Garlic: A Review of Its Medicinal Effect and Production

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Abstract- **This review's primary goal is to give a comprehensive overview of the productivity of garlic crops and the production management needs related to soil, climate, and fertilisation in Ethiopia, while also comparing these factors to current research trends and outlining potential future benefits of soil. studies on nutrient management and its significance for cultural and agronomic methods. This study examined the use of balanced nutrients when moisture availability is at its best. in various soil types is a crucial crop management technique that could aid in crop quality and yield. Moreover, insufficient moisture and nutrients in the soil have been the main limitations in the productivity and production of garlic; the crop's roots are relatively shallow It necessitates regular fertilisation and irrigation with several kinds of This review's primary goal is to give a comprehensive overview of the productivity of garlic crops and the production management needs related to soil, climate, and fertilisation in Ethiopia, while also comparing these factors to current research trends and outlining potential future benefits of soil. studies on nutrient management and its significance for cultural and agronomic methods. This study examined the use of balanced nutrients when moisture availability is at its best. in various soil types is a crucial crop management technique that could aid in crop quality and yield.04People utilise garlic products as medication in a variety of ways in their daily lives. Consequently, scientists from a range of fields are currently focusing their attention on learning more about the potential health benefits of garlic. Researchers' primary focus on the therapeutic benefits of Garlic has a minimally harmful, broad-spectrum medicinal effect. Antimicrobial properties of garlic extract action against numerous viral, fungal, and bacterial species. There is a greater concentration of in garlic. sulphur components, which give it its therapeutic properties. The components of garlic that are chemical have also been studied for the treatment of blood pressure, diabetes, cancer, and cardiovascular disease. atherosclerosis and hyperlipidaemia, receiving great marks from multiple writers.**

Medicinal History

Garlic has been used medicinally for around 5000 years. The Sumerians of Mesopotamia (the area around the Tigris and Euphrates rivers) and the ancient Indians were the first to document its use. It originated in far older writings and was first mentioned in an Ayurvedic medical textbook in 500 ADS, when it was incorporated into widespread Ayurvedic medicine in India. Additionally, garlic was highly valued in Egypt, where it was discovered preserved in the tombs of pharaohs and atop the Great Pyramid of Cheops bears an inscription indicating its widespread use by the pyramid builders. [1,2,3]

Garlic is mentioned in 22 medicinal formulae found in the Egyptian Ebers Codex, which dates back to 1550 BC. The Bible states in Numbers 11:5 that the Israelites, or Jews, wept for it when they fled Egypt in 1400 BC. The widespread use of garlic among The Jews have persisted since their dispersion among other people, and they still exist now. nations, and has even encouraged the use of it by other governments. China has utilised the use of garlic as medicine dates back to a Chinese medical literature and was initially documented about AD 500. Garlic was used by the Greeks to cure and fortify Olympic competitors. injuries. Garlic was widely utilised throughout Europe, particularly in England, during World War I to heal diarrhoea and combat wounds. Russia, a country where garlic has long been utilised, employed it once more to treat soldiers' wounds during World War II. drained of penicillin, earning them the moniker "Russian penicillin." Hippocrates, the Greek physician who lived from 460 to 370 BC, is regarded as the "father of medicine," suggested using garlic to treat cancer, pneumonia, and infections. better menstrual flow, increased urine production, and stomach issues. [6,7]

Climate and Soil Requirements of Garlic Crop

Garlic production occurs in most countries ranging from the equator to about the 500 latitude and grows best within the range of 12-24 0 C temperature (Nonnecke, 1989). High temperatures are required for bulb development, but cooler conditions in the early stages Favor vegetative growth and elevations from 500-2000 meters above sea level provide suitable growth condition The development of bulbs and vegetative growth are hampered by high humidity and precipitation. Too little moisture and readily accumulating water agitate plants. In order to get the most yield, the top 30 centimetres of soil should have kept near the field's development potential (Brewster, 1994; Yamaguchi and Rubatzky, (1997). [11,12] The yearly and seasonal fluctuations in precipitation seriously hinder the production of agriculture in in general and the production of garlic specifically. However, irrigation is available in every location, a significant amount of money and capital investment; consequently, rain-fed farming might will still be quite important in the near future, particularly in regions that receive enough rainfall. As a high-value crop, garlic needs rich soil, excellent drainage, friable soil—ideally with a high level of organic matter—and water that isn't lacking until two weeks prior to harvest. The crop loves soil with a pH of 6.5 to 7.5 since it is susceptible to greater acidity, and an excess of water supply two weeks prior to harvesting time impacts the storage quality. The types of soil that are best for growing garlic crops

