



ISSN 2456-3110

Vol 4 · Issue 6

Nov-Dec 2019

Journal of
**Ayurveda and Integrated
Medical Sciences**

www.jaims.in

JAIMS

An International Journal for Researches in Ayurveda and Allied Sciences



Charaka
Publications

Indexed

Spices - An imperative melange - back to the roots

Noora Beegum¹, Reshmi R.², Nandan N.³, Sunil Raj N.⁴, Soundarya Vishwanathan⁵

^{1,2}Post Graduate Scholar, ³Reader, ⁴Professor & Head, ⁵Senior Lecturer, Department of Pedodontics and Preventive Dentistry, Bangalore Institute of Dental Sciences & Hospital, Bangalore, INDIA.

ABSTRACT

Ayurveda is one of the world's oldest medical systems and remains one of India's traditional health care systems. Natural products have been used for thousands of years in traditional medicine for many purposes. Ayurveda has many evidences for the utilization of spices to cure various diseases. They not only increase the flavor of food but also have several therapeutic values. The objective of this article is to provide an overview regarding the health benefits of most commonly used spices and their applications in dentistry.

Key words: Ayurveda, Spices, Dentistry, Natural products.

INTRODUCTION

Spices are defined as any dried, fragrant or aromatic vegetable or plant substance that contributes flavor in whole, broken, ground form.^[1] India has traditionally been known to the world for spices. They embellish foods by imparting its characteristic colour, complimenting with aroma, masking other flavours, augmenting the taste and acting as preservatives in some foods.^[2]

Spices are functional foods which have beneficial effect on certain target functions in the body beyond basic nutritional requirements.^[3] Spices are usually aromatic and pungent, due to their essential oil content which also imparts them antiseptic and preservative properties.^[2] This review article focuses on the nutritional benefits and dental applications of

some traditional spices commonly used in India.

History

The word *spice* comes from the old French word *Espice*, which was derived from the Latin root *Spec*, the noun referring to "appearance, sort, kind".^[4] The story of Indian spices dates back to 7000 years into the past. Particles of Cumin, Coriander, Mustard seeds and Cinnamon have been found in 4500 year old grinding stones from the prehistoric cities of Mohenjo Daro and Harappa in the Indus valley.^[2]

Spices were the exotic treasures that lured explorers to India.^[2] Numerous people such as Christopher Columbus, Marco Polo and Vasco da Gama set sail in the hopes of finding the Land of Spices to establish the supremacy of their own country or empire.^[5]

Spices were viewed as a measure of wealth. The more spices one used, the more prosperous they were thought to be.^[5] In spite of all the geopolitical changes that eroded India's wealth, it still remains a proud symbol of Indian culture and heritage.^[2]

CLOVE^[6,7]

The name derives from the French word *Clou* (nail), as the buds are vaguely similar to small irregular nails in shape. This spice is used in Chinese medicine, Ayurveda, Western Herbalism and Dentistry where the essential oil is used as an anodyne (pain killer) for dental emergencies.^[3] The ancient Chinese Han

Address for correspondence:

Dr. Noora Beegum

Post Graduate Scholar, Department of Pedodontics and Preventive Dentistry, Bangalore Institute of Dental Sciences & Hospital, Bangalore, INDIA.

E-mail: noorabeegum91@gmail.com

Submission Date: 08/11/2019 Accepted Date: 15/12/2019

Access this article online

Quick Response Code



Website: www.jaims.in

Published by Maharshi Charaka
Ayurveda Organization, Vijayapur,
Karnataka (Regd) under the license CC-
by-NC-SA

Dynasty used cloves. Chinese physician of that era wrote that the court visitors to the emperor were required to hold clove in their mouth. This was done to save the ruler from the bad breath of the visitors.^[6]



Figure 1: Clove

Table 1: Scientific Aspects of Clove.^[7]

Botanical name	Syzygium Aromaticum
Family	Myrtaceae
Other names	Laung, Lavanga, Grambu, Karambu.
Active Components	Volatile oil, Non volatile ether, Crude fibre carbohydrates, Mineral matter, Flavanoids, Hexane, Methylene chloride, Ethanol, Thymol, Eugenol and Benzene.
Part used	Bud

Table 2: Nutritional value of Clove.^[8]

Energy	274 Kcal
Carbohydrates	65.5g
Protein	5.97g
Fat	13.0g
Cholesterol	0 mg
Dietary Fibre	33.9g
Sugar	2.38g

