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Formulation And Evaluation of Herbal Beetroot and Neem Soap for Management of Acne-Prone Skin

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ABSTRACT
Acne is a prevalent dermatological disorder characterized by excessive sebum secretion, microbial proliferation, and inflammation of the pilosebaceous unit. This study aims to formulate and evaluate an herbal soap incorporating beetroot (*Beta vulgaris*) and neem (*Azadirachta indica*) for the treatment of acne-prone skin. Beetroot powder was included due to its antioxidant, anti-inflammatory, and skin-revitalizing properties, whereas neem powder was selected for its established antibacterial, antifungal, and anti-acne activities. The herbal soap was formulated using the melt-and-pour technique with natural oils. The prepared formulation was assessed for various physicochemical parameters, including pH, hardness, foam height, foam stability, moisture content, cleansing efficiency, and skin irritation potential. The results indicated that the pH of the soap was within an acceptable range for topical use, and the formulation demonstrated satisfactory foaming ability along with effective cleansing properties.

Keywords: Herbal soap, Beetroot, Neem, Acne-prone skin.

I. INTRODUCTION:

The scientific study of cosmetics is known as **cosmetology**. Cosmetics primarily aim at temporary and surface-level enhancement, making them suitable for daily personal care as well as special occasions. Cosmetic products are substances used to improve the appearance, fragrance, and texture of the skin, hair, and body. Most cosmetic formulations are intended for external application on the face, hair, and body.

Solid dosage forms are pharmaceutical preparations in which the active drug is present in a solid state rather than in liquid or semi-solid form. In these formulations, the active ingredient is combined with suitable inactive excipients to ensure stability, ease of handling, and accurate dosing. Solid dosage forms are widely used due to their convenience in storage, transportation, and administration.

SOAP:

Soap is a type of cleaning product made from a combination of natural or synthetic ingredients, typically including;

- Oils or fats
- Alkaline
- Water

When these ingredients are mixed and processed, they undergo a chemical reaction called saponification, creating a surfactant that can effectively clean and remove dirt, grime and oils from skin and surfaces.

Soap can be formulated for various purposes, such as:

- Personal hygiene
- Skin care
- Household cleaning

TYPES OF SOAP:

1. Laundry soap
2. Cleaning soap
3. Personal soap
4. Novelty soap
5. Perfumed soap
6. Guest soap
7. Beauty soap
8. Medicated soap
9. Glycerine soap
10. Transparent soap

FUNCTION OF HERBAL SOAP:

- Herbal soap is designed to gently and effective clean the skin by removing dirt, excess oil and impurities without damaging or washing away the skin natural protective oils
- It helps shield the skin from harmful external factors such as allergens, harsh chemicals and everyday stress. A good herbal soap also produces sufficient lather to give a pleasant and satisfying cleaning experience.
- In addition, it nourishes the skin with natural ingredient, controls body odour and

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leaves the skin feeling fresh and revitalized.

- Due to the therapeutic properties of medicinal herbs, herbal soap can also support the management of common skin problems such as acne, eczema and psoriasis by soothing the skin and improving overall skin health.

SKIN:

Skin is the bodies outer protective covering. It acts as a shield that says "nope" to germs, dirt, chemicals and harsh weather. At the same time, it helps keep our body temperature study and prevents too much water from escaping.

The skin consists of three layers. They are,

- Dermis
- Hypodermis
- Epidermis.

STRUCTURE OF SKIN:

The structure of the skin is made up of three main layers, each with a specific role in protecting and supporting the body.

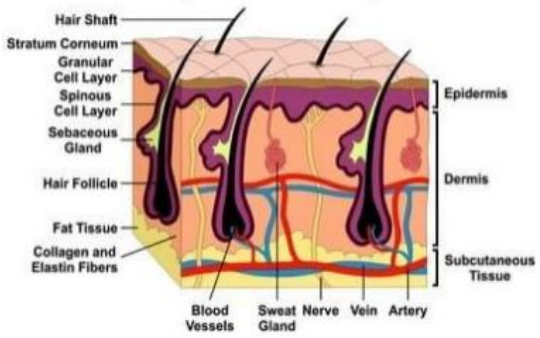

FIG NO ; 01 STRUCTURE OF SKIN

ACNE:

Acne is a common skin condition that occurs when the pores of the skin become blocked with excess oil, dead skin cell and bacterial. It mainly affects area where oil glands are more active such as the face, chest, back and shoulders.

TYPES OF ACNE:

Acne can be classified into different types based on the appearance and severity of the skin lesions.

i. **Non- Inflammatory acne:**
   - Blackheads
   - Whiteheads

ii. **Inflammatory acne:**
   - Papules
   - Pustules
   - Nodules
   - Cysts

FACTORS CAUSINF ACNE:

- Too much oil on the skin
- Hormonal changes
- Stress and diet
- Poor skin care
- Blocked pores

II. AIM AND OBJECTIVES:

AIM:

The aim of the present study was to formulate a safe, non-irritant, cost-effective and herbal soap using beetroot (Beta vulgaris) and neem (Azadirachtaindica) for the management of acne-prone skin. Herbal plants contain numerous biologically active compounds which are useful in the treatment of various skin disorders.

