

HD 3226: New Wheat variety

for the timely sown irrigated condition of North Western Plain Zone

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Wheat as a staple crop plays an important role in food and nutritional security of a larger section of the Indian population. The North Western Plain Zone covering ~37% wheat area is of prime importance in attaining the self-dependence on foodgrains. To meet the growing demand year by year and suitable for prevailing climatic condition, a wheat variety, HD 3226 was released on the basis of three years coordinated trial data. On weighted mean basis, HD 3226 out yielded the checks HD 2967, WH 1105, DBW 88, HD 3086 and DPW621-50. HD 3226 was having the highest average protein content (12.80 %) than checks. This variety has very good levels of resistance against all types of rust, Karnal bunt, powdery mildew and foot rot. Higher adaptability, high yield and quality parameters, make this variety suitable choice for farmers, wheat flour industry and nutritional enrichment of society.

Key words: HD 3226, Wheat variety

IN INDIA, wheat being the major *Trabi* crop helps in ensuring the food and nutritional security by contributing a large share in total calorie and protein intake of Indians' diet. Northwestern Plain Zone comprising Punjab, Haryana, Delhi, Western Uttar Pradesh, Rajasthan except Kota and Udaipur region, Tarai region of Uttarakhand, Jammu and Kathua of J&K, Una and Paunti valley of Himachal Pradesh contribute about 45% (44 mt) production from 37% (11.5 mha) of total area indicating the importance of this zone in the view of productivity and production. To meet the upscaling wheat demand under unprecedented climatic condition, breeders release the new variety over existing the best variety to maintain or even improve the supply-demand ratio. In this way, a wheat variety, HD 3226 (Pusa Yashasvi) having high yield, high protein content and high level of disease resistance for NWPZ was developed by wheat team of Division of Genetics, ICAR-IARI, New Delhi. This variety was

released by the Central Sub-Committee on Crop Standards, Notification and Release of Varieties for Agriculture Crops and notified vide S.O. 1498(E) dated April 1st, 2019 for commercial cultivation under normal sown irrigated condition under for NWPZ. HD 3226 was derived from the cross, GRACKLE/HD2894 by using pedigree method, and this variety having close resemblance for morphological traits to HD 2894.

Yield superiority and adaptability

HD 3226 was tested in NIVT, AVT I and AVT II for three consecutive years under coordinated trials of AICW&BIP during 2014-15 to 2016-17 over 56 locations under irrigated, normal sown conditions in NWPZ. On the weighted mean basis, HD 3226 out yielded the checks HD 2967, WH 1105, DBW 88, HD 3086 and DPW621-50 by 9.0, 4.3, 4.7, 0.1 and 3.1% respectively. The genetic yield potential of HD 3226 was 79.60 q/ha which had superiority over checks viz., HD 2967 (69.30 q/

ha), WH 1105 (71.00 q/ha), DBW 88 (68.40 q/ha), HD 3086 (75.20 q/ha) and DPW621-50 (71.60 q/ha).

Out of total 56 locations during three years of testing, 24 times it appeared in the first nonsignificant group against 11, 14 and 10 times of checks HD 2967, WH 1105 and DBW 88, respectively, which clearly established its superiority in yielding ability. Because of its long days to 50% flowering compared to checks, this variety performs very well in early sown condition (tested over location of IARI, Delhi) and significantly out yielded overall checks including HD 3086.

Distinguishing morphological characteristics

Wheat variety, HD 3226 has semi-spreading growth habit, dark green erect foliage with long leaves, with non-pigmented coleoptile, auricle and leaf sheath. At ear emergence, this variety shows the waxiness on leaf sheath, flag leaf surface, peduncle and spike. This variety is medium-tall (106 cm with a range 101-110





cm) with an average 97 days and 142 days of days to 50% flowering and maturity, respectively. The spike of this variety is medium long with tapering shape and medium-density, and spike and awn are of white colour at maturity. This variety shows no pubescence on glume with slanting shape; no shattering at maturity; and threshability is easy at maturity. The grain appearance characteristics of this variety are amber colour, oblong, lustrous, semi-hard, medium width and depth of crease, medium brush end hairs with 40.3 g average 1000 grain weight.