Therapeutic uses of Clove

Antimicrobial activity

Clove is a potent anti-viral, anti-fungal and anti-bacterial agent. Clove oil was found to be very effective against Staphylococcus species. Amongst fungi, Aspergillus Niger was found to be highly sensitive to clove oil. Essential oil of clove, dispersed (0.4% v/v) in a concentrated sugar solution, had a germicidal effect against various bacteria (*S. Aureus*, *Klebsiella Pneumoniae*, *Pseudomonas Aeruginosa*, *Clostridium perfringens*, *E.coli*) and *Candida albicans*. It also shows activity against clinically relevant fungi including fluconazole-resistant strains.^[6] Eugenol isolated from clove buds showed antiviral activity against Herpes Simplex virus at a concentration of 10 µg /ml. Clove is also effective in reducing fungal infections such as athlete's foot.^[6,10]

Essential oil which is the major constituent of clove interacts with the cell wall and membrane there by causing destruction leading to the loss of vital intracellular materials, which finally result in the bacterial death. The essential oil also penetrates the cytoplasmic membrane and enters inside the cell after the destruction of cell structure, there by inhibiting the normal synthesis of DNA and proteins that are required for bacterial growth.^[9]

Antioxidant Activity

Clove and Eugenol possess strong antioxidant activity, which is comparable to the activities of the synthetic antioxidant, BHA (butylated hydroxyl anisole) and Pyrogallol. Clove has the highest capacity to give off hydrogen and reduce lipid peroxidation. It also showed a significant inhibitory effect against hydroxyl radicals and act as an iron chelator.^[6] The antioxidant activity of clove bud extract and its major aroma components, eugenol and eugenol acetate were comparable to that of the natural antioxidant α -tocopherol.^[11] Eugenol inhibited 5-lipoxygenase activity and leukotriene C-4 in human PMNL cells.^[12]

Anti-inflammatory

Eugenol, the primary component of clove's volatile oils, variety of flavonoids, including kaempferol,

rhamnetin and β -caryophyllene contributes to clove's anti-inflammatory properties.^[6]

Applications of Clove in Dentistry

Clove oil has been used for pain relief. Holding a clove seed in the mouth next to an aching tooth is an age-old home remedy. The mechanism of action for pain relief appears to be linked to the activation of calcium and chloride channels in ganglion cells. It also inhibits the prostaglandin synthesis, cyclooxygenase, and lipoxygenase, which are all known to increase pain perception.^[7]

Rahim et al. conducted a study to compare the efficacy of crude aqueous and solvent extracts of clove on the caries inducing properties of *Streptococcus mutans*. The cariogenic properties investigated included cell-adhesion, cell surface hydrophobicity and glucan synthesis activity of *S. mutans*. They concluded that both the extracts exert inhibitory effects on the cariogenic properties of *S. mutans*.^[13]

Side-Effects of Clove^[10]

- Clove oil is very powerful oil and at times has unpleasant taste.
- If large quantities are accidentally ingested, it may cause irritation to the skin of some individuals and can easily irritate the mucus membranes.
- If it is used directly as clove oil, the concentration should be below 1%.
- It should be avoided during pregnancy.

TURMERIC



Figure 2: Turmeric

Turmeric - Known as the 'Golden Spice of India'. India is the world largest producer and consumer of turmeric powder. It is used in holy ritual and used to make kumkuma, a red cosmetic powder.^[14]

Table 3: Scientific Aspects of Turmeric.^[7]

Botanical name	Curcuma longa
Family	Zingiberaceae
Other names	Haldi, Manjal, Anestha, Bahula, Kashpa
Active components	Curcuminoids, Cyclocurcuminoids, Tumerones Essential oils
Part used	Rhizomes

Table 4: Nutritional values of turmeric.^[8]

Energy	354Kcal
Carbohydrates	64.9g
Protein	7.83g
Fat	9.88g
Cholesterol	0 mg
Dietary Fibre	21g
Sugar	3.21g

Therapeutic uses of turmeric

Antimicrobial activity

Turmeric has been shown to inhibit the growth of a variety of bacteria, pathogenic fungi, and parasites. It has also been found to have moderate activity against *Plasmodium falciparum* and *Leishmania major* organisms.^[14] The aqueous extract of turmeric rhizomes has antibacterial effects. Turmeric also prevents growth of *Helicobacter pylori* strains. Both Turmeric and the oil fraction suppress growth of several bacteria like *Streptococcus*, *Staphylococcus*, *Lactobacillus*. Curcumin has been shown to have antiviral activity as it acts as an efficient inhibitor of Epstein-Barr virus (EBV), and also shows anti-HIV

(human immunodeficiency virus) activity by inhibiting the HIV-1 integrase needed for viral replication. It also inhibits UV light induced HIV gene expression. Oil of turmeric also possesses antifungal activity.^[16]

