

Garlic: Medicinal Plant and Natural Aromatic Condiment

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Abstract: Objective: To relate the presence of active metabolites with therapeutic effects of the *Allium sativum* L whose common name is Garlic, as well as its contraindications and adverse reactions and its use as condiment. **Methods:** Searching about the topic in the last 5 years and present a general view of the *Allium sativum* L whose common name is Garlic. **Conclusions:** Technological prevision was based on the search of articles in the Virtual Library in Health (BVS) and using the key words "medicinal plants"/"spice"/*Allium sativum* L/garlic/adverse reactions and contraindications, and the association among them.

Key words: Medicinal plant, *Allium sativum* L, Garlic, spice, adverse reactions, contraindications.

1. Introduction

Garlic is broadly used as one of the best natural remedies we have to our disposition since all its parts are used to cure or relief different affections or illness, but it is also very common ingredient of the kitchen considered a spice because in accordance with the Dictionary of the Spanish Language [1], "especies", (of Latin species) refers to: Aromatic "vegetable substance that serves as condiment", the same as: azafran, cinnamon, onion, chili, pepper, vanilla, etc., while the term 'condiment' derives of Latin condimentum means what is good to season foods and to give them good flavor to be substances of vegetable origin that have been used to preserve or to improve the flavor of foods .

Beyond being an essential ingredient of the Mediterranean diet, garlic is one of the foods with more healing properties that exist.

During many centuries, these properties have been used in the preparation of natural medications. In the last years several studies have verified that garlic helps to combat infections, is a potent anti-inflammatory,

increases the defenses, improves circulation, prevents arteriosclerosis, diminishes the excess of fatty in blood, prevents hypertension, alleviates pains, is an effective expectorant, is diuretic and many other benefits.

The main minerals that we find in garlic are: sodium, potassium, calcium, magnesium, and phosphor. It is also a vegetable with high content in vitamin C and vitamin B. Also, it is a vegetable with a high content of sulfur what provokes its aroma and peculiar flavor that comes from the allicin.

Its consumption can be in raw, boiled, fried or stew. But in raw is where it maintains its properties better. Experts are also in favor of cooking it, whenever it is not more than 60 °C, since with higher temperatures allicin can finish dying. In fact, they advise to add it to recipes when the plate is already almost finished.

As many others, garlic comes as secondary metabolites of numerous organs or vegetable parts of aromatic plants, as their buds or yolks, barks, flowers, fruits, leaves, wood, branches or the seeds, although whole plants are also used, as aromatic grasses or culinary [2, 3].

At that stage of cultural evolution, the simple man becomes more complex as he enters another world, a kitchen or "cooking world", he discovered the

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saboriness properties or condiments of plants or minerals to obtain this way some minerals that require for its metabolism [4].

2. History of the Uses of Garlic

Garlic like other spices, along with aromatic grasses, was historically important because of their therapeutic and culinary importance.

The considered father of the allopathic medicine, Hippocrates, affirmed: “that your medicine is the food and the food is your medicine” and this therapeutic activity of some foods is evidenced especially in garlic, the most potent medicinal remedy in front of multiple dysfunctions and affections.

The species of garlic we know at the present time (*Allium sativum*) comes from the botanical species *Allium longicuspis*, which is a unique species of Central Asian countries and was later replaced by Hydric garlic as we know it today.

The use of garlic as medicinal remedy is documented B.C. from the third millennium on the part of the old Egypt. The engravings found in the Pyramid of Cheops of Gizeh manifest that the Egyptian pharaohs gave garlics to the workers of their pyramids so that these stayed healthy and strong. In the papyrus of Ebers, dated of the year 1.700 B.C. remedies are described in fact for the health that include the plant of garlic, it is believed that this food ended up being sacred for this culture.

Starting from the XVIII century, the Dutchmen, Englishmen and French were also devoted to monopolize its sale [5].

The aromatic properties of garlic have allowed that its seeds, fruits, rhizomes, floral stigmas, branches, buds, leaves or other parts of the plant have been being used for thousands of years [6].

Alexander the Great (320 B.C.), Attila (550 A.D.), and Genghis Khan (1200 A.D.) all contributed to the spread of garlic (its properties, such as preserving meat and fish, were easy to store).

