RAMA UNIVERSITY, KANPUR, UTTAR PRADESH

Faculty of Agricultural Sciences & Allied Industries

Dr. Sharvan Kumar, Assistant Professor, (Horticulture)

Course: Hi- tech Horticulture (UGE-321)

Lecture- 7

Canopy management of high density orcharding

Canopy management is the manipulation of tree canopies to optimize the production of quality fruits. The canopy management, particularly its components like tree training and pruning, affects the quantity of sunlight intercepted by trees, as tree shape determines the presentation of leaf area to incoming radiation. An ideal training strategy centers around the arrangement of plant parts, especially, to develop a better plant architecture that optimizes the utilization of sunlight and promotes productivity.

Light is critical to growth and development of trees and their fruits. The green leaves harvest the sunlight to produce carbohydrates and sugars which are transported to the sites where they are needed – buds, flowers and fruits. Better light penetration into the tree canopy improves tree growth, productivity, yield and fruit quality. The density and orientation of planting also impact light penetration in an orchard. Generally, in close planting, quicker shading becomes a problem. An east-west row orientation results in more shading as compared to the western and southern orientation of trees. Strong bearing branches tend to produce larger fruits. The problem of a fruit grower is initially to build up a strong and balanced framework of the trees, then equip them with appropriate fruiting. Obviously, pruning in the early years has to be of a training type to provide strong and stocky framework with well spaced limbs or any other desired shape.

Some of the basic principles in canopy management are:

- Maximum utilization of light.
- Avoidance of built-up microclimate 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.

Bael

New orchards of bael should also be trained like mango for proper orientation of newly developed shoots and ideal development of canopy. In bearing orchards, to reduce the height of tree, centrally located, upright growing branches should be removed from their place of origin. Productivity of senile and bael orchards grown from seedlings can also be improved by rejuvenation through top working with improved cultivars.

- During first year after planting, its plants are headed back at 0.90cm – 1.0m from the ground level, for emergence of new growth below the cut points.
- Three to four equally spaced shoots are retained around the stems to form the main scaffold of the trees. These shoots are allowed to grow approximately for 6-7 months then these selected shoots are further pruned to 50% of their total length for emergence of new shoots below the cut point. As a result, new shoots emerge which are allowed to develop further.

Top Working

- For top working, selected senile trees or trees grown from seedlings with inferior fruits should be headed back at a height of 1.5-2.0 m from the ground in winter. This results in profuse sprouting of shoots near cut ends during spring season.

- Like mango, thinning of excessive shoots is also needed. Thinning should be done twice at a monthly interval during May and June. Thinning of excessive shoots should be done to keep 6-8 healthy, well developed and well distributed shoots per branch.

- Top working by patch budding of improved cultivars can be done on these shoots during June-July. These shoots develop in two years and they start fruiting afterwards.

Banana

In most banana growing regions, solar radiation is abundant and productivity of banana largely depends upon the efficient utilization of this resource. In multistorey cropping system, banana is grown to harness maximum light, land and nutrient availability. Light interception, soil fertility, climatic conditions, soil moisture etc. are important points to be considered for laying out of high density plantation.

- Pruning of surplus leaves is a common operation in banana cultivation. Leaf pruning improves light penetration and reduces disease spreading through old and senescent leaves. The micro climate, especially availability of light and heat is improved by removal of leave. For optimum crop production, minimum of 12 leaves are required to be retained.

Ber

Although ber is not popularly grown and is not a commercially important fruit crop, it has better adaptability in marginal soils in arid regions of subtropics.

- After transplanting in the field and providing the vertical support during its growing period, no shoot is allowed to grow up to 80-90 cm.

- The height of the head is kept comparatively more than other fruit trees to avoid the drooping branches reach and spread on the ground. Beyond this height, 4-5 side shoots which are properly placed are selected to form scaffold limbs.

- During first 2-3 years after planting, ber trees are trained to develop a strong framework. After that, old growth is beheaded during March, keeping 1-2 nodes above the graft union to allow vigorous new growth.

