

THE EFFECTS OF VARYING SEEDLING DENSITIES ON THE GROWTH AND YIELD OF THREE WHEAT VARIETIES

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Investigations to evaluate the differential performance of three wheat varieties viz., Chenab-70, Yecora and Lyallpur 73 sown at four seeding densities, i.e. 125, 188, 250 and 313 seeds per m² were carried out on a sandy clay loam soil under irrigation. Seeding at a rate of higher or lower than 188 healthy grains per m² (82 kg per hectare) did not increase or decrease the grain yield substantially. The yield components like grains per spike and grain weight were reduced consistently with successive increases in the seeding rate. Chenab-70 and Yecora proved to be equally higher yielding than Lyallpur 73.

Key words: *Triticum aestivum* L; Wheat varieties; Seeding densities.

INTRODUCTION

No doubt, with all efforts made by the Government in the past, the country has attained self-sufficiency in food, but our average wheat yield is much lower than those of advanced countries of the world. In order to make substantial improvement in the present level of wheat production, all the improved agro-genetic techniques need to be brought into play. The various yield components have been found to be very much dependent upon planting density and genetic make up of a variety. Hutchison [7] recorded an increase in tillering, fertile tillers and grain number per ear by lowering the population density. Size of the heads and kernels was increased by higher seeding rate [12]. Higher seeding rate increased the straw yield, although it had a depressing effect on grain weight and grain number per spike [8]. Higher than the optimum seeding rate decreased tillering, the number of kernels and grain weight and ultimately the grain yield of wheat [2]. Borse and Mahajan [4] observed increased grain yield and yield components with increases in the sowing rate from 50 to 100 and 150 kg per hectare. However, Habib and Makki [6] reported that grain yield, grain weight and tiller number were not affected by sowing rates of 50, 100, 150 and 200 kg per hectare. Similarly, Joseph *et al* [9] observed that the grain yield of wheat did not vary significantly over a wide range of seeding densities. But grain number per ear and grain weight decreased and number of ear/m² increased with increasing seed rate.

Different cultivars have different yielding ability due

to their differential behaviour in fertile tillers, grain number and grain weight [11,5]. According to Aziz and Bajwa [3] Mexican dwarf wheat varieties gave greater yields than local tall varieties. The dwarf wheat varieties as a class had been found to possess higher yield potential because of their higher tillering capacity and 1000 grain weight [1,12]. It has been observed by Kalita and Choudhury [10] that wheat cultivar UP 262 with a greater number of ears per unit area, number of grains per ear and 1000-grain weight gave significantly higher grain yield than Sonalika. They further reported that yields were increased significantly with the increasing seed rate and 120 kg per hectare gave the highest yields.

MATERIALS AND METHODS

Research studies, to ascertain the differential yield performance of three wheat cultivars viz., Chenab-70, Yecora and Lyallpur-73 sown at various densities of seeding i.e. 125, 188, 250 and 313 seeds per m², were carried out on sandy clay loam soil at the Agronomy Research Area, University of Agriculture, Faisalabad under irrigated conditions. The experiment was laid out in a split plot design in four replications with a net plot size of 6 x 2.7 metre. The varieties and seeding densities were randomized in main and sub-plots respectively. The crop was sown in rows 22.5 cm apart with a single row hand drill in the middle of November. Half of the nitrogen and all of the P₂O₅ (68 kg N and 68 kg P₂O₅ per hectare) were applied at sowing in the form of urea and single super phosphate

respectively. The remaining nitrogen was supplied with the first irrigation. In all, four irrigations were applied during the growth period of the crop (one irrigation – 3 acre inches). The data collected were analysed statistically and Duncan's Multiple Range Test was employed to test the significance of the treatment means.

RESULTS AND DISCUSSION

The data presented in Table 1 regarding the performance of different wheat varieties sown at different seeding densities revealed that Chenab 70 and Yecora proved to be equally better yielding than Lyallpur-73. Lyallpur-73 produced significantly lower grain yield due to fewer and

As should be evident from Table 1, the conventional practice of seeding 188 seed per m² (82 kg) per hectare, still stands the optimum norm for obtaining the desirable and economic yields. The seeding rates higher than 188 seeds per m² adversely, affected yield and yield components. Higher seeding rates resulted in higher seedling density and more fertile tillers. The variation in seed rate is probably the main cause for such results. But grain weight and grain number per ear went on decreasing with successive increase in seeding rate, thus neutralizing the effect of increased fertile tiller number on final yield. Probably competition among the plants for light, moisture and nutrients in the thickly populated plots was the main cause for reduced grain weight and grain number.

