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## Training: A tool for canopy management in fruit crops

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### Abstract

Training may be defined as the art and science of cutting away of portion of plant to improve its shape, to influence its growth, flowering and fruitfulness and to improve the quality of the product. It is done to divert a part of plant energy from one part to another part of plant or else it can be defined as judicious removal of plant parts to maintain the shape and size of plants to maintain the frame work of plant. Unmanaged tree canopy not only reduces the productivity of fruits but also deteriorates the quality of produce as well. Good Canopy management practices results in good sunlight penetration and good yield. It enables profitable cropping, high, regular yields and improved farm management practices, leading to higher productivity. This system of management produces high and regular yields of good quality fruits and low labour requirement to meet ever rising production costs.

**Keywords:** training, canopy management in fruit crops

### Introduction

#### Canopy management

Canopy Management is the manipulation of tree canopies to optimise the production of quality fruits. The canopy management particularly affects the quality of sunlight which is intercepted by tree for proper tree shape and it determines the presentation of leaf area to enhance incoming radiation. Advancing knowledge in tree architecture, growth physiology, water management etc. has enabled farmers to adopt closer planting and maintaining reachable canopy by tailoring soil and crop management applications to fit in varying conditions in the field. It enables profitable cropping, high, regular yields and improved farm management practices, leading to higher productivity. This system of management produces high and regular yields of good quality fruits and low labour requirement to meet ever rising production costs.

#### Principle of canopy management

The aim is to induce trees to maintain a balance in between vegetative and fruiting wood, with uncrowded bearing wood situated conveniently within the relative shelter of the well-lit, adequately ventilated inner canopy.

The CMS (Canopy management strategy) manage tree complexity through three phases

- Induction of complexity in young trees.
- Maintenance of complexity in bearing trees.
- Reduction of complexity of large, old trees declining due to the effects of age and/or shading.

#### Basic principles in canopy management are

- Maximum utilization of light.
- Avoidance of built-up microclimate which is congenial for diseases and pest infestation.
- Convenience in carrying out the cultural practices.
- Maximizing productivity with quality fruit production.
- Economy in obtaining the required canopy architecture.

#### Objectives

Canopy management is an essential tree management operation starts from the first year of plant and enables the plant to produce/yield high quality and quantity by providing proper framework and more fruiting/yielding area.

- a. To remove the apical dominance for encouraging branching.
- b. To remove unproductive over crowded branches.

- c. To remove diseased and dead wood branches.
- d. To encourage vegetative growth.
- e. To control the overall size of the fruit tree.
- f. To regulate fruiting for regular cropping.
- g. To give particular training.

### Requirement of canopy management

If canopies are trained and pruned there is reduction of water use. The more canopy reduction, the more transpiration reduction.

### Importance of canopy management

- For proper density of trees/unit area
- For proper use of natural resources
- For better management of agronomical activities
- For good quality fruits
- Increase in production/unit area
- Annually regular fruit production

### Training

It means developing a desired shape of the tree with particular objectives by controlling habit of growth. Training is started from nursery stage of plant. Some fruit crops mostly like grape vines, ber, fig, guava etc. require training.

### Objects of training

- Provides more light and air to the centre of the tree to expose maximum leaf surface to the sun.
- Proper growth of the tree so that various cultural operations such as spraying, harvesting can be performed easily and at lower cost.
- Protects the tree from sun burn and wind damage.
- Secures a balanced distribution of fruit bearing capacity of the tree.

### Principles of training

- Involves in formation of the main frame work, which must be strong. The branches must be suitable and spaced apart as well as the tree must be balanced on all the sides.
- It never allows several branches to grow at one place or very near each other.
- Another important point about training is that if two branches are growing at the same point try to train them to grow at a wider angle. Narrow angle is always weak.

### Types of training systems

#### Central leader system

In this system the central leader branches are allowed to grow independently so that it will grow more rapidly and vigorously than the side branches and tree become tall. Such tree bears fruit more near the upper portion. The lower branches are less vigorous and less fruitful.

**Advantages:** Such trees are structurally best suited to bear crop load and to resist the damage from strong winds.

#### Disadvantages

- Trees under this system grow too tall and are less spreading.
- The tree management (spraying, pruning, thinning and harvesting) is difficult.
- Impact of shading effect on interior canopy (the lower branches of such trees may be so much in shade that the fruit may not be able to develop proper colour.)

### Open centre or vase system

The main stem is allowed to grow only up to a certain height about 1.5 to 1.8 m and then it cut for development of lateral branches. It allows full sunshine to reach each branch and resembles a vase like structure.

#### Advantages

- The trees trained allow maximum sunshine to reach the branches.
- Better colouration of fruits on the interior side of the tree.
- Trees are more fruitful and low spreading tree greatly facilitate operations like spraying, pruning, thinning and harvesting.

**Disadvantages:** Such trees are structurally weak, and their limbs are more likely to break with crop load and strong winds. This system does not only need severe pruning to start with but also constant effort to maintain its form through drastic pruning treatment.

