

Formulation and Physicochemical Evaluation of a Polyherbal Scrub Soap Containing *Vetiveria zizanioides* and *Cucumis melo*

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ABSTRACT

Background: With increased awareness of the importance of eco-friendly, user-friendly, skin friendly, the use of cosmetic prepared from herbal ingredients got increased. Few of medicinal plants were found to be having antimicrobial, antioxidant and anti-inflammatory properties along with moisturizing potential in which some of the plants are *Vetiveria zizanioides* and *Cucumis melo*. **Objectives:** The study aimed to prepare and evaluate the efficacy of polyherbal scrub soap containing powder of *Vetiveria zizanioides* and juice of *Cucumis melo*. **Materials and Methods:** The scrub soap was prepared using the melt and pour method. Physico-chemical properties were carried out. Physicochemical evaluation parameters such as appearance, colour, odour, pH, foam height, foam retention, washability, skin irritation test were performed for the formulation of the soap. **Results:** The prepared scrub soap was having good appearance with pleasant smell and penny-brown colour, pH ranged between 6.0-7.0 (skin compatibility range), foam height 7cm, foam retention 5 min. The scrub soap was having good washability without any sign of irritation and inflammation on skin. **Conclusion:** Poly herbal scrub soap prepared using the *Vetiveria zizanioides* powder and *Cucumis melo* juice was found to be safe for application on the skin and hence this could be concluded that the preparation of such natural cosmetic preparation for acne care will be effective.

Keywords: Cucumis melo , Herbal Skin Care, Physicochemical Evaluation, Polyherbal Scrub Soap, *Vetiveria zizanioides*.

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Received: 29-07-2026;

Revised: 02-09-2026;

Accepted: 13-10-2026.

INTRODUCTION

Acne vulgaris is chronic inflammatory condition of skin primarily found during the adolescent and early young adult stage. Acne lesions can include comedones, papules, pustules, and even cysts and nodules (Vasam *et al.*, 2023). Traditional treatment of skin diseases may include products formulated using chemical products like preservatives, colours and antibacterial agents which may result in problems such as dry skin, allergic reactions, etc. (Michalak, 2023). Therefore, products formulated from plant sources that do not have any adverse effects are preferred. Cosmetics based on plants, that are formulated using botanical substances, can treat many skin ailments and conditions due to presence of their active natural components like flavonoid compounds, phenols and etc. Due to bioactive elements like antioxidants and antimicrobial

substances and it helps prevent inflammation of the skin, gives it a moisturized and radiant look (Choi *et al.*, 2024). Consumer desire for skin-safe, eco-friendly cosmetics manufactured using organic raw materials is expanding the market of such products, which means it's high time to move beyond chemicals to nature in skincare products. *Vetiveria zizanioides*, commonly known as vetiver, is widely used in perfumery, folk medicine and also for beauty applications since centuries (Pandey *et al.*, 2023). Its root system is enriched with compounds like vetiverol, zizanoic acid, various terpenoids and it shows antioxidant, anti-inflammatory and antimicrobial properties, antiseptics, astringents (Lunz *et al.*, 2021). The roughened structure of vetiver roots can be utilized as an exfoliator. The presence of Vitamins such as Vitamin A and C in *Cucumis melo* (muskmelon) along with polyphenol and flavonoid compound give moisture, conditioning, protection from ageing, firm skin, antioxidant properties and help reduce inflammation in skin (Javid *et al.*, 2024). Many research articles reported the development of soaps by incorporating individual medicinal plant like scrub soap made with *Vetiveria zizanioides* and juice of *Cucumis melo* as combination were seldom reported, whereas the use of other cosmetic agents like soap to have better exfoliation, anti-inflammatory, anti-oxidant and moisturizing properties in a single agent would have significant effect in



DOI: 10.5530/fra.20260012

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managing the condition of acne (Deshmukh *et al.*, 2024). Polyherbal formulation with these two herbs could provide better outcomes due to their potential synergy, hence; an effort has been made in this present work to formulate polyherbal scrub soap with the help of vetiver roots and muskmelon juice (Nyarko *et al.*, 2021). The formulated poly herbal soap was then evaluated for its physico-chemical parameters and its skin tolerability and it could serve as a cleaning soap to manage acne condition.

