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Application of crude leaf extracts of pineapple in pest control of field collected insects

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Abstract
The study focuses on Sugar-Apple (*Annona squamosa*), a plant found in tropical regions worldwide. *Annona squamosa* leaves contain an organic compound called borneol, which exhibits insecticidal properties. The research aims to investigate the effectiveness of *Annona squamosa* leaf extract as an insecticide. The study's findings are expected to contribute valuable information for the development of biological insecticides within the field of environmental health. Additionally, this bioinsecticide could potentially play a role in preventing infectious diseases transmitted through contaminated food, insect bites, and reducing allergic reactions caused by insect exposure.

Keywords: *Annona squamosa*, IPM, insect exposure

Introduction
Pineapple leafy crown waste, often discarded after the pineapple fruit is harvested, can be converted into value-added products through various innovative processes. Pineapple waste conversion, which not only reduces waste but also aligns with the concept of turning waste into valuable resources. It recognizes the importance of sustainable waste management practices in the context of increasing pineapple production and consumption. Here are several potential ways to convert pineapple leafy crown waste into valuable products.

1. **Pineapple Fiber Extraction:** Pineapple leaves are a rich source of long, strong fibers known as pineapple leaf fibers (PALF). These fibers can be extracted and processed into textiles, including bags, clothing, shoes, and accessories.
2. **Handicrafts and Artisanal Products:** Pineapple leaf fibers can be used to create a wide range of handicrafts and artisanal products, such as baskets, mats, hats, and decorative items.
3. **Paper and Packaging Material:** Pineapple leaf fibers can be used to make eco-friendly paper products, including stationery, packaging materials, and paperboard.
4. **Bioenergy Production:** Pineapple leafy crown waste can be utilized as a feedstock for biogas production through anaerobic digestion, providing renewable energy.
5. **Organic Fertilizer:** Composting pineapple leafy crowns can yield nutrient-rich organic fertilizer that can be used in agriculture and gardening.
6. **Herbal and Medicinal Products:** Extracts from pineapple leaves may contain bioactive compounds with potential health benefits. Research and development can explore the creation of herbal supplements, cosmetics, or traditional medicines.
7. **Livestock Feed:** Pineapple leafy crowns can be dried and processed into nutritious feed for livestock, particularly in regions where feed resources are limited.
8. **Biochar Production:** Pyrolysis of pineapple leafy crowns can yield biochar, a type of charcoal that can improve soil fertility and sequester carbon.
9. **Natural Dyes:** Some parts of the pineapple leafy crown may be used to extract natural dyes for textiles or crafts.
10. **Pineapple Leaf Extracts:** Extracts from pineapple leaves may contain compounds with antioxidant or antimicrobial properties, which can be used in cosmetics, skincare products, or dietary supplements.
11. **Plant Propagation:** Pineapple leafy crowns can be used for propagating new pineapple plants, serving as an agricultural resource.
12. **Artificial Flavors and Fragrances:** Compounds from pineapple leafy crowns may be used to create natural flavors or fragrances for the food and cosmetic industries.

The conversion of pineapple leafy crown waste into value-added products can generate

additional income for farmers and reduce agricultural waste. However, it's important to note that proper processing, quality control, and adherence to safety regulations are critical in the production of these products. Market research and marketing strategies are also essential for successfully commercializing these value-added products.

Annona squamosa, commonly known as sugar apple or custard apple, has been explored as a potential component of Integrated Pest Management (IPM) practices in agriculture. IPM is a sustainable and environmentally friendly approach to pest management that combines various strategies to minimize the impact of pests on crops. Pineapple leaves can be used as mulch in gardens and agricultural fields. When spread around the base of plants, they can act as a natural barrier to crawling pests like slugs and snails. The rough texture of the leaves can deter these pests from reaching the plants. Pineapple leaves should be used in conjunction with integrated pest management (IPM) practices, which include a combination of cultural, biological, and chemical control methods for sustainable pest management. When using pineapple leaves for pest control, it's essential to consider their potential impact on non-target organisms and the environment. Always exercise caution and follow guidelines for safe and responsible pesticide use.

Application of crude leaf extracts of *Annona squamosa* in pest control

Crude leaf extracts of *Annona squamosa*, also known as sugar apple or custard apple, have been investigated for their potential application in pest control, particularly as natural pesticides. Here are some ways in which these extracts can be used:

Insecticidal Properties: *Annona squamosa* leaf extracts contain bioactive compounds like alkaloids, acetogenins, and flavonoids that have shown insecticidal properties. They can be used to repel or kill a wide range of insect pests such as aphids, whiteflies, leafhoppers, and caterpillars.

