

Spices (Coriander, Turmeric and Cinnamon) For Prevention of Cardiovascular Diseases

Loveneet Kaur

Department of Botany & Environment Science, Mata Gujri College, Fatehgarh Sahib-140406, Punjab (India)

loveneet.bhangu@gmail.com

Abstract

The primary cause of death and disability in the world is cardiovascular diseases. Atherosclerosis is the main feature of cardiovascular disease. Although the amounts of vegetables and fruits present in the diets vary by country, diets contain large amounts of spices. These spices may have positive or negative effects on the development of atherosclerosis. In this review, we will discuss on the botany, chemical composition and role of Coriander, Turmeric and Cinnamon in prevention and cure of cardiovascular disease.

Keywords: -Cardiovascular, Herbs, Medicinal, Properties.

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Introduction

Cardiovascular diseases (CVD) is one of the primary causes of death worldwide, which may include coronary artery disease, peripheral arterial disease, acute myocardial infarction, and stroke. The prevalence of cardiovascular diseases is estimated to increase from 36.9% to 40.5% from 2010 to 2030 and its medical cost will increase by 200% ^[1]. Therefore, it is essential to conduct biomedical research studies focusing on effective prevention and treatment strategies for cardiovascular diseases. Atherosclerosis is the leading cause of CVDs. The risk factors of atherosclerosis and CVD include diabetes, hypertension, smoking, dyslipidaemia, obesity and age ^[2]. Moreover, nutritionists have reported that the intake of a diet with high amounts of various vegetables and fruits and lower proportions of sugar, fat and salt, may effectively decrease the incidence of CVD and obesity. However, food consumptions and eating habits patterns vary across cultures and religions. The typical western diet comprises high levels of animal fat, red meat and sugar, and low levels of vegetables and fruits. The Mediterranean diet appears to be relatively healthy, as it includes fruits, vegetables, whole grains, fish, beans and olive oil. Herbs and spices are commonly used as subservient in Mediterranean-style cooking to enhance the flavour of food and decrease the need for oil and salt ^[3]. People taking a Mediterranean diet have a low incidence of CVD, hyperlipidaemia and diabetes ^[4].

In this review, we will discuss three spices Coriander, Turmeric And Cinnamon that are very helpful for prevention and cure of cardiovascular diseases.

Coriander has been reported to have many nutritional and medicinal implications such as it is used to lower the blood lipids and improve symptoms of CVD ^[5]. The protective properties of Turmeric on the cardiovascular system decreasing susceptibility of low density lipoprotein (LDL)

to lipid peroxidation, lowering cholesterol and triglyceride levels, and inhibiting platelet aggregation [6].

Cinnamon is a herbal medicine and an anti-inflammatory dietary supplement suggested for the primary and secondary prevention of coronary artery disease [7].

Coriandrum sativum

Common name: Coriander

Classification

Kingdom: Plantae

Division: Magnoliophyta

Class: Magnoliopsida

Order: Apiales

Family: Apiaceae

Genus: *Coriandrum*

Species: *C. sativum*

Part used: Fruit and Leaf

Botanical description of the *Coriandrum sativum*

Coriandrum sativum (Apiaceae) is a herbaceous annual plant. It grows upto a height of 20-70cm. It is commonly known as “Coriander” or Chinese Parsley” in English, “Dhanya” or “Kusthumbari” in Sanskrit, “dhani” in Bengal, “cilantro” in Spanish, pakchee in Thailand etc. The leaves of coriander are green in colour with variable lenticular shape and the surface is glabrous. [8]. The flowers are white or pink in umbels with asymmetric shapes [9]. The seeds of coriander are dry schizocarps present with two mericarps with globules that are oval shaped [10]. The stem is pale green. Branches are hollow. The surface is glabrous [11].



Fig. 1 Coriander leaves

Fig. 2 Coriander seeds

Chemical composition of *Coriandrum sativum*

Recent research has shown that *C. sativum* can be used to extract various types of alkaloids, essential oils, fatty acids, flavonoids, phenolics, reducing sugars, sterols, tannins, and terpenoids [12]. The leaves were said to be especially rich in folates, ascorbic acid, gallic acid,

caffeic acid, ferulic acid, and chlorogenic acid.^[13] According to Nadeem et al., 2013^[14], the chemical composition (in gram/ Kg) of coriander leaves include moisture (879g/Kg), Protein (33 g/ Kg.), Carbohydrates (65g/Kg.), Total ash (17 g/Kg.), (Calcium 1.4 g/Kg.), Phosphorus (0.6 g/Kg.) and Iron (0.1g/Kg.) (Table 1).