Antioxidant activity

Turmeric has been shown to be a powerful scavenger of oxygen free radicals. Its anti-oxidant activity is comparable to Vitamin C and E. It can protect lipids or hemoglobin from oxidation. It can significantly inhibit the generation of reactive oxygen species (ROS) such as H₂O₂, superoxide anions and nitrite radical generation by activated macrophages.^[15]

Anti-inflammatory effect

Turmeric has potent anti-inflammatory properties and acts by down-regulating the activity of cyclooxygenase-2 (COX-2), lipoxygenase, and inducible nitric oxide synthase (iNOS) enzymes. It inhibits the production of the inflammatory cytokines tumor necrosis factor-alpha (TNF- α), interleukin (IL) 1, 2, 6, 8, and 12 and hence can be beneficial in Arthritis.^[15,16,17]

Skin Treatments

Turmeric has lots of benefits for the skin including speeding up the process of healing wounds, calming pores on the face to reduce acne. Since it has antioxidant and anti-inflammatory properties, which is really useful for treating skin problems.^[16]

Dental applications of turmeric

As a Mouthrinse

- Rinsing the mouth with turmeric water (boil 5g of turmeric powder, two cloves, and two dried leaves of guauva in 200g water) gives instant relief. Massaging the aching teeth with roasted, ground turmeric eliminates pain and swelling. Turmeric mouthwash prepared by dissolving 10mg of curcumin extract in 100ml of distilled water and 0.005% of flavouring agent-peppermint oil with pH adjusted to 4 is found to be effective as an antiplaque agent.^[18]

As a Disclosing agent

- Dental plaque which are invisible to the naked eye are stained with plaque staining agents which

contains various dyes to determine their exact location. This dental plaque detection system includes a dental plaque staining agent containing at least one selected from yellow pigment of Beni-koji, turmeric extracts and curcumin; and a light emitting apparatus, which outputs light having a wavelength within a range of 250-500nm.^[7]

- Applying a paste made from 1 teaspoon of turmeric with ½ teaspoon of salt and ½ teaspoon of mustard oil provides relief from gingivitis and periodontitis.^[19]

In Precancerous Lesions

- It is used for the treatment of various precancerous lesions and conditions like Oral Submucous Fibrosis, Leukoplakia and Lichen Planus by reducing burning sensation and pain and also helps in reversal of trismus.^[19]

Anticariogenic

- Curcumin acts as an anti-cariogenic agent as it coats to hydroxyapatite crystals and inhibits the adherence of Streptococcus mutans.^[20]

As an Irrigant

- Curcumin inhibits E.Fecalis biofilm formation, showing that it can be used as an irrigant for root canal treatments.^[21]

CINNAMON



Figure 3 : Cinnamon

The name Cinnamon arises from Greek Kinnamomon, itself ultimately from Phoenician. It is a very commonly used spice in kitchen and is mainly present in India, Srilanka, Bangladesh and Nepal.^[3]

Table 5 : Scientific Aspects of Cinnamon^[7]

Botanical name	CinnamomumVernum
Family	Lauraceae
Other names	Dalchini, karuva, kurundu, Taj
Active components	Volatile oil, Fixed oil, Tannin, Resin, Proteins, Cellulose, Pentosans, Mucilage, Starch, Calcium Oxalate and mineral elements.

Therapeutic Uses

Antidiabetic activity

Cinnamon has been said to have an insulin mimetic and insulin sensitizing action. Cinnamon cassia plays a significant role in phosphorylation of signaling proteins and enhancement of expression of insulin sensitive glucose transporters which results in mitigation of the insulin resistance. Cinnamon, when taken in a dose of 120 mg/day to 6 g/day for approximately 4 months leads to a statistical decrease in levels of fasting plasma glucose along with an improvement in the lipid profile.^[22]

Antimicrobial activity

Cinnamon oil is effective against oral bacterial pathogens such as Streptococcus mutans, S. mitis, S. salivarius, Aggregatibacter, Actinomyces, Porphyromonas gingivalis and Fusobacterium nucleatum. Antibacterial activity is due to the presence of some phytochemicals and cinnamaldehyde in the extracts.^[23]

Antioxidant property

The antioxidant property is due to the eugenol component which inhibited peroxynitrite-induced nitration and lipid peroxidation. The oil is said to form a phosphomolybdenum complex which is responsible for its antioxidant activity.^[22]

Anti-inflammatory effect

Cinnamon water extract possesses anti-inflammatory effect by decreasing the levels of tumor necrosis factor α and Interleukin 6.^[22]

