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RESPONSE OF WHEAT TO DIFFERENT PLANTING DATES AND SEEDING RATES FOR YIELD AND YIELD COMPONENTS

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ABSTRACT

A study was designed to investigate the effects of various sowing dates and seeding rates on the yield and yield components of wheat (*Triticum aestivem* L.). The experiment was conducted at Agricultural Research Institute (ARI), Tarnab Peshawar during Rabi 2007-2008. Factor A including four planting dates (1st November, 15th November, 1st December and 15th December) were allotted to main plots while factor B including three seeding rates (100, 150 and 200 kg ha^{-1}) were applied to sub plots. Wheat variety Pirsabak 2005 was used for the experiments. Both sowing dates and seeding rates affect the yield and yield components of wheat. Significant differences were found among the planting dates for number of grains $spike^{-1}$, 1000 grain weight, biological yield and grain yield. Maximum number of grains (53.99) $spike^{-1}$, 1000 grain weight (40.2gm), biological yield (11953 kg ha^{-1}) and grain yield (4134 kg ha^{-1}) were produced from 1st to 15th November followed by number of grains (50.1) $spike^{-1}$, 1000 grain weight (32.1gm), biological yield (6824 kg ha^{-1}) and grain yield (2336 kg ha^{-1}) were produced from late sowing (15th December) while sowing dates had no effect on harvest index. Similarly, different levels of seeding rates had significant effect on 1000 grain weight (g) and grain yield (kg ha^{-1}). Seed rate of 100 kg ha^{-1} produced maximum 1000 grain weight (37.5gm) while 200 kg ha^{-1} seeding rate produced minimum 1000 grain weight (35.0gm). Likewise highest grain yield (3472 kg ha^{-1}) was obtained from 150 kg ha^{-1} seeding rates and lowest grain yield (3221 kg ha^{-1}) was obtained from 100 kg ha^{-1} seeding rates, whereas other yield components were non-significantly affected by seeding rates. The interaction of the two factors (planting dates and seeding rates) has showed no response towards the yield and yield components of wheat. So it was concluded that in order to get maximum yield from wheat, it should be grown from 1st November to 15th November at @ of 150 kg ha^{-1} seeds.

Keywords: wheat, planting dates, seeding rates, yield components.

INTRODUCTION

Wheat (*Triticum aestivem* L.) is used as a main source of food all over the world. It is the staple food of Pakistan and meets the major dietary requirements. Wheat occupies first position by covering 68 % of the total cropped area in Pakistan.

Demand for wheat in the country is increasing day by day. The greatest demand for wheat in the coming years will have to be met by increasing devotion of land to wheat and or increasing yield unit $area^{-1}$. In Pakistan wheat grown on an area of 8578.2 thousand hectare with total production of 23294.7 thousand tons, making an average yield of 2716 kg ha-1, while in Khyber Pakhtunkhwa, wheat grown on an area of 754.3 thousand ha with total production of 1160.4 thousand tons, making an average yield of 1538 kg ha^{-1} (MINFAL, 2007).

Low yield of wheat in Khyber Pakhtunkhwa and Pakistan as a whole is attributed to various factors such as lack of i) good seed of high yielding varieties ii) Proper cultural practices, iii) Plant protection measures, iv) chemical fertilizer, v) planting at proper time and proper seed rate level.

Planting date is one of the major factors which determine the ability of the crop to stand against different environmental conditions (air, temperature and humidity). Appropriate sowing date is important to have the crop in the field, when environmental conditions are conducive for growth and development.

Proper planting date is an important factor for crop production of wheat. Different planting dates affect seed development, quality and yield of wheat. Delay planting affect the crop performance in the field and ultimately produce low yield. Delay in planting normally reduces individual plant growth and tiller production (Nazir *et al.*, 2004). Late planted wheat grows slow because of low temperature, which impaired grain quality, resulted poor germination and also crop stand.

Like planning dates, balance seed rates have also a significant role in the crop production system of wheat. Wheat varieties react in different ways to various levels of seed rates. Seed rate effect the plant population, number of tillers m^{-2}, 1000 grain weight and straw yield (Amanullah *et al*., 2008). Biological yield is also affected by seed rate. Optimum planting time with balance seed rates improves the crop efficiency and high yield is resulted. (Nazir *et al*., 2004).

The present project was therefore designed with the objectives to find out the effect of planting dates and seeding rates on yield and yield components of wheat.

MATERIALS AND METHODS

An experiment titled "Response of wheat to different planting date and seeding rates for yield and yield components" was conducted at Agricultural Research Institute, Tarnab, Peshawar, during Rabi 2008-2009. The experiment was laid out in randomized complete Block Design with split plot arrangement having three

replications. Factor A including planting dates (1st November, 15th November, 1st December and 15th December) were allotted to main plots and factor B including seed rates (100, 150 and 200 kg ha^{-1}) was allotted to sub plots. The area of sub plot 9 m^2 was established to accommodate 6 rows with 30 cm row spacing. Recommended basic dose of NPK was applied at @ of 140: 80: 60 kg ha respectively. Phosphorus, potash and half of nitrogen was applied at planting time while remaining half of nitrogen was applied at tillering stage. Standard cultural practices were performed uniformly for all the experimental units in order to reduce experimental error. Data on biological yield (kg ha^{-1}), number of grains $spike^{-1}$, 1000 grain weight (g), grain yield (kg ha^{-1}) and harvest index (%). Biological yield was recorded in two central rows at the time of harvesting in each sub plot by making bundles and weighed to record the data and convert its average was worked out. Number of grains $spike^{-1}$ was recorded by counting grains in five spikes selected from the whole plot randomly and then converted into average number of grains $spike^{-1}$. The data regarding 1000 grain weight (g) was recorded with the help of electric balance by counting 1000 grains. Harvest index was calculated by given formula.

$$\text{Harvest Index (\%)} = \frac{\text{Grain yield Plot}^{-1}}{\text{Biological yield plot}^{-1}} \times 100$$

Data were statistically analyzed using ANOVA techniques. LSD test was applied for the significance of treatment difference.

