

THE TROPICAL GRAPE

By JOSEPH L. FENNEL

INTER-AMERICAN INSTITUTE OF AGRICULTURAL SCIENCES, TURRIALBA, COSTA RICA

FOR hundreds of years people of the Tropics have tried hopefully, almost desperately, to cultivate the grape. Literally hundreds of domestic varieties and every conceivable method of culture have been tested without success. But tropical varieties had never been planted.

Since climate is a controlling influence in the growth and adaptability of all plants, it is advantageous to consider the grape with respect to its geographical distribution. It is found that all species and domestic varieties, wild and cultivated sorts the world over, fall into three climatic groups: the arid-temperate, the humid-temperate, and the humid-tropical.

The arid-temperate group is composed of those species and domestic varieties that are native to regions having hot, semiarid summers and moist, cool (freezing) winters. The well-known European vineyard kinds (*Vitis vinifera*), which are believed to have originated in the region of the Caspian Sea, are examples. They are the grapes of antiquity and the Bible, so frequently mentioned in all recordings of the ancient past. Just when man first focused his attention on the original wild type or made the initial efforts at domesticating and improving it is beyond the horizon of recorded history. Viticulture was flourishing in the time of Homer and doubtless came into being long before his day.

Hundreds and even thousands of improved varieties of this climatic group are known, a few of the more prominent of which are: Malaga, Emperor, Sultania, Cabernet, Muscat—all pure forms of *vinifera* species.

The humid-temperate group is native to moist, temperate climates where the growing season is short, moist, and warm and the winters are long and cold. All the wild species native to the United States east of the Rocky Mountains and north of central Florida belong to this climatic classification, as do a few others from eastern Asia. Within this group there are many improved, domes-

ticated varieties, largely derived from the species *Vitis labrusca*, which have been developed in North America during the last 150 years. A few sorts, such as Concord, Delaware, Niagara, Beacon, Catawba, and Isabella, are widely grown in the United States east of California and are popularly known as "slip-skin, or American, grapes," in distinction from the meaty, solid-textured European types.

The humid-tropical group comprises the kinds of direct interest here. Although there have been in existence no improved or domesticated grapes of this class, there has been an interesting and valuable assortment of basic wild material. Fourteen or more wild species having humid-tropical adaptabilities are known, and there is a wide and varied range in the horticultural factors involved.

Within the humid-tropical group of wild species there are practically all of the fundamental qualities needed for the development of a new class of improved tropical vineyard kinds. The qualities of rugged health and disease resistance, high productivity, large berries and clusters, and sweet, delicious flavors can be found in one or another of the wild selections.

Since all species of true grape can be intercrossed with little difficulty, there remains but the matter of a methodical apportionment of the desired characters in conformity with specialized *Vitis* genetics until we realize our ultimate goal—fine vineyard grapes for the Tropics and Subtropics.

IN THE autumn of 1935, in pursuit of a general interest in botany, I became deeply immersed in the taxonomic complexities of the genus *Vitis*. Along the margins of the glades and streams and in the tropical hammocks of southern Florida there were various wild grape species that were faultily described and in some cases unknown in the reference manuals. Coincident with my difficulties in the identification of these wild

Florida species, I became interested in bringing about their horticultural improvement.

In less than a month my project was roughly outlined and under way. The beginning was slow and difficult. To attempt to bring into being a new race of fruiting plants with superior qualities in a climate and on soil where only local wild types could survive to the flowering age is naturally a difficult undertaking. The acquisition of that initial "toe hold" is generally the most difficult part of any such program.

The first six years of work was performed in the tropical climate of extreme southern Florida, south of Miami. Early in 1942 the project was transferred to Mayaguez, Puerto Rico, for a brief period. Then, in 1943, it was moved to the Institute in Costa Rica, where it is now (1944) officially under way.

Procurement of pollen of the finer temperate-zone domestic sorts constituted the hardest problem in the early stages of the effort. Of more than 150 varieties of the best European and American cultivated kinds that were carefully planted in the test vineyard as potential pollen vines, only six or seven lived to reach flowering age and they blossomed too late in the season to be of value.

Without a local production of pollen no breeding work could be done. Because of the earliness of the tropical season and the low viability of grape pollen when stored, it had become obvious that the success or failure of the entire program hinged on the solution of this difficulty. The handicap was ultimately overcome through the development of a technique that rendered it possible and easy to make any cross desired.

