

Development and Formulation of Anti-Acne Gel from Hibiscus Rosa-Sinensis

Riddhi Nandanwar and Dr. Nandu Kayande

Thakur Shivkumar Singh Memorial Pharmacy College, Burhanpur, MP, India

Abstract: *Objective: Hibiscus contains acids that act as chemical exfoliators and help to clear the clogged skin pores. It also has antibacterial properties that work to fight acne-causing bacteria on the skin. Thus, it prevents the formation of pimples. Acne, one among the very fashionable socially distressing skin conditions created by Propionibacterium acne have generally been treated by antibiotics. Within the light of the growing threat of antibiotic resistance, natural plant products are applied as a safer alternative. Keeping the very fact in the background, during this research work, the formulation of gel from the extracts of Hibiscus rosa sinensis flower are prepared and evaluated as an anti-acne drug.*

Methods: The fresh flower extracts were subjected to phytochemical screening. Gel formulation of the extracts was developed and evaluated. The manufactured formulations were subjected to In vitro antibacterial activity against P. acnes, S. epidermidis and S. aureus. Gel formulations containing the flower extract were prepared based on a HPMC gel.

Keywords: Anti-Acne, Herbal, Hibiscus rosa sinensis, Anti-oxidant, Anti-bacterium, Anti-inflammatory, P. acne, HPMC.

I. INTRODUCTION

Hibiscus, commonly called Roselle, belongs to the family Malvaceae. Hibiscus has over 300 species of flowering plants, and one of them is Hibiscus sabdariffa Linne. It is considered a multipurpose plant that may have various health benefits. Hibiscus is a perennial flowering plant grown throughout the seasons. The shrub originated in Africa and is planted worldwide in tropical and subtropical regions of India, China, Sudan, Malaysia, Taiwan and many other countries. Hibiscus is cultivated for flowers, leaves, stems, seeds and roots. Hibiscus flowers and seed oils are widely used in food, cosmetic, and pharmaceutical formulations. Hibiscus has medicinal value, which has been referenced in Ayurveda and the Chinese medicine system. It is commonly called Lalambari or Gudhal in Hindi and Jaswandh in Marathi. Hibiscus rosa-sinensis is a bushy, evergreen shrub or small tree growing 2.5–5 m (8–16 ft) tall and 1.5–3 m (5–10 ft) wide, with glossy leaves and solitary (axillary), symmetrical, typically red flowers in summer and autumn. The five-petaled flowers are 10 cm (4 in) in diameter, with prominent orange-tipped red anthers. Cultivars and hybrids have flowers in a variety of colors as well as red: white, pink, orange, peach, yellow, blue, and purple. Some plants have double flowers.

1.1 China Rose

At the bottom of every hibiscus bud is the calyx, which is green in color. The pointed ends of the calyx are called the sepals. When the hibiscus begins to bloom, the flower's petals begin to grow. Each hibiscus flower has both male and female parts. The ovary and other female parts of the flower lie in the main structure of the hibiscus: the pistil, which is long and tubular. The five "hairy" spots at the top of the pistil make up the stigma, which is where pollen is collected. In the middle of the pistil is the style, which is the tube down which pollen travels to the ovary. The ovary lies at the bottom of the blossom, and each hibiscus has only one superior ovary. The male part of the flower, called the stamen, consists of stem-like filaments and anthers. Each filament ends with the pollen-producing anther. The hibiscus plant has a branched taproot. The plant's stem is aerial, erect, green, cylindrical, and branched. The leaf is simple and petiolate, with alternate phyllotaxy. The leaf shape is ovate, the tip is acute, and the margin is serrated. Venation is unicostate reticulate, meaning the leaves' veins are branched or divergent. Free lateral stipules are present.

