

Miami, November 5-7, 1974

LIMB SHAKER HARVEST EFFECT ON SUBSEQUENT YIELD OF 'PINEAPPLE' AND 'VALENCIA' ORANGE TREES

G. E. COPPOCK

Florida Department of Citrus

IFAS Agricultural Research and Education Center

Lake Alfred

and

D. P. H. TUCKER

IFAS Cooperative Extension Service

Lake Alfred

Abstract. The effects of limb shaker harvesting on subsequent fruit yields were studied on 'Pineapple' and 'Valencia' orange trees. Shaker harvesting of 'Pineapple' orange trees with shallow roots growing in an East Coast grove showed no effect on fruit yields. 'Valencia' orange trees growing in a deep sandy soil showed a yield reduction when shaker harvested at various harvest dates. The abscission chemical Acti-Aid further reduced yields until near the end of the harvest season.

Limb shakers have been used to a limited extent for harvesting the citrus crop. Fruit removal is achieved by shaking at varying degrees of intensity, depending on the force required for detachment. Understandably, there has been concern that such shaking action might affect future fruit production. Research reported to date, has been limited to specific varieties and grove conditions (1, 4). This report provides information on the effect of the limb shaker on yields 1) of shallow-rooted 'Pineapple' orange trees growing in a bedded East Coast grove during the subsequent 2 seasons, and 2) on 'Valencia' orange trees grown on a deep 'Ridge' sand the year following shaker harvest.

Materials and Methods

A self-propelled limb shaker developed at the Agricultural Research and Education Center, Lake Alfred, was used to harvest the fruit (3). The 3-wheel transport was converted to a 4-wheel unit to enable it to straddle the furrows between beds when operated in bedded groves. All trees were shaken for 90% removal of the fruit.

Florida Agricultural Experiment Stations Journal Series
No. 5648.

On the East Coast near Fort Pierce, 2 experimental sites were selected in 'Pineapple' orange blocks. Trees at site 1, selected in 1970, were 50-year old 'Pineapple' orange on sour orange rootstock. The trees were 25 ft tall and planted on single row beds, spaced 34 ft apart with trees in the rows planted 25 ft apart. Trees at site 2, selected in 1971, were 24-year old 'Pineapples' on sour orange rootstock, planted on 2-row beds. Bed centers were 55 ft apart and rows were 25 ft apart on the beds, with a tree spacing of 20 ft in the row.

Each site consisted of 12 trees, of which 6 trees were shaker harvested, and 6 handpicked for 2 consecutive years. Individual tree yields were recorded for the first and second year following the year of the initial harvest.

On the 'Ridge' a fairly level experimental site was selected in 1971 in a block of 'Valencia' orange trees on a sandy soil. Trees were 15 to 18 ft high and planted on a 25 x 25 ft spacing. The middles were open enough to permit easy movement of the machine.

Tests were conducted at several dates during the 'Valencia' harvest season to determine shaker harvest effects at various stages of young fruit development. Three harvest methods, replicated 4 times, were used at each of 5 harvest dates. Harvest methods included 1) handpicked, 2) limb shaker, and 3) limb shaker plus Acti-Aid abscission chemical. Acti-Aid at 10 ppm was applied 5 days before harvest. Experimental trees were arranged in groups of 3, one tree being harvested by one of the 3 methods at each date. Yields of experimental trees the next season, young fruit weight at various dates, and number of young fruit dropped naturally, were determined.

Results and Discussion

East Coast 'Pineapple' oranges. Subsequent fruit yields from sites 1 and 2 are summarized in Fig. 1, each bar representing the average yield of 6 trees. The average yield over a 2-year period was slightly higher from the shaker harvested trees at both sites. This difference was not considered significant in light of the wide seasonal variation in yields. These results indicate that harvesting shallow-rooted 'Pineapple' trees growing under East Coast conditions with a limb shaker

