

**Department of Agriculture, Trade and Consumer Protection
Division of Agricultural Development
Agricultural Development & Diversification Program (ADD)
Grant Project Final Report**

Contract Number: 23002

Grant Project Title: Table Grape Trials for Fresh Market Production

Amount of Funding Awarded: \$20,075

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Organization: Board of Regents of the University of Wisconsin

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1) Original Intent of the Grant:

The primary purpose of the proposal was to continue and expand on a field trial of new seedless table grape cultivars in Southwest Wisconsin's - Zone 4/5 for fresh market production that was planted in June of 2007. Interest in grape production has been rapidly growing in Wisconsin for the last ten years. Trials have been implemented on a very limited basis for determining wine and juice grape cultivars, but not seedless table grapes. The study evaluation includes 15 cultivars of table grapes for cold hardiness, taste, and maturation time for Wisconsin's climate. Table grape production in Wisconsin can help increase the profitability for the fresh market growers on existing land will prove to be an incentive for new producers, and increase the competitive edge for imported table grapes for Community Supported Agriculture (CSA) s in Wisconsin.

Our main goal was to continue the trial of at least 15 seedless table grape cultivars to determine if any would be hardy in Wisconsin. There are two seedless grapes that are hardy in the state but both are "Concord" or "slipskin" grapes that are not generally palatable to the consumers in Wisconsin. Our ultimate goal was to find at least five of the fifteen that would have the following characteristics: relatively disease resistant, good winter hardiness, break bud later in the spring, and develop ripe fruit that tastes good during Wisconsin's short growing season.

The significance of this crop for farm market growers, (CSA), and small road-side stand growers is dual-fold. Seedless table grapes are a high value crop. Per acre income can be more than many other fruit crops in Wisconsin and more than general agricultural row crops. Once established, grapes are a long-lived crop, and can live for more than 25 years in some cases. Seedless table grape production has been limited by the few cultivars available for growers to plant. Several planted produce seeds if stressed by inclement weather: high temperatures, low temperatures, too much rain, or lack of rain. Determining if any additional cultivars are hardy in the state would increase what fresh market, road-side stands, and CSA growers have as "locally grown" fruit to add to their market baskets. Also, determining a grape ripening sequence that could add weeks to the fresh production of grapes would expand the sales for these growers.

The opportunity to diversify Wisconsin's agricultural crops by increasing the production of table grapes is of great interest to farmers seeking to add value to land production. And by increasing the interest in locally grown foods, consumers will seek other "Wisconsin Grown" fruits and vegetables.

2) Steps Taken to Reach the Goal Established in Grant Application:

A grant was written and secured from The Department of Agriculture Trade and Consumer Protection (DATCP) and we began to implement a five-year plan for seedless grape production at the West Madison Agricultural Research Station (WMARS). A second grant was written and secured in 2009 for continuation of the evaluation of the seedless table grapes.

The Wisconsin Grape Growers' Board of Directors was informed of our grant; Ms. Reith-Rozelle serves on the board and keeps the grape growers informed of all results through this group.

First Years of Establishment and Background for 2009 – 2010 Program

Through Mr. Coquard at Wollersheim Winery, we secured vines for 15 cultivars of seedless table grapes. Zone hardiness ranged from Zone 4 to Zone 6. Six red, five white, and four blue grape cultivars were chosen to be included in the trial. The ripening time ranged from early to late because a long period of harvest for fresh market production would be more economically feasible for growers.

In May of 2007 a plot 50 feet x 120 feet was established at the station. The area to be planted was in a heavy sod cover. We used a sod cutter and removed strips of sod that were 24 inches wide and 120 feet long. The soil within these strips was then tilled deeply so as to develop a deep soil base for the root development of the vines.

The plants arrived in late May and were placed in cold storage until the planting area was prepared and all chance of frost had passed. The cultivar list includes ratings for diseases and insect resistance from breeders.

A trellising system was installed directly after plot preparation. Poles used for trellising were 4 inches around by 8 feet tall and were made of Western Red Cedar. Red Cedar was used so that organic growing conditions could be followed if possible. Treated poles are not allowed in organic systems so our choice was the cedar. Poles were placed at 21 foot intervals, along the 120 feet of trellising. High tensile wire was strung across the poles and secured at each end of the grape trellising of five inch by eight feet poles. The first wire was placed at 32 inches from soil and two more wires were strung at 12 inch intervals up the post. We eventually found we had to place an additional wire on the trellising due to upright training systems that the majority of the table grapes required for best growth.

On June 5 of 2007, all grape vines were placed in containers and soaked over-night before planting. June 6, all vines were planted in the prepared plot. Rebars were set in the ground next to each grape vine to provide the support for strong, healthy trunk development. The rebars were all six feet long. Each was pounded into the ground to a level of four feet above ground.

The design for the planting was established following the general rule for planting, either wine or table grapes. Vines were spaced seven feet apart within the rows and nine feet apart between rows. Three rows 120 feet long were established. This spacing allows for small tractors to maneuver through the vines for spraying for disease and insect prevention, and for mowing grass that was established between the grape trellising. Wollersheim Winery staff visited the trial site several times during the summer of 2007 – 2008 to provide technical assistance and training for WMARS staff and student interns.

All plants were irrigated throughout both summers if less than one acre inch of rain was received during the growing period. Weather conditions were monitored using a Vantage PRO weather station, which recorded rain.

