

Wine and Juice Grape Varieties *for* Cool Climates

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Introduction

The majority of commercial grape varieties around the world belong to the species *Vitis vinifera*. In New York, however, *V. vinifera* varieties are only one of a diverse group of varieties that includes those derived from the fox grape, *V. labrusca*, and hybrids of native American species with *V. vinifera*. This bulletin describes the broad range of varieties available for commercial use, as well as those with potential for home vineyards and roadside markets. Most of the varieties described here are adapted to cool climate growing regions. Some may be suitable for use in the Northeast, Midwest, and Mid-Atlantic growing regions of the United States. The descriptions and information in Tables 1–3 may be used to help choose varieties suited to specific needs. Further information may be obtained from Cooperative Extension as well as from the references listed at the end of this publication.

Most of the grape acreage in New York is planted with the Concord variety (Table 1). This and other varieties of *V. labrusca* have a pronounced fruity flavor, often referred to as American flavor. Of the top five New York varieties, Concord, Catawba, and Niagara descended from *V. labrusca*; Aurore was derived from several American species crossed with *V. vinifera*; and Chardonnay is a pure variety of *V. vinifera*. Vinifera grapes are described in this publication and more extensively elsewhere (Pool et al., n.d.).

The most important factor for a potential commercial grower to consider is market. Before planting, growers should consult buyers to ensure that there is a demand for the fruit they will produce.

Grape varieties vary greatly in their tolerance to diseases. Disease resistance is an important consideration when deciding which varieties are suitable for a given site. Varieties that are more susceptible to disease will require more effort to keep disease under control. Home gardeners may be especially interested in growing the more disease-tolerant varieties.

Potential for winter cold tolerance is genetically controlled and is primarily a function of variety. The actual level of cold hardiness attained in the vineyard, however, is affected by the health of the vine, crop load during the previous season, degree of vine acclimation to cold when low temperatures are encountered, and other factors. Dormant buds may be damaged at one temperature and trunks at another. The ratings of relative resistance to winter cold (Table 2) are generalized to reflect the variation in tolerance by different varieties, although cultural practices and environmental conditions may reduce or increase a vine's resistance. Information on relative resistance to diseases and cold injury is found in Table 2.

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 early to mid-October in New York. 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 flavor of Concord makes

it a desirable dessert grape, and it is the leading table grape variety in New York. Skin cracking and excessive postharvest shelling, however, as well as the presence of seeds, limit its use for this purpose. Relative characteristics of Concord and other varieties are listed in Tables 2 and 3. More information on the Concord grape may be found in a separate publication (Zabada et al., 1988).

Catawba, developed in the early 1800s, is a spicy-flavored, slipskin grape with a pronounced labrusca aroma. To reach full maturity in New York, Catawba requires favorable sites with long growing seasons. The vines are vigorous, hardy, and productive, but the foliage is somewhat more suscep-

tible to fungal diseases than that of Concord (Table 2). Catawba also experiences foliar injury where ozone pollution occurs. High acidity may be a problem in some years. This grape is used primarily in white or pink dessert wines, but it is also used for juice production and fresh market sales.

Niagara is a floral, strongly American 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. It is grown successfully in many districts throughout New York.

American Varieties of Limited Acreage

Delaware is an early-ripening red variety with small berries, small clusters, and a mild American flavor. It is an important dessert variety in Japan but is used primarily for juice and white wine in New York. 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 ensure vigorous growth.

Once prized for champagne production in New York, Delaware is now being replaced by several interspecific hybrid and vinifera varieties. Delaware remains, however, one of the highest quality American varieties for wine.

Dutchess is a late-ripening white grape of *V. vinifera* and *V. labrusca* ancestry. The fruit has less of an American flavor than other varieties of *V. labrusca* ancestry. Because of its relatively low cold

tolerance (Table 2), this variety should be planted only on very favorable sites. Other interspecific hybrid varieties have now largely replaced Dutchess in New York wine production.

Elvira is a white grape descended from *V. riparia*, the Riverbank or Frost Grape. The variety ripens at the same time as Concord does and is one of the most productive varieties grown in New York. It is used primarily for bulk wine production. Because the skin is thin and the cluster is very compact, berries may crack during some seasons if the grapes are harvested at full maturity. The current practice is to harvest the fruit before cracking occurs. The must is typically high in acidity. See also Ventura.

