CHAPTER 11

Training and Pruning in Orchard

Training and pruning are important orchard operations. Both the processes form an indispensable operation having direct bearing on growth and vigour of plants besides on yield and quality of fruits. A properly trained and pruned plants sustain heavy crop load and produce bounteous harvest of quality. Such plants develop strong framework free from drooping branches, narrow crotch angle, water sprout, root suckers and crown suckers, etc. (Fig. 11.1).

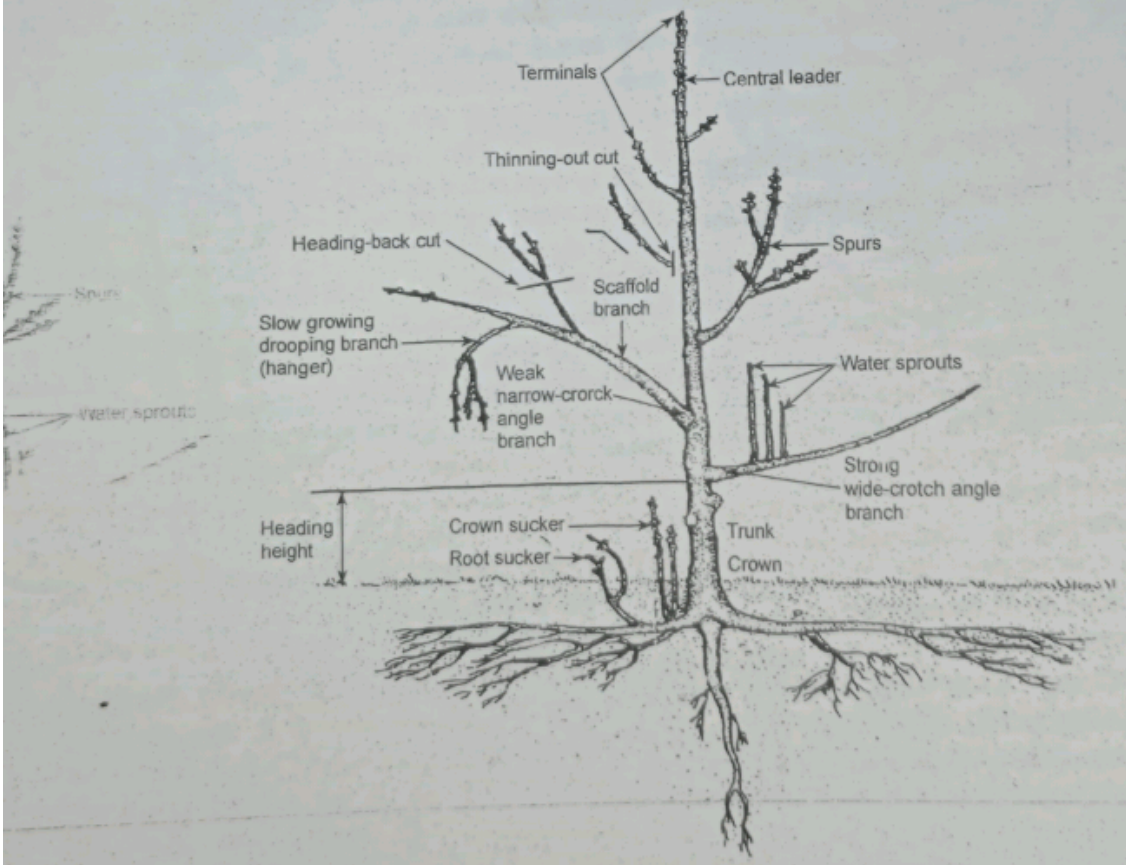

FIG. 11.1. The plant framework indicating various parts

Training refers to judicious removal of part to develop a proper shape of plant capable of bearing heavy crop load. Pruning is defined as the judicious removal of parts like root, leaf, flower, fruit etc. to obtain good and qualitative yield. Thus, it can be conceived that the training is related to shape and size of plants whereas pruning is related with harvesting better yield and more so with harvesting fruits of quality. Both the processes of training and pruning work together in maintaining shape and size of tree and harvesting desirable yield.

