

## Incredible Role of Spices in Diet – An Indian Perspective

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### ABSTRACT

Traditional medicines involve the use of herbs and plant extracts for the treatment of diseases. Right from scriptures to the current literature, herbs have carved and retained their spot as health boosters. The rise of drug resistance to antibiotics has been acting as a catalyst in capturing the interest of scientists globally to develop new medical healing models using plant-based products. Also, owing to the diverse medicinal properties and economic value of plants, there has been an increment in research studies related to their uses as food supplements. Indian cuisines seasoned with spices are therapeutic foods, as they are the cheapest source of bioactive phytochemicals essential for nutrition. Spices possess antimicrobial and antioxidant properties that have proven health benefits and can be exploited to even combat very serious ailments related to heart, lungs, stomach, skin, eyes etc. Phytonutrients present in spices are excellent therapeutic molecules and are essential for the very sustenance of healthy life. This review comprehends the multiple therapeutic potentials of spices of Bharat Ki Rasoi (Indian kitchen) in curing various health issues.

**Key words:** Traditional medicine, Spices, Aromatic, Seasoning, Therapeutic effects, *Bharat Ki Rasoi*

Indian culture documents the significance of plants in the system of medicine to meet the global health care needs since time immemorial. Such knowledge about plants compels us to look for ways to incorporate more plants and plant-based products in our diet and as medicine. These natural products have no side effects and most importantly, they work to remove the cause of the disease and not just the symptoms.

The present review article explores the research studies undertaken to exploit the benefits of spices by evaluating their healing and therapeutic properties. All the spices discussed in the literature till date have been proven to have excellent healing properties. However, none of the research studies were able to provide a plant-based healing strategy against the Coronavirus disease (COVID-19). An important point to note is that even though plant-based healing systems do not promise a curative method, they can be judiciously utilized to control the additional symptoms that come with the viral infections; especially in cases of patients with compromised immunity. Spices have been included in the diet not only for aroma but also for their underlying role in boosting the average human health and immunity. It has been reported that, populations with higher consumption of spices show correspondingly lesser number of people affected by COVID-19 [1]. However, there are reports that spices can pose risk to human health due to the presence of chemical hazards such as plant toxins (aflatoxins), pesticides, heavy metals, dyes etc.

[2]. The manuscript provides general information about use of spices in the diet, using very authentic and well-published studies along with key mention of prevalent and popular home remedies.

#### *Spices from the Indian kitchen*

Today, the world is gravitating towards green economy and plant-based healing strategies and India has been practicing these potent healing systems from ages. Spices are truly an integral part of Indian cuisine. The importance that is given to spices in Indian cooking is unparalleled. Spices are extensively used in cooking, not just for enhancing visual and aromatic appeal, but because of their health benefits too. Home remedies employ a combination of herbs and spices, which may be used in a form of a paste, powder or even concoction. The most colourful and aromatic area in the Indian kitchen is undoubtedly the spice rack which plays an integral role in the Indian Cuisine. Well-labelled and colourful spice containers have been the authenticity of *Bharat Ki Rasoi* (Indian kitchen).

In the present review article uses of spices have been described into five groups:

#### *1. Spices commonly used for tempering in dishes and their medicinal properties*

##### *Chilli Pepper, Bay Leaf, Cumin, Mustard and Asafoetida*

Indian dishes can never be called complete without a tempering. It forms the base of almost all dishes in the Indian cuisine. The diverse combinations of tempering originate from different Indian states. Out of all the vast varieties of spices, there is a handful of them that are used more often than the others. Bioactive compounds present in spices are responsible

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for their extraordinary properties. The spices that find notable mention in this category are chilli pepper, bay leaf, cumin, mustard and asafoetida (Fig 1).

**Chilli pepper** (*Capsicum annum*) belongs to *Solanaceae*. The bioactive compounds of chili pepper, capsaicin and capsaicinoids play a crucial role in plant defence by acting as repellent against animals and pests that may otherwise damage plants [3]. In North India cumin, chilli pepper and asafoetida are used as a base in cuisines, while in South India flavourful bay leaves, curry leaves and mustard seeds are preferred.

