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Nebraska VineLines

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Editors: Dr. Paul Read, Professor of Horticulture & Viticulture and Stephen J. Gamet, Department of Agronomy & Horticulture

DISEASES 2010: CHALLENGES IN THE VINEYARD

With the unusually frequent rains, it was difficult to spray in a timely manner. Every time after a rain when one should get into the vineyard and spray, it seemed to rain again, preventing getting back into the vineyard to spray and also washing off previously applied protectants.

This vintage started out on a promising note, that is, although the winter was long, it was not severely cold in many parts of the state, so most cultivars came through with minimal damage. We then experienced relatively early bud break - as much as two weeks early in some locations - so we waited for the "other shoe to fall" (late frost or freeze events after shoot elongation), but in most Nebraska vineyards it didn't happen. Then relatively good fruit setting weather occurred during flowering, so it sure looked as though we were heading for a bumper crop.

Then the rains came! Record-setting amounts and frequency persisted over a period of several weeks. As a result, a "Disease Alert" was placed on our web site <http://agronomy.unl.edu/viticulture> and in the most recent issue of the Nebraska VineLines. Like many Nebraska grape growers, we were unable to spray all of our research vineyards in a timely manner. This has resulted in an unusually severe disease Pressure at our Nemaha and Peru research sites. Fortunately, in our Nebraska City site, diseases have been kept relatively well-controlled, so we will be able to take data on many of the cultivars grown there.

Meanwhile, if life gives you lemons, make lemonade! By that I mean that since disease pressure was so great at our Peru and Nemaha sites, we were able to assess the relative disease susceptibility for several cultivars at those sites and we were able to record data on relative severity of Black Rot and Downy Mildew, the most serious diseases that we encountered. This meant that we could also note the relative degree of tolerance. Following are observations for a number of cultivars growing at our Nemaha and/or Peru sites, including winter injury ratings and seriousness of foliar Phylloxera.

(Turn to Diseases 2010, page 2)

HEMSTAD WILL HEADLINE NOVEMBER 20 WORKSHOP

Peter Hemstad, internationally renowned University of Minnesota grape breeder will be the featured speaker at the University of Nebraska Viticulture Program's Fall Workshop to be held at the Downtown Lincoln Holiday Inn on November 20, 2010. Peter will speak about the history of the University of Minnesota grape and fruit breeding program, discuss recent U of M grape introductions (Frontenac, LaCrescent, Frontenac Gris and Marquette) and will discuss what genotypes and potential new cultivars may be anticipated in the future to further aid the Midwest grape and wine industry. Panel discussions are planned to talk about vineyard management of these cultivars and to discuss the special attributes and challenges of the winemaking process for making the best wines from Frontenac, Frontenac Gris, LaCrescent and Marquette.

Save the date! This is a workshop that you won't want to miss!

Disease 2010 continued

Cultivar	Winter Injury*	Disease Sensitivity	Foliar	Other notes
Bianca	7	Severe BR, moderate DM	7	looks rough, needed spraying
Brianna	9	Severe BR, no DM	6	set well
Catawba	7	Moderate BR, little DM	8	set well
Cayuga White	8	Slight BR, DM	8	Should have good crop
Chambourcin	Variable -	Severe BR, slight DM	9	Modest crop on secondaries
Chardonel	2	Bad BR	7	Most plants are dead or very weak
deChaunac	8	slight BR, DM	7	Sparse fruit set
Delaware	9	very slight BR, DM	7	Good Crop, Second to Norton
Edelweiss	9	moderate BR, little DM	9	Fair to good crop, slight 2,4-D
Esprit	9	little BR, DM	7	Moderate crop potential
ES 5-4-29	8	slight BR, DM	8	Modest crop
Frontenac	9	significant BR, little DM	4.5	Good fruit set
GR-7	9	slight BR, no DM?	8	should have good crop
Lacrosse	8	Bad BR, slight DM	4	Modest fruit set, serious foliar loss
LaCrescent	8	Bad BR, moderate DM	3	BR&Phylloxera = poor crop
Lemberger	6.5	slight BR, DM	9	Could have been good crop
Leon Millot	8	slight DM	7.5	Moderate 2,4-D
Marechal Foch	8.5	slight DM		Slight 2,4-D
Niagara	9	moderate BR	9	Serious 2,4-D
Norton/Cynthiana	9	almost no disease (very slight BR)	8	Best cultivar for disease, Phylloxera
Prairie Star	8	slight BR, DM	7	Modest fruit set
Riesling	8	Bad BR, some DM	9	Crop lost to BR, DM
Saint Croix	9	Slight BR, very little DM	4	Good fruit set, crop
Seyval Blanc	6	Slight BR	6	Low crop
Traminette	8	Bad BR	8	Serious 2,4-D problem
Trollhaugen	9	Slight BR	9	Early crop (birds got most of crop)
Vidal Blanc	8	Slight BR	8	Good fruit set
Vignoles	9	Bad BR	7	Crop wiped out by BR

