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Cardioprotective Nature Of Spices: A Review

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Abstract

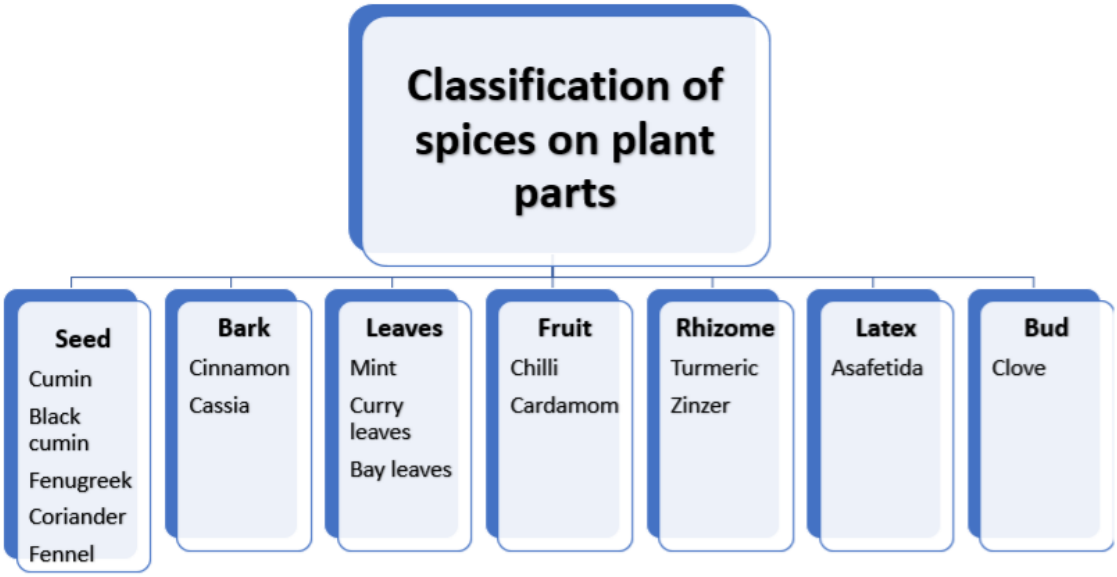
Spices are used in Indian kitchen to provide color taste and flavor to the food. Beside that they also have medicinal properties and used in traditional system of medicine. These spices and herbs have several medicinal properties that includes Antioxidant, Antipyretic, Anti-inflammatory, Antidiabetic, Antibiotic, Anticancer, Hepatoprotective properties[1]. The present study is a review carried out to evaluate the cardioprotective nature of spices and the results shows black pepper, coriander, turmeric, clove, cardamom, curry leaves, saffron and cinnamon have significant cardioprotective nature.

Keywords: Spices, Medicinal Properties, Cardioprotective

Introduction

Spices are used in Indian kitchens for very long time. They are generally used to provide color, taste and flavor to the food[1]; besides that, they are also used as preservative for food items. Historically India and south Asia were the major producer of spices and this region was used to export spices to whole world.

Spices and herbs are traditionally used as medicines in ayurvedic system of medicines. It is also popular in several other traditional system of medicine in whole Asia[2]. There are several spices used in Indian kitchens that includes Cumin, Coriander, Fennel, Fenugreek, Ajwain, True Cardamom, Black Cardamom, Clove, Curry Leaves, Nutmeg, Cinnamon, Black pepper, Chilli Pepper, Asafetida, Black Caraway and Bay Leaves etc. These spices and herbs have several medicinal properties that includes Antioxidant, Antipyretic, Anti-inflammatory, Antidiabetic, Antibiotic, Anticancer, Hepatoprotective properties[1]. The medicinal properties of spices are due the different aromatic compounds present in them. The spices can be classified into different categories on the basis of plant parts used, origin, flavor and uses of them[3].



Present time the non-communicable disease is responsible for the 60% of all deaths in the world. Among them cardiovascular diseases (CVD) are responsible for 17.7 million deaths every year and India accounts for one fifth of these death[4]. More than 80% of deaths from CVD are caused by ischemic heart disease and stroke. India has an age-standardized CVD death rate of 272 per 100,000 people, which is higher than the global average of 235 per 100,000 people, according to the Global Burden of Disease research[5]. After covid deaths due to CVD is more prominent among young population.

