WASHINGTON STATE UNIVERSITY

Summary of Results:

Wine Grape Variety Trial

for Maritime Western Washington

2000-2008

Wine Grape Cultivar Trials 2000-2008 in the Cool Maritime Climate of Western WA

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Wines produced from grapes grown in cool climate regions have generally low alcohol content, low viscosity, and high fruit aromas and flavor (Casteel, 1992; Jackson and Schuster, 1977; Zoecklein, 1998). Certain varietals from Germany, Austria Russia, Hungary, and Armenia, as well as some common French varieties such as Pinot Noir and Pinot Gris can produce excellent fruity wines in western Washington. Selection of the right clone is important and knowing the heat units of your site will greatly aid in the selection of which varieties to grow. The cool maritime region of western Washington is on the very low end of the spectrum with respect to the number of growing degree days (GDD) needed for ripening the more common wine grape cultivars. Although the Puget Sound region has a long growing season in terms of frost free days, mesoclimates within the area range from below 1200 GDD to 2200 GDD. The Washington State University Mount Vernon Northwestern Washington Research and Extension Center (WSU Mount Vernon NWREC) research site is located at 12 feet above sea level in the Skagit Valley floodplain, 3 miles from the Puget Sound. Since 2002, annual GDD averaged 1693; in 2003 there was a spike in GDD of 1965. Above average GDD were recorded for 2004 and 2005 also, but for 2006 - 2008 the GDD were below average and GDD for the last 2 years were at or slightly below 1500 GDD. This represents one of the coolest mesoclimates in the region (Table 1).

A previous study of wine grape cultivars was conducted at WSU Mount Vernon NWREC from 1975-1985. This study provided essential information on cultivar selection for commercial wine grape producers in western Washington and identified a few, mainly white, wine cultivars (Moulton, 1997 revised). The Washington State University Extension Publication "Growing Grapes for Wine and Table in the Puget Sound Region" EB0775 summarizes the findings from this study.

In 1999 local growers requested that a new cultivar trial be started to identify more red cultivars that produced good wine. Growers needed cultivars that matured at the cooler end of the GDD spectrum, with good profit potential and wine characters (Agria, Zweigelt, Pinot Noir Precoce, Muscat of Norway) This would broaden the range and increase sales potential for the local wineries. A major limiting factor for judging fruit maturity in the region is titratable acid (TA). Under warm growing conditions, fruit is considered mature when the range of TA is 0.7-0.9 for whites and 0.6-0.8 for reds; whereas, in a cool climate, TA readings of 1.0 and below are considered acceptable. The following is a report summarizing the work done from 2000-2008 to test wine grape cultivars in northwest Washington.

In 2000 two wine grape studies were begun at the WSU Mount Vernon NWREC. The first study was a cultivar trial to evaluate 68 wine cultivars. Entries included in this study were recently introduced cultivars, selections, and clones predominantly from cool climate areas (Casteel, 1992; Howell et al., 1999; Jackson and Schuster, 1997; Kerridge and Antcliff, 1999; Kiyomoto, 1994; Reisch et al., 1993; Smart and Robinson, 2000). Also included in this study was previously unavailable material from areas of eastern Europe with similar climate conditions (Avery, 1999; Goodman et al., 1999; Howell et al., 2000). Eight cultivars, Auxerrois, Burmunk, Golubok, Iskorka, Kerner, Muscat of Norway, Pinot Noir Precoce, and St. Laurent (all grafted on Couderc 3309 and/or Millardet et de Grasset 101-14) were

planted in spaces that had come open from early discards; harvest data was compared to previously-established self rooted plants. A smaller trial that included a subset of 38 of these cultivars was also planted at a farm in Concrete, WA so that selected cultivars could be evaluated in a warmer mesoclimate. In 2002 this trial was moved to another location at Everson, Washington with similar GDD levels.

The second study was initiated to evaluate cultivar Pinot Noir 2A grafted on 7 rootstocks and compare the performance of each grafted rootstock to self-rooted plants. Rootstocks were selected not only for pest resistance but also for potential to advance fruit maturity and/or control vine vigor (Catlin, 1991; Candolfi-Vasconceles, 1997; Galet, 1999; May, 1994; Winkler et al., 1974). Two rootstocks that propagate easily, Couderc 3309 and Millardet de Grasset 101-14, were shown to have a significant effect in advancing fruit maturity in this study (Table 2); these results were similar to those of other studies (Shaffer *et al*., 2004).

Based on the results from the rootstock study, 20 promising cultivars were grafted on either Couderc 3309 and/or Millardet et de Grasset 101-14. Nine of those cultivars were used in an observational study (Study 3) to see how these rootstocks impacted maturity on these promising cultivars when compared to a self rooted plant. Cultivars tested were Garanoir, Madeleine Angevine, Optima, Ortega, Pinot Gris (Ruhlander clone), Regent, Schonburger, Siegerrebe and Sylvaner (Table 3). In this same field block an observational Study 4 compared 3 cultivars (Agria, Zweigelt, and Dornfelder) in a spacing trial.

MATERIALS AND METHODS

Study 1 consisted of two parts: a replicated cultivar trial (A) and an observational screening trial (B). The experimental design of Part A included 28 entries in a randomized complete block of 3 replications, with 5 plants per replication. This provided enough fruit to make 5 gallons of wine for most cultivars when the fruit of all 3 replications was combined. All plants were self rooted, cane pruned and trained to wires in a vertical shoot position (VSP) system. Row spacing was 10 feet between rows with 6 feet between plants. The on-farm study in Concrete WA included 38 cultivars and had the same planting plan. This study was moved to Everson in 2002. Part B included 40 cultivars, clones or selections planted in 3-plant plots, which allowed a rapid observational evaluation of the cultivars. As cultivars from this trial showed promise they were multiplied, and added to the main (Part A) trial. Those that did not perform well were removed.

Study 2 consisted of Pinot Noir 2A (Wadenswil clone) grafted on 7 grape rootstocks. Rootstocks were Milllardet et de Grasset 101-14 and 420A, Couderc 3309, Kober 5BB, Malegue 44-53, Riparia Gloire and Teleki 5C. Plants were compared to self rooted plants. Plots each contained 5 plants and were replicated 5 times. Row spacing was 10 feet between rows with 6 feet between plants (Table 2).

Study 3 included 9 cultivars, each grafted on Couderc 3309 and/or Millardet et de Grasset 101-14. The study included 5 plants per plot, planted in rows 8 feet apart with 6 feet between plants. Cultivars were replicated two times on rootstock Courdec 3309 while Optima was replicated 3 times; Madeleine Angevine and Sylvaner were not replicated on Couderc 3309, but were were replicated two times on rootstock Millardet et de Grasset 101-14; all other cultivars except Optima were not replicated (Table 3).

In Study 4 the cultivars Agria, Dornfelder, Zweigelt, and Pinot Noir cl. 777 were grafted on one or both rootstocks Couderc 3309 and Millardet et de Grasset 101-14. Agria and Dornfelder were replicated twice on 3309 and once on 101-14; Zweigelt was replicated twice on 101-14 and once on 3309; and

Pinot 777 was replicated three times on 3309. Each rootstock replicate plot had 24 plants total, with 6 plants at each spacing of 4 feet, 6 feet, 8 feet and 10 feet.

Comparisons were made between grafted plants from Study 3 and 4 and self rooted plants from Study 1. The results and comparisons of these are recorded in Tables 4-12, where grafted plants from Study 3 and 4 are footnoted. Auxerrois, Burmunk, Golubok, Iskorka, Kerner, Muscat of Norway, Pinot Noir Precoce, and St. Laurent planted in the open spaces in Study 1 were compared for maturity with the earlier planted self rooted plants in Study 1.

Data collection in all studies consisted of sampling fruit after veraison and more often (weekly) as cultivars were within 2 weeks of estimated harvest. In the laboratory we measured juice for brix, pH and TA. Berry sampling was done by taking 10 berries from each plant for a sample of 50 berries from each replicated 5-plant plot in 2002-2005; a sample of 30 berries per plot was used in 2006-2008. In Study 1 part B (3 plants/cultivar), a sample of 30 berries total was collected from the 3 plants in each plot At harvest, juice samples were collected for analysis as the grapes were crushed. Because of the varying funding levels during this study period, the scope of data collection was adjusted each year with regard to the number of evaluations that could be performed in that year. In selected years plot yield was weighed and average pounds per plant were calculated. Yield per acre was calculated by multiplying by 907 (plant number per acre using 8 foot x 6 foot spacing).

Brix was measured with a hand-held refractometer and pH with a Beckman pH meter. Level of TA was determined by titrating a 5ml sample of juice in 25 mls of distilled water. A solution of 0.1N NaOH in a burette was slowly metered to the juice sample until the pH of the juice sample reached 8.2. The amount of NaOH solution was recorded and multiplied by .15 to produce the value for TA in mg per 100 mls. Annual GDD were measured using an Avatel RH 52 data logger unit located in the trial plot to record temperatures from April 1 to October 31 each year.

RESULTS AND DISCUSSION

In 2003 the weather provided one of the warmest seasons on record and excellent conditions for evaluating the full range of cultivars in the studies, with 1965 GDD (to October 31, 2003). However, several of the cultivars had not yet come into fruiting. From 2003 to 2008 there was a steady decline each year in GDD, allowing most cultivars to be tested in a wider climatic range (Table 1). In 2007 and 2008, conditions were the most marginal for the cultivars, and those that performed better at the coolest end of the GDD spectrum were identified over the span of these studies. A specific variety with TA levels at 1.0 g/liter or less was considered acceptable for wine making (Tables 4-12). In several cases cultivars grafted on certain rootstocks seemed to show advanced ripening compared with self rooted vines and reached acceptable TA levels at a lower GDD level (Tables 4-12). However, this was not the case with every variety. The difference was most apparent for the varieties that were marginal for ripening in that GDD window.

Another interesting observation also occurred between 2007 and 2008. Although 2008 had higher GDD (1523) than 2007 (1499), ripening was at least 2 weeks earlier in 2007 and bloom was also earlier. For example, for Pinot Noir bloom was July 10, 2007 and July 25, 2008. The spring of 2008 was much cooler than 2007, delaying bloom 2 weeks, but the fall of 2008 was warmer than 2007, allowing cumulative GDD for 2008 to catch up and exceed cumulative GDD for 2007. However, several varieties that ripened in 2007 did not reach acceptable levels of TA in 2008. This suggests that bloom date is a good indicator of when and if a variety will ripen, and early heat will advance that bloom date. In

addition, these 2 years helped identify cultivars that may be acceptable to plant in mesoclimates that drop below 1500 GDD (Table 3).

The following is a discussion of which cultivars have the best chance for success at a specific site, based on GDD. From the information collected in our studies, we have formed **GUIDELINES** to suggest which varietal selections may work best for a specific growing degree range. Wine quality is also a factor and descriptions of the wines are included whenever possible.

Tables 4-12 provide a summary of all the cultivars included in the various studies. Each cultivar is also placed in a specific table that suggests the minimum GDD needed for that cultivar. Some cultivars were tracked for a shorter period due to budget constraints, or they may have been added later or discarded earlier during the study. Discarded cultivars and selections are discussed under "Miscellaneous Cultivars." Yield data may be represented by only one year of data in some cases. **On a site at the cooler end of the GDD spectrum, the cultivars that will work are very limited.** In the warmer areas, more cultivars are available, as they also include the cultivars that ripen in cooler ranges. In addition, our data indicated several of the cultivars matured earlier when grafted on a rootstock (Tables 4-12). In particular it would benefit those growing grapes in the most marginal sites to plant grafted plants. Western Washington has a fairly mild climate that normally stays well above 0-10^{o}F during the winter, so cold damage is rarely an issue. Other regions may need to evaluate cold tolerance of any of these cool season cultivars. In addition, this list is not all-inclusive and should only be used as a **guideline**.

VINEYARD LOCATIONS AT 1600 GDD AND BELOW

White wine cultivars

Among the white wine cultivars tested, a few performed relatively well under the coolest of conditions (below 1500 GDD), and these are summarized in Table 4. Siegerrebe performed well whether self rooted or grafted on a rootstock, and no noticeable differences in TA values were observed. Burmunk, both on rootstock and self rooted, also performed well. However, when GDD approached 1500, grafted plants performed better, registering higher brix and pH, and lower TA. Madeleine Angevine performed well whether self rooted or grafted on a rootstock, even during the coolest years of this study. Ortega performed well in this GDD range, but when grafted on a rootstock had lower TA readings as GDD approached 1500. Auxerrois and Schoenberger, whether self rooted or grafted on rootstock, performed at an acceptable level at GDD closer to 1600 and above. (Table 5).

Red wine cultivars

Among the red cultivars tested, Pinot Noir Precoce performed well on rootstock and self rooted, even when heat levels were at 1500 GDD or slightly lower. However, when grown on either 101-14 or 3309, harvest was earlier (Table 6), suggesting that grafting to one of these rootstocks might allow the variety to be grown below 1500 GDD. Zweigelt, Muscat of Norway, and Agria all performed acceptably when GDD were approximately 1600 or higher. However, as the GDD approached closer to 1500, each of these cultivars performed better when they were grafted on either 101-14 or 3309, whereas the self rooted entries had unacceptable values at this lower GDD range. Garanoir also performed well in this window; however, not enough data were available on the rootstock for comparison (Table 6).

At a vineyard site where GDD often hovers below 1600 and frequently falls below 1500 GDD, best performance in the cooler years has been by: Siegerrebe, Madeleine Angevine, Burmunk, and/or Pinot Noir Precoce; grafted onto either 3309 or 101-14 rootstock (Table 4). If a site usually stays closer to 1600 GDD and higher, also select cultivars from Tables 4, 5 and 6 which include Auxerrois, Ortega or

Schoenberger on rootstock (3309 or 101-14). Red wine cultivars in this range are Pinot Noir Precoce, Zweigelt, Muscat of Norway, Garanoir on rootstock, Agria on rootstock.

Variety Descriptions

WHITE

Siegerrebe does well and ripens below 1500 GDD. The wine it produces has a distinct litchi fruit aroma with some spice and citrus (grapefruit), and several characters resembling Gewürztraminer. This variety loses its acids quite rapidly as it ripens even when self rooted. The study showed that the two rootstocks tested had little impact with regard to lowering TA earlier. Yield numbers suggest that yields of 2 tons per acre are easily attainable; 4-5 tons will require more work, but have been achieved by local growers. Grapes are tender skinned and susceptible to yellow jacket damage followed by rot.

Burmunk is an Armenian grape variety that produces a very early aromatic grape. The aromas display fresh sliced peaches, honey, and some litchi fruit characters, reminiscent of a Riesling. The two rootstocks promoted earlier ripening, with lower TA and higher brix. Therefore, it is advisable to use one of the rootstocks to promote earlier ripening when growing it at around 1500 GDD or lower. Yield is in the range of Siegerrebe at 2-4 tons per acre. Grapes are tender skinned and susceptible to yellow jacket damage followed by rot.

Madeleine Angevine does well below 1600 GDD; limited data comparing self rooted plants to those grown on rootstock indicated little or no significant effect on the lowering of TA levels as temperatures approached 1500 GDD. The wine produced has citrus aromas along with apricot or peach and honey. Yield is in the 3.5 to 7 ton range per acre on self rooted plants; no yield data were available for grafted plants. Grapes are tender skinned and susceptible to yellow jacket damage followed by rot.

Ortega self rooted plants appear to do well at 1600 GDD, similar to Madeleine Angevine. As GDD approach 1500 or lower, our studies suggest that grafting on rootstock enhances the ripening further. The wine produces citrus and litchi fruit aromas. The variety should have a yield potential of approximately 3.5 tons per acre. The fruit is thicker skinned and appears to be somewhat resistant to yellow jacket damage and bunch rot.

Auxerrois has many characters similar to Chardonnay. It performs better at GDD levels closer to 1600 or higher. When temperature drops so that GDD are near 1500 it will be difficult to get proper maturity; brix levels were low and sugar would need to be added when making wine. If the GDD are closer to 1500, particularly with a cool spring, a better option for this variety may be a sparkling wine. The yield is moderate but can reach 3.5 ton per acre.

Schoenberger has very similar wine characteristics to Siegerrebe. The grape clusters are uniform. If attempting to grow this variety below 1600 GDD, it is highly recommended to graft it on a rootstock promoting earlier ripening. If the yearly average GDD is nearer 1500, Siegerrebe would be a better choice. Tonnage has varied but reached above 4 tons per acre in 2003.

RED

Pinot Noir Precoce is a Pinot Noir clone that looks quite promising for the coolest sites. It ripens more than two weeks ahead of any other Pinot Noir clone we have tested. In Germany it is known as ‘Fruheburgunder’ and is grown at the coolest sites. Yield is low, 1.5 to 2 tons an acre. The wine produced is typical Pinot Noir, and the levels of acid and brix are still quite acceptable when harvested below 1500 GDD at Mount Vernon. The two rootstocks also show evidence of advancing ripening on

this variety and we were able to harvest them earlier. The wines exhibit cherry and strawberry aromas particularly in the coolest years. As the GDD increase, raisins form, and can add more raspberry, blackberry, plum and jam aromas to the wine. When the must is cold soaked, brix levels increase, often to above 20 (the sugars are pulled out of the raisins) even in the coolest year. At sites registering GDD below 1500, this variety would be worthy of trial if grafted on a rootstock.

Muscat of Norway self rooted at the Mount Vernon site reached maturity at about 1600 GDD. However, from our studies, as the GDD lingered near 1500 GDD, plants grafted on rootstock recorded lower TA levels compared to the self rooted plants. Also, at these cooler temperatures this variety is slow to accumulate brix above 18. The wine made from Muscat of Norway had a dominant blackberry pie aroma and has great potential as a dessert wine if residual sugar is left after bottling.

Zweigelt has clusters that resemble large Pinot Noir clusters. At around 1600 GDD this variety will reach values for TA below 1g/liter, attain brix close to 20, and make a good wine. When grown in an area where temperatures hover around 1500 GDD, it becomes more difficult to harvest useable grapes. Grafting to one of the trial rootstocks would probably enhance ripeness enough to attain a harvest, but caution should be used if growing this variety much below 1600 GDD. Yield potential is high, but cluster thinning may be needed at cooler sites. In 2003, yield was close to 8 tons per acre; more usual cropping is in the 4 to 6 ton range.

Agria is a *teinturier* (red juice) variety and does well at 1600 GDD; it was noted that raisins formed on the clusters at WSU Mount Vernon when grown at this temperature. At 1500 GDD the self rooted plants did not produce acceptable juice to ferment, but the Agria grown on rootstock was acceptable. However, at this temperature spectrum (1500 GDD), Agria grown on rootstock had low brix, requiring sugar to be added before fermentation, but levels of TA were acceptable, and it made a good wine. This grape offers a choice of winemaking styles. The skin of Agria grapes is quite bitter, and if fermented on the skins the wine will have significantly more bitterness. At WSU Mount Vernon, the crushed grapes were cold soaked for about 5 days, and the pressed juice was dark red with a boysenberry flavor and aroma. The wine was also prepared similar to a white, fermented off the skins, giving it tropical, berry and confectionary aromas. Nice clusters and yields were attained in the 4 to 5 ton range.

Garanoir produces good yield with thick-skinned berries and resistance to botrytis. Although this variety doesn't attain brix much above 18 when grown below 1600 GDD, TA values do drop rapidly as it ripens, making it a variety worthy of trial. Data were not available to give a good wine description with regard to aromas, and it is assumed that at lower GDD sugar will most likely need to be added to the wine. At 1500 GDD it may benefit from being grown on a rootstock, but data were not extensive enough to verify this. Tonnage was attained as high as 8 tons/acre but 3-5 tons may be a more normal range.

