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FORMULATION AND EVALUATION OF THE HERBAL SOAP

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ABSTRACT

This study describes the creation of an environment friendly herbal soap utilizing extracts from *Azadirachta indica* (neem) and *Coccinia grandis* (scarlet ivy gourd), which harness their combined anti-microbial, anti- inflammatory, and skin-nourishing qualities for natural cleansing. To preserve bioactive substances, including alkaloids, flavonoids, and terpenoids, which act against skin infections and irritations. Fresh leaves of both plants were shade-dried, ground, and extracted using ethanolic maceration. The herbal soap's relaxing properties are enhanced by the addition of glycerine soap base. *Azadirachta indica* extract for its antiseptic properties, *Coccinia grandis* extract for its hydrating and wound-healing properties, and additives like glycerine, coconut oil, and vitamin E oil for stability and additional skin nourishment. Physicochemical analyses verified pH 8–9, ideal foam stability, and moisture content, along with microbial tests demonstrating inhibition against *Aspergillus niger*, *Escherichia coli*, and *Staphylococcus aureus*. By reducing irritation and promoting skin health without the use of dangerous chemicals, this formulation provides an alternative substitute for synthetic soaps.

KEYWORDS: Herbal soap, ivy gourd, neem, anti-microbial, glycerine soap base.

INTRODUCTION

The skin is the largest organ since it covers the whole outside of the body. The epidermis, dermis, and hypodermis are the three layers of skin, each of which has a unique anatomical structure and purpose. The body's main defense against diseases, UV rays, toxins, and mechanical stress is the intricate structure of the skin. Additionally, by releasing water into the surroundings, this organ regulates body temperature. The skin's barrier function makes it susceptible to several inflammatory and viral illnesses. Cosmesis, sensory alterations, and wound healing are also important surgical issues. Understanding the structure and function of the skin is essential for managing diseases in all medical specialties.[1,2]

Herbal soaps are skin-purifying and beautifying products made from natural ingredients that nourish the skin without causing harmful side effects. Their purity helps maintain nutrients and beneficial minerals in the body, promoting healthier, clearer skin. Unlike commercial soaps that often contain harmful chemicals like plastics, aluminium, barium, mercury, and bisphenol, herbal soaps do not irritate the skin or cause long-term damage. They help prevent issues such as wrinkles, freckles, blemishes, and pigmentation caused by heat exposure. Because of their safety and effectiveness, the use of herbal ingredients and plant extracts in skincare has grown worldwide, especially in natural and traditional medicine practices.[3,4,5]

Ivy gourd, or *Coccinia grandis*, is a lesser-known perennial vegetable belonging to the Cucurbitaceae family. Over trees, shrubs, fences, and other support structures, this robust climbing vine spreads swiftly. India, tropical Africa, Malaysia, and a number of Southeast Asian nations, including China, cultivate ivy gourds. The southern, eastern, and western parts of India—specifically, Tamil Nadu, Karnataka, Kerala, Maharashtra, Gujarat, Andhra Pradesh, and West Bengal—are where it is primarily grown. Due to its skin-friendly properties and the presence of numerous phytoconstituents, such as flavonoids, terpenoids, and alkaloids, ivy gourd has historically been used to treat a

number of skin-related issues.[6,7,8]

Neem, or *Azadirachta indica*, is a tropical evergreen that is related to mahogany and is a member of the Meliaceae family. A few trees have lately been planted in the Caribbean and several Central American nations, including Mexico. It is native to East India and Burma and grows within all of Southeast Asia and West Africa.[9] Neem is very widely used in India due to its different medical uses due to its efficient Anti-fungal and Anti- bacterial activity. All plant part of neem including its bark, stem, seed, leaf have its own activity due to the presence of different phytoconstituents including flavonoid, terpenoid, tannins .Neem is not only a part of medical use but also a part of Indian agriculture system.[10,11]

Ethanolic extract of ivy gourd and neem are a prime member of skin care products due to its skin friendly activity.[12,13] Herbal soap which contain ivy gourd and neem provide synergistic effect and thereby generate wound healing and skin nourishing activity. Along with the active, the formulation also contains excipients which can improve the soothing and conditioning activity of the product. Excipients includes coconut oil, vitamin E and glycerine impart deep cleansing, antioxidant and moisturizing activities.[14] The finished product is assessed for anti-bacterial and anti-fungal activity along with number of physicochemical characteristics such as homogeneity, washability, pH, foam height and moisture content. The step by step careful evaluation of herbal soap ensure that the ingredients work well as a natural skin care product.[12]

