Cortex Cinnamomi

Definition

Cortex Cinnamomi consists of the dried inner bark of the shoots grown on cut stock of *Cinnamomum verum* J.S. Presl. (*1–5*) or of the trunk bark, freed of cork, of *Cinnamomum cassia* Blume (*6–8*) (Lauraceae).

Synonyms

Cinnamomum verum J.S. Presl.

Cinnamomum zeylanicum Nees (*9–11*), *Laurus cinnamomum* L. (*4*).

Cinnamomum verum J.S. Presl. is the correct botanical name according to the International Rules of Botanical Nomenclature (*11*).

Cinnamomum cassia Blume

Cinnamomum aromaticum Nees (*7, 12, 13*).

Selected vernacular names

Cinnamomum verum J.S. Presl.

Abdalasini, blood-giving drops, canela, canela en raja, cannalavanga pattai, cannelle de ceylan, cannelle dite de Ceylan, cannelier, Ceylon celonzimi cinnamon, Ceylon cinnamon, cinnamon, cinnamon bark, cinnamon tree, cortex cinnamomi ceylanici, dalchini, dalochini, dar sini quirfa, darchini, daruchini, darusila, ecorce de cannelier de Ceylan, echter Kanel, gujerati-dalchini, kannel, kuei-pi, kurundu, kurundu-potu, kulit kayumanis, ob choei, tamalpatra, wild cinnamon, Zimtrinde (*2–4, 10, 14, 15*).

Cinnamomum cassia Blume

Annan cinnamon, cassia, cassia bark, cassia bark tree, cassia lignea, chinazimt, Chinese cassia, Chinese cinnamon, ching hua yu-kuei, cinnamomi cassiae cortex, cinnamon, cinnamon bark, dalchini, guipi, guizhi, kannan keihi, keihi, keishi, kuei-chíi, lavanga-pattai, lavanga-patti, lurundu, macrophyllos cassia bark tree, rou gui, róugì, Saigon cinnamon, saleekha, taj, toko keihi, Viet Nam cinnamon (*6, 7, 12–17*).

Description

Cinnamomum verum J.S. Presl.

A moderate-sized evergreen tree; bark rather thick, smooth, pale; twigs often compressed; young parts glabrous except the buds which are finely silky. Leaves opposite or subopposite (rarely alternate), hard and coriaceous, 7.5–20 by 3.8–7.5 cm, ovate or ovate-lanceolate, subacute or shortly acuminate, glabrous and shining above, slightly paler beneath, base acute or rounded; main nerves 3–5 from the base or nearly so, strong, with fine reticulate venation between; petioles 1.3–2.5 cm long, flattened above. Flowers numerous, in silky pubescent, lax panicles usually longer than the leaves; peduncles long, often clustered, glabrous or pubescent; pedicels long. Perianth 5–6 mm long; tube 2.5 mm long; segments pubescent on both sides, oblong or somewhat obovate, usually obtuse. Fruit 1.3–1.7 cm long, oblong or ovoid-oblong, minutely apiculate, dry or slightly fleshy, dark purple, surrounded by the enlarged campanulate perianth that is 8 mm in diameter (*14*).

Cinnamomum cassia Blume

An evergreen tree, up to 10 m high. Leaves alternate, coriaceous, petiolate, oblong, elliptical-oval or oblong-lanceolate, 8–15 cm long by 3–4 cm wide, tip acuminate, base rounded, entire, 3-nerved; glabrous or underside lightly pubescent; petiole 10 mm long, lightly pubescent. Inflorescence a densely hairy panicle as long as the leaves; panicles cymose, terminal and axillary. Flowers yellowish white, small, in cymes of 2–5. Perianth 6-lobed. No petals. Stamens 6, pubescent. Ovary free, 1-celled. Fruit a globular drupe, 8 mm long, red. The bark is used in either channelled pieces or simple quills, 30–40 cm long by 3–10 cm wide and 0.2–0.8 cm in thickness. The surface is greyish brown, slightly coarse, with irregularly fine wrinkles and transverse lenticels. Here and there are found scars of holes, indicating the insertion of leaves or lateral shoots; the inner surface is rather darker than the outer, with fine longitudinal striae. The fracture is short, the section of the thicker pieces showing a faint white line (pericyclic sclerenchyma) sometimes near the centre, sometimes near and parallel to the outer margin (*14*).