Fredonia is a blue-black, Concord-type grape with very large berries that ripen about two weeks before Concord. Although Fredonia lacks the flavor associated with Concord, which is usually desired for juice and jelly, Fredonia is used for both juice production and roadside table

grape sales. With careful pruning, its vigor and production may approach that of Concord. The fruit clusters are susceptible to downy mildew.

Isabella is an old, black, labrusca-type variety used primarily for wine. In other parts of the world Isabella is one of the most common grapes of its type, but in New York it is rare, having been replaced by other varieties. Cold damage can occur in severe winters.

Ives is a black grape of the *V. labrusca* type that is used to add color to red wines and juices. It is highly susceptible to damage by the air pollutant, ozone, which may cause diminished vigor and productivity.

Moore's Diamond resembles the fruit of Niagara and the vine of Concord and is one of the few white American varieties that have been used to produce dry table wine. It is also desirable as a table grape, but the skins may crack during wet seasons.

French-American and Other Interspecific Varieties

The introduction of the North American pests phylloxera (*Daktulosphaira vitifoliae*) and powdery mildew (*Uncinula necator*) into Europe in the mid-1800s was devastating to grape-growing enterprises. French hybridizers responded by developing new varieties using wild American species resistant to phylloxera, powdery mildew, and other diseases. 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 were named later.

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 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 New York. 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. Ripening seasons for wine varieties are listed in Table 3.

Interspecific Varieties for Red Wine Production

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 freeze damage. The variety is also 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.

Cascade (Seibel 13053) is a productive and moderately hardy variety. The medium to large loose clusters ripen early. Birds often cause crop loss. Wines are generally light in color and body with low acidity. Because of this grape's susceptibility to soilborne virus diseases and generally low wine quality, acreage has declined dramatically since 1975 (Table 1).

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 a site less subject to low winter temperatures. The large, moderately loose bunches set medium-sized blue berries. The vine is very productive, and cluster thinning is required.

Chancellor (Seibel 7053) was once planted widely in France for table wine production. It is moderately cold hardy and productive but requires cluster thinning. Chancellor's wine quality is among the better of the French-American varieties. Planting might be more widespread if the clusters were less susceptible to downy mildew and the foliage less susceptible to powdery mildew.

Chelois (Seibel 10878) wine quality ranks highly among the French-American hybrids. It experienced a major decline in acreage in New York when demand for red wine decreased during the 1980s. However, there was a resurgence of interest in Chelois in the early 1990s as consumers regained interest in red wine. Chelois may be blended with other red hybrids (Chambourcin, Baco noir, and Chancellor) or *V. vinifera* varieties. Vines are healthy, vigorous, and productive but require cluster thinning to prevent overcropping. Berry splitting and subsequent bunch rots may be severe in some years. Because it is susceptible to winter damage, Chelois should be planted on better sites. Small, blue-black berries are borne on compact, medium-sized clusters.

Colobel (Seibel 8357) produces a heavily pigmented juice useful for blending as a coloring agent. Used alone, it makes poor wine. Vines are very productive but just slightly cold hardy. The large clusters of blue-black berries ripen late.

De Chaunac (Seibel 9549) is a very 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. Because of shrinking demand, acreage has declined dramatically in recent years.

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.

Maréchal Foch (Kuhlmann 188-2) is a very early ripening black grape with small berries and clusters that produce a fruity, light red table wine. The vines are hardy and medium in vigor and production. **Maréchal Foch** should be grafted on a resistant rootstock to ensure adequate vigor. Birds are attracted to the small, black berries.

Rougeon (Seibel 5898) is hardy and very productive but sometimes bears biennially. The wine is of high color and is used primarily for blending.

Villard noir (Seyve-Villard 18-315) is a late-ripening, productive variety that produces good-quality red wine when grown on favorable sites. For best performance, choose a site with moderate winter temperatures and a long growing season. Grafted vines are recommended to improve vigor, especially on heavy soils. Cluster thinning is also necessary to prevent overcropping.

