

## Grape Varieties for the Upper Midwest

Bruce Bordelon  
Department of Horticulture and Landscape Architecture  
Purdue University

Selection of the proper variety is a major factor for successful grape production in the Midwest. Properly matching the variety to the climate of the vineyard site is necessary for consistent production of high quality grapes. Grape varieties fall into one of three groups: American, French-American hybrids, and European. Within each group are types suited for juice, wine, or fresh consumption. American and French-American hybrid varieties are suitable for production in most parts of the Midwest. The European, or *vinifera* varieties, generally lack the necessary cold hardiness to be successfully grown except on the very best sites.

In the upper Midwest, only the most cold hardy hybrids are generally suitable. This is particularly true in USDA Plant Hardiness zone 4 and in many cases zone 5a. Zone 5a can expect  $-15\text{ }^{\circ}\text{F}$  to  $-20\text{ }^{\circ}\text{F}$  minimum winter temperatures each year and zone 4b can expect  $-20\text{ }^{\circ}\text{F}$  to  $-25\text{ }^{\circ}\text{F}$  each year. Temperatures below  $-15\text{ }^{\circ}\text{F}$  can be expected to cause significant winter injury on almost all except the hardiest grape varieties.

### Leading American Varieties

**Concord** is grown on a greater variety of soils and under a wider range of climatic conditions than any other variety of American grape. Its vine is vigorous and productive, ripening in mid to late September in central Indiana. Concord's versatility gives it a large market potential. It is the most important variety for sweet juice, jelly, and preserves, and it is also used in quantity for wine production and fresh market sales.

Concord produces medium-sized clusters bearing large, blue-black berries. It is typical of the American *V. labrusca*-derived grapes in having a tough skin that separates readily from the pulpy flesh (slipskin). The pronounced fruity, "labrusca", or American flavor of Concord makes it a desirable dessert grape. Skin cracking and excessive postharvest shelling, however, as well as the presence of seeds, limit its use for this purpose.

**Catawba**, developed in the early 1800s, is a spicy-flavored, slipskin grape with a pronounced labrusca flavor and aroma. The vines are vigorous, hardy, and productive, but the foliage is somewhat more susceptible to fungal diseases than that of Concord (Table 1). Catawba also experiences foliar injury where ozone pollution occurs. It ripens a little later than Concord. This

grape is used primarily in white or pink dessert wines, but it is also used for juice production and fresh market sales. This grape was widely grown in the Cincinnati area during the mid-1800s.

**Niagara** is a floral, strongly labrusca flavored white grape used for juice, wine, and fresh consumption. It ranks below Concord in cold hardiness and ripens somewhat earlier. On favorable sites, yields can equal or surpass those of Concord. Acidity is lower than for most other American varieties.

### **Other American Varieties**

**Delaware** is an early-ripening red variety with small berries, small clusters, and a mild American flavor. Rain during harvest season may cause the tender skins to crack. Delaware requires a deep, fertile, well-drained soil for satisfactory vine growth; on such soils, with good management, its yields may be as high as those of Concord. On all but the most favorable soils, Delaware should be grafted on a phylloxera-resistant rootstock to enhance vigor. Delaware is very sensitive to drift of 2,4-D and related herbicides which may limit its production in the Midwest. Once prized for champagne production in New York, Delaware is now being replaced by several interspecific hybrid and vinifera varieties. It remains, however, one of the highest quality American varieties for wine.

**Steuben** is a reddish-black grape that produces long, tapering, compact clusters that are among the most attractive of all fresh market cultivars. The flavor is sweet with a spicy tang. The vines are hardy, vigorous, productive, disease resistant, and easily grown by home gardeners. Cluster thinning is usually required until the vines are well established. Steuben is grown commercially for wine production by a few wineries in the Midwest and is used to make a blush or rose' wine.

**Fredonia** is a red-black grape that ripens about two weeks before Concord. It is used for juice, wine, and fresh eating. It makes a rose' style wine that is very popular. Its early ripening might be an advantage in areas with short growing seasons.

