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Research Article

A Topical Ointment Formulation Containing Adulsa Extract With Potent Antimicrobial Properties For The Treatment Of Skin Infection

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ABSTRACT

Adulsa, an evergreen shrub, is used in traditional medicine for its therapeutic benefits, particularly in treating respiratory ailments like asthma and bronchitis. A study aims to develop a topical ointment containing Adulsa extract for skin infections. The ointment is tested for its physicochemical properties, including pH, color, odor, and stability. The extract shows significant antibacterial activity against common skin pathogens. The ointment also includes rose water and citric acid. The study concludes Adulsa extract holds potential for effective skin infections treatments, highlighting the importance of traditional medicinal plants in modern therapeutic applications.

INTRODUCTION

Adhatoda vasica belonging to family Acanthaceae, commonly known as Adulsa, is a small, evergreen shrub found many regions of India and throughout the world, with a multitude of uses in traditional Ayurveda. Vasica is most well-known for its effectiveness in treating respiratory conditions (1) It is thought that plants are an important source of novel phytochemicals with possible medical applications (2). Native to Asia, Adhatoda vasica is a well-known herb in Ayurvedic, Siddha, and Unani medicine systems. This plant is known to exist in around 420 species, of which only a small

number have been thoroughly investigated. 13 of the species are located in Asia, 15 in America, and 8 in Africa. Of the examined species, 18 were primarily researched in the past ten years and included chemical and biological research on 23 species, pharmacological data on 31 species, and biological research on 18 species. It has been reported that the roots contain Vasicinolone, vasicol, and pegamine, while the flowers contain kaempferol and quercetin (3).

TOPICAL OINTMENT: -

This kind of bacteria can cause infections, which can be treated and prevented by topical ointments

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with antibacterial properties. The majority of topical medications on the market for the treatment of skin conditions are produced using different synthetic methods that involve chemicals and can have unintended consequence. One option to treating bacterial skin infections and avoiding the use of oral antibiotics, which can lead to the development of bacterial resistance, is topical ointment containing extract from medicinal plants. An ointment is the viscous semi solid preparations are use topically on the variety of body surface .It may not be (3).



Fig. No. 1: - Adhatoda Vasica



Fig.No.2: - Topical Ointment

Plant Description

Adhatoda vasica. belongs to the medicinal family Acanthaceae. It is a one to three-foot-tall evergreen shrub with several long, oblique

branches. Leaves are large and lance-shaped. Stem herbaceous above and woody below. Leaves opposite and exstipulate. Flower spikes or panicles, small irregular zygomorphic, bisexual, and hypogynous (4) It has capsular four seeded fruits. The blossoms are colored either purple or white. The Sanskrit word Vasaka is the basis for its commercial name. thickly flowered inflorescences in axillary spicate cymes; short peduncles; broadly oval, foliaceous bracts. As a sedative, expectorant, and antispasmodic, the leaves, flowers, fruit, and roots are widely used to treat asthma, whooping cough, chronic bronchitis, and cold cough (4).The botanical description of the plant is as follows: Kingdom: Plantae, Division: Angiosperms Class: Eudicots, Order: Lamiales, Family: Acanthaceae Genus: Justicia Species: Adhatoda (Adhatoda vasica) (5)

Scientific Classification: - -

Table No. 1: -. Scientific classification of Justicia adhatoda. (6)

JUSTICA ADHATODA	
Kingdom	Plantae
Order	Lamiales
Family	Acanthaceae
Class	Magnoliopsida
Genus	Justicia
Species	Justicia adhatoda
Botanical Name	Justicia adhatoda

Vernacular Names: -

Table No.2: -Vernacular name of Justicia adhatoda. (6)

JUSTICA ADHATODA	
English	Malabar nut
Gujarati	Araduso, Aduloso
Telugu	Vasa, Addasaramu
Hindi	Arusha, Adusa, Bansa
Sanskrit	Vasaka
Bengal	Adusa, Bakash, Vasok

