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Wheat (*Triticum aestivum*) varietal spectrum and need of varietal replacement in relation to north-eastern India

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Farmers are the ultimate stakeholders in agriculture and seed is a vehicle to derive almost all agricultural and technological innovations to them so that the maximum genetic potential of a variety can be exploited. The availability and access of quality seed of adaptable, stable and high yielding modern varieties is, therefore, determinant to the efficiency and productivity of other packages (irrigation, fertilizers, pesticides) in increasing crop production to enhance food security and alleviating rural poverty in developing countries (Gastel *et al.* 2002).

A total of 98 298.31 q of breeder seed of different crops have been produced against a total indent of 83 854.50 q during 2010-11. Major quantity belonged to cereals (47 813.77 q) and oilseeds (34 014.54 q) followed by pulses (15 360.32 q), forages (1039.01 q) and fibres (70.67 q) (Anonymous 2011a). In case of wheat in 2005-06, 16 407 q of breeder seed was produced against the indent of 10 906.02 q, in 2006-07, 14 863.42 q against 13 451.80 q, in 2007-08 26 204.13 q against 21 460.56 q, in 2008-09, 28 982.96 q against 23 349.24 q, in 2009-10, 35 049.11 q against 32 330.19 q and in 2010-11, 38 469.44 q was produced against the indent of 29 691.60 q (Anonymous 2011a).

Wheat is the second most important food crop of the country and contributes nearly one third of the total food grain production (Nagrajan 2005, Joshi *et al.* 2007). Global wheat production during 2010-11 was 682 million tonnes and during 2011-12 it is estimated as 693 million tonnes. Wheat consumption worldwide is estimated to surpass 817 million tonnes by 2030 and production would need to increase at 22.6-43.6% in different countries at the current production level to meet the estimated consumption demand (Sharma 2011a). The annual production of wheat in India during 2010-11 was 85.93 mt (Table 1) which was a tremendous

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Table 1 Area (m ha), production (mt) and productivity (kg/ha) of wheat in last ten years

Year	Area	Production	Productivity
2001-02	26.34	72.77	2 762
2002-03	25.20	65.76	2 610
2003-04	26.60	72.16	2 713
2004-05	26.38	68.64	2 602
2005-06	26.48	69.35	2 619
2006-07	27.99	75.81	2 708
2007-08	28.04	78.57	2 802
2008-09	27.75	80.68	2 907
2009-10	28.46	80.80	2 839
2010-11	29.25	85.93	2 938

Table 2 State wise Area (m ha) and production (mt) of wheat

State	2010-11	
	Area (m ha)	Production (mt)
Punjab	3.51	15.82
Haryana	2.51	11.04
Uttar Pradesh	9.63	30.01
Bihar	2.24	4.67
Rajasthan	2.47	7.22
Madhya Pradesh	4.34	7.63
Chhattisgarh	0.11	0.13
Gujarat	1.29	3.85
Maharashtra	1.32	2.29
West Bengal	0.32	0.84
Asom	0.06	0.06
Uttarakhand	0.38	0.89
Himachal Pradesh	0.36	0.67
Jammu & Kashmir	0.29	0.29
Jharkhand	0.10	0.15
Karnataka	0.25	0.25
Others	0.05	0.12

Table 3 Breeder and nucleus seed production status of some prominent varieties of NEPZ during *rabi* 2010-11

Varieties	Year	DAC Indent	Breeder seed production (q)			Nucleus seed production (q)		
			Targets as per BSP I	Production as per BSP IV	Surplus (+)/ Deficit (–) over DAC Indent	Targets as per BNS I	BNS IV	Surplus (+)/ Deficit (–) over DAC Indent
CBW 38	2008	359.20	275.00	186.50	–172.70	13.00	4.30	–8.70
DBW 14	2002	3.00	3.00	21.10	18.10	1.00	1.10	0.10
DBW 39	2010					1.00	5.00	4.00
HD 2643	1995	320.00	230.00	5.10	–314.90	10.00	7.32	–2.68
HD 2733	2001	700.00	675.00	850.00	150.00	31.00	30.79	–0.21
HD 2824	2003	122.00	122.00	240.00	118.00	6.00	15.55	9.55
HD 2888	2005	29.00	22.00	35.60	6.60	1.00	2.00	1.00
HD 2985	2009					0.00	1.10	1.10
HP 1633	1992	7.00	7.00	40.80	33.80	0.50	0.80	0.30
HP 1731	1994	6.00	6.00	36.80	30.80	0.50	1.00	0.50
HUW 234	1985	59.00	59.00	105.00	46.00	12.00	15.10	3.10
HUW 468	1999	325.00	325.00	187.50	–137.50	5.00	10.50	5.50
HW 2045	2002	16.00	16.00	63.60	47.60	1.00	2.00	1.00
K 0307	2006	234.00	234.00	145.25	–88.75	9.00	5.40	–3.60
K 7903	1999	125.00	125.00	192.20	67.20	4.50	13.60	9.10
K 9162	1999	100.00	100.00	140.00	40.00	3.00	3.00	0
K 9533	2002	112.00	112.00	56.00	–56.00	3.00	3.00	0
NW 1012	1997	254.00	254.00	211.00	–43.00	10.00	1.10	–8.90
NW 1014	1997	202.00	202.00	171.00	–31.00	12.00	4.10	–7.90
NW 2036	2002	316.00	316.00	172.00	–144.00	6.00	3.00	–3.00
PBW 443	1999	215.00	215.00	196.60	–18.40	8.00	4.40	–3.60
Raj 4120	2008	115.00	115.00	245.78	130.78	3.00	20.17	17.17
UP 262	1977	53.60	53.60	121.50	67.90	3.00	4.00	1.00
HD 2888	2005	29.00	22.00	35.60	6.60	1.00	2.00	1.00
MACS 6145	2002	2.00	2.00	4.50	2.50	1.00	1.55	0.55

