Biannual Peaches in the Tropics[1]

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The normal growth pattern of high-latitude, temperate zone peaches is such that shortening of daylength in late summer initiates mechanisms that cause the plant to stop growth well before the first killing frosts of autumn. Photoperiod regulates both flower bud formation and cessation of vegetative growth, the latter of which is the first stage of cold acclimation. This early stage of dormancy may be reversible in that trees not induced into deeper dormancy by cold weather may not have built up a full load of growth inhibitors, and thus may not need as much or any cold to overcome the dormancy inhibitors. In fact, observations have shown that peach cultivars induced into deep dormancy require more hours of chilling to break dormancy than those induced only into shallow dormancy. The second stage of acclimation requires low temperatures for induction and is not as reversible unless a certain amount of chilling is accumulated. Temperate zone peach trees have evolved rest period chilling requirements to keep them dormant during winters with temperatures fluctuating between severe freezes and warm periods which might induce growth. In peaches adapted to low latitudes, chilling requirement is not only reduced, but our hypothesis is that response to shortening daylength in late summer is also reduced so that trees tend to grow as long as temperatures and soil moisture are favorable. In addition, flower bud formation continues with vegetative growth.

Peaches are producing biannually generally at high-altitude in the low latitudes of Central America and northern South America where high latitude temperate zone fruits are considered nonadapted. The general concept is based on the hypothesis that trees not induced into dormancy by either shortening photoperiod (virtually non-existant in low latitudes) or low temperatures do not build up growth inhibitors and therefore continue growing except during periods of stress, usually drought. The trees are made to cycle biannually, usually under conditions of 2 dry and 2 wet seasons. Biannual production may be modified by climatic conditions (i.e., a long dry season perhaps coupled with one major rainy season) such that exact crop cycles average 1½ to 2½ per year.

Historical Aspects

The peaches now produced biannually in the new-world tropics are probably of Spanish origin as explorers brought seed to the new world. The trees have been propagated by seed for 10 or more generations and because peach is 95% self-pollinated, they tend to behave as pure lines resulting from inbreeding and need 300 to 500 hours of chilling requirement. They require 120 to 150 days from bloom to ripe fruit which also is the shortest time required for full seed maturation and high % germination without special germination techniques. Earlier-ripening peach cultivars exist (60 to 90 days) but would not survive pure line breeding due to low % germination of the immature seed. Fruit are usually uniform in size, yellow non-melting flesh, and clingstone.

Procedure

The complete cycle from fruiting to fruiting is classically combined with alternate wet and dry seasons (Fig. 1).

[1]Florida Agrciultural Experiment Stations Journal Series No. 4778.

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Figure 1. A schedule of plant responses from cultural practices coupled with wet and dry seasons for biannual production.

Month	Season	Cultural Practice	Plant Response
January	Dry	Without water	Stop growth
February	Dry	Defoliate and prune	
March	Wet	Irrigate and fertilize	Bud swell and bloom
April	Wet	Pest control	Fruit development
May	Wet	Pest control	Flower bud initiation and fruit development
June	Dry	Harvest I	Flower bud initiation and fruit development
July	Dry	Without water	Stop growth
August	Dry	Defoliate and prune	
September	Wet	Irrigate and fertilize	Bud swell and bloom
October	Wet	Pest control	Fruit development
November	Wet	Pest control	Flower bud initiation and fruit development
December	Dry	Harvest II	Flower bud initiation and fruit development

Wet and dry seasons do not always alternate in 3 month cycles. Some have varying duration and may last 2 to 5 months. For example, in Tovar, Venezuela, the big rainy season occurs in mid-July to September and the little rainy season in early December to January. Fruit are generally harvested during the dry season, and final fruit swell may be aided with irrigation. Trees are forced to stop growing by withholding irrigation during the dry season. This stress period is initiated a minimum of one month following harvest at which time trees may be defoliated either by hand or by chemical means such as spraying with Shed-o-Leaf (18% Sodium chloratae) or zinc sulfate at about 2%. The latter is recommended if Zn needs to be added to the nutrient balance of the tree. Two weeks after defoliation, irrigation is begun unless rains have fallen. Trees bloom and show none of the typical growth symptoms associated with inadequate chilling, such as delayed and sporadic bloom and foliation, poor fruit set, and parthenocarpic fruit. General cultural work is performed during fruit growth (120 to 150 days), and fruit ripen for harvest. Many pests common to other peach regions exist. There is generally enough flexibility in the growing schedule and climate to plan variability in ripening dates of given blocks or orchards. After harvest, the cycle of defoliation, bloom, and fruit development continues without apparent harm to the life of the tree.

Potential of New Cultivars

The successfullness of the cycling operation of biannual peach production indicates no alterations should be made, but several possibilities offer potential for experimentations and successes. Peach cultivars are now available that require less chilling than those currently in production (1, 3) and some have been initially tested (2, 4). The low chilling cultivars appear to have flower bud set, bloom, and foliation that are as strong or stronger than those of the old seed propagated lines under the biannual system. They are generally earlier ripening because they have a shorter (70 to 90 days) fruit development period (FDP) from full bloom to harvest. This would permit greater flexibility in scheduling dates of bloom and harvest, resulting in a longer fruit marketing period. A range of ripening dates from cultivars with differing FDP's (1) could make fruit available almost throughout the year. Furthermore, there appears to be much variability among low chilling, short FDP cultivars for degree of flower bud set and it is expected that some cultivars should perform better than others under biannual fruiting. Two serious defects may occur with the new cultivars. First, they must be propagated asexually (budding or as self-rooted cuttings) and this may present a grower problems in a crop normally propagated from seed. Propagation techniques may need to be learned. In addition, growth habits may be different, especially in young plants, and pruning would have to be modified to shape trees and to remove suckers below the stock scion union. Secondly, most low-chill, short FDP cultivars have melting flesh fruit which may not be suitable for non-refrigerated transportation and markets because of shorter shelf-life (3). The melting flesh may not have consumer acceptance because of fruit texture and generally higher acid content.

Summary

Many unknowns exist in the substitution of low chill, short FDP peach cultivars into the present biannual production scheme which currently uses mostly seed propagated trees which bear fruit that is non-melting, yellow flesh, and sweet but low in acid. The presence of red overcolor (blush) and possible red in the flesh, especially around the pit are also potential problems. Even with the unknowns it seems worthwhile for test orchard evaluations to be made comparing merits and shortfalls of the new promising cultivars with the standard reliable seed lines.

Literature Cited

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