During the first year of growth we had tremendously vigorous plant development. Each vine was secured to the wires and rebars, and allowed to grow upright for the whole growing season. Grape vines need to develop straight trunks when young. Straight trunks prove to be stronger, lead to fewer problems during winter fluctuating temperatures, and tolerate stress of heavy fruit loads. Flower clusters were removed in 2008. All cultivars were monitored for insect and disease development. A spray plan was established and implemented. Organic compounds were used for the first two months.

We found that the plant and trellis spacing worked well, planting techniques and irrigation provided for healthy growth and very strong development for first year establishment. The trellising was strong and provided the needed support for the heavy growth. In the future we would use nine foot post so a fourth wire could have been established the first year.

The spring of 2009 we added more trellising to the top of each post. The trellises are now over 7 feet tall and accommodate those vines that are very vigorous, have very upright growth, and are, therefore, trained on the vertical shoot positioning method.

Most plants over-wintered well in 2008 - 2009. During the spring of 2009 buds broke later than expected due to a cooler spring. Almost all plants produced early shoots and flower clusters, due to lack of any late frost. Plants were healthy and very productive, we believe, due to the removal of fruit the previous years and to irrigation of all vines during the establishment years - a practice that we believe must be followed to ensure healthy, strong vines that will have increased winter hardiness when establishing a vineyard in Wisconsin.

In 2010 we had a late frost in April and in early May; buds were damaged on eight of the varieties. We will be using a different pruning technique in 2011 to ensure later bud break. More on the lesson learned in a later section.

Fruit clusters were thinned to about one-third of actual load during the 2009 growing season - (The removal of fruit enhances the development of root systems for all grape vines). Strong, healthy root development is essential to over-wintering capabilities. Flower clusters were removed the first two years, 90% of the fruit for the third year, and the fruit was thinned to produce a commercial harvest for 2010.

We sprayed all vines during the summer of 2009 and 2010 with organic fungicides. The sprays worked well in 2009. The rainy season and high humidity the summer of 2010 provided a perfect environment for fungal growth. Downy Mildew was a major problem that was not controlled by the organic fungicide applied previous to the outbreak. In mid-August we had to begin using a non-organic fungicide and a non-organic insecticide to ensure a healthy crop of fruit for our evaluations.

Our first biggest challenge was possible herbicide damage during the 2007 growing season. Five of the cultivars were hit by drift from what was suspected to be Roundup. We could not verify that the damage was caused by herbicides, but all of the symptoms pointed to drift from an herbicide. We had to replant selections within these cultivars and severely prune the remaining plants. Those cultivars struggled to regain health and vigor and reach the growth pace of the other ten cultivars. Several of the selections

that had been damaged did not produce any flower clusters in the spring of 2008. During the summer of 2009, each established hardy, strong growth, and strong cordons were developed.

The second biggest challenge we faced was an infestation of Japanese Beetles during the second and third growing season – 2009. Thousands of beetles invaded the vineyard in mid-July. The organic compound did control beetles that were on the vines. However, it did not control new in-flights. New flights of beetles were constantly arriving and devouring the leaves of most selections. We found that those cultivars that were derived from crosses with concord grapes – *Vitis labrusca* had few if any beetles. The variety ‘Concord Seedless’ had minimal feeding of the Japanese Beetles. We attributed this to the leaf texture of concords, which is very rugous.

In 2010 we had very few beetles. In late July we had one flight of the beetles and one spray provided the protection needed. Later a second flight was detected in mid-August, but the numbers never reached a level that warranted any insecticide spray. We hope this trend will continue, since the beetles are very destructive and cause major damage to vines if in large numbers and if not controlled.

3) What We Were Able to Accomplish:

Fifteen cultivars of seedless table grapes were planted, trellising developed, and strong cordon development established. Winter injury data, summer growth development, veraison (fruit ripening data), and periderm (term used to describe the level of dormancy that each vine has reached in late fall) has been collected and now better understood than at the end of 2009 (Vines need to reach 90 to 100 % periderm before hard frost). Periderm development was tracked in late summer and fall for all fifteen cultivars for 2009.

An overall understanding of which cultivars are more disease tolerant, insect resistant, and complete periderm development and bud acclimation before hard frost has been established. Winter hardiness and time of bud break has been collected for two winters.

For the summer of 2009 – 2010 data has been collected on fruit maturation time, sugar development (brix), size of clusters and individual grape size, and spread of harvest time has been determined for some of the cultivars.

In 2010 numbers of fruit clusters were pruned to normal production levels for market production. Fruit evaluation was accomplished in 2010 for 12 of the cultivars.

We now have a strong record of production, bud break, winter injury records, and fruit production. The data has shown that Glenora did not produce any fruit in the four summers of the trial and was removed from the trial during the summer of 2010.

Work and Outreach Evolving from the Table Grape Project

In the fall of 2007 and spring of 2008, work began, to develop a research trial on wine grapes at the Peninsular, Spooner, and West Madison Agricultural Research Stations. This work was the result of the interest garnered through the table grape project. The Dean of the College of Agriculture and Life Sciences helped secure funding for a three year project on wine grape research. Also, the growth in grape growing as a profitable crop in Wisconsin has resulted in the newly appointed fruit

specialist/professor in the Horticulture Department to work closely with the grape growers....this is a first for the Horticulture Department and the UW-Madison.

