

COMPARATIVE ASSESSMENT OF WHEAT CULTIVARS AND SOWING DATES UNDER AGRO-CLIMATE OF SHEIKHUPURA, PAKISTAN

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ABSTRACT

With the objective to investigate the growth and yield response of three wheat varieties at two different sowing dates, a field study was conducted at Adaptive Research Farm, Sheikhupura, Punjab, Pakistan. The experiment was laid out in a randomized complete block design with split plot arrangement and replicated four times. The cultivars were Inqalab-91, Uqaab-2000 and AS-2002, whereas sowing dates were 24.11.03 and S₂ = 14.12.03, respectively. The sowing date was randomized in main plot and cultivars were randomized in sub plot. The study revealed that increase in all yield components (fertile tillers, number of spikelets per spike, number of grains per spike and 1000-grain weight) of wheat was observed in November sown crop. The cultivar AS-2002 performed better than the rest of two cultivars. Cultivar AS-2002 with the highest grain yield of 3647 kg ha⁻¹ and early (November) sowing were considered suitable for farmers under agro ecological conditions of Sheikhupura.

Keywords: Wheat cultivars, Sowing date, Growth, Yield components

INTRODUCTION

Wheat (*Triticum aestivum* L.) is one of the major food grain crops of the world including Pakistan being consumed as staple food of the one third world's population. In Pakistan, wheat is grown on an area of 8069 thousand hectares with an annual production of 19235 thousand tons having an average yield of 2384 kg ha⁻¹ (GOP, 2010). Despite higher yield potential, average yield in Pakistan is much less than most countries of the world.

There are many factors responsible for low yield of wheat such as cultivation of old varieties, sowing date, low seed rate, low fertilizer rates etc. The introduction of new varieties with high yield potential and wide range of adaptability is an important factor responsible for enhancing wheat production. Different varieties respond differently to applied nutrient fertilizer and hence differ in their yield potential. Similarly cultivars differ significantly regarding fertile tillers m⁻², spike length, number of grains per spike⁻¹, grain and straw yield (Naeem, 2001; Ali et al., 2010).

A number of researchers have investigated the

response of wheat to sowing date and cultivars in Pakistan (Ali et al. 2004). The environment under which crop is grown creates a tremendous impact on the growth, development and yielding ability of wheat crop. The crop needs optimum conditions during its growth and development to attain good yield. 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). Razzaq et al. (1986) studied the effect of sowing dates on emergence, growth rate and days to earing of wheat varieties and observed that emergence and number of days to earing for 15th November decreased with delay in planting to 15 December. Donaldson et al. (2001) in a field trial reported that early sowing resulted in increased wheat straw production and generally higher grain yield compared with mid to late sowing date. Jain et al. (1992) investigated the effect of 5 sowing dates on 6 wheat cultivars and concluded that late sowing significantly reduced grain yield in all the varieties compared to the crop sown on December 20. Lathwal et al. (1999) conducted an experiment on wheat cultivars sowing on different dates

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with 10 days interval from 5-November to 5-December. Plant height, grain and straw yield and harvest index decreased with the delay in sowing. An increase of 48 and 39% in grain yield was observed from 5 and 15 November sowing compared with fifth December (Late sowing) (Ali et al., 2004; Akdamar et al., 2002). Patel et al. (1999) planted field experiment to study yield and nutrient uptake of wheat varieties under different sowing dates (25th November, 5th, 15th and 25th December and 5th January). They observed that sowing of wheat on 1st week of December (5th December) was the most suitable. Kumar et al. (2000) reported that wheat growth was better when sown on 20th November than on 1st November or December, although there was little grain yield difference between the two dates in November.

Though appropriate sowing time of different wheat varieties, evolved so far has been determined through experimentation but the optimum sowing time of recently evolved genotype is still to be investigated for obtaining maximum yield under dynamic environmental conditions of Sheikhpura. The present study was therefore, undertaken with objective to study the growth, development and yield response of wheat cultivars at different sowing dates.

