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Integrated Pest Management in Washington Viticulture: Prospects and Potential

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Perspectives

I have been a Washington State University entomologist with responsibility for viticulture for just on 18 months now. I came from the land down under where I was a Research Scientist in horticultural entomology with the New South Wales State government for almost 20 years. My qualifications, experience and successes in developing integrated pest management programs in Australian stone fruit, citrus and grapes give me the credentials, I believe, to improve pest management in Washington viticulture. My knowledge and experience certainly provide me with a unique perspective of current pest management practices in Washington viticulture and a credible vision of what can be achieved over the next few years to improve insect and mite control whilst reducing pesticide inputs and increasing sustainability.

Pressures

Since the early 1980's my research career has been powered by the need to develop pest management systems that depend more on biological and/or cultural control and less on chemical control. Political, economic and sociological pressures in Australia created and maintained this need. I see the same need today in Washington State as public pressure against pesticide residues mounts and the Federal Government continues restricting pesticide availability and use. The Washington grape industry must respond to these pressures and I believe it is well placed to do so.

Key Pests vs Induced Pests

Viticulture currently uses less pesticide than most other agricultural industries in south central Washington. For example, in 1999 insecticides were used on 97% and 99% of the peach and apple crops, respectively. In comparison, insecticides were used on only 40% of the grape acreage. Washington grapes do not have the number nor complexity of insect problems that Washington tree fruit has. In fact as I shall explain, I believe only leafhoppers and cutworms can be considered 'key' pests of grapes in Washington.

By 'key pests', I mean that they occur on grapes 'naturally' and often at a level that causes economic injury. I can hear you protest, "but, mealybugs, thrips and mites also occur naturally at damaging levels on my grapes!". Yes, they are a natural part of the Washington vineyard environment but they should not reach damaging levels, because in the absence of pesticides or other human interference (e.g.

removal of habitat), their populations are effectively regulated by predators, parasitoids and pathogens. To some extent, I would even include leafhoppers in this 'induced pest' group, but their natural enemies appear somewhat less effective. Cutworms, whilst not affecting a large proportion of the grape acreage in any season are a key pest, simply because they are a district-wide phenomenon and not subject to natural regulation on a local, farm level. Hundreds of thousands of moths can invade regions laying their eggs and producing damaging caterpillar populations the following season.

So if leafhoppers and cutworms should be the only 'bugs' grape growers should worry about, why do the others (mealybugs, thrips, mites) cause so much concern to so many growers? More importantly, how can we make these pests 'go away'?

The Australian Lesson

To demonstrate why I am so convinced of these bold assertions, I'd like to take you downunder to visit Australian viticulture and its pests. There is one key pest of Australian grapes, a leaf folding caterpillar that sometimes 'folds' bunches too. However, like the Washington cutworms, its occurrence is relatively localized and sporadic and so most growers don't have to worry about it. These growers don't apply any insecticides and they don't have any significant pests affecting their grapes. 'Affecting their grapes' is the key phrase here, because potential grape pests are around. There are mealybugs, thrips and mites in the environment and they can often be found damaging adjacent tree fruit crops which do have key pests and are exposed to insecticides. What happens when the grape grower has a leaf folder problem and sprays Lorsban? Yes, he is soon also monitoring and spraying for mealybugs and mites. Fortunately, 'soft' sprays and biological controls are now available for the leaf folder and Australian vineyards remain peaceful.

I have no reason to doubt that mealybug and mite problems will largely disappear in most Washington vineyards once pesticide inputs are either lessened, tailored not to be harmful to natural enemies or totally removed. Of course there will be some exceptions that may need special attention. Beneficial insect and mite populations in the Yakima Valley will not be optimal until the pesticides which are harmful to them, are reduced or removed from all crops.

Early Evidence in Washington

Monthly sampling of a random selection of conventional pesticide-input and low or no pesticide-input vineyards over two seasons, has provided evidence to support the above assertions. In general, vineyards exposed to multiple applications of insecticides/miticides had larger populations of spider mites and mealybugs, than those which received no insecticides/miticides. For example, during May-October 2000 our selection of conventional-input vineyards had a mean monthly spider mite infestation of 14% of leaves occupied. In contrast, mean monthly infestation of leaves in low input vineyards was 4%. The opposite relationship was seen in numbers of predatory mites, the dominant controlling agents of spider mites, which were more abundant in low input vineyards. In both seasons mealybugs were present at similar levels in low and conventional-input vineyards in May, but were not seen again for the rest of the season at the low-input sites. In contrast, they persisted at the conventional-input sites with significant numbers during August in a number of individual vineyards.

