

THE EFFECT OF IODOACETIC ACID ON CITRUS FRUIT ABSCISSION¹

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The increase in acreage of citrus in the State of Florida and the decrease in the amount of available labor for harvesting citrus fruit have stimulated considerable interest in the development of mechanical harvesting equipment, either as mechanical aids or as complete mechanization. Mechanized harvesting of citrus fruit is a difficult and complex problem involving the fields of horticulture, engineering, physiology and economics. The most serious limitation in solving this problem is the bonding force between fruit and fruit stem. If this force of removal could be eliminated or greatly reduced, the problem would be one of simply protecting the fruit during the process of picking or shaking and conveying it to a suitable container for removal from the grove. Unfortunately, there is presently no method known of eliminating this force completely or satisfactorily reducing it. It tends to decrease over the harvesting season in some varieties, e.g., 'Hamlin' and 'Pineapples', and remain relatively constant in others, e.g., 'Valencias.' If it were possible to lower the removal force at harvesting time, the development of a practical, fully automatic, fruit harvesting machine would be greatly facilitated.

In a recent report of a screening trial, of many chemicals that might induce fruit loosening prior to harvest, it was reported that iodoacetic acid showed considerable promise as a fruit loosening agent (1). This paper is a report of tests conducted over a 2 year period on the effect of iodoacetic acid as an abscission-inducing compound. These tests were conducted in the field on mature citrus trees of 'Hamlin', 'Pineapple', and 'Valencia' sweet oranges.

MATERIALS AND METHODS

Iodoacetic acid was applied to mature sweet orange trees, approximately 25 years old, in concentrations ranging from 200 ppm to 3,500 ppm. The trees used in these experiments averaged 4 to 5 boxes of fruit per tree. The material

was sprayed on the entire leaf and fruit surface of the tree at 300 psi and 15 gallons of spray per tree.

The loosening effect of the chemical was determined on 30 fruits selected at random from each tree. The fruit was clipped from the tree, leaving a 4 to 5 inch twig on each fruit. They were then immediately inserted into an instrument designed to determine the pounds of force, on a straight pull, required to remove the stem from the fruits (1). The pull-tests were conducted at one or 2 day intervals for 8 days following spray application. The term plugged fruit, as used in this paper, means fruit in which part of the peel was removed with the stem when it was pulled from the fruit.

The percent fruit removed and the speed of removal of fruit from the tree were determined using an experimental model of a mechanical shaker developed by agricultural engineers at the Citrus Experiment Station, Lake Alfred, Florida.

RESULTS

Effective Concentration. The concentration of iodoacetic acid necessary to loosen the fruit was somewhat dependent on the variety (Tables 1, 2 and 3). The data in Table 2 show that iodoacetic acid applied to 'Pineapple' orange trees in early December was relatively ineffective regardless of the concentration used. 'Pineapple' oranges at this season of the year, although they had a Brix/acid ratio of 12 and had reached legal maturity, were not physiologically mature. As the season progressed, the same concentration became increasingly effective in loosening the fruit. From the data obtained, it seemed that the effective concentration required to loosen fruit on 'Hamlin' and 'Pineapple' varieties was approximately 700 to 1,000 ppm (Tables 1 and 2). 'Valencia' did not respond favorably to this particular compound (Table 3). It can be noted that concentrations of 1,700 to 3,500 ppm of iodoacetic acid were ineffective in loosening 'Valencia' oranges (Table 3). This occurred even though at the highest concentration (3,520 ppm), a rather high percentage of the leaves on the tree abscised. This was contrary to the reaction of early and mid-season varieties ('Hamlin' and 'Pineapple') where iodoacetic acid applied at al-

¹Approved as Florida Agricultural Experiment Stations Journal Series No. 2252.

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