IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Formulation And Evaluation Of Anti Rodent Gel By Using Gliricidia Sepium

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ABSTRACT

Rodent infestations pose a significant threat to food security, public health, and infrastructure across various sectors. Traditional rodenticides, while effective, have raised concerns due to their environmental impact and the development of resistance in rodent populations. This study explores the formulation and evaluation of an eco-friendly, plant-based anti-rodent compound utilizing readily available natural ingredients. The primary objective was to develop a biodegradable, non-toxic repellent that effectively deters rodent activity in storage and residential areas.

Rodent infestations pose a major challenge to agriculture, public health, and urban environments. Traditional rodenticides, while effective, often contain harsh chemicals that harm ecosystems and non-target species. This study introduces a more sustainable approach—an anti-rodent gel formulated using Gliricidia sepium, a plant known for its natural toxicity. By combining Gliricidia sepium extract with phosphorus and coumarin, the gel delivers targeted action against rodents while minimizing environmental risks. Developed with a sodium alginate base and enhanced for stability, the gel exhibited excellent physical properties, including ideal balance, spreadability, and homogeneity. Early tests confirmed its potent anti-rodent effects. With its promising results, this herbal gel offers a safer, eco-friendly alternative to conventional rodenticides, paving the way for sustainable and responsible pest Physicochemical analysis of the formulation confirmed its non-toxic nature and compatibility with standard packaging and storage materials. The results suggest that this plant-based compound offers a sustainable alternative to conventional rodenticides, with potential applications in agricultural storage, food processing units, and residential spaces.

Keywords: Gliricidia sepium, Anti-rodent gel, Coumarin, Sustainable rodent control, Herbal formulation

Introduction:

Rodent infestations pose significant challenges to both public health and agricultural productivity worldwide. Rodents, such as rats and mice, are known vectors of numerous diseases, including leptospirosis, hantavirus, and salmonella, making their control an such as poisons and traps, often have limitations, including risks to non-target species, environmental contamination, and the potential for resistance development. Consequently, there is an increasing demand for more sustainable and environmentally friendly alternatives to mitigate rodent populations.

One such alternative is the development of plant-based rodent repellents, which have gained attention for their natural and biodegradable properties. Among various plant species, **Gliricidia sepium**, commonly known as the "mother of cocoa," has shown potential as a bioactive agent due to its medicinal and pesticidal properties. Known for its antimicrobial, insecticidal, and repellent activities, Gliricidia sepium contains

various bioactive compounds, such as alkaloids, flavonoids, and tannins, which may play a key role in deterring rodents.

The formulation of an anti-rodent gel using Gliricidia sepium presents a promising avenue for developing a sustainable, effective, and safe rodent control product. This thesis aims to explore the potential of Gliricidia sepium as a natural repellent, focusing on the formulation, evaluation, and effectiveness of a gel-based rodent repellent. By harnessing the plant's natural compounds, this research seeks to provide a viable solution to rodent management that minimizes the environmental impact and reduces the risks associated with conventional rodent control methods.

In this study, we will investigate the process of extracting active compounds from Gliricidia sepium, formulating a gel suitable for application, and evaluating its efficacy in repelling rodents. Additionally, the study will assess the safety, environmental compatibility, and potential advantages of this plant-based gel over synthetic alternatives. This research could contribute to the development of an eco-friendly and effective solution for managing rodent populations, promoting both public health and environmental sustainability.

Rodent infestations pose significant challenges to agriculture, public health, and urban areas. Traditional rodent control methods often involve the use of harmful chemicals, which can have adverse environmental and health effects. This study explores an innovative approach by formulating an anti-rodent gel using Gliricidia sepium, a plant known for its toxic properties. When the leaves of Gliricidia sepium are ingested by rodents, coumarin can be converted by bacteria in the gut into dicoumerol. Dicoumerol is known to be a hemorrhagic agent, which means it can cause bleeding disorders. The gel formulation incorporates phosphorus and coumarin, two substances that are toxic to rodents. The aim is to create an effective, safer, and eco-friendly alternative to conventional rodenticides, offering targeted action against rodents while minimizing harm to other species and the environment. This poster presents the formulation process, the evaluation of its efficacy, and the potential of Gliricidia sepium-based gel as a sustainable rodent control solution.