Table 1. Effect of varying seeding densities on yield and yield components of three wheat varieties.

Varieties	Seeding density per unit area (60 x 60 cm)	Fertile tillers per unit area (60 x 60 cm)	Average number of grains per spike	Average weight of 1000 grains (g.)	Av. yield (Q/ha)	
					Grain	Straw
Chenab 70	70.35 b*	170.66 ^{NS}	53.69 a	46.72 b	47.87 a	92.99 a
Lyallpur-73	69.91 b	164.08	46.48 b	42.22 c	42.68 b	88.91 a
Yecora	83.80 a	163.53	51.41 a	48.17 a	47.49 a	75.63 b
Seeding Densities (Seeds/m ²)						
125	44.69 d	146.02 c	55.97 a	47.33 a	44.60 b	74.35 d
188	77.07 c	165.02 b	54.42 a	46.98 a	53.26 a	83.28 c
250	82.38b	170.41 b	47.17 b	44.94 b	44.99 b	90.54 b
313	100.42 a	182.91 a	44.54 b	43.54 c	41.20 c	95.20 a

* = Means not sharing a letter in common differ significantly at 5 percent level

NS = Non-significant.

lighter grains. Yecora produced heavier grains, but Chenab 70 had a better tillering capacity and produced more fertile tillers and grains per ear, thus counteracting the effect of the heavier grains of Yecora on grain yield. Yecora, being short statured, yielded significantly less straw than the other two varieties. Similar views were expressed by Pendleton and Dungan [11], Gill and Sandhu [5], Woodward [12], Amanullah [1] and Kalita and Chaudhury [10]. Yecora gave a significantly higher seedling density than Chenab 70 and Lyallpur 73 which in turn did not differ significantly. This finding lends support to the results reported by Aziz and Bajwa [3] and Amanullah [1] who speculated that the germinability might also be controlled by the genetic make-up of the seed.

These results are in line with those of Hutchison [7], Woodward [12], Ashraf [2] and Joseph *et al* [9]. But these results do not agree with those of Habib and Makki [6] and Borse and Mahajan [4] who found either no or beneficial effects of increased seeding density within a specific range on yield and yield components of wheat. The straw yield increased consistently with successive increase in seeding rate. This increase in straw yield was due to more germination and thicker stands. Similar results have been substantiated by Hussain and Butt [8].

REFERENCES

1. Amanullah, "Effect of NP application on the growth

- and yield of wheat varieties", M.Sc. Agr. thesis, WPAU, Lyallpur (1968).
2. M. Ashraf, "Effect of different planting times and seed rates on the growth, yield and quality of Mexican wheat varieties under Lyallpur conditions," M.Sc. Agr. thesis, WPAU, Lyallpur (1968).
 3. M.A. Aziz and M.A. Bajwa. *J. Agr. Res.*, **3**, 200 (1965).
 4. C.D. Borse, and V.K. Mahajan, *Indian J. Agron.*, **25**, 45 (1980); (*Field Crop Abstr.*, **34**, 5093, 1981).
 5. M.S. Gill and G.H. Sandhu, *J. Agr. Res.*, **1**, 5 (1963).
 6. M.M. Habib and Y.M. Makki. "Effect of seed rate and sowing date on yield of wheat grown in the Central Region of Saudi Arabia Proc. the Saudi Biol. Society, **3**, 15, (*Field Crop Abstr.*, **34**, 573; 1981).
 7. K. Hussain and S.D. Butt, *Pakistan J. Agr. Sci.*, **2**, 149 (1965).
 8. R.E. Hutchison, *J. Am. Soc. Agron.*, **28**, 699 (1936).
 9. K.D.S.M. Joseph, M.M. Alley, D.E. Brann and W.D. Gravelle. *Agron. J.*, **77**, 211 (1985).
 10. P. Kalita and A.K. Choudhury, *Indian J. Agron.*, **29**, 287 (1984). (*Field Crop Abstr.*, **39**, 1677 (1986).
 11. J.W. Pendleton and G.H. Dungan, *Agron. J.*, **52**, 310 (1960).
 12. R.W. Woodward, *Agron. J.*, **48**, 160 (1956).