

Performance of some improved bread wheat varieties grown in Khyber Pakhtunkhwa, Pakistan

Abstract

A field trial was conducted to evaluate the performance of some bread wheat varieties under agro-ecological conditions of Kohat, Khyber Pakhtunkhwa Pakistan. The experiment was laid out randomized complete block design with three replications at Barani Agricultural Research Station, Kohat. Fifteen promising wheat varieties were evaluated for yield and associated traits. Variety Faisalabad-08 surpassed all the varieties in this study for growth and yield performance, followed by Dhurabi and Kohat-2000. Faisalabad-08 produced highest grain yield (6167kg ha⁻¹), followed by Dhurabi and Kohat-200 (5244kg ha⁻¹), Fakhre Sarhad (5178 kg ha⁻¹), Pirsabak-08 (5089kg ha⁻¹) while lowest grain yield (3478kg ha⁻¹) was recorded in Aas-11. Therefore, Faisalabad-08 was the leading variety and could be recommended for cultivation in rainfed areas of Khyber Pakhtunkhwa.

Keywords: wheat, rainfed, varieties, grain yield

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Introduction

Wheat (*Triticum aestivum* L.), a leading cereal grain belongs to the gramineae family, is a staple food of billions of people in the world; used to make flour for leavened, flat and steamed breads, cookies, cakes, pasta, noodles and couscous; for fermentation to make beer and alcohol.¹ Development of new wheat varieties have resulted in remarkable increase in the yield per unit area worldwide. Varieties with different morphological and economic characteristics are now available as breeding stock.² Each variety has a genotype-specific ability to maintain performance over a wide range of environmental conditions.³ This ability is usually referred to as the sensitivity or adaptability of a variety. Such ability is an important property, because farmers naturally want to use varieties which perform well in their own fields. Assessing sensitivity has, however, proved difficult, because of problems involved in defining and measuring the wide diversity of natural environments. A key point is to use the conditional expectation of the yield given the environment as a latent explanatory variable.⁴ In this way the predicted yields of different varieties can be estimated at any expected environmental yield level.⁵ Demand for differential agronomic traits depends on the production environment of farmers and the extent to which they rely on genetic traits, rather than purchased inputs to combat biotic and abiotic pressures. In marginalized regions of the world where a cooperative structure would enable farmers to gain revenues and reduce marketing costs, and consumer demand is localized, promoting cooperatives might also generate a positive externality of maintaining variety diversity.⁶ To the extent that variety diversity also improves overall yield performance through genetic processes, it may also contribute to sustaining regional yield levels.⁷ In the present study, the performance of some improved wheat varieties grown in Khyber Pakhtunkhwa was evaluated under agro-ecological conditions of Kohat.

Materials and methods

Fifteen wheat varieties were field tested for yield and associated traits at Barani Agricultural Research Station, Kohat during Rabbi 2014-15. The experimental material was planted on 23rd October, 2014 in 5rows, 30cm apart and 5m long keeping plot size of 5×1.8m using randomized complete block design having three replications. Normal dose of fertilizers i.e. N: P₂O₅ @ 120:90kg/ha were applied at

the time of sowing. Data were recorded on plant height (cm), tillers m⁻², grains spike⁻¹, 1000grain weight (g) and grain yield (kg/ha).

Statistical analysis

The data collected were subjected to analysis of variance technique appropriate for randomized complete block design using computer software Statix ver. 8.1, upon significant differences means were separated using LSD test at 5% level of probability.

Results and discussion

Plant height (cm)

Analysis of variance revealed highly significant differences among varieties for plant height (Table 1). Plant height ranges from 99.0 to 103.3 cm with the mean value of 101.8cm. Maximum and minimum values for plant height were recorded for Amin-10 (103.3cm) and PS-08 (99.0cm), respectively (Table 2). The present finding are in line with the results of Yu⁸ who reported considerable variation in the plant height of different wheat varieties when planted under various environments. Genetic variability was also observed in different wheat varieties and advanced lines under multi-environment trials by Khan et al.,⁹; Voltas et al.,¹⁰ Nevo and Chen⁶, Ghuttai et al.,¹¹ & Khan et al.,¹²

Tillers m⁻² (no.)

Highly significant differences among varieties were observed for tillers m⁻² (Table 1). Data pertaining tillers m⁻² of 15 wheat varieties are presented in Table 2. Tillers m⁻² ranges from 159 to 248 with the mean value of 199 tillers. Wheat variety Siren-10 produced maximum tillers m⁻² (248 tillers), whereas, minimum values for tillers m⁻² were recorded for Aas-11 (159 tillers). Several researchers reported varied response of varieties for number of tillers in wheat. These results are further supported by Ozgen¹³, Piepho et al.,¹⁴, Ilyas et al.,¹⁵ & Zafar et al.,¹⁶ who were of the opinion that the tillers m⁻² is generally associated with genetic make of the parental material of different wheat varieties.

