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Varietal Release

HI 1628: A high yielding wheat variety for timely sown, restricted irrigated conditions of North Western Plains Zones of India

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Abstract

A high yielding bread wheat variety HI 1628 (Pusa Wheat 1628) has been released and notified by the Central Sub-Committee on Crop Standards, Notification and Release of Varieties for Agricultural Crops, Government of India for commercial cultivation under timely sown, restricted irrigated conditions of North Western Plains Zone (NWPZ) of the country. HI 1628 has an average yield of 50.4 q/ha over the zone and showed significant superiority over the checks; with a potential yield of 65.1 q/ha. It has shown an excellent and wider adaptation and significantly superior performance across different irrigation regimes over the checks with an average yield of 45.5 q/ha. It showed high levels of field resistance to stripe and leaf rusts. It is a good quality bread wheat genotype with excellent *chapati* quality (7.56), bread quality (7.64), biscuit spread factor (8.27) and high sedimentation value (56.6 ml). It has high protein content (~11 %) and protein quality (Glu score of 8/10) for high molecular weight subunits and presence of 5+10 subunit of Glu-D1 reflecting higher gluten strength in the genotype. It has good levels of essential micronutrients like iron and zinc making it rich in nutritional qualities. This variety has promise for timely sown, restricted irrigation planting areas and thus will contribute to increase wheat production and will alleviate the socio-economic status of farmers of NWPZ of India.

Key words: Bread wheat, rust resistance and quality traits, yield

Introduction

Wheat is the most important food crop of the world. It provides food to 36 % of the global population and 20 % of the food calories. The area of wheat cultivation in India is ~30 million hectares with the production

of ~108 million tones (IIWBR Director's Report, 2020). The area of early sown and restricted irrigated conditions in North Western Plains Zones (NWPZ) is increasing due to limited water availability, and there is priority to breed for resistance to stripe rust with tolerance to heat stress. The improvement in grain yield is the ultimate aim of wheat improvement programme in India. However, the increase in the yield may be effectively tackled on the basis of performance of yield components and related characters (Pal, 2017).

Development and Notification of HI 1628: The variety HI 1628 was developed from the cross FRET2*2/4/SNI/TRAP#1/3/ KAUZ*2/TRAP//KAUZ/5/PFAU/WEAVER// BRAMBLING and the same cross was the selection from exotic material received from CIMMYT 44th IBWSN International Nursery (44th International Bread Wheat Screening Nursery -1014) during 2012-13. The HI 1628 further developed by the ICAR-Indian Agricultural Research Institute, Regional Station, Indore and was released by the Central Sub-Committee on Crop Standards, Notification and Release of Varieties for Agricultural Crops and notified vide S.O. 91 E, dated 6.1.2020 for commercial cultivation under timely sown, restricted irrigation conditions of the NWPZ, which is the largest growing zone of the country and comprises states like Punjab, Haryana, Delhi, Rajasthan (except Kota and Udaipur Divisions), Western Uttar Pradesh (except Jhansi Division), Jammu & Kathua district of Jammu & Kashmir, Una district & Paonta Valley of Himachal Pradesh and Tarai region of Uttarakhand.

Yield superiority and adaptability: This variety entered in coordinated evaluation trial (NIVT) during 2016-17. Under co-ordinated trials of AICW&BIP, HI 1628 was evaluated at 35 locations during 2016-17 to 2018-19 out of which it occurred 11 times in the first non-significant group indicating its wider adaptability and stable yielding feature (Table 1). HI 1628 has produced an average yield of 50.4 q/ha over the zone and showed superiority over checks in timely sown, restricted irrigated conditions. The potential yield of HI 1628 is 65.1 q/ha in Sriganganagar (2017-18). It has significant yield advantage of 5.2 %, 16.1 %, 11.3 % and 11.3 % over the checks WH 1142, HD 3043, PBW 644 and WH 1080, respectively. The HI 1628 was medium late to flowering (95-100 days), maturity (145-150 days) as compared to all the check varieties and possessed bold grains (TGW 45.0 g).