VINEYARD LOCATIONS AT 1700 GDD AND BELOW

If you have a site that hovers above 1600 but usually less that 1700 GDD, in addition to the cultivars listed above, Sylvaner, Pinot Gris (early strains), and Iskorka performed well in this GDD range. Iskorka did better when grafted on a rootstock (3309 or 101-14). Optima was marginal at this range unless grafted on a rootstock and even then it would be best to be planted at a site that annually obtains GDD levels closer to 1700 GDD and above (Table 7). For the reds Regent, Dornfelder, Pinot 777 and Pinot 115 on 101-14 performed well at this range (Table 8).

Additional variety descriptions:

WHITE

Sylvaner does not record high brix in this range but generally reaches acceptable levels of acids. It has uniform clusters with a fair to good yield. The wines made from it at Mt Vernon have not been highly aromatic.

Pinot Gris, when grown above 1600 GDD, shows promise to ripen and make a good wine, especially the early strains such as Ruhlander. Wines are very aromatic with floral aromas. Since it is a mutation of Pinot Noir, rootstocks should also enhance the ripeness, although we do not have data to confirm.

Iskorka is a Russian variety whose name means "Sparkle;" it makes a highly aromatic wine with citrus and very flowery aromas. Self rooted plants reach only marginal levels of acid at this GDD range. Grafting on selected rootstocks appears to help lower the TA level, but not enough information is available to confirm this. Its highly aromatic characters indicate that it not only would be a good stand alone variety but might benefit from being blended with Sylvaner to lower acids and enhance aromas.

Optima has characteristics reminiscent of Sauvignon Blanc. At this GDD range self rooted plants are marginal with regard to maturity. However, our limited data indicate that grafted plants have shown reduced TA earlier, and produced a good grape product within this GDD window.

Ortega, Schoenberger, and Auxerrois have been discussed previously; self rooted plants will perform better when grown at this GDD range but grafted plants would still be preferable.

RED

Regent at Mount Vernon when self rooted and grown in the 1700 GDD range, produced grapes with both good brix and acceptable TA levels. This variety would probably benefit from being grafted onto a rootstock; however, no supporting data are available. The wine made from this grape can be on the more viscous side for a western WA red. The grape plant is resistant to powdery mildew and has open clusters that aid in bunch rot control, which indicates good potential for organic production.

Pinot Noir 115 and 777 grown on rootstock and above 1600 GDD have made good wines, with values for brix and TA well within the acceptable range. At this lower heat unit range most of the flavors will be cherry, strawberry and raspberry. Other strains might also work as well. Approaching 1700 GDD, the quality of these strains may change positively as well as some flavor profiles. Tonnage will commonly be in the 2-3 ton range.

Dornfelder loses it acids (below 1g TA) quickly as it approaches ripeness. Quite often, however, brix remains low. Clusters are very large and impressive and yields have been high, reaching 12 ton/acre. In addition, clusters are loose and little or no bunch rot was observed. This variety can ripen successfully below 1600 GDD, but will produce a better product above 1600 GDD. It is uncertain how its earliness would be affected if grafted to a rootstock. Although wines have been made from it in Germany, experiences here, thus far, have not been highly favorable.

Agria and Garanoir, as discussed previously, as self rooted plants would likely reach acceptable acid and brix ratings, but plants grafted on a rootstock would be preferable.

VINEYARD LOCATIONS AT 1800 GDD AND BELOW

The white cultivars observed include Iskorka, Optima, and Muller Thurgau. The red cultivars include Rondo, Pinot 2A on rootstock, and Pinot Noir Pommard on rootstock. Rondo self rooted performed well at this range. Initial data taken in 2008 indicated that grafting on selected rootstocks would lower the required GDD. From our initial data, St Laurent on rootstock looked promising at this GDD window (Table 9).

Additional variety descriptions:

WHITE

Muller Thurgau is an old standard variety in the area, and fruit on self rooted plants grown at very cool sites (under 1600 GDD) remain too acidic and don't ripen fully. It has not been evaluated on a rootstock but may perform better closer to 1700 GDD if grafted. Yield was recorded in the 3 ton range.

Iskorka and Optima both should perform better self rooted at this GDD range, but grafting on a rootstock should enhance maturity (see detailed description above).

RED

Rondo is a *vinifera* cross from Germany grown in England and Denmark, where it has been documented to ripen at GDD ranges lower than 1700. Results at Mount Vernon, however, showed that 1700 to 1800 GDD seems to be the range to reach acceptable TA levels for self rooted plants. The grapes develop high color, and we consider that TA levels will probably be significantly lower when this variety is grafted on a rootstock, which will then allow it to be grown at a cooler GDD level, although this has not been confirmed in trials. Yield was attained in the 3 ton range

St Laurent has similar characteristics to Pinot Noir, however, TA levels can remain quite high. Grafted on an appropriate rootstock and grown at temperatures around 1700 GDD, acceptable values should be reached to ripen grapes and make a good wine. In our plots, observed set was significantly higher when St Laurent was grafted on a rootstock compared with self rooted plants (data not shown). In addition, self rooted plants appear to be quite susceptible to early bunch stem necrosis (EBSN, Jackson and Coombe, 1995). In full production, yields could reach the 3-4 ton range.

Pinot Noir 2A, Pommard, and other clones should ripen to acceptable TA levels at this range, particularly those grafted on an appropriate rootstock.

VINEYARD LOCATIONS AT 1900 GDD AND BELOW

No additional white wine cultivars that are not listed above fall into this category. Red wine cultivars St. Laurent (self rooted), Golubok, and Dunkelfelder performed well in this range (Table 10).

Additional variety descriptions:

RED

Golubok is a Russian variety whose name means "my little pigeon" (a term of endearment). This variety tends to have high acids unless grown at higher GDD. Grafting on an appropriate rootstock should lower TA levels, but this is not confirmed. This is a *teinturier* (red juice) that makes a more viscous tannic wine. Even though brix can be high at cooler GDD levels, the wines have produced bell pepper and vegetable aromas at the lower GDD windows, as well as recording high TA values; this suggests that the grape has not reached proper maturity. Yield was attained in the 3 ton range.

Dunkelfelder is another *teinturier* variety that tends to have higher sugars and also higher acids. It has the opposite characteristics of Dornfelder (Dornfelder has lower acids and lower sugars) and perhaps was used as a blender. The single varietal wines made at Mount Vernon with this variety have not been impressive. Yield was attained in the 4 ton range

St Laurent is previously described above; our data indicate that a higher GDD range seems to be needed for self rooted plants. In addition, from limited observations, early bunch stem necrosis (EBSN) was very prevalent on self rooted plants, whereas little EBSN was observed on grafted plants thus far at Mount Vernon.

VINEYARD LOCATIONS AT 2000 GDD AND BELOW

The information on cultivars in this category was obtained from our warmer Everson plot. In addition to the white wine cultivars previously listed, Red Traminer, Gruner Vetliner grafted on 101-14, and Sauvignon Blanc 01 grafted on 101-14 all reached good levels of maturity. Red wine cultivars Gamaret (self rooted) and Dolcetto grafted on 3309 reached maturity; other successful red varieties were Pinot Noir 2A and Pinot Noir Pommard (Table 11).

Additional variety descriptions:

WHITE

Gruner Vetliner is the number one white varietal in Austria. In our Everson plot the values for brix and TA from grafted plants indicate promise of a premium wine.

Sauvignon Blanc values for brix and TA support this being a promising variety for making a premium wine when grafted on rootstock.

Red Traminer has yields that are rather low; however, brix and TA values indicate promise for making a premium wine.

RED

Dolcetto produces very large clusters; values for brix and TA on grafted plants are favorable to produce a good wine in this GDD range. High yield potential was observed, but specific yield data was not recorded.

Gamaret is a Swiss variety that performed well at this GDD range when self rooted. It may ripen earlier if grafted on a suitable rootstock, but this is not confirmed by trial data. Yield was attained in the 5 ton range.

Pinot clones should perform at this range when self rooted.

VINEYARD LOCATIONS AT 2100 GDD AND BELOW

Chardonnay 76 grafted on 3309 should perform well in this range, going by the 2006 data. At ranges below 2000 GDD, sparkling wines may be a viable option (Table 12). Kerner on rootstock should make a very good Riesling type wine. No new reds were identified in this range.

Additional variety descriptions:

WHITE

Chardonnay 76 should obtain acceptable TA levels for making a good wine in this GDD range when grafted on rootstock.

Kerner was developed in Germany as an early Reisling; self rooted plants should ripen sufficiently at this range and may attain ripeness at an earlier GDD level if on rootstock, but this is not confirmed. Kernling is a mutation of Kerner grown in the UK, though not tested here, which reportedly ripens at least 2 weeks earlier and thus should ripen at lower GDD.

A final note for consideration is that the number of GDD in a season is not the only factor that affects ripening. With regard to temperature influence, the time of year when heat levels are high has a significant impact on ripening time and harvest characteristics. For example, at Mount Vernon in 2007 the GDD were 1499 and in 2008 GDD were 1523. Both years were quite challenging with respect to successful ripening. However, in 2007 fruit ripened comparatively earlier, despite registering lower heat levels overall. Spring temperatures in 2008 were much cooler than the equivalent period in 2007, and bloom was 2 weeks later in 2008 compared with 2007. Although some additional heat late in the fall of 2008 pushed the final GDD level above that recorded in 2007, the fruit was further behind in maturity in 2008. Recorded values for harvest juice analysis of brix and TA showed this clearly. This issue can become critical for a very marginal site. In addition, consider other factors affecting maturity. For example, soil fertility should be sufficient and balanced. Best cultural practices should be adopted with respect to canopy and crop load management, pest control, and water management. Finally, in very cool years it may be beneficial to have an option of making a sparkling wine when the acids remain too high.

MISCELLANEOUS CULTIVARS FOR THE MARITIME CLIMATE OF WESTERN WASHINGTON

Some cultivars and selections were eliminated early in the study when they showed lack of promise **(**Table 13**)**. A more comprehensive study might reveal characteristics worth further evaluation in some of these discarded cultivars. Such cultivars as Perle of Csaba, Reichensteiner, Nero and Saperavi ripened at the lower GDD ranges, but data on wine quality was too limited, and where the initial wine quality was below an acceptable standard, the variety was discarded. Cultivars that showed no promise above 1800 GDD at the Mt Vernon site in the early part of the study were eliminated. Some of them were added to the warmer Everson plot but this warmer off-station plot had space limitations so not all cultivars could be added to the field study.

At the Everson study site, Goesji Zumalos had good values for brix and pH in the 1900 GDD range but the trial concluded before it could be fully evaluated. The cultivars Phoenix, Pitos, Plai, Rieslander, Riesling Muscat, Siewiernyl, and Tinta Mudera were entered in the last two years of the trial, and evaluations on them were not completed. Other cultivars, Baco Noir, Gamay Freaux, Gamay Rouge, Lagrein, and Aligote as self rooted plants had adequate numbers above 2000 GDD, but even at the warmer Everson site they did not consistently reach these levels during the study. The scope of the study did not permit increasing plant numbers and replications of these cultivars at this site.

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Table 1. Two western Washington mesoclimates: comparision of GDD at Mount Vernon (MV) in Skagit County and Everson in Whatcom County, 2003-2008 (recorded by on-site Avatel data loggers).

Location	2002	2003	2004	2005	2006	2007	2008
MV (F) Celsius	1527* 830	1965 1073	1817 992	1727 942	1600 871	1499 815	1523 828
Everson (F) Celsius	---	2147 1175	2075 1135	1897 1036	1948 1064	1684 918	1587 863

*To October 8th Mt Vernon only; no data was taken in Everson in 2002

Table 2. Comparisons of titratable acids (TA) in mg/100ml of juice of Pinot Noir 2A when grown on rootstocks and self rooted from 2002 to 2007 at WSU Mount Vernon NWREC.

Rootstock	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Self rooted	1.53 a	1.32 a	1.26 a	1.42 a	1.67 a	1.51 a
5BB	1.23 b	1.25 a				
44-53	1.22 b	1.10 ab				
5C	1.22 b	1.25 a				
Riparia Gloire	1.21 b	1.20 ab				
3309	1.08 bc	1.01 b	0.90 b	1.18 b	1.20 b	1.28 b
420A	1.07 bc	1.01 b	0.92 b	0.94 c	1.29 b	1.22 b
101-14	1.00 c	0 .99 b	0.94 b	1.10 bc	1.16 b	1.22 b

Table 3. Advanced cultivar trial (Study 3) on rootstocks Couderc 3309 and Millardet et de Grasset 101-14 at WSU Mount Vernon NWREC planted in 2005 at WSU Mount Vernon NWREC.

Cultivar	**3309**	**101-14**	**Cultivar**	**3309**	**101-14**
Garanoir	2[1]	1[1]	Regent	2[1]	1[1]
Madeleine Angevine	1	2	Schonburger	2	1
Optima	3	0	Siegerrebe	2	1
Ortega	2	1	Sylvaner	1	2
Pinot Gris, Ruhlander	2	1			

[1]number of replications

Table 4. White wine cultivars that performed well with respect to titratable acids (TA) in mg/100ml at 1500 or lower at WSU Mount Vernon NWREC.

Cultivar/Rootstock	**T. A. 2007**[1]	**T.A. 2008**[2]
Siegerrebe (W) / rootstock[3]	0.47	0.62
Siegerrebe (W) / self	0.48	0.65
Madeleine Angevine (W) / rootstock	0.83	0.94 / 0.92[4]
Madeleine Angevine (W) / self	0.81	0.99
Pinot Noir Precoce (R) / rootstock	0.66	0.99
Pinot Noir Precoce (R) / self	0.69	---[5]
Burmunk (W) / rootstock	0.77	0.89

[1] 1499 GDD recorded in 2007

[2] 1523 GDD recorded in 2008.

[3] Grafted plant from Study 3 used to compare with self rooted plants in Study 1.

[4] First reading is rootstock C3309, second reading is rootstock 101-14.
[5] Data not recorded.

Table 5. White wine cultivars maturing at 1600 GDD or lower at WSU Mount Vernon NWREC.

Year	2003	2004	2005	2006	2007	2008	Notes
GDD	**1965**	**1817**	**1727**	**1600**	**1499**	**1523**	
Auxerrois SR[1]							
Harvest Date		Oct. 4		Oct. 23	Oct.23	Oct 28	
Yield per Plant (lbs/plant)		3.15		-	8.4	-	
Brix		18.1		19	18	13.6	
Titratable Acid		0.69		0.69	0.8	1.29	
pH		2.94		2.96	3.03	2.85	
Auxerrois				101-14	combined rootstocks	C3309/ 101-14[4]	
Harvest Date				Sept 28	Oct.23	Oct 28	
Yield per Plant (lbs/plant)					9.2	-	
Brix				15.4	17.6	13.4 / 12.7	
Titratable Acid				1.02	0.83	1.47 / 1.27	
pH				2.85	3.02	2.86 / 2.93	
Burmunk SR							
Harvest Date	Oct 3	Sept 10	Sepe 22	Septe 27	October 2	October 22	2008-juices frozen
Yield per Plant (lbs/plant)	5.1	4.83	2.3	-		-	harvested 10/17/08
Brix	23.2	20.7	19.3	17	15.2	16.55	
Titratable Acid	0.98	0.83	0.73	0.83	1.02	1.07	
pH	3.15	3.21	3.19	2.98	3.0	2.885	
Burmunk				101-14	combined rootstocks	C3309/101-14	
Harvest Date				Sept 28	Sept 25	Oct 22	
Yield per Plant (lbs/plant)				-	6.9	-	
Brix				20.7	19.6	17.2 / 19.7	
Titratable Acid				0.77	0.77	0.86 /0.91	
pH				3.04	3.03	2.96 /2.99	
Madeline Angevine SR							
Harvest Date	Sept 15	Septe 21	Sept 30	Sept 28	Sept 25	Oct 22	
Yield per Plant (lbs/plant)		8.34	15.83		12.4	-	
Brix	15	19.4	20	17.6	18	17.1	
Titratable Acid	1.02	0.7	0.84	0.75	0.81	0.99	
pH	3.41	3.73	3.2	3.18	3.03	3.01	
Madeline Angevine[2]					combined rootstocks	C3309/101-14	
Harvest Date					Sept 25	Oct 22	
Yield per Plant (lbs/plant)					14.9	-	
Brix					17.2	17.2 / 18	
Titratable Acid					0.83	0.94 / .92	
pH					3.08	3.04 / 2.94	
Ortega SR							

Year	2003	2004	2005	2006	2007	2008	Notes
GDD	**1965**	**1817**	**1727**	**1600**	**1499**	**1523**	
Harvest Date		Sept 21	Sept 22	Sept 28	Oct 23	Oct 28	
Yield per Plant (lbs/plant)		5.54	7.33	-	3.2	-	
Brix		20.1	21	17.9	21.2	17.2	
Titratable Acid		0.7	0.89	0.99	0.87	1.01	
pH		3.76	3.2	3.05	3.02	3.06	
Ortega[2]					combined rootstocks	C3309/101-14	
Harvest Date					Oct 23	Oct 28	2008- some plants water
Yield per Plant (lbs/plant)					3.9	-	stressed
Brix					20.6	18.2 /18	
Titratable Acid					0.81	1.13 / 1.08	
pH					3.15	3.04 / 3.04	
Schoenberger SR							
Harvest Date	Oct 3	Oct 4	Sept 22	Sept 23	Sept 9	Oct 30	
Yield per Plant (lbs/plant)	10.25	1.82	3.01	-	-	-	
Brix	20.4	16.2	17.9	17.9	17.8	15.23	
Titratable Acid	0.74	0.75	1.13	0.77	0.82	1.26	
pH	3.77	2.97	3.06	2.9	3.04	3.18	
Schoenberger[2]					combined rootstocks	C3309/101-14	
Harvest Date					Oct 9	Oct 30	
Yield per Plant (lbs/plant)					-	-	
Brix					17.8	15 / 14.6	
Titratable Acid					0.6	1.19 / 1.23	
pH					3.13	3.27 / 3.22	
Siegerrebe SR							
Harvest Date	Sept 15		Sept 22	Sept 28	Sept 25	Oct 8	
Yield per Plant (lbs/plant)	-		5.32	-	4.2	-	
Brix	17.4		22.6	18	17.8	15.9	
Titratable Acid	0.45		0.54	0.45	0.48	0.65	
pH	3.73		3.62	3.46	3.54	3.18	
Siegerrebe [2]					C 3309	C3309/101-14	
Harvest Date					Sept 25	Oct 8	-
Yield per Plant (lbs/plant)					2.7	-	
Brix					18.8	16.2 /16.0	
Titratable Acid					0.47	0.59 / .65	
pH					3.48	3.33 / 3.36	

[1] SR=self rooted

[2] Readings from plants grafted on C3309 and 101-14 listed separately in order: C3309 / 101-14.

[3] Grafted plant from study 3 used to compare with self rooted plants in study 1

Table 6. Red wine cultivars that matured at 1600 GDD or lower at WSU Mount Vernon NWREC.

