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Polyherbal Anti-Hemorrhoidal Formulations

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ABSTRACT

Hemorrhoids are a prevalent anorectal condition characterized by inflammation and engorgement of venous structures in the rectal region. Conventional therapies frequently provide only symptomatic relief and may be accompanied by undesirable side effects. This research aims to formulate a polyherbal topical spray incorporating extracts of Mimosa pudica, Ricinus communis, and Lantana camara—plants recognized for their astringent, anti-inflammatory, analgesic, antimicrobial, and wound-healing properties[1–3]. A hydroalcoholic extraction method was employed to develop the spray, which was then evaluated for physicochemical parameters such as pH, stability, sprayability, and dermatological safety. Phytochemical screening revealed the presence of active constituents including flavonoids and tannins[4]. In vitro evaluations demonstrated substantial anti-inflammatory and antimicrobial activity. The formulation was found to be non-irritating and suitable for dermal application. The findings suggest that this polyherbal spray could serve as a safe, plant-based therapeutic alternative for hemorrhoidal management.

Keywords: Anti-inflammatory, wound healing, astringent, antimicrobial, soothing.

INTRODUCTION

Mimosa pudica, commonly referred to as the "sensitive plant" or "touch-me-not," is a medicinal species belonging to the Fabaceae family. It exhibits nyctinastic movement and has been historically valued in traditional medicinal systems, including Ayurveda and folk medicine, for its broad therapeutic potential[5]. Its pharmacological effects—particularly anti-inflammatory, antimicrobial, analgesic, and wound-healing—are attributed to its diverse phytochemical composition, which includes alkaloids, tannins, flavonoids, and glycosides[6]. Modern investigations have increasingly emphasized the role of botanical agents in developing alternatives to synthetic medications due to their safety and cost-effectiveness.

Among recent innovations, herbal sprays have emerged as favorable topical formulations due to their ease of application, rapid absorption, and localized effect[7]. In this context, Mimosa pudica

presents a compelling candidate for use in a polyherbal spray targeted at hemorrhoids—a condition marked by inflammation, vascular dilation, and discomfort in the anorectal area. Traditional synthetic treatments such as corticosteroids or local anesthetics may provide temporary relief but are often linked with irritation, sensitization, and mucosal damage upon prolonged use[8].

This study aims to design, formulate, and evaluate a polyherbal spray containing Mimosa pudica, supplemented with Ricinus communis and Lantana camara, to leverage their combined anti-inflammatory and wound-healing properties. The objective is to provide a safer and more effective plant-derived treatment for hemorrhoidal symptoms, while contributing to the integration of ethnobotanical knowledge into evidence-based medical practices[9].

FIG : 1

Literature Review

Mimosa pudica, often referred to as the "sensitive plant" or "touch-me-not," is a trailing annual or perennial herbaceous species belonging to the Fabaceae family. Though originally native to South and Central America, it has become widespread across tropical and subtropical climates worldwide due to its adaptive nature[1]. Its characteristic leaf-folding behavior in response to touch is well known, but its pharmacological importance in traditional medical systems such as Ayurveda, Unani, and folk practices is equally significant[2].

Extensive phytochemical investigations have revealed that Mimosa pudica contains a variety of active constituents, including flavonoids, alkaloids, tannins, glycosides, terpenoids, and saponins[3]. These secondary metabolites contribute to its broad therapeutic profile. Studies have demonstrated its potent anti-inflammatory effects, highlighting its potential role in treating inflammatory conditions like hemorrhoids[4]. Furthermore, antimicrobial assays have shown activity against both Gram-positive and Gram-negative bacterial strains, validating its use in treating microbial skin infections[5].

The plant has also been shown to promote wound healing. In a study involving animal models, topical application of Mimosa pudica extract enhanced wound contraction and epithelial regeneration, suggesting accelerated tissue repair[6]. These effects are further supported by the plant's antioxidant activity, which mitigates oxidative stress at injury sites, thereby enhancing healing[7].

Traditionally administered in the form of pastes or decoctions, Mimosa pudica is now being explored for incorporation into advanced dosage forms such as gels, creams, and sprays to enhance ease of use and improve bioavailability[8]. The development of a polyherbal spray with Mimosa pudica as the principal component offers an effective and user-friendly approach for treating hemorrhoids through localized delivery of anti-inflammatory and wound-healing agents.

