



CINNAMON (*CINNAMOMUM ZEYLANICUM*); A BRIEF REVIEW OF THE CULINARY SPICE WITH ITS POTENTIAL THERAPEUTIC INDICATIONS.

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Article Received on 31/03/2023

Article Revised on 20/04/2023

Article Accepted on 10/05/2023

ABSTRACT

Cinnamomum zeylanicum Blume (*Dārchjīnī*) is a small, tropical, evergreen tree belonging to the family Lauraceae. It attains a height of about 10 to 15 meters and a diameter of 50 cms. The bark of this tree is medicinally used, which is dull pale brown in colour, 0.5 mm thick, 7 to 13 mm wide. *Cinnamomum zeylanicum* Blume tree grows in the forests of Ceylon and some southern parts of India. Currently, the accepted scientific name of cinnamon is *Cinnamomum verum*. Unani physicians have mentioned various actions of *Cinnamomum zeylanicum* in the classical Unani literature. The actions are *Muffatih* (De-obstruent), *Muqawwī-i-kabid* (Liver tonic), *Muqawwī-i-A'da'Ra'isa* (Tonic for principal organs like brain, heart and liver), *Muḥalli-i-awrām* (Anti-inflammatory) etc. The principal constituent of cinnamon bark is the essential oil which contains cinnamaldehyde, Cinnamate, Cinnamic acid, trans-cinnamaldehyde, Cinnamyl acetate, linalool, Caryophyllene oxide, beta-caryophyllene, eucalyptol and eugenol.

KEYWORDS: *Cinnamom zeylanicum*, *Cinnamomum verum*, *Dārchjīnī*, *Cinnamomum*.

INTRODUCTION

Cinnamomum zeylanicum Blume is a small, tropical, evergreen tree belonging to the family Lauraceae. The genus '*Cinnamomum*' consists of aromatic evergreen trees and shrubs. There are approximately 300 species in this genus, which are distributed in tropical and subtropical regions of Asia, Australia, South America, North America, Central America and Oceania. Several species are most commonly known for their aromatic bark. Cinnamon is one of the most important and popular spices used worldwide not only for cooking, in aroma and essence industries but also in traditional and modern medicines. *Cinnamomum zeylanicum* Blume, which is native to India and Srilanka is the most commonly used and preferred species because of its subtle flavour and low coumarin content.^[1,2,3] Cinnamon is one of the oldest known and popular spices and also it is the first spice to be traded between Asia and Europe.^[4] Besides this, it is widely used in the Unani system of medicine and the classical literature of the Unani system of medicine is replete with detailed descriptions about *Dārchjīnī* and is regarded as a valuable medicine for a number of diseases.^[5]

HISTORY: Chinese were well aware of the cassia bark since 2700 BC, but no reference is found for the collection of cinnamon in Ceylon until the thirteenth

century. In the Chinese language it was named "Kwai". As Ceylon was occupied by Portuguese, the Dutch and the English East India Company, during different eras, cinnamon cultivation was started by the Dutch in 1770. Cinnamon was used by Romans for its medicinal action in respiratory and digestive tract diseases, they also used it to fend off the odour of dead bodies. Egyptians used it for its fragrance and flavouring properties and the embalming of mummies.^[6,7]

Taxonomy

Kingdom:	Plantae
Subkingdom:	Viridiplantae
Infra-kingdom:	Streptophyta
Phylum:	Magnoliophyta
Class:	Magnoliopsida/magnolid
Order:	Laurales
Family:	Lauraceae
Genus:	<i>Cinnamomum</i>
Species:	<i>Verum</i> / <i>Zeylanicum</i> ^[8,9]

Nomenclature: The genus "*Cinnamomum*" is derived from the Greek word '*Kinnamon*' or "*Kinnamomum*" meaning 'Sweet wood'. The common name cinnamon is derived from an Arabic and Hebraic term "*Amomon*" meaning fragrant spice plant. 'Ceylon cinnamon' is considered as the true common name of '*Cinnamomum*'

zeylanicum’ and the name cinnamon is the shortened version of it. Currently, the accepted scientific name of cinnamon is *Cinnamomum verum*.^[9,10] The real or true cinnamon spice is a part (bark) of *Cinnamomum verum*. The word ‘*verum*’ is derived from the Latin “*vera*” meaning truth, however, marketed cinnamon has many other sources i.e it is derived from other species, notably *Cinnamomum cassia*.^[3] In Hindi the name *Dalchini* is used for it, which means Chinese wood, originally referring to Chinese Cinnamon that was Commonly used in northern parts of India before the ‘Ceylon cinnamon’ became known.^[10]

