Art Mitchell Symposium II

**Fruit Thinning and Return Bloom**

**Tuesday afternoon 2:00 pm**

**Where:** Ballroom D

Recertification credits: 1 (1C, PRIV OR COMM CORE)
CCA Credits: CM(2.0)

**Moderator:** Jim Flore, Horticulture Dept., MSU

2:00 p.m. Chemicals to Thin Apples and Their Effect on Return Bloom Under Eastern Conditions

- Duane Greene, Plant and Soil Sciences Dept., Univ. of Massachusetts

2:45 p.m. Thinning Honeycrisp to Assure Return Bloom

- Phil Schwallier, District Horticulture & Marketing Educator, MSU Extension

3:15 p.m. New Compounds on the Horizon

- Gregory Clarke, Valent BioSciences, Libertyville, IL
- Peter Petracek, Valent BioSciences, Long Grove, IL
CHEMICALS TO THIN APPLES AND THEIR EFFECTS ON RETURN BLOOM UNDER EASTERN CONDITIONS

Duane W. Greene  
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The apple has a strong biennial bearing tree tendency which results in a heavy crop of small, poorly colored and inferior quality apples one year followed by a light fruiting year where fruit are large with a short postharvest life. Chemical regulation of cropping has proved to be the most practical way to break this biennial bearing cycle. The presentation will discuss the chemicals most frequently used, the circumstances when they are used and precautions associated with their use.

**Thinning Chemicals**

**Blossom Thinners.** Some of the first attempts to regulate biennial bearing involved the use of caustic chemicals to prevent pollination, pollen germ germination or pollen tube growth. The commercial product Elgetol emerged as an important thinner in the somewhat arid areas in the west, but Elgetol and its subsequent replacements have never become important commercial products, due in large part to the phytotoxicity. Ammonium thiosulfate, Elgetol, Wilthin, pelargonic acid, lime sulfur and lime sulfur plus oil can thin but under the humid conditions in the east but treatments that adequately reduce crop load also cause excessive leaf damage which adversely affected fruit size and return bloom. Ethephon and naphthaleneacetic acid (NAA) are generally nonphytotoxic but they are infrequently used at this timing. Unpredictable weather conditions during the bloom period may adversely affect fruit set thus thinning sprays are generally delayed until the full pollination potential can be judged.

**Postbloom Thinners**

The majority of thinning that is done commercially is done with postbloom thinners. Growers delay thinner application until the bloom period is over thus the potential for pollination can be assessed.

**Naphthaleneacetic acid (NAA).** NAA was the first hormone-type thinner to be adopted and used commercially. It is probably the most potent of the general-use thinners on the market today and is generally the preferred material for cultivars that are difficult to thin. It is used at concentrations between 2 to 20 ppm but under commercial conditions the concentration used is generally between 5 and 12 ppm. Lower concentrations may cause modest thinning while higher concentrations may overthin or reduce fruit size or not increase fruit size even though crop load is substantially reduced. Over application may lead to pygmy fruit production and severe leaf epinasty. Therefore, NAA is frequently combined with another thinner, especially carbaryl, and used at lower and potentially safer rates. The thinning action of NAA is not always immediately apparent since fruit abscission following NAA application is often delayed by as much as one or two weeks relative to the untreated trees.
Naphthaleneacetamide (NAD, NAAm). Initial testing of NAD was done with NAA but since NAD was less potent, NAA became the chemical of choice. It is applied at rates up to 100 ppm but it is normally used in the range between 35 and 50 ppm. NAD is used primarily as a petal fall thinner. It is frequently used on early maturing varieties, Macoun and on varieties that display severe leaf epinasty following NAA application. NAD is never used on Delicious since it can result in a high percentage of pygmy fruit that persist to harvest. NAD is frequently combined with carbaryl. In general NAD is an underutilized chemical, due in part to the lack of testing in recent years.

