Journal American Pomological Society 56(1):30-33 2002

Fruit Weight and Shoot Diameter Relationship in Early Ripening Peaches

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Abstract

Data were collected in early ripening peach [*Prunus persica* (L.) Batsch] varieties trained to a vase system to determine if a relationship exists between fruit weight and shoot diameter. The experiment was conducted with 3 varieties at Gainesville, FL with detailed pruning and with 3 other varieties at Atapulgus, GA with minimum pruning. All the varieties were similar in fruit development period (FDP) and fruit size. The largest shoot diameter was generally found in the upper canopy in all varieties. There was no correlation between shoot diameter and fruit weight for 'TropicBeauty', 'TropicSnow' and 'UF2000' at Gainesville under detailed pruning. There was a significant ($p=0.01$) correlation for 'Flordacrest' in the lower ($r=0.53$) canopy and for 'White Robin' in both the upper ($r=0.38$) and lower ($r=0.40$) canopy at Attapulgus, GA under minimal pruning. In these situations, large stems were associated with large fruit. 'Delta', grown at Attapulgus with minimal pruning, showed no correlation between shoot diameter and fruit weight, probably because it is male sterile and produced large fruit due to a reduced crop load.

Introduction

Observations have suggested that shoot diameter and fruit size are positively related. Fruiting wood is usually larger in diameter in the upper portion of the tree where the larger fruit are thought to occur and fruit size is thought to be more variable in the lower portion of the tree where large shoot diameter is more variable. Tree training systems (Tatura, palmette, etc.) with specialized pruning methods have been developed to produce a tree structure to maximize sunlight levels for strong fruiting wood in the lower tree canopy. These systems rely on the production of strong vegetative shoots that are selected and headed back in winter to give short, large diameter fruiting shoots for the following fruiting season. Each of these strong shoots is capable of producing several large fruit for harvest. Thus, smallest diameter shoots are selectively removed during detailed pruning. Selective detailed pruning is practiced by some growers, but the relationship between shoot diameter and fruit weight has not previously been investigated. In this study, shoot diameter and fruit weight were measured on 6 peach varieties in both the upper and lower portion of the canopy with 3 varieties under detailed pruning and 3 under non-detailed pruning.

Materials and Methods

Three low chill [2 melting flesh (mf), 'TropicBeauty' and 'TropicSnow' and 1 non-melting flesh (nmf), 'UF2000'] peach varieties were evaluated at Gainesville and 3 mid-chill (2 mf, 'Flordacrest' and 'White Robin' and 1 nmf, 'Delta') were evaluated at Attapulgus, respectively, for shoot diameter and fruit weight (Table 1). The 6 varieties are not adapted to one location, thus 3 different varieties were chosen at each location to be similar in FDP and fruit size. The FDP in the 6 varieties was between 85 and 95 days, classifying them as early-mid season varieties. Mature trees of each variety trained to the vase system were chosen. The low chill varieties at Gainesville were pruned immediately following harvest the previous year to keep the center of the vase open. Trees at both locations received winter pruning previous to cropping. Trees of

Florida Agricultural Experiment Station Journal Series No. R07668.

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the low chill varieties at Gainesville were pruned by the authors. Water sprouts were removed, main branches were headed back with loppers, and detailed pruning was done with hand clippers. The largest diameter fruiting laterals were selected and headed back, and the small diameter shoots were removed. Trees of the mid chill varieties at Attapulgus were pruned by a field crew. They received water sprout removal and heading back of main branches with loppers, but no detailed pruning. The largest diameter fruiting laterals were not selected and headed back and the small diameter flowering shoots were not removed. Except for 'Delta', varieties at both locations were fruit thinned to about 30 to 45kg of fruit per tree prior to pit hardening to simulate the crop load (15-20cm between fruit) in commercial orchards. Fruit from both orchards were harvested from 12 to 21 May, 2000.

For each variety, 100 fruit (50 fruit from the upper 1m and 50 fruit from the lower 1m of the canopy) were harvested from 2 mature trees of similar size and vigor (5 for 'Delta' because the crop was limited). Fruit were sampled with no regard to shoot diameter. Fruit from obviously under-thinned shoots were avoided. Fruit were picked after the ground color changed from green to yellow or green to white in the case of 'TropicSnow' and 'White Robini' on the Delwiche and Baumgardner scale (1,2), but before the fruit softened. For each fruit sample, shoot diameter from the upper and lower canopy, was measured with a micrometer to the nearest 0.1mm at the internode proximal to the harvested fruit, and fruit size was determined by weight measured to the nearest gram. Data for each variety were analyzed for linear correlation and noted if highly significant ($p = 0.01$).

