GAU Res. J. 1987. 13 (1) : 50-52

Response of Rainfed Cotton to Nitrogen and Phosphorus

K. N. Akabari, A. P. Gandhi and J. C. Patel

Main Dry Farming Research Station, GAU, Targhadia (Rajkot)

Cotton is an important cash crop of the dry farming region of North Saurashtra. Nitrogen by far, is the king pin for profitable cotton production and responses to phosphorus and potash applications have been only limited. But applications of both the nutrients, N and P, in the required proportion always enhanced seed cotton yields (Venkateswarlu and Sathe, 1971) considerably. Adequate information is not available on fertilizer requirements of Saurashtra region and hence the present investigation was undertaken.

A field experiment in randomised block design with three replications was conducted at Main Dry Farming Research Station, Targhadia (Rajkot) during three seasons of *kharif* 1980-81, 1981-82 and 1983-84. The soil was medium black and contained 56.33% clay. The soil was neutral in reaction and analysed for both organic carbon (0.5%) and available P_2O_5 (16.8 kg/ha). The treatments comprised of four levels each of nitrogen (0, 20, 40 and 60 kg/ha) and phosphorus (0, 10, 20 and 30 kg/ha). Half nitrogen and all phosphorus as per treatments was drilled at sowing. The remaining N was top dressed between 45-50 days of sowing. The crop during each season was sown after the onset of monsoon rains. The total rainfall received during 1980-81, 1981-82 and 1983-84 was 565, 706 and 750 mm, respectively. Cotton variety GAU-Cot-10 was used for testing. Cost Benefit Ratio (CBR) was worked out from the additional yield of seed cotton over control by multiplying the prevailing market rates for each level of nitrogen. The benefit was divided by cost of each level of nitrogen and the cost of nitrogen was then deducted to work out the net ICBR. The rainfall distribution during the cropping seasons is given in Table 1. The seed cotton yield during 1983-84 was low owing to dry spell which prevailed from 33rd to 37th standard week which coincided with flower initiation.

A perusal of data presented in Table 2 revealed that seed cotton yield was significantly increased with application of nitrogen in all the years (Table 2). The magnitude of increase over control due to 40 kg N/ha was to the tune of 48.6 per cent. The increase in yield with 40 kg N/ha was stemmed from favourable effect on growth and yield attributes viz. plant height, number of bolls/plant and seed cotton yield/plant (Table 2). These findings would show that an application of 40 kg N/ha secured seed cotton yield as high as that due to higher level of 60 kg N/ha. Failure to obtain significant increase in seed cotton yield beyond 40 kg N/ha can only imply that the optimum production has already been attained under lower level of 40 kg N/ha under rainfed conditions. This level has also recor-

TABLE 1

Standard week-wise rainfall (mm) distribution during the cropping seasons of 1980, 1981 and 1983.

Standard week number and date of start		*(Rainfall (mm)*		
		1980	*1981*	*1983*
22	28th May	0.0	0.0	0.0
23	4th June	5.2	0.0	0.0
24	11th June	8.4	0.0	14.2
25	16th June	76.4	0.0	87.0
26	25th June	220.2	48.0	19.7
27	2nd July	85.1	0.3	25.5
28	9th July	0.2	290.7	13.2
29	16th July	0.0	2.6	222.3
30	23rd July	77.7	34.4	53.4
31	30th July	19.2	0.4	29.0
32	6th August	26.9	124.4	164.6
33	13th August	0.0	68.2	12.9
34	20th August	22.9	6.2	7.5
35	27th August	7.2	0.0	0.0
36	3rd September	10.8	0.0	6.9
37	10th September	4.8	17.5	0.0
38	17th September	0.2	12.4	39.2
39	24th September	0.2	91.0	1.4
40	1st October	0.0	0.0	0.0
41	8th October	0.0	9.8	43.0
42	15th October	0.0	0.0	9.8

TABLE 2

Seed cotton yield, growth and yield attributes and economics as affected by levels of N and P.

