SJIF Impact Factor (2026): 8.863| ISI I.F. Value: 1.241| Journal DOI: 10.36713/epra2016 ISSN: 2455-7838(Online)
EPRA International Journal of Research and Development (IJRD)
Volume: 11 | Issue: 4 | April 2026 - Peer Reviewed Journal

REVIEW ON ANTI-HYPERTENSIVE AND VARIOUS DISEASES ACTIVITY OF ALLIUM SATIVUM

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ABSTRACT
One of the earliest known medicinal plants, garlic has been used to treat a variety of human ailments since ancient times. The main therapeutic applications of garlic include lowering blood pressure and cholesterol, combating infections, and preventing cancer. Sulfur-containing substances that are quickly absorbed and digested make up the active ingredients. Garlic has been shown in numerous trials to reduce total cholesterol levels by about 10%, improving HDL/LDL ratios. Garlic is a mild antihypertensive that lowers blood pressure by 5-7%, according to a review of the literature. Garlic reduces clots on injured endothelium by increasing fibrinolytic activity and inhibiting platelet aggregation. Garlic's antidiabetic properties are another significant usage.
Garlic uses a variety of methods to regulate blood sugar levels. Garlic may help prevent some solid tumors, according to in vitro research and animal data. Garlic is therefore also useful in preventing cancer. Studies assessing its efficacy in treating youngsters or pregnant or nursing women are lacking. Garlic has also been suggested to have hepatoprotective, antihelmentic, anti-inflammatory, antioxidant, antifungal, and wound-healing properties.
KEY WORDS : *Allium sativum, anticarcinogenic, antimicrobial, antioxidant, cardioprotective, garlic*

INTRODUCTION

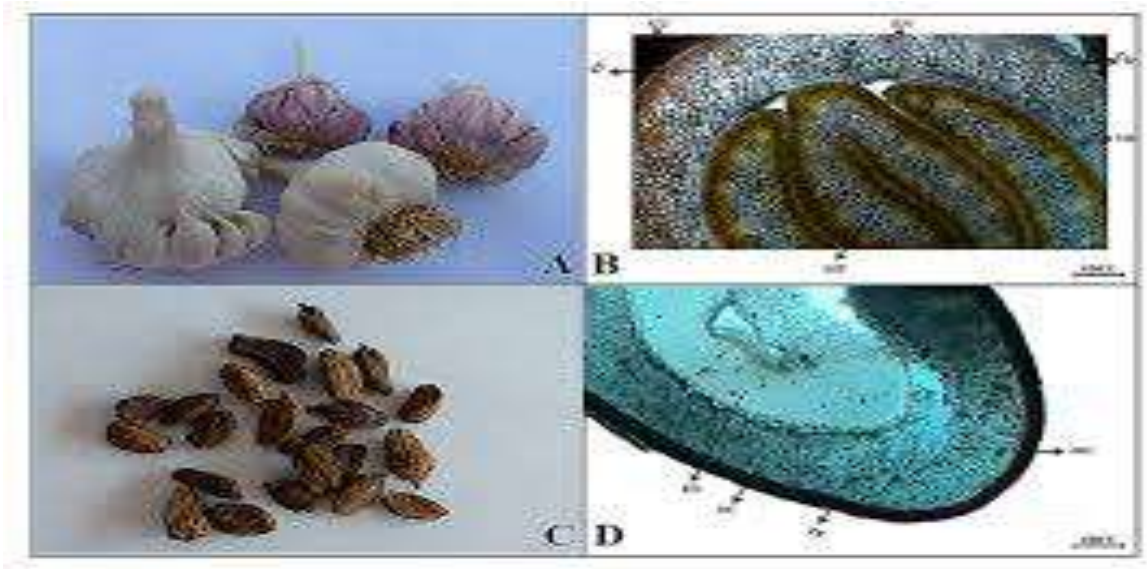
Allium sativum L., or garlic, belongs to the Alliaceae family and has long been valued as a spice and a common treatment for a number of illnesses and physiological conditions. The Celtic word "all," which means pungent, may be the source of the name garlic. Garlic is grown almost everywhere in the world. It seems to have started in central Asia, moved to China, the Near East, and the Mediterranean region, and then moved west to Central and Southern Europe, Northern Africa (including Egypt), and Mexico. For thousands of years, people have utilized garlic medicinally. Its therapeutic use dates back around 5,000 years to Sanskrit sources, while Chinese medicine has been using it for at least 3,000 years. Garlic was utilized medicinally by the Greeks, Romans, Babylonians, and Egyptians. Garlic was utilized as an antiseptic to prevent gangrene during World Wars I and II after Pasteur discovered its antibacterial properties in 1858.

