



Research Article

DEMONSTRATION AND EVALUATION OF HIGH YIELDING WHEAT VARIETIES IN ECOLOGICAL ZONE OF RAHIM YAR KHAN

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Abstract

A field experiment was conducted during winter seasons 2016-17 and 2017-18 at Adaptive Research Farm Rahim Yar Khan. Six wheat varieties i.e Galaxy-2013, Ujala-2016, Johar-2016, Gold-2016, Punjab-2011 and Faisalabad-2008, were evaluated in a three replicated RCBD method. Results revealed that all the yield and yield parameters were significantly affected by the performance of each wheat variety. The average of two years result revealed that significant maximum plant population i.e 225.9, tillers 406.3, height 110, 1000 grain weight 40.5 and grain yield of 4460 kg ha⁻¹ was obtained by the wheat variety Galaxy-13 with % increase 5.06 than all other wheat varieties. Johar-16 and Ujala-16 also performs better with a yield of 4370 and 4355 kg ha⁻¹ and % increase of 2.9 and 2.5.

Keywords: wheat varieties, RCBD method, grain yield.

Introduction

Wheat (*Triticum aestivum* L.) is a dominant crop with grains for staple food consumption and straw for fodder in the world and Pakistan. It is important food component of living being with richest source of protein and energy (Saleem et al. 2007). The average yield of wheat in Pakistan is comparatively low than the developed and developing countries of the world, due to certain biotic and abiotic factors faced during the whole crop growth period (Anonymous, 2013). Different varieties respond differently to applied nutrient fertilizer and hence differ in their yield potential. As cultivars differ significantly regarding fertile tillers m⁻², spike length, number

of grains per spike, grain and straw yield (Naeem, 2001; Ali et al. 2010). Many factors responsible for low yield of wheat such as cultivation of old varieties, sowing date, low seed rate, low fertilizer rates etc. Plants require a balanced supply of nutrients throughout their development. Mostly they have accumulated most of their nutrients during flowering and ripening stages. Approximately 50 to 90 percent of N and P in the plant at flowering moves from the leaves and stem to the developing seed (Chapin, et al. 1988). Sowing at improper time not only affects wheat germination and growth but also disturbs grain development (Haq & Khan, 2002). A serious

decline in grain yield of wheat due to delay in sowing is reported by a number of researchers (Kumar et al. 2000; Subhan et al. 2004; Sial et al. 2005). The environment under which crop is grown create a tremendous impact on the growth, development and yielding ability of wheat crop. Research has established that every wheat cultivar has its own definite requirements of temperature and light for growth, flowering and finally the production of grains (Haider, 2007; Aslani and Mehrvar, 2012). The optimum time of sowing of wheat varies with agro ecological locations. For instance, it was noted that grain yield of three long duration wheat varieties was improved when sowing date was advanced from November 15 to October 25 (Randhawa et al. 1981). Time of fertilizer application can affect the Nitrogen utilization efficiency by cereals (Ragheb et al. 1993). Late sowing and sub optimum temperature at sowing affects uniform stand establishment of wheat crop which results in yield reduction (Farooq et al. 2008, Tanweer et al. 2009; Khokhar et al. 2010 and Ali et al. 2010) reported that significantly higher wheat grain yield was obtained by sowing at November 10 followed by same variety sown on November 20. Donaldson et al. (2001) reported that early sowing resulted in increased wheat straw production and generally higher grain yield compared with mid to late sowing date. Kumar et al. (2000) also reported that wheat growth was better when sown on 20th November than on 1st November or December. The improvement of 35-50% in wheat has been achieved by the introduction of newly high yielding cultivars (Whiteman, 1985). The problems like leaf and yellow rusts which cause considerable economic losses to wheat. Wheat Research Institute has released many varieties i.e. Seher-2006, Faisalabad-2006, AaS-2002 and Faisalabad 2008 which are not only disease resistant but also high yielding (Hussain et al. 2009, Khan and Hussain 2006 and M. Hussain 2008). Wheat variety having the higher yield potential, disease and insect resistance and better adaptability is the need of the day because low seed yield is also attributed to non availability of pure seed of improved varieties along with low inputs and poor management practices (Ahmad et

al. 2005, Sarwar & Ahmad 2003 and Bakhsh et al. 2005) also reported that the yield per unit area may be increased substantially through the evolution of high yielding genotypes, bearing a good combination of all yield components and disease resistance. A comparative study showed that wheat varieties Punjb-11 and Faisalabad-08 produces a better yield in Punjab province District Bahawalnagr (Laila et al. 2016).

