Oklahoma State University and Oklahoma Cooperative Extension Service

Le Vigneron

A newsletter for the grape growers and wine makers of Oklahoma

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Inside this issue:

Off and Running…

This is an exciting time of year when we are counting down the days to budbreak (of course after that we spend a lot of time with our fingers crossed hoping a frost doesn't do irreparable damage). At OSU, we are starting to conduct some new experiments to find out answers to some of those "questions that bother us so". This year I am finishing up a pruning experiment on 'Cabernet franc' as well as a fruit removal study done at Victory Vineyard in Quinton. We also have some new publications that will be coming out in the coming year. One is a guide to diseases, insects, and other problems. It won't be comprehensive, but will cover the most prominent issues you will face in the vineyard. Also, on the way is a comprehensive guide to viticulture for Oklahoma grape growers. I have garnered funding to do this project and it is underway right now. So, good things are ahead for this year. In this issue of Le Vigneron, I give a little update on the 9th annual Grape Management Short Course, as well as an introduction to interspecific hybrid winegrapes, an assessment of Perkins weather data, and the seasonal risk assessment for grapevines at Perkins. Damon Smith has put together a nice profile of crown gall; hopefully, this information will clear up some of the questions you have about this disease. I also borrowed a piece from Dr. Joe Fiola of the University of Maryland on flea beetles. It is my sincere effort to provide you with beneficial information in every issue. If you think it is of value, let your friends know. It is easy to sign up and doesn't cost a thing. Please remember that we offer the Viticulture Education Program. This programs provides you with a baseline of knowledge for understanding the grapes in your vineyard, but also the vineyard ecosystem. Don't forget the website either. We have a new address at: www.grapes.okstate.edu. It is constantly being updated to provide you with useful information. If you have any comments or suggestions, feel free to let us know. So, until next time, have a great spring!

2008 OSU Grape Management Short Course Update

Eric T. Stafne

The first class of the year was held on February 28th. We covered a lot of territory in four short hours. Dr. Hailin Zhang discussed soil testing and soil requirements for growing grapes. Dr. Damon Smith provided an overview of the potential disease pathogens that face grape growers in the state of Oklahoma. I led the pruning part of the course. We had a presentation that went over the basics of pruning and then we went to the vineyard for a demonstration on two different trellis systems. After I demonstrated how to prune and what one looks for in a vine when pruning, the class took over. We had very good questions arise during the hands-on part of the class and great interest on the part of the students. It looks to be a very dedicated class this year!

Interspecific Hybrid Winegrapes

Eric T. Stafne

Introduction to Grapes

Grapes are in the Vitaceae family which consists of 11 genera and 600 species, including the most commercially important genus, *Vitis*. *Vitis* is the only food-bearing genus in the family and has two subgenera: Euvitis and Muscadinia. Muscadine grapes are native to North America and have a variety of uses. They are used for wine in southern states and are very popular, but acreage is only large in a few states such as North Carolina and Georgia. All bunch grapes are in the Euvitis subgenus of which *Vitis vinifera* is the most important species. *V. vinifera* originated in the Caspian Sea region and there have been more than 5000 named cultivars. The range in which *V. vinifera* can be successfully cultivated is limited by climatic factors. This species requires a long growing season, relatively high summer temperatures, low humidity, a rain-free harvest period, and mild winter temperatures. It is most often used for wine, but these grapes can also be used to produce juice, raisins, canned goods, rootstocks, or for fresh consumption. *V. vinifera* grapes are considered the premier grapes for wine-making purposes, hence their popularity around the world — even in areas where they are not well adapted.

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Flea Beetles

Joe Fiola, Viticulture and Small Fruit Specialist, University of Maryland Extension

• Flea beetles (Chrysomelid) are small (4-5 mm) metallic blue-purple beetles that jump when disturbed.

• Flea beetles become active on warm March/April days.

• They are most numerous following mild winters.

• Flea beetles overwinter in surface debris as adults and emerge to feed on developing host plant tissue.

• Flea beetles can be troublesome, particularly near woods so scout the vines row closest to the woods.

