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## Grapevine fanleaf virus, Tomato ringspot virus and Grapevine rupestris stem-pitting associated virus are present in Chardonnay with a severe vein-clearing disease

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A severe disease was observed on the grape variety *Vitis vinifera* 'Chardonnay' in a two-acre vineyard in Missouri (Qiu et al. 2007). More than 90% of vines were affected. Symptoms resembled those caused by virus-like pathogens, including short internodes of zigzagged growth, deformed leaves with a mosaic pattern of dark green and light yellow tissue, vigor decline, small clusters, and few fruits. The vineyard became unprofitable 10 years after planting, and hence the vines were removed and destroyed in 2007.

Because abnormal symptoms could be caused by adverse environmental conditions or other external factors, hardwood cuttings of symptomatic vines were collected and grown in potted soil in a greenhouse. New shoots and leaves of greenhouse-propagated Chardonnay developed similar symptoms. Two buds from the original symptomatic vines were grafted onto each of three asymptomatic Chardonnay vines in the greenhouse. Severe deformation of young leaves and conspicuous vein-clearing on expanded leaves were observed on leaves of the bud-grafted asymptomatic Chardonnay, suggesting that the causal pathogens are graft-transmissible. Two buds of originally infected source Chardonnay vines were also grafted onto

virus indicator grapevines, *V. vinifera* 'Cabernet Franc', *V. vinifera* 'Baco Blanc', and hybrid 'LN-33'. Vein-clearing appeared on all grafted vines although grafted LN-33 showed very mild vein-clearing. No visible symptoms were observed on herbaceous plants *Chenopodium quinoa*, *Nicotiana benthamiana*, cucumber, tomato, pepper, and cowpea after mechanical inoculation with leaf sap of diseased Chardonnay vines. This new disease of Chardonnay is tentatively named as 'grapevine vein-clearing disease'.

ELISA tests failed to detect the nepoviruses *Tomato ringspot virus* (ToRSV), *Tobacco ringspot virus*, *Arabidopsis mosaic virus*, and *peach rosette mosaic virus* as well as *Grapevine leafroll-associated virus 3*. Through reverse-transcription polymerase chain reaction (RT-PCR) using degenerate primers for detecting grapevine nepoviruses, we detected the presence of *Grapevine fanleaf virus* (GFLV)-specific sequences (Qiu et al. 2007). We then conducted RT-PCR to determine whether other members of the *Nepovirus* genus as well as viruses that belong to different taxonomic groups were also present in the infected Chardonnay. Using virus-specific primers, we detected ToRSV and *Grapevine rupestris stem pitting-associated virus* (GRSPaV). Electron microscopic observations provided evidence that nepovirus-like particles were present in infected grapevines. To investigate if the three viruses were simultaneously present in single vines, we sampled leaves with severe vein-clearing symptoms from three individual vines and performed RT-PCR assays with primers that are specific to the capsid protein (CP) genes of GFLV, ToRSV, and GRSPaV. Sequences of each of the virus-specific PCR-amplified DNA fragments were also determined and their identities confirmed each specific virus. These results demonstrated that GFLV, ToRSV, and GRSPaV were co-existent in individual vines.

The results from this study suggested that mixed infection of multiple viruses can result in severe disease on a cultivated grape variety.

Infection of multiple viruses either reveals symptoms or remains symptomless in grape varieties and rootstocks. Symptomless scions could develop symptoms once they were grafted onto different rootstocks and planted in commercial vineyards, such as in the case of the *Grapevine leafroll associated virus-2* Redglobe virus (Rowhani et al. 2005). Frequent exchanges of grapevine germplasm and grafting of various combinations of scions and rootstock create numerous opportunities for different viruses and viral isolates to merge within a single vine. Mixed infection of multiple virus species frequently aggravates the severity of symptoms in a single vine. Afterwards, a viral complex will remain and perpetuate in the progeny vines via large-scale vegetative propagation. This study presents a typical case supporting that it is imperative to develop a network for national and international exchange of clean grapevine propagation materials (Golino and Savino 2008). Propagating certified grapevines will greatly reduce the incidences of mixed infections and hence new diseases in grape growing regions with diverse climatic, environmental and soil conditions.

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Figure 1. Young shoots of virus-affected Chardonnay vines have short, zig-zag internodes and small, mosaic leaves. Major veins of mosaic leaves with green and yellow tissues are translucent when the leaves are held against sunlight.