Ecology And Botany

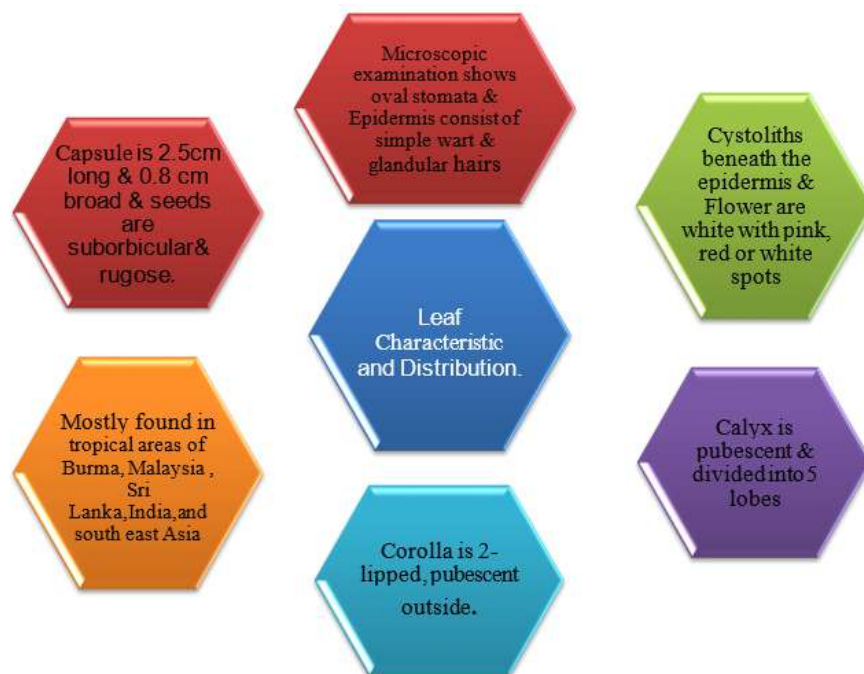


Fig No.03: -Ecology And Botany of Justicia Adhatoda

Phytochemistry

Justicia adhatoda L. includes an essential oil together with the main active chemical components vasicine and vasicinone. The yield of alkaloid ranged from 0.541 to 1.105 from different samples in India and the yield of vasicine is measured as 0.541 to 1.1% by dry weight. Vasicinone and vasicine are the two main alkaloids found in the leaves. In addition, adhatodine and anisotine has also been reported to present in leaves (7).

Adhatoda rich concentration of alkaloids is thought to be the cause of its wide range of pharmacological applications. Quinazoline is the main alkaloid present in Adhatoda leaves. Vasicine is an alkaloid. Adhatoda leaves and roots also contain the alkaloids l-vasicinone, deoxy vasicine, maiontone, Vasicinolone, and vasicinol, in addition to vasicine. According to research, these substances are in charge of Adhatoda bronchodilatory action (7).

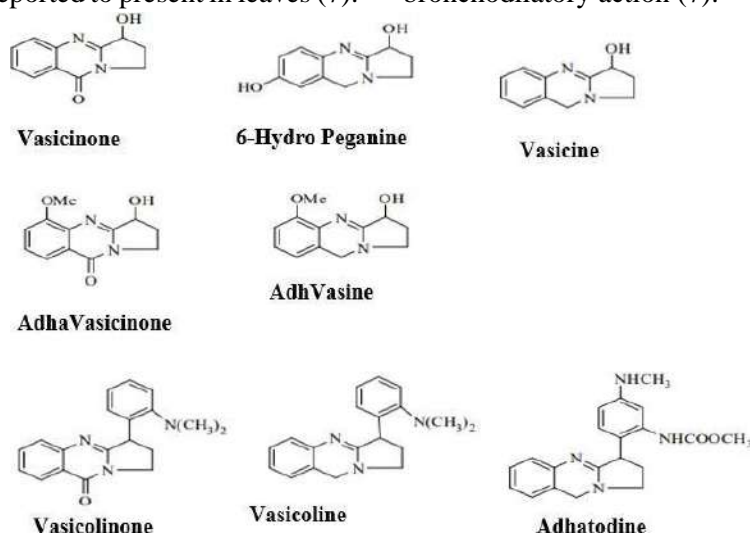
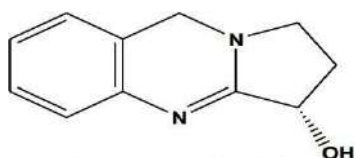
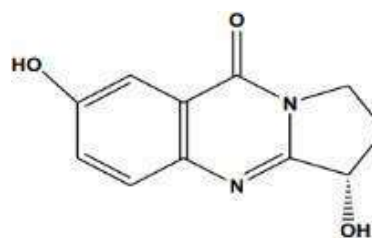


