



EFFECT OF ORGANIC AND INORGANIC FERTILIZER COMBINATIONS
ON SOIL BIOLOGICAL AND CHEMICAL PROPERTIES AND THE
NUTRIENT STATUS OF THE COCONUT PALM

By

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ABSTRACT

Inorganic fertilizers are widely used in coconut plantations, however they have very limited role or influence in bringing about improvement to soil physical and biological properties. Organic manure however plays a considerable role as a soil ameliorant and provides nutrients to the soil. In this regard the role of goat dung is little known. This study was thus identified to evaluate the effect on various levels of goat dung and combined treatment of inorganic fertilizers, on the biological and chemical and physical characteristics of soil and the yield of coconut.

Seven fertilizer treatments were used in this study. These were Control (T_1), Inorganic fertilizer (urea, 700 g, saphos phosphate 700 g, muriate of potash 1600 g) - (T_2), Inorganic fertilizer (urea 1050 g, saphos phosphate 1050 g, muriate of potash 2400 g) - (T_3), Organic manure (goat dung 6 kg, urea 480 g, saphos phosphate 520 g, muriate of potash 1460 g) - (T_4), Organic manure (goat dung 12 kg, urea 260, saphos phoshate 330 g, muriate of potash 1330 g) - (T_5), Organic manure (goat dung 18, urea 50 g, saphos phosphate 150 g, muriate of potash 1200 g) - (T_6) and Organic manure (goat dung 24 kg, urea 0 g, saphos phosphate 0 g, muriate of potash 1070 g) - (T_7). Dolomite at the rate of 500 g was included in all treatments as a basal application. All the treatments T_1 to T_7 were applied per palm per year from the commencement.

The experiment was conducted in a coconut plantation situated in the

low country wet zone with an average rainfall ranging 2200-2500 mm. The soil type is lateritic gravel. The design of the experiment was Randomized Block Design with three replicates.

The physical, chemical and microbiological changes of soil, after various treatments of fertilizer combinations were assessed by number of parameters. These included enumeration of total bacterial count, total fungal count, estimation of microbial biomass carbon by chloroform fumigation technique, measurement of CO₂ evolution, N mineralization rate, nitrification rate, soil moisture level, pH, electrical conductivity, available nitrogen, available phosphorus, exchangeable potassium, organic carbon and estimation of C/N ratio.

Each of the microbiological parameters measured at depths 0-8 and 8-16 cm in the first year after application of fertilizer showed high degree of relationship between the two depths for all the treatments. The correlation ranged from 0.591 to 0.988. In view of these results, the parameters were measured only at depth 0-8 cm for the detail studies carried out in the second year.

In addition, the microbiological parameters showed relationships with physical/chemical parameters. The most striking relationships observed were for N, P, K and soil moisture.

All fertilizer treatments to soil, inorganic and organic, showed significantly increased microbiological activity in the soil compared to the control. Similar increase was shown for physical/chemical

parameters too. Organic manure significantly increased microbiological activity in the soil compared to inorganic fertilizer. However application of different organic manure levels did not show differences corresponding increase in microbiological and physical/chemical parameters on soils. Further the decomposition rate of goat dung suggested a slow release pattern of nutrients to the soil over a period of 12 months. At the end of the period it released 59.3% N, 41.7% P, 98.9% K and 39.0% OC.

Foliar analysis showed no significant variation between the treatments and control for N, P, K and Mg at the end of first year. However all the plants which grew on fertilizer treated soil showed significantly high N, P, K and Mg over the control. No such differences were shown between inorganic fertilizer and organic manure.

The yield parameters, female flowers/palm/year, number of nuts/palm/year and copra/palm/year did not show worthwhile differences between the treatments during the first two years. In the third year the yield parameters showed 49%, 61% and 58% increases for all treatments compared to the control. Organic manure treated palms showed significant increase in the female flower production than the inorganic fertilizer treated palms. This increase was 7.2%. No such differences were shown for the number of nuts and copra. Among organic manure levels 6, 12, 18 and 24 kg applications, a significant quadratic response was evident, leading to maximising yields at 18 kg for the three yield parameters. At the end of the third year the female flowers/palm/year, number of nuts/palm/year

and copra/palm/year for 18 kg application of goat dung were 139, 40 and 7.6 compared to 88, 23, and 4.5 observed for the control respectively.

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