### **French-American and Other Interspecific Varieties**

The introduction of the North American pests phylloxera (*Daktulosphaira vitifoliae*) and downy mildew (*Plasmopara viticola*) into Europe in the mid-1800s was devastating to grape-growing enterprises. French hybridizers responded by developing new interspecific varieties using wild American species resistant to phylloxera, downy and powdery mildew, and other diseases, to cross with the *Vitis vinifera* varieties of Europe. Breeders rushed to market the results of their

crosses in an effort to solve the crisis. These selections were usually identified with the name of the originator plus a number. Many have been named since their initial release.

The first products of these programs (developed by breeders and nurserymen such as Seibel, Couderc, Kuhlmann, and Bertille Seyve) were planted widely in Europe, but wine quality was disappointing compared with the traditional varieties. Additional time was required to hybridize and select improved types. Initial crosses used low-quality *V. vinifera* grapes, such as Aramon, as parents. Aramon is grown widely in Europe for bulk, but not quality, wine production. Later products of French breeding programs descended from *V. vinifera* parents known for high-quality wines. Wines made from these more recent hybrids, such as Vidal blanc and Vignoles, have received acclaim.

*V. labrusca* was rarely used in the development of the French-American hybrids so as not to impart its strong flavor to the new selections. Many other wild American species were used, especially *V. aestivalis lincecumii* (the Post Oak Grape), *V. rupestris* (the Sand Grape), and *V. riparia* (the River Bank or Frost Grape). The flavors of the French-American group are variable but much more subtle than those of many varieties derived from *V. labrusca*.

More recent introductions from North American breeding programs have been based on further crosses using French-American hybrids, native American species, and *V. vinifera* varieties. It was only coincidental that some of the varieties bred in France were adapted to conditions in the eastern and midwestern US. Varieties produced by North American breeding programs have been selected specifically for their adaptation to local conditions.

Several interspecific varieties, such as Cascade, Baco noir, De Chaunac, Ventura, and Vidal blanc, are sensitive to attack by soilborne virus diseases of the ringspot complex. These varieties should be grafted onto virus-resistant rootstocks in areas known to have a high population of dagger nematodes. The virus is endemic in the northeastern and midwestern US and infects a wide range of deciduous fruit crops and weeds.

### **Interspecific Varieties for Red Wine Production**

**Chambourcin** (Joannes-Seyve 26-205) is a late-ripening grape that may produce a highly rated red wine when the fruit fully matures. It requires a long growing season and is moderately winter tender so it is not well suited to the upper Midwest. The large, moderately loose bunches set medium-sized blue berries. The foliage is resistant to downy mildew, but moderately susceptible

to powdery mildew. Wines from this grape are higher in tannins than other French-American hybrids and the variety has been widely planted across the lower Midwest in the past few years.

**Chancellor** (Seibel 7053) was once planted widely in France for table wine production. It is relatively cold hardy and productive but requires cluster thinning. Early budbreak increases the risk of spring frost damage, however it is very productive on secondary buds, so at least partial crops are possible following damage to primary buds. Chancellor's wine quality is among the better of the French-American varieties. It is very susceptible to downy mildew and moderately susceptible to powdery mildew.

**Maréchal Foch** (Kuhlmann 188-2), usually referred to as simply Foch, is a very-early ripening black grape with small berries and clusters. The vines are hardy and medium in vigor and production. Foch should be grafted on a resistant rootstock to ensure adequate vigor on heavy soils. Birds are attracted to the small, black berries. Wine styles can range from fruity, light red table wines, to hearty, full bodied reds.

**Léon Millot** (Kuhlmann 194-2) is an early-ripening black grape produced from the same cross as Maréchal Foch. The wines are similar, with distinct berry aromas. Vine characteristics tend to be similar as well, although Léon Millot is usually more vigorous and productive.

**De Chaunac** (Seibel 9549) is a very cold hardy, productive, and vigorous variety. Cluster thinning is required to maintain yield and fruit quality. The clusters are large and loose, resulting in few problems with bunch rots at harvest. Wine is only fair in quality, and the vine is subject to soilborne viruses.

