

# SCIENTIFIC CULTIVATION PRACTICES OF CINNAMON GROWN UNDER ARECANUT BASED HIGH DENSITY MULTI SPECIES CROPPING SYSTEM IN ASSAM

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## Introduction

Cinnamon (*Cinnamomum verum*) (Family-*Lauraceae*) is one of the earliest known spices mainly cultivated for aromatic dried inner bark of the tree. Cinnamon is native of Sri Lanka and in India its cultivation is mainly confined to the west coast areas of Kerala and Karnataka and in limited scale in North Eastern region. Other countries growing cinnamon are Sri Lanka, Seychelles, Myanmar, South America, Malayan peninsula (Singh, 1996). Weng (1981) reported that some genera of cinnamon are also grown in China for essential oil production. In India, cinnamon is cultivated in an area of about 0.87 thousand hectares with total production of 1.67 thousand tonnes and a total productivity of 1928 kg/ha.

Though cinnamon is grown generally as monocrop, it has potential to yield economic produces in mixed cropping system. Also, researchers proved its commercial cultivation in arecanut/coconut based cropping system in different parts of India. Assam being, one of the important states of arecanut production, cinnamon can well be integrated in arecanut as one of the component of the mixed cropping system for improving socio-economic status of the farmers of the state.

Generally the arecanut is grown at a

spacing of 2.7m x 2.7m. Cinnamon can be positioned at the centre of four arecanut palms. In alternate rows it can be planted in an arecanut + black pepper + betelvine + banana / papaya cropping system. By this way approximately 350 nos. of cinnamon plants can be accommodated in one hectare of arecanut plantation.

## Description of the plant

Cinnamon is medium sized tropical evergreen tree having a tendency to branch profusely at low level with aromatic bark and leaves. It has small yellowish white flowers, numerous in panicle, bisexual and pollinated by insects. The fruit (dark purple berry) consists of a pulpy pericarp and the seeds have a hard endocarp. It belongs to family Lauraceae and its botanical name is *Cinnamomum zeylanicum* (syn: *C.verum*). However, there are about 250 species of *Cinnamomum* as reported by several researchers.

## Uses of Cinnamon

Cinnamon is a useful green spice and every part of the tree viz., bark, wood, leaf, buds, flower, fruits and shoots is used for different purposes.

The bark is extensively used as spice and condiments in the form of small pieces or powder.

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It is aromatic, astringent, stimulative, carminative and also possesses the property of checking nausea and vomiting. Bark is also used in ayurvedic drug preparation. Cinnamon oil is used in perfume and flavouring industries. Medicinal oil is obtained from the fruit. Cinnamon wood provides a soft timber used as a low grade board wood.

**Table 1: Nutritive value of bark per 100 gm bark weight (Pruthi, 1976)**

Moisture	9.9 g	Iron	0.004 g
Protein	4.6 g	Sodium	0.01 g
Fat	2.2 g	Potassium	0.4 g
Fibre	20.3 g	Vit.B1	0.14 g

### Soil and Climate

Cinnamon is a hardy plant which can grow well in almost all types of soil under wide variety of tropical conditions. But, to derive the characteristic flavours careful cropping condition must be observed, as the quality of bark is greatly influenced by soil and ecological factors. It comes well from sea level to an elevation of about 1000m. Since it is mostly raised as rainfed crop, an annual rainfall of 200-250cm is ideal. The most suitable temperature is between 20<sup>o</sup>-30<sup>o</sup>C and the most favourable elevation is 300m to 350m from sea level. Cinnamon thrives well over a wide range of soils provided that the drainage is not impeded. A well drained fertile loamy lime stone soiled with a pH 6-8 is ideal.

### Varieties

Mainly two varieties of cinnamon viz. Nityashree and Navashree released from Indian Institute of Spices Research, Calicut are suitable for cultivation both as monocrop and under

arecanut based High Density Multi Species Cropping System (HDMSCS).

### Propagation

Cinnamon is propagated by three methods namely **seeds, cuttings** and layering. However, air layering is proved to be the best owing to easiness and proportionate success. Whatever be the method used for propagation, selection of best mother plant is the major factor to be considered. Cutting is very less practiced in this part of country.

### Seed Propagation

The fully ripened fruits are either picked from the tree or the fallen ones are collected from the ground. The seeds are removed and washed free of pulp and sown without much delay. Seeds are sown in sand beds or polythene bags containing mixture of sand:soil:FYM in 1:1:1 ratio. Frequent watering has to be provided for retaining adequate moisture. The seedling requires artificial shading till they are six months old. Under North-Eastern climatic conditions propagation is mainly done by air layering in the month of May-June.

### Air layering

In this method semi hardwood shoots of pencil thickness are selected. A ring of bark is removed from the semi hardwood portion of the shoot and a rooting hormone (IBA 2000ppm or IAA 2000ppm) is applied on the portion where the bark has been removed. A soil mixture of soil:FYM:sawdust in the ratio 1:1:1 well mixed with water is applied over the area and is kept in position by wrapping with a polythene sheet of 20cm length which would also avoid moisture loss. Normally rooting takes place within 40-60

days of layering. The well-rooted air layers are separated from mother plant and planted in polythene bags filled with potting mixture of soil:FYM in 1:1 ratio and kept in nursery with watering twice daily. These rooted layers show root growth in 20-30 days and new shoot growth in 25-35 days and new leaves are seen in 45-50 days after planting. So on an average 20-25 layer can be prepared from a mature 3-4 years old plant. These cuttings get ready for planting in 6-8 months and can be planted in main field with the onset of monsoon.

