

High yielding durum wheat variety HI 8759 Pusa Tejas

— a new rust and karnal bunt resistant

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A new durum wheat variety HI 8759 has been recommended for commercial cultivation under high fertility irrigated timely sown conditions of Central zone of India. HI 8759 has yield potential of >75.5 q/ha with an average yield of 56.9 q/ha; and shows superiority over checks by giving 3.8 % to 12.0 % higher yield over durum wheat checks HI 8498, MPO 1215, HI 8737 and HD 4728. It showed good levels of field resistance to stem and leaf rusts, the maximum ACI values remaining 6.0 for stem rust and 4.1 for leaf rust. It showed high levels of adult plant resistance to prevalent and virulent pathotypes viz., 40A and 117-6 of stem rust; and 77-5 and 104-2 of leaf rust. It exhibited resistance to virulent pathotypes viz., 40A, 40-3, 117-1, 117-3, 117-4, 117-5 of stem rust indicating the presence of unique stem rust resistance gene/s, and its resistance spectrum is different from currently popular durum cultivars HI 8498 and MPO 1215. It showed better resistance to loose smut and foot rot than all the checks, and comparable resistance to flag smut and Karnal bunt (8.1%). It can serve as a “dual purpose” variety suitable both for making chapati and for pasta preparations due to its moderate SDS-sedimentation value (~ 35 ml). It can contribute to “nutritional security” in central India, because of its high protein content (~12.0 %), good levels of yellow pigment (~5.7 ppm), and essential micronutrients like iron (42.1 ppm) and zinc (42.8 ppm); with very high overall acceptability (7.5).

Key words: Durum wheat variety ‘HI8759’, Yield, Micronu Tridents

THE durum wheat variety HI 8759 (Pusa Tejas) released vide notification number S.O 1007 (E) dated 30.03.2017 for Central Zone (CZ) of the country which is the largest durum producing zone with respect to area, production as well as productivity. Durum wheat cultivation has several advantages to offer like saving irrigation water due to its high water-use efficiency, minimizing the risk of rust epidemics because of its diverse rust resistance, providing naturally ‘biofortified health food’ due to its

high protein, yellow pigment and micronutrients content, and generating employment opportunities through establishment of durum wheat-based fast food industries. HI 8498 and HI 8663 are the only popular durum wheat varieties under irrigated, timely sown conditions in Central Zone, and hence, the release of HI8759 meets the urgent need for good durum varieties with high yield potential, bold and lustrous grains having excellent quality traits and resistance to stem and leaf rusts.

Yield potential and adaptation:

The newly released variety was tested for 3 years under 34 trial locations spread all over the Central zone. On the basis of its average yield (weighted



mean), it was found better as compared to the checks. HI 8759 has yield potential of >75.5 q/ha and yielded >60 q/ha at 13 out of 34 locations over three years with an average yield of 56.9 q/ha; and shows superiority over checks by giving 3.8 % to 12.0 % higher yield over durum wheat checks HI 8498, MPO 1215, HI 8737 and HD 4728 (Table 1 and Fig. 1).

Stability in agronomic trials: HI 8759 has shown good adaptation and significant yield superiority over the checks *i.e.*, MPO 1215 (+21.5%), HI 8498 (12.3%) and HI 8737 (7.1 %). Under late sown conditions, it showed significant yield superiority over check variety MPO 1215 *i.e.*, 15.6%. It showed significantly superior performance over the check varieties MPO 1215 (18.8%) and HI 8498 (6.8%) to variations in sowing times (pooled). It showed more number of ear heads/sq. m compared to durum check varieties HI 8498 and MPO 1215 under pooled analysis, which has contributed to its yield superiority (Table 2 and Fig 2). It showed tolerance to heat stress which is evident from the good performance of the variety under both timely and late sown conditions.