**Baco noir** (Baco No. 1) is an extremely vigorous variety that is best grown on heavy soils. Excessive vigor often occurs on light soils, increasing the risk of winter injury. Early budbreak increases the probability of spring frost damage. The variety is sensitive to attack by soilborne virus diseases. The fruit is usually high in acid and produces wines of good quality that are normally deeply pigmented but low in tannin content. This variety is very susceptible to black rot.

### **Interspecific Varieties for White Wine Production**

**Cayuga White**, named at Geneva in 1972, is one of the most productive and disease-resistant varieties grown in the eastern US. Its hardiness is only moderate so it may not be suitable for the upper Midwest. Its wine, which has medium body and good balance, has been rated highly. This

versatile grape can be made into a semisweet wine that brings out the fruit aromas, or, using oak aging, into a dry, less fruity wine. When harvested early, it may produce a very attractive sparkling wine with good acidity, good structure, and pleasant aromas. When overripe, however, it can develop strong hybrid aromas with slight American overtones. Its excellent cultural characteristics and high wine quality make it a promising variety for the future.

**Seyval** (Seyve-Villard 5-276, commonly marketed as Seyval blanc) is one of the most widely planted hybrid grapes east of the Rocky Mountains. Its hardiness is only moderate so it may not be suitable for the upper Midwest. When grapes are harvested at optimal maturity, wines have attractive aromas of grass, hay, and melon. The body tends to be thin, and either malolactic fermentation or barrel fermentation followed by oak aging will enhance quality. The vine tends to overbear and must be cluster and shoot thinned to ensure proper ripening and maintain vine size. Grafting is also recommended on all but the most fertile sites. Fruit clusters are very susceptible to *Botrytis* bunch rot.

**Ventura** was developed in Ontario, Canada, in 1974. A cross of Chelois and Elvira, it is a very productive, cold-hardy, crack-resistant replacement for Elvira. The berries are high in sugar and acidity and ripen at the same time as Concord. Although the grape is considered a hybrid, the wine has a pronounced labrusca aroma and flavor. The vine is susceptible to tomato ringspot virus and may require grafting on virus-infected sites.

**Vidal blanc** (Vidal 256) is a heavily productive white grape that produces good-quality wine when the fruit reaches maturity. It requires sites with long growing seasons and moderate winter temperatures. Hardiness is questionable for the upper Midwest. Small berries are borne on very large, compact, tapering clusters. Cluster thinning is required to prevent overcropping. Berries have thick skins, and *Botrytis* bunch rot has not been a problem.

**Vignoles** (Ravat 51) produces excellent wines of many different styles. It is favored for dessert wines, especially when picked late in the season. The fruit can develop high sugar content while retaining high acidity. Vines are hardy with moderate vigor and productivity. Budbreak is late, reducing the risk of spring freeze injury. Clusters are small, very compact, and highly susceptible to *Botrytis* bunch rot.

### **Recently Introduced Interspecific Hybrids**

**Traminette** was released by Cornell University in 1996. It is a hybrid of J.S. 23-416 and Gewurztraminer and is distinguished by its superior wine quality combined with good

productivity, partial resistance to several fungal diseases, and moderate cold hardiness. While bud hardiness is good, trunk injury is occasionally a problem, especially on heavier soils. Bud break is late and fruit ripens late mid-season. Fruit quality is excellent with a good balance between sugar, acidity, and pH. Wines are distinctively spicy and fragrant, much like the Gewurztraminer parent. Skin contact for 12 to 48 hours helps to enhance the desirable spicy flavor and floral aromas.

**Frontenac** was released by the University of Minnesota in 1995. It is a very cold hardy red wine grape suitable for production in the upper Midwest. It is moderately susceptible to powdery mildew and attractive to leaf phylloxera, but is essentially immune to downy mildew. Fruit quality has been excellent, but high titratable acidity is common and must be dealt with in the winery. Berry, cherry and plum flavors make this an interesting new variety.

**Chardonel** (Plant patent 7860) was released by Cornell University in 1990 because of superior performance in Michigan and Arkansas. Its cold hardiness has been nearly as good as for Seyval, but good locations with long growing seasons are required to ripen the fruit. It is probably too cold tender for the upper Midwest. This cross of Seyval and Chardonnay produces an excellent wine when mature fruit are used, with aromas characteristic of both parents. Its potential for sparkling wine production appears to be good.