Vincent was released in 1967 by the Horticultural Research Institute of Ontario (HRIO) at Vineland, Canada. The vine is medium in vigor, very productive, and ripens late. This dark blue grape produces a very dark juice that is useful for blending with varieties that have low pigment content. Care must be taken to control powdery mildew.

Interspecific Varieties for White Wine Production

Aurore (Seibel 5279) is the most widely planted nonlabrusca grape in New York. Processors have used **Aurore** to extend the harvest season because the fruit matures in late August and early September before most other varieties are ripe. The vine is productive, vigorous, and produces large bunches of amber-colored berries. Bird damage and fruit rot often occur. Wine quality is poor, and this grape is being replaced by interspecific varieties of higher quality. Its major use has been for bulk wine production, frequently blended with *V. labrusca* varieties.

Cayuga White, named at Geneva in 1972, is one of the most productive and disease-resistant varieties grown in New York. Its wine, which has medium body and good balance, has been rated highly. This versatile grape can be made into a semisweet wine emphasizing the fruity 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 promise an important future for this variety in New York.

Ravat 34 is a selection of the French hybridizer, J. F. Ravat. It ripens early and is moderately vigorous, productive, and winter hardy. Wine quality is good. There is limited commercial experience with this variety in New York. Trial results from Fredonia, New York, indicate excellent yield potential.

Seyval (Seyve-Villard 5-276, commonly marketed as **Seyval blanc**) is one of the most widely planted hybrid grapes east of the Rocky Mountains. 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 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 does 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. Small berries are borne on very large, compact, tapering clusters. Cluster thinning is required to prevent overcropping. Plantings in New York have increased from 35 acres in 1975 to 152 in 1990 (Table 1).

Vignoles (Ravat 51) produces an excellent dessert wine, especially when picked late in the season. The fruit can develop high sugar content while acidity remains high. 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. Acreage doubled between 1975 and 1990 (Table 1).

Villard blanc (Seyve-Villard 12-375) is a very productive, late-ripening grape that produces large, loose clusters of oval berries. It thrives on sites with a longer growing season than Geneva. Wine quality is average. The fruit may be sold as a dessert grape when it is fully ripe.

Recent Introductions of Interspecific Hybrids

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

Horizon, developed at Cornell University in 1982, is suitable for production of bulk white wine. Its low acidity makes it useful in blending. Wines have been described as neutral and free of labrusca and hybrid flavors, but some taste panelists have noted labrusca and hybrid aromas in recent samples. The vine is very productive and winter hardy, but *Botrytis* bunch rot is a problem in some years.

Melody (Plant patent 6159) was introduced by Cornell University in 1985. The young 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 (Table 2) and very productive and vigorous. Selection of well-exposed canes when pruning will ensure an adequate crop each year. No cluster thinning is required. Melody is in limited commercial production and acreage is increasing.

Vivant was introduced in 1983 at HRIO, Canada. This white wine variety is vigorous and productive but sensitive to fungal diseases (Table 2). No cluster thinning is required. Interest in this variety in Canada has been decreasing.

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 should do well in northeastern U.S. 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.

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.

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

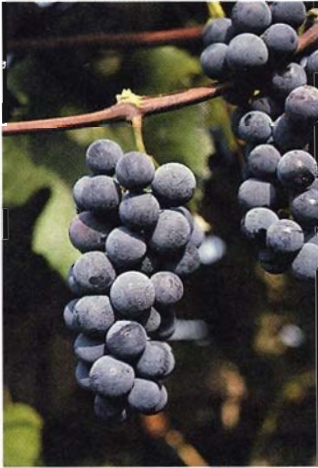
Table 1. New York grapevine acreage of all ages in 1975 and 1990 by variety¹

