A Review Study on Different Properties of *Cinnamon*

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Abstract: Since ancient times, people have used cinnamon, a member of the Lauraceae family and the species *Cinnamomum*, as a common spice. Numerous research have demonstrated cinnamon's medicinal benefits, including its antibacterial, antiviral, antifungal, antioxidant, anticancer, antihypertensive, antilipidemic, antidiabetic, gastroprotective, and immunomodulatory properties. For research that were published before my investigation, a thorough systematic evaluation was carried out in the following databases: PubMed, Web of Science, SciVerse, and Scopus. "*Cinnamomum zeylanicum*", "Ceylon *cinnamon*", "true *cinnamon*", and "Sri Lankan *cinnamon*" were used as search terms. A manual search was carried out utilising the reference lists of the included articles to gather more information.

Keywords: Antidiabetic, Anticancerous, Cinnamon, Medicinal properties.

Introduction

Cinnamon is made from the peeled, dried bark of some *Cinnamomum* species that belong to the Lauraceae family. Humans have been using it as a spice since the dawn of time (Anonymous, 2015; Barceloux, 2008; Leja & Czaczyk, 2016). In addition to being used as a spice, the plant's bark and leaves are utilised to make volatile oils (Barceloux, 2008). A staple in both theconfectionary and cosmetics sectors, *cinnamon* has been used in cooking for a very long time. In ancient Egypt, it was also utilised in the embalming process, and the Bible makes numerous mentions of *cinnamon* (Thomas & Duethi, 2001).

Systematic Position

- Kingdom: Plantae
- Division: Magnoliophyta
- Class: Magnoliopsida
- Order: Laurales
- Family: Lauraceae
- Genus: Cinnamomum

The bioactive compounds in *cinnamon* have been used in the perfume business, as a mosquito repellent, and as a treatment for a variety of illnesses (Baker & Grant, 2018; Bandara et al., 2011;Barceloux, 2008; Ulbricht et al., 2011). *Cinnamon* has historically drawn foreign invaders to Sri Lanka (formerly known as Ceylon). Up to the 10th–15th centuries, Arabs traded *cinnamon* all over the world while taking care to keep the product's provenance a well-kept secret (Ravindran & Nirmal-Babu, 2005). Early in the 16th century, the Portuguese made a major effort to invade Sri Lanka in order to gain access to *cinnamon* (Chatoor, 2017; Thomas & Duethi, 2001).

Chemical Constituent

Sl No.	Chemical Compound	Amount	Parts
01	Cinnamaldehyde Eugenol	1.00 to 5.00% 70.00 to 95.00%	Leaves
02	Cinnamaldehyde Eugenol	65.00 to 80.00% 5.00 to 10.00%	Bark
03	Camphor	60%	Root Bark
04	trans-Cinnamyl acetate caryophyllene	42.00 to 54.00% 9.00 to 14.00%	Fruit
05	Terpene hydrocarbons: alpha-Bergamotene: alpha-Copaene:	78.00% 27.38% 23.05% 9.00%	Bud

	Oxygenated terpenoids		
06	(E)-Cinnamyl acetate: trans-alpha-Bergamotene: Caryophyllene oxide:	41.98% 7.97% 7.20%	Flower

Study

The genus *Cinnamomum* contains more than 250 recognised aromatic species, most of which are found in Asia and Australia. Numerous of these species have strong aromas and are employed in flavouring (Thomas & Duethi, 2001). The medical benefits of *cinnamon* are numerous and include antibacterial, antioxidant, and structurally varied substances. The species, age of the bark and leaves, harvest dates, extraction techniques, and type of solvent all affect the flavonoid concentration, antioxidant capacity, composition, and chemical properties of *cinnamon* oils (Muhammad et al., 2017). The bioaccessibility and bioavailability of the biomolecules found in *cinnamon* are thought to be high despite the paucity of existing data (Muhammed & Dewettinck, 2017).

Cinnamon's leaves, barks, wood, twigs, roots, and fruits are used to make essential (volatile) oils and oleoresins through solvent extraction and distillation, respectively (Muhammed & Dewettinck, 2017). The processed *cinnamon* bark and extracts are prized for their insecticidal, medicinal, and bioactive properties, as well as their health benefits against common diseases and disorders, food-preservative activity, and use as a raw material in cosmetics and an ingredient forincorporating into foods, as will be discussed further.

Methods

The review that follows was done using widely accessible literature about medicinal plants. For the literature review, Google Scholar was used to conduct the searches. We concentrated on the most recent publications and used the following keywords: "*cinnamon* extract," "biologically

active compounds," "cinnamaldehyde," "medicinal properties of *cinnamon*," "*cinnamon* used in medicine," and "natural plants in medicine."

