MALPIGHIA EMARGINATA
(Acerola)

1. INTRODUCTION

Acerola fruits, which taste somewhat like European cherries, are best made into juice, sauce or jelly, relatively few being eaten raw because of their large stones. Their vitamin C content is exceptionally high (Table 1), and about 88% of it can be recovered from the juice (Santini and Nevarez, 1955). The tree also produces a gum which was used in folk medicine. The bark has been sold for its tannin content, and the wood can also be used (Ostendorf, 1963).

The acerola is currently of minor importance in the West Indies, Florida, Hawaii and parts of northern South America. Between 1945 and 1965 a significant increase in production occurred in Puerto Rico, and to a smaller extent in Florida and Hawaii, for processing fruits into powders and juices high in vitamin C. The crop also became more widely grown in orchards and gardens elsewhere. About 200 ha of acerola trees were planted in Puerto Rico, some of which are still harvested, frozen fruits being exported to the USA for use in health foods (Asenjo, 1980).

2. TAXONOMY AND BOTANY

The genus Malpighia L. contains about 40 species (Bailey, 1949). Vivaldi (1979) has recently reviewed the genus. The acerola or Barbados cherry, which is native to Mexico, is M. emarginata DC (Asenjo, 1980). The following species also have edible fruits: M. urens L. (Puerto Rico), M. coccigera L. (Antilles), and M. setosa Spreng. (northern Antilles, Puerto Rico, Cuba, Hispaniola). None of these are cultivated, but M. mexicana A. Juss is grown in Mexico for its fruits (Fouqué, 1973). M. glabra L. (syn M. punicifolia L.), which has small insipid fruits, and grows from southern USA to South America, may be known by the name semeruco in Venezuela. Both Latin names are sometimes incorrectly used as synonyms for M. emarginata, but M. emarginata and M. glabra have very different gynoecia (Vivaldi, 1979).

Acerola is a glabrous shrub to 8 m high. Leaves opposite, almost sessile, entire, (1.0)-2.0-2.5-(8.5) cm long, (0.7)-1.5-2.5-(5.0) cm wide, sub-chartaceous to chartaceous, variously obovate, in some cultivars almost ovate, the apex obtuse and usually emarginate, very rarely somewhat acute in some cultivars, the base acute to cuneate. Inflorescence a (1-)2-4(-6) flowered, umbel-like raceme 1.5-2.0(-2.5) cm long. Flowers bisexual regular, ca. 1.3 cm across; sepals 5 persistent, some or all bearing large sessile glands, up to a total of 6-10 in the calyx; petals erose or fringed, at anthesis (10-)13-17(-20) mm in diameter; stamens 10, all anther-bearing, the filaments united below, glabrous; ovary styles truncate or obtuse at the apex, but rarely somewhat uncinate, the lateral styles thick, somewhat curved, (2.5-)3.0-3.5(-4.0) mm long, the anterior style thin, straight 0.5-1.0 mm shorter than the lateral styles. Fruit = 3-pyrenous drupe, red or scarlet, depressed-ovoid, 1-3 cm in diameter, acid, with thin skin; epicarp thin and delicate; mesocarp of large juice-filled cells; endocarp of 3 hard stones, each formed by the lignified, elongated cells of vascular strands and adjoining cells. The development of the stones depends upon the degree of seed development in each carpel (Bailey, 1949; Vivaldi, 1983 pers. comm.).

Some Malpighia species, including M. emarginata, have to be pollinated by bees for a high rate of fruit set. Centris dirrhoda performs this role in Jamaica, but poor fruit yields in Hawaii were not improved when honey bees were introduced into orchards (Raw, 1979). There may be self-incompatibility in addition; both self-compatible and self-incompatible cultivars occur (Parthasarathy and Kalyanasundaram, 1979). Occasional cases of parthenocarpy have been found (Miyashita et al., 1964). The seedling progeny of open-pollinated acerola trees are very variable. A number of selected seedlings have been cloned in Florida, Puerto Rico and Hawaii, and have cultivar status.

