	6	0	49.7	2	1
RD2552 ©	IVTIRFB-21	75.18	2	1	37.89	20	0	24.64	22	0	54.05	3	0	33.51	1	1	45.1	9	0
HUB113 ©	IVTIRFB-22	60.69	18	0	48.64	10	0	42.39	2	1	47.40	9	0	29.12	5	0	45.6	6	0
BH959 ©	IVTIRFB-23	65.52	12	0	49.06	8	0	35.51	9	0	42.27	14	0	27.92	9	0	44.1	10	0
JYOTI ©	IVTIRFB-24	45.59	24	0	32.28	23	0	27.17	18	0	35.63	20	0	23.68	20	0	32.9	25	0
RD2786 ©	IVTIRFB-25	68.84	6	0	30.83	24	0	28.62	17	0	45.89	10	0	22.65	22	0	39.4	20	0
G.M.		62.79			43.89			32.41			44.32			26.62			42.0		
S.E.(M)		2.51			2.32			1.61			2.27			0.95			0.90		
C.D.		7.06			6.52			4.54			6.40			2.67			2.50		
C.V.		8.00			10.56			9.95			10.26			7.13					
DOS		19-11-2014			13-11-2014			12-11-2014			19-11-2014			22-11-2014					

**Data from Karnal (LSM) are not included in NWPZ means.*

IVT-IR-TS-FB

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

Varieties	Codes	Varanasi			Rewa			Kanpur			Sabour			NEPZ*		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BH993	IVTIRFB-10	34.31	10	0	38.90	17	1	38.41	3	1	33.27	15	0	36.2	7	0
BH994	IVTIRFB-14	36.10	8	0	36.49	23	0	30.43	19	0	34.84	10	0	34.5	15	0
BH995	IVTIRFB-11	30.86	21	0	41.70	2	1	25.00	24	0	30.62	17	0	32.0	22	0
DWRB137	IVTIRFB-17	41.95	2	1	39.80	10	1	38.04	4	1	36.71	5	0	39.1	2	1
DWRB142	IVTIRFB-4	38.78	3	0	39.50	12	1	37.68	5	1	33.76	13	0	37.4	5	1
HUB243	IVTIRFB-8	33.96	11	0	40.80	5	1	31.88	16	0	36.17	8	0	35.7	10	0
HUB245	IVTIRFB-7	33.74	12	0	39.20	16	1	32.61	15	0	39.01	3	0	36.1	8	0
JB301	IVTIRFB-15	32.16	16	0	38.40	21	1	30.80	18	0	33.82	12	0	33.8	17	0
JB303	IVTIRFB-16	31.55	18	0	40.30	8	1	36.96	7	1	20.05	24	0	32.2	21	0
KB1311	IVTIRFB-5	29.33	25	0	38.70	20	1	38.77	2	1	28.86	20	0	33.9	16	0
KB1318	IVTIRFB-12	34.63	9	0	40.90	4	1	27.90	20	0	36.23	7	0	34.9	14	0
NDB1608	IVTIRFB-13	31.18	19	0	39.70	11	1	25.00	24	0	23.19	23	0	29.8	24	0
NDB1609	IVTIRFB-9	30.28	22	0	41.30	3	1	31.88	16	0	29.83	18	0	33.3	19	0
PL883	IVTIRFB-3	42.31	1	1	36.39	24	0	36.59	9	1	37.50	4	0	38.2	3	1
PL884	IVTIRFB-2	36.75	7	0	35.70	25	0	26.45	22	0	35.51	9	0	33.6	18	0
RD2899	IVTIRFB-18	38.36	4	0	38.80	18	1	36.59	9	1	34.30	11	0	37.0	6	0
RD2900	IVTIRFB-19	31.73	17	0	40.50	7	1	26.81	21	0	23.67	22	0	30.7	23	0
RD2901	IVTIRFB-1	30.94	20	0	40.60	6	1	33.70	14	0	36.59	6	0	35.5	12	0
BH902 ©	IVTIRFB-6	33.26	13	0	41.80	1	1	37.14	6	1	44.75	1	1	39.2	1	1
BH946 ©	IVTIRFB-20	32.32	15	0	39.40	15	1	36.96	7	1	32.49	16	0	35.3	13	0
RD2552 ©	IVTIRFB-21	33.01	14	0	38.10	22	1	40.22	1	1	39.49	2	0	37.7	4	1
HUB113 ©	IVTIRFB-22	36.88	6	0	40.10	9	1	36.59	9	1	29.05	19	0	35.7	11	0
BH959 ©	IVTIRFB-23	29.34	24	0	39.50	12	1	34.96	12	0	26.87	21	0	32.7	20	0
JYOTI ©	IVTIRFB-24	36.97	5	0	38.70	19	1	34.06	13	0	33.39	14	0	35.8	9	0
RD2786 ©	IVTIRFB-25	29.37	23	0	39.40	14	1	26.45	22	0	16.18	25	0	27.9	25	0
G.M.		34.00			39.39			33.28			32.25			34.7		
S.E.(M)		0.62			1.77			1.36			1.65			0.71		
C.D.		1.75			4.99			3.83			4.63			1.97		
C.V.		3.66			9.01			8.17			10.21					
DOS		15-11-2014			25-11-2014			24-11-2014			20-11-2014					

**Data from Pusa and Faizabad (LSM) are not included in NEPZ means.*

IVT-IR-TS-FB

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

Varieties	Codes	S.K.Nagar			Sagar			Morena			Udaipur			Gwalior			CEN Z*			Overall*	
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk
BH993	IVTIRFB-10	42.87	22	0	38.54	9	0	39.40	13	0	43.00	19	0	26.72	22	0	38.1	21	0	38.5	16
BH994	IVTIRFB-14	47.22	16	0	25.69	21	0	29.55	22	0	38.65	24	0	34.11	7	1	35.0	25	0	36.7	20
BH995	IVTIRFB-11	47.40	15	0	40.63	8	0	33.01	19	0	43.24	18	0	28.71	19	0	38.6	18	0	37.5	18
DWRB137	IVTIRFB-17	62.32	1	1	31.60	19	0	41.74	9	1	41.91	20	0	33.90	9	1	42.3	9	0	43.7	2
DWRB142	IVTIRFB-4	53.26	5	0	37.50	10	0	29.49	23	0	38.59	25	0	33.64	11	1	38.5	19	0	39.2	12
HUB243	IVTIRFB-8	41.36	25	0	58.33	4	0	48.72	2	1	44.81	14	0	28.17	20	0	44.3	4	1	41.8	5
HUB245	IVTIRFB-7	46.56	18	0	62.50	2	1	30.87	20	0	45.41	13	0	38.83	1	1	44.8	3	1	38.8	15
JB301	IVTIRFB-15	47.04	17	0	25.00	23	0	46.56	6	1	49.82	2	1	30.87	15	0	39.9	16	0	37.9	17
JB303	IVTIRFB-16	48.85	11	0	27.78	20	0	43.88	8	1	49.58	3	1	33.89	10	1	40.8	11	0	39.4	10
KB1311	IVTIRFB-5	42.45	23	0	54.17	5	0	27.23	24	0	48.13	5	1	31.35	13	1	40.7	12	0	36.6	21
KB1318	IVTIRFB-12	44.14	21	0	21.53	25	0	48.00	3	1	46.62	8	1	30.32	18	0	38.1	20	0	37.5	19
NDB1608	IVTIRFB-13	42.33	24	0	35.42	12	0	25.92	25	0	46.26	10	1	34.01	8	1	36.8	23	0	33.7	25
NDB1609	IVTIRFB-9	51.27	8	0	60.07	3	1	41.03	11	1	44.57	16	0	23.04	24	0	44.0	5	1	39.1	13
PL883	IVTIRFB-3	55.50	4	1	52.08	6	0	37.88	15	0	44.26	17	0	35.40	6	1	45.0	2	1	43.3	3
PL884	IVTIRFB-2	48.67	12	0	31.94	18	0	29.78	21	0	46.32	9	1	30.66	17	0	37.5	22	0	39.5	9
RD2899	IVTIRFB-18	57.43	3	1	33.33	15	0	47.52	4	1	44.81	14	0	36.38	4	1	43.9	6	1	41.3	6
RD2900	IVTIRFB-19	51.69	7	0	32.99	17	0	49.28	1	1	45.71	12	0	21.87	25	0	40.3	13	0	36.2	23
RD2901	IVTIRFB-1	61.05	2	1	48.61	7	0	39.60	12	1	41.91	20	0	27.10	21	0	43.7	7	1	40.5	8
BH902 ©	IVTIRFB-6	49.82	10	0	65.28	1	1	37.10	17	0	48.31	4	1	31.06	14	0	46.3	1	1	43.8	1
BH946 ©	IVTIRFB-20	50.36	9	0	33.68	14	0	46.96	5	1	46.26	10	1	36.55	2	1	42.8	8	0	42.6	4
RD2552 ©	IVTIRFB-21	48.58	13	0	35.42	12	0	37.46	16	0	47.52	6	1	30.78	16	0	40.0	14	0	40.9	7
HUB113 ©	IVTIRFB-22	46.32	19	0	23.61	24	0	44.96	7	1	40.46	22	0	26.35	23	0	36.3	24	0	39.2	11
BH959 ©	IVTIRFB-23	48.37	14	0	33.33	15	0	41.30	10	1	39.98	23	0	36.52	3	1	39.9	15	0	38.9	14
JYOTI ©	IVTIRFB-24	44.44	20	0	25.69	21	0	36.99	18	0	50.54	1	1	35.97	5	1	38.7	17	0	35.8	24
RD2786 ©	IVTIRFB-25	52.96	6	0	35.76	11	0	38.22	14	0	47.40	7	1	33.25	12	1	41.5	10	0	36.2	22
G.M.		49.29			38.82			38.90			44.96			31.58			40.7			39.1	
S.E.(M)		2.45			2.01			3.51			1.61			2.64			1.13				
C.D.		6.89			5.66			9.87			4.54			7.51			3.13				
C.V.		9.94			10.36			18.03			7.17			14.49							
DOS		18-11-2014			25-11-2014			22-11-2014			13-11-2014			14-11-2014							

**Data from Banswara (UR) are not included in Cen zone means.*

INITIAL VARIETAL TRIAL (IR-FB) **ZONE: NWPZ**

Summary of ancillary and disease data **RABI: 2014-15**

Sr. No.	Entry	AGRONOMIC CHARACTERS						GRAIN CHARACTERISTICS			DISEASE REACTION						
		H. days Mean & Range	M. days Mean & Range	Height Mean & Range (cm)	Tillering Per meter Mean & range	Str. Stn. Mean & Range	Two/ Six row	colour	1000 g.w Mean & Range	H/N	RUST		SMUT		Leaf Blight	CCN	Aphid (1-5)
											YL	BR	L (%)	C (%)			
1	BH993	93 (83-105)	133 (122-147)	98 (90-118)	88 (47-105)	5 (4-5)	6	Y	39 (35-44)	H	10S				56		
2	BH994	86 (69-94)	129 (117-140)	100 (87-117)	129 (65-180)	1 (1-2)	2	Y	54 (51-56)	H				5	45		
3	BH995	90 (84-102)	130 (122-143)	94 (82-113)	97 (59-122)	4 (2-5)	6	Y	37 (33-40)	H	10S			5	45		
4	DWRB137	86 (71-98)	131 (120-142)	83 (68-90)	84 (53-110)	2 (1-4)	6	Y	43 (41-49)	H					56		
5	DWRB142	90 (80-100)	129 (120-143)	97 (89-111)	101 (49-140)	4 (4-5)	6	Y	42 (34-47)	H	5S				57		
6	HUB243	89 (74-101)	131 (119-145)	96 (86-111)	100 (44-134)	2 (2-3)	6	Y	40 (33-44)	H					56		
7	HUB245	86 (74-96)	130 (120-147)	101 (84-117)	102 (58-132)	5 (2-6)	6	Y	36 (33-41)	H					13		
8	JB301	92 (78-104)	133 (120-147)	103 (96-115)	96 (61-116)	5 (3-6)	6	Y	39 (36-43)	H					23		
9	JB303	92 (82-104)	134 (120-148)	98 (89-112)	95 (56-131)	2 (2-3)	6	Y	40 (33-45)	H					23		
10	KB1311	87 (72-98)	130 (117-143)	96 (87-105)	94 (49-116)	2 (1-3)	6	Y	34 (29-41)	H					56		
11	KB1318	91 (79-105)	133 (122-146)	101 (89-119)	105 (59-135)	6 (5-6)	6	Y	42 (38-47)	H	5S				23		
12	NDB1608	95 (84-111)	133 (123-144)	96 (70-129)	86 (43-108)	5 (2-6)	6	Y	37 (30-39)	H	20S				46		
13	NDB1609	88 (74-100)	130 (117-143)	90 (82-95)	94 (57-114)	2 (1-3)	6	Y	32 (27-38)	H	40S			5	45		
14	PL883	87 (74-99)	132 (120-144)	95 (82-108)	129 (86-162)	4 (2-5)	2	Y	46 (43-48)	H					56		

INITIAL VARIETAL TRIAL (IR-FB)

Summary of ancillary and disease data

ZONE: NWPZ

RABI: 2014-15

Sr. No.	Entry	AGRONOMIC CHARACTERS						GRAIN CHARACTERISTICS			DISEASE REACTION						
											RUST		SMUT				
		H. days Mean & Range	M. days Mean & Range	Height Mean & Range (cm)	Tillering Per meter Mean & range	Str. Stn. Mean & Range	Two/ Six row	colour	1000 g.w Mean & Range	H/N	YL	BR	L (%)	C (%)	Leaf Blight	CCN	Aphid (1-5)
15	PL884	90 (82-98)	128 (117-139)	99 (84-118)	125 (65-178)	2 (1-4)	2	Y	49 (47-51)	H	5S				45		
16	RD2899	91 (78-102)	134 (125-146)	96 (85-108)	105 (76-131)	1 (1-1)	6	Y	42 (37-46)	H					56		
17	RD2900	86 (80-98)	128 (117-139)	98 (84-109)	86 (53-116)	5 (2-6)	6	Y	34 (27-44)	H					35		
18	RD2901	90 (79-101)	130 (117-143)	95 (86-107)	88 (49-114)	2 (1-3)	6	Y	42 (36-53)	H					13		
19	BH902 ©	92 (84-103)	134 (125-143)	102 (92-128)	98 (54-128)	4 (3-5)	6	Y	40 (34-45)	H	5S				45		
20	BH946 ©	91 (78-103)	130 (118-143)	99 (85-117)	104 (59-129)	2 (1-3)	6	Y	36 (30-40)	H				5	45		
21	RD2552 ©	89 (78-103)	131 (120-146)	93 (85-110)	112 (51-150)	5 (2-6)	6	Y	33 (28-40)	H					45		
22	HUB113 ©	93 (83-103)	133 (123-144)	93 (84-102)	88 (60-116)	2 (1-3)	6	Y	38 (33-47)	H					23		
23	BH959 ©	89 (69-100)	130 (117-143)	88 (79-98)	101 (62-123)	2 (2-2)	6	Y	36 (28-40)	H	5S				56		
24	JYOTI ©	90 (83-96)	132 (122-144)	114 (96-130)	94 (42-120)	3 (2-4)	6	Y	39 (38-41)	H	80S				47		
25	RD2786 ©	91 (80-100)	133 (126-144)	105 (93-114)	86 (56-109)	3 (2-3)	6	Y	39 (35-43)	H					47		

INITIAL VARIETAL TRIAL (IR-FB)

Summary of ancillary and disease data

ZONE: NEPZ

RABI: 2014-15

Sr. No.	Entry	AGRONOMIC CHARACTERS						GRAIN CHARACTERISTICS			DISEASE REACTION						
											RUST		SMUT				
		H. days Mean & Range	M. days Mean & Range	Height Mean & Range (cm)	Tillering Per meter Mean & range	Str. Stn. Mean & Range	Two/ Six row	colour	1000 g.w Mean & Range	H/N	YL	BR	L (%)	C (%)	Leaf Blight	CCN	Aphid (1-5)
1	BH993	81 (69-88)	116 (111-120)	100 (86-117)	91 (68-133)	5 (3-6)	6	Y	37 (32-48)	H					46		
2	BH994	77 (74-83)	115 (108-127)	98 (88-112)	88 (62-99)	2 (2-3)	2	Y	47 (40-57)	H				0.01	36		
3	BH995	81 (70-90)	117 (113-122)	96 (86-107)	86 (58-118)	3 (2-3)	6	Y	39 (32-45)	H				0.01	24		
4	DWRB137	78 (74-83)	114 (110-124)	98 (85-113)	94 (44-137)	3 (1-5)	6	Y	40 (35-45)	H			0.01		67		
5	DWRB142	77 (69-83)	114 (109-122)	85 (69-99)	91 (77-124)	3 (1-5)	6	Y	37 (32-42)	H				0.01	78		
6	HUB243	79 (71-85)	116 (112-121)	97 (84-113)	88 (75-109)	2 (1-4)	6	Y	35 (28-46)	H					24		
7	HUB245	77 (69-82)	114 (105-124)	94 (70-116)	88 (57-143)	3 (1-5)	6	Y	33 (29-38)	H			0.01		67		
8	JB301	82 (72-89)	118 (112-122)	99 (92-112)	85 (60-144)	3 (2-4)	6	Y	36 (31-44)	H			0.01		58		
9	JB303	83 (73-88)	120 (118-124)	99 (92-112)	99 (61-162)	3 (2-3)	6	Y	37 (26-45)	H			0.01	0.01	24		
10	KB1311	78 (73-83)	114 (111-121)	94 (85-104)	102 (75-146)	4 (2-5)	6	Y	29 (18-41)	H					58		
11	KB1318	80 (69-90)	118 (115-121)	96 (84-109)	80 (58-111)	2 (1-3)	6	Y	37 (29-45)	H			0.01		46		
12	NDB1608	86 (73-90)	120 (114-123)	94 (76-112)	79 (50-123)	3 (3-4)	6	Y	33 (26-41)	H					68		
13	NDB1609	77 (68-85)	114 (111-121)	87 (79-98)	98 (68-141)	4 (2-5)	6	Y	29 (21-39)	H				0.01	46		
14	PL883	81 (68-68)	117 (111-130)	90 (75-104)	92 (74-106)	2 (1-3)	2	Y	41 (35-46)	H					67		

INITIAL VARIETAL TRIAL (IR-FB)

ZONE: NEPZ

Summary of ancillary and disease data

RABI: 2014-15

Sr. No.	Entry	AGRONOMIC CHARACTERS						GRAIN CHARACTERISTICS			DISEASE REACTION						
											RUST		SMUT				
		H. days Mean & Range	M. days Mean & Range	Height Mean & Range (cm)	Tillering Per meter Mean & range	Str. Stn. Mean & Range	Two/ Six row	colour	1000 g.w Mean & Range	H/N	YL	BR	L (%)	C (%)	Leaf Blight	CCN	Aphid (1-5)
15	PL884	79 (73-83)	116 (112-128)	93 (76-113)	95 (83-104)	2 (1-3)	2	Y	44 (37-54)	H			0.01		58		
16	RD2899	80 (70-92)	115 (108-120)	79 (63-100)	93 (74-114)	4 (3-5)	6	Y	37 (32-42)	H			0.01		58		
17	RD2900	71 (64-76)	111 (105-121)	90 (77-108)	70 (57-90)	4 (2-5)	6	Y	29 (25-39)	H			0.01		46		
18	RD2901	78 (68-87)	114 (107-122)	96 (79-113)	92 (62-119)	4 (3-5)	6	Y	33 (26-39)	H			0.01		36		
19	BH902 ©	81 (71-90)	117 (115-120)	99 (84-115)	94 (62-139)	2 (1-4)	6	Y	36 (32-42)	H					78		
20	BH946 ©	82 (72-89)	117 (114-124)	96 (83-104)	95 (62-126)	4 (3-5)	6	Y	32 (26-41)	H				0.01	78		
21	RD2552 ©	78 (64-92)	116 (110-121)	92 (79-109)	97 (54-149)	3 (2-4)	6	Y	32 (24-39)	H			0.01		35		
22	HUB113 ©	81 (70-90)	116 (108-123)	96 (81-107)	89 (53-137)	4 (3-5)	6	Y	33 (26-39)	H					67		
23	BH959 ©	79 (71-82)	115 (111-121)	81 (69-101)	89 (68-103)	3 (3-3)	6	Y	31 (20-40)	H			0.01	0.01	67		
24	JYOTI ©	78 (69-85)	115 (110-120)	109 (92-134)	85 (58-117)	4 (1-5)	6	Y	40 (35-46)	H					58		
25	RD2786 ©	79 (73-83)	116 (108-124)	97 (69-124)	84 (50-105)	3 (1-5)	6	Y	33 (21-40)	H				0.01	89		

INITIAL VARIETAL TRIAL (IR-FB)

ZONE: CZ

Summary of ancillary and disease data

RABI: 2014-15

Sr. No.	Entry	AGRONOMIC CHARACTERS						GRAIN CHARACTERISTICS			DISEASE REACTION						
		H. days Mean & Range	M. days Mean & Range	Height Mean & Range (cm)	Tillering Per meter Mean & range	Str. Stn. Mean & Range	Two/ Six row	colour	1000 g.w Mean & Range	H/N	RUST		SMUT		Leaf Blight	CCN	Aphid (1-5)
											YL	BR	L (%)	C (%)			
1	BH993	81 (65-96)	123 (113-135)	91 (78-106)	107 (58-217)	2	6	Y	46 (40-53)	H							
2	BH994	77 (55-90)	120 (120-134)	90 (60-105)	118 (62-237)	2	2	Y	48 (39-59)	H							
3	BH995	80 (62-96)	123 (113-136)	92 (76-101)	105 (67-186)	2	6	Y	44 (40-54)	H							
4	DWRB137	71 (56-90)	117 (90-132)	83 (73-100)	101 (60-168)	2	6	Y	46 (37-57)	H							
5	DWRB142	79 (65-93)	122 (110-132)	89 (77-118)	102 (50-195)	2	6	Y	45 (38-50)	H							
6	HUB243	79 (60-91)	120 (113-131)	92 (66-110)	112 (55-202)	2	6	Y	45 (40-51)	H							
7	HUB245	76 (60-92)	120 (111-136)	100 (79-125)	109 (59-189)	2	6	Y	41 (33-54)	H							
8	JB301	83 (66-94)	122 (116-135)	92 (65-118)	97 (61-154)	2	6	Y	46 (40-58)	H							
9	JB303	81 (66-98)	122 (110-136)	91 (68-106)	111 (57-198)	2	6	Y	44 (39-49)	H							
10	KB1311	78 (61-91)	119 (109-133)	92 (76-108)	102 (53-199)	2	6	Y	40 (36-45)	H							
11	KB1318	80 (66-98)	120 (102-134)	97 (74-118)	119 (60-227)	2	6	Y	46 (38-57)	H							
12	NDB1608	82 (63-99)	121 (114-133)	87 (75-103)	97 (55-189)	2	6	Y	44 (39-54)	H							
13	NDB1609	78 (60-95)	119 (113-131)	84 (65-110)	93 (58-165)	2	6	Y	45 (33-52)	H							
14	PL883	78 (59-92)	119 (112-133)	84 (67-101)	115 (67-188)	2	2	Y	48 (43-56)	H							

INITIAL VARIETAL TRIAL (IR-FB) **ZONE: CZ**

Summary of ancillary and disease data **RABI: 2014-15**

Sr. No.	Entry	AGRONOMIC CHARACTERS						GRAIN CHARACTERISTICS			DISEASE REACTION						
											RUST		SMUT				
		H. days Mean & Range	M. days Mean & Range	Height Mean & Range (cm)	Tillering Per meter Mean & range	Str. Stn. Mean & Range	Two/ Six row	colour	1000 g.w Mean & Range	H/N	YL	BR	L (%)	C (%)	Leaf Blight	CCN	Aphid (1-5)
15	PL884	78 (58-94)	121 (113-131)	96 (70-118)	108 (72-156)	2	2	Y	52 (43-58)	H							
16	RD2899	80 (66-95)	120 (103-135)	91 (76-104)	108 (60-191)	2	6	Y	46 (35-57)	H							
17	RD2900	77 (60-90)	118 (109-133)	98 (79-123)	100 (55-203)	2	6	Y	42 (35-52)	H							
18	RD2901	78 (61-92)	121 (113-132)	98 (82-125)	124 (61-255)	2	6	Y	42 (37-51)	H							
19	BH902 ©	81 (67-96)	120 (104-134)	95 (77-115)	104 (60-168)	2	6	Y	46 (40-56)	H							
20	BH946 ©	79 (60-95)	121 (107-134)	91 (75-107)	92 (51-143)	2	6	Y	46 (39-57)	H							
21	RD2552 ©	81 (67-94)	120 (109-134)	91 (81-110)	102 (62-157)	2	6	Y	43 (36-56)	H							
22	HUB113 ©	81 (68-95)	124 (113-136)	84 (67-102)	109 (66-203)	2	6	Y	44 (38-55)	H							
23	BH959 ©	76 (55-92)	120 (115-133)	84 (68-112)	102 (63-157)	2	6	Y	45 (36-57)	H							
24	JYOTI ©	79 (63-91)	119 (108-135)	97 (70-116)	97 (59-184)	2	6	Y	46 (36-56)	H							
25	RD2786 ©	81 (60-93)	122 (118-133)	97 (76-118)	104 (63-188)	2	6	Y	44 (35-56)	H							

IRRIGATED TRIALS (MALT)

ADVANCED VARIETAL TRIAL (IR-TS) - MALT BARLEY

The AVT-MB (IR-TS) was proposed at 13 centres in NWPZ. The trials were conducted at all the centres, except Navgaon. The trial of Mathura was rejected by monitoring team and rest of the locations, except Durgapura and Rohtak (both UR) data were considered for zonal mean compilation.

The trial consisted of 6 test entries and 5 checks viz. BH 902 (six-row) and DWRB92, DWRB101, DWRUB52 and RD2849 (two-row malt barley) making a total of 11 entries, where entries BH976 and PL874 were in the final year of evaluation.

The trial was monitored at Ludhiana, Rohtak, Hisar, Bawal and Durgapura centres during crop season. Entries BH 976, DWRB124 and RD2891 had few off types at some locations. Medium to high aphid incidences were observed in all the entries, while all the entries were found susceptible for cereal cyst nematode (CCN).

The trial mean grain yield was exhibited as 44.7 q/ha, which ranged from 32.9 q/ha (Karnal) to 54.9 q/ha (Bhatinda) indicating a wide difference across the centres. The entry DWRB123 (47.5 q/ha) ranked first and was numerically high to the best check DWRB101 (46.5 q/ha), which comprised in the first Non-Significant Group with final year entry BH976 (45.9 q/ha). The final year entries BH976 (45.9 q/ha) and PL874 ranked third and fourth with 45.9 and 45.3 q/ha grain yield, respectively.

AVT-MB-TS-NWPZ

Location wise (Grain Yield in q/ha)

Varieties	Codes	Hisar			Karnal			Bawal			Ludhiana			Bhatinda		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BH976*	AVTIRMBTS-3	62.7	1	1	31.0	10	0	55.3	1	1	48.6	6	0	52.8	8	0
DWRB123	AVTIRMBTS-8	47.0	8	0	36.8	1	1	50.8	5	1	56.7	1	1	60.9	1	1
DWRB124	AVTIRMBTS-7	55.5	2	0	34.3	4	1	46.1	9	0	55.8	2	1	51.4	9	0
DWRB128	AVTIRMBTS-6	50.7	7	0	33.6	5	1	47.5	8	0	47.7	8	0	57.4	5	0
PL874*	AVTIRMBTS-10	55.3	3	0	31.4	8	0	53.8	3	1	50.7	4	0	58.6	3	1
RD2891	AVTIRMBTS-11	42.8	10	0	31.3	9	0	55.0	2	1	47.7	9	0	58.8	2	1
BH902 ©	AVTIRMBTS-9	54.4	4	0	26.7	11	0	44.9	10	0	42.6	10	0	48.3	11	0
DWRB92 ©	AVTIRMBTS-5	42.5	11	0	34.6	3	1	44.4	11	0	48.6	7	0	49.8	10	0
DWRB101 ©	AVTIRMBTS-2	53.9	6	0	34.9	2	1	52.5	4	1	53.2	3	1	53.8	6	0
DWRUB52 ©	AVTIRMBTS-1	43.8	9	0	33.6	5	1	48.1	7	0	49.3	5	0	53.7	7	0
RD2849 © (I)	AVTIRMBTS-4	54.3	5	0	33.6	5	1	50.0	6	0	37.3	11	0	58.1	4	1
G.M.		51.2			32.9			49.9			48.9			54.9		
S.E.(M)		1.9			1.8			1.8			1.5			1.1		
C.D.		5.4			5.2			5.1			4.3			3.3		
C.V.		7.3			11.0			7.1			6.0			4.2		
DOS		12-11-2014			16-11-2014			11-11-2014			11-11-2014			18-11-2014		

Location wise (Grain Yield in q/ha)

Varieties	Codes	Modipuram			Pantnagar			SG Nagar			Dhaulakuan			NWPZ* Mean		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BH976*	AVTIRMBTS-3	37.8	5	0	39.2	4	0	55.6	2	1	30.4	10	0	45.9	3	1
DWRB123	AVTIRMBTS-8	40.6	2	1	43.2	1	1	53.2	5	0	38.0	4	0	47.5	1	1
DWRB124	AVTIRMBTS-7	37.0	7	0	36.1	7	0	52.8	6	0	34.6	8	0	44.9	6	0
DWRB128	AVTIRMBTS-6	38.6	4	0	37.0	6	0	45.8	11	0	36.0	7	0	43.8	7	0
PL874*	AVTIRMBTS-10	30.9	11	0	33.6	9	0	54.2	4	0	39.0	3	0	45.3	4	0
RD2891	AVTIRMBTS-11	32.0	10	0	36.0	8	0	54.4	3	0	33.9	9	0	43.5	9	0
BH902 ©	AVTIRMBTS-9	43.0	1	1	32.2	11	0	63.2	1	1	36.9	5	0	43.6	8	0
DWRB92 ©	AVTIRMBTS-5	33.9	9	0	33.3	10	0	47.5	10	0	54.2	1	1	43.2	10	0
DWRB101 ©	AVTIRMBTS-2	40.3	3	0	41.3	2	1	51.4	7	0	36.8	6	0	46.5	2	1
DWRUB52 ©	AVTIRMBTS-1	36.9	8	0	37.3	5	0	48.0	9	0	30.4	11	0	42.3	11	0
RD2849 © (I)	AVTIRMBTS-4	37.8	6	0	39.5	3	1	51.0	8	0	45.1	2	0	45.2	5	0
G.M.		37.2			37.1			52.5			37.8			44.7		
S.E.(M)		0.8			1.4			2.8			1.8			0.6		
C.D.		2.4			3.9			8.2			5.2			1.6		
C.V.		4.6			7.3			10.8			9.6					
DOS		23-11-2014			22-11-2014			10-11-2014			13-11-2014					

**Data from Durgapura & Rohtak (both UR) were not included in zonal mean.*

ADVANCED VARIETAL TRIAL MALT BARLEY (TS)

Summary of ancillary and disease data

ZONE : NWPZ

RABI – 2014-15

Sr. No.	ENTRY	AGRONOMIC CHARACTERS						GRAIN CHARACTERISTICS			DISEASE REACTION							
											RUST			SMUT				
		H. days Mean & Range	M. days Mean & Range	Height Mean & Range (cm)	Tillering per meter Mean & Range	Str. Stn. Mean & Range	Two/ Six row	Grain Colour	1000 g.w. Mean & Range	H/ N	YL	BR	BL	L (%)	C (%)	Leaf Blight	CCN	APHID
1	BH976*	92 (81-103)	132 (119-145)	96 (80-110)	150 (125-172)	2 (1-3)	2	Y	49 (38-55)	H	F				tR		S	4
2	DWRB123	88 (75-97)	131 (118-144)	96 (75-114)	131 (82-183)	3 (2-3)	2	Y	47 (37-50)	H	F				tR		S	4
3	DWRB124	93 (81-100)	131 (120-143)	98 (80-116)	147 (116-166)	3 (2-5)	2	Y	46 (40-52)	H	F						S	5
4	DWRB128	92 (80-102)	132 (118-143)	97 (78-115)	151 (120-178)	3 (3-3)	2	Y	48 (40-55)	H	10S						S	5
5	PL874*	91 (78-102)	132 (120-146)	98 (78-108)	129 (82-170)	3 (2-4)	2	Y	45 (40-48)	H	5MS				tR		S	4
6	RD2891	90 (79-99)	132 (122-144)	97 (81-109)	149 (94-187)	3 (3-3)	2	Y	46 (35-54)	H	5MS						S	4
7	BH902 (c)	92 (84-103)	135 (122-150)	106 (90-125)	128 (84-205)	2 (1-3)	6	Y	42 (37-45)	H	10S						S	5
8	DWRB92 (c)	94 (81-103)	132 (119-143)	95 (80-109)	127 (94-146)	2 (1-3)	2	Y	51 (43-58)	H	5S						S	4
9	DWRB101 (c)	91 (81-99)	132 (120-145)	99 (85-112)	138 (120-160)	3 (2-5)	2	Y	44 (37-47)	H	5MS						S	4
10	DWRUB52 (c)	90 (74-101)	132 (117-146)	96 (83-116)	127 (102-170)	2 (1-3)	2	Y	44 (40-46)	H	F				tR		S	4
11	RD2849 (c)	90 (78-100)	132 (119-145)	97 (78-109)	141 (122-169)	3 (2-4)	2	Y	44 (39-48)	H	5S						S	4

INITIAL VARIETAL TRIAL (IR-TS) - MALT BARLEY

The IVT malt barley under timely sown condition was proposed at 10 locations in NWPZ, and was conducted at 9 centres, except Navgaon centre. The results from all trial conducting centres were received, except Mathura (RMT). After the analysis, data from 7 locations were pooled for NWPZ mean, while yield data of Durgapura (UR) were not included in zonal mean.

The trial was proposed with 17 entries and 5 checks namely BH 902 (six-row) and DWRB92, DWRB101, DWRUB52 and RD2849 (two-row malt barley) for irrigated timely sown conditions of NWPZ. The zonal monitoring team visited the trial at Hisar, Ludhiana, Rohtak, Bawal and Durgapura centres. Entries BH 1000, BH1001 and KB 1322 were reported as mixtures/segregating, while entries viz. DWRB134, DWRB139, PL883 and RD2917 were having some off types and need purification.

Yellow rust reaction of 15S was reported in the genotype BH1001, while the entries DWRB136, DWRB141, KB 1322 and RD 2918 showed 10S reaction for stripe rust.

The trial mean ranged from 30.0 q/ha (Karnal) to 55.3 q/ha (Bhatinda), with 42.0 q/ha NWPZ mean. The entries RD2917 (47.2 q/ha) and DWRB136 (46.1 q/ha) were significantly superior to the best check RD2849 (43.8 q/ha) and both the entries were grouped in the first non-significant group. The genotype DWRB134 was also numerically high (44.7 q/ha) to the best check RD2849.

IVT-IR-TS-MB-NWPZ
Location wise & Zonal means (Grain Yield in q/ha)

Varieties	Codes	Hisar			Karnal			Ludhiana			Bathinda			Modipuram			Bawal			Pantnagar			NWPZ*		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BH1000	IVT-MB-TS-18	42.8	19	0	29.5	15	1	38.0	15	0	46.8	20	0	30.7	18	0	44.2	19	0	31.6	13	0	37.7	19	0
BH1001	IVT-MB-TS-15	47.0	14	0	29.2	17	1	54.2	2	1	56.9	11	0	43.1	4	0	48.4	14	0	31.5	14	0	44.3	5	0
BH1002	IVT-MB-TS-2	51.2	8	0	30.9	3	1	40.7	13	0	62.0	2	1	32.5	16	0	45.8	16	0	40.4	1	1	43.4	9	0
DWRB133	IVT-MB-TS-20	52.0	7	0	29.9	11	1	44.9	6	0	51.4	17	0	40.2	8	0	51.4	6	1	33.7	9	0	43.3	10	0
DWRB134	IVT-MB-TS-14	53.3	6	0	32.6	1	1	44.9	6	0	50.5	19	0	45.5	2	1	52.8	5	1	33.5	10	0	44.7	3	0
DWRB135	IVT-MB-TS-21	49.6	10	0	30.6	8	1	37.0	17	0	51.0	18	0	37.5	10	0	50.1	11	1	28.1	17	0	40.6	17	0
DWRB136	IVT-MB-TS-13	63.3	1	1	31.6	2	1	47.7	5	0	60.6	4	0	31.5	17	0	50.7	8	1	37.1	6	0	46.1	2	1
DWRB139	IVT-MB-TS-3	43.3	18	0	26.5	22	0	35.6	18	0	45.4	22	0	30.1	20	0	47.8	15	0	24.1	22	0	36.1	21	0
DWRB141	IVT-MB-TS-16	42.3	20	0	30.6	6	1	56.9	1	1	57.4	8	0	34.3	12	0	42.9	21	0	31.9	12	0	42.3	13	0
KB1322	IVT-MB-TS-9	31.5	22	0	29.9	12	1	27.8	22	0	52.8	16	0	29.0	22	0	49.7	13	0	28.0	18	0	35.5	22	0
KB1325	IVT-MB-TS-10	34.3	21	0	29.9	13	1	29.6	21	0	53.2	15	0	40.9	7	0	42.4	22	0	27.8	20	0	36.9	20	0
PL883	IVT-MB-TS-11	48.7	11	0	29.2	20	1	39.4	14	0	61.1	3	0	33.8	13	0	54.2	2	1	39.6	3	1	43.7	7	0
PL889	IVT-MB-TS-12	45.3	17	0	29.9	13	1	44.0	8	0	56.5	12	0	44.9	3	1	45.8	16	0	33.5	11	0	42.8	12	0
RD2917	IVT-MB-TS-4	61.6	2	1	29.2	17	1	37.5	16	0	66.5	1	1	49.0	1	1	56.2	1	1	30.6	16	0	47.2	1	1
RD2918	IVT-MB-TS-5	45.7	16	0	30.2	10	1	49.5	4	0	53.7	14	0	34.5	11	0	50.6	9	1	38.3	4	1	43.2	11	0
RD2919	IVT-MB-TS-6	47.9	13	0	29.2	17	1	32.4	19	0	55.1	13	0	42.6	5	0	50.2	10	1	31.2	15	0	41.2	16	0
RD2920	IVT-MB-TS-7	48.6	12	0	29.5	15	1	41.2	11	0	46.3	21	0	33.8	13	0	53.0	4	1	27.5	21	0	40.0	18	0
BH902 ©	IVT-MB-TS-17	56.3	4	1	29.2	20	1	42.1	10	0	57.9	7	0	39.9	9	0	53.9	3	1	33.8	8	0	44.7	4	0
DWRB92 ©	IVT-MB-TS-22	46.3	15	0	30.9	3	1	44.0	8	0	57.4	8	0	41.3	6	0	44.6	18	0	28.0	19	0	41.8	15	0
DWRB101 ©	IVT-MB-TS-1	50.0	9	0	30.9	5	1	51.9	3	0	59.3	5	0	29.3	21	0	43.4	20	0	39.7	2	1	43.5	8	0
DWRUB52 ©	IVT-MB-TS-19	54.1	5	0	30.6	6	1	32.4	19	0	58.4	6	0	33.7	15	0	49.7	12	0	37.3	5	0	42.3	14	0
RD2849 © (I)	IVT-MB-TS-8	60.9	3	1	30.6	8	1	41.2	11	0	57.2	10	0	30.1	19	0	51.2	7	1	35.3	7	0	43.8	6	0
G.M.		48.9			30.0			41.5			55.3			36.7			49.0			32.8			42.0		
S.E.(M)		3.0			2.1			1.6			1.9			1.7			2.3			1.0			0.8		
C.D.		8.5			5.9			4.6			5.4			4.9			6.4			2.9			2.1		
.V.		12.3			14.0			7.9			6.9			9.4			9.2			6.3					
DOS		13-11-2014			16-11-2014			11-11-2014			18-11-2014			21-11-2014			11-11-2014			22-11-2014					

**Data from Durgapura (UR) were not included in zonal mean*

INITIAL VARIETAL TRIAL (TS) MALT BARLEY

Summary of ancillary and disease data

ZONE : NWPZ
RABI – 2014-15

Sr. No.	ENTRY	AGRONOMIC CHARACTERS						GRAIN CHARACTERISTICS			DISEASE REACTION							
		H. days Mean & Range	M. days Mean & Range	Height Mean & Range (cm)	Tillering per meter Mean & Range	Str. Stn. Mean & Range	Two / Six row	Grain Colour	1000 g.w Mean & Range	H/N	RUST			SMUT		Leaf Blight	CCN	APHID
											YL	BR	BL	L (%)	C (%)			
1	BH1000	93 (83-103)	135 (122-146)	104 (96-115)	162 (108-212)	2 (1-3)	2	Y	44 (38-51)	H							S	4
2	BH1001	89 (75-101)	135 (120-147)	96 (87-104)	144 (85-202)	2 (2-3)	2	Y	44 (36-47)	H	15S						S	4
3	BH1002	90 (80-101)	133 (119-146)	95 (92-101)	144 (124-169)	3 (2-3)	2	Y	42 (29-46)	H							S	5
4	DWRB133	95 (84-104)	134 (123-147)	91 (84-99)	148 (95-182)	2 (1-3)	2	Y	45 (33-54)	H							S	5
5	DWRB134	94 (81-103)	134 (126-147)	93 (87-100)	137 (86-210)	3 (2-5)	2	Y	54 (44-63)	H	5S						S	5
6	DWRB135	91 (81-101)	134 (123-144)	101 (87-120)	111 (88-130)	3 (1-5)	2	Y	50 (43-54)	H							S	4
7	DWRB136	91 (80-101)	130 (112-145)	94 (85-106)	146 (98-192)	2 (1-3)	2	Y	48 (39-53)	H	10S						S	5
8	DWRB139	84 (73-90)	131 (116-141)	99 (85-113)	133 (118-149)	3 (3-4)	6	Y	40 (37-45)	H					tR		S	5
9	DWRB141	86 (79-94)	132 (120-144)	92 (87-97)	164 (124-207)	4 (3-5)	2	Y	43 (35-45)	H	10S						S	4
10	KB1322	89 (79-100)	131 (117-142)	98 (69-110)	132 (116-148)	3 (2-5)	2	Y	42 (35-50)	H	10S						S	5
11	KB1325	91 (83-103)	131 (108-144)	101 (81-113)	128 (89-164)	4 (3-5)	2	Y	48 (34-55)	H							S	4

INITIAL VARIETAL TRIAL (TS) MALT BARLEY

Summary of ancillary and disease data

ZONE : NWPZ

RABI – 2014-15

Sr. No.	ENTRY	AGRONOMIC CHARACTERS						GRAIN CHARACTERISTICS			DISEASE REACTION							
		H. days Mean & Range	M. days Mean & Range	Height Mean & Range (cm)	Tillering per meter Mean & Range	Str. Stn. Mean & Range	Two/ Six row	Grain Colour	1000 g.w Mean & Range	H/N	RUST			SMUT		Leaf Blight	CCN	APHID
											YL	BR	BL	L (%)	C (%)			
12	PL883	89 (75-101)	133 (123-147)	95 (72-104)	157 (95-208)	3 (3-3)	2	Y	47 (38-52)	H							S	5
13	PL889	93 (82-104)	134 (120-145)	101 (78-116)	122 (85-147)	3 (2-3)	2	Y	49 (34-57)	H					tR		S	5
14	RD2917	84 (72-95)	132 (119-145)	94 (85-104)	128 (105-164)	3 (1-4)	2	Y	44 (27-54)	H							S	4
15	RD2918	87 (72-97)	132 (122-146)	100 (85-112)	140 (95-191)	3 (2-5)	2	Y	57 (47-65)	H	10S						S	4
16	RD2919	90 (78-96)	132 (119-143)	92 (81-103)	115 (90-136)	3 (1-5)	2	Y	51 (38-58)	H				tR			S	4
17	RD2920	83 (72-95)	132 (122-145)	98 (87-105)	140 (86-190)	2 (1-3)	2	Y	46 (28-55)	H							S	5
18	BH902 (c)	92 (84-104)	135 (125-150)	103 (96-118)	128 (90-160)	2 (1-3)	6	Y	46 (36-53)	H							S	5
19	DWRB92 (c)	93 (83-103)	135 (125-144)	90 (77-103)	135 (78-199)	2 (1-3)	2	Y	51 (44-59)	H	5S						S	5
20	DWRB101 (c)	88 (75-101)	133 (117-146)	91 (80-97)	143 (112-202)	2 (1-3)	2	Y	40 (28-45)	H				tR			S	5
21	DWRUB52 (c)	89 (76-102)	133 (118-148)	97 (90-105)	150 (86-177)	3 (1-4)	2	Y	44 (38-47)	H							S	4
22	RD2849 (c)	89 (75-102)	133 (119-148)	89 (80-100)	148 (100-188)	2 (1-3)	2	Y	41 (32-47)	H				tR			S	5

INITIAL VARIETAL TRIAL (IR-LS)-MALT BARLEY

The IVT Malt Barley under late sown conditions was proposed at 7 locations in NWPZ and was conducted and reported from all the centres. The results from all the centres were considered for zonal compilation.

The trial was proposed with 13 entries and 3 checks namely DWRB91 (two-row) and BH946 and DWRUB64 (both six-row). The trials were monitored at Hisar, Ludhiana and Durgapura during the crop season. The entries namely BH 1000 and RD2918 were observed as mixture/segregating, while few off types were noticed in the entries viz. BH1001, BH1003 and RD2919. Yellow rust reaction of 40S was reported in the genotype RD2918 followed by BH1000 (15S) and 10S reaction was showed by the entries namely DWRB134, DWRB138 and check variety BH946.

The trial mean yield ranged from 25.8 q/ha (Ludhiana) to 60.5 q/ha (Durgapura) with zonal mean of 38.3 q/ha. The results of grain yield indicated that in NWPZ, genotype RD2917 ranked first with 43.2 q/ha grain yield followed by entry RD2919 (41.9 q/ha) in the first non-significant group. The two-row malt barley check DWRB91 ranked last with 32.0 q/ha grain yield.

IVT-IR-LS-MB-NWPZ
Location wise & Zonal means (Grain Yield in q/ha)

Varieties	Codes	Hisar			Karnal			Ludhiana			Bathinda			Modipuram			Durgapura			Pantnagar			NWPZ*		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BH1000	IVT-MB-LS-14	47.5	5	1	33.7	14	1	27.8	4	0	38.1	15	0	30.4	7	0	48.6	13	0	31.9	5	0	36.9	11	0
BH1001	IVT-MB-LS-11	46.0	9	0	34.2	12	1	23.6	13	0	44.2	7	1	27.0	14	0	57.9	11	0	25.1	12	0	36.9	12	0
BH1003	IVT-MB-LS-15	47.2	7	1	35.5	4	1	25.0	9	0	43.7	8	1	28.7	11	0	45.5	15	0	36.9	1	1	37.5	9	0
DWRB132	IVT-MB-LS-3	42.8	13	0	36.5	2	1	31.9	1	1	40.7	12	0	28.0	12	0	48.6	13	0	31.4	6	0	37.1	10	0
DWRB134	IVT-MB-LS-9	36.5	14	0	35.3	7	1	22.7	14	0	43.0	9	1	29.1	10	0	54.8	12	0	16.0	16	0	33.9	15	0
DWRB136	IVT-MB-LS-8	44.6	11	0	35.3	6	1	31.9	2	1	50.0	3	1	26.8	15	0	57.9	10	0	23.3	13	0	38.5	8	0
DWRB138	IVT-MB-LS-6	31.9	15	0	34.4	11	1	24.1	11	0	41.9	10	0	29.6	8	0	61.0	8	0	29.2	8	0	36.0	14	0
DWRB140	IVT-MB-LS-1	46.5	8	0	34.9	10	1	29.2	3	1	41.9	11	0	38.0	1	1	57.9	9	0	32.4	4	0	40.1	6	0
DWRB141	IVT-MB-LS-7	51.9	2	1	36.5	2	1	27.3	6	0	47.2	6	1	32.6	3	0	62.5	7	0	27.5	10	0	40.8	4	0
RD2917	IVT-MB-LS-5	47.2	6	1	34.9	9	1	26.9	8	0	51.2	1	1	34.7	2	1	73.3	4	1	34.0	3	0	43.2	1	1
RD2918	IVT-MB-LS-16	51.1	3	1	35.1	8	1	25.0	10	0	51.0	2	1	27.5	13	0	64.0	5	0	29.9	7	0	40.5	5	0
RD2919	IVT-MB-LS-4	53.8	1	1	33.7	14	1	26.9	7	0	48.6	5	1	31.0	5	0	76.4	1	1	22.7	14	0	41.9	3	1
RD2920	IVT-MB-LS-2	43.7	12	0	34.0	13	1	19.0	16	0	36.7	16	0	29.1	9	0	64.0	5	0	26.5	11	0	36.1	13	0
BH946 ©	IVT-MB-LS-13	49.7	4	1	35.4	5	1	23.6	12	0	49.5	4	1	31.1	4	0	73.7	3	1	35.5	2	1	42.7	2	1
DWRB91 ©	IVT-MB-LS-10	31.5	16	0	36.6	1	1	21.3	15	0	39.5	13	0	30.8	6	0	45.5	15	0	19.0	15	0	32.0	16	0
DWRUB64 ©	IVT-MB-LS-12	45.3	10	0	33.3	16	1	27.3	5	0	38.2	14	0	26.8	15	0	76.4	1	1	28.6	9	0	39.4	7	0
G.M.		44.8			34.9			25.8			44.1			30.1			60.5			28.1			38.3		
S.E.(M)		2.6			1.4			1.5			3.0			1.6			2.6			0.9			0.8		
C.D.		7.3			4.0			4.1			8.5			4.5			7.5			2.6			2.2		
C.V.		11.5			8.1			11.2			13.5			10.4			8.7			6.5					
DOS		10-12-2014			10-12-2014			17-12-2014			16-12-2014			16-12-2014			13-12-2014			24-12-2014					

INTIAL VARIETAL TRIAL - MB (LS)
Summary of ancillary and disease data

ZONE : NWPZ
RABI – 2014-15

Sr. No.	ENTRY	AGRONOMIC CHARACTERS						GRAIN CHARACTERISTICS			DISEASE REACTION							
											RUST			SMUT		Hel. Disease		
		H. days Mean & Range	M. days Mean & Range	Height Mean & Range (cm)	Tillering per meter Mean & Range	Str. Stn. Mean & Range	Two/ Six row	Colour	1000 g.w Mean & Range	H/N	YL	BR	BL	L (%)	C (%)	Stribe Leaf	CCN	APHID (1-5)
1	BH1000	86 (73-94)	119 (108-131)	96 (84-110)	117 (92-167)	3 (1-4)	2	Y	47 (40-52)	H	15S						S	4
2	BH1001	85 (72-92)	118 (107-129)	86 (79-98)	115 (93-161)	3 (1-4)	2	Y	47 (38-55)	H							S	4
3	BH1003	87 (76-94)	117 (107-129)	100 (88-115)	114 (58-140)	2 (1-3)	2	Y	39 (29-45)	H					tR		S	4
4	DWRB132	84 (73-94)	116 (102-125)	82 (74-94)	114 (92-127)	3 (1-5)	2	Y	47 (42-54)	H					tR		S	5
5	DWRB134	87 (76-95)	118 (107-125)	82 (70-94)	110 (66-152)	2 (1-3)	2	Y	53 (46-62)	H	10S						S	4
6	DWRB136	86 (75-94)	117 (104-127)	83 (71-96)	107 (76-157)	3 (1-4)	2	Y	51 (41-55)	H					tR		S	5
7	DWRB138	82 (67-94)	115 (103-121)	77 (70-85)	94 (84-112)	3 (3-3)	6	Y	37 (29-41)	H	10S						S	4
8	DWRB140	84 (72-94)	116 (100-123)	79 (72-87)	120 (90-133)	2 (1-3)	2	Y	44 (31-48)	H					tR		S	4
9	DWRB141	83 (70-94)	115 (102-123)	79 (70-88)	104 (74-132)	2 (1-3)	2	Y	43 (36-49)	H							S	4
10	RD2917	81 (67-92)	114 (104-119)	82 (66-98)	88 (52-127)	3 (1-4)	2	Y	51 (39-59)	H							S	4
11	RD2918	83 (70-94)	118 (106-131)	89 (74-99)	115 (107-124)	3 (2-3)	2	Y	61 (56-65)	H	40S						S	4
12	RD2919	84 (75-92)	117 (104-125)	80 (70-92)	107 (77-144)	2 (1-3)	2	Y	53 (45-60)	H	5S						S	4
13	RD2920	82 (69-92)	118 (103-131)	83 (70-97)	124 (96-160)	3 (2-3)	2	Y	49 (38-55)	H	5MS						S	5
14	BH946 (c)	86 (74-95)	117 (106-127)	87 (73-96)	95 (50-124)	2 (1-3)	6	Y	38 (30-45)	H	10S						S	4
15	DWRB91 (c)	85 (70-94)	114 (104-118)	80 (70-92)	80 (55-121)	2 (2-3)	2	Y	56 (49-65)	H	5MS				tR		S	5
16	DWRUB64(c)	81 (67-90)	115 (104-119)	78 (65-89)	87 (58-132)	3 (3-3)	6	Y	42 (36-47)	H	5MS				tR		S	4

SALINITY TRIALS

SOIL SALINITY TOLERANCE YIELD TRIAL

A special alkalinity/salinity trial was proposed at 8 locations and was conducted at all centres except Bhilwara location. The data were received from seven centres and the results from 7 locations were considered for zonal means. The data of Rampura centre was rejected due to unrealistic mean yield. The trial consisted of 16 test entries (contributed by five centres) and 3 checks viz. NDB 1173, RD 2552 and RD 2794. The trials were monitored at Hisar, Faizabad and Kanpur centres by the monitoring team during the crop season.

In case of NWPZ, entries NDB 1621, NDB 1623 and DWRB 145 showed segregation/mixtures while DWRB 144 and KB 1302 were having off types. In NEPZ, DWRB 145 was reported as mixtures/segregation and entries NDB 1618 and KB 1326 had off types.

In case of disease incidence, no rusts and leaf blight were recorded at the trial. However, presence of loose and covered smut was reported at the trial.

The trial means ranged from 17.64 q/ha (Faizabad-II) to 36.99 q/ha (Bawal) with 26.40 q/ha overall trial mean. The results indicated that testing entry RD 2907 (34.5 q/ha) showed rank first and was in the first non-significant group in grain yield.

AVT-SST- IR

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

Varieties	Codes	Hisar			Faizabad-1			Faizabad-2			Bawal			DWR Hisar			Dalipnagar			Mean		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BH996	AVTSST-8	35.66	11	0	16.18	19	0	16.00	13	0	36.44	11	1	20.91	10	0	21.38	11	0	24.4	13	0
BH997	AVTSST-9	44.16	3	1	21.44	10	0	20.59	5	0	43.96	2	1	16.44	14	0	22.46	7	0	28.2	5	0
BH 998	AVTSST-13	40.46	6	1	28.68	5	0	21.26	3	0	37.98	8	1	26.28	5	1	15.76	19	0	28.4	4	0
DWRB144	AVTSST-7	50.04	1	1	29.59	4	0	20.53	6	0	35.11	14	0	24.69	6	0	22.10	8	0	30.3	3	0
DWRB145	AVTSST-18	34.30	13	0	26.27	7	0	17.09	11	0	44.11	1	1	14.37	18	0	21.92	9	0	26.3	11	0
KB1302	AVTSST-10	35.51	12	0	18.12	16	0	19.02	9	0	30.98	17	0	10.57	19	0	18.84	15	0	22.2	17	0
KB1313	AVTSST-16	38.86	8	0	21.14	12	0	20.83	4	0	42.42	3	1	18.85	12	0	26.09	3	0	28.0	6	0
KB1326	AVTSST-11	38.01	10	0	23.25	8	0	15.94	14	0	41.49	4	1	16.00	16	0	20.83	13	0	25.9	12	0
NDB1618	AVTSST-5	26.99	19	0	26.87	6	0	12.98	16	0	35.63	12	0	16.32	15	0	21.01	12	0	23.3	14	0
NDB1621	AVTSST-4	27.17	16	0	21.07	13	0	11.17	18	0	29.17	19	0	20.97	9	0	21.92	10	0	21.9	19	0
NDB1622	AVTSST-17	27.17	16	0	18.12	16	0	16.61	12	0	30.80	18	0	15.99	17	0	22.83	6	0	21.9	18	0
NDB1623	AVTSST-6	40.40	7	1	17.15	18	0	19.93	7	0	38.98	7	1	19.13	11	0	28.26	2	1	27.3	9	0
RD2907	AVTSST-14	45.93	2	1	37.74	2	0	25.54	1	1	40.19	5	1	27.40	4	1	30.43	1	1	34.5	1	1
RD2908	AVTSST-19	30.07	15	0	18.72	15	0	11.11	19	0	33.97	15	0	22.08	8	0	18.12	17	0	22.3	16	0
RD2909	AVTSST-15	44.08	4	1	21.56	9	0	13.89	15	0	37.62	9	1	22.60	7	0	23.55	5	0	27.2	10	0
RD2910	AVTSST-1	26.99	18	0	20.11	14	0	12.38	17	0	35.63	12	0	18.39	13	0	20.83	13	0	22.4	15	0
RD 2794 ©	AVTSST-2	38.83	9	0	21.44	11	0	19.63	8	0	39.67	6	1	27.99	3	1	18.84	15	0	27.7	7	0
NDB1173 ©	AVTSST-3	30.80	14	0	31.04	3	0	18.12	10	0	32.10	16	0	29.49	1	1	23.91	4	0	27.6	8	0
RD2552 ©	AVTSST-12	41.82	5	1	45.29	1	1	22.46	2	0	36.53	10	1	28.58	2	1	17.57	18	0	32.0	2	0
G.M.		36.70			24.41			17.64			36.99			20.90			21.93			26.4		
S.E.(M)		3.47			1.12			0.85			2.75			1.55			1.29			0.84		
C.D.		9.85			3.19			2.41			7.79			4.38			3.64			2.34		
C.V.		18.94			9.21			9.64			14.86			14.79			11.72					
DOS		13-11-2014			03-12-2014			02-12-2014			14-11-2014			20-11-2014			14-11-2014					

**Data from Rampura (UR) are not included in zonal means.*

ADVANCED VARIETAL TRIAL–Salinity

ZONE: NWPZ / NEPZ

Summary of ancillary and disease data

RABI – 2014-15

Sr. No.	ENTRY	AGRONOMIC CHARACTERS						GRAIN CHARACTERISTICS			DISEASE REACTION							
		H. days Mean & Range	M. days Mean & Range	Height Mean & Range (cm)	Tillering per meter Mean & Range	Str. Stn. Mean & Range	Two/ Six Row	Colour	1000 g.w Mean & Range	H/ N	RUST			SMUT		Hel. Disease		APHID (1-5)
											YL	BR	BL	L (%)	C (%)	Spot Leaf	Leaf Blight	
1	BH 996	84 (70-93)	126 (110-140)	81 (63-111)	77 (39-118)	4 (3-6)	6	Y	36 (32-41)							57	35	
2	BH 997	87 (68-101)	127 (110-141)	71 (45-90)	89 (50-138)	4 (1-6)	2	Y	45 (40-47)							36		
3	BH 998	87 (69-99)	128 (114-140)	90 (66-115)	97 (49-146)	3 (1-6)	6	Y	37 (30-42)							24		
4	DWRB 144	86 (69-104)	129 (102-145)	90 (55-121)	78 (45-122)	3 (1-6)	6	Y	36 (31-46)							47		
5	DWRB 145	87 (73-101)	130 (112-147)	76 (59-106)	90 (53-130)	4 (1-6)	6	Y	39 (36-42)							24		
6	KB 1302	88 (74-103)	130 (119-145)	77 (60-93)	81 (46-144)	3 (1-6)	6	Y	38 (35-45)							57		
7	KB 1313	88 (71-103)	128 (114-149)	84 (63-113)	86 (51-118)	4 (3-6)	6	Y	35 (30-36)							36		
8	KB 1326	88 (75-104)	127 (115-141)	86 (53-113)	102 (54-157)	3 (1-6)	2	Y	43 (36-48)							24		
9	NDB 1618	90 (74-102)	131 (108-144)	86 (63-120)	80 (45-157)	3 (1-6)	6	Y	40 (31-45)							12		
10	NDB 1621	89 (74-104)	129 (112-143)	88 (68-122)	84 (44-124)	4 (3-6)	6	Y	39 (33-44)							36		
11	NDB 1622	89 (69-103)	127 (113-143)	82 (50-108)	93 (49-162)	3 (3-3)	6	Y	34 (29-42)							24		
12	NDB 1623	86 (68-100)	127 (107-145)	78 (61-105)	79 (47-116)	3 (1-6)	6	Y	38 (35-41)							57	24	
13	RD 2907	85 (65-102)	130 (112-143)	89 (54-136)	86 (48-130)	3 (1-6)	6	Y	42 (39-45)							12		
14	RD 2908	82 (71-96)	126 (109-145)	72 (43-96)	78 (47-120)	3 (1-6)	6	Y	35 (27-44)							68	25	
15	RD 2909	83 (63-97)	124 (107-138)	83 (58-110)	81 (52-140)	5 (3-6)	6	Y	36 (32-41)							99	35	
16	RD 2910	85 (68-103)	125 (111-141)	78 (54-111)	76 (44-110)	4 (3-6)	6	Y	35 (26-39)							99	23	
17	RD 2552 ©	87 (66-100)	128 (110-143)	80 (52-111)	84 (53-158)	4 (1-6)	6	Y	38 (31-43)							12		
18	RD 2794 ©	86 (71-98)	125 (111-140)	74 (51-105)	95 (50-156)	4 (3-6)	6	Y	38 (34-40)							12		
19	NDB 1173 ©	91 (77-107)	132 (112-149)	90 (62-113)	88 (56-123)	4 (1-6)	6	Y	38 (33-42)							37		

DUAL PURPOSE TRIALS

DUAL PURPOSE BARLEY

In order to evaluate the performance of new barley genotypes for single cut forage and grain yield, coordinated trials on dual purpose barley were proposed for rabi 2014-15, in all zones in plains as well in northern hills zone. The AVT was proposed under rainfed conditions in Northern Hills Zone. Similarly an AVT trial was also proposed for dual purpose in North Western Plains Zone (irrigated timely sown). The objective of the trials was to evaluate the barley genotypes for their green forage yield (at about 55 days stage in irrigated conditions of plains and at 70-75 days or first node stage under rainfed conditions in NH Zone) and then for the grain yield from the regenerated crop after the cut. The overall performance of the genotypes for forage cum grain yield is to be taken into consideration for promotion / retention of the entry in the trial.

Initial Varietal Trial (NWP, NEP and Central Zones)

The trial consisted of 13 entries and 4 checks (Azad, RD 2035, RD 2552, RD 2715) representing different centres in three zones. The IVT (common set of new entries) was proposed in NWPZ (5), NEPZ (4) and CZ (7) at 16 locations. The data were received from the fourteen centres. The trial of Banswara centre was rejected by monitoring team because it was not laid out properly. After analysis data of both grain and forage yield from Jhansi, Anand and Rewa were rejected due to LSM, HCV and UR in CEN and NEP Zone respectively while data were not received from Jalore centre. The trial was monitored at Hisar and Ludhiana centres in NWPZ, Kanpur, Faizabad and Varanasi in NEPZ and Banswara, Kota and Udaipur in Central zone by different teams. Amongst the entries KB 1325 and BH 999 were reported as segregating, while RD 2035, UPB 1046 and KB 1319 had few off-types and needs purification.

In NWPZ, yellow rust incidence was reported in the entries NDB 1614, RD 2035, JB 312, AZAD and NDB 1610. However, leaf blight was scored 68 and above in the entries BH 999, RD 2906 and RD 2715 in NEPZ. Loose smut was also reported in the entries RD 2906, RD 2905 and RD 2904 in NEPZ. In central zone, entries RD 2715 and BH 998 showed incidence of leaf blight. In case of NEPZ, leaf blight was reported in the entries BH 999, RD 2906 and RD 2715 and loose smut was observed in the entries RD 2904, RD 2905 and RD 2906.

In NWPZ, trial means for grain yield of the locations considered for reporting ranged from Bikaner (17.59 q/ha) to Ludhiana (49.84 q/ha). In general the crop situation was very good in zone. The entry KB 1319 ranks first in NWPZ and was in first non-significant group.

In case of NEPZ, trial means for grain yield of the locations considered for reporting ranged from Varanasi (15.64 q/ha) to Kanpur (21.34 q/ha). In general crop situation was very good in Zone. The check RD 2035 showed rank first in NEPZ and was in first non-significant. The testing entries KB1325 (21.1 q/ha) and NDB1610 (21.0q/ha) showed the rank second and third and was in first non-significant.

In case of central zone, entry NDB 1614 (45.00 q/ha) revealed rank first followed by UPB 1046 (44.2 q/ha) and was in first non-significant group. However, check RD 2552 (44.10q/ha) was ranked third for mean grain yield and was in first non-significant group.

On national basis entry UPB 1046 (35.28 q/ha) was ranked first and was in first NSG for mean grain yield. In this case, check RD 2552 (35.04 q/ha) showed second rank and was in the first non-significant group.

In NWPZ, a wide range of variation was observed for forage yield of the locations from Bikaner (88.80 q/ha) to Modipuram (208.74 q/ha). The entry RD 2903 (183.9 q/ha) showed rank first followed by RD 2906 (181.4 q/ha) and was in first NSG. However, check RD 2715 (181.1 q/ha) ranked third and was in first non significant group in the zone.

In NEPZ, for forage yield of the locations ranged from 83.41 q/ha (Kanpur) to 193.06 q/ha (Varanasi). In this zone, entry RD 2903 (159.0 q/ha) showed rank first followed by RD 2906 (158.8 q/ha) and was in first NSG. The check RD 2715 (152.1 q/ha) was ranked third in non significant group for forage yield.

However, in central zone, check RD 2715 ranks first and was in first NSG for forage yield

At national level, check RD 2715 (180.59 q/ha) showed rank first and was in NSG for forage yield. However, entry RD 2903 (176.90 q/ha) ranked second and was in first NSG.

Based on grain and forage yields together, there is no entry for promotion to AVT for dual purpose in irrigated timely sown conditions at national level.

IVT-DUAL- IR-TS
Location wise & Zonal means (Grain Yield in q/ha)

Varieties	Codes	Hisar			Durgapura			Bikaner			Modipuram			Ludhiana			NWP Zone*		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BH 998	IVTIRTSDP-13	27.38	15	0	40.46	13	0	20.83	4	0	21.11	15	0	54.95	5	0	32.9	12	0
BH 999	IVTIRTSDP-2	27.86	14	0	42.87	11	0	14.76	13	0	34.42	2	1	40.46	15	0	32.1	15	0
HUB 244	IVTIRTSDP-6	29.63	11	0	52.54	7	0	17.11	9	0	34.18	3	1	50.12	8	0	36.7	6	0
JB 312	IVTIRTSDP-8	35.19	8	0	35.63	15	0	16.22	11	0	29.74	6	0	59.78	4	0	35.3	8	0
KB 1319	IVTIRTSDP-15	45.73	1	1	54.95	6	1	13.09	16	0	35.96	1	1	67.63	1	1	43.5	1	1
KB 1325	IVTIRTSDP-7	36.43	7	0	47.71	9	0	17.68	8	0	24.55	11	0	60.39	3	0	37.3	4	0
NDB 1610	IVTIRTSDP-16	28.26	13	0	42.87	11	0	19.25	7	0	24.49	12	0	50.12	8	0	33.0	11	0
NDB 1614	IVTIRTSDP-1	31.00	10	0	38.95	14	0	21.14	2	1	25.88	10	0	48.91	11	0	33.2	10	0
RD 2903	IVTIRTSDP-11	44.32	2	1	55.25	4	1	15.21	12	0	18.42	16	0	46.50	13	0	35.9	7	0
RD 2904	IVTIRTSDP-17	31.77	9	0	45.29	10	0	13.36	15	0	22.64	14	0	54.35	6	0	33.5	9	0
RD 2905	IVTIRTSDP-14	40.82	4	1	59.48	2	1	12.08	17	0	23.34	13	0	49.52	10	0	37.0	5	0
RD 2906	IVTIRTSDP-9	26.79	16	0	54.95	5	1	19.63	6	0	9.27	17	0	27.78	16	0	27.7	17	0
UPB 1046	IVTIRTSDP-5	43.52	3	1	52.54	8	0	20.79	5	0	27.42	8	0	54.35	6	0	39.7	3	0
AZAD ©	IVTIRTSDP-12	29.27	12	0	28.68	16	0	25.36	1	1	33.39	5	1	44.69	14	0	32.3	14	0
RD2035 ©	IVTIRTSDP-3	40.18	5	1	26.27	17	0	20.88	3	0	28.50	7	0	48.31	12	0	32.8	13	0
RD2552 ©	IVTIRTSDP-4	38.65	6	1	60.39	1	1	16.94	10	0	26.84	9	0	61.59	2	0	40.9	2	0
RD2715 ©	IVTIRTSDP-10	22.26	17	0	56.16	3	1	14.70	14	0	33.57	4	1	27.78	16	0	30.9	16	0
G.M.		34.06			46.76			17.59			26.69			49.84			35.0		
S.E.(M)		2.66			2.05			1.54			1.38			1.66			**0.86**		
C.D.		7.68			5.82			4.39			3.92			4.71			**2.37**		
C.V.		13.53			8.76			17.54			10.32			6.64					
DOS		14-11-2014			19-11-2014			20-11-2014			19-11-2014			12-11-2014					

IVT-DUAL- IR-TS
Location wise & Zonal means (Grain Yield in q/ha)

Varieties	Codes	Varanasi			Kanpur			Faizabad			NEP Zone*		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BH998	IVTIRTSDP-13	18.98	1	1	21.56	9	0	12.32	17	0	17.6	12	0
BH999	IVTIRTSDP-2	12.47	15	0	17.75	13	0	18.36	9	0	16.2	15	0
HUB244	IVTIRTSDP-6	16.61	8	0	22.10	8	0	23.25	1	1	20.7	4	1
JB 312	IVTIRTSDP-8	16.12	9	0	20.29	10	0	19.93	5	0	18.8	8	0
KB 1319	IVTIRTSDP-15	18.72	2	1	17.75	12	0	15.28	16	0	17.3	14	0
KB 1325	IVTIRTSDP-7	16.93	7	0	26.45	2	1	19.87	7	0	21.1	2	1
NDB 1610	IVTIRTSDP-16	17.45	6	0	25.36	5	1	20.23	4	0	21.0	3	1
NDB 1614	IVTIRTSDP-1	14.01	13	0	19.20	11	0	19.32	8	0	17.5	13	0
RD 2903	IVTIRTSDP-11	18.12	4	0	15.58	17	0	19.93	5	0	17.9	11	0
RD 2904	IVTIRTSDP-17	13.23	14	0	26.09	3	1	16.43	13	0	18.6	9	0
RD 2905	IVTIRTSDP-14	15.71	10	0	24.28	6	1	17.81	10	0	19.3	5	0
RD 2906	IVTIRTSDP-9	11.24	16	0	17.39	14	0	16.61	12	0	15.1	16	0
UPB1046	IVTIRTSDP-5	18.42	3	0	22.46	7	0	15.94	15	0	18.9	7	0
AZAD ©	IVTIRTSDP-12	17.57	5	0	16.67	15	0	20.83	3	1	18.4	10	0
RD 2035 ©	IVTIRTSDP-3	15.04	11	0	27.90	1	1	21.74	2	1	21.6	1	1
RD 2552 ©	IVTIRTSDP-4	14.82	12	0	25.72	4	1	17.09	11	0	19.2	6	0
RD 2715 ©	IVTIRTSDP-10	10.47	17	0	16.30	16	0	16.00	14	0	14.3	17	0
G.M.		15.64			21.34			18.29			18.4		
S.E.(M)		0.19			1.30			0.91			0.53		
C.D.		0.55			3.69			2.59			1.49		
C.V.		2.49			12.15			9.97					
DOS		15-11-2014			24-11-2014			06-12-2014					

**Data from Rewa (LSM) are not included in NEPZ means.*

IVT-DUAL- IR-TS
Location wise & Zonal means (Grain Yield in q/ha)

Varieties	Codes	Kota			Udaipur			Jabalpur			CEN Zone*			Overall Mean		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BH 998	IVTIRTSDP-13	37.26	10	0	32.61	15	0	13.29	15	0	27.7	13	0	27.34	14	0
BH 999	IVTIRTSDP-2	26.99	16	0	41.12	12	0	41.67	1	1	36.6	10	0	28.98	13	0
HUB 244	IVTIRTSDP-6	32.61	13	0	32.55	16	0	14.49	14	0	26.5	14	0	29.56	12	0
JB 312	IVTIRTSDP-8	47.10	3	1	55.07	7	1	16.49	12	0	39.6	7	0	31.96	7	0
KB 1319	IVTIRTSDP-15	43.84	7	1	53.14	9	1	6.76	16	0	34.6	11	0	33.90	3	1
KB 1325	IVTIRTSDP-7	31.28	14	0	32.00	17	0	15.25	13	0	26.2	15	0	29.87	11	0
NDB 1610	IVTIRTSDP-16	45.35	4	1	55.25	6	1	21.14	9	0	40.6	5	0	31.80	8	0
NDB 1614	IVTIRTSDP-1	44.99	5	1	57.00	2	1	32.91	2	0	45.0	1	1	32.12	5	0
RD 2903	IVTIRTSDP-11	32.73	12	0	55.37	5	1	22.64	6	0	36.9	9	0	31.28	9	0
RD 2904	IVTIRTSDP-17	39.25	9	0	34.12	13	0	3.32	17	0	25.6	16	0	27.26	15	0
RD 2905	IVTIRTSDP-14	47.71	1	1	47.22	10	0	25.66	4	0	40.2	6	0	33.06	4	0
RD 2906	IVTIRTSDP-9	27.05	15	0	41.73	11	0	16.91	11	0	28.6	12	0	24.49	17	0
UPB 1046	IVTIRTSDP-5	47.52	2	1	56.70	3	1	28.38	3	0	44.2	2	1	35.28	1	1
AZAD ©	IVTIRTSDP-12	36.71	11	0	55.98	4	1	20.53	10	0	37.7	8	0	29.97	10	0
RD 2035 ©	IVTIRTSDP-3	44.44	6	1	53.44	8	1	25.06	5	0	41.0	4	1	31.98	6	0
RD 2552 ©	IVTIRTSDP-4	41.30	8	1	59.60	1	1	22.46	8	0	41.1	3	1	35.04	2	1
RD 2715 ©	IVTIRTSDP-10	19.75	17	0	33.82	14	0	22.52	7	0	25.4	17	0	24.85	16	0
G.M.		37.99			46.87			20.56			35.1			30.51		
S.E.(M)		2.65			3.03			1.47			1.43			0.57		
C.D.		7.54			8.62			4.19			4.01			1.58		
C.V.		13.95			12.93			14.34								
DOS		15-11-2014			13-11-2014			20-11-2014								

**Data from Jhansi (LSM) and Anand (HCV and LSM) are not included in Cen zone means.*

IVT-DUAL- IR-TS

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

Varieties	Codes	Durgapura			Bikaner			Modipuram			Ludhiana			Hisar			**NWP Zone***		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BH 998	IVTIRTSDP-13	143.12	10	0	45.89	17	0	173.31	13	0	162.44	10	0	154.19	3	0	135.8	14	0
BH 999	IVTIRTSDP-2	167.27	8	0	76.28	12	0	310.99	1	1	158.82	13	0	108.21	11	0	164.3	5	0
HUB 244	IVTIRTSDP-6	121.68	15	0	77.83	10	0	237.92	3	0	148.55	14	0	162.32	2	0	149.7	9	0
JB 312	IVTIRTSDP-8	133.76	12	0	75.75	13	0	169.08	14	0	161.23	12	0	104.99	14	0	129.0	15	0
KB 1319	IVTIRTSDP-15	155.19	9	0	103.80	6	0	234.00	4	0	147.34	15	0	117.75	7	0	151.6	8	0
KB 1325	IVTIRTSDP-7	214.67	3	1	63.13	16	0	206.52	9	0	207.13	5	0	111.07	10	0	160.5	7	0
NDB 1610	IVTIRTSDP-16	136.47	11	0	77.83	10	0	222.22	6	0	166.67	9	0	107.87	13	0	142.2	12	0
NDB 1614	IVTIRTSDP-1	106.58	17	0	69.44	14	0	166.67	17	0	137.68	16	0	120.21	6	0	120.1	6	0
RD 2903	IVTIRTSDP-11	214.98	2	1	121.64	2	1	169.08	14	0	231.28	2	1	182.53	1	1	183.9	1	1
RD 2904	IVTIRTSDP-17	124.40	14	0	116.01	3	1	190.82	12	0	194.44	7	0	98.95	17	0	144.9	10	0
RD 2905	IVTIRTSDP-14	119.26	16	0	110.66	4	1	218.60	7	0	161.84	11	0	108.13	12	0	143.7	11	0
RD 2906	IVTIRTSDP-9	232.49	1	1	104.94	5	0	217.39	8	0	230.68	3	1	121.60	5	0	181.4	2	1
UPB 1046	IVTIRTSDP-5	131.34	13	0	79.17	9	0	192.03	11	0	109.00	17	0	115.14	8	0	125.3	16	0
AZAD ©	IVTIRTSDP-12	195.65	4	0	65.82	15	0	168.48	16	0	177.54	8	0	102.70	16	0	142.0	13	0
RD 2035 ©	IVTIRTSDP-3	178.74	6	0	92.60	8	0	225.85	5	0	208.94	4	0	104.23	15	0	162.1	6	0
RD 2552 ©	IVTIRTSDP-4	170.59	7	0	95.90	7	0	248.19	2	0	203.20	6	0	112.50	9	0	166.1	4	0
RD 2715 ©	IVTIRTSDP-10	195.65	4	0	132.85	1	1	197.46	10	0	239.73	1	1	139.98	4	0	181.1	3	1
G.M.		161.29			88.80			208.74			179.21			121.90			152.0		
S.E.(M)		6.54			8.31			12.06			3.21			3.52			3.35		
C.D.		18.61			23.64			34.30			9.12			10.15			9.28		
C.V.		8.12			18.72			11.56			3.58			5.00					
DOS		19-11-2014			20-11-2014			19-11-2014			12-11-2014			14-11-2014					

IVT-DUAL- IR-TS
Location wise & Zonal means (Forage Yield in q/ha)

Varieties	Codes	Varanasi			Kanpur			Faizabad			NEP Zone*		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BH998	IVTIRTSDP-13	205.31	6	0	69.84	17	0	129.23	6	0	134.8	7	0
BH999	IVTIRTSDP-2	178.14	14	0	76.27	11	0	115.34	12	0	123.2	13	0
HUB244	IVTIRTSDP-6	214.37	3	0	72.83	16	0	115.94	11	0	134.4	8	0
JB312	IVTIRTSDP-8	186.59	11	0	78.35	8	0	107.49	13	0	124.1	12	0
KB1319	IVTIRTSDP-15	153.99	16	0	78.26	10	0	88.77	16	0	107.0	17	0
KB1325	IVTIRTSDP-7	199.28	7	0	78.35	8	0	118.36	7	0	132.0	9	0
NDB1610	IVTIRTSDP-16	190.22	10	0	96.01	3	0	89.98	15	0	125.4	11	0
NDB1614	IVTIRTSDP-1	175.12	15	0	80.34	7	0	103.26	14	0	119.6	14	0
RD2903	IVTIRTSDP-11	244.57	1	1	92.66	4	0	139.79	4	0	159.0	1	1
RD2904	IVTIRTSDP-17	184.18	13	0	88.95	5	0	76.09	17	0	116.4	15	0
RD2905	IVTIRTSDP-14	219.81	2	1	86.05	6	0	117.45	9	0	141.1	5	0
RD2906	IVTIRTSDP-9	208.33	5	0	104.26	2	0	163.89	1	1	158.8	2	1
VPB1046	IVTIRTSDP-5	138.89	17	0	72.83	15	0	118.36	7	0	110.0	16	0
AZAD ©	IVTIRTSDP-12	193.24	9	0	75.27	13	0	161.47	2	1	143.3	4	0
RD2035 ©	IVTIRTSDP-3	195.65	8	0	75.82	12	0	116.55	10	0	129.3	10	0
RD2552 ©	IVTIRTSDP-4	185.39	12	0	75.18	14	0	156.40	3	1	139.0	6	0
RD2715 ©	IVTIRTSDP-10	208.94	4	0	116.67	1	1	130.74	5	0	152.1	3	1
G.M.		193.06			83.41			120.53			132.3		
S.E.(M)		9.80			2.53			3.04			3.52		
C.D.		27.87			7.18			8.64			9.87		
C.V.		10.15			6.06			5.04					
DOS		15-11-2014			24-11-2014			06-12-2014					

IVT-DUAL- IR-TS

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

Varieties	Codes	Kota			Udaipur			Jabalpur			CEN Zone*			Overall		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BH 998	IVTIRTSDP-13	272.34	8	0	152.17	11	0	314.01	5	0	175.00	12	0	146.2	14	0
BH 999	IVTIRTSDP-2	253.62	14	0	160.02	9	0	329.71	2	0	169.3	14	0	154.47	9	0
HUB 244	IVTIRTSDP-6	285.02	5	0	143.72	14	0	211.96	13	0	189.3	7	0	156.301	6	0
JB 312	IVTIRTSDP-8	266.91	9	0	151.57	12	0	173.91	15	0	176.2	11	0	140.533	15	0
KB 1319	IVTIRTSDP-15	276.57	7	0	187.80	3	1	144.93	16	0	187.0	8	0	149.11	13	0
KB 1325	IVTIRTSDP-7	283.82	6	0	156.40	10	0	202.29	14	0	191.4	4	1	161.162	4	0
NDB 1610	IVTIRTSDP-16	303.14	3	1	181.16	6	1	246.38	9	0	201.8	3	1	153.871	12	0
NDB 1614	IVTIRTSDP-1	193.24	17	0	137.08	15	0	251.21	8	0	137.0	17	0	1254.584	17	0
RD 2903	IVTIRTSDP-11	286.84	4	1	147.34	13	0	315.82	4	0	183.1	10	0	176.903	2	1
RD 2904	IVTIRTSDP-17	307.37	2	1	185.99	5	1	101.45	17	0	206.6	2	1	153.968	11	0
RD 2905	IVTIRTSDP-14	262.08	12	0	208.94	1	1	306.76	6	0	191.1	5	1	155.908	7	0
RD 2906	IVTIRTSDP-9	264.49	11	0	180.56	7	1	218.00	12	0	186.7	9	0	176.902	3	1
UPB 1046	IVTIRTSDP-5	259.66	13	0	121.68	17	0	386.47	1	1	162.0	16	0	131.164	16	0
AZAD ©	IVTIRTSDP-12	265.10	10	0	195.05	2	1	225.85	11	0	191.1	5	1	155.76	8	0
RD 2035 ©	IVTIRTSDP-3	253.62	14	0	128.02	16	0	289.86	7	0	165.9	15	0	154.177	10	0
RD 2552 ©	IVTIRTSDP-4	250.60	16	0	172.10	8	0	234.90	10	0	174.6	13	0	161.013	5	0
RD 2715 ©	IVTIRTSDP-10	317.03	1	1	187.80	3	1	327.29	3	0	208.0	1	1	180.594	1	1
G.M.		270.67			164.55			251.81			182.1			154.848		
S.E.(M)		11.06			10.43			6.62			6.44			2.52		
C.D.		31.44			29.67			18.82			18.06			6.97		
C.V.		8.17			12.68			5.26								
DOS		14-11-201			13-11-2014			20-11-2014								

AVT (IR-TS) Dual: NWPZ

Grain and forage yield

The Advanced varietal trial for dual purpose was proposed at 6 locations under irrigated conditions of Haryana, Rajasthan, Punjab and U.P in the NWP zone. The results from five locations were reported for zonal means. The trial consisted of 1 entry and four checks [Azad, RD 2035, RD 2552 and RD 2715].

The zonal monitoring team visited at Haryana, Punjab and Rajasthan at the centres. All trials were in very good conditions. In case of disease incidence, yellow rust was reported 100S in checks Azad and RD 2035.

The trial means for grain yield of the locations considered for reporting ranged from 20.16 q/ha (Bikaner) to 45.94 q/ha (Ludhiana). In general the crop situation was very good in the zone. The Check RD 2552 (36.7 q/ha) ranked first and was in first NSG for grain yield in the zone.

The trial means for forage yield of the locations considered for reporting ranged from Hisar (85.59 q/ha) to Ludhiana (180.43 q/ha). The check RD 2035 (149.10 q/ha) ranked first followed by another check RD 2552 (146.6 q/ha) and were in first NSG. The checks were superior over entry.

Based on grain and forage yields together, there is no entry for promotion to AVT final year evaluation for dual purpose in NWP zone under irrigated conditions.

AVT- IR- Dual- NWPZ

Location wise and zonal means (Grain yield in q/ha)

Varieties	Codes	Hisar			Durgapura			Ludhiana			Modipuram			Bikaner			NWPZ		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	R k	G
KB 1369	AVTIRDPNWP 2	32.95	3	1	35.51	3	0	34.78	5	0	30.34	3	1	25.64	1	1	31.8	3	0
AZAD	AVTIRDPNWP 3	21.70	4	0	25.24	5	0	47.34	3	0	20.00	5	0	17.53	5	0	26.4	5	0
RD 2035	AVTIRDPNWP 4	34.29	2	1	25.85	4	0	59.42	1	1	31.81	1	1	19.46	2	0	34.2	2	0
RD 2552	AVTIRDPNWP 1	35.12	1	1	52.05	1	1	49.52	2	0	27.91	4	0	18.81	4	0	36.7	1	1
RD 2715	AVTIRDPNWP 5	20.89	5	0	36.59	2	0	38.65	4	0	31.21	2	1	19.37	3	0	29.3	4	0
G.M.		28.99			35.05			45.94			28.25			20.16			31.7		
S.E.(M)		1.41			1.22			0.90			0.61			1.74			0.55		
C.D.		4.35			3.76			2.79			1.87			5.36			1.57		
C.V.		9.74			6.97			3.93			4.29			17.27					
DOS		14-11-2014			19-11-2014			15-11-2014			18-11-2014			20-11-2014					

AVT- IR- Dual- NWPZ

Location wise and zonal means (Forage yield in q/ha)

Varieties	Codes	Hisar			Durgapura			Ludhiana			Modipuram			Bikaner			NWPZ		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	R k	G
KB 1369	AVTIRDPNWP 2	64.28	5	0	146.38	4	0	85.75	5	0	217.87	3	1	78.27	4	0	118.5	5	0
AZAD	AVTIRDPNWP 3	83.20	2	1	114.73	5	0	157.00	4	0	205.80	4	0	91.25	3	1	130.4	4	0
RD 2035	AVTIRDPNWP 4	82.56	3	1	167.39	1	1	189.86	1	1	231.64	1	1	74.14	5	0	149.1	1	1
RD 2552	AVTIRDPNWP 1	69.98	4	0	165.46	2	1	182.37	2	1	218.36	2	1	96.95	2	1	146.6	2	1
RD 2715	AVTIRDPNWP 5	85.59	1	1	154.59	3	1	180.43	3	0	160.14	5	0	110.71	1	1	138.3	3	0
G.M.		77.12			149.71			159.08			206.76			90.26			136.6		
S.E.(M)		1.54			5.99			2.74			6.44			8.43			2.52		
C.D.		4.75			18.45			8.46			19.84			25.96			7.11		
C.V.		4.00			8.00			3.45			6.23			18.67					
DOS		14-11-2014			19-11-2014			15-11-2014			18-11-2014			20-11-2014					

AVT (Dual Purpose)-RF-TS – (NH Zone)

Grain and forage yield

The Advanced varietal trial for dual purpose was proposed at 5 locations under rainfed conditions of Uttarakhand and Himachal Pradesh in the NH zone. The results from four locations were reported for zonal means. The trial consisted of 15 entries and three checks (BHS 380, BHS 400 and HBL 276).