Outreach:

The Wisconsin Fruit and Vegetable Growers Association (WFVGA) requested that Ms. Reith-Rozelle, Assistant Superintendent of WMARS, speak at the January 2009 and again at the upcoming 2010 conference, and present a program on the Seedless Table Grape Project and the newly emerging Wine Grape Research Program at the three research stations. Over 90 participants were in attendance, for the entire three-day grape section at the 2009 WFVGA conference.

The assistant superintendent and the Wisconsin Grape Growers Association (WGGA) also developed a Spring Vineyard School that was held at Wollersheim Winery in April of 2009 and again in 2010, as part of the outreach program for the grape project. The attendance for this program was over 100 in 2009 and 124 in 2010. In attendance were: grape growers, vintners, and farmers seeking information on grape growing and the grape industry in Wisconsin.

Numerous new growers and prospective growers have visited WMARS and requested information or tours of the trial. Many of those will be developing seedless table grapes as a new crop in an existing vineyard or as a new crop for an existing farm market business. The interest in the seedless table grapes has been tremendous and we will be releasing more information on the results of our work at the 2010 Fruit and Vegetable Growers Conference, on WMARS blog, and web-site, and as a short fact sheet to go out to extension offices.

4) Conclusions Gathered Based through Project Work:

Nine varieties overwintered well, during 2009: Canadice, Concord Seedless, Interlaken, Lakemont, Saturn, Somerset Seedless, Trollhaugen, Vanessa, and Venus. The plants were very strong and could have produced an abundance of flower clusters. Three varieties showed some damage, but grew well and still produced fruit: Einset, Marquis, and Reliance. Two varieties did not produce any fruit: Glenora and Himrod

The summer of 2009 was very cold. Even with a very cold summer, by the end of the growing season, all cultivars ripened before frost; we began evaluating for taste. The sugars developed very slowly in all grapes during this period we felt that a warm summer would give us a more distinct taste for each cultivar. A decision was made then to complete a more formal evaluation for taste, texture, and color during the summer of 2010, rather than in 2009.

Early spring of 2010 was very warm. Due to the high temperatures the buds, broke on all varieties by April 19. On April 28, frost destroyed the primary and secondary buds on seven of the varieties. This frost set back our evaluation ratings for these cultivars, since most produced little if any fruit. Our pruning methods may have lead to this early bud breaking and subsequent frost damage.

We determined that early pruning is not beneficial for table grapes in Wisconsin. What we have also learned is that all seedless table grapes should be soft pruned in March. This means that we would only prune the most rampant growth in late winter and wait until April to "hard" prune or prune to spur selection. Pruning later in April will keep fruiting buds – primary and secondary buds on the fruiting spurs – from breaking early in April and being destroyed due to early bud break or by late frost.

We have removed, or will remove Concord Seedless, Glenora, and Saturn:

Concord Seedless vines will be removed during the fall of 2010. Two of the vines produced fruit containing numerous seeds and the remaining vine - fruit was bland, small and unappetizing. We do not know if the selections planted were a genetic variant that may not have been seedless. We may replant a few more of the Concord Seedless to evaluate. The decision to replant will be made this winter.

Glenora has proven not to be winter hardy; it has produced little fruit or no fruit at all during any of the trial years. Winter damage was severe in 2009 and 2010. In 2010 it did not produce any fruit and the vines were removed from the trial.

Saturn is very winter hardy and produced abundant fruit in 2009 and 2010. However, it ripened much later in our growing zone than stated in all publications for this selection. In 2009 the fruit was full of large, very numerous seeds and the taste of the fruit was inferior to all other selections: a bit bitter, sour, and flat. We allowed some fruit to remain on the vine until frost. The flavor did not improve. In 2010, the fruit was seedy, late maturing, and very off flavor. We removed this selection late summer of 2010.

We are still evaluating Canadice, Interlaken, Lakemont, Himrod, Marquis, Vanessa, and Venus.

Canadice, a red fruited variety, produced abundant fruit in 2009. The plants were very vigorous, grew very well in the first three years of the trial, and produced an abundance of fruit in 2009. The fruit is of a marketable size, complex taste, and resulting in one of our favorites. In 2010 about one-third of the primary and secondary buds were damaged by the April frost. The tertiary buds broke and produced healthy, vigorous vines. A few remaining undamaged vines, produced abundant fruit of a beautiful rose-red color. We plan to evaluate Canadice for at least two more years. This is one variety that we hope can be included in our recommendations in the future.

Lakemont and Interlaken, white fruited varieties, grew well the first three years and produced abundant fruit in 2009. The fruit was extremely tasty: sweet, complex and spicy. Each grape was of a marketable size and the color was soft green. Frost damaged the buds in 2010. A limited amount of fruit developed on two of the canes in each selection: the taste was similar to 2009. We plan to evaluate both of these varieties for at least two more years before making any definitive statement. They are Zone 6 grapes so we are unsure of their development in future years. However, with a revised pruning system we think we can increase the production possibilities of these two selections. In southern Wisconsin, these grapes would sell well, due to their color, taste, and uniqueness for Wisconsin seedless table grapes.

Himrod, a white fruited variety, was damaged by possible herbicide drift in 2007 and recovered slowly. It produced very little fruit in 2009. One of the vines broke bud early on this selection in 2010. Two of the vines grew well and produced a few fruit clusters. The fruit had a very unusual taste: complex, herby, and a bit tart. We plan on continuing the evaluation of this variety for at least another year.

