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INFLUENCE OF ORGANIC AND INORGANIC AMENDMENTS ON CRUST PRONE SOILS

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ABSTRACT

Field experiments were conducted in red lateritic soils of National Pulses Research Centre, Vamban, for investigating the influence of organic and inorganic amendments for overcoming soil crusting and hardening conditions using black gram (KB 51) as test crop. Results showed that bulk density and soil hardness were favourably influenced by application of pressmud (5 t/ha). Grain yield of black gram increased due to application of amendments from 31.8 to 74.5% per cent. Experiment on the residual effect of amendments indicated positive influence on the yield of the succeeding crop.

KEY WORDS : Amendments, Influence, Crust Prone Soils

Soil crusting is a world wide problem under a wide range of soil and climatic conditions. Soil crusts affect seedling emergence and reduce infiltration rate causing loss of water and crop yield. Soil crust strength and impedance to seedling emergence have been studied in detail and measures to avoid crusting and ameliorate its adverse effects have been suggested. Peacock (1979) reported soil crusting as a major factor causing poor seedling establishment in sorghum. Compaction from rain drops and the subsequent drying of the compacted surface soil results in a soil crust (Cary and Evans, 1974). In the semi-arid tropics soils like alfisols are of poor physical structure and are prone to form crusts as reported by Hoogmoed (1983).

In the present investigation, studies were made under the lateritic soils of National Pulses Research Centre (NPRC) Tamil Nadu Agricultural University, Vamban, Pudukkottai, Tamil Nadu which have the crusting and hardening problems. The effect of organic and inorganic amendments in reducing the problem of crusting and hardening, changes in physico chemical properties and crop performance were studied.

MATERIALS AND METHODS

Field trials were conducted from 1985-88 for evaluating the addition of organic amendments like farm yard mare (FYM), rice husk and pressmud and inorganic amendents like gypsum and lime at different levels in alleviating or reducing the problem of soil hardening and crusting in the red lateritic soils of NPRC. The following treatments were tried.

Gypsum 2 t/ha; gypsum 4 t/ha; lime 2 /ha; lime 4 t/ha; rice husk 5 /ha; rice husk 10 t/ha; pressmud 5 t/ha; pressmud 10 t/ha; FYM 5 t/ha; FYM 10 t/ha and control.

The trials were conducted under randomised block design (RBD) with three replications. Black gram (T9 and KB 51) was tried as the test crop. Data were collected on per cent emergence, grain yield, bulk density, soil hardness, soil pH and available nutrients (N, P, K) The bulk density was determined by soil core sample method and soil hardness was estimated by pen-type penetrometer. Under each plot penetrometer readings were recorded in 12 spots and the mean values were taken. Soil pH and available N, P and K were estimated by standard procedures. The residual effect of applied amendments was also studied. For this the original plots were divided into two equal halves and for the one half, the amendments were applied again and no amendment was applied to the other half and black gram (KB 51) was raised as the test crop. The soil of the experimental site belongs to Vayalogam soil series. Soil texture is sandy loam and the soil is acidic.

The results of the trial during 1985-86 *(Kharif)* are presented in the Table 1. Application of pressmud (5 t and 10 t/ha) and rice husk (10 t/ha) significantly increased the grain yield over control and other treatments. Applications of rice husk (5 t/ha), lime (4 t/ha), gypsum (4 t/ha), lime (2 t/ha)

Table 1. Influence of amendments on soil properties and grain yield of black gram (KB 51) 1985-86

Treatments	Grain yield (kg/ha)	Percent emergence	Soil hardness (kg/sq.inch)	Soil pH	Bulk density (g/cc)	Root length (cm)	Available nutrients (kg/ha)		
							N	P	K
Gypsum 2 t/ha	250	77.8	2.5	5.1	1.35	34.64	178	10.9	150
Gypsum 4 t/ha	330	75.0	2.3	5.3	1.38	36.62	179	11.1	120
Lime 2 t/ha	325	77.5	2.7	5.8	1.41	36.79	141	10.6	127
Lime 4 t/ha	337	74.7	2.75	6.2	1.39	36.14	171	8.8	153
Rice husk 5 t/ha	355	77.3	2.25	5.4	1.34	36.08	196	10.1	127
Rice husk 10 t/ha	425	76.8	2.25	5.6	1.33	47.90	183	12.5	140
Pressumud 5 t/ha	450	78.3	2.58	5.9	1.37	42.65	150	10.6	137
Pressumud 10 t/ha	442	77.3	2.42	5.9	1.38	38.48	158	10.5	137
FYM 5 t/ha	300	74.8	2.92	5.2	1.41	35.48	186	10.5	190
FYM 10 t/ha	325	74.8	2.67	5.3	1.38	40.14	169	9.8	220
Control	160	70.2	2.92	5.2	1.43	32.47	146	10.9	150
CD (5%)	42	2.3	0.58	0.70	0.04	5.06	54	0.9	38

