International Journal of Psychosocial Rehabilitation, Vol. 24, Issue 02, 2020
ISSN: 1475-7192

ROLE OF SPICES IN FOOD FOR IMMUNE BOOSTING

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Abstract

"Let food be thy medicine and medicine be thy food", as said by the father of medicine, Hippocrates in 431 B.C. Nature has provided us with a spread of treatment modalities within the sort of food. Only within the past 60 years have we forgotten our medicinal "roots" in favor of patented medi- cines. While pharmaceutical ingredients have their value, we should always not overlook the well-documented, non-toxic and inex- pensive healing properties of food. Spices are esoteric food adjuncts that are used as flavoring and coloring agents, and as preservatives for thousands of years. Spices have also been recognized to possess medicinal properties and their use in traditional systems of drugs has been on record for an extended time. With the advancement within the technology of spices and on knowledge of chemistry in immunity and pharmacology of their active principles, their health benefit effects were investigated more thoroughly in recent decades. This review presents the role of various spices in immune boosting.

KEY WORDS: *immunity; antioxidant; disease; medicinal; spice.*

Introduction

A spice is actually a fruit, root, bark, or seed or other plant substance which is primarily used for flavoring or preserving food. Spices are extracted from herbs, flowers, or stems of plants used for flavoring. Many spices have antimicrobial properties [1]. Sometimes spices are used in medicine, religious rituals, cosmetics or perfume production. Because they usually have strong flavours and are used in small quantities. Spices tend to add few calories to food, even though many spices, especially those made from seeds which contain high amounts of fat, protein, and carbohydrates. However, when spices are used in larger quantities, spices can also contribute a some amount of minerals and micronutrients, such as iron, magnesium, calcium, and many others, to the diet.

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Spices generally have some notable nutritional values and provide some major health benefits. Immunity can be defines as the balanced state of multicellular organisms having adequate biological defences to fight infection, disease, or others unwanted biological invasion, while having adequate tolerance to avoid allergy, and autoimmune diseases. Results from this new study suggest that spicy foods can reduce your salt intake, lowering your blood pressure and ultimately, your risk for a heart attack or stroke [2 - 5].

These days consumers are cautious of their health so they are demanding for more natural and health benefiting food. Food items have an array of effects such as anti-inflammatory and antibiotic properties, boosting our immune system against infections, to anti-carcinogenic properties [6 - 8]. A diet rich in spices is able to control at least 20% of all the cancers [9]. The introduction of spices through the meals has various beneficial effects in health [10]. Spices can stimulate the secretion of saliva, promote digestion, prevent from cold and influenza, and reduce nausea and vomiting [11,12]. Some of the immune boosting fibres are cinnamon, ginger, turmeric, cayenne pepper, garlic, cloves, star anise, etc....Spices and its components plays an role in suppression of inflammatory pathways and also in the prevention and therapy of cancer and other chronic diseases [13 - 18]. Eating spicy foods right before bed can cause indigestion and discomfort, research also suggests that capsaicin, a compound found in spicy foods, may increase body temperature, thereby interfering with sleep [19 - 21].

However there is insufficient knowledge about the preventive and therapeutic aspects of these nutraceuticals in oral health care. People like daily wage workers do not have a proper immune system due to the lack of concern in their diet. The intake of a proper diet containing spices has more chances of boosting our immune system. The article presents a review on the role of spices in food for immune boosting.

METHODOLOGY:

This review was done based on the articles obtained from various platforms like PubMed and Google scholar. They were collected with a restriction in time basis from 1980 - 2020. The inclusion were original research papers, in vitro studies among various conditions and articles that contain pros and cons. Exclusion criteria came into account for review articles, retracted articles and articles of other languages. All the articles were selected based on immune boosting spices.

They are determined by article title, abstract and complete article. When article holder websites were analysed on the topic of immune boosting spices, more than 2000 articles and based articles were found, when it was shortlisted based on inclusion and exclusion criteria, the number of articles were lowered to 120 articles. When timeline and other factors were quoted only 37 articles came into play. This article is reviewed from 37 articles collected. Quality of articles used was assessed using a quality assessment tool and graded as strong, moderate and weak.