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## Grapevine virus survey underway in Missouri

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As part of a project funded by the Missouri Life Sciences Trust Fund, members of the ICCVE in cooperation with faculty from the Missouri State Fruit Experiment Station are conducting a survey for virus diseases of grapevines and potential nematode vectors in several locations around the state. During this first year of the three-year project, the focus is on 'Chardonel' vineyards known or suspected to have infected vines. Several mature blocks of 'Chardonel' grapevines around the state have experienced declining vigor and productivity due to suspected virus infection. In late July, cooperators in the project traveled to several mature 'Chardonel' vineyard blocks and collected tissue samples from both symptomatic and asymptomatic vines and from wild vines in nearby woods which will be used in laboratory tests to determine if, how many, and which viruses may be present. Previous work on Chardonnay grapevines in Missouri (see companion article on page 1 of this issue) has determined that a complex of several viruses may be present in a single grapevine. Later this season, soil samples will be collected from these same vineyard blocks to check for the presence of known nematode vectors of grapevine viruses. Also as part of the project, symptomatic and healthy vines will be identified and harvested each of the three years and the effects of virus infection on vine vigor, yield, and fruit composition will be determined. In subsequent years the project will be expanded to include other major wine-grape cultivars. Previous work (1, 2) has identified several viruses infecting grapevines in Missouri and has shown that native and hybrid cultivars may be infected with one or more viruses without necessarily showing symptoms. This project will expand on earlier work and will help to further determine the specific viruses and the extent of virus occurrence in Missouri vineyards as a step to developing strategies for dealing with virus disease incidence in the Missouri grape and wine industry.

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## A method for screening for H<sub>2</sub>S, Mercaptans and DMDS

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Even the most skilled winemaker has batches of wine that for some reason have propensities for the development of off aromas. However, the winemaker needs to be careful not to make unnecessary wine additions. Screening wines to discover what exactly the problem with the wine is can prevent unnecessary wine treatments.

H<sub>2</sub>S (hydrogen sulfide) has a characteristic rotten egg aroma (Jackson 2000) and has a sensory threshold of between 50-80 ppb (Wenzel et al. 1980). Mercaptans have a range of aromas including rotten onion, cabbage, burnt rubber, skunky and fecal odors (Jackson 2000; Zoecklein et al. 1999). Mercaptans have very low sensory thresholds, ethyl mercaptan around 1.1 ppb and methylmercaptan about 0.2-2ppb (Zoecklein et al. 1999). DMDS (dimethyl disulfide) arises from the oxidation of methyl mercaptan and has an odor of onion or cooked cabbage (Zoecklein et al. 1999).

The following method from Zoecklein et al. (1999) involves the use of copper and cadmium to discern what type of sulfur off aroma is in the problem wine. It also includes a final step of using ascorbic acid.

Copper (as copper II sulfate) reacts with both H<sub>2</sub>S and mercaptans but does not react with DMDS. Cadmium salts react with H<sub>2</sub>S but not mercaptans or DMDS. Finally, the addition of ascorbic acid to the copper treated wine reduces DMDS back to reactive methyl mercaptan species.

**Reagent preparation**Copper II sulfate 1% wt/vol solution

Add 1g of CuSO<sub>4</sub>.5H<sub>2</sub>O to 90mL of DI (de-ionized) water and dissolve. Make solution up to 100mL using DI water.

Cadmium sulfate 1% wt/vol solution

Add 1g of CdSO<sub>4</sub>.8H<sub>2</sub>O to 90mL of DI water and dissolve. Make up to 100mL using DI water.

Ascorbic acid 10% wt/vol solution

Add 10g of ascorbic acid to 90mL DI water and dissolve. Make up to 100mL using DI water.

**NOTE: Wines are to be assessed by smell only no tasting of the wines should be undertaken.**

**Method**

1. In three clean glasses place 50mL of sample wine in each.
2. Mark the glasses as follows Glass 1 – control, Glass 2 – copper, Glass 3 – cadmium
3. Set glass 1 aside
4. To glass 2 add 1mL of copper solution, set aside
5. To glass 3 add 1mL of cadmium solution, set aside
6. Mix each glass
7. Using the control sample for comparison, check glasses 1 & 2 for elimination or improvement in off aroma
8. Using Table 1 assess which compounds are responsible for off aromas
9. If there is no improvement place 50mL of sample wine in another clean wine glass, Glass 4, and label it ascorbic.
10. To the ascorbic glass add 0.5mL of ascorbic acid solution and 1mL of copper solution. Mix thoroughly. Compare ascorbic (Glass 4) with the copper glass (Glass 2). If there is a reduction in off aroma the cause is likely DMDS.

For a method for the removal of sulfur off odors using copper (II) sulfate see July 2008 issue of The Midwest Winegrower.

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**Managing the vineyard in the post-harvest period**

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As we enter September and begin to look toward the end of the season, it is important to remember that just because the grapes are coming off the vines now, that does not mean that the vineyard chores are finished. There are still several things to do to prepare for winter and to help get the vines off to a good start next season. Following are some reminders for the post-harvest period.

