

Evaluation of the Effect of Use of N.P. Fertilizer in Different Ratios on the Yield of Wheat (*Triticum aestivum*) Crop

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Abstract

Evaluation of the effect of use of N.P. fertilizer in different ratios on the yield of wheat crop was investigated at farmers fields at chak No. 2 JB during 2002-2003 and at chak No. 70 RB, Faisalabad during 2003-2004. In all the five treatments nitrogen was applied @ 128 kg ha⁻¹ whereas the phosphorus was applied @ 32, 42, 84, 96 and 128 kg ha⁻¹, respectively. Maximum number of productive tillers m⁻², number of grains per spike⁻¹, 1000-grain weight and grain yield ha⁻¹ were recorded and observed. All these parameters significantly maximum in the treatment where N and P ratio was 1:1 (i.e. 128 kg ha⁻¹) and significantly lowest in the treatment where this ratio was 4:1 (i.e. N 128 kg ha⁻¹ and P 32 kg ha⁻¹). Different phosphorus levels affect significantly to the yield components of wheat.

Key words: *Triticum aestivum*, Wheat, NP fertilizer, Grain yield

Introduction

Wheat is the most important food grain crop grown in the world. It ranks first in the world crop production and is a staple food of about one third of the world's population. It is principal source of carbohydrates and is the back bone of nutrition both for human being and animals. Its straw constitutes an integral part of livestock feed as well as for paper making.

Keeping in view, its immense and multipurpose use in daily life, there is no exaggeration in saying that prosperity and well being of bulk of the Pakistan's population primarily rests on good harvest of wheat.

Wheat production can be increased either by bringing more area under its cultivation or by increasing its yield per unit area.

Currently it is not possible to increase the area under wheat due to other competing crops, restricted supply of irrigation water and increasing occupation of fertile land by expanding cities and industry. Therefore, only alternative left for increasing wheat production in the country is to obtain higher yield per hectare. Low yield may be attributed to many factors, of which use of chemical fertilizers is the major one.

The judicious use of fertilizers can increase yield. N and P are to main important plant food nutrients and most of our soils are deficient in these nutrients (Ahmad *et al.*, 1999). Role of phosphorus fertilizer is of much importance to rise per hectare yield of wheat. Increasing phosphorus application to wheat caused an increase in grain yield, number of tillers per plant, plant height and number of grains per spike (Malik *et al.* 1999). Phosphorus also counter balances the effects of excessive nitrogen by hastening plant maturity, improving grain quality and retarding excessive vegetative growth. It is also involved in many metabolic activities and if soil is deficient in phosphorus, the response of crop to nitrogen is reduced (Schultheses *et al.* 1997).

Materials and Methods

Studies to determine influence of use of N.P. fertilizers in different ratios on the yield of wheat were conducted at farmers field chak No. 2 JB, Faisalabad during winter 2002-03 and at chak No. 70 RB Faisalabad during 2003-04. Experiment was laid out in randomized complete block design (RCBD) with three replications. The soil was a sandy clay loam in texture. Before sowing, soil test showed a pH of 8.1-8.2, organic matter content from 0.73 to 0.94% and N 0.036-0.041%, P₂O₅ 6.4-6.9 ppm and K₂O 148-175 ppm in both the years. The treatments included in the experiment were as follows:

<u>N(kg ha⁻¹)</u>	<u>P(kg ha⁻¹)</u>	<u>N:P</u>
128	32	4:1
128	42	3:1
128	84	1.5:1
128	96	1.3:1
128	128	1:1

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Wheat variety Inqlab-91 was sown during the second week of November, on a well prepared seed bed in 25 cm apart rows with the help of a single row hand drill during both the years. Seed was used @ 125 kg ha⁻¹. The whole quantity of phosphorus and half dose of nitrogen were applied at sowing time, while remaining half nitrogen was broadcasted to the crop with first irrigation. Single super phosphate and urea are used as a source of phosphorus and nitrogen, respectively. All other cultural practices like irrigation, weeding etc. were kept uniform and normal for all the treatments till harvest of the crop. Crop was harvested in the mid of April. For obtaining data regarding number of fertile tillers m⁻², number of grains per spike, 1000-grain weight and grain yield a unit area of one square meter from each plot was earmarked at random. Data were collected and analyzed statistically according to Fisher's analysis of variance technique and L.S.D. test was employed to see the significance of the treatments means at 5 percent probability level (Steel and Torrie, 1984).

