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By L. H. BAILEY

4. The Species of Grapes peculiar to North America

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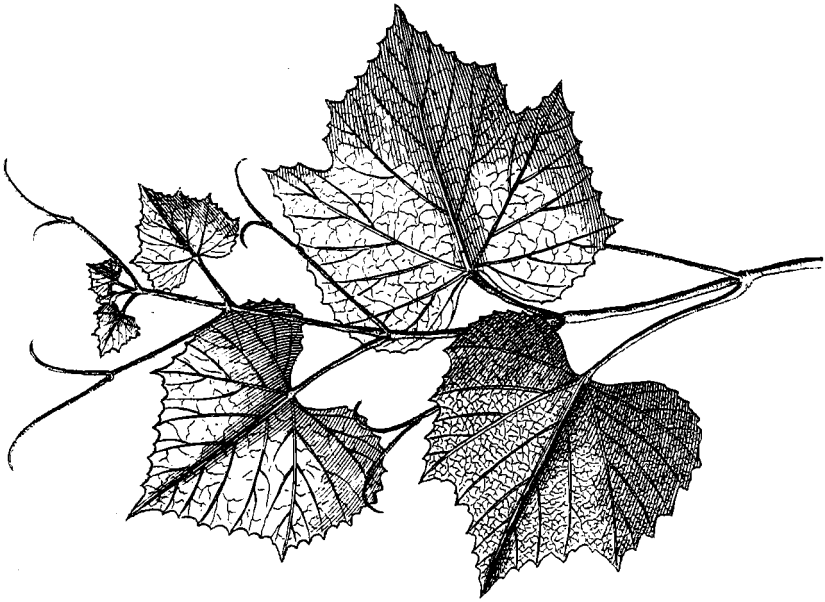

FIG. 98. "WHITE FOXE GRAPE" of Plukenet, 1692, *Vitis Labrusca*.

FIG. 99. LARGE MORE OR LESS DECIDUOUS BERRIES AND SMALL CLUSTERS of *Vitis Labrusca* (×1) in central-western New York. 1927.

ARTICLE 4. THE SPECIES OF GRAPES PECULIAR TO NORTH AMERICA

Reason for the present paper is to complete the work begun nearly fifty years ago on the botanical and horticultural identities of North American grapes, and particularly to extend the monograph prepared for Gray's Synoptical Flora published in 1897. In the intervening thirty-six years interest has been maintained in the genus Vitis, the herbarium collection has grown, and the writer has endeavored to see the plants under natural conditions in many parts of the country. Through many years the author grew vineyard grapes in great variety. Moreover, since that epoch international rules of nomenclature have been devised and adopted, requiring changes in names. The species concept, in the meantime, has also undergone generous modification. Even so, and although the writer can hardly hope to traverse the field again, this study can be regarded as only a preliminary sketch of the subject.

Discussions in this paper are allotted as follows:

I. PREVIEW

So many have been the attacks on the genus Vitis in North America and so numerous have been the writings and so diverse the conclusions that we must take a brief preliminary survey if we wish to comprehend the subject. Even a cursory view will disclose one of the few fields in which botany and horticulture have coordinated effectively.

SYSTEMATIC SUCCESSION

Literature on North American grapes and viticulture is extensive, comprising perhaps the richest literary field in American horticulture. More

than seventy entries were available in the bibliography on pages 118 to 126 of the writer's Sketch of the Evolution of Our Native Fruits published in 1898. In the commanding work, The Grapes of New York, 1908, by U. P. Hedrick and assistants, issued by the New York Agricultural Experiment Station at Geneva, the bibliographic entries are above ninety. Since that time notable books and pamphlets have appeared. In the present paper, however, the viticultural aspects are not under discussion, and attention must be confined to the systematic botanical succession.

Botanical nomenclature of North American Vites begins of course with Linnæus in Species Plantarum, 1753, when two specific names appeared, *Vitis Labrusca* "Habitat in America septentrionali" and *Vitis vulpina* "Habitat in Virginia." What these names signify is discussed in the phytographic part of this Fascicle.

First regular botanical enumerations of the Vites of North America were in the floras that accounted for the species of plants of the continent. We may take note of these and a few other inventories up to the middle of the past century, and then continue with special enumerations of Vitis.

Probably the first native enumeration is by Humphrey Marshall (1722-1801) in his Arbustrum Americanum, Philadelphia, 1785. He has five species, one of which is now included in Ampelopsis (*A. arborea*); the others are: *Vitis vinifera americana*, American Grape Vine, indeterminable; *Vitis vulpina*, Fox-Grape Vine, probably the plant we now know as *V. Labrusca* of the eastern country; *Vitis Labrusca*, Wild American Vine, but apparently not the Linnæan species of that name; *Vitis laciniosa*, Canadian Parsley-leaved Vine, very likely a form of *V. vinifera*. These names have little significance in the systematology of the native grapes, and cannot be employed in synonymy.

Three years later, 1788, Thomas Walter (1740?-1788) in his important Flora Caroliniana, published in London, enumerates three species: *Vitis Labrusca, taurina, vulpina*. The name *taurina*, as applied to an American grape, begins here, but the species is indeterminable from the very brief Latin diagnosis; the name is later given a rather definite standing by William Bartram who apparently meant the muscadine but Walter's use of *taurina* precludes Bartram's from supplanting Michaux's *V. rotundifolia*. Walter did not mean the muscadine for he describes the leaves as white-woolly underneath. Walter's *Labrusca* is apparently not the Linnæan plant of that name for he says the berries are small and acid. From the description his *vulpina* may have been *rotundifolia* or our present *vulpina* or something else. Thirty-six years later the grape flora of that region as recognized by Stephen Elliott in Sketch of the Botany of South Carolina and Georgia, 1824, had increased only to five species; the *Labrusca* of Walter is referred to *æstivalis, taurina* to *Labrusca* of Linnæus, *vulpina* to *rotundifolia*.

A major nomenclatorial event is Michaux in Flora Boreali-Americana, 1803, who admits *V. Labrusca* of Linnæus and founds four new species: *æstivalis* "Hab. in sylvis, a Virginia ad Carolinam"; *cordifolia* "Hab. in Pensylvania ad Floridam"; *riparia* "Hab. ad ripas et in insulis fluviorum Ohio, Mississippi, etc."; *rotundifolia* "Hab. a Virginia ad Floridam." His *cordifolia*, however, is antedated ten years by Lamarck's *cordifolia*, as appears in the sequel.

Only a year later (1804) than the publication by Michaux appeared William Bartram (1739-1823) Account of the Species, Hybrids, and Other Varieties of the Vine of North America in volume 1, hexade 2, of The Medical Repository, and Review of American Publications on Medicine, Surgery, and the auxiliary Branches of Science, published in New York. Apparently Michaux's work had not reached Bartram for he makes no mention of it. He refers only to Linnæus and Walter, with citation of the pre-Linnæans Plukenet and Clayton.

Bartram recognized four species of North American vines, admitting *V. vulpina* and giving new names to the others. His recapitulation (page 23) is as follows:

1. *Vitis sylvestris*, *Vit. Americana*, or *occidentalis*, common bunch grape.
2. *Vitis vulpina*, fox-grape.
3. *V. taurina*, bullet-grape.
4. *V. serotina*, winter-grape, by some called Bermudian grape, and innumerable varieties and hybrids.

One can guess what his binomials mean, but guessing is not identification. We must therefore pass them by, for the most part. His fox grape, "*Vitis vulpina* of Bartram," has systematic standing inasmuch as he cites Linnæus, a definite descriptive phrase of Plukenet and of Clayton; the Plukenet reference is the one that Linnæus cites for *V. Labrusca*.

In his Flora Americæ Septentrionalis, 1814, Pursh accepts six species, *Vitis Labrusca*, *æstivalis*, *cordifolia*, *riparia*, *rotundifolia*, *palmata*. He makes a var. *sinuata* of *V. æstivalis;* he asks "An species distincta?"; the description does not allow of identification, but there is a specimen in Philadelphia. George Don elevates it to specific rank in his General System of Gardening and Botany, 1831; it is retained in varietal standing by Amos Eaton, as the following paragraph discloses.

Amos Eaton's Manual of Botany for North America, fifth edition, 1829, has four species and two varieties: *labrusca* and var. *labruscoides*, *vulpina*, *æstivalis* and var. *sinuata*, *riparia*. Sixth edition, 1833, adds two southern species, *rotundifolia* and *palmata*, making six species of Vitis, aside from the wine grape, *V. vinifera*. In the eighth edition by Eaton and Wright, 1840, *palmata* is omitted and *cordifolia* is included. In the initial work, the little volume of 1817, Manual of Botany for the Northern and Southern States,

Eaton had allowed three native grapes, *vulpina, riparia, rotundifolia;* in the second edition, 1818, he admitted *labrusca* and var. *labruscoides, æstivalis, cordifolia* and var. *vulpina, riparia.*

As late as 1840 the grapes of "the northern parts of British America" were three according to Hooker in Flora Boreali-Americana: *V. Labrusca, vulpina, riparia.*

Several writings on American grapes, with various attention to species, appeared in the early part of the past century, but many years elapsed before a separate botanical enumeration was attempted by an American, Major John LeConte, F. L. S. (1784-1860) in Proceedings of the Academy of Natural Sciences of Philadelphia, vi, for February, 1853. Publication of volume vi of the Proceedings was 1854, but LeConte's paper must have been printed and distributed before that time inasmuch as it was partly reproduced in Flora for November, 1853. LeConte's paper described twelve species of which four are new, the others being *V. bracteata* of Rafinesque and *V. Labrusca, æstivalis, vulpina, riparia, odoratissima* of Don, *rotundifolia, palmata* of Vahl. Of the four novelties, *V. tenuifolia* is not represented in the loose herbarium specimens (mostly leaves) left by him with the Academy of Natural Sciences, Philadelphia. In a brown paper folder marked "Vitis araneosus, Norfolk" in LeConte's hand and "& V. bicolor. V. æstivalis Darl" in another hand, are various forms of *V. æstivalis.* There is nothing representing the plant we have been calling *bicolor.* The entry "Norfolk" is unexplained, inasmuch as he described his *araneosa* (*araneosus*) from "the upper parts of Georgia." Another folder is marked "V. pullarius" in LeConte's hand; the material is *V. cordifolia* except one or two leaves of *æstivalis.* His diagnosis suggests *V. cordifolia.* A folder marked "V. bracteata Rafin." is all *V. æstivalis.* The LeConte material includes leaves of a few cultivated varieties, one of them being the Warren, which is one of the forms lying behind Munson's *V. Bourquina.*

LeConte states that in his wanderings through the country he had, he thought, "seen two more species, but have no memoranda of their characteristics which allow me to say more than that one was observed in the middle regions of Georgia, which bore grapes of a tolerably large size, in clusters of such density that the berries were pressed into a cubic form. The other was a small grape, of which the inhabitants of the upper part of North Carolina made a considerable quantity of pale red wine. This may be the V. cordifolia of Michaux, which species I have not been able to determine."

Major LeConte contributed an article on "American grape-vines of the Atlantic states" to the Report of the Commissioner of Patents for the year 1857 (published 1858), pages 227-237. He discusses the twelve species of his previous technical paper but adds little to aid in botanical determinations. He repeats his former statement that he had never met a grape an-

swering Michaux's description of *V. cordifolia*, and this accounts for his new species *V. pullaria* or "chicken grape" which, we are now convinced, is the same as the one Michaux described.

A regional account is by John F. Weber of Washington in Report of the Commissioner of Patents for the year 1859 on the native grapes of Pennsylvania, New Jersey, New York, and New England with reference to their wine-producing qualities. This vinicultural account recognizes *Vitis Labrusca*, *V. cordifolia* and one variety, *V. æstivalis* and one variety, *V. sinuata*.

In 1860 appeared in Philadelphia a booklet entitled Both Sides of the Grape Question, which went to a second edition the same year. It contains three essays, by William Saunders of Germantown, Pennsylvania, by F. J. Cope of Greensburg, Pennsylvania, and by J. M. McMinn, Civil Engineer of Williamsport, Pennsylvania. The third part by M'Minn (as the name is spelled therein) comes within the field of our inquiry, being "a contribution to the classification of species and varieties to the grape vine." The paper had "been prepared from notes and observations made during the last twenty-five years." The author states that of the sixteen species found in the United States, six produce varieties yielding fruit of superior excellence when properly cultivated. It is difficult from his arrangement of binomials to make out the nomenclature that he adopts or recommends. Some of his binomials fall in what we now know as Cissus and Ampelopsis, but there are some thirty-three of grapes, including many of the random names of Rafinesque. The number of vineyard varieties of that day was large, many of them being accounted hybrids.

A general separate American enumeration was by S. B. Buckley (1809-1884), "The grapes of North America," in Report of the Commissioner of Patents (cited as Patent Office Report) for the year 1861, published in Washington in 1862, pages 478 to 486. He lamented the fact that "mere varieties of one species were sometimes described and made into two or more species." Seven species formerly established, including the muscadine, were admitted by Buckley and he described three new ones from Texas which "is emphatically the land of the grape,"—*V. mustangensis*, *monticola*, *Lincecumii*, making a total inventory of ten. The new species were the result of "nearly two years of almost continuous travel in Texas, as botanist of the State Geological and Natural History Survey." Original Buckley material of *V. mustangensis* is in the herbarium of Academy of Natural Sciences in Philadelphia and of *V. Lincecumii* and *monticola* in National Herbarium, Washington.

Comprehensive American review of Vitis was published eight years later by Dr. George Engelmann (1809-1884) of St. Louis, in the new American Naturalist (ii, 1869), with recognition of ten species, one of which (*arizonica*) was proposed as new although not technically described in that

place. As early as 1860 Engelmann had published on the grapes of Missouri in Transactions of the St. Louis Academy of Science. Engelmann's day was an epoch of strong conservatism in recognizing the forms of life. He reprehended attempts to increase the number of species in Vitis. He apparently did not know the paper of Buckley, as he does not mention him or include his new species.

In connection with the phylloxera studies of Charles V. Riley, State Entomologist of Missouri, Engelmann contributed a brief account of "The true grape vines of the old United States" to First Annual Report on the Noxious, Beneficial and other Insects of the State of Missouri, Jefferson City, 1869. This article was followed by a much fuller enumeration in Sixth Annual Report, 1874, on "The true grape vines of the United States," pages 70-76, which is a good botanical treatment of the species then known.

In 1883 appeared another general and fuller survey by Engelmann in third edition of "Bushberg Catalogue," being Illustrated Descriptive Catalogue of American Grape Vines by Bush & Son and Meissner at Bushberg, Jefferson County, Missouri: "Dr. George Engelmann, the celebrated Botanist, has enhanced the value of our Catalogue by revising for it his Classification of the True Grape-Vines of the United States. He has, in fact, entirely rewritten it, and many illustrations, made expressly for this valuable treatise, have been added thereto." Recognized species are thirteen. Here appear illustrations of seed characters and of distinguishing features of the diaphragm in the nodes of canes. Foliage differences are also displayed in pictures. This third edition of the Bushberg was translated into French by Bazille and Planchon, published in Montpellier and Paris in 1885, and in Berlin the same year translated by Von Babo and Rümpler. First edition of this important catalogue had appeared in 1869. Second edition was in 1875, with the botany by Engelmann and recognition of nine species, translated by Bazille and Planchon and published in Montpellier and Paris in 1876. The fourth edition was issued in 1895 (prefaced 1894); the standard treatment of Engelmann was retained but was supplemented by a synopsis by T. V. Munson with recognition of twenty-five species. The extensive Bushberg enterprise in Missouri, with nurseries and vineyards, has now passed out.

The various Vitis papers of Engelmann are reproduced in the large memorial volume by William Trelease and Asa Gray published in Cambridge in 1887, "The Botanical Works of the late George Engelmann." Dr. Engelmann was a commanding figure in the developing plant knowledge of the expanding country. It was the writer's rare privilege to have had his personal counsel on botanical subjects.

Striking botanical enumeration is the conspectus by Eduard August von Regel of the genus Vitis in North America, northern China and Japan published in St. Petersburg in 1873 (in Acta Horti Petropolitani, ii). Regel

includes Ampelopsis in Vitis; and of the true grapes of his vast region he recognizes only two species, *V. vulpina* and *V. Labrusca*, the wine grape, *V. vinifera*, being interpreted as *V. vulpina* × *Labrusca*. This simple treatment makes *rotundifolia*, *cordifolia*, *riparia* as well as the Asian *parvifolia* and *amurensis* to be varieties of *V. vulpina*, with *æstivalis* and the Asian *lanata* varieties of *V. Labrusca*. By these easy dispositions we escape many bibliographic difficulties and fail to understand the plants.

Regel's condensation is exceeded by Otto Kuntze's in volume i of his Revisio Generum Plantarum, 1891, in which he recognizes only *Vitis vinifera* as of specific rank, and makes seven main subdivisions for the grapes of the world. These categories are scarcely reducible to ordinary customs of nomenclature but for our purpose we may designate them as varieties: var. *vulpina*, including as subordinate categories among American grapes *cordifolia*, *rotundifolia*, *rupestris;* var. *tiliæfolia*, covering *caribæa*, *candicans*, and other species extra-American; var. *normalis*, including *riparia* and the Asian *amurensis;* var. *Labrusca*, covering "*americana*," *æstivalis*, among American grapes; var. *laciniosa;* var. *palmata* for *V. palmata*, Vahl.; var. *multiloba*. Extended nomenclatorial discussions accompany this arrangement, but the student of American realities in Vitis becomes bewildered in them.

Before these dates extensive viticultural studies in France, stimulated by the devastations of phylloxera and the search to find resistant stocks on which to graft the wine grape, began to find publication and attract wide attention elsewhere. The study of species of North American grapes was intensive and long continued, and literature in French is voluminous. The present paper is manifestly not the place to review these important investigations, but certain contributions of systematic interest to American botanists may be mentioned.

A general account of the vines and wines of the United States (Sur les vignes et les vins des États-Unis) by Elias Durand appeared in three parts in Bulletin de la Société Impériale Zoologique d'Acclimatation, Paris, 1862, beginning on pages 313, 410, 479; the third part or essay is a good botanical account of North American grapes, with recognition of ten species. The three Buckley species, *mustangensis*, *monticola*, *Lincecumii*, are fully published as "spec. nova ined." Durand also contributed an extended and careful monography of American Vitis to Actes de la Société Linnéenne de Bordeaux, 3rd series, volume iv, the paper being dated November 10, 1862: "Vites Boreali-Americanæ," pages 113-176. This important contribution, that should be better known to North American students, accepts ten species of true grapes (excluding Cissus, Ampelopsis, Parthenocissus), with well-cited synonymy.

Before the session of the 10th of April, 1874, of Société Botanique de France, J. E. Planchon (1833-1900), who had recently returned from a

visit to North America, presented a paper, "Les vignes sauvages des États-Unis de l'Amérique du Nord." The paper is published in volume xxi of the Bulletin of the Society, pages 107-112. Ten species are recognized. On the 27th of December, 1876, Planchon, from Montpellier, wrote an introduction to the newly established journal, "La vigne Américaine, sa culteur son avenir en Europe," which began publication in Vienna in 1877, "par J. E. Robin et V. Pulliat, sur la direction J. E. Planchon." In 1875 Planchon published a little book, "Les vignes Américaines, leur culture, leur résistance au phylloxera et leur avenir en Europe," of which one chapter is devoted to the wild species of Vitis. In this treatment, eleven species are admitted, together with three varieties of *cordifolia,—genuina, riparia, Solonis.* Subsequently Planchon gave us the standard treatment of the Vitaceæ of the world, 1887, "Monographie des Ampélidées vraies" in volume v of DeCandolle's Monographiæ Phanerogamarum, Vitis occupying pages 321-368. The genus is divided into two sections, Euvitis or the true grapes, Muscadinia or the muscadines with only *V. rotundifolia,* the section later raised to generic rank by John K. Small (1903). Accepted species of Vitis are twenty-eight, of which seventeen are North American, together with the doubtful *V. Solonis* and two hybrids.

Another major French authority on the grapes of North America was A. Millardet (1858-1902). In 1876 at Paris appeared his "Études sur les vignes d'origine Américaine qui résistent au phylloxera." In 1879 was published at Bordeaux "Études sur quelques espéces de vignes sauvages de l'Amérique du Nord," in which one chapter is devoted to seed characters with an excellent plate. In 1885 was issued Millardet's quarto volume, "Histoire des principales variétes et espèces de vignes d'origine Américaine qui resistent au phylloxera," with beautiful plates. Second part of this exhaustive work, pages 153-237, is devoted to "Les espèces sauvages," the North American wild species of Vitis. Fourteen species are described, and both natural and artificial hybrids listed.

Another of the French synopses is G. Foëx in Cours Complet de Viticulture, Montpellier and Paris, second edition, 1888, with a chapter devoted to systematology of Vitis. This treatment recognizes fifteen species of North American grapes. Third edition, 1891, admits eighteen species, with classification based on that of Munson. I do not know the first edition of this important work.

Subsequent French review is Les Vignes Américaines, 1896, by P. Viala and L. Ravaz, published in Paris. Part II, comprising the major body of the book, is devoted to the systematic account or vine-stocks (cépages). Treatment is extended, as to viticultural adaptations, under each of the eighteen American species, with many illustrations of them. Viala and Ravaz were associated in the founding of the influential cotemporaneous journal, Revue de Viticulture, which began in 1894 in Paris and

was started under their direction. In this periodical have appeared many articles on one or another aspect of American grape problems.

Second edition of Viala and Ravaz Les Vignes Américaines was translated into English by Raymond Dubois and W. Percy Wilkinson, "revised by P. Viala," and published by the Department of Agriculture of Victoria, Australia, at Melbourne in 1901. As American Vines it was published in San Francisco in 1903 translated by Dubois and Twight, with preface by Viala.

Foëx and Viala collaborated in the preparation of Ampélographie Américaine, Montpellier, 1885, an attractive folio with striking plates by E. Isard. The species are *Labrusca, candicans, monticola, Lincecumii* of large-fruited kinds; and *æstivalis, riparia, rupestris, cordifolia, Berlandieri, arizonica, californica, cinerea, caribæa* of small-fruited kinds. Thirteen species of American grapes were admitted in volume i of L. Portes and F. Ruyssen, Traité de la Vigne, Paris, 1886. In 1902 appeared the beautiful work by Ravaz, Les Vignes Américaines, Montpellier and Paris, with 433 engravings; this work is not primarily systematic, being devoted to viticultural varieties, races and hybrids but with recognition of the botanical sources.

Important resumé and estimate of viticulture in North America is Une Mission Viticole en Amérique, 1889, by Pierre Viala, professor of viticulture in the National School of Agriculture of Montpellier. This valuable work was the result of an official mission to the United States in the interest of French viticulture. United States Commissioner of Agriculture, N. J. Coleman, designated F. L. Scribner to accompany Professor Viala in his explorations, in the course of which the visitor met the leading authorities of the country on the subjects of his inquiries, among them T. V. Munson. The work comprises an account of the North American species of Vitis, the diseases, adaptation to soils. The recognized species are eighteen (and others are incidentally mentioned), each one fully treated botanically and viticulturally.

Now enters T. V. Munson (1843-1913), nurseryman, vineyardist and student at Denison, Texas, whose investigations began to find expression in 1885. Munson completed the scientific course in 1870 at the Agricultural College of Kentucky and later received the degree of Doctor of Science from the University. He was led to an interest in grapes, as he tells us, by visiting the vineyard of Dr. Robert Peter, who was his instructor in chemistry. In 1876 he went to Denison, and acquired "a rough piece of dark limestone, timbered land, on the bluffs of Red River." Here he engaged in notable experiments over many years in the amelioration of grapes, and traveled extensively to study and collect the native species.

At the meeting of the American Horticultural Society in New Orleans, January, 1885, Munson read a paper on "Native grapes of the United States" in which he proposed a classification in seven groups or sections. Fourteen species are definitely recognized, and also *vinifera* "for comparison." The paper appears in volume iii of the Transactions of the Society, pages 128-140; and in translation by M. G. Bourgade it reappeared in Progres Agricole et Viticole, Montpellier, 1885. He had made an exhibit of herbarium specimens in glass frames and of growing plants in pots at the Cotton Centennial Exposition at New Orleans, and the paper was a supplement thereto. The herbarium specimens were presented to the University of Missouri; they were destroyed by fire.

This New Orleans paper appeared also in volume vii of The Wine and Fruit Grower (published in New York by the Claytons) for August, 1885, pages 83-86, with considerable revision by Munson. The paper is accompanied by editorial approval including republication of an article by Munson in the issue of the journal for September, 1884, in which the origin of the Herbemont and similar varieties is traced. Munson was then convinced that these grapes originated as hybrids between *V. cinerea* and *V. æstivalis;* he takes issue with those who assume that the Herbemont has "vinifera blood," although later he became convinced that this class is of obscure south European origin. See discussion under *V. Bourquina*, No. 6a, in the sequence.

A more extended paper by Munson was presented to the twentieth session of the American Pomological Society at Grand Rapids, Michigan, September, 1885: Proceedings of the American Pomological Society for 1885, published in 1886, quarto, pages 95-100 and inset. The paper is "American grapes," with the subtitle "Importance of botanical and other scientific knowledge to the progressive horticulturist and especially to the viticulturist." It was a timely paper, with plea for better breeding in harmony with accumulating knowledge and recognition of evolutionary principles. It includes a classification of the sixteen recognized American species as well as a chart referring vineyard varieties to their species and recording much other viticultural information. Sexuality of the grape flower was explained and illustrated. It was at this Grand Rapids meeting that I met T. V. Munson, and the association and friendship continued until his death.

A third listing by Munson is in Proceedings of the Eighth Annual Meeting of the Society for the Promotion of Agricultural Science, 1887, consisting of a folded table of "The relative times of germination, leafing, blooming, ripening and size of fruit of species of American grapes." Here twenty-two species are recognized, including the new names *novo mexicana*, *Girdiana*, *texana*, *Simpsoni* (name later applied to another species), *argentifolia*. These new species are not formally described, but there are sufficient characters in the table and the footnotes for identification.

In 1890 an important government publication by Munson appeared. He had then become recognized authority not only on grape-growing but on the American species of Vitis. The pamphlet is "Classification and generic synopsis of the wild grapes of North America," comprising Bulletin number 3 of the Division of Pomology of the United States Department of Agriculture. This contribution represents the first great enlargement of the species of North American grapes, with admission of twenty-five species.

Subsequent classifications were published by Munson: Garden and Forest, iii, 474, 475 (1890); American Garden, xii, 580-586, and 659-661 (1891).

Systematic parts of these various Munson treatments are schemes of classification, mostly without definite contrasts of characters. Several new specific names are in them but some of them are botanically *nomina nuda*, and even though specimens may be available the names cannot be cited as published; however, some of them reappear in other contributions under conditions that validate them. Species are not keyed in the Munson papers. The only full key to the species of North American grapes is in Standard Cyclopedia of Horticulture, 1917.

Another set of Munson papers, little known in the United States, with pictures of representative leaves of species, ran in Revue de Viticulture, Paris, under the general title "Les vignes Américaines en Amérique": vol. i, 1894, beginning p. 81; vol. iii, p. 157; vol. iv., p 245; vol. v, p. 157; vol. vi, p. 421.

Other Munson writings are in bulletins of the Texas Agricultural Experiment Station. Bulletin 56, Special Series, 1900, is an extended account of his experiments together with much information on species of Vitis and many photographs. Bulletin 88, 1906, is a viticultural record of species and varieties.

Finally is the extended enumeration of Vitis species in Munson's Foundations of American Grape Culture, 1909, faithful work of a lifetime. The first 110 ample pages of this work comprise the systematic part with twenty-six species and many varieties, being the most generous recognition of the kinds of native Vites. This work is out of print.

Munson was a special agent of the Division of Pomology of the United States Department of Agriculture in 1888, and made extensive journeys to understand the native species, accompanied by C. L. Hopkins, the first Assistant Pomologist. Hopkins resigned about the end of 1890 because of failing health and was succeeded by William A. Taylor, who has recently retired as Chief of the Bureau of Plant Industry, to which he gave long and distinguished service. Munson was early interested in the preparation of a monograph on North American Vitis. Report of the Pomologist, H. E. VanDeman, for 1888, speaks of this enterprise as follows (page 569): "A monograph of the genus *Vitis* is being prepared for publication by the

Division with the assistance of Mr. T. V. Munson, of Texas, as a special agent, and a considerable part of the work is already done. As the field-work, the preparation of the original colored illustrations, and the literary part also progressed, it became evident that we would need all of another year to complete it." Expense of manufacture precluded the publication of the work. The Division of Pomology published a Generic Synopsis by Munson in 1890, as we have seen, as Bulletin number 3, and it was not until the publication of his Foundations as a private enterprise nearly twenty years later that he found full expression for his ideas on the species of American grapes.

The "colored illustrations" are unpublished natural-size water-colors by W. H. Prestele and are now preserved in the United States Department of Agriculture. These paintings were made directly from fresh living materials and I well remember the devoted work that Prestele gave to consignments as he received them from Munson. I have made photographs of these water-colors. All told, the paintings are twenty-nine, as follows, given under the original names they bear (the last six entries being those water-colors considered to be yet incomplete):

rupestris	Lincecumii	cinerea
riparia	Lincecumii var. glauca	Munsoniana
riparia	Lincecumii var. glauca	Munsoniana
Solonis	bicolor	cinerea var. floridana
Doaniana	aestivalis	Baileyana
arizonica	Simpsoni	cordifolia var. sempervirens
candicans	cordifolia	Champini
coriacea	rubra	californica
Labrusca	monticola	Girdiana
Bourquina	Berlandieri	

No type specimens of his species of Vitis were left by Munson, as such types are understood in this day. We have noted that his exhibit of 1885 was destroyed by fire. In Bulletin 56 of the Texas Agricultural Experiment Station, 1899, Munson made a full statement of his educational work with grapes (repeated in the Foundations). Here he says that "To Dr. Vasey, Botanist of the Department of Agriculture, eleven sets were supplied. These were placed in as many agricultural colleges. These sets contained young and mature wood, leaves, flowers and fruit of each American species." I do not know to what colleges these sets were sent, but apparently two of them are identified, one at the Mississippi Agricultural and Mechanical College, loaned me by Professor J. C. McKee, one at the University of Florida loaned later by H. H. Hume. Handwriting on the labels is the same in both sets but it is not Munson's. The sets comprise twenty-six mounted sheets in the Mississippi collection and twenty-three in the Florida, on printed mounting-paper of the United States Department of Agriculture, labels dated 1888. Two of the specific names were never published. Apparently this distribution of 1888 constituted the earliest botanical record of the Munson species.

