Influence of Long-Term Application of Organic Amendments on Soil Thermal Properties in Tea Grown Soils

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Long-term application of organic amendments to soil may alter soil thermal properties, modifying soil's ability to buffer against extreme temperature changes. The long-term effects of application of organic amendments on thermal properties of tea-grown soils, particularly the impact of different types of organic amendments compared to conventional synthetic fertilizer application, remain unstudied. Therefore, this study compared soil thermal properties in tea grown soils treated with Tea waste (TW), Compost (COM), and Neem oil cake (NOC) and only conventional synthetic fertilizers (CONV) in a twenty-five-year-old experimental site ("TRI-OR-CON") at St. Coombs estate of Tea Research Institute Thalawakale. In total, 48 intact soil core samples and 48 minimally disturbed samples were collected from the surface (0-15 cm) and the subsurface (15-30 cm). Soil samples were analyzed for soil thermal properties, bulk density, aggregate stability, volumetric water content at saturation and field capacity, and soil organic carbon. The incorporation of tea waste and compost into soil over a period of 25 years resulted in significant ($p<0.05$) improvements in soil aggregation and a decrease in bulk density, leading to substantial reductions in soil thermal conductivity and thermal diffusivity of surface soil compared to conventional synthetic fertilizer application. Further, soil volumetric heat capacity slightly increased in tea waste and compost applied soils due to their significantly high soil organic carbon and water storage. Results of this study suggested that the long-term application of tea waste and compost has increased soil's ability to buffer against extreme temperature changes and thereby to keep temperature of soil more stable favoring increased microbial activity and an overall healthy tea soil ecosystem. Future studies should consider monitoring the soil temperature at multiple depths at seasonal to annual temporal scales along with physiological responses of the tea plants.

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