Better disease resistance: HI



Table 1. Summarized yield data of HI 8759 under coordinated trials over three years (2013-2016)

Parameter	Year of testing	No. of trials/ locations	Proposed variety HI 8759	National Check HI 8498	Durum Check MPO 1215	Durum Check HI 8737	Durum Check HD 4728	CD
Mean yield (Q/ha)	2013-14	6	59.9	53.5	-	-	-	3.60
	2014-15	14	55.5	50.1	49.7	53.4	54.4	1.67
a) Zonal	2015-16	14	57.1	50.3	55.1	54.6	55.2	1.60
b) across zones (If applicable)	Weighted Mean		56.9	50.8	52.4	54.0	54.8	
% increase or decrease over the checks & qualifying varieties	2013-14			12.0				
	2014-15			10.8	11.7	3.9	2.0	
	2015-16			13.5	3.6	4.6	3.4	
	Overall			12.0	8.6	5.4	3.8	
Frequency in top group (pooled for 3 years)			27/34	9/34	13/28	16/28	17/28	

Table 2. Adaptability of durum wheat variety HI 8759 to changes in agronomic conditions.

Item	Sowing condition	New variety HI 8759	National Check HI 8498	Durum Check MPO 1215	Durum Check HI 8737	Durum Check HD 4728
Yield (Q/ha) under recommended sowing date	Timely	52.84	47.07	43.48	49.33	51.75
	Late	43.27	42.90	37.42	43.92	43.02
	Pooled	48.05	44.99	40.45	46.63	47.38
Percentage gain or loss when sown	Timely		12.3	21.5	7.1	2.1
	Late		0.9	15.6	-1.5	0.6
	Pooled		6.8	18.8	3.0	1.4
No. of earheads/ sq.m	Timely	332	315	311	326	322
	Late	323	312	287	315	306
	Pooled	328	314	299	321	314
Percentage gain or loss when sown	Timely		5.4	6.8	1.8	3.1
	Late		3.5	12.5	2.5	5.6
	Pooled		4.5	9.7	2.2	4.5
C.D. Sowing (A)		1.47	B within A			2.51
C.D. Varieties (B)		1.78	A within B			2.62

Table 3. Disease reaction of HI 8759, qualifying and check varieties against stem and leaf rusts under natural and artificial conditions during 2013-16.

Disease name	Item	New variety	National Check	Durum Check	Durum Check	Durum Check
		HI 8759	HI 8498	MPO 1215	HI 8737	HD 4728
Stem rust	Natural	2013-14	TR	TMS	-	-
		2014-15	-	-	-	-
		2015-16	0	0	0	tMR
	Artificial	2013-14	20MS (3.2)	20S (5.4)	-	-
		2014-15	20MR (1.6)	40S (8.9)	20S (7.7)	30MR (5.6)
		2015-16	20S (6.0)	30S (7.6)	20S (5.4)	20S (6.0)
Leaf rust	Natural	2013-14	TR (0.07)	TR (0.07)	-	-
		2014-15	0	0	0	TMR
		2015-16	0	0	0	tMR
	Artificial	2013-14	20S (4.1)	10S (3.7)	-	-
		2014-15	5S (1.5)	5S (2.3)	10MR (1.2)	5S (1.6)
		2015-16	20MS (3.3)	20S (4.7)	30S (3.9)	20S (3.9)
Genes postulated	Sr genes	Sr2+11+	Sr2+11+	Sr11+	-	Sr2+11+
	Lr genes	Lr23+	Lr23+	Lr23+	-	-
	Yr genes	Yr2+	Yr2+	-	Yr2+	Yr2+

Table 4. Some important quality parameters of Durum wheat.

Parameter	New variety HI 8759	National Check HI 8498	Durum Check MPO 1215	Durum Check HI 8737	Durum Check HD 4728
Grain appearance	7.1	6.9	7.3	7.3	7.5
Test weight (kg/hl)	83.1	82.4	82.0	82.3	82.4
Sedimentation value (ml)	35	36	37	37	34
Protein content (%)	11.9	12.6	12.1	12.3	12.2
Yellow berry incidence (%)	4.3	3.7	3.5	5.7	5.9
Yellow pigment (ppm)	5.7	5.0	6.0	5.9	4.8
γ-gliadin	45	45	45	45	45
Hardness index	69	80	69	73	77
Iron (ppm)	42.1	40.8	40.6	41.5	42.3
Zinc (ppm)	42.8	40.5	42.6	40.6	46.0
Cooking time (min./sec.)	11:50	11:25	10:35	10:25	10:30
Water absorption (%)	127	118	123	117	112
Water uptake ratio	1.27	1.18	1.23	1.17	1.12
Gruel solid loss (%)	1.47	1.76	1.63	1.81	2.39
Stickiness	PS	NS	PS	PS	S
Overall Acceptability (out of 9)	7.5	6.75	7.25	6.75	5.50

Table 5. FLD Demonstrations of durum wheat variety HI 8759 in comparison to Lok-1 and HI 8498 during 2015-16.