OBJECTIVES OF TRAINING

- To develop strong framework of tree.
- To control and regulate shape of trees so that orchard cultural operations, harvesting etc. can be done easily.
- To have a better crotch angle between scaffold branches of the trees.
- To facilitate interception of sunrays to each and every part of trees.
- To remove water sprout.
- To develop a balance between vegetative and reproductive growth of tree.

PRINCIPLES OF TRAINING

- Training should be started from very beginning age of the plant.
- Most of the fruit trees are trained through single stem system. However, being prone to insect attack, fruits like pomegranate, fig and custard apple are trained through multi-stemmed training system.
- In plants having prominent apical dominance, the terminal bud should be removed to facilitate emergence of side shoots. From side shoots selection is made for better shoots to be retained on the tree after training.
- The shoots having narrower crotch angle are discarded.
- Water sprout should be removed.
- Drooping branches needs to be removed.

METHODS OF TRAINING

1. Central leader system

In this system the main stem of the tree is allowed to grow uninterrupted. The first branch is allowed to grow at 45 to 50 cm height from ground level and other branches are allowed to grow on main stem at a distance of 15 to 20 cm. As the main stem grows continuously, in this system, the trees attain robust shape. Due to less interception of light by lower branches, mostly they remain unproductive. The bearing is confined in top portion of the trees. Furthermore, the robust shape of trees poses a problem in harvesting of fruits and practicing spray operation etc. The very high shape of plants make them prone to wind damage also. This method of training is not suitable for high altitude and hot arid places where wind velocity is high (Fig. 11.1).

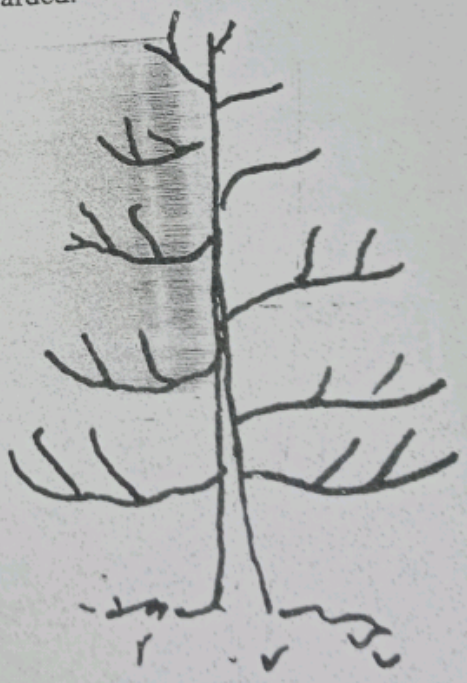

FIG. 11.1

2. Open centre system

In this system, when the plant attains a height of 40 to 50 cm, it is beheaded. From the subsequent vegetative growth, 4-5 branches well scattered, arranged and distributed all around the main stem are selected. The tree, thus, trained attains less height. There is better interception of light by all the shoots of the tree and all branches are capable of bearing flowers and fruits. This system facilitates easy carrying out of operations like harvesting and spraying on the tree. In this system, the plants take a bowl shape which provides a good base for settling of frost. Hence, open centre system of training is not suitable for high altitude where frost observance is common (Fig. 11.2).

FIG. 11.2

3. Modified leader system

This is intermediate form of central leader and open centre system and draws the benefits of both systems. In this system, the main stem is allowed to grow for 4 to 5 years. After that, it is cut at a height of 120 to 150 cm from ground level. On the main stem, the first shoot is selected at a height of 40 cm from the ground and 4 to 5 branches located at a distance of 15 to 20 cm and placed all around the main stem are selected. The plant, trained through this system, attains moderate height. All retained branches receive ample light and there is better production on the tree. This is very suitable method and practised in almost all regions. This system facilitates easy carrying out of orchard operations like harvesting, and spray of plant protection chemicals, nutrients etc. (Fig. 11.3).