Fig 1 Leaves of Gliricidia Sepium

Objective:

The objective of this thesis is to formulate an anti-rodent gel utilizing the bioactive compounds of Gliricidia sepium, a plant known for its potential pesticidal, antimicrobial, and repellent properties. This research aims to develop a sustainable, eco-friendly, and effective alternative to traditional rodent control methods, such as chemical poisons and traps. Rodent infestations pose significant challenges to public health, agriculture, and the overall environment. Current rodent control techniques, though effective, often rely on synthetic chemicals or mechanical devices that can have adverse effects on non-target organisms, the ecosystem, and human

health. The primary objective of this study is to explore the possibility of using Gliricidia sepium as a natural repellent in the form of a gel, which could provide a more sustainable and safer approach to rodent control.

The first major objective of this thesis is to investigate the bioactive compounds present in Gliricidia sepium and assess their potential role in repelling rodents. Gliricidia sepium is known to contain a variety of bioactive compounds, including alkaloids, flavonoids, tannins, and saponins, all of which have shown pesticidal and repellent properties in different contexts. Understanding the specific compounds responsible for these properties will be crucial for formulating an effective rodent repellent. This will involve conducting a detailed phytochemical analysis of the plant's leaves, stems, and flowers to identify the key bioactive components. The presence of these compounds and their individual contributions to rodent repellency will be analyzed, setting the foundation for further formulation of the gel. Moreover, understanding the mechanisms through which these compounds interact with rodent behavior will help optimize the gel's formulation and enhance its efficacy.

Following the identification of the active bio-compounds, the second key objective is to develop a gel formulation that incorporates Gliricidia sepium extracts. This task will involve extracting the bioactive compounds using appropriate solvents and techniques, such as solvent extraction or Soxhlet extraction, to ensure high yields of the active ingredients. The next step will be to combine these extracts with a suitable gelling agent to create a stable and effective gel. An essential part of this objective will be optimizing the gel's formulation to balance the effectiveness of the active compounds with the desired physical properties of the gel, ensuring it remains easy to apply, stable, and effective in repelling rodents for an extended period. The formulation must also be non-toxic to humans, pets, and other non-target organisms, as safety is a significant concern in pest control applications.

Once the gel formulation is developed, the third objective of the thesis is to evaluate the efficacy of the anti-rodent gel in repelling rodents. This will involve laboratory experiments where rodents such as rats and mice are exposed to areas treated with the gel. Their behavior will be monitored to assess how effectively the gel repels them from treated areas. The repellent effect will be compared to other conventional rodent control methods, such as chemical rodenticides or traps, to determine the gel's comparative efficacy. Behavioral studies will be designed to evaluate rodent avoidance, the time spent in treated vs. untreated areas, and the gel's ability to discourage nesting and feeding behaviors. This objective is crucial for determining whether the gel can serve as a viable alternative to existing rodent control methods, providing data on its effectiveness in a controlled setting.

The fourth objective of the thesis is to assess the safety and environmental impact of the formulated anti-rodent gel. One of the primary motivations behind using Gliricidia sepium as a natural rodent repellent is its potential to offer an eco-friendly alternative to synthetic chemicals. As such, it is essential to evaluate the safety of the gel for humans, pets, and the broader environment. Toxicity tests will be conducted to ensure that the gel does not pose any harm to non-target organisms or human health. Furthermore, the gel's biodegradability and potential impact on soil and water systems will be investigated to determine if it can be safely used in outdoor environments, such as farms or gardens. This objective will also involve a thorough environmental risk assessment to examine the long-term sustainability of using the gel in different ecosystems. By ensuring that the gel is non-toxic and environmentally friendly, this research aims to provide an alternative pest control solution that does not negatively impact the environment or human well-being.

An equally important objective is to evaluate the cost-effectiveness and market viability of the anti-rodent gel. For any pest control product to be widely adopted, it must not only be effective but also economically feasible. This research will estimate the cost of producing the anti-rodent gel, considering factors such as raw material costs, extraction processes, formulation, and packaging. A market analysis will be conducted to identify potential customers, such as homeowners, farmers, and pest control companies, and to gauge the demand for an eco-friendly, plant-based rodent control product. This objective will also involve analyzing the pricing of existing rodent control products and determining whether the Gliricidia sepium-based gel can compete in terms of cost-effectiveness. By evaluating the commercial potential of the gel, this research will determine whether it can be developed into a product that is both affordable for consumers and profitable for manufacturers, contributing to its future market success.

