

THE ORGANIC MATTER STATUS OF FOREST SOILS IN TRINIDAD

I. INTRODUCTORY

The decomposition and incorporation of leaf residues with the mineral soil play an important part in natural vegetative cycles. Waksman (46) pointed out that a forest and its soil form a harmonious equilibrium, 80 percent of the nutrients assimilated being returned to the ground in leaf litter and become available only after a period of decomposition has taken place. Mature soils developed from sedimentary material in Trinidad under forest vegetation are characterised by the existence of a dead layer, containing little or no available nutrients, underlying the surface humic horizons. This dead layer constitutes an effective barrier to root penetration, and colonising vegetation must rely on the liberation of nutrient minerals from the humic layer for growth and reproduction.

Investigation into utilisation of soil found under natural vegetative cover must involve study of changes in the quantity and properties of this humic layer likely to result from such utilisation. A preliminary investigation of the effects of different silvicultural operations on soil properties has been carried out at the Arena Forest Reserve, Trinidad, by the Chemistry Department, I.C.T.A. in conjunction with the Trinidad and Tobago Forestry Department. A summary of an interim report on the experiment has been published by Brooks (6). On the basis of a suggestion by Duthie (13), similar experiments were started at the Tumpuna Forest Reserve to contrast the deterioration of sand and clay soils on exploitation of the forest cover.

Duthie (13) had suggested that leaf litter and other plant remains lying on a sandy soil are washed down to the subsurface layers as soon as the material has been disintegrated into particles sufficiently small in size to pass between the sand grains. Mechanical incorporation may take place during the decomposition of organic

residues. On the other hand the impervious nature of a clay soil makes it necessary that the organic matter should be in colloidal solution before it can penetrate to the subsurface layers. He deduced that most of the chemical transformations involved in the decomposition of organic residues in a clay soil must take place at the surface and penetrating organic matter must be in an advanced state of decomposition. On this basis, he accounted for the rapid deterioration of a sandy soil on exploitation and for the difficulty of rejuvenating a deteriorated clay soil by the incorporation of organic matter.

Duthie's theory is based on the observation that the C/N ratio of sandy soils, as measured by the routine methods adopted at I.C.T.A. seem to be uniformly higher than the corresponding values obtained from clay soils, and on quantitative estimation of the main constituents of the organic matter of several soil types, as determined by a modification of the technique due to Waksman and Stevens (41).

The objects of the present enquiry were:-

- (1) to investigate the influence of soil texture on the depth function of the C/N ratio of organic matter of Trinidad forest soils
- (2) to investigate further the chemical changes occurring during decomposition and admixture of leaf residues in soils under forest cover, with the object of testing and elaborating Duthie's theory. The investigations are described and discussed in separate sections for each object of enquiry.