



A REVIEW ON THE BIOLOGICAL ACTIVITIES OF DIFFERENT SPICES

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Article Received on 17/08/2020

Article Revised on 07/09/2020

Article Accepted on 27/09/2020

ABSTRACT

Plant products has been greatly utilised as a source of many drugs in the medicine. Spices which is plant substances generally used for flavouring food but due to presence of different type of compounds like terpenoids, alkaloids, phenolic and many other, spices shows antioxidant, antimicrobial, anti-inflammatory, antibacterial and antifungal and other biological activities. This article have a try to defined biological activities of different spices.

KEYWORDS: Spices, antioxidant, antimicrobial.

INTRODUCTION

Man has been using herbs and plant products for combating diseases. The Indian subcontinent is enriched by a variety medicinal plants. These plant products has been greatly utilised as a source of many drugs in the Indian traditional system of medicine. Spices have been used since ancient times, not only as antioxidants and flavoring agents, but also for their antimicrobial activity against degradation induced by foodborne pathogens and food spoilage bacteria. Spices are known to possess a variety of antioxidant effects and other biological activities. These spices contain different type of alkaloids, terpenoids, Phenolic compounds. Due to presence of these compounds spices shows antioxidant, antimicrobial, antibacterial activity in which antioxidant activity mainly due to their redox properties and their capacity to block the production of reactive oxygen species. It is important to study the bioactive compounds that can modulate target functions related to defence against oxidative stress, and that might be used to achieve health benefits individually.



1. Black Pepper (Kali Mirch)

Black pepper (*Piper nigrum* L.) is a member of Piperaceae family that is well informed for its fruit, which is usually dried and used as a spice. In dried form the fruit is referred to as peppercorns. It is popularly known as “King of Spices”. Black pepper is well-known cooking herb and the extracts have been reported in various Ayurvedic and other traditional medicinal systems. Pepper is also used in medicine as aphrodisiac, carminative, stomachic, antiseptic diuretic, rheumatoid arthritis, and peripheral neuropathy, due to the presence of volatile compounds, tannins, phenols and other unknown substances.^[1,2]

It is found that Black pepper contain different type of compounds like Alkaloids, Terpenoids, phenols etc. Due to which black pepper contain different biological activities like antimicrobial and antibacterial. Alkaloids play a prime role in plant physiology, host plant resistance, the diet and medicine.^[3] Black pepper is used to inhibit the growth of various microbes such as *Staphylococcus aureus*, *Bacillus subtilis*, *Pseudomonas aeruginosa*, *Escherichia coli*, *Alternaria alternata*, *Aspergillus niger*, *Aspergillus flavus* and *Fusarium oxysporum*. It also found that black pepper leaf extract inhibit the growth of *Pseudomonas aeruginosa*.^[4] Black pepper have an important antioxidant, antimicrobial potential and gastro-protective role. Black pepper widely used in human dietary is attributed to the alkaloid piperine. Several physiological effects of black pepper and its bioactive alkaloid piperine have been reported in recent decades. By stimulating the digestive enzymes of pancreas, piperine enhances the digestive capacity.

This is also reported that antimicrobial activity of black pepper chloroform extract (BPCE) against *Escherichia*

coli and *Staphylococcus aureus*. The antibacterial components of pepper restrained cellular respiration by disrupting the TCA pathway.

Black pepper is also used as a food preservative. It have reported that due to presence of terpenoids in black pepper essential oil have the potential antibacterial activity. So it is also used in meat preservation.

Water and ethanol crude extracts from black pepper were investigated for their total antioxidant activity, reducing power, superoxide anion radical scavenging, hydrogen peroxide scavenging, and metal chelating activities. Both water extract (WEBP) and ethanol extract (EEBP) of black pepper exhibited strong total antioxidant activity.

