



(REVIEW ARTICLE)



The potential use of herbs as immunity booster II

Gamal AH Zaharan, Hanan A Hussien * and Shams SR Omima

Department of Bread and Pastry Research, Food Technology Research Institute, Agricultural Research Centre, Cairo, Egypt.

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Abstract

Many herbs are used as food additive to make food aromatic also give a lot of health benefits and nutritional values. Some of the herbs used in Egypt are paprika, zingiber, thyme, anise, marjoram etc. The main aim is to high light the role of some commonly used herbs on immunity. In this review we list some bakery products that use some herbs and can be used to improve the immunity of humans.

Keywords: Immunity; Paprika; Zingiber; Thyme; Anise; Marjoram

1. Introduction

Early on January 12, 2020, the World Health Organization (WHO) announced an unprecedented pandemic outbreak of new discovered virus from the beta-coronavirus family that has not been previously identified in human and was named 2019 novel coronavirus [1]. Corona virus is the group of viruses that have a crown-like appearance when viewed under the electronic microscope. Corona viruses cause respiratory tract infections in humans, which can cause a wide range of illnesses from the mild common cold to lethal SARS and MERS [2].

Immunity plays a crucial role in defending against various emerging and seasonal outbreaks of infections like cold. Boosting our natural immunity is that the best root to stay healthy.

One of the principal causes of staying safe against an epidemic is to have a good immune system; in other words, if the patients have a good immune system, a large percentage of them evince only mild symptoms.

The World Health Organization mentioned that, 80% of the earth's inhabitant's use traditional medicine and most of these medicines involves the use of plant extracts [3].

2. Paprika

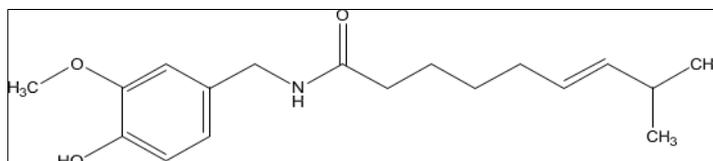
The chili pepper, paprika (*Capsicum annuum L.*), a plant belonging to the Solanaceae family, is a widely consumed vegetable worldwide. The genus *Capsicum* (Solanaceae) comprises more than 20 species. The most common ones are *C. annuum*, *C. baccatum*, *C. chinensis*, *C. frutescens*, and *C. pubescens*. *Capsicum* species are used as spice since ancient time. Pepper (*Capsicum annuum*) can be considered a functional food because it contains high levels of certain compounds that have beneficial effects for humans. Pepper contains vitamins A, B, C, and E and phytochemicals such as phenolic compounds, carotenoids, and capsaicin [4; 5]. Red peppers are used to produce dehydrated products (such as paprika), pickled peppers, and sliced or diced frozen peppers to be used in pizzas or to be eaten raw as salads. All used of peppers has been increasing considerably in the last years, as part of healthier food habits.

* Corresponding author: Hanan A Hussien

Department of Bread and Pastry Research, Food Technology Research Institute, Agricultural Research Centre, Cairo, Egypt.

The mineral composition of red pepper calcium value (1060.35 mg/100gm) and zinc (3.2 mg/100gm) [6 and 7]. The results of vitamin composition of red pepper shows that vitamin C content (41.55%), vitamin A content (1.55%) vitamin E contents (0.71%), folic acid value (8.14%) [6]. While Saad *et al.* [8], reported vitamin A content of 0.71 mg/100gm; vitamin E contents (0.11 mg/100gm) and Folic acid value (12.30 mg/100gm).

Capsaicin is considered a safe and effective topical analgesic agent in the management of arthritis pain, herpes zoster-related pain, diabetic neuropathy, mastectomy pain, and headaches. However, a study published in 2010 has linked capsaicin to skin cancer Antioxidant, enhances metabolic effects in weight management [9].



