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Research Article

Formulation And Evaluation of Anti Acne Herbal Gel

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ABSTRACT

Herbal medicines have become an ideal part of global importance both medicinal and economical. The plant-based medicines have more significant patient compliance as they devoid of typical side effects when compared to allopathic medication. The present study has been done with the aim to formulate and evaluate the anti-acne activity of hydrogel prepared from water extract of root of Rubia cordifolia and leaves of Azadirachta indica and Aloe barbadensis. Manjistha (Rubia cordifolia) is one of the most valuable herb used in Ayurveda. It is known for blood purification and helpful in various skin diseases. Manjistha also corrects the functioning of whole urine system and prevents kidney stones. It contains many compounds which act as antibacterial, antioxidant, and anti-inflammatory activities that are beneficial for the skin. The neem (Azadirachta indica) has a vital role in various problems associated with the human health. The chemical constituents present in the neem plant make it a doctor tree due to its wide scope in biological activities. Generally, it shows both antibacterial and anti-inflammatory properties that fight against acne-causing bacteria. Aloe vera is widely used in herbal medicine for its numerous health benefits. It is known for its soothing, anti-inflammatory, and healing properties. Additionally, aloe vera has moisturizing and antibacterial properties, making it beneficial for treating acne and improving skin health. An anti-acne herbal gel was developed by simple mixing of prepared Rubia cordifolia root extract and Azadirachta indica and Aloe barbadensis leaf extract along with hydrogel. All the in-vitro evaluation of prepared hydrogel showed better result. The developed formulation showed anti-acne activity against bacterial culture and produced a better zone of inhibition which was near to the zone of inhibition produced by standard amoxicillin disc. Hence, it was concluded that formulated anti-acne herbal gel was safe and effective for controlling acne vulgaris.

INTRODUCTION COSMETICS

As per drug and cosmetics Act 1940 and Rules 1945 "Cosmetics is defined as any article intended

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to be rubbed, poured, sprinkled or sprayed on or introduced into, or otherwise applied to the human body or any part therefore cleansing, beautifying, promoting attractiveness or altering the appearance.

HERBAL COSMETICS

Herbal cosmetics are formulated using different cosmetic ingredients to form the base in which one or more herbal ingredients are used to cure various skin ailments. Plants are highly used for the development of new drug products for cosmeceuticals and pharmaceutical applications.

HERBAL ANTI ACNE GEL

Herbal anti-acne gel is a topical formulation designed to treat and prevent acne using natural plant-based ingredients. These gels typically incorporate medicinal plants known for their anti-inflammatory, antibacterial, and healing properties.

MATERIALS AND METHODS

Collection of plant material

The fresh plant parts of *Azadirachta indica*, *Aloe barbadensis*, and *Rubia cordifolia* were collected from Kasaragod and Kannur districts, Kerala (India) in the month of March 2024.

Authentication of plant material

The plant material was identified and authenticated by Smitha K.O, Assistant professor

(Department of Horticulture), College of Agriculture, Padannakad, Kasaragod, Kerala. *Azadirachta indica*, *Aloe barbadensis*, and *Rubia cordifolia* were dried under shade.

Preparation of plant extracts

The collected plant materials are carefully washed under water and was dried at shade for 10-15 days. These shade dried plant material were homogenized to a coarse powder using an electronic blender and then stored at air tight container until further use .The organic solvents such as ethanol and water was used for extraction .10 gm of homogenized coarse leaf powder of *Azadirachta indica*, was soaked in different conical flasks containing 100 ml of ethanol and water .Then it is allowed to stand 30 minutes with occasional shaking, finally each sample extract was filtered through whatmanNO:1 filter paper .This filtrate used to detect various biologically active constituents present in various solvent extract.

Preliminary phytochemical screening

The extracts were subjected to preliminary phytochemical screening to detect the various phytoconstituents such as alkaloids, carbohydrates, flavonoids, saponins, glycosides, tannins and phenols.