Farmer	Variety		Area		Yield (q/ha)		Yield Increase	
	Test	Check	Test	Check	Test	Check	q/ha	%
Naushad Patel	HI 8759	Lok-1	0.3	0.5	56	30	26	86.7
Aryendra Singh Chauhan	HI 8759	HI 8498	0.3	0.4	64	40	24	60.0

8759 showed good levels of field resistance to stem and leaf rusts, the ACI values remaining 6.1 for stem rust and 4.2 for leaf rust (Table 3). It possess better resistance to loose smut and foot rot and comparable resistance to flag smut and *Karnal* bunt (8.1%) than all the check varieties. It showed high levels of adult plant resistance to prevalent and virulent stem rust pathotypes 40A and 117-6; and leaf rust pathotypes 77-5 and 104-2. In addition, HI 8759 showed resistance to durum virulent stem rust pathotype 117-5, to which HI 8498 and HD 4728 were susceptible. It exhibited resistance to virulent and aggressive pathotypes *viz.*, 40A, 40-3, 117-1, 117-3, 117-4, 117-5 of stem rust indicating the presence of unique stem rust resistance gene, and its resistance spectrum is different from



currently popular durum cultivars HI 8498 and MPO 1215; and hence can contribute to diversification of stem rust resistance base under wheat cultivation in central India.

Better quality: HI 8759 is a durum wheat variety with good levels of yellow pigment content (5.7 ppm), essential micronutrients like iron and zinc, less gruel solid loss compared to durum checks. It showed desired quality traits like good grain appearance, high protein content and test weight etc. It can be used as a “dual quality” durum suitable both for “*chapati* making” as well as for excellent pasta preparations because of its moderate SDS sedimentation value (~35 ml) and high semolina recovery (Table 4). It has high protein content, good levels of yellow pigment, good levels of micronutrients, low mottling (yellow berry incidence) and excellent overall acceptability (7.5).

Performance in farmers’ fields: HI 8759 was grown in demonstrations in farmers’ field during *rabi* 2015-16 in comparison with popular wheat varieties Lok-1 and HI 8498. HI 8759 had given about 86.7 % and 60.0 % average

increase in yield compared to Lok-1 and HI 8498, respectively (Table 5). Farmers had expressed complete satisfaction about this variety in terms of grain production and productivity compared to their local wheat varieties Lok-1 and HI 8498. Even, the farmers had conveyed that HI 8737 had fetched higher price than Lok-1 in the grain mandis, which in turn increase their profitability in terms of economic returns.

CONCLUSION

HI 8759 showed stable high yield, wider adaptability, high protein content (~12.0 %), moderate sedimentation value (~35 ml), good levels of yellow pigment (~5.7 ppm) and essential micronutrients like iron and zinc, low mottling (yellow berry incidence), excellent overall acceptability (7.5) and “dual quality” grain with high levels of resistance to stem and leaf rusts. It exhibited resistance to virulent and aggressive pathotypes *viz.*, 40A, 40-3, 117-1, 117-3, 117-4, 117-5 of stem rust indicating the presence of unique stem rust resistance gene(s), and its resistance spectrum is different from currently popular durum cultivars HI 8498 and MPO 1215; and hence can contribute to diversification of stem rust resistance base under wheat cultivation in central India. High hectoliter weight, good grain appearance, high protein content, good levels of yellow pigment, good levels of micronutrients, low mottling (yellow berry incidence) and excellent overall acceptability (7.5) etc. for good quality *chapati* as well as pasta add to its advantages. It meets all the requirements of an ideal durum wheat variety for Central Zone, and thus, can help in raising productivity and profitability of durum wheat crop in central parts of the country.

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