• Adult grape flea beetles eat holes into the sides of buds and gouge out the contents as the buds swell; if extensive enough can thereby destroy future canes.

• This damage can have potentially serious consequences if it limits or stops shoot growth on newly planted vines as the number of available buds may be limited.

• Adults also lay eggs in cracks in the bark, at bases of buds, between bud scales, and on leaves.

• Larvae are brown with black spots (10 mm) and can feed on the upper surface of new grape leaves for 3-4 weeks and leave characteristic chain-like feeding marks on leaves.

• At maturity, they drop to the soil, burrow about an inch deep, and transform to the adult stage.

• The new adults emerge about a week or two later and feed sparingly for the rest of the summer. There is only one generation each year.

• Bud inspection for adults is a must at least until there is one inch of new growth; then scout for the larvae.

• Most vineyards do not typically require sprays of this pest if attention was paid to winter vineyard clean up and destruction of local habitats.

• A small amount of damage is tolerable with the vigor capacity of most vineyards.

Publications Still Available!

Eric T. Stafne

A grape publication is now available as a pdf file here: (www.grapes.okstate.edu). The title of this publication is **Profile and Challenges of the Oklahoma Grape Industry**. Essentially this is a compilation of things I learned from the survey done in 2006 and information gleaned from the research trials at Perkins and Stillwater. A hardcopy can be ordered as well from me. The cost of the hardcopy is $3.00 to cover printing and shipping.

I also have copies of the **Midwest Commercial Small Fruit and Grape Spray Guide 2008**. The cost for this book is $3.00 It is 75 pages of great information about spraying fungicides, insecticides, and herbicides. Three dollars is a steal for this publication. It is also available online at: (www.hort.purdue.edu/hort/ext/extpubs.shtml).

The proceedings from the **2008 Oklahoma-Arkansas Horticulture Industries Show** is now available. I have linked the papers from the grape section on our website (www.grapes.okstate.edu) under the Grape Research/Data section. You will notice that my discussion on interspecific hybrids in this newsletter was taken from the proceedings. Perhaps this will entice some of you who didn't make it to join us next year. In the past the HIS has had some great presentations on grapes and winemaking. I hope to continue this tradition, as both Oklahoma and Arkansas have rich backgrounds in grape production.

Seasonal Temperature Assessment at Perkins and the Ramifications for Grapevines

Eric T. Stafne

I am still working on a way to assess the seasons (fall, winter, spring, and summer) in a quantitative way. Unfortunately, temperature doesn't always tell the entire story. Timing and duration of temperatures also play a very important role in how grapevines will respond. A grapevine can take several weeks to gain maximum hardiness, but begin to lose it in just a day or two of warm temperatures. I have made an assessment of the weather data from Perkins over the last 14 years using some formulas I developed. For the Spring model, phenology plays an important role (i.e. how does the growth of the vine change with increase in temperature). For the Fall model, phenology is also important, but it is not necessarily easy to gauge. For Spring we see budbreak. For Fall we don't see what level of dormancy and cold hardiness it has achieved. The Winter model is really based on temperatures — cold, warm, and the combination of the two. With these models I went through all the temperature data for Spring (mainly April), Fall (October and November), and Winter (December to February). March is a transitional month. Usually we don't have excessively cold temperatures during the month and budbreak normally doesn't occur until April for most cultivars. I need to think more on where March should fit into the overall scheme of things. Below is my assessment of temperatures at Perkins and the risk level for grapevines:

Seasonal Risk Levels at Perkins for Grapevines

Eric T. Stafne

Fall (based on 12 years of data):	Percentage of High Risk Years = 25%, Moderate Risk = 33%, Low Risk = 42%
Winter (based on 13-14 years of data):	December High Risk = 14%, Moderate Risk = 57%, Low Risk = 29%
	January High Risk = 21%, Moderate Risk = 64%, Low Risk = 14%
	February High Risk = 23%, Moderate Risk = 38%, Low Risk = 39%
Spring (based on 14 years of data):	Percentage of High Risk Years = 14%, Moderate Risk = 43%, Low Risk = 43%

Overall, Perkins is generally a moderate risk location throughout all seasons. January is a fairly high risk month, whereas Spring is moderate to low risk in April. I am still tweaking these models, but believe they give a good representation of the actual risk that exists at the Perkins location. This type of assessment can be done for other locations as well.

