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PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSI*net*

Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Varietal Response to Varying Doses of NPK Fertilizer

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Abstract: A field experiment was laid out to assess the yield performance of two cultivars under ten fertilizer (NPK) treatments during 1992, 1993 and 1994 crop seasons at CRS, Ghotki Sindh. On an average, highest seed cotton yield of 2062 kg ha⁻¹ was obtained when the crop was fertilized with 112, 56 and 50 kg ha⁻¹ of N, P and K respectively followed by 112 nitrogen, zero phosphorus and 50 potash kg ha⁻¹ where seed cotton yield of 1933 kg ha⁻¹ was obtained. The lowest yield of 1283 kg ha⁻¹ was produced from the control plot where no chemical fertilization was done. The highest yielding variety GH-3 produced 1751 kg ha⁻¹ seed cotton followed by Shaheen (1657 kg ha⁻¹).

Key words: Cotton, nitrogen, phosphorus, potash, NPK and varietal response

Introduction

For a healthy growth and better yield cotton crop needs continuous supply of essential nutrient elements. Deficiency or toxicity of any one nutrient results in reduction of plant growth and ultimately yield. It is established fact that new upland cotton varieties and their optimum nutritional requirement are of primary importance to boost up the cotton production in the country. Therefore a balanced supply of nutrients is essential to rise per hectare yields. It has been reported in Turkey that the, variety Nazilli gave maximum seed cotton yield at 80 kg N ha⁻¹ (Anonymous, 1977, 1978). Varshney (1979) has recommended the optimum dose as 131 kg ha⁻¹ and reported that increased nitrogen application increased the seed cotton yield. Colakoglu (1980) recommended the optimum dose of 80-120 kg N ha⁻¹, 60-90 kg P₂O₅ ha⁻¹ and 100-200 kg K₂O ha⁻¹ for realizing optimum yield from cotton in Turkey. Suhag *et al.* (1981) in their experiment on fertilizer requirement of cotton under Sindh conditions, found that application of fertilizer at the rate of 112 lbs. N + 50 lbs. P₂O₅ per acre proved better for getting good returns from cotton crop. Mithaiwala *et al.* (1981) studied response of long staple cotton to various NPK combinations and opined that response due to phosphorus was not significant however; application of nitrogen alone was more profitable than combined with nitrogen and potash. Soil tests carried out in Pakistan showed a general lack of nitrogen, a wider spread deficiency of phosphorus and an occasional deficiency of potassium (Wahhab, 1985). Khan *et al.* (1987) reported that phosphorus treatments did not help in increase yield of seed cotton and its components but application of nitrogen alone was more profitable than nitrogen-phosphorus combination. Khan *et al.* (1990) studied the combined effects of NPK fertilization and found that application of nitrogen alone at the rate of 100 kg ha⁻¹ was economical as compared to combine fertilization of NPK in Sakrand conditions.

Since cotton involves the growth of many cultivars in different soil, climatic and management environments, it is unreasonable to expect critical levels for one variety to be applicable to another variety. Present studies therefore, were carried out to determine the alone and combined effect of NPK fertilization on two varieties and also to assess the requirement of these three essential elements around the Ghotki upper Sindh area.

Materials and Methods

An experiment was conducted to assess seed cotton yield response of one advance strain GH-3 and one commercial variety Shaheen developed at CRS, Ghotki under ten fertilizer (NPK) treatments during 1992, 1993 and 1994 crop seasons. The sowing of the experiment was done in split plot design replicated four times. The fertilizer treatments were kept as main plots while varieties were kept as sub-plots. All the required agronomical practices such as hoeing, weeding earthing-up etc were carried out when needed. Crop was protected twice during all the three years against sucking as well as bollworm complex. The seed cotton was harvested plot-wise and finally calculated as kilograms per hectare basis. Duncan's Multiple Range Test was applied to bring out the differences between the treatments. Nitrogen was applied in two splits (113rd at sowing and 2/3rd at blooming). Full dose of P and K was applied at the sowing time.

Treatment details were as under:

Treatments	Kilograms per hectare		
	N	P ₂ O ₅	K ₂ O
T1	0	0	0
T2	0	56	0
T3	0	0	50
T4	56	0	0
T5	112	0	0
T6	112	56	0
T7	112	0	50
T8	112	56	50
T9	140	56	50
T10	168	56	50

