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Growth and Yield Response of Wheat (*Triticum aestivum* L.) To Different Sowing Times and Weed Competition Durations.

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Abstract: The treatments tested were two sowing dates (Mid November and end November) and six competition durations (No competition, competition for 4,6,8,10 weeks and full season competition). The experiment was laid out in a split plot arrangement with three replications placing the sowing dates and competition durations in the main and sub plots, respectively. Common weeds of wheat were allowed to compete with crop for different prescribed competition durations. The results revealed that various growth and yield components were significantly influenced by sowing dates and weed competition. Significantly maximum grain yield of 6122.21 kg ha^{-1} was obtained in no weed competition treatment followed by competition upto 4 to 6 weeks which were statistically at par with each other. However, the sowing dates had no significant effect on final grain yield.

Key words: *Triticum aestivum* L., sowing times, weed competition duration, grwoth and yield components,

Introduction

The average yield per hectare of wheat in Pakistan is 2238 kg (Anonymous, 1998) which is much lower than the agriculturally advanced countries. Among the various factors responsible for this low yield, late planting and weeds are of prime importance. Black and Siddoway (1977) indicated that earlier sowing gave more grain yield than late sowing. However, number of grains per ear and grain weight were not affected by sowing dates. Khan (1978) concluded that tillers per unit area, plant height, number and weight of grains were effected significantly by sowing dates. Where Nov. sowing resulted in the maximum yield with better grain-straw ratio. Similarly Melladoz (1980) reported reduced plant height and tillering with delayed sowing. Similarly Nazir *et al.* (1980) observed that number of fertile tillers per unit area, number of grains per spike, grain yield ha^{-1} and harvest index were decreased progressively with delay in sowing. However, Margin *et al.* (1983) noted that weed competition began to be apparent 35-48 days after sowing and weeds dry matter increased progressively with the increase in weed competition. While Muhammad *et al.* (1984) concluded decrease in grain yield of wheat when sown later than 15 November. Similarly Girothia *et al.* (1987) determined the optimum date of 15-20 November with the grain yield of 4.08 t ha^{-1}, compared with 3.33 t ha^{-1}, for a late sown crop (6-10 Dec.). Similarly, Aheer *et al.* (1993) reported decreased grain yield with delay in sowing.

The growth and yield components were also significantly influenced by different weed competitions. Gonzalez and Correa (1979) observed that if wheat is subjected to weed competition during and after tillering, growth and yield of wheat are significantly decreased. Similarly Dordio *et al.* (1980) reported that wheat in competition with *Lolium multiflorum* L. throughout the growth period reduced the 1000-grain weight yield of wheat by 18.50% depending on weed infestation. While Shafaat (1982) found that increased weed population decreased number of fertile tillers per plant, number of grains per ear and total yield. Ahmad *et al.* (1998) also noted decreased in yield from 11.1-41.7% by increasing in weeds from 15-105%.

Materials and Methods

Studies regarding the effect of sowing dates and different weed competition durations on growth and yield of wheat were carried out at the Agronomic Research Area, University of Agriculture, Faisalabad, during 1996-97. The experiment was laid out in split plot arrangement with three replications by randomizing the sowing dates and competition periods in the main and sub-plots, respectively. Each sub-plot consisted of an area of 1.5 m 9 m, with a row spacing of 25 cm. The experimental treatments were; sowing dates (S_1 = Mid Nov. and S_2 = End Nov.) and competition periods (C_0 = No weed competition, C_1 = competition for 4 weeks after sowing, C_2 = competition for 6 weeks after sowing, C_3 = competition of 8 weeks after sowing, C_3 = competition for 10 weeks after sowing and C_5 = Full season competition). The crop was sown with single row hand drill with a seed rate of 100 kg ha^{-1} for both sowing dates. A basal dose of 100-100 kg NP ha^{-1} was applied with 1/2 N + full P at sowing and remaining 1/2 N with first irrigation. Weed eradication after prescribed period was done by hoeing and after this period plots were kept free of weeds upto harvest. Observations on different growth and yield parameters were recorded during the course of these studies. The data collected were analysed statistically by using Fisher's Analysis of variance technique and the differences among the treatment mean were compared at 5% probability level using LSD (Least Significant Difference) test (Steel and Torrie, 1984).

Results and Discussion

4The data regarding dry weight of weeds (gm^{-2}) given in Table 1 indicate that dry weight of weeds was significantly affected by sowing dates and weeds competition durations. Early sowing date produced significantly more dry weight of weeds than later sowing date. In weed competition durations maximum dry weight was recorded in full season competition which differed significantly from rest of all the treatments. So it is clear from the table that as the dry weight of weeds increased it adversely affected the yield parameters and finally the yield of crop. The results are in line to those of Margin *et al.* (1983) who also reported increase in the weight of weeds with increasing competition durations.