The values are mean of three replications.

and FYM (10 t/ha) also significantly increased the yield over control. Maximum yield of 450 kg/ha was recorded with the application of pressmud (5 t/ha).

The increase in yield due to application of pressmud and rice husk may be because of increased per cent emergence as well as decrease in crust strength as the orgenic residues added decomposed (Kemper *et al.* 1974).

The data on soil hardness revealed no significant influence of the soil amendment. However, soil pH was significantly increased from 5.2 to 6.2 by application of lime 4 t/ha. The bulk density was found to be significantly decreased due to incorporation of rice husk, pressmud and gypsum. Similar trend of decrease in bulk density by application of farm yard manure and lime was reported by Mathan *et al.* (1986). So *et al.*, (1978) also reported that addition of gypsum significantly

Table 2. Resicual effects of amendments on soil properties and grain yield of black gram (KB 51)

Treatments	Grain yield (kg/ha)		Percent emergence		Soil hardness (kg/sq.inch)		Bulk density (g/cc)		Root length (cm)	
	T	R	T	R	T	R	T	R	T	R
Gypsum 2 t/ha	530	490	73.7	74.6	3.36	3.08	1.37	1.36	27.0	25.6
Gypsum 4 t/ha	537	490	80.4	78.9	3.12	3.16	1.40	1.39	27.8	27.9
Lime 2 t/ha	467	462	74.6	74.9	3.22	3.25	1.34	1.35	25.7	25.5
Lime 4 t/ha	583	542	63.8	74.6	3.33	3.24	1.37	1.39	26.0	24.5
Rice husk 5 t/ha	598	577	68.3	78.1	2.95	2.89	1.37	1.37	27.1	26.4
Rice husk 10 t/ha	586	570	70.9	71.8	3.26	3.22	1.38	1.38	29.0	28.1
Pressumud 5 t/ha	607	587	70.6	76.9	3.22	3.13	1.34	1.35	27.6	24.0
Pressumud 10 t/ha	623	590	74.9	74.4	3.10	3.00	1.32	1.35	35.2	31.5
FYM 5 t/ha	518	500	68.3	68.1	3.20	3.23	1.39	1.42	25.0	23.3
FYM 10 t/ha	590	560	75.2	76.9	3.36	3.19	1.38	1.41	25.6	24.9
Control	340	342	75.8	66.1	3.58	3.67	1.39	1.39	22.7	22.3
CD (5%)	94		NS		0.1*		0.04		2.8	

The values are mean of three replications

T - Treated
R - Residual

Table 3. Influence of amendments on soil properties and grain yield of black gram (KB 51) 1987-88

Treatments	Grain yield (kg/ha)	Percent increase over control	Percent emergence	Root length (cm)	Soil hardness (kg/sq.in.)	Soil pH	Bulk density (g/cc)
Gypsum 2 t/ha	497	31.8	77.7	34.8	2.83	5.3	1.42
Gypsum 4 t/ha	545	44.6	75.6	38.4	2.83	5.1	1.41
Lime 2 t/ha	658	74.5	77.4	36.9	2.67	6.2	1.40
Lime 4 t/ha	622	64.9	77.6	38.9	2.67	6.2	1.38
Rice husk 5 t/ha	538	42.7	79.9	40.5	2.33	5.2	1.39
Rice husk 10 t/ha	550	45.9	79.3	48.1	2.50	5.4	1.37
Pressumud 5 t/ha	647	71.6	79.9	42.4	2.33	6.0	1.39
Pressumud 10 t/ha	642	70.3	79.9	38.4	2.33	6.1	1.37
FYM 5 t/ha	505	33.9	75.6	38.7	2.67	5.2	1.38
FYM 10 t/ha	527	39.8	76.5	40.5	2.67	5.1	1.37
Control	377	-	70.8	31.4	2.83	4.9	1.43
CD (5%)	63		2.0	3.6	0.6	0.4	0.03

The values are mean of three replications

improved aggregate stability and reduced crust strength of red brown earth. Root growth was enhanced by application of rice husk and pressmud. The yield increment, the decrease in bulk density and enhancement of root growth may be a combined effect due to application of organic amendments like rice husk and pressmud. Hardan and Al-Ani (1978) and Chaudhry and Das (1978) reported that the organic matter has tremendous effect on increasing the resistance of soil aggregates to the destructure impact of rain drops.