Carbaryl. Carbaryl is the most versatile thinner in general use. It is a mild thinner and since the thinning is not rate dependent, overthinning is rarely observed. It can be used over a wide range of developmental stages from petal fall to 18 mm. It is very toxic to bees thus the earliest time of application must be considered when the bees are removed from the orchard at petal fall. Carbaryl is normally applied at rates ranging between 600 to 1200 ppm. It is reputed to thin down and break up fruit clusters. Good coverage is necessary since it is most effective when applied directly to the fruit.

Benzyladenine (BA). Benzyladenine was the newest commercial thinner to be introduced. The thinning activity of BA was recognized in the late 1970s but it was not introduced as a thinner until 15 years later. Initial results with the commercial formulation were only partially successful since the initial commercial product also contained 10% GA4+7. While the amount appeared to be small its presence did reduce the thinning effect as well as result in some smaller fruit. A BA alone formulation is now sold and the results are much more satisfactory. BA is generally applied at rates between 50 and 150 ppm. BA is unique among thinners in that it can increase fruit size in two ways, first by reducing fruit competition like all other thinners and secondly by increasing cell division.

Ethephon. Ethephon is generally not considered a mainstream postbloom thinner in most apple growing regions. Ethephon has the reputation of being an erratic thinner. Part of this is due to changing tree sensitivity at different developmental stages. Part is also due to the relatively short concentration range for effective thinning that appears to change from year to year. It may be most useful as a rescue thinner in the 20 to 25 mm stage where other thinners have limited or no effect. Experience has shown that ethephon applied at 250 to 300 ppm combined with carbaryl is the treatment that is the most satisfactory since in most years this will neither over thin nor under thin.

Combination sprays. In recent years the combination of chemical thinners either as tank mixes or applied at different times worked out to be most satisfactory. Usually the thinning response is additive. A major advantage is this approach is that lower rates of individual chemicals is usually used and this reduces the likelihood of experiencing negative side effects from a thinner that are often associated with high rates. Because carbaryl is a relatively mild thinner many thinner combinations include the use of carbaryl.

Time of Thinner Application

Chemical thinners may be applied over a relatively wide range of times, and depending on the year, this may be from bloom until fruit reach a diameter of up to 25 mm. Growth and development of fruit during this chemical thinning period is dynamic and continuous. There are specific times during this developmental process when fruitlets may be especially vulnerable to chemicals with specific modes of action, while at other times all thinners may be effective. Each time period during the developmental process provides thinning opportunities, and strategies may be devised to thin at those times.

Bloom. Blossom thinning offers several advantages over thinning at other times. Usually thinning at this time results in the largest fruit at harvest and it has the greatest influence on return bloom. Outside the Pacific Northwest, there has been grower reluctance to embrace blossom thinners for several reasons, but primarily because of uncertainty of crop potential. Inclement weather during bloom may affect bee activity, thus drastically affect crop potential. Growers prefer to have confidence that a crop has been set
before initiating chemical thinning. Ethephon, NAA and lime sulfur plus oil and ammonium thiosulfate may be effective at this time.

**Petal Fall.** This is the first time a grower can apply a thinner with the knowledge about the bloom period, and thus the potential crop for the year. This is a very important time to apply a chemical thinner. In the Northeast this time of application has been widely adopted by growers for several reasons. Over thinning is unlikely when thinners are applied at this time. Even a thinner such as NAA which is often perceived as a potent thinner shows 50% less thinning activity when applied a petal fall. Thinners can always be applied later. Frequently less aggressive thinning is required later thus reducing the potential for over thinning or experiencing undesirable side effects. Effect thinning at this time is less weather dependent than when thinners are applied at other times. Carbaryl, NAA, and NAAm, are routinely used, but BA is not applied at this time.

**7 to 12 mm Fruit Size.** Historically this is the timing when most thinners are applied. It is the timing when all thinners are effective and the developmental stage when fruit are most vulnerable to thinner application. Where aggressive or significant thinning is required, thinner application at this time is generally required. Favorable weather, especially temperatures in the upper 60s or 70s the 2 to 3 days following thinner application are required to achieve significant thinning. Light and photosynthesis are also involved. Factors such as low light and warm temperatures that can reduce the pool of available carbohydrate available to fruit at this time will enhance the thinner response. Carbaryl, NAA, NAAm, BA and thinner combinations are effective at this time.