Uses of Cinnamon in Orofacial conditions

Cinnamon as an antimicrobial agent can be used in the treatment of angular cheilitis, parotitis, stomatitis, cellulitis, endodontic infections, periodontitis, peri-implantitis, oral thrush, candidal leukoplakia, chronic granulomatous sinusitis, cutaneous aspergillosis, wound infection, and osteomyelitis by inhibiting wide range of microorganisms. Cinnamon due to its anti-inflammatory potential can be used in the management of inflammation mediated neurological diseases such as postherpetic neuralgia. It also plays a beneficial role in the management of autoimmune diseases such as pemphigus, oral lichen planus, recurrent aphthous stomatitis, and lupus erythematosus due to its immunomodulatory activity. Cinnamon also can prevent oral cancer because of its ability to prevent angiogenesis.^[24]

Gupta et al. conducted a study to compare the effect of cinnamon extract, chlorhexidine mouthwash and placebo on dental plaque level and gingivitis. They concluded that cinnamon proved to be an effective mouthwash because of its ability to reduce plaque level and gingivitis.^[25]

Ghada Al-Duboni et al. conducted a study to evaluate the antimicrobial activity of different concentrations of aqueous extracts of cinnamon and ginger on Mutans streptococcus and lactobacilli. They concluded that Cinnamon and ginger have excellent antimicrobial activity on the growth of Mutans streptococci and lactobacilli, but their effects are more on lactobacilli than mutans streptococci. Cinnamon should be prescribed prior to ginger because it has more antibacterial activity on the growth on both bacteria types even in small concentrations (50mg/ml).^[26]

Cinnamon has been used as a flavor in sweets and chewing gum due to the pleasant and refreshing effect that develops in the mouth.^[19]

BLACK PEPPER**Figure 4: Black pepper**

Black pepper (*Piper nigrum*), an Indian native spice, has been widely used in human diet for several thousands of years. It is valued for its characteristic sharp and stinging qualities attributed to the alkaloid piperine. While it is used primarily as a food adjunct, black pepper is also used as a food preservative and as an essential component in traditional medicines in India and China.^[27]

Table 6: Scientific aspects of Black Pepper.^[7]

Botanical name	Piper Nigrum
Family	Piperaceae
Other names	Maricha, KuruMulagu, Kari Menasu
Active components	Volatile oils, piperine, pinenes, d-limonene, caryophylline

Therapeutic uses of Black Pepper**Application of pepper in respiratory diseases**

Long pepper have been used in the treatment of Asthma and Chronic Bronchitis.

Dahanukar et al. conducted a study to evaluate the efficacy of pepper in childhood asthma. 20 pediatric patients with Asthma received long pepper in doses ranging from 9.35 to 15.75g daily for several weeks and they concluded that this treatment showed clinical improvement.^[28]

Antimicrobial activity

SK Shivarani et al. conducted a study to evaluate the antimicrobial activity of pepper against *Staphylococcus Aureus*, *Bacillus subtilis*,

Pseudomonas Aeruginosa, *E.Coli*, *Alternaria alternate*, *Aspergillus Niger*, *Aspergillus Flavous* and *Fusarium Oxysporum* and they concluded that piperine showed antimicrobial activity against all tested bacteria. Maximum activity against *Staphylococcus* and minimum against *E. Coli*.^[29]

Antipyretic activity

Pepper and pepper containing preparations are used for the treatment of intermittent fever (malarial fever) neuritis, cold, pains and diseases of throat.^[30]

Applications of Black Pepper in Dentistry

For treatment of oral abscesses, tooth decay and tooth aches.^[7]

Jaya Shankar S et al. conducted a randomized double blind placebo controlled study on the effects of a herbal toothpaste on gingival bleeding, oral hygiene and microbial values ; and they concluded that brushing with a herbal toothpaste with *piper nigrum*, one the major components for the period of 12 weeks showed a significant reduction in gingival bleeding, salivary anaerobic bacterial count and overall improvement in oral hygiene.^[31]

Sweta VR et al. conducted a study to evaluate invitro antibacterial activity of clove and pepper on *Streptococcus mutans* using disc diffusion technique and they concluded that the two extracts have got antibacterial activity against *Streptococcus mutans*. Clove extract was more effective against *S. mutans* than pepper extract.^[32]

CORIANDER**Figure 5: Coriander seed**

Table 7: Scientific aspects of Coriander.^[33]

Botanical name	Coriandrum sativum
Family	Umbelliferae/Apiaceae
Other names	cilantro, cilantro, Chinese parsley, Mexican parsley, Arab parsley, Dhania and Yuen sai
Active components	Linalool (58.0–80.3%), g-terpinene (0.3%–11.2%), a-pinene (0.2%–10.9%), p-cymene (0.1%–8.1%), camphor (3.0%–5.1%) and geranyl acetate (0.2%–5.4%)

