

Medicinal Uses of Some Indian Spices: A Review

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ABSTRACT: This review article is about to give collective information of medicinal activities of some Indian spices such as Turmeric(*Curcuma longa*), Black pepper(*Piper nigrum*), Cinnamon (*Cinnamomum zeylanicum*), Coriander (*Coriandrum sativum*) and clove(*Eugenia caryophyllus*) which are generally used in daily food in India for improving taste of food. These spices not only enhance the food taste but having some magical proven effects on human body in very less quantity. Those spices are used in Traditional Indian Medicine for various ailments. They having anti-hypertensive, aphrodisiac, anti-microbial, anti-diuretic, anti-viral, anti-bacterial, anti-diabetic, anti-oxidant, anti-asthmatic agent anti-inflammatory, analgesics etc. Those spices are easily available in market so that people can take advantage of their medicinal properties. This review aims to discuss pharmacological properties of Turmeric, Black pepper, Cinnamon, Coriander & Clove.

KEYWORDS: Turmeric, Piperine Medicinal Activity, Antioxidant, Anticancer, clove

I. INTRODUCTION

Turmeric, a rhizomatous herbal plant native to India (*Curcuma longa*) and belonging to the ginger family (Zingiberaceae), is widely recognized for its medicinal properties.[1, 2] Turmeric primarily consists of water (80–90%), with carbohydrates comprising approximately 13%, proteins accounting for 2%, minerals contributing 2%, and lipids making up the rest. [3] Curcumin, a polyphenol, exhibits the ability to target various signaling molecules and exert beneficial effects at the cellular level, thus contributing to its multiple health benefits.[4] Curcumin, demethoxycurcumin (DMC), and bisdemethoxycurcumin (BDMC) are classified as curcuminoids, which refer to a group of yellow-colored compounds derived from the rhizomes of *Curcuma longa* L. (turmeric).[5, 6,7] curcumin, which is a small molecular weight polyphenolic compound and lipophilic in nature. Curcumin is stable at the acidic pH of the stomach. [8] The role of curcumin, one of the most studied

chemopreventive agent, on anti-inflammatory and cancer activity has been well studied.[9,10-19] Turmeric is renowned as "The Golden Spice of India," with India holding the distinction of being both the largest producer and consumer of turmeric powder globally.[20]

Piper nigrum, a member of the Piperaceae family, is a highly esteemed medicinal plant. It holds significant value as one of the most widely utilized spices and is often regarded as the reigning monarch among various spices.[21] Phytochemical studies conducted on *P. nigrum* have identified a wide range of phytochemicals present in the plant. Among various members of the Piperaceae family, piperine was the first pharmacologically active compound isolated. Additionally, compounds such as piperene, piperamide, and piperamine have been extracted from *P. nigrum*, showcasing a diverse array of pharmacological activities. [22,23] Piperine has the ability to enhance the absorption of various nutrients, including selenium, vitamin B, beta-carotene, and curcumin, among others. Furthermore, it stimulates the stomach to increase the secretion of digestive juices, such as hydrochloric acid, which aids in the breakdown of proteins and improves the efficiency of digestion in the duodenum.[24]

Cinnamon, scientifically known as *Cinnamomum zeylanicum* and commonly referred to as Dalchini, is a member of the Lauraceae family. The bark of the cinnamon tree serves as the primary part utilized for its culinary and spice purposes. [25]. The chemical composition of the volatile oils derived from the bark, leaf, and root bark of *Cinnamomum zeylanicum* and *C. cassia* shows significant variations, indicating that their pharmacological effects may also differ accordingly. [26] Trans-cinnamaldehyde, eugenol, and linalool are the primary constituents of the essential oil extracted from the bark of *C. zeylanicum*. [27]