Botanical name: *Cinnamomum zeylanicum* Blume/
Cinnamomum verum J.presl.^[9,10,11,12,13]

Vernacular names

Arabic: *Darsini/Qirfa, Qirfah-e -ailaniyah, Shajratul Ain*.^[13,14,15]

Assamese: Dalcheni, Dalchini.^[16]

Bengali: *Dārḥjñī, Daruchini, Qalmi Dārḥjñī*^[17]

Burma: *Hmanthin, Lulingyaw, Simbosikiyabo, Thitkyabo, Timbolikyobo*^[17]

English: Cinnamon bark, True cinnamon, Chinese cassia, cinnamon, Ceylon cinnamon.^[17,18]

French: *Bois de cannelle, Cannelier, Laurier cannellier*^[17]

German: *Ceylonzim*^[17]

Gujarati: *Dalchini, Taj*^[17]

Italian: *Canella, Canella di Ceylon, Canella regina*^[17]

Hindi: *Dalchini, Dārḥjñī, Qalmi Dārḥjñī, Dalcini, Daruchini, Tavaka*.^[13,15]

Kannada: *Dārḥjñī, Chakke*^[16]

Kashmiri: *Dalchini, Dalchin*^[16]

Malayalam: *Karuvapatta, Ilavarangathely, Ethunai lavangam*^[16]

Marathi: *Dalchini, Darachini*^[17]

Oriya: *Dalochini, Gudotwako, Daruchini, Tapinchchha*^[16,17]

Persian: *Dārḥjñī, Salikha, Dare-chini*^[16,17,18, 19,20]

Punjabi: *Dalchini, Daruchini, Dārḥjñī, kirfa*.^[17]

Roman/Latin: *Qetarsensam*.^[15]

Sanskrit: *Darusita, Tvaka*^[17]

Spanish: *Arbol de lecanella, Canelero, Canela de ceylan, Canela de holanda, Canelo*^[17]

Syriac/Suryani: *Marsaloon*^[15]

Tamil: *Lavangapatta, Karuvapattai*.^[17]

Telugu: *Lavangapatta, Lvangamu, Dalchini Chakka, Akerpatri, Sanalavanga*^[16,17]

Turkish: *Tarcin*^[17]

Unani: *Qayamousees, Qasamoos, Qosoulone*^[15]

Urdu: *Dārḥjñī, Qurfa*^[19,21]

General description in classical Unani literature: *Dārḥjñī* is obtained from a tall petrous tree, which grows in the forests of Ceylon and some southern parts of India. The variety that is produced in Ceylon is considered to be the best. The bark is present as quills that are thin, fragile and rolled. According to *Ibn Sena Dārḥjñī* is of two types *Sādik* (Real) and *Kāzib* (False).

Sādik is better than *Kāzib* and is thin, more aromatic, smoother and stronger in action than *kāzib*.^[14] *Dioscorides* has described the best variety as blackish, brownish or reddish in colour and is smooth and closely attached to its stalk. There is some sweetness and saltiness in its taste and causes mild irritation on the tongue when chewed. It has a dominating odour.^[22,23]

Ibn baitaar in his treatise has mentioned that *Dārḥjñī* is the persian name of ‘*shajaratulaain*’. *Ibn baitaar* has mentioned many types: Real *Dārḥjñī*: produced in china; *Darsoos*: which is light and of low grade than real *Dārḥjñī*; *Qurfa* *Qurfa-e-qaranfal*: thin, hard and blackish in colour. *Dārḥjñī* has several types and names as per the source of production among which ‘*Molousoun*’ is considered as the best type, which is fresh or new and is rusty red in colour. Its wood is thin.^[15] As per *Najmul Ghani* it is divided into several types on the basis of the colour, taste, odour. The best type of *Dārḥjñī* is that which has pungent odour, aromatic and sweet taste, is reddish in colour, with a length of about one meter and is commonly found in the form of a quill.^[14]

