Legal Maturity of 'Temple' Oranges as Influenced by Lead Arsenate Sprays[1,2]

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Abstract. Applications of lead arsenate to 'Temple' oranges lowered the titratable acid content but not the soluble solids or percentage juice. The percentage total decay, peel injury, and creasing were not appreciably influenced by the lead arsenate sprays. Fruit from trees sprayed with lead arsenate passed legal maturity standards 15 to 20 days earlier than fruit from non-sprayed trees.

An increasing interest has recently been shown by fresh fruit shippers in Florida in the use of arsenic sprays on 'Temple' oranges to hasten legal maturity and lengthen the marketing season. The 'Temple' orange is classified as a tangor but may actually be a tangelo having either pummelo or grapefruit parentage (6). Lead arsenate sprays have been used in Florida for many years on grapefruit varieties to lower the titratable acid content, thus making it possible for growers to have fruit that will pass legal maturity standards earlier in the season (1,2,5).

In 1934, Longfield-Smith (3) tested lead arsenate on many varieties of citrus and determined that arsenic sprays lowered the acidity to varying degrees in the various varieties. Reitz (4) found that lead arsenate sprays made no significant changes in the levels of ascorbic acid, soluble solids, or juice content of grapefruit.

Lead arsenate, at rates of 0, 1/4, 1/2, and 3/4-pound per 100 gallons of spray, was applied to plots of 3 mature 'Temple' trees replicated 5 times. The material, in spray form, was applied under calm conditions to dry trees on September 21, 1967. Each tree received 12 to 15 gallons of spray mixture. As a result of extreme dry spring weather, the trees had set both a regular bloom crop in March and a late bloom crop the latter part of May. The average size of the regular bloom fruit at spraying time was 6.67 cm. in diameter, whereas the late bloom fruit averaged 3.73 cm.

Fruit samples were collected at monthly intervals between November, 1967 and March, 1968 for maturity study. Each sample consisted of 48 fruit picked randomly around the perimeter of the 3 trees in each plot. Fruit samples were taken each month through early March, when heavy fruit drop due to fruit senescence occurred. Fruit samples were analyzed for total titratable acid (calculated as citric acid), total soluble solids (using a Brix hydrometer), and the percentage juice on a weight basis.

Fruit for decay and peel blemish studies were harvested weekly from January 10 to February 8. Samples of 4 field boxes, each box containing approximately 1-4/5 bushels of fruit, were harvested from one of the replicated plots each week until all had been sampled in 5 weeks. Fruits were checked for decay, peel injury, and creasing (partial separation of the rind from the fruit segments) during 3-weeks' storage at 70°F.

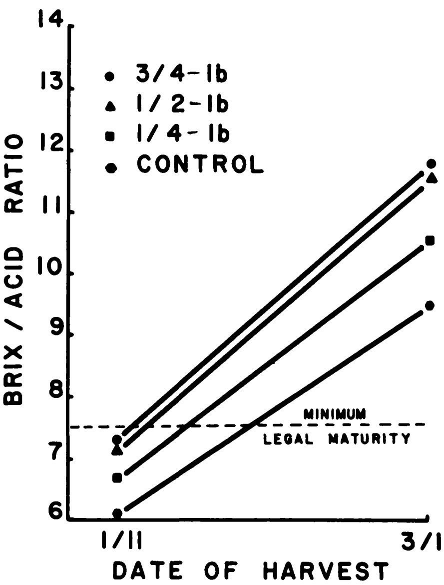

Fig. 2. Brix/acid ratio of late bloom 'Temple' oranges sprayed with lead arsenate on September 21, 1967.

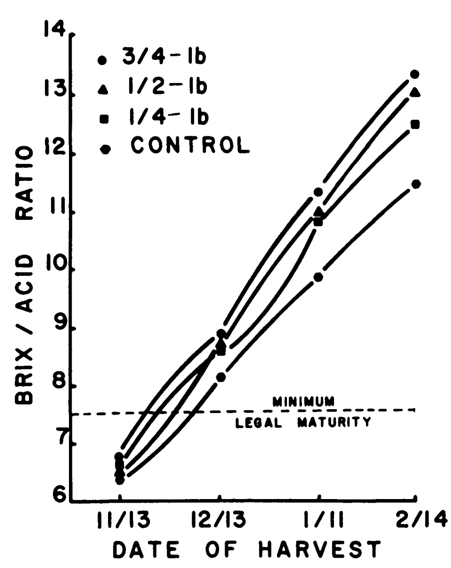

Fig. 1. Brix/acid ratio of regular bloom 'Temple' oranges sprayed with lead arsenate on September 21, 1967.