OBJECTIVE:

- To develop an effective herbal soap formulation using beetroot and neem for acne-prone skin
- To prepare a non-irritant and skin-friendly herbal soap using natural plant- based ingredients.
- To utilize the antibacterial property of neem to reduce acne-causing microorganisms.
- To incorporate beetroot for its antioxidant and skin-nourishing effects. [4]

III. MATERIALS AND METHOD:

MATERIALS:

The selection of herbal ingredients was based on their traditional use, availability, safety profile and scientific literature supporting their antibacterial, anti-inflammatory and antioxidant properties useful in the management of acne-prone skin.

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DRUG PROFILE:

1. NEEM POWDER:

FIG NO ; 02 NEEM POWDER

Kingdom: Plantae
Family: Meliaceae
Species: Azadirachtaindica
Order: Sapindales

Uses:

- Used in herbal soaps and face packs
- Help in excess oil and itching.
- Helps in wound healings

2. BEETROOT POWDER

FIG NO: 03 BEET ROOT POWDER

Kingdom: Plantae
Family: Amaranthaceous
Species: Beta Vulgaris
Order: Caryophyllales

Uses:

- Gives glow to skin
- Used in soaps, lip balms and face packs
- Used as a natural colorant

TABLE NO 01; INGREDIENTS:

Ingredients	Uses
Neem powder	Anti- acne, antibacterial
Beetroot powder	Antioxidant, skin conditioning
Neemoil	Sebam control
Reetha seed extract	Natural foaming agent
Multanimitti	Oil absorption, deep cleaning
Turmeric powder	Antiseptic, anti-inflammatory
Glycerine soap base	Mild cleanser, moisture
Glycerine	Humectant
Natural fragrance	Pleasant aroma

TABLE NO ; 02 FORMULATION:

INGREDIENT	F1	F2	F3	F4
Glycerine soap base	42g	41g	40g	39g
Beetroot powder	0.5g	1.0g	1.5g	2.0g
Neem powder	0.5g	1.5g	1.5g	2.0g
Neem oil	3 drops	4drops	5drops	6drops
Reetha seed extract	1ml	1.5ml	2ml	2ml
Turmeric powder	0.25g	0.5g	0.5g	0.75g

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Multanimitti	0.75g	1.0g	1.0g	1.25g
Glycerine	1ml	1.5ml	2ml	2ml
Natural fragrance	1drops	1drops	2drops	2drops
Distilled water	q. s	q. s	q. s	q. s

PROCEDURE:

- The glycerine soap base was taken in a beaker and melted on the hot water bath (60-70^0) until a clear liquid was obtained.
- Neem powder, beetroot powder, turmeric powder and Multanimitti were dispersed separately in a small quantity of warm distilled water to obtain a smooth paste without lumps.
- The prepared herbal dispersion was slowly added to the molten glycerine soap base with continuous stirring
- Reetha seed extract, neem oil and extra glycerine soap base with continuous stirring.
- Cosmetic- grade natural essential oil was added at the final stage and gently mixed to prevent loss of volatile components.
- The homogenous mixture was poured into clean, lubricated soap moulds.
- The moulds were allowed at cool at room temperature for 12-13 hours until complete solidification
- The solidified soaps were removed from the moulds and stored in airtight containers for further evaluation.

FIG NO 04 : FORMULATED SOAP

EVALUATION PARAMETERS:

1. PHYSICAL EXAMINATION:

a. Colour:
The colour of prepared soap was visually observed under natural light.

b. Odour:
The odour of the soap was evaluated by smelling the formulation.

c. Appearance:
The soap appeared smooth, glossy, and free from cracks or air bubbles.

d. Texture:
The texture was evaluated by gently touching the soap surface.

e. Shape and size:
The shape and size of the soap were visually inspected.

f. Hardness
The hardness of the soap was checked by applying gentle pressure with fingers.

g. Surface characteristics:
The soap surface was examined for roughness or cracks.

2. pH determination:
The pH was determined by using the pH meter. The sample was prepared and the pH meter was calibrated using standard buffer solutions of pH 6 and pH 7.5.

3. Foam height:
A 0.5g sample of soap was dispersed in 25ml of distilled water and transferred into a 100ml measuring cylinder. The volume was made up to 50 ml with distilled water, shaken with 25 strokes and allowed to stand until the aqueous volume settled at 50ml. The height of the formed above the aqueous layer was then measured.

4. **Foam retention:**
The duration of foam retention of the soap was measured after subjecting the sample to the same agitation process.

5. Skin irritation:
The formulation herbal soap was subjected to a skin irritancy test, and the treated area was observed for24 hours to detect any signs of irritation were observed.