Therapeutic uses of Coriander

Antimicrobial activity

V. Ratha bai et al. conducted a study to investigate the antimicrobial activity of Ethanol, Methanol, Acetone, Chloroform, Hexane and Petroleum ether extract of *Coriandrum sativum* against infectious disease causing bacterial pathogens such as such as E.Coli, *Pseudomonas aeruginosa*, *Staphylococcus aureus* and *Klebsiella Pneumonia* fungus like *Aspergillus niger*, *Candida albicans*, *Candida kefir* and *Candida tropicalis* using the Agar Well diffusion method. They concluded that both in bacteria and fungi, methanol extract showed a varying degree of inhibition to the growth of tested organism than Ethanol, Acetone, Chloroform, Hexane and Petroleum ether. The results confirmed that presence of antibacterial and antifungal activity in the sundried extract of *Coriandrum sativum* against the human pathogenic organisms. The Methanolic extract of sun dried *Coriandrum sativum* showed better activity against the most tested organisms.^[34]

Antioxidant activity

The *C. sativum* fresh leaf juice contains flavonoids (a major class of phenolic compounds with lower redox potential) have high antioxidant activities by its ability to scavenge hydroxyl- and superoxide-radicals, high reducing power, and protection against biological macromolecular oxidative damage and by increasing the level of glutathione.^[33]

Anti-inflammatory activity^[35]

Neha mohan et al. conducted a study to evaluate the anti-inflammatory potency of coriander oil in the ultraviolet (UV) erythema test in vivo. The effect of the test substances on the UV-induced erythema was measured photometrically after 48 hours. Additionally, the skin tolerance of the test preparations was assessed on non irradiated skin. They concluded that compared to placebo, the lipolotion with 0.5% coriander oil significantly reduced the UV induced erythema.^[35]

Application in Dentistry

Citronellol a component of essential oil in coriander is an excellent antiseptic. Additionally, other components have antimicrobial and healing effects which keep wounds and ulcers in the mouth from worsening. They help speed up the healing process of ulcers and also prevent bad breath .

The essential oils from *C. sativum* have been proven to have a strong antifungal effect against candida species.^[19]

BLACK CUMIN

**Figure 6: Black cumin****Table 8: Scientific aspects of black cumin**^[36]

Botanical name	<i>Nigella sativa</i> (N. sativa)
Family	Ranunculaceae
Other names	Black seed, Black cumin

Active components	Thymoquinone , Thymohydroquinone, Dithymoquinone, p-cymene, carvacrol, 4-terpineol, t-anethol, sesquiterpene longifolene α -pinene and thymol.
--------------------------	---

Therapeutic uses of Black Cumin

Antimicrobial activity

Hanafy et al. conducted a study to evaluate the antimicrobial activity of *Nigella sativa* against gram positive and gram negative bacteria and they concluded that microgram concentrations of the ether extract of *Nigella sativa* seeds inhibited growth of several species of pathogenic bacteria representing Grampositive bacteria (*Staphylococcus aureus*), Gramnegative bacteria (*Escherichia coli* and *Pseudomonas aeruginosa*) and a pathogenic yeast (*Candida albicans*). *Salmonella typhimurium* was non-sensitive to the range of concentrations of the extract used in this study (25400 μ g/disc). And the antibacterial action of the extract may be more pronounced on Grampositive than on Gram-negative bacteria.^[37]

Antioxidant activity

M. Burits et al. conducted a study to evaluate the antioxidant property of *Nigella sativum*. The essential oil of black cumin seeds was tested for a possible antioxidant activity. The results showed that thymoquinone and the components carvacrol, t-anethole and 4-terpineol demonstrated respectable radical scavenging property. These four constituents and the essential oil possessed variable antioxidant activity when tested in the diphenylpicrylhydrazyl assay for non-specific hydrogen atom or electron donating activity. They were also effective OH radical scavenging agents in the assay for non-enzymatic lipid peroxidation in liposomes and the deoxyribose degradation assay.^[38]

Anti-inflammatory activity

Lusi Putri Dwita et al. conducted a study to determine the anti-inflammatory activity of *Nigella sativa* oil in a simple balm stick by topical application. The results showed that balm sticks which contained 10% *Nigella*

sativa could overcome both acute and sub-acute inflammation showing by high oedema inhibition (60.64%), low leucocytes count (43.55% lower than control) as well as a notable TNF- α concentration (50% lower than control) on the inflamed area. They concluded that topical application of a *Nigella sativa* balm stick was effective for both acute and sub-acute forms of inflammation.^[39]

