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EFFECT OF CERTAIN TILLAGE PRACTICES AND AMENDEMENTS ON PHYSICO-CHEMICAL PROPERTIES OF PROBLEM SOILS

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ABSTRACT

Three tillage treatments *viz*, country ploughing, mammutty digging upto 30 cm and iron rod digging upto 45 cm and five amendments such as gypsum at 200 and 400 Kg/ha, saw dust, groundnut shell powder, coir dust and farm yard manure each at 2.5 and 5.0 tons/ha, besides control were tested for their effect on the nutrient availability in the soil and on th physical properties of red soil with characteristic surface hard pan. The trials were conducted during summer 1984 and 1985 and *Kharif* 1985. The results showed an increase in the available NPK status of soil due to application of amendments like coir dust, FYM and groundnut shell powder. The above organic amendments improved the soil physical characteristics like infiltration rate, total porosity and hydraulic conductivity of redsoil with hard pan.

KEY WORDS : Soil properties, Tillage practices, soil amendments.

In many parts of South Arcot district where groundnut is grown in red soil, the soils are characterised by high content of iron and alumina. Hard pan in soil surface especially on drying after rains was observed in such soils. The hardness in the root zone severely affects the peg formation, penetration, pod development and maturity resulting in poor yield of groundnut. Rubensam and Koepke (1964) reported that deep ploughing accompanied by deep placement of organic

amendments improved the rooting and biological activity in the rhizosphere. They also observed that the loosening of the subsoil by deep cultivation increased the porosity, infiltration rate etc., of the soil. Subramanian *et al.* (1975) studied the effect of tillage and organic amendments on the physical properties of red soil and found that amendments in general improved the capillary porosity and hydraulic conductivity of soil. The present study was aimed at finding the effect of certain cultural practices and amendments on the physical and chemical properties of red soil having distinct surface hard pan.

MATERIALS AND METHODS

Three field experiments were conducted in the Regional Research Station, Vriddhachalam in summer 1984 and 1985 and *Kharif* 1985 in the fields showing characteristic surface hard pan. The experiements were laid out in a split plot design with three main plot treatments Viz., country ploughing (M1), mammutty digging upto 30 cm (M2) and iron rod digging upto 45 cm (M3). The sub plot treatments inlcuded the incorporation of the following amendments 15 days before sowing.Control (T1), Gypsum 200 Kg/ha (T2), Gypsum 400 Kg/ha (T3), Saw dust 2.5 tons/ha (T4), Saw dust 5.0 tons/ha (T5), Groundnut shell powder 2.5 tons/ha (T6), Groundnut shell powder 5.0 tons/ha(T 7), Coir dust 2.5 tons/ha (T8), Coir dust 5.0 tons/ha (T9), Farm yard manure (FYM.) 2.5 tons/ ha (T10) and Farm yard manure (FYM.) 5.0 tons/ha (T11). The variety used for the study was Co 1 groundnut There were three replications.

Farm yard manure was included in the study during summer and *Kharif* 1985 seasons. NPK were applied basally to all the plots at the recommended level. Post harvest soil samples were collected and the available NPK were estimated by alkaline potassium permanganate method (Subbiah and Asija, 1956), olsen's method and flame photometry respectively. Core samples were collected with core cutters and examined for physical properties of soil like hydraulic conductivity and total porosity following the methods of Dakshinamurthi and Gupta (1968) and infiltration rate was estimated *in situ* by using double ring infiltrometer.

RESULTS AND DISCUSSION

The data on available N,P and K in the soil in summar '84 are presented in Table 1. Results of infiltration rate in summar 84, total porosity and hydraulic conductivity in summer '85 are presented in Table 2. The physical prosperties and available nutrients in the soil in kharif '85 are preseented in Table 3.

The available nitrogen content of the soil was higher in the treated plots. Application of coir dust at 5.0 t/ha in summer 1984 and groundnut shell powder at 5.0 t/ha in *kharif* 1985 recorded higher values.

