FPMS GRAPE PROGRAM NEWSLETTER

FOUNDATION PLANT MATERIALS SERVICE OCTOBER 2002 UCDAVIS

New Materials Released by FPMS in 2002

IN THE SPRING OF 2000, Jim Duarte, President of Duarte Nursery, arranged for FPMS to import eight varieties from Portugal for the FPMS public collection. Testing of the original material was completed in the spring of 2002, and the following three varieties now qualify for California Provisional Foundation Stock status without any further treatment or testing: Fernao Pires FPMS 01 (white wine variety); Trincadeira Preta FPMS 01 (red wine variety) and Periquita FPMS 01 (red wine and table grape variety). Many thanks to Jim Duarte for this important donation to the FPMS public collection.

Other new selections that are available from FPMS for the first time this year as California Provisional mist propagated plants include:

- Merlot FPMS 25, which is reported to be from the French clone #314;
- Nebbiolo FPMS 07, from the Italian clone CVT36 imported in 1993 from Torino, Italy;
- Negro Amaro FPMS 01, an Italian red wine variety that was collected out of the UC Davis Viticulture and Enology vineyard in 2000;
- Pinot noir FPMS 101, from the Italian clone R4 imported in1988 from Italy;
- Redglobe FPMS 02, a selection of the table grape developed by H.P. Olmo which tests negative for grapevine rootstock stem lesion-associated virus;
- Riesling Italico FPMS 04, which was incorrectly labeled Walsh Riesling when it was collected out of the UC experiment station in Jackson, California in the 1960s;
- Roussanne FPMS 02, a French white wine variety collected from Sonoma County, California in 2000;
- Sauvignon blanc (musque) FPMS 27 from Savagnin musque imported from Pont-de-la-Maye,

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2002–2003 Grape Orders

CALIFORNIA FOUNDATION STATUS grape materials available from FPMS for the upcoming dormant season are shown on the *Registered Grape Selections Offered by FPMS in the 2002–2003 Dormant Season* list. This list, as well as other ordering information, is available from the FPMS office. It can also be accessed on the Web at *http://fpms.ucdavis.edu.*

Forty-two public selections advanced this year from Provisional to Foundation Stock status thanks to variety identification work completed by Dr. Andy Walker, professor, viticulture and enology, UC Davis. If you have received provisional materials from any of the newly registered selections in the past, you may contact the FPMS office to request retroactive Foundation Stock tags.

Grape materials in short supply will be allocated among the orders received by November 30, 2002.

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France in 1962 which was also the source of the popular musque selection grown in Monterey County;

- Thompson Seedless FPMS 09, which was imported from Australia in 1970 and designated B7-7 while it was being tested by Pete Christensen, Emeritus, UC Extension Viticulture Specialist. Christensen reported this selection "... produces an attractive, more loose cluster of berries that are longer and more narrow than FPMS 2A or H5 (FPMS 07 and 08). However, it produces fewer clusters than FPMS 2A and the berries tend to have a more loose attachment to their pedicels;"
- Viognier FPMS 04, which was collected from Mendocino County, California in 2000 as Roussanne and later identified as Viognier.

Support to test and treat public materials to qualify them for the foundation block at FPMS was provided from the California nursery assessment fund.

New materials are only available as green potted plants on their own roots (mist propagated plants, MPP) for the next few years because of limited quantities of propagation material available. Green plants ordered in the fall of 2002 will be supplied about 9 to 12 months after they are ordered, depending on the total quantity ordered per selection. Sometimes it takes up to two years to supply large orders for new selections because of the small amount of material available for propagation. Hardwood cuttings will be available in about two to three years.

All new grape materials that are only available from FPMS as mist propagated plants are included on the *New Materials Available from FPMS in the 2002–03 Season* list. To request a list, contact FPMS.

Upcoming Meetings

2002 FPMS Annual Meeting to be held November 13, 2002 at the UC Davis Beuhler Alumni and Visitors Center. To request a reservation for the meeting, please contact the FPMS office by phone: 530-752-3590 or email: *fpms@ucdavis.edu*

2003 Unified Wine & Grape Symposium to be held January 28–30, 2003 in the Sacramento Convention Center, Sacramento, California. More information is available on the Web at: *http://www.unifiedsymposium.org*.

International Symposium on Grapevine Growing, Commerce and Research to be held in Lisbon, Portugal June 30 to July 02, 2003. Topics to be addressed in the five main sessions include: 1) evolution and innovation of viticulture, 2) the selection of grapevine varieties, 3) the environmental impact of viticulture, 4) the challenge of the markets, 5) grapevine biotechnology, taboo or challenge. For more information send email to: *mail@meetingpointtravel.com*.

14th Meeting of the International Council for the Study of Virus and Virus-like Diseases of the Grapevine (ICVG) in Bari, Italy Sept 12-17, 2003. Topics to be addressed include: leafroll and related viruses, rugose wood and related viruses, emerging diseases (e.g. graft incompatability), new viruses, advances in diagnosis, advances in epidemiology, sanitary control, transgenic resistance control, and phytoplasms. For more information send email to: *crsa@libero.it*.

The FPMS Grape Program Newsletter **is published annually by Foundation Plant Materials Service. FPMS is a department in the College of Agricultural and Environmental Sciences at the University of California, Davis.**

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Photo Credit: Jack Kelly Clark, page 6 Sauvignon blanc

October 2002

2002 Introductions for the Future Public Collection

TWO LARGE GROUPS OF CALIFORNIA SELECTIONS were donated this year for the FPMS public grape collection.

Gary Morisoli donated nine selections from the Napa Morisoli Heritage Vineyard, which is thought to have been originally planted in the late 1800s. Morisoli's grandfather (born 1902) said that he started replacing some of the old vines in the vineyard as they died when he was a teenager. About 1¼ acres of the vineyard remain today, and Morisoli suspects that some of the vines remain from the original planting.

In 2001, Jean Michel-Boursiquot, ampelographer and director of ENTAV, France, walked the vineyard and identified over nine varieties in it including: Alicante bouschet, Carignane, Durif, Grand noir de la Calamette, Muscat Hamburg, Negrette, Syrah, Valdiguie, and Zinfandel. Boursiquot marked the vines with the correct variety names and in December 2001, Deborah Golino, director of FPMS, collected wood from the vines for testing and treatment at FPMS. Results from the first set of tests will be completed in the spring of 2004.

Another group of 14 selections was donated by Larry Hyde, a Napa grape grower who is well respected for the quality of his fruit and his collection of field clones. This year, he generously donated one selection each of Cabernet Franc, Cabernet Sauvignon, and Sauvignon blanc (musque) as well as five selections of Chardonnay, four selections of Merlot, and two selections of Syrah to the FPMS public collection. Disease tests are now in progress and expected to be completed by the spring of 2004.

We also received a selection of Albarino from Michael Jones of Novavine, Inc. that is reported to be originally from the Morgadillo Vineyard in Galicia, Spain for the FPMS public collection.

Support for disease testing and disease elimination work to test new public selections has been provided from the California nursery assessment fund.

ENTAV-INRA® Clones at FPMS

THIS YEAR, THE NEW ENTAV DIRECTOR, Dr. Jean-Michel Boursiquot, officially confirmed the identity of 24 wine grape and five rootstock ENTAV-INRA® (trademarked) clones in the FPMS foundation vineyard. The FPMS mother vines for these 29 clones have therefore been assigned FPMS selection numbers and advanced to California Foundation Stock status. Many more ENTAV clones at FPMS that currently have quarantine or provisional status are expected to advance to California Foundation Stock status in the future when disease testing and vine identification work is complete.

It is now possible for California nurseries cooperating with ENTAV to produce ENTAV-INRA® planting stock that is also certified by the California Grapevine Registration and Certification Program, by using propagation materials from the registered mother vines at FPMS. Only a portion of all the ENTAV-INRA® materials produced by cooperating nurseries will also have California certified status because quarantine disease testing for 45% of the clones was done outside of California. Testing by FPMS is required to fulfill the California program requirements. Nurseries must also be participants in the California Grapevine Registration and Certification Program to qualify to produce California Certified Grape Stock. Growers are expected to benefit from dual certification because it shows that standards recognized by ENTAV, INRA and the State of California have been met.

By special agreement, FPMS assigns selection numbers to the French trademarked clones that are the same as the ENTAV-INRA® clone numbers. For instance, the Pinot noir ENTAV-INRA® 667 Authorized Clone from ENTAV has also been assigned the FPMS selection number 667. FPMS selection numbers that

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ENTAV greenhouses, laboratories, office and vineyards in l'Espiguette, France. *(Photo courtesy of Sunridge Nurseries)*

ENTAV-INRA Clones... *Continued from page 3*
correspond to all the ENTAV clone numbers have been reserved so that this practice can be continued in the future.

All ENTAV-INRA® clones at FPMS are privately controlled and only distributed from FPMS according to instructions from ENTAV. Growers may purchase ENTAV-INRA® planting stock from nurseries officially authorized by ENTAV. ENTAV currently has agreements with the Caldwell Nursery, Herrick Grapevine Nursery, and Sunridge Nurseries to produce ENTAV-INRA® planting stock. For further information about ENTAV, visit their Web site at: *http://www.entav.fr/index.htm.*

Fay Triplett Collection

by Peter Christensen, UC Extension Viticulture Specialist, Emeritus

FAY TRIPLETT WAS A BOTANIST who farmed wine grapes near Ceres in Stanislaus County. He enjoyed plant breeding and began making grapevine crosses in the 1940s. He was in close contact with Dr. Harold Olmo and began collecting breeding material from UC Davis, as well as from several European collections.

