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NON-MELTING FLESH FOR FRESH MARKET PEACHES

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Abstract. **Peach fruit with non-melting flesh are being bred at the University of Florida for the fresh market to provide tree-ripe fruit with a long shelf life. Non-melting flesh has traditionally existed in the United States only in moderate- to high-chilling, late ripening, peach cultivars grown for the canning industry. The fruit of these cultivars lacks the red overcolor and acidity found in melting flesh (dessert-type) peaches. The Florida breeding program has combined non-melting flesh with fruit acidity and red overcolor and has produced adapted genotypes that are low-chilling. Fruit development period has been reduced from about 120-150 days to about 80-110 days. Additional earliness and increased fruit size are being bred into the new genotypes with non-melting flesh in order to make them competitive in earliness and large fruit size with currently melting-flesh cultivars.**

Consumption of fresh peaches has been declining in the U.S. for the last half century. A main reason for this decline is the low flavor of fruit purchased. Tree ripened fruit have high flavor and aroma, but under modern peach production and marketing systems, fruit are often harvested too immature to properly ripen with high flavor. Fruit are harvested immature to increase firmness, to reduce bruises during picking, grading, and packing and to extend shelf life. Peach breeders have contributed to the early harvest problem by releasing cultivars which develop a bright yellow ground color and a high proportion of red overcolor several days before the fruit are harvest ripe. Growers also contribute to the problem by harvesting fruit at the break from green to yellow ground color. While early harvest results in fruit that is firmer and less mature, it also results in a higher packout by eliminating bruised and overripe fruit that must be discarded on the packing line. Shelf life of the fruit is increased at the expense of tree ripened flavor to the consumer. Fruit are highly attractive on the grocery shelf, but repeat sales decrease because of consumer dissatisfaction with fruit flavor, and the consumption trend for fresh fruit continues downward. Thus, the dilemma is how to increase tree-ripe flavor but still maintain firmness and shelf life.

Characteristics. The non-melting flesh character offers a quantum leap in firmness and shelf life for tree-ripened peaches. This character is the most intense and most simply inherited (one recessive Mendelian gene) form of firmness, but it is closely associated (genetically linked) with the genetic clingstone character (1). The early ripening, genetic melting flesh, freestone peaches are physiologically clings, presumably because they are not on the tree long enough for the fruit and pit to separate. Thus, genetic clingstone fruit would probably not be distinguished by the consumer from early ripening genetic freestone fruit; however, the difference in texture of melting and non-melting flesh is probably distinguishable by consumers. Firmness in the non-melting flesh is thought to be due to a lack of polygalacturonase (2), an enzyme that cleaves some cell wall molecules into short pieces, thus promoting fruit softening. Processing peaches have been bred to have non-melting flesh because the characteristic allows the fruit to hold together after it has been cooked for canning. Existing cultivars of non-melting flesh processing peaches have little or no red skin color, have low acidity, are generally late ripening, and generally have a high chill requirement for winter dormancy.

The non-melting character is often described as rubber flesh in opposition to the melting flesh of modern dessert fresh market cultivars. Non-melting flesh has been avoided by breeders and others in the U.S. who thought consumers of fresh fruit would prefer the melting flesh character. However, some late ripening, non-melting peaches are sold and consumed as fresh fruit in many countries.

Processing cultivars with non-melting flesh have been selected to have no red color around the pit or just under the skin because red color bleeds into the canned fruit and makes the product less attractive than the uniform bright yellow. The canned product is sweet and has little of the acidity that contributes to the flavor of fresh market peaches. Fruit of many non-melting flesh processing cultivars develop an off-flavor, resembling the products of anaerobic fermentation, within 24 hours after harvest. This off-flavor has been observed in some of our non-melting flesh germplasm such as 'Oro A' (3) which has low acidity. The off-flavor has not been observed in our non-melting flesh hybrid selections that incorporate acidity from the traditional melting flesh germplasm.

Breeding Program. Breeding low-chill, early-ripening peaches is a major goal in Florida. Most of our melting flesh genotypes have chill requirements of 150 to 450 chill units (cu), ripen between 60 and 100 days from bloom, and produce fruit with an attractive red overcolor and moderate acid. The initial breeding source of non-melting flesh was seed importations from feral genotypes selected in central Mexico. This germplasm has about 500 to 600 cu, ripens in about 150 days from bloom and produces fruit that have no red overcolor and are low in acidity. The first hybridization was with 'Sunred' nectarine in 1973, and an F_2 population was fruited in 1979. From this F_2 and other crosses, selections were made such as Fla. 9-20C and Fla. 9-26C in 1979 and Fla. 0-4C in 1980. These 3 non-

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melting flesh genotypes require less than 300 cu, ripen in about 120 days from bloom, and produce fruit that have a moderate amount of red overcolor and acid, but lack size and earliness of ripening. The degree of success in producing these 3 selections provided impetus to continue breeding genotypes with non-melting flesh.