Resistance to major diseases

Among the prevailing disease, currently, rust disease involving stripe and leaf rust is the main culprit for reduction of wheat yield in North Western Plains Zone (NWPZ). HD 3226 exhibited a high level of resistance against stripe rust and leaf rust both under natural and artificial epiphytotic conditions during all three years of testing. Over three years, yellow rust average ACI value of HD 3226 under natural and artificial condition were 1.66 and 1.86, respectively, which were quite lower than average ACI values of checks. Moreover, leaf rust under natural condition average ACI value of HD 3226 was 0.00 (zero) showing the absolute resistance compared to checks, and average leaf rust ACI value under artificial condition was at par with most of the

checks (Table 1).

Karnal bunt is a highly invasive disease and adversely affects the quality of seed, therefore, directly India's wheat industry come on the stack for their reduction in potential business opportunity within and outside country. Karnal bunt's teliospore can remain in the soil up to 4 years that is why complete eradication of spores is almost impossible. It infects grains at flowering, and under favourable condition (cool humid conditions) grain completely turns into black powder of bunt spore and fishy odour comes. Therefore, the best way to fight this disease is to develop a resistant variety. HD3226 is having the high level of resistance against

Karnal bunt (3.5 %) against checks, viz. HD 2967 (13.5 %), WH 1105 (15.9 %), DBW 88 (10.26 %), HD 3086 (9.8 %) and DPW621-50(21.6%). In addition, It also exhibits high level of resistance against powdery mildew (2), flag smut (1.1%) and foot root under artificially inoculated conditions.

Grain quality features

Over three year testing, HD 3226 was having the highest average protein content (12.80 %) than checks, viz. HD 2967 (12.33%), WH 1105 (12.28%), DBW 88 (12.35%), HD 3086 (11.39%) and DPW 621-50 (12.20%) (Table 2). This variety is having 10.65% more protein content than very recent and popular wheat

Table 1. Comparison of HD 3226 with checks for stripe and leaf rust under the natural and artificial condition

Rust	Year of Testing			Checks						
				H D	H D	W H	D B W	H D	D P W	K
				3226	2967	1105	88	3086	621-50	0307
				ACI	ACI	ACI	ACI	ACI	ACI	ACI
Stripe rust	Natural	2015-16		0	27.5	1.8	6.7	0	6.25	14.8
		2016-17		3.3	47.3	19.5	30	2.2		
		2017-18		1.7	23.3	10	17.8	3.4	12.8	NA
	Artificial	2015-16		2.1	40	18	18	2.1	22.5	26.4
		2016-17		0.6	51	25.4	37.4	3.3		39.8
		2017-18		2.9	39.9	27.1	35.5	2.9	45.5	33
Leaf rust	Natural	2015-16		0	3.3	0	1.7	5.2	0	0
		2016-17		0	2.8	3.8	1.3	16.3		
		2017-18		0	5	2	0	0.3	0.3	NA
	Artificial	2015-16		9.3	2.6	7	2.3	7.2	1.9	6.5
		2016-17		10	4	12	2.8	11.2		2.8
		2017-18		3	3.7	4.3	2.6	10.9	4.3	5.7

Source: AICRP on Wheat and Barley (2017-18; 2016-17; 2015-16)



Table 2. Protein, gluten and zinc content comparison of HD 3226 with checks

HD 3226	Adaptability zone: North Western Plains Zone					
	Production condition: Irrigated, Timely Sown					
	Checks					
	HD 3226	HD 2967	WH 1105	DBW 88	HD 3086	DPW 621-50
Protein content (%)	12.80	12.33	12.28	12.35	11.39	12.20
% superiority over check varieties		4.68	4.41	3.85	10.65	2.46
Wet gluten (%)	30.85	27.25	27.25	28.50	27.45	28.0
% superiority over check varieties		13.18	13.19	8.34	12.37	6.79
Dry gluten (%)	10.10	9.00	9.25	9.55	8.50	9.5
% superiority over check varieties		12.21	9.21	5.75	19.10	4.21
Zinc content (ppm)	36.8	36.0	38.1	34.5	34.8	30.7

