

#### **A HANDFUL OF ANDES BERRIES**

These luscious fruits, which resemble loganberries in character but are somewhat sweeter and richer in flavor, are produced by an immense, raspberry-like bramble which grows wild in the region between southern Mexico and Peru, and is cultivated in Colombia and Ecuador. They can probably be grown in several parts of the United States, and in addition, the species should be of great interest to plant breeders for crossing with our cultivated raspberries. The specimens here shown, slightly reduced in size, were picked from wild plants on the volcano Irazú, in Costa Rica. (Frontispiece.)

# THE ANDES BERRY

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SCATTERED throughout the high-lands of tropical America, mainly at elevations between 4,000 and 10,000 feet, are many species of *Rubus*, some of which produce excellent fruits. Few of them, however, are seen in cultivation, though the juicy berries of a dozen or more are sometimes gathered from wild plants and carried to the markets of large cities such as Guatemala, Bogotá, and Quito.

*Rubus glaucus* Benth., the Andes berry (as it may well be called, after the region in which it grows most abundantly) is certainly one of the most valuable. This species occurs as a wild plant in several countries, and is cultivated in at least two,—Colombia and Ecuador. That a fruit of such excellent quality should have escaped the attention of North American horticulturists until very recently seems difficult of explanation. Unlike the Colombian berry (*Rubus macrocarpus*), described in a recent number of the JOURNAL OF HEREDITY, its distribution is not limited to a narrow and rather inaccessible zone in the higher Andes: not only is it common as a wild plant throughout an extensive area, but it is also abundant in the gardens of numerous towns and villages.

In character of growth and foliage this species closely resembles the black raspberry, while the fruit is more like our blackberries in character. For this reason it does not seem proper to call it the "Andes raspberry," nor yet the "Andes blackberry." The canes, which are trailing to half-erect, are covered with whitish bloom, and root freely at the tips; the leaves are tri-

foliate, like those of the black raspberry; and the fruit-clusters are similar to those of the latter. The luscious fruits, in place of pulling off (separating from the torus or receptacle) as do our raspberries, must be picked like blackberries. The receptacle remains firmly attached within the fruit, and the calyx adheres to its base.

In this connection, it is worthy of mention that the Colombian berry presents conditions just the reverse of this. Its canes, leaves, and flowers resemble those of our northern blackberries, while its huge fruits are raspberries, if judged by our present standard, since they pull off the torus when fully ripe, leaving the latter attached to the plant. In other words, the Andes berry is a raspberry in growth but a blackberry in fruit, while the Colombian berry is a blackberry in growth and a raspberry in fruit. Our present classification will have to be altered somewhat if it is to include these tropical American species.

## A VARIABLE SPECIES

Traveling down the Andes in search of new food-plants for introduction into the United States, I was much interested by the wide range of variation exhibited by plants, both wild and cultivated, of *Rubus glaucus*.<sup>1</sup> Differences in the size, color, and quality of the fruits were particularly striking. Some of the varieties are, to my mind, superior to our northern raspberries in flavor, as well as in size.

I had picked many of these berries from wild plants in the mountains, and had enjoyed them; but a full ap-

<sup>1</sup> Since this species is not well known to North American botanists, I append the following brief characterization: Canes trailing to suberect, up to 5 m. long; branches, panicles, and petioles glabrous, glaucous-pruinose, armed with recurved thorns; leaves pinnately trifoliate, the leaflets ovate-lanceolate, long-acuminate, glabrous above and white tomentose beneath; flowers about 2 cm. broad, in few-flowered leafy panicles, the sepals long-acuminate, petals white, nearly as long as the sepals; fruits oblong to cordate, 2 to 4 cm. long, light to dark purplish red, composed of numerous drupelets which are pilose when immature.

preciation of their rich flavor, juiciness, and freedom from objectionable seeds did not come until I was served, at Charles J. Eder's home in the beautiful Cauca valley of Colombia, a saucer of thoroughly ripe ones, with cream and sugar. The scarcity of the former article in the Andean region makes it difficult for the agricultural explorer to test such fruits as blackberries and raspberries under conditions comparable with those to which he is accustomed in the United States. There are, I believe, a number of berries in the Andes which would compare favorably with our own, if served in the same fashion; but when one buys them in the market, picked before fully mature and badly bruised in transit, and eats them without the customary concomitants, he is not certain to appreciate them at their full value.