Marquis, a white fruited variety, was damaged by the possible herbicide drift in 2007, recovered well by 2009 and did produce some fruit. In 2010 this selection broke bud at the same time as the three above selections. One-half of the vines were damaged severely by the April frost. The buds that survived grew well and flower clusters developed. The fruit on undamaged vines was abundant, a beautiful clear color, complex taste, and good cluster size for a white grape. We left some of the fruit on the vines until September 21 to check on a possible late pick date. The fruit was tremendously sweet – Brix 22, and the taste very complex. The cluster did not shatter and did not have any major diseases on any individual fruit. We hope that 2011 will prove this to be a more tolerant selection.

Reliance, a red fruited variety, was damaged in 2007, and winter damage occurred in 2008; the vines slowly recovered in 2009. Fruit clusters were removed in 2008 and a very few were allowed to remain on the vines for 2009 due to development of new cordons for those growing seasons. In 2010 buds were damaged due to frost on two of the three vines. One vine (two cordons) produced an abundance of fruit. The fruit was of marketable size, the taste very sweet, complex and the color deep, clear red. This was one of the favorites of the people who evaluated the fruit for taste and texture. Again, this is one we plan on keeping in the trial for at least two more years.

Vanessa, a red fruited variety, grew well and suffered very little winter damage the first two years. The fruit production in 2009 was abundant; clusters were of a good size, fruit complex and seedless. In 2010, the primary and secondary buds were damaged by frost on two of the vines and a third had primary bud damage. The limited fruit produced in 2010 was very similar in taste and size to 2009 fruit. We will be evaluating this selection in 2011 before making a more solid recommendation.

Venus, a blue fruited variety, produced a tremendous crop in 2009, and the fruit was positively received by our evaluators. In 2010, this selection broke bud early and we lost the majority of the fruiting buds. The individual fruit that developed was of good size, the taste very deep and complex, and the clusters beautiful. This is a blue selection that will, we believe, sell well due to berry size and complex fruit taste. This fall we began to see the development of Crown Gall on Venus. The vines will be removed and new vines of this cultivar replanted. The early damage in 2007 may have weakened this selection. We plan to retest with new plants.

Given one or two more years, we will be in a position to release more definitive recommendations on the seven varieties listed above. At this point we believe at least four of the seven will be more productive if pruned later in April and flower clusters thinned to a smaller production level.

Recommended Varieties at this time:

Einset, Mars, Somerset Seedless, and Trollhaugen overwintered well, did not suffer from frost damage (this may be due to location in the vineyard) as other selections incurred. All four produced abundant fruit, and matured in August of 2010. The fruit of each selection was seedless (only small remnant seeds were found in a few fruit).

Einset, a red fruited variety, overwintered well in 2009. This variety developed cordons more slowly than others in the trial. It produced fewer fruit clusters during the summer of 2009. In 2010 it overwintered well, produced abundant flower clusters and fruit. The fruit was very spicy, deep colored, and solid. The vines are more susceptible to Downy Mildew than any of the other selections. However, a fungicide that specifically controlled Downy Mildew did provide protection. Downy Mildew came in so early that we had not been spraying for this fungal organism. We will, in the future, recommend a preventive spray if weather conditions are supportive of Downy Mildew development if this is one that a grower chooses to plant. Following a good Integrated Pest Management Program (IPM) program will help with managing the diseases on this promising variety.

Mars, a blue fruited variety, overwintered well in 2009. Fruit production was plentiful. The fruit was very deep blue, fragrant, and spicy. Berry size is smaller than Venus, yet of marketable size. Vines and fruit have not shown any extreme disease or insect susceptibility. Mars ripens later in the year and would extend the season harvest.

Somerset Seedless, a red fruited variety, has overwintered well for all three winters, produced abundant fruit in 2009 and 2010. The fruit is a beautiful red color, very solid, has a complex taste, with very small

remnant seeds. The one limiting factor is the size of the fruit. Berries are relatively small compared to the other varieties grown. We do plan on treating this selection with growth regulators in 2011 to increase the fruit size. There are organic and non-organic sprays available to produce bigger individual berries. Disease problems have been controlled easily with fungicide sprays throughout the summer. We hope to use the organic on one vine and the non-organic on another to compare results.

Trollhaugen, a blue fruited variety, is one that we would recommend at this point. It has grown well, and produced fruit in 2009 and 2010. The fruit is complex in taste, a nice deep blue color, and of marketable size. Disease problems were controlled with fungicide sprays. Japanese Beetles do seem to prefer Trollhaugen less than other varieties. With a managed (IPM) program this grape will grow well and produce abundant, blue fruit.

We have now garnered knowledge on all cultivars as to which are less disease prone and have fewer insect problems. We see great differences in the *Vitis vinifera* (reds and white fruited) and *Vitis labrusca*, (blue fruited) and French-American hybrids. The labrusca vines are less prone to diseases and Japanese Beetles. However, they are more susceptible to sulfur toxicity and thus are more problematic when sprays are needed. As the IPM Program for grapes continues to evolve in Wisconsin, the maintenance program can be refined and the vinifera vines.

Disease and Insect Problems:

Overall, the seven varieties we are still reviewing are not prone to major diseases. Disease problems have been controlled easily with fungicide sprays throughout the summer. The first three summers we used all organic fungicides. In 2010 we had an outbreak of Downy Mildew. A non-organic fungicide was the only product that controlled this outbreak. The above varieties exhibited only minor infection of Downy Mildew if at all.