Black pepper is described as health beneficial and disease preventing properties, like e.g. anti-inflammatory, antiviral, antipyretic, immune and bioavailability enhancing qualities.^[5]



2. Cinnamon (Dalchini)

Cinnamon is a member of genus *Cinnamomum* (family Lauraceae). It have different species in which Indian species is *Cinnamon verum*. shows different biological activities.

Cinnamon bark, leaves, flowers and fruits are used to prepare essential oils. according to traditional medicine cinnamon has been used as a neuroprotective agent^[6] and it also used for the treatment of diabetes.^[7] Cinnamon has also been used as a health-promoting agent for the treatment of diseases such as inflammation, gastrointestinal disorders and urinary infections.^[8,9] Cinnamon show antimicrobial properties, especially antibacterial activity. Cinnamon is used in herbal medicine for treatment of some diseases like respiratory problems and diabetes. Biologically active compounds such as cinnamaldehyde, cinnamic acid, cinnamyl acetate have been found in cinnamon. Due to their biological properties, these chemical compounds have some antimicrobial, antiulcer, antidiabetic, antiinflammatory and antioxidant properties. Cinnamaldehyde is one of the main components of cinnamon and it is less toxic, permeable across living

cell membranes, easily undergoes degradation and accepted as biocompatible.^[10]

Cinnamon stick extract show antibacterial activity against five common foodborne pathogenic bacteria (*Bacillus cereus*, *Listeria monocytogenes*, *Staphylococcus aureus*, *Escherichia coli*, and *Salmonella anatum*).

Cinnamon essential oil (EO) alone and in combination with some classical antibiotics against three multidrug-resistant bacteria, *Escherichia coli*, *Staphylococcus aureus*, and *Pseudomonas aeruginosa*.

Siddiqua et al. found that cinnamaldehyde and clove oils showed effective antibacterial activity and when combined, the activity increased.

Cinnamon has also been used to treat acne and melisma, gastrointestinal and colonic . Ayurvedic literature shows that cinnamon has potent antiemetic, anti-diarrheal, anti-flatulent, and stimulant activities.^[11] Cinnamon has a coagulant effect and therefore it can be used against hemorrhaging. Cinnamon improves tissue regeneration.



3. Turmeric (Haldi)

Turmeric extract consisting of a volatile oil fraction and a yellow-brown colored fraction. It contains a number of cucuminoids, monoterpenoids and sesquiterpenoids. The compounds showing yellow colour are three curcuminoid compounds- curcumin, demethoxycurcumin and dimethoxycurcumin. Curcumin, a yellow bioactive pigment, is the major component of turmeric.

Curcumin shows biological activities such as antifungal, antibacterial, antidiabetic, anti-oxidant, anti-allergic, anti-cancer and anti-protozoal activities. It has been reported that the volatile oil of *C. longa* possess anti-inflammatory, anti-bacterial and antifungal activities. These curcuminoids are responsible for the yellow color of root. For quite a long time, turmeric has been used as a potent anti-inflammatory agent in both Chinese and Indian systems of medicine (Gescher et al., 2005). It has a great ability for wound healing. *C. longa* is often cultivated to harvest rhizomes for ground turmeric powder as a spice and food colouring agent.

The plant has also been recognized as a pharmaceutical crop for the production of standardized therapeutic extracts (STES). India is the largest producer of turmeric supplying over 90% of world's demand (Olojede et al., 2009). There are about 70 cultivars or varieties of *C. longa*. Several medical properties have been attributed to *Curcuma longa* Linn. Rhizome of Haridra is known to possess therapeutic activities as an anti-diabetic,^[12-14] hypolipidemic, anti-inflammatory,^[14,15] anti-diarrhoeal,^[13] hepatoprotective,^[12,13] anti-asthmatic and anti-cancerous drug. Haridra is widely used in cosmetology.^[16]

The chemical constituents of *Curcuma longa* like Tumerones, curcuminoids, Curcumin and tetrahydrocurcumin has an anti-asthmatic action^[17] Mazumber et al. (1995) demonstrated that curcumin has an antiviral activity, being a HIV-1 integrase inhibitor and suggested that curcumin analogs may be developed as anti-Aids drugs.