Formulation of polyherbal toothpaste

SL NO	Ingredients(gm)	Quantity(w/w) %			Functions
		F1	F2	F3	
1.	Water extract of Rubia cordifolia	2.5%	2.5%	2%	Antiinflammatory, wound healing
2	Water extract of Azadirachta indica	2.5 %	2.5%	2%	Antiinflammatory, Anti bacterial
3	Slurry of Aloe vera	5%	4%	4.5%	Kills acne causing bacteria, reduce scars, moisturizer
4	Carbopol 934	2g	1g	1g	Gelling agent
5	Propylene glycol	7.5ml	7.5ml	7.5ml	Humectant
6	Glycerin	2.5ml	2.5ml	2.5ml	Humectant
7	Methyl paraben	0.5gm	0.5gm	0.5gm	Preservative
8	Alcohol	7.5ml	7.5ml	7.5ml	Kills inflammatory acne causing bacteria



9	Triethanolamine	qs	qs	qs	Neutralizer
10	Distilled water	Up to 100ml	Up to 100ml	Up to 100ml	Vehicle

Procedure

1. Water was taken in a beaker. Carbopol 934 was sprinkled slowly with vigorous mechanical stirring.
2. Waited for air bubbles to separate. Triethanolamine was added dropwise to adjust skin pH and gel consistency.
3. Extracts and propylene glycol were added and mixed properly. Methylparaben was dissolved in 5 ml of distilled water.
4. Glycerine and alcohol were added and stirred properly. Aloe vera extract was added and stirred.
5. Volume was made up to 100 ml by adding remaining distilled water.

Methods of evaluation

A. Physical Evaluation

Physical parameters such as color and appearance were evaluated.

B. Determination of pH

Take one gram of the gel in a 150ml beaker and add 10ml of freshly boiled and cooled water. Stir well to make a thorough suspension and determine the pH of the suspension using pH meter.

C. Determination of spreadability

Slip and drag characteristics of gel are used to determine the spreadability technique. About 1-2g of anti-acne herbal gel was weighed and placed between two glass slides (10×10) that were stacked one on top of the other, and then slides were moved in opposite directions. After 3 minutes measure the amount of toothpaste that has spread. Repeat three times.

$$S=M \times L/T$$

M- Weight placed

L- Length moved by glass slide

T- Time taken to separate upper slide from lower

D. Extrudability

In this method, the formulated gel was filled in standard capped collapsible aluminum tube and sealed by crimping to the end. The weights of tubes were recorded. The tubes were placed between two glass slides and were clamped. 500g was placed over the slides and then cap was removed. The amount of the extruded gel was collected and weighed. The percent of the extruded gel was calculated.

E. Viscosity

The viscosity of the gel was determined by using Brookfield viscometer at 10 rpm. About 200 g of the gel was taken in a beaker and spindle was dipped in it for about 5 minutes and then the reading was recorded

F. Swelling index

To determine the swelling index of the prepared gel, 1 gm of gel was transferred on porous aluminium foil and then placed in a 50 ml of beaker containing 10 ml 0.1N NaOH. Then the sample were removed from beaker at different time intervals and put it in a dry place for some time after it reweighed. Swelling index was calculated by using the formula;

$$\text{Swelling Index (SW)\%} = (W_t - W_o) / W_o \times 100$$

Where (SW)%= Equilibrium percentage swelling, W_t= Weight of swollen gel after time t, W_o= Original weight of gel at zero time

G. Stability study

The stability study was performed as per ICH guidelines. Prepared formulations were stored at different temperatures and humidity conditions like ambient temperature (R.T), refrigerator temperature (8±1°C) and condition of accelerated stability testing (45°C ± 2°C/75%±5%RH) for a period of three months

Screening for antimicrobial activity



Antimicrobial activity was determined by agar well diffusion method using ampicillin as standard. Activity of anti-acne herbal gel was tested against lactobacillus. The required amount of agar was prepared and inoculated into it by microorganisms. Then agar solution was poured into the petri plates and allowed to stand to solidify for a few minutes. After, solidification a sterilized well digger was used to generate the appropriate size of wells. The gel are then filled in. The plates were incubated in inverted condition at 37°C for

48 hours. After 48 hours, the plates were observed for the presence of inhibition of bacterial growth, and it was indicated in the form of a clear zone of inhibition. The zone of inhibition obtained for the developed anti acne herbal gel was compared with the standard Ampicillin.