During the 1950s and early 1960s, Fay was retained by Allied Grape Growers with the intention of making new varieties available to cooperative members. When Allied disbanded, Fay involved Julio Gallo in his program. Gallo made and evaluated wines from the selections, and Julio commented favorably about a number of them.

Later, the UC Davis Department of Viticulture and Enology made and evaluated wines from some selections. I was familiar with Fay's program and made contact with him in the early 1980s to view his collection, which numbered about 80 to 100 breeder selections. Soon after, Fay sold his vineyard but was allowed to keep much of the collection until he could find another location for it.

I began moving some of his most promising selections to Kearney in the 1980s and collecting data from them. Ultimately, I brought down over 40 selections. Subsequently, some wines were made at Gallo and at UC Davis. All the material was donated, and I have records and correspondence from Fay on the crosses and his evaluation notes. I eliminated all but 21 of the selections, based on performance data, fruit composition and perceived potential for production or breeding.

Peter Christensen (left) and Fay Triplett (right) taking notes on his wine variety selections at the Kearney Agricultural Center on August 13, 1991. *(Photo courtesy of Peter Christensen)*

Many of his crosses have interesting and complex parentage. Some are very high yielding for the concentrate market such as 99-9A, a cross of Vernaccia Sarda and Colombard; others show excellent viticultural and wine making potential for the Central Valley such as T194-1 and T793-1, black selections of excellent fruit composition and characteristics. Another black selection, F-16, has the highest titratable acidity of any cultivar experienced in the Central Valley, and it never rots. It should be retained for breeding purposes.

Wineries such as E&J Gallo and Canandaigua continue to show interest in some of the selections. However, possible virus status continues to be a stumbling block toward commercial evaluation and acceptance. Thus, they need to be indexed and possibly cleaned up; many of Fay's selections were grafted onto older commercial cultivars. The collection also needs to be moved because I am now retired and can no longer maintain it at Kearney.

FPMS and the National Clonal Germplasm Repository at Davis are cooperating to preserve twenty-one Triplett selections in the Davis Repository collection. In addition, disease testing and shoot tip culture was started in 2002 at FPMS to clean up 99-9A with support from the California nursery assesment fund. Several other Triplett selections may be cleaned up at FPMS in the future. A table showing the parentage of each variety being saved is shown on page 5.

Parentage of Fay Triplett Selections under Trial at UC Kearney Agricultural Research and Extension Center

Black Selections:

30-47	Ruby Cabernet x Calzin
F1-13	T213-13 (61-9 [Grenache x Gros Manzenc] x 74-21A [Zinfandel x Cabernet Sauvignon]) x T42-36 (Ruby Cabernet x Barbera)
F1-16	same as F1-13
F3-3	F170-10 (T4-9 [Ruby Cabernet x Zinfandel]) x Bolgnino
F3-4	same as F3-3
F3-5	same as F3-3
F101-3	F1-2 (T213-13 x T42-36 [Ruby Cabernet x Barbera]) x F793-20 (Grenache x Ravat noir) Parentage of 213-13 is: T61-9 (Grenache x Gros Manzenc) x T74-21 (Zinfandel x Cabernet Sauvignon)
F101-4	same as F101-3
T51-16A	Cabernet Sauvignon x Barbera
T61-13	Grenache x Gros Manzenc
T170-9B	T4-9 (Cinsaut x Ruby Cabernet) x Bolgnino
T194-1	Merlot x T46-14 (Ruby Cabernet x Koptcha)
T203-1	T4-9 (Cinsaut x Ruby Cabernet) x Ruby Cabernet
T213-19	T61-9 (Grenache x Gros Manzenc) x T74-21 (Zinfandel x Cabernet Sauvignon)
T793-1	Grenache x Ravat noir

White Selections:

99-9A	Colombard x Vernaccia Sarda
158-8B	Colombard x Chenin blanc
181-7A	Colombard x Malvasia bianca
T34-1	Clairette blanche x Colombard
T82-4B	F2-35 (Olmo) x Catarrato
T182-4	Malvasia bianca x Colombard

Sauvignon blanc Selections at FPMS

by Susan Nelson-Kluk, FPMS Grape Program Manager

Increasingly popular, Sauvignon blanc has been among the registered varieties at FPMS since 1966. Over the last 26 years, Sauvignon blanc materials from France, Italy and California have been collected, tested for disease, and professionally identified to develop eight Registered and seven Provisional selections for the California Grapevine Registration and Certification (R&C) Program. This is an account of some of the contributions made by private industry, UC Davis and USDA to produce the Sauvignon blanc collection at FPMS today.

Sauvignon blanc FPMS 01, which has the longest history in the R&C program, was collected from Wente Vineyards by Dr. Harold Olmo in 1958. Wente acquired this selection when they bought the El Mocho Vineyard in Livermore, probably sometime before 1925, according to Philip Wente, executive vice president of Wente Vineyards.

The El Mocho vineyard was originally owned and planted in the 1880s by Louis Mel, an insurance agent turned grape grower. He got material of Sauvignon blanc, Semillon, and several other varieties from Charles Wetmore who was the head of the State Viticultural Comissioners at that time. Wetmore shared cuttings with Mel that he was able to collect from the Chateau Yquem vineyard in France with the help of a letter of introduction from Louis Mel's wife. (1,2) Semillon FPMS 02 may also be from this original French source.

Sauvignon blanc FPMS 01 was first registered in the R&C program in 1967 after 82 days of heat treatment was used to eliminate a leafroll infection found in the original material.

Several other early selections of Sauvignon blanc were collected by Dr. Austin Goheen, USDA, ARS plant pathologist, out of the Jackson Vineyard in Amador County. This vineyard was one of seven experimental vineyards established around California by UC Berkeley Professor Hilgard in the 1880s. Goheen rediscovered the Jackson vineyard in 1963 after it had been overgrown and abandoned by the University. He also found old maps and records for it in the UC Berkeley library and managed to overcome resistance from the owner to get permission to visit the plot. The owner feared that the University was trying to take back land his parents had acquired by squatter's rights.

Although several Sauvignon blanc selections were collected from the Jackson vineyard, only one exists in the Foundation collection today and it was collected as another variety. Goheen wrote, "... I collected a vine which the records indicated should be Herbemont. Herbemont is an American bunch grape of Professor Munson, an early grape breeder from Texas. The grape I obtained turned out to be Sauvignon blanc. My collection was apparently three rows off from the original plan, an easy mistake when one considers the abandoned state of the planting at the time of my visit."

The selection first identified as Herbemont was tested for virus disease and later renamed Sauvignon blanc FPMS 03. By 1973, it was added to the list of registered selections in the R&C program. It remained in the program until 1983, when leafroll was detected in the selection when it was retested using the field indicator Cabernet Franc. Several plants have been made from the original FPMS 03 material using shoot tip culture to attempt to eliminate the leafroll disease. Testing of the tissue culture plants will be completed in the spring of 2003 when we hope to restore this selection to the collection.

Identity issues have plagued one of the older Sauvignon blanc selections in the FPMS collection. We now know that the selection labeled Savagnin musque, when it was imported from the viticulture station at Pont-de-la-Maye, (near Bordeaux) France in 1962, is in fact Sauvignon blanc. The name Savagnin musque FPMS 01 was used, however, when this selection was first registered in 1974. In 1978 the spelling of the name was changed to 'Sauvignon musque.' Sauvignon musque FPMS 01 remained registered until 1980 when it was removed because of a positive test for Rupestris stem pitting (RSP).

Old planting records from a T-bud and varietal trial planted in the 1970s by Curtis Alley, UC Davis viticulture extension specialist, and Terrel West, formerly with Arroyo Seco Vineyards in Monterey

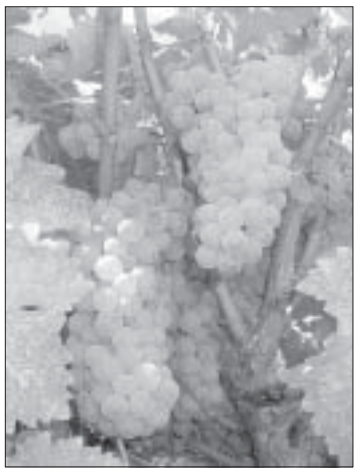
County, show that Savagnin/Sauvignon musque FPMS 01 was the Sauvignon blanc clone Doug Meador, president, Ventana Vineyards, discovered in that trial. Savagnin musque was among the many unusual varieties Alley took from the UC Davis Viticulture and FPMS collections to plant in the trial.

Meador had observed the Wente clone (Sauvignon blanc FPMS 01) growing in Monterey, but was not satisfied with its performance in his site. He recognized that the vines labeled Savagnin musque in the trial were really Sauvignon blanc and decided to make wine from it. His wine turned out "gorgeous" from the beginning and this selection has been the mainstay of his production. In general, he found that the musque clone did not have vegetative flavors when it was grown in the cool Monterey climate.

In order to confirm his opinion about the true identity of the musque clone, Meador took shoots and clusters to Pierre Galet, the French ampelographer, during Galet's first trip to California in 1982. He didn't tell Galet anything about the material. He just showed the samples. Galet immediately identified it as Sauvignon blanc. Later, when Galet wrote a report about his trip, he noted that there was true Sauvignon blanc in California, but for some strange reason it is called Savagnin musque. Galet's comments were misunderstood by some to mean that the Savagnin musque material was the only true Sauvignon blanc in California, so during Galet's second visit in 1985, Meador took shoots of the Wente and musque clones to him. Again Galet was given no information regarding the suspected variety or source. He identified both as Sauvignon blanc. Coincidentally, the same day, Monterey County Farm Advisor, Larry Bettiga, brought samples of the same two selections to show Galet. He identified them as Sauvignon blanc as well.

