FRUIT THINNING

Many temperate tree fruit crops, especially pome and stone fruits, produce an overabundance of flowers each year, perhaps as an evolutionary consequence of the potential for flower and flower bud losses during spring frosts. If pollinators are active, most of these flowers are pollinated and many are fertilized. After fertilization, tissues surrounding the embryos (which will eventually become the fruit) begin to enlarge in response to hormonal signals from the developing seed. Obviously, the growth and development of both seed and fruit tissues relies on an adequate supply of energy. However, carbohydrates are typically in limited supply, and this supply is not sufficient to grow and mature all the fruit that was initially set. In response to this stress, trees typically experience a period commencing a few weeks after bloom wherein many of the newly developing fruits abscise. This abscission period is called June drop and it can last as long as one month. June drop can be considered a natural thinning process whereby the tree adjusts its crop load to enhance seed and fruit development and thus ensure reproductive success. In some years, when environmental conditions are unfavorable, too many of the fruits drop, and yields are reduced. In some cases, however, the trees retain more fruit than is acceptable from a horticultural standpoint. In the latter case, fruit-thinning procedures are advocated.

Chemical or mechanical fruit-thinning procedures for apples, apricots, grapes, nectarines, peaches, pears, and plums are routinely practiced. The horticultural goal of all fruit-thinning procedures is to adjust crop load so that it is balanced between overall yield and fruit size and quality (Fig. 19–19). Fruit size is an extremely important commercial issue, with large fruit usually being preferred by consumers. In almost all fruit crops, the size of the fruit harvested is negatively correlated to the number of fruits developed on the plant. Final fruit size more or less depends on the leaf-fruit ratio on a branch. The more leaves per fruit, the larger the final fruit size, but fruit size is increased at the expense of total yield. Thinning can be highly profitable, however, where a premium is paid for larger-size fruits. Fruit thinning is the best way to increase fruit size, although flower and bud thinning (by pruning out fruiting shoots) is also effective. Overirrigation or excessive nitrogen fertilization will not increase fruit size; in fact, these approaches can stimulate new shoot growth, which competes with fruits for carbohydrates.

Ripening fruit undergoes a series of chemical and physical changes (e.g., increased pigmentation, increased sugar levels, the development of volatile flavor components, etc.)
that determine the eating or processing quality of the product. Typically, if the level of carbohydrate supplied by vegetative plant tissues is inadequate for the number of ripening fruits present, the quality of those fruits will be diminished. As with training and pruning, maintaining a balance between vegetative and reproductive growth through fruit thinning is an important physiological goal. In addition to its effects on fruit size and quality, removal of excess fruits by thinning results in a greater allocation of carbohydrates for the root and shoot growth that is important for sustaining the productive life of the orchard. Also, if fruit loads are not thinned effectively, floral bud initiation for next year’s crop will likely be decreased, inducing the alternate bearing pattern discussed previously in this chapter. Judicious fruit thinning to control excessive fruit numbers during an on year is one of the most effective cultural procedures for an orchardist or a home gardener in overcoming alternate bearing. Even if alternate bearing does not occur, however, several consecutive years of overcropping can greatly weaken trees or vines. Last, the inordinate masses associated with an overabundance of fruits may structurally damage or break shoots and even large limbs that cannot withstand the physical stresses the fruits impose.

**REFERENCE DATE**

In the stone fruits, fruits that are small early in the season are also small at harvest time. Commercial growers of clingstone peaches and apricots have made use of this relationship to predict much earlier in the season average fruit size at harvest. The young, developing fruits are measured at a specific time, called a reference date. For apricots, this time is determined by cutting through the ends of the young fruits at intervals. The reference date is seven days after the pit begins to harden, when representative fruit samples are measured for size. The reference date for clingstone peaches is the same except that ten days are added to the date that the tip of the pit begins to darken. For clingstone peaches an average suture diameter of 34 to 35 mm (1.36 to 1.40 in) at the reference date is needed to produce an average diameter at harvest of 67 to 68 mm (2.68 to 2.72 in). This is sufficient to make 90 percent of the fruits larger than the minimum harvest size. If the young fruits at reference date are too small, the fruits are thinned to bring the remaining fruits to a satisfactory size by harvest time.
Thinning Requirements

It may be obvious that a fruit tree is overloaded with young fruits and needs thinning—but how much? It is difficult to judge because several factors are involved, such as the cultivar, time of fruit maturity, availability of water, general vigor and age of the tree, as well as growing conditions. Some general guidelines for fruit thinning can be given, however. Peaches are often thinned to about one fruit every 15 to 20 cm (6 or 8 in.) of shoot. Another rule is twenty-five to forty leaves per fruit for apples and about fifty leaves per fruit for peaches. Thinning to control yields and fruit size is so important in crops such as peaches and apricots that thinning tables have been developed to determine the optimum number of fruits to leave on the tree. These tables consider the distances between trees, fruit size desired (number per pound), and number of tons of fruit desired per acre. For example, if a 22.4 MT/ha (10 t/ac) harvest is desired for apricots and the trees are set on a 7.2 × 7.2 m (24 × 24 ft) planting distance, no more than about 3,200 fruits should be left per tree to attain a fruit size of at least 200 g (0.4 lb). Fruit counts are made on sample trees throughout the orchard to determine if the fruit set is uniform.