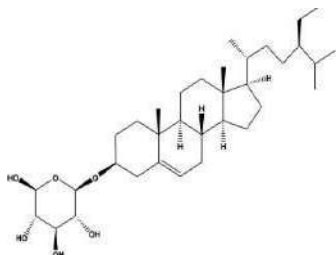
Fig. No 4: - Molecular structures of different components present in Justicia adhatoda L. Similarly, these structures of some bioactive compounds are shown below:



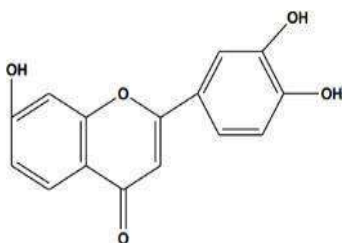
Vasicine



Vasicinolone



Daucosterol



Luteolin

Chemical Composition:

-Elemental analysis showed that *Justicia adhatoda* L. contains Ca, Na, Mg and K as chief elements and Ni, Co, Cd, Cr, Mn, Fe, Zn, Pb and Cu are present as trace element (7).

Table No.03: - chemical components analyzed in *Justicia adhatoda* L.

Sr. No.	Constituents	Percentages in Leaves	Percentages in Root
1	Moisture	15.3	24.6
2	Dry Matter	50.4	66.4
3	Fat	1.6	2.5
4	Protein	6.5	8.5
5	Fiber	6.4	5.2
6	Iron	1.2	0.7
7	Sugar	16.4	2.6
8	Sulphate	1.3	1.2
9	Sodium	1.4	2.4
10	Calcium	1.5	3.1
11	Zinc	0.6	0.5
12	Vitamin	1.5	5.2
13	Berberine	-	0.3
14	Vasicinone	4.5	7.5
15	Vasicinone	3.5	-

An analysis published in India has been reported the presence of 25.8% of deep yellow oil composed of lignoceric 10.7%, cerotic 5%,

behenic 11.2%, arachidic 3.1%, oleic 49.9%, β sitosterol 2.6% and linoleic acid 12.3% (1).

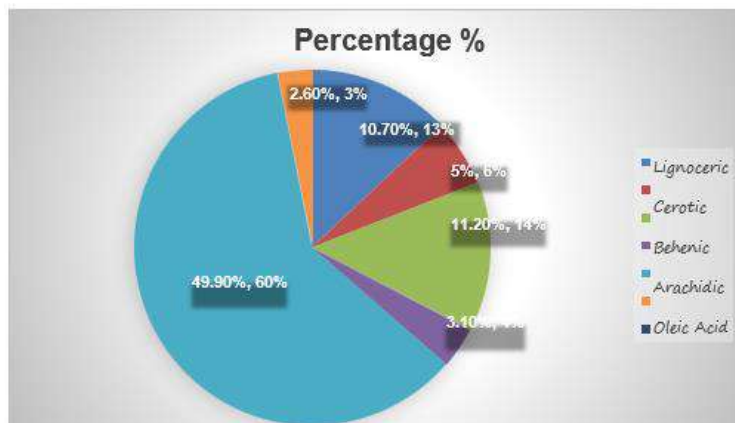


Fig.No.5: -Percentages of Chemical Composition.

Local Medicinal Uses.

1. Dried leaf powder is used to treat cough, TB, asthma, and dyspepsia.
2. Wounds are treated with bark, roots, and leaves; an infusion made from leaves has significant abortifacient, expectorant, and antispasmodic effects.
3. The leaf, which is powdered and dry, is used to treat wounds.
4. The leaf decoction has antispasmodic, expectorant, and abortifacient properties. It is also used to treat cow dysentery.
5. Leaf decoction has antispasmodic, expectorant, and abortifacient properties and is used to treat skin problems such as diabetes.
6. Justicia adhatoda is a well-known herb in both the modern pharmaceutical business and the conventional Ayurvedic, Unani, and Siddha medicinal systems (8) .