I first came upon the Andes berry in the highlands of northern Guatemala. Here it is found, in the region of Coban, at elevations of 4,000 to 6,000 feet. It is not abundant, as it is in northern South America, nor have I ever seen plants of such large size as in the latter region. Indeed, in Guatemala it usually occurs in the form of a straggling or trailing bush not over six or eight feet in height. It frequents clay soils, and open, sunny places.

The fruits produced by these wild plants in Guatemala (for I never saw it cultivated in that country) are oblong, up to an inch and a half in length, and dark maroon. They remind one of loganberries, except that they are broader in form and somewhat sweeter in taste. They have small, soft seeds, and are very juicy. The flavor is rich and delicious. The Indians, as they wander over the mountainsides, gather and eat them, but the quantity available is never large enough to warrant carrying the fruit to market,—at least, I have never seen it on sale in any of the Guatemalan towns. The Kekchi know this berry as *uuk-tokan*; the latter word is applied to several species of *Rubus*, and the prefix *uuk* is used to designate this particular one. We have here, in fact, another example

of the remarkable binomial nomenclature employed by the Guatemalan Indians of Maya descent, a system which recognizes botanical relationships, in a limited way, and which probably has been in existence since long before the Conquest.

In Costa Rica I again found the plant, growing abundantly upon the slopes of the volcano Irazú at elevations between 6,000 and 7,000 feet. In certain places it forms solid stands, twenty or thirty yards in diameter. The plants are suberect in habit, and reach about six feet in height. The fruits are different from those seen in Guatemala, being somewhat smaller, lighter red in color, and not so rich in flavor. Botanical specimens collected here, however, prove that the plant is not specifically different from the one studied in Guatemala, hence we can only conclude that we are dealing with a variation such as those which give rise to horticultural forms.

#### ABUNDANT IN COLOMBIA

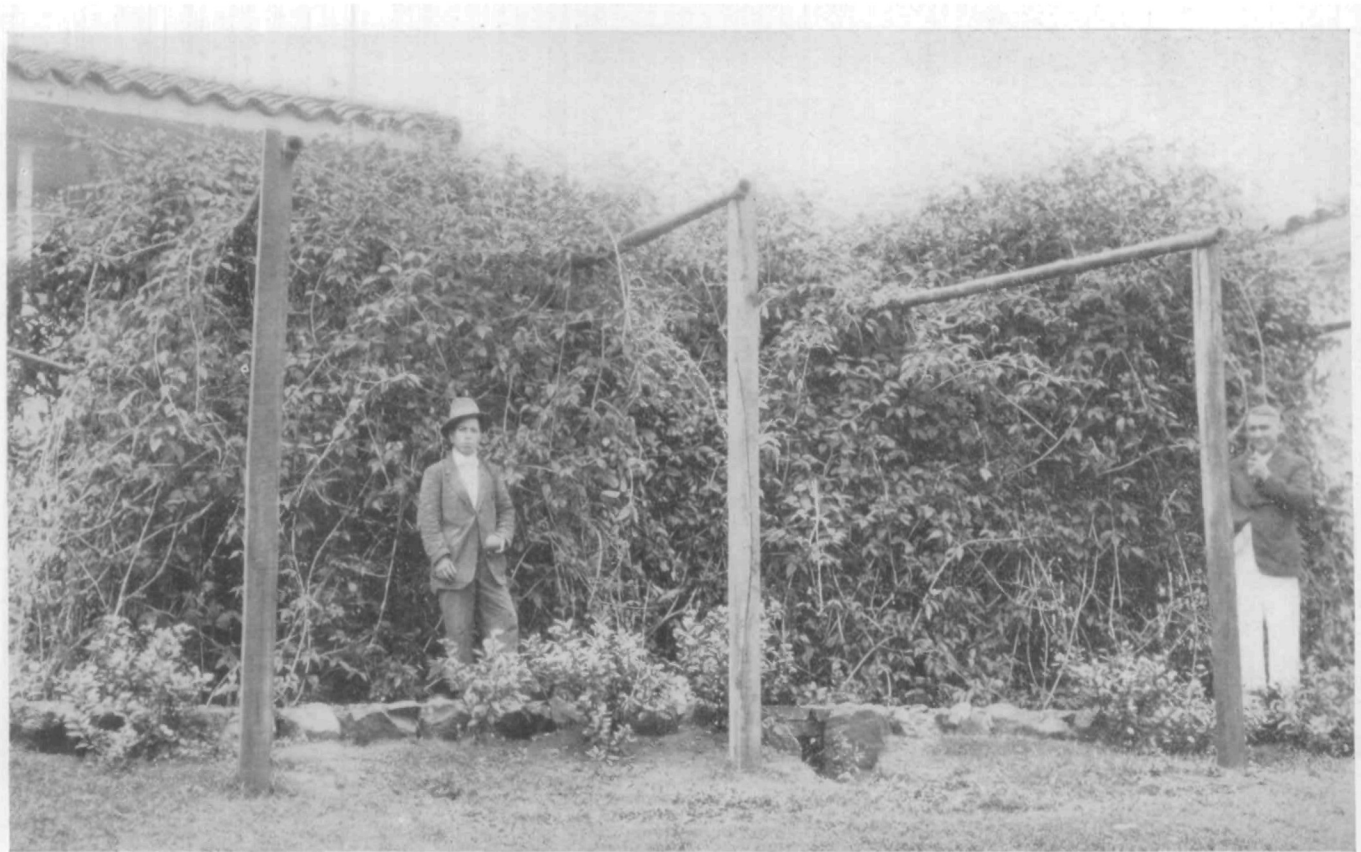
Upon reaching the highlands of Colombia, in the department of Cundinamarca, I again found *Rubus glaucus* growing as a wild plant, and here, for the first time, I saw its luscious fruits offered in the markets. In the city of Bogotá they can be obtained during a large part of the year; they are sold under the name of *mora de Castilla*, which does not, however, serve to distinguish them from the fruits of other species of *Rubus*, since several which grow wild in this region are commonly sold under the same name. The use of the term *mora*, originally meaning *mulberry* in Spanish, has been extended in Latin America to include many fruits of the genus *Rubus*. To indicate a variety of superior quality the Colombians generally add the phrase *de Castilla* (*Castilian*), a usage which has come down from Colonial days, when the best of everything was supposed to come from the Mother Country.

