

EXPERIMENT STATION
OF THE
KANSAS STATE AGRICULTURAL COLLEGE,
MANHATTAN.

BULLETIN NO. 44 — DECEMBER, 1893.

DEPARTMENT OF HORTICULTURE AND ENTOMOLOGY.

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FURTHER STUDY OF NATIVE GRAPES.

THE work attempted in the Experiment Station vineyard has been to make a collection of all varieties of the grape likely to prove of value in this section of the country, and, by varied treatment and close observation for a number of years, to determine, as far as can be done in one vineyard, the points of value or weakness in each variety. Owing to the large number of varieties that must be included in this trial, and the limited area that could be devoted to the vineyard, but two vines of each variety have been planted.

The ground selected was an average piece of clay loam, sloping to the east, and having a slight outcrop of limestone a few rods above it. This ground was subsoiled and put in thoroughly fine condition before the planting was commenced. The first planting, of 64 varieties, was made in 1888, and the list has been added to from year to year, till it now includes 157 varieties. The observations made on these have included all points affecting their value to the general planter and the special cultivator. Hardiness, resistance to fungus diseases, vigor of growth, date of blooming and of ripening the fruit, productiveness, character of fruit as to size, color, flavor, texture, shipping and keeping qualities: all of these points are of interest

to the one who wishes to make the best selection of vines for a family vineyard or for a particular purpose.

In order to study grapes to the best advantage regarding these and other characters, it is desirable to refer them to the botanical species from which our cultivated varieties are derived. The specific characters, both of vine and fruit, are readily detected when one becomes familiar with them; and as we find many of the points which make the variety a success or a failure in this or that locality, or determine the value of its fruit for table, market, or wine, to be constant in the different species, their study becomes of much importance.

CLASSIFICATION.

Of the varieties now in the vineyard, 100 have had sufficient trial to admit of a report, which may be regarded as fairly conclusive for this locality and soil, based on the observations of four or five seasons, for the most of the list. These varieties are arranged under nine classes, according to their botanical relations and characters.

The greater number of our common hardy varieties are derived from the wild fox grape of the Eastern states, *Vitis Labrusca*, L. This is confined to the region east of the Alleghany mountains, and ranges as far south as South Carolina.

In the scheme of classification used, all varieties of pure blood from this species are included under class I.

There are four varieties commonly classed with these which are of unknown origin, and about which there has been much speculation. These are: Catawba, Delaware, Isabella, and Maxatawney. There are characters of vine and fruit to be found in these varieties, and much more strongly pronounced in their seedlings and crosses, which make it highly probable that they are not of pure *Labrusca* origin. The Delaware, in particular, has been supposed by many to be the result of an accidental hybridization with *Vitis vinifera*, the cultivated grape of Europe, many trials of which were made in this country during the earlier history of grape culture. Similar traits may be detected in the Catawba and its seedlings. While Isabella points less strongly in this direction, its seedling, Prentiss, would not do to place in class I at all. As a provisional arrangement, these four varieties, with their seedlings and crosses, are placed in class II.

Those known to be hybrids of *Vitis Labrusca* with *Vitis vinifera*, as the Rogers hybrids and many later varieties, together with a few of uncertain origin but showing the characters of this class very strongly, have been placed in class III.

Class IV includes three varieties of *Vitis riparia*, Michx., the common wild grape along the rivers of the Western states.

In class V are placed Taylor and a number of seedlings from it. The Taylor is of unknown parentage, the original having been a wild vine taken into cultivation, but its character strongly indicates a hybrid between *Vitis*

riparia and *Vitis Labrusca*. Conqueror, a Concord seedling, clearly a hybrid with *Vitis riparia*, and Empire State, a known hybrid, are included in this class also.

Mr. T. V. Munson, of Denison, Tex., has placed with us a large number of his interesting seedlings for trial, and among them several in which the pistillate parent is Elvira, of the Taylor family, fertilized with pollen of different hybrids of class III, giving us, for class VI, *riparia-Labrusca* X *Labrusca-vinifera*.

Known hybrids of *Vitis riparia* with *Vitis vinifera* are placed in class VII.

In class VIII are placed the cultivated varieties of *Vitis æstivalis*, Michx., native of the Eastern and Southern states, and as far west as eastern Kansas. This is sometimes known locally as the "fox grape," but should not be confused with that of class I. The varieties Herbemont and Lenoir, with a number of others of similar character, have been referred to a Southern division of the species.

