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Mollusciciding Agent of Allium Sativum (Garlic) Allicin

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Short Communication

Water-borne diseases like schistosomiasis or fasciolosis with gastropods as intermediate hosts are still a burden for mankind especially in tropical countries. No continent is free from this disease. Besides using chemotherapeutic agents for treating man and infected animals as definite host, the "World Health Organization" recommends fighting against the intermediate hosts as a necessary and unpronounceable. Due to more attention on SARC, AIDS, malaria and research in immunological approaches to worm control, a little interest is focused on snail control to minimize the fasciolosis. With respect to this approach, mollusciciding is still in the centre of efforts. However, snail control is not synonymous with mollusciciding; additionally biological control mechanism and habitat alteration may play a role. With the interaction of none and safer drugs for the treatment of fasciolosis, snail control is perhaps employed use often as a means of combating the disease. Snail control can be controlled indirectly by reducing their habitat or directly removing them. Besides synthesized chemical agents, plant molluscicides may become more and more important. Its attraction was and is largely based on the philosophy of self-reliance, on savings of hard currency and on the idea, that natural products cannot be as harmful for the environment as synthetic chemicals. Tropical plants have a long history of use in traditional practice to solve local problem of health and socio-economic problem as they are less hazardous to the environment. The evaluation of molluscicides properties of plant extracts should be easier to handle, comparative safer for environment. In the last three decade a large number of plants have been screened out for their molluscicides activity. Interest in the chemical composition of garlic has increased in recent years due to established scientific acceptable manner of garlic and their constituents. One of the earliest chemical studies was made in 1844 by a German chemist Theodor Wertheim. He employed steam distillation. Distillation of oil yielded some strong smelling volatile substances. Wertheim called allyl. The word allyl still used today. The next discovery in the chemistry of garlic was made in 1944 by Cavallito and his colleagues. They established the method less vigorous than steam distillation. Chemically, Cavallito's oil is the oxide of diallyl disulfide. Cavallito called his discovery allicin. It is chemically unstable, colourless liquid that accounts for the pungent of garlic. Although allicin is responsible for the smell of garlic, a garlic bulb exhibits little or no odour until it is cut or crushed. In 1948 Stoll and Seebeck showed that allicin develops in garlic when an enzyme initiates its formation from an odourless precursor (+)-S-allyl-L-cysteine sulfoxide. They called the precursor alliin. The content of alliin in garlic is 0.2-2.0 percent. Allicin represents 70-80% weight of the total thiosulfinates. It is the least stable of garlic's eight thiosulfinates. The half life of allicin at room temperature is 10 days in 1.0 mM citric acid (pH-3.0), 4 days in water, 48h in methanol, 24 h in ethanol, 3 h in ether and 2 h in hexane. Garlic, Allium sativum L. (Family-Alliaceae) has been widely recognized as a valuable spice and a popular remedy for various ailments and diseases. The name garlic may have originated from the Celtic word 'all' meaning pungent. The medicinal properties of garlic were described by Galen, Aristophanes and Pliny the Elder. Father of Medicine, Hippocrates observed that garlic was excellent for curing tumors and is an effective diuretic. Aristotle attributed garlic as a cure for rabies, and the Prophet Mohammad recommended it for treating scorpion stings. Attention has been focused on the molluscicides activity of Allium sativum. Characterization of molluscicides component showed that the allicin is the active component present in the garlic bulb which causes snail mortality. Allicin in different months of dried garlic bulbs were extracted. The levels of extracted allicin in each month were measured at 210 nm with the help of standard curve. Level of allicin in dried garlic bulb was significantly increased from first month (0.6 mg/l) after sowing to five month (3.6 mg/l) garlic. After harvesting, there was no significant increase in allicin level of garlic bulb. It is synthesized in Malacology Laboratory, Department of Zoology, DDU Gorakhpur University; Gorakhpur, India was tested against harmful snail. Test animals were the snails Lymnaea acuminata and Indoplanorbis exustus, both being intermediate hosts for *Fasciola hepatica* and *F. gigantica.* Treatment of even 6.34 mg/l allicin can kill 50% of the snail population. Treatment of animals with allicin and their mode of action on enzyme system caused a significant inhibition of acetylcholinesterase, lactic

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dehydrogenase and alkaline phosphatase activity in the nervous tissue of Lymnaea acuminata. Maximum inhibition was observed in snails exposed to 80% of 96 h LC_{50} of allicin. The inhibition of enzymes was time and dose dependent. The time dependent may be due to the conversion of allicin into more toxic metabolites in the body of snails. *In vitro* preincubation of allicin caused significant dose dependent inhibition in acetylcholinesterase, lactic dehydrogenase and alkaline phosphatase activity. Line weaver-Burk plot on the inhibition of acetylcholinesterase by allicin is uncompetitive. Slope of inhibited and uninhibited acetylcholinesterase was not changed; both are parallel to each other whereas, the intercept of inhibited and uninhibited acetylcholinesterase was changed. K_m and V_{max} of control and inhibited enzyme are different. The Km of uninhibited and inhibited enzymes are $4.16x10^{-4}$ M and $2.3x10^{-4}$ M, whereas, V_{max} 0.20 and 0.12, respectively. Inhibition of acetylcholinesterase by allicin is uncompetitive. Slope of inhibited and uninhibited acetylcholinesterase was not changed; both are parallel to each other whereas, the intercept of inhibited and uninhibited acetylcholinesterase was changed. Km and V_{max} of control and inhibited enzyme are different. The Km of uninhibited and inhibited enzymes are $4.16x10^{-4}$ M and $2.3x10^{-4}$ M, whereas, V_{max} 0.20 and 0.12, respectively. Inhibition of lactic dehydrogenase and alkaline phosphatase by allicin is competitive as Km value of control ($2.85x10^{-5}$ M and $1.53x10^{-5}$, respectively) and inhibited enzyme ($8.3x10^{-5}$ M and $3.33x10^{-5}$, respectively) are different and V_{max} of both the enzymes are the same (0.41 and 1.33, respectively) which is evident from the same intercept ($1/V_{max}$) on the Y-axis of the Line weaver-Burk plot. Garlic's active component is more toxic than synthetic molluscicide. It can be used as a group of new molluscicide.