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REVIEW ARTICLE

IMPORTANCE OF GARLIC (*ALLIUM SATIVUM*): AN EXHAUSTIVE REVIEW

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ABSTRACT

Allium sativum, also known as Clove Garlic is part of the Lilliceae plant family. Garlic is a member of the onion family and is one of nature's most versatile medicinal plant. The name "*Allium sativum*" is derived from the Celtic word "all", meaning burning or stinging, and the Latin "sativum" meaning planted or cultivated. The English word, garlic, is derived from the Anglo-Saxon "gar-leac" or spear plant, referring to its flowering stalk. Garlic is used as a traditional dietary supplement for diabetes in Asia, Europe, and the Middle East. In addition to its reputation as a healthy food, Garlic has shown anti-viral, anti-bacterial, antifungal, antioxidant, anti-atherosclerotic and anti-cancer properties.

KEY WORDS: Garlic, *Allium sativum*, Anti-bacterial, Food

INTRODUCTION:

Garlic is a perennial bulb, thought to be indigenous to Central Asia, Siberia and west of the Himalayas and has been grown in England from before 1540. It is now widely cultivated all over the world[1].

Garlic is a common food for flavor, spice and it is one of the herbs most commonly used in modern folkloric medicine. Garlic was an important medicine to the ancient Egyptians as listed in the medical text *Codex Ebers* (ca.1550 BC) especially for the working class involved in heavy labor because it was an effective remedy for many aliments such as heart problems, headache, bites, worms and tumours[2, 3].

Garlic (Fig. 1) is a bulbous perennial herb, closely related to the onion. It has a tall, erect flowering stem that reaches 2-3 feet in height. The plant has pink or purple flowers that bloom in mid to late summer. The part used medicinally is the bulb. European standards specify that garlic supplements contain not less than 0.45% allicin[1].

Figure 1: Garlic (*Allium sativum*)[1]

MEDICINAL SPECIES: *Allium sativum*

BOTANICAL FAMILY: Liliaceae/Alliaceae/Amaryllidaceae

COMMON NAMES (SYNONYMS): Garlic (Eng.), lasun (Hindi), Rasonam & Lahsuna (Sanskrit), Knoblauch (Ger), Knoblauchzweibel (Ger), da suan (Chin), taisan (Jap), inniku (Jap), taesan (Kor), tafanuwa (Hausa), ayo-ishi (Igbo), kitunguusumu (Swahili), ayu (Yoruba), lobha (Nepalese)[4]

GEOGRAPHICAL SOURCE: Central Asia, Southern Europe, USA, India

CHEMICAL CONSTITUENTS: Alliin is an odorless sulfur-containing chemical derived from the amino acid cysteine. When garlic bulbs are crushed, Alliin is converted into another compound called Allicin. Allicin is further broken down to a compound called Ajoene, which may be the substance that inhibits blockage in blood vessels from clots and atherosclerosis.

- Allicin (released when crushed) an amino acid which gives Garlic its strong odor and is responsible for the powerful pharmacological properties of the plant
- Germanium
- Magnesium
- Selenium
- Vitamin A
- Vitamin C
- Volatile oil of which about 0.5% is composed of sulfur-containing compounds
- Zinc

It also contain 65% water, 28% carbohydrate, 2.3% organosulphur compound, 2% proteins, 1.2% Free amino

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acid (mainly arginine), 1.5% fiber, 0.15% lipids, 0.08% phytic acid, 0.07% saponins[1, 4].

VARIETIES:[4]

There are two types of garlic, the hard neck and soft neck type. Genetically there are 10 major varieties or types within these two categories. Climate can have significant impact on both taste and scape production, and a variety considered a soft neck in one location may produce a flower in another. This has lead to the renaming of many strains that may instead be genetically the same plant. In Bhutan the variety Namlo Jagbvxcvey is grown, however this writer was unable to find reference to this variety in any neither of the books, nor on the internet consequently. It is possible that the aforementioned variety is an example of such a case. Due to the inability to identify the origin of this variety this writer is also unable to distinguish if this is a soft neck or hard neck variety.