Results and Discussion

In order to make the best comparisons of fruit weight and shoot diameter in relation to pruning systems, the same varieties are required at one location where they are pruned differently. In this case, we had a different pruning system at each location and we chose varieties from each location (varieties are not adapted to both locations) that were similar in FDP and fruit size (Fig. 1).

There was no highly significant correlation between shoot diameter and fruit weight for 'TropicBeauty', 'TropicSnow'and 'UF2000' at Gainesville. The lack of correlation between shoot diameter and fruit weight at Gainesville is probably due to the use of detailed pruning which selectively removed most small-diameter shoots. 'UF2000' also produced the lowest range of stem diameter for all varieties tested (Fig. 1). At Attapulgus, in the moderate chill varieties, there was a highly significant, but small correlation between shoot diameter and fruit weight for 'Flordacrest' in the lower ($r=0.53$) fruiting canopy and for 'White Robin' in both the upper ($r=0.38$) and lower ($r=0.40$) canopy locations. This supports the observation that in trees without detailed pruning, the larger the shoot diameter, the higher the fruit weight. However, we cannot rule out a location effect or variety effect, even though we adjusted for FDP and fruit size in choosing varieties at each location. There was no significant correlation between shoot diameter and fruit weight for 'Delta', most likely due to its male sterility (3), which resulted in the lack of a full crop. Thus, an early and high degree of fruit thinning (at fruit set) produced a high percentage of large fruit regardless of shoot diameter.

Smaller diameter shoots were generally found in the lower canopy and larger diameter shoots in the upper canopy for all varieties at both locations. This is readily seen in for each variety in Figure 1 where most of the open squares (upper canopy) are to the right (larger twig diameter). Shoot diameter within each variety varied 3 fold (~3 to 10mm) and fruit weight 2 fold (~100 to 200g). Conversely, large fruit size occurring mostly in the upper part of the tree is not as evident in any variety at either location (Fig. 1).

The production of fruit on strong, large diameter flowering shoots after detailed pruning may reduce wind scarring by im-

