

Garlic: Exploring Its Health and Medicinal Properties

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Deepak Kumar

Assistant Professor, Department of Vegetable Science, MAJU, Rampur, Uttar Pradesh

Garlic, an essential spice and bulb crop from the Amaryllidaceae family, stands as a potent nutraceutical rich in polyphenol and organosulfur

compounds, revered for its consumption since ancient times. Its historical significance spans centuries, valued not only as a culinary spice but also as a medicinal remedy. In 1550 B.C., during a time when pharmaceuticals and antibiotics were nonexistent, garlic emerged as a primary solution to combat widespread epidemics such as cholera, influenza, typhus, and dysentery. Throughout diverse cultures and over millennia, garlic has maintained a pivotal role as a potent remedy deeply rooted in cultural traditions. Ancient Egyptians held garlic in reverence, placing it in tombs with a belief in its enduring benefits even in the afterlife. Greeks and Romans attributed strength and resilience to its consumption, while traditional Chinese and Indian medicine embraced its presumed body-warming

effects and health-boosting qualities. In medieval Europe, garlic was used to treat infections and digestive issues. Across varied cultures, it was believed

to ward off malevolent spirits and diseases. Beyond its medicinal value, garlic remains a culinary cornerstone globally, revered for its ability to enhance both health and flavour in cuisine. Moreover, spices, including garlic, are believed to offer



medicinal advantages by potentially preventing various acute and chronic illnesses through their role in enhancing flavour, aroma, and colour in food.

Nutritional Value of Garlic

Here are the nutritional values for garlic per 100 grams (3.5 oz), along with an approximate percentage of the Recommended Dietary Allowance (RDA) based on US recommendations for adults (see Table 1).

Nutritional Values	Quantity	% of RDA
Energy	623 kJ (149 kcal)	-

Carbohydrates	33.06 g	-
Sugars	1 g	-
Dietary fiber	2.1 g	-
Fat	0.5 g	-
Protein	6.36 g	-
Minerals		
Calcium	181 mg	18%
Iron	1.7 mg	13%
Magnesium	25 mg	7%
Manganese	1.672 mg	80%
Phosphorus	153 mg	22%
Potassium	401 mg	9%
Sodium	17 mg	1%
Zinc	1.16 mg	12%
Vitamins		
Thiamine (B1)	0.2 mg	17%
Riboflavin (B2)	0.11 mg	9%
Niacin (B3)	0.7 mg	5%
Pantothenic acid (B5)	0.596 mg	12%
Vitamin (B6)	1.235 mg	95%
Folate (B9)	3 µg	1%
Vitamin C	31.2 mg	38%

Medicinal Properties of Garlic

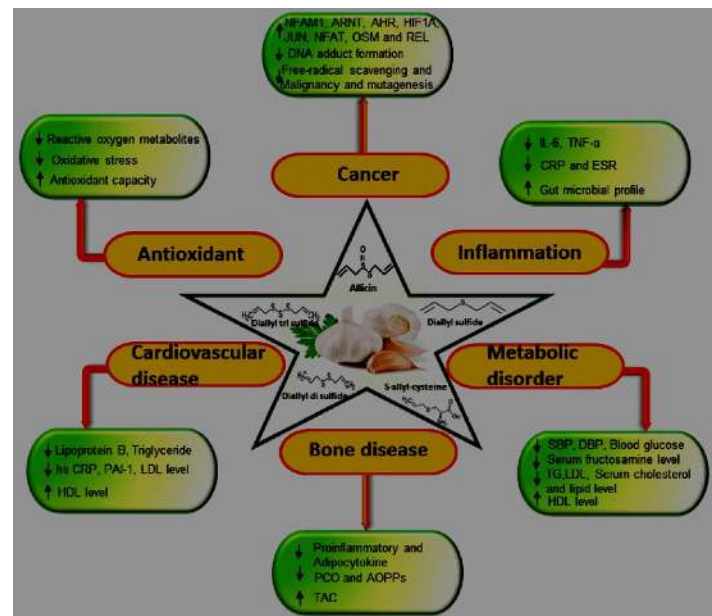
Here are several medicinal properties of garlic described below:

1. Antioxidant Capacity

Garlic boasts remarkable antioxidant capabilities owing to its phenolic compounds, contributing significantly to its nutritional value. Research highlights the efficacy of aged garlic extract (AGE) in combating endothelial dysfunction, an early marker of atherosclerosis, by curbing reactive oxygen species generated through heightened metabolism or chronic inflammation. Notably, a daily intake of 400 mg of garlic extract (GE) for three months showcased improved antioxidant status in a randomized double-

blind placebo-controlled nutritional study. This improvement played a pivotal role in reducing cardiovascular risk among obese individuals, evidenced by regulated levels of triglycerides (TGs), low-density lipoprotein cholesterol (LDL), high-density lipoprotein (HDL), C-reactive protein (hs-CRP), and plasminogen activator inhibitor-1 (PAI-1). Moreover, diabetic patients exhibited enhanced antioxidant activities after a 30-day regimen of consuming 3.6 g of garlic cloves daily. This intake notably amplified catalase (CAT), superoxide dismutase (SOD), and glutathione peroxidase (GPx) activities within circulating human erythrocytes, demonstrating a significant improvement compared to the control group.

2. Anti-Inflammatory Properties



Source: Ansari et al., 2020

Fig.1. Visual depiction illustrating how garlic influences biomarkers in cancer, antioxidant activities, cardiovascular disease, bone health, inflammation, and metabolic disorders in clinical trial. In this

representation, the symbol (↓) signifies decreased activity, while (↑) denotes increased activity.

Garlic's potent anti-inflammatory properties have shown promise in addressing chronic health concerns like cancer and heart disease linked to inflammation. In a notable eight-week clinical trial involving end-stage renal disease patients undergoing peritoneal dialysis, a standardized garlic extract (400 mg, twice daily) revealed significant reductions in key inflammatory markers such as interleukin 6 (IL-6), C-reactive protein (CRP), and erythrocyte sedimentation rate. This compelling evidence highlights garlic as a potential natural remedy for managing chronic conditions associated with inflammation.

3. Lipid Lowering Effect

Garlic showcases promising potential in reducing blood cholesterol among hyperlipidaemic patients. Its combined use with olive oil effectively managed cholesterol, triglyceride levels, and dyslipidaemia in diabetic individuals. Research findings revealed that both powdered and non-powdered forms of garlic significantly lowered serum lipid levels within one to three months. Additionally, a study involving 23 hyperlipidaemic patients demonstrated that garlic extract consumption over four months led to increased high-density lipoprotein (HDL) levels and decreased low-density lipoprotein (LDL) and overall cholesterol levels.

4. Reducing Blood Cholesterol

Garlic's efficacy in reducing blood cholesterol levels among hyperlipidaemic patients is noteworthy. When combined with olive oil, it effectively managed cholesterol, triglyceride levels, and dyslipidaemia in diabetic patients. Studies, such as the one by Silagy and

Neil in 1994, demonstrated that both powdered and non-powdered forms of garlic significantly lowered serum lipid levels within one to three months. Notably, a study involving 23 hyperlipidaemic patients revealed that consuming garlic extract for four months resulted in increased high-density lipoprotein (HDL) levels and decreased low-density lipoprotein (LDL) and overall cholesterol levels."

5. Panacea Against Cancer

Cancer stands as a leading global cause of mortality, with diagnosed cases projected to rise significantly by 2030. Certain epidemiological studies within the Chinese population highlight an inverse relationship between lung cancer risk and regular consumption of raw garlic or its components over several years. In hepatological malignancies, garlic extract (GE) showcased potential in preventing febrile neuropathy post-chemotherapy. Studies also revealed a correlation between prolonged intake of garlic supplements and reduced risk of colorectal adenoma, a precursor to colorectal cancer (CRC). Moreover, GE administration demonstrated a decrease in colon adenomas and CRC, potentially attributed to enhanced NK cell activity. Notably, in pancreatic and liver cancer patients, aged garlic extract (AGE) helped maintain NK cell count after six months of regular intake

Cardiovascular disease (CVD)

CVD causes over 17.3 million deaths annually and is expected to reach 23.6 million by 2030. Garlic's compounds have shown promise in reducing CVD risk factors like atherosclerosis, hypertension, and hyperlipidaemic. Studies highlight aged garlic extract's (AGE) ability to reduce plaque in coronary arteries and improve lipid profiles, while garlic extract (GE)

positively impacted endothelial function and inflammation markers in obese individuals. Additionally, GE lowered lipoprotein B and raised HDL levels in mild hypercholesterolemia patients, indicating a cardio protective effect.