33 compounds were also discovered after examining the water-soluble parts of *C. sativum* seeds, including monoterpenoids, monoterpenoids in their glycosides and glucosides, and aromatic compound glycosides like norcarotenoid glucoside^[15]. Essential oils and fatty oils are the most significant constituents of the seed of *Coriandrum sativum*^[16]. The content of these components is 0.03-2.6% and 9.9-27.7% respectively. Different essential oil chemotypes that are detected from *Coriandrum sativum* seeds includes ketones, aliphatic alcohols, aliphatic aldehydes, aliphatic hydrocarbon, esters, monoterpene oxides, monoterpene hydrocarbons, monoterpene esters, monoterpene alcohols and sesquiterpenes with linalool as the major monoterpene alcohol that are extracted in high quantities^[17].

Table 1: The chemical composition of coriander leaves^[14].

S.no.	Chemical composition	g/kg
1.	Moisture	879
2.	Protein	33
3.	Carbohydrates	65
4.	Total ash	17
5.	Calcium	1.4
6.	Phosphorus	0.6
7.	Iron	0.1

Role of *Coriandrum sativum* for protection of cardiovascular diseases :

Coriander has been proved as a treatment for the patients of cholesterol. Coriander has a long history as a traditional medicine^[17]. The seeds of *Coriandrum sativum* shows a noticeable hypolipidemic action. The levels of triglycerides and total cholesterol have been significantly decreased in the tissues of experimental group animal that receive the seeds of coriander. There is remarkable decrease in the level of LDL (low-density lipoprotein) + ULDL (Ultra Low-Density Lipoprotein) cholesterol while increase the level of HDL (high-density lipoprotein) cholesterol in the experimental group in comparison with control group . The activity of plasma LCAT (Lecithin-cholesterol acyltransferase) increases that leads to enhancement of production of hepatic bile acids. Its hypocholesterolemic effects are thought to be caused by an accelerated loss of cholesterol to bile acids and neutral sterols in the faeces.^[18]

Moreover, Animals under anaesthesia experienced a drop in arterial blood pressure due to coriander crude extract (1–30 mg/ml). In the rabbit aorta, coriander crude extract caused vasodilation in response to phenylephrine and K⁺ (80 mM)-induced contractions and caused cardio-depressant effect in guinea-pig atria. Bioassay-directed fractionation revealed the

separation of spasmogenic and spasmolytic components in the aqueous and organic fractions respectively. Furthermore, Coriander crude extract produced diuresis in rats at 1-10mg/kg^[19].

Curcuma longa

Common name: Turmeric

Classification

Kingdom : Plantae

Division : Magnoliophyta

Class : Liliopsida

Order : Zingiberales

Family : Zingiberaceae

Genus : *Curcuma*

Species : *C. longa*

Part used : Root (Rhizome, Tuber)

Botanical description

Curcuma longa is a perennial, leafy and erect plant with the large leaves. The leaves are lily like. The length of leaf is upto 1.2 m. The leaves are oblong and pointed. The rhizome is a portion that is used medicinally. It is boiled, cleaned and dried to yield a yellow coloured powder which is a common spice used in daily life, turmeric^[20]. The height of the plant of turmeric is 3 to 5 feet^[21]. The flower of turmeric is of yellow colour. The length of flower is between 10-15 cm. The flowers are present in groups together in dense spikes^[22].



Fig. 3 Turmeric

Chemical composition of *Curcuma longa*

Turmeric contains carbohydrates (69.4%), fat (5.1%), protein (6.3%), and moisture (13.1%). The essential oil (5.8%) present in the turmeric is obtained by the steam distillation of rhizomes. It has *a*-phellandrene (1%), cineol (1%), sabinene (0.6%), zingiberene (25%), borneol (0.5%), and Sesquiterpenes (53%)^[23]. Curcumin (diferuloylmethane) (3-4%), a substance present in turmeric. The yellow colour of turmeric is due to the presence of curcumin. It consists of Curcumin I, Curcumin II, Curcumin III. Their percentage is 94%, 6%, 0.3% respectively^[24].

Bisdemethoxy and demethoxy derivsatives have also been isolated. ^[4]. These are the derivatives of curcumin ^[25]. The Curcumin was isolated for the first time in 1815. The chemical structure of curcumin was determined in 1973. It was determined by Roughley and Whiting. Curcumin has a melting point of 176–177°C and reacts with alkali to produce a reddish-brown salt ^[21].