Botanical Description and morphology of *Cinnamomum zeylanicum/verum*

Cinnamomum verum is an evergreen tree of moderate size belonging to the family Lauraceae. It attains a height of about 10 to 15 meters and a diameter of 50 cms. It is a slow-growing plant. It has a thick, smooth and pale bark with compressed twigs. *Cinnamomum verum* has fine and silky buds and numerous inflorescence which is paniced, clustered, branched, glabrous; pedicles are long and usually longer than leaves. The flowers have a unique odour and are yellowish-white or greenish in colour. Its leaves are glabrous, opposite, coriaceous i.e. they have leathery texture on both surfaces, ovate to oblong in shape, 4 to 6 inches long, which have a blunt accumulation at the apex, shining bright green above and glaucous beneath. Fruit is 1.3 to 1.7 cm long, dry or may be slightly fleshy and surrounded by large campanulate perianth and is dark purple in colour.^[17,24,25]

The bark of this tree is medicinally used, which is dull pale brown in colour, 0.5 mm thick, 7 to 13 mm wide. It has a pale, undulating glossy outer surface with longitudinal lines, scars of vessels and holes, indicating leave insertions of lateral shoots and it lacks epidermis or cork. The inner surface is darker than the outer with longitudinal striations, the fracture is short and splintery. It has a delicate aromatic fragrance and sweet taste.^[11,16,26,27]

Microscopic features: On the transverse section of the cinnamon bark, the outermost part shows the cork made of numerous oval to polygonal parenchymatous cells having yellowish-brown contents. The outer layer of bark that is the cortical region is composed of rectangular to polygonal or longitudinally elongated pericycle fibres containing starch grain, with lignified cells.

Primary phloem is not easily distinguishable while as secondary phloem contains phloem parenchyma with oil and mucilage cells from which volatile oil constituents are derived. It also has phloem fibres and biseriate medullary ray cells. These cells possess small acicular crystals of calcium oxalate. These cells give a positive test for tannins with an aqueous solution of ferric chloride.^[10, 11,25]

Species of Cinnamon: The genus 'cinnamomum' consists of approximately 300 species, which are distributed in tropical and subtropical regions of Asia, Australia, South America, North America, Central America and Oceania. Several species are most commonly known for their aromatic bark. The cinnamon that is used in commerce is the dried inner bark of the tree *Cinnamomum Zeylanicum* (syn= *Cinnamomum verum*) belonging to Lauraceae family commonly known as Ceylon cinnamon.^[1,2,3] The other important species is the Cassia. Ceylon cinnamon is sweeter than cassia and has higher oil Content with more complex and citrusy flavour. Cassia Cinnamon or simply cassia has different origins, the important ones being the Chinese cassia (*Cinnamomum Cassia*, syn. *Cinnamomum aromaticum*), Indonesian cassia (*Cinnamomum burmannii*), Vietnamese cassia or Vietnamese cinnamon or Saigon cinnamon. *Cinnamomum tamala* and species like *Cinnamomum impressinervium*, *Cinnamomum Bejolghota* are the species present in India. The US Food, Drug and Cosmetic act permits use of the term cinnamon for Ceylon cinnamon, Chinese cassia and Indonesian cassia.^[10,28]

Habitat and Distribution

Cinnamomum verum is native to Srilanka and some parts of Southern India and it is also distributed in China, Burma, South East Asia, Indonesia, Madagascar, Caribbean, Australia, Africa and is cultivated in Malay islands and elsewhere in the tropics. It is extensively grown in Srilanka and imported with the trade name "Ceylon cinnamon" or "Srilankan cinnamon". For its optimum growth *Cinnamomum zeylanicum* requires a subtropical to tropical region, with maximum sunshine and humid soil. It can endure short mild frosts but not severe.^[17, 25]

Cultivation and Processing of Cinnamon: Cultivation of Cinnamon is done in well-drained soils, marshy places and tropical rainforest forests. *Cinnamomum verum* is the most harvested species of cinnamon. Cinnamon grows naturally in the forests of Western Ghats and is commercially cultivated in Kerala, Karnataka and Tamil Nadu. Cinnamon is adapted to a wide climatic range, being a hardy plant. For the cultivation of cinnamon hot and moist climate is highly favourable with an average temperature of about 27° celsius. The productive development of *Cinnamomum verum* in southern coastal regions of western India it occurs upto an altitude of 2000 meters and in Srilanka upto 2000 meters above sea level and is fairly common upto 1200 meters. It usually

thrives well at an altitude of 1000 metres and an annual rainfall of 200-250 cm is ideal for its cultivation. The quality of the harvest is greatly influenced by the soil and ecological factors. The bark of this tree is known as milled bark. The right time to peel the bark is when the red flush of young leaves changes into green colour. After harvesting the stems must be processed immediately while the inner bark is still wet. During the processing of cut stems, the outer bark is scraped off and the inner bark is pried off in long rolls. The outer woody portion is discarded and only 0.5 mm of the inner bark is used and a metre-long cinnamon strips are left that curl into rolls (quills) on drying, commonly known as cinnamon sticks. It takes four to six hours for the processed bark to dry completely in a warm environment. Once dry, the bark is cut into 5 to 10 cm lengths.^[6,10,24,28]