Biopesticides: The leaf extracts can serve as the active ingredient in the formulation of biopesticides. These natural pesticides can be less harmful to the environment, non-toxic to humans and beneficial organisms, and can help reduce the reliance on chemical pesticides.

Repellent Effects: *Annona squamosa* leaf extracts can be used as a natural repellent to deter pests from infesting crops or stored agricultural products. This can be particularly useful in organic farming practices.

Insect Growth Regulators: Some compounds found in these extracts may act as insect growth regulators, disrupting the development and reproduction of pests. This can help reduce pest populations over time.

Nematicidal Effects: In addition to insect pests, *Annona squamosa* leaf extracts have demonstrated nematicidal activity, making them potentially effective against plant-parasitic nematodes that can damage crop roots.

Antifeedant Properties: The extracts may also act as anti-feed insects, discouraging pests from feeding on plant tissues. This can prevent damage to crops and reduce the spread of diseases carried by insects.

Environmentally Friendly: The use of crude leaf extracts as natural pesticides can contribute to environmentally friendly and sustainable pest management practices, reducing the negative impact of chemical pesticides on ecosystems.

It's important to note that the effectiveness of *Annona squamosa* leaf extracts as a pest control agent can vary depending on factors such as the type of pest, concentration of the extract, and application method. Proper research and testing are necessary to determine the optimal conditions for their use. Additionally, caution should be exercised to ensure that the use of these extracts does not harm non-target organisms or have adverse effects on the environment.

Experimental Design

In this research study, the following variables and experimental details are outlined.

1. Independent Variable (IV): Concentrations of *Annona squamosa* leaf extract. These concentrations are the free independent variables manipulated in the experiment. They include seven levels: 100%, 75%, 50%, 25%, (measured in terms of weight per volume or volume per volume). These concentrations are prepared using RO Water as the solvent.

2. Dependent Variable (DV): Mortality of insects as a percentage (%). This is the dependent variable being measured and analyzed in response to the different concentrations of *Annona squamosa* leaf extract. It is calculated using the formula: (Number of dead insects / Total number of insects tested) x 100%.

3. Control Groups

- **Positive Control Group:** This group is exposed to the insecticide Chlorpyriphos at a concentration of 2.0%. It serves as a reference point to compare the effectiveness of *Annona squamosa* leaf extract in pest control.
- **Negative Control Group:** This group is exposed to RO Water. It provides a baseline for assessing the mortality rate in the absence of any treatment or insecticide.

4. Instruments and Materials

- **Tubes:** Tubes with dimensions of 20 cm in length and a diameter of 2.5 cm are used for conducting the experiments.
- **Gauze:** Gauze is employed to cover the tubes to ensure that the black garden insects can still respire during the experiment.
- **Tweezers:** Tweezers are used for handling insects during the experiment.
- **Filter Paper:** Filter paper may be used for various purposes, such as applying the *Annona squamosa* leaf extract.
- **Timer:** A timer is used to measure the duration of exposure or other time-related aspects of the experiment.
- **Materials:** The main materials used include the ethanolic extract of *Annona squamosa* leaves, Chlorpyriphos insecticide (2.0%), and RO Water. The *Annona squamosa* leaf extract is prepared in various concentrations for testing.

The study aims to assess the mortality of black garden insects when exposed to different concentrations of *Annona squamosa* leaf extract, ultimately evaluating its potential as a natural pesticide. The experimental setup and controls are crucial to ensure the validity and reliability of the results. The positive control with Chlorpyriphos and the negative control with RO Water allow for comparisons to determine the relative effectiveness of the leaf extract in pest control.

The preparation for the research involves two main steps
The collection of insects that are pests for crops and the creation of a test material, specifically the *Annona squamosa* leaf extract, for experimentation. Here are the steps for each part of the preparation:

1. Collection of Insects
Identify and collect different types of insects commonly found in the field that are known to be pests for crops. These insects could include species like aphids, mealybugs, insects, or any other pests that are relevant to the study.

2. Creation of Test Material (*Annona squamosa* Leaf Extract):
Obtain leaves from *Annona squamosa* trees, which will serve as the source material for creating the extract.

Air-Drying: Hang the collected *Annona squamosa* leaves in the air to allow them to dry naturally. This step helps remove moisture from the leaves and prepares them for extraction.

