FRUIT THINNING OF 'EARLY AMBER' PEACHES
WITH ETHREL (1) AND NIA 10637 (4)

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Abstract
Ethrel (2-chloroethylphosphonic acid) and Nia 10637 (Niagara Chemical Division) were applied as post-bloom thinning sprays to 'Early Amber' peach trees. Ethrel was consistently more effective in fruit thinning than Nia 10637. Higher concentrations of both chemicals increased thinning. Fruit size increased especially with early applications of Ethrel. Pit-splitting increased with higher concentrations of Ethrel when there was over-thinning.

Introduction
Three hundred fruits per tree is the recommended crop load for short-cycle peach varieties grown in Florida. These varieties have been thinned during 80% bloom, full bloom (4), and cytokinesis (3) with 2-chloroethylphosphonic acid (Ethrel).

It is commonly known that bloom thinning gives greater fruit size than does later thinning (7). If however, thinning is performed during bloom, one incurs a greater risk of injury to blossoms by spring frosts and consequently over-thinning, if marginal low temperatures occur. Post-bloom, pre-cytokinesis thinning would capitalize on benefits of early thinning while minimizing risks of blossom-kill by marginally low temperatures.

Blake et al. observed increases in the percentage of split pits when peaches were chemically thinned with Ethrel during cytokinesis (3). Earlier studies relate increased fruit size or associated cultural and internal fruit conditions to pit-splitting (2, 5, 8).

Ethrel (1) and Nia 10637 (6) were therefore evaluated for acceptability and efficiency as post-bloom thinning agents. The resulting influence upon fruit size and occurrence of split pits was observed.

Materials and Methods
Five single-tree replications of Prunus persica var. 'Early Amber' were selected for uniformity at the time of spraying. Non-thinned control replications were provided. A similar set of controls was hand-thinned on March 25. Chemicals were diluted in the field and applied to drip with a small power sprayer at 100, 200, and 300 ppm on February 27. Foliage damage prompted the use of lower concentrations (30, 60, and 100 ppm) on March 7. On April 3, Ethrel was applied at 30, 60, and 90 ppm concentrations and Nia 10637 was applied at 60 and 90 ppm concentrations.

The above spray dates corresponded to 4, 12, and 36 days after full bloom. Seed length averaged 11.5 mm the day before the 36-day application. This seed length predominates in 'Early Amber' peaches during cytokinesis (9).

Thinning data from the March 7 treatments consisted of the number of fruit retained on three 100-fruit limbs/tree two weeks after spraying. One week after fruit counts were taken, supplemental hand-thinning was performed on all March 7 treatments. In the February and April treatments, the number of fruit harvested per tree was recorded when normal harvest maturity was reached by approximately one-third of the fruit on the trees. No supplemental thinning was performed. The weight of 50 randomly selected fruit was used to estimate total number of fruit from total harvested weight. Fruit diameters and number of fruit with split pits were obtained for all Ethrel treatments, but not for Nia 10637 since this chemical produced foliar damage too severe for use in commercial thinning.

Split pits were determined from a 50-fruit sample from each replication. Percentage of split pits were subjected to an arc-sine transformation prior to analysis (10). Fruit diameters were obtained by measuring with calipers perpendicular to the peduncle stylar axis and to the suture plane. Ten fruit were measured for each replication. The .05 level for Duncan’s New Multiple Range Test was used for assigning significance to differences observed (10).
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CONTROL
ETHREL
NIA 10637

Figure 2.—Thinning to chemicals applied on March 7. All control limbs occurred in the 90 to 100 fruit/limb category. Chemical application was associated with lower numbers of fruit per limb.

Figure 1. Thinning response to chemicals applied on February 27. Bars of the graph which bear the same letter are not significantly different.

RESULTS

Fruit Thinning:

All concentrations of Nia 10637 and Ethrel applied on February 27 significantly reduced the number of fruit harvested (Fig. 1). Ethrel was associated with more thinning (average of 123 fruit harvested per tree) than was Nia 10637 (average of 249 fruit harvested per tree). Thinning varied significantly with concentration. Over-thinning occurred at all concentrations of Ethrel in comparison with the 300 fruit per tree recommended commercially (3). Only the 100 ppm treatment of Nia 10637 approximated the desired level of thinning. Both chemicals at all concentrations (100, 200, and 300 ppm) caused noticeable foliar damage. Nia 10637 treatment resulted in severe and persistent symptoms of yellowing, shot-holing, and dwarfing of leaves while Ethrel treatments resulted in transient yellowing and dwarfing of leaves with the March 7 application.

Approximately 30% thinning was observed for both chemicals as compared to non-thinned controls two weeks after treatment. The controls retained nearly 100%, while trees sprayed with Nia 10637 and Ethrel retained 75.5% and 70.8% respectively, of the fruit on counted limbs (Fig. 2). Differences between concentrations and between chemicals were not statistically significant in Duncan's Test. A larger number of limbs per treatment would probably permit the detection of different thinning rates between chemicals and higher concentrations. Since the number of limbs per concentration was insufficient to make meaningful statements about concentrations, the data on concentrations were combined for presentation purposes (Fig. 2). No foliar disorders were detected.