In 1889 Munson began to offer living plants of the native grapes to botanists and experimenters. List of them is recorded in Bailey, Annals of Horticulture for that year, 101-2. I grew the set and made botanical specimens, although some of the species did not long survive in New York.

Striking collection of the native grapes was made by Munson at the World's Fair in Chicago in 1893. The herbarium specimens were displayed on the wall in glass-covered frames. This collection went to the Department of Agriculture and the specimens are now being incorporated in the National Herbarium in the Smithsonian Institution. These specimens are more complete than the former ones, and they constitute the most authoritative representation of Munson's species.

Someone may be interested in a contemporaneous comment on the World's Fair grape exhibit, that may be read after the lapse of forty forgetful years (Bailey, Annals of Horticulture in North America for the year 1893): "The most exact and scientific pomological exhibit in the Horticultural Building was a collection of grapes shown by T. V. Munson. Every species of American Vitis was shown by photographs of the fruit and seeds; by herbarium specimens of leaves and usually of inflorescence; by dried twigs, cut to show the diaphragms at the joints; roots; by fruits preserved in liquids; by sections of old trunks; and, finally, by young plants growing in pots. The exhibit comprised a comprehensive study of the genus, to which Mr. Munson has given himself for many years. From time to time he exhibited fresh grapes, showing the progress he is making in the origination of varieties, particularly in his unique crosses with the Post Oak grape (*Vitis Lincecumii*) of the Southwest. Several of these varieties occasioned much favorable comment from expert judges."

Many of the Munson vineyard varieties are now standard grapes for the southern parts of the country. In the early days Munson made botanical specimens for me of his new varieties, as well as of other vineyard grapes; this material is now at Cornell University. Later, specimens were made for me by the son, the late Will B. Munson.

Remains of Munson papers and correspondence are now in possession of T. C. Richardson, Chairman of the Texas Agricultural History Committee; this collection includes his voluminous correspondence. It is proposed by Mr. Richardson to prepare a monograph on Munson's life work. Other papers, as journals, are at the Agricultural and Mechanical College of Texas.

An American botanical accounting, following Munson's early work, is by Bailey in Gray's Synoptical Flora, 1897, with twenty-three species and thirteen varieties.

Further treatment is by Hedrick in The Grapes of New York, 1908, comprising pages 95-156 of that large volume; twenty-four species are entered, including the wine grape, *Vitis vinifera*.

In volume i of the great Ampélographie of Viala and Vermorel, Paris, 1910, the monography of Vitis by Viala and Péchoutre recognizes eighteen species in North America north of Mexico. They are beautifully illustrated. Other species-names known to us in North America are not included or are considered to represent hybrids.

One is not to conclude that the systematic enumerations rehearsed in the foregoing pages comprise all the writings on the North American species of Vitis. The year 1830, for example, is marked by the appearance of three books that must have comment here, one by William Robert Prince aided by William Prince, and two by Rafinesque.

A Treatise on the Vine by Prince was an ambitious and studious work for its day, 355 pages, dedicated to Henry Clay. Much attention was given to the application of botanical names to viticultural varieties. Certain new binomials resulted from this practice, as *Vitis Blandi* probably *Labrusca*, *V. Nortoni* for Norton's Virginia one of the *æstivalis* group, *Orwigsburghi* probably a *vinifera*, *V. missouriensis* and *V. illinoensis* quite unidentifiable. Here originates, also, the disputable name *V. Longii*.

Trinomials also were made, for viticultural varieties, as *V. Labrusca* vars. *Worthingtonii*, *nigra*, *alba*, *rosea*, *rosea maxima*, *Elktoni*. The book is naturally not a botanical work.

The books by C. S. Rafinesque are American Manual of the Grape Vines and the Art of Making Wine, a paper-covered pamphlet of sixty-four pages, and volume ii of Medical Flora, or Manual of the Medical Botany of the United States of North America, both published in Philadelphia in 1830. The treatise on grape and wine-making is the same in both books barring a few lines at the beginning. Which book first appeared is not disclosed. The Medical Flora bears imprint of a publisher but the Manual was "printed for the author."

These Rafinesque books are mentioned here because two score new species of American grapes (and several of supposedly exotic grapes) are proposed. The descriptions do not distinguish species as we know them today or have ever known them, and the names are not identifiable. One may guess at some of them but there is no profit in this. Eight illustrations of leaves (reproduced in green ink in the Medical Flora) do not help greatly toward identification. In a genus as difficult as Vitis one should not be expected to place names without clear evidence; I disregard most of the Vitis nomina of Rafinesque as have others for the most part before me, and do no more than to list them (page 240); only those fortified by synonymy are

worth citation. It is a pity if any respectable current binomials must be displaced because of these occurrences.

Engelmann writing in 1869 observes: "Rafinesque, about forty years ago, undertook to describe and classify these forms; but, with his loose observation and lax scientific conscience, he, as usual, instead of becoming a guide, created inextricable confusion."

It is interesting to have the opinion of a contemporary, Major LeConte, on the Rafinesque work in Vitis: "Rafinesque, by believing in the various follies of the day, and led aside by writings which fell into his hands and by the false statements which he collected from different quarters, made forty-one species of this genus, the most of which he had never seen. Although able to investigate and describe as well as any naturalist of his day, he was led astray by an insatiable desire of making new species, and appropriating to himself every thing that he saw or even heard of in Natural Science, he gave names to many things which never existed, and furnished accounts of them as if he had had them in his possession. Although his lucubrations are little worthy of notice, I have endeavored to identify as many of these numerous species as possible, and to reduce them to some degree of certainty; guided as well by what I remember to have seen in his possession, as by the short, and, in many instances, very imperfect descriptions found in his American Manual of Grape Vines; some I have not been able to determine, but scarcely think them different from others already well known."

One should not leave the literature of Vitis without noting the challenging essays of Fernald on the vineland legend about the Norsemen. The legend, that has become respectable by many repetitions, assumes that Wineland the Good must have been a land of grapes and that the early Norse explorers came as far south in eastern America as the grape country. Fernald shows that the voyagers did not find grapes but berries in spring under the snow: these berries were undoubtedly the mountain cranberry (*Vaccinium Vitis-idæa*). This correction is less important to phytogeography than to American history, disposing of this supposed evidence that the Norsemen visited the region now known as New England (M. L. Fernald, Rhodora, xii, 17, Feb. 1910; Bulletin of the American Geographical Society, xlvii, 686, Sept. 1915).

The Present Problem

From the first the native grapes in North America have been counted as particularly difficult to define and to identify. This is evidenced by the fact, as we have noted, that Regel and Kuntze reduce them to one or two species whereas others recognize twenty to thirty species. Engelmann speaks of Vitis as "this intricate genus."

William Bartram in 1804 states that "with regard to the vine of America I find a great difficulty in discriminating the species from varieties or

hybrids, which, perhaps, may be partly accounted for from some of our vines being diœcious, and there being a much greater number of male vines than of fruit-bearing ones, whose *farina fecundans*, mixing with the air and winds, is carried to a great distance to the female organs of hermaphrodite flowers."

Rafinesque proposes (1830) "to give here a monography of the North American Grape Vines. The subject is new and obscure. The botanical species are scarcely indicated, and their numberless varieties have been overlooked by our best writers. I have ascertained about 40 species and 100 varieties, but I must confess that it is not always easy to say whether one or the other." And again: "Many varieties have no doubt escaped my researches, they abound in the woods, since the seeds do not always reproduce the identic kind, and Major Adlum has stated to me to have seen 200 varieties at least."

LeConte, 1853, recognized twelve species of native grapes, as we have seen, but was apparently none too certain of the results: "The number of species now recognized in systematic works is not more than five or six. I have increased this number considerably; with what propriety is for others to judge."

Buckley publishing in 1861 states, "the grapes are so varied in the shape of their leaves that it is difficult for the closest botanist to distinguish their species from mere specimens in the herbarium. The same vine often has entire leaves, and also those which are deeply lobed with many intermediate forms. The fruit, which is one of the most characteristic marks of species, is frequently wanting in the herbarium, or, if there, in its dry state it has nearly lost all its distinguishing characters."

Engelmann, master student of the genus, was perplexed (1869), following the work of Rafinesque and LeConte: "LeConte, long after him, did little to unravel the entanglement; and since their efforts to distinguish imaginary species, the tendency has rather been to combine what were formerly considered, even by conscientious authors, as distinct species.

"I have long devoted much attention to the grape-vines of my home (St. Louis), but have become satisfied that no satisfactory solution can be obtained without the coöperation of the friends of botany throughout the whole country; so I ask from their love and zeal for our science, and from the general interest which this particular investigation now commands, their friendly cooperation."

"Linnæus knew two species; and that sagacious observer, the founder of the flora of North America, Michaux, added three more. These five species are acknowledged to this day as the principal forms found in the regions between the Atlantic and the Mississippi. But even in their native haunts they vary to such a degree, that both scientific and non-scientific observers have never felt satisfied about them."

Perhaps when we are ready to recognize all the species in the country the terrors of the genus will largely disappear. This means better herbarium records. We need to be reminded that the botanical field collecting of Vitis has been largely fragmentary and haphazard. Specimens have been picked up here and there, mostly incomplete, and when assembled for study they may not be comparable and many essential parts may be lacking. Not until persons who know something of Vitis set forth for the purpose of collecting material that shall really represent the plants can we expect either precision or comfort in the study of the genus.

There are five prevailing limitations in herbarium specimens: lack of record whether the various pieces of a collection are from the same vine; insufficient care to obtain flowers showing the separation of sexes; inadequate representation of long verdurous sterile and ground shoots with their special foliage characteristics; lack of young tip growths; absence of mature fruit. Canes of some of the specimens should be split or the nodes cut through lengthwise to expose the diaphragm. It is difficult in herbarium work to correlate flowers and fruits because one does not know whether they represent the same plant. Aside from all these deficiencies is the prevailing meagerness and general insufficiency of herbarium material. In mounting Vitis specimens, under surface of some of the leaves should be exposed.

Long ago (1869) Engelmann gave good instructions for the making of herbarium specimens of Vitis, and they may be repeated:

"In order to arrive at satisfactory conclusions, it is necessary to study all the forms which present themselves, in all their bearings, and under the different conditions in which they are found. Specimens ought to be collected in flower, exhibiting also the young shoots and developing leaves, and, *from the same stock*, in fruit, if fruit they bear; and ripe seed should be obtained; the soil, the locality, the accompanying plants, and the size of the vine ought to be noted, the difference in shape and size of the leaves of young shoots and of bearing branches is often important; the exact time of flowering, and the period of maturity are interesting data; the size, color, and taste of the fruit, the presence or absence of the bloom on the ripe berry; the usual number of seeds in each, the conditions and color of the pulp,—all are points not to be neglected. It is not expected that species can be founded on the variations in all these characters, but it is important that the limits of variation of the different species should be defined; and that can only be done by exact study of as many forms as possible in all their bearings."

It is particularly important that young growing shoots and tips (Fig. 103) be added to the herbarium in pieces one foot or more long, dried naturally so that the color of the indumentum may be preserved.

If every monographer of Vitis has had doubts on the natural limits of species and on the identification of occasional forms, so are there still perplexities. We are to consider, however, that in all variable groups we undertake to confine plants in a formal book treatment, to which they naturally cannot conform.

The hybridity question

How far hybridity is involved in the wild grapes is not well understood. At first, when puzzling new forms were recognized from few imperfect specimens, it was natural to assume them to be hybrids, and literature abounds in suppositions. Some of the kinds once thought to be hybrids are now known to occur over extended natural ranges, to carry good marks of identification, and sometimes to constitute the characteristic Vitis flora of a region. If Vitis hybrids are as widespread as once supposed, we should expect specific lines to have largely disappeared by this time. Very likely we have confused hybridity and variation.

Thus, *Vitis* × *Champini* of Planchon, which apparently combines the features of *candicans* and *rupestris*, is regarded by Munson (who recorded numerous hybrids) in his latest work, having seen it from many places in the wild and grown hundreds of seedlings, "as a fairly good and distinct species."

The extent of hybridization can be determined only after we know the species. Modern studies in hybridity have thrown doubts on mere intermediateness as evidence. Perhaps variation is due to many factors. As a working basis in systematics at the present time, we are obliged to accept the wild grapes as we find them without unchecked speculation. We have come forth into a new epoch.

Aside from the wine-grape industry of California and adjacent territory, which is founded on *Vitis vinifera*, American grape-culture is the outcome of domestication of the native species of Vitis within about a century. Although this development, like that of the blackberries, has taken place before our eyes, we do not understand it. Descriptive records are not sufficient.

Parentage of many well known American vineyard varieties is speculative or opinional. This is particularly true of numbers of historic varieties, as Catawba, Delaware, Isabella, Concord, Herbemont and others. Varieties of these classes are usually "found" as seedlings on premises. By the nature of foliage, fruit, growing habit, a parentage may be assumed but not demonstrated. They may be first-generation hybrids or perhaps some of them straight mutants. Propagated asexually, they maintain their characteristics. Seedlings from them may not show a break-up into probable parentage. We know well enough that the Eurasian *vinifera* is capable of combining rather freely with *Labrusca* and *æstivalis*. These two crosses and related mutants have given rise to two prominent classes or pomologi-

cal families, the Labruscans and the Bourquinians. It would be violence to attempt to define these classes as either straight *Labrusca* or straight *æstivalis*, or as varieties of these species, and in this paper they are separately admitted for clarity. In time we shall recognize named classes issuing from other native species. Notwithstanding the voluminous literature, we are yet uninformed, in a scientific sense, of the origin of a good part of the current vineyard grapes, not only as to parentage when hybrids but as to the genetic reasons.

There are historic examples of designed hand crosses, as in the work of Rogers, Haskell, Jaeger, Wylie, Moore, and Munson. Today new experiments in these interesting fields are well in progress and we are aware that superior table and vineyard grapes are actively in the making, with new combinations of parentage.

North American viticulture is yet young. Marked departures in varieties will be required. Many of the native species will be involved. The present writing is an inventory of indigenous resources as understood in this day. Of the thirty Vites herewith admitted in North America, only a half dozen or so are yet known to have merit as the basis of ameliorated fruit varieties, and apparently only *V. Labrusca*, *V. æstivalis* and *V. vulpina* have yet contributed largely to North American viticulture.

Viticultural literature abounds in statements of hybridity between the native species, as confidently expressed as if we had the facts. These statements of course assume that the particular writer knew the species themselves, an assumption that most of us would not now hazard. The free statements of hybridity were hardly made in the sense of scientific precision required in the present day, but rather as general opinions of resemblances much as are yet current among horticultural folk. It is high time that this mode of expressing variation be discontinued, in all kinds of plants, and the subject of hybridity be left to investigation under proper methods of control. When we are still likely to consider *Vitis æstivalis* as a complex rather than a final species, and when most of the remaining species are imperfectly defined, it is futile to infer hybridity on surface indications.

Interesting example of a developed viewpoint is afforded in the writings of Munson. Considering *V. palmata* (or *rubra*) in 1885 (Trans. Amer. Hort. Soc. iii, 133) he wrote, "seemingly a multiplied hybrid of Cordifolia with Riparia, with possibly a trace of Cissus blood." In his final work, 1909 (Foundations, 81) *V. palmata* is "a very distinct and well characterized species."

Other examples might be taken from descriptions of seed characters. Thus, in describing *V. æstivalis* it is written: "chalaza generally small, circular or ovate at middle or above back of seed, surrounded by a shallow groove which extends over top of seed, in some cases making it appear slightly lobed, indicating admixture with *V. labrusca*." This assumes a

definite detailed conformation of the seed of *Labrusca*, but if one makes careful observation on *Labrusca* seeds from different collections one finds enough variation to invalidate the comparison.

The many printed assertions of hybridity between species of Vitis in nature are to be looked on as steps in the understanding of species rather than as records of crossing. No one is ready to deny hybridity of Vitis in feral conditions but its record must be based on evidence rather than on assumed standards, that is, approached objectively. Horticulturists and plant-breeders should be cautious in accepting customary statements of hybridity in any group of plants.

The grape flower

Genus Vitis is distinguished, among other things, by the fact that the five greenish narrow petals cohere at the top and are pushed off or shed as a single body or "cap:" note the stages in Fig. 100. Three types of grape

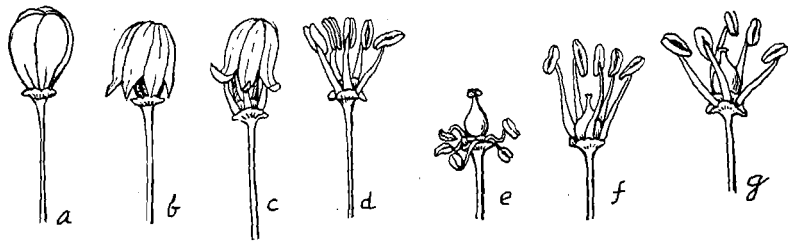

FIG. 100. THE GRAPE FLOWER (× about 5); a, bud with cap in place; b, c, cap in process of shedding; d, staminate flower; e, flower with good pistil and reflexed stamens; f, g, effective hermaphrodite flowers of Concord (*Vitis labruscana*) and Black Hamburgh (*V. vinifera*).

flowers are commonly recognized in respect to sexual characters: (1) the perfect hermaphrodite flower in which five good erect stamens and a single strong pistil are present; (2) imperfect hermaphrodites in which the stamens are short and variously reflexed or bent, the pollen usually ineffective, the flower therefore practically pistillate; (3) sterile, in which the pistil is only a rudiment but with long erect polliniferous stamens, practically staminate flowers. These types of flowers are on different plants. Clusters of staminate flowers are more showy than those of pistillate and commonly much larger; this accounts for the abundance of staminate clusters and the paucity of pistillates on herbarium sheets.

Although the perfect hermaphrodite flowers (with long erect stamens) are commonly described in connection with our native grapes, I have not seen them in any species in the wild although hundreds of clusters have been examined, with the exception of a *V. californica* from Oregon. Munson states (Foundations, 132) that "by cultivation and stimulation

we cause them [species of Vitis] to develop true hermaphrodite flowers,—both sexes in one flower." Dorsey writes that "in the wild the grape is diœcious, and fertile pollen borne by the pistillate flower with reflexed stamens is rare, if it occurs at all" (M. J. Dorsey, "Pollen development in the grape with special reference to sterility," Bull. 144, Minn. Exp. Sta. 1914, with plates and extensive bibliography). Richard Wellington, of the State Experiment Station at Geneva, New York, writes me that he once examined about fifty-five vines of *V. Labrusca* in bloom on his home farm in eastern Massachusetts and found about thirty-seven of them were male and remainder female with reflexed stamens. In no case did the female vines have flowers with long erect stamens. Stout states, 1921, "It appears that wild species of American grapes consist only of staminate plants and imperfect hermaphrodites except perhaps for rather rare cases when individuals are found bearing some or even all perfect flowers" (A. B. Stout, "Types of flowers and intersexes in grapes with reference to fruit development," Bull. 82, N. Y. Agr. Exp. Sta. Geneva, p. 4).

Perfect hermaphrodite flowers of the wine grape may be found among the vineyard varieties, *Vitis vinifera* var. *sativa*, but flowers of the feral plant, *V. vinifera* var. *sylvestris*, are apparently various. Baranov has investigated this subject in the wild grape of middle Asia (Transactions of the Experiment Irrigation Station at Ak-Kavak, fasc. 4, pages 1-78, 1927), and finds (as stated in the English rendering) that "the flowers of the wild grape are of two types: certain sorts have hermaphrodite flowers, others are functionally female. As for masculine flowers, they have not been found in any case." A full-page plate shows hermaphrodite flowers with strong erect stamens, those with short and reflexed stamens, but none with erect stamens and no pistil as in American native grapes. In another paper in the same fascicle, 119-137, Baranov describes a fourth form of grape flower, morphologically female, with complete absence of stamens throughout all stages of development; this occurred in the variety Mourvèdre. This second paper is "a morphological and embryological study."

These flower forms are mentioned here only for the benefit of the systematist in understanding Vitis specimens. Their relations to breeding and to vineyard production constitute quite another problem and on which there is special literature: note the citations for example in Olav Einset's "Open pollination vs. hand pollination of pollen-sterile grapes," New York State Agricultural Experiment Station, Technical Bulletin 162 (Geneva), July 1930. The main vineyard varieties of grapes have hermaphrodite flowers and are self-fertile, but a good number of important kinds, as some of the Rogers hybrids, need pollination from other vines for full yield.

Although hybrids are readily produced between the introduced *V. vinifera* and the native *V. Labrusca*, and in other cases, it is difficult to

determine in given suspected cases without record whether the two parents have been involved, due to natural variability of the species and since, also, the chromosome counts are apparently the same in various species (B. R. Nebel, The American Naturalist, lxiii, 188; Die Gartenbauwissenschaft, i, 577—both 1929; also K. Sax, Proc. Amer. Soc. Hort. Sci. 1929, 32; L. O. Gaiser, Genetica xii, 162 +, 1930).* The chromosomes of Vitis are very small and much alike in general appearance, so that specific observation is difficult.

Aside from characters of foliage and fruit, the *vinifera-Labrusca* hybrids are likely to be distinguished from the American parent by frequent intermittent tendril-bearing and more upright habit of growth.

It is interesting that Linnæus does not mention sex irregularities and places Vitis in Pentandria Monogynia (Genera Plantarum, fifth edition, 1754),—with five stamens and one pistil. Thomas Walter in 1788, however, in describing the grapes of Carolina speaks of male and female flowers and places Vitis in the class Diœcia; Michaux in 1803 questions whether they are all diœcious,—"Species meæ omnes dioicæ?" William Bartram, 1804, remarks on the divergence of Walter from the treatment of Linnæus and states, "all that I have observed in the northern and eastern districts of the United States are polygamous; i.e., those vines which bear fruit (female) have hermaphrodite flowers (pentandria monogynia); but the males have only five stamina, without any female organ, and are always barren." Rafinesque in 1830 says of North American grape vines, "Flowers in bunches, thyrsoidal or paniculate, small, more or less fragrant, greenish yellow, complete or pistiliferous or staminiferous, on 3 different individuals."

DeCandolle in the Prodromus, 1824, divides Vitis into two groups: hermaphrodite species, native in the Old World; diœcious or polygamous species, American.

We should have critical field study of grape flowers in correlation with species in the wild; but the student must be more than morphologist, having a keen eye for systematic values.

How comes it that vineyard varieties supposed to represent native species, as Concord, Hartford, Norton, Clinton, have hermaphrodite flowers?

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* Dr. Nebel accommodates me with the following citations to cytological literature:
Kobel, F. Ldw. Jahrb. Schweiz 43. 1929, 231.
Ghimpu, V. Chromosomes of Vitis, etc. Bull. Assoc. of Anat. No. 18, 243-247.
Hirayanagi, H. Chromosome Arrangement III. The pollen mother cells of the vine. Memoirs of the Coll. of Sci. Kyoto Imp. Univ. Series B. No. 4, 273-281.
Negrul, A. M. Chromosomezahl und charakter der reduktionsteilung bei den artbastarden der weinrebe (Vitis). Der. Zuchter. 2: 33-43. illus. F. 1930. No. 2.
Sax, K. Chromosome counts in Vitis and related genera. Proc. Amer. Soc. Hort. Sci. 26 (1929): 32-33. 1930.
The Russians, Baranov and Rajkova, have investigated both Eurasian and American grapes in respect to sterility and essential separation of sexes in them (Bulletin of Applied Botany, of Genetics and Plant-breeding," Leningrad, xxiv, 283-297. Jan. 1929).

Certain morphologies

One must understand something of the organography of Vitis before undertaking to trace and identify the species. The organs and parts constitute the marks by which one may hope to recognize the kinds in nature. This recognition may not come quickly and to the beginner evidences may seem to be conflicting. If one has access to a single growing grape vine, one should first study it carefully with a view of discovering at least the parts now to be mentioned. Attention has already been directed to morphology of the flowers. For leaf venation, see Dorsey, Proc. Amer. Breeders' Assoc. vii, 227-250.

Seeds

Ripe seeds afford marks of identification in a number of species of Vitis. They are not invariable in a given species, and probably their importance

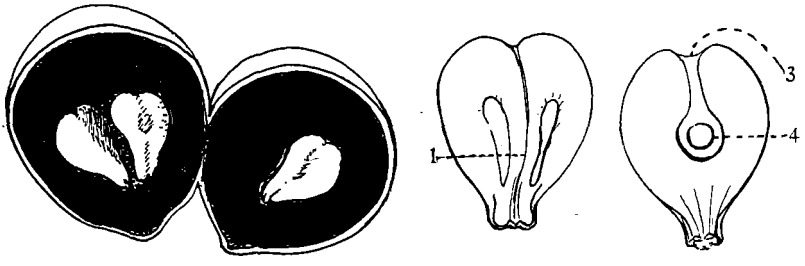

FIG. 101. SEEDS OF CONCORD GRAPE, showing them in position in longitudinal section of the berry, and diagram of the parts, all enlarged: 1, front showing line of raphe and cavities on either side; 3, ridge; 4, chalaza.

in diagnosis has been over-estimated. Size of seed in a given species conforms more or less to the size of berry. The diagram in Fig. 101 shows the features customarily employed in descriptions: 1, keel (inner face) with central line or raphe; 3, ridge over top of seed, with raphe in the groove; 4, chalaza, at end of raphe. On the inner face are two cavities, one either side of the keel and raphe, but these are usually not included in systematic descriptions. Size and shape of seed are of course important, and in some cases color and surface texture as in the glossy seed of *V. Helleri*. Number of seeds is perhaps normally four in the berry, but it may be reduced variously to three, two or even one, and is probably not a specific character. Fig. 102 displays seeds of several species.

Vine tips

Attention has been called to the importance of the young growing ends of grape vines in determining species. They are seldom represented in herbarium specimens, except in those made by Munson. It will be noticed

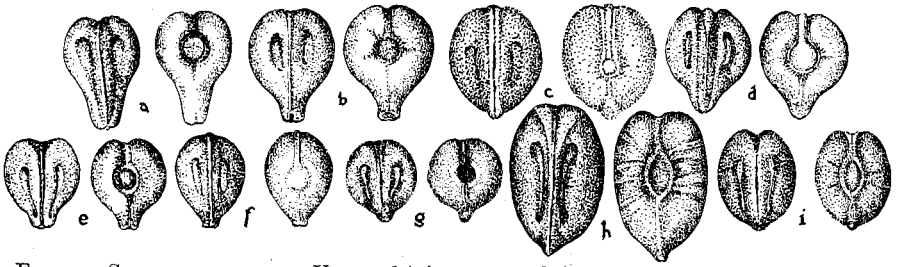

FIG. 102. SEEDS OF SPECIES OF VITIS, 2½ times natural size, showing front view and back or chalaza view in each case: a, *Vitis vinifera;* b, *V. Labrusca;* c, *V. vulpina;* d, *V. cordifolia;* e, *V. Baileyana;* f, *V. illex;* g, *V. vulpina* var. *præcox;* h, *V. rotundifolia;* i, *V. Munsoniana.*

FIG. 103. VINE TIPS OF THE EARLY SEASON, about ⅜ natural size, of *Vitis Longii* left, and *V. Lincecumii;* seeds of each, approximately twice natural size.

also that in every one of his full-page photographs of American species in his Foundations, the tips are shown prominently by intention. These tips of the early season make good herbarium specimens, as shown in Fig. 103, traced from Munson specimens in my possession.

Of *V. Lincecumii* Munson says, "expanding tips not leafy;" and under *V. vulpina*, "the rapidly expanding leaves, after first opening, make the growing branches appear quite leafy towards the tips in comparison with *V. cordifolia*, yet less so than in *V. Longii* and still less than *V. rupestris*."

Stipules

New axes of Vitis bear stipules at base of petiole. Stipules are soon caducous and are not often recognized, yet they may provide good marks of separation between species. They are thin brownish scarious scale-like bodies, sometimes as much as one-fourth inch long. If one collects growing tips for the herbarium, many of the stipules will remain with the specimens. Contrasts of stipules in two species are shown in *a* and *b*, Fig. 132, p. 234.

Narrow-lobed leaves

Many species of Vitis exhibit dimorphic foliage, that of certain verdurous shoots, as ground canes from old roots or stocks and of seedlings, often being deeply and very narrowly lobed mostly with sinuses rounded and enlarging at end or bottom. Lobes are 3, 5 or 7, sometimes imperfectly 9, and extend nearly to midrib. Only in *V. Smalliana* (Fig. 116) is this type of foliage a regular characteristic although one often sees it markedly in *Shuttleworthii, candicans, æstivalis, argentifolia, Lincecumii, palmata.*

Diaphragm

In the course of investigations in France and the growing of American vines from cuttings, it was found that many of the species are recognizable by the split woody cane not more than one season old. The pith in true Vitis is interrupted in the nodes by a partition or diaphragm which differs in thickness and to some extent in conformation. The thickness is not uniform in all samples one may take from different plants of one species, but it falls into three categories: (1) very thin, not more than 1/20 inch, in *vulpina*; (2) very thick, about 1/8 inch, in *cinerea, cordifolia, coriacea, palmata, Smalliana, sola*; (3) medium, between 1/16 and about 1/8 inch, comprising most or all of the remaining species. Representative differences are shown in the pictures. In the muscadines the center is more or less woody and is continuous through the nodes. Note Figs. 104, 132.

