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Fertiliser use on ARGOS kiwifruit orchards

Introduction

The Agriculture Research Group On sustainability (ARGOS) is investigating the environmental, economic and social consequences of different farming systems in NZ. In the kiwifruit sector, the three main production systems are being compared i.e. KiwiGreen Hayward ('Green'), KiwiGreen Hort16A ('Gold') and Organic Hayward ('Green Organic').

Understanding differences in management is important for interpreting differences in the impacts of management. Fertiliser use differs considerably between Organic and KiwiGreen systems and so the impacts of these could be quite different. Fertilisers add considerable to overall energy expenditure on orchards, so it is important that their application is optimized to meet production and environmental sustainability goals. This research note presents some of the differences in fertiliser use.

Nutritional requirements of kiwifruit

Much of the current knowledge on the nutritional needs of kiwifruit comes from research carried out in the 1980's and early 1990's. Little information has emerged since then. It has been found that the annual uptakes of nutrients by mature kiwifruit vines are greatest for nitrogen (N), potassium (K) and calcium (Ca) (between 125 and 180 kg/ha), while smaller quantities of chloride (Cl) (60 kg/ha), phosphorus (P),

magnesium (Mg) and sulphur (S) (< 25 kg/ha) are taken up. The quantity of nutrient recovered from fertiliser by mature kiwifruit vines is usually less than 50% for most elements. For some elements such as K the quantities that need to be replaced are large (Table 1).

Table 1. Suggested annual nutrient requirements for maintaining yields on established Hayward kiwifruit vines (Source: www.hortnet.co.nz)

Nutrient	Application rate (kg/ha)
N	140 – 200
P	40 – 60
K	110 – 200
S	40 - 70
Mg	20 – 40

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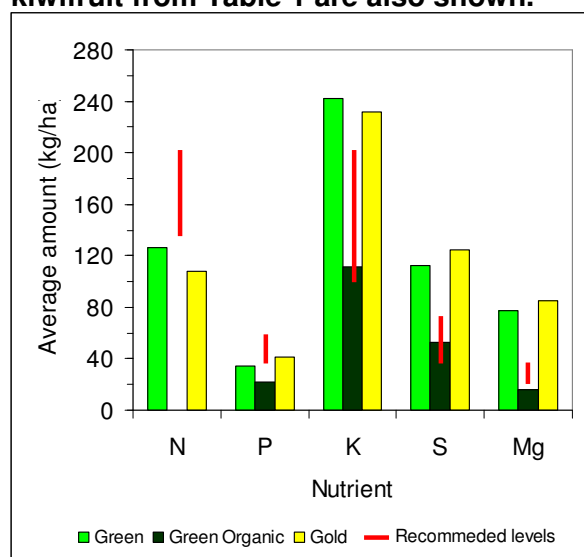
Soluble fertilisers

The average amounts of nutrients applied in soluble form to ARGOS orchards are shown in Figure 1. Not surprisingly, the amounts added to Organic orchards have been much lower than for KiwiGreen. The average amounts of nutrients applied annually to Green and Gold orchards have not been statistically different.

From a comparison of means, in recent years, Green orchards have on average

applied N and P at levels which are statistically within the recommended ranges shown in Table 1 (albeit at the lower ends). K is also within the recommended range but at the high end; a larger sample size might reveal it to be higher than recommended. The amounts of Mg and S applied have statistically been significantly more than recommended. It therefore seems worthwhile exploring the possibility of reducing the amounts of Mg and S used on Green orchards. For Organic orchards, the amounts of N and P used have been statistically less than recommended while K, S and Mg have been within the recommended ranges but at the lower ends. The optimum ranges for Hort16A have yet to be established.

Figure 1. Average annual amounts of major nutrients added to the soil in kiwifruit orchards via soluble fertilisers for the 2002/03 to 2005/06 period. The recommended levels for Hayward kiwifruit from Table 1 are also shown.



Composts

The Organic orchards have tended to apply large volumes of compost; 3 – 5 tonnes per hectare annually. Liquid fish products are often applied too and in some cases very large quantities (several thousand litres per hectare). Green and Gold orchards generally have not applied composts although chicken based manure has been applied occasionally to some orchards.

We have not yet quantified the amounts of nutrients being applied in these organic forms. However, according to all the published literature available manures and fish products contain something like 1 – 5% of N, P and/or K, on a dry weight basis. Compost applied at a rate of 10T/ha of compost could therefore potentially provide as much as 250kg/ha of N (assuming the compost is about 50% water). However, the availability of this N and other nutrients is likely to be limiting.

Foliar fertilisers

Orchardists may apply foliar fertilisers in addition to or as an alternative to ground fertilisers. There is little research available on the impacts of these types of fertilisers on kiwifruit and there seems to be mixed views about their value. We have yet to fully quantify the use of foliar fertilisers in our research, though anecdotal reports suggest they are not used much.

Conclusions

In this research note we have quantified large differences in fertiliser use and nutrient inputs in Organic and KiwiGreen systems. However, there is a gap in our knowledge of the nutrients applied in organic forms which we will endeavour to fill in upcoming years. Nevertheless, it seems that there could be an opportunity to optimise fertiliser practices. For example, relative to the historical recommendations, nutrients like Mg and S seem to be over-applied in Green orchards. We will be exploring issues like this in future years.

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