Keeping in view the importance of wheat crop, the present study was conducted to compare different wheat varieties and to see which variety of wheat performs better in grain yield production under the ecological zone of Rahim Yar Khan.

Materials and Methods

The experiment was conducted at Adaptive Research Frm Rahim Yar Khan during two consecutive years 2016-17 and 2017-18. The objective of this study was to check the efficacy of different wheat varieties under the ecological zone of Rahim Yar Khan. The experiment was laid out in Randomized Complete Block design (RCBD) with three replications. Six wheat varieties i.e Galaxy-2013, Ujala-2016, Johar-2016, Gold-2016, Punjab-2011 and Faisalabad-2008, as mention in table 1 were checked out for yield and yield parameters case. Recommended seed rate of each wheat variety was used. The previous crop was cotton in this field which was sown on 1st fortnight of May. Cotton picking was done from the month of October to December. All the wheat varieties were sown on same time in the 2nd week of November. The fertilizer application to wheat varieties and all other agronomic practices were same during both years. Weedicides were used for the control of narrow and broad leaved weeds during mid January and February. Harvesting was done during 1st week of May.

Following growth and yield parameters were recorded.

1. Germination count/m²
2. Tillers/m²
3. Plant height (cm)

4. 1000 grain weight(g)
5. Yield kg/ha

Data were analyzed statistically with M-stat package and means were compared by DMR test at 5 percent probability level (Duncan, 1955).

Table 1- Different wheat varieties sown in Ecological zone of Rahim Yar Khan.

Treatments	Wheat Varieties
V ₁	Galaxy-2013
V ₂	Ujala-2016
V ₃	Johar-2016
V ₄	Gold-2016
V ₅	Punjab-2011
V ₆	Faisalabad-2008

Results and Discussion

Germination count (m⁻²)

Data concerning germination counts m⁻² is shown in Table 1. Statistical analysis of the data revealed that the different wheat varieties shows significant results on germination counts for the growing seasons. Average values for germination counts m⁻² of different wheat varieties ranged from 200 to 219 m⁻². During the year (2016-17) average germination counts m⁻² observed from different wheat varieties such as Galaxy-2013, Ujala-2016, Johar-2016, Gold-2016, Punjab-2011 and Faisalabad-2008 was 219.3, 214, 201.6, 200, 202.6 and 205.3 m⁻² respectively. The maximum germination counts m⁻² was observed as 219.3 m⁻² for Galaxy-13 wheat variety and minimum as 200 m⁻² in case of wheat variety Gold-16. During the year (2017-18) average germination counts m⁻² observed from different wheat varieties such as Galaxy-2013, Ujala-2016, Johar-2016, Gold-2016, Punjab-2011 and Faisalabad-2008 were 232.6, 225.3, 218.3, 225, 211.6 and 207 m⁻² respectively. The maximum germination counts m⁻² was observed as 232.6 m⁻² for Galaxy-13 wheat variety and minimum as 207 m⁻² in case of wheat variety Fsd-08. The variation among wheat

varieties for the germination counts m⁻² due to many biotic, abiotic and other varietal characters. Sorour et al. (1995) reported significant differences in the emergence.m⁻² of wheat seeds.

