



TRAINING AND PRUNING IN DIFFERENT FRUIT CROPS

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Introduction

India is bestowed with diverse agro-climatic conditions ideal for the cultivation of fruit crops across the country with a wide window of availability. The national productivity of fruit crops is about 14.90 MT/ha (Anon., 2021) which can be further improved by adopting special horticultural techniques (training, pruning and bending *etc.*).

In India, productivity of fruit crops is low as compared to Israel and Australia due to poor orchard management practices like inadequate or lack of nutrient management practices, training and pruning, water management, pest and diseases management. There are several reasons attributed to low productivity of such fruit crop but among them, major cause is the dominance of vegetative phase over the reproductive phase especially under tropical conditions. The improvement in productivity in modern agriculture system is increasingly dependent of manipulation of physiological activity of the crop by pruning technique (tip pruning, heading back and thinning) and chemical means. In commercial orchard it is desirable to control the vegetative growth to get uniform and regular flowering. Such fruit trees

which compulsory required pruning is *i.e.* mango, guava, phalsa, grapes and ber.

Poor canopy management also reduces tree yield and quality of fruits. It is proven that the total yield and productivity per unit area can be increased manifold in mango with canopy management through training and pruning. In mango, new vegetative shoots arise two to three times during a year from apical portion of shoots, which produce flower panicle after attending maturity. Therefore, management of new vegetative flushes is the key for better flowering and fruiting.

In plant kingdom, management of canopy architecture is a critical component to improve crop performance by increasing the magnitude of partitioning of dry matter towards reproductive phase. In general, management of canopy architecture deals with positioning and maintenance of plant's framework in relation to optimum productivity of quality fruits. Among canopy management is the most important fruit plant management practice is that "Training and pruning".



Pruning is well judged removal of plant parts in order to ensure balance between vegetative and reproductive phases. It is done to maintain plant vigour and quantum of growth besides improving the quality of yield along with facilitating the horticultural operations. Pruning also leads to better ventilation, high access of sunlight and ease in plant protection managements (Bakshi *et al.*, 1997). Pruning, its extent, nature and type depends on the kind of plant, the bearing habit, the age of the plant and purpose for which it is being done. The floral induction management may be associated with the removal of the tip of productive branches (branch tip pruning). This practice results in flowering uniformity and production of more panicles per branch of the mango. According to Davenport (2006) conforms that the pruning of the tips of the branching of lateral shoots and removes structures that inhibit reproductive budding originating from the previous productive cycle.

Objectives of pruning

1. Reduce tree size
2. Control tree shape
3. Make trees structurally strong
4. Improves fruit quality, fruit size and quality by increasing leaf area per fruit.
5. Improve light penetration, improves fruit colour, flower bud initiation & flowering in the consequent season thus helps in pest control
6. Improve light penetration Flower bud initiation, Fruit colour, Pest control, facilitate cultural operations and keep the crop close to the ground
7. Removal of diseased wood

Pruning facts: Pruning involves both art and science, Art means make cut properly and Science in knowing how and when to prune for maximum benefits.

(a) Pruning is a dwarfing process:

Pruning increases vegetative growth near the pruning cut and this gives the illusion that pruning stimulates growth. However, the weight of a tree that was pruned annually is always less than the weight of a non-pruned tree.

(b) Pruning reduces yield:

Pruning removes wood with flower buds, and thus potential fruit. Yield from pruned trees is nearly always less than yield from non-pruned trees, but fruit quality is improved by pruning. Pruning improves fruit size by increasing the amount of leaf area per fruit. Pruning improves light distribution throughout the tree, which is important for the development of fruit red colour and sugar levels.

(c) Pruning delays fruiting:

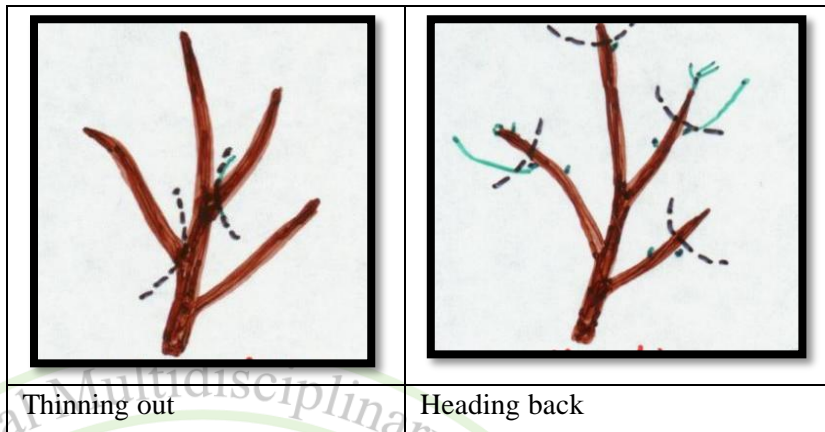
Pruning encourages vegetative growth rather than reproductive growth in young trees. A non-pruned tree will always flower and produce fruit earlier in the life of the tree than a pruned tree. The reason young trees are pruned is to induce branches to develop where they are wanted and to develop a strong tree structure that will support large crops as the tree matures. As a tree matures, the physiology changes from vegetative growth to reproductive growth. To obtain high annual yields of mature trees, it is important to minimize fruiting until trees have nearly filled their space.