Viticulture Education Program for Grape Growers Administered by OSU

Eric T. Stafne

Viticulture Education Program

The program is a cooperative effort among Oklahoma State University – Stillwater (OSU-S), Oklahoma State University – Oklahoma City (OSU-OKC), Tulsa Community College (TCC), and the Oklahoma Grape Growers and Winemakers Association (OGGWMA). It is administered by OSU-S.

This is a two-tier professional education program. The Basic level provides college training in the fundamentals of horticultural science, plus applied training in viticulture and related techniques through OSU Cooperative Extension. The Advanced level provides further college training in horticultural science and related disciplines, plus further applied training through OSU Cooperative Extension. There is a five-year total time limit to complete the program. The Basic level would need to be completed in two years, and the Advanced level would need to be completed no more than three years after completing the Basic level.

The list of approved courses and workshops may change over time. Participants should obtain approval from OSU-S prior to enrollment in courses or workshops other than those specifically listed. Knowledge testing will be required at completion of short courses and Extension workshops. A grade of "C" or better will be required in all college-level courses. Participants who anticipate matriculating towards a college degree in horticulture at OSU-S, OSU-OKC, or TCC should contact an academic advisor at the appropriate institution for guidance in college course selection. Those intending to eventually pursue at B.S. in horticulture should contact Dr. Brian Kahn, Department Undergraduate Advising Coordinator at OSU-S.

OSU-S will collect a one-time program registration fee of $25. Any additional fees for courses, workshops, conferences, pesticide applicator testing, etc. will be paid directly by program participants to the appropriate entities. Participants are responsible for documenting attendance at events, and agree to provide transcripts for purposes of verifying satisfactory completion of required college courses. Participants completing each level of the Viticulture Education Program will be duly recognized with a framed certificate at the annual conference of the OGGWMA.

For more information, or to register for the program, participants may contact me, visit the website (http://www.hortla.okstate.edu/grapes/viticulture_education_program.html) or write to:

Viticulture Education Program

c/o Ms. Stephanie Larimer

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Disease Profile: Grape Crown Gall

Damon L. Smith

The causal agent of grape crown gall was first identified in 1897 in Italy. In those investigations, a bacterium was identified as the infectious agent causing ailment of the vines. Since this discovery, it has been demonstrated that crown gall of grape is caused predominately by *Agrobacterium vitis*. However, *A. tumefaciens* has also been isolated from galls on grape. Reports of grape crown gall have come from many parts of the world including China, Japan, South Africa, several European countries, the Middle East, and North and South America. In Oklahoma, crown gall is probably the second most significant disease of grape. The most significant grape disease in Oklahoma is black rot.

Disease Cycle and Pathogen Survival

One of the most important characteristics of *A. vitis* is the systemic survival (bacterial cells have the ability to move and survive throughout the vine) of the bacterium inside the vine. Systemic survival allows the bacterium to take advantage of injuries induced by freeze damage or other wounding, and cause disease not only at the soil level, but also in the aerial parts of the canopy. In the spring, as sap begins to move into shoots from the roots, bacterial cells are transported throughout the plant. Bacteria can also be disseminated in apparently healthy cuttings. Vines can remain crown gall free for several years until conditions favorable for disease development occur such as wounding by freeze damage. Galls can also form at sites of disbudding, at the base of rooted cuttings, and at grafts. Galled vines will exhibit reduced vigor and yield. The bacterium also has the capability of causing death (necrosis) of roots. Severe infections can result in total mortality of the vines. *A. vitis* can survive saprophytically (without living host tissue) for several years on grape debris in the soil. As a result, eradication of the pathogen from an infested vineyard can be difficult.