Our review contains a synopsis of the compounds found in *cinnamon* that are naturally occurring, as well as examples of how *cinnamon* is used in various medical contexts.

Incorporation into foods

For millennia, *cinnamon* has been used in cuisine as a spice and flavouring ingredient due to its enticing aroma (Barceloux, 2008; Rao & Gan, 2014). Around the world, *cinnamon* is a common component in seasonings, sauces, baked items, and beverages. The sweetness of *cinnamon* is due to the presence of cinnamaldehyde, and when *cinnamon* is combined with sweet foods, the sweetness is increased as a result of the synergistic interaction between the sweetness of sugar and the sweetness of *cinnamon*. Trimethylamine is what gives *cinnamon* bark its deodorizing/masking properties (Thomas & Duethi, 2001).

The presence of phenolic compounds in *cinnamon* oil accounts for the extended shelf life(postharvest life) of food products treated with *cinnamon*. *Cinnamon* oil can be used for a varietyof purposes, although phenolic chemicals have been known to deteriorate and generate disagreeable odours and colour changes (Cadena et al., 2018; Ghaderi-Ghahfarokhi et al., 2017; Lu et al., 2010; Ostroschi et al., 2018; de Souza et al., 2018). Researchers have also discovered that *cinnamon* oil can form complexes with a variety of food ingredients (i.e., enrichment), conserving its biochemical capabilities and increasing its usability in a variety of food commodities. (Ahmed et al., 2018; Chuesiang et al., 2019; Hu et al., 2015; Lin et al., 2017; Meghani et al., 2018; Premkumar et al., 2018; Zhang, Zhang, et al., 2017; Zhang, Li, et al., 2017).

Antimicrobial activity of *cinnamon* on food commodities

The growth of drug-resistant bacteria has made microbial contamination of food products a significant health

care concern. Essential oils are an example of a natural antibacterial since they contain substances that can combat several micro- and macroorganisms found in food products. The antimicrobial activities of *cinnamon* are due to eugenol and cinnamaldehyde; however, coumarin, cinnamyl acetate, and benzaldehyde show little to no antibacterial activity. Cinnamaldehyde and cinnamic acid can harm cell membranes, change lipid profiles, and prevent certain microbes from reproducing, enzymatically active, and forming biofilms (Vasconcelos et al., 2018).

Cinnamon oil has demonstrated potential in preventing bacterial and fungi growth in a widerange of food products, including fresh fruits and vegetables, meat, fish, dairy, and other processed foods. These antimicrobial properties were gained by incorporating *cinnamon* oil into food commodities (Ghaderi-Ghahfarokhi et al., 2017; Lianou et al., 2018), by coating or immersing in a solution containing *cinnamon* oil (Cadena et al., 2018; Park et al., 2018), or by incorporating as a constituent in packing materials (Black-Solis et al., 2019; Kapetanakou et al., 2019).

Antioxidant activity of cinnamon

According to Decker et al. (2005) and Vidanarachchi et al. (2014), antioxidants can be utilised to prevent the oxidation of lipids from causing undesired features in food products and animal feeds, such as off flavours, odours, and hazardous chemicals. According to Singh et al. (2007), the oleoresins of cinnamon have been demonstrated to suppress lipid oxidation activity. Antioxidants can shield human cells from the harm wrought by reactive oxygen species and free transition metal ions, which harm structural and functional compounds/molecules in cells and result in a variety of health issues (Ngo et al., 2011; Vidanarachchi et al., 2014).

In recent years, more focus has been placed on plant-based natural antioxidants due to the adverse health effects of numerous synthetic antioxidants that are often utilised in the food business (Mathew & Abraham, 2004). Natural antioxidants derived from plants have been found and are largely regarded as being superior to synthetic antioxidants in terms of disease prevention, health promotion, increased safety, and consumer acceptability (Muhammed & Dewettinck, 2017; Schmidt et al., 2006; Singh et al., 2007).

Cinnamon in the Treatment of Diseases and Disorders.

Western natural medicine is well aware of the medicinal qualities of cinnamon as a natural species. It is now reported that it is a plant with unique properties that is used to treat a variety of illnesses. The most prevalent type of dementia is Alzheimer's disease. According to studies (Kang et al., 2016), cinnamon bark can prevent the onset of AD. Cinnamon oil contains phenylpropanoids, including crytamygin and medioresinol, which are responsible for the anti- AD benefits.

