Efficacy of Settlement Ponds for Reducing Pesticide Runoff in Almond Orchards

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Objectives

This study is designed to continue the investigation of the effectiveness of sediment basins for reducing pyrethroid loading in irrigation drainage water leaving almond orchards in the Central Valley of California.

Pyrethroids are typically applied to the orchards as either a winter dormant spray or as in-season sprays to control a number of various pests including Navel Orange Worm. CURES will locate a cooperative almond grower with an orchard size of a minimum 10 acres for the study.

Figure 1. Sediment Basin from 2008 Study

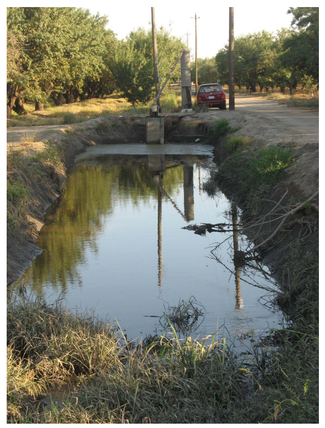
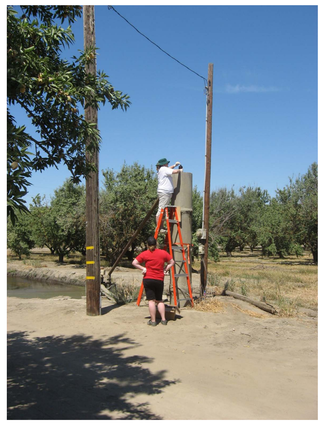


Figure 2. Sampling outflow from sediment basin 2008



Introduction

Previous research has demonstrated that sediment ponds or basins, can play a useful role in reducing the amount of both sediment and pesticide runoff from agricultural lands. A 2008 study by Markle, for example, showed that use of such a pond can reduce the discharged sediment load by 80-84% and the discharged load of lambda-cyahlothrin (a synthetic pyrethroid by 38-61%.

This new project will use an existing sediment basin in the Central Valley with irrigation runoff to conduct trials on up to three specific reduction methods focused on increasing the efficacy of sediment ponds in preventing sediment and pesticide run-off.

The three methods under consideration include:

1. The use of a novel new enzyme developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) in Australia. These enzymes are fast acting and can specifically target the pyrethroid molecule for degradation. A commercially available enzyme, Landguard® OP-A, is available for the organophosphate insecticides.
2. The use of polyacrylamide (PAM), a long-chained polymer that causes sediment particles to coagulate and drop out of the runoff water before it enters the pond and therefore increasing the amount of sediment and sediment-bound pyrethroids trapped in the pond. This was used in the previous study, but further research is required.
3. The use of sediment or turbidity curtains to slow down the movement of water and thereby promote sedimentation of smaller particles

Methods

This study is expected to start in the Spring, 2011.

A ground application of a synthetic pyrethroid, either bifenthrin of lambda-cyhalothrin, depending on the availability of the enzyme, will be ground-applied to almonds at the time of the May cover sprays.

Pyrethroid residues, total suspended solids (TSS), and flows (using a Doppler flow meter) will be measured at the inlet and outlet to the sediment basin.

Figure 3, Residue sampling from the inlet to the sediment basin-2008

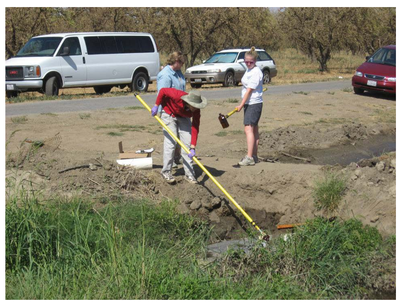


Table 1. Summary of 2008 Results

	Trial 1 (no PAM)	Trial 2 (with PAM)
Treated Area	11.6 acres	6.4 acres
Pyrethroid Applied	0.464 lb ai	0.256 lb ai
	210 g ai	116 g ai
Pyrethroid in inlet stream (% of applied)	0.05	0.12
Sediment Reduction (%)	80%	84%
Pyrethroid Reduction (%)	61%	38%

Acknowledgements

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