**Growth tubes**

For vineyards using growth tubes, it is time to begin

Table 1. Results for copper and cadmium treated wines

Control (Glass 1)	Copper (Glass 2)	Cadmium (Glass 3)	Result
Off odor present	Odor eliminated	Odor eliminated	H <sub>2</sub> S present
	Odor eliminated	No change	Mercaptans
	Odor eliminated	Odor reduced	Both H <sub>2</sub> S and mercaptans
	No change	No change	Possible DMDS

taking them off to allow the vines to begin acclimating for winter's cold temperatures. Growth tubes, when used properly, maintain an artificially warm and humid climate inside the tube that encourages rapid early season growth until the vine exits the top of the tube. Afterward, they still offer benefit during the growing season as shields around the young, green trunks of the vines to protect them against injury from herbicide sprays. In order to prepare for the coming winter cold, the vine's tissues must be exposed to progressively cooler temperatures over time to maximize the vine's cold hardiness. However, since the tube promotes warmer temperatures within, tubes left on the vine will slow the acclimation of that portion of the vine that is within the tube, delaying the acquisition of hardiness or preventing hardiness from reaching its potential maximum level. If a severe freeze event occurs, the portion of the vine inside the tube will be more susceptible to freeze injury. If perennial weeds have continued to be a problem up to this time, you can make a final application of a post-emergence herbicide before removing the tubes, but you should not delay removing the tubes for long. The vines will need time to acclimate for winter.

### ***Post-harvest fertilization and irrigation***

If your vines displayed nutrient deficiency symptoms or if you took petiole samples for nutrient analysis and the results indicated that your vines were low or deficient in one or more nutrients, the post-harvest period can be a good time to apply light or moderate amounts of fertilizer, particularly nitrogen, to increase the vines' nutrient content for next year. It can also be a good time to apply nutrients or amendments with low mobility or solubility in the soil, such as potassium, phosphorus, magnesium or lime. After the crop is removed from the vines, the roots undergo a flush of growth and the vines acquire nutrients and manufacture carbohydrates that will be stored in their woody tissues. These stored materials will be utilized in turn to support the vines' growth for the first few weeks of the following season. If the vines enter dormancy in a nutrient deficient state, they will begin growth in the following season in the same nutrient deficient state, since grapevine roots do not actively begin to grow and take up nutrients from the soil for approximately a month after budburst. Vines that go dormant in a nutrient-deficient state are also more prone to cold injury. The post-harvest period, while the vines still have active leaves and are acquiring nutrients, therefore, is a good time to replenish the vines' nutrient supplies. Recent research from California has also shown that fall is a better time than spring to apply foliar boron sprays to relieve deficiencies and improve fruit set. Fall-applied boron has more time to become incorporated into vine tissues than boron applied as a foliar spray either at bloom or pre-bloom.

Also to keep in mind during the post-harvest period is the possible continued need for irrigation. This year has been rather cool and wet and irrigation has not been as necessary, particularly in mature plantings, but it is important to remember in this wet year that this season is not the norm. The last three years have been very hot and exceptionally dry, with many vineyards showing signs of drought stress throughout much of the growing season. In drier years continued warm, dry weather during the harvest and post-harvest periods could result in a moderate-to-heavy stress that reduces that rate of photosynthesis in vines at a time when the vines are producing carbohydrates to be stored for next year, particularly in shallow or drought-prone soils. Continued drought stress at this time can also hasten the senescence of foliage, which also reduces late season carbohydrate production and storage (and hence, cold hardiness). Ideally, you want to see the vines retain a green and healthy canopy until the first frost. So, the idea here is not to water heavily to promote growth, but simply to relieve stress and promote optimum vine function until late in the season. (Note: New vineyards that may still be experiencing active shoot growth at this time of year should cease any irrigation to halt further shoot growth and promote maturation of wood and acclimation for winter.)

### ***Post-harvest disease control***

Very important during the waning summer and warm early autumn days is post-harvest disease control. Many growers discontinue their spray program once the crop is removed from the vines, thinking that disease issues are no longer a concern or that the amount of foliar infection that takes place in the post-harvest period can't be that serious since the vines will soon go dormant anyway. However, with temperatures falling back into the optimum ranges for many fungal diseases and rains becoming more frequent in the fall, this can be a period that fosters a lot of infection in unprotected vines by diseases such as downy and powdery mildew, particularly in earlier-harvested or more susceptible cultivars. A good example this year is Vidal Blanc, which in some vineyards has had a bad case of downy mildew. Downy mildew is favored by wet weather, and even in more normal dry seasons it is not uncommon to see downy mildew infections occurring on the leaves of susceptible cultivars in the post-harvest period as fall brings rains back to the region. Drier, humid weather, which is more of the norm for the region, favors powdery mildew infection. There are two dangers involved with post-harvest infections: one is the possibility of premature defoliation due to disease, which can weaken the vine and prevent the accumulation of carbohydrates which are necessary not only to support next year's growth but also to help the vine achieve its maximum cold hardi-

ness. Second, there is still enough time, particularly in the southern areas of the region, for infections to produce spores that will mature and overwinter to become inoculum for next year's disease infections. Controlling diseases during this time period can reduce the amount of inoculum and therefore the amount of disease pressure in the vineyard in the following season. With the fruit gone, materials such as mancozeb (Dithane) can be brought back into the picture since you no longer have to take pre-harvest intervals into consideration. You do have to be mindful, however, of other label restrictions, particularly those intended to reduce the buildup of fungicide-resistant populations in diseases such as powdery and downy mildew. If you've already applied the labeled maximum-amount-allowed of materials such as Abound or Rally, you cannot use them again now even though the fruit has been harvested.