Research in Italy and New York has investigated *A. vitis* infestation in wild grape populations. In both studies, strains of *A. vitis* were isolated from wild vines. However, all strains in both studies were identified as nontumerogenic (incapable of forming a gall) and symptoms of crown gall were not observed on wild grape vines. While it appears that these strains are not responsible for direct infection of commercial vineyards, their role in the crown gall disease process is not well understood.

How does *A. vitis* infect grape vines?

While the infection process of *A. vitis* has not been studied in great detail, it is considered very similar to that of other *Agrobacterium species* such as *A. tumefaciens* which causes crown gall on numerous plant species. Freezing and wounding are important in the infection process. Wounding results in the production of phenolic and other compounds by the plant, which attracts the bacterial cells to those sites. Once the bacterium has attached to the site of wounding, the infection process involves the transfer of a portion of the bacterial genetic material (T-DNA) into the plant cell. Once the transfer has taken place, the bacterial DNA is incorporated into one of the plant chromosomes. This 'genetic insertion' results in the stimulation of several processes by the plant cell that benefit the bacterium. First, they activate abnormal cell growth which results in the formation of galls. Second, the production of opine compounds is induced in the plant cells. These opine compounds are used by the bacterial cells in close proximity to the galls.

Management of Grape Crown Gall

Using cultivars resistant to crown gall is one of the best tools a grower can use to manage crown gall in a vineyard. Susceptibility to *A. vitis* varies among cultivars grown in Oklahoma. In general, *Vitis vinifera* varieties are very susceptible to crown gall (Table 1). Many American cultivars and hybrids have some genetic resistance to the pathogen (Table 1). While resistance in American and hybrid cultivars is promising, growers may be reluctant to plant these cultivars in favor of susceptible *V. vinifera* plantings in a quest to produce high-quality wines. Research in other areas of the U.S. has demonstrated that grafting of susceptible scion to resistant rootstock significantly reduced the incidence of crown gall under field conditions. While not well understood, the apparent resistance in the susceptible scion may be a result of reduced survival of *A. vitis* in the resistant rootstock or the production of compounds by the rootstock that are inhibitory to the bacterium.

Regardless of the scion or rootstock susceptibility, care should be taken to use *A. vitis* free material when establishing or replanting a vineyard. Hot water treatment of dormant cuttings has been used with limited success. While hot water at temperatures of approximately 50˚C (122˚F) can reduce the amount of bacteria in cuttings, all bacterial cells can not be eliminated. Furthermore, damage can occur to fully dormant cuttings if temperatures higher than 50˚C (122˚F) are used.

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Crown Gall continued

Shoot tip propagation has been used with some success to produce *A. vitis* free planting material. Researchers have been unable to detect the bacterium in green shoots. In New York, vines propagated from green shoot-tip cuttings remained free of crown gall under cold climate conditions even after 7 years of growth. This form of propagation may prove useful for Oklahoma producers looking to maintain their own high-quality disease free planting stock. An alternative is to purchase certified free stock. While using certified stock is considered a good management practice, be aware that the certification only means that the bacterium was not detected. There is no complete guarantee that stock will be completely free of bacterial cells, but odds are in the grower's favor that the bacterial cells are not present in certified planting stock.

Cultural practices that result in limiting mechanical and freeze injury have proven most useful for managing this disease. Proper site selection is critical for new plantings. Avoid heavy soils in wet areas where frost is likely. Limiting exposure to the north is also desirable. Good sanitation practices when removing infected vines is critical. Removing and destroying as much of the plant debris as possible will reduce the level of potential inoculum in the soil. The success of management strategies such as leaving soil fallow for extended periods or planting non-hosts to rid vineyards of the bacterium will have varying success depending on the level of infestation. Care should be taken to limit soilborne nematode damage. Studies have shown that crown gall incidence was positively correlated with root-knot nematode damage.

No consistently reliable chemical or biological control methods have resulted in adequate control of *A. vitis*. However, research in the area of biological control is promising. Several antagonistic, nontumerogenic strains of *A. vitis* have been identified as potential biological control organisms for the grape crown gall pathogen. Their efficacy and commercial viability are currently under evaluation around the world.