Mr. Munson, after extensive research, believes he has traced them all to an early importation from Europe into the South, and erects the species *V. Bourquiniana* to accommodate them. As there is nothing known in Europe, either wild or cultivated, from which these could have been derived, they are retained in the *æstivalis* class in these records for the present.

Two hybrids between *Vitis æstivalis* and *Vitis Labrusca* are found in class IX.

HARDINESS.

The method of testing the comparative hardiness of varieties has been to prune the vines late in autumn, in such a manner that the bearing wood was renewed near the ground, thus doing away with the most of the stiff, old wood. This enables the canes to be readily bent to the ground, where they are covered by mounding up with earth. By covering one vine of each variety and leaving the other exposed, simply attaching the canes to the lower wire of the trellis, a fair test of the effect of the winter's cold is secured. This, followed up for several winters, will allow a fair approximation to be reached of the degree of cold each variety will endure in our climate and under the conditions here subjected to. That varieties are rated tender with us, does not prove that they may not be hardy under a greater degree of cold in some other locality. The extremes of temperature incidental to a Kansas winter—60 degrees above zero for a number of days, and suddenly a drop to 10, 15 or 20 degrees below, under a high wind, together with the usual absence of protecting snow at the time when most needed—render this a trying climate for vines.

In this section of the state, we are seldom visited by late frosts which interfere with the vines after they have begun to open their buds. Last spring was the first serious damage that our vineyard has sustained from this source, and in the scheme of hardiness given this is not taken into ac-

count. The varieties there classed as hardy are those which, unprotected, have endured with comparatively little injury all of the winters since they were set. The coldest weather in that time was 27 deg. below zero.

In the scheme of classification, previously explained, the tender varieties are indicated by italics, all others being hardy.

Glancing at class I, we find, out of 27 varieties, only three tender, and these have been nearly hardy, and are grown without protection in localities slightly more favored.

Of class II, 15 varieties, 5 are hardy and 10 tender. While Delaware proves perfectly hardy, only one of the crosses from it is equally so — Beauty, a cross of Delaware with Maxatawney.

Of three Concord seedlings from crosses with this class, Diamond, cross between Concord and Iona, is the only one hardy. Moyer is regarded as a possible seedling of Delaware crossed with some wild variety. It has endured the severest tests without injury. Maxatawney, a seedling of unknown parentage, yet distinct in vine and fruit from the pure *Labruscas*, is the fifth hardy variety of this class.

Scanning the varieties derived from hybridizing *Vitis Labrusca* with *Vitis vinifera*, the list is headed by 10 of Rogers's hybrids.

The object sought by Mr. Rogers in this experiment was "to obtain grapes combining the hardy and early-fruiting qualities of the native with the rich and delicate flavor of the foreign species." While much was gained in the way of quality, none of these come up to our standard of hardiness; nor do we find in the list of seven hybrids of Concord with *V. vinifera* any perfectly hardy sorts. The 26 *vinifera* hybrids in class III must all rank as tender.

All of class IV are hardy.

In class V, we find all of the Taylor family entirely hardy; and so also is Conqueror; while Empire State, a hybrid between Hartford and Clinton; two perfectly hardy parents, is too tender for our severest winters.

Mr. Munson's Elvira hybrids, which comprise class VI, are, so far, perfectly hardy. In the case of the first, Beagle, originally given as Elvira X Black Eagle, Mr. Munson is now inclined to credit it to Ives instead of Black Eagle, which conclusion would eliminate all *V. vinifera* stock. President Lyon, which is given as Elvira X Lindley, would then have a fourth of *V. vinifera*, and Rommel, Elvira X Triumph, the same. Ruby, from Elvira X Brighton would contain one-eighth of the foreign blood, for Brighton is from Concord X Diana-Hamburg, one-half *vinifera*, yet Brighton is about with the Rogers hybrids in point of resistance.

If these last three of Mr. Munson's seedlings are true hybrids of the varieties supposed to have furnished the pollen, they would suggest that the influence of Elvira was much the strongest in determining the character of the seedlings.

In class VII, we have a number of varieties in which the attempt was

made to secure the finer qualities of the *vinifera* grapes, with a foundation of hardiness to be furnished by *Vitis riparia*, which is, if anything, more hardy than *Vitis Labrusca*. The four Arnold hybrids, Autuchon, Brant, Canada, and Othello, are from Clinton, as hardy a sort as is known, fertilized with pollen of different *vinifera* sorts. While all of them, in vine and fruit, show unmistakably their *riparia* origin, none of them escapes the tenderness which marks the *vinifera* hybrids.

