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A COMPREHENSIVE REVIEW ON CINNAMOMUM ZEYLANICUM AND ITS VARIETAL DIVERSITY

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ABSTRACT

A spice is a dried seed, fruit, root, bark or flower of a plant or an herb used in small quantities for flavor, color or as a preservative. The spices and Herbs used for flavor, aroma and medicinal properties derive a special value from the said factors. Long before modern medicine, spices were valued for their ability to help individuals in disease prevention and health promotion. Various civilizations relied on herbs and spices for both food and medicine. Cinnamon is a spice obtained from the inner bark of trees belonging to the family 'Lauraceae' and genus 'Cinnamomum'. Cinnamon is found widely in Sri Lanka but also distributed in South and South-East Asia. This study was carried out to give an overview on Cinnamon, to differentiate the varieties of Cinnamon in the view of therapeutic and commercial purposes and to review the recent scientific evidences phytochemical and pharmacological studies systematically. There are over 250 plant species in the cinnamon genus. But only 4 types or varieties of Cinnamon are used for commercial purposes. Such as, Ceylon cinnamon (*Cinnamon zeylanicum Blume.*), *Cassia cinnamon* (*Cinnamomum aromaticum*), *Korintje cinnamon* (*Cinnamomum burmanni*) and *Saigon cinnamon* (*Cinnamomum loureiroi*). Ceylon cinnamon (*Cinnamomum zeylanicum* Blume), a variety

native to Sri Lanka, sometimes referred to "true" cinnamon" globally, is one of the oldest and most important spice crops used for culinary purposes in Sri Lanka for centuries. With the exception of Ceylon Cinnamon, Cassia, Saigon and Korintje Cinnamon are also classified under the Cassia Cinnamon category because they are very similar to each other with only slight variations in color, taste, shape and Coumarin content. All Cassia type Cinnamon are hard and have high levels of Coumarin a substance known to cause liver damage, while Ceylon Cinnamon is the only soft and brittle Cinnamon with ultra-low Coumarin levels. Phytochemical evidences suggest major constituents found in Cinnamon are cinnamaldehyde, linalool, β-caryophyllene, eucalyptol, and eugenol. Pharmacological evidences suggest Cinnamon possess pharmacological activities such as Anti-hyperglycemic, Anti-hyperlipidemic, Anti-inflammatory activity, Anti-microbial and Anti-oxidant activities.

Keywords: Cinnamon, Darchini, Spices, Ceylon, Coumarin

INTRODUCTION

A spice is a dried seed, fruit, root, bark or flower of a plant or a herb used in small quantities for flavor, color or as a preservative. The spices and Herbs used for flavor, aroma and medicinal properties derive a special value from the said factors.[1] Spices and herbs have been in use for centuries both for culinary and medicinal purposes. Spices not only enhance the flavor, aroma, and color of food and beverages, but they can also protect from acute and chronic diseases. Long before modern medicine, spices were valued for their ability to help individuals in disease prevention and health promotion.[2] Cinnamon is a spice obtained from the inner bark of trees belonging to the family 'Lauraceae' and genus 'Cinnamomum'.[3] Cinnamon is found widely in Sri Lanka but also distributed in South and South-East Asia. There are over 250 plant species in the cinnamon genus.[4] But only 4 types or varieties of Cinnamon are used for commercial purposes. Such as, Ceylon cinnamon (*Cinnamon zeylanicum Blume.*), *Cassia cinnamon* (*Cinnamomum aromaticum*), *Korintje cinnamon* (*Cinnamomum burmanni*) and *Saigon cinnamon* (*Cinnamomum loureiroi*). Ceylon cinnamon (*Cinnamomum zeylanicum* Blume), a variety native to Sri Lanka, sometimes referred to "true"

cinnamon" globally, is one of the oldest and most important spice crops used for culinary purposes in Sri Lanka for centuries.[5]

OBJECTIVE

1. To review the literature on 'Cinnamon'
2. To compare and contrast the main categories of Cinnamon
3. To compare and contrast the varieties of Cinnamon in the aspect of therapeutic and commercial purposes
4. To review the recent scientific evidences of phytochemical and pharmacological studies systematically

METHODOLOGY

A systematic literature search was carried out to review articles and to gather the information available in the literature regarding Cinnamon in the view of description of the plant, chemical constituents, part used, therapeutic action and therapeutic uses, and recent scientific evidences of phytochemical and pharmacological activities. All the available information on Cinnamon was compiled from Unani textbooks and electronic databases such as Google scholar and PubMed.