Nutritional value of *Curcuma longa* ^[20]

S. no.	Nutrients	Value per tablespoon (7g)
1.	Calories	3.4
2.	Carbohydrate	2.4(70.3kj)
3.	Cholesterol	0
4.	Water	114.2
5.	Fiber	200
6.	Fat	0.8(23.4kj)
7.	Protein	0.214(6.3kj)
	Mineral	
1.	Calcium	1.77g
2.	Iron	0.4g
3.	Phosphorus	2.58g
4.	Potassium	24.2g
5.	Sodium	0.37g
6.	Zinc	0.04g
7.	Magnesium	1.85g
	Vitamins	
1.	Thiamine	0.0g
2.	Betaine	0.1g
3.	Riboflavin	0.0g
4.	Vitamin A	0.0IU
5.	Vitamin C	0.24g
6.	Choline	0.47g
7.	Folate	0.37g

Role of *Curcuma longa* in prevention of Cardiovascular diseases :

Turmeric has protective properties for cardiovascular system. It includes lowering of triglyceride level, lower the cholesterol, decrease the susceptibility of LDL (low density lipoprotein) to lipid peroxide and also inhibit the aggregation of platelets ^[26]. The turmeric extract showed the decrease in susceptibility of low density lipoprotein to lipid peroxidation with lowering the

Loveneet Kaur

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triglyceride levels and also lower the cholesterol. ^[6]. The extract of turmeric effect on level of cholesterol may be due to the decrease in cholesterol uptake in the intestine and the increase in converting the cholesterol into the bile acids in liver. ^[27]. The *c. longa* inhibit the aggregation of platelets. It is thought to be through potentiation of prostacyclin and by inhibiting thromboxane synthesis ^[26]. Curcumin, a component present in turmeric, moves the alpha-tocopherol from the adipose tissue. As a result of it, turmeric protects from the oxidative damage that is produced during development of atherosclerosis. The curcumin is also helpful for the increase in transport of VLDL cholesterol in plasma that results in increase in level of alpha-tocopherol. Curcumin has displayed to mobilized the alpha-tocopherol from adipose tissue, protect their body against the oxidative damage that is produced during the atherosclerosis development. ^[28]. It also increase the transport of plasma LDL. Alpha-tocopherol levels in plasma are raised by LDL cholesterol. In general, animal fatty acids are less likely to oxidise in the vessel walls. ^[26]. It was observed that the oral intake of curcumin for 7 days (500mg/d) resulted in the noticeable decrease in serum liquid peroxides level (33%), increase in level of HDL cholesterol (29%) and decrease in total serum cholesterol level (12%) ^[29].

Uses

It was observed that the oral intake of curcumin for 7 days (500mg/d) resulted in the noticeable decrease in serum liquid peroxides level (33%), increase in level of HDL cholesterol (29%) and decrease in total serum cholesterol level (12%) ^[29].

Cinnamomum zeylanicum

Common name: Cinnamon

Classification

Kingdom: Plantae

Division: Tracheophyta

Class: Magnoliopsida

Order: Laurales

Family: Lauraceae

Genus: *Cinnamomum*

Species: *zeylanicum*

Part used: bark

Botanical description

The cinnamon trees are of medium size. The leaves are green, leathery and glossy. The flowers are present in terminal panicles. They have slightly unpleasant scent. The fruits are ovoid and fleshy ^[30] ^[30].



Fig. 4 cinnamon

Chemical composition of *Cinnamomum zeylanicum*

The bark of cinnamon contains 1 to 2% volatile oils with cinnamaldehyde. Cinnamaldehyde is the main constituent. Other constituents are coumarin, cinnamic acid, tannins, methyl-eugenol diterpenes and melatonin ^[31].

GC and GC-MS were used to investigate the hydro-distilled volatile oil from *Cinnamomum zeylanicum* (*C. zeylanicum*) buds. A total of 34 components, or around 98 percent of the oil, were described. ^[32] Terpene hydrocarbons make up 78% of it, and oxygenated terpenoids make up the remainder (9 percent) ^[33]. The primary chemicals are determined to be alpha-copaene (23.15%) and alpha-bergamotene (27.38%). ^[34]

Role of *Cinnamomum zeylanicum* in prevention of cardiovascular diseases

The platelet hyperactivity is indulged in atherosclerosis and arterial thrombosis, the platelets play a major role in cardiovascular diseases the antiplatelet therapy is proved to decrease the risk of cardiovascular diseases ^[35]. Aspirin inhibits the activation of platelets ^[36]. But its use is associated with gastrointestinal bleeding There is an effort to decrease these side effects by use of traditional medicines like Cinnamon ^[37].

Conclusion

In this review, we demonstrated the cardio protective effects of three spices. Consumption of these spices in accurate manner should be proved very beneficial for the prevention and cure of cardiovascular disease. Nutritionists and consumers focus on adjusting food recipes and modifying dietary habits to avoid CVD development. The use of these spices must be encouraged across countries to promote good health. Although the studies that were included in this systematic review shed insight on cardio protective properties of these three medicinal spices i.e. Coriander, Turmeric and Cinnamon, more in vitro researches are required to understand in depth, the mechanism of action of extracts of these therapeutic spices in cardiovascular disorders.

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