Northern Grapes: Integrating Viticulture, Winemaking, and Marketing of New Cold-Hardy Cultivars Supporting New and Growing Rural Wineries

USDA Specialty Crops Research Initiative Coordinated Agricultural Project (CAP) #2011-51181-30850

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The Northern Grapes Project officially started in September 2011. In this first year of a five-year project, our project team has completed the first season of field studies (49 experiments involving field studies at 12 universities and several commercial sites), and winemaking trials (203 fermentation lots) are underway. Data from the project baseline survey of growers and winery owners was collected from 600 respondents, and economists have initiated studies of tasting room customer satisfaction, consumer profiles, and tourism associated with wineries. The first Northern Grapes Symposium at the Minnesota Grape Growers Association Cold Climate Conference, six outreach webinars, three newsletters, 26 presentations and 25 field days reached over 1850 participants in the 12 states involved in the project and beyond. Outreach information is posted on the project website and the eXtension Grape Community of Practice.

The project is currently funded through September 2013 and the project team hopes to submit a renewal for the remaining three years of the project, pending completion of a new farm bill by the US Congress.

Project Goals and Rationale

The project is a coordinated agriculture project (CAP), with objectives encompassing the three Specialty Crop Research Initiative (SCRI) focus areas of production (viticulture), processing and distribution (winemaking) and consumers/markets (winery business management and marketing). Its focus is the new cold-hardy varieties developed by the University of Minnesota and private breeders that have made possible grape and wine production in cold-climate areas where it was previously not feasible to grow grapes. These new cultivars have spawned an emerging industry in the upper Midwest and cooler portions of the Northeast and New England composed of over 300 wineries, 3,300 acres of grapes, and 1300 growers.

The project’s goals are to enhance and support growth and development of this industry through a coordinated research and outreach effort focused on varietal performance, specific viticultural and winemaking practices, and marketing/consumer studies.

To accomplish these goals, multi-disciplinary studies are addressing:

- Varietal performance and resulting fruit and wine flavor attributes in different climates.
- Applying appropriate viticultural practices to achieve consistent fruit characteristics for winemaking.
- Applying winemaking practices to the unique fruit composition of cold-climate cultivars to produce distinctive, high quality wines that consumers will like and purchase.
- Understanding consumer preferences and individual/regional marketing strategies that will increase sales and growth of wines made from cold-climate cultivars and result in sustained profitability of wineries and vineyards.

The project is a partnership among multi-disciplinary research and extension personnel at 12 universities and 19 regional/state winery and grape grower associations. It is governed by a seven-member executive committee, and a project advisory council (PAC) encompassing industry, research, and extension personnel.
Characterize changes in fruit composition during the ripening phase and how they influence grape chemistry/quality at harvest.

A multidisciplinary team from Iowa State University, South Dakota State University, and the University of Minnesota has started a detailed characterization of northern grape cultivar ripening from gene expression, to metabolites produced by the grapes, to sensory characteristics of the berry. The aim is to understand ripening dynamics and to use this information to develop novel maturity indices that guide cultural practices and harvest timing.

The focus in 2012 was on developing and testing equipment and protocols, collection of volatile metabolites and fruit samples for ‘Frontenac’ and ‘Marquette’, and transcriptome and metabolome analysis for ‘Frontenac’. Methods for transcriptome analysis of hybrid cultivars, LC-MS quantification of organic acid and polyphenols using liquid chromatography-mass spectrometry, and volatile sampling equipment and analysis protocols were developed. Skin and pulp samples for transcriptome and metabolome analysis were collected at five time points from véraison to harvest in the South Dakota NE1020 research block and samples for sensory evaluation were collected at 22, 24, 26-28° brix. Fruit sampling through the ripening period was completed September 12, 2012 and fruit, pulp and skin samples are being processed for respective berry analyses at Minnesota (metabolome, sensory) and South Dakota (transcriptome). Volatile emissions were sampled in-vivo seven times during fruit ripening in the Iowa and South Dakota NE1020 research blocks. Volatile head space samples were subjected to simultaneous chemical and sensory analysis using GC-MS-Olfactometry in Iowa to identify and quantify specific aromatic compounds. Data analysis and correlation with grape chemistry/quality at harvest is ongoing.