Methodology

The present study will evaluate the cardiovascular protective property of the common spices found in Indian kitchens. This study will carry out the by systematic literature review by using various data base including

- PubMed (http://www.ncbi.nlm.nih.gov/pubmed),
- Scopus (http://www.scopus.com),
- Scirus (http://www.scirus.com)
- Science Direct (http://www.sciencedirect.com)
- Google Scholar (http://www.scholar.google.com)

Cardioprotective properties of spices

There are several spices and herbs are used in Indian kitchens which have medicinal properties. Among them cardioprotective nature is appear in following spices-

Black pepper

Piper Nigrum which is commonly known as black pepper has been used for the treatment of various alignments and have several medicinal properties like Antioxidant, Antibacterial, Anti-fungal, Gastro protective, Anti-inflammatory, Anti carcinogenic, Hepatoprotective, Analgesic and Anti Diarrheal properties[1]. There are several terpenes like β-caryophyllene; α-pinene; β-pinene; α-humulene; limonene; and sabinene are found in black pepper that are responsible for its cardioprotective action[6].

A study carried out by Swiderski et. al 2023, to study the effect of turine and black pepper extract on treatment of cardiovascular and coronary artery diseases[6]. The results of this study shows that use of taurine and the terpene constituents like β-caryophyllene, α-pinene, β-pinene, α-humulene, limonene, and sabinene found in black pepper extract to target risk factors for CVDs (i.e., hypertension and hyperhomocysteinemia) can give prominent results[6].

Another study carried out by Salian et. al. 2024, to investigate the cardioprotective potential of resveratrol and its combination with Piperine on Isoproterenol-induced myocardial infarction in rat[7]. According to this study the resveratrol, which can be extracted from plants have cardioprotective properties but have limited therapeutic use due to its limited bioavailability and rapid metabolism. The combination of resveratrol and piperine is used to overcome these obstacles and the results shows that when compared to the group that received resveratrol alone, the combination of resveratrol and piperine dramatically decreased the risk of myocardial infarction caused by isoproterenol. The cardioprotective properties of both piperine and resveratrol, as well as piperine's capacity to increase resveratrol's oral bioavailability, are responsible for this impact[7].

Coriander

Coriandrum sativum commonly known as coriander is an important spice used in India. It contains various phytochemicals such as polyphenols, vitamins, and many phytosterols which provide it several medicinal properties like antioxidant, antibacterial, antifungal, anti-inflammatory, anti-cancer, anti-diabetic, hepatoprotective, anti-acne, anti-dandruff, cardio protective and anti-migraine properties beside this it can be useful in the treatment of neurodegenerative disorders and Alzheimer’s disease[8].

There are several studies that proves the cardioprotective nature of coriander. A study carried out by Patel et. al. 2012 to study the Cardio protective effect of *Coriandrum sativum* L. on isoproterenol induced myocardial necrosis in rats[9]. The study was carried out on male Wistar rats and they were pretreated with methanolic extract of CS seeds orally for 30 days at doses of 100, 200, or 300 mg/kg, and for the final two days, they were given IP (85 mg/kg body weight). The results shows that methanolic extract of coriander is able to prevent myocardial infarction by inhibiting myofibrillar damage[9].

Another study carried out by Dhyani et. al. 2018 to evaluate the potential of *Coriandrum sativum* extract in isoproterenol-induced heart failure (HF) in Wistar rats[10]. The study shows that the treatment with *C. sativum* extract significantly ($p < .05$) improved the left ventricular functions and also inhibited lipid peroxidation, improved lipid profile, and downregulated the expression of endothelin receptors in Wistar rat[10]. It proved the cardioprotective efficiency of coriander.

Cardamom

Cardamom is a fragrant seed spice that is grown all over the world. Its biological qualities include antioxidant, anti-diabetic, antibacterial, anti-cancer, gastric protection, and insecticidal activity[1], [11].

