

Trait Specific Germplasm Identified through Multi-location Evaluation of Wheat (2004-05 to 2008-09)



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LIST OF CONTRIBUTORS

S. No.	Location	Name of Scientist	Aspect
1.	DWR, Karnal	Dr.(Mrs.) Sushila Kundu	Agronomic traits
2.	GBPUAT, Pantnagar	Dr. J.P. Jaiswal	Agronomic traits
3.	PAU, Ludhiana	Dr. N.S. Bains Dr. V.S. Sohu	Agronomic traits
4.	BHU, Varanasi	Prof. Ram Dhari	Agronomic traits
5.	NDUA&T, Faizabad	Dr. B. N. Singh Dr. Vinay Kumar Singh	Agronomic traits
6.	SDAU, WRS, Vijapur	Dr. S. Acharya Dr. B.N. Patel Dr. S.S. Patel	Agronomic traits
7.	JNKVV, Powarkheda	Dr. P.C. Mishra	Agronomic traits
8.	ARI, Pune	Dr. S.C. Mishra Dr. M.D. Bhagwat Dr. B.K. Honaro	Agronomic traits
9.	UAS, Dharwad	Dr. R.R. Hanchinal Dr. V. Rudra Naik	Agronomic traits
10.	DWR, Karnal	Dr. A.K. Sharma Dr. M.S. Saharan Dr. Mangal Singh	Leaf and stripe rusts
11.	PAU, Ludhiana	Dr. Indu Sharma Dr. S.K. Mann	Karnal bunt, leaf and stripe rusts
12.	GBPUAT, Pantnagar	Dr. K.P. Singh Dr. Kanak Srivastava	Leaf and stripe rusts
13.	NDUA&T, Faizabad	Dr. R.N. Singh Dr. A.K. Singh Dr. S.P. Singh Dr. J. Verma	Leaf rusts and leaf blight
14.	BHU, Varanasi	Dr. Ram Dhari Dr. Dharmendra Kumar	Leaf rusts and leaf blight
15.	JNKVV, Powarkheda	Dr. P.C. Mishra	Leaf and stem rusts
16.	ARI, Pune	Dr. B.K. Honaro Dr. S.C. Misra Dr. V.S. Rao Dr. V.M. Khade	Leaf and stem rusts
17.	UAS, Dharwad	Dr. I.K. Kalappanavar	Leaf and stem rusts
18.	CSSRI, Karnal	Dr. Neeraj Kulshreshtha	Salt stress
19.	DWR, Karnal	Dr. R.K. Gupta	Quality traits
20.	NBPGR, New Delhi	Dr.Dinesh Kumar, Dr.Ambrish K Sharma, Dr.Vandana Joshi, Dr.B S Phogat, Y S Rathi , Dr. M Dutta (Head GED)	Coordination
21.	NBPGR, New Delhi	Dr. H L Raiger	Documentation

Introduction

National Bureau of Plant Genetic Resources holds a huge collection of about 3.8 lakh germplasm accessions of agri-horticultural crops conserved in the National Gene Bank. However, majority of them have not been properly characterized and evaluated yet. A small portion of the assembled germplasm has only been characterized and evaluated and that too at one location and for a particular season. Further there is no corresponding increase in their use by the crop improvement scientists, indicating that the collections were not being used to their full potential. Thus, a very large gap exists between availability of germplasm and their actual utilization in crop improvement programme.

Among the cereal crops, wheat is the world's most widely cultivated food crop. In India, it is the second most important staple food crop after rice with an area of 264.92 lakh ha and total production of 708.40 lakh tonnes. A number of improved varieties of wheat have been developed and released to enhance its production and productivity. However, further improvement in the productivity levels of wheat is required through breeding for cultivars endowed with resistance to biotic and abiotic stresses. It requires identification of the proper trait-specific donors for utilization in crop improvement programmes. NBPGR, being the nodal institute for PGR management, initiated a programme to evaluate the material across various agro-climatic zoned to identify the promising accessions for various agronomic traits and biotic/abiotic stresses from the germplasm available in the National Genebank.

Keeping these considerations in view, a programme on multi-location evaluation of germplasm for four major crops namely, rice, wheat, chickpea and pigeonpea was initiated during the X Plan period (2002-07) as **Characterization of germplasm of selected crops for specific traits through network approach (Anticipatory Research)**. Under this programme, a total of 15,525 germplasm accessions of rice, wheat, chickpea and pigeonpea received from the National Gene Bank were multiplied for characterization and evaluation purpose of agronomic traits, biotic and abiotic stresses and quality traits in collaboration with Project Directorate/ Project Co-ordinators of these crops and National Active Germplasm Sites (NAGS) associated with them. The hot spot location identified under the AICRP system was utilized for this purpose. The promising accessions identified out of 6169 accessions evaluated under this programme for different traits have been summarized in this bulletin. It is expected that this information would be of potential value to crop breeders as these could serve as important donors in crop improvement programmes.

ACKNOWLEDGEMENT

It gives us immense pleasure to place before you the Trait Specific Germplasm Identified Through Multi-location Evaluation of Wheat (2004-05 to 2008-09). Since there is component of GxE interaction, it is always desirable that the germplasm can be evaluated at a multiple location to identify stable desirable traits and region specific genotypes for their optimal utilization. With the objective a programme was initiated for multilocation evaluation of germplasm at NBPGR. The wheat is the second most important cereal crop after rice. To feed the burgeoning population of India, productivity of wheat needs to be enhanced with use of improved highly yielding varieties tolerant to biotic and abiotic stress. It requires identification of the proper trait specific donors for utilization in breeding programme. NBPGR initiated a programme to evaluate the material across the zones to identify stable and desirable trait promising accessions for various agronomic traits and biotic/abiotic stresses from the germplasm. This programme was initiated in 2004-05 across the zone of the country and promising accessions have been identified over the last five years. This information will be useful to breeders, researchers to select a material for further improvement.

It is to place on record our sincere gratitude to all the scientists for planning, conducting and recording observations on trials/experiments on pigeonpea for multilocation evaluation programme (2004-05 to 2008-09).

We express our deep sense of gratitude to the Secretary, DARE and Director General, ICAR and Deputy Director General (Crop Sciences), ICAR for kind approval of the project and making a special provision in the budget of the Xth Plan.

We express our sincere gratefulness to Dr. K.C. Bansal, Director, NBPGR New Delhi and S.K. Sharama, Former Director, NBPGR, New Delhi for providing useful guidance, critical inputs and all necessary facilities.

We are extremely grateful to Late Dr. S.K. Mishra, Ex-Head, Germplasm Evaluation Division, NBPGR New Delhi for his painstaking efforts and initiative for successful implementation of the programme. We thank the Head, Germplasm Conservation Division for providing the germplasm accessions from the National Genebank.

Special thanks are due to Mr. Satya Prakash, Ms. Amita and Mr. Sandeep for their help in data entry, computerization and compilation of this information.

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Important target traits of wheat in major agro-ecological zones

	Target Traits	CZ	PZ	NWPZ	NEPZ	NHZ
A	Agro morphological	√SDAU, JNKV	√ARI, Pune; UAS-D	√PAU, GBPUA&T	√BHU, NDAUA&T	√
	(Days to 75% spike emergence, Plant height-Tall(cm), Plant height-Dwarf(cm), Days to maturity, spike length(cm), No. of spikelets per spike, No. of grains per spike, Grain weight per spike(g), 1000 grain weight, Protein content (%),Hectolitre weight(kg/hl)					
B.	Biotic stress					
(i)	Diseases					
	Brown rust	√	√	√(GBPUA&T)	√ (NDAUA&T)	√
	Black rust	√	√(ARI, UAS-D)	-	-	√
	Yellow rust	-	√	√(PAU, GBPUA&T)	-	√
	Karnal bunt	-	-	√(PAU)	-	-
	Foliar blight	-	√	-	√(BHU, NDAUA&T)	√
	Loose smut	-	-	-	-	√
	Powdery mildew	-	√	-	-	√
(ii)	Nematode pest					
	Ear cockle	√	√	√	-	-
	Cyst nematode	√	√	√	-	-
C.	Abiotic stress					
	Drought tolerance		√	√	√	-
	Heat tolerance		√	√	√	-
	Salinity tolerance			√(CSSRI, Karnal)	√	
D.	Quality parameters					
	Protein content & Hectolitre content	√	√	√(DWR)	√	√
	Amino acid profile	√	√	√	√	√
	Gluten content	√	√	√	√	√
	Chapatti making quality	√	√	√	√	√
	Grain hardness	√	√	√	√	√