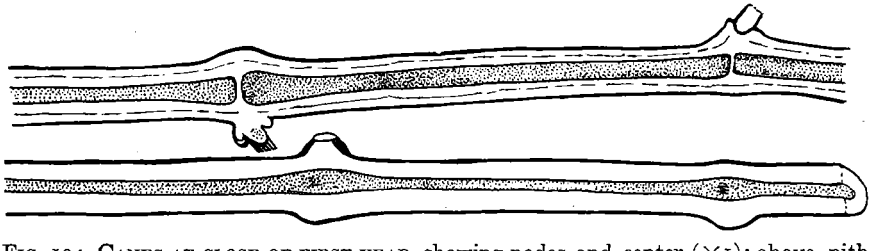

FIG. 104. CANES AT CLOSE OF FIRST YEAR, showing nodes and center (×1); above, pith and diaphragms of *V. vulpina;* below, woody but pith-like center, lacking diaphragms, of *V. rotundifolia.*

The materials

Evidences on which to base the present study have been many, consulted in the effort to find one's way through the maze of forms.

The main source is the author's personal collection. I have had the privilege of examining the Vitis collections at the Gray Herbarium and Arnold Arboretum of Harvard University, at the New York Botanical Garden, Academy of Natural Sciences in Philadelphia, National Herbarium in Washington. Their Vitis collections have been loaned me by the University of Montreal, Cornell University, Catholic University of America, University of Missouri, University of Wisconsin, University of Tennessee, University of Florida, University of Texas, the large series representing the counties of Indiana by C. C. Deam; the Missouri Botanical Garden has let me see again the type specimens of Engelmann and much other critical material; over a number of years B. F. Bush has supplied much Missouri Vitis, and latterly important material collected by J. H. Kellogg and Julian A. Steyermark has come to my hands; good material has been sent by R. E. Horsey of the Rochester Parks, New York; and E. J. Palmer of western collections. Many persons over long years have supplied specimens and suggestions. Certain ones have made collections for this particular paper, as Professor M. A. Rice, South Carolina; Professor C. F. Williams and F. E. Boynton, North Carolina; Dr. K. C. Davis, Nashville, and Dr. H. M. Jennison, Knoxville, Tennessee; Professor C. A. Brown, Baton Rouge, Louisiana; L. F. Locke, Southern Great Plains Field Station, Woodward, Oklahoma; W. W. Brookings, specimens from western Oklahoma; F. J. Crider, Boyce Thompson Southwestern Arboretum, Superior, Arizona; Helen Pearson, Davis, California. Aid in historical inquiries has been rendered by the United States Department of Agriculture, particularly by Dr. W. A. Taylor, H. P. Gould, and by George C. Husmann formerly in charge of the grape work and whose father, George Husmann, was an author and recognized authority on grape culture.

Indispensable aid in search of old and type material in European collections has been rendered by officials of various institutions, as of Linnean Society of London, Muséum National d'Histoire Naturelle, Paris, Institut Botanique, Geneva, Botanischer Garten und Museum, Berlin-Dahlem, Universitetets botaniske Museum, Copenhagen, Naturhistoriska Riksmuseet, Stockholm, Botaniska Institutionen, Upsala.

II. PHYTOGRAPHY

Unlike many other large cosmopolitan genera, Vitis is not represented in North America by naturalized species. The wine grape of history is grown extensively in California and similar regions and is sometimes inclined to persist and perhaps to be spontaneous about premises, and it is a parent in many hybrid vineyard grapes. It may therefore be entered briefly

for comparison. Grape lovers know it from the fact that the skin or rind of the ripe fruit is closely adherent to the pulp and is not separated in eating; it is the plumskin grape in distinction from the slipskin grapes developed from the American species. The plant is subject to extensive devastation by root-louse (phylloxera).

Vitis vinifera, Linn. Sp. Pl. 202 (1753). WINE GRAPE. Fig. 100, 102a, 105.

The vineyard grape of Europe; it has developed into many forms in the course of centuries of cultivation and dispersion and is therefore somewhat difficult to define and not critically treated in this paper: climbing but also capable of standing alone when trained in vineyard, more or less pubescent particularly on young growths but not tomentose or often floccose except perhaps on young parts and ribs: tendrils intermittent: diaphragm thick (4 mm.): leaves thin or at least not thick and heavy, cordate-ovate to cordate-orbicular, not of elongated form, margins coarsely toothed and sometimes irregularly lobed and with narrow obtuse sinuses, basal sinus deep and narrow with overlapping lobes or broad and open: clusters elongated and branched: berries small in the wild plant but large and of many shapes in viticultural varieties: seed narrow-pyriform, mostly emarginate at top, 4-5 mm. long, base mostly well developed and sometimes very long, chalaza well developed and sunken, raphe mostly not prominent.

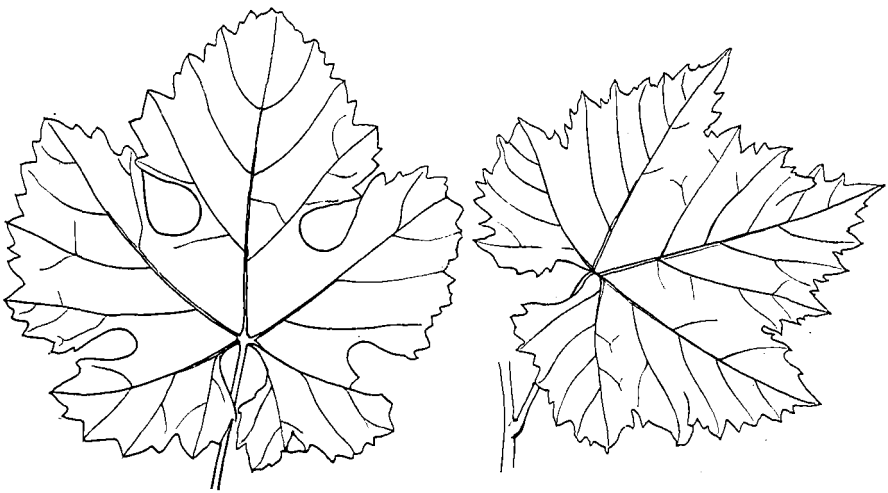

FIG. 105. CHARACTERISTIC LEAVES of *Vitis vinifera* (× nearly ½).

The *Vitis vinifera* of horticultural literature is var. **sativa** (D. C. Flore Française, v, 857. 1815. *V. sativa,* Duham. Arb. Fruit. Ed. 8, iii, 202, t. 1-7), the cultivated races, as distinguished from var. **sylvestris** (Willdenow, Hort. Berol. 1, 267. 1809. *V. sylvestris,* Gmel., in Fl. Badens. 1, 543. 1806), the wild or original form. The wild vine is recognized by Planchon in northern Africa, southern Europe, and from the Caucasus to central Asia. Willdenow distinguishes var. *sylvestris* by smaller fruits and leaves pubescent underneath.

With *Vitis vinifera* eliminated, we may now attempt the fascinating riddle of the native grapes.

In this phytography we cover the continental territory north of Mexico. Vitis is represented in the vast region from New Brunswick and Quebec to southern Florida, across the country northward to Manitoba and Montana, across southward to California and northward to central-western Oregon. Only the states Idaho and Washington are without report of one or more species of Vitis. The northwestern provinces, Saskatchewan, Alberta, British Columbia, apparently lack native grapes. The habitats cover an astonishing terrain,—hills, rocks, sands, dunes, shores, swamps, river banks, plains, special locations in desert regions, by the sea. They are beautiful plants to capture and collect. They are so widespread and abundant that they have been overlooked.

Inasmuch as we are not yet ready to record detailed distribution in North American Vitis, the author has not attempted to cite specimens. Many of the specimens one examines are not good enough for clear identification, nor (except in a few regions) are there sufficient series to show continuity of occurrence. Particular needs in the study of the genus are two: careful identification, dependable records of distribution.

The North American Vites are difficult to confine in a key. One ordinarily does not wish to base primary divisions on investiture, as tomentum, floccosity, webbiness, yet these features are characteristic marks in the genus. Similar divisions were adopted in the previous monograph (in Gray's Synoptical Flora) after much trial, and a better arrangement has not yet presented itself for practical purposes. Fortunately, these features are correlated with other characters but that are more difficult to express in words. These characters were employed prominently by Planchon in 1887, although he gave primary place to fruit characters, a practice that cannot be satisfactorily adopted with the closer differentiation required in the many species now known. The careful classifications of Munson cannot be adopted as keys because they are not based on contrasts.

The thirty species, two cultigens, two hybrids, and nine varieties here recognized assort themselves into the following schema:

Subgenus I. Euvitis.

1. *Labruscoideæ.*
   - 1. Labrusca
   - 1a. labruscana
   - 2. candicans
     - diversa
   - 3. Shuttleworthii
2. *Æstivales.*
   - 4. Lincecumii
     - glauca
   - 5. argentifolia
   - 6. aestivalis
   - 6a. Bourquina
   - 7. rufotomentosa
   - 8. sola
   - 9. Simpsoni
   - 10. Smalliana
3. *Arachnoideæ.*
   - 11. Champini
   - 12. californica
   - 13. Girdiana
   - 14. Doaniana
   - 15. arizonica
     - glabra
   - 16. cinerea
     - canescens

4. *Cordifoliæ*
   17. illex
   18. cordifolia
      fœtida
   19. Baileyana
   20. Berlandieri
   21. Helleri
   22. palmata
5. *Vulpinæ.*
   23. rupestris
      dissecta
   24. Longii
      microsperma
   25. monticola
   26. Treleasei
   27. vulpina
      syrticola
      præcox
   × Slavinii
   × Andersonii
   28. novæ-angliæ

Subgenus II. Muscadinia.

29. rotundifolia
30. Munsoniana

Species of Grapes

Descriptive document of species and botanical varieties of Vitis in North America, in two parts: key of the most evident usual contrasts on pages 179 to 183; regular diagnoses with discussion of ranges and nomenclature and other pertinent matters, beginning on page 185.

VITIS. Linnæus, Species Plantarum, 202 (1753); Genera Plantarum, Ed. 5, no. 250 (1754). Species probably 70 or more, mostly in northern hemisphere.

I. Section or subgenus I. Euvitis, Planchon in Les Vignes Américaines, 1873, 102. Bark longitudinally striate-fibrose, shredding at maturity (Fig. 106): pith interrupted in nodes by a diaphragm (Fig. 104): tendrils forked (Fig. 107): flower-clusters mostly elongated: berries in most species remaining more or less attached (No. 1 often an exception): seeds pyriform, with long or short handle-like base or beak. See Figs. pages 183, 184. The True Grapes.

Group 1. The plush-leaved grapes: leaves at maturity conspicuously felted underneath, with a thick dense continuous indumentum that covers and obscures the leaf surface itself (not to be confused with leaves merely pubescent on ribs and veins or irregularly floccose or webby in which the interlacing threads tend to accumulate in shreds and tufts with leaf surface exposed): berries few in cluster except in 1a and very large (usually above 9-12 mm. thick). § Labruscoideæ.

(Certain forms of the inconsistent *V. Doaniana*, No. 14, are plush-leaved; sometimes *V. rufotomentosa*, No. 7, *V. Girdiana*, No. 13, and perhaps *V. Longii*, No. 24, retain a rather heavy indumentum but they do not qualify under Group 1, nor does *V. Lincecumii*, No. 4).

A. Tendrils (represented also by flower-clusters) on tendril-bearing axes continuous, being three or more in succession at the nodes opposite a leaf (exceptions in 1a): indumentum usually tawny or rusty.

B. Berries few in a short nearly simple cluster that is often as broad as long: indigen: eastern states.....1. *V. Labrusca*

BB. Berries many in a large and commonly shouldered and more or less tapering or elongated cluster: cultigen.....1a. *V. labruscana*

AA. Tendrils intermittent (with marked exception in No. 28 which might be sought in this section) on tendriliferous growths, every third node vacant of tendril or inflorescence: indumentum on under surface of mature leaves white.

B. Growing tips white or only palely tinted: upper surface of mature leaves dull (except perhaps in var.) and outline usually prominently triangular-pointed: berries fiery and inedible: west of Mississippi, southwest.....2. *V. candicans*

BB. Growing tips prominently rusty: upper surface of mature leaves lucid, outline not often triangular-sharp-pointed: berries mild or pleasant-tasted: Florida.....3. *V. Shuttleworthii*

Group 2. The colored-leaved grapes: mature leaves dull above, variously blue or glaucous, or ferrugineous-pubescent or reddish-floccose underneath at least along ribs and veins, the under surface itself exposed: young growths rusty-tomentose or -woolly or red except in No. 5: berries various but of the eastern species prevailingly small in long clusters. (The *cordifolia*-like *V. illex*, No. 17, may have rusty-tomentose young ends). §ÆSTIVALES; most difficult of North American Vites.

A. Prevailingly large-fruited or else large-clustered grapes by and west of the Mississippi, the berries mostly 1 cm. or more in diameter and fruiting pedicels very stout: leaves large and heavy for the most part, under surface at maturity not prominently rusty nor speckled with floccules and often grayish or glaucous even if markedly webby.....4. *V. Lincecumii*

AA. Prevailingly small-fruited grapes mostly east of the Mississippi, berries commonly less than 1 cm. in diameter, in slender more or less open clusters (exception in 6a): under surface of leaves rusty-floccose or else silvery or glaucous.

B. General run of mature leaves not more than 3-lobed or even nearly or quite continuous in outline.

C. Young leaves not gray-pubescent or floccose above.

D. Ambitus or outline of general run of mature leaves on the cordate-ovate order with tapering or triangular apex, breadth usually not greater than the length from basal lobes to apex: petiole of prominent length and not conspicuously red-woolly even though somewhat invested: above the semitropical Florida-Gulf zone.

E. Growing ends of early season (vine tips) slender, with glabrous wood or axis which becomes reddish-green or bright red and with conspicuous bloom about nodes: tendrils glabrous when young: ribs and veins on under surface of leaf usually bearing prominent soft hairs about 1 mm. long in spring to midsummer, under surface in growing season bluish or glaucous or silvery beneath whatever thin pubescence or floccosity may remain, petiole nearly or quite glabrous and prevailingly red and often glaucous: fruit-clusters cylindrical and commonly simple or not shouldered nor conspicuously branched.....5. *V. argentifolia*

EE. Growing ends of early season with loosely woolly or floccose axes or wood when young and little if any bloom about nodes: tendrils mostly pubescent or shaggy at first: veins on under side bearing loose wool or fuzz, and under surface prominently colored with brown or rusty covering that remains in little floccules or tufts, the regular hairs (if any) small and chaffy and not making a hirsute appearance and usually obscured by the wool: petiole pubescent or tomentose: fruit-clusters often shouldered or branched and more or less irregular. (Not all the foregoing features apply in forms of 6a).

F. Under surface of leaves in growing season with rusty or reddish-brown look, particularly on ribs and veins: berries small, 12 mm. or less in diameter: indigen... 6. *V. æstivalis*

FF. Under surface only indifferently rusty, mostly gray: berries larger, in vineyard-like clusters: cultigen.....6a. *V. Bourquina*

DD. Ambitus or outline of average mature leaves on the circular or very broad order, usually broader than total length (or as broad), triangular apex if any short and broad: petioles prominently typically red-woolly or tomentose.

E. Margins of leaves with evident coarse teeth or notches: Florida, Georgia.....7. *V. rufotomentosa*

EE. Margins of leaves continuous or somewhat sinuate, each vein ending in a minute apicula: leaves very broad and apex short or none: Florida.....8. *V. sola*

cc. Young and sometimes even full-grown leaves gray-webby-pubescent above, becoming gray-floccose before the surface is nude: outline of leaf mostly with sharp shoulder-points: teeth very small: berries very small (mostly 5 or 6 mm. thick), in typically long loose clusters: Florida, Georgia, and perhaps Arkansas.....9. *V. Simpsoni*

bb. General run of mature leaves 3-5-lobed, with deep broad rounded sinuses often extending over half or more the depth of the blade: margins mostly sinuate without distinct separate teeth: berries relatively large (mostly exceeding 7 or 8 mm. thick) in rather dense not elongated narrow clusters: Florida.....10. *V. Smalliana*

Group 3. The gray- or floccose-leaved or araneose grapes, those with cottony covering or white tomentum on young parts, the investiture remaining on leaves more or less throughout the growing season or at least until they are full grown as a gray floccose or webby character on under surfaces and sometimes on upper (exception in var. of No. 15): margin of blade not big-toothed or jagged, even if sometimes lobed: foliage remaining dull except in No. 11: mostly high-climbing grapes of many aspects and of western distribution, only *V. cinerea* being known natively east of the Mississippi; the bushy big-toothed *V. Longii* is to be sought elsewhere (No. 24); sometimes young growths of *V. Baileyana* (No. 19) are gray-pubescent or somewhat webby. §ARACHNOIDEÆ.

A. Leaves very broad, usually broader than long, of a more or less circular outline, margins with a crenate rather than sharp-toothed aspect, or very finely toothed or even close-serrate in No. 13.

B. Upper surface of leaves becoming glossy, under surface not glossy but eventually glabrous or only slightly floccose: berries large, mostly above 1 cm. thick: Texas.....11. *V. Champini*

BB. Upper surface dull, under surface usually retaining less or more covering: berries not often exceeding 1 cm. diameter, usually much less.

C. Apex of usual mature leaves blunt or even pointless, the ambitus or outline nearly circular: blunt teeth or sinuations rather coarse: under surface at length only thinly cobwebby or even nearly glabrous: clusters commonly small and nearly simple: pedicels of fruit rough or warty: central and northern California, Oregon, Nevada.....12. *V. californica*

CC. Apex of leaves triangular and sometimes with distinct point and leaves more likely to be lobed than in No. 12: margins usually with minute rather sharp teeth: under surface commonly remaining densely tomentose: fruiting clusters more branched and often somewhat thyrsoid: fruiting pedicels smooth: southern California.....13. *V. Girdiana*

AA. Leaves of the ovate or cordate-ovate type, triangular-pointed, breadth usually less (or not more) than total length.

B. Berries relatively few, ordinarily 25 or less, in short nearly or quite simple clusters: leaves small or medium in size.

C. Under surface of leaf typically remaining covered with floccosity or tomentum: berries commonly more than 1 cm. thick: Oklahoma, northern Texas and New Mexico.....14. *V. Doaniana*

CC. Under surface commonly becoming glabrous: berries usually less than 1 cm. thick: western Texas to Arizona and Sonora. 15. *V. arizonica*

BB. Berries very many and small, in elongated compound open clusters: leaves large, prevailingly with large triangular apex and serrate or finely toothed margins, the under surface uniformly thin-webby and gray: western Georgia, central and lower Mississippi valley and westward.....16. *V. cinerea*

Group 4. The green- or nonfloccose-leaved grapes: foliage green (either bright or dull) rather than gray or cinereous or colored, glabrous at full size or only thinly pubescent on veins or hairy tufts in axillæ underneath, if any floccosity only on unfolding young parts and then usually not prominent: group of wide distribution, eastern seaboard to Rocky Mountains. (*V. arizonica* var. *glabra*, No. 15, might qualify in this group).

A. Leaf-blade characteristically of the cordate-ovate type, with mostly gradually and regularly produced or prominently triangular apex, lobing commonly not marked except in No. 22, the ambitus or outline angled or shouldered in upper part mostly with only one small spreading lobe (if any) on either side: berries small, often in compound clusters. (The short-clustered *V. monticola*, No. 25, and the anomalous *V. novæ-angliæ*, No. 28, are to be sought in AA as well as No. 24 with white-tomentose young axes). §Cordifoliæ.

B. Leaves not deeply lobed except on certain more or less aberrant shoots nor long-sharp-toothed.

C. Mature unlobed leaf-blades deltoid in shape with a very broad open almost truncate base: very young parts bronzy-tomentose: leaves on slender growths often deeply narrowly lobed: seed with prominently elevated raphe: southern Florida.....17. *V. illex*

CC. Mature leaf-blades with deep or evident basal sinus, cordate-ovate to broader-than-long: seed not bearing elevated or outstanding raphe.

D. Young growths perhaps temporarily pubescent but not cottony: main mature ovate leaves usually not broader than long (on certain shoots on the same plant some of the leaf-blades may be distinctly broadened or shortened).

E. Pedicels prominent, 5 mm. or more in fruit and the clusters consequently open: young branches terete: representative leaves triangular-ovate with long point and coarse sharp notch-like teeth, glossy above, under surface bright green and lacking strong small cross-veins without a lens: east of 100th meridian.....18. *V. cordifolia*

EE. Pedicels very short, mostly 3 mm. or less in fruit and the clusters therefore compact or "solid": young branches striate, angled or squared and mostly pubescent: leaves ovate and mostly short-pointed and with muticous small teeth, often with shoulder-points, dull both sides and more or less pubescent, under surface prominently cross-veined or reticulate, petiole often pubescent: southern Appalachian.....19. *V. Baileyana*

DD. Young growths shreddy or floccose with white cotton: branchlets angled: mature leaves glossy on both surfaces or at least underneath: blade characteristically at least as broad as long for the most part: Southwest.

E. Blade usually with a triangular apex and short lobe or shoulder on either side toward top, margins sharp-toothed: Texas, Arkansas.....20. *V. Berlandieri*

EE. Blade mostly obtuse or even rounded or with continuous ambitus, broader than long, margins shallowly broad-toothed to nearly scalloped, each tooth minutely apiculate: Texas.....21. *V. Helleri*

BB. Leaves characteristically deeply lobed, with long sharp teeth and lobes, the middle lobe narrow and prolonged into a prong-like end: young growing parts naked of leaves and very slender, prominently dark red: diaphragm very thick (4 mm. or more): Mississippi River region.....22. *V. palmata*

AA. Leaf-blade usually not regularly triangular-acute or cordate-ovate-pointed, not prominently lobed except on ground shoots, apical portion for the most part abrupt or narrow, margin strongly coarsely acutely toothed and frequently jagged or slashed: bright-leaved grapes except in No. 28. (The deeply lobed big-toothed *V. palmata*, No. 22, is more like the Cordifoliæ; the variously araneose *V. Champini*, No. 11, is retained in another relationship). §Vulpinæ.

B. Leaves nearly reniform in outline with open almost truncate base, commonly much wider than high: plant bushy, scarcely climbing, tendrils usually not evident or at most small and weak: midwestern.
.....23. *V. rupestris*

BB. Leaves not on the reniform order (even though sometimes as broad as long or broader) and usually cordate or with evident basal sinus.

C. Foliage gray-green, the short tips of young growths white-tomentose or floccose and under surface of leaves retaining more or less tomentum or pubescence: blade usually broader than long: plant stocky, little if at all climbing, the tendrils short or weak or even lacking: flower-clusters very short: Kansas west and south. 24. *V. Longii*

CC. Foliage green, or if grayish not from floccosity or tomentum, the nascent leaves and petioles and axes of young tips not white-tomentose: blade narrower in proportion to length: tendrils strongly developed except in No. 26.

D. Under surface of mature leaf conspicuously glossy or shining, and foliage noticeably very light green: leaves small or medium in size, not lobed unless on ground shoots: berries with slight bloom or none: Texas.....25. *V. monticola*

DD. Under surface of leaf dull, and foliage dull or dark green: leaves medium to large in size, usually conspicuously shoulder-lobed or -pronged: berries with bloom.

E. Berries small, usually less than 8 or 9 mm. thick: tendrils intermittent: leaves and petiole mostly glabrous or becoming so (except in var. of No. 27).

F. Plant bushy, little if at all climbing, tendrils tending to fall if not finding support: apex of leaf not prominently developed unless perhaps on thin shoots, margins not jagged even though sharp-toothed: diaphragm 2 mm. or more thick: western Texas to Arizona and Sonora. .....26. *V. Treleasei*

FF. Plant a normal climber, with well developed tendrils: apex of leaf long-triangular or even narrower: diaphragm under 2 mm., usually about 1 mm.....27. *V. vulpina*

EE. Berries large, 12 mm. or more thick: tendrils frequently continuous (tendril, or cluster, at 3 or more successive nodes): leaves retaining distinct pubescence underneath: New England.....28. *V. novæ-angliæ*

II. Section or subgenus II. MUSCADINIA, Planchon, in DeCandolle Monographiæ Phanerogamarum, v, 324 (1887). § *Lenticellosis* and *Chiri-Simpleses*, Munson. Genus *Muscadinia*, John K. Small, Flora of the Southeastern United States, 756, 1335 (1903). Bark tight with prominent lenticels, not shredding (Fig. 106): nodes without diaphragm (Fig. 104): tendrils simple (Fig. 107): flower-clusters very small and usually little if at all elongated: berries detaching one by one: seeds oblong, not ladle-like, the beak merely a short point. THE MUSCADINES.

A. Berries large, 12 mm. or much more in diameter: Delaware to Florida, Texas, Kansas.....29. *V. rotundifolia*

AA. Berries small, 8 mm. or less: Florida, probably southern Georgia. .....30. *V. Munsoniana*

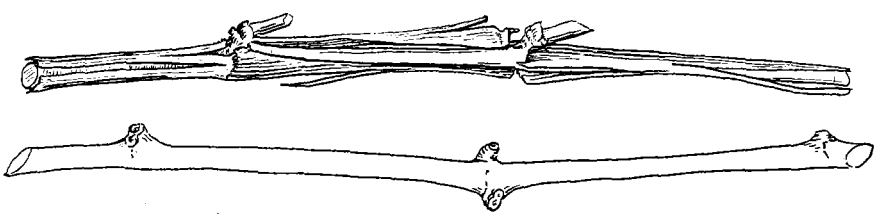

FIG. 106. BARK OF YEARLING (SEASON-OLD) CANES (×½): shredded bark of *V. labruscana* above; tight bark of *V. rotundifolia* below.

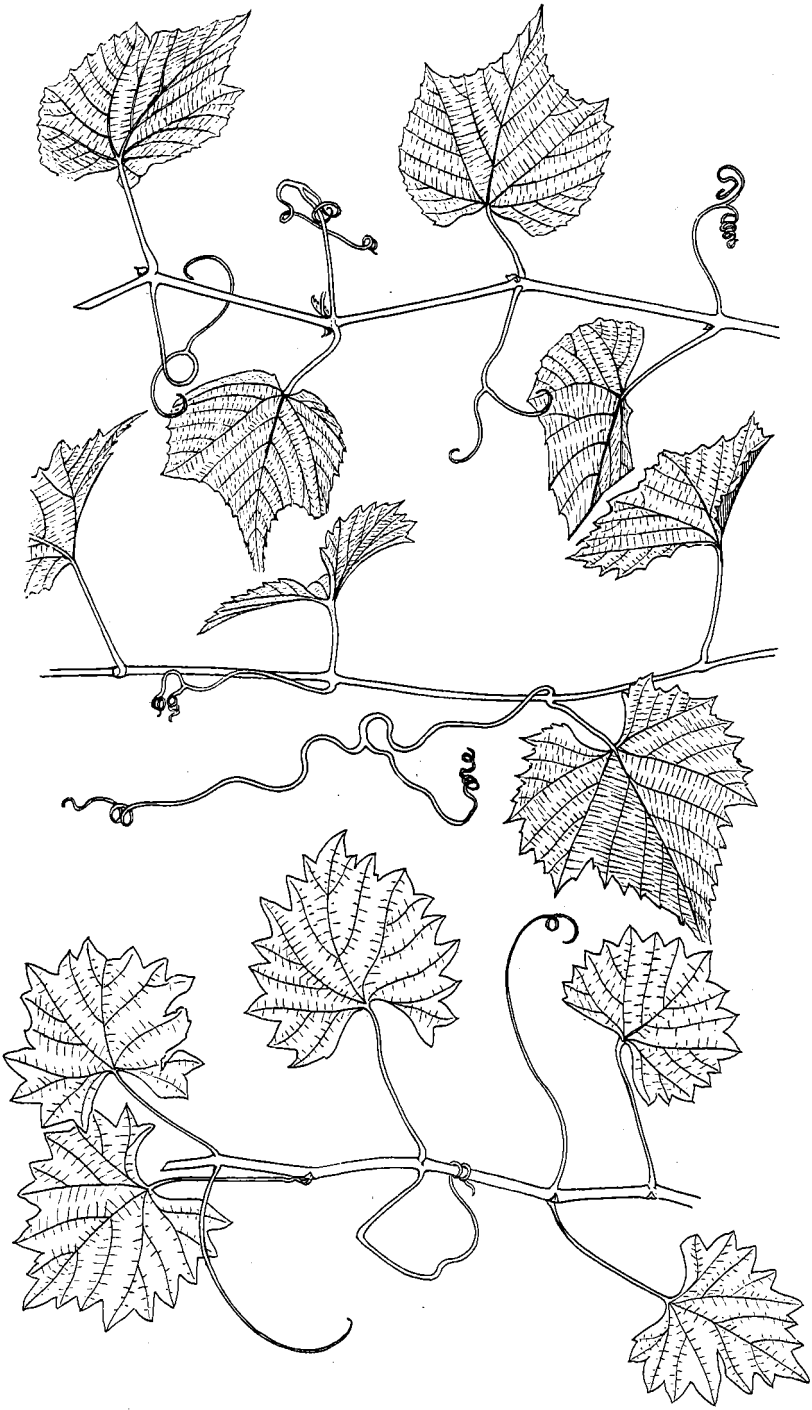

FIG. 107. TENDRILS IN VITIS, forked and simple (×⅓). Top, continuous (one at every joint) tendrils of *V. Labrusca;* middle, intermittent in *V. vulpina;* bottom, intermittent simple (not forked) of *V. Munsoniana.*

1. **Vitis Labrusca,** Linn. Sp. Pl. 202 (1753). FOX GRAPE. Figs. 98, 99, 102b, 107.