Capsaicin

Figure 1 Chemical structure of Capsanthin

Consumption of these compounds may prevent several human diseases, including several forms of cancer, arteriosclerosis and cardiovascular diseases [10 and 11]. Their quantities vary with genotype and maturity and are influenced by growing conditions and losses after processing [12].

2.1. Health Benefits

Chili pepper has preventive and therapeutic properties for many ailments such as different types of cancer, rheumatism, stiff joints, bronchitis and chest colds with cough and headache, arthritis, heart arrhythmias and used as stomachic [13]. Chili preparations for treating ailments can be standard capsaicin, pharmaceutically prepared gels, creams and plasters, essential oils distilled from pods, powder prepared by crashing pods and extracts by soaking pods in water or ethanol [14; 13; 15].

2.2. Zingiber

Ginger (*Zingiber officinale*) is the herbaceous plant native to South Asia belonging to the family of Zingiberaceae. The characteristic pungent flavor of the ginger rhizome is used extensively in foods and beverages [16]. Rhizome of *Zingiber officinale* is widely used in both of medicinal and culinary purposes in globally due to its ethno medicinal and nutritious value. Most of traditional and complementary systems of medicine prescribe ginger individually or as a combination in both of infective and non-communicable diseases [17]. The plant is mostly investigated for antimicrobial, anticancer, antioxidant, antidiabetic, nephroprotective, hepato-protective, larvicidal, analgesic, anti-inflammatory and immunomodulatory activities [18].

Mineral content of ginger for ginger root (Ground) consists of Calcium (114 mg per 100 g), Iron (19.8 mg per 100 g), Magnesium (214 mg per 100 g), Manganese (33.3 mg per 100 g), Phosphorus (168 mg per 100 g), Potassium (1320 mg per 100 g), Sodium (27 mg per 100 g), Zinc (3.64 mg per 100 g) [19] and Selenium 0.7 mcg [20].

Vitamin C content was (10.97) mg per 100 g [21]. Vitamin C 5 mg, Vitamin E 260 mcg, Vitamin K 0.1 mcg, Thiamin 25 mcg, Riboflavin 34 mcg, Niacin 750 mcg, Vitamin B6 160 mcg, Folic acid 11 mcg [20].

Ginger contain α - and β - zingiberenes, zingiberol, zingerone, gingerol, α - curcumene etc. as major chemical constituents. It has anti-inflammatory, anticholinergic, antihistaminic, antioxidant activities and it also has bioavailability enhancer property [22 and 23].