Growing bulbs is best suited for soils with a high concentration of organic matter (more than 2.0%), deep mineral topsoil, well-drained muck soils, and extremely fine sandy loam (silts) soils, according to the Journal of Agricultural Sciences, vol.11, no. 3 190 (2016). [13,14,15] The most significant agricultural soils in Ethiopia are Cambio sols (12%), Vertisols (9%), Flavanols (7%), Nitisols (6%) and Andosols (1%), among the different types of soil that are present there (FAO, 1986). According to M'Nen (1992), the two types of soil found in the Debre Zeit area are andosols and vertosols, with respective organic matter contents of roughly 2.05% and 1.89%. Compared to vertosols, andosols, or light grey soil, have better drainage, a higher concentration of organic matter, and nutrients (N, K, and some micronutrients). Andosols have a higher sand content, which is more crucial for bulb growth and easy soil expansion. However, this sand fixes minerals, especially phosphorus, making the resource unavailable to the crop. Vertisols are very prolific in the region, according to M'Nen (1992); yet, drainage and management of the dirt is laborious. Discussing about on the highlands, vertosols are found on 8 million acres. thought to be appropriate for grains and pulses alike Regarding veggies. But their meagre supply of N capacity and low level of organic matter in addition to their serious issues with water logging restrict their output Before planting, the crop needs a well-prepared soil seedbed that has been prepared through frequent ploughing and moderate irrigation. A well-decomposed FYM application at a rate of 10 to 20 t ha-1 is required (FAO, 2003). Because they can contain more moisture and nutrients and are less likely to crust or compaction, rich organic matter soils are desirable. Applying organic fertilisers helps clay soil structure to open up and allow air penetration to roots and drainage, two things that are essential for healthy plant growth. [16,17]

Post Harvest Handling and Bulb Storage Conditions of Garlic Crop

After harvesting, vegetables—especially perishable ones—need to be handled and stored properly. In this sense, bulb crops have greatly declined in quality; nonetheless, since curing bulbs fulfils multiple purposes, it should be done. Initially, it dries the outer two to four scales, which offers mechanical protection, restricts the entry of rot-causing organisms into wounded tissues or still-meaty pseudo stems, and limits gas exchange, including the intake of moisture, oxygen, and carbon dioxide as well as effluent, all while maintaining an appealing appearance. Additionally, it seals the neck left attached to the crown after topping and dries the roots still linked to the bulb after undercutting, preventing disease infection. Last but not least, cure promotes dehydration and the closing of any wounds from mechanical damage or bulb growth. All of these are intended to lower the bulbs' metabolism and encourage mechanical damage. sleeping Curing also permits the leaves to gradually senesce, and compounds in the leaves penetrate into the bulbs to prevent sprouting and increase resistance to fungi that cause illness. [18,19]

Since fresh garlic isn't being sold, it needs to be dried before being put away. To avoid losses, careful curing and drying before storage is essential. To guarantee that the product maintains its quality until it reaches the customer, further precautionary handling and the selection of an appropriate storage method are crucial for the cultivar type in question. Bulbs have organs for natural storage. Bulb shelf life can be efficiently increased at the small scale by using straightforward, naturally ventilated storage structures made of poles, wire meshes, and grass thatched covering facing the direction of the prevailing wind. [21,22] For appropriate storage, racks or stages with two or three layers of bulbs would be ideal. The most crucial thing to remember in this situation is that garlic needs to be fully dried, cured, and matured before being stored. Ventilation, a consistent, relatively low temperature, low humidity, appropriate maturity, and lack of disease infection are all necessary for optimal storage. The microflora of preserved temperate onions usually contains Aspergillus fumigates and Penicillium species, however the former only thrive at temperatures over 40 degrees Celsius and the latter at temperatures between 1 and 5 degree or 20 and 25 degrees Celsius. The shelf life of bulbs in storage is also influenced by the climate of the storage place. Generally speaking, garlic respiration rates are low, but they grow exponentially with storage temperature between 0 and 20C, and they are a reliable indicator of postharvest quality decline.

