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Effect of Nitrogen Alone and Combined with Phosphorus on Advance Strain CRIS-19

A.R. Soomro, A.W. Soomro, M.H. Arain, A.A. Memon,
A.M. Memon, G.H. Tunio and A.H. Soomro
Central Cotton Research Institute, Sakrand Sindh, Pakistan

Abstract: A field experiment was laid out to assess the yield performance of an advance strain CRIS-19 with four fertilizer (NP) treatments during 1997, 1998 and 1999 crop seasons at CCRI, Sakrand Sindh. Results reveal that on an average, highest seedcotton yield of 1951 kg ha^{-1} was obtained when the crop was fertilized with 120 and 60 kg ha^{-1} of nitrogen and phosphorus respectively followed by 90 nitrogen and 30 kg ha^{-1} of phosphorus where seedcotton yield of 1830 kg ha^{-1} was obtained. The lowest yield of 1605 kg ha^{-1} was produced from the plot where 60 kg ha^{-1} of nitrogen and no phosphorus were used.

Key words: Cotton, nitrogen, phosphorus, NP, 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.

An adequate supply of nitrogen is essential for growth, development, fruiting and yield of seedcotton (Boquet *et al.,* 1994; Chaudhry and Sarwar, 1999). Nitrogen at the rate of 131 kg ha^{-1} is required for the better harvest of cotton crop (Varshney, 1979). Colakoglu (1980) has recommended the optimum dose of 80-120 kg N and 60-90 kg P_2O_5 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 kg N + 50 kg P_2O_5 per hectare 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. Setatou and Simonis (1994) conducted 56 fertilizer experiments for 12 successive years and concluded that nitrogen affected seedcotton yield even at the very low application rate, while the effect of phosphorus was limited. Soomro *et al.* (1997) tried nitrogen up to 150 kg N ha^{-1} and obtained better results with the application of 100 kg N ha^{-1}. Present studies therefore, were carried out to determine the alone and combined effect of nitrogen and phosphorus fertilizer on an advance strain CRIS-19 and also to assess the requirement of two nutrients around the Sakrand area.

Materials and Methods

An experiment was conducted to assess seedcotton yield response of an advance strain CRIS-19 developed at CCRI, Sakrand under four fertilizer (NP) treatments during 1997, 1998 and 1999 crop seasons. The sowing of the experiment was done in Randomized Complete Block design replicated four times. All the required agronomical practices such as hoeing, weeding and 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 seedcotton was harvested plot-wise and finally calculated as kilograms per hectare basis. Duncan's Multiple Range Test was applied to bring out the difference between the treatments. Nitrogen was applied in two splits (1/3rd at sowing and 2/3rd at blooming). Full dose of phosphorus was applied at the sowing time.

Treatment details were as under:

Treatments	Kilogram per hectare	
	N	P
T1	60	0
T2	90	30
T3	120	60
T4	180	60

Results and Discussion

The seedcotton yield data for three years (1997 to 1999) of CRIS-19 under different NP treatments are depicted in Table 1. During 1997, significantly highest yield (1972 kg ha^{-1}) was obtained when N and P was applied at the rate of 120-60 kg ha^{-1} followed by 180-60 treatment where the yield of 1949 kg ha^{-1} was achieved. However, the yield of both the treatments was of same order according to DMR test.

During 1998 almost same trend of yield performance in respect of different NP treatment applications was observed as 120-60 NP recorded statistically significant highest yield of 2017 kg ha^{-1} followed by 90-30 NP that yielded 1994 kg ha^{-1}. It is interesting to note that during year 1997 the second best treatment was 180-60 NP but

Table 1: Performance lseedcotton yield (kg ha^{-1}) of CRIS-19 under four N and P fertilizer treatments at CCRI, Sakrand from 1997 to 1999

Treatments		N	P	1997	1998	1999	Average
T1	=	60	0	1633 c	1631 c	1552 c	1605 c
T2	=	90	30	1841 b	1994 ab	1656 b	1830 b
T3	=	120	60	1972 a	2017 a	1863 a	1951 a
T4	=	180	60	1949 ab	1767 bc	1615 b	1777 bc

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

this year i.e.1998, 90-30 NP treatment ranked second in respect of yield.

The results of year 1999 were not different from 1998 year. As usual treatment 120-60 NP was highest yielding treatment followed by 90-30 NP. This indicates that the crop behaved different in 1997 from the rest of two years responding high dose of nitrogen with non-significant increase in yield. This may further be explained that phosphorus is not critical as compared to nitrogen which is most limiting factor for cotton yield.

When three years data were averaged (Table 1), treatment 120-60 NP remained on top with 1951 kg ha^{-1} seedcotton yield followed by 90-30 NP treatment that yielded 1830 kg ha^{-1} of seedcotton. However, statistically both treatments were significantly different from each other according to DMR test. It is therefore concluded that high dose of nitrogen beyond 120 kg ha^{-1} did not increase the yield significantly, this is in agreement with the findings of Soomro *et al.* (1997) they tried nitrogen up to 150 kg N ha^{-1} and obtained better results with the application of 100 kg N ha^{-1}. Nitrogen fertilization at the high dose not only limits the yield but also increases the cost of production of the grower without giving marginal per hectare returns. It is also suggested that maximum dose of phosphorus may he restricted to 60 kg ha^{-1} which may be applied at the time of sowing as a full dose. It will be more cost beneficial if nitrogen and phosphorus be applied at the rate of 120N-60P kg ha^{-1} in combination. Similar results were achieved by Suhag *et al*. (1981) who found that application of fertilizer at the rate of 112 kg N + 50 kg P_2O_5 per hectare proved better for good returns from cotton crop.

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