Carole Meredith, UC Davis viticulture professor, provided further evidence that the selection in the FPMS collection, originally called Savagnin musque, is really Sauvignon blanc using DNA analysis. In the 1999 *FPMS Grape Program Newsletter* she reported that Sauvignon musque has the same DNA profile as Sauvignon blanc.

A selection created from Savagnin/Sauvignon musque FPMS 01 using heat treatment and tissue culture remains in the FPMS collection today. The new selection which is designated Sauvignon blanc (musque) FPMS 27 was planted in the foundation block in 2001. Currently, the vines have Provisional California Foundation Stock status. After they are professionally identified, the registration status of all the propagation materials from these vines will be advanced to Foundation Stock status.



Sauvignon blanc FPMS 01 was the only registered selection available from FPMS from 1992 to 1997. Then, in the 1998-99 dormant season, two Italian selections (ISV-CPF-5 and ISV-CPF-2) imported from Conegliano, Italy in 1988 became registered selections 06 and 07 respectively.

Five more Sauvignon blanc selections were added to the registered list in the 2001-02 dormant season. This set included an Italian clone (ISV1) from Conegliano, Italy in 1988, now designated FPMS 17, and three generic clones reported to be from the French 316, 242 and 378. They are now designated FPMS 14, 20 and 21 respectively. The first official ENTAV-INRA trademark clone of Sauvignon blanc was also registered last winter. It is designated as clone 376 at both ENTAV and FPMS.

Six other Sauvignon blanc selections (FPMS 18, 22, 23, 24, 25 and 26) with Provisional California Foundation Stock status have recently been planted in the FPMS foundation block and are awaiting professional identification. FPMS 18 and 25 are generic selections reported to be from the French clones 317 and 378 respectively. FPMS 24 is from the Italian clone ISV-CPF-3. The other three are California heritage selections.

Sauvignon blanc FPMS 22 came to Davis around 1990 from a very old head trained, gnarled and neglected vine in the southeast corner of the UC Davis Oakville field station. Phil Freese, former vice president of Wine Growing at Robert Mondavi Winery, encouraged FPMS to preserve this selection because he suspected that the vine might have been part of a very old vineyard that originated before the modern Sauvignon blanc introductions. Galet looked at this vine during one of his trips to California in the 1980s and told Freese that it was true Sauvignon blanc. Tests conducted

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Sauvignon blanc Selections... *Continued from page 7*

at FPMS showed the original material was infected with leafroll and severe RSP. Shoot tip tissue culture was used to create selection FPMS 22, which qualifies for provisional Foundation Stock status.

Sauvignon blanc FPMS 23 was donated in 1999 by Daniel Roberts at Kendall-Jackson. It was from their Howell Mountain Vineyard. Roberts said that, "According to our winemakers, this Sauvignon was the best fruit in our program. But a large part of the quality was the soil (well drained fractured volcanic rock) and the climate (cool mountain vineyard). The earlier source is very vague... some people said Dry Creek others said Russian River." The cuttings that came from Kendall-Jackson were negative on all the tests for virus conducted at FPMS, so no treatment was necessary to qualify FPMS 23 for Provisional Foundation Stock status.

Sauvignon blanc FPMS 26 was selected in 1997 out of a well-respected Napa County vineyard that was probably planted around 1945. The wines made from it are reported to be distinctive, with intense varietal character. Due to the vineyard age, we suspect that the source of this selection may be other than Sauvignon blanc FPMS 01. The original material was infected with leafroll and corky bark. Shoot tip culture was used at FPMS to eliminate the virus.

Tests are in progress to qualify the Italian clone R3 from Rauscedo, Italy in 1994 for the R&C Program. Tissue culture was used to attempt to eliminate Rupestris stem pitting from this selection which is currently designated FPMS S31. Test results are expected in the spring of 2003.

The newest candidate for the FPMS Savignon blanc collection is Sauvignon musque selected by Larry Hyde, a Carneros region grape grower well known for his collection of wine grape varieties and clones. He made the selection from Sauvignon musque materials that came from Arroyo Seco. Recent DNA analysis conducted by Gerald Dangl in Carole Meredith's lab showed that the Hyde Sauvignon musque selection is the same as Sauvignon blanc; it will be offered under that varietal designation. Disease tests were started at FPMS this spring 2002.

In less than a decade, the FPMS Sauvignon blanc collection has grown from a single registered selection to a total of eighteen selections—fifteen of which are currently registered or provisional in the R&C Program. The generosity of viticulturists and winemakers in California and Europe have made this growth possible. California nursery assessment funds proided for the disease testing and disease elimination work have also been key in creating this expansion.

References:

1. Stoll, H. F. How the Choice Sauterne Grapes Were Introduced into California, *Wines and Vines,* October 1935.

2. A Winelover's Wine Called Sauvignon Blanc, *Robert Lawrence Balzer's Private Guide to Food and Wine*, May 1977.

This old vine growing in the southeast corner of the UC Davis Oakville field station was the source of Sauvignon blanc FPMS 22. *(Photo courtesy of Phil Freese)*

Sauvignon blanc Selections at FPMS

Selection #	Period registered in CA R&C program	Source
01	registered 1967–81 and 1992 to present	Wente 1958 and Chateau Yquem, France 1880s
03	registered 1973–83 (currently non-registered)	Jackson, Amador County, plants produced from 03 using tissue culture are being tested to try to re-qualify this source for registration
06	registered 1998	ISV-CPF-5 from Conegliano, Italy in 1988
07	registered 1998	ISV-CPF-2 from Conegliano, Italy in 1988
14	registered 2001	reported to be from French 316
17	registered 2001	ISV1 from Conegliano, Italy in 1988
18	provisional 2000	reported to be from French 317
20	registered 2001	reported to be from French 242
21	registered 2001	reported to be from French 378
22	provisional 2000	UC Davis Oakville field station, 1990
23	provisional 2001	Kendall-Jackson Winery, CA, 1999
24	provisional 2001	ISV-CPF-3 from Conegliano, Italy in 1988
25	provisional 2001	reported to be from French 378
26	provisional 2001	Napa County, CA, 1997
27	provisional 2001	Savagnin/Sauvignon musque from Pont-de-la-Maye, France in 1962
376	registered 2000	Authorized proprietary clone ENTAV-INRA® 376 from ENTAV, France
group #7252	non-registered until disease tests completed in 2004	Larry Hyde, Hyde Vineyards, CA in 2002
S31	non-registered until disease tests completed in 2003	R3 from Rauscedo, Italy in 1994

Carneros Creek Clonal Trial

by Susan Nelson-Kluk, FPMS Grape Program Manager

In 1974, Francis Mahoney, owner of Carneros Creek Winery, began a groundbreaking Pinot noir clonal trial at Carneros Creek Winery in cooperation with Curtis Alley, UC Davis viticulture specialist. It was one of the first California studies to follow a selection from the vineyard all the way to wine making. Industry clones with a reputation for producing good Pinot noir wines, as well as FPMS selections, were included in the trial. Mahoney has recently donated the best five of the industry clones (A, E, M, P and V) from the trial to FPMS for the public collection.

Francis Mahoney and Clone P.

For many years the exact source of some of the clones was kept secret. However, Mahoney and his cooperators have now agreed to make all the sources public. The information they have generously provided for the whole trial is shown in the table on page 12.

The trial was planted on 1½ acres near the Carneros Creek Winery. AXR-1 was used as the rootstock for the whole trial. Twenty different selections–11 from FPMS and 9 non-certified industry clones–were included in the block. About 55 single-vine replications were planted for each selection throughout the block to compensate for the sloping ground, differences in soil depth and drainage. The exact number of replications per selection varied somewhat.

UC Davis and Carneros Creek made wine concurrently from the trial. Davis made the wine in 5-gallon containers in a controlled temperature environment without malolactic fermentation. Carneros Creek used typical commercial wine making methods including special barrels from France and malolactic fermentation. A trained panel of tasters evaluated the wine made at UC Davis, while experts from the industry judged the Carneros Creek wine.

Mahoney said that, "The big surprise for me was that we agreed with the UC Davis tasting results almost yearly." The clones that scored the highest in wine tastings at both UC Davis and Carneros Creek were A, P, L, N and E, in that order, with A scoring the best. The clones that scored the worst were O, C, F, J and D. Mahoney also concluded that there was no one best clone. "We liked different clones like we like different children. They had their own personality and a little bit of this with a little bit of that makes a more interesting wine. We concluded that we would not just plant one clone in a vineyard even if it was the #1 clone 10 years in a row."

Phase 2 of this Pinot noir project was planted in 1989 on a 40-acre hillside site in Las Lomas, California (3000 feet from the original clonal study). It was near the first site, so the climate was about the same. Six clones (A, E, L, N, P and R) on AXR-1 and St. George rootstocks were included in Phase 2. Production level of the clones was matched with soil quality so that shy bearing clones were planted on poor soil and more vigorous clones were planted on good soil.

Mahoney reported that Clone 'A' came from Paul

Francis Mahoney (left foreground) and Susan Nelson-Kluk (right) in a panorama of the Phase 2 Pinot noir clonal trial. In the background is the Carneros Creek Winery.

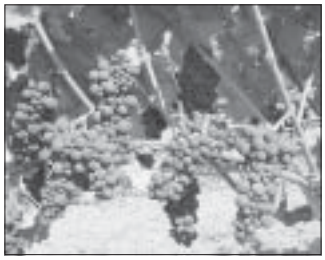
Masson/Martin Ray sources via Joe Swan and was considered unique because Martin Ray and Joe Swan had reputations for making good Pinot noir. "It was the most carefree clone that we had. It took very little viticultural work to keep it in balance. We used to say that it was self regulating, maybe because it was infected with leafroll. In our production of Swan, we produced 10-11 lbs of fruit/vine with 28 buds, which for us in that era was a quality statement. For Pinot noir there is good color—dark red brick color. It always had a strawberry jam flavor with a hint of pepper spice compound. It also has a little bit of a briary aroma like the smell you get when you cut a certain type of wood in the garden," according to Mahoney.

