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GROWTH, YIELD AND QUALITY RESPONSE OF THREE WHEAT *(Triticum aestivum* L.) CULTIVARS TO NP APPLICATION

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A field experiment was conducted to study the effect of different levels of NP on the productivity of three wheat cultivars: LU-26S, Pasban-90 and Inqalab-91. The application of 100-80 kg NP ha' produced the maximum grain yield (5.7 t ha'). The varieties, however, exhibited statistically similar performance. Pasban-90 fertilized with 100-80 kg NP ha' had 13.2% grain protein content against 11.3% for Inqalab-91 without fertilizer application.

Key words: NP application, quality response, wheat cultivars

INTRODUCTION

Among the various factors responsible for low yield of wheat i« ;rile coatun: poor It'nihly siuus of l)Jt: soj) aDd improper crop management practices are of primary importance. Production of wheat can be increased either by bringing more area under its cultivation or by increasing its yield per unit area. Under the present situation, it is not possible to increase area under wheat due to other competing crops and restricted supply of irrigation water. Therefore the only alternative left for increasing wheat production in the country is to obtain higher yield per hectare. The judicious use of fertilizer can increase yield from 30-47% (Maseh, 1994). Nitrogen and phosphorus are the two main plant food nutrients and most of our soils are deficient in these nutrients (Tahir, 1980). Nitrogen is one of the major plant food nutrients applied in the form of chemical fertilizers. Phosphorus counter-balances the effect of excessive nitrogen by hastening plant maturity, improving grain quality and retarding excessive vegetative growth. If soil is deficient in phosphorus, the response of crop to nitrogen is reduced (Senigagliesi *et al.*,1983). Different varieties respond differently to nutrients due to their variable physiological behaviour and hence differ in yield and yield components.

Rashid and Mian (1969) reported that the application of phosphorus increased protein, phosphorus and ash concentration of wheat grain. Similarly, Fjell *et al. (1984)* reported that nitrogen fertilizer increased plant N protein content and grain yield regardless of the cultivar's inherent protein potential and phosphorus nutrition. Ubaid (1987) found that the highest grain yield was obtained by 125-50--50 kg NPK ha ' application. Total number of tillers and fertile tillers per unit area, plant height. number of grains spike', grain and straw yield of Pb-85 were significantly more thfl Pak-Sl .

Ashraf (1987) concluded from a trial that Pak-81 gave the highest grain yield of 54.33 q ha' and differed significantly from LU-26S and Kohinoor-83. He stated that both the cultivars and NP levels affected significantly the various yield components like germination counts and fertile tillers per unit area, number of grains spike' and 1000-grain weight. Keeping this in view, the present study was undertaken to determine growth. yield and quality response of three wheat cultivars to different levels of NP under the agro-ecological conditions of Faisalabad.

MATERIALS AND METHODS

The experiments were conducted at the Postgraduate Agricultural Research Station (PARS), University of Agriculture, Faisalabad during 1993-94 on a sandy elay loam soil having pH 8.17, 0.52% N, 6.48 ppm PP, and 1-72ppm Kp. The experiment was laid out in a randomized complete block design with split plot arrangement and three replications. The net plot size measured 3m x 7m. The experimental treatments were 0-0, 50-40, and 100-80 kg NP ha', whereas the varieties were LU-26S, Pasban-90 and Inqalab-91.

The crop was sown November 11, 1993 on a well prepared seedbed in 25cm apart rows with the help of a single-row hand drill. A seed rate of 100 kg ha' was used. Urea and single super phosphate were used as sources of Nand P, respectively. The whole quantity of phosphorus and half of nitrogen was applied at the time of sowing, while the remaining nitrogen was applied with first irrigation. All other cultural practices such as irrigation, weeding, etc. were kept normal and uniform for all the treatments. The crop was harvested on April 24, 1994. The observations recorded included germination counts per unit area (m^{-2}), plant height at harvest (cm), number of fertile tillers per unit area (m^{-2}), number of grains spike^{-1}, lOO-grain weight, grain yield, straw yield and protein content of grain. The data collected were statistically analysed using Fisher's analysis of variance technique and least significant difference (LSD) test at 5% probability was employed to compare the differences among treatment means (Steel and Torrie, 1984).

RESUL TS AND DISCUSSION

The data pertaining to different growth, yield and quality parameters of wheat as influenced by different NP levels, presented in Table I, revealed that the varieties differed significantly from one another in germination count per unit

Table 1. Effect of different levels of NP on growth and yield components of three wheat cultivars

Treatments	Germination counts (m ~)	Plant height (cm)	No. of fertile tillers (m ~)	No. of grains spike '
Varieties (V)				
LU-26S (V,)	230.2 c"	99.9 a	330.9 ab	39.4 b
Pasban-90 (V~)	306.1 a	87.2 c	351.1 a	39.7 b
Inqalab-91 (V,)	254.5 b	95.2 b	320.7 b	48.4 a
NP levels kg ha-'				
N P (F)				
0 0	272.7	92.0	321.9	41.7
50 40	263.0	94.0	333.6	42.8
100 80	255.1 N.S	96.3 N.S	347.2 N.S	43.0 N.S
VXF				
V, X F,,	238.5	97.0	315.6	38.6
V2 X F,,	310.9	84.9	336.3	40.3
V, X F()	268.7	94.3	313.7	46.2
V, X F,	231.3	99.3	328.0	39.7
V2 X F,	298.5	86.9	352.8	39.4
V, X F,	259.3	96.0	320.1	49.4
V, X F2	220.8	103.6	349.1	39.9
V, X F,	308.9	89.8	364.2	39.4
V, X F,	235.6 N.S	95.4 N.S	328.2 N.S	49.7 N.S

"Entries carrying the same letters do not differ significantly from each other at 5% probability; N.S = Non-significant.

