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COMPARATIVE PERFORMANCE OF SOME NEW WHEAT CULTIVARS IN AGRO-ECOLOGICAL ZONE OF DERA GHAZI KHAN

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ABSTRACT

An experiment was conducted to evaluate yield potential of some newly introduced wheat varieties *i.e* Shafaq-2006 (V_1); AS-2002 (V_2); Ufaq-2002 (V_3) and Bhakkar-2002 (V_4) in different locations (L_1: mouza Rakh Chabbri Zareen, L_2: mouza Notak and L_3: mouza Kotla Shafi) of agro-ecological zone of Dera Ghazi Khan during the rabi season 2007-08. The trial was laid out in randomized complete block design with split plot arrangements keeping different locations in main plot effect and wheat varieties in sub plot with three blocks in a net plot size of 7.5 × 18 m. The results revealed that among all three locations, maximum number of tillers m^{-2} (356.16), 1000-grain weight (38.72 g) was recorded at mouza Rakh Chabbri Zareen. Similarly, the highest number of grains $spike^{-1}$ (39.58) and grain yield (48.80 q ha^{-1}) was recorded at mouza Notak. Whereas the highest germination count m^{-2} (134.58) was recorded at mouza Kotla Shafi. As for as the performance of different wheat varieties is concerned, Shafaq-2006 exhibited the highest germination count $^{-2}$ (131.55) and number of grains $spike^{-1}$(39.11). While Bhakkar-2002 exhibited the highest number of tillers m^{-2} (370.11), 1000-grain weight (40.38 g) and grain yield (39.58 q ha^{-1}). The interactive effects of different locations and varieties were highly significant. Maximum grain yield (51.42 q ha^{-1}) was obtained from wheat variety Bhakkar-2002, which is statistically at par with grain yield (50.14 q ha^{-1}) of Shafaq-2006 at mouza Notak and performed better in clay loam soils.

Key words: wheat varieties, locations, yield potential

INTRODUCTION

Wheat (*Triticum aestivum* L.) is an important cereal crop used as staple food in Pakistan. It is a principal source of carbohydrates for human beings while its straw is an integral part of livestock feed. Its grain contains carbohydrates 60-80%, protein 8-15 %, fat 1.5-2.0%, inorganic ions 1.5-2.0% and vitamins such as B complex and E (Schellenberger, 1996).

Wheat is grown in almost every part of the country. It contributes 12.7 percent to the value added in agriculture and 2.6 percent to GDP. Area and production target of wheat for the year 2007-08 were set at 8578 thousand hectares and 24 million tons, respectively, (GOP, 2008).

Despite to higher yield potential, average yield, of different varieties, in Pakistan is much less than the most countries of the world. To meet the increasing demand of food grains for rapidly growing population of the country, it is desired to have higher yield per unit area. A number of factors including, time of sowing, land preparation, seed bed preparation, fertilizer application, weed management, and irrigation scheduling are responsible for the variation in yield of wheat, but all these factors are agronomic and greatly influenced by temperature, rainfall and humidity. The vital factor for harvesting suitable environment into grain yield is the genetic potential of the crops (Nadeem, 2001).

The introduction of new varieties with their high yield potential and wide range of adaptability is an important factor responsible for enhancing wheat production (Alam *et al*., 2006). Different varieties respond differently to varied environment and hence differ in their yield. Cultivars differed significantly due to difference in number of tillers m^{-2} (Jan *et al*., 2003; Irfaq *et al*., 2005), number of grain $spike^{-1}$ (Akmal *et al*., 2000), 1000-grain weight (Alam *et al*., 2006; Saliva and Gomes, 1990) and grain yield (Nadeem, 2001).

The present study was, therefore, designed to determine the yield potential of some newly introduced varieties namely, Shafaq-2006, AS-2002, Ufaq-2002 and Bhakkar-2002 in different pockets of agro- ecological conditions of D. G. Khan Zone.

MATERIALS AND METHODS

A field study of some newly introduced wheat varieties was carried out to evaluate the production potential at (L_1) mouza Rakh Chabbri Zareen, (L_2) mouza Notak and (L_3) mouza Kotla Shafi in D. G. Khan zone. The experiment was laid out in randomized complete block design with split plot arrangements keeping different locations in main plot effect and varieties in sub

plot with three blocks and net plot size of 7.5 × 18 m. The experiment was conducted during *rabi* 2007-08. Four treatments namely, Shafaq-2006 (V_1); AS-2002 (V_2); Ufaq-2002 (V_3) and Bhakkar-2002 (V_4) were tested at three different locations L_1, L_2, and L_3. Crop was sown on 15 November, 2007 with hand drill at seed rate of 60 Kg acre^{-1}. Chemical fertilizers NPK (125-75-50 Kg ha^{-1}) was applied in the form of Urea, DAP and Sulphate of Potash. Whole potash and Phosphorus with ½ dose of the nitrogen was applied at the time of sowing, while rest of the nitrogen was applied at first irrigation. Crop was irrigated at all critical growth stages under normal conditions. It was harvested on April 20, 2008, when moisture %age in grain was less than 10 %. All other agronomic operations were performed uniformly except the treatment under study.

