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HI 8802 (Pusa Wheat 8802) a high yielding, drought tolerant and biofortified durum wheat variety for peninsular India

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Abstract

Pusa Wheat 8802 (HI 8802), a durum wheat variety was released for timely sown, restricted irrigation conditions of peninsular India in 2020 by the Central Sub-Committee on Crop Standards, Notification and Release of Varieties for Agricultural Crops, Government of India. Its yield was significantly superior over the checks with an average yield of 29.1 q/ha and potential yield of 36.0 q/ha in national coordination trials. HI 8802 showed plasticity for different irrigation levels and yielded superior with significantly higher number of grain/spikes and thousand grain weights. It was found to be resistant to all the major wheat pests and diseases. HI 8802 is a biofortified durum wheat variety suitable for pasta production with high protein (12.8 %) and iron (40.4 ppm) content, which will boost the nutritional and economic security of peninsular zone wheat farmers.

Key words: Durum Wheat, drought tolerance, pasta quality, peninsular zone and yield.

Introduction

Durum wheat (*Triticum durum* Desf.) is grown in central and peninsular wheat growing zones of India with an estimated production of more than 2 million tons per year (Divya et al., 2020). A peninsular wheat growing zone of India includes Maharashtra, Karnataka and plains of Tamil Nadu, where wheat cultivation is majorly practiced under rain-fed and limited irrigation conditions (Sai Prasad et al., 2019). Decline in water table

and temperature fluctuation during crop growth period were observed major wheat production constrains in this zone (Sendhil et al., 2020). Targeted breeding at ICAR-Indian Agricultural Research Institute, Indore, Madhya Pradesh is the main aim to develop drought-tolerant wheat varieties with high yield, early maturity, disease resistant with good end product quality suitable for the environments experiencing terminal heat and drought stress (Mondal *et al.,* 2016).

Development and Notification of HI 8802: HI 8802 (Pusa Wheat 8802) was developed from the cross HI 8627 / HI 8653 attempted during *rabi* 2006-07 at ICAR-Indian Agricultural Research Institute, Regional Station, Indore through modified pedigree method. It was released by the Central Sub-Committee on Crop Standards through notification and release of varieties for agricultural crops *viz.,* vide S.O. 91 E, dated 6.1.2020. HI 8805 was released for commercial cultivation of timely sown, restricted irrigation conditions of the Peninsular Zone.

Yield superiority and variety descriptors: In NIVT 5B, HI 8802 showed a mean yield of 33.4 q/ha and 20.1 % yield advantage over the check AKDW 2997-16 in 2016-17 (Table 1 & ICAR-IIWBR, 2017) and was promoted to AVT. Pooled analysis of yield data over three years of co-ordination indicated that HI 8802 showed a mean yield of 29.1 q/ha and potential yield of 36.0 q/ha in Niphad during *rabi* 2017-18 (IIWBR, 2018). It showed a significant mean yield advantage of 7% and 10.2% over the checks AKDW 2997-16 and UAS 446 respectively, over three years from 2016- 2019 (Table 1, ICAR-IIWBR, 2018 and 2019). It yielded more than 30.0 q/ha at 9 out of 18 locations over three years of testing (IIWBR, 2019). HI 8802 has an erect, green, medium size flag leaf with medium waxiness on sheath and strong waxiness on the blade, peduncle and spike. HI 8802 was early to flower within 60-65 days and mature within 105-110 days with an average height of 90-95cm. Spikes of HI 8802 were medium long, dense, pubescent, parallel and white with long and black awns at maturity.

Table 1. Yield data of HI 8802 in AICW&BIP Trials

Trait	Year of testing	No. of Trials	HI 8802	AKDW 2997-16 ©	UAS 446 ©	CD
Mean yield (q/ha)	NIVT 5B (2016-17)	2	33.4	27.8	-	5.0
	AVT I (2017-18)	8	27.7	25.7	25.9	1.3
	AVT II (2018-19)	8	29.5	28.6	26.9	1.7
	Weighted Mean		29.1	27.2	26.4	-
% Increase/ decrease over the checks & qualifying variety	NIVT 5B (2016-17)			20.1*	-	-
	AVT I (2017-18)			7.8*	6.9*	-
	AVT II (2018-19)			3.1	9.7*	-
	Overall Weighted Mean			**7.0***	**10.2***	-

*Significantly superior

Performance in agronomy trials: The results of experiments conducted to understand the adaptability under different irrigation levels indicated that HI 8802 performed well and recorded highest grain yield under two irrigation levels with a significant yield increase of 40.9% and 55.5% compared to yield of one irrigation and no irrigation levels respectively. On the basis of mean data, HI 8802 was found to be adaptable for sowing under no irrigation and two irrigations compared to check varieties. Higher yield of HI 8802 could be the function of significantly higher number of grain/spikes and thousand grain weight of HI 8802 as compared to both the check varieties (IIWBR, 2019a).

