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Growth and Yield Response of Three Wheat Varieties to Different Seeding Densities

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ABSTRACT

Investigations to assess the growth and yield response of three wheat varieties (Inqalab-91, Kharchia and Parwaz-94) to different seeding densities i.e. 100, 125 and 150 kg ha^{-1} were carried out on a sandy loam soil. The results indicated that seeding densities significantly affected various growth and yield parameters like germination count, total number of tillers m^{-2}, number of grains $spike^{-1}$ and grain yield, but total leaf area $plant^{-1}$, straw yield and harvest index were not affected significantly. The varieties differed significantly from one another with respect to the yield and yield contributing parameters. Wheat variety Inqalab-91 when sown @ 150 kg ha^{-1} gave the highest yield.

Key Words: Wheat; Varieties; Seeding densities; Crop yield

INTRODUCTION

Wheat (*Triticum aestivum* L.) yield potential in Pakistan is not being exploited fully due to many factors, among which use of improper seed rate and low yielding varieties are the most important ones (Cheema *et al*., 1980). According to Bhatti *et al*. (1990), the maximum grain yield was obtained when the crop was grown at the seed rate of 150 kg ha^{-1}. Nazir *et al*. (1987) reported that a seeding rate of 100 kg ha^{-1} led to maximum grain yield and good stand of wheat. Chatha *et al*. (1986) stated that a seeding rate of 92.5 kg ha^{-1} gave significantly higher yield. Likewise, there are numerous reports from other countries, which claim to effect of seeding rate on wheat yield (Ram & Bhardwaj, 1983; Maeztu, 1985; Naik *et al,*. 1991). In view of importance, present study was planned to evaluate the effect of different seeding densities on growth and yield of three wheat varieties, 'Inqalab-91, Kharchia and Parwaz-94' under agro-ecological conditions of Faisalabad.

MATERIALS AND METHODS

The study was conducted at the Agronomic Research Area, University of Agriculture, Faisalabad during 1999-2000. The experiment was laid out in a RCBD with split plot arrangement and replicated thrice. The varieties were randomized in the main plots and seed rate in the sub-plots. The net plot size was 3 m × 5 m. The seeding rates were 100, 125 and 150 kg seed ha^{-1} and the varieties used were Inqalab-91, Kharchia and Parwaz-94. Nitrogen, phosphorus and potassium were applied in the form of urea, diammonium phosphate (DAP) and sulphate of potash, respectively. The whole dose of P and K along with half dose of N was applied at sowing time and remaining nitrogen was top-dressed with first irrigation. All other agronomic practices like irrigation, weeding etc. were kept normal and uniform for all the treatments. Data on growth and yield components were collected using standard procedures and were analysed statistically by using Fisher's analysis of variance technique. Least significant difference test at 0.05 probability was employed to test the significance of treatment's means (Steel & Torrie, 1984).

RESULTS AND DISCUSSION

Plant height at maturity (cm). Table I indicated that plant height was non significantly affected by different seeding densities but significantly affected by different varieties. The interaction between the two factors was also non-significant. Inqalab produced the tallest plants but it did not differ significantly from that of Kharchia. Parwaz-94 produced plants of the produced plants of the lowest height but it differed significantly from the other varieties. The difference in plant height of the varieties was attributed to difference in their genetic make up. These findings were in line with those of Khokhar *et al*. (1985) and Khaliq *et al*. (1999).

Number of fertile tillers. Table I revealed that different seeding densities as well as the varieties significantly affected the total fertile tillers per unit area. However, the interaction between the two factors was non-significant. Inqalab-91 produced the highest number of fertile tillers than the other varieties. Varieties Kharchia and Parwaz did not differ significantly from each other. The highest number of fertile tillers per unit area in Inqalab-91 was due to more germination count and total number of tillers as compared to the other two varieties. 150 kg ha^{-1} seed produced the maximum number of fertile tillers but it was statistically at par with that recorded with 125 kg ha^{-1} seed rate. These results were in agreement with those of Khokhar *et al*. (1985) and Nazir *et al*. (1987).

