

Effect of Spices on Bacteria – A Short Review

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Abstract:

Spices have been used for thousands of years to enhance the flavor, color and aroma of food; additionally, they are known for their preservative and medicinal value. Humans have been using spices on their foods as far back as 50,000 B.C. But, beyond adding flavor, these dried seeds, fruits, root or bark can also add years to your life. Spices can be used as medicine because they are natural products easily absorbed by our bodies and generally do not have any adverse effects. Herbal remedies are an important source for the discovery of new antibiotics and numerous studies have identified compounds within herbal plants that are effective antibiotics. This review outlines the antimicrobial activity of some spices used in the Indian kitchen for its flavour and taste. Spices are natural fighters against most of the bacterias.

Key Words: Spices, Antibacterial activity, Black pepper, Clove, Fenugreek

INTRODUCTION:

Spices have been defined as a plant substance that is derived from indigenous or exotic origin, aromatic with strong taste and which is used to enhance the taste of food¹. Humans have been using spices on their foods as far back as 50,000 B.C. But, beyond adding flavor, these dried seeds, fruits, root or bark can also add years to your life. In ancient India, natural herbs and spices were consumed either in food, or used as medicine in order to maintain proper sanitation, health and hygiene, and to increase longevity of life. In this respect, spices, such as clove (toothache, fever, pain), cinnamon (nervous problems, stomach/intestine infections), mustard, garlic (antiseptic, diuretic), ginger (digestive aid, cold), etc. have been reported to possess very good medicinal properties.² Apart from being a major part of the Indian culinary, spices also contribute to the modern allopathic system of healthcare by providing large number of medicines or parent compounds. Spices were used not only as flavouring agents, but also as food preservative. Certain spices prolong the shelf life of foods by preventing rancidity through their antioxidant property. Spices are rich in phytonutrients and other active ingredients that protect against disease and promote healing. In worldwide studies, spices have been linked to the prevention and treatment of chronic conditions such as heart disease, cancer, Type II diabetes, and Alzheimer's. Unlike pharmaceutical drugs, spices can be used long-term without concern for side effects.³

Each spices has a unique aroma and flavour. They are widely used for their antibacterial effect against various bacteria. The ultimate use of spice may lie in the protective effects of phytochemicals. The phenolic present in the spices play an important role in anti bacterial activity.⁴ Use of spices reduces or inhibits the growth of micro organisms before they produce any toxins. An interrelationship between the health-benefiting properties of spices and their use in food needs to be scientifically re-established.⁵ In the traditional Indian system of medicine *Ayurveda* and *Siddha* various spices and herbs are described to possess medicinal properties, such as being anti oxidant, antibacterial, antithrombotic, antiatherosclerotic, hypolipidemic, hypoglycemic, anti-

inflammatory, antiarthritic, etc.⁶. This review outlines the antibacterial effect of some spices used in the Indian kitchen for its flavour and taste.

PIPER NIGRUM (Black pepper)

Black pepper bears the royal pedigree, "King of Spices." In early times, it was more valuable than gold. Only the wealthy could afford it; dowries were endowed with it and many bribes for special favors were paid with it.

Piper nigrum, belong to family piperaceae is a monoecious, perennial climbing herb, native of Southern India and Srilanka, cultivated in tropical regions. It is a branched climbing vine, rooting at the nodes. Leaves simple, alternate, cordate, broadly ovate, 5-9 nerved, dark green. Flowers minute, in spikes of variable length. Fruits ovoid or globose, one seeded, bright red when ripe. Seeds globose, testa thin, perisperm hard and white. It is found in vast altitudinal diversity and shows great adaptability to a wide range of climatic and soil conditions which leads to interspecies diversity⁷.



India is a leading producer, consumer and exporter of black pepper in the world. Pepper gets its spicy heat mostly from the piperine compound, which is found both in the outer fruit and in the seed. Black pepper contains between 4.6% and 9.7% piperine by mass. The outer fruit layer, left on black pepper contains important odour-contributing terpenes including pinene, sabinene, limonene, caryophyllene, and linalool, which give citrusy, woody, and floral notes.⁸ Various pharmacological activities such as antimicrobial, analgesic, antipyretic, anti-inflammatory,⁹ anticonvulsant, CNS depressant, antimutagenic, antioxidant

and radical scavenging,¹⁰ antiinsecticidal, synergist, and antirheumatism have been reported. It is found to be helpful in reducing pain, chills, flu, colds, fever and muscular aches. The dried fruits act as a source of medicine for aphrodisiac, carminative, antiseptic, diuretic, galactagogic and emmenagogic. It has many physiological activities and therefore is of high commercial, economic and medicinal importance¹¹