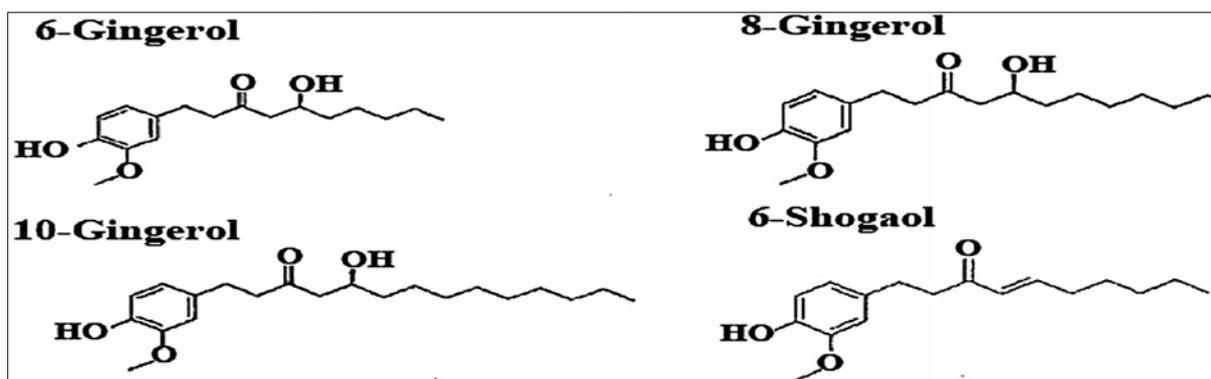


Figure 2 Structure of 6-gingerol, 8-gingerol, 10-gingerol and 6-shogaol

2.3. Health Benefits

Fresh ginger of high concentration could stimulate mucosal cells to secrete interferon-beta that possibly contributes to counteracting viral infection. Fresh ginger possesses anti-viral activity against human respiratory syncytial virus due to the presence of bioactive phenolic phytochemical 6-gingerol [24]. 6-gingerol is a bioactive phenolic phytochemical found in the fresh ginger rhizome. 6-gingerol is a promising drug candidate to treat various diseases associated with inflammation cancer, and viral disease. Fresh ginger possesses anti-viral activity against human respiratory syncytial virus due to the presence of bioactive phenolic phytochemical 6-gingerol [24].

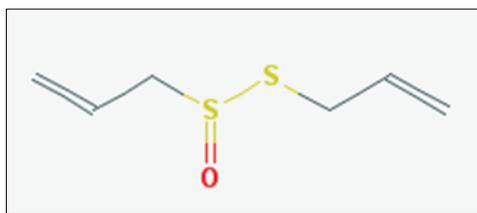


Figure 3 Structure of Allicin

Allicin is an active ingredient in *Z. officinale*, consists with anti-influenza cytokines. Hence, *Z. officinale* is effective as an antiviral agent against influenza A (H1N1) [25].

Ginger, garlic, and lemon are good to immune the human body since they contain antioxidants such as magnesium, zinc, calcium and other vitamins such as vitamin A, B1, B2, C, D, E that can help to slow or prevent damage to cells when one is infected with the Covid-19 virus [26]. These plants and herbs serve as dietary supplements for boosting the immune systems and help to produce free radicals for the body against inflammatory diseases. Some individuals drink water with honey, lime, ginger and garlic to cure the cold, cough, catarrh, and flu and they get better, and the use of this same ideology is incorporated into people that the consumption of ginger and garlic concoction can cure the Covid-19 [27, 28].

Fresh rhizome of *Z. officinale* has been proven with an antiviral effect against Human Respiratory Syncytial Virus (HRSV) infection via decreasing HRSV-induced plaque formation in respiratory mucosal cell lines. The lyophilized juice extract of *Z. officinale* is considered as containing antiviral effect against Hepatitis C viral infection. In the particular study, it has been proven that the *Z. officinale* is effective in inhibiting the viral replication inside the Hepatitis C virus infected Hep G2 cells by affecting viral RNA [29]. Specific compounds in ginger such as gingerols and zingerone have been found to inhibit viral replication and prevent viruses from entering host cells.

3. Thyme

Thyme (*Thymus vulgaris L.*) belong to Lamiaceae family [30] is an ancient herb widely used in folk medicine by the Greeks, the Egyptians and the Romans for the treatment of a variety of diseases [31; 32]. Thyme has been commonly used in foods mainly for the flavour, aroma and preservation [33].

It can be noticed that moisture contents were 8.66 % for thyme powder. Thyme powder had high contents of protein (9.7%) and fat (12.48%). Also, the results show that the herbs contain considerable amounts of fibers, thyme (30.33%) and ash (7.84%). The results also show that the total carbohydrates content was 39.65% [34]. **Ozcan [35]**, reported Ca 1245.5 mg/100 gm; Fe 40.5 mg/100gm; Zn 1.43mg/100 gm and Se 0.15 mg/100gm. As for vitamins, thyme is considered as moderate source of vitamins, USDA reported vitamin A 4751 IU in 100gm, while vitamin C was 160.1 mg, thiamin was 0.48 and niacin was 1.824mg [36]. Thyme provides 0.35 mg of vitamin B-6 or pyridoxine; furnishing about 27% of daily recommended intake. Pyridoxine keeps up gamma-aminobutyric acid (GABA) (beneficial neurotransmitter in the brain) levels in the brain, which has stress buster function [37].

