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A comprehensive ethnopharmacological review on onion, garlic and ginger

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***Abstract*---**It is a therapeutic aspect of medicinal herbs present in the kitchen for immediate treatment. Herbal plants can treat various diseases and ailments. It would be of great benefit in medical and surgical treatment. The promotion of the health system is easier, with medicinal plants than synthetic drugs. This study reviewed the medicinal properties of some of important spices generally found in every kitchen; onion, ginger and garlic. These commonly used spices are important in medicine due to the presence of many bioactive

constituents and nutrients. Some chemical constituents of these medicinal plants have been reported in various literatures to contribute to the prevention and treatment of various diseases and ailments. In literatures, some of the documented properties of onion, garlic and ginger include antioxidant, anti-inflammatory, rheumatologic, blood circulation and anticramp, anti-ulcer, anticholinergic, analgesic, antimicrobial, anti-stress, anti-cancer, immunity booster, anti-diabetic, regulation of blood pressure and treatment of cardiovascular diseases. The use of these medicinal plant materials as potent neutraceuticals will aid the promotion of human health system in socioeconomic aspects.

***Keywords*---**Ginger, antioxidants, garlic, onion, therapeutic activity, bioactive constituents.

1. Introduction

Herbal origins are always the source of promising treatment and control of wide range of diseases. There are numerous plants used in the world for various medicinal purposes (Imo et al., 2016). Besides using spices in food processing, they can also be used animal health treatment due to their therapeutic functions. Currently, there is much therapeutics being tested for their medical potentials. In previous research, spices have been found to possess medicinal properties (Imo et al., 2015). The greater demand for alternatives to traditional medications is primarily due to the declining quality of conventional medication and their prohibitive cost for many customers—natural substances (Everett, 1982). This species has been found in warm climates (Taiwan, India, Nigeria, and Bangladesh) (Moghaddasi and Kashani, 2012). Ginger has been highly used in herbal medicine for many years. The ginger has been utilized by Chinese medicine for its anti-inflammatory properties. It is thought to help treat baldness, snakebites, toothaches, and respiratory disorders (Afzal et al., 2001). In addition traditionally garlic and inion are used for the ailment of numerous diseases. The present article highlights all those therapeutic benefits of these important spices; onion, garlic and ginger focusing both their traditional uses and scientific investigations. The article will be benefitted for further research on these three spices to get better medication.

2. Onion (*Allium cepa)*

The onion is an herbal plant that has medicinal properties. The scientific name of onion is *Allium cepa L.* which belongs to the *Liliaceae* family. Onion is a bulbous plant that is widely grown in all over the world (Marrelli et al., 2019). The onion bulb is used as a vegetable as well as flavouring. The bulb may be consumed raw or roasted. The plant's leaves and flowers are also nutritious and are commonly used in salads (Lim, 2012). In nearly all ethnic areas, onions are used as a vegetable and spices. The onion is rich in many phytochemicals that are considered important in a balanced diet, but it has also been studied for its biological properties and potential role in the treatment and prevention of a range

of diseases. *A. cepa* is high in sulphur amino acids and contains many vitamins and minerals (Teshika et al., 2019). Figure 1 depicts the benefits of onions.

