Vineyard Pest Management News

an OSU Newsletter about Vineyard Arthropods and Projects

Oregon State University OSU

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MAR 2009

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Objectives of Proposed Pest Management Research for 2009

We believe that there are several underlying reasons for high pest mite numbers in Oregon vineyards. In order to better understand the impact of pest control regimes and interaction between biocontrol agents. Our research is planned by following the seasonal development of pest and beneficial populations under different vineyard conditions. The four objectives are:

1. Determine impact of fungicides on beneficial mites and pest mite populations.
2. Optimize 'rescue' sprays for pest mite management.
3. Measure the impact of herbivore-induced plant volatiles (methyl salicylate) on key natural enemy populations.
4. Describe the abundance and diversity of beneficial organisms in vines and cover crops.

Sample winter shoots to determine SSS management

Many growers are currently pruning which is an ideal time to collect shoots from areas in your vineyard to see if buds and other vine tissue have eriophyid mites that are associated with short shoot syndrome. Research at OSU has found that SSS and eriophyid mite infestations are directly linked.

Wooly bud stage treatments result in decreased SSS symptoms. We encourage growers who have had SSS during previous seasons to take shoot samples now, while the vines are dormant. This will determine mite infestation levels and help to plan a management strategy.

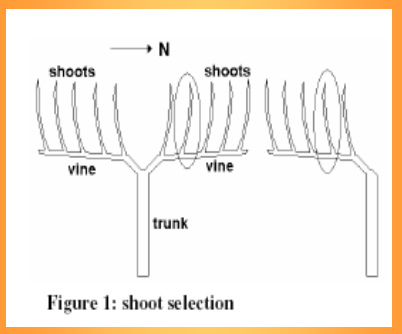

Figure 1: shoot selection

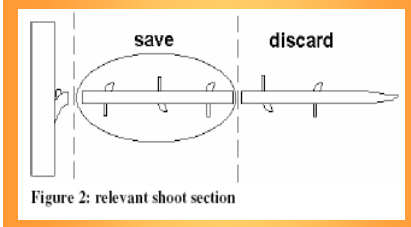

Figure 2: relevant shoot section

How to take vineyard samples:

Bud and rust mites are microscopic. Infestations can be verified by sampling during the late dormant period during pruning. Recommendations regarding control options can be made only after infestations have been verified. Collect samples from previously affected vineyards as described below. Area size to sample can be between 1 and 4 acres.

1. Collect the basal section (approx. 4 nodes) of one shoot from each of 40 evenly distributed vines in the affected vineyard area, Figs. 1 & 2. Discard the distal section.
2. Place shoots inside clearly marked plastic bags (Fig. 3). Be sure to include the following details: date, cultivar, year planted, location in field, contact name and address, and other pertinent information that might help researchers understand the problem (e.g., whether vines had symptoms before).
3. Refrigerate samples and keep out of direct sunlight. You can hold samples for as long as 2 weeks before submitting them for analysis.
4. **Send samples to** Vaughn Walton, see address listed above.

Fig. 3. Ideal shoot sample size to be analyzed for bud mite infestation.

Need more information on Short Shoot Syndrome and Symptoms?

For a detailed description of SSS, see http://extension.oregonstate.edu/catalog/pdf/em/em8944-e.pdf

For symptoms diagnosis of SSS, see http://extension.oregonstate.edu/catalog/pdf/em/em8975-e.pdf

We are currently looking for **vineyard sites to research in the following 2009 season. These include newly planted, young vineyards, weakly-established vineyards or those that have low vigor or exhibit weak growth in the past. Such sites may be more prone to mite infestations.

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Minimize dose and adequately time fungicides

Fungicides such as sulfur and stylet oils are known to have a negative impact on key beneficial organisms such as predatory mites. These compounds are often used in vineyards in the Pacific Northwest. Trials are planned to continue during April 2009 through 2010.