Coriandrum sativum, commonly referred to as dhaniya, is an annual herb that has been used as a spice since ancient times. Different parts of the coriander plant have been associated with diverse health benefits and organic activities.[28] In folk medicine, coriander fruits have been traditionally

employed to address various health issues including bronchitis, vomiting, dysentery, gout, rheumatism, intermittent fever, giddiness, indigestion, inflammation, and diarrhea.[29] The volatile oil content in coriander fruit ranges from approximately 0.2% to 1.5%, while the fat oil content ranges from 13% to 20%. [30] The essential oil obtained through distillation from the fruit primarily consists of linalool, along with other oxidized monoterpenes and monoterpene hydrocarbons. [31]

Cloves, which are the dried aromatic flower buds of the *Eugenia caryophyllata* tree (also known as *Syzygium aromaticum*), are extensively utilized as a spice in cuisines across the globe. They predominantly contain 82-88% eugenol, a small quantity of eugenyl acetate, and various other minor

constituents. Stem oils, on the other hand, are derived from the twigs of *Eugenia caryophyllus*. [32] The primary constituents of the essential oil are as follows: eugenol (87.00%), eugenyl acetate (8.01%), and β -Caryophyllene (3.56%). In total, 23 identified constituents are present in this essential oil, with eugenol (76.8%) being the most abundant, followed by β -caryophyllene (17.4%), α -humulene (2.1%), and eugenyl acetate (1.2%) as the main components.[33] Clove, along with its primary constituents, exhibits antimicrobial, antioxidant, anti-inflammatory, analgesic, anticancer, and anesthetic effects. Additionally, they demonstrate insecticidal, mosquito repellent, aphrodisiac, and antipyretic activities. [34,35]

II. MEDICINAL USES

Turmeric shows wide medicinal uses some of them listed here

1. Antibacterial: Curcumin exhibits the capacity to effectively hinder the growth of diverse periodontopathic bacteria, including *Porphyromonas gingivalis*, as well as inhibit the activities of Arg-specific proteinase (RGP) and Lys-specific proteinase (KGP). In fact, a concentration of 20 μ g/mL of curcumin was found to inhibit *P. gingivalis* biofilm formation by over 80%. [36,37]

2. Anti-viral activity: Curcumin exhibits antiviral activity against various viruses, including papillomavirus (HPV), influenza virus, Hepatitis B virus (HBV), Hepatitis C virus (HCV), adenovirus, coxsackie virus, Human norovirus (HuNoV), Respiratory syncytial virus (RSV), and Herpes simplex 1 (HSV-1). [38-42] The functionalization of graphene oxide with curcumin has demonstrated a synergistic antiviral effect against respiratory syncytial virus infection. [43]

3. Wound- healing activity: Curcumin treatment resulted in an increase in the immunohistochemical localization of transforming growth factor- β 1 in wounds, when compared to untreated wounds. [44]

4. Antioxidant: Studies have demonstrated that curcumin has the ability to enhance systemic markers of oxidative stress. [45] Curcumin employs multiple mechanisms to counteract the effects of free radicals. It has the capacity to scavenge various types of free radicals, including reactive oxygen species (ROS) and reactive nitrogen species (RNS). [46]

5. Anti-arthritis: While there is currently no definitive cure, pharmaceutical options for treatment are available; however, they often come

with high costs and undesirable side effects. As a result, there is growing interest in alternative treatments such as dietary supplements and herbal remedies. Numerous studies have highlighted the anti-arthritis effects of curcumin in individuals with osteoarthritis (OA) and rheumatoid arthritis (RA). [47-50]

6. Anti-cancer: Numerous studies have indicated the anticancer activities of curcumin, either on its own or in combination with conventional chemotherapy drugs, for the treatment of cancer and its associated complications. [51,52]

Some widely known Black pepper uses are listed here

1. Antifungal and antimicrobial effects: Piperine has demonstrated promising antimicrobial and antifungal effects against various microorganisms, including *Staphylococcus aureus*, *Bacillus subtilis*, *Escherichia coli*, *Aspergillus niger*, *Aspergillus flavus*, *Alternaria alternata*, and *Fusarium oxysporum*. Additionally, phenolic compounds extracted from fresh black pepper seeds have the potential to inhibit the growth of *Bacillus*, *Escherichia coli*, *Staphylococcus aureus*, *Streptococcus faecalis*, and *Bacillus cereus*. [53,54]