Blood Pressure

Hypertension, characterized by elevated blood pressure, poses health risks by straining arteries. Garlic shows promise in managing high cholesterol and enhancing immunity as a hypertension treatment. Studies reveal aged garlic extract's (AGE) ability to reduce systolic blood pressure (SBP) without adverse effects, particularly in uncontrolled hypertension. Crushed raw garlic intake at 100 mg/kg twice daily for four weeks lowered SBP and diastolic blood pressure (DBP) in metabolic syndrome patients by positively impacting lipid profiles. Additionally, a 12-week diet supplemented with 300 mg of garlic homogenate notably decreased SBP and DBP in mild hypertension patients, demonstrating garlic's potential in blood pressure management without notable side effects, particularly in those with mild hypertension

Help in Diabetes

Diabetes, a life-threatening chronic condition, arises from insulin deficiency or resistance, becoming increasingly prevalent globally. With the number of diabetics quadrupling in the last three decades, estimates project a rise to 642 million by 2040, according to the International Diabetes Federation. Recent meta-analyses suggest that garlic may benefit diabetic patients by reducing glucose parameters like haemoglobin A1C (HbA1C) and fasting blood glucose levels, alongside improving lipid profiles. Studies demonstrated that 300 mg of garlic supplementation

twice daily for 12 weeks notably enhanced serum lipid levels in diabetic patients with uncontrolled dyslipidaemia. Additionally, combining metformin and garlic showed promise in treating diabetes by significantly reducing total cholesterol, LDL, and TG levels, effectively improving hyperlipidaemic over 24 weeks.

Skin Disease

Garlic, a staple in traditional and complementary medicine, has proven effective in topical applications for various skin conditions. Clinical studies highlight its efficacy in treating symptoms related to warts, denture stomatitis, venous ulcers, and skin wounds. Aged garlic extracts (AGE) exhibited dose-dependent wound healing potential in preclinical studies within six days of application. In a randomized clinical trial, garlic extract (GE) at 40 mg/mL three times a day emerged as a viable alternative to nystatin in treating denture stomatitis. Additionally, a non-randomized pilot study on patients with venous ulcers using garlic-based herbal ointments demonstrated anti-inflammatory and epithelizing properties, reducing the ulcer area after seven weeks of application.

Other Disease

Given the escalating antibiotic resistance, there's growing interest in spices like garlic for their potent antimicrobial properties against viruses, bacteria, yeast, and fungi. Garlic's mechanisms involve inhibiting microbial enzymes, hindering growth substrates, altering microbial structure, and preventing bacteria from adhering to cells. Studies showcased garlic's effectiveness in mouth rinses against *Streptococcus mutans*, *Lactobacilli* species, and *Candida albicans* in children with severe early

childhood caries. Additionally, 1500 mg of garlic tablets per day effectively treated *Candida* vaginitis, while a trial reported adverse effects in asymptomatic women using 350 mg tablets twice daily. Moreover, Allicor tablets at 600 mg daily reduced acute respiratory diseases by 2–4-fold in the first stage and 1.7-fold in the second stage of acute respiratory viral infection compared to controls, demonstrating a reduction in infection-related morbidity.

Conclusions and Future Perspectives

From this extensive research, garlic emerges as a versatile option for treating and preventing a diverse range of illnesses. Its multifaceted properties, including antioxidants, anti-inflammatory agents, and lipid-lowering capabilities, demonstrate its potential in

addressing various health concerns. Garlic and its preparations have shown promising outcomes in combating cancer, providing cardio protection, managing blood glucose levels, fighting against microorganisms, reducing blood pressure, and offering an array of other health benefits. The rich array of health-promoting properties exhibited by garlic positions it as a valuable candidate for future exploration and utilization in medical treatments. Further investigations and clinical studies into the intricate mechanisms underlying garlic's effects across different diseases will likely unveil additional therapeutic avenues, enhancing our understanding and fostering its application in healthcare practices

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