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DIFFERENTIAL RESPONSE OF THREE WHEAT VARIETIES TO VARYING DENSITIES OF SEEDING IN AN IRRIGATED ENVIRONMENT.

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A study on the response of three wheat varieties viz. Maxi-Pak, 65, Chenab, 70 and LU. 227 to a varying seeding density ranging from half a million to one and a half million grains per acre, was conducted during the year 1973-74. The overall yield potential of all the three varieties was found to be similar. However, a seeding rate higher than half a million grains per acre did not increase the grain yield per acre substantially.

INTRODUCTION

Wheat constitutes a major food staple for the majority of the world population and thus dominates the economy of the world. In Pakistan too, wheat is the predominant food grain and our government is constantly pressing hard to increase the per acre yield of wheat to meet the ever increasing demand of a growing population. For this purpose, all genetic and agronomic techniques need to be brought into play. While a wheat breeder manipulates synthesis of desirable genotypes, an agronomist works for the maximum realization of the built in potential. The latest production philosophy emphasises the use of fertilizer - responsive wheat varieties of intermediate stature capable of superior performance in a properly balanced environment. Of the various important inputs for a successful crop of wheat, the size of the plant population plays a crucial role in developing the yield potential of a variety. The information available indicates that the wheat yield components are influenced differently by the varying seeding density. Hutchison (1936) observed that plants, resulting from a lower seeding density tillered better both productively and qualitatively than from higher densities. However, Singh (1965) and many others were of the view that high seeding density gave the highest yield of grains and straw per acre. Keeping in view both the above mentioned contradictory information, the present study was designed to ascertain the most appropriate and economical seeding density for the current high yielding varieties like Maxi-Pak, 65, Chenab 70 and LU. 227 under the conditions prevailing at Lyallpur.

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MATERIALS AND METHODS

The effect of varying seeding density on the growth and yield potential of three wheat varieties was investigated at the agonomic research area of the University of Agriculture, Lyallpur, during the year 1973-74. The experiment was laid out in a complex randomized block design (Factorial) with four replications and a net plot size of 1/165 acre. The crop followed summer following. The treatments of the experiment included three wheat varieties viz Maxi-Pak. 65, Chenab 70 and LU. 227: and three seeding densities, i.e. half a million, one million, and one and a half million grains per acre. The crop was sown on a finely prepared seed bed in rows 9 inches apart with a single row hand drill on November 15. The number of seeds per unit weight (250 grams) were counted exactly in each variety and then calculated on acre and plot basis respectively according to the treatments. All the plots were uniformly fertilized at the rate of 100 lbs of nitrogen per acre in urea, half at the sowing time and half at first irrigation. All other agro-practices like hoeing and irrigation etc. were normal and uniform in all the treatments.

For obtaining relative data on germination, the number of fertile tillers and stand density, three sampling units (2'x2¼') were randomly selected in each plot. For individual plant observations like number of spikelets and grains per spike, 1000 grain weight, and plant height, hundred tillers were selected randomly from the sample collected from the unit area in each plot. The crop was harvested on April 26 and allowed to remain in the respective plots for drying up till threshing. The data collected were statistically analysed by the analysis of variance method and Duncan's multiple range test and the 5 percent probability level was used to test the significance of the reatment means.

RESULTS AND DISCUSSION

The different seeding densities showed a significant effect on the various yield components of the wheat varieties, Maxi-Pak. 65, Chenab 70 and LU. 227 (Table 1). The tillering potential of Maxi-Pak. 65 was observed to be 7.6, and 9.07 per cent less than those of LU. 227 and Chenab 70, respectively. However, seeding at a rate higher than one million per acre did not contribute significantly towards productive tillering per unit area.

As regards number of spikelets and grains per spike, Maxi-Pak. 65 produced significantly more spikelets and grains per spike than Chenab. 70 and LU. 227 but the 1000 grains weight was observed to be significantly lower. However, the difference between chenab 70 and LU. 227 was nonsignificant for number of grains per spike and 1000 grains weight. Similarly, the varying seeding density affected the above mentioned yield components significantly.

The lowest rate of seeding, i.e., half a million grains per acre resulted in significantly a greater number of spikelets per spike, grains per spike, and 1000 grains weight than the seed rates, a million and one and a half million grains per acre. Probably, hard competition for food, light and moisture amongst the densely populated plants led to a comparatively poor growth and development. Almost similar results are reported by Thayer and Rather (1937), Das and Verna (1956), Hussain and Butt (1965), and Ashraf (1968).

The yield data showed that all the three varieties yielded fairly high but the differences among themselves were found to be nonsignificant, which clearly shows that the overall yield potential of Maxi-Pak. 65, Chenab 70, and LU. 227 is almost the same. It is interesting to note that the various yield components like tillers per unit area, number of grains per spike and 1000 grains weight varied a great deal, but this variability was so spread that one variety produced greater number of grains per spike but of a smaller size and the other produced fewer grains per spike but of a larger size. This pattern of the varietal behaviour ultimately led to comparable yield levels.

Similarly, a uniform yield level was observed for the various seeding treatments, ranging from 18.51 to 19.29 quintal per acre. It may be concluded from this discussion that a seeding rate higher than half a million of healthy grains per acre does not contribute materially to grain yield per acre provided the crop is sown at the proper time and under appropriate agro-practices. These findings are in agreement with those of Jordine (1916), Bullen and Scragg (1958), Rennie (1960), Holliday (1960) and Colwell (1963), but are in contradictory to those of Gill (1960), Guitard *et al.* (1961) and Single (1965).

TABLE 1. *Field performance of three wheat varieties at different seeding densities.*

Varieties	No. of fertile tiller per unit area 2'x2¼')	No. of spikelets per spike	No. of grains per spike	1000 grains weight (grm.)	Grain yield per acre (quintel)
Maxi-Pak. 65	174.58 b	19.28 a	48.81 a	32.84 b	18.30 a
Chenab 70	192.00 a	18.83 b	42.50 b	37.36 a	19.12 a
LU. 227	187.83 a	18.57 a	41.17 b	37.77 a	19.10 a
Seeding Densities.					
Half a million per acre	162.58 b	19.34 a	45.20 a	37.1 a	18.51 a
One million per acre	193.75 a	18.98 b	44.13 b	35.96 b	19.29 a
One and a half million per acre	198.35 a	18.35 c	43.18 d	34.82 c	18.82 a

Any two means not sharing a letter differ significantly.

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