MATERIALS AND METHODS

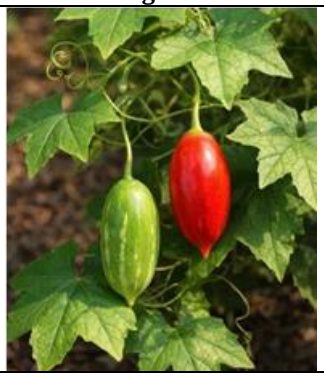
Collection of plant materials

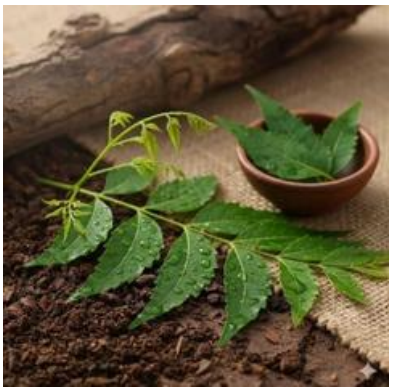
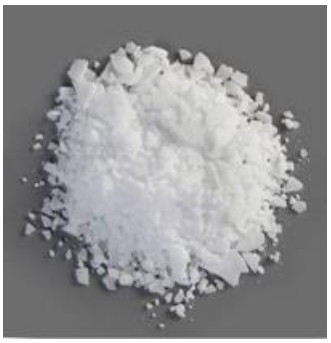
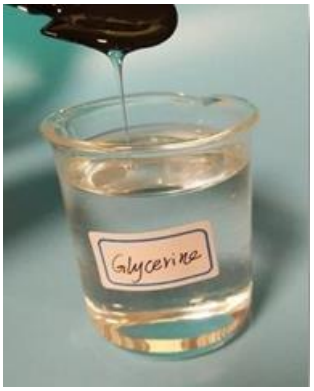
The perennial climbing vine ivy gourd (*Coccinia grandis*) is a member of the Cucurbitaceae family. It has slender, green stems with tendrils that help it climb, and simple, lobed leaves that are heart-shaped at the base. The plant bears small white flowers and smooth, elongated green fruits that turn bright red when ripe. Ivy gourd vines can grow up to 5–8 meters in length under suitable conditions.[15] While *Azadirachta indica* is a fast growing, evergreen species known for its resilience and wide array of medical, agricultural applications. This plant can persist different climatic conditions including hot, humid tropical and subtropical climates. The plant specimens (leaves of ivy gourd and neem) were collected from the nearby localities and verified botanically by trained botanist using accepted toxicological references. The collected plant parts were shade dried for 7 consecutive days, pulverised and stored in an air tight container for further studies. Coconut oil, vitamin E, glycerine, were collected from college laboratory and glycerine soap base were purchased from trustable buyers.[17]

Processing of plant materials

Extraction of plant materials are done by implementing solvent maceration process. In *Coccinia grandis*, 50g of the dried leaf powder were macerated in 500 ml of 95% ethanol for the solvent extraction. Over the course of 72 hours, the mixture was periodically stirred and maintained in an airtight glass container to optimize the phytochemicals' solubility. Whatman number one filter paper was used to filter the extract. The extract transferred into air tight container and stored in refrigerator.[16] Extraction of *Azadirachta indica*, were performed by weigh 40 g of dried neem leaf powder transferred into a 500ml beaker contain 250 ml of 70 % ethanol and kept it for 72 hours with periodic stirring. The filtration process is carried out by the aid of Whatman number one filter paper. The resultant extract was stored in refrigerator for further studies.[17]

Table 1: shows the materials and their descriptions.

SL.NO	Material	Description	Figures
1.	Ivy gourd	**Botanical**: Coccinia *grandis* **Kingdom**: Plantae **Order**: Cucurbitales **Family**: Cucurbitaceae **Genus:** Coccinia **Species:** grandis **Plant part used:** leaves **Uses:** As a strong anti- bacterial and anti-fungal agent, reduces inflammation, powerful antioxidant and skin nourishing activity.[18]	

