

Canopy Management in Fruit Crops

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Abstract

Canopy in a fruit tree refers to its physical composition comprising of the stem, branches, shoot and leaves also the number and size of the leaves, determining the density. Canopy management in fruiting trees has been practiced over the years for increasing the productivity and quality of the fruits. Management of canopy architecture is one of the predominant technologies by which huge and unmanageable trees are properly managed to make them more productive. Canopy management is the manipulation of tree canopies to optimize its production potential with excellent quality fruits. Canopy management deals with the development and maintenance of their structure in relation to their size and shape for maximizing productivity with quality fruits. To optimize the utilization of light for increased yield of quality fruits, canopy management deserves greater attention by exploiting the various available techniques like

training, pruning, skirting, notching, girdling, selection of proper rootstock, use of genetically engineered plants with altered architectural characters would help in maintaining the ideal canopies of trees. The basic objective of canopy management is to maximize light interception to optimize light distribution within canopy and to maintain proper airflow. Canopy management enhances productivity, improves fruit quality, facilitates cultural practices and help in management of pest and disease. In new plantations initial training and pruning is given to develop strong framework of the tree whereas in old plantation the aim of canopy management is to reduce tree height and make provision of solar radiation inside the canopy by thinning out excessive biomass.

Keywords: Canopy, training, pruning and tree management.

Introduction

Canopy management is one of the most important fruit plant management practices. This forms the basis of the precociousness and longevity of the fruit trees in an orchard. The strong scaffold system helps the trees to produce heavy crop loads of quality fruits without any major limb breakage, for example, Patharnakh. Some trees bear regularly only if pruned every year, for example, peach and grapes. Regular annual pruning is essential for the induction of a good amount of new growth, which will provide the tree with maximum fruit bearing area uniformly over the whole tree. Unpruned trees grow beyond limits provided for each tree in an

orchard. The branches start intermingling with the branches of adjacent trees giving an impression of a jungle. The photosynthetic activity of the trees gets adversely affected leading to the poor yields of low-quality fruits. Orchards become economically unproductive. To keep the fruit trees within the area provided for their spread for the whole of their life, canopy management is of prime importance. Many factors go into the production of fruits. One factor is the optimum quantity of light. When the fruit tree absorbs the right amount of sunlight, it can produce high-quality fruit. It is therefore essential for a fruit farmer to pay

attention to the tree canopies. And this is where canopy management plays a role.

Strategic canopy manipulation optimizes light distribution, enhances air circulation, and

Principles 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.

- Maximum utilization of light.
- Avoidance of built-up microclimate congenial for diseases and pest infestation.
- Convenience in carrying out cultural practices.
- Maximizing productivity with quality fruit production.
- Economy in obtaining the required canopy architecture.
- Induction of complexity in young trees.
- Maintenance of complexity in bearing trees.
- Reduction of the complexity of large, old trees declining due to the effects of age and/or shading.

Dwarfing rootstocks

Fruit Crops	Rootstocks	Desirable Characters
Apple	M-27	Ultra-dwarf, Suitable for (HDP) Semi dwarfing
	M-9	Dwarf, Suitable for (HDP) Precocious and very Productive rootstock.
Ber	<i>Ziziphus nummularia</i>	Dwarf, Salt tolerant.
Citrus	Troyer citrange	Suitable Dwarfing rootstock for Kinnow in India
	Flying dragon	Potential dwarfing rootstock (HDP)
Mango	Vellaikolumban	Dwarfing rootstock for Alphanso and Dasehari
Guava	Pusa Srijan	Dwarf rootstock for Allahabad Safeda.

Pruning Methods

Heading Back: Removal of terminal portion of shoot leaving basal portion intact is termed as heading back. e.g. Mango, Guava, Banana and Peach.

Thinning out: Selective and complete removal of part of the plant is termed as thinning. e.g. Apple, Plum, Pear.

Ringling or girdling: In this process, a circular ring of bark measuring about 3 cm in length is removed. Complete removal of the bark from the branch or trunk. Ex. Grapes.

improves spray coverage, reducing disease pressure while promoting uniform fruit ripening and superior quality across high-density plantings.

Objectives of Canopy Management

- The basic objective of canopy management is to maximize light interception to optimize light distribution within canopy and to maintain proper airflow.
- Canopy management enhances productivity, improves fruit quality, facilitates cultural practices and help in management of pest and disease.
- Economy in obtaining the required canopy architecture.
- To facilitate cultural practices.
- To increase input use efficiency.

Techniques for Canopy Management

- Use of dwarfing rootstocks.
- Pruning
- Training
- Growth Regulators

- Increase fruit bud formation.
 - Interrupts the downward passage of carbohydrates
 - Mango -force flowering over vegetative tree.
 - Grape -promote fruit set and large size fruit.
- Notching:** Making a notch above a bud by removing a wedge-shaped piece of bark is termed as notching. Increases yield of fig trees in Pune Produce strong shoots in apples. e.g. Fig.