4. Pippali

Pippali have scientific name (*Piper longum* Linn.) is one of the main drug in Ayurveda and is generally used to treat various diseases especially for the treatment of respiratory disorders.^[18]

The primary constituents isolated from various parts of *P. longum* are piperine, piperlongumine, sylvatin, sesamin, diaeudesmin piperlonguminine, pipermonaline, and piperundecalidine. It is most commonly used to treat chronic bronchitis, asthma, constipation, gonorrhoea, paralysis of the tongue, diarrhea, chronic malaria, viral hepatitis, respiratory infections, stomachache, bronchitis etc.

Piperine, which is the main constituent of fruit, is reported to be having significant anti-inflammatory activity.^[19,20] Different biological activities like immunostimulatory, anti-ulcer, anti-amebic, anti-oxidant, hepatoprotective and anti-inflammatory activities were reported on the fruit of this plant.^[21,22]

The various extracts of *P. longum* were demonstrated impressive adulticidal activity when tested on female mosquitoes by topical application.^[23]

P. longum exhibits promising antioxidant potential against free radical-induced oxidative damage. Petroleum ether extract of the root and piperine from roots of *P. longum* Linn. decrease lipid peroxide levels. Petroleum ether and ethyl acetate extracts of *P. longum* were found to exert antimicrobial effects against various microorganisms.

The ethanol extract of the *P. longum* L. fruit yields piperlonguminine, piperine, and piperonaline as the main antihyperlipidemic constituents. They exhibit appreciable antihyperlipidemic activity *in vivo*. Piperlonguminine from *P. longum* inhibits melanin production in melanoma B16 cells stimulated with alpha-melanocyte-stimulating hormone, 3-isobutyl-1-methylxanthine.

Thus the piper longum fruits represent a promising pharmacotherapeutic candidate against depression.^[24] An ethyl acetate fraction of Pippali extract was found active against *M. smegmatis* and *M. tuberculosis*. It also shows very significant activity against other bacterial strains like *E. coli* (*S. aureus*, *Salmonella typhi*, *Enterococcus faecalis*, and *Pseudomonas aeruginosa*).



5. Cloves

Botanical name of clove is (*Syzygium aromaticum*). The antioxidant and antimicrobial activity of clove is higher than many fruits, vegetables and other spices and should deserve special attention. Its antimicrobial potential was established when its essential oil extracts killed many Gram positive and Gram negative organisms including some fungi.^[25,26] The antimicrobial activity of clove is attributable to eugenol, oleic acids and lipids found in its essential oils.^[27]

The essential oil extracted from the dried flower buds of clove is used as a topical application to relieve pain and to promote healing. The main constituents of the essential oil are phenylpropanoids such as carvacrol, thymol, eugenol and cinnamaldehyde.

Cloves are used as a carminative, to increase hydrochloric acid in the stomach and to improve peristalsis. It is also used in dentistry where the essential oil of clove is used as anodyne for dental emergencies. the cloves are

antimutagenic, anti-inflammatory, antioxidant, antiulcerogenic, antithrombotic and antiparasitic, antibacterial and anti-inflammatory.^[28]

The antimicrobial activities of clove have been proved against several bacteria and fungal strains. The only sampled that showed complete bactericidal effect against all the food-borne pathogens tested *Escherichia coli* (*E. coli*), *Staphylococcus aureus* and *Bacillus cereus* was the aqueous extract of clove at 3%. At the concentration of 1% clove extract also showed good inhibitory action.

Clove extracts were found to inhibit the growth of *Pseudomonas aeruginosa*, *Candida albicans*, *Staphylococcus aureus*, *Salmonella choleraesuis*, *Klebsiella pneumoniae*.

Clove is used as an analgesic for toothache, joint pain and antispasmodic, due to the presence of eugenol.

The antiviral activity of eugenin, a compound isolated from *S. aromaticum* was tested against herpes virus strains.

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