**Melody** (Plant patent 6159) was introduced by Cornell University in 1985. The wine is fruity with hints of apricot and floral aromas. Its quality is among the better of the white hybrids. The vine is moderately disease resistant, very productive, and vigorous. Selection of well-exposed canes when pruning will ensure an adequate crop each year. No cluster thinning is required. Hardiness appears sufficient for zone 5a.

### **Cold-Hardy Varieties Developed by Elmer Swenson, Osceola, Wisconsin**

Several wine and table grape varieties have been developed through the private breeding efforts of Elmer Swenson and are described below. All have been bred for high levels of cold hardiness and have done well in midwestern US areas typified by cold winters and short growing seasons.

**Esprit** (Plant patent 5716), a seedling of Villard blanc, is very productive, with large clusters and large, white berries. The variety is consumed fresh or fermented into wine but is hardy enough only for good sites in southwestern Wisconsin; it is one of the least hardy of this group.

**LaCrosse** (Plant patent 5588) is a fruity, white wine grape derived from Seyval. Compared to Seyval, the vine is more cold hardy, the fruit ripens slightly earlier, and the wine is somewhat fruitier. This variety has performed very well in the upper Midwest. The major weakness of this variety is susceptibility to diseases, especially down mildew, powdery mildew and black rot, and to the leaf phase of phylloxera.

**St. Croix** (Plant patent 4928) bears medium-sized blue berries on medium clusters. The vine is very hardy, vigorous, and disease resistant and is very precocious in bearing. Cluster thinning may be required until the vines are well established.

**St. Pepin** (Plant patent 5771) is a sibling of LaCrosse, but it ripens earlier and makes a very fruity white wine with slight labrusca flavors. Winter hardiness ranks with Esprit. It must be planted near other grape varieties, because it is pistillate and requires cross-pollination.

**Edelwiess** is a Swenson hybrid that produces fruit similar to its parent Ontario, but is much more winter hardy. Fruit can be used for fruity wines, fresh juice, or table use. Berries ripen to a golden color. This variety is doing very well in Nebraska.

**Swenson Red** is a Swenson hybrid that has excellent eating quality for a seeded grape. It can also be used for juice and wine production. The berries are large and have a meaty texture and adherent skin. Ripens early and is hardy to  $-30^{\circ}\text{F}$ .

### **Interspecific Varieties for Table Use**

A number of varieties of seeded and seedless table grapes have been introduced over the past 20 years, specifically for production in the eastern U.S. Most are only moderately cold hardy, but a few have potential for production in the upper Midwest.

**Reliance** (plant patent #5174) was released by the University of Arkansas in 1982. It is one of the hardiest seedless table grapes. The red fruit are very thin skinned and achieve high sugar levels. Flavor and eating quality are excellent. Its main fault is the tendency for fruit to crack if rainfall occurs close to harvest.

**Mars** (plant patent #5680) is a slipskin seedless grape released by the University of Arkansas in 1984. The blue-black fruited berries are large and borne in medium clusters. Vines are very vigorous and precocious. The vines are also very disease resistant, making this a good choice for the home grower. It has been hardy to  $-15^{\circ}\text{F}$  in Indiana.

**Jupiter** is a new release (1998) from the University of Arkansas. The fruit have an adherent skin and semi-crisp texture. The mild muscat flavor is excellent. Vines are vigorous and cluster thinning may be required to reduce overcropping and achieve adequate fruit maturity. Foliage is somewhat susceptible to downy mildew. It has been hardy to  $-15^{\circ}\text{F}$  in Indiana.

### **European (*Vitis vinifera*) Wine Grape Varieties**

The first colonists attempted to grow European grapes but failed, as did all successive attempts in the eastern U.S. until the 1960s. Invariably, the failed vineyards succumbed to winter cold injury, and several underlying factors contributed to the failure to achieve satisfactory cold hardiness. The major reason is that *V. vinifera* vines generally are less cold hardy than the American grape species used to produce interspecific hybrids. Another important reason, however, these grapes failed is that they have little or no inherent resistance to several pests and diseases native to the eastern and midwestern US. These include the grape root aphid, phylloxera, and several fungal diseases (powdery mildew, black rot, and downy mildew). It was not until satisfactory phylloxera-resistant rootstocks were identified and modern fungicides developed that even the limited potential cold hardiness of these varieties could be attained in the field. Recently it has been found that *V. vinifera* varieties will not succeed in soils traditionally used to grow American varieties unless the soil pH is raised to 6.5 to 7.0.