### Protecting graft unions

For grafted vines up to the age of five years old, and especially for those vineyards growing *Vitis vinifera* varieties, it will be necessary to "hill-up" around the vines, covering the graft union with soil to insulate it from the cold and thus protect it from winter injury. This is not necessary with ungrafted vines, since any sucker arising from the roots or lower trunk of an ungrafted vine would still be the same cultivar. But suckers arising from winter-injured grafted vines may be from the rootstock cultivar. Hilling-up around the graft union with soil will protect latent scion cultivar buds in that area, so that if the trunk is winter-injured or killed, new scion cultivar shoots can be trained up to replace the vine. Soil should be mounded to at least 6 inches over the graft union before the occurrence of severe freezing temperatures. The soil acts to insulate the graft union from severe freezing air temperatures and conducts ground heat to the area around the graft union. Once the soil has been plowed and mounded up against the trunks, it is necessary to plant a cover crop in the row middles to stabilize the soil and prevent erosion by winter rains. After the danger of freezing temperatures has passed in early spring, the mounded soil must be pulled back down to prevent rooting of the scion cultivar. Allowing the vine to develop scion roots will negate the advantages conferred by the rootstock, can lead to the death of the rootstock, and with *vinifera* cultivars in particular will make the vine susceptible to phylloxera attack. Scion-rooted vines of *vinifera* cultivars or hybrid cultivars that have a large percentage of *vinifera* in their genetic makeup are also more susceptible to developing tomato ringspot virus or other nepovirus infections. To remove the mounds, the soil must be pulled away from the vines to expose the trunk back to the original planting depth. This can be done after the threat of severe

temperatures has passed and before the application of spring pre-emergent herbicides.

### Further Reading

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## Federal crop insurance available from USDA-RMA

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Federal crop insurance is available for Missouri grape production when applied for by the sales closing date and when proper records and reports are provided. The Federal crop insurance program is administered by the U.S. Department of Agriculture's (USDA) Risk Management Agency (RMA) and delivered through a re-insurance agreement with approved insurance companies.

RMA Topeka Regional Office Director, Rebecca Davis, reminds perennial crop growers in Missouri, Kansas, Colorado, and Nebraska that the sales closing date for Federal crop insurance is **November 20, 2008** for the 2009 crop year.

"Many growers who were hit hard by the April 2007 freeze did not have insurance," said Davis. "Vineyard production in this region may be insurable if growers have at least three years of production records, and can meet additional requirements that a crop insurance agent can explain. Growers should contact a crop insurance agent and fill out an application. If a grape insurance program has not been formally established in the county where the crop is produced, the crop may still be insurable through a written agreement."

Multi-peril crop insurance helps protect grape growers against economic losses resulting from loss of produc-

tion only due to natural causes such as drought, excessive moisture, hail, wind, frost, insects, and disease. It does not provide coverage for damage to or loss of vines.

Growers select the percentage of average yield they wish to insure, usually from 50-75 percent. They also select the percent of the price established annually by RMA. If their harvest is less than the yield guarantee selected, growers are paid the difference between what was produced and the guarantee level selected.

Growers should contact a local crop insurance agent for details. A list of agents may be found at <http://www3.rma.usda.gov/tools/agents/>.

Submission of an application for Federal crop insurance does not guarantee approval of a policy for grapes and other perennial fruit crops.

Additional conditions of insurance include the submission of completed "Pre-Acceptance Worksheet" and a completed "Vineyard Inspection Report". Thorough, highly detailed records of grape sales must be provided to support the Actual Production History (APH) certification.

All these materials must be accompanied by clear legible maps and legal descriptions with representative vineyard photos. Tax and Trade Bureau (TTB) data sheets such as "Report of Wine Premises Operations" are not a substitute for a completed APH certification, but can be used to support an APH certification.

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## Noninsured crop disaster assistance program