Of class VIII, the only perfectly hardy variety is Humboldt, said to be a seedling of Louisiana, but in character of vine and the readiness with which cuttings root, as well as in the fruit, it appears to be a hybrid with *V. riparia*. Cynthiana and Norton's Virginia endure our average winters uninjured, but require covering to carry them through the more severe seasons. Lenoir and Herbemont are regularly killed to the ground in this climate if not well protected.

Hybrids of *Vitis æstivalis* with *Vitis Labrusca* are not common, but in Centennial and Gold Coin, of class IX, we have two such—Centennial being a tender sort, while in Gold Coin, Mr. Munson's hybrid of Cynthiana with Martha, we have something apparently equal in hardiness to anything on our list.

Summing up results of our study of the hundred varieties here listed, we find 47 of them hardy and 53 tender. Dividing them according to their specific relations, 49 of them belong to three native species of the United States, while 51 are hybrids of native species with *Vitis vinifera*.

Of the 49 native varieties, 39 are hardy, and 10 tender. If we analyze the hardy natives, we find 37 of them belonging either to *Vitis Labrusca* or *V. riparia*, or hybrids between them, while the two hybrids of these species with *V. æstivalis* probably owe their hardy qualities to these species also. Our dependence for hardy vines for the northern states must be placed mainly on these two species, unless some new line of development can be found. The hint contained in the characters of Humboldt, an apparent *æstivalis-riparia* hybrid, and Gold Coin, which is *æstivalis-Labrusca*, is well worth the attention of those engaged in the production of new hardy varieties.

Of the *vinifera* hybrids, we find 43 tender, and only 8 hardy, and of these 4 are only provisionally referred to *vinifera* in class II, and the other 4 have not more than one-fourth of that blood.

QUALITY OF FRUIT.

When we consider the quality of the fruit produced by these various classes of vines, their differences are the most marked.

The fruit of Concord is better known than any other in cultivation, and Worden, Moore's Early and Cambridge are but little different in the matter of color, flavor, and texture. They are somewhat too tender of skin to ship to the best advantage, and apt to crack open after a rain when nearly ripe.

They have considerable of the tough pulp characteristic of the wild fruit and a little of the foxy flavor, yet they may be regarded as the best of the class, and are consumed with great relish by thousands of people. Several other black varieties—Champion, Hartford, Ives, and others—are much nearer to the wild type in quality, and are grown solely on account of their earliness. The red varieties, as Dracut Amber, Perkins, and Venango, are still more pulpy and foxy, with Vergennes, Wyoming Red, and Woodruff considerably better—in fact, quite palatable. Of the white sorts in this class, Green Mountain or Winchell is decidedly the best flavored, though rather too small to sell profitably. Hayes, Mason's Seedling, Martha, Pocklington and Niagara should be esteemed about in the order named. There is a peculiar flavor to all of these latter varieties, when rather ripe, which is unmistakable and characteristic. It may be likened to the flavor of an overripe or decaying pear.

In the varieties of class II, red colors predominate; a thinner and tougher skin is usually found, and in those of the Catawba and Delaware strains a flavor comparable to that of the best *vinifera* hybrids. This is most highly developed in Delaware, Iona, Jefferson, and Poughkeepsie Red, though Moyer is nearly as good, and the quality of well-ripened Catawbas is superior to anything in class I. Diana and Ulster Prolific seem to be rather variable in quality and to depend much on just the right conditions for maturing them. Isabella, Beauty and Diamond possess too much of the *Labrusca* flavor to be pleasant. Duchess, Prentiss and Maxatawney are of fine quality.

All of the *vinifera* hybrids are grapes of superior flavor and quality. They vary greatly in this regard, as would be expected from the diverse characters of the parents. The Rogers hybrids, varying from light to dark red, or nearly black, have a distinct character which separates them from a number of Concord hybrids. Amber Queen and August Giant are of similar parentage and resemble them strongly. Agawam and Wilder are, perhaps, all things considered, the most valuable of the Rogers, though Aminia has given excellent returns. These three have borne more freely than the others. Of the Concord hybrids, Eldorado and Lady Washington, which have but one-fourth of *vinifera* blood, have given the most profitable returns. Triumph, when secured in perfection, is the finest white grape in the collection, but is unreliable, with the best of care.

