University of Nebraska Viticulture Program Report to the Nebraska Grape and Wine Board

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Objectives:

1. Screen the viticulture characteristics of clones, cultivars and elite germplasm with significant potential throughout the USA.

2. Evaluate the viticultural and wine attributes of promising emerging cultivars and genotypes based on regional needs.

Objectives 1&2 Accomplishments:
Over 100 grapevine cultivars and selections have been evaluated over a period of 20 years by the University of Nebraska Viticulture Program. New selections from private breeders, the University of Minnesota and Cornell University have been tested for cold hardiness, tolerance to abiotic and biotic stresses, response to vineyard floor and trellis management systems, yield and fruit and wine quality and characteristics. New fertilizer and crop load adjustments are being explored in collaboration with UNL Food Science Department professionals (new faculty, Doctors Changmu Xu and Xiaoqing Xie). Additions for the 2020 part of these objectives involve new selections from North Dakota State University and from private breeders Ed Swanson and Max Hoffman.

3. Conduct explorations of new germplasm and lesser-known cultivars that may have economic potential for the Nebraska grape and wine industry.

New selections from Cornell University, the University of Minnesota, North Dakota State University and private breeders (Ed Swanson, Cuthills Vineyards owner and Capitol View Winery winemaker, and Max Hoffman, winemaker at Schillingbridge winery) have been newly initiated.

4. Explore alternatives potentially helpful to the Nebraska grape and wine industry.

a. Potential of High Tunnel Table Grape Production. This project was jump-started by a

USDA Block Grant and was continued with funding from the NGWB. It has been eminently successful as noted in the following table. (note that Canadice was decimated by vertebrate pests and Somerset Seedless also had its yield impacted before the pests were controlled.)

Harvest data collected from the table grape high tunnel project evaluating five different table grape cultivars.

Cultivar	Avg. Cluster Count	Total Yield - 15 plants (lbs)	Avg. Yield/Plant (lbs)	Avg. Cluster Weight (lbs)	Avg. pH	Avg. °Brix	Avg. TA
Canadice	5.6	n/a	n/a	n/a	3.12	19.6	6.96
Marquis	35	141	9.42	0.26	3.68	15.3	2.89
Thomcord	58	478	32	0.57	3.14	19.1	9.3
Mars	74	241	16	0.22	3.67	18.7	3.75
Somerset	33	204	14	0.33	3.43	18	10.72

b. Ground Cover Research. Impact of in-row and alleyway planted groundcovers on yield and juice quality in 'Edelweiss' grapevines. Note that this project was funded primarily by our NGWB grant and resulted in one commercial grower adopting the best cover crop mixture for more than five acres of commercial vineyard (Oak Creek Vineyards, Eric Nelson owner). This project also resulted in Ben Loseke completing his PhD degree. The following tables illustrate the results obtained for this multi-year cover crop research project.