1.2 ACNE

Acne vulgaris, known as acne, is a common chronic disease caused by abnormal sebaceous production within skin follicles. This disease often affects self confidence. The pathological feature of acne starts when abnormal sebaceous therapeutics for acne treatment, they have a lot of side effects caused by chemical ingredients in the cosmetic products, which frequently result in skin irritation and bacterial resistance problems. Recently, many reports have demonstrated that natural active compounds such as proteins or peptides derived from plants and animals display anti-acne properties with low toxicity to humans. Hence, many efforts have been made to use these compounds in the context of supplementary cosmetic products.

[9] Tropical regions, particularly Southeast Asia, are a rich source of biodiversity, especially with high varieties of medicinal plant and animal extracts. One medicinal derivative from animals is crocodile blood, a rich source of active proteins or peptides that demonstrate various biological properties. Previous reports have shown that crocodile blood components, such as the serum of the American alligator exhibit antibacterial activity against *Escherichia coli*, and is anti- virus in addition, our reports demonstrate that Siamese crocodile blood had antibacterial activity, especially crocodile leukocytes. There are peptides that have been discovered from Siamese crocodile leukocyte extracts, these peptides exhibit broad- spectrum antimicrobial activity. Moreover, crude crocodile leukocyte extract contains several biological properties, such as antioxidant activity and anti-inflammatory activity. Crocodile leukocyte extract is believed to represent a source of biologically active peptides, which may be suitable for developing a crocodile leukocyte-based cosmetics product as an anti-acne gel. Thus, in this study, the feasibility of preparing crocodile leukocyte extract anti-acne skin-care gel products assessed.

II. MATERIAL AND METHODS

- **Collection of Plant Material:** The Plant *Hibiscus rosa-sinensis* is collected from medicinal garden of Thakur Shivkumarsingh Memorial Pharmacy College. Methyl paraben, propyl glycol, and propyl paraben were procured from Thakur Shivkumarsingh Memorial Pharmacy College Burhanpur.
- **Method :** Drying pf *Hibiscus rosa-sinensis* flower (petals) – Drying is a simultaneous heat and mass transfer process which involves removal of water from a solid. Hibiscus flower dried by hot air-oven at 60OC after being frozen.
- **Powered making** – After drying process, the hibiscus flower (petals) are finely ground in a motor pestle.
- **Extraction:** Dried powder of flower was extracted by continuous hot extraction (maceration) method using methanol (95%). The extract obtained was concentrated and then subjected to phytochemical screening. 100g methanolic extract was refluxed with 100 ml 5% HCl solution for 1 hour. The chemical constituents were later separated in semisolid form.

Table 1. Phytochemical screening of methanolic extract of flower

Phytochemical	Test
Alkaloids	Mayer test
Glycoside	Keller test
Flavonoids	Shinoda's test
Proteins And amino acid	Biuret test
Carbohydrates	Benedicts test
Tannin	Ferric Chloride test
Saponins	Frothing test

Formulation of Gels:

Method of preparation: Required quantity of HPMC (Hydroxypropyl Methyl Cellulose) was soaked in some amount of distilled water for 2 to 3 hrs. (Phase I). Required quantity of Flower Extract was dissolved in the small amount of Propylene glycol propyl paraben and methyl paraben were later added (Phase II). Phase I and II were mixed and adjusted to a pH of 6.8-7.4 with drop wise addition of triethanolamine. The remaining quantity of distilled water was then added to make up the final 100gm weight. Stir the formulation with mechanical stirrer to homogenize the formulation.

Table 2. Formulation of gel

Ingredients	Formulation of gel		
	F1	F2	F3
Hibiscus rosa-sinensis extract	0.02%	0.05%	0.1%
HPMC	0.9%	0.9%	0.9%
Propylene glycol	20%	20%	20%
Propyl; paraben	0.08%	0.08%	0.08%
Methyl paraben	0.2%	0.2%	0.2%
Triethanolamine	q.s	q.s	q.s
Water	q.s	q.s	q.s

Evaluation of Hibiscus Rosa-Sinensis Extract Gel Formulation

The following parameters were evaluated from formulation:

Physical Appearance:

- **Color:** The color of the formulation was checked out against a White background.
- **Consistency:** The consistency was checked by applying on skin.
- **Odour:** The odour of the gels was checked by mixing the gel in water and taking the smell.
- **DETERMINATION OF PH:** The pH of various gel formulations was determined by using digital pH paper. The measurement of pH of each formulation was done and average values are calculated.
- **DETERMINATION OF VISCOSITY:** The measurement of viscosity of the prepared gel was done with a Brookfield Viscometer. The gels were rotated at 0.3, 0.6 and 1.5 rotations per minute. At each speed, the corresponding dial reading was noted.
- **DETERMINATION OF SPREADABILITY :** One of the criteria for a gel to meet the ideal quantities is that it should possess good spreadability. It is the term expressed to denote the extent of area to which gel readily spreads on application to skin or affected part. The therapeutic efficacy of a formulation also depends upon its spreading value. Spreadability is expressed in terms of time in seconds taken by two slides to slip off from gel and placed in between the slides under the direction of certain load. Lesser the time taken for separation of two slides, better the spreadability. Spreadability was calculated by using the following the formula:

$$S = (M \times L) T$$

Where, S = Spreadability
M = Weight in the pan (tied to the upper slide) L = Length of the glass slide
T = Time (in sec) taken to separate the slides.
- **DETERMINATION OF ANTIMICROBIAL ACTIVITY:** The culture of above bacteria's was standardized by spectrophotometric method using Mc Farland turbidity standard. The test organism used was grown on the plates of specified medium for specified time. The

inoculum suspension was prepared by picking 5 colonies of at least 1 mm diameter and suspending the material in 5 ml sterile 0.85% sodium chloride to match that 0.5 McFarland turbidity standard. This produced a cell suspension containing 1×10^6 to 5×10^6 cells per ml, which was diluted in the ratio 1:100 with the desired test medium to provide starting inoculums of 1×10^4 to 1×10^4 cells per ml.

III. RESULTS

- **FORMULATION OF ANTI-ACNE GEL:** Anti-Acne gel was successfully formulated by using natural active ingredient like Hibiscus rosa-sinensis flower Extract used Against Acne for face with anti-inflammatory, anti-oxidant properties and were used for further evaluation. Various evaluation parameters are done and their results has given.

Phytochemical Screening Of Hibiscus-Rosa-Sinensis Extract :

Table 3: Table Showing Phytochemical Present in Hibiscus rosa-sinensis (Flower)

Phytochemical	Name of Test	Methanolic flower extract of Hibiscus rosa sinensis
Alkaloids	Mayer's test	+
Glycoside	Keller Kilani test	-
Flavonoids	Shinoda's test	-
Proteins and amino acids	Biuret test	+
Carbohydrates	Benedicts test	+
Tannin & Phenol	Ferric chloride test	-
Saponins	Frothing test	+

Evaluated Of Anti-Acne Gel :

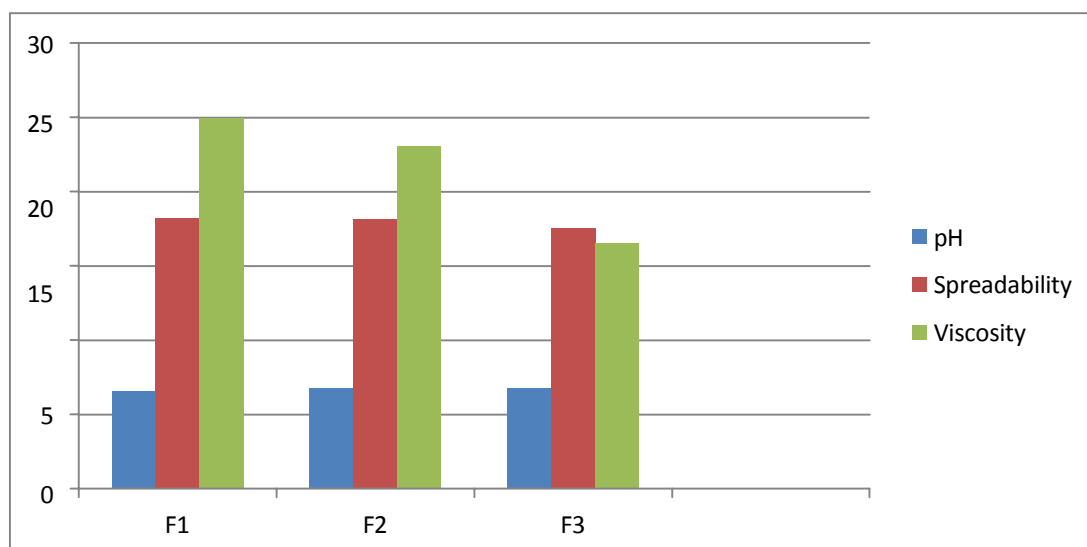
Table 4. Physicochemical characteristics of Anti-Acne gel