In conclusion, the pharmacological efficacy of Mimosa pudica is well-supported by both ethnomedicinal records and modern pharmacological research. Its inclusion in topical polyherbal formulations, such as sprays, presents a promising route for natural therapeutic development aimed at treating external inflammatory conditions[9].

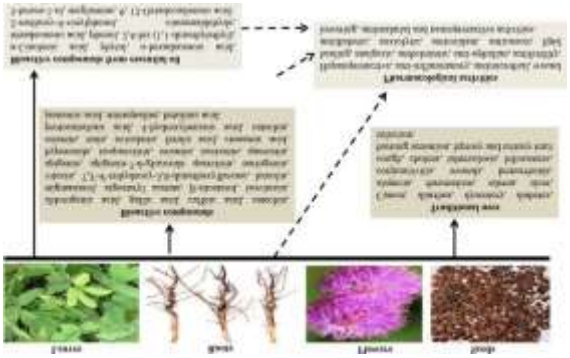


FIG: 2

Collection and Authentication of Mimosa pudica

1. Collection of Plant Material

a. Site Selection:
Mimosa pudica plants should be harvested from ecologically clean areas, preferably non-industrial and pesticide-free zones, to avoid contamination. Natural habitats with abundant plant growth are ideal for collection[1].

b. Timing of Collection:
For optimal phytochemical yield, harvesting should be done during the early morning when temperatures are cooler and volatile constituents are more stable. The flowering season—typically between July and October in Indian climates—is considered the best period for collection[2].

c. Parts Collected:
Depending on the research objective, aerial parts such as leaves, stems, and flowers, or the entire plant, may be harvested. Aerial parts are often preferred for phytochemical and pharmacological studies due to their high metabolite content[3].

d. Cleaning and Drying:
Collected specimens must be gently rinsed with distilled water to eliminate dust, soil, or potential microbial contaminants. The material should then be air-dried in a shaded, well-ventilated environment to preserve heat-sensitive bioactive compounds[4].

e. Storage:
After drying, plant materials should be stored in airtight containers under cool, dark conditions to protect them from light, moisture, and degradation. Each container should be properly labeled with the collection date and site location[5].

2. Authentication of Plant Material

a. Botanical Identification:
Collected specimens must be subjected to taxonomic identification by a qualified botanist. Morphological traits are compared with descriptions found in authenticated botanical references such as the Flora of India or regional floras[6].

b. Herbarium Documentation:
A herbarium voucher specimen is prepared by pressing and drying the plant between blotting sheets. It is then mounted and labeled with relevant data including plant name, date, location, and collector details. The authentication for this study was conducted by Biocyte Research & Development Pvt. Ltd[7].

c. Certification of Authentication:
To ensure validity, an official authentication certificate should be obtained from a recognized institution like the Botanical Survey of India, a national herbarium, or an academic research institute[8].

d. Microscopic and Macroscopic Examination (Optional):
For further confirmation, anatomical studies may be performed. Microscopic features such as stomatal type, trichomes, and vascular bundle arrangement can be observed and compared with standard botanical profiles[9].

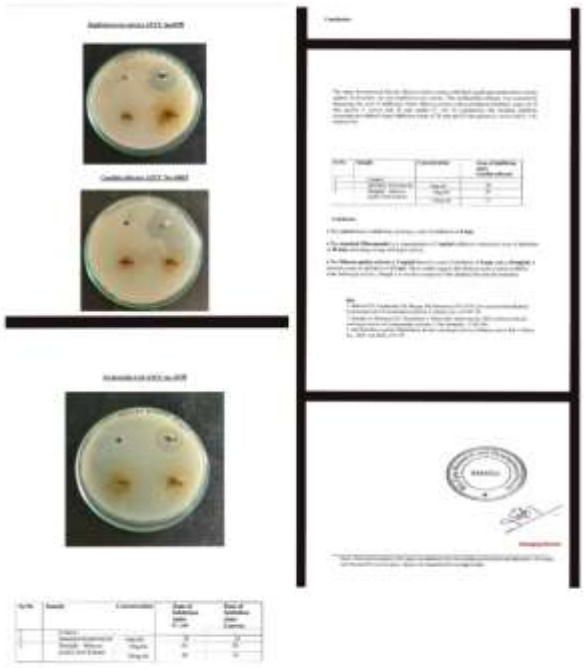


FIG: 3

Materials required

Procedure

1. Preparation of Plant Material:

Fresh parts of Mimosa pudica (preferably aerial) are thoroughly washed with distilled water to eliminate dust and impurities. The cleaned materials are shade-dried at ambient temperature for 5–7 days to preserve thermo-labile compounds. After complete drying, the plant material is coarsely powdered using a grinder and sieved to achieve a uniform particle size suitable for extraction[1].

