

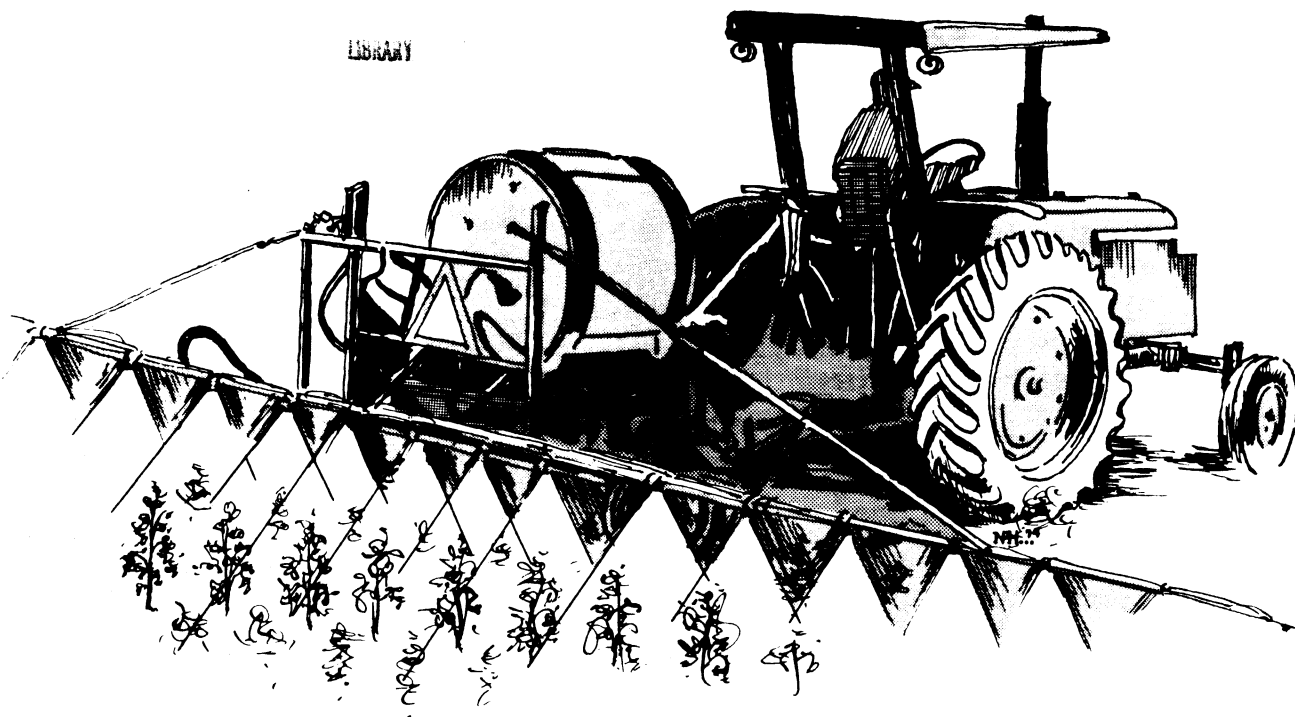
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CONSIDERATIONS FOR USING ETHEPHON ON TOMATOES FOR PROCESSING IN 1974

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CONSIDERATIONS FOR USING ETHEPHON ON TOMATOES FOR PROCESSING *

Ethephon was used on tomatoes for processing by a number of growers in Ohio in 1973. In general, it aided in scheduling earlier harvest, improved yields of mechanically harvested fields, as well as, hand-harvest operations and increased the amount of fruit harvested from late plantings which may have otherwise been lost due to cold temperatures late in the season. There also were experiences where the use of ethephon did not give the desired or expected results.

Experimental results and field experiences from 1973 and previous years indicate that there are several important factors which you should carefully consider before you use ethephon in your tomato production program. We are attempting to include as much information as we have available in this publication to aid you in making your management decisions on the use of ethephon this season.

Discuss it with your fieldman: Be sure you discuss your plans thoroughly with your processor fieldman. He can tell you the company policy on the use of this material on tomatoes they will be receiving. He can also give you some very valuable suggestions on the use of ethephon based upon his experiences in 1972 and 1973. His information should be extremely helpful as you determine the acreage you will treat at any one time. Keep in mind that ethephon influences the rate of ripening and ripe fruit accumulation and this can significantly influence the time and volume of harvest. It is obvious that you will not want to treat your entire acreage at one time, because this will likely concentrate your harvest and delivery time. Your fieldman can assist you in determining the amount of acreage of a variety or planting to be treated so that you can handle the harvesting and delivery to the processor in a reasonably workable schedule with a minimum of problems.

