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# Formulation and Evaluation of Herbal Gel

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**Abstract:** *The objective of the study was to develop a topical poly herbal gel for the treatment of mild acne vulgaris. Aqueous extracts of Garcinia mangostana and Aloe vera were formulated in an aqueous based carbopol-934(1%w/w) gel system. Preformulation studies on solubility, partition co-efficient, MIC, MBC were determined along with compatibility studies using a validated HPLC method. Six formulations of the gel were prepared by varying the proportions of polymers and evaluated for their physicochemical properties like pH, spreadability, viscosity and microbial assay. Based on these tests, formulation F-6 containing 1% carbopol-934 was selected as best formulation and carried over to in-vitro drug diffusion studies wherein it showed Cumulative Drug Release of 81.03% at the end of 8 hours with a flux of 0.0879 mg/cm2/hr.The microbial assay of all the formulations demonstrated better inhibitory activity against Propionibacterium acne and Staphylococcus epidermidis compared to the marketed clindamycin phosphate gel in equivalent amounts of application.*

*The preliminary in vitro antimicrobial activity of the extracts at various concentrations and those of their creams were determined against some microorganisms using the agar cup plate method. The growth inhibition zones of the extracts on the microorganisms were noted. The minimum inhibitory concentration (MIC) was also determined by agar dilution method. The physical properties of the creams formulated with these extracts were evaluated using standard procedures.*

*Acne a common skin disease in adolescence is a bacterial skin disorder found in many teenagers. Herbal remedies are used in ancient system of medicine they have natural healing properties, they are used in various acute and chronic skin diseases, which include eczema, contact dermatitis, psoriasis, leprosy, and other major skin diseases.*

**Keywords**: Polyherbal Gel, Anti-acne formulation, Acne vulgaris, Citrus sinensis, Curcuma longa

## I. INTRODUCTION

Aloe vera is known as a miracle plant. The most known species of Aloe vera which is grown worldwide is Aloe barbadensis Miller.Garcinia mangostana is a proven herbal extract possessing,anti-Bacterial,anti-inflammatory, antioxidant and antiallergenic properties.

The rate of skin infections due to bacterial and fungal organisms is on the increase. This has become a significant health problem in many underdeveloped and developing countries and is particularly predominant in overpopulated areas with high humidity and poor hygienic conditions.

It is formulated in such a way that gel can act as a coupling time travelling through air, so the gel prevents any extra air space between the probe and human skin in order to create a clear image of the fetusagent and reduce static. The ultrasound waves have a hard.

***Definition* :-** Gels are a attractive drug delivery system that can be use adminiter medication through various routes like skin, oral, nasal, and ocular. gel are semi-solid system made of a gelling agent that increases the viscosity of a liquid without modifying other properties.

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The current study makes reference to a few plant species whose extracts have been scrutinised. The scientific studies aiming at the development, evaluation and application of phytosomes of extracts in face serum formulations and that simultaneously meet consumer concerns are a challenge.

*Appication gel formulation :*

- Pharmaceutical: used for pain managment ,(e.g.,diclofenac sodiaum gel).
- cosmatics: provide a plumping and hydrating effect on the skin.
- other: the can also be used in oral, vaginal, and rectal administration.

***Plant and Extraction Process***

1)

**Alove vera :**

*Synonyms* :

Indian aloe,True aloe,Medicinal aloe,Chinese aloe,Ghritkumari (in Ayurveda)

*Biological Source* :

Biological Name: Aloe barbadensis Miller.

Plant Type: A succulent perennial with green, water-storing leaves.

Part Used: The dried latex from the leaves of various species of Aloe

*Uses* :

Topical (Skin):Treats burns, wounds, and sunburnSoothes skin irritation, rashes, and inflammationHelps with conditions like psoriasis, rosacea, and eczemaUsed in lotions, soaps, and cosmetics for dry skin and anti-aging propertiesAids in the healing of insect bites and sores.

Internal (Ingested):Acts as a laxative to relieve constipation (from the latex)Used in certain beverages and dessertsPotential for managing blood sugar levels.