MATERIALS AND METHODS

A field experiment to determine the effect of sowing date on growth, development and yield of three cultivars of wheat was carried out at Adaptive Research Farm, Sheikhpura, Punjab, Pakistan. Experiment was laid out in a randomized complete block design with split plot arrangement, keeping the sowing date in main plots and cultivars in sub plots with four replications. Plot size was 3 x 8 m having 12 rows at 25 cm apart per plot. The experiment comprised of two sowing date $S_1 = 24.11.03$, $S_2 = 14.12.03$ and three wheat cultivars V_1 (Inqalab-91), V_2 (Uqaab-2000) and V_3 (AS-2002). At proper conditions, the experimental area was deep ploughed followed by three cultivations and plankings to prepare the fine seed bed for planting. The crop was sown with the help of a single row hand drill on November 24, using a seed rate of 100 kg ha⁻¹. Half of the nitrogen was applied at the time of sowing along with a basal dose of P₂O₅ @ 100 kg ha⁻¹ in the form of DAP. The remaining N

was applied at the time of 1st irrigation. All other agronomic practices such as hoeing, irrigation, weeding etc. were kept normal for all the treatments.

At final harvest, data for number of fertile tiller m⁻², plant height, spike length, number of spikelets per spike, number of grains per spike, 1000-grain weight, grain yield, straw yield, TDM and harvest index were recorded by following the standard procedures. Analysis of variance technique was employed to analyze the data. Differences among the treatment means were compared using least significant difference (LSD) at 5% probability level (Steel et al. 1997).

RESULTS AND DISCUSSION

Data regarding number of fertile tiller m⁻² is presented in Table 1. Sowing date significantly effect the fertile tillers. The November sowing significantly enhanced the number of fertile tillers in November (496.72) and in December it was only 289.64 was observed.

Both the cultivars V_2 and V_3 were statistically at par with each other for the number of fertile tillers m⁻² and significantly enhanced number of productive tillers m⁻² over V_1 . Average number of spike bearing tillers was 422 m⁻² in V_1 , 388 m⁻² in V_2 and 368 V_3 , respectively. Similar results were reported by Naeem (2001), Ali et al. (2010) and Haider (2007) who also observed that cultivars differed significantly for the number of fertile tillers per unit area. Table 1 shows the effect of treatments on plant height at maturity. The November sowing significantly enhanced the plant height over December sowing. The average plant height 93.71 cm and 83.69 cm was observed in November and December sowing respectively. The cv. Uqaab-2000 (V_2) significantly enhanced plant height compared with cv. Inqalab-91 (V_1), and AS-2002 (V_3). The average plant height was 89.10 cm in V_1 , 92.57cm in V_2 , and 84.79 cm in V_3 . Similar results were reported by Naeem (2001) and Ali et al. (2004) who also observed that cultivars differed significantly for plant height at maturity. The early sowing significantly enhanced the spike length over late sowing crop. The average spike length 12.27 cm and 13.32 cm was observed in S_1 and S_2 respectively. Both cv. V_1 and V_2 were statistically at par for spike length and significantly increased the spike length over V_3 .

The average spike length was 12.68 cm in V₁, 13.44 cm in V₂ and 12.27 cm in V₃, respectively. Similar results were reported by Naeem (2001) and Aslani and Mehrvar (2012) who observed that spike length was significantly different in different cultivars. Table 1 shows the effect of sowing date and cultivar on the number of spikelets per spike. The November sowing significantly enhanced the number of spikelets per spike. The average number of spikelets per spike 17.69 and 16.44 was observed in S₁ and S₂ respectively. Both V₁ and V₂ cultivars were statistically at par in number of spikelets per spike. But they significantly increased the number of spikelets over V₃ cultivar. The average number of spikelets per spike was 17.75 in V₁, 17.70 V₂ and 15.75 in V₃, respectively. Similar results were reported by Naeem (2001) and Haider (2007) who also observed that cultivars differed significantly in the production of number of spikelets per spike. The early sowing (Nov.) significantly enhanced the number of grains per spike over late sowing (Dec.). The average number of grains per spike 39 and 35 in S₁ and S₂ was observed. Both V₁ and V₃ cultivars were statistically at par in production of number of grains per spike but they significantly increased the number of grains per spike over V₂ cultivar. The average number of grains per spike was 36.61 in V₁, 39.48 in V₂, 35.91 in V₃, respectively. Naeem (2001) also observed significant differences among cultivars in the production of number of grains per spike.