Koziel and Rice (IA), Hegeman, Cook and Vickers (MN), Fennell, He, and Ye (SD)
Evaluated crop and canopy management strategies to minimize fruit acid content and improve fruit composition.

Studies to identify vineyard training systems best suited for cold climate cultivars have been initiated in previous years in Connecticut and Nebraska, vineyards are being converted in Iowa, Michigan, and New York, and a vineyard was established in 2012 in Wisconsin with plans to evaluate various training systems. Training systems being evaluated include single curtain bi-lateral cordon, Geneva double curtain, umbrella kniffen, mid-wire cordon with shoot positioning, and two divided canopy catch-wire systems (Smart-Dyson and Scott-Henry). Cultivars being evaluated include ‘Frontenac’, ‘La Crescent’, ‘Marquette’, and ‘St. Croix’. Once the training systems are established, data will be collected on labor costs of cultural practices, light distribution within the canopy, yield and fruit quality.

Canopy management trials were initiated in grower vineyards at two sites for different cultivars in Iowa and at two sites in Wisconsin. Studies are evaluating all combinations of non-count shoot thinning, axillary shoot removal and shoot positioning. Treatments were monitored for time required to conduct the various cultural practices, light distribution in the grapevine canopy, and fruit quality indices at harvest. Cultivars being evaluated include ‘Frontenac’, ‘La Crescent’ and ‘Marquette’. However, ‘Marquette’ was not included in the Iowa study due to severe injury to primary shoots following an early April freeze.

Studies to evaluate the influence of adjusting the crop load were planned in for Iowa and New York in grower vineyards. However, due to the early April freeze, the study could not be conducted in Iowa. In New York, a study was to be conducted in ‘Frontenac’ and ‘La Crescent’ on timing of cluster thinning and severity of crop reduction. However, an early April freeze severely affected ‘La Crescent’, so the study was altered to evaluate the influence of crop load on individual vines following the freeze. The study was conducted as planned in ‘Frontenac’.

Our goal is to determine the relationships between soil characteristics, leaf petiole and blade nutrient contents, and fruit yield and juice characteristics of ‘Frontenac’, ‘La Crescent’, and ‘Marquette’, and to determine the optimal nutrient conditions to maximize fruit yield and quality. Sixteen study sites are located in commercial vineyards in five states: North Dakota (2 sites), South Dakota (4 sites), Minnesota (4 sites), Iowa (5 sites), and New York (1 site). Three study blocks of 15 vines were selected for each variety in each site. In each block, soil cores were collected at two depths (0 – 8” and 8 – 16”) and analyzed for nutrient content, organic matter, texture, cation exchange capacity, and pH. Leaf tissue samples were collected at bloom, 30 days later (except in the Dakotas), and at veraison, from all sites except two in South Dakota, where the vines were severely weather-damaged. Yield data was also collected. Berry cluster samples from most sites were collected. Due to timing issues with grower harvest, clusters were not collected for at least one variety in a total of five sites in North Dakota, South Dakota, Minnesota, and Iowa. Clusters will be analyzed for brix, pH, total acidity, and yeast-assimilable nitrogen. Data on juice characteristics will be obtained from growers where clusters were not collected. Statistical analyses will be performed to find correlations between soil and tissue traits and fruit yield and quality to determine optimal soil and tissue characteristics for maximum fruit yield and quality.
Objective 3: Develop and optimize winemaking practices to sustainably produce and market distinctive, high quality wines from cold climate cultivars.

Assess yeast strains for selected cold-hardy cultivars.

The most common question Northern winemakers ask is “What yeast should I use for fermentation?” To answer this question, enologists at the University of Minnesota and Cornell are performing replicated yeast trials with ‘Frontenac’, ‘Marquette’, ‘La Crescent’ and ‘Frontenac gris’, using yeasts selected for their ability to enhance desirable aromas in each cultivar. This year, 24 different wines were made, in duplicate. Replicating trials in the Midwest and Eastern US allows researchers to tease out the effects of yeast on wine aroma from those specific to growing region. Sensory characteristics of experimental wines produced with different yeast strains will be evaluated later in the project in both research and extension settings.