Source: AICRP on Wheat and Barley (2017-18; 2016-17; 2015-16)

Table 3. Agronomic practices for HD 3226

Agronomic practice	Irrigated timely sown
Seed rate (kg/ha)	100
Sowing time	05-25 Nov
Fertilizer dose (kg/ha)	Nitrogen: 150 (Urea @ 255 kg/ha); phosphorus: 80 (DAP @ 175 Kg/ha); Potash: 60 (MOP @ 100 kg/ha)
Timing of fertilizer application	Apply 1/3 rd nitrogen with full dose of phosphorus and potash at the time of sowing; remaining nitrogen apply after first and second irrigation equally
Irrigation	First irrigation after 21 days after sowing and further irrigation as per need
Weed control	Total @ 40 g/ha at 27-35 days after sowing; Topic @ 400 g/ha at 27-35 days after sowing
Yield maximization	For maximizing yield the variety should be sown in second fortnight of October. Appropriate nitrogen management and use of two sprays as tank mix-Chlormequat chloride (Lihocin) @ 0.2% + tebuconazole (Folicur 430 SC) @ 0.1% of commercial product dose at First Node and Flag leaf.

variety, HD 3086. Therefore, it is very clear 10% more protein can be pushed in living entities for nutritional upliftment without compromising yield. The backbone of bread quality i.e. gluten content, this variety has the highest wet gluten content (30.85%) and dry gluten content (10.10) in comparison to all the checks. This variety has a perfect Glu-1 Score (10) and Glu B1 (13+16) subunit which is different than all the checks. HD 3226 has good grain appearance (>5.2), high sedimentation value (>63.1ml), high extraction rate (>68.9%), and good chapatti (>7.6) and bread quality (>6.7). The zinc content (36.8 ppm) in HD 3226 is also higher than popular varieties HD 2967 and HD 3086. With all the

quality parameters this variety is suitable for various end-use products.

Agronomic Practices

The agronomic management plays crucial role in realizing the yield potential of a variety. For the optimum production of HD3226 following agronomic practices (Table 3) have been recommended based on the scientific experimentation during the course of development of variety. Besides the following agronomic practices farmers are advised to get their soil and water tested for better management of nutrients and irrigation. This is mainly important from the point of view of minimizing the input cost and utilizing the available nutrients present in soil.

Moreover the resident minor nutrients especially zinc and boron in soil, information on salinity and pH of soil and water is also important for crop management. To get the maximum production the timely consultation with the scientists along with the recommended package of practices is always rewarding.

SUMMARY

HD 3226 is suitable for irrigated, timely sown condition of North Western Plain Zone. This variety is having the very good levels of resistance against most of the diseases including three rusts, viz. stem, stripe and leaf rusts and Karnal bunt, powdery mildew and foot rot and hence, there is no need of any chemical control measures. It is widely adapted and high yielding genotype with high protein content, gluten, high sedimentation value, high extraction rate along with good grain appearance, good chapatti and bread quality, and high zinc indicating its suitability for various end-use products. Because of early seeding advantage, this variety can be seeded early to get the better yield. In comparison to recently released and very popular variety, HD 3086, it is equal in average yield over locations but having the significant superiority in terms of potential yield and number of quality parameters, viz. protein (superior by 10.65 %), wet gluten (superior by 12.37 %) and dry gluten (superior by 19.10 %) and disease resistance i.e. Karnal Bunt (less by 63.67%), powdery mildew, flag smut (less by 90.51%), footrot (less by 88.67 %), stem rust (R against all races) and leaf rust (F vs 60S against 77-9). Owing to wider adaptability, high yield and high-quality parameters, HD 3226 is a suitable choice from farmers' perspective, wheat flour industry and nutritional enrichment of society with the same quantity of food grain in their food bowl.

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