Formulation and Evaluation of Herbal Lizard Repellent Using Custard Apple (Annona squamosa)Seeds and Leaves and Neem Leaves (Azadirachta indica).

Nikita Vijay Rupawate
Department of Pharmacy,Dr.Naikwadi College Of D. Pharmacy,
Dr.Babasaheb Ambedkar Technological University, Maharashtra , India

***Abstract*—The increasing concern over the adverse effects of synthetic chemical repellents has created a need for safe, eco-friendly alternatives. The present research aims to develop and evaluate a herbal lizard repellent formulation using custard apple (Annona squamosa) seeds and neem (Azadirachta indica) leaves, which are rich in bioactive phytoconstituents with repellent potential. The extracts were prepared by aqueous extraction and formulated into a liquid dosage form with a suitable preservative to enhance stability.**

The formulated repellent was subjected to physicochemical and stability evaluation, including organoleptic characteristics, pH determination, viscosity measurement, and accelerated testing as per standard guidelines. Stability studies were conducted at room temperature, 4°C(±2) and accelerated conditions (40°C ± 2°C) over a defined study period. The formulation exhibited a slightly acidic and stable pH, while viscosity showed a marginal decrease under accelerated conditions, attributable to temperature-induced molecular mobility. No significant changes appearance, odor, or phase separation were observed during the study.

The findings indicate that the developed herbal formulation demonstrates good physical stability, safety, and environmental compatibility, supporting its potential use as a natural alternative to synthetic lizard repellents. Further studies on repellency efficacy and long-term stability are recommended to establish its practical applicability.

***Index Terms*—Herbal lizard Repellent , Annona Squamosal , Azadirachtin indica , Stability , physicochemical.**

I. INTRODUCTION

Lizard infestation is a common problem in residential houses, laboratories, food storage areas, and educational institutions, particularly in tropical and subtropical regions. The presence of lizards creates unhygienic conditions, causes discomfort, and may contaminate food and surfaces through droppings. Conventional lizard control methods mainly on chemical repellents and insecticides, which may pose potential risks to human health, pets, and the environment due to their toxic nature and persistent chemical residues.

In recent years, there has been a growing interest in the development of eco-friendly, biodegradable, and safe alternatives to chemical repellents. Herbal formulations derived from medicinal plants have gained significant attention because of their natural origin, low toxicity, cost-effectiveness, and minimal environmental impact.Many plants are known to possess bioactive phytochemicals such as alkaloids, flavonoids, tannins, terpenoids, and phenolic compounds, which exhibit antimicrobial, insecticidal, and repellent properties.

Custard apple (Annona squamosa) seeds and leaves are reported to contain bioactive compounds with insecticidal and repellent activity, while neem (Azadirachta indica) leaves are well known for their antimicrobial, antifungal, and pest-repellent properties. The combined use of these plant materials may enhance the effectiveness of the formulation through synergistic action. However, scientific validation of such herbal formulations is essential to ensure their safety, stability, and effectiveness of the formulation through synergistic action. However,

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lizard repellent formulation prepared using custard apple seeds, custard apple leaves, and neem leaves. The study aims to assess the physicochemical properties, microbial safety, and stability of the formulation under controlled conditions. By providing experimental validation, this project attempts to promote the use of herbal alternatives as a safe and sustainable solution for lizard control, thereby reducing dependence on harmful chemical repellents.

The outcome of this study may contribute to the development of an effective, economical, and environmentally friendly herbal lizard repellent suitable for household and institutional use.

II. MATERIALS AND METHODS

Sr.No.	Ingredients	Quantity	Functions
1.	Custerd apple seeds	20 g	Active Repellent components
2.	Custard apple leaves	20 g	Support Repellency
3.	Neem leaves	20 g	Repellent enhancer and Antimicrobial
4.	Potassium sorbate	0.1 g	Preservatives and prevent from microbial growth
5.	Glycerine	2 ml	Humectant and smooth spray
6.	Fresh Water	Q. S	Solvent

Table No.1. Formulation compostion of lizard Repellent

III. PLANT MATERIAL COLLECTION

Custard apple seeds, custard apple leaves, and neem leaves were collected from original sources.Water used for washing them. Potassium sorbate was used as a preservative. Agar , Glycerine is used as Humectant and for smooth spray and standard laboratory glassware used for evaluation studies.