Results and Discussion

The seed cotton yield data for the year 1992 of two cultivars under different NPK treatments are depicted in Table 1 whereas for the year 1993 in Table 2, for the year 1994 in Table 3 and average data of three years are given in Table 4. During 1992, significantly highest yield (2278 kg ha⁻¹) was obtained when NPK was applied at the rate of 112-56-50 kg ha⁻¹ respectively followed by 112-56-0 NPK where the yield of 2224 kg ha⁻¹ was achieved. However, the yield of both the treatments was of same order according to DMR test. Significantly highest yielding variety was GH-3 that produced 2010 kg ha⁻¹ seed cotton

followed by Shaheen (1921 kg ha⁻¹). During 1993 almost same trend of yield performance in respect of different NPK treatment applications was observed as 112-56-50 NPK recorded statistically significant highest yield of 2134 kg ha⁻¹ followed by (112-0-50 NPK) that yielded 1668 kg ha⁻¹. It is interesting to note that during year 1992 the second best treatment was 112-56-0 NPK but this year (1993) treatment 112-0-50 NPK ranked second in respect of yield that means the crop during 1992 and 1993 did not respond potash and phosphorus application respectively. This may further be explained that potash as well as phosphorus are not critical as compared to nitrogen which is most limiting factor for cotton yield. This year also highest yielding variety was GH-3 with 1739 kg ha⁻¹ yield followed by Shaheen (1626 kg ha⁻¹). The results of year 1994 were not different from 1993 year. Treatment 1 12 56-50 NPK was highest yielding treatment followed by 1 12 0-50 NPK. Varietal response was also the same as recorded during previous two years, i.e. GH-3 was high yielding variety as compared to Shaheen. When three years data were averaged (Table 4), treatment 112-56-50 NPK remained on top with 2062 kg ha⁻¹ seed cotton yield followed by 112-0-50 NPK that yielded 1933 kg ha⁻¹ of seed cotton. However, statistically both treatments were of same order according to DMR test. As regards the varietal performance, on an average, GH-3 remained on top by producing 1751 kg ha⁻¹ seed cotton yield and was statistically high yielding variety. Second best was Shaheen with 1657 kg ha⁻¹ seed cotton yield. Our results have confirmed the previous studies of Mithaiwala *et al.* (1981) Carried at this station that response due to phosphorus was not significant however; application of nitrogen alone was more profitable than combined with nitrogen and potash.

Table 1: Performance (seed cotton yield kg ha⁻¹) of strains under different NPK fertilization treatments during 1992 cotton season at CRS, Ghotki

Treatments					
N	P	K	GH- 3	Shaheen	Average
0	0	0	1614	1506	1560c
0	56	0	1508	1542	1525c
0	0	50	1542	1506	1524c
56	0	0	1973	1829	1901b
112	0	0	2126	2062	2094b
112	56	0	2295	2152	2224a
112	0	50	2259	2116	2188b
112	56	50	2331	2224	2278a
140	56	50	2259	2152	2206ab
168	56	50	2188	2116	2152ab
Average			2010a	1921 ab	

Means followed by similar letters are not significantly different at 5% level

Table 2: Performance (seed cotton yield kg ha⁻¹) of strains under different NPK

Treatments					
N	P	K	GH-3	Shaheen	Average
0	0	0	1237	1166	1202 c
0	56	0	1327	1219	1270c
0	0	50	1377	1265	1316c
68	0	0	1721	1542	1632 h
112	0	0	1851	1721	1786 b
112	56	0	1911	1851	1881 ab
112	0	50	2008	1829	1919 ab
112	56	50	2187	2080	2134 a
140	56	50	1901	1808	1865 ab
168	56	50	1865	1793	1825 ab
Average			1739 a	1626 ab	-

Means followed by similar letters are not significantly different at 5% level

Our results are also in conformity with the results achieved by Suhag *et al.* (1981) who found that application of fertilizer at the rate of 112 kg N+50 kg P₂O₅ per hectare proved better for getting good returns from cotton crop.

Table 3: Performance (seed cotton yield kg ha⁻¹) of strains under different NPK fertilization treatments during 1994 cotton season at CRS, Ghotki

Treatments					
N	P	K	GH- 3	Shaheen	Average
0	0	0	1112	1064	1088 c
0	56	0	1 255	1195	1225 c
0	0	50	1363	1267	1315 be
56	0	0	1375	1339	1357 bc
112	0	0	1494	1470	1482 ab
112	56	0	1518	1482	1500 ab
112	50	1769	1614	1692 ab	
112	56	50	1829	1721	1775 a
140	56	50	1638	1566	1602 ab
168	56	50	1710	1542	1626 ab
Average			1506 a	1424 ab	-

Means followed by similar letters are not significantly different at 5% level

Table 4: Average performance (seedcotton yield kg ha⁻¹) of strains under different NPK fertilization treatments at CRS, Ghotki

Treatments					
N	P	K	GH- 3	Shaheen	Average
0	0	0	1321	1245	1283 c
0	56	0	1362	1317	1340c
0	0	50	1427	1343	1385c
56	0	0	1690	1570	1630b
112	0	0	1824	1751	1780b
112	56	0	1908	1822	1865 ab
112	0	50	2012	1853	1933 ab
112	56	50	2116	2008	2062 a
140	56	50	1933	1842	1888 ab
168	56	50	1921	1817	1869 ab
Average			1751 a	1657 ab	-

Means followed by similar letters are not significantly different at 5% level

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