The final objective of this thesis is to explore the scalability of the anti-rodent gel, which involves investigating the feasibility of large-scale production and distribution. This will include assessing the availability of Gliricidia sepium on a large scale, including its cultivation and sourcing methods, as well as the infrastructure needed for mass production. The regulatory requirements for marketing a new pest control product will also be explored to ensure that the gel meets all legal standards for safety, efficacy, and environmental impact. Scaling up production involves addressing challenges such as cost control, quality assurance, and distribution logistics. This objective is critical to determining whether the gel can be produced

in sufficient quantities for widespread use and if it can be distributed effectively to consumers or businesses that may benefit from it.

Review of literature:

Literature Review on the Toxicity and Rodenticidal Properties of Gliricidia sepium

Introduction

Gliricidia sepium, commonly referred to as "mata raton," has gained attention for its potential in pest control, particularly as a natural rodenticide. Various studies have explored its toxic components, mechanisms of action, and effectiveness in different contexts. This review synthesizes existing literature on the subject, highlighting the plant's chemical composition, its effects on rodents, and its advantages over synthetic alternatives.

Toxic Compounds in Gliricidia sepium

Gliricidia sepium contains several toxic compounds, including alkaloids, tannins, dicoumarol, and hydrogen cyanic acid (HCN). These compounds can have detrimental effects on biological systems, particularly in rodents used as test subjects. Alkaloids and tannins have been found to cause damage to internal organs, with alkaloids being metabolically toxic and slow to be excreted, prolonging their harmful effects on liver cells. Tannins, in contrast, contribute to liver necrosis and gastrointestinal bleeding, intensifying the plant's toxicity (Harlis et al., 2023).

Mechanism of Toxicity

The primary active toxic component of Gliricidia sepium is coumarin, which is naturally present in its leaves. Upon ingestion, gut bacteria convert coumarin into dicoumarol, a well-known anticoagulant that inhibits blood clotting, leading to hemorrhagic conditions in rodents. Studies have confirmed that rats consuming incubated leaves of Gliricidia sepium exhibit internal bleeding and pathological signs consistent with hemorrhagic poisoning (Hochman, 1966). This conversion mechanism enhances the plant's rodenticidal properties and explains its historical use as a natural rat poison.

Impact on Rodent Physiology

Rodents exposed to Gliricidia sepium extract exhibit a range of physiological symptoms, including significant weight loss, organ discoloration, and behavioral changes. Studies on mice have shown that the toxic compounds disrupt normal digestion, leading to reduced food intake and energy absorption. Additionally, liver, kidney, and heart abnormalities have been reported, with the liver in particular showing a shift from a healthy bright-red appearance to a darker, damaged state (Harlis et al., 2023).

Effectiveness as a Rodenticide

The effectiveness of Gliricidia sepium as a rodenticide has been demonstrated in both laboratory and field settings. Laboratory experiments have confirmed that the plant's extracts not only reduce rodent populations but also inhibit the growth of pathogenic bacteria associated with rodent infestations (Urdaneta et al., 2015). Furthermore, its secondary metabolites interfere with rodent reproductive and metabolic processes, amplifying its impact beyond immediate toxicity (Shi et al., 2020; Wen et al., 2022).

Field Applications and Repellent Properties

Beyond its direct toxicity, Gliricidia sepium is also explored as a rodent repellent. Studies indicate that its extracts alter rodent behavior and metabolism, reducing their tendency to infest treated areas. For example, methanol extracts of the plant's leaves have been found to decrease food consumption and daily activity in rice-field rats (Bari et al., 2020). This repellent effect, attributed to secondary metabolites like flavonoids, can be further enhanced when used in combination with other botanical deterrents (Hansen et al., 2016; Kaur, 2016).