Nicking: Making a notch below a bud by removing a wedge-shaped piece of bark is

termed as nicking. e.g. Apple and Tea.

Training Methods

Central Leader System: The central leader is allowed to grow uninterrupted. The secondaries grow on the central axis on all directions. The fruit tree grows in a natural way. The tree trunks become very strong due to the spread of many scaffolds and secondaries. The trees become tall and spread mostly unmanageable at maturity. This system is most suited to litchi and mango.

Open Centre System: The plants are planted in the orchard and simultaneously headed back to 75 cm height. The well placed 4-5 side branches are allowed to develop on the main axis. The top growing axis is again cut and is not allowed to resprout and give side branches. The selected scaffolds are made to produce secondaries and tertiaries just like in modified leader system. Thus, the tree gives the appearance of the umbrella. The limbs can cause breakage on the small main axis due to over weight of fruit on few scaffolds in comparison to modified leader system. This system is preferred for those fruit trees which have 10-15 years of life span example peaches and plums. This system is very suitable for exotic peaches in North Indian plains.

Modified Leader System: The central leader is allowed to grow to produce 3-4 side branches, then it is headed back at 75 cm height for low headed and at 90 cm for high headed plants. In the next year, the top bud sprouts to take the shape of the central leader, which is again headed back after getting 2-3 scaffolds at the last scaffold giving it an open centre. This can be done after 2-3 years of removal of the central leader that is why the system of training is called modified leader system of training. In all, there can be 5-7 scaffolds on which secondaries are made to develop by removing apical dominance of each scaffold periodically. Thus, a tree takes the shape of an umbrella in spread and a cone in height. Modified leader system trees possess a strong durable framework like central leader system and openness of the open-centre system. Trees do not grow as tall as in central leader system, thus remain manageable for a long time. Orchard efficiency is never adversely affected due to overgrowth. There is no breakage of limbs due to the load of the fruits. This system is suited to pears, peaches, guava, mango, litchi and many more which can grow to form big trees.

Some special training methods

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 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. e.g.: Apple and Pear.

Espalier System: The word espalier is French origin meaning a fence, the tree are trained through this system consists of three to six tiers of horizontal branches trained to grow one foot apart from each other's. Hence, branches grow parallel to the ground. e.g.: Guava, Peach, Citrus and Apple.

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. The plants are planted at a distance 1 to 1.5 m. This system usually finds favour in apple and pear.

Tatura trellis: The system was developed by David Chalmers, Vanden Eude and Leo van Heek during the year 1973 at Irrigation Research institute, Tatura, Victoria, Australia. The orientation of trellis kept to North-South direction. This is suitable for training and maintaining orchard of apple, pear, peach, plum, apricot, sweet cherry, kiwifruit and grape.

Training methods in grape vines Bower System

This method is most popular in south India. The vines are trained on criss- cross network of wires poles are fixed at a distance of 4.5 to 6 meters [roof like structure/mandap] Most expensive but practiced at a commercial scale. e.g.: Thompson Seedless, Anab-e-shahi and gulabi etc.

Head System: In the head system of training, plants develop in a bush system, growing to a height of 75 to 90 cm with 5 to 6 side branches allowed at the terminal portion of shoots, as practiced in cultivars like Beauty Seedless, Delight, Parlette, and Gold.

Kniffin System: The Kniffin system, also known as the 4-cane system and first developed by William Kniffin in 1850, involves cutting vines to a height of 1.65 meters from ground level and is used to some extent in India, particularly in cultivars like Beauty Seedless, Early Muscat, and Delight.

Telephone System: The Telephone System, also known as the Overhead Trellis or 6-cane system, allows vines to grow to a height of 1.5 to 1.6 m before training on wires, proving superior to the Kniffin system by enabling better light penetration and good ventilation throughout each part of the vine.

Growth Regulators

Fruit Crops	Chemical	Role
Litchi	Paclobutrazol 5ml/m ²	Reduce tree growth
Grape	B-9 2000 ppm or thiourea 2000 ppm.	Enhance fruit bud differentiation.
Citrus	CCC 3000 ppm	Enhance flowering sex ratio and fruit set.
Ber	NAA 10 ppm.	Increases fruit set and TSS
Mango	Paclobutrazol 5ml/m ²	Control vegetative growth, induce flowering, and increase fruit yield.

Conclusion

Proper growth and definite shape of tree and more number plants per unit area can be obtained through canopy management. Reduced the infestation of insect pests and diseases through canopy management to get good quality of fruits. Dwarfing rootstocks can be used in

several fruit crop production system, especially in high density planting. A better understanding of rootstock and scion interaction, climatic factor needed to be studied, which would aid more efficient selection and use of rootstock in future.