

Cinnamon (*Cinnamomum zeylanicum*)

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1. Introduction

The Cinnamon popularly known as Dalchini (*Cinnamomum zeylanicum*), belongs to the Family Lauraceae. The main part of its tree which is used for the spice purpose is its bark. Cinnamon is found widely in Sri Lanka but also grows in Malabar, Cochin-China, Sumatra and in Eastern Islands too. Besides India, it is also cultivated in Brazil, Mauritius, India, Jamaica and in other countries also.



(See colour view on Plate - IV)

2. Common Name

Cinnamon, cassia, cinnamon twig, cassia aromaticum and cassia bark.

3. On the Basis of Countries of Origin, the Cinnamon is Categorized into 3 Groups

3.1. Cinnamomum cassia: The origin is China and its bark is thick.

3.2. Cinnamomum spp.: This type of cinnamon is imported in India from Sri Lanka. It is thinner, sweeter and less bitter as compared to China cinnamon. For medicinal purposes, cinnamon from Sinhal Island is the best.

3.3. Cinnamomum tamala: It is thick, less bitter and it becomes sticky, when grinded with water. Its leaves are known as tejpat. This variety found in India and China is called Taj. It does not have oil and only the bark is used. Cinnamon is used as a common spice in cooking.

4. Nutritional Properties

As far as nutritional properties are concerned, cinnamon is known to be a very good source of iron, calcium and dietary fiber as well as manganese. There are various nutrients present in cinnamon such as sodium, carbohydrates, sugar, fatty acids, amino acids and so on.

5. Useful Parts of the Plant

The most useful part of the cinnamontree is the outer bark which is generally used as a spice and for several natural medicinal applications. The inner bark of the cinnamon tree has more medicinal effects and also contains more essential oil. The cinnamon bark spice is known to be available throughout the year and is most ideal to be consumed as a tea especially during winter as it has a warm and sweet taste and is also very aromatic.



The bark of Cinnamon is used in cookery as a condiment and flavouring material. It is carminative, astringent, stimulant, antiseptic in action. The essential oil of this herb acts

as potent antibacterial, anti-fungal, and uterine stimulant. It controls vomiting, relieves flatulence and has been found useful in diarrhoea and haemorrhage of the womb. It has been reported that consuming atleast one-half teaspoon of Cinnamon each day may reduce blood sugar and cholesterol level.

6. Medicinal Properties

Parts used: Cinnamon oil, Cinnamon Powder, Stem bark

6.1. Cinnamon oil and uses

The essential oil of cinnamon is obtained by distilling the leaves/ inner bark of this plant. The leaf oil should be administered under medical supervision. For its external use, it should be diluted and should be used with caution to avoid irritation.



A piece of cotton if soaked in cinnamon oil and then applied on the aching tooth, may cure the tooth ache. Cinnamon leaves can be used to brush the teeth. It cleans the teeth and the teeth become brighter and whiter.

6.2. Cinnamon powder and uses

6.2.1. Influenza: Boil the mix of 2½ gm. cinnamon, 500 mg cloves, and 1 gm ginger root in 1/2 liter water till water is reduced to 200 ml. Strain the solution. Give 40 ml of this solution thrice a day. It cures influenza fever.

6.2.2. Cold and cough: Mix pinch of cinnamon powder with 1 spoon of honey and take it 3 times a day to relive cough.

6.2.3. Diarrhoea, loose motion: For diarrhoea treatment, cinnamon or dalchini is taken with equal amount of sonth, cumin seeds and honey. Make a thick paste by adding honey. Take 1 teaspoon of it three times a day.

6.2.4. Loss of taste: Make a paste of honey and dalchini. Rub this paste on tongue and keep for few minutes.

6.2.5. Tooth ache: Mix cinnamon powder and honey in 1:5 ratio and apply at area of tooth ache.

6.2.6. Hair fall: Mixture of cinnamon powder and honey with warm olive oil should be applied on scalp and wash the hair after 15 min.

6.2.7. Bad breathe: Cinnamon powder boiled in water can be used as mouth wash.

6.2.8. Acne and black heads: Mix cinnamon with lemon juice and apply on acne and black heads.

6.2.9. Memory improvement: Mix 1 gm cinnamon powder and honey and this mixture should be taken every night.

6.2.10. Insomnia or sleeplessness: Boil 2 gm of cinnamon powder in one cup water for 5 min. Add honey and drink before going to bed.

