7 Training and pruning

Introduction

Citrus trees are a perennial crop. As long as they remain healthy, they can flower and fruit for years on end, sometimes for as long as twenty or thirty years. However, if the trees are not maintained at a proper size, the height and canopy shape of mature trees in a citrus orchard will not be uniform and the branches will be too crowded.

In a crowded orchard, diseases and pests can spread quickly. Fruit quality tends to be poor, and trees may not bear fruit every year. A proper training and pruning program is essential for the maintenance of a healthy, productive citrus orchard.

Objectives of training and pruning

There are three main objectives. The first is to increase the total effective leaf area, and promote photosynthesis by exposing the leaves to light and air. If branches are well spaced and properly oriented, they have plenty of space and light. This improves the efficiency of their water use, and also their conversion of available plant nutrients. In turn, this increases the yield and quality of the fruit.

Secondly, proper training and pruning of the tree keeps it in the right size, so that the grower can easily manage his orchard and tend his trees. It also increases the vigor of the tree, enhances its tolerance of various stresses, and helps maintain the most efficient balance between vegetative growth and fruiting.

Thirdly, by removing diseased or infested branches and exposing leaves to light and air, a good training and pruning program helps control pests and diseases in the citrus orchard.

Shoot growth and bearing habits of citrus trees

General characteristics of growth

All cultivated citrus species are evergreen trees, with one exception (trifoliate orange: *Poncirus trifoliata* Raf.). Neglected trees tend to have overgrown tops and produce crowded shoots. In a few years, the canopy becomes very dense and grows into a dome.
Branches in the interior may die from lack of sunlight. The tree will bear fruit only on the surface of the canopy, and will become progressively less productive.

Flushes

In tropical and subtropical areas, new shoot growth occurs in spring, summer, autumn, and sometimes even in winter. The spring and summer shoots are the most important ones. They should develop properly, and not be too vigorous.

Bearing habits

In a mature citrus tree, the bearing wood develops mainly from the spring and summer shoots. The

spring shoots which sprout from the bearing woods are the most productive ones. Single flowers or inflorescences may develop from the shoot apex or axillary buds.

Tree form and training system

Citrus trees can grow very tall. They should be trained into a suitable shape, with an open center. There are several advantages if growers follow such a system. The trees are easy to manage, including spraying and harvesting the fruit. There is rapid growth of the canopy in young trees, which also bear fruit early. The trees are easy to prune, and the bearing canopy covers a large surface area.

The procedure of the open-center training system is shown in Figs. 7-1 to 7-4. The typical tree structure which results from this procedure can be seen in Fig. 7-5.
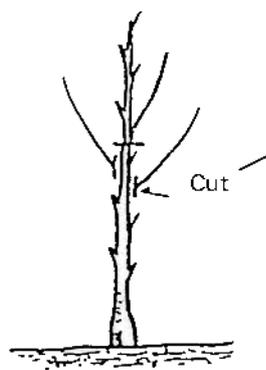

Fig. 7-1. **First year of planting.** After planting, when the leader grows to a height of 70 - 80 cm, it back cut to a height of 30 - 40 cm above the ground, and remove the side shoots
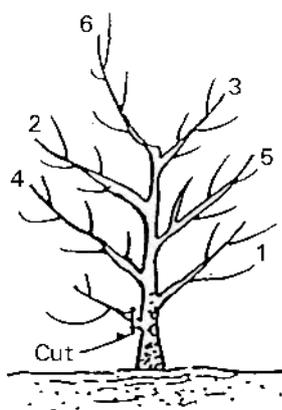