The plant is found in considerable abundance upon the mountainsides not far from Bogotá, mainly at eleva-



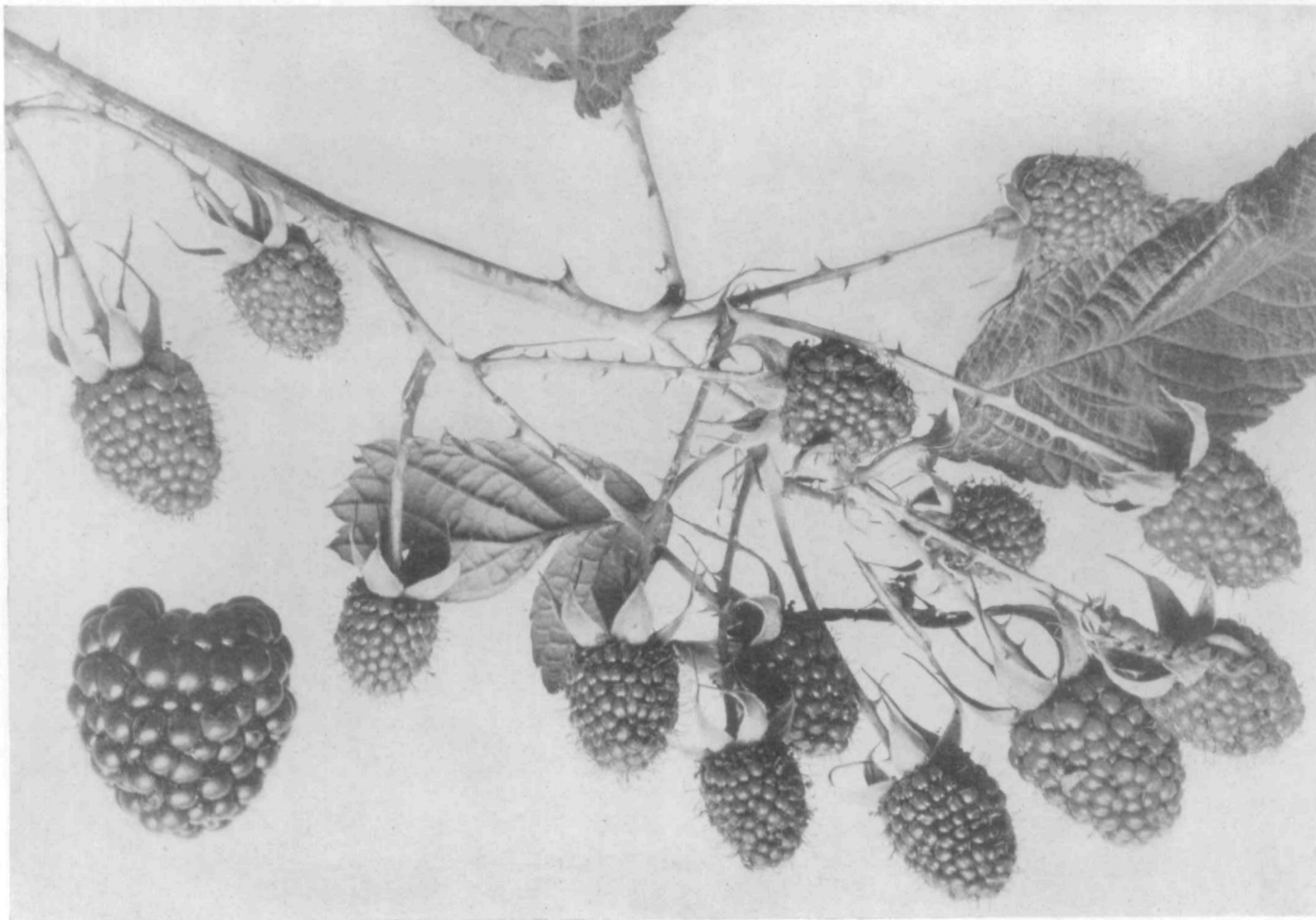
#### **FOLIAGE, FLOWERS AND FRUIT, NATURAL SIZE**