The seven main components of thymus essential oils are α -pinene, p-cymene, γ -terpinene, linalool, α -terpineol, thymol and carvacrol. The major mechanism of antimicrobial components thymol and carvacrol is to deteriorate the outermost membrane of gram-negative bacteria.

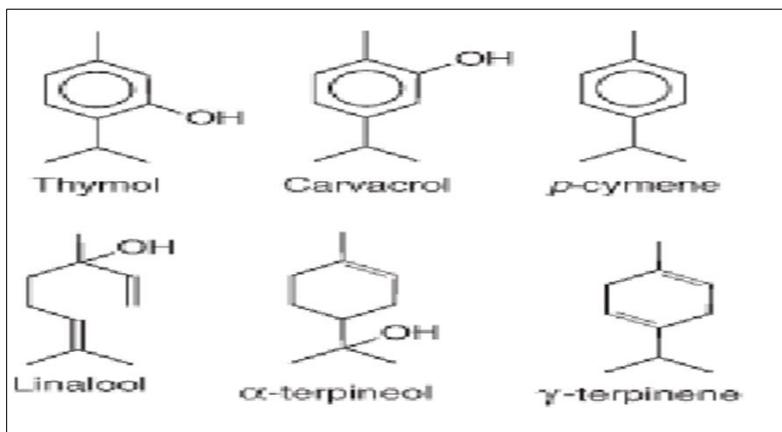


Figure 4 Main Components of Thymus

3.1. Health Benefits

Thyme is herbaceous plant of the platoon species, grows in mountainous areas, used as a beverage instead of or with tea, added to some food to give it an acceptable flavour, the plant is used in folk medicine frequently where it is prescribed to treat mouth infections, stomach, intestine and airways, coughing and gastroenteritis and expel intestinal worms, as well as to strengthen the heart [38]. Extracts from Thyme have been used in traditional medicine for the treatment of several respiratory diseases like asthma and bronchitis and for the treatment of other pathologies thanks to several properties such as antiseptic, antispasmodic, antitussive antimicrobial, antifungal, antioxidative, and antiviral [39].

Hamada [40] reported that compounds in thyme are with essential functions in defense against pathogens and may have unspecified effects on infection with COVID-19.

Gourch *et al* [41] reported that an infusion, prepared in a traditional way from certain plants such as thyme, lemon, ginger, with a supplement of honey, is used by the Moroccan population can be used to naturally strengthen the body's immunity because it contains a significant amount of vitamin C, zinc, quercetin, bioactive substances called essential for the proper functioning of cellular metabolism against pathogens and possibly the famous SARS-Cov-2.

Sardari *et al* [42] reported that one week after taking thyme showed that the fever, dizziness, cough, dyspnea, muscular pain, headache, anorexia, weakness and lethargy, fatigue, and chest wall pain were significantly reduced. Thyme plant, is recommended for reducing the symptoms of COVID-19.

4. Anise

Anise (*Pimpinella anisum*, L.), is an annual important spice and medicinal plant belonging to the family of *Apiaceae*, and native to Mediterranean region.

Anise seeds contain total ash 14.9%, total lipids 13.7-14.2 %, crude protein 17.6-18.1%, and total carbohydrates 51.4 % [43; 44].

it contains vitamin B complex (B1, B2, B5, B6), A and C vitamin, (0.332, 0.340, 2.789, 0.58, 15.56 and 19.89), respectively and minerals Ca, Fe, Mg, P, K, Na and Mn (42.171, 2.453, 53.432, 0.385, 536.312, 11.155 and 8.981) [45; 46]. Se 300.71 ($\mu\text{g}/\text{kg}$) on dry weight bases or 272.4 ($\mu\text{g}/\text{kg}$) on fresh weight bases. Anise seeds were found to contain 19 of phenolic compounds, among them catechin, cinnamic, ellagic, gallic, chlorogenic, ferulic and catechol were the major active in anise seeds [44]. Anise is rich in essential oil (1.5–6%) [47], which mainly contains trans-anethole (85-90%) followed by estragole, limonene, and pinenes.

