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EVALUATION OF SEA WEEDS AS MANURE TO COCONUT

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ABSTRACT

A field trial with sea weed mixture (containing 90% of *Cymodocea serrulata* as a manure to coconut with and without NPK fertilisers was conducted on an acidic red sandy loam soil for five years. The application of sea weed alone did not increase the nut yield over control while NPK fertilisers increased it. The sea weed material enriched soil exchangeable Na, Ca, and Mg, increased pH, and considerably reduced P in soil. Considering the interaction between soil K and Na, Ca, and Mg and its possible effect on reduced availability of K, it is inferred that the material is not very promising as manure to coconut.

INTRODUCTION

EVEN though sea weed application as manure to crop plants has been in practice since early times, relatively less attention has been given to study its effects on soil characteristics and plant growth. Franki (1960 a, b ; 1964) reported the results of some studies with sea weeds on plant growth and chemical composition of soils. Due to possible variation in chemical composition of different sea weed materials, a generalised statement on their effects as manure may not be of much significance. On the other hand, information on the relative advantages and disadvantages of different materials on different soils and crops are useful for judging their manurial value. This paper reports the results of a field trial with some sea weed material as a manure to coconut.

MATERIAL AND METHODS

The sea weed materials were supplied by the Central Marine Fisheries Research Institute, Mandapam (Tamil Nadu). They contained 90% *Cymodocea serrulata* and the rest was composed of other grasses like *C. isoetifolia*, *Diplanthera uninervis*, *Halaphila ovalis*, and *H. stipulacea* and the marine algae, *Sargasum* and *Turbinaria*. The sea grasses are locally known as *thalia*. The collection and processing of the materials were done as follows : The cast ashore sea grasses and sea weeds were collected in semidried and wet conditions and then sun-dried. At least a week was required for complete drying. The material gave an analysis of 0·60% N, 0·04% P, 0·05% K, 4·20% Ca, 1·39% Mg, and 2·5% Na with a C : N ratio of 26.

The experiment was conducted for five years starting from June 1968 using bearing palms of about 40 years age and receiving the recommended NPK fertiliser dose annually and growing on an acid sandy loam soil. Twenty-four palms were allocated for four manurial treatments (6 palms/treatment), *viz.*, T_0—Control ; T_1—50 kg sea weed ; T_2—25 kg sea weed + ½ recommended fertiliser dose (0·25 kg N, 0·16 kg P_2O_5, and 0·60 kg K_2O/tree/year) and T_3—Full recommended dose of NPK (0·50 kg N, 0·32 kg P_2O_5, and 1·20 kg K_2O/tree/year). NPK were added in the form of ammonium sulphate (21·0% N), superphosphate (16·0% P_2O_5), and muriate of potash (60·0% K_2O). The manure was applied around the palm in a single dose at 2 m radius and depth of about 20 cm in August-September. The data on yield and number of female flowers were collected for the pretreatment and experimental periods. The statistical analysis was done by the covariance technique.

Soil samples were taken before the application of manures in 1973 from palm basins at a radial distance of 150 cm from the bole and at two depths, 0–50 cm and 50–100 cm, and they were composited for each treatment. The air-dried soil samples were analysed for available N (Subbiah and Asija, 1956), NH_4OAC (pH 7)-exchangeable K, Na, Ca, and Mg, Bray'sP, pH (1 : 2·5), and organic carbon (Walkely and Black) by the methods suggested by Jackson (1967).

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RESULTS AND DISCUSSION

The treatment effects on yield are presented in Table I. The yield was decreased in palms receiving no fertiliser application (control) or sea weed alone. The reduction in yield in the latter was less as compared to that of control. An increase in yield was obtained from palms receiving full dose of NPK, while a slight decrease occurred in palms treated with ½ sea weed + ½ NPK as compared to the pre-treatment yield. No significant effect was found on the production of female flowers and hence no data are presented.

TABLE I

Effect of sea weed application on the yield of coconut (Annual mean yield of nuts/palm)

Treatment	Pre treatment 1967–68	Post treatment*			1970–72** (average)	Percentage increase or decrease over pre-treatment yield
		1970	1971	1972		
T_0 (Control)	72·8	60·7	50·4	59·2	57·3	−21·3
T_1 (Sea weed alone)	65·9	52·0	51·8	60·1	54·6	−17·1
T_2 (½ sea weed + ½ NPK)	69·0	68·8	61·8	71·8	68·6	−0·86
T_3 (Full NPK)	62·4	58·8	72·6	77·9	69·7	+10·1
S.E.	14·03	5·25	8·47	6·15	3·91	
C.D. at 5% level	..	..	..	..	11·9	

* Adjusted mean values.
** T_2 and T_3 are significantly higher than either T_0 or T_1.