RESULTS AND DISCUSSIONS

Biological yield (kg ha^{-1})

Planting dates significantly affected the biological yield (Table-1). Maximum biological yield (11953 kg ha^{-1}) was recorded from 15th November planting while minimum biological yield was obtained from December (6824 kg ha^{-1}). These findings are in agreements with those of Wajjid (2004), who also reported that early planting increases biological yield while late planting decreases biological yield. The first reason may be more suitable climatic condition for maximum vegetative and reproductive components resulted increased biological yield. Secondly it may be due to reproductive plants $unit^{-1}$ area. Seeding rate and interaction (SD x SR) had no significant effect on biological yield.

Number of grains $spike^{-1}$

The data concerning grains $spike^{-1}$ indicates that planting dates had significant effect on number of grains $spike^{-1}$ (Table-1). Maximum grains $spike^{-1}$ (53.99) was recorded at 1st November planting compared to 15th December planting date which showed minimum number of grains $spike^{-1}$ (50.1). These findings are supported by those of Hanson (2001), who reported significant variation in number of grains $spike^{-1}$ with sowing dates. The possible reasons could be due to suitable temperature during seed development and more number of branches $palnt^{-1}$ with more productive spikes, and thus resulted in greater number of grains $spike^{-1}$. While seeding rates and their interaction with sowing dates had non significant effect on number of grains $spike^{-1}$. The results are not matched with other workers (Habibullah *et al*., 2007) who observed that number of grains $spike^{-1}$ had significantly affected by seeding rates.

Thousand grains weight (g)

Planting dates and seeding rates had significant effect on 1000 grains weight (Table-1). The maximum 1000 grain weight (40.2g) was recorded on 15th November planting and minimum (32.1g) was recorded at 15th December sowing. These findings are in line with those of French *et al*. (2005), who observed the effect of different sowing times on 1000 grain weight of wheat. The reasons may be genetic make-up of the genotypes or less/more competition for plant nutrients which produced weak/healthy plants and turn into healthier and plump seed formation. Seeding rates and interaction (SD x SR) had non significant effect on 1000 grain weight.

Grain yield (kg ha^{-1})

Planting dates and seeding rates had significant effect on the grain yield (Table-1). Maximum grain yield (4134 kg ha^{-1}) was produced by genotype planted on 15th November compared to genotype sown on December (2336 kg ha^{-1}). Maximum grain yield (3472 kg ha^{-1}) was produced from 150 kg ha^{-1} seeding rates as compared to100 kg ha^{-1} seeding rates which produced minimum grain yield (3221 $kgha^{-1}$). This might be due to the fact that more number of plants emerged m^{-2} with more branches, more well filled spikes and plump seed, which in return yielded more grain yield. Our results supported by provided by Mahboob *et al*. (20050) and (2004), who reported that planting dates and seeding rates had significant effect on the grain yield. Interactions (SD x SR) had no effect on grain yield.

Harvest Index (%)

Harvest index (%) was non-significantly affected by planting dates, seed rates and their interaction (Table-1). The contrasting results reported by S.A. Wajjid (2004), who observed that both early and delay planting affect harvest index significantly.

CONCLUSIONS AND RECOMMENDATIONS

It is concluded from the results of the experiment that in order to get maximum yield from Pirsabak 2005 variety of wheat, it should be grown from 1st to 15th November under 150 kg ha^{-1} seeding rate. Therefore, sowing of Pirsabak 2005 variety of wheat from 1st to 15th November having 150 kg ha^{-1} seeding rate is recommended for higher yield in agro-climatic conditions of Peshawar valley.

Table-1. Response of wheat to different sowing dates and seed rates for yield and yield component.

Factors	**Biological yield** (kg ha^{-1})	**Number of grain/ spike**	**Grain yield** (kg ha$^{-1)}$	**1000 grain weight** (g)	**Harvest Index** (%)
Factor A sowing dates					
1st Nov.	11295b	53.99a	3769b	38.1b	34.2
15th Nov.	11953a	51.7a	4134a	40.2a	35.4
1st Dec.	9464c	52.0ab	3228c	36.0c	35.3
15th Dec.	6824d	50.1b	2336d	32.1b	34.0
LSD	620	2.23	58	1.55	ns
Factor B seeding rates					
100 kg	9669	52.1	3221b	37.5a	34.1
150 kg	9826	52.2	3472a	36.4b	35.4
200 kg	10157	51.5	3452a	35ab	34.6
LSD	ns	ns	137	1.34	ns
Interaction A x B					
	ns	ns	ns	ns	ns

Mean of the same category followed by different letters are significantly different at 5% level of probability.
LSD = Least significant difference
ns = Non-significant

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