MATERIALS AND METHODS

Collection of Vetiver

Vetiver was bought from the local market in Puducherry.

Extract of vetiver Powder

Roots with good growth were selected, mixed for 5 min and passed through a no. 80 sieve to get fine powder. The powder used in the experiment was:

Table 1: Materials used.

Sl. No.	Materials	Manufacture
1.	Vetiver powder	Local herbal market, Puducherry, India
2.	Musk melon juice	Local fruit market, Puducherry, India
3.	Rose oil	Local market, Puducherry
4.	Soap base	Commercial cosmetic grade soap base purchased from a local supplier, Puducherry, India
5.	Vitamin E capsules	Local market, Puducherry

Collection of fruits

Musk melon was bought from the local market of Puducherry. Fruits were cut and pulp extracted by grinding process and liquid part was filtered on filter paper. The filtrate obtained was used for the experiment.

Preparation of the soap

A block of 90 g soap base made in the local market was broken into pieces and melted in an oven until it turned into a liquid. Vetiver root powder in the amount of 10 g and musk melon pulp extract in the amount of 10 mL has been added and a few drops of rose oil, Vitamin E capsules has been added as the excipients.

Materials

The list of materials used in preparation and formulation of polyherbal soap are presented in Tables 1 and 2 respectively.

Preparation of soap

The soap base was chopped into small pieces and was melted in a water bath. The finely sieved vetiver powder (80 mesh) was sprinkled in the molten base and then the freshly filtered muskmelon juice, rose oil and Vitamin E were added to it. The mixture was well mixed and poured into moulds. Soap bars were taken out of moulds and left to dry and set after which were placed in airtight containers.

The evaluation of Physicochemical Parameters of the Prepared Formulations w

Various physicochemical parameters were evaluated to determine the quality of the formulations prepared:

Organoleptic evaluation

The color and clarity of the formulations was visually observed on a white background as well as the odor was evaluated.

Table 2: Formulation of the herbal soap.

Sl. No.	Ingredients	Quantity	Uses
1.	Vetiver powder	1 g	Removing dead skin cells. Skin whitening Anti -aging
2.	Musk melon juice	10 mL	Reduce skin irritation Psoriasis Skin glowing
3.	Soap base	90 g	removing dead skin cells Repair damaged skin tissues and maintain healthy and younger looking skin.
5.	Vitamin E	q.s	Reducing skin itching
6.	Rose oil	q.s	Perfume Preservative

Total weight of one soap=100 g.

Determination of pH

The pH of all the prepared formulations were measured by using pH paper. A pH paper was used to measure the pH of the formulation.

Determination of Foam Height

The cylinder shake method of measuring foam height was adapted from (Ilomuanya *et al.*, 2020).

Determination of Foam Retention

25 mL of the soap solution was poured into a 100 mL graduated measuring cylinder. The cylinder was tightly closed and shaken 10 times. The volume of foam was measured every minute for 4 min.

Washability Test

A 2 sq. The area on the right-hand dorsal surface was marked as Cm. A marked area was treated with the herbal soap and cleaned. This marked area was treated with the herbal soap and washed. Irritancy, erythema and edema were observed at regular intervals up to 24 hr and reported.

The irritancy test

Irritancy, erythema and edema were observed at regular intervals up to 24 hr and reported. A small area of healthy skin was treated with the prepared soap and the area was evaluated for erythema, edema and irritation at 24 hr.

Antimicrobial Activity

Nutrient Agar

The nutrient agar medium was prepared according to the directions given in the nutrient agar medium package (HiMedia Laboratories Pvt. Ltd., India) with 100 mL of distilled water. The medium was sterilized in an autoclave at 15 psi and 121°C for 15 min. This was then poured into sterile 100 mm Petri plates (20-25 mL per plate) and solidified.