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Extreme weather conditions such as flood, drought, late freezes etc... seem to be an everyday occurrence for grape growers in the Midwest. Because of these conditions many producers are looking for ways to protect their crops and survive these potentially devastating financial losses. Crop insurance is a great option for many producers and is available in many areas either with a published actuarial or with a written agreement. In counties where insurance on grapes is not available producers also have the option to buy a different type of coverage. USDA's Farm Service Agency's (FSA) Non-insured Crop Disaster Assistance Program (NAP) provides financial assistance to producers of noninsurable crops when low yields, loss of inventory or prevented planting occur due to natural disasters. The NAP program is very similar to crop insurance in many respects. This program is not limited to grapes. It can be purchased for most commercially grown crops as long as crop insurance is not available for the crop in the county. Once coverage is purchased the producer has individualized coverage to help offset catastrophic losses on their crops. Coverage is at 50% of the producers Actual Production History Yield (APH) and payments are at 55% of the established Price. Additional factors to the payment may also apply if the crop is not harvested or is prevented from being planted. For 2009 fees for each crop is \$250. See below for more information on fees. Grapes actually have two different pay types that would each require a separate fee if being grown by the producer. Participating growers would be required to keep records of all production to establish yields to be used for their coverage as well as to determine if they had suffered a loss. The NAP coverage covers losses on grapes and does not provide coverage for loss or injury to the grape vine. Grape growers should strongly consider purchasing coverage either through crop insurance or the NAP program. Not only do these programs offer producers protection on an individual basis, the availability of other assistance through the government may be dependent on whether insurance or NAP was purchased by the producer. The sales closing date for NAP on grapes is normally November 20 each year in Missouri (growers in other states should check with their local offices to determine when the applicable sales closing date is). For 2009 NAP fees for grapes may be purchased by December 1 (for 2009 the fee would need to be paid by December 1, 2008). Although the coverage is limited on the NAP program, the price is right. Producers who do not feel that they can afford crop insurance as an option should strongly consider purchasing NAP. Additional information is provided below. Anyone interested in the NAP program should

contact their local county FSA office for additional information.

### ***Eligible Natural Disasters***

An eligible natural disaster is any of the following:

- damaging weather, such as drought, freeze, hail, excessive moisture, excessive wind or hurricanes;
- an adverse natural occurrence, such as earthquake or flood; or
- a condition related to damaging weather or an adverse natural occurrence, such as excessive heat, disease or insect infestation.

The natural disaster must occur before or during harvest and must directly affect the eligible crop.

### ***Applying for Coverage***

Eligible producers must apply for coverage of noninsurable crops using Form CCC-471, "Application for Coverage," and pay the applicable service fees at their local FSA office. The application and service fees must be filed by the application closing date as established by the producer's FSA state committee. The service fee is the lesser of \$250 per crop or \$750 per producer per administrative county, not to exceed a total of \$1,875 per producer with farming interests in multiple counties. This fee is authorized by the 2008 Farm Bill and is effective as of May 22, 2008. It replaces the previous service fee of the lesser of \$100 per crop or \$300 per producer per administrative county, not to exceed a total of \$900 per producer with farming interest in multiple counties.

Limited resource producers may request a waiver of service fees. To qualify for an administrative service fee waiver, the producer must meet both of the following criteria:

- earn no more than \$100,000 gross income in farm sales from each of the previous two years (to be increased starting in FY 2009 to adjust for the inflation using price paid by farmer index as compiled by the National Agricultural Statistics Service (NASS); or
- have a total household income at or below the national poverty level for a family of four, or less than 50 percent of county median household in both of the previous two years.

Limited resource producer status can be determined using the USDA Limited Resource Farmer and Rancher Online Self Determination Tool at <http://www.lrftool.sc.egov.usda.gov/tool.asp>. The automated system calculates and displays adjusted gross farm sales per year and the higher of the national poverty level or county median household income.

### ***Coverage Period for NAP***

The coverage period for NAP may vary depending on whether the producer grows annual, perennial or value-loss crops.

The coverage period for annual crops begins the later of:

- 30 days after application for coverage and the applicable service fees have been paid; or
- the date the crop is planted and does not exceed the final planting date and ends the earlier of:
  - the date the crop harvest is completed;
  - the normal harvest date for the crop;
  - the date the crop is abandoned; or
  - the date the entire crop acreage is destroyed.

It benefits producers to report crop acreage shortly after planting (early in the risk period) to ensure reporting deadlines are not missed and coverage is not lost. In addition, producers must annually provide the following production information:

- the quantity of all harvested production of the crop in which the producer held an interest during the crop year;
- the disposition of the harvested crop, such as whether it is marketable, unmarketable, salvaged or used differently than intended; and
- verifiable or reliable crop production records (when required).

Producers must provide production information in a manner that can be easily understood by the FSA county committee. Questions regarding acceptable production records should be directed to your local FSA office. Failure to report acreage and production information may result in reduced or zero NAP assistance. Be aware that acreage reporting and final planting dates vary by crop and by region. Contact your local FSA office for your local dates.

For aquaculture, floriculture and ornamental nursery operations, producers must maintain records according to industry standards, including daily crop inventories. Unique reporting requirements apply to beekeepers and producers of Christmas trees, turfgrass sod, maple sap, mushrooms, ginseng and commercial seed or forage crops. Please contact your local FSA office for these requirements.

The coverage period for perennial crops, other than those intended for forage, begins 30 calendar days after the application closing date and ends the earlier of:

- 10 months from the application closing date;
- the date the crop harvest is completed;
- the normal harvest date for the crop;
- the date the crop is abandoned; or

■ the date the entire crop acreage is destroyed. Please contact your local FSA office for information on the coverage periods for perennial forage crops, controlled-environment crops, specialty crops, and value loss crops.

