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Tree and Vine Newsletter

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January 2011

Grapevine Canker Disease: Our Leading Vineyard Pest Problem

by Chuck Ingels, Paul Verdegaal, Doug Gubler, and Ria DeBiase

For many years, Eutypa dieback, caused by the fungus *Eutypa lata* was thought to be the main dieback disease of grapevines, causing death of spurs and cordons. The disease resulted in a gradual but severe decline in yields. Although Eutypa is still present, its effects are complicated by other aggressive pathogens, mainly species in the Botryosphaeriaceae family, some of which are able to colonize wood tissue three times faster than *E. lata.* Nine *Botryosphaeria* species have been isolated from grapevine cankers from California. The disease they cause is referred to as "bot canker".

Symptoms. Like Eutypa dieback, typical symptoms caused by bot canker on grapevines in California are the wedge-shaped canker in cross-cut cordons and dead spur positions. Eutypa dieback causes stunted shoots and leaves that are chlorotic, tattered, and cupped, but bot canker produces no foliar symptoms – i.e., the spur dies before spring push. Both diseases can be found on vines about 7-8 years of age and older or are common in vineyards older than 10 years. In susceptible varieties infection may occur after only 4-5 years when large cuts may be made during pruning.

Spore Release. *Eutypa lata* overwinters in diseased wood and produces fruiting bodies called perithecia under conditions of high moisture (areas with rainfall exceeding 16 inches). Sexual spores (ascopores) are discharged from perithecia soon after rainfall. Infection occurs through pruning wounds, which remain susceptible much longer in December than in February. Pruning wounds can be susceptible to infection by *E. lata* for 7 weeks or more in late fall, but this varies with the time of pruning, size of the wound, and age of the wood pruned. With *Botryosphaeria*, asexual spores (conidia) are produced from black fruiting bodies called pycnidia during the entire season, including and perhaps especially in spring when temperatures are more conducive for sporulation. Another important source of pycnidia may be the shredded prunings or portions of arms and spurs left in the vineyards.

Varietal Susceptibility. Wine grape varieties differ in their susceptibility to these diseases. In a 2003-2004 California survey, *Botryosphaeria* was isolated most often from Sauvignon Blanc (64% recovery from cankers tested) followed by Chardonnay (55%). Cabernet Sauvignon had the most cankers with *Eutypa* (58%). Petite Sirah is extremely sensitive to infections as is Chenin Blanc, while Zinfandel and Syrah are moderately susceptible.

Control Strategies

Training and Pruning. Once a vine is infected, the canker should be completely removed in order to reduce spore production, and the wood should be removed from the vineyard. In most cases, this means removing a portion of the cordon and retraining a cane to recreate the cordon. A cut of this size should be made no earlier than March, and preferably around bud break. On older vines, doubling of spurs to replace lost spur positions and extensive cordon retraining or use of "kicker canes" may be necessary to maintain production.

There are a few key strategies for preventing canker diseases. One is to use a vine training method that reduces or eliminates the amount of cuts made during winter, such as minimal pruning or mechanical pruning in the late dormant period. Research conducted in Sacramento County in the late 1990s showed that minimal pruning and mechanical pruning resulted in far less Eutypa dieback than spur pruning, while maintaining yield and fruit quality. Cane pruning also significantly reduced incidence of dieback. However, these training methods have not been widely adopted. In the case of machine, box or minimal (hedge) pruning, winemakers have been reluctant to accept these as standard practice, while cane pruning requires skilled labor and an extra operation of cane wrapping.

Another method is double pruning – mechanically pre-pruning to about 12-14 inches in fall or early winter followed by hand pruning before bud break. By removing most of the vine brush, the double pruning can speed up the final selective pruning, thus allowing growers to prune large acreages more quickly. Research in the North Coast showed that neither *E. lata* nor species of Botryosphaeria could be recovered from farther than 1.5 inches below the pruning cut. When pre-pruning occurred in winter months, *E. lata* was recovered from 40-65% of canes, compared to only 7-10% when pre-pruning took place in February. But the hand follow-up pruning removes these infections.