Garlic is currently used mostly as an antibiotic, as a cancer preventive agent, and to prevent and treat cardiovascular disease by decreasing blood pressure and cholesterol. The active ingredients include a number of intricate sulfur-containing substances that are quickly absorbed, changed, and broken down. Garlic appears to improve HDL/LDL ratios and reduce total cholesterol concentrations by about 10%, according to pooled data from many randomized trials. Garlic is also beneficial as a mild antihypertensive, lowering blood pressure by 5-7%, according to randomized research. Additionally, garlic increases fibrinolytic activity and prevents platelet aggregation, which lessens clots on injured endothelium. Human controlled trials have not assessed the antibacterial effects suggested by in vitro evidence.

CHEMISTRY OF GARLIC

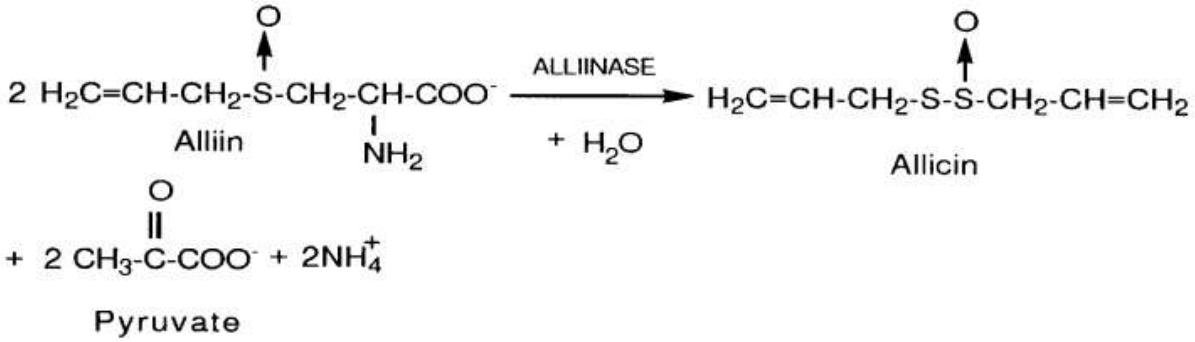
At least 33 sulfur compounds, a number of enzymes, 17 amino acids, and minerals like selenium are found in garlic. Compared to other Allium species, it has a greater concentration of sulfur compounds. Garlic's strong smell and many of its therapeutic benefits are caused by sulfur molecules. Alliin (S-allyl cysteine sulfoxide) makes up around 1% of dried, powdered garlic. Garlic does not contain allicin (diallyl thiosulfinate or diallyl disulfide), one of the most biologically active substances, unless it is crushed or sliced; damage to the garlic bulb triggers the enzyme allinase, which converts alliin to allicin. Vinyldithiines are produced through further metabolism of allicin. At room temperature, this breakdown takes place in a matter of hours; when cooking, it happens in a matter of minutes. Allicin has antibacterial properties against a variety of viruses, bacteria, fungus, and parasites. It was originally chemically isolated in the 1940s. Fresh garlic or garlic powder seem to have more physiological action than garlic oil, aged garlic, and steam-distilled garlic, which include different products of allicin transformation rather than substantial levels of aliin or allicin.

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Electroscopic view of allium sativum

Figure 1. Generation of allicin in a garlic clove.