Table 1. Relative crown gall susceptibility ratings for various grape cultivars grown in Oklahoma[a].

Cultivar	Type	Acres[b]	Crown gall[c]
Cynthiana	American	11.0	+
Marechal Foch	Hybrid	3.0	+
Concord	American	1.0	+
Traminette	Hybrid	3.0	++
Vignoles	Hybrid	3.0	++
Chardonel	Hybrid	7.7	++
Seyval Blanc	Hybrid	1.6	++
Chambourcin	Hybrid	8.2	++
Niagara	American	2.6	++
Chardonnay	Vinifera	12.6	+++
Merlot	Vinifera	22.4	+++
Gewurztraminer	Vinifera	3.1	+++
Pinot Gris	Vinifera	3.2	+++
Sauvignon Blanc	Vinifera	5.6	+++
Cabernet Franc	Vinifera	6.1	+++
Riesling	Vinifera	17.9	+++
Cabernet Sauvignon	Vinifera	32.4	+++

[a]Susceptibility ratings, cultivar, and acreage data were compiled from the "Midwest Commercial Small Fruit and Grape Spray guide, 2007" and "Profiles and Challenges of the Emerging Oklahoma Grape Industry."

[b]Estimates of Oklahoma grape vine acreage only.

[c]+ = slightly susceptible; ++ = moderately susceptible; +++ = highly susceptible.

Interspecific Hybrid Winegrapes continued

Eric T. Stafne

Other Important Grape Species

There are also other important grape species that have been utilized in the creation of interspecific hybrids. These species are from North America, and the most well-known is *V. labrusca*. *V. labrusca* (also called *V. labruscana*) is commonly called the Fox Grape. The most famous cultivars from this species are 'Concord', 'Niagara', and 'Isabella'. It has large berries, small clusters, fair pest resistance, and a distinctive and strong flavor. The Riverbank Grape is *V. riparia*. Several cultivars have this species in their lineage, such as 'Beta', 'Clinton', 'Baco Noir', 'Marechal Foch', and rootstocks 3309C, 5BBK, and SO4. It has small berries and small clusters with wide variation in ripening time and cold hardiness levels. It is vigorous, roots easily (which makes it attractive to use as a rootstock), and has fair to good pest resistance. The Summer Grape is *V. aestivalis*, which is mainly known for the cultivar Cynthiana (also called Norton). It has small to medium berries with medium to large, open clusters, and fair pest resistance. One of the issues with this grape is its tendency toward high sugar and high acid, thus rendering wine-making a challenge. *V. rupestris* is commonly known as the Sand Grape. Cultivars using this species are 'St. George' and the rootstock AxR1. It has small berries, small to medium clusters, and has a very "wild" taste. The plant is vigorous and roots easily while having good pest resistance. Another important species is *V. lincecumii*, the Post Oak Grape. This species is native to Oklahoma and surrounding states. Many cultivars have this species in their background, including 'Bailey', 'Beacon', 'Ellen Scott', 'Marguerite', and 'Rubaiyat'. It has medium to large berries with small to medium clusters and a distinctive "wild" taste, but different from *V. labrusca*. It also has fair pest resistance. This species was hailed by T.V. Munson as being especially important for creating hybrid grape cultivars.

Hybrid Grape Origins

The creation of interspecific hybrid grapes primarily came about because of problems encountered in France in the 1860s. A devastating phylloxera outbreak began there in 1860 and in the next 20 years about 90% of French vineyards were destroyed. To combat this epidemic, cultivars derived from American species were planted. At one time over 25,000 acres of 'Noah' was planted in France. 'Clinton', 'Othello', 'Lenoir', 'Isabella', and 'Herbemont' were also planted. 'Concord', 'Catawba', and 'Delaware' were tried but had low resistance to phylloxera. These species also brought with them new disease problems like downy mildew and black rot. In 1876, it was found that *V. vinifera* cultivars could be grafted onto American grapes successfully. The discovery helped transition back to *V. vinifera* grapes, but diseases were also a problem. In 1885, Bordeaux mixture was discovered as a broad spectrum fungicide to help alleviate the disease problems.