Fig. 7-2. **Second year.** Keep branches No. 1, 2 and 3, which will grow into scaffold branches. Pinch the ends of branches No. 4, 5 and 6, which should be cut off in the next two years.
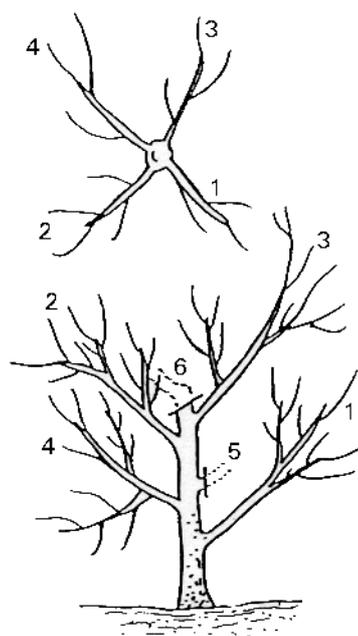
Pruning methods

Growers should select the correct time for their pruning. Since citrus trees are evergreens, they do not have a period of true dormancy. However, the metabolism of the tree is less active in the period after fruit harvest.

In countries with a cool winter, the metabolism is less active before the spring flush, because temperatures are lower and less water is available to the tree. In countries with a monsoon climate, trees may have a lower metabolism in the dry season.

It is this period of reduced metabolic activity which is the time to prune. Light pruning can also be conducted at other seasons to remove unwanted and overcrowded shoots.

Tree structure

Fig. 7-5 shows the different parts of the citrus tree. When the trees are being trained and pruned, growers must consider how these different parts should be distributed in space.

Fig. 7-3. **Third year.** Remove branches No. 5 and 6.

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Pruning principles and procedures

Fruit thinning

Fruit should not be allowed to ripen until the tree is mature. If the tree sets fruit during its second and third year, the fruit should be removed while they are small and green.

Fruit thinning in young trees will promote the growth of the canopy. Fruit thinning in mature trees will improve the fruit quality. Trees which bear heavy crops tend to produce small fruit.

Thinning will also correct the tendency found in citrus trees to bear a heavy crop of fruit only in alternate years, with few or no fruit during the year in between.

Don't remove too many shoots

In general, growers should be careful never to remove more than 15% of the total shoots. They should study the structure of each tree before they prune it.

Pruning should start at the top third scaffold branch, followed by the second and finally the first. For each scaffold, pruning should start from the secondary branch, and then the side shoots.

Undesirable branches and shoots

Diseased branches, or branches heavily infested with pests, should be removed. So should branches and shoots which are in the wrong position, or growing in the wrong direction. The undesirable branches and shoots of the citrus tree are shown in Fig. 7-6.

How to make the pruning cut

Heading back and thinning out are the two basic types of pruning cut. Heading back will promote the growth of lower buds and branching (Fig. 7-7).

Thinning removes the entire branch or shoot, to reduce the total number of the side shoots (Fig. 7-8). The branches and shoots which should remain after pruning are shown in Fig. 7-9. How the tree appears after pruning is shown in Fig. 7-10.
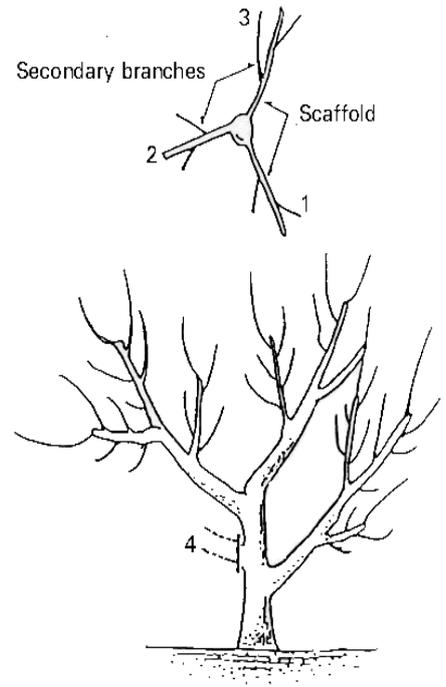