6.2.11. Arthritis pain: Make the paste of cinnamon powder with water and honey and apply it at the painful area.

6.2.12. Impaired or weak digestion: It is a good remedy for treating digestive problems.

6.3. Cinnamon bark

It is used for gastrointestinal (GI) upset, diarrhea, and gas. It is also used for stimulating appetite; for infections caused by bacteria and parasitic worms; and for menstrual cramps,



the common cold, and the flu (influenza). The oil present in cinnamon bark reduces spasms, gas and stimulates the appetite. It also increases blood flow and lowers blood sugar levels.

7. Growing Areas in the Country

The cinnamon is grown in lower elevations of Western Ghats in Kerala and Tamil Nadu.

8. Origin and Geographical Distribution

Cinnamon is mostly cultivated in Sri Lanka, Malagasy Republic and Seychelles. It has its origin in the central hills of Sri Lanka. In India, it is grown in one or two locations in Kerala. Cinnamon is a hardy plant and is cultivated in Sri Lanka under varying conditions ranging from semi dried to wet zone conditions. The optimum temperature for growing cinnamon is between 20-30 degree C and rainfall between 1250 to 2500 mm. It thrives well as a forest tree at 300-350 meter above MSL.

9. Taxonomic Hierarchy

| | |
|-----------------|---------------------------|
| Kingdom: | Plantae |
| Subkingdom: | Viridiplantae |
| Infrakingdom: | Streptophyta |
| Super division: | Embryophyta |
| Division: | Tracheophyta |
| Sub division: | Spermatophytina |
| Class: | Magnoliopsida |
| Super order: | Magnolianaes |
| Order: | Laurales |
| Family: | Lauraceae |
| Genus: | <i>Cinnamomum Schaeff</i> |
| Species: | <i>Cinnamomum verum</i> |

10. Botanical Description

The *C. verum* tree is evergreen, grows to around 10 m (30 ft). Its branches are strong and bark is smooth and yellowish in colour. It has leathery leaves, 11 to 16 cm (4.5 to 6.25 in)

long, with pointed tips. The leaves are dark green on top and light green at the bottom. The inconspicuous yellow flowers with a disagreeable odour, which are tubular with 6 lobes, grow in panicles (clusters) that are as long as the leaves. The fruit is a small, fleshy berry, 1 to 1.5 cm (0.25 to 0.5 in) long, that ripens to black, partly surrounded by a cup-like perianth (developed from the outer parts of the flower). The spice form of cinnamon is obtained by removing the outer bark of the tree, and scraping the inner bark, which is dried and ground into powder. Cultivated trees may also be coppiced (cut back to encourage shoot development), so that the coppiced shoots can be harvested. Cinnamon oil is steam distilled from the leaves and twigs.

11. Climate

Cinnamomum is adapted to a wide range of climatic conditions. Cinnamon requires a warm and humid climate with a well distributed annual rainfall of around 2000–2500 mm, and average temperatures of about 27°C. Wild cinnamon trees are adapted to tropical evergreen rainforests. It grows best at low altitudes, and is usually grown without shade, but being essentially a forest tree, light shade is tolerated. It grows well on different soils in the tropics, but soil type has a pronounced effect on bark quality. Fine sandy and lateritic gravelly soils rather than rocky and stony substrates are best in Sri Lanka and India, but in the Seychelles and Madagascar more loamy soils are preferred. Cinnamon is considered susceptible to salinity, and a bitter product results from waterlogged and marshy conditions.

12. Soil

The quality of the bark is greatly influenced by soil and ecological factors. Well-drained soil rich in humus content is most suitable. Sandy loam soils liberally incorporated with organic manures are best. Red dark brown soils free from rockj gravel or quartz are also good, for cinnamon cultivation.

The soil for cinnamon growth should have good draining ability otherwise its roots will rot if allowed to stay in water for prolonged period. A good combination of soil, sand and perlite is highly recommended for proper drainage. Sandy or siliceous soils with humus mixture are best suitable for cinnamon cultivation. Sheltered situations upto an altitude of 800 to 1000 metres receiving an annual rainfall of 200 to 250 cm are good for the crop.