French hyrids originally started as breeding for rootstocks on which to place *V. vinifera* grapes. Amateur grape breeders pushed the breeding process forward to look for vines with roots resistant to phylloxera, foliage resistant to fungal pathogens, and fruit that could produce wines more similar to *V. vinifera* types. The first stage of breeding for hybrids used crosses of American cultivars or rootstock with *V. vinifera* cultivars. This stage of breeding produced some cultivars such as 'Baco noir' and 'Baco blanc'. Some of the important American types used in the breeding process were 'Noah' and Jaeger 70. The *V. vinifera* cultivars used included 'Folle Blanche', 'Aramon', 'Clairette', and 'Cinsaut'. The second wave of breeding for interspecific hybrids used crosses between hybrids gained from the first stage. Some of the influential breeders of this time period were Seibel, Bertille Seyve, Joanes Seyve, Galibert, and Landot. The third stage of hybrid breeding led to the modern hybrid grapes commonly grown today. These were usually crosses of hybrids from the second stage with *V. vinifera* grapes to gain superior wine quality. However, with the elevation of wine quality came the dilution of pest resistance. There are several breeding programs now involved around the world in creating high quality hybrid grapes. Some of the programs in the United States are in New York, Arkansas, California, Florida, Mississippi, Georgia, North Carolina, and Missouri.

Final Comments

Hybrid grapes make good substitutes in areas where *V. vinifera* grapes are marginally adapted or not adapted. The modern hybrid grapes produce high quality wines that do not include "off" flavors that are characteristic of some older hybrids. Rombough (2002) stated that hybrid grapes can be as successful as *V. vinifera* grapes. He wrote:

"The question is one of marketing, and nothing else. Most wineries make their money from the walk-in trade. And each and every walker-in is amenable to hand-selling…it doesn't matter what name is on the label, so long as there is quality in the bottle."

Quality is an important aspect to consider. Adaptation is very important when deciding what type of grapes to grow. Just because *V. vinifera* cultivars like 'Pinot noir' or 'Zinfandel' make exceptional wines elsewhere does not necessarily mean they will make good wines in Oklahoma.

OKLAHOMA STATE UNIVERSITY AND OKLAHOMA COOPERATIVE EXTENSION

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We welcome feedback and suggestions. Any responses can be mailed or emailed to the addresses on the left. We will strive to provide useful, pertinent, and timely information.

Initially this newsletter will be published 4 times per year in January, April, July, and October. If warranted the timing can be amended to better serve the grape growers and wine makers of Oklahoma.

'Vigneron' is the French word for someone who grows grapes for use in wine making.

Interspecific Hybrids continued

Commercial Hybrid Grapes

There are many high quality hybrid grape cultivars available. Some examples follow:

'**Chambourcin**' (true parentage unknown), high yielding, moderately cold hardy, vigorous, disease resistant, also grown in France and Australia.

'**Chardonel**' (Seyval Blanc x Chardonnay), highly productive, moderately cold hardy, makes a wine very similar to 'Chardonnay', patented.

'**Frontenac**' (*V. riparia* x Landot 4511), vigorous and productive, very cold hardy, very resistant to diseases, must limit skin exposure in wine making, needs malolactic fermentation.

'**Marechal Foch**' (includes *V. riparia*, *V. rupestris*, and *V. vinifera*), a sibling of 'Leon Millot', vigorous, early ripening, good winter hardiness, early budbreak, fruitful secondary buds.

'**Rubaiyat**' (Seibel 5437 x Bailey), developed at Oklahoma State University, medium vigor, medium cluster size, large berry size, disease resistant, cold hardy, useful as a teinturier (add color in blends).

'**Traminette**' (J.S. 23.416 x Gewürztraminer), similar wine character to 'Gewürztraminer', good disease resistance, decent winter hardiness, large clusters, good yields.

'**Vignoles**' (unknown), cold hardy, moderate vigor and productivity, compact clusters, susceptible to bunch rots, makes a fruity, sweet wine.