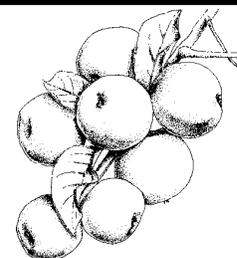




Tree Fruit Program

Integrated horticultural and pest management
of fruit trees in Massachusetts Orchards.



Thinning Apples Chemically

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Chemical thinning is an established and essential practice performed by fruit growers each spring. In recent years, the apple market has caused chemical thinning to become the single most important cultural practice that many growers undertake. The purpose of this leaflet is to summarize thinning recommendations and to discuss the conditions that may influence your chemical-thinning program.

Fruit thinning is done to increase fruit size and enhance repeat bloom. The fewer fruit that are allowed to develop on a tree, the larger those fruit will be. In general, reduction in the number of fruit to 4 to 6 fruit per cm of limb circumference is required for good size. Good return bloom can be assured if fruit density is reduced to 8 to 10 fruit per cm within four weeks of bloom. Therefore, more severe thinning is required to obtain good fruit size than to get adequate return bloom.

Growers must consider thinning all mature, bearing trees. Trees that carried a light crop last year will have a heavy bloom and will require extensive thinning this spring. Furthermore, trees with a light bloom this year will set a higher percentage of flowers than those with heavy bloom, will still require thinning, and may be as difficult to thin as those with heavy bloom.

Chemicals Available for Thinning

Carbaryl. Carbaryl or Sevin is the workhorse of thinning agents. It is the mildest and safest thinner that we have. It generally is used at 0.5 to 2 lbs 50WP or 0.25 to 1 qt XLR per 100 gal, assuming dilute application. The XLR formulation of Sevin is preferred over the 50WP, because of the particle size of the 50WP formulation. Particles of 50WP Sevin are approximately the same size as pollen grains, thus increasing the likelihood that these particles will be carried to the hive by bees. XLR Sevin has a much smaller particle size, reducing, but not eliminating, the likelihood of bee damage.

NAA. Naphthalene acetic acid is the most potent thinner that we have. It is used at rates between 2.5

and 20 ppm. Because it is a more active compound than Sevin, there is a greater chance of overthinning, especially when high temperatures (85° or higher) follow application. NAA should be used, but it should be treated with respect. Fruit size may be reduced or pygmy formation may increase with late or high-concentration applications or when it is very hot.

NAD. Naphthalene acetamide is less active than NAA. It frequently is used in situations where flagging of foliage is a problem. It generally is applied at 25 to 50 ppm. NAD never is used on Delicious, since small seedless fruit (pygmies) will result and persist to harvest.

Accel®. Accel® is a new chemical thinner, made available first in 1994. It is an altered formulation of Promalin®. Accel® is a combination of benzyladenine (at about the same concentration as in Promalin®) and gibberellin A₄₊₇ (at about 10% of the concentration found in Promalin®). Application of Accel® is limited to two sprays, each of no more than 30 g active ingredient per acre. Because the label is based on a per-acre rate, the maximum concentration applied depends upon tree size and dilute gallonage requirement to cover the trees. The table below gives the relationship among dilute gallonage requirement, g active ingredient per acre, and concentration. Generally, to obtain effective thinning of easy-to-thin cultivars, such as Empire, Idared, Rome, and possibly McIntosh, 50 to 75 ppm is required. Hard-to-thin cultivars require between 75 and 100 ppm. Avoid combining Accel® and NAA, since pygmies may result.

Promalin®. Promalin is used to improve the shape of Delicious fruit. When applied for this purpose, it can be a useful thinner. Promalin should be used only on mature trees. It should be applied just prior to full bloom using 1 pt per 100 gal with a spreader-sticker and 100 to 200 gal per acre. Both the elongation and thinning responses will be reduced if a spreader-sticker is not included. No more than 2 pts should be applied per acre. If Promalin® is used on Delicious at bloom, do not use NAA as a thinner, since small fruit size and pygmy formation may result.

SPECIFIC THINNING RECOMMENDATIONS

Cultivar	Petal fall to 3mm	7 to 12 mm	15+mm
McIntosh	Sevin	Sevin + 2.5-7.5 NAA or Sevin + 50-75 Accel [®]	Sevin
Cortland	Sevin	Sevin	Sevin
Delicious (Promalin [®] at bloom)	Sevin	Sevin (+75 Accel [®] if needed)	Sevin
Empire	Sevin	Sevin + 7.5-10 NAA or Sevin + 50-75 Accel [®]	Sevin
Macoun	Sevin + 5-7.5 NAA	Sevin + 5-7.5 NAA	Sevin
Macoun (alternative)	Sevin	Sevin + 75-100 Accel [®]	Sevin
Golden Delicious	Sevin	Sevin + 10-15 NAA or Sevin + 75-100 Accel [®]	Sevin
Mutsu	Sevin	Sevin + 5-7.5 NAA	Sevin
Fuji	Sevin	Sevin + 75-100 Accel [®]	Sevin
Gala	Sevin	Sevin + 5-7.5 NAA	Sevin

In all cases Sevin is recommended to be applied at 1 qt Sevin XLR per 100 gal. NAA and Accel[®] recommendations are in ppm.

