Small Fruit News

the Southern Region small fruits consortium

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Clemson University
NC State University
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Disease and Insect Control

Crown Gall: A Primary Bacterial Disease of Wine Grapes in the Southeast

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Crown gall is a major bacterial disease associated with wine grape production in the Southeast. Current losses to crown gall are largely equivalent to those from Pierce's disease within the major wine-grape production region of Georgia. Therefore, control measures should be addressed especially in the planning phase of vineyard establishment.

Crown gall is caused by *Agrobacterium vitus*, and results in destruction of the nutrient and water flow throughout the vine. When crown gall actually results in vine death, the symptoms can be confused with those of Pierce's disease (see Small Fruit News, Vol. 2, Issue 1). However, closer inspection will reveal the presence of an advanced gall, usually near the soil line or graft union (Figure 1). The bacterium which causes crown gall can reside in the soil, but where grapes have not been grown before, it is generally not present. However, the bacteria can reside within grape tissue, without producing any symptoms. Therefore, it is easy enough to introduce the bacterium into a vineyard during establishment. Resistance is found in some varieties and rootstocks, but *Vitus vinifera* cultivars are generally susceptible to crown gall.

Galls are produced by resident bacteria following an injury; freeze-events constitute a common injury observed in southeastern vineyards. Plant cells which respond to the wound as part of the healing process are the ones which are infected. Once an injury occurs, the bacteria inject bacterial DNA into these host cells; this DNA directs the overproduction of plant hormones -- resulting in production of a gall. Galls are produced wherever wound sites occur. Most often, the galls occur on the lower portions of the trunks, at graft unions, or at disbudded points on the rootstock. Aerial galls, those that develop on canes, can also be found at wire rubs or other injury points. Galls do not form on the roots, but root necrosis can occur from *A. vitus* infections.

Control methods are limited for crown gall. Since the bacterium can be disseminated in healthy-looking propagation material, the use of disease-free material is an imperative. Shoot-tip propagation or use of hot-water baths have been used to establish disease-free propagation material. Prevention of freeze damage is important, since the development of crown gall is closely correlated with freeze damage. Any techniques

or management practices which reduce freeze damage can therefore be of some value in preventing crown gall.

Figure 1. Gall near the graft union of a *Vinifera* grape vine caused by *Agrobacterium vitus* (Photo courtesy of Greg Shephard; Lumpkin County, GA).

Site selection can help; avoid planting vineyards on wet, heavy soils, in low areas with a northern exposure. In addition to prevention of cold injury, cultural practices should include avoidance of any injury to the base of the vine.
Dead vines should be removed from the vineyard and destroyed; as much of the root system as possible should also be removed. The bacteria can survive for several years in remaining debris. The effectiveness of this practice will depend on the amount of debris remaining and the breakdown of the debris (related to numerous soil and biological factors).

Multiple trunk systems are also of value. Galled trunks can be removed while production is maintained on non-galled trunks. New trunks are established from suckers.

Where nematode tests indicate the need for control prior to vineyard establishment, nematode management can help reduce galling. Once the vineyard is established, nematode management is not easily accomplished, so initial nematode samples are important.

The literature is replete with confusion concerning use of *Agrobacterium radiobacter* as a biocontrol for crown gall. Galltrol® (AgBioChem) is an EPA-registered biological control product. The product consists of bacteria (strain K84) grown directly on petri dishes. Grapes are <u>not</u> listed on the label. Norbac 84C® (New BioProducts, Inc.) is also a registered product of strain K84. A genetically modified strain of K84 is strain K1026, and it is sold as NoGall® (New BioProducts, Inc.). In both cases, grapes are <u>not</u> listed on the label. Some literature, state recommendations (web sites), refer to use of *A. radiobacter* for biocontrol of crown gall in grapes. However, it is unlikely that current products will be active against *A. vitus*, which is the primary crown gall organism on grapes.

Chemical control measures are very limited. Some producers are using kerosene to kill galled tissue. According to the "Compendium of Grape Diseases," eradicants, such as kerosene, will kill gall tissues, but new galls may develop the following year. Some producers have reported good results, and some producers have reported death of treated vines. Kerosene does not have an EPA registration. Gallex® (AgBioChem) is an EPA-registered product. Active ingredients are listed as 2,4-Xylenol and meta-cresol. It is used in similar fashion to kerosene (i.e. painted on galls). If utilized, the product is most effective on small galls. If a gall completely surrounds a vine, the gall must be treated in two stages. Half the gall is treated, and the remainder of the gall should be treated once new tissue has formed on the initially-treated side. Treatment of the entire gall will girdle the vine, resulting in vine death.