Fig. 7-4. **Fourth year.** Remove branch No. 4. Looking down on the trees, the angle between scalffolds should be around 120°. The vertical distance between scaffolds should be 20 - 30 cm.
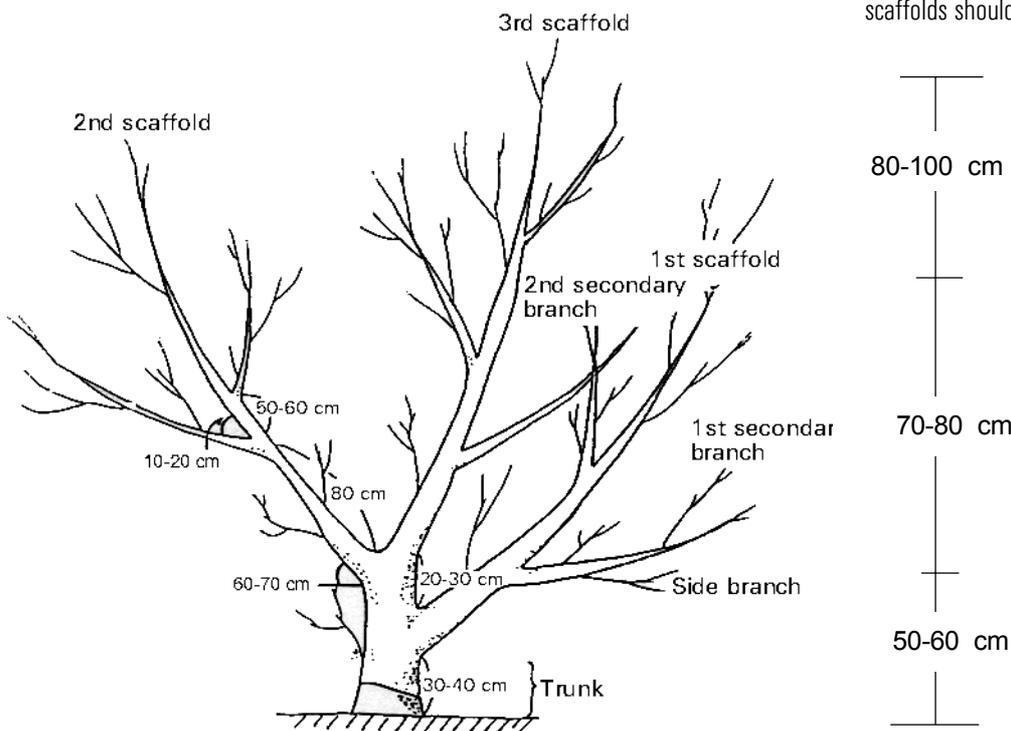

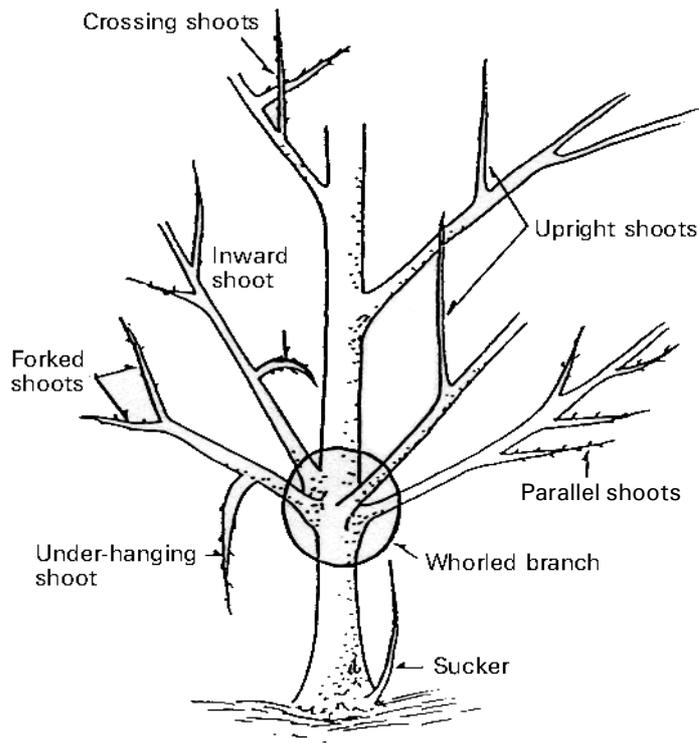Fig. 7-5. Arrangement of tree parts of a typical open-center training system

