



Chemical Thinning of Citrus with NAA for Bigger Fruit, Less Branch Breakage, and More Regular Cropping¹

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Introduction

The plant growth regulator NAA (naphthalene acetic acid) is widely used in apples and pears to reduce (or “thin”) the number of fruit on trees with excessive set, and is also registered for use in tangerines (Mandarins), oranges, tangors, and tangelos.

NAA is thought to enhance early fruit drop by increasing competition between fruitlets and increasing production of abscission-inducing ethylene, both encouraging greater physiological-drop (Usually in May for Florida citrus). Small-fruited tangerine cultivars such as Sunburst, Murcott, and Dancy are especially likely to benefit from judicious use of NAA. In trials from 1997 - 1999, six of eight tangerine groves have shown significant increases in profitability following treatment with NAA. The purpose of this report is to provide guidance to citrus growers interested in trying this practice.

Typical advantages of NAA thinning in heavily cropping trees are increased fruit size, reduction in branch breakage, and more consistent cropping from year to year, which all contribute to greater profitability. In our trials, crop value has been enhanced by as much as \$3000 per acre in the year of treatment.

Recommendations

Which groves should you treat with NAA?

Only groves which are expected to have excessively large numbers of fruit per tree should be thinned with NAA. Alternate bearing cultivars such as 'Sunburst', 'Murcott', and 'Dancy' in the “on” (high crop) year are obvious candidates, but other cultivars also may be profitably thinned. Young blocks which have already developed an alternate-bearing habit may be especially suited to initial grower “experiments” in thinning. Excessive fruit loads in such blocks not only result in many unmarketable, small fruit but also delay development of canopy volume necessary

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for maximum production potential, making thinning especially desirable. In addition, somewhat excessive loss of fruit ("overthinning") in these blocks may be compensated by greater tree growth and earlier development of mature canopy volume. The small size of young trees also permits use of lower spray volumes and reduces the cost of treatment per acre.

Until stronger recommendations can be developed, only groves expected to have very heavy cropping with breakage of branches or numerous unmarketable small fruit should be thinned with NAA.

How do you select the rate to use for your grove?

In applying NAA, or other growth regulators, the amount of active material absorbed and moved to the target tissue is of great importance. This depends on a number of factors including concentration of material, volume applied, and uniformity of application. Since concentration is so important, growth regulator treatments are usually expressed on a concentration basis (part per million or ppm) rather than grams per acre. Rates of 250-500 ppm NAA have been most effective in thinning citrus varieties, not only in Florida, but also around the world.

Most citrus thinning experiments have used NAA application in high volumes of water (400-600 gallons/acre) for uniform absorption, but to effectively thin, NAA only needs to be taken up in adequate amounts by leaves in the fruiting zone. Recent experiments in Florida indicate that application in lower water volumes, still thoroughly wetting the outer canopy where most fruit is carried, may be equally effective and substantially decreases cost of application. For mature groves of large trees, 125-150 gallons per acre is probably adequate and lower volumes should be used for smaller trees by turning off some sprayer nozzles. Growers uncomfortable with calculations on a ppm basis can use the ounces of NAA / 125 gallons, at appropriate ppm, as a rate per acre when applying at 125 gallons /

acre. Note that application in 250 gallons / acre instead of 125 gallons / acre is likely to yield poor results unless ounces of NAA used is also doubled, greatly increasing the cost for material.

For most healthy, unstressed groves NAA should be applied at 120 ounces Fruit Fix 200 (or similar product, NOT Citrus Fix which is 2,4-D rather than NAA, plus 6.5 ounces of surfactant per 100 gallons, at 125 gallons per acre. Murcott should receive a lower rate 60-96 oz. NAA / 100 gallons.

Until we have broader experience with Florida citrus we feel that we should approach our thinning trials with the attitude that we would rather overthin than risk seeing little effect. With this strategy in mind, we recommend that you use 500 ppm in thinning vigorous, well-watered blocks of all varieties except Murcott. Trees that are weak, freeze-damaged, or under nutrient or drought stress may overthin following NAA application and should be treated with a lower rate or left untreated. Studies show that Murcott thins effectively at lower rates of NAA, and 250-400 ppm is suitable for application to healthy, unstressed trees. All NAA applications should include a surfactant at 0.05% and should not be tank mixed with other materials, unless you confirm that it is compatible with NAA. Our experiments suggest that trees with ample water on heavier soils may need higher rates of NAA than similar trees on sandy soils. Our studies indicate that organosilicone surfactants may increase thinning, but often provide fewer large size fruit compared to nonionic surfactants. The following table provides directions to prepare NAA for grove application. Ease of thinning appears to vary greatly between groves, even when trees are quite similar, but shows some consistency from year-to-year within a grove. **The best guide for thinning each block is prior experience.** Adjust the rates suggested in the table based on individual grove response.

When should you apply NAA?

Worldwide, thinning studies have shown the greatest response, in a wide range of cultivars, when the average fruitlet diameter is around half an inch, which typically occurs 6 to 8 weeks postbloom.

Work in Florida suggests that best results are achieved when NAA is applied at the beginning, or just before, the period of natural fruit drop which normally occurs in May, and also usually coincides with the half-inch fruit diameter.

NAA should be applied near the beginning of physiological drop, when most fruitlets are about 1/2 inch in diameter. Rain within six hours of treatment, drought stress, or very hot or cool conditions may affect response.

Environmental conditions can greatly influence uptake and activity of NAA. Higher temperatures and delayed drying of spray solution both contribute to greater thinning action. Best results are likely to occur when applied between 75° and 85° F. Higher temperatures may cause excessive thinning. Since uptake continues for several hours after the spray dries, heavy rain within six hours of application may significantly reduce NAA action.

Developing expertise in citrus thinning.

While considerable work was done on chemical thinning of 'Dancy' and 'Murcott' in Florida during the 60s and 70s, changes in cultural practices and new cultivars suggest that most chemical thinning in Florida should be considered experimental. We do, however, recommend that growers experiment widely on small acreage. Potential profitability enhancement, of several hundred to more than a thousand dollars per acre, may ultimately make thinning of some Florida citrus varieties routine, as it now is in some other fruit crops. Experience with response of trees in your grove will accelerate your effective use of this technique. Please share your results with your citrus agent to help us develop more refined recommendations quickly.

Please tell your citrus agent about your experiences with NAA thinning. Your information will help us develop stronger recommendations more quickly!

Table. Preparing NAA for Spray Application ^a

<u>Thinning Conditions</u>	<u>ppm NAA in tank</u>	<u>fl. ounces of NAA^b /100 gallons</u>	<u>fl. ounces NAA^b / acre at 125 gallons/acre</u>
stressed trees	200	48	60
typical Murcott block	250	60	75
moderate thinning	350	84	105
maximum thinning	500	120	150
^a always include 6.5 ounces of surfactant / 100 gallons			
^b amount indicated is for K-Salt Fruit Fix 200 or similar product, use only 1/4 amount shown when using K-Salt Fruit Fix 800.			
NOTE: it is illegal to apply more than once per season to a grove, exceed 500ppm, or apply within 150 days of harvest. Always read the label carefully and follow directions.			