Experience is a necessity: As with any new management tool, you must gain some experience on its use before incorporating it into your regular production program. We do our best to include as many variables as we can in our research to provide guidance for you. But, it is impossible to conduct our research under each and every condition which we find in each tomato field in Ohio. We, therefore, strongly urge you to try ethephon in only a small area of your field until you gain sufficient experience and confidence under your particular conditions to adequately evaluate this tool and to determine if and how it will fit into your program. If you experimented with ethephon in 1973, you should remember that growing seasons differ and we can reasonably expect 1974 will be different from 1973. You, therefore, should keep this in mind as you plan for this season's use.

Rate of application: The manufacturer's label recommendations are to use 3 and 1/4 pints of the commercial 2 lb. per gal. ethephon formulation per acre (0.8 lb. ethephon) under normal conditions here in Ohio. Our research data confirms this

* Revision of Horticulture Series No. 397, June 8, 1973, Considerations For Using Ethrel on Tomatoes for Processing In 1973.

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suggested rate under most Ohio conditions. However, under cooler temperatures late in the season, it may be necessary to use up to 6 and 1/2 pints per acre (1.6 lb. ethephon) to obtain a satisfactory response since tomatoes ripen more slowly during low temperatures (when average temperatures are near 65 degrees F.). Some of our data suggests that 0.4 lb. per acre may be as effective as higher rates under certain conditions. However, we do not know the precise conditions under which this rate will be sufficiently effective to recommend its use. We believe it is related to high temperatures at application, early season treatments, and early maturing varieties, but we need more research on this before making specific suggestions.

It is important to have uniform and adequate coverage of the fruits and vines regardless of the rate of material used. It appears that 40 to 80 gallons of spray solution per acre gives good coverage depending primarily on foliage density and type of sprayer used. Boom-type sprayers appear to provide the more desirable spray coverage although we understand ethephon has been satisfactorily applied with properly adjusted and operated air-blast sprayers.

Aerial applications with spray rates as low as 5 to 7.5 gallons per acre have given satisfactory results. Adequate, thorough coverage is the important consideration here. With the small, open-vined varieties like Chico III, the 5-gallon-rate may be satisfactory, but we believe 10 to 15 gallons per acre would provide a more desirable coverage under most aerial application conditions in Ohio. The higher rates should certainly be used on most direct seeded plantings and on varieties and plantings with dense foliage.

Ethephon not only promotes fruit ripening but initiates aging and senescence of leaves. If plants are under any type of stress at the time of application, severe leaf yellowing and eventual drop will likely result. Moisture stress, disease, insect or hail damage, low plant vigor due to root damage or insufficient available nutrients all tend to increase the amount of foliage injury which may occur. Loss of foliage may be beneficial for mechanical harvest, but may also expose the fruits to high sunlight which may result in poor color development. Leaf effects will occur regardless of rate used but generally will be more severe at higher rates and especially under high temperature conditions. Frequently temperatures during harvest will be in the upper 80's and low 90's. Under these conditions, we believe ethephon could cause rapid loss of foliage.

Time of application: Ethephon is effective in ripening only fruits which have reached the mature green stage of development. It has little or no effect on ripening fruits which are immature or in which the coloring process has already been initiated. The trick, therefore, is to have the maximum number of fruits on the plants at the mature green stage when treated. With most of our processing varieties, this occurs when 5 to 30 percent of the fruits on the plants are pink or red. Our data suggest the greatest response to an ethephon application occurred when 5 to 20 percent of the fruits by count were showing color. These results were based upon a single once-over harvest.

Research data and field observations suggest that ethephon can significantly increase first harvest yields in multiple, hand-pick operations. It appears that the most effective time for application is when you first observe color break on fruits in the second fruiting clusters. This appears to hold true for a transplanted crop, but may not for a direct seeded planting or a transplanted crop in which you have removed the first cluster fruit.

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If you want to check your fruits to see how many have reached the mature green stage, you may cut several fruits with a sharp knife and if the seed cavities are filled with gelatinous pulp and your knife does not cut any seeds (the seed coats have hardened and the seeds are pushed aside by the blade into the pulp), the fruits are then generally considered to be mature.

The effectiveness of an ethephon application is influenced not only by the stage of fruit maturity, but by the plant condition at the time of application. It appears that plants which are wilted due to water stress will not respond satisfactorily. This is likely related to a low rate of absorption and translocation of the material when the tissues are stressed for water. Therefore, if your plants are in a wilted condition, even though the fruits are at the proper stage of maturity, you probably should delay your application until after a rain (or irrigation) and the plants return to their normal turgid condition.