* Winter injury rating - 1 = Dead, 9 = no injury
** Severity of foliar Phylloxera - 1 = extreme, many leaves curled and crispy, 9 = no obvious infestation or injury
BR = Black Rot; DM = Downy Mildew

WINE EVALUATION EVENT SET FOR FRIDAY NIGHT, NOVEMBER 19, 2010

Interested in honing your wine appreciation skills? Or just wanting to learn more about the basics of wine evaluation? This opportunity is for you. It will take place on the evening before the November 20 workshop and will cover five classic red wines, five classic white wines and a selection of Nebraska wines. It will take place at 6:30pm and for those folks coming to Lincoln and staying overnight will provide a chance to prepare for the next day's workshop.

Registration details and additional information about both of these events will be announced in the next issue of the Nebraska VineLines and on our University of Nebraska Viticulture Program web site <http://agronomy.unl.edu/viticulture>

Wine Making School – October 22 & 23!

Five Rivers Resource Conservation & Development is announcing their 8th Small Scale Commercial Wine Making Class which will be held Friday and Saturday, October 22 and 23, 2010
9:00 a.m. – 4:00 p.m. both days.
University of Nebraska Kimmel Education and Research Center
5985 G Rd., Nebraska City, NE

Sponsored by Five Rivers Resource Conservation and Development, Tecumseh, NE

TUITION: $375/person
(Price includes text and reference manual, Friday lunch and dinner, wine tasting and refreshments, and Saturday lunch.)

Advance registration and payment of tuition assures you a seat in the class. Class size is limited to 24. Registrations are accepted on a first-come-first served basis.
Your registration and check will hold your seat.

For more information, call Five Rivers RC&D at 402-335-3347 or email tammy.timms@ne.usda.gov.

Free Sustainable Winegrowing Guide

Published by the California Sustainable Winegrowing Alliance, "Reducing Risks through Sustainable Winegrowing: A Growers' Guide", is available online at:
www.sustainablewinegrowing.org/agrowersguide.php
The focus of this guide is on the use of sustainable practices to help reduce risk and help with long-term viability of grapegrowing enterprises.Although Nebraska vineyards are not the same as those in California, many of the principles should be the same.

ADVANCED Wine Making SCHOOL II, November 5 & 6, 2010

Join us Friday and Saturday, November 5th and 6th, 2010! Learn the Art of Perfecting Wines!
Cost is $395 per person. Please make check payable to Five Rivers RC&D. (We can only accept checks as a form of payment). Advance registration and payment of tuition assures you a seat in the class. Class size is limited to 16. Registrations are accepted on a first-come, first-served basis. Contact Bobbie Meints at Five Rivers RC&D with any questions: bobbie.meints@rcdnet.net
Your registration and check will hold your spot.

A WORD ABOUT THE INSTRUCTORS

• Ellie Butz, Lallemand, Vintage Winery Consultants – Instruction on Sanitation and Yeast Cultures –Ellie began her work with the wine industry in 1979 as a microbiologist employed by Tri Bio Labs to produce the first American freeze dried malolactic bacterial culture, LeucoStart.

• Michael Jones, Scott Laboratories, California –Instruction on MLF Basics and MLF Timing. In 1971, at the age of 21, Michael Jones made the jump from enthusiastic amateur to semi-impoverished professional in the wine business, eschewing the corporate lie in favor of a total dedication to liquid assets.

• Dr. Murli Dharmadhikari, Iowa State University Extension – Managing SO2 to determine free and total SO2 in wine using the Aeration-Oxidation method.-As Director and Extension Enologist, Dr. Dharmadhikari's main responsibility is to lead the development and coordination of the Enology and Viticulture program at ISU. The program includes education, research, extension and service projects aimed at building a strong and prosperous grape and wine industry in the state of Iowa and the uppermidwest region. Dr. Dharmadhikari has a Ph.D. from Ohio State University specializing in Midwest grapes and he is also the author of "Micro Vinification."