Preparation of Herbal Extract

The collected material were washed completely, shade- dried, and Seeds ground into coarse powder. The powdered material were mixed in a suitable proportion of water. As using Hot extraction method all material with water boiled it . At the 60°C to 70°C for 30-45 min. The extract was cooled and filtered to clear herbal extract. Addition of Potassium sorbate and Glycerine. Transfered extract into spray bottle.After this evolution test can be performed on herbal extract.

Fig.1.Crushed Custerd apple seeds and Custerd Apple leaves and Neem leaves used for herbal Repellent

IV. EVALUATION PARAMETERS

Preliminary Phytochemical Testing

Preliminary Phytochemical screening of herbal extract was carried out to detect the presence of Alkaloid , Saponins , Tannins , Terpenoids , Glycosides using s standard qualitative method.

Organoleptic Evaluation

The expression was estimated for color, clarity, and odor by visual and sensitive observation. pH Determination

The pH of the expression was measured using a calibrated digital pH metre .

Viscosity

Viscosity was determined using a Ostwald viscometer at room temperature.

Spray Performance Test

The spray pattern, uniformity, and ease of scattering were estimated manually from a fixed distance.

V. ODOUR ACCEPTABILITY AND STABILITY

The odor of the expression was assessed originally and after storehouse during stability studies.

Microbial Evaluation

The microbial safety of the expression was assessed using the spread plate technique. Agar plates were prepared, invested with the expression, and incubated at 37 °C for 24 – 48 hours. The plates were observed for microbial growth.

Stability Studies

Accelerated stability testing was carried out by storing the expression at 40°C(±2) and 4°C(±2) for 15 days. Changes in color, odor, pH, and physical appearance were observed at regular intervals.

VI. LIZARD REPELLENCY TEST

The repellency was estimated through an experimental study by scattering the expression in areas generally visited by lizards and observing avoidance of it.

VII. RESULT AND DISCUSSION

The present investigation aimed to develop and evaluate a herbal lizard repellent formulated using Annona squamosa (custard apple) seeds and Azadirachta indica (neem) leaves, emphasizing its physicochemical stability and potential repellent efficacy. The study systematically assessed phytochemical composition, organoleptic properties, and stability behavior under varied storage conditions to establish the formulation's scientific credibility

Table No.2. Phytochemical Screening Results

Sr. No	Phytochemicals	Test Method	Result
1.	Alkaloid	Dragendorff's Test	Pass
2.	Saponins	Foam Test	Pass
3.	Tannins	Ferric chloride Test	Pass
4.	Terpenoids	Salkowski Test	Pass
5.	Glycosides	Killer Killani Test	Pass

Preliminary phytochemical analysis revealed the presence of alkaloids, tannins, saponins, terpenoids, and glycosides, which are widely reported for their insecticidal, antifeedant, and repellent activities. These secondary metabolites are known to interfere with sensory perception and behavioral responses of pests and reptiles, thereby supporting the rationale for the formulation's repellent potential. The coexistence of multiple bioactive compounds suggests a synergistic effect, enhancing overall efficacy compared to single-component formulations.

Table No.3. Physical and Organoleptic Evaluation

Parameters	Observation
Colour	Light Brown
Odour	Strong , Pungent, Bitter
Apprence	Clear , No precipitation
Phase separation	No sepration
Sprayability	Uniform spray

Organoleptic evaluation demonstrated a strong, pungent, and bitter odor, a critical attribute for repellent action. Reptiles, including lizards, are highly sensitive to olfactory stimuli, and substances emitting intense odors are generally avoided. The characteristic odor profile observed in the present formulation may therefore play a pivotal role in deterring lizard presence, contributing to its functional effectiveness.

Table No .3. pH Determination

Day	pH Value
0	6.33(± 0.02)
7	6. 20(± 0.02)
15	6.78 (± 0.02)

The pH analysis indicated that the formulation maintained a slightly acidic nature throughout the stability study conducted at room temperature, (4°C±2) , and 40°C(±2). Minor fluctuations observed under accelerated conditions (40°C±2) are likely attributable to thermal stress and minimal solvent evaporation.
Nevertheless, the pH values remained within a narrow and acceptable range, indicating chemical stability and absence of degradation reactions during the study period.