Plant material of interest: dried bark, free from the outer cork

General appearance

Cinnamomum verum J.S. Presl.

The bark is about 0.2–0.8 mm thick and occurs in closely packed compound quills made up of single or double quills. The outer surface is smooth, yellowish brown with faint scars marking the positions of leaves and axillary buds and has fine, whitish and wavy longitudinal striations. The inner surface is slightly darker and longitudinally striated. The fracture is short and fibrous (*1*).

***Cinnamomum cassia* Blume**

The drug is channelled or quilted, 30–40 cm long, 3–10 cm in diameter, 2–8 mm thick. Outer surface greyish brown, slightly rough, with irregular fine wrinkles and transverse raised lenticels, some showing greyish white streaks; inner surface reddish brown, with fine longitudinal striations and exhibiting oily trace on scratching. Texture hard and fragile, easily broken, fracture uneven, outer layer brown and relatively rough, inner layer reddish brown and oily and showing a yellowish brown line between two layers (*6*).

Organoleptic properties

Odour, characteristic and aromatic (*2, 3, 4, 6*); taste, characteristic, slightly sweet and fragrant (*3, 4, 6*).

Microscopic characteristics

***Cinnamomum verum* J.S. Presl.**

The outside shows a few discontinuous layers of cortical parenchyma within which is a wide, continuous layer of pericyclic sclerenchyma composed of groups of isodiametric or tangentially elongated sclereids with thickened and pitted walls, and occasional groups of fibres. The phloem is composed of sieve tissue and parenchyma with large secretion cells containing essential oil or mucilage and phloem fibres occurring singly or in small groups, individual fibres 15–25 μm in diameter with thickened walls; medullary rays uniseriate or biseriate. Some of the cells contain small acicular crystals of calcium oxalate; the remainder, together with the phloem parenchyma, contain starch granules, simple or 2–4 compound, rarely more than 10 μm in diameter (*1, 3*).

***Cinnamomum cassia* Blume**

The transverse section shows the cork being composed of several layers of cells, the innermost layer with thickened and lignified outer walls. Cortex scattered with stone cells and secretory cells. Pericycle stone cells in groups arranged in an interrupted ring, accompanied by fibre bundles at outer side, the outer walls of stone cells usually thinner. Phloem rays 1 or 2 rows of cells wide, containing minute needle crystals of calcium oxalate; usually 2 or 3 fibres in bundles; oil cells scattered throughout. Parenchymatous cells contain starch granules (*6*).

Powdered plant material

***Cinnamomum verum* J.S. Presl.**

The powdered drug is yellowish to reddish brown and consists of groups of rounded sclereids with pitted, channelled and moderately thickened walls; numerous colourless fibres, often whole with narrow lumen and thickened, lignified walls and few pits; rarely small acicular crystals of calcium oxalate; abundant starch granules. Cork fragments are absent or very rare (*1, 3*).

***Cinnamomum cassia* Blume**

Reddish brown. Most fibres singly scattered, long fusiform, 195–920 μm long, up to 50 μm in diameter, with thickened and lignified wall, pits indistinct. Stone cells subsquare or sub-rounded, 32–88 μm in diameter, the walls thickened, some thin at one side. Oil cells sub-rounded or oblong, 45–108 μm in diameter. Needle crystals minute, scattered in ray cells. Cork cells polygonal, containing reddish brown contents (*1*).

Geographical distribution

Cinnamomum verum J.S. Presl.

Native to India and Sri Lanka (*4*, *11*, *14*); cultivated in parts of Africa, south-eastern India, Indonesia, the Seychelles, South America, Sri Lanka, and the West Indies (*4*, *10*, *11*).

Cinnamomum cassia Blume

Found in China, Indonesia, the Lao People's Democratic Republic, and Viet Nam, (*12*, *13*, *16*); mostly cultivated (*12*).