When possible, prune in dry weather, and preferably when rain is not predicted for a week or more. The susceptibility of pruning cuts to infection declines over time, so a week of dry weather after pruning should result in less infection than when rain occurs the following day. Of course, this may not be practical on large acreage, where pruning must be done through most of the winter. Pruning less susceptible varieties first may be one strategy. Also, results from an unpublished study in the 1980s suggested that late pruning and shoot thinning in the establishment of young vines can significantly reduce later onset of severe dieback.

Late pruning reduces exposure of wounds to rain events. It provides a good deal of control in a currently infected vineyard since spores are depleted over the course of the winter. It is a wise IPM strategy to prune as late as possible.

Chemical Fungicides. Benlate (benomyl) was registered for 30 years as a pruning wound protectant for the control of *E. lata*. It required painting cuts to prevent infection. However, it was removed from the market in 2001, leaving growers with no alternative treatments.

Research conducted in northern California tested registered products, applied as paste, for use in preventing infection and dieback. Results showed the difficulty of using chemical treatments to control a broad spectrum of taxonomically unrelated fungi. Biopaste (5% boric acid) and Topsin M WSB were shown to provide excellent control of *E. lata*. However, Biopaste did not perform as well against *Botryosphaeria* species. Cabrio EG was an effective fungicide against the Botryosphaeriaceae group, but was the least effective fungicide against the other species. The best overall product was Topsin M, which has the same mode of action as Benlate, and both are systemic fungicides.

Tractor-applied fungicides were the aim of a study in Napa County in 2008-09. Chardonnay vines were sprayed within 12 hours after pruning to the point of drip with single applications of Enable 2F, Rally 40W, Topsin M, and a combination of all three. Pentra-Bark was used on all treatments at a high label rate to ensure maximum penetration of the cork cambium. Pruning wounds were separately inoculated 2 days after treatment with several canker-producing pathogens. Results from both years showed that Enable + Rally + Topsin M was the most effective treatment for all pathogens, although Rally alone was as effective against *E. lata* as the combination.

A limitation of fungicide formulations is that they do not offer full protection for the entire period of susceptibility of pruning wounds. These formulations may be easily washed off with rainfall, or simply degrade before significant rainfall ends and require reapplications (increased cost for little benefit).

One thing to consider is that applications of Rally made to protect pruning wounds *must* be counted as part of the seasonal limit of 24 oz/ ac.

Biofungicides. Biocontrol agents have been tested as an alternative method for control of *E. lata.* and some other organisms. *Bacillus subtilis*, *Fusarium lateritium*, and *Cladosporium herbarum* all showed some potential activity in limiting the establishment of the pathogen. However, unlike chemical applications, which have an immediate protective effect, maximum protection from biocontrol agents requires colonization of the surface of the wound. So there is a window of susceptibility after treatment, until the biocontrol agent is established well enough to prevent development of *E. lata* in the wounded tissue. Biocontrols tested as alternatives to fungicides showed mixed success, but both *F. lateritium* and *C. herbarum* worked well when they were applied 2-3 weeks before infection occurred.

In research in South Africa, fresh pruning wounds were treated with benomyl, two Trichoderma-based commercial products, *Bacillus subtilis*, and *Trichoderma* isolates, USPP-T1 and -T2. Seven days after treatment the pruning wounds were spray inoculated with four Bot. species, *E. lata*, and other pathogens. After 8 months, *Trichoderma*-based products and isolates in most cases showed equal or better efficacy than benomyl, especially USPP-T1 and -T2. The isolates demonstrated a very good ability to colonize the wound tissue. In California studies, Trichoderma resulted in only 58% control in two years of testing.

Conclusions

The best strategy is still to prune as late as possible and minimize wounds greater than 5/8" diameter, or the size of a dime. When the wound diameter is doubled, susceptible surface area is increased 4X. Also, shoot-thin young vines during the early years to reduce as much as possible the number of wounds at pruning time. Coupled with late pruning is the tractor application of Rally and Topsin M within 24 hours of pruning. This is a rapid treatment that can he applied quickly if a storm is forecast after late pruning.