ROLE OF GARLIC IN VARIOUS DISEASES

Antihypertensive Potential

Systolic blood pressure (SBP) above 140 is considered hypertension. mm Hg; diastolic blood pressure (DBP) ≥ 90 mm Hg) is a recognized risk factor for cardiovascular morbidity and mortality, impacting an estimated 1 billion people globally. Throughout human history, garlic (Allium sativum) has been used both medicinally and in food. Garlic's ability to lower blood pressure has been associated with its hydrogen sulfide generation and allicin content, which is released from alliin and the enzyme allinase, which has angiotensin II-inhibiting and vasodilating actions, as demonstrated in research on human and animal cells. There are fewer studies on how eating garlic affects blood pressure than there are on how it affects serum lipids. Once more, there are numerous conflicting findings on garlic's impact on blood pressure.

For instance, individuals with hypercholesterolemia, mild hypertension, and normotension who consumed around 900 mg of garlic powder per day had lower diastolic blood pressure than those who did not. In another trial, consuming 900 mg of day-1 aged garlic resulted in a 5.5% drop in systolic blood pressure and a slight drop in diastolic blood pressure. Contrary to the aforementioned research, 42 healthy persons who took 900 mg of garlic powder daily showed no change in blood pressure. There aren't many studies using animal models to examine how garlic affects blood pressure, but all of the findings show that garlic can lower blood pressure. For example, consumption of 2% wild garlic leaves powder for 8 weeks was effective in lowering the blood pressure in normotensive rats'. The antihypertensive effects of garlic extract in the rat, two-kidney one-clip Goldblatt model has been reported by the researcher. Garlic gavage (100 mg, kg–1 body wt) in rats has also been shown to block hypoxic pulmonary hypertension. Allicin is known to be a systemic vasodilator; moreover it acts as a pulmonary vasodilator in anesthetized intact-chest cat and isolated lung of the rat under constant flow conditions.

Wound Healing Potential

Angiogenesis is essential for successful wound healing, and chronic wounds associated with diabetes and venous or arterial insufficiency are characterized by decreased angiogenesis. It is crucial to look into how various natural treatments affect wound healing in order to intervene and enhance wound closure. The effects of various old garlic solution (AGS) concentrations on wound

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healing were examined using the chicken dorsum skin excision wound assay. The effects of AGS on wound closure, re-epithelialization, dermal matrix regeneration, and angiogenesis were assessed using gross, histopathology, scanning electron microscopy (SEM), and computer-based three-dimensional (3D) image-probing techniques.

Antidiabetic Potential

Diabetes is a metabolic disturbance that gradually affects the function of various systems in the body. Poorly controlled blood glucose is believed to be the most important factor in the development of diabetic complications in both type 1 and type 2 diabetes. Based on report of WHO, garlic can be used for helping treatment of hyperglycemia. According to a report by Ryan et al. (2001), one-third of diabetic patients take alternative medications that they consider efficacious, of which garlic is the most commonly used. Garlic and garlic constituents prepared by various means have been shown to have antidiabetic actions.

In diabetic patients, it was reported that garlic oil can correct hyperglycemia. In addition, a precursor of various allyl sulfide constituents of garlic oil, S-allyl-cysteine sulfoxide (allin), was shown to have a hypoglycemic effect similar to that of glibenclamide. Garlic has been found to be effective in lowering serum glucose levels in STZ-induced as well as alloxan-induced diabetic rats and mice. Most of the studies showed that garlic can reduce blood glucose levels in diabetic mice, rats and rabbits. It is not clear how garlic actually works in alleviating hyperglycaemia. The hypoglycaemic action of garlic could possibly be due to an increase in pancreatic secretion of insulin from β-cells, release of bound insulin or enhancement of insulin sensitivity. It has been previously suggested that garlic (allicin) can enhance serum insulin by effectively combining with compounds like cysteine, which would spare insulin from SH group reactions which are a common cause of insulin inactivation.