V. Labrusca var. *typica,* Regel, in Act. Hort. Petrop. ii, 395 (1873).

V. vinifera var. *Labrusca,* Kuntze, Rev. Gen. i, 132 (1891).

Strong climbing heavy-foliaged vine, to 40 feet and more on thickets and in trees, with scurfy fuscous or tawny young growth that sometimes bears strong almost spinulose hairs: first-year twigs (canes) terete, diaphragm medium to thick, 3-5 mm.: leaves appearing thick and heavy due to dense tawny or rusty or red-brown tomentum underneath, prominently midribbed and side-veined underneath, dark and dull and soon glabrous above, rather uniformly cordate-ovate with a shoulder or incipient lobe toward apex on either side, about 12-24 cm. broad at maturity and usually somewhat less in length, abruptly or triangularly pointed, basal sinus either broad or narrow, prominent evenly spaced side-ribs 6-8, margins unevenly coarsely scallop-toothed with shortly mucronate teeth, in some specimens margins entire; on verdurous sterile or ground shoots leaves may be deeply 3-lobed with obtuse edentate sinuses extending one-third to one-half distance to midrib: flower-cluster small and nearly simple except with mostly a short branch near the base that becomes a shoulder in fruit, 5-8 cm. long, approximately the length of the peduncle: stamens long and erect in the staminate flowers, mostly short and recurved and oblique in the hermaphrodite ones: fruit-cluster short, commonly bearing less than 20 berries and often nearly as broad as long; berries globular or somewhat oblate, large, 1.5-2.5 cm. diameter, dull purple-black to dull red, amber and seldom amber-green, usually with only thin bloom, ripening in September in the North, mostly falling singly when ripe, for the most part musky-scented and sometimes astringent, rind mostly thick and tough: seeds large, 5-8 mm. long and one-half as broad, strongly angled, beak short, raphe a thin line on ventral face and becoming more prominent at the sunken ridge, chalaza mostly a circular or spatulate depression or basin, sometimes obscure.

Southern Maine, New Hampshire, southern and northern Vermont southward to the upper parts of Georgia, west to western-central-southern New York, southern Michigan, Indiana, Kentucky, Tennessee, on a variety of soils and in various conditions. The Linnæan citation is "in America septentrionali." Most important native grape in the development of North American viticulture. The plant passing as *V. Labrusca* in Florida is *V. rufotomentosa.*

Color of fruit in *Vitis Labrusca* is variable. I have noted marked differences in this respect. Richard Wellington, of the New York State Experiment Station at Geneva, writes me that on the parental farm and in the neighborhood in eastern Massachusetts he should say that nearly one-half of the wild Labrusca bore red fruits, but he recalled only one vine that bore white fruits. I am growing a green-fruited form found in the wild in Franklin County, Indiana, sent me by C. C. Deam. Prince recognized color varieties in his Treatise on the Vine, New York, in 1830: *Vitis Labrusca* var.

nigra (page 180), "the wild variety most common in this state and to the north and east of it. The fruit is very deep purple or black"; var. *alba* (page 181) with "large berries of oblate form, which vary somewhat in size on the same bunch; they are not perfectly white, but are tinged with a pale russet or amber colour" (see Rhodora, xxii, 183, 1920); var. *rosea* (page 182) with fruit "large, of oblate form, and of a red brick color"; var. *rosea maxima* (page 182), with fruit "of remarkably large size, measuring frequently above three inches in circumference. In its flavour and colour it resembles the common red fox"; var. *baccis albidis, magnis ovalis* (page 195), raised from a seed of a cultivated variety, "of a greenish-white colour."

Although widespread, the fox grape does not present great variations aside from color of fruit. The only regular botanical varieties I know to have been described are two foliar forms by R. Demcker in Mittheilungen der Deutschen Dendrologischen Gesellschaft, 1909, page 325 in German and page 329 in Latin: var. *dissecta*, with leaves strongly dissected, from northern New Jersey; var. *macrophylla* with leaves 2.2-2.5 dm. broad and densely whitish-tomentose and prominently yellowish-ribbed (ochraceous) underneath collected above New York City ("in den Parkwald von Süd-Mount-Vernon").

There is considerable range in the under surface leaf color. While mostly distinctly rusty to bright reddish-brown, the under side is sometimes tawny gray or perhaps even lighter or almost whitish in color; this character may appear on the same plant with the rusty under surfaces. Young leaves and shoot tips persistently reveal the ferrugineous tints.

The fox grape is distinguished from forms of *V. æstivalis* and *V. argentifolia*, with which it is most likely to be confused, by continuous tendrils, shouldered leaves with triangular apex, firmly tomentose or felted rather than floccose or blue-glaucous under surfaces, short and nearly simple flower-clusters and few very large berries and much larger seeds.

Certain specimens from the dune country at the southern end of Lake Michigan in Indiana appear to be hybrids of *V. Labrusca* and *argentifolia*, but evidence is meager.

Two important references lie behind the Linnæan account of *Vitis Labrusca* in Species Plantarum; one is to Plukenet Phytographia, t. 249 fig. 1 (Part iii, 1692), which is clearly *Labrusca* as we understand it, even to the continuous tendrils (Fig. 98); the other is to a small-fruited white grape in Sloane's Natural History of Jamaica, t. 210 fig. 4, which is undoubtedly the plant now known as *V. tiliæfolia* (see discussion under number 8) and is so regarded by Fawcett and Rendle in Flora of Jamaica, v, 74 (1926). Type specimens in the Linnean Herbarium, London, comprise two sheets. One sheet is labelled "K 3 Labrusca" in Linnæus' hand, K meaning Kalm the collector and 3 the number of the entry in Species Plantarum; this sheet is to be taken as the type. The sheet bears two small specimens in

flower; the lower specimen has the characteristic leaf and flower-clusters of the plant we now know as *Labrusca;* the upper specimen is different and in doubt, the photograph (showing upper leaf surfaces) suggesting the leaf shape, marginal indentation, venation, and particularly the flower-cluster of *V. æstivalis*. The other Linnæan sheet has the name "Labrusca" written, as Mr. Savage of the Linnean Society informs me, by Solander (as amanuensis), and "Br." written by Linnæus; the "Br." means Patrick Browne, author of The Civil and Natural History of Jamaica; the sheet also has "indica?" in the hand of Sir James Edward Smith; the specimen is apparently *V. tiliæfolia.*

The Plukenet reference may be further considered. Linnæus quotes "Vitis vinifera sylvestris americana, foliis aversa parte densa lanugine tectis"; but the full statement in Plukenet begins "Vitis Vulpina dicta *Virginiana* alba," and adds "White Fox-Grape." This is in contrast to Plukenet's "Vitis Vulpina dicta *Virginiana* nigra," or black fox grape, cited by Linnæus as a basis for his *V. vulpina*, and which, as we shall see, is not yet identified (No. 27). We have noted in the preceding paragraphs that white forms (greenish-white) of *V. Labrusca* are still known.

In all this devious history there is nothing to invalidate the name *Labrusca* as applied to the plant now known as fox grape or to upset the nomenclature of the North American floras.

The word "fox" as applied to this grape perhaps originated from the old verb *to fox*, meaning *to intoxicate*. Colonists from Europe would naturally estimate the merits of any grape they found in the New World in terms of its wine-making quality rather than in its flavor as a fruit product. Thus Beauchamp Plantagenet, in his New Albion, 1648, writing of "a valley sixe miles long" in what is now the state of Delaware, speaks of four sorts of wild grapes, one of which is "the great foxe and thick grape, after five moneths reaped being boyled and salted, and well fined, it is a strong red Xerxes," and he speaks of a Frenchman who "of these four made eight sorts of excellent wine, and of the Muscat acute boyled that the second draught will fox a reasonable pate four moneths old." Later, Beverly supposes that the name came from the odor of the grape which suggests that of the fox, a theory to which William Bartram subscribed in 1804. Other explanations are that foxes eat the grapes and that the leaves resemble the shape of a fox's track. Munson in his early writings dismisses the notion that the word "fox" designates the odor or taste but rather that the dense pubescence or wool on the under side of the leaf is often of a foxy color and that this is probably the reason for the name. "To call the musky flavor of Labrusca 'foxy' is a misnomer, as no fox smells or tastes like that" (Trans. Amer. Hort. Soc. iii, 136); he calls the class "foxy-leaved grapes." In his Foundations, however (page 28) he writes: "The strong, musky odor and flavor is peculiar to this species and found in no other

American species save rarely and slightly in *V. Lincecumii*. It is by this odor that skunks, foxes, raccoons and opossums are attracted and select the fruit at night from a vineyard and do not molest other varieties while these remain. There are not a few Americans who from this muskiness prefer this to other species. The peculiar odor and flavor in the 'Southern Muscadines'—*V. rotundifolia*,—though very pronounced, is quite different, and greatly refined above the 'foxiness' of *Labrusca*."

The term "foxiness" has now come to have a definite significance among grape-growers to designate the peculiar odor and flavor of "muskiness" of *Vitis Labrusca*.

Further note on the name of the fox grape is added under *V. vulpina*, number 27.

The name "Labrusca" is classical for the wild vine.

1a. **Vitis labruscana,** Bailey, Gent. Herb. i, 126 (1923). LABRUSCAN VINEYARD GRAPES. Figs. 100, 101.

The class of cultigens recognized by viticulturists as more nearly related to *V. Labrusca* than to any other Vitis but which are not that species. Characterized originally (1923) as comprising the most important pomological varieties in the eastern states, representing the direct offshoots of *V. Labrusca*, as Concord and Worden, together with such secondary derivatives (as Niagara) as retain the essential habit, foliage and flower character of *V. Labrusca*. The Labruscans are distinguished from the native species by the larger and usually shouldered and conic or thyrsoid rather than short or nearly simple clusters of fruit, larger and less "foxy" berries of various colors, usually more lobed and less tomentose leaves, tendrils often intermittent. Many of these grapes have partial *V. vinifera* parentage; none of them can be regarded as the indigenous *V. Labrusca*, a grape that is not in cultivation except as it may be now and then transferred from the wild. Whatever the parentage, the true Labruscan shows more of the *V. Labrusca* character than of any other. These grapes form a heavy-leaved class well understood by vineyardists and requiring no extended definition.

The Labruscans comprise a horticultural group. Clarity demands that they shall not be called *V. Labrusca*. Many cultivated classes or hybrid groups of horticultural importance require separate designations for definition and to avoid error, as *Pyrus Lecontei*, Rehder, for the extensive progeny of *P. serotina* and *P. communis*, and as *Clematis Jackmani*, Moore, for the important issue of *C. lanuginosa* and *C. Viticella*.

Certain viticultural varieties of the Labruscan kind have received Latin names but such names cannot be lifted from their special application and be employed for the group as a whole. Such, for example, is *Vitis Isabella*, Otto & Deitr. Allgem. Gartenz. x, 353 (1842), or *V. Labrusca* var. *Isabella*, Prince, Treat. Vine, 165 (1830), representing the Isabella grape of doubtful

origin but generally considered to be *Labrusca* × *vinifera*. Another example is *Vitis Catawba*, Hort. ex Koch, Dendrol. i, 551 (1869).

2. **Vitis candicans,** Engelm. in Gray, Plant. Lindh., Boston Journ. Nat. Hist. vi, 166 (1850). MUSTANG GRAPE. Fig. 108.

V. mustangensis Buckley, in Rept. U. S. Commr. Patents for 1861, 482 (1862); Proc. Nat. Acad. Sci. Phila. 1861, 451, and 1870, 136, 187.

V. vinifera var. *candicans,* Kuntze, Rev. Gen. i, 132 (1891).

Very vigorous and high-climbing vine, known for its felt-bottomed abele-like thick foliage, the living leaves convex with deflexed or drooping sides: young growth white or slightly tinted with woolly or cobwebby

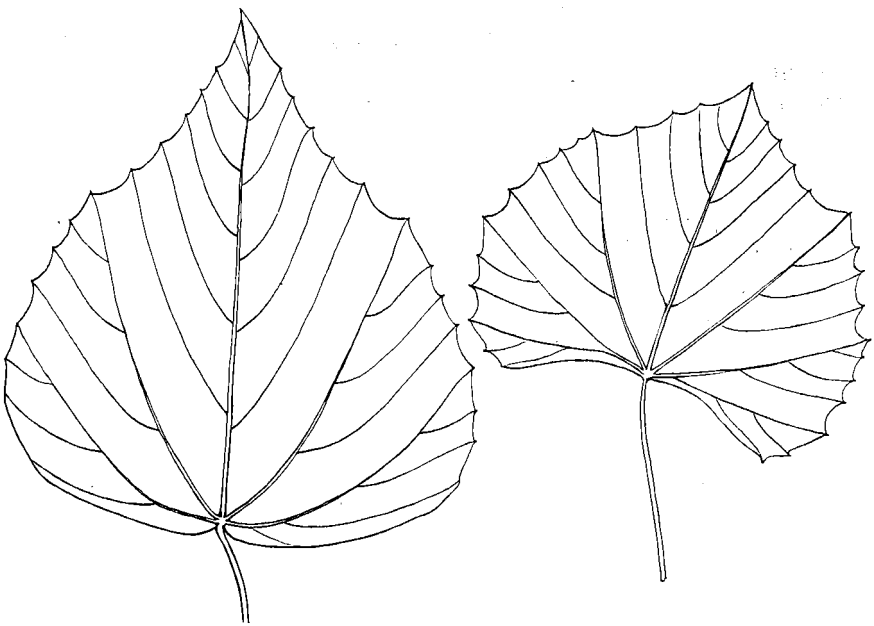

FIG. 108. REPRESENTATIVE LEAF of *Vitis candicans*, left, and *V. Shuttleworthii* (× about ½).

covering that becomes floccose or ragged late in the season, wood strongly striate: diaphragm mostly thick, 3-5 mm.: leaves of main growths triangular-pointed to cordate-ovate, sometimes nearly reniform-ovate, relatively small, 8-14 cm. long from top of petiole, breadth nearly equalling or exceeding length, outline continuous or interrupted at shoulder by a short indefinite lobe or large tooth, apex mostly deltoid-acuminate, base nearly truncate with a very small sinus or indentation at insertion of petiole or again nearly or quite cordate, margins sinuate to obscurely shallow-toothed, upper surface at first white-cobwebby, then floccose and shreddy, finally bare and dull green but long petiole remaining floccose, under surface permanently white-felty and color of leaves of the introduced white poplar,

main side-ribs 5 or 6 with a strong upward direction and on the upper surface often holding the webbing after it has shed from the surface; leaves on ground shoots deeply 3-lobed and then sub-lobed and with rounded sinuses: clusters short, the staminate 5-9 cm. long and commonly forked or shouldered, pistillate shorter and forked or with one main axis, peduncle short, axis and stalk woolly and in fruit becoming floccose: stamens in sterile flowers stout and of medium length, in fertile flowers short and recurved and bent, stigma large: berries few, 12 to 20 or less, globular, large, 12-18 or 22 mm. thick, without bloom, black to reddish to whitish, more or less punctate, very persistent, skin thick and tough, very pungent or fiery in flavor particularly if the skin is chewed, irritating the mouth and hands, ripe in August: seeds very large, 6-7 mm. long and often nearly as broad (sometimes 7 mm. long and only 4 mm. broad), beak short and stout and either gradual or abrupt, ridge distinctly grooved, raphe a thin line on keel and scarcely evident at ridge and on face, chalaza small for size of seed, depressed.

Characteristic Texan grape, ranging widely in eastern half of the state, accredited also to western Louisiana, southern Oklahoma, western Arkansas; Mexico. R. M. Harper sends me a specimen, "climbing on a roadside tree," near Montgomery, Alabama; introduced? Original locality near Houston. The Florida references probably belong to number 3.

The great size attained by the mustang vine is attested by Buckley: "Mr. Thomas Afflick, who resides near Brenham, in Washington County [Texas], showed me a Mustang vine on his grounds covering a large live-oak tree, from which, in one year, he gathered grapes sufficient to make two barrels of wine. Dr. Gideon Linsecom, of Long Point, in the same county, from a vine eight years old, growing in his garden, in one season made fifty-four gallons of wine." Munson reports this grape covering cottonwood trees at least 100 feet tall, and vine-trunks 3-6 inches in diameter.

† **V. candicans** var. **diversa,** var. nov.

Folia supra lucida, subter obscurius cinerea: baccæ multo minores, oblongæ vel pyriformes, leniores: semina 5-6 mm. longa.

Leaves glossy above and duller gray underneath and the tomentum less dense, shoots apparently sooner shedding the wool: berries much smaller, oblong or pyriform, milder in quality, lacking the excessive harshness of *V. candicans:* seeds 5-6 mm. long.

Gonzales County, southeastern Texas, *McBryde* 7929; perhaps also from Bexar and Brazos counties.

† 3. **Vitis Shuttleworthii,** House. CALLOOSA GRAPE. Fig. 108.

V. coriacea, Shuttleworth ex Planch. in DC. Monogr. Phaner. v, 345 (1887), not Miq. (1863).

V. candicans var. *coriacea,* Bailey, in Gray, Synopt. Fl. N. Amer. i, 429 (1897).

Vigorous high-climbing vine long confused with *V. candicans* but differing plainly in rusty young growth, in singular diaphragm structure, smaller

leaves relatively broader and not usually triangular-pointed and in bearing a denser less cobwebby indumentum, shining and less strongly ribbed upper surface of mature leaves, berries mild-flavored: canes remaining cottony or floccose till fruiting time: diaphragm various, sometimes 12 mm., again wanting and sometimes the pith woody practically from node to node: leaves small to medium, sometimes broadly imperfectly cordate-deltoid with short apex and the blade then 7-9 cm. long above petiole and fully as broad, but commonly tending to be reniform in outline and then 5-7 cm. long and much broader, outline mostly continuous except for a blunt shoulder or notch but sometimes shallowly 3-lobed with broad sinuses, base nearly truncate to open-cordate, margins sinuately small-toothed to almost crenate, upper surface at first white-webby but becoming glabrous and glossy, under surface permanently felty rusty or pinkish at first but becoming white; leaves on ground shoots 3-lobed and mostly sub-lobed with open rounded sinuses: clusters small, 4-10 cm., often shouldered, peduncle short and (as the rachis) cottony: stamens in sterile flowers erect, frequently purplish, stigma prominent: berries relatively few, globular and medium to large, 9-18 mm. thick, purple or dark red to blackish, skin lacking pungency, flavor pleasant, ripe in August, persisting: seeds much as in *V. candicans* but apparently not running quite as large.

Southern Florida, from the Palm Beach and Fort Myers regions; "found naturally in rich woods of south half of Florida," according to Munson. Planchon ascribed the species to southwestern Florida and New Orleans, but I do not know it from Louisiana.

The name *coriacea* as applied to this grape begins with James Robert Shuttleworth (1810-1874), British botanist with continental associations, in an herbarium distribution (without description) of specimens collected in June 1845 on the Manatee River in southern Florida by Rugel. Apparently the first published note is by Chapman in Flora of the Southern United States, 71 (1860) as a question under *V. caribæa* but without validation in either specific or varietal status; this query is repeated in Chapman's second edition, 1884, but omitted from the third, 1897. Chapman's information was probably derived from the Rugel specimen in the Gray Herbarium. In 1869 the binomial appeared in Koch's Dendrologie, i, 550, without description and as a straight synonym of *V. candicans*. The species was apparently first described or validly published under the name by Planchon, 1887, in DeCandolle's Monographiæ Phanerogamarum, volume v, attributed to "Shuttleworth mss. in herb. Boiss."; subsequently the name has been taken up by others. Finding that the name *coriacea* had earlier been employed in the genus by Miquel, House in 1921 (American Midland Naturalist, vii, 129) proposed the name *V. Shuttleworthii* with no other support than the Koch synonym; as Koch's synonym is not published so neither is House's binomial published, but I am glad to adopt his proposal as a *nomen novum* or at least a *publicatio nova*.

4. **Vitis Lincecumii,** Buckley, in Rept. U. S. Commr. Patents for 1861, 485 (1862). POST-OAK GRAPE. Fig. 103.

V. æstivalis var. *Lincecumii,* Munson, in Proc. Amer. Pom. Soc. xx, 97 (1886).

Stout moderately climbing vine on low trees but making bushy clumps when standing alone: perhaps grading into *æstivalis* in regions of contact (if there be such regions) but typically with good marks of separation in its much less rusty tips and young growth, in thinner diaphragms, in its thick heavy more coarsely notched leaves that are much more densely floccose- or webby-tomentose underneath, the vestiture less rusty and frequently gray and not tending to make floccules or tufts and thereby lacking the measled appearance between ribs so frequent on the other species, in much shorter fruit-clusters with bigger berries, in larger and different seeds, tendrils often twice-forked: young shoots densely whitish or light-brownish tomentose, old wood (late in season) becoming glabrous: internodes short: diaphragm 2-3 mm.: leaves broadly cordate-ovate, 8-12 cm. long from top of petiole and usually or at least often broader, with broad basal sinus, sometimes continuous in outline with obscure shoulders but oftener shallowly 3-lobed and frequently deeply 3-5-lobed with open rounded sinuses, margins coarsely shallowly toothed, petioles tomentose, pubescence heavy at first but tending to thin out as the season progresses, gray or somewhat tawny except on tips and very young leaves, principal side-ribs 3-5 and stout and widely spaced, ribs underneath sometimes remaining tawny until late: flower-clusters relatively short, 8-10 cm. long, shorter than leaves, commonly once-branched or forked, short peduncle and rachis more or less tomentose or woolly: stamens in sterile flowers strong and upright: berries large, spherical to nearly oblate, 10-25 mm. in diameter, black or dark purple with thin bloom, shedding at maturity, variable in quality, July and August: seeds large and wide, 7-8 mm. long and 5-6 mm. broad and 3 or 4 mm. thick, abruptly narrowed into a short stout beak, raphe usually a prominent keel on face and lying in the groove at ridge, chalaza small for size of seed and sunken.

Central and eastern Texas, Louisiana, characteristic on post-oak lands (*Quercus stellata*). Missouri material named *V. æstivalis* apparently belongs here. Buckley states, in founding the species, that "it grows in open post-oak and pine woods, where it is easily recognized by its large leaves and low habit, trailing on the ground or over bushes. In but one instance have I seen it climbing as high as six or eight feet." He says that the leaves are "larger than those of any other American grape." Munson states that the species climbs "20 to 40 feet or more in rich sandy soils." Type locality is near Austin, Texas.

As originally published, the specific name was spelled *Linsecomii,* and this orthography has been continued in certain writings. It appears, however, that the person for whom Buckley named the species, as cultivated in his garden at Long Point, Washington County, Texas, was Dr. Gideon Lincecum (see Munson, Foundations, 39 note). On the label of his type specimen in the National Herbarium, Washington, Buckley wrote the

name *Lincecumii* and in this way he also spells it in a subsequent publication (Proc. Acad. Nat. Sci. Phila. 1870, 136); the spelling as first published appears, therefore, to be a typographical error, or an inadvertence.

Relationship of *Vitis Lincecumii* to *V. æstivalis* cannot be made out from existing botanical materials. Its distinctness from a viticultural point of view has been recognized from the first, and it has been a parent in extensive breeding experiments. Buckley writes (1861) that "in the settlements where hogs run at large it seldom matures its fruit, which grows near the ground within reach of hogs and turkeys, and is eaten by them before it becomes ripe; hence there are few people living in Texas who have ever tasted its ripe berries. . . . At the house of a gentleman in Navarro County, Texas, I ate some delicious preserves of this grape, and I was assured at the same time that it was the best of grapes for family use, and superior to either the Isabella or Catawba. . . . Its grapes are from one-half to three-fourths of an inch in diameter, and of a deep purple or bluish-black color, tender and pleasant, without the musky taste peculiar to some forms of the Fox grape (*V. Labrusca*)." Munson declares that "taking all things into consideration, this species is one of the most remarkable, interesting and promising to viticulturists."

V. Lincecumii var. **glauca,** Munson, in Rev. de Vitic. v, 159 (1896). Fig. 112.

V. æstivalis var. *glauca,* Bailey, in Gray, Synopt. Fl. N. Amer. i, 427 (1897).

V. Linsecomii var. *lactea,* Small, Fl. Southeast. U. S. 755, 1334 (1903), not *Vitis glauca,* Wight & Arn.

Strong stocky short-jointed vine distinguished from *V. Lincecumii* by often smaller teeth on the less lobed leaves which are bluish and only lightly tomentose or floccose underneath, only once-forked tendrils, much larger and elongated clusters but smaller and more deeply glaucous more persistent berries and usually noticeably smaller seeds: young growths either rusty- or tawny-tomentose but soon becoming glabrous: diaphragm about 3 mm.: leaves broadly cordate-ovate, 10-15 cm. long above petiole and equally or more broad, mostly with a large but shallow lobe near apex on either side which may nearly equal the terminal lobe, the two sinuses sometimes extending deep into the blade, basal sinus open and moderately broad, margins often or for the most part small-toothed and in some cases nearly crenate-entire, upper surface soon glabrous, under surface thinly or even scantily woolly or flocculent, sometimes with spreading hairs on veinlets, petiole sparingly woolly to practically glabrous: clusters elongated, mostly 10-25 cm. long, very compact: stamens of sterile flowers moderately strong, upright, and in fertile flowers strongly reflexed and bent: berries globular, 10 or 12 mm. or less in diameter, numerous, mostly persistent, dark purple or black with thick bloom, juicy and quality mostly good, usually ripening somewhat later than the species: seeds 5-6 mm. long and about 4 broad and 3 thick, gradually or abruptly narrowed to beak, raphe

rather prominent but apparently not strongly keeled on face, little sunken at the ridge, chalaza small and sunken.

Southern and southwestern Missouri, Arkansas, Oklahoma, northern and central Texas. This plant apparently bears much the relationship to *Lincecumii* that *V. argentifolia* holds to *æstivalis*. Very likely a distinct species is hidden in this association, but evidence is yet insufficient and the present diagnosis may need modification.

5. **Vitis argentifolia,** Munson, in Proc. Soc. Prom. Agr. Sci., 1887, 59. SILVERLEAF GRAPE. Figs. 109, 110, 113.

V. bicolor, Auth.

V. cærulea, Munson ex Viala, Une Mission Viticole, 113 (1889); Viala & Péchoutre, in Viala & Vermorel, Ampél. i, 340 (1910).

V. Lecontiana, House, in Amer. Midland Nat. vii, 128 (1921).

V. æstivalis var. *bicolor,* Deam, Shrubs of Indiana, 207 (1924).

Vigorous climber, making dense rich canopies over bushes and ascending into small trees: young axes glabrous, striate, very slender, reddish or even bright red, often glaucous particularly at the nodes: tendrils and petioles long and slender and not floccose: diaphragm medium, 3-4 mm.: leaves broadly cordate-ovate, and mostly shallowly 3-lobed near summit with broad triangular apex, well grown blades 10-25 cm. and even more long from top of petiole and usually more in breadth, basal sinus deep or shallow but seldom narrow, margins with rather shallow teeth and sometimes nearly sinuate, upper surface glabrous and dull dark green, under face prominently blue or silvery as if glaucous but sometimes becoming whitish late in season and dull in autumn, scarcely cobwebby or floccose, ribs and veins commonly bearing soft spreading straight hairs about 1 mm. long (Fig. 109) that may more or less disappear in midsummer or later except on young or fresh leaves, ribs themselves light brown but only seldom indifferently floccose; leaves on ground shoots often deeply 3-7-lobed: flower-clusters slender and narrow, 7-15 cm. long, little or shortly branched, nearly glabrous and not floccose, peduncle 3-7 cm. long and not floccose: berries spherical, purple or black with heavy bloom, persistent, 5-10 mm. diam., pulpy, sour or astringent but pleasant-tasted when ripe, ripening in September in central New York: seeds medium, variable, 5-6 mm. long and 3-4 broad, gradually or abruptly tapering to a short base, prominent raphe elevated on front and ridge, chalaza medium size, circular, shapely.

Widespread and common northern grape on dry lands, making heavy mantles on bushes and fences: Massachusetts, Ontario, Wisconsin, Illinois, southeastern Minnesota (*Rosendahl*), southward to the uplands of North Carolina and Tennessee; Alabama (*Mohr, Harper*); not authenticated west of the Mississippi, but may be in Missouri.

The species is not widely variable except in the investiture of the under surfaces of the leaves, and in this character there may be marked differences (from almost glabrous to rather heavily pubescent) between leaves on the same plant. In some cases *V. argentifolia* is very like *V. æstivalis* but is

distinguished by the blue under color of the prevailingly larger leaves, peculiar hairs on underside ribs and veins (even if sometimes partly obscured by scurf), absence of the rusty floccose character of *æstivalis* and of the little brown tufts or floccules on under surfaces, by its glabrous red often glaucous "wood" on young growths, slenderer glabrous tendrils and petioles, less prevalent narrow lateral rounded and expanded leaf-sinuses, lobes

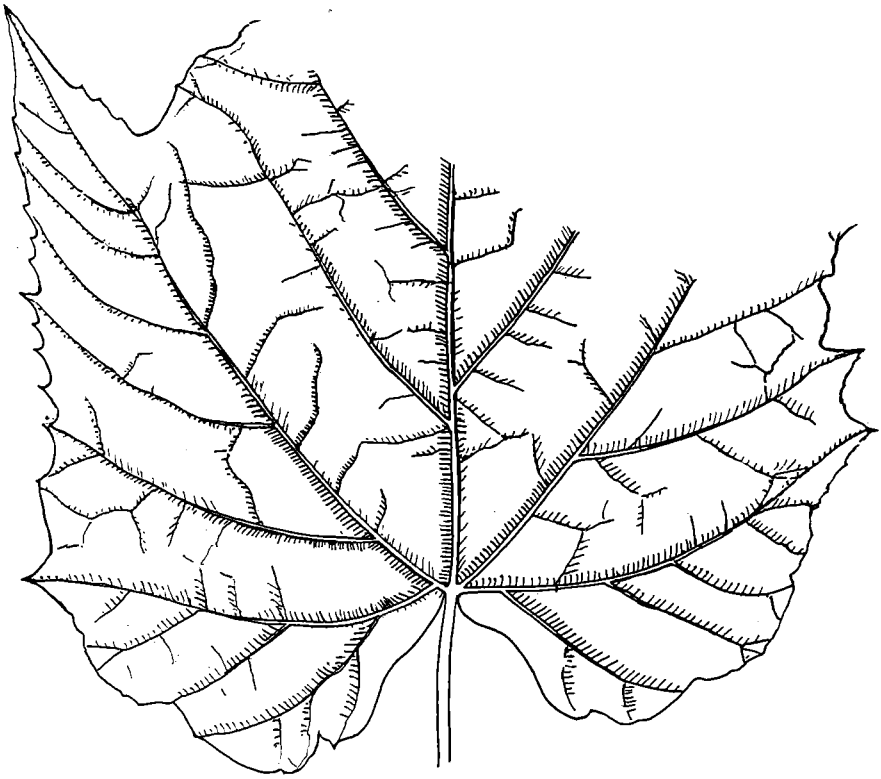

FIG. 109. PIECE OF A LEAF, nearly natural size, of *Vitis argentifolia*, to show the hairs on under surface, usually characteristic of the species early in the season.

mostly sharp-pointed and blades lacking the flowing or rounded outlines of *V. æstivalis*, straighter and less forked or shouldered clusters, mostly smaller later-maturing berries with heavier bloom; seeds appear to be narrower than in *æstivalis*, with a width-to-length proportion in most cases of 4 to 6 as distinguished from mostly 5 to 6 in the other species. It is prevailingly a larger-leaved species than *æstivalis*, with thinner young axes and longer internodes. There is also difference in the "cut" of the foliage, although not constant yet prevalent enough to constitute a character separating the two species even though difficult to define: in *argentifolia* the two side lobes (except on strong ground shoots) usually present more or less

straight tapering sides and a very sharp point, their sinuses open and angular, basal sinus never overlapped; in *æstivalis* the lobes (in case the leaves are lobed) have curving sides and the point is short or even none, lateral lobes sometimes four and their sinuses with rounded bottom, basal sinus sometimes with overlapping sides: these contrasts are well shown in Fig. 110, being leaves from Munson-Prestele paintings but of rather marginal forms of the two species.