Optimize deacidification methods for cold climate cultivars.

Balancing high acid is one of the biggest challenges faced in northern wine production, and the sensory effects of biological and chemical methods traditionally used for deacidification have not been fully explored. In 2012, enologists at the University of Minnesota and Cornell are assessing the reduction of tartaric and malic acids that can be achieved with malo-ethanolic fermentation, full and partial malolactic fermentation, amelioration, blending, and chemical deacidification. This year, 28 different wines were made, in duplicate. Data from initial trials will be used to design a cross-regional trial in the following years of the project.
Characterize yeast assimilable nitrogen profiles of cold-hardy cultivars.

The free amino acids and ammonium in the grape, collectively known as yeast assimilable nitrogen (YAN), are essential for complete fermentation and the prevention of sulfur-based off-aromas. Current research suggests that nitrogen type and content varies widely by grape variety, with potentially dramatic impact on wine sensory characteristics. This year, a sampling of cold-hardy cultivars grown in different regions and microclimates will be screened for YAN and concentration of individual amino acids; this data will provide the basis for studies in 2013 and 2014 that will track the influence of nitrogen source on varietal character.

Enhancement of red wine structure and mouthfeel through addition of enological tannins.

Tannins play an important role in structure, mouthfeel and overall quality of a red wine, and the addition of enological tannins to improve wine structure and quality is an increasingly common winemaking practice. To better understand these effects, enologists at Iowa State are collaborating with members of the Iowa industry to assess the concentration of tannins in ‘Frontenac’ and ‘Marquette’ grapes and to determine the impact of enological tannin additions during processing on the sensory attributes of the resulting red wines. Six different treatments, replicated three times, are being evaluated this year in both cultivars.

Objective 4: Identify strategies to support sustainable development of businesses based on cold climate cultivars, from the individual winery to regional agri-tourism.

Quantify current economic impact of the cold climate grape and wine industry on rural communities and assess impacts of state policy and law that impede or advance its development.

The Northern Grapes Baseline and Economic Impact Survey was distributed in March to project clientele in 14 states through cooperating state winery associations and the project’s 12 state extension representatives. The survey gathered data on acreage, wine production, economic impact, and current production practices from over 600 respondents. It will provide the basis for an economic impact analysis, expected to be complete by the end of November, and also will serve as our project evaluation instrument when repeated in Year 5 of the project.

Preliminary results reveal that survey respondents represented 330 vineyards and 1,498 acres of grapes, with an average of 4.5 acres in production. The 130 winery respondents reported production of 1,352,670 gallons of wine, averaging 10,400 gallons per winery. This represents 563,000 cases, with a conservative retail value (at $10/bottle) of $67.5 million.

The state policy research gathered policy information from over 35 states related to wine operations. Numerous differences were found among states ranging from subsidies for local production to distribution regulations and fees. Results to date were described in Policies Affecting the Domestic Production of Grapes and Wine in the United States, published in the 3rd issue of Northern Grapes News.
What tasting room marketing strategies produce customer satisfaction and loyalty?

During the period November 2011 – March 2012, we visited wineries in Iowa and in two New York regions (1,000 Islands and Lake Champlain) and invited them to participate in the Tasting Room Study. In June 2012, we started data collection in seven tasting rooms (3 in Iowa and 4 in New York). These surveys ask tasting room visitors to rate their perception of twenty-five consumer satisfaction attributes, which relate to their tasting room experience. In addition, respondents are asked to rate their overall satisfaction with the visit, as well as the amount of wine they intended to purchase. These questions allow for a direct analysis of the factors that drive customer satisfaction. They also make it possible to evaluate whether overall customer satisfaction influences the decision to purchase wine. After 3 months, a total of 350 surveys have been completed and processed. Based on this excellent response rate, the target of 600 surveys should be reached by November 2012. These data will allow us to shed light on successful marketing strategies for wineries in cold climate regions.

Gomez (NY)

Growing winery profits and rural economies through enhanced knowledge of customers and expanded collaborations.

