

Effects of Ethrel on Fruit Ripening of

WILLIAM L. SIMS

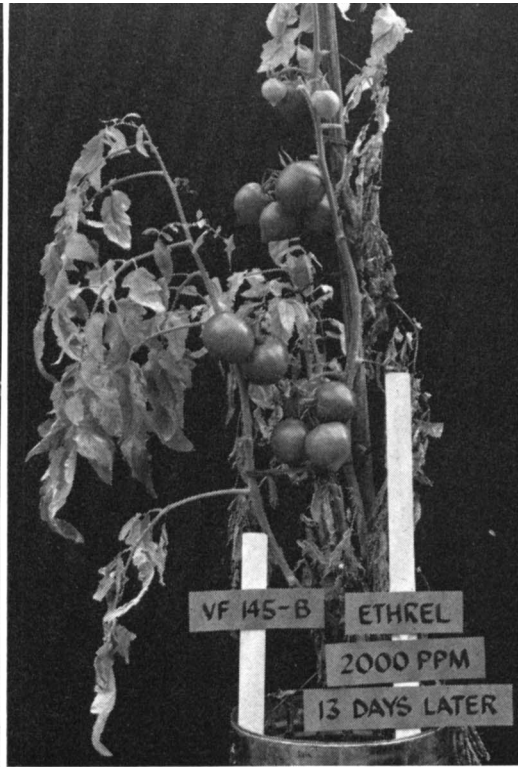


Photo 1. All fruits had ripened to red color (firm) in 13 days after application at the 250 ppm rate with the exception of the small immature green fruit (approx. 1 inch in diameter or less).

Photo 2. Some defoliation occurred at the 2,000 ppm rate.



Photo 3. Plant sprayed with 250 ppm Ethrel at blossom stage. Subsequent fruits formed in upper portion of plant.

Photo 4. Treatment 4 caused determinancy and leaf epinasty.

Tomatoes . . .

Greenhouse, Field and Postharvest Trials

STUDIES WITH ETHREL (2-chloroethanephosphonic acid) on pickling cucumbers have demonstrated the effects of this chemical plant regulator on sex expression and growth development. Recently several research workers have reported favorably on the influence of this ethylene releasing compound on tomato fruit development and maturation.

In 1968 and 1969 both greenhouse and field experiments were conducted at the University of California, Davis to study the effects of Ethrel on the ripening of tomatoes. Early and uniform ripening in both canning and fresh market tomatoes would be of real benefit in the scheduling of machine harvest.

The greenhouse experiment consisted of four treatments with Ethrel and one check plot for each of three canning tomato varieties (VF 145-B7879, VF 145-21-4, and VF 145-513). Application rates were: 2,000 ppm, 1,000 ppm, 500 ppm, and 250 ppm.

Four plants

Each treatment consisted of four plants of each variety. Seeds were sown in 5-gallon cans containing a greenhouse soil mix. Seedlings emerged in seven days. Plants were later thinned at the first true-leaf stage to a single plant per pot. The experiment was conducted from November to March. The Ethrel treatments were applied as single applications when one red and one pink fruit appeared in the first fruit cluster and when the fruits in all the remaining clusters on each plant were green. The plants were sprayed to run-off. Eleven to thirteen days after each treatment all fruits had ripened to a red color (firm) with the exception of the small immature green fruit (1 inch in diameter or less) (see photo 1). The size of immature green fruit varied with the variety. It took 11 days after the treatment at the higher rates for the green-shouldered variety, VF 145-B-7879, to ripen, and 13 for the uniform-color varieties, VF 145-21-4 and VF 145-513. Chlorophyll degradation in the leaves began to occur on the fourth day after the treatment regardless of the