FIG. 110. CONTRASTING LEAF FORMS of *Vitis argentifolia* (*bicolor*), left, and *V. æstivalis* reproduced about one-half size from the Munson-Prestele paintings; these represent rather extreme forms of the ambitus of the leaves and may not hold in a series of specimens.

Much of the confusion in respect to *argentifolia* is due to inadequate herbarium material, particularly to lack of young tip growths, and some of the incomplete specimens are scarcely determinable. Many specimens I do not undertake to name. It is yet too early to state its real relationship to *æstivalis*. Identification of *V. argentifolia* is not to be based on any single character but on association of characters: failure of one feature does not invalidate one's determination of a given specimen.

Perhaps we have not learned all the marks that distinguish these two species in nature. They have a different look in the field. Until the group is better known I prefer to keep the silverleaf grape spearate. If we combine it with *V. æstivalis* then we are confronted with the problem of *V. Lincecumii*; to throw all these elements into *æstivalis* would increase the difficulties in understanding that species. Munson thought there is a gradual transition to *æstivalis* going south; he gave the southern extension of *V. argentifolia* as Maryland and northern Virginia.

V. argentifolia has not yielded important vineyard varieties.

Interesting question of nomenclature is raised by the recognition of the silverleaf grape. The name *argentifolia* was proposed by Munson before the Society for the Promotion of Agricultural Science at a meeting held at Columbia College, in New York City, August 1887, without formal description and therefore it has been accounted invalid. Very soon thereafter he decided that his new grape is the *Vitis bicolor* of LeConte and so wrote in a letter dated November 17, 1887; subsequently he used the name *bicolor*, with *argentifolia* as a synonym. In fact, however, we do not know what LeConte meant by his *Vitis bicolor*. (See page 154). LeConte's diagnosis does not mention the silvery or blue feature of the leaves, which is a major distinguishing characteristic of the grape under consideration, nor does he state the relationship of his species. As to leaf color he states: "beneath paler in the younger leaves, sparsely arachnoideo-villous"; mature leaves may also show the two colors in the silverleaf grape but this fact is not mentioned. The name *bicolor* as he defines it might apply as well to a form of *Labrusca* as to one of the Æstivales in the country "from Pennsylvania to Virginia." The only item in the LeConte account that suggests a placement of *bicolor* is the citation, "V. æstivalis Darlington, Florula Cestrica." Why he thinks the *æstivalis* of Darlington to be different from *æstivalis* of Michaux is not stated. The citation only confuses the situation, however, for in Florula Cestrica Darlington describes the leaves of this Vitis as having "russet tomentum beneath"; this would take the name *bicolor* away from the plant to which we have assigned it.

However, LeConte's *bicolor* is now invalidated by Rafinesque's *bicolor* even though we do not know what Rafinesque meant either.

Under these conditions two courses are open to us, —to invent a new name, or to make the best of *V. argentifolia;* and each of these alternatives has been taken by House. In 1921 House proposed the name *V. Lecontiana* in place of *V. bicolor* of LeConte only because of conflict with *bicolor* of Rafinesque: as we do not know what *bicolor* is, no more do we know what *Lecontiana* is. In 1924 House correctly accepted *V. argentifolia* of Munson and subordinated his *Lecontiana* (List Ferns and Flowering Plants New York State, 486, in N. Y. State Museum Bull. 254).

It now remains to inquire into the status of *argentifolia*. The word "argentifolia" is itself descriptive and there is no other grape in "Mich., Ohio, Wis., and Illinois" (as Munson records it) that can qualify for such a name; it is a surer characterization of his proposed species than LeConte's description of his *bicolor*. Munson puts his *argentifolia* in the *æstivalis* group, calls it "Blue Grape," says it is as well separated from *æstivalis* as is *Lincecumii*, states that its germination is "very latest," leafing season "medium to late," blooming season "late," ripening season "medium to late," fruit "small."

If we cannot adopt *V. argentifolia* for the silverleaf grape, then we should make another new name for it. There is propriety in using the name since Munson was the first to distinguish the species.

The first valid publication of a varietal combination for the silverleaf grape known to me is Deam's, cited in the synonymy at the beginning of this entry. He gives a good characterization, and cites Britton and Brown as authority for the variety. Rusby in List of Pteridophyta and Spermatophyta growing without Cultivation in Northeastern America, 220 (1893-4) had cited a trinomial *V. æstivalis* var. *bicolor*, LeConte on the authority of Watson and Coulter in Gray's Manual, sixth edition, 113 (1890), and this is repeated in both editions of Britton and Brown's Illustrated Flora; but varietal combination is not made in the Manual and LeConte could not be cited for it if it were made.

6. **Vitis æstivalis,** Michx. Fl. Bor.-Amer. ii, 230 (1803). SUMMER GRAPE. Figs. 110, 111.

V. æstivalis var. *sinuata*, Pursh, Fl. Amer. Sept. i, 169 (1814).

V. sinuata, G. Don, Gen. Syst. Gard. and Bot. i, 711 (1831).

V. æstivalis var. *punctata*, Weber, in Rept. U. S. Commr. Patents for 1859, 67.

V. æstivalis var. *genuina*, Durand, in Actes Soc. Linnéene Bordeaux, xxiv, 162 (1860) excl. syn.

V. Labrusca var. *æstivalis*, Regel, in Act. Hort. Petrop. ii, 396 (1873).

V. vinifera var. *æstivalis*, Kuntze, Rev. Gen. i, 132 (1891).

Strong vine climbing to 40 or 50 feet, commonly with short internodes and rather short mostly pubescent or fuzzy petioles: new growths or shoots rusty-woolly, the under surface of young leaves prominently red: canes becoming smooth late in season or sometimes carrying a few glands, brown, terete, striate: diaphragm rather thick, about 4 mm.: leaves mostly large, cordate-ovate to broadly so in general outline, 4-20 cm. long from top of petiole and breadth as great or greater, in many cases with uniform unlobed outline and again deeply 3-5-lobed with narrow sinuses expanding and curving at base, lobes not usually long-pointed, basal sinus various but mostly deep and prominent and sometimes overlapping and the basal lobes rounded, apex broadly triangular, margins irregularly and not deeply sinuate-toothed and the teeth often sharp, petiole shorter than blade and usually carrying brown pubescence or tomentum, dull green and nearly glabrous above, rusty-floccose or tomentose underneath with the fuzz tending to persist in little tufts or floccules, side-ribs 3-5 and diverging: stamens in hermaphrodite flowers reflexed and laterally bent: clusters mostly long, 8-18 cm., usually with a long branch or shoulder near base, rather open and loose in anthesis and sometimes interrupted, often prolonged in fruit: berries spherical to somewhat oblate, 5-12 mm. diameter, black with medium to thin bloom, persistent, variable in quality sometimes being sweet and good, August, northward and upper elevations early

September: seeds medium and apparently variable in size, 5-7 mm. long and 4-5 broad, abruptly narrowed to base, raphe rather prominent on face and ridge, chalaza medium small and mostly circular and somewhat sunken.

Widespread upland eastern grape, apparently mostly on sandy and rocky lands, Massachusetts and southern New Hampshire to Michigan, central Missouri, and southward to Georgia; common in the mountains of Carolina-Tennessee. Reported from southern Ontario (Macoun Cat. iii. 1886, but silverleaf grape was not then distinguished). Michaux gives its nativity as "in sylvis, a Virginia ad Carolinam."

FIG. 111. ONE OF THE MICHAUX SPECIMENS of *Vitis æstivalis* (× 2/5). Paris.

Range of the summer grape is yet to be determined. Such material as I have seen from Florida distributes itself in *V. rufotomentosa* and *V. Simpsoni*, and other material from the lower South is *V. cinerea*. Occurrence west of the Mississippi needs verification: one must there first understand the big-leaved *V. Lincecumii* and var. *glauca*, as well as *V. cinerea*. Leaf form in *æstivalis* is remarkably inconstant. One cannot observe variations in leaves and fruit-clusters without wishing for sufficient material to correlate with distribution and wondering whether more than a single species is involved. Segregation of *V. rufotomentosa* and *V. Simpsoni* (*austrina*) has clarified the species.

Specimens of Michaux, on two sheets, are well preserved in Paris. One sheet represents a leaf form with nearly truncate base and shouldered

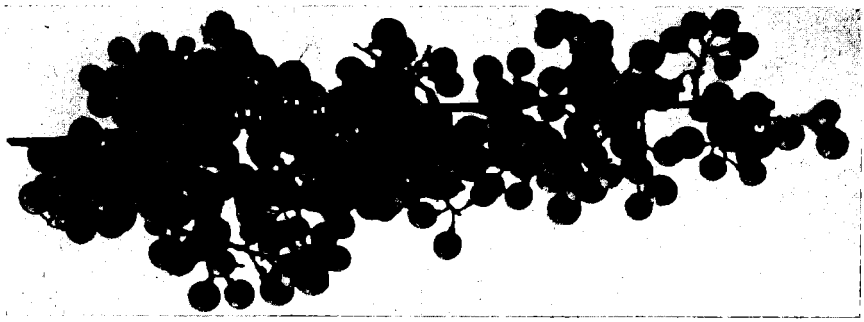

FIG. 114. NUMEROUS CURRANT-LIKE BERRIES of *Vitis Simpsoni* (× ⅔). 1891.

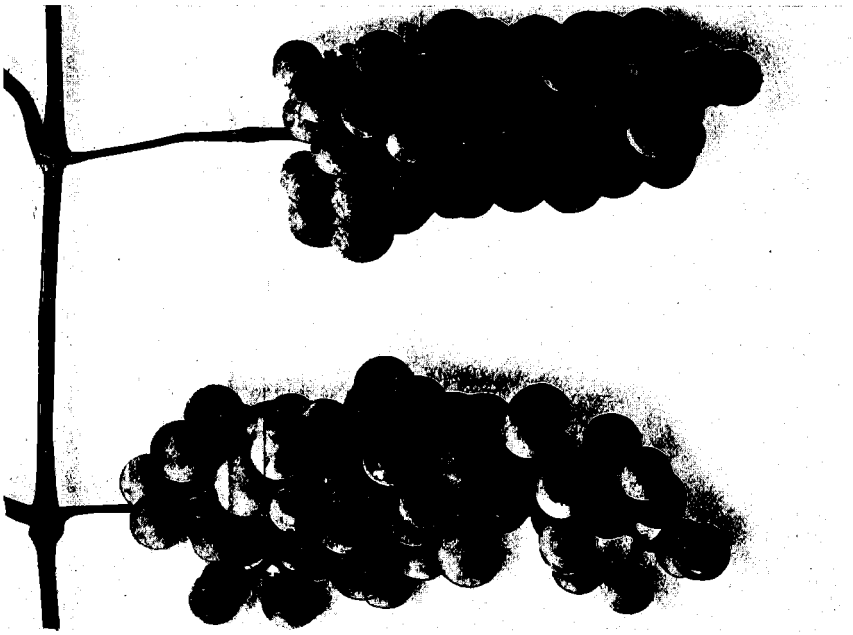

FIG. 113. CHARACTERISTIC CLUSTERS of *Vitis argentifolia* (× ⅔). 1895. New York.

FIG. 112. CLUSTER OF *Vitis Linceecumii* var. *glauca* (× ⅔). 1891.

rather than lobed blades; the other sheet (Fig. 111) has lobed leaves of the more familiar form.

Specimen of Pursh's *V. æstivalis* var. *sinuata* is preserved in the herbarium of the Academy of Natural Sciences in Philadelphia, there named *V. sinuata*. It represents the deeply 5-lobed leaves familiar on ground shoots of *æstivalis*. With the specimen is a note by Pursh: "Rich woodlands, Capon Springs. This grape does not alter the shape of the leaf by cultivation as I observed for several years."

How far *Vitis æstivalis* has entered into important vineyard grapes has not been accurately determined although there have been many guesses. Norton (Norton's Virginia), that originated in Virginia more than one hundred years ago, has the botanical marks of *æstivalis*, although the seeds are narrower, and the tendrils sometimes continuous (a trait that is not unknown in *æstivalis* itself); it is generally considered as representing that species. It is *Vitis Nortoni*, Prince, Treatise on the Vine, 186 (1830). It is an excellent wine grape, with small to medium-sized berries.

6a. **Vitis Bourquina,** Munson ex Viala, Une Mission Viticole, 119 (1889). SOUTHERN SUMMER GRAPE (southern æstivalis).

V. Bourquiniana, Munson, in Amer. Gard. xii, 584 (1891); Texas Farm and Ranch, Feb. 8, 1896, 10-12; Rev. de Vitic. v, 159 (Feb. 1896).

V. æstivalis var. *Bourquiniana*, Bailey, in Gray, Synopt. Fl. N. Amer. i, 428 (1897).

Distinguished from *V. æstivalis* by the young growth only moderately rusty, under surface of leaves bearing thin and loose cobwebby covering which is gray or dun-colored and may disappear with age, indifferent reddish aspect due to the somewhat colored ribs and veins: berries 8-20 mm. diameter, varying from dark purple to red and whitish-green: seeds much like those of *æstivalis*.

A class of cultigens, as now understood, comprising vineyard grapes grown in the southern United States, well represented by Herbemont which is an old variety of major importance in the South. Varieties Lenoir or Jacques, Bertrand, Cunningham, Harwood are typical representatives, and Caspar, Calloway, Devereux, Louisiana, Pauline, Robeson, Ruckland are other forms. Engelmann expected discovery of a native grape from which the southern æstivalis group might have sprung; Munson concluded that this class is not native and that it originated from a grape of southern Europe (see page 160). History of the introduction from France of two of this class of grapes was given Munson by Mr. Gougie Bourquin of Savannah Georgia, for whom the group or species is named. Many vineyard seedlings have been raised, and the resulting varieties employed in crossing. Southern æstivalis is a recognizable class of important vineyard grapes. In many

cases the leaf characters are greatly like those of *V. vinifera,* but the somewhat rusty or fulvous tips distinguish it.

The viticultural varieties assembled as *Vitis Bourquina* are rather heterogeneous as a botanical concept, and they may not all have had the same genetic origin. The characters are largely those of *æstivalis* and *vinifera.* We may not yet have exhausted the possibility of discovering a distinct native parental species inasmuch as our Vitis flora is not carefully explored; nor is it beyond probability that among the great variety of native *æstivalis* forms now known to us there may be one which could have yielded the Bourquin race by mutation or hybridization or by both; useful varieties of early origin would naturally be passed back and forth between France and the French of the southeastern settlements.

7. **Vitis rufotomentosa,** Small, Fl. Southeast. U. S. 756, 1334 (1903). Redshank Grape. Fig. 115.

Strong high-climbing thick-leaved vine with look of small-foliaged *V. Labrusca* but tendrils intermittent: young growth densely rusty-scurfy, tips rusty-red, internodes short: diaphragm 2-5 mm.: petioles short, 3-6 or 7 cm. long, stout, rusty-tomentose or shaggy: leaves broadly cordate-ovate to ovate, mostly as broad as long or even much broader, not large for the most part, 6-10 cm. long above petiole, uniform or continuous in outline on ordinary shoots or with more or less obscure short lobes or indications of them toward apex, on ground shoots 3-5-lobed and with deep rounded sinuses, basal sinus narrow or broad, margins shallowly sinuate-toothed, upper surface dull and more or less thinly webby at first, under surface suggesting *Labrusca* but loosely webby rather than compactly felty and more uniformly rusty rather than tawny or dun, about 3 or 4 side-ribs very prominent underneath and red-rusty: sterile clusters 8-12 cm. long in anthesis, rachis and peduncle rusty-tomentose and latter very short, fertile clusters shorter, the stamens not strongly reflexed: "berries black, with little or no bloom, often 5-6 mm. in diameter," August: seeds small, about 5 mm. long and 4 mm. broad, gradually narrowed to beak, raphe very prominent on keel and over ridge to the rather small but conspicuous circular chalaza.

"Florida to Louisiana" (Small). I know it positively only from northwestern and peninsular Florida as far south at least as the Tampa latitude, in which state it appears to be a common grape, but some of the *æstivalis* material from Georgia probably belongs here. Type, *Nash* no. 525, vicinity of Eustis, Lake County, Florida, from which left-hand leaf in Fig. 115 is traced.

The redshank grape apparently takes the place in Florida of *V. æstivalis,* although the latter may occur within that territory. *V. rufotomentosa* has more the look of *Labrusca* than of *æstivalis,* due to the rounder or broader leaves and the heavy webby redder tomentum underneath; young twigs are notably scurfy-woolly; under covering of leaves does not tend to separate

into floccules as in *æstivalis;* indumentum of young growth is conspicuously reddish. Good field work is necessary to determine the geographical limits of the species.

While *Vitis rufotomentosa* is distinguished by its rounded and mostly unlobed leaves, yet on certain shoots the leaves may be as deeply divided as on similar shoots of *V. Smalliana;* such leaves are distinguished by the coarse teeth on the margins in contrast to the sinuate or nearly entire margins of the lobes of *Smalliana.* In herbaria there is likely to be a general admixture of *rufotomentosa, Smalliana, Simpsoni,* and *sola.*

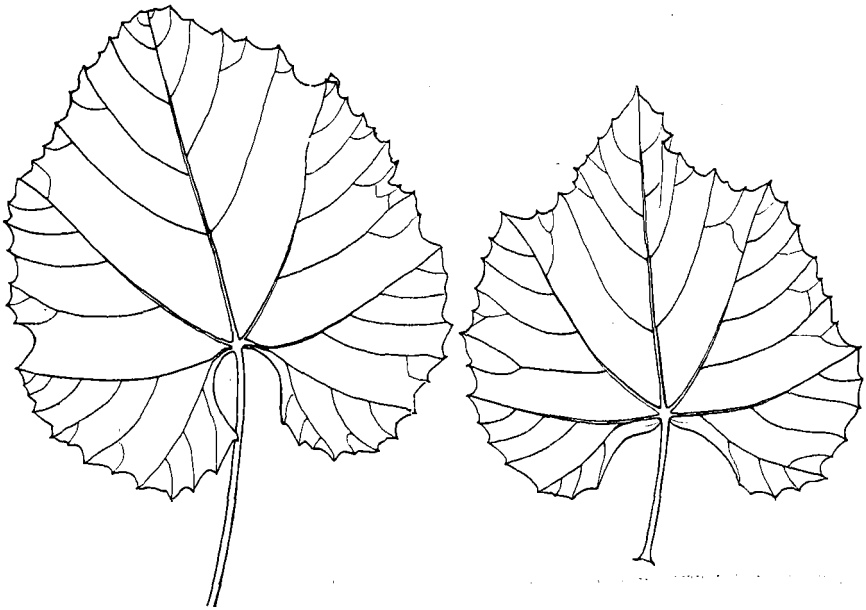

FIG. 115. TWO LEAVES of *Vitis rufotomentosa.* (×½).

†8. **Vitis sola,** spec. nov. *Æstivales.* CURTISS GRAPE. Fig. 116.

V. caribæa, Amer. Auth.; Bailey, fig. 2702 Cyclo. Amer. Hort. (1902), repeated in Stand. Cyclo. Hort. fig. 3963 (1917).

Rami teretes et multo-striati, plus vel minus ferrugineo-tomentosi: diaphragma 3-4 mm.: folia permagna, non lobata, prope reniformi-cordata, 12-16 cm. lata, sinus ad basim latus, ambitus orbicularis cum apiculis terminantibus nervos radiales: inflorescentia longissima et ramosa: baccæ globulares, 9-10 mm. diam., atræ: semen 4-5 mm. longum, 3 mm. latum, raphe tenuis, chalaza elliptica.

Vigorous long-jointed vine with terete many-striate canes pubescent-woolly up to flowering time or even to fruiting time, young tips and leaves distinctly rusty-woolly or rusty-tomentose: pith very large, diaphragm 3-4 mm.: leaves very large, not lobed, broadly or reniform-cordate with a very wide open basal sinus and continuous rounded outline or with only slight indication of a shoulder, apex shortly and broadly triangular or reduced to

little more than a cusp, blade 10-14 cm. long above the slender pubescent-tomentose petiole, breadth often considerably greater, margin not toothed or serrate but lightly and continuously undulate or crenate with each radial rib and nerve ending in an apicula, upper surface dull and soon becoming glabrous except that gray loose floccules may remain, under surface rusty-pubescent on ribs and nerves and bearing small floccules, main side-ribs 4-6 spreading at a wide angle: clusters very long, 10-20 cm. and long-peduncled, narrow but branched, either shouldered or bearing a tendril, axes floccose: sterile flowers slender-pedicelled, stamens long and ascending: fruiting cluster open and much branched, 9-12 cm. long and more than one-half as broad, long-peduncled, fruit long-pedicelled: berries black, globular,

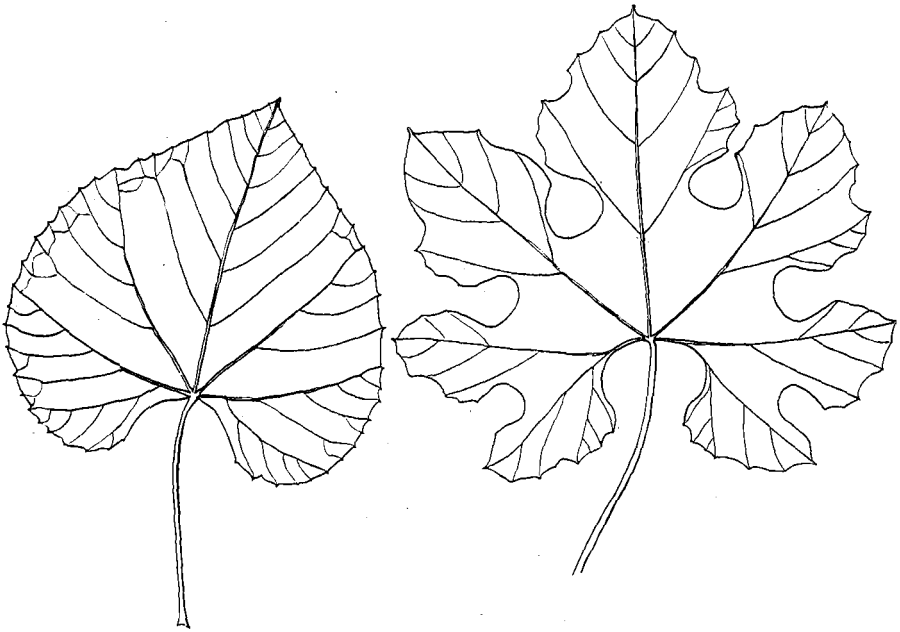

FIG. 116. LEAVES OF TWO FLORIDA GRAPES (× nearly ½); left, *Vitis sola;* right, *V. Smalliana.*

about 9-10 mm. thick, ripe in August and September, persisting: seeds 4-5 mm. long and about 3 mm. broad, surface roughened and marked with fine cross-lines on face, rather abruptly contracted to short beak, keel high, raphe very thin and only faintly evident in ridge groove and to the elliptic chalaza which is not elevated.

Florida: swamp near Jacksonville, *A. H. Curtiss* 4791, June 1894 (type) and again near Jacksonville, August and September, 1894, no. 4747, May 1898, no. 6415, also borders of Indian River, no. 453; also Alachua, Brevard and Lee counties.

We are now confronted with disposition of the North American grapes heretofore called *V. caribæa.* They are referable to three or four species. The name *caribæa* may be traced.

The species *Vitis caribæa* begins with DeCandolle in Prodromus, i, 634 (1824). It includes *V. indica* of Swartz, and its locality is Jamaica. DeCandolle's specimen at Geneva, of which a photograph is before me, is from Puerto Rico, coll. Bertero 1820. Specimens I have collected in Puerto Rico are a good match for it. It has been assumed that this West Indian plant occurs in Florida. Munson in his Foundations limits it to the tropics and his illustration is made from Jamaican material. "After the most diligent inquiry," he writes, "for this form in various parts of Florida and other Southern States and securing specimens of the vine which Prof. A. H. Curtiss has taken to be *V. Caribæa* (sent me by him for examination), I am unable to discover the slightest traces of this species in the United States. Prof. Curtiss' vine seems to be a hybrid between *V. Simpsoni* and *V. cinerea* (?). It is said to produce a medium sized fruit of fine quality, while *V. Caribæa* is small and acid" (Foundations, 64). I cannot see that the Curtiss specimens indicate combination of *Simpsoni* and *cinerea*; I agree with Munson, however, in considering the Curtiss plant to be unlike the West Indian.

The Swartzian *Vitis indica* (Observationes Botanicæ, 95, 1791) is antedated by the Linnæan *indica*. The name is now replaced by *V. tiliæfolia* (*tiliifolia*, Urban) of Humboldt and Bonpland in Roemer & Schultes edition of the Systema, v, 320 (1819) of which there is a specimen according to Urban (Symbolæ Antillanæ, v, 379) in the Willdenow Herbarium. Urban makes *V. caribæa*, DC. a synonym, but he does not mention *V. indica*, Swartz. Type specimen of Swartz's *indica* is in Naturhistoriska Riksmuseet at Stockholm and photograph of it shows it to be the same as the tropical American plant known to us as *V. tiliæfolia*. There may be some question whether all the tropical material passing under this name really belongs to a single species, but that question must await more consecutive specimens. I have taken it in Cuba, Panama, Venezuela as well as Puerto Rico. But it appears to be safe, on the basis of present collections, to exclude *V. tiliæfolia*, Humb. & Bonpl. (*V. caribæa*, DC.) from the United States.

Munson's *Vitis Blancoii* (Rev. de Vitic. vi, 424, 1906) of Mexico, designated by me in the Synoptical Flora as a white-leaved form of *caribæa* is quite unlike any material I have seen of *V. tiliæfolia*. Persons who may have occasion to consult the Munson herbarium distribution of 1888 will find leaves of *V. Blancoii* under another but unpublished binomial. It apparently belongs with the *Labruscoideæ*. See note under *V. Berlandieri*.

9. **Vitis Simpsoni,** Munson, in Proc. Soc. Prom. Agr. Sci. viii, 59 (1887); Viala, Une Mission Viticole, 37 (1889). CURRANT GRAPE. Figs. 114, 117.

   V. cinerea var. *floridana*, Munson, in Rev. de Vitic. vi, 424 (1896), not *V. floridana*, Raf.

   V. austrina, Small, Fl. Southeast. U. S. 755, 1334 (1903).

Strong high-climbing rather thin-leaved vine with cinereous-pubescent striate young canes that may long hold their pubescence or wool but which are rusty-pubescent at the tips comprising the nascent and unfolding leaves: internodes long and the vines lanky, pith large, tendrils very long: diaphragm 3-4 mm.: leaves medium to large cordate-triangular-ovate, full-grown blades often 12-20 cm. long from top of petiole and equally as broad, with a characteristic short prominent lobe or shoulder on either side (or one side) toward apex, middle lobe or apex triangular-pointed, basal sinus broad and shallow, leaves on certain young or ground growth deeply 3-5-lobed with obtuse sinuses, margins with small sinuate teeth or remote

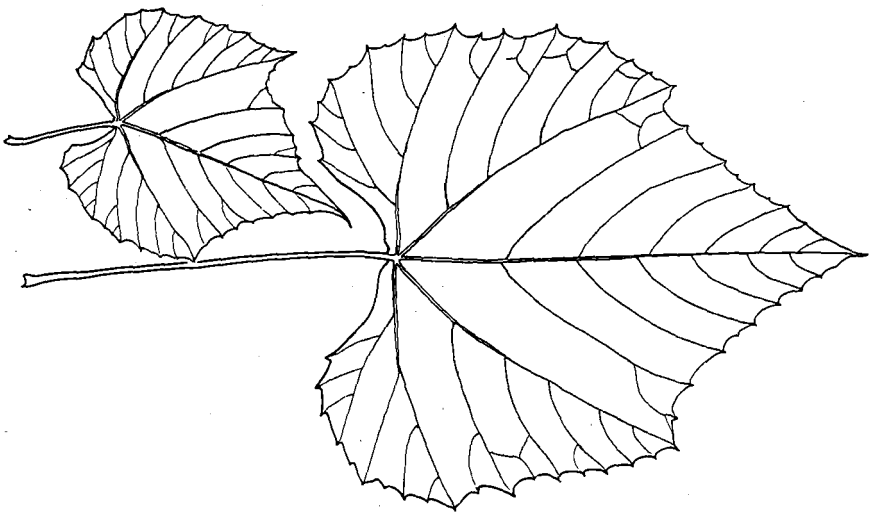

FIG. 117. LEAVES SMALL AND LARGE of *Vitis Simpsoni* (× ½).

serratures ending in a cusp-like point, main side-ribs about one pair ascending from petiole and 2 or 3 pairs of small ones, petioles long and gray-tomentose, upper surface of blade at first gray-floccose but becoming glabrous and dull, under surface pubescent and floccose, mostly gray but often with tawny veins and ribs that present an *æstivalis* look (but leaf shape and margin quite different): clusters elongated in full anthesis and in fruit and long-peduncled, sometimes 18 cm. long and peduncle 12 cm. (stalk sometimes longer than fruiting part), rachis and peduncle woolly, axis with many short divaricate side-branches or clusterlets: stamens of sterile flowers strong and straight: berries small and in well developed clusters many, 5-7 mm. in diameter, short-pedicelled, black, acid, August: seeds 1 or 2, scarcely flattened on the face and therefore with a globular look, beak short and abrupt, 5 mm. long and about 4 thick, raphe indistinct and in a groove at the ridge, chalaza spherical and small.

