Testing a Fall Ethrel Application for Flower Removal: A New Thinning Approach

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ABSTRACT

These 2008 fall trials focused on developing the optimum ethephon concentration-timing for crop load reduction for 'O'Henry' peach and 'May Glo' nectarine. Unfortunately, our plot was heavily affected by frost damage earlier in the season, therefore, the potential effect of ethephon on thinning was not possible to evaluate. However, among the ethephon treated trees, some ethephon treatments had higher fruit count than others. Ethephon treatments delayed bloom time by about one week and we also believe that ethephon increased frost damage resistance as has been previously reported. The 'O'Henry' peach and 'May Glo' nectarine trees treated with 150 ppm ethephon that was applied as a combined treatment had higher fruit counts than untreated trees at harvest time. Because of the frost event, no conclusion can be drawn from these two plots at the Kearney Agricultural Center.

INTRODUCTION

Tree fruit production costs have increased during the last decade while grower prices have not. Cost involved in early fruit hand thinning is a large component of the total production costs. Thus, researchers have been unsuccessfully investigating different techniques to chemically or mechanically reduce the fruit crop on peaches, nectarines and plums. The main approach has been to reduce flowers or very small fruits by using caustic chemicals or plant regulators. Unfortunately, this approach has been very erratic and ineffective on tree fruit.

Our approach is to use ethephon applications during the last stages of flower differentiation (fall) mainly to reduce floral pistil viability based on our early study carried out in the late 1980s during my graduate work in Oregon. At that time, the main objective of my work and others was to delay bloom and induce bud and stem hardiness on peaches growing in marginal areas. During my work in Oregon using 'Redhaven' peach and 'Italian' prune, I observed that bloom delay did not affect harvest date, but we reduced slightly fruit density as an indirect effect of our fall ethephon treatments. Thus, we are proposing to evaluate ethephon fall applications (during flower differentiation) as a novel approach to decrease flower and early fruit density and reduce hand thinning costs without jeopardizing fruit production.

Our ethephon applications at 100 and 200 ppm in early fall (October 19, 2007) significantly reduced (~30-40%) total fruit per tree or per trunk cross sectional (TCA) area in comparison to 50 ppm or untreated on 'Flavorcrest' and 'O'Henry' peaches. Number of fruit was reduced from 33 to 40% per square cm trunk area by the 100 ppm ethephon application in 'Flavorcrest' and 'O'Henry'. However, fall applications of ethephon did not affect the crop load of 'May Glo' or 'August Glo' nectarines. These differences in the thinning action of ethephon may possibly be explained by the differences on flower development physiological stages between cultivars at the time of application and/or ethylene susceptibility between freestone and cling type cultivars.

The 2008 fall trials were focusing on developing the optimum ethephon concentration-timing for crop load reduction for 'O'Henry' peach and 'May Glo' nectarine. These results will help to decide if a detailed and expensive research program should be pursued in the near future.

PLANS AND PROCEDURES

Test 1 (2009-2010)

Mature stone fruit trees at a Kearney Agricultural Center (KAC) plot were used in this study. In August 2008, trees were randomly selected and marked. Trees were managed using commercial practices for pest and weed control, fertilization and irrigation. Ethephon containing 21.7% ethephon (Bayer Crop Science) was applied at 0, 150, 150 combined and 300 ppm to runoff on 'O'Henry' peach and 'May Glo' nectarine trees on three dates (September 9th and 23rd, and October 7th). The ethephon at 150 ppm combined treatment consists of application of 150 ppm three times on the same trees. A complete randomized block design (CRBD) of six single-tree replicates for each treatment-cultivar was used in this study. Since the purpose of this trial was only to assess the potential for ethephon to reduce crop, trees were harvested earlier than commercial thinning time. All fruit from each tree were hand-picked and weighed, and the total number of fruit was recorded. Because of tree size variability, the trunks were measured at 30 cm above the soil surface, and crop load was also expressed in relationship to TCA (fruit/cm^2). Data was analyzed by ANOVA using SAS (SAS Institute, Cary, NC, 1998). Means was separated by LSD mean separation test at $P \leq 0.05$.

Test 2 (2009-2010) (This activity is being conducted from 09/09/09 – 07/31/10).

Ethephon at 0, 150 ppm and 300 ppm treatments were applied to runoff on 'May Glo' nectarine, 'O'Henry' and 'Spring Crest' peaches. Ethephon was applied on two dates and also as a combined treatment.

RESULTS

Our plot was heavily affected by frost damage earlier in the 2009 season, therefore, the potential effect of ethephon on thinning was not possible to evaluate. However, among the ethephon treated trees, ethephon at 150 ppm combined treatment applied three times (September 9th, 23rd, and October 7th) had higher fruit counts than the other treatments (Table 1). Ethephon treatments delayed bloom time by about one week (Table 1 & 2). The 2008 fall trials focused on developing the optimum ethephon concentration-timing for crop load reduction for 'O'Henry' peach and 'May Glo' nectarine. Because of the frost event, no conclusion can be drawn from these two plots.

A large ethephon unreplicated thinning trial was carried out in Chile using 'Rich Lady' and 'Royal Glory' peaches. In both cultivars, ethephon was applied at 150ppm at 40-60% leaf drop in their fall season (March-April 2009. During their 2009-2010 summer seasons, a 35% crop load reduction was determined and reduction of thinning time was reduced by approx 50%. This encouraged us to repeat our fall ethephon treatments in 2009 at Kearney Agricultural Center.

Table 1. Fruit Production Parameters after Different Fall Ethephon Applications 'MayGlo' Nectarines

Treatment	Date	Commercial Fruit / Tree	Culls Fruit / Tree	Total Fruit / Tree	Full Bloom Date (Days from Control)
Control	N/A	6.2	32.8	39.0	2/19/09
150	9/9/08	5.8	40.8	46.5	+5
150	9/23/08	6.5	24.5	31.0	+5
150	10/10/08	4.0	59.5	63.5	+5
300	9/9/08	6.5	39.8	46.3	+5
300	9/23/08	6.8	47.0	53.8	+5
300	10/14/08	4.5	26.3	30.8	+5
150c	9/9/08	9.5	72.5	82.0	+5
150c	9/23/08	5.3	85.0	90.3	+5
150c	10/14/08	6.5	67.8	74.0	+5

[c] = ethephon at 150 ppm combined treatment includes application of 150 ppm three times (September 9, 23, and October 14).

Table 2. Fruit Production Parameters After Different Fall Ethephon Applications O'Henry Peaches

TRT	Date	Fruit Set (%)	Starting Bloom / Days from Control	Full Bloom/ Days from Control
Control	N/A	12	2/28/2009	3/8/2009
150	9/9/2008	10	+3	+0
150	9/23/2008	8	+3	+2
150	10/14/2008	6	+3	+1
300	9/9/2008	5	+3	+2
300	9/23/2008	6	+3	+0
300	10/14/2008	9	+3	+2
150c	9/9/2008	8	+3	+2
150c	9/23/2008	7	+3	+2
150c	10/14/2008	4	+8	+4

[c] = ethephon at 150 ppm combined treatment includes application of 150 ppm three times (September 9th, 23rd, and October 14th).

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