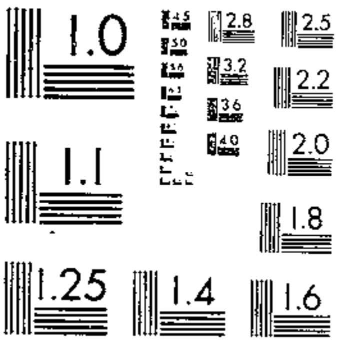
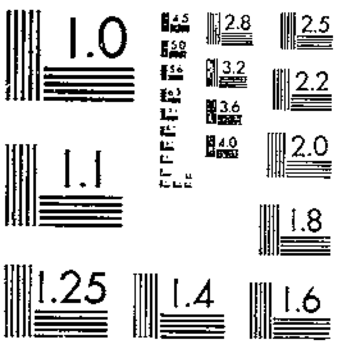
START



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

TECHNICAL BULLETIN No. 146 FEBRUARY, 1930

UNITED STATES DEPARTMENT OF AGRICULTURE
WASHINGTON, D. C.

TESTING PHYLLOXERA-RESISTANT GRAPE STOCKS IN THE VINIFERA REGIONS OF THE UNITED STATES

By GEORGE C. HUSMANN, *Pomologist in Charge of Grape Investigations, Office of Horticultural Crops and Diseases, Bureau of Plant Industry*

CONTENTS

	Page
Introduction	1
Phylloxera in California and in Europe	3
Early attempts at reconstruction of vineyards	3
Factors in resistance	5
Nature of phylloxera injury and inherent character of the vines	5
Adaptation to soil, climate, and other conditions	6
Foreign determinations as to resistance inapplicable in America	7
Cooperative experiment vineyards	10
General plan of plantings	10
Chico varietal vineyard	10
Colfax experiment vineyard	11
Elk Grove experiment vineyard	11
Fresno experiment vineyard	12
Cooperative experiment vineyards—Contd.	
Geyserville experiment vineyard	12
Guasti experiment vineyard	12
Livermore experiment vineyard	13
Lodi experiment vineyard	13
Mountain View experiment vineyard	14
Oakville experiment vineyard	11
Sonoma experiment vineyard	14
Stockton experiment vineyard	15
Data concerning the experiment vineyards	15
Growth ratings of phylloxera-resistant stocks	17
Value and use of hybrids	25
Direct producers originated in Europe and in the United States	27
Summary and conclusions	52

INTRODUCTION

During the vintage seasons of 1902 and 1903 the United States Department of Agriculture undertook a careful survey of the grape districts of the Pacific slope (fig. 1) and found that most serious devastating agencies threatened to wipe out the 225,000 acres of table, raisin, and wine grape vineyards. Of these destructive forces the *Phylloxera vitifoliae* (Fitch) and the so-called California vine disease were of prime importance. In southern California from 25,000 to 30,000 acres of vines had been laid waste (pl. 1), and the entire vineyard acreage of the Napa and Sonoma Valleys had been destroyed. In the Santa Clara Valley in 1903 the returns from the vineyards were scarcely one-twelfth of what they had been in 1900, and the vineyards were practically gone. In other bay counties similar conditions were evident, and the rapidity of the damage was appalling. Conservative calculations showed that the loss due to the destruction of vines in this State was at least $1,000 a day. Considering that the entire vinifera region of the United States was interested, and that California alone has an area adapted to grapes equal to almost the whole of France, which was then producing 60 times the quantity

85973°—30——1

of grapes annually, the magnitude of the interests involved and the importance of aiding the industry—which was still in its infancy—were apparent.

As various means suggested by scientific and practical men had been tried and large sums of money had been expended to safeguard the vineyards with little beneficial result, it was evident that a com-

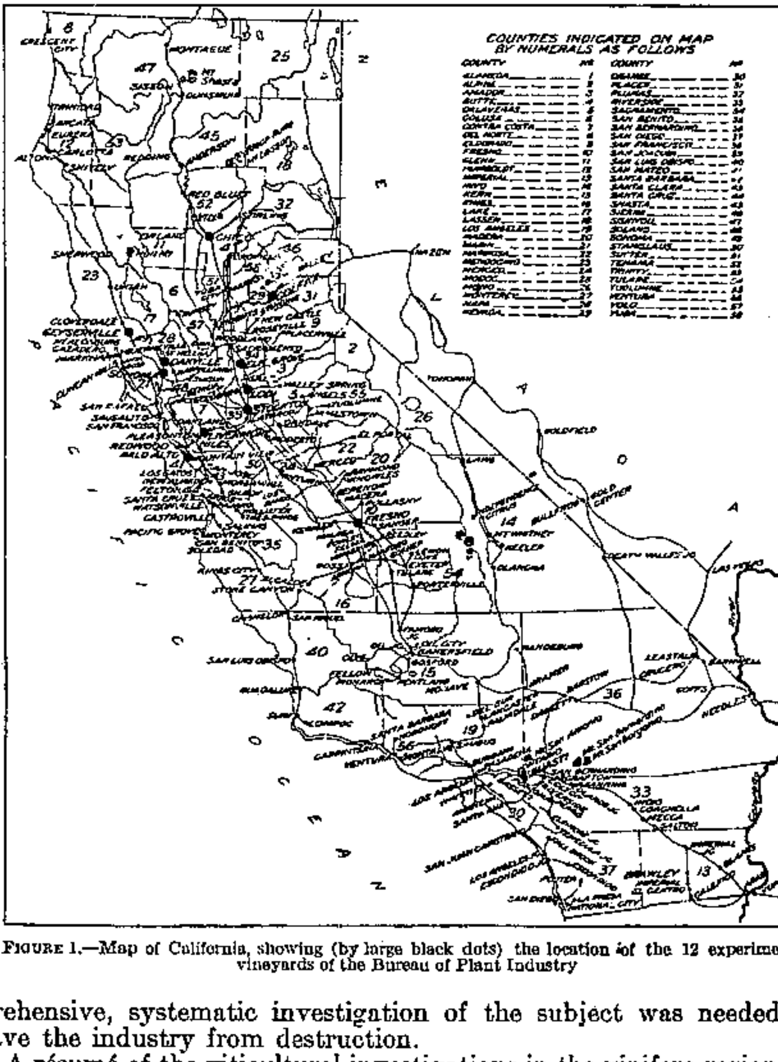


FIGURE 1.—Map of California, showing (by large black dots) the location of the 12 experiment vineyards of the Bureau of Plant Industry

prehensive, systematic investigation of the subject was needed to save the industry from destruction.

A résumé of the viticultural investigations in the vinifera regions of the United States was published in Bureau of Plant Industry Bulletin No. 172[1] and Department of Agriculture Bulletin No. 209,[2] giving data on the investigations and researches made up to 1915. The

[1] HUSMANN, G. C. GRAPE INVESTIGATIONS IN THE VINIFERA REGIONS OF THE UNITED STATES WITH REFERENCE TO RESISTANT STOCKS, DIRECT PRODUCERS, AND VINIFERAS. U. S. Dept. Agr., Bur. Plant Indus. Bul. 172, 86 p., illus. 1910.

[2] HUSMANN, G. C. TESTING GRAPE VARIETIES IN THE VINIFERA REGIONS OF THE UNITED STATES. U. S. Dept. Agr. Bul. 209, 157 p., illus. 1915.

present bulletin supplements the phylloxera-resistant stock researches reported in those bulletins and gives additional data relative to subsequent researches along this line. A few brief statements relative to the phylloxera are important.

PHYLLOXERA IN CALIFORNIA AND IN EUROPE

The phylloxera, which is not native in California, was introduced into that State either from east of the Rocky Mountains, where it is indigenous on wild vines, or from Europe, or possibly from both sources. In 1880 it was found to exist in Sonoma, Napa, Solano, Yolo, Placer, and Eldorado Counties. No careful investigations had been made at that time of much of the regions farther south in the State. It probably existed in Sonoma County as early as 1873, and it is possible that it occurred in the Sonoma Valley and on the Orleans Hills at least 20 years previous to that time.

The insect was probably introduced into Europe on American vines, being taken there about 1858 to 1862, when the destruction of the French vines from oidium was feared. From that period until 1885 it became widely scattered throughout Germany, Switzerland, Austria-Hungary, Italy, Russia, Turkey, and Australia.

Innumerable remedies have been suggested and tried to eradicate the phylloxera from vineyards, but it is conceded that the only way to combat it successfully is to reestablish the vineyards on resistant stocks, except in the case of those that can be flooded cheaply and sufficiently to kill the insects. Locations where this is possible are poor vineyard soils and sites.

EARLY ATTEMPTS AT RECONSTRUCTION OF VINEYARDS

The varying soil (pls. 2, 3, 4, and 5) and climatic conditions in California (Table 3, p. 16) have proved to be a great stumbling block in the reestablishment of the vineyards on resistant stocks. As early as 1876, introductions and plantings of resistant vines were made by some of the more intelligent grape growers. In the winter of 1880–81, several large orders were placed for resistant vine cuttings from east of the Rockies. Some of the earliest introducers from the start were fortunate in procuring resistant varieties well adapted to their locations, conditions, and soils. For instance, below the town of Sonoma (pl. 5, B), near San Francisco Bay, selected riparias introduced from Missouri showed some adaptability to the conditions there and also were congenial to the varieties grafted on them. When this was noted, riparias (pl. 7, D) as a stock were planted indiscriminately in high and low localities and on various soils, particularly in the Nada and Sonoma Valleys (pl. 5, A and B), the vineyards of which were the first to be destroyed by the phylloxera. Unfortunately, in most instances the soil and other conditions were not suited to riparia, and failures predominated.

Then, again, it was claimed that the native grape, *Vitis californica*, was resistant. Without any substantiation of this, by 1883 at least 300,000 of these vines had been planted as grafting stocks. Later their resistance was found to be even less than that of the labrusca. (Pl. 7, C.)

A few years later it was found that the Lenoir (fig. 2, C) variety did remarkably well in certain locations, and all who could obtain them planted this variety as stocks. However, it was observed that these were useless on soils not well drained or soils which their roots could not deeply penetrate. It is now known that they are not durable graft bearers.

The rupestris St. George (pl. 7, A) was and is now as indiscriminately planted, and similar and more extensive mistakes are being

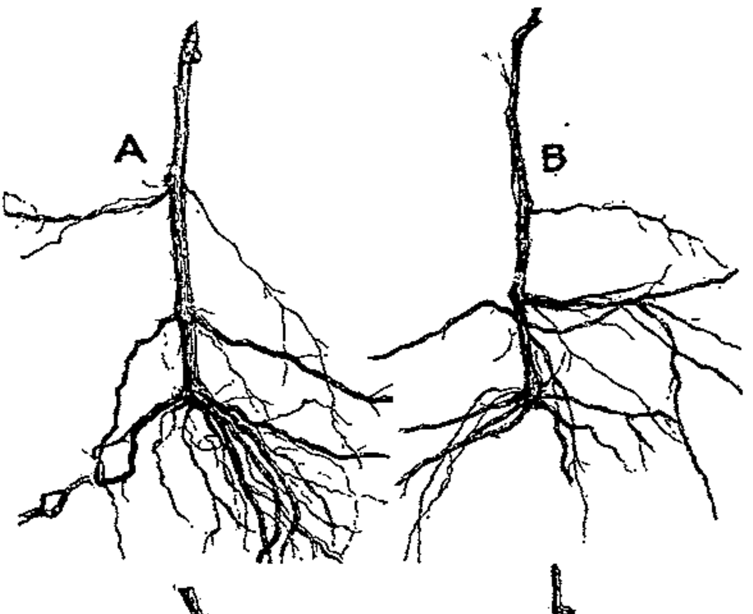
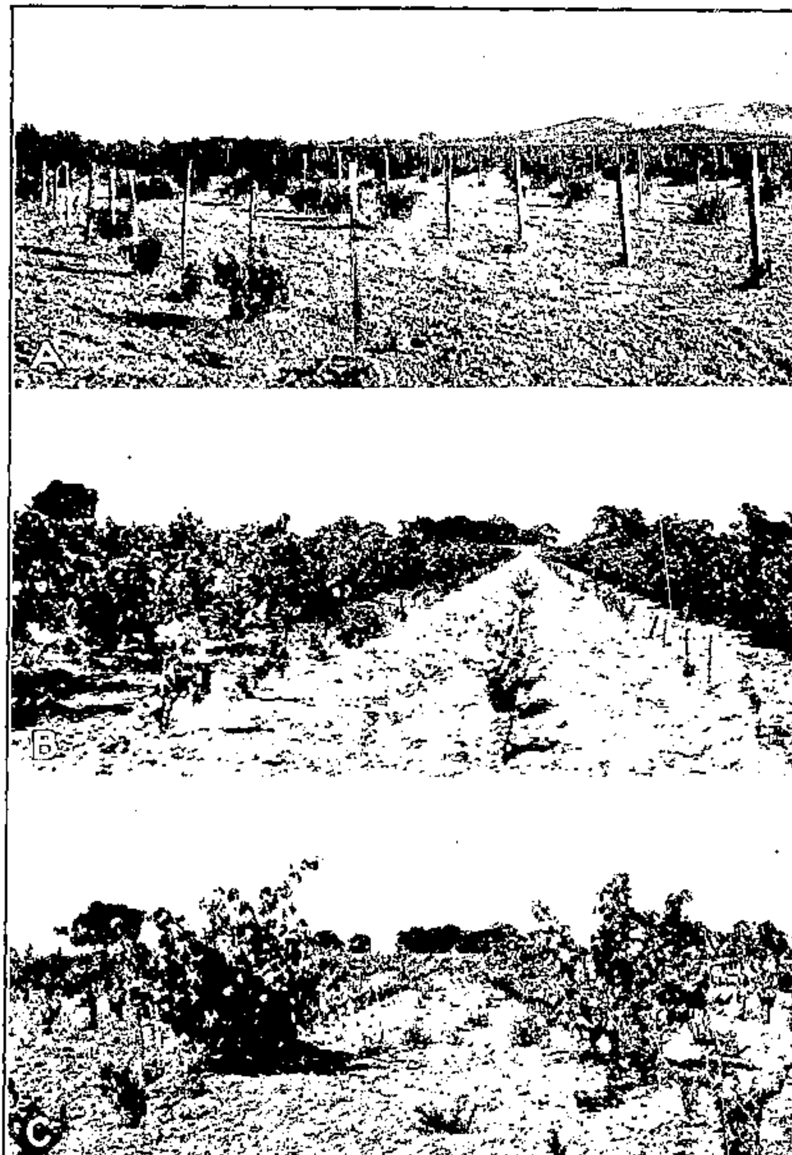
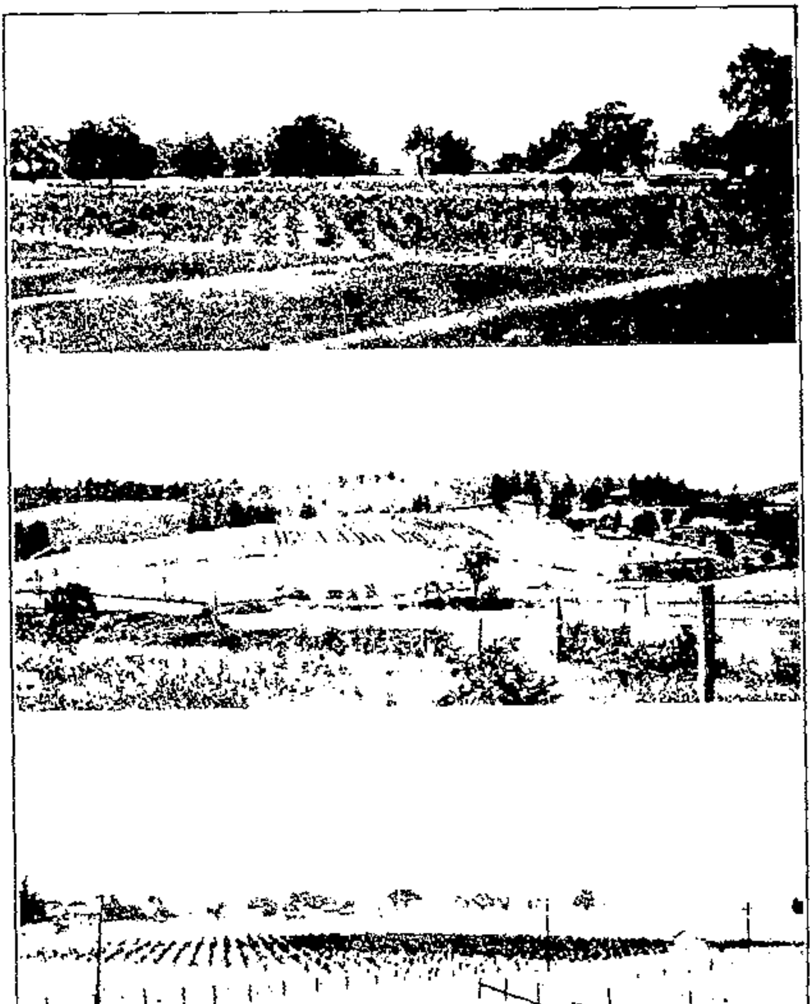


FIGURE 2.—Various types of grape root systems: A, Fleshy type; B, shallow or spreading type; C, deep-striking type; D, oblique type

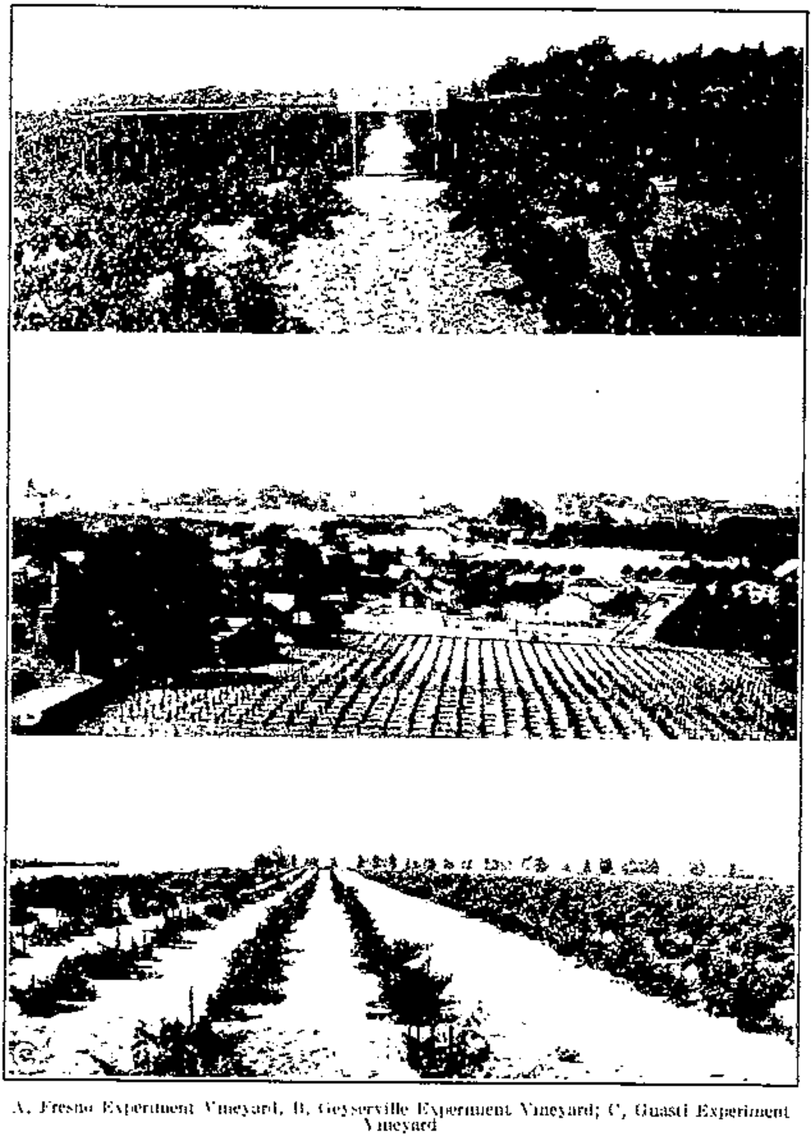
made with it. It is inadvisable to plant this variety for stock purposes in cool situations on northerly slopes in the coast ranges or to graft it with late-ripening sorts, or to attempt to grow it on shallow, wet, very rich, or stiff clay soils in any locality. It requires deep, permeable soils in the warmer districts and locations.



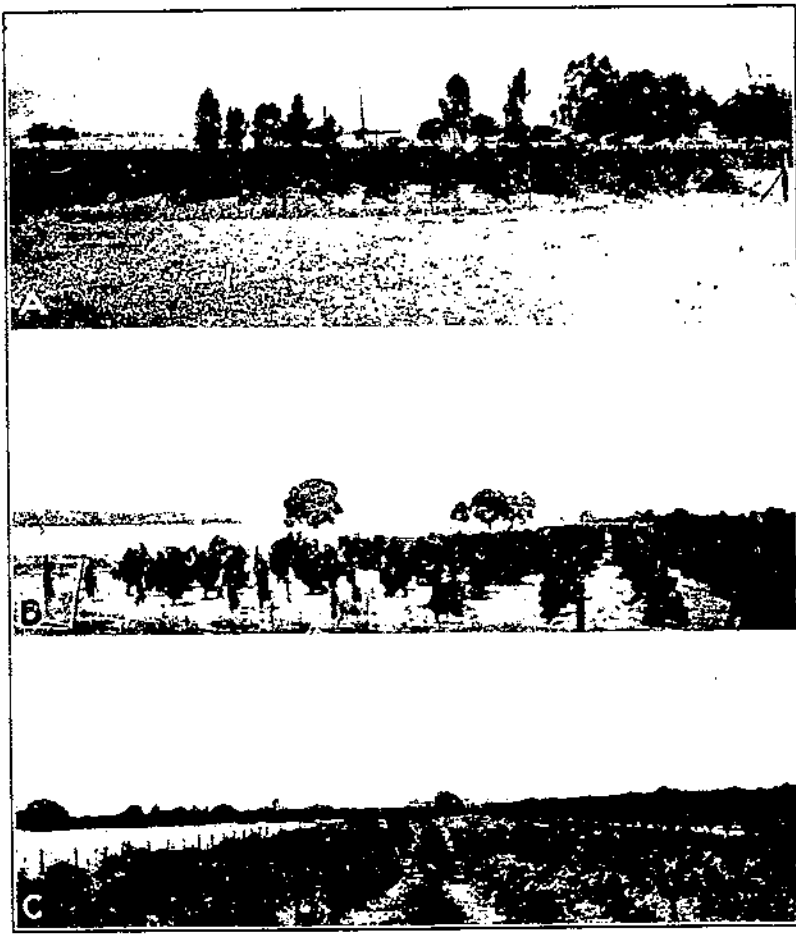
A, Vineyard partly destroyed by *Phylloxera vitifoliae*; B, vineyard partly destroyed by California vine diseases; C, vineyard destroyed by diverse agencies



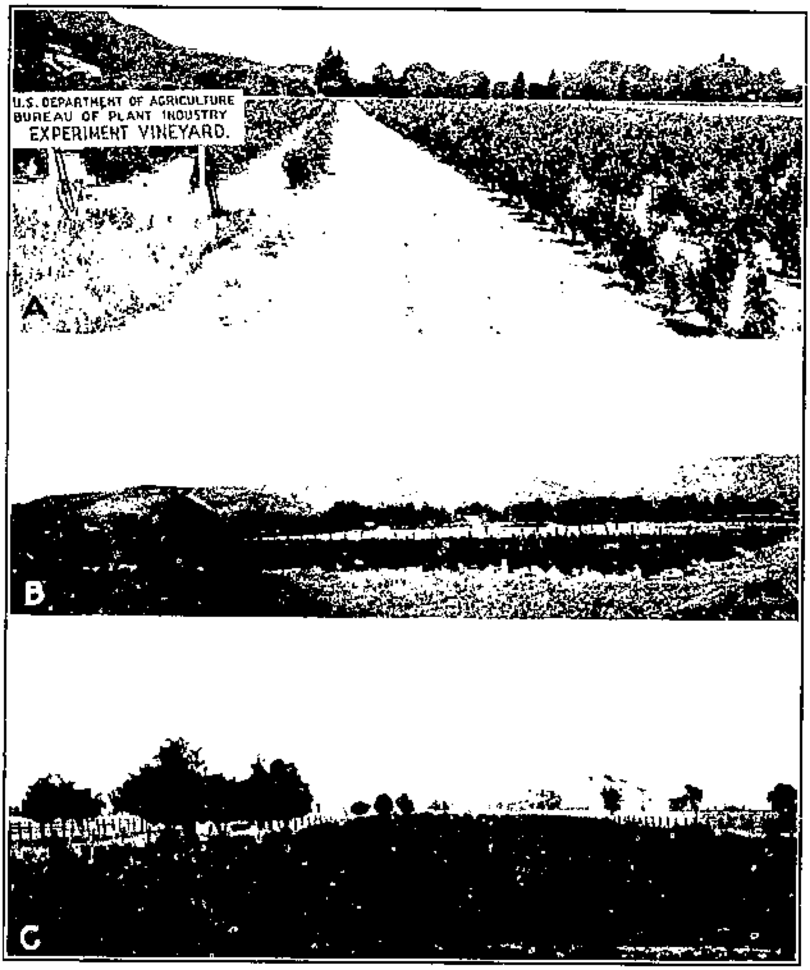
A, Chico Varietal Vineyard; B, Colfax Experiment Vineyard; C, Elk Grove Experiment Vineyard



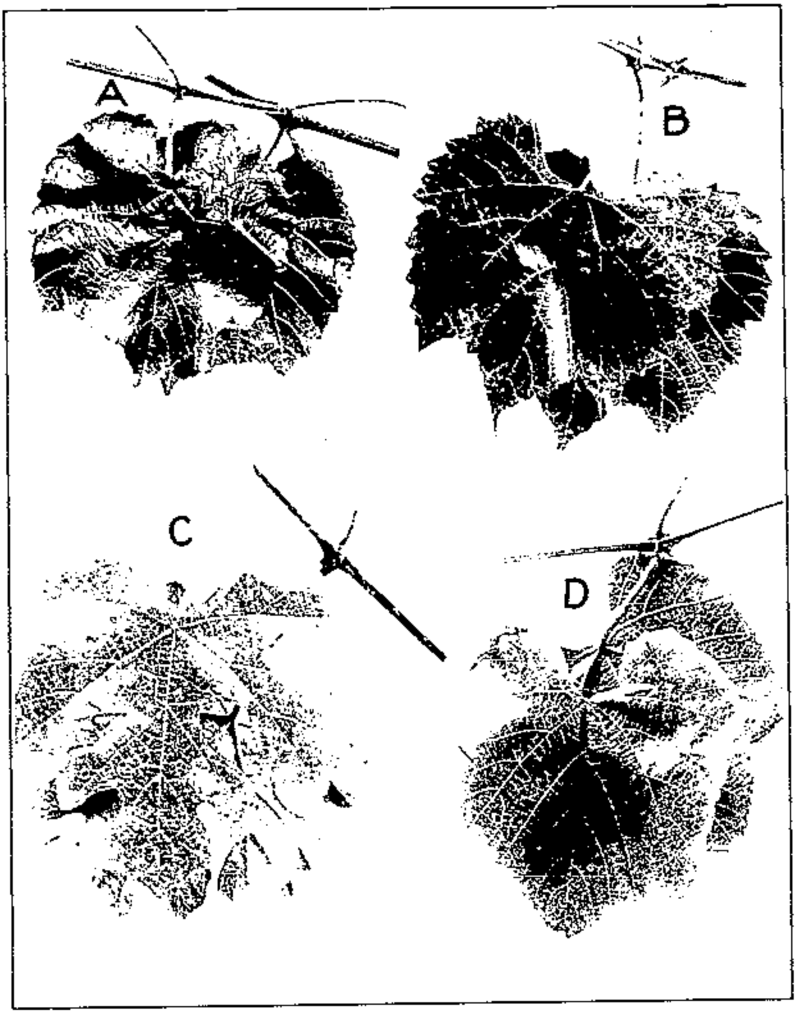
A, Fresno Experiment Vineyard; B, Geyserville Experiment Vineyard; C, Guasti Experiment Vineyard



A, Livermore Experiment Vineyard; B, Lodi Experiment Vineyard; C, Mountain View Experiment Vineyard



A, Oakville Experiment Vineyard; B, Sonoma Experiment Vineyard; C, Stockton Experiment Vineyard



Upper and lower sides of leaves of four native American species of grapes used as stocks: A, *Vitis champini*, one-fourth natural size; B, *V. doaniana*, one-sixth natural size; C, *V. candicans*, one-fourth natural size; D, *V. berlandieri*, one-sixth natural size

The resistant stocks mentioned and all others are good in soils and under conditions to which they are adapted (Tables 5 and 6, pp. 25 and 26), but are less valuable or even worthless where they are not.

FACTORS IN RESISTANCE

The resistance of vines to phylloxera depends upon their inherent resistant character and their adaptation to soil, climatic, and other conditions in which they are to be grown. When used as stocks, their resistance is influenced in direct ratio to the congeniality existing between them and the varieties to which they are to be grafted. Therefore, to establish successfully a vineyard on resistant stocks it is necessary to determine the resistants' adaptation to the soil and conditions where they are to be grown and the congeniality of the varieties it is desired to grow on them.

NATURE OF PHYLLOXERA INJURY AND INHERENT CHARACTER OF THE VINES

Vines of various species, particularly those of American origin and their hybrids, possess varying degrees of resistance to the attacks of phylloxera. Such resistance is manifest in the degree to which the roots of the vines develop the characteristic swellings, nodes, and tubercles resulting from phylloxera injury, and in the resulting health and vigor of the vine. Those showing no injury in phylloxerated soils are considered resistant. The rate at which those not resistant succumb to the attacks of phylloxera determines the degree of resistance that they possess.

Vines upon the roots of which the phylloxera does not remain or produce injury are said to be immune. The phylloxera usually first punctures the end of one of the youngest roots near the extremity and fixes itself there. Soon thereafter, the swelling or nodosity of the puncture appears. This constitutes the mildest noticeable form of the insect's root injury.

The nodosity is whitish or pinkish and when seen under the microscope somewhat resembles the head and neck of a long-billed bird, and the insect causing it is as a rule found on the throat, or the angle formed where the head joins the neck. The nodosities decay more or less rapidly in the different grape species. In the vinifera they usually rot in a very short time. In the American species the nodosities remain sound for a longer time, the various species differing in this respect. The size of the nodosities on the different species also vary greatly, those on the vinifera being about three times as large as those on the most resistant American species. Between these extremes may be found all intermediate sizes.

The number of nodosities caused by the phylloxera varies greatly on the different varieties. After the formation of a considerable number upon the rootlets, the insects, having multiplied gradually, eventually attack the relatively larger roots. When cancerous patches of decomposition are found on these roots tuberosities occur and the vine is greatly weakened. Wherever tuberosities are found there are also nodosities, but the reverse is not true. On some grape varieties nodosities may be found on practically all of the rootlets, while on others there may be practically none.

Varieties of some of the American species are not injured by the phylloxera any further than that a few nodosities form on the roots. Such vines have a very high resistance. In fact, the resistant ratings of the different species are based on a determination of the relative number and size of nodosities found on the roots. In order to indicate somewhat definitely the resistance to phylloxera (not the value of the stock), viticultural scientists have adopted an arbitrary scale of ratings in which the maximum of resistance or immunity is taken as 20, while absence of or no resistance is zero. In accordance with this rating, Viala and Ravaz [3] drew up the following scale of resistance of different species: Rotundifolia, 19; vulpina (pl. 7, D), riparia, rupestris (pl. 7, A), and cordifolia, 18; berlandieri (pl. 6, D) and monticola, 17; cinerea, aestivalis (pl. 7, B), and candicans (pl. 6, C), 15; longii and nova mexicana, 14; bourquiniana, 12; labrusca (pl. 7, C), 5; vinifera, 0. According to this, *Vitis rotundifolia* is rated highest, with 19 points, which for all practical purposes represents absolute resistance, whereas the vinifera show 0, or no resistance.

ADAPTATION TO SOIL, CLIMATE, AND OTHER CONDITIONS

The resistance of a vine to the attacks of the phylloxera without serious injury is influenced greatly by the adaptability of the vine to the climatic (Table 3) and soil conditions (see descriptions of experiment vineyard sites) in which it is grown. These either increase or diminish the vigor of the plant and retard or favor the repairing of the insect injuries. The soil and the climate also affect the resistance by favoring or hindering the approach, dissemination, and activity of the insect. For example, sand of a certain fineness is an obstacle to the insect in going from the surface of the ground to the roots of the vines and from one vine to another.