√: Proposed traits for evaluation in specific zone

Details of locations and number of wheat germplasm accessions evaluated under multi-location evaluation

Evaluation	Trait	Location	Centres	2004-2005	2005-2006	(2006-2007	2007-2008	2008-2009
Agro-morphological	Agronomic	PAU, Ludhiana; GBPUA&T, Pantnagar; BHU, Varanasi; NDAUA&T, Kumarganj; GAU, Wheat station, Vijapur; JNKV, ARS, Powarkheda; ARI, Pune; UAS, Dharwad	8	1500	1660	1039	1017	953
Biotic stress (Diseases)	Karnal bunt	PAU, Ludhiana; GBPUA&T, Pantnagar	2	1500	1660	1039	1017	953
	Yellow rust	PAU, Ludhiana	1	1500	1660	1039	1017	953
	Brown rust	PAU, Ludhiana; GBPUA&T, Pantnagar; BHU, Varanasi; NDAUA&T, Kumarganj; GAU, Wheat station, Vijapur; JNKV, ARS, Powarkheda; ARI, Pune; UAS, Dharwad, DWR, Karnal	9	1500	1660	1039	1017	953
	Black rust	GAU, Wheat station, Vijapur; JNKV, ARS, Powarkheda; ARI, Pune; UAS, Dharwad	4	1500	1660	1039	1017	953
	Foliar blight	BHU, Varanasi; NDAUA&T, Kumarganj	2	1500	1660	1039	1017	953
Quality Traits	Protein content, Hectolitre weight (kg/hl)	DWR, Karnal	1	1500	1660	1039	1017	953

Multi-location evaluation of wheat germplasm for important agro-morphological traits

Traits	Location	Year	Range	Promising accessions	Best check (value)
Days to 75% spike emergence	Faizabad	2004-05	63.00-109.0	IC128455, IC128510 (< 66.51)	Sonalika (71.37)
		2005-06	69.00-116.0	IC28599, IC28761 (=69.00)	Sonalika (71.76)
		2007-08	70.00-113.00	IC145976, IC252930, IC252979, IC138487, IC252920 (< 78.00)	Sonalika (78.40)
		2008-09	48.00-114.00	IC313156, IC279617, IC535218 (< 60.00)	Sonalika(62.82)
	Ludhiana	2004-05	61.00-117.00	IC138853, IC145414 (< 80.93)	Sonalika (88.63)
		2005-06	85.00-167.00	IC26720, IC26721, IC26728, IC28621, IC28622 (< 87.00)	Lok 1(104.12)
		2006-07	82.00-114.00	IC332293, IC326741, IC332273, IC361692, IC415839 (< 84.00)	Sonalika (89.50)
	Pantnagar	2004-05	124.00-160.00	Nil	Sonalika (73.30)
		2005-06	66.00-113.00	IC78732 (67.00)	Sonalika (69.12)
		2006-07	70.00-192.00	IC279331, IC416241, IC279329, IC279875 (< 72.00)	Sonalika (73.70)
		2007-08	70.00-102.00	IC138379, IC138643, IC138380, IC138381, IC138405 (< 71.00)	Sonalika (72.00)
	Powarkheda	2004-05	50.00-99.00	IC82176, EC104635, IC145622, IC128276, IC145623 (< 52.88)	Sonalika (61.67)
		2005-06	61.00-88.00	IC31969 (=61.00)	Sonalika (67.94)
		2006-07	51.00-114.00	IC321873 (< 51.00)	Lok 1(58.20)
		2008-09	50.00-112.00	IC279867, IC279317, IC290214 (< 53.00)	-
	Pune	2004-05	43.00-94.00	IC145782, IC128174, IC128455, IC128585, IC145719 (=46)	Sonalika (51.30)
		2005-06	47.00-109.00	IC26720, IC26721, IC28761, IC28861, IC28881 (=47.00)	Sonalika (54.65)
		2006-07	48.00-112.00	IC104615, IC281550, IC321883, IC415839, IC416007, IC416012, IC416211, IC416261, IC416262, IC416263 (< 49.00)	Sonalika (51.40)
		2007-08	46.00-98.00	IC138641, IC145839, IC252507, IC252955, IC138642 (< 47.00)	Lok 1& Sonalika (52.33)
		2008-09	48.00-110.00	IC290302, IC026720, IC026721 (< 51.00)	Sonalika (51.67)

	Varanasi	2004-05	62.00-110.00	IC47789 (=62)	Sonalika (67.17)	
		2005-06	59.00-109.00	IC28761, IC111882, IC112075, IC253015, IC28755 (< 62.00)	Sonalika (66.18)	
		2007-08	64.00-113.00	IC252523, IC252930, IC138351, IC138375, IC138408 (< 67.00)	-	
		2008-09	54.00-118.00	IC535320 (=54.00)	-	
	Vijapur	2004-05	48.00-117.00	IC79034 (=48.00)	Sonalika (52.53)	
		2005-06	50.00-114.00	IC28761 (=50.00)	Sonalika (53.71)	
		2006-07	35.00-114.00	IC258211, IC260723, IC260890, IC260938, IC268094 (< 35.00)	Sonalika (53.00)	
		2007-08	42.00-92.00	IC252540, IC252714, IC138388, IC138480, IC252382 (< 57.00)	-	
		2008-09	51.00-95.00	IC026743, IC036883, IC041877, IC290302, IC026721 (< 53.00)	-	
	UAS, Dharwad	2008-09	42.00-85.00	IC035033, IC535225, IC535226, IC535228, IC535263 (=42.00)	-	
	Pooled over locations	2004-05	62.17-103.67	IC356353 (=62.00)	Sonalika (66.57)	
		2005-06	65.14-105.20	IC28761, IC26720, IC26721, IC26743 A, IC28755 (< 67.00)	Sonalika (69.73)	
		2006-07	63.00-117.25	IC104615, IC281550, IC279874, IC397400, IC415839 (< 64.60)	Lok 1(67.28)	
		2007-08	64.20-95.50	IC138361, IC335701, IC138425, IC252807, IC138487 (< 65.67)	Sonalika (67.58)	
		2008-09	54.67-113.00	IC290289, IC290302, IC026721, IC026720, IC279329, IC026743 (< 57.00)	Sonalika (57.24)	
	Days to maturity	Faizabad	2004-05	99.00-139.00	IC145501 (=99.00)	Lok 1(114.13)
			2005-06	106.00-175.00	IC35079, IC35080, IC47532, IC47532 A, IC35121 (106-110.00)	Lok 1(114.59)
			2007-08	110.00-141.00	IC138487, IC138488, IC252783, IC145843, IC138408 (< 113.00)	GW 322 (121.90)
			2008-09	95.00-127.00	IC535210, IC535211, IC535228 (< 96.00)	Sonalika (102.09)
Ludhiana		2005-06	135.00-165.00	IC35062 (=135.00)	Sonalika (139.76)	
		2006-07	135.00-158.00	IC104606, IC281547 (< 144.55)	Sonalika (150.70)	
Pantnagar		2004-05	124.00-160.00	IC128261 (= 124.00)	Sonalika (126.17)	
		2005-06	107.00-137.00	IC36716, IC36701, IC36699, NC55661, IC47530 (< 108.00)	Sonalika (111.29)	
		2006-07	93.00-155.00	IC337357, IC032586, IC337354, IC338687, IC338685 (< 155.00)	Sonalika (121.60)	
		2007-08	108.00-147.00	IC252605, IC138390, IC138391, IC138379, IC138380 (< 110.00)	Sonalika (117.20)	