Table I. Effect of different seeding densities on agronomic traits and gram protein contents of three wheat cultivars

Treatment	Plant height at maturity (cm)	Number of fertile tillers m^{-2}	Number of grains $spike^{-1}$	1000-grain weight (g)	Grain yield (t ha^{-1})	Grain protein content (%)
Varieties						
V_1 = Inqalab-91	103.8^{a}	277.1^{a}	53.3^{a}	44.1^{a}	5.63^{a}	$10.5^{N.S}$
V_2 = Kharchia	104.4^{a}	259.1^{b}	50.4^{ab}	41.0^{b}	5.51^{a}	10.9
V_3 = Parwaz-94	97.5^{b}	256.3^{b}	48.4^{b}	40.7^{b}	5.17^{b}	10.1
LSD	0.79	15.73	3.54	2.07	0.20	-
Seeding densities (kg ha^{-1})						
S_1 = 100	$102.7^{N.S}$	248.3^{b*}	53.0^{b}	$43.3^{N.S}$	5.12^{b}	$10.2^{N.S}$
S_2 = 125	102.2	266.1^{ab}	50.9^{b}	42.0	5.45^{a}	10.6
S_3 = 150	100.9	278.1^{a}	48.2^{c}	40.9	5.75^{a}	10.6
LSD	-	19.95	2.07	-	0.30	-

N. S. = Non significant; Any two means not sharing a letter differ significantly at 0.05 probability; Interaction among all parameters are non significant.

Number of grains $spike^{-1}$. The results revealed that the differences among three varieties and seeding densities significantly affected the number of grains $spike^{-1}$. The interaction between the two factors was, however, non-significant. There was a consistent decrease in number of grains produced $spike^{-1}$ with increasing seed rate. S_1 (100 kg ha^{-1}) produced the highest number of grains spike followed by S2 (125 kg ha^{-1}) and S3 (150 kg ha^{-1}). The higher grain number obtained in the lowest seed rate can be attributed to more light penetration through plant canopy. Inqalab-91 produced significantly higher number of grains $spike^{-1}$ but it was statistically at par with Kharchia. Parwaz-94 gave the lowest number of grains $spike^{-1}$. These results were in conformity with those of Kalita and Choudhury (1984) and Olivera *et al*. (1981).

1000-grain weight. Table I showed that difference in 1000-grain weight due to varieties were significant while those of the seeding densities and the interaction of varieties and seeding densities were non-significant. Weight per 1000-grains was the highest in Inqalab-91. Kharchia and Parwaz-94 did not significantly from each other. The difference in 1000-grain weight among the wheat varieties was attributed to their variable inherent potential. These results are in agreement with Khokhar *et al*. (1985) and Silva and Gomes (1990).

Grain yield. Table I revealed that there were highly significant differences among the varieties and seed rates. The interaction between the two factors was, however, non-significant. Out of three varieties Inqalab-91 produced the maximum grain yield and Parwaz-94 gave the lowest grain yield. The higher grain yield in Inqalab-91 was attained due to higher number of total tillers and fertile tillers, more number of grains $spike^{-1}$ and 1000-grain weight as compared to Kharchia and Parwaz-94.As regards the seeding densities, the highest grain yield was recorded in S_3 (150 kg ha^{-1}). The lowest grain yield was observed in S_1 (100 kg ha^{-1}). These results were in line with those of Ram and Bhardwaj (1983) and Sharma and Smith (1987).

Protein contents of grain (%). Table I indicated that protein contents of grains were non-significantly affected both by the varieties as well as by the seeding densities. Similarly, the interaction between the two factors was also non-significant. These results were supported by the findings of Mazurek (1989) and Khaliq *et al*. (1999).

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