Variety	Acreage 1975	Acreage 1990	Change (%)
American Varieties			
Concord	27,568	21,006	-23.8
Catawba	3,477	2,102	-39.5
Niagara	2,355	2,055	-12.7
Delaware	2,051	841	-58.9
Elvira	538	466	-13.4
Dutchess	345	131	-62.0
Moore's Diamond	130	68	-47.7
Fredonia	166	59	-64.5
Ives	596	45	-92.4
Isabella	87	37	-57.5
Steuben	40	na ²	na
Total	37,353	26,810	-28.2
Interspecific Varieties			
Aurore	1,727	1,389	-19.6
Seyval	187	441	135.8
De Chaunac	899	353	-60.7
Baco noir	643	348	-45.9
Cayuga White	na	192	na
Vidal blanc	35	152	+334.3
Ventura	na	113	na
Rougeon	225	98	-56.4
Vignoles	46	87	+89.1
Colobel	97	85	-12.4
Maréchal Foch	276	79	-71.4
Chelois	156	38	-75.6
Chancellor	75	35	-53.3
Cascade	183	32	-82.5
Rosette	95	28	-70.5
Verdelet	24	na	na
Léon Millot	41	na	na
Vincent	47	na	na
Total	4,756	3,470	-37.1
Vitis vinifera Varieties			
Chardonnay	107	983	+818.7
White Riesling	123	404	+228.5
Pinot noir	na	196	na
Cabernet Sauvignon	na	160	na
Merlot	na	152	na
Gewürztraminer	na	103	na
Cabernet franc	na	73	na
Sauvignon blanc	na	40	na
Total	230	2,111	+818.8
All Other Varieties	314	455	na
Total all varieties	42,653	32,846	-23.0

¹Sources: N.Y. Orchard and Vineyard Survey 1975, N.Y. Crop Reporting Service, Albany, N.Y., Release No. 31, June 1976; N.Y. Vineyard Survey 1990, Dept. of Agriculture and Markets, Albany, N.Y., September 1991.

²Information not available

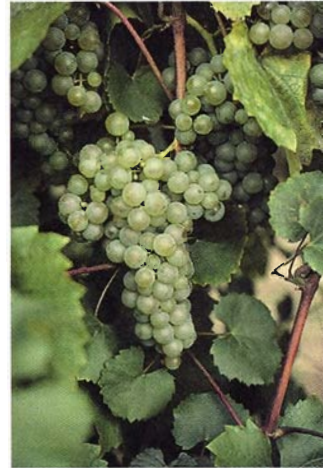
Figure 1. Leading wine and juice grape varieties



Concord, widely adapted and used for juice, jelly, wine, and fresh market sales.



Niagara, a white *V. labrusca* variety used primarily for juice and sweet wine production.



Melody, a 1985 Cornell introduction gaining in popularity for varietal wine production.



Cayuga White, released in 1972 from Cornell University, a productive and disease-resistant wine grape that produces dry, semi-sweet, and sparkling wines.



Vidal blanc, a heavily productive, late-ripening white wine grape increasing in popularity.



White Riesling, one of the most winter hardy *V. vinifera* wine grapes, well adapted to cool climates.



Chardonnay, the leading *V. vinifera* wine grape in terms of New York acreage (ruler shows centimeter measurements).



Cabernet franc, the best-adapted red *V. vinifera* variety (ruler shows centimeter measurements).

European (*Vitis vinifera*) Wine Grape Varieties

The first colonists of what is now New York State attempted to grow European grapes but failed as did all successive attempts until the 1960s. Invariably, the failed vineyards succumbed to winter cold injury, but several underlying factors contributed to the failure to achieve satisfactory cold hardiness. The fundamental reason is that *V. vinifera* vines generally are less cold hardy than the American grape species used to produce interspecific hybrids. Equally important, however, these grapes have little or no inherent resistance to several pests and diseases native to our state. 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 we have found that *V. vinifera* varieties will not succeed in soils traditionally used to grow American varieties unless the soil pH is raised to about 6.5.

Another important factor that limited the success of these old varieties was the health of the nursery stock from which they were produced. During the many centuries of culture, certain virus and viruslike diseases have become widespread in *V. vinifera*. In regions with less stringent climates, such as California, these diseases may have only marginal impact on yield or grape quality. It has been suggested that the vines may even benefit from a dwarfing effect. In New York's climate, however, anything that detracts from normal

vine function is likely to reduce winter cold tolerance. Certified planting stock that has been tested for known virus pathogens is now available. Unfortunately, because of stringent federal quarantine regulations, we have primary access only to selections from California and are unable to test clones of these varieties that have been selected and tested by European scientists to tolerate growing conditions more like those of New York than California.