Parts used: Bark and oil.^[10,29]

Mizāj (Temperament)

Bark: Hot and dry in second degree.

Oil: Hot and dry in third degree.^[14,15,30,31,32]

Miqdār khurāk (Dosage)

1 to 2 Masha^[11,33]

7 to 10.5 Masha^[14]

Af'āl (Actions)

Unani physicians have mentioned various actions of *Cinnamomun zeylanicum* in the Unani literature. The actions are *Muffatīh* (De-obstruent), *Muqawwī-i-kabid* (Liver tonic), *Muqawwī-i-A'da'Ra'isa* (Tonic for principal organs like brain, heart and liver), *Muḥalli-i-awrām* (Anti-inflammatory), *Kāsir-i-Riyāh* (Carminative), *Muqawwī-i-Mi'da* (Stomachic), *Munaffīṭ* / *Munaffīṭh-i-Balgham* (Expectorant), *Mufarriḥ* (Exhilarating), *Mudirr-i-Bawl* (Diuretic), *Mudirr-i-Hayḍ* (Emmenagogue), *Muqawwī-i-Raḥīm* (Uterine tonic), *Musakkin-i-Alam* (Analgesic), *Mulṭṭif* (Demulcent), *Dāfi'-i-'Ufūnat* (Antiseptic), *Jādhīb* (Absorbent), *Muṣaffī-i-Dam* (Blood purifier), *Jālī* (Detergent), Antidiabetic, *Mudammil* (Wound healing), Antiviral, Fungicide, Insecticide, Larvicide, *Qābiḍ* (Astringent), *Dāfi'-i-Tashannuj* (Antispasmodic), *Muqawwī-i-bāh* (Aphrodisiac), *Muqawwī-i-asnān* (Tonic for teeth), *Muqawwī-i-A'sāb* (Nervine tonic), *Mujaffif* (Dessicant), *Musakkhkhin* (Calefacient), *Musakkin* (Sedative), *Musqīṭ-i-Janīn* (Abortifacient), *Dāfi'-i-Hummā* (Anti-pyretic), *Mulayyin-i-Am'ā* (Laxative), *Mundij* (Concoctive), *Tiryāq* (Antidote), *Mukhaddir* (Anaesthetic), *Dāfi'-Qay'* (Antiemetic), *Mu'arriq* (Diaphoretic), *Hāḍim* (Digestive).^[14,15,16,16,19,21,23,29,31,33,34]

Therapeutic Uses: *Du'f al-Ishtihā'* (Anorexia), *Ḍiq al-Nāfas* (Asthma), *Buthur* (Acne), *Nisyān* (Amnesia), *Iḥtibās al-Ṭamth* (Amenorrhea), *Istisqā' Ziqqī* (Ascites), *Istisqā' Lahmī* (Anasarca), Bloating, *Jaryān-al-Dam* (Bleeding), *Burūdat-e-mi'da*, *Su'āl* (Cough), *Nazla-o-Zukām* (Coryza and Catarrh), *Tashannuj* (Cramps),

Jarāhat Basiṭā (Chronic wound), *Ishāl* (Diarrhoea), *Zahīr* (Dysentery), *Tukhma* (Dyspepsia), '*Uṣr ṭamath* (Dysmenorrhea), *Waja' al-uzn* (Earache), *Bayād al-'Ayn* (corneal opacity), Flu, Frigidity, *Laqwa* (Facial paralysis), '*Irq al-Nasā* (Lambago), *Bakhr al-fam* (Halitosis), *Behtul Ṣawt* (Hoarseness of voice), *Fataq* (Hernai), *Fuwāq* (Hiccup), *Waram-al-kabid* (Hepatitis), *Ikhtelāj al-qalb*, *Sahr* (Insomnia), *Waja' al-Asnān* (Toothache), *Ras'ha* (Tremors), *Qulā'* (Stomatitis), *Ilthāb Tajāwīf al-Anf* (Sinusitis), *Gashī* (Syncope), *Ḍu'f al-bāh* (Sexual debility), Spasms, *Hudār* (Rheumatism), *Matlī* (Nausea), Naevus, *Waja' al-'Aṣāb* (Neuralgia), *Kalaf* (Melasma), *Istihāda* (Menorrhagia), *Ḍu'f al-mi'da*, *Istirkhā'* (Prolapse), *Khafaqān* (palpitation), Pityriasis, *Qay'* (Vomiting), *Duwār* (Vertigo).^[14,15,16,21,31,34,36,37]