Data in Table 1 further show that number of fertile tillers (m^{-2}) were significantly influenced by sowing dates and weed competition durations. The wheat sown on November, 13 produced more number of tillers (397.8 m^{-2}) than the crop sown on November 26 producing 369.8 tillers/m^{-2}. The early sown crop would have enjoyed more favourable environmental conditions during seed emergence and crop establishment which resulted in more fertile tillers. These findings are in line with those of Khan (1978), Melladoz (1980) and Nazir *et al.* (1980) who reported decrease in tillering with delayed sowing. Similarly, number of fertile tillers decreased by increasing weed competition durations. The highest number of fertile tillers was recorded where the plot was kept free of weeds and was significantly greater from all other treatments. The linear decrease in number of fertile tillers with the increase in competition duration would be due to competition of weeds with wheat for different soil and climatic resources. These results are similar to that reported by Shafaat (1982).

Number of grains per spike was also significantly influenced by sowing dates and durations of wheat-weed competition as shown in Table 1. The earlier sown crop produced significantly higher

Table 1: Growth and yield of wheat as influenced by different sowing times and weed competition durations

Treatments	Dry wr. of weeds gm^{-2}	No. of fertile tiller (m^{-2})	No. of grains $spike^{-1}$	1000-grain weight (g)	Biological yield (kg ha^{-1})	Grain yield (kg ha^{-1})	Harvest index (%)
A. Sowing dates							
a. Sowing date I	42.53a	397.8a	51.01a	33.26^{NS}	17098.75a	5546.90^{NS}	32.42^{NS}
b. Sowing date II	34.70b	369.8b	47.61b	32.95^{NS}	1615.24b	5243.61^{NS}	32.46^{NS}
B. Competition durations							
a. No weed competition	0.00 e	431.2 a	55.71 a	34.47^{NS}	17654.30 a	6122.21 a	34.66 a
b. competition for 4 WAS	17.11 de	418.2 b	51.33 b	34.59^{NS}	17283.47 a	5688.88 b	33.20 ab
c. Competition for 6 WAS	26.59 cd	374.0 c	49.50 bc	34.61^{NS}	17160.93 ab	5495.05 bc	32.62 abc
d. Competition for 8 WAS.	40.48 c	376.2 c	48.67 bc	33.92^{NS}	16996.28 c	5302.45 cd	31.82 bc
e. Competition for 10 WAS.	60.59 b	361.7 d	46.83 cd	33.97^{NS}	16419.73 bc	5087.64 d	31.01 c
f. Full season competition	86.95a	342.2 e	44.33 d	33.76^{NS}	14938.25 d	4675.30 e	31.31 bc

number of grains per spike (51.01) than the crop sown during late November which produced less number of grains per spike (47.61). The results are in conformity with those of Nazir *et al.* (1980) but contradictory to those of Black and Siddoway (1977) who reported that number of grain per spike was not affected by sowing dates. In weed competition, weed free plots produced higher number of grains $spike^{-1}$ which was significantly more than all other treatments. The number of grains per spike progressively decreased with increasing competition duration plots where weeds were not allowed to complete with plants resulted in better growth of wheat and increased grain number. Similar results have been reported by Gonzalez and Correa (1979).

The table show that 1000-grain weight was not affected significantly by sowing dates and weed competition durations. These findings are confirmed by the reported results of Dordio *et al.* (1980).

The data given in Table 1 reveal that the total biomass production per hectare was affected significantly by planting times and weed competition durations. The crop sown on Nov. 13 yielded the maximum biomass of 17098.75 kg ha^{-1} than crop sown on Nov. 26 which yielded 16152.24 kg ha^{-1} dry matter. Higher dry matter by earlier planted crop was due to more tillering and better growth as caused by longer growth period. These results are in line with those of Khan (1978) and Melladoz (1980). In weed competition durations, maximum biomass weight was recorded in weed free plot and in plot where competition was upto 4 and 6 weeks which were statistically at par with each other as shown in Table 1. More biomass in weed free plot and in plots with competition for lesser period was obtained due to more number of fertile tillers and more number of grains per spike. These findings are similar to that of Shafaat (1982).

The data pertaining to grain yield of wheat presented in Table 1 shows that sowing date had non-significant effect on final grain yield. However, early sown crop produced relatively higher seed yield than late sown crop. While, grain yield was significantly affected by weeds competition durations. Maximum grain yield was obtained where there was no weed competition and it was significantly higher than all other treatments followed by weed competition durations upto 4 and 6 weeks which were statistically at par with each other. A linear decrease in grain yield was observed by increasing duration of wheat-weed competition. The decrease in grain yield with weed competition was due to decrease in the main components of grain yield like fertile tillers per unit area and number of grains per spike. The reduction in yield was also reported by Shafaat (1982) and Ahmad *et al.* (1998) due to weeds infestation.

Harvest index values given in Table 1 indicate that sowing date had no significant effect on harvest index. However, it was affected significantly by weed competition durations. The results show that where weeding was done throughout the crop growth period or after 6 weeks of weed competition, significantly higher harvest index values were recorded and it decreased progressively with increasing weed competition durations.

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