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6. Moisture content:

The percentage of water content in the soap was determined by comparing the wet and dry weights after drying the sample in a dryer at temperature ranging from 100-150. The constant weight was obtained. The loss in weight after drying was used to calculate the water content.

TABLE NO 03; RESULT AND DISSCUSION:

1. Physical examination:

s.no	properties	Formulation1	Formulation2	Formulation3	Formulation4
1.	colour	Light pink	Pinkish brown	Brownish pink	Dark brown
2.	odour	Mild herbal	Pleasant herbal	Pleasant herbal	Strong herbal
3.	Appearance	Smooth	Smooth and glossy	Smooth and glossy	Slightly dull
4.	Texture	Smooth	Smooth	Smooth	Slightly rough
5.	shape	Uniform	Uniform	Uniform	Uniform
6.	Hardness	Moderate	Good	Good	Very hard
7.	Surface characteristics	No cracks	No cracks	No cracks	Minor surface unevenness

2. P^H Determination:

Property	Std. Range	Formulation1	Formulation2	Formulation3	Formulation4
P^H	6.0-7.5	6.2	6.5	6.7	7.1

3. Foamability:

Property	Formulation 1	Formulation 2	Formulation 3	Formulation 4
Foamability	6.0	7.2	8.0	6.6

4. Foam retention:

Formulation	Foam height after 5 minutes
F1	4.5
F2	5.8
F3	6.5
F4	5.0

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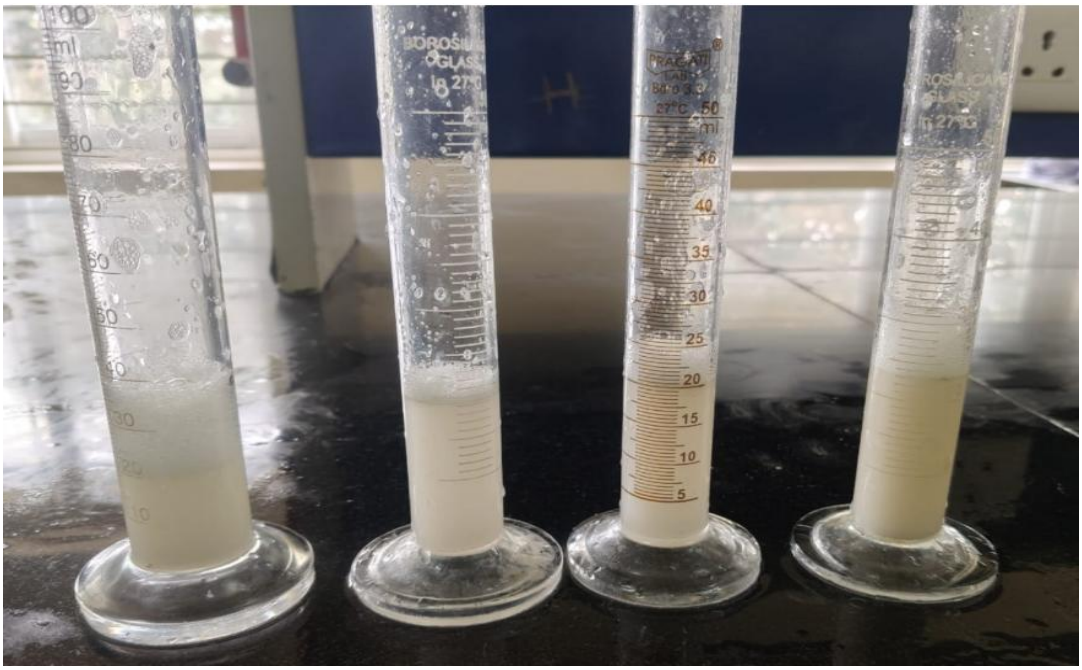

FIG NO 05; Foam retention

5. **Skin irritation:**

Formulation	Redness	Itching	Irritation
F1	Nil	Nil	Nil
F2	Nil	Nil	Nil
F3	Nil	Nil	Nil
F4	Nil	Nil	Nil

6. **Moisture content:**

Formulation	Moisture content (%)
F1	12.5%
F2	15.2%
F3	18.0%
F4	13.4%

IV. CONCLUSION:

The herbal soap containing neem and beetroot was successfully prepared using the melt-and-pour technique. Four different formulations (F1–F4) were evaluated for their physical and physicochemical characteristics, including color, odor, texture, pH, foam height, foam stability, moisture content, and skin irritation potential. All formulations exhibited acceptable pH values ranging from 6.2 to 7.1, along with good foaming ability, stable foam retention, and sufficient moisture content (12.5–18%). No signs of skin irritation were observed, indicating that the formulations are mild, safe, and suitable for acne-prone skin. The findings of this study confirm that herbal ingredients such as neem and beetroot can be effectively incorporated into a glycerin-based soap to produce a natural, safe, and potentially therapeutic formulation for the management of acne-prone skin.

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