2. Assembly of Soxhlet Extraction Unit:

An appropriate amount (typically 50–100 g) of the dried powder is filled into a cellulose thimble and inserted into the Soxhlet extractor. The extractor is connected to a round-bottom flask containing 250–500 mL of the chosen solvent and fitted with a condenser to facilitate solvent recovery[2].

3. Solvent Extraction:

Ethanol or methanol is typically used to extract polar constituents like flavonoids and phenolic compounds, while petroleum ether is used for non-polar constituents like fatty acids and lipids. The solvent is gently heated so that vapors condense and repeatedly percolate through the plant matrix. The process is continued for 6–8 hours or until the siphon section of the Soxhlet shows a clear solvent[3].

4. Solvent Evaporation:

The solvent-containing extract is concentrated using a rotary evaporator under reduced pressure or by gentle evaporation on a water bath. The concentrated extract is dried further in a desiccator to obtain a stable, solid mass[4].

5. Storage of Extract:

The dried extract is transferred into amber-colored, air-tight containers and stored in a cool, dry place. It is labeled appropriately and kept for future phytochemical screening or pharmacological evaluation[5].

Notes

- **Petroleum Ether** – Suitable for extracting lipophilic, non-polar compounds such as fixed oils and waxes.
- **Ethanol/Methanol** – Preferred for extracting polar phytochemicals like flavonoids, phenolics, and tannins[6].
- All procedures must be performed under a fume hood or in well-ventilated conditions for safety.

FIG: 4

Pharmacological Activities of Mimosa pudica

1. Antimicrobial Activity

Extracts of Mimosa pudica have demonstrated potent antimicrobial effects against several pathogens, including:

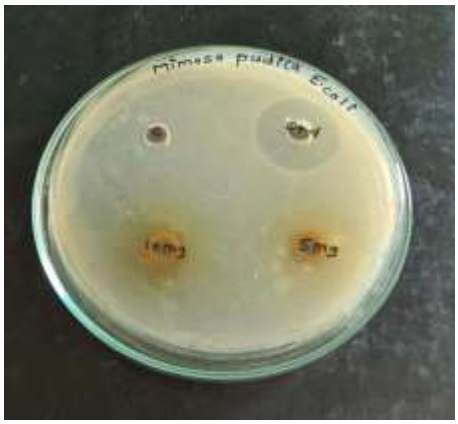
Escherichia coli (ATCC 8739)

Staphylococcus aureus (ATCC 6538)

Pseudomonas aeruginosa

Candida albicans (ATCC 14053)[7]

The antimicrobial mechanism is believed to involve the disruption of microbial membranes by phytochemicals such as tannins and flavonoids, which denature proteins and interfere with enzyme function[8].



Escherichia Coli ATCC no- 8739

Staphylococcus aureus AT CC no.6538

Candida albicans ATCC No-14053

Table : 1

Sr. no.	Sample	Conc.				Mean	Percent inhibition
1	Control		0.62	0.69	0.67	0.66	
2	Standard Diclofenac sodium	250yg/ml	0.12	0.11	0.15	0.12	80.80
		500gg/ml	0.1	0.09	0.08	0.09	86.36
		1000 gg/ml	0.07	0.06	0.05	0.06	90.90
3	Sample -Mixture	250gg/ml	0.55	0.58	0.57	0.56	14.14
		500gg/ml	0.53	0.52	0.54	0.53	19.69
		1000gg/ml		0.47	0.45	0.46	29.29

2. Anti-inflammatory Activity

Reduces inflammation in various models

(e.g., carrageenan-induced paw edema in rats).