Applications in Dentistry

In dental caries

Abd-Awn et al. conducted a study to assess the effect of the black seed oil extract on sensitivity of mutans streptococci and the adherence to tooth surface in comparison to chlorhexidine gluconate in vitro. Four different concentrations of black seed oil extract (1%, 5%, 10%, and 20%) were prepared using ethanol as a solvent for the evaluation of the antimicrobial activity of the black seed oil extract against mutans streptococci isolated from saliva of volunteers and compared with 0.2% chlorhexidine gluconate using agar diffusion test, followed by determination of the Minimum Bactericidal Concentration (MBC) of the black seed oil extract. The study showed inhibition zones for black seed oil extract which were found to be increased as the concentration of the extract increased. They concluded that the black seed oil extract has a bactericidal effect against mutans streptococci at a concentration of 10% and inhibits the adherence of these microorganisms to tooth surface.^[40]

As a pulpotomy agent

Omar et al conducted a split mouth study to investigate histopathologically the pulp response to *Nigella Sativa* oil and Formocresol in dogs. Four weeks after treatment the animals were sacrificed, paraffin sections were prepared for histological, histochemical and immuno-histochemical staining. Results showed that specimens in the NS group showed mild to moderate vasodilatation. Few specimens showed scattered inflammatory cell infiltration and the odontoblastic layer was continuous. While the FC group showed moderate to severe vasodilatation with high inflammatory cell infiltrate and degenerative

changes. They Concluded that NS possesses an anti-inflammatory effect and the pulp maintains its vitality after its application, which could qualify its use as a pulp medicament for pulpotomized teeth in clinical practice.^[41]

In periodontal diseases

Al-Bayaty et al. performed a study to develop a biodegradable periodontal chip containing thymoquinone and to evaluate its effectiveness for managing chronic periodontitis. Chips were formulated from thymoquinone and chitosan. All patients were treated with full-mouth scaling and root planning after which they were divided into three groups. Group one served as the control group, while group two received plain chitosan chips. Group three received chips containing thymoquinone. Plaque index, bleeding upon probing, periodontal probing pocket depths, and clinical attachment levels were recorded at days 0 and 60. The results indicated significant improvement in plaque index and bleeding upon probing and a reduction in periodontal pockets. clinical attachment levels were improved in the group receiving thymoquinone chips compared to other groups. They concluded that Periodontal chips containing thymoquinone can be used as adjuncts for the treatment of patients with chronic periodontitis.^[42]

Allergic response to Spices

Spices, as they are derived from plants though exhibit many therapeutic uses, they harbour allergenic potency and can induce symptoms ranging from mild local to severe systemic reactions.^[43] Due to the presence of pharmacologically active substances, they may manifest IgE (Urticaria, Angioedema, Rhinorrhea, Conjunctivitis, Wheezing Anaphylaxis) and Non-IgE mediated (Irritant contact dermatitis, Perioral dermatitis, Stomatitis, Allergic contact dermatitis, Systemic allergic contact dermatitis) immune reactions.^[44]

Table 9: Allergic response to spices.^[43,44]

Spice	Allergic Response
Clove	Contact dermatitis

Turmeric	Contact dermatitis, Asthma
Cinnamon	Respiratory symptoms, Rhinoconjunctivitis, Contact dermatitis, Stomatitis, Delayed type allergy
Black pepper	Respiratory symptoms, Contact dermatitis
Coriander	Asthma, Contact allergy, Anaphylaxis
Black cumin	Anaphylaxis, Contact dermatitis

CONCLUSION

Spices are not only of culinary importance but also have medicinal properties and are used in treatment of various diseases. The active components of these spices impart anti-microbial, anti-inflammatory, anti-oxidant, anti-cariogenic and anti-cancerous properties. They are rarely suspected as trigger for allergic reactions. Further research and knowledge on this is warranted in development of oral health care products using spices.