Climatic differences also affect the multiplication of the insect. Also, a vine variety which in one locality has splendid resistant qualities perishes in another locality having the same soil but a different climate, or in another locality having the same climate but a different soil. This is due not only to the adaptability of some species to moist and others to drier soil and the like, but also to the habit of the root systems of the species (fig. 2), which vary from horizontal to vertical, and to other characteristics of the roots, which vary from thick to thin and from soft to hard, with intermediate grades between these extremes. It will readily be seen how a horizontal-root system would suffer in a dry soil and a hot climate, also what a punishment it would be for a deep-rooting system to be planted in a shallow hard soil or a moisture-loving variety where there is but little moisture.

Congeniality, or the lack of it, existing between vine varieties when grafted on other vine varieties also has its influence on phylloxera resistance. For instance, varieties lacking in congeniality would make a comparatively weak growth and thus succumb more easily to phylloxera attacks. Other causes—and there are many—affect the resistant qualities of vines; and it is with the study of the adaptation of resistant varieties to varying conditions that the researches here reported are concerned. Under favorable conditions of soil and climate a variety will frequently prove more resistant than one that has greater natural resistance but is not adapted to the particular conditions. Thus, the Lenoir in many localities in California on deep loose soils (fig. 2, C) is an excellent resistant as an entire plant and has been largely planted in this and foreign countries for its

[3] VIALA, P., and RAVAZ, L. AMERICAN VINES (RESISTANT STOCK); THEIR ADAPTATION, CULTURE, GRAFTING AND PROPAGATION. Transl. of Ed. 2 by R. Dubois and E. H. Dwight. Pt. 3, pp. 198,199. San Francisco. 1903.

own fruit as a direct producer, but investigations[4] show that it should not be used as a graft bearer. Again, the rotundifolia, which of all the species is rated the highest in resistance to phylloxera, is uncongenial to vinifera varieties and therefore valueless as stocks.

The waste of money spent in the reestablishment of vineyards in California from the first appearance of phylloxera to the present time can not even be approximately estimated. Considerable losses of vineyards are likely to occur in the more than 400,000 acres planted in this State during the last 10 years which are not on resistant stocks. That the destruction of California vineyards has been continuous in recent years is evident from the fact that the annual yields of grapes during the last three years are practically the same, although large acreages have been set out each year.

Some of the direct causes of these results are the planting of nonresistants, or of resistants not adapted to the conditions, and grafting on these stocks vinifera uncongenial to them or not suited to the local conditions; the introduction of foreign resistants not true to name; and improper care and management of resistant vineyards, such as allowing roots to grow from vinifera tops grafted on resistant stocks.

Furthermore, in ante bellum days, when labor and production costs were less than half of what they are at the present time, California nurserymen began to furnish growers with resistant stocks and vinifera grafted on such stocks, but they found themselves undersold by foreign nurserymen who were delivering them for slightly more than half the cost of producing them here. Since the introduction of grafted vines is forbidden by the Federal quarantine, California nurseries carry only rupestris St. George, compelling growers who can not obtain other resistant stocks to plant either rupestris St. George or nonresistant vinifera varieties.

FOREIGN DETERMINATIONS AS TO RESISTANCE INAPPLICABLE IN AMERICA

In the portions of the United States where the vinifera varieties are commercially grown, soil, climate, and other conditions differ so much from those of France that it is not often safe to accept the resistance ratings given by French viticulturists to the different varieties. This is very forcibly shown by the experience with riparia varieties so largely used by the French in the past, but which are adapted to few grape localities in California. Also, the French vineyards are so largely located on limy soils that the ability of resistant stocks to endure calcareous conditions has entered much more largely into the varietal ratings than is necessary for stocks in California, making it plain that the resistance standards established by the French can not be accepted as infallible in America or, in fact, serve as more than general guides for American viticultural investigators or vineyardists.

Of the 23 species of grapes native to North America, 14 have been found sufficiently resistant to merit the attention of the viticulturist and have been under test in the experiment vineyards of the United States Department of Agriculture. Table 1 shows their natural habitat, the locations, sites, the type of soil they prefer, the habits of the vines, their root systems, the relative season of leafing, flowering, and ripening of the fruit, the ease or difficulty of propagating them, their suitability for either bench or field grafting, and their relative resistance to phylloxera, cold, dampness, heat, and drought.

[4] Husmann, G. C. Op. cit.

TABLE 1.—*Cultural data of 14 American species of grapes whose varieties or hybrids are under test as resistant stocks in 12 experiment vineyards in California* [1]

Name and region of nativity	Preferred location	Vine	Roots	Season of leafing, flowering, and ripening	Percentage of cuttings taking root	Grafting adaptation	Resistance to— Phylloxera (out of a possible 20)	Resistance to— Cold	Resistance to— Dampness	Resistance to— Heat	Resistance to— Drought
Vitis labrusca (northern fox grape): Allegheny Mountains, from New England to South Carolina.	Wet thickets; granitic soils.	Vigorous, medium-sized climber.	Large, fleshy	Very late	85	BF	5	VG		F	F.
V. candicans (mustang grape): Oklahoma, Texas, and New Mexico.	Black waxy lands or adobe.	Moderately vigorous, medium climber.	Vigorous, tender	Medium early	10	F	15	F	F	G	G.
V. aestivalis (summer grape): Southern New York to Florida; westward to the Mississippi and Missouri Rivers.	High, warm, gravelly, moist soils.	Vigorous, medium-sized climber.	Rather large, hard, plunging.	Medium late	25	F	14	VG		G	G.
V. linsecomii (post-oak or turkey grape): Texas	High, well-drained timber lands, granitic gravelly clay, compact, deep, rich river-bank soils.	Vigorous, good-sized climber.	Medium size, hard, and long.	do	25	F	14	F		G	G.
V. monticola (sweet mountain grape): Texas	Low limestone hills; does moderately well in sandy soils.	Rather small; good grower.	Bushy, plunging	do	35	FB	18	F		G	G.
V. berlandieri (little mountain grape): Texas and Mexico	Tops, sides, and bottoms of limestone hills.	Slender; medium grower.	Strong and plunging	Late	25	F	19	F		G	G.
V. cordifolia (frost or sour winter grape): Great Lakes to Florida, abundant in Illinois, Tennessee, Missouri, and Arkansas.	Deep, rich, loose soils on river banks.	Vigorous, strong climber.	Strong, hard, carneous	do	30	F	18	VG	F	G	G.
V. cinerea (sweet winter or ashy grape): Illinois to Texas	do	Vigorous, strong grower.	Large, fleshy, plunging	Very late	30	F	15	F	G		
V. champini (adobe-land grape): Texas	Limestone hills; adapts itself to a variety of soils.	Vigorous, spreading grower.	Large, ramified, plunging.	Early to medium	25	FB	12	F	G	G	G.

V. doaniana (Texas Panhandle large grape): Texas	Sandy, limy soils	Slender, fair grower	Numerous, thick, deeply penetrating.	Early	25	F	12	F	G	G	
V. longii (Solonis, bush or gulch grape): Texas Panhandle, New Mexico, Kansas, and Colorado.	Ravines along streams. Cretaceous, generally rich, sandy, moist, always fresh soils.	Bushy, upright, vigorous grower.	Large, ramified, horizontal, hard.	do	30	F	14	F	G	G	G.
V. rupestris (sand, sugar, or rock grape): From the Rio Grande in Texas northeasterly into Oklahoma, northwestern Arkansas, southern Missouri, Kentucky, and Tennessee; Cumberland Mountains north to Pennsylvania.	Open places in poor soils and along gravelly banks and ravines.	Vigorous, short, bushy grower.	Long, slender, or strong, plunging.	Very early	30	B	19	G		G	G.
V. vulpina (riparia or riverside grape): From Salt Lake east and from Texas north in all the States as far as 50 miles north of Quebec.	Moist, loose, sandy soils along creeks and river bottoms.	Vigorous; medium size.	Long, thin, slender, hard, wiry, ramified.	do	85	FB	19	VG	G		
V. bicolor (blue grape): Northern Missouri, Illinois, Wisconsin, Indiana, Michigan, Ohio, Kentucky, Pennsylvania, New York, New Jersey, Maryland, and Ontario.	Black sandy and red siliceous soils.	Fair grower	Rather hard, large, plunging.	Late	25	F	16	VG		G	G.

[1] Abbreviations used in this table: Under grafting, B for bench, F for field; under resistance, F for fair, G for good, and V for very.

COOPERATIVE EXPERIMENT VINEYARDS

To afford facilities for a comprehensive study and adaptability tests of phylloxera-resistant grape varieties, 12 experiment vineyards have been established in California at different times, one at the United States Plant Introduction Garden near Chico and the others at Colfax, Elk Grove, Fresno, Geyserville, Guasti, Livermore, Lodi, Mountain View, Oakville, Sonoma, and Stockton, in cooperation with growers in these grape-growing centers. These vineyards are located on the leading soil types at different altitudes, at varying distances from the ocean and other bodies of water, and under different climatic and other conditions (fig. 1), a brief description of which follows. The soil descriptions are from data furnished by the Bureau of Chemistry and Soils, and the weather data are taken from records furnished by the San Francisco office of the Weather Bureau and from observations made in the vineyards. Correlation and mechanical analysis of the soils and fuller climatic data are given in Bulletin 172 of the Bureau of Plant Industry.[5]

Attention is called to the fact that each of the aforementioned experiment vineyards[6] was located on land just cleared of phylloxera-infested vines, so that these sites and vineyards adjacent to them were full of phylloxera. Furthermore, in the Fresno and Oakville experiment vineyards (the plantings in these two vineyards conjointly including all the so-called phylloxera-resistant stock varieties that the department has had under test) the roots of the vines were annually inoculated with phylloxera to make absolutely certain that they were enabled to resist the attacks of this insect under the various climatic, soil, and other conditions found in the different experiment vineyard locations.

GENERAL PLAN OF PLANTINGS[7]

In the Chico varietal vineyard only 2 vines of each variety have been planted, whereas in all the other vineyards the plantings, for comparative tests and study, were made in regular checks of 10 vines of each variety except in instances where nothing definite was known of a variety, and plantings of a less number (usually 5 vines of a variety) were made for a preliminary study. Each vine received its block, row, and vine number. A complete history and accurate records were kept from the time of planting. Their behavior was closely noted, detailed descriptions were made of the vines, and their value and adaptability to different conditions recorded.

CHICO VARIETAL VINEYARD

The Chico varietal vineyard is located at the United States Plant Introduction Garden. (Pl. 2, A.) The alluvial soil, composed of material brought down from the mountains and hills on the east, is 8 to 12 feet deep and is underlain by a body of sandy waterworn gravel and bowlders, which always carry water. The soil is of light texture, varying from a light loam to heavy, fine sandy loam, the

---

[5] HUSMANN, G. C. 1910. Op. cit.

[6] Acknowledgment is made to the property owners of the various cooperative experiment vineyard sites for the very courteous cooperation at all times extended to representatives of the U. S. Department of Agriculture.

[7] In the care and maintenance of the California experiment vineyards and in prosecuting researches in them, George C. Husmann, pomologist in charge of grape investigations, is assisted by Fred L. Husmann, superintendent, and Elmer Snyder, associate pomologist.

heaviest being loam. It is well drained and easily cultivated. The heavy, fine sandy loam consists of 30 to 36 inches of fine sandy loam, underlain by very fine sandy loam, usually containing some gravel. The light loam has 10 to 15 inches of fine sandy loam underlain by a heavier structure closely approaching loam. The largest area of this soil is found about Chico, but similar soil occurs in the Feather and Bear River Valleys.

At the Chico vineyard are being assembled and maintained two plants each of grape varieties that prove of special value for specific purposes, together with grape immigrants from all parts of the world introduced by the Office of Foreign Plant Introduction.

COLFAX EXPERIMENT VINEYARD

The Colfax experiment vineyard was established on the property of Louis Cortopassi in the Sierra Nevada Mountains. (Pl. 2, B.)

The soil, which is usually fairly deep, well drained, and hilly, originated in the decomposition of the Mariposa formation, consisting of dark shales or slates, sandstone or quartzite sandstones, and conglomerates. The large proportion of iron present from decomposing volcanic-rock material when exposed to perfect weathering gives the soil a deep red color. Dark, shallow, conglomerate rocks sometimes outcrop in spots, and rock fragments occur. The first few inches are often dark red, from the accumulation of organic matter. The first 8 to 18 inches are usually brownish red clay or clay loam, underlain by 3 to 6 feet of red clay or clay loam, with partially decomposed and weathered-rock formation, giving the soil a yellow appearance. Rock outcrops of conglomerates, chert, and slate occur in the higher portions.

The native vegetation is manzanita, chaparral, live oak, and yellow pine. The Colfax district is unique in the diversity of fruits grown on sidehill locations.

ELK GROVE EXPERIMENT VINEYARD

The Elk Grove experiment vineyard is on the property of the Colonial Grape Products Co. in the Sacramento Valley plain. (Pl. 2, C.) This plain is gently undulating, with frequent low mounds and intervening depressions commonly called hog wallows and occasional larger but locally inclosed basinlike depressions. Surface drainage is moderately well developed. The occurrence of compact heavy subsoils is usually accompanied by indurated or cemented substrata or layers of hardpan. Subdrainage is restricted, which during and immediately following the winter rainy seasons renders the soils cold, wet, and boggy, with water standing in the depressions.

The soil of this vineyard tract strongly resembles both the San Joaquin and the Madera series. The surface is Madera loam—clay loam of dark-brown to light reddish or sometimes yellowish brown color—9 to 18 inches in depth and is friable when in favorable condition of moisture. The subsoil, occurring 9 to 18 inches below the surface, varies from 7 to 13 inches in depth and is a heavy, compact, semicemented, dark to yellow-brown clay, grading to hardpan. Underneath the subsoil is a hard stratum of hardpan. The soil and subsoil material are retentive of moisture and under favorable conditions of drainage, *irrigation*, cultivation, and depth to hardpan are well adapted to vine culture.

FRESNO EXPERIMENT VINEYARD

The United States Experiment Vineyard near Fresno, Calif., (pl. 3, A) was established on the property of the Fresno Vineyard Co. The soil is the San Joaquin sandy loam. The fact that it is an outlying isolated portion of soil of this character accounts for the increased depths to hardpan and the sandier subsoil immediately above. The San Joaquin sandy loams are confined to lands adjacent to the lower foothills on the eastern side of the San Joaquin and Sacramento Valleys, where 75,000 acres near Fresno, 6,000 acres near Stockton, and 265,000 acres in the vicinity of Sacramento have already been mapped. The soil is light red in color, granitic in origin, and composed largely of sharp, angular particles. The surface is rolling and generally covered with hog wallows and small mounds.

In this plot two varieties of soil were recognized, namely, an adhesive sandy loam, closely approaching a true loam, and a friable sandy loam. The former retains moisture longer than the latter, which is a deeper soil of lighter texture. In leveling the plot the natural soil conditions were disturbed, the depth of the sticky adhesive sandy loam was decreased in spots, and free sandy loam was exposed in other places, causing the hardpan underlying the plot to occur at depths varying from scarcely 20 inches to more than 6 feet, whereas the average depth is 3½ to 4 feet below the surface. This hardpan, which always accompanies San Joaquin sandy loam soil, is a red iron-sandstone substance cemented by hydrates of iron and alumina combined with clay. When this occurs at 2 feet or less below the surface, blasting is necessary. Trees and vines thrive when the hardpan is broken or where it lies at a sufficient depth below the surface.

The soil of the plot above the hardpan contains alkali varying from less than 0.05 to more than 20 per cent; in the lowest grade soil, however, no alkali is visible. Of the salts, about 2 per cent are potassium and more than 90 per cent are chlorides, about as follows: Calcium, 50; magnesium, 25; sodium, 15. The remainder consists of calcium sulphate and bicarbonate of soda. The depth of the water table on the tract averages 8 feet.

This is the second in importance of the experiment vineyards of the United States Department of Agriculture. It was purchased by the Federal Government in 1923, since which time it has become important as a place for viticultural research.

GEYSERVILLE EXPERIMENT VINEYARD

The Geyserville experiment vineyard was established on the property of John D. Bosch. (Pl. 3, B.) The soil consists of a uniform dark gravelly loam to a depth of 2½ to 3 feet with a subsoil of light or yellowish brown color, similar in texture to the topsoil. The soil is very mellow and carries considerable humus, which enables it to retain moisture well. This type of soil extends over considerable areas along the streams and the floor of the Sonoma Valley, having been washed from the shale, schist, and conglomerate hills. Soils of this type produce some of the choicest red and white grape juices of the State.

GUASTI EXPERIMENT VINEYARD

The Guasti experiment vineyard, in the San Bernardino Desert, was established on the property of the Italian Vineyard Co. (Pl. 3, C.)

The soil, mapped as Maricopa gravelly sand and washed from the Sierra Madres, is a gray-brown gravelly sand of a texture uniform to an unknown depth. The surface is compact when untilled, because the sharp angular sand in its composition becomes somewhat cemented by the organic matter occurring in the topsoil. At a depth of 3 feet it is more concentrated and often yellowish from the oxidation of iron. It is almost entirely granitic and contains quantities of undecomposed potash and feldspar particles, which would indicate that there would be abundant potash for the maturing of grapes. It covers most of the San Bernardino Valley floor and when thoroughly cultivated holds moisture well, the fine sand and silt giving the capillary power to bring water up from below. Two of the largest vineyards of the world are in this valley, on similar soil. As the phylloxera was not known to exist there, the plantings in this experiment vineyard were principally vinifera varieties. However, phylloxera-resistant stocks were included in the tests, to supply information relative to the adaptability of such stocks to that section.

LIVERMORE EXPERIMENT VINEYARD

The Livermore experiment vineyard was established on the property of C. H. Wente. (Pl. 4, A.) The vineyard has a very uniform, level, alluvial soil, derived from decomposed shales and schists, and is full of rounded gravel washed down from the surrounding mountains. The surface soil is a dark-brown gravelly loam; the second, third, and fourth feet are gravelly sandy loam, replaced by gravelly sand in the fifth foot. The humus decreases with the depth, while the gravel increases, varying from 30 to 59 per cent. The proportion of clay is greater than that of silt, which gives the soil a very heavy appearance, the gravel sticking together very tightly when dry or packed. There is no alkali in the soil, but ground water is encountered at a depth of 5 or 6 feet in some places. These soils are common over the Livermore Valley, and grapes grown on them produce a superior white juice of the sauterne type.

LODI EXPERIMENT VINEYARD

The Lodi experiment vineyard was established on the Lawrence & Murray property. (Pl. 4, B.) A large body of this soil exists between Lodi and Acampo.

There are two variations in the plot. Phase No. 1 is a brown, free, sandy loam, underlain below 4½ feet by a more adhesive light-brown or yellowish sandy loam. Occasional iron concretions give the subsoil a mottled color. The soil has good capillarity, and the water table occurs at 5 to 6 feet. Phase No. 2, an adhesive sand, was formed by an old stream channel. This is light-brown sand to a depth of 3 feet, the subsoil water-washed sand, much looser in texture and lighter in color, and dry to a depth of more than 6 feet, as the soil texture is too loose to exert much capillary force. There is no hardpan or alkali. The soils, however, are deficient in lime, but otherwise they are very productive, comparatively level, unirrigated, and easily tilled. This locality is well known for its table grapes and as a table-grape shipping point.

MOUNTAIN VIEW EXPERIMENT VINEYARD

The Mountain View experiment vineyard was established on the property of Mrs. Caroline Distel, on the west side of the Santa Clara Valley. (Pl. 4, C.)

The soil is a gravelly Placentia sandy loam. The first 12 inches are gravelly sandy loam, dark brown from humus; below this, to a depth of 4 feet, the subsoil becomes redder and more gravelly until sand is encountered. It is well drained, but inclined to become too dry in summer and fall. The surface soil at times becomes quite compact and when plowed breaks up into hard clods. When tilled at the right time it works into a very mellow condition. These soils are from washings of granitic sandy shales and schist rocks.

Before the destruction of vineyards by phylloxera and other agencies, the Santa Clara Valley was the banner wine-producing section of California.

The following areas of Placentia sandy loam have been surveyed in California: San Jose, 61,500; lower Salinas, 74,000; Los Angeles, 66,000; San Bernardino, 87,000; San Gabriel, 48,000; and Santa Ana, 16,800 acres. Soils of this series occur throughout the Coast Range of mountains from San Francisco to the Mexican line, occupying undulating portions of valleys close to the hills.

OAKVILLE EXPERIMENT VINEYARD

The United States Experiment Vineyard near Oakville, Calif., (pl. 5, A) was established on the property of the To-Kalon Vineyard Co. The soil is a dark-brown or black gravelly clay or heavy loam, containing a large quantity of organic matter formed in a swamp or lagoon extending in past geological ages up Napa Valley from San Pablo Bay, typical of the greater part of the soils in the valley floor. On weathering, the shales, sandstones, limestones, lime conglomerates, and large quantities of gravel with little erosion of edges are washed down from the steep hills or mountains surrounding Napa Valley and tend to form a heavy or clayey soil with only small quantities of sand. No hardpan or alkali appears. The surface is undulating, affording a fairly rapid run-off of surplus rain water, although in places the subsoil is somewhat wet during the spring months. No irrigation is necessary. The clay and silt in the subsoils greatly aid in retaining moisture in spite of the 20 to 40 per cent of gravel that they contain. Cultivation reduces the surface to a good mulch.

When grape culture in Napa Valley and the adjoining foothills became an important industry, a reputation for the superior qualities of Napa County wines, especially its white wines, was rapidly made, and it has remained one of the leading juice-grape sections of the State.

This property was purchased by the Federal Government in 1923, since which time it has rapidly become the most important experiment vineyard of the United States Department of Agriculture for viticultural research.

SONOMA EXPERIMENT VINEYARD

The Sonoma experiment vineyard was established on the property of the Gundlach-Bundschu Wine Co. (Pl. 5, B.) The soil is of rather poor quality. To a depth of 8 or 10 inches it is a gray loam, more easily tilled than its texture indicates. The subsoil is clay to a depth of 6 feet, showing at 4 feet an increase of sand, from light brown to a yellowish brown in color. The soil is found near where the weathered shales from the surrounding hills have been partially broken down and transported into the valleys, where they decompose. The soil usually occupies small undulating ridges or elevations and is surrounded by the dark-brown alluvial clay loam of the valley floor. The surface drainage is good, and alkali is not present in injurious quantities. This soil occurs over extensive areas in the Sonoma Valley and in the adjacent bay regions and produces superior white juices of the Riesling, Chasselas, and Traminer types.

STOCKTON EXPERIMENT VINEYARD

The Stockton experiment vineyard was established on the property of the San Joaquin Valley Realty Co., on Stockton clay-loam adobe. (Pl. 5, C.) This type of soil, locally known as black adobe, was laid down in a swamp or tidal marsh in quiet water, the decomposing vegetation giving it a black color. It is a clay loam in texture, adhesive and sticky when wet and very hard when dry, cracking into large cubical blocks full of small cubical fractures. Sufficient rain slakes the clods readily. If cultivated when neither too wet nor too dry, the soil is friable and pulverizes well. The subsoil is a light-yellow silt loam, usually separated from the surface soil at a depth of 2½ feet by a thin stratum about one-half inch in thickness, of rather soft marly or calcareous hardpan, which is not always continuous and is often broken or disintegrated. Roots and water readily penetrate the subsoil, often passing through the hardpan. The depth to the water table varies from 3½ to 6 feet in wet seasons and from 6 to 10 feet in dry ones. This variation is influenced by a thin, marly hardpan, which appears to hold the water down under pressure.

It is somewhat difficult to establish vineyards on these soils, but when successful they are very productive and lasting. Grapes for diverse purposes are grown on them. One of the largest grape-juice establishments in the world is located near Stockton, and heavy shipments of table grapes grown on these soils are made. Soils of this type in California have been mapped as follows: Stockton, 53,312 acres; Hanford, 5,470 acres; Fresno, 5,664 acres. This soil covers many thousand acres between the Marysville Buttes and about North Durham in the Sacramento Valley.

DATA CONCERNING THE EXPERIMENT VINEYARDS

Data concerning the 12 experiment vineyards are given in Tables 2 and 3.

TABLE 2.—*Location of the 12 experiment vineyards of the Bureau of Plant Industry in California, their elevation, year established, number of resistant vine varieties in each, and year when discontinued*

Location of vineyard	Elevation (feet)	Established in the spring of—	Resistant vine varieties	Discontinued June 30—
Chico, Butte Co., 4 miles south of town	196	1906	764	----------
Colfax, Placer Co., 1½ miles southwest of town	2,412	1906	122	----------
Elk Grove, Sacramento Co., one-fourth mile south of town	53	1914	147	----------
Fresno, Fresno Co., 4 miles southeast of town	290	1903	187	----------
Geyserville, Sonoma Co., immediately east of town	236	1904	94	1919
Guasti, San Bernardino Co., at the station	950	1904	83	1919
Livermore, Alameda Co., 3 miles south of town	450	1904	109	1914
Lodi, San Joaquin Co., one-fourth mile northeast of town	55	1904	112	1919
Mountain View, Santa Clara Co., 2 miles west of town	70	1904	124	1912
Oakville, Napa Co., one-half mile west of town	161	1903	306	----------
Sonoma, Sonoma Co., 2 miles south of town	110	1904	117	1919
Stockton, San Joaquin Co., 1 mile southeast of town	15	1907	91	1920

TABLE 3.—*Temperature and rainfall at the 12 experiment vineyards of the Bureau of Plant Industry in California*

MAXIMUM TEMPERATURE (° F.)

Vineyard	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual[1]
Chico	74	78	83	94	104	111	114	110	106	96	82	74	116
Colfax	73	88	89	86	98	110	107	108	99	91	82	78	110
Elk Grove	72	80	82	89	103	106	110	110	100	98	81	69	110
Fresno	73	77	84	101	110	107	115	113	108	98	84	74	115
Geyserville	79	83	91	102	108	116	118	110	113	103	98	79	118
Guasti	83	87	85	98	101	105	108	106	105	96	89	80	108
Livermore	77	79	88	95	108	106	113	107	108	99	87	75	113
Lodi	70	72	80	91	104	104	110	104	105	91	78	67	110
Mountain View	76	76	85	94	104	106	111	99	109	95	84	75	111
Oakville	77	75	86	95	106	109	110	105	110	98	84	74	110
Sonoma	77	76	82	91	104	109	106	101	111	97	82	72	111
Stockton	67	70	80	89	102	105	110	103	104	90	84	66	110

MAXIMUM TEMPERATURE (° F.)

Vineyard	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual[1]
Chico	18	20	25	30	33	40	46	48	40	34	21	22	18
Colfax	14	19	24	25	30	34	44	38	34	24	18	16	14
Elk Grove	19	21	29	35	37	44	47	48	44	36	27	24	19
Fresno	24	25	30	34	40	42	51	52	42	36	31	24	24
Geyserville	21	21	29	30	33	37	40	39	35	30	26	23	21
Guasti	26	26	30	32	36	39	42	42	44	39	30	26	26
Livermore	23	24	30	30	34	39	41	41	40	34	25	23	23
Lodi	22	24	30	33	38	43	45	44	40	31	25	21	21
Mountain View	25	23	20	29	34	36	40	39	37	30	27	24	23
Oakville	20	24	25	26	30	34	32	34	35	27	25	17	17
Sonoma	23	27	29	27	32	34	41	34	35	32	26	23	23
Stockton	24	24	32	36	40	40	48	42	42	38	25	20	20

MAXIMUM TEMPERATURE (° F.)

Vineyard	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual[1]
Chico	46.3	49.6	53.0	58.0	65.3	73.0	79.4	77.5	71.4	63.9	52.8	45.8	61.4
Colfax	42.6	44.1	46.3	52.9	59.4	68.0	75.1	73.6	65.7	59.0	51.6	43.5	56.9
Elk Grove	46.3	50.2	54.5	58.6	63.7	69.4	73.6	73.2	70.0	62.4	53.4	46.8	60.2
Fresno	47.6	50.9	55.4	60.8	66.4	74.5	81.8	80.2	73.1	64.4	54.3	45.7	62.9
Geyserville	47.4	50.3	52.8	57.8	62.4	67.3	69.8	68.2	67.0	62.2	53.9	47.7	58.9
Guasti	49.9	51.7	54.7	58.3	60.7	67.2	75.2	73.2	69.9	64.4	56.6	51.3	60.9
Livermore	48.0	51.0	53.5	57.2	60.6	66.0	70.0	69.8	68.3	62.8	54.5	48.8	59.3
Lodi	46.6	49.4	53.1	57.6	63.0	68.6	72.9	70.6	67.0	60.0	51.5	45.0	58.8
Mountain View	49.1	51.2	53.3	56.1	60.0	62.7	66.0	65.1	64.3	60.2	54.0	48.1	57.4
Oakville	45.4	48.3	50.4	55.1	59.7	64.1	66.8	65.8	65.1	60.8	52.3	45.5	56.6
Sonoma	47.3	50.1	51.7	55.5	59.4	63.8	66.2	64.5	64.2	60.6	52.9	46.3	56.8
Stockton	45.7	48.8	52.5	56.9	62.1	68.3	73.2	71.1	67.8	61.1	51.6	44.2	58.6

[1] The maximum and minimum temperatures given in this column are the highest and lowest during the entire period.

TABLE 3.—*Temperature and rainfall at the 12 experiment vineyards of the Bureau of Plant Industry in California*—Continued

PRECIPITATION (INCHES [1])

Vineyard	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Chico	6.41	3.77	5.46	1.14	0.96	0.20	T.	0.01	1.03	0.79	2.03	3.50	25.39
Colfax	13.12	7.78	11.02	3.00	2.59	.06	T.	.002	1.14	2.39	4.98	6.39	53.36
Elk Grove	3.86	2.68	2.84	1.47	.76	.13	.02	.01	.28	.78	1.95	3.80	18.78
Fresno	2.11	1.30	2.24	.77	.58	.03	.001	T.	.30	.56	.72	1.26	9.87
Geyserville	11.08	6.85	9.49	1.40	1.30	.45	T.	T.	.96	1.59	3.68	5.24	42.25
Guasti	6.05	4.30	6.40	1.29	.93	.12	.02	.01	.44	.56	.87	3.14	24.13
Livermore	4.55	2.00	3.75	.65	.57	.19	T.	.03	.31	.43	.90	2.47	15.86
Lodi	5.02	2.68	4.71	.80	1.56	.20	T.	.003	.40	.55	1.14	2.94	20.06
Mountain View	4.47	2.46	4.45	.80	.54	.18	T.	.04	.52	.51	.96	2.40	17.42
Oakville	8.07	4.42	6.57	1.10	.78	.26	T.	.01	.78	.77	2.10	3.95	28.61
Sonoma	6.60	4.91	6.6[illegible]	.74	.87	.25	.34	T.	.82	.83	2.75	4.00	28.33
Stockton	4.24	2.12	3.62	.72	.68	.14	T.	.01	.48	.42	.90	2.31	15.73

[1] T.=Trace.

GROWTH RATINGS OF PHYLLOXERA-RESISTANT STOCKS

In Table 4 (in which the parentage follows the name if the varietal designation does not give it), the upper numbers after each name in the column headed "Experiment vineyard" show the years when the vines were planted, and the lower numbers show the growth ratings, which in all cases were made in the fall of 1920, except that those at Mountain View were made in 1912 and those at Livermore in 1914. Growth ratings later than 1920 were not secured for those vineyards, which were discontinued that year.

