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Garlic: A Review of Medicinal uses and Therapeutic Effects

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ABSTRACT: Garlic (*Allium sativum*) is mainly used for prevention and treatment of different diseases. Recent studies support the effects of garlic and its extracts in a wide range of applications. Garlic, which is utilized as a spice and flavoring ingredient, is found to have fundamental nutritional components. It has anti-inflammatory, rheumatological, ulcer inhibiting, anticholinergic, analgesic, antimicrobial, antistress, antidiabetes, anticancer, liver protection, anthelmintics, antioxidants, antifungal, and wound healing properties as well as properties that help with asthma, arthritis, chronic fever, tuberculosis, runny nose, malaria, leprosy, skin discoloration, and itching, indigestion, colic, enlarged spleen, hemorrhoids, fistula, bone fracture, gout, urinary tract disease, diabetes, kidney stones, anemia, jaundice, epilepsy, cataract, and night blindness. The further studies are needed to find out the accurate action and more significance of garlic bioconstituents. Many studies showed the possibility of revival of garlic therapeutic values in different diseases.

KEYWORDS: Garlic, Bioconstituents, Cardiovascular diseases, Anti microbial, Therapeutic values etc.

I. INTRODUCTION

Dietary factors play a key role in the development of various human diseases. Across cultures, there are many different dietary patterns which are believed to promote human health. Despite cultural differences, there are some shared characteristics of healthy dietary patterns. Perceiving plant foods as beneficial diet is advised by the folklore of many cultures over centuries. (Leyla B. *et al.*, 2014).

Garlic (*Allium sativum* L.) has acquired a reputation in different traditions as a prophylactic as well as therapeutic medicinal plant. Garlic has played important dietary and medicinal roles throughout the history. Some of the earliest references to this medicinal plant were found in Avesta, a collection of Zoroastrian holy writings that was probably compiled during the sixth century BC (Dannesteter, 2003). Garlic has also played as an important medicine to Sumerian and the ancient Egyptians. There is some evidence that during the earliest Olympics in Greece, garlic was fed to the athletes for increasing stamina (Lawson and Bauer, 1998). Ancient Chinese and Indian medicine recommended garlic to aid respiration and digestion and to treat leprosy and parasitic infestation (Rivlrm, 1998). In the medieval period, garlic was also played an important role in the treatment of different diseases. Avicenna (1988), in his well-known book, *Al Qanoon Fil Tib* (The Canon of Medicine), recommended garlic as a useful compound in treatment of arthritis, toothache, chronic cough, constipation, parasitic infestation, snake and insect bites, gynecologic diseases, as well as in infectious diseases (as antibiotic). With the onset of Renaissance, special attention was paid in Europe to the health benefits of garlic. Garlic has attracted particular attention of modern medicine because of widespread belief about its effects in maintaining good health. In some Western countries, the sale of garlic preparations ranks with those of leading prescription drugs.



Fig.1 Garlic Bulb

Garlic is a bulbous plant; grows up to 1.2 m in height. Garlic is easy to grow and can be grown in mild climates (Figure1). There are different types or subspecies of garlic, most notably hard neck garlic and soft neck garlic. Allicin (allyl 2-propenethiosulfinate or diallyl thiosulfinate) is the principal bioactive compound present in the aqueous extract of garlic or raw garlic homogenate. When garlic is chopped or crushed, allinase enzyme is activated and produce allicin from alliin (present in intact garlic). Other important compounds present in garlic homogenate are 1 -propenyl allyl thiosulfonate, allyl methyl thiosulfonate, (E,Z)-4,5,9-trithiadodeca- 1,6,11-triene 9- oxide (ajoene), and γ -L-glutamyl-S-alkyl- L-cysteine. The adenosine concentration increases several-fold as the homogenate is incubated at room temperature for several hours. Another widely studied garlic preparation is aged garlic extract. Sliced draw garlic stored in 15-20% ethanol for more than 1.5 year is refereed to aged garlic extract. This whole process is supposed to cause considerable loss of allicin and increased activity of certain newer compounds, such as S-allylcysteine, sallylmercaptocysteine, allixin, N-0 -(Ideoxy- D-fructos- 1 -yl)-L-arginine, and selenium which are stable and significantly antioxidant. Medicinally used, garlic oil is mostly prepared by steam-distillation process. Steam-distilled garlic oil consists of the diallyl, allylmethyl, and dimethyl mono to hexa sulfides (Lawson and Bauer, 1998). Botanically, *Allium sativum* is a member of the Lillaceae family, along with onions, chives, and shallots (Iciek et al., 2009).

II. EFFECTS OF GARLIC ON CARDIOVASCULAR DISEASES:

Garlic and its preparations have been widely recognized as agents for prevention and treatment of cardiovascular diseases. The wealth of scientific literature supports the proposal that garlic consumption have significant effects on lowering blood pressure, prevention of atherosclerosis, reduction of serum cholesterol and triglyceride, inhibition of platelet aggregation, and increasing fibrinolytic activity (Chan et al., 2013). Both experimental and clinical studies on different garlic preparations demonstrate these favorable cardiovascular effects. In *in vivo* animal experiments, intravenous administration of garlic extracts produced slight reductions in both systolic and diastolic pressures (Sial and Ahmed, 1982) and oral ingestion of garlic extract in hypertensive animals brought the blood pressure back to the normal level (Chandekar and Jain, 1973).



