Testing Fall Ethrel® Applications for Flower Removal: A New Thinning Approach

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Abstract

Our 'O'Henry' peach and 'May Glo' nectarine treated with ethephon (Ethrel® – 21.7% ethephon, Bayer Bioscience) that was applied at 0, 150, 300, 150 combined and 300 ppm combined at 40% and 80% leaf drop had lower fruit counts than untreated trees at harvest time. In 'May Glo' nectarine, the 300 ppm applied at 40% and 80% (combined) leaf drop reduced crop load by about 30-40% without any negative side effect. In 'O'Henry' freestone peach, ethephon applied at 40% leaf drop at 150 ppm delayed bloom time by about one week and reduced crop load by about 35%. A slight delay on fruit maturity was observed with this treatment. The use of ethephon in peaches was included in the IR-4 Federal program and it is pending to find a distributor. We encourage our growers to validate our results using large plots and other cultivars.

Tree fruit production costs have increased during the last decade (Day et al., 2004) while grower fruit prices have not. The cost involved in early fruit hand thinning is a large component of the total production costs. Thus, researchers have been investigating different techniques to chemically or mechanically reduce the fruit crop on peaches, nectarines and plums (Byers et al., 1990; Costa and Vizzotto, 2000). 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 (Johnson and Handley, 1989).

A new approach is to use Ethrel (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 (Crisosto et al, 1989a, 1989b and 1990). At that time, the main objective of this work and others (Coston et al., 1985; Dennis, 1976; Durner, 1989; Durner and Gianfagna, 1988; Gianfagna et al., 1986; and Irving, 1987) was to delay bloom and induce bud and stem hardiness on peaches growing in marginal production areas. During this work in Oregon using 'Redhaven' peach and 'Italian' prune, we observed that bloom delay did not affect harvest date, but we slightly reduced fruit density as an indirect effect of our fall Ethrel treatments. Thus, we proposed to evaluate Ethrel 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.

Objective (Current & Future Timetable, if extended duration)

- Evaluate results of the 2009 ethephon applications on November 10th and 24th

Plans & Procedures (with Timeline)

Mature stone fruit trees at a Kearney Agricultural Center (KAC) plot were used in this study. In October-November 2009, trees were managed using commercial practices for pest and weed control. Fertilization and irrigation were randomly selected and marked. Ethephon (Ethrel®, Bayer Bioscience) was applied at 0, 150, 150 combined and 300, 300 combined ppm to runoff on 'O'Henry' 'and 'May Glo' nectarine on two dates (November 10th and 24th). The ethephon at 150 ppm or 300 ppm combined treatment includes application of 150 ppm or 300 ppm two times on the same trees. All fruit from each tree were hand-picked and weighed, and the total number of fruit was recorded at thinning and harvest. Data was analyzed by ANOVA using SAS (SAS Institute, Cary, NC, 1998). Means were separated by LSD mean separation test at $P \leq 0.05$.

Results

'May Glo' nectarine

Ethephon application(s) at 150 ppm reduced crop load, but not enough to be significant. Likewise, a single application at 300 ppm lowered the crop load, but not significantly (Table 1). A similar situation was observed in our two previous years on clingstone non melting peaches. However, when ethephon was applied as a 300 ppm combined treatment on two dates, this ethephon application treatment significantly reduced crop load by ~35% in 'May Glo' without affecting fruit quality attributes (Table 1).

Table 1

Influence of fall ethephon (Ethrel®) application at 40% leaf drop (November 10, 2009) and at 80% leaf drop (November 24, 2009) on number of 'May Glo' fruit per tree and fruit quality attributes.

Treatments	Number of Fruit Thinned	Number of Fruit Harvested	Total Number of Fruit	Fruit Weight (g)	Firmness Cheek (lb)	Firmness Shoulder (lb)	SSC (%)
300 ppm Nov 24	668 ab	248 a	917 ab	102.2 a	10.56 a	9.35 a	8.26 a
300 ppm both dates	438 b	233 a	671 b	101.1 a	10.42 a	9.51 a	8.42 a
150 ppm Nov 10	912 ab	286 a	1198 ab	96.4 a	9.82 ab	8.88 a	8.28 a
150 ppm Nov 24	967 a	283 a	1251 a	102.3 a	8.94 a	8.22 a	8.18 a

150 ppm both dates	734 ab	278 a	1012 ab	96.3 a	10.41 a	8.73 a	8.6 a
Control	970 a	276 a	1246 a	97.8 a	9.49 ab	8.24 a	8.37 a

'O'Henry' peach

Most of the ethephon applications significantly reduced crop load by ~30% without showing any negative side effects. Thus, the 150 ppm application at the 40% leaf drop stage reduced the crop load significantly (Table 2). The ethephon treatments did not affect fruit SSC, but we did see a difference in firmness (Table 3) which may be attributed to the later bloom date in the treated fruit resulting in later maturity.

Table 2

Influence of fall ethephon (Ethrel®) application at 40% leaf drop (November 10, 2009) and at 80% leaf drop (November 24, 2009) on number of 'O'Henry' fruit per tree and fruit quality attributes.

Treatments	Number of Fruit Thinned	Number of Fruit Harvested	Total Number of Fruit (thinned + harvested)
300 ppm Nov 10	311 a	174 bc	485 bc
300 ppm Nov 24	441 a	208 ab	649 abc
300 ppm both dates	309 a	164 bc	473 bc
150 ppm Nov 10	313 a	144 c	457 c
150 ppm Nov 24	459 a	208 ab	666 ab
150 ppm both dates	390 a	196 ab	587 abc
Control	461 a	229 a	690 a

Table 3

Effect of ethephon on postharvest firmness and soluble solids concentration (SSC).

Treatments	Firmness Cheek 1(lb)	Firmness Cheek 2 (lb)	SSC (%)
300 ppm both dates	15.2 a	14.9 a	12.8 a
Control	12.4 b	12.0 b	12.6 a

Discussion

This season's results indicated that combined application of fall ethephon at 300 ppm appears to be a successful potential thinning agent in 'May Glo' nectarines. In our previous years, we did not have a significant crop load reduction on 'May Glo' (low chilling, early season, and cling stone) and some canning peaches so we are encouraged with this year's data. Our results with the 'O'Henry' peaches are very much in alignment with other results showing a reduction in crop load of approximately 30% to 40% by a single application of ethephon at 150 ppm applied at the 40% leaf drop stage. In general, ethephon fall thinning treatment is not expensive since one gallon of product costs approximately $30.00. To make 100 gallons of spraying solution, 350 ml concentrated ethephon is used. This puts costs only $2.80 per 100 gallons. With these results, we encourage growers to validate our results using large plots and other cultivars.