Anticancer Potential

A number of studies have demonstrated the chemopreventive activity of garlic by using different garlic preparations including fresh garlic extract, aged garlic, garlic oil and a number of organosulfur compounds derived from garlic. The chemopreventive activity has been attributed to the presence of organosulfur compounds in garlic. The exact mode of action was not fully understood, but several modes of action have been proposed. These include its effect on drug metabolizing enzymes, antioxidant properties and tumor growth inhibition. Most of these studies were carried out in the animal models. Also, recent research has focused on the antimutagenic activity of garlic. Recently, it has been observed that aged garlic extract, but not the fresh garlic extract, exhibited radical scavenging activity. The two major compounds in aged garlic, S-allylcysteine and S-allylmercapto-L-cysteine, had the highest radical scavenging activity. In addition, some organosulfur compounds derived from garlic, including S-allylcysteine, have been found to retard the growth of chemically induced and transplantable tumors in several animal models. Therefore, the consumption of garlic may provide some kind of protection from cancer development

Antiatherosclerosis and Hypolipidemic Potential

Atherosclerosis, the complex interaction of serum cholesterol with the cellular components of the arterial wall, the pathogenic substratum of many cardiovascular diseases, continues to be the leading cause of death in developed countries. However, the mechanism of the onset and development of atherosclerotic lesions is not completely understood. Nevertheless, in recent years, remarkable progress has been made in the prevention and treatment of atherosclerosis. Atherosclerotic diseases such as ischaemic heart disease, stroke, and peripheral arterial disease are associated with high serum cholesterol, male gender, age, hypertension, cigarette smoking, diabetes. The direct influence of garlic in preventing onset and development of atherosclerotic lesions and inducing regression of the lesions on the artery wall can be divided into antiatherogenic or preventive and antiatherosclerotic or therapeutic, respectively. Garlic therefore has both antiatherogenic (preventive) and antiatherosclerotic (therapeutic) effects on experimental atherosclerosis. Since garlic does not rely on lowering blood cholesterol, its antiatherosclerotic action is likely caused by its direct impact on the processes taking place in the arterial wall. Garlic acts at the level of artery cells, which explains its direct antiatherosclerotic effect. An buildup of intracellular and extracellular lipids is the first sign of atherosclerosis. The main signs of atherosclerosis at various stages of plaque formation are lipid accumulation (lipidosis), increased proliferation, and accumulation of extracellular connective tissue matrix (fibrosis) in subendothelial intimal cells, which is accompanied by stimulation of cell proliferation and extracellular matrix production.

Antimicrobial Potential

Crushed garlic has long been known to have antimicrobial qualities. A broad range of antibacterial action against both Gram-positive and Gram-negative bacteria, including species of Escherichia, Salmonella, Staphylococcus, Streptococcus, Klebsiella, Proteus, Bacillus, and Clostridium, has been demonstrated by a number of garlic preparations. Garlic can affect even acid-fast microorganisms like Mycobacterium tuberculosis. A variety of allyl sulfides were extracted from steam distillations of crushed garlic cloves conducted more than a century ago, and the component responsible for the exceptional antibacterial action of crushed garlic cloves was found. The substance was discovered to be an oxygenated sulfur compound, which they named allicin after the Latin name of the garlic plant, Allium sativum.

Antifungal Potential

Garlic (Allium sativum) is an intriguing herb with alleged powers ranging from warding off vampires to the more recently reported power of curing fungal infections. Fungal infections have become an important aspect of modern infectious disease practice. The

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prominence of fungi as pathogens may be due to the longer survival of immunocompromised patients, the recent development and usage of broader-spectrum antibiotics, or the wider use of immunosuppressive and cancer chemotherapeutic agents. High dilutions of extracts of Allium sativum, or garlic, have been shown to possess fungistatic and fungicidal activity in vitro and in vivo. In the People's commercial A. sativum extracts are widely used to treat patients with systemic fungal infections. In support of the use of A. sativum to treat cryptococcal meningitis, researcher found anti-Cryptococcus neoformans activity in plasma and cerebrospinal fluid (CSF) following intravenous (I.V.) administration of a commercial A. sativum extract. Allium sativum, had the best activity against the three Candida albicans. The antifungal activity of six fractions derived from garlic was investigated in an in vitro system. Ajoene had the strongest activity in these fractions .

