
Evaluation of Systemic Chemicals for the Management of Avocado Pests

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In this project, we are evaluating several members of the neonicotinoid insecticide class as potential control agents for avocado pests. In particular, there are several methods by which these chemicals can be applied to trees to achieve systemic uptake, and we are comparing the efficacy of each of these methods to determine which is most effective. We conduct our research in commercial avocado groves so that our evaluations are realistic and relevant to California growers and grove conditions.

Field Trial

During the 2011 season, we conducted a trial at a commercial avocado grove in Ventura County to evaluate trunk spray applications of neonicotinoids as a possible treatment method for avocado thrips. The details of the trial are summarized in the following table. Note the low concentrations of active ingredient applied to each tree compared with those used for the trunk injection work last year (3.6 g imidacloprid per tree; clothianidin was not evaluated as a trunk injection).

Treatment	Active Ingredient	Application Type	Rate (g ai/tree)	Post-Treatment Evaluations
Confidor 200 SL	Imidacloprid	Trunk Spray	1.88 g	Leaf Residues
Belay 2.13 SC	Clothianidin	Trunk Spray	0.75 g	Leaf Residues
Controls	--	--	--	Leaf Residues

Imidacloprid Trunk Sprays

We did not detect any uptake of imidacloprid when it was sprayed on the trunk as Confidor 200 SL. Samples were taken at weekly intervals for 8 weeks and then at weeks 10, 11, 13, 15 and 21. We will complete the sampling program with a sample on week 24. Given that leaf residues of imidacloprid did not come close to reaching the LC₅₀ for avocado thrips (73 ng/cm² of leaf tissue), this trunk sprays do not appear to be an effective application method for this insecticide.

Clothianidin Trunk Sprays

In conjunction with the trunk sprays of Confidor 200 SL, we also evaluated the uptake of the clothianidin formulation Belay 2.13 SC when it was applied as a trunk spray. Valent advised that the Belay 2.13 SC should be mixed with a non-ionic surfactant in order to promote improved penetration through the bark, so their application procedure was followed. Residues of clothianidin were detected at 5 weeks after Belay 2.13 SC treatments were applied, although the concentrations that were measured were very low and would not be expected to provide good thrips control. The LC₅₀ for clothianidin is 217 ng/cm² of leaf tissue; the maximum levels measured during this trial were 39 ng/cm² of leaf tissue. This concentration would provide a small level of thrips control that would be

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unacceptable to growers. We did not detect clothianidin in samples collected at weeks 6-8, suggesting that the material may have depleted at this time.

Greenhouse Trial

We conducted a greenhouse trial to evaluate the uptake of Belay 2.13 SC in potted nursery avocados. Following soil drench treatment (with Belay 2.13 SC), samples were taken on a weekly basis for 4 weeks and then at weeks 6, 8, 10, 12 and 16. We will continue with the sampling program for a total of 24 weeks.

The uptake of clothianidin was rapid and the insecticide persisted for 16 weeks at concentrations that were well above the LC_{50} for avocado thrips (Figure 1). At these levels we would expect excellent control of thrips.

Publications

The first paper on our trunk injection studies was favorably reviewed and was formally accepted on Oct 27, 2011, for publication in the journal Pest Management Science.

Future Research Plans

We plan additional field trials to evaluate clothianidin applications by trunk sprays. This method of application has some real advantages and we'd like to see if we can make it work with avocados. We had modest uptake in our first trial, so we believe it is important to evaluate the method at different field sites. In this way, we will get a better idea of whether the levels of uptake by this method are consistent between sites. We detected ppm levels of clothianidin in citrus leaves when trees were treated using the same application method and the same formulation as those used for the avocado study. Perhaps citrus is more amenable to trunk applications, but a second trial will show whether this is the case.

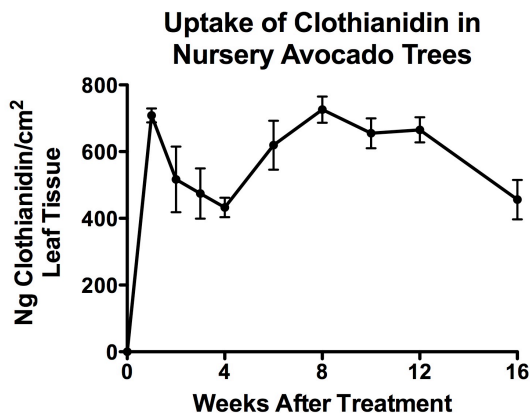


Figure 1. Uptake of clothianidin in nursery avocado trees treated by soil application as Belay 2.13 SC. Each point represents the mean (\pm SEM) concentration for 8 trees.