

MANIPULATING FLOWER BUD DENSITY AND BLOOM IN PEACHES¹

by
Gregory L. Reighard²

OVERVIEW OF PEACH THINNING

Preharvest removal or “thinning” of immature deciduous tree fruits is a necessary horticultural practice to adjust the number of fruits so that the remaining fruits will adequately size for commercial acceptance. Thinning practices that achieve a marketable fruit size that maximizes pack out yield per tree increases orchard production efficiency for growers. An important component of maximizing fruit size and yield is time of thinning (Day and DeJong, 1999). The thinning windows for peach are pre-bloom (floral buds), during bloom (flowers), or at post-bloom (fruitlets).

Yield and fruit size can be increased if thinning is performed before or at bloom, compared with the typical commercial timing of 50 days after full bloom (Stover, 2000). Dormant season applications of soybean oil in lieu of petroleum-based oils will kill weak flower buds and potentially reduce early competition for stored carbohydrates among flower buds (Myers et al., 1996; Moran et al., 2000). Early thinning is desirable for maximum fruit size but available early thinning options and their benefits are not always reliable or predictable. Therefore, thinning is often carried out in a timely but conservative manner (e.g., before pit hardening, but later than ideal). Labor logistics and a variety’s potential fruit size often determine when hand-thinning gets started in large commercial orchards. Implementing partial early thinning with chemicals like ethephon, ATS, and/or vegetable oils such as soybean oil will reduce follow-up hand-thinning costs, avoid over-thinning due to frost or fruit drop events, and increase ultimate fruit size compared to the one-time thinning approach often done late in the post-bloom thinning window.

To increase fruit size and marketable yields, growers should consider formulating an early thinning strategy, whether pre-bloom or at bloom, that is based on his or others experience as to when is the economically best time to thin a variety, how much to thin, and how environmental conditions will affect or modify thinning plans. Much of this is dependent on the variety’s genetics and the weather. Therefore, in any given year different controlled (labor and equipment) and uncontrolled events (weather) will help determine which is the best thinning strategy to implement to maximize fruit size and packout and hopefully profitability.

Finally, if the grower chooses --- or the weather dictates --- that he has to post-bloom thin, he should remember that early peach fruit development is positively correlated to **heat accumulation in the first 30 days** after bloom. This determines how quickly you need to thin after bloom. And to maximize fruit size, consider the peach fruit growth rate during phase one as analogous to the dollar return from the compound interest rate in banking. Simply put, the **SOONER** fruit thinning is started in Stage I, the **LARGER** the final fruit size will be in Stage III when it is harvested.

WHY PRE-BLOOM THIN?

Two good reasons to consider pre-bloom thinning in peaches are:

- 1) The greater the flower number at bloom, the more negative the effect on the rate of growth or cell division within each pollinated fruitlet due to competition for resources.
2. It may be a better option than flower thinning because there should be sufficient flower buds left for losses from frosts and/or enough to allow a full crop load to set.

HOW CAN ONE PREBLOOM THIN PEACH FLOWERS?

Vegetable oils (e.g., soybean oil) applied during the winter dormancy period have been effective in both thinning peach flower buds and delaying phenological bud development during spring bloom without being phytotoxic to spring growth. In South Carolina, application of 8% soybean oil by volume with a compatible and labeled emulsifier has been the most effective concentration for most varieties (Njoroge 2002; Reighard et al., 2006; Reighard et al., 2007). This rate generally removed 20-30% of the flower buds prior to bloom. Rates

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² Clemson University, Department of Horticulture., Clemson, SC 29634

below 8% were less effective (<20% flower bud kill) while rates of 10% or higher excessively thinned (>40% of buds) or caused some minor shoot necrosis around the bud nodes. The ideal rate does vary among varieties, so each variety needs to be tested to determine its optimum threshold. In addition to genotype, chill hour accumulation and temperature at application have some effect on both the thinning efficacy and bloom delay or advancement.

Some observations when using soybean oil as a thinner:

- 1) Needs an emulsifier and GOOD spray coverage to work
- 2) Can advance or delay bloom due to application timing
- 3) May counteract fall applied ethephon (Ethrel®) effects and/or lessen its benefits
- 4) Reduces hand labor thinning costs
- 5) Increases fruit size and yield except in a bad freeze year
- 6) Can advance fruit maturity due to early thinning effect
- 7) At 6% or higher can control scale and European red mites

Some answers we would like to have:

- 1) How little emulsifier and water is needed to effectively thin flower buds
- 2) When should you apply soybean oil during dormancy to advance or delay bloom
- 3) Can we split applications to achieve even better efficacy

To find a cost effective soybean oil plus emulsifier combination, the adjuvant Vegetoil® (Drexel Corporation) was tested as a replacement for mixing soybean oil with off-the-counter “emulsifiers”. Vegetoil® is 93% soybean oil. This product’s efficacy has been similar to vegetable grade soybean oil, but been less expensive since costly emulsifiers are not needed. However, there is no label for this product as a thinner; so it cannot be sprayed on peach trees at this time.