In character of growth the Andes berry is similar to our cultivated raspberries: the canes are glaucous, the leaves trifoliate (although the few shown above, arising from a flower-panicle, are simple) and the flowers white. The fruit, however, does not separate from the torus or receptacle, as does the raspberry, but more closely resembles our blackberries in character. Photographed at Ambato, Ecuador. (Fig. 1.)



#### TWO PLANTS IN WESTERN COLOMBIA

To plant breeders, the unusual vigor of the Andes berry is of great interest, as offering a valuable characteristic for combination, by means of hybridization, with our cultivated raspberries. The tangled mass of foliage shown above is derived from two plants growing in the grounds of the American Hospital at La Cumbre, near Cali, in western Colombia. It seems probable that more berries would be produced if the plants were pruned for the production of fruiting laterals, instead of being allowed to develop unchecked as is invariably the case in South America. (Fig. 2.)



**A CLUSTER OF IMMATURE ANDES BERRIES, AND A SINGLE MATURE ONE**

The fruits are borne on leafy panicles, and when fully ripe are light red to deep maroon in color, soft and juicy in texture, with small, soft seeds. Although the species has not had the benefit of intelligent cultivation with a view to improving the size and quality of the fruit, Andes berries are perhaps superior to most of our cultivated raspberries in flavor and quality. The fruits here shown, natural size, were produced by cultivated plants at Ambato, Ecuador. (Fig. 3.)

tions of 6,000 to 8,000 feet. The fruits appeared to me somewhat darker in color than most of those I had seen in Costa Rica, but not quite so large, soft, and luscious as those of northern Guatemala. I saw no plants in cultivation in this part of Colombia, but after crossing the Quindio pass and traveling up the Cauca valley, I found at La Cumbre, a small station on the railroad between Cali and the Pacific port of Buenaventura, a few plants growing in the garden of an American hospital. This was the first time I had seen the species in cultivation, but I was soon to become familiar with it in Ecuadorean gardens. Here at La Cumbre (elevation about 5,200 feet), in the western cordillera of the Andes, I was impressed by the luxuriant growth which the species makes when brought into cultivation. Two specimens covered a huge arbor 25 feet long by 10 feet in breadth and height, and furnished enough fruit to supply the hospital staff with excellent sauce and jelly. Yet I am convinced that much more fruit would be produced if the plant were systematically pruned. Fruiting laterals are not developed in great abundance by these huge plants; most of the fruit must therefore be borne on terminal clusters, which can never be very numerous.

It is in Ecuador that the Andes berry is best known, and horticulturally most important. Two towns, in particular, are noted for it: these are Ambato (8,500 feet) and Otavalo (8,100 feet). In both of these, plants are found in nearly every garden, and the fruit appears commonly in the markets; it is available throughout a large part of the year and is much used in the preparation of preserves and of a heavy syrup from which a refreshing drink is made. Otavalo is noted for this latter product.

