GARLIC: A WONDER NUTRACEUTICAL

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History

Thousand years ago garlic (*Allium sativum)* has been used as a food product and known for its medicinal values by civilizations around the world. Old existing corpus can supports its use in Chinese, Egyptian, French & Ayurvedic medicine. Garlic is indigenous to central Asia, where people live the longest, and the occurrence of cancer is the lowest known is not a seer coincidence. Garlic was included in the diet of the slaves for strength and endurance who built the pyramids in Egypt.[13] Evidence shows that Egyptians worshiped garlic, they placed clay models of the bulb in Tutankhamen's tomb. It is said that Hippocrates himself used garlic vapors to treat certain cancers.[11]

It was included as one of the first medicines in the *Codex Ebers*, a 1550 B.C. papyrus that consider the oldest medical text, and was mentioned even earlier in clay, cuneiform tablets from the library of Nineveh in Mesopotamia. Pliny, in his *Natural History* listed garlic as a remedy for sixty-one ailments.[16] Egyptian medical papers dating back to 1550 B.C. mentioned about eight hundred formulas for the therapeutic uses of garlic.[19] Gravediggers in early eighteenth-century in France drank a concoction of crushed garlic in wine to protect themselves from getting the plague that killed many people in Europe. During World Wars I and II, soldiers were given garlic to prevent gangrene.[2]

Regulatory Status[22]

US: generally recognized as sage
UK: included in general sales list
Canada: over-the-counter drug status
France: traditional medicinal use
Germany: commission E approved as over-the counter drug

Medicinal value

It is found that garlic (pulp) contains more than 200 chemical compounds including volatile oil with sulphur-containing compounds like allicin, alliin, and ajoene. It also contains enzymes such as allinase, peroxidase and myrosinase. It is considered that Allicin is responsible for antibiotic properties and strong odor; it also shows fibrinolytic activity which reduces platelet aggregation by inhibiting prostaglandin E2. Ajoene also contributes to the anticoagulant action of garlic. Apart from this garlic also contains citral, geraniol, linalool, Aphellandrene and B phellandrene. The allyl contained in garlic is also found in several members of the onion family and is considered a very valuable therapeutic compound.[22] Alliin and diallyl dysulphur are highly unstable substances and melt easily into liquids and gases. When transported by the blood, they infuse all tissues and organs of the body, thus they act on the whole body.[13]

Allium sativum pulp contains vitamins especially B-1, vitamin C, vitamin A, flavonoids, ascorbic acid, phosphorous, potassium, sulphur, selenium, calcium, magnesium, germanium, sodium, iron, manganese and trace iodine. Seventeen

amino acids are found in it, including eight essential ones.[22]

Garlic as nutraceutical

It is evident that garlic has been used as a food product across the globe. Today it became inseparable part of our diet. Scholars around the world have proved garlic for its medicinal use in treatment & prevention of certain diseases. It possesses both curative and preventative properties; new focus is on its use in prevention of heart attack and cancer. By studying these properties of garlic it can be categorised as nutraceuticals.

Clinical applications

From centuries garlic is being used in the treatment of bronchitis, respiratory problems, gastrointestinal problems, flatulence, leprosy, menstrual cramps, high blood pressure, diabetes and externally for warts, corns, arthritis, muscle pain, neuralgia and sciatica. In Ayurvedic medicine garlic is considered heating, diuretic, diaphoretic (enduces sweating), expectorant, carminative, anti-coagulant, anthelmintic and immune-enhancing. Homeopathically, garlic is used to treat upper respiratory tract inflammation, rheumatism and digestive problems.[16] Researchers are studying the use of garlic in prevention and treatment of several diseases.