Immunomodulatory Potential

Allium sativum an important medicinal plant having immunomodulatory effects. Three proteins showing immunomodulatory were separated from garlic by Q-Sepharose chromatography of 30 kD ultrafiltrate of raw garlic extract. All these proteins exhibit the mitogenic activity towards human peripheral blood lymphocytes, murine splenocytes and thymocytes. P.Venkatesh et al.,was isolated these immunomodulatory proteins from raw garlic, and examine their effects on the immune system (lymphocytes, mast cells and basophils) in relation to mitogenicity and hypersensitivity. The richly present garlic ImPs, QR-1 and QR-2, identified in present study as the lectins or agglutinins ASA II and ASA I, was found to be potent mitogenic activity having potential utility in therapeutic immunomodulation. Garlic has been shown to be a possible biological response modifier. First reported the augmentation of tumor immunity by garlic; subsequently a variety of immunostimulatory effects of garlic were reported. Because certain diseases can be caused by immune dysfunction, modification of immune functions by garlic may contribute to the treatment and prevention of diseases. Thus, some pharmacologic effects of garlic might be mediated through immunomodification. A unique garlic preparation, called aged garlic extract (AGE) has been reported to have an array of pharmacologic effects, including immunomodulation.

Antioxidant Potential

In vivo antioxidant effects of several organosulfur compounds derived from garlic have been studied. In one study, two lipophilic organosulfur compounds, diallyl sulfide (DAS) and diallyl disulfide (DADS) and two hydrophilic organosulfur compounds, s-ethyl cysteine (SEC) and n-acetyl cysteine (NAC), protected against lipid-related oxidations by activating associated antioxidant enzymes. The in vivo antioxidant effects of four test organosulfur compounds against lipid-associated oxidations have been studied by researcher reported that these antioxidant effects were due to the activation and modification of several enzymes such as 3-hydroxy-3 methylglutaryl- CoA reductase, glutathione-s-transferase and catalase



FIGURE 1: MORPHOLOGY OF *ALLIUM SATIVUM* LINN.

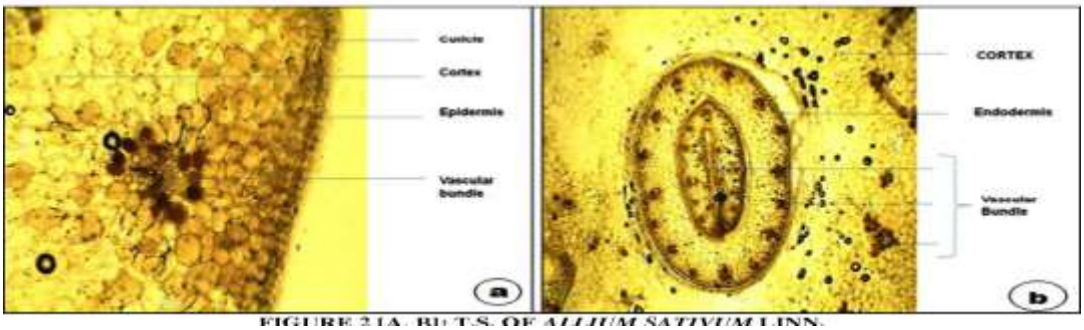


FIGURE 2 (A, B): T.S. OF *ALLIUM SATIVUM* LINN.

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CONCLUSION

By preventing the growth of many bacterial and fungal strains, a single clove of garlic has the power to heal a man from a wide range of illnesses. The use of garlic (Allium sativum) in cardiovascular therapies dates back more than three millennia to ancient times. Garlic has been found in numerous animal experiments to decrease cholesterol. When raw garlic is crushed, the enzyme alliinase can work on the stable precursor allin, producing allicin, the active ingredient in garlic. Due to the numerous scientific studies that support these benefits, garlic's antidiabetic, antibacterial, and perhaps anticancer properties are well acknowledged. Additionally, garlic possesses antihelmentic, antioxidant, and hepatoprotective properties. Garlic's anticoagulant, anti-inflammatory, immunomodulatory, and wound-healing properties are additional pharmacological effects that need more investigation.

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