Cinnamon has been demonstrated to reverse the biochemical and structural alterations seen in PD affected brains of mice, which is another frequent neurodegenerative disorder (Khasnavis & Pahan, 2014; Patel et al., 2019). Parkinson's disease (PD) is one of these disorders. The ability of cinnamon to prevent the onset of PD is therefore very promising. The most important chronic metabolic condition, diabetes mellitus is a global health concern. According to Ping et al. (2010), cinnamon enhances pancreatic cell activity and plays a regulatory role in blood glucose levels. Additionally, these researchers found that the proanthocyanidins in cinnamon were able to prevent the pathogenic process that leads to diabetes problems by preventing the in vitro production of advanced glycation end products. Therefore, adding cinnamon proanthocyanidins to meals is recommended, especially for consumption by those who have type 2 diabetes.

Other Applications of Cinnamon

In order to determine the bioactivity of cinnamon components against illnesses, a lot of studies have been conducted to date. Cinnamon contains high concentrations of cinnamic acid, cinnamic aldehyde, cinnamyl acetate, terpineol, -cubebene, coumarin, and thujene. According to Mohammed et al. (2020), these substances have potent antibacterial and anti-inflammatory effects and have an impact on bodily biological functions.

Studies in the scientific literature reveal that a variety of common ailments, including colds, dyspepsia,

coughs, and microbiological infections, are treated using species of Cinnamomum in traditional medicine. It is advantageous to cure disorders using the extracts from cinnamon that are released during consumption. Diarrhoea, dyspepsia, gastritis, tightness in the chest, and stomachaches are all treated with cinnamon as a remedy. Diabetes, acne, respiratory conditions, and urinary and digestive disorders are all treated with cinnamon bark oil. In benign prostatic hyperplasia, cinnamon exhibits therapeutic properties. This is accomplished by preventing the prostate-specific protein from functioning (Husain et al., 2018). Alopecia is treated using a cinnamon leaf water extract. According to Ibrahim et al. (2017), it considerably encourages the development of human hair dermal papilla cells.

Escherichia coli, a prominent cause of urinary infections, can be inhibited in its growth by the bioactive characteristics of cinnamon compounds (Harini & Suneetha, 2020). Patches containing cinnamon extract are effective in treating urine incontinence and overactive bladder syndrome (Chen et al., 2021).

According to reports, it may be able to help individuals with hypertension who also have cardiovascular illnesses. Clinical research demonstrates that natural substances, such as cinnamon, help to lower cardiovascular risk by modulating other factors such oxidative stress, inflammation, hyperlipidemia, and vascular resistance (Ghaffari & Roshanravan, 2020).

Additionally, melanoma and stomach cancer have been reported to be treatable with cinnamon oil. Leukaemia and lymphoma can be effectively treated with cinnamonaldehyde and eugenol. Additionally, these substances have been utilised as nutraceuticals to combat colon and liver cancer cells (Goel & Mishra, 2020).

By preventing Solobacterium moorei from growing, eliminating the biofilm, and lowering the amount of hydrogen sulphide (H2S) that it produces, cinnamon extract is another promising natural compound that could be used in oral products to treat foul breath. Chlorhexidine can be replaced by cinnamon oil, which is used in mouthwash as an antibacterial agent. Concentrated cinnamon oil can be used as a daily hygiene product because it has no adverse effects on oral keratinocytes. Aldehydes, ketones, alcohols, and esters are examples of oxygenated derivatives found in natural extracts, along with terpenoids and phenylpropanoids (Mutans.,2021) and LeBel et al.,(2017).

The most recent research results, which are presented in this review, unmistakably demonstrate that there is a connection between nutrition, food quality, and health, as well as physiologically

active substances found in cinnamon. Additionally, understanding the biologically active components of cinnamon can help in the creation of specialised diets based on foods that include it. The chemicals found in cinnamon, which can be used to make pharmacological preparations or nutritional supplements, are also employed in this article to add some freshness to nutrition instruction. Additionally, it demonstrates the relationship between ingested food items, nutrients, and human health.

Conclusions

Numerous investigations have demonstrated that cinnamon contains physiologically active chemicals, primarily cinnamaldehyde. These chemicals can be recognised with the aid of separation techniques and are present in various ratios in all plant sections. Cinnamon contains bioactive chemicals that have a variety of effects on the human body and can be used to treat a variety of illnesses and metabolic abnormalities. Cinnamon can be used as a spice in daily life with a beneficial effect on human health, according to enough data. It has use for antimicrobial defence, anti-diabetic, hepatoprotective, neuroprotective, cardioprotective, immunomodulatory, and anticancer defence. It can be utilised as a microbe-killing agent due to its antioxidant and antibacterial properties.

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