Powarkheda	2004-05	94.00-125.00	IC55664, IC55607 (< 96.53)	Lok 1 (103.97)
	2005-06	71.00-198.00	IC35060 (=71.00)	Sonalika (98.41)
	2006-07	85.00-147.00	IC281563, IC281564, IC281565, IC281557, IC281558 (< 86.00)	Lok 1(104.50)
	2008-09	73.00-126.00	IC290069, IC290071, IC290070 (< 74.00)	-
Pune	2004-05	67.00-119.00	EC104620, EC104626, IC145602 (< 87.07)	Sonalika (92.87)
	2005-06	69.00-128.00	IC28711, IC28712, IC28755, IC28734, IC28746 (=69.00)	Sonalika (100.00)
	2006-07	81.00-137.00	IC355883, IC279882 (< 81.00)	Sonalika (94.10)
	2007-08	89.00-123.00	IC252872, IC252879 (< 89.00)	Lok 1(95.83)
	2008-09	88.00-121.00	IC290213, IC290215, IC290216, IC290234, IC290302, IC313151, IC026720, IC026721, IC035029 (=88.00)	Sonalika (92.00)
Varanasi	2004-05	91.00-134.00	IC128324, IC128326 (=91.00)	Sonalika (101.33)
	2005-06	91.00-137.00	IC112075, IC253015, IC111882, IC47514, IC47515 A (97.00-99.00)	Sonalika (99.41)
	2007-08	102.00-135.00	IC252523, IC145843, IC138412 (< 102.00)	-
	2008-09	105.00-160.00	Nil	-
Vijapur	2004-05	92.00-136.00	IC145374 (=94.67)	Sonalika (99.47)
	2005-06	100.00-183.00	IC28969, IC32508 (=100.00)	Lok 1(101.88)
	2006-07	65.00-122.00	IC416154, IC060203, IC415848 (< 78.00)	Sonalika (93.00)
	2007-08	77.00-116.00	IC252895, IC252831, IC252635, IC252938, IC252986 (< 79.00)	-
	2008-09	93.00-118.00	IC036883, IC036886, IC036900, IC047013, IC535198, IC535318, (=93.00)	-
Dharwad	2008-09	70.00-190.00	IC035033, IC535225, IC535226, IC535228, IC535263 (=70)	-
Pooled over locations	2004-05	104.00-131.40	IC128703, IC128201, IC128542, EC104620, IC356355 (< 105.00)	Sonalika (106.50)
	2005-06	107.43-135.00	IC28755, IC28711, IC36699, IC47549, IC28712 (< 108.00)	Sonalika (109.41)
	2006-07	111.40-143.50	IC415848, IC415839, IC416280, IC281558 (< 111.80)	Sonalika (112.92)
	2007-08	103.60-125.20	IC252820, IC252635, IC138487, IC252831, IC252762 (< 106.00)	Sonalika (111.87)
	2008-09	85.00-135.00	IC535346, IC535395, IC025614, IC290289, IC035033 (< 87.00)	Sonalika (97.05)

Plant height (Tall) (cm)	Faizabad	2004-05	39.25-133.60	IC145605, IC41405, IC145726, IC145759, IC145567 (>123.6)	PBW 343 (86.90)
		2005-06	51.60-148.60	NC63954, NC63955, IC111672, IC111673, IC47791 (>139.20)	Sonalika (94.70)
		2007-08	54.20-54.20	IC335740, IC252557, IC138624, IC138631, IC138580 (<150.60)	PBW 343 (93.74)
		2008-09	44.30-153.50	IC535348, IC535470, IC535472, IC535471, IC535351, IC260870 (>135.00)	Sonalika (94.22)
	Ludhiana	2004-05	42.00-126.20	IC31616, IC145734, IC145558, IC145653, IC128616 (>115.20)	PBW 343 (78.03)
		2005-06	21.10-137.40	NC63954, NC63955, IC111672, IC111673, IC47791 (>135.00)	Sonalika (94.70)
		2006-07	58.00-146.00	IC281554, IC313148, IC319813, IC310076, IC355883 (>144.00)	Sonalika (94.80)
	Pantnagar	2004-05	65.00-154.00	IC279324, IC145726, IC145674, IC78744, IC79037 (>150.00)	Sonalika (100.60)
		2005-06	49.00-188.00	IC28936, IC47795, IC47790, IC47791, IC78774 (>150.00)	Sonalika (97.00)
2006-07		21.00-180.00	IC279323, IC047077, IC355881, IC355883, IC260870 (>144.00)	Sonalika (92.60)	
2007-08		56.00-112.00	IC335684, IC145911, IC138605, IC138597, IC138594 (<131.00)	Sonalika (91.60)	
Powarkheda	2004-05	11.00-158.09	EC73599, IC128412, IC82132, EC73573, EC73587 (>143.23)	Sonalika (97.15)	
	2005-06	33.00-194.00	IC28961, IC78720, IC47792, IC36692, IC28874 (>145.000)	Sonalika (101.76)	
	2006-07	20.00-190.00	IC356468, IC260866, IC260867, IC279402, IC384532 (>142.00)	Sonalika (99.60)	
	2008-09	56.00-145.00	IC281546, IC281542, IC281547, IC260943, IC279466, IC281551, IC260883, IC281545, IC281548 (>130.00)	-	
Pune	2004-05	11.60-134.60	IC128393, IC145456, IC82118, IC128363, IC128297 (>128.80)	PBW 343 (89.36)	
	2005-06	47.00-149.00	IC82434, NC63955, NC60593, IC36692, IC111968 (>138.00)	PBW 343 (93.42)	
	2006-07	50.60-142.00	IC311080, IC311078, IC059606, IC281551, IC059597, IC059619 (>135.00)	PBW 343(91.88)	
	2007-08	50.40-146.60	IC138628, IC252341, IC138629, IC138559, IC138358 (>135.20)	PBW 343 (84.32)	
	2008-09	42.60-130.20	IC258210, IC260854, IC028566, IC535499, IC535470 (>115.00)	Sonalika (79.53)	

	Varanasi	2004-05	47.00-122.00	IC145576, IC145571, IC145734, IC128423, IC145605 (>119.00)	Sonalika (81.55)	
		2005-06	38.00-152.00	IC82434, IC47791, IC79009, IC82171, IC111968 (>140.00)	Lok 1(90.52)	
		2007-08	60.00-133.00	IC138607, IC138631, IC252855, IC145907, IC253012 (>130.00)	-	
		2008-09	59.00-151.00	IC266764, IC535516, IC258210, IC260867, IC535489, IC260930, IC321163, IC041590, IC535470 (> 135.00)	-	
	Vijapur	2004-05	10.00-143.00	IC128296, IC128336, IC128335, IC128311, IC145726 (>141.00)	PBW 343 (88.60)	
		2005-06	52.00-187.00	IC35031, IC32015, IC111925, IC47795, IC118730 (>140.00)	Sonalika (95.65)	
		2006-07	48.00-124.00	IC356468, IC260867, IC355872, IC260870, IC260910 (>123.00)	Sonalika (91.91)	
		2007-08	50.00-114.00	IC138598, IC138622, IC138558, IC138428, IC138357 (>108.00)	-	
		2008-09	40.00-128.00	IC535499, IC535500, IC535516, IC028584, IC535271, IC535470, IC535483, IC535498, IC535504, IC535587 (>117.00)	-	
	Dharwad	2008-09	29.00-94.10	IC535272, IC535273, IC535497(91-94)	-	
	Pooled over locations	2004-05	52.10-128.69	IC145726, IC145556, IC128296, IC145456, IC145558 (>119.89)	PBW 343 (87.49)	
		2005-06	59.13-130.84	IC82434, IC47791, IC35031, NC63955, IC111668 (>127.00)	Sonalika (93.67)	
		2006-07	58.12-130.40	IC356468, IC260867, IC355872, IC260870, IC260910, IC258211, IC047077, IC260901 (> 125.04)	Sonalika (91.91)	
		2007-08	72.17-125.50	IC138631, IC138580, IC138497, IC138496, IC138605 (>123.17)	PBW 343 (88.79)	
		2008-09	54.00-135.80	IC535471, IC266764, IC258209, IC258211, IC266976 (>110.00)	Sonalika (86.88)	
	Plant height (Dwarf) (cm)	Faizabad	2004-05	39.25-133.60	IC28879, IC128221, IC145784, IC145787, IC145283 (< 53.60)	Lok 1(74.61)
			2005-06	51.60-148.60	IC111969, IC41589, IC112006, IC111948, IC35065 (< 54.80)	Lok 1(83.44)
			2008-09	44.30-153.50	IC035033, IC290174, IC290171, IC535380, IC535382, IC535379 (< 55.00)	GW322(80.31)
		Ludhiana	2004-05	42.00-126.20	IC145784, IC145713, IC145408, IC145785, IC145454 (< 52.00)	Lok 1 (75.37)
			2005-06	21.10-137.40	IC47592, IC111970, IC35093, IC112006, IC111867 (< 53.00)	PBW 343(82.94)
2006-07			58.00-146.00	IC415964, IC415977, IC415840, IC416173, IC345690 (< 70.00)	GW 322 (84.70)	
Pantnagar		2004-05	65.00-154.00	IC145331, IC145785, IC145255, IC145787, IC145784 (< 67.00)	GW 322 (96.00)	
		2005-06	49.00-188.00	IC111969, IC111847, IC36747, IC111726, IC111948 (< 60.00)	PBW 343 (86.24)	

