

# Factors affecting **ETHEPHON**

as an aid in

## **FRUIT RIPENING OF PEPPERS**

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**A**SERIES OF statewide field tests were conducted in 1973 to further study the performance of ethephon as an aid in fruit ripening of peppers under a wide variety of conditions. The tests were also intended to establish necessary residue and fruit quality information for registration. Greenhouse and field experiments conducted over the past five years in California indicated ethephon applications could result in improvement in ripening of chili, pimiento, and bell peppers for processing. Also observed were improvements in vine condition and fruit pod removal, which would greatly assist in a once-over, hand or machine harvest.

### **Scheduling**

It appears that ethephon can be helpful in scheduling harvest, getting fields started earlier, and in completing late fields. It also conditions the plant for harvesting by hastening senescence, results in some loss of leaf chlorophyll, and in the case of chili peppers permits the pods to

be removed easier. Finally, it assists in overcoming field variability in maturity and provides for a more uniform once-over harvest.

The test plots were located in Davis, in three warm interior valley counties, and in three cool coastal counties. Growers, farm advisors, processors, and chemical company representatives, all cooperated in the field tests.

In general, the field plots were of the same randomized block design. Ethephon rates were varied according to the location of the plot, and type of pepper. In the warmer interior valley areas the rates were 2 pts (0.5 lb) and 3 pts (0.75 lb) per acre on chili peppers and 3 pts (0.75 lb) and 4 pts (1.0 lb) per acre on bell and pimiento peppers. In the cooler coastal areas the rates were 3 pts and 4 pts of ethephon per acre on chili peppers and 3 pts and 5 pts (1.25 lb) per acre on bell and pimiento peppers. In each plot a third treatment served as a check or control. In several of the plots addi-

tional observational treatments were made just outside the replicated plot. These treatments consisted of one less pint and one extra pint of ethephon than those in the replicated trial. The main purpose was to observe how the plant foliage and pod removal might be affected by a lower or higher rate.

### **Replications**

Each trial plot was 50 ft long, with four replications in each trial. The observation plots were 100 ft. Generally, twin rows on 40-inch beds were used. The exceptions were single rows on 30-inch beds. The plots were direct-seeded, and cultural practices followed the usual general recommendations. Ethephon treatments were made with a backpack sprayer at 40 to 50 gals of water to the acre.

Ten ft of bed per plot were harvested by hand and the fruit sorted out by color into red, chocolate or breaker, and green. Fruit that had dropped to the ground

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RUS CROPS, 1974–1975. Introductory material in this 53-page booklet deals with the use of pesticides, their effects on beneficial insects, and includes information on residues. Following sections describe control of scale insects, mites, thrips, and orangeworms. There are also sections on control of citrus nematodes and plant diseases, and on plant growth regulation and weed control.

and immature greens were recorded in several of the plots. Also, several of the cooperating processors made laboratory quality evaluations of the fruit as to color and shrink ratios.

### Results

The variety, Anaheim chili, was treated with ethephon at Davis when approximately 25% of the fruit was in the red and chocolate color stage of maturity. The fruit was harvested 21 days after treatment. There were no significant differences between the treatments (0.5 and .75 lbs/A) on the yields of red or chocolate fruit, but there was significantly less green fruit in the ethephon treatments than in the check. Also, the percentage trends were in the direction of an increase in red and chocolate fruit with ethephon treatment. The 2 pts (0.5 lb) per acre rate appeared to be quite satisfactory and with less pod drop than the higher rate. There were no significant differences between ethephon treatments and check in color or shrink ratio.

Another test plot was established in the Bakersfield area, where the weather is similar to the warm interior valley conditions at Davis. The fruit maturity at time of application was 63% red and 20% chocolate. Harvest was 21 days after treatment. The ethephon treatments had significantly less green fruit than the check. There were no differences between treatments in the amount of red fruit or red plus chocolates. It is believed that the treatments were made on the late side, as most of the green fruit was immature, but there was considerable variability in fruit maturity from one plant to the other within the treatment zone. The ethephon treatments appeared to overcome this condition and gave a more uniform field maturity. It was believed this field could have been harvested a week earlier.