Impacts of fungicide applications will be determined by timing sprays based on detection and quantification of airborne *E. necator* inoculum in spore traps using PCR analysis in combination with powdery mildew models. Trials are planned in collaboration with Walt Mahaffee at two commercial vineyards with evidence of over-wintering on grape leaf rust mite, *Calepitrimerus vitis* (Nalepa) . Six fungicide spray regimes will be applied at 10-21 day intervals.

Powdery mildew severity and predator and pest mite densities will be assessed. Samples of resident cover crop will be taken before and after each spray application in order to determine movement of predominant predator mite (*Typhlodromus pyri*)and other beneficial arthropods due to fungicide application.

Many growers believe that lower rates of sulfur applications will play less of a detrimental role on key natural enemies such as *T. pyri*, the predatory mite.

Additional 2009 treatments include:

(1) **Low Dose Sulfur** (3 lbs): To determine if a low dose of sulfur can control powdery mildew and reduce pest mites; and ultimately have less of an impact on predatory mites and other beneficial insects.

(2) **Reduced Sulfur Use** – To see if less frequent sulfur applications benefit pest and beneficial balance in vineyard. PCR spore-traps will determine when first spray will be applied.

Measure toxicity effect on the predatory mite, T. pyri

Laboratory bioassays are being conducted to determine impact of a fungicide on direct mortality and indirect effects such as reproduction performance on the predominant predator mite, *Typhlodromus pyri*.

Precise pesticide concentrations and volume were applied using a Precision Potter Spray Tower at the OSU laboratory. Test substances include: several formulations of sulfur, stylet oil, three classes of synthetic fungicides and whey powder, an alternative 'soft' fungicide.

To date, results for sulfur (Cosavet) 4lbs/a, Pristine 12.5oz/a and whey powder 10lbs/a show percent mortality to be less than 15% and 10% for *T. pyri* adult females and juveniles, respectively. Mortality less than 50% is considered to be harmless according to IOBC/ WPRS classification . However additional analysis will be conducted to determine lethal concentration values once all bioassays are completed. The mean reproduction rate (# eggs/female over 7days) ranged from 4.04 to 5.21 for tests using adult females and 2.97 to 3.93 for tests starting at the juvenile stage (0-3 days). Interestingly, the percent reproduction reduction for the sulfur treatment was 24.4% less than the control group, indicating a decrease in reproductive performance for juvenile mites in direct contact with sulfur.

These impacts may however be much more pronounced if sulfur applications are made repeatedly during the season. Also sulfur may change the behavior of beneficial mites in a negative way by causing irritation and movement away from pest mites. Their pest mite finding ability and feeding efficiency may also be decreased.

T. pyri is being reared and used in experimental units consisting of one bean leaf placed in a glass Petri dish with a barrier to prevent mite escape.

Identify 'best' pesticide and timing for mite control

Efficacy spray trials will be conducted in two vineyards with known eriophyid pest mite infestations in 2009. We will focus on seven treatments timed at late dormancy and late summer control of pest mites:

(1) Untreated control
(2) Two sprays of Sulfur (4.5 lbs/a +1% surfactant); 1 at the onset of wooly bud and one 10-14d later
(3) Two sprays of Abamectin; one at the onset of wooly bud and one 10-14d later
(4) Two sprays of oil; one at the onset of wooly bud and one 10-14d later
(5) One Sulfur spray during mite movement in August
(6) One Abamectin spray during mite movement in August
(7) One standard miticide (e.g., Envidor) during mite movement in August

Wooly bud, bud break or August application for control of rust mites?

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Impact of herbivore-induced plant volatiles

Research shows that the use of herbivore-induced plant volatiles (HIPV's) may lead to emigration of pest arthropods and immigration of beneficials.

Trials were conducted during 2008 at a commercial vineyard in the Northern Willamette Valley to test the ability of methyl salicylate (Predalure®, a HIPV), a natural plant volatile, to attract and retain populations of *Typhlodromus pyri*, the predatory mite, and other vineyard natural enemies. This vineyard was however sprayed with sulfur repeatedly, which may have negatively affected beneficial mite populations. **No** *T. pyri* were found in baited or controlled blocks in 2008 preliminary trials. *T. pyri* was however found in surrounding blackberry hedges that were not sprayed.

