

Influence of Organic Manures Alone and in Combination with Inorganics on Properties of a Black Soil and Jowar Yield.

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Studies to evaluate the efficacy of organic sources of manures as compared to chemical fertilizers in a black soil revealed that the application of organic sources at different levels in combination with inorganic fertilizers had significantly increased the grain and straw yield of CSH 5 sorghum. The physical properties of the soil viz. bulk density, hydraulic conductivity and total porosity and also the nutrient contents were found to have improved. The uptake of the nutrients by the crop was found increased due to the addition of organic manures with fertilizers as compared to control and inorganic fertilizers alone.

Utilization of different organic wastes of sources of plant nutrients and also the humus in a cyclic manner helps their disposal in an efficient and useful way. An integrated approach of recycling the organic wastes is aimed at now in the interest of farming community. Such a programme will improve the environmental quality, decrease requirements of costly chemical fertilizers for deficient soils and improve the animal and human health.

Among the various attempts for better utilization of organic wastes, recovering and recycling of plant and animal residues deserves due consideration as they are available in the farm itself. During the recent times integrated use of organic sources of manures with inorganic and biofertilizers for increased soil productivity has been well established. Singh (1975) and Roychaudhuri (1979) found that application of farmyard manure increased the yield of wheat crop and the effect was marked when the level was above 5 t/acre. Naik

and Ballal (1968) found that the use of nitrogenous fertilizers along with inorganic sources of manures had given highest yields of both grain and straw of wheat. Laura and Idnani (1972) reported that sun dried cow dung slurry with urea gave better response than urea alone in respect of the yield of wheat grain and straw.

MATERIAL AND METHODS

A field experiment was conducted on a black soil (Perianaicken palayam series) with CSH 5 sorghum at Tamil Nadu Agricultural University Campus, Coimbatore. The soil of the experimental field was sandy loam with a pH of 8.4 and EC of 1.2 milli mho s/cm. The initial nutrient status of the soil was found to be low, medium and high in available nitrogen, phosphorus and potassium respectively. The total pore space of the soil was 58.5 per cent, bulk density 1.4 g/cc and hydraulic conductivity 0.58 cm/hr. The soil was medium in organic carbon content (0.39 percent)

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Randomised block design was adopted with 14 treatment and 3 replications. The treatments included organic sources of manures viz., farm yard manure, compost, poultry manure and sewage sludge each at three levels of 10, 20 and 30 t/ha plus half the recommended dose of NPK, recommended level of NPK as inorganic fertilizers alone and with a no manure control. Phosphatic (45 kg P_2O_5 /ha) and potassic (45 kg K_2O /ha) fertilizers were applied as basal dressing while nitrogenous fertilizer (90 kg N/ha) was applied in two split doses viz., half at sowing and the other half at boot leaf stage.

Sorghum (CSH 5) was sown and the various cultural operations were carried out. The crop was harvested and yield of grain and straw were recorded. Post harvest soil samples were drawn and analysed for physical and chemical properties and available nutrient status. The results were subjected to statistical scrutiny.

RESULTS AND DISCUSSION

The grain and straw yields of CSH 5 sorghum showed significant differences due to treatments (Table 1) with regard to grain yield, combination of compost or poultry manure at 30 t/ha with half the recommended dose of NPK registered maximum yield and was significantly superior to other treatments. Similarly combination of organic manures and inorganic fertilizers had significantly increased the straw yield also. The increase in yield (both grain and straw) can be attributed to the fact of additional nutrients

added, beneficial effects of the humus contributed by organic manures. The humus might have improved the physical condition of the soil, making a favourable environment for increased uptake of nutrient elements by the plants and resulting in the higher yield. Similar findings were also reported by Krishnamoorthi and Ravikumar (1973) from the results of permanent manurial experiments conducted at Coimbatore.

