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FORMULATION AND EVALUATION OF POLYHERBAL FACE GEL

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ABSTRACT

Medicinal plants are used all over the world to treat various diseases due to its variety of phytochemical constituents. Ideally, topical therapy is the first line treatment for many skin diseases. Among the various topical formulations, gels have been considered as a potential vehicle due to its non-sticky nature, stable and greater aesthetic value. The objective of this proposed study was to develop a polyherbal topical gel formulation containing *Citrus limon*, *Aloe barbadensis*, *Curcuma longa* is used to treat acne asa safe, effective and an alternative therapy to the current conventional harmful antibiotics. Medicinal plants used for this study are selected based on their antibacterial activity. Extracts of the selected plants were combined into a gel base and evaluated for its physicochemical properties such as pH, viscosity, spreadability. The physicochemical evaluation of the developed formulation showed no lumps, had uniform colour dispersion and from any fiber and particle. It was also observed to have easy washability, good spreadability and pH was found to be 6.94, similar to pH of the skin. The study results concluded that the Lemone peel extract, Aloevera extract, and Turmeric extract is an aqueous gel base system is an appropriate formulation for the topical therapy of glowing skin, acne and moisturize the skin.

KEYWORDS: Aloevera, Lemon, Turmeric, Antibacterial, Antiacne.

INTRODUCTION

In human being, skin is the most susceptible part for entering of various pathogens, microorganisms and spreading of diseases. In general acne vulgaris originates at puberty stage due to hormonal changes which ultimately results in changes in pathophysiologic factors1-3. Microorganisms such as *staphylococcus*, and *Escherichia* species are responsible

for the formation of acne. *Staphylococcus* is an abundant organism responsible for localizing cutaneous infections and colonizes in the skin.[1,8]

During the puberty stage, sebum is secreted in higher amount from the sebaceous glands due to increased productions of androgen. Sebum is a lipid rich secretion which act as a media for growing for acne causing bacteria. The severity for acne formation is depends upon the sebum production. Acne is the 8th most prevalent disease worldwide and the prevalence of acne is about 9.4%. Globally, the epidemiology of the acne were found to be around 85% of adults in the age between 12 and 25 years old, 8% of adults is the age between 25 and 34 years, 3% of adults in the age between 35 and 44 years old and 42.5% of men and 50.9% of women are getting affected in their twenties. Acne is treated by antibiotics either oral or topical application, hormonal therapies, corticosteroids or surgery. Prolong use of antibiotics may leads to develop antibiotic resistance and various side effects such as erythema, photosensitivity, allergic dermatitis, excessive skin irritation, urinary problem, joint an muscle pain, headache, depression etc.[5,6]

Due to the increasing frequency of intake of antibiotics, expensiveness and its side effects, there is a need to focus on the scientific exploration of herbal drugs. According to World Health Organization [WHO] estimate, nearly 75-80% of the world population still uses herbs and other traditional medicines for their primary health care needs9. India has about 45,000 plant species among which, medicinal property has been attributed to several thousands.

India is a hub for medicinal plants, about 15% out of the 20,000 medicinal plant of the world is found growing wild in different climatic conditionsn10. There is a need for continuous search of indigenous drugs which can provide cheaper and better therapeutic efficacy. Literatures have proven that plants of varying potency when combined theoretically might produce the synergistic therapeutic effect. The reason for the synergistic effect of the polyherbal formulation might be due to the potentiating effects of other plants active constituent's leads to require lower dose to produce the desired therapeutic effect which can improve patient's. Plant such as *Citrus limon, Curcuma longa* and *Aloe barbadensis* possess many potential therapeutic activities due to individually presence of rich phytoconstituents.

The ripen pericarp of *Citrus limon* is reported to have several bioactive compounds including geranial, Beta linalool, D- limonene, Beta myrcene, Diethyl phthalate which are mostly used in brighten the skin, removing tan layer and provide fairness. This essential oil also used to

treat erythema, papules, and vesicles upon the skin. Rhizomes of *Curcuma longa* (Zingiberaceae) have more potent superoxide anion, hydroxyl radical, singlet oxygen, peroxynitrite and nitric oxide which show anti-inflammatory, antioxidant property and therefore used in various skin infection. Leaves of *aloe barbadensis* (Liliaceae) is reported to have Bradykinase helps to reduce excessive inflammation when applied to the skin topically and Aloin and emodin act as analgesics, antibacterial.[8,9]

Advantages

1. It helps moisturize the skin.
2. It reduce infection and acne.
3. It helps healing of wound.

Biological sources of medicinal plants

1) Aloe vera

Biological sources: It is obtain from the dried juice of the leaves of aloe barbadensis belonging to family liliaceae.

