

Biowastes to augment essential oil production by *Leptospermum scoparium* and *Kunzea robusta*

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Biowastes are organic materials of biological origin, such as biosolids, dairy shed effluent, and sawdust. Often, these materials are rich in plant nutrients, but also contain contaminants, including heavy metals, pathogens and xenobiotics. Potentially, biowastes could rebuild degraded or low-fertility soils, where food is not produced, such as former forestry soils. Given the low economic returns from forestry, New Zealand Trade and Enterprise has propounded the development of “natural products”, such as honey and essential oils. We sought to determine the effect of biowastes on the quantity and quality of essential oils produced by mānuka (*Leptospermum scoparium*) and kānuka (*Kunzea robusta*). In a series of greenhouse experiments, we grew mānuka and kānuka in low fertility soils (Lismore stony silt loam, clay loam) amended with either biosolids (1200 kg/ha N equiv.), biosolids + sawdust (1:0.5), and dairy shed effluent (200 kg/ha N equiv.). We found that both mānuka and kānuka grew well (producing 17.07 & 12.42 t/ha equivalent, respectively) in the unamended soils. Addition of biowastes increased the growth of both species by up to 60%. While the biosolids increased the concentration of Zn, Cu and Cd in the plant leaves, these levels were well below those reported to pose a risk to ecosystems or human health. The most important components of the essential oils, namely β -pinene, p-cymene, limonene, geraniol, caryophyllene, humulene, seliene, calamenene, globulol for mānuka and α -pinene, β -pinene, p-cymene, limonene, 1.8 cineole, linalool, terpinen-4-ol, α -terpineol and calamenene for kānuka were unaffected by the addition of biowastes. Therefore, some biowastes could be diverted from landfills to degraded lands, where they can augment the production of essential oils using mānuka and kānuka. Field trials are required to elucidate ecological variables and production economics.