The Blackberries of South America — An Unexplored Reservoir of Germplasm

D. L. JENNINGS[1]

The genus *Rubus* has been divided into 12 sub-genera, of which only five contain fruits of pomological interest. Two of these, the *Eubatus* and the *Orobatus,* contain all the blackberries. The *Eubatus* has been further subdivided into six sections and four of these (*Xerocarpi, Dissitiflori, Floribundi* and *Duri*) are restricted to South America (4). The *Moriferi* subsection of the *Eubatus,* which contains all the European and eastern American blackberries. In this sub-section the peculiarities of the breeding system have produced many thousands of microspecies—a term used for a population wihch differs morphologically, however slightly, from other uniform populations. Thus, if the taxonomists are correct, it would be true to say that diversity in the blackberries is most developed in South America, because it is based upon differences of higher taxonomic rank there than elsewhere. By contrast, the blackberries of Europe and eastern America can be regarded merely as a network formed originally from a few, but an unknown number of, diploids and now represented by a great diversity of their polyploid, sub-sexual hybrid derivatives.

It is timely to review progress by blackberry breeders in using this germplasm, since its potential was reported by Popenoe as early as 1920, (7, 8) and was the subject of a two month survey by Darrow in 1952 (2). Breeding has been attempted with only two species—*Rubus glaucus* Benth, the Andean blackberry, and *R. macrocarpus* Benth, the Giant Colombian blackberry.



Fig. 1. Fruiting lateral of *Rubus glacus*

R. glaucus, the Andean Blackberry

In spite of its common name, *R. glaucus* was not regarded as a blackberry by the taxonomists, largely because its growth habit and foliage

[1]Scottish Horticultural Research Institute, Dundee, Great Britain.

closely resembles that of the black raspberry. The resemblance is so strong that Focke classified it with the black raspberries in the *Occidentalis* section of the *Idaeobatus,* the raspberry sub-genus. However, fruit abscission occurs at the base of the receptacle, which remains firmly attached within the fruit like a typical blackberry. The classification is therefore surprising because Focke used this abscission characteristic as the criterion for separating his sub-genera, and he should logically have placed *R. glaucus* with the blackberries. It turns out that his decision is supported by recent evidence on the chemical nature of the anthocyanin pigments present in the fruit: *R. glaucus* has four cyanidin-based pigments which include cyanidin - 3 - sambubioside and cyanidin - 3 - xylosylrutinoside, the two forms characteristic of black raspberries and not found in blackberries or red raspberries (5). Moreover, it is known that the species is tetraploid (9) and therefore probably not a primary species. A likely explanation of its origin, first suggested by Darrow (2), is that it is derived from an ancient hybrid formed between a plant of a black raspberry type and a diploid tropical blackberry, and that the hybrid doubled its chromosome number to become a fertile allotetroploid. Such a cross could easily have occurred because black raspberries have a southerly distribution which extends to South America and the blackberries of northern South America include such species as *R. bogotensis* HBK, whose leaves have some similarity to those of *R. glaucus.* The explanation also explains Darrow's observation that the species is remarkably constant over a large area; a characteristic of a true allotetraploid.

Whatever the origin and taxonomic status of *R. glaucus,* there is little doubt that it is one of the world's most widely grown cane fruits. Darrow (2) found it growing in highland areas from northern Guatemala to Ecuador, a distance of some 2000 miles, and in Colombia it occupies an area around Bogota alone of about 450 hectares. It undoubtedly deserves its popularity. Its fruits are bigger than many blackberries, usually weighing about 5gms, and are generally superior because the drupelets and pyrenes are much smaller. The fruit colour is a deep purple, near black, while in flavour it is rich and aromatic, like the Loganberry but richer and sweeter.

Plant breeding reports refer to the species' possible use as 'donor' of resistances to leaf spot and authracnose diseases and of adaptation to southern environments (6, 9), but attempts to use it as such have not been very successful, partly because it was at first thought to be diploid (9). The idea that it is a raspberry-blackberry hybrid deserves to be exploited, because such hybrids have hitherto been successful only at the hexaploid or septaploid level, and tetraploid hybrids have tended to have an unacceptable astringent flavour and downy appearance. The qualities of *R. glaucus* suggest that the use of tetraploid black raspberries rather than red raspberries in crosses with tetraploid black berries might give a different result.

The possibility of using *R. glaucus* itself to produce new forms of hybrid berry is being studied at the Scottish Horticultural Research Institute. But if the origin postulated for the species is correct, crossing it to either a tetraploid raspberry or blackberry would constitute a backcross and may lead to loss of fertility, and so crossing to another raspberry-blackberry hybrid is being tried too. The objective is to combine the excellent fruit qualities of *R. glaucus* with spinelessness and high productivity.

R. macrocarpus, the Giant Colombian blackberry

Whereas *R. glaucus* has the appearance of a raspberry plant bearing a blackberry fruit, *R. macrocarpus* looks like a robust blackberry with a raspberry-like fruit. Its receptacle is somewhat fleshy and succulent and can be eaten, but in fully ripe fruit it separates completely from the druplets, which cohere loosely among themselves. Its sub-acid flavour is more suggestive of a Loganberry than a blackberry and so its reddish colour. It is most notable for its large fruit size: Popenoe (7) measured fruits up to 2¼ inches long and 1½ inches broad. Clearly, an impression of hugeness is accentuated by the fruit's relathe species or of the sub-genus *Oro*tive broadness.

Little is known of the taxonomy of *batus*. Darrow (3) speculated that *R. macrocarpus* might be an ancient segregate of a hybrid between an eastern American blackberry and *R. odoratus* of the *Anoplobatus* subgenus, which has a similar large, purple-coloured flower. However, its fruit have only the two authocyanins which are characteristic of blackberries, cyanidin - 3 - glucoside and cyanidin - 3 - rutinoside (5). A larger number might be expected of a hybrid involving a species of the *Idaeobatus* or *Anoplobatus*, but some may have been lost during a period of evolution. No count of chromosome number has yet been possible.

Many breeders have attempted to use *R. macrocarpus* but most have either found it too difficult to grow or else failed to obtain flowers and fruit (3). Attempts at crossing it have been reported only from Tennessee (1). However, new material of the species has recently been collected from El Penon in Colombia, where Popenoe originally discovered it, and a further attempt to establish it for use in breeding is being made at the Scottish Horticultural Research Institute.

References Literature Cited

1. Anon., 1949. Sixty-second Rep. Tenn.-agric. Exp. Sta., 177 pp.
2. Darrow, G M. 1952. *Rubus glaucus*, the Andes blackberry of Central America and northern South America. *Ceiba, 3,* 97-101.
3. Darrow, G. M. 1955. The giant Colombian blackberry of Ecuador. *Fruit Var. Hort Dig., 10,* 21-22.
4. Focke, W. O. 1910-1914. Species *Ruborum. Bibl. Bot., 72,* 1-233; *83,* 1-274.
5. Jennings, D. L. and Eleanor Carmichael. Unpublished.
6. Knight, R. L. and E. Keep. 1966. Breeding new soft fruits. In, 'Fruit—Present and Future.' *Roy. Hort. Soc.* 98:111.
7. Popenoe, W. 1920. The Colombian berry or Giant blackberry of Colombia. *J. Hered., 11,* 194-202.
8. Popenoe, W. 1921. The Andes berry. *J. Hered., 12,* 386-393.
9. Williams, C. F., B. W. Smith, and G. M. Darrow. 1949. A Pan-American blackberry hybrid. Hybrids between the Andean blackberry and American varieties. *J. Hered., 40,* 261-265.