Incorporation of organic manures at different levels had improved the soil physical properties also (Table 2). Bulk density of post harvest soil samples was found to decrease as the level of organic manure increased and as a result, the porosity and hydraulic conductivity of the soil have increased to a significant level over control, thus creating a favourable conditions for the better availability and uptake of plant nutrients and possibly better air and water relations in soil. Bairathi *et al.* (1974) and Sathianarayana *et al.* (1975) reported that organic matter addition had favourably influenced the hydraulic conductivity and total porosity of the soil,

The data of organic carbon and available N, P, K, Ca, Mg contents of the soil are presented in Table 3. The organic carbon content increased significantly from 0.32 per cent (control) to 0.49 per cent (compost 30 t/ha). This increase was found to be gradual with the level of organic manure added. NPK alone had recorded only 0.39 per cent organic carbon. Kanwar and Prihar (1962) observed that both organic manure and fertilizer application had increased the organic carbon and total

nitrogen content at higher levels than control. Increased availability of N and P was also found in the treatments which received different levels of organic manures. However, the increase was not statistically significant. Naik and Dallal (1968) reported that application of organic matter had increased the available N and P contents of the soil. The increased availability of plant nutrients as well as the improvement in physical conditions due to the addition of organic sources of manures resulted in the better uptake of plant nutrients.

Thus, combined application of organic sources of manures with inorganic fertilizers had significantly increased the grain and straw yields as well as the physical properties of the soil and availability and uptake of plant nutrients by the crop over control or inorganic fertilizers alone.

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TABLE 1 Grain and Straw Yield of CSH 5 Sorghum (kg/ha)

Treatments	Grain	Straw
NPK (90:45:45)	4142	9445
FYM 10 t/ha + $\frac{1}{2}$ NPK	4417	10417
FYM 20 t/ha + $\frac{1}{2}$ NPK	4108	9722
FYM 30 t/ha + $\frac{1}{2}$ NPK	4058	10139
Compost 10 t/ha + $\frac{1}{2}$ NPK	4292	10833
Compost 20 t/ha + $\frac{1}{2}$ NPK	4483	11111
Compost 30 t/ha + $\frac{1}{2}$ NPK	4750	10833
Poultry manure 10 t/ha + $\frac{1}{2}$ NPK	4483	10139
Poultry manure 20 t/ha + $\frac{1}{2}$ NPK	4444	10278
Poultry manure 30 t/ha + $\frac{1}{2}$ NPK	4750	10833
Sewage sludge 10 t/ha + $\frac{1}{2}$ NPK	4108	9861
Sewage sludge 20 t/ha + $\frac{1}{2}$ NPK	4267	10694
Sewage sludge 30 t/ha + $\frac{1}{2}$ NPK	4350	10695
Control	3958	8889
C. D.	346	992

TABLE 2 Physical Properties of Post Harvest Soil Sample

Treatment	Bulk density (g/cc)	Hydraulic conduc- tivity (cm/hr)	Porosity (per cent)
1	1.40	0.59	59.10
2	1.35	0.61	59.87
3	1.26	0.71	60.33
4	1.25	0.79	60.43
5	1.35	0.69	58.47
6	1.29	0.76	59.07
7	1.24	0.82	59.37
8	1.31	0.65	57.83
9	1.21	0.77	60.67
10	1.17	0.83	61.00
11	1.26	0.67	58.28
12	1.28	0.80	59.70
13	1.21	0.82	60.23
14	1.43	0.55	51.97
C. D.	0.08	0.16	2.22

TABLE 3. Available Nutrient Contents of Post Harvest Soil Samples

Treatment	Organic carbon per cent	Av. N. (kg/ha)	AV. P (kg/ha)	Av. K (kg/ha)
1	0.39	173.53	10.45	724.30
2	0.41	175.61	10.09	784.00
3	0.45	180.84	8.96	772.80
4	0.45	187.11	13.81	754.10
5	0.34	186.40	13.79	780.30
6	0.41	197.80	16.13	806.40
7	0.49	192.34	17.92	769.10
8	0.37	189.44	16.43	753.90
9	0.38	190.25	13.11	761.60
10	0.42	188.39	12.69	769.10
11	0.34	174.57	13.11	757.90
12	0.38	181.89	11.20	832.50
13	0.40	179.80	13.07	810.10
14	0.32	162.03	7.59	806.40
C. D.	0.07	N. S.	N. S.	N. S.