**14 to 25 mm Fruit Size.** As fruit size they are less vulnerable to thinner application. If cool weather precede this time period thinning is still possible. If warm temperatures preceded this period, effective or significant thinning is less likely. BA and carbaryl can be used at this time. This may be too late to use NAAm. Application of NAA at this time comes with risks because it may result in no increase in fruit size or a possible reduction in fruit size even if thinning is achieved.

**18 to 25 mm Fruit Size.** This is a most difficult time to thin because fruit are far less vulnerable and likely to abscise. Carbaryl may cause modest thinning, but the best option may be to use ethephon plus carbaryl, although it does come with risk and uncertainty.

**Foliar Penetration and Thinner Response**

Before a chemical thinner can elicit a response it must be applied to and be taken up by the tree by migrating through the cuticle. It is well documented in the literature that there are plant factors, spray solution factors and weather factors that can profoundly affect the movement through the cuticle and into the plant. It is logical therefore, to conclude that any factor that affects uptake into the plant will play an important role in determining a response to a thinner. Weather is the one variable that cannot be altered, and it makes sense to apply a thinner under the environmental conditions that will favor uptake. This is true when we talk about thinner response to caustic blossom thinners. The mode of action of these compounds is related to burning or damaging portions of the flowers, especially the stigma and style. There is a good relationship between thinning and flowers part damage. However, experience over the years has indicated that weather at the time of postbloom thinner application plays a relatively minor role in determining a thinning response. The reason for this can be explained by the fact that foliar or fruitlet absorption is the first step in a two step process. The most important factor in thinner efficacy resides with the weather conditions 2 to 4 days immediately following thinner application. An important factor determining if a fruitlet abscises or continues growing is the carbohydrate status of the fruit and during the 7 to 12 mm stage the supply of carbohydrate available to the fruit from the spur leaves is precarious balanced with the demand from the many growing fruit as well and the metabolic demands of leaves and wood. Any factor that affects this balance will determine if the fruit abscises or persists. Therefore, even if there are differences in uptake, if the weather does not produce a carbohydrate stress or deficit, thinning will not occur, or if it does the thinning will be modest.
Chemicals and Strategies to Thin Apples and Enhance Return Bloom

Duane W. Greene
University of Massachusetts

Reasons to Chemically Thin

- Encourage return bloom
- Improve fruit size
- Assure high fruit quality at harvest

Encourage Return Bloom

- Frequently the most important consequence of thinning is to assure an adequate number of flowers for the following year.
- Improvements in orchard management practices may allow maturation and sizing of very large crops.

Factors that Influence Flowering on Bearing Trees

- Crop load
- Cultivar
- Leaf Area
- Light
- Thinners

Crop Load

- The most effective way to influence flowering is by reducing crop load with chemical thinners.
- The time of thinner application may influence thinning thus the extent of return bloom.

Effect of Time of Fruit Removal on Return Bloom
Seeds or lack of seeds in Apples Influence Flowering

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Spurs flowering (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No fruit</td>
<td>97.6</td>
</tr>
<tr>
<td>Seeded fruit</td>
<td>13.1</td>
</tr>
<tr>
<td>Seedless fruit</td>
<td>95.3</td>
</tr>
</tbody>
</table>

Flowing Inhibitor

- Gibberellins in the seeds.
- They move from the seed to the bourse bud and inhibit flowering.
- Early removal of fruit is the best way to encourage return bloom.
- GAs move from the flowers as early as the pink stage.

Spur leaves are important.

They can make an important contribution to enhance return bloom.