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Crossing shoots

Upright shoots

Inward shoot

Fig. 7-6. Undesirable branches and shoots

Forked shoots

Parallel shoots

Under-hanging shoot

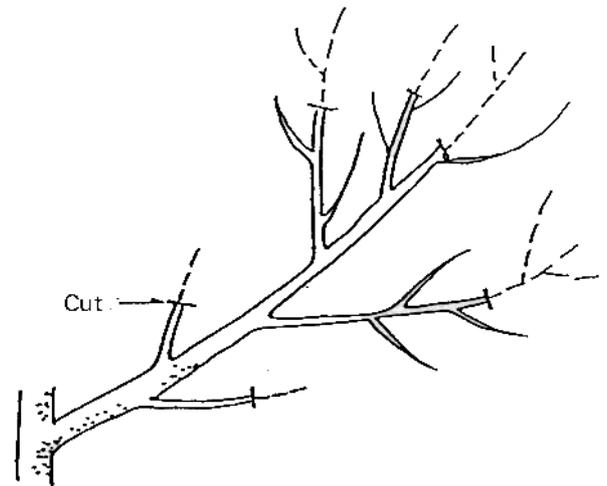Whorled branch

Sucker

Cut

Fig. 7-7. **Heading Back:** Shorten long shoots, side branches, and secondary branches
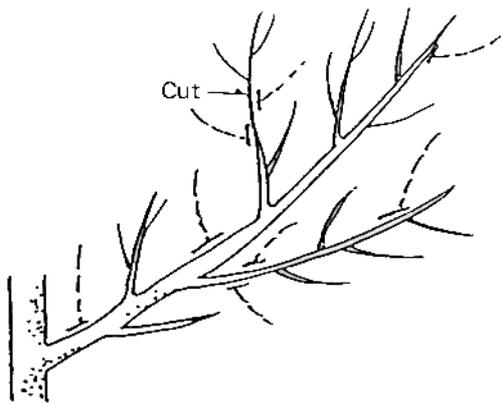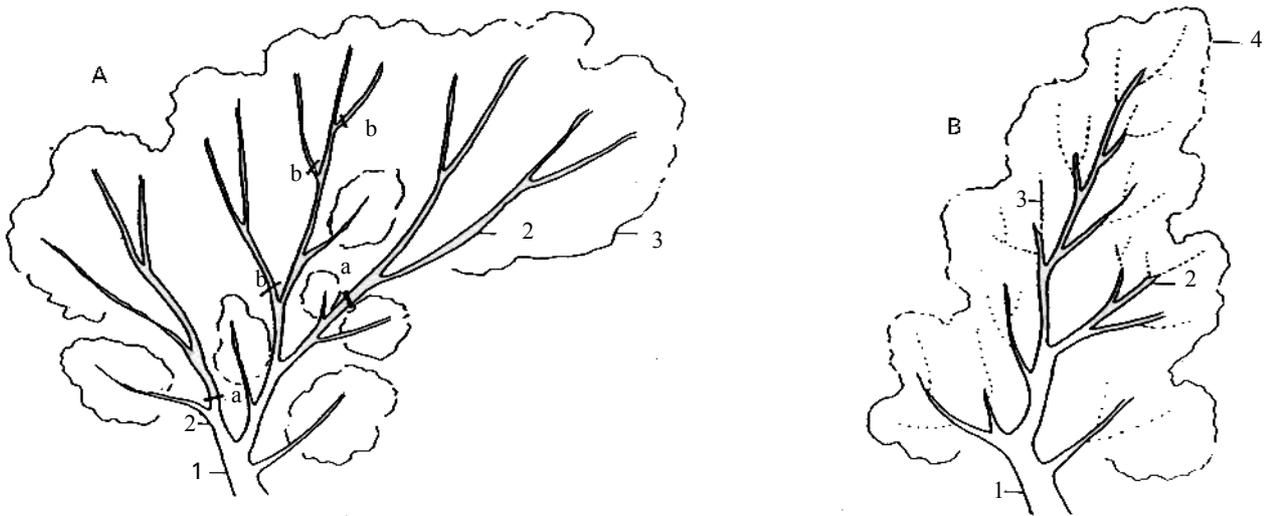