There are several studies showed the cardioprotective properties of cardamom. A study carried out by Goyal et. al. 2015 to study the protective effect of cardamom in Isoproterenol induced myocardial infraction in rats[12]. In this study Wistar male albino rats were split into groups at random and given either normal saline or cardamom extract (100 and 200 mg/kg per mouth) for 30 days. On days 29 and 30, ISO (85 mg/kg, subcutaneous) was administered concurrently at 24-hour intervals. Rats given ISO injections showed signs of cardiac dysfunction but the group which is given cardamom extract shows less signs of cardiac dysfunction[12].

Another study carried out by Kanthlal et. al. 2020 to study the effect of extract of cardamom to prevent vascular remodeling and oxidative stress in N^{ω}-Nitro-L-arginine methyl ester (L-NAME)-induced hypertension in male Wistar rat[13]. The study shows that Rats treated with L-NAME exhibited elevated systolic, diastolic, and mean arterial pressure; decreased nitric oxide levels; elevated levels of malondialdehyde in plasma, heart, aorta, and kidney; hypertrophy of the vascular wall; and impaired vascular responsiveness to acetylcholine in phenylephrine-precontracted aorta[13]. On treatment with aqueous extract of large cardamom shows positive results as it significantly lowered blood pressure, restored nitric oxide levels, decreased malondialdehyde levels, and lessened hypertrophy[13].

Another study carried out by Ahmed et. al. 2024, to study the cardioprotective effects of lipid carrier nanoparticles loaded with cardamom oil (CEO-LC NPs) on rats with diabetes caused by streptozotocin (STZ)[14]. The results shows that cardamom oil loaded lipid carrier nanoparticles improve cardio protection in streptozotocin-induced diabetic rats by lowering plasma lipid levels and oxidative stress[14].

Turmeric

Curcuma Longa known as turmeric is commonly used as spice in Indian kitchens. It is used as preservative as well as to provide color to the food material. The main chemical ingredient present in turmeric is curcumin, which provide it several medicinal properties like anti-inflammatory,

hepatoprotective, anticarcinogenic, antimicrobial, gastroprotective, antidiabetic, antifungal and cardioprotective etc.

A study carried out by Swamy et. al. 2012 to study the Cardioprotective effect of curcumin against doxorubicin-induced myocardial toxicity in albino rats[15]. In this study cardiotoxicity was produced by the administration of doxorubicin (Dox) and Curcumin (200 mg/kg, po) was administered as pretreatment for two weeks and then for two alternate weeks with Dox[15]. The biochemical and histopathological reports confirm the cardioprotective ability of curcumin and it is due to its antioxidant properties[15].

Another study carried out by Li et. al. 2023, to study the cardioprotective effects of curcumin against myocardial ischemia-reperfusion (I/R) injury[16]. This analysis comprised four human trials with a total of 435 patients and 24 animal studies with a total of 503 animals. Curcumin significantly decreased myocardial infarction size ($p < 0.00001$) and improved cardiac function indices (LVEF, LVFS, LVEDd, and LVESd) ($p < 0.01$) when compared to the control group, according to a meta-analysis of animal studies[16].

Cinnamon

Cinnamomum zeylanicum commonly known as cinnamon is a common spice found in kitchens. It is used to provide flavor, beside that it has medicinal properties like antioxidant, anti-inflammatory and cardioprotective[17].

A study carried out by Shang et. al. 2021, to study the effect of cinnamon extract in the management of cardiovascular disease and diabetes[18]. According to this study cinnamon extract can regulate cardiovascular disease by several ways like endothelium protection, regulation of immune response, lowering blood lipids, antioxidative properties, anti-inflammatory properties, suppression of vascular smooth muscle cell (VSMC) growth and mobilization, repression of platelet activity and thrombosis and inhibition of angiogenesis[18]. Beside that it is helpful in regulation for diabetes which is one of the factors of cardiovascular disease[18].

Another study carried out by Elmongy et. al. 2022 to evaluate the effect of Cinnamomum zeylanicum extract on rats fed on high fat high fructose diet[19]. This study is carried out on 50 male Sprague Dawley rats. The results shows that cinnamon extract have positive effect on reduction of glucose and thus it have cardioprotective nature[19].