Leaves can partially overcome the inhibitory effects of seeds

<table>
<thead>
<tr>
<th>Spur Condition</th>
<th>Spur flowering (%)</th>
<th>Leaf number per spur</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>No fruit</td>
<td>26</td>
<td>83</td>
</tr>
<tr>
<td>With fruit</td>
<td>0</td>
<td>5</td>
</tr>
</tbody>
</table>

Influencing of Leaves on Flowering

Light within a canopy is important for flower bud formation

<table>
<thead>
<tr>
<th>Percent full sun</th>
<th>Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 30</td>
<td>No flowers formed</td>
</tr>
<tr>
<td>30 to 60</td>
<td>Small to moderate size fruit, moderate set</td>
</tr>
<tr>
<td>60 to 100</td>
<td>Many flowers, large fruit, good fruit set</td>
</tr>
</tbody>
</table>
Thinning Chemicals

- The most effective way to enhance return bloom on bearing trees is to use thinners to adjust crop load down to a level where adequate return bloom can occur.

- Rarely do specific thinning chemicals applied at the normal thinning time have a major and direct effect on return bloom.
- The most dramatic effect that thinners have on return bloom is through the degree of thinning and the magnitude of the crop load reduction.
- Ethephon may be the exception.
- NAA??

Blossom Thinners

- Generally blossom thinners are not used.
- Unpredictable weather during bloom may adversely affect fruit set.
- Most prefer to delay any thinner application until the full pollination potential can be judged.
- Blossom thinners are used in arid areas where weather is more predictable.

Postbloom Thinners

- The majority of thinning is done using postbloom thinners starting as early as petal fall.
- Bloom is over thus the potential for pollination can be assessed.
Postbloom Thinners

- Carbaryl
- Naphthaleneacetic acid (NAA)
- Naphthaleneacetamide (NAAm)
- Benzyladenine (BA)
- Ethephon
- Thinner combinations

Carbaryl

- Most frequently used thinner
- Safe, mild thinner
- Most versatile thinner available
- Can be applied over a wide range of developmental stages
- Concentration independent
- May break up clusters
- A grower favorite, but???

Naphthaleneacetic acid (NAA)

- Most potent thinner in general use
- Overthinning possible- especially if warm weather follows application
- No increase in fruit size possible if:
  - Too warm following application
  - Too high a concentration used
  - Applied when fruit too large

NAA

- Generally early application is recommended
- May cause pygmy fruit
- An extremely important tool where more aggressive thinning required
- Rate- 3 to 15 ppm
- Treat it with respect, not fear

Naphthaleneacetamide (NAD)

- A milder version of NAA
- Less frequently used than NAA
- Used on trees that show severe epinasty with NAA
- Used most frequently:
  - Petal fall spray
  - On early varieties, Macoun
- Not applied after 2.5 weeks after FB

Naphthaleneacetamide

- Not used on Delicious- pygmy fruit
- Probably underutilized but also inadequately researched
- Rate 25 to 50 ppm
**Benzyladenine (BA)**
- Newest commercially-available thinner
- Formulation without GA4+7 much better
- Used alone, generally a mild thinner
- Used with carbaryl, a strong thinner
  - Carbaryl does not have to be applied at the same time to enhance thinning effect
- Applied at rates of 50 to 150 ppm

**Benzyladeneine (BA)**
- BA increases fruit size in two ways:
  - Reducing fruit competition
  - Increasing cell division
- Generally requires warm temperatures following application to be effective.
- It is somewhat ineffective when applied at petal fall.
- High rates may influence red color on McIntosh types.

**Ethephon**
- Ethephon is not a main stream thinner.
- It is most valuable as a rescue treatment and is applied when fruit are 20 mm+ and when there is no chance of getting thinning with other thinners.
- Applied at 250 to 300 ppm + carbaryl.
- Over thinning at this rate is unlikely.

**Thinner Combinations**
- BA-carbaryl
- NAA-carbaryl
- BA-NAA
- May allow lower rates to be used thus avoiding unwanted side effects associated with high rates.
- Different modes of action mean a better chance of thinning, lower rates mean that overthinning of one chemical is unlikely.

