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PACKINGHOUSE NEWSLETTER

W. Wardowski
CREC
700 Experiment Station Road
Lake Alfred, FL 33850
Phone: (941) 956-1151

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PLANT GROWTH REGULATOR USE STRATEGIES FOR DELAYED GRAPEFRUIT HARVEST

D. P. H. Tucker, A. Wheaton, L.G. Albrigo, S. Futch
University of Florida, IFAS, Citrus Research & Education Center

M.A. Ismail
Florida Department of Citrus, Lake Alfred

Extending the grapefruit season in years of high production could benefit Florida growers. An application of plant growth regulators can extend the season by reducing fruit drop and maintaining better peel quality.

Plant growth regulators (PGR's) 2,4 dichlorophenoxy acetic acid (2,4-D) and gibberellic acid (GA₃) are widely used on citrus in California, and to a much lesser extent in Florida. These products should be more widely used in Florida as they offer growers distinct economic advantages under certain circumstances. 2,4-D delays abscission and reduces fruit drop of grapefruit and other varieties, while GA₃ delays senescence i.e., peel aging and peel color development. As Florida strives to increase its marketing efforts for grapefruit both domestically and for export, practices that improve holding quality and therefore flexibility in supply and demand are of particular value. Recommendations for the use of these products on grapefruit are in the 1996 Florida Citrus Pest Management Guide which is revised annually. Several papers have been published over the years on the use of PGR's in Florida citrus, and may be obtained from the authors.

Choosing Groves for Late Season Harvesting:

When considering strategies for delayed grapefruit harvesting, growers should choose blocks with a history of extended fruit holding capabilities. Timely application of 2,4-D and GA₃ will reduce fruit drop and improve peel quality so that harvest may be delayed several weeks. However, these treatments

will not reduce seed sprouting in the fruit which can become a serious problem for some crops. GA and 2,4-D will not affect total soluble solids ($^{\circ}$ Brix) or % acid. Very late held crops should probably not be considered for export as the time between harvest and reaching market destination becomes more critical. Internal fruit drying and seed germination in the fruit is more likely to occur the longer the fruit is held on tree.

Cultural Practices:

In addition to PGR applications, modifications of cultural practices that may enhance fruit holding capabilities should be considered. They include:

- 1) Fertilizer practices should not necessarily be altered, but medium application rates within the recommended range should be used. Additional fertilizer applications should not be made during the extended crop holding period other than those scheduled for the next year's developing crop.
- 2) Irrigation should be applied at moderate levels, not allowing stress conditions to develop at any time as this could induce fruit drop. Excessive irrigation should also be avoided due to its negative effects on fruit quality.
- 3) Pruning operations may have to be delayed because of fruit loss and possible tree stress. The practice of tree skirting may be evaluated where delayed fruit harvest is considered in terms of reduced fruit decay, other fruit damage, and improved efficiency of late weed management operations with postemergence herbicides such as glyphosate. Properly designed herbicide booms will reduce fruit drop from spray contact, drift, and physical contact.

Pest Management Practices:

During the period of delayed harvest, insect, mite, disease and nutritional sprays should be minimized, and used only if careful monitoring procedures indicate a need to prevent fruit blemish. Spray applications that may have to be considered include those for spider mites in the fall for the existing crop, and rust mites, melanose and scab on the newly developing crop. Avoid, the use of nutritional sprays, oils and various surfactants and additives during the later stages of on-tree fruit storage, as the risk of fruit damage probably outweighs the potential benefits from applications during this time period. Having gone to the trouble and expense of using PGR's and holding fruit for extended harvest, why run the risk of spray-induced fruit blemish and lowered packout?

PGR Application:

PGR's exert their action at very low concentrations. Excessive amounts can be damaging to fruit and foliage. It is very important to follow the instructions listed below:

- 1) Follow label directions precisely and do not exceed recommended rates, as tree defoliation can result.
- 2) Spray volumes of 250 GPA or greater are recommended as more concentrated sprays have not been evaluated in Florida.
- 3) Avoid tank mixing of PGR's with nutritionals, oils and additives with known penetrating properties. Enhancing the penetration of PGR's may stimulate higher uptake rates. If a surfactant is to be added, use the one recommended on the product label.
- 4) PGR's should not be applied to trees under stress conditions or when freeze threat is imminent.
- 5) Avoid application of GA and 2,4-D to young trees.
- 6) Past research and field observations have shown that fruit held for extended harvest periods has the effect of reducing the subsequent crop size, and inducing alternate-bearing cycles.
- 7) Check and adjust pH of water to 7 if needed. Higher pH inhibits uptake of GA.
- 8) Apply GA when fruit is at 50% color break or better. Late applications run the risk of interfering with flower bud differentiation and may reduce next season's bloom.

- 9) Avoid early harvesting of treated blocks. Treated fruit may be more difficult to harvest and may require excessive degreening.

PGR's can be an important tool if used in a timely and proper manner. They are available to Florida citrus growers for better management of their grapefruit crop and may provide economic advantage in marketing grapefruit in the latter part of the harvesting season.

Plant Growth Regulators

Growth regulator sprays are specific for certain varieties and responses. Depending on variety and timing, they may improve fruit set, reduce crop load by fruit thinning, extend the harvest season by delaying rind aging, prevent preharvest fruit drop and be used for trunk sprout control on young citrus trees. Excessive rates, improper timing, and fluctuating environmental conditions can result in phytotoxicity, crop loss, and/or erratic results. Growers are urged to become familiar with these uses on small plots before applying to their entire planting. The newer spray adjuvants have not been tested with these growth regulators and may cause problems if uptake is significantly increased. Products containing 2,4-Dichlorophenoxyacetic acid are regulated to avoid drift onto susceptible crops in surrounding areas.