TABLE 4.—*Tests of Phylloxera-resistant grape stocks in the 12 experiment vineyards in California, showing the number of years since vines were planted and their relative growth ratings*

Variety	Experiment vineyard											
	Chico	Colfax	Elk Grove	Fresno	Geyserville	Guasti	Livermore	Lodi	Mountain View	Oakville	Sonoma	Stockton
Adobe Giant (Vitis longii):												
Years planted	13	14	----	17	16	----	----	----	----	17	13	13
Growth rating	5−	95+	----	68	60−	----	----	----	----	75	95+	82−
(Aestivalis×monticola)×(riparia×rupestris, No. 554-5):												
Years planted	14	14	----	15	16	----	----	16	----	17	16	12
Growth rating	98+	75−	----	62−	82−	----	----	100	----	65−	92+	60−
(Aestivalis×rupestris)×riparia, No. 227:												
Years planted	14	----	10	7	----	----	----	----	7	15	15	----
Growth rating	40−	----	85−	70+	----	----	----	----	81	95+	90−	----
Alicante Bouschet×cordifolia, No. 142-B:												
Years planted	14	14	6	14	----	----	----	----	----	15	15	13
Growth rating	78−	100	95+	90−	----	----	----	----	----	95	85+	92
Alicante Bouschet×riparia, No. 141-A:												
Years planted	11	----	6	17	12	----	----	----	----	16	15	12
Growth rating	20−	----	98+	99	92	----	----	----	----	85	70	30−
Aramon×riparia, No. 143-A:												
Years planted	----	----	16	17	----	----	----	----	----	16	----	13
Growth rating	----	----	80−	92	----	----	----	----	----	85+	----	85−

TABLE 4.—*Tests of Phylloxera-resistant grape stocks in the 12 experiment vineyards in California, showing the number of years since vines were planted and their relative growth ratings*—Continued

Variety	Experiment vineyard											
	Chico	Colfax	Elk Grove	Fresno	Geyserville	Guasti	Livermore	Lodi	Mountain View	Oakville	Sonoma	Stockton
Aramon×rupestris Ganzin, No. 1:												
Years planted	13	14	16	17	16	-----	10	16	8	16	16	12
Growth rating	100	100	98+	90+	96-	-----	96	98-	93	95	95	60-
Aramon×rupestris Ganzin, No. 2:												
Years planted	13	13	16	17	16	12	10	16	8	16	16	13
Growth rating	92-	92+	98+	94	95	92+	83	60+	93	100	92-	75-
Aramon×rupestris Ganzin, No. 9:												
Years planted	14	-----	6	17	16	-----	10	-----	8	16	10	13
Growth rating	98	-----	98+	88	82	-----	88	-----	67	57-	98+	88-
Arizonica Phoenix (V. arizonica):												
Years planted	8	-----	6	-----	-----	14	-----	-----	-----	-----	-----	-----
Growth rating	98	-----	95	-----	-----	100	-----	-----	-----	-----	-----	-----
Australis (V. longii):												
Years planted	14	14	6	17	16	-----	10	-----	5	17	16	13
Growth rating	100	80	90	95+	90	-----	89	-----	60	95+	95+	90
Barnes (V. champini):												
Years planted	14	14	6	17	-----	14	7	-----	5	16	-----	13
Growth rating	100	80	60	83	-----	100	87	-----	51	100	-----	90+
Berlandieri, No. 1:												
Years planted	14	14	6	17	16	-----	10	16	8	16	16	-----
Growth rating	100	100	80-	82	92-	-----	60	100	78	70-	92+	-----
Berlandieri, No. 2:												
Years planted	14	13	6	17	16	-----	-----	-----	-----	15	-----	-----
Growth rating	95+	85+	75+	50+	90+	-----	-----	-----	-----	78	-----	-----
Berlandieri Lafont, No. 9:												
Years planted	14	-----	6	16	16	-----	9	-----	8	16	16	-----
Growth rating	92	-----	75+	65+	96	-----	83	-----	72	92	72-	-----
Berlandieri×riparia, No. 33 E. M.:												
Years planted	13	14	16	16	-----	-----	-----	16	12	16	-----	13
Growth rating	100	90	85	70+	-----	-----	-----	75+	70	90+	-----	88
Berlandieri×riparia, No. 34 E. M.:												
Years planted	14	14	5	17	16	-----	7	-----	8	16	13	13
Growth rating	92	98+	85	85	92	-----	85	-----	66	90-	90+	95+
Berlandieri×riparia, No. 157–11:												
Years planted	12	14	6	16	16	-----	-----	16	8	16	-----	13
Growth rating	100	95+	82+	80+	90+	-----	-----	90+	75	92	-----	90+
Berlandieri×riparia, No. 420–A:												
Years planted	13	13	6	17	16	14	4	16	8	16	15	13
Growth rating	95+	96	90+	90	90+	95+	33	100	88	92-	100	90-
Berlandieri×riparia, No. 420–B:												
Years planted	8	13	6	16	-----	-----	7	16	8	16	-----	-----
Growth rating	80+	88	90+	85+	-----	-----	85	95+	94	88	-----	-----
(Bourisquou×rupestris, No. 601)× Calcicola, No. 13205:												
Years planted	14	-----	6	17	13	-----	9	-----	-----	15	-----	-----
Growth rating	92-	-----	90-	82-	100	-----	91	-----	-----	95+	-----	-----
Cabernet×berlandieri, No. 333 (E. M.):												
Years planted	14	-----	6	16	16	-----	10	10	8	16	-----	13
Growth rating	100	-----	88-	88+	92+	-----	77	92	91	93+	-----	75-
Cabernet×rupestris Ganzin, No. 33–A:												
Years planted	11	-----	-----	16	16	12	10	-----	8	16	15	-----
Growth rating	90+	-----	-----	93	92-	92+	87	-----	83	95+	80	-----
Chasselas×berlandieri, No. 41–B:												
Years planted	14	-----	-----	16	16	-----	-----	-----	8	16	13	13
Growth rating	98+	-----	-----	88+	98+	-----	-----	-----	69	75-	65-	90-
(Cinerea×rupestris)×riparia, No. 229:												
Years planted	14	-----	6	15	-----	-----	-----	-----	-----	15	-----	12
Growth rating	70	-----	82-	88	-----	-----	-----	-----	-----	93+	-----	40-
Columbaud×riparia, No. 2502: ;												
Years planted	14	-----	-----	16	-----	-----	7	-----	5	16	13	13
Growth rating	100	-----	-----	85-	-----	-----	74	-----	80	75-	80-	85
Columbaud×rupestris:												
Years planted	-----	-----	-----	-----	-----	-----	7	-----	-----	17	13	-----
Growth rating	-----	-----	-----	-----	-----	-----	94	-----	-----	98	98	-----
Cordifolia×riparia, No. 125–1:												
Years planted	13	-----	6	16	-----	-----	8	-----	-----	16	13	-----
Growth rating	95	-----	88	91-	-----	-----	81	-----	-----	95+	90+	-----

TABLE 4.—*Tests of Phylloxera-resistant grape stocks in the 12 experiment vineyards in California, showing the number of years since vines were planted and their relative growth ratings*—Continued

Variety	Experiment vineyard											
	Chico	Colfax	Elk Grove	Fresno	Geyserville	Guasti	Livermore	Lodi	Mountain View	Oakville	Sonoma	Stockton
Cordifolia×rupestris:												
Years planted	14	6	15	-----	-----	-----	9	-----	7	-----	-----	-----
Growth rating	80−	85−	80+	-----	-----	-----	88	-----	60	-----	-----	-----
De Grasset (V. champini):												
Years planted	14	13	6	17	14	-----	-----	-----	-----	17	13	13
Growth rating	95−	90−	98+	95+	98	-----	-----	-----	-----	100	95+	90−
Dog Ridge (V. champini):												
Years planted	14	14	6	17	16	14	10	-----	8	17	16	13
Growth rating	100	100	82−	92	85−	100	94	-----	98	98+	90−	40−
Hotporup (Solonis×linsecomii):												
Years planted	13	-----	-----	17	16	-----	10	-----	8	17	16	-----
Growth rating	100	-----	-----	83	92	-----	84	-----	74	89−	80−	-----
Joly (V. champini):												
Years planted	14	14	6	17	13	12	-----	-----	-----	17	13	-----
Growth rating	100	95	82−	85−	90	95+	-----	-----	-----	98+	95	-----
Judge (V. doaniana):												
Years planted	14	14	6	17	13	14	8	-----	5	17	13	-----
Growth rating	100	90+	90+	88−	82+	96+	66	-----	80	80	75	-----
Monticola×riparia, No. 554:												
Years planted	8	-----	6	16	16	-----	10	16	8	16	16	13
Growth rating	95+	-----	98+	60−	82−	-----	84	85−	80	96+	92+	85−
Monticola×riparia, No. 18804:												
Years planted	14	14	6	16	-----	-----	9	16	8	16	16	13
Growth rating	95+	90	92+	97+	-----	-----	90	95	81	88−	92−	95−
Monticola×riparia, No. 18808:												
Years planted	13	14	6	16	-----	-----	9	16	8	16	16	13
Growth rating	92−	98+	92	93+	-----	-----	90	95+	86	81−	92	90
Monticola×riparia, No. 18815:												
Years planted	14	14	6	16	-----	-----	10	-----	8	16	16	12
Growth rating	100	100	95+	70+	-----	-----	95	-----	86	86−	95−	90+
Monticola×rupestris:												
Years planted	13	14	6	17	14	14	-----	-----	-----	17	14	13
Growth rating	80−	100	88−	83−	90+	88+	-----	-----	-----	80	85−	50−
Motley (V. doaniana):												
Years planted	14	14	-----	-----	16	-----	8	-----	8	17	-----	-----
Growth rating	95−	100	-----	-----	78−	-----	76	-----	90	80+	-----	-----
Mourvedre×rupestris, No. 1202:												
Years planted	14	14	6	17	16	14	10	16	8	17	16	12
Growth rating	95+	90−	95−	98	98−	100	98	100	95	90−	80−	98−
Mourvedre×rupestris, No. 1203:												
Years planted	14	13	6	14	14	-----	8	-----	-----	14	14	-----
Growth rating	92−	80−	98	98	92	-----	81	-----	-----	98+	90−	-----
Pinot Bouschet×riparia, No. 3001:												
Years planted	13	-----	-----	16	-----	-----	-----	-----	-----	16	13	13
Growth rating	100	-----	-----	95+	-----	-----	-----	-----	-----	75−	90−	80+
Pinot×rupestris, No. 1305:												
Years planted	13	14	-----	15	15	12	10	15	8	16	15	13
Growth rating	100	90−	-----	90−	90+	100	96	100	94	95−	98+	98−
Ponroy:												
Years planted	14	13	-----	17	-----	13	-----	-----	-----	17	-----	-----
Growth rating	100	80	-----	90	-----	98	-----	-----	-----	95	-----	-----
Ramsey (V. rupestris×candicans):												
Years planted	14	13	6	17	-----	12	4	-----	6	17	-----	-----
Growth rating	98+	90−	92	95−	-----	100	85	-----	94	98	-----	-----
Riparia du Colorado:												
Years planted	13	-----	-----	17	16	12	9	16	8	17	16	-----
Growth rating	50−	-----	-----	70−	40−	92+	51	95+	66	50−	80+	-----
Riparia France:												
Years planted	14	-----	-----	16	-----	13	10	16	-----	-----	16	13
Growth rating	60+	-----	-----	93+	-----	95+	74	92	-----	-----	95+	60−
Riparia Gloire:												
Years planted	13	14	6	17	-----	14	10	-----	-----	17	16	13
Growth rating	25−	92+	86	89+	-----	95+	82	-----	-----	65−	95+	30−
Riparia Grand Glabre:												
Years planted	11	-----	6	16	-----	14	10	-----	8	17	16	13
Growth rating	95+	-----	90+	90+	-----	100	82	-----	74	50−	90	80
Riparia a Grand Feuilles:												
Years planted	14	-----	6	17	-----	-----	-----	-----	-----	17	16	-----
Growth rating	20	-----	86	80	-----	-----	-----	-----	-----	60	95	-----

TABLE 4.—*Tests of Phylloxera-resistant grape stocks in the 12 experiment vineyards in California, showing the number of years since vines were planted and their relative growth ratings*—Continued

Variety	Experiment vineyard											
	Chico	Colfax	Elk Grove	Fresno	Geyserville	Guasti	Livermore	Lodi	Mountain View	Oakville	Sonoma	Stockton
Riparia Martineau:												
Years planted	14	----	----	----	----	----	----	----	----	16	----	----
Growth rating	100	----	----	----	----	----	----	----	----	60−	----	----
Riparia Ramond:												
Years planted	8	----	----	----	----	14	----	----	----	14	----	----
Growth rating	92+	----	----	----	----	95	----	----	----	67−	----	----
Riparia Selected:												
Years planted	----	----	----	----	----	----	----	----	----	15	----	----
Growth rating	----	----	----	----	----	----	----	----	----	50−	----	----
Riparia×berlandieri, No. 161–49:												
Years planted	14	13	6	----	----	----	----	----	5	16	----	----
Growth rating	100	92−	80−	----	----	----	----	----	87	92	----	----
Riparia×(cordifolia×rupestris), No. 106–8:												
Years planted	14	14	6	16	16	----	10	16	8	16	16	13
Growth rating	40−	98−	95	90+	92+	----	76	95−	72	80−	92−	92−
Riparia Grand Glabre×Aramon rupestris, No. 4110:												
Years planted	14	----	----	16	----	----	10	16	----	16	16	12
Growth rating	98+	----	----	82+	----	----	92	100	----	80−	95−	30−
Riparia×rupestris, No. 101:												
Years planted	14	14	6	16	16	----	10	16	8	16	16	13
Growth rating	85+	60−	85−	90−	98+	----	91	100	65	90+	90	92+
Riparia×rupestris, No. 101–14:												
Years planted	14	14	6	16	16	14	10	16	8	16	16	13
Growth rating	95	90−	82+	88−	88+	78−	90	100	86	90+	98	88−
Riparia×rupestris, No. 108–103:												
Years planted	8	14	6	----	14	----	----	----	----	15	14	13
Growth rating	90+	98+	95+	----	90	----	----	----	----	69−	95−	50−
Riparia×rupestris, No. 3306:												
Years planted	13	14	6	16	16	12	10	16	8	16	16	13
Growth rating	98+	95	85−	90	92	98+	77	50−	91	84+	92+	90−
Riparia×rupestris, No. 3309:												
Years planted	14	14	6	16	16	12	10	16	8	16	16	13
Growth rating	100	85−	90−	95+	85−	95+	79	90−	88	83−	90	95
Riparia×rupestris de Jaeger:												
Years planted	11	14	----	16	----	12	----	----	----	16	16	----
Growth rating	98+	90−	----	90	----	85−	----	----	----	95+	95−	----
Riparia × (rupestris×Aramon) Jaeger, No. 201:												
Years planted	14	14	----	16	16	12	10	16	8	16	16	13
Growth rating	100	80−	----	88	98−	90+	95	92+	67	95−	90−	98−
Riparia×rupestris Ramond:												
Years planted	14	----	----	----	----	----	----	----	----	16	----	----
Growth rating	92+	----	----	----	----	----	----	----	----	60−	----	----
Rupestris des Causettes:												
Years planted	14	14	6	17	16	14	10	16	8	17	16	13
Growth rating	90−	90−	92+	85−	92	92+	85	88−	78	88−	85−	88−
Rupestris des Semis, No. 81–2:												
Years planted	13	14	6	16	----	----	7	----	5	16	----	13
Growth rating	100	85−	95+	92+	----	----	96	----	81	92−	----	92−
Rupestris Ganzin:												
Years planted	14	----	6	----	----	----	----	----	----	14	----	----
Growth rating	96+	----	90+	----	----	----	----	----	----	92+	----	----
Rupestris Le Reux:												
Years planted	14	----	6	----	----	14	----	----	----	14	----	----
Growth rating	82+	----	90+	----	----	90+	----	----	----	96+	----	----
Rupestris Martin:												
Years planted	14	13	----	17	16	14	10	16	9	17	16	13
Growth rating	92+	85+	----	75−	92−	80	92	100	75	85	90+	90+
Rupestris Metallica:												
Years planted	14	14	6	17	16	15	10	16	8	17	14	----
Growth rating	100	85−	85−	88−	92+	95	93	98+	82	99+	70−	----
Rupestris Mission:												
Years planted	14	14	6	16	15	----	10	----	8	17	16	13
Growth rating	90	85−	92+	50−	90+	----	88	----	74	94+	82+	60−
Rupestris Othello:												
Years planted	14	----	6	16	----	----	7	----	----	16	----	13
Growth rating	95+	----	92	75+	----	----	65	----	----	80−	----	82

TABLE 4.—*Tests of Phylloxera-resistant grape stocks in the 12 experiment vineyards in California, showing the number of years since vines were planted and their relative growth ratings*—Continued

Variety	Experiment vineyard											
	Chico	Colfax	Elk Grove	Fresno	Geyserville	Guasti	Livermore	Lodi	Mountain View	Oakville	Sonoma	Stockton
Rupestris Pillans:												
Years planted	14	14	6	15	14	14	9	-----	7	15	15	13
Growth rating	98+	100	95+	92−	90	96+	92	-----	80	90	95+	82+
Rupestris St. George:												
Years planted	14	14	6	17	16	14	10	16	8	17	16	13
Growth rating	98−	98−	95	90−	98	100	98	100	87	94−	95+	98
Rupestris×berlandieri, No. 219-A:												
Years planted	14	14	6	17	16	14	10	16	8	17	16	13
Growth rating	98	85−	90−	88−	90+	88−	88	100	73	90−	95	90−
Rupestris×berlandieri, No. 301-A:												
Years planted	14	14	6	17	16	-----	10	-----	5	17	16	13
Growth rating	92+	90−	60−	82	88	-----	85	-----	88	87	98+	85−
Rupestris×berlandieri, No. 301-B:												
Years planted	14	13	-----	-----	16	-----	-----	-----	7	-----	-----	-----
Growth rating	98+	80−	-----	-----	92	-----	-----	-----	87	-----	-----	-----
Rupestris×berlandieri, No. 301-37-152:												
Years planted	14	13	6	16	-----	-----	8	-----	5	16	-----	-----
Growth rating	98+	90+	88−	92+	-----	-----	84	-----	82	76−	-----	-----
Rupestris×Chasselas Rose, No. 4401:												
Years planted	14	14	6	-----	-----	-----	-----	-----	-----	13	-----	-----
Growth rating	95−	100	100	-----	-----	-----	-----	-----	-----	100	-----	-----
Rupestris×Cinerea:												
Years planted	11	13	6	16	-----	-----	-----	-----	5	13	-----	13
Growth rating	90+	85+	90	90	-----	-----	-----	-----	85	99+	-----	90
Rupestris×cordifolia, No. 107-11:												
Years planted	14	13	6	16	-----	-----	-----	-----	-----	15	15	-----
Growth rating	95	95	85	93	-----	-----	-----	-----	-----	90	95	-----
Rupestris×(cordifolia×rupestris, No. 202):												
Years planted	13	13	-----	16	-----	-----	-----	-----	5	16	16	13
Growth rating	88+	92+	-----	92+	-----	-----	-----	-----	82	95+	92	40−
Rupestris×(cordifolia×rupestris, No. 202-5):												
Years planted	-----	14	-----	16	14	-----	8	-----	-----	-----	14	-----
Growth rating	-----	95	-----	92+	78	-----	50	-----	-----	-----	90−	-----
Rupestris×Azemar, No. 215:												
Years planted	13	13	-----	16	15	-----	10	15	7	16	16	-----
Growth rating	82−	95+	-----	90+	78−	-----	74	30−	70	80−	97−	-----
Rupestris×Petit Bouschet, No. 503:												
Years planted	14	-----	-----	-----	-----	-----	10	-----	-----	-----	-----	-----
Growth rating	60−	-----	-----	-----	-----	-----	91	-----	-----	-----	-----	-----
Rupestris×Petit Bouschet Jaeger, No. 504:												
Years planted	14	-----	-----	-----	16	-----	8	-----	-----	16	13	-----
Growth rating	100	-----	-----	-----	85−	-----	90	-----	-----	90	85−	-----
Rupestris×riparia, No. 108-16:												
Years planted	8	-----	6	16	-----	-----	-----	-----	-----	16	16	-----
Growth rating	95+	-----	90−	88+	-----	-----	-----	-----	-----	71−	95+	-----
Salt Creek (V. doaniana):												
Years planted	14	14	6	17	16	-----	9	-----	8	17	-----	12
Growth rating	100	90+	90−	90+	90	-----	77	-----	68	90+	-----	72−
Solonis Ordinaire:												
Years planted	-----	-----	5	17	-----	-----	-----	-----	-----	-----	-----	13
Growth rating	-----	-----	88+	83	-----	-----	-----	-----	-----	-----	-----	50−
Solonis Robusta:												
Years planted	14	14	6	17	16	14	10	16	8	17	16	13
Growth rating	28−	72−	82−	85	40−	98+	83	92−	90	86+	95+	90−
Solonis×(cordifolia×rupestris, No. 202-4):												
Years planted	11	13	6	16	-----	-----	8	-----	-----	14	-----	-----
Growth rating	90+	95	88	88	-----	-----	76	-----	-----	90+	-----	-----
Solonis×Othello, No. 1613:												
Years planted	14	13	6	17	16	14	9	16	8	16	16	13
Growth rating	98−	98+	90	100	95+	100	88	90+	88	98−	100	90−
Solonis×riparia, No. 1615:												
Years planted	14	14	6	16	-----	-----	-----	16	5	16	16	13
Growth rating	80−	85−	90−	93+	-----	-----	-----	100	83	93	92−	95−

TABLE 4.—*Tests of Phylloxera-resistant grape stocks in the 12 experiment vineyards in California, showing the number of years since vines were planted and their relative growth ratings*—Continued

Variety	Experiment vineyard											
	Chico	Colfax	Elk Grove	Fresno	Geyserville	Guasti	Livermore	Lodi	Mountain View	Oakville	Sonoma	Stockton
Solonis×riparia, No. 1616:												
Years planted	14	14	6	16	16	12	10	----	8	16	16	13
Growth rating	80−	95+	95+	96+	92+	100	80	----	80	50	95	98
Taylor Narbonne (V. riparia):												
Years planted	14	13	6	16	16	12	10	----	8	16	16	13
Growth rating	88+	70+	85+	92+	95	78+	70	----	71	88+	96+	80−
Tisserand:												
Years planted	14	----	6	16	----	----	----	16	----	16	----	----
Growth rating	100	----	88	90	----	----	----	92	----	90	----	----
Vermorel (V. berlandieri×candicans):												
Years planted	14	14	5	----	17	12	----	----	----	17	----	----
Growth rating	95+	95+	95+	----	95+	100	----	----	----	90	----	----
Viala (V. riparia×labrusca):												
Years planted	14	13	----	16	----	----	10	----	----	17	13	13
Growth rating	95+	92	----	90+	----	----	71	----	----	100	60−	95
Viala×riparia (V. riparia×labrusca) ×riparia:												
Years planted	----	----	----	16	----	----	10	----	7	16	15	----
Growth rating	----	----	----	80+	----	----	70	----	78	50−	98+	----
Vitis candicans:												
Years planted	----	----	----	9	----	----	----	----	8	16	----	----
Growth rating	----	----	----	88+	----	----	----	----	65	80+	----	----
York×rupestris Ganzin, No. 212:												
Years planted	----	----	----	16	----	----	----	16	----	16	----	13
Growth rating	----	----	----	90−	----	----	----	85−	----	96+	----	85−

The growth or adaptability of each variety at each vineyard where it is under test is expressed in the form of a percentage rating on a scale in which the growth of the variety under conditions to which it is well adapted is taken as the standard of excellence, 100 per cent.

Therefore, these adaptability ratings represent the behavior of each variety under the conditions existing at the several vineyards expressed in terms that permit comparison with its behavior elsewhere. They are not based on a comparison with other varieties in the same vineyard. Each variety is therefore rated on a scale based on its own standard of excellence, rather than on an arbitrary scale formulated for application to all varieties. It is believed that this method renders a truer expression of the reaction of each variety to different soil and climatic conditions than would be possible were an arbitrary scale of growth measurement used.

To illustrate, Aramon×rupestris Ganzin, No. 2, planted at each of three experiment vineyards in 1904, at Oakville was rated 100, at Livermore 83, and at Lodi only 60. This shows that at Oakville the growth was most satisfactory and was therefore rated 100; at Livermore the growth was good but not nearly so good as at Oakville and was rated at 83; at Lodi it made a poor growth, which as compared with the perfect growth made at Oakville was as 60 to 100, i. e., 60 per cent.

The minus sign after a rating indicates that in previous years the vines had much higher rating but are steadily on the decline, whereas the plus sign shows they formerly had lower ratings which improved as the vines matured. Where no sign occurs such ratings were constant. This shows that some vine varieties start into growth and develop rapidly but speedily prove worthless; others take hold and develop slowly at first, but later prove most valuable as sturdy, safe, and constant vine varieties. Resistance to the phylloxera is, of course, an all-important consideration, and while these ratings may serve as a fairly safe guide in the selection of resistant stocks, nevertheless the writer wishes to stress the fact that these tests have been under way only 20 years, and there have been many instances in California where viniferas on their own roots under very favorable conditions have resisted phylloxera for an even longer time.

A number of the resistant-stock varieties have been growing a sufficient time to show what may be expected of them under similar conditions. In the following list of stocks worthy of special mention for having made excellent growth ratings at each of the 12 California experiment vineyards, the varieties are given in the order of their ratings, beginning with the best growers:

Chico Varietal Vineyard.—Aramon×rupestris Ganzin, No. 1; Constantia; Dog Ridge (champini); (aestivalis×monticola)×(riparia×rupestris, No. 554–5); Lenoir; monticola×riparia, No. 18815; Salt Creek; australis (longii); riparia×berlandieri, No. 161–49; Mourvedre×rupestris, No. 1202; Solonis×Othello, No. 1613; rupestris St. George; rupestris Pillans.

Colfax Experiment Vineyard.—Lenoir; Dog Ridge (champini); Aramon×rupestris Ganzin, No. 1; Mourvedre×rupestris, No. 1202; monticola×riparia, No. 18815; monticola×rupestris; rupestris Pillans; rupestris St. George; monticola×riparia, No. 18808; berlandieri×riparia, No. 34 E. M.; riparia×(cordifolia×rupestris), No. 106–8; Constantia; Solonis×riparia, No. 1616; Solonis×Othello, No. 1613; riparia×rupestris, No. 101–14; Salt Creek.

Elk Grove Experiment Vineyard.—Aramon×rupestris Ganzin, No. 1; Lenoir; Aramon×rupestris Ganzin, No. 2; Dog Ridge (champini); Constantia; (aestivalis×monticola)×(riparia×rupestris, No. 554–5); monticola×riparia, No. 18815; rupestris St. George; Solonis×Othello, No. 1613; Solonis×riparia, No. 1616; monticola×riparia, No. 18804; riparia×rupestris, No. 108–103; riparia×(cordifolia×rupestris), No. 106–8; rupestris×berlandieri, No. 219–A; riparia×rupestris, No. 3309; berlandieri×riparia, No. 420–A; Mourvedre×rupestris, No. 1202; Salt Creek.

Fresno Experiment Vineyard.—Solonis×Othello, No. 1613; Mourvedre×rupestris, No. 1202; Constantia; monticola×riparia, No. 18815; australis (longii); Aramon×rupestris Ganzin, No. 2; Dog Ridge (champini); Solonis×riparia, No. 1616; berlandieri×riparia, No. 34 E. M.; rupestris×cordifolia, No. 107–11; riparia×rupestris, No. 3309; cordifolia×riparia, No. 125–1; monticola×riparia No. 18804; rupestris St. George; riparia×rupestris, No. 101; berlandieri×riparia, No. 420–A; Salt Creek; riparia×(cordifolia×rupestris), No. 106–8.

Geyserville Experiment Vineyard.—Mourvedre×rupestris, No. 1202; rupestris St. George; Lenoir; riparia×rupestris, No. 101; Aramon×rupestris Ganzin, No. 1; Dog Ridge (champini); Solonis×Othello, No. 1613; Aramon×rupestris Ganzin, No. 2; Solonis×riparia, No. 1616; riparia×rupestris, No. 3306; riparia×(cordifolia×rupestris), No. 106–8; berlandieri×riparia, No. 33 E. M.; monticola×rupestris; berlandieri×riparia, No. 420–A; Salt Creek.

Guasti Experiment Vineyard.—Solonis×Othello, No. 1613; Constantia; Solonis×riparia, No. 1616; Dog Ridge (champini); Mourvedre×rupestris, No. 1202; rupestris St. George; riparia Gloire; riparia×rupestris, No. 3306, riparia×rupestris, No. 3309; Lenoir; Aramon×rupestris Ganzin, No. 2.

Livermore Experiment Vineyard.—Mourvedre×rupestris, No. 1202; rupestris St. George; Aramon×rupestris Ganzin, No. 1; monticola×riparia, No. 18815; Dog Ridge (champini); riparia×rupestris, No. 101–14; monticola×riparia, No. 18804; riparia×rupestris, No. 101; Solonis×Othello, No. 1613; berlandieri×riparia, No. 34 E. M.

Lodi Experiment Vineyard.—Solonis×Othello, No. 1613; Mourvedre× rupestris, No. 1202; (aestivalis×monticola)×(riparia×rupestris, No. 554–5); riparia×rupestris, No. 101–14; rupestris×berlandieri, No. 219–A; rupestris St. George; riparia×rupestris, No. 101; berlandieri×riparia, No. 420–A; Aramon×rupestris Ganzin, No. 1; monticola×riparia, No. 18804; monticola× riparia, No. 18808; riparia×(cordifolia×rupestris), No. 106–8.

Mountain View Experiment Vineyard.—Dog Ridge (champini); Mourvedre× rupestris, No. 1022; Aramon×rupestris Ganzin, No. 1; Aramon×rupestris Ganzin, No. 2; riparia×rupestris, No. 3306; Solonis×Othello, No. 1613; riparia× rupestris, No. 3309; rupestris×berlandieri, No. 301–A; Solonis×riparia, No. 1616; rupestris St. George; monticola×riparia, No. 18815; berlandieri×riparia, No. 420–A.

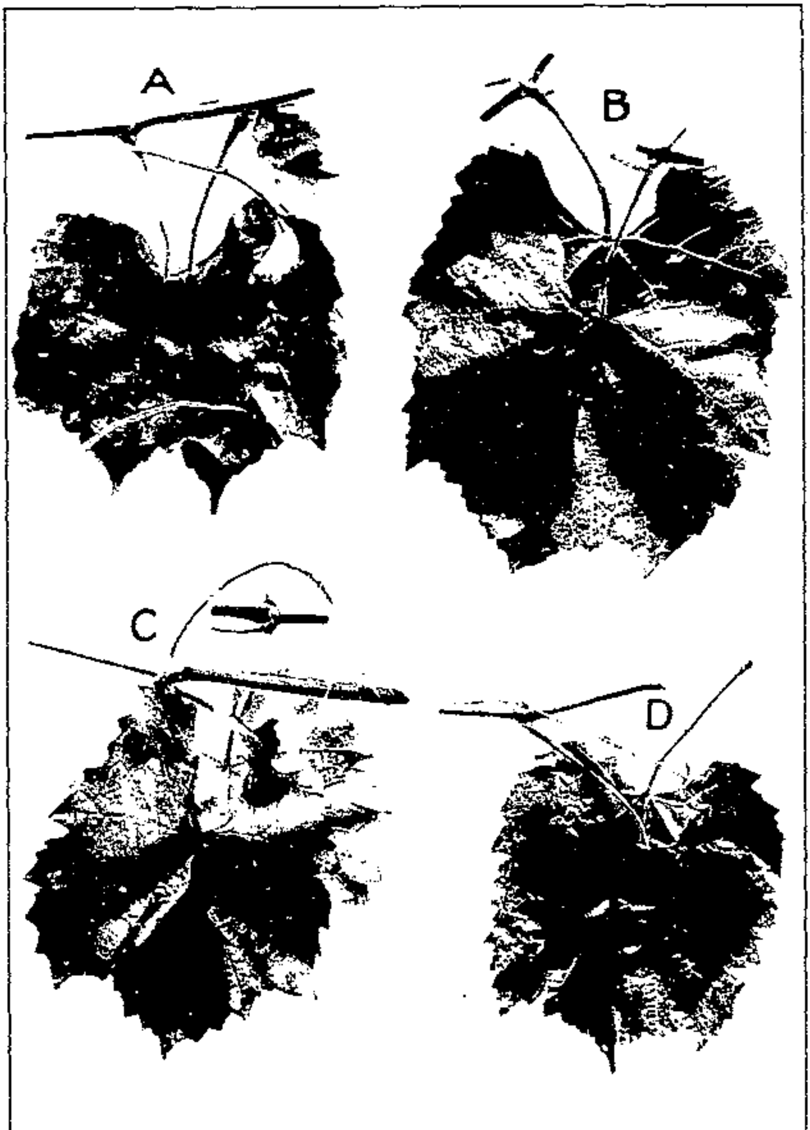
Oakville Experiment Vineyard.—Aramon×rupestris Ganzin, No. 2; Constantia; berlandieri×riparia, No. 33 E. M.; Dog Ridge (champini); Aramon×rupestris Ganzin, No. 1; Solonis×Othello, No. 1613; (aestivalis×monticola)×(riparia× rupestris, No. 554–5); riparia×rupestris, No. 101–14; riparia×rupestris, No. 101; riparia×rupestris, 108–103; australis (longii); rupestris St. George; Salt Creek; berlandieri×riparia, No. 34 E. M.; cordifolia×riparia, No. 125–1; berlandieri× riparia, No. 420–A; Mourvedre×rupestris, No. 1202; Lenoir; rupestris×berlandieri, No. 219–A; monticola×riparia, No. 18815; riparia×rupestris, No. 3306; riparia×rupestris, No. 3309.

Sonoma Experiment Vineyard.—Solonis×Othello, No. 1613; berlandieri× riparia, No. 420–A; Lenoir; rupestris×berlandieri, No. 301–A; riparia×rupestris, No. 101–14; Aramon×rupestris Ganzin, No. 1; monticola×riparia, No. 18815; riparia×rupestris, No. 108–103; rupestris×berlandieri, No. 219–A; rupestris St. George; Solonis×riparia, No. 1616; Dog Ridge (champini); australis (longii); monticola×riparia, No. 18804; riparia Gloire; riparia×(cordifolia×rupestris), No. 106–8; Mourvedre×rupestris, No. 1202; berlandieri×riparia, No. 34 E. M.; riparia×rupestris, No. 101; cordifolia×riparia, No. 125–1; riparia×rupestris, No. 3306; riparia×rupestris, No. 3309.