However, crown gall can be managed. Given the right site locations and proper preparation ahead of vineyard establishment, minimal problems may be encountered for both diseases. However, it is likely that even the best sites will experience some problems with these diseases. Therefore, it is an imperative that producers are aware of the issues, symptoms, and controls for these diseases if they are to be successful in wine grape production.

References:
Burr, T.S., Bazzi, C., Sule, S., and Otten, L. 1998. Crown gall of grape. Biology of Agrobacterium vitis and development of disease control strategies. Plant Disease 82:1288-1297.
Varela, L.G., Smith, R.J., and Phillips, P.A. 2001. Pierce's Disease. University of California Agriculture and Natural Resources Publication 21600.

Alternative Hosts - Vacation Spot for Spidermites

Tony Melton
Clemson University

Its vacation time again. However, this year because of problems like spidermites not very many strawberry growers have the finances to go on vacation. While you think about vacationing look around your farm to find plants where spidermites may so-to-say vacation for the summer and wait on your strawberries to be planted in the fall.

This spring one grower had two separate fields. One was devastated by spidermites the other unaffected. I looked for what made the difference. Both were planted at the same time using the same plants; however, the devastated field had a windbreak of red cedar trees. On close inspection the cedar trees were infested with spidermites. Another grower who has perpetual spidermite problem has an ornamental nursery beside his strawberry field. Spidermites are a continual problem in his nursery.

Therefore, the moral of the story is to look for alternative spidermite hosts. Unlike strawberries, many alternative hosts can be treated with systemic chemicals like Di-syston. which are very safe on beneficial insects because they only kill what is feeding on the plants. Remember to always follow label directions.

Elevate registered for grey mold control

Guido Schnabel
Clemson University

Elevate, a new fungicide with Fenhexamid as active ingredient, was recently registered for the control of *Botrytis cinerea* (grey mold) on bushberries, caneberries and grapes. In the southeastern United States we have been using this compound for grey mold control in strawberries for some time now with great success. The additional registration of Elevate for brambles comes in handy especially because Benlate will not be available for disease control in brambles any longer. The product should be used at 1.5 lbs/ac (with a maximum of 6 lbs/ac per year) and should be rotated with other botryticides to avoid resistance development. The PHI is 0 days!!!

Bramble Chores

Summer 2002 Work Schedule for Bramble Growers

Gina Fernandez
North Carolina State University

Pruning and training. Prune out spent floricanes after they have produced fruit, do not thin out primocanes until the winter. Tie primocanes to trellis. Prune tips of floricanes if lateral branching is desired.

Weeds. Control fall weeds in late summer/fall, see NC Ag Chem manual for recommendations.

Planting. Prepare ground for fall planting. Cover crops and pH adjustments should have been made in spring. Plants can be set in Oct-December in south and eastern parts of the state. You won't see much above ground growth this fall, but fall planting enables the plant to establish a good root system and allows for more growth next summer. Make sure you get virus-

indexed plants from a reputable nursery. Have water available for fall planting.

Harvest. Pick Berries in the early to mid morning. Stop harvest by noon to enable fruit to have a longer shelf life. Store fruit at 33F and 95% RH for maximum shelf life. Use evaporative cooling in the late morning and early afternoon to lessen the effects of sunscald. Make sure water is off by mid afternoon so plant canopy has a chance to dry adequately before sunset. Some higher elevations and western locations may still be harvesting blackberries and raspberries into September.

Irrigation. Water plants about1 inch every 7-10 days depending on natural rainfall. Water demand by the plants will decrease after fruiting, however keep water on plants if you are experiencing drought conditions in your area.