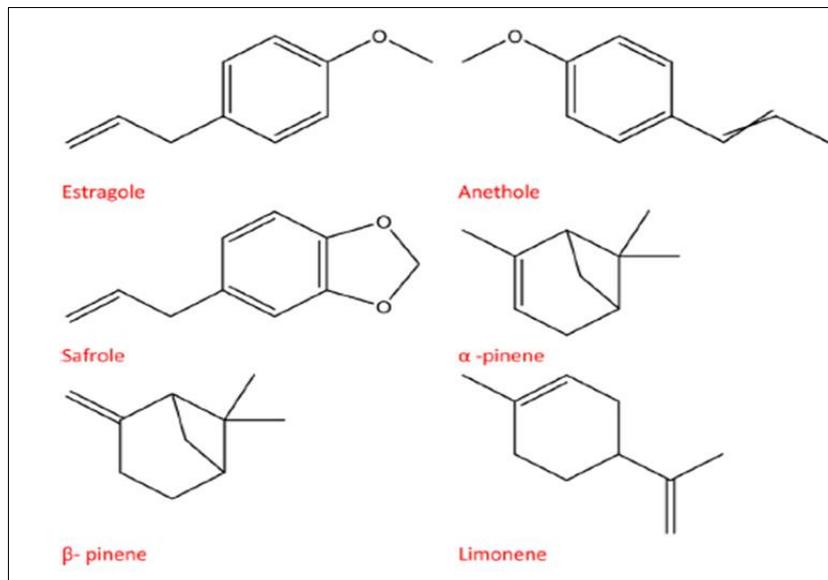


Figure 5 Main Components of Anise

4.1. Health Benefits

Anise leaves are used to treat gastrointestinal problems and tooth pain. Its oil is used to treat lice and scabies. It is also used to treat colds and mouth fresheners [48].

Anise seeds contain 1.5–5% essential oil and used as flavoring, digestive, carminative, and relief of gastrointestinal spasms. Consumption of anise seed in lactating women increases milk and also relieves their infants from gastrointestinal problems, in the food industry, anise is used as flavoring and aromatic agent for fish products, ice cream, sweets, and gums [49].

The boiled seeds in hot water are used as a carminative, antiseptic, diuretic and digestive, and as a folk remedy for insomnia and constipation [50]. Several therapeutic effects, including for digestive disorders, gynecological problems and dyspnea, as well as anticonvulsant and anti-asthma effects were described for the seeds of *Pimpinella anisum* L. in ancient medical books [51]. Aniseeds possess expectorant, antispasmodic, carminative, and parasitocidal properties. In traditional medicine, the drug is used internally for bronchial catarrh, pertussis, spasmodic cough, and flatulent colic, and externally for pediculosis and scabies. Furthermore, it is used as an estrogenic agent. It increases milk secretion, and promotes menstruation [52].

5. Marjoram

Origanum majorana L. from the family Lamiaceae (syn. *Majorana hortensis* Moench) is commonly known as sweet marjoram. This herb is native to Mediterranean region and cultivated in many countries of Asia, North Africa, and Europe, for example, Spain, Hungary, Portugal, Germany, Egypt, Poland, and France [53].

Marjoram contains 12.66% protein, 7% fat, 12% ash [36]. The calcium content 1990 mg/100gm iron 83 mg/100gm [54]. Vitamins estimated in marjoram include thiamin, riboflavin, niacin, ascorbic acid and vitamin A (RE) [36].

Monoterpene hydrocarbons, including alpha and beta-pinene, camphene, sabinene, a- and b- phellandrene, r-cymene, limonene, b-ocimene, g-terpinene, terpinolene, a-terpinene, carvone, and citronellol have been detected in essential oil of *O. majorana* [55; 56; 57].