It has been suggested that the mechanism of antihypertensive activity of garlic is due to its prostaglandin-like effects, which decrease peripheral vascular resistance (Rashid and Khan, 1985). Aged garlic extract was superior to placebo in lowering systolic blood pressure in patients suffering from uncontrolled hypertension. A dosage of 240-960 mg of aged garlic extract containing 0.6-2.4 of S-allylcysteine significantly lowered blood pressure by about 12 mmHg over 12 weeks (Ried et al., 2013a).

Anti-tumor effect of garlic

Many *in vitro* and *in vivo* studies have suggested possible cancer-preventive effects of garlic preparations and their respective constituents. Garlic has been found to contain a large number of potent bioactive compounds with anticancer properties, largely allylsulfide derivatives. Different garlic derivatives have been reported to modulate an increasing number of molecular mechanisms in carcinogenesis, such as DNA adduct formation, mutagenesis, scavenging of free radicals, cell proliferation and differentiation as well as angiogenesis. The growth rate of cancer cells is reduced by garlic, with cell cycle blockade that occurs in the G2/M phase (Capasso, 2013). In 1990, the U.S. National Cancer Institute initiated the Designer Food Program to determine which foods played an important role in cancer prevention (Dahanukar and Thatte, 1997). They concluded that garlic may be the most potent food having cancer preventive properties. Garlic has a variety of anti-tumor effects, including tumor cell growth inhibition and chemopreventive effects. In rodents, garlic and its constituents have been reported to inhibit the development of chemically induced tumors in the liver (Kweon et al., 2003) and reported in many organs in both rodent and human studies.

Diabetes mellitus

Many studies showed that garlic can reduce blood glucose level in diabetic animals. Garlic was effective in reduction of blood glucose in streptozotocin- as well as alloxan-induced diabetes mellitus in rats and mice (Sheela et al., 1995). Short term benefits of garlic on dyslipidemia in diabetic patients were shown (Ashraf *et al.*, 2005). Garlic significantly reduced serum total cholesterol and LDL cholesterol and moderately raised HDL cholesterol as compared with placebo in diabetic patients (Ashraf *et al.*, 2005). S-allyl cysteine, a bioactive component derived from garlic, restored erectile function in diabetic rats by preventing reactive oxygen species formation through modulation of NADPH oxidase subunit expression (Yang *et al.*, 2013). *Costus igneus* (Insulin plant) is also used as an alternative therapeutic for diabetes, the leaves of the plant help in curing diabetes and maintaining the blood sugar level and cholesterol (Pardhe D.D.,2021)

Anti-microbial effect of garlic

Garlic has been used for centuries in various societies to combat infectious disease. Historically, it is believed that Louis Pasteur described the antibacterial effect of garlic in 1858 for the first time, although no reference is available. More recently, garlic has been proven to be effective against a plethora of gram-positive, gram-negative, and acid-fast bacteria. It has been documented that garlic exerts a differential inhibition between beneficial intestinal microflora and potentially harmful enterobacteria (Ress *et al.*, 1993).The antibacterial activity of garlic is widely attributed to allicin. It is known that allicin has sulfhydryl modifying activity (Wills, 1956) and is capable of inhibiting sulfhydryl enzymes.

Antiviral properties

In comparison with the antibacterial action of garlic, very little work has been done to investigate its antiviral properties. The few studies have reported that garlic extract showed *in vitro* activity against influenza A and B (Fenwick and Hanley, 1985), cytomegalovirus (Meng *et al.*, 1993), rhinovirus, HIV, herpes simplex virus 1 (Tsai et al., 1985). In the case of HIV, it is thought that ajoene acts by inhibiting the integrin dependent processes (Tatarintsev *et al.*, 1992). Allyl alcohol and diallyl disulfide have also proven effective against HIV-infected cells (Shoji *et al.*, 1993).



Brain cancer

Organo-sulfur compounds found in garlic have been identified as effective in destroying the cells in glioblastomas, a type of deadly brain tumor. Scientists at the Medical University of South Carolina reported in the journal *Cancer* that three pure organo-sulfur compounds from garlic – DAS, DADS, and DATS – “demonstrated efficacy in eradicating brain cancer cells, but DATS proved to be the most effective.”

Garlic and the common cold

The “Prophylactic use of garlic may decrease the frequency of colds in adults, but has no effect on duration of symptoms.” Prophylactic use means using it regularly to prevent disease. Though there is some research to suggest that raw garlic has the most benefits, other studies have looked at overall allium intake, both raw and cooked, and have found benefits. Therefore, you can enjoy garlic in a variety of ways to reap its advantages.

III. CONCLUSION

The main biologically active ingredient of garlic (allicin) and its derivatives have significant nutritional and medicinal uses around the world. It's a low-toxicity, safe, and abundant source of physiologically active chemicals. Since ancient times, all portions of the plant have been used as a spice or seasoning for sausages and salads, as well as in folk medicine. The therapeutic benefits of garlic are due to a higher concentration of sulfur compounds in the plant. As a result, more pharmacological research is needed to determine its medical efficacy in improving human health. It would also be interesting to explore the effect of different forms of garlic extract on standard drug therapy, especially when used as adjuvant therapy. Although garlic is believed to be a safe substance, long-term trials of reasonable duration would provide insights into the possible side-effects of different garlic extracts. The safety of garlic should be tested especially in pregnant or breastfeeding women as well as in young children (Budzynska et al., 2012; Dante et al., 2013). Long-term and large trials are also needed to evaluate the differences in mortality, serious adverse events, and morbidity of cancer and cardiovascular diseases after garlic therapy.

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