compost for soils

Citrus Orchards

Developing an IPM system for citrus thrips with production and environmental benefits

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Research in citrus is showing that compost can encourage populations of beneficial soil predators, able to assist in controlling Kelly's Citrus Thirips (KCT).

Kelly's Citrus Thrips (KCT) feed on citrus fruit, causing cosmetic blemish and market downgrade. Control of KCT currently relies heavily on the use of organophosphate insecticides, which disrupt the natural enemies of KCT and other citrus pests. Losses to the South Australian industry due to quality downgrade and control costs are estimated to be above $10 M per annum. Now KCT are developing organophosphate resistance, resulting in more spraying and integrated pest management disruption.

KCT have a pupal life stage that takes place in the soil which creates an opportunity for their control. SARDI research has identified soil-dwelling predatory mites as an important biological control for this thrips pest. KCT pupal mortality is positively correlated with predatory mite abundance, which in turn is positively correlated with soil organic carbon levels. The current study aimed to assess the effect of different compost treatments (to raise soil carbon) on KCT biocontrol and a range of crop production statistics, including fruit size and water-use efficiency. The treatments included various rates of composted forms of animal manure, green waste and grape marc. Two trials, one with Valencia oranges and the other with Navel oranges, are underway.

Results

There has been a significant increase in predatory mite densities in response to some of the treatments (Fig. 1). Effects on thrips mortality will be assessed in October-November 2007.

Figure 1: Densities of predatory mites per 100 ml soil samples collected under Valencia orange trees at Loxton Research Centre (x – untreated control, A1-4 composted animal manure at 0.05, 0.1, 0.15 and 0.2 m^3 tree, M1-2 composted grape marc at 0.5 and 1 m^3, C1-5 composted green waste at 0.2, 0.4, 0.6, 0.8 and 1.0 m^3 tree, 200 trees/ha).

The first harvestable fruit data was collected in June from the Navel orange trial site, and included yield (Fig. 2), weight (Fig. 3) and diameter of fruit (Fig. 4). Using mid-range fruit prices these data indicate that the costs of compost application will be more than offset in the first year alone from increase in income. At current compost decomposition rates it appears that the higher application rates of compost are likely to provide benefits for at least three years. It is expected that subsequent applications of compost could be at lower rates.

Figure 2: Fruit yield per m^2 of Navel orange tree canopy, Loxton North, June 2007. (Treatments: Animal - 40 t/ha composted animal manure, Marc - 200 t/ha composted grape mark, C1, 3 and 5 - composted green waste at 40, 120 and 200 t/ha respectively).

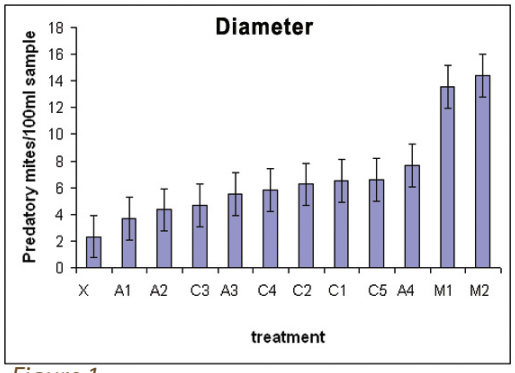

Figure 1

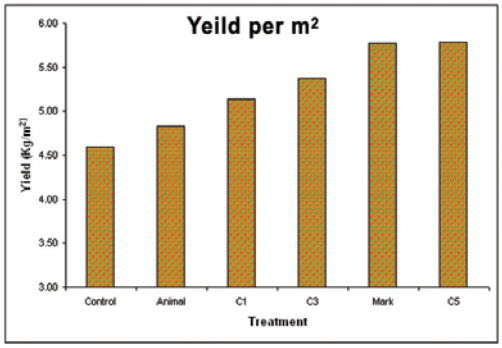

Figure 2

Figure 3

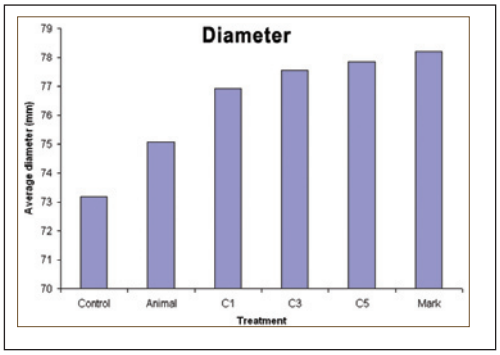

Figure 4

Figure 3: Mean weight of Navel orange fruit harvested from Loxton North trial, June 2007. (Treatments as per Fig. 2)

Figure 4: Mean diameter of Navel orange fruit harvested at Loxton North trial, June 2007. (Treatments as per Fig. 2)

The mean increase of 5-7 mm in fruit diameter (Fig. 4) adds approximately $100 per tonne ($4,000/ha) to the value of fruit for high-value markets.

When fruit size and yield gains are combined, net return in the first year is estimated at $4,500/ha before any pest management benefit is accounted for.

The compost treatments improved water use efficiency, with soil moisture levels under composted trees recorded on average about 25% higher than under untreated control trees. However, a water-use versus fruit size and yield pay-off is expected, so any reduction in water usage may well reduce some of the size-yield gains achieved by the higher compost rates.