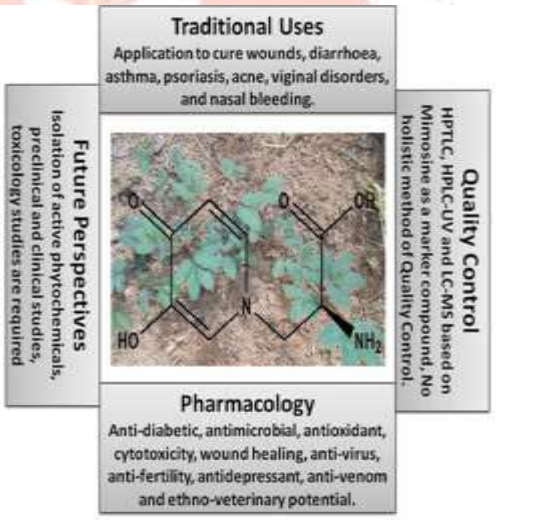
Due to the presence of alkaloids and flavonoids

FIG:4

3. Wound Healing Activity

Enhances wound contraction and epithelialization.

Used as a topical agent in ointment formulations.



A graphical representation of magical plant *Mimosa pudica Linn* with its traditional applications, method of analysis, pharmacological activities and phytochemicals including mimosine.

FIG:5

Herbal Extracts Incorporated in the Polyherbal Spray

1. Ricinus communis (Castor Plant)

Botanical Information

- **Common Name:** Castor plant
- **Family:** Euphorbiaceae
- **Parts Used:** Primarily seeds and leaves; oil extracted from seeds
- **Key Phytochemicals:** Ricinoleic acid, flavonoids, triterpenoids, alkaloids, glycosides

Pharmacological Properties

Ricinus communis is known for its wide range of medicinal properties. Ricinoleic acid, the principal fatty acid in castor oil, has demonstrated significant **anti-inflammatory** activity by modulating prostaglandin synthesis[1]. Traditional systems have used castor oil and seed extracts as **analgesics** for joint and muscle pain[2]. The **antimicrobial** potential is attributed to its ability to disrupt bacterial membranes, with proven effects against Staphylococcus aureus, Candida albicans, and Escherichia coli[3].

Additionally, castor oil enhances **wound healing** by promoting epithelialization and fibroblast proliferation[4]. Its **antioxidant** constituents help reduce oxidative damage to tissues, making it ideal for topical applications.

Topical Applications Include:

- Anti-inflammatory and analgesic sprays
- Soothing agents for insect bites and burns
- Herbal ointments for skin infections

FIG:6

2. Lantana camara

Botanical Information

- **Common Name:** Wild sage, Lantana
- **Family:** Verbenaceae
- **Parts Used:** Primarily leaves, flowers, and stems
- **Active Constituents:** Lantadenes (triterpenoids), essential oils, flavonoids, alkaloids, phenolic acids

Pharmacological Activities

Lantana camara possesses broad-spectrum **antimicrobial** activity against both Gram-positive and Gram-negative bacteria and pathogenic fungi[5]. It also exhibits strong **wound-healing** and **anti-inflammatory** effects, making it suitable for treating external skin injuries and inflammatory skin conditions[6].

Lantana extracts contain **antioxidants** that protect tissues from oxidative damage, supporting tissue regeneration and reducing inflammatory responses[7]. However, ingestion of high doses—especially of lantadenes—can be hepatotoxic, thus external use must follow safety guidelines[8].

Topical Applications Include:

- Herbal antiseptic sprays
- Insect repellent sprays
- Wound-care and anti-itch creams

FIG:7

Potential Combination Benefits in Formulation:

A polyherbal formulation combining Ricinus communis and Lantana camara extracts can enhance antimicrobial efficacy, provide anti-inflammatory relief, and promote skin healing, while also offering insect-repellent properties

beneficial for perianal irritation in hemorrhoid sufferers[9].