Clone 'E' reportedly came from the Gustav Neibaum/John Daniel/Inglenook estate originally. From there it went to the Oakville Viticulture Field station and then to the Stelling Vineyard across the street from the field station. Zellerbach got wood from Stelling for his Hanzel vineyard which was the source for clone E for the Carneros Creek trial. Mahoney said, "Clone E made a wonderfully dense wine that was very dark for Pinot with a hint of mint. It made a tremendous textural statement and yet at the same time it also made a delicate Pinot statement. In certain years it was stunning. You could fall in love with it. The big problem was the low production."

Alley and Mahoney picked Martini selections 44 (H), 54 (M) and 58 (V) for the Carneros Creek trial out of a block of Pinot noir selections collected by Louis Martini and Harold Olmo, Professor of Viticulture at UC Davis, right after World War II. Many of the selections Martini and Olmo collected came from the Niebaum Estate in Rutherford. Mahoney reported that, "M had bright fresh Pinot noir flavors, moderate middle texture and a very clean finish. It didn't have the texture that we looked for in top-of-the-line Pinot noir. It was good but its best characteristics were its balance and varietal character in a blend. It made a strong cherry and fresh strawberry statement. That's what it really came across with. It didn't give you that sort of deep textural follow through."

Alley and Mahoney chose FPMS 13 (L), which is a heat treatment of Martini 58 (V), for the Carneros Creek trial so that heat treated and non-heat treated clones could be compared. Regarding the differences Mahoney said, "L did better than V, but those were close. V produced a nice wine that had varietally clean tones. It didn't have any complex undertones. The wine had cherry and fresh strawberry flavors. V made a moderate middle balanced wine. You could find no fault with V, but you couldn't get overly excited about it either. V consistently did a good job and production levels were moderate. A little more than clone M but less than L."

Clone P came from a vineyard near Chambertin, France via the Chalone Vineyard, California. Mahoney reports that, "Clone P was liked immediately. It was one of our favorite wines. It was always rich with tremendous strawberry jammy flavors and texture. It was a mouth-filling experience all the way. The down side was it produced almost nothing. Some years you were lucky if you got 2½ pounds per vine. In a good year we got eight pounds per vine. It had a lot of shot berries that is typical for fanleaf."



Clone P, showing 'hen and chicken' symptoms associated with fanleaf.

Testing of the original material of the five Carneros Creek clones donated for the public collection has been completed at FPMS. Diseases of concern for the California Grapevine Registration and Certification (R&C) Program were detected in all but clone V, which was only positive for Rupestris stem pitting (RSP). Test results shown in the table on page 12 explain some of the very low yields Mahoney reports for clones E and P (positive for fanleaf). Shoot tip tissue culture has been used at FPMS to attempt to eliminate disease from the original diseased materials. New FPMS selections that qualify for the R&C program have been produced from clones A (FPMS 97), M (FPMS 75), P (FPMS 90 & 96) and V (FPMS 66). Support for this work was provided from the California nursery assessment fund.

Mahoney is now planning Phase 3 of the project, in which he will be planting some of the original clones and the new FPMS selections created from Carneros Creek clones. He also plans to experiment with several different rootstocks. Results from Phase 3 may help answer questions about the relationship between virus disease and wine quality.

Many thanks to Francis Mahoney and each of the cooperators for sharing this information and the clonal materials.

Carneros Creek Pinot Noir Clone Sources and Disease Status

CARNEROS CREEK CODE	SOURCE	FPMS TEST RESULTS	NEW VIRUS-NEGATIVE SELECTION AT FPMS
A	Joe Swan, Forestville, CA	leafroll+, RSP+	FPMS 97
B	FPMS 03A Wadenswil, Switzerland	leafroll+ 1982	
C	FPMS 22, Gamay Beaujolais type, heat treated 141 days currently registered at FPMS	all tests negative	
D	Beaulieu, block 2 Row 6&7		
E	Hanzel Vineyards via Stelling, UC Davis Oakville field station and Niebaum vineyards	fanleaf+, leafroll+, RSP+	
F	FPMS 01A, Wadenswil,Switzerland, Sel B111 currently registered at FPMS	all tests negative	
G	Chalone Vineyard, old block		
H	Martini selection 44		
J	FPMS 04, Pommard selection 820	RSP+ in 1981	
K	FPMS 27, Geisenheim, Germany	RSP+ in 1981	
L	FPMS 13, Martini selection 58, heat treated 105 days currently registered at FPMS	all tests negative	
M	Martini selection 54	leafroll+, RSP+	FPMS 75
N	FPMS 18, Gamay beaujolais type currently registered at FPMS	all tests negative	
O	FPMS 06, Pommard, France, heat treated 119 days	RSP+ in 1981	
P	Chambertin, France via Chalone Vineyard, new block	fanleaf+, fleck+, RSP+	FPMS 90 & 96
R	FPMS 12, Pommard, France selection 804, heat treated 89 days		
S	Beaulieu, block 1		
T	FPMS 23, Wadenswil, Switzerland		
V	Martini selection 58	RSP+	FPMS 66
Z	FPMS 29, Jackson, CA		

Gerald Dangl in front of a genetic analyzer in his variety identification lab.

2001-02 DNA Testing of FPMS Grapevines

by Gerald Dangl, Staff Research Associate, UC Davis; Carole Meredith, Professor, Department of Viticulture and Enology, UC Davis and Susan Nelson-Kluk, FPMS Grape Program Manager

WE HAVE CONTINUED TO USE DNA typing to resolve some of the variety name issues at FPMS. Some of these cases are simply a matter of our having used a name that is not complete (e.g., using only the first word of a two word name), as in the case of Touriga Nacional or Grenache noir. Verifying the identities of these varieties will allow us to adopt the name that is considered correct in the international grape research community.

We are not yet able to answer some of our variety name questions because we do not have an authentic DNA profile to use for reference. However, the number of grape varieties for which we can obtain reliable reference DNA profiles from colleagues in European countries is growing steadily, so we are optimistic that we will eventually be able to address all of our identification issues.

Sauvignon musque

This summer (2002) the name of Sauvignon musque FPMS S1F (reported to have the same DNA profile as Sauvignon blanc in the 1999 newsletter) was changed to Sauvignon blanc (musque) FPMS 27. Sauvignon blanc (musque) FPMS 27 was planted in the foundation block in 2001 and the vines currently have California Provisional Foundation Stock status.

The Sauvignon musque selection donated in 2002 to the FPMS public collection by Larry Hyde, California grape grower and winemaker, also tested the same as Sauvignon blanc and will be designated Sauvignon blanc (musque) as well. We expect to qualify the Hyde selection for the foundation block sometime in the next five years.

None of the industry Sauvignon musque selections that are reported to be different from Sauvignon blanc were tested. More information is therefore needed before we can say that all Sauvignon musque should be renamed Sauvignon blanc (musque).

Muscadelle/Sauvignon vert

There are reports that some of the Sauvignon musque used in industry is the same as Muscadelle or Sauvignon vert rather than Sauvignon blanc. To find out how these varieties are related at FPMS, one selection of Sauvignon vert (FPMS 01) and two selections of Muscadelle (FPMS 01 and 02) were tested this year. The DNA profiles for the Sauvignon vert selection and both Muscadelle selections were the same. They matched the profile of Muscadelle in the French national variety collection; they did not match Sauvignon blanc.

Grenache/Grenache noir

All three registered Grenache selections (FPMS 01A, 03, 04) at FPMS have black-colored berries. The French ampelographer Dr. Jean-Michel Boursiquot, Director of ENTAV, and UC Davis Viticulture Professor Dr. Andy Walker have recommended that the name be changed to Grenache noir to distinguish them from the grey and white fruited forms of Grenache.

Tests conducted in 2001 and 2002 showed that Grenache FPMS 01A, 03 and 04 all match the Grenache noir reference in the French national variety collection. The names have therefore been changed to Grenache noir FPMS 01A, 03, and 04.

Touriga

Eight Touriga selections at FPMS were characterized this year using DNA analysis. The results showed that Touriga FPMS 01 imported by Dr. Harold Olmo (Emeritus UC Davis viticulture professor) from Portugal in 1939, Touriga FPMS 02 imported from Portugal in 1981, Touriga Nacional FPMS 01 imported from Portugal for Olmo in 1981, and two new Touriga Nacional selections imported from Portugal for Mr. Jim Duarte of Duarte Nursery in 2000 all match.

The profiles for these five selections are also the same as reported for Touriga Nacional by several others, including researchers from Portugal. Touriga FPMS 01 and 02 will therefore be renamed Touriga Nacional-FPMS 03 and 02 respectively because their

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DNA testing... Continued from page 13

profiles matched Touriga Nacional references and recent imports from Portugal.

Boursiquot inspected Alvarelhao FPMS 02 in the FPMS foundation block in 1996 and 2000. He noted that it was misidentified and looked like Touriga. This selection was originally imported from Portugal by Olmo in 1939 and has been on hold at FPMS because of suspected misidentification. DNA analysis showed that Alvarelhao FPMS 02 matched all the Touriga Nacional selections at FPMS. The selection will therefore be renamed Touriga Nacional FPMS 04. We will also start using tissue culture to eliminate leafroll from a correctly identified selection of Alvarelhao (FPMS S1) currently in quarantine at FPMS.