2.	Neem	**Botanical name**: *Azadirachta indica* **Kingdom:** Plantae **Order**: **S**apindales **Family**: Meliaceae **Genus**: *Azadirachta* **Species**: *indica* **Plant part used**: leaves **Uses:** Widely used in medical field due to anti -fungal and anti - bacterial action, primarily neem leave is used as a skin protectant and skin cleansing products. Along with the medical use it also used the agriculture as a biopesticide.[19]	
3.	Coconut oil	**Botanical name**: *Cocos nucifera* **Kingdom**: Plantae **Order**: Commelinids **Family**: Arecaceae **Genus**: *Cocos. L* **Species**: *C. nucifera* **Parts used**: oil **Uses**: Treats skin conditions like eczema, psoriasis and reduce stretch mark.[20]	
4.	Stearic acid	**IUPAC name**: Octadecanoic acid **Other names**: Cetylacetic acid, Stearophanic acid. **Molecular weight**: 284.48 g/mol **Chemical formula**:CH3(CH2)16CO2H14. **Appearance**: a white, waxy solid that can also appear as crystals, powder, flakes, or crystalline powder. **Boiling Point**: 361 °C **Odour**: odourless **Melting point**: 69.4 °C **Solubility**: slightly soluble in water and soluble in many organic solvents. **Uses**: Used in the production of detergents, soaps and cosmetics. [21]	
5.	Glycerine	**IUPAC name**: propane-1,2,3-triol **Other name**: 1,2,3-Propanetriol, 1,2,3-Trihydroxypropane, glycerol. **Molecular weight**: 92.09g/ mol **Chemical formula**: $C_3H_8O_3$ **Appearance:** clear, colourless, and odourless liquid with a thick, syrupy, and viscous consistency. **Boiling point**: 290ºC **Odour**: odourless **Melting point** : 17.8∘C **Solubility**: Due to its polar nature highly soluble in water and alcohol. Practically insoluble in ether, benzene and chloroform. **Uses** : As a humectant in as skincare, food and pharmaceuticals**.**	
2.	Other chemicals	Essential oil, soft paraffin, vitamin E.	

FORMULATION OF HERBAL SOAP

50 g of gycerine soap base were melted in water bath by maintaing temperature 70ºC with continues stirring until the soap base melt completely. Add ingredients one by one into the resultant solution with constant stirring. Once the desired consistency acquired turn off the flame and then add 1-2 drops of rose oil. Pour it into the soap mould and place it in room temperature.

Table no. 04: composition of formulation of soap.

Composition of herbal soap	F1	F2	F3
Soap base	50g	50g	50g
Coccina grandis Extract	5 ml	5ml	5 ml
Azadirachta indica Extract	2 ml	2 ml	2 ml
Steric acid	0.5 gm	1 gm	1.5 gm
Soft paraffin wax	0.7gm	0.7	0.7
Coconut oil	10 ml	10 ml	10 ml
Glycerin	5 ml	5 ml	5ml
Vitamin E oil	2ml	2ml	2ml
Rose oil	q. s	q. s	q. s
Honey	q. s	q. s	q. s

EVALUATION OF HERBAL SOAP

Herbal soap means side-effect-free and skin-friendly. In order to ensure the quality of herbal soap, it is necessary to assess the physicochemical properties of herbal soaps. Evaluation steps noted below are the physicochemical parameters followed for the created formulations.

Physical appearance

The colour, odour, and smoothness of the herbal soap were examined under physical appearance. Colour is examined through visual inspection. Odour is checked by smelling the product. Smoothness is evaluated by rubbing the soap between palms.

Homogeneity

Homogeneity of the herbal soap is observed by visually inspecting the surface for the presence of lumps or bubbles. The procedure is only held after the complete development of the herbal soap.

Washability

Once the herbal soap is applied to the skin, we regularly assess its effectiveness and how easily it rinses off with water.[22]

Foam stability

The identical volumes of distilled water and soap sample were utilized. The foamability test was conducted using this manner. For half an hour, the mixture remained undisturbed. The foam height above the water volume was measured after 30 minutes.

Determination of pH

The pH of the herbal soap is evaluated by using a pH meter. A small part of herbal soap was diluted in 100 ml of water, and waited for 2 hours. After 2 hours, the pH is determined by using a calibrated pH meter.

Moisture content test

Immediately, 10 g of herbal soap was weighed and noted as the "wet weight of the sample." This damp sample was dried to a stable weight at a temperature of no more than 115°C using a hot air oven. The sample was weighed once more after cooling to determine its "dry weight." The sample's moisture content was calculated using the following formula.

