

The Impact of Spent Coffee Grounds on Nitrogen Availability in a Short-term Plant Growth Study

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In Australia, organic amendments from organic wastes have supplied nutrients and improved soil properties (Quilty and Cattle, 2011). While some studies suggest Spent Coffee Grounds (SCGs) may assist nutrient retention (Vardon et al., 2013) there are few scientific studies on the effect of applying large amounts of SCGs to soil. Typically, SCGs are produced in high volumes (10-20 kg/café/working day, dry weight) and are largely disposed to landfill. In this study, a high application rate of raw and lipid-extracted SCGs were used in a Silverbeet growth study. Lipids are commonly used for biodiesel (Vardon et al., 2013, Kondamudi et al., 2008).

20 t/ha of SCGs, applied on an acidic (pH 5.4) Dermosol, showed marginal differences in nitrogen availability between controls, SCGs alone and SCGs blended with fertiliser (urea). There were marginally lower nitrate concentrations in treatments with SCGs compared to controls (0.5 vs 1.3 mg/kg, $p < 0.05$). Furthermore, ammonium concentrations with lipid-extracted SCGs blended with urea were slightly higher than controls (246 vs 122 mg/kg respectively, $p < 0.05$).

Nitrous oxide soil emissions were lower under SCGs compared with controls from Day 3 after transplantation ($p < 0.05$), in particular raw SCGs and raw SCGs blended with urea had lower nitrous oxide emissions. Carbon dioxide soil emissions were higher with SCG treatments from Day 1 after transplantation ($p < 0.05$). However, SCGs had a detrimental effect on silver beet yield in comparison to controls (fresh leaf weight median of 11.6 vs 68.8 g respectively).

Available nitrogen concentrations were similar under most treatments, indicating that SCGs in this study was not an effective supply of available nitrogen. Soil emission trends indicate that applied SCGs contributed to nitrogen retention within the soil and stimulated microbial activity. Further research is required to distinguish potential toxic effects vs nitrogen drawdown as the causes of inhibited plant growth.