2. Anticancer effects: The growth of both androgen-dependent and androgen-independent prostate cancer cells was significantly suppressed by piperine. [55] Piperine exhibited the ability to induce DNA damage and apoptosis in tumor cells, suggesting its potential as a therapeutic agent for the treatment of osteosarcoma. [56,57]

3. Antioxidant activity: Black pepper serves as a significant natural antioxidant source. Its primary function as an antioxidant is to safeguard cells against free radicals, which are believed to

contribute to the development of various diseases, including heart disease and cancer. [58]

4. Anti-pyretic activity: Black Pepper is utilized in preparations for treating conditions such as intermittent fever, neuritis, colds, throat ailments, and pain. It is also employed as an anti-periodic agent for malarial fever, which suggests its potential analgesic and antipyretic properties. [59]

Some beneficial effects of Cinnamon are listed here

1. Anticancer Activity: Research has explored the potential antitumor effects of *C. zeylanicum* and *C. cassia* due to their antioxidant and immunomodulatory properties. Nevertheless, further examination is required to precisely determine the antitumor properties of cinnamon bark and its primary component, cinnamaldehyde. A study was conducted to analyze the impact of cinnamaldehyde on the cytotoxicity, induction of apoptosis, and potential mechanisms of action in human promyelocytic leukemia cells. [60]

2. Antibacterial & Antiviral Activity: Cinnamon, widely used in Chinese herbal medicine, is believed to possess numerous medicinal and calming qualities. The unique aroma and taste of cinnamon are derived from its essential oils found in the bark, specifically cinnamaldehyde. Cinnamaldehyde exhibits properties that are antiviral and anti-bacterial in nature. [61]

3. Antidiabetic Agent: Diabetes mellitus (DM) is one of the endocrine disorder which is commonly effecting many of the people. The impact of cinnamon supplementation was examined in patients who consumed 500mg capsules of cinnamon bark powder twice daily for a duration of 3 months. The results demonstrated that cinnamon supplementation led to significant improvements in various anthropometric measurements such as BMI, visceral fat, and body fat. Additionally, positive effects were observed in glycemic outcomes including insulin resistance, FPG, fasting insulin, 2hpp, and HbA1C. Cinnamon has the 182 ability to manage diabetes by boosting insulin function. Furthermore, there were favorable changes in lipid profiles, specifically total cholesterol, LDL-c, and HDL-c. [62]

4. Analgesic Agent: The results indicate that the use of *C. zeylanicum* bark extract demonstrated noteworthy analgesic effects at doses of 200 and 400mg/kg, surpassing the control group. The plant extract exhibited inhibitory properties against both heat and chemically induced pain, suggesting its antinociceptive effects through the

modulation of serotonin and γ -aminobutyric acid (GABA) pathways.[63]

5. Antioxidant: In vitro experiments showed that ethanol extracts derived from the dried bark of *C. cassia* demonstrated superior inhibition of lipid peroxidation in rat liver homogenate compared to alpha-tocopherol. The extracts also exhibited notable scavenging activity against superoxide anions and displayed strong anti-superoxide formation activity ($P < 0.05$). Moreover, the extracts demonstrated excellent antioxidant activity in both enzymatic and nonenzymatic liver tissue oxidative systems. [64]

Coriander having large no of medicinal activities such as

1. Diuretic: Anesthetized Wistar rats were subjected to continuous intravenous infusion (120 minutes) of the aqueous extract derived from coriander seed at two different doses (40 and 100 mg/kg). In a dose-dependent manner, the crude aqueous extract obtained from coriander seeds demonstrated an increase in diuresis, excretion of electrolytes, and glomerular filtration rate.[65]

2. Anti-hypertensive activities: In anesthetized rats, the anti-hypertensive effect of coriander was observed, which was attributed to its vasodilator properties. This vasodilator effect was mediated through a combination of endothelial-dependent and independent pathways. [66]