Topical application of *Dārḥinjī* powder mixed with honey is beneficial for gingivitis and melasma.^[21,36]

Cinnamon oil is locally used in *Waqr* (deafness) and *Waj' al uzn* (otalgia/earache).^[14,15,36]

Muzarrat (Adverse effects): Diseases of (*Mathāna*) bladder, Kidney diseases, Causes *Ṣudā* (Headache) in people with hot temperament, *Garam Mizāj*.^[15,14,19]

Nafah khās (Main action): *Muqawwī-i-A'ḍā'Ra'ṭsa* (Tonic for principle organs), *Muqawwī-i-bāh* (Aphrodisiac), *Muqawwī-i-basr* (Improves vision), *Dāfi' khafaqān* (Used in palpitations).^[11,19]

Muslih (Corrective)

Mastagi (*Pistacia lentiscus*)

Asaroon (*Asarum europium*)

Kateera (*Sterculia urens* Roxb.)

For headache *Khamera Banafsha* and for kidney *Sandal sufaid* (*Santalum album*).^[14,36]

Badl (Substitute)

Abhal (*Juniperus sabina* Linn)

Kababa (*Piper cubeba*)

Taj (*Cinnamomum cassia*)

Zarnab (*Taxus baccata*)^[14,15,19,21]

Compound formulations

There are many compound formulations in which *Dārḥinjī* is used as an ingredient.

Ma'jūn: *Ma'jūn Dabidulward*, *Ma'jūn Arad khurma*, *Ma'jūn Ispand sokhtani*, *Ma'jūn Azaraqi*, *Ma'jūn Brahmi*, *Ma'jūn Boulas*, *Ma'jūn Jalinoos luluvi*, *Ma'jūn Hafiz-ul-aṣṣad*, *Ma'jūn Rahul momineen*, *Ma'jūn Ushba*.^[38,39,40,41,42,43,44,45]

Jawārish: *Jawārish Jalinoos*, *Jawārish Bisbasa*, *Jawārish Dārḥinjī*, *Jawārish Dārḥinjī Qawi*, *Jawārish Kundur*, *Jawārish Kamooni Kabir*, *Jawārish Muqawwī Mida*, *Jawārish Ood-e-Shirin*, *Jawārish Ood-e-tursh*, *Jawārish pudina*, *Jawārish Kafoor*, *Jawārish Safar-jali*

Mushil, *Jawārish Shaharyaran*, *Jawārish Zarooni sada*.^[38,39,40,41,42,43,44,45]

'Arq: '*Arq-e-Chobchini*, '*Arq-e-Irqun-nasa*, '*Arq-e-Muna'ish*, '*Arq-e-Nazla*, '*Arq-e-Shaham-e-hanzal*, '*Arq-e-Ma'ullaham Khaas*.^[17,18,38,43,44]

Habb: *Habb-e-Nazla*, *Habb-e-Kuchla*, *Habb-e-Narmushk*, *Habb-e-Shingraf*, *Habb-e-Shahm-e-Hanzal*, *Habb-e-Zahab*.^[39,45]

Halwā: *Halwā-e-Muqawwī-e-Basr*, *Halwā-e-Salab*, *Halwā-e-Gheekwar*, *Halwā-e-Chobchini*.^[38,42,45]

Irtifal: *Irtifal Muqawwī-e-Dimagh*, *Irtifal Muqawwī-e-Basr*.^[45]

Other compound formulations are.