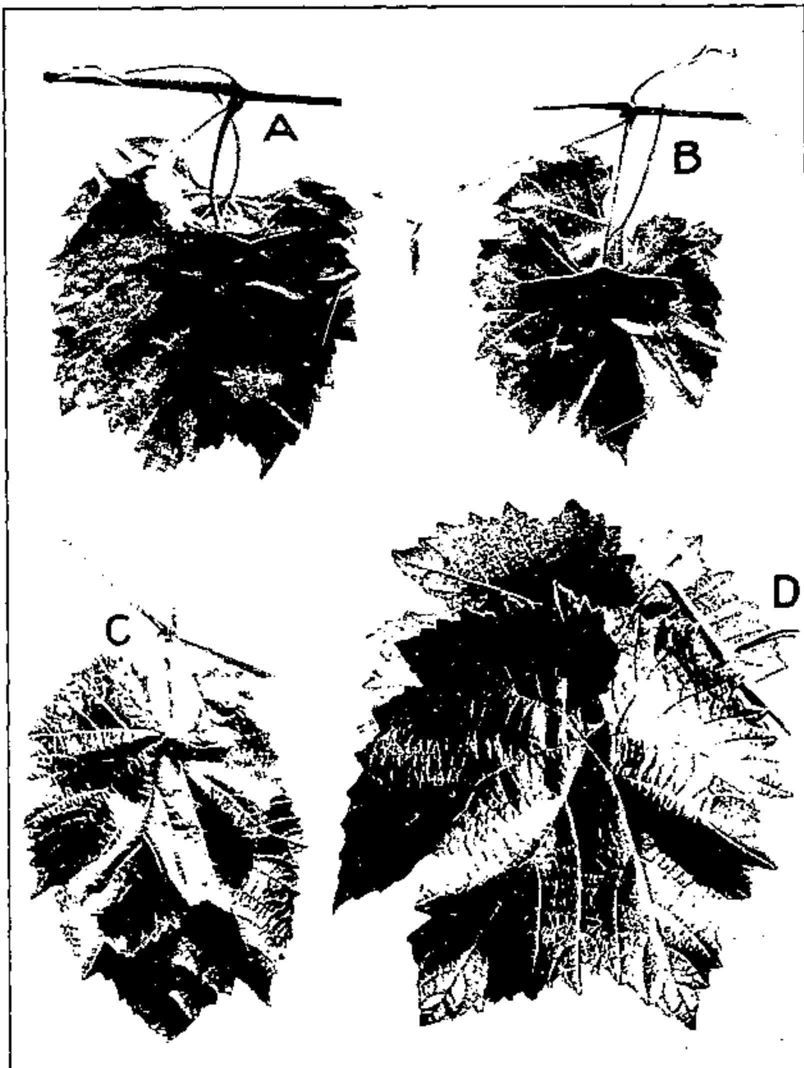
Stockton Experiment Vineyard.—Rupestris St. George; Solonis×riparia, No. 1616; berlandieri×riparia, No. 34 E. M.; riparia×rupestris, No. 3309; monticola×riparia, No. 18804; riparia×rupestris, No. 101; riparia×(cordifolia× rupestris), No. 106–8; Mourvedre×rupestris, No. 1202; monticola×riparia, No. 18815; Constantia; Dog Ridge (champini); Lenoir; Solonis×Othello, No. 1613; rupestris×berlandieri, No. 219–A; berlandieri×riparia, No. 420–A; Aramon× rupestris Ganzin, No. 2.

Table 5 gives the resistant varieties in each vineyard which are estimated to have made the most creditable growth records as compared with all the varieties tested. The number on the line with each name in the vineyard column shows the relative growth rating made by the variety in the respective vineyards where it is being tested. The highest rating is expressed by the figure 1, the next by 2, and so on. The ratings represent the behavior of each variety under the conditions existing at the several vineyards, expressed in terms that permit comparison with its behavior elsewhere and in comparison also with other varieties in the same vineyard. To illustrate: Of all the varieties at Livermore, the best records were made by Mourvedre ×rupestris, No. 1202 (rated as 1), whereas at Stockton it was eighth best (expressed by 8), and at Sonoma seventeenth best (expressed by 17).

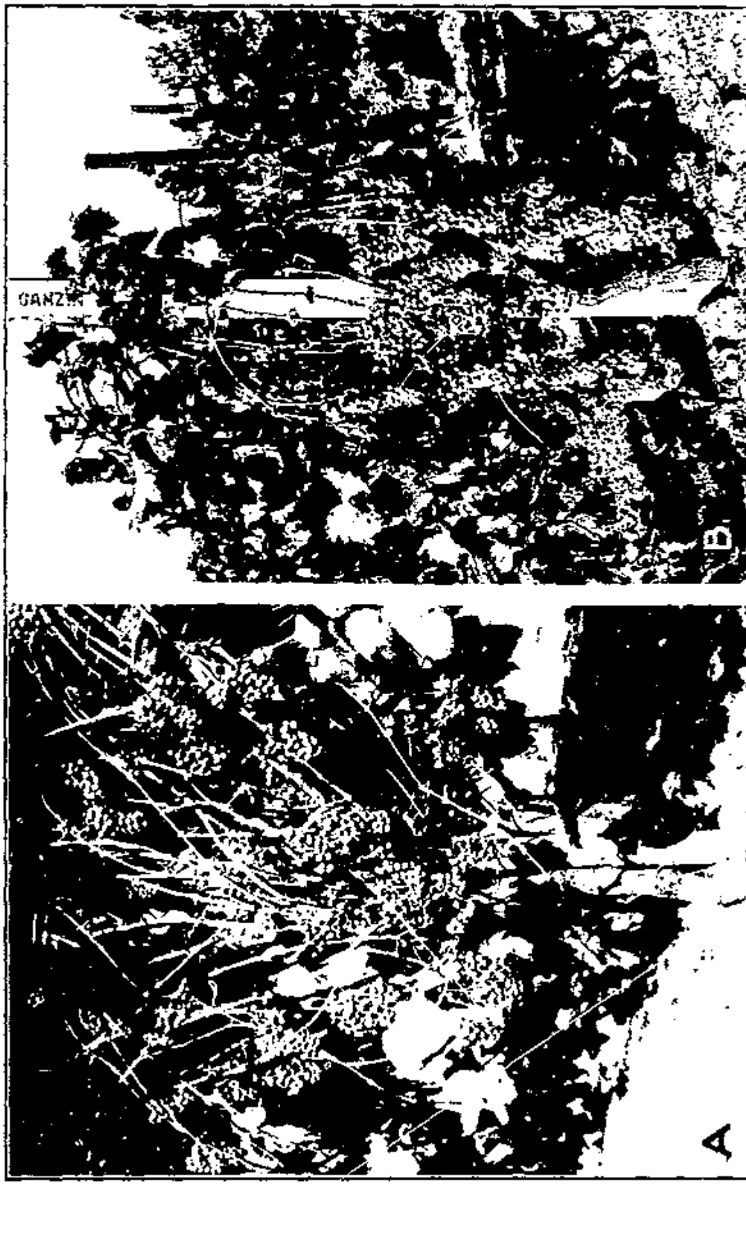
Upper and lower sides of leaves of four native American species of grapes extensively used as stocks: A, *Vitis rupestris*, one-fourth natural size; B, *V. aestivalis*, one-fourth natural size; C, *V. labrusca*, one-seventh natural size; D, *V. riparia*, two-fifths natural size



Upper and lower sides of leaves of four hybrids originated in France and extensively used as stocks A, Riparia×rupestris, No. 3306, one-eighth natural size. B, Mourvedre×rupestris, No. 1202, five-sixteenths natural size; C, riparia×rupestris, No. 101, five-fourteenths natural size; D, riparia×rupestris, No. 3309, one-third natural size



Upper and lower sides of leaves of four grape hybrids used as stocks on which to graft vinifera varieties, A, B, and C, having originated in France and D in the United States. A, Monticola × riparia, No. 18808, one-sixth natural size; B, cordifolia × riparia, No. 125-1, one eighth natural size; C, berlandieri × riparia, No. 420-A, one-sixth natural size; D, linsecomii × (labrusca × vinifera), one-eleventh natural size



A, A direct producer of American origin on its own roots (Norton); B, a direct producer of French origin on its own roots (Alicante-Ganzin)

TABLE 5.—*Resistant-stock varieties of grapes making the best growth records, showing their relative merits in each of the 12 experiment vineyards in California*

Variety	Chico	Colfax	Elk Grove	Fresno	Geyserville	Guasti	Livermore	Lodi	Mountain View	Oakville	Sonoma	Stockton
(Aestivalis×monticola)×(riparia×rupestris, No. 554-5)	4		6					3		7		
Aramon×rupestris Ganzin, No. 1	1	3	1		5		3	9	3	5	6	
Aramon×rupestris Ganzin, No. 2			3	6	8	11			4	1		16
Australis (longii)	8			5						11	18	
Berlandieri×riparia, No. 33 E. M.					12					3		
Berlandieri×riparia, No. 34 E. M.		10		9			10			14	18	3
Berlandieri×riparia, No. 420-A			17	16	14			8	12	16	2	15
Constantia	2	12	5	3		2				2		10
Cordifolia×riparia, No. 125-1				12						15	20	
Dog Ridge (champini)	3	2	4	7	6	4	5		1	4	12	11
Lenoir	5	1	2		3	10				18	3	12
Monticola×riparia, No. 18804			11	13			7	10			14	5
Monticola×riparia, No. 18808		9	12					11				
Monticola×riparia, No. 18815	6	5	7	4			4		11	20	7	9
Monticola×rupestris		6			13							
Mourvedre×rupestris, No. 1202	10	4	18	2	1	5	1	2	2	17	17	8
Riparia Gloire						7					16	
Riparia×berlandieri, No. 161-49	9											
Riparia×rupestris, No. 101				15	4		8	7		9	19	6
Riparia×rupestris, No. 101-14		15					6	4		8	5	
Riparia×rupestris, No. 108-103		10	13							10	8	
Riparia×rupestris, No. 3306					10	8			5	21	21	
Riparia×rupestris, No. 3309			16	11		9			7	22	22	4
Riparia×(cordifolia×rupestris), No. 106-8		11	14	18	11			12			15	7
Rupestris Pillans	13	7										
Rupestris St. George	12	8	8	14	2	6	2	6	10	12	10	1
Rupestris×berlandieri, No. 219-A			15					5		19	9	14
Rupestris×berlandieri, No. 301-A									8		4	
Rupestris×cordifolia, No. 107-11				10								
Salt Creek	7	16	19	17	15					13		
Solonis×Othello, No. 1613	11	14	9	1	7	1	9	1	6	6	1	13
Solonis×riparia, No. 1616		13	10	8	9	3			9		11	2

VALUE AND USE OF HYBRIDS

In the attempts to obtain resistants suited to soil, climatic, and other conditions and which at the same time would prove congenial, lasting, and productive stocks on which to graft the vinifera varieties, many difficulties were encountered. For instance, the stock may be adapted to the soil, but it may be so hard to root as to make its commercial use impracticable. Again, the stock may be suited to the soil and it may root easily and be resistant, but not congenial to or make a lasting junction with vinifera varieties; or the congeniality of the variety may be good but the fruitfulness of the graft may be impaired.

In many cases also no resistant species are exactly suited to the soil and climatic conditions. To overcome such difficulties and others of like nature, hybrids have been and are being produced, in the breeding of which such of the American species were selected as possessed the various qualities desired. (Pls. 8 and 9.) In this work some remarkable successes have been achieved, such, for instance, as riparia×rupestris, No. 101; riparia×rupestris, No. 3306; riparia×rupestris, No. 3309; Solonis×Othello, No. 1613; rupestris×cordifolia, Nos. 107–11; riparia×(cordifolia×rupestris), No. 106–8; rupestris×berlandieri, No. 301–A; berlandieri×riparia, No. 420–A; and monticola×riparia, No. 18808.

Establishing vineyards on phylloxera-resistant stocks is accomplished in two entirely different ways.

(1) Resistant stocks, either cuttings or young rooted vines from the nursery, are bench grafted with the desired vinifera varieties and grown in the nursery for one year; or resistant stocks growing in the nursery are grafted with the desired vinifera varieties and allowed to remain in the nursery one year. The following spring the grafted vines obtained in either way are used in direct vineyard plantings.

(2) Resistant stock varieties are planted directly in the vineyard and when thoroughly established are grafted with the desired vinifera varieties where they are to grow.

Experiments with various resistant stocks show them to be valuable only in soils and under other conditions to which they are suited. Some have been found too difficult to root from cuttings, which makes them expensive for use in bench grafting; others, rooting easily as cuttings, do not bench graft successfully; and some stocks are suitable for direct vineyard plantings only; all of which are important considerations in the cost of establishing resistant vineyards.

Table 6 gives a list of the more useful and valuable resistant stock varieties and gives the determinations obtained by observation of and experimentation on the more valuable of such hybrid resistant stocks, the soil conditions for which they are best suited, their rooting percentages as cuttings, and their relative value when grafted as cuttings or as rooted vines, and when planted directly in the vineyard or grafted in the vineyard.

TABLE 6.—*Resistant stock varieties, the soil and conditions for which each is best suited, the relative rooting percentages of their cuttings, their relative value for bench grafting, and their relative value for direct planting and grafting in vineyards*

Variety	Rooting percentages of cuttings	Value for bench grafting as cuttings	Value for bench grafting as rooted vines	Value for vineyard grafting	Soils and conditions for which best suited
(Aestivalis×monticola)×(riparia×rupestris, No. 554-5.)	95	25	90	90	Arid, gravelly, poor land with effective moisture.
Aramon×rupestris Ganzin, No. 1.	90	10	80	92	Deep, cool, fertile, moist, silicious, alluvial clay.
Aramon×rupestris Ganzin, No. 2.	85	10	80	90	Arid, heavy clays with effective moisture.
Aestivalis×(rupestris×riparia, No. 227).	40	50	85	85	Moist, poor land.
Berlandieri×riparia, No. 33 E. M.	30	25	90	90	Arid, hot, poor, gravelly decomposed land with effective moisture.
Berlandieri×riparia, No. 34 E. M.	30	25	90	90	Do.
Berlandieri× riparia, No. 420-A.	25	40	85	90	Arid, deep, warm, gravelly with effective moisture.
Chasselas×berlandieri, No. 41-B.	60	50	90	90	Arid, limy, compact land with effective moisture.
Constantia	85	60	95	95	Deep, well-drained, gravelly land with effective moisture.
Cordifolia×riparia, No. 125-1	50	65	90	90	Arid, poor land with effective moisture.
Dog Ridge	20	10	85	95	Prefers arid, compact soils with effective moisture but adapts itself to a variety of soils.
Lenoir	20	5	90	95	Warm, deep, gravelly, moist soils.
Monticola×riparia, No. 18804.	60	30	80	85	Arid, limy, gravelly, decomposed land with effective moisture.
Monticola×riparia, No. 18808.	80	65	95	90	Do.
Monticola×riparia, No. 18815.	80	65	95	90	Do.
Monticola×rupestris	90	70	95	95	Arid, limy hot, loose, deep gravelly land with low water table.
Mourvedre×rupestris, No. 1202.	92	5	80	95	Moist, heavy, loose, gravelly clay land.
Riparia Gloire	75	50	85	90	Moist, loose, sandy, along creek and river bottoms.

TABLE 6.—*Resistant stock varieties, the soil and conditions for which each is best suited, the relative rooting percentages of their cuttings, their relative value for bench grafting, and their relative value for direct planting and grafting in vineyards*—Continued

Variety	Rooting percentages of cuttings	Value for bench-grafting as cuttings	Value for bench grafting as rooted vines	Value for vineyard grafting	Soils and conditions for which best suited
Riparia×(cordifolia×rupestris, No. 106-8).	40	10	60	85	Moist, poor land.
Riparia×rupestris, No. 101	50	15	75	85	Deep, cool, fertile alluvial clay.
Riparia×rupestris, No. 101-14	75	30	90	92	Deep, fertile, heavy, alluvial clay.
Riparia×rupestris, No. 108-103	50	30	90	92	Deep, heavy, fertile alluvial soils.
Riparia×rupestris, No. 3306	30	30	85	80	Deep, cool, fertile clay, heavy alluvial flooded bottom land.
Riparia×rupestris, No. 3309	40	20	80	90	Arid, poor, land with effective moisture.
Rupestris×berlandieri, No. 219-A.	50	40	85	90	Arid, hot, limy land with effective moisture.
Rupestris×berlandieri, No. 301-A.	40	20	85	88	Do.
Rupestris Pillans	60	25	80	85	Moist, deep, well drained, gravelly.
Rupestris St. George	90	75	90	92	Deep, well-drained, gravelly land with effective moisture.
Rupestris×cordifolia, No. 107-11.	60	30	90	92	Poor, loose, deep, gravelly, with effective moisture.
Solonis×(cordifolia×rupestris, No. 202-4).	60	20	80	90	Moist, not of first quality.
Solonis×Othello, No. 1613	80	40	85	90	Moist, mediocre, flooded bottom land.
Solonis×riparia, No. 1616	40	30	85	90	Do.

DIRECT PRODUCERS ORIGINATED IN EUROPE AND IN THE UNITED STATES

The important European grape-producing countries have endeavored to produce hybrids between the vinifera and the American native grape species which would be resistant to *Phylloxera viticola* and at the same time yield sufficient crops of fruit of desirable character and quality. It was reasoned that if such direct producers could be obtained, the time and cost of grafting would not only be saved but congeniality would not have to be considered. Some remarkable strides are being made in this direction. The more promising of these hybrids have been introduced and tested in the department's experiment vineyards, but no complete successes were found among them. Either the hybrid reverted too far toward the vinifera, and the phylloxera-resistant qualities were found wanting; or too much toward the resistant, thus impairing the quality of the fruit; or both resistance and the quantity and quality of the fruit of the hybrid were undesirable. So far, none of them are equal to the improved finer American juice-grape varieties or hybrids of American native grape species.

No doubt American grape history suggested this plan of crossing, for in this country such men as Rogers and Ricketts crossed labrusca with vinifera principally to obtain varieties hardy to American conditions, but in which the strong foxy flavor and aroma of the labrusca would be at least partly eliminated. The late T. V. Munson, however, went a step farther and originated not only valuable hybrids of vinifera and American Euvitis but many valuable hybrids of American native grape species that already are destined to feature conspicuously in American viticulture.

Table 7 gives an alphabetical list of the direct producers (originated in Europe and the United States) that have been tested on their own roots in the department's California experiment vineyards. (Pl. 10.) Column 1 gives the varietal name and shows the parentage (whether a seedling of a single species or a hybrid of different species), the abbreviations used to designate the species being A. for aestivalis, Ba. for bourquiniana, C. for cordifolia, Ca. for candicans, Ci. for champini, La. for labrusca, Li. for linsecomii, R. for riparia, Ru. for rupestris, and V. for vinifera. Column 2 shows the experiment vineyards in which the growth was tested, use being made of the following abbreviations: C for Chico, Cx for Colfax, EG for Elk Grove, F for Fresno, G for Geyserville, Gi for Guasti, L for Lodi, Li for Livermore, M for Mountain View, O for Oakville, S for Sonoma, and St for Stockton. Column 3 shows the number of years covered by the test. Column 4 shows the growth and adaptability of each variety at each vineyard where it is under test, expressed in the form of a percentage rating on a scale in which 100 per cent is taken as the standard of excellence. Column 5 gives the pruning method, s being used for spurs and c for canes. Column 6 gives the nodes at which fruit is borne; 7 and 8, the growth-starting dates in early and late seasons; 9 and 10, the blossoming dates in early and late seasons; 11 and 12, the fruit-setting dates in early and late seasons; 13 and 14, the fruit-ripening dates in early and late seasons. Column 15 shows the condition of productiveness, whether excellent (e), good (g), medium (m), or poor (p); column 16, the bearing habit, whether regular (r) or occasional (o); column 17, the average percentage of sugar, Balling scale; column 18, the average acid, as tartaric, per 100 c. c. (sugar and acid determinations and fruit-ripening dates are given only of such varieties as it was thought might be worth while). Column 19 shows the size of the cluster, whether medium (m), medium to large (z), large (l), very (v), or small (s). Column 20 shows the shape of the clusters, whether round (r), cylindrical (c), long (l), or tapering (t). Column 21 designates the density of the clusters, whether compact (c), medium (m), or loose (l). Column 22 shows the size of the berry, whether large (l), medium (m), or small (s). Column 23 gives the shape of the berry, whether round (r), oval (o), or oblong (b). Column 24 shows the color of the berry, whether black (b), red (r), or white (w). Column 25 indicates the purpose for which the fruit is used, whether for table (t), shipping (s), juice (j), wine (w), or cold storage (c). In this table the nomenclature of varieties has been brought into conformity with the code of the American Pomological Society [8] in so far as has appeared practicable.

[8] AMERICAN POMOLOGICAL SOCIETY. CODE OF FRUIT NOMENCLATURE. 2 p. 1923. [Mimeographed.]

TABLE 7.—*Relative behavior and value for different purposes of grape direct producers originated in Europe and in the United States growing on their own roots in 12 experiment vineyards in California*

Variety and parentage	Experiment vineyard	Period planted (years)	Growth rating	How pruned	Nodes bearing fruit	Growth-starting date		Blossoming date		Fruit-setting date		Fruit-ripening date		Productiveness	Bearing habit	Sugar, Balling scale	Acid, as tartaric, grams per 100 c. c.	Cluster			Berry			Use
						Early season	Late season	Early season	Late season	Early season	Late season	Early season	Late season					Size	Shape	Compact or loose	Size	Shape	Color	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Agawam:																								
V.×La	C	14	40−	s	2-7	Mar. 15	Apr. 12	Apr. 30	May 8	May 3	May 11	----	----	g	r	----	----	m	c	mc	m	r	r	ts
Do	Cx	9	70−	s	2-6	Apr. 2	Apr. 24	May 17	June 12	May 31	June 16	Oct. 12	Oct. 15	g	r	----	----	m	c	mc	m	r	r	ts
Do	F	13	75−	s	2-6	Mar. 7	May 21	Apr. 25	May 3	Apr. 3	May 6	----	----	g	r	----	----	m	c	mc	m	r	r	ts
Do	O	15	80+	s	2-6	Mar. 11	Apr. 10	May 6	May 27	May 8	May 29	Sept. 16	Oct. 4	g	r	22	0.6101	m	c	mc	m	r	r	ts
Albania:																								
(Li.×A.)×(La.×Ba.)	F	16	40−	s	2-6	Mar. 25	Apr. 5	May 10	May 18	do	May 20	----	----	m	r	----	----	l	t	m	m	----	w	tj
Do	O	17	70−	s	1-7	Mar. 10	May 28	May 24	June 1	Apr. 4	June 1	Sept. 19	Oct. 21	m	r	22	1.9881	l	t	m	m	----	w	tj
Alexander Winter:																								
La.×V	C	8	90+	cs	2-6	Mar. 15	Apr. 30	Apr. 25	May 6	Apr. 29	May 9	----	----	m	r	----	----	ms	t	l	m	r	r	t
Do	O	7	30	s	3-6	Mar. 11	Apr. 6	May 21	June 1	May 25	May 27	----	----	m	r	----	----	ms	t	l	m	r	r	t
Alicante Ganzin:																								
V.×Ru	C	13	100	s	2-8	Mar. 17	Apr. 1	Apr. 30	June 4	May 4	June 11	----	----	e	r	----	----	z	tl	ml	ms	r	b	jw
Do	Cx	10	90−	s	2-6	Mar. 24	Apr. 20	May 19	June 23	do	do	Sept. 28	Oct. 25	e	r	25	.4875	z	tl	ml	ms	r	b	jw
Do	EG	6	98−	s	2-6	Mar. 16	Apr. 6	May 12	May 16	May 14	May 25	----	----	e	r	----	----	z	tl	ml	ms	r	b	jw
Do	G	6	92+	s	----	do	Apr. 12	----	----	----	----	----	----	e	r	----	----	z	tl	ml	ms	r	b	jw
Do	O	13	80−	s	2-6	Mar. 13	Apr. 8	May 21	May 30	May 25	June 2	Sept. 19	Oct. 11	e	r	26	.8665	z	tl	ml	ms	r	b	jw
Do	S	6	90	s	2-6	Mar. 18	Apr. 13	May 23	June 2	May 26	June 5	----	----	e	r	----	----	z	tl	ml	ms	r	b	jw
Alicante×Terras, No. 20:																								
V.× Ru	C	6	98+	s	4-6	Mar. 20	Apr. 15	May 10	May 24	----	----	----	----	g	r	----	----	ms	c	c	m	r	b	jw
Do	Cx	3	20−	----	----	Apr. 9	Apr. 26	----	----	----	----	----	----	g	r	----	----	ms	c	c	m	r	b	jw
Do	EG	6	82−	s	2-7	Mar. 20	Apr. 1	May 12	May 20	May 16	May 22	----	----	g	r	----	----	ms	c	c	m	r	b	jw
Do	O	17	75−	s	2-6	Mar. 11	Apr. 6	May 11	May 25	May 13	May 28	Sept. 19	Oct. 10	g	r	26	.6083	ms	c	c	m	r	b	jw
Do	S	6	80	s	2-6	Mar. 18	May 2	May 18	June 1	May 22	June 14	----	----	g	r	----	----	ms	c	c	m	r	b	jw
Do	St	13	88	s	2-8	Mar. 17	Apr. 18	May 10	do	May 4	June 4	----	----	g	r	----	----	ms	c	c	m	r	b	jw
Alice:																								
La	C	8	92	cs	2-8	Mar. 15	Apr. 7	Apr. 28	May 15	Apr. 30	May 20	----	----	m	o	----	----	m	t	mc	ms	r	r	t
Do	F	----	----	s	----	Mar. 20	Apr. 8	----	----	----	----	----	----	m	o	----	----	m	t	mc	ms	r	r	t
Do	O	7	5−	s	2-5	Mar. 16	Apr. 5	May 25	June 1	May 28	June 4	----	----	m	o	----	----	m	t	mc	ms	r	r	t
Amber Queen:																								
V.×(R.×La.)	C	8	92+	cs	2-8	Mar. 10	Apr. 2	Apr. 27	May 15	Apr. 29	May 28	----	----	p	o	----	----	svs	----	l	m	ro	r	t

TABLE 7.—*Relative behavior and value for different purposes of grape direct producers originated in Europe and in the United States growing on their own roots in 12 experiment vineyards in California*—Continued

Variety and parentage	Experiment vineyard	Period planted (years)	Growth rating	How pruned	Nodes bearing fruit	Growth-starting date: Early season	Growth-starting date: Late season	Blossoming date: Early season	Blossoming date: Late season	Fruit-setting date: Early season	Fruit-setting date: Late season	Fruit-ripening date: Early season	Fruit-ripening date: Late season	Productiveness	Bearing habit	Sugar, Balling scale	Acid, as tartaric, grams per 100 c. c.	Cluster: Size	Cluster: Shape	Cluster: Compact or loose	Berry: Size	Berry: Shape	Berry: Color	Use
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Ambrosia:																								
La.×V.	C	7	60−	s	2-6	Mar. 20	Apr. 1	May 2	May 18	May 5	May 22	---	---	m	---	---	---	z	t	m	ml	b	w	t
Amberbonte:																								
Ba.×Li.×Ru.	C	13	98	s	2-6	Mar. 15	Apr. 3	May 6	June 1	May 9	June 6	---	---	g	r	---	---	m	c	m	sm	r	r	tj
Do.	F	16	65+	s	2-6	Mar. 1	Mar. 28	May 5	May 15	---	---	---	---	g	r	---	---	m	c	m	sm	r	r	tj
Do.	O	17	85−	s	2-7	Mar. 3	May 25	May 28	June 4	June 1	June 7	Sept. 20	Oct. 5	g	r	22	0.6525	m	c	m	sm	r	r	tj
America:																								
Li. × Ru.	C	12	40+	s	2-6	Mar. 20	Apr. 2	May 12	May 24	---	---	---	---	m	r	---	---	m	c	c	m	r	b	jw
Do.	G	16	80−	s	---	Mar. 14	Apr. 28	May 2	May 26	---	---	---	---	m	r	---	---	m	c	c	m	r	b	jw
Do.	O	17	75−	s	3-6	Mar. 13	May 24	May 27	June 4	May 6	June 10	---	---	m	r	---	---	m	c	c	m	r	b	jw
Do.	S	16	95−	s	2-6	Mar. 15	May 8	May 16	June 26	---	---	---	---	m	r	---	---	m	c	c	m	r	b	jw
Antoinette:																								
La.	C	8	45−	s	2-6	Mar. 8	Apr. 4	Apr. 30	May 18	May 6	May 23	---	---	m	r	---	---	s	c	ml	m	r	w	t
Aramon-Seibel (No. 2044):																								
(Ru.×Li.) × (V.×Ru.)	C	8	98+	cs	2-6	Mar. 12	Apr. 5	do.	June 2	May 5	June 21	---	---	g	r	---	---	m	c	c	m	r	b	jw
Do.	EG	6	80−	s	2-6	Mar. 25	Apr. 8	May 12	May 18	May 16	May 27	---	---	g	r	---	---	m	c	c	m	r	b	jw
Do.	O	13	90+	s	2-6	Mar. 13	Apr. 13	May 2	May 28	May 5	June 1	Sept. 14	Oct. 15	g	r	23	.9831	m	c	c	m	r	b	jw
Arkansaw:																								
La.	C	8	95+	s	2-8	Mar. 6	Apr. 3	Apr. 25	May 26	Apr. 28	May 20	---	---	g	r	---	---	m	c	mc	ml	r	r	ts
Do.	O	7	5−	s	2-6	Mar. 13	Apr. 6	May 25	do.	May 29	May 30	---	---	g	r	---	---	m	c	mc	ml	r	r	ts
Atoka:																								
(Li.×Ru.)×(Ba.×La.)	F	16	95+	s	2-6	do.	Apr. 8	Apr. 30	May 20	May 3	May 25	Sept. 4	Sept. 6	m	---	25½	.6462	m	c	mc	s	r	r	t
Do.	O	17	92	s	2-6	Mar. 12	May 26	May 26	June 2	May 28	June 6	June 28	Oct. 14	m	---	27	.8136	m	c	mc	s	r	r	t
August Giant:																								
La.×V.	C	8	90	cs	3-8	Mar. 20	Apr. 2	May 2	May 16	May 2	May 21	---	---	p	o	---	---	m	t	l	m	rb	b	t
Azemar Seibel (No. 215):																								
R.×A.	C	14	95−	s	2-7	Mar. 22	Apr. 28	May 4	June 8	May 7	June 4	---	---	m	---	---	---	m	t	m	sm	r	b	jw
Do.	EG	6	90−	s	2-8	Mar. 18	Apr. 6	May 16	May 26	May 20	June 1	---	---	m	---	---	---	m	t	m	sm	r	b	jw
Do.	Gi	14	85+	s	3-8	Mar. 13	Apr. 12	Apr. 30	May 16	May 2	May 14	Aug. 1	Oct. 6	m	---	22	.8375	m	t	m	sm	r	b	jw
Do.	O	13	66−	s	2-6	do.	Apr. 15	May 4	June 1	May 7	June 4	Sept. 4	Oct. 11	m	---	23	.6646	m	t	m	sm	r	b	jw
Bacchus:																								
R.×La.	C	3	98+	cs	2-7	Mar. 8	Apr. 20	Apr. 15	May 2	Apr. 19	May 9	---	---	m	r	---	---	z	c	mc	sm	r	b	jw
Do.	O	7	15+	c	---	Apr. 19	Apr. 25	---	---	---	---	---	---	m	r	---	---	z	c	mc	sm	r	b	jw