1. **Hard neck varieties** (*Allium sativum var ophioscorodon*)

Hard neck varieties produce a flower stalk (scape), and are often termed as bolting or topsetting varieties. Flowers if they are produced usually abort and form bulbils instead. These are small aerial cloves which are genetically the same as the parent plant. If the aerial cloves are used for propagation they will produce a bulb, but these well be small and take 2-3 years before the bulb reaches marketable size. Hard necks produce 4-12 cloves per plant, they can't be braided because of a hard flower stalk and do not store well as roots and cloves dry after a few months. Typical hard neck varieties are "Rocambole," "Purple Stripe" "Glazed Purple Stripe," "Marbled Purple Stripe," and "Porcelain," Other varieties are Asiatic, Crecole and Turban. In cold climates hard neck varieties can be just as productive, or even more productive as soft neck varieties.

2. **Soft neck varieties (***Allium sativum var sativum)*

Soft neck varieties do not normally produce a flower stem. These are the most common varieties used for commercial cultivation, due to minimal flower stalk and bulbil production which generally makes them more productive because all the energy goes to producing a bulb, while in hard necks it is diverted to scape production. In some soft necks a partial flower stalk can be produced and bulbils will form directly above the bulb. Soft neck varieties normally have a longer shelf life than hard necks and store for up to six to eight months. Soft necks are also easily braided and contain 10-40 cloves per plant. Soft neck varieties are "Artichoke" and "Silverskin".

PHARMACOLOGICAL STUDY:[4, 5]

S-allyl cystein sulfoxide (SACS), the precursor of Allicin and garlic oil, is a sulphur containing amino acid, which is believed to account for most of its medicinal properties i.e, controlled lipid peroxidation better than Glibenclamide and Insulin. It also improved diabetic conditions. SACS also stimulated*in vitro* insulin secretion from beta cells isolated from normal rats.

Anti-diabetic effects: The component Allicin increases hepatic metabolism increases the release of insulin. It exhibits Insulin sparing effect by competing with the insulin activating compound as a result more insulin becomes free to act and exert greater antidiabetic effects.

Action[1]**:**

1. Anti-bacterial [an agent that destroys bacteria; bactericide]
2. Antibiotic [an agent that destroys or stops the growth of micro-organisms] (a powerful natural antibiotic which does not destroy the body's natural flora)
3. Anthelmintic [an agent that destroys or expels intestinal worms and/or parasites; vermicide; vermifuge]
4. Antioxidant [contributing to the oxidation of free radicals which are believed to contribute to premature aging and dementia] (very potent one)
5. Antispasmodic [an agent which relieves or eases muscular spasms, cramps or convulsions]
6. Blood thinner
7. Carminative [an agent for easing griping pains, colic and expelling gas from the intestines]
8. Anti-cancerous activities
9. Anticoagulant [an agent that prevents the formation of clots in a liquid, as in blood]
10. Antiseptic [an agent for inhibiting the growth of microorganism on living tissue or destroying pathogenic or putrefactive bacteria]
11. Anti-tumor (inhibits tumor cell formation)
12. Anti-viral [an agent that destroys viruses]
13. Cholagogue [an agent for increasing the flow of bile into the intestines]
14. Diaphoretic [an agent that promotes perspiration]
15. Digestive [aids the digestive system]
16. Diuretic [an agent that increases the volume and flow of urine which cleanses the urinary system]
17. Expectorant [an agent that promotes the discharge of mucous and secretions from the respiratory passages]
18. Febrifuge [an agent that reduces or eliminates fevers]
19. Stomachic [an agent that strengthens, stimulates or tones the stomach]
20. Stimulant [an agent that excites or quickens the functional activity of the tissues giving more energy]

USAGE OF GARLIC[1, 4, 5, 6]

Medicinal Parts Used: Fresh bulbs, dried bulbs, and Garlic oil

Culinary uses:

It is an important spice or condiment and is chiefly used for flavouring and seasoning vegetable and meat

dishes. Most often the bulb is used either eaten raw or cooked. When cooked the whole bulb can be roasted in olive oil in an oven and eaten whole, or the cloves are used as flavouring. Garlic can also be dehydrated and preserved in oil. When home preserving in home care must be taken no get botulism, this can be avoid by refrigerating and not keeping for more than two weeks. Garlic can also be pressed for its oil, and pickled. The garlic flower stems (scapes) are also edible and used in cooking. It is used similar to chives but has a more mild taste.