3. ORIGIN, DISTRIBUTION AND ECOLOGY

The cultivated acerola originated somewhere in the area extending from southern USA through Mexico and Central America to northern South America and the Caribbean islands, and now only grows wild in the Yucatan area of Mexico. Domestication must have taken place before 1492; its distribution to countries outside tropical America has been since that date, and in many cases only since the beginning of this century. The crop is rarely cultivated outside of these areas.

The acerola is a tropical tree, but is quite drought-resistant. In areas of low rainfall it may be deciduous and only green in the rainy season, as in the Guajira peninsula of Colombia (Rieger, 1976). More rain is required for good fruit production. In Puerto Rico the best crops are grown where there is over 1,800 mm of rainfall/year, but too much rain may result in tender fruits of low quality. The acerola is not very exacting as to soil quality, but the heavier soils of Puerto Rico are preferred since they are usually less infested with nematodes (Py and Fouqué, 1963; Marty and Pennock, 1965).

4. AGRONOMY, DISEASES AND PESTS

The acerola can easily be grown from seed, despite the stony endocarp, but many seeds contain non-viable embryos, and germination may be poor (Argles, 1976). Methods of vegetative propagation, most commonly using hardwood cuttings, but also by air and ground layering and several grafting techniques, can be employed successfully. Seedlings are ready for grafting at 10-12 months after sowing (Holmquist, 1967).

Seedlings commence flowering when only 6 months old, and depending on climatic conditions, continue to bloom the whole year round or with seasonal peaks. A single plant may carry flowers and fruits at the same time. Yields vary with cultivar and growing conditions, but may vary from 20-50 kg per tree, which is equivalent to 8 to 20 tons/ha when plants are at a 5 m x 5 m spacing. The main factor limiting production of acerola is the availability of bee pollinators of the genus Centris.

Fungus diseases do not seem to be a great problem (Cook, 1975). Anthracnose (Colletotrichum spp.) may be important in India. Cercospora leaf spot (Cercospora bunchosia) occurs in Florida and Hawaii, especially in conditions of high humidity. Cultivars '269-2' and 'Florida Sweet' have some resistance. Cercospora leaf spot may also occur in Puerto Rico (Meléndez, 1963).

Insect pests, including scale insects, aphids, mealy bugs, mites, leaf-eating caterpillars and soil-borne insects, do not often cause excessive damage and may be controlled with insecticides. Nematodes are probably the most serious pests of acerola (Ostendorf, 1963). There has been some research in Florida on resistant rootstocks (Argles, 1976).

5. GENETICS AND IMPROVEMENT

Until about 35 years ago seed propagation was usually practised and little selection had been attempted. Since then, selection for desirable characteristics, including high vitamin C content and flavour has been carried out in Florida, Puerto Rico and Hawaii (Miyashita et al., 1964; Knight, 1980), some of the work in Florida being based on hybridization (Singh, 1961). Considerable improvements in the yield and quality of acerola have been achieved.

Some work has been done on the use of species related to acerola, such as M. suberosa, M. urens and M. cubensis, as rootstocks in order to obtain nematode resistance (Argles, 1976).

6. GENETIC CONSERVATION

There is little evidence of genetic erosion in either wild or cultivated

acerola. A few collections contain acerola trees, and although the seeds are orthodox, it is not known that they are stored in any genebanks. IBPGR (1984) 1/ lists the following, which are too minor to be regarded as genetic resources collections: Manaus, Amazonas, Brazil; Habana, Cuba; Cozolapa, Oaxaca, Mexico.

1/ M. glabra is used instead of M. emarginata in IBPGR (1984).

Table 13. Collections of acerola

Country	Location	Number of accessions	
		Malpighia emarginata	Other Malpighia spp.
USA	Miami, Florida	10	Malpighia spp. (3)
USA	Mayaçuez, Puerto Rico	6	
USA	Hilo, Hawaii	6	