Trellis. Inventory and make list for fall/winter repair season

Fertilizer. Just after harvest is the time to take leaf tissue analysis to fine tune your fertilizer program for next season. Sample healthy leaves on primocanes in late summer. Collect the youngest fully expanded leaves on each of 50 randomly selected primocanes. Do not apply nitrogen fertilizers until spring. Apply non nitrogenous fertilizers in fall so that fall and winter rains can move them into the rooting zone. Apply lime if needed

Insect and disease issues. Apply late season fungicides and insecticides

From the Plant Problem Clinics…

Compiled by Margaret A. Williamson, Clemson University

Shown below is a summary of small fruit samples received between January and May, 2002 from the clinics in South Carolina (SC), North Carolina (NC) and Georgia (GA)

			NUMBER OF OCCURENCES		
HOST	**DIAGNOSIS**	**CAUSAL ORGANISM**	**SC**	**NC**	**GA**
Blackberry	Cane blight	*Coniothyrium diapleella*		2	
	Cane and leaf rust	*Kuehneola uredinis*		1	
	Crown gall	*Agrobacterium tumefaciens*		1	
	Dieback	*Phomopsis* sp.		1	
	Double blossom	*Cercosporella rubi*	1		
	Green scurf/algal spot	unidentified alga	1		1
	Root rot	*Pythium sp.*			4
		Rhizoctonia sp.			2
	Stem canker	*Sphaeropsis* sp.		1	
		Phomopsis sp.			1
	Stem lesion	*Colletotrichum* sp.			2
	Virus	suspect Tobacco Ringspot Virus	1		
	Virus	Tobacco ringspot virus			1
	Virus	Tomato ringspot virus			1
Blueberry	Canker/dieback	*Botryosphaeria sp.*	1		1
		Fusicoccum sp.			1
		Phomopsis sp.			1
	Root rot	*Phytophthora cinnamomi*		1	
		Phytophthora sp.			1
		Pythium/Rhizoctonia sp.			2
		Rhizoctonia sp.			1
Fig	Cold damage				1
Grape	Anthracnose	*Elsinoe ampelina*	1		
	Crown gall	*Agrobacterium tumefaciens*			1
	Root rot	*Pythium* sp. and *Rhizoctonia* sp.			1
Kiwi	Cold damage		1		
Strawberry	Angular leaf spot	*Xanthomonas fragariae*		2	1
	Anthracnose	*C. fragariae*		1	
	Anthracnose	*Colletotrichum acutatum*		2	
	Anthracnose	*C. gloeosporioides*		1	
	Anthracnose crown rot	*Colletotrichum* sp.	1	2	
	Anthracnose fruit rot	*C. acutatum*		8	
	Anthracnose fruit rot	*Colletotrichum sp.*			3
	Black root rot complex			1	
	Botrytis blight	*Botrytis cinerea*		1	
	Botrytis crown rot	*Botrytis cinerea*		6	
	Botrytis fruit rot	*Botrytis cinerea*		1	1
	Drowning		1		
	Fruit rot	*Phomopsis* sp.		1	
		Cladosporium sp.			1

HOST	DIAGNOSIS	CAUSAL ORGANISM	NUMBER OF OCCURENCES SC	NC	GA
Strawberry	Leaf blotch	*Gnomonia* sp.		1	
continued	Leaf spot	*Mycosphaerella* sp.			1
		Alternaria sp.			4
	Petiole blight	*Rhizoctonia* sp.			1
	Phytophthora crown rot	*Phytophthora cactorum*	1	6	
		Phytophthora sp.	1	4	
	Root and crown rot	*Phytophthora sp.*			2
		Pythium sp.			3
	Root and stem rot	*Rhizoctonia* sp.		1	
	Phytoplasma disease	Phytoplasma		1	
	Powdery mildew	*Oidium* sp.	1		1
	Southern blight	*Sclerotium rolfsii*		1	

Implementation/Increase of Fees for Diagnosing Plant Problem Samples

Margaret A. Williamson
Clemson University

Due to budget cuts at the participating universities, submission fees have either been implemented for the first time or increased. Here are the specifics:

At the Clemson University Plant Problem Clinic, new forms have been designed and fees have been implemented for the first time. There is now a $10.00 charge for disease diagnosis, and also for plant or insect identification. Previously the same form was used for all types of samples but now there are three separate submission forms. Having a separate form for each type of submission allows a greater amount of information to be collected so that diagnosis or identification and control recommendations are enhanced. If nematode or nutritional problems are also suspected, clients can submit diagnostic plant problem samples and pay $25.00, which is less than the combined fees of separate analyses. This complete plant problem analysis includes plant disease diagnosis, soil nutrient analysis and pH, nematode assay and tissue nutrient analysis. All results will be sent via an email message to the client and also to the county submitting the sample. Fees for all samples sent from out of state are doubled. Of course, the separate analyses can be conducted through the appropriate labs if confirmation of the suspected diagnosis requires fewer analyses. These labs have various fees for their services and should be contacted for information. This information and the forms for all labs at the Clemson University Agricultural Service Laboratory can be obtained through the website: http://www.clemson.edu/agsrvlb/ .