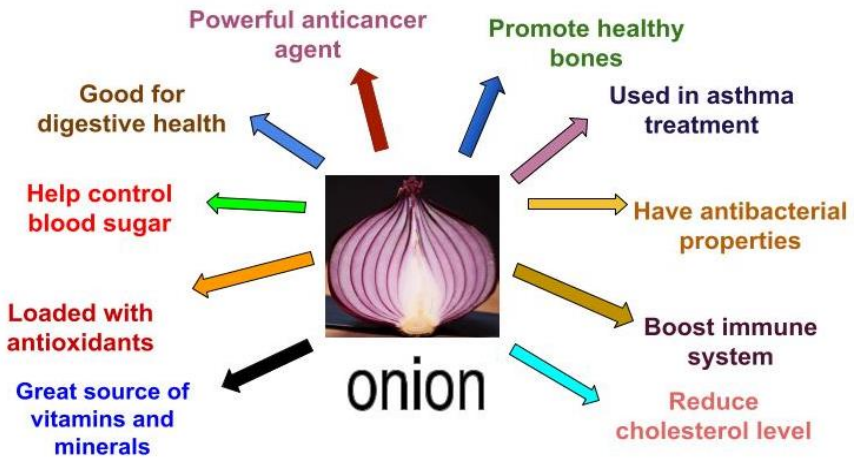


Fig1. Health benefits of onion

2.1. Pharmacological effects of onion

Anti-diabetics effects- In various studies, onion have shown hypoglycemic properties (Dorant et al., 1996; Galeone et al., 2006; Hsing et al., 2002). Besides Allium cepa crude hydro alcoholic extract increased blood sugar. It also caused an improvement or regeneration of pancreatic β cells. Moreover, the purple skinned onion has several positive health effects on the circulatory system and used as a diuretic to decrease swelling, reduce blood cholesterol levels along with development of blood clots, treat diabetes is supposed to lower blood sugar levels (Steinmetz et al., 1994). Some literature stated that Allium cepa is a hypoglycaemic agent because it acts directly on some tissue such as the liver and controls glycolysis, muscle, and so on.

Antioxidant effects- Onions may be effective for managing cardiovascular and degenerative diseases. Because of their inability to meet consumer expectations, 10% of onions are thrown out and not sold A. (Bordia, 1981). It shows that demand for quality assurance has made sorting and testing even more important (irregular shape, injured parts, non-commercial sizes). Garbage coming from the onion industry is a significant concern for consumer suppliers (Lau, 2006; Jeyaraj et al., 2006; Ohaeri, 2001; Eidi et al., 2006). First, cattle feed can make neither phytopathogenic nor a fertilizer because of pungent smell and rapid production of pathogenic agents, such as Sclerotium Cepivorum. The disposal of onion waste in landfills causes high costs and has a bad environmental impact. Hepatoprotective Aceppha significantly decreased alanine aminotransferase, total serum bilirubin; alkaline phosphatase and lactate dehydrogenase levels dose-dependent manner (Lau et al., 1987). The methanolic extract of onion was found to have Hepatoprotective properties. Onion extracts demonstrated important effects on biochemical markers due to paracetamol hepatotoxicity and findings of histopathological studies (Salman et al., 1999).

Anticancer effects- Organosulfur substances present in onions inhibit the growth of six different cancer cells (Morbidoni et al., 2001). Allium produces the flavonoid Quercetin, which has been shown to have anticancer properties. The flavonoid Quercetin contained in allium has been shown to have anticancer properties. It has the ability to stop cancer cells from multiplying. By inhibiting the NF-kB and MMP-2/-9 signalling pathways, Quercetin prevents the proliferation and migration of SAS human oral tumour cells (Singh and Singh, 2008). Quercetin facilitates natural killer cell activation by stimulating macrophage phagocytosis (Lanzotti, 2006).

Hepatoprotective effects- The A. cepa L. test was used to assess the cytogenotoxic activity of a cool aqueous extract from Achyrocline satureioides (Adetumbi and Lau, 1986). Onion extract were found to have Hepatoprotective properties against cadmium-induced oxidative damage (Nasri et al., 2013). Onion extracts had a dose-dependent Hepatoprotective effect, preventing and protecting against cadmium-induced neuroinflammation. Hepatoprotective efficacy of onion extracts (aqueous extract) ethanol-induced hepatotoxicity (Chaiyakunapruk et al., 2006).

Anti-inflammatory effect- Since the flavonoid quercetin is present in onions, it has anti-inflammatory properties. Onion is used in arthritis disease (Verma et al., 1993). Allium contains ajones that has anti-inflammatory effect (Ha et al., 2012). The mechanism of action for onion extract is the control of the local inflammatory response, which helps to prevent atherosclerosis (Hahn, 1996).

3. Garlic *(Allium sativum)*-

Garlic is one of the oldest known examples of plant used in the treatment of various human health conditions, with over 300 different varieties cultivated all over the world (Mehdizadeh et al.,2012). Garlic is grown all over the world; it is believed to have arisen in Central Asia and later spread around the world (Ahmed et al., 2008). Allicin is the active ingredient in garlic (Waggas, 2009). Garlic was used to cure stomach pain, rheumatism, cough, and dermatitis, lack of appetite, fever, epilepsy, cancer and snake bites, and antispasmodic in ancient time (Pecoraro et al., 1998). Benefits of garlic shown in Figure 2.