GREAT WINE QUOTES

• Let us have wine and women, mirth and laughter. Sermons and soda water the day after. —Lord Byron

• Here's to the corkscrew – a useful key to unlock the storehouse of wit, the treasury of laughter, the front door of fellowship, and the gate of pleasant folly.
—W. E. P. French

• Wine is the most civilized thing in this world. —Ernest Hemingway

Now that we know Norton has such potential - we need to find out what it is.

To read the entire article, please go to:
http://ddr.nal.usda.gov/bitstream/10113/41645/1/IND44361358.pdf

Investigations into the Origin of 'Norton' Grape using SSR Markers

ED STOVER[1*], MALLI ARADHYA[2], JUDY YANG[3], JOHN BAUTISTA[2], AND GERALD S. DANGL[3]

[1]USDA, ARS US HORTICULTURAL RESEARCH LABORATORY, 2001 SOUTH ROCK ROAD, FT. PIERCE, FL 349453

[2]USDA, ARS NATIONAL CLONAL GERMPLASM REPOSITORY, ONE SHIELDS AVENUE, UNIVERSITY OF CALIFORNIA, DAVIS, CA 95616

[3]FOUNDATION PLANT SERVICES, ONE SHIELDS AVENUE, UNIVERSITY OF CALIFORNIA, DAVIS, CA 95616

ADDITIONAL INDEX WORDS. 'Cynthiana', grape breeding, pest resistance, *Vitis aestivalis*

'Norton' produces excellent wine in some regions where *Vitis vinifera* is difficult to grow. The high-quality and pest resistance of 'Norton' make it attractive to generate hybrids of similar parentage, producing cultivars with traits distinct from 'Norton' but with similar adaptation. 'Norton' is frequently described as *V. aestivalis*, but was initially declared a hybrid between an American grape ('Bland') and *V. vinifera* ('Miller's Burgundy', a synonym for 'Pinot Meunier'). To try to identify the parents of 'Norton', simple sequence repeat (SSR) markers were compared across *V. vinifera* cultivars and accessions derived from American species. The precise parentage could not be identified using available data. Allele frequencies were compared among 181 Euvitis of North American origin and 354 *V. vinifera* cultivars for which there were data at 13 loci. At least one allele found in 'Norton' at all 13 loci was also present among the vinifera cultivars, while at 6 loci the other allele in 'Norton' did not occur among the vinifera cultivars, suggesting these alleles may derive from a non-vinifera parent. Allelic frequency distributions for different *Vitis* series indicated that the putative non-vinifera 'Norton' alleles were common within the aestivales. These data are consistent with 'Norton' being a hybrid with ancestry including *V. aestivalis* and *V. vinifera*. 'Norton' alleles for locus VVMD36 are rare and may offer the best opportunity for identifying 'Norton' parents. Interestingly, 'Enfariné noir', a vinifera cultivar which has similarities in synonymy, morphology, and origin with 'Pinot Meunier', shares the rare as well as most common alleles with the presumed 'Norton' vinifera parent.

The 'Norton' grape is grown in many US wine growing regions where *Vitis vinifera* L. production requires extensive pesticide use, especially in the humid southern and midwestern US (Ambers and Ambers, 2004). 'Norton' is noteworthy for being quite disease and pest resistant, therefore requiring minimal pesticide use, while also producing wines which many tasters report to be similar to quality vinifera wine. Hedrick (1908) reports that 'Norton' is more resistant to fungal diseases than other "native grapes" and very resistant to phylloxera (Hedrick, 1908), and 'Norton' is specifically mentioned as "only slightly susceptible to black rot, powdery mildew, Botrytis and anthracnose and only moderately susceptible to downy mildew" and therefore suitable for growing with reduced spraying (North Central IPM Center, 2000) and displays tolerance to Pierce's disease (Kamas et al., 2000). 'Norton' has been routinely reported to be a grape of American origin, frequently described as being in the species *Vitis aestivalis* Michx. (e.g., Hogan et al., 2009; Main and Morris, 2004) or *Vitis aestivalis*–derived (Hou et al., 2002; Reisch et al., 1993). The first report of the 'Norton' grape by William Prince (1830) of the renowned Prince Nursery of Flushing, NY, indicates that the 'Norton' was a seedling produced in the Virginia garden of Dr. Norton as a hybrid of the 'Bland' grape and likely 'Miller's Burgundy'. There is evidence that this description came directly from Dr. Norton himself (Amber and Amber, 2004). An understanding of the parentage is quite useful in that repeated crosses made with the 'Norton' parents might produce a range of quality grape cultivars with pest resistance similar to 'Norton' but diverse distinctive traits which may be of value to wine producers (Fig. 1.)