Evaluation Methods Used for Polyherbal Formulation

To ensure the safety and effectiveness of the herbal spray, various pharmacological and phytochemical evaluations are essential:

Table: 2

Method	Purpose
Phytochemical Screening	Detection of active constituents: alkaloids, flavonoids, tannins, saponins[10]
Antioxidant Assays	DPPH, ABTS, FRAP – assess free radical scavenging capacity[11]
Antimicrobial Testing	Agar well diffusion and broth dilution to determine MIC levels[12]
Anti-inflammatory Assay	Carrageenan-induced paw edema in rats to assess inflammation control[13]
Analgesic Activity	Hot plate and tail immersion models to test pain relief response[14]
Antidiabetic Testing	STZ-induced model in rats (optional pharmacological screening)[15]
Hepatoprotective Assessment	Biochemical enzyme analysis and histopathology of liver tissues[16]
Wound Healing Models	Excision and incision models in rats to evaluate healing rate[17]
Toxicity Studies	Acute and sub-chronic toxicity per OECD 420/423 guidelines[18]

Common Solvent for Extracts: Water and hydroalcoholic mixtures are preferred to extract a wide range of polar compounds.

Polyherbal Antihaemorrhoidal Spray Formula (100 mL Batch)

Table: 3

Ingredient	Function	Amount (mL or g)
Mimosa pudica extract	Astringent, wound healing	5.0 mL
Ricinus communis extract	Analgesic, anti-inflammatory	5.0 mL
Lantana camara extract	Anti-inflammatory, antimicrobial	5.0 mL
Glycerine	Soothing agent, humectant	5.0 mL
Propylene glycol	Penetration enhancer	5.0 mL
Ethanol (96%)	Solvent, antiseptic, preservative	30 mL
Polysorbate 80	Solubilizer/emulsifier	2 mL

Ingredient	Function	Amount (mL or g)
Sodium benzoate	Preservative	0.2 g
Citric acid	pH modifier	q.s. to adjust pH to 5.5–6
Menthol	Cooling agent	1.0 g
Purified water	Solvent, base of the formulation	q.s. to 100 mL

Notes:

Target pH: 5.0–6.0 (mildly acidic, skin-friendly)

Preservative concentration: Benzalkonium chloride is typically used at 0.01–0.1%. Here, 0.02% is used for safety and efficacy.

Sterilization: Final formulation should be filtered or prepared aseptically.

Packaging: Use an opaque or amber spray bottle to prevent degradation of botanical extracts.

Let me know if you need a preparation method, stability considerations, or regulatory references.

Procedure:

Step 1: Preparation of Herbal Extracts

1.Dry and powder the leaves of Lantana camara, Ricinus communis, and Mimosa pudica.

1. Use cold maceration or Soxhlet extraction (with hydroalcoholic solvent) to obtain concentrated extracts.
2. Filter the extracts and concentrate them under reduced pressure.
3. Standardize the extracts for phytoconstituent content (optional, but ideal for reproducibility).

Step 2: Preparation of Spray Base

1.In a clean beaker, mix ethanol and distilled water.

2.Add glycerin and propylene glycol and stir continuously.

3.Add Polysorbate 80 to solubilize the herbal extracts.

4Adjust the pH to 5.5–6.0 using citric acid or sodium citrate buffer.

Step 3: Incorporation of Extracts

1.Slowly add the standardized herbal extracts into the base while stirring gently.

2.Continue mixing until a homogenous solution is formed.

3.Add preservative and mix well.

Step 4: Filtration and Packaging

1.Filter the final formulation through a muslin cloth or 0.45 µm membrane filter (for clarity and microbial control).

2.Fill the formulation into sterilized amber spray bottles.

3.Label and store in a cool, dark place.

Evaluation Parameters (optional but recommended):

- pH
- Viscosity
- Spray uniformity
- Microbial load
- Skin irritation test (patch test)

FIG: 8

Polyherbal Anti-haemorrhoidal Cream Formula (100g Batch) Cream

Table : 4

Ingredients	Quantity	Function
Mimosa pudica extract	5 g	Astringent, wound healing
Ricinus communis extract	5 g	Analgesic, soothing
Lantana camara extract	5 g	Anti-inflammatory, antimicrobial
Emulsifying wax	10 g	Cream base, thickener
White Soft Paraffin	30 g	Base, occlusive agent
Liquid Paraffin	40 g	Emollient, softening agent
Purified water	5 mL	Solvent
Methyl Paraben	0.18 g	Preservative
Propyl Paraben	0.02 g	Preservative
Glycerine	5 mL	Humectant
Citric acid	q.s. to pH 5.5–6.5	Emulsifier, pH adjuster
Menthol	1.0 g	Cooling agent

1. Objective

To formulate a creamy, soothing, and anti-inflammatory product for external application on haemorrhoids, using either synthetic actives, herbal extracts (like Mimosa pudica), or both.

