



Fig. 1. Avocado trees are very sensitive to bromacil toxicity especially in sandy or shallow Rockdale soils low in organic matter. Symptoms consist of leaf vein clearing and poor tree performance which may persist as long as three years.

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RESIDUES OF 2,4-DICHLOROPHENOXYACETIC ACID HERBICIDE IN PERSIAN LIMES AND THEIR PROCESSED PRODUCTS FOLLOWING PREHARVEST SPRAYING¹

H. ANSON MOYE AND CHARLES BARMORE²
*Pesticide Research Laboratory,
Food Science and Human Nutrition Department,
University of Florida, Gainesville, Florida 32611*

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Abstract. 2,4-D herbicide has been reported to be effective in a water soluble form (25 and 50 ppm as the alkalamine salt) as an agent for prevention of stylar-end breakdown of mature limes. Following a single spraying, fruit were harvested at 0, 14, 21 and 42 days, then stored at 21°C for 0, 2 or 4 weeks prior to storage at -8°C and residue analyses. Residues ranged from 0.008 to 0.32 ppm in the peel. No residues could be found in the pulp nor in any processed samples.

Research as early as 1948 by Stewart (4) and separately in 1949 by Gates (1) indicated that 2,4-dichlorophenoxyacetic acid (2,4-D) might be effective as a preharvest spray in the prevention of stylar-end breakdown of limes after harvest. Both workers used the butyl ester form of the herbicide and attributed the degree of irreproducibility observed to a possible water solubility problem of the formulation. Small scale experiments with a water soluble form (alkalamine salt, Dow Formula 40) have indicated that improved protection might be realized (2).

¹Florida Agricultural Experiment Station Journal Series No. 851.
²Agricultural Research and Education Center, University of Florida, Lake Alfred, Florida 33850.

This report describes the 2,4-D residues observed from samples resulting from a typical application of 2,4-D to 'Persian' limes preharvest.

Materials and Methods

A 'Persian' lime grove in good horticultural condition in Homestead, Florida was used for this experiment. Approximately 10 to 12 trees per treatment were sprayed with a 25 or 50 ppm solution of 2,4-D (Dow Formula 40, alkalamine salt). A Hardie spray unit with a handgun was used to apply approximately 5 gallons per tree, until runoff. Approximately 5 pounds of fresh fruit for each storage interval (0, 2 and 4 weeks) were harvested at random for each treatment (0, 25 and 50 ppm) at day zero (immediately after treatment) days 14, 21 and 42. Storage was at 21°C with subsequent transfer to -8°C until residue analyses. At 21 days after treatment approximately two and one quarter tons of each treatment was transported to A.R.E.C. Lake Alfred and subjected to the pilot plant feed mill where various fractions were prepared and stored for additional residue analyses.

Analysis was performed on peel and pulp separately, as well as the following processed products: washed peel, washed pulp, chopped peel, dried peel, peel oil, press liquor, fruit juice, emulsion water, peel frit, finisher pulp, pre-water rinse, after-water rinse, dried pulp and molasses. Residues were determined by gas chromatography following a hydrolytic extraction and derivatization to the 2-butoxyethyl ester (3).

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Results and Discussion

Percentage recoveries obtained by fortifying control (check) samples of lime peel and lime pulp at various levels are shown in Table 1.

Table 1. Percent recoveries of control lime peel and pulp fortified with 2,4-D.*

Peel, ppm	Recovery
0.00	—
0.05	92%
0.10	90
0.25	100
0.50	93
Pulp, ppm	Recovery
0.00	—
0.05	87
0.10	69
0.25	93
0.50	93

*Average of 3 separate determinations.

No residues were found at the limit of detection of the method (0.008 ppm) for lime pulp or any of the 16 other fractions of processed samples. There were residues in the peel, however, as seen in Fig. 1. As can be seen, the higher residues were measured in the zero day, 4 week and 2 week storage samples. The fact that the zero day "frozen immediately" samples were lower suggests that the 2,4-D was "freeze dried" or "sublimed" from the peel surface before it had the opportunity to penetrate the waxy layer during 21°C storage. Since residues were found only in the peel samples, and only at the maximum level of 0.35 ppm, the 25 and 50 ppm preharvest spray can no way be considered a practice detrimental to the health of the consumer considering present toxicological data on 2,4-D and the existing residue tolerance of 5 ppm based on fresh wt of whole fruit.

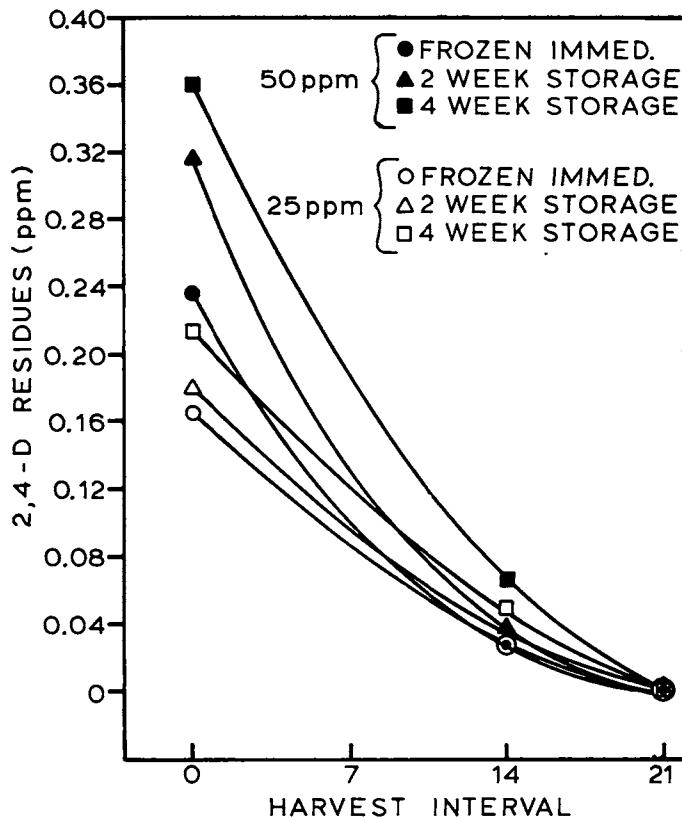


Fig. 1. Disappearance curves of 2,4-D in lime peel as affected by treatment level, storage time (21°C) and harvest interval. Averages of duplicate field replications.

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