The data was collected and quality analysis of the collected data was done using Health Evidence's Quality Assessment Tool (Health Evidence's Quality Assessment Tool, no date) and the data was shown in a tabular colour (Table 1). The knowledge at current point of time analysed and thus the consensus was established.

Table 1: Quality analysis of the studies referr

S. No	Authors	Year	Taken from	Quality of study
1	Shelef LA	1984	Pubmed	Moderate
2	Renuka S, et.al.,	2015	Pubmed	Moderate
3	Timothy CN, et.al.,	2019	Pubmed	Moderate
4	Gayatri DR, et.al.,	2018	Pubmed	Strong
5	Swathy S, et.al.,	2015	Pubmed	Weak
6	McClements DJ, et.al.,	2009	Google scholar	Strong
7	Zain RB	2001	Pubmed	Strong
8	Anand P, et.al.,	2008	Pubmed	Strong
9	Hsu S, et.al.,	2004	Pubmed	Weak
10	Priya J, et.al.,	2019	Pubmed	Strong
11	Ravindran PN, et.al.,	2002	Pubmed	Moderate
12	Sultana S, et.al.,	2010	Pubmed	Moderate
13	Fathima F, et.al.,	2016	Pubmed	Modreate
14	Samuel AR, et.al.,	2015	Pubmed	Strong
15	Harsha L, et.al.,	2015	Pubmed	Weak
16	Baheerati MM, et,al.,	2018	Pubmed	Weak
17	Iyer PK, et.al.,	2019	Pubmed	Strong
18	Dave PH, et.al.,	2016	Pubmed	Moderate
19	Priya AJ, et.al.,	2019	Pubmed	Weak
20	Rj I, et.al.,	2016	Pubmed	Moderate
21	Shruthi M, et.al.,	2018	Pubmed	Moderate
22	Gupta SC, et.al.,	2013	Google scholar	Weak
23	Zikaki K, et.al.,	2014	Google scholar	Strong
24	Nimgulkar C, et,al.,	2015	Pubmed	Strong
25	Mohd Yusof YA	2016	Pubmed	Moderate
26	Nicoll R, et.al.,	2009	Punbmed	Strong
27	Tsui P-F, et.al.,	2018	Moderate	Weak
28	Rana SV, et.al.,	2011	Pubmed	Moderate
29	Cicero AFG, et.al.,	2016	Pubmed	Strong
30	Stabler SN, et.al.,	2012	Pubmed	Moderate
31	Akilen R, et.al.,	2010	Google scholar	Moderate
32	Srinivasan K	2014	Pubmed	Strong
33	Adefegha SA, et.al.,	2014	Pubmed	Moderate
34	Dibakar SP, et.al.,	2015	Google scholar	Moderate
35	Ghosh S, et.al.,	2012	Pubmed	Moderate
36	Wang G-W, et.al.,	2011	Pubmed	Weak
37	Choudhari S, et.al.,	2016	Pubmed	Moderate

TURMERIC:

This powerful and flavourful ancient spice gets its vibrant colour from curcumin, a potent anti-inflammatory compound with properties rivalling that of ibuprofen, without the side effects [22]. The golden yellow color of turmeric is due to curcumin. It also contains an orange-colored volatile oil. Turmeric is derived from the flowering plant of the ginger family and is used medicinally. Turmeric remains a staple treatment for skin conditions, digestive issues and bodily discomfort in Ayurvedic medicine[23], an ancient Indian healing system

still practiced today. The active ingredient, curcumin, boosts the body's antioxidant capacity by being highly effective against free radicals[24]. Turmeric has also been shown to inhibit fungal growth and suppress tumour cell growth. Phytochemical components of turmeric include diarylheptanoids, curcuminoids, curcumin, demethoxycurcumin, and bisdemethoxycurcumin.

