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Effect of Different Doses of Nitrogen Fertilizer on the Yield of Wheat

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ABSTRACT

The response of wheat variety Uqab–2000 to N fertilizer levels viz. 84, 128, 150, 175 and 200 kg ha^{-1} was studied. Two years data during Rabi 2000–2001 and 2001–2002 indicated that number of productive tillers m^2, 1000–grain weight and grain yield of wheat increased with the application of 150 kg N ha^{-1}. Whereas nitrogen @ 175 kg ha^{-1} resulted in the highest number of grains per spike and maximum plant height was observed at the nitrogen rate of 200 kg ha^{-1}.

Key Words: *Triticum aestivum L.*; Nitrogen; Growth; Yield; Pakistan

INTRODUCTION

An adequate supply of nitrogen to the crop plants during their early growth period is very important for the initiation of leaves and florets primordia (Tisdale & Nelson, 1984). Application of nitrogen improves various crop parameters like 1000–grain weight (Kirrilov & Pavlov, 1989; Maqsood *et al.,* 2000; Warraich *et al.,* 2002), fertile tillers m^2 (Behera & Sharma, 1991; Warraich *et al.,* 2002), grain yield (Singh & Uttam, 1992; Al–Abdul Salam, 1997; Maqsood *et al.,* 2000; Warraich *et al.,* 2002), more productive tillers (Wilhelm, 1998), more number of spikes per unit area, number of grains per spike and biological yield (Al–Abdul Salam, 1997). Grain weight is a genetically controlled trait, which is greatly influenced by environment during the process of grain filling, (Kausar *et al.*, 1993).

This paper describes the optimum nitrogen requirement of new wheat variety uqab–2000 in south zone of Punjab at the Adaptive Research Farm, Vehari.

MATERIALS AND METHODS

A field experiment on wheat variety Uqab–2000 was conducted at Adaptive Research Farm, Vehari during Rabi 2000–01 and 2001–02. The trial was sown on loam soil having pH 8.5, TSS 0.18%, O.M. 0.72%, nitrogen 0.04%, available phosphorus P_2O_5 6.5 ppm and available K_2O 127 ppm during 2000–01 and on loam soil having pH 8.60, TSS 0.22%, organic matter 0.77%, nitrogen 0.48%, available P_2O_5 6.6 ppm and available K_2O 120 ppm during Rabi 2001–02. The experiment was laid out according to RCBD having three replications. The net plot size was 1.5 x 6 m. Nitrogen @ 84, 128, 150, 175 and 200 kg ha^{-1} was applied in respective plots in the form of urea. P_2O_5 and K_2O @ 114 and 62 kg ha^{-1}, respectively, were applied in all the plots. Full dose of phosphorus (P_2O_5) and potassium (K_2O) along with half of nitrogen in the form of SSP, potassium sulphate and urea were broadcasted before sowing and remaining half nitrogen was applied with first irrigation. The wheat variety Uqab–2000 was sown in six rows spaced at 30 cm in each plot @ 125 kg ha^{-1} seed. Four irrigations were applied at the growth stages of crown root development, booting, milking and grain development during both the years of study. Chemical herbicides viz. Isoproturon and Logran extra were employed against different weeds during the course of study. Observations on final plant height (cm), number of tillers m^2, number of grains per spike, 1000 grain weight (g) and grain yield (kg ha^{-1}) were recorded using standard procedures. The data were analyzed statistically by ANOVA techniques, LSD test at 5% probability level was applied to compare the differences among the treatment means (Steel and Torrie, 1984).

RESULTS AND DISCUSSION

Plant height reveals the overall vegetative growth of the crop in response to various management practices. Application of different levels of nitrogen significantly increased the plant height at maturity (Table I). There were a gradual increase in plant height with each successive dose of N. Probably increased N rates enhanced more leaf area resulting in higher photo assimilates and thereby resulted in more dry matter accumulation. These findings are supported by the work done by Mandal *et al.* (1992).

The number of tillers m^2 increased with increasing rates of nitrogen (Table I). The increase in number of fertile tillers with the increase in nitrogen levels can be attributed to the reduction in mortality of tillers and enabling the production of more tillers from the main stem (Anwar, 1988). Application of N @ 150 kg ha^{-1} resulted in highest (408.0 and 416.0) number of tillers m^2 in both the year. These results are in conformity with Chaudhry *et al.* (1989), Behera and Sharma (1991) and Martin *et al.* (1992).

Number of grains per spike increased significantly by different doses of N fertilizer. Nitrogen @ 175 kg ha^{-1} resulted the highest number of grains per spike (42 and 46) during 2000–01 and 2001–02, respectively (Table I). Increasing N beyond this level resulted in decrease in grains

Table I. Influence of different N levels on growth and yield components of wheat variety Uqab 2000

N level (kg ha^{-1})	Height (cm)		Tillers/m		Grain per spike		1000 grain weight (g)	
	2000–01	2001–02	2000–01	2001–02	2000–01	2001–02	2000–01	2001–02
T_1 = 84	75.5 e	86.2 e	340 e	350 d	32 e	38 d	34.6 d	37.0 d
T_2 = 128	80.0 d	88.4 d	356 d	387 c	36 d	41c	37.0 c	39.2 c
T_3 = 150	84.5 c	91.6 c	408 a	416 a	40 b	43 b	41.2 a	42.4 a
T_4 = 175	87.0 b	95.4 b	380 b	405 b	42 a	46a	38.6 b	40.0 b
T_5 = 200	89.8 a	97.6 a	365 c	390 c	39 c	40 c	36.9 c	37.6 d
LSD (<0.05)	2.12	1.92	7.64	5.41	0.86	1.31	1.21	0.71

Means followed by similar letters are not significantly different from each other according to DMR test.

per spike during both the years probably because higher N rates promoted vegetative growth as is apparent by higher plant heights (Table I). These results are quite in line with Gundapur and Bhatti (1993).

Application of 150 kg N ha^{-1} resulted in the highest 1000–grain weights of 41.2 and 42.4 g during 2000–01 and 2001–02, respectively (Table I). It appears that the application of nitrogen increased the protein percentage, which in turn increased the grain weight (Kauser *et al.*, 1993). Increase in N application rates beyond 150 kg ha^{-1} resulted in lighter grains during both the years. These results are in close agreement with findings of Kirrilov and Pavlov (1989) and Brennan (1992).

Table II. Influence of N application on wheat grain yield

N levels (kg ha^{-1})	Grain yield (kg ha^{-1})	
	2000–01	**2001–02**
84	2940e	3600e
128	4090b	4770c
150	4330a	5160a
175	3890c	4920b
200	3250d	4730d
LSD (<0.05)	38.81	6.85

Means followed by similar letters are not significantly different from each other according to DMR test.

Nitrogen @ 150 kg ha^{-1} gave grain yield of 4330 and 5160 kg ha^{-1} during Rabi 2000–01 and 2001–02, respectively (Table II). Increasing N rates further resulted in reduction in grain yield during both the years. Similar results were obtained by Gupta and Singh (1971) reported that addition of nitrogen alone caused significant increase in wheat grain yield. The current data are supported by the findings of Singh and Uttam (1992), Islam *et al.* (1993), Al–Abdul Salam (1997) and Bellido *et al.* (2000).

CONCLUSION

Nitrogen application @ 150 kg ha^{-1} alongwith 114 kg P_2O_5 and 62 kg K_2O ha^{-1} resulted in highest wheat grain yield under the agro ecological conditions of Vehari.

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