VIII. VISCOSITY STUDY REPORT (HERBAL LIZARD REPELLENT)

Objective:
To determine the viscosity of the prepared herbal lizard repellent sample using the Ostwald viscometer at room temperature (25°C – 30°C approx.)
Materials:
1)Ostwald viscometer
2)Prepared sample liquid
3)Distilled water (reference)
4)Thermometer

Method:
The Ostwald viscometer was cleaned and dried.
The sample was filled into the viscometer up to the mark.
Temperature of the sample was recorded room temperature.Flow time was measured using a stopwatch.
Measurement was repeated to get multiple readings; mean flow time was calculated.

Viscosity of the sample was calculated using:
Where:
= sample viscosity
= water viscosity (0.89 cP at Room temprature)
= densities of sample and water
= flow times of sample and water
Observations and Calculated Viscosity:

Table 4. Viscosity Study

Sample	Mean flow Time (s)	Density (g/ ml)	Water flow time (s)	Water Viscosity(cP)	Calculated viscosity (cP)
Sample 1	3.34	1.01	3.00	0.89	1.00
Sample 2	4.26	1.01	3.00	0.89	1.28
Sample 3	4.05	1.01	3.00	0.89	1.21

IX. RESULT / CONCLUSION

The viscosity of the prepared herbal formulation was found to range from 1.00 to 1.28 cP at room temperature. This indicates that the formulation has suitable consistency for easy handling and application as a lizard repellent.

Table No. 5. Microbial Growth Test

Test	Result	Conclusion
Bacterial Growth	Absent	No Microbial Growth

Fig.2. Microbial test performed with Spread Plate Technique.

Microbial stability of the herbal lizard repellent formulation was evaluated using the spread plate technique. Prepared plate by using agar agar then spread herbal extract on it and incubated at 37°C for 24-48 hrs.No microbial growth was observed during the study period, indicating that the formulation was microbiologically stable. Potassium sorbate acted as an effective preservative and helped maintain the microbial safety of the formulation

Table No.6. Stability Study Testing

1) Stability Study 7 Days

Parameters	Initial	4°C	40°C	Room temperature
pH (approx.)	6.33 (± 0.02)	6.31 (± 0.02)	6.20 (± 0.02)	6.30 (± 0.02)
Colour	Light Brown	No change	Dark brown	No change
Odour	Strong, Bitter, pungent	No Change	No change	No change
Phase separation	Absent	Absent	Absent	Absent

2) Stability Study 15 Days

Parameters	Initial	4°C	40°C	Room temperature
pH (approx.)	6.33(± 0.02)	6.39 (± 0.02)	7.03(± 0.02)	6.78 (± 0.02)
Colour	Light Brown	No change	No change	No change
Odour	Strong, Bitter, Pungent	No change	No change	No change
Phase separation	Absent	Absent	Absent	Absent

Accelerated stability studies revealed no significant changes in color, odor, pH, or viscosity, indicating that the formulation is resistant to physicochemical changes under stressed environmental conditions.

At 40°C ± 2°C, slight evaporation may occur, leading to a minor shift in pH toward acidic values due to the release of acidic phytochemicals into the solution. Other organoleptic characteristics remain unchanged. Although there is slight loss of solution volume due to evaporation, the formulation remains stable. These findings suggest a favorable shelf-life and consistent performance under normal storage and usage conditions.

The inclusion of potassium sorbate at a low concentration (0.1 g) proved effective in maintaining formulation stability without adversely affecting its physicochemical properties. This concentration aligns with established safety guidelines while providing adequate preservative action, thereby enhancing product acceptability.In conclusion, the formulated herbal lizard repellent demonstrated physicochemical stability, presence of bioactive phytoconstituents, and desirable organoleptic characteristics, validating its potential as a natural, eco-friendly alternative to synthetic chemical repellents. The findings provide a strong scientific basis for further biological efficacy studies and support the formulation's applicability for household lizard control.

Conclusion

The present study concludes that the developed herbal lizard repellent formulation showed satisfactory physicochemical stability and effectiveness during the study period. The formulation demonstrated acceptable pH, viscosity, and stability parameters, indicating its suitability for household application. Being herbal in nature, it may serve as a safer alternative to synthetic lizard repellents. Further long-term stability and field studies are recommended to confirm its efficacy.

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