GINGER:

Ginger is grown in many areas across the globe, ginger is "among the earliest recorded spices to be cultivated and exported from southwest India." Ginger is a very popular spice; whether it be used to spice up meals, or as a medicine, the demand for ginger has been consistent throughout history. Raw ginger is actually composed of 79% water, 18% carbohydrates, 2% protein, and 1% fat. In 100 grams. Raw ginger contains 80 Calories and supplies moderate amounts of vitamin B6. Ginger originated from China contains chemicals called sesquiterpenes that target cold viruses. This immune-boosting spice also has antibacterial properties[25] that can help prevent nausea. Other functional chemicals include gingerols, shogaol and parasols that have the potential to prevent various cancers. The spice's anti-inflammatory and anti-oxidative properties[26] help control the process of aging, aid digestion and demonstrate the potential to treat degenerative disorders, as well as cardiovascular disease. Ginger also contains antimicrobial compounds that allow it to help in treating infectious diseases.

CAYENNE PEPPER:

Cayenne pepper is also known as the chili peppers family. One tablespoon (5 grams) of cayenne pepper contains Calories: 17, Fat: 1 gram, Carbs: 3 grams, Fiber: 1.4 grams, Protein: 0.6 grams, Vitamin A: 44% of the RDI, Vitamin E: 8% of the RDI, Vitamin C: 7% of the RDI, Vitamin B6: 6% of the RDI, Vitamin K: 5% of the RDI, Manganese: 5% of the RDI, Potassium: 3% of the RDI, Riboflavin: 3% of the RDI. Cayenne peppers contain a high amount of capsaicin which suppresses a neuropeptide in inflammatory processes. According to a study, the pepper contributes to digestive health by fighting gastrointestinal pathogens, ulcerations and cancer. It also regulates appetite and digestive function. Herbalists also use cayenne pepper to activate the circulatory system as a cold and flu treatment. In one tablespoon of cayenne pepper, there is 44% of the RDA of vitamin A. In addition to its potent immune-boosting nutritional composition, the spice is also an excellent source of beta carotene, a powerful antioxidant [27]. Cayenne pepper boosts metabolism, reduces hunger, lowers the blood pressure, may aid digestive health, relieve pain and may reduce cancer risk.

GARLIC:

Garlic is one of the major ingredients that boosts our immune system. Major civilizations, like the Egyptians, Greeks, Babylonians and Chinese, are using garlic for medicinal purposes since the past . Fresh or crushed garlic yields the sulfur-containing compounds allicin, ajoene, diallyl polysulfides, vinyl thins, S-allylcysteine, and enzymes, saponins, flavonoids, and Maillard reaction products, which are not sulfur-containing compounds. Garlic is generally known as "rustic's theriac" (cure-all). The major physiological roles of garlic are its antimicrobial, anticancer, antioxidant, immune boosting, anti diabetic, hepatoprotective, antifibrinolytic and antiplatelet aggregatory activity[28] and its potential role in preventing cardiovascular diseases. A 12-week study found that, compared to a placebo, garlic reduced the amount of participants with the cold by 63%. Garlic supplements have also been shown to increase antioxidant enzymes in humans, in addition to notably reducing oxidative stress in individuals with high blood pressure[29]. High doses of garlic have also demonstrated the potential to guard the body against heavy metal toxicity. clinical research to determine the effects of consuming garlic on hypertension found that consuming garlic produces only a small reduction in blood pressure (4 mmHg), and there is no clear long-term effect on cardiovascular morbidity and mortality. Because garlic might reduce platelet aggregation, people taking anticoagulant medication are cautioned about consuming garlic. Garlic intake is associated with a decreased rate of stomach cancer and there is no effect of garlic on colorectal cancer.

CINNAMON:

Ground cinnamon consists of around 11% water, 81% carbohydrates (including 53% dietary fiber), 4% protein, and 1% fat. In a 100 gram reference amount, ground cinnamon may be a rich source of calcium (100% of the Daily Value, DV), iron (64% DV), and vitamin K (30% DV). Cinnamon has also been used for its medicinal

properties for thousands of years. Made from the inner bark of the Cinnamomum tree, its use has been dated as far back as ancient Egypt. Cinnamon fights inflammation and helps ward off infections and heal damaged tissue 30]. Containing large amounts of polyphenol, cinnamon outranked “superfoods” like garlic and oregano in a study comparing the antioxidant activity[31] of 26 spices. Some studies have shown that Cinnamon may have anti-diabetic effects[32] and help cut the risk of heart disease. A meta-analysis of cinnamon supplementation trials with lipid measurements reported lower total cholesterol and triglycerides, but no significant changes in LDL-cholesterol or HDL-cholesterol. But some researchers have concluded that, "There is insufficient evidence to support the use of cinnamon for type 1 or type 2 diabetes mellitus."