**Bay leaf** (*Laurus nobilis*) belongs to *Lauraceae*. All Indian curries, dals, and even the basic pulao can be elevated to royalty in terms of taste, just with the addition of a few bay leaves. The trees species of *Lauraceae* are cultivated in warmer regions of the world and in Mediterranean [4]. In the traditional Indian household, the use of bay leaves in cooking and food preservation is customary. Besides their use in cooking, bay leaves are also used as insect repellents for food preservation in traditional storage at home. Bay leaf is known to have tannins, flavonoids, alkaloids, eugenol, methyl chavicol, anthocyanins etc. as its constituents make it a great wound healer, analgesic, antibacterial and antiviral agent [5]. The antibacterial activity of bay leaf, was tested using Zinc Oxide Nanoparticles and it was found that the activity was greater against the Gram-positive bacteria (*Staphylococcus aureus*) as compared to Gram-negative bacteria (*Pseudomonas aeruginosa*). The essential oil of bay leaf showed high efficacy against twenty-two strains of bacteria tested, among them highest sensitivity was seen in the species of *Enterobacter* [6].

**Cumin** (*Cuminum cyminum*) belongs to *Apiaceae* has been used as an antiseptic and a disinfectant for a long time. Oil extracted from cumin i.e., Cumin Essential Oil (CEO), has various constituents like-cymene, terpenoids and cumin aldehyde that make it a good candidate for research use in plant-based medicine [7]. [8] demonstrated that antibacterial activity of cumin in Gram-positive and Gram-negative bacteria. Their results revealed that the cumin extract caused cellular destruction to both the types of pathogens.

**Mustard** (*Brassica juncea*) belongs to *Brassicaceae*. Its oil is often the most common oil of choice in Indian cooking. The oil is relatively healthier than the commercially available refined oils. The oil is much valued due to the presence of various phytonutrients viz. phenolic compounds, flavonoids, sterols, glycosides, and triterpene alcohols, carbohydrates and proteins. The oil has unique odour because of which, it is used as a mosquito repellent. The intake of mustard seeds and curry leaves reduces cholesterol levels and prevents colon tumorigenesis possibly by absorbing carcinogens in the intestinal lumen [9].

**Asafoetida** (*Ferula asafoetida*) popularly called as ‘Hing’, belongs to *Apiaceae*. The gum (commercial product) derived from the roots of the *Ferula* species is often used in dried and powdered forms. It owes its properties to various bio-active compounds viz. resin, gum, volatile oil and ash. It has been reported that the polar extracts of asafoetida possessed broad range of antibacterial activity compared to non-polar extracts [10]. Interestingly, asafoetida finds a place in ‘Dadi ke nuskhe’ or the home remedies that we are introduced to by our grandmothers who often described Hing to be of great use in treating indigestion.

