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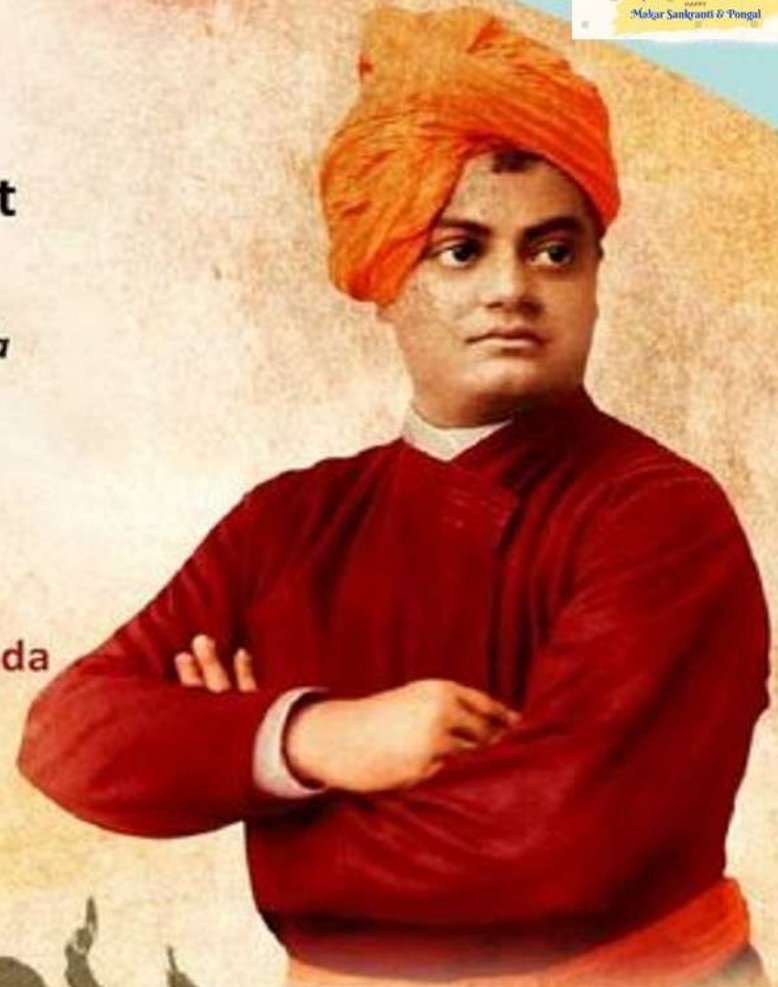
**“Arise, Awake and Stop not
till the goal is reached.”**

-Swami Vivekananda

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12th January



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CANOPY MANAGEMENT IN CASHEW THROUGH TRAINING AND PRUNING TECHNIQUE

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Introduction

Cashew is a tropical nut tree introduced from Brazil during the 16th century to mitigate soil and water erosion in coastal areas. The commercial cultivation of cashew started during late 19th century when the relishing and nutritive status of cashew nuts was explored. Every year cashew growing area has increased exponentially not only for the delicious nut but also for reasonable income with minimum crop management practices. Cashew is a vigorously growing woody perennial tree. Naturally grown cashew trees produce unconditional branches resulting in irregular canopy shapes. Sometimes, the condition of too many branches in one direction results in the lodging of trees. In such kind of orchards, taking up intercultural operations in later years become difficult and those criss-crossed branches affect the quantity of light interception which results in low yield and poor-quality fruit development. Light is an important natural requirement for plant growth, development, yield, and production of quality fruits. The green leaves exposed to sunlight produces photo assimilates such as carbohydrate and sugars which are translocated to the needy and interior plant parts viz., shoots, buds, flowers, and fruits. Since, trees' shape determines light interception, maintaining the shape of the tree through proper training and pruning practices is essential.

Training

Training is a method of regulating plant growth in a desired direction during the early years of planting, to form a definite canopy shape. Such type of initial training provides a good

architecture to the plants and is further helpful in good nut production. In the case of the new plantations with the grafts the plants should be trained in the early years i.e., 2-3 years so as to provide better plant architecture which facilitates easy inter-cultural operations. Training indirectly assists in the ease of other operations such as weeding, manuring, and pest and disease management (Satpathy, 1988)

In cashew, the training system and the diameter of the canopy to be maintained are dependent on spacing. In general, two types of training systems are being practiced in cashew, a) Modified leader system and, b) Open center system.

a) Modified leader system

In this system, cashew grafts are allowed to grow as single stem up to a height of 75 to 100 cm by removing side sprouts. Then lateral branches are allowed to grow at desirable direction by de-topping. De-topping height varies from 2.5 to 4 m depending on spacing. Under normal spacing (8m x 8m), de-topping at 4 m from ground level is recommended. Whereas, for high-density planting (5m x 5m), de-topping at 2.5 m from ground level is recommended. Removal of criss-cross branches and trimming of branches has to be resorted to getting dome shape canopy and the same should be maintained in later years by imposing mild pruning. This kind of canopy helps in reducing weak shoots and water shoot development. The modified training system is suitable for both normal and high-density planting systems.



b) Open center system.