Chemical Thinning

The idea of using chemical sprays applied to trees to remove some of the fruits is definitely appealing, and much research has been given to develop thinning sprays to replace hand thinning. For apples, several natural or synthetic, hormone-based thinning sprays are available and are used commercially. However, the two most effective and widely used thinning chemicals are naphthaleneacetic acid (NAA) and carbaryl (1-naphthyl N-methyl carbamate.) It is often difficult to obtain consistent results with chemical-thinning sprays, and general recommendations applicable to different situations cannot be made. First, there is often a cultivar-specific response to chemical-thinning agents. For instance, NAA can be a successful thinning agent for late-maturing apples, but its use on summer cultivars results in foliage injury, premature ripening, and fruit cracking. The use of NAA on ‘Fuji’ and spur-type ‘Red Delicious’ often results in the formation of pygmy (small, seedless) apples. Carbaryl is a preferred thinning agent for the latter cultivar, but its use with ‘Gallia Beauty’ and ‘Rome’ can result in overthinning. ‘Honeycrisp’ may be overthinned if thinning agents
are applied in combination. Environmental conditions also affect the efficacy (potency) of spray compounds. In general, chemical-thinning agents remove more developing fruit if (1) the trees are not vigorous or have been only lightly pruned, (2) the bloom is particularly heavy or the flowers have not been well pollinated, (3) the humidity is high and the spray’s drying time is slow, and (4) the weather is cloudy and cool before or after bloom. There are exceptions to these generalities, however; For example, NAA is a more efficient thinner if it dries quickly. Adding a surfactant (wetting agent) to the tank mix increases foliar absorption rates and minimizes the effects of adverse climatic conditions.

With any chemical-thinning applications, proper timing is critical. Typically chemical-thinning treatments are applied at petal-fall or postbloom (ten to thirty days after full bloom). The critical periods for thinning are both cultivar- and product-specific. In general, it is recommended that late-maturing cultivars be sprayed when the predominant fruit in each cluster is approximately 11 to 13 mm in diameter and that early maturing cultivars be treated at petal-fall. Both NAA and its derivatives and carbaryl have applications as either petal-fall or postbloom sprays, whereas some of the newer thinning agent, such as Accel® [Benzyladenine, N-(phenyl)-1H-purine 6-amine] and Vydate and {oxamyl, 2-(Dimethylamino)-N-[(methylamino)carbonyl]oxy]-2-oxoethanoimido-thioic acid methyl ester} are labeled for postbloom treatments. With any chemical-thinning applications, proper timing is critical.

### Mechanical Thinning

Many other fruit crops are mechanically thinned. Hand thinning is the most precise method of thinning because the decision to remove a fruit is made on a fruit-by-fruit basis. However, it is laborious, time-consuming, and expensive and perhaps is a suitable method for the homeowner with only a few trees to thin.

As an improvement over slow and expensive hand thinning, long poles with sections of rubber hose at the end can be used to hit fruiting branches and knock off some of the fruit. Hand thinning to remove missed fruiting clusters may follow. Mechanical tree shakers, used in harvesting operations, are sometimes used to shake the trees to remove a portion of the small, immature fruits. Shaking can be satisfactory, but it is not very precise and the desirable larger fruits tend to be removed. A light machine shaking, followed by hand
thinning or pole knocking, works well in some cases. Hand thinning gives the best results, however, and should be used whenever practicable.

In addition to tree fruits, some vine crops are also thinned. To obtain better yields of high-quality grape berries, one extra bud on half or more of the fruiting spurs (spur pruning) and an extra cane or two per vine (cane pruning) can be retained. Thinning of grapes can be done as flower thinning—removal of part of the fruiting clusters before bloom—or cluster thinning—removal of clusters after the berries have set. Clusters or fruits should be thinned to reduce the crop to the amount it would have been had the extra fruiting canes not been left. The increased leaf area produced by retaining the extra spurs or canes to support the same number of fruits per vine raises the yield and the quality of the berries.

Because of the production of fruit-bearing shoots from latent or noncount buds, some cultivars of the French-American hybrids (e.g., Seyval blanc, Vidal blanc, and Chambourcin) need annual cluster thinning. This cluster thinning is necessary to maintain sufficient vine growth for subsequent production and to maintain grape quality.

Mature sweet and sour cherries, prunes, almonds, walnuts, pistachio and hazelnuts, cane fruits, bush fruits, and strawberries ordinarily do not require fruit thinning. During plant establishment and juvenility, however, some species benefit greatly from hand removal of flower buds or flowers to conserve carbohydrates for root and shoot development. For instance, it is recommended that flower buds and flowers be hand stripped from newly planted blueberries for the first two years of the planting. Strawberries grown in a matted-row system also benefit from flower removal in the planting year to proliferate runners (stolons) that will be used to establish the solid bed.

REFERENCE

HARTMANNS PLANT SCIENCE 4th ed.