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# HerbClip™



**File: ■ Cinnamon (*Cinnamomum* spp.)**

**HC 061445-509**

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**RE: Cinnamon Species and Their Pharmacological Activities**

Rao PV, Gan SH. Cinnamon: a multifaceted medicinal plant. *Evid Based Complement Alternat Med*. April 10, 2014;2014:642942. doi: 10.1155/2014/642942.

The genus cinnamon (*Cinnamomum* spp.) comprises about 250 species worldwide. The bark of many species is used as a cooking spice, in perfumes and fragrances, as a food preservative, and in traditional and modern medicines. True cinnamon (*C. verum* syn. *C. zeylanicum*) and cassia cinnamon (*C. aromaticum* syn. *C. cassia*) are most used as a spice. Essential oils of both contain cinnamaldehyde and *trans*-cinnamaldehyde (together, CIN). Essential oil from pseudocinnamomum (*C. osmophloeum*) leaf also has high CIN content and is used as a spice. Resins in cinnamons include cinnamate, cinnamic acid, and other essential oils. Procyanidins, endocyclic double bond-containing compounds (α-thujene, α-terpineol, α-cubebene), unconjugated exocyclic double bond-containing compounds (eugenol, β-caryophyllene, terpinolene), hydroxyl-substituted aliphatic compounds (E-nerolidol, L-borneol), and other compounds, including catechins and epicatechins, are also found.

Cinnamon is used in chewing gums and dental care products to combat toothache and bad breath. It can improve colon health. Cinnamon is a coagulant; it increases blood flow to the uterus and boosts tissue regeneration. It is used against nematodes, termites, mosquito larvae, and other insects; ants dislike cinnamon. Some cinnamon constituents are antifungal, antimycotic, and antimicrobial. From studies published from 1982 to 2013, some results include the following:

*Antioxidant effects*: Ether, aqueous, methanol, ethanol, alcohol, and n-hexane extracts and bark powder from cinnamon species had significant antioxidant effects in vitro and/or in vivo. Of 26 spices, cinnamon was the most antioxidative. Cassia bark's 41 volatile compounds vary significantly in percentage composition by growth stage and tree segment. Best ages for extraction of cassia bark oil differ for branch and stem bark. (E)-cinnamaldehyde from cassia's essential oil, an antityrosinase, suppresses skin hyperpigmentation and browning of mushrooms, fruit, and vegetables by air and light.

*Anti-inflammatory actions*: In one study, 2'-hydroxycinnamaldehyde from cassia bark inhibited production of nitric oxide (NO) by inhibiting activation of nuclear factor kappa B (NF-κB) cells. An ethanol extract of cassia reduced activation of Src/spleen-tyrosine-kinase (Src/Syk)-mediated NF-κB. In another study, compounds in cassia (referred to as *C. ramulus* by those researchers) suppressed NO, inducible NO synthesis (iNOS), and

cyclooxygenase-2 (COX-2) in the central nervous system. This could be useful in treating or preventing inflammation-mediated neurodegenerative conditions.

*Antidiabetic effects*: An aqueous cinnamon extract was 20 times stronger than any other spice in a study of the insulin-potentiating activity of many spices. Polyphenol type-A cinnamon polymers (rutin, catechin, quercetin, kaempferol, and isorhamnetin) are insulin-like. In vitro, an aqueous extract of cinnamon greatly reduced absorption of alanine, a key compound in gluconeogenesis. Found in hydroxycinnamic acid, naphthalenemethyl ester lowers blood glucose. In a recent study, linalool chemotype cinnamon at 5, 10, or 20 mg/kg body weight improved insulin secretion and glycemic control in diabetic rats.

*Anticancer activity*: The aqueous extract and procyanidin fraction of cinnamon inhibits vascular endothelial growth factor subtype 2 (VEGFR2). CB403, synthesized from 2'-hydroxycinnamaldehyde, inhibits tumor growth. Cinnamic aldehyde inhibited NF-κB activity and tumor necrosis factor-alpha (TNF-α) and induced interleukin-8 (IL-8) in cancer cells. A preliminary study of cinnamon and cardamom (*Elettaria cardamomum*) in colon cancer in mice found that it increased detoxifying and antioxidant activities of glutathione-s-transferase (GST) and lowered lipid peroxidation compared to control.

*Cholesterol- and lipid-lowering effects*: In vivo, cinnamon, cassia, and cinnamon oils increased high-density lipoprotein (HDL) cholesterol, lowered triglycerides, and/or lowered total cholesterol. In humans, cinnamon at 1, 3, or 6 g/d reduced serum glucose, triglycerides, total cholesterol, and low-density lipoprotein (LDL) cholesterol.

*In neurological disorders*: Cinnamophilin, a novel thromboxane A2 receptor antagonist from wild Palawan cinnamon (*C. philippinense*), protected rat brains from ischemic damage when given up to six hours after insult. Effects on abridged brain infarction were considerable, enhancing neurobehavioral outcomes. Procyanidin type-A trimer (trimer 1) from a water-soluble cinnamon extract may reduce swelling in brain injuries, controlling movement of intracellular calcium (Ca). Sodium benzoate, a cinnamon metabolite, protects against Parkinson's disease. A cinnamon extract compound, CEppt, significantly reduced toxic β-amyloid polypeptide (Aβ) oligomers in a model of Alzheimer's disease, reducing plaques and improving cognitive performance in vivo, while an aqueous extract of cinnamon reduced tau aggregation and filament formation.

*In cardiovascular diseases*: Cinnamophilin may be helpful in cardiovascular diseases like platelet aggregation and cancers and have the potential to prevent vascular disease and atherosclerosis. A cassia compound, 2-methoxycinnamaldehyde (2-MCA), reduces expression of vascular cell adhesion molecule-1 (VCAM-1). Cinnamic aldehyde and cinnamic acid may be useful in myocardial ischemia. Cinnamaldehyde's hypotensive effects may be due to peripheral vasodilation, impeding $Ca^{2+}$ influx and $Ca^{2+}$ release.

*In inhibiting formation of advanced glycation end products (AGEs)*: Cinnamon's catechin, epicatechin, and procyanidin B2 may inhibit AGE formation, offering a therapeutic approach to diabetes and its complications.

*—Mariann Garner-Wizard*

Referenced article can be found at http://www.hindawi.com/journals/ecam/2014/642942/.