References

Gu, S., Cochran, C., Du, G., Hakim, A., Fugelsang, K., Ledbetter, J., Ingels, C., Verdegaal, P. 2005. Effect of training-pruning regimes on Eutypa dieback and performance of 'Cabernet Sauvignon' grapevines. J. Hort. Sci. Biotech. 80(3): 313-318. http://www.lodiwine.com/Gu_et_al_Pruning_Training_and_Eutypa.pdf

Gubler, W.D., Rolshausen, P.E., Trouillas, F.P., Urbez, J.R., Voegel, T., Leavitt, G.M., and Weber, E.A. 2005. Grapevine trunk diseases in California. Practical Winery & Vineyard, Jan./Feb. 2005. http://www.practicalwinery.com/janfeb05/janfeb05p6.htm

Kotze, C. , Fourie, P. H., and Van Niekerk, J. M. 2008. Biological control of the grapevine trunk disease pathogens: Pruning wound protection. Master' Thesis. https://scholar.sun.ac.za/handle/10019.1/2117.

Rolshausen, P. E., Urbez-Torres, J. R., Rooney-Latham, S., Eskalen, A., Smith, R. J., and Gubler, W. D. 2010. Evaluation of Pruning Wound Susceptibility and Protection Against Fungi Associated with Grapevine Trunk Diseases. Am. J. Enol. Vitic. 61:1, 113-119 (2010) http://www.cdfa.ca.gov/plant/ppd/PDF/RolshausenEtAl2010.pdf

Weber, E. A.; Trouillas, F. P.; Gubler, W. D. 2007. Double pruning of grapevines: a cultural practice to reduce infections by *Eutypa lata*. Am. J. Enol. Vitic. 58:1, 61-66. http://www.ajevonline.org/cgi/content/abstract/58/1/61.

New Super Pest: Brown Marmorated Stink Bug

Another new pest has arrived on the scene that has the potential to blow IPM programs out of the water, at least initially. The brown marmorated stink bug (BMSB) is not only a huge threat to California agriculture, but is also a nightmarish nuisance pest, gathering in buildings and around outdoor lights in such numbers that manure shovels and 5-gal. buckets are required to dispose of them. The insect has a strong, unpleasant odor when disturbed. I recently attended a talk at UC Davis by Tracy Leskey, USDA Research Entomologist in West Virginia, who has focused on this pest in the last 2 years; this article is mostly based on that talk.

Origin and Spread. BMSB is native to East Asia, where it is a pest but is kept under fairly good control by natural enemies. Pests often arrive in the US without their natural enemies, so populations are initially very high until sometimes being brought under control by introduced natural enemies. However, conditions may not always be as conducive for the natural enemies, and the presence of many more crop species in California may give pests a wider host range.

The pest was identified in Pennsylvania in 2001, and began causing widespread crop damage in 2009. It has now been found in 29 states, and is resident in Oregon from Portland south to Corvallis and east to Hood River. It has been present in Los Angeles since 2005, and it was intercepted by CDFA in a storage facility in Vallejo, CA in 2005. The pest is an excellent hitchhiker, transferring to other areas very easily. It may have been introduced to the US by way of cargo shipments from Asia.

Characteristics. The name "marmorated" is from the Latin word for marble, "marmor"; the back of the adult has a marble-like pattern. It can be identified by the white bands on antennae & legs. Also, the mouthparts extend beyond the third pair of legs. BMSB has up to 6 generations per year, although in West Virginia there are only two. It has large overwintering populations, even in cold climates.

Crop Hosts. The many hosts of BMSB include tree fruits including apples, pears, and cherries; small fruits including grapes, and fruiting vegetables including corn, tomatoes, peppers, and legumes. Both adults & nymphs feed on immature and ripening fruit, causing cat-facing on the surface and internal injury. In 2010, apple and peach orchards have sustained 50-70% damage, with a large number of orchards having complete crop loss. In some cases, fruit has gone into cold storage apparently healthy but injury develops in storage. BMSB moves into crops from adjacent areas, but unlike most stink bugs, it is able to reproduce within the orchard as well. In grapes, berries collapse and rot increases, and tasters have been able to detect stink but odor in wines with 10 bugs in a "lug" of grapes. BMSB has also done severe damage to ornamentals and nursery crops, feeding through the bark of young trunks.

