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Effect of Population Density on Yield and Yield Components of Wheat

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Abstract: Response of various population densities towards yield was tested in Pajnad-88, Pirsabak-85 and Chakwal-86 under natural rainfed conditions. Harvest index, spike length, number of spikelets/spike, grains/spike tend to decrease significantly with increase in seed rate. Plant height and grain weight was not significantly affected by seed rate. Maximum yield was obtained with seed rate of 60 kg ha⁻¹.

Key words: Population density, yield components, yield, wheat

Introduction

One third of wheat crop is grown under rainfed conditions with an average yield of 573 kg ha⁻¹ which is very low. Plant density which is an important factor of wheat production technology requires attention for boosting yield in barani areas. Presently, farmers are practicing average seed rate of about 70 kg ha⁻¹. Svoboda (1989) studied three varieties at sowing rate of 4.5 and 6 million seeds per ha and concluded that higher sowing rate increased yield by 11.34% averaged over all varieties. Bhatti *et al.* (1990) concluded that more yield was obtained when crop was planted at seeding rate of 150 kg ha⁻¹. Nayital and Sharma, (1990) planted Cv.421 and noted that grain yield increased with seed rate of 100 kg ha⁻¹. Hucl and Baker (1990) studied that grain yield could not be altered by sowing rate. Sarker and Torofder (1992) reported yield averaged 97,1.10 and 1.22 ton ha⁻¹ with sowing rate of 80,100,120 kg ha⁻¹ respectively. Shrivastava *et al.* (1994) mentioned that grain yield was higher at sowing rate of 120 than 90 kg seed/ha⁻¹. Parihar and Singh (1995) concluded sowing rate of 100 and 125 kg ha⁻¹ gave grain yield of 5.41 and 5.65 ton/ha respectively. The present study was designed to find out the response of various plant population densities towards yield.

Materials and Methods

This study was conducted at NARC, Islamabad during 1996

rabi season under natural rainfed condition. The experiment was laid out in a split plot design with four replications. Three varieties viz Pajnad 88, Chakwal-86 and Pirsabak-85 were randomized in main plots and five seed rates 60, 80, 100, 120, 140 kg ha⁻¹ were randomized in sub plots. The experiment received usual management practices. At maturity data were recorded for the following parameters and analysed statistically.

- i) Plant height (cm)
- ii) Spike length (cm)
- iii) Spikelets/spike
- iv) No. of grains/spike
- v) 1000 grain weight (gm)
- vi) Bundle weight/m² (gm)
- vii) Grain yield/m² (gm)
- viii) Harvest index%

Results and Discussion

The effect of various seed rates on some physiological characteristics of wheat crop are depicted in Table 1. Plant height did not differ significantly with variation in seed rate. However varieties differ significantly in height. Spike lengths was highly affected by seed rate. With increase in seed rate spike length tends to decrease. The varieties did not differ significantly in spike length.

Table 1: Effect of Population Density on Yield, Yield Components of Wheat at Islamabad

Seed Rate	Height	Spike length	Spikelets /spike	Grain weight	Grain per spike	Bundle weight	Grain yield	Harvest index
60	106.3	10.4	21.2	34.5	56.5	966.6	403.8	0.41
80	106.4	10.4	20.9	32.3	55.5	933.3	395.5	0.42
100	106.3	9.6	19.4	30.0	50.0	944.4	380.0	0.40
120	106.8	9.6	19.7	29.5	56.5	988.8	385.5	0.39
140	105.3	9.2	18.6	29.5	57.0	944.4	371.1	0.39
Varieties								
Chakwal-86	112.1	9.9	20.5	34.684	52.0	966.6	351.6	0.36
Pirsabak-85	109.2	10.1	20.4	33.64	61.5	980.0	419.0	0.42
Pajnad-85	97.4	9.3	18.9	25.24	55.0	920.0	391.0	0.42
Statistical analysis								
Source	D.F	Height	Spike length	Spikelets/spike	Grains/spike			
Reps	2	32.06	1.32	0.78	126.28			
Varieties	2	915.26**	2.63	11.92	10076.95			
Error	4	16.23	0.89	4.8	1432.42			
Seed rate	4	2.92	0.063**	10.96*	1060.02**			
V X S	8	7.65	0.474	5.29	330.45			
Error	24	5.26	0.368	3.01	296.04			
Source	D.F	1000 Grain weight	Bundle weight	Grain yield	Harvest index			
Reps	2	2.24	2022.22	8387.22	0.001			
Varieties	2	14.95**	14888.88	17162.22	0.02**			
Error	4	0.32	38222.22	7817.22	0.001			
Seed rate	4	0.26	4444.44	1488.88	0.002**			
V X S	8	0.23	877.77	2008.05	0.002			
Error	24	0.42	11666.67	2260	0.001			

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Number of spikelets also tend to significantly decrease with increase in seed rate. Same was true in case of no. of grains/spike. Maximum no. of grains/spike was obtained with low seed rate. Grain weight remained constant with seed rate variation. Bundle wt and yield/m² was not significantly affected by increase in seed rate. However harvest index tends to decrease significantly with increase in seed rate. Maximum yield in the present study was obtained with seed rate of 60 kg ha⁻¹.

It is therefore concluded that in lower plant densities the differences are covered through exploiting no. of grains/spike, harvest index to a certain optimum extent. So planting practices at that optimum density would be the most productive as the study revealed seed rate of 60 kg ha⁻¹ yielding maximum under barani condition provided proper moisture conservation practices are done to conserve monsoon rains.

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