Black Eagle and Brighton, while of fine quality, have not borne freely enough to make them profitable for marketing. Creveling has fruited abundantly, and is an excellent table grape, but the bunches are rather too loose and irregular to be attractive. It has the fault, in common with Black Eagle, Brighton, and Croton, of failing to fertilize perfectly, even in the neighborhood of other varieties. Mills has borne quite regularly and well, and approaches the nearest to the meaty texture of some of the foreign sorts of anything we have. In keeping and shipping qualities it surpasses any other in the collection. It lacks somewhat in the finer qualities of flavor.

Downing has been too delicate for general culture, but occasionally has produced bunches of very large size and fine quality.

The three varieties in class IV are much alike, producing medium-sized clusters and berries; juicy and very acid till fully ripe; more useful for jelly or wine than for the table.

In class V all varieties are greenish or yellowish white, excepting Conqueror and Montefiore. These light-colored sorts are thin skinned, inclined to be too thick in the bunch and to crack. In flavor, there is well-marked quality difficult to describe, but peculiar to the class, and which prevents their taking a high place as table fruits. They are considered better adapted to wine making. Conqueror and Montefiore are of fair quality only.

In Mr. Munson's seedlings in class VI, President Lyon is the only one of good quality as a table grape, and this, on account of the small size of the fruit, can only be recommended for garden cultivation. It is not sufficiently large or productive to hold the very early market against the half-ripe Champion or Ives so commonly sold at that season. The other varieties lack, both in appearance and flavor, the qualities to make them valuable.

The Arnold hybrids, of class VII, are fruits of good quality, though with a decided "wild" flavor not relished by everyone.

Of class VIII, Cynthiana and Norton's Virginia are wine grapes, though fair eating when at just the right stage. Humboldt bears a resemblance to the white Taylor seedlings in flavor. Eumelan, Herbemont and Lenoir afford handsome bunches, with a small, juicy berry, almost without pulp, and of delicious and refreshing flavor. They lack the size to render them popular on the market.

Neither Centennial nor Gold Coin, of class IX, possess the qualities to bring them into general cultivation.

LIABILITY TO DISEASE.

In liability to attack from fungus diseases, the crosses in class II and the hybrids of class III have been specially prominent, though only those varieties in classes VIII and IX have been exempt. The regular use of Bordeaux mixture or other fungicides will so fully control these diseases, that the liability to them is not the serious objection it was formerly.

The best in quality of the hardy varieties are confined, we discover, to a small number in classes I and II. The finer-flavored fruits of class II, excepting Delaware, and of class III, can only be secured with any regularity by covering the vines in winter as a protection against the cold, and spraying them in summer as a protection against disease. Will it pay to do this? The reply must depend much upon conditions. Those who delight in choice fruit for the home table will easily find their pay in the satisfaction derived. Whether such treatment would pay on a larger scale for market must depend largely on the market. At prices realized for Concord, 1½ to 2½ cents per pound, it would scarcely pay. For the limited quantity of these choice

varieties which we have had to offer from the Experiment Station vineyard, we have had a ready market at 5 cents. A market for this grade of fruit sometimes needs to be developed, but in a town where choice fruit sells readily there is little doubt that a paying market for choice grapes could be found.

The cost of covering vines for winter protection by mounding up with earth will not exceed 5 cents per vine, and of spraying five times will not exceed 2½ cents.

COMPARITIVE EARLINESS.

The relative earliness of different varieties seems to be a matter of varietal or individual peculiarity, since all of a variety are propagated from one individual, rather than to be due to specific characters.

In the list given of time of ripening, the varieties are arranged in order of earliness as nearly as could be approximated from the records of different years. The perpendicular lines divide the season into three-day periods; the beginning of the horizontal line shows the date of ripening, while the length of it shows approximately the length of season of the variety, or the time during which the fruit remains in good edible condition upon the vines. This last condition has sometimes been secured by protecting the bunches in small manilla sacks. Systematic tests of the keeping qualities of the fruits after they are gathered have not been made, so the record closes with the 9th of October, about the usual date of our first hard frosts. For this reason it should be stated, that those varieties for which the line runs up to that date are all capable of being kept a long time.

It will be noticed by studying this table, that the varieties derived from *Vitis Labrusca*, or from *V. riparia*, with their hybrids, or hybrids from *Vitis vinifera*, are pretty evenly distributed throughout the season. The few from class VIII are medium to late.

