Effect of applying pelletised pig compost to soil on plant growth and rhizosphere microbiology

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Recycling composted piggery waste, which is generally high in phosphorus (P), is gaining interest to augment inorganic P fertiliser. Precise placement of compost in the root zone by pelletising and mixing with a low rate of inorganic fertiliser could support application of compost at an economically viable level in broad-acre agriculture and horticulture. This study compared the effects of applying pelletised pig compost either singly or combined with an inorganic fertiliser on plant growth, soil fertility and changes in bacterial and fungal communities. Wheat was grown in pots with 4 treatments: (1) inorganic fertilizer 100 kg ha-1, (2) Pelletised compost 100 kg ha-1, (3) Pelletised compost 50 kg ha-1 + inorganic fertilizer 50 kg ha-1, and (4) a nil application. The experiment was harvested 4, 6, and 8 weeks from sowing. Shoot and root dry weights, plant P uptake, and arbuscular mycorrhizal (AM) colonisation of roots were assessed. Soils were analysed for electrical conductivity, pH, total carbon, total nitrogen, available P, nitrate-N and ammonium-N. The bacterial and fungal diversity was analysed using Tag sequencing approaches for both rhizosphere soil and plant root colonising bacteria. There was a positive correlation between soil available P and plant P uptake, and a strong negative relationship between soil available P level and AM colonisation, irrespective of the source of P. Applications of the combined pelletised compost and inorganic fertilizer was the most effective treatment for wheat growth and soil fertility. Changes in bacterial community composition for this soil amendment were associated with an increase in soil available P, plant P uptake, and shoot and root dry weights. Reducing the inorganic fertilizer application rate by replacing with pelletised compost could be a feasible option for sustainable farming.