### ***Information Required to Remain Eligible for NAP***

To remain eligible for NAP assistance, the following crop acreage information must be reported annually:

- name of the crop (lettuce, clover, etc.);
- type and variety (head lettuce, red clover, etc.);
- location and acreage of the crop (field, sub-field, etc.);
- share of the crop and the names of other producers with an interest in the crop;
- type of practice used to grow the crop (irrigated or non-irrigated);
- date the crop was planted in each field; and
- intended use of the commodity (fresh, processed, etc.).

### ***FSA Use of Reported Acreage and Production***

FSA uses acreage reports to verify the existence of the crop and to record the number of acres covered by the application. The acreage report and the production report are combined to calculate the approved yield (expected production for a crop year). The approved yield is the average of your actual production history (APH) for a minimum of 4 to a maximum of 10 crop years (5 years for apples and peaches). To calculate your APH, FSA divides your total production by your crop acreage.

The approved yield may be calculated by using substantially reduced yield data if you do not report acreage and production, or report less than 4 years of crop production.

### ***Applying for NAP Assistance When a Natural Disaster Strikes***

When a crop or planting is affected by a natural disaster, you must notify your local FSA office and complete Part B, (the Notice of Loss portion) of the application, which is Form CCC-576, the Notice of Loss and Application for Payment. This must be completed within 15 calendar days of the:

- natural disaster occurrence;
- final planting date if your planting was prevented by a natural disaster;
- date damage to the crop or loss of production becomes apparent to you.

To receive NAP benefits, producers must complete Form CCC-576, Notice of Loss and Application for

Payment, parts D, E, F as applicable, and G, no later than the immediately subsequent crop year acreage reporting date for the crop. The CCC-576 requires producers to provide evidence of production and note whether the crop was marketable, unmarketable, salvaged or used differently than intended.

### ***Amount of Production Loss to Receive a NAP Payment***

The natural disaster must have either:

- reduced the expected unit production of the crop by more than 50 percent; or
- prevented the producer from planting more than 35 percent of the intended crop acreage.

Expected production is the amount of the crop produced in the absence of a natural disaster. FSA compares expected production to actual production to determine the percentage of crop loss.

### ***Defining a NAP Unit***

The NAP unit includes the specific crop acreage in the county in which the producer has a unique crop interest.

A unique crop interest is either:

- 100 percent interest; or
- a shared interest with other producers.

### ***How Much Loss NAP Covers***

NAP covers the amount of loss greater than 50 percent of the expected production based on the approved yield and reported acreage.

### ***Information FSA Uses to Calculate Payment***

The NAP payment is calculated by unit using:

- crop acreage;
- approved yield;
- net production;
- 55 percent of an average market price for the specific commodity established by the FSA state committee;
- a payment factor reflecting the decreasing cost incurred in the production cycle for the crop that is harvested, unharvested or prevented from being planted.

### ***More Information***

Further information on NAP is available from your local FSA office or on FSA's Web site at: [www.fsa.usda.gov](http://www.fsa.usda.gov).

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## ICCVE UPDATE

### Missouri River winery owners participate in Mississippi River Hills field trip

Dr Beth Barham  
Leader Missouri Regional Cuisines Project  
University of Missouri  
Institute for Continental Climate Viticulture and Enology

On August 14, the Missouri Regional Cuisines Project led a field trip by bus from Columbia to the Mississippi River Hills (MRH) region. The trip was sponsored by the Missouri Wine & Grape Board for the purpose of networking participants in new Regional Cuisines regions with the pilot region. Owners of wineries, restaurants and B&Bs from along the Missouri River, as well as local farmers and Extension Specialists, learned first hand from members of the MRH Association how they had developed a wine and food reputation for their six-county area over a period of five years. Their work recently culminated in the formation of a non-profit regional Association to carry their goals forward. Stops included the Pevely Market, where Lynne Parker is creating a year-round farmers market that will also feature regional wines (delicious cookies for the stop were provided by the Blue Owl in Kimmswick); Chaumette Vineyards and Winery, a lovely spot for a wine tasting followed by lunch on the wrap-around porch overlooking the River Hills; and a goat cheese tasting at Baetje Farms, where the group was hosted by Steve Baetje while their goats were being milked in the barn by his wife, Veronica.

Some comments received about the trip:

*Thank you for a wonderful day exploring some of the Missouri small businesses and the fares they have to offer. I see the Mississippi River Hills organization is a great organization assisting small Missouri producers. To start a new business can be overwhelming doing it on*

*your own. This organization gives confidence and encouragement when needed. I, personally, want to thank everyone who has done so much already and for allowing me the opportunity to see first hand the enthusiasm and effort already displayed by a few dedicated individuals.*

- Carolyn Warnebold of OakGlenn Winery in Hermann

*I wanted to say a big thanks for the amazingly fun trip we had on Thursday. I had a great time and learned something all at the same time. The lunch was soooo good, and the fellowship was great. I have been buying from the local Farmers Market for some time now, but now I have a greater appreciation of what they do. They supply my summer produce for our home and for the last month I have been buying different varieties of breads from local farmers' wives for my Bed and Breakfast.*

- Debbi Schwaab, Hiding Place Bed & Breakfast in Warrenton

Missouri winery folk who attended the trip included Rachel Mills, Les Bourgeois Vineyards, Jennifer Johnson, Chaumette Vineyards & Winery, Tony Kooyumjian, Augusta & Montelle Wineries, Lois Mueller, Robbler Vineyard & Winery, Carol Warnebold, OakGlenn Winery, Cheryl Daro, Double D Vineyard, Richard and Kathleen Livingston, Baltimore Bend Winery.