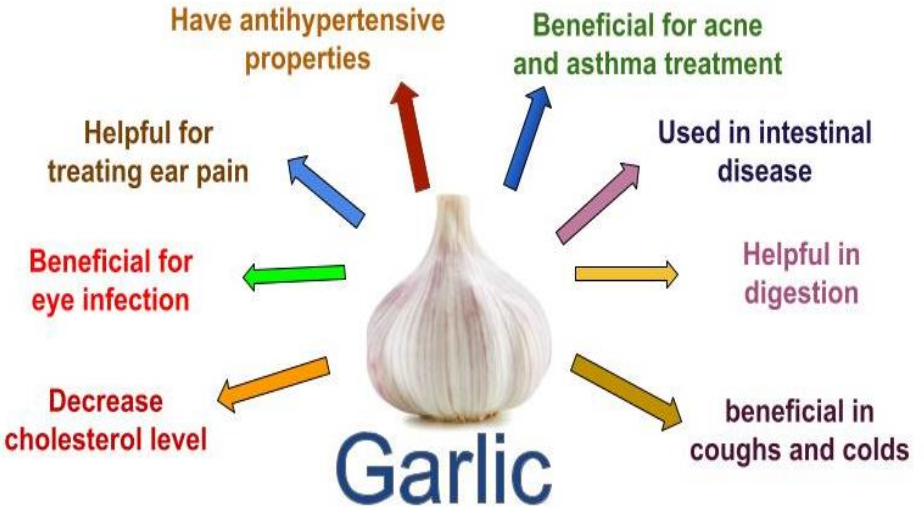


Fig 2. Health benefits of garlic

3.1. Pharmacological effects of Garlic

Antioxidant, anti-inflammatory and antistress effects

Garlic extract has been shown to have powerful antioxidant properties and to boost the levels of two antioxidant enzymes in the blood: catalase and glutathione peroxidase (Wojdyło et al., 2007). Garlic Organosulfur compounds were also thought to be able to inhibit glutathione depletion. Garlic intake can benefit patients whose liver function is being harmed by an increase in reactive oxygen species (Török, 1994). Garlic can be helpful in combating the detrimental effects of chronic stress on human physiology, given the severe chronic stress that many people currently experience in their everyday lives (Morihara et al., 2006).

Anticancer effects- Consuming garlic decreased an individuals' cancer production in the Netherlands cohort sample. The ingestion of garlic will minimize the incidence of oesophageal, stomach and colon cancer. One of the advantages of Allicin is that it reduces the formation of the compounds that cause cancer in the digestive system. There was also a reduction in the risk of urinary tract cancer for physically active men. Prostate-specific antigen (PSA) levels dramatically decreased at four weeks (Ozgoli et al., 2009; Choi et al., 2013; Chen et al., 2009; Lantz et al., 2007).

Cardiovascular effects- Several studies have shown a high association between garlic consumption and improved heart health. In these cases, garlic may protect against heart disease and high cholesterol (Newall et al., 1996; Block, 2010). A review showed that from the total of 432 patients diagnosed with coronary artery disease, 402 were given garlic-laced milk to drink, while 104 patients drank only plain milk. Analysis of results reveals that garlic juice decreases the death risk of patients who heart related disease (Petchdee, 2012).

Antidiabetic effect- Some animal research suggests that garlic decreases blood glucose levels and alloxan (in some types of mice) induced diabetes. It was being reported that the diabetic effect of garlic is more effective than glibenclamide (Jabar and Al-Mossawi, 2007).

Action on Immunity booster- Garlic root is alleged have antioxidants that enhance the body's immune function. It is a significant part of the immune system as it makes the cells called killer cells more active. It has been shown that garlic is very effective for fighting off disease. There is an outstanding amount of germanium occurring in this substance (Macpherson et al., 2005; Wojdyło et al., 2007; Prasad et al., 1995; Török et al., 1994).

Activities on Regulation of blood pressure- For decades, garlic has also been regarded as the most common spice to regulate blood pressure and hypertension (Sabayan et al., 2007; Morihara et al., 2006; Kasuga et al., 1999; Imo and Za'aku , 2019; Qureshi et al., 1998; Connell and Sutherland, 1969). In vitro research suggests that garlic has vasoactive properties and that organic garlic polysulfide enable endogenous cardio protective mediators' development.

Antimicrobial effects- Garlic is known to be safer than standard drugs as a result of fewer side effects. Ajoene has been reported to be an effective topical antifungal agent (Gull et al., 2012). Amoeba is killed by levels that are just 30µg/ml of Allicin. At very low concentrations, Allicin exhibited antileishmanial activity (Ajith et al., 2008; Duarte et al., 2016; Uz et al., 2009; Kumar et al., 2015).

