

# Growth, Yield and Quality Response of Three Wheat (*Triticum aestivum* L.) Varieties to Different Levels of N, P and K

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## ABSTRACT

Investigations into the effect of three N, P and K levels (35-25-25, 70-50-50 and 105-75-75 kg ha<sup>-1</sup>) on growth, yield and quality of three wheat varieties i.e. Inqulab-91, Kharchia and Parwaz-94 were carried out at Agronomic Research Area, University of Agriculture, Faisalabad during 1999-2000. Different NPK levels significantly affected plant height, Number of fertile tillers, 1000-grain weight, grain yield and grain protein content of wheat. The highest grain yield (4.99 t ha<sup>-1</sup>) was recorded in Inqulab-91 with the application of 105-75-75 kg NPK ha<sup>-1</sup>.

**Key Words:** Wheat; Growth; Yield; Quality; NPK fertilizer

## INTRODUCTION

Wheat (*Triticum aestivum* L.) is the most important among all cereals used as a food grain in the world. It ranks first in the world cereal production and is a staple food of about one third of the world's population. In Pakistan, it was grown on an area of 8355 thousand hectares with an annual production of 18694 thousand metric tonnes, resulting in an average yield of 2238 kg ha<sup>-1</sup> during 97-98 (F.A.O. 1998). There are many factors responsible for low yield of wheat but poor crop nutrition and use of varieties with low yield potential are the most important. Fertilizers play a pivotal role in increasing yield and improving the quality of crops. Ali *et al.* (1997) reported that P application alongwith N resulted in a significant increase in number of tillers, plant height, number of grains per spike, 1000-grain weight and grain yield. Khan *et al.* (1997) concluded that maximum grain weight and yield were obtained when N and P were applied @ 50 + 40 kg ha<sup>-1</sup>. Mehla and Gupta (1998) found that maximum grain yield of wheat was obtained with the application of 200 kg N ha<sup>-1</sup>. The combined application of N, P and K has proved to be more effective in increasing yield of wheat as compared to sole application of either N or P or K (Petkov, 1983).

High yielding wheat varieties demand adequate nutrient supply to produce maximum grain yield (Ali & Yasin, 1991). Varieties, however, respond differently to nutrient with respect to their genetic make up and physiological life processes (Chandra *et al.*, 1992).

The present studies were executed to determine astute NPK requirements for three wheat genotypes, namely Inqulab-91, Kharchia and Parwaz-94 grown under agro-ecological conditions of Faisalabad.

## MATERIALS AND METHODS

Studies were carried out at the Agronomic Research Area, University of Agriculture, Faisalabad during 1999-

2000. The experiment was laid out in a randomized complete block design with split plot arrangement, replicated thrice and net plot size was 3 m 5 m. Three wheat varieties namely Inqulab-91, Kharchia and Parwaz-94 were randomized in the main plots while fertilizer levels *viz.* low (35-25-25), medium (70-50-50) and high (105-75-75) kg NPK per hectare were allocated to subplots. Nitrogen, phosphorus and potassium were applied in the form of urea, diammonium phosphate (DAP) and potassium sulphate, respectively. Whole of P and K and half of N was applied at sowing time and remaining nitrogen was top-dressed with first irrigation. All other agronomic practices were kept normal for all the treatments. Data collected on different growth, yield and quality parameters were analysed statistically by Fisher's analysis of variance technique and the least significant difference (LSD) test at 5% probability level was employed to test the significance of treatment means (Steel & Torrie, 1984).

## RESULTS AND DISCUSSION

Data regarding growth, yield and yield component of different wheat varieties as influenced by different fertilizer levels are presented in Table I and discussed in this section.

**Plant height at maturity (cm).** The differences among varieties for plant height were non-significant (Table I). A slight difference in plants height, may be due to genetic variability, was recorded.

Medium (70-50-50 kg NPK ha<sup>-1</sup>) and high fertilizer levels (105-75-75 kg NPK ha<sup>-1</sup>) produced statistically similar plant height that was higher than that recorded at low fertilizer level. Increase in plant height at medium and high fertilizer level might be due to proper nutrition availability which resulted in increase in vegetative growth of the plants. Similar results were reported by Kausar *et al.* (1993), Ayoub *et al.* (1994) and Maqsood *et al.* (1999).

