A useful *in vitro* bioassay for evaluation of weed suppression provided by cover crop residues

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Summary Legume cover crops provide rotational diversity resulting in reduced erosion and improved soil health, nitrogen availability, weed control, and moisture retention. Legume covers have also been shown to successfully suppress weeds due to their physical and/or chemical properties. We utilised a unique *in vitro* soil bioassay (Weston and Mueller 1989) to further evaluate the suppressive potential of selected legume residues, performed in combination with replicated field studies. Dried field-grown cover crop residues (including clover spp., French and yellow serradella, vetch, lupin, field and chick pea) were evaluated for weed suppression at various rates using a control treatment of inert cellulose. Experiments also evaluated soil type and the presence of soil microbiota on residue activity using selected indicator species [barnyard grass (*Echinochloa crus-galli*), annual ryegrass (*Lolium rigidum*), cress (*Lepidium sativum*), and radish (*Raphanus raphanistrum*)]. Higher rates of residues were associated with greater reductions in seed germination and growth, as compared to the cellulose control. Rates as low as 1.0 g residue 100 cm^{-2} (~1000 kg ha^{-1}) showed significant suppression of seed germination and seedling growth; biserrula, yellow serradella and subterranean clover were most suppressive. Some treatments provided selective control of some weeds i.e. chickpea and field pea suppressed dicot weeds most significantly. Soil type also impacted suppression, with the greatest reduction in growth observed in red sodosol soils vs. cracking clays or higher organic soils. Soil pasteurisation resulted in decreased phytotoxicity of all dried residues, suggesting that microbial activity was instrumental in causing increased suppression of weed growth.

Keywords Legumes, biserrula, French serradella, soil microbiota, phytotoxicity, mulch effect.