Bailey:																								
Li.×(La.×V.)	O	8	75−	s		Mar. 15	Apr. 1	May 10	May 18					g	r			m	c	mc	m	ro	b	jw
Barry:																								
La.×V	O	14	78+	s	4-5	Mar. 19	Apr. 28	Apr. 28	May 2					m	o			z	t	mc	ml	r	b	ts
Do	Cx	9	80−	s	2-6	Mar. 30	Apr. 22	May 17	June 12	May 21	June 16	May 6	Oct. 11	m	o			z	t	mc	ml	r	b	ts
Do	F	14	80+	s	2-6	Mar. 14	Mar. 30	Apr. 24	May 10	Apr. 27	May 18	Aug. 20	Sept. 3	m	o	24	.4950	z	t	mc	ml	r	b	ts
Do	G	15	90+	s	4-8	Mar. 17	May 29	May 10	May 21	May 13	May 24	Sept. 8	Sept. 12	m	o			z	t	mc	ml	r	b	ts
Do	O	15	83	s	2-6	Mar. 13	May 24	May 18	May 30	May 20	June 2	Sept. 19	Oct. 8	m	o	22	.6500	z	t	mc	ml	r	b	ts
Do	S	15	95+	cs	2-6	Mar. 16	May 15	May 24	June 30	May 28	do			m	o			z	t	mc	ml	r	b	ts
Bayard(Couderc, No. 28-112):																								
La.×Ru	C	13	90−	s	2-6	Mar. 20	Apr. 15	Apr. 30	June 1	May 2	June 7			g	r			m	c	m	m	r	b	jw
Do	Cx	13	95−	s	2-8	Mar. 31	Apr. 25	May 19	June 29	May 23	June 12	Sept. 26	Oct. 6	g	r	23	.6925	m	c	m	m	r	b	jw
Do	F	15	85−	s	2-6	Mar. 10	Mar. 29	Apr. 29	July 10	Apr. 24	May 12	Sept. 4	Sept. 30	g	r	22	.5262	m	c	m	m	r	b	jw
Do	G	16	92−	s	2-8	Mar. 12	Apr. 17	Apr. 28	May 30	May 2	June 2	Sept. 21	Oct. 16	g	r	21	1.013	m	c	m	m	r	b	jw
Do	Gi	12	100+	s	2-7	do	Apr. 1	Apr. 18	June 1	May 11	June 30	Sept. 6	Sept. 30	g	r			m	c	m	m	r	b	jw
Do	O	16	95	s	2-6	Mar. 13	Apr. 13	May 2	do	May 5	June 3	Sept. 12	Oct. 2	g	r	21	.8636	m	c	m	m	r	b	jw
Do	S	16	92	s	1-7	Mar. 5	May 10	Apr. 26	June 12	May 21	June 17	Sept. 28	Oct. 21	g	r	25	.9631	m	c	m	m	r	b	jw
Do	St	13	80−	s	2-6	Mar. 17	Apr. 16	May 7	June 1	May 11	June 4			g	r			m	c	m	m	r	b	jw
Bell:																								
(R×La.)×(Ba.×B)	C	8	92+	cs	2-6	Mar. 10	Apr. 6	Apr. 26	May 12	Apr. 30	May 15			m	r			s	t	c	m	ro	r	tsj
Do	O	13	30−	s	2-5	Mar. 13	Apr. 16	May 25	May 26	May 29	May 30			m	r			s	t	c	m	ro	r	tsj
Berckmans:																								
R.×(La.×Ba.)	C	11	62−	s	2-6	Mar. 18	Apr. 20							m	r			z	c	c	m	r	r	tsj
Do	Cx	9	60−	s	2-8	Mar. 25	Apr. 23	May 15	June 12	June 2	June 16	Oct. 10	Oct. 23	m	r			z	c	c	m	r	r	tsj
Do	EG	6	72+	s	2-6	Mar. 26	Apr. 15							m	r			z	c	c	m	r	r	tsj
Do	G	16	60+	s	2-8	Mar. 14	Apr. 10	Apr. 16	June 5	Apr. 19	June 8	Sept. 15	Oct. 2	m	r			z	c	c	m	r	r	tsj
Do	O	16	16−	s	1-8	Mar. 11	Apr. 4	May 4	May 30	May 6	May 25			m	r			z	c	c	m	r	r	tsj
Do	S	16	35	s	2-6	Mar. 15	Apr. 8	May 8	June 15	May 18	June 18			m	r	23	.825	z	c	c	m	r	r	tsj
Bertha: La	C	8	90+	cs	2-6	do	Apr. 9	May 6	May 12	May 6	May 11			m				m		c	m	r	w	
Beta, No. 1:																								
La.×R	C	7	40	s	4-6	do	Apr. 2							m	r			s	rc	mc	s	r	b	jw
Do	Cx	3	15+	c		Apr. 12	Apr. 26							m	r			s	rc	mc	s	r	b	jw
Do	F	3	10	s		Mar. 25	Apr. 1							m	r			s	rc	mc	s	r	b	jw
Do	O	3	10	s		Apr. 1	Apr. 10							m	r			s	rc	mc	s	r	b	jw
Do	S	3	10+	c		Apr. 5	Apr. 23							m	r			s	rc	mc	s	r	b	jw
Beta, No. 2:																								
La.×R	C	7	82+	s	2-6	Mar. 27	Apr. 3	Apr. 10	May 21					m	r			s	rc	mc	s	r	b	jw
Do	Cx	3	35+	c		Apr. 16	Apr. 26							m	r			s	rc	mc	s	r	b	jw
Do	F	2	10	s		Mar. 28	Apr. 1							m	r			s	rc	mc	s	r	b	jw
Do	O	3	15+	c		Apr. 4	Apr. 10							m	r			s	rc	mc	s	r	b	jw
Do	C	4	82	s	2-6	Mar. 17	Mar. 30	May 1	May 17	May 5	May 6			m	r			s	rc	mc	s	r	b	jw
Beta, No. 3:																								
La.×R	C	4	82+	s	2-6	Mar. 20	Apr. 5	do	May 2	May 4	do			m	r			s	rc	mc	s	r	b	jw
Do	O	3	10	s		Apr. 1	Apr. 10							m	r			s	rc	mc	s	r	b	jw
Big Extra:																								
Li.×(La.×V.)	C	8	95+	s	3-6	Mar. 19	Apr. 8	May 10	May 20	May 14	May 20			g	r			m	c	mc	m	r	b	jw
Do	Cx	13	96+	s	2-8	Mar. 30	Apr. 23	May 20	July 1	May 20	July 1	Sept. 20	Oct. 12	g	r	22	.6071	m	c	mc	m	r	b	jw
Do	EG	6	95+	s	2-6	Mar. 28	Apr. 8	May 15	May 26	May 18	May 29			g	r			m	c	mc	m	r	b	jw
Do	F	16	75	s	2-6	Mar. 1	Mar. 25	Apr. 24	May 20	Apr. 26	May 25	Sept. 8	Sept. 30	g	r	22	.4858	m	c	mc	m	r	b	jw
Do	G	16	90+	s	2-6	Mar. 16	Apr. 22	May 6	June 2	May 9	June 5	Sept. 23	do	g	r	20	.8541	m	c	mc	m	r	b	jw
Do	O	17	40−	s	2-5	Mar. 12	May 20	May 28	do	Mar. 30	June 8	Sept. 19	Oct. 5	g	r	22	.7331	m	c	mc	m	r	b	jw
Do	S	16	95+	s	2-8	Mar. 15	May 10	May 18	June 9	May 22	June 11	Sept. 22	Sept. 24	g	r	23	.8581	m	c	mc	m	r	b	jw
Do	St	13	70−	s	2-8	Mar. 16	Apr. 15	Mar. 6	May 25	May 13	June 7			g	r			m	c	mc	m	r	b	jw

TABLE 7.—*Relative behavior and value for different purposes of grape direct producers originated in Europe and in the United States growing on their own roots in 12 experiment vineyards in California*—Continued

Variety and parentage	Experiment vineyard	Period planted (years)	Growth rating	How pruned	Nodes bearing fruit	Growth-starting date: Early season	Growth-starting date: Late season	Blossoming date: Early season	Blossoming date: Late season	Fruit-setting date: Early season	Fruit-setting date: Late season	Fruit-ripening date: Early season	Fruit-ripening date: Late season	Productiveness	Bearing habit	Sugar, Balling scale	Acid, as tartaric, grams per 100 c. c.	Cluster: Size	Cluster: Shape	Cluster: Compact or loose	Berry: Size	Berry: Shape	Berry: Color	Use
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Big Hope: Li.×(La.×V.)	C	8	90+	s	3-8	Mar. 10	Apr. 2	Apr. 30	May 20	May 3	June 4	--------	--------	g	r	----	------	m	l	m	s	----	b	------
Black Eagle: La.×V	C	4	75+	s	2-6	Mar. 18	Apr. 15	May 9	May 16	May 10	May 20	--------	--------	p	o	----	------	z	lc	m	l	r	b	ts
Blondin: (Ba.×A.)×(Li.×La.)	O	17	58−	s	2-6	Mar. 12	May 25	May 28	June 5	May 30	June 8	Sept. 19	Oct. 14	g	r	24	0.7422	z	c	c	m	r	w	ts
Bourisquou×rupestris, No. 601:																								
B.×Ru	C	14	98−	s	2-8	Mar. 18	Apr. 15	May 2	May 31	May 4	June 5	--------	--------	g	r	----	------	m	t	l	s	r	b	jw
Do	Cx	14	30+	s	2-6	Mar. 25	Apr. 20	May 20	June 4	--------	--------	--------	--------	g	r	25	1.053	m	t	l	s	r	b	jw
Do	EG	6	68−	s	2-7	Mar. 28	Apr. 8	May 12	May 19	May 16	May 31	--------	--------	g	r	----	------	m	t	l	s	r	b	jw
Do	F	17	85	s	2-6	Mar. 10	Mar. 30	Apr. 24	May 10	Apr. 27	May 13	Sept. 6	Sept. 30	g	r	25	.5858	m	t	l	s	r	b	jw
Do	G	14	88+	s	2-6	Mar. 13	Apr. 12	Apr. 18	May 15	Apr. 20	May 10	Sept. 13	Oct. 7	g	r	24	.7312	m	t	l	s	r	b	jw
Do	O	17	65−	s	1-6	Mar. 6	Apr. 9	May 2	May 28	May 5	June 1	--------	--------	g	r	23	1.138	m	t	l	s	r	b	jw
Do	St	11	88	s	----	Mar. 8	Apr. 8	May 1	May 15	--------	--------	--------	--------	g	r	----	------	m	t	l	s	r	b	jw
Bourisquou×rupestris, No. 603:																								
V.×Ru	Cx	14	95+	s	2-7	Mar. 25	Apr. 20	May 16	June 20	May 19	June 24	Apr. 25	Sept. 27	g	r	21	.6895	s	ct	m	s	r	b	jw
Do	EG	6	88	s	3-7	Mar. 20	Apr. 10	May 12	May 27	May 16	May 30	--------	--------	g	r	----	------	s	ct	m	s	r	b	jw
Do	F	16	85+	s	3-6	Mar. 8	Apr. 2	Apr. 24	May 20	Apr. 26	May 4	Sept. 30	Oct. 23	g	r	23	.5890	s	ct	m	s	r	b	jw
Do	O	16	95+	s	2-6	Mar. 13	May 28	May 23	May 26	May 27	May 29	--------	--------	g	r	19	.7387	s	ct	m	s	r	b	jw
Do	S	15	75−	s	2-6	Mar. 16	May 16	May 13	June 1	June 4	June 5	Sept. 22	Oct. 18	g	r	23	.7162	s	ct	m	s	r	b	jw
Bourisquou×rupestris, No. 109-4:																								
V.×Ru	C	14	98	s	2-6	Mar. 18	Apr. 8	Apr. 30	Sept. 18	May 4	May 24	--------	--------	m	r	----	------	m	t	l	m	r	b	jw
Do	Cx	13	90−	s	2-8	Mar. 25	Apr. 20	May 14	June 20	May 7	June 18	Sept. 22	Oct. 20	m	r	27	.6750	m	t	l	m	r	b	jw
Do	EG	6	100	s	2-7	Mar. 19	Apr. 2	Apr. 29	May 21	May 8	May 24	--------	--------	m	r	----	------	m	t	l	m	r	b	jw
Do	F	16	88−	s	2-5	Mar. 2	do	Apr. 22	May 8	Apr. 24	May 3	Sept. 8	Sept. 30	m	r	27	.4117	m	t	l	m	r	b	jw
Do	O	16	88	s	2-6	Mar. 1	May 30	May 10	May 24	May 12	May 26	--------	--------	m	r	23	.6975	m	t	l	m	r	b	jw
Do	S	15	81−	s	2-6	Mar. 18	May 12	Apr. 1	June 26	May 22	June 4	--------	--------	m	r	24	.935	m	t	l	m	r	b	jw
Bourisquou×rupestris, No. 3907:																								
V.×Ru	C	14	95+	s	2-6	Mar. 20	Apr. 15	May 4	June 2	May 7	May 24	--------	--------	m	o	----	------	m	c	m	ms	r	b	jw
Do	Cx	14	35+	s	3-6	Mar. 30	Apr. 25	May 20	June 6	--------	--------	--------	--------	m	o	25	1.012	m	c	m	ms	r	b	jw

Do	EG	5	85−	s	2-7	Mar. 18	Apr. 4	May 1	May 24	May 16	June 1	----	----	m	o	----	----	m	c	m	ms	r	b	jw
Do	F	16	90	s	2-6	Mar. 2	Mar. 27	Apr. 22	May 5	Apr. 25	May 2	Aug. 30	Oct. 23	m	o	25	.8846	m	c	m	ms	r	b	jw
Do	G	16	92	s	2-7	do	Apr. 2	Apr. 30	June 2	May 1	June 6	Sept. 18	Sept. 27	m	o	32	.8825	m	c	m	ms	r	b	jw
Do	Gi	12	100+	s	3-6	do	Apr. 8	Apr. 22	May 9	Apr. 22	May 11	----	----	m	o	----	----	m	c	m	ms	r	b	jw
Do	O	16	77−	s	1-8	Mar. 11	Apr. 30	May 18	May 25	May 21	May 29	----	----	m	o	----	----	m	c	m	ms	r	b	jw
Do	S	16	95+	s	2-7	Mar. 16	Apr. 12	May 8	June 2	do	June 5	Sept. 22	Oct. 25	m	o	23	.9100	m	c	m	ms	r	b	jw
Bourisquou×rupestris, No. 4306:																								
V.×Ru	C	14	98−	s	2-6	Mar. 20	Apr. 20	May 2	do	May 5	June 8	----	----	m	r	----	----	m	t	l	ms	r	b	jw
Do	Cx	13	90	s	2-6	Mar. 26	Apr. 21	May 7	June 29	May 20	July 2	Sept. 28	Oct. 15	m	r	25	1.02	m	t	l	ms	r	b	jw
Do	F	16	90−	s	2-6	Mar. 10	Apr. 2	Apr. 22	May 20	May 3	June 3	----	----	m	r	23	.9295	m	t	l	ms	r	b	jw
Do	G	12	99+	s	2-6	Mar. 13	June 15	do	May 7	Apr. 22	May 11	----	----	m	r	----	----	m	t	l	ms	r	b	jw
Do	O	16	81−	s	1-6	Mar. 11	Apr. 7	May 1	May 30	May 3	June 3	----	----	m	r	----	----	m	t	l	ms	r	b	jw
Do	S	13	90−	s	2-6	Mar. 18	Apr. 18	May 2	June 6	May 6	June 10	----	----	m	r	----	----	m	t	l	ms	r	b	jw
Do	St	12	50−	s	2-6	Mar. 17	Apr. 12	do	May 26	May 5	June 3	----	----	m	r	----	----	m	t	l	ms	r	b	jw
Bourisquou×rupestris, No. 4308:																								
V.×Ru	C	13	93	s	2-8	Mar. 20	Apr. 20	Apr. 30	May 21	May 3	May 25	----	----	m	r	----	----	m	t	l	ms	r	b	jw
Do	Cx	14	80	s	2-6	Mar. 25	Apr. 25	May 20	June 4	May 22	June 6	Sept. 30	Oct. 1	m	r	24	1.113	m	t	l	ms	r	b	jw
Do	F	16	88+	s	2-6	Mar. 10	Apr. 2	Apr. 24	May 8	Apr. 26	May 6	----	----	m	r	25	.8625	m	t	l	ms	r	b	jw
Do	G	12	100+	s	2-6	Mar. 16	Apr. 12	Apr. 27	May 16	Apr. 29	May 13	Oct. 2	Oct. 6	m	r	26	.6540	m	t	l	ms	r	b	jw
Do	O	16	95+	s	2-6	Mar. 11	May 24	May 15	May 29	May 22	June 1	----	----	m	r	25	.78	m	t	l	ms	r	b	jw
Do	St	12	80−	s	2-6	Mar. 17	Apr. 15	May 4	June 3	May 6	June 7	----	----	m	r	----	----	m	t	l	ms	r	b	jw
Brighton:																								
La.×V	C	14	85+	s	3-6	Mar. 18	Apr. 8	Apr. 30	May 10	May 2	May 13	----	----	m	r	----	----	lvl	lt	m	ml	ro	r	ts
Do	O	15	90+	s	2-6	Mar. 13	May 20	May 21	June 1	May 25	June 4	Sept. 19	Sept. 25	m	r	25	.4912	lvl	lt	m	ml	ro	r	ts
Brilliant:																								
(La.×V.)×A	G	15	75	s	2-8	Mar. 18	Apr. 24	Apr. 30	June 2	May 2	June 5	Sept. 15	Sept. 20	e	r	----	----	z	c	r	ml	ro	r	tsjwc
Do	Gi	14	100+	s	2-6	Mar. 12	Apr. 13	Apr. 26	May 23	Apr. 28	May 18	Aug. 2	Oct. 4	e	r	23	.5100	z	c	r	ml	ro	r	tsjwc
Do	O	16	10−	s	1-6	Mar. 11	Apr. 4	May 8	June 2	May 10	June 7	----	----	e	r	----	----	z	c	r	ml	ro	r	tsjwc
Brown:																								
La.×V	C	6	60+	s	2-6	Mar. 16	Apr. 2	May 4	May 12	May 7	May 16	----	----	g	r	----	----	sm	ct	m	m	ro	b	ts
Campbell:																								
La.×V	C	8	95+	s	2-6	Mar. 19	Apr. 12	May 10	May 16	----	----	----	----	g	r	----	----	z	ct	m	l	ro	b	tsjwc
Canada:																								
R.×(La.× V.)	C	14	95+	s	2-8	Mar. 23	Apr. 28	May 2	June 5	May 6	June 12	----	----	g	o	----	----	m	c	mc	sm	r	b	ts
Do	Cx	10	90	s	2-8	Mar. 25	Apr. 24	May 17	June 29	May 21	July 2	Oct. 18	Oct. 26	g	o	----	----	m	c	mc	sm	r	b	ts
Do	F	16	60−	s	2-6	Mar. 13	Mar. 28	Apr. 24	May 10	May 9	May 27	Sept. 8	Sept. 30	g	o	23	.4703	m	c	mc	sm	r	b	ts
Do	O	20	60−	s	1-6	do	Apr. 14	May 2	May 26	May 5	May 28	do	Oct. 17	g	o	26	.7955	m	c	mc	sm	r	b	ts
Do	S	14	85−	s	2-6	Mar. 17	May 8	May 15	June 26	June 3	Sept. 19	Sept. 28	Oct. 21	g	o	23	.6537	m	c	mc	sm	r	b	ts
Do	St	12	80−	s	----	Mar. 19	Apr. 8	----	----	----	----	----	----	g	o	----	----	m	c	mc	sm	r	b	ts
Carignane×rupestris, No. 404:																								
V.×Ru	C	14	100	s	2-6	Mar. 20	do	Apr. 30	May 31	May 3	June 5	----	----	g	r	----	----	m	ct	m	m	r	b	jw
Do	EG	6	82−	s	2-7	Mar. 17	Apr. 6	May 15	May 19	May 20	May 27	----	----	g	r	----	----	m	ct	m	m	r	b	jw
Do	F	16	90	s	2-6	Mar. 4	Apr. 14	Apr. 24	May 10	Apr. 27	May 6	Sept. 8	Sept. 30	g	r	23	.4465	m	ct	m	m	r	b	jw
Do	G	15	92+	s	2-9	Mar. 16	Apr. 30	Apr. 30	June 1	May 2	June 7	Sept. 26	Sept. 27	g	r	28	.4553	m	ct	m	m	r	b	jw
Do	O	16	95+	s	1-6	Mar. 11	May 28	May 6	May 28	May 19	May 24	Oct. 7	Nov. 5	g	r	22	.6862	m	ct	m	m	r	b	jw
Do	S	13	65−	s	2-6	Mar. 14	May 12	May 18	June 30	May 22	June 11	Sept. 22	Oct. 22	g	r	21	.7950	m	ct	m	m	r	b	jw
Do	St	13	92+	s	2-6	Mar. 18	July 17	May 10	May 30	May 13	June 2	----	----	g	r	----	----	m	ct	m	m	r	b	jw

TABLE 7.—*Relative behavior and value for different purposes of grape direct producers originated in Europe and in the United States growing on their own roots in 12 experiment vineyards in California*—Continued

Variety and parentage	Experiment vineyard	Period planted (years)	Growth rating	How pruned	Nodes bearing fruit	Growth-starting date: Early season	Growth-starting date: Late season	Blossoming date: Early season	Blossoming date: Late season	Fruit-setting date: Early season	Fruit-setting date: Late season	Fruit-ripening date: Early season	Fruit-ripening date: Late season	Productiveness	Bearing habit	Sugar, Balling scale	Acid, as tartaric, grams per 100 c. c.	Cluster: Size	Cluster: Shape	Cluster: Compact or loose	Berry: Size	Berry: Shape	Berry: Color	Use
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Carignane×rupestris, No. 501:																								
V.×Ru.	C	13	90	s	2-6	Mar. 12	Apr. 26	Apr. 30	May 25	Apr. 30	May 20	----	----	g	r	----	----	m	ct	m	m	r	b	jw
Do.	EG	6	92	s	2-7	Mar. 25	Apr. 6	May 12	May 18	May 16	May 25	----	----	g	r	----	----	m	ct	m	m	r	b	jw
Do.	L	16	100+	s	3-6	Mar. 10	Apr. 4	Mar. 18	May 16	May 10	May 20	----	----	g	r	----	----	m	ct	m	m	r	b	jw
Do.	O	16	80−	s	2-6	Mar. 20	May 28	May 21	May 25	May 26	June 2	Oct. 5	Oct. 14	g	r	23	0.8827	m	ct	m	m	r	b	jw
Do.	S	13	80−	s	2-6	Mar. 18	Apr. 6	May 16	June 2	May 21	June 7	Sept. 22	Oct. 15	g	r	23	0.6	m	ct	m	m	r	b	jw
Do.	St	12	90+	s	2-6	Mar. 13	Apr. 10	May 1	---do---	May 4	June 5	----	----	g	r	----	----	m	ct	m	m	r	b	jw
Carman:																								
(Li.×V.)×(La.×Ba.)	O	17	30−	s	3-6	---do---	May 28	May 29	June 3	June 1	June 7	Sept. 19	Oct. 17	p	r	22	.5966	m	t	m	m	r	b	tsj
Catawba:																								
La.×V	C	13	82+	s	2-6	Mar. 20	Apr. 8	May 8	May 18	May 11	May 21	----	----	e	r	----	----	z	c	m	ml	or	r	tsjwc
Do.	Cx	14	10−	s	3-6	Mar. 25	Apr. 16	----	----	----	----	----	----	e	r	----	----	z	c	m	ml	or	r	tsjwc
Do.	G	15	90+	s	2-6	Mar. 20	---do---	May 10	June 8	May 5	June 13	Sept. 18	Oct. 6	e	r	22	.3125	z	c	m	ml	or	r	tsjwc
Do.	O	15	49−	s	2-6	Mar. 13	Apr. 9	May 2	May 27	May 4	May 30	Sept. 14	Oct. 11	e	r	24	.5900	z	c	m	ml	or	r	tsjwc
Do.	S	15	100+	cs	2-6	Mar. 17	May 15	May 21	June 12	May 26	June 7	Sept. 22	Oct. 28	e	r	21	.8258	z	c	m	ml	or	r	tsjwc
Cayuga:																								
La.×V	C	8	90−	s	1-6	Mar. 10	Mar. 30	Apr. 15	May 4	Apr. 21	May 7	----	----	p	r	----	----	----	r	----	m	----	r	----
Centennial:																								
La.×A.×V	F	15	70+	s	2-5	Mar. 14	May 15	Apr. 6	May 5	Apr. 28	May 10	----	----	m	----	24	.6602	ms	ct	c	ms	r	r	t
Do.	G	14	100+	s	3-6	Mar. 12	Apr. 10	Apr. 30	May 20	May 2	May 20	----	----	m	----	----	----	ms	ct	c	ms	r	r	t
Do.	O	15	98+	s	2-6	Mar. 13	May 20	May 21	May 28	May 23	May 31	Sept. 19	Oct. 6	m	----	21	.8030	ms	ct	c	ms	r	r	t
Challenge:																								
La.×V	O	5	10−	c	----	Apr. 1	Apr. 5	----	----	----	----	----	----	----	----	----	----	m	t	c	m	r	b	t
Chambril:																								
(Ci.×La.)×(V.×Ba.)	C	8	30+	s	3-6	Mar. 9	Apr. 20	----	----	----	----	----	----	----	----	----	----	m	----	----	s	----	b	----
Do.	O	5	5−	s	2-5	---do---	Apr. 16	May 26	June 1	May 30	June 3	----	----	----	----	----	----	m	----	----	s	----	b	----
Do.	S	6	90+	s	----	Mar. 16	May 4	----	----	----	----	----	----	----	----	----	----	m	----	----	s	----	b	----
Champenel:																								
Ci.×La.	C	14	100+	s	2-6	Mar. 22	Apr. 28	Apr. 28	May 6	Apr. 17	May 9	----	----	m	r	----	----	m	t	----	l	r	b	tjw
Do.	EG	6	100+	s	2-6	Mar. 28	Apr. 6	May 10	May 24	May 5	July 20	----	----	m	r	----	----	m	t	----	l	r	b	tjw
Do.	O	17	95	s	2-6	Mar. 13	May 29	May 20	May 26	May 22	May 30	Sept. 19	Oct. 11	m	r	20	.8700	m	t	----	l	r	b	tjw

Champion:																								
La	C	8	90+	s	3-8	Mar. 14	Apr. 10	Apr. 15	May 8	Apr. 20	May 11			g	r			z	ct	m	ml	r	w	ts
Chasselas×rupestris, No. 901:																								
V.×Ru	C	11	98+	s	2-6	Mar. 18	Apr. 1	Apr. 30	May 12	May 2	May 17			g	r			m	c	ml	m	r	b	jw
Do	F	16	90+	s	2-6	Mar 4	Mar. 30	Apr. 22	May 2	Apr. 30	May 2			g	r	26	.6337	m	c	ml	m	r	b	jw
Do	O	16	65−	s	1-6	Mar. 13	May 18	May 22	May 29	May 26	June 1			g	r	25	.7275	m	c	ml	m	r	b	jw
Do	St	12	88	s	2-6	Mar. 16	Apr. 28	Mar. 16	June 1	May 1	June 4			g	r			m	c	ml	m	r	b	jw
Chautauqua:																								
La	C	8	60+	s	2-6	Feb. 27	Mar. 26							p	o			m	t	mc	m	ro	b	ts
Clairette dore Ganzin:																								
(V.×Ru. No. 60)×V	C	6	100+	s	2-8	Mar. 17	Apr. 25	Apr. 28	June 2	Apr. 30	June 30			g	r			l	t	l	m	r	w	jw
Do	F	17	83	s	2-6	Mar. 2	Mar. 20	Apr. 24	May 12	Apr. 26	May 17	Sept. 20	Oct. 10	g	r	19	.9500	l	t	l	m	r	w	jw
Do	G	12	92	s	4-8	Mar. 15	Apr. 16	Apr. 27	May 21			Sept. 25	Nov. 6	g	r			l	t	l	m	r	w	jw
Do	Gi	14	95+	s	2-6	Mar. 2	Apr. 10	Apr. 30	May 18	May 2	May 28			g	r			l	t	l	m	r	w	jw
Do	O	17	50−	s	2-8	Mar. 5	May 30	May 11	June 2	May 26	June 5	Oct. 11	Oct. 16	g	r	20	.7275	l	t	l	m	r	w	jw
Do	S	13	80−	s	2-8	Mar. 18	May 10	May 23	June 7	May 27	June 9			g	r			l	t	l	m	r	w	jw
Do	St	12	40−	s	2-8	Mar. 9	Apr. 12	May 1	June 4	May 4	do			g	r			l	t	l	m	r	w	jw
Clinton:																								
R.×La	C	8	98+	cs	3-7	Mar. 15	Mar. 30	Apr. 12	May 2	Apr. 16	May 3			m	r			s	r	c	s	r	b	jw
Do	S	3	70+	c		Apr. 15	Apr. 25							m	r			s	r	c	s	r	b	jw
Cleopatra:																								
La.×R	C	7	20+	s		Mar. 18	Apr. 18							g	r			m			m		b	ts
Clevener:																								
(La.×R.)×A	Cx	9	80−	s	2-6	Mar. 22	Apr. 17	May 12	June 12	May 16	June 16	Oct. 4	Nov. 2	m	r			s	rc	c	s	r	b	jw
Do	G	4	62+	c	2-6	Mar. 12	Apr. 20	May 21	May 22					m	r			s	rc	c	s	r	b	jw
Do	O	10	68−	s	2-6	Mar. 8	Apr. 10	Apr. 12	May 25	Apr. 30	May 28	Sept. 19	Oct. 2	m	r	23	.8150	s	rc	c	s	r	b	jw
Do	S	6	80+	s		Mar. 16	May 8							m	r			s	rc	c	s	r	b	jw
Cloeta:																								
(Li.×Ru.)×(La.×V.)	C	4	10	s										m	r			m	t	mc	ms	or	b	jw
Do	F	16	95+	s	2-8	Mar. 10	Mar. 30	Apr. 8	May 12	May 2	May 18			m	r			m	t	mc	ms	or	b	jw
Do	O	17	63−	s	2-7	Mar. 15	Apr. 14	May 24	June 1	May 26	June 3			m	r	22	.6600	m	t	mc	ms	or	b	jw
Cochee:																								
La.×Ba	C	8	90+	s	2-7	Mar. 15	Apr. 15	May 12	May 26	May 16	May 30			g	r			ms		c	m		r	
Do	O	5	40−	s	2-5	Mar. 11	Apr. 8	May 22	May 28	May 25	do			g	r			ms		c	m		r	
Colerian:																								
La	C	8	90+	s	2-8	Mar. 22	Apr. 10	May 2	May 18	May 4	May 22			g	o			m	tc	m	ml	ro	w	tsjw
Collier:																								
Li.×La	C	8	40−	s	3-8	Mar. 19	Aug. 8	May 4	May 20	May 11	May 25			g	r			m		m	l	r	r	tsj
Colonel Seibel:																								
Li.×V	O	13	90	s	2-6	Mar. 13	Apr. 17	May 24	June 4	May 24	June 6	Sept. 10	Oct. 11	g	r	26	.7400	m	ct	m	sm	r	b	jw
Columbian Imperial:																								
La.×R	C	8	95+	s	2-6	Mar. 19	Apr. 15	Apr. 20	May 6	Apr. 24	May 10			p	o			m	r	m	vl	r	b	ts
Do	O	5	10−	s	2-5	Mar. 13	Apr. 17	May 21	May 31	May 26	June 2			p	o			m	r	m	vl	r	b	ts
Do	S	6	20	c		Apr. 10	Apr. 25							p	o			m	r	m	vl	r	b	ts
Concord:																								
La	C	14	88+	s	2-5	Mar. 20	Apr. 12	May 4	May 25					g	r			mz	ct	m	m	r	b	tsjw
Do	Cx	14	90+	s	2-8	Mar. 25	Apr. 29	May 16	June 4	May 18	June 10	Sept. 24	Oct. 10	g	r	27	.5325	mz	ct	m	m	r	b	tsjw
Do	G	16	10−	s		Mar. 12	Apr. 16							g	r.			mz	ct	m	m	r	b	tsjw
Do	Gi	14	92+	s	3-6	Mar. 13	Apr. 8	Apr. 16	May 27	Apr. 18	May 30			g	r	23	.3525	mz	ct	m	m	r	b	tsjw
Do	O	16	18−	s	1-8	Mar. 3	Apr. 5	May 5	May 28	May 7	June 3	Sept. 18	Sept. 19	g	r	22	.7912	mz	ct	m	m	r	b	tsjw
Do	S	16	100+	s	2-7	Mar. 16	Apr. 20	May 19	June 2	May 22	June 5			g	r	20	1,132	mz	ct	m	m	r	b	tsjw

TABLE 7.—*Relative behavior and value for different purposes of grape direct producers originated in Europe and in the United States growing on their own roots in 12 experiment vineyards in California*—Continued

