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Role of the vetiver (*Chrysopogon zizanioides* L.) and arbuscular mycorrhizal fungi on soil quality improvement in *Pinus* plantation soil

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Abundant public lands and deforested areas of South-West wet zone region of Sri Lanka has subjected to reforested by *Pinus caribaea* exotic species during 1970's and 1980s. Yet, several environmental problems such as groundwater extraction, forest fire, soil erosion, effects on natural regeneration were recognized due to this reforestation. The strategies are needed to improve soil quality in *Pinus* plantation soil, which mitigates negative impacts and restores soil biological functions while increasing the ecosystem processes, services, and productivity. Vetiver (*Chrysopogon zizanioides* L.) belongs to family Poaceae with arbuscular mycorrhizal fungi (AMF) can be used in soil quality improvement. Therefore, this study was carried out for evaluating the ability of vetiver with AMF to enhance the soil quality in *Pinus* plantations. A pot experiment was carried out at Panwila, Central Province of Sri Lanka, in a randomized complete block design with four replicates. Soil collected randomly from two different depths of 0-10 cm and 15- 25 cm, from *Pinus* plantation at Panwila was used as respective controls. The four treatments were soil with 5% biochar, soil with 5% organic manure, soil with native AMF and soil with 2.5% biochar and native AMF. Vetiver plants of approximately similar size and age were selected and one plant was transplanted in each pot. Soil chemical, biological and plant growth parameters were determined initially and after three months of growing vetiver. The soil from the forest patch of the Knuckles mountain range which is subjected to similar climatic conditions as Panwila, was tested for the above soil parameters and used as the reference of the healthy soil in statistical analysis. Analysis was carried out as a three-factor factorial design. It was revealed that different treatments were significantly different ($p < 0.05$) for soil pH, electrical conductivity, soil microbial activity, bacterial count, fungal count, plant dry root and shoot biomass, yield and percentage AMF colonization ($p = 0.001$). It can be concluded that the application of vetiver with or without tested amendments improved the soil chemical and biological properties in disturbed *Pinus* plantation soil towards the healthy soil of Knuckles mountain region. Furthermore, with the amendments of AMF, biochar and organic manure, some soil biological properties of disturbed soil in tested vegetation type, was improved more than the reference soil. Hence the application of vetiver with the AMF, biochar and organic manure is an effective strategy to be used in soil quality improvement in disturbed vegetation.

Keywords: AM fungi, *Chrysopogon zizanioides*, *Pinus* plantations, Soil improvement