IMPORTANCE OF ORGANIC MATTER IN TEA SOILS

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It is known that acceptable properties of an agricultural soil are connected with the reserves of organic matter it contains. The role that organic matter plays on fertility of any soil is readily illustrated by reference to what takes place under a complex vegetation such as the natural forest where the conservation of adequate soil moisture in the soil, and the entire nutrient requirements of the forest trees are all met by the abundant deposit of mulch (leaf litter) available as a definite layer on the soil surface.

All soils contain organic matter in varying stages of decomposition, but agriculturally it is the partially decomposed mass which is important, particularly that portion forming a dark amorphous substance usually referred to as 'humus'. In the tea growing districts of Sri Lanka, the soil organic matter in general is reported to vary with elevation (about 1.5 to 2.0 percent carbon at low elevations and 3.0 to 4.0 percent carbon at high elevations).

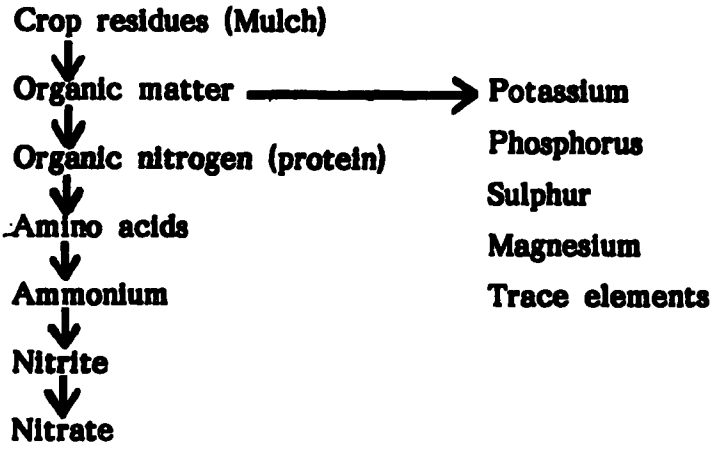
The crop residues available on the soil surface help to build up the organic matter status of the soil. Soil organic matter plays a dual role, i.e. supplying nutrients steadily to plants through mineralization, as well as forming humus which provides the necessary building material for the formation of soil crumbs. The latter in turn helps to build a better soil structure and tilth thereby improving the water holding capacity, exchange capacity and buffering capacity of the soil.

While a soil poor in organic matter would suffer in relation to tilth, moisture retention, retention of nutrients etc., a soil well supplied with organic matter can hold much more water than a similar soil without it. The addition of loppings and compost builds up the organic matter of soil and such practices help to maintain

and increase the fertility of the soil. However, what is not so often realized is that the tea bush itself returns a considerable amount of organic matter which contributes to humus for water and nutrient conservation. In the first place, pruning at periodic intervals (once in 2 to 3 years in the low country, 3 to 4 years in the mid country and 4 to 5 years in the up country) returns sizeable amount of material (PROVIDED THAT THEY (PRUNINGS) ARE NOT REMOVED FROM THE FIELDS) and secondly poor light conditions under the plucking table cause a continual and substantial leaf fall throughout the cycle.

A continued supply of soluble artificial fertilizers to a soil may at great expense supply enough nitrogen and other nutrients for immediate use, the rest being lost in drainage. On the other hand, green manures from Dadap, Gliricidia, and other shade trees as well as prunings and leaf litter from tea usually supply enough organic matter to the soil and for that reason are of particular value. Experience in a variety of crops seems to show that a judicious use of soluble manures and organic matter does in fact give the best results.

Eden (1929) refers to the products of the decomposition of organic matter as representing the current account on which the plant draws its supply of N, P, K, Mg, S etc. The organic matter derived from added crop residues finally undergoes mineralization releasing the nutrients that they contain in a form readily available for tea plants. In this process, the first stage in the decomposition is ammonification which relates to a series of biological reactions that decompose proteins and amino acids and other nitrogen containing organic compounds into ammonium nitrogen, the form of nitrogen that is readily utilized by tea plants. Other nutrients released in the process of mineralization are potassium, sulphur, magnesium, phosphorus and small quantities of trace elements. A generalized process of this series of reaction is as follows:



Thus, considerable reserves of plant nutrients are accumulated in the composition of soil organic matter; for such important elements as nitrogen and potassium the amounts can be reckoned in tons as the percentage of N and K is high in tea mulch (about 3.0 to 3.5% N and 1.0 to 1.5% K). In such soils where the organic matter is reasonably high the nitrogen reserves of the soil would be large. In an incubation study carried out recently, it was shown that from a well decomposed tea mulch and the soil collected below this layer of mulch there was a release of about 180 to 250 kg nitrogen (as ammonium and nitrate) during a period of six weeks. Similarly, the water soluble and exchangeable potassium released during this period was 200 to 250 kg as K_2O. The values obtained for magnesium and phosphate were 90 to 100 kg and 60 to 90 kg respectively. According to Ranganathan (1970) the amount of nutrients returned to the soil by retention of prunings in the field is large. Foliage and twigs alone readily released about 337 kg N, 40 kg P and 93 kg K per ha. Wilson (1969) estimated the amount of nutrients from prunings (on a three-year pruning cycle) to be as high as 785 kg N, 135 kg P_2O_5 and 570 kg K_2O from 22, 440 kg of prunings/ha.

Thus in a pruned field with adequate supply of mulch enormous amount of nutrients could be made available to the plant from the mineralization of the available mulch in the soil. The observation by Tolhurst (1960) that there was rapid recovery of pruned tea plants in spite of the cessation of manuring for about 4 to 6 months shows that the tea plants have been solely utilizing the nutrients

released from the mineralization of mulch for their growth. Further, frequent soil sampling following pruning have also shown that at the same time that the rapidly-growing bushes were suffering from an excess of nitrogen (as indicated by dark and distorted leaves which accumulated 50% more total nitrogen than comparable healthy leaves), there were considerable reserves of readily extractable ammonium and nitrate in the upper soil layers, amounting to 50 lb of N per acre in the 0 to 3" layer alone. According to him, accumulation of such plant available nitrogen and probably other nutrients may have considerable practical importance in connection with vigorous stands of tea which may, in the pruning leaf, return 300 to 500 lb of N per acre, much of which may become available to the roots within a few months.

It is, therefore, vital that the natural mulch (prunings and leaf litter from tea and shade trees, weeds, etc.) which forms at the soil surface be allowed to remain undisturbed. In this layer, almost all the nutrients required by the plants are made available and absorbed. The mulch thus represents the major part of the circulating store of nutrients and their removal will jeopardise the process of recovery. Further, when the mulch layer is complete it is possible to conserve the top soil and to circulate nutrients efficiently to the plant minimizing losses to a great extent.

In view of the fact that soil organic matter improves soil moisture retention, nutrient retention and supply through recycling and minimizing soil erosion and nutrient losses we advice that every effort should be taken by estates to improve the organic matter status of their soils, by retaining prunings on the soil. The extra cost incurred in chopping the prunings and retaining them in the field is more than compensated.

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