Advantages Over Synthetic Rodenticides

Gliricidia sepium offers several advantages over synthetic rodenticides. Firstly, it is biodegradable and exhibits low toxicity to non-target species, making it an environmentally sustainable alternative (Sathyananth et al., 2024). Additionally, its widespread availability in tropical and subtropical regions makes it a cost-effective option, particularly for small-scale farmers who may not have access to expensive synthetic rodenticides (Singh & Mirza, 2019; Karn et al., 2023). Lastly, its use reduces the risk of environmental contamination, a major concern with traditional chemical-based rodenticides (Babii & Hlavachek, 2023; Witmer, 2017).

Challenges and Limitations

Despite its promising benefits, the widespread adoption of Gliricidia sepium as a rodenticide faces several challenges. One major issue is the variability in its effectiveness, which can be influenced by plant growth conditions, extraction methods, and bacterial conversion efficiency (Hochman, 1966; Urdaneta et al., 2012). Furthermore, regulatory and commercialization hurdles must be addressed before its large-scale use can be realized. The establishment of standardized formulations and safety protocols is crucial for ensuring its efficacy and minimizing risks (Souto et al., 2021; Jacoblinnert et al., 2021).

Future Research and Development

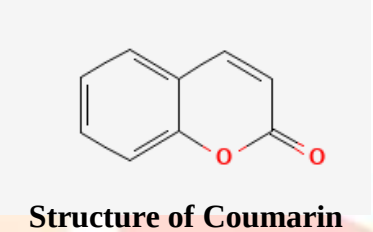
Future research should focus on optimizing the formulation of Gliricidia sepium-based rodenticides through nanotechnology and advanced extraction techniques. The incorporation of nanoparticles and nanoemulsions has been suggested as a means of improving the plant's stability and potency in rodent control applications (Namasivayam et al., 2022). Additionally, integrating Gliricidia sepium into broader pest management strategies that combine biological, cultural, and chemical controls could enhance its effectiveness while minimizing the likelihood of resistance development (Singleton et al., 2003).

Materials & Method:

Materials:

1.Gliricidia sepium:

Scientific name: Gliricidia sepium
Family: Fabaceae
Subfamily: Faboideae
Genus: Gliricidia
Order: Fabales
Kingdom: Plantae



Structure of Coumarin

Phytochemicals: alkaloids, flavonoids, tannins, saponins, glycosides, coumarin.

Gliricidia sepium, commonly known as "gliricidia," is a fast-growing, nitrogen-fixing tree native to Central America, now widely used in tropical regions for various purposes, including shade, fodder, green manure, and soil conservation. The leaves and bark are safe for livestock, all parts of the plant are poisonous to rats, mice, and dogs.

EXCIPIENT PROFILE:

Excipient Profile of Sodium Alginate

General Information

- **Excipient Name:** Sodium Alginate
- **Chemical Formula:** $(C_6H_7O_6Na)n$
- **Molecular Weight:** Varies based on polymer chain length
- **CAS Number:** 9005-38-3
- **IUPAC Name:** Sodium (2S,3S,4S,5R,6R)-3,4,5,6-tetrahydroxyoxane-2-carboxylate polymer
- **Source:** Derived from brown seaweed (Phaeophyceae)
- **Synonyms:** Alginic acid sodium salt, Algin
- **Appearance:** White to yellowish-brown powder
- **Taste & Odor:** Odorless, neutral to slightly salty taste
- **Hygroscopicity:** Hygroscopic in nature

2) Excipient Profile of Glycerin

General Information

- **Excipient Name:** Glycerin
- **Chemical Name:** Propane-1,2,3-triol
- **Chemical Formula:** $C_3H_8O_3$
- **Molecular Weight:** 92.09 g/mol
- **CAS Number:** 56-81-5
- **IUPAC Name:** Propane-1,2,3-triol
- **Synonyms:** Glycerol, Glycerine
- **Source:** Derived from natural (vegetable or animal fats) or synthetic sources
- **Appearance:** Clear, colorless, odorless, and viscous liquid
- **Taste & Odor:** Sweet taste, odorless
- **Hygroscopicity:** Highly hygroscopic

3) Excipient Profile: Fructose

General Information

- **Chemical Name:** D-fructose
- **Molecular Formula:** $C_6H_{12}O_6$
- **Molecular Weight:** 180.16 g/mol
- **CAS Number:** 57-48-7
- **Synonyms:** Levulose, Fruit Sugar