Extraction: After the leaves have dried, they are processed for extraction. Here's a simplified version of the extraction process.
1. Grind the dried *Annona squamosa* leaves into a fine powder.
2. Place the powdered leaves in a container.
3. Add ethanol solvent to the container, ensuring that the leaves are fully submerged in the solvent.
4. Allow the mixture too steep for a certain period to facilitate the extraction of bioactive compounds from the leaves. This period may vary depending on the specific extraction method being used.
5. Filter the mixture to separate the liquid extract from the solid plant material.
6. The resulting liquid is the *Annona squamosa* leaf extract.

Determining Viscosity: Measure the viscosity of the extract. The highest viscosity corresponds to 100% concentration.

Dilution: To create different concentrations of the extract for testing, perform dilution by using the formula "weight/volume (b/v)" with RO Water as the diluent. This step allows you to achieve the desired concentrations of the extract, such as 75%, 50%, 25%, 10%, 5%, and 0.1% (as mentioned in your previous description).
Ensure that dilutions are prepared immediately before conducting tests on black garden insects.
The created *Annona squamosa* leaf extract, with varying concentrations, can then be used in experiments to assess its effectiveness as an insecticide against the pests collected in step 1. These experiments can involve exposing the pests to different concentrations of the extract and measuring their mortality rates to evaluate the extract's insecticidal properties.
The description provides a detailed methodology for assessing the insecticidal properties of *Annona squamosa* leaf extracts on black garden insects. Here's a step-by-step summary of the experimental procedure.

Preparation of *Annona squamosa* Leaf Extract
1. Collect *Annona squamosa* leaves from plants and air-dry them.
2. Powder 12.5 grams of the dried material.
3. Soak the powdered material in a glass jar with a solution consisting of 12.5 ml water and 50 ml of solvent (methanol) for 24 hours.
4. Filter the solution to separate the extract from solid plant material.
5. Store the extracted solution in a refrigerator at 4°C until ready for use.

Experimental Setup
1. The experiment involves different research groups, each targeting the insects affect the crops in negative manor.
2. Each test tube contains filter paper and is prepared by smearing 2 ml of the *Annona squamosa* leaf extract onto the filter paper.
3. In each research group, five black garden insects are placed inside the tube with the treated filter paper.
4. The experiment is conducted in duplicate, meaning that the same setup is replicated two times.
5. In total, you have two replications for each research group.

Observation and Data Collection
1. After 24 hours of exposure to the leaf extract, observe and count the number of dead insects in each research group.
2. Calculate the death rate as a percentage (% mortality) for each research group based on the number of insects that died.

Data Analysis
1. Perform an analysis of variance (ANOVA) to assess the significance of differences in mortality rates between the research groups. This statistical test helps determine if the *Annona squamosa* leaf extract had a significant effect on ant mortality.
2. Calculate the lethal concentration (LD50) if the mortality rate in the negative control group falls within the range of 5-10%.
3. To calculate the corrected mortality for the treatment group, use Abbott's formula (1925), which corrects for any mortality observed in the negative control group.

% Corrected Mortality = (% Test Group Mortality - % Negative Control Mortality) / (100 - % Negative Control Mortality)

This research aims to evaluate the effectiveness of *Annona squamosa* leaf extract as an insecticide against different field insects. The data collected, including mortality rates and LD50 calculations, will help assess the extract's potential for pest control. The use of statistical analysis and correction factors ensures the reliability of the results.

Result
For the test the different species of the insects were collected and subjected to the leaf extract of *A. Squamosa* ie 100%, 75%, 50%, 25% and calculated the no of death the percentage out of the insect studied.

Table 1: The calculation of different Concentration of *Annona squamosa* leaf extract on percentage Mortality of the insects

Insects chosen	Concentration of *Annona squamosa* leaf extract (percentage Mortality)			
	100%	75%	50%	25%
Aphids	68	61	55	48
Whiteflies	61	48	41	32
Leafhoppers	09	6	4	2
Thrips	11	5	4	1
Black ant	22	16	11	6
Moths	72	61	53	46

If we count and calculate the percentage mortality of the insects we have found that the moths and aphides were highly affected by the leaf extract of we can say they have highest effective mortality rate 58%. The ascending list of percentage mortality of the insect under the influence of *Annona squamosa* leaf extract is.