A research team from Michigan State University is surveying tasting room visitors to construct consumer profiles and tourism characteristics of visitors to tasting rooms in a northern wine region. To date, researchers have distributed web-based or paper surveys to 2,136 participants recruited by tasting room operators from 15 wineries. Thus far, 930 completed surveys have been entered into a database and are awaiting analysis upon the completion of data collection. Results will help winery marketing efforts and will inform the work being done to identify best practices for collaboration among wineries and between wineries and the tourism system. The tasting room visitor survey was informed by telephone interviews with 53 winery owners in Michigan. Additionally, a comprehensive literature review has been done to identify best practices for collaboration in wine regions throughout the world. This information was shared with stakeholders during a March webinar. Interviews have also been conducted with 15 wine trail coordinators and destination marketing organization directors in northern wine regions. These interviews, and preliminary analysis of the tasting room visitor data, have informed the ongoing development of an instrument that will be used to identify opportunities for and barriers to collaboration in emerging northern wine regions.

Holecck and McCole (MI)

Northern Grapes Project Outreach Efforts

Northern Grapes Project outreach is not a separate objective, but rather integrated with our research effort, as detailed in the Project Management and Evaluation plan (p.7) appendix of our original grant proposal. In year 1, the project provided outreach to an estimated audience of 1800, through the Northern Grapes Symposium, Northern Grapes Enterprise Workshops, Northern Grapes Webinars, and the Northern Grapes News. We also established a project website and Facebook page, and linkage with the eXtension grape community of practice.
The Northern Grapes Symposium

The project kicked off with the first Northern Grapes Symposium, held on February 23, 2012, in conjunction with the Minnesota Grape Growers Association Cold Climate Conference in St. Paul. Approximately 200 attended, with six presentations followed by five “bar camps,” which were small group discussions focused on economics and marketing, enology, fruit composition and genetics, pest management, and viticulture.

The presentations given at the Northern Grapes Symposium, “From Vine to Cash Register: What the Northern Grapes Project Will Do to Help Develop the Cold Climate Grape and Wine Industry” are as follows, and are available on the project website:


Other Presentations

Members of the Northern Grapes Project gave several presentations throughout the year. Many were given at the Minnesota Grape Growers Association Cold Climate Conference.


Martinson, T.  *Canopy Management; Balancing Costs and Results.* MGGA Cold Climate Conference. St. Paul, MN. 25 Feb., 2012. (Keynote address.)

Schloemann, S.  *Overview of Cold Climate Wine Grape Culture and Cultivar Review.* University of Massachusetts Extension Fruit Program Twilight Meeting. UMass Cold Spring Orchard Research and Education Center. 17 April, 2012.

Schloemann, S.  *Overview of Cold Climate Wine Grape Culture and Pruning Principles and Practices.* UMass Stockbridge School of Agriculture Pruning Class. UMass Cold Spring Orchard Research and Education Center. 19 April, 2012.


Northern Grapes Enterprise Workshops

The *Northern Grapes Project* sponsored or co-sponsored 25 enterprise workshops, with participation by over 1050 people, this year. Many events were part of university field days, while others were stand-alone meetings. Topics varied from the Oak Barrel and Wine Workshop held in Iowa, to a pruning workshop in Massachusetts, to a bus tour in North Dakota. Most speakers at these events were *Northern Grapes Project* team members, but some featured speakers from outside the project as well.

![Francis Durand, Master Cooper, fits the final hoop on the barrel during the Oak Barrel and Wine Workshop held on July 6-7 at Tassel Ridge Winery in Leighton, IA.](photo: Jennie Savits)


Schloemann, S.  *Cold Climate Grape Pruning Workshop.* 26 March, 2012.  Umass Cold Spring Orchard, Belchertown, MA.  Topics:  Overview of cold climate winegrape cultivars and principles and practices of cold climate winegrape pruning.  Attendance: 35


Jungerman, K.  *Dormant-Pruning “Working Seminar” sessions with Cold Climate Grapes.* 11-14, 19-21, and 28 April and 5 May, 2012.  Willisboro Wine Grape Trial, Cornell Baker Farm, Willisboro, NY.  Topics:  One-on-one instruction in pruning and training, included balancing pruning and crop load management, combined with the intent of pruning the trial plot.  Attendance: 15


