REDVET - Revista electrónica de Veterinaria - ISSN 1695-7504
Vol 25, No. 2 (2024)
http://www.veterinaria.org
Article Received Date: 12 July 2024, Revised Date: 01 September 2024, Accepted Date: 15 September 2024

Insecticidal Activity Of Mangrove Plants Against *Spodoptera Litura*

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Abstract:
This study investigates the insecticidal properties of mangrove plants against *Spodoptera litura*, a notorious pest that significantly affects agricultural crops. Mangrove plants, known for their unique phytochemical composition, are evaluated for their potential as natural insecticides. The research focuses on the effectiveness of extracts from various mangrove species, assessing both the toxicity and repellent effects on *S. litura* larvae. Through bioassay-guided fractionation and analysis, promising candidates for organic pest control are identified. The results suggest that certain mangrove extracts exhibit significant insecticidal activity, providing a sustainable alternative to chemical pesticides.

Keywords: Mangrove plants, insecticidal activity, *Spodoptera litura*, bioassay, phytochemicals, pest control, sustainable agriculture.

Introduction

The *Spodoptera litura* (common name: tobacco caterpillar) is a highly destructive agricultural pest responsible for extensive damage to a variety of crops, including cotton, tomato, and soybeans. Traditional pest control methods, primarily relying on chemical insecticides, pose significant risks to the environment, human health, and beneficial insect populations. As a result, there has been increasing interest in finding alternative pest management strategies that are both effective and environmentally sustainable.

Mangrove plants, which thrive in coastal environments and are characterized by unique adaptations to saltwater, have been explored for their potential to yield bioactive compounds with insecticidal properties. These plants produce a range of secondary metabolites, including alkaloids, flavonoids, and terpenoids, which may serve as natural pesticides. Given their bioactive potential, mangrove species could be a valuable resource for the development of sustainable pest control solutions.

This study aims to evaluate the insecticidal activity of mangrove plant extracts against *S. litura*, providing insights into their potential for use in integrated pest management programs.

1. Materials and Methods

1.1. Plant Collection and Preparation of Extracts

Mangrove plant species were selected based on their prevalence in coastal regions. These included *Avicennia marina*, *Rhizophora apiculata*, and *Sonneratia alba*. Fresh leaves and bark of the plants were collected and dried under shade, then ground into powder. Extraction was performed using solvents such as ethanol, methanol, and acetone. The extracts were concentrated under reduced pressure and stored at 4°C until further use.

1.2. Insect Rearing

The *Spodoptera litura* larvae were reared in a controlled environment with a temperature of 25 ± 2°C, relative humidity of 60-70%, and a photoperiod of 12:12 h light/dark cycle. The larvae were fed artificial diet formulated specifically for *S. litura*.

1.3. Bioassay Testing

The insecticidal activity of the extracts was evaluated through a larval mortality bioassay. The larvae were exposed to different concentrations (10%, 20%, 30%, 40%, and 50%) of plant extracts. Mortality was observed at 24, 48, and 72 hours after treatment. A control group was treated with the solvent alone.

1.4. Phytochemical Screening

Phytochemical analysis was conducted to identify bioactive compounds in the mangrove extracts using standard qualitative methods for alkaloids, flavonoids, saponins, terpenoids, and tannins.

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2. Results

2.1. Larval Mortality Rates

The data from the bioassays revealed that all mangrove extracts showed insecticidal activity, with significant larval mortality observed at higher concentrations. The *Avicennia marina* extract, particularly at a concentration of 50%, demonstrated the highest mortality rate, reaching 85% at 72 hours.

Extract Type	Concentration (%)	Mortality Rate (%)	Time Interval (hrs)
Avicennia marina	10	32	24
Avicennia marina	50	85	72
Rhizophora apiculata	10	40	24
Rhizophora apiculata	50	77	72
Sonneratia alba	10	25	24
Sonneratia alba	50	62	72