The zonal monitoring team visited at Uttarakhand as well as Himachal Pradesh at many centres along with wheat group. All trials were in very good conditions. In case of disease incidence, stripe disease was reported more than 10% in testing entries HBL 722, HBL 736 and HBL737.

The trial means for grain yield of the locations considered for reporting ranged from 11.80 q/ha (Shimla) to 36.71 q/ha (Palampur). In general the crop situation was very good in the zone. The check BHS 400 (27.1 q/ha) showed rank first and was in first NSG. However, entry VLB 144 (26.7 q/ha) was second rank and were in first NSG.

The trial means for forage yield of the locations considered for reporting ranged from 15.01 q/ha (Shimla) to 71.82 q/ha (Majhera). The entry VLB 141 (45.0 q/ha) ranked first followed by VLB 145 (44.6 q/ha) and were in first NSG. The entries were superior over all checks.

Based on grain and forage yields together, no entry was superior over the checks for promotion to AVT final year evaluation for dual purpose in NH zone under rainfed conditions.

AVT- RF- Dual- NHZ

Location wise and zonal means (Grain yield in q/ha)

Varieties	Codes	Majhera			Shimla			Bajaura			Palampur			Zonal mean		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	R k	G
BHS 438	NHDBZ 17	12.58	17	0	16.13	4	0	25.75	2	1	29.48	15	0	21.0	13	0
BHS 439	NHDBZ 10	23.60	8	1	7.48	16	0	18.68	10	0	37.16	10	0	21.7	12	0
BHS 440	NHDBZ 4	26.55	2	1	8.28	15	0	15.83	16	0	36.39	11	0	21.8	11	0
BHS 441	NHDBZ 14	22.36	10	0	11.98	10	0	27.58	1	1	39.78	6	1	25.4	4	1
BHS 442	NHDBZ 11	25.47	5	1	9.08	13	0	19.90	8	0	46.20	2	1	25.2	5	1
HBL 722	NHDBZ 6	25.16	6	1	15.09	5	0	16.58	15	0	33.33	12	0	22.5	9	0
HBL 723	NHDBZ 19	18.32	16	0	6.72	18	0	18.61	12	0	28.52	17	0	18.0	18	0
HBL 736	NHDBZ 8	21.43	14	0	12.18	8	0	19.63	9	0	38.92	7	0	23.0	8	0
HBL 737	NHDBZ 15	22.83	9	1	16.15	3	0	18.61	12	0	37.81	9	0	23.8	7	0
HBL 738	NHDBZ 13	21.66	12	0	8.75	14	0	20.04	7	0	27.28	18	0	19.4	16	0
VLB 141	NHDBZ 1	22.36	11	0	9.70	11	0	24.18	3	0	30.82	14	0	21.8	10	0
VLB 142	NHDBZ 3	20.19	15	0	7.03	17	0	13.32	17	0	38.30	8	0	19.7	15	0
VLB 143	NHDBZ 5	21.58	13	0	12.00	9	0	18.68	10	0	28.70	16	0	20.2	14	0
VLB 144	NHDBZ 2	24.38	7	1	17.19	2	1	23.03	4	0	42.29	4	1	26.7	2	1
VLB 145	NHDBZ 7	25.62	4	1	9.53	12	0	22.08	5	0	39.80	5	1	24.3	6	1
HBL 276©	NHDBZ 18	11.02	18	0	19.36	1	1	12.30	18	0	31.60	13	0	18.6	17	0
BHS 380©	NHDBZ 16	26.24	3	1	12.49	7	0	18.61	12	0	49.30	1	1	26.7	3	1
BHS 400©	NHDBZ 12	28.61	1	1	13.21	6	0	21.47	6	0	45.11	3	1	27.1	1	1
G.M.		22.22			11.80			19.72			36.71			22.9		
S.E.(M)		2.09			0.88			0.71			3.52			1.10		
C.D.		5.93			2.49			2.01			9.93			3.06		
C.V.		18.81			14.85			7.19			19.06					
DOS		07-11-2014			30-10-2014			31-10-2014			31-10-2014					

AVT- RF- Dual - NHZ

Location wise and Zonal means (Forage yield in q/ha)

Varieties	Code	Majhera			Shimla			Bajaura			Palampur			Zonal mean		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	R k	G
BHS 438	NHDBZ 17	77.64	6	1	15.68	16	0	24.12	12	0	25.36	11	0	35.7	9	0
BHS 439	NHDBZ 10	93.17	1	1	21.95	7	0	26.90	9	0	24.84	12	0	41.7	5	1
BHS 440	NHDBZ 4	75.70	7	1	22.05	6	0	29.96	5	0	28.99	6	1	39.2	6	1
BHS 441	NHDBZ 14	62.89	17	0	19.82	9	0	23.78	13	0	29.50	5	1	34.0	14	0
BHS 442	NHDBZ 11	69.49	14	0	16.93	15	0	22.21	14	0	26.92	9	0	33.9	15	0
HBL 722	NHDBZ 6	79.19	5	1	26.97	3	1	37.43	1	1	23.81	13	0	41.9	4	1
HBL 723	NHDBZ 19	71.43	12	0	22.46	5	0	28.13	7	0	28.99	6	1	37.8	7	0
HBL736	NHDBZ 8	57.45	18	0	19.77	10	0	19.70	17	0	26.92	9	0	31.0	17	0
HBL 737	NHDBZ 15	71.82	10	0	19.46	11	0	20.18	16	0	18.63	17	0	32.5	16	0
HBL 738	NHDBZ 13	71.43	12	0	18.53	12	0	26.70	10	0	23.81	13	0	35.1	11	0
VLB 141	NHDBZ 1	82.69	4	1	28.73	2	1	36.01	2	1	32.61	2	1	45.0	1	1
VLB 142	NHDBZ 3	84.63	3	1	21.12	8	0	24.18	11	0	20.19	15	0	37.5	8	0
VLB 143	NHDBZ 5	65.99	15	0	14.75	18	0	22.08	15	0	15.53	18	0	29.6	18	0
VLB 144	NHDBZ 2	72.98	9	1	18.43	13	0	27.85	8	0	19.15	16	0	34.6	12	0
VLB 145	NHDBZ 7	90.06	2	1	29.45	1	1	30.03	4	0	28.99	6	1	44.6	2	1
HBL 276©	NHDBZ 18	63.66	16	0	17.91	14	0	30.64	3	0	30.54	4	1	35.7	10	0
BHS 380 ©	NHDBZ 16	74.92	8	1	25.93	4	1	28.46	6	0	40.89	1	1	42.6	3	1
BHS 400 ©	NHDBZ 12	71.82	11	0	15.01	17	0	18.89	18	0	31.57	3	1	34.3	13	0
G.M.		74.28			20.83			26.51			26.51			37.0		
S.E.(M)		7.36			1.94			2.31			4.28			2.26		
C.D.		20.89			5.51			6.57			12.14			6.26		
C.V.		19.82			18.64			17.64			32.26					
DOS		07-11-2014			30-10-2014			31-10-2014			31-10-2014					

REJECTED

TRIALS

AVT- RF-NHZ

Varieties	Codes	Berthin Yield	Rk	G
BHS434	NHGBZ 1412	35.11	6	1
BHS435	NHGBZ 1405	26.79	13	0
BHS436	NHGBZ 1409	34.29	7	1
BHS437	NHGBZ 1420	34.29	7	1
FILLER	NHGBZ 1403	22.52	16	0
HBL722	NHGBZ 1406	29.83	11	1
HBL723	NHGBZ 1415	23.34	14	0
HBL736	NHGBZ 1413	38.56	4	1
HBL737	NHGBZ 1416	45.66	1	1
VLB141	NHGBZ 1407	36.93	5	1
VLB142	NHGBZ 1410	21.31	17	0
VLB143	NHGBZ 1418	32.26	10	1
VLB144	NHGBZ 1402	29.63	12	1
VPB1043	NHGBZ 1414	23.34	14	0
VPB1044	NHGBZ 1417	21.31	17	0
VPB1045	NHGBZ 1408	38.76	3	1
BHS352 ©	NHGBZ 1404	20.50	19	0
BHS400 ©	NHGBZ 1401	42.82	2	1
HBL113 ©	NHGBZ 1419	17.86	20	0
VLB118 ©	NHGBZ 1411	33.28	9	1
G.M.		30.42		
S.E.(M)		5.66		
C.D.		16.05		
C.V.		37.25		
DOS		20-10-2014		
Reason	HCV			

AVT-DP-NHZ

Almora							
Varieties	Codes	Grain Yield	Rk	G	Forage Yield		
BHS438	NHDBZ-1418	20.06	7	0	15.62	3	1
BHS439	NHDBZ-1411	15.99	14	0	11.82	7	0
BHS440	NHDBZ-1404	23.15	5	0	9.06	15	0
BHS441	NHDBZ-1415	24.82	3	1	8.33	16	0
BHS442	NHDBZ-1412	25.14	2	1	13.82	4	0
FILLER	NHDBZ-1410	17.08	10	0	9.60	13	0
HBL722	NHDBZ-1406	16.82	11	0	16.92	1	1
HBL736	NHDBZ-1408	19.44	8	0	11.34	9	0
HBL737	NHDBZ-1416	15.75	15	0	12.21	6	0
HBL738	NHDBZ-1414	26.58	1	1	15.97	2	0
VLB141	NHDBZ-1401	15.58	16	0	11.79	8	0
VLB142	NHDBZ-1403	16.39	12	0	13.00	5	0
VLB143	NHDBZ-1405	19.23	9	0	7.77	18	0
VLB144	NHDBZ-1402	16.29	13	0	10.91	11	0
VLB145	NHDBZ-1407	22.05	6	0	10.11	12	0
BHS380 ©	NHDBZ-1417	24.18	4	1	8.31	17	0
BHS400 ©	NHDBZ-1413	1.39	18	0	9.47	11	0
HBL276 ©	NHDBZ-1419	14.72	17	0	11.15	10	0
G.M.		18.59			11.51		
S.E.(M)		0.90			0.58		
C.D.		2.56			1.65		
C.V.		9.71			10.07		
DOS		25-10-2014					
Reason	LSM						

AVT-IR-TS-MB

Genotypes	Codes	Durgapura			Rohtak		
		Yield (q/ha)	Rk	G	Yield (q/ha)	Rk	G
BH976*	AVTIRMBTS-3	82.3	1	1	63.9	1	1
DWRB123	AVTIRMBTS-8	64.9	6	0	51.7	8	0
DWRB124	AVTIRMBTS-7	54.5	11	0	56.1	2	0
DWRB128	AVTIRMBTS-6	62.0	7	0	51.7	7	0
PL874*	AVTIRMBTS-10	58.3	10	0	52.0	6	0
RD2891	AVTIRMBTS-11	82.3	1	1	48.8	11	0
BH902 ©	AVTIRMBTS-9	66.0	5	0	48.8	10	0
DWRB92 ©	AVTIRMBTS-5	66.7	4	0	53.2	4	0
DWRB101 ©	AVTIRMBTS-2	60.8	9	0	50.9	9	0
DWRUB52 ©	AVTIRMBTS-1	61.8	8	0	52.7	5	0
RD2849 ©	AVTIRMBTS-4	81.8	3	1	54.5	3	0
G.M.		67.4			53.1		
S.E.(M)		2.7			1.5		
C.D.		7.8			4.4		
C.V.		8.0			5.8		
DOS		22-11-2014			10-11-2014		
Reason		UR			UR		

IVT-MB-TS- Yield (Q/ha)

Genotypes	Codes	Durgapura		
		Yield	Rk	G
BH1000	IVT-MB-TS-18	61.0	20	0
BH1001	IVT-MB-TS-15	85.6	6	1
BH1002	IVT-MB-TS-2	86.8	5	1
DWRB133	IVT-MB-TS-20	88.3	3	1
DWRB134	IVT-MB-TS-14	80.6	10	0
DWRB135	IVT-MB-TS-21	77.9	13	0
DWRB136	IVT-MB-TS-13	67.1	17	0
DWRB139	IVT-MB-TS-3	79.5	12	0
DWRB141	IVT-MB-TS-16	82.2	9	0
KB1322	IVT-MB-TS-9	72.9	15	0
KB1325	IVT-MB-TS-10	70.2	16	0
PL883	IVT-MB-TS-11	83.7	8	1
PL889	IVT-MB-TS-12	62.5	18	0
RD2917	IVT-MB-TS-4	80.6	10	0
RD2918	IVT-MB-TS-5	85.6	6	1
RD2919	IVT-MB-TS-6	91.4	1	1
RD2920	IVT-MB-TS-7	88.7	2	1
BH902 ©	IVT-MB-TS-17	88.0	4	1
DWRB92 ©	IVT-MB-TS-22	62.1	19	0
DWRB101 ©	IVT-MB-TS-1	76.4	14	0
DWRUB52 ©	IVT-MB-TS-19	56.7	21	0
G.M.		76.5		
S.E.(M)		3.0		
C.D.		8.6		
C.V.		8.0		
DOS		22-11-2014		
Reason		UR		

IVT-IR-DP-TS

Varieties	Code	Anand			Rewa			Jhansi		
		Yield(q/ha)	Rk	G	Yield(q/ha)	Rk	G	Yield(q/ha)	Rk	G
BH998	IVTIRTSDP-13	10.87	16	0	38.21	1	1	10.56	15	0
BH999	IVTIRTSDP-2	14.49	14	0	30.85	16	0	15.52	3	0
HUB244	IVTIRTSDP-6	15.34	12	0	36.67	5	1	18.06	1	1
JB312	IVTIRTSDP-8	27.17	2	1	34.40	10	1	14.58	5	0
KB1319	IVTIRTSDP-15	21.01	5	0	38.00	2	1	14.88	4	0
KB1325	IVTIRTSDP-7	18.48	7	0	26.93	17	0	16.64	2	1
NDB1610	IVTIRTSDP-16	18.12	8	0	32.08	12	1	12.39	9	0
NDB1614	IVTIRTSDP-1	10.87	17	0	31.59	14	0	10.54	16	0
RD2903	IVTIRTSDP-11	17.75	10	0	31.84	13	1	12.23	10	0
RD2904	IVTIRTSDP-17	15.22	13	0	34.52	8	1	11.86	12	0
RD2905	IVTIRTSDP-14	13.04	15	0	36.64	6	1	10.08	17	0
RD2906	IVTIRTSDP-9	15.94	11	0	33.70	11	1	10.79	13	0
VPB1046	IVTIRTSDP-5	19.20	6	0	37.34	4	1	14.04	6	0
AZAD ©	IVTIRTSDP-12	23.55	3	1	37.80	3	1	12.14	11	0
RD2035 ©	IVTIRTSDP-3	21.74	4	0	34.42	9	1	10.75	14	0
RD2552 ©	IVTIRTSDP-4	18.12	8	0	35.72	7	1	13.16	7	0
RD2715 ©	IVTIRTSDP-10	29.35	1	1	30.89	15	0	12.77	8	0
G.M.		18.25			34.21			13.00		
S.E.(M)		2.53			2.28			0.69		
C.D.		7.18			6.48			1.96		
C.V.		27.69			13.31			10.62		
DOS		15-11-2014			14-11-2014			18-11-2014		
Reason		HCV			LSM			LSM		

IVT-IR-TS-FB

Varieties	Code	Karnal			Faizabad			Pusa			Banswara		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BH993	IVTIRFB-10	10.77	25	0	13.22	21	0	28.51	7	0	71.86	11	0
BH994	IVTIRFB-14	19.09	1	1	18.84	8	0	29.09	5	1	41.06	22	0
BH995	IVTIRFB-11	11.42	24	0	15.33	15	0	22.90	16	0	79.71	6	0
DWRB137	IVTIRFB-17	16.05	10	1	21.16	3	0	28.22	9	0	53.14	16	0
DWRB142	IVTIRFB-4	16.26	7	1	25.00	1	1	19.93	19	0	96.62	3	1
HUB243	IVTIRFB-8	13.74	18	0	20.98	4	0	25.51	12	0	51.37	18	0
HUB245	IVTIRFB-7	16.64	4	1	15.22	18	0	30.18	2	1	99.03	2	1
JB301	IVTIRFB-15	16.36	6	1	17.43	12	0	28.26	8	0	40.30	23	0
JB303	IVTIRFB-16	14.79	15	1	18.04	10	0	15.58	23	0	44.69	19	0
KB1311	IVTIRFB-5	18.46	2	1	12.43	22	0	17.50	21	0	72.46	8	0
KB1318	IVTIRFB-12	13.35	21	0	19.67	6	0	25.94	11	0	44.69	19	0
NDB1608	IVTIRFB-13	16.91	3	1	13.91	19	0	17.07	22	0	90.58	4	1
NDB1609	IVTIRFB-9	13.54	20	0	12.39	23	0	25.36	13	0	44.69	19	0
PL883	IVTIRFB-3	15.01	12	1	21.23	2	0	30.04	3	1	75.48	7	0
PL884	IVTIRFB-2	16.09	9	1	18.62	9	0	29.20	4	1	67.92	12	0
RD2899	IVTIRFB-18	13.67	19	0	19.02	7	0	27.36	10	0	52.96	17	0
RD2900	IVTIRFB-19	12.43	23	0	11.49	25	0	8.95	24	0	72.46	8	0
RD2901	IVTIRFB-1	15.26	11	1	13.70	20	0	28.88	6	0	80.92	5	0
BH902 ©	IVTIRFB-6	12.61	22	0	19.96	5	0	24.67	14	0	28.38	24	0
BH946 ©	IVTIRFB-20	14.98	14	1	15.25	17	0	18.01	20	0	72.16	10	0
BH959 ©	IVTIRFB-23	14.69	16	1	16.99	14	0	22.83	17	0	53.14	15	0
HUB113 ©	IVTIRFB-22	14.99	13	1	12.07	24	0	23.95	15	0	56.76	14	0
JYOTI ©	IVTIRFB-24	16.48	5	1	17.59	11	0	30.94	1	1	62.20	13	0
RD2552 ©	IVTIRFB-21	14.06	17	0	15.25	16	0	21.49	18	0	99.64	1	1
RD2786 ©	IVTIRFB-25	16.24	8	1	17.03	13	0	5.36	25	0	27.48	25	0
G.M.		14.96			16.87			23.43			63.19		
S.E.(M)		1.76			0.68			0.68			4.66		
C.D.		4.94			1.91			1.91			13.11		
C.V.		23.49			8.04			5.78			14.75		
DOS		16-11-2014			25-11-2014			08-11-2014			20-11-2014		
Reason		LSM			LSM			LSM			UR		

AVT-SST

Location : Rampura				
Varieties	Code	Yield(q/ha)	Rk	G
BH996	AVTSST-8	62.38	4	1
BH997	AVTSST-9	52.96	14	0
BH998	AVTSST-13	45.77	18	0
DWRB144	AVTSST-7	58.12	8	1
DWRB145	AVTSST-18	51.54	16	0
KB1302	AVTSST-10	49.88	17	0
KB1313	AVTSST-16	63.77	1	1
KB1326	AVTSST-11	55.74	13	0
NDB1618	AVTSST-5	60.14	5	1
NDB1621	AVTSST-4	51.63	15	0
NDB1622	AVTSST-17	56.76	11	0
NDB1623	AVTSST-6	57.46	9	0
RD2907	AVTSST-14	56.88	10	0
RD2908	AVTSST-19	63.47	2	1
RD2909	AVTSST-15	58.33	7	1
RD2910	AVTSST-1	45.11	19	0
NDB1173 ©	AVTSST-3	60.08	6	1
RD2552 ©	AVTSST-12	62.44	3	1
RD2794 ©	AVTSST-2	56.52	12	0
G.M.		56.26		
S.E.(M)		2.00		
C.D.		5.66		
C.V.		7.10		
DOS		13-11-2014		
Reason	UR			

INTERNATIONAL/ NATIONAL TRIALS/NURSERIES

International trials and nurseries

Exchange of genetic resources has played an important role in broadening the genetic base of plant breeding. International Centre for Agricultural Research in Dryland Areas (ICARDA), Rabat, Morocco is pioneer institute in the area of barley germplasm improvement and exchange along with wheat and pulse with India. Plant breeders require diverse germplasm to be utilized in the breeding programme having tolerance/resistance abiotic and biotic stresses apart for high yield to improve the productivity of the crop. To facilitate the availability of new diversity in the national barley programme during the year 2014-15, the following yield trials and nurseries were received from ICARDA, Rabat, Morocco which include 472 genotypes for different production conditions. One set of these trials/nurseries was sown at IIWBR, Karnal and few nurseries were conducted at other network centres under All India Coordinated Wheat and Barley Improvement Project (AICWBIP). The Indian barley program has utilized the trials/nurseries to enhance the genetic base of our collection.

International trials/nurseries conducted during crop season 2014-15

Sr. No.	Trial/Nursery	Origin	No. of Entries	Set No.	Location
1.	2nd GSBYT- 2015	ICARDA	25	4	Karnal
					Faizabad
					Rewa
					Kanpur
2.	IBYT-HI-2015	ICARDA	25	4	Karnal
					Ludhiana
					Hisar
					Durgapura
3.	INBYT-HI-2015	ICARDA	25	3	Karnal
					Bajaura
					Ludhiana
4.	2nd GSBSN–2015	ICARDA	150	4	Karnal
					Faizabad
					Durgapura
					Kanpur
5.	IBON-HI-2015	ICARDA	167	4	Karnal
					Durgapura
					Ludhiana
					Hisar
6.	INBON-2015	ICARDA	80	3	Karnl
					Bajaura
					Shimla

The significant findings of different trials/nurseries including the promising entries are given below-

International Barley Yield Trial- High Input (IBYT-HI)

The IBYT-HI consisted of 25 entries with 2 replications including the national check (BH 946) were sown at Karnal, Ludhiana, Hisar and Durgapura under favourable conditions with recommended doses of irrigation and fertilizer. The yield data (Table 2) reveal that check variety BH 946 ranks first and was in the first non-significant group. The entry IBYT-HI-18-(2015) showed the second rank in first NSG among all the test entries including the check BH 946. There are number of entries which fall into the first non significant group at the individual location as well. Out of 25 entries, 3 entries including check at Karnal, 3 entries at Ludhiana, 4 entries including check at Hisar and 6 entries including check at Durgapura which fall into the first non-significant group at the individual location as well. Based on mean yield, grain type and ancillary data entries IBYT-HI15 (2015) and IBYT-HI18(2015) were selected for future utilization in the national programme. Based on field performance and plant type, the entries 1, 4, 5, 6, 10, 11, 12, 13, 14, 15, 18, 19, 20, 21 and 24 were selected by breeders during the field day at IIWBR, Karnal for use in their breeding programme. These selected entries will be evaluated further in next crop season in elite international barley germplasm nursery (EIBGN) at all barley network centres under AICW&BIP.

IBYT-HI: Grain yield and rank of entries from different locations

S.No	Entry	Karanl			Ludhiana			Hisar			Durgapura			Over all Mean		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
1	**IBYT-HI-(2015)-1**	30.49	5	0	18.86	11	0	22.52	17	0	65.56	3	1	**34.36**	**4**	**0**
2	**IBYT-HI-(2015)-2**	18.81	22	0	14.80	18	0	27.34	6	0	67.78	1	1	**32.18**	**8**	**0**
3	**IBYT-HI-(2015)-3**	14.38	24	0	16.17	14	0	20.66	19	0	61.11	7	0	**28.08**	**18**	**0**
4	**IBYT-HI-(2015)-4**	21.59	19	0	22.02	6	0	24.05	10	0	45.56	20	0	**28.30**	**15**	**0**
5	**IBYT-HI-(2015)-5**	28.79	8	0	15.90	15	0	19.23	22	0	48.89	18	0	**28.20**	**16**	**0**
6	**IBYT-HI-(2015)-6**	21.48	20	0	14.67	19	0	23.20	13	0	50.00	17	0	**27.34**	**21**	**0**
7	**IBYT-HI-(2015)-7**	24.35	13	0	14.67	19	0	29.13	5	0	67.78	1	1	**33.98**	**5**	**0**
8	**IBYT-HI-(2015)-8**	25.59	11	0	26.73	1	1	23.34	11	0	56.67	9	0	**33.08**	**6**	**0**
9	**IBYT-HI-(2015)-9**	20.44	21	0	14.34	21	0	24.93	8	0	56.67	9	0	**29.09**	**13**	**0**
10	**IBYT-HI-(2015)-10**	27.30	10	0	9.59	22	0	17.30	25	0	57.78	8	0	**27.99**	**19**	**0**
11	**IBYT-HI-(2015)-11**	15.42	23	0	17.11	13	0	22.79	15	0	27.78	25	0	**20.77**	**25**	**0**
12	**IBYT-HI-(2015)-12**	23.77	15	0	15.43	17	0	17.33	24	0	35.56	24	0	**23.02**	**23**	**0**
13	**IBYT-HI-(2015)-13**	30.25	6	0	25.88	2	1	31.10	2	1	42.22	21	0	**32.36**	**7**	**0**
14	**IBYT-HI-(2015)-14**	23.66	17	0	6.43	24	0	23.11	14	0	37.78	22	0	**27.75**	**24**	**0**
15	**IBYT-HI-(2015)-15**	35.47	2	1	5.79	25	0	19.98	21	0	51.11	14	0	**28.09**	**17**	**0**
16	**IBYT-HI-(2015)-16**	30.13	7	0	22.29	5	0	21.53	18	0	51.11	14	0	**31.26**	**11**	**0**
17	**IBYT-HI-(2015)-17**	28.15	9	0	25.88	2	1	31.09	3	1	54.44	12	0	**34.19**	**3**	**0**
18	**IBYT-HI-(2015)-18**	35.89	1	1	8.95	23	0	34.79	1	1	63.33	4	1	**35.74**	**2**	**1**
19	**IBYT-HI-(2015)-19**	23.79	14	0	15.61	16	0	19.12	23	0	51.11	14	0	**27.41**	**20**	**0**
20	**IBYT-HI-(2015)-20**	23.16	18	0	20.49	8	0	22.70	16	0	62.22	5	1	**32.14**	**9**	**0**
21	**IBYT-HI-(2015)-21**	12.38	25	0	18.82	12	0	20.47	20	0	48.89	18	0	**25.14**	**22**	**0**
22	**IBYT-HI-(2015)-22**	24.79	12	0	19.25	10	0	24.83	9	0	56.67	9	0	**31.39**	**10**	**0**
23	**IBYT-HI-(2015)-23**	30.65	4	0	23.53	4	0	25.48	7	0	36.67	23	0	**29.08**	**14**	**0**
24	**IBYT-HI-(2015)-24**	23.75	16	0	19.89	9	0	23.32	12	0	53.33	13	0	**30.08**	**1**	**0**
25	**BH 946©**	34.54	3	1	21.86	7	0	30.37	4	1	62.22	5	1	**37.25**	**1**	**1**
	G.M	25.16			17.40			23.99			52.49					
	S.E (m)	1.10			1.00			1.63			2.27					
	C.D	3.30			3.01			4.89			6.62					
	C.V	6.18			8.15			9.62			6.11					

Summary of ancillary data of IBYT-HI - (2015) from different locations

S.No.	Entry	H days Mean & range	M days Mean & range	Height Mean & range (cm)
1	IBYT-HI-(2015)-1	96 (81-105)	132 (120-143)	96 (86-104)
2	IBYT-HI-(2015) -2	99 (85-107)	134 (122-145)	94 (92-96)
3	IBYT-HI-(2015)- 3	91 (79-101)	132 (118-144)	98 (92-104)
4	IBYT-HI-(2015)- 4	90 (81-100)	130 (120-140)	96 (90-114)
5	IBYT-HI-(2015)- 5	91 (81-99)	131 (120-144)	92 (85-102)
6	IBYT-HI-(2015)- 6	88 (81-100)	130 (119-139)	92 (81-99)
7	IBYT-HI-(2015)- 7	94 (81-105)	132 (120-145)	92 (84-101)
8	IBYT-HI-(2015)- 8	100 (86-111)	135 (124-147)	96 (91-101)
9	IBYT-HI-(2015)- 9	97 (80-106)	131 (120-143)	97 (89-105)
10	IBYT-HI-(2015)- 10	91 (82-101)	130 (122-141)	94 (84-101)
11	IBYT-HI-(2015)- 11	93 (82-98)	132 (122-142)	99 (85-107)
12	IBYT-HI-(2015)- 12	95 (88-104)	134 (124-144)	95 (86-106)
13	IBYT-HI-(2015)- 13	94 (87-100)	133 (124-144)	102 (94-109)
14	IBYT-HI-(2015)- 14	87 (82-91)	130 (118-143)	89 (77-103)
15	IBYT-HI-(2015)- 15	94 (87-105)	133 (122-143)	104 (96-112)
16	IBYT-HI-(2015)- 16	97 (84-106)	135 (122-146)	97 (81-111)
17	IBYT-HI-(2015)- 17	94 (86-104)	135 (122-144)	94 (80-110)
18	IBYT-HI-(2015)- 18	96 (85-104)	133 (120-143)	98 (90-109)
19	IBYT-HI-(2015)- 19	94 (86-101)	132 (120-142)	98 (88-115)
20	IBYT-HI-(2015)- 20	92 (79-104)	131 (118-142)	98 (87-104)
21	IBYT-HI-(2015)- 21	88 (75-97)	129 (118-138)	96 (88-103)
22	IBYT-HI-(2015)- 22	98 (85-108)	133 (120-143)	100 (94-105)
23	IBYT-HI-(2015)- 23	101 (87-113)	136 (124-144)	100 (89-113)
24	IBYT-HI-(2015)- 24	88 (76-98)	130 (120-139)	96 (89-101)
25	BH 946 ©	90 (77-104)	132 (120-144)	99 (93-110)

International Naked Barley Yield Trial (INBYT-HI)

The huskless barley trial consisted of 25 entries including national check (BHS 352) was conducted at three locations namely Karnal, Bajaura and Ludhiana. Observations were recorded on yield and ancillary characters (Table 4 & 5). The results showed that entry INBYT-HI-20(2015) ranked first and was in first non-significant group. This entry revealed superiority over all the entries and check also at all three locations. Based on grain yield and plant type entries 1, 2, 3, 4, 6, 7, 8, 9, 10, 12, 13, 14, 16, 17, 18, 19, 20, 21, 22, 23 and 24 were selected for further evaluation as EIBGN at different centres under barley network.

INBYT-HI: Grain yield and rank of entries from different locations

S.No.	Entry	Karnal			Bajura			Ludhiana			Over all		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Mean		
1	INBYT-HI-(2015)-1	23.56	21	0	15.71	21	0	10.85	18	0	16.71	21	0
2	INBYT-HI-(2015)-2	31.81	5	1	21.21	5	1	5.68	24	0	19.57	16	0
3	INBYT-HI-(2015)-3	16.80	25	0	11.20	25	0	12.05	14	0	13.35	25	0
4	INBYT-HI-(2015)-4	28.38	11	0	18.92	11	0	19.18	6	1	22.16	5	0
5	INBYT-HI-(2015)-5	27.83	15	0	18.55	15	0	12.13	13	0	19.50	17	0
6	INBYT-HI-(2015)-6	32.03	4	1	21.35	4	1	8.16	23	0	20.51	12	0
7	INBYT-HI-(2015)-7	21.36	22	0	14.24	22	0	20.38	3	1	18.66	19	0
8	INBYT-HI-(2015)-8	33.09	2	1	22.06	2	1	14.15	9	0	23.10	3	0
9	INBYT-HI-(2015)-9	28.00	13	0	18.67	13	0	13.98	10	0	20.22	14	0
10	INBYT-HI-(2015)-10	31.66	6	1	21.10	6	1	12.57	12	0	21.78	7	0
11	INBYT-HI-(2015)-11	31.40	7	1	20.94	7	1	11.93	15	0	21.42	8	0
12	INBYT-HI-(2015)-12	31.35	8	1	20.90	8	1	11.54	16	0	21.27	9	0
13	INBYT-HI-(2015)-13	24.55	20	0	16.37	20	0	4.23	25	0	15.05	23	0
14	INBYT-HI-(2015)-14	26.22	17	0	17.48	17	0	19.23	5	1	20.98	10	0
15	INBYT-HI-(2015)-15	27.96	14	0	18.64	14	0	11.28	17	0	19.29	18	0
16	INBYT-HI-(2015)-16	32.87	3	1	21.91	3	1	10.56	21	0	21.78	6	0
17	INBYT-HI-(2015)-17	30.69	9	1	20.46	9	1	10.81	19	0	20.65	11	0
18	INBYT-HI-(2015)-18	17.77	24	0	11.85	24	0	10.72	20	0	13.45	24	0
19	INBYT-HI-(2015)-19	25.55	18	0	17.04	18	0	8.67	22	0	17.09	20	0
20	INBYT-HI-(2015)-20	34.42	1	1	22.95	1	1	21.36	1	1	26.24	1	1
21	INBYT-HI-(2015)-21	27.25	16	0	18.17	16	0	13.59	11	0	19.67	15	0
22	INBYT-HI-(2015)-22	18.10	23	0	12.07	23	0	16.58	8	0	15.58	22	0
23	INBYT-HI-(2015)-23	25.51	19	0	17.01	19	0	18.64	7	1	20.39	13	0
24	INBYT-HI-(2015)-24	30.17	10	1	20.11	10	1	20.00	4	1	23.43	2	0
25	BHS 352©	28.08	12	0	18.72	12	0	21.03	2	1	22.61	4	0
	G.M.	27.46			18.31			13.57					
	S.E.(M)	1.87			1.25			0.95					
	C.D.	5.61			3.74			2.86					
	C.V.	9.64			9.64			9.93					

Summary of ancillary data of INBYT-HI from different locations

S.No.	Entry	H days Mean & range	M days Mean & range	Height Mean & range (cm)
1	INBYT-HI-(2015)-1	103 (89-130)	145 (131-169)	64 (54-75)
2	INBYT-HI-(2015)-2	109 (96-131)	150 (135-175)	95 (84-105)
3	INBYT-HI-(2015)-3	103 (88-130)	144 (131-167)	66 (52-74)
4	INBYT-HI-(2015)-4	103 (88-128)	144 (132-169)	66 (52-80)
5	INBYT-HI-(2015)-5	111 (97-131)	150 (136-174)	100 (95-105)
6	INBYT-HI-(2015)-6	105 (91-127)	148 (135-170)	92 (83-98)
7	INBYT-HI-(2015)-7	114 (101-134)	151 (135-179)	93 (80-105)
8	INBYT-HI-(2015)-8	120 (94-141)	152 (136-176)	79 (66-91)
9	INBYT-HI-(2015)-9	109 (98-129)	145 (134-166)	101 (81-113)
10	INBYT-HI-(2015)-10	113 (99-135)	150 (136-175)	92 (83-103)
11	INBYT-HI-(2015)-11	118 (102-137)	152 (136-172)	95 (81-105)
12	INBYT-HI-(2015)-12	110 (98-130)	148 (135-167)	92 (81-101)
13	INBYT-HI-(2015)-13	112 (99-133)	151 (136-173)	92 (76-109)
14	INBYT-HI-(2015)-14	115 (103-133)	153 (139-175)	94 (89-103)
15	INBYT-HI-(2015)-15	117 (104-131)	155 (138-177)	90 (74-101)
16	INBYT-HI-(2015)-16	117 (102-137)	153 (138-175)	89 (76-100)
17	INBYT-HI-(2015)-17	112 (98-133)	150 (137-174)	95 (78-106)
18	INBYT-HI-(2015)-18	118 (106-141)	151 (137-176)	89 (82-102)
19	INBYT-HI-(2015)-19	110 (97-131)	150 (136-174)	91 (84-98)
20	INBYT-HI-(2015)-20	113 (99-136)	151 (136-175)	96 (82-105)
21	INBYT-HI-(2015)-21	113 (99-137)	150 (135-172)	92 (68-110)
22	INBYT-HI-(2015)-22	113 (101-132)	151 (137-176)	99 (93-111)
23	INBYT-HI-(2015)-23	111 (98-133)	151 (138-175)	100 (88-112)
24	INBYT-HI-(2015)-24	104 (89-127)	146 (135-165)	103 (98-113)
25	**BHS 352 ©**	111 (98-131)	148 (135-172)	100 (96-106)

2nd Global Spring Barley Yield Trial (2nd GSBYT)

2nd Global Spring barley yield trial comprised of 25 entries including national check (Jyoti) was conducted at Karnal, Faizabad, Rewa and Kanpur locations. The results based on yield at national level revealed that 7 entries fall into the first non-significant group. Among entries 2nd GSBYT-3 (2015) ranks first followed by 2nd GSBYT-23-(2015), 2nd GSBYT-19(2015), 2nd GSBYT-1(2015), 2nd GSBYT-6(2015), 2nd GSBYT-22(2015) and 2nd GSBYT-2(2015) and were in first NSG. The national check Joyti ranks eight among all 25 entries. Out of 25 entries, 1 entry at Karnal, 20 entries including check at Faizabad, 6 entries including check at Rewa and 2 entries at Kanpur which fall into the first non-significant group at the individual location. Based on field observation and plant type, entries 1, 2, 4, 5, 10, 11, 12, 13, 15, 16, 17, 19, 20, 21, 22 and 23 were selected by breeders of different centres during field day at IIWBR, Karnal. These entries will also be evaluated in elite International barley genetic stock nursery at different centers under barley network program.

2nd GSBYT: Grain yield and rank of entries from different locations

S.No	Entry	Karnal			Faizabad			Rewa			Kanpur			Over all Mean		
		Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
1	2nd GSBYT- 2015)- 1	19.89	8	0	43.67	9	1	24.98	3	1	36.85	7	0	31.35	4	1
2	2nd GSBYT- 2015)- 2	20.84	6	0	44.81	6	1	11.20	23	0	42.23	2	1	29.77	7	1
3	2nd GSBYT- 2015)- 3	21.16	5	0	44.43	8	1	22.85	5	1	38.76	5	0	31.80	1	1
4	2nd GSBYT- 2015)- 4	8.08	24	0	44.59	7	1	21.08	9	0	35.86	8	0	27.40	14	0
5	2nd GSBYT- 2015)- 5	10.92	21	0	38.14	21	0	12.24	21	0	34.01	11	0	23.83	23	0
6	2nd GSBYT- 2015)- 6	19.85	9	0	47.58	1	1	20.28	10	0	34.86	10	0	30.64	5	1
7	2nd GSBYT- 2015)- 7	21.80	4	0	43.23	11	1	17.79	11	0	30.71	19	0	28.38	10	0
8	2nd GSBYT- 2015)- 8	11.18	18	0	45.89	5	1	12.98	17	0	30.85	18	0	25.23	18	0
9	2nd GSBYT- 2015)- 9	7.13	25	0	39.38	20	1	14.11	15	0	20.13	25	0	20.19	25	0
10	2nd GSBYT- 2015)- 10	11.07	20	0	42.85	13	1	14.27	14	0	40.12	3	0	27.08	16	0
11	2nd GSBYT- 2015)- 11	17.71	11	0	42.60	16	1	17.62	12	0	32.55	16	0	27.62	13	0
12	2nd GSBYT- 2015)- 12	13.60	14	0	42.65	14	1	12.51	19	0	29.09	20	0	24.46	21	0
13	2nd GSBYT- 2015)- 13	15.59	13	0	37.15	25	0	14.49	13	0	32.92	12	0	25.04	20	0
14	2nd GSBYT- 2015)- 14	26.70	2	0	42.05	18	1	13.87	16	0	32.59	15	0	28.80	9	0
15	2nd GSBYT- 2015)- 15	16.87	12	0	43.40	10	1	21.18	8	0	27.92	21	0	27.34	15	0
16	2nd GSBYT- 2015)- 16	12.55	17	0	46.14	4	1	8.33	25	0	38.86	4	0	26.47	17	0
17	2nd GSBYT- 2015)- 17	30.09	1	1	37.86	24	0	11.91	22	0	31.87	17	0	27.93	11	0
18	2nd GSBYT- 2015)- 18	10.07	23	0	38.06	22	0	12.62	18	0	22.04	24	0	20.70	24	0
19	2nd GSBYT- 2015)- 19	24.85	3	0	47.52	2	1	27.23	1	1	26.72	23	0	31.58	3	1
20	2nd GSBYT- 2015)- 20	19.61	10	0	47.31	3	1	11.04	24	0	32.59	14	0	27.64	12	0
21	2nd GSBYT- 2015)- 21	10.17	22	0	42.21	17	1	12.44	20	0	32.72	13	0	24.39	22	0
22	2nd GSBYT- 2015)- 22	19.89	7	0	41.42	19	1	23.07	4	1	35.55	9	0	29.98	6	1
23	2nd GSBYT- 2015)- 23	11.12	19	0	42.61	15	1	26.68	2	1	45.99	1	1	31.60	2	1
24	2nd GSBYT- 2015)- 24	13.39	15	0	37.98	23	0	21.87	7	0	27.38	22	0	25.15	19	0
25	Jyoti ©	13.37	16	0	42.98	12	1	21.96	6	1	37.70	6	0	29	8	0
	G.M	16.30			42.66			17.14			33.23					
	S.E (m)	1.02			2.86			1.78			1.46					
	C.D	3.05			8.58			5.35			4.37					
	C.V	8.82			9.48			14.72			6.20					

Summary of ancillary data of 2nd GSBYT from different locations

S.No.	Entries	H days Mean & range	M days Mean & range	Height Mean & range (cm)
1	2nd GSBYT-(2015)- 1	79 (70-96)	121 (109-137)	94 (60-110)
2	2nd GSBYT-(2015)- 2	88 (73-105)	126 (116-143)	85 (65-96)
3	2nd GSBYT-(2015)- 3	87 (71-102)	125 (118-142)	92 (69-103)
4	2nd GSBYT-(2015)- 4	81 (70-98)	122 (110-136)	94 (70-111)
5	2nd GSBYT-(2015)- 5	84 (69-101)	121 (105-137)	84 (61-98)
6	2nd GSBYT-(2015)- 6	83 (67-105)	122 (102-141)	91 (77-108)
7	2nd GSBYT-(2015)- 7	84 (70-99)	123 (113-136)	85 (68-98)
8	2nd GSBYT-(2015)- 8	81 (65-100)	119 (105-135)	91 (59-106)
9	2nd GSBYT-(2015)- 9	87 (70-105)	126 (113-144)	89 (63-104)
10	2nd GSBYT-(2015)- 10	86 (72-101)	123 (113-140)	89 (71-102)
11	2nd GSBYT-(2015)- 11	84 (69-103)	120 (105-137)	86 (62-101)
12	2nd GSBYT-(2015)- 12	86 (71-103)	123 (111-139)	91 (57-104)
13	2nd GSBYT-(2015)- 13	82 (66-98)	120 (102-137)	89 (63-113)
14	2nd GSBYT-(2015)- 14	85 (68-105)	123 (106-141)	93 (80-119)
15	2nd GSBYT-(2015)- 15	83 (70-99)	120 (107-135)	90 (66-98)
16	2nd GSBYT-(2015)- 16	89 (75-105)	126 (114-140)	86 (60-103)
17	2nd GSBYT-(2015)- 17	87 (70-102)	122 (107-138)	91 (70-100)
18	2nd GSBYT-(2015)- 18	87 (71-105)	125 (113-146)	89 (71-99)
19	2nd GSBYT-(2015)- 19	82 (71-101)	124 (112-141)	94 (82-109)
20	2nd GSBYT-(2015)- 20	80 (65-99)	121 (105-137)	84 (53-97)
21	2nd GSBYT-(2015)- 21	86 (70-102)	123 (115-140)	90 (65-110)
22	2nd GSBYT-(2015)- 22	83 (73-99)	119 (106-135)	86 (61-96)
23	2nd GSBYT-(2015)- 23	87 (70-105)	125 (112-143)	85 (58-100)
24	2nd GSBYT-(2015)- 24	82 (68-100)	120 (110-135)	90 (62-113)
25	**Jyoti ©**	89 (72-107)	125 (115-143)	89 (70-98)

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

The nursery consisting of 167 entries including national check (DWRB 91) was conducted at four locations (Karnal, Durgapura, Hisar and Ludhiana). This nursery is more suited to Indian condition under optimum management and also fits better in maturity group. The mean grain yield & range and ancillary data is depicted in table given below for entries giving comparable yield to the national and international check. Based on plant types, yield and ancillary data, entries 2, 4, 6, 9, 19, 20, 23, 24, 27, 28, 31, 36, 37, 38, 41, 43, 50, 52, 55, 56, 57, 58, 59, 62, 64, 65, 67, 68, 69, 71, 72, 73, 77, 80, 83, 88, 93, 96, 98, 104, 110, 111, 113, 123, 124, 127, 131, 137, 138, 141, 146, 147, 148 and 153 were selected by breeders during field day at IIWBR, Karnal for use in their breeding programs. These selected entries will be evaluated in the next crop season as EIBGN at all barley network centres.

Summary of ancillary data of IBON-HI from different locations

S.No.	Entries	H days Mean & range	M days Mean & range	Height Mean & range (cm)	Yield (q/ha)
2	IBON-HI-14-15-2	89 (77-100)	131 (122-143)	91 (82-101)	16
19	IBON-HI-14-15-19	89 (79-97)	130 (120-139)	95 (90-101)	16
20	IBON-HI-14-15-20	91 (80-97)	131 (121-142)	92 (84-101)	22
23	IBON-HI-14-15-23	88 (77-96)	131 (120-139)	99 (88-112)	16
24	IBON-HI-14-15-24	97 (83-109)	135 (120-135)	101 (92-111)	18
27	IBON-HI-14-15-27	89 (81-96)	134 (127-143)	95 (81-109)	23
28	IBON-HI-14-15-28	102 (93-108)	137 (125-148)	99 (78-110)	19
29	IBON-HI-14-15-29	91 (79-100)	131 (120-139)	107 (88-105)	20
31	IBON-HI-14-15-31	87 (78-95)	130 (120-140)	101 (87-116)	20
36	IBON-HI-14-15-36	92 (79-102)	132 (123-143)	98 (92-104)	16
37	IBON-HI-14-15-37	92 (80-101)	132 (122-144)	99 (84-107)	22
40	IBON-HI-14-15-40	90 (77-102)	131 (120-143)	85 (77-94)	17
41	IBON-HI-14-15-41	85 (77-95)	133 (124-145)	86 (79-91)	16
43	IBON-HI-14-15-43	92 (79-100)	132 (123-143)	103 (93-114)	16
49	IBON-HI-14-15-49	96 87-102()	134 (127-140)	103 (96-109)	20
50	IBON-HI-14-15-50	92 (77-99)	129 (120-139)	93 (88-100)	18
52	IBON-HI-14-15-52	95 (79-104)	132 (120-143)	86 74-95()	16
55	IBON-HI-14-15-55	91 (83-98)	132 (122-141)	97 (82-112)	17
56	IBON-HI-14-15-56	91 (81-100)	133 (124-145)	95 (80-100)	16
57	IBON-HI-14-15-57	89 (81-98)	129 (122-139)	92 (85-98)	17

60	IBON-HI-14-15-60	99 (75-114)	134 (119-150)	103 (92-111)	19
62	IBON-HI-14-15-62	98 (88-105)	136 (28-143)	95 (87-106)	20
64	IBON-HI-14-15-64	90 (82-97)	131 (124-136)	94 (91-97)	19
65	IBON-HI-14-15-65	98 (87-104)	132 (124-138)	104 (90-118)	20
67	IBON-HI-14-15-67	92 (82-98)	131 (124-139)	99 (88-114)	21
68	IBON-HI-14-15-68	90 (82-100)	129 (124-137)	99 (94-104)	17
71	IBON-HI-14-15-71	93 (85-86)	131 (128-136)	93 (82-105)	17
75	IBON-HI-14-15-75	87 (77-95)	131 (120-137)	98 (92-104)	19
80	IBON-HI-14-15-80	90 (78-99)	130 (120-143)	99 (90-109)	22
87	IBON-HI-14-15-87	91 (83-101)	131 (124-136)	94 (83-105)	21
88	IBON-HI-14-15-88	93 (85-95)	131 (124-136)	100 (92-111)	19
102	IBON-HI-14-15-102	91 (79-99)	131 (120-143)	92 (82-102)	18
110	IBON-HI-14-15-110	90 (78-97)	129 (120-136)	89 (83-95)	21
112	IBON-HI-14-15-112	85 (78-91)	129 (122-137)	92 (78-98)	20
113	IBON-HI-14-15-113	88 (80-93)	128 (120-135)	91 (81-96)	22
116	IBON-HI-14-15-116	94 (82-105)	135 (122-144)	101 (86-115)	25
121	IBON-HI-14-15-121	92 (82-101)	132 (120-144)	98 (85-109)	19
123	IBON-HI-14-15-123	90 (81-100)	130 (120-140)	99 (92-102)	21
124	IBON-HI-14-15-124	91 (83-100)	131 (124-140)	99 (90-114)	20
127	IBON-HI-14-15-127	98 (86-103)	135 (126-146)	101 (85-117)	18
129	IBON-HI-14-15-129	88 (79-96)	129 (120-136)	93 (89-99)	25
130	IBON-HI-14-15-130	90 (80-100)	129 (120-136)	93 (88-102)	18
131	IBON-HI-14-15-131	90 (77-100)	130 (122-135)	88 (82-98)	21
133	IBON-HI-14-15-133	91 (82-100)	129 (122-137)	98 (92-102)	20
138	IBON-HI-14-15-138	91 (84-98)	132 (122-140)	100 (92-113)	19
139	IBON-HI-14-15-139	97 (82-107)	135 (122-147)	89 (84-96)	19
140	IBON-HI-14-15-140	91 (86-98)	133 (124-143)	91 (84-99)	21
146	IBON-HI-14-15-146	91 (83-99)	129 (122-136)	102 (87-109)	20
147	IBON-HI-14-15-147	88 (78-96-)	130 (122-136)	101 (88-110)	20
148	IBON-HI-14-15-148	96 (86-102)	134 (126-140)	105 (90-112)	18
167	IBON-HI-14-15-167	91 (80-99)	130 (120-139)	95 (84-104)	24

International Naked Barley Observation Nursery (INBON-HI)

The nursery consisted of 80 entries including national check (BHS 352) was grown at three locations viz., Karnal, Bajaura and Shimla. The yield and ancillary data are presented in table given below. There are number of entries which were higher yielder than checks. Based on grain yield and ancillary data the entries, 1, 2, 16, 17, 21, 22, 25, 26, 28, 32, 33, 37, 38, 39, 40, 42, 43, 44, 45, 46, 47, 61, 62, 74, 76 and 78 were selected by breeders during field day at IIWBR, Karnal for utilization in breeding programme.

Summary of ancillary data of INBON from different locations

S.No.	Entries	H days Mean & range	M days Mean & range	Height Mean & range(cm)	Yield (q/ha)
1	INBON-14-15-1	108 (91-125)	152 (135-168)	100 (92-107)	14
2	INBON-14-15-2	115 (101-129)	157 (144-170)	90 (88-91)	15
16	INBON-14-15-16	120 (104-135)	156 (142-170)	93 (88-98)	15
17	INBON-14-15-17	116 (101-131)	153 (143-163)	92 (91-93)	16
21	INBON-14-15-21	113 (100-125)	152 (136-168)	89 (88-89)	19
22	INBON-14-15-22	112 (98-125)	154 (136-171)	87 (87-87)	18
25	INBON-14-15-25	115 (100-129)	156 (142-169)	85 (77-94)	16
26	INBON-14-15-26	114 (99-158)	153 (136-170)	94 (90-97)	18
33	INBON-14-15-33	116 (103-129)	156 (142-170)	98 (96-100)	15
40	INBON-14-15-40	108 (91-125)	149 (132-165)	101 (101-101)	15
41	INBON-14-15-41	115 (100-130)	156 (142-170)	94 (85-102)	15
42	INBON-14-15-42	109 (89-129)	155 (141-168)	94 (84-104)	14
43	INBON-14-15-43	114 (99-128)	156 (142-170)	100 (96-103)	17
44	INBON-14-15-44	115 (100-129)	157 (143-171)	98 (95-102)	14
45	INBON-14-15-45	116 (102-130)	156 (142-169)	99 (95-102)	17
48	INBON-14-15-48	114 (99-129)	152 (137-166)	102 (100-105)	15
61	INBON-14-15-61	117 (104-130)	157 (146-168)	87 (85-88)	19
70	INBON-14-15-70	115 (102-127)	153 (136-170)	104 (98-110)	17
76	INBON-14-15-76	110 (95-125)	149 (135-163)	97 (91-103)	23
77	INBON-14-15-77	110 (95-125)	157 (142-171)	96 (93-98)	20
78	INBON-14-15-78	112 (98-125)	151 (136-165)	96 (90-102)	16

2nd Global Spring Barley Screening Nursery (2nd GSBSN)

The nursery consisted of 150 entries including national check RD 2552 was conducted at four locations (Karnal, Durgapura, Faizabad, and Kanpur). The yield and ancillary data are depicted in table given below. Based on plant types, yield and ancillary data, the entries 1, 2, 3, 4, 5, 7, 8, 11, 13, 16, 18, 23, 25, 26, 28, 35, 36, 37, 41, 44, 45, 56, 57, 58, 64, 78, 79, 81, 86, 89, 95, 104, 124, 128, 131, 133, 134 and 146 were selected by the breeders during field day at IIWBR, Karnal. The selected entries will be utilized in breeding programme.

Summary of ancillary data of 2nd GSBSN from different locations

S.No.	Entries	H days Mean & range	M days Mean & range	Height Mean & range (cm)	Yield (q/ha)
1	2nd GSBSN-2015)-1	90 (77-107)	128 (118-146)	82 (76-85)	10
2	2nd GSBSN-2015)-2	85 (74-99)	125 (112-147)	88 (81-98)	12
3	2nd GSBSN-2015)-3	86 (70-100)	122 (110-138)	80 (67-91)	10
5	2nd GSBSN-2015)-5	84 (70-98)	122 (110-137)	87 (69-105)	10
8	2nd GSBSN-2015)-8	79 (68-90)	119 (109-130)	85 (68-100)	14
11	2nd GSBSN-2015)-11	90 (75-106)	126 (112-145)	94 (85-105)	12
12	2nd GSBSN-2015)-12	88 (75-107)	125 (112-147)	92 (84-95)	13
13	2nd GSBSN-2015)-13	91 (74-107)	126 (112-147)	91 (82-100)	16
19	2nd GSBSN-2015)-19	90 (73-108)	127 (110-148)	91 (79-98)	13
22	2nd GSBSN-2015)-22	84 (72-90)	123 (110-136)	89 (71-97)	13
25	2nd GSBSN-2015)-25	86 (68-99)	123 (109-137)	84 (62-105)	13
28	2nd GSBSN-2015)-28	92 (82-114)	128 (118-147)	88 (79-100)	13
30	2nd GSBSN-2015)-30	85 (72-97)	123 (110-137)	81 (64-95)	14
35	2nd GSBSN-2015)-35	88 (74-98)	123 (112-133)	92 (70-100)	14
37	2nd GSBSN-2015)-37	91 (70-115)	128 (110-151)	83 (64-100)	12
41	2nd GSBSN-2015)-41	89 (71-111)	127 (110-146)	87 (60-100)	14
45	2nd GSBSN-2015)-45	89 (81-99)	125 (115-135)	88 (62-105)	13
48	2nd GSBSN-2015)-48	92 (84-107)	130 (118-147)	88 (69-100)	13
49	2nd GSBSN-2015)-49	93 (78-109)	130 (115-149)	91 (82-100)	11
56	2nd GSBSN-2015)-56	94 (80-109)	128 (115-144)	88 (71-100)	12
57	2nd GSBSN-2015)-57	88	123	90	12

		(75-99)	(112-136)	(70-100)	
58	2nd GSBSN-2015)-58	89 (74-104)	125 (112-141)	90 (80-98)	13
60	2nd GSBSN-2015)-60	85 (74-96)	123 (112-136)	77 (69-94)	18
63	2nd GSBSN-2015)-63	92 (80-106)	125 (115-143)	88 (69-99)	14
64	2nd GSBSN-2015)-64	91 (72-102)	123 (110-139)	82 (66-103)	12
66	2nd GSBSN-2015)-66	86 (78-92)	123 (115-131)	83 (65-104)	14
69	2nd GSBSN-2015)-69	90 (79-106)	123 (114-146)	85 (68-101)	13
70	2nd GSBSN-2015)-70	94 (80-107)	128 (115-147)	85 (70-94)	15
80	2nd GSBSN-2015)-80	91 (72-107)	124 (110-146)	88 (79-100)	10
81	2nd GSBSN-2015)-81	87 (73-99)	122 (110-138)	90 (86-94)	14
83	2nd GSBSN-2015)-83	94 (80-108)	126 (115-146)	89 (79-98)	12
88	2nd GSBSN-2015)-88	97 (80-111)	128 (115-149)	90 (88-96)	14
90	2nd GSBSN-2015)-90	83 (67-93)	122 (109-135)	76 (64-88)	13
96	2nd GSBSN-2015)-96	87 (76-104)	124 (112-144)	83 (68-98)	12
99	2nd GSBSN-2015)-99	92 (79-106)	126 (118-145)	91 (85-97)	12
100	2nd GSBSN-2015)-100	97 (84-109)	128 (118-148)	84 (77-93)	13
104	2nd GSBSN-2015)-104	91 (79-106)	125 (115-145)	89 (75-101)	13
123	2nd GSBSN-2015)-123	98 (86-105)	131 (122-146)	95 (84-104)	15
124	2nd GSBSN-2015)-124	96 (86-106)	131 (122-146)	92 (73-104)	13
128	2nd GSBSN-2015)-128	92 (80-103)	127 (119-140)	91 (85-94)	12
138	2nd GSBSN-2015)-138	89 (79-104)	124 (115-139)	92 (80-99)	13
139	2nd GSBSN-2015)-139	93 (76-107)	125 (112-142)	93 (76-101)	16
143	2nd GSBSN-2015)-143	89 (79-104)	124 (115-138)	87 (68-100)	14
145	2nd GSBSN-2015)-145	94 (79-112)	125 (115-144)	92 (81-108)	12
146	2nd GSBSN-2015)-146	87 (74-98)	122 (112-137)	90 (71-104)	13
150	2nd GSBSN-2015)-150	86 (77-99)	123 (114-137)	86 (78-94)	17

National Barley Genetic Stock Nursery (NBGSN)

A regular activity of barley network, every year this nursery is constituted with promising entries from network centres which include released varieties and advanced breeding materials from national programme. This year the nursery was constituted with 22 entries including donors of different traits along with better yielding ability. The nursery was supplied to all 11 centres under barley network and data were received from Durgapura, Hisar, Karnal, Ludhiana, Kanpur, Faizabad, Varansi, Rewa and Bajaur. The mean ancillary data and their range are given in table. Most of the entries were utilized by centres in their hybridization programme.

Elite International Barley Germplasm Nursery (EIBGN)

An elite international barley germplasm nursery was constituted with 45 genotypes selected from various international trials and nurseries of 2012-13 and 2013-14 and six national checks viz., BH 902, DWRB 73, DWRUB 52, DWRUB 64, RD 2035 and RD 2552. The nursery was supplied to all 11 cooperating centres and was also grown at IIWBR, Karnal during *rabi,* 2014-15. The nursery was sown in augmented block design along with national checks. This nursery included 4 entries each from IBYT-HI-(2013-14) and INBYT-HI-(2013-14), 3 entries from INBYT-HI-(2012-13), 13 entries from INBON-HI-(2013-14), 6 entries from Ist GSBSN-(2013-14), 8 entries from SMM-(2012-13) and 1 entry each from IBCB-W-(2012-13), IBYT-HI-(2012-13), IBYT-W-(2012-13), IstGBYT-HI-(2012-13), IBON-(2012-13) and IstGBON-(2012-13), respectively. The data received from different locations were analysed. Among the checks the highest yield was noticed in RD2552 at national level. Entry IBYT-HI-5(2013-14) ranked first in the first non significant group and showed superiority over all the checks. Out of 45 entries, 7 entries showed ranks in the non significant group. The result showed in general yield levels of Varanasi, Faizabad and rewa location were lower in comparison to other locations.

Summary of ancillary data of NBGSN from different locations

S.No.	Name	Sources for	D. Heading Maen & range	M. days Mean & range	Height Mean &range(cm)	Tillers/ meter	Spike length(cm)	Grains/ spike	1000 g. w. Mean &range	2/6 row
1	BH 963	High beta glucan	89 (74-116)	127 (115-148)	97 (87-113)	107 (80-195)	8.5 (6.6-10.2)	28 (17-38)	49.4 (39-58.4)	2
2	BH 946	Bold grain	85 (72-106)	125 (110-147)	94 (84-108)	97 (62-116)	7.5 (5.4-9.0)	51 (35-69)	36.7 (29-42)	6
3	BH 968	Test weight	84 (71-104)	125 (111-148)	91 (78-99)	112 (81-188)	8.2 (6.6-9.0)	28 (23-39)	44.3 (33.6-50.9)	2
4	BH 987	Overall malting quality	88 (75-106)	126 (111-146)	88 (77-102)	120 (77-210)	9.1 (8-10.2)	29 (19-40)	49.6 (38.8-58.2)	2
5	BH 992	Overall malting quality	77 (34-103)	126 (108-145)	94 (88-103)	115 (79-215)	8.6 (7.2-10)	31 (21-41)	47.6 (40.1-53.6)	2
6	BHS 380	Powdery mildew resistance	90 (73-108)	129 (120-145)	97 (86-106)	106 (68-141)	6.7 (5-8)	57 (44-66)	37.7 (29.9-46.6)	6
7	BHS 416	Powdery mildew resistance	94 (74-126)	131 (120-149)	98 (85-117)	108 (55 -177)	7.4 (5.3-9)	54 (40-70)	41.1 (35.7-47.6)	6
8	DWRB 101	Test weight and Kolbach index	84 (68-103)	125 (106-147)	87 (72-100)	111 (81-189)	7.8 (6-9)	29 (14-39)	49.1 (39.6-57.6)	2
9	DWRB 118	Test weight	82 (72-98)	124 (107-142)	86 (75-96)	91 (44-179)	7.3 (4.8-9.6)	38 (26-61)	47.1 (38-53.1)	6
10	DWRB 122	Malt friability	84 (73-100)	126 (106-143)	89 (78-102)	95 (52-172)	8.0 (6.8-9)	29 (16-38)	50.2 (41.3-57.7)	2
11	DWRB 127	Overall malting quality	83 (72-97)	125 (109-142)	92 (81-105)	103 (65-184)	8.6 (7.5-9.8)	30 (20-38)	52.6 (40.1-62.9)	2
12	HBL 719	Stripe rust resistance	90 (72-104)	129 (120-141)	95 (87-103)	117 (65-186)	8.44 (4.8-9.5)	41 (17-62)	34.8 (29.3-41.2)	6
13	NDB 1577	Bold grain & stripe rust resistance	85 (74-98)	127 (109-147)	95 (75-114)	109 (70-147)	6.8 (4.4-8)	57 (24-76)	43.5 (34-51.8)	6
14	NDB 1580	Stripe rust resistance	83 (72-97)	126 (109-148)	93 (77-107)	106 (66-167)	7.6 (5.4-10)	56 (45-72)	41.8 (34.2-50.1)	6
15	NDB 1592	Protein content and malt friability	87 (74-103)	125 (110-144)	91 (71-101)	97 (58-123)	8.2 (79.5)	53 (18-74)	38.2 (30-42.1)	6
16	RD 2786	Crude Protein & Yellow rust resistance	86 (71-104)	127 (111-147)	91 (82-103)	83 (62-100)	8.4 (6-9.7)	51 (12-72)	40.2 (34-46.1)	6
17	RD 2849	Test weight and malt friability	84 (71-98)	125 (108-143)	89 (70-99)	109 (68-184)	7.6 (5.3-9)	30 (21-41)	48.2 (40.2-53.9)	2
18	UPB 1037	Stripe rust resistance	85 (71-99)	126 (108-143)	89 (72-105)	119 (82-192)	7.8 (5.3-10)	29 (19-41)	46.5 (37-56.8)	2
19	UPB 1039	Stripe rust resistance	86 (72-100)	128 (120-147)	84 (71-109)	115 (80-190)	8.5 (6.6-10)	28 (14-40)	48.8 (40.1-56)	2
20	UPB 1042	Stripe rust resistance	89 (73-104)	130 (121-147)	87 (64-107)	123 (78-194)	8.5 (5.3-10.5)	31 (26-42)	43.9 (39-49)	2
21	VLB 118	Powdery mildew resistance	89 (72-106)	129 (120-142)	88 (69-102)	106 (67-181)	8.0 (4.9-10)	51 (31-76)	43.9 (31-51.2)	6
22	VLB 133	Leaf blight resistance	90 (74-107)	129 (119-142)	91 (78-107)	95 (48-138)	8.3 (5.8-10)	59 (38-84)	43.0 (30-65.2)	6

EIBGN: Grain yield data of different locations and national average with their ranks

Varieties	Durgapura			Karnal			Hisar			Ludhiana			Kanpur		
	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
IBYT-HI-(2013-14)-5	445	32	0	340	19	0	1296	10	1	808	1	1	715	19	0
IBYT-HI-(2013-14)-10	445	32	0	417	13	0	1271	11	1	458	12	0	765	16	1
IBYT-HI-(2013-14)-11	845	16	0	561	3	1	1258	12	1	358	22	0	1015	5	1
IBYT-HI-(2013-14)-13	145	45	0	307	28	0	1505	1	1	158	41	0	715	19	0
INBYT-HI-(2013-14)-12	195	44	0	343	18	0	1024	27	0	258	37	0	615	29	0
INBYT-HI-(2013-14)-13	1145	2	1	279	36	0	996	29	0	408	16	0	715	19	0
INBYT-HI-(2013-14)-14	945	10	1	324	23	0	1471	2	1	358	22	0	615	29	0
INBYT-HI-(2013-14)-22	945	10	1	425	10	0	1142	21	0	308	28	0	665	24	0
IBCB-W-36	845	16	0	482	7	1	1235	15	1	558	7	0	1315	2	1
IBYT-HI-(2012-13)-16	1028	6	1	231	43	0	1145	20	0	392	17	0	965	7	1
INBYT-HI-(2012-13)-2	1128	4	1	175	44	0	1190	17	1	292	29	0	665	24	0
INBYT-HI-(2012-13)-8	1028	6	1	339	20	0	1210	16	1	142	42	0	765	16	1
INBYT-HI-(2012-13)-14	428	35	0	267	38	0	1080	24	0	142	42	0	865	11	1
Ist GBYT-HI-(2012-13)-21	428	35	0	411	14	0	900	33	0	292	29	0	715	19	0
IBYT-W- (2012-13)-18	328	41	0	305	31	0	762	42	0	242	38	0	615	29	0
Ist GBYT-HI-(2012-13)-11	928	12	1	317	25	0	1073	25	0	242	38	0	465	37	0
INBON- HI- (2013-14)-3	428	35	0	310	27	0	1246	13	1	342	24	0	665	24	0
INBON- HI- (2013-14)-10	428	35	0	292	35	0	684	45	0	292	29	0	715	19	0
INBON- HI- (2013-14)-19	1028	6	1	267	39	0	1361	6	1	375	21	0	557	35	0
INBON- HI- (2013-14)-26	1128	4	1	257	40	0	1319	8	1	275	35	0	1257	3	1
INBON- HI- (2013-14)-55	628	26	0	106	45	0	745	43	0	125	44	0	307	41	0
INBON- HI- (2013-14)-59	528	30	0	299	33	0	1377	5	1	475	10	0	607	32	0
INBON- HI- (2013-14)-62	628	26	0	257	40	0	1120	22	0	125	44	0	157	43	0
INBON- HI- (2013-14)-64	928	12	1	432	9	0	1069	26	0	325	27	0	357	39	0
INBON- HI- (2013-14)-68	228	43	0	242	42	0	1118	23	0	275	35	0	157	43	0
INBON- HI- (2013-14)-42	828	18	0	312	26	0	1151	19	0	475	10	0	357	39	0
INBON- HI- (2013-14)-49	728	21	0	302	32	0	876	37	0	425	15	0	107	45	0
INBON- HI- (2013-14)-57	637	22	0	498	6	1	1236	14	1	383	19	0	573	34	0
INBON- HI- (2013-14)-25	237	42	0	534	4	1	1411	4	1	333	26	0	623	28	0
Ist GSBSN-(2013-14)-42	637	22	0	440	8	0	1006	28	0	233	40	0	873	10	1
Ist GSBSN-(2013-14)-7	617	28	0	418	12	0	1184	18	1	383	19	0	973	6	1
Ist GSBSN-(2013-14)-4	637	22	0	321	24	0	826	40	0	283	34	0	823	12	1
Ist GSBSN-(2013-14)-80	1137	3	1	424	11	0	770	41	0	683	4	1	1073	4	1
Ist GSBSN-(2013-14)-60	437	34	0	398	16	0	846	39	0	483	9	0	373	38	0
Ist GSBSN-(2013-14)-108	637	22	0	338	21	0	741	44	0	433	14	0	773	15	1
IBON- (2012-13)- 20	762	19	0	517	5	1	905	32	0	692	2	1	790	13	1
Ist GBON-(2012-13)-160	962	9	1	596	2	1	1454	3	1	592	5	0	1390	1	1
SMM- (2012-13)-18	1362	1	1	307	29	0	1300	9	1	492	8	0	890	8	1
SMM- (2012-13)-19	862	14	0	295	34	0	883	35	0	292	29	0	790	13	1
SMM- (2012-13)-39	862	14	0	399	15	0	890	34	0	592	5	0	640	27	0
SMM- (2012-13)-103	462	31	0	620	1	1	932	31	0	292	29	0	490	36	0
SMM- (2012-13)-105	562	29	0	335	22	0	1327	7	1	442	13	0	740	18	1
SMM- (2012-13)-106	362	39	0	375	17	0	943	30	0	392	17	0	590	30	0
SMM- (2012-13)-110	362	39	0	270	37	0	868	38	0	342	24	0	290	42	0
SMM- (2012-13)-120	762	19	0	307	29	0	882	36	0	692	2	1	890	8	1
BH 902	840.0			553.2			1139.4			530.0			850.0		
DWRB 73	980.0			452.0			1247.8			650.0			880.0		
DWRUB 52	980.0			353.6			1153.4			470.0			760.0		
DWRUB 64	840.0			375.6			1187.8			430.0			660.0		
RD 2035	310.0			143.0			1009.8			190.0			880.0		
RD 2552	1120			557.8			1268.6			580			1110		
CD at 5%	442.68			146.72			343.08			152.37			664.34		
DOS	22-11-2014			16-11-2014			19-11-2014			11-11-2014			25-11-2014		

EIBGN: Grain yield data of different locations and national average with their ranks

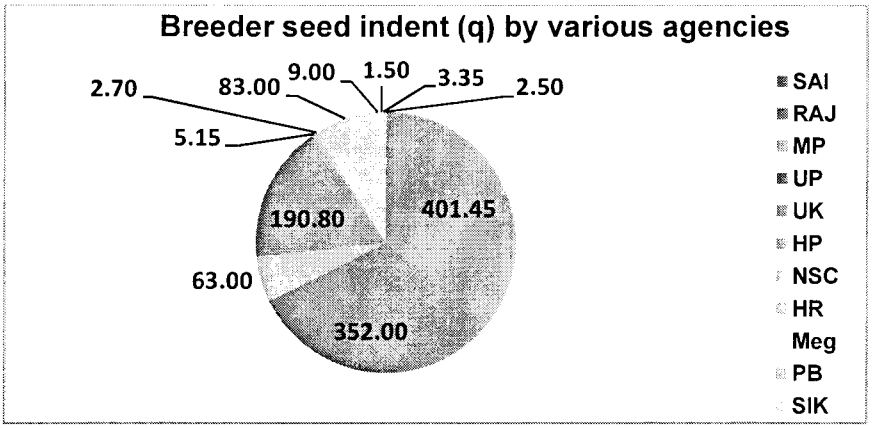
Varieties	Faizabad			Varanasi			Rewa			Bajaura			Pooled		
	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
IBYT-HI-(2013-14)-5	322	7	1	3649	1	1	262	38	0	821	13	1	962	1	1
IBYT-HI-(2013-14)-10	172	33	0	148	37	0	311	27	0	1031	3	1	558	17	0
IBYT-HI-(2013-14)-11	332	4	1	260	26	0	244	44	0	651	26	1	614	8	0
IBYT-HI-(2013-14)-13	197	25	1	148	37	0	294	33	0	941	8	1	490	31	0
INBYT-HI-(2013-14)-12	202	20	1	323	19	0	251	42	0	89	45	0	347	43	0
INBYT-HI-(2013-14)-13	201	22	1	276	25	0	265	37	0	561	30	0	538	20	0
INBYT-HI-(2013-14)-14	202	20	1	463	8	0	303	29	0	501	34	0	576	14	0
INBYT-HI-(2013-14)-22	197	25	1	148	37	0	326	17	1	421	41	0	509	28	0
IBCB-W-36	322	7	1	380	15	0	252	41	0	411	42	0	644	5	0
IBYT-HI-(2012-13)-16	88	40	0	287	23	0	307	28	0	756	20	1	578	12	0
INBYT-HI-(2012-13)-2	313	9	1	425	11	0	387	1	1	1056	2	1	626	7	0
INBYT-HI-(2012-13)-8	103	39	0	187	34	0	325	19	1	1086	1	1	576	13	0
INBYT-HI-(2012-13)-14	293	12	1	491	6	0	357	3	1	726	23	1	516	23	0
Ist GBYT-HI-(2012-13)-21	88	40	0	207	31	0	326	17	1	876	11	1	471	34	0
IBYT-W- (2012-13)-18	238	17	1	233	29	0	295	32	0	786	17	1	423	39	0
Ist GBYT-HI-(2012-13)-11	198	24	1	239	28	0	348	7	1	826	12	1	515	25	0
INBON- HI- (2013-14)-3	201	23	1	337	18	0	342	9	1	766	19	1	515	24	0
INBON- HI- (2013-14)-10	213	19	1	307	21	0	296	31	0	736	22	1	440	36	0
INBON- HI- (2013-14)-19	324	5	1	453	9	0	312	25	0	777	18	1	606	9	0
INBON- HI- (2013-14)-26	399	1	1	401	12	0	319	22	0	817	14	1	686	3	0
INBON- HI- (2013-14)-55	224	18	1	285	24	0	229	45	0	457	39	0	345	44	0
INBON- HI- (2013-14)-59	394	2	1	445	10	0	320	21	0	707	24	1	572	15	0
INBON- HI- (2013-14)-62	164	34	0	145	40	0	261	39	0	587	29	0	383	41	0
INBON- HI- (2013-14)-64	154	35	0	113	44	0	260	40	0	497	35	0	459	35	0
INBON- HI- (2013-14)-68	249	15	1	219	30	0	348	7	1	497	35	0	370	42	0
INBON- HI- (2013-14)-42	239	16	1	203	33	0	341	11	1	617	28	1	503	29	0
INBON- HI- (2013-14)-49	324	5	1	348	17	0	339	13	1	477	30	0	436	38	0
INBON- HI- (2013-14)-57	190	29	1	150	36	0	321	20	0	804	16	1	533	22	0
INBON- HI- (2013-14)-25	270	14	1	158	35	0	313	24	0	984	5	1	540	19	0
Ist GSBSN-(2013-14)-42	30	42	1	384	14	0	353	4	1	884	10	1	538	21	0
Ist GSBSN-(2013-14)-7	10	44	0	514	4	0	341	10	0	974	6	1	599	11	0
Ist GSBSN-(2013-14)-4	15	43	0	288	22	0	301	30	0	894	9	1	488	32	0
Ist GSBSN-(2013-14)-80	150	37	0	204	32	0	317	23	0	1024	4	1	643	6	0
Ist GSBSN-(2013-14)-60	140	38	0	664	3	0	329	16	1	954	7	1	514	26	0
Ist GSBSN-(2013-14)-108	10	44	0	374	16	0	364	2	1	674	25	1	481	33	0
IBON- (2012-13)- 20	191	27	1	489	7	0	340	12	1	742	21	1	603	10	0
Ist GBON-(2012-13)-160	191	27	1	687	2	0	248	43	0	812	15	1	770	2	0
SMM- (2012-13)-18	351	3	1	397	13	0	311	26	0	542	31	0	661	4	0
SMM- (2012-13)-19	301	10	1	257	27	0	290	34	0	442	40	0	490	30	0
SMM- (2012-13)-39	301	10	1	309	20	0	280	36	0	642	27	1	546	18	0
SMM- (2012-13)-103	176	31	0	137	42	0	337	14	1	482	37	0	436	37	0
SMM- (2012-13)-105	176	31	0	135	43	0	352	5	1	522	32	0	510	27	0
SMM- (2012-13)-106	151	36	0	139	41	0	349	6	1	152	44	0	384	40	0
SMM- (2012-13)-110	281	13	1	109	45	0	287	35	0	162	43	0	330	45	0
SMM- (2012-13)-120	181	30	0	503	5	0	337	14	1	512	33	0	563	16	0
BH902	371.0			339.6			350.2			600.0			619.3		
DWRB73	311.6			510.0			234.2			510.0			641.7		
DWRUB52	375.0			423.6			246.0			578.0			593.3		
DWRUB64	143.0			451.2			241.6			478.0			534.1		
RD2035	206.0			276.0			338.8			554.0			434.2		
RD2552	260			388			301.8			814.0			711.1		
CD at 5%	210.78			337.43			62.16			483.21			89.25		
DOS	22-12-2014			01-12-14			27-11-2014			15-11-2014					

BREEDER SEED PRODUCTION

Barley Breeder and Nucleus Seed Production and Test Stock Multiplication

Indent of Breeder Seed

To meet out the barley seed requirement of the country a consolidated indent of 1114.45 q breeder seed of 41 varieties was received from Deputy Commissioner (Seeds), Department of Agriculture & Cooperation, Ministry of Agriculture, Govt. of India. The indent included the requirements of nine states viz., Haryana, Himachal Pradesh, Madhya Pradesh, Meghalaya, Punjab, Rajasthan, Sikkim, Uttrakhand and Uttar Pradesh, National Seeds Corporation and Seed Association of India for the Rabi 2014-15. The major portion of the indent was given by SAI (401.45q) followed by Rajasthan (352.00q), U.P (191.10q), N.S.C. (83.00q), M.P. (63.00q), Haryana (9.00q), Uttrakhand (4.85q), Punjab (3.35q), H.P. (2.70q), Sikkim (2.50q) and Meghalaya (1.50q).



Production of Breeder Seed

To meet out the indented seed requirement, the allocation of 1111.75q breeder seed of 39 varieties was made to 12 research centers spread over in seven states (Haryana, H.P., M.P., Punjab, Rajasthan, Uttrakhand and U.P.) in the 53rd All India Wheat and Barley Workers' meet organized at JNKVV, Jabalpur. Due to certain technical reasons, the allocation of two varieties (BH 75 and K 287) could not be accepted by the concerned centers. Similarly, the production of Dolma, HBL 87, PRB-502, NDB 1020 and NDB 1173 varieties also, could not be materialized. The purity of breeder seed was verified by conducting 'Grow out Test' at IIWBR, Karnal and other centers. With a surplus of 29.41q, a net production of 1141.16q breeder seed of different varieties was reported against the total allocated quantity of 1111.75q.

From the indent, it is clear that highest demand was made for the variety RD 2660 (238.0q) followed by DWRUB 52 (105.0q) and PL 426 (95.65q) while least demand was also for outdated varieties namely Dolma (0.30q), HBL 87 (0.40q) and BH 75(0.40q). On the production front,

Rajasthan state occupied first position with a net production 522.0 q against the total allocation of 513.3 q breeder seed. Due to adverse climatic conditions especially during crop maturity (untimely heavy rainfall and winds), a deficit seed production was reported for the varieties DWRUB 52 (-45.44 q), DWRUB 64 (-3.80 q), DWRB 73 (-1.63 q), DWRB91(-6.05 q), DWRB-92 (-3.12 q), JB-58(-8.60 q), RD 2660(-198.0 q), RD-2668(6.00 q) and NDB 943(-30.70 q). On the other hand, surplus production was also reported in some varieties viz. PL-426 (41.50 q), RD 2052 (41.90 q), RD 2552 (57.20 q), RD 2592 (16.0 q), RD2624 (11.2 q), RD 2715 (23.0 q), RD 2786 (60.0 q), HUB 113 (36.8 q), NDB 940 (11.8 q) etc.

Test Stock multiplication and Nucleus seed Production

To ensure the breeder seed production for next year, the responsibility of nucleus seed production of 45 varieties was assigned to different concerned centers. In response to this, a total 61.35 q seed production was reported against the total allotment of 48.60 q nucleus seed. Except five varieties (BH 75, Dolma, HBL 87, NDB-1020, PL 426 and PRB 502), the nucleus seed of all varieties was reported to be produced in less or more quantity by respective centers. The maximum nucleus seed production was reported for variety RD-2668 (8.0 q) followed by RD 2668 (5.0 q), BH 946 (4.0 q), K 287 (3.5 q), RD 2715 (2.8 q) etc. In addition, test stock multiplications for the varieties of DWRB 101 (157.0 q), BH 959 (90.0 q) and RD 2849 (58.0 q) was also reported from National Seed Corporation Limited.

