

DBW443 (Karan Saanvi): A High Yielding, Biofortified Bread Wheat Variety for Irrigated Timely-Sown Conditions of Peninsular Zone, India

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Article history: Received: 19 Dec., 2025 Revised: 24 Dec., 2025 Accepted: 29 Dec., 2025

Citation: Gupta V, C Singh, AK Sharma, BS Tyagi, A Gupta, S Kumar, CN Mishra, V Kumar, UR Kamble, S Sareen, S Sheoran, RK Bairwa, S Ram, PL Kashyap, P Prasad, R Kumar, OP Ahlawat, G Singh and R Tiwari. 2025. DBW443 (Karan Saanvi): A High Yielding, Biofortified Bread Wheat Variety for Irrigated Timely-Sown Conditions of Peninsular Zone, India. *Journal of Cereal Research* **17** (3): 395-398. <http://doi.org/10.25174/2582-2675/2025/174352>

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Wheat is one of the widely cultivated cereal crops, occupying nearly 17% of the global cultivated area and a main dietary source for about 35% of the global population (Barnes, 2022). Like other major cereals, wheat grains inherently contain low amounts of iron (Fe) and zinc (Zn) (Tyagi *et al.*, 2023; Yadava *et al.*, 2018). Micronutrient malnutrition, particularly Fe and Zn deficiency, is a growing concern in regions where wheat constitutes the major dietary staple, especially in developing countries. Biofortification through breeding approaches offers a economical and long term solution to this problem, as alternative strategies such as supplementation, food fortification, and agronomic fortification incur additional costs and require continuous external inputs (Yadava *et al.*, 2018).

The development of high-yielding, biofortified wheat genotypes through genetic improvement is particularly advantageous, as nutrient-dense seeds can reach large populations without requiring changes in consumer dietary habits (Ortiz-Monasterio *et al.*, 2007; Cakmak, 2008, Chatrath *et al.*, 2018). Wheat biofortification utilizing known iron and zinc sources from both cultivated and wild species is an essential part of each of the breeding projects operational at ICAR-Indian Institute of Wheat

and Barley Research Karnal (ICAR-IIWBR) since 2013. Several biofortified wheat varieties have been released since 2017 which are having either Zn (>40ppm), Fe (>40ppm), protein (>12%) or a combination of two components (Mishra *et al.* 2025). The efforts are needed to develop genotypes having combination of all the three nutritional factors *viz.*, protein, iron and zinc.

To develop a biofortified wheat genotype having all the three nutritional factors a cross was attempted between the wheat genotypes NW1014 [having resistant to all the three rusts and Karnal bunt, protein content > 12.0%, Fe and Zn (40ppm)] and 7th HLBSN 21 (having high yield and Fe/Zn > 40ppm). The segregating generations were advanced following modified bulk method utilizing both main season at Karnal and off-season at ICAR-IIWBR, Regional Station, Dalang Maidan, Himachal Pradesh (advancing two generations per year). The fixed lines were evaluated for yield and micro-nutrients. The entries which were found promising in micronutrients and protein content were submitted to the all India Coordinated trials for testing in 2021-22 crop season.

The variety DBW443 was tested for three years in the All India Coordinated trials from 2021-2024. During 2021-22, DBW443 was tested as NEQ 2021-2 along-with



49 other entries in the Quality Component and Wheat Biofortification nursery at 18 centers (ICAR-IIWBR, 2022). The entries having superior yield than zonal checks along with rust resistance and high nutritional traits (protein > 13.0%; Fe and Zn > 40.0 ppm) were promoted to the next stage of testing. This genotype was promoted to the Advanced Varietal Trials (AVT) in the Peninsular zone based on its superior performance in yield (51.18 q/ha) and grain nutritional traits [Protein (13.31%), Fe (41.1 ppm) and Zn (43.7 ppm)]. DBW443 was then evaluated in the Advanced Varietal Trials under irrigated timely sown conditions of Peninsular zone. DBW443 recorded significantly superior grain yield (50.8 q/ha) and nutritional traits grain protein (13.9%), Fe (39.9 ppm)

and Zn (43.0 ppm) during 2022-23 in the AVT-I and promoted to AVT-II (ICAR-IIWBR, 2023a, b). During 2023-24, DBW443 recorded grain yield (46.0 q/ha) and nutritional traits grain protein (13.0%), Fe (44.3 ppm) and Zn (44.9 ppm) (ICAR-IIWBR 2024 a,b). Based on the three years data, it had shown significantly superior grain yield (49.2 q/ha) over check varieties GW322 (1.8%) and MACS6222 (3.4%), MP1378 (4.0%) and qualifying varieties AKAW5100 (3.86%), WH1306 (3.04%) and NWS2222 (0.81%). The variety had a potential yield of 77.6 q/ha and thousand grain weight of 45g (Fig1, 2). After three years of testing in AICRP, DBW443 was identified by the Varietal Identification committee held during the 63rd Annual Group Meeting of the All India Coordinated



Fig. 1. Field view of DBW443 (Karan Saanvi) at grain filling stage having dark green foliage, erect spike and waxy peduncle.



Fig. 2. Lustrous and bold grains of DBW443 (Karan Saanvi)

Research Project (AICRP) on Wheat and Barley held at ANDUA&T, Ayodhya from September 11-13, 2024. This variety was subsequently released by the Central Sub-Committee on Crop Standards, Notification, and Release of Varieties; Ministry of Agriculture and Farmers Welfare, Government of India vide Gazette Notification No. S.O. 2128 (E) dated 13th May, 2025. The variety was released for irrigated timely sown conditions of Peninsular zone comprising states of Maharashtra and Karnataka.

DBW443 was found resistant to leaf and stem rust under natural and artificial conditions which is indicated from the lower average coefficient of infection (ACI) values (ICAR-IIWBR 2024c). Average coefficient of infection (ACI) was calculated by multiplying of disease severity and constant values of infection type. The constant values for infection types were used based on; R=0.2, MR=0.4, M=0.6, MS=0.8 and S=1.0 (Saari and Wilcoxson, 1974). Under adult plant resistance (APR) studies, conducted for virulent races of brown rust viz., 77-5,77-9, 104-2 and black rust viz., 11, 40A it had shown immune reaction. Gene postulation indicated gene combination *Lr26+R* & *Lr13+1+* for brown rust and *Sr31+&R* for black rust. DBW443 was found resistant to wheat blast disease (Av. Score <10.0) under artificial screening at Bangladesh and Bolivia in collaboration with CIMMYT, Mexico and also found resistant against Karnal bunt (Avg. score 8.8) under artificial screening. Karnal bunt is a disease of International importance as it is a quarantine disease. Resistance to this disease is polygenic and only a few limited sources are available.

DBW 443 exhibits dark green foliage with a semi-erect, compact plant type (Fig. 1). The spikes are long, tapering, white in colour (at maturity), dense and parallel with spreading awns. It had waxy leaf sheath peduncle and spike. The grains of DBW443 are amber in colour, lustrous, semi hard texture, oblong in shape, angular crease width, and medium brush end hair (Fig. 2). It has a plant height of 89cm, comes to flowering in about 63 days and matures in about 109 days.

Acknowledgements

The authors acknowledge the Indian Council of Agricultural Research New Delhi, for funding the Institute Research Project.

Author contributions

All the authors contributed in the generation of data and development of the variety.

Conflict of interest

The authors declare no conflict of interest.

Ethical Approval

The article doesn't contain any study involving ethical approval.

Generative AI or AI/Assisted Technologies use in Manuscript Preparation

No

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