A Touriga Francesa selection (FPMS S1) imported for Olmo in the 1980s was compared to a new Touriga Francesa selection imported from Portugal in 2000 for Duarte. The DNA profiles were different from each other and all the other types of Touriga at FPMS. The Touriga Francesa imported in 2000 did, however, match data from Portugal for Touriga Francesa. We can conclude that the Touriga Francesa imported in 2000 is likely to be correctly identified. Touriga Francesa S1 is probably misidentified, so it has been noted as such in the records and placed on hold.

Touriga Brasileira was imported from Portugal for Olmo in 1984. Shoot tip culture was used at FPMS to eliminate leafroll from the original material and create selection FPMS 01 which was planted in the foundation block in March 2000. During an early visual inspection conducted in August 2000, the vines appeared to be misidentified, but DNA analysis conducted this year (2002) showed that Touriga Brasileira FPMS 01 matched a profile for that variety from Portugal. Additional visual inspections will be conducted as the vines at FPMS grow older to confirm their identity.

Overall, the DNA test results indicate that we have three distinct Touriga varieties at FPMS. The results also show that DNA profiles for FPMS Touriga selections are internally consistent by variety (with the adjustments noted) and they test the same as references for Touriga Nacional, Touriga Francesa and Touriga Brasileira obtained from Portugal.

Grignolino 02

Grignolino FPMS 02 was derived from Grignolino clone CVT 275 imported from Italy in 1993. Both Walker (1999) and Boursiquot (2000) reported that the Grignolino FPMS 02 vines in the Foundation block are misidentified because the fruit color is white instead of red. Boursiquot also said that the correct identity might be Arneis. DNA tests conducted this year showed that Grignolino FPMS 02 matched Arneis FPMS 01, but it did not match a published Grignolino reference from Italy. No outside references for Arneis were available. Grignolino FPMS 02 has been placed on hold at FPMS and the suspected misidentification has been noted in the records.

Grignolino FPMS 03 (from a California vineyard in the early 1960s) appears to be correctly identified according to a preliminary visual inspection by Boursiquot. Grignolino FPMS 03 vines were planted in the Foundation block at FPMS in 2000 and currently have Provisional Foundation Stock status.

Viognier/Roussanne

As most of you are aware, some of the common stock selections of Roussanne growing in private California vineyards turned out to be Viognier. DNA testing and visual inspections by Boursiquot have therefore been used to sort out the identity of some recent Roussanne and Viognier introductions at FPMS. Two selections from Lodi and one selection from Mendocino originally labeled Roussanne were changed to Viognier FPMS 02, 03 and 04 as a result of these tests and inspections. Viognier FPMS 02 and 03 were planted in the foundation vineyard in 2001. Viognier FPMS 04 was planted in 2002. None of the misidentified Roussane material was distributed by FPMS before the name was changed to Viognier.

Roussanne selections from Sonoma county (FPMS 02) and the UC Davis Viticulture and Enology vineyard proved to be correctly identified. Roussanne FPMS 02 was planted in the foundation vineyard in 2002. The selection from the Viticulture and Enology collection is currently being tissue cultured to eliminate fleck.

Support for DNA variety typing of public grape selections was provided from the California nursery assessment fund.

Developing Rootstocks to Combat Nematodes in California Vineyards

by Andy Walker, Professor, Department of Viticulture and Enology, UC Davis

THERE ARE RELATIVELY FEW grape rootstocks with strong nematode resistance, and their resistance is often directed at a single species or even a strain of a given nematode species. The need for broadly resistant rootstocks that are capable of controlling both endo- and ectoparasitic (feeding from within or on the outside of the roots) nematodes is intensifying as growers face the loss of methyl bromide and concerns heighten over the environmental safety and efficacy of alternative nematicides and fumigants. Nematode damage is also becoming far more widespread because vineyards are replanted without fallow or crop rotation.

The Walker lab has been developing rootstocks to resist nematodes. These efforts address two primary concerns: fanleaf degeneration caused by grapevine fanleaf virus (GFLV) and vectored from vine to vine by the dagger nematode, *Xiphinema index*; and aggressive populations of root-knot nematodes, *Meloidogyne* spp (RKN).

Currently, the only rootstock recommended for the control of fanleaf degeneration is O39-16. This *Vitis vinifera* x *Muscadinia rotundifolia* hybrid is resistant to *X. index* feeding, but the test probing of the nematode allows vectoring of GFLV. However, the effects of GFLV on fruit set are not expressed due to a tolerance induced in the scion by the O39-16 root system, a tolerance that is probably due to its *rotundifolia*-based root system. The primary problem with O39-16 is its *vinifera* parentage, which casts doubts about its long-term resistance to phylloxera. There are also concerns about its relatively high vigor and susceptibility to RKN.

We have successfully used *rotundifolia* in crosses with *rupestris* to produce hybrids with strong resistance to a wide range of pests. The "89" series of crosses was selected for strong resistance to *X. index* and phylloxera. Selections from this series are being field tested in Napa, Sonoma, Mendocino, San Benito, San Joaquin, Santa Barbara and Kern counties. These field tests are designed to determine what happens to scions on these rootstock selections when they become infected by *X. index*'s probing attempts at feeding, and whether they induce fanleaf tolerance in the manner of O39-16. Most of these plots were established with the same group of 30 rootstock selections and include St. George, 3309C and O39-16 as standards. The Napa Valley site is grafted to Cabernet Sauvignon with interspersed St. George (highly *X. index* susceptible) to keep nematode pressure high. We have four years of crop data from this site and many of the rootstock selections look very promising. This site was tested for the presence of *X. index* and GFLV and both were evenly distributed. However, we do not yet have uniform fanleaf infection in the susceptible controls, so that conclusions about their fanleaf tolerance are not possible.

The Sonoma site was grafted to Chardonnay and inter-planted between existing AXR#1 vines that were both fanleaf infected and phylloxerated. The "89" series selections have been slow to establish at this site because of the competition with mature AXR#1 vines, but the vines are all GFLV infected. We hope to observe fanleaf tolerance induced by these selections in the coming year.

The Lodi site was grafted to Viognier and planted with alternating St. George vines. Nematodes are evenly distributed and both *X. index* and RKN are present. We chip-budded GFLV infected buds into all of the selections and controls so that GFLV infection would be rapid and uniform and provide results on the fanleaf tolerance of these rootstocks earlier. We expect to see uniform GFLV infection by next spring and perhaps indication that fanleaf tolerance is being induced.

We evaluated the progeny from *rupestris* x *rupestris* sibling crosses and found that a single dominant gene controlled resistance to *X. index*. This discovery prompted the completion of a genetic map that will lead to the identification of that gene. These mapping

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Developing Rootstocks... *Continued from page 15*

efforts have also produced DNA markers that are strongly linked to *X. index* resistance and are being used to accelerate breeding progress. This same population is being used to develop a genetic map for Pierce's Disease resistance.

Crossing *rupestris* x *rotundifolia* selections with strong nematode resistance to 101-14 Mgt and 161-49C rootstocks has produced hundreds of seedlings. These two rootstocks are female flowered and have good horticultural characters not present in the *rupestris* x *rotundifolia* selections. These stocks should incorporate better rooting, long internode length, limited laterals, and better cold and lime tolerance into the resistance background. Testing of these will begin in 2003.

Lloyd Lider examined RKN resistance about 50 years ago and came to the conclusion that resistance was due to a single gene. Peter Cousins, during his PhD research in my lab, also found that RKN resistance in grape rootstocks, including Harmony and Freedom, was due to a single dominant gene. Pests often overcome single gene resistance and strains of nematodes have been shown to be successful in overcoming such resistance in a variety of species. In 1993 and 1994, I made many crosses with a mixture of root-knot resistant but hard to propagate species including *V. arizonica*, *V. candicans*, *V. champinii*, *V. cinerea* and *V. rufotomentosa*, to the easy to root *V. riparia* and *V. rupestris*. These crosses were made to combine dagger and root-knot nematode resistance and incorporate multiple sources of RKN resistance so that resulting rootstocks would have a more durable resistance based on multiple alleles or genes. More than 5,000 seedlings were established in the field and we first screened them for their ability to root from dormant cuttings (cuttings that root well generally graft well). We selected about 100 that rooted very well and began testing them for resistance to nematodes in a collaborative project with Howard Ferris (Nematology, UC Davis). The first screen evaluated resistance to *Meloidogyne incognita* Race 3, a strain we used earlier to characterize resistance. This strain is not aggressive on Harmony or Freedom, but feeds on a wide range of species and rootstocks. Seedlings that passed this screen were then tested against two very aggressive strains of RKN (Harm A and C) that feed freely on Harmony and Freedom, and *Xiphinema index*.

Table 1 lists the selections that are resistant to all of these nematodes and that are now undergoing testing with all possible combinations of these nematodes. These selections will also be screened against ring, lesion and citrus nematodes. In Spring 2002, the best of the "89" and "93" series selections (Table 1) were crossed to combine a wide range of resistances and ensure that we have a very broad base of resistance to combat nematodes. Many of these selections were also crossed to 101-14 Mgt and 161-49C to improve horticultural characteristics. We also bench-grafted most of these selections to Fiesta, Thompson Seedless, and Chardonnay and planted them in vineyards with severe nematode pressure in Fresno, Kern and Santa Barbara County.

The overall strategy of the breeding program is to develop broad and durable resistance to grape nematodes and phylloxera. These efforts are complemented by studies directed at developing genetic markers linked to resistance and creating genetic maps. Genetic maps are the first step toward locating the genes responsible for resistance and then using these genes to genetically engineer rootstocks.