Table 2. Effect of different levels of NP on grain yield and protein contents of three wheat cultivars

Treatments	lOO-grain weight (g)	Grain yield ha I (t)	Straw yield ha ' (t)	Protein content of grain (%)
Varieties (V)				
LII-26S (VI)	4.5	5.2	6.6c	11.9
Pasban-90 (V 2)	4.1	5.2	7.lb	12.8
Inqalab-91 (V I)	4.3NS	5.3NS	7.7a	12.3
NP levels kg ha-'				
N P (F)				
0 0 (F,,)	4.3	4.6c	5.9c	12.0
50 40 (F,)	4.4	5.4b	7.4b	11.1
100 80 CF,)	4.4NS	5.7a	8.1a	12.7
VXF				
VI X F,,	4.4	4.7	5.6	11.91'
V2 X F,,	4.2	4.7	5.9	12.8b
V, X F()	4.2	4.5	6.2	11.3g
VI X F,	4.5	5.3	6.9	11.8f
V2 X F,	4.4	5.4	7.2	12.4d
V, X F,	4.2	5.4	8.0	12.7c
VI X F:	4.6	5.7	7.4	12.le
V, X F,	4.1	5.5	8.1	13.2a
V, X F,	4.4NS	6.0NS	8.8NS	12.8b

* Entries carrying the same letters do not differ significantly from each other at 5% probability; N. S = Non-signi ficant.

area but the different NP levels and their interactions with varieties had no effect on germination. Among three varieties, Pasban-90 exhibited significantly the highest germination count (306.1 m')., It was followed by Inqalab-91 (254.5 m'), while LII-26S showed the minimum germination count per unit area. This variation might be attributed to better seed

gerrninability of Pasban-90. These findings are supported by those of Anwar (1981) and Ashraf (1987).

The data on plant height revealed that all the three varieties differed significantly from one another, while the different fertilizer treatments as well as their interaction with varieties did not significantly affect the plant height. LU-26S produced thc tallest plants (99.9 cm), whereas the lowest plant height of 872 cm was recorded in Pasban-90. Differences in plant height among the varieties might be attributed to their genetic diversity. These results are similar to those of Anwar (1981) and Shakoor (1985).

The number of fertile tillers per unit area (m^{-1}) was the highest in Pasban-90 (351.1 m c). However, non-significant difference was observed between Pasban-90 and LU-26S. The highest number of fertile tillers m c produced by Pasban-90 was due to its mort: germination count per unit area. The number of fertile tillers/unit area was not significantly affected by both the levels of NP or their interaction with varieties. Variable number of fertile tillers/unit area in different wheat varieties was also reported by Ashraf (1987).

The number of grains spike^{-1} was significantly affected by varieties while different fertilizer treatments and their interaction with varieties had no effect on grains spike^{-1}. Inqalab-91 produced greater number of grains spike^{-1} (48.4) against the lowest of 39.4 in LU-26S. However, LU-26S and Pasban-90 were statistically at par with each other. Variation in the number of grains spike^{-1} of wheat cultivars was attributed to their genetic variability.

The data on lOO-grain weight, presented in Table 2, indicated that neither the varieties nor the fertilizer levels and their interaction significantly affected the lOO-grain weight. The results indicated that all the three varieties under study seemed to be equally efficient in utilizing their photosynthats towards grain development. The data regarding grain yield indicated that all the three varieties were statistically at par with each other. However, differences in grain yield due to different fertilizer treatments were significant. The application of NP at the rate of 100-80 kg ha^{-1} gave the highest yield of 5.7 t ha^{-1} against the minimum of 4.6 t ha^{-1} in check plots. These results are in consonance with those of Bhagat *er al.* (1995). Similarly, straw yield ha^{-1} varied significantly in different cultivars from one another. Inqalab-91 produced the highest straw yield (7.7 t ha^{-1}) against the lowest of 6.6 t ha^{-1} for LU-26S. Differences in straw yield of different varieties were also reported by Ashraf (1987). Straw yield was also affected significantly by fertilizer application. The application of 100-80 kg NP ha^{-1} produced the highest straw yield (8.1 t ha^{-1}) and differed significantly from other treatments. The lowest straw yield (5.9 t ha^{-1}) was recorded in case of check.

The application of 100-80 kg NP ha^{-1} to Pasban-90 caused a significant increase in protein content of grain against the lower doses (Table 2). It differed significantly from Inqalab-91 producing 12.8% of protein in the grains. LU-26S treated with NP @ 100-80 kg ha^{-1} showed rnnumum response and the protein percentage recorded was 12.1. Generally, the protein percentage in Pasban-90 was higher with all the fertilizer treatments as compared to either LU-26S or Inqalab-91. These findings are similar to those of Fjell *er al.* (1984) and Ayub *er al. (1994).*

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