Table 1: Summarized yield data of coordinated trials over North Western Plains Zone (NWPZ)

Items	Year of testing	No. of trials/ location	Proposed variety	Check Varieties			
			HI 1628	WH 1142	HD 3043	PBW 644	WH 1080
Mean yield (q/ha)	1st year (2016-17)	8	55.0	51.6	-	-	-
	2nd year (2017-18)	13	47.5	45.5	41.7	44.7	44.8
	3rd year (2018-19)	14	50.5	47.9	45.0	45.9	45.7
	Weighted Mean		50.4	47.9	43.4	45.3	45.3
% increase/ decrease over the checks & qualifying variety : Overall Weighted Mean				5.2*	16.1*	11.3*	11.3*
Frequency in the first top non-significant group : Pooled for three years			**11/35**	7/35	1/27	4/27	1/27

* Significantly superior

Distinguishing morphological characteristics: Wheat variety HI 1628 has semi-erect growth habit, green foliage colour and anthocyanin pigmentation was absent on coleoptile at boot stage. It has semi-erect, medium sized having green flag leaf, strong waxiness on sheath and blade. Peduncle of HI 1628 is medium, with medium dense, white coloured, weak waxy and tapering spike which bears white awn. The lower glume has narrow sloping shoulder with long straight beaks. It possesses amber coloured, ovate, medium sized, hard grain with medium germ width.

Performance in agronomical evaluation: The HI 1628 was higher yielding genotype (45.5 q/ha) in agronomic evaluation at different irrigation levels than the check varieties HD 3043 (43.53 q/ha), PBW 644 (44.54 q/ha) and WH 1080 (45.51 q/ha). It has shown excellent and wider adaptation and significantly superior performance across different irrigation regimes over the checks HD 3043 (4.5 %) and PBW 644 (2.2 %). It showed significantly high yield gain at one irrigation (16.0 %) and two irrigations (21.0 %) over no irrigation conditions. It registered 3.7 to 8.5 per cent grain yield superiority over the three checks under no irrigation. It showed significant increase (3.0 % to 12.0 % in overall mean) for 1000 grain weight over all the checks.

Resistance to major disease and pests: Under artificial epiphytotic conditions, HI 1628 showed high levels of field resistance to stripe rust (ACI: Mean-15.0) compared to checks. Under natural conditions, highest stripe rust severity during three years of observations under natural conditions remained only up to 20S in HI 1628, whereas, all the check varieties showed highest stripe rust severity from 40S to 60S. HI 1628 showed high level of field resistance to leaf rust (ACI: Max.-5.8, Mean-2.1) compared to checks. It also showed good levels of adult plant resistance to prevalent and virulent stripe rust pathotypes 46S119 and 110S119; and leaf rust pathotypes 77-5 and 77-9. It showed good levels of resistance to leaf blight, Karnal bunt, flag smut; and was not affected by major insect pests.

Grain quality: HI 1628 is a good quality bread wheat genotype with excellent *chapati* quality (7.56), bread quality (7.64), biscuit spread factor (8.27) and high sedimentation value (56.6 ml). It has high protein content (~11 %) and protein quality (Glu score of 8/10) for high molecular weight subunits and presence of 5+10 subunit of Glu-D1 reflecting higher gluten strength in this genotype. It has good levels of essential micronutrients like iron and zinc making it rich in nutritional qualities. It meets all desirable components for better biscuit, *chapati* and bread making qualities that makes it also favourable for industrial purpose.

In nutshell, the high yield potential variety HI 1628 couples with moisture stress tolerance and heat with plasticity for sowing time and resistance to major insect pests, stripe and leaf rusts makes this variety a suitable choice for the farmers of NWPZ of the country.

Table 2: Adaptability to changes in agronomic conditions (2019-20)

Experiment / Item	Irrigation levels	Proposed Variety	Check Varieties			
		HI 1628	WH 1142	HD 3043	PBW 644	WH 1080
Yield (q/ha)	I1 (No irrigation)	40.51	40.46	37.32	38.72	39.06
	I2 (One irrigation)	46.98	48.20	44.01	45.81	46.66
	I3 (Two irrigations)	49.02	52.10	49.25	49.09	50.82
	Mean	45.50	46.92	43.53	44.54	45.51
% gain or loss with irrigation levels	I2 : I1	16.0	19.1	17.9	18.3	19.5
	I3 : I1	21.0	28.8	32.0	26.8	30.1
	I3 : I2	4.3	8.1	11.9	7.2	8.9

CD (P = 0.05): *Irrigation = 0.48; Variety = 0.71; Variety within irrigation = NS, Irrigation within variety = NS* * Significantly superior

Table 3: Quality characteristics of wheat variety HI 1628

Quality trait	NWPZ
Protein %	10.95
Fe (ppm)	33.6
Zn (ppm)	35.5
Grain Hardness index	81.9
Sedimentation value (ml)	56.6
Phenol test (max score 10)	6.8
Wet Gluten (%)	24.6
Dry Gluten (%)	8.0
Gluten Index	82.0
Chapati quality	7.56
Bread Loaf Volume (ml)	610
Bread Quality (Max. Score – 10)	7.64
Biscuit Quality- Spread Factor	8.27
HMW subunits	
Glu-D1	5+10
Glu-A1	2*
Glu-B1	7
Glu-1 Score	8

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