CALCULATING APPLICATION RATES FOR COMPOSTED MULCH AND SOIL CONDITIONERS TO MAXIMISE SOIL HEALTH

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INTRODUCTION

Composts can provide a stable, but slowly available source of organic carbon, capable of improving the biological and physical condition of soil. High rates of compost applied as a mulch conserve soil moisture, and can potentially replace fumigants for the control of root diseases.

Composts vary from municipal solid waste treated with worms for one month, to windrowed feedlot manure processed at 55^0 C for four months, marketed as mulch, potting media, topsoil or fertiliser. Despite the diversity of raw inputs and end-markets, very little information is available on calculating appropriate application rates. At worst, the use of generic composts in agriculture has resulted in seedling emergence failure and yield reductions of over 30% and 25% respectively in cotton crops, the local elimination of earthworms in a vineyard, and severe leaf yellowing in oranges (1). In this paper, a methodology for calculating agronomically objective application rates is outlined, using two case studies as examples.

CASE STUDY 1: Mulch for Avocadoes

Applying eucalypt mulch at 0.4 m^3 per tree (14 t/ha) improved root growth and fruit size in trials in the USA and South Africa (2). A Mt Binga grower applied a pig manure/wood chip/summer forage mulch at equivalent rates, and induced severe leaf yellowing in his trees.

Table 1. Australian Standard 4454 for compost, mulch and soil conditioner test results for Mt Binga mulch, interpreted against test benchmarks in AS 4419 & 3743.

Test and Result	Interpretation using AS 4419 Organic and low density soils
Ammonium 16.9 mg/L	< 200 mg/L, low risk of ammonium toxicity
pH 6.09	5.5 – 7.5 considered suitable
Soluble P 16 mg/L	< 3 mg/L for P-sensitive species. High rate use may inhibit mycorrhizae
Electrical conductivity 5.51 dS/m	< 2.2 AS 3743 Potting mixes. Avocadoes are salt-sensitive!

The mulch used by the grower had been tested using the Australian Standard for compost, mulch and soil conditioners (AS 4454). Results were interpreted using equivalent tests in AS 4419 for organic and low density soils, or AS 3743 for potting mixes (Table 1). The mulch used had a very high salt and soluble phosphorus level, detrimental to the trees.

The grower continues to produce his own compost, analysing for fertiliser equivalence using tests developed for Australian soils (3). His compost is much finer than the mulch used in the published trials, and must be applied as a soil conditioner, integrating the plant-available P and K of the compost into his fertiliser management program. Soil tests are used to monitor nitrate released from the organic slow-release pool, from previous compost applications.

CASE STUDY 2: Root Disease Control in Pineapples.

Organic amendments have been applied at rates of up to 50 t/ha to reduce root knot nematodes and to control fungal root diseases (4). A cured feedlot manure and sawdust compost was applied at 50 t/ha to a pineapple crop, with no reduction in conventional fertiliser application rates. The outcome was a 34% decrease in root mass, and a 163% increase in phytophthora root disease.

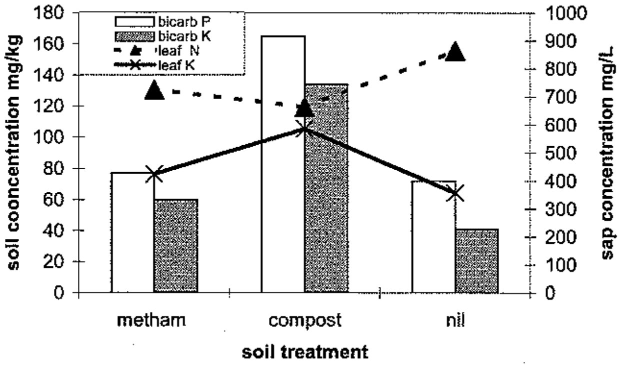

Figure 1. Soil bicarbonate-extractable phosphorus and potassium and pineapple leaf nitrate and potassium concentrations. The treatments were fumigation with metham sodium, 50 t/ha feedlot manure compost, and a control. All received conventional inorganic fertiliser.

The fertiliser replacement rate for a 99 t/ha pineapple crop is 173 kg/ha for K and 14 kg/ha for P. At 50 t/ha the compost supplied 880 and 110 kg/ha respectively. At this very high rate of K, leaf nitrate levels were depressed (Figure 1), and root tips suffered from salt burn. Mycorrhizal colonisation may also have been inhibited.

Applying the compost at the reduced rate of 10 t/ha as a total replacement for fertiliser K and P, would have avoided these problems. Also the soil health outcomes associated with organic amendments should accrue, with repeat compost applications at the corrected rate, over the next 5 years.

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