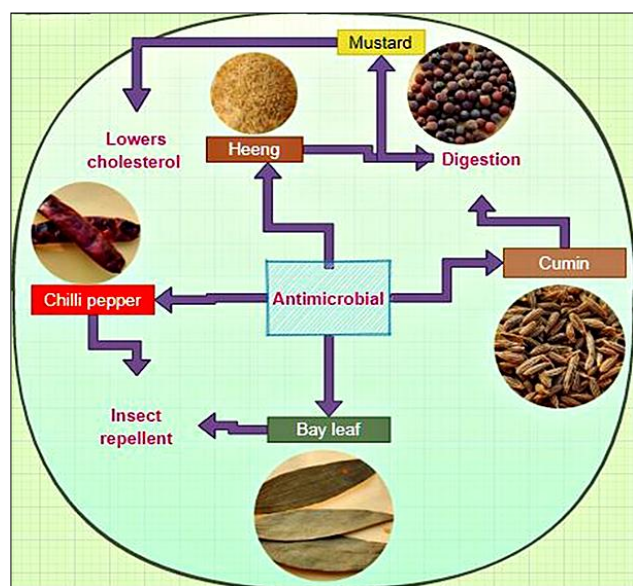


Fig 1 Spices commonly used in food and medicines

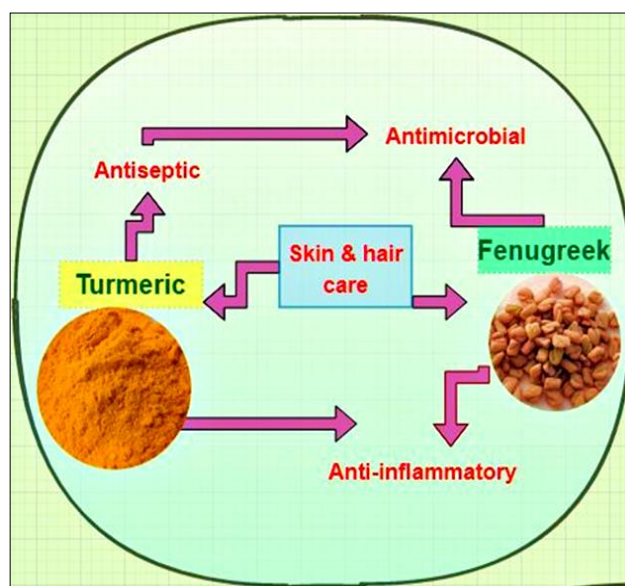


Fig 2 Spices with antiseptic and antimicrobial properties

## 2. Spices of cosmetic importance with antiseptic and antimicrobial properties

### Fenugreek and Turmeric

Fenugreek and turmeric are inarguably two of the most popular spices used in herbal cosmetics. Although both the spices popular for their beneficial properties, but turmeric is highly valued spice in Indian culture owing to its excellent antiseptic properties (Fig 2).

**Fenugreek** (*Trigonella foenum-graecum*) belongs to *Fabaceae*. It is a very well-known spice for its antimicrobial properties due to the presence of numerous secondary

metabolites like tannins, alkaloids, flavonoids, terpenoids and glycosides. The seeds and leaves are edible and are consumed as fresh and dried forms. Dried fenugreek seeds are known for their anticancer, antibacterial and anti-inflammatory activities. A research investigation was carried out to determine the antimicrobial action of ethanol extract of fenugreek seeds which exhibited a significant effect on *Staphylococcus aureus* and *Pseudomonas aeruginosa*. This study has established the importance of utilizing fenugreek seeds as a potential source for extracting antibacterial compounds for treatment against a variety of pathogenic bacterial strains. An important finding is that the fenugreek seed extract also displayed anticancer

activity by inhibiting the proliferation of about more than half of the human breast cancer MCF-7 cell lines [11]. Other health benefits of the use of fenugreek include reduce body pain and fat, control fever improve appetite and safeguard against cancer, malaria, allergies, bacterial and viral diseases [12]. It is also used in a variety of ways in cooking to enhance flavour. Indian women are known for their long, lustrous hair all over the world and many of them follow a hair care routine involving the use of fenugreek seeds.

**Turmeric** (*Curcuma longa*) belongs to *Zingiberaceae*. In India turmeric has been used customarily, not only for antiseptic, anti-inflammatory, antifungal, and analgesic purposes but also to treat ailments like skin infection, cancer, liver disorder etc. [13] have proven in their research the analgesic and anti-inflammatory effects of turmeric. It is a well-known home remedy in Indian households to use turmeric powder and milk in a variety of combinations to lighten skin scars and reduce any type of skin irritation. It is used in powdered form to treat wounds, bruises, inflamed joints and sprains [14]. It is also useful in treating menstrual and abdominal problems as it is reported to help in purification of blood when used with other plant products [15].

### 3. Spices with potential to cure gastrointestinal problems and other beneficial effects

#### Ajwain and Kalonji

Spices like Ajwain (*Trachyspermum ammi*) and kalonji (*Nigella sativa*) are sometimes added to the dough of Indian breads (rotis and paranthas) to make the food a bit lighter and easier to digest. They are two very versatile spices used for flavouring and garnishing. Ajwain seeds have a typical aroma and a spicy mouthfeel which make them useful not only in curries and stuffing, but also in biscuits consumed commercially. The small, triangular black kalonji seeds are

often confused with onion seeds, but are different in respect to their characteristic taste and exceptional therapeutic properties (Fig 3).

**Ajwain** (*Trachyspermum ammi*) belongs to *Apiaceae* is a well-known seed spice. It has been reported to be used for various pharmacological and therapeutic properties due to the presence of predominantly thymol and many secondary metabolites. Ajwain seeds and its extracts have been used to cure several gastrointestinal disorders like flatulence, diarrhoea, abdominal pain, piles, lack of appetite, etc. [16]. The proven antibacterial activity of Ajwain supports its use as traditional medicine [17]. The solvents used for the extraction of Ajwain play an important key role in controlling the growth of various pathogens. The extract of Ajwain made with alcohol inhibited the growth of *Aedes aegypti* while as the ethanol-acetone extract was found to be effective against *Pseudomonas aeruginosa* and *Escherichia coli* [18].