A Program for Improving Biological Control in Washington Vineyards

So how do we go about improving biological control in our vineyards? Simply put, this must involve a reduction in insecticide/miticide use and/or a change in the chemicals we use, or the way in which we use them. Please realize that there is an untapped resource around your vineyard, a complex of beneficial insects and mites which will happily go to work for you if you let them.

While pesticides are probably the main reason endemic biological control agents cannot successfully

colonize vineyards, the impact of individual chemicals on different natural enemy species varies considerably. Some pesticides (e.g. many fungicides) have little or no toxicity to many predators/parasitoids and are thus safe for use in biological control programs. Conversely, many insecticides, particularly those with a broad-spectrum of activity against pests, are highly toxic to many natural enemies. However, the information we need on the toxicity of currently used and new pesticides on the natural enemy fauna of central Washington, has not been available to date. Our program at WSU-Prosser is now changing this with a full time pesticide/beneficial arthropod bioassay subprogram now underway. This subprogram is being CO-funded by the Washington wine and grape industries as well as the State Commission for Pesticide Registration. The results from this research will provide an important plank for development of biological control and IPM strategies in grapes. In the future, grape growers will be able to consult a chart or table that will identify the compatibility of all pesticide choices with biological control.

Although I am confident we have the endemic natural enemy fauna available to deal effectively with most of the current vineyard pest problems, taxonomic, biological and ecological information on specific predators and parasitoids is either completely lacking or incomplete. To utilize natural enemies optimally, it is essential that we know a) what species we have and their relative importance to biological control of grape pests and b) what makes them 'tick'. Surprisingly, there are many gaps in our knowledge on what species are actually involved in regulating pests like leafhoppers, mealybugs and mites on grapevines in Washington.

Work at WSU-Prosser during the last 18 months has identified at least six predatory mite species involved in biological control of mites on grapes. The relative importance of these species remains to be determined. Similarly, we have also found three or four species of Anagrus wasps involved in controlling leafhopper populations. Again, determination of their relative importance awaits further research. Once we know which biological control agents are the most useful we can research their life histories, their ecology in and around vineyards and their biocontrol efficacy. This information may then allow us to optimize their effectiveness, by providing alternative hosts, refugia, overwintering sites, or minimizing disturbance through modification of cultural practices. A detailed knowledge of population and functional biology is also important for the development of accurate predator/parasitoid monitoring protocols.

Optimism for a Sustainable and Low Pesticide Input Future

I have an optimistic view of how pest management in Washington grapes will evolve over the next decade. I have seen enough in my 18 months here to know that future control strategies will depend more on biological and less on chemical control. I believe effective biological control strategies will be developed for mites and mealybugs and the role of biological control in managing leafhoppers will be greatly enhanced. Thrips present a bigger challenge although there is some evidence that these too can be an induced problem. Cutworms and some other pests like weevils and borers will always affect some of the crop and may require chemical treatment. The challenge here is to develop chemical control strategies that are non-disruptive to the vineyard ecosystem as a whole.

Development and implementation of improved IPM and biological control strategies for Washington grape pests will not occur overnight. It will be progressive, facilitated as much by the reduced chemical programs being developed in other agricultural industries (apples, hops, stone fruit etc), as by the provision of research results from the grape entomology program at WSU-Prosser and their adoption by grape growers. Naturally there will be skepticism by a lot of people who will feel extremely vulnerable if they don't apply insecticides. This is understandable and will take time and demonstrations of success of the low-input approach, to change.

On a personal note, I am excited to be part of the process of improving pest management in Washington viticulture. I do have a sense of 'déjà vu' having also been part of the process in developing the 'clean and green' profile of Australian viticulture. I have the opportunity of doing the same thing for Washington and I am sure success will be even sweeter the second time around!

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