Garlic was a basic food in the Egyptian culture,

along with Onions and bread.

In Greek Hippocrates and Ancient Roman medicine, physicians, Plinio the Elder and Dioscórides, they all mentioned garlic as a treatment for parasites, respiratory problems or changes in the digestive system [7, 8].

During the 19th and 20th centuries, Spain normalized the consumption of this important healthy food, and garlic became the preferred food in other countries such as Italy and France.

Dioscórides says [9]: It is useful to bites of vipers and snakes, when drinking wine after them. In the form of a plaster, it helps those bitten by mad dogs. It clarifies voice and softens the old cough when it is eaten raw and cooked. When it is drunk with boiled oregano, it kills the nits and lice. If it is burnt and blended with honey, it is healthy to the black-and-blue eyes. If it is applied with nard oil, it restores the hair that tints made lose. It cures bladders and crusts that appear in the whole body, when it is applied with salt and oil. It exterminates the whiteness, insteps, freckles, and spring sores from the head, dandruff and scabies, when it is mixed with honey. Boiled garlic, cooked with and incense, clarifies the pain of teeth if you rinse with it. Applies, pounded with fig leaves and cumins, against bites that made the shrew. The boiled of its leaves causes the menses. The paste that is made of garlic and of black olives, if it is eaten up, it causes urine, despoil the pores and it is useful against dropsy.

In homemade medicine, garlic and olive oil sauce (emulsion of olive oil in the juice of mashed garlics) are used to lower blood pressure

Professor Malte Bühring says in the book “Introduction to Naturist Medicine” that scientific bases of the natural therapies put garlic like as example of the humoral medicine; considers the plant for their organoleptic properties that are those ones we are able to detect through senses. Thus, he compares the action of hot plants to treat a cold illness. Then Garlic would be a hot plant and arteriosclerosis, arthrosis or cancer would be cold illnesses [10].

3. Botanical Description

Garlic is a bulbous plant, 30 to 40 cm of height; alternating, long and very narrow leaves; from the center of the leaves the floral pendulum arises from 40 to 50 cm of high, hairless and hole; flowers contained in terminal umbels. Its flowers has whitish petals turning to violaceous. Fruits in an ovoid capsule form. The bulb or head of garlic is generally of white color and it is divided into parts (6 at 12) called cloves of garlic that are wrapped by a whitish tunic (bract) that is sometimes blushed and similar to the membrane that covers the whole bulb (Fig 1).

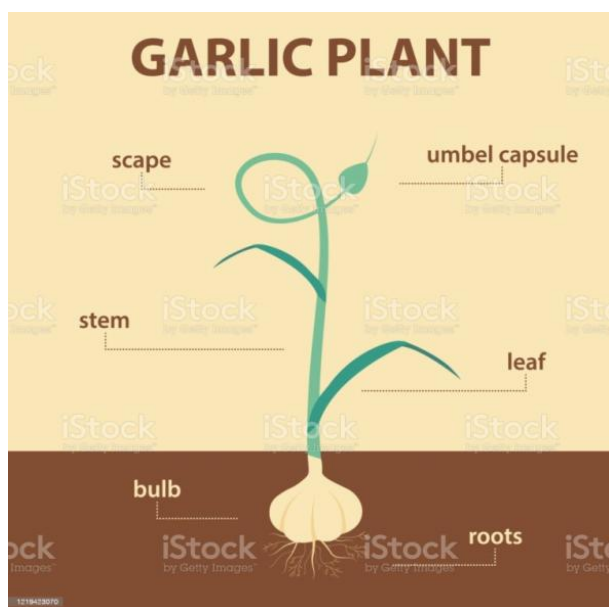


Fig. 1 Illustration of garlic.

4. Scientific Classification

Kingdom: Plantae.
 Division: Magnoliophyta.
 Class: Liliopsida.
 Order: Asparagales.
 Family: Amaryllidaceae.
 Subfamily: Allioideae.
 Tribe: Allieae.
 Gender: Allium.
 Species: *Allium sativum*.
 Name: binomial: *Allium sativum* L. [11].