13. Variety/ species

A number of species are normally sold as cinnamon

- » *Cinnamomum cassia* (Chinese cinnamon or commercial cinnamon)
- » *C. burmannii* (Padang cassia or Indonesian cinnamon)
- » *C. loureiroi* (Saigon cinnamon, Vietnamese cassia or Vietnamese cinnamon)
- » *C. verum* (Srilanka cinnamon/ ceylone cinnamon)
- » *C. citrodorum* (Malabar cinnamon)
- » *C. Tamale* (Indian cinnamon)

14. Propagation

Cinnamon is generally propagated by seed. Other means of propagation are planting, cutting and layering.

14.1. By seeds

Cinnamon fruits ripe in July-August and fall down when they are fully ripened. The fleshy berries are kept in heaps in shade to soften and rot. The mass is then trampled. The seeds without pulp are washed and dried in shade. They have to be sown without much delay because they have a short period of viability. The nursery is raised in a suitable spot in soil, rich in organic matter. The place is dug well twice or thrice. The soil is broken to powder and made loose, making it altogether free from stones, root bits, etc. The seed beds are made 1 metre wide and of suitable length with adequate provision for drainage. The seeds are sown in lines 12 cm. apart and are covered with a layer of soil to a thickness of about 2.5 cm. Germination of seed occurs in about 20 days. The beds have to be provided with artificial shade and watered regularly. The shade should continue until the plants are about 12 cm. in height and then removed gradually. Frequent irrigations are required for maintaining adequate moisture level.

14.2. Micro-propagation

Embryo culture was developed by Subasinghe *et al.* (2016) in half strength MS medium in order to optimize the culture condition for axillary buds. 15% Clorox® for 20 min was very effective in minimizing pathogenic contaminants (100% non contaminants) embryos as well as minimum browning. Embryonic axis with ½ of cotyledon portion was used as

explants for in-vitro establishment and inoculated into the half strength MS basal medium supplemented with 1.5mg L⁻¹ BAP + 0.2mg L⁻¹ IAA to initiate in-vitro seedlings, giving maximum culture initiation (90%). 1g L⁻¹ activated charcoal was effective for establishment of in-vitro culture, recording minimum browning effect (34.9 mean rank value on nonbrowning appearance), enhancing stem elongation (19.5mm height) and leaf initiation (2.06 leaves/plantlet) after 14 days of culturing. Treatment combination of 0.1mg L⁻¹ NAA + 4.0m L⁻¹ BAP + 1.0g L⁻¹ activated charcoal in full strength MS medium was effective for adventitious root elongation on in-vitro micro-stem cuttings and given the highest root length (6.7cm) after 6 weeks of incubation period. Coir dust was the best potting medium for acclimatization giving maximum survival (90%).

15. Cultivation

15.1. Land preparation and planting

Pits of 50 cm are dug at a spacing of 3 x 3 m filled with compost and topsoil before plantation. Seedlings are transplanted when they are about 12 months old at a distance of about 2 metres between plants and rows. The planting is done in suitable weather conditions, preferably in June-July to get benefit of monsoon for the establishment of seedlings. In each pit, 5 seedlings can be planted. Partial shade in the initial years is advantageous for healthy and rapid growth of plants.

15.2. Manuring and fertilization

First year: 20 g N, 18 g P₂O₅, and 25 g K₂O/seedling.

Three years after planting: 29 kg F.Y.M., 4 kg *neem* cake, 150 g N, 75 g P₂O₅ and 150 g K₂O per plant. The fertilizers are applied in two doses during first week of September and in March.

Fertilizer should be applied along with watering using a time released fertilizer 8-3-9 or similar for better production of Cinnamon crop. These trees are moderate feeders and may require multiple feeding during the growing season.

15.3. Training and pruning

The time, when the seedlings are 2-3 years old, the shoot is cut from the height of 30 cm from ground level so that side shoots can be produced. This is called 'coppicing'. This is done until the whole tree takes the shape of a low bush.

15.4. Aftercare

The newly planted seedling should be regularly irrigated. In the first 3-4 years, weeding is done 3-4 times in a year. Subsequently one or two weedings are required during June to July and October to November. Normally seedlings grow to a height of 2 m in 7 years.

15.5. Watering

For watering the cinnamon tree, the soil should be lightly soaked. Do not water again until the top 2 inches of soil are dry. Depending on light conditions, location and foliage watering may be required weekly or daily.

