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INHERITANCE OF FRUIT COLOR IN SURINAM CHERRY (*EUGENIA UNIFLORA* L.)—A PRELIMINARY STUDY

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Abstract. **Surinam cherry (*Eugenia uniflora* L.) is commonly used in Florida, Hawaii, and in many tropical regions of the world as an ornamental shrub. The fruits are also commonly eaten fresh or used in cooking, although some fruits may have a somewhat unpleasant resinous flavor. Most plants bear fruits that are red to red-orange in color. Plants bearing dark-colored (maroon, purple or "black") fruits have been reported, but are uncommon. Ten grafted plants of a clone of a dark-fruited, non-resinous selection ('Zill Dark') of Surinam cherry were purchased from Zill High Performance Plants and planted on the Florida Southern College campus in the mid 1990s. Four of these plants were planted in an isolated area of the campus, away from any red-fruited plants. Surinam cherry plants appeared to self-pollinate easily, and these isolated plants set dark-colored fruits the next year after planting. In spring 1999, 150 seeds were extracted from the fruits and planted in community pots in the FSC greenhouses. Most of the seeds germinated within one month's time and the seedlings were repotted into individual 10 centimeter (4 inch) pots. Several months later, the seedlings were potted up into 3.78 liter (1-gallon) containers where they remained for 2 1/2 more years. Only a few plants came into bloom during that time. In spring 2002, the surviving seedlings (120) were potted up into 11 liter (3-gallon) containers, spaced in full sun conditions, and placed on drip irrigation. Plants were fertilized with Sierra 17-6-10 & minors (8-9 month) slow-release fertilizer. In central Florida, blooming of Surinam cherry tends to be asynchronous except in the early spring of the year, when most plants bloom all at the same time. In spring 2003, fruits were collected and sorted by the color of the mature fruit. Of the 120 plants remaining from the initial planting, 88 had dark (maroon or black) fruits, 27 had red or red-orange fruits and 5 did not bear any fruit. From these data, it appears that the 'Zill Dark' cultivar of Surinam cherry is heterozygous for the gene for mature fruit color with the dark (maroon or black) phenotype dominant over red in the classic Mendelian ratio of 3:1. It also appears likely that a single gene determines fruit color in Surinam cherry.**

Surinam cherry (*Eugenia uniflora* L.), the most widely known of the edible-fruited *Eugenia* species, is a shrub or small tree of the family Myrtaceae (Morton, 1987). The plant has something of a spreading growth habit, with aromatic foliage that is bronze-colored when young, but darker green and glossy when mature. The fruits, which resemble small pumpkins, turn from green to orange to red and in some cases, on to dark maroon as the fruit matures (Ferreira dos Santos, 2001; Galvão de Lima, 2002; Morton, 1987). The plants are rather widely distributed throughout eastern South America from Surinam south to Uruguay (Morton, 1987), although they are often cultivated in other areas such as Florida, California, Hawaii, the West Indies, Southern China, Algeria, Southern France (Glass, 1997), Central America, Venezuela, Central Africa, the Philippines (Morton, 1987) and Israel (Lahav and Slor, 1997). Only in Brazil, and to some small degree in Israel, is the fruit commonly found at market. There is also some interest in the fruit for culinary uses in Hawaii and elsewhere. In Florida, the Surinam cherry is one of the most common landscape hedge plants in the central and southern parts of the state (Morton, 1987; Sturrock, 1959) although it has come under attack recently as being "invasive" (Wirth et al., 2004). It certainly is known as a "colonizing species" in some areas of Brazil (Margis et al., 2002). The fruit has a significant place in the Brazilian market and there has been considerable interest in the selection and commercial production of improved varieties for both fresh fruit and prepared culinary purposes (Bezerra et al., 1995, 1997, 1999, 2002, 2004; Donadio, 1997; Melo et al., 2000). There is also considerable interest in *Eugenia uniflora* foliage and immature fruits for various pharamacological purposes (Agbedahunzi and Aladesanmi, 1993; Auricchio et al., 2003; Consolini et al., 1999; Holetz et al., 2002).