Figure No. 1: Aloe vera.

2) Turmeric

Biological sources: It is obtain from dried from dried rhizome of Circuma longa belonging to family Zingiberaceae.

Figure No. 2 Turmeric.

3) Lemon

Biological sources:- Lemon peel is obtained from the fresh ripe fruits of Citrus limon belonging to family Rutaceae.

Figure No. 3: Lemon.

❖ **AIM AND OBJECTIVE**

➢ **AIM:** Formulation and evaluation Polyherbal Face Gel.

➢ **OBJECTIVES**

- To formulate herbal face gel for improvement beauty of face.
- To moisturize the skin and give clarity and improve texture to the skin.
- To evaluate herbal face gel for various parameter.

MATERIALS AND METHODS PREPARATIONS

MATERIALS

Collection of the instance such as Ripen pericarp of fruits Citrus limon (Rutaceae), leaves of Aloe barbadensis (Liliaceae) and Rhizomes of Curcuma longa (Zingiberaceae). The specimens for the proposed study were collected and authenticated.[10]

1] Extraction of the pericarp of fruits Citrus Limon (Lemon peel)

Citrus Limon peels were collected from an lemon peel manufacturer. The peels were then washed and fully dried in an oven at 60^{o}c for 72 hrs. Using Mortar and Pestle the dried peels were powdered with particle size ranging of 0.5 mm to 0.1 mm and socked in methanol with mass to volume ratio 1:25(g/mL) for 72 hrs. It was then filtered through Whatman No.1 filter paper and collected into glass Petri plates. This complete process of extraction and purification was repeated two-three times followed by evaporation of the collected extracts and dry at 37^{o}c.[6,7]

Figure No. 4: Extract of the pericarp fruits Citrus Limon (lemon peel).

2] Extraction of leaves of Aloe barbadensis (aloe vera)

Aloe vera leaves collected from the local nursery. The leaves washed with water and rinds were removed. The inner gel scrapped and cut into pieces, solar - dried at 30 - 40^{o}c for 3 weeks and dry gel particles were collected.[2,3]

Figure No. 5: Extract of leaves of Aloe barbadensis (Aloe vera).

3] Extraction of Curcuma longa (Turmeric extract)

Take 20 gm of *Curcuma longa* powder was mixed with a sufficient amount of n-Hexane and kept aside for 2 hrs. Then the solution was filtered and then precipitated powder was mixed within acetone for 10- 15 minutes. The solution was filtered again and the filtrate was dried in air, the extracted curcumin was isolated bya scrapping using a spatula.[7,4]

Figure No. 6: Extraction of Curcuma longa (Turmeric extract).

4] Antibacterial Activity

- **Prepared of inoculum**

Uniform suspension of microorganism is obtained by suspending 24 hrs. fresh culture of bacteria (*S. aureus and S. epidermis)* in several 15mL of the sterile water.[1,3]

➢ **Determination of the zone of inhibition**

Agar well diffusion method was used to determined the antibacterial activity of the prepared extract. Transferred 20 mL of liquefied agar medium previously inoculated with 0.1 mL bacteria into the sterile petri dish having an internal diameter of 8.5 cm and allowed to form the uniform thickness of the medium in the petri dish, after complete solidification of the liquefied inoculated medium, the wells were made aseptically with cork borer having 6mm diameter. 100 mg/mL of each extract was carefully added into the well and the plates were kept for 30 min. for pre-diffusion of the extracts. After pre-diffusion, the Petri plates were incubated at 37^{o}c for 24 hrs. in the incubator and measured the zone of inhibition for its antibacterial activity.[3,4]

➢ **Method of Preparation of Gel Containing Extract**

The topical gels were prepared which comprised extract of orange peel, aloe-vera, and turmeric with a different concentration. The gels were prepared by using Carbapol 940, propylene glycol-400, ethanol, methyl paraben, propyl paraben, EDTA, tri ethanolamine and required amount of water in a sufficient quantity to prepare 50 g of gel. Water required for these formulations was divided into two parts. In one part, an accurate amount of extracts were separately dissolved in 15 mL of water and to this calculated quantity of propylene glycol-400 and ethanol were added.8 In another part, Carbapol-940 was dissolved in 35 mL and to this solution methyl paraben, propyl paraben, EDTA (Ethylenediaminetetraacetic acid) were added. (15) Both of these solutions were mixed in a beaker and triethanolamine was added dropwise to the formulation for adjustment of required skin pH (6.8- 7) and to obtain the gel with required consistency. It was then stirred by using propeller for 2 hrs. at 500 rpm. After stirring, the prepared gel appeared to be homogeneous and devoid of any bubbles. The prepared gel was kept at room temperature gor 24 hrs.[2,4]

Table 1: Formulation of polyherbal gel with different concentration of herbal extract.