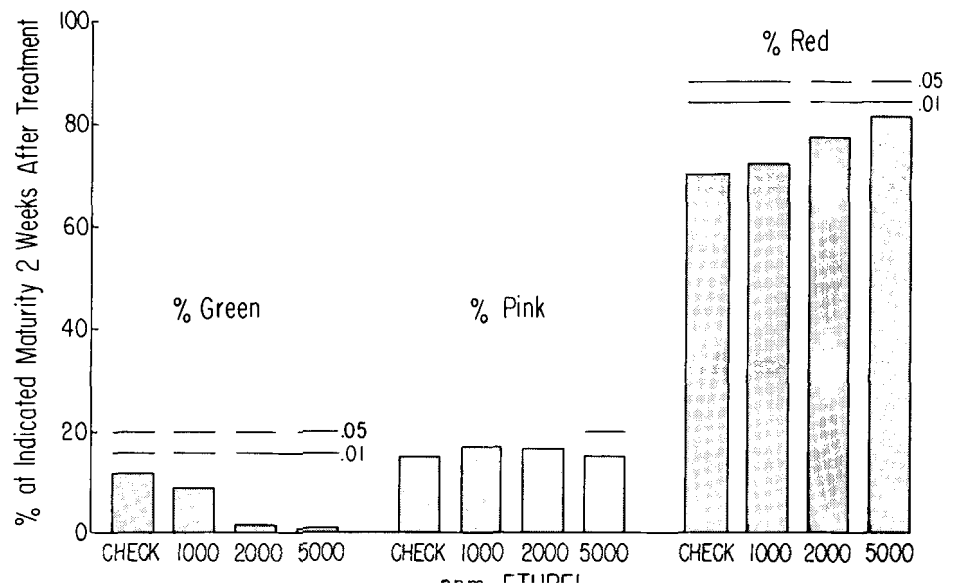


Photo 5. Ripening seven days after mature green fruits had been dipped for 30 seconds in Ethrel at concentrations of 5,000, 2,000, and control.

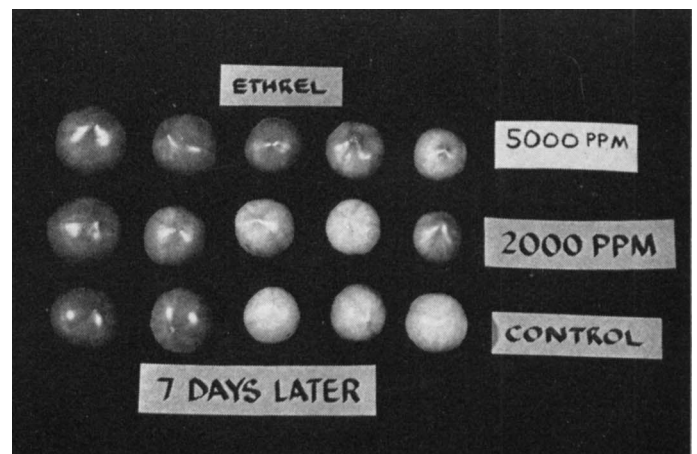
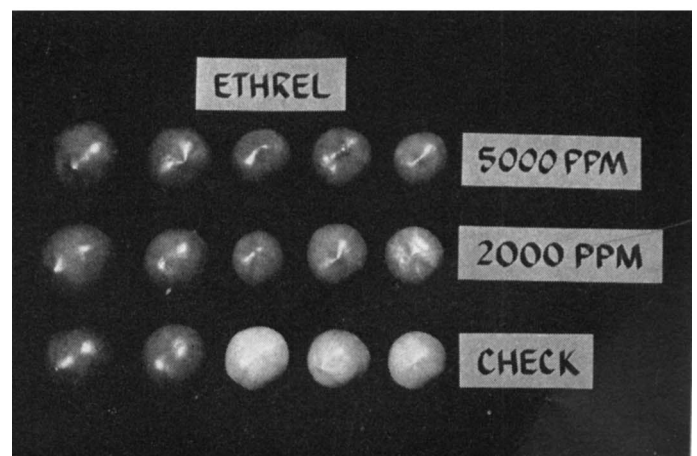


Photo 6. Ripening twelve days after mature green fruits had been dipped for 30 seconds in Ethrel at concentrations of 5,000, 2,000 and check.



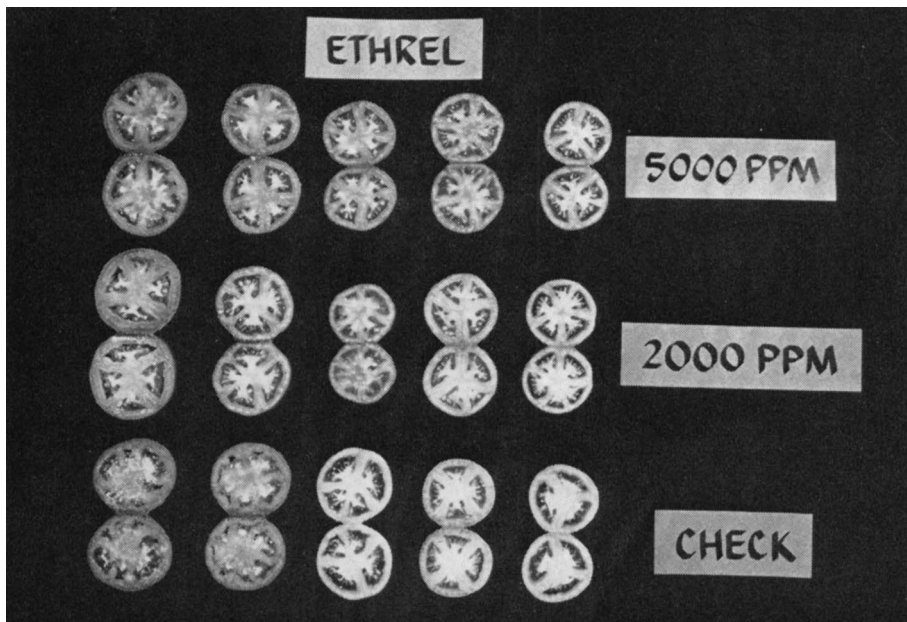


Photo 7. Ripening twelve days after mature green fruits had been dipped for 30 seconds in Ethrel at various concentrations is indicated by sliced fruits.