Plant disease samples submitted to the University of Georgia Extension Plant Pathology Laboratory are still free of charge as long as the sample comes through the county extension office of sample origin. Otherwise, there is a $25.00 fee. Soil samples for routine nematode assay that are submitted through the County Extension Office are charged a $6.00 fee, but each county may submit 40 of these samples per calendar year without charge. Nematode samples for problem diagnosis are assayed at no charge, as long as the samples are submitted by the county office of sample origin. Otherwise, there is a $25.00 charge. The fee for disease diagnosis and nematode assay for out of state samples is $25.00. Copies of the results will be sent to the client or to the County Extension Office that submitted the sample. Forms can be obtained through the county offices.

The North Carolina State University Plant Disease and Insect Clinic charges $10.00 for in-state samples submitted by Cooperative Extension Service, NCSU and NC Dept. of Agriculture personnel. Otherwise there is a $20 charge. Out of state samples cost $50.00. Nematode and soil samples aren't run through the Clinic; the North Carolina Department of Agriculture labs do these. More information on submitting samples and sample submission forms can be obtained from the following website: http://www.ces.ncsu.edu/depts/ent/clinic/Submit/submit.htm .

Focus

Small Fruit News Favorites

Compiled by Guido Schnabel
Clemson University

Site, variety and cultureal practices are keys to growing table grapes by Tom Zabadal, The Fruit Growers News, April 2002.

NCSA offers members to post offers both to sell and buy berries. North Carolina Strawberry Association. The Strawberry Grower, April 2002.

Early Season disease management for wine grapes, by Sharon von Broembsen, Oklahoma Plant Disease and Insect Advisory, April 2002 http://plants.okstate.edu/pddl/advisory.htm.

Making compost for your farm, by Gary Burchfield, The Grower, April 2002.

Monitoring Bramble Pests by Brian Sparks, Fruit Grower, May 2002.

Anthracnose ripe fruit rot widespread in North Carolina by Frank Louws, The Strawberry Grower, May 2002.

A new device controls rodent problems with instant kill while destroying tunnels, by Melissa Hansen, Good Fruit Grower, May, 2002.

You may request a copy of one (or more) of the above articles sent to you free of charge by fax (call 864 656 6705) or by sending a stamped and self-addressed envelope to Guido Schnabel, Clemson University, Department of Plant Pathology & Physiology, 218 Long Hall, Clemson, SC 29634-0377. Don't forget to indicate which article you would like.

Meetings

July 11, 2002 Virginia Bramble & Blueberry Day at Southern Piedmont Agricultural Research and Extension Center (SPAREC), near Blackstone. For more information call H.D. Stiles or Margaret J. Kenny, (434-292-5331).

July 26, 2002 Annual Meeting of the NC Muscadine Grape Grower, Bennett Vineyards, Edward, NC. Call 919 322 7154 for more information or check out the web at: http://intra.ces.ncsu.edu/depts/hort/berrydoc/.

August 9, 2002 Florida-Georgia Grape Field Day at the Florida A and M Center for Viticulture and Small Fruits. If you are interested in growing grapes as a hobby or commercially, make plans to attend. The field day will be held at the Florida A and M Center for Viticulture and Small Fruits from 9 a.m. to 3 p.m. on Friday, Aug. 9, 2002. The Center is located on US 90 eight miles east of Tallahassee or about one mile west of I-10, Exit 209-A. The program will feature a large taste panel of grape cultivars, a lab tour showing tissue culture and other lab projects, field research plots on grape growing, and information on home wine making. There will also be trade show of grape industry suppliers. A complimentary lunch will be provided and registration is free. No preregistration is necessary. For additional information see www.smallfruits.org or call 229-386-3410 (Ga.) or 850-599-8682 (Fla.)

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