Figure 1 shows the effects of treatments on soil characteristics. Soil organic C, available N, and CEC were unaffected by either sea weed or fertiliser application, the mean values being 0·22%, 159 ppm, and 6·0 me/100 g, respectively. Significant differences were obtained in the case of soil pH, available P, exchangeable K, Na, Ca, and Mg. The pattern of the effect was similar for both 0–50 and 50–100 cm soil depths. Hence only pooled values are presented. Enrichment of soil exchangeable Na, Ca, and Mg indicates that the sea weed material tested was a potential source of these elements to soil. High content of Ca and Na and the low buffering capacity of the soil would have been responsible for the rise in pH with a consequent reduction in available P. There was an increase in available P in plots receiving no sea weed. The reduction in soil K in plot receiving sea weed alone may be because of the exchange antagonism between K and Na, Ca and Mg, and consequent loss by leaching. However, a higher level of exchangeable K in T_2 (½ sea weed + ½ NPK) than in T_3 (full NPK) and lower level of exchangeable Na in T_1 (sea weed alone) than in T_2 (½ sea weed + ½ NPK) cannot be explained. The sea weed application did not increase the organic matter content of the soil, possibly because of the rapid oxidising conditions prevailing in the humid tropics.

The increased yield of nuts in the NPK fertilised plots could be attributed to the increase in availability of K based on the results of earlier work of Wahid, Kamaladevi, and Pillai (1974) who found that the antagonism existing between K and other mono- and divalent cations is in the decreasing order of Na < Mg < Ca. Since the availability of all these three elements is high in the sea weed applied plots, it might be expected that the K nutrition of the palm would be adversely affected. That K is the most important nutrient as far as the yield of coconut is concerned, is widely accepted. However, along with NPK fertilizers, reduction in yield was less pronounced. From the fact that no additional benefit by the application of sea weed over NPK was obtained, the material

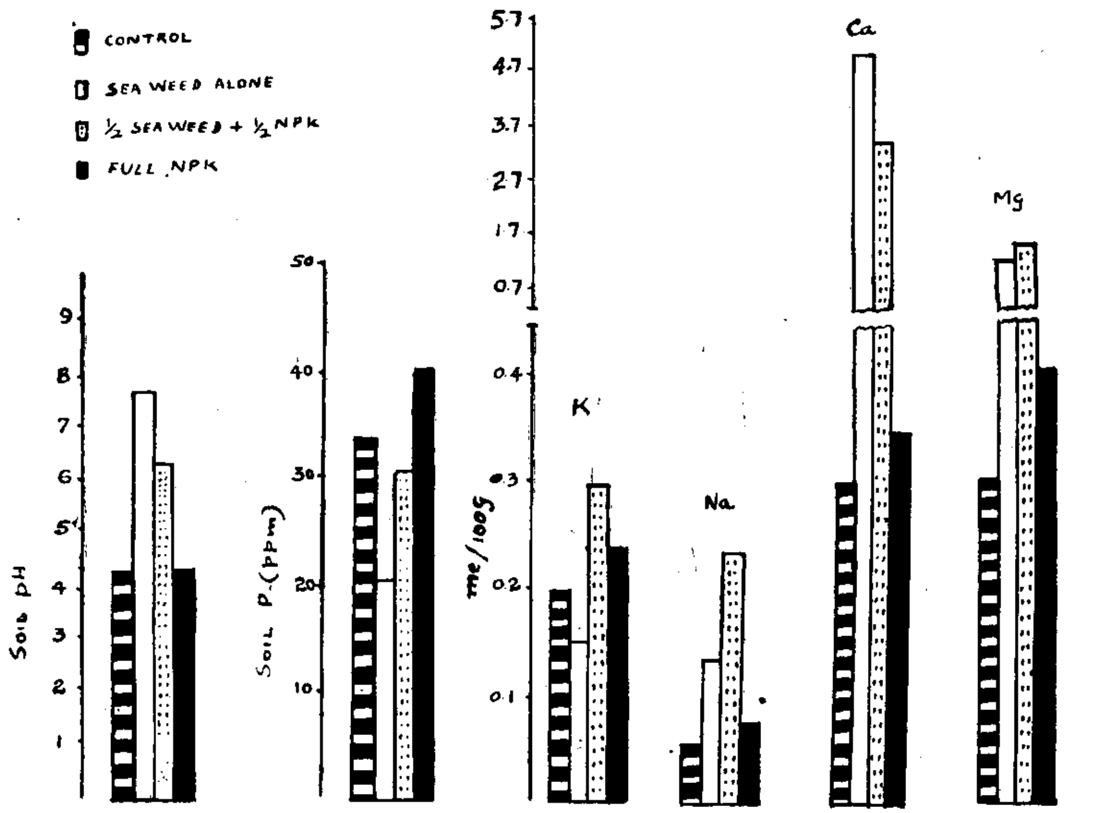

FIG. 1. Effect of sea weed application on soil pH, available P and exchangeable K, Na, Ca and Mg.

tested in this study appears to be less promising as a manure to coconut in this type of soil.

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