**Timing of Thinner Application**
- Bloom
- Petal fall to 5 mm
- 7-12 mm
- 15-18 mm
- 20+ mm

**Bloom**
- Timing that is seldom used.
- Unless we have a proven thinner that is clearly better than thinners applied a PF, this will not be an important time of application in the Eastern US.
Petal Fall

- Important time of application
- Critical component in the multiple thinner approach to thinning
- Over 80% of growers in New England apply a thinner at petal fall

Thinners Used at Petal Fall

- Carbaryl – The main thinner at petal fall
- NAA – Used when more aggressive thinning is desired
  – Not as potent as when applied later
  – Combinations with carbaryl underutilized
- NAAm – Used on early varieties
  – Underutilized

7 to 12 mm Stage

- Traditional time to apply a thinner.
- Stage in fruit development when fruit are most susceptible to thinners.
- All traditional thinners are effective at this time.
- The thinners used and their concentration are influenced at this time by the weather.

Thinners Used at 7 to 12 mm

- Carbaryl – A grower favorite because it is mild
- NAA – Potent and weather-sensitive
- Benzyladenine (BA) – The BA alone formulations are better
- NAAm – Underutilized

12 to 18 mm Stage

- Thinning is often more difficult at this time, but it can be done especially if the weather has been cool.
- May become an important second or third chance to thin.
- Successful thinning at this time depends upon favorable weather and how much stress fruit have been exposed to.

Thinners Used 12 to 18 mm

- Carbaryl
- NAA – Small fruit size is a potential problem if NAA is applied late.
- Benzyladenine – Increased fruit size is possible even if no thinning if rapid cell division is occurring at the time of application.
Above 18 mm Stage

- This is a very difficult time to thin consistently.
- Carbaryl may be useful.
- Ethephon is very erratic, primarily because it has a very narrow concentration range in which it thins satisfactorily. 250 to 300 ppm + carbaryl suggested range.

Additional Concepts

- Multiple thinner application
- The weather

Multiple Thinner Application

- "Nibble Approach"
- Rarely do all of the bits and pieces come together to achieve a perfect thinning job with just one thinner application.
- Do thinning in several applications (1 to 3).
- This approach is safer, usually requires lower rates of chemicals, and final fruit set is often close to the desired level.

Multiple Thinner Approach

- Make a petal fall application.
- This is very important!
- Do not wait for the perfect weather, just get it on (but not in the rain or high winds).
- You will always have at least one more opportunity to thin, and perhaps several more opportunities.

Multiple Thinner Application

- When fruit reach the 6 mm stage look for growth of the fruit.
- Fruit that are rapidly growing at this time have set and the number present is a good indicator of how heavy the set is.
- If further thinning is necessary, look for a weather forecast where temperatures will favorable for 3 days in a row, then spray.
The Weather

- The weather conditions following thinner application are the dominant factors that influence the ultimate thinning response.
- The Factors:
  - Temperature
  - Light
- These affect tree carbon balance.

Carbon Balance

- The demand by the tree for photosynthate is large after bloom. Any factor that increases the gap between supply and demand will increase thinning.
- High temperature and low light are the dominant weather factors.
- Both of these are components of the predictive thinning model developed by Alan Lakso.

The Effect of Temperature on Postbloom Thinner Response

Light

- Under low light conditions photosynthesis is reduced, widening the carbon deficit.
- If cloudy conditions are accompanied by warm temperatures, heavy drop may be expected.
- If cloudy conditions are accompanied by cool conditions, heavy drop is unlikely.
Cloudy Weather Can Influence Thinner Response

- The time a thinner is applied relative to a cloudy period can make a very large difference in thinner response, especially if temperate are moderate after thinner application.