Hatterman-Valenti, H., T. Plocher, S. Sagaser, and M. Vining.  *Wine and Warbirds.* 14 June, 2012.  NDSU and Fargo Air Museum.  Topics:  Grape breeding to develop cold-hardy cultivars, winemaking basics and testing of NDSU grapes; NDSU germplasm enhancement project; grape crossing process; tour of greenhouse, field nursery, and native grape preservation plot; wine tasting and evaluation.  Attendance: 85


Jungerman, K. Cornell Baker Farm Research Projects Information Open House. 10 July, 2012. Willboro Wine Grape Trial, Cornell Baker Farm, Willsboro, NY. Topics: History and purpose of Willboro grape trial, brief viticulture and enology basics, increase in cold-climate grape and wine production, Northern Grapes Project purposes and resources. Attendance: 65


Schloemann, S. Massachusetts Fruit Growers’ Association Summer Meeting. 16 July, 2012. UMass Cold Spring Orchard, Belchertown, MA. Topics: Overview of cold climate winegrape culture and cultivar review. Attendance: 100


Jungerman, K. and J. Kowalski. Seasonal Netting and Electric Fence Crop Protection at Veraison to Prevent Crop Loss. 13 Aug., 2012. Willboro Wine Grape Trial, Cornell Baker Farm, Willsboro, NY. Topics: Veraison, need for bird netting and electric fence, demonstration of improved battery-powered fence charged by a solar panel, hands-on working demonstration of bird netting application. Attendance: 5


Jungerman, K. and J. Kowalski. Willboro Grape Trial Harvest Sessions. 6, 7, 15, 16, and 21-23 Sept., 2012. Willboro Wine Grape Trial, Cornell Baker Farm, Willsboro, NY. Topics: Volunteers assist in grape harvest, including data collection, in exchange for a share of the harvest; participants then make wine, and later have group tasting and evaluation. Attendance: 8

Cook, K., P. Hemstand, J. Thull. University of Minnesota Grape Open House. 8 Sept., 2012. University of Minnesota Horticultural Research Center, Victoria, MN. Topics: Review of cold climate grape cultivars, experimental selections, tasting of 100+ cultivars, common grape diseases, vineyard tour (trainings systems, canopy management, floor management, pest/disease management), experimental wine tasting, use of yeast to enhance varietal aroma. Attendance: 70


Hatterman-Valenti. NDSU Horticulture Research Field Day. 25 Sept., 2012. NDSU Horticulture Research Site and Horticulture Research Arboretum. Topics: Grape cultivars for North Dakota and grape samples from the cultivar trial were
Three issues of the Northern Grapes News have been published so far this year (February, May, and August) with one more slated for November. Articles have covered the history of cold hardy cultivars, ripening chemistry, profiles of team members, and announcements. As the project continues, we will include more information generated from our research studies.

23 Feb, 2012. Vol 1, Issue 1


17 August, 2012. Vol 1, Issue 3


Web Presence

The Northern Grapes Project Website was launched in February 2012. It contains information about upcoming events, detailed information about the project, webinar registration information and recordings, current and past issues of the Northern Grapes News, and copies of presentations given by project members.

We also created a Facebook page in April 2012, which is primarily used to notify followers when registration opens for a new webinar and when new content is posted to the project website.
Northern Grapes Webinar Series

The *Northern Grapes Project* hosted six webinars this year from January through June. Webinars were presented on the second Tuesday of each month, at noon and again at 7pm (eastern). All webinars were recorded and are archived on the [Recorded Webinars tab](#) of the project website.

Webinar registrants were from 37 US states and Canada. Our webinar email list currently contains 897 unique email addresses, which was developed as people registered for webinars or asked to be added to the list. Post-webinar surveys indicate that participants are finding the series to be educational: an average of 75% said their awareness and 81% said their knowledge of the subjects changed at a moderate or higher level.