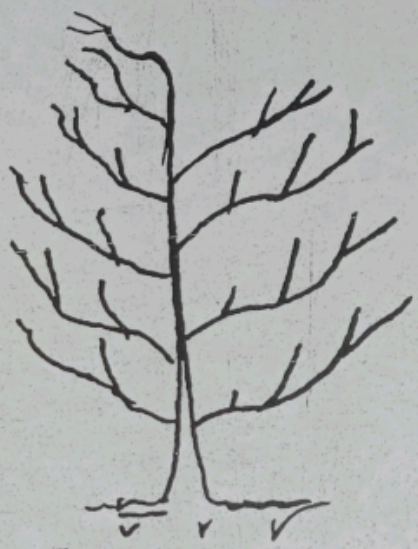

FIG. 11.3

SOME SPECIAL METHODS OF TRAINING

1. Bush system

In this system, the height of the plant is kept to 2.0 metres. During first year, the plant is cut at a height of 70 cm. No shoot is allowed to grow upto a height of 25 to 30 cm. Above this height, 3 to 4 branches are allowed to grow over which number of branches emerge out. The plants acquire the shape of bush. The centre of the plant is kept open. This system is suitable for apple (Fig. 11.4).

FIG. 11.4

2. Pyramid system

In this system, the plants are trained in a fashion so that the lower branches may remain longer and higher branches gradually smaller. The alternative tiers of horizontal branches radiating from main stem scattered all around, gives the plant an appearance of pyramid. The branches are allowed to grow on main stem at 20 cm height from ground level.

The plants are pruned from the tip of main stem and branches to maintain pyramid shape (Fig. 11.5).

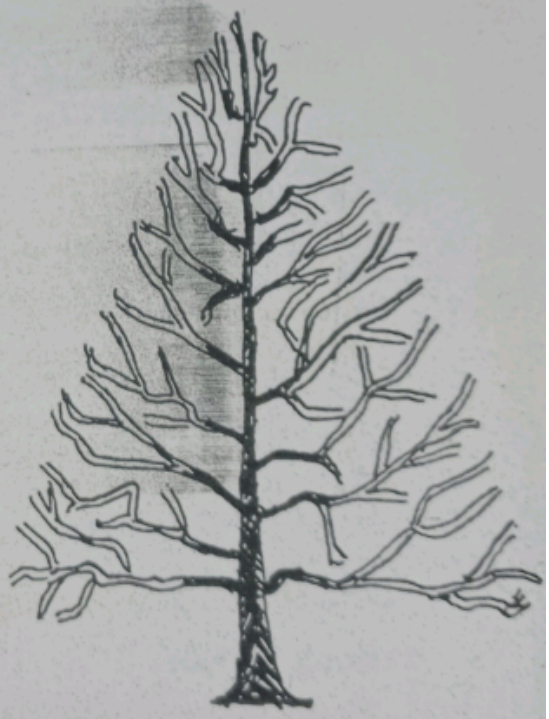

FIG. 11.5

3. Espalier system

The word *espalier* is French in origin meaning a fence, a fruit wall or paling'. It refers to the support used for training trees especially apples and pears. The tree trained through this system consists of three to six tiers of horizontal branches trained to grow one foot apart from one another at right angles to the main stem (See Fig. 11.6). Thus, the branches grow parallel to the ground. In this system, using poles, three to six rows of wires are stretched one above the other. The first row of wire is stretched at a height of 60 to 70 cm, the second row at 130 to 140 cm height and the third row is stretched at a height of 200 cm from ground level. Over these wires, the branches of the trees are trained in both the

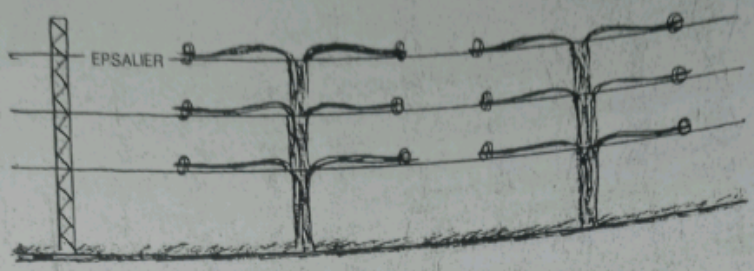

FIG. 11.6

directions parallel to the ground. In this system, the line to line distance of the plant is kept less as the plants are grown only in two direction along with wire.

