

NCCC212 virtual meeting 2020 North Dakota State University

Evaluation of performance of small fruit selections in North Dakota. Harlene Hatterman-Valenti, Esther McGinnis, Janet Knodel, and David Dai.

Graduate students: Caitlin Krueger PhD, Andrej Svyantek PhD, Sarah Borgenrief MS, Venkateswara Kadium MS, and Jacob Lachowitz MS

Objective 1 - Develop improved small fruit germplasm through cooperative breeding and evaluation programs:

Grapes: Initiated a germplasm enhancement project in 2009 with the goal of developing one red and white wine grape that will be winter hardy to -40 F without protection and ripen with only 1800 GDD base 50 F. Utilizing *V. riparia* for winter hardiness. Have planted 18 advanced selections into replicated trials at five locations in comparison to industry standards and have sent two selections that have been approved for pre-release to five states.

Juneberry: Collected native Juneberry biotypes for nursery evaluation in comparison to the most common cultivars available in Canada and the US. Continue to evaluate thirty-one biotypes and 14 named cultivars at two locations (Williston and Absaraka) for phenotypic and fruit yield evaluations. Yield data gathered from harvests over the past three years indicate up to 10 biotypes have superior attributes compared to 14 named cultivars. One nursery is interested in the biotype with upright characteristics, which is one of two approved for pre-release.

Other small fruit crops: Dr. Dai continues to test chokecherry lines for resistance to X-disease. Hatterman-Valenti continues to evaluate black currant germplasm from BC breeder and continues to evaluate blackberry production methods.

Objective 2 - Develop practices for small fruit production tailored for climatic and market needs of growers.

Grapes: For two winters in a row devastating dieback of almost all cultivars occurred in a variety trial initiated in 2004 despite what was considered a rather mild winter. Ranking of cultivars from least injury to most injury would be: Valiant, » King of the North » » John Viola, Baltica » » MN1131, Bluebell, Frontenacs (noir, gris, blanc) » » » St. Croix, Marquette, Sabrevois, Crimson Pearl, Petite Pearl, Prairie Star, Brianna, Alpenglow, Summerset Seedless, La Crescent, Verona » » » » Marcehal Foch, GR 7, Leon Merlot, Laura's Laughter, Louise Swenson, Edelweiss.

A trial to examine the effects of four trellis systems for 'Marquette' and 'Petite Pearl' grapes was also severely damaged repeatedly by winter dieback. No trellis system did better for trunk survival and the same was true for the two cultivars.

Trials also continue to assess the effect of viticultural practices (fruit zone leaf removal, shoot thinning, crop positioning, and crop load management) on fruit yield, quality, and vine cold hardiness for 'Frontenac', 'Marquette', and 'Prairie Star'. Another trial is screening the North Dakota State University grape germplasm collection for temperature adaptive acclimation responses. A joint trial with the UM (Clark) is evaluating how soils impact cold hardy grapes and wine quality. Lastly, a trial was initiated in 2020 to identify economically important fruit quality traits in diverse grape genotypes for elite germplasm development.

Blackberry and Raspberry: Continue to evaluate ways to get more fruit from primocane blackberry cultivars. Continue to evaluate organic production methods for raspberry and blackberry cultivars.

Other small fruit crops: A PhD student continues to evaluate SWD distribution and presence in small fruit somewhat unique to North Dakota. So far, there appears to be little to no connection between penetrometer values and reproductive success on tested cultivars. While not definitive, initial results suggest that skin toughness among small ND fruits is not the deciding factor in host preference or resistance.

Objective 3 - Explore the association between fruit constituents and human health impacts

Collaboration with Dr. Shetty to selectively modify and stimulate the phenolic profiles using system-based metabolic innovation and up-regulation of key defense related pathways to enhance both fruit quality and longevity during post-harvest stages for grape and blackberry.

2. List short and sweet impact statements under each objective.

North Dakota has some unique environmental challenges that must be overcome for successful small fruit production. Through germplasm enhancement and by examining practices to hastening ripening or extend the season and avoid winter injury, profitable farm diversification practices and locally produced small fruit will become available.

4. List publications arising from your collaborative research projects including journal articles, book chapters, review articles, theses, proceedings, and extension publications. Please use ASHS style (examples pages 14-15 of pdf at http://c.ymcdn.com/sites/www.ashs.org/resource/resmgr/files/style_manual.pdf).