Variety wise details of *Breeder Seed Production* and *Nucleus Seed Production* of Barley (2014-15)

S. No	Varieties	Year of Notification	Quantity of Breeder seed (q)				Quantity of Nucleus Seed (q)		
			DAC Indent	Allotment as per BNS-I	Actual Production	Surplus(+) / Deficit (-) over BNS-I	Allotment as per BSP I	Actual Production	Surplus(+)/ Deficit(-) over BSP-I
1	BH-75	1985	0.40	-	--	-	0.40	--	-0.40
2	BH-393	2002	62.70	62.70	63.00	0.30	2.00	2.50	0.50
3	BH-902	2010	23.20	23.20	24.00	0.80	1.40	2.50	1.10
4	BH-946	2014	52.80	52.80	52.80	0.00	3.00	4.00	1.00
5	BH 959	2015	-	-	-	-	0.40	1.00	0.60
6	BHS-400	2014	5.0	5.0	5.0	0.0	0.40	0.85	0.45
7	Dolma	1982	0.30	0.30	0.00	-0.30	3.00	0.88	-2.12
8	DWRUB-52	2007	105.00	105.00	59.56	-45.44	0.80	0.58	-0.22
9	DWRUB-64	2012	11.20	11.20	7.40	-3.80	0.40	0.45	0.05
10	DWRB-73	2011	5.00	5.0	3.37	-1.63	0.80	0.88	0.08
11	DWRB-91	2013	29.40	29.40	23.35	-6.05	0.40	0.68	0.28
12	DWRB-92	2013	4.00	4.00	0.88	-3.12	0.40	0.41	0.01
13	DWRB 101	2015	-	-	-	-	0.20	-	-0.20
14	HBL-87 (Sonu)	1982	0.40	0.40	0.00	-0.40	0.20	-	-0.20
15	HUB-113	2014	23.20	23.20	60.0	36.80	1.40	0.60	-0.80
16	K-409 (Priti)	2001	5.00	5.00	4.10	-0.90	0.40	0.35	-0.05
17	K-551 (Ritambra	1998	4.00	4.00	10.0	6.00	0.40	0.30	-0.10
18	K-560 (Haritma)	1998	2.00	2.00	4.50	2.50	0.40	0.75	0.35
19	K-287 (Jagriti)	1985	2.30	-	-	-	0.40	3.50	3.10
20	NDB-940(NB-2)	2001	1.20	1.20	13.00	11.80	0.40	0.60	0.20
21	NDB-943(NB-5)	2009	48.20	48.20	17.50	-30.70	2.00	2.00	0.00
22	NDB-1020 (NB-3)	2002	1.20	1.20	0.00	-1.20	0.40	0.00	-0.40
23	NDB-1173	2005	30.20	30.20	27.00	-3.20	1.00	1.00	0.00
24	NDB-1445	2014	6.60	6.60	0.00	-6.60	0.40	0.70	0.30
25	JB-58	2005	41.00	41.00	32.40	-8.60	2.00	1.17	-0.83
26	JB-110	2010	15.00	15.00	29.70	14.70	0.80	1.05	0.25
27	PL-172	1987	7.60	7.60	10.00	2.40	0.40	0.90	0.50
28	PL-426	1996	95.65	95.65	137.15	41.50	3.00	--	-3.00
29	PL-751	2007	10.00	10.00	12.10	2.10	0.80	1.30	0.50
30	PL-807	2012	0.35	0.35	8.00	7.65	0.40	1.25	0.85

31	PRB-502	2010	1.20	1.20	0.00	-1.20	0.40	0.00	-0.40
32	UPB-1008	2011	3.45	3.45	3.50	0.05	0.40	0.50	0.10
33	VL Jau-56	2005	0.60	0.60	4.25	3.65	0.40	0.50	0.10
34	VL Jau-118	2012	3.00	3.00	6.60	3.60	0.80	1.00	0.20
35	RD-2035	1994	89.60	89.60	93.00	3.40	3.00	2.50	-0.50
36	RD-2052	1991	34.10	34.10	78.0	41.90	1.00	1.10	0.10
37	RD-2552	2000	2.80	2.80	60.0	57.20	0.80	2.00	1.20
38	RD-2592	2004	20.00	20.00	36.0	16.00	0.80	1.00	0.20
39	RD-2624	2005	5.80	5.80	17.00	11.20	0.80	1.00	0.20
40	RD-2660	2006	238.00	238.0	40.0	-198.0	7.00	8.00	1.00
41	RD-2668	2007	6.00	6.00	0.00	-6.00	0.40	5.00	4.60
42	RD-2715	2009	67.00	67.0	90.0	23.0	2.00	2.80	0.80
43	RD-2786	2013	50.00	50.0	110.0	60.0	2.00	2.25	0.25
44	RD 2794	2013	-	-	-	-	0.00	1.00	1.00
45	RD 2849	-	-	-	-	-	0.40	2.50	2.10
	Grand Total		**1114.45**	**1111.75**	**1141.16**	**29.41**	**61.35**	**48.60**	**61.35**

State/Centre wise details of Nucleus and Breeder Seed Production of Barley (2014-15)

S.N	State/ Institute	Varieties	Year of notification	Quantity of Nucleus Seed (q)			Quantity of Breeder Seed (q)			
				Allotment as per BNS-I	Actual Production	Surplus (+)/ Deficit (-) over BNS-I target	DAC Indent	Allotment as per BSP-I	Actual Production	Surplus (+)/Deficit (-) over BSP-I target
I.	Haryana									
	CCSHAU Hisar	BH-75	1985	0.40	--	-0.40	0.40	-	-	-
		BH-393	2002	2.00	2.50	0.50	62.70	62.70	63.00	0.30
		BH-902	2010	1.40	2.50	1.10	23.20	23.20	24.00	0.80
		BH-946	2014	3.00	4.00	1.00	52.80	52.80	52.80	0.00
		BH-959	--	0.40	1.00	0.60	-	-	-	-
				7.20	*10.00*	*2.80*	*139.10*	*138.70*	*139 .80*	*1.10*
	IARI Karnal	BHS-400	2014	0.40	0.85	0.45	5.0	5.0	5.0	0.00
				0.40	*0.85*	*0.45*	*5.0*	*5.0*	*5.0*	*0.00*
	IIWBR Karnal	DWRUB-52	2007	3.00	0.88	-2.12	105.00	105.00	59.56	-45.44
		DWRUB-64	2012	0.80	0.58	-0.22	11.20	11.20	7.40	-3.80
		DWRB-73	2011	0.40	0.45	0.05	5.00	5.00	3.37	-1.63
		DWRB-91	2013	0.80	0.88	0.08	29.40	29.40	23.35	-6.05
		DWRB-92	2013	0.40	0.68	0.28	4.00	4.00	0.88	-3.12
		DWRB-101	2015	0.40	0.41	0.01	-	-	-	-
				5.80	*3.88*	*-1.92*	*154.60*	*154.60*	*94.56*	*-60.04*
		Haryana Total		*13.40*	*14.73*	*1.33*	*298.70*	*298.30*	*239.36*	*-58.94*
2	Himachal Pradesh									
	CSKHPKV Bajaura	Dolma	1982	0.20	-	-0.20	0.30	0.30	0.00	-0.30
		HBL-87 (Sonu)	1982	0.20	-	-0.20	0.40	0.40	0.00	-0.40
		Himachal Pradesh Total		*0.40*	-	*-0.40*	*0.70*	*0.70*	*0.00*	*-0.70*
3	Madhya Pradesh									
	JNKVV Jabalpur	JB-58	2005	2.00	1.17	-0.83	41.00	41.00	32.40	-8.60
		JB-110	2010	0.80	1.05	0.25	15.00	15.00	29.70	14.70
		Madhya Pradesh Total		*2.80*	*2.22*	*-0.58*	*56.00*	*56.00*	*62.10*	*6.10*
4	Punjab									
	PAU Ludhiana	PL-172	1987	0.40	0.90	0.50	7.60	7.60	10.00	2.40
		PL-426	1996	3.00	--	-3.00	95.65	95.65	137.15	41.50
		PL-751	2007	0.80	1.30	0.50	10.00	10.00	12.10	2.10
		PL-807	2012	0.40	1.25	0.85	0.35	0.35	8.00	7.65
		Punjab Total		*4.60*	*3.45*	*-1.15*	*113.60*	*113.60*	*167.25*	*53.65*
5	Rajasthan									
	SKNAU Jobner	RD-2035	1994	3.00	2.50	-0.50	89.60	89.60	93.0	3.40
		RD-2052	1991	1.00	1.10	0.10	34.10	34.10	76.0	41.90
		RD-2552	2000	0.80	2.00	1.20	2.80	2.80	60.0	57.20

		RD-2592	2004	0.80	1.00	0.20	20.00	20.00	36.0	16.00
		RD-2624	2005	0.80	1.00	0.20	5.80	5.80	17.0	11.20
		RD-2660	2006	7.00	8.00	1.00	238.00	238.00	40.0	-198.00
		RD-2668	2007	0.40	5.00	4.60	6.00	6.00	0.00	-6.00
		RD-2715	2009	2.00	2.80	0.80	67.00	67.00	90.0	23.00
		RD-2786	2013	2.00	2.25	0.25	50.00	50.00	110.0	60.00
		RD-2794	--	0.00	1.00	1.00	--	--	--	--
		RD-2849	--	0.40	2.50	2.10	--	--	--	--
		Rajasthan Total		*18.20*	*29.15*	*10.95*	*513.30*	*513.30*	*522.00*	*8.70*
6	Uttrakhand									
	GBPUA &T Pantnaga	PRB-502	2010	0.40	0.00	-0.40	1.20	1.20	0.00	-1.20
		UPB-1008	2011	0.40	0.50	0.10	3.45	3.45	3.50	0.05
				0.80	0.50	-0.30	4.65	4.65	3.50	-1.15
	VPKAS Almora	VL Jau-56	2005	0.40	0.50	0.10	0.60	0.60	4.25	3.65
		VL Jau-118	2012	0.80	1.00	0.20	3.00	3.00	6.60	3.60
				1.20	1.50	0.30	3.60	3.60	10.85	7.25
		Uttrakhand Total		*2.00*	*2.00*	*0.00*	*8.25*	*8.25*	*14.35*	*6.10*
7	Uttar Pradesh									
	BHU Varanasi	HUB-113	2014	1.40	0.60	-0.80	23.20	23.20	60.0	36.80
				1.40	0.60	-0.80	*23.20*	*23.20*	*60.0*	*36.80*
	CSAUA &T Kanpur	K-409 (Priti)	2001	0.40	0.35	-0.05	5.00	5.00	4.10	-0.90
		K-551	1998	0.40	0.30	-0.10	4.00	4.00	10.00	6.00
		K-560 (Haritma)	1998	0.40	0.75	0.35	2.00	2.00	4.50	2.50
		K-287 (Jagriti)	1985	0.40	3.50	3.10	2.30	-	-	-
				1.60	*4.90*	*3.30*	*13.30*	*11.00*	*18.60*	*7.60*
	NDUA&T Faizabad	NDB-940(NB-	2001	0.40	0.60	0.20	1.20	1.20	13.00	11.80
		NDB-943(NB-	2009	2.00	2.00	0.00	48.20	48.20	17.50	-30.70
		NDB-1020 (NB-	2002	0.40	0.00	-0.40	1.20	1.20	0.00	-1.20
		NDB-1173	2005	1.00	1.00	0.00	30.20	30.20	27.00	-3.20
		NDB-1445	2014	0.40	0.70	0.30	6.60	6.60	0.00	-6.60
				4.20	*4.30*	*0.10*	*87.40*	*87.40*	*57.50*	*-29.90*
		Uttar Pradesh Total		*7.20*	*9.80*	*2.60*	*123.90*	*121.6*	*136.1*	*14.5*
Grand Total				48.60	61.35	12.75	1114.45	1111.75	1141.16	29.41

Molecular Report of AVT Final Year Entries

Advanced Varietal Trial entries (BH976 and PL874) for irrigated (Malt Barley) Timely Sown (NWPZ) were characterized at molecular level for developing molecular profiles and to understand the genetic variability in Indian barley lines. A set of seven genotypes including two test entries and five checks were screened using SSR/STS markers randomly covering seven chromosomes of barley genome. Total 59 SSR markers covering all the seven chromosomes of barley were screened with two final year test entries (BH976 and PL874) and five check varieties (BH902, DWRUB52, DWRB92, DWRB101 and RD2849) 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) values were determined. In total 104 alleles were scored in selected genotypes for PCR based amplification profiles of AVT 2nd year entries. The number of alleles ranged from 1 to 4 with an average of 1.74 alleles per locus. The band fragment sizes varied from 109 bp to 800 bp with PIC values ranging from 0 to 0.736. Out of 59 molecular markers screened, 38 were found polymorphic for the entries and checks thus indicating sufficient coverage of barley genome during molecular screening. Molecular statistics were comparable with previous crop season (2013-14) AVT 2nd year trial entries. This suggested that genetic variability of barley genotypes has maintained for major barley sowing region (NWPZ) of India. These statistics of genetic variability at molecular may also be due to use of higher number of SSR/STS markers screened this year to comprehensively cover barley genome to address lesser number of entries i.e. only seven in this year AVT trial. During molecular analysis, chromosome 3H was found most variable followed by 2H and 6H chromosomes whereas chromosome 4H was observed least variable followed by 1H chromosomes for final year AVT.

Allele molecular weight data of amplified profiles were converted to develop binary format (allele presence = "1" and allele absence = "0") for analysis with NTSYS-PC version 2.1. The 0/1 matrix was used to calculate genetic similarity as DICE coefficient using SIMQUAL subprogram and the resultant similarity matrix was employed 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. The dendrogram generated clearly indicates that the final year test entries do not cluster at one place and are quite diverse from each other and rest of five check lines. The seven genotypes grouped within similarity coefficient (GS) value from 0.55 to 1.0 and showed sufficient genetic variability at molecular level.

The cluster tree for seven genotypes divided was into two sub-clusters at GS= 0.55. The cluster I grouped four genotypes including both test entries (BH976 and PL874) and two check lines. Group II comprised rest of the three check lines developed for NWPZ sowing zone for similar end use i.e. malt barley. Cluster I further subdivided into two sub cluster at GS=0.61 into two equal groups carrying one check line and one test entry in each group. All the genotypes under study could be distinguished using these markers. 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.

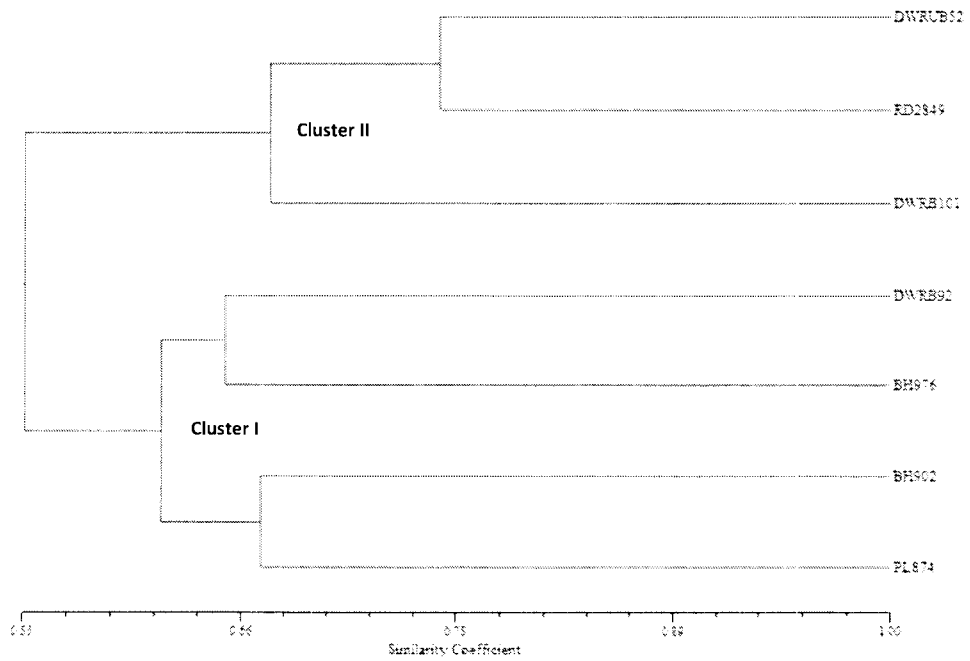


Figure 1: UPGMA based clustering of AVT 2nd year genotypes on the basis of SSR/STS markers based amplification profiles.

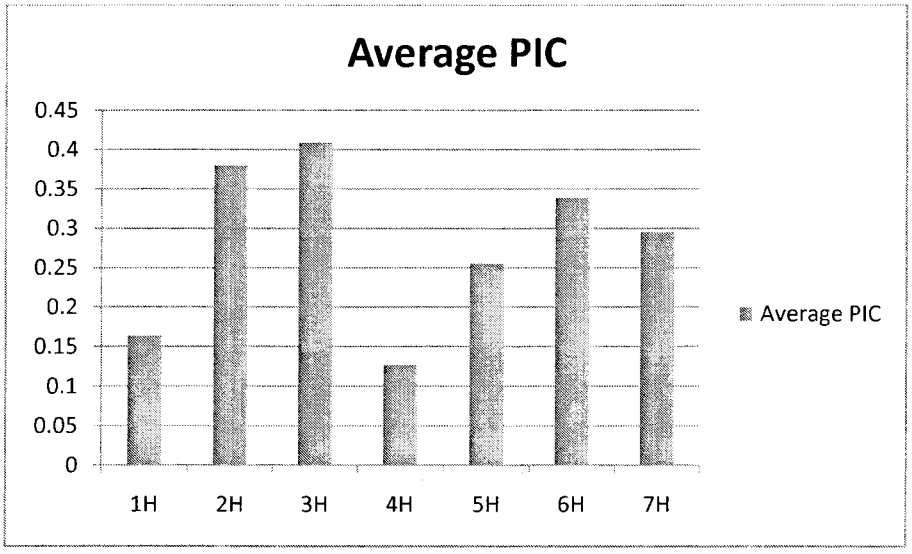


Figure 2: Polymorphic information content scored for individual chromosome of barley genome

Molecular Profiles of Barley AVT Final Year Entries (2014-15)

Sr No.	Marker-SSR/STS	Chr	BH 902©	DWRUB52©	DWRB92 ©	DWRB101 ©	RD2849©	BH976	PL874
1.	Bmac154	1H	130	130	140	130	140	140	140
2.	Bmac213	1H	180	180	180	180	180	180	180
3.	Bmag382	1H	109	109	109	109	109	109	109
4.	Bmag579	1H	126	126	126	126	126	110	126
5.	MGB402	1H	260	260	260	260	260	260	240
6.	ScSSR10477a	1H	150	150	150	150	150	150	150
7.	Bmac67	2H	175	190	160	190	190	190	175
8.	Bmac175c	2H	160	180	160	180	180	180	180
9.	Bmac576	2H	149	160	149	160	160	149	149
10.	Bmag15	2H	181	181	181	181	181	181	181
11.	Bmag518	2H	168	140	140	140	140	140	168
12.	Bmag749	2H	166	140	166	166	140	166	166
13.	Bmag829	2H	350	300	350	350	300	350	350
14.	cMWG658	2H	580	600	600	580	580	600	600
15.	EBmac525	2H	149	149	N	149	149	149	149
16.	EBmac623	2H	154	168	154	168	154	154	154
17.	EBmac640	2H	176	190	190	176	190	176	190
18.	Ebmac715	2H	153	190	153	190	190	153	153
19.	Ebmatc 39	2H	139	150	150	150	150	139	139
20.	Bmag6	3H	274	274	274	274	274	274	274
21.	Bmag13	3H	160	160	210	195	180	210	180
22.	Bmag541	3H	120	220	220	220	220	220	120
23.	Bmag603	3H	140	122	140	122	122	122	122
24.	Bmag877	3H	153	153	153	165	165	153	153
25.	Ebmac541	3H	140	120	140	140	120	120	140
26.	MWG798	3H	340	375	340	375	375	375	375
27.	ABG500b	4H	189	189	189	189	189	189	189
28.	EBmac701	4H	180	180	180	180	180	180	180
29.	EBmag781	4H	149	149	149	149	149	149	149
30.	HVM40	4H	160	150	150	150	160	160	150
31.	HVM67	4H	136	136	136	136	136	136	136
32.	HVMLOH1A	4H	185	185	175	185	185	185	185
33.	Ksug10	4H	130	110	130	130	110	130	130
34.	MWG634	4H	800	800	800	800	800	800	800
35.	WG622	4H	161	161	161	161	161	161	161
36.	Bmac163	5H	146	160	146	146	146	160	146
37.	Bmag222	5H	150	150	179	179	179	150	150
38.	Bmag337	5H	135	145	145	145	135	135	145
39.	Bmag387	5H	123	123	123	123	123	123	123

40.	Bmag751	5H	189	189	189	189	189	189	189
41.	Bmag760	5H	110	110	110	110	110	110	110
42.	Bmag812	5H	157	157	167	157	167	157	157
43.	GMS61	5H	135	145	145	145	145	145	145
44.	ABG458	6H	248	N	248	N	N	248	248
45.	Bmac40	6H	236	210	210	210	236	236	210
46.	Bmac500	6H	190	190	190	110	190	110	110
47.	Bmag173	6H	140	150	150	150	150	150	150
48.	GBM1215	6H	240	200	240	200	200	240	200
49.	HVM11	6H	175	150	150	185	175	185	185
50.	MWG2029	6H	N	200	N	200	200	N	N
51.	ABC15864	7H	167	167	167	167	167	167	167
52.	Bmac64	7H	140	140	155	140	155	155	140
53.	Bmac162	7H	200	200	200	200	200	200	200
54.	Bmac167	7H	184	195	184	195	195	184	184
55.	Bmac224	7H	210	210	210	210	210	210	210
56.	Bmac297	7H	110	110	110	100	110	110	100
57.	Bmag110	7H	145	145	160	160	145	160	135
58.	Bmag369	7H	191	191	191	191	191	191	191
59.	Bmag341	7H	230	200	215	215	200	215	230

Molecular weight of amplicons measured in base pairs and calibrated with 100 bp Ladder; N: Null allele

CROP PROTECTION

BARLEY CROP PROTECTION

Status of barley diseases

The different cooperating centres carried out the survey for recording the presence of barley diseases in their command area throughout the crop season 2014-15. Stripe rust was observed in Punjab, Haryana, Uttarakhand, Himachal Pradesh, Jammu and Kashmir in some of the farmer's fields. There was no report of natural occurrence of black rust in barley from any of the barley growing areas of India except Wellington and Dharwar.

The scientist from cooperating centre RARI, Durgapura, Jaipur conducted survey on 14th - 15th January, and 25th - 26th February, 2015 in the area of Dausa and Chomu, Sahapura, Kotputli, Paota and Jobner areas of Jaipur. None of the rust was observed. However, traces to 5 per cent Incidence of loose smut was noted in most of the barley fields having variety RD2035 and RD2552. Incidence of covered smut, *Drechslera* stripe and bacterial streak *in traces* were also noted in few fields. In some fields, early sown crop of barley was facing infertility problem due to adverse effect of cold. Mild infestation of termite was also noted. Overall barley crop was healthy in the area surveyed.

The monitoring team visited barley growing regions / centres during the crop season on 15-19 Feb. 2015, in the areas of SK Nagar, Udaipur, Banswara and Kota centres. There was no rust incidence in any of barley field. Leaf blight and foliar aphids were present in few areas. During 25-26 Feb. 2015 survey was undertaken in Mathura, Morena and Gwalior centres to monitor barley trials. There was no rust in any of barley field in the visited areas. Leaf blight and foliar aphids were present in few areas.

Survey was also conducted North Eastern and South Western Districts of Haryana by the scientists from CCS HAU, Hisar center. Mainly BH393 and local varieties were grown in this area. Among three rusts, only stripe rust was observed with the severity of traces to 40S in the variety BH 393. The leaf blight was recorded at some places with severity of 35 on double digit scale. In some farmers field loose smut and covered smut were also observed.

Varanasi, Miezapur, Gazipur and Azangarh area were survey by scientist from BHU, Varanasi center on 6 March 20415. K 125, Jyoti, Ratana, Lakhan, RD 2552 and RD 2508 were the varieties commonly grown in the area. Leaf blight severity was around 57 in the area surveyed. Loose smut, covered smut and powdery mildew were also observed at low incidence.

Incidence of barley rusts and pathotype distribution

Among the three rusts of barley, yellow rust occurred in some areas during the year. however, incidence was negligible. Black and brown rusts of barley were not reported from any location. Among the fifteen samples of barley yellow rust (*Puccinia striiformis* f. sp. *hordei*) received during the year, 10 were analyzed. Pathotypes M(1S0) and 57 (0S0) were observed in samples received from Himachal Pradesh, Jammu and Kashmir, Uttarakhand, Rajasthan and Nepal. The frequency of pathotype M (1S0) was higher than the pathotype 57 (0S0).

Pathotype distribution of *Puccinia striiformis hordei* during 2014-15 in India and Nepal

S. No.	States/ Countries	Number of sample received	Number of samples analyzed	Pathotypes	
				M (1S0)	57 (0S0)
1	Himachal Pradesh	06	03	03	-
2	Uttarakhand	03	03	02	01
3	Rajasthan	01	01	-	01
4	Nepal	05	03	02	01
Total		15	10	07	03

Observation of any new barley diseases/ insect pests

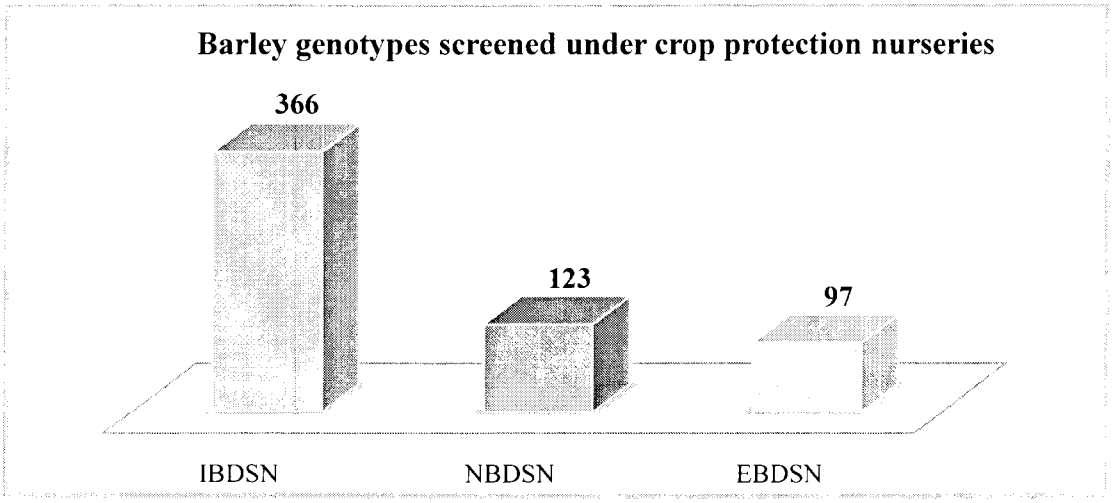
To observe the appearance of any quarantine pests on barley crop the nurseries were observed for any new symptoms during the crop season till the harvest. There was no report from any centre for presence of any of following quarantined pests (disease / insect pest) in their respective areas during the crop season 2014-15.

i. Glume rot - Not reported by any centre
ii. Barley stripe mosaic - Not reported by any centre
iii. Ergot - Not reported by any centre

Status of resistance in breeding lines and advanced entries

Adult plant resistance (APR)

During the year 2014-15, barley entries were screened under various nurseries (IBDSN, NBDSN and EBDSN) for resistance against various diseases, aphid and CCN at different cooperating centers. There were 366 entries under IBDSN, 123 were for NBDSN and 97 for EBDSN. Seedling Resistance Test (SRT) for NBDSN and EBDSN entries was conducted at DWR Regional station, Shimla.



During this season, experiments on chemical control of stripe rust and blight were conducted at various locations to evaluate various fungicides for management of diseases. NBDSN entries were screened for aphid and CCN resistance in five locations viz., Vijapur, Ludhiana, Kanpur, Pantnagar and Durgapura.

Initial Barley Disease Screening Nursery (IBDSN)

During 2014-15 crop season, 366 IBDSN entries were screened for resistance against major diseases viz., stripe rust, stem rust, and leaf blight at various coordinating centres. The screening of stripe rust was done at Dhaulakuan, Durgapura, Karnal, Bajaura, and Ludhiana. Due to rainfall with stormy winds at the time of heading stage resulted in lodging therefore yellow rust severity remained very low at Ludhiana, Dhaulakuan, Karnal and Hisar so these data are not included. Leaf rust screening was done at Ludhiana but due to poor rust development the entries could not be screened properly for leaf rust resistance. Stem rust screening was done at Wellington centre but severity remained low. The leaf blight screening was done at Pantnagar, Varanasi, Dharwar, Kanpur and Faizabad.

The inocula for stripe rusts were supplied by DWR 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 DWR, Karnal centre was applied by centres in the field during Jan..- Feb. and the scoring of blight disease was done at dough stage in double digit scale on F and F-1 leaf. The highest score (HS) was taken into consideration for leaf blight whereas in case of 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, the genotypes showed an average score of 00-13 with highest score upto 35 at multilocation were considered highly resistant and genotypes with average score of 14-35 and 36 to 57 with highest score not exceeding 57 were considered as resistant (R) and moderately resistant (MR) respectively.

Out of 366 IBDSN entries tested, 42 entries were found free from yellow rust (ACI = 0) and 126 entries showed resistant reaction have ACI less than 10. In case of leaf blight screening, 6 entries were found between average score of 36-57 and the highest score of 69 against leaf blight.

Yellow rust, ACI = 0, Entries – 42,	PKB1404, PKB1405, HBL740, BL988, JB322, JB331, NDB1650, BBM696, BBM709, BBM713, BK1413, HUBL1428, UPBM14, BH39, BH44, BD1633, BD1641, BD1642, BD1643, BD1644, BD1645, BD1646, BD1648, BD1651, BD1652, BD1653, BD1654, BD1655, BD1656, BD1657, BD1659, BD1660, BD1661, BD1662, BD1663, BD1665, BD1667, BD1668, BD1669, BD1670, VLB6, and VLB16
Yellow rust, ACI > 0 to 10, Entries – 126,	PKB1401, PKB1402, PKB1403, PKB1419, PKB1420, PKB1424, PKB1426, HBL733, HBL739, HBL743, HBL746, HBL747, HBL748, HBL749, HBL750, HBL751, HBL752, HBL753, HBL754, HBL755, HBL756, HBL757, HBL758, BL978, BL980, BL981, BL982, BL984, BL993, BL1050, BL1054, BL1055, JB314, JB315, JB316, JB318, JB319, JB324, JB325, JB328, JB330, NDB1628, NDB1638, NDB1639, BBM697, BBM698, BBM699, BBM703, BBM704, BBM705, BBM706, BBM708, BBM710, BBM711, BBM712, BBM714, BBM715, BBM716, BBM717, BBM718, BBM719, BK1401, BK1403, BK1404, BK1405, BK1406, BK1407, BK1408, BK1409, BK1410, BK1411, BK1412, BK1416, BK1418, BK1422, BK1424, BK1425, BK1426, BK1427, BK1428, BK1429, BK1430, HUBL1414, UPBM4, UPBM9, UPBM11, BH1, BH7, BH11, BH17, BH24, BH25, BH31, BH40, BH41, BH42, BH43, BD1632, BD1634, BD1635, BD1636, BD1637, BD1638, BD1639, BD1640, BD1647, BD1649, BD1650, BD1658, BD1664, VLB1, VLB2, VLB3, VLB4, VLB5, VLB9, VLB14,

	VLB15, VLB17, VLB18, VLB19, VLB21, VLB22, VLB23, VLB26 and VLB27
Leaf blight, Avg. 36-57 HS 69, Entries - 6	UPBM5, BH21, BH25, VLB20, VLB21 and VLB24

Reactions of different entries of barley in Initial Barley Disease Screening Nursery (IBDSN)

S. No.	IBDSN (2014- 15)	Yellow Rust		Leaf Blight		Stem Rust	Leaf Rust
		ACI	HS	Avg.	HS		
1	PKB1401	1.0	5MR	57	89	5S	0
2	PKB1402	2.0	5MS	58	89	5S	0
3	PKB1403	1.0	5MR	57	89	0	0
4	PKB1404	0.0	0	78	89	0	0
5	PKB1405	0.0	0	68	89	0	0
6	PKB1406	55.0	80S	56	89	5S	0
7	PKB1407	11.0	20 S	67	99	0	0
8	PKB1408	34.0	60 S	78	99	0	0
9	PKB1409	11.0	20 S	78	99	5S	0
10	PKB1410	25.0	40 S	78	89	0	0
11	PKB1411	55.0	80S	78	99	0	TS
12	PKB1412	45.0	60S	58	89	0	5S
13	PKB1413	45.0	80S	68	89	5S	0
14	PKB1414	12.0	20 S	68	89	0	0
15	PKB1415	60.0	80S	78	99	5S	0
16	PKB1416	90.0	100S	77	99	5S	5S
17	PKB1417	80.0	80S	77	99	5S	TS
18	PKB1418	70.0	80S	78	99	0	20S
19	PKB1419	2.0	10MR	67	99	0	0
20	PKB1420	4.0	10MS	57	89	0	0
20A	INFECTOR	100.0	100S	89	99	5S	40S
21	PKB1421	45.0	60S	68	99	0	20S
22	PKB1422	17.0	30 S	57	89	0	10S
23	PKB1423	80.0	100S	78	99	5S	0
24	PKB1424	8.0	20MS	78	99	0	0
25	PKB1425	15.0	30S	68	99	0	10S
26	PKB1426	4.0	10MS	57	79	0	0
27	PKB1427	25.0	30S	68	78	0	0
28	PKB1428	20.0	40S	58	79	0	0
29	PKB1429	20.0	20S	56	89	0	0
30	PKB1430	30.0	60S	67	89	0	0
31	PKB1431	40.0	80 S	67	89	0	0
32	PKB1432	50.0	100S	67	89	0	10S
33	PKB1433	22.0	40 S	57	89	5S	0
34	PKB1434	11.5	15 S	57	99	0	0

35	PKB1435	37.5	60S	67	89	0	20S
36	PKB1436	14.0	20 S	67	89	5MR	0
37	PKB1437	50.0	60S	67	89	5MR	0
38	PKB1438	60.0	100S	78	99	5MR	0
39	PKB1439	30.0	60S	68	89	0	0
40	PKB1440	21.0	30 S	67	89	0	0
40A	INFECTOR	100.0	100 S	89	99	0	40S
41	HBL733	8.5	15 S	57	89	0	0
42	HBL739	8.0	20MS	67	99	0	0
43	HBL740	0.0	0	78	99	0	0
44	HBL741	30.0	60S	67	99	0	0
45	HBL742	11.5	15 S	68	89	0	0
46	HBL743	4.0	10MS	57	89	0	0
47	HBL744	15.0	30S	57	99	5S	0
48	HBL745	30.0	60S	56	89	10MR	0
49	HBL746	10.0	20S	67	89	0	0
50	HBL747	2.0	10MR	78	99	0	0
51	HBL748	0.2	TMR	67	99	0	0
52	HBL749	2.0	10MR	88	99	0	0
53	HBL750	4.0	10MS	57	89	0	0
54	HBL751	2.0	5MS	46	89	0	0
55	HBL752	2.5	5S	57	89	0	0
56	HBL753	5.0	10S	46	89	0	0
57	HBL754	5.0	10S	56	89	0	0
58	HBL755	0.2	TMR	57	89	0	0
59	HBL756	10.0	20S	67	89	0	0
60	HBL757	2.5	5 S	57	89	0	0
60A	INFECTOR	100.0	100 S	89	99	0	40S
61	HBL758	8.0	20MS	67	99	0	0
62	HBL759	15.5	20MS	67	89	0	5S
63	HBL760	11.5	20MR	57	89	0	0
64	BL976	24.0	60MS	56	99	0	0
65	BL978	7.0	10MR	47	79	0	10S
66	BL980	2.0	10MR	46	79	0	20S
67	BL981	2.0	10MR	57	89	0	10S
68	BL982	1.0	5MR	57	89	0	10S
69	BL984	2.0	10MR	57	89	0	5S
70	BL988	0.0	0	46	79	0	0
71	BL989	50.0	100S	57	89	0	0
72	BL993	2.0	10MR	46	79	0	10S
73	BL1020	24.0	60MS	56	89	0	0
74	BL1023	20.0	40S	57	89	0	0

75	BL1033	45.0	60S	67	89	0	0
76	BL1034	50.0	60S	46	79	0	5S
77	BL1043	40.0	80S	57	89	0	0
78	BL1045	70.0	80S	57	79	0	0
79	BL1048	11.0	20 S	56	79	5S	5S
80	BL1050	8.5	15 S	57	89	0	0
80A	INFECTOR	90.0	100S	89	99	0	40S
81	BL1051	55.0	80S	58	89	0	5S
82	BL1052	20.0	40S	57	89	0	5S
83	BL1053	18.0	20MS	57	89	0	5S
84	BL1054	4.0	20MR	57	89	0	0
85	BL1055	8.0	20MS	57	89	0	0
86	BL1057	30.0	60S	67	99	0	10S
87	BL1059	20.0	40S	68	89	0	5S
88	BL1060	50.0	80S	67	99	0	0
89	BL1070	24.0	60MS	68	89	0	0
90	JB313	30.0	60S	67	89	0	0
91	JB314	8.0	20MS	78	99	0	5S
92	JB315	10.0	20S	68	79	0	0
93	JB316	8.0	20MS	57	79	0	0
94	JB317	30.0	60S	67	89	0	0
95	JB318	4.0	10MS	68	89	0	10S
96	JB319	4.0	10MS	46	99	0	0
97	JB320	40.0	60S	57	99	0	5S
98	JB321	60.0	60S	68	99	0	20S
99	JB322	0.0	0	78	99	0	5S
100	JB323	16.0	30 S	67	99	0	0
100A	INFECTOR	100.0	100 S	89	99	0	60S
101	JB324	10.0	20S	78	99	0	0
102	JB325	0.2	TMR	78	99	0	10S
103	JB326	14.0	20 S	67	99	0	0
104	JB327	50.0	100S	68	89	0	10S
105	JB328	2.0	10MR	78	89	0	0
106	JB329	20.0	40S	67	99	0	20S
107	JB330	2.0	10MR	68	89	0	0
108	JB331	0.0	0	78	99	0	0
109	JB332	70.0	80S	78	99	0	60S
110	NDB1626	27.5	40S	68	99	0	20S
111	NDB1627	27.5	40 S	67	99	0	0
112	NDB1628	8.5	15 S	68	99	0	0
113	NDB1629	19.0	30 S	68	99	10MR	0
114	NDB1630	25.0	30 S	78	99	0	0

115	NDB1631	40.0	60 S	67	99	0	20S
116	NDB1632	90.0	100S	68	99	0	40S
117	NDB1633	25.0	30 S	68	89	0	10S
118	NDB1634	14.0	20 S	57	89	0	0
119	NDB1635	30.0	40S	68	89	0	40S
120	NDB1636	55.0	80S	57	99	0	40S
120A	INFECTOR	100.0	100S	88	99	5S	60S
121	NDB1637	90.0	100S	56	79	5S	20S
122	NDB1638	3.5	5 S	57	89	0	0
123	NDB1639	2.0	10MR	67	99	0	0
124	NDB1640	40.0	60S	68	99	5S	0
125	NDB1641	80.0	100S	78	89	5S	40S
126	NDB1642	80.0	100S	78	99	0	0
127	NDB1643	35.0	40 S	78	89	10S	20S
128	NDB1644	50.0	80S	68	99	5S	0
129	NDB1645	45.0	60S	78	99	0	20S
130	NDB1646	37.5	60S	68	99	0	5S
131	NDB1647	25.0	30 S	67	99	0	0
132	NDB1648	18.0	20 S	78	99	5S	5S
133	NDB1650	0.0	0	68	89	0	0
134	BBM695	23.0	30 S	68	99	0	0
135	BBM696	0.0	0	88	99	5S	0
136	BBM697	2.0	10MR	68	89	5S	0
137	BBM698	2.0	10MR	68	99	5S	0
138	BBM699	9.5	15 S	78	99	0	0
139	BBM700	65.0	100S	68	99	10S	10S
140	BBM701	60.0	80S	68	89	20S	0
140A	INFECTOR	90.0	100S	78	99	5S	40S
141	BBM702	60.0	100S	67	99	0	5S
142	BBM703	4.0	20MR	67	89	10S	0
143	BBM704	2.0	10MR	57	89	0	0
144	BBM705	4.5	10MR	67	99	5MR	0
145	BBM706	2.0	10MR	67	89	5MR/MS	0
146	BBM707	47.5	80S	67	89	20S	0
147	BBM708	1.0	10R	57	89	5S	0
148	BBM709	0.0	0	56	89	0	0
149	BBM710	9.5	15 S	67	89	20S	5S
150	BBM711	7.0	10 S	57	89	5S	0
151	BBM712	1.0	5MR	57	89	5S	0
152	BBM713	0.0	0	57	89	5S	0
153	BBM714	2.0	10MR	57	99	5S	0
154	BBM715	10.0	20S	67	99	0	0

155	BBM716	2.0	10MR	57	99	0	0
156	BBM717	2.0	10MR	68	99	0	10S
157	BBM718	4.0	20MR	68	99	0	40S
158	BBM719	0.2	TMR	67	89	0	0
159	BK1401	2.0	10MR	77	99	0	0
160	BK1402	14.0	20 S	57	89	0	0
160A	INFECTOR	100.0	100 S	79	99	5MR	40S
161	BK1403	2.0	10MR	79	89	0	10S
162	BK1404	2.0	10MR	67	89	0	5S
163	BK1405	1.0	5MR	67	99	0	0
164	BK1406	2.0	10MR	57	89	0	0
165	BK1407	2.5	5S	57	89	0	0
166	BK1408	2.5	5S	57	89	0	0
167	BK1409	1.0	5MR	57	99	0	5S
168	BK1410	5.0	10S	57	89	0	5S
169	BK1411	2.0	10MR	68	89	0	10S
170	BK1412	5.2	10 S	68	99	0	0
171	BK1413	0.0	0	68	99	0	0
172	BK1414	15.5	20MS	57	89	0	0
173	BK1415	37.5	60S	67	99	0	0
174	BK1416	9.5	15 S	68	99	0	5S
175	BK1417	30.0	40S	57	79	0	0
176	BK1418	10.0	20S	68	89	0	5S
177	BK1419	30.0	60S	67	99	0	10S
178	BK1420	30.0	60S	67	89	0	0
179	BK1421	30.0	60S	57	89	0	0
180	BK1422	10.0	20S	79	99	0	0
180A	INFECTOR	100.0	100S	89	99	0	40S
181	BK1423	55.0	100S	57	89	0	5S
182	BK1424	1.0	5MR	57	79	5S	0
183	BK1425	2.0	10MR	58	89	0	40S
184	BK1426	10.0	20S	68	89	0	10S
185	BK1427	8.0	20MS	57	89	0	0
186	BK1428	4.0	10MS	56	89	0	0
187	BK1429	4.0	10MS	57	99	5S	0
188	BK1430	0.2	TMR	57	89	5S	0
189	BK1431	90.0	100S	67	99	20S	0
190	HUBL1401	13.0	20MS	56	99	5S	0
191	HUBL1402	70.0	80S	56	89	0	10S
192	HUBL1403	80.0	100S	56	99	0	0
193	HUBL1404	90.0	100S	57	89	0	5S
194	HUBL1405	90.0	100S	57	89	0	10S

195	HUBL1406	100.0	100S	46	99	10S	40S
196	HUBL1407	90.0	100S	46	99	0	0
197	HUBL1408	100.0	100S	56	99	5S	0
198	HUBL1409	55.0	80S	46	79	5S	10S
199	HUBL1410	90.0	100S	58	89	0	5S
200	HUBL1411	65.0	100S	57	99	0	5S
200A	INFECTOR	90.0	100S	89	99	0	40S
201	HUBL1412	90.0	100S	57	99	0	0
202	HUBL1413	60.0	60S	57	99	5S	5S
203	HUBL1414	0.2	TMR	46	69	0	0
204	HUBL1415	35.0	60S	57	89	5S	5S
205	HUBL1416	70.0	100S	67	99	5MR	60S
206	HUBL1417	15.0	30 S	57	99	5S	5S
207	HUBL1418	80.0	100S	57	89	0	40S
208	HUBL1419	90.0	100S	57	89	5S	20S
209	HUBL1420	100.0	100S	58	99	5S	5S
210	HUBL1421	90.0	100S	57	89	0	0
211	HUBL1422	100.0	100S	57	89	10S	40S
212	HUBL1423	100.0	100S	57	89	0	40S
213	HUBL1424	70.0	80S	46	99	0	0
214	HUBL1425	90.0	100S	35	89	5MR/MS	5S
215	HUBL1426	50.0	100S	57	89	0	0
216	HUBL1427	24.0	20MR	57	89	10S	0
217	HUBL1428	0.0	0	57	89	5S	0
218	HUBL1429	31.0	40MS	46	89	0	5S
219	HUBL1430	90.0	100S	67	99	5S	40S
220	HUBL1431	60.0	80S	57	99	10MR	0
220A	INFECTOR	100.0	100S	79	89	5S	40S
221	HUBL1432	100.0	100S	57	99	0	5S
222	HUBL1433	100.0	100S	68	99	0	5S
223	HUBL1434	90.0	100S	78	89	0	5S
224	HUBL1435	90.0	100S	68	99	0	0
225	HUBL1436	90.0	100S	68	99	5S	10S
226	HUBL1437	50.0	100S	67	99	5S	0
227	HUBL1438	90.0	100S	46	89	0	0
228	HUBL1439	90.0	100S	57	89	10MS	0
229	HUBL1440	90.0	100S	89	99	0	40S
230	HUBL1441	100.0	100S	78	99	0	0
231	HUBL1442	100.0	100S	77	99	0	0
232	UPBM1	70.0	80 S	68	89	5S	0
233	UPBM2	45.0	60 S	68	89	0	0
234	UPBM3	15.0	30 S	57	89	0	0

235	UPBM4	10.0	20S	57	89	0	40S
236	UPBM5	50.0	60 S	46	68	0	0
237	UPBM6	22.0	40 S	68	89	0	0
238	UPBM7	12.5	20S	46	79	0	10S
239	UPBM8	18.0	20MS	46	79	5S	0
240	UPBM9	10.0	20 S	68	89	10S	0
240A	INFECTOR	100.0	100 S	89	99	5S	40S
241	UPBM10	40.0	80 S	67	99	5S	5S
242	UPBM11	2.0	10MR	57	89	5MR/MS	0
243	UPBM12	70.0	100S	67	99	0	20S
244	UPBM13	40.0	80 S	68	99	5S	0
245	UPBM14	0.0	0	67	99	5MR	0
246	UPBM15	15.0	20 S	67	99	5S	5S
247	BH1	2.0	10MR	67	99	0	0
248	BH2	15.5	30 S	78	99	20S	0
249	BH3	50.0	100S	68	89	10S	0
250	BH4	41.0	80 S	58	99	5MR	0
251	BH5	17.0	30 S	56	89	5S	0
252	BH6	12.0	20 S	68	89	10S	20S
253	BH7	2.5	5S	57	89	10S	5S
254	BH8	45.0	80S	68	89	10S	0
255	BH9	70.0	80 S	57	99	5MR	0
256	BH10	45.0	60S	68	89	20S	0
257	BH11	5.0	10S	57	89	5S	0
258	BH12	50.0	80S	79	89	5S	0
259	BH13	50.0	60S	67	99	10S	0
260	BH14	54.0	60MS	67	99	5S	0
260A	INFECTOR	90.0	100S	89	99	10S	40S
261	BH15	56.0	80 S	68	89	10S	0
262	BH16	17.0	30 S	67	99	10MR	0
263	BH17	8.0	20MS	67	99	5S	0
264	BH18	18.0	20MS	67	99	10MR/MS	0
265	BH19	22.0	30MS	67	99	10MR/MS	0
266	BH20	15.0	20 S	57	99	20S	0
267	BH21	25.0	30 S	35	68	5S	5S
268	BH22	23.0	30 S	57	89	5MR	0
269	BH23	11.0	20 S	57	89	0	0
270	BH24	10.0	20S	47	89	0	0
271	BH25	3.5	5 S	47	68	5MR/MS	0
272	BH26	35.0	60S	56	99	10S	0
273	BH27	26.0	40MS	57	89	5S	0
274	BH28	35.0	60S	57	89	5MR/MS	0

275	BH29	34.0	60MS	67	99	5S	0
276	BH30	17.0	30 S	57	79	0	5S
277	BH31	8.0	20MS	47	79	5S	0
278	BH32	14.0	20 S	67	89	10S	0
279	BH33	65.0	100S	68	89	10MR/MS	5S
280	BH34	60.0	60S	68	99	0	0
280A	INFECTOR	100.0	100S	89	99	5S	40S
281	BH35	80.0	100S	67	99	5S	5S
282	BH36	56.0	80 S	57	89	0	0
283	BH37	60.0	60 S	57	89	0	5S
284	BH38	24.0	40 S	57	89	5S	0
285	BH39	0.0	0	67	99	0	5S
286	BH40	2.0	10MR	57	89	0	0
287	BH41	10.0	20S	67	89	0	0
288	BH42	7.5	15 S	78	99	20S	0
289	BH43	1.0	5MR	57	89	5S	5S
290	BH44	0.0	0	56	89	5MR/MS	0
291	BH45	40.0	80S	68	89	20S	0
292	BH46	35.0	40 S	79	99	5S	0
293	BD1631	20.0	40 S	99	99	10S	0
294	BD1632	2.0	5MS	89	99	0	0
295	BD1633	0.0	0	89	99	0	5S
296	BD1634	4.0	10MS	78	89	0	0
297	BD1635	4.0	10MS	78	89	0	5S
298	BD1636	4.1	10MS	89	89	0	10S
299	BD1637	2.0	5MS	89	99	0	5S
300	BD1638	1.0	5MR	89	99	5S	5S
300A	INFECTOR	100.0	100S	89	99	0	40S
301	BD1639	2.0	10MR	67	99	0	0
302	BD1640	2.0	10MR	78	89	0	0
303	BD1641	0.0	0	89	99	5S	0
304	BD1642	0.0	0	99	99	0	0
305	BD1643	0.0	0	99	99	0	0
306	BD1644	0.0	0	79	99	40S	0
307	BD1645	0.0	0	99	99	0	0
308	BD1646	0.0	0	89	99	5MR/MS	0
309	BD1647	2.5	5S	89	99	5S	0
310	BD1648	0.0	0	89	99	10S	0
311	BD1649	5.0	10S	89	99	10S	0
312	BD1650	8.0	20MS	89	99	10S	0
313	BD1651	0.0	0	89	99	10S	5S
314	BD1652	0.0	0	99	99	10S	0

315	BD1653	0.0	0	89	99	40S	0
316	BD1654	0.0	0	89	99	0	0
317	BD1655	0.0	0	89	99	5S	0
318	BD1656	0.0	0	89	99	5S	0
319	BD1657	0.0	0	89	99	5S	5S
320	BD1658	1.0	5MR	89	99	0	40S
320A	INFECTOR	100.0	100S	89	99	5S	60S
321	BD1659	0.0	0	89	99	5S	0
322	BD1660	0.0	0	89	99	0	0
323	BD1661	0.0	0	89	99	5MR/MS	0
324	BD1662	0.0	0	89	99	10MR/MS	0
325	BD1663	0.0	0	89	99	5S	0
326	BD1664	7.5	15 S	89	99	0	10S
327	BD1665	0.0	0	89	99	0	0
328	BD1666	40.0	60 S	89	99	10S	0
329	BD1667	0.0	0	89	99	10MR/MS	0
330	BD1668	0.0	0	89	99	10MR/MS	0
331	BD1669	0.0	0	89	99	5S	0
332	BD1670	0.0	0	89	99	5S	0
333	VLB1	2.0	10MR	68	89	5MR/MS	0
334	VLB2	8.0	20MS	68	89	0	0
335	VLB3	2.0	10MR	68	89	0	0
336	VLB4	4.0	20MR	68	99	0	5S
337	VLB5	5.0	10S	68	89	0	0
338	VLB6	0.0	0	67	89	5S	0
339	VLB7	35.0	40S	57	89	0	0
340	VLB8	11.0	20 S	57	89	0	0
340A	INFECTOR	100.0	100 S	79	99	0	40S
341	VLB9	5.0	10S	56	99	5S	0
342	VLB10	24.0	60MS	57	89	5S	0
343	VLB11	80.0	80S	68	99	0	0
344	VLB12	60.0	80S	57	89	5MR/MS	5S
345	VLB13	32.0	60MR	68	89	10MR/MS	0
346	VLB14	0.2	TMR	57	68	0	0
347	VLB15	1.0	5MR	57	89	10S	0
348	VLB16	0.0	0	58	89	5S	0
349	VLB17	2.0	10MR	47	89	0	0
350	VLB18	0.1	10R	35	99	20S	0
351	VLB19	0.2	TMR	57	99	40S	0
352	VLB20	10.2	20 S	47	69	10S	20S
353	VLB21	7.5	15 S	47	69	20S	0
354	VLB22	0.1	5R	57	89	5S	0

355	VLB23	0.2	TMR	47	99	10S	0
356	VLB24	20.0	40S	46	69	5S	0
357	VLB25	70.0	80 S	57	99	20S	0
358	VLB26	4.0	20MR	46	89	20S	0
359	VLB27	1.0	5MR	56	99	40S	0
360	VLB28	44.0	80 S	57	89	20S	0
360A	INFECTOR	100.0	100 S	89	99	10S	40S
361	VLB29	64.0	80 S	57	99	10S	0
362	VLB30	30.0	60 S	46	89	10S	5S
363	Special Trial 1	28.0	40 S	46	79	20S	0
364	Special Trial2	44.0	80 S	67	99	5S	0
365	Special Trial 3	80.0	100S	45	99	0	5S
366	Special Trial 4	90.0	100S	46	89	0	10S

HS- Highest Score, AV- Average, ACI- Average Coefficient of Infection, R- Resistant, MR- Moderately Resistant, MS- Moderately Susceptible, S- Susceptible

National Barley Disease Screening Nursery (NBDSN)

During 2014-15, a total of 123 entries from AVT and IVT yield trials including checks were screened against stripe rust, stem rust, leaf blight, aphids and cereal cyst nematode (CCN) at hot spot locations.

The screening of stripe rust was done at Almora, Bajaura, Dhaulakuan, Durgapura, Hisar, Karnal and Ludhiana centers. Due to rainfall with stormy winds at the time of heading stage resulted in lodging therefore yellow rust severity remained very low at Ludhiana, Dhaulakuan, Karnal and Hisar so these data are not included. For blight, Kanpur, Dharwad, Faizabad, Pantnagar and Varanasi data were used. CCN screening was done at Durgapura, and Hisar centers. Powdery mildew appeared at very low severity in Dhaulakuan and Almora therefore powdery mildew data is not reported. For CCN, the number of nematode cysts / plant 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).

Yellow rust, ACI = 0, Entries – 29,	BH1001, DWRB132, DWRB136, BH1000, PL887, KB1318, HUB242, RD2914, HUB241, DWRB143, RD2913, VPB1046, HUB244, RD2906, RD2903, RD2904, RD2901, HUB243, JB301, JB303, DWRB137, RD2900, RD2910, RD2907, RD2909, RD2908, DWRUB64 (c), HUB113 (c) and RD2786 (c)
Yellow rust, ACI > 0 to 10, Entries – 55,	DWRB128, DWRB124, DWRB123, PL874, RD2891, BH1002, DWRB139, RD2917, RD2919, RD2920, KB1322, KB1325, PL883, PL889, DWRB136, DWRB141, BH1000, DWRB133, DWRB135, DWRB140, RD2920, RD2919, RD2917, DWRB141, BH1001, KB1369, PL889, KB1313, NDB1602, NDB1607, KB1320, HUB240, JB307, RD2915, RD2916, KB1323, BH999, PL884, PL883, KB1311, HUB245, KB1318, BH994, RD2899, NDB1621, BH997, BH998, KB1313, DWRUB52 (c), DWRB101 (c), RD2849 (c), BH902 (c), DWRB91 (c), BH946 (c) and RD2552 (c)

Leaf blight, Avg. 36-57 HS 69, Entries - 1	BH1000

Reactions of different entries of barley in National Barley Disease Screening Nursery (NBDSN)

S. No.	Entries	Yellow Rust		Leaf Blight		Stem Rust	Leaf Rust	CCN	Aphid
		ACI	HS	Avg.	HS			HS	HS
1	BH976	23.3	40S	57	79	5S	5S	HS	5
2	DWRB128	0.1	TMR	57	89	0	10S	HS	5
3	DWRB124	0.2	TMR	57	89	0	20S	HS	5
4	DWRB123	0.7	5MR	57	89	0	20S	HS	5
5	PL874	0.7	5MR	57	89	0	10S	HS	5
6	RD2891	1.7	5S	57	89	0	20S	HS	5
7	BH1002	0.6	TS	57	89	0	10S	HS	5
8	DWRB139	1.9	5S	67	79	0	0	S	5
9	RD2917	0.9	5MR	57	79	5MR	5S	HS	5
10	RD2918	53.3	60S	58	89	0	40S	S	5
11	RD2919	4.0	10MR	68	89	0	5S	HS	5
12	RD2920	0.7	5MR	68	89	0	5S	HS	5
13	KB1322	2.7	10MS	58	89	5MR	0	HS	5
14	KB1325	4.0	10MS	58	79	0	0	HS	5
15	PL883	2.0	5MR	58	79	0	10S	HS	5
16	PL889	4.0	10MS	57	79	5S	10S	S	5
17	DWRB136	1.7	5S	57	89	0	5S	HS	5
18	DWRB134	16.7	40S	57	79	0	20S	HS	5
19	BH1001	0.0	0	58	89	5S	5S	HS	5
20	DWRB141	1.3	5MS	67	89	0	0	HS	5
21	BH1000	0.1	TMR	46	59	5S	0	HS	5
22	DWRB133	0.1	TMR	67	99	0	10S	HS	5
23	DWRB135	2.3	5MR	78	99	0	0	HS	5
24	DWRB140	1.3	5MR	57	99	0	0	HS	5
25	RD2920	1.3	5MS	68	99	0	5S	HS	5
26	DWRB132	0.0	0	56	99	0	0	HS	5
27	RD2919	8.0	20MS	57	89	0	0	HS	5
28	RD2917	2.0	5MS	67	99	0	0	HS	5
29	DWRB138	16.7	30S	67	99	5S	0	S	5
30	DWRB141	3.3	10MS	68	99	5S	0	S	5
31	DWRB136	0.0	0	57	99	5MR	5S	S	5
32	DWRB134	16.7	20S	56	89	0	5S	HS	5
33	BH1001	3.3	5S	57	99	0	10S	S	5
34	BH1000	0.0	0	46	99	5S	0	S	5
35	BH1003	12.0	20MS	57	89	0	5S	HS	5

36	RD2918	23.3	40S	58	79	0	20S	S	5
37	KB1369	1.3	10MR	68	89	0	0	S	5
38	DWRB145	14.0	40MS	57	89	0	TS	S	5
39	PL887	0.0	0	67	89	0	0	HS	5
40	PL889	8.0	20S	58	79	5S	10S	S	5
41	JB308	22.7	60MS	68	99	0	5S	HS	5
42	KB1318	0.0	0	68	99	0	5S	HS	5
43	KB1313	3.3	10MS	57	89	20S	5S	HS	5
44	HUB242	0.0	0	68	89	10S	40S	S	5
45	NDB1602	2.7	10MR	58	99	5S	0	HS	5
46	RD2914	0.0	0	89	99	20S	5S	HS	5
47	HUB241	0.0	0	68	99	40S	40S	S	5
48	NDB1607	10.0	20S	67	99	0	0	HS	5
49	KB1320	3.0	10MR	46	89	40S	0	HS	5
50	HUB240	1.3	10MR	67	99	0	20S	HS	5
51	DWRB143	0.0	0	78	99	20S	5S	S	5
52	JB307	4.0	10MS	79	89	20S	0	HS	5
53	RD2915	6.7	20 S	89	99	20S	5S	HS	5
54	RD2916	1.3	10MR	79	99	20S	0	HS	5
55	KB1323	6.7	15MS	67	89	5S	0	HS	5
56	RD2913	0.0	0	89	99	5S	0	HS	5
57	NDB1614	46.7	80S	89	99	20S	0	S	5
58	BH999	3.3	10MS	89	99	5S	5S	HS	5
59	VPB1046	0.0	0	67	89	10S	20S	HS	5
60	HUB244	0.0	0	67	99	10S	60S	HS	5
61	KB1325	11.3	30S	67	89	0	0	HS	5
62	JB312	66.7	100S	68	99	5S	5S	HS	5
63	RD2906	0.0	0	89	99	10S	0	HS	5
64	RD2903	0.0	0	78	99	5S	5S	S	5
65	BH998	30.7	60MS	68	99	0	5S	HS	5
66	RD2905	20.0	60 S	57	89	0	20S	HS	5
67	KB1319	18.7	40 S	46	78	5MR	0	HS	5
68	NDB1610	73.3	100S	57	79	0	0	HS	5
69	RD2904	0.0	0	78	99	0	5S	HS	5
70	RD2901	0.0	0	79	99	0	5S	HS	5
71	PL884	1.3	5MR	57	89	0	0	HS	5
72	PL883	0.1	TMR	67	99	0	20S	HS	5
73	DWRB142	33.3	80S	68	99	0	0	S	5
74	KB1311	1.4	10MR	67	89	10S	0	HS	5
75	HUB245	8.0	20S	67	99	10S	10S	HS	5
76	HUB243	0.0	0	67	99	5S	40S	HS	5
77	NDB1609	80.0	100S	67	99	10S	5S	S	5

78	BH993	20.0	40 S	68	89	5S	5S	HS	5
79	BH995	16.7	40S	47	79	0	0	HS	5
80	KB1318	0.7	5MR	67	89	0	10S	HS	5
81	NDB1608	33.3	60S	57	89	5S	0	HS	5
82	BH994	0.9	5MR	67	99	0	0	S	5
83	JB301	0.0	0	68	89	0	5S	HS	5
84	JB303	0.0	0	78	99	10S	5S	HS	5
85	DWRB137	0.0	0	68	99	0	5S	S	5
86	RD2899	0.1	TR	67	99	10S	5S	HS	5
87	RD2900	0.0	0	89	99	5S	0	HS	5
88	RD2910	0.0	0	89	99	0	0	HS	5
89	NDB1621	2.0	10MR	67	99	10S	0	HS	5
90	NDB1618	12.1	20MS	57	89	10S	0	HS	5
91	NDB1623	34.0	80 S	58	79	5S	0	HS	5
92	DWRB144	46.7	60S	57	79	0	0	HS	5
93	BH996	16.7	30S	89	99	0	0	HS	5
94	BH997	6.0	10MS	57	89	10S	20S	HS	5
95	KB1302	33.3	40S	68	89	10S	5S	HS	5
96	KB1326	11.0	20 S	58	89	0	0	HS	5
97	BH998	5.3	30MR	57	79	0	0	HS	5
98	RD2907	0.0	0	68	89	0	5S	HS	5
99	RD2909	0.0	0	88	99	5S	0	HS	5
100	KB1313	2.7	10MR	79	99	5MR	0	HS	5
101	NDB1622	36.0	60MS	78	99	5S	5S	S	5
102	DWRB145	30.0	60S	67	99	10MS	0	HS	5
103	RD2908	0.0	0	78	99	5S	20S	HS	5
104	DWRUB52 (c)	2.3	5S	68	89	0	40S	HS	5
105	DWRB101 (c)	3.0	5S	57	89	0	40S	HS	5
106	RD2849 (c)	3.0	5S	57	89	10S	40S	HS	5
107	DWRB92 (c)	19.3	30 S	68	99	0	10S	HS	5
108	BH902 (c)	1.7	5S	68	99	0	20S	HS	5
109	DWRB91 (c)	5.0	10S	58	89	0	5S	S	5
110	DWRUB64 (c)	0.0	0	78	89	0	0	S	5
111	BH946 (c)	7.3	10MS	78	99	5S	10S	HS	5
112	RD2552 (c)	1.7	5S	68	89	10S	5S	HS	5
113	AZAD (c)	76.7	90S	89	99	5S	10S	HS	5
114	RD2035 (c)	86.7	100S	79	89	40S	40S	S	5
115	RD2715 (c)	20.0	60 S	89	99	10S	0	HS	5
116	LAKHAN (c)	80.0	100S	68	89	0	5S	HS	5
117	K603 (c)	53.3	80S	78	99	5MR	0	HS	5
118	HUB113 (c)	0.0	0	68	89	5S	0	HS	5
119	BH959 (c)	16.0	40MS	78	99	0	0	S	5

120	JYOTI (c)	86.7	100S	79	99	0	40S	HS	5
121	RD2786 (c)	0.0	0	89	99	5S	0	HS	5
122	RD2794 (c)	26.7	80 S	68	99	10S	0	HS	5
123	NDB1173 (c)	86.7	100S	68	99	0	20S	HS	5
124	INFECTOR	86.7	100S	89	99	20S	40S	-	5

* Out of 136 entries, few check varieties were found place in many trials and only one check is retained in NBDSN thus resulting 123 entries under NBDSN.

HS- Highest score, ACI- Average Coefficient of Infection; CCN- Cereal Cyst Nematode, HS- Highly susceptible, S- Susceptible, MR- Moderately Resistant, R-Resistant, (C)- Released Checks

Elite Barley Disease Screening Nursery (EBDSN)

This nursery was having resistant entries (showing ACI=0 for LR and ACI upto 5 for stripe rust) during 2013-14 crop season in NBDSN. During the crop season 2014-15, in total there were 97 entries screened in EBDSN. The screening of stripe rust was done at Almora, Bajaura, Dhaulakuan, Durgapura, Hisar, Karnal and Ludhiana centers. Due to rainfall with stormy winds at the time of heading stage resulted in lodging therefore yellow rust severity remained very low at Ludhiana, Dhaulakuan, Karnal and Hisar so these data are not included.

Confirmed sources of resistance

Out of 97 entries screened in EBDSN, the following entries were confirmed for resistance against the particular disease under AICW&BIP.

Yellow rust, ACI = 0, Entries – 38,	BCU7594, BCU7595, BCU7606, BCU7615, BCU7616, BCU7621, BCU7719, BCU7732, BCU7746, BCU7748, BCU7758, BCU7780, BCU7784, BCU7793, BCU7811, BCU7819, BCU7821, BCU7911, BCU7967, BH972, BH981, BH983, BH989, BHS429, DWRB111 , DWRB126, DWRB127, KB1349, KB1351, KB1367, RD2874, RD2880, RD2895, UPB1038, UPB1040, HBL713, HBL718 and VLB130
Yellow rust, ACI > 0 to 10, Entries – 43,	BCU7596, BCU7598, BCU7623, BCU7625, BCU7643, BCU7767, BCU7802, BCU7820, BCU7906, BCU7926, BH976, BH988, BH990, BH992, BHS423, BHS425, BHS430, DWRB101, DWRB118, DWRB121, DWRB122, DWRB124, DWRB128, HBL718, HUB232, HUB239, KB1363, RD2833, RD2849, RD2875, RD2881, RD2882, RD2885, RD2889, RD2894, UPB1039, UPB1042, VLB137, VLB138, VLB140, HUB234, HBL717 and HBL731
Leaf blight, Avg. 36-57 HS 69, Entries - 1	BCU7767

Reactions of different entries of barley in EliteBarley Disease Screening Nursery (EBDSN)

S. No.	EBDSN (2014- 15)	Yellow Rust		Leaf Blight		Stem Rust	Leaf Rust
		ACI	HS	Avg.	HS		
1	BCU7594	0.0	0	78	89	5MR/MS	0
2	BCU7595	0.0	0	67	89	10MS	0
3	BCU7596	1.8	5 S	79	89	0	0
4	BCU7598	5.1	15 S	57	99	5S	5S
5	BCU7600	21.3	60 S	47	79	0	5S
6	BCU7601	21.3	60 S	46	89	10MR	5S

7	BCU7602	20.7	60 S	46	79	10S	0
8	BCU7604	53.3	100S	57	99	10MR/MS	0
9	BCU7606	0.0	0	57	99	0	0
10	BCU7615	0.0	0	78	99	0	0
11	BCU7616	0.0	0	79	99	5MR/MS	0
12	BCU7621	0.0	0	68	99	10S	0
13	BCU7623	6.7	20 S	46	99	0	0
14	BCU7624	12.7	30 S	35	89	0	0
15	BCU7625	7.3	20 S	47	78	0	0
16	BCU7633	23.3	60 S	57	99	5MS	0
17	BCU7643	6.0	10 S	36	79	5S	0
18	BCU7694	53.3	100S	35	68	5S	10S
19	BCU7719	0.0	0	46	79	5S	0
20	BCU7732	0.0	0	57	89	0	0
20A	INFECTOR	80.0	100S	78	99	10S	40S
21	BCU7746	0.0	0	57	89	0	0
22	BCU7748	0.0	0	46	89	0	0
23	BCU7758	0.0	0	68	99	5S	0
24	BCU7767	0.9	5MR	46	68	10S	0
25	BCU7780	0.0	0	46	89	10MS	0
26	BCU7784	0.0	0	57	89	10S	0
27	BCU7793	0.0	0	57	89	5S	0
28	BCU7802	3.3	10S	56	89	5S	0
29	BCU7811	0.0	0	57	89	10S	0
30	BCU7819	0.0	0	56	99	0	0
31	BCU7820	1.7	5S	57	79	0	0
32	BCU7821	0.0	0	57	79	5S	0
33	BCU7906	5.7	15 S	57	89	0	40MS
34	BCU7911	0.0	0	57	89	5S	0
35	BCU7926	0.7	5MR	57	89	10S	40S
36	BCU7967	0.0	0	57	89	10S	0
37	BH972	0.0	0	68	89	10S	0
38	BH976	10.0	20S	57	99	20S	0
39	BH981	0.0	0	46	79	10S	TS
40	BH983	0.0	0	58	89	5S	0
40A	INFECTOR	80.0	100S	79	89	20S	40S
41	BH988	9.3	20S	57	89	10S	TS
42	BH989	0.0	0	56	99	5S	5S
43	BH990	0.1	TMR	57	79	5S	10S
44	BH992	1.0	5MR	68	99	0	20S
45	BHS423	2.7	10MR	57	99	40S	5S
46	BHS425	1.3	10MR	57	99	10MS	0

47	BHS429	0.0	0	56	78	5S	0
48	BHS430	3.3	15MR	46	79	20S	0
49	DWRB101	1.3	5MS	47	99	10MS	20S
50	DWRB111	0.0	0	67	89	10MS	0
51	DWRB118	0.1	TMR	47	79	10MR/MS	10S
52	DWRB121	3.3	10S	56	99	10S	10S
53	DWRB122	0.7	5MR	57	79	5S	20S
54	DWRB124	0.7	5MR	57	99	10S	5S
55	DWRB126	0.0	0	57	89	10S	5S
56	DWRB127	0.0	0	68	99	10S	0
57	DWRB128	0.7	5MR	68	99	0	0
58	HBL718	10.0	30S	57	79	0	0
59	HUB232	0.7	5MR	67	99	0	0
60	HUB239	6.7	20S	67	99	0	0
60A	INFECTOR	80.0	100S	79	99	10S	60S
61	KB1349	0.0	0	78	99	10MR/MS	0
62	KB1351	0.0	0	68	99	0	0
63	KB1363	1.3	10MR	57	99	10S	0
64	KB1367	0.0	0	68	99	0	0
65	KB1370	23.3	40S	47	79	20S	0
66	PL874	33.3	60S	46	79	10MR	0
67	RD2833	3.4	10S	46	89	20S	0
68	RD2849	1.3	5MS	67	99	5MR	5S
69	RD2860	21.7	60S	67	99	5MR	0
70	RD2874	0.0	0	46	99	0	20S
71	RD2875	0.1	TMR	56	99	0	20S
72	RD2878	22.0	60 S	46	99	NG	0
73	RD2880	0.0	0	67	99	10MR/MS	5S
74	RD2881	0.1	TR	57	99	0	0
75	RD2882	3.3	10S	67	99	0	0
76	RD2883	16.7	40 S	57	99	10S	5MS
77	RD2885	1.3	5MS	46	99	5MR	5MS
78	RD2887	28.5	80 S	57	79	5MR	0
79	RD2889	4.0	10MS	67	89	0	0
80	RD2891	40.0	80 S	56	79	NG	0
80A	INFECTOR	86.7	100 S	89	99	20S	40S
81	RD2894	0.7	5MR	57	89	10S	5S
82	RD2895	0.0	0	57	89	5S	0
83	UPB1037	27.3	80 S	67	89	5S	5S
84	UPB1038	0.0	0	46	79	0	0
85	UPB1039	1.7	5S	67	99	0	0
86	UPB1040	0.0	0	57	99	0	10S

87	UPB1042	6.7	20 S	57	79	5S	TS
88	VLB137	0.1	TMR	46	99	10MR/MS	0
89	VLB138	6.7	10S	57	99	5S	0
90	VLB140	0.3	TMR	46	99	10MR/MS	0
91	HUB234	0.1	TMR	57	89	0	0
92	HUB237	21.3	60 S	78	99	5MR	0
93	HBL713	0.0	0	78	99	0	0
94	HBL717	1.3	5MS	56	79	0	0
95	HBL718	0.0	0	56	79	5MR	10S
96	HBL731	0.3	5R	67	99	0	0
97	VLB130	0.0	0	68	99	0	0

HS- Highest score, ACI- Average Coefficient of Infection; HS- Highly susceptible, S- Susceptible, MR- Moderately Resistant, R-Resistant

Center wise reactions of different entries of barley in National Barley Disease Screening Nursery (NBDSN), 2014-15

S. No.	Entries	Yellow Rust			Leaf Blight					CCN	
		Durgapura	Bajaura	Almora	Varansi	Dharwar	Pantnagar	Kanpur	Faizabad	Durgapura	Hisar
1	BH976	30S	0	40S	79	79	12	57	46	S	HS
2	DWRB128	TMR	0	0	89	59	13	68	57	S	HS
3	DWRB124	TMR	0	TR	89	68	12	79	46	S	HS
4	DWRB123	5MR	0	0	89	58	45	79	35	S	HS
5	PL874	5MR	0	TR	89	68	12	89	46	S	HS
6	RD2891	0	0	5S	89	68	23	79	47	S	HS
7	BH1002	TMS	0	TS	89	68	13	68	36	S	HS
8	DWRB139	TMS	0	5S	78	79	46	68	46	S	R
9	RD2917	5MR	0	TMS	78	59	13	79	36	S	HS
10	RD2918	60S	60 S	40S	89	58	14	89	58	S	R
11	RD2919	10MR	0	10MS	89	59	23	89	58	S	HS
12	RD2920	5MR	0	0	89	68	28	89	46	S	HS
13	KB1322	TR	0	10MS	89	68	26	79	46	S	HS
14	KB1325	10MS	0	NG	79	79	18	79	36	S	HS
15	PL883	5MR	0	5MS	79	79	17	68	47	S	HS
16	PL889	10MS	0	NG	69	68	12	79	36	S	MR
17	DWRB136	0	0	5S	58	56	36	89	47	S	HS
18	DWRB134	40S	0	10S	58	56	27	79	46	S	HS
19	BH1001	0	0	0	89	56	28	79	47	S	HS
20	DWRB141	5MS	0	0	89	79	23	89	36	S	HS
21	BH1000	TMR	0	0	59	46	24	56	35	S	HS
22	DWRB133	TMR	0	0	99	68	12	99	57	S	HS

23	DWRB135	5MR	0	5S	99	99	15	99	67	S	HS
24	DWRB140	5MR	0	5MR	99	68	3	68	47	S	HS
25	RD2920	5MS	0	0	99	99	36	89	35	S	HS
26	DWRB132	0	0	0	99	56	24	79	24	S	HS
27	RD2919	20MS	0	10MS	89	68	23	79	46	S	HS
28	RD2917	5MS	0	5MR	89	99	24	68	35	S	HS
29	DWRB138	30S	0	20S	89	99	45	68	46	S	R
30	DWRB141	5MR	0	10MS	89	99	36	79	35	S	MR
31	DWRB136	0	0	0	89	99	23	68	24	S	MR
32	DWRB134	20S	20 S	10S	89	68	12	57	36	S	HS
33	BH1001	5S	0	5S	89	99	13	68	35	S	S
34	BH1000	0	0	0	35	68	24	99	24	S	S
35	BH1003	20MS	0	20S	89	56	35	79	35	S	HS
36	RD2918	40S	10 S	20S	79	79	25	79	36	S	R
37	KB1369	10MR	0	0	89	58	34	89	58	S	R
38	DWRB145	40MS	0	10S	89	59	34	68	46	S	-
39	PL887	0	0	0	89	46	23	89	78	S	HS
40	PL889	20S	0	5MS	59	68	37	79	58	S	MR
41	JB308	60MS	0	20S	59	79	37	99	46	S	HS
42	KB1318	0	0	0	79	68	45	99	67	S	HS
43	KB1313	10MS	0	5MR	68	59	13	89	NG	S	HS
44	HUB242	0	0	0	89	69	48	78	46	S	R
45	NDB1602	10MR	0	5MS	99	59	28	79	36	S	HS
46	RD2914	0	0	0	99	99	89	68	78	S	HS
47	HUB241	0	0	0	89	99	14	68	58	S	R
48	NDB1607	20S	0	10S	78	99	23	89	46	S	HS
49	KB1320	10MR	0	5S	35	34	18	89	36	S	HS
50	HUB240	10MR	0	0	89	99	13	79	46	S	HS
51	DWRB143	0	0	0	89	99	48	89	57	S	-
52	JB307	10MR	0	10MS	79	68	79	89	58	HS	HS
53	RD2915	0	20 S	0	99	99	49	99	89	S	HS
54	RD2916	10MR	0	0	69	99	79	99	58	S	HS
55	KB1323	15MS	0	10MS	89	79	13	89	57	S	HS
56	RD2913	0	0	0	99	99	89	99	78	S	HS
57	NDB1614	80S	0	60S	89	79	99	89	67	S	R
58	BH999	10MS	0	5MR	89	99	89	99	68	S	HS
59	VPB1046	0	0	0	68	79	34	89	57	S	HS
60	HUB244	0	0	0	78	79	13	99	46	S	HS
61	KB1325	30S	0	10MR	89	79	35	89	24	S	HS
62	JB312	100S	80 S	20S	69	99	47	79	47	S	HS
63	RD2906	0	0	0	89	99	89	99	89	S	HS
64	RD2903	0	0	0	89	99	67	89	47	S	R

65	BH998	60MS	40 S	5MS	89	99	38	68	36	S	HS
66	RD2905	0	60 S	0	89	56	37	89	35	S	HS
67	KB1319	20MS	40 S	TR	78	56	36	46	24	S	HS
68	NDB1610	100S	80 S	40S	78	79	35	68	36	S	HS
69	RD2904	0	0	0	89	99	56	89	46	S	HS
70	RD2901	0	0	0	89	99	58	79	58	S	HS
71	PL884	5MR	0	5MR	89	68	23	79	24	S	HS
72	PL883	TMR	0	0	89	99	13	89	36	S	HS
73	DWRB142	80S	0	20S	99	99	15	89	58	S	R
74	KB1311	10MR	0	TR	89	79	23	89	47	S	HS
75	HUB245	5MS	0	20S	89	99	25	79	24	S	HS
76	HUB243	0	0	0	89	99	34	89	36	S	HS
77	NDB1609	100S	60 S	80S	89	99	24	89	24	S	R
78	BH993	10S	40 S	10S	89	78	38	89	36	HS	HS
79	BH995	40S	0	10S	68	59	13	79	35	S	HS
80	KB1318	5MR	0	0	89	68	34	79	46	S	HS
81	NDB1608	60S	0	40S	89	79	14	68	47	S	HS
82	BH994	5MR	0	TMS	89	99	34	79	46	S	R
83	JB301	0	0	0	89	79	25	89	36	S	HS
84	JB303	0	0	0	89	99	46	89	58	S	HS
85	DWRB137	0	0	0	89	99	14	79	58	S	R
86	RD2899	0	0	TR	79	99	24	89	36	S	HS
87	RD2900	0	0	0	99	99	89	99	78	S	HS
88	RD2910	0	0	0	99	99	89	79	89	S	HS
89	NDB1621	10MR	0	5MR	79	68	12	99	58	S	HS
90	NDB1618	20MS	20 S	TMR	47	68	23	89	58	S	HS
91	NDB1623	5MR	80 S	20S	69	68	16	79	46	S	HS
92	DWRB144	60S	40 S	40S	68	79	13	79	24	S	HS
93	BH996	30S	0	20S	99	99	89	68	78	MR	HS
94	BH997	10MS	0	10S	89	56	14	89	46	S	HS
95	KB1302	40S	40 S	20S	89	68	37	68	67	S	HS
96	KB1326	10MS	20 S	5S	89	59	28	79	46	S	HS
97	BH998	30MR	0	5MS	79	68	24	57	47	S	HS
98	RD2907	0	0	0	89	79	13	89	58	S	HS
99	RD2909	0	0	0	99	99	99	57	78	S	HS
100	KB1313	10MR	0	5MS	89	99	78	79	58	S	HS
101	NDB1622	60MS	0	60S	89	99	78	79	57	S	MR
102	DWRB145	60S	0	30S	89	99	12	68	46	S	HS
103	RD2908	0	NG	0	99	68	78	89	78	S	HS
104	DWRUB52 (c)	5MS	0	5S	89	79	46	89	46	S	HS
105	DWRB101 (c)	5MS	0	5S	89	58	13	68	58	S	HS
106	RD2849 (c)	5MS	0	5S	89	68	37	68	58	S	HS

107	DWRB92 (c)	20MR	30 S	20S	99	99	15	79	67	S	HS
108	BH902 (c)	TMR	0	5S	89	99	37	99	58	S	HS
109	DWRB91 (c)	10S	0	5S	89	79	14	68	58	S	R
110	DWRUB64 (c)	0	0	0	89	79	67	79	78	S	R
111	BH946 (c)	10MR	10 S	10MS	89	99	47	99	46	S	HS
112	RD2552 (c)	0	0	5S	89	79	48	99	67	S	HS
113	AZAD (c)	100S	80 S	80S	89	99	68	99	68	S	HS
114	RD2035 (c)	100S	80 S	80S	89	99	89	99	67	S	R
115	RD2715 (c)	0	60 S	0	99	99	79	99	89	S	HS
116	LAKHAN (c)	100S	60 S	80S	89	58	36	68	67	S	HS
117	K603 (c)	60S	20 S	80S	89	99	48	89	67	S	HS
118	HUB113 (c)	0	0	0	69	79	36	89	46	S	HS
119	BH959 (c)	40MS	0	20MS	99	99	34	99	67	S	R
120	JYOTI (c)	100S	80 S	80S	89	99	78	79	68	S	HS
121	RD2786 (c)	0	0	0	89	99	89	79	89	S	HS
122	RD2794 (c)	0	80 S	0	69	99	48	79	67	S	HS
123	NDB1173 (c)	100S	80 S	80S	69	99	24	69	57	S	HS
124	INFECTOR	100S	100S	60S	89	99	67	99	89	-	-

* Out of 136 entries, few check varieties were found place in many trials and only one check is retained in NBDSN thus resulting 123 entries under NBDSN.

R = Resistant; MR = Moderately Resistant; S = Susceptible; HS=Highly Susceptible; * =Reaction not determined

Center wise reactions of different entries of barley in Elite Barley Disease Screening Nursery (EBDSN)

S. No.	EBDSN (2014-15)	Yellow Rust			Leaf Blight				
		Durgapur a	Bajaura	Almora	Varanasi	Dharwar	Pantnagar	Kanpur	Faizabad
1	BCU7594	0	0	0	89	79	NH	57	78
2	BCU7595	0	0	0	89	68	13	89	78
3	BCU7596	TMR	5 S	0	79	79	NH	89	67
4	BCU7598	TMR	15 S	0	78	68	14	99	46
5	BCU7600	10MR	60 S	0	69	79	2	47	46
6	BCU7601	10MR	60 S	0	79	89	12	36	36
7	BCU7602	5MR	60 S	0	78	79	12	47	35
8	BCU7604	100S	60 S	0	89	99	23	36	58
9	BCU7606	0	0	0	34	99	89	36	46
10	BCU7615	0	0	0	89	99	89	47	78
11	BCU7616	0	0	0	89	99	89	57	79
12	BCU7621	0	0	0	89	99	37	57	78
13	BCU7623	0	20 S	0	47	99	3	24	46
14	BCU7624	10MS	30 S	0	36	89	12	24	35

15	BCU7625	5MR	20 S	0	36	78	NH	36	36
16	BCU7633	10S	60 S	0	47	99	12	47	58
17	BCU7643	10MS	10 S	0	47	79	2	24	46
18	BCU7694	100S	40 S	20S	34	68	2	24	47
19	BCU7719	0	0	0	47	79	13	47	36
20	BCU7732	0	0	0	48	89	12	68	46
20A	INFECTOR	100S	**80 S**	60S	**89**	99	57	57	89
21	BCU7746	0	0	**0**	47	89	12	**68**	47
22	BCU7748	0	0	0	89	79	0	36	46
23	BCU7758	0	0	0	89	99	13	79	58
24	BCU7767	TMS	0	5MR	47	68	13	68	36
25	BCU7780	0	0	0	89	79	12	24	46
26	BCU7784	0	0	0	89	79	1	46	58
27	BCU7793	0	0	0	89	89	5	57	47
28	BCU7802	0	0	10S	89	79	12	47	35
29	BCU7811	0	0	0	89	68	12	68	36
30	BCU7819	0	0	0	89	99	12	36	46
31	BCU7820	0	0	5S	78	79	12	57	58
32	BCU7821	0	0	0	78	79	12	57	47
33	BCU7906	10R	15 S	0	89	79	12	57	46
34	BCU7911	0	0	0	89	79	13	47	78
35	BCU7926	5MR	0	0	89	89	12	47	67
36	BCU7967	0	0	0	89	68	14	57	58
37	BH972	0	0	0	89	79	24	79	58
38	BH976	20S	0	10S	79	99	23	68	36
39	BH981	0	0	0	36	79	23	57	46
40	BH983	0	0	0	89	79	27	68	35
40A	INFECTOR	100S	**100 S**	40S	**89**	79	58	68	89
41	BH988	20S	0	10MS	89	89	24	**36**	47
42	BH989	0	0	0	89	99	13	24	36
43	BH990	TMR	0	0	79	79	13	79	47
44	BH992	5MR	0	TS	78	99	16	79	57
45	BHS423	10MR	0	5MS	69	99	24	68	46
46	BHS425	10MR	0	0	69	99	23	47	36
47	BHS429	0	0	0	78	68	23	68	24
48	BHS430	15MR	0	5MS	47	79	12	68	36
49	DWRB101	5MS	0	0	36	99	13	47	58
50	DWRB111	0	0	0	89	79	12	79	58
51	DWRB118	TMR	0	0	78	79	14	47	35
52	DWRB121	10S	0	0	78	99	12	57	24
53	DWRB122	5MR	0	0	79	79	34	46	36
54	DWRB124	5MR	0	0	89	99	15	36	35

55	DWRB126	0	0	0	89	68	14	67	36
56	DWRB127	0	0	0	89	99	13	79	58
57	DWRB128	5MR	0	0	89	99	26	79	58
58	HBL718	30S	0	0	68	79	13	57	46
59	HUB232	5MR	0	0	99	79	12	68	67
60	HUB239	20S	0	0	99	79	12	99	24
60A	INFECTOR	100S	**80 S**	60S	**99**	69	57	99	89
61	KB1349	0	0	0	99	99	35	89	58
62	KB1351	0	0	0	99	68	45	89	58
63	KB1363	10MR	0	0	36	99	13	79	46
64	KB1367	0	0	0	79	79	13	99	58
65	KB1370	40S	30 S	0	36	68	14	79	36
66	PL874	60S	40 S	0	35	79	12	68	36
67	RD2833	10S	0	TR	35	89	13	57	46
68	RD2849	5MS	0	0	89	79	23	99	47
69	RD2860	60S	0	5S	89	68	12	99	58
70	RD2874	0	0	0	36	58	12	99	46
71	RD2875	TMR	0	0	78	79	12	99	24
72	RD2878	10MR	60 S	5MR	35	68	12	99	36
73	RD2880	0	0	0	89	68	23	99	58
74	RD2881	0	0	TR	78	68	25	99	36
75	RD2882	10S	0	0	78	99	13	68	58
76	RD2883	10S	40 S	0	36	99	34	68	46
77	RD2885	5MS	0	0	35	99	13	57	47
78	RD2887	5S	80 S	TMR	79	79	12	68	58
79	RD2889	10MS	0	5MS	89	89	35	67	46
80	RD2891	NG	80 S	0	79		13	67	NG
80A	INFECTOR	100S	**100 S**	60S	**89**	89	67	99	89
81	RD2894	5MR	0	0	89	79	13	79	36
82	RD2895	0	0	0	89	68	26	57	24
83	UPB1037	5MR	80 S	0	89	78	34	79	67
84	UPB1038	0	0	0	78	79	24	47	24
85	UPB1039	5S	0	0	79	89	12	99	46
86	UPB1040	0	0	0	36	99	13	79	58
87	UPB1042	0	20 S	0	47	79	12	79	46
88	VLB137	TMR	0	0	36	99	12	68	24
89	VLB138	10S	0	10S	79	99	12	68	36
90	VLB140	TMR	0	TMR	36	99	12	68	36
91	HUB234	TMR	0	0	89	89	24	46	46
92	HUB237	5MR	60 S	5MR	89	99	34	89	67
93	HBL713	0	0	0	89	99	24	89	78
94	HBL717	0	0	5MS	78	79	23	46	36

95	HBL718	0	0	0	78	79	34	57	24
96	HBL731	5R	0	0	99	89	13	68	47
97	VLB130	0	0	0	89	99	37	57	46

Evaluation for seedling rust resistance against three rusts of barley

Two hundred twenty lines of NBDSN (123) and EBDSN (97) were evaluated at seedling stage against three pathotypes of barley yellow rust viz. (0S0)57, 1S0 (M), 5S0 (Q) , mixture of *Puccinia striiformis* f. sp. *hordei* (Yellow/stripe rust), five pathotypes 79G31(11),62G29(40A) and 75G5 (21A-2), 37G19 (117-6), 7G43 (295) of *P. graminis* f. sp. *tritici* (Black/stem rust) and H4 isolate as well as mixture of five isolates of *P. hordei* (Brown/leaf rust) under controlled conditions. One week old seedlings were inoculated and incubated in saturated humidity chambers for 48 hours. Subsequently these plants were transferred to the greenhouse benches where sufficient day light (more than 10,000 Lux) and temperature of 16±2°C (for yellow rust), 22±2°C (for brown rust), 24±2°C (for black rust) and relative humidity of 40-60% were maintained. Observations recorded are summarized below.

Rust resistant lines in NBDSN

Nine lines (RD2035, RD2550, RD2552, RD2849, RD2900, RD2904, RD2909, RD2913, and RD2915) were resistant to all the three rusts of barley. Five lines were resistant to black & brown rusts, 7 to brown & yellow rusts and 12 to yellow & black rusts. Eighteen lines were resistant only to yellow rust of barley.

Resistant to	No. of Lines	NBDSN Lines
All the rusts	09	RD2035, RD2550, RD2552, RD2849, RD2900, RD2904, RD2909, RD2913, RD2915
Black and Brown rusts	05	BH994, BH995, DWRB141, HUB242, RD2919
Brown and Yellow rusts	07	NDB1607, NDB1618, RD2550, RD2786, RD2901, RD2905, RD2907
Yellow and Black rusts	12	BH993, BH999, DWRB132, HUB113, HUB243, RD2035, RD2552, RD2891, RD2903, RD2908, RD2914, VPB1046
Yellow rust	18	BH1000, BH902, BH996, DWRB137, DWRB143, DWRB64, HUB240, HUB241, HUB242, HUB244, HUB245, JB301, JB303, KB1318, PL887, RD2715, RD2899, RD2910

Rust resistant lines in EBDSN

Three lines viz. BCU7719, BH972 and BH983 were resistant to all the rusts. In addition 6 lines were resistant to black & brown, 2 to brown & yellow and 1 line to yellow & black rusts. Seven lines were resistant to yellow rust only.

