

Molluscicidal Effect of Essential Oils of *Lantana Indica* Against the Vector Snail of *Fasciola* Species

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Abstract

Fascioliasis is an endemic zoonotic disease that is very common in eastern Uttar Pradesh. The production of essential oils from a variety of plants is crucial to human health. According to the current study, the essential oils of different plant materials of *Lantana indica* work well as herbal molluscicides against the vector snail *Lymnaea acuminata*. Essential oils from different plant materials of *Lantana indica* are extracted utilizing both traditional and nontraditional methods, including solvent extraction (SE) and hydrodistillation (HD). It is clear from the findings section that the essential oils from *Tachyspermum ammi* seeds and *Syzygium aromaticum* cloves both exhibit strong molluscicidal activity (24-hour LC_{50} value is 3.76 especially against the vector snail *Lymnaea acuminata*). The results of the current study clearly demonstrated the tremendous harm that the essential oils cause to the vector snails. Establishing the molluscicidal action of the essential oils of different plant material of *Lantana indica* against the vector snail *Lymnaea acuminata* is the goal of the current study.

Keywords: Molluscicides, Essential Oils, *Lymnaea Acuminata*, *Lantana Indica*

1. Introduction

Fascioliasis is one of the most common dreaded disease in the cattle population of eastern Uttar Pradesh. The causative agents of this endemic disease are two digenean trematodes *Fasciola hepatica* and *Fasciola gigantica*. As these pathogens are digenetic the vector of these parasites are an aquatic snail *Lymnaea acuminata*. It was reported that 94% of the cattle population are infected with fascioliasis in eastern Uttar Pradesh. One of the best methods to reduce the incidence of fascioliasis is to delink the life cycle of the fluke by controlling snail population. As the synthetic pesticides play an adverse effect on other biota it is necessary to use a pesticide which must be biodegradable, eco-friendly and cost effective. Earlier reports clearly demonstrates that plant based molluscicides caused potent effect on snail *Lymnaea acuminata* as a part of integrated pest management. Many plant materials contain volatile evaporating chemical compounds which are potent molluscicides against *Lymnaea acuminata*. *Lantana indica* (Family- Verbenaceae) also called Lantana wild sage, is a low, erect or sub-scandent woody perennial shrub that grows to a height of 0.3 to 1.8 meters or more. It has a strong black currant scent and robust, recurved prickles. Seven or eight species are found in India, including in addition to species with horticultural importance. It is a troublesome invasive species introduced to many tropical regions including India. The plant has an incredible property of having essential oils which has several medicinal use as well as potent molluscicidal and insecticidal properties. It was earlier reported that the essential oils of different plant origin act as an effective pesticide for a number of pests like insects,

mites, fungus and nematodes. In the present investigation the essential oils from different parts of *Lantana indica* used against the vector snail *Lymnaea acuminata* show significant effect on reduction of incidence of fascioliasis [1-25].

2. Materials and Methods

2.1. Collection of Different Parts of *Lantana Indica*

The collection of different plant materials like leaves, flowers and stems of *Lantana indica* was done from the local Botanical Garden of Gorakhpur UP India and further used for toxicity experiments. The materials were dried in sunlight and grinded in the grinder to make them powder [26].

2.2. Collection of Snails

Grown-up *Lymnaea acuminata* (2.25±0.20 cm long) were gathered locally from lakes and low lying lowered fields in Gorakhpur. The snails were adjusted for 72 hours in dechlorinated faucet water at 25±10 C. The pH of the water was 7.1-7.3 and broken up oxygen, free carbon dioxide and bicarbonate alkalinity were set to 6.5-7.2 mg/l, 5.2-6.3 mg/l and 102.0-105.0 mg/l, separately.

2.3. Extraction of Essential Oils

The essential oils of different plant materials of *Lantana indica* were gotten by hydrodistillation technique portrayed in English Pharmacopeia. The Essential oil was extracted from 500 g test through hydro-refining in Clevenger's mechanical assembly (Merck Specialities Pvt., Ltd., Mumbai, India). The essential oil (EO) was isolated and hints of water eliminated by going through anhydrous Na_2SO_4 .