Japanese Beetles proved to be our one major insect problem in 2008 and 2009. Beetle levels were far above an economic threshold. Levels remained high throughout the summer months. The organic compounds we were using killed on contact, but provided no residual control. A non-organic insecticide was used during both years to limit the damage caused by the beetles feeding. In 2010 the numbers of beetles decreased to a level that only one spray was required. We hope this is a trend that we will see continue in 2011. Japanese Beetles can destroy young grape leaves in one or two days if left uncontrolled.

5) What do you plan to do in the future as a result of this project?

We will be continuing the evaluation for winter hardiness, disease and insect resistance, production quality, harvest periods, training of student interns, and continue with outreach programs to spread the knowledge we are gaining related to all selections of grapes. We will evaluate the fruit of all varieties for brix. This measure is an indicator of the sweetness of the grapes, which indicates the ripening point for each cultivar.

We will “hard” prune the grapes in April rather than in March. This pruning technique will help with early bud break on most of the varieties.

We also plan to add a few more seedless table grape cultivars as they are released from breeding programs, and as we learn more about additional cultivars on the market. Replacement of any cultivars that are not winter hardy, with new ones that may be more so, will be ongoing to keep the program active and useful to farmers in the future.

We will develop a regime for treating Somerset Seedless flower clusters with a growth hormone to increase size. We have found an organic form of the hormone and will plan our spray program using this compound.

We will be presenting information at conferences and at our field days related to the data collected.

We will continue to work with the WGGGA, provide outreach programs on the production of seedless table grapes, and produce fact sheets for recommended varieties for Wisconsin as we determine those that are truly hardy. We will continue to feature the trial at our outreach gardens at WMARS, and establish a field day for both table and wine grapes.

6) What information or additional resources are needed to commercially develop this enterprise?

A few more years of funding for a project manager would be very helpful. We have secured a grant through the DATCP, Specialty Crop Grant Program for 2010 – 2011. Two or three years from now, in 2011, 2012 and 2013 we can begin to make strong recommendations for the varieties that have proven to be hardy, produce quality fruit, are disease and insect resistant, and hold well for market production. We would also then have the resources to add new selections that were not in the first trial. We believe that the trials will, in the future, expand the selection of seedless table grapes recommended for growing in Wisconsin.

We believe that the seedless table grape trials will be an ongoing project at the West Madison Agricultural Research Station. And in the future, expand the trials to more research stations if possible. Continued review of existing varieties will continue, and as new seedless table grapes are released we will trial those also, as long as we can find resources to keep trialing these new selections. The excitement generated by the first trials should be fostered and growers encouraged to expand their small fruit production.

7) How should the agricultural industry use the results from your grant project?

The agricultural industry may begin to plant a limited selection of the seedless table grapes that we have determined hardy for Wisconsin. Wisconsin Grape Growers Association will be releasing some of the information. A few of the more adventurous farmers could begin to plant a few of the French-American hybrids that we see as overwintering well, and begin production, and do small trials of their own on several that we have listed as possibilities.

The results that we will release in January of 2011 will provide the needed information to begin to choose those selections that will be a valued crop for Wisconsin agriculture and grape growers in particular.

We know that four of the selections will do well and that with revised management techniques five to seven more may prove to be as hardy as those listed above.

We also believe the knowledge gained will lead to more cultivars being trialed in Wisconsin. Farmers/growers will be more willing to at least try seedless table grapes as a new crop. The hesitancy in even beginning to plant seedless table grapes may, for many growers, have been overcome by the knowledge gained through this trial.

Attached: Data for 2009 and 2010 Growing Season and Financial Report.

Information for New Table Grape Trial West Madison Agriculture Research Station

Table A	Cultivar Name	Color	USDA Hardiness Zone	Harvest Season	Growth Habit	Vigor	Suggested Training System	Susceptibility to:				
								Black Rot	Downy Mildew	Powdery Mildew	Botrytis	Sulfur Sensitivity
	Canadice	Red	5	Early	Semi-upright	Medium Vigor	Mid Wire Cordon	High	Low	Low	Medium	No
	Concord Seedless	Blue	4	Mid	Trailing	Vigorous	Top Wire Cordon	Medium	Low	Medium	Medium	Yes
	Einset	Red	5	Early	Semi-Upright	Vigorous	Mid Wire Cordon	High	Medium	High	Low	?
	Glenora	Blue	6	Mid	Upright	Vigorous	Mid Wire Cordon	Medium	Medium	High	Low	?
	Himrod	White	5	Early	Semi-upright	Vigorous	Mid Wire Cordon	High	Low	Medium	Low	No
	Interlaken	White	6	Early	Semi-upright	Medium Vigor	Mid Wire Cordon	High	Low	High	Medium	No
	Lakemont	White	6	Early	Semi-upright	Medium Vigor	Mid Wire Cordon	Medium	Low	Medium	Medium	No
	Marquis	White	5	Mid	Semi-Trailing	Medium Vigor	Mid Wire Cordon	Medium	Medium	Medium	Low	?
	Mars	Blue	5	Mid	Trailing	Vigorous	Mid Wire Cordon	Low	Low	Low	Low	?
	Reliance	Red	5	Early	Trailing	Medium Vigor	Mid Wire Cordon	High	Medium	Medium	High	?
	Saturn	Red	4 ~ 5	Mid-Late	Semi-upright	Medium Vigor	Mid Wire Cordon	Medium	Medium	Medium	Medium	?
	Somerset Seedless	White	4	Mid	Semi-upright	Vigorous	Top Wire Cordon	?	?	?	?	?
	Trollhaugen	Blue	Hardy to -30F	Early	Semi-upright	Vigorous	Mid Wire Cordon	Low	Medium	Medium	Medium	Yes
	Vanessa	Red	5	Early	Trailing	Medium Vigor	Mid Wire Cordon	High	Medium	Medium	Low	?
	Venus	Blue	5	Early	Semi-Trailing	Vigorous	Mid Wire Cordon	Low	Medium	Low	High	?