Other:Contains antioxidant and antibacterial propertiesUsed to treat inflammatory processes in the mouthCan aid in digestion and improve bowel movementMay support wound healing by stimulating cell regeneration and collagen synthesis.

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**Alove Vera Extract :**

The aloe vera extraction process involves harvesting, washing, and filleting the leaves to separate the inner gel from the outer rind and yellow latex. The gel is then typically processed by grinding and filtering, often using a centrifuge, to remove solid plant matter and purify the final product. For commercial or specific applications, the extracted gel may undergo further steps like pasteurization, decolorization, or stabilization to increase shelf life and enhance properties.

2)

**Termaric :**

*Synonyms :*

Haldi (Hindi),Indian saffron,Curcuma,Curcuma domestica,Curcumin (referring to its active compound),Haridra (Sanskrit).

*Biological source :*

Plant: Curcuma longa L. (syn. C. domestica Valeton).

Family:

Zingiberaceae (ginger family).

*Uses :*

Culinary: Used as a flavoring and coloring agent in food.

Medicinal:Anti-inflammatory: Used to treat inflammatory conditions.

Antioxidant: Fights free radicals in the body.

Antimicrobial: Has antibacterial, antifungal, and antiviral properties.

Digestive: Used as a digestive aid and to treat conditions like diarrhea.

Wound healing: Applied externally for bruises and pains.

Other therapeutic uses:To lower cholesterolFor skin conditions like psoriasisTo support liver healthIn the treatment of respiratory diseases

Cosmetic: Used in cosmetics.

Religious and cultural: Used in various rituals and traditions.

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**Termaric Extract :**

Turmeric extraction involves grinding dried turmeric root into powder and using a solvent like acetone or ethanol to dissolve the compounds, particularly curcumin. Common methods include solvent extraction, which can be done using a Soxhlet apparatus or steam distillation, while more advanced techniques use supercritical CO2 or microwaves for faster, more efficient results. The solvent is then removed, often with a rotary evaporator, to yield a concentrated extract.

***Materials and method***

***Materials/Requirement:-***

*Apparatus:-*

Beaker
Measuring cylinder
Glass rod
Tripod stand
Funnel
Dropper.

*Chemicals:-*

Alove vera extract
Turmeric extract
Carbapol
PEG
Glycerin
Calcium aceated
Trimethanolamine
Methyl paraben
Propyl paraben
Purified water.

***Method/Procedures:-***

Preparation of gel accurately weighed quality of gelling agent.
Dissolved in water and then trimetholamine was added drop by drop.
Triethanolamine was added slowly to dipersion with contious strring.
Measured quality of aqueous extract alove vera and turmeric and mixed.
Contious string 30 mins. Then glycerine was add moistring agent.
Propyl paraben and methyl paraben were added required quantities dissolved in water.
Contious strring until homogenous was formed semi-solid was obtained.
Then to filter the moisture of gel formed.

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***Calculation Table***

1 Carbapol-940 :- 1.
2 Water 35mL.
3 Methylparaben 0.2%.
4 Propylparaben 0.02%.
5 EDTA (Ethylenedi-amine tetraacetic acid)0.03%.
6 Triethanolamine 0.025%.

***Evaluation of parameter Prepared Gel***

The following parameters were used to evaluate the formulated gel:

**3.1. Visual Clarity and Appearance**

Prepared gel formulation was inspected visually for its clarity, appearance, colour, and consistency against a black and white background [15-16].

**3.2. Transparency**

Approximately 5 mL of formulated gel was taken in the 10 mL test tube and its transparency was checked visually.

**3.3. Homogeneity**

The formulation was tested for the homogeneity by visualappearance and by touch.

**3.4. pH**

The pH meter was calibrated using standard buffer solution. About 0.5 g of the gel was weighed and dissolved in 50.0 mL of distilled water and its pH was measured.

**3.5. Thermal Stability**

With the help of a spatula, the gel was inserted into a glass bottle and tapped to settle at the bottom. Two-third of the bottle was filled up and plug was inserted into it and then the cap was tightened. This filled bottle was kept erect inside the incubator at 45°C for 48 hours [17].