**Number of fertile tillers (m<sup>-2</sup>).** Inqulab-91 produced the maximum number of fertile tillers (295.33 m<sup>-2</sup>) while

**Table I. Effect of different fertilizer rates on growth, yield and quality of wheat cultivars**

Treatment	Plant height (cm)	No. of Fertile tillers m <sup>-2</sup>	No. of grains spike <sup>-1</sup>	1000-grain weight (g)	Grain Yield (t ha <sup>-1</sup> )	Grain protein content (%)
<b>A: Varieties</b>						
Inqulab-91	89.41 <sup>ns</sup>	295.33a	50.64a	47.28a	4.87a	10.26 <sup>ns</sup>
Kharchia	94.67	262.77b	44.64b	46.59a	4.54b	10.60
Parwaz-94	88.59	254.33b	38.78c	43.17b	4.44b	10.24
LSD $\alpha$ 0.05	-	13.56	3.60	2.54	0.20	-
<b>B: Fertilizer levels (NPK) (kg ha<sup>-1</sup>)</b>						
Low = 35-25-25	85.24b	262.00b	43.9 <sup>ns</sup>	44.30b	4.22c	9.88b
Medium = 70-50-50	95.09a	281.11a	43.89	45.18b	4.64b	10.34ab
High= 105-75-75	92.37a	269.33b	44.25	47.56a	4.99a	10.89a
LSD $\alpha$ 0.05	4.75	11.51	-	1.77	0.17	0.65

Means sharing a letter in common do not differ significantly at P=0.05; n.s = Non-significant

Parwaz-94 and Kharchia, produced statistically similar number of 254.33 and 262.77 fertile tillers respectively. Medium dose of fertilizer (70-50-50) kg NPK per hectare gave highest number of fertile tillers (281.11). Low and higher doses of fertilizer gave lower but statistically similar number of fertile tillers. These results are in agreement with those obtained by Malik *et al.* (1990), and Ali and Yasin (1991).

**Number of grains spike<sup>-1</sup>.** The maximum number of grains spike<sup>-1</sup> (50.64) was recorded in Inqulab-91. Next to follow in this regard was Kharchia with 44.64 grains per spike. The minimum number of grains spike<sup>-1</sup> (38.78) were recorded in Parwaz-94.

However, there was a non significant difference between wheat cultivars for number of grains spike<sup>-1</sup> regarding NPK fertilizer treatments which on an average varied from 43.9 to 44.25.

**1000-grain weight.** Inqulab-91 and Kharchia produced highest but statistically similar 1000-grain weight of 47.28 and 46.59g, respectively. Parwaz-94 produced lowest 1000-grain weight (43.17g). The maximum 1000-grain weight (47.56 g) was recorded in high fertilizer dose (105-75-75 kg NPK ha<sup>-1</sup>). Low and medium fertilizer levels produced statistically similar 1000-grain weight.

Significant effects of NPK fertilizers level on 1000-grain weight were also reported by Malik *et al.* (1990), Khaliq *et al.* (1999), Maqsood *et al.* (1999) and Ali *et al.* (2000).

**Grain yield.** The grain yield varied significantly among the wheat varieties. Inqulab-91 produced the highest grain yield (4.87 t ha<sup>-1</sup>). Kharchia and Parwaz-94 were at par with each other and on an average produced grain yields of 4.54 and 4.44 t ha<sup>-1</sup>, respectively. The higher grain yield in Inqulab-91 was achieved due to more fertile tillers, number of grains per spike and maximum 1000-grain weight as compared to Kharchia and Parwaz-94.

Grain yield increased significantly with each gradual increase in fertilizer level. The highest grain yield (4.99 t ha<sup>-1</sup>) was recorded in low fertilizer level (105-75-75 kg NPK ha<sup>-1</sup>). The lowest grain yield (4.22 t ha<sup>-1</sup>) was recorded in low fertilizer level (35-25-25 kg NPK ha<sup>-1</sup>) while medium level (70-50-50 kg NPK ha<sup>-1</sup>) produced an average grain

yield of 4.64 t ha<sup>-1</sup>. The increased in grain yield with higher NPK levels was also reported by Hayee *et al.* (1989), Kausar *et al.* (1993), Gwal *et al.* (1999), Maqsood *et al.* (1999) and Ali *et al.* (2000).

**Grain protein content.** Non significant differences were observed regarding protein content of grains among the wheat cultivars, which on the average varied from 10.24 to 10.60%.

Medium and high fertilizer level exhibited similar grain protein content. Similar trends were recorded for low and medium fertilizer levels. Higher percentage of grain protein (10.89) were obtained from high NPK levels (105-75-75 kg ha<sup>-1</sup>) and it differed significantly from low NPK (35-25-25 kg ha<sup>-1</sup>) which has lowest grain protein content (9.88%). Jamro *et al.* (1992) and Imtiaz *et al.* (1995) also reported an increase in grain protein content with increase in NPK fertilizer levels.

## CONCLUSION

It was concluded that Inqulab-91 when treated with NPK @ 105-75-75 kg ha<sup>-1</sup> produced the maximum under agro ecological conditions prevailing at Faisalabad.

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