Treatment	*Seed cotton yield (q/ha)*				*Plant height at maturity (cm)*	*No. of bolls/ plant*	*Seed cotton yield (g)/plant*	*Net ICBR*
	1980-81	*1981-82*	*1983-84*	*Average*				
Nitrogen (kg/ha)								
0	5.0	3.5	2.2	3.6	80.2	11.4	15.8	—
20	5.4	4.9	2.9	4.4	84.9	11.5	18.1	1:3.29
40	6.0	6.6	3.2	5.3	85.6	17.9	22.1	1:3.41
60	5.9	7.3	3.9	5.7	87.8	13.5	25.1	1:2.67
C.D. at 5%	0.6	1.1	0.7	0.5	–	–	–	
Phosphorus (kg/ha)								
0	5.5	5.1	2.9	4.5	83.4	11.9	19.6	–
10	5.4	5.6	3.2	4.7	86.4	12.1	18.2	–
20	5.6	5.2	3.0	4.6	83.3	12.6	20.8	–
30	5.8	6.4	3.2	5.1	85.6	12.8	22.7	–
C.D. at 5%	NS	NS	NS	NS	–	–	–	–

NS = Not significant
Interaction N × P was not significant

Cost of nitrogen Rs. 4.9/kg
Cost of P_2O_5 Rs. 5.7/kg
Cost of seed cotton Rs. 500/q

ded higher net ICBR of 1 : 3.41. The findings corroborate the results put forward by Khistaria *et al.* (1980); Patel *et al.* (1986) and Dhoble *et al.* (1986).

Different levels of phosphorus did not exert their significant influence on seed cotton yield in all the three years and in the pooled results. Lack of response to phosphorus in the soil rating low to medium in available phosphorus can probably be attributed to high phosphorus fixation capacity of these soils (60 to 70%) because of high calcareousness (30.0 m.e. exchangable ca/ 100 gm soil) and clay content (56.33), fluctuation in moisture due to scanty, erratic and unevenly distributed rains and contribution of native P from subsurface soil. The findings lend support to the results reported by Patel and Sutaria (1972), Khistaria *et al.* (1980) and Anon. (1984) who also found no response of P application to cotton under rainfed conditions.

Thus, from the results of the present study, it is recommended to apply 40 kg N/ha to cotton (GAU-Cot-10) for potential production and profit under rainfed conditions on medium black soil of North Saurashtra region.

(*Received on 18th March, 1986*)

REFERENCES

Anonymous (1984). Proceedings of the 20th meeting of Agronomy and Soil Science Sub-Committee of the Agricultural Research Council of Gujarat Agricultural University, Sardar Krushinagar held at Junagadh during 9-10 October, 1984.

Khistaria, M. K., Patel, R. B. and Patel, J. C. (1980). Effect of different levels of nitrogen and phosphorus on the yield of cotton. *Indian J. Agron.* **25** (1): 315-317.

Patel, A. S. and Sutaria, M. H. (1972). A summary of Agronomic studies in Gujarat State in cotton and paddy. *Agriculture in ten years.* **6** (1): 95-100.

Dhoble, M. V., Jadhav, J. K., Patil, V. D. and Giri, D. G. (1986). Studies on the effect of different levels of nitrogen, phosphorus and potassium on the yield of cotton (G. hirsutum). A paper presented at National Seminar on "Effect of application of phosphatic fertilizers to cotton held at Surat, May 21-22, 1986.

Patel, P. G., Mehta, N. P., Sanandia, C. J. and Patel, B. D. (1986). Response of rainfed cotton to graded levels of N, P and K in different soils. A paper presented at National Seminar on "Effect of application of phosphatic fertilizers to cotton, held at Surat, May 21-22, 1986.

Venkateswarlu, J. and Sathe, A. (1971). Use of Isotopes and Radiation in Agric and Animal Husbandry Res., New Delhi, Dec. P. 573.