Southern Georgia and Florida according to Munson; I have a specimen apparently this species cultivated by Munson ticketed as native in southeastern Arkansas. It is widespread and apparently common in Florida;

it is the plant passing there as *V. cinerea*. I have seen it at Augusta, Georgia and southward, ordinarily confused with *æstivalis*; to be expected in the Carolinas. The short side shoots bear many characteristic little leaves.

Two species of Vitis were named *Simpsoni* by Munson, neither one with adequate description. The older name appears in a phenological table in 1887 with footnote, where it is placed in the group with *V. cinerea*, as "a peculiarly red, rusty form of cinerea, about as distinct from Western cinerea as V. Lincecumii is from V. æstivalis. May prove identical with the Curtis grape specifically [A. H. Curtiss: see *V. sola*], and stands about midway between V. cinerea, true, and V. Caribæa." It is recorded from Manatee River, Florida, germination "medium," leafing "very late," blooming "very late," ripening season "very late," fruit "small." The identity is confirmed by Munson in his Foundations, 68, by citing it as a synonym of his *V. cinerea* var. *floridana*. In his herbarium distribution of 1888 this plant appears as *V. Simpsoni*, Munson, as attested by the collection at the Mississippi Agricultural College and again at the University of Florida. A similar botanical specimen was sent me in 1923 taken from the vineyard of North Carolina Experiment Station, which suggests that living plants under that denomination were probably sent out early by Munson. This is undoubtedly the plant understood as *Simpsoni* by Simpson himself in a communication of November 8, 1898, in which he says, "bearing vines seldom found except on shell mounds near salt water."

In his synopsis of The Wild Grapes of North America, 1890, Munson uses the name *V. cinerea* var. *floridana* for the plant he had formerly described and distributed as *V. Simpsoni* and it was also named var. *floridana* in the World's Fair Exhibit 1893, and he applied the name *Simpsoni* to a different grape without description but the second name was more or less validated in American Garden in 1891, in Revue de Viticulture in 1896 and accepted by Bailey in Gray's Synoptical Flora in 1897, and it was fully characterized and figured by Munson in 1909; this second *Simpsoni* must now take a new name (see number 10). Of this second *Simpsoni* (number 10) I have four good Munson sheets under this name dated 1890, 1891, 1895. That is, there are good Munson specimens of both species he named *V. Simpsoni*.

The currant grape properly commemorates Mr. J. H. Simpson, botanist of Manatee, Florida: see reference under *V. Munsoniana*, No. 30.

† 10. **Vitis Smalliana,** nom. nov. FIGLEAF GRAPE. Figs. 116, 118.

V. Simpsoni, Munson, in Amer. Gard. xii, 586 (1891); Rev. de Vitic. v, 164 (1896); Foundations Amer. Grape Cult. 50, t. xvi (1909); not Munson 1887.

Rather slender but a high grower under favorable conditions or confined on low bushes in dry sandy areas, with bright rusty-tomentose young shoots and always strikingly lobed leaves with deep sinuses enlarged and

rounded at bottom: young wood tomentose becoming floccose and then nearly or quite glabrous toward the end of the season, gray except growing ends for a foot or less: internodes as well as tendrils mostly long: diaphragm 6 mm. or less in mature first-year canes but perhaps not developed in young

FIG. 118. THE LARGE BERRIES of *Vitis Smalliana*, natural size, photographed 1891.

axes: leaves nearly circular in general outline, large ones 10-16 cm. across, very deeply lobed with sinuses expanded and mostly rounded at base and edentate, main lobes 3 or 5 and often intermediate or secondary lobes, the lobes rounded and obtuse or terminating in a cusp, margins with few obscure sinuate teeth or practically entire, main side-ribs one strong divaricate

pair and minor ones above, upper surface essentially glabrous or soon becoming so and bright green, under surface densely webby-tomentose and gray or dun (early or young ones ferrugineous): clusters 4-10 cm. long or longer when in fruit, somewhat branched, rachis and peduncle more or less floccose-pubescent at anthesis, peduncle likely to equal or exceed the cluster: stamens in fertile flowers reflexed and bent: berries 6-15 mm. in diameter, black with bloom, usually juicy, August: seeds large and broad, 6 or 7 mm. long and 4 or 5 broad, beak short and mostly abrupt, raphe prominent on keel and at ridge, chalaza small, spherical and depressed.

"Confined almost entirely in Florida, and . . . abundant all over the southern half of that state" (*Munson*).

This plant (*Smalliana*) was early distributed by Munson (1888) as *V. floridana* but not published under that name: see note under *V. Simpsoni* for explanation of confusion in nomenclature of species 9 and 10. In this connection it may be noted that still another Vitis was accepted as *V. floridana* by Munson, supposing it to be of Rafinesque (Proc. Amer. Pom. Soc. for 1885, xx, 97): this is the plant now known as *V. Munsoniana* (p. 240).

I prize the opportunity to dedicate this species to Dr. John K. Small in recognition of his extended studies of the Florida flora.

11. **Vitis Champini,** Planch. in La Vigne Amér. vi, 22 (1882), also ix, 192 (1885). CALCAIRE GRAPE. Figs. 119, 120.

Robust, stocky, climbing to 40 feet, making abundant strong tendrils under favorable conditions, internodes mostly short except on strong shoots: young growth white-tomentose or floccose but nearly or quite glabrous with age, at first strongly striate or angled but becoming terete: stipules broad, 3 mm. long: diaphragm 2-3 mm.: leaves medium to large, broadly cordate to nearly reniform, blade 5-12 cm. from apex of petiole and usually considerably broader, not often distinctly lobed but mostly prominently shouldered, apex short-triangular and acute, basal sinus inverted V-shaped or broader and usually acute at insertion of petiole, main side-ribs prominent and strongly ascending in about 3 pairs, the stout and rather short petiole long remaining floccose, margins with broad short apiculate teeth or angles, upper surface becoming shining dark green, under surface more or less floccose or becoming glabrous but not glossy at maturity: clusters 4-10 cm. long and frequently prominently shouldered, rachis and peduncle more or less floccose till near fruit maturity: stamens in sterile flowers of medium length and ascending, in fertile flowers short and strongly recurved: berries globular, medium to large, 10-18 mm. thick, black with thin bloom or none, persistent, skin thin, pulp juicy and pleasant-tasted, August: seeds medium for size of berry, 5-6 mm. long and somewhat narrower, prominently short-beaked, raphe thin but plain on the face or keel but scarcely evident in the ridge-groove and to the elliptic rather small chalaza.

Central-southern Texas, in limy soils. First recognized in southern France among grapes introduced from North America and named for M. Champin, French viticulturist, described by Planchon as a hybrid probably between *V. rupestris* and *V. candicans*, without specific type locality. The plant is now known over a large range of territory and often where the sup-

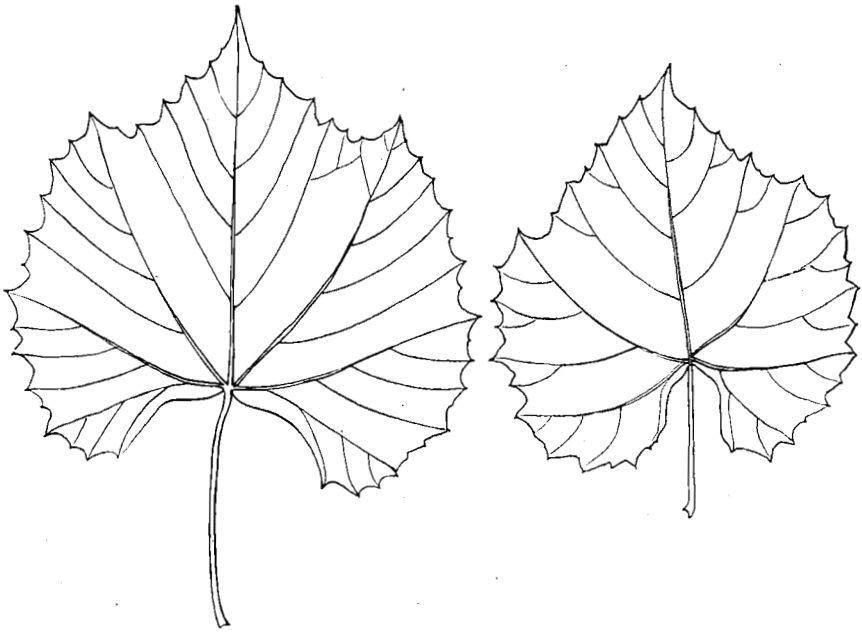

FIG. 119. LEAVES OF TWO SOUTHWESTERN GRAPES (× ½); left, *Vitis Champini*; right *V. arizonica*.

FIG. 120. CLUSTERS OF TWO SOUTHWESTERN GRAPES (× ⅔): two left, *Vitis Doaniana*, photographed 1890; bunch at right, *V. Champini*, 1891.

posed parents may not grow, and is to be accepted as an independent species. It is a promising vineyard vine for grafting-stocks and natural varieties of it for wine grapes; Dog Ridge and Australis are viticultural varieties.

This is one of the lime-loving grapes, along with *V. Berlandieri*, *V. monticola*, *V. candicans*, and others. "One of the best graft stocks," according to Munson, "for all soils and especially for regions in France,—as in the Chérente-Inferieur and elsewhere,—where the soils are similar to the dry limey and chalky soils, in which this is so vigorous, in its native habitat."

12. **Vitis californica,** Bentham, Botany of the Voyage of H. M. S. Sulphur, 10 (1844), by error Vitex. PACIFIC GRAPE.

Vigorous vine to 60 feet, sometimes so densely covering bushes and trees that it may kill them, but frequently making only low bush-like clumps when without support: young growth gray-tomentose or floccose or indumentum sometimes tinted, canes often terete and either glabrous or somewhat floccose at fruiting time: stipules small, 1-2 mm., hairy, soon caducous: diaphragm about 4 mm.: leaves nearly reniform to almost circular to round-ovate, apex completely rounded or somewhat short-triangular and obtuse, blade 7-12 cm. long above petiole and considerably broader, basal sinus mostly narrow and deep but sometimes broad, outline continuous but frequently obscurely shouldered or shallowly lobed on upper part, margin rather coarsely sinuate-toothed but various in this respect, main side-ribs about 2 diverging pairs, teeth sometimes ending in a small mucro, upper surface cottony but becoming glabrous, under surface gray-pubescent-cobwebby: flower-clusters rather small, 5-10 cm. long, somewhat branched or forked, rachis and slender petiole thinly floccose, blossoms fragrant: stamens in sterile flowers medium length and ascending, in fertile flowers stout and reflexed: berries globose, 4-10 mm. thick (seldom more), blue-black or purplish from the heavy bloom, persistent, on warty pedicels, seedy, sweet, September, October: seeds rather large for size of fruit, various, 6-7 mm. long and 4-5 mm. broad, beak short, sometimes about as broad as long, in some cases raphe a thin line on keel and scarcely evident in shallow groove on ridge and to the elliptic chalaza, in other cases raphe prominent throughout and chalaza elevated.

Along streams, by springs, in creek beds and valleys but not near the sea, central and northern California to the western Sierra foothills, and to central-western Oregon; Nevada; apparently in Arizona. Original citation "Rio Sacramento."

13. **Vitis Girdiana,** Munson, in Proc. Soc. Prom. Agr. Sci., 1887, 59, and ex Viala, Une Mission Viticole, 148 (1889); Amer. Gard. xii, 660 (1891); Rev. de Vitic. iv, 247 (1895). VALLEY GRAPE.

Robust climber with grayish-green look: young parts thickly white-woolly but the canes eventually becoming glabrous and in the meantime conspicuously floccose: stipules 2-3 mm., somewhat hairy, early caducous: tendrils long and prominent: diaphragm 2-3 mm.: leaves broadly cordate-ovate to rather narrowly cordate but mostly not conspicuously circular or

reniform in outline, 8-12 cm. long above petiole and commonly somewhat broader, basal sinus narrow or broad, apex in most cases broadly triangular-pointed, outline usually not continuous but shouldered or frequently prominently lobed with rounded deep sinuses, side-ribs 2 or 3 strong divaricate pairs, margins for the most part with very small apiculate teeth or serratures but sometimes obscurely sinuate, upper surface more or less tomentose and floccose at first but gradually becoming nearly or quite glabrous and light full green, under surface remaining gray-tomentose or -floccose: clusters 5-12 cm. long and perhaps longer in fruit, usually nearly equally forked and sometimes compound, rachis and peduncle lightly floccose: stamens in sterile flowers large and strongly ascending, those in fertile flowers small and short and reflexed: berries small, globular, 5-9 mm. thick, black with only thin bloom, persistent, pedicels nearly or quite free of warts, skin thin, sour until thoroughly ripe, August: seeds broad, 5-6 mm. long and nearly as broad, beak abrupt and short, raphe prominent on the keel and over the ridge to the very small sunken raphe.

Southern California. Along streams and in valleys, Tulare and Inyo counties south and often near the ocean. The species is dedicated to H. H. Gird of San Diego County, who first sent specimens to Munson.

It is supposed that this grape hybridizes naturally with *V. vinifera*, and some of the vines even in wild places bear leaves somewhat resembling that species, but *Girdiana* is apparently a well distinguished native species; thought by some persons to be a marked xerophytic form of *V. californica*, but it carries characters that can hardly be explained on that hypothesis. The old Mission grape of early settlements may be a hybrid but the name Mission is applied to other things in cultivation. From *V. californica* the valley grape differs in longer tendrils, more pubescent and tomentose shoots and foliage, leaves much less circular and mostly with triangular apex, more shouldered and lobed, margins much closer- or smaller-toothed, shouldered or even thyrse-like fruit-clusters, smaller less glaucous berries on smooth pedicels.

14. **Vitis Doaniana**, Munson ex Viala, Une Mission Viticole, 101 (1889); Munson, in Amer. Gard. xii, 660 (1891) and in Rev. de Vitic. iii, 160, fig. 61 (1895). PANHANDLE GRAPE. Figs. 120, 121.

Vigorous, bushy when not finding support but otherwise climbing to 25 or 30 feet, grayish in aspect particularly on all young growths because of the cottony pubescence, separated from *V. arizonica* by more vigorous habit, by the prominent lobing of many or most of the leaves as well as by larger fruits and seeds, from *V. Champini* by much grayer aspect and much longer pointed more lobed leaves, from *V. Longii* by climbing habit, more developed tendrils, much grayer and more cottony foliage and shoots, more lobed leaves and larger fruit: internodes short: stipules broad and rather prominent, 4-5 mm. long, gray-hairy: tendrils long and well developed: diaphragm $1\frac{1}{2}$-2 mm.: leaves of good size, thick or firm, bluish-green, cordate-ovate or broader, blade 7-13 cm. above petiole and commonly somewhat broader, apex long-triangular, mostly prominently lobed or strongly cornered in upper half with either open or very narrow sinuses,

basal sinus broad inverted U-shaped or narrower, main side-ribs 3 or 4 prominent pairs, margins rather coarsely and sharply angular-toothed, upper surface dull green and usually retaining floccose fragments or shreds along veins, under surface gray-cobwebby and pubescent or sometimes densely felted so that the surface itself is not visible; leaves on ground shoots often deeply 3-5-lobed: flower-clusters short, 3-4 cm. with rachis and prominent peduncle cottony, forked: stamens in sterile flowers medium length and ascending, in the fertile ones short, stout and recurved: berries large, 12-15 mm. thick, black with heavy bloom, persistent, skin thick, quality good, August: seeds large, 6-7 mm. long and about 5 mm. broad, narrowed to short stout beak, raphe evident on ventral keel then prominent over the ridge to the narrow often elliptic not much elevated chalaza.

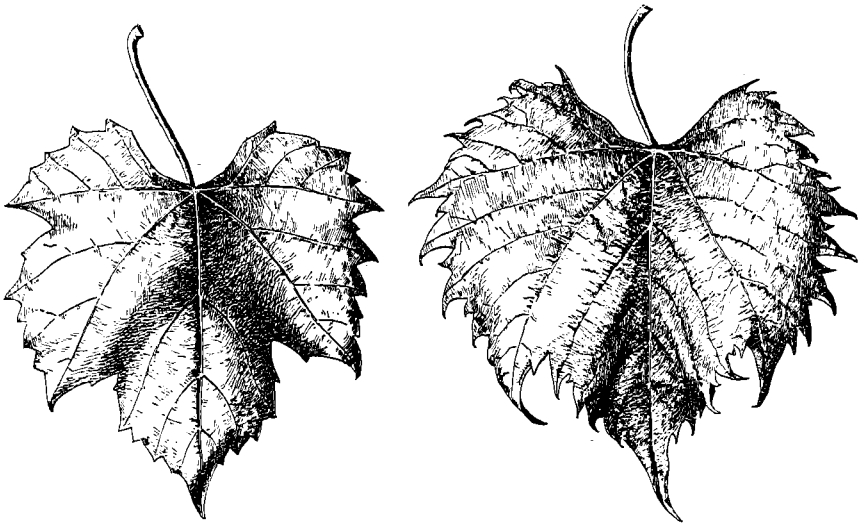

FIG. 121. GOOD PICTURES of *Vitis Doaniana* left, and *V. Longii* (*Solonis*), right, reduced from Munson in Revue de Viticulture, 1895.

Sand hills, plains, timber regions, southwestern Oklahoma, northern Texas and adjacent New Mexico. Dedicated by Munson to Judge J. Doan of Wilbarger County, northern Texas, who "for years manufactured fine wine from this species." Promising as a vineyard grape.

Panhandle grape presents very unlike forms in respect to investiture of the under surface of leaves. Sometimes these surfaces are as felted as in *V. candicans* and in other cases they become nearly glabrous. It is difficult to typify the species inasmuch as Munson does not specify a type locality and his specimens represent both phases. Originally (Wild Grapes of North America) Munson classified it with the *Vulpinæ* but later with *candicans;* the name is there a *nomen nudum*. It was once accounted a natural hybrid but Munson abandoned this explanation inasmuch as he found it in regions where neither of the supposed parents grows; or, as the case is put in Revue

de Viticulture, "Si elles constituent des hybrides, leur characters sont, en tous cas, fixés depuis des milliers d'années."

In its western limits *V. Doaniana* must be carefully distinguished from *V. arizonica*, from which it is separated according to Munson "by the much larger leaves, fruit and seeds and greater hardiness."

15. **Vitis arizonica,** Engelm. in Amer. Nat. ix, 268 (1875). CANYON GRAPE. Fig. 119.

Grayish vine, mostly small or weak, much branched, not high-climbing in native locations: young growths ashy-gray from the tomentum of the shoots (which may be slightly tinted at first) and cobwebby covering of leaves: stipules likely to be prominent, about 3 mm. long: internodes very short, and tendrils mostly soon deciduous if not finding support but often strong and persistent when the vine is planted in moister regions: diaphragm about 2 mm., sometimes nearly or quite lacking: leaves broadly cordate-ovate with triangular apex, small in native regions being 5-10 cm. long above petiole and as much or more in breadth, commonly obscurely lobed or shouldered but outline sometimes continuous, basal sinus from narrowly inverted U-shaped to broad and open, main side-ribs a single strong pair running to upper lobes and thinner pairs above, margins with rather small but sharp or mucronate uneven teeth (that are 2-4 mm. high), both surfaces more or less permanently covered with gray cottony hairs or upper surface becoming only indifferently floccose, petiole floccose: flower-clusters short, 4-6 cm., usually branched, rachis and peduncle more or less floccose: stamens in sterile flowers slender and ascending, those in fertile flowers strong and reflexed: berries globular, 10 mm. or less thick, in bunches usually not exceeding the leaves, black with little bloom, sweet and agreeable, July, August: seeds small, 4-5 mm. long and 3-4 broad, very short-beaked, rachis a thin line on keel and more or less evident over ridge and to the circular or short-oblong often obscure chalaza.

In canyons and along river banks, western Texas, New Mexico, Arizona; Mexico; reported from southeastern California and Nevada but these occurrences may be *V. californica* or *V. Girdiana*. Based on "*V. æstivalis* var.? foliis parvis," Gray, Plantæ Wrightianæ, ii, 27 (1853, in Smithsonian Contributions to Knowledge), *Wright* 919 collected at Santa Cruz, Sonora, "climbing on small trees 8 or 10 feet high." Variable in leaf margins. As commonly accepted, *V. arizonica* is an inharmonious species.

V. arizonica var. **glabra,** Munson ex Bailey, in Gray, Synopt. Fl.N. Amer. i, 426 (1897).

Plant essentially glabrous: leaves mostly larger and more or less glossy: seeds often larger. With the species and reported in southern Utah; imperfectly understood.

V. arizonica var. **Galvini,** Munson, in Rev. de Vitic. iv. 246 (1895).

Leaves larger and more cut, bright green, clusters and berries larger. Chihuahua, Mexico.

The binomial *Vitis arizonica* begins with Engelmann in American Naturalist, volume ii, 321 (1869) as a *nomen nudum*. The name must have become more or less current before formal publication, for it appears in an article in Report of Department of Agriculture for 1870, 416 in which it is stated that the grape had been "provisionally named *Vitis arizonensis*" by Dr. Engelmann; this occurrence is also a *nomen nudum*. First tenable publication was in 1875. In his Foundations of American Grape Culture, 1909, Munson states that this grape was obtained for him in the mountains thirty miles north of Phoenix, Arizona, by Dr. Turner. This explains specimens in Munson's early distribution (of 1888) named for Turner, apparently before he recognized the plant as *V. arizonica*, but he never published the name; these specimens are *V. arizonica* var. *glabra*. While Munson used the varietal name *glabra* in his Wild Grapes of North America, 1890 (*nomen*), he does not enter the variety in his Foundations nor does he allow the leaves of *V. arizonica* to be glabrous. I have three Munson sheets named by him *V. arizonica* var. *glabra*, one collected in Brewster County, Texas, another in the mountains north of Phoenix, Arizona, and the third from his vineyard at Denison, Texas. The group known to us as *Vitis arizonica* needs definite field study.

16. **Vitis cinerea,** Engelm. ex Millardet, Études sur quelques espéces de Vignes Sauvages de l'Amérique du Nord, 34-5 (1879); Engelm. in Bushberg Cat. Ed. 3, 16 (1883). GRAYBACK GRAPE. Fig. 122.

V. æstivalis var.? *cinerea*, Engelm. ex Gray, Man. Bot. North U. S. Ed. 5, Addenda of 1868, 679.

High and vigorous climber of lanky appearance, with long tendrils and elongated slender gray or ashy or whitish tomentose young tip growths (sometimes at first with a suggestion of color): wood angled or striate, gray-pubescent or -floccose, the smaller canes cinereous-pubescent till the end of the season: stipules 2-4 mm., more or less hairy: diaphragm thick, 3-5 mm.: leaves large, blade thin, broadly ovate with long triangular pointed apex, 10-20 cm. long above petiole and about equal width, mostly with shallow pointed lobe or perhaps indefinite shoulder either side above middle and the sides often not equal in this respect, basal sinus either narrow or broad, side-ribs 3 rather prominent pairs in a quartering direction, teeth small and shallow and apiculate or short-mucronate, petiole shorter than blade and pubescent or floccose, upper surface floccose at first but gradually shedding and becoming dull glabrous green, under surface with thin ashy-gray webs or strands: clusters long and many-flowered, 10-12 cm. or more, often crooked at first, with many short side cluster-branches, rachis and long petiole gray-floccose or webby: stamens in sterile flowers long and ascending, in the fertile short, reflexed and bent: berries many and small in clusters often 8-12 cm. long on long peduncle, 4-7 mm. diameter, globular, black or purple with thin bloom, hanging long (persistent), sweet when ripe, September and October or later, August in southern regions: seeds often only 1, sometimes 3, small but broad, 4-5 mm. long and nearly or quite as

broad, keeled, raphe usually filling ridge, chalaza nearly circular and not prominently sunken.

River banks and bottom lands and pond margins, Indiana, southwestern Wisconsin, Illinois, Missouri, Kansas, Arkansas, Oklahoma, eastern Texas, Louisiana, Alabama, western Georgia. The species is variable in leaf shape and also investiture; under surface of leaves may be thinly or thickly covered, but the flocculent or cobwebby appearance under a lens (the loose tomentum gathering in lines or shreds), is characteristic and reminds one of the covering in forms of *æstivalis* except that it is gray or whitish rather than ferrugineous (but the leaves themselves are of course very different from those of *æstivalis* in shape, lobing and indentation).

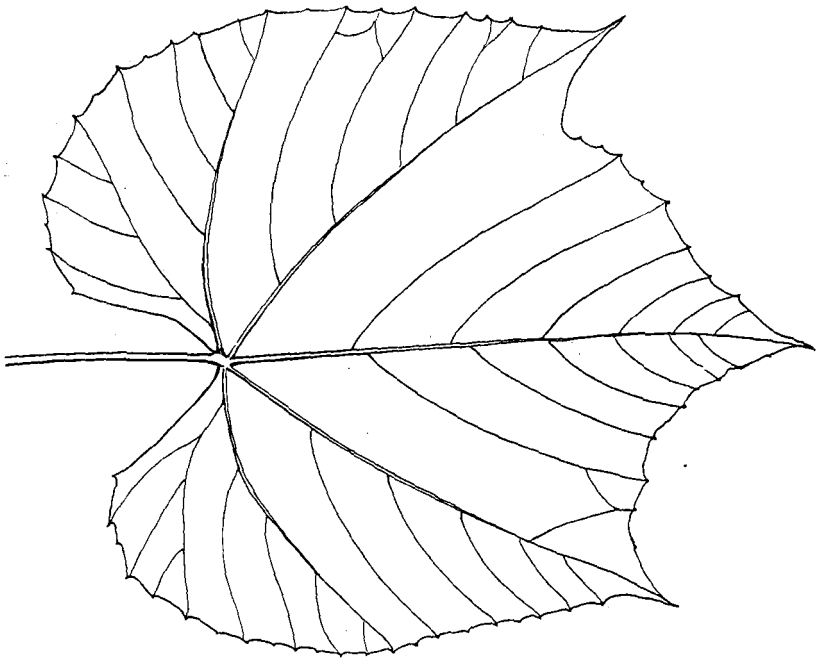

FIG. 122. THE LEAF of *Vitis cinerea* as taken in the South. (× ⅔).

V. cinerea var. **canescens,** Bailey, in Gray, Synopt. Fl. N. Amer. i, 425 (1897).

V. æstivalis var. *canescens*, Engelm. in Amer. Nat. ii, 321 (1869), without descr., spec. in Hb. Gray.

Leaves substantial, more regularly cordate-ovate and less frequently sharp-lobed and lacking the long deltoid apex and point, under surface much less floccose and prominently soft-pubescent or canescent even to maturity: clusters apparently shorter: berries larger, 8 or 9 mm. thick: seeds somewhat larger, 5-6 mm.

Southern Illinois; near St. Louis and in Boone and Jasper counties, central and southwestern Missouri; near Austin, Texas. Perhaps a distinct species; and if so, Engelmann's name may be validated as of specific rank by publication: see Planchon-DeCandolle Monographiæ Phanerogamarum, v, 343 under *V. cinerea*, and Compt. Rend. des Sci. Paris, xci, 426; also Handlist of Trees and Shrubs Grown in Arboretum, Royal Gardens Kew, pt. i, 77 (1894).

† 17. **Vitis illex,** st. nov. MANATEE GRAPE. Fig. 123.

V. cordifolia var. *sempervirens*, Munson, in Rev. de Vitic. v, 165, fig. 53 (1896), not *V. sempervirens*, Hort.

Yet insufficiently known but well distinguished from *V. cordifolia* by its bronzy-tomentose young leaves or shoots, apparently thinner diaphragm,

FIG. 123. LEAVES AND FRUIT of *Vitis illex*, lobed leaves being on ground shoots (× ½).

foliage characters, leaves persisting, smaller clusters, and peculiar seeds: stipules broad, hairy on margin, 2-3 mm. long: leaves of verdurous ground shoots or of certain extremities deeply 3-lobed with rounded sinuses enlarged at bottom, the side lobes again similarly lobed, so that the leaf may look skeleton-like as in certain manifestations of *V. æstivalis;* regular leaves not lobed, broadly cordate-ovate to triangular-ovate, about 10 cm. long above slender petiole and of equal breadth toward base, the basal sinus very broad and sometimes so flat as to present an almost truncate bottom, side-ribs about 3 strong evenly spaced pairs, coarsely sharp-toothed or notched, apex with long slender point, upper surface glabrous and bright green,

under surface glabrous except tufts in the axillæ: fruiting cluster 8-10 cm. long on slender peduncle, prominently side-branched: berries 8-10 mm., globular, ripening late: seeds medium sized and broad, 5 mm. long and nearly or quite as broad, rounded on top, beak short and abrupt, face straight-keeled, raphe standing above the ridge and prominent down the back to the small rather indistinct not sunken chalaza.

Manatee County, southwestern Florida.

18. **Vitis cordifolia,** Lam. Illustr. (Tableau Encyclopédique et Méthodique. Botanique) ii, 134 (1793); Michx. Fl. Bor.-Amer. ii, 231 (1803), independently founded. WINTER GRAPE (Michaux, in distinction from summer grape, *V. æstivalis*). Figs. 102d, 124, 125, 132.

