

## Antimicrobial Effect of Garlic (*Allium sativum*) and Traditional Medicine

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**Abstract:** Medicinal plants like pumpkin seed, thyme, onion, nigella sativa, lemon balm, stinging nettle are used extensively today. One of these plants used most intensively and widespread is garlic. In this context, fresh shape, powder state and oil of garlic have been used all around the world especially in Far East for centuries. In conclusion it is observed that the information transferred between generations and studies made scientifically that garlic is effectively used in cardiovascular diseases as regulator of blood pressure and with dropper effects of it on glycaemia and cholesterol, against bacterial, viral, mycosis and parasitic infections. It's also known that garlic is a wonderful plant having the properties of empowering immune system, anti-tumour and antioxidant. Garlic shows its this effect thanks to >200 components it involves. Garlic includes to >200 components such as volatile oils (allicin, alliin and ajoene) consisting of sulphur, enzymes (alliinase, peroxidase and miracynase), carbohydrates (sucrose, glucose), minerals (germanium, selenium, zinc), amino acids like cysteine, glutamine, isoleucine and methionine, bioflavonoids like quercetin and cyanidin and allistatin I and allistatin II, C, E and A vitamins and niacin, B<sub>1</sub>, B<sub>2</sub> vitamins and beta carotene. In this study, it will be given a summary about properties of garlic and its areas of use against bacterial diseases.

**Key words:** Garlic, *Allium sativum*, antimicrobial effect, traditional medicine, plants

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### INTRODUCTION

Garlic is an earth wonder the name of which has been lived by Turks without forgetting during long history and extensive geography of them (Akcicek, 2006). Garlic (*Allium sativum*) the land of which is said as Middle and West Asia steps has a place among eldest crop plants. This plant, which is of great medical importance takes place inside many foods especially, meat ones due to its sharp odour, appetizer property and bitter taste and gives flavour to them. Garlic, its calorie value is 140, has 63.8 g water, 28.2 g carbohydrate, 5.3 g protein, 0.2 g oil and 11 g cellulose in its 100 g (Baytop, 1999; Kutevin and Turkes, 1987). Garlic can be consumed as fresh and has also its pills, capsules and extracts. While, it is safe, when taken in careful amounts, it can lacerate stomach, when consumed in excessive amounts (Ayaz and Alpsoy, 2007).

### MATERIALS AND METHODS

**Medical properties of garlic:** Garlic is a plant, which kills bacteria, fungus, parasites and lowers glycaemia and cholesterol and have liver protector property and includes antitumor agents. Garlic, with >200 chemical substances in its body, has the capacity of protecting human body against many illnesses. Although, it is said that garlic should be consumed as fresh for it can be effective, some

researchers argue that in some situations its cooked and waited extracts and oils can provide better protection against free radicals and infections than fresh garlic (Baytop, 1999; Ayaz and Alpsoy, 2007). Garlic cloves include a mixture of mono and polysulphides smelling very heavy.

**Natural antibiotic effect:** It's declared that garlic, as an anti-bacterial agent, is effective against many more gram negative and gram positive bacteria like *Helicobacter pylori*, *E. coli*, *Lactobacillus casei* and that this effect is sourced from allicin inside it (Cellini *et al.*, 1996; Lemar *et al.*, 2005). It is also declared that components including sulphur in garlic and also bioflavonoids like quercetin and cyanidin in it have great value in preventing diseases and infections. It's revealed that active substances like allistatin I and allistatin II in garlic are powerful agents against staphylococcus and *E. coli* bacteria (Baytop, 1999; Ayaz and Alpsoy, 2007; Ankri and Mirelman, 1999; Hanafy *et al.*, 1994; Yoshida *et al.*, 1998). It's predicted that antimicrobial effect of garlic has revealed in conclusion that thiosulphonates in garlic inhibit enzymes including thiol, which can take place in micro-organisms, as a result of the ability of quick reaction giving with thiol groups (Ayaz and Alpsoy, 2007; Imai *et al.*, 1994). In traditional eastern medicine, garlic has been used in various forms and in the treatment of almost all infections. It's pointed