5. Chemical Composition

Sulphur compounds (0.1-0.2%): are soluble in water. Those are derived of the cysteine: S-allyl-cysteine (21%); S-allyl-mercaptocysteine, S-methylcysteine and gamma-glutamyl-cysteine. This last one component gives origin to the S-allyl-cysteine.

Odorless: They are soluble in oil. Among them there are: diallyl disulfide (diallyl disulphide), diallyl trisulfide (diallyl-trisulfide); allylmethyl trisulphide; aliina (precursor of the allicin), dithiins, vinyl dithiins and ajoene

Fragrant: The fragrant component of garlic is conformed by allicin that is an oxidizer component taken place by raw garlic when its cells break, for example during the act of cutting. [12].

Aliina is a "parent" component, which is inactive and tasteless in pharmacology. Its active substance allicin comes from it, and its bactericidal ability was found in 1944.

Aliina, through the action of enzymes contained in allicin, is first transformed in allicin (this transformation occurs when in contact with air, pH value is higher than 3), and then transformed in allyl disulfide, with the odor characteristics of garlic. It is also ajoene (an unsaturated disulfide composed of three allicin molecules) and has antioxidant effect; Quercetin flavonoids are also antioxidants. If the bulb is intact and fresh, the main component determined is linoleic acid or sulfoxide allyl cysteine (sulfuric acid amino acid). There are other water-soluble sulfur compounds, such as sulfoxide, s-diallyl-l-cysteine and s-allyl-s-cysteine, s-drip, g-glutamyl-s-allylcysteine and g-glutamyl-s-allylmercapto-l-cysteine [13].

Also, in the bulb of garlic there are mineral salts (selenium), sugars, lipids, essential amino acids, saponosides, terpens, vitamins, enzymes, flavonoids and other phenolic compounds. It is also considered that contains essential oil (due to the formation of the volatile sulphur compounds) [14, 15].

6. Therapeutic Effects

6.1 Antioxidant Activity

The increase of cellular antioxidant enzymes (such as superoxide dismutase [SOD], catalase and glutathione peroxidase) can effectively inhibit the formation of free radicals and enhance the acceptance mechanism of endogenous free radicals. They protect free radical oxidized LDL and inhibit nuclear factors κ B (oxidant induced transcription factor). The main mechanism of action will be determined by the antioxidant activity of compounds S-allylcysteine, S-allylmercaptocysteine, selenium and vitamin C on cell membrane before lipid peroxide invasion, the protective effect of hydrogen peroxide on vascular endothelium before hydrogen peroxide invasion, and the inhibitory effect of free radicals on low-level chemiluminescence emission and the early formation of TBA-RS (oxidation marker). Some people think that the antioxidant activity of garlic may be the main reason for the cardioprotective effect of adriamycin. The antioxidant effect of garlic depends on dose and time. It has anti atherosclerosis, anti hepatotoxicity and anti-cancer effects [16-19].

6.2 Hypolipidemic and Anti-atherogenic Activity

As for cholesterol, allicin improves the oxidation of LDL, thereby inhibiting the synthesis of cholesterol in the liver. It can inhibit the key enzymes of the process (hydroxymethylglutaryl CoA synthase and hydroxymethylglutaryl CoA reductase), and reduce the values of total cholesterol and low density lipoprotein (LDL). The lowering effect of cholesterol is related to the dosage. In the proposed mechanism of action, inhibition of cholesterol biosynthesis is included when inhibiting the activities of enzymes such as hydroxymethylglutaryl CoA reductase (HMG CoA) and lanosterol-14-dimethylase [19, 21].

6.3 Anti-agglutination and Fibrinolytic Activity

Garlic contains inhibitors of aggregation and platelet

release (although some authors attribute this property to ajoenes). Among the action mechanisms proposed for this anti agglutination effect include the inhibition of thromboxane synthesis by inhibiting cyclooxygenase and lysozyme, as well as the inhibition of platelet receptor ADP, collagen and fibrinogen [18].

Garlic can increase the levels of nitric oxide synthetase (causing enzyme of the formation of nitric oxide or endothelium-derived relaxing factor), potent vasodilator. Allicin and the ajoene reduce the levels of calcium in the flat muscular cells causing a vasodilatation due to the intracellular low levels of calcium. Certain components of garlic also affect the processes that proceed to the platelet aggregation, as the activation of thrombocytes. In different clinical rehearsals the antithrombotic effect of garlic is demonstrated [18,22].