V. pullaria, LeConte, in Proc. Acad. Nat. Sci. Phila. vi, 273 (1853); Flora, 1853, 708.

V. cordifolia var. *punctata,* Weber, in Rept. U. S. Commr. Patents for 1859, 67 (1860).

V. cordifolia var. *genuina,* Durand, in Actes Soc. Linneéne de Bordeaux, xxiv, 166 (1861).

V. vulpina var. *cordifolia,* Regel, in Act. Hort. Petrop. ii, 394 (1873).

Tall and vigorous vine reaching the tops of tallest trees and the great trunks several inches in diameter often hanging free for 50 feet or more as the old tendrils and branchlets lose hold, forming glossy canopies on forests and thickets and fences, old trunks reported to 5 feet in girth: tips slender and rapid-growing, nearly smooth or grayish- to tawny-pubescent but soon becoming glabrous: first-year canes angled or striate, internodes long or short: stipules 3-5 mm.: diaphragm mostly thick, 2-6 mm., usually 4 or 5: leaves cordate-ovate or sometimes more or less triangular in form above sinus, of a firm hard texture, prevailingly small to medium in size (as compared with *Labrusca*), blade 5-15 cm. or even more long above petiole and two-thirds to equal in width, petiole slender and sometimes nearly as long as blade from its apex, mostly unlobed but frequently shouldered or angled and sometimes with a distinct lobe on either side toward the sharp usually long-pointed apex, basal sinus mostly broad, margins variously simply but not deeply apiculate-toothed, upper surface glabrous and glossy, lower surface light clear green, glabrous with tufts in axillæ varying to puberulent and then mostly glabrescent (sometimes distinctly pubescent): clusters slender and open, 6-12 cm. long, frequently forked at base but otherwise with only very short side branches and appearing simple, narrow, elongating in fruit, peduncle slender but short, fruiting-cluster open due both to branching and to the pedicels which are 5 mm. long: flowers slender-pedicelled, stamens in sterile flowers long and ascending, in fertile flowers short, reflexed and bent: berries nearly or quite globular, small, 3-9 mm. diameter, black and only slightly if at all glaucous, persistent, sweet after frost, September and October, late August southwards: seeds medium, 5 mm. long and 3-4 broad, gradually or shortly narrowed to beak, keeled on face, ridge not sunken and raphe well marked in the groove but not distinctly elevated, chalaza circular, rather small but well marked.

Polymorphous species of wide range, northern Pennsylvania to central Florida, westward to Kansas, Oklahoma, eastern and central Texas. The original citation by Lamarck is "Virginia."

V. cordifolia var. **foetida,** Engelm. in Amer. Nat. ii, 321 (1869).

Recognized as yet apparently only from Engelmann's account: vine "often 4-6 inches in diameter, climbing the highest trees, and bearing fetidly aromatic berries"; "of the Mississippi Valley." Authentic material is insufficient for a judgment on the standing of the variety. Seeds are like those of *V. cordifolia.*

Winter grape has several foliage phases, and one must be prepared for unusual forms. Sometimes it is confused with *Ampelopsis cordata,* but that is not the fault of the grape. I know a Vitis that has the marks of *cordifolia* except that it bears somewhat rusty tips and has fulvous ribs on under surface of leaves; one might suppose it to be a hybrid with *æstivalis,* but as I have seen it from Pennsylvania, Indiana, Maryland, and two parishes in southern Louisiana I hesitate to guess.

Fortunately, specimens are preserved of the *cordifolia* of both Lamarck and Michaux. They represent different leaf phases of the species; and the main Linnæan sheet of *vulpina* is apparently still another phase (see number 27).

Pubescent forms of *V. cordifolia* are sometimes confused with *V. cinerea* although the two species differ obviously in leaf shape, indentation, twigs, and flower-clusters; the covering on under surface of leaves in *cordifolia* and *Baileyana* is a pubescence of short upstanding hairs while in *cinerea* it is araneose (unless on ribs); yet in Georgia and Alabama is an undetermined *cordifolia*-like grape with araneose under surfaces.

19. **Vitis Baileyana,** Munson, Leaflet, June 20, 1893; Rev. de Vitic. vi, 421 (1896). POSSUM GRAPE. Figs. 102e, 124, 125.

V. virginiana, Munson, in Gard. & For. iii, 475 (1890), not Poiret.

Rugged but rather slender very leafy vine with short internodes and short side branches making thereby a thick top or canopy, often climbing 50 feet or more but not as tall as *V. cordifolia,* trunk sometimes 3 inches or more in diameter: young growths thinly gray-pubescent or expanding tip leaves sometimes pinkish but mostly grayish or greenish, axes becoming glabrous at or before maturity, young canes angled or squared and then prominently striate and ridged: stipules narrow, 4-5 mm.: diaphragm 3-4 mm.: leaves mostly rather small to medium, 6-10 cm. long from apex of pubescent petiole or 15 cm. on very vigorous shoots, of similar width, cordate-ovate, basal sinus open or broad, blade often continuous in outline but sometimes with a short spreading pointed lobe on either side near top and apex then deltoid-acuminate, side-ribs several and rather closely spaced (about 1-1.5 cm.), margins with unequal but mostly small apiculate teeth or serratures, upper surface dull, glabrous or retaining slight pubescence

along veins, under surface grayish-green and usually holding pubescent hairiness along veins: flower-clusters dense due to the very short-pedicelled flowers, 5-10 or 12 cm. long, more or less shouldered, side-branches short, rachis and peduncle tomentose or webby: flowers very small, stamens in sterile flowers ascending and in the pistillate reflexed: berries small to medium, 4-7 mm. thick, closely packed in the long cluster (pedicels about 3 mm.), globular, black and glossy with little if any bloom, sweet when fully ripe, in August and September: seeds short and broad with a very short beak, 4-5 mm. long and nearly as wide, obtusely keeled on face with thin raphe which is then hardly traceable in groove over the ridge to the very small and perhaps indistinct chalaza.

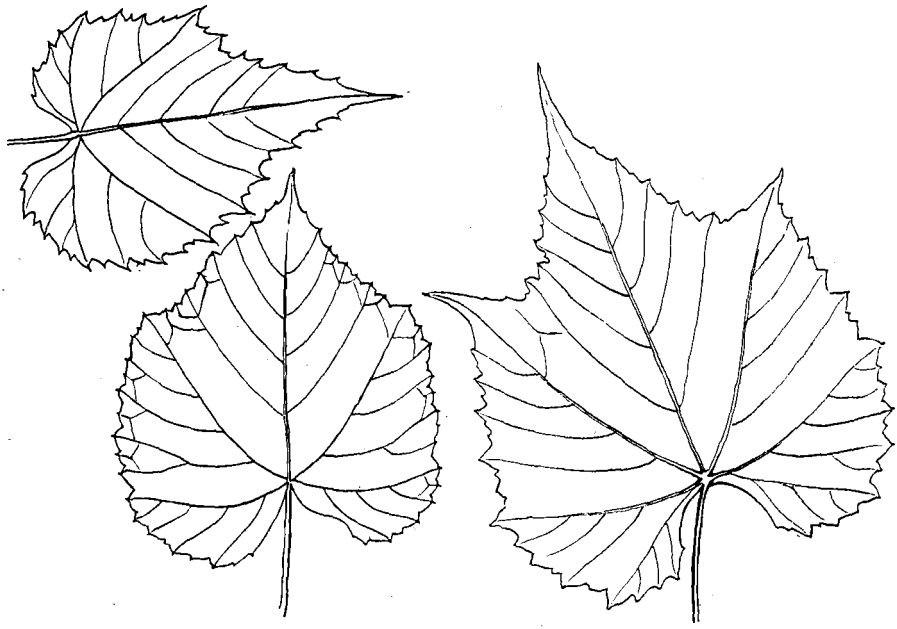

FIG. 124. TWO LEAVES of *Vitis Baileyana*, and one above of *V. cordifolia* for comparison (× ½).

Upland and mountain areas, southwestern Virginia, West Virginia, southeastern Kentucky, eastern Tennessee, western North and South Carolina, northwestern Georgia, Alabama (*Small*). Original locality Roanoke County, southwestern Virginia. Species dedicated to L. H. Bailey, who once wrote on Vitis. A similar plant is in central-southern Indiana (*Deam*).

A well marked species when once understood, with its angular young canes, dull-surfaced leaves somewhat pubescent underneath with small indentations and often with two characteristic pointed short divaricate lobes, very small nearly sessile flowers, compact fruit-clusters due to the very short pedicels, and rather distinctive seeds. Its nearest ally, so far as

identification is concerned, is apparently *V. Berlandieri*, distinguished by its cottony young growth, proportionally much broader and glossy leaves with larger teeth, longer-pedicelled and different berries, unlike seeds. By these and other tokens *V. Baileyana* is well distinguished from *V. cordifolia*, with which it is often confused because it grows in the same region.

FIG. 125. CONTRAST IN FRUIT-CLUSTERS of *Vitis cordifolia*, left, and *V. Baileyana* as seen on the herbarium sheet (× 1); note the dense cluster of *Baileyana*, right, due to the short pedicels. 1933.

20. **Vitis Berlandieri,** Planch. in Compt. Rend. des Sci. Paris, xci, 425-8 (1880); and in La Vigne Amér. 1880, 318. SPANISH GRAPE. Fig. 126.

V. æstivalis var. *monticola*, Engelm. ex Planch. in Compt. Rend. l. c. 426 (1880).

Stocky or stout vine moderately climbing or in moist favorable conditions reaching tops of trees: tips gray-cottony or -tomentose, young growth striate or angled, canes remaining more or less cinereous the first year:

internodes short to medium, 2-10 cm.: stipules small, about 3-4 mm. long: diaphragm 3-4 mm.: leaves cordate-orbicular to cordate-ovate in outline, commonly broader than long, 8-12 cm. long from apex of petiole, blade mostly with short lobes or indications of them toward apex and the apex mostly deltoid, basal sinus narrow or broad, teeth of different sizes and commonly broad or bluntish although short-apiculate, side-ribs about 3 strong spreading pairs, upper surface at first thin-hairy but becoming glabrous and dark shining green, under surface cottony when young but eventually glossy although retaining short pubescence on ribs and nerves: flower-clusters 2-8 cm. long and stout peduncle of similar length, rachis cottony, often strongly

FIG. 126. THE GRAPES of *Vitis Berlandieri*, natural size, photographed 1891.

forked, in fruit usually strongly shouldered and sometimes 15 cm. long: stamens in sterile flowers reflexed and bent: berries medium size, 4-7 mm. thick, globular, purple to black or reddish, with light or heavy bloom, on pedicels 4-5 mm. long, August: seeds variable, small to medium, largest 5 mm. long and 4 mm. broad, beak abrupt and short, keel straight and prominent on face, evident but not filling depression over ridge, chalaza small, sitting in a cavity.

Central southwestern Texas west of Brazos River; southwestern Arkansas; Mexico; along streams and on hills. The glossy leaves gray-veined underneath distinguish the species. Founded primarily on the collections of J. L. Berlandier, Swiss collector and explorer in Texas and Mexico, died 1851 in the latter country.

Definition of *Vitis Berlandieri* is not yet satisfactory. The species was founded by Planchon in Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences, Paris, 1880, on two collections of Berlandier, No. 2412 from New Mexico or Texas, a relatively smooth plant, and No. 3116 from the state Nuevo Leon, Mexico, a tomentose plant. In his De-Candolle Monograph, 1887, Planchon recognizes the unlike character of these two plants, and designates Berlandier 2412 and 3315 as *forma typica*, citing also others collections as constituting the species. It appears that Engelmann, Millardet and others confused the plant with *V. monticola*. I have seen Berlandier 2412 in the herbarium of the Academy of Natural Sciences in Philadelphia; it has suggestion of the plant we have later separated as *V. Helleri*. I have seen No. 3116 in the herbarium of the University of Wisconsin; it is probably the plant later described by Munson as *V. Blancoii* (see under No. 8). I have largely followed Munson in the interpretation of *V. Berlandieri*, as this appears to recognize a well-marked type in Texas; final diagnosis and nomenclature must await much more extensive field work.

21. **Vitis Helleri,** Small, Fl. Southeast. U. S. 754, 1334 (1903). ROUND-LEAF GRAPE.

V. cordifolia var. *Helleri*, Bailey, in Gray, Synopt. Fl. N. Amer. i, 424 (1897).

Like a round-leaved smooth scallop-toothed *Berlandieri* and with glossy foliage something like *cordifolia*: young growth lightly cottony soon becoming glabrous, angled and striate, short-jointed, new unfolding tip perhaps brownish: stipules 3-4 mm. long: diaphragm thick, about 4 mm.: leaves with a circular aspect due to breadth mostly greater (9-13 cm.) than length and either a short triangular apex or none (sometimes a leaf or two on a branch more or less pointed), sides lacking tendency to bear a shoulder or short lobe as in *V. Berlandieri*, rather thin, strong side-ribs 2-4 pairs and spreading, basal sinus mostly deep and narrow to open, margins with broad usually bluntish teeth except for the small apicula terminating each nerve, petiole shorter than blade and becoming glabrous, both surfaces at last smooth or with fine pubescence on veins underneath and perhaps thin

remains of webs, under surface at least conspicuously glossy: clusters 6-9 cm. long and perhaps longer in fruit, branched, main divisions long and narrow at least in staminate inflorescences, pedicels prominent: stamens in sterile flowers long and erect: berries 7-9 or 10 mm. thick, July: seeds rather large, broad, 5-6 mm. long and nearly as wide, glossy, beak abruptly very short, raphe little evident on the keel but conspicuous although not elevated at the ridge and to the small but prominent chalaza.

Southern Texas: Kerrville, Kerr County, *A. Arthur Heller* 1750 (type); Turtle Creek and Lacey's Ranch, Kerr County, *W. L. Bray*, 183, 163; Ottine, Gonzales County, *Tharp*; Del Rio, Val Verde County, *Tharp* 6029. This plant may have been confused with *V. Champini*, as if a smooth glossy-leaved form; and its relationship is yet to be determined (see explanation under No. 20, *V. Berlandieri*).

22. **Vitis palmata,** Vahl, Symbolæ Botanicæ, iii, 42 (1794). CAT GRAPE. Figs. 127, 128.

V. virginiana, Poiret, in Lam. Encyc. Méth. viii, 608 (1808), probably.

V. rubra, Michx. apud Planch. in DC. Monogr. Phaner. v, 354 (1887).

V. riparia var. *palmata*, Planch. in DC. Monogr. Phaner. v, 352 (1887).

V. monosperma, Michx. apud Sargent, in Proc. Amer. Philos. Soc. xxvi, 124 (1889).

V. vinifera var. *palmata*, Kuntze, Rev. Gen. i, 133 (1891).

Slender high-climbing late-blooming and late-fruiting vine, with somewhat the look of an ampelopsis, and various foliage often on one shoot: young growth very slender and herb-like, angled, conspicuously red (as are the petioles), with a very smooth look although perhaps carrying slight pubescence or flocculence at first, the tips naked or not leafy: internodes short to medium, tendrils red when young: stipules broad at base and pointed, about 3-4 mm. long: diaphragm 4-5 mm.: leaves small or not above medium, thin, ovate-acuminate, blade above petiole 7-12 cm. and nearly or equally as broad, commonly distinctly 3-lobed with long narrow points, basal sinus mostly narrowly inverted U-shaped, margins unevenly large-toothed with sharp or mucronate points and narrow middle lobe with long apex, midrib strong and running conspicuously straight to slender point of middle lobe, side-ribs a conspicuous pair for the lateral lobes, upper surface shining dark green and glabrous except on ribs, under surface pale and usually retaining pubescence on ribs and with tufts in the axillæ; leaves on certain young or ground shoots deeply 3-lobed with rounded enlarging sinuses and additional side-lobes giving the blade a skeletoned appearance: clusters large, 7-15 cm. long, usually much branched, slender rachis and peduncle mostly thinly pubescent, blooming late: stamens in sterile flowers long and slender and erect, in fertile flowers short and recurved and pistil very small: berries small, globular, 6 mm. or less thick, black or bluish-black mostly without bloom, persistent, skin thick,

pulp sweet at maturity, September, October: seed often 1 and then nearly globular, very large for size of fruit, 5-6 mm. long and nearly or quite as broad, very abruptly contracted to short beak, raphe thin but evident on the keel but obscure in ridge groove and to the depressed or mostly obscure chalaza.

Ornamental neat vine of local occurrence, southern Indiana, Illinois and Missouri to Louisiana and eastern Texas, Oklahoma, often about ponds and in sloughs. Records of outlying distribution of *V. palmata* are apparently due to confusion with deeply cut leaves on young shoots of *V. vulpina*; the very slender wholly smooth red young growths of *palmata* are usually unmistakable.

FIG. 127. VAHL SPECIMEN of *Vitis palmata*. Copenhagen. (× about 3/8).

The name of this grape has been in dispute. Vahl's description is insufficient for satisfactory diagnosis and he records it from Virginia, where the plant is unknown. Vahl knew it only as a cultivated plant in Paris: it may have been introduced by way of Virginia. Type specimens are not at the Jardin des Plantes or Museum in Paris. Vahl, however, was a Dane and the Symbolæ was published in Copenhagen. Two specimens are at the Universitetets botaniske Museum in Copenhagen, one of which (ex hort. Paris) is taken as the type and is reproduced in Fig. 127. The other is wholly similar and is apparently a co-type, being named in Liebmann's hand. These specimens are shoots with divided foliage, such as one often sees in the cat grape, and they establish the name *palmata* for this species. This is apparently the plant later named *V. virginiana* by Poiret, which was also cultivated in the Jardin des Plantes but of which no herbarium

specimens are extant in Paris: this identity is attested by a note on the Vahl specimen, and Poiret's description fits the cat grape well enough; in fact, Poiret himself suggests the relationship: "La plante que M. Vahl a décrite sous le nom de *vitis palmata*, a beaucoup de rapport avec cette espece." There was confusion about these plants, however, as is attested

FIG. 128. MICHAUX SPECIMEN of *Vitis rubra* = *V. palmata*. Paris. (× about ⅜ full size).

by Poiret's remarks preceding his account of *V. virginiana* (about *V. palmata*); probably the dimorphic foliage of the cat grape explains these discussions. It is possible there may have been two species in the Jardin at that time: note the duplicate citation of *virginiana* in Index Kewensis.

Type specimens of *V. rubra*, Michx. extant in Paris, show the less lobed and prevailing leaf form of the cat grape (Fig. 128). Michaux did not publish the species. It remained an herbarium name until taken up by Planchon.

23. **Vitis rupestris,** Scheele, in Linnaea, xxi, 591 (1848). SAND GRAPE. Fig. 129.

V. vinifera var. *rupestris*, Kuntze, Rev. Gen. i, 132 (1891).

Low bushy plant to 6 or 8 feet or less with early fruit, seldom really climbing, either ascending or prostrate, sometimes trailing over rocks and bushes, tendrils red, few and thin or even none but sometimes developing on vines planted outside its native regions, young shoots leafy to the tip: bark tardily shredding, perhaps not till second year or later: stipules large, 4-5 mm. long: diaphragm 2-3 mm.: leaves thick, reniform to reniform-ovate, blade folded upward or trough-shaped so that the light-colored under surface is exposed, 5-10 cm. long above petiole and usually considerably broader, sometimes 15-20 cm. broad, outline continuous or sometimes with indication of shoulder, base with broad and open sinus to nearly

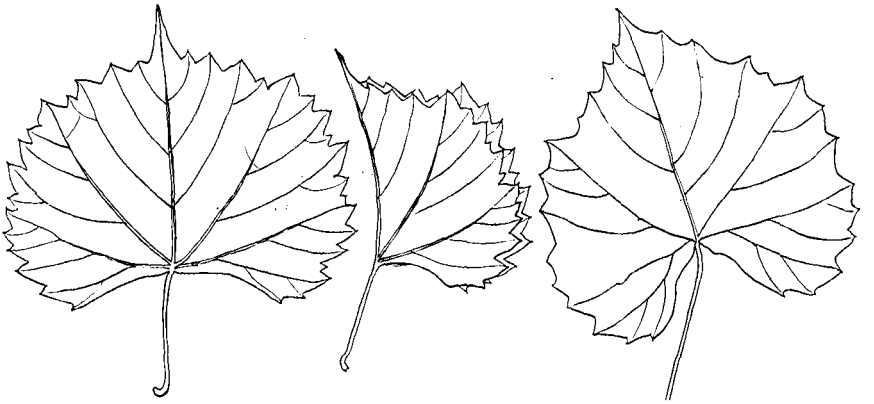

FIG. 129. REPRESENTATIVE LEAVES of *Vitis rupestris*, two left, and of *V. monticola*, the latter from Buckley's type material. (× ½).

truncate, one pair of somewhat curving side-ribs and one or two thinner pairs above, margins with few coarse apiculate teeth, apex an abrupt short point, glabrous on both surfaces, tinted light-glaucous above, petiole short, angled and glabrous; ground shoots sometimes bearing slightly lobed leaves: clusters small, 1-5 cm. long on a peduncle of equal or less length, staminate usually forked and fertile ones mostly simple or nearly so, rachis and peduncle usually somewhat floccose in anthesis: stamens in sterile flowers slender and erect, in the fertile ones usually recurved and bent: berries globular or somewhat flattened endwise, 6-12 mm. thick, black and somewhat glaucous, not very persistent, skin thin, pulp pleasant, July (or late June), August: seeds small, 4-5 mm. long and nearly as broad, abruptly very short-beaked, raphe obscure on keel but evident on ridge which is not notched and to the small little developed chalaza.

Sandy banks and hills and in ravines particularly along streams, southern Missouri and Illinois, Kentucky, western Tennessee, Arkansas, Oklahoma, eastern and central Texas to the Rio Grande; sometimes appears in vineyards when used as grafting-stock, and this may explain occurrences

reported in Pennsylvania, District of Columbia, and elsewhere. Some of the records of outlying distribution are the result of erroneous determinations, being confused with *V. vulpina*. Type station, near New Braunfels, Comal County, southeastern Texas (*Roemer*).

V. rupestris var. **dissecta,** Eggert ex Bailey, in Gray, Synopt. Fl. N. Amer. i, 422 (1897).

A state found along brooks in hills near St. Louis, Missouri (*H. Eggert*) with more ovate long-toothed leaves and strong tendency toward irregular lobing.

24. **Vitis Longii,** Prince, Treat. Vine, 184 (1830). BUSH GRAPE. Figs. 103, 121.

V. rubra var. *Solonis,* Planch. in Les Vignes Amér. 118 (1875).

V. Solonis, Hort. Berol. ex Planch. l. c. 119.

V. nuevo mexicana, Lemmon ex Munson, in Trans. Amer. Hort. Soc. iii, 132 (1885); Munson, in Wine and Fruit Grower, vii, 85 (Aug. 1885).

V. novo-mexicana, Munson, in Proc. Soc. Prom. Agr. Sci. 1887, 59; ex Foëx, Cours Complet de Vitic., Ed. 2, 876 (1888).

Stocky erect much branched short-jointed grape in its native places, little or indifferently climbing but often covering rocks and shrubs, early-fruited, with light-colored gray-green foliage, new tips short and leafy: young parts pubescent or tomentose and floccose, whitish or grayish: internodes short, bark shredding tardily, tendrils short even when planted beyond its region: stipules conspicuous but shedding early, 5-7 mm. long: diaphragm 1-3 mm.: leaves somewhat *vulpina*-like but thicker in texture, more circular and teeth more angular and less prolonged, one pair of diverging side-ribs stout and prominent and other pairs less conspicuous, blade becoming free of cotton and tomentum above but retaining slight pubescence along ribs, variously pubescent underneath until midseason or later, broadly cordate-ovate to almost circular in outline aside from the triangular point, 7-12 cm. long above petiole and commonly broader, indistinctly or shallowly lobed or often only shouldered, basal sinus inverted U-shaped and sometimes narrow, teeth on mature average leaves coarse-angular and short and not long-pointed, petiole short and pubescent or becoming glabrous: clusters short, 3-7 cm. long, usually shouldered but otherwise nearly or quite simple, rachis and very short peduncle at first floccose but becoming glabrous: flowers fragrant, stamens in staminate flowers long and stout, in the pistillate short, laterally reflexed: berries globular or nearly so, 8-12 mm. thick, black with heavy bloom, persisting, skin thin, seedy, pulp sour but becoming sweetish at full maturity, July, August: seeds medium large, 5-6 mm. long and 4-5 broad, rather abruptly short-beaked, raphe a thin line on the manifest keel but little evident over the ridge and to the small sunken chalaza.

Sandbanks, canyons and valleys, southwestern Kansas, Oklahoma, northern Texas, eastern New Mexico, southeastern Colorado.

V. Longii var. **microsperma,** Bailey, in Gray, Synopt. Fl. N. Amer. i, 423 (1897).

V. Solonis var. *microsperma,* Munson, in Rev. de Vitic. iii, 160 (1895).

Plant very vigorous: seeds much smaller. Red River, Grayson County, northeastern Texas (*Munson*).

Long's Arkansas grape or *Vitis Longii* was so named by Prince in 1830 as having been "found by Major Long on or near the Rocky Mountains." Stephen H. Long (1784-1864) was a military engineer who made important explorations to the Rocky Mountain region; Long's Peak commemorates him. The grape did not come first into viticultural and botanical notice under the name *Longii,* but was found in the botanic garden in Berlin labelled *Solonis,* which is assumed to be a mistake for *Long's*: see Engelmann in Bushberg Catalogue, third edition, 18 note (1883). Formerly this grape was assumed to be a hybrid, sometimes of intricate parentage, but it is now known to inhabit great natural areas where other species do not grow; and it has good marks of its own.

Apparently the bush grape is *Vitis acerifolia* of Rafinesque (Amer. Man. Grape Vines, 14; Med. Fl. ii, 130, with fig.). Rafinesque states that his grape came "from the Oregon mountains by the expedition of Long, cultivated in Bartram's garden." It had not produced fruits. His picture of a leaf is a good enough representation of certain leaves of *V. Longii.* As both *Longii* and *acerifolia* were published in 1830, one cannot choose between them by priority. One description is about as good as the other, but Prince had the plant in fruit. Inasmuch as the name *Longii* has been adopted for many years, it may be retained.

Small specimens of *V. Longii* without note of habit or tip ends or indication of tendril character are difficult to distinguish from fragments of *V. vulpina.*

25. **Vitis monticola,** Buckley, in Rept. U. S. Commr. Patents for 1861, 485 (1862); Proc. Acad. Nat. Sci. Phila. for 1861, 450 (1862) and for 1870, 136. SWEET MOUNTAIN GRAPE. Figs. 129, 130.

V. æstivalis var. *monticola,* Engelm. in Amer. Nat. ii, 321 (1869), as to name.

V. Foexeana, Planch. in DC. Monogr. Phaner. v, 616 (1887).

V. texana, Munson, in Proc. Soc. Prom. Agr. Sci. 1887, 59; ex Viala, Une Mission Viticole, 66 (1889).

V. montana, Buckley ex Foëx, in Cours Complet de Vitic. Ed. 2, 877 (1888).

Rather slender small-leaved climber, to 20 or 30 feet: young growth gray- or white-tomentose or floccose but becoming glabrous and canes eventually terete: internodes mostly short or at least not elongated:

stipules small, 3-4 mm. long: diaphragm 2-3 mm.: leaves becoming glabrous and glossy, cordate-ovate to deltoid-ovate, 5-10 cm. long above petiole and usually somewhat broader than long, outline continuous or with only indication of shoulders (except on certain ground shoots when the leaf may be 3-lobed), basal sinus from almost oblique-truncate to commonly inverted U-shaped, side-ribs 3 or 4 evenly spaced pairs, teeth broad-angled and short ending in sharp or bluntish mucro or apex, very light bright green above and soon shining underneath even though a little cotton may remain on veins: flower-clusters short, 4-7 cm. long, forked, rachis and short peduncle glabrous and only indifferently floccose: stamens in sterile flowers

FIG. 130. THE SHORT COMPACT CLUSTERS of *Vitis monticola*, photographed 1891; natural size.

short and erect, in fertile flowers also short but recurved: berries globular or nearly so, 6-12 mm. thick, black or rarely red or white or pinkish, roughish, bloom thin, seedy, sweet, August: seeds large, 5-7 mm. long and nearly as broad, mostly with short and abrupt beak, raphe obscure on keel but becoming evident in shallow groove at ridge and on the back, chalaza sunken and either prominent or little developed.

Limestone hills and ridges in central southwestern Texas, an abundant and characteristic grape of the region. Type station, hills near Austin, Texas.

Because of the smallish broad glossy leaves with squared notches the foliage might readily be mistaken for that of *V. rotundifolia*, but the more prolonged apex distinguishes it, and of course it does not bear the simple tendrils or tight lenticellate bark of that species or the woody center in the canes without diaphragms.

Apparently Buckley first called this grape *montana* as evidenced in his hand on the label of the type specimen in the National Herbarium, and this name appears in French literature; it was published by him, however, as *V. monticola*.

26. **Vitis Treleasei,** Munson ex Bailey, in Gray, Synopt. Fl. N. Amer. i, 423 (1897). GULCH GRAPE.

More or less shrubby in its native places with short tendrils that fall the first year if not finding attachment, but becoming a considerable vine with developed tendrils when grown in moister climates: young parts glabrous: internodes short: stipules small, 2-3 mm. long: diaphragm 2-4 mm.: leaves large, very broad-ovate to nearly reniform in outline except the triangular apex (short as compared with *V. vulpina*), blade 9-12 cm. above petiole and mostly somewhat broader, indistinctly 3-lobed, basal sinus broad and open, margin unequally notch-toothed but not bearing prolonged or jagged teeth, 3 or 4 pairs of prominent quartering side-ribs, shining on both surfaces except for the tufts in axillæ underneath: clusters small, 5 or 6 cm. or more long or 8-12 cm. in fruit, glabrous, somewhat branched: stamens in staminate flowers slender and ascending, in the pistillate recurved: berries globular, 8 mm. or less thick, black with thin bloom, skin thin, pulp juicy and sweet, September: seeds 6 mm. long and about 4 broad, tapering to beak, raphe only a thin line on keel, scarcely evident in groove over ridge to the elliptic sunken chalaza.

Canyons, Brewster County, southwestern Texas, New Mexico, Arizona. Dedicated by Munson "to my friend, Doctor Wm. Trelease." First obtained by Munson from Bradshaw Mountains, Arizona, in 1887.

27. **Vitis vulpina,** Linn. Sp. Pl. 203 (1753). FROST GRAPE. Figs. 102c, 104, 107, 131, 132.