rate of application. Some defoliation occurred at the 2,000 ppm rate but none at the other rates (see photo 2). The ultimate size of the fruit was not affected by the treatment. Fruits of the treated plants ripened eight to 10 days earlier than those of the untreated plants. When the ripe (firm) fruits were left on the plants, they remained until taken off in a ripe (soft) condition thirty days later.

Separate experiment

In a separate experiment, plants were sprayed with single applications of 100 ppm and 250 ppm Ethrel concentrations at (1) first true-leaf, (2) fourth true-leaf, (3) first flower buds and (4) small fruits (less than 1 inch in diameter) on the plant. At stages 1 and 2 there was a slight inhibition of terminal bud growth and further growth was delayed for seven to 10 days. There was no major lateral branching. At stage 3 the flower buds abscised and lateral branching did occur. Further flowering was delayed for two weeks with fruits developing in the upper portion of plant (see photo 3). Treatments at stage 4 caused abscission of flower buds, determinacy and leaf epinasty.

Field experiments

Several field experiments with Ethrel were conducted at Davis on canning tomatoes of variety VF 145-B7879 in September and October of 1968. In all field experiments the treatments included

Ethrel applications at 1,000 ppm, 2,000 ppm, and 5,000 ppm, at a volume of 80 gallons per acre under 40 psi. Each treatment consisted of 32 ft of row, and there were three replications. In the first experiment, the application was made when 65 per cent of the fruit was red or pink. The experiment was terminated 10 days after the application date because the 5,000 ppm treatment had completely defoliated the plants and the fruits were severely sunburned. The check plots yielded more green fruit than the treated plots, and with each increase in Ethrel concentration the percentage of the green fruit decreased. The same field plot design as the first was used in the second and third experiments but time of application varied. In the second experiment, application was made at the mature green fruit stage when there were no pink fruit showing. The results of this experiment indicated that the application of Ethrel had been made too early, causing a loss of fruit yield; again, the 5,000 ppm rate was too high causing excessive defoliation.

In the third experiment the application was made when 50 per cent of the fruit were red or pink. The plots were harvested in mid-October, 15 days after application. There were no significant differences between treatments in yields, pH, or percentage of soluble solids. The coolness of days and nights in the late season prevented the severe defoliation and sunburn of fruit that had occurred under high temperatures. The charts

show the percentage of ripe, pink, and green fruit for each treatment at time of harvest. It appears that an earlier application, say first pink to 25 per cent pink and red fruit would be preferable.

Additional field trials, including studies of volume of spray and rates and timing of applications, are needed before the implications of this new chemical regulator will be known. Further studies are planned for the 1969 tomato season. Ethrel is not registered or recommended for use at this time.

Mature green tomatoes

In another experiment, mature green tomato fruits for fresh market were dipped into a solution of Ethrel. The fruits had been mechanically harvested, washed in chlorinated water, and waxed. The variety used was VFN-Bush. Ten fruits, size 5×6, and five fruits, size 7×7, were dipped for 10 seconds in an Ethrel solution of 10,000 ppm and then removed and stored at 68°F. The same number of fruits of the same size was left untreated. In eight days all the fruits, regardless of size, which had been treated with Ethrel were red, pink, or breaker in color. Whereas, of the untreated fruits, 27 per cent remained green. In 12 days, all the treated fruits were red in color, whereas 20 per cent of the untreated fruits were still green. Most of these were in the 7×7 size. Ripening of the treated fruits was earlier and much more even. There were no differences between waxed and unwaxed fruit.

Greenhouse fruit

In another test, fruits of the tomato variety VF 145-21-4 grown in the greenhouse, were picked as mature-green and dipped for 30 seconds in Ethrel solutions of 2,000 ppm, and 5,000 ppm. Again all fruits were stored at 68°F. In six days the 5,000 ppm treatment had 20 per cent red, 40 per cent pink and 40 per cent breaker color; the 2,000 ppm treatment had 20 per cent red, no pink, 40 per cent breaker, and 40 per cent green fruit; and in the check (no treatment) had 20 per cent red, no pink, 20 per cent breaker, and 60 per cent green fruit. In 12 days all fruits were red in both treatments, while the check treatment still had 60 per cent green fruit.

William L. Sims is Extension Vegetable Crops Specialist, University of California, Davis. Ethrel used in these tests was made available by Amchem Products Inc., Ambler, Penn.