4) Excipient Profile: Sorbitol

General Information

- **Chemical Name:** D-glucitol
- **IUPAC Name:** (2R,3R,4R,5S)-Hexane-1,2,3,4,5,6-hexol
- **Molecular Formula:** $C_6H_{14}O_6$
- **Molecular Weight:** 182.17 g/mol
- **CAS Number:** 50-70-4
- **E Number:** E420 (as a food additive)
- **Synonyms:** D-sorbitol, Glucitol

5) Excipient Profile: Starch Powder

General Information

- **Chemical Name:** Starch
- **Molecular Formula:** $(C_6H_{10}O_5)n$
- **Molecular Weight:** Variable (polymeric)
- **CAS Number:** 9005-25-8
- **Synonyms:** Amylum, Corn Starch, Potato Starch, Rice Starch, Wheat Starch
- **Source:** Extracted from plants such as corn, potato, wheat, and rice.

6) Excipient Profile: Butylated Hydroxytoluene (BHT)
General Information

- **Chemical Name:** 2,6-Di-tert-butyl-4-methylphenol
- **Molecular Formula:** $C_{15}H_{24}O$
- **Molecular Weight:** 220.35 g/mol
- **CAS Number:** 128-37-0
- **Synonyms:** BHT, Dibutylhydroxytoluene, 2,6-Di-tert-butyl-p-cresol
- **Source:** Synthetic antioxidant

7) Excipient Profile: Triethanolamine (TEA)
General Information

- **Chemical Name:** 2,2′,2″-Nitrilotriethanol
- **Molecular Formula:** $C_6H_{15}NO_3$
- **Molecular Weight:** 149.19 g/mol
- **CAS Number:** 102-71-6
- **Synonyms:** TEA, Trolamine, Triethylolamine, Tris(2-hydroxyethyl)amine
- **Source:** Synthetic, produced by the reaction of ethylene oxide with ammonia

8) Excipient Profile: Vanillin
General Information

- **Chemical Name:** 4-Hydroxy-3-methoxybenzaldehyde
- **Molecular Formula:** $C_8H_8O_3$
- **Molecular Weight:** 152.15 g/mol
- **CAS Number:** 121-33-5
- **Synonyms:** Vanillaldehyde, p-Vanillin, 3-Methoxy-4-hydroxybenzaldehyde
- **Source:**
  - **Natural:** Extracted from vanilla beans (Vanilla planifolia).
  - **Synthetic:** Derived from lignin, guaiacol, or eugenol.

9) Excipient Profile: Erythrosine (FD&C Red No. 3)
General Information

- **Chemical Name:** Disodium 2,4,5,7-Tetraiodofluorescein
- **Molecular Formula:** $C_{20}H_6I_4Na_2O_5$
- **Molecular Weight:** 879.86 g/mol
- **CAS Number:** 16423-68-0
- **Synonyms:** Erythrosine B, Red No. 3, Acid Red 51, CI 45430
- **Source:** Synthetic dye derived from fluorescein and iodinated derivatives

- **1. MATERIAL**

Table No. 1: list of chemicals used

SR. NO	CHEMICAL NAME	CATEGORY
1	Sodium alginate	Gelling Agent
2	Fructose	Sweetner
3	Sorbitol	Stabilizer
4	Glycerine	Humectant
5	Triethanolamine	Neutralizing Agent
6	Starch powder	Thickening Agent
7	Butylated hydroxytoluene	Preservative
8	Vanillin	Flavouring Agent
9	Erythrosine	Colourant

Table No.2: List of Instruments

SR. NO	INSTRUMENT NAME
1	Digital weighing balance
2	Mechanical stirrer
3	Digital ph meter

FORMULATION AND OPTIMIZATION OF GELLING AGENT:

Sodium alginate is a natural polymer that forms gels due to its viscosity and water-binding properties. the gel formation relies on optimizing the polymer concentration, pH, and other excipients to achieve a stable and suitable consistency.

Preparation of Sodium Alginate Gel Base

Step 1: Disperse Sodium Alginate: Slowly add sodium alginate to warm distilled water (40–50°C) with continuous stirring to prevent clumping. Stir for 1-2 hours until fully hydrated.

