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Formulation and Evaluation of Anti-acne Herbal Gel using *Vigna radiata* and *Aloe barbadensis*

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A b s t r a c t

This study targets the chronic skin condition acne with the aim of formulating an effective and safe Polyherbal gel by using *Vigna radiata* and *Aloe barbadensis*. The ethanolic extract of *Vigna radiata* and collected *Aloe barbadensis* gel were incorporated in to optimized Carbopol gel base. The combination of these two herbal constituents may produce an effect to minimise the Acne problem. Antimicrobial study shows that there was no microbial contamination observed and it showed good zone of inhibition and in vivo skin irritation study results showed that there was no skin lesions like defatting of skin, adverse skin reactions, local systemic change. Overall, this study reports concluded that the formulation of polyherbal gel may offer an effective and safe dosage form which leads to patient adherence and compliance to the therapy.

Keywords: polyherbal gel, Vigna radiate, *Aloe barbadensis*

A r t i c l e I n f o

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C O N T E N T S

1. Introduction

Skin is the biggest organ of the body, accounting for about 15% of the total adult body weight. It performs many vital functions, including protection against external physical chemical, as well as prevention of excess water loss from the body and a role in thermoregulations. Humans shed around 500 million skin cells each day. In fact, the outermost parts of the epidermis consist of 20–30 trusted Source layers of dead cells. The epidermis constantly makes new cells in its lower layers. Over the course of around four weeks, these cells make their way to the surface, become hard, and replace the shedding, dead cells. Keratinocytes are the most common type of cells within the epidermis. Their job is to act as a barrier against bacteria, parasites, fungi, viruses, heat, ultraviolet (UV) rays, and water loss [1-4].

ACNE: As oil and dead skin cells clog pores, sebum can accumulate inside the pores and cause acne, an inflammatory skin condition. It is a chronic skin condition that develops when dead skin cells clog hair sacs. Acne vulgarism is the common term for the condition. The age range of the patients who are afflicted by this is between 16 and 25. A mild form of acne is common during adolescence, but a severe case can leave scarring long after therapy and can give an unpleasant look. Practically speaking, acne symptoms can be divided into three categories: mild, moderate, and severe [5-7].

Acne is affected by two major factors:

- Heredity
- Hormones

Types of acne

Spots or pimples appear when the skin generates excessive amounts of oil, which encourages the growth of germs that clog the skin's pores and cause swelling and redness. In no way are pimples infectious. Whiteheads: These little bumps that remain under the skin's surface. Although having a strikingly black appearance and rising to the skin's surface, blackheads are not caused by dirt. Black skulls don't have a black hue due of dirt; they are just black. The keratin protein is often oxidized by air [7-10].

Papules:

These little, pink pimples on the skin are visible and painful to the touch.

Pustules:

(pimples or zits) can be seen on the surface of the skin. They are red at the lowest level and contain pus at their top.

Nodules:

Prominent growths on the skin's surface. These are painful, huge, solid pimples that are visible on the skin's surface as well as deep into the skin.

2. Methodology

Collection and Authentication of the Plant

Vigna radiata seeds were collected from local market in Nellore and *Aloe barbadensis* leaves were collected from medicinal garden. It was identified as *Vigna radiata and Aloe barbadensis* and a specimen was authenticated by Dr. K. Madhava Chetty, Dept of Botany, S V University, Tirupati.

Extraction of V*igna radiata* [11,12]

The seeds of *Vigna radiata* were collected and bruised in to fine particles. About 500gm of the crushed *Vigna radiata* powder were extracted using ethanol as a solvent by hot extraction method using Soxhlet apparatus. The process was continued until the solvent in the thimble became clear. Then, the extract was evaporated to dryness using vacuum desiccator.

Collection of *Aloe barbadensis* gel [13]

Fresh leaves of *Aloe barbadensis* were collected. The outer thick epidermis of the leaf was selectively removed and the inner gel-like pulp in the centre of the leaf was separated minced, and homogenized in a mortar and pestle. It was filtered using muslin cloth to get a clear liquid.

Formulation of Gel base [14-17]

Gelling agent was dispersed in sufficient quantity of water. Propylene glycol- 400 which is used as humectant or plasticizer was added to the dispersion. Other excipients such as methylparaben and propyl paraben was added with continuous stirring. In Carbopol gels, pH ofthe vehicle was brought to neutral by using TEA (Triet hanolamine).The final weight of the gel was adjusted to 50 gm with distilled water. Then the mixture was stirred by using propeller for 2 hours at 500 rpm. After stirring, this homogenous gel appeared to be free of bubbles. It was kept at room temperature for 24 hours to check the consistency and stability of gel.

Table No. 1: Formulation of Carbopol gel

Ingredients	G1	G2	G3
Carbopol 940	1%	1.5%	2%
Propylene glycol	5ml	5ml	5ml
Methyl paraben	0.15gm	0.15gm	0.15gm
Propyl Paraben	0.30gm	0.30gm	0.30gm
Triethanolamine	5ml	5ml	5ml
Water	q. s	q. s	q. s

Table No. 2: Formulation of polyherbal gel containing *Vigna radiata* and *Aloe barbadensis*.