Medicinal uses:

1. **Bacterial and Viral Conditions**
   - Fights bacteria like an antibiotic
   - Inhibits the growth of different species of bacteria
   - Garlic is reported to be more effective than penicillin against:
     - ✓ The organisms responsible for cholera, dysentery and enteritis
     - ✓ Paratyphoid disease
     - ✓ Putrefactive intestinal bacteria
     - ✓ Streptococcus and staphylococcus bacteria
     - ✓ Typhus disease
   - One medium clove of Garlic can equal the antibacterial action equivalent to 1% penicillin
     - ✓ Blood Conditions
     - ✓ Dissolves blood clots
     - ✓ Reduces fat levels in the blood
2. **Cardiovascular Conditions**
   - Angina pectoris
   - Arteriosclerosis
   - Balances blood pressure
   - Decreases triglycerides
   - Helps maintain healthy circulation
   - Helps prevents atherosclerosis (plaque buildup in the arteries causing blockage and possibly leading to heart attack or stroke)
   - Improves circulation
   - Lowers blood pressure
   - May prevent blood clots
   - Mild hypertension
   - Prevents thrombosis (counteracts the tendency of clot forming cells to stick together within the blood vessels)
   - Protects against cardiovascular disease
   - Reduces blood pressure in hypertensive conditions
   - Thins the blood (which reduces the risk of heart attack and stroke)
3. **Ear Conditions**

   Garlic oil drops can be used for
   - Earache
   - Ear infection are put in the ears for and
   - Otitis media, (an ear infection) a combination herbal extract (also used as ear drops) containing
   - Garlic
   - Calendula,
   - Mullein flower
   - St. John's Wort
4. **Brain and Nervous System Conditions**
   - Epilepsy
   - Hysteria
5. **Gastrointestinal Conditions**
   - Chronic stomach and intestinal catarrh
   - Digestive infections
   - Relieves belching and heaviness
   - Relieves colic
   - Relieves gas (flatulence)
   - Relieves nausea
   - Rids the body of intestinal parasites, especially pinworms
   - Stimulates the activity of the digestive organs
   - Ulcers
6. **Immune System Conditions**
   - Fights infection
   - Improves resistance to infection
   - Increases the activity of white blood cells and T-helper cells (natural killer cells), the cells that are central to the activity of the entire immune system infections of the body
   - Preventative measure for infectious diseases
   - Stimulates the body's natural defenses against foreign invaders
   - Protects cell membranes and DNA from damage
7. **Inflammatory Conditions**
   - Arthritis
   - Infantile catarrh
8. **Genitourinary Conditions**
   - Dropsy
   - Urinary infections
   - Fluid retention
9. **Respiratory Tract Conditions**
   - Asthma
   - Breathing difficulties
   - Chronic bronchitis
   - Colds (reduces symptoms faster)

- Coughs and hoarseness
- Inhibits the growth of the bacteria, Mycobacterium tuberculosis, the organism responsible for tuberculosis (high doses)
- Preventative measure for colds and influenza
- Sinusitis
- Upper respiratory infections (especially infections deep in the lungs and throat and in the nasal passages or sinuses)