$\%Weight = A\text{-}B/A \times 100$

Where; %Weight = % of moisture in sample, A = weight of wet sample (gm), B = weight of dry sample (gm).[23]

Anti-bacterial assay

The well diffusion technique was used to evaluate the antibacterial efficacy. Using the well diffusion method, the sample's antibacterial efficacy was tested against clinical bacterial isolates, such as gram-positive *Staphylococcus aureus* and gram-negative *Escherichia coli*. Each test organism was evenly distributed over the solidified Muller-Hinton agar media (MHA) in sterile petri plates using a sterile cotton swab to create a bacterial lawn. The sample was put into wells that were made on sterile MHA. After that, the plates were incubated for 24 hours at 37°C while upright. The clearance areas surrounding the wells were measured and inspected following incubation.[25]

Anti-fungal assay

The antifungal effectiveness of the sample was evaluated against Aspergillus niger through the dual culture technique. Fungal spores were placed at the centre of Sabouraud dextrose agar (SDA). The sample was added to wells that were made in sterile SDA plates. After that, the plates were incubated upright for three to four days at room temperature. The zones of inhibition surrounding the wells were measured and recorded following incubation.[26]

RESULT AND DISCUSSION

Physicochemical and anti-bacterial analysis were performed. From the observation F1 is the best preparation.

Table no. 2: Physico-chemical parameter of formulations.

Parameters	F1	F2	F3
Physical appearance	Excellent	Good	Not good
Homogeneity	Excellent	Good	Not good
Washability	Very easy	Easy	Not easy
Foam stability	38	32	30
pH	8.03	8.40	8.48
Moisture content (%)	1.075	1.653	2.041

Anti-bacterial property of F1

The F1 sample exhibited 15mm of inhibition against *Staphylococcus aureus* and 12 mm of inhibition against *Escherichia coli*. Both of the result showing great anti-bacterial activity.

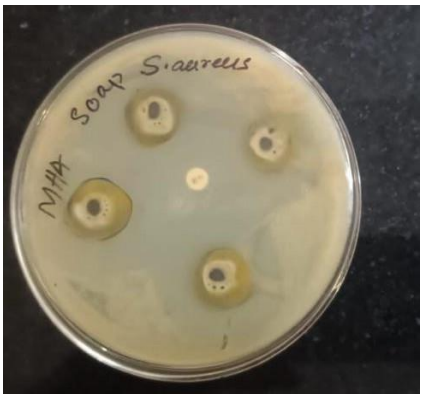


Fig. no: 1 zone of inhibition of *S.aureus.*

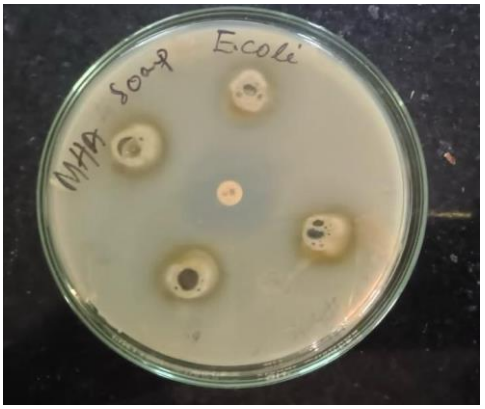


Fig.no:1 zone of inhibition of *E.coli.*

Zone of inhibition of F1 *S.aureus* against in mm	Zone of inhibition of F1 against *E. coli* in mm
15	12

Anti-fungal property of F1

The F1 sample exhibited 23mm of inhibition against *Aspergillus niger*. Hence the result showing great anti - fungal activity.

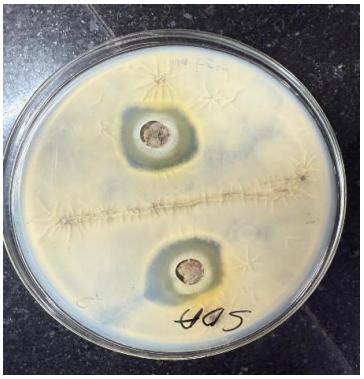


Fig.1: zone of inhibition of *Aspergillus niger.*

Zone of inhibition of F1 against *Aspergillus niger* in mm
23

CONCLUSION

Preparation of herbal soap by using herbal extract of *Coccinia grandis* and *Azadirachta indica* was performed. The physical, chemical, and biological properties of the prepared soaps were analysed. The formulation featured an attractive colour and fragrance, along with an appealing appearance. The pH level was found to be within the specified range of 8 to 9. Other attributes, such as moisture content and foam stability, were also noted as reflecting typical values for soap. An evaluation of biological parameters, including antibacterial and antifungal activities was performed, by changing the concentration of stearic acid, three different formulations are done (F1, F2, and F3). Among the three formulations,

F1 had excellent physicochemical properties and effective antibacterial and antifungal properties. The results of the study indicate that the herbal soaps are more advantageous over synthetic soaps, while considering various factors like skin friendly activity, herbal benefits, and efficacy.

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