	Powarkheda	2004-05	11.00-158.09	EC73498, IC128393, IC28875, IC82219, IC145254 (< 15.30)	GW 322 (94.02)	
		2005-06	33.00-194.00	IC78751, IC82270, NC60593, IC36767, IC47528 (< 54.00)	PBW 343 (87.29)	
		2006-07	20.00-190.00	IC321156, IC313159, IC313147, IC315871, IC313154, IC313155, IC279321 (> 30.00)	PBW 343 (86.50)	
		2008-09	56.00-145.00	IC290172, IC290166, IC290174, IC290169, IC290168 (< 70.00)	-	
	Pune	2004-05	11.60-134.60	IC145668, IC128337, IC128222, IC145788, IC145784 (< 48.80)	Lok 1(79.55)	
		2005-06	47.00-149.00	IC111969, IC111948, IC35176, IC35076, IC111847 (< 53.00)	Lok 1(87.05)	
		2006-07	50.60-142.00	IC416039, IC415977, IC332293, IC415840, IC416212, IC415964 (>56.40)	Lok 1(78.18)	
		2008-09	42.60-130.20	IC535205, IC047016, IC047017, IC290296, IC047437 (< 60.00)	GW-322(70.05)	
	Varanasi	2004-05	47.00-122.00	IC145785, IC145786, EC104557, IC145787, IC145782 (< 54.00)	GW 322 (78.08)	
		2005-06	38.00-152.00	IC35042, IC111969, IC47018, IC111867, IC112078 (< 53.00)	PBW 343(84.73)	
		2008-09	59.00-151.00	IC535287, IC290296, IC047437, IC047017, IC290172, IC290163, IC041589, IC290297, IC535205, IC290171, IC290305, IC290326 (< 70.00)	-	
	Vijapur	2004-05	10.00-143.00	IC145541, IC128312, IC145283, IC145522, IC128221 (< 50.00)	Lok 1(77.87)	
		2005-06	52.00-187.00	IC47017, IC36739, IC79110, IC78930, IC35076 (< 55.00)	Lok 1(86.06)	
		2008-09	40.00-128.00	IC026721, IC026724, IC535446, IC279571, IC279324, IC273931, IC290305, IC290332, IC290336, IC290297, IC290334 (< 55.00)	-	
	Dharwad	2008-09	29.00-94.10	IC535379, IC535378, IC290172, IC535446, IC535196 (< 38.00)	-	
	Pooled over locations	2004-05	52.10-128.69	IC145784, IC145785, IC145788, IC145786, IC145787 (< 60.00)	Lok 1 (83.24)	
		2005-06	59.13-130.84	IC111948, IC47018, IC47017, IC35176, IC35076 (< 62.00)	PBW 343(88.02)	
		2008-09	54.00-135.80	IC535395, IC290172, IC310534, IC535346, IC313152 (< 65.00)	-	
	Spike length (cm)	Faizabad	2004-05	5.60-14.20	IC145759, IC128661, IC145253, IC145304, IC145810 (>13.10)	Sonalika (9.61)
			2005-06	6.00-14.00	NC63954, NC63955, IC35125, IC35159, IC35166 (>13.00)	Sonalika (9.35)
			2007-08	6.20-13.70	IC138640, IC252970, IC138489, IC252803, IC138630 (>12.80)	GW 322 (10.29)
2008-09			3.70-20.00	IC266764, IC290167, IC260942, IC290168, IC290165, IC290164 (>16.00)	Sonalika (9.95)	

	Ludhiana	2004-05	0.90-13.80	IC128548, IC128651, IC35152, IC128439, IC35153 (>12.60)	Sonalika (9.46)
		2005-06	6.00-14.00	NC59608, IC28518, IC28526, IC28542, IC47510 (>11.30)	Lok 1(8.69)
		2006-07	5.60-16.10	IC279030, IC335993, IC258209, IC258212, IC313154 (> 14.80)	Sonalika (9.97)
	Pantnagar	2004-05	1.50-20.90	IC145759, IC128535, IC145253, IC128552, IC128448 (>16.80)	Sonalika (12.54)
		2005-06	6.00-21.50	NC63954, NC63955, IC36763, IC28544, IC82190 A (>15.50)	Sonalika (10.98)
		2006-07	5.50-14.30	IC266977, IC279334, IC356111, IC416127, IC427216 (> 13.40)	Sonalika (9.51)
		2007-08	6.40-14.20	IC252565, IC252831, IC252992, IC252798, IC252763 (>14.00)	Sonalika (10.52)
	Powarkheda	2004-05	0.10-16.50	IC82118, IC145303, IC145519, IC279890, IC145789 (>14.20)	Sonalika (9.37)
		2005-06	1.50-17.50	NC63954, IC28952, IC82201, IC78812 A, IC28515(>12.40)	Sonalika (9.13)
		2006-07	2.30-15.60	IC345671, IC416248, IC313157, IC321881, IC372643 (> 12.40)	Sonalika (10.32)
		2008-09	6.00-25.00	IC266764, IC266733, IC290165, IC290169, IC290167, IC290168, IC281561, IC319813 (> 13.00)	-
	Pune	2004-05	5.22-15.96	EC104555, IC55666, IC79037, IC82203, IC128559 (>12.66)	PBW 343 (9.16)
		2005-06	5.20-19.20	IC111889, NC63956, NC63955, IC47339, IC82434 (>13.60)	Sonalika (9.75)
		2006-07	1.28-14.40	IC355867, IC278994, IC279208, IC310099, IC415844, IC321993 (>12.82)	PBW 343 (10.21)
		2007-08	6.26-13.36	IC335708, IC138628, IC138497, IC252799, IC138526 (>12.90)	PBW 343 (10.00)
		2008-09	5.40-20.48	IC535213, IC290164, IC290167, IC266764, IC290168, IC290163 (>14.00)	Sonalika(9.10)
	Varanasi	2004-05	5.50-18.00	IC145449, IC128344, IC128206, IC128239, IC145821 (>14.00)	Sonalika (10.87)
		2005-06	5.00-19.80	NC63955, NC63954, IC78808, IC73649, IC28518 (>12.80)	Sonalika (9.45)
		2007-08	6.00-14.00	IC252630, IC138601, IC138470, IC252837, IC138435 (>13.00)	-
		2008-09	5.00-17.50	IC290165, IC290170, IC266764, IC290163, IC290164, IC290166 (>17.00)	-
	Vijapur	2004-05	0.40-18.30	IC321163, IC145685, IC145537, IC79050, IC128657 (>14.30)	PBW 343 (11.07)
2005-06		3.80-19.20	NC63954, NC62431, NC63955, IC82367, IC82221 (>14.50)	GW 322 (9.26)	
2006-07		5.00-17.00	IC415848, IC047077, IC322004, IC416248, IC279154, IC427217, IC310117, IC397959, IC416061, IC321159, IC415983, IC415979 (> 12.2)	Sonalika (10.23)	

