

HD 3090 (*Pusa Amulya*) - A new rust resistant, high yielding wheat variety for late sown irrigated conditions of Peninsular Zone in India

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Abstract

A new bread wheat variety, HD3090 (*Pusa Amulya*) has been released and notified by the Central Sub-Committee on Crop Standards, Notification and Release of Varieties for Agricultural Crops, Government of India vide S. O. 224 E dated 24th January 2014, for commercial cultivation under late sown irrigated conditions of Peninsular Zone (PZ) of the country. HD 3090, a semi-dwarf (80 cm), rust resistant and early maturing (101 days) wheat variety has average yield of 4.21 t/ha with yield potential of 6.31 t/ha under late sown irrigated conditions and showed superiority over checks (HD2932, Raj4083 and NIAW34). HD3090 being resistant to leaf and stem rust would help in disease management by minimizing the incidence of rust diseases. High protein content (13.3%), high (79.4 kg/hl) hectolitre weight and good grain appearance of this wheat would have better farmer acceptance. This being an early maturing, rust resistant varieties has promise for late sown irrigated planting areas under various cropping systems in the peninsular zone and thus will contribute to increasing wheat production and contribute in alleviating the socio-economic status of farmers in this region.

Keywords: Bread wheat, late sown irrigated conditions, yield, rust resistance

1. Introduction

India achieved a production of 92.46 million tons from 29.65 million hectare area with productivity of 3.12 t/ha during 2012-13 (Anonymous, 2013). Peninsular zone comprising states of Maharashtra, Karnataka, plains of Tamil Nadu and Andhra Pradesh constitutes an area of about 1.6 million hectare where wheat is grown. Recently area of wheat cultivation under late sown, irrigated conditions in peninsular zone has increased due to adoption of various cropping systems. The sowing of wheat is extended to mid-December. Area under delayed sowings is further expected to increase due to better adaptiveness of varieties to such diverse conditions. On account of short winter duration for wheat crop in this area, wheat varieties needs avoidance of high temperature during booting and flowering period and thus farmers need early maturing varieties,

which can withstand high temperature at the time of anthesis and maturity.

Among the biotic stresses, leaf and stem rusts are the major concerns in peninsular zone particularly in late sown crop due to high humidity and ambient temperature at the time of vegetative growth phase. Otherwise also peninsular zone is asensitive epidemiological zone for leaf and stem rust and is an established route of urediospores transport (*Puccinia* path) to wheat growing areas of central India. Therefore, by diversification of resistant varieties in this epidemiological important zone, the *Puccinia* path could be interrupted and that will help in disease management by minimizing the incidence of rust diseases in central India.

Thus, the peninsular zone demands early maturing and rust resistant wheat varieties. The variety HD3090 will

meet these demands with high yielding capacity, high degree of resistance against rust diseases and better quality.

Development and notification of HD3090: To meet this demand a semi-dwarf (80 cm), rust resistant, early maturing (101 days) and wheat variety HD3090 (*Pusa Amulya*) was developed from the cross SFW / Vaishali// UP2425 following pedigree method by Indian Agricultural Research Institute, New Delhi. This was released and notified vide Gazette Notification No. S. O. 224 E dated 24th January 2014 by the Central Sub-Committee on Crop Standards, Notification and Release of Varieties for Agricultural Crops, Government of India for commercial cultivation under late sown irrigated conditions of Peninsular Zone (PZ) comprising states of Maharashtra, Karnataka, plains of Tamil Nadu and Andhra Pradesh of the country.

Yield superiority and adaptability to changes: HD3090 was entered in coordinated evaluation trial (NIVT) during 2010-11 and has been tested for three years at 23 locations spread across the peninsular zone with average yield of 42.1 q/ha and potential of yielding 63.1 q/ha at Karad location during 2011-12. This variety has recorded highest mean yield over the checks and qualifying varieties during three years of testing. The variety has yielded better by 3.0, 3.8 and 10 percent than the checks HD2932, RAJ4083 and NIAW34 respectively (Table 1). The variety HD 3090 has indicated wider adaptability and stability in yield performance across the zone as compared to all the three checks. The variety has appeared 13 times in first non-significant group out of 23 trials, whereas, the checks varieties NIAW34 (4/20), RAJ4083 (8/20) and HD2932 (11/23) appeared with much lower frequency.