Ethrel treatments applied on April 3 resulted in significantly lower numbers of fruit harvested than were obtained from non-thinned controls. The rate of thinning with Ethrel at 60 ppm was not significantly different from 30 or 90 ppm, but 90 ppm thinned a significantly greater number of fruit from trees than did 30 ppm. Further, Ethrel at 60 ppm yielded harvests which were comparable to commercial standards for hand-thinning. Nia 10637 applications did not significantly influence the number of fruit harvested (Fig. 3). No foliar damage was observed.

Fruit Size:

Ethrel, applied on February 27 or March 7, but not April 3, significantly increased fruit size above that of non-thinned controls (Fig. 5). Larger mean diameters, for all three dates, were associated with increased thinning resulting from increased concentrations. Increased fruit diameter observed with March 25 hand-thinning

0 100 200 300
CHEMICAL CONCENTRATION (ppm)

Figure 3. Mean diameters of fruit harvested from trees sprayed with Nia 10637 and Ethrel at various concentrations. (30-39 50-59 60-69 70-79 80-89 90-100 mm FRUIT/LIMB)
Figure 3.—Thinning response to chemicals applied April 3. Responses which are not significantly different are denoted by the presence of a similar letter above the respective data points. was not significantly different from non-thinned control or chemically thinned fruit diameters.

Split Pits:

Ethrel sprays, applied on February 27 or April 3 but not March 7, increased the occurrence of split pits (Fig. 5). With higher concentrations of Ethrel applied February 27 and April 3, splitting increased except at the highest concentration for the earliest application. In this case, sample size was severely depressed by over-thinning. Essentially no pit-splitting occurred as a result of applying Ethrel on March 7. Hand-thinning on March 25 resulted in a rate of splitting which was similar to that for 30 ppm Ethrel applied on April 3. This increase above non-thinned controls was not significant at the .05 level.

Discussion

Ethrel and Nia 10637 were effective post-bloom thinning agents. Some phytotoxicity symptoms were observed for both chemicals at the concentrations of 100, 200, and 300 ppm used immediately after bloom. Ethrel was a more efficient chemical thinner and it produced milder, more transient foliar symptoms than did Nia 10637. On the basis of its harsh effects and comparatively inefficiency in this experiment, Nia 10637 seems to have limited potential for peach thinning.

Thinning with Ethrel early in the season facilitated an increase in fruit size. Neither the application on April 3 nor hand-thinning on March 25 increased fruit size.

Pit-splitting usually results from the influence of cultural and environmental conditions.
which are favorable for larger fruit size (5). These factors may act upon tissue differentiation and maturation processes which normally lead to a fully developed and enclosing endocarp or they may act indirectly through the modification of physical stresses exerted by the expanding mesocarp (8).

Pit-splitting has also been associated with chemical thinning (3). In this experiment, application of Ethrel during cytokinesis and 4 days after full bloom were associated with increased splitting, but splitting did not result from March 7 applications. This is interesting since the March 7 application facilitated significant size increases while April 3 applications did not. The absence of splitting observed with March 7 applications seems to reflect a direct and favorable influence upon differentiation processes. This could explain the absence of pit-splitting in the presence of increased fruit diameters and increased chemical concentrations. However, these treatments were hand-thinned on March 25, while earlier and later treatments were not hand-thinned. This variation in procedure could, therefore, invoke other interpretations. Further investigation would be required to verify any of these alternatives.

LITERATURE CITED

INFLUENCE OF ALAR ON CENTRAL FLORIDA PEACHES

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ABSTRACT

Alar was applied with an air-blast sprayer at 1,000, 1,500 and 2,000 ppm to 'Flordasun' and 'Early Amber' peaches in a commercial orchard in central Florida. 'Flordasun' and 'Early Amber' trees were sprayed 25 and 18 days after full bloom, respectively.

Fruit on 'Flordasun' and 'Early Amber' trees sprayed with Alar were harvested 3 days before fruit on non-treated trees, due to an advancement in maturity. There was also more uniformity in ripening, and color was visibly enhanced in both varieties. Soluble solids were slightly reduced in 'Early Amber' fruits with no effect in 'Flordasun' fruits. Fruits treated with 1,000 and 1,500 ppm were slightly firmer than controls. Fruit size was not significantly affected.

INTRODUCTION

Some of the low chilling peach varieties grown in central Florida typically lack good color development. Also, several pickings are needed to remove the fruit at the proper stage of development due to lack of uniform ripening. In addition, central Florida peaches can be marketed for a higher price and the harvest season lengthened by advancing the harvest date.

Alar (succinamic acid 2, 2-dimethyl hydrazide), a plant growth retardant, has advanced peach ripening 3 to 7 days depending on variety, timing, and concentration (3, 4, 5, 6, 7). Likewise, Alar has increased uniformity of ripening (4, 5, 6) and red external color (3, 4, 5) without reducing fruit size (4, 6), fruit quality (4, 5, 6), total yield (4, 5, 6), or vegetative growth (3) of the trees. Some workers have reported a slight reduction in soluble solids (3) and fruit