Some observations when using Vegetoil® as a thinner:

- 1) Need GOOD spray coverage (130-150 gals./acre best) to be effective
- 2) Can advance or delay bloom due to application timing
- 3) Reduces live flower buds by ~20 to 40 % at rates of 7 to 9% soybean concentration
- 4) Most effective rate for thinning in SC has been 9% Vegetoil® (8% soybean oil)
- 5) Reduces hand labor thinning costs
- 6) Can increase fruit size and yield in non-freeze years
- 7) Can advance fruit maturity due to early thinning effect
- 8) Addition of 100 ppm ethephon was effective in thinning difficult to thin varieties and marginally “safe” (low phytotoxicity)

Some answers we still are looking for when using Vegeoil®:

- 1) What are the rates needed to thin hard-to-thin cultivars consistently
- 2) 10% Vegetoil® (i.e., 9% SO) can overthin and 12% excessively thins
- 3) What ethephon rates are effective for thinning, but “safe” when mixed with Vegetoil®

THINNING STRATEGIES FOR PEACH

Follow the Precepts: WHEN, HOW MUCH, & WHAT IF

- A)** Know your pre-bloom flower crop and variety to determine **WHEN** you should thin.
- B)** Know **HOW MUCH** thinning is required for each peach variety and situation.
- C)** Be pragmatic and use common sense when the **WHAT IF** arises such as poor pollination weather.

A. WHEN to thin “rules” that are based on weather events:

1. *Winter or spring cold damage:* Hand-thin fruitlets after fruit set
2. *Little or no cold damage:* Pre-bloom or bloom thin early ripening or difficult to size varieties
3. *Little or no cold damage:* All other varieties use pre-bloom, bloom thin and/or hand-thin methods depending on labor supply, expected market conditions, or company pack-out goals

4. *Poor pollination weather*: Hand-thin fruitlets after fruit set (~45 days after full bloom)
5. *Inadequate chilling*: Hand-thin fruitlets after fruit set (~45 days after full bloom)

B. WHEN and HOW MUCH should you thin each variety under “normal” conditions:

1. The number of fruits to be left per tree after thinning is based on variety age, vigor, and pack-out history.
2. Thinning to a specific fruit number per tree based on variety and orchard age is one of best formulas for maximizing fruit quality and yield and still maintaining fruit size.
3. Thin early ripening varieties **early (pre-bloom/bloom)** to get size since their genetics limit fruit size potential. However, over-thinning due to mistakes or late frosts will decrease yield and these short crops can increase or exacerbate quality problems such splits. Thus these varieties require the most thinning expertise concerning crop load management to turn a profit at harvest.
4. Thin as early as practical during stage I for mid-season varieties that are hard to size.
5. When hand thinning, fruit spacing is less important than the fruit location on the shoot and the fruit number that the tree should carry. Random thinning is ok if flower losses due to cold are insignificant. Fruit adjacent to a secondary side shoot generally receive more carbohydrates and thus have a bigger size potential.
6. Flowers/fruit on short or shaded bearing shoots usually produce smaller fruit. Remove them by thinning or pruning.
7. Abnormally warm temperatures in late March or April increase cell activity and division if other resources are **NOT** limited. Thus, more cells are produced in Stage I, which increases size potential. Therefore, be careful not to overthin large-fruited varieties to reduce the incidence of softening, splitting or cracking at harvest.

C. The WHAT IF obstacles that disrupt thinning plans:

1. If the flowers exhibit cold damage, or there was poor pollination weather and/or inadequate chilling; then the grower has limited options since he does not know how many fruits will set and grow. Therefore, make thinning decisions based on past experience.
2. If a frost occurs during or after bloom, trees that were bloom thinned often have adequate basal flowers since flower thinning removes more of the early opening (larger) flowers and less of the tight, late opening ones. Thus, if a post-bloom, partial immature fruit kill from frost occurs, bloom thinned trees will not necessarily have an increased crop loss, though the grower will have a bill for bloom thinning. Moreover, this expense may be counter-balanced by larger fruit (i.e., better price) in a potentially short crop year.
3. If labor is or may be in short supply to hand-thin within the bloom or post-bloom thinning windows, then thinning at pre-bloom or bloom with chemicals or oils and/or detailed pruning will reduce the amount of thinning labor required later.
4. Currently, there are few if any cost-effective “tools” for the grower to pre-bloom or bloom thin consistently. However, new technologies such as the Darwin blossom thinner are being developed or refined to overcome this constraint.
5. If every year the grower finds himself procrastinating doing his thinning with excuses such as **too busy** to follow through or adjust his thinning plans, then he should focus on increasing efficiency by either reducing acreage or designating someone he trusts to do the thinning in the best time window for each variety and situation.

REMEMBER KEY SCIENCE-BASED PEACH THINNING “FACTS”

- I. Thinning ~30% of the flower buds during winter will increase fruit size on difficult to size varieties as much as or more than thinning at a later time.
- II. Removing 50% or more of the flowers at bloom will increase fruit size and yield 10-30 % more than thinning immature fruits at ~45 days after full bloom.
- III. After full bloom, each 10 to 15 days you wait to start hand thinning, you lose some potential fruit size and crop value.
- IV. Thinning at stage II (pit hardening) is too late to increase fruit size potential and only serves to prevent limb breakage.

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