Number of tiller (m⁻²)

Different wheat varieties have a significant effect on tillering counts m⁻². Data regarding number of tillers m⁻² is presented in table 1. Average values for tillers m⁻² of different wheat varieties ranged from 347.8 to 406.3 tillers m⁻². During the year (2016-17) average tillers m⁻² observed from different wheat varieties such as Galaxy-2013, Ujala-2016, Johar-2016, Gold-2016, Punjab-2011 and Faisalabad-2008 was 415, 396, 390, 374, 370 and 357 respectively. The maximum tillers m⁻² was observed as 415 m⁻² for Galaxy-13 wheat variety and minimum as 357 m⁻² in case of wheat variety Fsd-08. During the year (2017-18) average tillers m⁻² observed from different wheat varieties such Galaxy-2013, Ujala-2016, Johar-2016, Gold-2016, Punjab-2011 and Faisalabad-2008 were 397.6, 374.6, 370.3, 362.0, 342.6 and 338.6 m⁻² respectively. The maximum tillers m⁻² was observed as 397.6 tillers m⁻² for Galaxy-13 wheat variety and minimum as 338.6 tillers m⁻² in case of wheat variety Fsd-08.

Plant height (cm)

Data concerning plant height is shown in Table 1. Statistical analysis of the data showed that plant height has significantly ($P \leq 0.05$) affect by the different wheat varieties. Average values for plant height of different wheat varieties ranged from 104 to 110 cm. During the year (2016-17) average plant height observed from different wheat varieties such as Galaxy-2013, Ujala-2016, Johar-2016, Gold-2016, Punjab-2011 and Faisalabad-2008 was 112, 107, 111, 110, 107 and 108 cm respectively. The maximum plant height was observed as 112 cm for Galaxy-13 wheat variety and minimum as 107 cm in case of wheat varieties Uajla-16 and Punjab-11. During the year (2017-18) average plant height observed from different wheat varieties such as Galaxy-2013, Ujala-2016, Johar-2016, Gold-2016, Punjab-2011 and Faisalabad-2008 was 108, 103, 108, 109, 102 and 102 cm respectively. The maximum plant height was observed as 109 cm for Gold-16 wheat variety and minimum as 102 cm in case of wheat varieties Punjab-11 and Fsd-08. The possible reason for this variation could be the availability of more space, light and nutrients to wheat plants and water applied. The results are similar with Javadi et al. (2004).

1000-grain weight (g)

Data recorded on thousand-grain weight is shown in Table 1 for the two growing seasons. Analysis of the data revealed that 1000-grain weight has non significant ($P \leq 0.05$) affect on all wheat varieties. Average values for 1000 grain weight (g) of different wheat varieties ranged from 37 to 40.5 (g). During the year (2016-17) average 1000 grain weight (g) observed from different wheat varieties such as Galaxy-2013, Ujala-2016, Johar-2016, Gold-2016, Punjab-2011 and Faisalabad-2008 was 41, 39, 39, 39, 38 and 37 respectively.

The maximum grain weight (g) was observed as 41 (g) for Galaxy-13 wheat variety and minimum as 37 (g) in case of wheat variety Fsd-08. During the year (2017-18) average 1000 grain weight (g) observed from different wheat varieties such as Galaxy-2013, Ujala-2016, Johar-2016, Gold-2016, Punjab-2011 and Faisalabad-2008 was 40, 39, 38, 38, 37 and 37 respectively. The maximum 1000 grain weight (g) was observed as 40 (g) for Galaxy-13 wheat variety and minimum as 37 (g) in case of wheat variety Fsd-08.

Grain yield (kg ha⁻¹)

