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Effect of Biofilm Biofertilizer on Tea Cultivation

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In tea cultivation, decreased soil quality can be seen in places where tea has been grown for a long period. Although chemical fertilizers (CFs) release nutrients quickly, they are leached to the deeper layers of soil polluting water bodies. Also, CFs deplete beneficial microbes and insects, thus decreasing plant immunity and soil fertility, causing huge damage to the ecosystem. Biofilm is an assemblage of microbes adherent to each other and/or biotic/abiotic surfaces and embedded in a self-produced extracellular matrix of polymers. *In-vitro* developed biofilms can be used as biofilm biofertilizers (BFBFs). BFBFs can break the dormancy of microbial forms in the soil, thus enhancing biodiversity, nutrient cycling, plant immunity, and crop production. This study focused on analysing the effects of the BFBF on soil, plant, and microbial parameters. The study consisted of two uniformly managed tea lands in Badulla. The fields were applied with two treatments separately; (a) 100% CF of Tea Research Institute (TRI) recommendation of VPUva 925, and (b) 75% CF of TRI recommendation of VPUva 925 + BFBF 2.5 L ha^{-1}. All quantitative data were analysed with a two-sample t-test. An increasing trend was observed in endophytic diazotrophs ($p=0.08$) in BFBF treatment over the growers' 100% CF practice. Significantly ($p\leq0.05$) higher soil pH, moisture, labile carbon, organic carbon, total nitrogen, leaf total polyphenols (SPAD), made tea production and the amount of soil carbon sequestered was observed in the BFBF practice over the growers' practice. However, a significant ($p>0.05$) difference could not be observed for soil available potassium and soil total phosphorous contents. Application of BFBF improved the nutrient utilization efficiency of plants and led to an increase in tea yield over the growers' practice of CF alone application while cutting down CF usage by 25%. Therefore, it is concluded that the BFBF is an eco-friendly and economically viable method to replace the growers' current practice of CF alone application.

Keywords: Biofilm, Biofilm biofertilizers, Nutrient cycling, Soil fertility