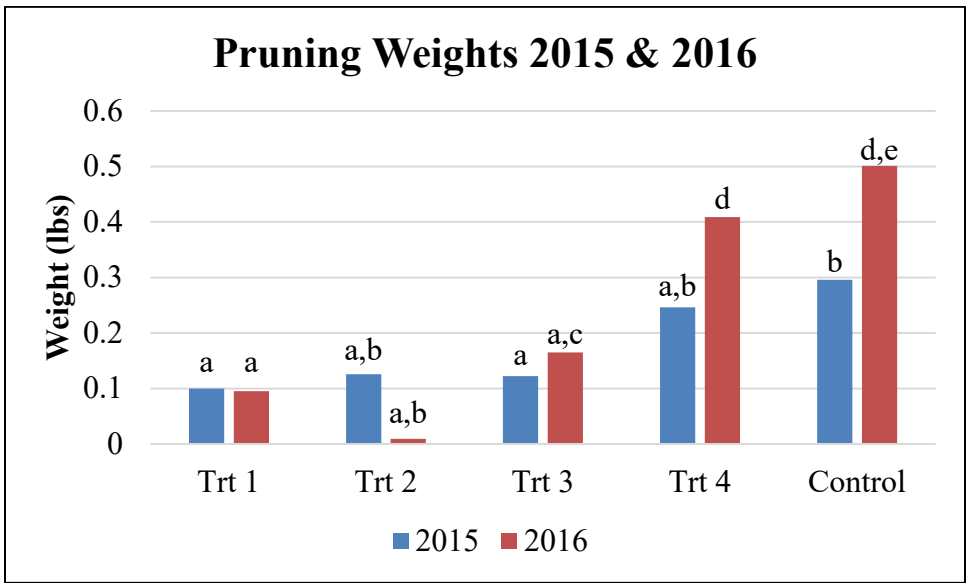
Trt 1 = Western Yarrow, Birdsfoot Trefoil and Dutch Clover; Trt 2 = Hard Fescue, Sheep's Fescue, Sideoats Grama, Buffalograss and Blue Grama; Trt 3 = KY Bluegrass, White Clover, Red Fescue, Hard Fescue and Chewing's Fescue; Trt 4 = Texoka Buffalograss; Control = weeds controlled by herbicide under-row.

2016	Cluster Number	Avg Vine Yield (g)	Avg Cluster Weight (g)	Avg Berry Weight (g)	°Brix	pH	TA
Trt 1	46.1 a	2709.6 a	58.6 a	1.8 a	15.8 a,b	3.2	10.3 a
Trt 2	32.3 a	2575.1 a	58.0 a	1.8 a	15.8 a,b	3.2	10.3 a
Trt 3	53.3 a	2345.1 a	57.5 a	1.8 a	15.9 a,b	3.2	10.2 a
Trt 4	60.9 a	2345.1 a	58.6 a	1.8 a	15.9 b	3.2	10.0 a

Control	51.2 a	2382.1 a	59.1 a	1.8 a	16.0 a	3.2	10.0 a
2017	**Cluster Number**	**Avg Vine Yield (g)**	**Avg Cluster Weight (g)**	**Avg Berry Weight (g)**	**°Brix**	**pH**	**TA**
Trt 1	112.0 a	4989.5 a	43.7 a,b,d	2.3 a	18.0	3.4	7.6 a,b
Trt 2	52.4 b	1583.0 b	29.1 a,b	2.0 a	17.1	3.3	8.5 b
Trt 3	118.0 a	5302.5 a,c	56.0 c,d	2.1 a	18.2	3.5	6.5 a
Trt 4	105.6 a	4136.8 a,b	36.3 a	2.0 a	15.7	3.4	8.2 b
Control	150.5 a	7833.5 c	49.9 d,c	2.1 a	17.0	3.4	8.2 b

*Values with the same letter in the same column indicate no statistical differences at $p \leq 0.05$

Impact of in-row and alleyway planted groundcovers on the pruning weights in two and three year old 'Edelweiss' grapevines. See treatments on above table.



c. Hail Damage Prevention. Although an exploratory trial was initiated in 2019, the planned follow-up research has been delayed by the pandemic-dictated shutdown of travel by University of Nebraska personnel. It is envisioned to be followed up in 2020-2021.

d. Grapevine Trunk Disease Evaluation. This research was initiated based upon the observations and encouragement of Dr. Richard Smart, who demonstrated at a UNVP-sponsored field day at Soaring Wings Vineyards near Springfield, Nebraska that grapevine trunk diseases are indeed a problem in Nebraska vineyards. Following the request to terminate the UNVP 20-year-old research vineyard near Nebraska City, more than 100 vines were evaluated for GTD. These evaluations were summarized and reported in regional and national media (see articles noted under "Publications"). Numerous disease organisms have been implicated, including the Botryosphaeria

complex, Eutypa and Phomopsis. Plans for evaluation of wild grapevine germplasm and commercial grapevines have been curtailed by the coronavirus imperatives, but continuation of documentation of GTD is being considered for implementation in late 2020 and 2021.