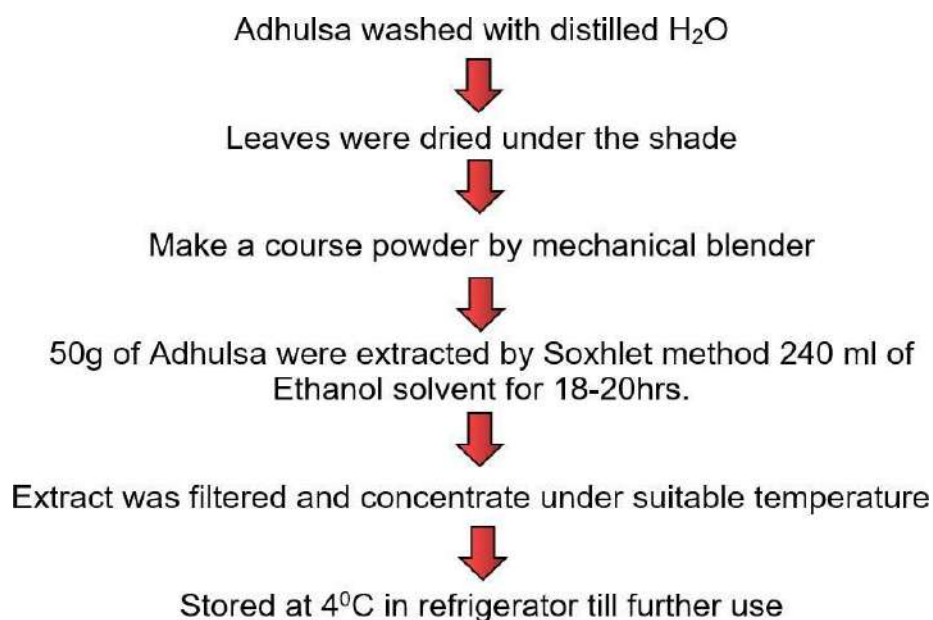
METHOD AND MATERIAL (11)

Table No. 04: -Material Used in Topical Ointment.

Sr. No	Ingredients	Quantity	Uses
1	Ethanollic extract of Adulsa leaves	1ml	Anti – BacterialandAnti- Microbial Properties.
2	Emulsifying wax	9g	Help to blend oil & water base.
3	White soft paraffin	25g	Act as a Vehicle and Emollient.
4	Liquid paraffin	15	For lubrication and moisturizing.
5	Rose Water	q. s	For aromatic
6	Citric Acid	q. s	Act as Preservative.

FORMULATION: -

I. Procedure of Extraction



II. Procedure of topical Ointment






QUALITATIVE ANALYSIS: -

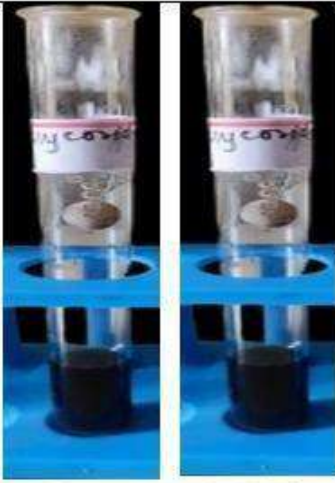

The Ethanollic Extract of Adulsa leaves were subjected to the phytochemical analysis by using

PHYTOCHEMICAL

various chemical tests to identify the phytoconstituents present in it are as follow (17).

Table. No.5: - Qualitative Phytochemical Test.

Sr.No.	Test	Observation	Inference	Photos
1	<p>Test for carbohydrate</p> <p>1.Molish test: - 1 ml Adulsa Extract +1 ml α-naphthol Solution +1-2 Drop Conc.H₂SO₄</p> <p>2.Fehling's Test: - 1 ml Extract +1 ml Fehling Solution (A, B)</p>	<p>Purple Colour is Observed</p> <p>White Precipitate is Observed</p>	Presences of Carbohydrate	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Molish Test</p>  </div> <div style="text-align: center;"> <p>Fehling's Test</p>  </div> </div>
2	<p>Test for Alkaloids</p> <p>1.Mayer's Test: -1 ml Extract +2-3 drop Mayer's Reagent.</p> <p>2.Dragendoff's Test: -1 ml Extract + 2-3Dragendoff's Reagent.</p> <p>3.Wagner's Test: - 1 ml Extract + 2-3 drop Wagner Test.</p> <p>4.Hager's Test:- 1 ml Extract +2-3 drop Hager's Reagent.</p>	<p>Dull White Precipitate is Observed</p> <p>Orange Precipitate is Observed</p> <p>Reddish Brown Precipitate is Observed</p> <p>Yellowish White Precipitate is Observed</p>	Presences of Alkaloids	