Resistant to	No. of Lines	EBDSN Lines
All the rusts	03	BCU7719, BH972, BH983
Black and Brown rusts	06	BCU7598, BCU7621, BCU7623, BCU7643, BCU7732, BCU7746
Brown and Yellow rusts	02	HBL713, HUB237
Yellow and Black rusts	01	BH981
Yellow rust	07	BCU7615, BCU7616, DWRB127, KB1351, KB1367, UPB1040, UPB1042

Different infection types (ITs) of the NBDSN and EBDSN lines is presented below:

Rust resistance of NBDSN entries evaluated

S. No	Entries	PATHOTYPES										
		Yellow rust				Brown rust		Black rust				
		M	Q	57	Mix	Mix	H4	11	21A-2	40A	117-6	295
1	BH976	S	S	S	MX	S	R	R	R	R	MR	R
2	DWRB128	S	S	S	R	S	R	S	R	R	R	R
3	DWRB124	S	R	R	R	S	MS	R	R	R	MS	MR
4	DWRB123	S	R	R	R	S	MS	R	R	MR	MR	R
5	PL874	S	R	MS	R	S	R	R	R	R	R	R
6	RD2891	R	R	R	R	S	R	R	R	R	R	R
7	BH1002	S	S	R	R	S	M	R	R	R	MR	R
8	DWRB139	S	S	R	R	MS	M	S	R	R	MS	R
9	RD2917	S	R	MS	S	MS	R	R	R	R	R	R
10	RD1918	S	R	R	R	MS	R	R	R	-	R	R
11	RD2919	MS	R	MS	R	R	R	R	R	R	R	R
12	RD2920	S	R	R	S	MS	R	R	R	R	R	R
13	KB1322	S	S	S	R	S	R	R	R	R	MS	R
14	KB1325	R	R	S	R	R	R	S	S	MR	S	MS
15	PL883	S	MS	R	R	S	M	R	R	MR	MR	R
16	PL889	S	-	S	S	S	S	S	MS	R	MR	R
17	DWRB136	S	R	R	R	S	S	MS	S	MR	R	R
18	DWRB134	S	S	S	S	S	S	S	S	MR	S	R
19	BH1001	MS	MS	R	R	S	S	R	MS	R	R	R
20	DWRB141	MS	R	R	R	MS	R	R	R	R	R	R
21	BH1000	R	R	R	R	S	R	MS	R	MR	MS	R
22	DWRB133	S	R	S	S	S	S	R	S	MR	MS	R
23	DWRB135	S	R	R	R	S	R	S	R	R	R	R
24	DWRB140	MS	R	R	R	M	R	R	R	R	R	R
25	RD2920	S	S	MS	R	S	R	R	R	R	R	R
26	DWRB132	R	R	R	R	S	R	R	R	MR	R	R
27	RD2919	R	R	MS	R	R	R	R	R	R	R	R
28	RD2917	S	R	S	R	MS	R	S	R	MR	R	S
29	DWRB138	MS	R	S	MS	MS	R	S	R	R	R	R
30	DWRB141	MS	R	S	R	R	R	R	R	R	R	R
31	DWRB136	S	R	S	R	S	S	R	R	MR	R	R
32	DWRB134	S	S	S	S	S	S	S	MS	MR	R	-
33	BH1001	S	R	R	R	S	R	R	R	R	R	R
34	BH1000	R	R	R	R	S	S	R	S	R	R	MS
35	BH1003	S	R	S	R	S	S	S	R	MR	R	R
36	RD2918	MS	S	R	MS	MS	S	R	R	R	R	R
37	KB1369	MS	R	MS	R	S	R	S	MS	R	S	R
38	DWRB145	S	R	S	R	S	R	R	R	R	MR	R
39	PL887	R	R	R	R	S	S	S	R	R	MS	MS
40	PL889	S	R	S	R	S	S	S	R	R	-	R
41	JB308	MS	R	MS	R	S	S	S	MR	R	R	R
42	KB1318	R	R	R	R	S	S	S	S	R	S	S
43	KB1313	S	R	S	R	S	S	S	R	R	S	R
44	HUB242	R	R	R	R	S	S	S	R	R	R	MS
45	NDB1602	MS	R	S	R	R	R	R	R	R	MR	R
46	RD2914	R	R	R	R	S	R	R	R	R	R	R
47	HUB241	R	R	R	R	S	S	R	S	R	MR	R
48	NDB1607	R	R	R	-	R	R	MS	MS	R	MR	MS
49	KB1320	S	R	S	R	R	S	S	S	R	S	S
50	HUB240	R	R	R	R	S	S	S	S	R	R	R
51	DWRB143	R	R	R	R	S	S	S	R	R	R	R

52	JB307	S	R	S	R	S	MS	R	S	R	R	R
53	RD2915	R	R	R	R	R	R	R	R	R	R	R
54	RD2916	R	S	R	R	R	S	R	R	R	R	R
55	KB1323	R	S	MS	R	S	MS	R	S	R	R	S
56	RD2913	R	R	R	R	R	R	R	R	R	R	R
57	NDB1614	S	S	S	S	S	R	S	S	R	MS	MS
58	BH999	R	R	R	R	S	R	R	R	R	MR	R
59	VPB1046	R	R	R	R	S	R	R	-	R	R	R
60	HUB244	R	R	R	R	S	S	MS	S	MR	R	R
61	KB1325	S	S	MX	R	S	S	S	S	R	R	MS
62	JB312	S	S	R	R	S	S	R	S	R	S	MR
63	RD2906	S	S	R	R	S	MS	R	R	R	S	S
64	RD2903	R	R	R	R	MS	R	R	R	R	R	R
65	BH998	S	S	S	-	S	S	S	R	MR	MS	S
66	RD2905	R	R	R	R	R	R	R	R	R	R	MS
67	KB1319	S	R	S	R	R	R	M	R	S	MR	R
68	NDB1610	S	S	R	MS	S	S	S	S	R	MS	R
69	RD2904	R	R	R	R	R	R	R	R	R	R	R
70	RD2901	R	R	R	R	R	R	S	R	R	R	R
71	PL884	S	R	R	R	R	R	R	S	R	MR	R
72	PL883	S	R	R	R	S	R	S	R	R	R	R
73	DWRB142	S	R	S	S	S	S	S	S	MS	R	MS
74	KB1311	S	R	S	S	MS	S	S	R	R	MS	R
75	HUB245	R	R	R	R	S	R	S	R	MR	S	R
76	HUB243	R	R	R	R	S	S	R	R	R	R	R
77	NDB1609	S	R	R	R	S	R	S	R	R	R	R
78	BH993	R	R	R	R	S	S	R	R	R	R	R
79	BH995	S	R	MS	R	R	R	R	R	R	R	R
80	KB1318	R	R	R	R	S	S	S	R	R	MS	R
81	NDB1608	S	S	S	R	R	R	S	R	S	MS	S
82	BH994	MS	R	MS	R	R	R	R	R	R	R	R
83	JB301	R	R	R	R	S	S	R	R	R	R	S
84	JB303	R	R	R	R	S	S	S	R	R	S	S
85	DWRB137	R	R	R	R	S	S	S	S	S	R	MR
86	RD2899	R	R	R	R	S	R	S	R	MR	R	R
87	RD2900	R	R	R	R	R	R	R	R	R	R	R
88	RD2910	R	R	R	R	S	R	R	R	MS	R	R
89	NDB1621	S	S	S	S	R	R	S	R	MS	MR	R
90	NDB1618	R	R	R	R	R	R	S	S	R	S	R
91	NDB1623	R	R	S	R	S	R	S	R	R	R	R
92	DWRB144	S	R	S	S	S	MS	S	R	R	R	R
93	BH996	R	R	R	R	S	S	S	R	R	R	R
94	BH997	S	R	S	R	S	R	S	MS	R	R	R
95	KB1302	S	S	S	S	R	S	S	S	S	MS	R
96	KB1326	R	MX	MS	R	R	R	S	S	MS	MR	MR
97	BH998	MS	R	S	S	S	S	S	S	MR	R	R
98	RD2907	R	R	R	R	R	R	R	R	R	MR	MS
99	RD2909	R	R	R	R	R	R	R	R	R	R	R
100	KB1313	S	R	S	S	MS	S	S	R	MS	MR	R
101	NDB1622	S	R	S	R	S	S	S	R	R	MR	S
102	DWRB145	S	R	MS	R	R	R	M	R	R	R	R
103	RD2908	R	R	R	R	R	MS	R	R	R	R	R
104	DWRUB52 (c)	S	R	S	S	S	R	MS	R	MS	MR	R
105	DWRB101 (c)	S	S	S	R	S	R	R	S	MS	R	R
106	RD2849 (c)	MS	S	R	R	S	R	R	R	R	R	R
107	DWRB92 (c)	S	R	MS	S	S	S	S	S	R	R	R
108	BH902 (c)	R	R	R	R	S	R	MS	S	MR	S	S

109	DWRB91 (c)	S	-	-	R	S	S	R	S	R	R	S
110	DWRUB64 (c)	R	R	R	R	S	S	MS	S	R	MR	R
111	BH946 (c)	S	R	S	MS	S	S	S	R	MR	R	S
112	RD2552 (c)	R	R	R	R	R	R	R	R	R	R	R
113	AZAD (c)	S	S	MS	MS	S	S	S	S	R	S	MR
114	RD2035 (c)	R	R	R	R	S	R	R	R	R	R	R
115	RD2715 (c)	R	R	R	R	S	M	S	R	MR	R	MS
116	LAKHAN (c)	S	R	R	R	S	S	R	R	R	R	MS
117	K603 (c)	S	R	R	R	S	S	R	MS	R	R	S
118	HUB113 (c)	R	R	R	R	S	R	R	R	R	R	MR
119	BH959 (c)	S	S	R	S	S	S	S	R	R	R	R
120	JYOTI (c)	S	S	MS	R	S	S	S	R	R	R	R
121	RD2786 (c)	R	R	R	R	R	R	S	R	R	R	R
122	RD2794 (c)	S	R	R	R	S	R	R	R	R	R	R
123	NDB1173 (c)	S	R	R	S	MX	S	R	R	R	R	R

* Out of 136 entries, few check varieties were found place in many trials and only one check is retained in NBDSN thus resulting 123 entries under NBDSN.

Rust resistance of EBDSN entries evaluated during 2014-15

S.No	Entries	PATHOTYPES										
		Yellow rust				Brown rust		Black rust				
		M	Q	57	Mix	Mix	H4	11	21A-2	40A	117-6	295
1	BCU7594	R	S	R	R	MS	R	R	-	R	R	R
2	BCU7595	S	R	R	R	R	R	MS	MS	MR	MS	R
3	BCU7596	MS	R	R	R	S	S	R	S	R	R	R
4	BCU7598	S	R	R	R	R	-	R	R	R	R	R
5	BCU7600	S	S	S	R	S	S	R	S	R	R	MR
6	BCU7601	S	R	MS	R	S	S	S	S	R	R	MS
7	BCU7602	S	R	R	-	R	-	R	S	R	R	R
8	BCU7604	S	S	-	R	S	S	R	S	R	R	R
9	BCU7606	S	R	-	-	R	R	-	-	R	-	R
10	BCU7615	R	R	R	R	R	S	R	S	R	R	R
11	BCU7616	R	R	R	R	S	S	S	S	MS	S	MS
12	BCU7621	MS	R	MS	R	R	R	-	R	R	R	R
13	BCU7623	-	R	MS	-	R	-	R	-	R	R	R
14	BCU7624	MS	R	S	R	R	S	S	S	-	R	R
15	BCU7625	MS	R	-	-	MS	S	R	-	-	-	R
16	BCU7633	S	R	S	R	S	S	R	R	R	MR	R
17	BCU7643	S	S	S	R	R	R	R	R	R	R	R
18	BCU7694	S	S	S	R	S	R	R	R	R	MS	R
19	BCU7719	R	MR	R	R	R	R	R	R	R	R	R
20	BCU7732	MS	R	R	-	R	R	R	R	R	R	R
21	BCU7746	R	R	MS	R	R	R	R	R	R	R	R
22	BCU7748	MS	R	R	R	S	R	S	S	R	MS	R
23	BCU7758	MS	R	MS	R	S	MS	S	S	R	MR	MS
24	BCU7767	S	R	S	R	S	R	S	S	MR	MS	R
25	BCU7780	S	R	R	R	S	S	S	S	MR	MR	R
26	BCU7784	S	MS	R	R	S	S	S	S	MR	R	MR
27	BCU7793	S	MS	MS	-	R	MS	S	S	MS	MR	MR
28	BCU7802	S	MS	R	R	S	R	R	R	R	R	MR
29	BCU7811	S	R	R	-	S	R	R	S	R	MR	MR
30	BCU7819	S	S	R	R	S	R	R	R	MR	R	MS
31	BCU7820	MS	R	R	R	S	R	-	R	R	MR	R
32	BCU7821	S	R	MS	R	S	-	S	S	R	MS	MS
33	BCU7906	S	R	MS	R	S	S	S	S	R	R	R
34	BCU7911	S	MS	R	R	R	R	R	S	R	R	R

35	BCU7926	MS	R	MS	-	S	R	S	R	R	R	R
36	BCU7967	-	R	-	-	S	-	R	R	-	R	-
37	BH972	R	R	R	-	R	R	R	R	-	R	-
38	BH976	S	R	S	R	S	R	R	R	R	R	R
39	BH981	R	R	R	R	S	S	R	R	R	R	R
40	BH983	R	R	R	R	R	R	R	R	R	R	R
41	BH988	S	S	S	S	S	S	S	R	MS	R	R
42	BH989	S	R	MS	R	S	R	R	R	MR	R	R
43	BH990	S	MS	R	S	S	R	R	R	MS	R	R
44	BH992	S	R	R	R	S	S	R	R	MS	R	R
45	BHS423	S	MX	S	R	MS	-	S	S	MS	R	MS
46	BHS425	R	R	S	R	S	-	S	R	R	-	MR
47	BHS429	-	-	-	-	S	-	-	R	-	R	-
48	BHS430	S	S	S	R	S	S	S	R	MR	R	MS
49	DWRB101	S	S	S	R	S	R	R	R	MR	R	R
50	DWRB111	R	S	-	-	R	R	-	-	R	R	MS
51	DWRB118	MS	S	R	R	MS	R	R	R	R	R	MR
52	DWRB121	S	R	MS	R	S	S	MS	R	MR	R	R
53	DWRB122	S	R	MS	R	S	R	R	R	R	R	R
54	DWRB124	S	R	MS	MS	S	S	S	R	R	R	MR
55	DWRB126	S	R	S	R	S	S	S	S	R	MS	MR
56	DWRB127	R	R	R	R	S	R	MS	R	R	R	R
57	DWRB128	S	R	MS	S	S	S	S	S	R	R	R
58	HBL718	R	-	R	-	S	-	R	-	R	MR	MR
59	HUB232	MS	R	-	S	S	-	S	R	MS	R	R
60	HUB239	MX	R	MS	S	S	S	-	S	MR	R	R
61	KB1349	S	-	MS	-	MS	-	S	R	MR	R	R
62	KB1351	R	R	R	R	S	S	S	S	MS	MS	MR
63	KB1363	S	S	S	S	MS	R	S	R	R	MR	MR
64	KB1367	R	R	R	R	S	-	R	S	R	S	MR
65	KB1370	S	S	S	S	S	R	S	S	MR	S	S
66	PL874	R	S	MS	S	S	R	S	S	R	R	S
67	RD2833	S	S	R	S	MS	R	S	R	R	R	R
68	RD2849	R	R	MS	R	S	MS	R	R	R	R	R
69	RD2860	S	S	S	R	S	S	S	S	MS	MS	R
70	RD2874	S	R	-	-	S	R	S	R	R	R	R
71	RD2875	S	R	MS	R	S	R	-	R	R	R	R
72	RD2878	R	R	S	R	R	R	R	S	R	R	R
73	RD2880	S	R	S	R	S	R	R	R	S	R	R
74	RD2881	S	R	-	R	S	R	R	R	R	-	S
75	RD2882	S	-	-	-	MS	R	-	-	-	R	R
76	RD2883	R	R	-	R	R	S	-	R	-	MS	S
77	RD2885	S	R	S	R	S	-	R	R	R	R	R
78	RD2887	-	-	-	-	R	-	R	R	R	-	R
79	RD2889	R	S	MS	-	MS	-	S	R	-	R	MS
80	RD2891	-	-	-	-	R	-	-	-	-	-	-
81	RD2894	R	-	R	-	S	S	R	R	R	R	R
82	RD2895	R	R	S	R	S	-	-	R	R	R	R
83	UPB1037	MS	-	-	-	S	R	-	-	-	-	-
84	UPB1038	MS	S	-	-	S	R	-	-	-	R	R
85	UPB1039	S	S	-	-	S	R	-	-	-	-	R
86	UPB1040	R	R	R	R	S	R	R	S	-	R	MS
87	UPB1042	R	R	R	R	S	S	R	S	MR	R	MS
88	VLB137	MX	R	MS	R	S	R	M	R	R	R	R
89	VLB138	S	S	S	S	R	R	R	R	MS	R	R
90	VLB140	S	S	R	S	R	R	S	R	R	R	R
91	HUB234	S	S	S	R	R	MS	S	S	R	R	R

92	HUB237	R	R	R	R	R	R	MS	S	MR	R	R
93	HBL713	R	R	R	R	R	R	S	S	MR	MR	MR
94	HBL717	-	-	MS	-	MS	-	R	-	R	-	R
95	HBL718	-	S	-	-	-	S	S	-	R	-	R
96	HBL731	S	-	R	-	-	R	-	-	R	S	R
97	VLB130	R	R	MS	R	R	R	R	S	R	MS	R

EXPERIMENT - CHEMICAL CONTROL OF BARLEY FOLIAR BLIGHT

Objective: To validate the effectiveness of various fungicides against foliar blight

Locations: Varanasi, Dharwar, Ludhiana and Faizabad

Leaf blight susceptible variety was planted in a plot at row to row distance of 23 cm and recommended packages of practices were followed. Three replications were maintained for each treatment. The fungicides were sprayed after first appearance of blight and the blight observation was taken at various intervals.

Centre	Recommendation
Varanasi	• ST with Vitavax 2g/Kg + Tilt spray @0.1%
Ludhiana	• ST with Vitavax 2g/Kg + Tilt spray @0.1%
Faizabad	• ST with Vitavax 2g/Kg + Tilt spray @0.1%
Dharwad	• T7- Propiconazole 0.1% spray

CHEMICAL CONTROL OF LEAF BLIGHT OF BARLEY (VARANASI)

Date of sowing:12.12.2014 Variety: RD2503; Plot size: 2 x 2 m; Replications : 3

Date of Inoculum spray: Natural condition Date of first appearance of blight in the field:08.02.2015

Date of fungicide application:20.02.2015 Date of harvest:10.05.2015

S. No.	Treatment	Blight severity with date of observation			1000 grain weight (g)	Grain yield q/ha
		I 4/3/2015 GS-75	II 17/03/15 GS=83	III 24/03/15 GS=85-87		
1.	*Seed treatment with Vitavax @2g/Kg seed	57	79	99	39.97	31.2
2.	*Seed treatment with Raxil @ 2g/Kg	67	79	99	41.73	31.7
3.	ST with Vitavax 2g/Kg + Tilt spray @0.1%	01	01	24	46.35	38.1
4.	ST with Vitavax 2g/Kg + Folicur spray @0.1%	01	01	24	42.12	36.5
5.	ST with Raxil @ 2g/Kg + Tilt spray @0.1%	01	01	24	43.88	36.0
6.	ST with Raxil @ 2g/Kg + Folicur spray @0.1%	01	01	35	43.04	35.5
7.	Tilt spray @0.1% only	01	01	24	43.92	35.1
8.	Folicur spray @0.1%	01	01	35	43.26	34.1
9.	*Control without seed treatment	69	89	99	38.60	30.3

*= Infection was up to ear; †, average of 10 plants of each replication and adjusted to whole value; GS, growth stage based on Zadoks' scale;

CHEMICAL CONTROL OF LEAF BLIGHT OF BARLEY (DHARWAR)

Date of sowing:25.11.2014 Variety: Jyoti

Number of treatments:10 Number of replications:3

Date of inoculation: 12.01.2015 and 16.01.2015 Plot size- Gross plot: 1.60m X 3 m

Date of fungicide application:19/1/2015and 6.02.2015 Net plot: 1.20m X 3 m

Date of harvest:23.03.2015 Date of first appearance of blight in the:17.01.2015

Sl.	Treatments	Disease scores	TGW	Seed

No.		RI	RII	RIII	Mean	(g)	yield (q/ha)
1	T1- ST withCarboxin+Thiram @ 2 g/kg	89	67	68	78	41.27	16.41
2	T2- ST with Tebuconazole (Raxil)@ 2 g/kg	57	78	68	68	41.58	16.96
3	T3-T1 and Propiconazole 0.1% spray	34	34	24	34	43.06	22.86
4	T4- T1 and Tebuconazole (Folicur) 0.1%spray	34	23	34	34	43.40	24.07
5	T5- T2 and Propiconazole 0.1% spray	24	34	23	24	43.15	24.24
6	T6-T2 and Tebuconazole (Folicur) 0.1%spray	23	24	23	23	43.40	23.78
7	T7- Propiconazole 0.1% spray	23	34	24	24	43.69	26.11
8	T8- Tebuconazole (Folicur) 0.1% spray	23	23	34	23	43.36	23.89
9	T9- Mancozeb(DM-45) 0.2% spray	23	34	24	24	41.82	21.41
10	T10- Unsprayed spray	99	78	89	89	40.99	14.44
S Em±						0.80	0.76
CD (p=0.05)						2.38	2.26
CV %						3.26	6.16

CHEMICAL CONTROL OF LEAF BLIGHT OF BARLEY (FAIZABAD)

Date of sowing:26.12.2014 Variety: RD2503; Plot size: 2 x 2 m; Replications : 3

Date of Inoculum spray: 08.02.2015 Date of first appearance of blight in the field:02.02.2015

Date of fungicide application:01.03.2015 & 10.03.2015 Date of harvest:15.05.2015

S. No.	Treatment	Blight severity with date of observation				1000 grain weight (g)	Grain yield q/ha
		I 23.03.2015	II 23.03.2015	III 23.03.2015	Mean		
1.	Seed treatment with Vitavax @2g/Kg seed	35	35	34	35	37.9	31.50
2.	Seed treatment with Raxil @ 2g/Kg	36	35	36	36	36.3	28.57
3.	ST with Vitavax 2g/Kg + Tilt spray @0.1%	13	13	12	13	40.2	41.50
4.	ST with Vitavax 2g/Kg + Folicur spray @0.1%	24	24	24	24	38.7	34.32
5.	ST with Raxil @ 2g/Kg + Tilt spray @0.1%	23	23	23	23	38.6	32.32
6.	ST with Raxil @ 2g/Kg + Folicur spray @0.1%	24	25	25	25	39.5	32.32
7.	Tilt spray @0.1% only	35	35	35	35	37.1	30.15
8.	Folicur spray @0.1%	35	36	36	36	37.4	30.15
9.	Control without seed treatment	68	68	68	68	35.7	29.50

CHEMICAL CONTROL OF LEAF BLIGHT OF BARLEY (LUDHIANA)

Date of sowing: Variety: PL 426; Plot size: 2 x 2 m; Replications : 3
Date of Inoculum spray: Date of first appearance of blight in the field:
Date of fungicide application: Date of harvest:

S. No.	Treatment	Blight severity with date of observation				1000 grain weight (g)	Grain yield q/ha
		I	II	III	Mean		
1.	Seed treatment with Vitavax @2g/Kg seed	47	34	25	35	40.03	45.00
2.	Seed treatment with Raxil @ 2g/Kg	36	36	35	36	39.32	41.25
3.	ST with Vitavax 2g/Kg + Tilt spray @0.1%	11	12	11	11	40.16	42.50
4.	ST with Vitavax 2g/Kg + Folicur spray @0.1%	11	11	11	11	40.15	38.50
5.	ST with Raxil @ 2g/Kg + Tilt spray @0.1%	11	12	12	12	40.10	39.50
6.	ST with Raxil @ 2g/Kg + Folicur spray @0.1%	15	14	12	14	40.10	39.50
7.	Tilt spray @0.1% only	25	11	11	12	39.97	39.25
8.	Folicur spray @0.1%	11	12	11	11	40.20	39.75
9.	Control without seed treatment	37	34	25	35	39.06	35.50

CHEMICAL CONTROL OF RUSTS (LEAF / YELLOW RUST) OF BARLEY (LUDHIANA)

Date of sowing: 29.11.2014 Variety: Jyoti, Plot size 2 X 2m, Replications:3
Method of creation of epiphytotics: Natural / Artificial condition Date of First appearance of rust in the field:
Infection of infectors: Yes Dates of fungicide application:
Spray the rust inoculums in the field: Yes
Date of inoculation / spray in the field: Date of harvest:

Sl. No.	Treatments	Rust severity with date of observation			1000 grain weight (g)	Grain yield q/ha
		RI	RII	RIII		
1	ST withCarboxin+Thiram @ 2 g/kg	20S	20S	10S	39.80	49.50
2	ST with Tebuconazole (Raxil)@ 2 g/kg	10S	20S	10S	40.00	50.00
3	Propiconazole 0.1% spray	5S	0	5MS	41.03	51.50
4	Tebuconazole (Folicur) 0.1%spray	5S	0	5MS	40.80	55.00
5	Bayleton 0.1% spray	0	0	0	40.85	51.00
7	Propiconazole 0.05% spray	0	0	0	39.99	50.25
8	Tebuconazole (Folicur) 0.05% spray	5MS	0	5MS	40.01	45.75
9	Beyleton 0.05% spray	0	0	5MS	39.47	41.50
10	Unsprayed spray	60S	60S	60S	34.95	31.50

Recommendation: Propiconazole 0.05% spray and Bayleton 0.1% spray were equally effective in managing yellow rust.

ENTOMOLOGY

Screening of NBDSN barley entries (2014-15) against foliar aphids

During 2014-15, One twenty four NBDSN entries were screened against aphids at six locations (Durgapura, Kanpur, Karnal, Ludhiana, Pantnagar, Vijapur) as per the programme of work. The promising entries identified from previous screening were also planted in single row. The seeds were supplied by IIWBR, Karnal. Aphid counts/shoot was recorded at weekly interval from all theses entries and grades were given according to 5 point system described below.

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

At all the locations all the entries were having large number of aphids and were categorized as susceptible (grade 4) or highly susceptible (grade 5) to barley aphid. However entry DWRB142 found to be resistant and entry RD2918 found to be moderately resistant to foliar aphid in barley at Kanpur. The differential reaction of aphids on entries showed the availability of biotypes of barley foliar aphids in various locations.

Screening of NBDSN barley entries (2014-15) against foliar aphids

No.	NBDSN 2014-15		Aphid					
		Ludhiana	Vijapur	Kanpur	Durgapura	Pantnagar	Karnal	HS
1.	BH976	5	5	5	4	5	5	5
2.	DWRB128	5	5	5	5	4	5	5
3.	DWRB124	5	5	5	5	4	5	5
4.	DWRB123	5	5	5	4	5	5	5
5.	PL874	5	5	5	4	5	5	5
6.	RD2891	5	5	5	4	4	5	5
7.	BH1002	5	5	5	5	4	5	5
8.	DWRB139	5	5	5	5	5	5	5
9.	RD2917	5	4	5	4	5	5	5
10.	RD2918	5	5	4	4	5	5	5
11.	RD2919	5	5	5	4	5	5	5
12.	RD2920	5	5	5	5	4	5	5
13.	KB1322	5	5	5	5	5	5	5
14.	KB1325	5	5	5	4	4	5	5
15.	PL883	5	5	5	5	4	5	5
16.	PL889	5	5	5	5	4	5	5
17.	DWRB136	5	5	5	5	4	5	5
18.	DWRB134	5	5	5	5	4	5	5

19.	BH1001	5	5	5	4	4	5	5
20.	DWRB141	5	5	5	4	4	5	5
21.	BH1000	5	5	5	4	5	5	5
22.	DWRB133	5	4	5	5	5	5	5
23.	DWRB135	5	4	5	4	5	5	5
24.	DWRB140	5	5	5	4	4	5	5
25.	RD2920	5	5	5	5	4	5	5
26.	DWRB132	5	5	5	5	5	5	5
27.	RD2919	5	5	5	4	4	5	5
28.	RD2917	5	5	5	4	4	5	5
29.	DWRB138	5	5	5	4	4	5	5
30.	DWRB141	5	5	5	4	4	5	5
31.	DWRB136	5	5	5	5	5	5	5
32.	DWRB134	5	5	5	4	4	5	5
33.	BH1001	5	5	5	4	5	5	5
34.	BH1000	5	5	5	4	5	5	5
35.	BH1003	5	5	5	4	5	5	5
36.	RD2918	5	5	3	4	5	5	5
37.	KB1369	5	5	5	4	5	5	5
38.	DWRB145	5	5	5	5	5	3	5
39.	PL887	5	5	5	4	5	5	5
40.	PL889	5	5	5	5	5	5	5
41.	JB308	5	5	5	4	5	5	5
42.	KB1318	5	5	4	5	5	5	5
43.	KB1313	5	5	5	4	5	5	5
44.	HUB242	5	4	5	4	5	4	5
45.	NDB1602	5	5	5	4	5	5	5
46.	RD2914	5	5	5	4	4	5	5
47.	HUB241	5	5	5	5	4	5	5
48.	NDB1607	5	5	5	4	4	5	5
49.	KB1320	5	5	5	5	4	5	5
50.	HUB240	5	5	5	5	5	5	5
51.	DWRB143	5	5	5	5	4	5	5
52.	JB307	5	5	5	4	4	5	5
53.	RD2915	5	5	5	4	5	5	5
54.	RD2916	5	5	5	4	5	5	5
55.	KB1323	5	5	5	4	5	5	5
56.	RD2913	5	5	5	4	5	5	5
57.	NDB1614	5	5	5	5	5	5	5
58.	BH999	5	5	5	5	4	5	5
59.	VPB1046	5	5	5	5	4	5	5

60.	HUB244	5	5	5	5	5	5	5
61.	KB1325	5	5	5	5	4	5	5
62.	JB312	5	5	5	5	5	5	5
63.	RD2906	5	5	5	5	5	5	5
64.	RD2903	5	5	5	5	5	5	5
65.	BH998	5	5	5	4	5	5	5
66.	RD2905	5	5	5	5	4	5	5
67.	KB1319	5	5	5	5	4	5	5
68.	NDB1610	5	5	5	5	4	5	5
69.	RD2904	5	5	4	4	5	5	5
70.	RD2901	5	5	5	5	5	5	5
71.	PL884	5	5	5	5	5	5	5
72.	PL883	5	5	5	5	5	5	5
73.	DWRB142	5	5	2	5	4	5	5
74.	KB1311	5	5	5	5	5	5	5
75.	HUB245	5	5	4	5	5	5	5
76.	HUB243	5	5	5	4	5	5	5
77.	NDB1609	5	5	5	4	5	5	5
78.	BH993	5	4	5	4	5	5	5
79.	BH995	5	5	5	4	5	5	5
80.	KB1318	5	5	5	5	4	5	5
81.	NDB1608	5	5	5	5	4	5	5
82.	BH994	5	5	5	5	5	5	5
83.	JB301	5	5	5	4	5	5	5
84.	JB303	5	5	5	5	4	5	5
85.	DWRB137	5	5	5	4	5	5	5
86.	RD2899	5	5	5	5	5	5	5
87.	RD2900	5	5	5	5	5	5	5
88.	RD2910	5	5	5	5	5	5	5
89.	NDB1621	5	5	4	5	4	5	5
90.	NDB1618	5	5	4	5	4	5	5
91.	NDB1623	5	5	5	5	4	5	5
92.	DWRB144	5	5	5	4	4	5	5
93.	BH996	5	5	4	4	4	5	5
94.	BH997	5	5	4	5	4	5	5
95.	KB1302	5	4	5	5	4	5	5
96.	KB1326	5	5	4	4	4	5	5
97.	BH998	4	5	4	5	4	5	5
98.	RD2907	5	5	4	5	4	5	5
99.	RD2909	4	5	4	4	4	5	5
100.	KB1313	5	5	5	5	4	5	5

101.	NDB1622	4	5	5	4	4	5	5
102.	DWRB145	4	5	5	5	4	5	5
103.	RD2908	5	5	5	5	5	5	5
104.	DWRUB52(C)	5	5	5	4	4	5	5
105.	DWRB101(C)	5	5	5	4	4	5	5
106.	RD2849(C)	5	5	5	5	5	5	5
107.	DWRB92(C)	5	5	5	4	4	5	5
108.	BH902(C)	5	5	5	5	5	5	5
109.	DWRB91(C)	5	5	5	5	5	5	5
110.	DWRUB64(C)	5	5	5	5	5	5	5
111.	BH946(C)	5	5	5	5	5	5	5
112.	RD2552(C)	5	5	5	5	5	5	5
113.	AZAD(C)	5	5	5	5	5	5	5
114.	RD2035(C)	5	5	5	5	5	5	5
115.	RD2715(C)	5	5	5	5	5	5	5
116.	LAKHAN(C)	5	5	2	4	5	5	5
117.	K603(C)	5	5	5	5	5	5	5
118.	HUB113(C)	5	5	5	4	4	5	5
119.	BH959(C)	5	5	5	5	5	5	5
120.	JYOTI(C)	5	5	5	5	4	5	5
121.	RD2786(C)	5	5	5	5	5	5	5
122.	RD2794(C)	5	5	4	5	5	5	5
123.	NDB1173(C)	5	5	4	5	4	5	5

HS = Highest Score, Av = Average Score.

EXPERIMENT - Chemical control of foliage feeding barley aphids (*Rhopalosiphum maidis*) Fitch

Objective: The objective of conducting this experiment was to find out eco-friendly and high potent molecules, which are more efficient, at lower doses than presently recommended molecules.

Methodology: The experiment consisted of eight treatments conducted at Vijapur, Ludhiana, Kanpur, Durgapura, and Karnal during 2014-15. The details of the treatments and their doses are given below:

Chemical control of foliage feeding barley aphids (*Rhopalosiphum maidis*) Fitch.

S. No.	Treatments	Dose ml or g / ha	Dosages (g a.i./ha)
1	Confidor (imidacloprid 200 SL)	100 ml	20
2	Dantotsu (Clothianidin 50 WDS)	30 gm	15
3	Fame (Flubendamide 480 SC)	250 ml	20
4	Pride (Acetamiprid 20SP)	100 gm	20
5	Actara (Thiamethoxam 25 WG)	50 gm	12.5
6	Coragen (Chlorantranilipride 18.5 SC)	100 ml	20
7	Rogor (Dimethoate 30 EC)	1000 ml	100
8	Control	-	-

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.

Summary of Results:

At Durgapura, the minimum aphid population at 1 day, 2 day and 7 day after spray was recorded in clothianidin at par with imidacloprid 200 SL, chlorantranilipride 18.5 SC, acetamiprid 20 SP insecticidal treatments. The minimum aphid population at 7th day after spray was recorded in clothianidin (3.83: 22.00), at par with all other treatments. At Ludhiana, one day after spray, acetamiprid (1.46 aphids/tiller) recorded minimum aphids/tiller and was at par with all other insecticidal treatments as compared to untreated control. Similar results were recorded 2 days after treatment and all insecticides treated plot were at par with each other and better than untreated control (20.15 aphids/tiller). Fifteen days after treatment chlorantranilipride (0.10 aphid/tiller) was the best treatment and it was at par with other insecticidal treatments. At Vijapur, on 7th day, the aphid population was recorded minimum in flubendiamide and was at par with rest of the insecticidal treatments.At Kanpur, maximum aphid control was achieved from Flubendamide and Thiamethoxam 25WG spray after recorded 1.75 and 2.14 aphids infestation and were at par imidacloprid 17.8 SL and clothianidin 50 WDG 2.36 and 2.84 aphids in insecticidal treatments. The aphid population per shoot lowers than untreated control (29.38). At Karnal, On 7th day and 15 days after spray the aphid population was recorded significantly minimum in Flubendamide 480 SC@ 20 g a.i./ha(0.87 and 0.00) respectively and it was followed by imidacloprid 17.8 SL, thiamethoxam 25 WG and Clothianidin 50 WDG.

Durgapura

To test the Bio-efficacy of insecticides an experiment was carried for the control of foliage feeding barley aphid, (*Rhopalosiphum maidis* Fitch.) through foliar spray at RARI. Durgapura Jaipur. There were eight treatments including untreated check and each treatment was replicated thrice .The highly susceptible barley variety to aphids was sown on 02.12.2014 in plots of 16 q m size. The aphid population per shoot was recorded on five tagged shoots from each plot separately in different replications at 1, 2, 7 and 15 days after spray whereas, yield was recorded at harvest .The percent reduction was calculated by Abort's formula. The data presented in table 2 revealed that all the treatments reduced the aphid population/shoot significantly and increased the grain yield as compared to untreated check.

The minimum aphid population at 1st day of spray was observed in clothianidin 50 WDG at 15 g a.i/ha, at par with imidacloprid 200 SL at 20 g a.i. /ha followed by acetamiprid 20 SP at 20 g a.i./ha, flubendamide at 20 g a.i/ha and chlorantaniliprid 18.5 SC at 20 g a.i/ha, thiamethoxam 25 WG at 12.5 g a.i/ha and dimethoate as compared to untreated check Observations taken after 2nd day of spray indicated that the minimum aphid population was observed in clothianidin at par with imidacloprid and acetamiprid chlorantaniliprid followed by flubendamide and thiamethoxam. Other treatment dimethoate was significantly better than untreated check (Table No.2). On 7th day the aphid population was recorded minimum in clothianidin treated plots at par with imidacloprid, acetamiprid and flubendamide, followed by chlorantaniliprid and thiamethoxam whereas dimethoate was significantly inferior to newer tested insecticidal treatments. The aphid population in all treatments were significantly lower than untreated check. The aphid population at 15th day after spray was recorded minimum in clothianidin at par with all other treatments which was due to rainfall and natural storm during the experimentation after 7th day of insecticidal application, reducing of aphid population as compare to aphid population in untreated check. The natural storm was also affected the production of barley. Even after significantly grain yield q/ha

was obtained in the treated plots with maximum in clothianidin at par with imidacloprid, acetamiprid, flubendamide followed by chlorantaniliprid, thiamethoxam. Dimethoate treatment gave significantly higher grain yield over untreated check.

Ludhiana

This trial was conducted under irrigated conditions at Plant Breeding Research Farm, PAU, Ludhiana. The wheat variety PL 426 was sown on 6th Nov.2014 in the plots of 6 rows of 6m long in a replicated trial. There were eight treatments including untreated check and each was replicated three times. For recording observations, five tiller were ear marked in each plot and from these plants observations were recorded 1 day before spray and then 1, 2, 7 and 15 days after spray. Aphid population did not differ significantly among all treatments one day before treatment (Table No.3). When observed one day after spray, acetamiprid (1.46 aphids/tiller) recorded minimum aphids/tiller and was at par with all other insecticidal treatments as compared to untreated control. Similar results were recorded 2 days after treatment and all insecticides treated plot were at par with each other and better than untreated control (20.15 aphids/tiller). Seven days after treatment, all insecticidal treatment resulted in significant reduction in aphid population and all were at par with each other except dimethoate, however even this treatment was significantly better than untreated control (17.80 aphids/tiller). However, fifteen days after treatment chlorantranilipride (0.10 aphid/tiller) was the best treatment and it was at par with other insecticidal treatments. Grain yield (q/ha) obtained was maximum (54.57) from acetamiprid treated plots followed by imidacloprid (53.33) treated plots. However, all the foliar insecticidal treatments recorded significantly higher than grain yield than untreated check (49.24).

Vijapur

The experiment was conducted at Centre of Excellence for Research on Wheat, Vijapur under an irrigated condition. The barley variety RD 2052 was sown on 23-11-2014. Aphid populations did not differ statistically among all treatments during 24 hrs before spraying. The data given in Table 3 indicated that all the treatments reduced the aphids population significantly and increased the grain yield as compared to untreated check. When observed 1 day after spray, imidacloprid noticed minimum aphids/shoot, which was at par with rest of the insecticidal treatments. Observation taken after 2nd day of spray revealed that the minimum aphid population was noticed in dimethoate and at par with rest of the insecticidal treatments and significantly better than untreated check. On 7th day, the aphid population was recorded minimum in dimethoate and was at par with rest of the insecticidal treatments. The aphid population in all the insecicidal treatments were significantlly lower than untreated check.The grain yield did not differ statistically among all the treatments. Although, the maximum grain yield was recorded in, imidacloprid treatment. (Table No.4)

Kanpur

The experiment was conducted under irrigated condition at research farm Nawabganj C.S.A.Univ. Kanpur. The barley variety K551 was shown on 20.11.2014 in plot of 16 rows of 3m length. These were total of eight treatments including untreated check and each was replicated thrice. For recoding the observation, five shoots were randomly selected in each plot and observation were recorded 24 hr before spray and thereafter at 1,2,7 and 15 days interval on these plants. The number of aphids recorded 24 hr. before spray did not differ significantly but after one day of application of insecticides, it was observed that Flubendamide and Thiamethoxam 25WG spray after recorded 1.75 and 2.14 aphids infestation and were at par

imidacloprid 17.8 SL and clothianidin 50 WDG 2.36 and 2.84 aphids in insecticidal treatments. The aphid population per shoot lowers than untreated control (29.38). Similarly 2days, 7days and 15 days after spray against all these insecticide were at par with each other and better than untreated checks. Grain yield q/ha was maximum (41.38 and 40.83) from flubendamide and Thiamethoxam 25WG respectively, followed by imidacloprid 17.8 SL 40.69q/ha & clothianidin 50 WDG 39.86q/ha. However, all the insecticidal treatment recorded significantly higher than untreated check (Table No.5).

Karnal

The experiment was conducted at Directorate of Wheat Research, Karnal under an irrigated condition. The barley variety DWR-UB-64 was sown on 16-11-2014. Aphid populations did not differ statistically among all treatments during 24 hrs before spraying. The data given in (Table No.6) revealed that all the treatments reduced the aphids population significantly and increased the grain yield as compared to untreated check. At 1 day after spray, the plots treated with imidacloprid 17.8 SL @ 20g a.i /ha registered significantly minimum (5.53) number of aphids/shoot/plant. It was followed by acetamiprid 20 SP @ 50g a.i./ha (7.33) and Dimethoate 30 EC @ 100g a.i./ha (7.47). Observation taken after 2nd day of spray indicated that again minimum aphid population was noticed in imidacloprid 17.8 SL @ 20g a.i /ha (1.40) which was significantly superior to thiamethoxam 25 WG @ 12.5 g a.i./ha (1.47), Clothianidin 50 WDG @ 15 g a.i./ha (1.93), Flubendamide 480 SC@ 20 g a.i./ha(2.33) and acetamiprid 20 SP @ 50g a.i./ha (2.47) as compared to untreated control(55.67) number of aphids/shoot/plant. On 7th day and 15 days after spray the aphid population was recorded significantly minimum in Flubendamide 480 SC@ 20 g a.i./ha(0.87 and 0.00) respectively and it was followed by imidacloprid 17.8 SL, thiamethoxam 25 WG and Clothianidin 50 WDG **(Table No.6)**. The aphid population in all the insecicidal treatments were significantlly lower than untreated check.The grain yield did not differ statistically among all the treatments. Although, the maximum grain yield was recorded in Flubendamide 480 SC treatment (41.01qt./ha.).

Chemical control of foliage feeding barley aphids (*Rhopalosiphum maidis*) Fitch. 2014-15 (Location: Durgapura)

S. No	Treatments	Dose g a.i./ha or g/ml/ha	Number of aphids population/shoot after spray					Grain yield q/ha
			Before spray	1	2	7	15	
1	Imidacloprid 17.8 % SL (Confidor)	20 (100 ml)	20.67a	11.00 a (47.62)*	9.17 a (57.99)	4.50 a (79.54)	2.17 a (61.72)	15.47a
2	Clothianidin 50 WDG (Dantosau)	15 (30 g)	20.33a	10.50 a (50.00)	8.33 a (61.84)	3.83 a (82.59)	1.50 a (73.54)	15.53a
3	Flubandamide (Fame 480 SC)	20 (110 ml)	20.33a	12.33 b (41.29)	9.33 b (57.26)	5.10 a (67.40)	2.50 a (55.90)	15.40a
4	Aacetamiprid 20SP (Pride)	50 (250 g)	20.17a	12.17 b (40.04)	9.17 a (57.99)	4.83 a (73.50)	2.50 a (55.90)	15.40a
5	Thiamethoxam 25WG (Actara)	12.5 (50 g)	20.33a	13.33 b (36.53)	10.66 b (51.12)	7.83 b (64.40)	2.67 a (52.91)	14.27b
6	Chlorantaniliprid 18.5 SC (Coragen)	20 (250ml)	20.33a	12.67 b (39.66)	9.50 a (56.48)	7.33 b (66.68)	2.67 a (52.91)	15.13b
7.	Dimethoate 30EC (Rogor)	100 (1.0 L)	20.67a	15.83 c (24.61)	12.50 c (42.73)	9.00 c (59.09)	2.50 a (55.90)	12.53c
8	Control		20.67a	21.00 d	21.83 d	22.00 d	5.67 b	10.47d
	S. Em ±		0.17	0.53	0.52	0.42	0.40	0.31
	CD 5%		NS	1.61	1.58	1.27	1.22	0.95

Figures followed by same alphabets are statistically at par, *Figures in parenthesis are reduction percent.

Date of sowing: 02.12.2014
Date of insecticide spray: 19.02.2015.
Date of harvesting: 31.03.2015

Plot size: 3.0 x 2.5 sq.m.
Variety: Highly susceptible to Barley aphids
Replications - 3

Chemical control of foliage feeding aphid of barley 2014-15 (Location: Ludhiana)

S. No.	Treatments	Dose ml or g / ha	Dosages (g a.i./ha)	Aphid population per earhead					Grain Yield (q/ha)
				Before spray	After spray				
				1 day	1 day	2 days	7 days	15 days	
1	Confidor (Imidacloprid 17.8 SL)	100 ml	20	27.93 (5.37)	1.93 (1.71)	1.32 (1.52)	0.53 (1.23)	0.26 (1.12)	53.33
2	Dantotsu (Clothianidin 50 WDS)	30 gm	15	27.53 (5.34)	1.54 (1.59)	1.28 (1.50)	0.40 (1.18)	0.15 (1.06)	52.53
3	Fame (Flubendamide 480 SC)	250 ml	20	25.86 (5.18)	1.53 (1.59)	1.20 (1.48)	0.42 (1.19)	0.13 (1.06)	52.93
4	Pride (Acetamiprid 20SP)	100 gm	20	26.40 (5.22)	1.46 (1.57)	0.80 (1.34)	0.31 (1.14)	0.21 (1.10)	54.57
5	Actara (Thiamethoxam 25 WG)	50 gm	12.5	25.63 (5.15)	1.60 (1.60)	0.99 (1.41)	0.40 (1.18)	0.32 (1.15)	52.80
6	Coragen (Chlorantranilipride 18.5 SC)	100 ml	20	25.53 (5.14)	1.53 (1.59)	0.95 (1.39)	0.43 (1.20)	0.10 (1.05)	52.00
7	Rogor (Dimethoate 30 EC)	1000 ml	300	26.40 (5.23)	1.85 (1.68)	1.24 (1.49)	0.74 (1.32)	0.35 (1.16)	52.71
8	Control	-	-	28.00 (5.38)	20.10 (4.59)	20.15 (4.60)	17.80 (4.33)	15.48 (4.05)	49.24
CD (p=0.05)				(NS)	(0.13)	(0.17)	(0.11)	(0.13)	2.76

- Figures within parentheses are transformed means

Date of sowing : 06.11.2014
Date of insecticidal application : 05.03.2015
Date of harvest : 26.04.2015

Plot size : 7.5 m²
Variety : PL 426
Replications : Three

Chemical control of foliage feeding aphid on barley 2014-15 (Location: Vijapur)

Sr. No.	Treatment	Doses g a.i./ha	Aphid population per shoot				Grain yield (Q/ha)
			Before spray 1 day	After spray			
				1 day	2 day	7days	
1.	Imidacloprid 200 SL (Confidor)	20 g	27.33	14.07a	6.20a	3.20a	49.08
2.	Clothianidin 50WDG (Dantotsu)	15g	34.00	19.27a	8.40a	3.20a	43.17
3.	Flubendiamide (Fame 480 SC 39.35 % mm SC)	20	26.87	15.13a	6.27a	2.60a	40.67
4.	Acetamiprid 20 SP (Pride)	50 g	32.07	17.80a	8.20a	4.60a	38.25
5.	Thiamethoxam 25WG (Actara)	12. 5	30.07	16.73a	6.80a	3.67a	45.75
6.	Chlorantranilipride 18.5 SC (Coragen)	20	32.27	17.13a	6.47a	2.67a	36.13
7.	Dimethoate 30 EC (Rogar)	100 g	31.33	17.13a	5.67a	2.20a	38.38
8.	Untreated check	-	33.80	37.53b	31.73b	17.20b	32.67
	S.Em. ± C.D. at 5%) C.V. %		4.51 NS -	3.02 9.17 -	1.93 5.85 -	1.13 3.43 -	3.21 NS 13.72

Figures followed with same letter(s) are not differed statistically

Date of sowing : 23/11/2014
Date of insecticide application : 06/01/2015
Date of harvesting : 14 /03/2015

Design : R.B.D
Replications : Three
Spacing : 20 cms between row
No. of rows / plot : 6
Plot size : Gross : 6.0m x 1.20m
Net : 5.0m x 0.80m
Variety : RD 2052
Condition : Irrigated

Chemical control of foliage feeding aphids on barley 2014-2015 (Location: Kanpur)

S.No.	Treatments	Dosage g.a.i./ha	Actual dose ml/g/ha	Aphid population per main shoot					Overall Av. Aphid Popu./ shoot after spray	Grain yield (q/ha)	Increase yield (q/ha) over untreated
				Before spray	After spray						
				1 day	1day	2 days	7 days	15 days			
1.	Imidacloprid (17.8% SL)	20	100ml	18.66	2.36 (1.692)	2.12 (1.617)	1.77 (1.509)	0.75 (1.101)	1.75	40.69	5.13
2.	Clothianidin 50 WDG	15	30gm	17.66	2.84 (1.814)	2.48 (1.724)	1.87 (1.542)	1.63 (1.459)	2.05	39.86	4.30
3.	Flubendamide (Fame 480 SC)	20	250ml	18.00	1.75 (1.494)	1.38 (1.378)	1.08 (1.254)	0.50 (0.972)	1.18	41.38	5.82
4.	Acetamiprid 20SP	50	100gm	19.33	2.85 (1.837)	2.51 (1.737)	1.91 (1.553)	0.73 (1.493)	2.00	39.03	3.47
5.	Thiamethoxam 25 WG (Actara)	12.5	50gm	18.00	2.14 (1.623)	2.08 (1.603)	1.52 (1.423)	0.58 (1.32)	1.58	40.83	5.27
6.	Chlorantaniliprid (Coragen) 18.5 SC	20	100ml	19.00	3.43 (1.984)	2.66 (1.773)	1.96 (1.574)	1.83 (1.529)	2.47	38.79	3.19
7.	Dimethoate (30EC) (Rogar)	100	1000ml	17.66	2.66 (1.771)	2.37 (1.698)	1.81 (1.529)	1.50 (1.413)	2.08	40.55	4.99
8.	Control	-	-	21.33	29.38 (5.464)	35.72 (6.019)	45.77 (6.797)	61.99 (5.981)	43.22	35.56	-
S.Em ±		-	-	-	0.070	0.060	0.079	0.819	-	0.665	-
CD 5%		-	-	-	0.211	0.174	0.207	2.485	-	2.011	-

Date of sowing : 20.11.2014
Date of insecticidal application : 28.01.2015
Date of harvest : 10.04.2015
Design : R.B.D.

Plot size : 3 x 4m = 12 Sqm
Variety : K551
No. of rows/plot : 16
Replication : Three

Chemical control of foliage feeding aphids on barley2014-15 (Location-Karnal)

S. No.	Treatments	Dosage (g a.i./ha.)	Aphid population per shoot					Grain yield (q./ha.)
			Before spray	After Spray				
				1 Day	2 Day	7 Day	15 Day	
1	Imidacloprid 17.8 SL (Confidor)	20	52.13 (7.29)	5.53 (2.55)	1.40 (1.54)	1.00 (1.41)	0.00 (1.00)	37.63
2	Clothianidin 50 WDG (Dantotsu)	15	50.33 (7.16)	8.87 (3.14)	1.93 (1.70)	1.67 (1.63)	0.00 (1.00)	40.55
3	Flubendamide (Fame 480 SC)	20	48.00 (7.00)	8.07 (3.00)	2.33 (1.82)	0.87 (1.37)	0.00 (1.00)	41.01
4	Acetamiprid 20SP (Pride)	50	48.87 (7.06)	7.33 (2.88)	2.47 (1.86)	1.87 (1.68)	2.93 (1.98)	35.59
5	Thiamethoxam 25 WG (Actara)	12.5	51.07 (7.21)	8.47 (3.07)	1.47 (1.57)	1.27 (1.51)	0.00 (1.00)	36.34
6	Chlorantaniliprid (Coragen) 18.5 SC	20	50.20 (7.15)	9.80 (3.28)	6.73 (2.78)	5.47 (2.54)	7.60 (2.93)	32.18
7	Rogor (Dimethoate 30 EC)	100	48.53 (7.04)	7.47 (2.90)	5.13 (2.46)	2.40 (1.84)	5.60 (2.56)	33.72
8	Control		50.93 (7.20)	59.93 (7.80)	55.67 (7.52)	47.67 (6.97)	26.67 (5.25)	28.68
S.Em±			0.12	0.13	0.15	0.09	0.07	2.39
CD at 5%			NS	0.41	0.44	0.26	0.21	7.22

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

Date of sowing : 16-11-2014 Plot size : Six row of six meter length at 25 cm spacing

Date of insecticide application : 16-02-2015 Variety :DWRUB64

Date of harvest : 14-04-2015 Replication : Three

List of Cooperators in Barley Crop Protection (2014-15)

Cooperators		Centre	Nursery/ trial
Stripe rust			
1.	Dr. Dhanbir Singh	Dhaulakuan	IBDSN,NBDSN, EBDSN
2.	Dr. (Ms.) Madhu Meeta	Ludhiana	IBDSN,NBDSN, EBDSN
3.	Dr. P.S. Shekhawat	Durgapura	IBDSN,NBDSN, EBDSN
4.	Dr. Rakesh Devlash	Bajaura	IBDSN,NBDSN, EBDSN
5.	Dr. R. Selvakumar	(Coordinating unit), Karnal	IBDSN,NBDSN, EBDSN
6.	Dr. M.K.Pandey	Jammu	IBDSN,NBDSN, EBDSN
7.	Dr. S. S. Karwasra	Hisar	NBDSN, EBDSN
8.	Dr.S.K. Jain	Almora	NBDSN, EBDSN
Stem rust			
1.	Dr. I. K. Kalappanawar	Dharwad	IBDSN,NBDSN, EBDSN
Leaf rust			
1.	Dr. (Ms) Madhu Meeta	Ludhiana	IBDSN,NBDSN, EBDSN
2.	Dr. R. Selvakumar	(Coordinating unit) Karnal	IBDSN,NBDSN, EBDSN
3.	Dr. Javed Baher	Kanpur	IBDSN,NBDSN, EBDSN
4.	Dr.S.K. Jain	Almora	NBDSN, EBDSN
Leaf blight			
1.	Dr J. Kumar	Pantnagar	IBDSN,NBDSN, EBDSN
2.	Dr. Javed Baher	Kanpur	IBDSN,NBDSN, EBDSN,
3.	Dr. S.P. Singh	Faizabad	IBDSN,NBDSN, EBDSN
4.	Dr. S.S. Vaish	Varanasi	IBDSN,NBDSN, EBDSN
5.	Dr. I. K. Kalappanawar	Dharwad	IBDSN,NBDSN, EBDSN
6.	Dr.S.K. Jain	Almora	NBDSN, EBDSN
Powdery Mildew			
1.	Dr. Dhanbir Singh	Dhaulakuan	IBDSN,NBDSN, EBDSN
2.	Dr.S.K. Jain	Almora	NBDSN, EBDSN
Rust pathotype analysis			
Dr. S.C. Bhardwaj		Flowerdale, Shimla	NBDSN, EBDSN
Chemical control of Leaf rust		Kanpur, Karnal, Dharwad	
Chemical control of Yellow rust		Ludhiana, Durgapura & Bajaura	
Chemical control of blight		Faizabad & Varanasi	

Entomology		
No.	Scientist (s)	Centre
1.	Dr. Subhash Katare	Coordinating unit, IIWBR, Karnal
2.	Dr. A. A. Patel	Vijapur
3.	Dr. Beant Singh	Ludhiana
4.	Dr. J. Kumar	Kanpur
5.	Dr. Ruchira Tiwari	Pantnagar
6.	Dr. K. K. Bhargava	Durgapura
Cereal Cyst Nematode (CCN)		
1.	Dr. (Ms.) Indra Rajvanshi	Durgapura
2.	Dr. R. S. Kanwar	Hisar
3.	Dr. (Ms) Damanjeet Kaur	Ludhiana

RESOURCE MANAGEMENT

RESOURCE MANAGEMENT

The varietal evaluation programme for higher productivity under different agronomic conditions with optimum input is of continuous nature under resource management programme and various centres of different zones are actively engaged in this evaluation. The priority researchable areas in barley agronomy includes input management under resource scarce conditions, fine-tuning of sowing dates under changing climatic conditions, investigations on dry/marginal lands, limited and brackish water resource, late sowing conditions, saline-alkali soils and resource poor farmers, malt barley under good management conditions, dual purpose barley in dry areas and improvement in naked (food) barley. In spite of the fact that the crop is being grown mostly on marginal and problematic lands, there is an increasing trend in the average grain productivity per unit area during recent years. This indicates the important contribution of the improved technologies developed recently. New plant type of malt barley, fertilizer responsiveness and use of disease resistant barley germplasm has broaden the scope of raising the production potential of this crop through agronomic research in near future. There is need to develop lodging resistant varieties as barley is prone to lodging under high input application. Input management for feed, fodder and malt barley for increased input use efficiency and higher profitability is also an area of concern.

The barley resource management group is involved in the evaluation of advanced barley genotypes and updating the package of practices under the "All India Coordinated Wheat and Barley Improvement Project". During 2014-15, the experiments were carried out at 12 locations covering the states of Himachal Pradesh, Uttarakhand, Punjab, Haryana, Rajasthan, Uttar Pradesh and Madhya Pradesh. Three centres in the Northern Hills zone (Almora, Bajaura and Malan), five centres (Agra, Durgapura, Hisar, Ludhiana and Karnal) in the North Western Plains Zone, four centres (Faizabad, Varanasi, Kanpur and Rewa) in the North Eastern Plains Zone were involved in the evaluation programme. The soils of Ludhiana and Durgapura are loamy sand and rest of centres are sandy loam except Malan which is silty clay loam in texture. Soils of Ludhiana, Faizabad, Varanasi and Kanpur are medium in organic carbon content and Agra, Hisar Karnal and Durgapura are low in organic carbon. Soils of all locations except Malan are poor in nitrogen and medium to high in potash. Soils of Durgapura, Hisar, Kanpur and Faizabad are slightly alkaline in nature. During the season, there were high winds and rains during March-April which on one side extended the crop season but another side adversely affected the crop yield due to lodging.

AVT second year entries were evaluated under fertility management and date of sowing conditions in North West plain zone. The irrigated timely sown (malt type) under

different N levels and Irrigated (malt type) under different sowing conditions were conducted at five locations. Resource management group also made efforts to fine-tune the package of practices for barley and conducted eight special trials i.e. sprinkler irrigation, sulphur application, weed management trials in NWPZ, weed management, phosphorus and potash response and interactions and N doses & its scheduling in NHZ, mulching and weed management experiments in NEPZ, date of sowing and varieties trials in NWPZ, NEPZ & NHZ.

The details of the coordinated varietal and special trials (proposed and conducted) are reported in Table 1. Out of the 10 proposed trials for varietal evaluation, all were conducted and reported. In special trials, out of 38 trials proposed at different locations, 36 were conducted and reported. The trial conducted at Almora is not included in the report due to late receiving.

Table 1 Details of barley coordinated and special trials during 2014-15

Trial Name	Number of trials				
	Proposed locations	Not conducted/ Failed	Data Received	Trial/data Rejected	Data Reported
Varietal Evaluation					
IR-TS- Malt- N levels (NWPZ)	5	-	5	-	5
IR-Malt- DOS (NWPZ)	5	-	5	-	5
Total	10	-	10	-	10
Special trials					
DOS x varieties NHZ	3	-	3	-	3
Phosphorus x potash NHZ	2	-	2	1	1
N doses x N schedules NHZ	3	-	3	1	2
Sprinkler irrigation NWPZ	1	-	1	-	1
Sulphur application NWPZ	4	-	4	-	4
DOS x varieties (timely) NWPZ	5	-	5	-	5
DOS x varieties (late) NWPZ	5	-	5	-	5
Mulching x irrigation variety NEPZ	2	-	2	-	2
DOS x varieties NEPZ	4	-	4	-	4
Weed management(NEPZ)	3	-	3	-	3
Weed management(NWPZ &NHZ)	6	-	6	-	6
Total	38	0	38	0	36

EVALUATION OF NEW GENOTYPES

Timely sown irrigated malt barley and N levels (NWPZ)

The performance of test entries (BH 976 and PL 874) was evaluated against five checks (DWRUB52, DWRB101, BH902, DWRB92 and RD2849) at different nitrogen levels in NWPZ (Agra, Durgapura, Hisar, Ludhiana and Karnal). Sowing was done using seed 100 kg/ha keeping N levels in main plots and genotypes in sub plots. Irrigations and other cultural practices were applied as per recommendations of the crop. Full doses of P and K and half of nitrogen were applied as basal. The rest of nitrogen was applied after first irrigation.

The test entry BH 976 recorded highest yield (43.6 q/ha) at 60 kg N/ha, whereas, the other test entry PL 874 recorded highest yield (44.7 q/ha) at 90 kg N/ha (Table 2). The test entry BH 976 responded up to 60 kg N/ha and PL 874 responded upto 90 kg N /ha. At 120 kg N levels, the yield decreased in most of the genotypes

Table 2 NORTH WESTERN PLAINS ZONE POOLED 2014-15
IR-TS-Malt-N levels X Variety

Varieties	Nitrogen Levels, kg/ha						Mean	
	60		90		120			
	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.
			Yield, q/ha					
DWRUB52(c)	42.2	2	43.5	3	43.9	1	43.2	2
DWRB 101(c)	40.8	5	41.7	6	43.3	3	41.9	5
BH 902 (c)	40.7	6	43.6	2	41.5	6	42.0	4
BH 976	43.6	1	42.2	5	40.4	7	42.1	3
PL 874	41.5	3	44.7	1	43.4	2	43.2	1
DWRB 92(c)	41.0	4	39.9	7	41.5	5	40.8	7
RD 2849(c)	39.7	7	43.1	4	42.6	4	41.8	6
MEAN	41.4		42.7		42.4		42.1	
CD (0.05)	Nitrogen Levels(A)		Varieties (B)		B within A		A within B	
	1.4		1.1		2.4		2.4	
			Earhead/ m^2					
DWRUB52(c)	398	7	425	2	424	4	416	6
DWRB 101(c)	407	5	421	4	434	3	421	2
BH 902 (c)	404	6	392	7	405	7	400	7
BH 976	414	1	423	3	415	6	418	5
PL 874	413	2	421	5	423	5	419	3
DWRB 92(c)	409	4	427	1	439	1	425	1
RD 2849(c)	411	3	412	6	434	2	419	4
MEAN	408		417		425		417	
CD (0.05)	Nitrogen Levels(A)		Varieties (B)		B within A		A within B	
	10		11		NS		NS	
			Grains/Earhead					
DWRUB52(c)	29.8	2	28.5	5	30.3	2	29.5	2
DWRB 101(c)	27.7	5	28.7	4	30.0	4	28.8	4
BH 902 (c)	46.2	1	46.6	1	48.7	1	47.2	1
BH 976	28.4	3	28.4	6	28.9	5	28.6	5
PL 874	28.4	4	28.8	3	30.2	3	29.1	3
DWRB 92(c)	25.9	7	25.3	7	25.2	7	25.5	7
RD 2849(c)	26.5	6	29.4	2	27.8	6	27.9	6
MEAN	30.4		30.8		31.6		30.9	
CD (0.05)	Nitrogen Levels(A)		Varieties (B)		B within A		A within B	
	1.0		1.1		1.6		1.9	
			1000 Grain Weight, g					
DWRUB52(c)	44.0	5	44.5	5	43.3	5	43.9	5
DWRB 101(c)	43.5	6	44.3	6	42.6	6	43.5	6
BH 902 (c)	41.1	7	43.0	7	41.0	7	41.7	7
BH 976	49.2	2	48.5	2	46.4	2	48.0	2
PL 874	46.1	4	46.2	3	44.7	4	45.7	4
DWRB 92(c)	52.5	1	51.0	1	51.5	1	51.7	1
RD 2849(c)	46.6	3	46.2	4	46.2	3	46.3	3
MEAN	46.1		46.2		45.1		45.8	
CD (0.05)	Nitrogen Levels(A)		Varieties (B)		B within A		A within B	
	0.9		0.5		1.6		1.5	

Centres: Agra, Durgapura, Hisar, Ludhiana and Karnal

except DWRB 101 and DWRB 92. On mean basis, the test entry PL 874 and BH 974 were at par with the check DWRUB 52 at recommended N level. There is increase in earhead/m^2 & grains/earhead as the N level increased.

Irrigated malt barley x DOS (NWPZ)

The performance of test entries (BH 976 and PL 874) was evaluated against five checks (DWRUB52, DWRB101, BH902, DWRB92 and RD2849) at five locations namely Agra, Durgapura, Hisar, Ludhiana and Karnal, under normal and late sown conditions. Full doses of P and K and half of nitrogen were applied as basal. The rest of nitrogen was applied after first irrigation. Sowing was done using seed 100 kg ha^{-1}, keeping date of sowing in main plots and genotypes in sub plots. Other cultural practices were as per recommendations of crop.

The data presented in Table-3 indicated that the test entry BH 976 recorded highest grain yield (44.5 q ha^{-1}) closely followed by the other test entry PL 874(44.3 q ha^{-1}) under timely sown condition. The check varieties DWRB101and RD2849 were at pat to test entries. Check variety BH 902 recorded significantly higher grain yield (36.2 q ha^{-1}) than the test entries under late sown conditions. The grain yield reduced by 21.1 % under late sown condition as compared to normal sown conditions on mean basis. The genotypes differed significantly in yield attributing characters (1000 grain weight, tillers/m^2 but at par in grains/ earhead).

Table 3 **NWPZ** **POOLED** **2014-15**

IR-TS-DOS X VAR

	Sowing Time				Mean	
	Timely		Late			
Varieties	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.
			Yield, q/ha			
DWRUB52(c)	39.9	6	33.9	4	36.9	5
DWRB 101(c)	42.5	4	34.7	2	38.6	3
BH 902 (c)	41.6	5	36.2	1	38.9	2
BH 976	44.5	1	32.5	5	38.5	4
PL 874	44.3	2	33.9	3	39.1	1
DWRB 92(c)	38.9	7	30.2	7	34.6	7
RD 2849(c)	42.8	3	30.7	6	36.8	6
MEAN	42.1		33.2		37.6	
CD (0.05)	Sowing Time (A)		Varieties (B)		B within A	A within B
	1.7		0.6		2.4	2.3
			Earhead/ m^2			
DWRUB52(c)	425	5	404	2	414	2
DWRB 101(c)	442	1	379	3	410	3
BH 902 (c)	410	7	333	7	371	7
BH 976	424	6	359	5	392	6
PL 874	434	3	357	6	396	5
DWRB 92(c)	438	2	375	4	406	4
RD 2849(c)	426	4	405	1	415	1
MEAN	428		373		401	
CD (0.05)	Sowing Time (A)		Varieties (B)		B within A	A within B
	10		3		15	14

			Grains/Earhead			
DWRUB52(c)	28.2	6	26.2	2	27.2	3
DWRB 101(c)	28.3	5	25.2	4	26.7	5
BH 902 (c)	44.3	1	41.6	1	43.0	1
BH 976	28.5	4	24.1	7	26.3	6
PL 874	28.8	3	25.0	5	26.9	4
DWRB 92(c)	26.9	7	24.1	6	25.5	7
RD 2849(c)	28.9	2	26.2	3	27.6	2
MEAN	30.6		27.5		29.0	
CD (0.05)	Sowing Time (A)		Varieties (B)		B within A	A within B
	0.5		1.4		2.0	1.9
			1000 Grain Weight, g			
DWRUB52(c)	44.5	5	44.9	5	44.7	4
DWRB 101(c)	44.7	4	44.2	6	44.4	6
BH 902 (c)	42.1	7	41.2	7	41.6	7
BH 976	48.6	1	47.4	2	48.0	1
PL 874	47.5	3	46.5	3	47.0	3
DWRB 92(c)	48.1	2	47.5	1	47.8	2
RD 2849(c)	44.2	6	45.0	4	44.6	5
MEAN	45.7		45.2		45.5	
CD (0.05)	Sowing Time (A)		Varieties (B)		B within A	A within B
	0.5		1.3		1.9	1.8

Centres: Agra, Durgapura, Hisar, Ludhiana and Karnal

PRODUCTION TECHNOLOGIES

To improve the productivity of barley, updating of package of practices of barley cultivation is must. So, eight special trials were conducted in different zones. Experiments on sowing dates under changing climate, sprinkler irrigation, sulphur application, mulching, nitrogen doses and their scheduling, phosphorus &potash application and weed management were conducted. The results from these trials are presented below.

SPL1: Date of Sowing and varieties

Timely sown irrigated barley in NWPZ

Four varieties (BH 902, RD 2552, DWRUB 52 and RD 2668) were evaluated against four dates of sowing (dates starting from last week of October to last week of November, 10 days interval) to fine-tune the sowing dates under changing agro climatic conditions. The experiment was conducted at five locations namely Agra, Durgapura, Hisar, Ludhiana and Karnal in split plot design. Full doses of P and K and half of nitrogen were applied as basal. The remaining nitrogen was applied at first irrigation. Sowing was done using seed 100 kg ha^{-1} keeping date of sowing in main plots and genotypes in sub plots. Other cultural practices were as per recommendations of crop.

The data presented in Table 4 clearly revealed that all varieties except RD 2668 recorded significantly higher grain yield when they were sown under D^2 and D^3 (6-25 November) whereas RD 2668 recorded significantly higher yield under D^2

condition (6 – 15 November). All the varieties registered significantly decline in grain yield after 25th November sowing. Grains per earhead were more in six row varieties BH 902 and RD 2552 but earheads/m^2 and 1000 grains weight were significantly higher in two row varieties DWRUB 52 and RD 2668 under all sowing dates.

Table 4 NORTH WESTERN PLAINS ZONE POOLED 2014-15

SPL – 2 Varieties x DOS (Timely)

Varieties	Date of Sowing								Mean	
	DI		DII		DIII		DIV			
	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.
Yield, q/ha										
BH 902	38.06	1	39.64	1	39.34	1	36.15	1	38.30	1
RD 2552	36.46	2	37.53	3	36.99	3	34.00	2	36.25	3
DWRUB 52	35.82	3	39.04	2	38.20	2	33.25	3	36.58	2
RD 2668	31.56	4	35.15	4	33.83	4	30.92	4	32.86	4
Mean	35.48		37.84		37.09		33.58		36.00	
CD (0.05)	DOS (A)		Varieties (B)		B within A		A within B			
	0.91		0.92		1.85		1.83			
Earhead/m^2										
BH 902	389	3	380	4	391	3	370	4	383	4
RD 2552	383	4	395	3	387	4	377	3	386	3
DWRUB 52	411	2	411	2	418	1	407	1	412	2
RD 2668	422	1	421	1	410	2	406	2	415	1
Mean	401		402		402		390		399	
CD (0.05)	DOS (A)		Varieties (B)		B within A		A within B			
	10.0		9.0		19.0		19.0			
Grains/Earhead										
BH 902	45.1	1	44.6	1	44.8	2	43.2	2	44.4	2
RD 2552	43.3	2	43.9	2	47.0	1	43.8	1	44.5	1
DWRUB 52	26.3	3	28.2	3	28.4	3	25.9	3	27.2	3
RD 2668	24.3	4	25.6	4	25.7	4	24.6	4	25.1	4
Mean	34.8		35.6		36.5		34.4		35.3	
CD (0.05)	DOS (A)		Varieties (B)		B within A		A within B			
	1.13		1.12		2.28		2.25			
1000 Grain Weight, g										
BH 902	39.7	3	41.4	2	40.2	3	40.6	2	40.5	3
RD 2552	37.2	4	38.0	4	37.7	4	38.1	4	37.7	4
DWRUB 52	43.4	1	44.1	1	43.1	1	43.4	1	43.5	1
RD 2668	39.8	2	41.3	3	42.0	2	40.5	3	40.9	2
Mean	40.0		41.2		40.8		40.7		40.7	
CD (0.05)	DOS (A)		Varieties (B)		B within A		A within B			
	0.7		0.4		1.3		1.2			
Centres Agra, Durgapura, Hisar, Ludhiana, Karnal										
Three year yield data, q/ha										
BH 902	45.34	1	44.71	2	44.19	2	38.82	1	43.26	1
RD 2552	43.43	3	42.71	3	41.41	3	38.77	2	41.58	3
DWRUB 52	43.93	2	45.52	1	42.42	1	37.40	3	42.32	2
RD 2668	40.65	4	41.94	4	39.34	4	36.29	4	39.55	4
Mean	43.34		43.72		41.84		37.82		41.68	
CD (0.05)	DOS (A)	1.18	Varieties (B)	2.19						

Three year data revealed that the optimum date of sowing for all the varieties tested was 10-19 November, although BH 902, a feed barley variety recorded similar yield between 30th of October to 29th of November. The varieties BH 902 and DWRBUB 52 were at par in all sowing dates and above the other two varieties.

Late sown irrigated barley in NWPZ

Four varieties (DWRUB64, DWRB73, DWRB 91and RD 2508) were evaluated against four dates of sowing (dates starting from first week of December to first week of January, 10 days interval) to work out the optimum date of sowing under changing agro climatic conditions. The experiment was conducted at five locations namely Agra, Durgapura, Hisar, Ludhiana and Karnal in split plot design. Full doses of P and K and half of nitrogen were applied as basal. The remaining nitrogen was applied at first irrigation. Sowing was done using seed 100 kg ha^{-1} keeping date of sowing in main plots and genotypes in sub plots. Other cultural practices were as per recommendations of crop.

All the varieties recorded significantly higher grain yield up to 10th of December sowing among the four dates of sowing barley. Overall, there was significant decrease in yield of all varieties as the sowing date advanced. Among varieties, DWRUB 64 was ranked first followed by RD 2508, DWRB 91 and DWRB 73 (Table 5). The grain yield on mean basis of all varieties reduced by 11.8, 19.5 and 30.8 % as the sowing dates were advanced by 10days. Yield attributing characters such as tillers/m^2, 1000 grains weight and grains/earhead decreased after 10th December sowing.

Table 5 **NORTH WESTERN PLAINS ZONE POOLED 2014-15**
SPL – 1Varieties x DOS (Late)

Varieties	Date of Sowing								Mean	
	DI		DII		DIII		DIV			
	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.
					Yield, q/ha					
DWRUB 64	38.8	1	32.2	1	32.9	1	27.9	1	32.9	1
DWRB 73	32.4	4	29.9	4	26.8	4	22.1	4	27.8	4
DWRB 91	36.3	3	30.3	3	27.1	3	25.1	3	29.7	3
RD 2508	38.1	2	32.1	2	30.4	2	25.4	2	31.5	2
Mean	36.4		31.1		29.3		25.2		30.5	
CD (0.05)	DOS (A)		Varieties (B)		B within A		A within B			
	1.1		0.8		2.2		2.0			
					Earhead/m^2					
DWRUB 64	336	4	310	3	325	2	290	4	316	336
DWRB 73	358	2	323	2	327	1	308	2	329	358
DWRB 91	361	1	331	1	324	3	312	1	332	361
RD 2508	338	3	308	4	320	4	300	3	317	338
Mean	349		318		324		303		323	349
CD (0.05)	DOS (A)		Varieties (B)		B within A		A within B			
	7.0		6.0		14.0		13.0			

					Grains/Earhead					
DWRUB 64	42.1	1	38.6	2	37.8	1	36.4	1	38.7	2
DWRB 73	27.1	4	26.9	3	25.2	3	22.9	4	25.5	4
DWRB 91	28.5	3	26.4	4	24.9	4	24.5	3	26.1	3
RD 2508	42.0	2	39.6	1	37.0	2	36.4	2	38.8	1
Mean	34.9		32.9		31.2		30.1		32.3	
CD (0.05)	DOS (A)		Varieties (B)		B within A		A within B			
	1.3		1.1		1.69		1.70			
					1000 Grain Weight, g					
DWRUB 64	40.7	3	40.1	3	40.2	3	38.4	3	39.8	3
DWRB 73	49.3	2	47.6	2	46.5	2	44.6	2	47.0	2
DWRB 91	52.5	1	50.2	1	48.8	1	45.4	1	49.2	1
RD 2508	39.1	4	39.6	4	36.7	4	34.9	4	37.6	4
Mean	45.4		44.4		43.0		40.8		43.4	
CD (0.05)	DOS (A)		Varieties (B)		B within A		A within B			
	0.8		1.0		1.9		1.8			
Centres Agra, Durgapura, Hisar, Ludhiana, Karnal										
					Three year data					
DWRUB 64	38.10	3	35.35	3	34.51	1	29.95	1	34.48	3
DWRB 73	37.05	4	34.31	4	31.96	4	26.66	4	32.49	4
DWRB 91	40.69	1	36.60	1	33.86	2	29.22	3	35.09	1
RD 2508	40.50	2	35.71	2	33.48	3	29.87	2	34.89	2
Mean	39.09		35.49		33.45		28.92		34.24	
CD (0.05)	DOS (A)		Varieties (B)		B within A		A within B			
	1.55		1.49		2.98		3.00			

Three year data showed that all the varieties recorded significantly higher grain yield up to 10th of December sowing. And thereafter there was significant decrease in yield of all varieties as the sowing date advanced. DWRUB 64 produced highest yield in December late and January sowing whereas DWRB 91 was on top in early December sowing.

Timely sown irrigated barley (North Eastern Plain Zone)

Four varieties (RD 2552, K 508, K 551 and JB 1) were evaluated against four dates of sowing (sowing dates starting from second week of November to second week of December, 10 days interval) to fine-tune the sowing dates under changing agro climatic conditions. The experiment was conducted at four locations namely Kanpur, Varanasi, Faizabad and Rewa in split plot design. Full doses of P and K and half of nitrogen were applied as basal. The remaining nitrogen was applied at first irrigation. Sowing was done using 100 kg seed per ha keeping date of sowing in main plots and genotypes in sub plots. Other cultural practices were as per recommendations of crop.

A perusal of data in table 6 indicated that sowing between 15-24 November (D_2) was significantly superior to other dates of sowing. The grain yield decreased in

5-14 November(D_1) sowing may be due to lodging and the grain yield decreased after 25th November sowing due to late sown condition (less tillers/m2 and grains/earhead). Variety RD 2552 recorded highest grain yield under D_1 and D_2. Overall, D_2 was the optimum sowing date for all the varieties and thereafter significant yield reduction was noticed. Among varieties, RD 2552 was ranked at first position and followed by K 508. Other varieties recorded significantly lower grain yields. The grain yield reduced by 11.8, 23.2 % as the sowing dates advanced by 10 days after 24th November. Almost similar trends were observed in yield attributing characters *ie* earheads/m^2, grains/earhead and 1000 grains weight.

Table 6 **NORTH EASTERN PLAINS ZONE** **POOLED** **2014-15**

SPL – 1 Varieties x DOS

Varieties	Date of Sowing								Mean	
	DI		DII		DIII		DIV			
	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.
Yield, q/ha										
RD 2552	36.4	1	37.1	1	32.0	2	28.0	1	33.4	1
K 508	33.5	2	35.9	2	32.4	1	27.6	3	32.4	2
K 551	31.7	4	34.5	4	30.4	4	26.0	4	30.6	4
JB 1	32.9	3	35.1	3	31.2	3	28.0	2	31.8	3
Mean	33.6		35.7		31.5		27.4		32.0	
CD (0.05)	DOS (A)		Varieties (B)		B within A		A within B			
	0.6		0.7		1.3		1.3			
Earhead/m^2										
RD 2552	331	1	321	1	303	3	299	2	313	2
K 508	329	2	315	2	315	1	303	1	315	1
K 551	277	4	291	4	292	4	248	4	277	4
JB 1	323	3	299	3	308	2	272	3	301	3
Mean	315		306		304		281		301	
CD (0.05)	DOS (A)		Varieties (B)		B within A		A within B			
	8.0		6.0		17.0		16.0			
Grains/Earhead										
RD 2552	39.5	3	40.4	2	38.9	2	35.0	2	38.5	3
K 508	40.1	2	39.9	3	39.9	1	34.9	3	38.7	2
K 551	37.7	4	37.8	4	37.0	4	34.0	4	36.6	4
JB 1	40.3	1	41.9	1	37.7	3	38.2	1	39.5	1
Mean	39.4		40.0		38.4		35.5		38.3	
CD (0.05)	DOS (A)		Varieties (B)		B within A		A within B			
	1.1		0.9		2.2		2.1			
1000 Grain Weight, g										
RD 2552	38.4	1	37.8	2	35.2	2	33.2	2	36.1	2
K 508	34.3	4	35.5	4	32.5	4	31.8	4	33.5	4
K 551	37.8	2	39.7	1	36.5	1	36.4	1	37.6	1
JB 1	35.5	3	37.1	3	33.1	3	32.8	3	34.6	3
Mean	36.5		37.5		34.3		33.6		35.5	
CD (0.05)	DOS (A)		Varieties (B)		B within A		A within B			
	0.69		0.73		1.37		1.38			

Centres Kanpur, Faizabad, Rewa,Varanasi

Three year Yield data, q/ha										
RD 2552	37.75	1	40.96	1	34.76	1	30.66	2	36.03	1
K 508	36.52	4	39.55	2	34.44	2	31.24	1	35.44	3
K 551	36.64	3	38.37	4	33.47	4	29.40	4	34.47	4
JB 1	37.75	2	39.25	3	34.08	3	31.56	3	35.66	2
Mean	37.16		39.53		34.19		30.72		35.40	
CD (0.05)	DOS A)	0.69		Varieties (B)	1.37					

Three year data revealed that second date of sowing (20-30 November) was best for all the varieties after that there was significant reduction in yield. All the varieties were at par except JB 1 which produced significantly lower yields.

Date of Sowing and varieties (Rainfed) in NHZ

Four varieties (BHS 352, UPB 1008, VLB 118 and HBL 113) were evaluated against five dates of sowing (dates starting from 25th October goes up to 25 December, at 15 days interval) to optimize the sowing dates under changing agro climatic conditions. The experiment was conducted at three locations namely Almora, Bajaura and Malan in split plot design. Full of P and K and one half of nitrogen were applied as basal. The rest of nitrogen was applied at tillering stage. Sowing was done using 100 kg seed/ha keeping date of sowing in main plot and genotypes in sub plot. Other cultural practices were as per recommendations of crop.

A perusal of data in Table 7 indicated that the grain yield of all the varieties except BH 352 decreased significantly due to delay in sowing after 1st date of sowing (25 October -09 November). Among varieties, HBL 113 was ranked at first position and followed by UPB 1008 and VLB 118. The reduction in yield was 6.7, 31.9, 32.8 and 43.9 % respectively as the dates of sowing were advanced by 15 days. Yield attributing characters *viz.* grains/earhead and earhead/m^2 were also maximum in 1st date of sowing.

Table 7 SPL-1 DOS X Varieties (NHZ) POOLED 2014-15

Varieties	Date of Sowing											
	D I		D II		D III		D IV		D V		Mean	
	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.
Yield, q/ha												
BHS 352	24.6	4	24.4	4	20.5	3	23.5	2	17.0	3	22.0	4
UPB 1008	34.0	2	32.7	2	24.2	1	19.3	3	18.8	2	25.8	2
VLB 118	32.0	3	29.7	3	20.3	4	18.1	4	15.2	4	23.1	3
HBL 113	39.6	1	34.7	1	23.9	2	26.6	1	22.1	1	29.4	1
Mean	32.6		30.4		22.2		21.9		18.3		25.1	
CD(0.05)	DOS (A) 1.3		Varieties(B) 1.7		B within A 2.9		A within B 3.0					
Earhead m^{-2}												
BHS 352	275	4	251	4	244	4	237	4	198	4	241	4
UPB 1008	427	2	421	2	355	2	310	2	306	2	364	2
VLB 118	300	3	306	3	266	3	242	3	232	3	269	3
HBL 113	447	1	424	1	380	1	361	1	318	1	386	1
Mean	362		351		311		287		264		315	
CD(0.05)	DOS (A) 16.7		Varieties(B) 18.9		B within A		A within B					

Grains/Earhead												
BHS 352	27.2	2	27.8	1	23.9	1	27.6	1	23.0	1	25.9	1
UPB 1008	20.6	4	18.9	4	16.5	4	14.1	4	13.8	4	16.8	4
VLB 118	30.8	1	27.3	2	19.9	2	17.9	3	15.4	3	22.3	2
HBL 113	24.0	3	22.5	3	18.0	3	20.2	2	19.7	2	20.9	3
Mean	25.7		24.2		19.6		20.0		18.0		21.5	
CD(0.05)	DOS (A)		Varieties(B)		B within A		A within B					
	1.2		1.4		2.7		2.7					
1000 Grains Weight, g												
BHS 352	33.4	4	34.8	4	36.3	3	35.5	4	38.3	3	35.7	4
UPB 1008	39.1	1	40.9	1	41.9	1	44.5	1	44.1	1	42.1	1
VLB 118	34.3	3	35.5	3	38.6	2	42.2	2	42.8	2	38.7	2
HBL 113	37.3	2	36.4	2	35.1	4	37.2	3	35.9	4	36.4	3
Mean	36.0		36.9		38.0		39.9		40.3		38.2	
CD (0.05)	DOS (A)		Varieties(B)		B within A		A within B					
	0.8		1.1		1.8		1.8					
Centres: Bajoura, Malan												
Three year yield data, q/ha												
BHS 352	27.48	4	28.94	4	26.76	4	25.93	4	21.94	4	26.21	4
UPB 1008	36.13	2	38.42	2	34.36	2	30.11	3	27.03	3	33.21	2
VLB 118	35.03	3	38.34	3	34.20	3	30.51	2	27.25	2	33.07	3
HBL 113	40.82	1	40.28	1	34.96	1	33.77	1	29.14	1	35.79	1
Mean	34.86		36.49		32.57		30.08		26.34		32.07	
CD (0.05)	DOS (A)		Varieties(B)		B within A		A within B					
	5.19		2.42		5.42		6.57					

Three year data revealed that second date of sowing (10 - 24 November) was better among all the date of sowing and for all the varieties. Among varieties, HBL 113 was ranked at first position and followed by UPB 1008 and VLB 118.

SPL 2 Effect of sprinkler irrigation on yield and quality of barley crop

An experiment was conducted to evaluate and standardise the method of sprinkler irrigation in respect of malting quality and productivity. A total of five treatments, four of sprinkler irrigation (20DAS + 15 days interval, 20DAS + 20 days interval, 20DAS + 25 days interval, and 20DAS + 30 days interval) and one flood irrigation were undertaken at Durgapura centre. Full doses of P and K and half of nitrogen were applied as basal. The rest of nitrogen was applied at first irrigation. Other cultural practices like weed control were common to all the treatments. Irrigation was applied as per treatments.

The data presented in table 8 showed that sprinkler irrigation initially 20 days after sowing and thereafter 20, 25 and 30 days interval recorded the better yield as compared to sprinkler irrigation with interval of 15 days. Although the highest yield was recorded in flood irrigation treatment but at par with sprinkler irrigation with 20, 25 and 30 days interval. BH 902 produced better grain yield in 30 days sprinkler irrigation interval and flood irrigation while DWRUB 52 recorded better grain yield in 20 and 25 days sprinkler irrigation interval and flood irrigation. Almost similar trends were observed in yield attributing characters. Thousand grains weight of DWRUB 52 and BH

902 was at par in 15, 20 & 25 and 15& 20 days sprinkler irrigation intervals respectively.