		2007-08	5.40-14.70	IC138458, IC252635, IC252701, IC252449, IC252487 (>15.60)	-
		2008-09	3.00-19.20	IC290164, IC290168, IC290166, IC290167, IC290170, IC290169 (>13.00)	-
	Pooled over locations	2004-05	7.06-13.16	IC128439, IC145759, IC145386, IC128639, IC145253 (>12.35)	Sonalika (10.16)
		2005-06	6.30-16.40	NC63954, NC63955, IC82367, IC28544, IC35166 (>11.00)	Sonalika (9.39)
		2006-07	5.84-12.02	IC416248, IC415848, IC313152, IC330927, IC345671, IC310117, IC278994, IC321902 (> 11.02)	Sonalika (10.02)
		2007-08	7.42-11.77	IC138458, IC252635, IC252701, IC138527, IC252809 (>11.69)	Sonalika (10.09)
		2008-09	5.62-19.34	IC266764, IC290167, IC290164, IC290166, IC290168 (>16.00)	Sonalika (9.52)
No. of spikelets per spike	Faizabad	2004-05	10.40-36.00	IC138865, IC145780, IC145779, IC145729 (>23.25)	PBW 343 (18.52)
		2005-06	10.60-49.30	NC63954, NC63955, IC47072, IC73570, IC73588 (>31.00)	GW 322 (18.88)
		2007-08	11.20-28.80	IC145854, IC252509, IC252994, IC138604, IC252508 (>25.20)	PBW 343 (18.34)
		2008-09	5.60-50.80	IC266764, IC290170, IC290167, IC290165, IC279466, IC290164 (>23.20)	Sonalika(18.21)
	Ludhiana	2004-05	10.00-26.00	IC145779, IC145478, IC128637, IC128631, IC128570 (>24.00)	PBW 343 (18.03)
		2005-06	12.10-22.30	NC55718, IC79062, IC82331, NC59191, IC118712 (>20.00)	PBW 343 (15.58)
		2006-07	9.80-27.80	IC321924, IC258212, IC258210, IC258208, IC315871 (> 24.60)	PBW 343 (16.74)
	Pantnagar	2004-05	10.00-29.00	IC145253, IC145825, IC145322, IC145479, IC145478 (>27.00)	PBW 343 (20.03)
		2005-06	10.00-42.00	NC63954, NC63955, IC30291, IC36763, IC47795 (>26.00)	GW 322 (17.41)
		2006-07	10.00-74.00	IC279825, IC258210, IC315871, IC258212, IC260723 (>24.00)	GW 322 (15.50)
		2007-08	11.00-27.00	IC335708, IC335683, IC138489, IC252869, IC252841 (>26.00)	PBW 343 (23.80)
	Powarkheda	2004-05	1.07-31.00	IC145581, IC47518, IC128196, IC145781, IC145410 (>27.10)	PBW 343 (19.23)
		2005-06	9.00-52.00	IC47079, IC78932, NC63954, IC75337, IC75341 (>24.00)	PBW 343 (17.82)
		2006-07	9.00-31.00	IC321993, IC260867, IC035058, IC059619, IC066542, IC260877, IC273931, IC321163 (> 25.00)	PBW 343 (19.80)
		2008-09	23.00-53.00	IC274004, IC279336, IC290169, IC258207, IC260941, IC266764, IC279439, IC290168 (>49.00)	-

	Pune	2004-05	10.00-28.00	IC145780, IC145643, IC145478, IC145783, IC145276 (>24.00)	PBW 343 (18.63)
		2005-06	7.20-27.60	NC63956, IC82434, IC73595, IC75320, IC111783 (>23.80)	GW 322 (16.99)
		2006-07	10.00-31.00	IC335997, IC279889, IC310099, IC416272, IC416078, IC415844, IC279740, IC281557 (>24.00)	PBW 343 (22.10)
		2007-08	11.00-24.00	IC252651, IC138464, IC138393, IC138530 (>23.00)	PBW 343 (20.17)
		2008-09	7.80-37.80	IC266764, IC279314, IC535297, IC321163, IC535473, IC258212 (>28.00)	PBW-343 (21.07)
	Varanasi	2004-05	12.00-26.00	IC145293, IC145779, IC1145478, IC36882 (>24.00)	GW 322 (16.93)
		2005-06	9.00-44.00	NC63955, NC63954, IC66542, IC36764, IC82249 (>24.00)	PBW 343 (16.94)
		2007-08	12.00-25.00	IC252509, IC145895, IC138597, IC145875, IC138524 (>23.00)	-
		2008-09	10.00-47.00	IC266764, IC279466, IC290162, IC290165, IC315871, IC260977 (>24.00)	-
	Vijapur	2004-05	0.20-28.20	IC128448, IC128397, IC128422, IC128396 (>24.33)	PBW 343 (19.56)
		2005-06	5.80-37.00	NC63954, NC62431, NC63955, IC82367, IC111951 (>24.00)	PBW 343(17.07)
		2006-07	9.00-24.00	IC321159, IC322004, IC035171, IC066542, IC266791, IC260870, IC338682, IC281569, (> 23.00)	PBW 343 (17.60)
		2007-08	8.40-39.40	IC252873, IC145943, IC145962, IC252484, IC145864 (>26.00)	-
		2008-09	5.00-19.00	IC535337, IC290170, IC290168, IC47017, IC535299, IC535300, IC535280, IC535339, IC535559, IC290165 (>11.00)	-
	Dharwad	2008-09	2.40-3.80	IC030283, IC030282, IC030289, IC030297, IC030293, IC031529, IC035039, IC047011, IC030266, IC031774 (>26.40)	-
	Pooled over locations	2004-05	12.69-24.52	IC145780, IC145779, IC145478, IC145253, IC145781 (>202.39)	PBW 343 (18.66)
		2005-06	13.07-31.93	NC63954, NC63955, IC75341, IC30291, IC78932 (>21.00)	PBW 343 (17.11)
		2006-07	13.32-31.80	IC279825, IC313159, IC260870, IC260867, IC311078, IC260723, IC260866, IC281548 (> 21.76)	PBW 343 (18.77)
		2007-08	15.57-27.07	IC252873, IC145835, IC145943, IC252480, IC335744 (>27.00)	PBW 343 (20.77)
		2008-09	8.00-46.65	IC266764, IC258207, IC266976, IC258211, IC258212, IC290161 (>35.00)	PBW-343 (18.93)

No. of grains per spike	Faizabad	2004-05	3.00-91.20	IC145605, IC128165, EC104657, IC321152, EC104586 (> 71.60)	GW 322 (51.78)
		2005-06	17.00-78.00	IC28594, IC75356, IC75341, IC75343, IC111749 (> 65.00)	GW 322 (47.59)
		2007-08	19.60-92.20	IC335743, IC252995, IC145921, IC252579, IC145981 (>74.00)	GW 322 (47.31)
		2008-09	4.00-95.00	IC260871, IC290167, IC026724, IC535366, IC290079, IC290206 (>68.00)	Sonalika (41.12)
	Ludhiana	2004-05	3.80-82.20	IC128456, IC128573, IC128688, IC128596, IC145294 (>79.00)	PBW 343 (47.03)
		2005-06	4.40-78.80	IC111843, IC32517, IC78867, IC66515A, IC111760 (>72.00)	GW 322 (43.56)
		2006-07	4.40-78.80	IC104588, IC260888, IC066548, IC260866, IC260871 (> 69.2)	PBW-343(39.70)
	Pantnagar	2004-05	9.00-95.00	IC145410, IC82161, IC145523, IC128566, IC145397 (> 90.00)	GW 322 (65.03)
		2005-06	10.00-98.00	IC32584, IC41595, IC31964, IC75341, IC28838 (> 85.00)	GW 322 (50.12)
		2006-07	6.96-92.00	IC393108, IC416272, IC104582, IC393114, IC427216, (> 80.00)	PBW 343 (49.76)
		2007-08	18.60-83.00	IC252665, IC145968, IC335692, IC252745, IC252841 (>64.80)	PBW 343 (48.65)
	Powarkheda	2004-05	6.00-129.50	IC145368, IC128601, IC36845, IC145626, IC57579 (> 90.00)	PBW 343 (37.60)
		2005-06	10.00-94.00	IC29040, IC28960, IC111893, IC47038, IC26730 (>78.00)	GW 322 (48.53)
		2006-07	5.00-92.00	IC316098, IC416238, IC415953, IC415839, IC260875, IC066548 (> 76.00)	PBW 343 (52.70)
		2008-09	15.00-91.00	IC290180, IC279327, IC290099, IC260878, IC290271, IC290272, IC260877, IC290169 (> 78.00)	-
	Pune	2004-05	10.00-65.00	IC145610, IC145591, IC145752, IC145339, IC82283 (> 60.00)	GW 322 (42.07)
		2005-06	8.60-72.20	IC75322, IC82192, IC118712, IC111995, IC82190 A (> 62.00)	GW 322 (47.73)
		2006-07	11.60-68.60	IC416056, IC310099, IC416078, IC279315, IC279380, IC398039, IC427217, IC416285 (> 64.2)	PBW 343 (49.56)
		2007-08	21.20-72.00	IC252688, IC252720, IC335683, IC252773, IC335721 (> 68.80)	GW 322(49.80)
		2008-09	7.00-77.60	IC290168, IC290165, IC290044, IC290033, IC290261, IC290086 (> 63.00)	GW 322(45.45)