Year	2003	2004	2005	2006	2007	2008	Notes
GDD	**1965**	**1817**	**1727**	**1600**	**1499**	**1523**	
Agria[2] (SR[1])							
Harvest Date	Oct 5	Oct 4	Sept 29	Oct 11	Oct 25	Oct 28	
Yield per Plant (lbs/plant)	8.89	4.65	4.23	-	7.60	-	
Brix	20.4	19.2	20.0	18.5	19.0	15.8	
Titratable Acid	0.74	0.62	0.95	0.56	1.19	1.49	
pH	3.93	3.33	3.39	3.12	3.20	3.00	
Agria[3]					Combined Rootstock	C3309/101-14[4]	
Harvest Date					Oct 23	Oct 29	
Yield per Plant (lbs/plant)					10.3	-	
Brix					18.4	14.7 / 15.6	
Titratable Acid					0.66	1.03 / 1.17	
pH					3.63	3.70 / 3.69	
Garanoir (SR)							
Harvest Date	Oct 6	Oct 4	Oct 11	Oct 11		Nov 12	
Yield per Plant (lbs/plant)	18.51	7.10	5.71	-		-	
Brix	17.7	17.9	19.1	18.2		15.4	
Titratable Acid	0.96	0.75	0.63	0.53		1.11	
pH	3.70	3.04	3.65	3.09		3.43	
Garanoir[2]						C3309/ 101-14	
Harvest Date						Nov 12	
Yield per Plant (lbs/plant)						-	
Brix						16.2 / 14.6	
Titratable Acid						1.01 / 1.20	
pH						3.49 / 3.01	
Muscat of Norway (SR)							
Harvest Date	Sept 15	Oct 4	Sept 30	Oct 11	Oct 25	Oct 29	
Yield per Plant (lbs/plant)	-	1.99	-	-	17.80	-	2008- tested after cold soak
Brix	17.8	19.3	17.6	19.0	17.2	18.6	
Titratable Acid	0.89	0.74	0.71	0.72	1.02	1.29	
pH	3.32	3.06	3.24	3.14	3.11	3.37	
Muscat of Norway				101-14	Combined Rootstock	C3309/101-14	
Harvest Date				Sept 28	Oct 25	Oct 29	2008- tested after cold soak
Yield per Plant (lbs/plant)					4.3	-	
Brix				18.1	19.0	19.4 /19.8	
Titratable Acid				0.86	0.84	1.25 / 1.30	
pH				2.94	3.06	3.35 / 3.38	
Pinot Noir Precoce (SR)							
Harvest Date			Sept 29	Sept 28	Oct 23		
Yield per Plant			-	-	4.3		

Year	2003	2004	2005	2006	2007	2008	Notes
GDD	**1965**	**1817**	**1727**	**1600**	**1499**	**1523**	
(lbs/plant)							
Brix			21.3	18.9	20.8		
Titratable Acid			0.81	0.68	0.69		
pH			3.31	2.93	3.53		
Pinot Noir Precoce				C3309/101-14	C3309/101-14	Self & Rootstock combined	
Harvest Date				Sept 27	Oct 5	Oct 22	2007- After cold soak
Yield per Plant (lbs/plant)				-	3.6 / 2.8		
Brix				18.6 /19.2	20.6 / 20.6	20.0	
Titratable Acid				1.00 /0.93	0.6 0/ 0.66	0.99	
pH				3.13 /3.11	3.39 /3.39	3.18	
Zweigelt (SR)							
Harvest Date	Oct 18	Oct 4	Oct 11	Oct 23	Oct 11	Oct 30	
Yield per Plant (lbs/plant)	17.59	9.74	4.07	10.87		-	
Brix	18.4	19.5	21.1	18.7	18.0	14.9	
Titratable Acid	0.98	0.95	0.81	0.85	1.12	1.68	
pH	3.79	2.88	3.58	2.65	2.87	3.03	
Zwiegelt [3]					C3309	C3309/101-14	
Harvest Date					Oct 26	Oct 30	
Yield per Plant (lbs/plant)					24.1	-	
Brix					18.2	15.2 / 14.9	
Titratable Acid					0.83	1.40/ 1.29	
pH					3.02	3.10 / 3.15	

[1] SR=self rooted
[2] Grafted plant from study 3 used to compare with self rooted plants in study 1
[3] Grafted plant from study 4 used to compare with self rooted plants in study 1
[4] Readings from plants grafted on C3309 and 101-14 listed separately in order: C3309 / 101-14.

Table 7. White wine cultivars that matured at 1700 GDD or lower at WSU Mount Vernon NWREC.

Year	2003	2004	2005	2006	2007	2008	Notes
GDD	**1965**	**1817**	**1727**	**1600**	**1499**	**1523**	
Auxerrois (SR[1])							
Harvest Date		Oct 4		Oct. 23	Oct 23	Oct 28	
Yield per Plant (lbs/plant)		3.15		-	8.40	-	
Brix		18.1		19.0	18.0	13.6	
Titratable Acid		0.69		0.69	0.80	1.29	
pH		2.94		2.96	3.03	2.85	
Iskorka (SR)							
Harvest Date	Oct 3	Sept 24	Sept 22	Sept 28	Oct 23	Nov 12	
Yield per Plant (lbs/plant)	4.98	4.90	2.37	-	2.00	-	
Brix	20.2	21.5	20.8	17.8	20.8	20.4	
Titratable Acid	0.71	0.60	0.86	1.17	1.08	1.31	
pH	3.68	3.09	3.05	2.79	2.98	3.33	

Year	2003	2004	2005	2006	2007	2008	Notes
GDD	**1965**	**1817**	**1727**	**1600**	**1499**	**1523**	
Iskorka				101-14	Combined Rootstock	C3309/101-14[3]	
Harvest Date				Sept 28	Oct 23	Nov 12	
Yield per Plant (lbs/plant)				-	5.1	-	
Brix				17.0	20.6	19.8 / 21.0	
Titratable Acid				0.99	0.99	1.49 / 1.32	
pH				2.80	2.98	3.27 / 3.33	
Optima (SR)							
Harvest Date		Sept 24	Sept 30	Sept 28	Oct 23	Oct 30	
Yield per Plant (lbs/plant)		6.06	8.59	-	7.20	-	
Brix		17.8	18.3	15.4	19.6	17.4	
Titratable Acid		0.77	1.05	1.13	1.02	1.31	
pH		3.14	2.99	2.92	3.04	3.20	
Optima[2]					Combined Rootstock	C3309	
Harvest Date					Oct 23	Oct 30	
Yield per Plant (lbs/plant)					7.9	-	
Brix					20.2	15.8	
Titratable Acid					0.95	1.43	
pH					2.99	3.32	
Ortega (SR)							
Harvest Date		Sept 21	Sept 22	Sept 28	Oct 23	Oct 28	
Yield per Plant (lbs/plant)		5.54	7.33	-	3.20	-	
Brix		20.1	21.0	17.9	21.2	17.2	
Titratable Acid		0.70	0.89	0.99	0.87	1.01	
pH		3.76	3.20	3.05	3.02	3.06	
Pinot Gris [Ruhlander] (SR)							
Harvest D*ate*		Oct 4	Oct 11	Oct 23	Oct 23	Oct 30	
Yield per Plant (lbs/plant)		2.43	4.82	10.10	4.10	-	
Brix		18.8	20.2	18.8	20.2	19.0	
Titratable Acid		0.86	0.98	0.87	1.40	1.43	
pH		2.86	3.53	2.81	2.91	3.45	
Schoenberger (SR)							
Harvest Date	Oct 3	Oct 4	Sept 22	Oct 23	Oct 9	Oct 30	
Yield per Plant (lbs/plant)	10.25	1.82	3.01	-	-	-	
Brix	20.4	16.2	17.9	17.9	17.8	15.2	
Titratable Acid	0.74	0.75	1.13	0.77	0.82	1.26	
pH	3.77	2.97	3.06	2.90	3.04	3.18	
Sylvaner (SR)							
Harvest Date	Oct 13	Oct 4	Oct 11	Oct 23	Oct 23		
Yield per Plant (lbs/plant)	8.01	11.67	5.76	-	15.70		
Brix	16.8	15.5	16.9	15.8	16.6		
Titratable Acid	0.90	0.80	0.94	0.78	1.07		
pH	3.70	3.00	3.62	2.83	2.92		

[1] SR=self rooted

[2] Grafted plant from study 3 used to compare with self rooted plants in study 1
[3] Readings from plants grafted on C3309 and 101-14 listed separately in order: C3309 / 101-14.

Table 8. Red wine cultivars that matured at 1700 GDD or lower at WSU Mount Vernon NWREC.

Year	2003	2004	2005	2006	2007	2008	Notes
GDD	**1965**	**1817**	**1727**	**1600**	**1499**	**1523**	
Agria (SR)							
Harvest Date	Oct 5	Oct 4	Sept 29	Oct 11	Oct 25	Oct 28	
Yield per Plant (lbs/plant)	8.89	4.65	4.23	-	7.60	-	
Brix	20.4	19.2	20.0	18.5	19.0	15.8	
Titratable Acid	0.74	0.62	0.95	0.56	1.19	1.49	
pH	3.93	3.33	3.39	3.12	3.20	3.00	
Agria [2]					Combined Rootstock	C3309/101-14[3]	
Harvest Date					Oct 23	Oct 29	
Yield per Plant (lbs/plant)					10.3	-	
Brix					18.4	14.7 / 15.6[3]	
Titratable Acid					0.66	1.03 / 1.17	
pH					3.63	3.70 / 3.69	
Dornfelder (SR)							
Harvest Date	Oct 18	Oct 4	Oct 11	Oct 23			
Yield per Plant (lbs/plant)	14.11	14.44	6.54	-			
Brix	17.6	16.0	18.0	16.6			
Titratable Acid	0.89	0.77	0.90	0.74			
pH	3.76	-	3.58	2.79			
Garanoir (SR)							
Harvest Date	Oct 6	Oct 4	Oct 11	Oct 11		Nov 11	
Yield per Plant (lbs/plant)	18.51	7.10	5.71	-		-	
Brix	17.7	17.9	19.1	18.2		15.4	
Titratable Acid	0.96	0.75	0.63	0.53		1.11	
pH	3.70	3.04	3.65	3.09		3.43	
Pinot 777[2]		44-53	44-53	101-14	C3309	C3309	
Harvest Date		Oct 27	Oct 11	Sept 27	Oct 25	Oct 28	
Yield per Plant (lbs/plant)		2.9	-	-	6.4	-	
Brix		18.6	19.8	18.3	19.8	17.1	
Titratable Acid		1.14	0.93	0.93	1.13	1.32	
pH		2.97	3.68	2.93	3.10	2.96	
Pinot 115				101-14			
Harvest Date				Sept 27			
Yield per Plant (lbs/plant)				-			
Brix				15.9			
Titratable Acid				1.08			
pH				2.87			
Pinot 115				Riparia			
Harvest Date				Oct 23			
Yield per Plant (lbs/plant)				-			

Year	2003	2004	2005	2006	2007	2008	Notes
GDD	**1965**	**1817**	**1727**	**1600**	**1499**	**1523**	
Brix				18.0			
Titratable Acid				1.25			
pH				2.71			
Regent (SR)							
Harvest Date	Oct 13	Oct 4	Oct 11	Oct 23		Oct 30	
Yield per Plant (lbs/plant)	6.58	2.40	1.73	-		-	
Brix	19.6	21.2	22.6	21.2		19.0	
Titratable Acid	0.89	0.72	1.07	0.81		1.39	
pH	3.76	3.05	3.69	3.08		3.23	

[1] SR=self rooted
[2] Grafted plant from study 4 used to compare with self rooted plants in study 1
[3] Readings from plants grafted on C3309 and 101-14 listed separately in order: C3309 / 101-14.

Table 9. White and red wine cultivars that matured at 1800 GDD or lower at WSU Mount Vernon NWREC.

Year	2003	2004	2005	2006	2007	2008	Notes
GDD	**1965**	**1817**	**1727**	**1600**	**1499**	**1523**	
WHITE							
Iskorka (SR[1])							
Harvest Date	Oct 3	Sept 24	Sept 22	Sept 28	Oct 23	Nov 12	
Yield per Plant (lbs/plant)	4.98	4.90	2.37	-	2.00	-	
Brix	20.2	21.5	20.8	17.8	20.8	20.4	
Titratable Acid)	0.71	0.60	0.86	1.17	1.08	1.31	
pH	3.68	3.09	3.05	2.79	2.98	3.33	
Muller Thurgau (SR)							
Harvest Date		Oct 4	Oct 11				
Yield per Plant (lbs/plant)		5.48	6.28				
Brix		18.1	19.2				
Titratable Acid		0.71	0.90				
pH		2.87	3.60				
Optima (SR)							
Harvest Date		Sept 24	Sept 30	Sept 28	Sept 23	Sept 30	
Yield per Plant (lbs/plant)		6.06	8.59	-	7.20	-	
Brix		17.8	18.3	15.4	19.6	17.4	
Titratable Acid		0.77	1.05	1.13	1.02	1.31	
pH		3.14	2.99	2.92	3.04	3.20	
RED							
Pinot 2A (SR)							
Harvest Date	Oct 27	Oct 14	Oct 11	Oct 23	Oct 25		
Yield per Plant (lbs/plant)	11.0	-	-	9.9	4.9		
Brix	19.8	18.0	18.6	18.3	18.1		
Titratable Acid	1.32	1.26	1.42	1.67	1.51		
pH	3.10	3.00	3.45	2.63	2.94		

Year	2003	2004	2005	2006	2007	2008	Notes
GDD	**1965**	**1817**	**1727**	**1600**	**1499**	**1523**	
Pinot 2A	C3309/101-14[2]	C3309/101-14	C3309/101-14	C3309/101-14	C3309/101-14		
Harvest Date	Oct 27	Oct 14	Oct 11	Oct 23	Oct 25		
Yield per Plant (lbs/plant)	7.20 /10.20		-	5.28 / 6.26	6.20 /5.40		
Brix	21.0 / 20.5	19.7 / 19.7	18.9 / 18.7	18.8 / 19.1	18.8 /18.9		
Titratable Acid	1.01 /0 .99	0.90 / 0.94	1.18 / 1.10	1.20 / 1.16	1.28 /1.22		
pH	3.28 / 3.20	3.11 / 3.10	3.53 / 3.55	2.75 / 2.74	3.02 /3.03		
Pinot Noir Pommard				C3309			
Harvest Date				Sept 27			
Yield per Plant (lbs/plant)				-			
Brix				16.4			
Titratable Acid				1.11			
pH				2.89			
Pinot Noir Pommard			Riparia	Riparia			
Harvest Date			Oct 11	Sept 27			
Yield per Plant (lbs/plant)			-	-			
Brix			18.1	15.7			
Titratable Acid			1.17	1.10			
pH			3.61	2.88			
Rondo (SR)							
Harvest Date			Oct 5	Sept 28	Oct 25	Oct 29	
Yield per Plant (lbs/plant) (lbs/plant)			-	-	5.1	-	
Brix			20.8	18.6	19.4	20.0	
Titratable Acid			1.02	1.10	1.17	1.32	
pH			3.29	2.84	3.12	3.40	
Rondo						101-14	
Harvest Date						Oct 30	
Yield per Plant (lbs/plant)						-	
Brix						19.0	
Titratable Acid						1.16	
pH						3.45	
St. Laurent (SR)							
Harvest Date	Oct 27	Oct 11		Sept 28			
Yield per Plant (lbs/plant)	13.00	5.72		-			
Brix	17.6	17.3		15.6			
Titratable Acid	1.19	0.86		1.64			
pH	3.82	3.15		2.76			
St Laurent				101-14	Combined Rootstock		
Harvest Date				Sept 28	Oct 25		
Yield per Plant (lbs/plant)				-	6.4		
Brix				16.7	18.2		
Titratable Acid)				1.20	1.14		
pH				2.78	3.07		

[1] SR=self rooted
[2] Readings from plants grafted on C3309 and 101-14 listed separately in order: C3309 / 101-14.

Table 10. Red wine cultivars that matured at 1900 GDD or lower at WSU Mount Vernon NWREC.

Year	2003	2004	2005	2006	2007	2008	Notes
GDD	**1965**	**1817**	**1727**	**1600**	**1499**	**1523**	
Dunkelfelder (SR[1])							
Harvest Date	Oct 18	Oct 4	Sept 15	Sept 28			
Yield per Plant (lbs/plant)	9.75	4.07	-				
Brix	20.2	17.5	16	15.1			
Titratable Acid	1.1	0.98	1.26	1.2			
pH	3.85	3.11	2.75	2.98			
Golubok (SR)							
Harvest Date	Oct 18	Oct 14	Oct 11	Oct 23			
Yield per Plant (lbs/plant)	5.6		4.41	-			
Brix	21.7	21.8	21	19.4			
Titratable Acid	1.25	1.05	1.31	1.22			
pH	4.15	3.15	3.65	2.68			
Golubuk				101-14			
Harvest Date				Sept 28			
Yield per Plant (lbs/plant)							
Brix				17.3			
Titratable Acid				1.19			
pH				2.83			
St. Laurent (SR)							
Harvest Date	Oct 27	Oct 11		Sept 28			
Yield per Plant (lbs/plant)	13	5.72					
Brix	17.6	17.3		15.6			
Titratable Acid	1.19	0.86		1.64			
pH	3.82	3.15		2.76			

[1] SR=self rooted

Table 11. Red [red] and white wine cultivars that matured at 2000 GDD or lower at Everson, WA.

Year	2003	2004	2005	2006	2007	2008	Notes
GDD	**2147**	**2075**	**1867**	**1948**	**1684**	**1587**	
Dolcetto [red]				C3309			
Harvest Date				Sept 26			
Yield per Plant (lbs/plant)							
Brix				18.6			
Titratable Acid				0.95			
pH				3.24			
Gamaret [red[(SR[1])							
Harvest Date	Oct 27	Oct 5	Oct 11				
Yield per Plant (lbs/plant)		-	13.02				
Brix	18.6	18.1	19				
Titratable Acid	0.95	0.42	1.07				

pH	3.18	2.95	3.04				
Gruner Vetliner				101-14			
Harvest Date				Oct 11			
Yield per Plant (lbs/plant)							
Brix				22.2			
Titratable Acid				0.98			
pH				3.02			
Red Traminer (SR)							
Harvest Date		Oct 5	Oct 11				
Yield per Plant (lbs/plant)		0.58	0.73				
Brix		21.8	22.6				
Titratable Acid		0.56	0.92				
pH		3.07	3.3				
Sauvignon Blanc 01				101-14			
Harvest Date				Sept 26			
Yield per Plant (lbs/plant)				-			
Brix				20.8			
Titratable Acid				0.89			
pH				3.04			

[1] SR=self rooted

Table 12. White wine cultivars that matured at 2100 GDD or lower at Everson WA.

Year	2003	2004	2005	2006	2007	2008	Notes
Everson GDD	**2147**	**2075**	**1867**	**1948**	**1684**	**1587**	
Chardonnay 76				C3309			
Harvest Date				Sept 26			
Yield per Plant (lbs/plant)				-			
Brix				19.3			
Titratable Acid				1.1			
pH				3.03			
Chardonnay 76				101-14			
Harvest Date				Sept 11			
Yield per Plant (lbs/plant)				-			
Brix				17.2			
Titratable Acid				1.13			
pH				3.00			
Kerner (SR)							
Harvest Date		Oct 5	Oct 11				
Yield per Plant (lbs/plant)		1.6	2.57				
Brix		21.6	20				
Titratable Acid)		0.75	1.31				
pH		2.65	2.83				

[1] SR=self rooted

Table 13. Cultivars and selections discarded from trial at WSU Mount Vernon NWREC and at Everson, 2003-2008.