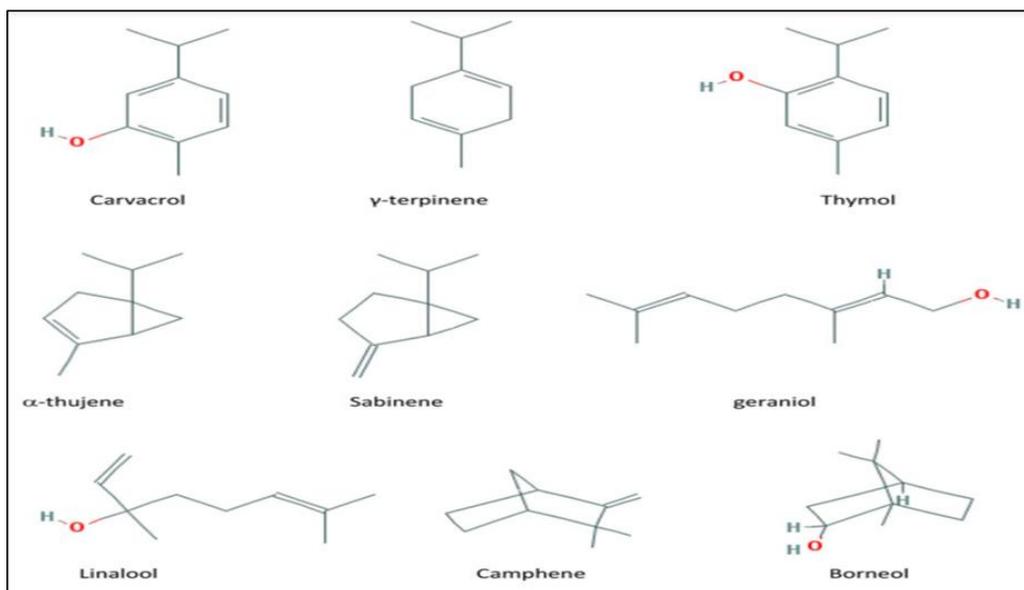


Figure 6 Main Components of Marjoram

5.1. Health Benefits

It functions as a cure for asthma, coughs, in-digestion, rheumatism, toothache and heart conditions. According to Mabey [58], marjoram contains tonic and astringent bitter principles, which rouse the appetite and hence it is helpful for invalids.

Chiej [59] reported that the powder acts as a sternulatory (inducing sneezing) if inhaled and is, therefore, effective against head colds. Prakash [60] mentioned the use of volatile oil as an aromatic stimulant in colic, dyspepsia, flatulence and dysmenorrhoea. Sweet marjoram appears to have a stronger effect on the nervous system than its wild cousin [61; 62].

6. Potential and Current Industrial Applications

Saad *et al* [8] studied the effect of drying and different extraction methods (water and ethanolic extracts) of red pepper on the phytochemical (carotenes, phenols and flavonoids) contents and their effect as antioxidants. The texture profile of resulting batun salet showed an increase in hardness, gumminess and chewiness of samples with red pepper powder, while all other samples showed non-significant difference.

Abd-El-Reheem *et al.* [63] prepared crackers with 5% thyme and 20% red kidney beans. The resulting crackers were rich in protein (13.5%) while iron reached 8.85 mg/100gm, zinc was 2.30 mg/100gm and calcium was 49.60mg/100gm.

Abdelazim [64] reported the effect of addition of marjoram oil 0.01-0.07% on organoleptic evaluation of pan bread. He illustrated that the overall consumer acceptance ranged between 67.7 to 78.2%. The taste score decreased with the increase of oil present.

Nahed Lotfy Zaki [65] reported that ginger extracts and its essential oil are safe substance from the point of human nutrition and can be used in chronic inflammatory diseases and protect against lipid peroxidation.

7. Conclusion

Herbs not only add aroma to the food but also give a lot of health benefits and nutritional values. The role of some commonly used herbs on immunity were reported. In this review we also list some products that use some herbs and can be used to improve the immunity of humans.

Compliance with ethical standards

Acknowledgments

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Disclosure of conflict of interest

The authors have declared that no conflict of interest exists.

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