3	<p>Test for Glycoside: - 1.Keller – Kiliani Test Extract Dissolve in Acetic Acid (Contain traces of Ferric Chloride) & transfer surface of Conc. Sulphuric Acid. 2. Baljit’s Test :- 1 ml Extract +1 ml Sodium Picrate Solution</p>	<p>Reddish Brown Colour is Observed</p>	<p>Presences of Glycoside</p>	
4	<p>Test for Tannins: - 1.Ferric Chloride Test 1 ml Extract +1 ml Ferric Chloride</p>	<p>Dark blue or greenish black colour is Observed</p>		
5	<p>Test For Steroids 1.Salkowski Test 1 ml Extract +1 ml Chloroform+1 ml Conc. H₂SO₄.</p>	<p>Bluish red to cherry red colour is Not Observed.</p>	<p>Absents of Steroids & sterols.</p>	

PHARMACOLOGICAL ACTIVITY

ANTI – MICROBIAL ACTIVITY: -

- The definition of an antimicrobial is a substance that kills or stops the development of microorganisms.
- An ethanolic leaf extract shown antibacterial efficacy against Staphylococcus aureus and Escherichia coli.
- The antibacterial effectiveness hierarchy is as follows: ethanol, petroleum ether, and ethyl acetate.
- acetone.
- The extract from Adulsa leaves contains a range of bioactive chemicals; its efficacy against bacteria varies. These substances' properties determine how quickly they can

pierce a microorganism's cell membrane. (18).

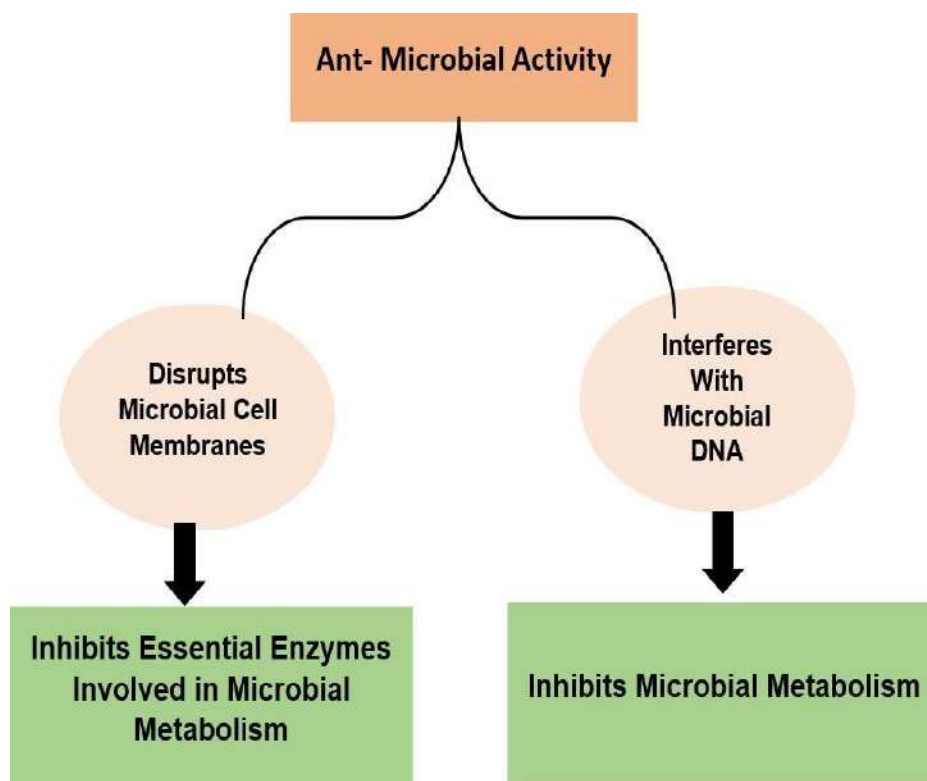


Fig.No. 10.: - Mechanism of action

- Some Bacteria Are Becoming Resistant To Antibiotics, Using Medicinal Plants Is Becoming More
- Popular As An Alternative Way To Fight Against These Tough Bacteria (13).

EVALUATION OF OINTMENT.

The evaluations were carried out on the ointment by using the following parameters: -

Colour and odour

Colour and odour of prepared ointment was examined by visual examination.

pH

The pH of ointment was determined by digital pH meter. 01 g of ointment was dissolved in 50 ml of distilled water and the pH was measured.

Spreadability Test

It was examined by using Spreadability instrument. It was calculated by using formula (19).

$$S = m. l/t$$

Were, S – Spreadability l – length of glass slide
 m – weight tied to upper slide t – time taken

Stability study

The stability study was carried out for the prepared ointment at temperature of 370C for 24 Hours.