Although, the primary purpose of spices is to impart flavour and piquancy to food, the medicinal, antimicrobial and antioxidant properties of spices have also been exploited.¹² Alkaloids play a significant role in plant physiology, agriculture, resistance, entomology, the diet and medicine. The spicy tang of pepper is due to the presence of piperamides which are the pungent bioactive alkaloids accumulate that in the skin and seeds of the fruit. Among them piperine is the major chemical constituent is responsible for the antimicrobial activity.¹³

SYZYGIUM AROMATIC

Syzygium aromaticum (Cloves) are the aromatic dried flower buds of a tree belonging to the family; *Myrtaceae*. They are native to Indonesian. Cloves are like small, round-headed nails, about 10-17,5mm long and blackish brown in color and consist of a long calyx, terminating in four spreading sepals, and four unopened petals which; form a small ball in the center.¹⁴ Cloves have high mineral content like manganese, calcium, potassium, magnesium and vitamins like C and K.

India is an leading cultivator of clove. Clove is proved to have antiseptic, antibacterial, antifungal, antiviral, spasmolytic, local anaesthetic, anti stress, antipyretic,¹⁶ anti platelet, anti-inflammatory activities.¹⁵



The antimicrobial component of clove is *eugenol*.¹⁷ The antimicrobial activity of methanolic extract of clove was better than the ethanolic extract of clove against many organisms. It was effective against *L.monocytogens*, *S.enteritidis* in triptone Soya broth and cheese. The phenolic compounds present in clove can denature proteins and react with cell membrane phospholipids and inhibits a great number of gram negative and gram positive bacteria as well as different types of yeast¹⁸.

TRIGONELLA FOENUM – GRAECUM L (Fenugreek)

Fenugreek belongs to the family Papilionaceae which is known for its aroma. It is 30 – 60 cm tall, annual herb,

cultivated throughout country. Fenugreek seeds, an ancient spice, with a slightly bitter taste, are small, hard, yellowish-brown, smooth and oblong shaped. The fresh tender green leaves of the fenugreek plant, called methi or menthi, have a bitter-sweet flavor and used as a regular green vegetable in Indian cuisine like dals and vegetables. Fenugreek seeds can be sprouted, have a slight pungent-sweet flavor and used to prepare salads. The dried form of fenugreek leaves, called “kasoori methi”, is a popular spice used to enhance the flavor of Indian dishes. Fenugreek is one of mankind's oldest medicinal plants and was cultivated by the ancient Assyrians around 3000 years ago.¹⁹ Fenugreek seeds contain alkaloids, including trigonelline, gentianine and carpine compounds. The seeds also contain fiber, 4-hydroxyisoleucine and fenugreekine, a component that may have hypoglycemic activity. They are also source of saponins such as yamogenin, tigogenin, gitogenin, neotigogens.

It is proved to have protective effect against CP-induced urotoxicity activity. It also has anti-inflammatory,²⁰ antipyretic, hypoglycemic and immunomodulatory, hypocholesterolemic, antiradical, antioxidant.²¹ Chemopreventive, anti cancer, antidiabetic activities.²²⁻²⁴



Fenugreek has a good antimicrobial property it is resistant against gram positive (*S.aureus*, *B.subtilis*) and gram negative (*E.coli*, *Klebsiella*). It also shows good antifungal activity against *Aspergillus niger*. It contains certain bioactive components such as volatile oils, alkaloids, mucilage. All these components in Fenugreek adds on to its antibacterial activity.²⁵

CONCLUSION:

Spices are heterogeneous collections of a wide variety of volatile and non-volatile staple dietary additives. India with its wide climatic conditions and topographical features naturally possesses wide variety of spices which are being used in the diet. These spices turn an ordinary meal to an extraordinary experience. They contain multiple constituents with antimicrobial activity including phenols, quinones, flavones, tannins, terpenoids, and alkaloids. Some spices and culinary herbs also possess antiadhesive properties, or substances that prevent the adhesion of the microbe to the host tissue, thus preventing the primary infection point. The above discussed spices namely pepper, clove, fenugreek are commonly used spices in Indian delicacies and proven to have antimicrobial activity

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