Table 18. Growth regulators

Growth Regulator	Rate/Acre ¹	Variety and Activity	Time of Application
Citrus Fix Hivol-44 (2,4-Dichlorophenoxyacetic acid isopropyl ester 3.38 lb/gal)	3.2 oz	Orange, Temple and grapefruit. Reduction of fall drop.	Nov-Dec. Do not apply during periods of leaf flush.
Citrus Fix Hivol-44 (2,4-Dichlorophenoxyacetic acid isopropyl ester 3.38 lb/gal)	2.4 oz	Navel orange. Reduction of summer-fall drop.	6-8 wks after bloom or Aug-Sept for fall drop. Do not apply later spray when fruit is to be harvested early. Do not apply during periods of leaf flush.
Pro-Gibb (Gibberellic acid, GA ₃ , 3.91% liquid concentrate) ²	20 oz	Seedless grapefruit. Delay of rind aging process and peel color development at maturity. Combine with Citrus Fix or Hivol-44 for fruit drop control.	Nov-Jan
Pro-Gibb (Gibberellic acid, GA ₃ , 3.91% liquid concentrate) ²	10-30 oz	Tangelo. Improvement of fruit set. Can result in small fruit size and leaf drop.	Full bloom
Pro-Gibb (Gibberellic acid, GA ₃ , 3.91% liquid concentrate) ²	20 oz	Minneola tangelo. Delay of stem end rind deterioration.	
Tre-Hold (Naphthaleneacetic acid NAA, 1.0% liquid concentrate)	Apply to trunk only as thorough spray or light brush application. Excessively heavy application may result in tree damage.	Nonbearing citrus. Inhibition of trunk sprout growth.	Prior to sprout growth. Caution - may inhibit sprouting desired for tree recovery following freeze damage. Do not apply after Sept 1.
Fruit Fix (Naphthaleneacetic acid, NAA, 800 g/gal liquid amine formulation)	2-5 pt. Use lower rates on Murcotts.	Tangerine & Murcott. Fruit thinning. Activity is temperature dependent. Severe overthinning may result from applications made to trees of low vigor and/or under stress conditions.	Mid-May

¹Rates are based on application in 250-500 gal per acre to mature trees. The effects of applications at lower volumes (concentrate sprays) are unknown.

²Do not use in water above pH 8. Use only non-ionic surfactants.

IN MEMORIAM**R. V. "RED" PHILLIPS: A PERSONAL TRIBUTE.**

Bill Grierson, CREC, Emeritus

It is now over 44 years since I arrived at the then Citrus Experiment Station and immediately lucked into being the Project Leader on a very promising cooperative Industry/University project. This was the Fresh Fruit Bulk Handling Project, designed to do away with harvesting and degreening in those old man-killing field boxes. Another concern behind this project was that the Federal minimum wage would soon apply to agricultural labor.

The experimental prototype system was at Haines City C.G.A. which had very recently employed a new, young, enthusiastic General Manager. Unlike so many of his fellow packinghouse managers, Red Phillips was ready and willing to take a step into the future. Most particularly, he was a manager who was always willing to think, not of getting rid of workers, but instead in terms of "How can we make our people more productive."

Thus, I came to know and work very closely with Red Phillips, whom I immediately liked and soon came to deeply respect. The term "a self made man" is often misused to describe people who started (as I did) with a scholarship funded by some benefactor, or with an inherited nest egg of property or funds. Red had no such head start. He began work as a teenager laborer at Waverly C.G.A., where the manager, discerning that this young lad was intelligent, hard working and capable, soon gave him some small role in the sales office.

Others will write of how he became one of the citrus industry's leaders, a Citrus Commissioner, and so on. I would rather recall an apparently trivial encounter. Red and I were on a trip to New York City where we were to address a meeting of food editors. When we got into a cab at the airport, Red immediately recognized the cabbie's accent. They both came from the same remote corner of rural Alabama, knew the same places and some of the same people. They could have been cousins, the way they reminisced! No stranger would have dreamed that this unassuming passenger was a Citrus Commissioner, General Manager of a large cooperative, Board Member of one of the State's biggest canneries, etc. Of such did Robbie Burns write "A man's a man for a' that."

And the Bulk Handling Project? A happy memory is going over the books at the end of the 1953-54 season with Red and Mr. Adams, his precise old accountant. Haines City C.G.A. had remodeled to the new bulk handling system. They had absorbed a 25% increase in labor cost (from 80 cents to a dollar an hour!), put part-time workers on full time, not laid anyone off, and still finished up with a slightly decreased cost per box packed.

Everyone who worked with Red, from the humblest hoehand to the largest grower (not to mention this appreciative scientist) profited from his homely wisdom, his ability and his unalloyed good will.

AVAILABLE PUBLICATION

Available from Publications Department, University of Florida, P. O. Box 110011, Gainesville, FL 32611-0011, Phone (352) 392-1764 or in Florida only (800) 226-1764

Knapp, J. L. (Ed.). 1996 Florida Citrus Pest Management Guide. Univ. of Fla. Coop. Ext. Svc. SP 43. Gainesville: Jan. 1996. 69 pp. \$3.00 plus shipping and sales tax.