Table 8	NORTH WESTERN PLAIN ZONE SPL-3 Sprinkler Irrigation								Durgapura		2014-15	
	Method of Irrigation											
Varieties	20DAS + 15 days interval		20DAS +20 days interval		20DAS+ 25 days interval		20DAS + 30 days interval		control (flood irrigation)		Mean	
	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.
Yield, q/ha												
DWRUB52	41.1	2	47.2	1	48.5	1	44.1	2	48.8	2	45.9	2
BH 902	42.7	1	44.3	2	43.3	2	50.1	1	51.1	1	46.3	1
Mean	41.9		45.7		45.9		47.1		49.9		46.1	
CD (0.05)	Irrig. (A)		Varieties(B)		B within A		A within B					
	5.3		2.9		6.4		6.9					
Earhead/m^2												
DWRUB52	450	2	463	1	468	1	399	2	383	2	433	1
BH 902	452	1	461	2	403	2	408	1	403	1	426	2
Mean	451		462		435		404		393		429	
CD (0.05)	Irrig. (A)		Varieties(B)		B within A		A within B					
	29.4		27.0		60.5		51.8					
Grains/Earhead												
DWRUB52	17.6	2	18.7	1	18.9	2	24.6	2	28.4	1	21.7	2
BH 902	17.7	1	18.0	2	23.6	1	26.0	1	26.6	2	22.4	1
Mean	17.7		18.4		21.3		25.3		27.5		22.0	
CD (0.05)	Irrig. (A)		Varieties(B)		B within A		A within B					
	3.4		2.7		5.9		5.3					
1000 Grain Weight, g												
DWRUB52	52.3	2	54.5	1	55.1	1	45.2	2	45.1	2	50.4	1
BH 902	53.4	1	53.3	2	45.8	2	47.3	1	48.3	1	49.6	2
Mean	52.9		53.9		50.5		46.3		46.7		50.0	
CD (0.05)	Irrig. (A)		Varieties(B)		B within A		A within B					
	3.0		2.6		5.0		4.6					
Three year yield data												
DWRUB52	41.41	2	43.98	1	47.45	1	43.21	2	43.95	2	44.00	2
BH 902	41.82	1	41.25	2	43.50	2	46.28	1	50.26	1	44.62	1
Mean	41.61		42.62		45.47		44.75		47.11		44.31	
CD (0.05)	Irrig. (A)		Varieties(B)		B within A		A within B					
	4.45		1.98		4.44		5.32					

Three data showed that sprinkler irrigation 20DAS and 25 days interval was best treatment except flood irrigation which gave the highest yield. The variety DWRUB 52 was recorded best at 25 days interval and BH 902 at 30 days interval sprinkler.

SPL 3 Effect of Sulphur application on productivity and quality of barley

Experiments were conducted to evaluate the effect of sulphur application on yield and quality of barley crop at four locations (Agra, Durgapura, Ludhiana and Karnal). The experiment was conducted with four treatments of sulphur application (0, 20, 30, 40 kg ha^{-1}) and three varieties (DWRUB 52, RD 2668, BH 902) in split plot design. Full doses of P and K and half of nitrogen were applied as basal. The rest of

nitrogen was applied at first irrigation. Sulphur was applied as per treatments. Other cultural practices like irrigation and weed control were common to all the treatments.

A perusal of data (table 9) revealed that sulphur application increased the productivity of all varieties up to 30kg S ha^{-1} except BH 902 which registered higher grain yield when S was applied @ 20 kg ha^{-1}.The grain yield was higher in BH 902 followed by DWRUB52. Yield attributing characters like tillers/m^2, grains /$m^2$and 1000 grains weight were significantly increased with S application @ 30kgha^{-1} over no S application.

Table 9 **NORTH WESTERN PLAINS ZONE** **POOLED** **2014-15**

SPL3– Sulphur x Varieties

Varieties	Sulphur application, kg/ha								Mean	
	0		10		20		30			
	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.
					Yield, q/ha					
DWRUB 52	39.79	2	42.07	2	42.43	2	43.45	1	41.93	2
RD 2668	37.05	3	36.96	3	39.68	3	40.53	3	38.55	3
BH 902	40.13	1	42.96	1	44.37	1	43.38	2	42.71	1
Mean	38.99		40.66		42.16		42.45		41.07	
CD (0.05)	Sulphur (A)		Varieties (B)		B within A		A within B			
	0.85		0.93		1.86		1.73			
					Earhead/m^2					
DWRUB 52	374	2	383	2	388	2	388	2	383	2
RD 2668	383	1	388	1	391	1	391	1	388	1
BH 902	360	3	367	3	377	3	376	3	370	3
Mean	373		379		385		385		380	
CD (0.05)	Sulphur (A)		Varieties (B)		B within A		A within B			
	10.0		11.0		19.1		18.8			
					Grains/Earhead					
DWRUB 52	24.6	2	24.7	2	25.0	2	25.9	2	25.0	2
RD 2668	23.0	3	23.4	3	23.9	3	24.2	3	23.6	3
BH 902	34.4	1	34.8	1	34.6	1	35.3	1	34.8	1
Mean	27.3		27.7		27.8		28.4		27.8	
CD (0.05)	Sulphur (A)		Varieties (B)		B within A		A within B			
	1.1		1.9		2.2		2.5			
					1000 Grains Weight, g					
DWRUB 52	44.6	1	45.6	1	45.3	1	46.0	1	45.4	1
RD 2668	43.8	2	44.9	2	44.0	2	44.7	2	44.3	2
BH 902	40.3	3	41.0	3	41.9	3	41.5	3	41.2	3
Mean	42.9		43.8		43.7		44.1		43.6	
CD (0.05)	Sulphur (A)		Varieties (B)		B within A		A within B			
	0.94		0.91		1.9		1.8			
Centres Agra, Durgapura, Ludhiana										
					Three year yield data, q/ha					
DWRUB 52	38.39	2	40.57	2	41.51	2	42.30	1	40.69	2
RD 2668	35.88	3	36.98	3	38.22	3	39.08	3	37.54	3
BH 902	38.88	1	41.26	1	42.29	1	42.27	2	41.17	1
Mean	37.72		39.60		40.67		41.22		39.80	
CD (0.05)	Sulphur (A)		Varieties (B)		B within A		A within B			
	1.05		0.87		1.74		1.69			

Three year data revealed that the response of sulphur was up to 30 kg/ha but optimum dose of sulphur application was 20kg /ha as 20 and 30 kg S application were at par in yield.

SPL:4 Effect of mulching and irrigation on yield of barley crop in NEPZ

The experiment was conducted with an objective is study effect of mulching on productivity of barley and water saving at Kanpur and Varanasi. There was nine treatments and three replications in RBD design. Full of P and K and one half of nitrogen were applied as basal. The rest of nitrogen was applied at 1st irrigation. Residue and irrigation were as per treatments.

Mulch application and irrigation increased the grain yield significantly (Table 10). The significantly highest yield (36.1 q ha $^{-1}$) was attained with combination of mulching @ 6 t ha $^{-1}$ and two irrigations. Extra residue load and irrigation resulted in significantly higher grain yield. Significant lower yield were observed in no mulch, no irrigation combination. Residue load @6 t ha $^{-1}$ and two irrigations recorded significantly higher grains / earhead and 1000 grains weight.

Table 10 NORTH EASTERN PLAIN ZONE Pooled 2014-15
SPL 6– Mulching

Treatments	Yield, q/ha	Earhead /m^2	Grains/ Earhead	1000 Grains Weight, g
6 t mulch, no irrigation	27.9	342	30.6	32.5
6 t mulch, one irrigation 35 DAS	32.9	326	35.0	35.0
6 t mulch, two irrigation 35& 85 DAS	36.1	331	35.2	37.5
4 t mulch, no irrigation	25.4	331	29.8	34.9
4 t mulch, one irrigation 35 DAS	30.6	332	31.7	34.4
4 t mulch, two irrigation 35& 85 DAS	34.0	343	33.4	34.0
No mulch, no irrigation	24.6	335	30.0	31.3
No mulch, one irrigation 35 DAS	29.5	303	33.1	33.9
No mulch, two irrigation 35& 85 DAS	32.0	326	33.4	33.5
MEAN	30.3	330	32.5	34.1
CD (0.05)	0.54	7.5	0.9	0.46

Centres Kanpur, Varanasi

SPL 5 Effect of nitrogen doses and time of application on productivity of barley under rainfed condition in NHZ

The trial was conducted with an objective to optimise dose and time of N application under rainfed conditions and their effect on productivity of grain yield. Five doses of nitrogen (0, 20, 40, 60 and 80 kg/ha) with three schedule of application (Full basal, half basal + half after 1st rain, ⅔ as basal+⅓ after 1st rain) were undertaken in split plot design taking N doses in main plots and N scheduling in split plots at Bajaura and Malan. Fertilisers (P and K) were applied as basal. Sowing was done using 100

kg seed ha^{-1}. Other cultural practices like irrigation and weed control were common to all the treatments.

Pooled data presented in Table 11 revealed that the grain yield increased significantly with the increase in the level of nitrogen only up to 60 kg N ha^{-1}, whereas significantly higher grain yield was recorded by applying half N as basal and remaining half after 1st rain @ 80 kg ha^{-1}. On an average, higher yields were recorded in half basal + half after rain and ⅔ as basal+⅓ after 1st rain as compared to full basal. Almost similar trends were observed in yield attributing characters.

Table 11	**NORTHERN HILL ZONE SPL-5 N Doses X N schedules**								**Pooled**		**2014-15**	
	N Levels											
N schedule	0		20		40		60		80		Mean	
	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.
Yield, q/ha												
Full basal	17.7	1	24.8	3	32.3	1	34.5	3	34.7	3	28.8	3
1/2+1/2	16.7	3	28.5	1	31.9	3	34.6	2	37.1	2	29.8	1
2/3+1/3	16.8	2	26.2	2	31.9	2	35.6	1	37.3	1	29.6	2
Mean	17.1		26.5		32.0		34.9		36.4		29.4	
CD(0.05)	N Level (A)		N sched.(B)		B within A		A within B					
	1.9		0.9		2.1		2.5					
Earhead/m^2												
Full basal	212	3	247	3	282	1	296	1	318	1	271	1
1/2+1/2	215	2	255	1	255	3	291	2	313	2	266	2
2/3+1/3	215	1	250	2	262	2	281	3	298	3	261	3
Mean	214		251		267		289		310		266	
CD(0.05)	N Level (A)		N sched.(B)		B within A		A within B					
	19.0		13.0		28.0		29.0					
Grains/Earhead												
Full basal	22.6	1	24.4	3	26.4	3	26.3	3	24.7	3	24.9	3
1/2+1/2	20.6	2	27.2	1	28.8	1	27.0	2	26.3	2	26.0	2
2/3+1/3	20.6	3	25.2	2	27.6	2	28.9	1	27.9	1	26.0	1
Mean	21.2		25.6		27.6		27.4		26.3		25.6	
CD(0.05)	N Level (A)		N sched.(B)		B within A		A within B					
	2.1		1.5		3.4		3.5					
1000 Grain Weight, g												
Full basal	38.3	3	41.9	2	43.4	2	44.3	1	44.2	3	42.4	3
1/2+1/2	38.9	1	41.4	3	43.4	3	44.0	2	45.0	1	42.5	2
2/3+1/3	38.7	2	42.0	1	44.3	1	43.6	3	44.4	2	42.6	1
Mean	38.7		41.7		43.7		44.0		44.5		42.5	
CD(0.05)	N Level (A)		N sched.(B)		B within A		A within B					
	0.9		0.8		1.9		1.8					
Centers	Bajaura, Malan											

SPL 6 Doses of Phosphorus and Potash application in barley in NHZ

The trial was conducted to optimise doses of phosphorus and potash in Northern Hill Zone. Four doses of phosphorus (0, 20,30, 40 kg ha^{-1}) and three doses of

potash (0,20,40 kg ha^{-1}) were taken in split plot design at Bajaura. ⅔ N was applied as basal and ⅓ after first rain. P and K were applied as per treatments. Sowing was done using 100 kg seed ha^{-1}. Other cultural practices like irrigation and weed control were common to all the treatments.

Data presented in table 12 revealed that the grain yield increased significantly with the increase in the doses of phosphorus up to the level of 40 kg ha^{-1} at all levels of potash except no potash application and the yield increased as the doses of potash increased up to the level of 40 kg ha^{-1} at all levels of phosphorus. Overall, optimum and significantly higher grain yield levels were obtained by applying 40 kg of phosphorus and 40 kg of potash per ha. Yield attributing characters viz. earhead/m^2, grains/earhead and 1000 grains wt. were also maximum in P and K @ 40 kg ha^{-1}.

Table 12 **NORTHERN HILL ZONE** **Bajoura** **2014-15**
SPL6– Phosphorus X Potash

Potash	Phosphorus level, kg/ha								Mean	
	0		20		30		40			
Level,kg/ha	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.
					Yield, q/ha					
0	14.7	3	21.2	3	29.3	3	27.3	3	23.1	3
20	18.7	2	29.1	2	32.4	2	38.4	2	29.7	2
40	21.6	1	32.1	1	35.2	1	42.0	1	32.7	1
MEAN	18.3		27.5		32.3		35.9		28.5	
CD(0.05)	P level(A)		K level (B)		B within A		A within B			
	2.9		3.0		6.1		5.6			
					Earhead/m^2					
0	232	3	242	3	279	3	278	3	258	3
20	251	2	254	2	295	2	303	2	276	2
40	253	1	267	1	303	1	308	1	283	1
MEAN	245		254		292		297		272	
CD 0.05)	P level(A)		K level (B)		B within A		A within B			
	21.0		15.0		30.0		30.0			
					Grains/Earhead					
0	19.7	3	23.1	3	25.9	3	24.5	3	23.3	3
20	20.8	2	28.6	1	26.8	2	30.2	2	26.6	2
40	23.1	1	28.3	2	27.7	1	30.7	1	27.4	1
MEAN	21.2		26.6		26.8		28.5		25.8	
CD(0.05)	P level(A)		K level (B)		B within A		A within B			
	2.2		2.6		5.2		4.6			
					1000 Grains Weight, g					
0	33.2	3	37.9	3	40.4	3	40.1	3	37.9	3
20	35.5	2	40.0	2	40.9	2	42.1	2	39.6	2
40	36.5	1	42.4	1	42.3	1	44.6	1	41.5	1
MEAN	35.1		40.1		41.2		42.3		39.7	
CD(0.05)	P level(A)		K level (B)		B within A		A within B			
	1.3		1.1		2.1		2.1			

	Three year yield data q/ha									
0	33.2	3	37.9	3	40.4	3	40.1	3	37.9	3
20	35.5	2	40.0	2	40.9	2	42.1	2	39.6	2
40	36.5	1	42.4	1	42.3	1	44.6	1	41.5	1
MEAN	35.1		40.1		41.2		42.3		39.7	
CD(0.05)	P level(A)		K level (B)		B within A		A within B			
	4.74		1.60		3.19		4.86			

Three year data showed that the response of P and K application was up to 40 Kg/ha each.

SPL 7 Weed management in Barley (NEPZ)

Experiments were conducted to manage the broad leaves weeds through herbicides at Kanpur, Varanasi and Durgapura with eleven treatments of metsulfuron and carfetrazone in combination or alone. It was conducted in RBD design with three replications. In addition weedy check and weed free plots were also maintained. Full doses of P and K and half of nitrogen were applied as basal. The rest of nitrogen was applied at 1st irrigation. Sowing was done using 100 kg seed ha^{-1}. Other cultural practices were as per recommendations of crop.

Pooled data presented in Table 13 revealed that the grain yield in Metsulfuron+ Carfentrazone 20g+ NIS 0.2% and Metsulfuron+Carfentrazone 25g+ NIS 0.2% treatments was statistically at par with grain yield in weed free treatment. Among the herbicides the best treatment was Metsulfuron+Carfentrazone 25g+ NIS 0.2%, which produced 1.4 q ha^{-1} less grain yield as compared to weed free treatment. The grain yield reduction due to weeds in weedy check was 22.3 % as compared to weed free conditions.

Table 13 **NORTH EASTERN PLAIN ZONE** **Pooled** **2014-15**
SPL 9– Weed management

Treatments	Yield, q/ha	Earhead /m^2	Grains/ Earhead	1000 Grain Weight, g
Metsulfuron+Carfentrazone 15g	35.0	384	29.5	35.2
Metsulfuron+Carfentrazone 20g	38.9	383	33.5	35.8
Metsulfuron+Carfentrazone 25g	39.8	391	32.5	36.3
Metsulfuron+Carfentrazone 15g+ NIS 0.2%	39.7	387	33.2	36.0
Metsulfuron+Carfentrazone 20g+ NIS 0.2%	41.1	393	33.9	36.3
Metsulfuron+Carfentrazone 25g+ NIS 0.2%	41.2	398	32.8	36.4
Metsulfuron 4g	38.8	379	33.5	36.6
Carfentrazone 20g	36.5	378	32.0	35.8
2,4-D 500g	36.1	379	32.3	35.5
Weedycheck	33.1	345	31.0	34.9
Weed free	42.6	402	34.3	37.3
MEAN	38.4	384	32.6	36.0
CD (0.05)	2.0	19.0	2.5	2.0

Centres Kanpur, Varanasi, Durgapura

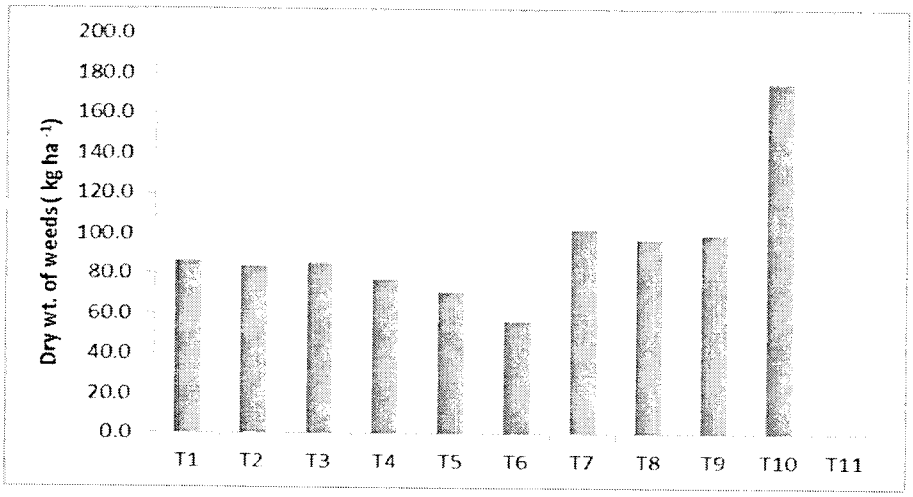


Fig. 1 Dry weight of weeds 90 DAS

Almost similar trends were observed in yield attributing characters *viz.* earhead/m^2, grains/earhead and 1000 grains weight. Application of Metsulfuron+Carfentrazone 25g+ NIS 0.2% resulted in maximum reduction in dry weight of weeds (Figure 1).

SPL 8 Weed management in Barley (NWPZ)

Experiments were conducted to manage the grasses and broad leaves weeds through herbicides at Karnal, Ludhiana, Hisar, Durgapura, Bajaora and Malan locations. Eleven treatments of pinoxaden and isoproturan in combination with metsulfuron /carfentrazone / 2,4 D or alone were evaluated. It was conducted in RBD design with three replications. In addition weedy check and weed free plots were also maintained. Full doses of P and K and half of nitrogen were applied as basal. The rest of nitrogen was applied at 1st irrigation. Sowing was done using 100 kg seed ha^{-1}. Other cultural practices were as per recommendations of crop.

Pooled data of Karnal, Ludhiana and Hisar presented in Table 14 revealed that the grain yield in the treatments of Pinoxaden @ 40g ha^{-1} +Carfentrazone @ 20g ha^{-1} and Pinoxaden @ 40g ha^{-1} followed by Metsulfuron @ 4g ha^{-1} were were statistically at par with weed free treatment but the highest yield was recorded in weed free treatment. The grain yield reduction due to weeds was 23.3 percent as compared to weed free conditions. Yield attributing characters *viz.* earhead m^{-2}, grains/earhead and 1000 grains weight were also maximum in weed free treatment. Data presented in fig. 2 clearly revealed that application of Pinoxaden @ 40g ha^{-1} +Carfentrazone @ 20g ha^{-1} and Pinoxaden @ 40g ha^{-1} followed by Metsulfuron @ 4g ha^{-1} resulted in maximum reduction in dry weight of weeds.

Table 14

SPL 10– Wed management

Treatments	Yield, q/ha	Earhead /m^2	Grains/ Earhead	1000 Grain Weight, g
Pinoxaden 30g	38.1	430	34.0	42.0
Pinoxaden 40g	40.4	422	34.9	42.4
Pinoxaden 50g	41.1	443	34.1	42.2
Pinoxaden 40g +Metsulfuron 4g	38.1	432	33.5	43.1
Pinoxaden 40g followed by Metsulfuron 4g	42.7	448	36.1	42.3
Pinoxaden 40g+Carfentrazone 20g	42.2	464	35.3	40.9
Isoproturon 1000g	36.9	424	33.1	41.5
Isoproturon 750g+ 2,4-D 500g	41.8	453	35.4	43.2
Isoproturon 750g+Metsulfuron 4 g	40.4	434	34.6	42.7
Weedycheck	34.9	411	34.9	42.1
Weedfree	45.5	466	36.6	42.8
MEAN	40.2	439	34.8	42.3
CD (0.05)	3.6	25	NS	NS

Centres: Karnal, Ludhiana and Hisar

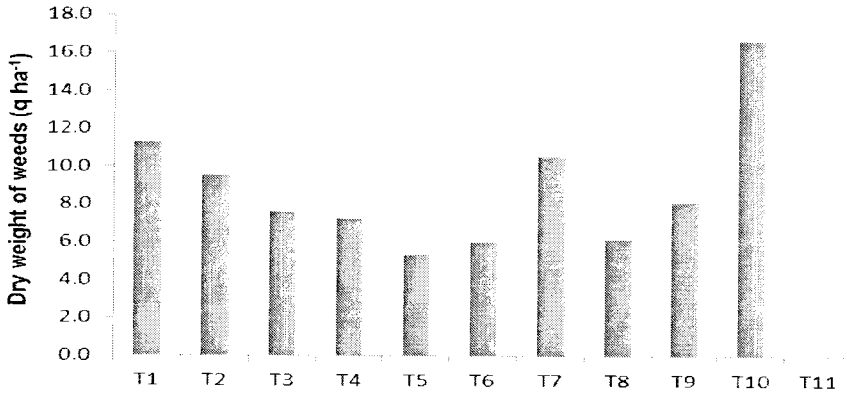


Fig. 2 Dry weight of weeds 90 DAS

Weed management in Barley (NHZ)

Pooled data of Bajaura and Malan presented in Table 14a revealed that the grain yield was statistically at par in the treatments Pinoxaden @ 40g ha^{-1} +Carfentrazone @ 20g ha^{-1}, Pinoxaden @ 40g ha^{-1} followed by Metsulfuron @ 4g ha^{-1}, Pinoxaden @ 40g ha^{-1} + Metsulfuron @ 4g ha^{-1}, Isoproturon @ 750g ha^{-1}+ Metsulfuron @ 4g ha^{-1}, Isoproturon @ 750g ha^{-1}+ 2,4-D @ 500g ha^{-1} and weed free treatments. Yield attributing characters *viz.* earhead m^{-2}, grains earhead^{-1} and 1000 grains weight were also significantly reduced due to weeds in weedy check as compared to weed free treatment.

Table 14a **NORTHERN HILL ZONE** **Pooled** **2014-15**

SPL10 – Wed management

Treatments	Yield, q/ha	Earhead /m^2	Grains/ Earhead	1000 Grain Weight, g
Pinoxaden 30g	31.6	245	32.1	39.2
Pinoxaden 40g	32.8	247	32.8	39.2
Pinoxaden 50g	32.8	242	34.1	38.8
Pinoxaden 40g +Metsulfuron 4g	38.8	263	34.2	41.3
Pinoxaden 40g followed by Metsulfuron 4g	38.6	260	34.7	40.9
Pinoxaden 40g+Carfentrazone 20g	34.2	259	33.1	39.2
Isoproturon 1000g	33.5	248	33.5	39.2
Isoproturon 750g+ 2,4-D 500g	38.0	270	34.3	39.9
Isoproturon 750g+Metsulfuron 4 g	39.7	263	35.2	41.0
Weedycheck	24.6	211	29.8	36.9
Weedfree	37.7	256	34.5	40.7
MEAN	34.8	251	33.5	39.7
CD (0.05)	2.7	21	2.1	1.5

Centres: Bajaura, Malan

Data presented in fig. 3 clearly revealed that application of Pinoxaden at the rate of 40g ha^{-1} followed by Metsulfuron @ 4g ha^{-1}, Isoproturon @ 750g ha^{-1}+ Metsulfuron @ 4g ha^{-1} and Pinoxaden @ 40g ha^{-1} + Metsulfuron @ 4g ha^{-1}resulted in maximum reduction in dry weight of weeds.

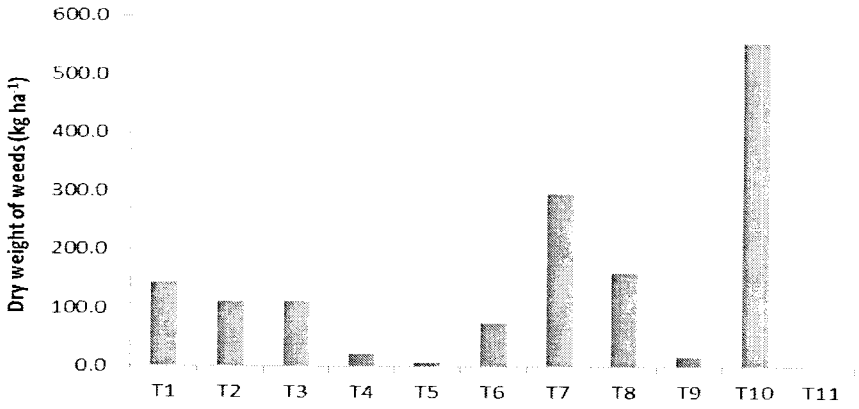


Fig. 3 Dry weight of weeds 90 DAS

Centre wise Yield Tables

Table 2.1	**MB-IR-DOS**	Agra			Year (2014-15)	
		Date of sowing			(Yield q/ha)	
Varieties	Normal	Rank	Late	Rank	Mean	Rank
DWRUB52	37.66	3	33.26	3	35.46	3
DWRB 101	40.83	2	34.09	2	37.46	2
BH 902	43.38	1	36.27	1	39.83	1
BH 976	37.32	4	27.36	5	32.34	5
PL 874	36.63	5	30.63	4	33.63	4
DWRB 92	32.40	6	25.15	6	28.78	6
RD 2849	28.64	7	23.38	7	26.01	7
MEAN	36.69		30.02		33.36	
		F. Test	S.E.m	C.D.	C.V.(%)	
Date of sowing	(A)	**	0.35	2.13	4.81	
Varieties	(B)	**	0.67	1.97	4.95	
B within A		NS	0.95	1.78		
A within B			0.95	1.77		
Date of Sowing: 15.11.14, 15.12.14			Date of Harvesting: 28.03.15, 10.04.15			

Table 2.2	**MB-IR-DOS**	Durgapura			Year (2014-15)	
		Date of sowing			(Yield q/ha)	
Varieties	Normal	Rank	Late	Rank	Mean	Rank
DWRUB52	53.28	7	48.13	4	50.70	7
DWRB 101	61.19	1	49.16	3	55.17	1
BH 902	54.26	5	52.66	1	53.46	2
BH 976	58.20	3	43.75	7	50.97	6
PL 874	58.44	2	47.43	5	52.93	3
DWRB 92	53.63	6	50.47	2	52.05	4
RD 2849	56.23	4	45.74	6	50.99	5
MEAN	56.46		48.19		52.33	
		F. Test	S.E.m	C.D.	C.V.(%)	
Date of sowing	(A)	**	0.23	1.38	1.98	
Varieties	(B)	NS	0.167	4.87	7.82	
B within A		N.S.	2.36	6.89		
A within B			2.20	6.41		
Date of Sowing: 16.11.14, 15.12.14			Date of Harvesting: 26.03.15, 8.04.15			

Table 2.3	**MB-IR-DOS**	Hisar			Year (2014-15)	
		Date of sowing			(Yield q/ha)	
Varieties	Normal	Rank	Late	Rank	Mean	Rank
DWRUB52	36.23	7	33.85	4	35.04	36.23
DWRB 101	39.92	4	38.60	3	39.26	39.92
BH 902	36.93	6	33.13	6	35.03	36.93
BH 976	44.54	1	40.88	1	42.71	44.54
PL 874	42.57	3	39.28	2	40.93	42.57
DWRB 92	39.33	5	27.09	7	33.21	39.33
RD 2849	42.64	2	33.28	5	37.96	42.64
MEAN	40.31		35.16		37.73	40.31

	F. Test	S.E.m	C.D.	C.V.(%)
Date of sowing (A)	*	0.51	3.09	6.17
Varieties (B)	**	0.49	1.42	3.16
B within A	**	0.71	2.01	
A within B		0.82	2.38	

Date of Sowing: 12.11.14 , 23.12.14 Date of Harvesting: 11.04.15, 16.04.15

Table 2.4 **MB-IR-DOS** Ludhuana Year (2013-14)

Varieties	Normal	Rank	Late	Rank	Mean	Rank
	Date of sowing				(Yield q/ha)	
DWRUB52	44.75	4	32.02	1	38.39	4
DWRB 101	43.02	5	29.90	5	36.46	5
BH 902	42.44	6	30.48	3	36.46	6
BH 976	51.12	2	27.20	7	39.16	3
PL 874	49.77	3	30.29	4	40.03	2
DWRB 92	39.74	7	28.16	6	33.95	7
RD 2849	54.21	1	31.44	2	42.82	1
MEAN	46.43		29.93		38.18	

	F. Test	S.E.m	C.D.	C.V.(%)
Date of sowing (A)	**	0.46	2.79	5.50
Varieties (B)	NS	2.10	6.12	13.4
B within A	NS	2.96	8.65	
A within B		2.78	8.12	

Date of Sowing: 13.11.14, 15.12.14 Date of Harvesting: 20.04.15, 20.04.15

Table 2.5 **MB-IR-DOS** Karnal Year (2014-15)

Varieties	Normal	Rank	Late	Rank	Mean	Rank
	Date of sowing				(Yield q/ha)	
DWRUB52	27.52	6	22.23	3	24.87	6
DWRB 101	27.48	7	21.98	5	24.73	7
BH 902	31.10	4	28.43	1	29.76	1
BH 976	31.25	3	23.50	2	27.37	3
PL 874	34.16	1	22.10	4	28.13	2
DWRB 92	29.50	5	20.27	6	24.88	5
RD 2849	32.37	2	19.63	7	26.00	4
MEAN	30.48		22.59		26.54	

	F. Test	S.E.m	C.D.	C.V.(%)
Date of sowing (A)	*	0.62	3.77	10.7
Varieties (B)	*	1.07	3.11	9.84
B within A	*	1.51	4.40	
A within B		1.53	4.46	

Date of Sowing:10.11.14, 10.12.14 Date of Harvesting: 20.04.15

Table 3.1 **MB-IR-TS** Agra Year (2014-15)

Varieties	60	Rank	90	Rank	120	Rank	Mean	Rank
	N levels, kg /ha						Grain yield, q/ha	
DWRUB52	36.33	2	37.14	2	39.20	2	37.56	2
DWRB 101	34.17	3	35.17	4	37.51	3	35.62	3
BH 902	37.76	1	40.69	1	42.11	1	40.19	1
BH 976	26.67	6	29.01	7	32.21	7	29.29	6
PL 874	27.79	5	31.04	6	33.21	5	30.68	5
DWRB 92	30.78	4	33.23	5	35.24	4	33.08	4
RD 2849	25.04	7	35.24	3	33.08	6	27.56	7
MEAN	31.22		33.48		35.57		33.42	

		F. Test	S.E.m	C.D.	C.V.(%)
N levels	(A)	**	0.18	072	2.50
Varieties	(B)	**	0.53	1.51	4.72
B within A		NS	0.91	2.61	
A within B			0.86	2.48	

Date of Sowing: 17.11.14 Date of Harvesting: 29.03.15

Table 3.2 **MB-IR-TS** Durgapura Year (2014-15)

	N levels, kg /ha						Grain yield, q/ha	
Varieties	60	Rank	90	Rank	120	Rank	Mean	Rank
DWRUB52	50.92	4	58.44	3	60.60	3	56.65	4
DWRB 101	51.08	3	58.44	3	61.60	2	57.04	3
BH 902	46.03	7	54.32	6	57.23	6	52.53	6
BH 976	47.92	6	52.87	7	53.18	7	51.32	7
PL 874	49.08	5	56.40	5	58.65	5	54.71	5
DWRB 92	55.87	1	61.65	2	63.07	1	60.20	1
RD 2849	52.87	2	63.07	1	60.20	4	59.56	2
MEAN	50.54		57.70		59.76		56.00	

		F. Test	S.E.m	C.D.	C.V.(%)
N levels	(A)	**	0.42	1.64	3.43
Varieties	(B)	**	1.22	3.51	6.55
B within A		N.S.	2.12	6.07	
A within B			2.00	5.75	

Date of Sowing: 20.11.14 Date of Harvesting: 26.03.15

Table 3.3 **MB-IR-TS** Hisar Year (2014-15)

	N levels, kg /ha						Grain yield, q/ha	
Varieties	60	Rank	90	Rank	120	Rank	Mean	Rank
DWRUB52	57.29	2	50.54	3	50.73	4	52.85	1
DWRB 101	46.88	6	47.65	4	53.63	2	49.38	
BH 902	45.52	7	46.49	5	44.95	5	45.65	
BH 976	60.57	1	53.05	2	52.28	3	55.30	5
PL 874	54.40	3	54.59	1	55.17	1	54.72	3
DWRB 92	51.12	4	39.78	7	42.44	7	44.44	2
RD 2849	47.65	5	42.44	6	44.44	6	49.90	4
MEAN	51.92		49.88		49.16		50.32	

		F. Test	S.E.m	C.D.	C.V.(%)
N levels	(A)	NS	1.33	5.24	12.5
Varieties	(B)	*	1.77	5.08	10.5
B within A		NS	3.06	8.80	
A within B			3.14	9.00	

Date of Sowing: 12.11.14 Date of Harvesting: 10.04.15

Table 3.4 **MB-IR-TS** Ludhiana Year (2014-15)

	N levels, kg /ha						Grain yield, q/ha	
Varieties	60	Rank	90	Rank	120	Rank	Mean	Rank
DWRUB52	37.37	7	44.94	5	46.24	4	42.85	6
DWRB 101	43.11	3	43.92	6	44.07	6	43.70	5
BH 902	42.25	5	46.68	3	47.63	3	45.52	3
BH 976	45.44	1	48.43	2	47.94	2	47.27	2
PL 874	44.83	2	51.28	1	50.21	1	48.77	1
DWRB 92	40.29	6	40.65	7	45.73	5	42.22	7
RD 2849	42.74	4	45.73	4	42.22	7	44.38	4
MEAN	42.29		45.78		46.81		44.96	

		F. Test	S.E.m	C.D.	C.V.(%)
N levels	(A)	**	0.30	1.17	3.05
Varieties	(B)	**	0.61	1.74	4.06
B within A		**	1.05	3.02	
A within B			1.05	2.93	

Date of Sowing: 13.11.13 Date of Harvesting: 21.04.14

Table 3.5 **MB-IR-TS** Karnal Year (2014-15)

	N levels, kg /ha						Grain yield, q/ha	
Varieties	60	Rank	90	Rank	120	Rank	Mean	Rank
DWRUB52	29.03	5	26.64	4	22.74	2	26.14	4
DWRB 101	28.75	6	23.23	6	19.68	5	23.89	7
BH 902	32.10	2	30.02	2	15.64	7	25.92	5
BH 976	37.46	1	27.52	3	16.22	6	27.07	3
PL 874	31.61	3	30.37	1	19.96	4	27.31	2
DWRB 92	26.73	7	24.37	5	21.21	3	24.11	6
RD 2849	30.07	4	21.21	7	24.11	1	27.58	1
MEAN	30.82		26.56		20.62		26.00	

		F. Test	S.E.m	C.D.	C.V.(%)
N levels	(A)	**	1.11	4.37	19.6
Varieties	(B)	*	0.88	2.53	10.2
B within A		**	1.53	4.38	
A within B			1.80	5.17	

Date of Sowing: 10.11.14 Date of Harvesting: 15.04.15

Table 4.1 **SPL 2 - DOS X Varieties** Agra Year (2014-15)

Varieties	Date of Sowing								(Yield q/ha)	
	DI	Rank	DII	Rank	DIII	Rank	DIV	Rank	Mean	Rank
BH 902	35.41	1	38.28	1	40.92	1	45.45	1	40.01	1
RD 2552	32.97	2	36.56	2	38.67	2	42.58	2	37.69	2
DWRUB 52	30.27	3	34.37	3	36.34	3	39.68	3	35.16	3
RD 2668	28.20	4	32.47	4	33.95	4	36.54	4	32.79	4
MEAN	31.71		35.42		37.47		41.06		36.42	

	F. Test	S.E.m	C.D.	C.V.(%
DOS (A)	**	0.26	0.89	2.44
Varieties(B)	**	0.41	1.20	3.92
B within A	NS	0.82	2.40	
A within B		0.76	2.26	

Date of Sowing: 28.10.14, 07.11.14, 17.11.14, 27.12.14 Date of Harvesting 10.04.15, 15.04.15, 18.04.15, 20.04.15

Table 4.2 **SPL-2 DOS X Varieties** Durgapura Year (2014-15)

Varieties	Date of Sowing								(Yield q/ha)	
	DI	Rank	DII	Rank	DIII	Rank	DIV	Rank	Mean	Rank
BH 902	52.94	1	56.60	1	49.94	1	41.61	1	50.27	1
RD 2552	51.97	2	53.56	2	49.18	2	41.40	2	49.03	2
DWRUB 52	48.11	3	51.75	3	46.98	3	40.96	3	46.95	3
RD 2668	47.40	4	50.30	4	45.45	4	39.65	4	45.70	4
MEAN	50.10		53.05		47.89		40.90		47.99	

	F. Test	S.E.m	C.D.	C.V.(%
DOS (A)	**	0.77	2.66	5.55
Varieties(B)	**	0.87	2.54	6.28
B within A	N.S.	1.74	5.08	
A within B		1.69	5.13	

Date of Sowing: 4.11.14, 15.11.14, 23.11.14, 03.12.14 Date of Harvesting: 29.03.15, 5.04.15, 8.04.15, 8.04.15

Table 4.3 Varieties	**SPL2 - DOS X Varieties**						Hisar		Year (2013-14) (Yield q/ha)	
	Date of Sowing									
	DI	Rank	DII	Rank	DIII	Rank	DIV	Rank	Mean	Rank
BH 902	30.61	3	34.56	4	32.29	4	30.19	4	31.91	3
RD 2552	32.37	1	35.14	2	34.17	2	31.81	2	33.37	2
DWRUB 52	32.11	2	42.21	1	34.94	1	33.52	1	35.70	1
RD 2668	28.75	4	34.65	3	32.61	3	31.29	3	31.83	4
MEAN	30.96		36.64		33.50		31.70		33.20	
		F. Test	S.E.m	C.D.	C.V.(%					
DOS (A)		**	0.33	1.15	3.48					
Varieties(B)		**	0.34	0.99	3.55					
B within A		**	0.68	1.98						
A within B			0.68	2.06						
Date of Sowing: 05.11.14, 15.11.14, 25.11.14, 25.05.14					Date of Harvesting: 11.04.15, 12.04.15, 16.04.15					

Table 4.4 Varieties	**SPL- DOS X Varieties**						Ludhiana		Year (2014-15) (Yield q/ha)	
	Date of Sowing									
	DI	Rank	DII	Rank	DIII	Rank	DIV	Rank	Mean	Rank
BH 902	47.59	2	41.30	3	41.67	3	34.44	1	41.25	2
RD 2552	39.07	4	39.63	4	42.78	2	33.33	2	38.70	3
DWRUB 52	52.22	1	46.67	1	51.48	1	30.74	3	45.28	1
RD 2668	39.26	3	42.22	2	37.04	4	27.78	4	36.57	4
MEAN	44.54		42.45		43.24		31.57		40.45	
		F. Test	S.E.m	C.D.	C.V.(%					
DOS (A)		**	1.17	4.04	8.78					
Varieties(B)		**	1.18	3.45	6.48					
B within A		*	2.36	6.90						
A within B			2.36	7.19						
Date of Sowing: 25.10.13, 05.11.13, 15.11.13, 25.12.13					Date of Harvesting:19.04.14, 19.04.14, 22.04.14, 22.04.14					

Table 4.5 Varieties	**SPL 2 - DOS X Varieties**						Karnal		Year (2013-14) (Yield q/ha)	
	Date of Sowing									
	DI	Rank	DII	Rank	DIII	Rank	DIV	Rank	Mean	Rank
BH 902	23.74	2	27.49	1	31.89	1	29.08	1	28.05	1
RD 2552	25.94	1	22.74	2	20.15	3	20.89	3	22.43	2
DWRUB 52	16.39	3	20.21	3	21.26	2	21.36	2	19.81	3
RD 2668	14.21	4	16.10	4	20.09	4	19.31	4	17.43	4
MEAN	20.07		21.63		23.35		22.66		21.93	
		F. Test	S.E.m	C.D.	C.V.(%					
DOS (A)		*	0.60	2.09	9.53					
Varieties(B)		**	0.53	1.56	8.43					
B within A		**	1.07	3.11						
A within B			1.10	3.40						
Date of Sowing: 31.10.14,10.11.14, 20.11.14, 29.11.14					Date of Harvesting:					

Table 5.1 Varieties	**SPL 2 – DOS (Late) X Varieties**						Agra		Year (2014-15) (Yield q/ha)	
	Date of Sowing									
	DI	Rank	DII	Rank	DIII	Rank	DIV	Rank	Mean	Rank
DWRUB 64	42.82	1	41.25	1	39.12	1	38.79	1	40.49	1
DWRB 73	37.12	4	35.64	4	33.37	4	34.17	4	35.07	4
DWRB 91	37.66	3	36.39	3	35.88	3	36.24	3	36.54	3
RD 2508	40.39	2	37.43	2	37.47	2	36.85	2	38.03	2
MEAN	39.50		37.68		36.46		36.51		37.54	

	F. Test	S.E.m	C.D.	C.V.(%
DOS (A)	**	0.29	0.99	2.65
Varieties(B)	**	0.23	0.68	2.15
B within A	NS	0.47	1.36	
A within B		0.49	1.53	

Date of Sowing: 05.12.14, 15.12.14, 25.12.14, 05.01.15 Date of Harvesting: 08.04.15, 16.04.15, 20.04.15

Table 5.2 **SPL 2 – DOS (Late) X Varieties** Hisar Year (2014-15)

Varieties	Date of Sowing								(Yield q/ha)	
	DI	Rank	DII	Rank	DIII	Rank	DIV	Rank	Mean	Rank
DWRUB 64	31.06	4	28.01	3	26.33	3	26.68	1	28.02	3
DWRB 73	32.97	2	30.86	1	26.48	1	25.92	3	29.06	2
DWRB 91	36.76	1	29.40	2	26.45	2	26.28	2	29.72	1
RD 2508	31.73	3	26.06	4	24.13	4	23.52	4	26.36	4
MEAN	33.13		28.58		25.85		25.60		28.29	

	F. Test	S.E.m	C.D.	C.V.(%
DOS (A)	**	0.38	1.32	4.69
Varieties(B)	**	0.33	0.96	4.03
B within A	**	1.66	1.92	
A within B		1.69	2.12	

Date of Sowing: 10.12.14, 20.12.14, 30.12.14, 09.01.15 Date of Harvesting:13.04.15, 15.04.15

Table 5.3 **SPL2- DOS(Late) X Varieties** Ludhiana Year (2014-15)

Varieties	Date of Sowing								(Yield q/ha)	
	DI	Rank	DII	Rank	DIII	Rank	DIV	Rank	Mean	Rank
DWRUB 64	40.28	3	30.00	4	31.11	2	25.56	2	31.74	3
DWRB 73	33.33	4	34.17	3	29.44	3	16.67	4	28.40	4
DWRB 91	41.67	2	35.56	2	26.11	4	28.06	1	32.85	2
RD 2508	42.78	1	36.67	1	33.06	1	19.44	3	32.99	1
MEAN	39.51		34.10		29.93		22.43		31.49	

	F. Test	S.E.m	C.D.	C.V.(%
DOS (A)	**	0.62	2.15	6.83
Varieties(B)	*	1.07	3.13	11.8
B within A	*	2.15	6.27	
A within B		1.96	5.83	

Date of Sowing: 05.12.14, 15.12.14, 25.12.14, 05.01.15 Date of Harvesting:27.04.15,29.04.15, 02.05.15,

Table 5.4 **SPL 2- DOS (Late) X Varieties** Durgapura Year (2014-15)

Varieties	Date of Sowing								(Yield q/ha)	
	DI	Rank	DII	Rank	DIII	Rank	DIV	Rank	Mean	Rank
DWRUB 64	44.58	1	37.86	1	32.12	1	21.79	1	34.09	1
DWRB 73	37.57	3	34.25	3	26.51	4	18.46	3	29.20	3
DWRB 91	37.28	4	32.95	4	26.87	3	17.02	4	28.53	4
RD 2508	43.22	2	37.48	2	31.64	2	20.31	2	33.17	2
MEAN	40.66		35.63		29.29		19.40		31.24	

	F. Test	S.E.m	C.D.	C.V.(%
DOS (A)	**	0.56	1.95	6.24
Varieties(B)	**	0.84	2.46	9.34
B within A	NS	1.68	4.92	
A within B		1.56	4.67	

Date of Sowing: 10.12.14, 20.12.14, 30.12.14, 09.01.15 Date of Harvesting:04.04.15, 08.04.15, 10.04.15, 12.04.15

Table 5.5 Varieties	**SPL2- DOS(Late) X Varieties**						Karnal		Year (2014-15) (Yield q/ha)	
			Date of Sowing							
	DI	Rank	DII	Rank	DIII	Rank	DIV	Rank	Mean	Rank
DWRUB 64	35.15	1	23.75	1	35.63	1	26.69	2	30.30	1
DWRB 73	21.18	4	14.35	4	18.30	4	15.48	4	17.33	4
DWRB 91	27.99	3	17.19	3	20.16	3	18.07	3	20.85	3
RD 2508	32.37	2	23.06	2	25.55	2	27.06	1	27.01	2
MEAN	29.17		19.59		24.91		21.83		23.87	
		F. Test	S.E.m	C.D.	C.V.(%					
DOS (A)		**	0.93	3.21	13.46					
Varieties(B)		**	1.32	3.85	19.16					
B within A		NS	2.64	7.71						
A within B			2.47	7.39						
Date of Sowing: 05.12.14, 16.12.14, 26.12.14, 06.01.15					Date of Harvesting:20.04.15					

Table 6.1 Varieties	**SPL 2- DOS X Varieties (NEPZ)**						Rewa		Year (2014-15) (Yield q/ha)	
			Date of Sowing							
	DI	Rank	DII	Rank	DIII	Rank	DIV	Rank	Mean	Rank
RD 2552	38.77	2	41.00	2	39.20	2	37.23	2	39.05	2
K 508	37.47	4	38.87	3	38.23	3	36.67	3	37.81	3
K 551	37.77	3	37.87	4	37.33	4	34.20	4	36.79	4
JB 1	40.80	1	43.20	1	41.70	1	40.20	1	41.48	1
MEAN	38.70		40.23		39.12		37.08		38.78	
		F. Test	S.E.m	C.D.	C.V.(%					
Date of Sowing A		**	0.13	0.46	1.19					
Varieties B		**	0.40	1.17	3.57					
B within A		N.S.	0.80	2.33						
A within B			0.71	2.07						
Date of Sowing: 12.11.14, 22.11.14, 02.12.14, 12.12.14					Date of Harvesting: 04.04.15					

Table 6.2 Varieties	**SPL 2- DOS X Varieties (NEPZ)**						Faizabad		Year (2014-15) (Yield q/ha)	
			Date of Sowing							
	DI	Rank	DII	Rank	DIII	Rank	DIV	Rank	Mean	Rank
RD 2552	36.02	1	33.15	4	21.80	4	20.21	1	27.80	1
K 508	32.71	2	34.97	1	23.42	1	19.61	2	27.68	2
K 551	32.58	3	34.77	2	23.02	2	18.87	4	27.31	3
JB 1	32.43	4	33.36	3	22.83	3	19.57	3	27.05	4
MEAN	33.44		34.06		22.77		19.57		27.46	
		F. Test	S.E.m	C.D.	C.V.(%					
Date of Sowing A		**	0.34	1.17	4.27					
Varieties B		NS	0.44	1.27	5.51					
B within A		NS	0.87	2.55						
A within B			0.83	2.49						
Date of Sowing: 14.11.14, 21.11.14, 03.12.14, 21.12.14					Date of Harvesting: 20.04.15					

Table 6.3 Varieties	SPL 2- DOS X Varieties (NEPZ)						Kanpur		Year (2014-15) (Yield q/ha)	
	Date of Sowing									
	DI	Rank	DII	Rank	DIII	Rank	DIV	Rank	Mean	Rank
RD 2552	38.50	1	40.10	1	37.32	2	30.25	3	36.54	2
K 508	37.20	2	39.42	4	37.84	1	32.34	1	36.70	1
K 551	34.05	4	40.09	2	35.72	4	30.05	4	34.98	4
JB 1	36.70	3	39.59	3	36.10	3	30.80	2	35.80	3
MEAN	36.61		39.80		36.75		30.86		36.00	
	F. Test	S.E.m	C.D.	C.V.(%						
Date of Sowing A	**	0.37	1.29	3.59						
Varieties B	NS	0.53	1.54	5.08						
B within A	N.S.	1.06	3.08							
A within B		0.99	2.96							
Date of Sowing: 10.11.14, 20.11.14, 30.11.14, 10.12.14							Date of Harvesting:			

Table 6.4 Varieties	SPL 2- DOS X Varieties (NEPZ)						Varanasi		Year (2014-15) (Yield q/ha)	
	Date of Sowing									
	DI	Rank	DII	Rank	DIII	Rank	DIV	Rank	Mean	Rank
RD 2552	32.13	1	34.23	1	29.55	2	24.41	1	30.08	1
K 508	26.43	2	30.51	2	30.18	1	21.75	2	27.22	2
K 551	22.27	3	25.24	3	25.42	3	20.77	4	23.43	3
JB 1	21.58	4	24.29	4	24.22	4	21.48	3	22.89	4
MEAN	25.60		28.57		27.34		22.10		25.90	
	F. Test	S.E.m	C.D.	C.V.(%						
Date of Sowing A	**	0.82	2.85	11.0						
Varieties B	**	0.43	1.25	5.72						
B within A	N.S.	0.86	2.50							
A within B		1.11	3.56							
Date of Sowing: 13.11.14, 22.11.14, 26.11.14, 06.12.14							Date of Harvesting:			

Table 7.1 Varieties	SPL 2- DOS X Varieties (NHZ)				Malan						Year (2014-15) (Yield q/ha)	
	Date of Sowing											
	DI	Rank	DII	Rank	DIII	Rank	DIV	Rank	D V	Rank	Mean	Rank
BHS 352	22.07	4	20.70	4	19.65	4	19.04	3	17.71	3	19.83	4
UPB 1008	32.88	2	27.72	2	25.51	2	25.53	1	25.08	1	27.34	1
VLB 118	23.49	3	21.44	3	19.72	3	18.36	4	17.43	4	20.09	3
HBL 113	36.74	1	28.38	1	25.82	1	24.74	2	20.97	2	27.33	2
MEAN	28.79		24.56		22.68		21.92		20.30		23.65	
	F. Test	S.E.m	C.D.	C.V.(%								
DOS (A)	**	0.97	3.18	14.3								
Varieties(B)	**	0.71	2.05	11.6								
B within A	N.S.	1.59	4.59									
A within B		1.69	4.87									
Date of Sowing: 06.11.14, 20.11.14, 03.12.14, 20.12.14, 05.01.15							Date of Harvesting: April end to May 15					

Table 7.2 Varieties	SPL 2- DOS X Varieties (NHZ)				Bajaura						Year (2014-15) (Yield q/ha)	
	Date of Sowing											
	DI	Rank	DII	Rank	DIII	Rank	DIV	Rank	D V	Rank	Mean	Rank
BHS 352	27.20	4	28.11	4	21.40	3	27.94	2	16.31	2	24.19	4
UPB 1008	35.13	3	37.65	3	22.88	1	13.06	4	12.46	4	24.24	3
VLB 118	40.51	2	38.00	2	20.83	4	17.81	3	12.92	3	26.01	2
HBL 113	42.48	1	40.99	1	22.04	2	28.48	1	23.13	1	31.43	1
MEAN	36.33		36.19		21.79		21.82		16.21		26.47	

	F. Test	S.E.m	C.D.	C.V.(%
DOS (A)	**	0.64	2.09	8.39
Varieties(B)	**	0.57	1.65	8.35
B within A	**	1.28	3.68	
A within B		1.28	3.69	

Date of Sowing: 06.11.14, 24.11.14, 09.12.14, 02.01.15, 16.01.15 Date of Harvesting: 01.06.15

Table 9.1 **SPL 3- Sulphur X Varieties** Agra Year (2014-15)

Varieties	Sulphur (Kg/ha)								(Yield q/ha)	
	0	Rank	10	Rank	20	Rank	30	Rank	Mean	Rank
DWRUB 52	29.78	3	32.47	3	34.28	3	36.54	3	33.27	3
RD 2668	31.62	2	34.37	2	36.34	2	38.91	2	35.31	2
BH 902	36.07	1	38.28	1	40.92	1	42.89	1	39.54	1
MEAN	32.49		35.04		37.18		39.45		36.04	

	F. Test	S.E.m	C.D.	C.V.(%
Sulphur A	**	0.42	1.45	3.48
Varieties B	**	0.54	1.63	5.23
B within A	N.S.	1.09	3.26	
A within B		0.98	2.94	

Date of Sowing: 18.11.14 Date of Harvesting: 10.04.15

Table 9.2 **SPL 3- Sulphur X Varieties** Durgapura Year (2014-15)

Varieties	Sulphur (Kg/ha)								(Yield q/ha)	
	0	Rank	10	Rank	20	Rank	30	Rank	Mean	Rank
DWRUB 52	42.21	2	45.37	2	46.54	2	46.70	2	45.21	2
RD 2668	41.28	3	43.73	3	44.80	3	45.06	3	43.72	3
BH 902	46.81	1	48.04	1	48.99	1	49.33	1	48.29	1
MEAN	43.44		45.72		46.78		47.03		45.74	

	F. Test	S.E.m	C.D.	C.V.(%
Sulphur A	N.S.	0.90	3.12	5.92
Varieties B	*	0.99	2.96	7.47
B within A	N.S.	1.97	5.91	
A within B		1.85	5.53	

Date of Sowing: 20.11.14 Date of Harvesting: 30.03.15

Table 9.3 **SPL 3- Sulphur X Varieties** Ludhiana Year (2014-15)

Varieties	Sulphur (Kg/ha)								(Yield q/ha)	
	0	Rank	10	Rank	20	Rank	30	Rank	Mean	Rank
DWRUB 52	47.02	1	49.70	1	50.30	1	52.83	1	49.96	1
RD 2668	40.48	3	40.77	3	38.99	3	39.88	3	40.03	3
BH 902	42.26	2	45.24	2	47.62	2	47.62	2	45.68	2
MEAN	43.25		45.24		45.63		46.78		45.23	

	F. Test	S.E.m	C.D.	C.V.(%
Sulphur A	N.S.	1.52	5.24	10.05
Varieties B	**	1.29	3.86	9.87
B within A	N.S.	2.58	7.73	
A within B		2.59	7.77	

Date of Sowing: 13.11.14 Date of Harvesting: 21.04.15

Table 9.4	**SPL 3- Sulphur X Varieties**						Karnal		Year (2014-15)	
Varieties	Sulphur (Kg/ha)								(Yield q/ha)	
	0	Rank	10	Rank	20	Rank	30	Rank	Mean	Rank
DWRUB 52	19.6	2	22.5	1	25.1	1	26.9	1	23.5	1
BH 902	20.5	1	19.2	2	22.3	2	24.3	2	21.6	2
MEAN	20.0		20.9		23.7		25.6		22.6	
CD (0.05)	Sulphur A 3.9 Varieties B 2.6 B within A 5.1 A within B 5.2									
Date of Sowing: 10.11.13							Date of Harvesting: 15.04.14			

Table.10.1 NORTH EASTERN PLAIN ZONE Yield, q/ha 2014-15

SPL 4– Mulching x Irrigation

Treatments	Kanpur	Varanasi
6 t mulch, no irrigation	28.50	27.35
6 t mulch, 35 DAS one irrigation	35.12	30.67
6 t mulch, 35& 85 DAS two irrigation	39.23	32.97
4 t mulch, no irrigation	26.10	24.66
4 t mulch, 35 DAS one irrigation	32.54	28.63
4 t mulch, 35& 85 DAS two irrigation	37.44	30.54
No mulch, no irrigation	24.50	24.61
No mulch, 35 DAS one irrigation	30.83	28.14
No mulch, 35& 85 DAS two irrigation	35.10	28.80
MEAN	32.15	28.28
CD (0.05)	2.90	1.45
Date of Sowing	10.11.14	20.11.14
Date of Harvesting	07.04.15	04.03.15

Table 11.1	**SPL 5- N dose X N schedule**				Malan						Year (2014-15)	
N schedule	N Doses										(Yield q/ha)	
	0	Rank	20	Rank	40	Rank	60	Rank	80	Rank	Mean	Rank
Full basal	16.64	1	23.30	3	27.30	2	27.58	3	26.84	3	24.33	3
1/2+1/2	15.34	2	24.72	1	27.05	3	29.39	2	29.77	1	25.25	1
2/3+1/3	15.30	3	23.98	2	28.11	1	30.08	1	28.67	2	25.23	2
MEAN	15.76		24.00		27.49		29.02		28.43		24.94	
		F. Test	S.E.m	C.D.	C.V.(%							
N levels (A)		**	0.99	3.22	11.9							
N schedle(B)		N.S.	0.43	1.26	6.63							
B within A		N.S.	0.95	2.81								
A within B			1.26	3.71								
Date of Sowing: 21.11.14							Date of Harvesting: 13.05.15					

Table 11.2	**SPL 5- N dose X N schedule**				Bajoura						Year (2014-15)	
N schedule	N Doses										(Yield q/ha)	
	0	Rank	20	Rank	40	Rank	60	Rank	80	Rank	Mean	Rank
Full basal	18.66	1	26.37	3	37.27	1	41.49	1	42.56	3	33.27	3
1/2+1/2	18.02	3	32.21	1	36.69	2	39.90	3	44.45	2	34.25	1
2/3+1/3	18.35	2	28.44	2	35.63	3	41.18	2	45.88	1	33.90	2
MEAN	18.34		29.01		36.53		40.85		44.30		33.81	
		F. Test	S.E.m	C.D.	C.V.(%							
N levels (A)		**	0.74	2.41	6.56							
N schedle(B)		N.S.	0.50	1.48	5.76							
B within A		N.S.	1.12	3.32								
A within B			1.18	3.48								
Date of Sowing: 14.11.14							Date of Harvesting: 28.05.15					

Table **SPL 7-Weed management** Yield, q/ha (2014-15)

Treatments	Centers		
	Kanpur	Varanasi	Durgapura
Metsulfuron+Carfentrazone 15g	32.43	24.40	48.03
Metsulfuron+Carfentrazone 20g	35.10	33.46	48.18
Metsulfuron+Carfentrazone 25g	35.70	34.00	49.77
Metsulfuron+Carfentrazone 15g+ NIS 0.2%	35.10	35.67	48.25
Metsulfuron+Carfentrazone 20g+ NIS 0.2%	38.50	36.93	47.84
Metsulfuron+Carfentrazone 25g+ NIS 0.2%	36.67	37.73	49.23
Metsulfuron 4g	33.65	33.19	49.44
Carfentrazone 20g	31.50	29.67	48.33
2,4-D 500g	29.20	31.00	48.24
Weedycheck	27.34	23.80	48.25
Weed free	39.45	38.40	49.90
G.M.	34.06	32.57	48.68
S.E.(M)	1.06	0.38	1.74
C.D.	3.13	1.11	5.14
C.V.	5.39	2.00	6.20
Date of Sowing	15.11.14	14.11.14	20.11.14
Date of harvesting	09.04.15	20.04.15	30.03.15

Table **SPL 8-Weed management** Yield, q/ha (2014-15)

Treatments	Centers					
	Bajoura	Malan	Hisar	Durgapur a	Ludhiana	Karnal
Pinoxoden 30g	40.91	22.35	36.05	48.60	49.00	21.32
Pinoxoden 40g	42.77	22.74	38.38	48.54	50.33	29.27
Pinoxoden 50g	43.01	22.64	39.35	49.28	51.50	28.64
Pinoxoden 40g +Metsulfuron 4g	53.11	24.53	38.10	49.70	42.83	33.46
Pinoxoden 40g followed by Metsulfuron 4g	52.59	24.70	36.75	48.79	56.33	31.16
Pinoxoden 40g+Carfentrazone 20g	42.84	25.62	38.08	49.66	55.17	32.60
Isoproturon 1000g	43.26	23.70	36.34	49.65	45.67	34.93
Isoproturon 750g+ 2,4-D 500g	48.81	27.14	36.00	48.87	58.17	38.39
Isoproturon 750g+Metsulfuron 4 g	53.96	25.36	39.26	48.91	50.50	32.43
Weedycheck	35.13	14.00	34.45	48.69	49.00	33.29
Weedfree	52.21	23.28	37.48	50.07	60.67	31.56
G.M.	46.24	23.28	37.29	49.16	51.74	31.55
S.E.(M)	1.45	1.22	2.76	2.32	2.31	1.25
C.D.	4.28	3.60	8.14	6.83	6.81	3.68
C.V.	5.43	9.07	12.8	8.16	7.73	6.85
Date of Sowing	13.11.14	26.11.14	12.11.14	20.11.14	12.11.14	10.11.14
Date of harvesting	26.05.15	01.05.15	12.04.15	30.03.15	21.04.15	15.04.15

AICW&BIP CENTRES AND COOPERATING SCIENTISTS

Sr No.	AICW&BIP Centre	Cooperating Scientist Address
NORTHERN HILL ZONE		
1.	Almora	Dr, Dibakar Mahanta, Scientist Agronomy, VPKAS, Almora-263 601 (Uttarakhand).
2.	Palampur/ Malan	Dr Sandeep Manuja, Scientist (Agronomy), CSK HPKV Rice-wheat Research Centre, , Malan, District Kangra, HP.
3.	Bajaura	Dr Gurudev Singh, Assitsnt Agronomist, CSKHPKV, HAREC, Bajaura-175 125 (HP).
4.	Shimla	Dr D P Walia / Dr Madhu Patial, IARI RS, Tutikandi, Shimla-171 004, Himachal Pradesh.
NORTH WESTERN PLAIN ZONE		
5.	Karnal	Dr Ajit Singh Kharub, Principal Scientist, PB NO. 158, DWR, Karnal -132 001 Dr. Anil Khippal, Senior Scientist, PB NO. 158, DWR, Karnal - 132 001
6.	Ludhiana	Dr Hari Ram Saharan, Sr. Agronomist, Deptt. of Agronomy, PAU Ludhiana - 141 004
7.	Agra	Dr BP Singh, Head, Department of Agronomy, RBS College, Bichpuri, Agra, UP-283105.
8.	Hisar	Dr. Neelam, Junior Agronomist (barley), CCS HAU, Hisar (Haryana)-125 004
9.	Durgapura	Dr Sudesh Kumar, Sr. Agronomist (Barley), Govt. Agril. Res. Station, Durgapura, Jaipur (Rajasthan)
NORTH EASTERN PLAINS ZONE		
11.	Kanpur	Dr Rajvir Singh, Asstt. Agronomist, Section of EB (Rabi Cereals), CSAUA&T, Kanpur (UP)- 208 002
12.	Varanasi	Dr RK Singh, Sr. agronomist (AICWIP), Institute of Agricultural Sciences, BHU, Varanasi (UP)- 221 005
13.	Faizabad	Wheat & barley Agronomist, Department of Agronomy, NDUA&T, Kumarganj, Faizabad (UP)- 224 229
14.	Rewa	Dr AK Singh, Sr. Barley Breeder, College of Agriculture, Rewa, Madhya Pradesh – 486 001
CENTRAL ZONE		
15.	Udaipur	Dr Jagdish Choudhary, Assitt. Professor (Agronomy), Department of Agronomy, College of Agriculture, Udaipur, Rajasthan-313 001.
16.	Kota	Dr Arun Kumar Sharma, Associate Professor (Agronomy), MPUAT, Agricultural Research Station, Ummedganj Farm, PB No.7, GPO Nayapura, Kaithoon Road, Kota- 324 001.
17.	Gwalior	Dr SPS Tomar, Agronomist, Wheat Improvement Project, College of Agriculture, RVRSUA&T, Gwalior, 474002 (M.P.)
18.	Rewa	Dr AK Singh, Sr. Barley Breeder, College of Agriculture, Rewa, Madhya Pradesh – 486 001

Soil Physico-Chemical Properties of different Centres

Soil Properties	Malan	Agra	Durgapura	Hisar	Ludhiana	Karnal	Bajaura	Kanpur	Varanasi
Soil group	Silty clay loam	Sandy loam	Loamy sand	Sandy loam	Loamy sand	Clay loam	Silty loam	Sandy loam	Sandy clay loam
Sand,%	25.4	60.69	86.15	72	84.1	-	-	56	52.9
Silt, %	38.2	20.08	5.2	18.5	7.9	-	-	28	27.6
Clay,%	36	18.89	6.82	9.5	8.0	-	-	16	19.5
Bulk Density, Mg m^{-3}	1.55	1.62	1.45	1.4	1.5	-	-	-	1,46
Field Capacity	31	18.5	10.4	-		-	-	-	20.5
Permanent wilting point,%	13	9.5	3.15	-		-	-	-	5.4
Organic carbon,%	0.58	0.34	0.21	0.48	0.3	-	0.58	0.5	0.39
Available N, kg/ha	270	188.4	162	-	-		368	-	187.4
Available P_2O_5, kg/ha	23	29.8	67.86	22	22.8	22.0	30	16	22.5
Available K_2O, kg/ha	240	312	244.24	420	132.5	210	266	185	175.6
pH (1:2)	6.1	8.4	7.8	7.8	8.1	8.3	6.8	8	7.3
EC (1:2)	-	1.64	0.09	0.24	0.2	0.4	-	0.15	0.28

Meteorological Information

Bajaura Latitude 31° 48' N Longitude 77 ° 00' E Height above MSL 1090 m **Almora Latitude 29°36' N Longitude 79° 40' E Height above MSL1250 m**

Julian weeks	Temperature		RH %		Rainfall	Pan Evap.	Sun Shine	Julian weeks	Temperature		RH %		Rainfall	Pan Evap.	Sun Shine
	Max.	Min.	Max.	Min.	mm	mm	hrs/day		Max.	Min.	Max.	Min.	mm	mm	hrs/day
40 (01-07 Oct.)	30.0	14.0	90.0	52.0	0.0	30.1	7.8	40 (01-07 Oct.)	27.4	12.9	98.7	64.1	2.5	2.1	5.71
41 (08-14 Oct.)	29.0	10.0	93.0	44.0	10.2	24.3	8.3	41 (08-14 Oct.)	27.1	9.9	100	67.9	41.5	2.1	5.21
42 (15-21 Oct.)	25.8	8.4	93.0	40.0	2.1	23.5	7.3	42 (15-21 Oct.)	24.1	6.9	87	56.3	8.5	2.1	5.21
43 (22-28 Oct)	27.2	8.2	93.0	43.0	0.2	19.4	7.8	43 (22-28 Oct)	25.5	9.6	100	64.4	0	2.4	7.61
44 (29-04 Nov.)	25.9	5.8	95.0	41.0	4.1	17.4	7.4	44 (29-04 Nov.)	25.9	6.9	100	35.3	0	2.1	8.5
45 (05-11 Nov.)	24.6	6.6	94.0	37.0	7.1	14.1	6.0	45 (05-11 Nov.)	26.1	4.4	100	34.4	0	2	8.61
46 (12-18 Nov.)	25.8	1.8	94.0	32.0	0.0	14.5	7.4	46 (12-18 Nov.)	25.3	2	100	34.7	0	2	8.32
47 (19-25 Nov.)	24.4	-0.1	96.0	32.0	0.0	11.9	6.8	47 (19-25 Nov.)	24.1	1.3	100	39.4	0	1.5	7.93
48 (26-02 Dec.)	23.1	0.2	96.0	41.0	0.0	11.2	6.3	48 (26-02 Dec.)	23	0.3	87	43.4	0	1.7	7.32
49 (03-09 Dec.)	22.2	-0.9	95.0	42.0	0.0	10.2	6.3	49 (03-09 Dec.)	23.2	-0.4	100	39.9	0	1.4	6.54
50 (10-16 Dec.)	14.3	-0.7	91.0	48.0	65+ 250 mm snowfall	7.3	3.0	50 (10-16 Dec.)	14.6	-1.1	100	58.7	78.5	1.8	3.61
51 (17-23 Dec)	11.8	0.1	93.0	53.0	0.0	6.0	4.1	51 (17-23 Dec)	19.4	-1.1	100	43.9	0	1.1	5.18
52 (24-31 Dec)	17.7	-0.4	94.0	36.0	0.0	8.9	6.2	52 (24-31 Dec)	18.2	0	100	52.1	0	1.8	6.13
1 (01-07 Jan)	15.5	-0.3	96.0	52.0	10.1	5.8	4.7	1 (01-07 Jan)	16.4	6.7	98	73.1	32.5	0.9	4.11
2 (8-14 Jan)	18.9	0.6	94.0	44.0	4.2	7.3	4.9	2 (8-14 Jan)	18.5	1.5	94	47	2.5	1.1	5.64
3 (15-21 Jan)	17.2	0.3	94.0	40.0	10.4	9.1	5.6	3 (15-21 Jan)	17.7	-0.9	98.7	45.9	0	1.3	5.89
4 (22-28 Jan)	13.7	2.4	97.0	67.0	26.8	7.3	3.6	4 (22-28 Jan)	16.1	3.6	94.1	56	11	1.1	3.93
5 (29-04 Feb.)	12.7	1.1	96.0	71.0	31.5	5.9	3.1	5 (29-04 Feb.)	17.9	1.2	96.3	52.9	6.5	1.5	4.96
6 (05-11 Feb.)	18.3	1.5	94.0	58.0	0.0	8.0	5.9	6 (05-11 Feb.)	21.8	0.3	96.4	52.7	0	1.5	8.75
7 (12-18 Feb.)	19.9	4.2	96.0	69.0	31.8	9.9	6.2	7 (12-18 Feb.)	20.3	2.6	94	50.3	0	1.2	5.79
8 (19-25 Feb.)	18.0	3.9	95.0	79.0	96.1	7.2	3.9	8 (19-25 Feb.)	21.1	5.4	92.6	54	20	1.5	5.21
9 (26-04 Mar.)	13.6	4.6	95.0	67.0	62.9	4.8	1.6	9 (26-04 Mar.)	14.9	6.1	98	74	48.9	0.7	3.86
10 (05-11 Mar.)	17.3	2.8	93.0	48.0	31.6	11.2	5.9	10 (05-11 Mar.)	20.6	3.6	94.3	46.9	0	1.9	7.18
11 (12-18 Mar.)	18.1	4.8	92.0	50.0	11.5	9.3	2.7	11 (12-18 Mar.)	20.5	5.4	91.4	51.9	14.9	1.9	5.71
12 (19-25 Mar.)	26.2	5.8	89.0	28.0	0.0	25.3	9.5	12 (19-25 Mar.)	26.5	8.1	92.4	46.4	0	2.7	9.32
13 (26-01 Apr.)	25.0	6.8	91.0	48.0	31.7	18.6	5.6	13 (26-01 Apr.)	22.9	9.6	91	56.9	11.5	1.7	4.29
14 (02-08 Apr.)	18.6	8.4	91 0	62.0	60.0	12.0	3.1	14 (02-08 Apr.)	20.9	7.6	87.4	63.3	33.5	1.6	5.71
15 (09-15 Apr.)	25.7	8.4	92.0	37.0	6.5	26.2	8.8	15 (09-15 Apr.)	25.3	7.9	78.1	56	16	2.3	5.64
16 (16-22 Apr.)	27.2	10.5	91.0	47.0	19.7	29.1	7.2	16 (16-22 Apr.)	29.6	12.3	79.7	55.3	0	3.2	7.71
17 (23-29 Apr.)	29.3	11.1	89.0	45.0	2.7	33.7	9.5	17 (23-29 Apr.)	28.7	10.6	82	53.9	0	3.2	6.68
18 (30-06 May)	28.6	9.4	89.0	39.0	7.2	29.1	8.4	18 (30-06 May)	30.4	10.6	82.1	44.4	0	3.5	7.14
19 (07-13 May)	30.5	11.7	88.0	47.0	5.1	29.5	7.9	19 (7-13 May)	31	13	75.9	41.4	2.2	3.3	6.47
20 (14-20 May)	29.7	13.3	89.0	51.0	19.3	24.7	7.3	20 (14-20 May)	32.9	14.2	76.4	37.3	1.2	3.7	7.64
21 (21-27 May)	32.3	12.2	90.0	33.0	11.1	38.8	9.4	21 (21-27 May)	34.7	12.4	74.7	35.9	0	4.3	8.68

Malan Latitude 32° 1' N Longitude 76 ° 2' E Height above MSL 950 m

Julian weeks	Temperature		RH %		Rainfall	Pan Evap.	Sun Shine
	Max.	Min.	Max.	Min.	mm	mm	hrs/day
40 (01-07 Oct.)	17.2	30.1	63.4	61.1	13.3		
41 (08-14 Oct.)	14	28.9	60	55.1	3.6		
42 (15-21 Oct.)	13.7	28	55.4	50.9	0		
43 (22-28 Oct)	12.9	27.9	52.3	47.4	1.6		
44 (29-04 Nov.)	11.9	27.9	48.1	43.7	0		
45 (05-11 Nov.)	12	28.9	47.3	42.3	0		
46 (12-18 Nov.)	11.6	28.1	45.7	41.6	0		
47 (19-25 Nov.)	9.7	27.1	46.3	39.6	0		
48 (26-02 Dec.)	8.2	26.8	44.7	40.9	0		
49 (03-09 Dec.)	7.9	25.6	44.6	40.9	0		
50 (10-16 Dec.)	6	16.3	52	48.3	77		
51 (17-23 Dec)	4.8	11.2	44.6	41	0		
52 (24-31 Dec)	4.9	10.4	44.1	40.6	0		
1 (01-07 Jan)	4.7	11.4	48.3	44.4	2.2		
2 (8-14 Jan)	4.7	13.1	52.9	49.6	109		
3 (15-21 Jan)	4.1	16.6	57.9	54	0		
4 (22-28 Jan)	4.1	14.1	59.8	55.2	84.1		
5 (29-04 Feb.)	3.9	14.1	56.3	52.3	140.3		
6 (05-11 Feb.)	5.3	17.7	58.4	53.7	0		
7 (12-18 Feb.)	7.2	17.8	57.6	52.3	31.5		
8 (19-25 Feb.)	8.6	19	61.6	56.8	117.8		
9 (26-04 Mar.)	8	16.5	61.3	56.6	144.6		
10 (05-11 Mar.)	8.1	19.9	64.9	60.1	6.2		
11 (12-18 Mar.)	9.1	20.6	65.9	63	106.8		
12 (19-25 Mar.)	12.8	26	64.6	58.7	0		
13 (26-01 Apr.)	13.4	23.9	66.1	62.6	55.7		
14 (02-08 Apr.)	11.5	20.6	65.9	62.3	50.2		
15 (09-15Apr.)	13	27	60	54.9	4.2		
16 (16-22Apr.)	31	14.1	59.6	54.1	0		
17 (23-29Apr.)	33.4	16.6	56.3	52	0		
18 (30-06 May)	31.5	16.4	72	64.6	17.4		
19 (07-13 May)	32.2	17.3	60	54.7	0		
20 (14-20 May)	33	18	66.4	62	4.4		

Agra Latitude 27.2° N Longitude 77.9 ° E Height above MSL 168 m

Julian weeks	Temperature		RH %		Rainfall	Pan Evap.	Sun Shine
	Max.	Min.	Max.	Min.	mm	mm	hrs/day
40 (01-07 Oct.)	37.4	23.0	76.4	59.1	-	4.6	
41 (08-14 Oct.)	33.7	21.2	76.4	63.6	5.20-	4.1	
42 (15-21 Oct.)	33.2	18.0	83.1	65.0	-	3.4	
43 (22-28 Oct)	33.5	17.8	77.1	55.3	-	3.9	
44 (29-04 Nov.)	32.3	16.9	79.1	51.9	-	3.0	
45 (05-11 Nov.)	31.3	16.1	82.1	50.6	-	2.6	
46 (12-18 Nov.)	28.4	10.4	77.1	52.3	-	2.3	
47 (19-25 Nov.)	27.9	9.2	86.0	62.9	-	1.6	
48 (26-02 Dec.)	29.1	9.37	83.7	47.6	-	3.0	
49 (03-09 Dec.)	27.8	9.20	86.1	44.3	-	2.3	
50 (10-16 Dec.)	21.1	8.9	74.3	62.3	8.75	1.3	
51 (17-23 Dec)	16.7	5.3	81.5	77.0	-	0.7	
52 (24-31 Dec)	17.1	5.4	86.0	73.9	-	0.7	
1 (01-07 Jan)	18.7	10.5	83.7	70.9	9.40	1.3	
2 (8-14 Jan)	15.2	5.7	99.7	88.3	2.80	0.4	
3 (15-21 Jan)	16.4	7.7	100	83.9	-	1.1	
4 (22-28 Jan)	16.2	9.6	94.4	63.1	35.60	1.3	
5 (29-04 Feb.)	21.7	8.1	93.9	58.4	-	1.7	
6 (05-11 Feb.)	24.2	8.3	86.7	47.0	-	1.9	
7 (12-18 Feb.)	27.4	12.	89.0	66.1	-	1.9	
8 (19-25 Feb.)	29.6	14.5	88.0	38.4	-	2.4	
9 (26-04 Mar.)	25.1	14.3	94.3	56.3	56.60	1.4	
10 (05-11 Mar.)	26.2	12.0	90.1	59.9	-	3.4	
11 (12-18 Mar.)	26.0	14.2	92.7	62.9	38.60	1.9	
12 (19-25 Mar.)	32.5	16.3	79.7	24.9	-	3.1	
13 (26-01 Apr.)	34.37	19.10	85.7	33.6	25.00	3.9	
14 (02-08 Apr.)	33.65	18.12	85.71	41.42	19.40	3.7	
15 (09-15Apr.)	33.54	19.21	76.57	23.71	22.40	4.1	
16 (16-22Apr.)	37.65	21.5	71.85	20.07	-	6.1	
17 (23-29Apr.)	39.70	22.42	68.80	14.0	-	7.1	
18 (30-06 May)							

Hisar Latitude 29°10' N Longitude 75° 46' E Height above MSL 215.2 m **Durgapura Latitude 26° 51' N Longitude 75° 47' E Height above MSL 390 m**

Julian weeks	Temperature,C		RH %		Rainfall	Pan Evap.	Sun Shine	Julian weeks	Temperature,C		RH %		Rainfall	Pan Evap.	Sun Shine
	Max.	Min.	Max.	Min.	mm	mm	hrs/day		Max.	Min.	Max.	Min.	mm	mm	hrs/day
40 (01-07 Oct)	37.0	21.7	76	32	0.0	5.2	9.5	40 (01-07 Oct.)							
41 (08-14 Oct)	34.6	18.9	80	39	20.3	4.9	9.0	41 (08-14 Oct.)							
42 (15-21 Oct)	29.8	15.3	90	38	0.0	3.0	8.0	42 (15-21 Oct.)							
43 (22-28 Oct)	32.4	19.0	85	47	0.0	2.9	7.0	43 (22-28 Oct)							
44 (29-04 Nov)	30.7	14.6	88	35	1.0	2.7	6.4	44 (29-04 Nov.)	31.8	18.2	63	27	0.0	3.4	6.6
45 (05-11 Nov)	29.9	14.3	87	36	0.0	2.8	6.7	45 (05-11 Nov.)	31.6	18.1	66	27	0.0	3.8	7.5
46 (12-18 Nov)	27.1	7.7	79	28	0.0	2.4	7.1	46 (12-18 Nov.)	29.3	12.3	59	19	0.0	3.0	8.0
47 (19-25 Nov)	26.6	6.9	88	29	0.0	2.9	7.8	47 (19-25 Nov.)	29.1	11.2	70	21	0.0	2.5	9.2
48 (26-02 Dec)	28.1	9.9	81	32	0.0	3.0	7.7	48 (26-02 Dec.)	29.5	13.3	69	21	0.0	3.7	9.0
49 (03-09 Dec)	26.9	7.9	91	35	0.0	1.9	7.8	49 (03-09 Dec.)	27.8	10.7	71	19	0.0	3.4	9.0
50 (10-16 Dec)	20.5	6.8	94	56	9.0	1.5	5.2	50 (10-16 Dec.)	21.4	10.7	66	46	0.0	2.4	4.2
51 (17-23 Dec)	13.8	5.0	100	88	0.0	0.3	1.6	51 (17-23 Dec)	21.5	6.6	84	32	0.0	1.8	8.2
52 (24-31 Dec)	15.0	3.9	100	71	0.0	0.5	4.0	52 (24-31 Dec)	21.5	5.3	89	27	0.0	1.8	8.4
1 (01-07 Jan)	16.1	7.6	97	81	2.6	0.9	1.8	1 (01-07 Jan)	20.0	9.5	87	50	0.0	2.1	4.7
2 (08-14 Jan)	14.9	6.3	98	77	4.0	0.9	2.8	2 (8-14 Jan)	23.2	7.2	86	34	0.0	2.0	8.5
3 (15-21 Jan)	18.6	4.8	99	62	2.8	1.2	5.9	3 (15-21 Jan)	20.9	7.7	85	41	0.0	1.9	6.6
4 (22-28 Jan)	14.7	7.2	98	83	6.0	1.2	0.8	4 (22-28 Jan)	17.7	9.6	93	62	21.0	1.2	2.5
5 (29-04 Feb)	18.8	6.0	88	59	8.5	1.6	4.2	5 (29-04 Feb.)	21.4	8.2	78	33	0.0	2.0	8.8
6 (05-11 Feb)	21.9	6.2	92	46	0.0	1.8	8.2	6 (05-11 Feb.)	23.8	11.7	59	34	1.4	2.9	9.0
7 (12-18 Feb)	24.3	9.5	90	53	0.0	2.0	6.6	7 (12-18 Feb.)	27.6	12.7	64	26	0.0	4.1	9.6
8 (19-25 Feb)	25.9	14.4	97	63	3.7	2.3	4.5	8 (19-25 Feb.)	30.6	16.0	74	27	0.0	3.8	7.7
9 (26-04 Mar)	22.4	9.2	87	57	40.4	3.1	6.0	9 (26-04 Mar.)	25.5	13.5	60	30	29.8	3.1	6.8
10 (05-11 Mar)	23.5	8.3	93	58	17.5	2.5	8.2	10 (05-11 Mar.)	26.2	12.9	68	26	0.0	4.0	9.5
11 (12-18 Mar)	24.8	11.8	94	57	49.0	2.8	6.0	11 (12-18 Mar.)	25.6	15.1	79	50	49.6	3.3	5.9
12 (19-25 Mar)	29.4	13.9	92	43	0.0	2.9	9.1	12 (19-25 Mar.)	32	18.4	61	25	0.0	5.2	9.8
13 (26-01 Apr)	32.0	17.5	88	45	14.2	4.5	7.4	13 (26-01 Apr.)	35.3	21.5	62	29	0.6	6.3	7.7
14 (02-08 Apr)	29.9	17.2	88	45	68.1	2.9	8.0	14 (02-08 Apr.)	32.3	18.4	66	31	15.0	5.1	9.4
15 (09-15 Apr)	32.1	17.9	79	40	5.5	4.5	8.5	15(09-15 Apr.)	32.3	19.7	63	28	1.0	5.5	7.9
16 (16-22 Apr)	35.8	19.1	67	30	11.5	6.0	9.5	16 (16-22 Apr.)	37.7	22.7	43	16	0.0	8.2	9.6
17 (23-29 Apr)	38.0	21.6	56	27	0.0	7.8	9.8	17 (23-29 Apr.)	39.9	24.0	42	12	0.0	10.0	10.0
18(30-6 May)	36.6	23.4	48	26	0.0	7.7	8.2	18(30-6 May)	40.8	26.1	31	8	0.0	11.0	10.7
								19(7-13 May)	40.5	26.9	32	14	0.0	11.1	10.1

KARNAL Latitude 29° 43' N Longitude 76 ° 58' E Height above MSL 245

Julian weeks	Temperature,C		RH %		Rainfall	Pan Evap.	Sun Shine
	Max.	Min.	Max.	Min.	mm	mm	hrs/day
40 (01-07 Oct.)	34.3	22.7	95.4	48.9	00.0	03.2	05.3
41 (08-14 Oct.)	32.0	17.4	95.4	52.0	65.6	02.6	08.4
42 (15-21 Oct.)	29.1	15.0	94.3	43.7	00.0	02.5	08.8
43 (22-28 Oct)	29.9	17.5	98.0	57.0	00.0	02.0	02.2
44 (29-04 Nov.)	29.2	14.0	88.1	32.6	00.0	02.4	06.8
45 (05-11 Nov.)	30.2	14.3	82.3	31.3	00.0	03.5	07.4
46 (12-18 Nov.)	27.1	08.6	84.3	26.6	00.0	02.2	08.0
47 (19-25 Nov.)	26.5	07.2	88.3	29.0	00.0	02.0	07.7
48 (26-02 Dec.)	26.7	10.5	81.1	31.1	00.0	02.3	07.6
49 (03-09 Dec.)	25.7	08.3	85.1	36.6	00.0	02.5	07.9
50 (10-16 Dec.)	19.3	07.8	92.6	57.9	06.4	01.4	04.7
51 (17-23 Dec)	14.2	05.9	100	73.1	00.0	01.0	02.0
52 (24-31 Dec)	14.7	05.0	98.9	68.1	00.0	01.1	02.3
1 (01-07 Jan)	16.5	08.8	96.1	75.6	06.6	01.3	01.9
2 (8-14 Jan)	13.4	06.5	97.0	82.0	01.2	00.8	01.1
3 (15-21 Jan)	17.1	05.9	99.6	74.6	01.0	01.3	03.6
4 (22-28 Jan)	15.1	07.6	98.7	80.3	06.2	01.2	02.3
5 (29-04 Feb.)	18.9	05.9	94.6	57.4	25.5	01.8	05.5
6 (05-11 Feb.)	20.7	05.9	96.6	51.3	00.0	01.9	08.7
7 (12-18 Feb.)	22.5	09.6	93.9	61.9	00.0	02.3	05.6
8 (19-25 Feb.)	25.1	14.2	90.0	60.0	02.8	02.6	03.8
9 (26-04 Mar.)	21.1	10.6	92.1	56.1	103.0	02.2	05.0
10 (05-11 Mar.)	23.0	09.2	93.3	52.3	19.0	02.2	08.3
11 (12-18 Mar.)	24.5	12.3	92.4	56.7	00.0	02.4	04.4
12 (19-25 Mar.)	28.3	14.0	93.7	46.7	00.0	02.9	09.4
13 (26-01 Apr.)	30.5	16.8	87.9	49.6	07.0	03.1	06.6
14 (02-08 Apr.)	28.3	15.6	90.9	48.3	56.0	02.3	08.9
15 (09-015 Apr.)	31.7	16.8	81.4	33.9	00.4	03.6	08.5
16 (16-22 Apr.)	36.2	19.3	70.7	28.9	11.8	04.6	09.4
17 (23-29 Apr.)	36.5	19.8	63.1	29.9	00.0	07.0	09.3
18 (30-06 May)	37.2	19.8	60.0	20.3	00.0	06.9	10.2

Ludhiana Latitude 30°56' N Longitude 75 °52' E Height above MSL 247 m

Julian weeks	Temperature,C		RH %		Rainfall	Pan Evap.	Sun Shine
	Max.	Min.	Max.	Min.	mm	mm	hrs/day
40 (01-07 Oct.)							
41 (08-14 Oct.)	31.1	17.9	97	70	5.6	25.6	8.3
42 (15-21 Oct.)	30.1	15.7	89	64	0	22.4	8.3
43 (22-28 Oct)	30.4	17.9	87	68	2.5	15.7	3.3
44 (29-04 Nov.)	29.1	14.1	90	38	0	22.2	7.2
45 (05-11 Nov.)	28.7	14.2	90	37	0	17.2	5.5
46 (12-18 Nov.)	26.1	8.9	90	31	0	17.6	8.1
47 (19-25 Nov.)	25.4	8.3	94	33	0	14.8	7.7
48 (26-02 Dec.)	26.2	9.8	91	47	0	14	7.4
49 (03-09 Dec.)	25.1	7.7	93	42	0	15	7.9
50 (10-16 Dec.)	18.6	7.2	92	60	42.2	11.2	4
51 (17-23 Dec)	12.5	6.9	95	81	0	5.4	1.4
52 (24-31 Dec)	13.3	5.2	97	82	0	6.2	1.8
1 (01-07 Jan)	16.2	8.2	97	74	0.4	7.2	0.9
2 (8-14 Jan)	13.3	7.3	95	80	4.6	6.1	0.3
3 (15-21 Jan)	17.4	6.2	95	69	6.2	7.2	5.7
4 (22-28 Jan)	14.7	7.7	97	77	14.6	6	3.1
5 (29-04 Feb.)	18.6	7.1	92	61	11.6	13.2	5.9
6 (05-11 Feb.)	20.9	7.2	95	59	0	13.6	7.4
7 (12-18 Feb.)	23.9	11.2	93	62	8.4	17.2	5.8
8 (19-25 Feb.)	23.5	14.5	94	77	19	15.4	3.7
9 (26-04 Mar.)	20.3	10.6	93	67	24.8	14.8	8.3
10 (05-11 Mar.)	22.5	9.2	94	61	8.2	16.4	8.2
11 (12-18 Mar.)	24.1	12.5	93	63	36.2	18.5	6.1
12 (19-25 Mar.)	29	15.2	96	53	0	28.2	10.2
13 (26-01 Apr.)	30.2	17.7	87	52	15.8	34.2	6.8
14 (02-08 Apr.)	27.1	17.3	85	60	3.4	28	6.7
15 (09-15 Apr.)	32.6	18.1	79	49	17.6	40.6	9.4
16 (16-22 Apr.)	34.7	20.3	80	45	8	50	9
17 (23-29 Apr.)	36.6	21.7	56	25	0	63.5	10.4
18 (30-06 May)							
19 (7-13 May)							

Varanasi Latitude 25° 20' N Longitude 83 ° 03' E Height above MSL 75.7 m

Julian weeks	Temperature, C		RH %		Rainfall	Pan Evap.	Sun Shine
	Max.	Min.	Max.	Min.	mm	mm	hrs/day
40 (01-07 Oct.)	32.2	24.2	79	64	0	3	6
41 (08-14 Oct.)	31.2	24	88	68	50.7	3.1	4
42 (15-21 Oct.)	29.8	19.8	88	69	0	3.4	5.2
43 (22-28 Oct)	29.8	19.2	83	58	6.2	4.1	9.3
44 (29-04 Nov.)	30.4	18	85	41	0	3.1	7.2
45 (05-11 Nov.)	31.4	16.3	86	39	0	2.6	6.1
46 (12-18 Nov.)	27.5	13.6	83	37	0	1.7	6.8
47 (19-25 Nov.)	26.9	11	89	36	0	1.8	6.8
48 (26-02 Dec.)	27.8	11.9	84	49	0	2.4	6.8
49 (03-09 Dec.)	24.5	9.4	85	45	0	2.3	7.2
50 (10-16 Dec.)	21.2	11.5	89	58	2.8	2	5.4
51 (17-23 Dec)	19.3	8.1	94	54	0	1.7	7.2
52 (24-31 Dec)	17.9	6.2	93	65	0	1.9	7.3
1 (01-07 Jan)	20	13.3	96	74	33.1	0.8	2.8
2 (8-14 Jan)	14.6	8.3	90	77	0	0.8	1.8
3 (15-21 Jan)	14.5	7.8	91	74	0	0.5	1
4 (22-28 Jan)	19.9	11.8	94	69	10.6	0.7	3.5
5 (29-04 Feb.)	22.1	10.2	86	63	3.5	1.2	5.2
6 (05-11 Feb.)	22.5	11	88	56	0	1.8	6.6
7 (12-18 Feb.)	25.6	13.1	84	52	0	2.2	6.9
8 (19-25 Feb.)	29.3	14.9	87	48	0	2.7	7.2
9 (26-04 Mar.)	25.6	17.4	89	62	11.8	2.5	3.1
10 (05-11 Mar.)	28	13.9	80	38	0	3.2	9.5
11 (12-18 Mar.)	28.1	16.3	79	49	8	3.4	6.9
12 (19-25 Mar.)	32.2	16.7	69	38	0	4.6	9.8
13 (26-01 Apr.)	34.1	20.9	74	40	0	3.7	6.9
14 (02-08 Apr.)	35.2	20.3	60	39	7	4.9	8.2
15 (09-15 Apr.)	33.9	20.6	64	44	29.9	4.5	7.6
16 (16-22 Apr.)	36.6	23.2	68	36	24.4	5.4	8.2
17 (23-29 Apr.)	35	24.8	68	44	0	6.4	6.9
18(30-6 May.)	39	23.6	67	37	0	6	9.7

Kanpur Latitude 26° 29' N Longitude 80 ° 18' E Height above MSL 125.9 m

Julian weeks	Temperature		RH %		Rainfall	Pan Evap.	Sun Shine
	Max.	Min.	Max.	Min.	mm	mm	hrs/day
40 (01-07 Oct.)	35.0	23.9	80.4	63.1	-	4.4	7.4
41 (08-14 Oct.)	31.8	21.4	87.5	59.8	38.8	4.5	7.5
42 (15-21 Oct.)	30.2	18.7	90.0	47.0	21.6	3.6	7.5
43 (22-28 Oct)	31.2	18.2	90.5	46.8	-	3.0	8.0
44 (29-04 Nov.)	31.2	16.9	79.0	41.1	-	2.8	4.0
45 (05-11 Nov.)	31.0	16.0	84.1	42.1	-	2.7	5.0
46 (12-18 Nov.)	27.7	11.4	82.2	36.7	-	2.4	4.9
47 (19-25 Nov.)	27.1	9.7	87.5	41.7	-	2.4	6.4
48 (26-02 Dec.)	28.7	12.1	80.0	40.8	-	2.3	6.6
49 (03-09 Dec.)	26.1	10.9	83.8	44.4	-	2.4	4.2
50 (10-16 Dec.)	21.6	10.1	91.0	54.0	16.8	2.2	3.5
51 (17-23 Dec)	14.4	7.4	96.5	69.1	-	2.0	1.9
52 (24-31 Dec)	16.0	5.7	99.5	69.4	-	2.0	2.8
1 (01-07 Jan)	20.2	11.4	96.0	72.2	-.2	1.6	1.4
2 (8-14 Jan)	14.0	6.3	97.0	80.0	-	1.6	2.0
3 (15-21 Jan)	14.2	8.4	96.0	81.4	-	1.0	0.2
4 (22-28 Jan)	17.9	9.4	97.7	78.5	14.9	1.0	1.7
5 (29-04 Feb.)	21.1	8.3	91.5	60.5	10.3	1.1	5.8
6 (05-11 Feb.)	21.9	10.2	94.5	63.8	-	1.3	4.4
7 (12-18 Feb.)	25.8	11.9	88.4	55.1	-	1.4	8.1
8 (19-25 Feb.)	29.2	14.9	95.1	60.7	-	1.6	6.9
9 (26-04 Mar.)	26.3	16.2	81.1	65.2	11.5	1.8	4.8
10 (05-11 Mar.)	26.4	12.9	86.0	55.2	-	2.0	5.8
11 (12-18 Mar.)	26.8	13.9	89.8	61.7	95.0	1.9	6.4
12 (19-25 Mar.)	29.8	15.7	82.0	49.1	83.0	2.0	10.0
13 (26-01 Apr.)	33.6	18.4	83.4	48.2	4.6	2.2	7.8
14 (02-08 Apr.)	32.8	18.0	75.0	49.0	-	2.5	7.3
15 (09-15 Apr.)	32.6	18.1	76.5	58.1	4.8	2.8	6.8
16 (16-22 Apr.)	42.2	21.4	74.5	50.7	-	3.1	7.9
17 (23-29 Apr.)	36.7	22.2	73.7	57.2	-	3.8	8.6
18(30-6 May.)							