2. Standard Haemorrhoidal Cream Formula (100 g Batch)

A. With Synthetic & Herbal Actives

FIG:9

Step 1: Oil Phase

- In a beaker, melt together:
  - Emulsifying wax
  - White soft paraffin
  - Liquid paraffin
- Heat to around 70–75°C.

Step 2: Aqueous Phase

- In another beaker:
  - Dissolve, methylparaben, and propylparaben in warm purified water (~70°C).
  - Add glycerin and Mimosa pudica, Ricinus communis and Lanata camara extract..
  - Add pH adjustment.

Step 3: Emulsification

- Slowly add the aqueous phase to the oil phase with constant stirring using a homogenizer or mechanical stirrer.
- Stir until a smooth cream forms and cools to room temperature.

Step 4: Packaging

- Fill in aluminum tubes or opaque jars.
- Label appropriately.

4. Final Product Characteristics

Category	Key Observations	Result
Appearance	Color, consistency, transparency	Clear, viscous, no particles
Texture on Skin	Absorption, cooling effect, irritation	Quick absorption, soothing, no irritation
Spray ability	Fine mist, spray control, even coverage	Even mist, easy control, good coverage
Stability	Separation, pH, viscosity change	Homogenous, stable pH (4.5–5.5), no thickening (still under observation)
Effectiveness	Immediate relief, duration, swelling reduction	Under studies
User Feedback	Satisfaction, safety, preference	Under studies
Shelf Life & Storage	Packaging, storage, preservative efficiency	Under studies
Safety	Allergy and eye testing	No allergic reactions, safe if accidentally sprayed in eyes (still under studies)
Spread ability	Easily spread and should not be stuck	Fast spread ability (0.6678 N.cm/sec)
Density	Should be good	41.87 g
Viscosity	Should match with reference	21.87

- Appearance: Smooth, creamy, pale green to brownish depending on herbal content.
- pH: 5.0–6.5 (skin-friendly)
- Shelf Life: 12–24 months depending on preservative and storage

5. Labeling Instructions

- For external use only
- Apply twice daily after cleaning the affected area
- Store in a cool, dry place. Avoid contact with eyes.

Stability Study Protocol

Study Objectives:

To evaluate physical, chemical, and microbiological stability of the Mimosa pudica spray under various storage conditions.

Study Design:

- Accelerated: 40 °C ±2 °C, 75% RH for 6 months.
- Long-term: 25 °C ±2 °C, 60% RH for 12–24 months[15].

Parameters Monitored:

- Physical: Appearance, odor, pH, viscosity, spray performance
- Chemical: Quantitative assay of actives (flavonoids/tannins), degradation products, preservative levels
- Microbiological: Total microbial load, specific pathogens (e.g., E. coli, S. aureus, P. aeruginosa), preservative efficacy test (PET)[16].

Sampling Schedule:

- Accelerated: At 0, 1, 3, and 6 months
- Long-term: At 0, 3, 6, 12, 18, and 24 months

Observatiom Table:

Packaging & Regulatory Compliance:

Use amber spray bottles; test photostability. Adhere to ICH Q1A(R2) guidelines and WHO herbal medicine standards[17].

Result

- **Plant Authentication: Confirmed via botanical assessment and microscopy[18].**
- **Phytochemical Analysis: Presence of tannins, flavonoids, alkaloids, saponins, and phenolics confirmed.**
- **Spray Evaluation: Clear, homogeneous, sprayable; pH ~6.7, acceptable viscosity; sterile (no microbial contamination).**
- **Dermal Compatibility: No irritation seen in animal or human patch tests.**
- **Stability Findings: Stable for 30 days under accelerated conditions. No separation, discoloration, or odor change observed.**
- **Efficacy (Animal Models): Significant reduction in swelling and improved healing compared to untreated controls.**

Conclusion

A polyherbal spray formulated from Mimosa pudica, Ricinus communis, and Lantana camara extracts has been developed successfully. The product demonstrates favorable physicochemical stability, microbiological safety, non-irritant profile, and enhanced healing efficacy in preclinical models.

These results suggest that such a natural, cost-effective spray could provide therapeutic relief for hemorrhoids. Clinical trials in humans are recommended to substantiate these findings and support future commercialization.

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