Treatments

- Untreated control
- Shade- 80 % for 6 days- either before or after thinner application
- Thinner- 7 ppm NAA + 0.5 lb/100 gal carbaryl applied at 11.9 mm
- Shade and thinner

Effect of NAA + Carbaryl and Shade on Fruit Set of McIntosh Apples applied on 29 May

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Shade before thinner</th>
<th>Shade after thinner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>10.1</td>
<td>9.3</td>
</tr>
<tr>
<td>Shade (S)</td>
<td>10.0</td>
<td>1.6</td>
</tr>
<tr>
<td>Thinner (T)</td>
<td>4.1</td>
<td>3.7</td>
</tr>
<tr>
<td>T + S</td>
<td>4.6</td>
<td>0.9</td>
</tr>
</tbody>
</table>

Light

- Thinning during cloudy period can come with some perils.
- If a thinning spray is applied after a period of extended cloudy period one can expect no effect on thinner response.
- If a thinning spray is applied going into a cloudy period, it is possible to extensive and excessive thinning.

Conclusions

- Crop load is the most important factor influencing return bloom on bearing trees.
- Leaf area on spurs, seed content of fruit and light can modify return bloom.
- Both chemicals and time of application can influence thinning.
- Both temperature and light can modify the thinning response, sometimes drastically.
Questions?
Thinning Honeycrisp to Assure Return Bloom

Philip Schwallier
MSU Clarksville
Horticultural Experiment Station

Honeycrisp is a wonderful variety. It has a outstanding name, “Honeycrisp” that very accurately describes the “explosively crisp eating experience” a consumer tastes with each bite. It has many grower friendly characteristics and perhaps the best is the price. It is very precocious, productive, pretty appearance, medium-large fruit size and more.

But one of Honeycrisp’s greatest faults is it strong tendency for biennial bearing.

Honeycrisp has the ability to overset, even in frosty years. This over-setting characteristic has a big impact on current year apple maturity and especially on next years return bloom.

Honeycrisp will set fruit easily on young trees, even the first year of planting. Of course, this causes the blocks to start at a young age the biennial bearing cycle. One year on and then off and then on again.
This is a concept figure from Honeycrisp cropload studies at CHES. By observation we judge a tree to have a nice desirable crop (100% cropload). This 100% cropload is approximately 8 fruit per Trunk Cross-Sectional Area (cm²). If the trunk is cut in half about 1’ above the ground, the exposed area of the stump is measured in square cm’s and is known as TCSA. Lighter croploads might be judged as 50% to 75% of a full crop or perhaps 4 to 6 fruits/TCSA.

Our cropload and return bloom data indicates that the desired full 100 % crop of 8 fruits/TCSA had a return bloom of near 3%. The lighter croploads of 75% crop, 5 or 6 fruit/TCSA will return with 25% bloom and 4 or 5 fruit/TCSA returns with near full 100% return bloom. Thus the slightly lighter croploads return bloom much better and their seems to be a point where return bloom turns on if you will.

I will review some research trials on young trees and full bearing mature trees and summer NAA results.

At CHES we measured tree yield and then return bloom the following year and plotted them on this chart. The bars indicate yield in Kg/tree and the diamonds are return bloom the following year for the same tree. It is quite interesting that there are a few trees that return bloom even though that had considerable crop. But what is quite apparent is that there is a point where return bloom is turned on. Return bloom is near zero and then at some point of cropload jumps to 100% with very little variation in-between.
Now the diamonds in this chart indicate the return yield. Plotting the yield/tree of one year against the yield/tree of the next, basically indicates the same results. Those trees that have return bloom set a crop.

This is the number of fruit/TCSA plotted against the return bloom rating. There is good return bloom at the lower cropload and as cropload increases considerable variation in return bloom occurs.

If we plot the data to a line, we learn that at 4 to 6 fruits/TCSA there is a change in the slope of the line where return bloom quickly drop off to low levels.

Honeycrisp needs to have a cropload between 4 and 6 fruits/TCSA, or I recommend a target of 5 fruit/TCSA to have good return bloom. Greater than 6 fruit/TCSA results in poor return bloom.