	Varanasi	2004-05	14.00-92.00	IC128519, IC128509, IC107397, IC82435, IC36882 (> 74.00)	GW 322 (52.23)	
		2005-06	10.00-72.00	IC79089, IC111769, IC75334, IC28962, IC111958 (> 69.00)	GW 322 (46.76)	
		2007-08	21.00-77.00	IC335707, IC145921, IC252351, IC335726, IC335721 (> 72.00)	-	
		2008-09	0.40-84.00	IC290165, IC290230, IC290293, IC321157, IC290170, IC535384 (>71.00)	-	
	Vijapur	2004-05	3.80-76.60	IC145610, IC145521, IC145249, IC319812, IC128196 (>71.00)	PBW 343 (52.14)	
		2005-06	6.00-80.00	IC26724, IC47509, IC78861, IC111799, IC36724 (>58.00)	PBW 343 (45.58)	
		2006-07	6.00-66.00	IC416272, IC316087, IC260871, IC416167, IC416251, IC415958, IC416079, IC322004 (> 58.00)	PBW 343 (43.90)	
		2007-08	14.00-96.00	IC138599, IC145890, IC145860, IC252739, IC138634 (>73.00)	-	
		2008-09	3.20-68.20	IC290088, IC290193, IC290166, IC290230, IC290082, IC290033 (>58.00)	-	
	Pooled over locations	2004-05	24.16-67.34	IC128566, IC128544, IC82161, IC128601, IC82236 (> 61.00)	GW 322 (49.05)	
		2005-06	17.06-62.46	IC75341, IC36711, IC26734, IC36715, IC75239 (> 58.29)	GW 322 (47.10)	
		2006-07	19.60-63.00	IC066548, IC066531, IC260871, IC416272, IC260888, IC316087, IC073209, IC416238 (> 58.00)	PBW 343 (47.12)	
		2007-08	29.63-60.07	IC252794, IC252351, IC335718, IC252739, IC335743 (> 57.70)	GW 322 (47.43)	
		2008-09	02.40-65.00	IC535334, IC290230, IC260877, IC290033, IC290165, IC290193 (> 55.00)	GW322(42.13)	
	Grain weight per spike (g)	Faizabad	2004-05	0.31-2.82	IC128690, IC128258, IC145747, IC128589, IC128691 (>2.7)	GW 322 (1.87)
			2005-06	0.18-2.98	IC79059, IC28594, NC57578, IC75356, IC75343 (>2.60)	GW 322 (1.57)
			2007-08	0.25-3.64	IC335747, IC252380, IC252400, IC145921, IC138430 (>3.15)	GW 322 (1.95)
			2008-09	0.02-3.11	IC290167, IC290231, IC290230, IC260871, IC290206, IC279707, IC290293, IC290071, IC316093, IC279604, IC290079, IC290227 (>2.55)	Lok 1(1.76)
		Ludhiana	2004-05	0.10-8.90	IC47487, IC28532, IC145314, IC55607, IC128434 (>3.00)	GW 322 (1.49)
			2005-06	0.02-9.72	IC111804, IC28864, IC75313, IC73575, IC111836 (>3.00)	PBW 343 (1.78)
2006-07			0.20-2.90	IC316099, IC372656, IC111887, IC104606, IC313156 (> 2.40)	PBW 343 (1.72)	
Pantnagar		2004-05	0.12-3.93	IC128623, IC321157, IC128154, IC145257, IC145414 (>3.70)	GW 322 (2.44)	

		2005-06	0.90-5.78	NC59512, IC41595, IC35124, IC78818 A, IC111895 (>3.84)	Lok 1 (2.20)
		2006-07	0.19-5.88	IC415959, IC416272, IC322020, IC416063, IC416105, IC416125 (>3.03)	PBW 343 (2.08)
		2007-08	0.14-3.19	IC252665, IC252441, IC252386, IC252380, IC252394 (>2.70)	Sonalika (1.92)
	Powarkheda	2004-05	0.10-8.10	IC145494, IC145434, IC335996, IC313157, IC321154 (>3.90)	GW 322 (1.49)
		2005-06	0.20-3.30	IC28962, IC26734, IC79059, IC28616, IC28902 (>3.00)	GW 322 (1.82)
		2006-07	0.10-6.00	IC416226, IC416261 (>3.50)	Lok 1(2.21)
		2008-09	0.50-4.00	IC290051, IC290250, IC279327, IC279466, IC274004, IC260878, IC273931, IC281566, IC290015, IC290060 (>3.40)	-
	Pune	2004-05	0.20-2.50	IC145670, IC145250, IC145332, IC128680, IC128521 (>2.40)	GW 322 (1.67)
		2005-06	1.00-13.70	IC75322, IC82192, IC118712, IC111995, IC82190 A (>12.40)	GW 322 (9.52)
		2006-07	0.30-2.86	IC416056, IC369878, IC398039, IC416152, IC279315, IC427217, IC397874 (> 2.64)	PBW 343 (2.14)
		2008-09	0.20-8.25	IC047012, IC535407, IC535212, IC321873, IC290205, IC290177 (>2.70)	GW322 (1.78)
	Varanasi	2004-05	0.02-3.15	IC59575, IC107397, IC82435, IC59568, IC59595 (>2.60)	Lok 1 (1.53)
		2005-06	0.09-2.41	IC145544, IC111849, NC59551, IC111769, IC79019 (>2.20)	PBW 343 (1.36)
		2007-08	0.40-4.10	IC145907, IC145908, IC138423, IC138504, IC252833 (>2.60)	-
		2008-09	0.10-7.00	IC535358, IC290230, IC290067, IC290335, IC290341, IC290334 (>2.00)	-
	Vijapur	2004-05	0.40-5.05	IC145615, IC381144, IC145810, IC128660, IC128589 (>3.18)	PBW 343 (2.23)
		2005-06	0.02-3.36	IC28609, IC35030, IC111773, IC28603, IC75359 (>2.35)	PBW 343 (1.94)
		2006-07	0.12-6.42	IC382722, IC416236, IC416251, IC415958, IC397879, IC341417, IC313151, IC416009 (> 2.70)	GW 322 (1.87)
		2007-08	0.10-3.65	IC252670, IC252410, IC145950, IC252409, IC252424 (>3.50)	-
		2008-09	0.02-2.54	IC290193, IC290166, IC321875, IC290194, IC290204, IC290215 (>2.20)	-