Fruit Set 2009

Table A			1-Jul-09	15-Jul-09	28-Jul-09	17-Aug-09	24-Aug-10	30-Aug-10	15-Sep-10
Cultivar Name	Color	Hardiness Zone	Fruit Set	Fruit Set	Verasion	Verasion	Verasion	Verasion	Verasion
Canadice	Red	5	0	low	0	30%	65%	100%	
Concord Seedless	Blue	4	high	high	0	15%	25%	60%	100%
Einset	Red	5	high	high	0	10%	65%	100%	
Glenora	Blue	6	v. low	v. low	0	5%	15%	65%	100%
Himrod	White	5	none	none	0	0	0%	0%	
Interflaken	White	6	low	low	0	10%	80%	100%	
Lakemont	White	6	low	low	0	5%	65%	95%	100%
Marquis	White	5	high	high	0	5%	65%	100%	
Mars	Blue	5	medium	medium	10%	90%	100%	100%	
Reliance	Red	5	low	low	0	20%	65%	100%	
Satum	Red	4 ~ 5	high	high	10%	50%	100%		90%
Somerset Seedless	Red	4	high	high	15%	100%	100%		
Trollhaugen	Blue	Hardy to -30F	v high	v high	15%	90%	100%		
Vanessa	Red	5	high	high	10%	100%	100%		
Venus	Blue	5	v high	v high	10%	75%	90%	90%	

* Pruned off many fruit clusters to allow for good root growth

Fruit Set 2010

Table A			June 15 2010	15-Jul-09	28-Jul-09	15-Aug-10	18-Aug-10	7-Sep-10	15-Sep-10
Cultivar Name	Color	Hardiness Zone	Fruit Set	Fruit Set	Verasion	Verasion	Verasion	Verasion	Verasion
Canadice	Red	5	medium	medium	0%	30%	100%		
Concord Seedless	Blue	4	high	high	0%	15%	30%	80%	100%
Einset	Red	5	medium	medium	0%	10%	100%		
Himrod	White	5	low	low	0%	30%	100%		
Interflaken	White	6	none	none	0%	50%	90%	100%	
Lakemont	White	6	v low	v low	50%	80%	90%	100%	
Marquis	White	5	high	high	25%	90%	100%		
Mars	Blue	5	medium	medium	50%	90%	100%	100%	
Reliance	Red	5	low	medium	60%	100%			
Satum	Red	4 ~ 5	high	high	0%	10%	30%	60%	90% (2)
Somerset Seedless	Red	4	v high	v high	90%	100%			
Trollhaugen	Blue	Hardy to -30F	v high	v high	75%	100%			
Vanessa	Red	5	high	high	75%	85%	100%		
Venus	Blue	5	medium	medium	50%	85%	100%		

Harvested on date of 100% verasion

Glenora removed in August of 2010 due to very low production - now flowers 2010
 1. removed due to high seeds, late ripening and poor taste

Fruit Ripening 2009

Date of Ripening	Hardiness Zone	Color	8/20 Brix	8/27 Brix	9/2 Brix	9/10 Brix	Flower cluster #
Somerset Seedless*	4	White	20.20	20.00	22.20	harv	high
Canadice	5	Red	17.20	17.10	21.00	22.10	medium
Concord Seedless *	4	Blue	17.00	17.60	21.50	21.80	high
Vanessa*	5	Red	16.50	18.00	20.60	harv	v.high
Trollhaugen*	Blue hardy to -30	Blue	16.30	16.30	21.60	harv	v high
Einset *	5	Red	15.00	16.10	19.10	20.10	low
Venus *	5	Blue	14.20	15.10	17.80	19.50	medium
Glenora	6	Blue	14.10	15.90	16.50	17.10	none
Interlaken	6	White	13.60	15.60	18.10	21.60	medium
Lakemont	6	White	13.50	19.50	20.10	22.80	medium
Mars *	5	Blue	12.50	14.20	17.00	18.60	high
Saturn*	4 ~ 5	Red	11.10	13.10	15.30	17.10	high
Marquis	5	White	11.00	12.30	17.20	18.20	v low
Himrod	5	White	0.00	0.00	0.00	0.00	none
Reliance	5	Red	0.00	0.00	0.00	0.00	low