Storage life is greatly impacted by relative humidity, which can occasionally have a bigger impact than temperature. Depending on the cultivar and species, long-term preservation can be achieved with relative humidity ranges of 50–60% and ideal temperature ranges of 0 to 5 0C. preservation times can range from 6 to 9 months. Additionally, they need to have a mesh bag or an open tray for proper air circulation. Garlic crop quality and shelf life are also influenced by the methods and intentions of bulb storage. The bulbs that are chosen for planting stock are often kept in cold warehouses with their dry tops attached. Whole bulbs keep better than individual cloves. [23,24]

ROLE OF GARLIC IN HEALTH

With good reason, garlic is regarded as one of nature's amazing plants with therapeutic properties. It has anti-tumour qualities, lowers blood pressure, blood sugar, blood cholesterol, and blood coagulation, and inhibits and kills germs and fungi. In order to prevent illness and preserve health, it can also strengthen the immune system. It is capable of invigorating the lymphatic system. This accelerates the elimination of waste items from the physical form. Additionally, it is thought to be a powerful antioxidant to ward off damage from free radicals to cells. It could assist in prevent heart disease, strokes, certain types of cancer, and illnesses caused by viruses. Garlic on its own can provide us more than two One hundred strange substances with the potential to shielding the human body against a range of illnesses with substances. [24,25]

As natural blood thinner

A higher level of fibrin in the blood can result in a heart attack. Platelets and fibrin are important components of blood coagulation. Garlic components are even more effective than aspirin at reducing blood fibrin levels by preventing its production. Garlic's anti-clotting properties appear to be attributed to a sulphur component called ajoene, which is only present when the temperature is room temperature or higher. Raw or freeze-dried garlic does not contain ajoene. Garlic is thought to aid increase the breakdown of fibrin in persons from 24 to 30% when added to a diet. [26,27]

As natural immunity booster

The emergence of terrifying viral infections such as HIV/AIDS has led to a renewed focus on strengthening the immune system. Increasing the body's resistance to infection has become even more crucial since these diseases lack viable therapies or cures. There are a lot of sulphur-containing amino acids and other chemicals in garlic that appear to stimulate the immune system. It is one of the body's most remarkable immune system conductors, boosting immunological function by increasing the activity of killer cells, or macrophages. Inadequate diet, cigarette smoke, physical harm, stress, and chemical pollution are some of the things that continuously beat us. Given the extreme strains that our immune systems endure, it is obvious that extra nutrients like garlic are required.[28]

Just the extraordinary germanium content provides outstanding immunological activation. Garlic also includes thiamine, sulphur, niacin, phosphorus, and selenium in addition to germanium. Using an alliin standardised garlic powder mixture, preliminary human investigations have shown beneficial benefits on phagocytosis and immunoreactions. When examined ex vivo for their ability to engulf Escherichia coli bacteria, 600 mg of garlic powder administered daily for three months caused significant ($p<0.01$) increases in the percentage of phagocytosing peripheral granulocytes and monocytes in aged participants. HIV/AIDS patients were administered an unprocessed garlic extract (5 to 10 g/day) in a further human trial. The natural killer cell activity of the seven patients who finished the 12-week study significantly increased from a very low mean.