REFERENCES

1. Kshirsagar MM, Dodamani AS, Karibasappa GN, Vishwakarma PK, Vathar JB, Sonawane KR, Jadhav HC, Khobragade VR. Antibacterial activity of garlic extract on cariogenic bacteria: An in vitro study. *Ayu*. 2018 Jul;39(3):165.
2. Satheeshkumar N, Vijayan RS, Lingesh A, Santhikumar S, Vishnuvardhan C. Spices: Potential Therapeutics for Alzheimer's Disease. In *The Benefits of Natural Products for Neurodegenerative Diseases 2016* (pp. 57-78). Springer, Cham.
3. Sachan AK, Kumar S, Kumari K, Singh D. Medicinal uses of spices used in our traditional culture: Worldwide. *J Med Plants Studies*. 2018;6(3):116-22.
4. Dubey S. Indian Spices and their Medicinal Value. *Indian Journal of Pharmaceutical Education and Research*. 2017 Jul 1;51(3):S330-2.
5. Yuvaraj S, Antony S. An assessment of the erosive potential of commonly used Indian spices. *Drug Invention Today*. 2018 Sep 2;10.
6. Milind P, Deepa K. Clove: a champion spice. *Int J Res Ayurveda Pharm*. 2011 Jan;2(1):47-54.
7. Srinath J, Lakshmi T. Application of spices in dentistry-A literature review. *Int J Drug Develop Res*. 2014;6:1-9.

8. Katyal R, Prashar D. Nutritional aspects of four common spices used in dentistry. *International Journal Of Pharma Sciences and Research*. Jan 2015;(6).
9. Xu JG, Liu T, Hu QP, Cao XM. Chemical composition, antibacterial properties and mechanism of action of essential oil from clove buds against *Staphylococcus aureus*. *Molecules*. 2016;21(9):1194.
10. Bhowmik D, Kumar KS, Yadav A, Srivastava S, Paswan S, Dutta AS. Recent trends in Indian traditional herbs *Syzygium aromaticum* and its health benefits. *Journal of Pharmacognosy and Phytochemistry*. 2012;1(1):13-22.
11. Lee KG, Shibamoto T. Antioxidant property of aroma extract isolated from clove buds [*Syzygium aromaticum* (L.) Merr. et Perry]. *Food Chemistry*. 2001 Sep 1;74(4):443-8.
12. Raghavenra H, Diwakar BT, Lokesh BR, Naidu KA. Eugenol—the active principle from cloves inhibits 5-lipoxygenase activity and leukotriene-C4 in human PMNL cells. *Prostaglandins, Leukotrienes and Essential Fatty Acids*. 2006 Jan 1;74(1):23-7.
13. Rahim ZH, Khan HB. Comparative studies on the effect of crude aqueous (CA) and solvent (CM) extracts of clove on the cariogenic properties of *Streptococcus mutans*. *Journal of oral science*. 2006;48(3):117-23.
14. Yadav RP, Tarun G. Versatility of turmeric: A review the golden spice of life. *Journal of Pharmacognosy and Phytochemistry*. 2017;6(1):41-6.
15. Nasri H, Sahinfard N, Rafieian M, Rafieian S, Shirzad M, Rafieian-Kopaei M. Turmeric: A spice with multifunctional medicinal properties. *Journal of HerbMed Pharmacology*. 2014;3.
16. Verma RK, Kumari P, Maurya RK, Kumar V, Verma RB, Singh RK. Medicinal properties of turmeric (*Curcuma longa* L.): A review. *IJCS*. 2018;6(4):1354-7.
17. Grover HS, Deswal H, Bhardwaj A. Curcumin: A medicinal plant and its effects in medicine and dentistry. *International Journal of Contemporary Dental & Medical Reviews*. 2015;2015.
18. Sharma A, Ahlawat B, Sharma S. Turmeric-Its Applications in Dentistry. *J Adv Res Med*. 2016;3(1):27-30.
19. Sachdeva A, Sharma A, Bhateja S. Emerging Trends of Herbs and Spices in Dentistry. *Biomedical Journal*. 2018;2:5.
20. Lee KH, Kim BS, Keum KS, Yu HH, Kim YH, Chang BS, Ra JY, Moon HD, Seo BR, Choi NY, You YO. Essential oil of *Curcuma longa* inhibits *Streptococcus mutans* biofilm formation. *Journal of Food Science*. 2011 Nov;76(9):H226-30.
21. Neelakantan P, Subbarao C, Sharma S, Subbarao CV, Garcia-Godoy F, Gutmann JL. Effectiveness of curcumin against *Enterococcus faecalis* biofilm. *Acta Odontologica Scandinavica*. 2013 Nov 1;71(6):1453-7.
22. Kawatra P, Rajagopalan R. Cinnamon: Mystic powers of a minute ingredient. *Pharmacognosy research*. 2015 Jun;7(Suppl 1):S1.
23. Wisal GA. Antibacterial and Antifungal Effect of Cinnamon. *Microbiology Research Journal International*. 2018 May 10:1-8.
24. Femine CG, Joy ET, Kiran MS. Efficacy of cinnamon in the treatment of orofacial conditions.
25. Gupta D, Jain A. Effect of cinnamon extract and chlorhexidine gluconate (0.2%) on the clinical level of dental plaque and gingival health: A 4-week, triple-blind randomized controlled trial. *J Int Acad Periodontol*. 2015 Jul;17(3):91-8.
26. Al-Duboni G, Osman MT, Al-Naggar R. Antimicrobial activity of aqueous extracts of cinnamon and ginger on two oral pathogens causing dental caries. *Research Journal of Pharmaceutical, Biological and Chemical Sciences*. 2013 Jul;4(3):957-65.
27. Srinivasan K. Black pepper (*Piper nigrum*) and its bioactive compound, piperine. In *Molecular targets and therapeutic uses of spices: Modern uses for ancient medicine 2009* (pp. 25-64).
28. Majeed M, Prakash L. The medicinal uses of pepper. *International Pepper News*. 2000 Jan;25(1):23-31.
29. Rani SS, Saxena N, Udaysree N. Antimicrobial activity of black pepper (*Piper nigrum* L.). *Global J. Pharmacol*. 2013;7:87-90.
30. Meghwal M, Goswami TK. Nutritional constituent of black pepper as medicinal molecules: A review. *Open Access Scientific Reports*. 2012;1(1):1-7.
31. Jayashankar S, Panagoda GJ, Amaratunga EA, Perera K, Rajapakse PS. A randomised double-blind placebo-controlled study on the effects of a herbal toothpaste on gingival bleeding, oral hygiene and microbial variables. *Ceylon Medical Journal*. 2011 Mar 28;56(1).
32. Geetha RV. In vitro anti bacterial activity of clove and pepper on *Streptococcus mutans*. *Asian Journal of Pharmaceutical and Clinical Research*. 2015 Sep 1:269-70.
33. Mandal S, Mandal M. Coriander (*Coriandrum sativum* L.) essential oil: Chemistry and biological activity. *Asian Pacific Journal of Tropical Biomedicine*. 2015 Jun 1;5(6):421-8.
34. Ratha Bai V, Kanimozhi D. Evaluation of antimicrobial activity of *Coriandrum sativum*. *Int J Sci Res Rev*. 2012;1(3):1-0.
35. Neha Mohan PV, Suganthi V, Gowri S. Evaluation of anti-inflammatory activity in ethanolic extract of *Coriandrum sativum* L. using carrageenan induced paw oedema in albino rats. *Der Pharma Chemica*. 2013;5(2):139-43.
36. Ahmad A, Husain A, Mujeeb M, Khan SA, Najmi AK, Siddique NA, Damanhoury ZA, Anwar F. A review on therapeutic