In cardiovascular diseases

Dioscorides was a well-known first century physician who wrote that garlic "clears the arteries and opens the mouths of veins."[11] Today, studies around the globe have suggested that garlic consumption can reduce the risk of heart disease caused by the hardening of the arteries.[14] Garlic is considered good for the health of heart because it lowers the cholesterol and blood fats called triglycerides in the bloodstream. According to Yu-Yan Yeh, Ph.D., professor of nutrition science at Pennsylvania State University in University Park, many of garlic protective effects take place in the liver, where cholesterol is produced. In laboratory studies, rats given garlic extract produced 87% less cholesterol and 64% fewer triglycerides. In a review of 16 studies involving 952 people, British researchers found that eating garlic, whether fresh or in powdered form lowered total cholesterol an average of 12 to 13%.[21]Thirty years of research has shown garlic to be affective in reducing cholesterol levels. It is known to reduce systolic blood pressure and lower the blood sugar.[20]

Sulfur compounds of garlic, including diallyldisulfide (DADS) which seem to help smooth blood flow by preventing platelets from sticking together and clotting. In a Brown University study, researchers gave 45 men with high cholesterol aged garlic extract (the equivalent of about 5-6 cloves of fresh garlic). When they examined the men's blood, they saw that the rate at which platelets clumped and stuck together had dropped anywhere from 10 - 58%.[21]

It decreases the level of LDL cholesterol in the blood, because it makes its absorption by the intestine more difficult. It has been proven that in the hours following a breakfast of toast with butter, the level of cholesterol increases 20%, however when the bread is rubbed with garlic, even if it has butter, this increase does not take place.[13] Garlic also has been shown to protect blood vessels from the deleterious effects of free radicals. This antioxidative

activity has also been linked to its blood cholesterol-lowering action and its ability to decrease deposits of cholesterol on the walls of blood vessels.[5]

A garlic-supplementation trial on 432 patients over a three-year period done by Arun Bordia, M.D. a cardiologist at India's Tagore Medical College, shows that 10-percent drop in blood cholesterol and in blood pressure, and less expressions of angina in the population who ate garlic daily. While the non-garlic eaters saw no cardiovascular changes.[5]

As an anticancer

Recent researches have supported the fact that garlic shows excellent potential in the prevention of cancer. Laboratory tests on animal studies suggest that garlic may have some anti-cancer activity. Population-based observation studies suggest that people who have more raw or cooked garlic in their diet are less likely prone to colon, stomach breast, prostate, and laryngeal cancers.[2] Researchers have found that certain enzymes contained in some cancers are totally inhibited by alliinase and other compounds contained in garlic. Several Japanese experiments suggest that injecting garlic into rats with certain types of sarcoma blocked tumor cell reproduction and caused mutations in the cancer cells themselves. Garlic's role in simulating the body's immune defenses may also be linked to cancer control and prevention, in laboratory experiment, the natural killer cells of garlic-eating subjects destroyed 159 percent more tumor cells than those who had not consumed garlic. [22]

A 1994 study done on 41,000 women who consumed a weekly serving of garlic demonstrated a 35% decrease in the risk of colon cancer.[20] In animal studies by Weisberger and Pensky of Western Reserve University, as reported in *Science,* mice injected with cancer cells died within 16 days. When cancer cells were treated with Garlic extract and injected into the animals, no deaths occurred for a period of 6 months. In other studies, feeding fresh Garlic to female mice completely inhibited the development of mammary tumors. It is considered that the high germanium content of garlic may also play a role in cancer treatment and prevention. [22] The ajoene in garlic is showing some promise in the treatment of skin cancer.[18]

According to John Milner, Ph.D., professor and head of the department of nutrition at the Pennsylvania State University, s-allycysteine of garlic appears to stop the metabolic action that causes a healthy cell to become cancerous. The substance called DADS chokes cancer cells until their numbers are reduced and they start dying. Another substance in garlic is diallyl trisulfide (DATS), which is 10 times more powerful than DADS at killing human lung cancer cells. Its effectiveness is comparable to that of 5 flluorouracil, a widely used chemotherapy agent. In his view, garlic contains compounds that help prevent nitrites, common substances found in some foods and pollutants from transforming themselves into nitrosamines, harmful compounds that can trigger cancerous changes in the body[21]