Ingredients	F1	F2	F3
Vigna radiata extract	1%	1.5%	2%
Aloe barbadensis Gel	5ml	5ml	5ml
Carbopol	2%	2%	2%
Propylene glycol	5ml	5ml	5ml
Methyl Paraben	0.15gm	0.15gm	0.15gm
Propyl paraben	0.30gm	0.30gm	0.30gm
Triethanolamine	5ml	5ml	5ml

Water	q. s	q. s	q. s

3. Results & Discussion

Table No. 3: Phytochemical constituents of *Vigna radiata*

Constituents	Test	End point	Results
Flavonoids	Ferric chloride	Green color	++
	Lead acetate	Yellow precipitate	++
Protein	Xanthoprotein	Yellow precipitate	++
	Ninhydrin	Blue color	++
Amino acids	Ninhydrin	Purple or bluish color	++
	Tyrosine	Dark red color	++
Phenol	Ferric chloride	Blue or red color	++
Organic acid	Phosphoric acid	Light yellow precipitate	++

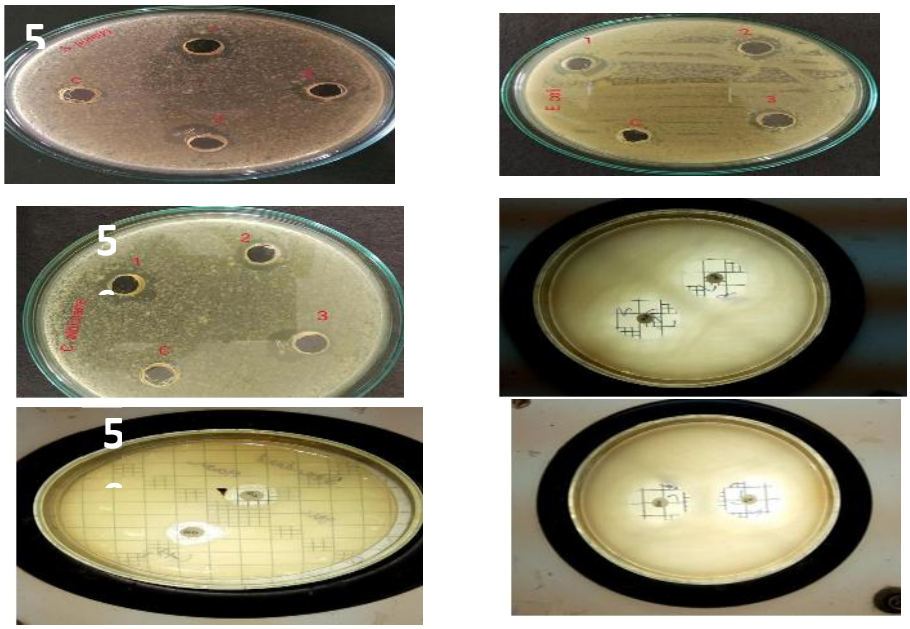

Fig No: 1 5a: Zone of inhibition of *Vigna radiata* extract towards *Staphylococcus aureus.*
5b: Zone of inhibition of *Vigna radiata* extract towards
5c: Zone of inhibition of *Vigna radiata*
5d: Standard on *Staphylococcus aureus*
5e: Standard on *Escherchia coli*
5f: Standard on *Candida albicans.*

Table No. 4: Zone of inhibition of the extract

Vigna radiata extract	Name of the Organism										
	Staphylococcus aureus (ATCC- 6538P)			Mean (in mm)	*Escherchia coli* (ATCC - 8739)			Mean (in mm)	*Candida albicans* (ATCC - 18804)			Mean (in mm)
	1 (mm)	2 (mm)	3 (mm)		1 (mm)	2 (mm)	3 (mm)		1 (mm)	2 (mm)	3 (mm)	
10µl/ml	13.2	13.4	13.2	13.3± 0.1	13.2	13.3	13.2	13.2± 0.06	12.7	12.8	12.7	12.7± 0.06
20µl/ml	13.5	13.4	13.4	13.4± 0.03	13.4	13.3	13.3	13.3± 0.03	12.7	12.6	12.6	12.6± 0.03

30µl/ml	13.5	13.6	13.4	13.5± 0.1	13.5	13.5	13.4	13.5± 0.03	12.7	12.7	12.6	12.7± 0.03
Gentamicin (10-mcg)	21.1	23.2	21.5	22.1± 0.1	22.2	22.5	22.2	22.3± 0.2	-	-		
Fluconazole (25-mcg)	-	-			-	-			23.2	21.2	21.3	22.2± 0.03

Formulation of polyherbal gel containing *Vigna radiata* and *Aloe barbadensis:* Polyherbal gel containing *Vigna radiata* and *Aloe barbadensis* was incorporated into optimized 2% Carbopol gel base. Different concentrations of ethanolic extract of *Vigna radiata* such as 1,1.5 and 2% were incorporated in to Carbopol gel base. *Aloe barbadensis* concentration was kept constant [5 ml] in all the Carbopol gel base.