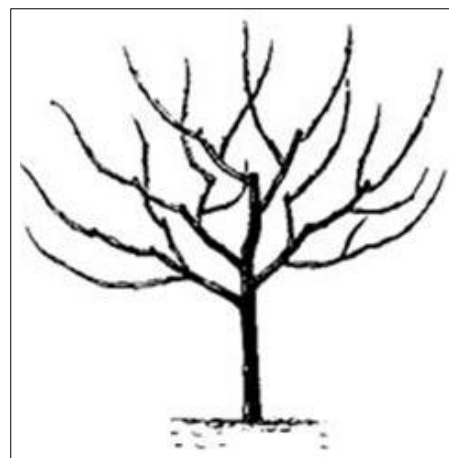


Fig 1: Open centre or vase system

### Delayed open centre or modified leader system

It is intermediate between the above systems. It is developed by first training the tree to the leader type by allowing the central axil to grow unpruned for the first four or five years. Then central stem is headed back and lateral branches are allowed to grow as in the open centre system.

#### Advantages

- The branches are well distributed, allowing plenty of sunshine to reach the interior of the tree.
- The trees are structurally strong and not prone to limb breakage.
- Owing to limited height of trees, spraying, pruning and harvesting may be done easily.

### Spindle bush system

Modification of the dwarf pyramid or intermediate between a vertical cordon and a bush form. It differs from the dwarf pyramid, it has no specific arrangement of scaffold branches and forms the vertical cordon, here the fruit is borne on short branches, not directly on the main stem or trunk. Most important feature of this system is the laying down of lateral shoots in a horizontal position with little or no summer pruning. It is trained with or without support posts with a central leader straight and with many small fruiting branches. These branches are bent out and down by spreaders to develop wide crotches and to induce early fruiting. Tree

spread is controlled by cutting back the shoots to ½ to ¾ of their length or back to weak laterals.

### Overhead trellis or Bower system

Bower system of training provides a desirable microclimate in the vine canopy and reduces the adverse effects of arid and hot weather on vine metabolism and life. In this system vines are spread over a pandal mounted at 2-2.4 m above the ground on poles made up of concrete, stone or iron.

### Modified bower or telephone system

It is similar to bower system, here in every two meter as space is kept to walk and carry out cultural operations.

### Cordon system

This is a system where in espalier is allowed with the help of training on wires. This system is followed in vines as these are incapable of standing on their stem. This can be trained in single cordon or double cordon and commonly followed in crops like grape and passion fruit.

### Kniffin system

A main stem or a vine is carried to the upper supporting wires. Renewed fruiting vines are tied. The bearing of fruiting vines are allowed to hang down. It is most adopted, easily understandable and easy to maintain. Provides higher yield and cost are effective in nature. The yield may vary hence it is important to adopt the specific system depending upon the crop.

### Head training systems

When the growth commences, two shoots are selected and the remaining shoots are removed. The two shoots selected are then trained up using the stake and tied loosely to provide support but prevent girdling.

### Advantages

- Ease of pruning to long canes.
- Vertical distribution of fruit.
- More compatible with tolerating winter injury than cordon systems.

### Disadvantages

- Requires annual tying of canes.
- Difficult to maintain quality on lower wires (shading).
- Not compatible with systematic leaf removal & shoot positioning.

### Pyramids training systems

Consists of a tree with a central stem about 2.5 m tall from which short branches radiate in successive tiers so that a pyramidal shape is build up. Fruiting spurs are developed on the short branches. Summer pruning forms an essential part of success with dwarf pyramids

### Espaliers

Similar to Kniffin system of training grapes. The trellis is 5 feet high with either 2 wires at 3 feet and 5 feet or 4 wires at 2, 3, 4, and 5 feet.

### Y shaped

One of the highest yielding systems. This system appears to be V shaped. Here trees are planted about 6 x 1 m apart (1668 trees/ha) bearing starts in the second year. Main framework

consists

### Advantages of training systems

#### Prevent weaker stem from lodging

Lodging means the displacement of the stem or root from their proper position. However, lodging is caused by many factors including wind and rain. And considering the weaker stem of plants and weight of the fruits, the right option is to provide support to get fruitful results.

#### Helps positioning of the leaves for adequate sunlight

Sunlight is very vital to the growth and increases the yield of crops. When crops do not receive an adequate amount of sunlight, they tend to wither or grow poorly. Trained crops are directed to receive an adequate amount of sunlight as they grow vertically. The leaves are better exposed to sunlight and the outcome is successful.

### Conclusion

Unmanaged tree canopy not only reduces the productivity of fruits but also deteriorates the quality of produce as well. Good Canopy management practices results in good sunlight penetration and good yield. It enables profitable cropping, high, regular yields and improved farm management practices, leading to higher productivity. This system of management produces high and regular yields of good quality fruits and low labour requirement to meet ever rising production costs.

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