Cashew grafts are allowed to grow straight up to 50-60 cm from ground level. The terminal growing point is pinched off to form lateral branches. The branches are regulated to grow in four directions at equal distances. Because of fast vegetative growth, the canopy spreads rapidly. To avoid this, the canopy center needs to be opened once in a while to support more light interception to the interior plant parts. This encourages flowering at the inner and outer surface of the canopy and thus increases the yield.

Pruning systems in cashew

Cashew plantation under normal or less spacing requires regular pruning to avoid unnecessary supply of photo assimilates to unproductive shoots i.e., water shoots and weak branches.



In cashew, trimming of exhausted branches induce productive growth and helps to promote the yield. In a high-density planting system, pruning operation plays a vital role to accommodate the canopy within the allotted space. Pruning and canopy shaping along with suitable special operations need to be taken up every year after the harvest of the crop. Cashew trees enter a distinct resting period (quiescent stage) after harvest (May – June) till the next flush production time (September - October). The lateral shoots which bear flowers/fruits are formed in the terminal of the leader shoot after the resting period. The past season leader shoots can produce only one lateral from its terminal. Pruning enhances the production of lateral shoots, thus the yield can be increased. Pruning intensity and time vary for different specific agro-



climatic regions. The details of pruning pertaining to the East coast region are furnished in the table below

Region	Best Pruning method	Month of pruning	Collective operations (if any)	Percentage of yield increase	Suitable varieties
Karnataka	Leader shoot pruning (Secondary shoots) 50 % to 60 % canopy	July	-	34.02	H-130,VRI-1, VRI-3,Vengurla-4,Ullala - 1,VTH30/4
	Leader shoot pruning (Secondary shoots) Whole tree	August	-	53.85	VTH-539
Tamil Nadu	Lateral shoot pruning (Tertiary shoots) Whole tree	August	Two foliar spray 1. New flush stage (August)- NPK-19:19:19 @ 1 % 2. Flowering stage (December-January)	44.69	VRI-3
Odisha	Branch thinning (3 branches)	July	-	37.92	Vengurla-4
West Bengal	Leader shoot pruning (Secondary shoots)-whole tree	July	-	53.51	Vengurla-4



The trees which are not received any training and pruning in the initial years grow haphazardly and resulting in canopies without desirable shape and size. Besides, the development of deadwood, inter-mingling of branches with neighboring trees, crisscross branches, development of water shoots, etc. will bring down the productivity of the tree (Nayak *et al.*, 1996). Pruning laterals at a 25% level in September significantly enhanced the yield in the Bhaskara variety under the West coast (Adiga *et al.*, 2020)

Deadwood/dry branches:

The dead wood/dry branches develop mainly because of the effect of shade on lower branches caused by overlapping of the upper branches. Deadwood will be an additional burden to the plants. Furthermore, the dead and decaying woods may invite the entry of pathogenic organisms or saprophytic growth which may spread to heal their parts of the plant in due course of time.

Crisscross branches:

The lower branches remain crawling on the ground for want of space and sunlight, where the plants are not trained or pruned in the initial years. Similarly, the branches at higher level also grow haphazardly in search of sunlight resulting in irregular canopy architecture.

The intermingling of branches:

The problem of entangling branches starts after 10-12 years in regular spaces (8x8 m) plantations. The exterior branches get entangled with neighboring trees as a result only a portion of the canopy (crown portion) remains exposed to sunlight. Such a development inside the plantation is a hindrance to the regular intercultural operations and general maintenance of the orchard.

Water shoots/sprouts:

Water shoot is vegetative shoots that are extraordinarily vigorous growth from dormant buds at higher points on the main stem in an upright direction. They grow at the expense of parent branches from which they arise. They are erect in growth and much thicker in size than the normal branches and bear much longer and coarser leaves. These branches outgrow the rest of the neighboring drooping branches. If water shoots are not removed in time they soon cover the center of the canopy and obstruct sunlight. The old trees with deadwood, crisscross branches, water shoots and intermingling branches should be pruned at least once in 2-3 years. Pruning can be taken up in the dormant season i.e. at least 2-3 months earlier to productive flushing. All the

types of unwanted growth mentioned before are to be pruned off. However, the plant should have a better look and structure after pruning. This can be achieved using one's discretion and experience in pruning and orchard management.

Leader shoot pruning

Cashew trees enter a brief resting period after the harvest of the crop (May - June) and it continues up to next productive flushing season (September - November). The flushes or flower bearing twigs are known as lateral shoots. These shoots usually form the terminal portion of a leader shoot will give a single shoot (lateral) from its terminal bud. If the terminal bud is disturbed by means of pruning the dormant lateral buds will sprout resulting in more number of lateral shoots per unit area. This will result in increased number of productive inflorescences. Pruning the leader shoots can be taken up at least 2-3 months (July to August) before flushing. In a tree about 50-60% of the leader shoots may be headed back to one-third of their original length. A pair of leaves may be retained while pruning wherever possible. While pruning, the leader shoot should be of a pencil thickness and should not have turned to ash color before taking up pruning.