**3.6. Removal**

The ease of removal of the gel applied was examined by rubbing the applied part with tissue paper.

**3.7. Non-Volatile Matter**

Approximately 1-5 gm of the prepared gel was weighed in a tred evaporating dish and heated on a steam-bath until most of the volatile matter had escaped. Heating was continued at 105°C in an oven for 2 hours. Then it was cooled in a desiccator and the weight was taken. The procedure of heating, cooling and weighing were repeated until the difference in mass between two successive weights did not exceed 1 mg.

The formula for calculation is

Non-Volatile Matter=(m2-m3) × 100/(m1-m3)

Where,

**m1=mass, in grams, of the dish with the sample.**
**m2=mass, in grams, of the dish after heating and.**
**m3=mass, in grams, of the empty dish.**

*Spreadability Test*

Sample was applied between two glass slides and then compressed to uniform thickness by placing 100 gm weight for 5 minutes. Weight was added to the pan. The time required to separate the two slides i.e. the time in which the upper glass slide moved over the lower slide was taken as measure of spreadability.

The formula is

**Spreadability=ml/t**

Where,

**m=Weight tide to upper slide.**
**l=length moved on the glass slide.**
**t=time taken.**

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*Viscosity*

Brookfield viscometer was used to measure the viscosity and torque of the formulated gel in addition to the CG at 23±2°C using spindle (T-Bar, TD-94). Sample holder of the Brookfield viscometer was filled with the gel sample and then spindle was inserted into this holder. The spindle was rotated at 20 rpm. Viscosity and Torque measurements were recorded in triplicate.

*Skin Irritation Test*

Skin irritation test was performed for the prepared ultrasound gel by applying it on human volunteers to find out any irritation problems which could make it unsuitable for use. Three human volunteers were selected to check skin irritancy test. 1 gm of the sample was topically applied to the hand over a 2 square inch. In this test, the three human volunteers signed an informed consent letter for their agreement to participate. Observation for any lesions, irritation, edema or redness was performed at regular intervals for about 24 hrs and recorded.

*Accelerated Stability Test*

Accelerated stability test of prepared gel was conducted for stable formulation at room temperature, studied for 7 days. This formulation was studied at 40°C±1°C for 20 days. The formulation was kept both at room and elevated temperature and observed on 0th, 5th, 10th, 15th and 20th day with required parameters.

*Microbial Growth Test*

The formulated gel was inoculated on the plates of agar media by streak plate method and a control was prepared by omitting the gel. The plates were placed inside the incubator and kept at 37°C for 24 hours. After the incubation period, plates were taken out and the microbial growth was checked by comparing it with the control.

*Conductivity*

The conductivity of the formulated ultrasound gel was measured by using HACH conductivity meter (Model: sensionTM156 portable multi parameter). This measuring system has a two-cell probe design. With this design, a single probe can take measurement within the full, dynamic range of the instrument. This method determines the total conductivity. Before going to analysis sample, the meter was calibrated. Then the probe was placed into the sample and the slot on the end of the probe was totally immersed. The sample was agitated with the probe for 5-10 seconds to remove bubbles that might be trapped in the slot. The conductivity value of the sample was then automatically displayed on the instrument.

## II. RESULT AND DISCUSSION

**Phytochemicals screening of different extracts**

Phytochemical components primarily control the pharmacological and toxicological characteristics of plants. These metabolites are advantageous to plants, but dangerous to animals, including people. These chemical elements are present in this plant, which impliesthat, if thoroughly screened, it could be able to produce pharmaceutically significant drugs. The results of phytochemicals screening summarizes in.

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**Color & Appearance**

The texture, colour, and aroma of the serum were directly examined in order to gauge its physical characteristics. All formulas resulted in products that had a milky white finish and were non-greasy and non-oily. Compared to the classic damask rose scent, the rose smells pleasant. It seemed like it was transparent white in hue.