Timing

Apples can be thinned satisfactorily any time from bloom to 3 to 4 weeks after bloom. The exact length of the thinning period will be determined by the weather. If warm temperatures occur during the 3 weeks prior to treatment, results of thinning may be disappointing. However, if cool conditions prevail before treatment, thinning may be accentuated and the thinning window may be extended.

Over the last number of years, the preferred time, assuming that the weather cooperated, was when fruit were 8 to 10 mm in diameter (approximately 10 to 14 days after petal fall). As mentioned above, the market has caused thinning to become the most important cultural practice for many orchardists. Thinning must work! Inadequate thinning will result in significant losses of crop value, much more than will be experienced by light to moderate over thinning. You must create every opportunity possible to thin your fruit chemically. Because of this need, we recommend that you begin thinning at petal fall or shortly thereafter, probably with Sevin alone or Sevin plus NAA or Accel[®]. Assess the response when fruit are 7 to 12 mm in diameter (about 7 to 10 days after petal fall), and treat again if necessary with Sevin alone or Sevin plus NAA or Accel[®]. When fruit are

over 15 mm in diameter (after another 7 to 10 days), assess the response again and determine whether or not any stress periods have occurred, and treat if necessary with Sevin only. This approach will improve your results possibly in two ways. Multiple applications should provide more thinning response, and multiple applications will spread the applications through a number of possible weather windows for optimal response. Please note that data have not shown that there is any advantage to multiple applications of Accel[®]. Further, you must take care if you choose to use two applications of NAA; however, situations where you do not find two applications of Sevin desirable will be rare.

Weather Conditions

The effectiveness of chemical thinners is influenced by the weather in several ways.

Penetration. All chemical thinners, to be effective, must diffuse across the cuticle, which covers all aerial portions of the plant, including leaves, flowers, and young fruit. Waxes on the cuticle provide a major barrier to penetration. When the weather is cold and cloudy, little wax is secreted on the leaf surface, thus permitting greater penetration of the chemical. Conversely, when the weather is sunny and dry, wax

The relationship among dilute gallonage requirement, g active ingredient per acre, bottles per acre, and concentration of Accel®.

Dilute gallonage requirement (gal per acre)	Accel® rate				
	(g active ingredient per acre)				
	(bottles* per acre)				
	10	15	20	25	30
	0.5	0.75	1	1.25	1.5
	Concentration (ppm)				
50	53	79	106	132	159
100	26	40	53	66	79
150	18	26	35	44	53
200	13	20	26	33	40
250	11	16	21	26	32
300	9	13	18	22	26

*Accel® is sold in 35.6-oz bottles.

is secreted and deposited at an accelerated rate, thus restricting penetration of thinning chemicals. Therefore, chemical thinners, generally, are less effective after warm, dry periods and more effective after cool, moist periods.

Stress. Regardless of the mode of action of each thinning chemical, all require some type of stress to be imposed by weather for an ideal thinning response. Competition among flowers, fruit, leaves, and growing points occur for water, nutrients, metabolites, and growth regulators. Chemical thinners increase this stress on fruit, causing weak fruit and those with a small number of seeds to abscise. It is our opinion that in years where chemical thinners have worked poorly, weather-imposed stress has occurred before thinner application, or stress has not occurred until after the time that fruit abscission can be altered. Satisfactory thinning results may be obtained if thinning is followed by 3 days of sunny weather with temperatures in the mid to upper 70's. Ideal results, however, require 3 days of sunny weather in the 80's. Cloudy, rainy weather following chemical thinning has been shown to result in enhanced thinning in the Mid Atlantic region; however, this response has not been confirmed in the Northeast.

Pollination weather. If weather during pollination was good and considerable bee activity occurred, then a heavy initial set of fruit with many seeds is likely. Thinning will be required and may be difficult. If the

weather was less than ideal for bee activity and developing fruit have few seeds, set may be reduced and thinning may occur more easily.

Other Conditions Affecting Thinning

Frost damage. Frost which may kill only a few flowers low in the tree also may injure spur leaves throughout the tree. Absorption of thinning chemicals into these injured fruit and leaves is likely to be greater than into noninjured fruit and leaves, and therefore the thinning response may be greater. Further, impaired photosynthesis and stress caused by reduced carbohydrate supply also may accentuate thinning.

Winter injury. Winter injury to either the tree top or the roots can accentuate thinning activity.

Vole damage. Trees that have been damaged by voles will be weakened and will thin more easily. Root damage caused by pine voles is not always apparent, and effects may not be seen until it is time to thin chemically.

Heavy crop the previous year. Trees bearing a heavy crop store less reserve food than trees bearing a light crop. These less vigorous trees will be more responsive to thinning sprays the following year.

Low-vigor trees. Trees that have had insufficient nitrogen or have a deficiency of another essential element will thin more easily.

Young trees. Care must be taken to chemically thin young trees very carefully. They thin very easily, and at most, reduced rates of chemical thinners are all that is needed.

Thick, dense trees. Interior spurs, those located on shaded (or shaded prior to pruning) portions of the tree, and spurs on lower limbs usually are weak and low in carbohydrate reserves. These spurs thin easily. If trees were pruned to expose a number of previously shaded spurs, realize that these spurs will be thinned easily.

Chemical thinning is a difficult process, often thought to be more art than science. Regardless, it is one that orchardists must master to be successful. Poor thinning results in loss of more crop value than all other problems together.

UMass Extension Factsheet F-118