### Planting and after-care

Layers with well established root system are planted in pits of 50x50x50 cm before the onset of monsoon at the centre of four arecanut palm. The pit before planting are filled with compost and top soil up to 2/3<sup>rd</sup> height of the pit. After planting the pits are filled with soil. Care should be taken to avoid water logging during heavy rains and to avoid any attack of termite and ants.

Irrigation should be provided at an interval of 15 days in summer and winter seasons. Cinnamon requires large amount of nitrogenous fertilizers as leaves, young shoots and barks are of use. Hence, it is necessary to apply nitrogenous fertilizer to encourage vegetative growth. In the first year, 2 or 3 months after planting, compost or FYM @4-5kg/plant is applied. During the second year an increasing dose of FYM (8-10 kg/plant) along with 25g of Muriate of Potash should be given with the onset of the monsoon. From third year onwards when production starts, it is advisable to apply chemical fertilizer with a dose of 150g nitrogen, 90g phosphorus and 100g of potassium per tree along with 25kg of organic manure in two split doses for commercial crop. The fertilizers are to

be applied in two equal splits, in May-June to September-October. Mulching with green leaves (25kg) during summer is also recommended.

Care should be taken for disease and pest management in nursery and young plantations. Leaf spot and seedling blight are the main diseases of cinnamon. Leaf spot and die back diseases are caused by *Colletotrichum gloeosporioides*. A small deep brown specks appear on the leaf lamina, which later coalesces to form irregular patches. In some cases the affected portions are shed leaving shot holes on the leaves. Another disease, seedling blight is caused by *Diplodia* sp. It occurs on seedlings in nursery. The fungus causes light brown patches which girdle the stem resulting in mortality later the entire lamina is affected and the infection spreads to the entire stem causing die back. Pruning the affected branches and spraying Bordeaux mixture 1% are recommended to control the diseases.

The cinnamon butterfly (*Chilasa clytia*) and leaf miner (*Colopomorpha civica*) are the most serious pests especially in younger plantation and nursery and are generally seen during post-monsoon season. The larvae of *Chilasa* feed on tender and slightly mature leaves. In severe cases of infestation, the entire plant is defoliated and only midribs of leaves, the portions of vein are left behind. The larvae of *Colopomorpha* feed on the tissue between lower and upper epidermis of tender leaves resulting in linear mines that end in blister like patches. The infested leaf becomes crinkled and dries up. The pest can be controlled by spraying Quinalphos 0.5% at 15 days interval.

### Training and pruning

The objective of training is to establish a sturdy base which is capable of producing a greater

number of healthy stems. When the seedlings attain the age of two years (diameter of main stem at the base is about 4-6 cm) the main stem is coppiced/cut back to a height of 4-5 cm from the ground level. This will promote the tillering from the base leaving only 3 strong and straight tillers. All the other shoots should be removed so as to promote the growth of these shoot as main stem.

For testing the suitability and quality of cinnamon under Assam conditions an experiment was conducted in the year 2008-09 at CPCRI, RC, Kahikuchi, Guwahati. For this purpose monthly harvesting of bark of both varieties (Nithyashree and Navashree) was done. From the analysis, it was revealed that winter harvested bark is ideal for bark recovery for both the varieties.

**Table 2 : Quality parameters of Cinnamon Bark of two varieties grown as intercrop in Arecanut garden at CPCRI RC, Kahikuchi, Guwahati**

Variety	Season	Bark oil (%)	Oleoresin (%)	Leaf oil (%)	Bark recovery (%)
Nithyashree	Summer	0.6	5.7	-	39.4
	Monsoon	1.0	9.6	-	38.7
	Winter	1.3	9.4	3.0	40.0
Navashree	Summer	1.2	8.4	-	37.5
	Monsoon	1.2	9.0	-	40.4
	Winter	1.3	11.4	3.8	43.0

After 1-2 year the main stems are harvested (pruned) alternately. It is necessary to allow base of each pruned stem to initiate three new stems. This would generate 5-8 stems for harvest after 8-10 years from a single bush/year.

### Bark extraction

For the purpose of bark extraction cutting of the shoots of pencil thickness is done as the rain ceases. Peeling is done generally with the help of a small knife having a round edge at the end. The cut stems or sticks are given a longitudinal slit from one end to the other. The two halves of the entire bark are removed with the help of a knife. The sticks are rubbed in between hard pieces of wood or beaten with a stick so as to enable easy detachment of the bark if the bark does not peel easily.

### Harvesting and yield

The first cutting is made after 2<sup>nd</sup> or 3<sup>rd</sup> year of transplanting when the plant reaches a height of 150-200 cm. At the time when the red flush of the leaves begin to change green and the sap is flowing freely. Harvesting on limited scale continues throughout the year. But the best quality bark is obtained from November to February. On an average under Assam conditions approximately 150-200g of dry bark is obtained from a 3 to 4 year old tree.

### Conclusion

Keeping the easiness of cultivation and processing, cinnamon can well be fitted as a profitable component in the arecanut based mixed cropping system. An additional return of Rs.4000/ha could be obtained from this crop alone from one hectare of arecanut plantation.