I have seen, in Ecuador, two well-defined varieties of this berry, and have heard of a third. The common sort is deep maroon, about like the form observed in Guatemala, though slightly different in flavor, as far as I can compare the two by recollection. The

second kind is light red—almost rose red—and is of a milder flavor than the common sort. The third one is said to be light pink, and for this reason is called *mora blanca* (white mora).

As in Colombia, the species occurs abundantly in Ecuador as an indigenous plant. I have seen it most commonly at elevations between 8,000 and 10,000 feet. In the wild state it is rarely over six or eight feet high, and not particularly vigorous in growth; but when brought into cultivation I have seen a single specimen cover the side of a small house, or reach several feet above a garden wall ten feet high.

#### CULTURAL NEEDS

In Ecuador, although it ranks as a cultivated plant, very little attention is given to its cultural requirements, and we can learn but little from an examination of the methods used by Ecuadorean horticulturists. No pruning is done, though it seems reasonable to believe that careful attention to this subject would result in far greater yields of fruit. It must be admitted that even the most productive plants observed in Ecuadorean gardens bear small crops, when compared with northern blackberries or raspberries. Probably this is largely due to the circumstance that they are allowed to develop too much wood, and are not pruned for the production of fruiting laterals.

I have seen wild plants upon clay soil, light sandy loam of volcanic origin, and rich alluvial loam. In northern Guatemala, they occur in a region where the rainfall is between 80 and 120 inches per annum, and is distributed through not less than ten of the twelve months. In Ecuador, on the other hand, they are sometimes found in places where the annual rainfall is not more than 15 or 20 inches.

Plants sent from Guatemala to the United States have been winter-killed at Washington, D. C., as would be expected of a species from an elevation of 5,000 feet in the latitude of the Central American countries. In Ecuador, wild plants are occasionally seen

at elevations of 10,000 to 11,000 feet, where light frosts are experienced; but it is not to be anticipated that the Andes berry will succeed in parts of the United States which are too cold for the loganberry. More probably its cultivation will be limited in this country to the Pacific Coast states,

Arizona, New Mexico, and parts of Texas. Particular attention may be directed to its value for plant breeders: because of its vigor, and the large size and good quality of its fruit, it seems likely to prove an excellent subject for crossing with some of our northern raspberries.

## THE USE OF THE GREENHOUSE IN CORN BREEDING

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THE improvement of corn by selection within self-fertilized lines necessarily is a slow process, and any method that will shorten the time required is highly desirable. It has been shown that sweet corn is adapted for forcing under glass.<sup>1</sup> The greenhouse also has been used successfully in inheritance studies with corn as shown by casual reference in several articles. The author is informed by Mr. G. N. Collins, however, that attempts to grow corn during the winter—that is, planted in the fall—in the greenhouse have not been successful. The plants under such conditions have failed to develop normally and have ripened prematurely with a scanty production of seed. The following notes indicate that under some conditions such practice is entirely successful. The determining differences are not known, and these notes are offered to indicate the practicability of this method, with the hope that interest in the possibilities of greenhouse culture may be promoted.

### USE OF THE GREENHOUSE

The crop was grown in one of the department greenhouses at the Arlington Farm, Rosslyn, Virginia, during the winter of 1920-21. The center space was excavated to a depth of 12 inches and filled with good soil. Under greenhouse conditions the secondary roots of corn frequently originate

abnormally near, and in extreme cases even above, the soil surface. To nullify the effect of this tendency the seed was planted in the bottom of a 6-inch furrow which was not filled in until the root system had become well established. This method proved very effective.

After emergence the plants were thinned to a stand that provided 1.67 square feet per plant. This is at the rate of over 25,000 plants per acre, and was entirely too thick, as, although there was plenty of moisture and fertility, it interfered with proper light distribution. It is thought that a rate allowing three square feet per plant would utilize the space to good advantage.

The following strains were grown: 8 plants of Gerrick that had been self-fertilized for five generations; 24 plants of a Chinese dent variety, self-fertilized for one generation; and 20 plants of a chlorophyll-deficient, brachytic strain of U. S. Selection No. 201 that had been self-fertilized for three generations. Two ears were obtained from the Gerrick, none from the No. 201, and a few seeds on each of three cobs from the Chinese variety.

There also were 116 plants from 58  $F_1$  crosses between self-fertilized strains of U. S. Selection No. 201. The following notes refer to these cross-bred plants.

<sup>1</sup> Rane, F. W. Green Corn Under Glass. N. H. Agr. Expt. Sta. Bull. 60. 1899.