RESULTS

Types of Cinnamon

There are over 250 plant species in the cinnamon genus.[4] But only 4 types or varieties of Cinnamon are used for commercial purposes.[5,6] Such as,

1. Ceylon cinnamon (*Cinnamon zeylanicum* Blume.)
2. Cassia cinnamon (*Cinnamomum aromaticum*)
3. Korintje cinnamon (*Cinnamomum burmanni*)
4. Saigon cinnamon (*Cinnamomum loureiroi*)

Ceylon cinnamon (*Cinnamomum zeylanicum* Blume), a variety native to Sri Lanka, sometimes referred to "true" cinnamon" globally, is one of the oldest and most important spice crops used for culinary purposes in Sri Lanka for centuries. With the exception of Ceylon

Cinnamon, Cassia, Saigon and Korintje Cinnamon are also classified under the Cassia Cinnamon category because they are very similar to each other with only slight variations in color, taste, shape and Coumarin content. All Cassia type Cinnamon are hard and have high levels of Coumarin a substance known to cause liver damage, while Ceylon Cinnamon is the only soft and brittle Cinnamon with ultra-low Coumarin levels.[5,7]

Scientific Classification of Cinnamon[8,9]

Fig. 1: Cinnamon flowers, fruits, and dried bark

Kingdom: Plantae

Division: Tracheophyta

Class: Magnoliopsida

Order: Laurales

Family: Lauraceae

Genus: Cinnamomum

Species: Zeylanicum

Botanical name: *Cinnamomum zeylanicum*

Vernacular names[10]

English name: Cinnamon

Tamil: *Karuva/ Ilavangam*

Sinhala: *Kurundu*

Urdu: *Darchini*

Description of the Cinnamon

Tree:

Cinnamon (*Cinnamomum zeylanicum* Blume), a moderate sized or large tree with a rather thick, reddish bark, glabrous young parts and finely silky buds.[8]

Leaves:

Simple, opposite or sub-opposite without stipules, variable in size, 7.5-25cm long, oval or lanceolate-oval, subacute at base, slightly acuminate, obtuse, glabrous, stiffy coriaceous, strong, 3 or 5-nerved.with fine, reticulate venation, shining above, slightly paler beneath, bright pink when young, petioles 1.2-2.5 cm long, stout, flattened above.[8]

Flowers:

Regular, bisexual or monoecious, pale yellow, small, numerous on rather long, slightly pubescent pedicels in subterminal panicles longer than leaves, lax peduncles often clustered, glabrous or pubescent, bracts absent; perianth about 0.6 cm long, silky, tube short-campanulate, segments 6, oblong-lanceolate, acute or obtuse, usually persistent, imbricated in two rows; stamens 9 in three rows, perigynous, anthers 4-celled, filaments of the first and second rows without glands and filaments of the third row with glands, staminodes 3, sagittate forming the fourth row; ovary superior, unilocular with a solitary ovule pendulous from the top, style shorter than stamens, stigma bilobed.[8]

Fruit:

Fruit about 1.2 cm long, oblong-ovoid, surrounded by much enlarged perianth, dry or fleshy, dark purple, seed without endosperm.[8]

The following Table 01 shows the Comparison of Main Categories of Cinnamon.[11]

Table 01: Comparison of Main categories of Cinnamon

Main Category	Ceylon Cinnamon	Cassia
Bark	Inside filled with thin concentric layers composed of multiple layers rolled like cigar-quill	Hollow thick and hard layers, one thick piece of bark strip curled inward on both sides
Colour	Golden brown	Dark reddish brown
Texture	Smooth	Rough
Taste	Soft and sweet aromatic pungent	Hot or spicy
Smell	Sweet, pleasant fragrance	Strong scent
Price	Three to four times expensive than Cassia	Cheaper
Country of Origin	Native to Sri Lanka	Native to China, Indonesia and Vietnam
Coumarin Content	Very low	High