Table 1. Yield performance (q/ha) of wheat variety HD3090 under coordinated trials over the three years (2009-12)

Item	Year of testing	No. of Trials	HD 3090	Checks			C. D. (0.05)
				HD2932	RAJ 4083	NIAW 34	
	2010-11	3	44.2	40.6	5.2
	2011-12	10	44.0	44.8	44.7	41.5	1.7
Mean Yield (q/ha)	2012-13	10	38.0	35.5	35.1	33.7	1.7
	Mean		42.1	40.3	39.9	37.6	
	Weighted Mean		41.4	40.2	39.9	37.6	
Per cent superiority over checks	Weighted Mean			3.0	3.8	10.1	
Frequency in 1 st NS group	Total		13/23	11/23	8/20	4/20	

Entries in 1st non-significant group; *significantly superior

Under agronomic trials conducted for DOS (date of sowing) in Peninsular Zone, HD 3090 has shown superior yield performance in late sown irrigated conditions over all the three check varieties HD2932, RAJ4083 and NIAW34

(Table 2). Under very late sown conditions this genotype has shown minimum yield loss in comparison to all the three check varieties (Table 2).

Table 2. Adaptability of variety HD 3090 to changes in agronomic conditions

Experiment / Item	Agronomic Conditions	HD 3090	Checks		
			HD2932	RAJ4083	NIAW34
	Late sown	34.84	34.32	33.43	33.47
Yield (q/ha)	Very late sown	29.96	30.52	29.00	29.35
	Mean	32.40	32.42	31.22	31.41
Percentage yield loss under very late sown			11.07	13.25	12.31

CD (P=0.05). DOS = 0.79; VARIETY = NS; Variety within DOS = NS; DOS within Variety = NS

Morphological characteristics: HD3090 is a semi-erect genotype with medium green foliage at boot stage without anthocyanin pigmentation of auricles. Semi-erect flag leaves are of medium size in length and breadth with slight waxiness of leaf sheath, leaf blade, peduncle and ear heads. This 80 cm tall semi-dwarf variety took 62 days to flower and 101 days to mature. Its white medium dense parallel sided ear heads carry white, medium length awns. Average 1000 grain weight of this variety is 37g with semi-hard, amber, ovate shaped grains with medium germ width and medium brush hairs.

Higher levels of disease resistance: HD3090 displayed high degree of resistance at seedling stage against all 34 races of leaf rust and 26 races of stem rust. At adult plant stage also, the genotype showed high degree of resistance to both the rusts, under artificial rust epiphytotic conditions at multi-locations in all the three years with maximum leaf rust incidence of 15MS, ACI: 1.3-5.0 in comparison to the checks HD2932 (Max.80S, ACI: 22.0-27.3), RAJ4083 (Max.60S, ACI: 8.0-10.8) and NIAW34 (Max.30S, ACI: 3.7-10.6).

Superior quality: HD3090 was found on par with the check varieties for most of the quality traits and end-use for bread and *chapati* purposes. It has average grain protein content

of 13.3% over three years. This variety demonstrated a high value (79.4kg/hl) of hectolitre weight. Any amount over 76kg/hl is considered to give a positive correlation with flour recovery. The bread quality score (7.17/10) of HD3090 was found comparable to the checks. Any value of more than 7/10 is acceptable for bread making. The *GLU-1* Score (8/10) of this genotype is comparable to the checks. The variety showed the highest spread factor (7.73) and biscuit diameter (7.54cm) amongst the checks of its group along with lower sedimentation values (38.3ml) indicating it as a potential donor for development of biscuit quality lines.

It early maturity, high yield potential, high degree of resistance to leaf and stem rusts along with good quality characteristics for most of the quality traits and end-use for bread and chapatti will fulfil all the requirements of a successful wheat variety under late sown, irrigated conditions in peninsular zone.

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