Test microorganisms

A panel of common pathogenic microorganisms were used in the study, which includes gram-positive bacteria (Staphylococcus aureus or Bacillus cereus) and gram-negative bacteria (Escherichia coli or Pseudomonas aeruginosa).

Viscosity test

The viscosity of each ointment formulation was determined using Brook Field Viscometer with spindle number 3. A 15 g sample of the ointment was used for each determination. (19).

Irritation Test

It was examined by applying ointment on human skin (13).

RESULT AND DISSCUTION

The Preliminary Phytochemical screening of Ethanolic Extract of Adulsa leaves was showed for



the presence of Carbohydrates, Steroids, Glycoside, Flavonoids, Tannins, Proteins, Amino Acids and Absence of Alkaloids and Saponins

Table No.6: -Qualitative phytochemicals analysis of the Ethanolic extract of Adulsa leaves.

Sr. No	Qualitative Phytochemical Test	Result
1	Carbohydrates	+
2	Alkaloids	+
3	Steroids and Sterols	-
4	Glycosides	+
5	Saponins	+
6	Flavonoids	+

The Formulated Ointment was Evaluated for Physicochemical Parameters Such as Colour, Odour and pH, the Results were shown in Table 6. This was good Sign for Ointment and It was Acceptable.

Table No.7: - Evaluation of Formulated

Sr. No	Physicochemical Parameters	Formulation
1	Colour and odour	Light Greenish
2	Odour	Slight Aromatic
3	Irritation Test	No Irritation
4	Stability study	Stable

Table No.8: - Viscosity Test for ointment

Sr. No	Formulation Code	Viscosity (CP)
1	F1	23,740 ± 6.2
2	F2	30,545 ± 5.4
3	F3	32,284 ± 22.8
4	F4	31,124 ± 12.4

Table No.9: - PH and Spreadability Test for ointment

Sr No	pH	Spreadability
F1	7.40 ± 0.2	18.4 ± 0.3
F2	8.56 ± 0.4	27.6 ± 0.2
F3	8.69 ± 0.5	36.8 ± 0.4
F4	8.79 ± (0.7)	25.76 ± (0.1)

Table No .10.: - Antibacterial Activity of the Ethanolic Extract of Adulsa leaves Extract

		Zone of Inhibition			
		5 ug/ml	10 ug/ml	15 ug/ml	20 ug/ml
1	Staphylococcus aureus	200.16mm ² ± 2.4	254.34mm ² ± 2.43	452.14mm ² ± 1.2	153.86mm ² ± 2.2
2	Escherichia coli	153.86mm ² ± 1.2	200.16mm ² ± 1.6	314mm ² ± 1.8	156.86mm ² ± 1.2



Table No .11.: - Antibacterial Activity of the Ethanolic Extract of Adulsa leaves Ointment.

		Zone of Inhibition				
		Standard	F1	F2	F3	F4
1	Staphylococcus aureus	706.1 mm ²	314mm ² ± 2.4	28.26mm ² ± 2	405.3mm ² ± 2.5	306.5mm ² ± 2.9
2	Escherichia coli	452.16 mm ²	200.16mm ² ± 2.4	50.24mm ² ±2.51	352.1mm ² ± 1.28	252.16mm ² ± 2.51

FUTURE SCOPE

1. In Research and Clinical Validation will be Important in the Future to improve the Safety and Effectiveness of Ointments.
2. Using Natural Chemicals and Cutting-Edge Botanical Extracts to Maximize the Benefits of Plant-Based Substances while Minimizing Adverse Effects is One Feature of the Product
3. Nano Tech is Currently Used in Herbal Ointments to Improve Component Delivery. AI Assists in Creating Customized Ointments for Various Skin Types. To Help the Environment, they Also use Eco-Friendly Plants.
4. Combination Therapies that Combine the Advantages of Many Natural Ingredients. These Formulations will offer Improved Efficacy and Versatility as they are Especially made to Deal with Various Skin Issue.

CONCLUSION

1. The present study observed that the ethanolic extract of Justicia adhatoda leaves exhibited antibacterial Activity
2. When the extract was added to the base of the ointment for topical ointment, the effect was maintained.
3. The final substance dispersed easily across the skin's surface, had no irritating effects, and because of its antibacterial properties, it may be applied topically to treat rashes, boils, wounds, and Other Skin Infection.
4. With ongoing research, creating new formulations that are powerful, stable, and more effective would be simpler.

5. The ointment formulation with F3 had the highest level of antibacterial activity.

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