Data recorded on grain yield kg ha⁻¹ is shown in Table 1 for the two growing seasons. Analysis of the data revealed that grain yield kg ha⁻¹ has a significantly ($P \leq 0.05$) affect on all wheat varieties. Average values for grain yield kg ha⁻¹ of different wheat varieties ranged from 4245 to 4460 kg ha⁻¹. During the year (2016-17) grain yield kg ha⁻¹ observed from different wheat varieties such as Galaxy-2013, Ujala-2016, Johar-2016, Gold-2016, Punjab-2011 and Faisalabad-2008 was 4830, 4780, 4790, 4760, 4670 and 4630 kg ha⁻¹ respectively. The maximum grain yield kg ha⁻¹ was observed as 4830 for Galaxy-13 and minimum as 4630 kg ha⁻¹ in case of wheat variety Fsd-08. During the year (2017-18) average grain yield kg ha⁻¹ observed from different wheat varieties such as Galaxy-2013, Ujala-2016, Johar-2016, Gold-2016, Punjab-2011 and Faisalabad-2008 was 4090, 3930, 3950, 3900, 3880 and 3860 kg ha⁻¹ respectively. The maximum grain yield kg ha⁻¹ was observed as 4090 kg ha⁻¹ for Galaxy-13 wheat variety and minimum as 3860 kg ha⁻¹ in case of wheat variety Fsd-08. The improvement of 35-50% in wheat has been achieved by the introduction of newly high yielding cultivars (Whiteman, 1985).

Table 1: The efficacy of different Wheat varieties on grain yield and yield components during Rabi season 2016-17 and 2017-18.

Year	Treatments	Average germination counts (m ⁻²)	Avg. Tiller counts (m ⁻²)	Average plant height (cm)	Average 1000-grain weight (g)	Average grain yield (kg/ha)
2016-17	V ₁	219.3a	415a	112a	41a	4830a
	V ₂	214.0b	396b	107e	39b	4780bc
	V ₃	201.6de	390c	111b	39b	4790b
	V ₄	200.0e	374d	110c	39b	4760d
	V ₅	202.6d	370e	107e	38c	4670e
	V ₆	205.3c	357f	108d	37d	4630f
LSD(0.05)		1.27	2.35	0.72	Non-significant	15.40
2017-18	V ₁	232.6a	397.6a	108b	40a	4090a
	V ₂	225.3b	374.6b	103c	39b	3930c
	V ₃	218.3c	370.3c	108b	38c	3950b
	V ₄	225.0b	362.0d	109a	38c	3900d
	V ₅	211.6d	342.6e	102d	37d	3880e
	V ₆	207.0e	338.6f	102d	37d	3860f
LSD(0.05)		2.06	3.910	0.69	Non-significant	12.701

Table 2: Average values of all parameters from 2016-17 to 2017-18

Treatments	Average germination counts (m ⁻²)	Avg. Tiller counts (m ⁻²)	Average plant height (cm)	Average 1000-grain weight (g)	Average grain yield (kg/ha)
V ₁	225.9	406.3	110	40.5	4460
V ₂	219.6	385.3	105	39.0	4355
V ₃	209.9	380.1	109	38.5	4370
V ₄	212.5	368.0	109	38.5	4330
V ₅	207.1	356.3	104	37.5	4275
V ₆	206.1	347.8	105	37.0	4245

Table.2 shows the average values of all yield parameters during both years. In which all the wheat varieties produced better yield, while in case of comparison in most of the yield parameters Galaxy-13 wheat variety performs

better and produced highest germination counts m⁻² (225.9), tillers m⁻² (406.3), plant height cm (110), 1000 grain weight g (40.5) and grain yield kg ha⁻¹ (4460).

Table 3: Percentage increase in wheat yield (kg/ha) of Different Wheat varieties for the year 2016-17 and 2017-18

Treatments	Combined Avg. yield of 2016-17 and 2017-18 (kg/ha)	Percentage increase in wheat yield (%)
Galaxy-13	4460	5.06
Ujala-16	4355	2.5
Johar-16	4370	2.9
Gold-16	4330	2.0
Punjab-11	4275	0.7
Fsd-08	4245	-

Table 3 shows that the highest grain yield was produced in V₁ for Galaxy-13 wheat variety with 5.06% yield increase during both study years i.e., 2016-17 and 2017-18 in comparison with Fsd-08 wheat variety (V₆) which produced the least avg. yield i.e., 4245 kg/ha. Treatment V₃ Johar-16 wheat variety also performed well with a yield of 2.9% increase followed by V₂ Ujala-16 wheat variety with yield increase 2.5%.

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