6.4 Antihypertensive Activity

Because garlic has a vasodilator effect, it is usually used at a dose of 600-900 mg/day. In addition, in the culture of endothelial cells, it has been proved that the water extract of garlic under cold air can effectively inhibit the activity of adenosine deaminase (ADA), which contributes to the antihypertensive activity and vascular protection of garlic [18].

6.5 Antimicrobial and Antifungal Activity

Allicin is active against gram-positive and gram-negative bacteria, although allicin also produces ajoene and diallyl trisulfide during this action. In a study on the effectiveness of the treatment of condyloma acuminatum conducted by Pérez Wearms at Celia Sanchez Manduri University Hospital in 2006 and 2007, the garlic group was more effective (73.3%), the recurrence rate is lower (9.1%). The results are usually observed between the third and fourth weeks of treatment [16].

6.6 Anticancer and Antitumor Activity

Garlic has protective effects, which can reduce the

incidence rate of certain types of cancer, such as gastric cancer, colorectal cancer, breast cancer, cervical cancer, etc. Its anticancer effect is obviously caused by the following mechanisms: capturing free radicals, increasing agglutination value, increasing or regulating enzyme activity, such as agglutination-s-transferase, catalase, DNA repair mechanism, preventing chromosome damage, etc [19, 20].

6.7 Immunomodulatory Activity

Different extracts of garlic have demonstrated to stimulate the phagocytic activity of macrophages, at the same time that they increase the activity of natural killer cells, IL-2 (interleukin-2), TNF (tumor necrosis factor) and gamma-interferon. [19].

6.8 Anti-anemic Effect

Potential relief against the anemia, specifically against the sickle cell anemia, it was observed that the bodies of Henz diminished in a significant way due to its antioxidant character [21].

7. Contraindications

Hyperthyroidism and active bleeding (hematemesis, hematuria, preoperative and postoperative thrombocytopenia, frequent hemoptysis, etc.) shall not be treated with garlic extract.

Garlic extract should not be taken orally during pregnancy, lactation, young children or patients allergic to garlic or its components.

Dosage forms with alcoholic content should not be prescribed to children under two years old, neither to people in process of avoiding ethylic habituation [15].

8. Secondary Effects

Eating garlic can irritate the intestines. Using it for external use can cause contact dermatitis because of its foaming effect. Pure essential oils can cause nausea. Their vasodilatory effect can worsen varicose veins and hemorrhoids.

Some people are allergic to garlic and other

household plants. Symptoms may include irritable bowel, diarrhea, mouth and throat ulcers, nausea, difficulty breathing, and, in strange cases, allergic reactions. People who are allergic to garlic are usually sensitive to many plants, including onions, chives, leeks and scallions, iris, ginger, and bananas.

Garlic can reduce platelet aggregation (just like aspirin). Eating large amounts or concentrates may increase the risk of bleeding, but it is safe to consume while cooking.

Some uses for acne or in compresses for rheumatic pains or in vaginal applications have produced serious skin burns and mucous for a bad use.

It can vary the pleasure of maternal milk for a nursing baby, but it doesn't diminish the production of milk and there are nursing babies who like its flavor. Also, blended garlic with milk diminishes its scent, and the nursing baby doesn't have any problem with that.

Allicin is the responsible for the sensation of heat when drinking raw garlic. The process of cooking of garlic eliminates allicin, and therefore it's spicy and scent in perspiration and encouragement due to its decomposition. To avoid this, it can be taken parsley that masks it or can also be eliminated with sauna.

It is necessary to always keep in mind the alcoholic content of the flowing extract and of the dye [21].

9. Conclusions

In the revision on the therapeutic effects of *Allium sativum*, garlic, it was obtained that this natural product possesses a great functionality as antioxidant, in the prevention in the cellular oxidation; essentially this function is due to the antioxidant activity of the S-allyl-cysteine and allicin. It has marked antimicrobial effect since it has been demonstrated that inhibits and induces death of different types of bacteria that put in risk health, as well as it is useful in the treatment of different pathologies like cardiovascular illnesses and cancers.

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