

Effect of α -pinene on the Soil Bacterial and Fungal Population and Soil Organic Carbon and its Variation with the Stand Age of *Eucalyptus grandis* Plantations.

W. H. N. Madhushani^{1*}, M. M. S. N. Premetilake¹, A. P. Henegamage¹
and H. M. S. K Herath²

^{1*}Department of Science and Technology, Uva Wellassa University, Badulla, Sri Lanka.

²Department of Export Agriculture, Uva Wellassa University, Badulla, Sri Lanka.

Eucalyptus is one of the most commonly established plantation forests in the world. However, they emit α -pinene which is known to have allelopathic characteristics that suppress the microbial activities. Therefore, organic matter decomposition rates could be affected by α -pinene in plantation soil which may lead to higher carbon sequestration in soil. Further emission of α -pinene could be affected by the stand age of the plantation. To investigate these the present study of the relationship between soil α -pinene content, microorganisms, and organic carbon (OC) content in 30,13 and 4 -year-old *Eucalyptus grandis* plantations were studied. As the control plantation, an adjacent Patana grassland (previous land-use before afforestation) was used. Three plots (20 × 20 m) were established within each site and 12 soil samples from each site were collected from 30 cm depth. Soil OC content was measured using the Walkley-Black method and microbial counts were taken using the pour plate method. The α -pinene in soil samples were analyzed using GC-MS. The highest OC content was observed in 30-year-old *E. grandis* plantation (3327.09 Kg) and interestingly the lowest bacterial and fungal populations (2.15×10^3 CFU mL⁻¹ and 1.07×10^3 CFU mL⁻¹) and the highest α -pinene content ($(0.47\% \pm 0.09)$) were recorded in the same. There were significant positive relationships between stand age and α - pinene and OC in soil (Pearson correlation value 0.982, 0.913; $p < 0.05$). The OC had shown a significant negative relationship with the bacterial and fungal population (Person correlation 0.669,0.653, $p < 0.05$). The results showed that with the stand age, α -pinene content in soil increases and affects negatively on microbial populations which results in higher OC content in the soil. Therefore, we can conclude that as *Eucalyptus grandis* plantations ages they support soil carbon sequestration and the findings could be useful in promoting the minimizing of atmospheric CO₂ level.

Keywords: *Eucalyptus grandis*, Stand age, α -pinene, Organic carbon, Carbon sequestration

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