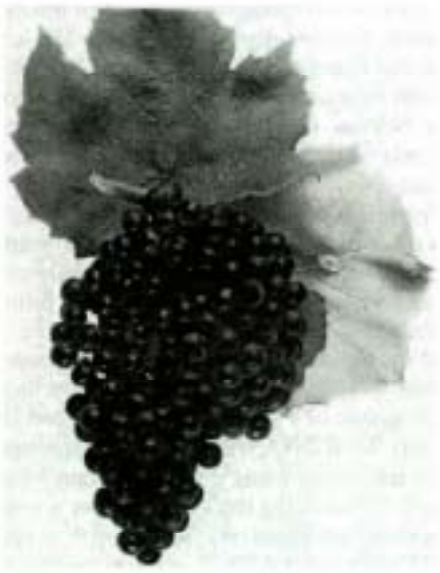

Fig 1. 'Norton' grape from Hedrick, 1908, "Grapes of New York."

Acknowledgment. Thanks to Dr. Wenping Qiu of Missouri State University for providing the leaves of verified 'Norton' that were used in this study.

*Corresponding author; email: Ed.Stover@ARS.USDA.GOV; phone: (772) 462-5951.

It is now possible to determine relationships between individual cultivars, using the same methods which are used in human paternity testing. These tests are based on simple sequence repeat (SSR) DNA markers, which are also known as microsatellite markers. These repetitive regions are seldom associated with functional genes, permitting them to accumulate mutations at a relatively high rate, and providing useful diversity for distinguishing individuals. Six carefully selected, highly polymorphic SSR markers in grape provide distinctive markers for virtually all tested *V. vinifera* cultivars (This et al., 2004) and international adoption of this uniform set has provided an extensive database of genotypes from around the world, permitting comparison to type fingerprints and providing an initial framework for testing potential parent/progeny relationships. More SSR markers are available for many grape genotypes and confirmation of parent/progeny relationships requires use of such additional SSR markers to reduce the likelihood of erroneous conclusions. Many papers have been published establishing parentage of important *V. vinifera* cultivars, perhaps most noteworthy that 'Cabernet Sauvignon' is likely an offspring of 'Cabernet Franc' and 'Sauvignon Blanc' (Bowers and Meredith, 1997) and 'Pinot Noir' and 'Gouais Blanc' are the likely parents of many important varieties including 'Chardonnay' (Bowers et al., 1999). We recently published such a study assessing validity of reported parentage for releases from the Cornell grape breeding program (Bautista et al., 2008). Similar methodology was used in this study to explore the likely parents of 'Norton'.

Materials and Methods

The National Clonal Germplasm Repository (NCGR) in Davis, CA, maintains the national collection of grape genotypes, with more than 3000 *Vitis* accessions. Included in this collection are 1500 *Vitis vinifera*, many hundreds of species accessions, and a large number of cultivars of North American origin. During the years 2003–08, SSR markers were run on a substantial portion of the accessions in the NCGR collection, including many North American species and *V. vinifera* cultivars to provide much of the data used in this study, and SSR marker data from collaborators were acquired for many more accessions. 'Norton' material from the Missouri State University collection was included in the evaluation to provide a reference fingerprint of the most studied 'Norton' material. Specifically for this study, DNA was newly extracted from this material and 59 additional NCGR accessions that are of North American origin and were likely to be in cultivation when 'Norton' was first identified or were construed to be potentially related to 'Norton', including many accessions of North American species (data not shown). A variety of sources were used to determine which accessions may have been available to Dr. Norton prior to the origin of the 'Norton' grape, with the Prince Nursery Catalogue (1822) being especially useful.

The basic technique for SSR analysis was as follows. Young leaves from near the shoot-tip of rapidly growing grapevines were collected and rapidly dried between blotting paper in sealed, labeled envelopes, which were placed in plastic bags with approximately 20 grams of Drierite (W.A Hammond Drierite Co. Ltd., Xenia, OH). Total DNA was extracted from approximately 20 mg of dried leaf tissue using a DNeasy Plant Mini Kit (Qiagen, Valencia, CA) following the manufacturer's protocol. PCR amplifications were performed on a GeneAmp PCR system model 9700 Thermal Cycler in total 20-μL volume reactions following typical protocols (Dangl et al. 2005). Samples were prepared for capillary electrophoresis by diluting 1.0 μL of amplified product and 0.4 μL of the internal size standard 400HD ROX (ABI) in 12 μL of formamide. Forward primers were labeled with one of three fluorescent dyes. Fragment amplifications were verified on 2% agarose gels. Typically, products from three loci labeled with different fluorescent dyes were multiplexed in PCR and thus also in electrophoresis. Amplified fragments were separated by electrophoresis on an ABI Prism 3100 Genetic Analyzer using 22 cm capillary with 3100 POP-4 as the matrix, and were scored using ABI Genotyper software (Applied Biosystems Inc., Foster City, CA) as described in Dangl et al. (2005).