The ethephon treatments caused abscission or pod drop, with the 3 pt (.75 lb/A) rate more severe than the lower 2 pt (.5 lb/A) rate. There was also defoliation at the 3 pt rate but very little at the 2 pt rate. It is believed that the 2 pt rate is best in the San Joaquin Valley, although perhaps under high temperatures (during or following application) a 1½ pt rate should be used.

Several plots were located in the cooler coastal areas of King City and Santa Maria. In King City one plot was established with a selection of Anaheim chili pepper strain #724. Fruit maturity at time of ethephon application was 21% red, 58% chocolate, and 21% green. Harvest was 15 days after treatment.

The data indicate a significant difference in yield of red and green fruit between the check and ethephon treatments. Ethephon produced more red fruit and less green fruit. Immature greens were not affected by the treatment. The 3 pt rate was sufficient and performed as well as the 4 pt rate on Anaheim chili peppers in the coastal areas. There were no significant differences between ethephon treatments and check in color or shrink ratio.

A pimiento pepper plot was also established in the King City area. Fruit maturity at time of application was 20% reds, 30% chocolates, and 50% greens. In addition to the regular replicated trial with both 3 pt and 5 pt rates, observational rates of 2 pts and 6 pts (1.5 lb) were applied. Harvest was 15 days after treatment.

### Once-over harvest

In general, the total yields were not affected by ethephon treatment, if considering a multiple harvest, but the trend is for more marketable red fruit in a single or once-over harvest. During unusually cool (below 70°F) weather, the ethephon treatment rates may be increased by one pt on chili, pimiento and bell peppers in the coastal areas, although application rates ordinarily are less for chili than for bell and pimiento peppers.

There was significantly less green fruit in the ethephon treatments than in the check. There were no significant differences in weight of red or chocolate fruit between treatments. The 5 pt rate gave the highest total percent of color but not significantly more than the 3 pt rate. This also held for the Central Valley areas.

It probably would have been better to have delayed the harvest for another week (21 to 23 days following treatment), since the chocolates were running approximately 50% of the total. It was observed that even the 6 pt (1.5 lbs) observational rate did not cause any defoliation or pod drop. Thus, there is quite a safety factor on pimiento peppers, although high temperature may reduce this margin.

In the Santa Maria area a Mexican chili pepper plot was treated with ethephon when the fruit maturity showed 9% red, 33% chocolate, and 58% green. Harvest date was 15 days after treatment. There were significant increases in red and green fruit with ethephon treatment but no differences between the two rates (.75 and 1.0 lbs) of ethephon. Again the ripening response was believed to be due

to the good concentration of mature green fruit, since 58% of the fruit was green at the time of treatment. There was more defoliation in the 4 pt rate but still no pod drop.

### Summary

Significantly less green fruit was found with ethephon treatments in the majority of the trials. The amount of red fruit was not always significantly increased with treatment, but the trends strongly suggest improvement in ripening of chili, pimiento and bell peppers for processing.

A majority of the green peppers must be mature green. A minimum of immature green fruit is desirable at time of treatment. If most of the peppers in a field are mature green and the field is uniform in fruit maturity, then a 5 to 10% field maturity of red and chocolate fruit is satisfactory for treatment. A field maturity of approximately 20% red, 30% chocolate and 50% green was appropriate at the time of the ethephon treatment for chili, bell, and pimiento peppers. A minimum of 14 days is required from treatment to harvest for peppers in the warm central valley areas and 21 or more days may be required under the cooler temperatures and coastal areas. Stage of field maturity at time of treatment also affects the interval following treatment to harvest.

Postharvest handling observations indicated the chocolate red fruit harvested from ethephon treated plots turned red within 24 hours when stored at 68°F, and the chocolate green fruit turned red within 48 hours.

Ethephon appears to have no significant effect on such quality factors as color and dry weight, although in several plots the treatments gave a higher color index reading than the check.

Plants should not be under stress (disease, insect, fertility, moisture, etc.) during or immediately following treatment.

Ethephon is not registered for use on peppers at this time.

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