Moths > Aphids > Whiteflies > Black ant > Thrips > Leafhoppers

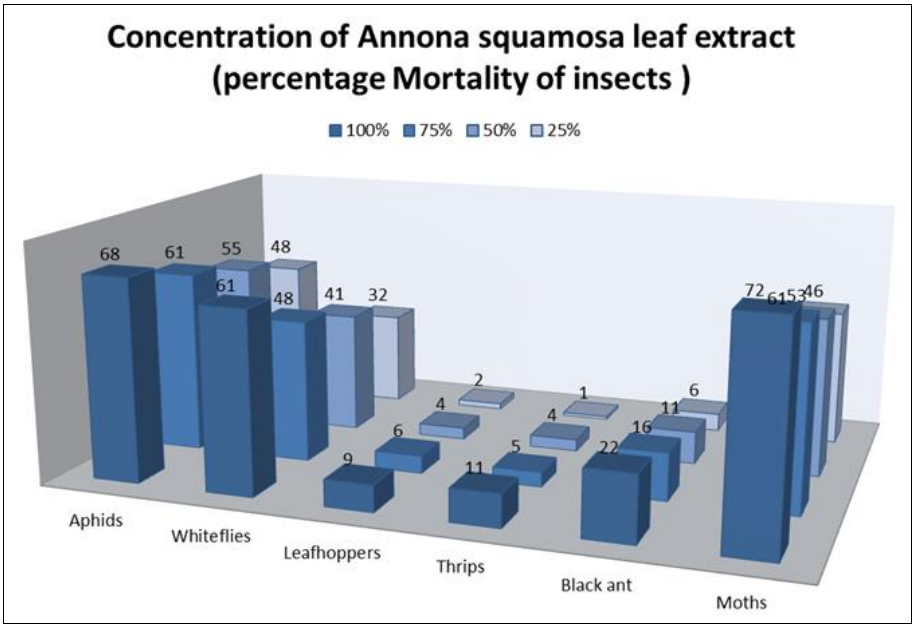

Fig 1: Graphical representation of different Concentration of *Annona squamosa* leaf extract on percentage Mortality of the insects

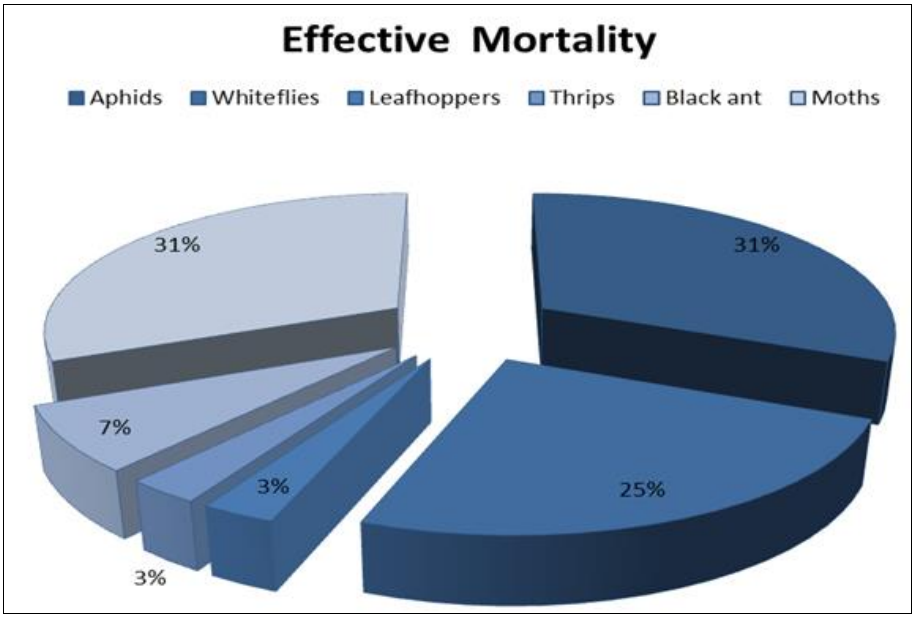

Fig 2: Effective mortality of the different insect under *Annona squamosa* leaf extract.

Future perspective

The experimental setup was done to see the impact of the crude extract spray of *Annona squamosal* leaf to different insects which were supposed to harm the field crops were studied and found effective in a way, we may suggest to further research on the topic to explore the potential of the tonns of leaves thrown in trash to help in repel the insects, we also work on the specific compound associated and

biochemical and histological analysis of its working.

Conclusion

Crude leaf extracts of pineapple have been explored for their potential application in pest control, particularly against field-collected insects. Pineapple leaf extracts contain bioactive compounds that may exhibit insecticidal and repellent properties. The effectiveness of pineapple leaf extracts in pest control may vary depending on the specific insect species, the concentration of the extract, and the application method. Additionally, further research and testing are needed to validate the efficacy and safety of using crude pineapple leaf extracts as a pest control strategy in various agricultural contexts. Integrated pest management (IPM) approaches, which combine multiple strategies for pest control, can be enhanced by incorporating natural products like pineapple leaf extracts.

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