- *Jauhar-e-Seemab*.^[45]
- *Kohal Basaliqoon Kabir*.^[45]
- *Laboob Kabeer Khas*, *Laboob Muqawwī Bah*.^[44,46]
- *Laooq-e-zeequnnaḥs balghami*.^[46]
- *Muffareh Yaqooti Motadil*.^[39,42]
- *Namak Sulemani*.^[44]
- *Qurs-e-Pudina*.^[39,42]
- *Roghan-e-Dārḥinjī*, *Roghan-e-Surkh*.^[38,39,40,41,42]
- *Safoof Dārḥinjī Wala*.^[38]
- *Sharbat Nankhawah*, *Sharbat Salajeet*.^[39]
- *Tiryaq-e-Samania*.^[38,40,41,42]
- *Tila-e-Dārḥinjī Wala*, *Tila-e-Nishat Angez*.^[38,44]

Chemical constituents and active principles: The principal constituent of cinnamon bark is the essential oil which contains cinnamaldehyde, Cinnamate, Cinnamic acid, trans-cinnamaldehyde, Cinnamyl acetate, linalool, Caryophyllene oxide, beta-caryophyllene, eucalyptol and eugenol. The Bark also contains glycosides, phenolic compounds, tannins steroids, resins and flavonol. Cinnamaldehyde is the major constituent, 74% of Bark. The inorganic constituents present are iron, magnesium, calcium, sodium, potassium, chloride and phosphorus. The difference between *Cinnamomum cassia* and *Cinnamomum zeylanicum*/*Cinnamomum verum* is their coumarin content. One kilogram of *Cinnamomum zeylanicum* powder contains approximately 2.1 to 4.4 grams of coumarins while *Cinnamomum verum* hardly has any coumarins. Coumarins are said to have anticoagulant, carcinogenic, and hepatotoxic properties.^[2,11,13,25]

Scientific reports on Dārḥinjī (Cinnamomum zeylanicum Blume)

1. Hepatoprotective activity: In a study conducted on the hepato-protective activity of ethanolic extract of Cinnamon against CCL₄ induced liver injury in male Wistar rats, Cinnamon extracts (0.01, 0.05 and 0.1 gm/kg) were administered for 28 days, which significantly reduced CCL₄ toxicity effects by reducing liver enzymes like AST, ALP, SGOT. The extracts were

also shown to increase levels of Superoxide dismutase (SOD) and Catalase in rats.^[47]

2. Cholesterol and lipid-lowering effect: A study conducted on the effects of *Cinnamomum zeylanicum* on lipid levels of diabetic rats induced by streptozocin, showed a significant reduction in serum triglycerides and cholesterol and HDL levels were increased after treatment. A study to investigate the hypolipidemic effect of *Cinnamomum verum* ethanolic extract in triton x-100 induced hyperlipidemia in rats showed a significant hypolipidemic effect on cholesterol and triglycerides. The histopathologic study demonstrated the preventive effect of ethanolic extract from fatty liver infiltration and granular degeneration.^[48,49,50]

3. Anti-diabetic effect: *Cinnamomum zeylanicum* extracts have many beneficial effects on diabetes.

A. In vitro *Cinnamomum zeylanicum* was shown to have the potential for: Reducing the activity of pancreatic alpha-amylase and alpha-glucosidase (enzymes involved in carbohydrate metabolism) and thereby reducing post prandial glucose absorption; Increasing glucose uptake by membrane translocation of GLUT-4; Stimulating glycogen synthesis and glucose metabolism; Affecting regulatory enzymes of gluconeogenesis and inhibiting it; Stimulating the release of insulin and potentiates insulin receptor activity.

B. In vivo effects: Weight loss attenuation associated with diabetes; Reduction of fasting glucose levels; Reduction of LDL and increase in HDL; Reducing HbA1c; Increase insulin levels in the blood.

A study conducted on high fructose-fed rats followed by treatment with *Cinnamomum zeylanicum* concluded that extracts of *Cinnamomum zeylanicum* exhibited insulin-sensitizing effect in insulin resistance and associated risk factors by modulating adiponectin in HFr fed rats.^[52,51]