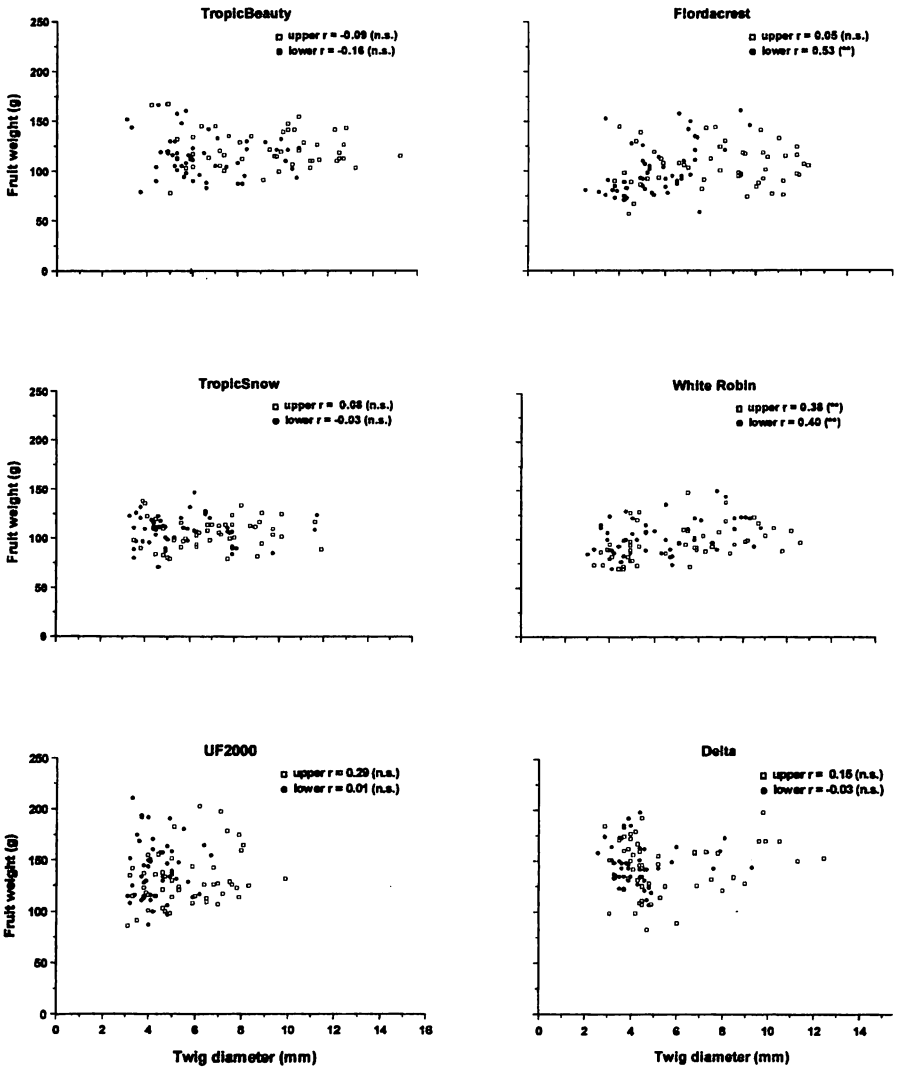

Fig. 1. Relationship of peach fruit weight (g) and twig diameter (mm) of 'TropicBeauty', 'TropicSnow' and 'UF2000' at Gainesville, FL and 'Flordacrest', 'White Robin', and 'Delta' at Attapulgus, GA for upper (top 1 m) and lower (bottom 1m) canopy. (p=0.01)**

proving wind resistance, improve color by increasing light penetration, and facilitate cultural management by creating a stronger tree structure.

The nmf 'UF2000' and 'Delta' produced the largest fruit of the varieties in this study. This large fruit size was probably due, at least in part, to the fact that the fruit

Table 1. Fruit characteristics of mid-early season peach varieties used in this study.

Variety (chill units)		FDP[z]	Stone type
Low chill melting flesh			
TropicBeauty	(150)	90	semi-free
TropicSnow	(225)	95	free
Low chill non-melting flesh			
UF2000	(300)	90	cling
Mid-chill melting flesh			
Flordacrest	(400)	80	semi-free
White Robin	(500)	85	semi-free
Mid-chill non-melting flesh			
Delta	(550)	85	cling

[z]Fruit Development Period (FDP) in days after 50% bloom to first commercial harvest.

were harvested at mature ripe, which was possible because of the superior flesh firmness associated with nmf.

In summary, there was a positive correlation between shoot diameter and fruit size in trees at Attapulgus that did not receive detailed pruning, but not in trees at Gainesville that received detailed pruning in the vase system, even though in the detail-pruned trees there was a 3 fold range in shoot diameter and a 2 fold range in fruit size. While the correlation on trees that did not receive detailed pruning was highly significant, it was not as high as had been expected. This lack of a high correlation and the fact that the upper half of the tree had the most large diameter fruiting stems, but not the most large fruit, suggests that above a minimum shoot size in peach, shoot diameter may not be as important as previously thought, especially in early ripening varieties under detailed pruning and where fruit are thinned to increase size.

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Fruit Bagging and Nutrition

Increasingly N application decreased fruit peel red color, N, Fe and Mn. Bagging of fruit reduced peel red color, fruit soluble solids and dry weight compared to non-bagged fruit. Bagged fruit had higher N, K, and Ca but fruit size or firmness were not affected by bagging. Fruit peel has higher concentration of all mineral elements compared to flesh tissue and should be kept separate when analyzing fruit tissue. From Fallahi et al 2001 Hort Technology 11(3):462-466.

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Journal of the American Pomological Society is owned and published by the American Pomological Society, with publication and business offices located at: 102 Tyson Building, University Park, PA 16802. Frequency of issue: quarterly. Publication number: 0091-3642. Annual subscription price: $40.00. Editor: David C. Ferree, Dept. Horticulture, OARDC, Wooster, Ohio 44691. Business manager: Robert M. Crassweller, 102 Tyson Building, University Park, PA 16802.

The average number of copies of each issue printed during the preceding 12 months was 750; total paid circulation, 545; free distribution, 0; total distribution, 545. Office use and left over, 205. The actual number of copies of a single issue published nearest to filing date was 750; total distribution, 545; office use and left over, 205.

I certify that the statements made by me above are correct and complete. R. M. Crassweller, Business Manager. December 31, 2001.