In conclusion, it may be said that we have numerous other varieties on trial, not sufficiently tested to report fully upon, among the most interesting of which is a series of Mr. Munson's hybrids upon post oak (*Vitis Lincecumii*) varieties. These are uniformly late in blooming, and it is hoped that they may prove of special value in the western portion of the state, where the high altitude induces late spring frosts, which are often destructive to ordinary varieties in bloom.

DIAGRAMS

SHOWING THE CLASSIFICATION AND EARLINESS OF LEADING
VARIETIES.

SCHEME OF CLASSIFICATION OF THE LEADING VARIETIES OF
NATIVE GRAPES.

[Tender varieties printed in italics.]

CLASS I.

Vitis Labrusca.

Concord Family.	{	CONCORD.	<i>Antoinette.</i>
		COTTAGE.	CAMBRIDGE.
		EATON.	CHAMPION.
		EVA.	DEACUT AMBER.
		HAYES.	EARLY VICTOR.
		LADY.	GREEN MOUNTAIN.
		MARTHA.	HARTFORD.
		MASON'S SEEDLING.	IVES.
		MOORE'S EARLY.	PERKINS.
		NEW HAVEN.	TELEGRAPH.
		POCKLINGTON.	VENANGO.
		WOODRUFF.	<i>Vergennes.</i>
		WORDEN.	WYOMING RED.
		<i>Niagara.</i>	

CLASS II.

Vitis Labrusca × *Vitis vinifera* (?).

<i>Calawba.</i>	<i>Ulster Prolific.</i>
<i>Diana.</i>	<i>Duchess.</i>
<i>Iona.</i>	<i>Jefferson.</i>
<i>Dinkel.</i>	DIAMOND.
DELAWARE.	MOYER.
BEAUTY.	<i>Isabella.</i>
<i>Poughkeepsie Red.</i>	<i>Prentiss.</i>
	MAXATAWNEY.

CLASS III.

Vitis Labrusca × *Vitis vinifera.*

Regers Hybrids.	{	<i>Agawam.</i>	{	<i>Black Eagle.</i>
		<i>Aminia.</i>		<i>Brighton.</i>
		<i>Barry.</i>		<i>Eldorado.</i>
		<i>Goethe.</i>		<i>Highland.</i>
		<i>Herbert.</i>		<i>Irving.</i>
		<i>Lindley.</i>		<i>Lady Washington.</i>
		<i>Massasoit.</i>		<i>Triumph.</i>
		<i>Merrimac.</i>		<i>Brilliant.</i>
		<i>Salem.</i>		<i>Creveting.</i>
		<i>Wilder.</i>		<i>Croton.</i>
		<i>Amber Queen.</i>		<i>Downing.</i>
		<i>August Giant.</i>		<i>Mills.</i>

Peter Wylie.
Red Eagle.

CLASS IV.

Vitis riparia.

CLINTON.
BACCHUS.
MARION.

CLASS V.

Vitis riparia × *Vitis Labrusca* (?).

Taylor Family.	{	TAYLOR. AMBER. ELVIRA. FAITH. GREIN'S GOLDEN.	Taylor Family.	{	MISSOURI RIESLING. MONTEFIORE. PEABL. ROMMEL'S ETTA.
CONQUEROR. <i>Empire State.</i>					

CLASS VI.

Riparia-Labrusca × *Labrusca-vinifera*.

BEAGLE. PRESIDENT LYON.	ROMMEL. RUBY.
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CLASS VII.

Vitis riparia × *Vitis vinifera*.

Arnold Hybrids.	{	Autuchon. Brant. Canada. Othello.		{	Jessica. Gazelle.
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CLASS VIII.

Vitis œstivalis.

Cynthiana. Eumelan. Herbemont.	HUMBOLDT (× ?). Lenoir. Norton's Virginia.
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CLASS IX.

Vitis œstivalis × *Vitis Labrusca*.

Centennial.
GOLD COIN.

SUMMARY.

	<i>Class.</i>	<i>Number.</i>	<i>Hardy.</i>	<i>Tender.</i>
I.....		27	24	3
II.....		15	4	11
III.....		26	0	26
IV.....		3	3	0
V.....		11	10	1
VI.....		4	4	0
VII.....		6	0	6
VIII.....		6	1	5
IX.....		2	1	1
Totals.....		100	47	53
Native.....		49	39	10
<i>Vinifera</i> hybrids.....		51	8	43