With regard to nutrient availability, it was found that N availability was not influenced by amendments, phosphorus availability was enchanced by application of rice husk (10 t/ha) and gypsum (2 t/ha) and potassium availability was increased by application of farm yard manure (10 t/ha).

The results of the field trial conducted in the same field during the following *rabi* season with blackgram (KB 51) as the test crop to study the residual effect of applied amendments are presented in Table 2. The results showed significant influence of amendments in the main plots as well as in the sub-plots indicating that there was good residual effect over the grain yield and that there was response to further additions of amendments. However, the data on soil hardness and bulk density showed no significant influence due to residual effect of amendments.

The results of the field experiment repeated during 1987-88 with black gram (KB 51) as the test crop are presented in Table 3.

The statistical scrutiny of the grain yield data revealed that application of pressmud (5 and 10 t/ha and lime 2 and 4 t/ha) increased significantly the grain yield and all the four treatments were on par. The per cent increase in grain yield over control ranged from 31.8 to 74.5 and the maximum grain yield was 658 kg/ha with the application of lime at 2 t/ha. Soil hardness was not influenced by application of amendments.

However, soil pH was increased significantly by application of lime (2 t/ha and 4 t/ha) and pressmud (5 and 10 t/ha). The bulk density of soil was significantly lowered by rice husk application (10 t/ha), FYM (10 t/ha) and pressmud (10 t/ha).

The results of the field experiments showed that grain yield of pulses like black gram can be increased under soils with crusting with application of amendments like pressmud @ 5 t/ha or lime @ 2 t/ha or 4 t/ha or rice husk @ 5 t/ha. These amendments revealed significant beneficial effects on percent emergence, and soil pH. Bulk density of soil and soil hardness were also favourably

influenced due to application of these amendments, to a lesser degree, probably due to short term effects of the amendments. It is therefore concluded that application of pressmud @ 5 t/ha or lime @ 2 t/ha over a long period of time will be beneficial in increasing crop yields and improving the physico-chemical properties of soil.

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NUTRIENT UPTAKE IN MESTA (*Hibiscus sabdariffa*) UNDER VARYING FERTILIZER COMBINATIONS

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ABSTRACT

A field experiment was conducted at the Agricultural College Farm, Dharwad during *kharif* 1984-85 to study the nutrient uptake in mests under different fertilizer levels. It was observed that N uptake increased with an increase in N levels. The P uptake varied from 10.73 to 12.56 kg/ha which indicated the low P requirement by mesta. On the other hand, the K uptake by mesta was more than N and P and showed higher K requirement.

KEY WORDS : Mesta, Fertilizer Combinations, Nutrient Uptake

Mesta, a fibre and hardy crop which suppresses the weeds, can be cultivated under low levels of fertility with less care and expense. This crop can be cultivated where jute cultivation is not possible. The crop can be cultivated on almost all types of soils with varying fertility levels in low rainfall areas. The main reasons for low yield of this crop in India as compared to other countries are the low yielding local varieties and lack of proper crop management practices.If the yield and quality of the crops is to be increased, there is a need to generate the information on the fertilizer requirement of the crop. With this objective, the present experiment was undertaken to study the nutrient uptake under different fertilizer combinations.

MATERIALS AND METHODS

A field experiment was conducted at the Agricultural College Farm, Dharwad (Karnataka) during *kharif* 1984-85 under rainfed condition. There were 36 treatment combinations consisting of 3 levels of phosphorus, 3 levels of potassium forming 9 treatment combinations in main plot and 4 levels of nitrogen in sub-plots in each main plot. The experiment was laid out in split plot design with three replications. The fertilizer combinations tried were:

Phosphorus (P_2O_5) : O (P_0), 20 (P_1) and 40 (P_2)

Potassium (K_2O) : O(K_0), 20 (K_1) and 40 (K_2)