Figure 1: Ceylon Cinnamon[12]

Figure 2: Korintje cinnamon[12]

Figure 3: Saigon cinnamon[12]

Table 02 shows the Comparison between different varieties of Cinnamon[13]

Table 02: Comparison of Varieties of Cinnamon

Varieties of Cinnamon	**Ceylon Cinnamon**	**Cassia Cinnamon**	**Korintje cinnamon**	**Saigon cinnamon**
Scientific name	*Cinnamomum zeylanicum, Cinnamomum verum*	*Cinnamomum aromaticum*	*Cinnamomum burmanni*	*Cinnamomum loureiroi*
Other names	Ceylon cinnamon, True cinnamon, Mexican cinnamon	Chinese cinnamon, Cassia cinnamon,	Indonesian cinnamon	Vietnamese cassia, Vietnamese cinnamon
Origin	Sri Lanka	China	Indonesia	Vietnam
Shape	Multiple layers of very thin layers of Cinnamon inner bark rolled into a shape of cigar like stick	A single layer of thick Cinnamon bark curled into hollow piece of bark	A single layer thick Cinnamon bark , curled into in hollow stick	A single layer of thick Cinnamon bark curled with hollow stick
Colour	Light to medium reddish brown	Dark reddish brown	Dark reddish brown	Dark reddish brown
Taste	Pungent with mild sweetness	Mild aroma but sharp fragrance when boiled or cooked	Strong Cassia Cinnamon taste	The taste is bold, spicy and sweet.
Coumarin Content	0.017 g/kg	0.31 g/kg	2.15 g/kg	6.97 g/kg
Advantage	Ultra Low Coumarin levels, the essential oils derived from	Not as expensive as Ceylon Cinnamon.	Not as expensive as Ceylon Cinnamon.	Very high essential oil content. Not as expensive as

	Ceylon Cinnamon is of significantly better quality.			Ceylon Cinnamon. Strong and bold cinnamon smell.
Disadvantage	Expensive, does not have strong taste like Cassia Cinnamon.	High Coumarin levels that cause liver damage, hard to break into small pieces, poor oil quality essential oil.	High in Coumarin that cause liver damage, hard to break into small pieces or to grind into powder. Poor quality essential oil	Very high Coumarin levels that can cause liver damage, hard to break into small pieces.

Parts used: Leaf, Stem bark[10]

Chemical Constituents:

The chief constituent of cinnamon is the essential oil which consists of Cinnamic aldehyde with variable proportions of hydrocarbons. The bark contains besides the oil, sugar, Mannite, starch, mucilage, and tannic acid. The oil from leaves contains eugenol which is useful in perfume and flavouring industries. The oil from roots contains camphor, eucalyptol and Safrol. The seeds contain fat.[8]

***Mizaj*[10] (Temperament):** Hot and Dry 3°

***Naf 'e Khas*[10] (Actions)**

According to Unani System of Medicine *Darchini* (Cinnamon) shows following properties,

- *Dafa-e-Tafun* (Antiseptic)
- *Jazib* (Absorbent)
- *Moharrik* (Stimulant)
- *Mulattif* (Demulscent)
- *Mufatteh* (Deobstruent)
- *Muddir-e-Haiz* (Emmenagogue)

- *Muddir-e-Baul* (Diuretic)
- *Muharrik-e-Bah* (Sex Stimulant)
- *Mufarreh-e-Qalb* (Exhilarant)
- *Mufarreh-e-Dimagh* (Exhilarant)
- *Muqawwi-e-Bah* (Aphrodisiac)
- *Muqawwi-e-Meda* (Stomachic)
- *Muqawwi-e-Kabid* (Liver Tonic)
- *Muqawwi-e-Aza-e-Raeesa* (Tonic for Principal organs).

