

Progress Report - Year 1

An integrated vegetated treatment system for mitigating imidacloprid and permethrin in agricultural irrigation runoff

Agreement Number DPR 18-C0043
October 2018 – March 2019
UC Davis – Granite Canyon Lab

The goal of this project is to evaluate the efficacy of using an integrated vegetated treatment system (VTS) to mitigate chemical loading and related toxicity of the neonicotinoid imidacloprid and the pyrethroid permethrin. The VTS will incorporate a sediment ponding area to remove coarse particulates, a grass-lined ditch with compost installations to remove suspended sediment and insecticides, and a final treatment using granulated activated carbon or biochar to remove residual chemicals not eliminated by the previous steps.

Trials will proceed over two field seasons. In Year 1, the VTS will be evaluated using simulated irrigation events that contain spiked concentrations of imidacloprid and permethrin. In Year 2 the effectiveness of the VTS will be evaluated using multiple runoff events from insecticide-treated lettuce grown adjacent to the system. Results of the trials will be extended to growers and industry clientele in a final technical report, field demonstrations, conference presentations and a peer-review journal article during Year 3.

Task 1 – Simulated Irrigation Events (December 2018 – June 2019)

The effectiveness of the VTS will be evaluated by creating simulated irrigation events, and collecting and analyzing water samples at various points in the system. Year 1 irrigation events will be simulated using well water containing the insecticides and suspended particles using a spiking system similar to the experimental design used by Phillips et al. (2017). During each simulated irrigation event water samples will be collected at the inlet to the VTS, and before and after the carbon installation. These samples will be analyzed for the spiked insecticides and tested for toxicity to relevant invertebrate test organisms (the amphipod *Hyalella azteca* and the midge *Chironomus dilutus*). Trials will be replicated six times at a flow rate representative of those measured in field irrigation runoff (75 gallons/minute).

Level of Completion – Three field trial sampling events have taken place. Toxicity results are complete for two trials and chemistry results are complete for the first trial.

Task 2 – Irrigation Events with Lettuce Runoff (July 2019 – October 2019)

The effectiveness of the VTS will be further evaluated using irrigation runoff from a lettuce crop grown adjacent to the system. The crop will undergo conventional insecticide applications and standard irrigation events. Runoff water from these events will be directed into the integrated

VTS. Three runoff events will be evaluated for chemical concentrations and toxicity as described above.

Level of Completion – This task has not yet begun.

Task 3 - Education and Outreach (October 2019 – March 2020)

Results will be communicated through a technical report, extension materials that summarize the key findings of the project, field demonstrations, conference presentations, and a peer-reviewed journal article. The technical report will provide thorough cost estimates for design and construction of the VTS, including the purchase and disposal of the GAC. We will present results of our trials during the end of the second year of the project.

Level of Completion – This task has not yet begun.

Table 1. Project Timeline and Percent Completion

Task	Start	End	Percent Completed
1: Simulated Irrigation Events	12/1/18	6/30/19	50
2: Monitoring VTS Effectiveness with Lettuce Crop	7/1/19	10/31/19	0
3: Education and Outreach	11/1/19	3/31/20	0

Reference

Phillips BM, Anderson BA, Cahn M, et al. (2017) An Integrated Vegetated Ditch System Reduces Chlorpyrifos Loading in Agricultural Runoff Integ Environ Assess Manage 13:423-430