- potential of *Nigella sativa*: A miracle herb. Asian Pacific journal of tropical biomedicine. 2013 May 1;3(5):337-52.
37. Hanafy MS, Hatem ME. Studies on the antimicrobial activity of *Nigella sativa* seed (black cumin). Journal of ethnopharmacology. 1991 Sep 1;34(2-3):275-8.
38. Burits M, Bucar F. Antioxidant activity of *Nigella sativa* essential oil. Phytotherapy research. 2000 Aug;14(5):323-8.
39. Dwita LP, Yati K, Gantini SN. The Anti-Inflammatory Activity of *Nigella sativa* Balm Sticks. Scientia Pharmaceutica. 2019 Mar;87(1):3.
40. Abd-Awn BH, Al-Dhaheer ZA, Al-Dafaai RR. The effect of black seed oil extracts on mutans streptococci in comparison to chlorhexidine gluconate (in vitro). Journal of baghdad college of dentistry. 2012;24(4):126-31.
41. Omar OM, Khattab NM, Khater DS. *Nigella sativa* oil as a pulp medicament for pulpotomized teeth: A histopathological evaluation. Journal of Clinical Pediatric Dentistry. 2012 Jul 1;36(4):335-41.
42. Al-Bayaty FH, Kamaruddin AA, Ismail MA, Abdulla MA. Formulation and evaluation of a new biodegradable periodontal chip containing thymoquinone in a chitosan base for the management of chronic periodontitis. Journal of Nanomaterials. 2013 Jan 1;2013:16.
43. Schöll I, Jensen-Jarolim E. Allergenic potency of spices: hot, medium hot, or very hot. International archives of allergy and immunology. 2004;135(3):247-61.
44. Chen JL, Bahna SL. Spice allergy. Annals of Allergy, Asthma & Immunology. 2011 Sep 1;107(3):191-9.

How to cite this article: Noora Beegum, Reshmi R., Nandan N., Sunil Raj N., Soundarya Vishwanathan. Spices - An imperative melange - back to the roots. J Ayurveda Integr Med Sci 2019;6:93-103.

Source of Support: Nil, **Conflict of Interest:** None declared.