2.4. Statistical Analysis

The statistical analysis has been done by using a computer programme, POLO in which calculations of lethal concentration values (LC₅₀), lower and upper confidence limits (LCL and UCL), slope values, t- ratio, 'g' value and heterogeneity factor were included. The product moment correlation coefficient was applied between different data obtained in Tables 1[27,28].

3. Results

The slope values observed in the Table 1 are all very steep. A separate estimate of the LC₅₀ based on each of the six replicates was found to be within the 95% confidence limits. The t-ratio is greater than 1.96 and the heterogeneity is less than 1.0. The "g" value is less than 0.5 at all probability levels (90, 95, 99). The aforementioned investigation unequivocally demonstrates that the essential oils extracted from different plant materials of *Lantana indica* was extremely toxic to the vector snail *Lymnaea acuminata* (24-hour LC₅₀ value is 3.76). Current research investigation clearly suggests that essential oils extracted from *Lantana indica* may be source of potent plant-based molluscicide. The duration and dosage of their detrimental effects differ. This is the first time this plant based essential oil has been tested against hosts of fascioliasis. The positive outcomes that have been seen offer a different method of fascioliasis management. To comprehend the mechanisms at play, aliquots of the active raw materials must be submitted to biological experiments that isolate and identify the molecule causing the molluscidal activity.

4. Discussion

Choosing a safe and environmentally friendly molluscicide is crucial for integrated pest management since overuse of chemical molluscicides can disrupt the aquatic ecosystem [29]. Molluscicides made from essential oils from various plants are highly effective, inexpensive and environmental benign. The snail *Lymnaea acuminata*, which is the vector of digenean trematodes, may be susceptible to molluscicides action from *Lantana indica* and its bioactive components. The result section makes it evident that the 24-hour LC50

value for the essential oils of *Lantana indica* is 3.76. In earlier studies the *Lantana indica* has several medicinal value for human being. It was used by many communities in many ways. *Lantana camara* is recognized in traditional medicine for its wide-ranging therapeutic benefits, which encompass antiinflammatory, antimicrobial, antidiabetic, and anticancer properties. The plant's medicinal effectiveness is attributed to its bioactive constituents, such as alkaloids, flavonoids, and triterpenoids. The molluscicidal and insecticidal properties of the *Lantana indica* was also describedearlier [30].

Because essential oils have a higher toxicity than their crude counterparts and act at low concentrations, it has previously been documented that essential oils derived from several plants are effective molluscicides. The steep slope values show that snail mortality is significantly increased by a slight increase in the concentration of plant based essential oils of *Lantana indica*.The regression is considered significant if the t-ratio value is larger than 1.96.

Heterogeneity values below 1.0 show that the concentration reaction line would fall inside the 95% certainty constraint limit within the replicates, indicating that the model fit the data adequately.Given that the value of "g" is less than 0.5, the statistics clearly show the index of significance of the potency estimate. It is clear from the present study that the use of plant origin essential oils can be used to reduce the incidence of fascioliasis by delinking the life cycle of the liver fluke by controlling the vector snail *Lymnaea acuminata* . The plant originated molluscicides are biodegradable, eco-friendly, cost effective and safe for the biota sharing the same ecosystem [31-35].

5. Conclusion

The essential oils are specialized compounds present in plant parts are effectively used as potent insecticides as well as molluscicides. It can be concluded from the above research article that the plant origin essential oils of *Lantana indica* is highly effective against the vector snail *Lymnaea acuminata*. The use of these eco-friendly methods are a newer approach in vector snail control programme.

Table 1: Toxicity and Molluscicidal Action of Different Plant Materials of Lantana Indica Essential Oil Against the Snail Lymnaea Acuminata

Exposure period	Molluscicides	LC50	LCL	UCL	Slope Value	t-ratio	g-value	Heterogeneity
24h	<i>Lantana indica</i>	3.76	1.11	4.45	1.67±0.41	3.70	0.21	0.24
48h	<i>Lantana indica</i>	3.16	0.91	3.50	1.21±0.32	3.01	0.18	0.21
72h	<i>Lantana indica</i>	2.86	0.83	3.29	1.10±0.31	2.80	0.16	0.20
96h	<i>Lantana indica</i>	2.43	0.78	3.01	1.07±0.29	2.71	0.15	0.19

Notes: There is a negative correlation was observed from the above data in between the exposure period and essential oils of *Lantana indica* as the Product moment correlation observed (p<0.05).

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