The plant parameters *viz.* germination count m^{-2}, number of tillers m^{-2}, number of grains spike^{-1}, 1000-grain weight and grain yield were recorded using standard procedures. Statistical analysis was carried out by using "MSTAT-C" program (Anonymous, 1987). LSD test ($P< 0.05$) was used to compare the treatment means (Steel *et al*., 1997).

RESULTS AND DISCUSSION

Germination Count m^{-2}: There was significant variation among different locations regarding the germination count m^{-2}. The highest germination count m^{-2} (134.58) was recorded in Kotla Shafi (L_3), whereas the lowest germination count (123.67) was recorded at Rakh Chabri Zareen (L_1), D. G. Khan. The results showed that germination count m^{-2} of different varieties exhibited significant variation. The highest germination count m^{-2} (131.55) was recorded in Shafaq-2006 against the lowest germination count m^{-2} (128.33) in wheat variety AS-2002.

The interactive effects of different locations and varieties were found significant. The highest germination count (139.67) was recorded when Shafaq-2006 was cultivated at Mouza Kotla Shafi, D. G. Khan, while the AS-2002 at location of Rakh Chabbri Zareen exhibited the lowest germination count m^{-2} (120.00). The results are in line with the finding of Nadeem (2001) who reported similar results and found significant differences among the different wheat varieties.

Number of tillers m^{-2}: Stand density per unit area at harvest is the most important yield determining factor in wheat. Tillering potential is controlled by the genetic make up of a variety and external environmental factors. The data regarding total number of tillers m^{-2} shown in Table.1 indicated that there was significant variation among different locations. The highest number of tillers m^{-2} (356.16) was produced at mouza Rakh Chabri Zareen (L_1), where as the lowest number of tillers m^{-2} (285.58) was observed at mouza Kolta Shafi (L_3). There were also significant differences among varieties for number of tillers m^{-2}. The highest number of tillers m^{-2} (370.11) was recorded in Bhakkar-2002 against the lowest (279.89) in AS-2002. The variation in total number of tillers for the different varieties may be attributed due to their genetic make up and environmental conditions like temperature, humidity and rainfall (Table 2). The interactive effects of locations on different varieties were significant. The highest number of tillers m^{-2} (407.67) was recorded in Bhakkar-2002 at mouza Rakh Chabbri Zareen, while the lowest number of tillers m^{-2} (254.67) were observed in Ufaq-2002 at mouza Kotla Shafi. Similar trends were observed by Jan *et al*., (2003), and Irfan *et al*., (2005), who stated that different varieties respond differently due to difference in their genetic make up, as far as the difference at different location was justified with change in agro-physiological and ecological conditions.

Number of grains Spike^{-1}: Number of grains spike^{-1} is another important yield contributing parameter and it has direct impact on the final yield of crop. Data given in Table 1 showed significant differences among the three locations. The results revealed that maximum number of grains spike^{-1} (39.58) were obtained at mouza Notak (L_2), which was also statistically at par with number of grains spike^{-1} (39.50) at mouza Rakh Chabbri Zareen (L_1). The lowest number of grains spike^{-1}(35.25) was recorded at mouza Kotla Sahfi (L_3). Significant differences were also observed by different varieties regarding the parameter of number grains spike^{-1}. The highest number of grains spike^{-1} was recorded in Shafaq-06 and Bhakkar-2002 (39.11). The interaction between the location and varieties was observed significant. Maximum number of grains spike-1 (41.00) was noted in Shafaq-2006 at mouza Rakh Chabbri Zareen against the lowest number of grains spike^{-1}(33.33) in Ufaq-2002 at Kotla Shafi. Similar results were reported by Akmal *et al*. (2000) and Nadeem (2001), who also observed significant differences among the cultivars for number of grain spike^{-1}. The reasons for those differences were number of tillers m^{-2} and environmental factors like temperature, humidity and rainfall as shown in Table 2.

1000 grain weight (g): The weight of grain is an important yield component and makes major contribution towards wheat grain yield. There was significant variation among different locations regarding 1000-grain weight. Maximum 1000 grain weight (38.72 g) was observed at mouza Rakh Chabbri Zareen (L_1), which was statistically at par with 1000-grain weight (38.70 g) at mouza Kotla Shafi (L_3). The lowest 1000-grain weight (37.03 g) was recorded at mouza Notak (L_2). Similarly, significant variations were recorded in different varieties regarding 1000-grain weight. The highest 1000-grain weight (40.38 g) was observed in Bhakkar-2002, which was statistically at par with 1000-grain weight (39.58 g)

in Shafaq-2006. The interaction effect of both, locations and varieties showed significant variations. Bhakkar-2002 at mouza Notak exhibited the highest 1000-grain weight (41.08 g), whereas AS-2002 at mouza Notak exhibited the lowest 1000-grain weight (33.33 g). Saliva and Gomes (1990) Alam *et al*. (2006) and Irfan *et al*., (2005) also described significant differences for 1000-grain weight among wheat varieties at different locations because of the difference in number of grains spike^{-1} and number of tillers m^{-2} among different varieties. The differences in yield at different locations might be due to soil type (marginally saline at mouza Rakh Chabbri Zareen & clay loam at mouza Notak & Kotla Shafi) and environmental conditions like temperature, humidity and rainfall as shown in Table 2.