3. Antioxidant activity: The anti-oxidant properties of both coriander leaves and seeds have been observed, with the leaves exhibiting a stronger effect. The phenolic and carotenoid extracts derived from the plant have shown greater effectiveness in safeguarding cells against oxidative damage, as they display a higher potential for scavenging hydroxyl radicals.[67] The researcher's findings indicated that the methanolic extracts derived from coriander fruits exhibited superior antioxidant activity compared to essential oils (EOs). Additionally, the methanolic extracts of coriander fruits demonstrated a higher scavenging ability against 2,2-diphenyl-1-picrylhydrazyl (DPPH) radicals when compared to the synthetic antioxidant butylated hydroxytoluene (BHT), with an IC₅₀ value of 25 mg/mL. [68]

4. Antifungal activity: coriander leaf extract, had fungicidal activity against *Penicillium lilacinum* and *Aspergillus niger* with MICs 67.8 and 62.1 mg/mL, respectively. [69]

Widely used medicinal uses of clove given below

1. Analgesic activity: The potential involvement of the opioid system in the analgesic effect of clove can be proposed. Clove oil, which

contains eugenol as its active ingredient, acts as a natural anesthetic. This eugenol component aids in numbing and alleviating pain associated with toothaches. Furthermore, eugenol possesses inherent anti-inflammatory properties, which can help diminish swelling and irritation in the affected area. [70]

2. Anticancer Activity: To enhance cancer protection, it is recommended to increase the consumption of cloves. This is due to the potent anticarcinogenic properties of eugenol, which is present in cloves. Eugenol has been found to effectively regulate the progression of lung cancer, breast cancer, and ovarian cancer during their early stages. Additionally, cloves have shown the ability to reduce the abnormal crowding of cells in specific lung tissue regions and inhibit the growth of pre-malignant cells by over 85 percent. In an in vitro study, clove oil demonstrated the ability to halt the growth of various cancer cell lines, including but not limited to breast, cervical, and colon cancer. Furthermore, clove extract increased cell death and

disrupted cell division in a colon cancer cell line. [71,72]

3. Antimicrobial Activity: It has been documented that this particular essential oil possesses the ability to hinder the growth of molds, yeasts, and bacteria. The remarkable biological and antimicrobial properties of clove essential oil can be attributed to its significant concentration of eugenol. The antimicrobial properties of cloves have been demonstrated, indicating their efficacy in inhibiting the proliferation of microorganisms. [73]

4. Hepatoprotective activity: The hepatoprotective capacity of an aqueous extract derived from cloves was assessed using a paracetamol-induced hepatic damage model in Wistar albino rats. The rats were administered doses of 0.1 and 0.2g/kg of the clove extract. The extent of hepatic damage was determined by evaluating the elevated levels of cytoplasmic enzymes. The clove extract effectively restored the enzyme levels in the serum back to normal concentrations. [74]

III. CONCLUSION

In conclusion, the medicinal properties of turmeric, black pepper, cinnamon, coriander & Clove have been extensively studied, highlighting their potential therapeutic benefits. Turmeric, with its antibacterial and anti-viral activities, wound-healing properties, antioxidant effects, and potential anti-arthritis and anti-cancer activities, offers a versatile range of medicinal uses. Black pepper exhibits antifungal and antimicrobial effects, anticancer activities, antioxidant properties, and antipyretic activity. Cinnamon showcases anticancer, antibacterial and antiviral activities, antidiabetic effects, and analgesic properties. Coriander demonstrates diuretic and anti-hypertensive activities, antioxidant effects, and antifungal properties. Cloves possess analgesic, anticancer, antimicrobial, and hepatoprotective activities. These findings suggest the potential therapeutic value of these natural spices in various health conditions. Further research and clinical trials are warranted to explore their full therapeutic potential and optimize their usage for medicinal purposes. Incorporating these spices into a balanced diet and exploring their application in traditional and alternative medicine may offer new avenues for improving human health and well-being

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