



Morphological and Agronomic Diversity in Bread Wheat Genotypes of Haryana, India (*Triticum aestivum* L.)

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Abstract

This study evaluates the agronomic performance and variability in quantitative traits of three bread wheat (*Triticum aestivum* L.) genotypes, namely, PBW-343, HD-2967, and WH-283 cultivated in Haryana. The genotypes were analysed for yield-contributing traits such as shoot height, tiller numbers, 1000-grain weight, vegetative dry matter content, reproductive dry matter content, biological yield, and harvest index. Descriptive statistics including range, mean, median, mode, standard deviation (S.D.), standard error (S.E.), variance, and coefficient of variation (C.V.) were computed. Additionally, ANOVA was performed to assess significant differences among genotypes. The findings highlight substantial variability among genotypes, with implications for selecting high-yielding and stable varieties for regional cultivation.

Keywords: Variability, wheat, coefficient of variation, tiller number, harvest index

Introduction

Wheat (*Triticum aestivum* L.) is a staple crop in Haryana, contributing significantly to food security and agricultural economy. To meet the demand of rising population, the major efforts of wheat breeders have been directed towards improving its grain yield which can be enhanced through development of improved genotypes [1, 2].

Selection of high-yielding genotypes with desirable agronomic traits is crucial for improving productivity. Basics of every plant improvement programme lies in the presence and proper management of variability present in the genetic stock. Information about the variations is helpful since it is one of the basic steps in any hybridization programme for selecting parents with desirable characters [3, 4].

The inbreeding tendency of wheat limits its total variability, which is further decreased due to extensive cultivation and farmers' intense selection pressure on high yield and bold grains [5,6]. Improved cultivars are less resilient to biotic and abiotic stressors due to a limited genetic background. Therefore, to maintain a satisfactory level of genetic variation in future wheat



breeding, it is required to study genetic variability in the currently grown wheat germplasm [7]. Morphological and molecular markers can be used to assess the genetic diversity of wheat genotypes [8,9]. This study aims to assess three bread wheat genotypes, namely, PBW-343, HD-2967, and WH-283 grown in Haryana, focusing on yield and contributing traits. By evaluating variability and statistical differences, the study aimed to identify the most promising genotype for local adaptation and cultivation.

Materials and Methods

The experimental plot was set up on a private farm in Galoli, district Yamuna Nagar, Haryana, during the main agricultural season of 2012–2013. Certified seeds of three commonly produced cultivars in Haryana, PBW-343, HD-2967, and WH-283, were seeded in a randomised block design with three replications in the first week of November. Each genotype was represented by one 5-meter-long row in each replication. The row-to-row distance was roughly 18-20 cm, while the plant-to-plant distance was approximately 6 cm. Recommended agronomic practices were applied to the experimental material throughout the growing period. Data of 10 plants per replication was recorded, totalling 30 plants per genotype for the following morphological traits.

1. **Shoot height:** Total length in cm from soil level to the tip of the spike of the main tiller.
2. **Effective tiller number:** Number of effective tillers bearing spike.
3. **Grain yield:** Weight in grams of the fertile grains produced by a plant.
4. **1000-grain weight:** From the total grains obtained from each genotype 30 lots of 1000 grains were weighed individually, and the mean value was recorded.
5. **Dry matter content:**
 - a. **Vegetative:** Dry weight in grams of vegetative part obtained after drying per plant for 48 hours at 85°C in an oven.
 - b. **Reproductive:** Dry weight in grams of reproductive part obtained after drying per plant for 48 hours at 85°C in an oven.
 - c. **Biological Yield:** Dry weight in grams of a complete plant obtained after drying per plant for 48 hours at 85°C in an oven.

6. Harvest Index:

$$\frac{\text{Economic yield(Grain yield)}}{\text{Biological Yield}} \times 100$$

The data recorded was averaged and statistically analysed (Table I, II, & III). Descriptive



statistics, coefficient of variation (C.V.), and Analysis of Variance (ANOVA) were performed to determine variability and significance among genotypes [10].

Observations:

Table I: Phenotypic Variability Parameters in selected bread wheat genotypes:

Table II: Mean Values of Agronomic Traits for Each Genotype

Trait	Range	Mean	Median	Mode	S.D.	S.E.	Variance	C.V. (%)
Shoot Height (cm)	80-110	95.5	96	98	8.2	2.65	67.24	8.59
Tiller Numbers	6-12	9.2	9	10	2.1	0.67	4.41	22.83
1000-Grain Weight (g)	35-50	42.3	42	41	4.5	1.43	20.25	10.63
Vegetative Dry Matter (g)	150-220	185.6	187	190	17.4	5.49	302.76	9.38
Reproductive Dry Matter (g)	60-95	78.2	79	81	10.3	3.24	106.09	13.17
Biological Yield (g)	210-300	263.8	265	270	25.1	7.9	630.01	9.51
Harvest Index (%)	35-50	42.7	43	44	4.2	1.32	17.64	9.83
Trait	PBW-343		HD-2967		WH-283			
Shoot Height (cm)	92.4		98.6		95.5			
Tiller Numbers	8.7		9.9		9.0			
1000-Grain Weight (g)	41.2		44.5		41.1			
Vegetative Dry Matter (g)	180.3		190.5		186.0			
Reproductive Dry Matter (g)	75.2		82.1		77.3			
Biological Yield (g)	258.5		272.4		260.6			
Harvest Index (%)	41.2		44.3		42.5			

Table III: ANOVA Results

Source of Variation	df	SS	MS	F-Value	P-Value
Genotype	2	435.6	217.8	5.43	0.014
Error	6	240.3	40.05	-	-
Total	8	675.9	-	-	

Results and Discussion

The analysis revealed significant differences among genotypes for key yield-related traits. The above findings are at par with that of other workers like Mohibullah *et. al.* [11] and Majumdar *et.al.* [12] who studied variability parameters in other wheat varieties. The mean values for



agronomic traits indicate that the genotype HD-2967 exhibited the highest shoot height (98.6 cm), tiller numbers (9.9), and biological yield (272.4 g), making it a promising candidate for further breeding programs. Significant variation in 1000-grain weight and harvest index was observed, with HD-2967 having the highest values at 44.5 g and 44.3%, respectively, suggesting its potential for improved yield stability. The coefficient of variation suggested moderate variability in most traits, highlighting stable performance under Haryana's agro-climatic conditions. These findings support the selection of HD-2967 as a superior genotype for regional wheat production, emphasizing its potential contribution to increased productivity and farmer profitability.

Conclusion

The study confirms the presence of significant variability among wheat genotypes, with HD-2967 emerging as the most promising for higher yield potential. The differences observed in agronomic traits emphasize the importance of genotype selection for enhanced wheat production. Future research should focus on multi-location trials and genetic studies to validate these findings and enhance wheat breeding programs in Haryana.

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