4. Cordon system

Cordon refers to closely spurred single stemmed tree tied to a support *e.g.* wires or bamboo canes, either in vertical, oblique or horizontal position. This system usually finds favour in apples and pears. The trained plants bear early crop as compared to dwarf, pyramid and bush system. The plants are planted at a distance of 1 to 1.5 m. The stem of the plant is tied with wire. The wires of 12 to 13 gauge are fixed to the ground using cement and concrete at 4.5 to 6.0 metre interval. The plants are maintained single stemmed by practising severe pruning of emerged branches during winter and summer. Depending upon the number of main stem trained along with wire, the system is known as single cordon, double cordon and triple cordon (Fig. 11.7).

FIG. 11.7

5. Tatura trellis

This is a system of training fruit trees along with trellis of wire (Fig. 11.8) to harvest early and high yield without use of dwarfing rootstock. The alignment of tree lies in the centre of trellis and its branches are trained along the wires of the trellis. The system was developed by David Chalmers, Ban Van den Ende and Leo van Heek during the year 1973 at Irrigation Research Institute, Tatura, Victoria, Australia. The trellis of wire is erected using iron pole of 10.5 feet height over which $12^1/_2$ guage high tensile steel wire is stretched. In between two trellises, gap of 7 ft is maintained. The orientation of trellises are kept to north-south directions. Common orchard cultural practices are followed. Canopy of

tree is maintained under desired frame using mechanical hedger. Harvesting is done mechanically. However, the system is highly labour intensive, as it requires hand training and hand thinning also, to get more yields of large, high quality fruit. The system favours high yield owing to optimum light interception and close planting. This is suitable for training and maintaining orchard of apple, pear, peach, plum, apricot, nectarine, sweet cherry, kiwifruit, grape etc. which sustains the rigour of pruning.

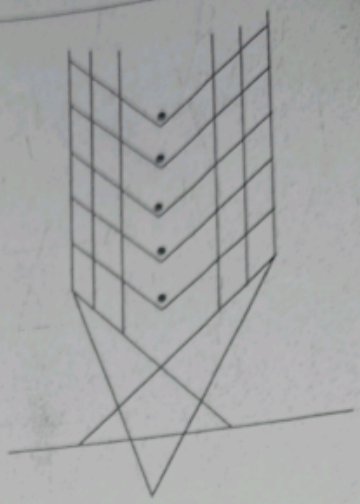

FIG. 11.8

TRAINING METHODS FOR GRAPE VINES

1. Head system

The plants trained through this system, develop in a bush shape. During early years, the vines require support. After 4 to 5 years, the stem becomes sturdy enough to stand at its own strength. The plants are allowed to grow to a height of 75 to 90 cm. At the terminal portion of shoot, 5 to 6 side branches are allowed to grow. The growth of side shoots, which are one year old, is pruned during winter (October in south India, January in north India). On pruned shoot, flowers and fruits appear. This system is suitable for less vigorous cultivar and is very simple and inexpensive. This is practised in Beauty Seedless, Perlette, Delight and Gold etc. cultivar (Fig. 11.9).

FIG. 11.9

2. Kniffin system

This is also known as 4-canes system. In this system, two rows of wires are stretched at a height of 1.05 and 1.65 metres from ground level with the help of iron or concrete poles. The

vines are cut at a height of 1.65 metres from ground level. Along with both the lines of wire, 2 branches of the vines are trained parallel to the ground. Thus, the vines develop 4 arms. This system is suitable for medium vigorous cultivar. This is practised in Beauty Seedless, Early Muscat, Banqui-Abyad, Bhokri and Delight etc. (Fig. 11.10).

FIG. 11.10

3. Telephone system/Overhead trellis system

This system is also known as 6-canes system. In this system, poles are erected at a distance of 3.6 to 4.8 metre. At the terminal end of pole, there is 1.2 m long arm. The arm is