Rewa Latitude 24° 31' N Longitude 81° 15' E Height above MSL364 m

Julian weeks	Temperature C		RH %		Rainfall	Pan Evap.	Sun Shine
	Max.	Min.	Max.	Min.	mm	mm	hrs/day
36(03-09 Sep.)	22.0	32.6	90	61	39.6		
37(10-16 Sep.)	22.0	34.0	87	51	18.8		
38(17-23 Sep.)	22.0	34.0	92	52	40.0		
39(24-30 Sep.)	19.0	35.0	75	44	-		
40 (01-07 Oct.)	19.2	35.0	76	46	-		
41 (08-14 Oct.)	16.0	34.0	82	52	161.0		
42 (15-21 Oct.)	16.2	32.4	94	60	-		
43 (22-28 Oct)	16.0	31.4	94	46	-		
44 (29-04 Nov.)	12.0	32.4	82	33	-		
45 (05-11 Nov.)	10.0	31.8	73	36	-		
46 (12-18 Nov.)	7.4	30.8	71	33	-		
47 (19-25 Nov.)	7.0	29.2	73	34	-		
48 (26-02 Dec.)	7.0	31.2	80	34	-		
49 (03-09 Dec.)	6.2	28.6	77	31	-		
50 (10-16 Dec.)	6.8	22.4	95	35	21.0		
51 (17-23 Dec)	4.8	23.2	90	50	-		
52 (24-31 Dec)	4.0	25.4	92	40	-		
1 (01-07 Jan)	7.5	24.6	100	59	55.4		
2 (8-14 Jan)	7.4	22.4	95	54	-		
3 (15-21 Jan)	6.6	25.0	100	57	-		
4 (22-28 Jan)	8.0	30.6	93	62	2.0		
5 (29-04 Feb.)	5.0	25.0	95	43	17.0		
6 (05-11 Feb.)	7.0	29.6	89	46	2.0		
7 (12-18 Feb.)	7.0	32.6	89	41	2.6		
8 (19-25 Feb.)	10.4	32.6	88	32	-		
9 (26-04 Mar.)	14.0	32.6	90	47	25.4		
10 (05-11 Mar.)	8.0	32.5	89	42	-		
11 (12-18 Mar.)	11.8	33.4	93	51	12.6		
12 (19-25 Mar.)	10.0	31.0	95	50	-		
13 (26-01 Apr.)	9.6	29.3	95	51	15.4		
14 (02-08 Apr.)	9.4	30.0	94	50	Trace		

QUALITY EVALUATION

MALTING QUALITY EVALUATION

The Barley Network Unit took up the evaluation of grain samples of Advanced Varietal Trial (AVT) and Initial Varietal Trial (IVT) on malt barley received from various test sites at its central facility for malting quality evaluation. The malt barley varietal trials were conducted in NWPZ during Rabi 2014-15, in two sowing dates as separate sets. The trial conducting centers were requested to provide about 500 gm grain sample of each genotype. The grain samples were received from seven locations (Hisar, Karnal, Bawal, Ludhiana, Bathinda, Durgapura and Pantnagar) in timely sown and from five locations (Hisar, Karnal, Ludhiana, Pantnagar and Durgapura,) in late sown conditions. This year a total of 311 coded entries were received. There were 22 test entries in IVT (TS) which were analyzed with five checks, while 13 test entries in IVT (LS) were evaluated with three checks. In case of AVT (TS), six entries (BH 976, DWRB 123, DWRB 124, DWRB 128, PL 874, and RD 2891) with five checks were analyzed.

Table-1 Details of grain samples received and analyzed for malting quality

State	Location	Trial	No. of Samples
Timely Sown			
Haryana	Hisar	AVT/IVT	33
	Karnal	AVT/IVT	33
	Bawal	AVT/IVT	33
Punjab	Ludhiana	AVT/IVT	33
	Bathinda	AVT/ IVT	33
Rajasthan	Durgapura	AVT/IVT	33
Uttrakhand	Pantnagar	AVT/IVT	33
Late Sown			
Haryana	Hisar	IVT	16
	Karnal	IVT	16
Punjab	Ludhiana	IVT	16
Uttrakhand	Pantnagar	IVT	16
Rajasthan	Durgapura	IVT	16
Total			**311**

The grain samples were analyzed for different malting quality traits as shown in the table 2.

Table 2. Malting quality traits analyzed

Grain Quality	Malt Quality
- 1000 Grain Weight (g)	- Malt Yield (%)
- Test Weight (kg/hl)	- Malt Friability (%) & Homogeneity (%)
- Germinative Energy (at 72 hrs) (%)	- Hot Water extract % (F.g.d.b.)
	- Diastatic Power (^{0}L)
- Husk Content (%)	- Wort Filtration rate (ml/hr)
- Protein Content (%)	- Kolbach Index
- Beta glucan (%)	- Wort Colour (on EBC scale)
- Kernel Plumpness (%)	- Wort pH
- Proportion of bold grain (on 2.5 mm sieve)	- Wort appearance
- Proportion of thin grain (through 2.2 mm sieve)	- Saccharification rate

The samples were first analyzed for physical and biochemical grain parameters important for malting based on the approved guidelines. The different traits (test weight, bold / thin proportion, germinative energy, 1000 grain weight and husk

weight, bold / thin proportion, germinative energy, 1000 grain weight and husk content) were analyzed as per EBC approved procedures. Crude protein content of grains was predicted using FOSS NIR system and is expressed on dry weight basis. The processed grain samples (thin grains removed) were subjected to micro-malting on the "Joe White Micro-malting System" taking 100 gm sample from each variety. Micro-malting was done with 24 hours steeping in three stages; 72 hours germination in three stages and 24 hours kilning in eight stages.

The Analytical Guidelines for Barley Breeders in India (Annexure-1) approved by the "National Core Group on Malt Barley Development" (NCGMBD) were followed for the minimum standards of physical and biochemical properties of barley grain and malt, for evaluation of new genotypes. The analytical methods of EBC (Analytica EBC, 2003) were followed for determination of various quality parameters. The analysis of diastatic power (D.P.) of malt was done as per the IOB method and expressed in °Linter value.

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

Protein content and Kolbach index has been estimated using NIR system on dry weight basis.

Husk content analysis was done by Sodium hypo-chlorite method (dry basis) as per EBC procedure.

he wort was filtered through Whatman folded filter papers (2555 1/2, (dia 320 mm) to determine filtration rate and subsequent analysis of wort.

Several genotypes were observed as good source for individual grain and malt quality traits (Table 3), though they may not have good values for remaining traits. The average zonal performance of the AVT and IVT entries for grain and malt quality traits is given in Tables 4(a, b, c & d) and Table 5 (a & b) respectively, for timely and late sown trials. The location wise data for each physical and biochemical grain/malt quality parameter are given in annexure 2a, 2b and 3 for timely and late sown trials, respectively. The mean values were taken for identifying promising lines based on minimum standards determined by the 'NCGMBD' for malt barley in the country.

The interpretation of results for important grain and malt characters from different locations and other important observations are summarized below:

1000 grain weight (g)

AVT: Under timely sown conditions, highest value was obtained for Bh 976 (50.6 g) and lowest for BH 902 © (43.1 g) and DWRUB 52 (43.1 g).

IVT: The overall mean 1000 grain weight varied from minimum of 38.4 g (DWRB 139) to the maximum of 53.6 g (RD 2918). Among centres maximum mean value was obtained at Hisar (48.6) and lowest at Karnal (37.6). In late sown trials, minimum value of 38.6 g was obtained in DWRB 138 and maximum value of 55.8 g in RD 2918. Among the centers, the lowest 1000 gw was noticed at Ludhiana (36.6 g), while highest at Durgapura (51.6g).

Test weight (Kg/hl)

AVT: Under timely sown conditions, the average zonal test weight varied from 57.9 (BH 902 ©) to 63.8 Kg/hl (DWRUB 52). Centre wise average hectoliter weight was highest at Durgapura (64.8 Kg/hl) and lowest at Bawal (58.1 kg/hl).

IVT: Under timely sown conditions, the average zonal test weight varied from 55.1 (RD 2918) to 62.5 Kg/hl (PL 889 & DWRUB 52 ©) and under late sown conditions it varied from 58.3 (RD 2918) to 68.3 Kg/hl (DWRB 136). Centre wise average hectoliter weight was highest at Ludhiana (64.7Kg/hl) and lowest at Bawal (56.9kg/hl) in timely sown and in late sown, it was highest at Karnal (64.4 kg/hl) and lowest at Ludhiana (56.3 kg/hl).

Grain Plumpness

Barley grain used for malting should be uniform and plump to allow for consistent processing and for high yields of malt extract. Percentage of bold and thin grains determines the overall grain plumpness. The maximum limit for thin grains is 3% and minimum for bold grains is 90% and 80% for two rowed and six rowed barley, respectively.

AVT: In timely sown AVT trial highest bold grain percentage was obtained in DWRB 92 (92.0 %) and lowest in RD 2849 (72.1 %). Hisar centre registered the highest bold grain percentage (94.1 %) and Ludhiana the lowest (74.5 %). The thin grain percentage was lowest in DWRB 92 © (1.4%) and highest in RD 2849 (6.8%) in timely sown trial.

IVT: The data indicate that in timely sown trials the bold grain percentage was maximum in DWRB 92 © (93.8 %) and minimum in KB 1322 (68.4 %). Centre-wise it was lowest in Karnal (59.1%) and highest at Hisar and Pantnagar (90.9 %). In case of late sown trials, the highest bold grain percentage was recorded by RD 2918 (94.1%) and lowest in BH 1003 (64.0%). Among the centers maximum value of this parameter was achieved at Karnal (93.7%) and minimum at Ludhiana (59.6%).

Thin grains proportion varied from 1.4 % (DWRB 92 ©) to maximum of 80.5 % (KB 1322) in timely sown trials. In case of late sown trials, minimum thin grain percentage was obtained in RD 2898 (1.9 %) and highest in BH 990 (10.7 %).

Germinative Energy

One of the key qualities of malting barley is its ability to germinate rapidly and synchronously. Germination was checked through petri plate test after 72 hrs.

AVT: Satisfactory germination of >92% was achieved in all the entries included in timely sown except DWRB 101 © and DWRB 123.

IVT: The overall germinative energy was above 92 % in the timely sown entries except BH 1001, BH 1002, DWRB 139, DWRB 141 and KB 1322, while in late sown trials the exceptions were BH 1003, DWRB 132, DWRB 134, RD 2918 and DWRUB 64 ©.

Husk content

Adhering husk is one of the key attributes which makes barley suitable for malting as it protects the growing acrospires from mechanical damage during malting operations. However lower values of husk are desirable to get better modification and higher product recovery.

AVT: Lowest husk content was obtained in DWRB 101 (10.6%) and highest in BH 902 © (12.6%) in timely sown trials. Minimum values in this experiment was obtained at Karnal (10.3%) and highest at Bawal (12.4%).

IVT: In timely sown trial lowest value of 10.9% was obtained in PL 883 and highest value of 13.2 % in RD 2918. Centre wise minimum value was obtained at Ludhiana (9.7%) and highest at Bhatinda (13.5%). In late sown trials minimum value for this trait was obtained for BH 1001 (10.3%) and highest for the check DWRUB 64 (12.6%). Mean value for Durgapura location was 10.4%, being lowest and highest at Hisar with value of 13.4%.

Protein content

Protein content is one of the important parameters in selecting malting barley. It is affected by genotype, cultural practices and growing environments. Malt barley with high protein content usually results in lower extracts.

AVT: Protein content was lowest in the six row control genotype BH 902 (10.2%) and highest in DWRB 128 (12.1%). Lowest mean value of this trait was obtained at Hisar 9.9% and highest at Durgapura (12.4%).

IVT: The protein content ranged from 10.8 % in three genotypes (BH 902 ©, DWRB 101 © and DWRUB 52 ©) to 12.4% (RD 2918) in timely sown conditions. Pantnagar had the lowest mean protein content (10.0%) and Durgapura the highest (12.4%). In late sown trial the range was from 11.3 % (DWRB 132) to 14.1% (DWRB 136). Mean values were lowest at Pantnagar (11.7%) and highest at Durgapura (12.9%).

β- glucan content

The major constituent of barley endosperm cell walls are β-D-(1-3), (1-4) glucans (75%). The level of β-glucan has been shown to have a relationship with other malt quality traits such as viscosity, speed of filtration and Kolbach index and may affect extract value. Entries from Hisar and Ludhiana centers only were screened for beta glucan content.

AVT: In timely sown trial, Bh 976 and RD 2849 had lowest value (4.2%) for this trait, while RD 2891 had highest value of 5.3%.

IVT: Under timely sown conditions, desirable beta glucan content of <4.0% was obtained in three genotypes i.e. DWRB 136 (3.2%), KB 1325 (3.4%) and KB 1322 (3.6%). In the entries of late sown season crop two entries BH 946 (3.8%) and BH 1001 (3.9%) had lower beta glucan content.

Malt Yield (%)

In case of the malt yield, the absolute value is not an indicator, and the malt yield with acceptable range of malt friability should be taken into consideration. Since lower germination may also result in higher values.

AVT: Overall percent malt yield varied from 84.3 % to 87.5 % under timely sown condition.

IVT: The malt yield ranged from 85.2 % to 88.2% in timely sown conditions and in late sown conditions the values ranged from 81.2 % to 88.5 %.

Malt Friability (%)

The physical quality of malt is measured by malt friability and homogeneity.

AVT: Under timely sown conditions, the values ranged from 44.5 to 67.6, with genotypes PL 874 and RD 2891 registering friability value of > 65.0%.

IVT: The friability values ranged from 35.3 to 65.9% in timely sown entries with good friability values in BH 1002, DWRB 141 and RD 2919. In late sown trial, values ranged from 40.6 to 73.0 % with promising values in BH 1000, BH 1003, DWRB 138, DWRB 140, RD 2917 and RD 2919.

Hot Water Extract (HWE)

Hot water extract is one of the most important malting quality traits for the industry. Malt extract may be the most complex malting quality trait in terms of biochemistry and genetics. It is a comparable trait to grain yield in that they are both mega-traits influenced by a number of sub-traits.

AVT: Under timely sown conditions, HWE values ranged from 79.0 to 81.4 %. The entries having desirable HWE were BH 976, RD 2891, BH 902 ©, DWRB 101 ©, DWRUB 52 © and RD 2849 ©.

IVT: HWE values for timely sown genotypes varied from 75.9 to 81.2% with genotypes BH 1001, DWRB 141, DWRB 101 © and RD 2849 © having > 80.0% extract value. In case of late sown entries range of HWE was from 76.3-80.8% with only one entry (BH 1001) having > 80.0% value for this trait.

Diastatic Power (^{0}L)

The diastatic power (DP) of barley malt represents the collective activity of several starch degrading enzymes that accumulate or activated during malting. The enzyme activities of β-amylase, α-amylase, limit dextrinase and α-glucosidase have been identified as being active during malting and mashing. The Diastatic Power (DP) was analyzed by IOB method and expressed in ^{0}L values. There are different standards/ preferences for the value of DP in different countries as per the end product requirements. In India the desirable limit was fixed as 90-110 ^{O}L.

AVT: In timely sown conditions all the entries had desirable values of DP (90-110 ^{o}L).

IVT: All the IVT entries had the values of DP in desirable range in the timely as well as late sown conditions.

Wort Filtration (ml/hr)

AVT: The wort filtration rate was in desirable range of > 250.0 ml/hr in all the entries tested from timely sown trials except PL 874.

IVT: In timely sown samples values of > 250 ml/hr had desirable value of this parameter except DWRB 136. In late sown trial except DWRB 134 all the entries and checks had the value of > 250 ml/hr.

Kolbach Index (%)

The Kolbach Index (KI) is an important parameter that provides information on the level of protein modification (breakdown) that has occurred during the malting process. Is a ratio of soluble nitrogen in wort to total nitrogen in malt. This was analyzed using NIR system.

AVT: Mean desirable values of this trait were obtained in DWRB 123, RD 2891 and DWRB 92 ©, all others had KI value of less than 40%.

IVT: In timey sown conditions, the desirable values was obtained in BH 1000, DWRB 141, RD 2918, RD 2920, DWRB 101 © and DWRUB 52 ©.. However, in late sown situation two entries (BH 1003 and BH 946) had desirable value of 40%.

Other Traits

Apart from the above traits, the other malt quality traits like wort colour, pH and Sachharification rate were also analyzed. The results are given in Annexure 1 & 2.

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 6a and 6b). Thus based on the ten important traits (a maximum possible score of 30), entries BH 976 and RD 2891 were having better overall malting quality score under timely sown conditions. In late sown trials BH 1001 and RD 2917 were found promising.

Table 3. Promising entries* for individual malting quality trait

Traits	Promising entries	
	Timely sown	Late sown
Test Weight	PL 889	BH 1001, DWRB 136, DWRB 140, DWRB 141, RD 2917, RD 2919
Protein content	BH 976, PL 874, RD 2891	BH 946, DWRB 132
Thousand grain weight	BH 976, RD 2918	RD 2918
Husk Content	PL 883	BH 1001, DWRB 136, DWRB 138, DWRB 140, DWRB 141, RD 2917
Beta glucan	BH 976, DWRB 136, KB 1322, KB 1325, RD 2920	BH 1000, BH 1001, BH 946
Malt Friability	PL 874, RD 2891, BH 1002, DWRB 141, RD 2919	BH 1000, BH 1003, DWRB 138, DWRB 140, RD 2917, RD 2920
Hot water extract	-	BH 1001, DWRB 141
Over all MQ (Overall score > best check)	BH 976, RD 2891	BH 1001, RD 2917

**Superior or at par to best check*

Table 4 a. Grain quality of AVT (Timely sown) malt barley entries in NWPZ

S. No.	Genotype	Test wt (kg/hl)	Bold (%)#	Thin (%)	1000GW (g)	GE (%)	Protein (%)	Husk (%)	Beta glu (%)
1	BH 976	60.0 (56.8-65.4)	88.1 (74.3-97.6)	3.2 (0.6-8.5)	50.6 (34.5-59.2)	96 (90-100)	10.7 (9.7-13.1)	10.9 (9.4-11.9)	4.2 (3.9-4.6)
2	DWRB 123	62.2 (58.5-66.4)	91.0 (84.9-96.5)	2.1 (0.4-4.0)	48.2 (43.4-53.5)	90 (62-99)	11.0 (8.3-14.2)	11.4 (10.2-12.5)	4.7 (4.7-4.7)
3	DWRB 124	62.6 (57.2-65.5)	85.0 (69.1-92.9)	2.7 (0.6-6.6)	47.9 (39.4-52.1)	95 (86-99)	11.2 (9.6-14.0)	11.7 (9.5-14.9)	4.7 (4.6-4.9)
4	DWRB 128	61.0 (56.3-65.9)	78.4 (51.5-96.1)	5.9 (0.5-19.8)	46.0 (31.9-53.6)	95 (87-99)	12.1 (9.4-15.3)	11.9 (9.7-14.5)	4.3 (3.7-5.0)
5	PL 874	61.0 (51.9-64.7)	85.7 (76.6-98.0)	2.4 (0.8-4.3)	43.5 (35.7-47.6)	94 (92-99)	10.6 (9.0-12.8)	11.3 (9.2-13.0)	4.4 (4.3-4.5)
6	RD 2891	61.6 (58.2-65.4)	82.1 (57.6-95.3)	4.5 (0.5-11.3)	43.8 (36.0-51.2)	96 (93-98)	10.9 (9.8-13.0)	10.8 (8.7-12.6)	5.3 (5.0-5.6)
7	BH 902 (c)*	57.9 (51.7-66.8)	86.1 (70.4-92.6)	3.5 (1.5-9.5)	43.1 (35.5-47.5)	93 (78-99)	10.2 (9.1-11.9)	12.6 (9.1-14.9)	5.1 (4.6-5.5)
8	DWRB 101 (c)	62.8 (59.7-67.9)	83.0 (69.5-93.8)	3.3 (0.8-6.5)	43.8 (35.6-46.4)	84 (50-99)	11.7 (10.0-13.8)	10.6 (9.4-11.5)	4.9 (4.6-5.3)
9	DWRB 92 (c)	60.5 (57.8-64.3)	92.0 (80.8-97.4)	1.4 (0.3-3.8)	48.5 (40.2-57.3)	95 (92-98)	11.4 (10.3-12.1)	11.7 (9.9-13.0)	4.5 (4.2-4.7)
10	DWRUB 52 (c)	63.8 (60.1-68.6)	79.4 (61.0-92.9)	4.7 (0.7-13.2)	43.1 (32.9-51.7)	94 (90-98)	11.0 (9.0-12.5)	11.1 (8.6-13.1)	4.6 (4.5-4.6)
11	RD 2849 (c)	62.3 (57.6-66.4)	72.1 (41.6-90.8)	6.8 (1.4-15.9)	44.8 (37.2-57.3)	92 (80-97)	11.5 (9.8-12.9)	10.9 (8.0-13.3)	4.2 (4.1-4.3)

Table 4 b. Malt quality of AVT (Timely sown) malt barley entries in NWPZ

S. No.	Genotype	MY (%)#	Frib (%)	FR (ml/hr)	HWE (%fgdb)	DP (^{0}L)	KI (%)
1	BH 976	84.5 (79.0-89.7)	62.1 (41.3-81.2)	280 (180-320)	81.0 (78.3-83.5)	101 (87-111)	39 (35-42)
2	DWRB 123	86.6 (82.6-91.6)	52.0 (22.3-81.8)	289 (175-325)	79.0 (72.1-85.20	97 (83-105)	40 (36-43)
3	DWRB 124	86.6 (79.8-90.2)	45.8 (30.0-67.6)	266 (175-325)	79.7 (76.5-83.3)	103 (100-108)	39 (37-42)
4	DWRB 128	87.5 (81.9-90.7)	44.5 (23.0-58.1)	259 (170-305)	79.2 (74.9-81.7)	100 (91-105)	39 (37-41)
5	PL 874	86.2 (83.5-89.3)	67.6 (48.9-84.7)	249 (150-305)	79.2 (77.0-80.9)	99 (82-118)	38 (36-41)
6	RD 2891	86.3 (82.1-89.9)	66.1 (32.8-84.1)	266 (125-325)	80.5 (76.8-84.8)	102 (85-114)	40 (35-42)
7	BH 902 (c)*	86.8 (83.0-90.7)	48.9 (37.7-65.1)	257 (170-325)	80.6 (76.6-83.1)	98 (83-114)	39 (37-41)
8	DWRB 101 (c)	86.4 (83.1-88.7)	62.4 (38.6-78.8)	276 (170-315)	81.4 (78.6-83.7)	100 (80-111)	39 (34-41)
9	DWRB 92 (c)	86.3 (83.3-90.8)	55.3 (24.2-72.6)	280 (190-325)	79.5 (75.1-82.9)	99 (74-111)	40 (36-42)
10	DWRUB 52 (c)	84.3 (78.2-88.6)	62.9 (43.8-83.1)	288 (250-310)	81.2 (77.2-83.0)	94 (77-105)	39 (37-40)
11	RD 2849 (c)	85.5 (78.2-90.0)	64.1 (47.7-81.9)	276 (210-325)	81.3 (77.7-83.5)	104 (83-118)	39 (35-42)

* = six- row barleys # = range

Table 4 c. Grain quality of IVT (Timely sown) malt barley entries in NWPZ

S.No.	Genotype	Test wt (kg/hl)	Bold (%)#	Thin (%)	1000GW (g)	GE (%)	Protein (%)	Husk (%)	Beta glu (%)
1	BH 1000	58.0 (55.6-61.2)	78.5 (65.9-91.1)	5.5 (0.9-10.0)	44.7 (39.9-49.7)	94 (88-99)	11.9 (9.6-14.0)	12.6 (10.9-14.3)	5.2 (5.0-5.3)
2	BH 1001	61.8 (58.2-66.1)	75.8 (57.0-93.6)	5.4 (1.0-11.8)	41.0 (37.2-47.2)	90(56-99)	11.5 (9.1-12.9)	11.0 (8.4-13.4)	4.1 (3.9-4.2)
3	BH 1002	59.5 (53.8-66.5)	74.7 (36.7-89.0)	7.8 (1.8-27.3)	42.8 (30.4-51.1)	91 (68-98)	11.0 (9.1-12.0)	11.1 (9.5-13.2)	4.8 (4.5-5.0)
4	DWRB 133	61.0 (57.2-66.7)	86.0 (66.3-93.0)	4.1 (1.3-12.5)	46.9 (37.7-50.6)	94 (86-98)	11.9 (9.9-13.1)	12.7 (9.5-14.5)	5.2 (4.9-5.6)
5	DWRB 134	60.5 (55.3-67.5)	87.3 (67.0-98.8)	2.8 (0.3-7.3)	50.4 (42.1-61.1)	95 (94-98)	11.7 (10.3-12.7)	11.7 (8.8-14.4)	5.4(4.7-6.2)
6	DWRB 135	60.7 (58.1-64.3)	89.6 (80.3-97.4)	2.1 (0.6-4.1)	50.4 (43.7-54.7)	97 (90-99)	11.7 (10.3-13.4)	11.7 (9.2-13.9)	5.6 (5.3-5.8)
7	DWRB 136	61.1 (50.5-67.7)	81.6 (55.8-95.6)	3.1 (0.4-6.2)	45.4 (32.1-53.9)	95 (90-99)	11.6 (9.4-13.3)	11.9 (9.7-15.3)	3.2 (3.2-3.2)
8	DWRB 139	59.1 (53.8-64.1)	80.1 (68.8-90.7)	5.7 (2.5-8.2)	38.4 (34.8-42.8)	90 (70-99)	11.7 (10.0-12.7)	11.8 (10.2-14.9)	4.3 (4.3-4.3)
9	DWRB 141	59.2 (50.1-66.2)	82.3 (66.1-94.5)	4.6 (0.6-10.5)	42.5 (34.0-52.4)	89 (70-97)	11.5 (9.1-13.9)	11.6 (9.3-13.8)	5.0 (4.8-5.1)
10	KB 1322	58.1 (50.2-66.9)	68.4 (42.3-85.7)	8.5 (3.9-26.2)	43.0 (34.5-50.2)	87 (50-100)	11.3 (9.3-13.6)	11.8 (9.5-13.8)	3.9 (3.6-4.2)
11	KB 1325	60.3 (55.7-65.0)	79.8 (44.2-91.4)	4.7 (1.4-14.7)	46.1 (39.0-51.1)	92 (83-99)	11.5 (9.7-13.1)	11.9 (8.4-14.1)	3.8 (3.4-4.3)
12	PL 883	62.2 (59.1-65.5)	80.5 (43.0-96.1)	5.1 (0.6-18.0)	43.4 (36.3-46.4)	97 (93-99)	11.4 (9.5-12.9)	10.9 (9.2-13.4)	5.6 (4.8-6.4)
13	PL 889	62.5 (57.8-69.5)	85.4 (49.8-96.1)	3.4 (0.6-11.9)	46.9 (36.3-52.5)	94 (86-99)	11.4 (9.6-12.9)	12.1 (9.3-14.4)	4.3 (4.3-4.3)
14	RD 2917	58.9 (51.9-63.9)	78.3 (29.9-95.5)	7.5 (1.4-32.1)	45.3 (31.6-49.6)	95 (87-98)	11.8 (8.1-13.2)	12.6 (10.7-15.90	4.4 (4.0-4.7)
15	RD 2918	55.1 (47.9-69.2)	89.4 (76.2-97.5)	2.6 (0.3-5.7)	53.6 (41.5-61.4)	94 (85-99)	12.4 (10.7-13.8)	13.2 (9.0-15.4)	4.8 (4.6-5.0)
16	RD 2919	60.1 (54.5-66.2)	90.2 (74.1-98.3)	2.4 (0.3-6.3)	47.7 (39.4-56.0)	95 (78-100)	11.2 (10.0-12.3)	11.9 (9.1-13.3)	4.4 (4.0-4.7)
17	RD 2920	59.6 (53.0-63.6)	78.5 (42.3-94.9)	6.2 (1.0-21.9)	43.6 (32.5-49.8)	93 (70-99)	11.9 (10.6-12.8)	11.8 (10.1-13.0)	4.0 (3.7-4.3)
18	BH 902 (c)*	56.9 (50.0-65.5)	82.2 (77.4-86.6)	4.8 (3.4-8.0)	42.0 (35.8-44.5)	93 (84-98)	10.8 (9.2-11.6)	12.1 (9.7-13.90	5.4 (5.2-5.6)
19	DWRB 101 (c)	62.2 (56.7-66.5)	73.9 (37.7-91.5)	7.2 (1.2-24.9)	41.8 (31.3-47.0)	92 (68-99)	10.8 (9.4-13.3)	11.2 (9.3-12.2)	5.3 (5.1-5.5)
20	DWRB 92 (c)	60.3 (56.5-66.1)	93.8 (85.2-98.9)	1.4 (0.3-3.9)	53.4 (47.5-59.4)	95 (92-98)	11.7 (10.8-13.2)	11.4 (7.9-14.30	4.9 (4.6-5.2)
21	DWRUB 52 (c)	62.5 (58.5-67.3)	78.8 (39.7-92.7)	5.9 (1.0-25.2)	42.7 (34.0-46.3)	94 (90-98)	10.8 (9.6-12.2)	11.6 (9.7-14.9)	4.9 (4.6-5.1)
22	RD 2849 (c)	61.5 (55.1-66.2)	75.4 (55.5-92.1)	5.5 (0.9-14.3)	43.2 (33.7-50.1)	96 (90-99)	11.2 (9.4-12.5)	11.6 (10.4-13.9)	4.8 (4.5-5.0)

* = six- row barleys # = range

Table 4 d. Malt quality of IVT (Timely sown) malt barley entries in NWPZ

S.No.	Genotype	MY (%)#	Frib (%)	FR (ml/hr)	HWE (%fgdb)	DP (^{0}L)	KI (%)
1	BH 1000	85.5 (82.2-89.2)	57.3 (30.3-74.7)	274 (230-310)	80.2 (77.3-82.9)	102 (98-111)	40 (37-42)
2	BH 1001	87.2 (84.6-90.8)	55.6 (19.7-82.4)	278 (205-310)	78.4 (66.0-84.2)	96 (80-111)	39 (33-43)
3	BH 1002	85.9 (82.1-89.6)	65.0 (32.0-83.7)	276 (155-325)	77.8 (69.8-82.6)	100 (82-118)	39 (37-42)
4	DWRB 133	85.7 (79.9-90.1)	43.9 (16.6-61.8)	279 (220-310)	78.6 (73.5-82.1)	103 (85-118)	39 (36-41)
5	DWRB 134	86.9 (83.9-90.7)	56.5 (37.4-79.0)	272 (200-310)	77.3 (71.2-83.2)	105 (89-111)	39 (37-43)
6	DWRB 135	85.2 (80.7-89.0)	57.3 (40.5-67.6)	277 (240-310)	76.6 (59.8-82.7)	106 (98-111)	39 (38-42)
7	DWRB 136	86.7 (84.2-89.0)	48.2 (36.5-68.9)	244 (130-310)	78.7 (75.0-83.5)	97 (83-111)	39 (36-41)
8	DWRB 139	87.2 (82.2-91.60	59.5 (24.3-80.0)	251 (120-305)	76.7 (72.0-79.6)	104 (87-114)	39 (37-42)
9	DWRB 141	85.4 (82.8-87.2)	64.6 (23.5-84.1)	273 (110-320)	80.7 (76.5-85.4)	100 (82-111)	40 (36-42)
10	KB 1322	85.8 (79.6-89.9)	59.3 (34.9-81.7)	251 (135-290)	79.7 (75.6-81.8)	105 (95-114)	39 (37-40)
11	KB 1325	88.2 (86.9-89.7)	57.4 (36.9-65.9)	256 (150-310)	78.6 (75.0-80.9)	107 (103-111)	39 (36-45)
12	PL 883	86.5 (80.1-89.7)	59.5 (32.9-76.7)	269 (165-310)	79.7 (73.3-82.9)	102 (91-111)	39 (36-42)
13	PL 889	86.7 (82.5-90.1)	53.7 (25.0-69.0)	261 (210-290)	78.5 (73.1-85.8)	102 (83-125)	38 (36-40)
14	RD 2917	86.3 (82.5-89.4)	59.4 (35.6-81.1)	274 (155-305)	77.6 (74.8-81.3)	103 (87-111)	39 (36-41)
15	RD 2918	87.8 (83.0-91.8)	35.3 (13.1-57.8)	266 (120-315)	75.9 (69.0-80.9)	103 (93-118)	40 (39-42)
16	RD 2919	85.9 (78.9-90.9)	65.9 (35.9-84.3)	281 (225-310)	78.9 (73.3-85.9)	106 (100-119)	38 (36-40)
17	RD 2920	87.9 (87.2-89.1)	62.7 (42.0-75.3)	276 (250-290)	77.2 (74.3-80.5)	106 (91-118)	40 (38-42)
18	BH 902 (c)*	87.2 (80.6-91.30	44.5 (33.1-55.6)	254 (130-300)	78.2 (74.9-81.7)	99 (87-111)	39 (37-42)
19	DWRB 101 (c)	85.9 (78.7-89.6)	63.6 (42.0-84.7)	263 (140-310)	80.1 (77.4-83.0)	96 (80-108)	40 (38-46)
20	DWRB 92 (c)	86.0 (83.3-89.8)	63.4 (47.0-73.5)	269 (215-315)	76.5 (63.6-82.2)	104 (93-118)	39 (36-40)
21	DWRUB 52 (c)	86.4 (81.6-90.7)	58.8 (31.5-85.7)	279 (235-320)	78.5 (72.8-82.1)	101 (78-114)	40 (37-42)
22	RD 2849 (c)	85.7 (78.2-89.6)	63.9 (37.6-83.7)	271 (170-305)	81.2 (73.5-85.1)	104 (82-118)	39 (37-40)

*= six- row barley # = range

Table 5 a. Grain quality of IVT (Late sown) malt barley entries in NWPZ

No	Entries	Test wt (kg/hl)	Bold (%)#	Thin (%)	1000GW (g)	GE (%)	Protein (%)	Husk (%)	Beta glu (%)
1	BH 1000	59.9 (53.8-65.2)	81.5 (53.9-94.0)	3.2 (1.2-7.6)	48.0 (40.3-51.1)	94 (84-99)	12.2 (10.7-14.2)	12.3 (9.3-15.5)	4.1 (4.0-4.1)
2	BH 1001	63.4 (58.5-66.5)	81.3 (47.4-92.6)	3.2 (1.4-8.0)	46.0 (34.8-50.8)	95 (90-98)	12.5 (11.3-13.6)	10.3 (9.0-11.9)	3.9 (3.8-4.0)
3	BH 1003	60.1 (52.7-65.9)	64.0 (21.6-86.5)	14.4 (4.1-42.7)	38.9 (24.7-45.3)	89 (69-99)	12.2 (10.3-14.7)	11.6 (9.9-13.8)	4.8 (4.2-5.5)
4	BH 946	54.9 (49.2-61.6)	76.3 (50.1-96.2)	3.3 (0.4-7.2)	39.7 (31.4-46.3)	96 (94-99)	11.5 (9.6-12.6)	12.4 (11.5-13.7)	3.8 (3.5-4.1)
5	DWRB 132	61.3 (57.7-64.9)	77.7 (49.5-95.1)	4.1 (0.8-7.7)	45.6 (37.2-49.6)	85 (53-97)	11.3 (10.3-12.6)	12.6 (11.1-15.2)	6.1 (5.7-6.5)
6	DWRB 134	58.0 (54.5-64.3)	91.9 (84.0-96.2)	1.9 (0.3-3.4)	52.6 (46.5-61.0)	88 (70-99)	13.9 (13.1-14.9)	12.5 (10.3-15.6)	5.2 (4.8-5.6)
7	DWRB 136	64.2 (60.6-68.3)	80.1 (50.8-94.2)	2.9 (0.7-5.0)	49.8 (42.5-54.0)	94 (88-97)	14.1 (13.3-15.1)	11.4 (9.3-14.1)	5.7 (5.4-5.9)
8	DWRB 138	58.8 (55.2-62.2)	82.2 (60.2-95.4)	5.0 (1.2-10.7)	38.6 (27.5-46.9)	95 (90-99)	12.3 (10.8-13.9)	10.9 (9.3-12.7)	4.5 (4.1-4.8)
9	DWRB 140	62.6 (57.9-68.2)	77.7 (33.7-95.2)	6.5 (0.4-24.4)	43.6 (31.3-49.5)	95 (93-98)	12.2 (10.0-14.1)	11.3 (8.9-14.5)	5.3 (5.1-5.5)
10	DWRB 141	62.6 (58.7-66.5)	77.7 (28.6-96.9)	5.8 (0.6-18.6)	44.2 (32.6-52.9)	94 (80-98)	12.4 (11.2-14.1)	11.2 (9.2-14.4)	5.2 (4.7-5.7)
11	RD 2917	62.0 (57.9-65.0)	86.8 (69.2-96.6)	3.6 (0.8-6.6)	49.8 (38.8-57.8)	99 (98-99)	11.8 (11.0-13.2)	10.9 (9.5-12.4)	5.8 (5.5-6.1)
12	RD 2918	54.3 (47.5-58.3)	94.1 (91.7-98.9)	1.2 (0.2-2.0)	55.8 (39.6-62.6)	83 (70-98)	12.5 (11.5-13.6)	12.5 (11.3-13.7)	4.4 (4.3-4.4)
13	RD 2919	62.6 (59.6-65.3)	93.3 (85.8-98.0)	1.8 (0.4-2.7)	51.3 (42.2-56.1)	95 (90-99)	12.8 (11.9-14.7)	11.6 (10.0-13.1)	4.7 (4.2-5.1)
14	RD 2920	59.1 (53.5-65.6)	87.1 (66.3-94.2)	2.5 (1.0-5.8)	49.8 (40.2-52.8)	94 (91-96)	12.5 (11.7-13.7)	12.0 (9.7-15.7)	4.8 (4.7-5.0)
15	DWRB 91 (c)	61.3 (58.0-66.3)	90.4 (83.5-95.9)	2.2 (0.7-4.6)	53.3 (42.4-62.2)	94 (85-98)	12.9 (11.8-14.1)	11.6 (9.6-13.7)	4.5 (3.6-5.4)
16	DWRUB 64 (c)*	58.2 (54.8-61.1)	87.0 (75.9-90.4)	2.6 (1.8-4.6)	40.8 (33.3-44.4)	83 (57-98)	11.7 (11.0-12.3)	12.6 (10.2-16.5)	4.8 (4.6-4.9)

* = six- row barley # = range in brackets

Table 5 b. Malt quality of IVT (Late sown) malt barley entries in NWPZ

No	Entries	MY (%)#	Frib (%)	FR (ml/hr)	HWE (%fgdb)	DP (^{0}L)	KI (%)
1	BH 1000	86.4 (84.3-89.4)	73.0 (56.3-87.4)	290 (195-335)	77.8 (74.5-80.1)	97 (87-103)	39 (37-41)
2	BH 1001	86.5 (80.2-90.1)	56.3 (24.8-77.5)	284 (215-325)	80.8 (77.5-83.4)	96 (83-105)	39 (37-40)
3	BH 1003	85.3 (79.9-90.3)	65.2 (37.3-77.5)	308 (280-330)	79.1 (75.0-82.7)	99 (91-108)	40 (37-42)
4	DWRB 132	88.5 (86.6-90.8)	53.8 (23.1-74.9)	271 (220-310)	76.3 (71.7-80.2)	96 (83-108)	39 (37-39)
5	DWRB 134	87.7 (85.5-90.3)	54.8 (42.0-76.8)	236 (180-300)	77.4 (70.9-83.8)	103 (98-114)	38 (36-40)
6	DWRB 136	85.6 (78.5-91.0)	48.3 (34.1-68.8)	283 (235-310)	77.1 (75.2-79.3)	104 (95-111)	38 (35-42)
7	DWRB 138	81.2 (71.1-89.4)	70.2 (58.1-81.6)	305 (285-320)	77.8 (76.7-80.1)	103 (95-114)	38 (37-39)
8	DWRB 140	84.9 (80.7-88.7)	69.1 (58.9-80.0)	292 (260-310)	77.6 (73.6-82.2)	99 (87-111)	39 (36-42)
9	DWRB 141	84.3 (82.3-87.4)	62.7 (38.0-82.1)	308 (300-315)	79.9 (73.7-84.3)	100 (87-111)	38 (37-39)
10	RD 2917	85.8 (84.2-88.6)	69.1 (45.6-80.5)	278 (240-315)	78.1 (76.1-80.1)	104 (100-108)	39 (37-42)
11	RD 2918	87.8 (84.0-90.0)	44.1 (24.4-79.1)	293 (225-330)	77.3 (74.0-81.4)	101 (95-111)	39 (37-40)
12	RD 2919	86.1 (84.2-87.7)	63.8 (44.9-72.5)	286 (260-300)	78.1 (75.8-80.2)	103 (93-114)	38 (36-41)
13	RD 2920	86.1 (82.0-89.1)	65.5 (36.5-79.0)	275 (240-310)	77.4 (73.8-81.5)	99 (91-108)	39 (38-40)
14	BH 946 © *	85.1 (81.8-89.4)	51.7 (39.3-68.9)	268 (240-290)	77.0 (72.6-81.7)	95 (87-103)	40 (37-42)
15	DWRB 91 (c)	87.0 (85.4-89.0)	64.6 (55.6-73.8)	271 (215-315)	79.0 (74.7-82.4)	98 (83-111)	39 (36-41)
16	DWRUB 64 (c)*	88.4 (85.2-90.6)	40.6 (21.8-75.8)	273 (255-310)	79.3 (77.6-81.2)	97 (91-100)	38 (37-40)

*= six- row barley # = range

Table 6 a. Weighted performances of AVT entries for malting quality (Timely sown)

No	Entries	TW	Bol	Hus	Pro	BG	Fria	HW	FR	DP	KI	Total (30)
1	BH 976	1	2	2	3	1	2	3	3	3	2	**22**
2	DWRB 123	1	2	2	2	0	1	2	3	3	3	**19**
3	DWRB 124	1	1	1	2	0	1	2	3	3	2	**16**
4	DWRB 128	1	0	1	1	1	0	2	3	3	2	**14**
5	PL 874	1	1	2	3	1	3	2	2	3	2	**20**
6	RD 2891	1	1	2	3	0	3	3	3	3	3	**22**
7	BH 902 (c)*	0	3	0	3	0	1	3	3	3	2	**18**
8	DWRB 101 (c)	1	1	2	2	0	2	3	3	3	2	**19**
9	DWRB 92 (c)	1	2	1	2	1	2	2	3	3	3	**20**
10	DWRUB 52 (c)	2	0	2	2	0	2	3	3	3	2	**19**
11	RD 2849 (c)	1	0	2	2	1	2	3	3	3	2	**19**

Table 6 b. Weighted performances of IVT entries for malting quality (Timely sown)

No	Entries	TW	Bol	Hus	Pro	Fri	HW	FR	DP	BG	KI	Total (30)
1	BH 1000	0	0	0	2	2	3	3	3	0	3	**16**
2	BH 1001	1	0	2	2	2	2	3	3	1	2	**18**
3	BH 1002	0	0	2	2	2	1	3	3	0	2	**15**
4	DWRB 133	1	1	0	2	0	2	3	3	0	2	**14**
5	DWRB 134	1	1	1	2	2	1	3	3	0	2	**16**
6	DWRB 135	1	2	1	2	2	1	3	3	0	2	**17**
7	DWRB 136	1	1	1	2	1	2	2	3	3	2	**18**
8	DWRB 139	0	1	1	2	2	1	3	3	1	2	**16**
9	DWRB 141	0	1	1	2	2	3	3	3	0	3	**18**
10	KB 1322	0	0	1	2	2	2	3	3	2	2	**17**
11	KB 1325	1	0	1	2	2	2	3	3	2	2	**18**
12	PL 883	1	1	2	2	2	2	3	3	0	2	**18**
13	PL 889	1	1	1	2	1	2	3	3	1	2	**17**
14	RD 2917	0	0	0	2	2	1	3	3	1	2	**14**
15	RD 2918	0	2	0	1	0	0	3	3	0	3	**12**
16	RD 2919	1	2	1	2	3	2	3	3	1	2	**20**
17	RD 2920	0	0	1	2	2	1	3	3	2	3	**17**
18	BH 902 (c)*	0	1	1	3	0	2	3	3	0	2	**15**
19	DWRB 101 (c)	1	0	2	3	2	3	3	3	0	3	**20**
20	DWRB 92 (c)	1	3	2	2	2	1	3	3	0	2	**19**
21	DWRUB 52 (c)	1	0	1	3	2	2	3	3	0	3	**18**
22	RD 2849 (c)	1	0	1	2	2	3	3	3	0	2	**17**

*= six- row barleys

Score range

TW	<60=0, 60- 63=1,> 63-65=2, >65=3
Bold	(Two-Row) >92=3, 88-92=2, 80-87=1, <80=0 (Six-row) = >82= 3, 78-82=2, 70-77=1, <70=0
Husk	<10.5=3, 10.6-11.5=2, 11.6-12.5=1, >12.5=0
Protein	Two-row= <11=3, 11-11.9=2, 12-13= 1, >13=0 Six-row = <11.5=3, 11.5-12.4=2, 12.5-13.5= 1,>13.5=0
Friability	>65=3, 55-65=2, 45-55=1, <45=0
HWE	Two-row= >80.0=3, 78-80=2, 76-78=1, <76=0 Six-row = >78=3, 76-78=2, 74-76=1, <74=0
FR	>250=3, 200-250=2, 150-200=1, <150=0
DP	<90=1, 90-110=3, 111-120=2, 121-130=1, >130=0
B. glucan	3.5=3, 3.5-4.0=2,4.1-4.5=1,>4.5=0
KI	40-44% = 3, 35-39 & 45-49=2, 30-34 & 50-54=1, <30 & >54=0

TW= Test Weight, Bol= Bold grain (%), Hus= Husk (%), Pro= Protein, Fri= Friability, HWE= Hot water extract (%), FR= Filtration rate, DP= Diastatic power, BG= Beta glucan, KI= Kolbach index

Table 7. Weighted performances of IVT entries for malting quality (Late sown)

No	Entries	TW	Bol	Hus	Pro	Fri	HW	FR	DP	β-glu	KI	Total (30)
1	BH 1000	0	1	1	1	3	1	3	3	1	2	**16**
2	BH 1001	2	1	3	1	2	3	3	3	2	2	**22**
3	BH 1003	1	0	1	1	3	2	3	3	0	3	**17**
4	DWRB 132	1	0	1	2	1	1	3	3	0	2	**14**
5	DWRB 134	0	2	1	0	1	1	2	3	0	2	**12**
6	DWRB 136	2	1	2	0	1	1	3	3	0	2	**15**
7	DWRB 138	0	1	2	1	3	1	3	3	1	2	**17**
8	DWRB 140	1	0	2	1	3	1	3	3	0	2	**16**
9	DWRB 141	1	0	2	1	2	2	3	3	0	2	**16**
10	RD 2917	1	1	2	2	3	2	3	3	0	2	**19**
11	RD 2918	0	3	1	1	0	1	3	3	1	2	**15**
12	RD 2919	1	3	1	1	2	2	3	3	0	2	**18**
13	RD 2920	0	1	1	1	3	1	3	3	0	2	**15**
14	BH 946 ©*	0	0	1	2	1	1	3	3	2	3	**16**
15	DWRB 91 (c)	1	2	1	1	2	2	3	3	1	2	**18**
16	DWRUB 64 (c)*	0	3	0	2	0	3	3	3	0	2	**16**

*= six- row barleys

Score range

TW	<60=0, 60- 63=1,> 63-65=2, >65=3
Bold	(Two-Row) >92=3, 88-92=2, 80-87=1, <80=0 (Six-row) = >82= 3, 78-82=2, 70-77=1, <70=0
Husk	<10.5=3, 10.6-11.5=2, 11.6-12.5=1, >12.5=0
Protein	Two-row= <11=3, 11-11.9=2, 12-13= 1, >13=0 Six-row = <11.5=3, 11.5-12.4=2, 12.5-13.5= 1,>13.5=0
Friability	>65=3, 55-65=2, 45-55=1, <45=0
HWE	Two-row= >80.0=3, 78-80=2, 76-78=1, <76=0 Six-row = >78=3, 76-78=2, 74-76=1, <74=0
FR	>250=3, 200-250=2, 150-200=1, <150=0
DP	<90=1, 90-110=3, 111-120=2, 121-130=1, >130=0
B. glucan	3.5=3, 3.5-4.0=2,4.1-4.5=1,>4.5=0
KI	40-44% = 3, 35-39 & 45-49=2, 30-34 & 50-54=1, <30 & >54=0

TW= Test Weight, Bol= Bold grain (%), Hus= Husk (%), Pro= Protein, Fri= Friability, HWE= Hot water extract (%), FR= Filtration rate, DP= Diastatic power, BG= Beta glucan, KI= Kolbach index

Annexure - 1

ANALYTICAL GUIDELINES FOR BARLEY BREEDERS IN INDIA

No.	Parameter	2-row	6-row
BARLEY GRAIN			
1	Moisture (%)	<12.0	<12.0
2	Kernel Shape	Elliptical with major axis 2 to 2-½times to minor axis	
3	Kernel Size	Uniform plump	Uniform plump
	on 2.5 mm	90%	80%
	Through 2.2 mm	<3%	<3%
4	Skinned/broken grains	<10%	<10%
5	1000 grain weight(g)	>45	>42
7	Husk Content	<11.0%	<11%
8	Protein Content(d.b.)	9.0-11%	9.0-11.5%
9	Germination Capacity	>96%	>96%
10	Germination Energy (72hrs)	>96%	>96%
11	Beta-glucan	<4.0%	<4.0%
11	Dormancy	Some amount of dormancy to avoid the pre-germination	
MALT			
1	Malt Modification	Satisfactory modification with four days germination cycle	
	Malt Homogeneity	>90%	>90%
	Malt Friability	>60%	>60%
2	Total Protein (d.b.)		
	Soluble Protein	5-6%	5-6%
	S/T/Ratio	40-44%	40-44%
3	Malt Extract (minimum)	80%	78%
	Coarse v/s Fine difference	<3.0 %	<3.0 %
4	Wort Viscosity	<1.5	<1.5
5	Wort turbidity	Clear	Clear
6	Diastatic Power(^{0}L.V.)	90-110	90-120
7	Alpha Amylase	Equal to or greater than check	
9	Di-methyl Sulphide	20-30ppb	20-30ppb

** 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.*

Abbreviations used in different tables

MY=% Malt Yield, FB= % malt friability, HG= % malt Homogeneity, DP= malt diastatic power ($^\circ$ L), HWE = % Hot water extract, FR= Wort filtration rate, VIS = wort viscosity (m pas), KI= Kolbach Index, WC= Wort colour, SR= Sachharification rate (minutes), C-F= HWE difference between coarse and fine grind malt , W pH= Wort pH

Annexure 2 a: AVT-TS-MALT BARLEY

GRAIN PARAMETERS

Table 2.1 a : Thousand grain weight (g) of AVT (TS-MB) entries from different locations

S. No.	Genotype	Hisar	Bawal	Karnal	Bhatinda	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 976	53.3	49.6	45.6	57.5	34.5	54.1	59.2	**50.6**
2	DWRB 123	53.5	45.7	48.1	51.3	50.4	45.4	43.4	**48.2**
3	DWRB 124	51.7	39.4	51.9	52.1	46.0	43.7	50.8	**47.9**
4	DWRB 128	50.8	41.1	53.6	50.1	31.9	49.3	45.4	**46.0**
5	PL 874	44.7	35.7	44.3	46.8	47.6	43.3	42.0	**43.5**
6	RD 2891	47.5	45.7	36.0	51.2	40.0	40.6	45.5	**43.8**
7	BH 902 (c)*	44.4	35.5	45.4	45.2	47.5	42.0	41.4	**43.1**
8	DWRB 101 (c)	46.4	42.4	35.6	46.4	46.4	43.5	46.2	**43.8**
9	DWRB 92 (c)	45.1	42.1	40.2	56.9	43.4	54.2	57.3	**48.5**
10	DWRUB 52 (c)	51.7	43.4	42.4	48.0	32.9	41.5	42.0	**43.1**
11	RD 2849 (c)	46.5	42.5	37.2	48.5	39.4	41.9	57.3	**44.8**
	Mean	**48.7**	**42.1**	**43.7**	**50.4**	**41.8**	**45.4**	**48.2**	

Table 2.2 a : Test weight (kg/hl) of AVT (TS-MB) entries from different locations

S. No.	Genotype	Hisar	Bawal	Karnal	Bhatinda	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 976	58.8	57.8	62.0	62.5	57.1	65.4	56.8	**60.0**
2	DWRB 123	60.7	58.5	66.4	61.3	61.7	65.4	61.4	**62.2**
3	DWRB 124	62.8	57.2	64.4	61.6	65.5	64.6	62.3	**62.6**
4	DWRB 128	63.5	57.2	65.9	62.7	57.3	64.1	56.3	**61.0**
5	PL 874	62.1	51.9	62.9	62.5	63.3	64.7	59.7	**61.0**
6	RD 2891	60.5	58.2	63.1	62.0	63.6	65.4	58.5	**61.6**
7	BH 902 (c)*	53.9	60.7	57.7	53.3	66.8	61.5	51.7	**57.9**
8	DWRB 101 (c)	62.6	60.2	61.1	62.1	65.6	67.9	59.7	**62.8**
9	DWRB 92 (c)	58.6	60.2	60.1	59.3	64.3	63.5	57.8	**60.5**
10	DWRUB 52 (c)	62.3	60.1	65.3	63.4	68.6	65.6	61.1	**63.8**
11	RD 2849 (c)	62.6	57.6	66.4	62.4	61.5	64.9	60.9	**62.3**
	Mean	**60.7**	**58.1**	**63.2**	**61.2**	**63.2**	**64.8**	**58.7**	

*= 6 row barley

Table 2.3 a : Proportion of bold grains (%) of AVT (TS-MB) entries from different locations

S. No.	Genotype	Hisar	Bawal	Karnal	Bhatinda	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 976	97.6	88.4	79.6	95.8	74.3	87.8	93.1	88.1
2	DWRB 123	94.7	87.6	96.5	93.3	94.8	84.9	85.2	91.0
3	DWRB 124	91.2	72.2	89.4	90.5	89.5	69.1	92.9	85.0
4	DWRB 128	96.1	70.1	94.5	90.6	51.5	73.7	72.6	78.4
5	PL 874	94.3	98.0	82.8	89.8	80.6	76.6	78.0	85.7
6	RD 2891	95.3	91.6	58.4	90.7	57.6	89.2	92.0	82.1
7	BH 902 (c)*	92.5	70.4	86.8	92.6	89.9	85.6	84.8	86.1
8	DWRB 101 (c)	93.8	85.3	69.5	82.1	81.1	80.0	89.1	83.0
9	DWRB 92 (c)	96.0	86.5	89.7	97.4	80.8	95.9	97.4	92.0
10	DWRUB 52 (c)	92.9	79.3	81.6	89.6	61.0	73.6	77.9	79.4
11	RD 2849 (c)	90.8	71.6	41.6	88.3	58.8	72.4	81.4	72.1
	Mean	**94.1**	**81.9**	**79.1**	**91.0**	**74.5**	**80.8**	**85.9**	

Table 2.4 a : Proportion of thin grains (%) of AVT (TS-MB) entries from different locations

S. No.	Genotype	Hisar	Bawal	Karnal	Bhatinda	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 976	0.6	2.8	5.5	0.8	8.5	2.7	1.5	**3.2**
2	DWRB 123	1.4	3.3	0.4	2.0	1.1	4.0	2.2	**2.1**
3	DWRB 124	1.1	6.6	1.0	1.6	1.7	6.4	0.6	**2.7**
4	DWRB 128	0.5	7.9	0.5	2.1	19.8	4.4	6.5	**5.9**
5	PL 874	0.8	2.4	1.6	1.6	3.5	4.3	2.9	**2.4**
6	RD 2891	0.5	1.9	11.3	1.6	10.0	4.6	1.4	**4.5**
7	BH 902 (c)*	1.5	9.5	2.8	1.6	1.9	3.4	3.7	**3.5**
8	DWRB 101 (c)	0.8	2.9	6.5	3.6	3.8	4.4	1.0	**3.3**
9	DWRB 92 (c)	0.3	2.2	1.7	0.5	3.8	0.7	0.5	**1.4**
10	DWRUB 52 (c)	0.7	5.2	1.7	1.4	13.2	4.7	6.2	**4.7**
11	RD 2849 (c)	1.4	8.7	15.9	2.2	10.5	5.6	3.5	**6.8**
	Mean	**0.9**	**4.9**	**4.4**	**1.7**	**7.1**	**4.1**	**2.7**	

*= 6 row barley

Table 2.5 a : Germinative energy# (% 72hrs) of AVT (TS-MB) entries from different locations

S. No.	Genotype	Hisar	Bawal	Karnal	Bhatinda	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 976	100	97	98	95	93	90	98	**96**
2	DWRB 123	90	93	99	94	93	62	98	**90**
3	DWRB 124	98	90	98	99	96	86	95	**95**
4	DWRB 128	99	94	97	98	97	87	94	**95**
5	PL 874	99	94	94	94	92	93	95	**94**
6	RD 2891	98	98	98	93	96	93	96	**96**
7	BH 902 (c)*	98	97	99	96	78	90	95	**93**
8	DWRB 101 (c)	99	86	80	96	50	85	93	**84**
9	DWRB 92 (c)	98	94	97	96	95	92	95	**95**
10	DWRUB 52 (c)	98	90	90	98	92	92	97	**94**
11	RD 2849 (c)	80	94	96	97	93	90	96	**92**
	Mean	**96**	**93**	**95**	**96**	**89**	**87**	**96**	

Table 2.6 a : Protein content (%) # of AVT (TS-MB) entries from different locations

S. No.	Genotype	Hisar	Bawal	Karnal	Bhatinda	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 976	10.1	13.1	10.3	9.9	10.7	11.2	9.7	**10.7**
2	DWRB 123	11.1	11.6	8.3	11.9	11.5	14.2	8.7	**11.0**
3	DWRB 124	9.8	12.7	9.6	11.6	10.5	14.0	10.3	**11.2**
4	DWRB 128	9.4	12.5	9.6	12.0	15.3	13.5	12.4	**12.1**
5	PL 874	9.0	12.8	9.5	10.9	10.5	12.2	9.3	**10.6**
6	RD 2891	9.8	11.5	10.2	10.0	13.0	11.6	10.1	**10.9**
7	BH 902 (c)*	9.1	11.9	9.6	10.3	10.5	10.6	9.7	**10.2**
8	DWRB 101 (c)	10.1	12.7	11.3	11.4	12.6	13.8	10.0	**11.7**
9	DWRB 92 (c)	11.3	11.9	10.5	12.1	10.3	12.0	11.8	**11.4**
10	DWRUB 52 (c)	9.0	11.8	10.1	10.6	12.5	11.9	11.0	**11.0**
11	RD 2849 (c)	9.8	12.9	12.6	10.9	12.6	11.7	10.2	**11.5**
	Mean	**9.9**	**12.3**	**10.1**	**11.1**	**11.8**	**12.4**	**10.3**	

*= 6 row barley

Table 2.7 a : Husk content (%) of AVT (TS-MB) entries from different locations

S. No.	Genotype	Hisar	Bawal	Karnal	Bhatinda	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 976	10.9	11.9	9.4	11.4	11.3	10.0	11.8	**10.9**
2	DWRB 123	12.5	12.5	10.3	11.8	10.2	10.7	12.1	**11.4**
3	DWRB 124	13.0	14.9	10.2	11.5	9.5	12.9	9.5	**11.7**
4	DWRB 128	14.5	11.3	9.7	11.8	11.1	11.6	13.4	**11.9**
5	PL 874	13.0	12.6	9.2	11.2	10.1	10.2	12.5	**11.3**
6	RD 2891	10.3	8.7	11.5	11.1	10.3	11.3	12.6	**10.8**
7	BH 902 (c)*	12.2	14.8	13.0	11.9	9.1	12.6	14.9	**12.6**
8	DWRB 101 (c)	10.7	11.5	10.5	10.6	9.4	10.2	11.2	**10.6**
9	DWRB 92 (c)	11.1	12.9	11.7	13.0	9.9	11.4	11.5	**11.7**
10	DWRUB 52 (c)	8.6	13.0	9.6	10.7	10.5	13.1	12.3	**11.1**
11	RD 2849 (c)	11.0	12.1	8.0	10.9	13.3	10.6	10.4	**10.9**
	Mean	**11.6**	**12.4**	**10.3**	**11.4**	**10.4**	**11.3**	**12.0**	

Table 2.8 a : β-Glucan Content (% d.w.b.) of AVT(TS-MB) entries at two locations

S. No.	Genotype	Hisar	Ludhiana	Mean
1	BH 976	3.9	4.6	**4.2**
2	DWRB 123	4.7	4.7	**4.7**
3	DWRB 124	4.9	4.6	**4.7**
4	DWRB 128	5.0	3.7	**4.3**
5	PL 874	4.5	4.3	**4.4**
6	RD 2891	5.0	5.6	**5.3**
7	BH 902 (c)*	4.6	5.5	**5.1**
8	DWRB 101 (c)	4.6	5.3	**4.9**
9	DWRB 92 (c)	4.2	4.7	**4.5**
10	DWRUB 52 (c)	4.5	4.6	**4.6**
11	RD 2849 (c)	4.1	4.3	**4.2**
	Mean	**3.9**	**4.6**	**4.2**

*= 6 row barley

MALT PARAMETERS

Table 2.9 a : Malt yield (%) of AVT (TS-MB) entries from different locations

S. No.	Genotype	Hisar	Bawal	Karnal	Bhatinda	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 976	85.5	81.2	79.0	88.7	83.0	89.7	84.4	**84.5**
2	DWRB 123	88.8	84.6	87.9	91.6	86.7	84.1	82.6	**86.6**
3	DWRB 124	90.2	83.7	88.6	79.8	87.8	89.3	86.7	**86.6**
4	DWRB 128	89.4	81.9	90.7	90.7	83.2	90.4	86.6	**87.5**
5	PL 874	89.3	83.5	86.8	85.7	87.5	86.1	84.6	**86.2**
6	RD 2891	87.0	88.7	89.9	87.7	84.0	82.1	84.9	**86.3**
7	BH 902 (c)*	83.0	86.0	90.6	90.7	89.0	84.8	83.7	**86.8**
8	DWRB 101 (c)	88.5	84.4	87.1	88.1	83.1	88.7	85.0	**86.4**
9	DWRB 92 (c)	86.0	83.5	83.3	88.5	87.9	90.8	84.4	**86.3**
10	DWRUB 52 (c)	86.7	84.6	87.3	78.2	80.8	88.6	84.2	**84.3**
11	RD 2849 (c)	87.7	82.2	78.2	88.3	86.7	90.0	85.5	**85.5**
	Mean	**87.5**	**84.0**	**86.3**	**87.1**	**85.4**	**87.7**	**84.8**	

Table 2.10 a : Malt friability (%) of AVT (TS-MB) entries from different locations

S. No.	Genotype	Hisar	Bawal	Karnal	Bhatinda	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 976	81.2	62.5	60.8	53.8	41.3	55.1	80.3	**62.1**
2	DWRB 123	52.8	49.9	63.4	32.8	61.1	22.3	81.8	**52.0**
3	DWRB 124	45.5	42.8	52.5	30.0	67.6	35.5	46.7	**45.8**
4	DWRB 128	55.4	43.2	58.1	23.0	54.1	29.6	47.8	**44.5**
5	PL 874	81.1	48.9	79.8	60.6	64.2	53.8	84.7	**67.6**
6	RD 2891	84.1	67.5	66.5	69.1	32.8	58.8	83.7	**66.1**
7	BH 902 (c)*	65.1	37.7	38.8	52.6	42.5	42.3	63.1	**48.9**
8	DWRB 101 (c)	78.0	59.0	74.6	65.0	38.6	42.7	78.8	**62.4**
9	DWRB 92 (c)	72.6	72.5	63.0	24.2	62.3	31.0	61.5	**55.3**
10	DWRUB 52 (c)	82.5	61.9	83.1	44.2	43.8	49.0	75.9	**62.9**
11	RD 2849 (c)	77.6	60.8	55.9	64.6	60.3	47.7	81.9	**64.1**
	Mean	**70.5**	**55.1**	**63.3**	**47.3**	**51.7**	**42.5**	**71.5**	

*= 6 row barley

Table 2.11 a : Malt homogeneity (%) of AVT (TS-MB) entries from different locations

S. No.	Genotype	Hisar	Bawal	Karnal	Bhatinda	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 976	99.3	86.3	85.6	86.4	66.1	80.7	98.8	**86.2**
2	DWRB 123	75.6	83.7	94.5	56.8	85.5	40.2	99.4	**76.5**
3	DWRB 124	62.4	77.7	72.2	60.6	95.3	72.3	82.2	**74.7**
4	DWRB 128	77.3	77.2	79.3	41.9	86.8	60.1	76.6	**71.3**
5	PL 874	99.3	81.5	97.9	91.9	93.7	81.8	99.5	**92.2**
6	RD 2891	99.5	93.0	89.6	92.6	62.5	90.1	98.9	**89.4**
7	BH 902 (c)*	85.2	70.5	58.8	86.4	72.3	74.4	89.6	**76.8**
8	DWRB 101 (c)	98.2	85.6	96.2	90.1	58.3	76.1	97.9	**86.1**
9	DWRB 92 (c)	93.4	95.4	85.3	45.3	93.1	60.9	90.3	**80.5**
10	DWRUB 52 (c)	99.5	88.7	98.9	77.0	84.3	80.3	97.5	**89.4**
11	RD 2849 (c)	97.2	89.7	84.7	89.0	91.0	77.9	98.7	**89.7**
	Mean	**89.7**	**84.5**	**85.7**	**74.3**	**80.8**	**72.3**	**93.6**	

Table 2.12 a : Hot water extract (% fgdb) of AVT (TS-MB) entries from different locations

S. No.	Genotype	Hisar	Bawal	Karnal	Bhatinda	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 976	82.4	80.3	78.5	78.3	83.5	82.6	81.4	**81.0**
2	DWRB 123	81.9	80.4	78.7	72.1	76.8	77.6	85.2	**79.0**
3	DWRB 124	80.4	78.6	78.5	76.5	83.3	78.6	82.3	**79.7**
4	DWRB 128	81.3	79.8	81.2	78.0	77.6	81.7	74.9	**79.2**
5	PL 874	77.0	79.5	80.9	78.9	80.7	77.1	80.1	**79.2**
6	RD 2891	76.8	81.8	77.4	81.3	79.2	82.6	84.8	**80.5**
7	BH 902 (c)*	80.9	76.6	80.2	79.5	82.5	83.1	81.2	**80.6**
8	DWRB 101 (c)	82.9	81.4	81.3	78.6	83.7	81.1	80.8	**81.4**
9	DWRB 92 (c)	82.3	80.6	79.7	75.1	82.9	78.3	77.2	**79.5**
10	DWRUB 52 (c)	83.0	82.5	81.2	77.2	83.0	81.9	79.3	**81.2**
11	RD 2849 (c)	82.9	79.0	83.1	77.7	83.1	83.5	79.9	**81.3**
	Mean	**81.1**	**80.0**	**80.1**	**77.6**	**81.5**	**80.7**	**80.6**	

*= 6 row barley

Table 2.13 a : Wort filtration rate (ml/hr) of AVT (TS-MB) entries from different locations

S. No.	Genotype	Hisar	Bawal	Karnal	Bhatinda	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 976	315	180	300	310	320	230	305	**280**
2	DWRB 123	320	175	325	310	320	295	275	**289**
3	DWRB 124	310	175	325	325	275	230	225	**266**
4	DWRB 128	310	170	275	295	305	200	255	**259**
5	PL 874	325	165	220	300	280	150	305	**249**
6	RD 2891	310	125	325	305	295	220	280	**266**
7	BH 902 (c)*	305	170	285	320	325	170	225	**257**
8	DWRB 101 (c)	315	170	300	260	315	270	300	**276**
9	DWRB 92 (c)	310	220	305	310	325	190	300	**280**
10	DWRUB 52 (c)	320	250	280	310	305	275	275	**288**
11	RD 2849 (c)	315	225	245	290	325	210	320	**276**
	Mean	**314**	**184**	**290**	**303**	**308**	**222**	**279**	

Table 2.14 a : Saccharification rate (minutes) of AVT (TS-MB) entries from different locations

S. No.	Genotype	Hisar	Bawal	Karnal	Bhatinda	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 976	5	5	5	5	10	5	5	**6**
2	DWRB 123	5	5	5	10	5	5	5	**6**
3	DWRB 124	5	5	5	10	5	5	5	**6**
4	DWRB 128	5	5	5	5	5	5	5	**5**
5	PL 874	5	5	5	5	5	5	10	**6**
6	RD 2891	5	5	5	5	5	5	5	**5**
7	BH 902 (c)*	5	5	5	10	5	5	5	**6**
8	DWRB 101 (c)	5	5	5	5	5	5	5	**5**
9	DWRB 92 (c)	5	5	5	5	5	5	5	**5**
10	DWRUB 52 (c)	5	5	5	5	5	10	5	**6**
11	RD 2849 (c)	5	5	5	10	5	5	5	**6**
	Mean	**5**	**5**	**5**	**7**	**5**	**5**	**5**	

*= 6 row barley

Table 2.15 a : Wort pH of AVT (TS-MB) entries from different locations

S. No.	Genotype	Hisar	Bawal	Karnal	Bhatinda	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 976	5.9	5.9	5.4	6.3	5.3	6.0	5.5	**5.7**
2	DWRB 123	5.7	6.0	6.0	6.5	6.3	5.4	5.9	**6.0**
3	DWRB 124	5.5	6.0	6.1	6.3	5.9	5.9	6.1	**6.0**
4	DWRB 128	5.3	6.0	6.1	6.4	6.2	6.1	6.2	**6.0**
5	PL 874	6.1	5.8	5.9	5.8	6.3	5.4	6.0	**5.9**
6	RD 2891	5.9	6.0	5.7	5.9	5.9	6.1	6.0	**5.9**
7	BH 902 (c)*	6.0	5.8	6.0	5.6	5.8	6.9	6.0	**6.0**
8	DWRB 101 (c)	5.4	6.1	5.3	6.1	6.3	5.5	5.9	**5.8**
9	DWRB 92 (c)	6.3	5.6	5.9	5.8	6.2	6.1	5.3	**5.9**
10	DWRUB 52 (c)	6.1	5.4	6.0	6.0	5.6	5.2	6.0	**5.7**
11	RD 2849 (c)	5.8	5.4	6.0	6.4	5.1	6.1	6.7	**5.9**
	Mean	**5.8**	**5.8**	**5.9**	**6.1**	**5.9**	**5.9**	**5.9**	

Table 2.16 a : Wort colour (EBC method) of AVT (TS-MB) entries from different locations

S. No.	Genotype	Hisar	Bawal	Karnal	Bhatinda	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 976	2.5	2.0	2.0	2.5	2.5	2.0	2.0	**2.2**
2	DWRB 123	2.5	2.0	2.5	2.0	2.5	2.0	2.5	**2.3**
3	DWRB 124	2.0	2.5	2.5	2.5	2.5	2.0	2.0	**2.3**
4	DWRB 128	2.0	2.5	2.0	2.5	2.5	2.5	2.0	**2.3**
5	PL 874	2.5	2.0	2.0	2.5	2.0	2.0	2.0	**2.1**
6	RD 2891	2.0	2.0	2.0	2.5	2.0	2.5	2.5	**2.2**
7	BH 902 (c)*	2.0	2.0	2.0	2.5	2.0	2.0	2.0	**2.1**
8	DWRB 101 (c)	2.5	2.0	2.0	2.5	2.5	2.0	2.0	**2.2**
9	DWRB 92 (c)	2.0	2.0	2.5	2.0	2.0	2.5	2.5	**2.2**
10	DWRUB 52 (c)	2.5	2.0	2.0	2.5	2.5	2.0	2.5	**2.3**
11	RD 2849 (c)	2.0	2.0	2.0	2.0	2.5	2.5	2.0	**2.1**
Mean		**2.2**	**2.1**	**2.1**	**2.4**	**2.3**	**2.2**	**2.2**	

*= 6 row barley

Table 2.17 a : Diastatic power (0L) of AVT (TS-MB) entries from different locations

S. No.	Genotype	Hisar	Bawal	Karnal	Bhatinda	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 976	100	111	103	105	93	87	111	**101**
2	DWRB 123	105	95	100	83	103	95	100	**97**
3	DWRB 124	100	105	103	103	108	103	103	**103**
4	DWRB 128	105	100	98	105	91	95	105	**100**
5	PL 874	100	87	105	82	118	93	111	**99**
6	RD 2891	111	100	95	85	114	105	105	**102**
7	BH 902 (c)*	95	89	111	83	114	100	95	**98**
8	DWRB 101 (c)	108	108	111	80	100	95	95	**100**
9	DWRB 92 (c)	111	103	103	103	74	91	111	**99**
10	DWRUB 52 (c)	80	93	105	103	77	100	100	**94**
11	RD 2849 (c)	108	100	111	83	100	105	118	**104**
Mean		**102**	**99**	**104**	**92**	**99**	**97**	**105**	

Table 2.18 a : Kolbach Index (KI) # of AVT (TS-MB) entries from different locations

S. No.	Genotype	Hisar	Bawal	Karnal	Bhatinda	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 976	42	38	40	38	35	39	42	**39**
2	DWRB 123	42	36	41	41	40	38	43	**40**
3	DWRB 124	37	39	40	39	39	37	42	**39**
4	DWRB 128	39	40	38	39	39	37	41	**39**
5	PL 874	37	36	37	38	39	39	41	**38**
6	RD 2891	42	41	35	39	40	39	41	**40**
7	BH 902 (c)*	41	37	38	38	41	37	41	**39**
8	DWRB 101 (c)	39	39	40	41	39	34	41	**39**
9	DWRB 92 (c)	42	36	40	39	41	40	39	**40**
10	DWRUB 52 (c)	39	38	39	38	40	40	37	**39**
11	RD 2849 (c)	40	38	39	39	35	40	42	**39**
Mean		**40**	**38**	**39**	**39**	**39**	**38**	**41**	

*= 6 row barley

Annexure 2 b: IVT-TS-MALT BARLEY

GRAIN PARAMETERS

Table 2.1 b : Thousand grain weight (g) of IVT (TS-MB) entries from different locations

S.No.	Genotype	Hisar	Bawal	Karnal	Bhatinda	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 1000	46.3	41.2	39.9	49.7	46.5	41.4	47.8	**44.7**
2	BH 1001	47.2	40.8	37.9	37.4	37.2	42.4	44.1	**41.0**
3	BH 1002	42.5	43.7	30.4	44.6	51.1	43.8	43.4	**42.8**
4	DWRB 133	49.2	50.6	37.7	46.9	44.5	49.4	50.0	**46.9**
5	DWRB 134	56.5	47.8	44.4	42.1	46.5	61.1	54.2	**50.4**
6	DWRB 135	53.1	54.7	43.7	52.6	46.8	51.8	50.0	**50.4**
7	DWRB 136	53.9	45.1	41.9	32.1	43.0	49.8	52.2	**45.4**
8	DWRB 139	36.7	42.8	35.1	42.1	34.8	38.3	39.0	**38.4**
9	DWRB 141	41.8	41.3	34.0	52.4	40.5	42.3	45.3	**42.5**
10	KB 1322	50.2	42.7	34.5	48.3	38.6	47.5	39.4	**43.0**
11	KB 1325	49.0	45.8	39.0	49.2	39.7	49.1	51.1	**46.1**
12	PL 883	46.4	45.2	39.6	46.1	36.3	44.5	45.5	**43.4**
13	PL 889	52.0	51.9	36.3	41.9	41.2	52.4	52.5	**46.9**
14	RD 2917	49.6	45.0	31.6	49.5	46.0	46.7	48.4	**45.3**
15	RD 2918	59.0	53.6	43.7	58.0	41.5	58.0	61.4	**53.6**
16	RD 2919	55.5	50.1	41.4	39.4	40.0	56.0	51.7	**47.7**
17	RD 2920	43.1	47.1	32.5	44.1	40.5	49.8	48.0	**43.6**
18	BH 902 (c)*	44.5	35.8	40.8	43.6	44.2	44.3	40.9	**42.0**
19	DWRB 101 (c)	43.5	36.9	31.3	44.1	47.0	43.6	45.9	**41.8**
20	DWRB 92 (c)	54.1	53.4	47.5	55.8	50.3	59.4	53.5	**53.4**
21	DWRUB 52 (c)	46.1	42.0	34.0	46.3	45.6	40.8	44.4	**42.7**
22	RD 2849 (c)	50.1	40.7	33.7	47.6	42.8	40.4	46.7	**43.2**
Mean		**48.6**	**45.4**	**37.8**	**46.1**	**42.9**	**47.8**	**48.0**	

*= 6 row barley

Table 2.2 b : Test weight (kg/hl) of IVT (TS-MB) entries from different locations