V. riparia, Michx. Fl. Bor.-Amer. ii, 231 (1803).

V. incisa, Jacq. Hort. Schoenbr. iv, 14, t. 427 (1804).

V. cordifolia var. *vulpina*, Eaton, Man. Bot. North. & Middle States, 497 (1818).

V. cordifolia var. *riparia*, Gray, Man. Bot. North. U. S. Ed. 5, 113 (1867).

V. vulpina var. *riparia*, Regel, in Act. Hort. Petrop. ii, 395 (1873).

V. vinifera var. *vulpina*, Kuntze, Rev. Gen. i, 132 (1891).

V. boulderensis, Daniels, in Univ. Mo. Studies, Sci. Ser. ii, no. 2, 159 (1911), specimen Univ. Mo.

Vine vigorous and moderately high-climbing, reaching into medium tall trees and covering bushes and fences: young growth glabrous, or if somewhat pubescent then soon becoming glabrous, canes terete and finely if at all striate: internodes medium to short: stipules 5-8 mm.: diaphragm very thin, 1 (or less)-2 mm. separating a large pith: leaves medium size or above, blade 8-18 cm. long from petiole and mostly somewhat less in breadth, thin or

at least not coriaceous, cordate-ovate and usually with a long sharp apex, outline showing mostly a short lobe on either shoulder with open not expanded-rounded sinus, basal sinus prevailingly broadly inverted U-shaped which is a characteristic feature, each margin cut into 12-20 deep sharp upward-pointing teeth 1-2 cm. long and a few smaller ones between, upper surface bright green and glabrous or becoming so except along ribs under a lens, under surface lighter green and usually retaining thin pubescence on ribs and veins and tufts in axillæ, petiole shorter than mature blade and glabrous or becoming so; leaves on long ground shoots often deeply 3-

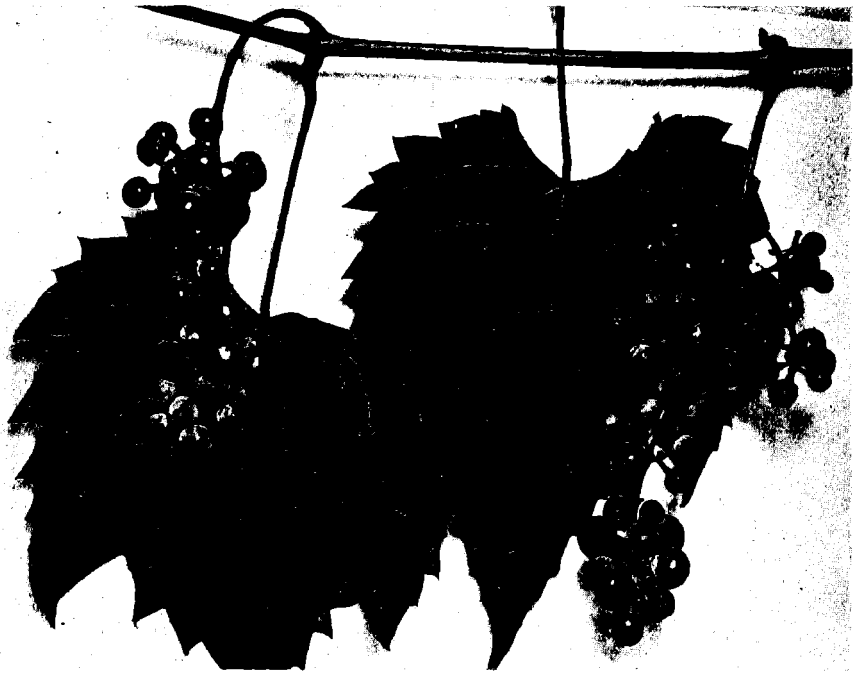

FIG. 131. GOOD EXAMPLE of *Vitis vulpina* as seen in central New York (× 5/8). 1933.

lobed and teeth long and narrow (one must be careful not to confuse them with those of *V. palmata*): clusters small to medium, the sterile ones 4-7 cm. long not including the shorter peduncle, very floriferous and fragrant, commonly prominently shouldered and branched, fertile ones shorter but becoming 6-12 cm. long in fruit: stamens slender and ascending in sterile flowers, reflexed and laterally curved in fertile flowers: berries globular, small to medium, 6-12 mm. thick, black with heavy bloom, persistent, sour until fully ripe and then mostly mild and often agreeable, skin thin: seeds medium to large, about 6 mm. long, 4-5 mm. broad, short-beaked, keeled on face with raphe obscure but evident at grooved ridge, chalaza well formed but not large, mostly narrow or elliptic.

Most widely dispersed of North American Vites, along woodsides, in fields, on roadsides, umbrageous on trees along river banks, New Bruns-

wick and Quebec to Manitoba and Montana, south to Tennessee, northern Texas, Colorado, and in much of the country (in suitable localities) within these great boundaries. Cited by Linnæus "in Virginia." Variable in pubescence.

V. vulpina var. **syrticola,** Fernald & Wiegand, in Rhodora, xxv, 212 (1923). DUNE GRAPE.

Leaves even when full grown soft-pilose underneath to the finger, as also the petioles.

Sand dunes southeastern shore of Lake Ontario, New York, and on southern shore of Lake Michigan in Michigan and Indiana; probably in similar intermediate places and perhaps of still wider distribution. I have seen it on dunes in southwestern Michigan with canes buried in sand.

V. vulpina var. **præcox,** Bailey, in Gray, Synopt. Fl. N. Amer. i, 422, (1897). JUNE GRAPE. Fig. 102g.

V. riparia var. *præcox,* Engelm. ex Bailey, in Amer. Gard. xiv, 353 (1893).

Flower-clusters small, 6 cm. or less long, very early (April): berries many and small, 6 or 7 mm. thick or less, on short pedicels in close clusters, with bloom, sweet, ripe in June: seeds small, sometimes nearly circular in outline aside from the very short abrupt beak, about 4 mm. long, raphe little evident on the keel and in the groove, chalaza sunken, small and little developed, perhaps "blind."

Vicinity of St. Louis, Missouri, on both sides the Mississippi River. Perhaps a separate species. Early-fruiting forms of *V. vulpina* are not understood.

This species, *Vitis vulpina,* presents many aspects, and it is rather surprising that only two botanical varieties have been described. Probably more than a single species is involved.

In cultivation *Vitis vulpina* is represented by a good number of vineyard grapes although now little planted, of which Clinton is best known; this variety has been supposed to have Labrusca parentage. Vulpina, as well as rupestris, is extensively employed in Europe as phylloxera-resistant stock on which to graft the wine grape.

Frost grape is often confused with *V. cordifolia* but the very thin diaphragm should distinguish it when flower-clusters and fruits are not available, also the dull rather than glossy leaves, sides of leaf not gradually narrowing to apex in regular cordate outlines, great coarse pointed teeth, very different venation, and the broad-bottomed petiolar sinus with nearly parallel sides in most cases; if stipules are present they should be 5-8 mm. long on *vulpina* and about one-half of that length on *cordifolia;* moreover, the growing tips are quite unlike, in *cordifolia* being long and slender and lanky with few and small leaves, in *vulpina* leaf-bearing and not greatly projecting. Of course, the fruit-clusters, berries and seeds are different

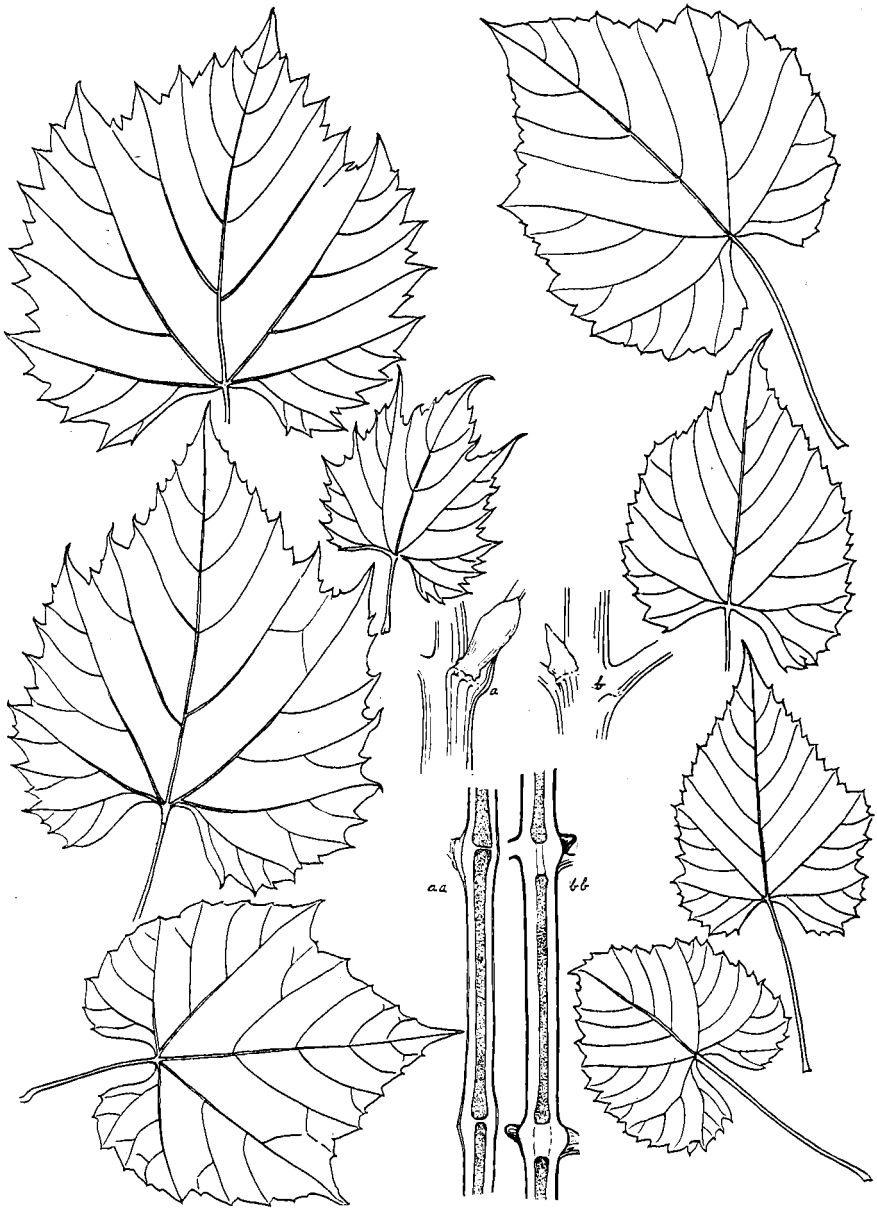

FIG. 132. CONTRASTS OF FROST GRAPE AND WINTER GRAPE, *Vitis vulpina* (left) and *V. cordifolia* (right), showing various leaf forms (× about ⅛); stipules at *a* and *b* (× about 2); diaphragms at *aa* and *bb* (× ⅛).

enough. Even with the wide variation in foliage of both species, one soon comes to recognize at a glance the leaves of each by shape, texture, indentation, color of under surfaces. Cane cuttings of *vulpina* grow readily but those of *cordifolia* with difficulty.

The name *vulpina* has had a shifting history, and perhaps the end is not yet. Michaux did not take it up. William Bartram the following year (1804) admits "Vitis vulpina of Bartram" and describes the grape we know as *V. Labrusca*; "*Vit. vulpina* of Linnæus and Walter" he makes a synonym of *V. taurina* of Bartram and describes the muscadine, but the *taurina* of Walter is clearly a different plant as we noted on page 152. Torrey and Gray, 1838, applied *vulpina* to the muscadine and made *rotundifolia* of Michaux a synonym, and plants so named are still in the herbaria. This practice was followed by Gray in the Manual; in the sixth edition, by Watson and Coulter, 1890, *rotundifolia* was restored for the muscadines and *vulpina* was relegated in a dubious synonymy.

Planchon, 1887, definitely identified *V. vulpina* of Linnæus with the river-bank grape, *V. riparia*, Michx., although he disregarded priority and did not adopt the Linnæan binomial. Britton examined the Linnæan specimens and pronounced them *V. riparia*, and Bailey thereupon followed in 1893 by making the frost grape *V. vulpina* with *V. riparia* as a synonym (American Garden, xiv, 353; see also Munson, Foundations, 94 note); this disposition was adopted in Gray's Synoptical Flora, 1897, and the name *vulpina* has been so employed until the present.

Subsequent to the preparation of Vitis for the Synoptical Flora I made examination of the Linnæan material in London and came to a different conclusion: "In the above monograph I therefore used the older name (*V. vulpina*). Since that time, however, I have myself examined Linnæus' specimens in London, and find that he had specimens of two species under the name of vulpina. On one sheet are two leaves, one marked *V. vinifera* and the other *V. vulpina*, both in Linnæus' hand. The former is the wine-grape (*V. vinifera*), and the latter is the river-bank grape (*V. riparia*). Another herbarium sheet, however, has a large flowering specimen, labelled, in Linnæus' hand, *V. vulpina*, and this is the frost-grape (*V. cordifolia*). It would have been better to have taken this latter specimen as Linnæus' type, and to have made the name vulpina supplant cordifolia; but since the other disposition has been made of the case, I shall not make the change" (Sketch of the Evolution of our Native Fruits, 103). I took photographs of the specimens, which I have kept. To make sure that there had been no confusion in the old photographs I have now had a new one taken of the Linnæan sheet, through the courtesy of Mr. S. Savage of the Linnean Society, who has kindly supplied notes: my opinion still holds that the specimen represents the winter grape (*V. cordifolia*) although a new examination of the specimen itself might afford additional clues. The conflict

is between frost grape (known now as *vulpina*) and winter grape (*cordifolia*).

The Linnæan sheet identified as *cordifolia* is inscribed by Linnæus with the name *vulpina* and the numeral 4 that refers to the entry in Species Plantarum. Rules of nomenclature adopted since the foregoing publications require, on the face of the record, that *vulpina* supplant *cordifolia*, in which case *riparia* comes up for the plant now known as *vulpina* or frost grape; the net gain would be confusion. But the case is not as simple as this.

As one looks at the Linnæan account in Species Plantarum one is struck by the fact that *Vitis vulpina* is not described, but is attended with the phrase "foliis cordatis dentato-serratis utrinque nudis"; then is cited "Vitis vulpina dicta virginiana nigra" from Plukenet, Almagestum, 1696; apparently Linnæus took the name *vulpina* from Plukenet. The Latin line precludes *V. Labrusca*, *æstivalis*, and its relatives, and it leaves only the frost grape and winter grape and the muscadine among Virginian species to qualify for the name. Linnæus cites no collector; yet the sheet bears the letter K which means Kalm, who collected in Canada, New York, New Jersey and Pennsylvania, whereas Linnæus ascribes *vulpina* to Virginia (and he would hardly have used the term "Virginia" as broady as to include New Jersey and Pennsylvania), and also H. U. which means the garden or hortus at Upsala. The word *fox* (*vulpina*) does not aid us in identifying the Plukenet grape for at that time it may have been applied to more than one species and not alone to *V. Labrusca* as at present as, indeed, is done by Plunkenet himself; in fact, the muscadine (*V. rotundifolia*) was once known as fox grape.

The Linnæan sheet bears two specimens, the lower one of three leaves apparently from the wild and collected by Kalm, the upper one of three leaves and two flower-clusters being grown at Upsala from Kalm seeds. The Linnæan sheet of *Vitis Labrusca* is also marked with a K, showing that Peter Kalm collected it; and in this case, as we have seen, the species is supported by the picture (Fig. 98) in Plukenet, but we have no cited figure back of *V. vulpina*.

It is apparent that Linnæus meant to designate two American grapes, one species (*Labrusca*) with tomentose leaves, and the other (*vulpina*) with naked leaves. We have noted (page 186) that his *Labrusca* apparently included *æstivalis*, and his *vulpina* is undoubtedly also to be considered an aggregate species and one therefore has considerable latitude in interpretation of it. If there is extant an authentic Plukenet specimen of his "Virginiana nigra" it might either change the application of *V. vulpina* or eliminate it as a *nomen confusum*.

The frost grape, *Vitis vulpina*, is a potent phylum, apparently giving much of its character to hybrids. It has been extensively employed in artificial hybridization for viticultural purposes, and more recently two assumed spontaneous hybrids have been separately described:

Vitis Slavinii, Rehder, in Journ. Arn. Arb. iii, 43 (1922), was found on banks of the Genesee River, Seneca Park, Rochester, New York, by B. H. Slavin and R. E. Horsey of the Rochester Parks, growing near *V. argentifolia* and *V. vulpina* and partaking of the characters of both species: from the former it is distinguished "by the greenish or grayish green, not whitish under side of the leaves, their coarser more prominent serration and their usually smaller size"; from *V. vulpina* in the partly deeply lobed leaves with rounded sinuses, the shorter much broader teeth and in the more or less pubescent and somewhat grayish green under side of the leaves and the narrower and slenderer fruiting panicle."

Vitis Andersonii, Rehder, l.c. 44, was raised by Mr. William Anderson, gardener to Mrs. Bayard Thayer at Lancaster, Massachusetts, from seed of *V. Kaempferi* (*Coignetiæ*) var. *glabrescens* (a Japanese species) "apparently fertilized by a nearby *V. vulpina.*" From the seed parent it is distinguished "by the smaller more deeply 3-lobed leaves, the coarser serration with triangular, acute or short-acuminate teeth and by the very slight or entirely absent floccose tomentum on the under side of mature leaves"; from *V. vulpina* it is separated "chiefly in the usually larger less deeply 3-lobed leaves, in their narrower basal sinus its sides diverging at an acute or right angle, in the broader and shorter scarcely acuminate teeth and in the more pubescent under side."

28. **Vitis novæ-angliæ,** Fernald, in Rhodora, xix, 146 (1917). PILGRIM GRAPE.

Vigorous climber, presenting certain of the marks of *V. Labrusca* and *V. vulpina*: young parts more or less reddish- or rusty-tomentose: stipules about 4 mm. long, pointed: diaphragm 1½-2 mm.: tendrils (or clusters) frequently continuous, 3 or more in succession: leaves mostly more circular than in *V. vulpina* although perhaps with deltoid apex, only obscurely 3-lobed, basal sinus narrower for the most part and sometimes closed or sides overlapping, prominent side-ribs one strong ascending pair and 2 or 3 lesser ones, teeth broad-deltoid and hardly prolonged, glabrous above or becoming so except slight pubescence on main nerves, hairy-pubescent along veins underneath and perhaps somewhat cobwebby, petiole lightly pubescent: clusters 6-10 cm. long in fruit, often shouldered: berries large for the group, globular, 12-17 mm. thick, black-purple and glaucous, persisting, sharp acid in flavor, September: seeds well developed, often 4, large, 6-8 mm. long and 4-5 mm. broad, prominently beaked, raphe a thin line on keel but disappearing or much sunken in notch at ridge and on the back, chalaza not distinctly developed and sometimes obscure.

Thickets, largely alluvial, Penobscot Valley, southern Maine, New Hampshire, to Connecticut Valley in Massachusetts and Connecticut, also Barnstable County (Cape Cod), Massachusetts; Rhode Island. Type locality, Orono, Maine.

This is the grape described in Gray's Synoptical Flora as a hybrid between *V. vulpina* and *V. Labrusca*, "being known by the tomentose young shoots and unfolding leaves, and the darker foliage which is marked with rusty tomentum along the veins of the less jagged leaves." It resembles a more or less pubescent dark-leaved mostly small-toothed *vulpina* with

large berries and usually continuous tendrils. In some occurrences it looks like an intermediate and in others not so. I have taken a plant in southern Vermont between stands of *vulpina* and *Labrusca,* much like *novæ-angliæ* but with leaves showing large teeth like the former species. Fernald finds the hybridity assumption unsatisfactory to account for *V. novæ-angliæ* "for the very practical reason that the intermediate vine occurs in great profusion as a river-thicket vine . . . where no plants of either of the supposed parent have ever been detected"; and again "Even though it may have been of hybrid origin in the long-distant past it has now become a thoroughly fixed and constant vine through a considerable area and demands the same recognition that is given other species of similarly intermediate characters but distinct ranges, such for instance as *V. Treleasei* Munson." It occurs in northern New Hampshire, where no other Vitis is recorded (Arthur Stanley Pease, Vascular Flora of Coös County, New Hampshire, 1924). With Fernald's conclusion I agree for purposes of identification, until the subject is better understood. Perhaps some of the occurrences are direct hybrids and others represent a stabilized self-going phylogeny; that is, there may be two groups of plants under consideration.

29. **Vitis rotundifolia,** Michx. Fl. Bor.-Amer. ii, 231 (1803). MUSCADINE GRAPE. Figs. 102h, 104, 106.

V. muscadina, Raf. Amer. Man. Grape Vines, 16 (1830).

V. vulpina var. *rotundifolia,* Regel, in Act. Hort. Petrop. ii, 394 (1873).

V. vinifera var. *rotundifolia,* Kuntze, Rev. Gen. i, 132 (1891).

Muscadinia rotundifolia, Small, Fl. Southeast. U. S. 757, 1335 (1903).

Great vigorous vine climbing to 100 feet over bushes and trees, with hard lenticellate striate glabrous wood, hard continuous pith, tight non-shredding bark, intermittent simple tendrils: young shoots practically glabrous although the unfolding leaves may be floccose-tomentose: stipules very small, 1-2 mm. long: leaves small, hard, glossy both surfaces, triangular-ovate to nearly circular except the terminal prong or prolonged narrow apex, 6-12 cm. long above petiole and of equal or greater breadth, sinus open or base of blade sometimes nearly truncate, only seldom indifferently lobed in upper part and outline usually irregularly continuous, unevenly coarsely notched or toothed, midrib straight to the apex and bearing 1-3 rather prominent veins from either side, upper surface glabrous except perhaps thinly minutely strigose on the nerves, under surface much reticulated and minutely floccose along ribs and hairy-tufted in axillæ, petiole slender and about equalling blade and usually retaining slight pubescence or floccosity: clusters short and often bearing a tendril-branch, 2-4 cm. long and slender-peduncled, branched: stamens in sterile flowers prominent and ascending, in fertile flowers short, reflexed and bent: berries few in a more or less globular cluster, each falling separately, globular, large, 12-25 mm. thick, surface rough, without bloom, dull black

varying to bronzy and in the Scuppernong variety to silvery amber-green, skin very thick, flavor musky but many vineyard varieties of excellence, ripe in summer and early autumn: seeds large, oblong with nearly parallel sides suddenly tapering to very short beak, 7-8 mm. long and 4-5 broad, keel prominent and straight with raphe showing as very thin line and continuing in groove over the ridge to the small narrow depressed chalaza with more or less evident corrugations or furrows extending to the sides.

Stream banks, high bottoms, woodlands and thickets from southern Delaware to eastern Kentucky and Tennessee to central Florida, west to Missouri, Kansas, Arkansas and eastern Texas.

The muscadine was once supposed to be the grape intended by Linnæus as *V. vulpina,* but we trust that much-abused name is now properly even if not satisfactorily placed. Michaux's diagnosis of *V. rotundifolia* is characteristic of the muscadine even though brief, and this is fortified by his entry "*Muscadin grape* vulgo audit"; he gives the range as "a Virginia ad Floridam." Two Michaux sheets are in Paris and are characteristic of the muscadine. Persons desiring to learn the vineyard value of the muscadines should consult George C. Husmann and Charles Dearing in Bureau of Plant Industry Bulletin number 273 (1913), and in United States Farmers' Bulletin number 709 (1916); and on the question of self-sterility in the muscadine varieties, note Reimer and Detjen in Bulletin number 209 of the North Carolina Experiment Station (1910).

30. **Vitis Munsoniana,** Simpson ex Munson, in Proc. Soc. Prom. Agr. Sci., 59 (1887); Viala, Une Mission Viticole, 165 (1889); Munson, in Rev. de Vitic. vi, 426-7 (1896), descr. LITTLE MUSCADINE GRAPE. Figs. 102i, 107.

Muscadinia Munsoniana, Small, Fl. Southeast. U. S. 757, 1335 (1903).

Lesser slenderer vine than *V. rotundifolia,* mostly on the ground or over bushes, brush and fences, side branches drooping, more evergreen, and nearly continuously blooming: leaves smaller, 8 cm. or less long and for the most part rounder but on vigorous growths sometimes cordate-ovate-pointed, clusters usually longer and often more branched: berries decidedly smaller, 8 mm. or less thick and more numerous (usually 15-30) in a cluster, shining black, without bloom but punctate, somewhat persistent, skin thin, sourish and lacking musky flavor, August and later: seeds much smaller than in *V. rotundifolia* and of different shape and appearance the sides not being so prominently parallel and the corrugations on the back not so pronounced, chalaza more marked and upstanding, 4-5 mm. long and 3-4 broad, beak very short, raphe evident on keel but not apparent in ridge groove or to the circular or oval mostly prominent not sunken chalza.

Florida, reported also from southern Georgia and supposed to grow farther north: "rarely found north of Central Florida, but in Southern Florida it is by far the most abundant species. It grows equally well in various locations and soils in South Florida from near streams to the poorest

pine soils, though chiefly found in rich woods," Munson, Foundations, quoting Simpson; "hammocks, nearly throughout Fla. (Ga. W. I.)," Small, Shrubs of Florida. Chapman referred to *V. rotundifolia* (*vulpina*) "a form with smaller leaves and berries, the latter very austere, sometimes called the mustang grape," supposed by Munson to mean *V. Munsoniana* but the true mustang is *V. candicans* which does not come within Chapman's territory, being represented in Florida by *V. Shuttleworthii*.

Separation of this species began with T. V. Munson before the American Pomological Society in 1885 (pub. 1886), in a tabulation of "species of American grapes" in which is the entry "Vitis Floridana (Raf.)—Florida Grape, first noticed in 1830 by Rafinesque. Recently re-discovered in S. Fla. by Mr. J. H. Simpson, and identified by myself." This Munson paper appeared in a reprint, Lansing, Michigan, in 1886, in which the item was changed to read, "Vitis Munsoniana. Recently identified by myself from specimens found in S. Fla. by Mr. J. H. Simpson, amateur botanist of Manatee, Fla., and by him named for me"; this paper has been cited as authority for the species. As *V. Munsoniana* the plant also appears in Munson's Wild Grapes of North America, 1890. In these cases the specific name is botanically a *nomen nudum*.

FREE BINOMIALS

Nomina nuda et dubiosa

Names without diagnosis or of such uncertainty as not to be cited confidently in regular synonymy.

Rafinesque names are accompanied by two page numbers, the first one meaning American Manual of the Grape Vines, the second number referring to Medical Flora, volume ii, both published in 1830 (see page 164).

Bartram names are paged from the Medical Repository, second hexade, volume i, 1804 (see page 153).

amara, Raf. 16, 132.
americana, Bartram, 21, 23.
angulata, Raf. 17, 133 fig.
araneosa, LeConte, in Proc. Acad. Nat. Sci. Phila. vi, 272 (1853); Flora, 1853, 708. See page 154.
bicolor, LeConte, in Proc. Acad. Nat. Sci. Phila. vi, 272 (1853); Flora, 1853, 708.
bifida, Raf. 12, 128.
blanda, Sweet, Hort. Brit. Ed. 1, 73 (1826).
blanda, Raf. 12, 128 fig.
Blanda, *Blandi*, Prince, Treat. Vine, 177 (1830).
bracteata, Raf. 9, 125; LeConte in Proc. Acad. Nat. Sci. Phila. vi, 271, 272 (1853).
callosa, Raf. 9, 125.
campestris, Fraser Cat. 1813, no. 88.
canina, Raf. 11, 127.
ciliata, Raf. 13, 129 fig.
columbina, Raf. 15, 131.
concolor, Raf. 14, 130.
denticulata, Raf. Ann. Nat. 11.
digitata, Raf. 9, 125.

dimidiata, Raf. 13, 129.
diversifolia, Prince, Treat. Vine, 183 (1930).
ferruginea, Raf. 12, 128.
ficifolia, Bunge, in Mém. Sav. Etr. Pétersb. ii, 86 (1835).
floridana, Raf. 17, 133 [209, 240].
fulva, Raf. 8, 124.
glareosa, Raf. 10, 126.
hyemalis, Raf. 9, 125.
illinoensis, Prince, Treat. Vine, 185 (1830).
integrifolia, Raf. 18, 134.
intermedia, Muhl. Cat. 26 (1878).
Labrusca var. *blanda*, G. Don, Gen. Syst. Gard. & Bot. i, 711 (1831).
Labrusca var. *ficifolia*, Regel, in Act. Hort. Petrop. ii, 396 (1873).
Labrusca var. *labruscoides*, Eaton, Man. Bot. North. and Middle States, Ed. 2, 496 (1818).
labruscoides, Muhl. Cat. 26 (1878); Muhl. & Raf. Med. Fl. ii, 127; Mg. & Raf. Amer. Man. Grape Vines, 11.
laciniosa, Marsh. Arb. Amer. 166 (1785).
latifolia, Raf. 10, 126.
longifolia, Raf. 13, 129.
luteola, Raf. 11, 127.
missouriensis, Prince, Treat. Vine, 184 (1830).
multiloba, Raf. 9, 125.
obliqua, Raf. 12, 128.
obovata, Raf. 19, 135.
occidentalis, Bartram, 21, 23.
odoratissima, Donn, Hort. Cantabr. Ed. 6, 62 (1811): probably *V. vulpina*.
peltata, Raf. 17, 133.
poiretia, Raf. 18, 134.
populifolia, Raf. 15, 131.
populifolia, Lindh. ex Gray, in Boston Journ. Nat. Hist. vi, 165 (1850): *rupestris*.
prolifera, Raf. 18, 134.
rugosa, Raf. 11, 127.
saxatilis, Raf. 8, 124.
serotina, Bartram, 22.
serotina, Raf. 10, 126.
Sieboldii, Hort. ex C. Koch, Dendrol. i, 549 (1869).
sylvestris, Bartram, 21, 23.
taurina, Walt. Fl. Carol. 242 (1788).
taurina, Bartram, 22: *V. rotundifolia*?
tenuifolia, LeConte, in Proc. Acad. Nat. Sci. Phila. vi, 271 (1853); Flora, 1853, 707.
ursina, Raf. 8, 124.
verrucosa, Raf. 17, 133: *V. rotundifolia*?
vinifera americana, Marsh. Arb. Amer. 165 (1785).
vulgaris, Bartram, ex Dippel Handb. Laubholz. ii, 545 (1892): error.

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of Latin Vitis names in the phytographic text. *Nomina nuda* may be found in the special list, pages 240, 241.