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Effect of Tillage and Organic Amendments on the Physical Properties of Soil and Yield of Bajra

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ABSTRACT

A study on the effect of tillage and organic amendments on the structural properties of soil and yield of bajra (HB 3) was conducted in red sandy loam soil. The tillage treatments consisted of ploughing up to 10, 20, 30 and 45 cm depths. The amendments included in the experiment were maize straw, rice husk, farm yard manure, tank silt, gypsum, neem cake and polystyrene. An improvement in capillary porosity, hydraulic conductivity, structural coefficient and stability index was observed in the post-harvest soil samples when compared to pre-sowing samples. Deep tillage to 20 and 45 cm depth had shown beneficial effects in improving the physical properties mentioned above when compared to shallow ploughing up to 10 cm depth. Amendments in general improved capillary porosity and hydraulic conductivity of soil. Neem cake and rice husk treatments improved the stability index. Gypsum and polystyrene when incorporated at a depth of 20 and 45 cm recorded higher grain yield of bajra while FYM, neem cake and rice husk when incorporated at a depth of 45 cm recorded higher straw yield.

INTRODUCTION

Tillage practices and addition of organic amendments are resorted to in the management techniques employed in the improvement of soil structural conditions. Rubensam and Koepke (1964) reported that deep ploughing accompanied by deep placements of organic amendments improved rooting, biological activity in the rhizosphere and crop yield. Loosening the subsoil by deep cultivation was observed to increase pore volume, infiltration rate, field capacity and humus reserves of soil. Hamdi *et al.* (1965) observed that deep ploughing increased yield and reduced soil compaction. Hepp (1965) reported that organic amendments like lucerne, dung and maize straw were in the decreasing order of efficiency in improving yield of crops in sandy soils. Data on the conjoint effect of tillage and organic amendments on physical properties of soil and yield of crop are scarce and attempts were made to evaluate the influence of tillage and organic amendmends on soil physical properties and crop yield.

MATERIALS AND METHODS

Field experiments were conducted in red sandy loam soil under irrigated

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condition in Tamil Nadu Agricultural University Farm, Coimbatore with bajra (HB 3) as the test crop. The experiment was laid out in split plot design with four main plot treatments and eight sub-plot treatments replicated four times and in all there were 128 plots, each plot measuring 5 x 2 square metres. The main plot treatments included tillage practices 10, 20, 30 and 45 cm as depths of ploughing. The following were the sub-plot treatments:

(1) maize straw 250 Q/ha, (2) rice husk 250 Q/ha, (3) farm yard manure 250 Q/ha, (4) tank silt 250 Q/ha, (5) gypsum 50 Q/ha, (6) neem cake 250 Q/ha, (7) Polystyrene 10 Q/ha and (8) Control. Nitrogen at the rate of 100 kg/ha was applied for quicker decomposition of maize straw and rice husk and 50 kg P_2O_5/ha was applied to all treatments. The amendments were allowed to decompose for about eight weeks after which bajra was sown. Soil samples were collected at pre-sowing and post-harvest stages and were examined for various physical properties like capillary porosity, hydraulic conductivity, aggregation index, structural coefficient and stability index (Dakshinamurthi and Gupta, 1968).

RESULTS AND DISCUSSION

Structural properties of soil like non-capillary porosity, aggregation index, structural coefficient and stability index showed improvement in the post harvest soil samples when compared with presowing soil samples (Table 1). Tillage up to 20 and 45 cm depths significantly increased the capillary porosity hydraulic conductivity, structural coefficient and stability index when compared with shallow ploughing up to 10 cm depth. This is in conformity with the findings of Novacek *et al.* (1961) and Zatko (1967) who observed that deep ploughing improved soil structure and yield of crop.

The soil analysis data showed that the effect of application of various organic amendments did not attain statistical significance. However the mean values showed the trend that the amendments under study in general improved the phsical properties of soil like hydraulic conductivity, aggregation index, stability index and capillary porosity (Table 1). Neem cake increased the hydraulic conductivity of the soil by about 70 per cent over control. Rice husk improved the aggregation index by about 26 per cent over control which is in agreement with the findings of Sandhu and Bhumbla (1967). Neem cake and rice husk improved the stability index of the soil by 13 per cent than control which is in agrrement with the findings of Biswas and Khosla (1971). Rice husk application improved the capillary porosity of soil.

Though the yield of grain and straw did not attain statistical significance, the mean yield data showed

that tillage up to 20 and 45 cm depth increased the grain and straw yield

FIG.1 YIELD OF BAJRA GRAIN

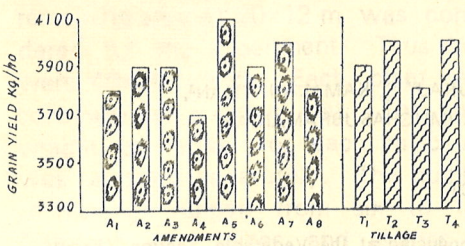
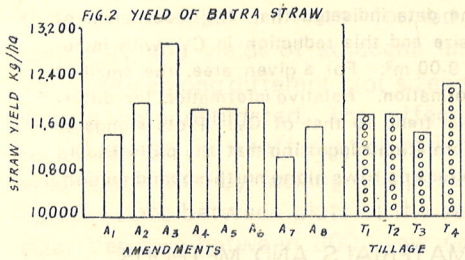


FIG.2 YIELD OF BAJRA STRAW



LEGEND

A_1 = MAIZE STRAW	A_5 = GYPSUM	T_1 = 10 cm
A_2 = RICE HUSK	A_6 = NEEM CAKE	T_2 = 20 cm
A_3 = FYM	A_7 = POLYSTYRENE	T_3 = 30 cm
A_4 = TANK SILT	A_8 = CONTROL	T_4 = 45 cm

(Fig. 1 and 2). Gypsum, polystyrene (thermocole industrial waste), rice husk, and FYM were observed to be effective in increasing grain yield. Regarding straw yield FYM, neem cake and rice husk were better than control.

Thus the results of the above investigation showed that gypsum, polystyrene, rice husk, neem cake and FYM when incorporated at 20 to 45 cm depth improved not only the yield of bajra crop but also the physical properties of soils. Hepp (1965) found that application of maize straw at 20 to 50 cm depth increased the yield of cereals in chernozemic sandy soil. The findings of the present investigation are in line with that of Hepp (1965).

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