As an antibiotic

Louis Pasteur first verified garlic's antibacterial properties scientifically in 1858, and showed how it killed bacteria under laboratory conditions.[16] Several modern extensive studies confirm that

garlic has definite antibiotic properties and is effective against many bacteria, fungi and viruses. According to Wright State University, garlic is approximately one per cent as potent an antibiotic as penicillin. The significant advantage of using garlic as antibiotic is that, the body does not seem to build up a resistance to it as it does to many modern antibiotics.[1] Garlic is effective against diverse types of fungi, yeasts, and some viruses, including herpes. The active principles of garlic are supposed to interact with the nucleic acids of the virus, thus limiting its proliferation.[13]

Researchers around the globe are extensively studying the role of Garlic in enhancing the immune system, as antidiabetic, and anti oxidant ability to neutralize damaging free radicals before they can harm healthy cells.

As an antidiabetic

Few studies suggest that garlic may have some mild blood-sugar-lowering properties. It is believed that garlic lower blood sugar levels by decreasing the rate at which insulin is inactivated and degraded by the body, effectively increasing quantities of circulating insulin and decreasing blood glucose levels. Overall, these effects do not appear to be strong enough to warrant use of garlic as a blood-sugar-lowering agent.[45] In general, sulfur compounds in garlic are believed to exert hypoglycemic activity by competing with insulin.[44]

Safety

Garlic may increase bleeding, especially in patients already taking certain anti-clotting medications. Rarely, gastrointestinal upset symptoms are considered as possible side effects.[32] It is advised that people taking warfarin, regular doses of aspirin, or other blood thinners should not use garlic for anything other than seasoning.[35]

At the National Institutes of Health's (NIH) HIV clinic, one woman who was on ritonavir (Norvir) treatment and then started garlic supplements was developed severe nausea and vomiting, which resolved after stopping the garlic. It is considered that the garlic may have increased the levels of ritonavir. It was also supported in one more case study. Still it is unclear, if garlic was increasing the risks of ritonavir related side effects or if it was the actual cause of them. Subsequently, small single-dose studies of ritonavir and garlic do not suggest a serious herb-drug interaction.[36]

Garlic may also increase the risk of side effects associated with other anti-HIV drugs. It is assumed that garlic has an effect on p450 enzyme. Garlic supplements should not be used while taking saquinavir as the sole protease inhibitor due to the risk of decreased saquinavir plasma concentrations.[30] Moreover, people using the supplement with anti HIV drugs who experience serious stomach problems might consider stopping it to see if these symptoms lessen.[36]

Garlic may intensify the effects of drugs that decrease blood sugar levels (hypoglycemic drugs, such as insulin and glipizide) causing an excessive decrease in blood sugar levels (hypoglycemia).[25]

Dosage and dosage form

Garlic supplement preparations are available in oil, extract, powder, capsules and tablet forms. It is observed that chemical composition of these preparations may not mirror the

composition of fresh garlic clove. Hence it is always advisable to take daily dose equivalent to 4 g[41] of fresh garlic cloves, which is about the size of one average clove of garlic. Average daily dosage: fully-dried powder, 400-1200 mg; fresh (air-dried) bulb, 2-5 g; garlic oil, 2-5 mg. Fully-dried powder, 400-1200 mg, fresh (air-dried) bulb, 2-5 g; garlic oil, 2-5 mg.[28]

Conclusion

Garlic is being used from thousand of years for its medicinal properties. Numerous researches have proved its beneficial role in cardiovascular condition. Indeed, garlic does indeed have cardio-protective properties. Researches also proved its active role as anticancer, natural immunity booster, antioxidant, antibiotic & antidiabetic product. On other hand studies also report some side effects of garlic if it is used with blood-thinners, anti HIV, or hypoglycemic drugs. This observation suggests that more research is needed in safety and active use of garlic as a Nutraceutical.

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