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## Effect of Various Doses of Nitrogen on the Growth and Yield of Two Wheat (*Triticum aestivum* L.) Cultivars

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**Abstract:** Response of two wheat cultivars namely Inqalab-91 and Punjab-96 to nitrogen levels of 0, 50, 100 and 150 kg ha<sup>-1</sup> was studied under field conditions. The cultivar Inqalab-91 gave significantly higher grain yield than cultivar Punjab-96 due to more spike length, number of grains spike<sup>-1</sup> and 1000-grain weight. Yield and yield components were also influenced significantly by nitrogen levels. The application of 150 kg N ha<sup>-1</sup> produced maximum grain yield of 5.44 t ha<sup>-1</sup> which was, however, statistically similar to that of 100 kg N ha<sup>-1</sup>. The increase in grain yield with nitrogen application was related to higher number of tillers m<sup>-2</sup>, spike length, number of grains spike<sup>-1</sup> and 1000-grain weight.

**Key words:** *Triticum aestivum* L., nitrogen application, cultivars, yield and yield components, field conditions

### Introduction

Average yield of wheat in Pakistan is 2238 kg ha<sup>-1</sup> which is much lower than yields obtained in many other countries of the world like France, UK, Netherlands and Egypt having average yields of 7603, 7558, 7376 and 5990 kg ha<sup>-1</sup>, respectively (Anonymous, 1998). Among the various factors responsible for low yield, the deficiency of nitrogen in our soils is considered the most important. Soils in Pakistan are mainly deficient in nitrogen due to mineralization, leaching and volatilization (Nisar *et al.* 1996). Wheat yield increased with the increasing rates of N application (El-Ganbeehy, 1993). Wheat cultivars also vary in yield and yield components (Atta, 1987).

Ubaid (1987) found an increase in the grain yield of wheat with the increasing levels of nitrogen and obtained the highest grain yield with the application of 125-50-50 kg NPK ha<sup>-1</sup>, respectively. Pb-85 variety produced more number of tillers per unit area, plant height, number of grains per spike, grain and straw yields than Pak-81. Behera and Sharma (1991) reported that yield of wheat cv. HD 2285 increased with NPK rates from 1.48 t ha<sup>-1</sup> without fertilizer to 3.83 t ha<sup>-1</sup> with 120 kg N + 60 kg P<sub>2</sub>O<sub>5</sub> + 40 kg K<sub>2</sub>O ha<sup>-1</sup>, but no further increase in yield was observed at a higher NPK rate. Number of spikes m<sup>-2</sup>, spike length, number and weight of grains spike<sup>-1</sup> and number of fertile spikelets spike<sup>-1</sup> also increased with increasing fertilizer rates. Whereas, Chandra *et al.* (1992) reported an increase in grain yield with upto 120 kg N ha<sup>-1</sup>. However, a significant decrease in grain yield was observed by the application of 150 kg N ha<sup>-1</sup>. Malviya-12 produced highest grain yield followed by Janak and Sonalika. Miressa *et al.* (1992) compared the grain yield of four wheat cultivars Boohai, Cocorit-71, DZ-04-118 and Enkoy while applying N at the rates of 0, 30, 60 or 90 kg ha<sup>-1</sup>. The highest grain yield was obtained by the application of 90 kg N ha<sup>-1</sup>. Enkoy produced highest grain yield followed by Cocorit-71, DZ-04-118 and Boohai. Similarly Awasthi and Bhan (1993) reported that grain yield increased with increasing rates of nitrogen and was maximum in cv. K-78. However, 1000-grain weight was not affected by either cultivar or nitrogen application. The present study was, therefore, undertaken to compare the growth and yield performance of two wheat cultivars and also to determine the most appropriate level of nitrogen for wheat under agro-ecological conditions of Faisalabad.

### Materials and Methods

The experiment was carried out to evaluate the effect of different doses of nitrogen on the growth and yield of two wheat cultivars

at the Agronomic Research Area, University of Agriculture, Faisalabad, on a sandy clay loam soil having 0.42 percent N, 9.1 PPM available P and 137 PPM K. The experiment was laid out in split plot design with four replications. The net plot size measured 2.5 m × 7 m. Cultivars were randomized in main plots and nitrogen levels were kept in sub plots. Wheat cultivars Inqalab-91 and Punjab-96 were sown in the second week of November, 1996 on a well prepared seed bed in 25 cm apart rows with single row hand drill. The experiment comprised 0, 50, 100 and 150 kg N ha<sup>-1</sup>. Whole quantity of phosphorus was applied at the time of sowing. Nitrogen was applied in two equal splits i.e., at sowing and first irrigation. All other agronomic practices were kept uniform and normal for all the experimental units. The crop was harvested manually in April, 1997. Observations were recorded on plant parameters like number of tillers m<sup>-2</sup>, spike length, number of grains spike<sup>-1</sup>, 1000-grain weight, grain yield ha<sup>-1</sup> and straw yield ha<sup>-1</sup> using standard procedures. Data collected were analysed using analysis of variance technique and least significant difference test was employed at 0.05 probability level to compare the differences among treatment means (Steel and Torrie, 1984).