It is important to remember the vulnerability of European grape varieties. Only sites that do not place extra restrictions on vine function, such as poor soil or air drainage, excessive or inadequate fertility, or local restrictions on length of 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. These techniques are discussed in Jordan et al. (1980).

Leading *Vitis vinifera* White Wine Varieties

Chardonnay is the most widely planted *V. vinifera* variety in New York (Table 1). 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. Of the several clones tested at Geneva, we have found the locally available New York clone to be superior to those from Foundation Plant Materials Service of California. Those clones tend to set excessive crops of very compact clusters that rot easily and do not ripen reliably. Their vegetative growth is excessive, often leading to winter cold injury.

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. New York White Riesling wines are probably superior to any except those of its homeland in Germany. The major disadvantage is the susceptibility of its fruit to *Botrytis* bunch rot and the relatively late harvest date. White Riesling quite reliably reaches the maturity levels commonly chosen in Europe (17–20 percent soluble solids) for the variety. Its susceptibility to bunch rot suggests that additional canopy management techniques such as leaf removal and extra sprays to combat bunch rot may be advantageous. 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.

Pinot blanc, a white-fruited form of Pinot noir, is an important white wine variety in Germany, Alsace, and the Loire Valley of France. This grape's adaptability to New York growing conditions is similar to Chardonnay, and it has more resistance to bunch rot. It seems worthy of more extensive culture in New York and similar cool climate districts.

Pinot gris is the "gray" (light red) form of Pinot noir. The clone we have tested is not as cold hardy as our Pinot blanc clone but is as hardy as the better Pinot noir clones we have tested. It also appears to resist bunch rot. Pinot gris makes a fuller-bodied white wine than does Pinot blanc. Both the blanc and gris forms add to the quality of sparkling wine cuvées and make interesting still wines. They have the potential to offer an interesting alternative to Chardonnay or White Riesling for high-quality wine production.

Gewürztraminer has red fruit but makes white wine with very distinctive spicy aromas that have a selective market appeal. It is less cold hardy than the best-adapted *V. vinifera* varieties (Table 2), and its high vigor and long vegetative growth cycle have created problems in many New York vineyards. The large vines result in shaded fruit, uneven ripening, and less than optimal cold hardiness. On favorable sites and with appropriate canopy management techniques, however, production and wine quality can be excellent. We have tested only a single clone from California.

Muscat Ottonel is a productive variety that does well in most years. However, if wood maturity is restricted by cool summer temperatures or when winter cold is severe, cold injury results. Cold hardiness

of Muscat Ottonel is similar to that of Gewürztraminer. It makes excellent muscat-flavored wines and is the best adapted of the traditional muscat varieties in New York. It is moderately resistant to bunch rot.

Sauvignon blanc has produced outstanding wines in New York. It should be planted, however, with caution. It is a very vigorous variety with a long vegetative cycle. Cold hardiness is difficult to attain in our climate, and its maximum hardiness appears to be low. The clusters are very susceptible to *Botrytis* infection, and the strong vegetative growth produces a large canopy that increases the potential for bunch rot and reduces vine fruitfulness. We have tested only a single clone from California. Clones from Europe are reported to have shorter vegetative cycles and might be better adapted to New York.

Other *Vitis vinifera* White Wine Varieties

Tests of *V. vinifera* performance at Geneva and elsewhere in the state have identified several less well known white wine varieties that appear to have some potential for use in cold climates. They include **Comtessa**, which produces fruity wines with good acid structure that are similar to those of White Riesling. Winter cold hardiness and bunch rot tolerance appear to be good. Comtessa ripens at the same time as Chardonnay, well before White Riesling.

Morio Muscat appears to be slightly more cold tolerant and ripens earlier than Muscat Ottonel. The wine has a distinct muscat flavor. It may be less resistant to bunch rot than is Muscat Ottonel.

Noblessa has moderate cold tolerance and few cultural problems. Its fruit ripens very early (the first week in September in Geneva), and the wines have been rated highly. Its primary defect is low vigor and hence low yields when planted at standard vine spacing intervals. Therefore, closer in-the-row spacing than the norm should be considered.