out that garlic water has been used in typhoid and meningitis, its fume in whooping cough, garlic wicks in yeast infections and garlic soup in pneumonia. Garlic's this specialty possibly sourced from allicin components and being effective even against some organisms resistant to antibiotics necessitates its more use in standard medicinal applications (Ayaz and Alpsoy, 2007; Imai *et al.*, 1994). It is stated that garlic has very wide spectrum against gram positive and gram negative Pasteurella, Coryne and Micro-bacteria and this effect is seen in the bulb of garlic at the most. Furthermore, antibacterial spectrum of various garlic species shows difference. Antibiotic effect of garlic in watery extracts drops fast especially, at high temperatures. One of substances having strong antibiotic effect in it is allicin. Degrading with cysteine stops antibiotic effect without return. Oxygen must be available for the continuation of antibacterial effect of garlic and its active substance Allicin. Powerful effect of garlic extract is seen especially against *Candida albicans*, *Histoplasma capsulatum*, *Aspergillus*, *Trichophytum* species and *Penicillium*. The results got with garlic extract can also be got with pure allicin (Adetumbi and Benjavin, 1983; Venugopal and Vanugopal, 1995).

In various researches made the effect of garlic on *Salmonella typhimurium*, *Salmonella enteritidis*, *Staphylococcus aerus*, *Brusella abortus*, *Bacillus anthracis*, vibrio and fungus growth has been determined (Weber *et al.*, 1992; Frontling *et al.*, 1978; Prasad and Sharma, 1980; Lemar *et al.*, 2005).

## RESULTS AND DISCUSSION

The studies made on bacteria concerning garlic are not limited only with social originated infection factors and it is effective against micro-organisms, which are got from infections growing in patients lying in the hospital and which resist many medicines. It has been pointed out that within these pressed and dried garlic and allicin on enterococcus (VDE) species having resistance against Vancomycine individually and also by forming synergic effect on VDE species with garlic dried with vancomycine and vancomycine and allicin, bacteriostatic effect has been revealed (Jonkers *et al.*, 1999). Antibacterial activities against various antimicrobials and garlic oil that have been made as *in vitro* against 237 *Klebsiella pneumoniae* and *Pseudomonas aeruginosa* isolate being another hospital infection factor and disk diffusion test has been made by combining Diallyl Trisulphide (DAT) and Diallyl Tetra-Sulphide (DATS) together with cephtazidim, gentamicin, imipenem and meropenem and it has been determined

that synergistic or additive effect against the given isolates has been got (Weber *et al.*, 1992; Tsao and Yin, 2001).

Limuroa *et al.* (2002) has researched gastritis and stomach cancer formation by comparing with control group by giving a group of mice *H. pylori*, which can lead to gastritis and stomach cancer and garlic extract. In conclusion, while gastritis and stomach cancer occur in control group, it is observed that in the individuals given extract gastritis symptoms have grown slightly and stomach cancer hasn't occurred. It has been judged that garlic extracts can be used in the prevention of gastritis and stomach cancers to which *H. pylori* can lead.

Aydin *et al.* (2007) demonstrated that the chopped garlic added to raw meatball, which is a traditional food product eaten raw in Turkey has a slowing-down effect on microbiological growth in ground meat depending on the garlic concentration, but this effect was not at an expected level even at the highest concentration, because potential antimicrobial agents in chopped garlic were probably insufficiently extracted.

**Effect against viral infections:** In laboratory study, it has been shown that garlic is effective both against influenza B and also herpes simplex viruses. While, Chinese scientists have examined the effect of garlic on viral encephalitis for almost 30 years, an English researcher has used garlic extract successfully against a pertinacious virus in horses. At the last, no matter infection becomes bacterial or viral, garlic mobilizes immune system and empowers the defence ability of the body against infectious organisms (Josling, 2001; Hanafy *et al.*, 1994; Weber *et al.*, 1992).