**Homogeneity**

Products with a higher concentration of active ingredients than other types of skin care may offer more obvious advantages. Some serum drops will be applied to a hand, and the homogeneity will be checked by seeing it. The formulation requires that the serum be applied evenly. Under a microscope, the serum was analysed. It was discovered that the phytosomes from both extracts are uniform in size and shape and are dispersed with a gelling agent.

**pH of the serum**

The formulation's pH was found to be 5.6, which is close to the expected value. The medicine is still unionised, helping it to be compatible with skin pH, and there are no heavy metals in the formulation. The formulation is not responsible for irritation or allergic reactions.

**Particle Size Distribution and Zeta Potential**

The phytosomes come in a variety of shapes, including spherical and oval. Cariya papaya phytosomes had an average diameter of 198.09±0.04 nm while gingerol phytosomes had a diameter of 245.21±0.06 nm as determined by DLS with a negative zeta potential surface charge of -27.8 mV.

**Transition Temperature**

The transition temperature of the phytosome systems was determined by using a melting point apparatus. The average Tm measurement was found to range in between 32-350C.

**Drug content & compatibility study**

The samples were prepared by dissolving 10 mg percent w/v concentration into 100 ml of pH 5.6 buffer solutions (10 mg/100ml). The extract's UV absorption spectra were measured using a Shimadzu-1800 double beam UV-Vis Spectrophotometer in the 200-800 nm range.The highest absorbance of Cariya papaya pure extract was 378 nm, while gingerol pure extract was 265 nm. The same procedure should be used for the compatibility study. Both the medication extract phytosome and the control phytosome produced results in the same range.

**Rheological study**

The viscosity of the formulation was assessed using a Brookfield Viscometer, and it was found to be 2687cps.

**Ash Value**

The ash value of the extract was determined to be less than 1%.

**Spreadability test**

It was anticipated that the formulation would have good spreadability. There is a Viscosity and spreadability has a linear relationship in rheological studies; the lower the viscosity, the lower the surface tension, and the higher the spreadability.

**Absorbance time**

The serum starts to absorb as soon as it is applied to the skin and is fully absorbed in 1-2 minutes.

**Washability**

The washability of the formula was evaluated on the face. The skin was left fresh, luminous, and moist after its simple removal.

**Microbial Study**

The results of antimicrobial studies indicate that agar plate of test inoculums show similar microbial growth as compared to standard from 24 h grown culture. The result indicating that the formulation was free of microorganisms and safe to use.

**Stability study**

Stability studies for physical and chemical change were conducted on the formulation. There were no discernible differences in the formularization’s attributes. Throughout the stability study, the product's quality, safety, and efficacy are maintained.

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**Antioxidant Activity**

Blank, sample, and standard solution were tested after 10 minutes of incubation. The activity of antioxidants rises as reaction time increases. When compared to rutin, the standard, the formulation demonstrated (42.26%) strong total antioxidant and hydrogen peroxide scavenging properties.


## DISCUSSION

Qualitative phytochemical screening detects the presence of flavonoids, terpenoids, phenol, phytesterol, and ascorbic acid in both the herbal plant extracts. The exhausted phytochemicals show antioxidant and antimicrobial activity. The phytosomes of gingerol was prepared by anti-solvent precipitation technique by mix gingerol oil with soy lecithin in a molar ratio of (2:2) and gingerol phytosomes had a diameter of 245.21±0.06 nm. The extract of Carica papaya pulp and phosphatidyl choline were mixed in ethanol at a 1:2 molar ratio, and the mixture was then refluxed for two hours at 300C and 120 rpm in a vacuum rotary evaporatorto create the phytosomes and it had an average diameter of 198.09±0.04 nm. The negative zeta potential surface charge of found to be -27.8 mV. The viscosity of the formulation was determined by using a Brookfield Viscometer, and it was 2687cps.The formulation has 42.26% antioxidant and hydrogen peroxide scavenging properties. The stability studyindicated that the product has good quality, efficacy, and safe to use.

## IV. CONCLUSION

The combination of gel formulation containing basil leaf and aloe vera extracts meets the product quality requirements, including organoleptic and physical stability. This combination gel formulation did not cause irritation in volunteers during irritation testing using the patch test method.

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