Step-1.

Sr No.	Ingredient	F1	F2	F3	F4
1	Lemon peel extract	0.1%	0.2%	0.3%	0.5%
2	Aloe Vera extract	0.5%	1.5%	2.0%	2.5%
3	Turmeric extract	0.6%	0.9%	1.2%	1.5%
4	Propylene glycol-400	4%	4%	4%	4%
5	Ethanol	3%	3%	3%	3%
6	Water	15 ml	15 ml	15 ml	15 ml

Step 2.

Sr. No	Ingredients	F1	F2	F3	F4
1	Carbapol-940	1%	1%	1%	1%
2	Water	35ml	35ml	35ml	35ml
3	Methylparaben	0.2%	0.2%	0.2%	0.2%
4	Propylparaben	0.02%	0.02%	0.02%	0.02%
5	Ethylenediamine (EDTA)	0.03%	0.03%	0.03%	0.03%
6	Triethanolamine	0.025%	0.025%	0.025%	0.025%

❖ METHODS OF EVALUATION

Physicochemical evaluation of formulations

Physical evaluation

Physical parameter such as colour, homogeneity, phase separation and uniformity were checked visually.

PH

the aqueous solution (1%) of the formulation was measured by using a calibrated digital pH meter at a constant temperature.

Rheological study

By using Brookfield viscometer, the viscosity of the formulated batches was determined. In a procedure, a definite quantity of gel was added to a beaker covered with a thermostatic jacket. The gel was rotated at 100 rpm with spindle 7.17.[9]

Figure No. 7: Brookfield viscometer.

Spreadability

Two sets of a glass slide with standard dimension were taken. Polyherbal formulation gel was placed in between the two slides and sandwiched about the length of 60mm. Removed the adhered excess gel on the surface of the glass slides and fixed to a stand without any disturbance. In the upper slide, 20g weight was tied and noted the time taken for movement of the upper slide to the distance of 60 mm under the influence of weight. 18 Meantime was calculated by repeating the experiment three times and the spreadability was calculated using the following equation.

1. Spreadability = (Weight x Length) / Time.[7]

Antibacterial activity studies

Transferred 20 mL of liquefied agar medium previously inoculated with 0.1 mL bacteria into the sterile petri dish having an internal diameter of 8.5 cm and allowed to form the uniform thickness of the medium in the petri dish. After complete solidification of the liquefied inoculated medium, the wells were made aseptically with cork borer having 6 mm diameter. 500 mg concentrations of polyherbal gel were weighed and diluted with 2 mL of sterile water in sterile test tubes. The drug solution was carefully transferred into the cup and incubated at 37^{o}c for 24 hrs. And the zones of inhibition were measured.[5,8]

❖ RESULT AND DICUSSION

In general, oral or topical antibiotic formulation is used for the treatment of skin diseases. Traditional medicinal and aromatic plants are interesting and explore its various bioactive natural organic compounds for various treatments. In the last two decades, more research has been carried out towards the identification of the bioactive compound from medicinal plants and developing into drug for the various treatments.

Antibacterial activity

The antibacterial activity study results showed that all the selected herbal plants showed antibacterial activity against acne causing bacteria staphylococcus aureus and staphylococcus epidermis. The antibacterial activity study.

Physicochemical evaluation of Gel formulation

Physicochemical parameter like colour homogencity, presence of fiber and particles, washability, pH and viscosity are evaluated. The visual inspection of the prepared formulation indicated no lumps and to have uniform colour dispersion, free from any fiber

and particles, easy washable, pH was found to be 6.94, its is near to the skin pH which indicates that the prepared formulation can be compatible with skin and viscosity was found to be 6506 cps.

Spreadability

Rheological property of the semisolid formulations gel can be assessed by spreadability. Spreadability test is a qualitative test is a qualitative tool to evaluate physical state as well as the bioavailability of the formulation. The spreadabilty value was found to be 7.1 +0.1 or 7.1-0.1 (gm. cm/sec) which indicates the better spreadability of the formulation.

Antibacterial activity of the formulations

The antibacterial activity studies were performed by well diffusion method by measuring the zone of inhibition (in mm). The study results of the polyherbal gel showed antibacterial activity in a dose dependent manner against the bacteria's causing acne. The antibacterial activity study of the formulation is shown in figure 8.