**McManus, P. and W. Wilcox.** *Grape Disease Management Basics (and All About Anthracnose).* Northern Grapes Project Webinar Series. 10 April, 2012. Participants: 90


**Summary of Year One Grape Community of Practice Activities Related to the Northern Grapes Project**

During the first year of the *Northern Grapes Project*, the eXtension grape community of practice (GCoP) has been involved in training project members and promoting the project through eXtension.org and eViticulture.org. The training was done by Dr. Eric Stafne (Project Director of the GCoP, Mississippi State University and Co-PI, Northern Grapes Project) and Dr. Lane Greer (Project Manager of the GCoP, Oklahoma State University) at the *Northern Grapes Symposium* which was held in conjunction with the Minnesota Grape Growers Association Cold Climate Conference held in St. Paul, Minnesota in February 2012. Two videos from the Symposium have been posted on the eViticulture YouTube channel. All webinars have been linked from the eXtension page and on the eXtension calendar of events. In addition, a direct link to the *Northern Grapes Project* was added on the main eXtension grapes page. Webinars are other news events related to the *Northern Grapes Project* have been included in the social media efforts of the GCoP, including tweets, facebook posts, and YouTube videos. Dr. Stafne and Dr. Greer have also maintained contacts with the *Northern Grapes Project* Leader and Coordinator (Dr. Tim Martinson and Dr. Chrislyn Particka, respectively) including phone conferences and face-to-face meetings.

*Stafne (MS), Greer (OK), Particka (NY)*
Other Newsletters, Blogs, and Websites Associated with the Northern Grapes Project

Berkett, L. **Vermont Grape IPM Updates.** Time-sensitive IPM updates sent out during growing season via email and archived on Cold Climate Grape Production website. Thirteen issues in 2012 sent to 245 people via email, archive accessed over 700 times in past year.

Berkett, L. **U. Vermont Vineyard Website.** Provide quick grower access to data collected in cold climate grape research vineyard.

Kingsley-Richards, S. and L. Berkett. **U. Vermont Cold Climate Grape Production Website.** Provide relevant and time-sensitive information to cold climate winegrape growers in Vermont and beyond.

Martinson, T. **Northern New York Grape Production Update.** Blog distributed to 70 Northern New York growers weekly from June-Sept. 35 posts.

Nail, W. and V. Bomba-Lewandoski. **The Connecticut Agricultural Experiment Station Viticulture Information Page.** Website posts information on resources, events, for regional cold-climate grape growers. Updated as needed, audience of 70.

Schloemann, S. G. **UMass New England Wine Grape Grower’s Resource Center.** Comprehensive website with production, pest management, and industry resources for cold climate wine-grape growers in New England. Post meeting announcements and other calendar events and archive UMass Grape Notes Newsletters.

Schloemann, S. G. **UMass New England Grape Notes.** Periodic electronic newsletter published during the growing season with approximately 10 issues annually, distributed throughout New England. Each issue contains seasonally relevant information on grape production, insect and disease management, harvest parameters, upcoming meetings, and related topics.

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**Northern Grapes Project**

**Thanks Our Partnering Industry Associations**

Connecticut Vineyard and Winery Association  
Illinois Grape Growers and Vintners Association  
Iowa Wine Growers Association  
Lake Champlain Wines  
Massachusetts Farm Wineries and Growers Association  
Michigan Grape and Wine Industry Council  
Minnesota Grape Growers Association  
Nebraska Winery and Grape Growers Association  
New Hampshire Winery Association  
New York Wine and Grape Foundation  
North Dakota Grape Growers Association  
Northern Illinois Wine Growers  
Northern New York Wine Grape Growers  
Scenic Rivers Grape and Wine Association (Iowa & Illinois)  
South Dakota Specialty Producers Association  
Upper Hudson Valley Wine and Grape Association  
Vermont Grape and Wine Council  
Western Iowa Grape Growers Association  
Wisconsin Grape Growers Association

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Visit us on-line at [www.northerngrapesproject.org](http://www.northerngrapesproject.org)

Visit our sister site [eViticulure.org](http://eviticulure.org)  
eViticulure.org is the national online viticulture resource containing the latest science-based information for viticulturists.

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