Monitoring. No truly effective monitoring tools have been developed yet. Tall, baited pyramid traps placed on the ground are used for capture, and black and dark green have been found to be the most attractive to BMSB, probably because they resemble a tree trunk. These traps catch far more than standard Asian traps placed in the canopy. The standard bait used is methyl decatrienoate, and whereas 50 mg lures are typical for standard stink bugs, trap catches increased up to 450 mg. Average catches of over 400 adults/trap/week were recorded; one trap had over 1,500.Because trap counts greatly increase late in the season, there is potential for attract & kill or mass-trapping strategies in late summer. There is also potential monitoring with light and pheromones, as the aggregation pheromone has been identified.

Insecticides typically used for stink bug control are may not work as well on BMSB. In lab and field tests, Dr. Leskey has found that several neonicotinoids and pyrethroids knock down and paralyze adults but then they recover in the days following treatment. In lab tests, only the OP Lannate (methomyl) provided high mortality, and the pyrethroid Danitol (fenpropathrin) had 50% mortality. She also found that mortality of these products dropped dramatically when adults were subjected to treated and dried foliage. Since there is constant movement from adjacent areas, residual pesticide will be required for effectiveness. However, repeated use of such pesticides would kill beneficials and affect IPM programs.

Upcoming Meetings (More info in next newsletter)

1. Pear Research Meeting. Mon., Jan. 31, 2011. Walnut Grove Library (see agenda on next page).

2. Organic Tree Fruit Meeting. Wed., Feb. 16, 2011. Includes featured speakers – Harold Ostenson (cherry consultant and former organic program manager, Stemilt Growers) and David Granatstein (Washington State Univ. organic researcher)

3. Clarksburg District Wine Grower Meeting. Thurs., Mar. 3. Jean Harvie Community Center, Walnut Grove

2011 SACRAMENTO RIVER DISTRICT PEAR RESEARCH MEETING

Monday, January 31, 2011

Walnut Grove Library Meeting Room, 14177 N. Market St., Walnut Grove, CA 95690

(Same building as Ag. Commissioner Office in Walnut Grove)

(a wheelchair accessible facility)

3.5 hours DPR approved

4.5 hours Certified Crop Advisor credit applied for

Sponsored by:

UC Cooperative Extension, Calif. Pear Advisory Board, and the Pear Pest Management Research Fund

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Eating Lunch?

Please let us know by Jan. 26 if you plan to eat lunch at this meeting and how many.

Contact Chuck Ingels, (916) 875-6527 or email: caingels@ucdavis.edu

(There is no charge for the meeting or lunch)

Agenda

8:00 Refreshments

8:25 Welcome and announcements

8:30 Growing the California Pear Sustainability Story: Continued Practices Program Implementation
Daniel Sonke & Andrew Arnold – SureHarvest

10:00 ***--Break--***

Entomology

10:20 Why Puffers Work: Determining the Effects of Residual Releases on the Effective Area of Control for Codling Moth
Steve Welter – UC Berkeley

10:40 Outreach to Preserve Pheromone Mating Disruption Programs in California and Oregon Pear Orchards; Supplemental funds for Western IPM Grant
Rachel Elkins – UCCE Lake & Mendocino Counties

Plant Pathology

11:00 Evaluation of New Bactericides for Control of Fire Blight
Jim Adaskaveg – UC Riverside

11:20 Evaluation of Potential Components of a Fire Blight IPM Program
Rachel Elkins – UCCE Lake & Mendocino Counties

11:40 Integrating Variable Rates of Kocide 3000 in a Fire Blight Management Program
Chuck Ingels – UCCE Sacramento County

12:00 ***Lunch – Provided by CPAB and PPMRF***

Horticulture

12:45 Evaluation of Potential New Size Controlling Rootstocks
Rachel Elkins – UCCE Lake & Mendocino Counties

1:05 1) Efficient Nitrogen Fertilization for Control of Vegetative Growth, Cropping and Fruit Quality
2) Optimizing Fertilizer Practices Based on Seasonal Demand and Supply
Kitren Glozer – UC Davis

1:45 Finding Cost-Effective Weed and Nutrient Management Practices in Organic Pear Orchards
Chuck Ingels – UCCE Sacramento County

2:00 Adjourn