

Influence of Soil Biological Properties on Growth and Yield of Tea

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Organic matter transformation and nutrient recycling in soil depends on the activity of soil organisms. Deterioration of soil fertility lowers the biological activity and lower productivity. In the absence of adequate organic matter, the process of conversion of nutrients to available forms and their retention becomes very low. To enhance the activity of soil organisms especially that of beneficial microbial population, high quality organic matter addition is very important. Even though there are plenty of organic materials available in tea lands, information on their suitability and influence on biological properties of soil is inadequate. Therefore, three trials were conducted to study the suitability of some commonly available mulching materials with varying C/N ratios and their influence on soil organisms at different growth stages of tea, i.e. nursery stage, young and immature tea and mature tea after pruning in the field. In the nursery trial, mulching materials tested were (a) *Brachiaria decumbens* (soft grass), *Calliandra calothyrsus* (a legume) and fresh tea leaves (*Camellia sinensis* L.) as a mulch, with and without tea plants. Soft grass improved soil organic carbon, CEC, soil pH, microbial biomass carbon, plant available phosphorus and total nitrogen and the growth of plants when compared to *Calliandra* legume and tea mulch. Application of grass and legume mulches increased the beneficial population of gram positive bacteria, fungi, and mycorrhiza. Grass mulch also improved the growth of tea as measured by shoot weight and total biomass.

The objective of the second and third trials was to determine the improvement of soil microbial properties in terms of functional group of microbes such as of bacteria, fungi, mycorrhiza, microbial biomass carbon, microbial respiration and earthworm populations. In addition, organic carbon, soil pH, soil nitrogen, mulch decomposition rate were also measured. The materials tested were refuse tea (25 tonnes ha⁻¹ year⁻¹), mana (*Cymbopogon confertiflora* (35 tonnes fresh weight ha⁻¹ year⁻¹), and dadap (*Erythrina lithosperma*) (35 tonnes fresh weight ha⁻¹ year⁻¹). For young tea, mana and dadap were applied three times and refuse tea two times per year for the first two years after planting. For mature tea, mana and dadap were applied three times and refuse tea two times during the first year after pruning. The results indicated that dadap and refuse tea improved yield of tea significantly by more than 16% and 19% respectively. It brings soil pH to a favourable range, enhances microbial biomass carbon, soil respiration and also showed suppression of gram negative bacteria one year after the application of treatments.

The suitable mulching materials to accelerate the biological activity are those with C/N ratios below 20 and low in lignin and unoxidisable polyphenol content. Therefore, *Brachiaria*, Refuse tea and Dadap are suitable materials for use in tea. They also suppress the unfavourable bacterial populations such as gram negative bacteria. These materials improve the biological properties of soil and thereby enhance the growth and yield of tea.