Semillon is a standard variety of Bordeaux. Although not included in recent tests at Geneva, it performed reasonably well in earlier trials. Semillon might be planted experimentally as a white wine alternative to the standard New York *V. vinifera* varieties.

Siegerrebe was produced from a cross of Madeleine Angevine by Gewürztraminer. It ripens very early (last week of August to the first week of September at Geneva) and has good winter cold hardiness. The wine is very fruity with some similarity to that of Gewürztraminer. It would probably be of most interest in areas with shorter than normal growing seasons. Because it ripens early, bird depredation has been severe.

Leading *Vitis vinifera* Red Wine Varieties

Pinot noir is one of the world's great red wine varieties. When fully mature, it produces superior red table wines. Excellent white sparkling wines can be produced as well. These may be made from Pinot noir alone or by blending with other traditional sparkling wine varieties. Because it ripens early (first week of October in Geneva) relative to other classic red *V. vinifera* varieties and is reasonably cold hardy, Pinot noir is an attractive choice for the cooler production areas of New York. The variety has two important

defects, however. It tends to produce very compact clusters of thin-skinned fruit that are highly susceptible to *Botrytis* infection and subsequent bunch rot. Wines tend to be deficient in color, especially when the fruit is harvested early to avoid bunch rot. When used for sparkling wine production the fruit are harvested before bunch rot becomes a problem.

Many clones of Pinot noir are being tested, and there are great differences among them. The following are listed primarily because of their general availability. **Pinot noir "Mariafeld"** ("Klevner Mariafeld") originated in Switzerland. It has the greatest resistance to bunch rot of any Pinot noir clone tested at Geneva. It tends to have high yield, large berry size, and relatively low winter cold tolerance. Normally these factors should discourage planting, but because harvest can be delayed until full maturity, the clone often produces wines superior to those made from clones with potentially higher quality that must be harvested early to avoid bunch rot. The wines are high in color and tannin relative to other clones. "Mariafeld" is recommended for planting as one of a mix of clones when red Pinot noir wines are desired. Information on the origin of Pinot noir "**Geneva**" has been lost. Relative to other clones it has good winter cold hardiness but low resistance to bunch rot. Pinot noir "**Gamay Beaujolais**" is another variety whose moderate wine quality is enhanced because bunch rot tolerance allows harvest to be delayed until fruit are fully mature. Other promising clones are currently being tested. Before making planting decisions, growers should check current information on suitability and availability of alternative Pinot noir clones.

Pinot Meunier resembles Pinot noir closely. It is among the most winter hardy of the red Pinot family that we have tested and is also the most susceptible to bunch rot. In France the variety is used solely as a component of Champagne blends, and it would appear to be best suited for that role in New York. Good red wines have been made, however, in years of low *Botrytis* hazard.

Cabernet Sauvignon is one of the most cold hardy and disease-resistant *V. vinifera* varieties. Although it ripens late, satisfactory levels of sugar in most New York production areas are usually attained. 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 we have tested. The fruit ripens earlier and has produced good-quality wines more consistently than has that of Cabernet Sauvignon.

Other *Vitis vinifera* Red Wine Varieties

Merlot has produced superior wines in New York. It has a very long vegetative growth cycle, however, and tends to produce dense, shaded canopies, leading to bunch rot and reduced winter cold tolerance. It is recommended for only the most favored sites in cool climate regions.

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 in New York, but results to date have been favorable. 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.

Gamay noir has only recently been tested in New York. It is the primary red wine variety of Beaujolais in France, and New York wines have been well received. We do not have enough experience to judge its real potential, so that plantings should be considered experimental.

Trollinger has been a consistent vineyard performer in tests at Geneva. The variety is grown widely in northern Europe to produce early-maturing, light red table wines. Experimental planting is suggested for producers who are interested in wines of this type. A cross of Trollinger named **Rotberger** has also been a consistent producer of enjoyable fruity red wines.

Petite Verdot is one of the classic red Bordeaux varieties. Yields have been low at Geneva; fruit matures late, and wine quality has been mediocre at best. Small trial plantings of this variety are recommended for producers who wish to make complex blends of Bordeaux red wine varieties.