- One upright growing vigorous shoot is retained to develop into main trunk whichis kept clean of secondary branches up to 30 cm. height from theground level.

- On the main trunk, 3 or 4 well spaced and favorably located main branches are allowed when it is headed back. During second year, these main branches are also clipped, retaining 3-4 secondary branches on each of them. This process is continued to develop tertiary branches. Upward growing shoots are retained at each stage to develop an upright statured tree. Not more than one upright growing shoot is retained at a node so that narrow crotches are avoided. This basic frame of the tree is maintained by removing water sprouts as and when they emerge. Correction in the framework is done at the time of annual pruning.

- Annual pruning in ber is essential to induce maximum number of new healthy shoots which bear good quality fruits. It is also essential to remove the undesirable, weak, intercrossing, diseased and broken branches to avoid crowding and to encourage healthy growth for maximum fruit bearing.

- Pruning is done during the hot and dry season when tree sheds leaves and enters into dormancy. In Tamil Nadu, its trees are pruned during January- April in Maharashtra, pruning must be completed by the April end, while in Haryana by the May end. Severity in pruning also differs at different locations. In general, light pruning, at about 25 buds, is the best. However, pruning could be done at 15-20 buds under more moderate climatic conditions.

- All the secondary shoots should be completely removed. To avoid the occurrence of long, unfruitful basal portions of branches caused by lightpruning of several years, half the past season's shoots are pruned down to 20 buds, while the remaining half to the basal 1 or 2 nodes.

- Spraying of 3% thiourea or potassium nitrate once in 2 days before pruning induces bud sprouting from maximum number of nodes.

Cashew

Canopy in cashew, a fast growing woody perennial, is characterized by spreading branches and irregular shape. Plantations having trees of irregular canopy shape and size are difficult to manage and thus result in poor nut yield in later years. Plants should be meticulously trained from the first year of orchard life itself so as to derive maximum benefit of high density system of planting and avoid thinning of plants. It is advisable to adopt modified leader system or open center system of training for plantations with wider spacing in order to avoid overlapping of canopies at later stage of orchard life.

Initially, grafts are allowed to grow with a clear single stem up to a height of 75- 100 cm by removing all side branches. Thereafter, branching is allowed in all directions in different whorls up to a height of 3-4 m and subsequently, the central leader is de- topped at a height of half of the spacing given between the plants to ensure a semi globular canopy shape. Further, regular trimming of branches and removal of criss cross and low spreading branches should be resorted to in order to maintain the canopy size and shape.

- In **Modified Leader System**, the side sprouts on leaf axils of young grafts are removed periodically during the first year as and when arise and a clear single stem of 0.5-0.75 m from the ground level is maintained and later the trunk is allowed to branch in all the directions. The central leader is de-topped at a

height of 3-3.5 m and a clear semi globular canopy should be allowed to form. Height of de-topping may be decided depending on spacing allotted to plants. Less spaced plants are de-topped at a lower height.

- The canopy needs annual maintenance by minimum trimming of the over growth after harvesting of fruits. This kind of canopy helps in tapping maximum sunlight and helps in reducing the dead wood and water shoot development. The system is well suited for plants spaced at spacing closer than 5 m x 5 m.
- In **Open Centre System**, the plant is allowed to grow up to a height of 0.30-
- 0.45 m height from the ground with a clear single stem and then the main stem is pinched off in this system. The lateral shoots in all directions are encouraged to grow and form a vase shape.
- Canopy shape is maintained by minimum trimming annually. This shape helps in flowering and setting of nuts both in inner and outer surfaces of canopy and covers the allotted space faster. For plantations having wider spacing (8m x 8m), the system is adoptable but it cannot be adopted in very closely planted plantations.

Pruning to Bush Shape

These training systems can be adopted in closely spaced plantations and need to attempted from the initial years of planting. In closely planted plantations under high density system, canopy development within the manageable size is most essential. Plants can be pruned to bush shape at a height of 0.75-1.00 m. The yield of bush pruned plants is superior even at a closer spacing of 2.5m x 2.5m during several years at the beginning. Thus, a yield of more than 4 tonnes/ha can be achieved.