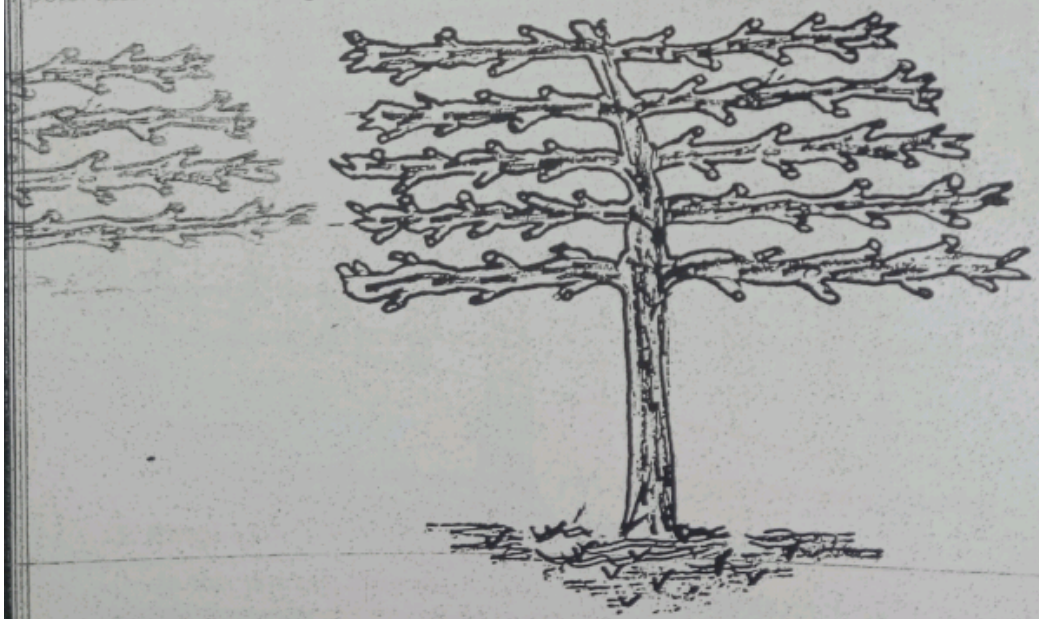

FIG. 11.11

drilled with 6 holes. Through these holes, 6 wires are stretched from one pole to another and the vines are trained over these wires. The vines are allowed to grow to a height of 1.5 to 1.6 m and then trained along with the wires.

This system is superior over kniffin system in which lower arm of the cane remains unproductive. In telephone system, as all the arms of vines are trained at the same height, hence there is no question of unproductivity of lower vines. Further, in telephone system, there is better penetration of light and good ventilation is there in each and every part of the vine. This system is suitable for moderately vigorous cultivar having more apical dominance (Fig. 11.11).

4. Bower system

This system is well-suited for vigorous cultivar like Anab-e-Shahi. The vines are trained on criss-cross network of wires. To create network of wires, poles are fixed at a distance of 4.5 to 6.0 metres. The poles are 2.1 to 2.4 metres high. Angle irons are fixed through poles to develop a roof like structure. At a distance of 60 cm, holes are drilled in angle iron. Through these holes, wires are stretched length and width wise to have a criss-cross network of wires. The vines are allowed to grow single stem till it reaches the network of wires. Then it is pinched off to facilitate production of side shoots. Two vigorous shoots in opposite direction are selected at the wire level for training as primary arms. On each primary arm, three laterals on either side are selected at 60 cm distance to develop as secondary arms. Each secondary arm is allowed to have 8 to 10 tertiary branches. The tertiary branches form the fruiting cane and covers the entire network of wire. It is most expensive of all systems but still practised at a commercial scale. In tropical climate, where the vine grows vigorously and have prominent apical dominance, bower system is best suited for training grape vines. This system has many advantages. As the grape berries remain hidden under canopy of leaves, the bird scaring is prevented in bower system. The berries are not desiccated by wind. Due to shade of vines, the weed growth in vineyard is smothered. The vines yield more. But this system is costly. Pruning and spraying operations on the trellis becomes difficult (Fig. 11.12).