15.6. Insect pests and their management

In India and Sri Lanka, caterpillars of the cinnamon butterfly (*Chilasa clytia*) are destructive to new flushes, and shot-hole borers (*Xylosandrus* spp.) cause damage to stem and bark. Leaf miners (*Acrocercops* spp., *Phyllocnistischrysophthalma*), gall and leaf mites (*Eriophyes bois*, *E. doctersi*, *Typhlodromus* spp.), leaf webbers (*Sorolopha archimedi*) and arboreal ants (*Oecophylla smaragdina*) cause occasional damage.

Psyllid bug: It feeds on leaves. It can be controlled by spraying 0.05 % endosulphan or 0.05 % quinolphos.

Stem Borer: It feeds on bark. It can be controlled by spraying Lindane powder.

Leaf Miner and Tussock Caterpillar: It can be controlled by spraying 05 % quinolphos.

Young seedlings are vulnerable to damage by agrotid larvae or mole crickets (*Grylotalpa* spp.), and larvae of *Popillia* spp., attacking roots. Ceylon cinnamon is also attacked by root-knot nematodes (*Meloidogyne* spp.).

Storage pests of cinnamon quills include *Lasioderma serricorne*, *Pyralis ferinalis* and *Sitodrepa panicea*.

15.7. Diseases and their management

Stripe canker (*Phytophthora cinnamomi*) may damage trunks and branches of young trees in particular, symptoms being vertical strips of dead bark, particularly near ground level.

Root rots include black rot caused by *Rosellinia* spp., **brown rot** caused by *Phellinus lamaensis*, and white rot caused by *Fomes lignosus*.

Pink disease (*Corticium salmonicolor*) causes pink encrustations on the stem with death of small shoots.

Anthracnose (*Glomerella cingulata*), **Rust** (*Aecidium cinnamomi*) and other **leaf and stem diseases** (*Cephaleuros virescens*, *Diplodia* spp., *Exobasidium* spp., *Gloeosporium* spp., *Leptosphaeria* spp. and *Pestalotia cinnamomi*) may occasionally cause damage.

Stem rot: It is a fungus disease causing flaking-and rotting. It can be controlled by spraying 1 % Bordeaux mixture.

16. Harvesting

Cinnamon bark is harvested twice a year immediately after each of the rainy seasons when the humidity makes the bark peel more easily. The trees are first harvested when they are three years old, one year after pruning. The side stems that are about three years old are removed and the bark is stripped off. Cinnamon bark is only obtained from stems that are between 1.2 and 5cm in diameter.

17. Yield

There are two regular cutting seasons in South India, which more or less synchronize with two monsoons. The appropriate time for cutting the shoots for peeling is determined with reference to the circulation of sap between the wood and the corky layer. The yield varies with type of variety and age.

3-4 year and onwards - 62 to 125 kg quills/ha.

10-11 year and onwards - 225 to 300 kg quills/ha.

Further, about 75 kg of quillings and featherings are additionally obtained. One ton of leaves yielding 1 to 1.25 kg of oil are obtained per year.

18. Processing

Processing accounts for about 60% of the cost of production of cinnamon as removal of bark from the stem is very labour intensive and is usually done by hand and by skilled labourers.

The quality of cinnamon depends on how well the bark is removed from the stems. The larger pieces of bark known as quills are sold at higher rate than the smaller broken pieces. Drying is also one of the important stages of cinnamon processing as it adds to the quality of the final product.

18.1. Peeling and extraction of bark

Branches, 1 to 2 cm in thickness and which have attained brown colour are cut. The branches should be 1 to 2 years old. Cutting of shoots for extraction of bark is done in May and November. The cut shoots are collected, bundled and tied to shed for peeling. Peeling is done with a small knife having a round edge at the end.

18.2. Rolling

Peeled barks are packed together and placed one above the other and pressed. Length of peeled barks is reduced to 20 cm and these are piled up in small enclosures covered with dried leaves or mats-to preserve moisture for next day's operation and also to aid slight fermentation.

18.3. Piping

Peeled and rolled slips are bundled and taken to piping yard. These slips are kept on a horizontal stick supported on a stand. The outer skin of the slip is scrapped-off with a curved knife. These scrapped slips are then graded according to thickness. The graded slips are rolled to form pipes by fitting them over the outer cover of pipes. After piping, slips are dried. Such piped slips are called quills'. The smaller quills are inserted into larger ones to form compound quill. The compound quills are placed on coir rope racks and dried in the shade to avoid warping. After drying for 4-5 days, the quills are rolled on a board to tighten the filling and then placed in subdued sunlight for further drying. After drying, they are packed in mats for marketing.