The available soil phosphorus was higher in treatments with coir dust at 5.0 t/ha which was on par with coir dust at 2.5 t/ha in summer 1984, whereas in *Kharif* 1985 application of farm yard manure at 5.0 t/ha recorded higher available phosphorus which is in conformity with the findings of Loganathan *et al*. (1979).

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Table 1. Available nitrogen, phosphorus and potassium (Kg/ha) in soil, Summer 1984.

Sub/Main	Available Nitrogen				Available Phosphorus				Available Potassium			
	M1	M2	M3	Mean	M1	M2	M3	Mean	M1	M2	M3	Mean
T_1	102	105	113	106	4.09	5.06	4.14	4.59	82	98	98	92.7
T_2	122	116	128	122	5.06	5.00	4.75	4.93	96	104	119	106.3
T_3	132	142	135	136	6.19	6.21	5.44	5.94	94	112	104	103.3
T_4	136	146	143	142	5.04	6.26	5.49	5.99	100	107	111	106.0
T_5	157	133	163	151	5.59	5.96	5.90	5.80	101	109	107	105.6
T_6	133	146	139	139	5.13	6.19	5.78	5.70	105	111	117	111.0
T_7	142	130	154	142	5.71	6.42	4.67	5.60	99	99	107	101.7
T_8	146	135	148	143	6.54	6.10	6.31	6.32	117	125	124	122.0
T_9	182	182	208	190	7.02	6.96	7.05	7.01	128	112	136	125.3
Mean	139	137	148		5.69	6.02	5.50		102	108	114	
	C.D. (P = 0.05)											
Main treatment		-	-	-								
Sub treatment		23.76	0.75	16.69								

Table 2. Infiltration rate (Summer 1984), total porosity and hydraulic conductivity (Summer 1985)

Sub/main	Infiltration rate (cm./hour)				Total porosity (per cent)				Hydraulic conductivity (cm./hour)			
	M1	M2	M3	Mean	M1	M2	M3	Mean	M1	M2	M3	Mean
T_1	7.2	11.4	10.4	9.7	41.6	42.2	42.4	42.0	8.5	12.3	11.8	10.8
T_2	4.8	13.2	7.2	8.4	42.3	41.6	43.2	42.4	10.3	16.5	9.5	12.8
T_3	6.9	13.7	8.4	9.7	42.6	43.5	43.4	43.2	10.4	17.5	12.4	13.4
T_4	6.6	20.4	9.6	6.2	43.1	42.5	44.1	43.2	10.1	18.5	12.6	13.7
T_5	4.2	18.0	7.2	9.8	43.2	44.2	44.2	43.9	7.5	20.3	10.1	12.6
T_6	7.2	18.0	12.8	12.7	42.7	43.9	43.7	43.4	10.3	20.4	16.5	15.7
T_7	3.3	18.0	12.0	11.1	42.9	44.1	44.5	43.8	6.5	24.5	18.5	16.5
T_8	6.3	19.2	14.4	13.3	44.2	44.3	44.3	44.3	9.7	22.6	19.6	17.3
T_9	7.2	31.2	14.4	17.6	44.5	43.9	43.9	44.1	10.5	30.6	19.8	20.3
T_{10}	13.2	38.4	13.2	21.6	43.8	43.5	43.5	43.6	13.8	35.9	20.6	23.4
T_{11}	4.2	18.0	10.3	10.8	43.9	44.2	44.1	44.0	8.4	26.4	15.7	16.8
Mean	6.4	19.9	10.9		43.2	43.4	43.8		9.6	22.5	15.2	
	C.D. (P=0.05)											
Main treatment				0.21	0.43			1.05	3.10			
Sub treatment				0.34	0.71			2.40	5.10			

Table 3. Physical properties and available nutrients (kg/ha) in the Soil (kherj 85)