Funding from the California Grape Rootstock Improvement Commission, the Fruit Tree, Nut Tree, and Grapevine Improvement Advisory Board and the California Table Grape Commission has been outstanding and critical in the rootstock breeding efforts described above, and is greatly appreciated. Their support ensures that resistant rootstocks will be available to combat California's current and future soil-borne pest problems.

Changes to Oregon's Grapevine Quarantine

By Gary McAninch, Supervisor, Nursery Program, Oregon Department of Agriculture

OREGON'S GRAPEVINE QUARANTINE WAS AMENDED on May 22, 2002 to reflect the current pest and disease situation and industry practices in the state. The original quarantine, adopted in 1970, was designed to keep grapevine leafroll and fanleaf virus diseases and grape phylloxera out of Oregon.

The original quarantine is outdated because we believe that both leafroll virus disease and grape phylloxera are now established in Oregon. We also have information that large numbers of non-certified and

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Table 1. Rootstock selections that resist *Xiphinema index*, *Meloidogyne incognita* Race 3, and *M. arenaria* strains Harmony A and Harmony C.

Selection	Parentage
8909-05	*V. rupestris* 'A. de Serres' (M23:17) x *M. rotundifolia* 'Cowart'
9317-06	*V. rupestris* 1595 X L513-4 (*V. rufotomentosa* x *V. riparia*)
9332-43	L514-10 (*V. rufotomentosa* x (*V. riparia* x Dog Ridge)) x *V. champinii* C9038
9344-03	L514-20 (*V. rufotomentosa* x (*V. riparia* X Dog Ridge)) X L25-19 (*V. champinii* x (*V. riparia* x Ramsey))
9363-16	L514-30 (*V. rufotomentosa* x (*V. riparia* x Dog Ridge)) X *V. riparia* 1438
9365-62	L514-20 (*V. rufotomentosa* x (*V. riparia* x Dog Ridge)) X *V. riparia* 1438
9365-85	L514-20 (*V. rufotomentosa* x (*V. riparia* x Dog Ridge)) X *V. riparia* 1438
9403-35	L 6-1(*V. riparia* x Ramsey) x L91-64 (*V. riparia* x *V. candicans*)
9403-107	L 6-1(*V. riparia* x Ramsey) x L91-64 (*V. riparia* x *V. candicans*)
9407-14	L 6-1 x *V. champinii* 9021
9449-17	*V. rufotomentosa* x *V. cinerea* 9008
9449-23	*V. rufotomentosa* x *V. cinerea* 9008
9449-25	*V. rufotomentosa* x *V. cinerea* 9008
9449-27	*V. rufotomentosa* x *V. cinerea* 9008

Oregon changes... *Continued from page 16*

untested grapevines had been brought into Oregon and planted over the past 10 years. In fact, as far as the department is aware, the only grapevines brought into the state legally in recent years were done so under exemption to the original quarantine. This told us that industry needs were not being met by the quarantine.

The amended quarantine removes the requirement that vines entering Oregon be index tested for fanleaf and leafroll virus diseases. The prohibition against the importation of field-grown grapevines and vines containing field soil remains in effect. This will help protect Oregon grape growers from the introduction of soil-borne pests and diseases. Under the amended quarantine, all shipments of grapevines are required to be inspected and accompanied by a certificate issued by the state of origin verifying that the plants are free of soil and dangerous pests and diseases. The shipper is required to pre-notify the department of all shipments.

Oregon's glassy-winged sharpshooter and Pierce's disease quarantine still remains in effect. All grapevines entering Oregon from California must be tested for Pierce's disease and treated for glassy-winged sharpshooter prior to shipment. Oregon's grapevine certification program also remains in effect. Only grape nursery stock from foundation plant programs or mother block plantings approved by the Oregon Department of Agriculture may be planted in a certified grape increase block.

Links to all Oregon Department of Agriculture quarantines can be found at: *http://oda.state.or.us/Plant/plant_division_homepage.htm.* Anyone needing more information concerning Oregon's amended grapevine quarantine can contact **Gary McAninch, Nursery Program Supervisor, Plant Division, Oregon Department of Agriculture, 635 Capitol Street NE, Salem, Oregon 97301**; e-mail: *quarantine@oda.state.or.us.*

NAPPO News

by Ray Johnson, Chair of the NAPPO Grape Standards Panel

TEN YEARS AGO, the North American Plant Protection Organization (NAPPO) began developing standards to govern the movement of plant materials, including grape nursery stock, between Canada, Mexico and the United States. The format and content for this process has changed over the years to conform with the evolving requirements of the International Plant Protection Convention (IPPC) and the many Food and Agriculture Organization of the United Nations standards.

The last draft of the NAPPO Grapevine Standard was sent out for public comments the summer of 2002. These comments were reviewed and a final draft prepared at a meeting held at UC Davis in April 2002. This draft was sent to the NAPPO Standards Panel who reviewed it for consistency with other NAPPO and FAO standards in June. The Panel has recommended some changes to the document that will be incorporated. The changed document was sent out to the NAPPO Grape Panel members in August for review and comment back in September 2002. The grapevine Standard is expected to be approved by the NAPPO Executive Committee in the fall of 2002 and announced at the annual meeting in Oaxaca, Mexico in October 2002.

This Standard describes the requirements for the importation of grapevines by the member countries of the North American Plant Protection Organization (NAPPO), and for the movement of grapevines among the member countries of NAPPO. Grapevine pests specifically addressed in this Standard are viruses and virus-like agents, viroids, phytoplasmas, and bacteria. Other pests of grapevines will be considered in later documents. The scope of this Standard does not include non-pest-related items such as varietal trueness-to-type, and quality grades and standards. The objectives of the Standard are to prevent the introduction of quarantine pests into NAPPO member countries, manage regulated non-quarantine pests within NAPPO member countries, facilitate equitable and orderly trade into and within the NAPPO region, and mitigate possible introduction of regulated pests to an acceptable level.

Quarantine pests are defined as those that are "of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled." Other plant pests may be regulated at importation if they are designated as regulated non-quarantine pests (RNQPs). A RNQP is defined as "a non-quarantine pest whose presence in plants for planting affects the intended use of those plants with an economically unacceptable impact and which is therefore regulated within the territory of the importing contracting party." Official control is required for a RNQP. Official control has been defined as the "active enforcement of mandatory phytosanitary regulations and the application of mandatory phytosanitary procedures with the objective of eradication or containment of quarantine pests or for the management of regulated non-quarantine pests." Importation of grapevines and other crops will be affected as the U.S. federal quarantine laws are reviewed for consistency with the IPPC.

The IPPC is an international treaty for plant protection to which 117 governments, including the United States, currently adhere. The latest revision of the IPPC reflects an updating of the Convention to reflect contemporary phytosanitary concepts and the role of the IPPC in relation to the Uruguay Round Agreements of the World Trade Organization, particularly the Agreement on the Application of Sanitary and Phytosanitary Measures (the SPS Agreement). The SPS Agreement identifies the IPPC as the organization providing international standards for measures implemented by governments to protect their plant resources from harmful pests through phytosanitary measures. The IPPC complements the SPS Agreement by providing the international standards that help to ensure that phytosanitary measures have a scientific basis for their placement and strength and are not used as unjustified barriers to international trade. The IPPC emphasizes cooperation and the exchange of information toward the objective of global harmonization. Its application to plants is not limited only to the protection of cultivated plants or direct damage from pests. The scope of the Convention extends to the protection of cultivated and natural flora as well as plant products, and includes both direct and indirect damage by pests. More information about the IPPC may be obtained through the International Phytosanitary Portal (IPP) at *http://193.43.36.94/cds_ippc/IPP/En/default.htm.*

Young Vine Decline and Black Measles Report

by W. Douglas Gubler, Cooperative Extension Specialist, Plant Pathology, UC Davis

PETRI DISEASE (syn:Young vine decline) and black measles (esca) are two of the most destructive grapevine diseases in many viticultural regions including California. Causal agents of these diseases include the fungi *Phaeomoniella chlamydospora*, *Phaeoacremonium inflatipes* and *Phaeoacremonium aleophilum*. (*Pa. chlamydospora, Pm. infilatipes* and *Pm. aleophilum*). The study of these diseases was undertaken to further our understanding of the biology, epidemiology and habitats of the associated pathogens and to develop effective control strategies.

Detection of fungal pathogens with PCR

A Nested-PCR method has been developed that detects *Pa. chlamydospora* and *Pm. inflatipes and Pm. aleophilum.*The research to date shows that this testing method has potential for detecting fungi directly in host tissue and infested soil but *Pa. chlamydospora* has not yet been successfully detected in soil. This approach is particularly well suited to these organisms that are difficult to identify and isolate because of the presence of inhibitors both in vine tissue and soil.

Association of fungal spores with grapevine cordons in California

A study was carried out to determine when or under what conditions spores of the pathogens (*Pa. chlamydospora*, *Pm. inflatipes and Pm. aleophilum*) are released to potentially re-infect plants. Spore traps were placed in selected vineyards where black measles and young vine decline was known to occur. These included: Napa County, Sonoma County, Mendocino County, San Joaquin County, Madera County, Tulare County, San Luis Obispo County, Kern County and Solano County. The traps were designed to catch spores of *Pa. chlamydospora* and *Pm. inflatipes and Pm. aleophilum* on grapevine cordons.

Spores were trapped on glass microscope slides coated on both sides with white petroleum jelly and affixed to the cordon. They were collected and changed each week. Observations were recorded at weekly intervals. According to the results taken from February to July, 2001, spores of three pathogens were trapped at different locations during different periods of time.