Our tests of the many domestic, temperate-climate grapes alongside the wild tropical selections have afforded a valuable opportunity to study the factors responsible for success or failure in tropical viticulture. While the European and North American cultivated sorts struggled under hopeless climatic and disease handicaps, the wild tropical kinds grew and fruited luxuriantly. This fact has lighted the way through the entire effort.

The collection of the best wild vines from river swamps and tropical jungles for use as breeding parents has been an even slower and

more difficult task. Yet in many ways it has been something of a colorful adventure.

Many exploration trips afoot through sultry, snake-infested woods and by canoe down treacherous jungle streams have been highlighted with moments of excitement, disappointment, and joy, along with a varied assortment of discomforts and hardships. The quest for the imaginary and ever-elusive ideal wild vine, which the mind's eye might vision as decorating some secluded tree or canyon ledge with a profusion of fine black grapes, has almost led to Eldorado.

I shall not forget the circumstances associated with the discovery of Number 24. The picture of it is most vivid: the lone canoe journey down many miles of treacherous river, flooded by summer rains; the darkening forest, crowding the channel with jungle growth; the colorful leafy streamers of the Calloosa grape that canopied the treetops; then, in the faint light of a setting sun—a glorious sight! In a reclining tree along the east bank there hung beautiful clusters of large black grapes that suggested Concord. They were sweet and good, and I was overjoyed.

The variety Sable is another parent vine taken from the wild which has an interesting history. It has been used perhaps more than any other in the author's latest breeding experiments. This selection is obviously a midway, or hybrid, form between the large Calloosa (*Vitis shuttleworthii*) and the Redshank-Figleaf grape (*V. rufotomentosa*-*V. smalliana*) and holds its present horticultural significance mostly through a peculiar act of chance.

It had been previously reasoned that wild hybrids with all-round superior qualities could and should exist within a certain region where the range of two superior species overlapped. It was carefully decided just what was wanted and just how good a grape in all respects might be possible from the best blending of the two species. With this goal in mind a determined search was undertaken.

After long days of search, by canoe and afoot, through the river swamps and forests and after inspecting literally thousands of vines, nothing outstanding had been found. True, there were many supposed hybrids but,

strangely, all of those examined seemed to inherit only the very worst qualities of the parent species.

Late in the afternoon of the fourth day, the large blue-green foliage of another of these midway types was observed sprawling over a group of palms and small trees along the left bank of the stream. A somewhat hasty inspection was made, a few moderately large and sweet grapes were tasted, but the vine was adjudged as of no especial value due to an apparent smallness of the fruit clusters. As it was late in the afternoon and there were many miles yet to be navigated through regions where camping for the night would be impossible, the journey was resumed.

Two days later while we were encamped on another stream many miles distant, the realization came that perhaps we had hastily and unfairly appraised this vine. The conviction became so hauntingly acute that we were soon packed and on the way back for another inspection.

A second and more thorough examination revealed typical fruit clusters seven to eight inches long from top berry to bottom. Secluded among the branches there was an occasional bunch that rivaled in size and appearance many of the better vineyard varieties of the temperate climates.

A selection of the wild Calloosa grape, referred to here as "Number 5," has been employed extensively in first-generation crosses. This vine was originally taken from the woods near Miami, Florida, some fifty years ago by J. J. Soar, of that city, and planted in his garden where it is now of immense size and canopies the top of a giant live-oak. Though the large berries of this wild parent plant are of poor edible quality, it has given some very good offspring.

Another wild selection, which we refer to as Number 18 and which belongs to the novel *Vitis gigas* species, has been much used in later crosses. It is healthy, vigorous, and extremely productive of large clusters with medium sized fruit of good quality. Its value was ascertained more by deduction than by the actual observance of characters and then only after sweltering, insect-plagued hours of discomfort. At the time of

its discovery just two undersized berries could be found that had escaped the animals and birds, but later performance in the vineyard more than fulfilled every confidence placed upon it. The vine was discovered in southeastern Florida, in general association with such tropical plants as the mango and avocado tree and the coconut palm.

Ten or twelve additional wild selections have been used as parent vines, one of the most important of which is the Number 10. This is a supposed natural hybrid of the large Calloosa grape with the big clustered Redshank-Figleaf type. It has moderately-large sweet fruit, maroon red in color and a vine of great vigor and resistance to disease.

Another, the Number 6, seems to be a natural cross of the Calloosa and the pure Figleaf species. It has medium-large black grapes of moderately good quality, but the vine is a little subject to disease.