Table 2. Relative susceptibility of wine and juice grape varieties to low-temperature injury, disease, and leaf damage resulting from sulfur applications¹

Variety	WH	BR ²	DM	PM	BOT	PHOM	EU	CG	ALS	SULFUR
Aurore	4	+++	++	+++	+++	+	+++	++	+++	No
Baco noir	3	+++	+	++	+	+	++	+++	++	No
Cabernet franc	3	+++	+++	+++	+	?	+++	+++	?	No
Cabernet Sauvignon	2	+++	+++	+++	+	+++	+++	+++	?	No
Cascade	4	+	+	++	+	++	++	+	?	No
Catawba	5	+++	+++	++	+	+++	+	+	+	No
Cayuga White	4	+	++	+	+	+	+	?	++	No
Chambourcin	3	+++	++	+	++	?	?	++	?	Yes
Chancellor	4	+	+++	+++	+	+++	+	++	+++	Yes
Chardonel	4	?	++	+++	++	?	?	++	++	No
Chardonnay	2	++	+++	+++	+++	+++	++	+++	++	No
Chelois	4	+	+	+++	+	+++	+++	?	+++	No
Colobel	3	?	+	+++	+	?	?	?	?	?
Comtessa	2	+++	+++	+++	+	?	+++	+++	?	No
Concord	5	+++	+	++	+	+++	+++	+	++	Yes
De Chaunac	4	+	++	+++	+	++	+++	++	+++	Yes
Delaware	5	++	+++ ³	++	++	+++	+	+	+	No
Dutchess	3	+++	++	++	+	?	+	++	+	No
Elvira	6	+	++	++	+++	+	+	++	++	No
Esprit	5	?	++	+++	++	?	?	?	?	?
Fredonia	5	+	+++	++	+	?	?	+	+	No
Gamay noir	2	+++	+++	+++	++	?	+++	+++	?	No
Gewürztraminer	2	+++	+++	+++	++	?	+++	+++	?	No
Horizon	5	?	+	+++	++	?	?	+	+++	No
Isabella	4	++	++	+	+	?	?	?	?	?
Ives	5	+	+++	+	+	?	++	?	+	Yes
LaCrosse	5	?	+	++	+++	?	?	?	?	?
Léon Millot	5	?	+	++	+++	?	?	+	?	?
Limberger	2	+++	+++	+++	+	?	+++	+++	?	No
Maréchal Foch	5	++	+	++	+	?	+++	?	+	Yes
Melody	4	+++	++	+	+	?	?	?	++	No
Merlot	1	++	+++	+++	+++	+++	+++	+++		No
Moore's Diamond	4	+++	+	+++	++	?	++	?	?	No

Table 2. (continued)

Variety	WH	BR ²	DM	PM	BOT	PHOM	EU	CG	ALS	SULFUR
Morio Muscat	2	+++	+++	+++	+++	?	+++	+++	?	No
Muscat Ottonel	2	+++	+++	+++	++	?	+++	+++	?	No
Niagara	4	+++	+++	++	+	+++	+	++	+	No
Noblessa	2	+++	+++	+++	++	?	+++	+++	?	No
Petite Verdot	2	+++	+++	+++	+	?	+++	+++	?	No
Pinot blanc	2	+++	+++	+++	++	?	+++	+++	?	No
Pinot gris	2	+++	+++	+++	++	?	+++	+++	?	No
Pinot Meunier	2	+++	+++	+++	+++	?	+++	+++	?	No
Pinot noir	2	+++	+++	+++	+ to +++	?	+++	+++	+	No
Ravat 34	4	?	+	++	+	?	?	+	++	No
Rougeon	4	++	+++	+++	++	+++	+	?	+++	Yes
Saint Croix	6	?	++	++	++	?	?	?	?	?
Saint Pepin	5	?	+	+++	++	?	?	?	?	?
Sauvignon blanc	1	+++	+++	+++	+++	?	+++	+++	?	No
Semillon	2	+++	+++	+++	++	?	+++	+++	?	No
Seyval	4	+++	++	+++	+++	+	+	+++	++	No
Siegerrebe	3	+++	+++	+++	++	?	+++	+++	?	No
Trollinger	2	+++	+++	+++	+	?	+++	+++	?	No
Ventura	6	++	++	+++	+	?	?	+	+++	No
Vidal blanc	3	+	++	+++	+	+	+	+++	+	No
Vignoles	4	+	++	+++	+++	++	++	+++	++	No
Villard blanc	3	?	++	+++	+	?	?	?	?	?
Villard noir	4	?	+	+++	+	?	?	?	?	?
Vincent	4	?	+	++	+	?	?	?	?	?
Vivant	4	++	++	++	++	?	?	?	+++	?
White Riesling	3	+++	+++	+++	+++	++	++	+++	+	No