Treatment	Infiltration rate (cm/hour)	Porosity (%) Total	Capillary	Non-Capillary	Hydraulic conductivity (cm/hr)	Available nutrients N	P_2O5	K_2O
T1	6.26	4.05	24.2	16.3	7.03	141	6.25	123
T2	6.53	42.1	25.0	17.1	8.23	159	7.44	153
T3	6.73	42.9	24.3	18.6	9.16	192	8.51	152
T4	6.73	43.4	24.6	18.8	9.30	177	6.01	158
T5	6.96	43.2	24.7	18.5	9.50	173	7.16	169
T6	7.70	42.6	25.0	17.6	8.93	170	6.55	155
T7	7.86	43.4	24.3	19.1	9.33	239	8.05	160
T8	7.23	44.1	25.0	19.1	9.16	160	6.79	173
T9	7.73	44.5	25.5	19.0	9.13	186	7.23	182
T10	7.83	42.2	24.4	18.8	9.40	145	7.35	159
T11	8.06	43.9	25.0	18.9	9.63	176	10.96	178
S. ED	0.09	0.17	0.19	0.23	0.25	12.34	0.79	10.22
C.D.(P = 0.05)	0.33	0.36	0.45	0.53	0.52	25.74	1.65	21.31

In respect of available potassium of soil, incorporation of coir dust at 5.0 t/ha recorded higher values in both the seasons. However in summer 1984, it was on par with the application of 2.5 t/ha of coir dust while in *Kharif* 1985 it was on par with saw dust and FYM each at 5.0 t/ha.

Infiltration rate was higher following the application of FYM at 2.5 t/ha in summer 1985 and 5.0 t/ha in *Kharif* 1985. In summer 1985, however, application of FYM at 2.5 t/ha was on par with coir dust at 5.0 t/ha, while in *Kharif* 1985 the infiltration rate due to FYM at 5.0 t/ha was on par with FYM at 2.5 t/ha, coir dust and groundnut shell powder each at 5.0 t/ha.

Total porosity in soil was high following the incorporation of coir dust at 2.5 t/ha in summer 1985 which was on par with coir dust, saw dust, groundnut shell powder and FYM each at 5.0 t./ha and FYM at 2.5 t/ha. In *Kharif* 1985 season coir dust at 5.0 t/ha recorded higher values for total porosity. Similar observations were made by Loganathan *et al.* (1979).

Among the tillage practices, digging with iron rod upto 45 cm recorded higher values of total porosity but was on par with mammutty digging upto 30 cm.

Hydraulic conductivity was higher following the application of FYM at 2.5 t/ha which was on par with coir dust at 5.0 t/ha in summer 1985. But in *Kharif* 1985, hydraulic conductivity was higher in the treatment FYM at 5.0 t/ha which was on par with FYM at 2.5 t/ha, coir dust 2.5 and 5.0 t/ha, groundnut shell powder at 5.0 t/ha, gypsum 400 Kg/ha, saw dust 2.5 and 5.0 t/ha.

In respect of main plot treatments mammutty digging upto 30 cm depth registered higher values for hydraulic conductivity than the other treatments.

From the foregoing results it becomes evident that organic amendments like coir dust, FYM and groundnut shell powder favourably increased the available NPK contents of soil besides improving the physical characters like infiltration rate, total porosity and hydraulic conductivity of red soil with distinct hard pan.

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EFFECT ON DATES OF SOWING AND GROWTH PATTERNS OF PIGEONPEA [Cajanus cajan (L) Millsp.] IN WINTER SEASON

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ABSTRACT

The investigation was carried out during winter seasons of 1980 - 81 and 1981 - 82 at the University Farm, Kalyani to study the response of 20(105), 5(124), HY3C and Bahar varieties of pigeonpea to different dates of sowing (September 29, October 14 and 29 and November 14 and 30). Variety Bahar recorded maximum LAI, leaf, stem, pod, total dry matter per plant and also CGR, whereas variety 20(05) had the minimum LAI, leaf, stem, pod, total dry matter per plant and CGR. Date of sowing significantly influenced the dry matter production of leaf, stem and pod, LAI and CGR. September 29 sowing was found superior to other dates of sowing in respect to all the characters studied.

KEY WORDS : Pigeonpea, Sowing date, Growth pattern

Pigeonpea is one of the most promising legumes but the yield potentiality of this crop is very low in India. The main reasons of low level of production are non-availability of high yielding disease resistant varieties and non-adoption of