Spores of *Pa. chlamydospora, Pm. inflatipes, and Pm. aleophilum* were trapped in Napa County, Sonoma County, Mendocino County, San Joaquin County, San Luis Obispo County, and Solano County. Successful trapping of *Pa. chlamydospora and Pm. inflatipes* was correlated with rainfall events in each location. Trapping of *Pm. aleophilum* was not associated with rainfall. *Pa. chlamydospora* and *Pm. inflatipes* were trapped in the winter and spring. *Pm. aleophilum* was trapped in the spring and early summer.

These results show conclusively that *Pa. chlamydospora* and *Pm. infilatipes* have the ability to act as airborne inoculum in California vineyards during winter and spring. We suspect that *Pm. aleophilum* may be insect vectored.

Additionally, symptomatic grape berries were collected from different regions in California during ripening and were found to be contaminated with conidia of *Pm. inflatipes* and *Pm. aleophilum*.

Spore trapping using glass slides coated with petroleum jelly.
(Photo courtesy of Doug Gubler)

Susceptibility of grape rootstocks to fungal pathogens

Young vine decline has emerged as a significant problem in vineyard establishment. The problem affects grapevines during the first ten years of establishment and is not specific to any scion/rootstock combinations. We suspect that these pathogens of young vines have been present for many years but largely unnoticed. Recent planting and re-planting of large acreages has increased awareness of the problem.

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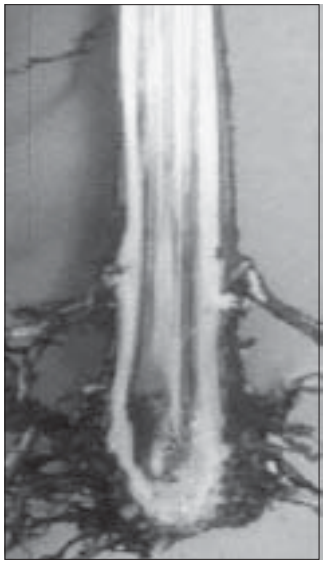
Susceptibility of different rootstock varieties to fungal pathogens was studied by artificially inoculating about 20 healthy cuttings of each variety with *Pa. chlamydospora, Pm. inflatipes* and *Pm. aleophilum*. After the formation of callus, they were planted in pots. Approximately one year after inoculation, disease occurrence was recorded as the length of brown vascular streaking from the base of plant toward the tip of each plant. Discolored areas were cultured on PDA-tet medium and pathogens were re-isolated. Inoculation with *Pa. chlamydospora* showed that the rootstocks 3309, 420A, 110R, 5C, Schwarzmann, St. George, and Salt Creek were the least susceptible while 99R, 039-16, Freedom, Riparia Glore, 140Ru, 1616, and 1103P were the most susceptible. Inoculation with *Pm. inflatipes* showed that 1616, 3309, AXR1, Salt Creek, 110R, 5C, Freedom and 140Ru were the least susceptible while 420A, St. George, 161-49, and Harmony were the most susceptible. Rootstock inoculated with *Pm. aleophilum* showed that 1103, 420A, Harmony, and Salt Creek were the least susceptible while 110R, SO4, 039-16 and 161-49 were the most susceptible.

None of the rootstocks tested were completely resistant to the fungi, but they did show a wide range of susceptibility. However the susceptibility of rootstock in these studies and the occurrence of vine decline in the field in California does not appear to be well correlated because invariably, 3309,101-14, 5C, and 110R seem to show the disease most prevalently. Natural occurrence may be skewed toward these rootstocks because they are the most widely planted. This may mean that the degree of susceptibility is not an important factor in disease expression under natural conditions.



Vascular streaking. *(Photo courtesy of Doug Gubler)*

Susceptibility of grapevine pruning wounds to fungal pathogens

Pa. chlamydospora, Pm. inflatipes and *Pm. aleophilum* have all been shown to be aerially dispersed in California vineyards. Dispersal was correlated to rain events and for the most part took place during the winter pruning season. This study was conducted to examine the susceptibility of grapevine pruning wounds to fungal pathogens present during pruning. Studies were conducted on Thompson Seedless and Cabernet Sauvignon grapevines. Pruning wounds became less susceptible over time and reached the lowest susceptibility rate some four months after pruning. Vascular streaking was observed in pruning wounds inoculated from February to June, indicating that grapevine tissue was susceptible from dormancy to green actively growing tissue.

Distance of vascular streaking in Thompson seedless grapevines ranged from 1.4 cm in the control to 6.0, 7.0, and 9.1 cm for *Pa. chlamydospora, Pm. inflatipes,* and *Pm. aleophilum,* respectively. Distance of vascular streaking in Cabernet Sauvignon was 1.2 cm in the non-inoculated control and 4.5, 6.7, and 10.1 in the *Pa. chlamydospora, Pm. inflatipes* and *Pm. aleophilum* inoculated spurs, respectively. Vascular discoloration and presence of all three pathogens were documented to be present at both bud positions of a 2-bud spur.

In a related study, spurs of Thompson Seedless and Cabernet Sauvignon grapevines were inoculated in February, 2001. Shoot growth from inoculated and control spurs was measured in June, 2001. Growth of non-inoculated control shoots reached an average of 140 cm for Cabernet Sauvignon while growth reached only 69.7 cm, 76.1 cm, and 89.9 cm shoot length for *Pa. chlamdospora, Pm. inflatipes* and *Pm. aleophilum* inoculated spurs, respectively. Growth on Thompson Seedless control spurs reached an average length of 172.3 cm while growth reached only 54.0 cm. 86.0 cm, and 87 cm shoot length for *Pa. chlamydospora, Pm. inflatipes,* and *Pm. aleophilum* inoculated spurs, respectively. All three pathogens were capable of infecting pruning wounds and resulted in significantly reduced growth in shoots emerging from diseased spurs.

Histological investigations of grape roots and shoots infected with fungal pathogens

Shoots or roots of tissue-cultured plants cv. Cabernet Sauvignon were inoculated with *Phaeoacremonium inflatipes* at approximately 10^6 spores/ml to determine the path of fungal invasion inside the host. Shoots were inoculated by cutting the tips and depositing 10 µl of inoculum on the wounds. Roots were inoculated

by cutting about 1.5 cm off the tips and dipping the cut ends in the inoculum for 30 min or by injecting 1 ml of inoculum into the culture media where plants were being grown. When inoculum was injected into the culture media, the fungus successfully invaded intact roots. In these roots, vesicle-like structures were observed in the inner walls of the epidermis and cortical cells. Spread of the fungus was initially intercellular. At early stages of infection, abundant hyphae were seen in the epidermis and cortex but not in the vascular tissues. When root and shoot invasions were through wounds, hyphae were observed in all tissues including cortex, xylem, phloem, and pith as well as varying degrees of tylose and gum occlusions at the early stages of infection. In the stem, rapid spread of the fungus was accomplished through the intercellular spaces of the pith. Symptoms of the disease appeared after two months but isolations made in symptomless plants two weeks after inoculation demonstrated the presence of the fungus in all parts of the plant, including petioles and leaves.

Effect of hot water treatments for eradication of fungal pathogens from dormant grapevine wood

The use of hot water treatments to effectively control pathogens including *Pa. chlamydospora, Pm. inflatipes* and *Pm. aleophilum* has been touted worldwide. However, our data show that a thirty-minute treatment of cuttings in 51°C water does not eliminate these pathogens from dormant wood. Cuttings first inoculated with *Pa. chlamydospora, Pm. infilatipes* and *Pm. aleophilum* and then subjected to a hot water treatment were either incubated in crispers or planted in plastic pots for six to eight weeks. Ratings for vascular discoloration were performed followed by isolation from the cuttings onto Potato Dextrose Agar modified with 0.10 g/L Tetracycline (PDA-tet). No statistical differences of vascular discoloration existed between inoculated, non-treated cuttings and inoculated, treated cuttings. In addition, isolations confirmed the presence of the pathogens in the inoculated, hot water treated cuttings as well as the inoculated, non-treated control cuttings. This finding, along with earlier research on the direct effect of hot water on fungal mycelium of these species leads us to the conclusion that hot water treatments are ineffective in eliminating vine decline pathogens from dormant wood.

Selective media for the extraction of fungal pathogens from soil

Due to their slow growth on standard media, *Pa. chlamydospora, Pm. inflatipes* and *Pm. aleophilum* are often difficult to recover from infected wood, spore traps and soil. Contamination from other fungi and bacteria with quicker growth rates often inhibit the ability of *Pa. chlamydospora, Pm. inflatipes* and *Pm. aleophilum* to grow. Rose Bengal Chloramphenicol Agar (RCBA) is a medium often used for enumerating yeasts and molds in food for product evaluation. The pH and the added chloramphenicol tend to suppress the growth of most bacteria. Additionally, the Rose Bengal, when taken up intracellularly by most fungi, tends to limit their size and growth rate. This can prevent the overgrowth of slow growing fungi by faster growing species. RBCA seems to be a suitable medium for isolating vine decline organisms from soil, aerial spore traps, and plant tissue. Using the soil dilution method, soils from many areas of California were examined for populations of *Pa. chlamydospora, Pm. inflatipes* and *Pm. aleophilum*. Populations of these organisms were recovered from the soil from many different areas of California. In addition, in a few vineyard sites these fungi were recovered from dried plant sap, which had oozed from grapevine girdling wounds and from standing water under grapevine drip systems. RBCA is a useful tool in determining the presence of vine decline pathogens in vineyard soils and has been demonstrated to be useful in detecting these fungi from spore traps. A statewide survey of vineyard soils from all different regions of California as well as non-vineyard and native soils will help us further understand the abundance of these fungi and their means of survival.