It is important to recognize the vulnerability of European grape varieties. Only sites that do not place extra restrictions on vine function, such as winter temperatures below  $-10^{\circ}\text{F}$ , poor soil or air drainage, excessive or inadequate fertility, or short growing season, should be used for *V. vinifera*. In addition, growers must use stringent measures to control diseases and insects, superior pruning and training methods, and canopy management techniques such as leaf removal that will enhance wood maturity and minimize disease.

The potential for growing European varieties in the upper Midwest appears bleak. In order to survive the winters, the vines would need to be buried with soil or covered with straw. This type of production could be done on a limited basis, but the economics would be questionable.

### **Leading *Vitis vinifera* White Wine Varieties**

**Chardonnay** is the most widely planted *V. vinifera* variety in the eastern US. Relative to other *V. vinifera* varieties, it is cold hardy, but not as hardy as White Riesling or Cabernet franc. Its advantages include very high quality of both still and sparkling table wines, early and reliable fruit and wood maturity, and moderate vigor. Its primary disadvantage is its relatively high

susceptibility to *Botrytis* bunch rot. For that reason, vertical training combined with summer pruning and leaf removal have often produced superior results.

**White Riesling** is also planted widely because of its high relative cold hardiness and the excellent quality of still and sparkling wines made from its fruit. The major disadvantage is the susceptibility of its fruit to *Botrytis* bunch rot and the relatively late harvest date. Several excellent clones are available, but older ones that have not been tested for freedom from viruses should be avoided because they have reduced production potential compared to certified clones. Clone 239 is the most popular.

### **Leading *Vitis vinifera* Red Wine Varieties**

**Cabernet Sauvignon** is one of the most cold hardy and disease-resistant *V. vinifera* varieties. Although it ripens late, satisfactory levels of sugar are usually attained in New York. Sugar alone, however, does not determine wine quality, and consistently superior wines have been produced only in the warmer production areas.

**Cabernet franc** should be considered an alternative or a supplement to Cabernet Sauvignon. It is the most cold hardy *V. vinifera* variety tested in New York and Michigan. The fruit ripens earlier and has produced good-quality wines more consistently than has that of Cabernet Sauvignon.

**Limberger** is grown under several different names in the northern production areas of Europe (e.g., Lemberger, Blaufränkisch). It has not been widely tested commercially, but results to date have been favorable in New York. It has also attracted attention in Washington. Cold hardiness appears acceptable, and *Botrytis* resistance is good. The clusters are large and yield potential is high, which may dictate the need for crop control in some years. Wines have been rated highly; they have deep red color and rich tannins.

Table 1. Relative susceptibility of wine and juice grape varieties to low-temperature injury, disease, and sensitivity to sulfur applications.