Most SSR fingerprints were collected using the procedure described above, but some database fingerprints had been scored on gels and allele sizes were rigorously adjusted, using common standard genotype references, to be consistent with data from capillary electrophoresis.

Each sample was analyzed at seven to 13 SSR loci. All analyses included the six internationally adopted reference markers for distinguishing vinifera cultivars (This et al., 2004). In the first study set, the SSR fingerprint of 'Norton' for the seven loci VVMD5, VVMD7, VVMD27, VVMD31, VVS2, VrZAG62, and VrZAG79 was compared to the Grape DNA Identification Reference Database maintained by Foundation Plant Services at University of California, Davis (unpublished). This database has more than 1200 unique grape DNA profiles, including *V. vinifera*, rootstocks and hybrid cultivars. In the second study set, the 13 loci analyzed were VVMD5, VVMD6, VVMD7, VVMD21, VVMD25, VVMD27, VVMD28, VVMD31, VVMD34, VVMD36 (Bowers et al., 1996, 1999), VVS2 (Thomas and Scott, 1993), and VrZAG62, VrZAG79 (Sefc et al., 1999). The frequencies of 'Norton' alleles, calculated using Excel Microsatellite Toolkit (Park, 2001) were compared among 181 Euvitis of North American origin and 354 *V. vinifera* cultivars for which there were data at all 13 SSR loci. Inferences were drawn regarding likely origins of 'Norton' based on these allele frequencies.

Genetic distance analyses were conducted on several study subsets, to assess the relatedness of 'Norton' to other accessions. Alleles at each locus were used to calculate pairwise genetic distance "proportion of shared alleles" (Bowcock et al., 1994), and dendrograms were constructed using UPGMA (Sneath and Sokal, 1973). Analysis sets with 'Norton' included: all 175 Euvitis of North American origin and a subset of 40 diverse *V. vinifera* cultivars for which there were complete data at all 13 SSR loci, the 175 Euvitis of North American origin alone, and a group of 49 accessions including 6 diverse accessions from each Euvitis series in North America and Europe. In this final analysis, the representatives from each of the six series of Euvitis were selected based on separate dendrograms for each of the series. Six diverse *V. vinifera* and six hybrids of North American origin were also included.

Results and Discussion

'Norton' material from the Missouri State University collection had SSR alleles (Tables 1a and 1b) which were identical to those for the NCGR accessions 'Cynthiana' (DVIT0043) verifying synonymy reported based on isozyme profiles (Riesch et al., 1993), and 'Virginia' (DVIT0154) reflecting a variation on the reported 'Norton' synonyms 'Virginia Seedling' and 'Norton's Virginia' (Hedrick, 1908). With co-dominant markers such as SSRs a parent/progeny relationship can be absolutely disproved by any one marker where the two do not share at least one allele. 'Pinot

University of Nebraska Lincoln | DEPARTMENT OF AGRONOMY & HORTICULTURE

Viticulture Program
377 Plant Science Hall
P.O. Box 830724
Lincoln, NE 68583-0724

Nebraska VineLines Calendar of Events

- October 22 & 23, 2010
  Wine Making School
  Nebraska City, Nebraska
- November 5 & 6, 2010
  Advanced Wine Making School II
  Sponsored by Five Rivers Resource
  Conservation and Development
  Tecumseh, NE
- November 19, 2010
  Wine Evlauation Event – 6:30PM
  Downtown Lincoln Holiday Inn
- November 20, 2010
  University of Nebraska Viticulture Program's
  Fall Workshop
  Featuring Peter Hemstad, internationally renowned
  University of Minnesota grape breeder
  Downtown Lincoln Holiday Inn

Future Nebraska Winery & Grape Growers Forums

- 2011 – March 3 – 5, Holiday Inn, Kearney
- 2012 – March 1 – 3, Holiday Inn, Kearney
- 2013 – February 28 – March 1-2, Holiday Inn, Kearney

***Please be sure to visit us on the Web for important registration information and other updates at: http://agronomy.unl.edu/viticulture.**