RESULT AND DISCUSSION

Phytochemicals present in ethanol and aqueous extracts of *Azadirachta indica*, *Aloe barbadensis*, and *Rubia cordifolia*

SL NO.	Chemical constituents	<i>Azadirachta indica</i>		<i>Aloe barbadensis</i>		<i>Rubia cordifolia</i>	
		Water extract	Ethanol extract	Water extract	Ethanol extract	Water extract	Ethanol extract
1	Alkaloids	+	+	—	+	+	+
2	Carbohydrate	—	—	—	+	+	—
3	Flavonoids	+	+	+	+	+	+
4	Saponins	+	—	—	—	+	+
5	Glycosides	—	+	—	—	—	+
6	Tannins	+	+	+	+	+	+

Evaluation of Antiacne herbal gel

A. Physical evaluation

Physical parameters such as color and appearance were evaluated.

SL NO.	Parameters	Observation		
		F1	F2	F3
1.	Colour	Reddish brown	Reddish brown	Reddish brown
2.	Odour	Pleasant	Pleasant	Pleasant
3.	Homogeneity	Homogenous	Homogenous	Homogenous

B. Determination of pH

	F1	F2	F3
pH	6.20	6.23	6.46

C. Determination of spreadability

	F1	F2	F3
Spreadability	3.76cm/sec	3.79cm/sec	3.83cm/sec

D. Extrudability

SL NO	Extrudability	Observation		
		F1	F2	F3
1	Net wt. of formulation in tube (gm)	15.00gm	15.02gm	15.01gm



2	Wt. of gel extruded (gm)	12.12gm	12.3gm	12.4gm
3	Extrudability amount percentage	80.8%	81.89%	82.61%

Screening for antimicrobial activity

The developed formulations showed anti-bacterial activity against *Lactobacillus* produced a better zone of inhibition of about 7mm respectively which was near to the zone of inhibition produced by standard Ampicillin (10mm,8mm).

DISCUSSION

The present work is to develop an herbal anti-acne gel using *Rubia cordifolia*, *Aloe barbadensis*, and *Azadirachta indica*. Acne is a common skin condition, often treated with synthetic agents that can cause side effects like itching. Herbal formulations are a safer alternative. The plant materials were collected, authenticated, dried, and extracted using maceration. Phytochemical analysis confirmed the presence of glycosides, flavonoids, and saponins, which contribute to anti-acne properties. The hydrogel, containing extracts from the selected plants, was formulated and evaluated for appearance, pH, spreadability, viscosity, and extrudability. It was found to have good consistency and antibacterial activity, producing a 7 mm zone of inhibition against *Lactobacillus*, close to the 10 mm produced by standard Amoxicillin. The results indicate that the herbal gel is effective for acne treatment.

CONCLUSION

The aim of study is to formulate an herbal hydrogel using *Rubia cordifolia* root extract and *Azadirachta indica* and *Aloe barbadensis* leaf extracts for anti-acne activity. Physicochemical and phytochemical investigations show the presence of glycosides, saponins, and flavonoids, which contribute to anti-inflammatory effects beneficial for acne treatment. The hydrogel was prepared using Carbopol 934, which provided good consistency and spreadability. In vitro testing showed a 7 mm zone of inhibition against

Lactobacillus, close to the 10 mm produced by Amoxicillin. The results indicate that the herbal gel is effective, safe, economical, and a better alternative to synthetic formulations.

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