**Acknowledgements.** Many thanks to Lisa Palmer and Tish Johnson of the Ste. Genevieve Extension Office for their assistance in organizing the trip and helping to carry it out. Learn more about the Mississippi River Hills regional experience at their website: <http://www.showme.net/MRH/>.



Figure 1. Wine tasting at Chaumette Winery.



Figure 2. Rachel Mills from Les Bourgeois meets the goats at Baetje Farms.

## Drs. Striegler and Barham feature Missouri wine in presentation to Missouri Academy of Science

Dr Beth Barham  
Leader Missouri Regional Cuisines Project  
Institute for Continental Climate Viticulture and  
Enology  
University of Missouri

On the evening of August 19, Dr. Keith Striegler and Dr. Beth Barham gave an invited presentation titled, "Missouri by the Bottle: The Science and History of Missouri Wine." The event was held at the Missouri History Museum in Forest Park, St. Louis, as part of the Academy of Science of Missouri Lecture Series, *Perspectives on Science and History*. Over 120 persons attended, breaking all records for the lecture series. Of course, a wine tasting featuring Missouri wines from Les Bourgeois, Crown Valley and other wineries in the state that preceded their talk helps explain the keen level of public interest. Dr. Striegler discussed current research related to wine production, as well as the history of scientific work that utilized Missouri grapevines to save the French wine industry in the mid-1800s. Dr. Barham, leader of the ICCVE's Missouri Regional Cuisines Project, talked about current efforts to encourage rural regions in the state to work together to market Missouri wine and food products based on regional identity.



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## ASEV-ES Ontario tour

Jackie Harris  
Extension Viticulture Assistant  
Institute for Continental Climate Viticulture and  
Enology  
University of Missouri

Recently members of the ICCVE Staff had the opportunity to tour seven vineyard and winery operations in Ontario, Canada prior to the ASEV Eastern Section Annual Conference. Included in the tour were organic, biodynamic, energy efficiency focused, and conventional vineyard and winery operations from family owned to extremely well funded corporate operations. The operations on the tour included Le Clos Jordanne Vineyard, Creekside Winery, Fielding Estate Winery, Hernder Estate Wines, Stratus Winery, Southbrook Winery, and Coyote's Run Estates. The main topics discussed during the tour were terroir, climatic challenges, and sustainability.

The industry in Ontario has developed distinct regions that they believe express the terroir of the area. Within these regions they are exploring terroir in greater detail from site to site. Various viticultural techniques have been employed to aid in expressing terroir within the wine. As one grower said, one tactic that they are using is mixed clonal plantings which they believe overrides clonal expression and thus enhances the expression of terroir. Another method they use is separating vineyards and soil types at bottling.

Being a cool climate there are many challenges in growing grapes, especially vinifera, which is primarily what is grown in Ontario, with the exception of Vidal blanc for icewine. The climate is extremely variable and location is the determining factor for what varieties can be successfully grown. The main varieties that are grown in Ontario are Riesling, Pinot gris, Gewurztraminer, Cabernet franc, Cabernet Sauvignon, Pinot noir, Vidal blanc, and surprisingly Sauvignon blanc. Their greatest threat is frost and freeze damage especially with Sauvignon blanc. To combat this issue wind machines are widely used throughout the area. Additionally, mounding of the graft union is used by some operations. Even with the assistance of wind machines and mounding, frost or freeze damage is fairly common.

Even though seasonal variation is the main challenge of the area, it is not the only difficulty. In Ontario another challenge is heavy clay soil which can be problematic for vine health and growth. Nearly all the vineyard land in the region has drainage tile installed to alleviate the

problem. Several of the vineyard operations plant cover crops with deep tap roots to aid in breaking up the heavy clay soils. Yet another issue is bird damage. The most reliable method to control bird damage that is widely used is netting. Netting has additionally been employed as canopy management and shading devices.

As expressing terroir has become more explored so has sustainability. The current methods in use focus on reducing environmental impact. This includes organic, biodynamic and energy efficient operations. For example, to reduce energy inputs a high end winery uses gravity flow in their operations without the use of pumps. Due to disease pressure, being organic or biody-

namic is always a challenge. To deal with disease issues one organic vineyard applies copper sulfate with reducing concentrations throughout the growing season and a biodynamic operation uses nettle tea for pest control. In addition, they are starting to experiment with sheep grazing for weed control.

As in all eastern growing areas there are many challenges to growing grapes in Ontario. They are constantly experimenting with new methods to deal with these challenges. At the same time they are seeking ways to reduce the amount of environmental impact of their operations.



