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STUDIES ON THE INFLUENCE OF AMENDMENTS ON THE SOIL SURFACE CRUSTING

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Studies were conducted at the National Pulses Research Centre, Vamban (Pudukkottai District, Tamil Nadu) in lateritic soils to alleviate the soil crusting problems with organic and inorganic amendments. Green gram (Co 4) and Black gram (T 9) were raised as test crops. The results showed that liming at 4 t/ha and farm yard manure at 20 t/ha were the best and improved the soil physical properties and yield.

Formation of crust is a function of geological setting, climate, morphology and time. The cause of crust formation in the sandy soils of Mali was high intensity of rain which has a high impact (Kinetic energy) on the soilsurface on freshly tilled soil (Hoogmoed and Stroosnijder, (1984). Scanning electron microscopic observations by Gal *et. al.* (1984) revealed that in soils with no ex. Na aggregates breakdown and surface compaction by rain drops are the dominant mechanisms In soil with ESP values more than 15, chemical dispersion of the soil clays and the downward movement of the clays into the washed in layer clogging the pores in these layers is the mechanism In the lateritic groups of soil which have high soluble iron and alumina as in the soil of Pudukkottai and Ramanathapuram districts of Tamil Nadu which bind soil particles get irreversibly oxidised on exposure to the atmosphere on the surface. This type of crusting can be prevented by proper methods like incorporating amendments, cultural operations, etc A study was therefore taken up to find out a suitable amendment for alleviating crusting problem in lateritic soils.

MATERIALS AND METHODS

Field trials were conducted at the National pulses Research Centre, Vamban, Pudukkottai district. The following were the treatments. Lime requirement of the soil was estimated to be 4 tonnes per hectare and the subplot treatments were fixed accordingly.

Main Plot :

1. No Farm yard manure
2. Farm yard manure at 5 tonnes/ha
3. Farm yard manure at 10 tonnes/ha
4. Farm yard manure at 20 tonnes/ha

Sub plot :

1. No lime
2. Lime at 2 tonnes/ha
3. Lime at 4 tonnes/ha
4. Lime at 6 tonnes/ha
5. Lime at 8 tonnes/ha

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The treatments were replicated twice in a split plot design. Both the amendments were applied before the last ploughing and incorporated. Green gram (var Co 4) was the test crop. The trial was repeated with Black gram (var T 9) as test crop. The observations recorded and the soil analytical data are discussed in the paper. Post harvest soil core samples were analysed for bulk density, total porosity and non-capillary porosity by the methods described by Gupta and Dakshinamoorthy (1980).

RESULTS AND DISCUSSION

The soil was acidic (pH 4.5) and clay loam in texture (clay 30.5% silt 22.5%; coarse sand 16.0%; and fine sand 26.0%). The post harvest soil analyses data furnished in table 1 reveal that incorporation of farm yard manure decreased the bulk density. For clay and loam soils a bulk density value of 1.4 to 1.5 g/cc is considered to be hard enough to cause a physical impedement. It was 1.426 g/cc in the F_0 plots and it decreased to 1.363 g/cc in the plots which received 20 t/ha of farm yard manure. Similarly liming also decreased the bulk density from 1.482 to 1.320 g/cc.

The total porosity increased from 38.6 to 43.2% by the application of farm yard manure and from 38.3 to 44.5% by lime at 8 t/ha. Non-capillary porosity also increased by the application of lime from 7.6 to 10.7 per cent.

Table 1. Bulk density of post harvest core soil samples (g/cc)

Lime	FYM application t/ha				
	0	5	10	20	Mean
1. No Lime	1.499	1.488	1.478	1.463	1.482
2. Lime at 2 t/ha	1.474	1.449	1.448	1.381	1.438
3 Lime at 4 t/ha	1.430	1.412	1.422	1.349	1.403
4. Lime at 6 t/ha	1.373	1.376	1.371	1.332	1.363
5. Lime at 8 t/ha	1.356	1.325	1.307	1.292	1.320
Mean	1.426	1.410	1.405	1.363	

CD (5%) = 0.359

Statistical analysis of the yield data indicated that among the levels of farm yard manure 10 to 20 t/ha. were on par but superior to 0 to 5 t/ha levels. Among the lime levels, 4 t/ha was significantly superior to

Table 2. Total Porosity %

Lime/FYM	FYM application t/ha				
	0	5	10	20	Mean
1. No lime	35.6	37.5	39 4	40.7	38.3
2. Lime at 2 t/ha	36 4	38.6	40 6	41 6	39.3
3. Lime at 4 t/ha	38.3	39.5	41.7	43 7	40.8
4. Lime at 6 t/ha	39.9	41.7	42.5	44.1	42.1
5. Lime at 8 t/ha	42.8	43.6	44.9	45.8	44.5
Mean	38.6	40.2	41.8	43 2	

Table 3. Non-capillary porosity (%)

Lime/FYM	FYM application t/ha				
	0	5	10	20	Mean
1. No lime	6.1	7.3	8.0	8.8	7.6
2. Lime at 2 t/ha	6.8	7.9	9.0	9.4	8.3
3. Lime at 4 t/ha	8.2	8.8	9.6	10.4	9.3
4. Lime at 6 t/ha	8.6	10.0	10.4	11.0	10.0
5. Lime at 8 t/ha	9.6	10.3	11.1	11.8	10.7
Mean	7.9	8 9	9.6	10.3	

Table 4. Grain yield of green gram (var Co 4) kg/ha

Lime/FYM	Farm Yard Manure				
	0 t/ha	5 t/ha	10 t/ha	20 t/ha	Mean
1. No Lime	168.4	114.2	202.5	150.0	158.8
2. Lime at 2 t/ha	248.4	129.2	244.2	225.0	211.7
3. Lime at 4 t/ha	110.9	279.2	258.4	339.2	246.9
4. Lime at 6 t/ha	122.5	123.3	200.0	216.7	165.6
5. Lime at 8 t/ha	168.3	169.2	185.9	254.2	194.4
Mean	143.7	163.0	218.2	237.0	

CD for lime 38.07 CD for FYM 17.75

control (no lime) while other treatments were on par. The combination of the amendments viz., 20 t/ha of farm yard manure and 4 t/ha of lime registered the highest yield.

The study on residual effect was made with Black gram (var T 9) as the test crop. The data revealed that plant height was influenced by the application of farm yard manure. Applications of 10 and 20 t/ha of farm yard manure were on par and superior to control and 5 t ha. Application of 4 t/ha of lime four to be the best in alleviating the problem.

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THE MOISTURE RETENTION CHARACTERISTICS IN RED AND LATERITE SOILS (IN HUMID TROPICAL REGION) OF KERALA

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The moisture retention of red and laterite soils is comparatively poorer, since these soils are generally coarse textured with Kaolin and Iron oxide clay minerals. The maximum water holding capacity, field capacity, moisture retained at tensions of 1, 5, 10 and 15 bars were higher in laterite than in red loams. The available water was also higher in laterite than in red loam.

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