Resistance to major insect pests: Under three years (NIVT 5B, AVT I & AVT II) of co-ordination trials, HI 8802 recorded a highest score of 20S and mean ACI score of 6.3 for stem rust; highest score of 30MS with mean ACI value of 3.4 for leaf rust. In comparison, durum check variety AKDW 2997-16 recorded very high mean stem rust ACI value of 21.8 (Table 2). Seedling resistance tests indicated that HI 8802 was resistant to moderately resistant to the majority of virulent pathotypes of stem rust. It was resistant to most of the prevalent leaf rust races *viz.,* 77 group (IIWBR, 2018a and IIWBR, 2019b). HI 8802 was also resistant to other important diseases *viz.,* Karnal bunt, loose smut and flag smut.

Table 2. Field reaction of HI 8802 to major diseases

Diseases	HI 8802	AKDW 2997-16 ©	UAS 446 ©
Stem rust	20S (6.3)	40S (21.8)	20S (6.6)
Leaf rust	30MS (3.4)	20S (3.4)	20S (3.9)
Leaf blight (dd)	89 (41)	99 (52)	89 (40)
Flag smut (%)	23.5 (3.7)	25.9 (4.0)	5.3 (1.1)
Foot rot (%)	16.7 (10.8)	50.0 (35.5)	25 (20)

* Highest score and Average Coefficient of Infection (ACI) in parenthesis

Quality attributes: Mean values of quality parameters recorded for HI 8802 for three years of co-ordination trials at ICAR-IIWBR indicated that HI 8802 had a good grain appearance score of 7.4, hector liter weight of 83.7 Kg/hl, protein content of 13% and sedimentation value of 53.7ml. HI 8802 was found to have 5.7 ppm of yellow pigment content, 39.5 ppm of Iron and 35.9 ppm of Zinc content (Table 3). Pasta, being the main end product of durum wheat, the parameters determining pasta cooking quality of HI 8802 showed that cooking time, Water absorption (%), Water uptake ratio, Gruel solid loss (%) and Stickiness were superior to AKDW 2997-16 and on par with UAS 446 (IIWBR 2019c). Sensory evaluation of pasta prepared from HI 8802 showed that color, texture, flavor and taste of pasta was superior to AKDW 2997-16 and on par with UAS 446 with an overall pasta acceptability of 6.2.

Table 3. Data on Quality Characteristics of HI 8802

Quality Parameter	HI 8802	AKDW 2997-16©	UAS 446©
Grain quality traits			
Grain Appearance (Max score 10)	7.4	7.1	6.8
Test weight (kg/hl)	83.7	81.7	81.9
Sedimentation value (ml)	40.4	40.7	53.7
Kernel weight (g)	43	37.3	36
Protein content (%)	13	12.3	12
Yellow berry incidence (%)	2	1	1
Yellow pigment (ppm)	5.7	3.4	5.4
Iron Content (ppm)	39.5	38.3	40
Zinc Content (ppm)	35.9	33	33.9
Pasta cooking quality			
Cooking time (min./sec.)	10.5	12	11.5
Water absorption (%)	125.2	122.8	130.4
Water uptake ratio	1.25	1.22	1.3
Gruel solid loss (%)	10	10	10
Stickiness	PS	PS	PS
Pasta Sensory evaluation			
Colour	6.5	3.6	6
Texture	6.5	5.8	6.3
Flavour/ Aroma	5.8	6	6.1
Taste	6	6	6
Overall Acceptability	6.2	5.4	6.1

To conclude, HI 8802 (Pusa Wheat HI 8802) is a high yielding, drought adaptive early maturing, disease resistant and good end use quality durum wheat variety suitable for timely sown, moisture and temperature stress areas of peninsular wheat growing zone.

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