CLOVE:

Clove may be a common spice utilized in medicine since past . Long-used in traditional medicine, there's evidence that oil of cloves containing eugenol is effective for toothache pain and other sorts of pain, and one review reported efficacy of eugenol combined with flowers of zinc as an analgesic for alveolar osteitis. It is best known for its anti inflammatory properties and to treat sore throat [33]. The warm clove adds a taste of spicy buzz to the food when added. Clove oil is widely used in curing pain and aches. The spice is warm and soothing during the winters. Chewing on some cloves early in the morning can be good for your health [34]. Use of clove for any medicinal purpose has not been approved by the US Food and Drug Administration, and its use may cause adverse effects if taken orally by people with liver disease, blood clotting and immune system disorders, or food allergies. It remains unproven whether blood sugar levels are reduced by cloves or clove oil. It remains unproven whether blood sugar levels are reduced by cloves or clove oil. Use of clove for any medicinal purpose has not been approved by the US Food and Drug Administration, and its use may cause adverse effects if taken orally by people with liver disease, blood clotting and immune system disorders, or food allergies.

STAR ANISE:

This star-shaped pod or like we call it, chakra phool in Hindi contains shikimic acid that helps boost metabolism during low immunity periods [35]. It is often used in biryanis or masala chai, enhancing the flavour profiles of each of these dishes. Some of the major health-promoting compounds found in star anise include Linalool, Quercetin, Anethole, Shikimic acid, Gallic acid and Limonene. Together, these compounds may contribute to the antioxidant, anti-inflammatory and antimicrobial properties of star anise. Rich in antioxidants & vitamins A and C, it helps in fighting free-radicals, improving immunity, bloating, digestion & nausea and also has pharmacological potential [36, 37]. Study shows Star Anise are often used as anti quorum sensing and anti-biofilm agent in food matrix. The oil produced from star anise contains thymol, terpineol and anethole, which is employed for treating cough and flu. Anise also helps improve digestion, alleviate cramps and reduce nausea. Consuming star anise tea after meals helps treat digestive ailments like bloating, gas, indigestion and constipation. The properties and the effects of the spices that help in immune boosting are shown in a tabular column (Table 2).

Table 2: Spices and its protective effects:

SPICES	EFFECTS
Turmeric	Anti-inflammation Anti-oxidation Anti-atherogenesis Anti-diabetes
Ginger	Anti-inflammation Anti-oxidation
Cayenne pepper	Anti-inflammation Anti-oxidation
Garlic	Anti-oxidation CVD protection Anti-atherogenesis
Cinnamon	Anti-coagulation Anti-oxidation Anti-inflammation Anti-diabetes
Clove	Anti-inflammation Anti-oxidation Reduction of hyperglycaemia hyperlipidemia
Star anise	Anti-oxidation Anti-inflammation

CONCLUSION:

Daily consumed food has got incredible medicinal and healing properties. The healing properties of food have been reported by many scientific analyses worldwide. However, the past decade has presented an outburst of clinical research to illustrate specifically what health benefits individual foods can offer, identifying the various nutrients and phytochemicals associated with these benefits. But lack of awareness and knowledge can devalue its use. Nutritionists and consumers must focus on adjusting food recipes and modifying dietary habits. Efforts to increase the understanding will help us provide a new horizon for improving various dimensions of an individuals' health. Our review suggests that the use of healthy spices in our meals will help in boosting immunity. There are some side effects in all these spices that indicate some caution, but still they are popular and nutrient containing spices in recent times.

ACKNOWLEDGEMENT:

The author extends gratitude to the institution for their support.

CONFLICT OF INTEREST:

The author declares that there was no conflict of interest in the present study.

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