(d) Summer pruning:

Summer pruning involves the selective removal of leafy shoots during the growing season. Responses to summer pruning vary with time of pruning, severity of pruning, tree vigour, geographical location, and variety. Several researchers evaluated summer pruning during the 1980s and several general statements can be made about the practice. Summer pruning reduces within-tree shade and usually improves fruit red colour development and sometimes improves flower bud development. Summer pruning removes leaves that produce photosynthates (sugars) for growth of all tree parts. Summer pruning sometimes reduces fruit size and sugar levels. Due to reduced whole-tree photosynthesis, summer pruning suppresses late season trunk enlargement and root growth. Summer pruning does not suppress shoot elongation the following season. Summer pruning reduces late-season photosynthesis, and theoretically should reduce the accumulation of reserve carbohydrates within the tree that are used for early season growth. However, results from most pruning experiments indicate that the response to a certain type of pruning cut will be the same regardless of the time of year the cut was made.

Method of pruning:

1. **Thinning out:** This refers to the removal of undesirable branches without leaving any stubs.



2. **Heading back:** Removal of terminal portion of branches without leaving any basal portion.

Different intensities of pruning with examples are given below;

Intensity of pruning	Examples
Light pruning	Guava, Kinnow, Mandarin, Litchi
Slightly severe pruning	Apple
Heavy or severe pruning	Phalsa, Ber, Mulberry

Apart from this, different pruning techniques like tip pruning can be used to encourage frequent flushing and branching of young trees to bring them into commercial production years early. It can also stimulate timely flushes of lateral stems in an annual program to maintain tree size and prepare trees for synchronous flowering. Severe pruning coupled with subsequent tip pruning of huge, non-productive trees facilitates rapid restoration of orchard production. Each of these types of pruning can be used to get fruit trees into production quickly and thereafter maintain maximum



annual production while maintaining their desired size.

Training and pruning in grape:

Different systems of training-head, kniffin, telephone, V, expanded Y and gable-are in vogue in India. Predictive potential of vines is better exploited on bower than on any other system of training. But this system is expensive, encourages diseases, and is not suitable for mechanization of cultural operations. On head, kniffin and telephone systems of training not only the yields are low but the fruits are exposed to sun resulting in sun-burn of berries. The V and Y systems are slightly better than these systems in respect of sun-burn, but the yield is the same. The expanded Y with long arms and gable system connecting the side arms of adjacent rows are best-suited for training seedless grapes, since these systems possess the advantages of bower and at the same time do not have disadvantages associated with it.

In North India, vines are pruned in winter (December-January). Half of the canes are pruned to renew spurs and the rest for fruiting canes. One or two buds from the cordon (arm) are retained in renewed at spurs and 12 buds are retained on fruiting canes. The number of buds left on fruiting canes depends on variety and thickness of cane. Thick canes are pruned longer and the thin shorter. The fruited canes are pruned to renewal spurs and the canes developed from renewal spurs are pruned to fruiting canes in the next winter. In Maharashtra, Andhra Pradesh and north Karnataka, vines are pruned twice (April and

October). The April pruning is generally termed as back pruning or foundation pruning. While, October pruning is called fruit pruning or forward pruning. All the canes are pruned to spurs at back pruning, irrespective of the variety or cane thickness. The number of buds retained on a cane at forward pruning depends on variety and cane thickness.

Training and pruning in pomegranate:

Pomegranate plants can be trained on a single-stem or in multi-stem system. The single-stem training has its own disadvantages. The plants have a tendency to produce ground suckers, making the plant bushy. As such it is rather difficult to train the plant to a single stem. The crop is highly susceptible to stem-borer and shoot-hole borer. Moreover, this system is hazardous. Thus single-stem training is uneconomical for commercial cultivation. Therefore multi-stem training is more prevalent in the country. Allowing too many stems also comes in the way of intercultural operation. The varying of stem number of 3-4 does not affect the yield significantly in early years of bearing and a multi-stem training with 4-5 stems/hill is beneficial.

Pomegranate plants do not require pruning except removal of ground suckers, water shoots cross branches, dead and diseased twigs and giving a shape to the tree. Pomegranate fruits are borne terminally on short spurs, arising from matured shoots, which have the capacity to bear fruits for 3-4 years. With advance in age they decline. A little thinning and pruning of old spurs to encourage growth of new ones is



required. Some useful tips on pomegranate pruning are:

- Fruitful and differentiated buds are located at the distal portion of the branches.
- Pruning of terminal portion of a branch lowers down the total flower production.
- Pruning does not affect sex ratio and fruit quality.
- Pruning affects significantly total fruits, marketable and unmarketable fruits. Fruit size and yield of higher grade fruits are more with high intensity pruning.
- Pruning minimizes the bending of branches and staking.

Training and pruning in ber:

During the first 2-3 years after planting, ber trees should be trained to develop a strong framework. After that old growth is beheaded during March keeping 1-2 nodes above the graft union to induce vigorous new growth. One upright growing vigorous shoot is retained to develop into main trunk which is kept clean of secondary branches up to 30cm height from the ground level, On the main trunk, 3 or 4 well-spaced and favourably located main branches are allowed above when it is headed back. During the 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 tree stature. 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 of 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 would 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 the tree sheds leaves and enters into dormancy. In Tamil Nadu, the trees are pruned during January-April, in Maharashtra pruning must be completed by the April end and in Haryana by the May end. Severity of 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 as a result of light pruning for several years, half the past season's shoots are pruned to 20 buds and 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.