Figure No.2: Image of Formulated of polyherbal gel containing *Vigna radiata* and *Aloe barbadensis*

Table No. 5: Physical appearance of formulated gel.

	F1 [1% ethanolic extract of *Vigna radiata*]	**F2 [1.5% ethanolic extract of *Vigna radiata*]**	**F3 [2% ethanolic extract of *Vigna radiata*]**
Physical appearance	Transparent yellow gel	Transparent yellow gel	Transparent yellow gel
Color	Pale yellow	Pale yellow	Pale yellow
Homogeneity	Absence of aggregates	Absence of aggregates	Slight aggregates

Table No. 6: Measurement of pH

Formulation code	**pH**
F1	**5.9**
F2	**5.7**
F3	**5.8**

Table No. 7: Measurement of viscosity

Formulation code	**Viscosity [cps]**
F1	1428±0.1
F2	1425±0.75
F3	1358±0.25

Table No. 8: Measurement of spreadability

Formulation Code	**SPREADABILITY** (gm.cm/sec)
F1	19.37
F2	21.35
F3	22.13

Table No. 9: Measurement of stability studies

S. No	PARAMETERS	DURATION					
		STORAGE CONDITION					
		7 days		15 days		30 days	
		8^0C	40^0C	8^0C	40^0C	8^0C	40^0C
1	**Appearance**						
	F1	Semisolid	Semisolid	Semisolid	Semisolid	Semisolid	Semisolid
	F2	Semisolid	Semisolid	Semisolid	Semisolid	Semisolid	Semisolid
	F3	Semisolid	Semisolid	Semisolid	Semisolid	Semisolid	Semisolid
2	**Colour**						
	F1	Yellow	Yellow	Yellow	Yellow	Yellow	Pale yellow
	F2	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
	F3	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
3	**Odour**						
	F1	Characteristic	Characteristic	Characteristic	Characteristic	Characteristic	characteristic
	F2	Characteristic	Characteristic	Characteristic	Characteristic	Characteristic	characteristic
	F3	Characteristic	Characteristic	Characteristic	Characteristic	Characteristic	Bad smell
4	**pH**						
	F1	5.9	5.9	5.8	5.9	6.1	6.3
	F2	5.8	5.8	5.8	5.9	5.8	5.8
	F3	5.9	6.1	6.1	6.1	6.2	6.3
5	**Viscosity** (Cps)						
	F1	1428±0.1	1425±0.1	1378±0.75	1376±0.25	1420±0.1	1470±27
	F2	1425±0.75	1456±0.75	1457±0.25	1455±45	1444±0.7	1425±0.75
	F3	1358±0.25	1336±0.45	1377±0.75	1336± 0.25	1357±7.5	1357±0.25
6	**Spreadability** (gm.cm/sec)						
	F1	19.37	19.45	19.25	18.75	18.65	19.18
	F2	22.13	22.13	22.15	22.12	22.11	22.09
	F3	21.35	21.33	21.22	20.19	20.18	22.18

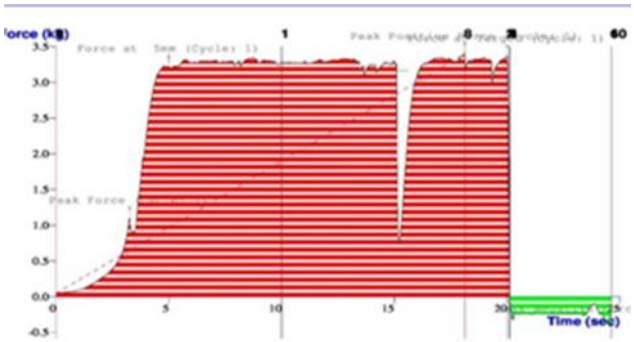

Figure No. 3: Extrudability graph

4. Conclusion

These investigations have brought out ultimate factors which leads to the following conclusions: This study targets the chronic skin condition acne with the aim of formulating an effective and safe Polyherbal gel by using *Vigna radiata* and *Aloe barbadensis.* The ethanolic extract of *Vigna radiata* and collected *Aloe barbadensis* gel were incorporated in to optimized Carbopol gel base. The combination of these two herbal constituents may produce an effect to minimise the Acne problem. Antimicrobial study shows that there was no microbial contamination observed and it showed good zone of inhibition and *in vitro* skin irritation study results showed that there was no skin lesions like defatting of skin, adverse skin reactions, local systemic change. Overall, this study reports concluded that the formulation of polyherbal gel may offer an effective and safe dosage form which leads to patient adherence and compliance to the therapy.

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