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SOIL FERTILITY UNDER CONTINUOUS ROTATIONAL CROPPING OF COTTON - PEARL MILLET IN A DRYLAND VERTISOL

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ABSTRACT

In a field study under dryland vertisol four annual addition of FYM in a fixed crop rotation of Cotton - pearl millet to supply 40 kg N/ha markedly increased the organic carbon content. Total and available N content of soil also tended to increase under FYM addition. Available P_2O_5 and K_2O contents were not altered by the addition of inorganic fertilizers and FYM or their combination.

Keywords : Cotton, Pearl millet, Soil fertility, Vertisol

Long term manurial experiments provide reliable means for evaluating the effects of continuous application of fertilizers and manures on soil fertility. Reports of several workers on the changes of soil properties as a result of continuous manuring are at variance. To evaluate the direct and cumulative effect of continuous application of nitrogen through urea and organic source as Farmyard manure with and without P on the crop yield and soil fertility under a fixed rotation of cotton-bajra in dryland condition a field experiment was initiated at the Agricultural Research Station, Kovilpatti during 1982-83. In this paper, results on fertility status of soil as influenced by manurial practices for four years are reported.

MATERIALS AND METHODS

The experimental soil was deep clay loam, free from salinity (0.2m. mhos/cm) and alkali hazards (pH 8.2). The initial available N, P_2O_5 and K_2O contents were 91, 10 and 463 kg/ha respectively. The organic corbon content was 0.35 per cent. The treatments consisted of control (T_1), application of N at 20 (T_2) and 40 (T_3) kg/ha through urea, application 20 kg N and 10 kg P_2O_5/ha as inorganic fertlizers (T_4), application of N and P at 40kg and 20kg/ha as inorganics (T_5). addition of N at 20 kg (T_6) and 40 kg(T_7) through FYM, T_6 with 10kg P_2O_5 (T_8), T_7 with 20 kg P_2O_5 (T_9), addition of N at 20kg/ha, half through urea and half throngh FYM (T_{10}), addition of N at 40 kg / ha half through urea and half through FYM (T_{11}), T_{10} with 10 kg P_2O_5 (T_{12}) and T_{11} with 20 kg P_2O_5/ha (T_{13}). Each treatment was replicated thrice in a randomised block design. The experiment was repeated in two series *viz.*, eastern series and western series. A fixed crop rotation of cotton followed by bajra in the succeeding year was followed in each series. Commencing from 1982-83, four crops were raised in each series (two cotton and two bajra). Potash was not added and fertilizers and farmyard manure were applied basally. At the end of fourth crop, surface soil samples from 0-30 cm were collected from each plot and evaluated for avai-

Table 1. Soil fertility as influenced by manurial treatments

Treatments	Eastern Series					Western Series				
	Org. Carbon (%)	Total N (kg/ha)	Available NPK Status of soil (kg/ha)			Org. carbon (%)	Total N (kg/ha)	Available NPK Status of soil (kg/ha)		
			N	P_2O_5	K_2O			N	P_2O_5	K_2O
1. Control	0.36	494	114	4.2	529	0.37	635	117	6.7	542
2. N at 20 kg/ha as urea	0.42	553	119	5.6	438	0.43	653	149	8.9	495
3. N at 40 kg/ha as urea	0.45	672	109	8.1	509	0.44	691	149	9.4	437
4. Tr.2 + 10 kg P 205	0.46	691	149	8.0	467	0.44	703	163	7.6	450
5. Tr.3 + 20 kg P 205	0.45	691	117	6.2	417	0.43	681	147	8.3	493
6. FYM to supply 20 kg N/ha	0.48	719	119	7.2	442	0.51	653	168	8.3	549
7. FYM to supply 40 kg N/ha	0.49	756	140	6.2	458	0.54	700	154	9.4	440
8. Tr. 6 + 10 kg P_2O_5	0.43	765	135	5.0	513	0.47	656	159	10.7	452
9. Tr: 7 + 20 kg P_2O_5	0.44	690	133	6.1	542	0.44	691	131	10.0	560
10. 10 kg N/ha as urea + 10 kg N as FYM	0.46	635	145	5.5	504	0.46	644	168	8.3	575
11. 20 kg N/ha as urea + 20 kg N as FYM	0.47	635	119	5.6	500	0.43	700	131	8.3	478
12. Tr. 10 + 10 kg P_2O_5	0.49	672	128	7.1	579	0.46	644	135	9.4	427
13. Tr. 11 + 20 kg P_2O_5	0.48	672	124	6.5	467	0.46	709	131	8.9	506
C. D.	0.06	84	37	NS	NS	0.03	NS	32	NS	NS

lable NPK status besides organic carbon and total N following conventional procedures.

RESULTS AND DISCUSSION

The organic carbon content of soil (Table 1) was higher under all those treatments which received the addition of fertilizer or manure as compared to control. Highest organic carbon content was recorded under those treatments which received FYM to supply 40 kg. N/ha in both the series (T9). Enhancement in the organic carbon content as a result of FYM addition is natural and the same has already been reported by Maurya and Ghosh (1972), Prasad *et al.* (1971), Muthuvel, (1979), and Bijay Singh *et al.* (1983). Similar trendwas observed in the case of total N content also; all those treatments receiving nutrient addition recording higher total N content. However, the difference did not attain the level of significance in the western series. In general, those treatments which received the highest dose of FYM recorded maximum total N content. This might be due to enhanced biomass addition to the soil as a result of improved microbial activity and soil properties as a consequence of FYM addition. Available N content of soils was in general, higher under those treatments which received nutrient addition either through urea or FYM. In western series, addition of FYM to supply 30 kg N/ha recorded the maximum available N content and this was on par with the treatments which received FYM to supply 20 kg N/ha with 10 kg P_2O_5 (T_4). In the eastern series, though a similar trend was in evidence, the differences among the treatments were not significant. Higher available N content of soils under FYM addition could be due to favourable microbial activity and enhanced biomass addition to the soil, probably as a result of improved soil physical properties. Mandal and Pain (1965) and Grewal *et al.* (1981) also observed the beneficial effects of organic manure addition in increasing the available N content. Not much variation could be observed in the case of available P and K contents of soil, probably due to the fact that the quantity of P and K added in four years were too low to influence the available P_2O_5 and K_2O content of soil.

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