Data showed that early sowing significantly enhanced the 1000 grain weight over late sowing crop (Table 1). The average 1000-grain weight 41.16g and 38.92g was observed in S₁ and S₂ respectively. V₁ and V₂ cv. were statistically at par in 1000-grain production. But V₃ cultivar significantly enhanced 1000-grain weight compared with V₁, and V₂ varieties. The average 1000-grain weight was 38.37g in V₁, 36.11g in V₂ and 45.64g in V₃ per 1000- grains, respectively. These results corroborate the findings of Naeem (2001), Sardana et al. (2002) and Singh et al. (2002)

who also observed that cultivars differed significantly for mean grain weight.

The November sowing significantly enhanced the grain yield over December sowing crop. The average grain yield 3977.02 Kg ha⁻¹ and 2851.21 Kg ha⁻¹ was observed. The cv. V₃ (AS-2002) significantly enhanced grain yield as compared with V₁ (Inqalab-91) and V₂ (Uqaab-2000), but cv. V₁ and V₂ were statistically at par. The average grain yield was 3265 kg ha⁻¹ in V₁, 3329 kg ha⁻¹ in V₂ and 3648 kg ha⁻¹ in V₃, respectively. Similar results were reported by Naeem (2001) and Donaldson et al. (2001) who also observed that cultivars differed significantly for final grain yield. Data in table 2 shows significant effect of treatments on straw yield. The early sowing significantly enhanced the straw yield over late sowing. The average straw yield of 7277 Kg ha⁻¹ and 4968 Kg ha⁻¹ was observed. The cv. showed non significant effect on straw yield production so all the cultivars were statistically at par in straw yield production. The average straw yield was 6391 kg ha⁻¹ in V₁, 6501 kg ha⁻¹ in V₂ and 5476 kg ha⁻¹ in V₃, respectively. The effect of sowing date and cultivar on final total dry matter (TDM) is presented in table 2. The November sowing significantly enhanced the TDM over December sowing crop. The average TDM 11391 Kg ha⁻¹ and 7893 Kg ha⁻¹ was observed. All the three cultivars were statistically at par in TDM production. The cv. V₁ produced the lowest TDM yield. The average TDM yield was at 9544 kg ha⁻¹ in V₁, 10182 kg ha⁻¹ in V₂ and 9199 kg ha⁻¹ in V₃, respectively. Data in table 2 showed that both the sowing date and cultivars were not significantly effect the harvest index. The average harvest index was 23.01 % in V₁, 30.14 % in V₂ and 26.42 % in V₃, respectively.

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Table 1 Effect of sowing date and cultivars on yield components of wheat

Treatment	Fertile tillers m ⁻²	Plant height (cm)	Spike length (cm)	Spike lets Per spike	Grains per spike	1000-grain weight (g)
S ₁ = 24.11.03	496.72 a	93.71a	12.27b	17.69a	39.18 a	41.16a
S ₂ = 14.12.03	289.64 b	83.69b	13.32a	16.44b	35.48b	38.92b
LSD 5%	13.79	4.76	0.53	0.73	0.79	0.90
Significance	**	**	*	**	**	**
V ₁ = Inqalab-91	422.22a	89.10ab	12.68ab	17.75a	36.61b	38.37 b
V ₂ =Uqaab-2000	388.62b	92.57a	13.44a	17.70a	39.48a	36.11b
V ₃ = A S-2000	368.58 a	84.41b	12.27b	15.75b	35.91b	45.64 a
LSD 5%	33.20	6.36	0.89	1.07	1.85	4.86
Significance	**	*	*	**	**	**

Means having different letters differ significantly from each other by LSD (P= 0.05)

*,**= Significant and highly significant

NS= Non significant

Table 2 Effect of sowing date and cultivars on grain yield, straw yield, TDM and harvest index of wheat

Treatment	Grain yield (kg ha ⁻¹)	Straw yield (kg ha ⁻¹)	TDM (kg ha ⁻¹)	HI (%)
S ₁ = 24.11.03	3977.02a	7277.53a	11391.40a	28.62
S ₂ = 14.12.03	2851.21b	4968.50b	7893.40b	34.54
LSD 5%	89.84	1521.11	1112.25	4.70
Significance	**	*	**	NS
V ₁ = Inqalab-91	3265.42b	6391.16	9544.53	23.01
V ₂ =Uqaab-2000	3329.07a	6501.27	10182.23	30.14
V ₃ = AS-2000	3647.85a	5476.60	9199.79	26.42
LSD 5%	64.86	1551.00	1171.00	7.93
Significance	**	NS	NS	NS

Means having different letters differ significantly from each other by LSD (P= 0.05)

*,**= Significant and highly significant

NS= Non significant

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