

# COVER CROP RESEARCH TAKES NEW TURNS

By Patrick Cavanaugh

*Editor's Note: This is part 1 in a 2 part series on the benefits of cover crops.*

Cover crops and how they affect the pest and beneficial populations in a vineyard, as well as their effect on nutrients, weeds, soil tilth and water have been the focus of many UC research projects over the past several years.

Cover crops have been reported as being the panacea for correcting various problems in vineyards but often that panacea is only speculation.

For instance, while cover crops have been cited as encouraging the population of beneficial insects that may in turn help reduce leafhopper populations, it has never been scientifically established.

Rachid Hanna, an entomologist and

postdoctoral researcher at UC Davis, has looked into this with some research focusing on two new angles concerning spiders

tive impact they have on leafhoppers. Hanna also pointed out that all the spiders found in their research vineyard were observed feeding on the various stages of leafhoppers.

In a Madera raisin vineyard, in 1992, where a spider vs. leafhopper relationship was documented, Hanna conducted a laborious and intensive study.

"We went into the vineyard and established plots where we tried to reduce the numbers of spider on the vine; we tried to exclude them," Hanna said. "Early in the season, before budbreak, we stripped the bark off of the experimental vines."

Hanna said several spiders species utilize the bark of vines as an overwintering

place, or as a place to hide. The vine trunk was also banded with stick-um (tanglefoot) to prevent spiders from climbing the exclusion vines. He also folded shoots up on the vine canopy to minimize shoot contact with the ground. Every 7-10 days, Hanna and a crew were in the vineyard for observations and destroying any spiders found.

The 36 exclusion vines had both a cover and a control (clean middles). The cover crop was oat mixed with common and purple vetch. The experiment included a cover crop with spiders on the vine canopy and a cover crop with spiders excluded from the canopy. The bare ground plots included vineyards with spiders and without spiders.

"We wanted to find out whether it was the cover crop or the spiders that caused fewer leafhoppers, as we observed in the previous year," Hanna said. "We wanted to



A close-up of a vetch-oat cover crop under investigation in a vineyard where Rachid Hanna's research took place.

and leafhoppers.

His research was sponsored by USDA's Sustainable Agricultural Resource and Education, California Tablegrape Commission, American Vineyard Foundation and UC IPM. Frank Zalom, an extension entomologist at UC Davis, has also worked with Hanna on this research.

Hanna first wanted to see what the relationship was between spiders and cover crops. And beyond that, if spiders were having an impact on leafhoppers.

Hanna said that their early research indicated that there were higher levels of certain species of spiders and fewer leafhoppers on covercropped vines compared to clean till vines.

These findings pointed to a possible affect of spiders on leafhoppers in that the more spiders there are, the more of a posi-

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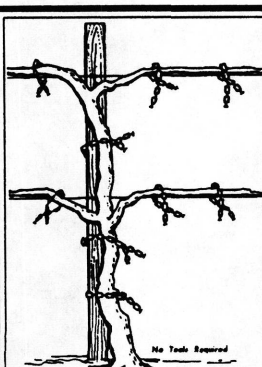


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partition out the factors that are strictly related to the presence of the cover, from those related to spiders.

Hanna found that during the first brood, there were about twice as many leafhoppers where he had excluded the spiders, compared to where he had not excluded them. But the findings were independent of the cover crop. "We found that it did not make any difference whether there was a cover crop or not during the first leafhopper brood," Hanna said. This was consistent with previous finding where the only effect of cover crops on spider was observed during July and August.

"Even when there is no cover crop and when there are enough spiders they can reduce early leafhopper broods," said Hanna. "We would have liked to have carried the experiment to the second brood, but we were unable to keep spiders out of the vines once the canopy was fully formed. We would have probably seen a greater connection between cover crops and spiders."

Hanna cautions, however, that the effect of cover crops on spiders and leafhoppers has not been seen in all of the vineyards that he has worked in. Hanna points out that factors such as vineyard age and pesticide-use history probably affects species composition of spiders and may be responsible for the variability in his observation regarding the relationship between cover crops, leaf-



An adult variegated grape leafhopper, the target insect of Hanna's research.

hoppers and spiders.

In another trial, Hanna (in cooperation with Dr. Andrew Corbett of UC Davis) wanted to find out why there seemed to be more spiders in some vineyards with cover crops. Over the past few years he's worked with a metallic marker called rubidium, a rare metal found in nature. "We sprayed the rubidium on the cover crop early in the season. We then trapped and sampled spiders and other insects in the cover and on the vines adjacent to it," said Hanna. He found that a significant number of spiders (which feed on insects) were marked with the rubidium.

"What happens is that the plants take up

the rubidium, insects feed on the plants and spiders feed on the insects, thus picking up the marker," said Hanna. "What we are demonstrating is that spiders do utilize food that is coming out of the cover crop. And maybe the presence of the food is increasing their populations and keeping the spiders on the vines longer."

Other factors such as temperature and humidity may also affect spider species composition and abundance, but Hanna thinks that these factors are not very strong and could not have caused the relationships he observed between cover crops, spiders and leafhoppers.

Hanna said that based on the rubidium concentrations, it appeared that some spiders had foraged for food in the cover crop and not just fed on marked insects in the vineyard canopy.

Hanna and co-workers are currently trying to further refine the rubidium experiments. They would like to see if this material can be used to determine the type and number of insects that spiders consume in nature.

Hanna cautions that there are several biological and environmental factors that he has been looking at that also affect leafhopper abundance in vineyards. "It is definitely not a straightforward system, but we are slowly, but surely putting together the pieces of the puzzle."

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