Cv	Pltd	Disc	Notes
Alicante	2000	2005	In pretest; late and not impressive self rooted
Bianca[1]	2001	2007	needs heat level above 1800 GDD to ripen well
Bromariu[1]	2001	2003	too late
CSFT 194[1]	2001	2003	too late
CSFT 195[1]	2001	2003	too late
Demetra	2001	2003	too late
Gamay Chaudenay	2000	2007	needs heat level above 2000 GDD to ripen well; not impressive at either site
Gamay Freaux	2000	2003	ripened above 2000 GDD at Everson, too late at MV, not impressive at either site
Gamay Noir	2000	2003	too late
Gamay Rouge de la Loire	2000	2003	ripened above 2000 GDD at Everson, too late at MV
I 31/67[1]	2001	2004	poor quality, ripened about 1800 GDD
II 70/21[1]	2001	2003	too late
Johnson clone	2001	2003	too late
Juwel	2000	2003	too late, severe susceptibility to powdery mildew
K 15[1]	2001	2003	too late, poor quality
K 38[1]	2001	2003	too late
Kozma Pal Muskataly	2001	2003	too late
Kozma 55[1]	2000	2003	too late, needs minimum 2000 GDD
Kozma 525[1]	2000	2003	too late
L 4-9-18[1]	2001	2003	too late
Lagrein	2001	2007	too late for Everson self rooted
Laurot (MI 5-106)[1]	2000	2003	3 plants retained in pretest
Liza (SK77-12/6)[1]	2001	2007	needs heat level above 1800 GDD to ripen well
Malverina (BV19-143)[1]	2001	2003	too late
M 39-4/63[1]	2001	2003	too late
M 39-9/7488[1]	2000	2003	too late
Malbec	2000	2007	pretest Everson only, discard at MV, too late
Nero	2001	2005	mediocre wine quality, ripens about 1800 GDD
Perle of Csaba	2000	2007	ripens below 1600 GDD, very early, lacks aroma, best as a possible blender
Petra (SK 77-5/3)[1]	2001	2007	needs heat level above 1800 GDD to ripen well
Pinot Blanc	2000	2003	pretest only, too late in MV
Rani Riesling[1]	2001	2007	needs heat level above 1800 GDD to ripen well
Regner	2000	2008	needs heat level around 1800 GDD or better
Reichensteiner	2004	2007	Ripens very early, thin, only fair quality
Reislander	2004	2008	Too late at MV, not fully evaluated at Everson
Rubin Tairovski.	2000	2003, 2007	needs heat level above 1800 GDD to ripen well
Saperavi	2005	2008	good at 1600 GDD but clusters didn't fill, yield very light

Toldi	2001	2008	brix too low, ripens aboutt 1800 GDD
Viorica	2001	2007	needs heat level above 1800 GDD to ripen well
XIV 11-57	2000	2003	too late
XIV 1-86	2001	2003	too late
XX 15-51	2001	2003	too late

[1]tested only at WSU Mount Vernon NWREC

WASHINGTON STATE UNIVERSITY

Annual Reports:

Wine Grape Variety Trial

for Maritime Western Washington

Years included:

2002, 2003, 2004,

2005, 2007

Annual Report 2002

Evaluation of Wine Grape Cultivars and Selections for a Cool Maritime Climate

G.A. Moulton, J. King, L.J. Price, R.S. Darland and T.R. Bronkema

Introduction

Previous wine grape trials at WSU - Mount Vernon starting in the in the mid 1970s provided essential information to commercial wine grape producers in western Washington. Some of the best white grape varieties in this trial, such as 'Siegerrebe,' 'Madeleine Angevine' and 'Muller-Thurgau,' have already proven successful in area vineyards. In 2000 a variety trial was re-established consisting of recently introduced varieties, selections, and clones, including some previously unavailable material from certain areas of eastern Europe with similar climate conditions. The primary focus of this trial is red wine varieties, to broaden the range and increase the sales potential for the local wineries. In addition, the trial will test the effect of selected rootstocks on topworked Pinot Noir 2A to advance fruit maturity. Rootstocks may expand the range of areas where high quality red wine such as Pinot Noir can be produced.

Methods

Thetwo trial sites are located at Mount Vernon research station and at a vineyard near Everson, WA. The range of cumulative heat units in western Washington varies by location from 1400 to 2300, and the site at the Mount Vernon station is at the cool end of the scale (1600 annual heat units). The second site near Everson reaches the higher range of about 2000 annual heat units, at an elevation of 250' elevation on a southwest slope. Vines in both the varietal plot and the rootstock trial have been cane pruned and trained to wires in a vertical shoot position (VSP) system.

Thereplicated varietal trial consists of about 30 cultivars, selections, and clones (see Appendix A, Table 1). Early ripening red varieties are emphasized. The experimental design of the plots is a randomized block of 3 replications, with 5 plants per replication. At the station site, row spacing is 10' rows with 6' between plants. At Everson the spacing is 9' rows with 5' between plants.

A varietal pretest (see Appendix A, Table 3) evaluates other varieties, including new white wine grapes from cool climate areas in Europe. The varietal pretest consists of three plants per variety, replicated once. Promising varieties from the pretest will be multiplied, replicated and added to the main trial.

The rootstock trial of Pinot Noir 2A consists of seven rootstocks (see Appendix A, Table 2). They are being evaluated for their effect on maturity, yield, and quality compared with self rooted plants. Replications consist of five plants on each rootstock, replicated three times at the Everson plot and five times at the Mount Vernon plot.

At Mount Vernon the two additional replications have allowed comparison of the standard cultural treatment (control) with cultural methods that may advance maturity. In 2002 soil mulch, plastic tent/shelter applied both early and late in the season, and cluster number per shoot were examined.

A. Soil mulch/Early Plastic: In mid-April (4/18-19/02), before shoot growth occurred on the pruned vines, a solar ground mulch and plastic tents (a form of plastic cloche tented over the vines) were installed in specific plots. The treatments consisted of 1.) control, no mulch or plastic, 2.) mulch only, 3.) plastic tent only, and 4.) mulch and plastic tent. The mulch remained in place throughout the season; the plastic tents were redeployed in early May (5/06/02) as the shoots developed and removed in early June (6/10/02).

B. Late Plastic: On August 19 one replication was treated by applying a plastic sheet to the west side of the vine row in the area where the grape clusters were developing. This remained in place until harvest.

C. Clusters per shoot: After clusters were set in early July, fruit on vines was thinned to 1 cluster/shoot, except in Row 4 where all replications were left with 2 clusters/shoot.

Preliminary harvest evaluations were begun in 2002, and harvest data was collected. Cooperation of area winemakers is engaged in the post-harvest evaluation of varieties suitable for wine production. Individual wines are being made from grapes of Pinot Noir 2A from each of the 8 rootstocks harvested separately. Wine is also being made from several of the varieties, as well as a blend from the varieties with a partial first crop. Evaluation of the wines is estimated for spring-summer of 2003.

Results

In 2002 the first crop of grapes sufficient for evaluation was produced and data collected, although most of the vines have not yet reached full production capacity. (Data from the Everson trial are shown in Appendix B.) On October 8, an overall comparison of maturity for the varieties in the Mount Vernon trial was obtained by taking 10 sample berries from each vine (= 50 berries/plot) and testing for brix and titratable acid. At that date, heat units for the Mount Vernon site totaled 1520. Results of juice analysis for the variety trial and varietal pretest are shown in Tables 1 and 2, below.

Table 1. Variety trial, Mount Vernon 10/08/02 – Average pH, brix and titratable acid (in ascending order by % titratable acid)

Cultivar	avg pH	avg brix	% t. acid

Schoenburger	3.2	17.0	0.79
Garanoir	3.3	17.2	0.79
Burmunk	3.3	21.0	0.80
Dunkelfelder	3.5	17.9	0.86
Agria	3.4	18.4	0.93
Zweigelt	3.1	17.8	1.04
Dornfelder	3.1	14.8	1.05
Regent	3.3	16.3	1.09
Sylvaner	3.2	15.0	1.10
Gamaret	3.1	15.3	1.33
Gamay Rouge	3.1	14.3	1.40
Gamay Freaux	3.1	15.7	1.45
Rubin Tairofski	3.1	14.6	1.48
Gamay Noir	3.1	15.6	1.50
Kozma 55	3.1	16.1	1.51
St. Laurent	3.1	15.8	1.55
Kozma 525	3.1	14.8	1.57
Baco 1	3.1	17.8	1.67
Gamay Beaujolais	3.2	15.0	1.70
Gamay Chaudenay	3.0	14.8	1.80
Laurot	2.9	14.9	1.80
39-9/74	2.9	14.7	2.25
Chardonnay	3.0	14.6	2.30
XIV 11-51	2.9	16.8	2.50

Table 2. Varietal pretest, 3 plants/plot, Mount Vernon 10/08/02 – Average pH, brix and titratable acid (in ascending order by % titratable acid)

Cultivar	avg pH	avg brix	% t. acid
Siegerrebe	4.0	19.1	0.42
Perle of Csaba	3.7	17.5	0.50
Madeleine Angevine	3.6	17.7	0.70
Leon Millot	3.4	17.2	0.80
i 31-67	3.3	15.8	0.85
Ortega	3.4	18.2	0.87
Muscat (Norwegian)	3.3	16.6	0.99
Optima	3.3	16.6	1.07
Reichensteiner	3.2	18.0	1.10
Kozma Pal Muscataly	3.3	15.0	1.13
Pinot Gris	3.2	17.1	1.20
Auxerrois	3.1	15.0	1.20
Muller - Thurgau	3.2	14.8	1.20
Pinot Noir Dijon 113	3.2	16.0	1.30
Pinot Blanc	3.1	16.0	1.40
Kerner	3.0	15.0	2.00

At the same time, using the same sampling method as above, juice from the Pinot Noir rootstock trial was tested for brix, pH and titratable acid, with the results shown in Table 3. The Pinot Noir rootstock plot was nearly at full cropping capacity.

Table 3. Rootstock trial – Mount Vernon 10/08/02 – Average pH, brix and titratable acid. (clone Pinot Noir 2A, in ascending order by % titratable acid)

Row	Plot	Rootstock	Culture tmt.	pH	brix	% t.a.
5	7	101-14	late plastic only	3.30	18.6	0.80
4	6	101-14	2 clusters/shoot	3.25	18.0	0.96
5	1	420A	late plastic only	3.30	18.4	0.98

5	8	C3309	late plastic only	3.20	18.0	0.98
3	1	420A	control	3.30	19.4	0.99
3	7	101-14	control	3.30	18.9	1.00
5	3	44-53	late plastic only	3.25	17.0	1.00
1	5	5BB	solar mulch, plastic tent	3.30	15.6	1.00
3	6	C3309	control	3.85	18.4	1.03
1	8	420A	plastic tent	3.25	17.6	1.04
2	1	101-14	control	3.30	19.2	1.04
5	4	5C	late plastic only	3.30	17.8	1.05
1	2	44-53	plastic tent	3.40	18.2	1.06
1	1	C3309	control	3.40	18.0	1.06
2	6	420A	solar mulch	3.25	17.8	1.06
2	4	C3309	control	3.30	17.6	1.06
1	6	101-14	solar mulch, plastic tent	3.65	17.4	1.06
4	8	420A	2 clusters/shoot	3.20	17.8	1.07
4	5	C3309	2 clusters/shoot	3.25	17.0	1.10
1	4	Riparia	plastic tent	3.29	16.0	1.10
5	5	5BB	late plastic only	3.25	17.9	1.13
2	5	44-53	solar mulch	3.30	17.8	1.13
2	7	Riparia	solar mulch	3.25	17.6	1.17
3	8	44-53	control	3.25	18.8	1.20
3	5	5BB	control	3.30	17.8	1.20
4	7	5BB	2 clusters/shoot	3.20	17.8	1.20
3	2	5C	control	3.20	17.4	1.20
1	7	5C	solar mulch, plastic tent	3.10	17.0	1.20
5	2	Riparia	late plastic only	3.25	17.0	1.20
4	2	5C	2 clusters/shoot	3.20	16.6	1.20
2	3	5C	control	3.25	17.4	1.23
2	2	5BB	control	3.25	18.4	1.25
3	4	Riparia	control	3.20	17.8	1.25
4	4	Riparia	2 clusters/shoot	3.20	17.6	1.25
5	6	self	late plastic only	3.15	17.4	1.30
4	3	44-53	2 clusters/shoot	3.25	16.9	1.30
2	8	self	control	3.15	17.6	1.40
3	3	self	control	3.15	15.8	1.60
4	1	self	2 clusters/shoot	3.05	17.0	1.65
1	3	self	control	3.15	14.9	1.75

Yield and Crush Data

After taking sample juice for analysis from fruit in both the Mount Vernon and Everson trial plots, and in consultation with Tom R. Bronkema as wine manager, ripe grapes were harvested on October 17 and 18,2002 and processed at the Mount Vernon station on October 18 and 19. Yields were measured for the different varieties and for the eight different treatments of the Pinot Noir rootstock trial. Processing included stripping of berries from clusters in some instances, and crushing the grapes. After crushing, the juice Brix was measured using both a hygrometer and a refractometer, and the results recorded.

A few of the varietal plots were more advanced than others and yielded sufficient fruit for production of a varietal wine. Other varieties yielded enough fruit to combine for producing a blended wine. At Mount Vernon the Pinot Noir rootstock trial produced sufficient fruit to make a separate crush of wine from each of the eight rootstocks.

A yeast starter was prepared on October 17, using the following method: fruit of St. Laurent from Everson (19.2 brix) was crushed and added back with moldy discards from Zweigelt (17.0 brix) to total 1/2 gallon of juice with a combined pH of 3.2, then 6 fl oz of Assmanhausen from Wyeast(dated 3 Oct 2001) with yeast nutrients was added. On October 21, Wyeast ML culture was added to the yeast starter, 150 ml of yeast starter transferred to each 5 gallon fermenter, and 200 ml of yeast starter culture transferred to each 18 gallon tub.

Assmanhausen was selected to deal with the moldy Pinot. Moldy fruit was added to the yeast starter to proof the yeast with mold, and to balance the mold contribution in each wine,as a method of reducing some of the mold induced variation.

Table 4. Data from wine crush October 17, 2002

Batch #	Cultivar(s)	Wt. lbs	Brix H*	Brix R*	Comments
1	Schoenburger	52.03	21.0	19.2	added 8.2g pectic enzyme and cold soaked at ambient temp
2	Pinot Noir (Everson) Agria Dunkelfelder Garanoir Zweigeltrebe	88.30 1.62 0.64 1.72 1.10	22.5	21.3	destemmed by hand entire lot, added whole clusters 93.38 lbs total split to 2 5 gallon fermenters with air locks and set outside at ambient temp
3	Zweigeltrebe	60.69	20.0	19.3	removed 7.06 lbs botrytised and/or unripe fruit (53.63 lbs total) destemmed by hand entire lot of fruit
4	Garanoir Siegerrebe Agria	47.61 2.00 4.17	19.2	18.1	destemmed entire lot by hand added and crushed 53.78 lbs. total
5 (White Blend)	Kerner Auxerrois Cl. 22 Perle of Csaba Pinot Gris Reichensteiner Ortega Optima Sylvaner Chardonnay Ortega (Everson) Reichensteiner (Everson) Siegerrebe (Everson) Mad. Angevine (Everson)	16.41 5.89 28.24 23.45 3.09 0.67 3.29 2.14			transferred to Chuck Jackson 83.18 lbs total
6 (Red Blend)	Gamay Freaux Gamaret Dornfelder Dunkelfelder Agria	33.93 26.91 49.44 26.29 19.83			transferred to Chuck Jackson 156.90 lbs total
7	Pinot Noir 2A/Riparia	86.97	22.2	20.6	crushed to 18 gal. open topped tub
8	Pinot Noir 2A/101-14	77.69	22.0	20.6	crushed to 18 gal. open topped tub
9	Pinot Noir 2A/44-53	85.69	21.8	20.2	crushed to 18 gal. open topped tub
10	Pinot Noir 2A self rooted	75.28	19.7	18.6	crushed to 18 gal. open topped tub
11	Pinot Noir 2A/5 BB	99.65	21.8	19.6	crushed to two 5-gal fermenters (11-1, 11-2)
12	Pinot Noir 2A/5C	86.73	20.2	18.9	crushed to two 5-gal fermenters (12-1, 12-2)
13	Pinot Noir 2A/420A	77.6	22.5	20.3	crushed to one 5-gal fermenter (13-1) and one 4-gal bucket (13-2)
14	Pinot Noir 2A/C3309	47.68	21.3	19.9	crushed to one 5-gal fermenter

*Brix H = measured by hygrometer, Brix R = measured by refractometer, post crushing

Discussion

I. Rootstock trial

In comparing the juice samples from rootstocks on Pinot Noir 2A, those that were most successful in promoting overall earlier ripening were Millardet et de Grasset 101-14, Millardet et de Grasset 420A and Couderc 3309.

Comparison of juice samples indicates that with respect to pH value, the rootstocks 101-14, C3309 and 49-53 had significantly the highest pH at 3.275. All other rootstocks averaged 3.225, and self rooted vines had the lowest pH at 3.1.

Values for brix (soluble solids) showed 101-14 and 5BB with significantly higher brix than self rooted. Vines of 420A and Riparia Gloire were also higher in brix than the self rooted Pinot Noir, but was not statistically significant at the 5% level.

Mean values for percent of titratable acid (Table 4) indicated all rootstocks had significantly lower titratable acid than the self rooted vines. The outstanding performers again were 101-14, 420A and C3309 with the lowest levels. Plants grown on 101-14 were also more vigorous than those on 420A or C3309.

Table 5. Rootstock trial, Mount Vernon 10/08/02 – Mean values for titratable acid (LSD 0.1899)

Rootstock	% t. a.			
self rooted	1.53	a		
5BB	1.23		b	
44-53	1.22		b	
5C	1.22		b	
Riparia Gloire	1.21		b	
C3309	1.08		b	c
420A	1.07		b	c
101-14	1.00			c

A. Early Plastic: Where a plastic tent was applied early (April), initial observations showed an advanced bloom date of two weeks. Analysis of the juice indicated that initial pH was higher and titratable acid lower for the vines covered with early plastic but the levels were not significant at the 5% level. Brix registered higher for the vines with no plastic, but a variation occurred in the methodology, so that soluble solids readings for those treatments were not valid for comparison.

B. Late Plastic: In row 5 a plastic sheet was applied on the west side of the vine row in late August to see its effect. Analysis of data comparing these vines with the control (no plastic) resulted in no significant difference in the levels of initial pH or of brix. However, there was a significant reduction in titratable acid for the treated vines compared with the control (Table 5).

Table 6. Rootstock trial, Mount Vernon 10/08/02 - Mean values for titratable acid (LSD 0.0835)

Treatment	**% t.a.**		
Control, no plastic	1.184	a	
Late plastic	1.055		b

C. Clusters per shoot: Data comparing the vines which were thinned to 1 cluster per shoot with those where two clusters were left on each shoot indicated no statistically significant differences in values for initial pH, brix and percent titratable acid. Though not statistically significant at the 5% level, values for brix and pH were higher and titratable acid lower for vines with 1 cluster/shoot than for vines with 2 clusters/shoot.

II. Variety trial and varietal pretest

Several of the varieties in the trial produced sufficient fruit both for sample tests and for wine making. Evaluating the performance in the first year of production resulted in several promising varieties (Table 6).

Table 7. Promising varieties tested at Mount Vernon (tested October 8, 2002– 1520 h.u.)