Step 2: Dissolution of Excipients

2. Prepare Preservative Solution: Dissolve butylated hydroxytoluene in a small quantity of warm water and add to the gel base with continuous stirring.

3. Adjust pH: Dissolve TEA in water, then add them slowly to achieve a pH of ~6-7.

Step 3: Addition of Humectants & Solvents.

4. Incorporate Glycerin: Add these gradually while stirring to ensure uniform mixing.

Step 4: Homogenization & Final Mixing

6. Final Stirring: Continue mixing for 30-60 minutes at moderate speed until a smooth, homogeneous gel is formed.

7. Storage: Transfer into a well-closed container and store at room temperature.

Fig 2 Filtration of extraction

Fig 3 Extraction process

Table No 3: Formulation of sodium alginate gel for 5g.

Ingredient	G1	G2	G3
Sodium alginate	0.1g	0.2g	0.3g
Glycerin	1ml	1ml	1ml
Starch powder	0.05g	0.05g	0.05g
Sorbitol	0.25g	0.25g	0.25g
butylated hydroxytoluene	0.001g	0.001g	0.001g
Fructose	0.1g	0.1g	0.1g
Triethanolamine	0.01ml	0.01ml	0.01ml
Water	qs	qs	qs

METHODOLOGY:

Collection of plant material: The plant Gliricidia sepium was collected from the surrounding of, PRES's college campus, Chincholi. The fresh leaves were separated from the plant and used for extraction.

Preparation of leaves extract of Gliricidia sepium: The collected fresh leaves of Gliricidia sepium were washed with water and dried in shade. After drying plant leaves were fined powdered and kept in well closed container. About 25gm of fined powder of leaf was weighed and 100 ml of water then left for about 24 hours. After this extract was concentrated and used for further formulations.

Development of Herbal Gel Formulation

1. Disperse 1-2% Sodium alginate in distilled water with continuous stirring and allow it to swell for 2-3 hrs at RT.
2. Add 5-10% of Gliricidia sepium extract into the gel base with continuous stirring.
3. Add 5% of Glycerin for hydration and smooth texture.
4. Add 2% of fructose for mild sweetness.
5. Add 5% of sorbitol for enhancing the gel strength and stability.
6. Add 2% starch powder for thickening of gel
7. Add 0.2% of butylated hydroxytoluene as preservative and adjust ph to 6.4 to 7.1 using triethanolamine.
8. Add 2-3 drops of vanillin for flavour and erythrosine for red colour.
8. Stirred well until a smooth and uniform gel is obtained.

Table no. 4: Formulation of anti-rodent gel using Gliricidia sepium.

Name of Ing.	F1	F2	F3
Gliricidia sepium extract	0.5gm	0.4gm	0.6gm
Sodium alginate	0.1gm	0.1gm	0.1gm
Glycerin	1ml	1ml	1ml
fructose	0.1gm	0.1gm	0.1gm
Sorbitol	0.25gm	0.25gm	0.25gm
starch powder	0.1gm	0.1gm	0.1gm
butylated hydroxytoluene	0.001gm	0.001gm	0.001gm
triethanolamine	0.01ml	0.01ml	0.01ml
vanillin	qs	qs	qs
erythrosine	qs	qs	qs
Distilled water	qs	qs	qs
total	5gm	0.1gm	0.1gm

RESULT AND DISCUSSION:

1)Identification test for Coumarin

TEST	OBSERVATION	RESULT
2ml extract + 3ml 10% Sodium hydroxide	Yellow colour appears	Coumarin is present

2)Identification test for Alkaloids

TEST	OBSERVATION	RESULT
**1)Mayer`s test** Extract +few drops of Mayer`s reagent	Yellow precipitate forms	Alkaloid present
**2)Dragendorff`s test** Extract + few drops of Dragendorff`s reagent	Orange red precipitate forms	Alkaloid present
**3)Hager`s test** Extract +few drops of Hager`s reagent	Yellow precipitate forms	Alkaloid present

3)Identification test for Tannins

TEST	OBSERVATION	RESULT
Alcoholic solution of compound +1% FeCl2	Brownish green colour appears	Tannins present

Fig no 4. Test for coumarin

Fig no 5. Test for Tannins

EVALUATION OF HREBAL GEL FORMULATION:

The prepared herbal gel was subjected to physical characterization such as colour, appearance, pH, spreadability. It was also evaluated for its stability property, antirodent activity.