**Kalonji** (*Nigella sativa*) belongs to *Ranunculaceae*, is well known for the use of its seeds and oil in controlling antimicrobial activities as they prevent the growth of *Streptococcus mutans* and thus, dental caries. It is also used in the treatment of diarrhoea, indigestion, sour belching and removing bad breath [19]. [20] have reported the use of *Nigella sativa* in controlling a wide spectrum of human disorders due to the presence of bio-active component thymoquinone. They have also suggested the use *Nigella* species for protection against natural and chemical toxins. The wide-spread use of *Nigella sativa* as herbal drug is mainly due to the presence of a secondary metabolite-thymoquinone [21].

Pandemics often result in stress and anxiety and this makes the public more vulnerable to myths and rumours. Fake claims and myths have been stated regarding the use of *Nigella sativa* to cure and potentially prevent further spread of COVID-19 due to the presence of hydroxychloroquine. The use of Kalonji as an alternative for the treatment of the COVID-19 disease can be explored only after substantiating and analyzing its full therapeutic efficacy.

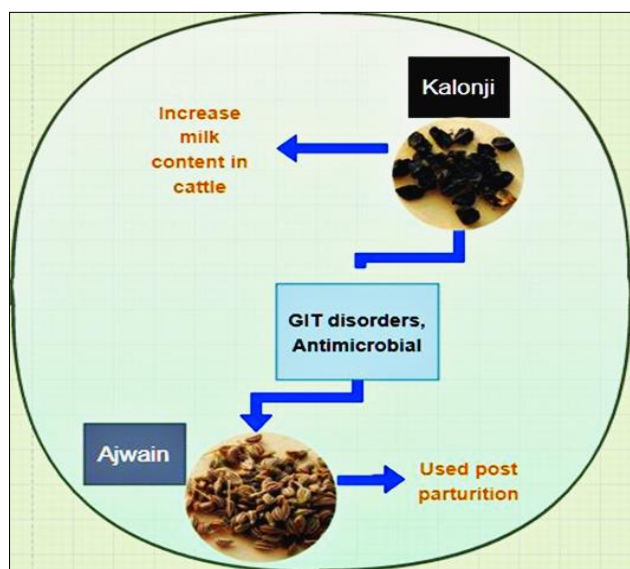


Fig 3 Spices to cure gastrointestinal tract (GIT) problems

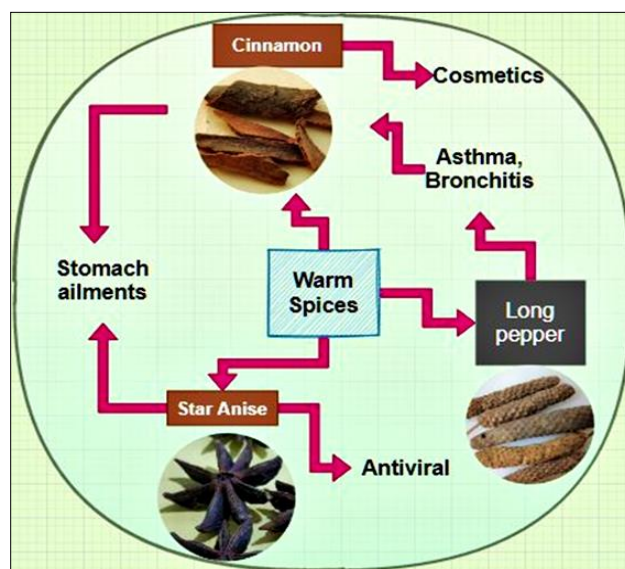


Fig 4 Spices with antioxidant and antiviral properties

### 4. Flavouring spices with warm effects, antioxidant and antiviral properties

#### Cinnamon, Long Pepper and Star Anise

A few spices like cinnamon (*Cinnamomum cassia*), long pepper (*Piper longum*) and star anise (*Illicium verum*) are

used as additional spices with all other basic spices in order to add royal aroma and exquisite taste to the food. These spices are often referred to as warm spices, i.e., they have a warming effect on our body upon consumption. They are mostly utilized for their strong flavours. Hence, these spices provide a lot of aroma even when small quantities are used (Fig 4).