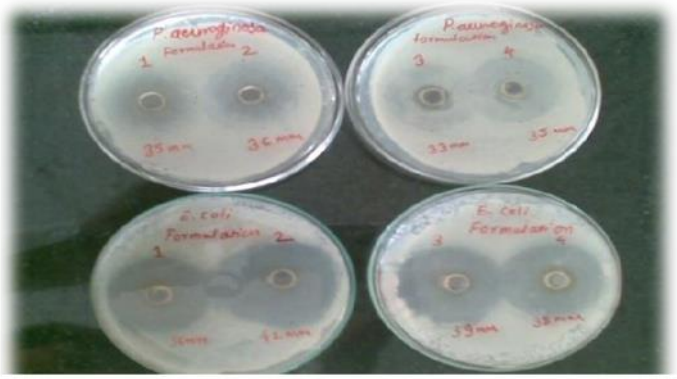

Figure No. 8: Zone of inhibition study of polyherbal gel formulation.

On storage of anti-acne polyherbal gel sample at 40+2 or 40-2 C at 72+5 % or 72-5% RH respectively, the appearance of the formulations was found to be formulations F2 be clear with no significance variation in pH, spreading coefficient and viscosity.

Table 2: Observation table.

Sr. No.	Parameters	Result
1	Appearance	Clear
2	Colour	Yellow
3	pH	6.2-0.4
4	Viscosity	6023cps

❖ SUMMARY AND CONCLUSION

The objective of this proposed study was to develop a polyherbal topical gel formulation containing Citrus Limon, Aloe Barbadensis and Curcuma Longa treat acne as a safe, effective and an alternative therapy to the current conventional harmful antibiotics.

Medicinal plants used for this study are selected based on antibacterial activity. In human being, skin is the most prone part for entering of various pathogens, microorganisms and spreading of diseases. In general, acne vulgaris originates at puberty stage due to hormonal changes which ultimately results in change in pathophysiologic factors.

Recently herbal medicines are more considered as safe with fewer side effects than synthetic drug for the treatments of acne vulgaris. Therefore in the global market. Natural remedies including herbal formulation are in great demand. It is a very good attempt to formulate and evaluate the polyherbal anti-acne gel along with the stability studies. Based on this studies polyherbal anti-acne gel prepared from the extract of citrus limon, Aloe barbadensis and Curcuma longa showed significant anti bacterial activity on Staphylococcus aureus and Staphylococcus epidermis with no irritation. The polyherbal gel showed a synergitics effect as compared to individual extract with good stability. Thus the study result concludes that the formulated polyherbal gel with extract of Citrus limon, Aloe babradensis and Curcuma longa with concentrations 0.2 %, 1% and 0.8% respectively can be used for the treatment of acne vulgaris.

❖ REFERENCES

1. Ajinkya mate, Padmashree Ade, Formulation and Evaluation of polyherbal gel for management of Acne, 2021; vol 13.
2. Salthivel Lakshmana Prabhu, Formulation and Evaluation of Polyherbal Gel Containing Natural Antimicrobials For the Management of Acne Vulgaris, 2017; 8(5).
3. Suva MA, Patel AM, Sharma N.A Brief Review on acne Vulgaris: Pathogenesis, Diagnosis and Tratment. Res Rev J Pharmacol., 2016; (1): 1-12. 2. Prabu SL, Umamaheshwari A, Kumar CA, Banumuthupriya M, Dhanasekaran D. Formulation and Evaluation of Polyherbal Gel Containing Natural Antimicrobials for the Management of Acne Vulgaris. Int Res J Pharm., 2017; 8(5): 65-69.
4. Prasad SB. Acne vulgaris: A review on pathophysiology and treatment. Asian J Pharm Clin Res., 2016; 9(4): 54-59.

5. Sinha P, Srivastava S, Mishra N, Yadav NP, New Perspectives on Anti-acne Plant Drugs: Contribution to Modern Therapeutics. Biomed Res Int., 2014; 301304.
6. Mishra BP, A quest of Anti- acne Potential of Herbal Medicines for extermination of MDR Staphylococcus aureus. Int J Pharm Sci Invent, 2014; 3(6): 12-17.
7. EI-Ishaq A. Extraction of limonene from orange peel. Nutr Heavy Met., 2015; 1-15.
8. Gotmare S. Orange Peel: A Potential Source of Phytochemical Compounds. Int J ChemTech Res., 2018; 7(3): 231.
9. Arunkumar S, Muthuselvam M. Analysis of phytochemical constituents and antimicrobial activities of Aloe vera L. against clinical pathogens. World J Agric Sci., 2009; 5(5): 572-576.
10. Rani. RHP shetty; M. Phytochemical analysis of methanolic extract of Curcuma longa Linn Rhizome. Int J Univers Phar bio Sci., 2013; 2(2): 285-297.