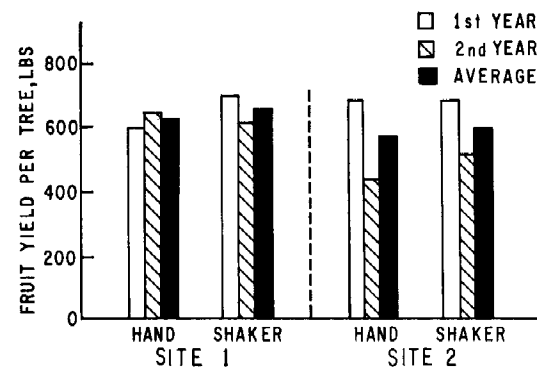


Fig. 1. Average fruit yields of the first and second year following the initial shaker harvest of 'Pineapple' orange trees growing in bedded East Coast groves.

does not significantly affect subsequent fruit yields when compared to handpicked checks. This is in agreement with the results of previous studies on shaker harvesting of 'Pineapple' oranges grown under 'Ridge' conditions (4).

'Ridge' 'Valencia' oranges. Yields from the 'Valencia' site are summarized in Fig. 2, each bar representing the average yield of 4 trees. Plots shaken without Acti-Aid resulted in a yield reduction per tree over handpicked checks ranging from 2 to 50%. This reduction became progressively larger with consecutive harvest dates, except with the May 25 harvest, when the reduction was only 5%. The yields of shaker plots with the abscission chemical was less than those where no chemical was applied, except for the June 15 harvest date. On this date, the yield reduction was less, indicating a lower degree of damage from the chemical applied this late in the season. This is in agreement with the results of previous abscission chemical studies (5). Data was not taken on the April

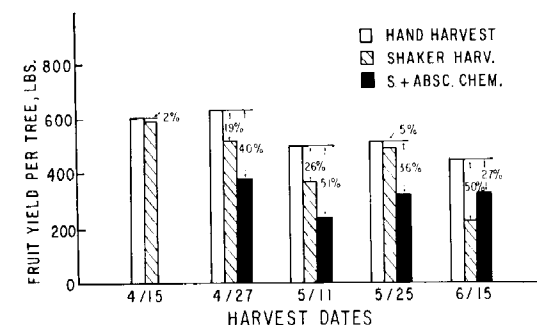


Fig. 2. Average fruit yields for the year following the shaker harvest of 'Valencia' orange trees growing in deep 'Ridge' sand.

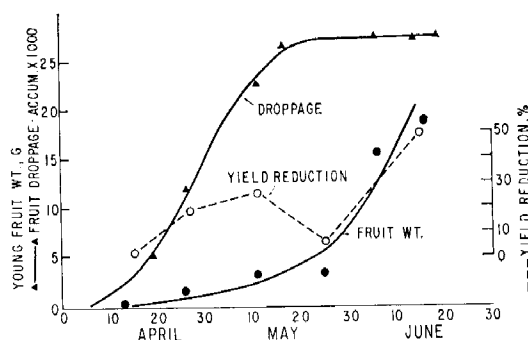


Fig. 3. The relationship of young fruit droppage and weight to the next year's reduction in yields of shaker harvested 'Valencia' orange trees growing on the 'Ridge'.

15 harvest date in the abscission chemical treatments.

The harvesting of 'Valencia' oranges with a limb shaker is complicated as both the current and next year's crops are borne on the tree at the same time (2). Therefore, for shaker harvesting to be commercially feasible, maximum mature fruit removal, coupled with a minimum of young fruit loss, is essential so not to reduce the subsequent year's crop. Since the limb shaker principle depends on differential fruit mass for selective removal, the relative weight of the young fruit is a critical factor in an efficient harvesting system. The relationship of these factors to yield reduction is shown in Fig. 3. Yield reduction increased with the weight of young fruit at harvest dates, up until May 25, when young fruit droppage decreased to near zero, indicating that a physiological change had taken place in the young fruit system. Similar results were reported from a study of the properties of young and mature 'Valencia' oranges (2).

The results strongly suggest that a yield reduction can be expected when 'Valencia' oranges are harvested with a limb shaker for a 90% removal of mature fruit, and that this reduction will be less near the beginning of the season.

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