Cut

Fig. 7-8. **Thinning out**
Cut off some of the shoots and branches (shown as dotted lines)

Fig. 7-9. Branches and shoots remaining after pruning

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Fig. 7-10. **Pruning of side branches**
    A. Before pruning: 1. Secondary branch, 2. Side branch, 3. Leaf layer,
       a. Positions of cuts in 1st year, b. Positions of cuts in 2nd year.
   B. After pruning: 1. Secondary branch, 2. Side branch, 3. New shoot, 4. Leaf layer

Rejuvenation of old trees

In an old citrus orchard, the trees may lose vigor. Their yields decline and their canopies become too large. This is the time they need to be rejuvenated (Fig. 7-11). The procedure is shown in Fig. 7-12, Fig. 7-13, Fig. 7-14 and Fig. 7-15. It should be carried out over three or four years before it is completed. Fig. 7-16 shows the shape of the tree before and after rejuvenation.

Conclusion

There are many different cultivated citrus species, all of which have different growth and fruiting habits. Optimal light interception for the entire orchard is the first thing to be considered when choosing a training and pruning system. The second is the individual tree form and tree vigor.

    Tree age is another important factor that should be taken into account, because the tree's response to pruning varies according to its age. Therefore, citrus growers have to recognize the characteristics of the different cultivars they are growing, in order to select the best training and pruning system for their orchards (see Fig. 7-17, Fig. 7-18 and Fig. 7-19).
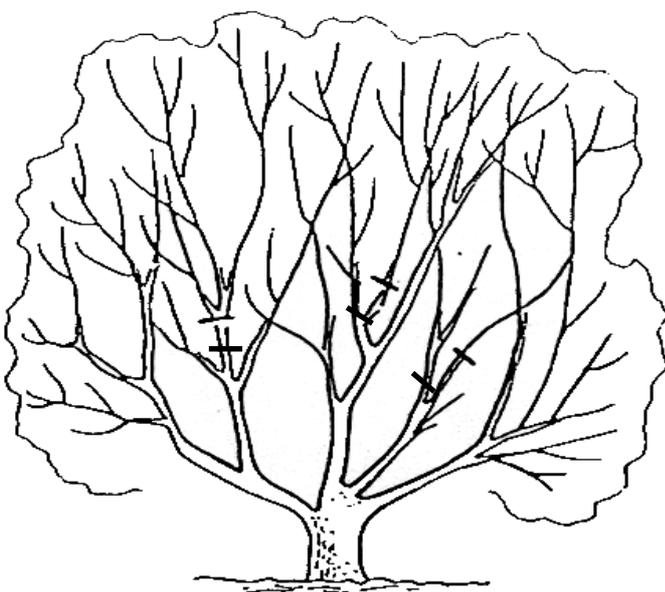
Fig. 7-11. **Old tree before pruning.**
    The short heavy lines mark the positions of the cuts made at the first winter-spring pruning
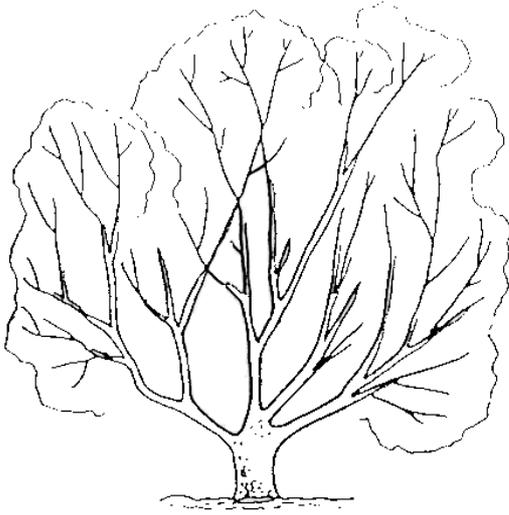
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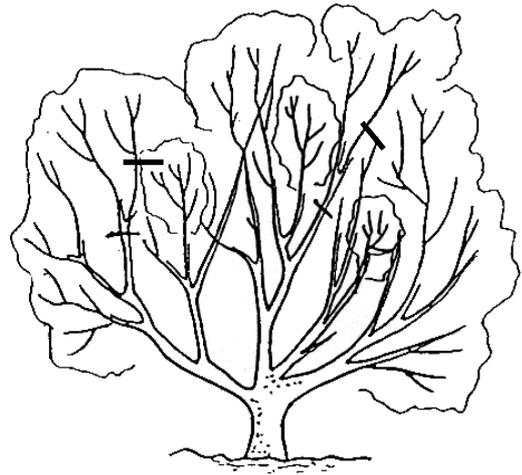Fig. 7-12.   The tree form after pruning