Temperature effects on fungal pathogens

Water agar plates inoculated with plugs of *Pa. chlamydospora, Pm. inflatipes* and *Pm. aleophilum* were incubated at 23°C for two weeks for complete colonization of the plates. Autoclaved 5C rootstock wood shavings were then placed on the agar surfaces. Plates were placed in incubators, with continuous cool white (15W) light, at temperatures ranging from 5-35°C. Wood pieces were examined weekly and observations were recorded. After twenty-one days, pycnidia could be found forming on wood pieces inoculated with *Pa. chlamydopsora* incubated at 10,

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15, 20 and 25°C. After twenty-eight days pycnidia were very abundant on wood at these same temperatures and most abundant at 25°C. Pycnidia were dark, superficial to slightly embedded, subglobose to globose in shape and ranged in size from 110 to 190 µm. A cloudy gray conidial cirrhus could be seen oozing from the ostiole after 21 days. Conidia contained in pycnidia were hyaline, subglobose to oblong and ranged in size from 2.0–3.0 µm x 1.0–1.5 µm. Conidia were viable and germinated after 48 hours on water agar. After twenty-one days, wood pieces inoculated with *Pm. inflatipes* incubated at 10, 15, 20, and 25°C were observed to have microsclerotia-like structures on their surface as well as on the agar surface near and around the pieces. Structures appeared as dark compacted masses of hyphae. They were globose, superficial to slightly embedded and ranged in size from 65 to 120 µm. Conidia could be found on conidiophores extending from mycelium around and attached to the structures. Conidia were hyaline, oblong to ellipsoidal and ranged in size from 2.5–5.0 µm x 1.25–2.0 µm. Neither pycnidia nor microsclerotia could be found on wood pieces or media inoculated with *Pm. aleophilum*. These findings are important to our understanding of the biology of these elusive fungi. The finding, that *Pm. inflatipes* is able to produce microsclerotia-like structures on grapevine wood as well as on artificial media, along with previous research (unpublished) showing that it can be recovered from soil and the fact that this species is a good root pathogen indicates that this fungus is a soil-borne pathogen. This is the first reported study on the effect of temperature on pycnidia production of *Pa. chlamydospora.*

Shoot growth in vines with Petri disease. *(Photo courtesy of Doug Gubler)*

Syrah Decline in French Vineyards

by Anne-Sophie Renault-Spilmont and Jean-Michel Boursiquot
ENTAV, Le Grau Du Roi, France

BECAUSE OF ITS GREAT POTENTIAL to produce quality wine, Syrah is one of the most important grape varieties cultivated in southern French vineyards. Since the 1990s, a unique problem has been observed by grape growers and researchers on Syrah plants: leaf reddening and swollen graft unions. The scions of affected vines declined and died more or less rapidly. By contrast, the rootstock often stays alive and canes can be observed suckering below the union.

Symptom description

Syrah decline is characterized by two symptoms on mature plants:

-swelling and cracking at the graft union (Fig. 1)
-early leaf reddening (from July)

The graft union becomes enlarged and the wood hard. After peeling the bark, deep and parallel grooves can be observed in this specific localized area. The vines can also show a premature discoloration of the leaves during the spring, becoming red in autumn.

All rootstocks and clones are known to demonstrate this problem although there are some indications that their sensitivity might vary.

Figure 1: Swelling and cracking at graft union. *(Photo courtesy of ENTAV)*

Development of the problem

Development of the symptoms is very different depending on the site. In the last few years, symptoms seem to be observed on more young plants than previously, perhaps due to more careful observation. Four year-old vines are now recorded to show typical symptoms.

Syrah vineyards have been surveyed and some sites have been followed since 1999. Each plant is identified and observed from one year to another with the aim of describing the spatial and temporal evolution of the problem. Statistical analyses of these records will aid in better understanding of symptom development.

As explained previously, two types of symptoms are associated with Syrah Decline. The relationship between those two symptom types needs to be well established. Careful observations in a number of different situations showed that many plants show only cracking without leaf reddening. By contrast, very few plants showing only leaf reddening (without cracking) could be found. This has led us to suggest that two different factors could be implied in this problem: the first one would be involved in the cracking of the wood and a second one (different from the first) is responsible for inducing the leaf reddening and the death of the plant.

To understand cracking morphology, several graft unions were dissected for observation under a microscope. Precise observations in the cracking areas suggest a dysfunction of the cambial zone with a disruption of the local area. We are trying to determine the origin of this disruption.

Current studies and preliminary results

A pathogen?

A study was set up to identify this disorder and tests were carried out to look for any associated transmissible agent(s).

Disease associated viruses were sought with ELISA and biological indexing tests. The virus tests were performed on traditional grapevine viruses responsible for Leafroll, Fanleaf, Fleck, Corky Bark, Rupestris Stem Pitting and Kober Stem Grooving. No correlation could be established between one or more viruses' presence and the previously described symptoms. No phytopathogenic bacteria (Crown Gall, Bacteria Blight, Pierce's disease) could be found.

As far as the fungi, some of them associated with wood diseases were found in symptomatic plants but also in control vines. Thus, it does not seem that their presence could be correlated with the specific Syrah decline. Nevertheless, these fungi involved in wood diseases might play a second role in increasing or quickening the decline of already weakened plants. The cracking may be a point of entry for penetration of these fungi. They could also induce necrosis, leading to plant death. The possible involvement of these fungi with Syrah decline will be further studied by a field experiment.

Furthermore, experiments were conducted to determine if the problem was associated with a graft transmissible agent. Some interesting results were obtained several months after green grafting as leaf reddening was sometimes observed with Syrah or rootstock taken from diseased vines. No symptoms at the graft union have been observed so far but experiments are on-going.

An incompatibility?

The previously described symptoms might be similar to those observed in incompatible grafted fruit trees. To confirm this hypothesis, an important experiment is currently being conducted to describe the first events after vine grafting. The process of graft union development was studied in Syrah compared to two other grape varieties (Cabernet-Sauvignon and Grenache) used as controls. Histological studies are being performed on the first events following grafting; callus proliferation, cambium formation and vascular connections are compared among the varieties. The first results seem to indicate that the level of vascular connections is lower during the healing of Syrah than for the other two varieties.

Possible grafting factors?

As the primary symptoms of Syrah decline involve the graft union, studies were conducted to compare different grafting techniques. Experiments were made comparing bench grafted Syrah ("long-whip" and omega cut), field grafted Syrah (with and without hormone applications) and green grafted plants. Five years after establishment, many plants show cracked and swollen unions but none have died yet. No significant difference could be found between these grafting techniques up to now.

The problem of Syrah Decline appears to have no simple explanation. We believe that the problem is very complex, and may involve multiple factors. Results of our experiments with possible graft transmission of a potential pathogen agent are awaited with hope. In the meantime, our research will go on.

Carole Meredith Solves the Mystery of Zinfandel

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Department professor Carole Meredith, a grapevine geneticist, has confirmed that a Croatian black grape called Crljenak kasteljanski (pronounced tsurl-ye-nak kas-tel-yanskee) is identical to Zinfandel, whose origins have long stumped grape researchers.

Meredith and Croatian collaborators Dr. Edi Maletic and Dr. Ivan Pejic of the University of Zagreb began exploring the Dalmatian Coast of Croatia, including a number of its major coastal islands, in 1998 in an effort to gather information about, and help preserve, the country's ancient wine grapes. Inherent in this project was Meredith's desire to determine Zinfandel's true European identity. In the fall of 2001 the team's efforts paid off: Maletic and Pejic discovered the Crljenak vine, which was then found by Meredith's lab to be identical to Zinfandel.

"The credit for the discovery should go to Dr. Edi Maletic and Dr. Ivan Pejic," says Meredith. "My lab certainly played a significant role, but Edi and Ivan found the vine and were quite certain that it was the one. We were then able to confirm this by DNA analysis in mid-December."

The next challenge will be to look for Zinfandel's mom and dad. "Zinfandel may be so old that its parents are no longer grown anywhere," Meredith speculates. "We've already figured out that Zin is the parent of Plavac mali, a famous Dalmatian grape that is thought to be ancient, so Zin must be even older."

Meredith's grape genetic sleuthing abilities helped her research group to identify the parents of Cabernet Sauvignon in1997 and Chardonnay and Syrah in 1999.

Maletic sent cuttings of Crljenak kastelanski to FPMS last winter for quarantine testing. While visiting FPMS this June 2002 Pejic and Maletic discussed their plans to search for more Crljenak kastelanski vines in Croatia and create a collection of diverse Crljenak kastelanski/Zinfandel/Primitivo clones.

Negotiations to trade FPMS registered selections in exchange for Croatian clones for the FPMS public collection are in progress.

Left:
Crljenak kasteljanski, the 'Zin twin.' *(Photo courtesy of Carole Meredith)*

Below:
Dr. Edi Maletic (left), Dr. Carole Meredith (center) and Dr. Ivan Pejic (right) in the Zinfandel Heritage Vineyard in Oakville, California. *(Photo courtesy of Carole Meredith)*

Acknowledgement

A large part of the funding for the public FPMS grape program is from an assessment that growers pay when they purchase fruit tree, nut tree, and grapevine planting stock from California nurseries. The California nursery industry sponsored legislation to create the assessment in 1987.

The California Fruit Tree, Nut Tree and Grapevine Improvement Advisory Board (better known as the IAB) makes recommendations to the Secretary of Agriculture for use of the assessment to fund activities that will improve the quality of planting stock produced in our state.

Over the years, the assessment has been used to fund various research projects, support the registration and certification programs, and fund a virus-testing program at the California Department of Food and Agriculture.

A major portion of the assessment funds has been provided to FPMS. This support has made many important FPMS grape program projects possible, such as the expansion of the FPMS collections, annual testing of foundation mother vines, professional variety identification and the development of new disease detection methods.