NOTE ON THE AVAILABILITY OF NITROGEN IN GROUNDNUT CAKE AND COCONUT POONAC

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INTRODUCTION

In view of the possibility that the import of groundnut cake from India may in future be seriously reduced owing to transport difficulties, it was considered desirable to examine the possibility of substituting coconut poonac for groundnut cake as a nitrogenous fertilizer. Groundnut cake is used largely to make up the shortage of nitrogen due to the depleted stocks of mineral nitrogenous fertilizers.

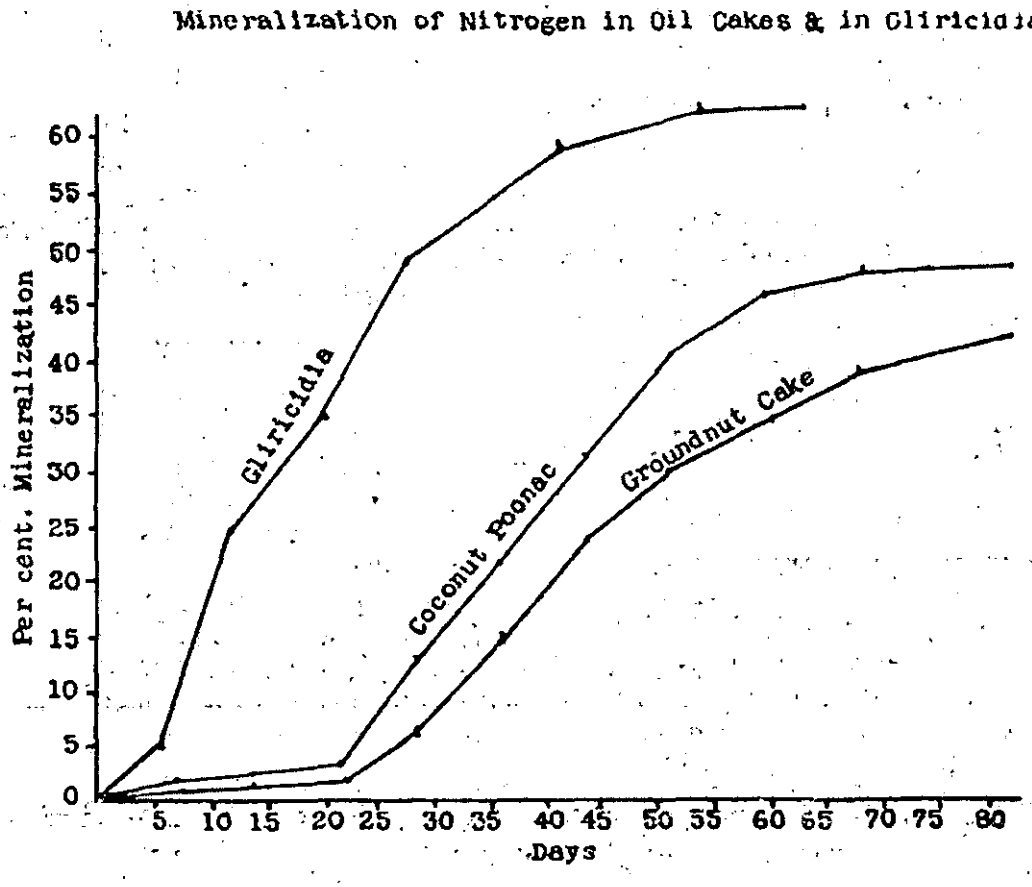
One of the primary values of oil cakes as fertilizers is the available nitrogen fur nished by them during the process of decomposition. Their high nitrogen contents, like those of the legumes and other green manures, together with a rapid rate of mineralization justifies their use as nitrogenous fertilizers.

PRINCIPLES OF GENERAL DECOMPOSITION

Most of the nitrogen added to the soil, when plant and animal residues such as dried bloodmeal, fish scraps and oil cakes are ploughed in, is in the form of proteins and their derivatives. All these substances have first to be broken down into simpler bodies before they can be of any use to the growing plant. This breaking-down process is carried on in the soil by micro-organisms and one of the final products is ammonia which often is further oxidized to nitrate. The nitrogen in ammonia or nitrate is available to plants; it may also be assimilated by the micro-organisms themselves if energy is available in the form of carbohydrates. The rate at which ammonia and nitrates are produced can be used as a measure of the rate at which the protein nitrogen of organic materials becomes available to growing plants.

RESULTS

The accompanying graph shows the rate at which ammonia is produced from the two oil cakes For the sake of comparison the curve showing the rate of ammonification of Gliricidia leaves, which are commonly used as green manure, is also included in the graph. Because the Gliricidia leaves were young and succulent materials produce the maximum amount of ammonia in about 8 to 9 weeks' time. But the point of interest to be noted is that, contrary to expectation, coconut poonac ammonified slightly more rapidly than the groundnut cake although the former is poorer in nitrogen It looks as though the protein nitrogen in coconut poonac is more readily available to the micro-organisms than that in groundnut cake.



they decomposed quickly and produced ammonia more rapidly than the oil cakes. Oil cakes are derived from seeds matured before crushing and consequently have a structure different from young leaves which makes them more resistant to decomposition by micro-organisms. The three curves indicate that all the three

The carbon-nitrogen ratio of an organic material merely indicates whether that material is suitable for direct incorporation into the soil; it gives no indication of the rate at which the nitrogen will become available during decomposition. Since the value of a manure depends more on the quantity of plant food that is released from

it in an available form by the micro-organisms than on its total nutrient content the experiment described here has not only demonstrated the value of coconut poonac as a suitable nitrogenous fertilizer but it has also shown the actual amount of nitrogen that becomes available to the plant during the process of decomposition. About 50 per cent of the total nitrogen was ammonified in 8 to 9 weeks. The process of ammonification is rapid in the earlier stages when the micro-organisms are growing rapidly at the expense of hemicelluloses and the soluble constituents like starches and sugars which provide a more easily available source of energy than cellulose When these constituents and about 40 per cent of cellulose are decomposed the microbiological process slows down considerably and so affects the rate of mineralization of nitrogen. Such a stage is almost invariably reached in about 8 or 9 weeks' time.

THE RELATIVE VALUES OF GROUNDNUT CAKE AND COCONUT POONAC

It is customary to value a fertilizer in terms of unit values. Since nitrogen is the chief plant food in oil cakes it will be worth while comparing the two oil cakes investigated in terms of their unit values of nitrogen. To represent the cost of transport, Rs. 15 per ton has been added on to the cost of cakes before dividing by the percentage of nitrogen in order to determine the unit values of the two cakes in the following table :—

Material	% Nitrogen	Price per ton including Rs.15 for transport	Unit cost of nitrogen
		R. c.	R. c.
Groundnut cake	7·0	217-00	31-00
Coconut poonac	3·4	47-00	13-80

Although coconut poonac is cheaper than groundnut cake per unit it is the question of transport that stands in the way of using coconut cake in up-country districts. Owing to the restricted space available for transport of fertilizers to up-country tea estates only half the amount of nitrogen would reach estates if coconut poonac were to be used as a substitute for groundnut cake.

SUMMARY

It has been demonstrated that the rate of ammonification of coconut poonac during decomposition is almost similar to that of groundnut cake. Nearly 50 per cent of the total nitrogen becomes available in 8 to 9 weeks' period.

Although coconut poonac is cheaper than groundnut cake when compared in terms of unit values of nitrogen, its bulk and the limited space of transport militate against its use on up-country tea estates.

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