

USING DRONES TO CONTROL PESTS IN ALFALFA

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Introduction

Integrating drones (unmanned aerial vehicles, UAV) as a new method of pesticide application into existing commercial crop protection systems requires extensive research and comparison to conventional, proven application technology. Insecticide spray performance, expressed as efficacy against target pests, spray quality expressed as coverage, and chemical residue are three key criteria for evaluating the new technology. We investigated and compared these quantitative parameters between a multi-rotor electric UAV, conventional piloted airplanes, and a ground sprayer rig in three commercial alfalfa fields in California in 2020-21 for controlling armyworm and alfalfa caterpillar leaf-feeding insect pests, using the insecticide chlorantraniliprole (Prevathon[®] and Vantacor[®]).

Methods

2020. Drone vs Airplane: Prevathon[®] at 5, 10 gpa.

2021. Drone vs Ground rig: Vantacor[®] at 2, 5 gpa and Prevathon at 10 gpa (ground).

- Prevathon[®] and Vantacor[®] insect control (chlorantraniliprole) + surfactant.
- Vantacor[®], a highly concentrated formulation, to replace Prevathon[®] in marketplace.
- 2 gpa is minimum labeled rate for aerial application of Vantacor[®] insect control.



Six-rotor UAV sprayer, PV35X. Photo: I Grefenberger

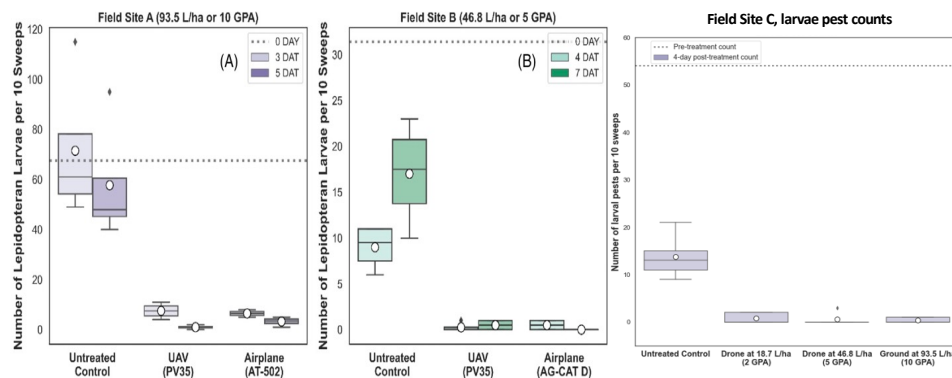
The results of this study provide confidence supporting the use of spray drones for pesticide application on alfalfa for controlling insect pests.

Results

- Effective and equivalent control of armyworms and alfalfa caterpillars was achieved in all three application methods (drone, airplane, ground rig) when delivering Prevathon[®] and Vantacor[®] insect control at the same active ingredient labeled use rate in different spray volumes (2, 5, and 10 gpa) on alfalfa.
- Insecticide residue levels and spray coverage were comparable and consistent between the UAV and airplane application methods across three sampling techniques as measured by residue levels on alfalfa foliage, insecticide recovery from filter paper sentinel targets, and spray coverage on water sensitive cards.
- Differences in droplet size and deposit characteristics were more variable for the UAV than airplanes based on analysis of deposition images.
- Prevathon[®] and Vantacor[®] is soft on natural enemies, including predators and parasitoid wasps.



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Conclusion

The results of this study provide confidence supporting the use of drones for pesticide application on agricultural crops. UAV application quality and crop protection performance were comparable to that of the conventional fixed wing airplane and ground applications. However, drone technology is new, and a bit more fine-tuning is needed with drones to ensure reliable crop protection. In particular, the droplet spectrum and the short-term fate of droplets from unmanned aerial spray systems may require further characterization and optimization.

Reference:

Li X et al. 2021. Comparison of UAV and fixed-wing aerial application for alfalfa insect pest control: evaluating efficacy, residues, and spray quality Pest Mngmt Sci, 77:4980-4992.