improvement over the production level in 1964 (12.57 mt) due to the genetic potential of genotypes, rapid growth in irrigated areas and popularization of recommended agronomic package of practices (Kumar and Maloo 2011). The per capita availability of wheat in India is near about 67 kg/ annum and in the only wheat dependency areas for complete suffice it should be much higher than the present availability. After the incorporation of dwarfing gene Norin 10 production was tremendously capitalized, which brought food self-sufficiency and promoted the build-up of buffer stocks in the country (Kumar and Maloo 2011). However, to meet the wheat production targeted as 100 mt by the year 2030 (Sharma 2011a), sustained research efforts are further needed to keep the upward trend in wheat production well above the population growth.

The wheat growing parts of India has been divided in the six zones namely, viz. NHZ (Northern Hills Zone), NWPZ (North Western Plain Zone), NEPZ (North Eastern Plain Zone), CZ (Central Zone), PZ (Peninsular Zone) and SHZ (Southern Hills Zone). All the zones are mega environments and considerably differ in terms of soil type, rainfall pattern, temperature and biotic and abiotic stress. The perusal of data in Table 2 depicted that Uttar Pradesh was the highest wheat producing state (30.01 mt) followed by Punjab (15.82 mt) and Haryana (11.04 mt), respectively (Sharma 2011b). The area under wheat is less than one m ha in the states, viz. Chhattisgarh, West Bengal, Asom, Jharkhand, Uttarakhand, Karnataka, Jammu & Kashmir and Himachal Pradesh, etc.

The NEPZ is the second largest zone after NWPZ and hovers near about 10.5 m ha area and includes parts of East Uttar Pradesh, Bihar, Jharkhand, West Bengal, Odisha, Asom and plains of north-eastern states. The area in NEPZ is mostly covered by rice in *kharif* season, and wheat crop is naturally delayed due to late harvesting of previous rice crop. Keeping in mind about the climatic, biotic and abiotic conditions of the NEPZ the research priorities are as development of early maturing wheat varieties suitable in rice-wheat system, high yielding varieties with tolerance to post harvest sprouting, leaf blight complex and cereal rusts and as per as the concern of abiotic stress, heat stress, sodicity,

micronutrient deficiency and water stress are the main breeding objectives.

Seed play a catalytic role, it should reach farmers in a good quality state, i e high genetic purity and identity, as well as high physical, physiological and health quality (Gastul *et al.* 2002). In contrast to fertilizers and pesticides, farmers select and save seed to plant the next year's crop, but they innocent are unaware about genetic impurities as mixtures, weeds and any off-farm seed. However, the long time farm saved seed sowing practice is not only diminishing the seed replacement ratio but also the seed multiplication rate due to the genetic deterioration of a variety.

After the perusal of data in Table 3 it was exhibited that variety HD 2733 was highly indented variety (700 q) followed by CBW 38 (359.20 q) and HUW 468 (325 q), respectively. The varieties namely, viz. NW 2036 (316 q), NW 1012 (254 q), K 0307 (234 q), NW 1014 (202 q), K 7903 (125 q), Raj 4120 (115 q), K 9533 (112 q), K 9162 (100 q) and HUW 234 (59 q) were also indented well in seed production chain (Anonymous 2011b). In terms of actual breeder seed produced (BSP IV), Table 3 depicted that the varieties, viz. HD 2733 (850 q), Raj 4120 (245.78 q), HD 2824 (240 q), NW 1012 (211 q), K 7903 (192.20 q), HUW 468 (187.50 q) and CBW 38 (186.50 q) are becoming more popularized. The HD 2733 (150 q) was the highest positively surplus variety followed by HD 2824 (118 q) and Raj 4120 (130.78 q).

SUMMARY

The varieties as UP 262, HUW 234, HP 1633 and HP 1731 were promising and released quite earlier and are still in breeder seed production chain. The old varieties which are susceptible to cereal rusts and leaf blight should be replaced by newly released varieties. Under timely sown conditions (sowing window- 10-25 Nov.) varieties, viz. DBW 39, CBW 38, Raj 4120, K 307, HD 2733, HD 2824, HD 2888 (rainfed, sowing window- 25 Oct.-15 Nov.) and MACS 6145 (rainfed) are recommended. For late sown conditions (sowing window- 10-25 Dec.) the short duration varieties, viz. HD 2985, HD 2643, HW 2045, NW 2036, DBW 14, etc. should come in real farmers practice. In terms of production north-eastern part of the country is sleeping giant and having the great potential. Popularization and acceptance of newly released high yielding and disease tolerant varieties will definitely contribute efficiently in the wheat basket of the country and certainly will help to match the wheat availability demand under the rising population pressure.

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