1)Physical Appearance and Homogeneity

The Gliricidia sepium leaf extract gel exhibited a smooth, uniform texture without visible lumps or phase separation. Its dark red colour was stable throughout the study period, indicating good formulation stability

2)PH Measurement

F1: 0.5g of Extract of Gliricidia sepium.
F2: 0.4g of Extract of Gliricidia sepium.
F3: 0.6g of Extract of Gliricidia sepium.
The gel maintained a pH between 6.5 to 7, which is within the acceptable range for antirodent formulations.

Table No 5. pH of formulation

Formulation Code	pH
F1	6.9
F2	6.8
F3	6.9

3) Spreadability

Spreadability denotes the extent of area to which the gel readily spreads on application to skin or the affected part. The spreading was expressed in terms of time in seconds taken by two slides to slip off from the gel, placed in between the slides, under certain load. Lesser the time taken for separation of the two des better the Spreadability, two sets of glass slides of standard dimensions were taken. The gel Formulation was placed over one of the slides. Spreadability of different gel Formulation were studied. The formulation F2 produced good spreadability than other formulation.

Table No . 6 Spreadibility of Gel

Formulation Code	Spreadibility
F1	5.1g.cm/sec
F2	5.7g.cm/sec
F3	5.4g.cm/sec

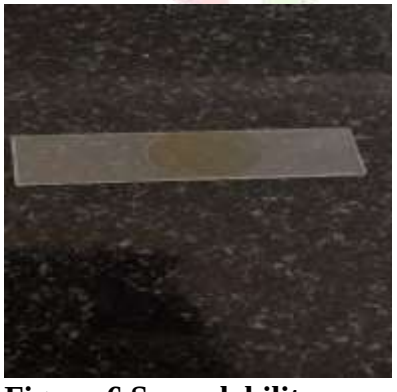


Fig no. 6 Spreadability

Fig no. 7 pH testing

4.Smoothness

The smoothness of the formulation was tested by rubbing the gel formulation between the fingers and it was observed that whether the gel is smooth, clumped, homogenous or rough.

5.Transparency

Formulated gel was taken in the 10 ml test tube and its transparency was checked visual.

6.Clarity

The clarity of gel was determined by visual inspection.

7.Stability study

Stability study of different formulations were carried out at storage condition of 4C, room temperature and 40C for a period of 15 days. Samples were withdrawn at the time interval of 1,7 and 15 days. During the study Period, all the formulations [kept at 4C room temperature & 40C] were found to be homogenous and free from microbial growth which may attributed to the presence of preservatives. There is slight change of colour in F1 formulation and formulation F3 shows bad smell when stored at 40C at 15th day but pH of the gel was not changed in both F1 and F3 Formulation.

8.Selection of optimized formulation

In order to have a good formulation, gel should have ideal property and stable over the long period of time. From the results, obtained from the stability studies and physical parameters such as spreadibility, PH, viscosity and Spreadibility it was indicated that Formulation F2 was ideal and it was chosen for further characterisation such as texture analysis, antimicrobial activity testing.

Fig no. 8 Final Product.

SUMMARY AND CONCLUSION:

The present research aimed to formulate and evaluate a herbal gel using Gliricidia sepium, a plant known for its medicinal properties with antirodent formulation including activities such as antimicrobial, anti-inflammatory, and wound-healing activities. Various gel formulations were prepared using sodium alginate as the gelling agent and different concentrations of Gliricidia sepium extract. The formulations were evaluated for physical parameters like pH, viscosity, spreadability, homogeneity, and stability. Additionally, antimicrobial activity was tested against common skin pathogens.

Among the formulations, the optimized gel showed desirable physical characteristics, acceptable pH range (5.5–6.5), good spreadability, and stability over a period of time. The study concludes that the Gliricidia sepium gel formulation holds promising potential as an effective and natural topical agent for skin applications. The formulation not only demonstrated good physicochemical properties and stability but also showed significant antimicrobial activity. Hence, Gliricidia sepium-based gel can be further developed and explored for its therapeutic potential in treating skin ailments and promoting wound healing. Future studies may include in vivo evaluations and clinical trials to further validate its efficacy and safety.

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