Fig. 7-13.   The short heavy lines mark the positions of the cuts made at the second winter-spring pruning

Fig. 7-14.   Tree shape after the second year's pruning. The short, heavy lines mark the positions of the cuts to be made the following year
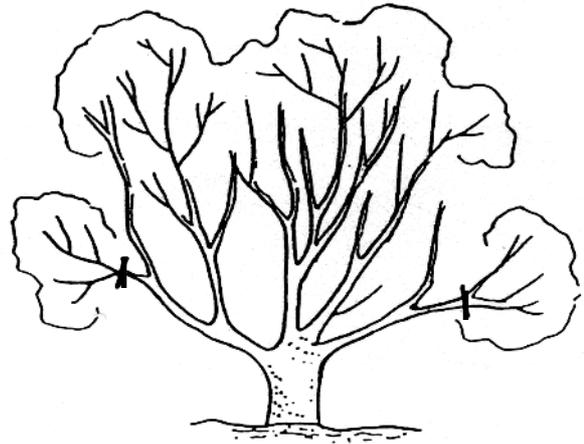

Fig. 7-15.   Tree shape after the third year's pruning. The short, heavy lines mark the position of the cuts to be made the following year
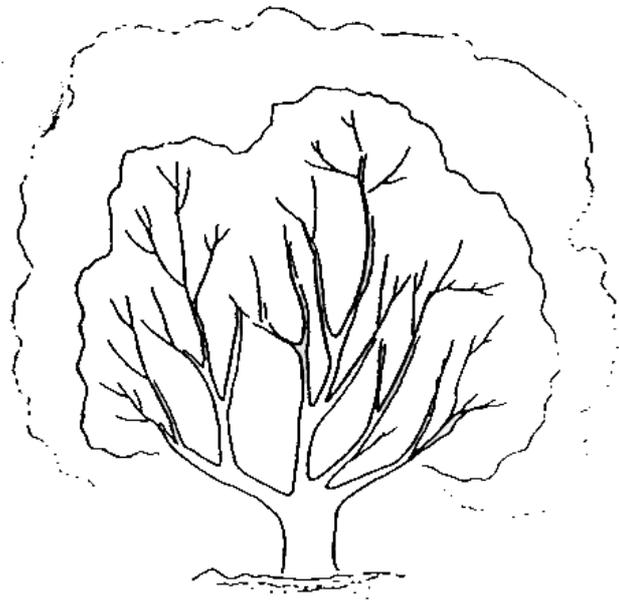

Fig. 7-16.   Tree shape before and after rejuvenation pruning

Fig.7-17.   A well-shaped citrus tree

Fig. 7-18.   Showing growers the right way to prune

Fig. 7-19.   (Left) A badly pruned tree, with poor fruit set
  on the lower branches. The upper branches have
  almost no fruit at all