General identity tests

Macroscopic and microscopic examinations (*1–6*); and thin-layer chromatographic analysis for the presence of cinnamaldehyde (*1–6*, *8*).

Purity tests

Microbiology

The test for *Salmonella* spp. in Cortex Cinnamomi products should be negative.The maximum acceptable limits of other microorganisms are as follows (*18–20*). For preparation of decoction: aerobic bacteria—not more than 10^7/g; fungi—not more than 10^5/g; *Escherichia coli*—not more than 10^2/g. Preparations for internal use: aerobic bacteria—not more than 10^5/g or ml; fungi—not more than 10^4/g or ml; enterobacteria and certain Gram-negative bacteria—not more than 10^3/g or ml; *Escherichia coli*—0/g or ml.

Foreign organic matter

C. verum: not more than 2% (*4*, *14*). *C. cassia*: not more than 1% (*16*).

Total ash

C. verum: not more than 6% (*2*). *C. cassia*: not more than 5% (*6*, *8*, *14*, *16*).

Acid-insoluble ash

C. verum: not more than 4% (*4*). *C. cassia*: not more than 2% (*14*, *16*).

Sulfated ash

C. verum: not more than 6% (*1*, *3*). *C. cassia*: to be established in accordance with national requirements.

Alcohol (90%)-soluble extractive

C. verum: 14–16% (*4*). *C. cassia*: to be established in accordance with national requirements.

Pesticide residues

To be established in accordance with national requirements. Normally, the maximum residue limit of aldrin and dieldrin for Cortex Cinnamomi is not more than 0.05 mg/kg (*21*). For other pesticides, see WHO guidelines on quality control methods for medicinal plants (*18*) and guidelines for predicting dietary intake of pesticide residues (*20*).

Arsenic and heavy metals

Recommended lead and cadmium levels are not more than 10 mg/kg and 0.3 mg/kg, respectively, in the final dosage form of the plant material (*18*).

Radioactive residues

For analysis of strontium-90, iodine-131, caesium-134, caesium-137, and plutonium-239, see WHO guidelines on quality control methods for medicinal plants (*18*).

Other tests

Chemical tests to be established in accordance with national requirements.

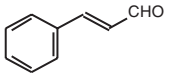
Chemical assays

Not less than 1.2% v/w of volatile oil derived from C. *verum* (*1*–*3*) and 1–2% v/w of volatile oil derived from C. *cassia* (*16*), containing 60–80% w/w aldehydes calculated as cinnamaldehyde (*3*, *16*).

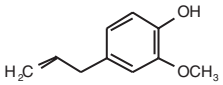
Assay for cinnamaldehyde content by means of thin-layer (*1*–*4*, *6*) or high-performance liquid chromatographic (*21*, *22*) methods.

Major chemical constituents

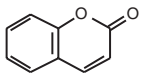
The major constituent in both *C. verum* and *C. cassia* is cinnamaldehyde, at concentrations of 65–80% (*9*, *10*) and 90% (*9*) of the volatile oil, respectively.



cinnamaldehyde



eugenol



coumarin

Cinnamomum verum also contains *o*-methoxycinnamaldehyde (*10*). *Cinnamomum verum* differs from *C. cassia* in its eugenol and coumarin content. *Cinnamomum verum* volatile oil contains 10% eugenol, whereas in *C. cassia*, only a trace quantity of this compound is found (*9*). Coumarin is present in *C. cassia* (0.45%), but not in *C. verum* (*21*).

Dosage forms

Crude plant material, powder, volatile oil, other galenic preparations. Store in a well-closed glass or metal container (do not use plastic), protected from light and moisture (*1–6*, *10*).

Medicinal uses

Uses supported by clinical data

None.

Uses described in pharmacopoeias and in traditional systems of medicine

The treatment of dyspeptic conditions such as mild spastic conditions of the gastrointestinal tract, fullness and flatulence, and loss of appetite (*4*, *6*, *7*, *12*). Also used to treat abdominal pain with diarrhoea, and pain associated with amenorrhoea and dysmenorrhoea (*6*, *12*).

Uses described in folk medicine, not supported by experimental or clinical data

The treatment of impotence, frigidity, dyspnoea, inflammation of the eye, leukorrhoea, vaginitis, rheumatism, neuralgia, wounds, and toothache (*15*).