Variety and parentage	Experiment vineyard	Period planted (years)	Growth rating	How pruned	Nodes bearing fruit	Growth-starting date		Blossoming date		Fruit-setting date		Fruit-ripening date		Productiveness	Bearing habit	Sugar, Balling scale	Acid, as tartaric, grams per 100 c. c.	Cluster			Berry			Use
						Early season	Late season	Early season	Late season	Early season	Late season	Early season	Late season					Size	Shape	Compact or loose	Size	Shape	Color	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Cornucopia:																								
V.×R	C	14	85	s	2-6	Mar. 17	Apr. 1	Apr. 12	May 20	Apr. 16	May 24	------	------	g	r	----	------	m	c	m	m	----	b	ts
Do	Cx	10	95	s	2-8	Mar. 22	Apr. 19	May 14	June 18	May 18	June 21	Oct. 20	Oct. 28	g	r	28	0.7200	m	c	m	m	----	b	ts
Do	O	17	88+	s	2-6	Mar. 10	May 26	May 4	May 28	May 7	May 31	------	------	g	r	22	.8250	m	c	m	m	----	b	ts
Do	S	13	85−	s	2-8	Mar. 16	May 6	May 15	June 28	May 18	June 3	Oct. 8	Oct. 20	g	r	25	.8625	m	c	m	m	----	b	ts
Cottage:																								
La	C	8	60	s	2-6	Mar. 18	Apr. 16	Apr. 27	May 27	Apr. 30	May 30	------	------	m	r	----	------	sm	ct	m	m	r	b	ts
Couderc, No. 101:																								
V.×Ru	C	13	92−	s	2-8	do	May 27	Apr. 30	June 6	May 3	June 12	------	------	m	r	----	------	s	c	m	m	r	b	jw
Do	Cx	13	96	s	2-8	Mar. 24	Apr. 20	May 17	June 29	May 20	July 2	Sept. 28	Oct. 12	m	r	28	1.127	s	c	m	m	r	b	jw
Do	EG	6	82	s	2-6	Mar. 28	Apr. 3	May 4	May 21	May 6	May 23	------	------	m	r	----	------	s	c	m	m	r	b	jw
Do	F	16	90	s	2-6	Mar. 1	Mar. 25	Apr. 22	May 12	Apr. 30	May 22	Sept. 3	Sept. 8	m	r	25	.6435	s	c	m	m	r	b	jw
Do	G	16	88−	s	2-7	Mar. 10	Apr. 8	Apr. 28	June 2	do	June 8	Sept. 12	Sept. 27	m	r	26	.6275	s	c	m	m	r	b	jw
Do	O	16	88	s	2-6	Mar. 11	Apr. 10	May 4	May 30	May 7	June 1	Sept. 19	Oct. 14	m	r	24	.5845	s	c	m	m	r	b	jw
Do	S	16	95+	s	2-6	Mar. 8	May 20	May 14	June 5	May 17	June 10	Sept. 22	Oct. 18	m	r	24	.5725	s	c	m	m	r	b	jw
Couderc, No. 3701:																								
V.×Ru	C	13	100	s	2-8	Mar. 20	Apr. 16	Apr. 28	May 23	May 1	May 27	------	------	g	r	----	------	m	t	c	m	r	b	jw
Do	Cx	13	96−	s	2-8	Mar. 28	Apr. 24	May 18	June 24	May 26	June 18	Sept. 27	Oct. 5	g	r	24	.6108	m	t	c	m	r	b	jw
Do	F	14	98−	s	2-7	Mar. 3	Apr. 2	Apr. 23	May 25	Apr. 25	May 29	Aug. 30	Sept. 18	g	r	21	.6601	m	t	c	m	r	b	jw
Do	G	16	95−	s	2-7	Mar. 12	Apr. 16	Apr. 30	May 30	May 2	June 6	Sept. 27	Oct. 6	g	r	22	.7275	m	t	c	m	r	b	jw
Do	Gi	14	100+	s	2-6	Mar. 13	Apr. 10	Apr. 29	May 28	May 1	May 12	May 6	Oct. 15	g	r	25	.8137	m	t	c	m	r	b	jw
Do	O	16	99+	s	2-6	Mar. 11	Apr. 12	May 6	June 1	May 9	June 4	Sept. 16	Oct. 14	g	r	21	.8131	m	t	c	m	r	b	jw
Do	S	15	82−	s	2-6	Mar. 16	May 12	May 18	June 30	May 22	June 19	Sept. 22	Oct. 23	g	r	21	.9225	m	t	c	m	r	b	jw
Do	St	12	50−	s	2-8	Mar. 14	Apr. 12	May 4	June 1	May 8	June 4	------	------	g	r	----	------	m	t	c	m	r	b	jw
Do	EG	6	90−	s	2-7	Mar. 16	Apr. 6	May 12	May 20	May 14	May 28	------	------	m	r	----	------	m	t	c	m	r	b	jw
Couderc, No. 4401:																								
V.×Ru	O	13	99+	s	2-6	Mar. 13	May 20	May 20	May 28	May 27	June 1	Sept. 18	Oct. 15	m	r	25	.7932	m	c	m	s	r	b	jw
Couderc, No. 71-06:																								
(Ru.×Li.)×V	O	13	81+	s	2-6	Mar. 11	Apr. 5	May 8	June 1	May 11	June 4	Sept. 12	Oct. 11	g	r	24	.6126	m	c	m	m	r	b	jw
Couderc, No. 74-17:																								
¾V.×¼Ru	O	13	99+	s	2-6	Mar. 3	Apr. 8	May 10	May 30	May 13	June 2	do	do	g	r	24	.5882	m	c	m	m	r	b	jw

Couderc, No. 82×32:																								
¾V.×¼Ru.	C	13	98	s	2-8	Mar. 20	Apr. 20	May 8	do.	May 11	May 30	--------	--------	g	r	----	------	m	c	l	l	o	w	jwtc
Do.	Cx	13	98+	c	2-8	do.	Apr. 25	May 21	July 1	May 24	July 4	Sept. 18	Oct. 8	g	r	14	.7550	m	c	l	l	o	w	jwtc
Do.	F	16	85−	s	2-0	Mar. 14	Apr. 2	Apr. 26	May 18	Apr. 28	May 21	Aug. 24	Sept. 6	g	r	21	.5719	m	c	l	l	o	w	jwtc
Do.	G	16	95	s	2-8	Mar. 16	Apr. 4	May 4	May 30	May 7	June 2	Sept. 12	Sept. 26	g	r	22	.8250	m	c	l	l	o	w	jwtc
Do.	O	16	94+	s	2-6	Mar. 13	Apr. 14	May 9	June 1	Apr. 4	June 5	Sept. 19	Oct. 14	g	r	18	.7350	m	c	l	l	o	w	jwtc
Do.	S	16	85−	s	2-6	Mar. 16	May 28	May 24	June 15	May 23	June 19	Sept. 18	Sept. 22	g	r	24	.1907	m	c	l	l	o	w	jwtc
Couderc, No. 84×61:																								
¾V.×¼Ru.	C	13	85+	s	2-8	Mar. 22	Apr. 20	May 4	June 2	May 8	June 8	--------	--------	g	r	----	------	m	t	m	m	r	b	jw
Do.	Cx	13	85	s	2-8	Mar. 25	May 21	May 17	June 20	May 21	July 2	Sept. 25	Oct. 11	g	r	24	.6775	m	t	m	m	r	b	jw
Do.	G	16	30−	s	2-8	Mar. 18	Apr. 10	May 2	May 29	May 5	May 31	Sept. 27	Oct. 12	g	r	23	.5750	m	t	m	m	r	b	jw
Do.	Gi	14	30−	s	2-8	Mar. 9	June 18	Apr. 18	May 16	Apr. 20	May 15	Sept. 6	Oct. 6	g	r	24	.6450	m	t	m	m	r	b	jw
Do.	O	17	5−	s	2-6	Mar. 11	Apr. 4	May 22	May 22	May 24	May 25	May 10	Sept. 30	g	r	22	.5965	m	t	m	m	r	b	jw
Couderc, No. 85–113:																								
¾V.×¼Ru.	O	13	95+	s	2-6	Mar. 14	Apr. 7	do.	June 4	do.	June 7	Aug. 19	Oct. 15	g	r	23	.6800	m	c	m	m	r	b	jw
Couderc, No. 87–115:																								
¾V.×¼Ru.	C	13	90−	s	2-8	Mar. 18	Apr. 4	May 2	June 5	May 5	June 0	--------	--------	g	r	----	------	l	ct	l	s	r	b	jw
Do.	Cx	13	82−	s	2-8	Mar. 28	Apr. 24	May 17	June 24	May 20	June 28	Oct. 12	Oct. 15	g	r	24	.6050	l	ct	l	s	r	b	jw
Do.	EG	6	90+	s	2-7	Mar. 17	Apr. 6	May 15	May 19	May 17	May 22	--------	--------	g	r	----	------	l	ct	l	s	r	b	jw
Do.	F	16	95+	s	2-6	Mar. 14	Apr. 13	Apr. 24	May 13	Apr. 26	May 18	Aug. 24	Sept. 4	g	r	22	.6763	l	ct	l	s	r	b	jw
Do.	G	13	98+	s	2-8	Mar. 19	Apr. 15	May 4	June 12	May 4	June 12	Sept. 20	Oct. 15	g	r	20	.7850	l	ct	l	s	r	b	jw
Do.	Gi	12	100+	s	2-6	Mar. 10	Apr. 8	Apr. 15	May 8	Apr. 17	May 11	--------	--------	g	r	25	.6125	l	ct	l	s	r	b	jw
Do.	O	16	80−	s	2-6	Mar. 11	Apr. 6	May 4	June 2	May 7	June 5	Apr. 16	Oct. 14	g	r	22	.5737	l	ct	l	s	r	b	jw
Do.	St	13	20−	s	2-8	Mar. 16	Apr. 18	May 1	do.	May 5	June 6	--------	--------	g	r	----	------	l	ct	l	s	r	b	jw
Couderc, No. 124–20:																								
¾V.×¼Ru.	C	12	20−	s	2-6	Mar. 19	Apr. 10	Apr. 30	do.	May 1	June 5	--------	--------	g	r	----	------	m	c	m	l	r	b	jw
Do.	EG	6	50−	s	2-7	Mar. 18	Apr. 1	May 15	May 24	May 18	May 27	--------	--------	g	r	----	------	m	c	m	l	r	b	jw
Do.	F	16	88	s	2-6	Mar. 1	Mar. 29	Apr. 20	May 7	Apr. 28	May 20	Sept. 4	Sept. 8	g	r	23	.6325	m	c	m	l	r	b	jw
Do.	G	16	85−	s	2-7	Mar. 12	Apr. 12	Apr. 30	May 31	May 2	June 5	Sept. 23	Oct. 6	g	r	20	.7181	m	c	m	l	r	b	jw
Do.	Gi	14	85−	s	2-6	do.	Apr. 10	Apr. 18	May 18	Apr. 20	May 20	Sept. 18	Oct. 2	g	r	21	.7200	m	c	m	l	r	b	jw
Do.	O	16	77−	s	2-6	Mar. 11	Apr. 12	May 4	June 3	May 7	June 5	Sept. 19	Oct. 14	g	r	20	.9124	m	c	m	l	r	b	jw
Couderc, No. 267–27:																								
¾V.×¼Ru.	EG	6	90+	s	2-7	Mar. 21	Apr. 6	May 4	May 18	Mar. 25	May 21	--------	--------	g	r	----	------	m	cy	m	m	r	b	jw
Do.	O	13	98+	s	1-6	Mar. 13	do.	May 16	May 20	May 19	June 2	Sept. 19	Oct. 11	g	r	23	.5370	m	cy	m	m	r	b	jw
Creveling:																								
La.×V.	C	8	92+	s	2-8	Mar. 16	Apr. 8	Apr. 25	May 8	Apr. 30	May 11	--------	--------	p	r	----	------	z	ct	l	ml	o	b	tjw
Do.	O	5	5−	s	2-5	Mar. 11	Apr. 12	May 26	May 30	May 30	June 1	--------	--------	p	r	----	------	z	ct	l	ml	o	b	tjw
Croton:																								
V.×La.×V.	C	8	90+	s	2-6	Mar. 15	Apr. 7	May 4	May 17	May 7	May 21	--------	--------	g	r	----	------	l	lt	m	ml	r	w	tsjw
Cunningham:																								
Ba.	C	8	70+	s	2-6	Mar. 20	Apr. 10	May 2	May 25	May 5	May 28	--------	--------	g	r	----	------	m	ct	c	s	r	b	jw
Do.	Cx	9	40−	s	2-8	Mar. 7	Apr. 20	May 15	June 12	June 1	June 16	Oct. 12	Nov. 11	g	r	----	------	m	ct	c	s	r	b	jw
Do.	Gi	14	62+	s	2-5	Mar. 23	Apr. 12	Apr. 28	June 1	May 1	June 7	--------	--------	g	r	----	------	m	ct	c	s	r	b	jw
Do.	O	15	64−	s	2-6	Mar. 13	May 20	May 20	May 30	May 24	June 2	Sept. 20	Oct. 14	g	r	24	.5250	m	ct	c	s	r	b	jw
Cynthiana:																								
A.×Ba.	EG	6	85+	s	3-6	Mar. 28	Apr. 12	May 15	May 27	May 19	May 30	--------	--------	e	r	----	------	m	ct	m	m	r	b	tsjw
Do.	S	6	95+	s	----	Mar. 26	May 2	--------	--------	--------	--------	--------	--------	e	r	----	------	m	ct	m	m	r	b	tsjw
Dakota:																								
R.×La.	C	8	30−	s	2-6	Mar. 16	Apr. 8	Apr. 30	May 1	May 4	May 4	--------	--------	g	r	----	------	s	rc	r	s	r	b	jw
Diamond:																								
La.×V.	G	14	90+	s	2-6	Mar. 10	Apr. 12	Apr. 13	May 22	May 14	May 22	--------	--------	m	s	25	.5350	z	ct	m	ml	r	w	ts
Do.	O	15	21−	s	2-6	do.	May 28	May 22	May 30	May 25	June 2	Sept. 16	Oct. 2	m	s	21	.6105	z	ct	m	ml	r	w	ts
Do.	S	6	85+	s	----	Mar. 23	May 4	--------	--------	--------	--------	--------	--------	m	s	----	------	z	ct	m	ml	r	w	ts

TABLE 7.—*Relative behavior and value for different purposes of grape direct producers originated in Europe and in the United States growing on their own roots in 12 experiment vineyards in California*—Continued

Variety and parentage	Experiment vineyard	Period planted (years)	Growth rating	How pruned	Nodes bearing fruit	Growth-starting date: Early season	Growth-starting date: Late season	Blossoming date: Early season	Blossoming date: Late season	Fruit-setting date: Early season	Fruit-setting date: Late season	Fruit-ripening date: Early season	Fruit-ripening date: Late season	Productiveness	Bearing habit	Sugar, Balling scale	Acid, as tartaric, grams per 100 c. c.	Cluster: Size	Cluster: Shape	Cluster: Compact or loose	Berry: Size	Berry: Shape	Berry: Color	Use
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Diana:																								
La.×V.×A.	C	8	90+	cs	2-6	Mar. 10	Apr. 10	Apr. 28	May 19	May 1	May 23	----	----	g	r	----	----	m	c	l	m	r	r	jwct
Do.	Cx	10	100+	s	2-8	Mar. 29	Apr. 24	May 18	June 28	May 21	July 1	Sept. 26	Oct. 20	g	r	23	0.5625	m	c	l	m	r	r	jwct
Do.	Gi	14	100+	s	3-5	Mar. 13	Apr. 20	Apr. 26	June 1	Apr. 30	May 15	----	----	g	r	23	.8585	m	c	l	m	r	r	jwct
Do.	O	15	76−	s	2-6	do.	May 20	May 22	May 30	May 27	June 1	Sept. 17	Oct. 6	g	r	22	.6600	m	c	l	m	r	r	jwct
Diogenes:																								
R.×La.	C	4	10−	c	----	Mar. 24	Apr. 2	----	----	----	----	----	----	m	r	----	----	s	ct	m	s	r	b	jw
Do.	G	6	50−	c	2-6	Mar. 16	Apr. 24	----	----	----	----	----	----	m	r	----	----	s	ct	m	s	r	b	jw
Do.	S	6	90+	s	----	Mar. 18	May 3	----	----	----	----	----	----	m	r	----	----	s	ct	m	s	r	b	jw
Downing:																								
V.×A.×La.	O	5	92+	s	2-6	Mar. 10	Apr. 16	May 20	May 30	May 24	June 2	Sept. 28	Oct. 8	e	r	----	----	z	ct	m	ml	o	b	tsjwc
Dracut Amber:																								
La.	C	8	90+	s	2-6	Mar. 15	Apr. 10	Apr. 25	May 8	Apr. 20	May 12	----	----	m	r	----	----	sm	rc	m	ml	or	r	tsj
Do.	O	5	10−	s	3-4	Mar. 11	Apr. 13	May 18	June 5	----	----	----	----	m	r	----	----	sm	rc	m	ml	or	r	tsj
Dutchess:																								
(V.×La.)×Ba.	C	14	80	s	3-6	Mar. 21	Apr. 10	May 4	June 12	May 7	June 5	----	----	mg	r	----	----	l	t	m	s	r	w	wt
Do.	Cx	14	90	s	2-6	Mar. 23	Apr. 19	May 10	June 6	----	----	----	----	mg	r	24	.5025	l	t	m	s	r	w	wt
Do.	G	15	88+	s	3-8	Mar. 19	Apr. 8	May 6	June 1	May 9	June 5	Sept. 12	Sept. 18	mg	r	----	----	l	t	m	s	r	w	wt
Do.	O	15	52−	s	2-6	Mar. 13	May 20	May 19	May 28	May 24	June 2	Sept. 19	Sept. 24	mg	r	26	.7012	l	t	m	s	r	w	wt
Do.	S	15	95+	s	2-6	Mar. 9	May 6	do.	June 30	May 22	June 9	Sept. 14	Oct. 25	mg	r	23	.5277	l	t	m	s	r	w	wt
Early Daisy:																								
La.	O	6	90−	s	1-6	Mar. 15	Apr. 10	May 21	May 27	May 24	May 30	Sept. 25	Oct. 15	m	r	----	----	sm	c	mc	m	r	b	ts
Early Dawn:																								
La.×V.×A.	C	6	90−	s	3-6	Mar. 18	do.	May 4	May 12	May 7	May 17	----	----	g	r	----	----	z	c	m	s	r	b	ts
Early Victor:																								
La.×Ba.	C	14	82+	s	2-6	do.	Apr. 15	May 15	May 18	May 20	May 21	----	----	g	r	----	----	ms	ct	m	sm	r	b	ts
Do.	G	6	50+	c	----	Mar. 16	Apr. 24	----	----	----	----	----	----	g	r	----	----	ms	ct	m	sm	r	b	ts
Do.	S	6	85+	s	----	Mar. 18	May 6	----	----	----	----	----	----	g	r	----	----	ms	ct	m	sm	r	b	ts
Eclipse:																								
La.	C	6	60	s	----	do.	Apr. 2	----	----	----	----	----	----	p	r	----	----	m	ct	c	ml	o	b	ts
Eldorado:																								
La.×V.	C	8	100+	s	2-6	Mar. 15	Apr. 1	Apr. 28	May 15	May 2	May 9	----	----	p	o	----	----	----	----	----	ml	r	w	t

Elvibach:																								
R.×La.	C	8	95+	s	2-8	Mar. 13	Apr. 3	Apr. 29	May 4	do	May 10			g	r			m	c	c	sm	r	b	jw
Do.	O	5	50+	s	2-4	Mar. 7	Apr. 4							g	r			m	c	c	sm	r	b	jw
Elvicand:																								
Ca.×(R.×La.)	O	4	30+	c		Mar. 22	Apr. 5							g	r			s	l		m	r	b	
Elvira:																								
R. × La.	C	14	80	s	3-6	Mar. 12	Apr. 10	May 4	June 12	May 7	June 5			e	r			m	c	c	m	r	w	tsjw
Do.	Cx	14	50−	s	2-6	Mar. 25	Apr. 23	May 10	do	May 16	June 16	Sept. 10	Oct. 12	e	r			m	c	c	m	r	w	tsjw
Do.	F	16	60	s	1-6	Mar. 11	Mar. 24	Apr. 20	May 5	Apr. 24	May 7			e	r	24	.5959	m	c	c	m	r	w	tsjw
Do.	Gi	15	85+	s	2-6	Mar. 9	May 20	May 1	May 20	May 3	May 13	Sept. 18	Oct. 9	e	r	20	.7450	m	c	c	m	r	w	tsjw
Do.	O	16	15−	s	1-6	Mar. 10	Apr. 6	May 4	do	May 7	May 24	Sept. 19	Oct. 14	e	r	23	.5762	m	c	c	m	r	w	tsjw
Emerald:																								
V.×Ba.×La.	C	8	90	s	3-6	Mar. 8	Mar. 30	Apr. 16	May 10	Apr. 21	Apr. 30			p	r			s	c	m	s	r	b	
Do.	O	5	20−	s	2-4	Mar. 10	Apr. 13	May 23	May 24					p	r			s	c	m	s	r	b	
Empire State:																								
R.×La.×V.	C	8	98+	s	3-8	do	Apr. 2	Apr. 28	May 26	May 1	May 29			g	r			m	cl	c	m	r	w	tsjw
Do.	O	4	10−	s		Mar. 11	Apr. 20							g	r			m	cl	c	m	r	w	tsjw
Do.	S	6	25+	s		Apr. 8	Apr. 25							g	r			m	cl	c	m	r	w	tsjw
Erickson:																								
La.	C	6	100+	s	3-6	Mar. 15	Apr. 10	May 10	May 23	Apr. 14	May 27			g	r			m	cl	c	m	r	w	tsjw
Essex:																								
La.×V.	C	8	90+	s	2-8	do	Apr. 2	Apr. 15	May 12	Apr. 19	May 19			g	r			m	t	c	m	ro	b	ts
Ester:																								
La.	C	6	60+	cs	2-6	Mar. 22	Apr. 12	May 10	do	May 13	May 16			m	r			m	c	c	m	r	w	ts
Etta:																								
R.×La.	C	8	92	s	2-8	Mar. 10	Apr. 4	Apr. 20	do	Apr. 29	May 24			g	r			ms	rc	c	s	r	w	jw
Do.	O	4	40−	s	2-4	do	Apr. 12	Mar. 23	May 26					g	r			ms	rc	c	s	r	w	jw
Do.	S	6	60+	s		Mar. 18	May 2							g	r			ms	rc	c	s	r	w	jw
Eumedel:																								
(La.×V.)×(A.×Ba)	C	8	92+	s	2-8	Mar. 15	Mar. 26	Apr. 26	May 20	Apr. 29	May 25			m	r			s	t	c	s	r	b	jw
Do.	O	5	5−	s		Mar. 10	Apr. 3							m	r			s	t	c	s	r	b	jw
Do.	S	6	65+	s		Mar. 18	May 6							m	r			s	t	c	s	r	b	jw
Eumelan:																								
La.×V.×A.	C	8	90+	s	3-6	Mar. 8	Apr. 4	Apr. 28	June 1	May 1	June 6			m	r			m	l	mc	m	r	b	tsjw
Do.	EG	6	85+	s	2-6	do	Apr. 2	May 15	May 23					m	r			m	l	mc	m	r	b	tsjw
Do.	G	6	82+	c		Mar. 16	Apr. 26							m	r			m	l	mc	m	r	b	tsjw
Do.	S	6	75+	s		Mar. 18	May 4							m	r			m	l	mc	m	r	b	tsjw
Faith:																								
R.×La.	C	8	92+	cs	3-6	Mar. 15	Mar. 30	Apr. 15	May 8	Apr. 19	May 11			p	o			sm	l	l	s	r	w	ts
Do.	O	5	10−	s	2-5	Mar. 9	Apr. 10	May 22	May 25	May 26	May 28			p	o			sm	l	l	s	r	w	ts
Do.	S	6	100+	s		Mar. 16	May 4							p	o			sm	l	l	s	r	w	ts
Fern Munson:																								
Li.×(V.×La.)	C	14	95	s	2-8	Mar. 23	Apr. 24	May 12	June 14	May 15	June 16			m	r			l	c	m	m	r	b	jwt
Do.	Cx	10	90	s	2-8	Mar. 28	Apr. 25	May 25	June 26	June 4	July 4	Sept. 25	Oct. 26	m	r	24	.5925	l	c	m	m	r	b	jwt
Do.	O	17	23−	s	2-6	Mar. 13	May 30	May 28	June 1	May 30	June 4	Sept. 19	Oct. 10	m	r	22	1.054	l	c	m	m	r	b	jwt
Do.	S	16	85	s	2-8	Mar. 16	May 15	May 24	June 12	May 28	June 16	Sept. 22	Nov. 2	m	r	25	1.010	l	c	m	m	r	b	jwt
Franklin:																								
R.×La.	C	4	30	s		Mar. 20	Apr. 2							p	r			sm	cr	m	s	r	b	jw
Do.	G	6	70+	s		Mar. 18	Apr. 18							p	r			sm	cr	m	s	r	b	jw
Do.	O	10	85+	s	2-6	Mar. 10	Apr. 12	Apr. 17	May 26	May 16	May 27			p	r			sm	cr	m	s	r	b	jw
Do.	S	6	80+	s		Mar. 18	May 4							p	r			sm	cr	m	s	r	b	jw

TABLE 7.—*Relative behavior and value for different purposes of grape direct producers originated in Europe and in the United States growing on their own roots in 12 experiment vineyards in California*—Continued

Variety and parentage	Experiment vineyard	Period planted (years)	Growth rating	How pruned	Nodes bearing fruit	Growth-starting date		Blossoming date		Fruit-setting date		Fruit-ripening date		Productiveness	Bearing habit	Sugar, Balling scale	Acid, as tartaric, grams per 100 c. c.	Cluster			Berry			Use
						Early season	Late season	Early season	Late season	Early season	Late season	Early season	Late season					Size	Shape	Compact or loose	Size	Shape	Color	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Gaertner:																								
V.×La.	C	8	92−	s	2-8	Mar. 21	Apr. 10	May 1	June 1	May 5	June 4			m	r			z	ct	l	m	ro	r	ts
Do.	O	6	95+	s	1-6	Mar. 15	do	May 20	do	May 20	do	Oct. 6	Oct. 16	m	r			z	ct	l	m	ro	r	ts
Glenfield:																								
La.	C	8	92	s	2-7	Mar. 20	Apr. 6	May 1	May 19	May 6	May 23			g	r			m	ct	m	m	r	w	ts
Goethe:																								
La.×V.	C	8	95+	cs	2-6	Mar. 19	Apr. 3	do	May 20	May 5	May 24			m	o			m	rc	l	m	o	r	tsjw
Gold Dust:																								
La.×V.×Ba.	O	6	5−	s	2-5	Mar. 11	Apr. 8	May 23	May 26	May 26	May 29			g	r			m	c	l	m	r	w	ts
Do.	C	8	92+	s	2-6	do	Apr. 2	May 6	May 16					g	r			m	c	l	m	r	w	ts
Golden Drop:																								
La.×V.×Ba.	C	8	92+	s	3-8	Mar. 10	do	Apr. 26	May 6	Apr. 28	May 10			p	r			s	c	l	s	ro	w	ts
Do.	O	5	40+	c		Mar. 13	Apr. 6							p	r			s	c	l	s	ro	w	ts
Golden Grain:																								
La.×V.×Ba.	C	8	32	s	3-6	Mar. 12	Apr. 4	May 5	May 16	May 8	May 19			m	r			m	c	c	s	o	w	ts
Gold Coin:																								
A.×La.	G	16	80+	s	2-6	Mar. 18	Apr. 26	May 4	June 2	May 7	June 6	Sept. 12	Sept. 27	g	r	21	0.5062	m	c	m	m	r	w	tc
Do.	O	16	14−	s	2-7	Mar. 15	May 25	May 24	June 1	May 26	June 5			g	r	26	.445	m	c	m	m	r	w	tc
Do.	S	15	95+	s	2-7	Mar. 20	May 20	May 25	do	May 29	June 6			g	r	23	.607	m	c	m	m	r	w	tc
Governor Ross:																								
La.×V.	C	14	88+	s	2-6	Mar. 25	Apr. 15	May 6	do	May 9	do			m	r			l	c	m	l	o	w	t
Green Early:																								
La.×V.	C	6	90+	cs	2-6	Mar. 17	Apr. 1	May 2	May 23	Apr. 5	May 27			g	r			m	ct	m	sm	or	w	ts
Green, Chas. A.:																								
La.	O	6	90+	s	1-6	Mar. 15	Apr. 6	Apr. 28	June 2	May 27	June 6	Oct. 4	Oct. 22	g	r			z	ct	m	ml	r	w	ts
Grein Golden:																								
R.×La.	C	8	82+	cs	2-7	Mar. 18	Apr. 8	Apr. 30	May 14	May 2	May 18			g	r			l	lt	m	m	r	w	tsjw
Do.	O	6	90+	c		Mar. 13	Apr. 15							g	r			l	lt	m	m	r	w	tsjw
Hartford:																								
La.×V.	C	8	90	cs	2-6	Mar. 10	Apr. 2	Apr. 12	May 28	Apr. 18	May 16			g	r			m	ct	l	m	ro	b	ts

Helen Keller:																								
(La.×V.)×A.	C	8	98+	cs	2-6	Mar. 17	Mar. 30	May 2	May 10	May 8	May 14	----	----	g	r	----	----	m	lt	l	l	r	r	ts
Do.	O	5	50+	s	2-5	Mar. 10	Apr. 6	May 23	May 27	May 28	May 30	----	----	g	r	----	----	m	lt	l	l	r	r	ts
Do.	S	6	100+	s	----	Mar. 16	May 2	----	----	----	----	----	----	g	r	----	----	m	lt	l	l	r	r	ts
Herbemont:																								
Ba.	C	14	90+	s	2-6	Mar. 23	Apr. 8	May 9	June 4	May 12	June 5	----	----	g	r	----	----	m	c	c	s	r	b	jwct
Do.	Cx	14	85+	s	3-8	Mar. 31	Apr. 26	Apr. 16	June 15	June 3	July 7	Sept. 24	Oct. 6	g	r	23	.8652	m	c	c	s	r	b	jwct
Do.	Gi	14	100+	s	3-5	Mar. 13	Apr. 20	May 10	May 30	May 12	May 24	Oct. 5	Oct. 7	g	r	22	.6825	m	c	c	s	r	b	jwct
Do.	O	17	45−	s	3-6	Mar. 15	May 26	May 28	June 7	May 30	June 11	do	Oct. 15	g	r	22	.9113	m	c	c	s	r	b	jwct
Do.	S	15	60	s	2-6	Mar. 12	May 8	May 14	May 30	May 20	June 4	----	----	g	r	----	----	m	c	c	s	r	b	jwct
Herbert:																								
La.×V	C	14	60−	s	2-6	Mar. 21	Apr. 10	May 5	May 14	----	----	----	----	m	r	----	----	m	c	m	l	r	b	tsc
Do.	Cx	9	60−	s	2-6	Mar. 25	Apr. 22	June 2	June 15	June 16	June 16	Oct. 5	Nov. 8	m	r	----	----	m	c	m	l	r	b	tsc
Do.	O	15	76−	s	2-6	Mar. 11	May 24	May 20	June 2	May 24	June 4	Sept. 19	Oct. 8	m	r	21	.6423	m	c	m	l	r	b	tsc
Hercules:																								
La.×V	C	6	10	s	----	Mar. 20	Apr. 10	----	----	----	----	----	----	g	r	----	----	z	t	m	l	r	b	ts
Hexamer:																								
Li.×(La.×V.)	C	14	98	s	2-8	Mar. 10	Apr. 2	Apr. 28	May 25	May 1	May 28	----	----	g	r	----	----	m	c	m	m	o	b	tsjw
Do.	Cx	10	75−	s	2-8	Mar. 20	Apr. 21	May 19	June 16	May 21	June 19	Oct. 23	Oct. 24	g	r	----	----	m	c	m	m	o	b	tsjw
Do.	O	15	65−	s	2-7	Mar. 13	May 20	May 24	June 1	May 23	June 5	Oct. 2	Oct. 11	g	r	23	.5923	m	c	m	m	o	b	tsjw
Do.	S	6	75−	s	----	Mar. 20	May 4	----	----	----	----	----	----	g	r	----	----	m	c	m	m	o	b	tsjw
Hopican:																								
(La.×V.)×(A.×R.)	C	8	80+	s	2-6	Mar. 8	Apr. 27	Apr. 28	May 12	May 1	May 17	----	----	g	r	----	----	l	c	c	m	r	w	tsjw
Do.	O	5	92+	s	2-5	Mar. 10	Apr. 13	----	----	----	----	----	----	g	r	----	----	l	c	c	m	r	w	tsjw
Hopkins:																								
Li.×(A.×La.)	C	8	92+	cs	2-6	Mar. 15	Mar. 30	Apr. 15	May 8	Apr. 23	May 11	----	----	m	o	----	----	s	c	c	s	o	b	----
Husmann:																								
Li.×(V.×La.)	C	14	92+	s	2-8	Mar. 23	Apr. 24	May 8	June 15	May 11	June 18	----	----	g	r	----	----	z	c	l	l	r	b	tsjw
Do.	O	14	46	s	2-8	Mar. 10	May 24	May 25	June 1	May 27	June 4	Oct. 2	Oct. 11	g	r	20	.7926	z	c	l	l	r	b	tsjw
Iona:																								
La.×V	C	8	88+	s	2-6	Mar. 18	Apr. 3	May 2	May 19	May 5	May 23	----	----	p	r	----	----	m	ct	m	m	or	r	tsjw
Isabella:																								
La.×V	C	14	98+	s	3-8	Mar. 20	Apr. 28	do	May 20	do	May 29	----	----	g	r	----	----	m	c	c	m	r	b	tsjwc
Do.	Cx	14	85−	s	2-6	Mar. 28	May 15	May 15	June 21	May 21	June 25	Oct. 1	Oct. 8	g	r	25	.6090	m	c	c	m	r	b	tsjwc
Do.	F	13	85	s	2-6	Mar. 13	May 9	Apr. 20	May 10	Apr. 22	May 12			g	r	18	.587	m	c	c	m	r	b	tsjwc
Do.	G	13	92	s	2-8	Apr. 2	May 28	Apr. 30	June 4	May 2	June 9	Sept. 23	Oct. 2	g	r	20	.5425	m	c	c	m	r	b	tsjwc
Do.	Gi	14	98+	s	3-6	Mar. 6	Apr. 20	Apr. 20	June 1	Apr. 22	June 4	----	----	g	r	----	----	m	c	c	m	r	b	tsjwc
Do.	O	15	88−	s	2-7	Mar. 11	May 20	May 20	May 29	May 22	June 1	Sept. 18	Oct. 10	g	r	23	.5625	m	c	c	m	r	b	tsjwc
Do.	S	15	100	s	2-6	Mar. 16	June 2	May 16	June 26	May 21	June 6	Sept. 22	Oct. 20	g	r	24	.8100	m	c	c	m	r	b	tsjwc
Jaeger:																								
Li.×Ba	C	8	100+	cs	3-8	Mar. 18	Apr. 14	May 4	May 25	May 7	May 30	----	----	g	r	----	----	m	c	c	s	r	b	jw
Do.	EG	6	80+	s	----	Mar. 20	Apr. 12	----	----	----	----	----	----	g	r	----	----	m	c	c	s	r	b	jw
Do.	G	15	50−	s	2-8	Mar. 17	Apr. 20	May 2	May 22	May 5	May 22	Sept. 19	Sept. 26	g	r	22	.7350	m	c	c	s	r	b	jw
Do.	O	17	32−	s	2-5	Mar. 13	May 30	May 26	June 7	May 28	June 10	----	----	g	r	24	.81	m	c	c	s	r	b	jw
Janesville:																								
La.×R.	O	8	20	s	2-6	Mar. 17	Apr. 15	----	----	----	----	----	----	g	r	----	----	sm	ct	c	m	ro	b	jw