We believe that the use of these compounds show promise and we plan to continue testing methyl salicylate (MeSa) lures in the field over the 2009 and 2010 seasons. In 2009, MeSa field trials will be carried out in in two other Northern Willamette Valley vineyards that showed continued presence of both pest and beneficial mites during 2008. Treatments will include "un-baited" blocks (approx. 156m^2 in size), "baited" low density MeSa lures (Predalure®) or "baited" high density MeSa lures). The treatments will be replicated three times in each vineyard. We will use sticky traps to measure immigration of general predatory arthropods. Leaf samples (32/block) will be collected to assess pest mites and beneficial populations.

In addition, we are currently conducting laboratory assays using a y-tube olfactometer to assess the behavioral response (attraction, no attraction) of *T. pyri* towards methyl salicylate odors (see picture above).

Effect of field-applied fungicides on pest mites and beneficials

Fungicide spray trials were conducted in western Oregon vineyards over two seasons for control of powdery mildew and to study the timing and effect of seasonal treatments (sulfur, synthetics, and whey) on grape leaf rust mite, *Calepitrimerus vitis* (Nalepa), and beneficial insects and mites.

- Sulfur early; Synthetics late
- Synthetics early; Sulfur late
- Rotation of Sulfur & Synthetics
- Sulfur only
- Rotation of Synthetics
- Rotation of Milk (Whey) & Sulfur

Trends from two season's field work indicate negative impact from repeated sulfur use however further analysis needs to take place. In field trials restricted sulfur use during the early part of the season resulted in lower pest mite numbers without severe impact on *T. pyri* populations.

Pest Alert: Leafroll virus and mealybugs, a dangerous mix

Grapevine leafroll viruses (GLRaV's) occur throughout California, Oregon and Washington grape growing regions. This group of viruses is present worldwide. Current infestations in Oregon vineyards are low (~4.4%) . However, infected vineyards are in all regions of the state. Many likely are infected through unclean plant material, not necessarily infected in-field.

When leafroll and mealybugs occur in vineyards simultaneously it can be a dangerous mix, because mealybugs can transfer (vector) the virus to vines that are virus-free-leading to increased infection levels.

It is widely known that widespread virus infection in Oregon vineyards will severely impact crop quality. Vine leafroll and grape mealybug, *Pseudococcus maritimus*, have been found in Southern and Eastern Oregon, Washington, and Idaho. Virus transmission has been demonstrated to be vectored by four mealybug species in West Coast vineyards; vine, grape, obscure and longtailed mealybugs (*Planococcus ficus*, *Pseudococcus maritimus*, *Ps. viburni* and *Ps. longispinus*).

As a first step to determine the origin and spread of virus in Oregon vineyards we believe that the mapping of spatial distribution of virus-infected vineyards. Need to be done. This information will lead more informed future decision making.

Resident beneficials on vines and cover crops

In 2007 and 2008, small developing shoots were visually inspected for arthropod presence early in the season by examining 16 shoots per plot x 3 replications. As plants grew, 48 developing leaves were visually examined biweekly per treatment in the field for arthropods beginning with a pre-treatment assessment in early April and continuing until grape harvest in September and October, respectively.

As shoots grew taller (>10-20 cm), motile natural enemies were enumerated from canopy shake samples at 14-day intervals. Dislodged arthropods were identified and counted on a 1 meter^2 white cloth. The pest management research has demonstrated the value of abundance and diversity of the beneficial organisms contributing to pest reductions.

The most common inhabitants in the Oregon vineyards include: ladybird beetles, predatory bugs such as the minute pirate bug, green and brown lacewings, six-spotted and black hunter thrips, micro-parasitic wasps, four spider families, and two main predacious mites.

Sulfur applications may negatively affect juvenile *T. pyri* reproduction potential, which comprise a relatively large portion of the total population. Field and laboratory work is ongoing and aimed to minimize environmental impact, decrease reliance on pesticides and conserve resident biocontrol agents.

A Special Thanks to **Patty Skinkis, OSU Viticulture Extension Specialist, for her input and edits to this publication.