18.4. Grading

The quills are graded from '00000' being the finest quality, to '0' the coarsest quality. The small pieces of the bark, left after preparing the quills are graded as 'quillings'. The very thin inner pieces of bark are dried as 'featherings'. From the coarser canes, the bark is scrapped-off, instead of peeling and this grade is known as 'scrapped chips'. The bark is also scrapped-off without removing *the* outer bark and is known as 'unscrapped chips'. The different grades of bark are powdered to get 'cinnamon powder'. The quality of the cinnamon is dependent upon the thickness of the bark, the appearance, aroma and flavor. The Sri Lankan grading

system divides the cinnamon quills into four main groups according to diameter:

| Classification | Description | Measurements |
|----------------|--|--------------------------|
| 1. Quills | Alba | Less than 6 mm diameter |
| | Continental | Less than 16 mm diameter |
| | Mexican | Less than 19 mm diameter |
| | Hamburg | Less than 32 mm diameter |
| 2. Quillings | Pieces of bark less than 106 mm long | |
| 3. Featherings | Inner bark of twigs and twisted shoots | |
| 4. Chips | Trimnings of quills, outer and inner bark that cant be separated | |
| 5. Powder | | |
| 6. Leaf oil | | |

18.5. Grinding

Most consumers, from wholesalers to individual customers, prefer to buy whole spices. Cinnamon is sometimes ground to powder form prior to sale. The ground powder should be packaged in moisture proof packaging (polypropylene bags) to retain the flavour.

19. Packaging

Cinnamon quills are normally cut into pieces of 10 cm in length and packed into moisture-proof polypropylene bags for sale. The bags should be sealed to prevent moisture entering. The label on the bags should contain all relevant product and legal information – the name of the product, brand name, details of the manufacturer (name and address), date of manufacture, expiry date, weight of the contents, added ingredients etc.

20. Storage

Dried cinnamon quills must be stored in moisture-proof containers away from direct sunlight. If they have absorbed moisture, they should be re-dried to a moisture content of 10%. The storage room should be clean, dry, cool and free from pests. Mosquito netting should be fitted on the windows to prevent pests and insects from entering the room. Strong smelling foods, detergents and paints should not be stored in the same room as they will spoil the delicate aroma and flavour of the cinnamon.

21. Trade and Marketing of Cinnamon

21.1. Laxmi enterprises,

Mr Bharat Maskai, 170/172, Samuel Street, Mumbai, Maharashtra.

21.2. Nani Agro Foods (p) ltd.,

Ms. Gayathri, 32, Ottukarra Chinnaiya Street, Post Box No. 549
Erode, Near Manigoondu, Tamil Nadu 638003.

21.3. Kitchen express overseas Ltd.,

Mani Konar, 29/P Santej, Santej Vadsar Road.
Tal. Kalol, Distt. Gandhinagar, Kalol, Santej, Gujarat, Pin 382721.

21.4. Synthite Industries Ltd.,

Mr. C.V.JACOB, Ajay Vihar, Cochin, MG Road, Kerala, 682016
Phone: 0484-3012222, 0484-2378801, Email: info@synthite.com

21.5. Nilkanth Exports,

Mr. Arpit Patel, Thakkar Wadi, Nr Town Hall, Anand, Gujarat 388001.
Telephone: 02692244081, Mobile: 09898566476 Email: nilkanthexports98@gmail.com

21.6. M M International,

Mr. Nimish Vora, C95, Turbhe MIDC, Navi Mumbai,
South Central Road, Maharashtra, 400705, Ph: 02227620366
Mob: 8169325350, Email: nimish@mmispices.com

21.7. Ramdev Food Products Pvt. Ltd.,

Sachin Patel, 527, Spice World
Sharkhej Bavla High Way, Ahmedabad, Changodar, Gujarat 382213.
Ph: 02717-304200, Mob.: 9328731920.

21.8. Adani Food Products,

Siddharth Adani, Rashtriya Shala Marg, Rajkot 360002,
Ph: 0281-2466796, Mob.09825229296, Email: siddharth@adanispices.com

References

Subasinghe, S., Hettiarachchi, C.S. and Iddagoda, N. 2016. In-vitro propagation of cinnamon (*Cinnamomum verum* Presl) using embryos and *in vitro* axillary bud. *Journal of Advance Agricultural Technologies*, **3**(3):164-169.