Preparation of Bacterial Inoculum

A new 24 hr culture of *Staphylococcus aureus* was obtained in sterile nutrient broth and the bacterial suspension was adjusted to 0.5 McFarland turbidity standard.

Agar Well Diffusion Method

The anti-bacterial activity of the formulated polyherbal scrub soap of *Vetiveria zizanioides* was tested by agar well diffusion method. The soap formulation was dissolved in sterile distilled water and then used in concentrations of 50, 100, 250 and 500 g/mL. The surface of nutrient agar plates was uniformly inoculated with a standardized quantity of the bacterial suspension with a sterile cotton swab. A sterile cork borer was used to make sterile wells (6 mm diameter), and 100 µL of each test concentration

(50, 100, 250 and 500 g/mL) was carefully pipetted into each well. Gentamicin was used as the positive control. Inoculated plates were incubated at 37°C for 24 hr. The zone of inhibition (in mm) around each well was measured to evaluate anti-bacterial activity after incubation (Nisansala *et al.*, 2025).

RESULTS

Determine the organoleptic properties

The organoleptic property and overall acceptability of the prepared polyherbal scrub soap was determined by visual assessment of their colour and odor (Table 3).

Determination of pH

The pH of all the prepared formulations has been determined by using pH paper, which are given in Table 4.

Determination of Foam Height

2 g of the soap sample was diffused in 25 mL distilled water. This mixture was poured into a 100 mL measuring cylinder and water added to make up the volume to 50 mL. The volume of the aqueous layer and foam after 25 strokes were noted as foam height above aqueous volume (Table 5). The volume of water was measured up to 50 mL.

Determination of Foam Retention

The soap solution (25 mL) was placed in a graduated measuring cylinder (100 mL). This cylinder was hand-sealed and shaken 10 times. The amount of foam at 1 min intervals for 5 min was noted (Table 6 and Figure 1).

Skin irritancy test

A 2 sq.cm area was marked on the right hand's dorsal surface. A herbal soap was used on this area and the reaction of the hand was

Table 3: Determination of colour and odour.

Sl. No.	Colour	Odour
1.	Penny Brown	Smelled (Jasmine)

Table 4: Determination of pH test.

Sl. No.	pH Range	No. of soap samples in the pH range
1.	6.00-7.00	1

Table 5: Determination of foam height.

Sl. No.	Herbal soap foam height
1.	7 cm

Table 6 Determination of Foam retention.

Sl. No.	Foam retention time
1.	5.0 min



Figure 1: Determination of pH test.



0 mins



After 24 hrs

Figure 2: Determination of skin irritancy test.

Table 7: Determination of Skin irritancy test.

Sl. No.	Irritancy test (after 24 hr)
1.	No irritancy

observed. The irritancy, erythema and edema were monitored at regular time intervals up to 24 hr (Table 7 and Figure 2).

Washability

A small amount of the scrub soap was applied to the skin and washed off with water and it was easily washable (Table 8).

Anti-microbial study

The antibacterial activity of the formulated polyherbal scrub soap of *Vetiveria zizanioides* against *Staphylococcus aureus* (as the model organism) was evaluated using the agar well diffusion method. This antibacterial activity was concentration dependent. The results showed that the bacterial activity was greater at 500 µg/mL. The zone of inhibition was seen at 100 µg/mL and 250 µg/mL but not at 50 µg/mL. The antibacterial activity of the formulation

Table 8: Determination of Washability.