Cultivar	Skin Color	Juice Color	pH	brix	% t. a.
Schoenburger	pink/tan	white	3.20	17.0	0.79
Garanoir	red	white	3.30	17.2	0.79
Dunkelfelder	red	red	3.45	17.9	0.86
Agria	red	red	3.35	18.4	0.93
Zweigelt	red	white	3.10	17.8	1.04
Dornfelder	red	white	3.10	14.8	1.05
Regent	red	white	3.30	16.3	1.09
Sylvaner	white	white	3.20	15.0	1.10

Table 8. Promising varieties from Mount Vernon, varietal pre-test (tested October 8, 2002)

(note that the pretest consists of 3 plants/cultivar vs 15 plants/cultivar in main trial)

Cultivar	Skin Color	Juice Color	pH	brix	% t. a.
Siegerrebe	pink/tan	white	4.00	19.1	0.42
Perle of Csaba	white	white	3.70	17.5	0.50
Madeleine Angevine*	white	white	3.60	17.7	0.70
Leon Millot*	red	white	3.40	17.2	0.80
Ortega	white	white	3.40	18.2	0.87
Muscat (Norwegian)	red	white	3.30	16.6	0.99
Optima	white	white	3.30	16.6	1.07
Reichensteiner	white	white	3.20	18.0	1.10
Pinot Gris (BC)	pink/tan	white	3.20	17.1	1.20
Muller - Thurgau*	white	white	3.20	14.8	1.20

* established varieties

Appendix A – Cultivars/Selections and Rootstocks on trial

Table 1. Main variety evaluation (2002)

Agria	Gamay Freaux	Nero	Tskerka (54-36-33)
Burmunk	Gamay Rouge de la Loire	Pinot Precoce	Zweigelt
Baco 1	Garanoir	Regent	39-9/74
Dornfelder	Golubok	Rubin Tairovsky	I 55/8
Dunkelfelder	Kozma 55	Schonberger	XIV 11-57
Gamaret	Kozma 525	St. Laurent	XX 15-51
Gamay Beaujolais	Laurot (MI 5-106)	Sylvaner	

Table 2. Rootstock Trial (Pinot Noir 2A)

1. Control – own root
2. Couderc 3309
3. Kober 5BB
4. Malegue 44-53
5. Millardet et de Grasset 101-14
6. Millardet et de Grasset 420A
7. Riparia Gloire
8. Teleki 5C

Table 3. Varietal Pretest (2002)

Aligote	i 31-67	Meunier	Regner
Auxerrois cl. 22 Gm	ir 26/5	Muller Thurgau	Reichensteiner
Bianca	Juwel	Muscat	Siegerrebe
Bromariu	K-15	Optima	SK 77-513
BV 19-88	K-38	Ortega	SK 77-1216
BV 19-143	Kerner	Perle of Csaba	Toldi
CSFT 194	Kozma Pal Muscataly	Pinot Blanc	Viorica
CSFT 195	L 4-9-18	Pinot Gris	XIV 186
Dave Johnson	Lagrein	Pinot Noir Dijon 113	34-4-49
Demetra	Leon Millot	Pinot Noir R14 V4	1170/21
Dolcetto	M 39-4163	Plai	
Gamay Chaudenay	Madeleine Angevine	Rani Riesling	
Gamay Noir	Malbec	Red Traminer	

Appendix B – Everson Plot, 2002 Data

NOTE: Grape plants in this plot were moved in winter 2001–02 from a previous site where they had been initially planted in spring 2000. Heat units at Everson to October 8, 2002 were approximately 1900 (vs. 1520 at Mount Vernon). However, some effects of earlier ripening may be due to the stress of transplant, independent of the higher heat units at the Everson site. For this reason, data collected in 2002 on the fruit from the Everson plot is regarded as inconclusive. Seven gallons of wine from a mixture of Pinot Noir on the various rootstocks was made and will be sampled at the same time as the other wines.

Table 1. Variety trial, Everson 10/08/02 – Average brix and titratable acid (in ascending order by % titratable acid)

Cultivar	avg pH	avg brix	% t. acid
Siegerrebe	3.65	21.4	0.45
Ortega	3.25	18.6	0.59
Schoenburger	3.30	18.0	0.60

Leon Millot	3.25	20.7	0.72
Reichensteiner	3.10	20.2	0.78
Optima	3.15	19.0	0.78
Dunkelfelder	3.40	18.0	0.93
Zweigelt	3.10	20.0	0.98
Pinot Gris	3.20	19.2	1.00
Gamay Rouge	3.15	19.0	1.04
Gamaret	3.10	18.0	1.07
St. Laurent	3.10	17.6	1.35
Kerner	2.95	17.2	1.44
Baco Noir	3.05	20.8	1.70

Table 2. Pinot Noir rootstock trial (clone Pinot Noir 2A), Everson 10/08/02 – Average brix and titratable acid (in ascending order by % titratable acid)

Rootstock	avg pH	avg brix	% t. acid
101-14	3.17	19.1	0.91
420A	3.20	18.9	0.93
44-53	3.22	19.6	0.94
Riparia Gloire	3.20	19.7	0.99
5C	3.15	18.7	1.02
5BB	3.18	19.4	1.12
self rooted	3.10	18.2	1.35

NOTES – October 25 Harvest and crush

Transferred to Mike L
Schonburger in two 5 gallon carbouys with bubblers
St. Laurentfree run blanc de noir in one 1 gallon with bubbler
St. Laurent pink press wine in one 1 gallon with bubbler
St. Laurent blend free run / press wine in one 1/2 gallon with bubbler
Red Blend: Leon Millot, 39-X, Regent, Rubin T pressed with pommace of the others, in two 1 gallons with bubblers
This is more an inventory of hardware than wines, so the actual data for various wines should be obtained from Mike.

Annual Report 2003

Evaluation of Wine Grape Cultivars and Selections for a Cool Maritime Climate

G.A. Moulton, G.H. Spitler, J. King, L.J. Price, R.S. Darland and T.R. Bronkema

Summary

In 2003 the weather provided excellent conditions for evaluating the full range of cultivars on trial, with 1965 AHU at the Mount Vernon site and 2147 AHU at Everson (to October 31, 2003). The wines produced this year should prove to be a benchmark for comparison with future seasons. A full crop was produced from most of the trial plots at Mount Vernon, and from many of the main cultivar and rootstock plots at Everson. In some cases where wines were made from cultivars in the pretest plots with only 3 plants per cultivar, juice from both sites were combined to yield enough for a 3 or 5 gallon carboy. Cultivars vinified at Mount Vernon in 2003 included 14 red wine cultivars and 15 white wine cultivars. This includes the wine from the Pinot Noir rootstock trial, in which fruit from each rootstock was vinified separately.

New planting in 2003 included additions to the pretest and an advanced cultivar trial grafted to selected rootstocks. After seeing results of the rootstock trials in 2002 , it was decided to graft certain promising cultivars that had showed good performance onto the best performing rootstocks. This advanced cultivar trial includes standards like Madeleine Angevine, Siegerrebe and Leon Millot along with promising cultivars from the pretest and main trial. Most of these will be planted in spring 2004 and begin fruiting in 2005-2006.

Collecting and analyzing harvest data and producing wines for evaluation continued in 2003. Cooperation of area winemakers is engaged in the post-harvest evaluation of varieties suitable for wine production (see **Discussion & Recommendations**, below.) Individual wines are being made from grapes of Pinot Noir 2A from each of the 8 rootstocks harvested separately. Wine is also being made from several of the varieties, as well as a blend from the varieties with a partial crop. Evaluation of the 2003 wine crop is estimated for spring-summer of 2004.

After seeing results of the rootstock trials in 2002 and 2003, new planting in 2004 included additions to the pretest and an advanced (replicated) cultivar trial grafted to one of the 3 promising rootstocks. This trial includes standards like Madeleine Angevine, Siegerrebe and Pinot Noir along with promising cultivars from the pretest and main trial. Most of these were planted in spring 2004 and should begin fruiting in 2005-2006, if funding is maintained. Aim of this trial is to see whether the rootstock effects observed in Pinot Noir 2A will also carry over to other varieties.

Methods

Data collection in this trial consists primarily of weekly sampling of fruit as harvest season approaches, and laboratory analysis of the juice to determine brix, pH and titratable acid. Berry sampling is done by taking 10 berries from each plant for a sample of 50 berries from each 5-plant replicated plot in the rootstock and cultivar trials. Each plot in the cultivar trial is replicated 3 times, and in the rootstock block 5 times. (In the pretest plots with only 3 plants/cultivar, berry samples are collected from the 3 plants at random, depending on the amount of fruit available.)

At harvest, yield of each plot is weighed, a bunch count is made of a sample bin to determine bunch weight (an aid for preparing yield estimates), and juice samples are collected for analysis as the grapes are being crushed.

Project categories

1. Cultivar Trials

The trial initiated in 2000 presently consists of about 20 cultivars, selections, and clones (see Appendix B, Table 1). Plot design is a randomized block of 3 replications, with 5 plants per replication. At the Mount Vernon site, row spacing is 10' rows with 6' between plants. At Everson the spacing is 9' rows with 5' between plants.

In 2003 an advanced cultivar trial on selected rootstocks was begun at Mount Vernon (to be completed in 2004), consisting of 3 replications, with 5 plants per replication, spaced in 10' rows with 6' between plants: Rootstocks are Millardet et de Grasset 101-14 and Couderc 3309. Cultivars are Garanoir, Leon Millot, Madeleine Angevine, Optima, Ortega, Pinot Gris (Ruhlander clone), Pinot Noir 777, Regent, Reichensteiner, Schonburger, Siegerrebe and Sylvaner, all of which have performed well at the trial sites.

2. Pretest

The pretest(see Appendix, **Table 2**) screens potential cultivars, to determine if they should be added to the main replicated trial, from which varietal wines can be produced for evaluation. The pretest consists of 3 plants per cultivar, replicated once. Promising grapes from the pretest will be multiplied, replicated and added to the main trial. Some promising cultivars or clones advanced to the main trial in 2004 are Optima, Ortega, Pinot Gris [Ruhlander] and Reichensteiner.

3. Rootstock Trial

The rootstock trial consists of Pinot Noir 2A grafted on 7 rootstocks plus a self rooted control (see Appendix B, Table 3). Each rootstock is evaluated for its effect in terms of maturity, yield, and quality compared with self rooted plants. Replications consist of five plants on each rootstock, replicated three times at the Everson plot and five times at the Mount Vernon plot. At Mount Vernon the two additional replications have been used for conducting cultural studies in comparison of the standard cultural treatment in the rootstock block.

4. Cultural Studies

A. Clusterthinning – In one row, fruit was thinned to 1 cluster per shoot, and compared with 2 clusters per shoot which was the standard for the rest of the plot.

B. Plastic row shield – A 3' wide sheet of clear plastic was hung on the west side of the trial row in April and retained until harvest. The sheet extended 1 ½' above and 1 ½' below the lateral canes (fruiting area.) Fruit from this row was compared with the control (no plastic) to examine possible effect in advancing ripeness.

C. Fruit harvest timing – On October 8, 2003 fruit samples were taken from all plots in the Pinot Noir rootstock trial, at which time several of the plots met standard criteria for harvest. However, it was decided to keep the fruit hanging and monitor the plants for any disease (rot). Because of good canopy management, vine structure was open to air circulation. This combined with careful monitoring of disease and timely application of fungicides, allowed harvest to be delayed until October 27. Comparison was made between juice samples taken at harvest with those taken earlier to see what changes occurred over time in brix, pH and titratable acid.

D. Spacing – In 2003, a vine spacing trial was initiated, consisting of replicated plots at 8' spacing between rows, with in-row spacing at 4', 6', 8' and 10' to evaluate the effect of various spacings and rootstock on vine vigor, canopy management, production efficiency and overall vine balance. Cultivars included in the trial are: Agria, Dornfelder, Dunkelfelder, Pinot Noir 777 and Zweigelt.

Results

1. Cultivar trials

Harvest data from 2003 are shown below. Data from the trial at Everson are shown in Appendix A.

Table 1. Cultivar trial, Mount Vernon – Harvest date, average pH, brix, titratable acid and fruit yield (in harvest order)

Cultivar	Harvest	avg brix	% t. acid	Yield (lbs/plant)
Schoenburger	10/03	19.5	0.66	10.3
Iskorka	10/03	20.2	0.71	5.0
Burmunk	10/03	23.2	0.98	5.1
Agria	10/05	18.1	0.87	14.4
Garanoir	10/06	17.4	0.96	18.5
XX 15-51	10/06	16.2	1.07	7.0
Regent	10/13	19.6	0.89	6.6
Sylvaner	10/13	16.8	0.90	8.0
Zweigelt	10/18	18.4	0.98	17.6
Dunkelfelder	10/18	20.2	1.10	9.8
Golubok	10/18	21.7	1.25	5.6
I 55/8	10/18	17.0	1.32	11.1
Dornfelder	10/23	17.6	0.89	14.1
Gamaret	10/27	18.3	1.08	9.1
St. Laurent	10/27	17.6	1.19	13.0
Rubin Tairofsky	10/31	18.6	1.16	14.3
Gamay Freaux	10/31	17.0	1.25	14.1
Kozma 55	10/31	20.6	1.46	12.8

2. Pretest

Harvest data from the pretest (3 plants/plot) 2003 are shown below.
Table 2. Pretest cultivars, Mount Vernon - Harvest date, brix, titratable acid and fruit yield (in harvest order, R = red wine cultivar)

Cultivar	Harvest	avg brix	% t. acid	Yield (lbs/plant)
Madeleine Angevine	10/03	19.0	0.82	16.5
Ortega	10/03	20.6	0.91	21.7
Perle of Csaba	100/3	19.2	0.50	11.3
Muscat (Norway) **R**	100/6	18.5	0.90	13.1
Optima	10/06	18.3	1.01	22.3
Siegerrebe	10/06	19.5	0.60	19.3
Reichensteiner	10/06	19.6	0.94	16.0
Auxerrois	10/09	19.3	0.74	7.6
Leon Millot **R**	10/09	20.6	0.90	8.5

Muller-Thurgau	10/09	17.1	0.97	14.4
I 31-67 **R**	10/09	16.7	0.65	7.5
Pinot Gris	10/09	19.4	1.04	10.7
K-15	10/30	19.9	1.28	8.9
Kerner	10/.30	21.0	1.80	16.9
Red Traminer	10/31	19.8	1.11	8.8

Most of the cultivars and selections in the pretest produced enough fruit for evaluation in 2003, and several of them yielded enough for wine making in either single varietals or blends, when crops from Mount Vernon and Everson plots were combined. Cultivars were evaluated for their performance in an exceptionally good year such as this, and those that did not do well were scheduled for discard (see Appendix B.)

3. Rootstock Trial

Samples of 10 berries per plant/50 berries per plot were taken on October 8, 2003 and the juice extracted and analyzed. Results of juice analysis for selected rootstocks are shown below.

Table 3. Average pH, brix, titratable acid, cluster size and fruit yield of selected rootstocks (10/08/2003)

Rootstock	pH	brix	% t.a.	Cluster size	Yield (lbs/plant)
self	3.1 a	19.8 a	1.30 a	181 a	11.0 a
101-14	3.2 a	20.5 a	0.99 b	158 b	10.3 a
420A	3.2 a	20.7 a	1.00 b	183 a	9.7 a
C3309	3.3 a	21.0 a	1.00 b	147 b	7.3 b

The entire Pinot Noir trial was harvested on October 27, 2003 and the juice analyzed with results shown below.

Table 4. Rootstock trial – Mount Vernon 10/27/03 - Average fruit yield, cluster size, brix, pH and titratable acid (in ascending order by titratable acid)

Rootstock	Yield lbs/plant	Cluster gms.	brix	pH	t. acid
101-14	10.2	158.3 bc	20.5 a	3.20 b	0.99 b
C3309	7.2	147.3 c	21.0 a	3.28 b	1.01 b
420A	9.7	183.0 abc	20.7 a	3.18 b	1.01 b
44-53	8.9	172.0 abc	20.1 a	3.25 b	1.10 ab
Riparia	8.9	186.0 ab	20.7 a	3.24 b	1.20 ab
5BB	10.5	179.8 abc	21.3 a	----	1.25 a
5C	10.4	199.3 a	20.2 a	3.18 b	1.25 a
self rooted	11.0	181.0 abc	19.8 a	3.10 b	1.32 a

All rootstocks had lower levels of titratable acid than self rooted; Table 4 above shows those where differences were statistically significant. All had higher pH than self rooted but differences did not reach 5% level of significance except for 5BB. All had higher brix readings than self rooted but did not reach 5% level of significant difference. Cluster weight varied and some differences were significant. The biggest difference was between C3309 and 5C. Both 101-14 and 420A had lower titratable acid and higher brix than self rooted, though yields were statistically the same.

In comparing the rootstocks overall, those that were most successful in promoting earlier ripening were Millardet et de Grasset 101-14, Millardet et de Grasset 420A and Couderc 3309.

4. Cultural Studies

A. Cluster Thinning - Analysis of juice from vines with 1 cluster/shoot vs. 2 clusters/shoot is shown below.

Table 5. Cluster Thinning Trial 2003

Treatment	pH	brix	% t.a.	Cluster size (gms)	Yield (lbs/plant)
1 cluster	3.23 a	20.7 a	1.15 a	198 a	6.8 b
2 clusters	3.27 a	20.4 a	1.15 a	161 b	11.2 a

Data from juice analysis showed significant differences in yield and cluster weight between the plants where clusters were thinned to 1 cluster/shoot, compared to 2 clusters/shoot. Yield of vines with 2 clusters/shoot was 38% higher than with 1 cluster/shoot. No significant difference was found between the treatments in the measurement of brix, pH and titratable acid.

B. Plastic row shield – Analysis of juice from vines with plastic shield vs. no plastic is shown below.

Table 6. Plastic shield trial 2003

Treatment	pH	brix	% t.a.	Cluster size	Yield

				(gms)	(lbs/plant)
plastic	3.50 b	21.3 b	0.87 b	123 b	9.3 b
no plastic	3.30 a	20.4 a	1.15 a	161 a	11.2 a

Application of plastic row shield advanced bloom by approximately 2 weeks, and bunches in the shielded row were noticeably earlier to color. Yield in tons/acre at 10 X 6 plots was 4.0 T/A for plots with no plastic and 3.4 for plots with plastic shield. Both treatments were trained at 2 clusters/shoot.

C.Fruit harvest timing - Analysis of juice from the Pinot Noir plot sampled on October 8, 2003 was compared with juice sampled from the same plots at harvest on October 27, 2003.. Data were averaged for all plots harvested on each date and results are shown below.

Table 7. Fruit samples 10/08/2003 and 10/27/2003

Harvest date	brix	% t.a.
10/08/2003	18.9 a	1.14 a
10/27/2003	20.5 b	1.13 a

Data averaged for all Pinot Noir plots tested on October 8 and harvested on October 27 showed no significant change in total acids. However, brix continued to rise in the 3 weeks between sample and harvest date from 18.9 to 20.5. This indicates that fruit maturity will continue to advance as long as healthy green leaves remain on the plants.

Discussion

Results of the trials to date have clearly shown that high quality wine grapes can be grown in western Washington, given careful choice of the appropriate varieties and rootstocks, and selection of a good site. After selecting a suitable area for establishing the vineyard, take soil tests and amend the soil as needed. Many soils tend to be low in potash, magnesium and calcium. Monitor heat unit accumulation from April 1 - October 31, using an Avatel, Hobo or similar recording device.

Most of the plots in the trial produced sufficient fruit both for sample tests and for wine making. Evaluating their performance in 2003 resulted in several promising cultivars.

RED

Agria
Dornfelder
Dunkelfelder
Garanoir
Golubok
Leon Millot
Muscat of Norway
Pinot Noir (clones)
Regent
Zweigelt

WHITE

Burmunk
Iskorka
Madeleine Angevine
Optima
Ortega
Pinot Gris (Ruhlander)
Reichensteiner
Schonburger
Siegerrebe
Sylvaner

Recommended varieties with high potential are early clones of Pinot Noir and Pinot Gris, grafted onto a rootstock (preferably Millardet et de Grasset 101-14, Couderc 3309 or Millardet et de Grasset 420A.) On a site with marginal heat units, it may be necessary to concentrate on the earlier varietals such as Siegerrebe, preferably grafted on a rootstock. Some of the promising newer German varietals may also be worth trying, also grafted on rootstock, either as varietals or for blending (see list of promising cultivars, above.)

Good cultural practices can do much to enhance fruit maturity. Cluster thinning, plastic row shields, good canopy management and attention to nutrition and disease sprays in a timely manner all help to maximize fruit quality.