TABLE 7.—*Relative behavior and value for different purposes of grape direct producers originated in Europe and in the United States growing on their own roots in 12 experiment vineyards in California*—Continued

Variety and parentage	Experiment vineyard	Period planted (years)	Growth rating	How pruned	Nodes bearing fruit	Growth-starting date		Blossoming date		Fruit-setting date		Fruit-ripening date		Productiveness	Bearing habit	Sugar, Balling scale	Acid, as tartaric, grams per 100 c. c.	Cluster			Berry			Use
						Early season	Late season	Early season	Late season	Early season	Late season	Early season	Late season					Size	Shape	Compact or loose	Size	Shape	Color	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Jardin, No. 201:																								
(R.×Ru.)×(V.×Li.)	C	13	100	s	2-7	Mar. 21	Apr. 16	May 2	May 22	May 5	May 31	----------	----------	g	r	----	------	s	c	c	s	r	b	jw
Do	F	16	92	s	2-6	Mar. 1	Apr. 5	Apr. 24	May 23	Apr. 26	May 26	Sept. 3	Sept. 8	g	r	23	0.5460	s	c	c	s	r	b	jw
Do	G	16	92−	s	2-8	Mar. 16	Apr. 9	May 4	June 1	May 7	June 6	Sept. 22	Oct. 24	g	r	22	.8581	s	c	c	s	r	b	jw
Do	Gl	12	100+	s	3-7	Mar. 18	Apr. 12	Apr. 18	May 20	Apr. 20	May 23	----------	----------	g	r	21	.8818	s	c	c	s	r	b	jw
Do	O	16	98	s	2-6	Mar. 3	Apr. 7	May 4	June 1	May 6	June 4	Sept. 16	Oct. 14	g	r	20	.9275	s	c	c	s	r	b	jw
Do	S	16	82−	s	2-6	Mar. 16	May 14	May 23	---do---	May 26	June 8	Sept. 22	Oct. 21	g	r	22	.8437	s	c	c	s	r	b	jw
Do	St	11	40−	s	1-6	Mar. 17	Apr. 20	Mar. 19	June 2	May 20	June 6	----------	----------	g	r	----	------	s	c	c	s	r	b	jw
Jardin, No. 503:																								
Ru.×V	C	13	100	s	2-6	Mar. 23	Apr. 10	Apr. 28	June 1	May 15	June 8	----------	----------	g	r	----	------	l	t	l	s	r	b	jw
Do	Cx	13	15−	s	2-6	Mar. 10	Apr. 25	May 18	June 24	May 21	June 28	Sept. 23	Oct. 8	g	r	23	.8	l	t	l	s	r	b	jw
Do	EG	6	88−	s	2-7	Mar. 16	Apr. 6	Apr. 28	May 18	May 18	May 21	----------	----------	g	r	----	------	l	t	l	s	r	b	jw
Do	F	16	82−	s	2-6	Mar. 14	Apr. 2	Apr. 24	May 11	Apr. 27	May 13	Sept. 3	Sept. 8	g	r	22	.5812	l	t	l	s	r	b	jw
Do	G	15	90	s	2-6	---do---	Apr. 16	Mar. 19	May 30	May 2	June 3	Sept. 23	Oct. 2	g	r	20	.8371	l	t	l	s	r	b	jw
Do	Gl	12	95+	s	2-6	Mar. 12	---do---	Apr. 28	May 20	Apr. 30	May 23	Sept. 20	Oct. 10	g	r	20	.6160	l	t	l	s	r	b	jw
Do	O	16	97+	s	2-6	Mar. 10	Apr. 10	May 12	May 29	May 19	June 1	Sept. 19	Oct. 11	g	r	19	.6700	l	t	l	s	r	b	jw
Do	S	16	80−	s	2-6	Mar. 15	May 6	May 18	June 2	May 22	June 6	Sept. 21	Oct. 19	g	r	22	.6250	l	t	l	s	r	b	jw
Do	St	12	85−	s	2-6	Mar. 7	Apr. 12	Mar. 27	May 30	May 6	June 2	----------	----------	g	r	----	------	l	t	l	s	r	b	jw
Jefferson:																								
La.×V	C	14	80−	s	2-8	Mar. 23	Apr. 28	May 6	May 28	May 9	May 25	----------	----------	g	r	----	------	m	c	c	l	r	r	tscjw
Do	Cx	8	80−	s	3-6	Apr. 1	Apr. 25	May 16	June 4	----------	----------	Oct. 25	Nov. 2	g	r	----	------	m	c	c	l	r	r	tscjw
Do	O	15	61−	s	2-6	Mar. 16	Apr. 10	May 1	May 24	May 4	May 29	Sept. 14	Oct. 6	g	r	23	.5540	m	c	c	l	r	r	tscjw
Jessica:																								
La.×V	C	6	92+	cs	3-6	Mar. 20	Apr. 26	----------	----------	----------	----------	----------	----------	g	r	----	------	s	t	mc	m	r	w	ts
Judge Miller:																								
Ba.×La	O	6	60	s	1-5	Mar. 15	Apr. 10	May 23	May 28	May 26	May 30	----------	----------	g	r	----	------	m	t	mc	m	r	w	jw
Kellar White:																								
La.×V	C	8	60+	s	----	Mar. 18	Apr. 12	----------	----------	----------	----------	----------	----------	g	r	----	------	m	t	mc	m	r	w	jw
Kensington:																								
(R.×La.)×V	O	4	5−	cs	----	Mar. 10	Apr. 6	----------	----------	----------	----------	----------	----------	m	r	----	------	m	ct	l	m	o	w	ts

King Philip:																								
(V.×La.)×R	C	8	90+	cs	2-6	Mar. 15	Apr. 18	Apr. 30	May 18	May 3	May 10			m	r			z	t	l	l	ro	b	tsjw
Do	G	6	60+	c		Mar. 18	Apr. 21							m	r			z	t	l	l	ro	b	tsjw
Do	O	9	20−	s		Mar. 13	Apr. 16							m	r			z	t	l	l	ro	b	tsjw
Do	S	6	75+	s		Mar. 20	May 6							m	r			z	t	l	l	ro	b	tsjw
Kingsessing:																								
La.×V	C	8	90+	s	2-7	Mar. 15	Apr. 4	Apr. 27	May 20	Apr. 30	May 24			g	r			l	t	l	m	r	r	jw
Kiowa:																								
Li.×Ba	C	8	95+	cs	2-6	Mar. 18	Apr. 12	May 6	June 2	May 8	June 5			m	r			m	cy	m	l	r	b	tjw
Do	F	15	50−	s	1-6	Mar. 14	Apr. 2	Apr. 16	May 4	Apr. 19	May 6			m	r			m	cy	m	l	r	b	tjw
Do	O	17	45−	s	1-6	do	May 26	May 28	June 5	June 6	June 7			m	r	20	.66	m	cy	m	l	r	b	tjw
Lady:																								
La.×V	O	6	35−	s	1-6	Mar. 17	Apr. 10	May 25	May 26					m	r			m	c	m	m	r	w	ts
Lady Washington:																								
La.×V	C	8	75+	s	3-6	Mar. 12	Apr. 3							g	o			z	c	m	ml	ro	w	ts
Lampasas:																								
La.×Ba	C	11	50+	s	2-6	Mar. 18	Apr. 10	May 8	May 12	May 12	May 16			g	r			m	c	c	m	r	b	tsjw
Do	Cx	10	85−	s	2-6	Mar. 25	May 28	May 18	June 15	May 21	June 18	Oct. 21	Oct. 28	g	r			m	c	c	m	r	b	tsjw
Do	O	15	81−	s	2-8	Mar. 11	May 22	May 20	May 28	May 22	June 2			g	r			m	c	c	m	r	b	tsjw
Lenoir:																								
Ba	C	14	100+	s	2-8	Mar. 21	Apr. 10	May 6	June 2	May 9	June 6			e	r			l	t	l	s	r	b	jw
Do	Cx	14	100+	cs	2-8	Mar. 31	Apr. 22	May 25	June 28	May 28	June 16	Sept. 28	Oct. 8	e	r	27	.7923	l	t	l	s	r	b	jw
Do	EG	6	88−	s		Mar. 22	May 25							e	r			l	t	l	s	r	b	jw
Do	G	15	95−	s	3-8	Mar. 16	Apr. 10	May 4	June 4	May 7	June 8	Sept. 21	Oct. 8	e	r	23	.6782	l	t	l	s	r	b	jw
Do	Gi	14	100+	s	3-6	Mar. 13	Apr. 5	May 3	June 1	May 5	June 6	Oct. 4	Oct. 10	e	r	24	.8942	l	t	l	s	r	b	jw
Do	O	17	85−	s	2-8	Mar. 11	May 23	May 18	May 30	May 22	June 3	Sept.16	Oct. 5	e	r	23	.9570	l	t	l	s	r	b	jw
Do	S	15	100	s	3-8	Mar. 14	May 4	May 20	June 12	May 24	June 20			e	r	23	.8493	l	t	l	s	r	b	jw
Do	St	12	90−	s	2-8	Mar. 15	Apr. 30	May 5	June 5	May 9	June 11			e	r			l	t	l	s	r	b	jw
Lindley:																								
La.×V	C	14	82+	cs	2-8	Mar. 21	Apr. 4	May 2	May 20	May 6	May 24			g	r			m	c	l	m	r	r	tsjw
Do	Cx	14	88−	s	3-7	Apr. 29	June 10	May 4	June 10	May 24	June 6	Sept. 23	Oct. 8	g	r	25	.4987	m	c	l	m	r	r	tsjw
Do	F	14	80−	s	2-6	Mar. 1	Mar. 25	Apr. 26	May 10	Apr. 28	May 15	Aug. 10	Sept. 30	g	r	23	.4025	m	c	l	m	r	r	tsjw
Do	Gi	12	98+	s	2-6	Mar. 13	Apr. 10	May 2	May 28	May 5	May 30			g	r	22	.5512	m	c	l	m	r	r	tsjw
Do	O	13	77−	s	2-6	do	May 20	May 20	June 1	May 26	June 4	Sept. 9	Oct. 10	g	r	20	.4880	m	c	l	m	r	r	tsjw
Lindmar:																								
La.×V	C	8	98+	s	2-6	Mar. 21	Apr. 6	Apr. 28	May 18	May 1	May 21			p	o			s	c	c	s	o	w	ts
Do	O	6	20−	s	3-5	Mar. 13	Apr. 14	May 22	May 28					p	o			s	c	c	s	o	w	ts
Linn:																								
La	C	8	90+	s	2-6	Mar. 16	Apr. 4	Apr. 27	May 26	Apr. 30	May 21			p	o			m	c	c	m	r	w	ts
Little Blue:																								
(La.×V.)×A.	C	8	60+	s	2-6	do	Apr. 1	Apr. 30	May 10					m	o			m	c	m	m	o	b	ts
Livingston:																								
La.×V	C	8	88	s	2-8	Mar. 15	Apr. 2	Apr. 28	May 22	May 2	May 27			m	o			l	l	c	m	r	b	ts
Long John:																								
Li.×(La.×V.)	C	6	90	s	2-5	Mar. 18	Apr. 8							m	r			l	l	mc	l	r	b	jw
Louisiana:																								
Ba	C	8	95+	cs	2-6	Mar. 21	Apr. 10	May 8	June 2	May 12	June 8			g	r			s	c	c	s	r	b	tjw
Do	Cx	10	80−	s	2-8	Apr. 1	Apr. 27	May 20	July 1	May 24	July 4	Sept. 24	Oct. 28	g	r	28	.6041	s	c	c	s	r	b	tjw
Do	O	11	16−	s	2-5	Mar. 13	May 26	May 27	June 3	June 2	June 6			g	r	25	.7350	s	c	c	s	r	b	tjw
Lucile:																								
La	C	8	60+	s	2-6	Mar. 15	Apr. 1	Apr. 26	May 28	Apr. 30	May 31			g	r			z	c	c	ml	ro	r	tsjw
Lutie:																								
La	C	7	10−	c		Feb. 9	Mar. 10	Apr. 10	May 17					m	r			m	c	c	m	r	r	tsjw

TABLE 7.—*Relative behavior and value for different purposes of grape direct producers originated in Europe and in the United States growing on their own roots in 12 experiment vineyards in California*—Continued

Variety and parentage	Experiment vineyard	Period planted (years)	Growth rating	How pruned	Nodes bearing fruit	Growth-starting date: Early season	Growth-starting date: Late season	Blossoming date: Early season	Blossoming date: Late season	Fruit-setting date: Early season	Fruit-setting date: Late season	Fruit-ripening date: Early season	Fruit-ripening date: Late season	Productiveness	Bearing habit	Sugar, Balling scale	Acid, as tartaric, grams per 100 c. c.	Cluster: Size	Cluster: Shape	Cluster: Compact or loose	Berry: Size	Berry: Shape	Berry: Color	Use
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Lukfata:																								
Ci.×La.	C	13	98+	s	2-6	Mar. 20	Apr. 28	Apr. 15	May 31	Apr. 19	June 5	----	----	m	r	----	----	m	c	c	l	r	b	ts
Do.	F	15	65−	s	1-6	Mar. 10	Apr. 5	Apr. 16	May 10	do	May 12	----	----	m	r	20	0.7275	m	c	c	l	r	b	ts
Do.	O	17	80−	s	2-8	Mar. 13	May 25	May 12	May 25	May 15	May 25	----	----	m	r	----	----	m	c	c	l	r	b	ts
Madame Castel:																								
R.×V.	C	12	20−	s	2-6	Mar. 19	Apr. 10	Apr. 28	May 31	May 2	June 6	----	----	g	r	----	----	m	c	m	m	r	b	jw
Do.	EG	6	82−	s	2-6	Mar. 16	Apr. 4	May 8	May 23	May 10	May 26	----	----	g	r	----	----	m	c	m	m	r	b	jw
Do.	O	13	68−	s	2-6	Mar. 13	Apr. 6	May 22	June 1	May 25	June 4	Sept. 16	Oct. 14	g	r	25	.6146	m	c	m	m	r	b	jw
Madame Lussan:																								
(V.×Ru.)×V.	C	8	82−	s	2-8	Mar. 17	Apr. 2	Apr. 28	May 28	May 2	May 26	----	----	g	r	----	----	m	c	m	m	r	b	jw
Do.	EG	6	75−	s	2-6	Mar. 15	do	Apr. 29	May 18	May 3	May 21	----	----	g	r	----	----	m	c	m	m	r	b	jw
Do.	O	13	55−	s	1-6	Mar. 10	Apr. 12	May 8	May 30	May 11	June 2	Sept. 14	Oct. 14	g	r	23	.6520	m	c	m	m	r	b	jw
Manito:																								
(Li.×Ru.)×(La.×V.×Ba.)	C	13	90+	s	2-8	Mar. 18	May 29	May 1	May 29	May 5	June 1	----	----	m	r	----	----	m	c	c	m	r	b	t
Do.	F	16	70+	s	2-6	Mar. 9	Apr. 1	Apr. 20	May 10	Apr. 23	May 15	----	----	m	r	----	----	m	c	c	m	r	b	t
Do.	O	17	75−	s	2-8	Mar. 12	May 28	May 12	May 25	May 16	May 30	Sept. 21	Sept. 22	m	r	20	.6175	m	c	c	m	r	b	t
Marguerite:																								
Li.×Ba.	C	11	95+	s	----	Mar. 24	Apr. 15	do	Sept. 25	----	----	----	----	m	o	----	----	m	c	c	m	r	b	tjw
Do.	Cx	12	95	s	2-8	Mar. 31	Apr. 20	May 24	June 16	May 28	June 20	----	----	m	o	----	----	m	c	c	m	r	b	tjw
Do.	EG	6	88+	s	----	Mar. 26	Apr. 10	----	----	----	----	----	----	m	o	----	----	m	c	c	m	r	b	tjw
Do.	F	16	75+	s	2-6	Mar. 10	Apr. 5	Apr. 25	May 15	Apr. 30	May 17	----	----	m	o	----	----	m	c	c	m	r	b	tjw
Do.	G	16	90−	s	2-8	Mar. 16	Apr. 20	May 8	June 2	June 4	June 8	Sept. 20	Oct. 6	m	o	23	1.357	m	c	c	m	r	b	tjw
Do.	Gi	14	90+	s	3-5	Mar. 22	Apr. 23	May 3	do	May 5	June 5	----	----	m	o	----	----	m	c	c	m	r	b	tjw
Do.	O	17	80+	s	3-6	Mar. 15	May 20	May 28	June 4	----	----	----	----	m	o	----	----	m	c	c	m	r	b	tjw
Do.	S	16	95−	s	2-8	Mar. 16	Apr. 27	May 12	June 12	May 15	June 17	----	----	m	o	26	.9	m	c	c	m	r	b	tjw
Marion:																								
R.×La.	C	6	70+	s	2-6	Mar. 18	Apr. 1	Apr. 8	Apr. 30	Apr. 12	May 4	----	----	g	r	----	----	l	c	c	l	ro	b	tsjw
Martha:																								
La.	C	8	85+	s	2-6	Mar. 10	Apr. 10	May 4	May 12	May 7	May 16	----	----	m	r	----	----	m	t	l	m	r	w	tsjw
Do.	Gi	14	30−	s	----	Mar. 19	Apr. 22	Apr. 30	May 20	----	----	----	----	m	r	23	.51	m	t	l	m	r	w	tsjw

Mary Favorite:																								
La.×Ba.×V	C	8	80+	s	3-6	Mar. 17	Apr. 2	Apr. 24	May 2	Apr. 27	May 5			g	r			s	rc	c	s	r	b	tjw
Massasoit:																								
La.×V	C	8	90+	cs	2-6	Mar. 10	Apr. 6	May 4	May 29	May 23	May 31			g	r			m	ct	m	m	ro	r	tsjw
Maxatawney:																								
La.×V	C	8	98+	s	2-6	do	Apr. 8	Apr. 30	May 19	May 3	May 12			g	r			m	c	m	m	o	r	tsjw
Mericadel:																								
(Li.×Ru.×La.)×(Ba× V.)	C	14	100+	s		Mar. 22	Apr. 22	May 12	May 23					g	r			l			m		b	jw
Do	EG	6	90+	s	2-5	Mar. 27	Apr. 10							g	r			m	c	m	m	o	b	jw
Do	O	17	66−	s	1-6	Mar. 13	May 25	May 26	June 2	May 28	June 5			g	r			m	c	m	m	o	b	jw
Merrimac:																								
La.×V	C	8	90	cs	2-6	Mar. 15	Apr. 2	Apr. 20	May 22	Apr. 15	May 25			g	r			m	tc	m	ml	r	b	tsjw
Missouri Riesling:																								
R.×La	C	11	90+	s	2-8	Mar. 19	Apr. 18	Apr. 28	May 30	May 1	June 2			m	r			s	c	c	s	r	w	jw
Do	F	16	85+	s	2-6	Mar. 14	Mar. 28	Apr. 21	May 3	Apr. 26	May 7	Sept. 8	Sept. 30	m	r	23	.5662	s	c	c	s	r	w	jw
Do	O	16	65+	s	1-7	Mar. 11	Apr. 14	May 6	May 25	May 8	May 30	Sept. 19	Oct. 5	m	r	22	.2862	s	c	c	s	r	w	jw
Montefiore:																								
R.×La	C	8	90+	cs	2-6	Mar. 15	Apr. 6	Apr. 26	June 2	Apr. 30	June 5			p	r			m	tc	m	ms	or	b	jw
Do	S	6	60+	s		Mar. 20	May 8							p	r			m	tc	m	ms	or	b	jw
Moore:																								
La	C	5	10+	s		Apr. 7	Apr. 28							p	r			m	tc	l	ml	r	b	tsjw
Moyer:																								
La.×Ba	C	8	90+	s	2-6	Mar. 18	Apr. 4	Apr. 26	May 29	May 14	June 1			p	r			ms	t	c	s	ro	r	tsjw
Muench:																								
Li.×Ba	C	13	98	s	2-7	Mar. 23	Apr. 10	May 4	May 22	May 26	May 11			m	r			m	c	c	s	r	b	jw
Do	Cx	10	100	s	2-6	Apr. 1	Apr. 23	May 26	July 2	May 29	July 5	Oct. 24	Oct. 26	m	r	27	.5775	m	c	c	s	r	b	jw
Do	EG	6	82+	s	2-6	Mar. 28	Apr. 12	May 20	May 26	May 22	May 29			m	r			m	c	c	s	r	b	jw
Do	F	14	85+	s	3-7	Mar. 14	Mar. 30	May 4	May 22	May 7	May 27	Sept. 3	Sept. 30	m	r	24	.8587	m	c	c	s	r	b	jw
Do	O	17	60−	s	1-6	Mar. 10	May 30	May 28	June 4	May 30	June 10	Sept. 16	Oct. 14	m	r	24	1.672	m	c	c	s	r	b	jw
Mrs. Munson:																								
Li.×Ba	C	8	92	cs	3-8	Mar. 6	Apr. 4	May 4	May 23	May 7	May 27			p	r			m	c	l	m	r	b	t
Do	EG	6	92	s	2-6	Mar. 26	Apr. 8	May 15	May 29	May 18	June 1			p	r			m	c	l	m	r	b	t
Do	Gi	14	75+	s	3-5	Mar. 17	Apr. 20	Apr. 30	May 28	May 1	May 30			p	r	22	.3750	m	c	l	m	r	b	t
Do	O	15	45−	s	2-6	Mar. 14	May 26	May 25	June 5	May 20	June 10	Sept. 14	Oct. 11	p	r	24	.7800	m	c	l	m	r	b	t
R. W. Munson:																								
Li.×(La.×V.)	C	14	95+	s	4-6	Mar. 22	Apr. 24	May 18	May 25					m	r			z	c	l	ml	r	b	tsjw
Do	Cx	14	80−	s	2-6	Mar. 26	Apr. 22	Feb. 10	June 20	June 6	June 12	Sept. 26	Oct. 6	m	r			z	c	l	ml	r	b	tsjw
Do	F	15	80+	s	2-7	Mar. 12	Mar. 26	May 1	May 10	May 1	May 16	Sept. 4	Sept. 6	m	r	26	.597	z	c	l	ml	r	b	tsjw
Do	G	16	85−	s	2-8	Mar. 14	Apr. 24	May 12	May 25	May 15	May 29			m	r			z	c	l	ml	r	b	tsjw
Do	Gi	13	98+	s		Mar. 11	May 17	Apr. 26	May 18	Apr. 28	May 19			m	r			z	c	l	ml	r	b	tsjw
Do	O	17	19−	s	2-6	Mar. 10	May 24	May 24	June 2	May 28	June 5			m	r	26	.7513	z	c	l	ml	r	b	tsjw
Do	S	16	80	s	2-6	Mar. 14	May 25	May 22	June 6	May 26	June 12			m	r			z	c	l	ml	r	b	tsjw
Do	St	12	10−	s	2-6	Mar. 12	Apr. 21	May 18	May 25			Apr. 25	May 29	m	r			z	c	l	ml	r	b	tsjw
Muscat d'Aubenas:																								
¾ V.×¼ Ru.	O	13	37−	s	2-6	Mar. 11	Apr. 8	May 19	June 2	May 22	June 4	Sept. 16	Oct. 11	g	r	23	.6345	m	c	m	s	r	b	jw
Nectar:																								
La.×(Ba.×V.)	C	8	92+	cs	2-6	Mar. 15	Apr. 4	May 2	May 21	May 5	May 24			p	r			m	ct	c	m	r	b	tsjw
Do	F	4	10	s		Mar. 24	Apr. 8							p	r			m	ct	c	m	r	b	tsjw
Do	S	6	85+	s		Mar. 20	May 3							p	r			m	ct	c	m	r	b	tsjw

TABLE 7.—*Relative behavior and value for different purposes of grape direct producers originated in Europe and in the United States growing on their own roots in 12 experiment vineyards in California*—Continued

Variety and parentage	Experiment vineyard	Period planted (years)	Growth rating	How pruned	Nodes bearing fruit	Growth-starting date		Blossoming date		Fruit-setting date		Fruit-ripening date		Productiveness	Bearing habit	Sugar, Balling scale	Acid, as tartaric, grams per 100 c. c.	Cluster			Berry			Use
						Early season	Late season	Early season	Late season	Early season	Late season	Early season	Late season					Size	Shape	Compact or loose	Size	Shape	Color	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Niagara:																								
La.×V	C	14	92+	s	3-6	Mar. 20	Apr. 24							g	o			z	c	m	l	r	w	tsj
Do	Cx	14	80−	s	2-8	Mar. 25	Apr. 20	May 15	June 12	May 21	June 15	Sept. 25	Oct. 13	g	o	26	0.51	z	c	m	l	r	w	tsj
Do	G	15	88	s	2-8	Mar. 20	Apr. 6	May 8	June 2	May 11	June 6	Sept. 12	Sept. 21	g	o	22	.5587	z	c	m	l	r	w	tsj
Do	O	15	50−	s	2-6	Mar. 13	Apr. 4	May 10	May 26	May 14	May 31	Sept. 19	Oct. 2	g	o	20	.8475	z	c	m	l	r	w	tsj
Do	S	15	90	s	2-6	Mar. 12	May 16	May 16	June 30	May 21	June 7			g	o			z	c	m	l	r	w	tsj
Nitodal:																								
Ci.×La.×Ba.×A	O	3	30	s		Mar. 20	Apr. 2							e	r			z	t	c	m	r	r	tjw
Noah:																								
R.×La	C	8	92+	s	2-6	Mar. 10	Apr. 12	Apr. 30	May 12	May 6	May 16			e	r			m	ct	c	m	r	w	tjw
Noé (Fils de Noé):																								
(Ru.×Li.)×(V.×Ru.)	C	8	95+	s	2-6	Mar. 22	Apr. 10	May 6	June 4	May 9	June 6			m	r			s	c	c	s	r	b	jw
Do	O	13	40−	s	2-6	Mar. 13	Apr. 13	May 23	June 1	May 26	June 4	Sept. 14	Oct. 1	m	r	25	.8025	s	c	c	s	r	b	jw
Nortons:																								
A.×La	EG	6	82+	s		Apr. 2	Apr. 10							g	r			z	lt	m	sm	r	b	jw
Nouveau Bayard:																								
¾ V.×¼ Ru	C	13	98+	s	2-6	Mar. 8	Mar. 28	Apr. 30	May 31	May 2	June 5			g	r			l	t	m	m	r	b	jw
Do	EG	6	88−	s	2-6	Mar. 28	Apr. 3	May 4	May 20	May 9	May 23			g	r			l	t	m	m	r	b	jw
Do	O	13	88−	s	2-7	Mar. 11	Apr. 10	May 10	May 30	May 13	June 2	Sept. 19	Oct. 15	g	r	20	.5614	l	t	m	m	r	b	jw
Olita:																								
Ba.×(La.×V.)	C	8	95+	s	2-6	Mar. 20	Apr. 6	May 2	May 20	May 5	May 24			m	r			m	cl	m	m	r	w	tjw
Olitatoo:																								
(V.×La.)×(Li.×V.×La.)	C	11	100+	s	2-8	Mar. 18	Apr. 7	May 1	June 4	May 10	June 8			g	r			m	t	l	m	r	w	tjw
Do	Cx	10	75−	s		Mar. 25	Apr. 26	May 24	June 10			Oct. 2	Oct. 4	g	r	25	.5850	m	t	l	m	r	w	tjw
Do	G	6	82+	s		Mar. 16	Apr. 12							g	r			m	t	l	m	r	w	tjw
Do	O	13	35−	s	2-6	Mar. 11	Apr. 8	May 23	June 5	May 20	June 9	Sept. 12	Sept. 29	g	r	26	.5475	m	t	l	m	r	w	tjw
Do	S	6	100+	s		Mar. 18	May 2							g	r			m	t	l	m	r	w	tjw
Oneida:																								
V.×La	C	8	95+	s	2-6	Mar. 17	Apr. 1	Apr. 26	May 8					m	o			sm	t	l	m	r	r	t
Osage:																								
La.×V	C	8	80	s		Mar. 10	Apr. 4							m	r			m	rc	c	l	r	b	t