Garlic has been shown to increase the activity of natural killer cells in HIV/AIDS patients' trials conducted in the United States. extracts, as well as Chinese research on viral infections in the bone patients undergoing bone marrow transplants have shown a "potent antiviral properties. A placebo-controlled double-blind study employing a supplement that yields 100% allicin has revealed that allicin can lessen the likelihood of the typical cold and overcame its symptoms [29,30]

Antiviral

Vaccinia virus, vesicular stomatitis virus, herpes simplex virus types 1 and 2, influenza B, para-influenza virus type 3, coxsackievirus species, human immunodeficiency virus type 1, and human rhinovirus type 2 have all been shown to exhibit antiviral action against garlic and its sulphur components. Ajoene > allicin > allyl methyl thiosulfate > methyl allyl thiosulfate was the sequence in which the chemicals in garlic were found to have virucidal activity; alliin, deoxy alliin, diallyl disulfide, and diallyl trisulfide showed no virucidal activity.[31]

Garlic is an effective treatment for the herpes simplex virus and the influenza B virus, according to several scientific investigations. Garlic has been proved by two independent researchers in Romania and Japan to be able to shield living things from the influenza virus; a double-blind placebo-controlled trial has demonstrated notable protection. common cold pathogen. The Garlic Centre's research, which was published in Advances in Therapy, is the first comprehensive study to demonstrate the benefits of taking Alima Powder capsules once day for the prevention, treatment, and decrease of reinfections.[32]

Antibacterial

Bacteria include Staphylococcus, Streptococcus, Micrococcus, Enterobacter, Escherichia, Klebsiella, Lactobacillus, Pseudomonas, Shigella, Salmonella, Proteus, and Helicobacter pylori are inhibited in growth by garlic extract. The primary cause of its antibacterial activity is the allicin that is formed by the enzyme alliinase when alliin is present. In crushed garlic extracts, allicin is thought to be the most effective antibacterial agent; nevertheless, it can be unstable, degrading in 16 hours at 23°C. The allicin molecule is stabilised when a water-based extract is used, though, since water forms a hydrogen bond with the reactive oxygen atom in allicin. Alternatively, the molecule may be destabilised by water-soluble components in crushed garlic. This method's drawback is that allicin can react to create diallyl disulphide, which lacks allicin's antibacterial potency when combined with water.[34]

Prevents diabetes

Numerous animal studies have demonstrated the efficacy of garlic in lowering blood glucose levels in both alloxan- and streptozotocin-induced diabetic mice mellitus. The majority of these studies have shown that garlic can lower blood glucose levels in diabetic mice and rabbits. An investigation was carried out to assess the effects of oral administration of garlic extract for 14 days on the levels of serum glucose, total cholesterol, triglycerides, urea, uric acid, aspartate amino transferase, and alanine amino transferase levels in both streptozotocin-induced diabetic mice and normal mice. The findings of the study demonstrated a significant ($p<0.05$) decrease in serum glucose, total cholesterol, triglycerides, urea, uric acid, and aspartate amino transferase and alanine amino transferase levels, while increasing serum insulin in diabetic mice, but not in normal mice. glipalamide, it was demonstrated that garlic's antidiabetic action outperformed glipalamide's.[35]

Pharmacological Effects and Indicated Active Compounds

As stated in the Introduction and Table I, there are an astounding number of papers regarding the pharmacological effects of garlic cloves and garlic products—1202 in vivo and in vitro studies total, of which 208 involve human subjects. Since it is not possible to cover every effect in depth in this brief analysis, Reuter et al. just released an extremely comprehensive evaluation of almost all of this research. Following the presentation of the data supporting each pharmacological effect of garlic, the data supporting each effect's primary active ingredient is also covered. When talking about potential active ingredients, it's crucial to remember that the term "active compound" does not always imply that the substance under the cause of the effect is actually consideration effect at the location of action, but rather that the compound's initial existence is required for the effect This difference is necessary because, similar to many herbs, the compounds in garlic have an unknown metabolic destiny and because the effects could very well be mediated by the compounds' metabolites. Thus, to more precisely characterise a "active compound," the phrases "essential to," "responsible for," or "initially responsible for" are frequently, but not always, employed. [36,37]

Effects on Fibrinolysis, Blood Coagulation and Blood Flow

Garlic has been shown to have impacts on platelet antiaggregatory activity, as well as on fibrinolysis (breakdown of fibrin), blood clotting time, and peripheral blood flow rate. One of the more striking effects of garlic consumption on humans is its effect on fibrinolysis, which becomes apparent within a few hours of ingestion. The fibrinolytic benefits of garlic powders, cloves, and allicin-derived garlic oils have been the subject of 11 clinical investigations (3 controlled), with the results showing an average 70% increase in fibrinolysis for a dose corresponding to 2–6 g of garlic. Using standardised garlic powder tablets (800 mg dose), improved erythrocyte flow through the capillaries and lower plasma viscosity have been proven by a unique non-invasive subcutaneous (under the fingernails) approach