Canopy Management in Productive Orchards

- Cashew responds very well and gives higher yield when exposed to bright sunlight. Well maintained cashew plants need annual pruning and trimming to get proper shape and to tap maximum sunlight which leads to better photosynthesis.

- In a plantation, inter-mingling branches with neighboring trees need to be trimmed every year and a clear gap of minimum one foot may be maintained for tapping the intermittent light.
- Depending on the spacing of plantation, the height of tree canopy should be regulated so as to overcome the shading effect of plants over neighboring plants. For example, height of plants spaced at 5m x 5m is contained at 2.5 m. Similarly, in the plantations of 8m x 8m spacing, the plants are de-topped at 4m height.
- While attending the annual pruning, the criss cross branches, dead wood and branches which touch the ground, can also be removed.

Lime (K.lime)

- Acid lime plants may be trained to modified central leader system, with a smooth trunk up to 75-100cm height from the ground level and 4-5 well spaced and well spread branches, as scaffolding branches.

- All sprouts appearing on the trunk up to a height of 75-100 cm should be removed. Similarly on grown up trees, the water suckers appearing on main trunk and scaffolding

branches should be removed promptly.

- Once a young plant is trained to a desired shape, it requires very little pruning. Light pruning may be given during later years.
- Lightly pruned young trees make more development of roots and shoots, producing fruits earlier that those pruned heavily. Pruning of bearing trees though differs with
- variety, chiefly consists of removal of dead, dried, diseased, broken and cris cross branches, whose existence is detrimental to the health of trees. Removal of water suckers is also essential.
- Pruning may be done just after harvesting. Soon after pruning, the cut ends may be smeared with Bordeaux paste or Blitox.

Guava

- Untrained or unpruned guava trees become huge and unmanageable after a few years of growth. The bearing area is reduced and the interior of plants become entirely without fruits.

- Trees are topped to a uniform height of 60-70 cm from the ground level, 2-3 months after planting to induce the emergence of new growth below the cut points.
- Three to four equally spaced shoots are retained around the stem to form the main scaffold limbs of tree. These shoots are allowed to grow for 4-5 months after topping until they attain a length of 40-50 cm.
- The selected shoots are further pruned to 50% of their length for inducing multiple shoots from the buds below the cut end. Newly emerged shoots are allowed to grow up to 40-50 cm and pruned once again for emergence of new shoots. This is chiefly done to obtain the desired shape.
- The pruning operations continue during the second year after planting. After two years, short branches within the tree canopy produce a compact and strong structure. All the plants are confirmed to a hedge shape of 2m inter row width and 2.5m height for which pruning is performed in January and May-June every year.

Jackfruit

- Training in jackfruit in early stage to build strong framework and to avoid weak crotches is necessary. Plants of jackfruit should be trained on single stem. Apical growth needs to be controlled within first year of planting for better canopy architecture.
- Plants are topped (headed back) to a uniform height of 70-80 cm from the groundlevel, 3-4 months after planting to induce the emergence of new growth.
- Three to four well spaced limbs are retained around the main stem to form the scaffold limbs of the plant.
- Additional unwanted shoots are removed from time to time to give the plant desired shape.

Mango

- Tree canopy management, especially size control, has become a priority for reducing production cost and increasing fruit yield and quality. However, unlike temperature fruits, where tree management technologies have been developed and refined for over a century, the similar tools and experiences can be applied with a few modifications in mango. Tree management techniques, specifically for mango have been developed and are being used in different parts of the world, which can be adopted after certain modifications in different mango growing regions. Early height control and tree canopy management are important techniques and should be practiced in India.

- Similarly, the problem of large tree size in mango can be tackled by using topping and hedging because large and crowded trees pose many disadvantages. Appropriate height, topping and hedging, cutting angles, as well as time and frequency of hedging determined for mango, which are common practices in Israel, USA, Australia and South Africa, can be used for increased efficiency and production in India. Shaping the mango tree immediately after planting has its own importance for keeping desirable plant height at first branching, so that proper clearance for equipment is possible.