Results and Discussion

Number of productive tillers per unit area contributes positively to the economic yield. The data pertaining to the number of fertile tillers per unit area (Table 1) showed that these were affected significantly by the phosphorus rates. Highest number of productive tillers 335 and 310 were recorded in plots receiving 128 kg P₂O₅ ha⁻¹ during 2002-03 and 2003-04. Plots gave lowest productive tillers 270 and 265 with 32 kg P₂O₅ ha⁻¹ but it was at par with the treatment having 42 kg P₂O₅ ha⁻¹. These results are supported by the findings of Kausar *et al.* (1993) and Vyas *et al.* (2000).

Number of grains per spike has a direct effect at the economic yield. Any change in grain number influences the final yield considerably.

The data (Table 1) regarding number of grains per spike showed that the maximum number of grains per spike 53.84 and 52.50 were produced from plots where phosphorus was applied @ 128 kg ha⁻¹ and the minimum 49 and 48 was observed in the treatment receiving phosphorus @ 32 kg ha⁻¹ during both the years, respectively. These results are supported by the work of Anurage *et al.* (1992).

Grain weight contributes considerably to final grain yield and change in grain weight is bound to effect the grain yield. The perusal of data (Table 1) indicates that all the treatments positively contributed to grain weight. Maximum 1000-grain weight (45.90g) during 2002-03 and 43.0g during next year was recorded in plots receiving phosphorus 128 kg ha⁻¹ which was, however, at par with the treatments where phosphorus was applied @ 96 kg ha⁻¹ and 84 kg ha⁻¹, respectively during 2003-04. These results coincide with the findings of Qadir (2000).

Grain yield or economic yield is the final product, which is governed by the inherent potential and environmental factors. The data regarding grain yield showed that it was affected significantly by phosphorus rates. Phosphorus applied @ 128 kg ha⁻¹ resulted in maximum grain yield 4767 and 4563 kg ha⁻¹ during both the years while the minimum grain yield 3973 and 3928 kg ha⁻¹ was recorded in plots receiving phosphorus @ 32 kg ha⁻¹ during 2002-03 and 2003-04, respectively. Similar findings were reported by Vyas *et al.* (2000).

As given in Table 2, the economic analysis of indicated the higher net income ha⁻¹ and benefit cost ratio in the treatment where N and P ratio was 1:1 (128 kg N ha⁻¹: 128 kg P ha⁻¹) over all other rates of P fertilizer application.

Table 1: Effect of use of N.P fertilizer in different ratios in the yield of wheat.

Treatments	N (kg ha ⁻¹)	128	128	128	128	128
	P (kg ha ⁻¹)	32	42	84	96	128
	N: P	4:1	3:1	1.5:1	1.3:1	1:1
No. of fertile tillers m ⁻²	2002-03	270 d	265 d	302 c	323 b	335 a
	2003-04	265 c	269 c	284 b	301 a	310 a
No. of grains spike ⁻¹	2002-03	49.00 d	49.90 c	52.10 b	52.22 b	53.84 a
	2003-04	48.00 d	50.10 c	51.00 b	52.00 a	52.50 a
1000-grain weight (g)	2002-03	40.00 e	41.50 d	43.60 c	45.00 b	45.90 a
	2003-04	39.60 c	41.80 b	42.70 a	42.90 a	43.00 a
Grain yield (kg ha ⁻¹)	2002-03	3973 d	4111 c	4417 b	4712 a	4767 a
	2003-04	3928 e	4187 d	4297 c	4404 b	4563 a

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

Table 2: Economic analysis

Treatments			Av. Of two years yield (kg ha ⁻¹)	Gross income (Rs. ha ⁻¹)	Total Exp. (Rs. ha ⁻¹)	Net income (NFB) (Rs. ha ⁻¹)	Benefit cost ratio (BCR)
N (kg ha ⁻¹)	P (g ha ⁻¹)	N:P					
128	23	4:1	3951	38518	26781	11737	1.43
128	42	3:1	4149	40453	27063	13390	1.49
128	84	1.5:1	4357	42481	28147	14334	1.50
128	96	1.3:1	4558	44441	28853	15588	1.54
128	128	1:1	4665	45484	29006	16478	1.57

Urea = Rs. 450/bag; DAP = Rs. 760/bag; Wheat = Rs. 350/40 kg; Wheat straw Rs. 40/40 kg

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