Panache blanche:																								
V.×(Ru.×V.)	O	13	36–	s	2-6	Mar. 9	Apr. 1	May 4	June 1	May 7	June 30	Sept. 18	Oct. 11	g	r	21	.5547	m	t	m	m	r	w	jwt
Plant verni:																								
Ru.×(Li.×V.)	EG	6	82	s	2-6	Mar. 28	Apr. 28	do	May 21	May 6	May 23			g	r			m	c	m	m	r	b	jw
Do	O	13	90	s	2-6	Mar. 13	Apr. 18	May 10	May 30	May 13	June 2	Sept. 12	Oct. 11	g	r	24	.5896	m	c	m	m	r	b	jw
Paradox:																								
La.×V	C	8	92+	cs	2-6	Mar. 15	Apr. 1	Apr. 28	May 14	Apr. 30	May 18			p	o			m	r	c	m	r	b	t
Paragon:																								
La	C	8	90+	cs	2-6	do	Mar. 26	Apr. 26	May 8	Apr. 29	May 12			p	o			m	r	c	m	r	b	t
Pardes:																								
V.×La	C	14	100+	s	2-7	Mar. 18	Apr. 18	Apr. 27	June 2	Apr. 30	June 5			m	r			m	c	m	s	r	b	jw
Do	Cx	13	95+	s	2-7	Mar. 24	Apr. 19	May 18	June 24	May 22	June 28	Sept. 22	Oct. 6	m	r	25	.9037	m	c	m	s	r	b	jw
Do	F	16	88+	s	1-7	Mar. 2	Mar. 25	Apr. 25	May 14	Apr. 30	May 28	Aug. 24	Sept. 6	m	r	22	.5737	m	c	m	s	r	b	jw
Do	G	15	95	s	2-6	Mar. 4	Apr. 10	May 2	June 1	May 6	June 4			m	r			m	c	m	s	r	b	jw
Do	Gi	14	100	s	2-9	Mar. 6	Apr. 6	Apr. 14	May 8	Apr. 14	May 10	Aug. 2	Oct. 6	m	r	23	.6850	m	c	m	s	r	b	jw
Do	O	16	95	s	2-6	Mar. 10	do	May 8	May 26	May 11	May 29	Sept. 16	Oct. 14	m	r	22	.7258	m	c	m	s	r	b	jw
Do	S	16	100	s	2-6	Mar. 14	May 8	May 16	June 26	May 21	June 8	Sept. 22	Oct. 21	m	r	23	.8407	m	c	m	s	r	b	jw
Do	St	13	80–	s	2-8	Mar. 12	Apr. 8	May 1	May 31	May 4	June 3			m	r			m	c	m	s	r	b	jw
Pâte noir:																								
Li.×V	C	8	100	cs	1-6	Mar. 6	Mar. 28	Apr. 28	May 28	May 2	May 30			g	r			m	t	m	m	r	b	jw
Do	EG	6	90–	s	2-6	Mar. 23	Apr. 18	May 15	May 23	Mar. 30	May 26			g	r			m	t	m	m	r	b	jw
Do	O	13	55	s	2-6	Mar. 13	Apr. 10	May 24	June 1	May 20	June 3	Sept. 12	Oct. 11	g	r	23	.7768	m	t	m	m	r	b	jw
Peabody:																								
(R.×La.)×V	C	8	92+	cs	2-8	Mar. 10	Mar. 25	Apr. 25	May 30	Apr. 27	June 2			g	r			m	lc	c	m	or	b	tjws
Do	O	3	5–	c		Mar. 7	Apr. 14							g	r			m	lc	c	m	or	b	tjws
Do	S	6	80+	s		Mar. 16	May 8							g	r			m	lc	c	m	or	b	tjws
Pearl:																								
R.×La	C	8	92+	s	2-8	Mar. 15	Apr. 2	Apr. 12	May 16	Apr. 17	May 21			p	r			m	rc	c	s	r	w	jw
Do	O	15	20	s	2-6	Mar. 11	Apr. 10	May 20	May 22	May 24	May 25			p	r			m	rc	c	s	r	w	jw
Perkins:																								
La.×V	C	6	90+	cs	2-6	Mar. 16	Apr. 6	Apr. 15	June 2	Apr. 20	June 5			g	r			m	rct	c	m	o	w	tsjw
Pickaninny:																								
La.×Ru	C	6	60	s	2-6	do	Apr. 2	May 12	May 16	May 13	May 26			g	r			m	rct	c	m	o	w	tsjw
Pierce:																								
La.×V	F	17	60–	s	2-6	Mar. 8	Mar. 30	Apr. 30	May 8	Apr. 27	May 10			e	r			m	c	c	l	o	b	tsjwc
Do	G	15	90–	s		Mar. 14	Apr. 15	Apr. 28	June 8	May 1	June 12	Sept. 8	Sept. 28	e	r			m	c	c	l	o	b	tsjwc
Do	O	15	5–	s	3-4	Mar. 11	do							e	r			m	c	c	l	o	b	tsjwc
Do	S	15	90–	s		do	May 8	May 15	June 24	May 19	June 4			e	r	19	.9187	m	c	c	l	o	b	tsjwc
Pocklington:																								
La	C	8	72+	cs	2-6	Mar. 15	Apr. 8	Apr. 15	May 6	Apr. 19	May 9			m	o			m	ct	m	ml	o	w	tjw
Pompon d'Or:																								
Complex hybrid	O	13	95+	s	2-6	Mar. 13	Apr. 17	May 12	June 3	May 14	June 5	Sept. 16	Oct. 11	g	r	22	.6341	m	t	m	m	r	r	jwt
Poughkeepsie:																								
Ba.×La.×V	C	6	88	cs	2-6	Mar. 15	Apr. 1	May 6	May 23	May 12	May 27			p	o			sm	ct	c	s	r	r	tjw
Presley:																								
La.×R	C	8	92	cs	3-8	Mar. 8	Apr. 6	Apr. 27	May 12	Apr. 30	May 15			g	o			m	c	l	s	r	b	jwt
Do	O	5	5–	s	3-5	Mar. 10	Apr. 10	May 23	June 1					g	o			m	c	l	s	r	b	jwt
Prentiss:																								
La.×R	C	8	92	s		Mar. 15	Apr. 8							g	o			m	ct	c	sm	ro	w	jw
Ragan:																								
Li.×(La.×V.)	C	8	90–	cs	2-8	Mar. 10	Apr. 1	May 2	May 22	May 6	May 26			m	r			z	t	c	m	r	b	tjw
Do	Gi	14	88–	s	3-6	Mar. 8	May 18	May 5	June 2	May 7	May 24			m	r			z	t	c	m	r	b	tjw
Do	Cx	9	80–	s		Mar. 25	Apr. 20							m	r			z	t	c	m	r	b	tjw

TABLE 7.—*Relative behavior and value for different purposes of grape direct producers originated in Europe and in the United States growing on their own roots in 12 experiment vineyards in California*—Continued

Variety and parentage	Experiment vineyard	Period planted (years)	Growth rating	How pruned	Nodes bearing fruit	Growth-starting date		Blossoming date		Fruit-setting date		Fruit-ripening date		Productiveness	Bearing habit	Sugar, Balling scale	Acid, as tartaric, grams per 100 c. c.	Cluster			Berry			Use
						Early season	Late season	Early season	Late season	Early season	Late season	Early season	Late season					Size	Shape	Compact or loose	Size	Shape	Color	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Rautenberg, No. 47:																								
La.×(La.×A.×V.)	O	6	50+	s	----	Mar. 15	Apr. 4	--------	--------	--------	--------	--------	--------	p	o	----	----	m	c	c	m	r	w	tjw
Rebecca:																								
La.×V	C	8	90−	cs	2-8	Mar. 17	Apr. 1	May 6	June 2	May 9	June 5	--------	--------	g	r	----	------	m	c	m	m	o	w	tsjw
Do	G	15	88−	s	2-6	Mar. 18	Apr. 8	May 8	---do---	May 5	---do---	Sept. 4	Sept. 22	g	r	20	0.4950	m	c	m	m	o	w	tsjw
Do	O	15	30−	s	2-6	Mar. 13	Apr. 10	May 12	May 28	May 15	May 30	Sept. 16	Oct. 8	g	r	22	.5865	m	c	m	m	o	w	tsjw
Do	S	15	85−	s	2-6	Mar. 18	May 18	May 19	June 26	May 23	June 5	Sept. 20	Oct. 28	g	r	21	.7175	m	c	m	m	o	w	tsjw
Red Eagle:																								
La.×V	C	8	95+	cs	2-6	Mar. 10	Apr. 2	Apr. 26	June 1	Apr. 20	---do---	--------	--------	g	o	----	------	sm	t	m	m	r	r	t
Regal:																								
La.×V	C	8	95+	cs	2-6	Mar. 15	Apr. 10	Apr. 28	May 18	May 1	May 26	--------	--------	g	o	----	------	sm	ct	c	m	r	r	tj
Requa:																								
La.×V	C	8	92+	cs	2-8	Mar. 8	Apr. 8	May 6	May 23	May 9	May 25	--------	--------	m	r	----	------	m	c	c	ml	or	r	tsj
Rockwood:																								
La	C	8	90+	cs	2-6	Mar. 17	---do---	Apr. 27	May 6	Apr. 20	May 9	--------	--------	p	r	----	------	m	ct	c	ml	o	b	ts
Rogers, No. 5:																								
La.×V	C	8	90+	cs	2-6	Mar. 15	Apr. 6	May 1	May 21	May 4	May 20	--------	--------	m	r	----	------	m	tc	l	l	ro	b	tsj
Rogers, No. 13:																								
La.×V	C	8	98+	cs	2-8	Mar. 6	---do---	Apr. 25	May 25	Apr. 28	May 23	--------	--------	p	o	----	------	m	tc	l	l	ro	b	tsj
Do	O	5	5−	c	2-6	Mar. 13	Apr. 13	--------	--------	--------	--------	--------	--------	p	o	----	------	m	tc	l	l	ro	b	tsj
Rogers, No. 32:																								
La.×V	C	8	90+	s	2-6	Mar. 19	Apr. 2	May 2	May 6	May 5	May 9	--------	--------	----	----	----	------	m	tc	l	ml	ro	r	tsj
Rommel:																								
(La.×R.)×(La.×V.)	C	14	82+	s	2-6	Mar. 20	Apr. 10	---do---	May 12	May 6	May 16	--------	--------	g	r	----	------	m	c	l	l	r	w	tsjw
Do	F	17	55−	s	2-6	Mar. 5	Mar. 27	Apr. 20	---do---	Apr. 22	May 14	Aug. 20	Sept. 4	g	r	25	.4182	m	c	l	l	r	w	tsjw
Do	O	16	40−	s	1-6	Mar. 11	Apr. 18	May 12	May 28	May 15	May 30	May 12	May 20	g	r	23	.9375	m	c	l	l	r	w	tsjw
Do	S	13	95+	s	2-6	Mar. 16	May 2	May 18	June 30	May 22	June 11	Sept. 22	Sept. 26	g	r	23	.975	m	c	l	l	r	w	tsjw
Do	St	13	10−	s	2-6	Mar. 15	Apr. 12	Apr. 30	June 3	May 2	June 7	--------	--------	g	r	----	------	m	c	l	l	r	w	tsjw

Rupert:																								
(Li.×Ru.)×(La.×V.×Ba.)	C	8	95+	s	3-8	Mar. 8	Apr. 6	May 4	May 29	May 7	June 1			p	o			m	l	l	m	r	b	tjw
Do	O	5	92+	s	2-6	Mar. 15	Apr. 18	May 26	June 1	May 30	June 4			p	o			m	l	l	m	r	b	tjw
Rustler:																								
La.×V.	C	8	95+	cs	3-6	Mar. 18	Apr. 4	Apr. 30	May 16	May 5	do			p	o			m	c	c	m	r	w	tjw
Sackstedcr, No. 15:																								
La.×V.	C	6	90	s		Mar. 23	Apr. 12							p	o			m	c	c	m	r	w	tjw
Salem:																								
La.×V.	C	8	88	cs	2-6	Mar. 18	Mar. 30	Apr. 12	May 12	Apr. 18	May 17			m	r			z	t	l	ml	r	r	tjw
Secretary:																								
(R.×La.)×V.	C	8	40−	s	2-6	Mar. 15	do	Apr. 25	May 20	Apr. 28	May 24			m	r			m	trc	mc	m	ro	b	tsjw
Seibel, No. 1:																								
Li.×V.	C	13	92−	s	2-6	Mar 21	Apr. 12	Apr. 30	June 4	May 3	June 10			e	r			m	c	l	l	r	b	jw
Do	Cx	13	40−	s	2-8	Apr. 1	Apr. 24	May 18	June 24	May 21	June 28	Sept. 25	Oct. 8	e	r	24	.7800	m	c	l	l	r	b	jw
Do	EG	6	75−	s	2-7	Mar. 16	Apr. 6	May 15	May 23	May 10	May 26			e	r			m	c	l	l	r	b	jw
Do	F	15	90+	s	1-7	Mar. 2	Mar. 25	Apr. 18	May 14	Apr. 30	May 28	Aug. 24	Sept. 6	e	r	18	.5725	m	c	l	l	r	b	jw
Do	G	16	90+	s	2-7	Mar. 16	Apr. 20	Apr. 30	June 6	May 3	June 9	Sept. 19	Sept. 27	e	r	23	.7125	m	c	l	l	r	b	jw
Do	Gi	14	98+	s	2-6	Mar. 13	Apr. 14	Apr. 26	May 20	Apr. 28	May 22	Sept. 13	Oct. 10	e	r	21	.7412	m	c	l	l	r	b	jw
Do	O	16	50−	s	2-6	Mar. 11	Apr. 10	May 23	May 30	May 25	June 2	Sept. 12	Oct. 14	e	r	22	.7500	m	c	l	l	r	b	jw
Seibel, No. 2:																								
Li.×V.	C	14	95−	s	2-8	Mar. 19	Apr. 8	May 2	May 28	May 5	May 30			e	r			m	c	l	l	r	b	jw
Do	Cx	13	70−	s	2-8	Apr. 3	Apr. 23	May 24	do	May 27	June 30	Sept. 27	Oct. 14	e	r	24	.7575	m	c	l	l	r	b	jw
Do	G	16	85−	s	2-8	Mar. 18	Apr. 18	May 6	June 6	May 9	June 24	Sept. 24	Oct. 2	e	r	23	.9650	m	c	l	l	r	b	jw
Do	Gi	14	90+	s	2-6	Mar. 13	Apr. 20	Apr. 30	May 27	May 2	May 29	Sept. 20	Oct. 4	e	r	24	.7608	m	c	l	l	r	b	jw
Do	O	16	45−	s	2-5	Mar. 3	Apr. 10	Apr. 19	June 2	May 20	June 5	Sept. 12	Oct. 14	e	r	17	1.188	m	c	l	l	r	b	jw
Seibel, No. 14:																								
(Ru.×Li.)×V.	C	14	92−	s	2-8	Mar. 23	do	May 6	do	May 10	June 9			g	r			m	c	l	l	r	b	jw
Do	Cx	14	85−	s	2-6	Apr. 1	Apr. 24	May 22	July 4	May 25	July 7	Sept. 27	Oct. 12	g	r	28	.8512	m	c	l	l	r	b	jw
Do	EG	6	82−	s	2-7	Mar. 27	Apr. 2	May 15	May 20	May 18	May 23			g	r			m	c	l	l	r	b	jw
Do	G	14	98+	s	2-6	Mar. 18	Apr. 28	May 1	June 1	May 4	June 7			g	r			m	c	l	l	r	b	jw
Do	Gi	14	90	s	2-6	Mar. 11	Apr. 10	Apr. 26	May 15	Apr. 28	May 17	Sept. 20	Oct. 8	g	r	23	.6458	m	c	l	l	r	b	jw.
Do	O	16	62−	s	1-6	Mar. 13	Apr. 13	May 15	June 1	May 18	June 4	Sept. 19	Oct. 16	g	r	22	.6047	m	c	l	l	r	b	jw
Seibel, No. 29:																								
(Ru.×Li.)×V.	C	8	98+	s	2-6	Mar. 20	Apr. 8	May 4	June 8	May 7	June 10			g	r			s	c	c	s	r	b	jw
Do	EG	6	95−	s	2-6	Mar. 28	Apr. 10	May 8	May 28	May 20	May 31			g	r			s	c	c	s	r	b	jw
Do	O	13	93+	s	2-6	Mar. 15	Apr. 17	May 24	June 5	May 27	June 9	Sept. 18	Oct. 15	g	r	22	.8308	s	c	c	s	r	b	jw
Seibel, No. 38:																								
(Ru.×Li.)×V.	C	14	95−	s	2-6	Mar. 19	Apr. 28	Apr. 28	May 23	May 1	May 22			m	r			s	c	c	s	r	b	jw
Seibel, No. 70:																								
Li.×V.	EG	6	72−	s	2-6	Mar. 28	Apr. 10	May 16	May 25	May 19	May 28			g	r			s	c	c	s	r	b	jw
Do	O	13	40−	s	2-6	Mar. 11	Apr. 14	May 12	May 30	May 15	June 2	Sept. 16	Oct. 15	g	r	42	.8075	s	c	c	s	r	b	jw
Seibel, No. 78:																								
Ru.×(Li.×V.)	O	13	84+	s	2-6	do	Apr. 12	May 10	do	May 12	do	do	Oct. 11	g	r	25	.6775	m	c	c	m	r	b	jw
Seibel, No. 80:																								
Ru.×(Li.×V.)	EG	6	80−	s	2-6	Mar. 22	Apr. 2	do	May 21	May 15	May 30			g	r			m	c	c	m	r	b	jw
Do	O	13	90+	s	2-7	Mar. 11	Apr. 8	May 8	May 27	May 11	do	Sept. 12	Oct. 15	g	r	23	.7310	m	c	c	m	r	b	jw
Seibel, No. 209:																								
Ru.×(Li.×V.)	O	13	85+	s	2-6	Mar. 13	Apr. 6	May 22	June 1	May 23	June 4	Sept. 16	Oct. 6	g	r	23	.7800	m	c	c	m	r	b	jw
Do	EG	6	95+	s	2-6	Mar. 28	do	May 12	May 23	May 16	May 20			g	r			m	c	c	m	r	b	jw
Seibel, No. 334:																								
(Ru.×Li.)×(V.×Ru.)	O	13	92	s	1-7	Mar. 13	Apr. 10	May 22	June 4	May 25	June 7	Sept. 18	Oct. 11	m	r	21	.8460	l	c	c	m	r	b	jw

TABLE 7.—*Relative behavior and value for different purposes of grape direct producers originated in Europe and in the United States growing on their own roots in 12 experiment vineyards in California*—Continued

Variety and parentage	Experiment vineyard	Period planted (years)	Growth rating	How pruned	Nodes bearing fruit	Growth-starting date: Early season	Growth-starting date: Late season	Blossoming date: Early season	Blossoming date: Late season	Fruit-setting date: Early season	Fruit-setting date: Late season	Fruit-ripening date: Early season	Fruit-ripening date: Late season	Productiveness	Bearing habit	Sugar, Balling scale	Acid, as tartaric, grams per 100 c. c.	Cluster: Size	Cluster: Shape	Cluster: Compact or loose	Berry: Size	Berry: Shape	Berry: Color	Use
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Seibel, No. 1004:																								
Li.×V.	EG	6	90−	s	2–8	Mar. 21	Apr. 20	May 14	May 27	May 16	June 1			g	r			l	c	m	m	r	b	jw
Do.	O	13	50−	s	2–7	Mar. 15	Apr. 8	May 23	May 31	May 26	June 2	Sept. 19	Oct. 15	g	r	21	0.6639	l	c	m	m	r	b	jw
Seibel, No. 1070:																								
Ru.×(Li.×V.)	EG	6	90−	s	2–8	Mar. 28	Apr. 6	May 4	June 10	Apr. 16	June 13			g	r			l	c	m	m	o	b	jw
Do.	O	13	75+	s	2–6	Mar. 11	Apr. 7	May 22	June 1	May 25	June 4	Sept. 19	Oct. 11	g	r	21	.7728	l	c	m	m	o	b	jw
Seibel, No. 1077:																								
Ru.×(Li.×V.)	O	13	65−	s	2–6	Mar. 13	Apr. 17	May 24	June 5	May 27	June 8	Sept. 10	do	g	r	25	.7881	m	c	c	m	r	b	jw
Seibel, No. 2007:																								
Ru.×(Li.×V.)	C	8	90−	s	2–6	Mar. 10	Apr. 1	May 2	June 1	May 5	June 4			g	r			s	c	c	m	r	b	jw
Do.	EG	5	90−	s	2–6	Mar. 20	Apr. 4	May 14	May 22	May 8	June 1			g	r			s	c	c	m	r	b	jw
Seibel, No. 2010:																								
Ru.×(Li.×V.)	O	13	65−	s	2–7	Mar. 11	Apr. 30	May 25	May 30	May 9	June 2	Sept. 19	Oct. 11	g	r	22	.7084	m	c	c	m	r	b	jw
Seibel, No. 2029:																								
Ru.×(Li.×V.)	O	13	62−	s	2–6	Mar. 14	Apr. 17	May 23	June 5	May 28	June 9	Sept. 14	Oct. 7	g	r	24	.8700	s	c	c	m	r	b	jw
Seibel, No. 2033:																								
Ru.×(Li.×V.)	C	8	90+	cs	2–6	Mar. 10	Apr. 12	Apr. 30	do	May 3	do			g	r			s	c	c	m	r	b	jw
Do.	EG	6	90−	s	2–6	Mar. 18	Apr. 4	May 15	May 24	May 16	May 29			g	r			s	c	c	m	r	b	jw
Do.	O	13	62−	s	2–6	Mar. 10	do	May 20	June 2	May 20	June 5	Sept. 18	Oct. 11	g	r	23	.6800	s	c	c	m	r	b	jw
Seibel, No. 2043:																								
(Ru.×Li.)×(V.×Ru.)	O	10	88	s		do	Apr. 8	May 18	May 22					g	r			l	c	c	m	r	b	jw
Do.	St	11	60−	s	2–6	Mar. 17	Apr. 20	May 9	June 2	May 12	June 5			g	r			l	c	c	m	r	b	jw
Seibel, No. 2056:																								
(Ru.×Li.)×(V.×Ru.)	O	13	85−	s	2–6	Mar. 11	Apr. 12	May 12	May 30	May 26	June 2	Sept. 19	Oct. 10	g	r	21	.7500	m	c	c	m	r	b	jw
Shalah:																								
Li.×Ru.×La.	C	13	72+	s	3–6	Mar. 20	Apr. 10							m	r			m	c	c	m	r	b	jwt
Do.	O	17	75−	s	1–6	Mar. 15	May 20	May 20	May 30	May 23	June 2	Sept. 17	Oct. 11	m	r	23	.9450	m	c	c	m	r	b	jwt
She by:																								
La.×R.	C	8	80+	cs	2–6	Mar. 8	Apr. 8	Apr. 18	May 12	Apr. 23	May 16			p	o			sm	t	mc	sm	r	w	jw
Tonkawa:																								
La.×V.×Ba.	C	9	88+	cs	2–8	Mar. 10	Apr. 1	Apr. 28	do	May 2	May 17			g	o			m	l	l	m	o	r	tjw

Triumph:																								
La.×V	C	9	95+	cs	2-6	Mar. 18	Apr. 6	May 1	May 18	May 5	May 22			m	r			z	ltc	m	ml	o	w	tsjw
Do.	O	6	88−	s	1-6	Mar. 14	Apr. 12	May 26	June 1	May 20	June 2			m	r			z	ltc	m	ml	o	w	tsjw
Ulster:																								
La.×V	C	8	90+	s	2-6	Mar. 15	Apr. 6	Apr. 20	May 2	Apr. 24	May 6			m	o			m	ct	mc	m	ro	r	tjw
Valhallah:																								
(La.×V.×Ba.)×(C.×R.)	C	14	80+	s	2-8	Mar. 22	Apr. 18	Apr. 30	May 20					g	r			m	c	c	m	r	b	jwt
Do.	O	17	65−	s	1-6	Mar. 13	Apr. 12	Mar. 30	May 29	May 9	June 1			g	r		.7650	m	c	c	m	r	b	jwt
Do.	Cx	3	80−	s	2-8	Mar. 25	Apr. 20	May 15	June 12	May 20	June 15	Sept. 25	Oct. 15	g	r			m	c	c	m	r	b	jwt
Do.	F	17	82	s	2-6	Mar. 10	Mar. 29	Apr. 24	May 28	Apr. 27	May 14	Sept. 8	Sept. 20	g	r		.4750	m	c	c	m	r	b	jwt
Vergennes:																								
La.	C	8	82+	s	2-6	Mar. 20	Apr. 4	May 2	May 16	May 6	May 20			g	r			m	ct	mc	ml	or	r	tsjw
Wapanuka:																								
(La.×R.×V.)×(La.×V.×Ba.)	C	7	10−	c		do.	Apr. 10							g	r			z	ct	c	l	r	w	tsjwc
Wheaton:																								
La.×Ba.×V	C	6	20	s		do.	Apr. 8							p	o			sm	c	mc	s	r	w	jw
Wilder:																								
La.×V	C	8	92	cs	2-8	Mar. 17	Apr. 4	Apr. 30	May 25	May 3	May 29			p	r			m	t	l	l	o	b	tsjwc
Winchell:																								
(La.×V.)×A	G	5	30+	c		Mar. 16	Apr. 30							e	r			m	t	mc	m	r	w	tjw
Do.	O	6	70+	s	1-6	do.	Apr. 6	May 21	May 27	May 24	May 30	Oct. 12	Oct. 20	e	r			m	t	mc	m	r	w	tjw
Do.	S	6	90+	s		do.	May 2							e	r			m	t	mc	m	r	w	tjw
Wine King:																								
(A.×La.)×(Li.×Ru.)	C	13	98−	s	3-8	Mar. 21	Apr. 6	Apr. 30	May 20	May 2	May 23			m	r			l	c	c	m	r	b	jw
Do.	O	17	89−	s	2-7	Mar. 13	Apr. 12	May 24	June 1	May 28	June 3	Sept. 14	Oct. 4	m	r	24	1.181	l	c	c	m	r	b	jw
Woodruff:																								
La.×V	C	8	50+	s	2-6	Mar. 16	Apr. 10	May 2	May 5	May 5	May 6			m	r			m	rt	mc	ml	ro	r	tsjw
Worden:																								
La.	C	14	10−	s	2-4	Mar. 23	Apr. 28	Apr. 9	May 8	do.	May 11			g	r			m	c	l	m	r	b	tjw
Do.	Cx	14	85+	s	2-8	Mar. 20	Apr. 27	May 16	June 17	May 10	June 20	Sept. 26	Oct. 4	g	r	20	.5812	m	c	l	m	r	b	tjw
Do.	G	15	82+	s	2-8	Mar. 19	Apr. 12	May 2	June 8	May 5	June 12	Oct. 2	Oct. 18	g	r			m	c	l	m	r	b	tjw
Do.	O	15	14−	s	2-4	Mar. 10	do.	May 22	May 24	May 25	May 26			g	r			m	c	l	m	r	b	tjw
Wyandotte:																								
Li.	C	6	88+	s		Mar. 19	Apr. 10							e	r			m	t	mc	m	r	w	tjw
Wyoming:																								
La.	C	14	40−	s	3-6	Mar. 17	Apr. 18	Apr. 23	May 12	May 1	May 17			m	r			m	c	l	m	r	r	tsj
Do.	G	15	82−		2-9	Mar. 19	Apr. 12	May 6	May 24	May 9	May 28	Sept. 15	Sept. 24	m	r			m	c	l	m	r	r	tsj
Do.	O	15	56−		2-6	Mar. 13	Apr. 15	May 21	June 1	May 25	June 4	Oct. 2	Oct. 8	m	r	24	.5100	m	c	l	m	r	r	tsj
Do.	S	15	60−	s	2-6	Mar. 17	May 19	do.	do.	May 24	June 5			m	r			m	c	l	m	r	r	tsj
Xinta:																								
(V.×La.)×(Li.×Ru.)	C	13	85+	s	2-8	Mar. 15	Apr. 4	May 2	May 20	May 1	May 27			m	r			l	c	m	m	r	b	jw
Do.	F	16	60	s	3-6	Mar. 8	Mar. 30	Apr. 24	May 15	Apr. 27	May 19	Sept. 3	Sept. 6	m	r	21	.4300	l	c	m	m	r	b	jw
Do.	O	17	70−	s	2-7	Mar. 19	Apr. 16	May 29	June 4	June 1	June 8	Sept. 19	Oct. 5	m	r	24	.9812	l	c	m	m	r	b	jw

SUMMARY AND CONCLUSIONS

Information relative to the successful use of the different phylloxera-resistant grape stock varieties best suited to various soil, climatic, and other conditions, as well as for the successful establishment of vineyards on resistant stock, is given in this bulletin. It also contains information relative to the so-called direct producers originated in Europe, together with those originated in the United States, that have been tested in the United States Department of Agriculture experiment vineyards located in the various vinifera regions.

The ideal resistant stock is one having a most resistant root which is congenial to a top producing an abundance of best-quality fruit.

Varying soil, climatic, and other conditions complicate the establishment of vineyards on resistant stocks.

Good resistant vineyards can result only when stocks are grafted with vinifera varieties congenial to them and grown in soil and under climatic and other conditions to which they are suited.[9]

The adaptability of resistant stocks to soil, climatic, and other conditions can be closely forecast, but their congeniality to varieties grafted on them must be determined by actual test.

Where conditions are not suited to any given species they are often adapted to hybrids of a species with some other species; and where all the qualities desired can not be found in a hybrid, a complex hybrid (a hybrid of hybrids) may yield the desired results.

The congeniality of the variety to the stock on which it is grafted very materially affects the phylloxera-resistant quality of the stock.

The relative rooting quality of resistant cuttings is an important consideration in the cost of establishing a resistant vineyard.

Cuttings of many of the hybrids root easily, although the cuttings from one of the parents may be hard to root.

Stocks that root easily from cuttings may not give good results in bench grafting.

Some stocks are especially suited for bench grafting, whereas others are suitable only for vineyard grafting.

Some of the hybrid resistant-stock varieties are resistant stocks in California under conditions suited to them.

Resistant stocks giving excellent results as entire plants may be failures as graft bearers.

Species difficult to propagate otherwise can be readily grown from seed, but seedlings vary greatly and for this reason are undesirable for vineyard purpose.

Cuttings of monticola, berlandieri, aestivalis, linsecomii, bicolor, and candicans rooting with difficulty should be grown by layering or rooted in the nursery and either grafted there or planted in the vineyard and subsequently grafted.

Riparia cuttings root easily and are excellent stocks well suited for vineyard and bench grafting, but in California they are adapted only to locations where they are influenced by the sea and coast to a marked degree. Soils in which riparia varieties thrive usually produce

---

[9] In the department's experiment vineyards at Fresno and Oakville, Calif., are mother-vine plantings of all the important phylloxera-resistant stock varieties considered valuable in establishing vinifera vineyards on resistant stocks. Growers will be able to obtain a limited supply of cuttings of such varieties as are not procurable in nurseries of this country by making a direct request for them sufficiently early in the winter for the cuttings to be prepared in time for spring use.

large crops of fruit which ripens relatively early and is of only fair quality.

Rupestris stands drought well, its cuttings root and graft easily, and it is best adapted for bench grafting, but when so used the dormant eyes should be cut out of the stocks. Many grape varieties are not congenial to rupestris and usually ripen their fruit somewhat later on it than when grown on other stocks.

A grower intending to establish a vineyard on resistant stocks should decide on the vinifera varieties he intends to grow and then choose soil and other conditions suited for the object in view. It should be previously determined whether the plantings are to be bench or nursery grafts or stocks planted in the vineyard and grafted afterwards, and resistant varieties congenial to the variety to be grown should then be selected. Familiarity with all the operations required in establishing a resistant vineyard is most essential.

The more promising of the direct producers introduced and tested in the department's experiment vineyards showed no complete successes. Either the hybrids reverted too far toward the vinifera and the phylloxera-resistant qualities were found wanting, or too much toward the resistant, thus impairing the quality of the fruit; or both resistance to phylloxera and the quantity and quality of the fruit of the hybrid were not as desired. So far none of them are equal to some of the finer American grape-juice varieties that are improved varieties or hybrids of native species.

Information relative to grape propagation and grafting is to be had in Farmers' Bulletin No. 471.[10] Information relative to vinifera grape varieties and their congeniality to important resistant stocks can be had in Department of Agriculture Bulletin No. 209.[11]

---

[10] HUSMANN, G. C. GRAPE PROPAGATION, PRUNING, AND TRAINING. U. S. Dept. Agr. Farmers' Bul. 471, 29 p., illus. 1911.

[11] HUSMANN, G. C. 1915. Op. cit.

ORGANIZATION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE

January 23, 1930

Secretary of Agriculture	ARTHUR M. HYDE.
Assistant Secretary	R. W. DUNLAP.
Director of Scientific Work	A. F. WOODS.
Director of Regulatory Work	WALTER G. CAMPBELL.
Director of Extension Work	C. W. WARBURTON.
Director of Personnel and Business Administration	W. W. STOCKBERGER.
Director of Information	M. S. EISENHOWER.
Solicitor	E. L. MARSHALL.
Weather Bureau	CHARLES F. MARVIN, *Chief.*
Bureau of Animal Industry	JOHN R. MOHLER, *Chief.*
Bureau of Dairy Industry	O. E. REED, *Chief.*
Bureau of Plant Industry	WILLIAM A. TAYLOR, *Chief.*
Forest Service	R. Y. STUART, *Chief.*
Bureau of Chemistry and Soils	H. G. KNIGHT, *Chief.*
Bureau of Entomology	C. L. MARLATT, *Chief.*
Bureau of Biological Survey	PAUL G. REDINGTON, *Chief.*
Bureau of Public Roads	THOMAS H. MACDONALD, *Chief.*
Bureau of Agricultural Economics	NILS A. OLSEN, *Chief.*
Bureau of Home Economics	LOUISE STANLEY, *Chief.*
Plant Quarantine and Control Administration	LEE A. STRONG, *Chief.*
Grain Futures Administration	J. W. T. DUVEL, *Chief.*
Food, Drug, and Insecticide Administration	WALTER G. CAMPBELL, *Director of Regulatory Work, in Charge.*
Office of Experiment Stations	————, *Chief.*
Office of Cooperative Extension Work	C. B. SMITH, *Chief.*
Library	CLARIBEL R. BARNETT, *Librarian.*

This bulletin is a contribution from

Bureau of Plant Industry	WILLIAM A. TAYLOR, *Chief.*
Office of Horticultural Crops and Diseases	EUGENE C. AUCHTER, *Principal Horticulturist, in Charge.*

U. S. GOVERNMENT PRINTING OFFICE: 1930

END