	Pooled over locations	2004-05	0.61-2.84	IC47487, IC145494, IC128588, IC128600, IC128589 (>2.26)	GW 322 (1.79)
		2005-06	0.50-3.81	IC111794, IC111804, IC75312, NC57578, IC111829 (>3.53)	GW 322 (2.80)
		2006-07	0.39-2.58	IC416226, IC416236, IC415959, IC416076, IC416272, IC416071, IC416125, IC416167(>2.26)	Sonalika (1.97)
		2007-08	0.60-2.55	IC252375, IC145907, IC145908, IC252670, IC252801 (>2.50)	PBW 343 & GW 322 (1.87)
		2008-09	2.05-2.98	IC290289, IC047012, IC535358, IC290230, IC290334, IC290193 (>2.00)	-
1000 grain weight (g)	Faizabad	2004-05	9.50-54.10	IC145278, IC128651, IC145611, IC128236 (>50.00)	Lok 1 (44.87)
		2005-06	8.70-66.80	IC28603, IC82270, IC78983, IC28604, IC28616 (>60.00)	Sonalika (43.99)
		2007-08	9.50-75.20	IC335737, IC252789, IC335671, IC138453, IC138640 (>62.00)	Lok 1 (43.62)
		2008-09	6.00-62.30	IC290256, IC290191, IC290083, IC258212, IC290065, IC026720 (>55.30)	Sonalika(41.49)
	Ludhiana	2004-05	2.80-52.60	IC128551, IC145255, IC128585, IC128588, IC128616 (>44.00)	GW 322 (31.01)
		2005-06	3.80-94.30	NC59547, IC49607, IC66515, IC111858, IC28604 (>70.60)	Lok 1 (47.44)
		2006-07	6.30-117.50	IC416182, IC416168, IC321868, IC321926, IC416232 (>96.40)	Sonalika (52.61)
	Pantnagar	2004-05	2.54-57.66	IC128638, IC361692, IC128218, IC55129, IC128590 (>55.00)	Lok 1 (47.92)
		2005-06	20.40-55.92	IC28604 (=55.92)	Lok 1 (47.44)
		2006-07	12.73-60.93	IC372661, IC279874, IC321923, IC345589, IC416038 (> 58.20)	Lok 1 (55.85)
		2007-08	11.43-64.80	IC252682, IC138428, IC138375, IC335711, IC252385 (>54.32)	GW 322 (44.54)
	Powarkheda	2004-05	7.10-79.00	IC128592, IC128593, IC128591, IC128590 (>60.00)	Sonalika (37.07)
		2005-06	6.00-64.50	IC111715, IC28599, IC28603, IC111895, IC28761 (>50.00)	Sonalika (40.12)
		2006-07	14.00-62.00	IC416179 (> 62.00)	Sonalika (51.00)
		2008-09	25.00-52.50	IC313151, IC290214, IC290335 (>51.00)	-
	Pune	2004-05	4.20-55.80	IC145250, IC78819, IC145372, IC145277 (>54.00)	Sonalika (46.64)
		2005-06	13.80-73.90	IC28603, IC28604 (>60.00)	Lok 1(50.12)
		2006-07	14.26-53.60	IC321991, IC427170, IC416263, IC416158, IC310127, IC321958, IC416038, IC397986 (>50.26)	Sonalika (46.69)
		2008-09	7.80-59.40	IC290205, IC290256 (>59.00)	Lok 1 (50.78)

	Varanasi	2004-05	1.59-48.30	IC128684, IC310106, IC128535, IC128312, IC128273 (>46.40)	Lok 1 (36.58)
		2005-06	6.30-53.30	IC75313, IC28604, IC111896, IC82288, IC112073 (>45.00)	Lok 1(38.33)
		2007-08	11.20-50.90	IC252858, IC252379, IC138557, IC252970, IC138642 (>48.00)	-
		2008-09	1.90-58.90	IC290027, IC290300, IC290335, IC310106, IC279317, IC281555 (>51.00)	-
	Vijapur	2004-05	3.96-89.21	IC145679, IC145536, IC145557, IC145730, EC104566 (>78.20)	Lok 1 (51.33)
		2005-06	8.30-79.40	IC111660, IC112009, NC55719A, IC28604, IC28609 (>64.00)	Lok 1 (51.54)
		2006-07	4.50-67.70	IC361576, IC393129, IC396578, IC066548, IC416009, IC415961, IC416088, IC372646 (>59.80)	Lok 1(50.02)
		2007-08	6.20-85.20	IC252851, IC252407, IC252428, IC252490, IC252912 (>59.50)	-
		2008-09	4.50-86.08	IC290179, IC290180, IC535386, IC290333, IC316093, IC317471 (>60.50)	-
	Pooled over locations	2004-05	18.19-49.24	IC145372, IC128156, IC145430, IC128632, IC128593 (> 45.90)	Lok 1 (41.89)
		2005-06	16.54-59.22	IC28603, IC28604, IC36889, IC36716, IC111896 (>49.50)	Lok 1(45.02)
		2006-07	13.21-58.67	IC416182, IC332329, IC416175, IC321926, IC321923 (>54.34)	Sonalika (49.06)
		2007-08	18.28-50.36	IC252381, IC252851, IC252379, IC252407, IC335704 (>47.86)	W 322 (43.17)
		2008-09	4.20-50.88	IC290256, IC290333, IC317471, IC290179, IC290205, IC290180, IC313152, IC290334, IC535212, IC316086, IC290226 (>46.00)	Lok 1(45.50)

Multi-location evaluation of wheat germplasm for quality traits

Traits	Location	Year	Range	Promising accessions	Best check (value)
Hectolitre weight (kg/hl)	Ludhiana	2004-05	52.40-81.60	IC128296, IC128423, IC128394, IC128403, IC128359 (>80.60)	Lok 1 (72.38)
		2005-06	52.00-85.00	IC75340, IC111652, IC78820A, IC111875, IC75358 (>84.00)	Sonalika (77.18)
		2006-07	49.55-96.50	IC063988, IC321938, IC321894, IC321918, IC321916, IC396578, IC321919, IC321914 (>79.70)	Sonalika (76.12)
		2007-08	57.30-81.40	IC252824, IC252981, IC252965, IC145935, IC145907 (>79.50)	-
		2008-09	53.00-79.60	IC290258, IC290082, IC290175, IC258214 (>78.00)	-
	Powarkheda	2004-05	57.90-44.10	IC128174, IC128184, IC279876, IC145403, IC145722 (>83.10)	Lok 1 (75.34)
		2005-06	51.20-85.00	IC111638, IC111901, IC118723, IC78829, IC111702 (>83.5)	Sonalika (78.51)
		2006-07	49.75-89.18	IC416000, IC416098, IC078855, IC384529, IC384536, IC321918, IC321910 (>84.90)	Sonalika (81.18)
	Pune	2004-05	63.70-90.50	IC128445, IC128360, IC128273, IC128700, IC128669 (>85.00)	Sonalika (80.81)
		2005-06	64.00-85.50	IC111668, IC28929, IC111838, IC111905, IC111689 (>85.50)	Lok 1 (79.45)
		2006-07	60.90-88.75	IC415979, IC396582, IC279564, IC268094, IC384529, IC279329 (>84.50)	Sonalika (80.36)
		2007-08	64.30-84.80	IC252879, IC252519, IC138325, IC252516, IC252894 (>84.60)	-
	Varanasi	2004-05	55.40-87.10	EC73573, IC145368, IC145428, IC145454, IC128583 (>83.60)	Sonalika (77.04)
		2005-06	57.30-83.00	IC78776, IC111902, IC111905, IC47939, IC111686 (>82.40)	PBW 343 (72.34)
		2007-08	65.00-83.50	IC138628, IC138633, IC252861, IC145976, IC145971 (>82.00)	-
	Pooled over locations	2004-05	62.40-84.60	IC128376, IC128386, IC128371, IC128304, IC59595 (>82.70)	Lok 1 (76.25)
		2005-06	58.10-83.30	IC111905, IC111638, NC60201, IC111920, IC11166 (>82.30)	Sonalika (76.61)
		2006-07	61.19-86.41	IC063988, IC321918, IC321941, IC321914, IC384536, IC384529, IC321867, IC321157 (>82.47)	Sonalika (79.22)
		2007-08	64.80-84.00	IC138424, IC138481, IC138482, IC252796, IC252517 (>83.17)	-