e. Field Days and Tailgates. Several tailgates were held in summer and fall of 2019, with current commercial growers and individuals considering establishing a vineyard attending. Topics included summer and fall vineyard management tasks, crop estimation, bunch rot disease prevention/management and the potential of high tunnel table grape production.

f. Cold Hardiness, Growing Degree Days (GDD) and Chilling Hours. Research related to grapevine cold hardiness has been a focus for over 20 years by the UNVP. It continues to be emphasized in relationship to our ongoing evaluation of potential new cultivars and elite germplasm. Research on GDD and its impact on timing of harvest is continuing to be emphasized, with a preliminary publication resulting, (see list of publications). We plan to continue studying GDD as they relate to vineyard management decisions with the goal of assisting growers and winemakers in harvest timing decisions. Chilling hours has been a focus by Ben Loseke as we continue to learn more about the physiology of grapevine dormancy. (A poster has been presented with a publication anticipated to follow).

g. Vines, Wines and You. This class has been taught to a wide array of students, both agriculturally focused students and those in other majors ranging from language majors to architecture and business majors. Graduates have been inspired to seek further education in viticulture and enology and several are now professionally involved in the grape and wine industry, both in Nebraska and nationally. (Specific examples can be provided if desired.)

Publications and Presentations

Title	Authors	Year	Type	Presented/Published	Status
History of Viticulture and Wine Making in Midwest USA	Read, P.E. Loseke, B.A. Gamet, S.J.	2019	Journal Article	Acta Horticulturae	Accepted
Teaching Beverage Crop Science: Vines, Wines and You, a Case Study	Read, P.E. Loseke, B.A. Gamet, S.J.	2019	Journal Article	Acta Horticulturae	Accepted
Relating Harvest Timing to Growing Degree Day Accumulation	Read, P.E. Loseke, B.A. Gamet, S.J.	2019	Journal Article	Acta Horticulturae	Accepted
Biofortification with Selenium and Lithium Improves Nutraceutical Properties of Major Winery Grapes in the Midwestern United States	Zhao, H. Xie, X. Xu, C. Read, P.E. Li, W. Loseke, B.A. Gamet, S.J.	2019	Journal Article	Journal of Agricultural and Food Chemistry	In Review

Rootstock and Mounding Affect Growth and Cold Hardiness of Young 'Gewürztraminer' (Vitis vinifera) Vines	Gu, S. Read, P.E. Loseke, B.A.	2019	Journal Article	International Journal of Fruit Science	In Review
Impact of Alleyway and In-row Planted Groundcovers on 'Edelweiss' Grapevine Growth and Fruit Production	Read, P.E. Loseke, B.A. Gamet, S.J.	2019	Journal Article	International Journal of Fruit Science	Submitted
High Tunnel Table Grapes: An Alternative to Field Production in Nebraska?	Read, P.E. Loseke, B.A. Gamet, S.J.	2019	Poster	American Society for Horticultural Science	Presented
Chilling Requirements for 'Edelweiss', 'Frontenac' and 'Norton' Grapevines	Read, P.E. Loseke, B.A. Gamet, S.J.	2019	Poster	American Society for Horticultural Science	Presented
Hybrid Trunk Disease Evaluation: A Serendipitous Opportunity	Read, P.E. Loseke, B.A. Gamet, S.J.	2019	Oral Pres.	International Workshop on Trunk Diseases	Presented
Trunk Diseases and Winter Injury in NE America, How are They Related?	Smart, R. Barriault, E. Read, P. Volenberg, D.	2019	Magazine Article	Wine Business Monthly	Published

Nebraska VineLines. An average of 6 electronic issues per year have been provided to our NVL list of nearly 300 grape and wine professionals. In addition, occasional brief timely topics are forwarded electronically to this readership.