Grains spike⁻¹(no)

Means squares due to varieties exhibited highly significant for grain spike⁻¹ (Table 1). Grains spike⁻¹ of 15 wheat varieties ranges

from 45 to 63 with the mean value of 54 grains. NARC-11 (63 grains) produced maximum grains spike⁻¹, whereas Siren-10 (45 grains) produced minimum grains spike⁻¹ (Table 2). Previous studies carried out in different parts of the world also supported the findings of

the present research in relation to grains spike⁻¹ 2,11,16 Experienced that varieties developed under different environmental conditions possessed grains spike⁻¹ in different number.

Table 1 Means squares for various traits of 15 wheat varieties evaluated at BARS, Kohat during 2014-15

Traits	Reps(df=2)	Varieties(df=14)	Error (df=28)	CV(%)
Plant height	2.82	3.66**	1.41	11.7
Tillers m ⁻²	305.27	2634.5**	286.65	8.5
Grains spike ⁻¹	6.06	78.37**	6.92	14.8
1000 grain weight	1.56	5.01**	1.63	3.09
Grain yield	88788	1728036**	78119	16.25

* and ** showed significant at 1% and 5% level of probability, where NS, non-significant

Table 2 Mean performance of 15 wheat varieties evaluated at BARS, Kohat during 2014-15

Variety	Plant height (cm)	Tillers m ⁻²	Grains spike ⁻¹	1000 grain weight (g)	Grain yield (kg ha ⁻¹)
Pirsabak-05	103	205	51	42.9	4444
Pirsabak-08	99	210	55	44	5089
Faisalabad-08	101	245	59	42.9	6167
Amin-10	103.3	199	50	40.6	3989
Siren-10	101.3	248	45	41.4	4578
Aas-11	103	159	55	39.9	3478
NARC-11	101	165	63	39.1	4078
Punjab-11	102	178	52	40.3	3700
Dhurabi	102	204	62	41.7	5244
Shahkar-13	102	176	50	42.5	3722
Lalma-13	102.3	196	50	41.3	4056
Pirsabak-13	101	177	53	41.6	3944
Atta Habib	101.7	164	60	41.8	4122
Fakhre Sarhad	101.7	227	56	40.9	5178
Kohat-2000	103	236	55	40.3	5244
Mean	101.8	199	54	41.4	4469
LSD(0.05)	1.78	25.69	4.2	2	430.5

1000 grain weight (g)

Analysis of variance revealed highly significant differences among varieties for 1000 grain weight (Table 1). Mean values for 1000 grain weight of 15 wheat varieties are presented in Table 2. 1000 grain weight ranges from 39.1 to 44.0 g with the mean value of 41.4 g. Wheat variety PS-08 (44.0 g) produced heaviest grain weight, whereas minimum 1000 grain weights were recorded for NARC-11 (39.0 g). The present results are in line with earlier studies reported by Porfiri et al.,¹⁷ who found higher 1000 seed weight in local varieties as compared to exotic cultivars; while Piepho et al.,¹⁴, Ghuttai et al.,¹¹ and Zafar et al.,¹⁶ reported significant genetic differences among varieties for 1000-grain weight.

Grain yield (kg ha⁻¹)

Highly significant differences among varieties were noticed for grain yield (Table 1). Data regarding grain yield of 15 wheat varieties

are given in Table 2. Grain yield ranges from 3478 to 6167 kg ha⁻¹ with the mean value of 4469 kg ha⁻¹. Wheat variety Faisalabad-08 produced maximum grain yield (6167 kg ha⁻¹), whereas, minimum value for grain yield were recorded for Aas-11 (3478 kg ha⁻¹). Genotypic difference among varieties for grain yield might be associated with genetic make of parental material of these varieties tested under similar field conditions. These results are in agreement with those of Voltas et al.,¹⁰ and Khan et al.,¹² who reported marked difference in grain yield of wheat varieties developed in different ecologies; while Porfiri et al.,¹⁷ reported that the grain yield of wheat varieties is mostly associated with the environmental conditions.

Conclusion

Wheat variety Faisalabad-08 out yielded all the tested varieties. Therefore, the said variety could be recommended for cultivation in rainfed areas of Khyber Pakhtunkhwa, Pakistan.

Acknowledgments

None.

Conflicts of interest

The authors declared there is no conflict of interest.

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