Protein (%)	Ludhiana	2004-05	7.80-15.78	IC145550, IC145551, IC145553, IC145779, IC145759 (>14.92)	Sonalika (11.63)
		2005-06	7.49-16.16	IC36886, IC47790, IC28604, IC47527, IC28603 (>14.80)	Sonalika (11.22)
		2006-07	8.77-14.86	IC311079, IC279203, IC311076, IC381168, IC310078, IC310081, IC310076, IC381085, IC381007, IC382719, IC278948, IC278994, IC361576 (>14.28)	PBW 343 & Sonalika (10.43)
		2007-08	9.05-16.56	IC252400, IC252398, IC138400, IC138456, IC138499 (>16.25)	-
		2008-09	8.63-16.31	IC310124, IC321866, IC535422, IC290020, IC290169 (>16.10)	-
	Powarkheda	2004-05	7.77-16.77	IC145659, IC63947, IC145641, IC145664, IC145646 (>15.36)	PBW 343 (12.26)
		2005-06	9.24-17.85	IC111643, IC111673, IC82151, IC111672, IC111644 (>16.44)	GW 322 (12.53)
		2006-07	8.68-14.69	C361281, IC415941, IC260912, IC382658, IC260902, IC382649, IC341374, IC268094, IC313149, IC356466, IC338688, IC313157 (>13.35)	PBW 343 (11.06)
	Pune	2004-05	10.59-18.81	IC145399, IC335958, IC145780, IC145791, IC82382 (>17.00)	PBW 343 (13.81)
		2005-06	9.06-17.86	IC47504, IC47495, IC47508, IC47511, IC36877 (>17.40)	Sonalika (13.15)
		2006-07	8.12-15.26	IC415845, IC364055, IC415942, IC335958, IC416260, IC321894, IC416016, IC260941 (>14.30)	Sonalika (12.05)
		2007-08	9.33-16.67	IC145953, IC145898, IC138546, IC252369, IC252344 (>16.61)	-
	Varanasi	2004-05	9.41-15.11	IC145759, IC145748, IC145797, IC128553, IC128587 (>14.66)	PBW 343 (11.96)
		2005-06	8.09-16.65	IC118720, IC82312, IC35092, IC35094, IC36881 (>15.10)	PBW 343 (11.85)
		2006-07	8.63-15.63	IC416261, IC416003, IC416280, IC266791, IC416248, IC118779, IC321877, IC281542 (>14.29)	Sonalika (11.95)
		2007-08	9.05-14.23	IC252968, IC252775, IC252965, IC252618, IC138578 (>13.86)	-
	Pooled over locations	2004-05	10.14-15.22	IC145399, IC145661, IC145780, IC145664, IC145759 (>14.60)	PBW 343 (12.25)
		2005-06	9.85-15.81	IC118720, IC82312, IC35092, IC35094, IC36881 (>14.71)	PBW 343 (11.85)
		2006-07	9.33-13.63	IC416280, IC311079, IC415941, IC260941, IC416211, IC279203, IC381111, IC381168 (>12.95)	Sonalika (11.33)
		2007-08	9.63-14.60	IC138456, IC145953, IC252398, IC145971, IC145954 (>14.31)	-

Promising wheat germplasm accessions with multiple disease resistance under hot spot locations

Multiple diseases	Year	Promising accessions
Leaf blight, black rust, brown rust and yellow rust	2004-05	IC145780
	2005-06	IC82194, IC111692
	2008-09	IC260849, IC279320, IC290261, IC290262, IC290264
Leaf blight and black rusts	2007-08	IC138411, IC138419, IC138538, IC138551, IC138557
Leaf blight and yellow rusts	2007-08	IC138512, IC138538, IC145871, IC145888, IC252785
Leaf blight	2007-08	IC138458, IC138516, IC138591, IC252784
Leaf blight, black rust and yellow rust	2004-05	IC145780, IC145779
	2005-06	IC82194, IC111692
	2008-09	IC260849, IC260919, IC260930, IC260967, IC260972
Leaf blight, brown rust and yellow rust	2004-05	IC145780
	2005-06	IC82194, IC111692
	2008-09	IC260849, IC279320, IC290076 , IC290088, IC290185
Leaf blight, black rust and brown rust	2004-05	IC145798, IC145780
	2005-06	IC82194, IC28960, IC111692
	2007-08	IC138404, IC138408, IC138429
	2008-09	IC260849, IC279320, IC290261, IC290262, IC290264, IC290299, IC290309, IC290314, IC290316, IC316100
Karnal bunt, black rust, brown rust and yellow rust	2004-05	IC128619, IC128642, IC128647, IC128643, IC128624
	2005-06	IC47044, IC63954, IC63955, IC75314, IC111670, IC111771, IC111783
	2006-07	IC321981, IC416082, IC416083, IC416084, IC416089, IC416092, IC416102, IC416112, IC416113, IC427210
	2008-09	IC24177, IC260849, IC279321, IC290065, IC290096, IC290196
Black rust, brown rust and Karnal bunt	2004-05	IC128181, IC128186, IC128197, IC128201, IC128202
	2005-06	IC111670, IC82394, IC75356, IC75352, IC75348
	2006-07	IC279864, IC279879, IC372646, IC397922, IC415945, IC415954, IC415977, IC415981
	2008-09	IC279688, IC290086, IC290156, IC290205, IC290262, IC290297, IC290322, IC290334, IC535459
Black rust, yellow rust and Karnal bunt	2004-05	IC128172, IC128507, IC128521, IC128525, IC128526
	2005-06	IC28936, IC35161, IC36705, IC36761, IC47044
	2006-07	IC321985, IC416074, IC416072, IC427231, IC416075, IC416258, IC398115, IC398067, IC416161, IC397999, IC416273, IC416247, IC397830, IC416162, IC416219, IC397986
	2008-09	IC24175, IC24548, IC255632, IC260875, IC260876
Brown rust , yellow rust and Karnal bunt	2004-05	IC128654, IC128638, IC128642, IC128656, IC128592
	2005-06	IC36747, IC41589, IC47044, IC63954, IC63955
	2006-07	IC416081, IC416095
	2008-09	IC290038, IC290322

Leaf blight and Karnal bunt	2004-05	IC145797, IC145779, IC145798
	2005-06	IC31979, IC36737, IC36739, IC73647, IC78981
	2006-07	IC355872
Black, brown and yellow rusts	2005-06	IC63954, IC63955, IC111659, IC111667, IC111668
	2006-07	IC260877, IC321981, IC416080, IC416082, IC416083, IC416084, IC427210
	2007-08	IC138364, IC138426, IC138432, IC138438, IC138477
	2008-09	IC24177, IC260849, IC260877, IC279320, IC279320, IC279321, IC279875, IC281566, IC290022, IC290025, IC290039
Black and brown rusts	2005-06	IC111954, IC111930, IC111944, IC111828, IC111736
	2006-07	IC118713, IC262365, IC279314, IC279321, IC279327, IC279335, IC279480, IC279604
	2007-08	IC138395, IC138397, IC138401, IC138404, IC138406
	2008-09	IC260878, IC279688, IC279864, IC290037, IC290040, IC290041, IC290043, IC290043, IC290051, IC290055, IC290056, IC290072
Black and yellow rusts	2005-06	IC111648, IC111652, IC111660, IC111664, IC111669
	2006-07	IC026048, IC279886, IC281560, IC315871, IC321953, IC321985, IC381144, IC382720
	2007-08	IC138357, IC138361, IC138362, IC138363, IC138392
	2008-09	IC24175, IC24548, IC255632, IC258214, IC258215
Brown and yellow rusts	2005-06	IC41589, IC36751, IC36747, IC36723, IC112006
	2006-07	IC321977, IC321982, IC415940, IC415966, IC416081, IC416085, IC416095
	2007-08	IC138507, IC138511, IC145909, IC252402, IC252425
	2008-09	IC260935, IC266764, IC279564, IC279877, IC281564

Evaluation of wheat germplasm for abiotic stress

Salt stress			
Location	Year	Promising accessions based on higher grain yield	Best check (grain yield)
CSSRI, Karnal	2007-08	IC252813, IC252881, IC252799, IC252876 (580-636g /m ²)	KRL 3-4 (580g/m ²)
	2008-09	Nil	KRL3-4 (384.4 g/m ²)