4. Ginger

Zingiber officinale belongs to the genus *Zingiberaceae*. The ginger gene is found all over the world. Ginger to relieve nausea and to treats stomach aches. In medicine, ginger is considered an aphrodisiac. Also, ginger has been used to repel mosquitos. Oil from ginger is known to be therapeutic (Morioka et al., 1993). The advantages of ginger are shown in Figure 3.

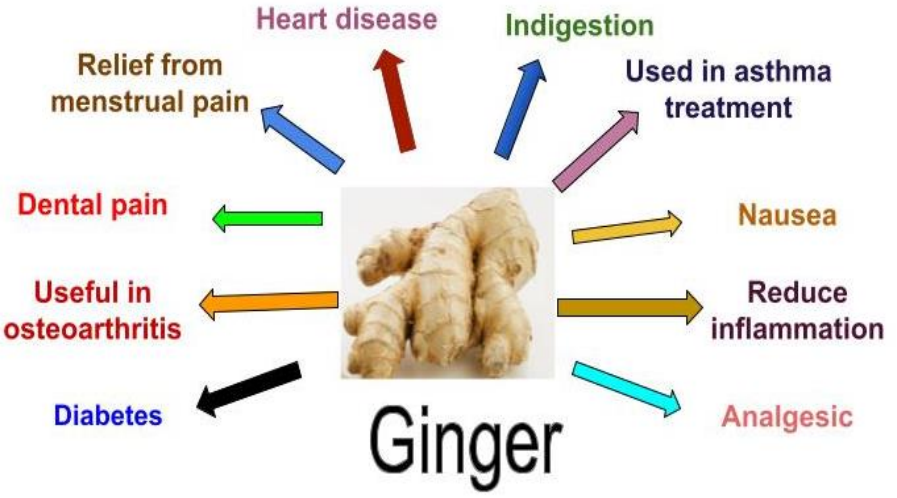


Fig.3 Health benefits of ginger

4.1. Pharmacological effects of ginger -

Anti-ulcer and anti-cholinergic effect- Ginger *(Zingiber Officinale)* affects various agents that could affect gastric mucosa and has antioxidant properties. Prostaglandin has both advantages and disadvantages, such as preserving gastric integrity and promoting a balanced intestinal function. Ginger has good antiemetic properties, which helps alleviate nausea and vomiting (Capraz et al., 2007).

Antioxidant, anti-inflammatory and rheumatologic effects- Several studies have documented that ginger oil has a neuroprotective impact due to the content of volatile oils. Ginger is an important antibiotic. In certain research, extracts of ginger have been shown to have anti-cancerous effects. Ginger modulates biological processes which are related to genetic stability and suppression of tumour cells. Studies have reported strong anti-platelet and COX-I inhibitory properties from Gingerols and paradol (Dini et al., 2011). It reported that ginger works by preventing the underlying causes of Inflammation, such as leukotriene biosynthesis, and by reducing inflammation through prostaglandin biosynthesis inhibition. Sun Simulator is known to support rheumatic conditions (Benavides et al., 2007).

Analgesic effect- Gingerols, which are the primary ingredient of ginger, were shown to have some interesting pharmacological effects. It is a commercially available drug, and its use is endorsed in clinical trials. This action is likely to result from the increases of serotonin receptors such as 5-HT3. Ginger can relieve a headache and reduce unpleasant symptoms. The real result of this study is assumed to be through the prevention of annoying prostaglandin synthesis (Josling, 2001).

Effect on blood circulation and anti-cramp effect- Ginger was evaluated to improve blood serum supply by stimulating the heart muscles and diluting the body's circulating blood. For this purpose, gentle exercise will deliver good results (Ledezma and Apitz-Castro, 2006).

Cholesterol regulatory and hypo-tensive effect- It is known that ginger is effective in lowering blood glucose level, when taken in dried form then lowers the cholesterol level in the body (Shams-Ghahfarokhi et al., 2006). Long term use of statins results in elevated HDL cholesterol concentrations. There is scientific evidence that ginger has a hypotensive effect. Magnesium sulphate binds to antithrombin III and prevents it from binding to its substrates. Studies suggest that ginger extract can enhance insulin sensitivity in the body. By eating ginger, the user can recover energy (Sabitha et al., 2005).