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San Juan Vineyards – Kurt Niznik
Vashon Island Winery – Ron Irvine
Carpenter Creek Winery – Jeff Hammer
Pasek Cellars – Gene Pasek
Chuck Jackson, Boeing Wine Club
Steve & Susan Oleson
Lou Hollers
Bob Tombs
Steven Mohns
Lynne Irelan
Jim Haack
Steve Wilbur
Bill Swartz
Megan Rutherford
Pete Bradley

Appendix A – Results of Everson Trial

Table 1. Red wine cultivars vinified in 2003, Everson (AHU 2127)

Cultivar	Date	brix	T. Acid
Agria	10/5	19.6	0.80

Garanoir	10/12	17.2	0.66
Regent	10/12	20.1	0.96
Dornfelder	10/27	18.8	0.69
Dunkelfelder	10/27	15.2	0.74
Zweigelt	10/27	17.0	0.78
St. Laurent	10/27	15.2	0.95
Gamaret	10/27	18.6	0.95

Table 2. Rootstock trial 2003, Everson

Rootstock	brix	pH	T. Acid
3309	20.5	3.40	0.83
101-14	18.5	3.24	0.90
420A	19.2	3.20	0.96
Self	18.5	3.20	1.18
Riparia	19.2	3.24	1.05
44-53	18.4	3.21	10.4
5C	18.0	3.22	1.09
5BB	19.1	3.24	1.07

Appendix B – Cultivars/Selections and Rootstocks on trial

Table 1. Main variety evaluation 2003 (* = Everson only)

Agria	Garanoir	Regent	Sylvaner
Burmunk	Golubok	Reichensteiner	Iskorka (54-36-33)
Dornfelder	Nero	Schonberger	Zweigelt
Dunkelfelder	Pinot Precoce	St. Laurent	I 55/8
Gamaret*			

Discards 2002-2003

Baco 1 – 3 plants retained in Pretest
Gamay Beaujolais – too late, not true to name
Gamay Freaux – 3 plants retained in Pretest
Gamay Rouge de la Loire – too late
Kozma 55 – too late
Kozma 525 – too late
Laurot – 3 plants retained in Pretest
Rubin Tairovsky – 3 plants retained in Pretest
XIV 11-57 – too late
XX 15-51 – too late
39-9/74 – too late

Table 2. Pretest, 2003 (* = Everson only)

Aligote*	Lagrein	Ortega	Red Traminer*
Auxerrois cl. 22 Gm	Laurot	Perle of Csaba Petra [SK 77-5/3]	Regner
Baco 1	Leon Millot	Pinot Gris (Ruhlander)	Reichensteiner
Bianca	Liza [SK 77-12/6]	Pinot Noir Dijon 113	Siegerrebe
Dolcetto*	Madeleine Angevine	Pinot Noir 777	Toldi
Gamay Chaudenay	Muller Thurgau	Plai	Viorica
i 31-67	Muscat	Rani Riesling	
Kerner	Optima		

Discards 2003

Bromariu – too late
BV 19-143 – too late
BV19-88 – plants died
CSFT 194 – too late
Demetra – too late
Johnson clone – too late
Juwel – too late
K-15 – poor quality, late
K -38 – too late
Kozma Pal Muscataly – low yield, late
L 4-9-18 – too late
Meunier – some not true to name, too late
Pinot Blanc – too late
Pinot Noir clone R14 V4 – not true to name
XIV 1-86 – too late
34-4-49 – too late
1170/21 – too late

Gamay Noir – too late	M 39-4/63 – too late
Ir 26/5 – plants died	Malbec – too late

Table 3. Rootstock Trial (Pinot Noir 2A)

Control - own root	Couderc 3309	Millardet et de Grasset 101-14	Millardet et de Grasset 420A

Discards 2003
Kober 5BB – better than own root plants but inferior to best
Malegue 44-53 – same
Riparia Gloire – same
Teleki 5C – same

Annual Report 2004

Evaluation of Wine Grape Cultivars and Selections for a Cool Maritime Climate

G.A. Moulton, G.H. Spitler and J. King

Summary

In 2004 the weather conditions in the beginning of the season were good, but became more challenging a month prior to harvest. Incomplete set on some varieties was a problem with two factors. First, early bud break and early warm spring weather created conditions for rapid shoot growth. This in turn caused a larger carbohydrate demand at the shoot tip, which we believe competed as a carbohydrate sink with the new blooms. The result was a reduced or incomplete set in some varieties. The second factor appeared to be an instance of early bunch-stem necrosis (EBSN). The causes of this physiological disorder are not fully understood, but it is characterized by sections of the bunch that shrivel up and dry shortly after bloom. Insufficient boron spray applications might have exacerbated the EBSN problem. In Pinot Noir (clone 2A) grown on rootstocks there was very little evidence of either problem in comparison with self rooted plants. Some varieties (e.g. St. Laurent, Siegerrebe) were more severely affected and lost part or all of the crop.

August and September are usually seen as the predictably dry months. However, in 2004 9.75 inches of precipitation were recorded in those 2 months, compared to the 40-year average of 3.47 inches for this period. This resulted in high potential for rot infection. Vines trained to the VSP and Scott-Henry systems had clusters exposed early, approximately 2 weeks after berry set, and suffered little or no rot at either the Mount Vernon or the Everson locations. Rot was not a problem on most cultivars and the Pinot Noir clones were able to remain hanging on the vines until mid October with very little rot. At the Mount Vernon site 1817 AHU were recorded and 2075 AHU at Everson (to October 31, 2004).

A full crop was produced from most of the trial plots at Mount Vernon and Everson. In the main replicated plots, cultivars vinified in 2004 included varietal wines from both red and white wine cultivars, as well as some blends. This includes the wine from the replicated Pinot Noir rootstock trial, which was reduced in 2004 to the 3 most promising rootstocks plus self rooted control, and used for cultural studies (See Wine List, below.)

After seeing results of the rootstock trials in 2002 and 2003, new planting in 2004 included additions to the pretest and an advanced (replicated) cultivar trial grafted to one of the 3 promising rootstocks. This trial includes standards like Madeleine Angevine, Siegerrebe and Pinot Noir along with promising cultivars from the pretest and main trial. Most of these were planted in spring 2004 and should begin fruiting in 2005-2006, if funding is maintained. Aim of this trial is to see whether the rootstock effects observed in Pinot Noir 2A will also carry over to other varieties.

Collecting and analyzing harvest data and producing wines for evaluation continued in 2004. Cooperation of area winemakers is engaged in the post-harvest evaluation of varieties suitable for wine production (see Discussion & Recommendations, below.) Individual wines are being made from grapes of Pinot Noir 2A. Evaluation of the 2003 wine crop is estimated for winter of 2004, and the 2004 wine crop is in process of vinification.

Methods

Data collection in this trial consists primarily of weekly sampling of fruit as harvest season approaches, and laboratory analysis of the juice to determine brix, pH and titratable acid. Berry sampling is done by taking 10 berries from each plant for a sample of 50 berries from each 5-plant replicated plot in the rootstock and cultivar trials. Each plot is replicated 3 times. (In the pretest plots with only 3 plants per cultivar, berry samples are collected from all 3 plants.) At harvest, yield of each plot is weighed and juice samples are collected for analysis as the grapes are being crushed.

Project categories

1. Cultivar Trials

The trial initiated in 2000 presently consists of about 35 cultivars, selections, and clones with predominant emphasis on red wine production (see Appendix, **Table 1**). Plot design is a randomized block of 3 replications, with 5 plants per replication. At the Mount Vernon site, row spacing is 10' rows with 6' between plants. At Everson the spacing is 9' rows with 5' between plants.

In 2004 an advancedcultivar trial on selected rootstocks was begun at Mount Vernon consisting of 3 replications, with 5 plants per replication, spaced in 8' rows with 5' between plants: Rootstocks are Millardet et de Grasset 101-14 and Couderc 3309. Cultivars are Agria, Dornfelder, Dunkelfelder, Garanoir, Leon Millot, Madeleine Angevine, Optima, Ortega, Pinot Gris [Ruhlander clone], Pinot Noir 777, Regent, Reichensteiner, Schonburger, Siegerrebe and Sylvaner, all of which have performed well at the trial sites. Additional plantings in the rootstock block include several more Pinot Noir clones and Pinot types on the rootstocks Couderc 3306 and Millardet et de Grasset 101-14.

2. Pretest

The pretest (see Appendix, **Table 2**) screens potential cultivars, to determine if they should be added to the main replicated trial, from which varietal wines can be produced for evaluation. The pretest consists of 3 plants per cultivar, replicated once. Promising grapes from the pretest will be multiplied, replicated and added to the main trial. Some promising cultivars or clones advanced to the main trial in 2004 are Optima, Ortega, Pinot Gris [Ruhlander] and Reichensteiner.

3. Rootstock Trial

The rootstock trial was downsized in 2004 from 7 rootstocks to the 3 best performing rootstocks (from data and observations 2001-2003). It now consists of Pinot

Noir 2A grafted on the 3 most promising rootstocks (C3309, 101-14 and 420A) plus a self rooted control. Each rootstock is evaluated for its effect in terms of maturity, yield, and quality compared with self rooted plants. Replications consist of five plants on each rootstock, replicated three times at the Everson plot and five times at the Mount Vernon plot (see Appendix, **Table 3**).

4. Cultural Studies

1. *Spacing* – In 2003, a vine spacing trial was initiated, consisting of replicated plots at 8' spacing between rows, with in-row spacing at 4', 6', 8' and 10' to evaluate the effect of various spacings on vine vigor, canopy management, production efficiency and overall vine balance. Cultivars included in the trial are Agria, Dornfelder, Dunkelfelder, Pinot Noir 777 and Zweigelt.
2. *Plastic row shield* – Once again in 2004 some cultural experiments were conducted in the Pinot Noir rootstock block planted in 2000. In the first trial, a 3' wide sheet of clear plastic was hung on the west side of the row in April and retained until harvest. The sheet extended 1 ½' above and 1 ½' below the lateral canes (fruiting area.) Fruit from this row was compared with the control (no plastic) to examine possible effect in advancing ripeness.
3. *Scott-Henry training system* – In 2004 a trial row was selected in the Pinot Noir rootstock block and trained in the Scott-Henry (S-H) system which trains two cane tiers, half the shoots trained upward and half downward. Fruit from this row was compared with the control row which was trained in the standard Vertical Shoot Positioning (VSP) system.
4. *Ethrel application* – To test the effect of Ethrel application in mid season as an aid in canopy management, a trial row was selected in the Pinot Noir rootstock block and material applied to the canopy area by backpack sprayer. On July 23, 2004 an application of 10 ml/gal (approx. 100gal/A) was made to the test row, applied only to the leafy canopy. On August 18 the same material was reapplied at the same concentration to both leaves and fruit clusters. Fruit from this row was compared with the control row which did not receive any Ethrel applications.
5. *Delayed fruit harvest* – On October 14, 2004 fruit samples were taken at harvest from plots in the control row of the Pinot Noir rootstock trial. In one row the fruit was left hanging and plants monitored for any disease (rot). This allowed harvest to be delayed until October 27. Comparison was made between juice samples taken at harvest in the control row with those taken in the late harvest row to see what changes occurred over time in brix, pH and titratable acid.

Results

1. Cultivar trials

Harvest data from 2004 are shown below.

Table 1. Cultivar trial, Mount Vernon (1817 AHU) – Harvest date, average pH, brix, titratable acid and fruit yield, in harvest order (W=white)

Cultivar	Harvest	avg brix	% t. acid	Yield (lbs/plant)
Burmunk (W)	9/10	18.6	0.98	4.83
Iskorka (W)	9/10	21.5	0.60	4.90
Agria	10/4	19.8	0.62	4.63
Garanoir	10/4	17.9	0.75	7.10
Regent	10/4	21.2	0.72	2.40
Sylvaner (W)	10/4	15.5	0.80	11.62
Schonburger (W)	10/4	16.2	0.75	1.81
Dunkelfelder	10/4	17.5	0.98	4.34
Zweigelt	10/4	19.5	0.95	10.98
Dornfelder	10/4	16.0	0.77	14.37
Nero	10/4	20.0	0.89	5.50
Golubok	10/14	21.8	1.05	3.06

Table 2. Cultivar trial, Everson (2075 AHU) – Harvest date, average pH, brix, titratable acid and fruit yield, in harvest order (W=white)

Cultivar	Harvest	avg brix	% t. acid	Yield (lbs/plant)
Agria	10/2	20.1	0.42	4.98
Dornfelder	10/2	17.6	0.62	6.29
Dunkelfelder	10/2	17.2	0.62	6.29
Zweigelt	10/2	17.1	0.65	6.38
Regent	10/5	21.9	0.66	2.71
Schonburger (W)	10/5	19.0	0.38	2.09
St. Laurent	10/5	18.6	0.65	3.33
Garanoir	10/5	18.1	0.42	4.17

2. Pretest

Harvest data from the pretest (3 plants/plot) 2004 are shown below.

Table 2. Pretest cultivars, Mount Vernon – Harvest date, brix, titratable acid and fruit yield (in harvest order, R = red wine cultivar)

Cultivar	Harvest	avg brix	% t. acid	Yield (lbs/plant)
Perle of Csaba	9/10	19.0	0.53	5.18
Pinot Precoce (R)	9/17	17.4	0.92	3.18
Madeleine Angevine	9/21	19.7	0.70	8.30
Ortega	9/21	20.1	0.70	5.52
Optima	9/24	17.8	0.77	6.04
Muscat [Norway] (R)	10/04	19.3	0.74	3.29
Reichensteiner	10/04	20.0	0.87	2.89
Auxerrois cl. 22 GM	10/04	18.1	0.69	5.24
Pinot Gris [Ruhlander]	10/04	18.8	0.86	4.03
Muller-Thurgau	10/04	18.1	0.71	9.10
Kerner	10/06	18.0	1.19	6.45
Regner	10/14	20.3	0.87	---
Liza	10/14	19.8	1.25	---
Rani Riesling	10/14	19.8	1.05	---
Gamay Chaudenay (R)	10/14	17.4	1.41	---
Toldi	10/14	14.0	0.88	---
I 31-67	10/14	19.6	0.67	---
Plai	10/14	18.0	1.07	---
Viorica	10/14	17.4	1.10	---
Laurot	10/14	18.1	0.97	---
Petra	10/14	20.0	1.08	---
Bianca	10/14	18.4	0.98	---
Pinot Noir 777	10/27	18.3	0.84	2.90

Mostof the cultivars and selections in the pretest produced enough fruit for evaluation in 2004, and several of them yielded enough for wine making in either single varietals or blends, when crops from Mount Vernon and Everson plots were combined. Some varieties lost most of their fruit due to the physiological disorder EBSN (see Discussion for detailed remarks.) Cultivars were evaluated for their performance, and those that did not do well were scheduled for discard.

3. Rootstock Trial

The Pinot Noir trial was harvested on October 14, 2004 and the juice analyzed with results shown below.
Table 3. Rootstock trial – Mount Vernon 10/14/04 – Average brix, pH, titratable acid, cluster size and fruit yield (in ascending order by titratable acid)

Rootstock	brix	pH	% t.a.	Cluster size (gms)	Yield (lbs/plant)
101-14	19.7 a	3.10 a	0.94 b	104	3.99
C3309	19.7 a	3.11 a	0.90 b	127	3.72
420A	20.1 a	3.13 a	0.92 b	104	4.34
self rooted	18.0 b	3.00 b	1.26 a	95	2.69*

*In 2004, empty or partial clusters may have resulted from two possible causes, 1.) competition for critical nutrients by rapidly growing shoot tips at bloom time and 2.) EBSN. Set was affected more in self rooted Pinot Noir than on rootstocks.

4. Cultural Studies

1. *Spacing* – Though some fruit was produced in these plots in 2004, it was insufficient to provide data of any significance.

2. *Plastic Row Shield* - Analysis of juice from vines with plastic shield vs. no plastic is shown below.

Table 5. Plastic shield trial 2004

Treatment	brix	pH	% t.a.	Cluster size (gms)	Yield (lbs/plant)
plastic	20.0	3.08 a	0.90	127	4.08
no plastic	19.4	3.05	0.98	118	4.88

3. *Scott-Henry Training System*
Table 6. Scott-Henry training system compared with Vertical Shoot Positioning (VSP)

Treatment	brix	pH	% t.a.	Cluster size (gms)	Yield (lbs/plant)
Scott-Henry	19.5	3.06	0.92 b	213	8.12
VSP	19.4	3.05	0.98 a	118	4.08

4. *Ethrel application*
Table 7. Ethrel application trial 2004

Treatment	brix	pH	% t.a.	Cluster size (gms)	Yield (lbs/plant)
Ethrel	20.6 a	3.18 a	0.86 b	118	4.18
untreated	19.4 b	3.05 b	0.98 a	114	4.08

5. Delayed fruit harvest – Analysis of juice from the Pinot Noir plot sampled on October 14, 2004 was compared with juice sampled on October 27, 2004. Data were averaged for all plots harvested on each date and results are shown below.
Table 8. Fruit samples 10/14/2004 and 10/27/2004

Harvest date	brix	pH	% t.a.
10/14/2004	19.4 b	3.05 a	0.98 b
10/27/2004	20.0 a	2.85 b	1.30 a

Discussion

Inthe rootstock trial, juice from Pinot Noir 2a grafted on Millardet et de Grasset 101-14, Millardet et de Grasset 420A and Couderc 2209 rootstocks had significantly lower TA levels and higher brix and pH readings than that from self rooted plants. Cluster weight varied and some differences were significant. Results from 2004 are consistent with data from previous years in showing that these 3 rootstocks are effective in advancing maturity of Pinot Noir compared to self rooted plants.

As noted above, yields of self rooted plants were most adversely affected by defective set which we believe is due to a combination of factors. Competition with shoot tip growth at bloom time for essential nutrients can result in uneven berry set. This was also seen in grafted plants but at a much lower level. The second possible factor, early bunch-stem necrosis (EBSN) is described in *The Production of Grapes & Wine in Cool Climates* (Jackson and Schuster, 1997, p. 118.) EBSN as illustrated there appears identical to the damage seen in the Mount Vernon trial plots, (**shown in photo at left**) particularly with certain varieties such as St Laurent and Dunkelfelder. Jackson writes that "EBSN causes sections of the bunch to shrivel and dry so the bunch ends up with fewer branches. EBSN is exacerbated by stress factors such as poor nutrition, drought prior to capfall, and severe shade around the bunches. Cool overcast and wet weather will also enhance the disorder." Causes of ESBN are not well understood, but in this case a deficiency of Boron at early bloom seems the most likely contributing factor.

A number of cultural experiments were carried out in the Pinot Noir trial plot in 2004. The effect of installing a plastic row shield in April was again compared to a control row of unshielded plants.The juice from plants shielded by plastic row cover showed significantly higher pH levels and also showed higher levels of brix and lower titratable acid. Due to overall warmer conditions and earlier harvest in 2004, the differences between plastic and no plastic treatment were not statistically significant (5% level) except for pH. As in previous years the plastic row shield advanced fruit maturity, but not as significantly as in 2003.

Another cultural trial involved converting one row from the standard Vertical Shoot Positioning (VSP) system to the Scott-Henry system described above. The Scott-Henry system produced nearly double the yield without any significant effect on the brix or pH. Titratable acid levels showed significant differences (0.90 for the VSP trained plants vs. 0.98 for Scott-Henry). It will be interesting to continue this comparison in a cooler year to see the effects of heavier production in the Scott-Henry on maturity and quality.

Use of Ethrel applications in July and August was tested for reduction of shoot growth. In the row given Ethrel application, juice brix and pH were significantly increased, and titratable acid reduced. A reduction in top growth of new shoots was observed in the canopy of the treated row. This suggests that use of Ethrel applications in canopy management has some potential for saving of labor and expense by reducing the amount of hedging etc. needed in the canopy.

In thetest of fruit hanging time, one row was left on the vine approximately two weeks after the standard harvest (October 14 vs October 27), and juice from those vines compared with the juice characteristics of the fruit picked earlier. Later harvest fruit had significantly higher brix and for unexplained reasons, significantly higher titratable acid and significantly lower pH levels.