Sl. No.	Washability test
1.	Easy to wash

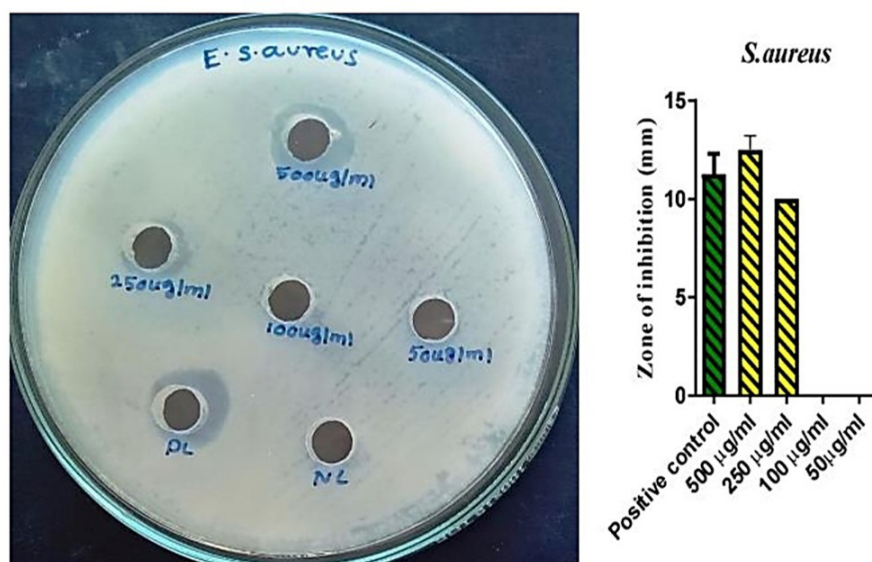
was compared with the positive control (Gentamicin) and is shown in Table 9 and Figure 3.

DISCUSSION

The polyherbal scrub soap was successfully prepared by using melt-and-pour method using *Vetiveria zizanioides* and *Cucumis melo*. The formulation was found to be good in physicochemical evaluation having pH value suitable for skin application, good foaming quality, washability and no signs of skin irritation on application to the skin. The scrub soap has been screened for its antibacterial activity against *S. aureus*, which may be due to the presence of active constituent of vetiver. It seems the formulation would be useful for the skin due to its exfoliate properties due to vetiver and moisturizing properties due to muskmelon. It also

Table 9: Anti-Microbial test.

Sample	Concentration	Test organism	Observation from the figure
Gentamicin (Positive control)	Standard	<i>Staphylococcus aureus</i>	Highest zone of inhibition (exact value not readable)
Polyherbal scrub soap	500 µg/mL	<i>Staphylococcus aureus</i>	Clear zone of inhibition
Polyherbal scrub soap	250 µg/mL	<i>Staphylococcus aureus</i>	Moderate zone of inhibition
Polyherbal scrub soap	100 µg/mL	<i>Staphylococcus aureus</i>	Less zone of inhibition
Polyherbal scrub soap	50 µg/mL	<i>Staphylococcus aureus</i>	No measurable inhibition

Figure 3: Effect of polyherbal scrub soap against *S. aureus*.

appears useful to the acne-prone skin to help prevent and manage breakouts.

CONCLUSION

A polyherbal scrub soap was prepared from *Vetiveria zizanioides* and *Cucumis melo*. The prepared product possessed good physicochemical characteristics, skin acceptability and antimicrobial activity against *Staphylococcus aureus* thus showing promise as natural herbal scrub soap for acne-prone skin. *In vivo* studies are needed to further evaluate skin safety and efficacy and investigation against other acne-related microorganisms may be carried out.

ACKNOWLEDGEMENT

The authors gratefully acknowledge the Department of Pharmaceutics, School of pharmacy, Sri Balaji Vidhyapeeth deemed to be university, Puducherry, India, for providing the facilities required to conduct this research.

ABBREVIATIONS

pH: Potential of hydrogen; **mL:** Millilitre; **g:** Gram; **mm:** Millimetre; **psi:** Pounds per square inch; **°C:** Degree Celsius; **hr:** Hour; **min:** Minute; **mL:** Millilitre; **sq. cm:** Square centimetre; **S. aureus:** *Staphylococcus aureus*; **P. aeruginosa:** *Pseudomonas aeruginosa*.

CONFLICT OF INTEREST

The author declares that there is no conflict of interest.

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Cite this article: Solomon GG, Gopu A, Anbarasane G, Karnan P. Formulation and Physicochemical Evaluation of a Polyherbal Scrub Soap Containing *Vetiveria zizanioides* and *Cucumis melo*. *Free Radicals and Antioxidants*. 2026;16(2):62-7.