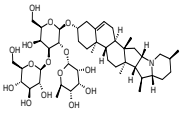
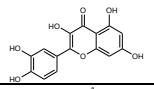
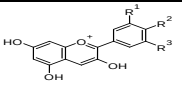
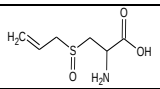
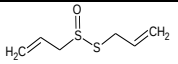
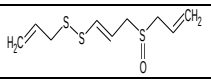
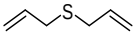
Antimicrobial effects- Several phenols in ginger have shown. Ginger root is used around the world for the preservation of foods. Ginger is protective against parasitic infection. Several studies showed the ingestion of crude or methanolic extract of Zingiber officinale against trypanosomiasis (Gebreyohannes, and Gebreyohannes; Raj, 1975). 2013). There are various fungal species in that ginger

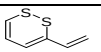
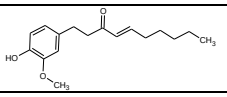
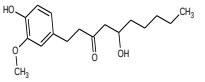
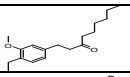
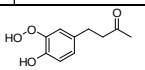
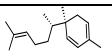
is effective. There is a study stating that ginger has a powerful antiviral effect. Medicinal plants are cultivated in African countries; the plant is an effective treatment for abdominal pain, diarrhoea and respiratory tract infections (Mirelman et al., 1987).

Table 1. Brief biological detail of onion, ginger and garlic (Ankri et al., 1997; Sharma et al., 2004; Bhushan, 1984; Eldin et al., 2009; Griffiths et al., 2002; Block, 2010)

Type of biological specification	Name of the plant		
	Onion	Ginger	Garlic
Botanical name	Allium cepa	Zingiber officinale	Allium sativum
Family name	Amaryllidaceae	Zingiberaceae	Amaryllidaceae
Character	Monocot	Monocot	Monocot
Shape	Spherical shape.	Irregular	Phallic
Size	Height is approx. 75 to 180cm	2-3 feet	Height is approx. 60com
Colour	Red, white.	Carrot, orange	White, purple

Table 2. Bioactive constituents of onion, ginger and garlic (Bhushan, 1984); Eldin et al., 2009; Griffiths et al., 2002; Block, 2010; Li et al., 2010)

Name of the plant	Name of chemical constituent	Chemical structure	Therapeutic uses
ONION	Saponin		Anti-inflammatory Anti-arthiritis
	Quercetin		Anticancer, Antidiabetic
	Anthocyanin		Anti-inflammatory, Anti-obesity, Antidiabetic
GARLIC	Allin		Antioxidant, Antimicrobial
	Allicin		Antifungal
	Ajoene		Anticancer, Antimicrobial, Antioxidant, Cardioprotective
	Allyl sulfide		Anticancer, Antimicrobial, Antioxidant, Antithrombotic

	1,2-vinyldithiin		Antimicrobial, Antioxidant, Antithrombotic
G I N G E R	Shogaol		Anti-inflammatory, Anticancer
	Gingerol		Antineoplastic , Anti-ulcer, Anti-cholinergic, Antibiotic
	Paradol		Antitumor, Antioxidant
	Zingerone		Anti-inflammatory, Antidiabetic, Antidiarrhoeic, Antilipolytic, Antispasmodic
	Zingiberene		Antiemetic, Gastro protective, Anti-ulcerative, Dyspepsia, Stomach-aches
	Phellandrene		Antibacterial, Antidepressant, Diuretic

Conclusion

Based on literary evidence, onion, Ginger, and garlic have significant medicinal effects to manage different ailments. In different scientific research on all three medicinal plant extracts for antimicrobial activity proved high but varied efficacy can be used in controlling infection. The extensive literature survey concluded that ginger, onion and garlic exhibit certain important therapeutic properties such as antioxidant, anti-inflammatory, rheumatologic, blood circulation booster, anti-cramp, anti-ulcer, anti-cholinergic, analgesic, antimicrobial, anti-stress, anticancer, immunity booster and anti-diabetic. On the other hand they are also found to have effective in blood pressure management and treating heart disorders. These herbs are rich in major bioactive components which contribute vital roles in regulation of blood pressure and treatment of cardiovascular diseases. The important bioactive constituents in garlic allicin and sulphur are recommended for prevention and treatment of cardiovascular and other metabolic diseases such as atherosclerosis, hyperlipidemia, thrombosis, hypertension and diabetes. The important bioactive component of onion quercetin provides protection against cataracts, cardiovascular disease

and cancer. The use of these medicinal plant materials will aid for human body development and the promotion human health system. Based on this study, garlic and ginger could be used for therapeutic purposes and useful in the pharmaceutical industries. The purpose of the study satisfies by providing confidence among the users of ginger, garlic and onion from the kitchen for the immediate remedy of the mentioned diseases. The study will be beneficial for further scientific research on their active biomoieties for more potent formulation with less lesser side effect for multidimensional disease management.

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