Recommendations

Results of the trials to date have clearly shown that high quality wine grapes can be grown in western Washington, given careful choice of the appropriate varieties and rootstocks, and selection of a good site. After selecting a suitable area for establishing the vineyard, take soil tests and amend the soil as needed. Many soils

tend to be low in potash, magnesium and calcium. Monitor heat unit accumulation from April 1 – October 31, using an Avatel, Hobo or similar recording device.

Most of the plots in the trial produced sufficient fruit both for sample tests and for wine making. Evaluations over the past 3 years have produced new promising cultivars, along with some established standard varieties.

RED

Agria
Dornfelder
Dunkelfelder
Garanoir
Golubok
Leon Millot
Muscat of Norway
Pinot Noir (clones)
Regent
Zweigelt

WHITE

Burmunk
Iskorka
Madeleine Angevine
Optima
Ortega
Pinot Gris [Ruhlander]
Reichensteiner (blending)
Siegerrebe
Sylvaner

These recommended varieties with high potential should benefit from being grafted onto a rootstock (preferably Millardet et de Grasset 101-14, Couderc 3309 or Millardet et de Grasset 420A.) On a site with marginal heat units, it may be necessary to concentrate on the earlier varietals such as Siegerrebe and Pinot Precoce Noir. When plant material is made available, Golubok (red) and Burmunk and Iskorka (whites) should be included as well

Preliminary observations of varietals that are worth trying, particularly in warmer sites and grafted on rootstocks, include St. Laurent (red) and Auxerrois, Chardonnay 76 and Sauvignon Blanc (whites). Regent is particularly recommended for home growers who are interested in red wine making. It is very productive, with potential for making a high quality wine, and the plants show good resistance to disease. Adopting certain cultural practices can do much to enhance fruit maturity. Cluster thinning, plastic row shields, good canopy management and attention to nutrition and disease sprays, applied to an open canopy in a timely manner, all help to maximize fruit quality.

WINE LIST – The following varietal and blended wines were vinified in 2004 from fruit in the Mount Vernon and Everson trial plots:

RED

Agria
Dornfelder
Dunkelfelder
Garanoir
Golubok
Nero
Pinot Noir [clone 2A]
Pinot Precoce
Regent
Zweigelt

WHITE

Auxerrois (blend)
Burmunk
Chardonnay 76
Iskorka
Pinot Gris [Ruhlander]
Schonburger
Sylvaner

Acknowledgements

Support for this project in 2004 has been provided by the Washington State Wine Advisory Board and the Northwest center for Small Fruit Research. The help and participation of our cooperators from the Puget Sound Wine Growers and Coastal Cascadia Wine Growers in harvesting and winemaking is gratefully acknowledged.

Tom Bronkema, Wine Consultant
Tom Thornton, Cloud Mountain Farm
Lopez Island Winery – Brent Charnley
San Juan Vineyards – Kurt Niznik
Vashon Island Winery – Ron Irvine
Carpenter Creek Winery – Jeff Hammer
Pasek Cellars – Gene Pasek
Chuck Jackson, Boeing Wine Club
Steve Snyder, Woodinville Winery
Steve & Susan Oleson
Lou Hollers
Bob Tombs
Steven Mohns
Lynne Irelan
Jim Haack
Steve Wilbur
Bill Swartz
Megan Rutherford
Pete Bradley

Appendix – Cultivars/Selections and Rootstocks on trial

Table 1. Main variety evaluation 2004 (* = Everson only)

Agria	Golubok	Pinot Noir 23	Rubin Tairofsky
Auxerrois cl. 22 GM	I 55/8	Pinot Noir 115	Schonburger
Burmunk	Iskorka (54-36-33)	Pinot Noir 667	Siegerrebe
Chardonnay 76	Kerner	Pinot Noir 777	St. Laurent
Dornfelder	Leon Millot	Pinot Pommard	Sylvaner
Dunkelfelder	Madeleine Angevine	Pinot Precoce	Zweigelt
Gamaret*	Muscat of Norway	Regent	
Gamay Freaux	Nero	Reichensteiner	
Garanoir	Optima	Rondo	

Table 2. Pretest, 2004 (* = Everson only)

Aligote*	i 31-67	Muscat of Norway	Pinot Noir 115	Regner
Auxerrois cl. 22 Gm	Kerner	Optima	Pinot Noir 777	Reichensteiner
Baco 1	Lagrein*	Ortega	Pinot Pommard	Reisland
Bianca	Laurot	Perle of Csaba	Pitos	Saperavi
Chardonnay 76	Leon Millot	Petra [SK 77-5/3]	Plai	Siegerrebe
Dolcetto*	Liza [SK 77-12/6]	Phoenix	Rani Riesling	Toldi
Gamay Chaudenay	Madeleine Angevine	Pinot Gris [Ruhlander]	Red Traminer*	Viorica
Gruner Veltliner	Muller Thurgau			

Table 3. Rootstock Trial (Pinot Noir 2A)

Control–own root	Couderc 3309	Millardet et de Grasset 101-14	Millardet et de Grasset 420A

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Summary

In 2005 the weather conditions were within the normal range from the beginning of April to the end of October. Early in the year the months of January and February were unusually warm, then this period was followed by cool wet weather in April, May and June. July, August and September were warm and dry, and October was within the normal 40-year average for temperature and precipitation. Vines trained to the VSP and Scott-Henry systems had clusters exposed early, approximately 2 weeks after berry set, and suffered little or no rot at either the Mount Vernon or the Everson locations. At the Mount Vernon site 1727 Growing Degree Days (GDD) were recorded and 1867 GDD at Everson using Avatel data logging units (to October 31, 2005).

A full crop was produced from many of the trial plots at Mount Vernon and Everson. However, certain varieties sustained damage from early bunch stem necrosis (EBSN) and toward the end of the harvest there was also some loss of crop due to bird damage. In the main replicated plots, cultivars vinified in 2005 included varietal wines from both red and white wine cultivars, as well as several white wine blends. This includes the wine from the replicated Pinot Noir rootstock trial, which was also used for cultural studies.

After seeing results of the rootstock trials in 2002 and 2003, new planting in 2004 included additions to the pretest and an advanced (replicated) cultivar trial grafted to one of the 3 promising rootstocks. This trial includes standards like Madeleine Angevine, Siegerrebe and several Pinot Noir clones, along with promising cultivars from the pretest and main trial. Most of these were planted in spring 2004, but were moved in fall 2004 and should begin fruiting in 2006, and data will be collected if funding is maintained. Aim of this trial is to see whether the rootstock effects observed in Pinot Noir 2A will also carry over to other varieties. A spacing trial including several of the promising cultivars grafted onto two different rootstocks was also established and preliminary harvest data from the trial is anticipated in 2006.

Collecting and analyzing harvest data and producing wines for evaluation continued in 2005. Cooperation of area winemakers is engaged in the post-harvest evaluation of varieties suitable for wine production (see Discussion & Recommendations, below.) Evaluation of previous vintages of 2003 and 2004 is continuing, and the 2005 wine crop is in process of vinification.

Methods

Data collection in this trial consists primarily of weekly sampling of fruit as harvest season approaches, and laboratory analysis of the juice to determine brix, pH and titratable acid. Berry sampling is done by taking 10 berries from each plant for a sample of 50 berries from each 5-plant replicated plot in the rootstock and cultivar trials. Each plot is replicated 3 times. (In the pretest plots with only 3 plants per cultivar, berry samples are collected from all 3 plants.) At harvest, yield of the plot is weighed and juice samples are collected for analysis as the grapes are being crushed.

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1. Cultivar Trials

The trial initiated in 2000 presently consists of about 25 cultivars, selections, and clones with predominant emphasis on red wine production (see Appendix, **Table 1**). Plot design is a randomized block of 3 replications, with 5 plants per replication. At the Mount Vernon site, row spacing is 10' rows with 6' between plants. At Everson the spacing is 9' rows with 5' between plants, and 10 cultivars are included in the replicated trial.

In 2004 an advanced cultivar trial on selected rootstocks was begun at Mount Vernon consisting of 3 replications, with 5 plants per replication, spaced in 8' rows with 5' between plants: Rootstocks are Millardet et de Grasset 101-14 and Coudrec 3309. Cultivars are Agria, Dornfelder, Dunkelfelder, Garanoir, Leon Millot, Madeleine Angevine, Optima, Ortega, Pinot Gris [Ruhlander clone], Pinot Noir 777, Regent, Reichensteiner, Schonburger, Siegerrebe and Sylvaner, all of which have performed well at the trial sites. Additional plantings in the rootstock block include several more Pinot Noir clones and Pinot types on the rootstocks Coudrec 3309 and Millardet et de Grasset 101-14.

2. Pretest

The pretest (see Appendix, **Table 2**) screens potential cultivars, to determine if they should be added to the main replicated trial, from which varietal wines can be produced for evaluation. The pretest consists of 3 plants per cultivar, replicated once. Promising grapes from the pretest will be multiplied, replicated and added to the main trial.

3. Rootstock Trial

The rootstock trial was downsized in 2004 from 7 rootstocks to the 3 best performing rootstocks (from data and observations 2001-2003). It now consists of Pinot Noir 2A grafted on the 3 most promising rootstocks (Coudrec 3309, Millardet et de Grasset 420A and Millardet et de Grasset 101-14) plus a self rooted control. Each rootstock is evaluated for its effect in terms of maturity, yield, and quality compared with self rooted plants. Replications consist of five plants on each rootstock, replicated three times at the Everson plot and five times at the Mount Vernon plot (see Appendix, **Table 3**).

4. Cultural Studies

1. *Spacing* – In 2004, a vine spacing trial was initiated, consisting of replicated plots at 8' spacing between rows, with in-row spacing at 4', 6', 8' and 10' to evaluate the effect of various spacings on vine vigor, canopy management, production efficiency and overall vine balance. This planting was relocated in the fall of 2004. Cultivars included in the trial are Agria, Dornfelder, Dunkelfelder, Pinot Noir 777 and Zweigelt.
2. *Scott-Henry training system* – In 2004 a trial row was selected in the Pinot Noir rootstock block and trained in the Scott-Henry (S-H) system. This training system was maintained in 2005 but cordons were used instead of cane pruning in order to maintain vigor in the lower section of the vine. This spur pruned Scott-Henry system is sometimes referred to as "Smart-Dyson." Fruit from this row was compared with the control row which was trained in the standard Vertical Shoot Positioning (VSP) system.
3. *Ethrel application* – To test the effect of Ethrel application in mid season as an aid in canopy management, a trial row was selected in the Pinot Noir rootstock block and material applied to the canopy area by backpack sprayer. On July 13, 2005 an application of 300 ppm (approx. 100gal/A) was made to the test row, applied only to the leafy canopy. This row was compared with the control row which did not receive any Ethrel applications.

Results

1. Cultivar trials

Harvestdates are based on laboratory analysis of juice samples collected as described in Methods, (above.) Some variation has been noted between the results of analysis from pre-harvest juice samples and the juice samples collected and analyzed as the grapes are being crushed. (See Table 7, below, for an example.)

Table 1. Cultivar trial, Mount Vernon - Harvest date, average brix, pH and percent titratable acid, in harvest order (W=white)

Cultivar	Harvest	avg brix	pH	% t. acid
Schonburger (W)	Sept 22	17.2	2.88	0.71
Burmunk (W)	Sept 22	19.3	3.19	0.73
Iskorka (W)	Sept 22	20.8	3.05	0.86
Pinot Noir Precoce	Sept 29	21.3	3.31	0.81
Agria	Sept 29	20.0	3.39	0.95
Rondo	Oct 5	20.8	3.29	1.02
Garanoir	Oct 11	19.1	3.65	0.63
Zweigelt	Oct 11	21.1	3.58	0.81
Dornfelder	Oct 11	18.0	3.58	0.90
Auxerrois cl. 22 (W)	Oct 11	18.0	3.57	0.92
Sylvaner (W)	Oct 11	16.0	3.52	0.98
Regent	Oct 11	22.6	3.69	1.07
Golubok	Oct 11	21.0	3.65	1.31

Table 2. Cultivar trial, Everson - Harvest date, average brix, pH and percent titratable acid, in harvest order (W=white)

Cultivar	Harvest	avg brix	pH	% t. acid
Schonburger (W)	Sept 22	20.0	3.15	0.75
Agria	Sept 30	20.0	3.28	0.63
Garanoir	Oct 11	20.0	3.32	0.59
Dunkelfelder	Oct 11	19.1	3.21	0.86
Regent	Oct 11	22.4	3.32	0.78
St. Laurent	Oct 11	20.0	3.09	0.85
Zweigelt	Oct 11	19.0	3.09	0.83
Dornfelder	Oct 11	18.0	3.11	0.87
Gamaret	Oct 11	18.6	2.93	1.04
Kerner (W)	Oct 11	20.0	2.83	1.31

2. Pretest

Harvest data from the pretest (3 plants/plot) 2005 are shown below.

Table 3. Pretest cultivars, Mount Vernon – Harvest date, brix and titratable acid (in harvest order, R = red wine cultivar)

Cultivar	Harvest	avg brix	pH	% t. acid
Siegerrebe	Sept 22	22.6	3.62	0.54
Ortega	Sept 22	21.0	3.20	0.89
Optima	Sept 30	16.6	3.17	1.02
Madeleine Angevine	Sept 30	19.1	3.39	0.77

Muscat of Norway (R)	Sept 30	17.6	3.24	0.71
Leon Millot (R)	Oct 11	18.7	3.75	0.74
Pinot Noir 115 (R)	Oct 11	19.8	3.71	0.80
Reichensteiner	Oct 11	22.0	3.67	0.86
Pinot Noir 777 (R)	Oct 11	19.8	3.68	0.93
Pinot Gris [Ruhlander]	Oct 11	20.2	3.53	0.98
Muller-Thurgau	Oct 11	18.6	3.42	0.99
Pinot Pommard/Riparia (R)	Oct 11	18.1	3.61	1.17
Chardonnay 76	Oct 11	18.8	3.52	1.19
Plai (R)	Oct 11	17.6	3.57	1.25
Kerner	Oct 11	19.0	3.41	1.58

Table 4. Pretest cultivars, Everson – Harvest date, brix and titratable acid (in harvest order, R = red wine cultivar)

Cultivar	Harvest	avg brix	pH	% t. acid
Siegerrebe	Sept 22	23.6	3.47	0.49
Ortega	Sept 22	22.2	3.50	0.78
Optima	Sept 30	20.0	2.96	0.88
Madeleine Angevine	Sept 30	20.7	3.02	0.78
Leon Millot (R)	Oct 11	19.1	3.39	0.74
Reichensteiner	Oct 11	21.2	3.12	0.80
Muller-Thurgau	Oct 11	18.8	3.06	0.86
Red Traminer	Oct 11	22.6	3.30	0.92
Sylvaner	Oct 11	17.6	3.06	0.92
Dolcetto (R)	Oct 11	18.6	3.10	0.95
Pinot Gris [Ruhlander]	Oct 11	21.8	3.16	0.96
Chardonnay 76	Oct 11	21.2	3.06	1.07
Aligote	Oct 11	15.6	3.02	1.07
Gamay Beaujolais (R)	Oct 11	16.2	3.00	1.17
Gamay Rouge (R)	Oct 11	17.0	3.04	1.21
Lagrein (R)	Oct 11	16.0	2.97	1.41
Baco 1 (R)	Oct 11	21.8	2.75	1.68

Most of the cultivars and selections in the pretest produced enough fruit for evaluation in 2004, and several of them yielded enough for wine making in either single varietals or blends, when crops from Mount Vernon and Everson plots were combined. Some varieties lost most of their fruit due to the physiological disorder EBSN (see Discussion for detailed remarks.) Cultivars were evaluated for their performance, and those that did not do well were scheduled for discard.

3. Rootstock Trial

The Pinot Noir trial was harvested on October 11, 2005. Juice samples were taken and analyzed with results shown below.
Table 5. Rootstock trial – Mount Vernon 10/11/05 – Average brix, pH and, titratable acid (in ascending order by titratable acid)

Rootstock	brix	pH	% t.a.
420A	20.0 a	3.64 a	0.94 c
101-14	18.7 a	3.55 ab	1.10 cb
C3309	18.9 a	3.53 ab	1.18 b
self rooted	18.6 a	3.45 b	1.42 a

Table 6. Rootstock trial - Everson 10/11/05 – Average brix, pH and, titratable acid (in ascending order by titratable acid)

Rootstock	brix	pH	% t.a.
101-14	19.5 a	3.16 a	0.87 a
420A	19.9 a	3.13 a	0.92 a
C3309	19.9 a	3.09 a	1.00 a
self rooted	19.7 a	3.04 a	1.07 a

Table 7. Comparison of average brix, pH and, titratable acid for Pinot Noir 2A pre-harvest test (all plots averaged) with juice tested at harvest pressing

Juice test	brix	pH	% t.a.
Mount Vernon – pre harvest average	19.1	3.55	1.11
Mount Vernon – juice pressed	20.6	3.04	1.13
Everson – pre harvest average	19.8	3.11	0.96
Everson – juice pressed	20.8	3.60	0.99

4. Cultural Studies

1. *Spacing* – Though some fruit was produced in these plots in 2005, it was insufficient to provide data of any significance.

2. *Scott-Henry Training System* - Comparison of pre-harvest juice tests between the row trained to the Scott-Henry system and the adjacent row trained to a VSP system showed no significant differences in brix, pH or percent titratable acid.

3. *Ethrel applicaton* – Ethrel applications were made in July and August and observations taken of the subsequent vine growth to compare treated and untreated rows. Due to lack of funds for data collection, no direct measurement (e.g. pruning weights) was taken. Observation indicated, however, that there was a visible reduction in shoot development in treated versus non-treated plants.

Discussion

In the In the rootstock trial at Mount Vernon, juice samples from Pinot Noir 2a grafted on Millardet et de Grasset 101-14, Millardet et de Grasset 420A and Coudrec 3309 rootstocks had significantly lower TA levels than samples from self rooted plants. Values for pH showed a significant difference between the plants grafted to 420A and self-rooted plants, though differences in pH were not significant for 101-14 and C3309. Differences in brix were not statistically significant though tending to indicate higher brix in the grafted plants than the self-rooted plants. Overall the results from 2005 are consistent with data from previous years in showing that these 3 rootstocks are effective in advancing maturity of Pinot Noir compared to self rooted plants.

Data from the Everson rootstock trial indicated the same trend as in Mount Vernon but did not reach levels of statistical significance. Since Everson is a warmer site than Mount Vernon, the data suggest that selection and use of specific rootstocks to advance fruit maturity is more crucial in sites where heat levels are marginal.

Comparison of the average values from pre-harvest fruit samples with values for juice tested at pressing (Table 7, above) shows that pre-harvest test samples under-reported the brix compared with the juice analyzed from the harvest pressing, in both the Mount Vernon and Everson samples. Values for titratable acid were also somewhat under-reported.

Cultural experiments carried out in the Pinot Noir trial plot in 2005 included evaluation of one row converted from the standard Vertical Shoot Positioning (VSP) system to the Scott-Henry system described above. No significant differences in juice composition were seen in 2005 (data not shown) and any difference in yield could not be quantified due to bird damage in some plot areas.

Use of Ethrel applications in July was also tested for its effect on reduction of shoot growth. A reduction in top growth of new shoots was observed in the canopy of the treated rows. This suggests that use of Ethrel applications in canopy management has some potential for saving of labor and expense by reducing the amount of hedging etc. needed in the canopy. A second application at veraison may advance fruit maturity, an effect that has been observed with its use in other countries, e.g. New Zealand.

Cultural trials involving variationsin vine spacing have not yet begun fruiting so no data was available from that portion of the trial.

Recommendations

Results of the trials to date have clearly shown that high quality wine grapes can be grown in western Washington, given careful choice of the appropriate varieties and rootstocks, and selection of a good site. For more information and detailed recommendations on culture and suitable varieties, see EB2001, Growing Wine Grapes in Maritime Western Washington, December 2005.