Afal e Khawas[10] **(Therapeutic uses)**

According to Unani System of Medicine *Darchini* (Cinnamon) is used for following diseases,

- *Zof-e-Meda* (Weakness of stomach)
- *Zeequn-Nafas* (Asthma)
- *Sual* (Cough)
- *Dard-e-Sar* (Headache)
- *Idrar-e-Haiz*

Muslih[10] **(Corrective):** *Kateera*, *Asaroon*.

Miqdar e Khurak[10] **(Dosage):** 1-2 *Masha* (1-2 gm.)

RECENT SCIENTIFIC EVIDENCE

Phytochemical analysis of Cinnamon

Alizadeh BB*, et al*. (2020) conducted a study to examine the chemical constituents, antioxidant potential, antibacterial mechanism, and antiproliferative activity of *Cinnamomum zeylanicum* bark essential oil. The compositions of the oil were analyzed by GC-MS, and the major constituents were found to be (E)-cinnamaldehyde (71.50%), linalool (7.00%), β-caryophyllene (6.40%), eucalyptol (5.40%), and eugenol (4.60%). C. *zeylanicum* essential oil contained remarkable levels of phenolic and bioactive compounds with outstanding ability to scavenge free radicals and inhibit β-carotene oxidation.[14]

Pharmacological activities of Cinnamon

Following table shows the recent evidences of pharmacological activities of Cinnamon

Table 03: Pharmacological activities of Cinnamon

Pharmacological activities	References
Anti-hyperglycemic activity[15,16,17]	Zare R, et al. (2019) Ranasinghe P, et al. (2017) Hayward NJ, et al. (2019)
Anti-hyperlipidemic activity[18]	Tuzcu Z, et al. (2017)
Anti-inflammatory activity[18,19]	Han X, et al. (2017) Tuzcu Z, et al. (2017)
Anti-microbial activity[14,20]	Sim JXF, et al. (2019) Alizadeh BB, et al. (2020)
Anti-oxidant activity[14]	Alizadeh BB, et al. (2020)

DISCUSSION

Cinnamon is a spice obtained from the inner bark of trees belonging to the family 'Lauraceae' and genus 'Cinnamomum'. Cinnamon is found widely in Sri Lanka but also distributed in south and South-East Asia. There are over 250 plant species in the cinnamon genus. There are different varieties of Cinnamon that originate from and grow in different places. But only 4 types or varieties of Cinnamon are used for commercial purposes. Such as, Ceylon cinnamon (*Cinnamon zeylanicum* Blume.), *Cassia cinnamon* (*Cinnamomum aromaticum*), *Korintje cinnamon* (*Cinnamomum burmanni*) and *Saigon cinnamon* (*Cinnamomum loureiroi*). Cinnamon is separated into two main categories: Ceylon Cinnamon and Cassia Cinnamon. With the exception of Ceylon Cinnamon, Cassia, Saigon and Korintje Cinnamon are also classified under the Cassia Cinnamon category because they are very similar to each other with only slight variations in color, taste, shape and Coumarin content. All Cassia type Cinnamon are hard and have high levels of Coumarin a substance known to cause liver

damage, while Ceylon Cinnamon is the only soft and brittle Cinnamon with ultra-low Coumarin levels. Ceylon cinnamon (*Cinnamomum zeylanicum* Blume), a variety native to Sri Lanka, sometimes referred to "true" cinnamon" globally, is one of the oldest and most important spice crops used for culinary purposes in Sri Lanka for centuries. Coumarin is a toxic, fragrant chemical compound commonly found in high concentration in Cassia Cinnamon. Phytochemical evidences suggest major constituents found in Cinnamon are cinnamaldehyde, linalool, β-caryophyllene, eucalyptol, and eugenol. Pharmacological evidences suggest Cinnamon possess pharmacological activities such as Anti-hyperglycemic, Anti-hyperlipidemic, Anti-inflammatory activity, Anti-microbial and Anti-oxidant activities.

CONCLUSION

Today, people are increasingly interested in spice, not only to enhance the flavor of cuisine, but for the collective evidence in complementary and alternative medicine. The significant health benefits of numerous types of cinnamon have been explored. Further investigations are necessary to provide additional clinical evidence for the traditional uses of this spice. Research is progressing and mounting evidence supports the therapeutic benefits of spices.

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