ISSN: 2287-688X

Annals of
Plant Sciences

Volume 11, Issue 02 (2022) pp. 4797-4801

Research Article

Molluscicidal Effect of Essential Oils from Plant Origin against the Vector Snail *Lymnaea acuminata*

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Abstract

Snail control is one of the most major tools in the crusade to reduce the prevalence of fascioliasis. The interest in essential oils is widespread, and has seen them proven effective against various pests including molluscs. Essential oils and/ or their ingredients are gaining adding interest for using as safe druthers to fungicides for controlling colorful pests including gastropods. In the present study the molluscicidal activity of some of the essential oils of plant origin have been evaluated and demonstrated as potent molluscicides against the vector snail, *Lymnaea acuminata*. It was clearly demonstrated that the essential oils are highly toxic to the snails exposed to 24 h up to 96 h. The main objective of this research is to evaluate the molluscicidal activity of essential oil of *Polianthes tuberosa* and *Allium sativum* bulb. It's apparent from the present results that *P. tuberosa* and *A. sativum* essential oils displayed as strong molluscicides of plant origin. The present study can be helpful to reduce the prevalence of fascioliasis.

Keywords: *Polianthes tuberosa, Allium sativum, essential oils, molluscicidal activity, snail control*

Introduction

Certain freshwater draggers are of great profitable significance because they play as intermediate hosts for digenean trematodes. Two similar breaks, *Fasciola hepatica* and *Fasciola gigantica*, are transferred by the snail *Lymnaea acuminata* which beget aboriginal disease fascioliasis in cattle population of eastern region of the state of Uttar Pradesh in India [Agarwal, R. A. *et al*., 1988]. An obvious solution is to reduce the incidence of fascioliasis is to de-link the life cycle of fluke by destroying the vector snails [Chattoraj, A. N. *et al*., 1965; Madsen, H. 1992]. The development of a particular and safe molluscicide should always be a realistic aim. It must be effective at low attention and ply minimum adverse effect on the other biota participating the same territory with snail Lack of connection between molluscicides and target snail population due to mushy leafage, dilution in upwelling sewage water are two main cases of the failure of snail control programme [Abd-El Hamid, A. Z., 1997]. It has been reported before that the application of attractants, arrestants, phagostimulants and poisonous factors in control release formulations or bait formulations prepared to put off trematode host snails from the fresh water terrain is cost effective and ecologically respectable [Marston, A. *et al*., 1985]. The snails use chemical signals for locating food sources. These signals are released from the dead and living aquatic organisms into the modular system of the snails [Marston, A. *et al*., 1987]. Bait formulation bearing attractant and a molluscicide is an advisable way in order to bait the target snail population to the molluscicide. In the present study the essential oils of different plant derived molluscicides have been used against the vector snail *Lymnaea acuminate* [Abd-El Hamid, A Z 1997]. The interest in essential oils is widespread, and has seen them proven effective against various pests including insects, mites, fungi, and nematodes [Singh, A. *et al*., 1996]. The most poisonous oils

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DOI: http://dx.doi.org/10.21746/aps.2022.11.2.11

overall feel to be thyme, oregano, basil, rosemary, and mint; still, testing of a wider range of oils on various pests will probably reveal particular exertion of certain oils against certain pests [Singh, K. *et al*., 1996; Tiwari, F. *et al*., 2004a]. Tuberosa essential oil is scientific known as polianthes tuberosa and its essential oil is uprooted from its flowers by a solvent birth system. The main factors of tuberosa essential oil are benzyl alcohol, butyric acid, eugenol, Farnesol, geraniol, menthyl benzoate, menthyl anthranilate and nerol. Therapeutic Properties**-** Tuberosa essential oil can treat the onset of nausea to avoid the uncomfortable sensation. It is considered an effective remedy for nasal congestion. Tuberosa essential oil is an effective aphrodisiac. It helps to stave off infections of the skin. Its antispasmodic property is similarly salutary for spasmodic coughs, convulsions, as well as for degrading muscle pressure. Skincare-It hasanti-fungal andanti-bacterial properties that support to treat skin problems like acne. It's similarly a valid remedy for cracked heels due to its mending properties. It smoothes fine lines and wrinkles as well as accelerating the moisture binding credentials of the skin. As a result, skin looks youngish and suppler. Haircare-Tuberosa oil helps to repairs damaged hair and spilt ends. It's applied for hair fall, dandruff and hair lice due to its anti-dandruff and sebum controlling properties. Emotional-It helps to calm people and give relief from stress, tension, anxiety, depression, and angriness. Essential oil compositions of garlic (*Allium sativum*) attained by different distillation methodologies. The major components of Serbian garlic essential oil obtained by hydrodistillation were diallyl trisulfide (33.6%), diallyl disulfide (28.1%), and allyl methyl trisulfide (17.8%) [Tiwari, F. *et al*., 2004b].