THE improved varieties derived from the wild vines of the jungle have afforded an inspiring sight. In the extremely humid tropical climate and waterlogged soils at Mayaguez, Puerto Rico, where all other domestic grapes were impossible to grow, the new kinds have made healthy and luxuriant growths. On the dry and impoverished rocklands of southern Florida their growth has been equally good. Even under the tropical rain-forest conditions (110 inches precipitation annually) at Turrialba, Costa Rica, where grape culture in any sense has been thought impossible, our select-types in the Institute vineyard show beautiful and healthy vines with a normal set of fruit. It might be of interest to add, moreover, that these plants have never in their entire existence known the protection of fungicides.

The first fruit from any of the tropical hybrids was borne in the summer of 1940. One of the most interesting of these is the Fairchild (Number 106), which came from a cross of the wild "agras" of lowland Central America and the large-fruited European variety, Alphonse Lavellee. This unusual grape has a healthy vine with self-fertile flowers and medium-sized (one-half inch) sweet fruit that is several times larger than the berries of the mother species. The va-

riety is completely immune to the difficult grape-leaf rust, which is one of the most destructive grapevine diseases of the Tropics. It has been employed in various secondary crosses.

The new variety Tropico (Number 240) is one of the best descendants of the wild Calloosa grape that has yet borne fruit. It has a strong, productive, disease-free vine with large purple-black berries that are larger and of better quality than the well-known Concord variety of the United States. The fruit is sweet and tender with a thin skin and a delectable, mild, almost *vinifera* flavor. Tropico was originated from Number 5, crossed with a complex hybrid of *V. champini*, *V. labrusca*, and *V. vinifera*.

Marco (Number 3) is a medium-sized, dark-red grape, quite like the variety Delaware. It has in fact a sweet, mild Delaware flavor and an equally melting and tender pulp with small seeds. It is a juicy and truly delicious fruit. The vine is healthy and productive of moderately large compound clusters. Though the berries are rather small (average one-half inch) and a bit seedy for a fresh dessert fruit, they would in all probability make an excellent light-colored wine. The variety has three parts tropical wild parentage and one part temperate cultivated blood. It is a descendant of Number 9 (*V. rufofomentosa*) crossed with a hybrid of the wild Calloosa grape and the northern cultivated variety Niagara.

Another hybrid selection, Wachula (Number 126), has the same parentage as the preceding. It has compact clusters of sweet, medium-sized (one-half inch) black grapes of good mild-vinous flavor. The vine is healthy and very productive.

Crosses between Number 9 and the finer European varieties have given some interesting progeny. One of these, Biscayne (Number 113) has dark red, translucent berries that average one-half to five-eighths inch diameter. They have a sweet, delicious, *vinifera* flavor and are borne in moderately large clusters. The vine is strong, healthy, and productive.

Some combinations between the wild tropical selections and the North American vineyard sorts (humid-temperate group) have

given fruit with the Concord, or *labrusca*, taste.

Throughout the course of the project more than 100,000 hybridized grape seeds have been planted. Many thousand seedlings have been grown and hundreds have already borne fruit. Carefully planned secondary crosses, between the best of these newly developed sorts, as again with the better of the wild selections, have been made and are fruiting for the first time. There is every reason to expect some good things from these later crosses.

Plant diseases and other pests are a factor that must always be considered. Under humid, tropical conditions some diseases of the grape are very severe, even fatal, unless the variety possesses special resistance to them. In the development of our novel tropical types we have given much consideration to this matter and have obtained kinds that have health and disease immunity to a remarkable degree. As a result, fungus diseases have never troubled our better selections.

Insects, birds, and animals are occasionally a problem, as in the cooler climates. In Central America the *zompopo*, or leaf cutting ant, may do much damage if not controlled. It is easy to eradicate, however, and would never exist in a well-kept vineyard.

Though it is beyond question that these recent humid-tropical originations are incomparably better adapted to hot, humid climates than are any other of the known grape varieties planted at present in the Tropics, the full limit and range of this superiority must yet be determined. Their value for the manufacture of fine wines and as tropical market grapes presents highly interesting and ever-enlarging possibilities.

Good natural wines (without addition of sugar or alcohol) have been made from a few of the new sorts, but their individual and finer points in this regard must await later investigations.

These new tropical grapes have not as yet been made available to the public. Usually it requires several years after a variety is developed before it can or should be released. Still, we hopefully believe that within a relatively short time it may be possible to make a limited first distribution of a few sorts.