NOTE: WH = Winter hardiness, 1 = too tender for all but a few select sites, 2 = tender, 3 = slightly hardy, may be grown on better sites, 4 = moderately hardy, 5 = hardy, and 6 = very hardy, worthy of trial on cold sites. BR = Black rot, DM = Downy mildew, PM = Powdery mildew, Bot = Botrytis, Phom = Phomopsis, Eu = Eutypa, CG = Crown gall, ALS = Angular leaf scorch, Sulfur = sensitivity to sulfur spray injury.

¹ Portions of this table were excerpted from the *1991 Pest Management Recommendations for Grapes*, a Cornell Cooperative Extension Publication.

² Disease categories are rated as follows: + = slightly susceptible or sensitive, ++ = moderately susceptible or sensitive, +++ = highly susceptible or sensitive, ? = relative susceptibility or sensitivity not established.

³ Berries not susceptible.

Table 3. Season of maturity of cool climate wine and juice grape varieties¹

	Early	Midseason	Late
White Wine	Aurore (h)	Cayuga White (h)	Catawba (a)
	Comtessa (v)	Chardonnay (v)	Chardonel (h)
	LaCrosse (h)	Delaware (a)	Dutchess (a)
	Noblessa (v)	Elvira (a)	Gewürztraminer (v)
	Ravat 34 (h)	Esprit (a)	Muscat Ottonel (v)
	Saint Pepin (h)	Horizon (a)	Vidal blanc (h)
	Siegenerrebe (v)	Melody (h)	Villard blanc (h)
		Moore's Diamond (a)	White Riesling (v)
		Morio Muscat (v)	
		Niagara (a)	
		Pinot blanc (v)	
		Pinot gris (v)	
		Sauvignon blanc (v)	
		Semillon (v)	
		Seyval (h)	
		Ventura (a)	
		Vignoles (h)	
		Vivant (h)	
	Red Wine	Cascade (h)	Baco noir (h)
Léon Millot (h)		Chelois (h)	Cabernet franc (v)
Maréchal Foch (h)		Concord (a)	Chambourcin (h)
Saint Croix (a)		De Chaunac (h)	Chancellor (h)
		Gamay noir (v)	Colobel (h)
		Limberger (v)	Isabella (a)
		Pinot Meunier (v)	Ives (a)
		Pinot noir (v)	Merlot (v)
		Rougeon (h)	Petite Verdot (v)
		Trollinger (v)	Villard noir (h)
			Vincent (h)

Note: a = American type, derived from *Vitis labrusca*

h = Interspecific hybrid, without dominant *labrusca* characteristics

v = *Vitis vinifera*

¹In New York, early varieties ripen between late August and mid-September; mid-season varieties ripen between late September and early October; late varieties mature after the first week in October.

Bird Damage

All grape varieties, particularly those that ripen early, may be seriously damaged or destroyed by birds. In small plantings it may be helpful to enclose the ripening grape clusters in paper bags to prevent damage. An alternative is to cover the vines completely with netting. In commercial plantings netting, noisemakers, balloons, and ribbons that flash in the wind are the most widely used controls.

Insect and Disease Damage

Any variety of grape may be injured by insects or diseases. Table 2 provides relative ratings of disease resistance. Varieties that are resistant to several diseases may be grown with fewer fungicide applications. Publications providing guidance on grape disease and insect control are listed in the following section under Disease Identification and Insect Identification. Researchers at the New York

State Agricultural Experiment Station continue to search for environmentally sound practices to control crop losses from insects and diseases. Areas of research include the development of disease-resistant varieties, the development of biological control technology, identification of cultural practices that reduce disease incidence, and testing of chemical materials with minimal environmental impact.

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