S.No	Parameters	Anti-Acne gel Procured
1	Color	Orange-yellow
2	Odour	Aromatic
3	Acid value	3.66
4	Solubility	Freely soluble

Table 5. Characteristics of gel formulation

Formulation	color	Appearance	pH	Spreadability	Viscosity	Homogeneity
F1	Orange-yellow	Translucent	6.6	18.20	24.937	Good
F2	Orange-yellow	Translucent	6.7	18.14	23.062	Good
F3	Orange-yellow	Translucent	6.7	17.49	16.500	Good

Table 6. Formulation of Anti-Acne gel chart



IV. DISCUSSION AND CONCLUSION

Hibiscus rosa-sinensis seem to have inhibitory effects on the growth of bacteria, fungi and virus in vitro. However, there are a few clinical evidences about the effectiveness and safety of these plant in the treatment of ace and other skin infections. Also a gel formulation F3 with 0.1% flower extract was found to be effective against P. acne. The gel formulations also complied with standards of various pharmaceutical parameters. Thus the present research work suggests that Hibiscus gel formulation holds a tremendous potential against acne and can prove to be a safe and efficacious remedy for treating this dermatological disorder. However an elaborate protocol for the clinical trials is needed to be designed and implemented to check the anti-acne activity on human volunteers. In the research project before formulate the Anti-Acne gel various identification test are to be done successfully, phytochemical screening study of Alkaloids, Glycoside, Flavonoids, Proteins and amino acids, Carbohydrates, Tannin, Saponins test are perform of hibiscus extract. In Anti-Acne gel alkaloids should be present in gel to settle down acne on face, so In my gel formulation Proteins, Carbohydrates, Saponins, alkaloids is present. In my Anti Acne gel formulation Chemical constituents is present.

REFERENCES

- [1]. Ehrhardt Praoksch, johanna M. Brandner, jens-michael Jensen, "The skin : an indispensable barrier" ISSN 12, Vol.17, page 1063-1072, December (2008).
- [2]. Ron.Carter, Cambridge words "Herbs" Cambridge Advanced Learner's Dictionary & Thesaurus combridge University press". (24 October 2022).
- [3]. Arber, Agnes, 1986Herbals. Their Origin & Evolution, a chapterin the History of botany 1470-1670,Cambridge ISBN 0-521-33879-4,(1912).
- [4]. Aderson Frank J. "An llustrated HUistory of the Herbals" ISBN 0-231,040024.
- [5]. Andrews, Theodara , "A Biblography on Herbs, Herbs medicine, "Natural Foods & Unconventional Medical Treatment Littleton, colorade : Librarial unlimited, ISBN 0- 87287-288-2.
- [6]. "Hibiscus rosa-sinensis Germplasm Resources information Network", Agriculture Resource services,(2 August 2014).
- [7]. "RHS Plant Selector Hibiscus rosa-sinensis cooper" Royal Horticultural society (23 august 2020).
- [8]. "Genus: Hibiscus" Gerplasm Resources information network, united state Department of Agricultural,(30 October 2020).
- [9]. RHS A-Z encyclopedia of garde plant United Kingdom. Darling Kindersely p.1136, ISBN 978-1405332965 (2008).