### Results and Discussion

Both cultivars produced statistically similar number of tillers m<sup>-2</sup> (Table 1). The results are contradictory to those of Ubaid (1987). The number of tillers m<sup>-2</sup> were significantly affected by N application. The application of 150 and 100 kg N ha<sup>-2</sup> remaining at par with each other produced significantly more number of tillers m<sup>-2</sup> than 50 kg N ha<sup>-1</sup> and control which did not differ significantly between themselves. Both cultivars produced statistically different spike lengths. The cultivar Inqalab-91 produced larger spikes than cultivar Punjab-96. These differences can be attributed to genetic characteristics of crop plants. All nitrogen levels produced significant differences on the spike lengths. The application of nitrogen at the rate of 150 kg ha<sup>-1</sup> produced significantly larger spikes than all other treatments. The minimum spike length was recorded in control. Significant differences of nitrogen application on spike length have been reported by Behera and Sharma (1991).

The cultivar Inqalab-91 produced significantly more number of grains spike<sup>-1</sup> than Punjab-96 (Table 1). The results are similar to the findings of Ubaid (1987) who also reported difference in number of grains spike<sup>-1</sup>. All levels of nitrogen produced significantly more number of grains spike<sup>-1</sup> than control. The differences between 50, 100 and 150 kg N ha<sup>-1</sup> were also significant. The highest number of grains spike<sup>-1</sup> were produced

Ali *et al.*: Response of wheat cultivars to nitrogen application.

Table 1: Performance of two wheat cultivars under different levels of nitrogen.

	No. of tillers (m <sup>-2</sup> )	Spike length (cm)	No. of grains spike <sup>-1</sup>	1000-grain weight (g)	Grain yield (t ha <sup>-1</sup> )	Straw yield (t ha <sup>-1</sup> )
Cultivars						
Inqalab-91	355.66 <sup>NS</sup>	16.06 a	45.10 a	43.01 a	4.67 a	6.66 a
Punjab-96	347.66	14.81 b	42.33 b	37.92 b	4.53 b	6.41 b
Nitrogen levels (kg ha <sup>-1</sup> )						
0	320.33b	12.84 d	32.80 d	27.78 c	3.15 c	5.12 c
50	327.66b	14.77 c	39.59 c	38.37 b	4.57 b	6.32 b
100	378.16a	16.28 b	49.11 b	45.57 a	5.24 a	7.12 a
150	380.00a	17.86 a	53.37 a	49.65 a	5.44 a	7.57 a

Any two means not sharing a letter in common differ significantly at 5% probability level

by the application of 150 kg N ha<sup>-1</sup>. The least number of grains spike<sup>-1</sup> were recorded in control. Increase in number of grains spike<sup>-1</sup> by N application has also been reported by Behera and Sharma (1991). Inqalab-91 produced significantly heavier grains than Punjab-96. 1000-grain weight was also affected significantly by nitrogen application. The application of 100 and 150 kg N ha<sup>-1</sup> remaining at par with other produced significantly higher 1000-grain weight than 50 kg N ha<sup>-1</sup> and control. The results are contradictory to these of Awasthi and Bhan (1993) who reported that 1000-grain weight was not affected by either cultivar or nitrogen application.

The cultivar Inqalab-91 produced significantly higher grain yield than cultivar Punjab-96 (Table 1). The higher grain yield of Inqalab-91 was due to more spike length, number of grains spike<sup>-1</sup> and 1000-grain weight. Miressa *et al.* (1992) and Atta (1987) have also reported significant differences among the cultivars for grain yield. The differences in grain yield among the various nitrogen levels were also significant. The maximum grain yield was obtained with the application of 150 kg N ha<sup>-1</sup> which, however, did not differ significantly from that of 100 kg N ha<sup>-1</sup>. The application of 50 kg N ha<sup>-1</sup> produced significantly higher grain yield than control. Significant effects of N application on grain yield of wheat have been reported by El-Ganbeehy (1993) and Ubaid (1987).

Inqalab-91 produced significantly higher straw yield than Punjab-96. The results are similar to the findings of Ubaid (1987). Straw yield was also affected by the application of nitrogen. N application at the rate of 100 and 150 kg ha<sup>-1</sup> remaining at par with other produced significantly higher straw yield than 50 kg N ha<sup>-1</sup> and control.

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