Acknowledgements

Support for this project in 2005 has been provided by the Northwest Center for Small Fruit Research. The help and participation of cooperators and volunteers in harvesting and winemaking is gratefully acknowledged.

Appendix – Cultivars/Selections and Rootstocks on trial

Table 1. Main variety evaluation 2005 (* = Mount Vernon only, ** = Everson only)

Agria	Garanoir	Pinot Noir 23	Rondo*
Auxerrois cl. 22 GM*	Golubok*	Pinot Noir 115	Schonburger
Burmunk*	Iskorka (54-36-33)*	Pinot Noir 667	St. Laurent
Chardonnay 76*	Kerner	Pinot Noir 777	Sylvaner*
Dornfelder	Muscat of Norway*	Pinot Pommard*	Zweigelt
Dunkelfelder	Nero*	Pinot Noir Precoce*	
Gamaret**	Optima*	Regent	

Table 2. Pretest, 2005 (* = Mount Vernon only, ** = Everson only)

Aligote**	Gruner Veltliner	Malbec**	Pinot Noir 777**	Reisland
Auxerrois cl. 22 Gm**	i 31-67*	Muller Thurgau	Pinot Noir Dijon 113*	Rubin Tairofsky*
Baco 1**	Kerner**	Optima	Pinot Noir Precoce**	Saperavi
Bianca*	Lagrein**	Ortega	Pitos	Sauvignon Blanc 01
Chardonnay 76**	Laurot*	Perle of Csaba	Plai*	Sauvignon Blanc Musque
Dolcetto**	Leon Millot	Petra [SK 77-5/3]*	Rani Riesling*	Siegerrebe
Gamay Chaudenay*	Liza [SK 77-12/6]*	Phoenix	Red Traminer*	Sylvaner**
Gamay Freaux*	Madeleine Angevine	Pinot Gris [Ruhlander]	Regner*	
Gamay Rouge*	Madeleine Sylvaner*	Pinot Noir 115**	Reichensteiner	

Table 3. Rootstock Trial (Pinot Noir 2A)

Control - own root	Couderc 3309	Millardet et de Grasset 101-14	Millardet et de Grasset 420A

Supplemental Pinot Noir clones (3 replications each, planted 2004)

Pinot Pommard/Coudrec 3309	Pinot Noir Precoce/Millardet et de Grasset 101-14	Pinot Noir 777/Millardet et de Grasset 101-14
Pinot Noir Precoce/Coudrec 3309	Pinot Noir 23/Millardet et de Grasset 101-14	Pinot Noir 115/Millardet et de Grasset 101-14
	Pinot Noir 667/Millardet et de Grasset 101-14	

Table 4. Replicated Spacing Trial (spacing between plants at 4', 6', 8', 10')

Dornfelder/Coudrec 3309	Dunkelfelder/Millardet et de Grasset 101-14	Zweigelt/Couderc 3309
Dunkelfelder/Coudrec 3309	Agria/Millardet et de Grasset 101-14	Zweigelt/Millardet et de Grasset 101-14
Agria/Coudrec 3309	Pinot Noir 777/Coudrec 3309	

Table 5. Replicated Variety & Rootstock Trial (Rootstocks Coudrec 3309 and Millardet et de Grasset 101-14)

Garanoir	Ortega	Schonburger
Leon Millot	Pinot Gris [Ruhlander]	Siegerrebe
Madeleine Angevine	Regent	Sylvaner
Optima	Reichensteiner	

Annual Report 2007

Evaluation of Wine Grape Cultivars and Selections for a Cool Maritime Climate

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Summary

In 2007 the Growing Degree Days (GDD) at WSU Mount Vernon NWREC were recorded at 1499, below the average range [compared to1600 in 2006, 1727 in 2005 and 1817 in 2004]. At Everson 1684 GDD were recorded [compared to 1948 in 2006, 1867 in 2005 and 2075 in 2004] using Avatel data logging units.

Trial results to date support the proposition that high quality wine grapes can be grown in western Washington even at some of the coolest sites, provided that a careful choice of the appropriate cultivars and rootstocks is made for each site. In the coolest areas (1600 GDD and below), red cultivars such as Pinot Noir Precoce and Agria have ripened and produced good wines. Other early red cultivars that look promising include Garanoir, Rondo and Zweigelt. When grown on rootstocks, juice analysis has shown brix and acid values well in the range for successful wine making. An interesting new wine is being made for the first time from the early red variety Muscat of Norway. Good early ripening white cultivars are Sigerrebe, Burmunk, and Madeleine Angevine when grafted onto rootstocks. Preliminary results also show Ortega ripening at low heat unit levels.

In mesoclimates with 1600-1900 GDD, in addition to the earliest ripening cultivars noted above, Iskorka, Pinot Gris (Ruhlander, cl. 146), Auxerrois, and Optima are promising whites. Among the reds, Regent (for organic growers), St. Laurent (on rootstocks), Zweigelt, Agria, and several early Pinot Noir clones should be considered. On warmer sites in the Puget Sound region (above 1900 GDD) Gruner Veltliner, Pinot Gris and Sauvignon Blanc look promising, as well as Dolcetto, all Pinot Noir clones and Dornfelder among the reds.

Methods

Data collection as harvest season approaches consists of sampling of fruit for laboratory analysis of the juice to determine brix, pH and titratable acid. Berry sampling is done by taking berries from clusters on each plant for a sample of 30 berries. At harvest, yield of the plot is weighed and juice samples are collected for analysis as the grapes are being crushed.

Trial categories

1. Cultivar Trials

The trial initiated in 2000 presently consists of 23 cultivars, selections, and clones with emphasis on red wine production (see Appendix, Table 1). Plot design is a randomized block of 3 replications, with 5 plants per replication.

In 2004 an advanced cultivar trial on selected rootstocks was begun at WSU Mount Vernon NWREC consisting of 3 replications, with 5 plants per replication: Rootstocks are Millardet et de Grasset 101-14 and Couderc 3309. Cultivars are Garanoir, Madeleine Angevine, Optima, Ortega, Pinot Gris [Ruhlander clone], Pinot Gris clone 146, Regent, Schonburger, Siegerrebe and Sylvaner. Aim of this trial is to see if the rootstocks already tested with Pinot Noir 2A will enhance the ripening of other cultivars.

2. Cultivar screening

Certain selected cultivars are screened to determine if they should be added to the main replicated trial. Most of the plants are self rooted and some are grafted on selected rootstocks where available. The pretest consists of 3 plants per cultivar, non-replicated.

3. Rootstock Trial

The rootstock trial was downsized in 2004 from 7 rootstocks to the 3 best performing rootstocks (from data and observations 2001-2003). It now consists of Pinot Noir 2A grafted on Couderc 3309, Millardet et de Grasset 420A and Millardet et de Grasset 101-14 plus a self rooted control. Replications consist of five plants on each rootstock, replicated five times at the WSU Mount Vernon NWREC plot, with the exception of the self rooted control at WSU Mount Vernon NWREC which is replicated only 3 times.

4. Cultural Studies

1. *Spacing* – In 2004, a vine spacing trial was initiated, consisting of replicated plots at 8' spacing between rows, with in-row spacing at 4', 6', 8' and 10' to evaluate the effect of various spacings on vine vigor, canopy management, production efficiency and overall vine balance. Cultivars included in the trial are Agria, Dornfelder, Pinot Noir 777 and Zweigelt. Vines are grafted on rootstocks Couderc 3309 and Millardet et de Grasset 101-14.
2. *Smart-Dyson training system* – In 2004 a trial row was selected in the Pinot Noir rootstock block and trained in the Scott-Henry system. This training system was revised in 2005, with cordons used instead of cane pruning in order to maintain vigor in the lower section of the vine. This spur pruned variant of the Scott-Henry system is referred to as “Smart-Dyson.” The pruning system has been continued in 2006 and 2007. The row was compared with a control row which was trained in the standard Vertical Shoot Positioning (VSP) system.

Results

1. Cultivar trials

Data from 2007 are shown below. Only certain cultivars were harvested for wine making, due to budget considerations. Data from the trial at Everson was not collected, since cold damage to the vines occurred in several plots.

Table 1. Cultivar trial, WSU Mount Vernon NWREC – Sample date, average brix, pH, and titratable acid, (W=white)

Cv.	Test Date	Brix	pH	% T.A.
Siegerrebe (W)	25 Sept	18.8	3.48	0.47
Madeline Angevine (W)	27 Sept	17.2	3.08	0.83
Burmunk (W)	27 Sept	21.4	3.09	0.85
Pinot Noir Precoce /3309	5 Oct	20.6	3.39	0.60
Pinot Noir Precoce /101-14	5 Oct	20.4	3.39	0.66
Schonburger (W)	9 Oct	18.8	3.48	0.60
Pinot Noir Precoce / self	13 Oct	20.8	3.53	0.69
Agria / rootstock	13 Oct	18.4	3.63	0.66
Ortega (W)	24 Oct	20.6	3.15	0.81
Optima (W)	24 Oct	20.2	2.99	0.99
Auxerrois cl. 22 (W)	24 Oct	17.6	3.02	0.83
Iskorka (W)	24 Oct	20.6	2.98	0.99
Sylvaner (W)	24 Oct	16.6	2.92	1.07
Pinot Gris [Ruhlander] (W)	24 Oct	20.6	2.93	1.13
Kerner (W)	24 Oct	20.4	2.82	1.56
Dornfelder	26 Oct	14.4	3.06	0.80
Zweigelt	26 Oct	18.2	3.02	0.83
Muscat of Norway	26 Oct	19.0	3.06	0.84
Pinot Noir 777	26 Oct	19.8	3.12	1.08
St. Laurent	26 Oct	18.2	3.07	1.14
Rondo	26 Oct	19.4	3.12	1.17

In the variety/rootstock trial, a measured 15 foot row length was harvested from each of 4 cultivars grafted to Couderc 3309 rootstock, which had a heavier set. The fruit was weighed to determine yield, and juice samples taken at crushing were analyzed to determine wine making parameters.

Table 2. Cultivar and rootstock trial, WSU Mount Vernon NWREC – average brix, pH, titratable acid, and yield.

Cultivar	brix	pH	T. Acid	Yield (lbs/plot)*	Yield (T/A)
Dornfelder	14.4	3.06	0.8	70.0	12.7
Zweigelt	18.2	3.02	0.83	72.4	13.0
Agria	19.0	3.19	0.94	30.8	5.6
Pinot Noir 777	20.2	3.42	0.98	19.1	3.5

*(15 ft.measured row length)

3. Rootstock Trial

The trial of Pinot Noir clone 2a on various rootstocks was harvested on October 25, 2007. Juice samples were taken and analyzed at that time.

Table 3. Pinot Noir clone 2A grafted to selected rootstocks, WSU Mount Vernon NWREC – average brix, pH, titratable acid, and yield

Rootstock	brix	pH	T. Acid	Yield (lbs/plot)	Yield (T/A)*
101-14	18.9	3.03	1.22	17.3	1.6
420A	18.5	3.04	1.22	32.1	2.9
C3309	18.8	3.02	1.27	29.6	2.7
Self rooted	18.1	2.94	1.51	24.7	2.2

*based on 8 ft. x 6 ft. spacing

4. Cultural Studies

1. *Spacing* – Data not collected.

2. *Smart-Dyson training system* – Yield from the plots trained to the Smart-Dyson system was notably higher (50.6%) compared the standard VSP training system. Average yield per plot in the Smart-Dyson row was 43.6 lbs./plot compared to 20.4 lbs/plot for the adjacent row pruned in the VSP method. Juice samples from the Smart-Dyson plots were not collected.

Discussion

Evaluations of the wines produced from 2002–2006, and including the current 2007 harvest, have shown a number of promising cultivars suited for commercial production. For mesoclimates in the higher heat ranges of maritme western Washington, the number of cultivars available for selection increases. Based on the results of the trial to date, a number of new vineyards are being established in the Puget Sound region. New acquisitions continue to be added to the pretest to increase the varietal selections available in each mesoclimate. In addition, cultural practices are also being tested that have potential to improve the efficiency and reduce the cost of vineyard management, as well as promote wine quality.

Comparison of yields from 15 feet of measured row length from vines of the same planting year (Table 2) gives an indication of the potential production from some of the newer recommended cultivars. Crop load adjusted earlier in the season should increase fruit quality, and needs further study.

In the Pinot Noir rootstock trial, results showed that the values for titratable acid in all the Pinot Noir 2A plots were unacceptable for general wine making, due to the cold year with very low recorded heat levels. However, the crop was still acceptable for producing sparkling wine, which is being done in cooperation with a local wine maker. The difference between the self rooted plants and those grafted to rootstocks remained clearly evident in the significantly lower titratable acid of the grafted plants compared to the own rooted plants (Table 3). This emphasizes the importance of selecting the earlier ripening Pinot Noir clones for cooler sites.

Recommendations

Results of the trials to date have clearly shown that high quality wine grapes can be grown in western Washington, given careful choice of the appropriate cultivars and rootstocks, matched to a specific site. Certain rootstocks enhance ripening so that some cultivars when grafted on these rootstocks can potentially ripen at lower GDD levels than own-rooted plants of the same variety. Based on current trials, the variety guidelines for planting have been updated (Table 4). We are still studying the effects of these rootstocks on the different cultivars, so keep in mind that the information below is a guideline not a rule. Cultivars grafted on rootstocks can sometimes mature successfully in areas with lower GDD depending on the specific variety and rootstocks, soil conditions and other factors.

Table 4. Variety guidelines according to Growing Degree Days[1]
(W=white wine variety, R=red wine variety)

Under 1600 GDD	1600–1900 GDD	Above 1900 GDD
Pinot Noir Precoce (R) Garanoir (R) Leon Millot (R) Muscat of Norway (R) Siegerrebe (W) *When available*: Rondo (R) Burmunk (W)	Pinot Noir cl. 667 (R) Pinot Noir cl. 777 (R) Pinot Noir cl. 115 (R) Agria (R) Regent (R) Zwiegelt (R) Marechal Foch (R) St. Laurent (R) Pinot Gris [Ruhlander] (W) Madeleine Angevine (W) Muller-Thurgau (W) Iskorka (W) Ortega (W) Optima (W) Sylvaner (W) Auxerrois Blanc (W) *When available*: Golubok (R) *Also everything in left column*	Pinot Noir [all clones] (R) Dornfelder (R) Dunkelfelder (R) Gamaret (R) Dolcetto (R) Chardonnay cl. 76 (W) Sauvignon Blanc (W) Kerner [Kernling] (W) Red Traminer (W) Gruner Veltliner (W) *Also everything in left columns*

[1]Revised from Bulletin EB 2001, Growing Wine Grapes in Maritime Western Washington, Moulton and King, 2005.

At the coolest sites be careful in choosing which cultivars to plant to achieve consistent ripening. Remember that grafting vines to an appropriate rootstock will increase the chances of ripening a specific variety.

In some of the coolest sites, such as WSU Mount Vernon NWREC (1600 GDD and below), several cultivars have produced very good wines with unique qualities. **Pinot Noir Precoce** has performed very well in these conditions even with own-rooted plants. Grafting this variety to a rootstock such as Millardet et de Grasset 101-14 or Couderc 3309, which have been shown to promote earlier ripening in the WSU Mount Vernon NWREC trials, will expand its possibilities even further. **Leon Millot** is an early red variety that has potential for organic production due to its good disease resistance. **Auxerrois** on rootstock performed well in 2007; although the brix was relatively low, acids were also low, suggesting that a good quality wine can be produced even in these cool seasons.

In the intermediate sites from 1600–1900 GDD **Agria**, a *teinturier* red variety with distinctive berry flavored juice, is productive and also adapts to the coolest sites when grafted on selected rootstocks. **Regent** has good disease resistance, which suggests its use in organic plantings.

On warmer sites in the Puget Sound region (above 1900 GDD) several cultivars have stood out in the current trials. In addition to earlier cultivars listed above, **Gruner Veltliner**, **Kerner**, and certain clones of **Sauvignon Blanc** (white) have performed very well and should be considered as future possibilities. Included among the red wine cultivars for warmer sites are all **Pinot Noir** clones, **Dolcetto**, and **Dornfelder**.

For more information and detailed recommendations on culture and suitable cultivars, see EB2001, Growing Wine Grapes in Maritime Western Washington, December 2005.

Acknowledgements

Support for this project in 2007 has been provided by the Northwest Agricultural Research Foundation and the Washington Wine Advisory Board. The help and participation of cooperators and volunteers in harvesting and winemaking is gratefully acknowledged.

Appendix – Cultivars/Selections and Rootstocks on trial

Table 1. Main variety evaluation 2007 (3 replications)
* = Mount Vernon only, ** = Everson only

Agria	Garanoir	Pinot Noir 23	Regent
Auxerrois cl 22Gm*	Golubok*	Pinot Noir 115	Rondo*
Burmunk*	Iskorka*	Pinot Noir 667	Schonberger
Chardonnay 76*	Kerner	Pinot Noir 777	Sylvaner*
Dornfelder	Muscat of Norway*	Pinot Noir Precoce*	Zweigelt
Gamaret**	Optima*	Pinot Pommard*	

Table 2. Pretest, 2007 (3 plants per cultivar, self rooted except as noted, non-replicated)
* = Mount Vernon only, ** = Everson only

Aligote** Auxerrois cl. 22	Leon Millot**	Plai*
Auxerrois / Riparia	Madeleine Angevine	Red Traminer
Chardonnay 76 / 101-14	Malbec**	Red Traminer / 3309
Dolcetto**	Muller Thurgau	Red Traminer / 5B
Gamaret	Muscat of Norway	Regner*
Goesji Zumalos / 3309	Optima	Reisland / 101-14
Gruner Veltliner / 101-14	Ortega	Riesling Muscat / 3309
Heroldrebe / 3309	Perle of Csaba	Sauvignon Blanc 01 / 420A
Italian Merlot / 3309	Phoenix	Sauvingnon Blanc Musque / 3309
Kekoyelve	Pinot Gris [Ruhlander]	Siegerrebe
Kerner	Pinot Noir 115 / Riparia	Siewiernyl / 330Malbec**
Kerner / 101-14	Pinot Noir 777 / 44-53M Pinot Pommard / Riparia	
Lagrein**Aligote**	Pitos	

Table 3. Pinot Noir Rootstock Trial (5 replications, control 3 replications, planted 2000)

Pinot Noir 2A self rooted (control) Pinot Noir 2A/Couderc 3309

Pinot Noir 2A/Millardet et de Grasset 101-14 Pinot Noir 2A/Millardet et de Grasset 420A

SUPPLEMENTAL PINOT NOIR CLONES (3 replications each, planted 2004)

Pinot Pommard/Couderc 3309
Pinot Noir Precoce/Couderc 3309
Pinot Noir Precoce
/Millardet et de Grasset 101-14
Pinot Noir 23/Millardet et de Grasset 101-14

Pinot Noir 667/Millardet et de Grasset 101-14
Pinot Noir 115/Millardet et de Grasset 101-14
Pinot Noir 777/Millardet et de Grasset 101-14

Table 4. Replicated Spacing Trial (spacing between plants at 4', 6', 8', 10')

Agria/Couderc 3309
Agria/ Millardet et de Grasset 101-14
Dornfelder/Couderc 3309

Pinot Noir 777/Couderc 3309
Zweigelt/Couderc 3309
Zweigelt/ Millardet et de Grasset 101-14

Table 5. Variety & Rootstock Trial (3 replications, rootstocks Couderc 3309 and Millardet et de Grasset 101-14)

Garanoir
Madeleine Angevine
Optima Ortega

Pinot Gris [Ruhlander]
Pinot Gris #146 Regent

Schoenburger
Siegerrebe Sylvaner