Reduction of titratable acid in regular bloom fruit was noted less than 2 months after the lead arsenate sprays were applied (Table 1). While differences were slight, all 3 rates caused a reduction in acid content. The ratio of soluble solids to titratable acid (Brix/acid ratio) was therefore increased (Fig. 1). Fruit treated with the 3 rates of lead arsenate passed legal maturity standards sooner than the non-sprayed fruit. Fruit on trees receiving 3/4-pound of lead arsenate could have been harvested 15 to 20 days sooner than fruit of the non-sprayed check, thereby lengthening the harvesting season by approximately 2 weeks. Three subsequent maturity tests at monthly

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intervals showed that the 3 rates of arsenic continued to cause a reduction in titratable acid. At the time of the final sampling, the 1/4, 1/2, and 3/4-pound rates showed 0.81, 1.40, and 1.82 points increase, respectively, in Brix/acid ratio over the non-sprayed control.

A reduction in titratable acid caused by lead arsenate was also evident in the late bloom fruit (Table 1). Differences in Brix/acid ratio were greater in late bloom fruit than in regular bloom fruit between the control and sprayed plots as indicated in Fig. 2. This suggests that the more immature the fruit is at the time of spraying, the greater the influence of lead arsenate. On the last sampling date, the 1/4, 1/2, and 3/4-pound rates showed differences of 1.12, 2.04, and 2.23 points in Brix/acid ratio in comparison with the control.

Differences in total titratable acid were relatively large and related to the rate of arsenic applied, whereas the differences in soluble solids and juice content were small and not related to the level of arsenic applied. It is thereby concluded that the only maturity component affected was the acid content.

Regular bloom fruit sprayed with lead arsenate generally had less decay (Table 2). There was no appreciable difference in decay in fruit receiving the 3 rates of arsenic, but there was about 7 to 8% more decay in the unsprayed fruit.

Lead arsenate caused no apparent increase in peel injury (Table 2). The percent fruit with creasing appears to be inversely related to the amount of lead arsenate applied. While these differences were small, the trend existed, indicating lead arsenate sprays may decrease peel creasing. Further experiments, however, will be required to definitely determine the effect.

Table 1. Effect of lead arsenate on titratable acid in regular and late bloom 'Temple' oranges.[1]

	Regular bloom				Late bloom	
Treatments	11-13-67	12-13-67	1-11-68	2-14-68	1-11-68	3-1-68
Control	1.73	1.46	1.27	1.12	1.83	1.33
1/4-lb.	1.70	1.42	1.18	1.05	1.67	1.19
1/2-lb.	1.70	1.35	1.14	1.00	1.58	1.07
3/4-lb.	1.67	1.36	1.11	0.96	1.54	1.07

[1]Data represent the average from 5 replicated samples.

Table 2. Effect of lead arsenate on keeping quality of 'Temple' oranges held in storage for 3 weeks at 70°F.

Treatment	% total decay	% peel injury	% creasing
Control	31.4	2.4	3.2
1/4-lb.	24.4	5.0	2.8
1/2-lb.	23.6	2.6	2.2
3/4-lb.	23.8	1.6	0.8

[1] Data are an average of 5 fruit samples harvested between 1-10-68 and 2-8-68.

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A New Approach to Rooting of Difficult-to-Root Avocado Cuttings*

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The use of growth-promoting substances has greatly improved the rooting ability of softwood cuttings under intermittent mist. Nevertheless, some clones of economic value have failed to root even under the best known conditions.

Garner (2) described an experiment carried out at East Malling in which M.XVI was inarched with non-rooted shoots of the Ribston Pippin. The inarched component leafed, without forming roots. On the other hand, hardwood cuttings inarched onto a well-established plant "remain for one or two seasons until they develop roots and shoots on their own before they are separated and transplanted." Floor (1) succeeded in inducing rooting by grafting a cutting which roots easily onto another which was difficult to root ("X cuttings").

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This report comprises one aspect of our work with difficult-to-root cuttings over a two-year period. The West Indian avocado types are shy-rooted, unless their cuttings are taken from tips or laterals of young seedlings. Five-month-old Mexican seedlings (Duke and Mexicola) grown in containers of one-gallon capacity were inarch-grafted on April 1st, 1967, with Fuchs 20, Hall 30, Nahalath 10, Ma'oz and Guatemalan Benik 31/6 scions, taken from well-established trees of local selections. The Benik selection is a moderately difficult-rooting type, Fuchs 20 a shy-rooting, Hall 30 very shy; Nahalath and Ma'oz did not root at all from ordinary cuttings, even when treated with a high auxin concentration.

The grafts were tied with plastic strips, covered with polyethylene bags (0.01 mm thick) and their basal ends placed in the sandy-loam soil of the container. Two weeks later the Mexican grafted seedlings were tipped, and late in April some of the buds of the