Grain yield (Kg ha^{-1}): Grain yield of the wheat crop is the function of its individual yield components in response to the genetic potential of varieties, environmental conditions and input used. It was obvious from the yield data presented in Table 1 that there were significant differences among the different locations. Maximum yield (48.80 q ha^{-1}) was recorded at mouza Notak (L_2), whereas the lowest grain yield (27.65 q ha^{-1}) was observed at mouza Rakh Chabbri Zareen (L_1). There were significant differences among different varieties regarding the parameter of grain yield. The highest grain yield (39.58 q ha^{-1}) recorded in Bhakkar-2002, which was statistically at par with grain yield (39.15 q ha^{-1}) of Shafaq-2006. The interaction effects of locations and varieties revealed significant differences. The maximum grain yield (51.42 q ha^{-1}) was calculated in Bhakkar-2002 at mouza Notak, which was statistically at par with grain yield (50.14 q ha^{-1}) of wheat variety Sgafaq-2006 at mouza Notak. Whereas the lowest grain yield (26.23 q ha^{-1}) was recorded in AS-2002 at mouza Rakh Chabbri Zareen. The differences in yield at different locations might be due to soil type, environmental conditions like temperature, humidity and rainfall as shown in Table 2. Nadeem (2001) showed his results in conformity with this study and found significant differences among the different wheat varieties.

Conclusion: May be concluded from the study carried out at different locations of D. G. Khan zone that wheat variety Bhakkar-2002 and Shafaq-06 performed better by giving maximum yield (51.42 q ha-1) and (50.14 q ha^{-1}), respectively at mouza Notak, D. G. Khan. So, Bhakkar-2002 and Shafaq-06 are recommended to the farmers for cultivation in agro-ecological zone of D. G. Khan.

Table 1: **Comparative performance of some new wheat cultivars in agro-ecological zone of D. G. Khan**

Treatments	Germination Count m^{-2}	No. of Tillers m^{-2}	No. of Grains Spike^{-1}	1000-Grain Weight	Grain Yield q ha^{-1}
Locations (L)					
L_1: Rakh Chabbri Zareen	123.67c	356.16a	39.50a	38.72a	27.65c
L_2: Mouza Notak	131.92b	315.92b	39.58a	37.03b	48.80a
L_3: Kotla Shafi	134.58a	285.58c	35.25b	38.70a	37.32b
LSD (a)	6.470	2.476	1.466	1.049	1.279
Varieties (V)					
V_1:Shafaq-06	131.55a	332.00b	39.11a	39.58a	39.15a
V_2: AS-02	128.33b	279.89d	36.44b	35.91b	36.07b
V_3: Ufaq-02	130.11ab	294.89c	36.44b	36.73b	36.88b
V_4: Bk-02	130.22ab	370.11a	39.11a	40.38a	39.58a
LSD (b)	2.475	2.859	1.693	1.212	1.477
Interaction (V x L)					
L_1 x V_1	124.00e	287.33b	41.00a	40.30ab	29.35f
L_1 x V_2	120.00f	304.67f	39.00bc	36.40b	26.23h
L_1 x V_3	124.33de	325.00d	38.00cd	38.27c	27.01gh
L_1 x V_4	126.33b	407.67a	40.00ab	39.90b	28.01g
L_2 x V_1	131.00c	325.00d	40.00ab	38.25c	50.14a
L_2 x V_2	130.67c	252.67h	37.00de	33.33e	46.46b
L_2 x V_3	133.67b	305.00f	37.00de	35.46d	47.18b
L_2 x V_4	132.33bc	381.00c	40.33ab	41.08a	51.42a
L_3 x V_1	139.67a	283.67g	36.33e	40.19ab	37.96d
L_3 x V_2	134.33b	282.33g	34.33f	37.99c	35.54e
L_3 x V_3	132.33bc	254.67h	33.33f	36.46d	36.44e
L_3 x V_4	132.00bc	321.67e	37.00de	40.16ab	39.32c
LSD (c)	2.143	2.476	1.466	1.049	1.279
CV (%)	1.95	0.92	4.60	3.26	4.00

The means in columns bearing same letters do not differ significantly ($p<0.05$)

Table 2. Meteorological data recorded during the crop growth period 2007-08

Months	Max. Temp. (°C)	Min. Temp. (°C)	Relative Humidity (% age)	Rainfall (m.m)
November, 2007	25	15	87	0
December, 2007	20	10	75	3
January, 2008	17	5	85	20
February, 2008	20	07	80	2.5
March, 2008	30	17	85	15
April, 2008	31	20	76	3
May, 2008	41	27	68	0

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