Precautions to be taken while pruning

As a natural response, the cuts resulting from pruning will heal faster if cuts are smooth and non-jagged. While attending pruning the following points are to be considered

- While removing the deadwood the cut must be made back to living tissue as good callus formation and healing cut end is only possible to form properly made cut end only.
- It is essential to make the cut close to the branch. The cut should be nearly even along the stem or trunk leaving a minimum stub and clear wound for faster healing.
- In the case of pruning off the diseased part care should be taken to remove all the infested parts.



d) Wherever larger branches are being removed, care should be taken to avoid breaking way of bark or wood portion of the plant.

e) When a cut is made a considerable amount of hardwood will be exposed and it should be protected from pests and pathogens. All the larger cuts may be treated with 10% Bordeaux paste while the leader shoot pruned canopy may be sprayed with 1% Bordeaux mixture.

f) It is essential to relate the appearance of the plant while pruning. The plant should have a balanced and natural appearance after pruning. The yield increase in pruned trees

The past season leader shoots can produce only one lateral from its terminal. Pruning enhances the production of lateral shoots, thus the yield can be increased. Pruning intensity and time vary for different specific agro-climatic regions. Pruning of dead wood and crisscross branches can increase yield by 30- 40% (Khan *et al.*, 1987). Leader-shoot pruning doubled the yield in cashew (Mohan and Room Singh, 1988) Results of pruning on 28-year-old trees revealed that trees with three branches pruned recorded the highest number of panicles/sq.m (39), the highest number of flowers/panicle (588.70) and fruit-set to an extent of 14.42%, while unpruned trees recorded only 7.75% increase in yield (Panda, 1990). Under Jhargram conditions, pruning of leader shoots during July enhanced the number of productive laterals and increased the number of bisexual flowers per panicle, fruits per panicle, and yield per tree (Chattopadhyay and Ghose, 1994). Pruning treatment increased the number of laterals/leaders but did not affect the duration of flowering and harvest (Mohan and Rao, 1995).

Effect of the pruning in different shoots in two varieties namely, BPP-4 and BPP-6 were conducted at the Cashew Research Station, Bapatla, Guntur district (AP). The shoots were decapitated back to 5 cm in mid-July, mid-August, and mid-September months of the leader shoots, lateral shoots, and leader as well as lateral shoots were pruned separately and different growth parameters on individual trees were studied. The response to the pruning, the variety 'BPP-4' performed better as compared to BPP-6. The production of flowering shoots and nut yield as influenced by the cultivar, level of pruning, and time of pruning that a moderate incremental growth with a large number of flowering shoots could be obtained by pruning the leader shoot in mid-August under local agro-climatic conditions. The study further indicated that the vigorous cultivar 'BPP-4' and off-season production cultivar 'BPP-6' performed well during a rainy year compared to the dry year which was associated with prolonged dry spells and delayed rains in the August- September months. Another important observation from the study

indicated that the off-season cultivar of cashew needs essentially the pruning of the leader shoot in mid-August so as to avoid off-season flowering and to increase productivity in the normal season. Pruning of leader shoots in mid-July was found to be beneficial during both the years of study to produce higher tree yield of nuts (Prasanna Kumar *et al.*, 2015).

Advantages of training and pruning

- Harvesting and utilization of maximum solar energy by regulating plant growth for the betterment of yield and quality of nut and apple
- Development of a stronger framework of branches with equal distance at the desirable direction
- Equi-distant branches enhance resistance against a strong wind in wind prone areas
- Trimming of tangled and low-lying branches facilitates the intercultural operations
- Less vegetation restricts the micro-climate congenial for pest infestation
- Maximum exposure to the ground helps to disinfect pest and disease inoculum during summer
- Removal of dried branches, dead woods, and criss-cross branches reduce the effect of shade and extra burden on trees
- Thinning out of dead branches reduce the chance of secondary infection. Precautions and aftercare during training and pruning
- Training must be made in live tissue to facilitate good callus formation for rapid healing
- Sharp tools should be used for implementing training or pruning to avoid the damage to bark/phloem
- After training or pruning, 10% Bordeaux mixture paste swabbing for large cut ends or 1% Bordeaux mixture spray for pruned shoots is recommended
- As a preventive measure, the pruned trees are to be sprayed with 0.2% l-cyhalothrin twice or thrice in the initial 24 months of pruning
- The tender shoots should be protected against Tea mosquito bug attack by spraying l-cyhalothrin 0.003% (6 ml in 10 L of water)

Tools used for pruning

Training and pruning done through manual method is cumbersome in cashew. There are tools available to make the operation simple and easy.

Tools used for pruning



Secateur



Pruning saw



Pole tree pruners



Pruning shears



Chain saw



Telescopic power tree pruner

Secateur: Used to prune lateral shoots and small twigs of 1.5 to 3 cm diameter

Pruning saw: Used to prune small woody branches of 5 to 10 cm diameter

Pole tree pruner and Pruning shears: Used to prune 10 to 20 cm diameter upto its reachable height

Chain saw: Power or fuel operated chain saw is used to prune woody shoots of any size

Telescopic power tree pruner: Used to prune woody branches of smaller size upto its reachable height

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