Temperature effect: We do not have sufficient information to tell you the precise temperature at which an application will give maximum response, although it is likely effective over a relatively wide range. Temperature significantly influences absorption and likely also translocation of the chemical. Limited information indicates that the temperature at the time of application should be above 64 or 65 degrees F. and the temperature should be "on-the-rise". Plant absorption of ethephon is apparently very slow at temperatures below 64 degrees F. It appears inadvisable to apply the material at temperatures above about 90 degrees F. because the plants will probably be under moisture stress and the response may not be as favorable as desired and more loss of leaves may occur.

As most of you know, higher temperatures hasten natural fruit maturity and ripening, as well as, a general reduction in plant vigor. Therefore, the response from ethephon applications made at relatively high temperatures will also be accelerated. Thus, if you apply ethephon during a warm period and the post-treatment period remains warm, you will want to watch your field closely and harvest it when the fruits are at the correct degree of ripeness and before fruit rots become severe.

Rainfall effects: We do not know the specific length of time between application and rainfall necessary to give a good response from ethephon. There is little doubt that temperature plays a role here. Absorption is greater at higher temperatures, but we presently do not know the rate of absorption at specific temperatures, and therefore, cannot say how much drying time is needed after application at any one temperature. General information indicates that there should be a minimum of 3 hours after application before rainfall. If you have rainfall before this minimum time, do not make a second application, as this is not permitted under the label restrictions. You may want to treat another section which had not been treated previously. Keep your delivery schedule in mind to determine the area to be treated and remember also that you may get a response from your application which may have received rainfall before the 3 hour minimum time.

Variety response: It appears that most, if not all, of our present varieties will respond to ethephon applications. Differences may occur between early and later maturing varieties. These differences may be more closely related to temperature conditions at the time of treatment and thereafter, than to the varieties themselves. Differences may also occur between the highly determinant, concentrated fruit set types and the less determinant and later varieties. These differences are very likely related to the relative number of mature green fruits

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on the plants at the time of treatment. Field observations suggest that varieties which have a loose fruit attachment when ripe, tend to have above normal numbers of detached fruit after ethephon treatment.

Holding tank mixes: It is best to apply your spray mixture as soon as possible after adding ethephon to the water. The ethephon will start breaking down and releasing ethylene as soon as it is mixed with water. However, this is usually very slight and of no consequence provided you apply the material as soon as you can. A few hours delay will probably not be serious, but if you must hold the material over-night, it would probably be advisable to mix a new batch. This is especially the case if you have very "hard" water with a pH at or above 7, which is true for most of the water in northwestern Ohio. We have no information relative to the merits of adding materials to reduce pH of your spray water. At the moment, we do not feel it is necessary nor desirable since these additives may influence the performance of the ethephon in some unknown manner. Proper planning with an eye on the weather should permit you to apply your material without undue delay.

Mixing with pesticides: We have some conflicting information on the influence of insecticides and fungicides on the effectiveness of ethephon when applied in the same spray mixture. Some of our preliminary results in 1972 suggested that the effects of ethephon may be nullified when applied with maneb. However, studies made in 1973 indicated no such influence. Until we have more information, we suggest you apply the ethephon alone.

Fruit quality aspects: We have not found any undesirable effects of ethephon applications on fruit quality, nor have we heard of research to indicate such undesirable effects. It is quite likely that the over-all quality of a lot of fruit may be improved because, with proper harvest management, you should be able to pick the treated plants earlier than normal and thus, have less over-ripe fruits and diseased fruits in your loads. On the other hand, you may have more over-ripe fruit in the load, if you are unable to harvest the crop at the optimum ripeness. Therefore, watch your crop closely and harvest it at the proper time. It is likely that this could be around 12 days after treatment for an early season crop and up to 3 or 4 weeks from treatment later in the season. Our data suggests that the average time interval is 14 to 18 days after treatment for optimum once-over harvest. However, weather conditions, especially temperature, may greatly affect these time periods, so be prepared.

We should also add that you may want to start your harvest before the maximum amount of usable fruit is on the vines, so that you can complete the picking of the entire treated field before the later harvested fruits become over-ripe and rotten fruits become serious.

We hope these comments and suggestions are helpful as you make your management decisions concerning the use of ethephon this season. We feel treatment with the material can be a useful tool in enabling you to start your harvest season earlier with economical yields and increasing the percentage of useful fruit from a once-over mechanical harvest or from the first hand picking. We admittedly do not have all the answers, but we are working on the problems and hopefully, as we share our experimental results and your experiences, we will soon be able to provide you with much greater assistance in your production programs for our very important processing tomato industry in Ohio.

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