Variety	WH <sup>1</sup>	BR <sup>2</sup>	DM	PM	BOT	PHOM	EU	CG	Sulfur
Baco noir	4	+++	+	++	+	+	++	+++	No
Cabernet franc	3	+++	+++	+++	+	?	+++	+++	No
Cabernet Sauvignon	2	+++	+++	+++	+	+++	+++	+++	No
Catawba	5	+++	+++	++	+	+++	+	+	No
Cayuga White	4	+	++	+	+	+	+	?	No
Chambourcin	3	+++	++	+	++	?	?	++	Yes
Chancellor	5	+	+++	+++	+	+++	+	++	Yes
Chardonel	4	?	++	+++	++	?	?	++	No
Chardonnay	2	++	+++	+++	+++	+++	++	+++	No
Concord	5	+++	+	++	+	+++	+++	+	Yes
De Chaunac	5	+	++	+++	+	++	+++	++	Yes
Delaware	5	++	+++	++	++	+++	+	+	No
Edelweiss	5	?	?	++	++	?	?	?	?
Esprit	5	?	++	+++	++	?	?	?	?
Fredonia	5	+	+++	++	+	+++	?	?	No
Frontenac	6	+	+	++	+	+	?	?	?
Jupiter	5	++	+++	+	+	+	?	?	?
LaCrosse	6	+++	+	++	+++	?	?	?	?
Léon Millot	6	?	+	++	+++	?	?	+	?
Limberger	2	+++	+++	+++	+	?	+++	+++	No
Maréchal Foch	6	++	+	++	+	?	+++	?	Yes
Mars	5	++	+	+	+	+	?	?	?
Melody	4	+++	++	+	+	?	?	?	No
Niagara	4	+++	+++	++	+	+++	+	++	No
Reliance	5	+++	++	++	+	+	?	?	?
Saint Croix	6	?	++	++	++	?	?	?	?
Saint Pepin	5	?	+	+++	++	?	?	?	?
Seyval	4	+++	++	+++	+++	+	+	+++	No
Steuben	5	++	+	+	+	?	?	+	No
Swenson Red	5		+++	++	++	?	?	?	?
Traminette	4	+	++	+	+	+	?	?	?
Ventura	6	++	++	+++	+	?	?	+	No
Vidal blanc	3	+	++	+++	+	+	+	+++	No
Vignoles	5	+	++	+++	+++	++	++	+++	No
White Riesling	2	+++	+++	+++	+++	++	++	+++	No

<sup>1</sup>WH = Winter hardiness, 1 = +5 to -5°F, too tender for all but a few select sites, 2 = 0 to -10°F, tender, 3 = -5 to -15°F, moderately tender, may be grown on better sites, 4 = -10 to -20°F, moderately hardy, 5 = -15 to -25°F, hardy, and 6 = -25 to -35°F, very hardy, worthy of trial on cold sites.

<sup>2</sup>BR = Black rot, DM = Downy mildew, PM = Powdery mildew, Bot = Botrytis, Phom = Phomopsis, Eu = Eutypa, CG = Crown gall, Sulfur = sensitivity to sulfur spray injury.

<sup>3</sup>Disease categories are rated as follows: + = slightly susceptible or sensitive, ++ = moderately susceptible or sensitive, +++ = highly susceptible or sensitive, ? = relative susceptibility or sensitivity not established.

Table 2. Season of maturity of wine and juice grape varieties in central Indiana.<sup>1</sup>

	<b>Early</b>	<b>Midseason</b>	<b>Late</b>
<b>White Wine</b>		Cayuga White (h)	Catawba (a)
	LaCrosse (h)	Chardonnay (v)	Chardonel (h)
	Saint Pepin (h)	Delaware (a)	Vidal blanc (h)
	Swenson Red (a)	Esprit (a)	White Riesling (v)
	Edelweiss	Melody (h)	
		Niagara (a)	
		Seyval (h)	
		Traminette (h)	
		Ventura (h)	
		Vignoles (h)	
<b>Red Wine</b>	Léon Millot (h)	Baco noir (h)	Cabernet Sauvignon (v)
	Maréchal Foch (h)	Concord (a)	Cabernet franc (v)
	Saint Croix (h)	De Chaunac (h)	Chambourcin (h)
		Limberger (v)	Chancellor (h)
<b>Table Grapes</b>		Mars (a)	
		Reliance (a)	
		Jupiter (a)	

<sup>1</sup>In Indiana, early varieties ripen between late July and mid-August; mid-season varieties ripen between late August and mid-September; late varieties mature after the third week in September.

<sup>2</sup> a = American type or hybrid derived from *Vitis labrusca* with distinct labrusca characteristics  
h = Interspecific hybrid, without dominant labrusca characteristics  
v = *Vitis vinifera*

Acknowledgments: The information in this publication is based on Cornell Cooperative Extension Publication: "Wine and Juice grape Varieties for Cool Climates" (Information Bulletin 233) 1993. Bruce I. Reisch, Robert M. Pool, David V. Peterson, Mary-Howell Martens, Thomas Henick-Kling.