4. Anti-oxidant properties: *Cinnamomum verum* was administered for 90 days in a study on rats and was reported to produce antioxidant activities as proven by cardiac and hepatic anti-oxidant enzymes, GSH (Glutathione) and lipid conjugated dienes. Extracts from *Cinnamomum zeylanicum* bark were found to be potent free radical scavengers against DPPH (2,2-Diphenyl-1-picrylhydrazyl) radicals and ABTS [2,2'-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid)] radical cations as well as hydroxyl and superoxide radicals.^[52,53] In a study, mice were pre-treated with an aqueous extract (200 mg/kg/day) of cinnamon bark, 14 days before intra-gastric administration of toxic dose (200mg/kg) of acetaminophen. The results exhibited a highly significant preventive potential by ameliorating elevated levels of serum alanine aminotransferase, aspartate aminotransferase, creatinine, urea and macroscopic and histological derangement in the liver and kidney, possibly due to its antioxidant potential.^[54] The antioxidant profile of Ethanolic (EEC) and Aqueous (WEC) extracts of cinnamon (*Cinnamomum verum*) was

evaluated by eight different bioanalytical antioxidant methods. The inhibitory effects of these extracts were tested against enzymes like acetylcholinesterase, butyrylcholinesterase, α -glycosidase and α -amylase. Both the extracts were found to have rich phenolic composition and demonstrated effective anticholinergic, antidiabetic and antioxidant effects.^[55]

5. Anti-bacterial activity: *Cinnamomum zeylanicum* is a potential anti-microbial against a wide variety of bacteria. A study conducted by Watan et al reported anti-bacterial and anti-fungal effects of cinnamon oil. Anti-microbial activity against *Vibrio cholera*, *Escherichia coli* and fungus like *Candida mycosis* has been seen.^[22,52]

The action of the cinnamon bark essential oil alone and in combination with piperacillin was observed in a study for its antimicrobial and synergistic activity against beta-lactamase TEM-1 plasmid-conferred *Escherichia coli* J53R1. A complete killing profile was observed by this combination of a viable count of bacteria at 20 hours and it was observed that the bacterial cell wall gets disrupted irreversibly by the essential oil.^[56]

6. Anti-fungal activity: In an in vitro study conducted by using *Cinnamomum verum*, *Ferula asafoetida*, *Azadirachtin*, *Curcuma Longa* and *Myristica fragrans* on eight different species of *Candida* Cinnamon was found to possess the strongest anticandidal property.^[57]

7. Effect in PCOS: *Cinnamomum zeylanicum* Blume showed significant improvement in the menstrual pattern in patients with PCOS. A marked improvement was observed in ovarian size and complete amelioration of PCOS was reported in six patients. The therapy was well tolerated by the majority of patients and it was concluded that *Cinnamomum zeylanicum* Blume can be considered as an alternative therapy for the management of PCOS.^[58]

8. Thermogenesis: Cinnamaldehyde enhances metabolic health by increasing the expression of thermogenic genes and by acting directly on the murine adipose tissue/fat cells and human primary subcutaneous adipocytes and causing them to start burning energy via a process called thermogenesis.^[59]

9. Relaxant Effect: Cinnamaldehyde was shown to have a vasodilatory effect on isolated rings of rat aorta in an experiment. These aorta rings were pre-treated with phenylephrine in a dose-dependent manner to induce contraction in them. It was observed that potassium channel blockers like glibenclamide, tetraethylammonium and BaCl_2 did not affect the relaxation produced by cinnamaldehyde.^[60]

In another isolated organ study, the effect of cinnamaldehyde on pre-contracted ileum was observed, in which direct relaxation of the smooth muscle was detected. The cause of relaxation may be due to the

direct inhibition of smooth muscles by cinnamaldehyde.^[61]

10. Analgesic effect: In a randomized double-blind clinical trial on dysmenorrhea 420 mg cinnamon capsules were given to the test group and the severity and duration of pain was monitored. Cinnamon showed a significant reduction in the severity and duration of pain in comparison to the placebo.^[62]

The antinociceptive effect of cinnamon essential oil in comparison with Morphine and Diclofenac in mice was studied by Dashti-R MH et al. They found that cinnamon essential oil possesses anti-nociceptive properties. Its effect in chronic pain inhibition was found to be similar to Diclofenac but the acute anti-nociceptive effect was reported to be less than Morphine.^[63]

CONCLUSION

Dārĉhīnī has been in use since times immemorial with a soaring place in different kinds of traditional medicines. The irrefutable medicinal values of *Dārĉhīnī* have maintained its healing position since antiquity.

ACKNOWLEDGEMENT

The Authors duly acknowledge the coordination and cooperation extended by the Assistant Director In charge, HOD department of Moalajat and the library staff of central library, Regional Research Institute of Unani Medicine, Srinagar, in collecting the literature pertaining to the manuscript.

Conflict of interest: There is no conflict of interest.

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