An ideal Honeycrisp cropload looks a little on the light side but returns good numbers of bloom in the next year.
Here is a Honeycrisp Cropload Guide table you can use on either limbs or trunks. For example, if you have a tree or a limb that is 1" in diameter, then it has 5.1 cm² CSA and at 5 fruits/CSA should carry about 25 fruits either on the tree or on the limb. A 1" diameter limb can easily set 51 fruit (10 fruit/CSA). This table also indicates the the bushels a tree should or could carry at various CSA’s.

The best cropload-return bloom for Honeycrisp is 5 fruits/TCSA.

Chemical thinning Honeycrisp is very straight forward. Young Honeycrisp trees are very sensitive to chemical thinners. Plan on hand thinning young trees.

In a trial using mostly mild rates of various thinners at either Petal Fall or 10 mm stage, the Honeycrisp over-thinned.
Slide 19

During this trial the Honeycrisp thinned the greatest at the Petal Fall timing. These were mild rates, even rates that typically don’t thin at all. Honeycrisp are far to valuable to thin off the tree. Also, Bitterpit is a major problem on trees with too light of a crop.

Slide 20

In another trial using moderate rates of thinners applied at normal timings, we measured return bloom.

Slide 21

In this trial MaxCel and NAA improved return bloom the best. Sevin and hand thinning were not different from one another and had no effect on return bloom.

Slide 22

To summarize young Honeycrisp thinning should be done by hand. A semi-dwarf tree is considered young until it is 6 years old. A full dwarf high density tree is young until it is 4 years old.

Slide 23

Full bearing trees need to be thinned most years with combinations of Sevin + NAA or MaxCel.
This trial was applied at moderate normal rates at 2 timings, Petal Fall and 10 mm.

This trial had the best thinning at 10 mm and not Petal Fall. The normal combination rates thinned just about perfect. Honeycrisp will respond well to normal rates. Non-combination thinning typically under-thins Honeycrisp.

In a trial trying to measure a difference between thinning timings, trees were hand thinned at 6 timings starting at Pink and periodically up to 40 mm, no differences were found in return bloom from any of the timings except the Petal Fall timing. Was this a fluke or is Honeycrisp most receptive to Improving return bloom at Petal Fall. This needs more study. But it points out the importance of thinning at Petal Fall if conditions are favorable.

Our recommendation is to thin mature Honeycrisp trees with combinations at normal rates. Sevin + 50-75 ppm MaxCel or Sevin + 8-10 ppm NAA both work well thinning Honeycrisp.
Enhancing return bloom is desirable with Honeycrisp. Applying summer NAA at 5, 7 and 9 weeks after Full Bloom will increase return bloom by 5 to 15%. That is not a great increase but it can be helpful when trees have heavy crops and return bloom will be disappointing.

In this trial we used Ethrel and NAA to promote bloom and Provide to decrease bloom. The treatments were made during that sensitive 5 to 6 WAFB.

The summer Ethrel increased return bloom similar to summer NAA and Provide did decrease return bloom somewhat.

There is however a problem with summer Ethrel. This UTC at harvest time has a small amount of drops.
Summer NAA trees have a similar amount of drop to the UTC.

The summer Ethrel, however, had considerable ripening and drop.

Summer Ethrel will increase return bloom, hasten apple maturity and increase pre-harvest drop.

Summer NAA increases return bloom similar to Ethrel but has no effects on the fruit if used at recommended rates. High rates will reduce fruit size and there can be a stop drop effect.

Future thinning of Honeycrisp may involve multiple thinning treatments. We can start as early as Pink perhaps with Ethrel. A second treatment could be to blossom thin with a ATS or Lime-Sulfur or NAA. Combination thinners could be applied at Petal Fall if weather permits and then again at 10 mm if needed, followed by summer NAA’s.
To summarize, hand thin young trees, use combinations of thinners at normal rates on bearing trees. Consider thinning at Petal Fall if conditions are favorable. Follow with summer NAA to enhance return bloom.

Target croploads at 5 fruits/TCSA. More than 6 fruits/TCSA will result in poor return bloom.

You too can produce the best Honeycrisp can offer year after year.