10. **Metabolic Conditions**
    - Balances blood sugar
    - Late-onset diabetes
11. **Liver Conditions**
    - Lowers cholesterol while increasing the level of beneficial HDL's (high-density lipoproteins) the so-called good
    - Cholesterol
    - May help lower homocysteine levels (similar to cholesterol which may contribute to increasing amounts of blood clots and plaque in blood vessels)
    - Regularizes liver and gallbladder activity
    - Stimulates the production of the liver's own detoxifying enzymes which neutralize carcinogens and other
    - Environmental toxins
12. **Parasitic Conditions**
    - Ascaris lumbricoides (roundworm) especially fresh, raw Garlic
13. **Skin Conditions**
    - Acne
    - Cutaneous eruptions
    - Pimples
14. **Other Conditions**
    - Cancer (people who include more raw or cooked garlic in their diet are less likely to have certain types of cancer especially:
    - Colon cancer
    - Stomach cancer
    - Skin cancer
15. **Dietary Garlic may also offer some protection against the development of:**
    - Breast cancer
    - Laryngeal (throat) cancer
    - Prostate cancer
    - Stimulates cell growth and activity
    - Tumors
    - Wounds
16. **Externally: Garlic is used in Oil, Ointments or Poultices for:**
    - Abscesses
    - Arthritis
    - Dispelling hard swellings
    - Earaches
    - Insect bites
    - Scrofulous sores
    - Toothache
    - Wounds

DOSAGE[1]:

1. Whole Garlic clove - 2-4g/day fresh, minced garlic clove (each clove is approximately 1g)
2. Dried - 600-900mg daily
3. Infusion: 4 grams in 150 mL of water/day
4. Fluid extract of 1:5 4 mL/day
5. Oil - 0.03-0.12mL 3/day

GARLIC SUPPLEMENTS/PREPARATIONS[1]:

1. Essentional oil (Garlic oil)
2. Dehydrated powder (Garlic Powder)
3. Pills
4. Oil macerate
5. Extract

DRUG INTERACTIONS[1]

Do not use Garlic supplements without first talking to your healthcare practitioner if taking any of the medications below:

1. **Antiplatelet medications** (Garlic may exaggerate the activity of medications that inhibit the action of platelets in the body) including:
   - aspirin
   - dipyridamole
   - indomethacin
2. **Blood-thinning medications** (large quantities of Garlic, either fresh or commercially prepared may increase the risk of bleeding) including:
   - aspirin
   - warfarin
3. **Sulfonylureas** - A class of diabetes medications (Garlic may lower blood sugar considerably so when using Garlic with these medications, blood sugar levels should be monitored must be followed closely) including:
   - chlorpropamide
   - glimepiride
   - glyburide.
4. **Protease inhibitors** - a medication used to treat people with the human immunodeficiency virus (HIV) (Garlic may reduce blood levels of protease inhibitors) including:
   - indinavir
   - ritinavir

- saquinavir.

5. **Statins** - a class of cholesterol lowering medications (Garlic may behave similarly to Statins) including:
    - atorvastatin
    - lovastatin
6. **ACE inhibitors** - a class of blood pressure lowering medications (Garlic may behave similarly to ACE inhibitors so it is recommended not to take large quantities of Garlic with any of these medications) including:
    - captopril
    - enalapril
    - lisinopril

SIDE EFFECTS[1, 4]:

Side effects may include:

Internally:

- upset stomach,
- bloating,
- bad breath,
- body odor
- headache
- fatigue
- loss of appetite
- muscle aches
- vertigo
- allergic asthmatic reaction

Externally:

A stinging sensation on the skin from handling too much fresh or dried garlic can cause blistering if applied to delicate skin handling may also cause the appearance of skin lesions contact dermatitis (skin rash). Due to Garlic's blood-thinning properties it should not be used by people:

- with bleeding disorders such as:
- hemophilia
- platelet disorders

Too much Garlic can increase your risk for bleeding during or after:

- delivering a baby
- undergoing surgery

Conclusion:

According to the US Food and Drug Administration survey of 900 People, garlic stands as the second most utilized supplement. In its medicinal use garlic preparation are given in whooping cough and other lung diseases, stomach complaints (as ulcers of the intestines) disorders resulting from child birth and as a specific remedy for sore eyes and earache. During the plague it in 1722 in Marseilles it was the principle ingredient for the "*four thieves vinegar*" a protective ointment. The ointment was given the name from the confession of four thieves who used a mixture of garlic and vinegar to protect themselves from the plague while they plundered the riches from dead. In World War II and many of the earlier wars garlic was used as an antiseptic to treat the wounded.

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