There are relatively few dark maroon fruited varieties available as cleft-grafted plants (Bezerra et al., 1999, 2002) from Florida tropical fruit nurseries. Most other nurseries produce Surinam cherry strictly from seeds. According to Campbell (1977), the dark-fruited varieties he was familiar with produced not only dark-fruited offspring from seed, but also a number of seedlings that bore red or red-orange fruits. Certainly the genetic variability of *Eugenia uniflora* is well known (Bezerra et al., 1995, 1997, 2004; Margis et al., 2002; Singhal et al., 1983). However, there does not appear to be any study that specifically examines fruit color inheritance in Surinam cherry. The dark maroon fruit color also appears to be closely associated with a substantial increase in anthocyanins, flavonols, and carotenoids in the mature fruits (Galvao de Lima et al., 2002). This may make the dark-fruited Surinam cherries a more valuable source of antioxidant compounds than any of the red-fruited varieties (Galvao de Lima et al., 2002). The main objective of this project was to determine how fruit color, particularly the dark maroon fruit color displayed by some varieties of Surinam cherry, would be inherited if a given cultivar could be selfed.

Materials and Methods

This preliminary study was conducted on the Florida Southern College campus in Lakeland, Florida. Ten grafted plants of a clone of a dark-fruited, non-resinous flavored selection of Surinam cherry (*Eugenia uniflora* 'Zill Dark') were

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purchased from Zill High Performance Plants of Boynton Beach, Fla. in the mid 1990s. These were planted on the Florida Southern College campus near to the Jack M. Berry Citrus building and isolated from any red-fruited plants located elsewhere on campus. In spring 1999, ripe fruits were removed from one of these isolated plants, 150 seeds were extracted from the fruits, and the fresh seeds were promptly planted in six community pots in the FSC greenhouses. Most of the seeds germinated within one month's time and the seedlings were removed from the community pots and were repotted into individual 10 cm (4 inch) square pots. Six months later, the seedlings were potted up into 3.78 L (1-gal) containers where they remained for 2 1/2 more years. During this time, the existing greenhouses at FSC were removed and replaced with new ones. Plants, such as these Surinam cherries, were removed from the old greenhouses and were grown for some time under natural shade with reduced maintenance practices. Only a few seedling Surinam cherry plants came into bloom during that time and the colors of the ripe fruits were not recorded. However, in spring 2002, the 120 remaining seedlings were potted up into 11 L (3-gal) containers, spaced in full sun conditions, and watered with drip irrigation. Plants were fertilized with Sierra 17-6-10 & minors (8-9 month) slow-release fertilizer and they responded with considerable new growth (although it was not quantified).

Blooming of Surinam cherry tends to be somewhat asynchronous in central Florida except in the early spring of the year, when nearly all of the mature plants bloom at the same time. At other times of the year, Surinam cherry plants will often respond to a dry period followed by irrigation and fertilization with an additional flush of flowers followed by fruits. In spring 2003, most of the seedling Surinam cherry plants in this trial bloomed and set fruit. Fruits were collected and sorted by the color of the mature fruit and plants were also labeled according to mature fruit color.

Results and Discussion

Only 5 of the 120 seedlings Surinam cherry plants in this trial failed to set fruit in the spring of 2003. Of the other 115 plants remaining from the initial planting, 88 had dark (maroon or black) fruits, 27 had red or red-orange fruits. It appears, according to these preliminary results, that the 'Zill Dark' cultivar of Surinam cherry is heterozygous for the gene for mature fruit color with the dark (maroon or black) phenotype dominant over red in the classic Mendelian ratio of 3:1 (Russell, 1998). It also appears quite likely that a single gene determines fruit color in Surinam cherry. It is important not to score fruit color too quickly, as all maturing fruits pass through a red stage and only a day or two later do they transition to dark (maroon) if they are going to do so (Ferreira dos Santos et al., 2001).

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