**Effect on fungal infections:** Treatment of fungal infections are difficult like in viruses and medicines used for this aim are generally toxic and a resistance can develop against the medicine in long term. It's stated that garlic, which consists of allicin being a fungistatic substance, has proved itself against micro-organisms such as *Candida*, *Aspergillus* and *Cryptococci* as an effective anti-fungal substance. Chinese people state that intravenous garlic extract application against a deathful and rarely seen fungal infection called cryptococcal meningitis is more effective than a very poisonous antibiotic Amphotericin-B standard application and is not toxic no matter its dosage. In another research, chickens infected with *C. albicans* have healed after they have consumed garlic for 10 days and this effect has been linked to allicin components in garlic as well. In addition, since high glycaemia increases yeast infections risk and components in garlic drop glycaemia, therapy of garlic provides an extra advantage

in the treatment of yeast infections (Ayaz and Alpsoy, 2007; Prasad and Sharma, 1980). An *et al.* (2009) demonstrated that a combination of Amphotericin B (AmB), which is the gold standard of antifungal treatment for the most severe invasive mycoses, with allicin proved to be a promising strategy for the therapy of disseminated candidiasis. The researchers, An *et al.* (2009) and Ogita *et al.* (2009) observed that allicin, an allyl sulphur compound from garlic, has shown to significantly enhance the effect of AmB against *Candida albicans* and *Aspergillus fumigatus* *in vitro* and *in vivo*, although allicin did not exert a fungicidal effect.

It's stated that antibacterial and antifungal effects of garlic extracts are sourced from the existence of diallyl disulfide having evaporation ability and allicin (Agrawal, 1996; Tariq and MaGee, 1990; Yoshida *et al.*, 1998). It has been pointed out that antifungal effect of garlic extract on *Aspergillus niger*, *A. flavus* and *A. fumigatus* is not available but with acetic acid addition into this extract, in the situation of increasing acidity, fungal development decreases in important ratio (Yin and Tsao, 1999).

It has been determined that the effect of water and ethanol extracts of garlic on *Penicillium digitatum* and *P. italicum* being green and blue mould factor in the orange is more effective than control but this effect is not as much as a fungicide (Obagwu and Korsten, 2003).

It has been determined that garlic is effective first against *Candida* species and against *Histoplasma capsulatum*, dermatofit factors and a variety of fungus species such as *Cryptococcus neoformans*, *Rhodotorula torulopsis* and *Trichosporon*. In the studies made, it has been found that it is also effective on *Coccidioides immitis* and *Sporothrix schenckii* (Lemar *et al.*, 2005; Adetumbi and Benjavin, 1983).

In a clinical and mycological study made on ajoene and *Tinea pedis* being an organo-sulphur component got from garlic, a 0.4% cream form has been used for 7 days. Absolute clinical and mycological treatment have been got in 27 (79%) of 34 events. In this study, the events have been evaluated again in the scope of the infection reiteration 90 days after the finishing of the treatment and it has been determined that a proliferation has not occurred in the taken fungus moulds. According to these results, it has been arrived to the opinion that ajoene can be effective against *Tinea pedis* and has low cost and can be an alternative agent in short term treatment of *T. pedis* (Ledezme *et al.*, 1996).

In a study, concerning antifungal activity of *Allium sativum*, a fresh garlic extract, after taken orally, after it has been applied to voluntary people orally, antibody forming against *Candida* and *Cryptococcus* species in

serum and urine at certain intervals has been researched and it has been concluded that treatment activities of garlic extracts taken from mouth are limited (Caporaso *et al.*, 1983).

## CONCLUSION

The use of herbal drugs is increasing. One of these plants used the most intensively and widespread is garlic. Fresh shape, powder state and garlic oil has been effectively used all around the world against bacterial, viral, mycotic and parasitic infections.

With the scientific studies in this issue increase, garlic prescriptions will be written by physicians for many diseases and sold in pharmacy shelves But, its traditional used must be primarily proven with scientific data. In this study, it was be given a summary about properties of garlic and its areas of use against bacterial diseases.

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