**Allium sativum**

**Phytotherapy**

**SYNONYMS**
Garlic, black garlic, fermented garlic

**EFFECT**
Garlic has been used for medicinal purposes since time immemorial. It is for good reason that garlic is seen as an anti-aging remedy; garlic undeniably helps to combat cardiovascular disease and improves the blood flow to organs and tissues, it also strengthens the immune system and protects the body against toxic substances. Garlic is also an excellent remedy for a range of infections caused by viruses, bacteria, fungi and parasites.

Garlic is rich in unique sulphur compounds, the most important component being alliin (S-Allyl-L-cysteine sulfoxide). When fresh garlic is chopped or crushed, the (stable) alliin is converted by the enzyme alliinase into allicin (diallyl thiosulfinate). Allicin, a very unstable substance, is then rapidly converted into more than a hundred active metabolites (thio-sulfinates). Good garlic formulas mainly contain alliin, which is converted in the intestines and elsewhere in the body into metabolites, with a powerful medicinal effect (allicin, etc.).

1. Garlic has an impact on factors which play a decisive role in the pathogenesis and progression of atherosclerosis. Garlic reduces the total and LDL-cholesterol and triglyceride levels, increases the beneficial HDL-cholesterol, reduces the fibrinogen concentration, lowers arterial blood pressure, enhances fibrinolysis, inhibits platelet aggregation and reduces plasma viscosity.
2. Allicin and S-Allyl cysteine protect endothelial cells and LDL cholesterol against oxidation and inhibit atherosclerosis partially by means of the antioxidant protection. Garlic also directly inhibits the anti-atherosclerotic process by combating smooth muscle cell multiplication in atherosclerotic plaques and fat accumulation in the vascular wall.
3. Black garlic is obtained by fermenting fresh, white garlic at a specific temperature and humidity for up to 20 months. It gets its name from the darker colour that occurs during this period. During the fermentation process, unique water-soluble sulphuric compounds occur, such as S-allylcysteine (SAC) and S-allylmercaptocysteine (SMAC) with a significantly higher oral bioavailability than the compounds in
4. Disulfides and trisulfides and allyl mercaptan from garlic also chelate heavy metals such as mercury, cadmium and lead. Not insignificant is that compounds in garlic enzymes induce phase II detoxification in the liver and other organs, resulting in improved break down and excretion of toxins, and the body is protected against highly reactive metabolites from the phase I detoxification. Garlic protects the liver against toxic substances, such as aflatoxin, benzopyrene and acetaminophen. The action of garlic reduces significantly when fresh garlic is heated.
5. From traditional medicine it is known that garlic supports digestion, combats dysbiosis and stimulates the appetite.

Garlic extract lowers the systemic blood pressure in hypertension. Because (in vivo) garlic stimulates the enzyme nitric oxide synthase in vascular endothelial cells, the production of artery-widening nitric oxide (NO) is increased. The lowering of blood pressure is furthermore the result of hyperpolarisation of the smooth muscle cells in the blood vessels and/or inhibition of the opening of calcium channels in the muscle tissue. Inhibition of angiotensin-converting enzyme (ACE), modulation of the synthesis of prostaglandins or affecting the atherosclerotic process perhaps also play a role.

6. Allicin deactivates the enzymes of pathogenic bacteria, viruses and fungi by reacting with the thiol group (SH group or sulfhydryl proteinases and alcohol dehydrogenases in the amoeba.

Garlic shows wide spectrum antimicrobial activity and is effective against gram-positive and gram-negative bacteria, viruses, parasites and yeasts and fungi including Candida albicans. Garlic also combats toxin production by the micro-organisms that are present. As far as potency is concerned, one milligram of allicin is the same as approximately 15 IU of penicillin. Garlic is also effective against intestinal parasites; allicin kills amoeba which cause dysentery (Entamoeba histolytica) by blocking cysteine proteininas and alcohol dehydrogenase in the amoeba.

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In vitro and in vivo studies have revealed that garlic strengthens the immune system, partially because of the antioxidant effect of garlic. Allicin and countless metabolites, including diallyl sulfide (DAS), diallyl disulfide (DADS) and Gamma-glutamyl-Se-methylselenocysteine (GGMSC) are responsible for this.

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ordinary garlic. The medicinal effect (as a result of anti-inflammatory, vasodilatory, neuroprotective, antibiotic and antioxidative characteristics) are mainly ascribed to the main component SAC. As well as these water-soluble components, it contains fermented garlic extract, the fat-soluble alliin metabolites diallyl sulfide (DAS), diallyl disulfide (DADS), diallyl trisulfide (DATS), and diallyl tetrasulfide, also responsible for the antioxidative effects. Although both types of garlic are very beneficial and show comparable health effects, the black garlic wins in popularity because of a number of substantial benefits. Whereas white garlic can potentially cause gastrointestinal side effects, these are very rare in the fermented form and undesirable effects such as a sharp flavour and strong odour are more or less lost during the ripening process. Furthermore, to date, no adverse interactions have been observed with other medication and it is non-toxic at higher doses.

INDICATIONS
- Cardiovascular diseases (including atherosclerosis, coronary heart disease, stroke, thrombosis, hypertension)
- Peripheral circulatory disorders (intermittent claudication, Raynaud's phenomenon)
- Hyperlipidaemia, hypertriglyceridaemia, hypercholesterolaemia
- Bacterial, viral, fungal infections and parasitic infections of the airways (including bronchitis, asthma, common cold, sinusitis, pneumonia, pharyngitis)
- Bacterial, viral, fungal infections and parasitic infections of the gastrointestinal tract (including gastroenteritis, diarrhoea, dysentery, candidiasis and parasitic intestinal infections)
- Bacterial, viral, fungal infections and parasitic infections of the urinary tract (including cystitis, candida)
- Dyspepsia
- Interactions
- Caution should be exercised if using an allium sativum extract before and soon after surgery and when using anticoagulant medication (such as warfarin, indomethacin and aspirin), as garlic delays coagulation. Allium sativum extract is contraindicated if there is a known allergy to garlic and when protease inhibitors are used for the HIV virus. Garlic can significantly decrease serum concentration levels of protease inhibitors.

SIDE EFFECTS
The use of Allium sativum extracts (particularly at high doses) can lead to nausea, dizziness, stomach disorders or irritation of the mucous membranes lining the gastrointestinal tract. Lowering the dose generally helps these symptoms. In principle, an allergic reaction is possible but it is very rare. Fermented garlic has few to no side effects.

INTERACTIONS
Exercise caution when using blood glucose lowering medication (sulfonylurea), because in combination with garlic, the blood glucose level can fall more rapidly. In theory, garlic extract can intensify the effect of statins (cholesterol-lowering medication) and ACE inhibitors (high blood pressure medication). For reasons of safety, the use of high doses of Allium sativum extract is advised against when the aforementioned medication is used. Finally, it is known that Allium sativum extract potentiates the effect of antibiotics.

CONTRA-INDICATIONS

DOSAGE
Use a dose of allium sativum extract that corresponds with approximately 10 mg of alliin. Higher doses can be administered for shorter periods of time (e.g. for infections). It is advised that allium sativum extract is taken with meals.

SYNERGISM
Supplements that can be used at the same time as an Allium sativum extract, depending on the indication, include omega-3 fatty acids, vitamin E, alpha-lipoic acid, antioxidants, chlorella and a good probiotic. For candidiasis and other fungal infections, caprylic acid in addition to an Allium sativum extract is a good choice.

REFERENCES


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