Surgeons might request that patients refrain from eating garlic before surgery because blood clotting times have proven to be adequate. The effect appears to be primarily caused by allicin, as cloves, powder, and garlic oils derived from allicin are equally effective in clinical trials at similar levels of allicin equivalency. The active compounds in garlic have not been directly proven, nor has cooked (alliinase-inhibited) garlic been tested at a moderate dose. But other active ingredients must be present, since both fried and raw garlic (alliinase-inhibited) increased fibrinolysis nearly equally when taken at large dosages (35 g daily). Given that cycloallyl (Figure 1 and Table III) has been demonstrated in two human studies to significantly accelerate fibrinolysis at 125–250 mg/person, it could be the cause of the activity at higher doses. [38,39]

Anticancer Effects

The most reliable and nearly exclusive proof of garlic's anticancer properties in people comes from eleven epidemiological research conducted across six nations. Consuming garlic cloves has been consistently linked to a lower incidence of gastrointestinal malignancies, according to research. In fact, a preventive effect has been demonstrated in 79% of the 34 epidemiological research on allium vegetables (garlic, onion, and leek) and cancer; this percentage is comparable to that of green and cruciferous vegetables. According to research from the Shandong Province of China, eating 20 g (4-6 cloves) of raw garlic every day was linked to a 92% lower risk of stomach cancer than eating less than 1 g. The thiosulfates' apparent cause of the impact is the death of nitrate-reducing bacteria, which results in a drop in nitrosamines.

The Iowa Women's Health research, a 5-year cohort research that tracked 41,837 Iowa women, ages 55 to 69, as they consumed 127 foods, is a significant study for Americans. The only food that had a statistically significant correlation with a lower risk of colon cancer—a 35% lower risk for consuming one or more servings of garlic per week—was garlic. A second U.S. study with 488 case-control Californians supports the findings of this study by demonstrating a strong correlation between garlic consumption (three or more servings per week) and a reduction (37%) in the incidence of pre-cancerous colorectal polyps. [38,40]

The results of epidemiological studies conducted in the Netherlands on garlic supplements have not shown a protective association against colorectal, stomach, or breast cancers. Nevertheless, these studies are not very relevant because the questionnaire did not distinguish between brands or types of supplements, and garlic supplements differ significantly in composition depending on the type and brand—even European brands. Moreover, it is unlikely that supplements will be used consistently enough over an extended period of time to demonstrate an anticancer relationship, unlike garlic cloves. Numerous animal (carcinogen-induced tumours and DNA aberrations) and in vitro anticancer investigations have been carried out with garlic cloves, despite the lack of human intervention trials to far. The anticancer properties of garlic seem to be attributed to both allicin and other unknown components. Numerous experiments conducted on animals have demonstrated the beneficial effects of diallyl sulphides generated just from allicin. While the majority of these investigations have employed extremely high dosages (100-200 mg/kg body weight), several recent investigations have found that diallyl disulfide at 4–10 mg/kg and steam-distilled garlic oil at 2 mg/kg considerably inhibited the formation of generated tumours. Actually, diallyl disulfide was just as successful as the preferred chemotherapeutic medication, 5-fluorouracil, in an equivalent dose. Since neither 0-allyl compounds nor dipropyl sulphides have any activity, the S-allyl group is crucial to the effect. Moreover, diallyl trisulfide works better than disulfide. [41]

Effects on memory loss and aging

A lifelong ingestion of an aged extract of garlic at 2% of the diet (dry weight) increases learning memory retention, produces a better ageing index, and reduces brain shrinkage, according to numerous recent investigations using senescence-accelerated mice .Although research on memory or ageing have not yet examined the effects of fresh or cooked garlic, it is anticipated that similar effects—particularly for cooked garlic, given its higher concentration of garlic compounds—may be observed at much lower levels. [41]

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