S.No.	Genotype	Hisar	Bawal	Karnal	Bhatinda	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 1000	57.1	57.1	58.4	55.6	57.8	61.2	58.6	**58.0**
2	BH 1001	62.6	58.2	60.1	58.2	66.1	64.6	63.1	**61.8**
3	BH 1002	60.7	56.0	59.2	53.8	60.1	66.5	60.5	**59.5**
4	DWRB 133	58.3	58.7	57.2	60.1	66.7	66.0	59.9	**61.0**
5	DWRB 134	57.8	60.2	59.0	55.3	67.5	64.5	59.0	**60.5**
6	DWRB 135	60.0	58.1	59.4	58.2	64.3	63.7	61.3	**60.7**
7	DWRB 136	61.8	57.1	61.0	50.5	67.7	64.6	65.3	**61.1**
8	DWRB 139	56.4	57.8	62.0	60.5	53.8	64.1	58.8	**59.1**
9	DWRB 141	62.5	51.2	60.9	50.1	62.4	66.2	61.1	**59.2**
10	KB 1322	56.3	56.3	50.2	57.0	66.9	63.5	56.3	**58.1**
11	KB 1325	58.4	59.2	55.7	59.4	65.0	64.7	60.0	**60.3**
12	PL 883	62.7	59.1	61.8	61.4	63.4	65.5	61.4	**62.2**
13	PL 889	60.2	59.3	62.1	57.8	69.5	66.1	62.8	**62.5**
14	RD 2917	58.5	55.1	51.9	60.0	63.9	61.7	61.1	**58.9**
15	RD 2918	51.4	56.1	51.1	47.9	69.2	57.9	52.4	**55.1**
16	RD 2919	58.6	54.5	57.4	58.9	65.9	66.2	58.9	**60.1**
17	RD 2920	56.1	59.3	61.1	60.9	63.0	63.6	53.0	**59.6**
18	BH 902 (c)*	54.7	52.5	58.5	50.0	65.5	61.5	55.9	**56.9**
19	DWRB 101 (c)	63.4	56.7	58.2	63.4	66.1	66.5	61.0	**62.2**
20	DWRB 92 (c)	58.8	56.5	58.7	58.9	66.1	64.8	58.4	**60.3**
21	DWRUB 52 (c)	62.5	58.5	59.9	61.6	67.3	65.9	61.9	**62.5**
22	RD 2849 (c)	62.3	55.1	59.6	59.2	66.2	65.9	62.2	**61.5**
Mean		**59.1**	**56.9**	**58.3**	**57.2**	**64.7**	**64.3**	**59.7**	

*= 6 row barley

Table 2.3 b : Proportion of bold grains (%) of IVT (TS-MB) entries from different locations

S.No.	Genotype	Hisar	Bawal	Karnal	Bhatinda	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 1000	86.0	72.7	65.9	86.2	75.4	72.0	91.1	**78.5**
2	BH 1001	93.6	80.1	57.1	57.0	77.2	73.2	92.5	**75.8**
3	BH 1002	79.4	85.4	36.7	76.5	83.7	72.5	89.0	**74.7**
4	DWRB 133	92.4	91.1	66.3	88.1	82.0	89.3	93.0	**86.0**
5	DWRB 134	98.0	97.0	78.2	67.0	73.2	98.8	98.7	**87.3**
6	DWRB 135	97.4	95.9	80.3	92.9	83.6	83.4	94.1	**89.6**
7	DWRB 136	95.6	86.9	55.8	68.3	87.3	83.3	93.9	**81.6**
8	DWRB 139	79.7	90.7	68.8	80.7	79.1	76.8	85.0	**80.1**
9	DWRB 141	94.5	90.6	66.1	81.8	78.2	74.6	90.6	**82.3**
10	KB 1322	66.1	76.9	42.3	85.7	69.7	76.3	62.1	**68.4**
11	KB 1325	82.7	91.3	44.2	88.5	75.7	84.8	91.4	**79.8**
12	PL 883	96.1	92.1	70.4	85.8	43.0	80.8	95.0	**80.5**
13	PL 889	96.1	91.5	49.8	93.2	77.3	95.0	94.8	**85.4**
14	RD 2917	95.5	87.1	29.9	88.4	80.8	73.4	92.9	**78.3**
15	RD 2918	97.5	93.2	76.5	92.0	76.2	93.1	97.5	**89.4**
16	RD 2919	98.3	94.5	74.1	89.7	80.1	96.8	97.9	**90.2**
17	RD 2920	94.9	89.1	42.3	83.0	66.3	83.2	91.1	**78.5**
18	BH 902 (c)*	86.6	77.4	78.3	80.0	82.0	86.3	84.4	**82.2**
19	DWRB 101 (c)	91.5	61.8	37.7	83.3	76.9	77.2	88.6	**73.9**
20	DWRB 92 (c)	97.4	96.5	85.4	96.2	85.2	97.3	98.9	**93.8**
21	DWRUB 52 (c)	92.7	87.1	39.7	85.8	89.0	70.8	86.2	**78.8**
22	RD 2849 (c)	87.4	84.9	55.5	67.2	77.7	63.3	92.1	**75.4**
Mean		**90.9**	**87.0**	**59.1**	**82.6**	**77.3**	**81.9**	**90.9**	

*= 6 row barley

Table 2.4 b : Proportion of thin grains (%) of IVT (TS-MB) entries from different locations

S.No.	Genotype	Hisar	Bawal	Karnal	Bhatinda	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 1000	2.5	6.6	8.6	4.0	5.5	10.0	0.9	**5.5**
2	BH 1001	1.0	3.5	11.8	9.4	5.8	5.4	1.2	**5.4**
3	BH 1002	6.6	3.4	27.3	5.6	3.0	7.1	1.8	**7.8**
4	DWRB 133	2.0	2.3	12.5	4.2	4.3	2.3	1.3	**4.1**
5	DWRB 134	0.3	2.1	4.6	7.3	4.3	0.3	0.6	**2.8**
6	DWRB 135	0.6	0.9	4.1	2.1	3.3	2.8	1.0	**2.1**
7	DWRB 136	0.4	2.2	6.1	6.2	2.8	3.7	0.7	**3.1**
8	DWRB 139	6.8	2.5	8.2	6.4	5.9	6.3	3.8	**5.7**
9	DWRB 141	0.6	2.0	10.5	4.9	7.1	5.4	1.9	**4.6**
10	KB 1322	6.1	4.8	26.2	4.6	8.7	3.9	5.3	**8.5**
11	KB 1325	4.1	1.6	14.7	4.1	4.1	2.9	1.4	**4.7**
12	PL 883	0.6	2.0	6.5	3.3	18.0	4.5	0.6	**5.1**
13	PL 889	0.6	1.8	11.9	1.5	5.5	1.2	0.9	**3.4**
14	RD 2917	1.4	2.8	32.1	2.9	5.2	6.4	1.8	**7.5**
15	RD 2918	0.3	1.7	5.7	1.9	5.5	2.3	0.6	**2.6**
16	RD 2919	0.3	1.8	6.3	2.5	3.9	1.2	0.7	**2.4**
17	RD 2920	1.0	2.8	21.9	4.8	9.3	2.7	1.2	**6.2**
18	BH 902 (c)*	3.4	6.5	4.7	8.0	3.6	3.5	4.1	**4.8**
19	DWRB 101 (c)	2.0	10.0	24.9	4.4	4.1	3.9	1.2	**7.2**
20	DWRB 92 (c)	0.4	0.7	3.0	1.2	3.9	0.5	0.3	**1.4**
21	DWRUB 52 (c)	1.0	2.5	25.2	2.9	2.6	5.3	2.1	**5.9**
22	RD 2849 (c)	3.0	3.3	14.3	5.6	4.0	7.5	0.9	**5.5**
Mean		**2.0**	**3.1**	**13.2**	**4.4**	**5.5**	**4.0**	**1.6**	

*= 6 row barley

Table 2.5 b : Germinative energy# (% 72hrs) of IVT (TS-MB) entries from different locations

S.No.	Genotype	Hisar	Bawal	Karnal	Bhatinda	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 1000	90	93	99	96	97	88	98	**94**
2	BH 1001	98	99	94	97	91	56	98	**90**
3	BH 1002	98	93	96	96	88	68	98	**91**
4	DWRB 133	95	91	96	98	95	86	97	**94**
5	DWRB 134	98	95	94	96	95	95	95	**95**
6	DWRB 135	90	97	99	99	97	98	97	**97**
7	DWRB 136	90	98	92	95	96	96	99	**95**
8	DWRB 139	95	91	99	97	85	70	95	**90**
9	DWRB 141	97	79	96	92	92	70	97	**89**
10	KB 1322	100	93	97	94	50	83	94	**87**
11	KB 1325	99	88	98	90	95	91	83	**92**
12	PL 883	99	97	99	94	98	97	93	**97**
13	PL 889	99	94	95	93	86	98	94	**94**
14	RD 2917	95	98	98	97	94	87	98	**95**
15	RD 2918	85	99	94	96	90	98	93	**94**
16	RD 2919	98	100	98	95	96	78	98	**95**
17	RD 2920	99	99	98	98	92	70	98	**93**
18	BH 902 (c)*	95	96	98	95	90	84	96	**93**
19	DWRB 101 (c)	99	97	94	95	68	96	97	**92**
20	DWRB 92 (c)	92	92	97	94	92	98	98	**95**
21	DWRUB 52 (c)	98	93	94	97	90	94	94	**94**
22	RD 2849 (c)	95	99	98	99	90	95	99	**96**
Mean		**96**	**95**	**97**	**96**	**89**	**86**	**96**	

*= 6 row barley

Table 2.6 b : Protein content (%) # of IVT (TS-MB) entries from different locations

S.No.	Genotype	Hisar	Bawal	Karnal	Bhatinda	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 1000	11.4	13.2	12.6	10.8	11.6	14.0	9.6	**11.9**
2	BH 1001	10.0	12.6	12.4	10.6	12.7	12.9	9.1	**11.5**
3	BH 1002	11.2	11.5	10.4	11.4	11.5	12.0	9.1	**11.0**
4	DWRB 133	9.9	12.1	13.1	11.4	12.3	13.1	11.7	**11.9**
5	DWRB 134	10.3	12.7	11.6	11.9	12.5	12.3	10.3	**11.7**
6	DWRB 135	11.1	11.8	10.3	13.4	11.6	13.0	10.7	**11.7**
7	DWRB 136	10.3	12.8	10.9	12.2	13.3	12.5	9.4	**11.6**
8	DWRB 139	11.6	12.7	11.3	11.7	10.0	12.0	12.5	**11.7**
9	DWRB 141	9.3	11.3	11.6	12.7	13.9	12.4	9.1	**11.5**
10	KB 1322	9.5	12.1	10.7	12.5	13.6	11.5	9.3	**11.3**
11	KB 1325	9.7	11.9	11.7	11.6	11.9	13.1	10.4	**11.5**
12	PL 883	12.0	10.9	11.0	11.4	12.9	12.2	9.5	**11.4**
13	PL 889	9.6	12.4	12.9	11.1	10.8	12.3	10.5	**11.4**
14	RD 2917	11.3	11.9	13.2	12.4	13.1	12.3	8.1	**11.8**
15	RD 2918	10.7	12.5	12.2	12.7	13.2	13.8	11.4	**12.4**
16	RD 2919	11.3	12.2	10.4	12.3	10.8	11.1	10.0	**11.2**
17	RD 2920	11.6	11.8	12.8	10.7	12.7	12.8	10.6	**11.9**
18	BH 902 (c)*	10.4	11.4	11.4	11.6	10.5	11.0	9.2	**10.8**
19	DWRB 101 (c)	9.4	13.3	10.1	11.7	10.1	11.4	9.9	**10.8**
20	DWRB 92 (c)	10.8	11.8	12.0	13.2	10.9	12.6	10.9	**11.7**
21	DWRUB 52 (c)	9.6	11.5	12.2	11.2	10.1	11.7	9.6	**10.8**
22	RD 2849 (c)	9.8	11.9	10.1	12.5	12.2	12.3	9.4	**11.2**
Mean		**10.5**	**12.1**	**11.6**	**11.9**	**11.9**	**12.4**	**10.0**	

*= 6 row barley # Predicted values by NIR on dry weight basis

Table 2.7 b : Husk content (%) of IVT (TS-MB) entries from different locations

S.No.	Genotype	Hisar	Bawal	Karnal	Bhatinda	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 1000	11.3	13.7	11.0	14.3	10.9	13.5	13.2	**12.6**
2	BH 1001	10.8	12.6	11.9	13.4	8.4	10.1	9.6	**11.0**
3	BH 1002	13.2	9.5	12.7	10.4	10.6	11.0	10.1	**11.1**
4	DWRB 133	13.6	13.6	13.2	14.5	9.5	11.2	13.3	**12.7**
5	DWRB 134	11.2	12.2	11.9	14.4	8.8	10.9	12.2	**11.7**
6	DWRB 135	11.6	12.0	12.6	13.9	9.2	11.7	11.2	**11.7**
7	DWRB 136	10.0	13.9	11.9	15.3	9.7	10.9	11.4	**11.9**
8	DWRB 139	10.2	14.9	12.0	13.1	10.2	11.0	11.2	**11.8**
9	DWRB 141	12.1	13.8	11.3	12.5	9.3	11.1	10.8	**11.6**
10	KB 1322	11.7	13.0	12.1	13.8	9.5	10.4	11.9	**11.8**
11	KB 1325	13.7	12.8	12.5	14.1	8.4	10.3	11.6	**11.9**
12	PL 883	10.3	13.2	10.8	13.4	9.2	10.0	9.4	**10.9**
13	PL 889	11.8	13.7	12.4	14.4	9.3	10.9	12.5	**12.1**
14	RD 2917	12.1	11.7	14.2	15.9	12.3	11.3	10.7	**12.6**
15	RD 2918	14.7	13.0	15.4	15.2	9.0	12.5	12.7	**13.2**
16	RD 2919	12.7	13.2	10.8	11.9	9.1	12.5	13.3	**11.9**
17	RD 2920	11.7	12.9	11.8	12.2	11.3	10.1	13.0	**11.8**
18	BH 902 (c)*	13.2	13.9	12.5	11.8	9.7	12.7	11.3	**12.1**
19	DWRB 101 (c)	10.4	12.2	12.1	11.5	9.3	10.9	11.9	**11.2**
20	DWRB 92 (c)	11.0	12.3	11.2	14.3	7.9	10.9	11.9	**11.4**
21	DWRUB 52 (c)	9.9	14.9	11.6	13.3	9.7	10.4	11.1	**11.6**
22	RD 2849 (c)	12.1	11.6	11.0	13.9	11.3	11.2	10.4	**11.6**
Mean		**11.8**	**12.9**	**12.1**	**13.5**	**9.7**	**11.2**	**11.6**	

*= 6 row barley

Table 2.8 b : β-Glucan Content (% d.w.b.) of IVT(TS-MB) entries at two locations

S.No.	Genotype	Hisar	Ludhiana	Mean
1	BH 1000	5.0	5.3	**5.2**
2	BH 1001	3.9	4.2	**4.1**
3	BH 1002	4.5	5.0	**4.8**
4	DWRB 133	5.6	4.9	**5.2**
5	DWRB 134	4.7	6.2	**5.4**
6	DWRB 135	5.3	5.8	**5.6**
7	DWRB 136	3.2	3.2	**3.2**
8	DWRB 139	4.3	4.3	**4.3**
9	DWRB 141	4.8	5.1	**5.0**
10	KB 1322	3.6	4.2	**3.9**
11	KB 1325	3.4	4.3	**3.8**
12	PL 883	4.8	6.4	**5.6**
13	PL 889	4.3	4.3	**4.3**
14	RD 2917	4.0	4.7	**4.4**
15	RD 2918	4.6	5.0	**4.8**
16	RD 2919	4.7	4.0	**4.4**
17	RD 2920	3.7	4.3	**4.0**
18	BH 902 (c)*	5.2	5.6	**5.4**
19	DWRB 101 (c)	5.1	5.5	**5.3**
20	DWRB 92 (c)	5.2	4.6	**4.9**
21	DWRUB 52 (c)	4.6	5.1	**4.9**
22	RD 2849 (c)	4.5	5.0	**4.8**
	Mean	**4.5**	**4.9**	

*= 6 row barley

MALT PARAMETERS

Table 2.9 b : Malt yield (%) of IVT (TS-MB) entries from different locations

S.No.	Genotype	Hisar	Bawal	Karnal	Bhatinda	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 1000	85.6	82.2	86.6	88.7	82.3	89.2	84.1	**85.5**
2	BH 1001	88.6	84.6	87.8	90.8	85.3	87.8	85.8	**87.2**
3	BH 1002	82.1	84.7	86.7	89.2	89.6	87.2	82.2	**85.9**
4	DWRB 133	88.1	85.4	84.5	90.1	87.5	79.9	84.6	**85.7**
5	DWRB 134	86.9	83.9	87.9	86.9	86.3	90.7	85.7	**86.9**
6	DWRB 135	88.7	80.9	80.7	86.8	84.7	89.0	85.8	**85.2**
7	DWRB 136	88.1	85.1	87.4	84.2	86.2	89.0	87.0	**86.7**
8	DWRB 139	86.7	85.6	87.4	91.6	88.2	89.1	82.2	**87.2**
9	DWRB 141	87.2	85.9	86.3	86.2	83.1	86.5	82.8	**85.4**
10	KB 1322	84.1	79.6	87.6	86.3	87.1	89.9	86.0	**85.8**
11	KB 1325	87.9	87.9	87.6	89.7	86.9	89.1	88.3	**88.2**
12	PL 883	88.5	80.1	88.3	88.9	84.4	89.7	85.5	**86.5**
13	PL 889	87.6	84.8	88.3	90.1	82.5	89.3	84.7	**86.7**
14	RD 2917	86.2	83.1	89.4	89.3	88.2	82.5	85.7	**86.3**
15	RD 2918	91.8	84.2	90.7	89.7	86.2	89.2	83.0	**87.8**
16	RD 2919	87.7	83.3	85.7	88.9	86.2	90.9	78.9	**85.9**
17	RD 2920	87.5	87.2	89.1	87.2	87.2	89.1	87.8	**87.9**
18	BH 902 (c)*	89.0	84.3	91.3	91.0	80.6	89.5	85.2	**87.2**
19	DWRB 101 (c)	87.9	78.7	89.3	87.8	85.8	89.6	82.6	**85.9**
20	DWRB 92 (c)	86.5	83.3	85.5	88.5	84.7	89.8	83.5	**86.0**
21	DWRUB 52 (c)	87.8	84.3	81.6	89.6	90.7	86.8	84.1	**86.4**
22	RD 2849 (c)	87.8	82.3	87.8	89.6	85.8	88.2	78.2	**85.7**
Mean		**87.4**	**83.7**	**87.2**	**88.7**	**85.9**	**88.3**	**84.2**	

*= 6 row barley

Table 2.10 b : Malt friability (%) of IVT (TS-MB) entries from different locations

S.No.	Genotype	Hisar	Bawal	Karnal	Bhatinda	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 1000	74.7	49.7	30.3	58.4	64.0	51.1	72.9	**57.3**
2	BH 1001	81.7	60.2	41.1	19.7	55.8	48.1	82.4	**55.6**
3	BH 1002	75.4	69.1	70.8	57.1	32.0	66.8	83.7	**65.0**
4	DWRB 133	53.2	53.3	42.8	30.7	48.9	16.6	61.8	**43.9**
5	DWRB 134	69.5	60.8	48.6	57.2	43.3	37.4	79.0	**56.5**
6	DWRB 135	67.6	52.3	65.4	51.7	59.8	40.5	63.8	**57.3**
7	DWRB 136	52.2	52.5	39.3	36.5	46.6	41.4	68.9	**48.2**
8	DWRB 139	78.0	79.3	73.8	24.3	40.8	40.3	80.0	**59.5**
9	DWRB 141	70.6	69.7	65.7	78.0	60.8	23.5	84.1	**64.6**
10	KB 1322	72.8	47.0	81.7	60.8	48.7	34.9	69.3	**59.3**
11	KB 1325	65.0	59.4	51.8	65.9	57.2	36.9	65.9	**57.4**
12	PL 883	72.5	67.3	72.0	61.3	33.6	32.9	76.7	**59.5**
13	PL 889	67.7	61.8	62.2	25.0	57.9	32.1	69.0	**53.7**
14	RD 2917	80.6	56.8	45.2	57.0	59.6	35.6	81.1	**59.4**
15	RD 2918	26.1	42.6	13.1	24.2	45.4	57.8	37.8	**35.3**
16	RD 2919	84.3	59.4	75.2	63.4	60.7	35.9	82.4	**65.9**
17	RD 2920	72.8	63.6	61.3	75.3	49.0	42.0	74.8	**62.7**
18	BH 902 (c)*	55.0	47.9	33.6	33.1	55.6	34.7	51.7	**44.5**
19	DWRB 101 (c)	84.7	51.1	73.2	68.9	43.0	42.0	82.4	**63.6**
20	DWRB 92 (c)	71.1	56.8	72.2	59.2	63.6	47.0	73.5	**63.4**
21	DWRUB 52 (c)	85.7	67.0	31.5	56.3	49.8	39.7	81.2	**58.8**
22	RD 2849 (c)	83.0	72.9	80.0	37.6	48.9	40.9	83.7	**63.9**
Mean		**70.2**	**59.1**	**55.9**	**50.1**	**51.1**	**39.9**	**73.0**	

*= 6 row barley

Table 2.11 b : Malt homogeneity (%) of IVT (TS-MB) entries from different locations

S.No.	Genotype	Hisar	Bawal	Karnal	Bhatinda	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 1000	94.8	79.1	60.7	81.8	93.6	81.3	95.9	**83.9**
2	BH 1001	98.3	86.4	67.6	40.0	91.0	80.1	99.1	**80.4**
3	BH 1002	96.3	93.0	95.3	83.2	57.1	91.4	99.2	**87.9**
4	DWRB 133	76.2	78.3	74.7	52.7	91.9	34.0	88.8	**70.9**
5	DWRB 134	88.7	85.0	71.4	80.7	73.5	67.3	98.6	**80.8**
6	DWRB 135	96.0	78.7	94.7	88.0	85.3	66.9	97.3	**86.7**
7	DWRB 136	72.5	79.7	67.0	75.1	73.9	60.6	91.5	**74.3**
8	DWRB 139	96.6	97.1	96.3	46.7	70.8	68.7	97.7	**82.0**
9	DWRB 141	93.8	95.1	92.9	96.1	83.9	41.7	99.0	**86.1**
10	KB 1322	95.5	81.8	98.3	91.3	85.2	58.2	92.7	**86.1**
11	KB 1325	89.4	86.8	82.6	87.5	87.0	64.4	90.7	**84.1**
12	PL 883	97.8	93.8	94.9	90.9	54.3	57.0	99.1	**84.0**
13	PL 889	91.4	84.1	89.5	37.0	91.2	63.0	94.3	**78.7**
14	RD 2917	98.6	83.6	81.5	84.7	89.2	35.3	99.3	**81.7**
15	RD 2918	45.5	68.8	33.1	43.7	76.8	83.3	61.3	**58.9**
16	RD 2919	99.4	84.5	92.3	86.1	90.7	66.7	98.8	**88.4**
17	RD 2920	96.9	89.3	89.0	95.8	80.3	71.5	97.5	**88.6**
18	BH 902 (c)*	79.3	78.2	55.9	56.5	86.4	59.9	80.7	**71.0**
19	DWRB 101 (c)	87.3	86.8	95.6	90.5	63.6	72.2	99.1	**85.0**
20	DWRB 92 (c)	93.8	85.0	84.1	84.1	83.1	73.1	96.4	**85.7**
21	DWRUB 52 (c)	99.0	91.2	76.6	86.2	78.6	73.9	99.4	**86.4**
22	RD 2849 (c)	97.1	95.3	97.3	63.3	74.3	63.2	99.6	**84.3**
Mean		**90.2**	**85.5**	**81.4**	**74.6**	**80.1**	**65.2**	**94.4**	

*= 6 row barley

Table 2.12 b : Hot water extract (% fgdb) of IVT (TS-MB) entries from different locations

S.No.	Genotype	Hisar	Bawal	Karnal	Bhatinda	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 1000	82.8	79.3	77.6	77.3	81.7	79.8	82.9	**80.2**
2	BH 1001	82.5	80.0	79.0	66.0	79.9	77.1	84.2	**78.4**
3	BH 1002	77.9	79.7	78.4	74.5	69.8	81.4	82.6	**77.8**
4	DWRB 133	82.1	80.6	78.3	75.7	79.6	73.5	80.7	**78.6**
5	DWRB 134	80.7	78.4	72.2	74.1	83.2	71.2	81.4	**77.3**
6	DWRB 135	81.1	81.5	78.3	75.6	59.8	77.6	82.7	**76.6**
7	DWRB 136	83.5	77.9	77.7	78.8	79.6	78.1	75.0	**78.7**
8	DWRB 139	72.0	79.3	79.6	74.1	78.3	75.2	78.6	**76.7**
9	DWRB 141	76.5	81.4	85.4	78.4	82.1	78.6	82.1	**80.7**
10	KB 1322	80.1	79.4	81.8	75.6	81.5	79.6	80.1	**79.7**
11	KB 1325	79.5	80.0	77.5	77.5	80.9	75.0	79.7	**78.6**
12	PL 883	82.8	82.9	80.8	73.3	81.4	78.5	78.2	**79.7**
13	PL 889	74.7	79.1	78.6	73.1	85.8	75.9	82.1	**78.5**
14	RD 2917	81.3	79.5	74.8	76.3	79.8	76.4	75.4	**77.6**
15	RD 2918	76.9	80.2	70.6	69.0	80.9	77.3	76.7	**75.9**
16	RD 2919	75.0	82.8	79.8	76.6	85.9	73.3	78.8	**78.9**
17	RD 2920	74.3	78.4	75.3	79.9	80.5	75.1	77.0	**77.2**
18	BH 902 (c)*	81.7	78.5	78.9	77.2	77.7	74.9	78.2	**78.2**
19	DWRB 101 (c)	83.0	78.1	78.1	80.6	80.9	77.4	82.6	**80.1**
20	DWRB 92 (c)	82.2	78.9	77.5	77.2	63.6	78.1	77.9	**76.5**
21	DWRUB 52 (c)	82.1	81.5	76.9	72.8	80.6	73.5	81.9	**78.5**
22	RD 2849 (c)	83.3	83.7	79.5	73.5	85.1	84.1	79.4	**81.2**
Mean		**79.8**	**80.0**	**78.0**	**75.3**	**79.0**	**76.9**	**79.9**	

*= 6 row barley

Table 2.13 b : Wort filtration rate (ml/hr) of IVT (TS-MB) entries from different locations

S.No.	Genotype	Hisar	Bawal	Karnal	Bhatinda	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 1000	290	250	230	310	295	245	300	**274**
2	BH 1001	325	205	285	250	310	290	280	**278**
3	BH 1002	305	155	315	255	325	295	285	**276**
4	DWRB 133	310	220	270	310	265	285	290	**279**
5	DWRB 134	320	200	265	300	220	310	290	**272**
6	DWRB 135	310	240	280	310	245	260	295	**277**
7	DWRB 136	320	175	260	285	310	130	230	**244**
8	DWRB 139	310	120	235	305	295	205	285	**251**
9	DWRB 141	310	110	275	320	305	285	305	**273**
10	KB 1322	310	135	290	255	245	235	285	**251**
11	KB 1325	310	150	295	290	225	210	310	**256**
12	PL 883	325	165	255	285	295	310	250	**269**
13	PL 889	320	210	260	260	260	230	290	**261**
14	RD 2917	305	155	300	275	300	305	280	**274**
15	RD 2918	325	120	300	310	315	295	200	**266**
16	RD 2919	320	225	310	280	260	290	280	**281**
17	RD 2920	295	250	275	285	255	290	280	**276**
18	BH 902 (c)*	315	195	130	300	285	300	250	**254**
19	DWRB 101 (c)	320	140	270	260	255	310	285	**263**
20	DWRB 92 (c)	310	215	250	315	275	220	295	**269**
21	DWRUB 52 (c)	305	235	245	300	295	255	320	**279**
22	RD 2849 (c)	315	170	290	225	305	295	300	**271**
Mean		**313**	**184**	**268**	**286**	**279**	**266**	**281**	

*= 6 row barley

Table 2.14 b : Saccharification rate (minutes) of IVT (TS-MB) entries from different locations

S.No.	Genotype	Hisar	Bawal	Karnal	Bhatinda	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 1000	5	5	5	5	5	5	5	**5**
2	BH 1001	10	5	5	10	5	5	5	**6**
3	BH 1002	5	5	5	5	5	5	5	**5**
4	DWRB 133	5	5	5	5	5	5	5	**5**
5	DWRB 134	5	5	5	5	5	5	5	**5**
6	DWRB 135	5	5	5	5	5	10	5	**6**
7	DWRB 136	5	5	5	5	5	5	5	**5**
8	DWRB 139	5	5	5	5	5	5	5	**5**
9	DWRB 141	5	5	5	5	5	5	5	**5**
10	KB 1322	5	10	5	5	5	5	5	**6**
11	KB 1325	5	5	5	5	5	5	5	**5**
12	PL 883	5	5	5	5	5	5	5	**5**
13	PL 889	5	5	5	10	5	5	5	**6**
14	RD 2917	5	5	5	5	5	5	5	**5**
15	RD 2918	10	5	5	10	5	10	5	**7**
16	RD 2919	5	5	5	5	5	5	5	**5**
17	RD 2920	5	10	5	5	10	5	5	**6**
18	BH 902 (c)*	5	5	5	5	5	5	5	**5**
19	DWRB 101 (c)	5	5	5	5	5	5	5	**5**
20	DWRB 92 (c)	5	5	5	5	5	5	5	**5**
21	DWRUB 52 (c)	5	5	5	10	5	5	5	**6**
22	RD 2849 (c)	5	5	5	10	5	5	5	**6**
Mean		**5**	**5**	**5**	**6**	**5**	**5**	**5**	

*= 6 row barley

Table 2.15 b : Wort pH of IVT (TS-MB) entries from different locations

S.No.	Genotype	Hisar	Bawal	Karnal	Bhatinda	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 1000	5.4	6.1	5.3	5.9	5.9	6.1	5.3	**5.7**
2	BH 1001	6.0	5.1	5.5	5.6	5.8	6.1	5.4	**5.6**
3	BH 1002	5.4	5.3	5.9	6.3	5.6	6.5	6.1	**5.9**
4	DWRB 133	6.0	6.0	6.0	6.3	6.2	5.5	5.2	**5.9**
5	DWRB 134	6.0	5.9	6.5	5.9	5.8	5.1	5.7	**5.8**
6	DWRB 135	5.9	5.7	5.4	6.5	6.0	6.1	6.3	**6.0**
7	DWRB 136	6.2	5.5	5.6	6.3	6.3	6.3	5.7	**6.0**
8	DWRB 139	5.7	5.6	5.4	6.4	6.4	6.2	6.0	**5.9**
9	DWRB 141	5.5	5.4	5.9	6.0	5.8	5.6	6.0	**5.8**
10	KB 1322	5.5	5.3	5.5	6.3	6.3	6.3	6.0	**5.9**
11	KB 1325	5.2	6.0	5.3	5.8	6.3	5.8	6.1	**5.8**
12	PL 883	6.1	5.8	5.5	6.0	6.3	6.3	6.0	**6.0**
13	PL 889	6.2	6.0	5.5	6.3	6.3	5.8	5.4	**5.9**
14	RD 2917	5.3	5.4	5.3	6.3	6.3	6.3	6.1	**5.9**
15	RD 2918	6.4	6.0	5.6	5.8	6.3	6.3	6.0	**6.1**
16	RD 2919	6.1	5.5	5.3	6.0	6.3	5.9	6.2	**5.9**
17	RD 2920	6.0	5.4	5.1	6.3	5.5	5.8	6.0	**5.7**
18	BH 902 (c)*	5.7	6.5	6.0	6.1	6.0	6.3	6.0	**6.1**
19	DWRB 101 (c)	5.1	6.0	5.3	5.2	5.1	5.3	6.0	**5.4**
20	DWRB 92 (c)	6.4	6.0	5.4	6.3	6.3	6.0	6.1	**6.1**
21	DWRUB 52 (c)	6.1	5.3	5.4	6.1	6.3	6.0	5.3	**5.8**
22	RD 2849 (c)	5.4	5.6	6.1	6.3	6.4	6.0	6.0	**6.0**
Mean		**5.8**	**5.7**	**5.6**	**6.1**	**6.1**	**6.0**	**5.9**	

*= 6 row barley

Table 2.16 b : Wort colour (EBC method) of IVT (TS-MB) entries from different locations

S.No.	Genotype	Hisar	Bawal	Karnal	Bhatinda	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 1000	2.0	2.5	2.0	2.5	2.0	2.5	2.0	**2.2**
2	BH 1001	2.0	2.0	2.5	2.0	2.5	2.5	2.5	**2.3**
3	BH 1002	2.0	2.5	2.0	2.5	2.0	2.5	2.0	**2.2**
4	DWRB 133	2.5	2.5	2.0	2.0	2.0	2.5	2.0	**2.2**
5	DWRB 134	2.0	2.0	2.5	2.5	2.5	2.5	2.5	**2.4**
6	DWRB 135	2.0	2.0	2.5	2.0	2.5	2.0	2.5	**2.2**
7	DWRB 136	2.5	2.5	2.5	2.5	2.5	2.5	2.0	**2.4**
8	DWRB 139	2.5	2.0	2.0	2.5	2.0	2.0	2.5	**2.2**
9	DWRB 141	2.5	2.0	2.0	2.0	2.0	2.5	2.5	**2.2**
10	KB 1322	2.0	2.0	2.0	2.5	2.5	2.0	2.0	**2.1**
11	KB 1325	2.0	2.0	2.0	2.5	2.5	2.0	2.0	**2.1**
12	PL 883	2.5	2.0	2.5	2.5	2.5	2.0	2.0	**2.3**
13	PL 889	2.5	2.0	2.5	2.5	2.5	2.5	2.5	**2.4**
14	RD 2917	2.0	2.5	2.0	2.0	2.0	2.0	2.0	**2.1**
15	RD 2918	2.0	2.5	2.0	2.0	2.0	2.0	2.0	**2.1**
16	RD 2919	2.5	2.0	2.0	2.5	2.0	2.0	2.0	**2.1**
17	RD 2920	2.0	2.5	2.0	2.0	2.0	2.0	2.0	**2.1**
18	BH 902 (c)*	2.5	2.0	2.0	2.0	2.0	2.5	2.0	**2.1**
19	DWRB 101 (c)	2.0	2.0	2.0	2.5	2.0	2.0	2.0	**2.1**
20	DWRB 92 (c)	2.0	2.0	2.0	2.5	2.5	2.0	2.0	**2.1**
21	DWRUB 52 (c)	2.5	2.0	2.0	2.0	2.0	2.5	2.0	**2.1**
22	RD 2849 (c)	2.0	2.5	2.0	2.5	2.5	2.0	2.0	**2.2**
Mean		**2.2**	**2.2**	**2.1**	**2.3**	**2.2**	**2.2**	**2.1**	

*= 6 row barley

Table 2.17 b : Diastatic power (°L) of IVT (TS-MB) entries from different locations

S.No.	Genotype	Hisar	Bawal	Karnal	Bhatinda	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 1000	100	98	98	105	111	103	100	**102**
2	BH 1001	80	100	91	89	100	111	100	**96**
3	BH 1002	100	111	111	85	95	82	118	**100**
4	DWRB 133	85	105	114	95	98	108	118	**103**
5	DWRB 134	103	105	111	111	89	111	105	**105**
6	DWRB 135	98	100	111	103	111	105	111	**106**
7	DWRB 136	93	111	98	83	98	98	100	**97**
8	DWRB 139	108	98	103	87	114	105	114	**104**
9	DWRB 141	95	105	100	95	111	82	111	**100**
10	KB 1322	103	114	95	105	111	108	100	**105**
11	KB 1325	111	111	111	108	103	105	103	**107**
12	PL 883	103	111	103	100	91	100	105	**102**
13	PL 889	111	125	95	83	103	103	93	**102**
14	RD 2917	103	100	100	87	111	109	111	**103**
15	RD 2918	95	95	93	118	114	103	103	**103**
16	RD 2919	100	105	100	119	108	111	100	**106**
17	RD 2920	98	111	103	91	118	114	111	**106**
18	BH 902 (c)*	93	111	105	87	105	87	105	**99**
19	DWRB 101 (c)	103	103	100	82	108	80	100	**96**
20	DWRB 92 (c)	93	108	98	95	118	100	118	**104**
21	DWRUB 52 (c)	78	100	108	100	114	93	111	**101**
22	RD 2849 (c)	118	103	82	103	114	105	103	**104**
Mean		**99**	**106**	**101**	**97**	**107**	**101**	**106**	

*= 6 row barley

Table 2.18 b : Kolbach Index (KI) # of IVT (TS-MB) entries from different locations

S.No.	Genotype	Hisar	Bawal	Karnal	Bhatinda	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 1000	40	42	37	41	40	39	42	**40**
2	BH 1001	38	40	43	33	37	39	42	**39**
3	BH 1002	37	39	41	38	37	38	42	**39**
4	DWRB 133	40	38	NA	39	41	36	41	**39**
5	DWRB 134	41	38	37	37	43	39	39	**39**
6	DWRB 135	42	38	39	40	38	38	40	**39**
7	DWRB 136	40	38	37	41	36	39	38	**39**
8	DWRB 139	38	37	42	39	39	38	40	**39**
9	DWRB 141	38	42	41	42	36	37	40	**40**
10	KB 1322	39	39	38	39	37	40	40	**39**
11	KB 1325	39	39	45	39	36	36	41	**39**
12	PL 883	39	42	36	37	39	38	40	**39**
13	PL 889	39	39	38	40	36	38	39	**38**
14	RD 2917	40	41	37	38	40	36	39	**39**
15	RD 2918	39	42	NA	39	39	39	41	**40**
16	RD 2919	40	38	36	39	40	36	40	**38**
17	RD 2920	38	42	42	40	38	39	41	**40**
18	BH 902 (c)*	42	38	38	37	40	38	41	**39**
19	DWRB 101 (c)	40	40	46	40	39	38	38	**40**
20	DWRB 92 (c)	40	39	36	37	38	39	39	**39**
21	DWRUB 52 (c)	40	42	NA	40	40	37	41	**40**
22	RD 2849 (c)	39	39	39	37	39	39	40	**39**
Mean		**39**	**40**	**39**	**39**	**39**	**38**	**40**	

*= 6 row barley #NIR predicted values

Annexure 3: IVT-LS-MALT BARLEY

GRAIN PARAMETERS

Table 3.1: Thousand grain weight (g) of IVT (LS-MB) entries from different locations

S.N	Genotype	Karnal	Hisar	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 1000	50.1	48.3	40.3	51.1	50.1	**48.0**
2	BH 1001	47.2	50.8	34.8	47.5	49.6	**46.0**
3	BH 1003	45.0	40.6	24.7	45.3	39.2	**38.9**
4	DWRB 132	47.9	46.9	37.2	49.6	46.3	**45.6**
5	DWRB 134	53.7	48.4	46.5	61.0	53.4	**52.6**
6	DWRB 136	54.0	50.5	42.5	53.3	48.7	**49.8**
7	DWRB 138	38.7	46.9	27.5	41.1	38.6	**38.6**
8	DWRB 140	46.1	47.8	31.3	49.5	43.2	**43.6**
9	DWRB 141	44.5	52.9	32.6	51.1	40.1	**44.2**
10	RD 2917	49.5	50.6	38.8	57.8	52.2	**49.8**
11	RD 2918	62.6	57.1	39.6	61.7	58.0	**55.8**
12	RD 2919	52.5	52.6	42.2	56.1	53.2	**51.3**
13	RD 2920	52.5	51.5	40.2	52.0	52.8	**49.8**
14	BH 946 ©*	45.7	37.7	31.4	46.3	37.4	**39.7**
15	DWRB 91 (c)	55.3	51.0	42.4	62.2	55.4	**53.3**
16	DWRUB 64 (c)*	42.3	44.2	33.3	39.9	44.4	**40.8**
	Mean	**49.2**	**48.6**	**36.6**	**51.6**	**47.7**	

*= 6 row barley

Table 3.2: Test weight (kg/hl) of IVT (LS-MB) entries from different locations

S.N	Genotype	Karnal	Hisar	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 1000	65.1	55.8	53.8	65.2	59.4	**59.9**
2	BH 1001	66.5	60.7	58.5	66.3	64.9	**63.4**
3	BH 1003	65.9	58.3	52.7	65.0	59.0	**60.1**
4	DWRB 132	64.9	57.7	58.1	63.9	62.1	**61.3**
5	DWRB 134	64.3	54.5	56.1	59.7	55.7	**58.0**
6	DWRB 136	68.3	61.5	60.6	67.0	63.7	**64.2**
7	DWRB 138	62.2	55.2	55.8	61.8	59.1	**58.8**
8	DWRB 140	67.6	58.8	57.9	68.2	60.8	**62.6**
9	DWRB 141	66.5	59.9	58.7	65.2	62.8	**62.6**
10	RD 2917	64.9	59.8	57.9	65.0	62.4	**62.0**
11	RD 2918	57.8	47.5	52.9	58.3	54.7	**54.3**
12	RD 2919	65.3	59.6	61.0	65.3	61.9	**62.6**
13	RD 2920	62.5	54.4	53.5	65.6	59.7	**59.1**
14	BH 946 ©*	61.6	49.2	50.2	60.2	53.4	**54.9**
15	DWRB 91 (c)	65.4	58.0	58.5	66.3	58.1	**61.3**
16	DWRUB 64 (c)*	61.1	55.7	54.8	60.5	58.8	**58.2**
	Mean	**64.4**	**56.7**	**56.3**	**64.0**	**59.8**	

*= 6 row barley

Table 3.3: Proportion of bold grains (%) of IVT (LS-MB) entries from different locations

S.N	Genotype	Karnal	Hisar	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 1000	94.0	86.1	53.9	87.5	85.7	**81.5**
2	BH 1001	92.6	91.7	47.4	86.0	88.6	**81.3**
3	BH 1003	86.5	73.8	21.6	74.3	64.0	**64.0**
4	DWRB 132	95.1	80.9	49.5	80.1	83.0	**77.7**
5	DWRB 134	93.3	93.4	84.0	96.2	92.7	**91.9**
6	DWRB 136	94.2	87.4	50.8	89.5	78.7	**80.1**
7	DWRB 138	95.4	86.8	60.2	83.0	85.7	**82.2**
8	DWRB 140	93.1	85.0	33.7	95.2	81.6	**77.7**
9	DWRB 141	90.5	89.7	28.6	96.9	82.7	**77.7**
10	RD 2917	92.7	91.1	69.2	96.6	84.3	**86.8**
11	RD 2918	98.9	94.1	93.6	91.7	92.1	**94.1**
12	RD 2919	98.0	95.1	85.8	98.0	89.8	**93.3**
13	RD 2920	94.2	88.8	66.3	92.1	94.2	**87.1**
14	BH 946 © *	96.2	68.7	50.1	94.8	71.8	**76.3**
15	DWRB 91 (c)	94.4	86.9	83.5	95.9	91.2	**90.4**
16	DWRUB 64 (c)*	90.1	89.8	75.9	90.4	89.0	**87.0**
	Mean	**93.7**	**86.8**	**59.6**	**90.5**	**84.7**	

*= 6 row barley

Table 3.4: Proportion of thin grains (%) of IVT (LS-MB)entries from different locations

S.N	Genotype	Karnal	Hisar	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 1000	1.2	2.9	7.6	1.5	2.7	**3.2**
2	BH 1001	1.4	2.1	8.0	2.7	2.0	**3.2**
3	BH 1003	4.1	7.7	42.7	6.3	11.0	**14.4**
4	DWRB 132	0.8	5.4	7.7	3.2	3.1	**4.1**
5	DWRB 134	1.9	2.7	3.4	0.3	1.2	**1.9**
6	DWRB 136	1.3	3.1	5.0	0.7	4.4	**2.9**
7	DWRB 138	1.2	3.8	10.7	5.5	3.7	**5.0**
8	DWRB 140	0.4	3.7	24.4	0.7	3.6	**6.5**
9	DWRB 141	2.5	2.6	18.6	0.6	4.7	**5.8**
10	RD 2917	2.3	2.2	6.3	0.8	6.6	**3.6**
11	RD 2918	0.2	1.4	0.6	1.7	2.0	**1.2**
12	RD 2919	1.6	1.8	2.6	0.4	2.7	**1.8**
13	RD 2920	1.7	3.1	5.8	1.1	1.0	**2.5**
14	BH 946 © *	0.9	7.2	1.7	0.4	6.3	**3.3**
15	DWRB 91 (c)	1.0	4.6	3.0	0.7	1.8	**2.2**
16	DWRUB 64 (c)*	1.8	1.8	4.6	2.5	2.5	**2.6**
	Mean	**1.5**	**3.5**	**9.5**	**1.8**	**3.7**	

*= 6 row barley

Table 3.5 : Germinative energy (% 72hs) of IVT (LS-MB) entries from different locations

S.N	Genotype	Karnal	Hisar	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 1000	94	98	99	84	96	**94**
2	BH 1001	95	90	98	98	95	**95**
3	BH 1003	90	99	90	69	95	**89**
4	DWRB 132	97	53	90	90	97	**85**
5	DWRB 134	70	90	83	99	96	**88**
6	DWRB 136	93	88	93	97	97	**94**
7	DWRB 138	90	90	98	99	99	**95**
8	DWRB 140	96	94	93	98	94	**95**
9	DWRB 141	80	95	98	98	98	**94**
10	RD 2917	99	98	99	98	99	**99**
11	RD 2918	70	80	98	70	98	**83**
12	RD 2919	93	90	97	99	98	**95**
13	RD 2920	93	91	96	95	96	**94**
14	BH 946 ©*	94	96	95	99	97	**96**
15	DWRB 91 (c)	98	85	98	95	95	**94**
16	DWRUB 64 (c)*	75	57	98	90	93	**83**
	Mean	**89**	**87**	**95**	**92**	**96**	

*= 6 row barley

Table 3.6 : Husk content (%) of IVT (LS-MB) entries from different locations

S.N	Genotype	Karnal	Hisar	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 1000	10.9	15.5	14.6	9.3	10.9	**12.3**
2	BH 1001	9.0	11.9	10.5	9.5	10.6	**10.3**
3	BH 1003	9.9	13.8	10.4	11.2	12.4	**11.6**
4	DWRB 132	11.1	15.2	13.6	11.1	11.8	**12.6**
5	DWRB 134	10.7	15.6	10.3	12.3	13.7	**12.5**
6	DWRB 136	9.3	12.3	14.1	9.7	11.7	**11.4**
7	DWRB 138	9.7	11.4	12.7	9.3	11.4	**10.9**
8	DWRB 140	8.9	12.4	14.5	9.5	11.1	**11.3**
9	DWRB 141	9.2	11.1	14.4	9.4	11.9	**11.2**
10	RD 2917	10.1	12.4	11.1	9.5	11.5	**10.9**
11	RD 2918	13.5	11.3	12.1	11.8	13.7	**12.5**
12	RD 2919	10.4	13.1	13.0	10.0	11.7	**11.6**
13	RD 2920	10.6	15.7	12.2	9.7	11.8	**12.0**
14	BH 946 ©*	11.5	11.8	13.1	12.1	13.7	**12.4**
15	DWRB 91 (c)	10.0	13.7	11.9	9.6	12.8	**11.6**
16	DWRUB 64 (c)*	10.6	16.5	13.7	11.8	10.2	**12.6**
	Mean	**10.3**	**13.4**	**12.6**	**10.4**	**11.9**	

*= 6 row barley

Table 3.7 : Grain protein content (%) of IVT (LS-MB) entries from different locations

S.N	Genotype	Karnal	Hisar	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 1000	12.4	10.7	12.0	14.2	11.8	**12.2**
2	BH 1001	13.6	12.7	11.3	12.3	12.4	**12.5**
3	BH 1003	11.1	12.6	14.7	12.5	10.3	**12.2**
4	DWRB 132	10.3	11.6	11.1	12.6	10.9	**11.3**
5	DWRB 134	14.1	13.7	13.8	13.1	14.9	**13.9**
6	DWRB 136	13.4	15.0	15.1	13.3	13.7	**14.1**
7	DWRB 138	13.9	12.1	12.0	12.5	10.8	**12.3**
8	DWRB 140	10.0	13.0	14.1	12.9	10.9	**12.2**
9	DWRB 141	14.1	11.9	11.7	13.1	11.2	**12.4**
10	RD 2917	13.2	11.7	11.2	12.0	11.0	**11.8**
11	RD 2918	13.5	11.5	11.9	13.6	12.1	**12.5**
12	RD 2919	14.7	11.9	12.2	13.1	12.1	**12.8**
13	RD 2920	12.8	12.0	12.2	13.7	11.7	**12.5**
14	BH 946 ©*	11.7	12.6	11.8	11.9	9.6	**11.5**
15	DWRB 91 (c)	14.1	13.4	11.8	13.3	11.8	**12.9**
16	DWRUB 64 (c)*	11.8	12.3	11.0	11.8	11.4	**11.7**
	Mean	**12.8**	**12.4**	**12.4**	**12.9**	**11.7**	

*= 6 row barley

Table 3.8: β-Glucan content (%dwb) of IVT (LS-MB) entries from two locations

No	Entries	Hisar	Ludhiana	Mean
1	BH 1000	4.0	4.1	4.1
2	BH 1001	3.8	4.0	3.9
3	BH 1003	4.2	5.5	4.8
4	DWRB 132	5.7	6.5	6.1
5	DWRB 134	4.8	5.6	5.2
6	DWRB 136	5.4	5.9	5.7
7	DWRB 138	4.1	4.8	4.5
8	DWRB 140	5.5	5.1	5.3
9	DWRB 141	4.7	5.7	5.2
10	RD 2917	5.5	6.1	5.8
11	RD 2918	4.3	4.4	4.4
12	RD 2919	4.2	5.1	4.7
13	RD 2920	4.7	5.0	4.8
14	BH 946 ©*	3.5	4.1	3.8
15	DWRB 91 (c)	3.6	5.4	4.5
16	DWRUB 64 (c)*	4.6	4.9	4.8
	Mean	4.5	5.2	

*= 6 row barley

MALT PARAMETERS

Table 3.9 : Malt yield (%) of IVT (LS-MB) entries from different locations

S.N	Genotype	Karnal	Hisar	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 1000	88.8	84.9	84.3	89.4	84.8	**86.4**
2	BH 1001	90.1	87.6	80.2	89.2	85.3	**86.5**
3	BH 1003	87.1	85.2	79.9	90.3	83.9	**85.3**
4	DWRB 132	90.8	88.6	87.5	89.0	86.6	**88.5**
5	DWRB 134	90.3	88.0	86.1	88.7	85.5	**87.7**
6	DWRB 136	91.0	78.5	86.8	85.3	86.2	**85.6**
7	DWRB 138	86.4	76.7	82.2	89.4	71.1	**81.2**
8	DWRB 140	87.3	84.1	80.7	88.7	83.9	**84.9**
9	DWRB 141	85.0	84.3	82.3	87.4	82.5	**84.3**
10	RD 2917	88.6	85.5	84.2	86.6	84.4	**85.8**
11	RD 2918	90.0	84.0	89.6	90.0	85.2	**87.8**
12	RD 2919	87.7	86.1	84.2	87.1	85.6	**86.1**
13	RD 2920	86.9	89.0	82.0	89.1	83.5	**86.1**
14	BH 946 ©*	87.9	81.8	83.9	89.4	82.5	**85.1**
15	DWRB 91 (c)	89.0	85.6	86.7	88.1	85.4	**87.0**
16	DWRUB 64 (c)*	90.6	89.7	90.0	86.5	85.2	**88.4**
	Mean	**88.6**	**85.0**	**84.4**	**88.4**	**83.8**	

*= 6 row barley

Table 3.10 : Malt friability (%) of IVT (LS-MB) entries from different locations

S.N	Genotype	Karnal	Hisar	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 1000	56.3	66.8	69.7	84.7	87.4	**73.0**
2	BH 1001	50.5	56.5	72.2	24.8	77.5	**56.3**
3	BH 1003	77.5	77.2	61.4	37.3	72.6	**65.2**
4	DWRB 132	23.1	41.7	74.9	68.3	61.0	**53.8**
5	DWRB 134	42.0	49.4	47.8	76.8	58.0	**54.8**
6	DWRB 136	34.1	39.8	43.6	68.8	55.2	**48.3**
7	DWRB 138	59.6	58.1	80.4	71.2	81.6	**70.2**
8	DWRB 140	72.7	60.2	73.8	58.9	80.0	**69.1**
9	DWRB 141	55.2	57.6	82.1	38.0	80.7	**62.7**
10	RD 2917	45.6	63.3	80.3	80.5	75.8	**69.1**
11	RD 2918	24.4	38.4	33.8	79.1	44.9	**44.1**
12	RD 2919	44.9	62.3	72.5	70.4	68.9	**63.8**
13	RD 2920	62.1	36.5	72.4	79.0	77.6	**65.5**
14	BH 946 ©*	39.3	39.3	45.5	65.3	68.9	**51.7**
15	DWRB 91 (c)	55.6	58.7	63.2	71.6	73.8	**64.6**
16	DWRUB 64 (c)*	21.8	28.9	23.8	52.5	75.8	**40.6**
	Mean	**47.8**	**52.2**	**62.3**	**64.2**	**71.2**	

*= 6 row barley

Table 3.11 : Malt homogeneity (%) of IVT (LS-MB) entries from different locations

S.N	Genotype	Karnal	Hisar	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 1000	78.3	88.9	94.4	89.7	99.2	**90.1**
2	BH 1001	84.5	91.9	96.6	24.8	97.1	**79.0**
3	BH 1003	96.2	95.5	97.5	37.3	93.6	**84.0**
4	DWRB 132	40.1	69.4	96.4	68.3	87.5	**72.4**
5	DWRB 134	69.6	83.5	90.9	76.8	91.2	**82.4**
6	DWRB 136	61.9	68.0	78.9	68.8	87.3	**73.0**
7	DWRB 138	82.9	84.9	98.1	71.2	98.5	**87.1**
8	DWRB 140	95.3	90.4	97.7	58.9	98.2	**88.1**
9	DWRB 141	87.0	89.2	99.0	38.0	98.4	**82.3**
10	RD 2917	70.0	86.6	97.6	84.5	95.5	**86.8**
11	RD 2918	51.2	69.1	65.6	82.1	76.7	**68.9**
12	RD 2919	72.8	83.5	92.5	70.4	91.3	**82.1**
13	RD 2920	94.1	67.9	96.7	83.0	98.6	**88.1**
14	BH 946 ©*	60.5	78.1	91.1	65.3	94.5	**77.9**
15	DWRB 91 (c)	88.0	89.2	95.3	71.6	99.4	**88.7**
16	DWRUB 64 (c)*	36.3	46.8	45.3	52.5	91.1	**54.4**
	Mean	**73.0**	**80.2**	**89.6**	**65.2**	**93.6**	

*= 6 row barley

Table 3.12 : Hot water extract (% fgdb) of IVT (LS-MB) entries from different locations

S.N	Genotype	Karnal	Hisar	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 1000	74.5	79.5	80.1	77.0	78.2	**77.8**
2	BH 1001	79.3	82.4	81.3	77.5	83.4	**80.8**
3	BH 1003	78.6	82.7	79.4	75.0	79.8	**79.1**
4	DWRB 132	75.4	80.2	77.4	71.7	76.7	**76.3**
5	DWRB 134	70.9	80.5	72.9	83.8	78.8	**77.4**
6	DWRB 136	75.5	79.3	79.3	76.2	75.2	**77.1**
7	DWRB 138	77.4	80.1	78.1	76.7	76.9	**77.8**
8	DWRB 140	81.4	82.2	73.6	75.2	75.6	**77.6**
9	DWRB 141	79.4	84.3	73.7	78.4	83.8	**79.9**
10	RD 2917	76.1	78.7	79.4	80.1	76.4	**78.1**
11	RD 2918	74.0	81.4	76.4	77.5	77.2	**77.3**
12	RD 2919	77.5	78.6	78.4	80.2	75.8	**78.1**
13	RD 2920	76.1	81.5	73.8	75.6	79.9	**77.4**
14	BH 946 ©*	76.6	77.9	72.6	76.2	81.7	**77.0**
15	DWRB 91 (c)	79.3	82.4	77.4	74.7	81.1	**79.0**
16	DWRUB 64 (c)*	81.2	79.2	77.6	78.4	80.0	**79.3**
	Mean	**77.1**	**80.7**	**77.0**	**77.1**	**78.8**	

*= 6 row barley

Table 3.13 : Wort filtration rate (ml/hr) of IVT (LS-MB) entries from different locations

S.N	Genotype	Karnal	Hisar	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 1000	195	325	295	300	335	**290**
2	BH 1001	215	325	290	295	295	**284**
3	BH 1003	280	330	310	315	305	**308**
4	DWRB 132	275	310	285	265	220	**271**
5	DWRB 134	245	300	245	210	180	**236**
6	DWRB 136	310	295	290	235	285	**283**
7	DWRB 138	285	300	310	320	310	**305**
8	DWRB 140	300	280	310	260	310	**292**
9	DWRB 141	300	315	300	310	315	**308**
10	RD 2917	240	315	285	275	275	**278**
11	RD 2918	225	330	305	325	280	**293**
12	RD 2919	260	300	290	295	285	**286**
13	RD 2920	245	310	295	240	285	**275**
14	BH 946 ©*	245	290	240	285	280	**268**
15	DWRB 91 (c)	295	295	215	235	315	**271**
16	DWRUB 64 (c)*	255	270	310	275	255	**273**
	Mean	**261**	**306**	**286**	**278**	**283**	

*= 6 row barley

Table 3.14: Wort colour (EBC units) of IVT (LS-MB) entries from different locations

S.N	Genotype	Karnal	Hisar	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 1000	2.0	2.0	3.0	2.0	2.0	**2.2**
2	BH 1001	2.5	2.5	2.5	2.5	2.0	**2.4**
3	BH 1003	2.5	2.0	2.5	2.5	2.5	**2.4**
4	DWRB 132	2.0	2.0	2.0	2.5	2.0	**2.1**
5	DWRB 134	2.0	2.5	2.5	2.0	2.0	**2.2**
6	DWRB 136	2.0	2.0	2.0	2.5	2.5	**2.2**
7	DWRB 138	2.5	2.5	2.5	2.0	2.5	**2.4**
8	DWRB 140	2.0	2.5	2.0	2.5	2.0	**2.2**
9	DWRB 141	2.5	2.5	2.5	2.0	2.5	**2.4**
10	RD 2917	2.0	2.0	2.5	2.0	2.5	**2.2**
11	RD 2918	2.0	2.0	2.0	2.5	2.0	**2.1**
12	RD 2919	2.5	2.0	2.0	2.0	2.0	**2.1**
13	RD 2920	2.0	2.0	2.0	2.5	2.0	**2.1**
14	BH 946	2.0	2.0	3.0	2.0	2.5	**2.3**
15	DWRB 91 (c)	2.5	2.0	2.5	2.0	2.0	**2.2**
16	DWRUB 64 (c)*	2.0	2.5	2.5	2.5	2.5	**2.4**
	Mean	**2.2**	**2.2**	**2.4**	**2.3**	**2.2**	

*= 6 row barley

Table 3.15 : Sachharification rate (minutes) of IVT (LS-MB) entries from different locations

S.N	Genotype	Karnal	Hisar	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 1000	5	5	10	5	10	**7**
2	BH 1001	5	10	5	10	5	**7**
3	BH 1003	5	5	5	5	5	**5**
4	DWRB 132	5	5	5	5	5	**5**
5	DWRB 134	5	5	5	5	5	**5**
6	DWRB 136	5	5	5	5	5	**5**
7	DWRB 138	5	5	10	10	5	**7**
8	DWRB 140	5	5	5	5	5	**5**
9	DWRB 141	5	5	5	10	5	**6**
10	RD 2917	5	5	5	5	5	**5**
11	RD 2918	5	5	5	5	5	**5**
12	RD 2919	10	5	5	5	5	**6**
13	RD 2920	5	5	5	5	5	**5**
14	BH 946 ©*	5	5	10	5	5	**6**
15	DWRB 91 (c)	10	5	5	5	5	**6**
16	DWRUB 64 (c)*	5	5	5	5	5	**5**
	Mean	**6**	**5**	**6**	**6**	**5**	

*= 6 row barley

Table 3.16 : Diastatic power (^{0}L) of IVT (LS-MB) entries from different locatins

S.N	Genotype	Karnal	Hisar	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 1000	87	100	98	100	103	**97**
2	BH 1001	83	89	103	100	105	**96**
3	BH 1003	100	103	93	91	108	**99**
4	DWRB 132	83	95	105	89	108	**96**
5	DWRB 134	114	103	100	98	103	**103**
6	DWRB 136	105	100	108	95	111	**104**
7	DWRB 138	98	98	114	95	111	**103**
8	DWRB 140	105	87	98	93	111	**99**
9	DWRB 141	108	93	103	87	111	**100**
10	RD 2917	108	108	103	100	100	**104**
11	RD 2918	111	95	98	105	95	**101**
12	RD 2919	114	103	108	93	95	**103**
13	RD 2920	93	91	108	100	105	**99**
14	BH 946 ©*	87	95	95	95	103	**95**
15	DWRB 91 (c)	83	111	91	95	111	**98**
16	DWRUB 64 (c)*	95	100	100	91	100	**97**
	Mean	**99**	**98**	**101**	**95**	**105**	

*= 6 row barley

Table 3.17 : Wort pH of IVT (LS-MB) entries from different locations

S.N	Genotype	Karnal	Hisar	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 1000	5.9	6.1	6.1	5.8	5.7	**5.9**
2	BH 1001	5.3	5.1	6.4	5.9	5.4	**5.6**
3	BH 1003	6.0	6.0	6.0	5.5	5.4	**5.8**
4	DWRB 132	6.1	6.3	6.4	6.3	6.0	**6.2**
5	DWRB 134	6.1	5.8	6.4	5.9	5.7	**6.0**
6	DWRB 136	5.4	6.1	6.3	6.3	6.4	**6.1**
7	DWRB 138	6.1	5.8	6.3	6.1	5.3	**5.9**
8	DWRB 140	6.0	6.4	6.3	5.8	5.6	**6.0**
9	DWRB 141	6.0	6.1	6.3	5.6	5.3	**5.9**
10	RD 2917	6.0	5.9	6.4	5.1	6.4	**5.9**
11	RD 2918	6.0	5.8	6.1	5.4	5.9	**5.8**
12	RD 2919	5.4	6.0	6.4	5.8	6.0	**5.9**
13	RD 2920	5.3	6.0	6.0	6.3	5.7	**5.9**
14	BH 946 ©*	6.4	5.5	6.2	6.0	6.0	**6.0**
15	DWRB 91 (c)	6.0	5.7	6.2	6.0	5.9	**6.0**
16	DWRUB 64 (c)*	5.1	5.6	6.4	5.5	5.8	**5.7**
	Mean	**5.8**	**5.9**	**6.2**	**5.8**	**5.8**	

*= 6 row barley

Table 3.18 : Kolbach Index# (KI) of IVT (LS-MB) entries from different locations

S.N	Genotype	Karnal	Hisar	Ludhiana	Durgapura	Pantnagar	Mean
1	BH 1000	37	39	40	39	41	**39**
2	BH 1001	40	40	37	37	40	**39**
3	BH 1003	42	38	40	37	41	**40**
4	DWRB 132	39	39	39	37	39	**39**
5	DWRB 134	37	38	40	36	40	**38**
6	DWRB 136	37	42	39	35	39	**38**
7	DWRB 138	38	38	38	37	39	**38**
8	DWRB 140	38	42	39	36	41	**39**
9	DWRB 141	37	38	38	39	39	**38**
10	RD 2917	38	42	38	39	37	**39**
11	RD 2918	39	38	39	37	40	**39**
12	RD 2919	36	41	37	40	37	**38**
13	RD 2920	38	40	39	38	39	**39**
14	BH 946 ©*	38	42	41	37	40	**40**
15	DWRB 91 (c)	40	40	37	36	41	**39**
16	DWRUB 64 (c)*	40	37	39	37	39	**38**
	Mean	**38**	**40**	**39**	**37**	**39**	

*= 6 row barley #Predicted values through NIR

BARLEY QUALITY SCREENING NURSERY

This season barley quality screening nursery consisted of two sets of genotypes, in one set four genotypes (BCU 407, BCU 424, BCU 546 and DWRB 53) found to had higher diastatic power at Karnal location in previous year testing were included and in another set two genotypes (BK 1319 and DWRB 107) found to had low husk content at Karnal location were included. Both sets were grown at four locations *i.e.* Ludhiana, Hisar, Karnal and Durgapura. The samples from each centre were then sent to ICAR-IIWBR, Karnal and tested for respective trait.

Genotypes with higher diastatic power: The four genotypes along with four checks were tested for several grain physical and malting quality traits. Diastatic power differences were non-significant among the genotypes. Therefore, the higher DP observed in these genotypes at one location could be due to particular environmental conditions during the year of test and secondly as only small sample of one location was screened. However as far as other traits are concerned, highest test weight was observed in DWRB 53 (63.9 kg/hl) which was statistically at par to the check DWRUB 52 (63.9 kg/hl). There was significant genotypic differences in the values of thousand grain weight, bold grain percentage, thin grain percentage, grain protein content, husk content, malt friability and filtration rate. Location wise differences were also observed in all traits except diastatic power. Among locations Karnal location has superior values for almost all the traits. Genotype × Location effect was observed for most of the traits except malt friability, hot water extract and diastatic power.

Genotypes with lower husk content: Two genotypes alongwith two checks were tested for husk content and some other grain physical traits. Though the mean values of husk content were numerically lower in the two genotypes tested, but statistically at par to the checks. Values of test weight had also non-significant differences among the genotypes tested. Significant genotypic differences were observed for thousand grain weight (TGW), bold grain percentage (BG), thin grain percentage (TG) and protein content. However, there was significant effect of growing location on husk content and all the other grain physical parameters tested. Lowest value of husk content was obtained at Durgapura (8.8%) and highest at Ludhiana (10.9%). Genotype × Location effect was found to be non-significant for all the traits tested, showing uniform effect of locations on the genotypes tested.

Table 1: Mean values of grain and malt quality traits of genotypes grown over four different locations

Effect of genotype

Genotype	Test wt (kg/hl)	TGW (g)	Bold grain (%)	Thin grain (%)	Protein (%)	Husk (%)	Friability (%)	HWE (fgdw)	FR (ml/hr)	DP (°L)	KI (%)
BCU407	60.8	37.7	70.3	6.1	12.4	9.6	57.7	79.0	262.1	107.8	38.2
BCU424	61.8	32.3	33.3	26.0	13.5	11.0	53.8	80.2	266.3	108.2	38.3
BCU546	56.1	38.7	69.8	8.6	11.9	11.6	61.5	78.5	250.4	103.5	39.7
DWRB53	63.9	41.6	70.6	4.9	12.2	9.3	69.1	77.9	246.7	105.2	38.2
DWRUB52 (c)	63.6	48.7	88.6	3.5	11.8	9.8	60.0	80.2	176.7	106.5	38.4
DWRB92 (c)	61.9	54.4	90.5	1.5	12.9	10.2	60.9	79.7	223.3	112.7	38.7
RD2668 (c)	61.1	44.4	68.5	8.1	12.2	10.0	60.5	79.7	240.0	109.6	38.9
CDC BOLD (c)	62.2	39.5	62.4	11.3	11.6	10.1	77.2	78.0	234.0	109.4	39.2
LSD (5%)											
Genotype (G)	1.7	3.2	9.9	4.6	0.5	0.9	10.1	NS	37.7	NS	NS

Effect of location

Genotype	Test wt (kg/hl)	TGW (g)	Bold grain (%)	Thin grain (%)	Protein (%)	Husk (%)	Friability (%)	HWE (fgdw)	FR (ml/hr)	DP (°L)	KI (%)
Ludhiana	61.1	38.5	55.9	15.2	11.7	9.9	64.0	80.8	174.7	109.7	39.3
Hisar	55.4	40.2	67.2	9.4	14.1	11.8	60.1	75.2	277.3	107.3	38.3
Karnal	65.0	46.0	83.8	2.5	9.9	9.3	75.9	80.9	275.4	108.3	39.2
Durgapura	64.2	43.8	70.1	7.9	13.7	9.7	50.3	79.8	222.3	106.2	38.0
LSD (5%)											
Location (L)	1.2	2.2	7.0	3.3	0.4	0.7	7.2	1.8	26.7	NS	0.8
G × L	3.5	6.3	19.7	9.3	1.1	1.9	NS	NS	75.4	NS	2.2

Table 2: Mean values of grain quality traits of potential low husk genotypes grown over four different locations

Effect of genotype

Genotype	Husk (%)	Test Wt (kg/hl)	TGW (g)	Bold grain (%)	Thin grain (%)	Protein (%)
BK 1319	9.9	59.5	54.3	93.0	1.5	12.7
DWRB 107	9.3	62.3	47.5	86.9	2.5	13.0
DWRUB 52 ©	10.1	64.0	50.1	89.9	1.9	12.4
DWRB 92 ©	10.1	61.5	55.3	95.9	0.9	13.4
LSD (5%)	NS	NS	3.3	4.3	1.1	0.6

Effect of location

Genotype	Husk (%)	Test Wt (kg/hl)	TGW (g)	Bold grain (%)	Thin grain (%)	Protein (%)
Ludhiana	10.9	62.3	47.7	90.5	1.5	10.3
Hisar	10.4	54.9	48.5	88.7	2.5	14.7
Karnal	9.2	64.7	57.6	97.0	0.4	11.5
Durgapura	8.8	65.4	53.5	89.4	2.2	15.0
LSD (5%)	1.2	4.1	3.3	4.3	1.1	0.6
G × L	NS	NS	NS	NS	NS	NS

FEED BARLEY QUALITY EVALUATION

The feed grain samples from various trials and grown at different locations were analysed for few physical parameters and protein content. Each centre was requested to provide a grain sample of 250 g. The parameters analysed included test weight (kg/hl), thousand grain weight (g), grain plumpness and grain crude protein content (%),. The details of samples received are as under:

Table-1 Details of grain samples received and analyzed for quality

Trial	Zone	Locations	Total No. of Samples
AVT (RF)	NHZ	Bajaura, Malan, Shimla, Almora	80
AVT (IR-DPB)	NWPZ	Hisar, Ludhiana, Durgapura	15
IVT (IR-FB)	NWPZ/NEPZ/CZ	Hisar, Ludhiana, Durgapura, Pantnagar, Faizabad, Kanpur, Rewa, Sabour, Varansi, Udaipur	250
IVT (Rainfed)	NEPZ	Kanpur, Faizabad, Varansi, Sabour, Rewa	105
AVT (SAL/ALK)	NWPZ/NEPZ	Faizabad-1, Faizabad-2, Kanpur, Bawal, Hisar, Rampura (Jodhpur)	114
IVT (DPB)	NWPZ/NEPZ/CEN	Hisar, Ludhiana, Durgapura, Anand, Kota, Udaipur, Faizabad, Varansi	136
AVT (DPB)	NHZ	Bajaura, Shimla	38
		Total	**738**

Hectolitre weight (test weight) was measured with DWR Hectolitre 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 test weight; crude protein and thousand grain weight have been listed in table no.2.

Table 2. Entries having highest test weight, thousand grain weight, bold grain percentage and protein content in respective trials

No.	Trial	Test weight	Thousand grain weight	Bold grain (%)	Crude protein
1	**AVT (Rainfed Barley) – NHZ**	VLB 143	VPB 1043	HBL 722, VPB 1043	VLB 142
2	**AVT (Irrigated Dual Purpose Barley) – NWPZ**	RD 2552 ©	KB 1369	RD 2552 ©	RD 2715 ©
3	**IVT (Irrigated Feed Barley) – NWPZ/NEPZ/CZ**	BH 994	BH 994	BH 994	BH 995
4	**IVT (Rainfed Feed Barley) –NEPZ**	DWRB 145	KB 1323, PL 889	NDB 1602, PL 889	DWRB 145, RD 2914
5	**AVT (SAL/ALK) – NWPZ/NEPZ**	BH 997	BH 997	BH 997	KB 1302
6	**IVT (Dual Purpose Barley) – NWPZ/NEPZ/CZ**	KB 1319	KB 1325	KB 1319	KB 1319
7	**AVT (Dual Purpose Barley) – NHZ**	HBL 276 ©	HBL 722, HBL 738	HBL 722	VLB 142, HBL 738

Annexure -1

Table 1. Test weight (kg/hl) of entries from AVT (Rain Fed) North Hill Zone

S.No.	Genotype	Bajaura	Almora	Shimla	Malan	Mean
1	BHS 434	55.6	73.6	67.5	61.2	**64.5**
2	BHS 435	57.2	64.7	64.7	55.3	**60.5**
3	BHS 436	60.9	63.8	69.8	63.6	**64.5**
4	BHS 437	61.9	65.6	69.2	60.1	**64.2**
5	FILLER	59.8	65.1	67.9	59.5	**63.1**
6	HBL 722	61.2	59.6	69.8	64.2	**63.7**
7	HBL 723	57.8	58.8	68.6	55.4	**60.1**
8	HBL 736	57.4	60.7	64.8	60.1	**60.8**
9	HBL 737	52.9	64.0	62.8	56.1	**58.9**
10	VLB 141	59.2	78.2	63.6	58.0	**64.7**
11	VLB 142	53.4	66.8	75.9	56.0	**63.0**
12	VLB 143	71.9	58.9	78.6	74.4	**70.9**
13	VLB 144	64.8	62.5	71.4	61.7	**65.1**
14	VPB 1043	65.3	60.7	71.3	63.7	**65.3**
15	VPB 1044	62.4	66.9	70.6	66.7	**66.6**
16	VPB 1045	61.1	75.1	70.3	63.5	**67.5**
17	BHS 400 ©	55.9	65.1	64.2	51.0	**59.1**
18	BHS 352 ©	71.9	66.4	74.8	68.9	**70.5**
19	HBL 113 ©	63.4	58.5	70.9	64.0	**64.2**
20	VLB 118 ©	57.2	63.2	63.8	51.4	**58.9**
	Mean	**60.6**	**64.9**	**69.0**	**60.7**	

Table 2. Thousand grain weight of entries from AVT (Rain Fed) North Hill Zone

S.No.	Genotype	Bajaura	Almora	Shimla	Malan	Mean
1	BHS 434	34.1	29.9	35.5	34.0	**33.4**
2	BHS 435	43.4	50.4	45.0	38.8	**44.4**
3	BHS 436	50.2	33.9	50.9	47.3	**45.6**
4	BHS 437	40.5	44.8	45.3	44.7	**43.8**
5	FILLER	38.0	45.4	39.2	37.1	**39.9**
6	HBL 722	43.0	34.7	48.4	46.2	**43.1**
7	HBL 723	40.2	33.6	45.3	39.3	**39.6**
8	HBL 736	37.3	42.9	39.7	37.7	**39.4**
9	HBL 737	34.9	43.6	38.6	33.9	**37.7**
10	VLB 141	41.1	43.7	47.8	42.6	**43.8**
11	VLB 142	37.5	33.9	37.3	34.6	**35.8**
12	VLB 143	39.4	46.6	44.4	37.8	**42.1**
13	VLB 144	40.2	25.2	39.5	38.2	**35.8**
14	VPB 1043	46.7	43.5	45.5	49.0	**46.2**
15	VPB 1044	41.2	39.0	43.4	42.9	**41.6**
16	VPB 1045	38.4	35.2	44.9	45.4	**41.0**
17	BHS 400 ©	37.8	45.3	34.6	37.8	**38.9**
18	BHS 352 ©	38.8	43.4	44.3	39.7	**41.5**
19	HBL 113 ©	35.6	40.0	40.5	35.7	**37.9**
20	VLB 118 ©	42.0	47.4	46.2	42.9	**44.6**
	Mean	**40.0**	**40.1**	**42.8**	**40.3**	

Table 3. Bold grain (%) of entries from AVT (Rain Fed) North Hill Zone

S.No.	Genotype	Bajaura	Almora	Shimla	Malan	Mean
1	BHS 434	74.6	13.9	58.2	49.7	**49.1**
2	BHS 435	93.1	91.7	91.3	81.4	**89.4**
3	BHS 436	91.8	38.8	87.9	83.7	**75.5**
4	BHS 437	96.1	39.2	85.1	89.5	**77.5**
5	FILLER	49.3	85.8	50.5	26.7	**53.1**
6	HBL 722	94.2	85.7	94.7	94.6	**92.3**
7	HBL 723	89.8	67.2	87.0	89.3	**83.3**
8	HBL 736	74.8	79.2	68.5	72.6	**73.8**
9	HBL 737	64.9	93.5	82.6	56.2	**74.3**
10	VLB 141	89.8	46.8	88.1	90.0	**78.7**
11	VLB 142	67.1	66.9	42.3	61.8	**59.5**
12	VLB 143	32.7	94.6	57.1	30.3	**53.7**
13	VLB 144	91.3	42.6	81.2	82.8	**74.5**
14	VPB 1043	92.0	91.8	90.2	94.9	**92.2**
15	VPB 1044	86.4	83.7	85.7	89.8	**86.4**
16	VPB 1045	87.2	29.3	87.6	91.1	**73.8**
17	BHS 400 ©	28.5	90.6	25.0	26.1	**42.5**
18	BHS 352 ©	67.2	82.8	80.2	67.1	**74.3**
19	HBL 113 ©	67.9	51.0	80.3	65.3	**66.1**
20	VLB 118 ©	88.5	92.2	79.9	89.5	**87.5**
	Mean	**76.3**	**68.4**	**75.2**	**71.6**	

Table 4. Thin grain (%) of entries from AVT (Rain Fed) North Hill Zone

S.No.	Genotype	Bajaura	Almora	Shimla	Malan	Mean
1	BHS 434	18.4	50.3	30.0	26.8	**31.4**
2	BHS 435	1.8	1.6	2.0	5.1	**2.6**
3	BHS 436	1.0	21.0	1.9	1.8	**6.4**
4	BHS 437	0.8	3.1	4.3	3.2	**2.8**
5	FILLER	4.6	5.3	10.8	17.2	**9.5**
6	HBL 722	3.1	3.5	1.5	1.2	**2.3**
7	HBL 723	2.0	9.2	4.7	3.2	**4.8**
8	HBL 736	4.6	5.2	11.9	6.2	**7.0**
9	HBL 737	7.8	1.9	15.5	10.1	**8.8**
10	VLB 141	1.8	9.5	3.6	2.1	**4.2**
11	VLB 142	3.6	9.7	18.7	7.3	**9.8**
12	VLB 143	20.1	1.2	12.5	16.2	**12.5**
13	VLB 144	1.3	34.2	3.5	3.9	**10.7**
14	VPB 1043	1.0	2.9	2.9	1.0	**2.0**
15	VPB 1044	2.1	3.7	4.0	2.2	**3.0**
16	VPB 1045	2.8	14.6	4.5	2.1	**6.0**
17	BHS 400 ©	6.6	1.4	8.1	8.7	**6.2**
18	BHS 352 ©	33.1	2.4	38.6	36.0	**27.5**
19	HBL 113 ©	3.3	2.2	6.1	5.3	**4.2**
20	VLB 118 ©	2.6	2.2	7.0	2.9	**3.7**
	Mean	**6.1**	**9.3**	**9.6**	**8.1**	

Table 5. Crude protein content in grains of entries from AVT (Rain Fed) North Hill Zone

S.No.	Genotype	Bajaura	Almora	Shimla	Malan	Mean
1	BHS 434	8.9	12.5	9.3	8.0	**9.7**
2	BHS 435	7.7	10.9	9.8	9.1	**9.4**
3	BHS 436	9.6	10.8	9.8	8.8	**9.8**
4	BHS 437	8.6	9.1	10.6	9.8	**9.5**
5	FILLER	7.6	9.0	8.0	9.3	**8.5**
6	HBL 722	8.2	9.2	9.9	9.4	**9.2**
7	HBL 723	7.5	9.2	9.9	9.8	**9.1**
8	HBL 736	7.8	9.1	11.0	8.8	**9.2**
9	HBL 737	8.5	11.3	10.7	8.9	**9.9**
10	VLB 141	7.5	10.7	9.6	8.3	**9.0**
11	VLB 142	8.7	8.9	12.6	9.7	**10.0**
12	VLB 143	8.6	9.1	11.4	9.6	**9.7**
13	VLB 144	8.9	9.3	10.6	9.7	**9.6**
14	VPB 1043	8.7	9.4	11.5	9.8	**9.9**
15	VPB 1044	6.5	10.8	8.2	8.2	**8.4**
16	VPB 1045	7.1	11.7	8.9	9.1	**9.2**
17	BHS 400 ©	8.1	10.6	11.3	8.9	**9.7**
18	BHS 352 ©	8.6	10.3	9.9	10.1	**9.7**
19	HBL 113 ©	7.2	9.2	8.6	9.0	**8.5**
20	VLB 118 ©	7.8	10.1	10.6	9.7	**9.6**
	Mean	**8.1**	**10.1**	**10.1**	**9.2**	

Table 6. Test weight (kg/hl) of entries from AVT (IR-DP) in NWPZ

S.No.	Genotype	Hisar	Durgapura	Ludhiana	Mean
1	KB 1369	45.8	53.5	45.8	**48.3**
2	AZAD (c)	50.9	48.8	51.9	**50.5**
3	RD 2035 (c)	52.3	47.4	49.3	**49.7**
4	RD 2552 (c)	47.0	60.2	54.6	**53.9**
5	RD 2715 (c)	48.6	51.3	47.9	**49.3**
	Mean	**48.9**	**52.2**	**49.9**	

Table 7. Thousand grain weight of entries from AVT (IR-DP) in NWPZ

S.No.	Genotype	Hisar	Durgapura	Ludhiana	Mean
1	KB 1369	32.7	33.1	33.0	**32.9**
2	AZAD (c)	34.3	27.3	34.3	**32.0**
3	RD 2035 (c)	31.2	18.9	34.8	**28.3**
4	RD 2552 (c)	26.9	33.3	36.7	**32.3**
5	RD 2715 (c)	29.8	28.6	35.3	**31.3**
	Mean	**31.0**	**28.2**	**34.8**	

Table 8. Bold grain (%) of entries from AVT (IR-DP) in NWPZ

S.No.	Genotype	Hisar	Durgapura	Ludhiana	Mean
1	KB 1369	47.0	34.7	39.6	**40.4**
2	AZAD (c)	20.8	10.0	46.0	**25.6**
3	RD 2035 (c)	39.4	7.7	54.1	**33.7**
4	RD 2552 (c)	36.1	46.1	75.5	**52.5**
5	RD 2715 (c)	49.6	37.9	49.9	**45.8**
	Mean	**38.6**	**27.3**	**53.0**	

Table 9. Thin grain (%) of entries from AVT (IR-DP) in NWPZ

S.No.	Genotype	Hisar	Durgapura	Ludhiana	Mean
1	KB 1369	14.0	34.1	17.6	**21.9**
2	AZAD (c)	32.1	67.1	15.0	**38.1**
3	RD 2035 (c)	17.6	78.9	11.2	**35.9**
4	RD 2552 (c)	27.8	21.0	5.5	**18.1**
5	RD 2715 (c)	20.7	29.7	17.2	**22.5**
	Mean	**22.4**	**46.1**	**13.3**	

Table 10. Grain crude protein of entries from AVT (IR-DP) in NWPZ

S.No.	Genotype	Hisar	Durgapura	Ludhiana	Mean
1	KB 1369	11.1	13.5	10.9	**11.8**
2	AZAD (c)	10.8	14.0	10.9	**11.9**
3	RD 2035 (c)	12.8	11.8	9.9	**11.5**
4	RD 2552 (c)	11.8	11.3	10.2	**11.1**
5	RD 2715 (c)	10.8	13.2	12.1	**12.0**
	Mean	**11.5**	**12.8**	**10.8**	

Table 11. Test weight (kg/hl) of entries from IVT (Irrigated Feed Barley) in NWPZ/NEPZ/CZ

S.No.	Genotype	Hisar	Ludhiana	Durgapura	Pantnagar	Average	Faizabad	Rewa	Sabour	Varansi	Average	Udaipur	O.Average
1	KB 1318	54.3	54.7	63.6	54.2	**56.7**	55.3	53.9	47.9	47.0	**51.0**	64.4	**57.4**
2	BH 993	56.8	54.6	58.5	48.1	**54.5**	56.0	58.4	47.0	47.1	**52.1**	NA	**53.3**
3	BH 994	62.1	66.0	66.9	60.3	**63.8**	62.7	65.1	57.6	52.2	**59.4**	65.5	**62.9**
4	BH 995	56.6	59.7	61.4	57.4	**58.8**	62.8	63.9	53.3	57.9	**59.5**	60.4	**59.6**
5	DWRB 137	58.0	58.8	61.7	55.0	**58.4**	59.5	56.9	48.5	52.9	**54.4**	NA	**56.4**
6	DWRB 142	57.0	57.4	60.0	52.6	**56.7**	65.1	58.0	48.1	55.2	**56.6**	58.1	**57.2**
7	HUB 243	53.0	52.4	62.5	51.8	**54.9**	54.6	58.5	47.4	49.6	**52.5**	59.4	**55.6**
8	HUB 245	52.9	61.1	57.5	49.8	**55.3**	55.7	57.0	50.2	50.9	**53.4**	61.5	**56.7**
9	JB 301	55.1	59.5	59.6	49.7	**56.0**	50.6	56.6	48.4	47.2	**50.7**	58.6	**55.1**
10	JB 303	51.8	62.2	60.5	54.5	**57.3**	53.7	55.4	46.2	47.2	**50.6**	63.2	**57.0**
11	KB 1311	51.8	53.8	57.7	54.0	**54.3**	55.1	50.7	43.5	46.2	**48.9**	59.1	**54.1**
12	NDB 1608	57.2	55.7	62.5	52.1	**56.9**	51.2	58.8	46.8	49.3	**51.5**	61.3	**56.6**
13	NDB 1609	54.3	56.3	56.8	48.2	**53.9**	44.4	52.7	40.4	44.7	**45.5**	61.8	**53.7**
14	PL 883	63.0	66.6	66.3	57.0	**63.2**	60.3	63.1	55.4	56.0	**58.7**	63.0	**61.6**
15	PL 884	58.9	63.9	66.0	61.0	**62.4**	61.2	62.4	53.8	50.8	**57.0**	63.3	**60.9**
16	RD 2899	52.3	54.5	59.1	47.1	**53.3**	55.5	58.3	44.0	47.0	**51.2**	62.7	**55.7**
17	RD 2900	43.5	49.9	61.3	45.7	**50.1**	43.7	47.2	42.4	45.2	**44.7**	57.9	**50.9**
18	RD 2901	52.1	53.6	62.4	48.3	**54.1**	55.1	55.7	45.5	46.1	**50.6**	59.6	**54.8**
19	BH 902 ©	52.0	52.2	61.3	47.1	**53.1**	57.0	54.9	49.4	48.5	**52.5**	NA	**52.8**
20	BH 946 ©	54.2	49.6	56.8	54.1	**53.7**	49.2	56.7	41.5	44.3	**47.9**	57.3	**53.0**
21	BH 959 ©	47.9	49.0	54.5	48.4	**49.9**	46.6	47.8	35.3	38.5	**42.0**	56.2	**49.4**
22	HUB 113 ©	51.8	54.7	63.5	51.4	**55.3**	55.5	55.5	42.8	46.8	**50.1**	60.6	**55.4**
23	JYOTI ©	57.2	56.1	59.8	53.7	**56.7**	59.5	58.2	51.7	52.1	**55.4**	58.9	**57.0**
24	RD 2552 ©	48.5	52.2	54.6	48.1	**50.8**	52.3	54.5	43.2	45.8	**48.9**	59.1	**53.0**
25	RD 2786 ©	51.3	56.5	59.2	52.8	**55.0**	54.1	49.6	47.7	46.3	**49.4**	60.7	**55.0**
	Mean	54.1	56.4	60.6	52.1	55.8	55.1	56.4	47.1	48.6	51.8	60.6	55.8