Figure 1. Vineyards at Fielding Estates Winery, with Lake Ontario in the background.



Figure 2. Hernder Estate Wines in St. Catharines, Ontario.

## ICCVE welcomes new member

The ICCVE would like to welcome Dr Satisha Jogaiah as Viticulture Post Doctoral Research Associate. Dr Jogaiah has a wealth of viticulture research experience at the National Research Centre for Grapes based in the Maharashtra region of India. The Maharashtra region has approximately 124, 000 acres of India's total of 148,000 acres of table and wine grapes.

Dr Jogaiah has conducted research in a number of areas including evaluation of grape rootstocks for salinity and drought tolerance, grape germplasm, grapevine genetics and the use of growth regulators to improve grape quality.

Dr Jogaiah will report to the ICCVE Director and Viticulture Program Leader Dr R Keith Striegler. His work will focus primarily on Norton canopy management, rootstock evaluation and rootstock management research.



Figure 1. Dr Satisha Jogaiah

## UPCOMING EVENTS

### Southwest Center Field Day—September 12

The Southwest Center Agricultural Experiment Station at Mount Vernon, MO will hold its annual Field Day on Friday, September 12. Along with the regular activities there will be a Special Field Day Tour focusing on viticulture and the new vineyard research plots at the Center. The field Day will begin at 9:00 a.m. and continue until 1:00 p.m. Other tours will focus on forages, dairy, beef, and horticulture. No pre-registration is required. The center is located 4 miles west of Mount Vernon on Hwy H. For more information contact the Southwest

Center at 417-466-2148 or by e-mail at [Rathmann@missouri.edu](mailto:Rathmann@missouri.edu).

### Bottling Workshop—November 14th 2008

A bottling workshop to be held at St James Winery, St James Missouri. The focus of the workshop is on basic bottling procedures, and practical bottling work including bottling line sanitation, bottling and clean-up. The workshop starts at 8:00 am—3:30pm. Registration and updated information about this workshop will be uploaded to the ICCVE website soon. For more information go to the upcoming events section on the ICCVE website <http://iccve.missouri.edu/> or contact Rebecca Ford, email [fordrj@missouri.edu](mailto:fordrj@missouri.edu) or 573 884 2950.

### Missouri Wine Technical Group Norton Workshop—November 4th 2008

This workshop is organized for 2008 vintage Norton that is still in tank/barrel. A blind tasting will be followed by winemaker discussion on wine style and wine treatments. The workshop will be held at Stonehaus Farms Winery, Lees Summit, Missouri from 9:30am—4:30pm. Registration details and further information will be uploaded to the ICCVE website soon. For more information go to the upcoming events section of the ICCVE website <http://iccve.missouri.edu/> or contact Rebecca Ford, email [fordrj@missouri.edu](mailto:fordrj@missouri.edu) or 573 884 2950.

### Midwest Grape and Wine Conference—February 7-9, 2009

The Midwest Grape and Wine Conference will again be held at the Tan-Tar-A Resort at Osage Beach, MO. The theme for next year's conference will be vineyard and winery sustainability. There will be advanced and introductory sessions in both viticulture and enology. Check <http://www.missouriwine.org/> for details.

## Factoid: Word derivation œnology/enology

Information from:

James Cleve

Missouri Winemaking Society

<http://www.mowinemakers.org/>

The study of wine and winemaking

The first spelling, *œnology*, which is chiefly British, carries the ligature *œ* at the beginning as homage to its Greek etymology:

*œno-* is from the Greek οἶνος, the word for wine; classical transliteration of the diphthong

oi is oe, which medieval Latin scholars wrote as the ligature œ; since this diphthong is largely lost in English pronunciation, the spelling eventually dropped the first o to become *enology*; since American spellings do not preserve etymologies as purposefully as British spellings, *enology* has become the preferred form amongst Americans, whereas *œnology* is the preferred form amongst Britons

In continuation:

-*logy* is from the Greek *λογία*, which is from the word *λόγος*, meaning word or story, thereby making *λογία* mean “story of...” or “knowledge of...”; hence *œnology* is knowledge of wine

-the reason that the Romance languages write *–logie* (as in French) or *–logía*

(as in Spanish) or *–logia* (as in Italian) is simply a result of orthographic changes which are to represent phonetic changes on classical transliteration initiated by the Romans; the *–logy* spelling that English uses is merely a Germanic form of the classical Roman transliteration style; this effect is seen in numerous technical words

Some ligatures have traditionally been used to compress two letters into one in an effort to save space (e.g. *fi* for *f* and *i* and *fl* for *f* and *l*); however, the ligature *œ* is not just a typographic ligature; it is also a linguistic ligature, for it is a reflection of etymology. The ligature *œ* was once far more common in English orthography than it is today. For example, *economy* has historically been written as *œconomy* or *œconomie*, in reference to the French method of transliteration; similarly *federal* used to be written as *fxederal*.