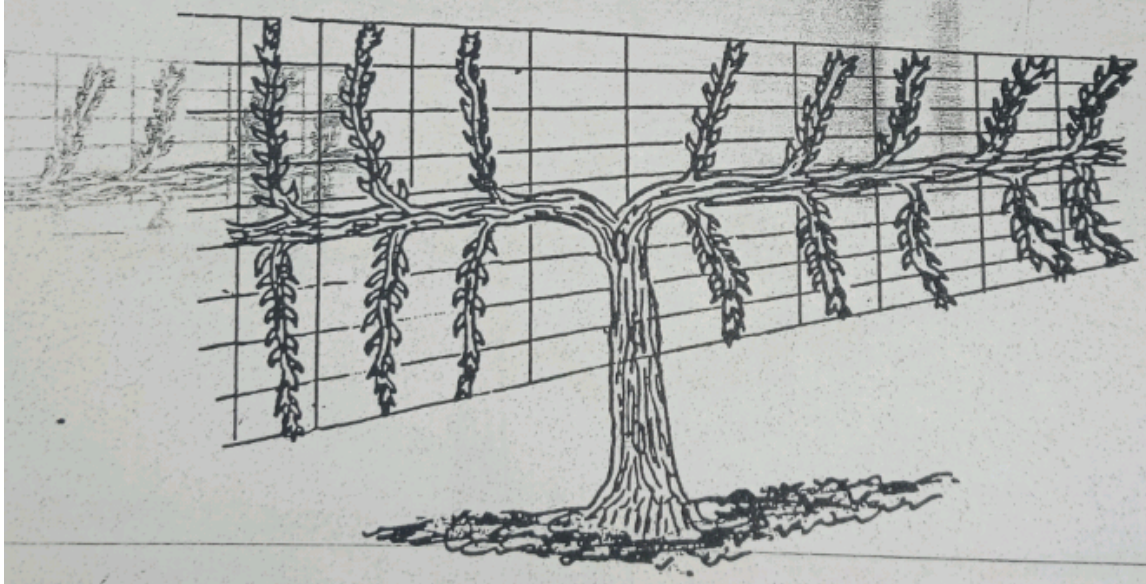

FIG. 11.12

PRUNING

Judicious removal of plant part to obtain better and qualitative yield is termed as pruning. Pruning is started in later part of plant life, when it becomes capable to produce flowers and fruits.

OBJECTIVES OF PRUNING

- To control flowering and fruiting.
- To augment production in plants which bear on new shoots.
- To obtain regular bearing.
- To remove diseased, damaged, insect infested and weak shoots.
- To thin out flowers and fruits.
- To ensure access to sunlight to bearing shoots.
- To invigorate the plants.
- To have a balance between vegetative and reproductive growth.

PRINCIPLES OF PRUNING

- Remove water sprout.
- To remove a shoot completely, it should be removed from the base.
- Avoid bark injury while pruning. To do so, the branches of bigger diameter should be cut from downward surface.
- Pruning should be completed well in advance of flowering season.
- In deciduous plants, pruning should be done in advance of winter so that low temperature injury may be minimized.
- Apply Bordeaux paste after pruning to avoid incidence of diseases.
- Crowded, interlacerating, diseased, damaged and insect infested shoots should be removed.

METHODS OF PRUNING

1. Heading back

Removal of terminal portion of shoot leaving basal portion intact is termed as heading back.

2. Thinning

Selective and complete removal of part of the plant is termed as thinning.

3. Ringing or Girdling

In this process, a circular ring of bark measuring about 3 cm in length is removed. It hastens flowering and fruiting by allowing greater accumulation of photosynthates in upward portion of the plant.

4. Notching

Making a notch above a bud by removing a wedge shaped piece of bark is termed as notching. It checks the influence of hormone and encourages growth.

5. Nicking

Making a notch below a bud by removing a wedge shaped piece of bark is termed as nicking. This ensures accumulation of carbohydrates from the leaves to the bud and may result in the formation of fruit bud.

All the above kinds of pruning are practised in case of stem. Root and leaf pruning are also in vogue. Root pruning is very essential operation in developing bonsai and growing potted plants.

The very purpose of maintaining plants in dwarf shape is achieved by root pruning. While repotting, a portion of coiled and old roots are removed to invigorate the potted-plants. In citrus fruits, root pruning is regularly done by tilling the soil during December-January. In guava, to regulate flowering, root pruning is done by digging trenches. Leaf pruning is very common practice in bonsai. A portion of leaves is removed to maintain the plant in dwarf form. In guava, newly emerged flush of leaves are pruned to regulate flowering.

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