Presentations:

- Espe, A. D. Sarkar, H. Hatterman-Valenti, and K. Shetty. (2019). Phenolic antioxidant-linked anti-diabetic properties of blackberry cultivars using rapid *in vitro* assay models. North American Raspberry and Blackberry Conference, Savanna, GA Jan. 9-11, 2019.
- Espe, A. C. Auwarter, and H. Hatterman-Valenti. (2019). Organic versus conventional production of primocane blackberries in North Dakota. North American Raspberry and Blackberry Conference, Savanna, GA Jan. 9-11, 2019.
- Espe, A. D. Sarkar, H. Hatterman-Valenti, and K. Shetty. (2019). Phenolic antioxidant-linked anti-diabetic properties of serviceberry cultivars and accessions using rapid *in vitro* assay models. North American Raspberry and Blackberry Conference, Savanna, GA Jan. 9-11, 2019.
- Stenger, J. and H. Hatterman-Valenti. (2019). Weed management options in cold hardy grapes. 72nd Annual Conference of the Western Society of Weed Science (WSWS) Denver, CO, Mar. 11-14, 2019.
- Hatterman-Valenti, H., A. Espe, J. Stenger, and C. Auwarter. (2019). Primocane blackberry cultivar response to pseudo double-cropping. XII Rubus & Ribes Symposium, International Society Horticulture Science, Zurich, SZ, June 25-28, 2019.
- Espe, A. D. Sarkar, H. Hatterman-Valenti, and K. Shetty. (2019). Phenolic bioactive-linked type 2 diabetes relevant functionalities and blackberry ripeness. XII Rubus & Ribes Symposium, International Society Horticulture Science, Zurich, SZ, June 25-28, 2019.
- Espe, A. D. Sarkar, H. Hatterman-Valenti, and K. Shetty. (2019). Phenolic bioactives in unripe and ripe blackberry fruits targeted for type 2 diabetes using *in vitro* assay models. XII Rubus & Ribes Symposium, International Society Horticulture Science, Zurich, SZ, June 25-28, 2019.
- Svyantek, A. and H. Hatterman-Valenti. (2019). Viticulture practices geared towards improving fruit quality. Montana Grape and Winery Association 5th Annual Meeting and Conference, Mar. 21-23, 2019, Helena, MT.

- Svyantek, A., J. Stenger, I. Tatar, N. Thiesen, C. Auwarter, H. Hatterman-Valenti. (2019). Growth Chamber Analysis of Dormancy Acclimation Response of NDSU Grape Germplasm. American Society for Enology and Viticulture- Annual Conference. Napa, CA.
- Lachowitz, J., A. Svyantek, J. Stenger, and H. Hatterman-Valenti. (2019). Yeast influenced on 'Petite Pearl' and 'Crimson Pearl' wine sensory attributes. American Society for Enology and Viticulture – Eastern Section 44rd Annual Conference, July 16-18, 2019, Geneva, NY.
- Svyantek, A. J. Stenger, C. Auwarter, N. Theisen, M. Brooke, and H. Hatterman-Valenti. (2019). Leaf removal practices alter cluster morphology and soluble solid content of North Dakota grown 'Marquette'. American Society for Enology and Viticulture – Eastern Section 44rd Annual Conference, July 16-18, 2019, Geneva, NY.
- Hatterman-Valenti, H., J. Stenger, A. Svyantek, N. Theisen, R. Ibrahim, C. Auwarter. (2019). Delayed Pruning Does Little to Mitigate Risk of Late Spring Frost in North Dakota Grown Cold-Hardy Grapevine Cultivars. American Society for Enology and Viticulture – Eastern Section 44rd Annual Conference, July 16-18, 2019, Geneva, NY.
- Hatterman-Valenti, H. and A. Svyantek. (2019). North Dakota State University Grape Germplasm Enhancement Project. North American Grape Breeders Conference. Aug. 15-16, 2019, Springfield, MO.
- Svyantek, A., J. Stenger, N. Thiesen, I. Tatar, M. Brooke, Z. Rivera, C. Auwarter, H. Hatterman-Valenti. (2019). Improving Fruit Quality in Cool-Climate Viticulture Under Inclement Environmental Conditions. Food for Health Workshop. Hunan Agricultural University. Changsha, Hunan. China.

Publications:

- Askari-Khorasgani, O., H. Hatterman-Valenti, F. Pardo, and M. Pessarakli. 2019. Plant and symbiont metabolic regulation and biostimulants application improve symbiotic performance and cold acclimation. *J. Plant Nutrition*. 42(17):2151-2163.
- Askari-Khorasgani, O., H. Hatterman-Valenti, F. Pardo, and M. Pessarakli. 2019. Managing plant-environment-symbiont interactions to promote plant performance under low temperature stress. *J. Plant Nutrition*. 42(16):2010-2027.
- Debner, A., H. Hatterman-Valenti, and F. Takeda. 2019. Blackberry propagation limitations when using florican cuttings. *HortTechnology*. 29(3):276-283.