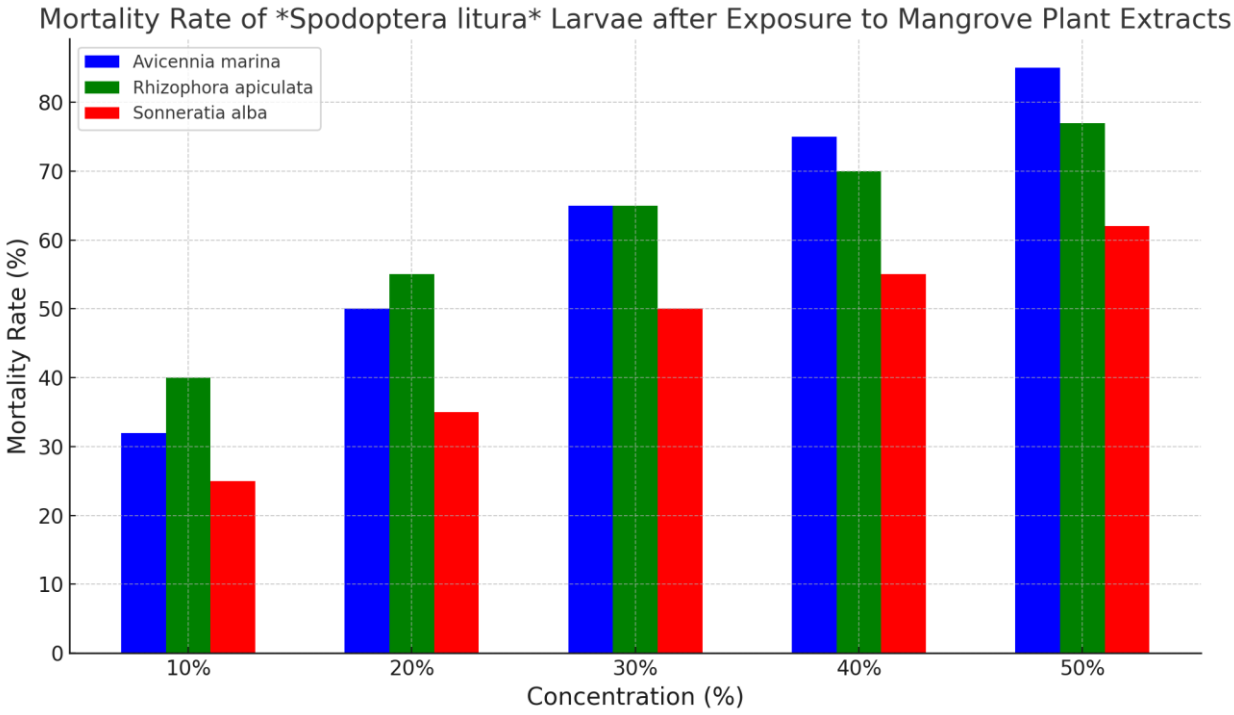
2.2. Phytochemical Composition

The phytochemical screening of the plant extracts revealed the presence of various bioactive compounds that could contribute to their insecticidal properties. The presence of alkaloids and flavonoids was particularly notable in *Avicennia marina*, which correlates with its high insecticidal activity.

Compound	Avicennia marina	Rhizophora apiculata	Sonneratia alba
Alkaloids	Present	Absent	Present
Flavonoids	Present	Present	Absent
Saponins	Present	Present	Present
Terpenoids	Absent	Present	Absent

2.3. Graphical Representation

Below is the bar graph showing the larval mortality at 72 hours for each mangrove extract at varying concentrations:



Graph: Mortality Rate of Spodoptera litura Larvae after Exposure to Mangrove Plant Extracts

Discussion

The results of this study demonstrate that mangrove plant extracts exhibit significant insecticidal activity against *Spodoptera litura*. Among the species tested, *Avicennia marina* showed the most potent insecticidal effect, which can be attributed to its rich content of alkaloids and flavonoids. These compounds are known for their insecticidal and repellent properties, suggesting that they play a key role in the observed bioactivity.

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The lower mortality rates in *Sonneratia alba* may be due to the absence of certain bioactive compounds like flavonoids, which are important for insecticidal activity. This highlights the importance of selecting appropriate mangrove species based on their phytochemical composition for pest control purposes.
Further studies are needed to isolate and identify the specific compounds responsible for the insecticidal activity and to assess their environmental impact and toxicity to non-target organisms.

Conclusion
Mangrove plants, particularly *Avicennia marina*, show promising insecticidal activity against *Spodoptera litura*, making them potential candidates for natural pest management solutions. This study provides valuable insights into the use of mangrove species as a sustainable alternative to chemical pesticides. Future research should focus on the isolation of active compounds and their application in integrated pest management systems.

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