Pharmacology

Experimental pharmacology

Antibacterial and antifungal activities of the essential oil have been demonstrated *in vitro* (*10*). The essential oil of *C. verum* is active *in vitro* against the following bacteria: *Bacillus subtilis* (*23*, *24*), *Escherichia coli*, *Staphylococcus aureus* (*24*, *25*), *Salmonella typhimurium* (*26*), and *Pseudomonas aeruginosa* (*24*). It was also active *in vitro* against the following fungi: *Aspergillus* spp., *Cladosporium werneckii* (*27*), *Geotrichum candidum*, *Kloeckera apivulata*, *Candida lipolytica* and *C. albicans* (*23*, *28*). The antibacterial and fungicidal effects have been attributed to *o*-methoxycinnamaldehyde (*9*).

The essential oil of *C. verum* has carminative activity (*29*) and decreases smooth muscle contractions in guinea-pig trachea and ileum (*30*), and in dog ileum, colon and stomach (*31*). The active antispasmodic constituent of the drug is cinnamaldehyde. A reduction of stomach motility in rats and dogs and

intestinal motility in mice and a decrease in the number of stress- and serotonin-induced ulcers in mice have been described (*32–36*). An ethanol extract of the drug inhibits histamine- and barium-induced contractions in guinea-pig ileum; the hot-water extract was not active (*36*).

Contraindications

The drug is contraindicated in cases of fever of unknown origin, pregnancy, stomach or duodenal ulcers (*7*, *9*, *12*), and in patients with an allergy to cinnamon or Peru balsam (*9*).

Warnings

No information available.

Precautions

Drug interactions

Cinnamomum cassia bark extract (2 g in 100 ml) markedly decreased the *in vitro* dissolution of tetracycline hydrochloride (*37*). In the presence of *C. cassia* bark, only 20% of tetracycline was in solution after 30 minutes, in contrast to 97% when only water was used (*37*). However, the clinical significance of this interaction has not been established. The drug is reported to be incompatible with *Halloysitum rubrum* (*6*).

Carcinogenesis, mutagenesis, impairment of fertility

There are insufficient data to evaluate the carcinogenic potential of Cortex Cinnamomi (*35*). Reports concerning the mutagenicity of the drug are contradictory. Extracts of the plant and cinnamaldehyde have been reported to be both mutagenic and non-mutagenic in *Salmonella typhimurium* (Ames assay) and in assays using *Bacillus subtilis* (*38*, *39*). However, the results of these *in vitro* mutagenicity studies are difficult to assess because, at the doses given, the effects may have been due to the antimicrobial effects of the drug (*35*). Cortex Cinnamomi and cinnamaldehyde gave positive results in chromosomal aberration tests using Chinese hamster cell cultures (*35*), and in *Drosophila* test systems (*40–43*). An aqueous extract of the drug was also negative in the *Drosophila* test system (*35*).

Pregnancy: teratogenic effects

Available data are not sufficient for an adequate benefit/risk assessment. Therefore, Cortex Cinnamomi should not be used during pregnancy. There is one report of teratogenicity of cinnamaldehyde in chick embryos (*35*), but studies of teratogenicity in chick embryos are of limited usefulness when evaluating the teratogenic potential for humans (*35*). A methanol extract of the drug given by gastric intubation was not teratogenic in rats (*44*, *45*).

Pregnancy: non-teratogenic effects

Cortex Cinnamomi should not be used during pregnancy. See Contra-indications.

Nursing mothers

Available data are not sufficient for an adequate benefit/risk assessment. Therefore, Cortex Cinnamomi should not be used during lactation.

Paediatric use

The safety and efficacy of the drug in children have not been established.

Other precautions

No information available concerning general precautions, or drug and laboratory test interactions.

Adverse reactions

Allergic reactions of the skin and mucosa have been reported (*7*, *46–49*).

Posology

Crude drug—average daily dose, 2–4 g (*7*); volatile oil—average daily dose, 0.05–0.2 g (*7*); other preparations—average daily dose as above (*7*).

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