**Cinnamon-** It belongs to *Lauraceae* and finds use in traditional medicine to treat issues related to blood circulation and inflammation. The buds of cinnamon (Cassia buds) are widely used as a flavouring agent in the food industry [22]. It is often added along with bay leaves before boiling or steaming vegetables to infuse them with sweet-spicy flavours. Its extracts are known to contain diverse active components and among them cinnamic aldehyde has shown the potential as an anti-inflammatory agent and therefore, cinnamon can be used as a natural resource for health benefits [23]. The bark of this plant and its powder is used to make tea which has a natural sweetness and is consumed during cough and cold. The aromatic cinnamon trees are widely grown in several parts of the world, including China, India, Vietnam, Indonesia and other countries [24]. Eugenol, an important constituent of cinnamon, shows effects ranging from antiseptic and analgesic to cytotoxic effects. It is also used in ailments like influenza, cough, bronchitis, and in stomach complaints related to cold and chills [25]. The essential oil of cinnamon and its bioactive constituents possess antibacterial and antifungal properties that can be effectively utilized in medicine to prevent disorders that are affecting human health worldwide. Also reported the remarkable effectiveness of cinnamon oil against various species of *Streptococcus* and other bacterial species except *Salmonella para typhi* B. [26] demonstrated that *Cinnamomum cassia* was able to prevent the infection of the airway epithelia caused by Human Respiratory Syncytial Virus (HRSV). Based on their research findings, they proposed cinnamon as a potential candidate for the management of this viral disease.

**Long pepper** (*Piper longum*) belongs to *Piperaceae*, has been used in conventional healing for several ailments since ages [27]. A mixture of Long pepper along with other spices has been shown to possess hepatoprotective and antioxidant properties [28]. Traditionally also Long pepper has been used in combination with a variety of similar spices and herbs to treat sore throat, cough, cold and bronchitis. The pungent and laxative ripe fruit of Long pepper may be used for the treatment of diarrhoea and dysentery [29]. Long pepper is well known for its anti-asthmatic, anti-spasmodic activity and has also been used for treating allergic rhinitis [30].

**Star anise** (*Illicium verum*) belongs to *Schisandraceae*, is an ever-green tree. The oil obtained from this plant is used in cooking, cosmetic and pharmaceutical industries. Currently Star anise is attracting a lot of attention in research due to its use as a medicinal plant for the development of anti-flu drug. The extract obtained from its fruits contains shikimic acid which is used to manufacture an anti-viral drug- Oseltamivir - Tamiflu [31]. Based on various research findings, Star anise has been proposed as a promising plant for the synthesis of anti-viral drugs [32]. Besides, the antiviral activity, Star anise possesses excellent antifungal, anti-mycotoxigenic, antioxidant, and antidiarrheal properties [33]. Common home remedies with Star anise make use of its fruit in dried whole form or as a powder against common complaints of stomach ache, vomiting, insomnia, asthma and bronchitis [34].

##### 5. Common Spices having Diverse Medicinal Properties

###### *Coriander, Cardamom, Fennel, Oregano and Black Pepper*

The spices like coriander, cardamom, fennel, oregano and black pepper (Fig 5) are used in our daily routine cooking for their very unique flavour. While most of these have been in use in our kitchens for a long time now, oregano is a rather new entry that found its way into Indian kitchens through the

fast-food consumed mostly by younger generation and, in the process, more people have become well accustomed to its taste. Its leaves are mostly dried and crushed before adding to a dish. The leaves are also infused with olive oil and added in salad dressing.

**Coriander** (*Coriandrum sativum*) from *Apiaceae* family is referred to both as herb and spice. The leaves are used for garnishing whereas the small, oblong brown seeds are used as spice. It has been reported that coriander seeds can be used as a sedative, as the seeds depress the Central Nervous System [35]. Each part of the coriander plant is edible, but they have varied fragrance and uses. The plant is known to possess antibacterial, antidiabetic, anticancer and antimutagenic effects. Food industry suffers due to the formation of biofilms on the uncleaned surfaces, which are hard to remove by any physical or chemical means. Coriander Essential Oil (CEO) doesn't allow the formation of biofilms, thus preventing huge losses to food industry [36].

