



FACTSHEET



Fruit Program

Integrated horticultural and pest management of fruits in Massachusetts

Maintaining a Balance Between the Top and the Bottom of Apple Trees

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Regulation of vegetative growth in the tops of apple trees is one of the most important management activities. It can be a challenge in both dwarf and larger trees. Allowing excessive growth in the upper canopy will result in shading in the lower portions of the canopy, reducing vegetative growth, flower bud formation, fruit set, fruit size, and fruit quality.

Pruning often is used to control the growth in the tops of trees. Pruning, however, can result in the development of a “grow and cut” cycle, where excessive vegetative growth is removed, thus stimulating excessive regrowth which needs to be removed the next year, and so on.

Other techniques can be more useful than pruning for reducing this vegetative growth. These techniques can be divided between tree development to control top growth and controlling growth in a mature tree.

Tree Development

Managing a tree from planting to reduce the vigor of the leader is one way of eliminating the potential for excessive vegetative growth in the top of the tree. Two practices are appropriate: leader bending and leader renewal. These techniques are used most often in high density plantings of dwarf trees, but also may be applicable to low density plantings of semi-dwarf trees.

Leader Bending. Leader bending is used on a relatively vigorous leader, beginning in the first or second dormant season. Near the end of the dormant season, the youngest 12 to 15 inches of the leader is tied at an angle of about 45 degrees from vertical. In early June, the end of the leader is bent in the opposite direction to approximately 45 degrees from vertical. Over time, the leader develops a snake-like form. This type of training causes somewhat of a restriction in the flow of materials through the central leader’s conductive tissues and results in a slowing of terminal growth. In a study conducted

in 1992, Pioneer Mac/Mark trees were manipulated with various central-leader modifying treatments. The leader bending treatment resulted in a reduction in growth of the terminal shoot by 25%, but it also increased the number of lateral shoots by 75%. In some situations, this large increase in lateral shoot development may be excessive, resulting in the need to remove some of them by pruning. In general, however, leader bending produces a tree that is in balance without the use of excessive amounts of pruning.

Leader Renewal. Leader renewal is used when trees reach about two thirds of their desired final height. Simply, it is the removal of the top of the central leader down to a lateral in two-year-old wood during the dormant season. The lateral is tied to vertical in June, becoming the new leader. The result is to restrict the flow of materials through the leader’s conductive tissues by continually diverting it through these lateral branches which are converted to the central leader. In the study mentioned above, leader renewal reduced the growth of the terminal shoot by approximately 20% and reduced the number of laterals produced by approximately 25%. Although, with the Pioneer Mac/Mark trees we obtained very much the desired result, in some situations, the response to this type of manipulation is excessive growth.

Either of these methods of training a tree to reduce top vigor can be effective. The most important point is that growth should be managed so that the tops do not become excessively vigorous and a “grow and cut” cycle is avoided.

Top Control in a Mature Tree

Once a tree has become overly vegetative in the top of the canopy, pruning must be used to remove the excess growth, but girdling can be used quite effectively to reduce the regrowth that can occur. Two types of girdling may be used: scoring and ringing. Scoring is simply cutting through the bark



a



b

Figure 1. The effects of top scoring on mature Cortland/M.7 trees (a. without top scoring; b. scored approximately four feet down from the top of the two-year-old portion of the central leader).

down to the wood in a circle completely around the trunk. Ringing is similar except some bark tissue is removed. The width of the ring can vary, but usually the width of a pruning saw is adequate. Girdling should be performed approximately one to two weeks after bloom, when vegetative growth is four to six inches long. The height of the girdle depends upon where the growth control is needed, but for semi-dwarf trees, usually is best performed approximately three to four feet down from the desired height of the tree.

In one study with mature Cortland/M.7 trees, shoot length and shoot diameter in the tops of the trees were reduced by approximately 40% by scoring (see Figure 1). In another study, with Delicious/MM.106, shoot length was reduced by 20%, fruit set was increased by 50%, and flower bud formation was increased by 35% by either scoring or ringing. As was seen in this experiment, girdling affects more than vegetative growth. Long-term benefits will arise from its effects on fruiting. Increases in fruiting in the top of the canopy will shift that portion of the tree away from vegetative growth toward reproductive growth. The result will be weaker, more productive wood in the top of the canopy. Once this situation develops, pruning can be done that does not stimulate excessive growth.

Girdling in the top of the tree is a simple, but very effective way to break the “grow and cut” cycle. It can be used after a dormant season when the height of a tree was dramatically reduced or in situations where the top has been allowed to become overly vigorous. It also can be used before a dramatic problem develops, establishing the kind of weak wood and productivity that will allow pruning in the top of the tree that does not stimulate excessive growth.

Managing the growth in the top of apple trees must be part of the training process in every orchard. Mismanagement can lead to significant reductions in long-term productivity.