* Thinned flower clusters

harv = harvest - frt falling off vines

Date of Fruit Wght	453 g/lb	8/20	8/27	9/2	9/10	8/20	8/27	9/2	9/10	Data	Data	Data
Cultivar Name	Color	Hardness Zone	Weight g/Cluster	Fruit Weight g/Cluster	Fruit Weight g/Cluster	Fruit Weight g/Cluster	Fruit Wgh/1 berry	Fruit Wgh/1 berry	Fruit Wgh/1 berry	Cluster Wgt g/cluster	Fruit Wgh g/1 berry	Tons/Acre
Canadice	Red	5	73	133	136	126	1.8	1.9	1.5	187	1.6	
Concord Seedless	Blue	4	94	52	191	181	1.9	1.4	3.1	121	2.6	
Einset	Red	5	69	108	216	209	2.8	2.2	2.1	154	2.3	4.5
Glenora	Blue	6	0	0	0	0	0	0	0	122	1.3	
Himrod	White	5	0	0	0	0	0	0	0	172	2.1	4.2
Interlaken	White	6	91	167	186	198	1.7	1.8	1.9	245	1.5	
Lakemont	White	6	87	172	197	169	1.8	1.2	1.8	220	1.7	
Marquis	White	5	81	69	91	89	1.6	1.2	1.5	245	3.5	10.5
Mars	Blue	5	105	149	218	195	4.6	3.8	3.3	193	2.6	6.7
Reliance	Red	5	0	0	0	0	0	0	0	280	2.3	6.5
Saturn	Red	4 ~ 5	62	68	78	56	1.8	1.6	1.6	236	3.0	4.3
Somerset Seedless	White	4	160	161	165	harv	1.5	1.2	1.2	149	1.8	
Trollhaugen	Blue hardy to -30	Blue	113	99	181	harv	1.5	1.3	1.8	225	1.5	
Vanessa	Red	5	63	89	82	harv	1.3	1.8	1.5	116	1.2	6.0
Venus	Blue	5	142	226	274	259	3.4	4.4	4.1	250	2.9	8.0

Sizing by UNECE Standards	Under	Open Grown Seedless Table Grapes
	Glass	Small-berry varieties listed
Extra Class	300g	150g
Class I	250g	100g
Class II	150g	75g

2009 -Disease Ratings for 2009 - 2010

Cultivar Name	Color	USDA Hardiness Zone	Susceptibility to:					
			Black Rot	Downy Mildew	Powdery Mildew	Botrytis	Sulfur Sensitivity	
Canadice	Red	5	High	Low	Low	Medium	No	
Concord Seedless	Blue	4	Medium	Low	Medium	Medium	Yes	
Einset	Red	5	High	HIGH	High	Low	?	
Glenora	Blue	6	Medium	Medium	High	Low	?	
Himrod	White	5	High	Low	Medium	Low	No	
Interlaken	White	6	High	Low	High	Medium	No	
Lakemont	White	6	Medium	Low	Medium	Medium	No	
Marquis	White	5	Medium	Medium	Medium	Low	?	
Mars	Blue	5	LOW	Low	Low	Low	?	
Reliance	Red	5	High	Medium	LOW	High	?	
Saturn	Red	4 ~ 5	Medium	Medium	Medium	Medium	?	
Trollhaugen	Blue	Hardy to -30F	Low	Low	Medium	Low		
Vanessa	Red	5	High	Medium	Medium	Low	?	
Venus	Blue	5	Low	Low	Low	High	?	
		Diseases detected and sprayed for in 2009						
		Diseases detected and sprayed for in 2010						

All grapes were sprayed on a 10 or 14 day rotation depending on weather and disease incidents.
 *Charts show possibly susceptibility to disease determined by breeders and other researchers

Summer of 2010 - little if any Powdery Mildew due to the high rain fall, Downey Mildew problems

Insect - Table Grape Trial West Madison Agriculture Research Station

Cultivar Name	Color	USDA Hardiness Zone	Japanese Beetles	Asian Lady Beetles
Canadice	Red	5	---	***
Concord Seedless	Blue	4	+++	***
Einset	Red	5	-	***
Glenora	Blue	6	---	***
Himrod	White	5	---	***
Interlaken	White	6	---	***
Lakemont	White	6	---	***
Marquis	White	5	---	***
Mars	Blue	5	+++	***
Reliance	Red	5	++	***
Saturn	Red	4 ~ 5	---	***
Somerset Seedless	Red	4	-	***
Trollhaugen	Blue	Hardy to -30F	++	***
Vanessa	Red	5	+	***
Venus	Blue	5	+	***

+++ (Few Japanese Beetles on plants and little damage)

++(More Japanese Beetles and some damage, but not at threshold that destroyed leaves)

+(30% more and needed to spray and leaf damage very noticeable)

-(Beetle damage on all leaves - sprayed several times)

--(Fairly severe damage and very hard to control)

---(Severe damage - hundreds of beetles on leaves and organic sprays every few days)

*** Almost no Lady Beetle Problems this year

Periderm Development Fall of 10/1/2009

Cultivar Name	Color	USDA Hardiness Zone	Verasion or Periderm Development	Vigor	Vine Habit
Canadice	Red	5	100%	Medium Vigor	Semi-upright
Concord Seedless	Blue	4	90%	Vigorous	Trailing
Einset	Red	5	100%	Vigorous	Semi-upright
Glenora	Blue	6	75%	Vigorous	Upright
Himrod	White	5	90%	Vigorous	Semi-upright
Interlaken	White	6	90%	Medium Vigor	Semi-upright
Lakemont	White	6	95%	Medium Vigor	Semi-upright
Marquis	White	5	100%	Medium Vigor	Semi-Trailing
Mars	Blue	5	100%	Vigorous	Trailing
Reliance	Red	5	100%	Medium Vigor	Trailing
Saturn	Red	4 ~ 5	100%	Medium Vigor	Semi-upright
Somerset Seedless	Red	4	100%		Upright
Trollhaugen	Blue	Hardy to -30F	100%		Trailing
Vanessa	Red	5	90%	Medium Vigor	Trailing
Venus	Blue	5	80%	Vigorous	Semi-Trailing