Table 12. Thousand grain weight of entries from IVT (Irrigated Feed Barley) in NWPZ/NEPZ/CZ

S.No.	Genotype	Hisar	Ludhiana	Durgapura	Pantnagar	Average	Faizabad	Rewa	Sabour	Varansi	Kanpur	Average	Udaipur	O.Av
1	KB 1318	40.9	38.2	46.4	46.0	**42.9**	39.4	35.4	32.0	36.6	39.9	**36.6**	50.2	**43.2**
2	BH 993	41.5	39.1	37.1	53.5	**42.8**	36.9	38.3	32.8	38.4	40.1	**37.3**	NA	**40.0**
3	BH 994	54.3	47.0	53.4	52.4	**51.8**	98.2	52.4	50.1	50.7	55.2	**61.3**	52.7	**55.3**
4	BH 995	36.8	39.4	35.6	38.3	**37.5**	41.3	42.3	30.5	41.8	41.7	**39.5**	39.8	**38.9**
5	DWRB 137	45.1	39.0	46.1	48.9	**44.8**	40.4	40.4	37.8	41.9	43.9	**40.9**	NA	**42.8**
6	DWRB 142	38.2	33.4	32.4	49.0	**38.2**	36.5	40.3	30.9	35.9	37.4	**36.2**	41.3	**38.6**
7	HUB 243	38.3	31.7	42.6	34.9	**36.9**	34.3	35.2	32.4	29.7	42.9	**34.9**	45.0	**38.9**
8	HUB 245	32.7	28.5	30.0	31.7	**30.7**	40.7	33.9	33.7	33.7	33.1	**35.0**	41.9	**35.9**
9	JB 301	39.8	33.0	37.6	38.0	**37.1**	31.5	39.7	34.0	31.4	42.9	**35.9**	42.1	**38.4**
10	JB 303	36.1	36.2	41.9	39.6	**38.4**	37.4	37.8	34.1	35.9	41.5	**37.3**	51.3	**42.3**
11	KB 1311	32.8	30.5	32.1	35.4	**32.7**	36.1	30.2	29.3	24.6	34.7	**31.0**	42.0	**35.2**
12	NDB 1608	39.4	40.2	39.1	37.5	**39.0**	28.9	35.7	31.7	29.9	40.7	**33.4**	48.1	**40.1**
13	NDB 1609	38.4	25.1	30.6	26.0	**30.0**	24.3	29.7	20.7	21.7	33.9	**26.1**	42.7	**32.9**
14	PL 883	48.5	40.1	44.2	43.6	**44.1**	41.2	40.4	38.7	40.5	47.6	**41.7**	44.8	**43.5**
15	PL 884	50.6	48.1	45.0	51.1	**48.7**	45.5	48.0	37.7	47.4	52.3	**46.2**	47.8	**47.6**
16	RD 2899	44.5	33.5	37.0	42.2	**39.3**	41.9	41.6	36.1	42.0	41.1	**40.5**	52.5	**44.1**
17	RD 2900	25.3	32.5	40.2	27.9	**31.5**	22.5	27.7	27.1	31.3	31.5	**28.0**	47.6	**35.7**
18	RD 2901	37.6	35.6	42.2	36.4	**37.9**	35.1	35.9	34.3	36.1	38.3	**35.9**	50.6	**41.5**
19	BH 902 ©	38.6	38.3	41.9	37.6	**39.1**	24.7	41.8	34.3	41.1	39.5	**36.3**	50.9	**37.7**
20	BH 946 ©	37.9	31.3	36.3	41.4	**36.7**	26.4	35.7	26.0	27.1	38.3	**30.7**	45.6	**37.7**
21	BH 959 ©	34.5	30.7	33.6	39.3	**34.5**	26.6	30.5	24.7	25.0	32.5	**27.9**	46.0	**36.1**
22	HUB 113 ©	35.0	34.5	42.7	26.9	**34.8**	36.7	33.0	26.2	34.5	38.3	**33.7**	49.8	**39.4**
23	JYOTI ©	40.1	39.8	39.6	37.0	**39.1**	40.7	40.9	39.2	29.4	42.2	**38.4**	44.2	**40.6**
24	RD 2552 ©	32.5	36.4	25.3	26.3	**30.1**	27.5	33.9	24.3	30.1	34.6	**30.1**	43.3	**34.5**
25	RD 2786 ©	33.3	36.1	37.5	35.8	**35.7**	32.3	28.7	35.7	33.1	33.0	**32.6**	48.2	**38.8**
	Mean	38.9	35.9	38.8	39.1	38.2	37.1	37.2	32.6	34.8	39.9	36.3	46.4	40.0

Table 13. Bold grain (%) of entries from IVT (Irrigated Feed Barley) in NWPZ/NEPZ/CZ

S.No.	Genotype	Hisar	Ludhiana	Durgapura	Pantnagar	Average	Faizabad	Rewa	Sabour	Varansi	Average	Udaipur	O.Average
1	KB 1318	79.8	69.6	90.9	91.9	**83.0**	76.6	56.2	44.9	59.1	**59.2**	98.1	**80.1**
2	BH 993	86.6	67.4	57.4	66.5	**69.5**	82.8	60.5	48.6	63.0	**63.7**	NA	**66.6**
3	BH 994	95.3	78.1	89.1	93.5	**89.0**	81.9	82.3	77.5	81.7	**80.8**	94.0	**88.0**
4	BH 995	77.5	75.8	51.2	91.3	**73.9**	94.3	82.0	60.7	91.8	**82.2**	78.0	**78.0**
5	DWRB 137	90.5	72.6	91.4	88.5	**85.7**	85.9	69.0	72.3	84.7	**78.0**	NA	**81.9**
6	DWRB 142	73.2	50.5	46.4	71.0	**60.3**	82.4	65.5	48.2	69.2	**66.3**	97.3	**74.6**
7	HUB 243	81.3	65.2	84.7	92.1	**80.8**	52.6	71.3	66.3	76.9	**66.8**	95.1	**80.9**
8	HUB 245	50.3	39.6	31.2	58.9	**45.0**	51.6	51.3	53.8	45.2	**50.5**	91.2	**62.2**
9	JB 301	79.7	61.0	64.4	79.4	**71.1**	52.4	62.6	44.1	59.3	**54.6**	89.4	**71.7**
10	JB 303	70.0	62.1	75.2	85.4	**73.1**	68.8	52.2	54.2	61.7	**59.2**	97.6	**76.6**
11	KB 1311	51.2	30.2	33.7	70.1	**46.3**	16.8	29.8	16.3	33.5	**24.1**	85.4	**51.9**
12	NDB 1608	85.6	39.1	77.8	75.5	**69.5**	36.6	57.4	45.0	70.2	**52.3**	96.5	**72.8**
13	NDB 1609	89.0	45.3	51.6	53.2	**59.8**	23.6	42.1	21.9	48.8	**34.1**	93.5	**62.5**
14	PL 883	94.4	75.9	79.6	89.5	**84.9**	63.1	69.2	61.9	80.4	**68.7**	82.3	**78.6**
15	PL 884	84.6	69.2	53.6	76.6	**71.0**	75.6	65.1	30.5	46.0	**54.3**	44.4	**56.6**
16	RD 2899	91.1	60.9	72.4	74.9	**74.8**	88.6	81.9	62.8	68.4	**75.4**	98.8	**83.0**
17	RD 2900	46.1	69.2	81.0	64.7	**65.3**	29.5	40.3	46.8	69.1	**46.4**	96.7	**69.5**
18	RD 2901	75.3	63.7	88.4	75.3	**75.7**	69.7	51.7	46.4	38.5	**51.5**	94.9	**74.0**
19	BH 902 ©	82.6	74.6	78.3	65.7	**75.3**	88.0	66.0	57.7	63.5	**68.8**	0.0	**72.1**
20	BH 946 ©	88.3	54.2	69.8	86.3	**74.7**	37.0	62.4	32.9	69.4	**50.4**	93.9	**73.0**
21	BH 959 ©	66.5	34.9	56.6	79.0	**59.2**	16.1	39.6	14.0	31.4	**25.3**	92.6	**59.0**
22	HUB 113 ©	66.9	60.8	88.4	67.5	**70.9**	68.1	48.1	28.1	50.8	**48.8**	94.5	**71.4**
23	JYOTI ©	69.5	61.4	50.2	73.6	**63.7**	73.0	39.2	37.9	55.0	**51.2**	80.7	**65.2**
24	RD 2552 ©	53.1	53.1	33.8	53.3	**48.3**	39.2	42.5	20.3	39.6	**35.4**	92.0	**58.6**
25	RD 2786 ©	62.4	74.0	62.2	82.9	**70.4**	65.2	32.3	60.1	53.1	**52.7**	93.5	**72.2**
	Mean	75.6	60.3	66.4	76.3	69.6	60.8	56.8	46.1	60.4	56.0	86.1	71.2

Table 14. Thin grain (%) of entries from IVT (Irrigated Feed Barley) in NWPZ/NEPZ/CZ

S.No.	Genotype	Hisar	Ludhiana	Durgapura	Pantnagar	Average	Faizabad	Rewa	Sabour	Varansi	Average	Udaipur	O.Average
1	KB 1318	5.2	9.9	1.9	1.4	**4.6**	6.5	14.4	22.0	11.9	**13.7**	0.3	**6.2**
2	BH 993	2.9	10.4	16.6	11.4	**10.3**	4.2	11.7	19.7	10.3	**11.5**	0.0	**10.9**
3	BH 994	0.6	6.4	1.6	1.2	**2.5**	2.8	2.1	3.1	2.0	**2.5**	0.5	**1.8**
4	BH 995	3.2	5.7	13.0	1.1	**5.7**	0.8	3.1	10.9	0.9	**3.9**	1.9	**3.9**
5	DWRB 137	1.5	7.8	1.7	2.3	**3.3**	3.2	8.3	10.4	2.6	**6.1**	0.0	**4.7**
6	DWRB 142	8.2	24.8	30.6	10.0	**18.4**	3.9	12.9	24.9	9.7	**12.9**	0.4	**10.5**
7	HUB 243	3.0	12.4	4.8	1.2	**5.3**	18.4	8.3	7.8	3.9	**9.6**	0.4	**5.1**
8	HUB 245	17.2	31.7	28.4	10.8	**22.0**	15.4	13.8	15.7	16.2	**15.3**	1.7	**13.0**
9	JB 301	5.9	15.9	12.2	6.0	**10.0**	17.4	10.8	19.6	11.1	**14.7**	1.1	**8.6**
10	JB 303	10.9	12.6	6.4	3.6	**8.3**	10.0	17.0	14.7	10.4	**13.0**	0.4	**7.2**
11	KB 1311	20.8	34.0	21.0	7.4	**20.8**	44.8	31.1	49.3	23.7	**37.2**	1.5	**19.8**
12	NDB 1608	2.6	22.4	4.4	5.7	**8.8**	24.8	12.2	18.0	5.7	**15.2**	0.4	**8.1**
13	NDB 1609	10.5	24.2	14.7	16.0	**16.4**	34.0	21.5	45.5	13.9	**28.7**	0.7	**15.3**
14	PL 883	1.1	7.6	3.3	1.8	**3.4**	11.0	9.2	7.5	2.6	**7.6**	2.7	**4.6**
15	PL 884	4.2	8.6	9.7	4.0	**6.6**	6.6	8.0	20.2	8.4	**10.8**	1.4	**6.3**
16	RD 2899	1.7	16.5	8.3	8.3	**8.7**	2.7	4.5	10.8	8.8	**6.7**	0.1	**5.2**
17	RD 2900	17.7	9.7	5.0	8.6	**10.2**	30.8	17.7	20.5	7.9	**19.2**	0.7	**10.0**
18	RD 2901	7.9	13.0	2.5	6.7	**7.5**	7.0	16.0	20.2	19.7	**15.7**	0.8	**8.0**
19	BH 902 ©	4.2	7.4	6.8	10.1	**7.1**	2.4	9.7	14.7	9.8	**9.2**	NA	**8.1**
20	BH 946 ©	2.0	15.4	7.2	2.9	**6.9**	18.7	9.9	27.5	6.6	**15.7**	0.6	**7.7**
21	BH 959 ©	8.7	29.5	12.9	3.9	**13.7**	43.2	25.8	56.1	25.1	**37.5**	0.4	**17.2**
22	HUB 113 ©	10.0	14.1	1.7	10.1	**9.0**	8.2	21.0	39.0	16.7	**21.2**	0.4	**10.2**
23	JYOTI ©	5.3	13.9	15.7	6.4	**10.3**	4.3	14.4	15.2	7.5	**10.4**	2.8	**7.8**
24	RD 2552 ©	16.5	18.5	36.5	15.2	**21.6**	25.9	22.4	43.6	25.4	**29.3**	0.8	**17.3**
25	RD 2786 ©	11.5	7.5	8.3	4.5	**8.0**	5.5	29.6	13.4	12.9	**15.3**	0.7	**8.0**
	Mean	7.3	15.2	11.0	6.4	10.0	14.1	14.2	22.0	11.0	15.3	0.9	9.0

Table 15. Grain crude protein content of entries from IVT (Irrigated Feed Barley) in NWPZ/NEPZ/CZ

S.No.	Genotype	Hisar	Ludhiana	Durgapura	Pantnagar	Average	Faizabad	Rewa	Sabour	Varansi	Average	Udaipur	O.Average
1	KB 1318	12.1	12.0	9.6	9.7	**10.9**	10.3	11.9	12.1	10.3	**11.2**	8.7	**10.2**
2	BH 993	11.0	12.7	12.1	11.1	**11.7**	10.7	11.7	11.3	9.8	**10.9**	NA	**11.3**
3	BH 994	12.0	11.6	13.1	10.8	**11.9**	11.8	15.2	11.9	11.9	**12.7**	11.1	**11.9**
4	BH 995	12.6	13.3	11.5	11.8	**12.3**	15.0	16.6	13.9	14.5	**15.0**	11.1	**12.8**
5	DWRB 137	8.6	10.7	8.5	9.1	**9.2**	10.4	13.1	10.3	11.2	**11.3**	NA	**10.2**
6	DWRB 142	10.2	12.7	12.9	10.3	**11.5**	12.8	13.1	11.0	10.9	**12.0**	8.3	**10.6**
7	HUB 243	11.0	13.4	10.6	9.8	**11.2**	10.4	13.3	11.1	10.7	**11.4**	12.1	**11.6**
8	HUB 245	11.6	13.8	13.1	10.4	**12.2**	9.6	11.9	10.1	10.9	**10.6**	9.5	**10.8**
9	JB 301	11.6	12.1	11.8	11.0	**11.6**	10.9	11.7	11.1	10.8	**11.1**	11.2	**11.3**
10	JB 303	11.1	12.1	10.4	9.7	**10.8**	9.8	12.2	11.7	10.8	**11.1**	9.0	**10.3**
11	KB 1311	13.4	13.0	13.1	10.0	**12.4**	13.9	13.9	11.9	11.6	**12.8**	10.0	**11.7**
12	NDB 1608	10.5	13.4	9.7	8.8	**10.6**	12.3	13.7	13.3	11.0	**12.6**	9.5	**10.9**
13	NDB 1609	8.8	11.7	9.7	10.0	**10.1**	13.0	13.4	12.7	11.2	**12.6**	10.8	**11.1**
14	PL 883	9.6	12.5	11.7	9.9	**10.9**	10.4	14.6	10.3	11.0	**11.6**	12.2	**11.6**
15	PL 884	11.3	12.5	13.4	10.0	**11.8**	14.0	14.8	12.0	12.0	**13.2**	10.8	**11.9**
16	RD 2899	9.5	11.6	11.0	9.4	**10.4**	10.8	11.5	10.7	10.8	**11.0**	8.7	**10.0**
17	RD 2900	12.5	12.2	10.8	10.5	**11.5**	12.5	14.5	11.6	11.8	**12.6**	8.8	**11.0**
18	RD 2901	11.1	12.3	9.0	10.4	**10.7**	12.5	12.9	10.9	12.7	**12.3**	10.1	**11.0**
19	BH 902 ©	10.3	10.2	10.6	10.1	**10.3**	11.0	11.4	10.5	11.8	**11.2**	9.0	**10.7**
20	BH 946 ©	9.4	13.3	12.6	10.1	**11.4**	11.0	12.1	12.1	11.2	**11.6**	9.4	**10.8**
21	BH 959 ©	9.3	11.6	9.9	9.8	**10.2**	10.6	12.8	12.1	12.5	**12.0**	9.5	**10.6**
22	HUB 113 ©	11.0	11.1	9.3	10.6	**10.5**	11.4	12.5	11.5	11.5	**11.7**	9.9	**10.7**
23	JYOTI ©	10.8	12.8	13.3	11.2	**12.0**	12.4	13.5	11.3	11.3	**12.1**	10.8	**11.7**
24	RD 2552 ©	11.3	11.3	15.3	9.5	**11.9**	11.2	12.0	12.1	11.5	**11.7**	10.2	**11.3**
25	RD 2786 ©	11.3	13.2	14.6	8.9	**12.0**	13.1	14.1	9.9	13.2	**12.6**	9.3	**11.3**
	Mean	10.9	12.3	11.5	10.1	11.2	11.7	13.1	11.5	11.5	11.9	10.0	11.1

Table 16. Test weight (kg/hl) of entries from IVT (Rainfed) NEPZ

S.No.	Genotype	Varansi	Faizabad	Sabour	Rewa	Mean
1	DWRB 143	55.1	51.4	47.8	58.4	**53.2**
2	DWRB 145	59.4	55.6	55.0	63.2	**58.3**
3	HUB 240	53.0	54.3	48.9	58.6	**53.7**
4	HUB 241	51.9	51.6	47.6	56.8	**51.9**
5	HUB 242	51.5	51.2	45.4	57.2	**51.3**
6	JB 307	55.2	54.7	49.1	60.3	**54.8**
7	JB 308	46.5	47.4	42.4	53.2	**47.3**
8	KB 1313	45.2	46.2	41.8	53.2	**46.6**
9	KB 1318	48.5	50.4	46.3	58.1	**50.8**
10	KB 1320	45.6	49.9	44.6	55.8	**49.0**
11	KB 1323	54.7	56.5	46.3	62.0	**54.8**
12	NDB 1602	58.6	54.0	51.3	60.1	**56.0**
13	NDB 1607	54.8	55.9	52.0	60.5	**55.8**
14	PL 887	47.3	48.4	44.4	57.1	**49.3**
15	PL 889	55.0	57.4	53.0	66.5	**58.0**
16	RD 2913	52.2	42.0	47.3	55.6	**49.3**
17	RD 2914	51.3	45.4	44.0	51.2	**48.0**
18	RD 2915	50.5	45.8	42.6	49.5	**47.1**
19	RD 2916	58.0	53.0	51.5	58.3	**55.2**
20	K 603 ©	51.6	49.7	47.2	55.7	**51.0**
21	LAKHAN ©	51.5	53.2	47.4	56.6	**52.2**
	Mean	**52.2**	**51.1**	**47.4**	**57.5**	

Table 17. Thousand grain weight (g) of entries from IVT (Rainfed) NEPZ

S.No.	Genotype	Varansi	Faizabad	Sabour	Rewa	Kanpur	Mean
1	DWRB 143	42.3	30.9	39.6	36.3	36.7	37.2
2	DWRB 145	38.1	34.9	39.2	37.6	34.3	36.8
3	HUB 240	39.9	38.3	37.6	34.1	35.8	37.1
4	HUB 241	40.4	36.0	35.6	37.2	40.0	37.8
5	HUB 242	40.7	42.3	36.3	39.2	40.3	39.8
6	JB 307	30.2	38.5	36.3	35.0	36.1	35.2
7	JB 308	35.2	36.4	45.2	35.9	34.8	37.5
8	KB 1313	26.3	23.0	30.9	27.3	28.5	27.2
9	KB 1318	35.0	40.8	38.3	39.4	39.6	38.6
10	KB 1320	37.9	42.0	31.8	35.4	37.7	36.9
11	KB 1323	45.0	48.5	44.9	48.0	45.2	46.3
12	NDB 1602	47.7	38.8	53.5	41.2	35.3	43.3
13	NDB 1607	39.5	40.6	40.6	36.9	35.8	38.7
14	PL 887	33.0	32.4	39.0	34.2	37.3	35.2
15	PL 889	26.9	49.8	48.5	56.5	52.1	46.7
16	RD 2913	48.2	19.9	41.7	34.6	39.0	36.7
17	RD 2914	33.2	29.6	29.2	28.0	35.5	31.1
18	RD 2915	41.2	41.4	28.9	26.0	36.6	34.8
19	RD 2916	49.0	30.7	41.9	37.5	41.5	40.1
20	K 603 ©	40.4	37.8	44.6	37.4	41.3	40.3
21	LAKHAN ©	32.9	31.0	42.7	36.5	41.4	36.9
	Mean	**38.2**	**36.4**	**39.3**	**36.9**	**38.3**	

Table 18. Bold grain (%) of entries from IVT (Rainfed) NEPZ

S.No.	Genotype	Varansi	Faizabad	Sabour	Rewa	Mean
1	DWRB 143	72.7	59.5	57.1	62.1	**62.8**
2	DWRB 145	79.7	82.8	74.2	81.4	**79.5**
3	HUB 240	56.9	68.3	57.8	45.9	**57.2**
4	HUB 241	76.9	89.5	68.3	79.9	**78.6**
5	HUB 242	75.2	92.2	66.7	86.0	**80.0**
6	JB 307	67.4	80.9	58.6	71.7	**69.7**
7	JB 308	64.0	71.8	47.5	64.7	**62.0**
8	KB 1313	31.5	29.8	18.4	18.5	**24.5**
9	KB 1318	60.6	85.9	51.0	67.3	**66.2**
10	KB 1320	32.3	67.2	32.6	40.9	**43.3**
11	KB 1323	70.4	77.4	57.1	70.5	**68.8**
12	NDB 1602	91.8	81.7	84.2	85.1	**85.7**
13	NDB 1607	66.7	85.5	70.8	67.1	**72.5**
14	PL 887	44.7	73.8	34.3	46.7	**49.9**
15	PL 889	77.7	93.8	75.9	97.0	**86.1**
16	RD 2913	85.5	17.8	63.1	69.3	**58.9**
17	RD 2914	84.8	26.2	53.8	40.4	**51.3**
18	RD 2915	86.0	49.4	44.1	37.5	**54.2**
19	RD 2916	87.5	84.5	79.4	73.3	**81.2**
20	K 603 ©	51.3	59.5	36.6	30.8	**44.6**
21	LAKHAN ©	45.3	49.4	37.8	19.3	**37.9**
	Mean	**67.1**	**67.9**	**55.7**	**59.8**	

Table 19. Thin grain (%) of entries from IVT (Rainfed) NEPZ

S.No.	Genotype	Varansi	Faizabad	Sabour	Rewa	Mean
1	DWRB 143	7.3	16.2	12.2	8.4	**11.0**
2	DWRB 145	2.1	2.7	4.8	3.3	**3.2**
3	HUB 240	14.5	9.2	16.3	15.6	**13.9**
4	HUB 241	5.3	1.4	10.1	3.4	**5.1**
5	HUB 242	6.3	1.4	10.5	2.1	**5.0**
6	JB 307	6.7	3.6	11.4	4.5	**6.5**
7	JB 308	11.2	4.8	23.1	7.5	**11.6**
8	KB 1313	35.4	26.2	46.3	35.1	**35.7**
9	KB 1318	12.9	2.8	21.0	7.6	**11.1**
10	KB 1320	23.3	7.3	26.5	18.1	**18.8**
11	KB 1323	5.0	4.3	11.4	4.6	**6.3**
12	NDB 1602	1.2	3.5	4.9	2.5	**3.1**
13	NDB 1607	5.9	3.9	8.5	4.5	**5.7**
14	PL 887	21.2	5.6	33.8	18.9	**19.9**
15	PL 889	4.2	1.4	5.1	0.5	**2.8**
16	RD 2913	4.5	51.0	12.3	6.7	**18.6**
17	RD 2914	5.5	29.7	20.8	21.6	**19.4**
18	RD 2915	3.8	17.6	22.5	18.1	**15.5**
19	RD 2916	2.1	2.1	6.8	4.5	**3.9**
20	K 603 ©	14.9	11.3	25.1	20.7	**18.0**
21	LAKHAN ©	16.0	12.6	26.2	28.7	**20.9**
	Mean	**10.0**	**10.4**	**17.1**	**11.3**	

Table 20. Grain crude protein content (%) of entries from IVT (Rainfed) NEPZ

S.No.	Genotype	Varansi	Faizabad	Sabour	Rewa	Mean
1	DWRB 143	12.4	10.0	11.2	11.4	**11.3**
2	DWRB 145	13.4	11.3	13.4	14.3	**13.1**
3	HUB 240	11.0	9.0	10.3	11.3	**10.4**
4	HUB 241	12.3	9.9	10.2	10.9	**10.8**
5	HUB 242	12.3	9.7	12.0	10.7	**11.2**
6	JB 307	13.5	10.8	12.4	13.4	**12.5**
7	JB 308	11.7	9.9	13.8	11.6	**11.8**
8	KB 1313	13.5	10.8	11.0	12.7	**12.0**
9	KB 1318	12.3	9.8	11.0	10.8	**11.0**
10	KB 1320	12.8	9.4	10.3	12.8	**11.3**
11	KB 1323	12.8	10.8	11.5	12.2	**11.8**
12	NDB 1602	15.0	10.3	13.7	12.6	**12.9**
13	NDB 1607	12.8	14.1	13.8	10.7	**12.9**
14	PL 887	11.1	9.0	10.9	10.8	**10.5**
15	PL 889	13.5	10.7	11.1	12.8	**12.0**
16	RD 2913	12.5	15.0	11.4	9.9	**12.2**
17	RD 2914	14.2	15.3	13.0	11.4	**13.5**
18	RD 2915	12.5	10.1	12.2	12.6	**11.9**
19	RD 2916	13.4	10.9	12.1	11	**11.9**
20	K 603 ©	11.1	10.9	11.2	12.1	**11.3**
21	LAKHAN ©	10.9	10.9	10.1	12.9	**11.2**
	Mean	**12.6**	**10.9**	**11.7**	**11.9**	

Table 21. Test weight (kg/hl) of entries from AVT (SAL/ALK) in NWPZ/NEPZ

S.No.	Genotype	Faizabad -1	Faizabad-2	Hisar	Bawal	Rampur	Mean
1	BH 996	45.2	42.5	48.4	45.1	56.5	**47.5**
2	BH 997	55.2	55.2	59.5	56.7	60.0	**57.3**
3	BH 998	48.5	45.7	56.9	50.1	61.5	**52.6**
4	DWRB 144	48.4	54.8	57.4	51.3	61.6	**54.7**
5	DWRB 145	54.3	57.5	57.8	52.2	57.8	**55.9**
6	KB 1302	45.7	61.3	55.1	54.1	50.0	**53.2**
7	KB 1313	46.6	48.8	55.9	49.9	57.0	**51.6**
8	KB 1326	51.0	48.1	59.3	48.6	59.9	**53.4**
9	NDB 1618	53.9	57.5	60.5	52.7	59.0	**56.7**
10	NDB 1621	46.2	52.2	54.4	50.0	59.4	**52.4**
11	NDB 1622	45.5	44.1	47.3	41.4	59.6	**47.6**
12	NDB 1623	51.0	57.7	54.5	52.0	NA	**53.8**
13	RD 2907	47.1	47.1	55.0	49.1	59.5	**51.6**
14	RD 2908	45.6	42.9	48.8	50.9	55.5	**48.7**
15	RD 2909	46.7	33.3	51.2	49.7	62.7	**48.7**
16	RD 2910	46.9	37.4	47.0	54.3	60.8	**49.3**
17	NDB 1173 ©	48.5	47.3	55.4	49.9	58.0	**51.8**
18	RD 2552 ©	49.0	46.9	51.3	52.0	48.9	**49.6**
19	RD 2794 ©	48.4	51.3	51.3	49.2	63.3	**52.7**
	Mean	**48.6**	**49.0**	**54.0**	**50.5**	**58.4**	

Table 22. Thousand grain weight (g) of entries from AVT (SAL/ALK) in NWPZ/NEPZ

Genotype	Faizabad -1	Faizabad-2	Hisar	Bawal	Rampur	Kanpur	Mean
BH 996	33.4	25.3	34.7	29.0	48.6	35.5	**34.4**
BH 997	46.9	41.3	48.4	37.6	43.3	42.0	**43.2**
BH 998	34.5	22.5	40.8	32.7	55.0	36.6	**37.0**
DWRB 144	29.9	33.7	29.0	28.7	41.7	32.6	**32.6**
DWRB 145	38.9	36.7	39.1	33.0	39.9	35.8	**37.2**
KB 1302	29.5	26.7	31.1	35.4	42.5	31.2	**32.7**
KB 1313	26.8	28.8	32.3	28.9	42.1	31.0	**31.7**
KB 1326	34.6	29.4	48.0	29.6	54.5	39.2	**39.2**
NDB 1618	33.1	37.5	44.1	30.0	51.2	40.9	**39.5**
NDB 1621	33.0	32.1	35.9	27.0	45.6	38.0	**35.3**
NDB 1622	32.9	25.6	24.9	27.3	50.8	31.7	**32.2**
NDB 1623	31.3	32.9	40.5	31.8	NA	35.5	**34.4**
RD 2907	37.8	33.3	41.9	36.2	47.2	39.5	**39.3**
RD 2908	32.2	28.6	41.8	36.8	43.6	34.4	**36.2**
RD 2909	30.1	26.3	32.1	29.3	47.2	29.5	**32.4**
RD 2910	29.5	22.8	31.5	33.6	55.8	36.4	**34.9**
NDB 1173 ©	33.1	32.0	36.3	32.3	48.7	39.6	**37.0**
RD 2552 ©	35.4	29.0	37.4	32.0	41.2	38.0	**35.5**
RD 2794 ©	31.4	32.3	40.3	29.7	56.2	35.6	**37.6**
Mean	**33.4**	**30.4**	**37.4**	**31.6**	**47.5**	**36.0**	

Table 23. Bold grain (%) of entries from AVT (SAL/ALK) in NWPZ/NEPZ

S.No.	Genotype	Faizabad -1	Faizabad-2	Hisar	Bawal	Rampur	Mean
1	BH 996	48.8	29.8	64.1	47.9	95.2	**57.1**
2	BH 997	92.9	69.3	87.7	77.1	79.2	**81.2**
3	BH 998	64.9	10.2	83.9	69.3	98.2	**65.3**
4	DWRB 144	47.6	51.0	57.7	46.6	78.8	**56.3**
5	DWRB 145	76.0	70.7	79.0	62.1	94.5	**76.5**
6	KB 1302	43.0	23.6	49.4	63.0	86.3	**53.1**
7	KB 1313	21.2	40.9	68.1	47.2	85.0	**52.5**
8	KB 1326	36.7	16.3	85.9	61.0	90.2	**58.0**
9	NDB 1618	49.7	71.8	85.1	44.8	97.8	**69.8**
10	NDB 1621	55.7	60.0	79.5	56.3	89.7	**68.2**
11	NDB 1622	43.8	13.6	43.7	27.1	79.2	**41.5**
12	NDB 1623	61.7	58.3	74.3	50.9	NA	**61.3**
13	RD 2907	81.7	40.0	91.4	70.1	85.1	**73.7**
14	RD 2908	48.8	19.3	62.2	64.2	86.3	**56.1**
15	RD 2909	72.0	7.5	73.3	57.6	86.1	**59.3**
16	RD 2910	52.7	2.7	41.5	80.2	96.1	**54.6**
17	NDB 1173 ©	7.1	11.5	48.4	28.0	88.5	**36.7**
18	RD 2552 ©	54.7	30.8	70.7	46.1	68.3	**54.1**
19	RD 2794 ©	59.8	53.9	69.1	50.8	97.2	**66.1**
	Mean	**53.6**	**35.9**	**69.2**	**55.3**	**87.9**	

Table 24. Thin grain (%) of entries from AVT (SAL/ALK) in NWPZ/NEPZ

S.No.	Genotype	Faizabad -1	Faizabad-2	Hisar	Bawal	Rampur	Mean
1	BH 996	15.4	34.7	11.4	20.9	1.3	**16.7**
2	BH 997	0.9	5.5	2.6	6.8	4.3	**4.0**
3	BH 998	7.5	62.3	3.5	9.4	0.5	**16.6**
4	DWRB 144	16.0	15.4	13.5	24.0	4.6	**14.7**
5	DWRB 145	4.8	5.9	4.8	14.4	1.1	**6.2**
6	KB 1302	24.5	39.6	16.6	16.4	2.7	**20.0**
7	KB 1313	36.2	22.8	7.6	19.4	2.0	**17.6**
8	KB 1326	18.8	42.2	3.2	16.8	2.7	**16.7**
9	NDB 1618	14.0	6.3	2.7	22.8	0.5	**9.3**
10	NDB 1621	10.3	9.2	3.8	16.7	0.7	**8.2**
11	NDB 1622	18.1	47.7	21.8	34.1	4.7	**25.3**
12	NDB 1623	9.3	13.2	2.2	17.9	NA	**10.6**
13	RD 2907	3.5	22.6	1.1	11.2	3.0	**8.3**
14	RD 2908	13.4	11.3	11.8	11.4	2.8	**10.2**
15	RD 2909	5.6	52.9	5.8	17.4	1.3	**16.6**
16	RD 2910	14.4	40.4	25.7	5.9	1.2	**17.5**
17	NDB 1173 ©	39.4	33.4	19.6	35.9	2.7	**26.2**
18	RD 2552 ©	11.3	30.5	7.0	20.9	5.9	**15.1**
19	RD 2794 ©	8.0	15.9	8.1	22.9	0.7	**11.1**
	Mean	**14.3**	**26.9**	**9.1**	**18.2**	**2.4**	

Table 25. Grain crude protein content (%) of entries from AVT (SAL/ALK) in NWPZ/NEPZ

S.No.	Genotype	Faizabad -1	Faizabad-2	Hisar	Bawal	Rampur	Mean
1	BH 996	14.1	12.8	11.2	11.3	9.8	**11.8**
2	BH 997	14.6	14.9	10.5	12.1	9.4	**12.3**
3	BH 998	14.4	15.1	11.4	12.8	9.9	**12.7**
4	DWRB 144	15.5	12.7	12.1	11.9	12.0	**12.8**
5	DWRB 145	13.0	14.7	12.4	11.7	9.4	**12.2**
6	KB 1302	15.9	16.5	11.6	14.1	11.6	**13.9**
7	KB 1313	15.8	14.1	10.4	13.1	10.3	**12.7**
8	KB 1326	12.8	14.1	11.4	12.4	9.6	**12.1**
9	NDB 1618	16.9	15.3	9.6	13.6	10.9	**13.3**
10	NDB 1621	14.0	14.3	11.8	13.6	11.0	**12.9**
11	NDB 1622	15.5	14.1	12.2	12.4	10.9	**13.0**
12	NDB 1623	16.3	13.9	11.1	12.0	0.0	**10.7**
13	RD 2907	12.5	12.1	11.2	12.5	10.1	**11.7**
14	RD 2908	14.3	15.8	11.8	12.2	9.5	**12.7**
15	RD 2909	13.1	13.8	11.3	13.1	9.8	**12.2**
16	RD 2910	13.9	16.9	12.8	12.6	11.3	**13.5**
17	NDB 1173 ©	13.6	13.6	12.4	12.2	11.5	**12.7**
18	RD 2552 ©	12.3	11.4	9.7	11.2	11.5	**11.2**
19	RD 2794 ©	13.7	13.5	10.6	13.4	12.3	**12.7**
	Mean	**14.3**	**14.2**	**11.3**	**12.5**	**10.0**	

Table 26. Test weight (kg/hl) of entries from IVT (Dual Purpose Barley)

S.No.	Genotype	Hisar	Ludhiana	Durgapura	Average	Anand	Kota	Udaipur	Average	Faizadbad	Varanasi	Rewa	Average	O Avg
1	BH 998	51.4	56.3	62.4	**56.7**	52.9	60.2	55.7	**56.3**	45.5	48.8	56.9	**50.4**	**54.5**
2	BH 999	46.3	44.1	53.8	**48.1**	52.3	50.3	53.2	**51.9**	38.3	35.9	48.2	**40.8**	**46.9**
3	HUB 244	56.2	54.5	62.5	**57.7**	52.5	57.6	58.1	**56.1**	44.6	42.0	54.2	**46.9**	**53.6**
4	JB 312	52.8	51.4	58.5	**54.3**	53.9	57.2	58.7	**56.6**	43.7	42.3	57.3	**47.8**	**52.9**
5	KB 1319	54.8	57.3	65.3	**59.1**	52.0	60.6	56.5	**56.4**	54.4	54.3	61.3	**56.7**	**57.4**
6	KB 1325	55.0	58.5	63.9	**59.1**	52.5	60.9	57.8	**57.1**	46.9	39.2	62.5	**49.6**	**55.2**
7	NDB 1610	51.5	51.1	50.9	**51.2**	54.6	59.1	60.7	**58.1**	44.2	45.1	58.2	**49.2**	**52.8**
8	NDB 1614	50.2	52.8	62.5	**55.2**	51.2	59.4	58.8	**56.4**	49.6	44.9	58.5	**51.0**	**54.2**
9	RD 2903	49.0	53.2	58.8	**53.7**	54.3	53.9	55.3	**54.5**	43.7	41.5	57.5	**47.5**	**51.9**
10	RD 2904	52.5	55.3	62.7	**56.9**	50.8	59.7	57.7	**56.1**	44.0	49.2	57.4	**50.2**	**54.4**
11	RD 2905	50.6	51.4	60.5	**54.2**	52.5	57.6	58.8	**56.3**	45.0	48.6	55.8	**49.8**	**53.4**
12	RD 2906	48.6	52.0	55.8	**52.1**	51.7	57.6	60.4	**56.6**	40.4	31.3	50.3	**40.7**	**49.8**
13	VPB 1046	51.9	55.5	59.7	**55.7**	47.6	57.7	57.4	**54.2**	45.0	43.9	57.9	**49.0**	**53.0**
14	AZAD ©	52.5	52.3	54.0	**52.9**	54.9	54.8	58.1	**55.9**	48.2	44.9	56.6	**49.9**	**52.9**
15	RD 2035 ©	51.5	51.6	44.5	**49.2**	53.8	56.7	59.0	**56.5**	42.2	37.0	55.4	**44.9**	**50.2**
16	RD 2552 ©	49.9	52.9	55.3	**52.7**	48.3	54.9	58.3	**53.8**	44.3	36.6	53.0	**44.7**	**50.4**
17	RD 2715 ©	44.3	43.3	58.1	**48.6**	51.2	49.4	55.4	**52.0**	48.9	NA	50.3	**49.6**	**50.1**
	Mean	**51.1**	**52.6**	**58.2**	**54.0**	**52.2**	**56.9**	**57.6**	**55.6**	**45.2**	**42.8**	**56.0**	**48.1**	**52.6**

Table 27. Thousand grain weight (g) of entries from IVT (Dual Purpose Barley)

S.No.	Genotype	Hisar	Ludhiana	Durgapura	Average	Anand	Kota	Udaipur	Average	Faizadbad	Varanasi	Rewa	Average	O Avg
1	BH 998	34.0	39.9	37.3	**37.1**	36.7	42.1	40.5	**39.7**	23.8	30.2	35.3	**29.8**	**35.5**
2	BH 999	30.7	34.7	35.2	**33.5**	32.8	32.1	38.3	**34.4**	22.8	20.6	32.9	**25.5**	**31.1**
3	HUB 244	40.7	41.1	38.1	**39.9**	39.4	38.8	39.7	**39.3**	27.0	26.0	35.2	**29.4**	**36.2**
4	JB 312	37.6	40.4	33.4	**37.2**	41.4	41.6	40.4	**41.1**	27.6	28.2	37.9	**31.2**	**36.5**
5	KB 1319	33.4	38.0	39.4	**36.9**	36.0	41.2	38.8	**38.7**	32.8	36.6	41.2	**36.8**	**37.5**
6	KB 1325	42.2	54.2	49.8	**48.7**	26.9	52.7	42.3	**40.6**	29.9	28.1	50.7	**36.2**	**41.9**
7	NDB 1610	32.9	33.0	23.7	**29.9**	38.2	33.6	36.9	**36.2**	24.9	22.6	32.7	**26.7**	**30.9**
8	NDB 1614	33.8	37.4	37.0	**36.0**	33.8	41.2	40.5	**38.5**	30.6	26.7	36.6	**31.3**	**35.3**
9	RD 2903	36.4	42.9	37.0	**38.8**	33.1	39.5	38.1	**36.9**	31.4	27.5	45.2	**34.7**	**36.8**
10	RD 2904	37.2	43.4	39.0	**39.9**	31.6	38.9	39.8	**36.8**	25.5	31.4	37.0	**31.3**	**36.0**
11	RD 2905	38.4	42.2	35.9	**38.8**	33.0	38.7	40.4	**37.4**	27.5	31.6	42.1	**33.7**	**36.6**
12	RD 2906	28.6	42.1	31.9	**34.2**	34.3	35.9	42.5	**37.5**	21.7	26.6	31.1	**26.5**	**32.7**
13	VPB 1046	33.2	41.3	35.5	**36.7**	31.8	36.8	39.1	**35.9**	25.9	26.6	32.8	**28.4**	**33.7**
14	AZAD ©	37.3	38.5	32.4	**36.1**	34.2	36.2	39.2	**36.5**	28.2	27.9	39.1	**31.7**	**34.8**
15	RD 2035 ©	31.7	37.8	16.4	**28.6**	37.2	32.2	36.8	**35.4**	22.1	20.7	32.2	**25.0**	**29.7**
16	RD 2552 ©	33.5	40.0	26.6	**33.4**	25.1	32.8	38.8	**32.2**	23.8	27.0	32.2	**27.7**	**31.1**
17	RD 2715 ©	26.2	29.6	37.2	**31.0**	31.1	30.5	42.2	**34.6**	37.4	NA	31.0	**34.2**	**33.3**
	Mean	**34.6**	**39.8**	**34.5**	**36.3**	**33.9**	**37.9**	**39.7**	**37.2**	**27.2**	**27.4**	**36.8**	**30.6**	**34.7**

Table 28. Bold grains (%) of entries from IVT (Dual Purpose Barley)

S.No.	Genotype	Hisar	Ludhiana	Durgapura	Average	Anand	Kota	Udaipur	Average	Faizadbad	Varanasi	Rewa	Average	O Avg
1	BH 998	64.8	82.9	66.1	**71.3**	53.0	91.7	59.2	**67.9**	23.5	45.3	66.3	**45.0**	**61.4**
2	BH 999	40.5	51.5	52.0	**48.0**	30.5	49.0	72.7	**50.7**	12.2	13.9	32.1	**19.4**	**39.4**
3	HUB 244	66.1	57.6	39.3	**54.3**	38.2	47.6	65.7	**50.5**	19.4	14.5	24.8	**19.5**	**41.5**
4	JB 312	59.9	76.5	39.0	**58.5**	75.2	60.3	67.5	**67.7**	10.7	13.5	47.0	**23.7**	**50.0**
5	KB 1319	58.6	77.0	74.6	**70.1**	58.3	77.7	51.2	**62.4**	66.1	84.5	76.4	**75.7**	**69.4**
6	KB 1325	68.9	90.5	62.5	**74.0**	21.3	80.0	60.4	**53.9**	35.3	17.3	67.8	**40.1**	**56.0**
7	NDB 1610	48.7	34.6	6.9	**30.1**	67.0	55.0	57.5	**59.8**	8.5	11.2	38.2	**19.3**	**36.4**
8	NDB 1614	41.5	58.4	70.4	**56.7**	47.0	67.5	65.5	**60.0**	24.6	23.1	40.1	**29.3**	**48.7**
9	RD 2903	55.0	75.8	39.0	**56.6**	55.0	62.8	66.5	**61.5**	48.4	31.3	71.3	**50.4**	**56.1**
10	RD 2904	75.8	86.8	66.8	**76.5**	42.1	81.9	75.5	**66.5**	21.7	39.0	66.2	**42.3**	**61.8**
11	RD 2905	80.3	86.4	61.3	**76.0**	56.8	70.6	67.0	**64.8**	36.8	48.3	76.7	**53.9**	**64.9**
12	RD 2906	38.3	66.8	43.2	**49.5**	59.3	65.3	79.4	**68.0**	22.3	6.7	48.4	**25.8**	**47.8**
13	VPB 1046	71.3	82.5	57.5	**70.4**	34.0	70.3	70.5	**58.2**	22.2	34.5	63.6	**40.1**	**56.2**
14	AZAD ©	45.0	53.5	12.4	**37.0**	41.7	27.7	57.6	**42.3**	5.8	6.7	23.8	**12.1**	**30.5**
15	RD 2035 ©	40.9	52.3	6.9	**33.3**	39.2	40.4	64.7	**48.1**	5.6	13.8	44.1	**21.2**	**34.2**
16	RD 2552 ©	53.0	69.9	27.6	**50.2**	26.2	41.1	74.8	**47.4**	9.8	15.5	49.4	**24.9**	**40.8**
17	RD 2715 ©	29.5	47.8	68.3	**48.5**	63.9	44.3	71.6	**59.9**	39.4	NA	51.8	**45.6**	**51.4**
	Mean	**55.2**	**67.7**	**46.7**	**56.5**	**47.6**	**60.8**	**66.3**	**58.2**	**24.3**	**26.2**	**52.2**	**34.6**	**49.8**

Table 29. Thin grains (%) of entries from IVT (Dual Purpose Barley)

S.No.	Genotype	Hisar	Ludhiana	Durgapura	Average	Anand	Kota	Udaipur	Average	Faizadbad	Varanasi	Rewa	Average	O Avg
1	BH 998	11.1	3.4	12.2	**8.9**	5.9	1.7	9.7	**5.8**	37.5	17.7	11.2	**22.1**	**12.3**
2	BH 999	24.5	18.0	17.0	**19.9**	13.8	16.3	5.2	**11.8**	56.4	49.8	29.1	**45.1**	**25.6**
3	HUB 244	7.2	9.3	16.7	**11.0**	9.0	11.1	6.5	**8.9**	44.3	57.2	26.1	**42.5**	**20.8**
4	JB 312	NA	4.7	27.6	**16.2**	7.7	2.0	6.2	**5.3**	52.0	49.2	13.0	**38.1**	**19.8**
5	KB 1319	9.0	3.2	4.7	**5.6**	7.2	4.1	12.0	**7.8**	6.7	2.2	2.0	**3.6**	**5.7**
6	KB 1325	5.4	1.3	9.2	**5.3**	36.9	1.7	7.6	**15.4**	24.1	43.3	5.6	**24.3**	**15.0**
7	NDB 1610	17.8	17.4	69.8	**35.0**	4.5	11.7	6.4	**7.5**	57.7	56.5	15.4	**43.2**	**28.6**
8	NDB 1614	20.3	9.8	7.6	**12.6**	20.1	6.2	6.5	**11.0**	30.5	43.6	14.9	**29.7**	**17.7**
9	RD 2903	12.5	4.5	23.9	**13.6**	16.3	8.5	7.8	**10.9**	14.8	34.8	4.3	**17.9**	**14.1**
10	RD 2904	6.0	3.3	6.0	**5.1**	11.2	2.9	4.2	**6.1**	34.0	25.2	9.1	**22.8**	**11.3**
11	RD 2905	4.2	3.0	13.9	**7.0**	5.6	6.8	6.8	**6.4**	24.4	16.9	4.6	**15.3**	**9.6**
12	RD 2906	22.7	10.0	25.4	**19.3**	12.7	7.8	2.6	**7.7**	44.1	37.6	14.3	**32.0**	**19.7**
13	VPB 1046	6.6	3.4	12.7	**7.6**	26.8	6.5	7.1	**13.5**	32.6	27.5	10.6	**23.6**	**14.9**
14	AZAD ©	15.4	13.5	56.2	**28.4**	8.9	30.0	9.6	**16.2**	57.3	64.0	26.6	**49.3**	**31.3**
15	RD 2035 ©	19.7	12.5	75.6	**35.9**	20.2	20.0	6.9	**15.7**	64.7	63.3	17.4	**48.5**	**33.3**
16	RD 2552 ©	17.0	6.4	39.7	**21.0**	37.5	21.2	3.4	**20.7**	49.7	57.9	17.0	**41.5**	**27.7**
17	RD 2715 ©	36.0	19.2	8.8	**21.3**	12.9	21.5	5.3	**13.2**	15.2	NA	11.3	**13.2**	**15.9**
	Mean	**14.7**	**8.4**	**25.1**	**16.1**	**15.1**	**10.6**	**6.7**	**10.8**	**38.0**	**40.4**	**13.7**	**30.2**	**19.0**

Table 30. Grain crude protein content (%) of entries from IVT (Dual Purpose Barley)

S.No.	Genotype	Hisar	Ludhiana	Durgapura	Average	Anand	Kota	Udaipur	Average	Faizadbad	Varanasi	Rewa	Average	O Avg
1	BH 998	13.8	11.6	16.7	**14.0**	11.0	11.3	13.2	**11.8**	15.8	15.0	11.9	**14.2**	**13.4**
2	BH 999	13.0	12.2	12.6	**12.6**	11.7	10.9	12.1	**11.6**	12.8	12.8	12.1	**12.6**	**12.2**
3	HUB 244	13.0	11.8	15.3	**13.4**	11.5	11.4	14.8	**12.6**	12.4	12.7	11.3	**12.1**	**12.7**
4	JB 312	12.7	11.9	14.8	**13.1**	11.0	13.8	13.2	**12.7**	12.4	13.2	12.0	**12.5**	**12.8**
5	KB 1319	14.3	12.2	13.9	**13.5**	11.7	14.5	14.6	**13.6**	14.6	16.9	14.4	**15.3**	**14.1**
6	KB 1325	13.4	12.0	13.3	**12.9**	12.1	11.1	15.6	**12.9**	12.8	13.1	11.2	**12.4**	**12.7**
7	NDB 1610	12.3	11.4	14.5	**12.7**	12.3	12.7	13.6	**12.9**	12.1	13.0	12.4	**12.5**	**12.7**
8	NDB 1614	12.1	11.8	12.7	**12.2**	12.1	9.6	13.5	**11.7**	12.3	14.3	11.1	**12.6**	**12.2**
9	RD 2903	11.1	10.6	11.5	**11.1**	11.7	9.8	12.3	**11.3**	10.2	11.1	10.5	**10.6**	**11.0**
10	RD 2904	13.4	12.2	14.9	**13.5**	11.0	10.7	12.0	**11.2**	11.3	13.4	11.2	**12.0**	**12.2**
11	RD 2905	12.6	12.5	14.1	**13.1**	13.2	13.0	11.8	**12.7**	12.6	13.0	12.0	**12.5**	**12.8**
12	RD 2906	12.6	12.9	15.6	**13.7**	12.0	9.4	13.9	**11.8**	12.7	14.6	10.3	**12.5**	**12.7**
13	VPB 1046	11.0	11.3	13.6	**12.0**	11.4	11.1	11.8	**11.4**	12.9	14.7	12.3	**13.3**	**12.2**
14	AZAD ©	14.1	12.8	14.5	**13.8**	10.7	14.8	12.5	**12.7**	10.0	11.8	12.3	**11.4**	**12.6**
15	RD 2035 ©	11.6	10.3	12.3	**11.4**	12.6	11.3	13.4	**12.4**	10.4	13.2	10.5	**11.4**	**11.7**
16	RD 2552 ©	11.7	9.9	14.8	**12.1**	10.1	11.8	12.6	**11.5**	13.7	12.7	10.7	**12.4**	**12.0**
17	RD 2715 ©	12.3	11.4	12.3	**12.0**	12.5	11.6	11.2	**11.8**	11.9	NA	12.2	**12.1**	**11.9**
	Mean	**12.6**	**11.7**	**14.0**	**12.8**	**11.7**	**11.7**	**13.1**	**12.1**	**12.4**	**13.5**	**11.7**	**12.5**	**12.5**

Table 31. Test weight (kg/hl), thousand grain weight and grain crude protein of entries from AVT (Dual Purpose Barley) in North Hill Zone

S No	Genotype	Test weight (kg/hl)			Thousand grain weight (g)			Bold grain (%)			Thin grain (%)			Protein (% dwb)		
		Bajaura	Shimla	Mean	Bajaura	Shimla	Mean	Bajaura	Shimla	Mean	Bajaura	Shimla	Mean	Bajaura	Shimla	Mean
1	BHS 438	52.7	65.2	**59.0**	32.6	44.1	**38.4**	64.0	79.8	**71.9**	7.4	6.3	**6.8**	7.2	10.3	**8.8**
2	BHS 439	59.7	67.2	**63.4**	32.0	30.5	**31.3**	79.2	66.0	**72.6**	3.6	11.4	**7.5**	7.9	11.0	**9.5**
3	BHS 440	56.0	65.3	**60.6**	37.3	40.9	**39.1**	63.4	76.1	**69.7**	11.4	6.7	**9.1**	7.1	9.2	**8.2**
4	BHS 441	55.5	65.6	**60.5**	36.5	40.6	**38.5**	61.5	70.3	**65.9**	5.4	7.4	**6.4**	7.6	10.2	**8.9**
5	BHS 442	56.3	61.5	**58.9**	32.1	45.0	**38.5**	65.6	87.0	**76.3**	8.6	3.0	**5.8**	7.1	9.8	**8.5**
6	FILLER	54.6	68.9	**61.7**	31.5	34.8	**33.2**	17.4	31.0	**24.2**	18.8	12.8	**15.8**	7.3	10.1	**8.7**
7	HBL 722	58.2	69.9	**64.1**	38.2	42.1	**40.2**	87.7	91.5	**89.6**	1.9	2.9	**2.4**	7.5	10.1	**8.8**
8	HBL 723	53.7	65.0	**59.3**	34.2	39.9	**37.1**	74.3	85.5	**79.9**	6.9	4.5	**5.7**	7.4	9.6	**8.5**
9	HBL 736	54.7	65.2	**59.9**	31.4	35.8	**33.6**	53.2	61.2	**57.2**	12.8	11.8	**12.3**	7.6	11.7	**9.7**
10	HBL 737	52.2	65.5	**58.9**	33.5	37.1	**35.3**	37.6	57.6	**47.6**	24.4	13.9	**19.1**	7.4	11.0	**9.2**
11	HBL 738	64.9	70.6	**67.8**	38.4	41.6	**40.0**	83.9	77.0	**80.4**	2.2	4.0	**3.1**	9.0	11.4	**10.2**
12	VLB 141	55.3	64.7	**60.0**	37.7	42.2	**39.9**	72.7	86.1	**79.4**	7.8	3.5	**5.6**	7.5	9.0	**8.3**
13	VLB 142	54.7	77.6	**66.1**	29.5	33.2	**31.4**	42.3	26.5	**34.4**	12.3	26.5	**19.4**	8.7	12.0	**10.4**
14	VLB 143	74.0	77.8	**75.9**	38.0	37.5	**37.7**	16.5	43.5	**30.0**	36.6	17.3	**26.9**	8.3	10.8	**9.6**
15	VLB 144	63.0	69.0	**66.0**	33.2	33.4	**33.3**	67.4	67.4	**67.4**	5.4	8.0	**6.7**	7.7	9.8	**8.8**
16	VLB 145	54.9	64.8	**59.8**	31.7	46.5	**39.1**	66.6	89.3	**77.9**	9.4	3.1	**6.3**	7.0	9.7	**8.4**
17	BHS 380 (c)	57.3	64.3	**60.8**	34.4	31.4	**32.9**	65.7	44.7	**55.2**	5.7	19.5	**12.6**	7.4	10.1	**8.8**
18	BHS 400 (c)	54.9	63.1	**59.0**	35.6	41.7	**38.7**	56.8	60.5	**58.6**	10.9	14.9	**12.9**	7.3	11.8	**9.6**
19	HBL 276 (c)	74.1	77.8	**75.9**	30.2	29.5	**29.8**	21.4	39.5	**30.4**	27.3	34.8	**31.0**	8.6	10.8	**9.7**
	Mean	**58.2**	**67.8**		**34.1**	**38.3**		**57.7**	**65.3**		**11.5**	**11.2**		**7.7**	**10.4**	

ZONAL MONITORING REPORTS

Proforma for Zonal Monitoring Report 2014-15

Zone: NHZ

Period of visit: 06.04.2015 to 09.04.2015

Name of team members:

Name	Centre
Dr Satish Kumar	ICAR-IIWBR, Karnal
Dr Anil Khippal	ICAR-IWBR, Karnal
Dr Lakshmi Kant,	ICAR-VPKAS, Almora
Dr S.K. Rana	CSK HPKV Rice & Wheat, Research Centre, Malan
Dr Madhu Patial	ICAR-IARI-RS, Shimla

Centres visited:

Centre	Date
06.04.15	Una, Akrot, Bara
07.04.15	Kangra, Malan, Palampur
08.04.15	Bajaura, Katrain
09.04.2015	Berthin

Trials not conducted:

Centre	Trial	Remark
Sundernagar	AVT-LS-RI	Not Conducted
	Barley-Grain	Not Conducted

Entries recommended for purification:

Trial	Entries	Remark
AVT-ES-RF	NHESZ 1408	Late maturing off-types
IVT-TS-RF&IR	NHIZ 1412	Late maturing off-types, Waxy/Non waxy types
	NHIZ 1414, NHIZ 1417	Early/Late maturing types
SPL-TCL-RF-TS	SPL-TCL-01, SPL-TCL-02	Off types
Barley-Grain	NHGBZ 1407	Two rowed off type plants
	NHGBZ 1411	Two rowed off type plants
	NHGBZ 1420	Taller off types

Entries recommended to be dropped from further testing:

Trial	Entries	Remark
IVT-TS-RF & IR	NHIZ 1418	Variation for early/late types, brown/white ears
	NHIZ 1423	Variation for plant height and ear shape
SPL-TCL-RF-TS	SPL-TCL-07	Mixture for ear shape and plant height
Barley-Grain	NHGBZ 1408	Mixture of six rowed in two rowed barley up to 40%

Entries exhibiting higher diseases (More than 20S:

Barley-Grain	
NHGBZ 1409	YR-More than 20S
NHGBZ 1402, NHGBZ 1403, NHGBZ 1405, NHGBZ 1406, NHGBZ 1407, NHGBZ 1408, NHGBZ 1411, NHGBZ 1412, NHGBZ 1413, NHGBZ 1414, NHGBZ 1415, NHGBZ 1415, NHGBZ 1416, NHGBZ 1417, NHGBZ 1418, NHGBZ 1419	LB more than 33
NHGBZ 1413, NHGBZ 1416	BSD more than 10%
Barley-Dual	
NHDBZ 1406, NHDBZ 1408, NHDBZ 1415	BSD more than 10%

Report on Agronomical Trials:

Trial	Centre	Remark
Wheat		
RF-TS-TAS-LON	Malan, Bajaura	Very good, entry V5 exhibited higher yellow rust up to 60S
IR-TS-TAS-DOS	Malan, Bajaura	Very good, entry V5 exhibited higher yellow rust up to 60S
SPL – 1	Malan, Bajaura	Very good
SPL – 2	Malan	Very good
Barley		
SPL – 1	Malan, Bajaura	Very good
SPL – 5	Malan, Bajaura	Very good
SPL – 6	Malan, Bajaura	Very good at Bajaura, Rejected at Malan due to poor site and suggested change of field site for this experiment
SPL – 8	Malan, Bajaura	Very good

Report on Pathological Nurseries:

Nursery	Centre	Remark
IPPSN	Malan	Very good disease pressure
PPSN	Malan, Bajaura	Very good disease pressure
PMSN	Malan, Bajaura	Very good disease pressure
HBSN	Malan	Very good disease pressure

Report on Physiology Trials MLHT-1 & 2:

Centre	Remark
N.A	

Special comments, if any

1. Trial conduction was very good at all the locations. However the yellow rust incidence was high across the locations.
2. The duration of the zonal monitoring should be increased at least by two days. I hilly and difficult terrain it is difficult to cover more number of locations/trials at shorter time and give proper attention to the monitoring.

Signature of the monitoring team

Satish 9.4.15
(Satish Kumar)

(Madhu Patial)

(S K Rana)

(Anil Khippal) 9/4/15

(Lakshmi Kant) 9/4/15

Monitoring Report of Hill Zone

Period of Visit: 14-16 April, 2015

Name of Team members

Dr. Dharam Pal, IARI, Regional Station, Shimla
Dr. Jogendra Singh, ICAR-IIWBR, Karnal
Dr. S.K. Jain, ICAR- VPKAS, Almora
Dr. Rajpal Meena, ICAR-IIWBR, Karnal
Dr. Anil Kumar, G.B Pant University of Agri. & Tech., Pantnagar

Centres visited

Almora
Majhera
Dholakaun
Shimla

Breeding trials allocated and monitored:

Centre	Trial	Remark*
Almora	AVT-RF-Grain, AVT-RF-Dual purpose	Good
Majhera	AVT-RF-Grain, AVT-RF-Dual purpose	Very good
Dholakaun	AVT-MB-IR-TS	Lodging
Shimla	AVT-RF-Grain, AVT-RF-Dual purpose	Very good

*Evaluation trials as very good, good and average based on conduction

Trials not conducted/√ rejected by monitoring team

Centre	Trial	Remark
Almora	Effect of Nitrogen and its doses (20:40:60:80)	Due to hail storm and birds damage

Entries showing promising performance in breeding trials

Centre	Trial	Entry	Remarks
Almora	AVT-RF-Grain	NHGBZ 01, NHGBZ 03, NHGBZ 04,NHGBZ 18	
	AVT-RF-Dual	NHDBZ 5, NHDBZ 10, , NHDBZ 18	
Majhera	AVT-RF-Grain	NHGBZ 01, NHGBZ 02, NHGBZ 10, NHGBZ 18, NHGBZ 20	
	AVT-RF-Dual	NHDBZ 3, NHDBZ 5, NHDBZ 10, NHDBZ 12,	
Shimla	AVT-RF-Grain	NHGBZ 01, NHGBZ 04, NHGBZ 10, NHGBZ 11, NHGBZ 14, NHGBZ 18, NHGBZ 20	
	AVT-RF-Dual	NHDBZ 2, NHDBZ 7, NHDBZ 10, NHDBZ 18	
Dholakaun	AVT-MB-IR-TS	Entries were lodged therefore could not be judged properly.	

Entries recommended for purification

Trial	Entry	Remark
AVT-RF-GRAIN	NHGBZ-08	Few off types for rowed
AVT-RF-DUAL	NHDBZ-15	Few off types for rowed

Entries recommended to be dropped from further testing

Trial	Entry	Remarks
AVT-RF-Grain	nil	
AVT-RF-Dual	nil	
AVT-MB-IR-TS	nil	

Entries exhibiting higher diseases incidence/ insect infestation

Centre	Trial	Entry	Remarks
Amora	AVT-RF-Grain	NHGBZ 13 (20%), NHGBZ 16 (30%),	Stripe disease
	AVT-RF-Dual	NHDBZ 11 (60S), NHDBZ 14 (40S), NHDBZ 8 (20S), NHDBZ 17 (20S)	Stripe rust
Majhera	AVT-RF-Grain	NHGBZ 13 (20%), NHGBZ 16 (20%)	Stripe disease
	AVT-RF-Dual	NHDBZ 8 (20%)	Stripe disease
Shimla	AVT-RF-Grain	NHGBZ 13 (10%), NHGBZ 16 (20%),	Stripe disease
	AVT-RF-Dual	NHDBZ 8 (10%),	Stripe disease

Sd-
(Jogendra Singh)
Senior Scientist (Plant Breeding)
Barley Network
Indian Institute of Wheat and Barley
Research, Karnal-132001, Haryana

Sd-
(Rajpal Meena)
Senior Scientist (Agronomy)
Natural Resource Management
Indian Institute of Wheat and Barley
Research, Karnal- 132 001

Sd-
Dharm Pal
Principal Scientist (Plant Breeding)
IARI, RS, Shimla

Sd-
S.K. Jain
Principal Scientist (Plant Pathology)
VPKAS, Almora

Sd-
(Anil Kumar)
Assistant Professor (Plant Breeding)
Deptt. of Genetics and Plant Breeding
College of Agriculture,
G.B. Pant University of Agriculture & Technology,
Pantnagar, Utrakhand.

Barley Network (AICW&BIP)
Monitoring Report of NWPZ

Duration: 8th – 11th March 2015 **Locations visited:** Durgapura, Bawal, Rohatak, Hisar, and Ludhiana

Team Members :

Dr. PS Shekhawat, Barley Pathologist, ARS, Durgapura, Jaipur
Dr. AS Kharub, Pr. Scientist & PI, Barley Network, DWR, Karnal
Dr. SR Verma, Barley Breeder, CCSHAU HIsar
Dr. Simarjit Kaur, Barley Breeder, PAU Ludhiana
Dr Neelam, Agronomist, CCSHAU HIsar (Joined at Hisar and Ludhiana)

The team constituted by the Director, IIWBR, Karnal for monitoring of Barley Network Trials & Nurseries in NWPZ, assembled at Durgapura (Jaipur) on 8th March, 2015 and visited the different locations.

During the period, Dr RPS Verma, Barley Breeder, ICARDA and Dr Shobha Sivasanker, Programme Director, Dryland Cereals, ICRISAT also join the team and visited/ monitored international nurseries particularly and whole programme in general. Two field days were also organized during the monitoring one at Mundru(Sikar) on 08.03.15 and other in Jaipur district on 09.03.15.

A: Location wise observations

Durgapura

On 8th March, the team visited the barley trials at RARI, Durgapura. There were seven agronomy and eight breeding trials conducted at the centre. Most of the trials were lodged but technically trials were in good shape hence no trial was rejected by the team. No disease incidence was observed except covered smut on few entries. The team noticed the mixtures/segregation and rust score in advanced material.

Bawal

The team visited two AVT IVT trials on malt and one salinity trial conducted at Bawal on 9th March, 2015. Technically the trials were in good shape but due to heavy wind and rains, most of entries lodged.

Rohtak

The team visited the AVT malt trial at Rohtak on 9th March.. The trial was lodged due to wind and rains.

Hisar

On 9th and 10th March, the team visited the barley trials at HAU, Hisar. There were five agronomy and eight breeding trials conducted at the centre. All the trials and nurseries were in very good condition; hence no trial was rejected by the team. No disease incidence was observed except covered smut on few entries. There was no lodging at the time of monitoring except a few.

Hisar (IIWBR)

The team visited one dual purpose trial and one salinity trial on 10th March. Both the trials are in were in good shape.

Ludhiana

The team visited at the centre on 11th March in the afternoon. All the six allotted trials (AVT & IVT) and nurseries were conducted at the centre. Trials were in good condition and the crop expression was very good. All allotted IBDSN / NBDSN/ EBDSN disease/ pest screening nurseries along with chemical control trials were conducted with good incidence of the disease/pests on the infector lines. Eight agronomic trials were also conducted at the centre, those were in good conditions.

B: Disease / pest incidence.

During the season incidence of yellow rust was observed in at Durgapura in AVT dual purpose trials. Entry no. AVTIRTSDP 3&4, the score for yellow rust was 100S. the leaf blight was also observed in this trial at Hisar. In IVT feed barley trials, IVTIRFB-9 & 24 has the yellow rust incidence at Durgapura. Also leaf blight was observed at Hisar in IVTIRFB-19 & 25. In Malt barley late sown trial the yellow rust incidence was observed in entries IVTIRMBLS15&16 at Durgapura and in IVT dual purpose trials. Entry no. IVTIRTSDP 1,3&8,12&16 were most affected by yellow rust. In most of the centres, the team observed the covered smut incidence in many of the entries.

C: Trials rejected: Nil

D: Entries observed as segregating/off types/mixtures:

The following entries were noticed to have segregation/ off types/mixture in various trials

Trial Name	Entries with	
	Segregation / mixtures and so rejected	Off types/ mixtures and needs purification
IVT (IR-FB)	IVTIRFB-2	IVTIRFB-3, 10, 14
AVT (MB) NWPZ-IR-TS	-	AVTMBTS-3, 11, 7
IVT (MB) TS NWPZ	IVT-MB-TS-9, 15, 18,	IVT-MB-TS-3, 4, 11, 14
IVT (MB) Late Sown NWPZ	IVTIRMBLS-14, 16	IVTIRMBLS- 4, 11, 15
AVT-SAL:/ALK	AVTSST-4,6,18	AVTSST-7, 10
IVT(IR) Dual purpose	IVTIRTSDP-7	-

E. Disease / pest screening

All the IBDSN / NBDSN/ EBDSN disease/ pest screening nurseries along with chemical control trials were conducted with good incidence of the disease/pests on the infector lines.

.

F: Agronomic Trials

All trials were well conducted.

G: Barley Quality Screening Nursery

The nursery was well conducted both at Durgapura, Ludhiana and Hisar

Sd/-	Sd/-	Sd/-	Sd/-	Sd/
(AS Kharub)	(SR Verma)	(PS Sekhawat)	(Simarjit kaur)	(Neelam)
PS&PI barley	Sr Breeder	Pathologist	Breeder	Agronomist
IIWBR, Karnal	CCSHAU Hisar	RARI Durgapura	PAU Ludhiana	CCSHAU Hisar

Barley Network (AICW&BIP)
Monitoring Report of NWPZ and CEN Zone

Duration: 25-26, February, 2015 **Locations: Mathura, Morena and Gwalior**

The zonal monitoring of the barley coordinated yield trials conducted in NWPZ and Central Zone was held during February 25-26, 2015. During the monitoring, the centres namely Mathura, Morena and Gwalior were visited by Drs. Vishnu Kumar and R Selvakumar from IIWBR, Karnal. The zonal meeting of barley workers was also held at RVSKVV, Gwalior after field visit and convened by Dr. Vishnu Kumar.

The trial wise observations are summarized below-

AVT-MB-TS: The trial was monitored at Mathura and found infested with the weeds heavily. The date of sowing was also beyond recommended dates and hence the trial was rejected.

IVT-MB-TS: The trial was monitored at Mathura centre and was rejected due to very heavy weed infestation and delayed sowings.

IVT-IR-FB: The trial was monitored at two locations viz. Morena and Gwalior. Both the trials were good in shape and entries were free from pest and diseases. The entries IVT-FB-2, 3, 4 and 14 were observed as mixtures for waxy and non-waxy spikes, while the entries IVTIRFB- 9, 13, 20 and 23 were noticed with off types and needs purification. Due to tag mismatch one replication was rejected in IVT-IR-FB at Gwalior centre.

The following entries showed the segregation/mixtures (rejected) and off types (needs purification)-

Trial	Segregation/mixture	Off types
IVT(IR-FB)	IVTIRFB– 2, 3,4 and 14	IVTIRFB- 9, 13, 20 and 23

Sd/-
R Selvakumar
ICAR-IIWBR, Karnal

Sd/-
Vishnu Kumar
ICAR-IIWBR, Karnal

Barley Network (AICW&BIP)
Monitoring Report of CEN Zone

Duration: 16-19 February, 2015 Locations: SK Nagar, Udaipur, Banswara and Kota

The zonal meeting of the barley workers of Central Zone was held during February 16-19, 2015. The group comprising of following barley workers assembled at S.K. Nagar and monitored trials at SK Nagar, Udaipur, Banswara and Kota centres.

DWR, Karnal	Dr. Jogendra Singh and Dr. R. SelvaKumar
ARS, Durgapura	Dr. Ajeet Shekhawat and Dr. Sudesh Kumar

In general, crop condition was very good at all the places the team visited. The trial wise observations of the group are summarized below.

IVT-IR-FB: The trial was monitored at four locations, SK Nagar, Udaipur, Banswara and Kota. Mixture was observed in entries IVTIRFB- 10, 14 and 25. However, segregation was revealed in IVTIRFB 2. Loose smut was observed in IVTIRFB- 15 while leaf blight was present in IVTIRFB 25. Off type plants were recorded in entries IVTIRFB-3, IVTIRFB-4, IVTIRFB-5, IVTIRFB-9, IVTIRFB-11, IVTIRFB-12, IVTIRFB-13, IVTIRFB-16, IVTIRFB-17, IVTIRFB 20 and IVTIRFB 23. There was lodging in entry no. IVTIRFB- 7, IVTIRFB- 16 and IVTIRFB- 19 at SK Nagar.

IVT-IR (Dual purpose): This trial was conducted at three locations, Udaipur, Banswara and Kota. The trial was monitored at all three locations but performance of trial was good only at Kota. The experiment was properly laid out. Mixture was observed in entry IVTIRTSDP- 2. However, off types were observed in entries 5, 7 & 15. Leaf blight was observed in entries 10 & 13. At Udaipur, crop was not in heading after first cutting during monitoring time.

Trial conducted at Banswara was **rejected** because it was not laid out properly.

In general there was no incidence of yellow rust although leaf blight and aphid was observed sporadically in the trials.

Following entries showed the segregation and mixtures and requires purification.

Trial	Segregation	Off types /mixtures
IVT(IR-FB)	IVTIRFB - 2	IVTIRFB-3, IVTIRFB-4, IVTIRFB-5, IVTIRFB-9, IVTIRFB- 10, IVTIRFB-11, IVTIRFB-12, IVTIRFB-13, IVTIRFB- 14, IVTIRFB-16, IVTIRFB-17, IVTIRFB- 19 IVTIRFB 20, IVTIRFB 23 and IVTIRFB 25
IVT (dual purpose)		IVTIRTSDP- 2, 5, 7 & 15

Sd/-
(Jogendra Singh)
Senior Scientist
Indian Institute of Wheat and barley
Research, Karnal 132001 Haryana

Sd/-
(R. Selva Kumar)
Senior Scientist
Indian Institute of Wheat and barley
Research, Karnal 132001 Haryana

Barley Network (AICW&BIP) Monitoring Report of NEPZ
Dates: 21-24th, February 2015

Centres visited: Kanpur, Dalipnagar, Kumarganj, Varanasi, Mirzapur and Tissuhi

Team Members:

Dr. Dinesh Kumar, Pr. Scientist (Biochemistry), Barley Network Unit, IIWBR Karnal

Dr. Lokendra Kumar, Senior Scientist (Plant Breeding), Barley Network Unit, IIWBR Karnal

Dr. SR Vishwakarma, Barley Breeder, NDUA&T, Faizabad

Dr. PK Gupta, Barley Breeder, CSAUA&T, Kanpur

Dr. SS Vaish, Wheat & Barley Pathologist, BHU, Varanasi

The monitoring team with above members constituted by the Director, IIWBR, Karnal visited different centres under NEPZ. The team for monitoring of Barley Network Trials & Nurseries in NEPZ assembled at Kanpur on 21st February, 2015 and visited various locations as per programme schedule. Dr. Sanjay Gayavali from ICARDA was also with the team for observation on ICARDA nurseries and trials.

A: Location wise observations

CSAUA & T at Kanpur and Dalipnagar

Four Coordinated yield trials on feed barley (IVT –RF, IVT-IR-FB, IVT-IR- Dual and AVT-SAL/ALK) were conducted by the centre which was monitored on 21st February, 2015. Out of these four trials, AVT-SAL/ALK was sown at Dalipnagar location of the University while remaining trials were conducted at Kalyanpur experimental farm. However, agronomy and pathology programme were conducted at the main campus. All the experiments were properly conducted as per the technical programme and crop stand was good. The team also visited various trials under resource management (3 trials namely fine tuning of date of sowing; Effect of mulching on water saving and Weed management), international trials/nurseries (2nd GSBYT and 2nd GSBSN), national NBGSN & EIBGN, pathological nurseries (IBDSN, NBDSN and EBDSN), pathology trial on chemical control of LR, entomological nursery and trial (could not enter in the field of entomology due to wet conditions) at the centre.

Faizabad

The team visited Faizabad trials on 22nd February and visited the trials at Kumarganj, Faizabad. The centre conducted two sets of AVT-SAL/ALK trials under different pH level (Set- I pH 8.5- 9.2 and Set-II pH 8.5-8.9) and three other trials namely IVT (RF), IVT (IR-FB) and IVT (IR) Dual purpose for different production conditions. All trials were in good conditions. The team also visited experiments under resource management (fine tuning of date of sowing; Effect of mulching on water saving) programme and barley pathological nurseries i.e. IBDSN, NBDSN and EBDSN. Dr. SR Vishwkarma informed that due to unusual rains, during sowing time, delayed the sowing dates of experiments.

BHU, Varanasi:

The team visited the barley yield trials, experiments under agronomy, pathology nurseries and international trials/nurseries at BHU, Varanasi on 23rd February. The trials were conducted properly and all the trials were in good conditions. There was high incidence of leaf blights disease in susceptible entries both under irrigated and rain fed conditions. The centre conducted three breeding trials ((IVT-RF, IVT (IR-FB) and IVT (IR) Dual purpose and two agronomy trials at the centre, all of which properly conducted at the centre. The team also visited various trials under resource management (3 trials namely fine tuning of date of sowing; Effect of mulching on water saving and Weed management, national NBGSN & EIBGN, pathological nurseries (IBDSN, NBDSN and EBDSN), and pathology trial on chemical control of LB.

Barkachha, Mirzapur

The team visited at south campus of BHU, Barkachha on 23rd February, 2015 and visited the IVT-RF trial. This trial was not laid out properly and crop growth was not found satisfactorily. The trial was rejected by the team.

Tissuhi:
The IVT-RF trial was sown at the NDUAT centre located at Tissuhi, Mirzapur and it was properly conducted.

B. Trials rejected:
The team rejected the IVT-RF trial of RGSC-BHU, Barkachha Mirzapur.

C. Disease/pest screening
Disease scoring was made at different locations viz., Kanpur, Faizabad, Varanasi and Tissuhi. At all locations, no rust disease was observed in any field/trial. However, leaf blight was scored 68 and above in the trial IVT-RF for entries 10, 18 and 21; in the trial IV-IR-FB nos. 19 and 25 and in IVT (IR) dual purpose (DP) 2,9 and 10.
The details are as under:

Kanpur

- The different plant pathological nurseries of barley viz., Initial Barley Disease Screening Nursery (IBDSN-338 entries), National Barley Disease Screening Nursery (NBDSN-136 entries) and Elite Barley Disease Screening Nursery (EBDSN) to asses against leaf blight and leaf rust artificially were conducted. The sowing of these nurseries was done on 30.11. 2014. Leaf rust (LR) was absent, however, leaf blight (LB) showed low disease level on check/susceptible. Environmental conditions were told to be the main factor by the co-operator for the low level and absence of LB and LR, respectively.
- Leaf rust was also absent in the chemical trial for management of the disease. Leaf rust of barley did not develop under poly house control condition; however, it showed its presence on wheat in nearby plot within the same ploy house.
- Stripe disease of barley was seen at Kanpur under natural condition.

Faizabad:

- The aforesaid nurseries were found to be well conducted at Faizabad. The sowing was done late on 26/12/2014. As far as level of LB on check is concerned, the disease could not its presence on Flag leaf but better than Kanpur. However, it should be more. Late showing might be one of the major reasons.
- The chemical trial for management of leaf blight of barley was well conducted, but till heading disease was not developed and no spraying of the chemical was done.

BHU,Varanasi

- The different plant pathological nurseries of barley viz., Initial Barley Disease Screening Nursery (IBDSN-366 entries), National Barley Disease Screening Nursery (NBDSN-136 entries) and Elite Barley Disease Screening Nursery (EBDSN-97 entries) to asses against leaf blight artificially were well conducted. The sowing of the nurseries was done on 11.12.2014. The level of LB was high and showed its high severity (60-70%) on flag leaf and some of the entries showed presence of the disease on awns, glumes and spikes (i.e., 99 score).
- The chemical trial for management of LB of Barley was well conducted for all the nine assigned treatments. The experiment was conducted using RD-2503 variety with three replications. Seed treatment with Vitavax and foliar spraying with Tilt @0.1% judged to be good in performance over the other treatments by the monitoring team.

Status of Loose and covered smuts under natural conditions in Breeding Trials

- Loose and covered smut showed their presence in the AVT(RF), IVT(IR-FB) and AVT-SAL/ALK trials and IVT(IR)DP trial showed the presence of loose smut.
- Loose smut was observed for the different entries, viz., IVTRFNEP-3,6&13; IVTIRFB-1,215,16,18,19,20, 21 &23; AVTSST-11&12 and IVTIRSDP-914&17 of the AVT(RF), IVT(IR-FB), AVT-SAL/ALK and IVT(IR)DP trials, respectively.
- Covered smut was observed for IVTRFNEP-9, 12, 15 &16; IVTIRFB- 9,11,14,17, 20 &23; AVTSST-4, 10&11.
- Further, loose smut was present at the three monitored locations (Kanpur, Faizabad and Varanasi) for IVTRFNEP-3 and IVTIRFB-15, 16.
- Both covered and loose smuts were present on IVTIRFB-20&23 of the IVT (IR-FB) trial. Thus, these entries showed the problem of both the smuts.

D. Entries observed as segregating/mixture/off types:

The following entries were noticed to have segregation/mixtures/off types in various trials.

Trial Name		
	Segregation/mixtures	**Off types**
IVT (RF)	-	IVTRFNEP 4,6,7,8,9,11,12,17
IVT (IR-FB)	-	IVTIRFB 2,3,5,9,10,11,12,23
AVT-Sal/Alk	AVTSST 18	AVTSST 5, 11
IVT-IR (Dual)	-	IVTIRSDP 3,5,7

E. Agronomy Trials

The agronomy trials at Kanpur, Faizabad and BHU Varanasi were visited. At Kanpur and BHU Varanasi, three agronomic trials (Date of sowing, mulching and weed management), while at Faizabad conducted two agronomic trials (Date of sowing and mulching). At all locations, experiments were conducted in systemic way. International nurseries/trials, NBGSN and EIBGN were conducted at all locations as allocated to the locations.

(Dinesh Kumar)
Pr. Scientist (Biochemistry)
Barley Network Unit
IIWBR, Karnal-132 001

(Lokendra Kumar)
Sr. Scientist (Plant Breeding)
Barley Network Unit
IIWBR, Karnal-132 001

ANNEXURE

Annexure

Ancillary data and grain yield recording in coordinated trials

SN	Characteristic	Method of recording
1.	Days to heading	It is calculated as days taken from sowing to emergence of 75% of ears (spikes) in a plot. Observation on off-type plant(s) should not be considered.
2.	Days to maturity	At this stage all the plants in the plot show natural senescence and the grains become very hard which make a sound when crushed between the teeth.
3.	Plant height	Measured at the time of maturity in centimeters from the ground level upto the terminal spikelet, excluding the awns. Care should be taken to record the measurement from the most commonly representative plants in the plot.
4.	Lodging	It is visually determined in plots per replication and recorded in percentage when plants are bent at more than 30° angle.
5.	Hulled/hulless	It is recorded on the basis of husk present (hulled) or absence (hulless) on the grains
6.	Grain colour	This trait is recorded in three categories i.e., Amber (A), Light yellow (LY) or yellow (Y). Most of the test entries bear yellow colour of grain, few might be amber for hulless.
7.	Two/Six row	On the basis of number of spikelet (two lateral and one central-six row) and (only central present-two row) the trait should be recorded.
8.	1000-grains weight	Bulk harvest of grains from a test entry should be utilized to draw sample(s) for counting grains (250, 500 or 1000 in number) and their weight is recorded in grams using electronic balance. Grain counter may be used, wherever available, for increasing efficiency and precision.
9.	Grain yield per plot	Two border rows (one row from each side) of the gross plot should be removed to record the grain yield from the remaining rows which comprise the net plot (4 rows in case of IVT and 10 rows in case of AVTs). The net plot grain yield is recorded in grams.

Criteria for Promotion/Retention of Varieties in the Coordinated Barley Varietal Trials

The varieties to be promoted/retained should, besides being as high yielding as the best check (including latest identified variety) should possess adequate degree of resistance to rusts and other diseases of regional importance and good nutritional and malting qualities. The following criteria are followed to achieve these objectives.

(I) Yield

Varieties which are (i) significantly superior and (ii) at par with the best check are only to be considered for retention/promotion. To limit the number of entries to a manageable limit, if situation so demands, the yield of varieties upto the group having better check under it can be considered and not upto the last variety in the at par group.

(II) Resistance to diseases

(A) Rusts

Varieties qualifying from yield point of view must have adequate degree of resistance to rusts under both natural as well as artificial conditions of infection.

The average coefficient of infection (ACI) for each of the rusts of importance in the particular zones should be considered in respect of varieties qualifying in yield criteria. Important rusts in each zone are as follows:

NHZ & NWPZ : Brown and Yellow
NEPZ : Brown
CZ : Black and Brown

When rust data are available from one location only, as ACI is not calculated, the intensity of susceptibility to rusts should be considered.

(i) Under natural conditions of rust infection (In coordinated varietal trials)

a) ACI upto 10.0 and not more than 15.0 for varieties meant for rainfed/salinity/alkalinity condition.

b) Maximum, susceptibility should be considered if ACI could not be worked out. It should not be more than 20S.

(ii) Under artificial conditions of rust infection (in plant pathological screening nurseries).

a) ACI not more than 15.0 for varieties meant for irrigated condition and not more than 20.0 for varieties meant for rainfed/salinity/alkalinity condition.
b) If ACI is not worked out, maximum susceptibility should not exceed 30S both in case of varieties meant for irrigated and rainfed conditions.

(B) Other diseases

Due weightage should be given to other diseases of regional importance *such as the leaf blight for NEPZ and CZ* and varieties with extreme susceptibility shall be avoided from advancement/retention.

(III) Quality

Varieties qualifying for yield and disease resistance criteria should have adequate malting quality for malt barley as overall score comparable to the checks with special emphasis on malt extract, diastatic power, protein content, hectoliter weight.

Disease Criteria for Promotion/Retention of Varieties Qualifying from Yield Criteria

Variety qualifying yield criterion	ACI value ACI=av. Coefficient of infection		acceptable rust score (ACI not available)	
	Co-ord. trial	NBDSN	Co-ord. trial	NBDSN
Varieties under stress environments	upto 15.0	upto 20.0	upto 30s	-
Varieties under normal environments	upto 10.0	upto 15.0	upto20s	-

Norms for conduct of yield trials

1. The name and parental details of IVT entries submitted once and finalized in the workshop should not be changed.
2. The test sites and AVT entries including the checks finalized in the workshop should not be changed.
3. Date of sowing should be strictly adhered to as given in the planting details.
4. Seed rate and plot size should not be changed. Border rows should be excluded for reporting the net plot yield for analysis.

Norms with respect to site mean and coefficient of variation (CV) for acceptance/rejection of coordinated yield trials

Minimum limit of site mean (Yield in q/ha)

Zone/Trial	irrigated condition	Rainfed condition
NHZ	-	15
NWPZ	30	-
NEPZ	30	15
CZ	30	-
Salinity Alkalinity Trial	12	-
Dual purpose-plains	22 (125 Forage)	
Dual purpose-Hills	12 (20 Forage)	

Maximum limit of coefficient of variation (CV)

Production condition	Maximum limit
Irrigated condition (Timely or late sown)	20%
Rainfed condition (Timely sown)	25%
Salt affected condition	25%

Sowing time of yield trials in different zones

Trial Series	NHZ	NWPZ	NEPZ	CZ
Irrigated trials-TS	-	Nov. 10-25	Nov. 10-25	Nov. 10-25
Rainfed trials	25 Oct-10 Nov.	-	Oct. 25-10 Nov	-
Irrigated trails-LS	-	Dec. 10-20	-	-
Irrigated-Dual	-	25 Oct-15 Nov.	25 Oct-15 Nov.	-