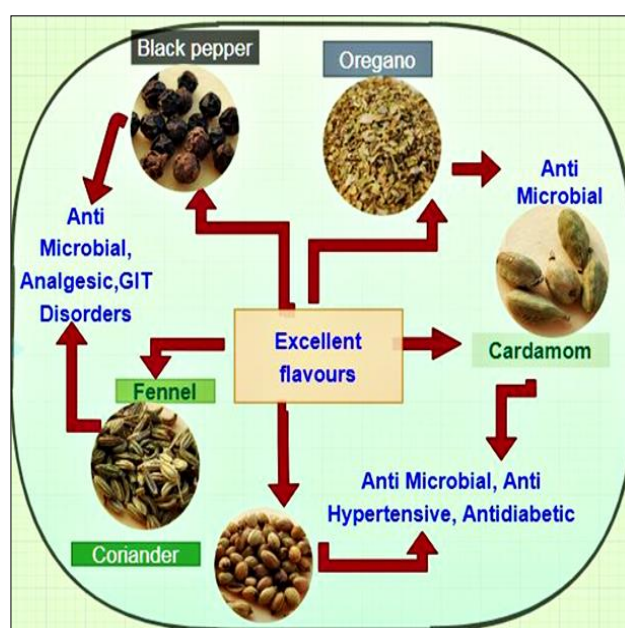


Fig 5 Spices with diverse medicinal properties

**Cardamon** (*Elettaria cardamomum*) and (*Amomum subulatum*) popularly known as Chhoti elaichi and Badi elaichi respectively belong to *Zingiberaceae* family. *Elettaria cardamomum* is commonly referred to as the 'Queen of Spices' is a popular spice of choice in typical Indian food and is a key ingredient in sweet and savoury dishes. Their fruits are used as spice and for various medicinal properties both conventionally and commercially. The fruits of Cardamom are trilocular containing several aromatic seeds. Dental caries is a major concern from childhood to old-age. The antimicrobial effects of *Amomum subulatum* and *Elettaria cardamomum* on dental caries have been reported in a study by [37]. The fruits are often used as mouth freshener and in treating constipation, anorexia, cough and cold. Traditionally *Elettaria cardamomum* has been used as an antidote to poison [38]. Research findings have shown the successful effects of using cardamom in controlling glycemia in diabetes patients [39]. Long- term administration of cardamom helps in lowering BP in patients with stage 1 hypertension. Studies conducted using cardamom over the years have shown successful antioxidant, antihypertensive, gastroprotective, antispasmodic, antibacterial, anti-platelet aggregation and anticancer properties in animal systems [40].

**Fennel** (*Foeniculum vulgare*) belongs to family *Apiaceae*, finds use as an anti-inflammatory, antimicrobial, antioxidant, analgesic, carminative, diuretic and antispasmodic agent in conventional medicine [41]. It has been found that oil extracted from fennel i.e., Fennel Essential Oil (FEO) caused varying degrees of damage in bacteria. The antibacterial activity of FEO was successfully investigated against many species of bacteria and it was reported to be most effective against *Shigella dysenteriae* [42]. The seeds of fennel are sugar-coated to make mouth fresheners, powdered to garnish sweets and crushed to improve the flavour of savoury items.

**Oregano** (*Origanum vulgare*) belongs to *Lamiaceae*. There are two components of Oregano Essential Oil (OEO) known for their anti-microbial properties- Carvacrol and Thymol. These compounds are extremely effective in controlling the growth of bacteria [43]. Carvacrol has a stronger effect against Gram positive than Gram negative bacteria as it damages the membrane [44]. Drugs made from these components were used to treat mouth infections and prevent gingivitis. The oil has also been used for massaging the joints and to treat nails infected with fungi. OEO is beneficial to health due to its antioxidant, anti-inflammatory, anti-diabetic activities [45].

**Black pepper** (*Piper nigrum*) belongs to *Piperaceae*. This spice is regarded as ‘The King of Spices’. It is a very popular spice of choice all over the globe. It is well known for its amazing digestive properties and is also believed to be beneficial for cough and throat allergies. It displays a myriad of digestive properties against conditions like diarrhoea, indigestion and certain intestinal toxins [46] owing to its

bioactive compounds like piperine and piperidine, essential oils, saponins, flavonoids, and starch [47].

## CONCLUSIONS

It is evident from the review article that spices have an incredible role in Indian diet since antiquity. They are believed to have a significant value in maintaining the overall equilibrium of the body. In addition, spices are potent aromatic agents exhibiting antiseptic, antibacterial, antiviral, antifungal, antioxidant, antipyretic, antispasmodic and antihypertensive properties. Spices offer an excellent alternative to modern synthetic drugs. The spice rack in *Bharat ki Rasoi* (Indian kitchen) is incredible pharmacy and is thus a very handy home remedy. Looking at the tremendous medicinal values of the spices, they can be used to boost-immunity not only to fight against COVID-19 but also other infectious diseases. However, further research studies are required to explore the full potential of herbs and spices in the field of health care system

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## Conflict of Interest

There is no conflict of interest among the authors.

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