Concord Seedless used as Standard for vine development

- v. vigorous - long vines and cordons growing rapidly - pruned vigorously two times during summer
- m. vigorous - long vines and cordons developing, but less growth than Concord Seedless
 - pruned twice, second time fewer leaves removed
- less vigorous - leaves smaller, less growth on vines and pruned once during summer

Data on Bud Break 2010 - Table Grape Trial

Cultivar Name	Color	USDA Hardiness Zone	Date of Bud Break	Shoot Development on 5/3
Canadice	Red	5	4/19	2"
Concord Seedless	Blue	4	4/25	<1"
Einset	Red	5	4/19	2"
Glenora	Blue	6	buds dead	*
Himrod	White	5	4/25	*1"
Interlaken	White	6	4/15	*
Lakemont	White	6	4/15	*
Marquis	White	5	4/25	*2"
Mars	Blue	5	4/19	2"
Reliance	Red	5	4/19	2"
Saturn	Red	4 ~ 5	4/12	3"
Somerset Seedless	White	4	4/19	4"
Trollhaugen	Blue	Hardy to -30F	4/19	5"
Vanessa	Red	5	4/25	*1/2
Venus	Blue	5	4/19	*1/2

Flower clusters visible
Flower clusters visible

* Buds killed by frost on April 28
* upto 1/2 of half of buds killed

Fruit Ripening 2009

Date of Ripening	Hardiness Zone	Color	8/15 Brix	8/21 Brix	9/7 Brix
Somerset Seedless	4	Red	18.50	20.00	harv
Canadice	5	Red	18.00	19.20	
Concord Seedless *	4	Blue	14.00	16.80	17.00
Vanessa *	5	Red	16.50	17.50	
Trollhaugen *	Hardy to -30F	Blue	18.50	19.30	
Einset *	5	Red	17.50	19.60	
Venus *	5	Blue	16.50	17.90	
Interlaken	6	White	15.90	19.10	
Lakemont	6	White	16.80	19.50	
Mars *	5	Blue	14.50	17.10	18.50
Marquis	5	White	15.30	18.20	
Himrod	5	White	18.50	19.20	
Reliance	5	Red	19.10	20.50	0.00

Date of Fruit Wght	453 g/lb	8/15	8/21	9/7	9/15	8/20	Data	Data	Data
Cultivar Name	Color	Hardiness Zone	Fruit Weight g/Cluster	Fruit Weight g/Cluster	Fruit Weight g/Cluster	Fruit Wgh/1 berry	Cluster Wgt g/cluster	Fruit Wgh g/1 berry	Tons/Acre
Canadice	Red	5		125		1.8	187	1.6	
Concord Seedless	Blue	4		182	156	1.9	121	2.6	
Einset	Red	5		165		2.8	154	2.3	4.5
Himrod	White	5		195		1.8	172	2.1	4.2
Interlaken	White	6		220		1.9	245	1.5	
Lakemont	White	6		165		1.8	220	1.7	
Marquis	White	5		165		2.9	245	3.5	10.5
Mars	Blue	5		152	140	2.6	193	2.6	6.7
Reliance	Red	5		160		2.8	280	2.3	6.5
Somerset Seedless	Red	4	115			1.4	149	1.8	
Trollhaugen	Blue	Hardy to -30F	115			1.7	225	1.5	
Vanessa	Red	5		105		1.4	116	1.2	6.0
Venus	Blue	5		221		3.2	250	2.9	8.0
Expected weights and total acreage from breeders results									
Fruit Ripe Date									

Sam

2010 Seedless Table Grapes – Urban Horticulture Day

Opinions from Taste Testing

Rating: 1 - 5 (5 is the highest rating)

Evaluations	
Tst - Taste	
Tex - Texture	
Col - Color	

Canadice	Einset			Mars			Reliance			Somerset			Trollhaugen			Venus			Himrod			Marquis			Saturn				
	Tst	Col	Col	Tst	Tex	Col	Tst	Tex	Col	Tst	Tex	Col	Tst	Tex	Col	Tst	Tex	Col	Tst	Tex	Col	Tst	Tex	Col	Tst	Tex	Col		
3	3	3	3	2	2	3	3	5	3	4	2	0	2	2	2	2	4	3	4	5	5	4							
5	3	3	5	4	5	3	4	5	5	5	5	5	4	4	4	4	5	5	4	5									
3	4	5	4	3	5	2	1	5	3	3	4	4	5	3	3	5	3	3	5	5									
3	4	4	4	4	3	2	3	3	4	3	3	3	3	4	4	4	4	4	4										
3.38	3.45	3.67	3.98	3.70	3.77	3.21	3.15	4.41	4.15	3.86	4.22	3.92	3.62	4.04	3.30	3.30	4.30	3.32	3.45	4.31	3.58	3.50	3.25	2.78	3.82	1.63	2.09	3.45	
	3.50				3.83			3.59		4.08			3.89		3.64		3.68					3.40			3.23				2.32

Average of over 117 tasters - scroll up to see all of the numbers
 Interlaken, Lakemont, Glenora, Concord Seedless, Vanessa - did not have enough fruit, or fruit was not ripe for taste test