Another study carried out to study the effects of cinnamon bark extract against ischemia–reperfusion injury and arrhythmias in rat[20]. In this study the benefits of cinnamon bark ethanolic extract against ischemia-induced arrhythmias and heart damage were examined in an in vivo rat model of regional cardiac ischemia[20]. The study carried out on 32 adult male Sprague–Dawley rats and results show that

the ethanolic extract of cinnamon bark is able to protect the heart against ischemia–reperfusion injury probably due to its antioxidant properties[20].

Clove

Syzygium Aromaticum commonly known as clove is used as spice as well as medicinal plant to treat several diseases. The clove oil contains eugenol as main compound which have antioxidant as well as anti-inflammatory properties, beside that there are several studies which shows its cardioprotective property.

A study carried out by Kumar et. al. 2024 to study the cardioprotective effect of eugenol on Cd induced inflammation, oxidative stress and dyslipidemia in male rats[21]. According to this study Cd is a toxic compound and it can damage several vital organs like kidney, liver, brain and heart[21]. This study evaluates the effect of eugenol, which is one of the components of clove oil on rats get toxic by Cd. The results shows that co-administration of eugenol alongside cadmium exhibited remarkable protective efficacy against cadmium-induced cardio-toxicity[21].

Another study carried out by Singhal et. al. 2025, to evaluate the cardioprotective ability of *Syzygium aromaticum* in high-glucose and trimethylamine-N-Oxide-induced diabetic cardiomyopathy[22]. The results shows that exposure to TMAO and hyperglycemia resulted in greater morphological and oxidative damage but *Syzygium aromaticum* extract treatment dramatically decreased oxidative stress and cellular and nuclear damage[22].

Saffron

Crocus sativus L. commonly known as saffron is used as an important medicine in traditional way. The main components of saffron are crocin, crocetin, safranal, which are responsible for its medicinal properties that includes cardioprotective nature.

A study carried out by Su et. al. 2021, to evaluate the effect of saffron extract on potential oxidative stress in cardiovascular disease[23]. This study analyzes the four types of oxidative stress that includes antiatherosclerosis, antimyocardial ischemia, anti-ischemia reperfusion injury, and improvement in drug-induced cardiotoxicity, particularly anthracycline-induced. The results show the protective effect of saffron in cardiovascular diseases and drug-induced cardiotoxicity[23].

Another study carried out by Mehdizadeh et. al. 2013, on cardioprotective effect of saffron extract and safranal in isoproterenol-induced myocardial infarction in Wistar rats[24]. The findings of this study show that myocardial injury confirmed in Histological findings of the heart with ISO administration and saffron or safranal pretreatment preserve the tissue[24].

Curry leaves

Murraya Koenijii is a spicy plant commonly called curry leaves plant. The main components of curry leaves are phenolic, carbazole alkaloids and phenols[25] which are responsible for its medicinal properties like antioxidant, anti-inflammatory, analgesic, anticancer, antidiabetic, hepatoprotective and many more[1].

There are several studies that proved its cardioprotective nature. A study carried out by Sandamali et. al. 2020, to study the cardioprotective potential of curry leaves extract against doxorubicin-induced cardiotoxicity in rats [26]. According to this study the cardiotoxicity caused by doxorubicin leads to irreversible congestive heart failure and the flavonoids and phenolic compounds present in curry leaves have antioxidant properties and they work as free radical scavenger. The results shows less damage in the rats which are administer the dose of curry leaves extract before toxicity[26].

Another study carried out by Ghosh et. al. 2016 to study the protective effect of melatonin and curry leaves extract on Cd induced toxicity in rat heart[27]. The male Wistar rats were used in the study and the results shows significant protective effect of the combination of melatonin and aqueous extract of curry leaves on Cd induced oxidative stress. The study also suggest that this protective action is due to the synergistic antioxidant mechanism[27].

Conclusion

The above observations shows that there are several spices used in kitchen to provide color and flavor to the food. These spices are also used as medicine in traditional systems like ayurveda, Unani and other traditional systems. These spices have several medicinal properties that includes cardioprotective nature. The present study proves the cardioprotective nature of black pepper, coriander, turmeric, clove, cardamom, curry leaves, saffron and cinnamon. These results are based on the review of different studies carried out on animals especially rat, however there is further scope of human trail to study their cardioprotective nature.

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