Materials and Methods

Tested Material

Plant species, *Polianthes tuberosa* and *Allium sativum* leaves and bulb were collected from the botanical garden of the college. These plant materials were carefully examined for identification by the Herbarium at the Botany Department, M. G. P. G. College, Gorakhpur, UP India.

Isolation of Essential Oils

The essential oils of *Polianthes tuberosa* and *Allium sativum* were obtained by hydrodistillation method described in British Pharmacopoeia [Salim *et al*. 2017; Tiwari, F. 2021].

Collection of Snails

Adult *Lymnaea acuminata* (2.25±0.20 cm in length) were collected locally from lakes and low lying submerged fields in Gorakhpur. The snails were acclimatized for 72 hours in dechlorinated tap water at 25±10 C. The pH of the water was 7.1-7.3 and disappeared oxygen, free carbon dioxide and bicarbonate alkalinity were set to6.5-7.2 mg/ l,5.2-6.3 mg/ l and102.0-105.0 mg/ l, independently.

Lethal concentration values (LC_{50}), lower and upper confidence limits (LCL and UCL), slope values, t- ratio, 'g' value and heterogeneity factor were calculated using POLO computer programme [Russel, R. M. et al., 1977]. The product moment correlation coefficient was applied between different data obtained in Tables 1 [Sokal, R. R. et al., 1973].

Results and Discussion

Mollusciciding is still considered the most important means of controlling fascioliasis transmission. I in pastoral communities the value of synthetic molluscicides and/ or chemotherapy prohibits their use. Plant molluscicides, applied as crude waterless dormancies are the source of cheap, efficient and environmentally respectable options. The discovery of the potent molluscicidal properties of some plant-derived agents in Mortality was expressed on probit probabilities and plotted against the log. Transformed values of aromatic water extract concentration. The results of the toxicity of the investigated essential water solutions against the tested snails are presented in Table 1.

The slope values provided in Tables 1 were abrupt. Separate estimate of LC_{50} based on each of the six replicates was found to be within 95% confidence limits. The t-proportion was lesser than1.96 and the

diversity lower than1.0. The'g' value was lower than0.5 at all probability situations (90, 95, 99).

The essential oil of *Allium sativum* bulb leaves exhibited high toxic effects on *Lymnaea acuminata* (24h LC_{50} -3.28) whereas the essential oil water solution extract of the *Polianthes tuberosa* bulb also showed high toxic effects (24h LC_{50} -4.36). It was evident from the present results that *A. sativum* and *P. tuberosa* essential oils are potential sources of botanical molluscicides. Their toxic effect is dose dependent. This is the first evaluation of these plants against the hosts of fascioliasis. The good results observed offer an alternative tool for the control of fascioliasis. Bioassay-directed fractions of the active crude materials, to isolate and identify the compound responsible of the molluscicidal activity, are essential to understand the mechanisms involved [Tiwari, F. 2013; Blythe, E. K. *et al*., 2020; Tiwari, F. 2011].

Table-1: Molluscicidal activity and lethality of *Polianthes tuberosa* and *Allium sativum* essential oil extracts against the snail *Lymnaea acuminata*.

Exposure period	Molluscicides	LC_{50}	LCL	UCL	Slope Value	t-ratio	g-value	Heterogeneity
24h	*Polianthes tuberosa*	4.36	2.07	4.38	1.8±0.45	3.92	0.24	0.28
	Allium sativum	3.28	1.10	4.10	1.45±0.33	4.38	0.20	0.32
48h	*Polianthes tuberosa*	3.85	0.93	1.29	1.12±0.37	3.03	0.41	0.15
	Allium sativum	2.65	0.59	2.59	1.14±0.27	4.15	0.22	0.16
72h	*Polianthes tuberosa*	3.02	0.61	2.0	1.16±0.34	3.35	0.34	0.22
	Allium sativum	2.04	0.24	0.45	1.34±0.25	5.21	0.14	0.28
96h	*Polianthes tuberosa*	2.54	0.64	0.88	2.61±0.50	5.22	0.14	0.29
	Allium sativum	1.70	0.50	0.73	2.71±0.61	4.45	0.19	0.11

Product moment correlation showed significant ($p<0.05$); negative correlation in between the exposure period and LC_{50} of different molluscicides.

Conclusion

In the conclusion it can be stated that the plant derived essential oils might be used as an effective tool for controlling the molluscan pests to reduce the incidence of fascioliasis. Its further studies can be helpful in integrated snail control programme.

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Source of support: Nil; **Conflict of interest:** Nil.

Cite this article as:
Tiwari, F. "Molluscicidal Effect of Essential Oils from Plant Origin against the Vector Snail Lymnaea Acuminata." *Annals of Plant Sciences*.11.02 (2022): pp. 4797-4801.

DOI: http://dx.doi.org/10.21746/aps.2022.11.2.11