The next main goal was to get earlier ripening genotypes. First, the 3 selected genotypes were self-pollinated, and from these progeny, genotypes such as 86-28C (ripening in about 100 days from bloom) were selected. Second, the 3 selected genotypes were crossed with genotypes having a short bloom to ripe period and melting flesh, and an F_2 population was generated which resulted in selections like 88-25C (ripening in about 100 days from bloom). Third, the seed introduction from 'Diamante' from Brazil yielded Fla. 84-12C (released as 'Oro A') which ripens in 85 days from bloom. 'Oro A' was hybridized with non-melting flesh selections obtained earlier, and 21 non-melting flesh genotypes that ripened in 78 to 115 days from bloom were selected in 1990. A large range of desirable fruit quality characteristics are exhibited by these genotypes, but are not maximized in any single individual. Thus, selected plants of these 21 genotypes will be intercrossed to increase the intensity of some characteristics. Meanwhile, the 21 genotypes will be evaluated for cultivar potential.

Intensely non-melting flesh offers other advantages to the peach breeder (4). The breeder can handle larger populations without fear of missing the optimum peak in firmness because of weekly, instead of twice weekly, observations of seedling populations. Efficiency of the program should be increased as the breeder would not have to discard a high percent of hybrids from progenies because of fruit softness on the suture, tip or shoulder. This firmness should be advantageous in markets where refrigerated storage is not readily available (i.e. u-pick and roadside stands) or where long storage is required (i.e. export).

Reduced fruit size may be correlated with non-melting flesh. In 1990, we evaluated hybrid seedlings twice weekly to select superior genotypes. During these surveys some seedlings were flagged that were not ripe enough for final evaluation but had good fruit shape and color and were near the minimum acceptable size of 2 inches diameter. When the plants were next surveyed, the non-melting flesh genotypes appeared to show less increase in fruit size than the melting flesh genotypes. This apparent lack of size increase in the non-melting flesh genotypes was accompanied by an apparent reduction in split pits. Breeding genotypes with large fruit size (greater than 2 inches or 80 grams) and non-melting flesh will be hindered if additional measurements show that final size increase in non-melting is less than in melting flesh genotypes.

Future goals. A goal of the University of Florida breeding program is to produce a series of low-chill, non-melting flesh peach cultivars ripening 70 to 110 days from bloom. Hybridization among the non-melting flesh types has increased in the last 4 years. At least one parent of 90% of the 1990 hybrids has non-melting flesh. Most hybridization to date with the non-melting flesh character has been in peaches with the traditional fruit shape. However, one non-melting peento (saucer-shaped) peach has been selected for hybridization with non-melting peaches and 2 non-melting nectarines (fuzzless peach) were selected for additional hybridizations. Additional hybrids have been made to combine the white and orange fruit flesh with the non-melting germplasm at Gainesville. We believe that some or all of the combinations will eventually be presented to the public for trial and some may be marketed as new fruits.

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POTENTIAL FOR LOW-CHILL JAPANESE PLUMS IN FLORIDA

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Abstract. **Low-chill cultivars and selections of Japanese-type plum (*P. salicina* Lindl. and hybrids) from the University of Florida breeding program were evaluated for fruit and tree characteristics at Gainesville, Florida in 1990. Information is provided on chilling requirement, ripe date, fruit development period (FDP), fruit size, fruit quality traits and field resistance to bacterial spot and plum leaf scald. The earliest ripening clone (Fla. 85-3) ripened on 31 March and the latest clone (Fla. 87-11) on 29 May. Chilling requirement was estimated to range from 200 to 450 chill units and FDP ranged from 76 to 125 days. The best of these clones have the potential to significantly extend the availability of fresh, early season plums in the USA when grown in appropriate regions of Florida, other areas with similar low-chill winters, and in colder locations in the absence of spring freezes.**

The University of Florida Japanese-type plum (*Prunus salicina* Lindl. and hybrids) breeding program aims to produce low-chill, early ripening, cultivars with high fruit quality and disease resistance (10). Growing these cultivars in Florida should be economically attractive because the

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