e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:07/July-2024 Impact Factor- 7.868 www.irjmets.com

FORMULATION AND EVALUATION OF POLYHERBAL SOAP WITH PAPAYA, CARROT, NEEM, AND BEETROOT

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ABSTRACT

The demand for natural and herbal skincare products has surged due to their perceived safety and efficacy. This study focuses on developing a multiherbal soap incorporating papaya, carrot, neem, and beetroot, known for their skin-enhancing properties. The research aimed to formulate and evaluate the effectiveness of a multiherbal soap by examining its physicochemical properties, antimicrobial activity, and consumer acceptability. The formulated soap exhibited favorable physicochemical characteristics, including appropriate ph., foam stability, and cleansing efficiency. The presence of bioactive compounds in papaya, carrot, neem, and beetroot contributed to significant antimicrobial activity against common skin pathogens. Sensory evaluation indicated high consumer satisfaction, with positive feedback on fragrance, texture, and overall skin feel. The study demonstrates that a multiherbal soap with papaya, carrot, neem, and beetroot can be an effective alternative to conventional soaps, offering both antimicrobial benefits and consumer appeal. Further research should explore the long-term effects of regular use, scalability of production, and the potential for incorporating additional herbal ingredients to enhance the soap's therapeutic properties.

Keywords: Papaya, Neem, Carrot, Saphonification, Soap.

I. INTRODUCTION

According to the drugs and cosmetic act 1940 soap is defined as articles intended to be rubbed, poured, sprinkled or sprayed on, introduced into or otherwise applied to the human body or any part there of for cleansing, beautifying, promoting attractiveness or altering the appearance. [1]

Definition of soap according to FDA

'The bulk of nonvolatile matter in the product consist of an alkali salt of fatty acids and products detergent properties are due to alkali fatty acid compounds. 'By definition , soaps are water soluble sodium or potassium salt of fatty acids . Soaps are made by fats and oils by treating them chemically with strong alkali. [2]

Herbal soap preparation is a medicine or drugs it contain Antibacterial and antifungal agents which mainly uses of part of plants such as like leaves, stem, roots and fruits to treatment for a injury or disease or to achieve good health6. This preparation possess antimicrobial property are

administered topically and available to apply in various forms like creams, lotion gel, soap, solvent extract or ointment. The variety of creams and soap properties have been used to treat various skin disorders. [3]

Soap is a lubricating product and cleansing agent which is usually manufactured using fatty acids, containing one of the primary constituents as sodium or potassium salts. Generally, soaps are manufactured in distinct shapes and textures corresponding to their harness and their application agents. Lye is typically a concentrated alkaline solution principally consisting of sodium hydroxide and potassium hydroxide which is used in the manufacturing of soaps.[4]

Herbal soaps basically consist of plant parts such as seeds, rhizomes, and roots. It has antibacterial, anti-aging, antioxidant, and antiseptic effects. Herbal soap contains none of the synthetic dyes, flavors, fluorides, or other additives typically found in commercial soap. The majority of individuals lack awareness regarding the extended ramifications of using commercial soaps. According to Aiello., et al. (2007), commercial products contain certain substances that are deemed unhealthy and have the potential to cause harm to the body over time.

A natural soap is prepared without a non-natural surfactant, with addition of functional ingredient from natural

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substances, such as essential oils or plant extracts. Herbs are the natural products could be found in the treatment of almost all diseases and skin problems owing to their high medicinal value, cost effectiveness, availability and compatibility. Hence it can be used in soap base. The attribute of a soap includes gentleness on the skin, rich lather, protection against various skin disorders (including rashes, eczema, scabies) treatment of skin infection (such as ringworm), protection of even skin toning and smoothness of the skin. [6]

Soap is a salt of fatty acids that may be found in many household cleaning and personal care items. Soaps have several uses in the home, the most common of which are washing, bathing, and general cleaning. [7]

Soaps are cleansing agents that act as a first line of defense against pathogens in order to protect the body. Now day's we use a variety of brand items to keep our appearance. Long term use of these soaps might cause skin dryness, spots, and irritation. Environmental pollution poor eating habits, stressful life styles, a lack of sleep, and other factors can contribute to cutaneous infection. Herbal soap is typically hand crafted with 100% organic components that are beneficial to the skin while also being environmentally friendly. Some herbs work great for naturally coloring your items. Some plants are excellent for relaxation and stress reduction.

Herbal ingredients will aid the skin by decreasing acne and soothing inflammation. The soap formulation mostly contains neem, tulshi, vitamin, aloe vera, and a glycerin soap base. This content provides it a common property or many favorable effects on the skin. Neem is the the most effective since it has numerous properties such as antibacterial, antifungal, and many skin problems. Neem leaves were employed in the soap-making process. [8]

A report published by WHO stated that a whopping 34% of all occupational disorders are skin diseases and data of 2020 revealed that skin diseases death in India reached 17,857 i.e. 0.21% of total deaths. So, in order to counteract the situation, the best option is to incorporate herbal potentials in the formulation, which provide fewer effects and impart good treatment options with lesser side effects and higher safety. So, the present work focuses on the preparation of medicated herbal soap incorporating different herbs active potentials, making it antioxidant and antibacterial active soap, which can be used as a regular bathing soap. [9]

II. INGRIDENTS

Papaya

Color - red or orange flesh

Odor - slightly sweet smell

Test - sweet test

Botanical name: Carica papaya

Kingdom: Plantae

Order: Brassicales

Family: Caricaceae

Genus: Carica

Species: C. Papaya

Parts used: Fruit Blub

Uses: Skin whitening, boosting immunity, purifying agent for skin, to treat sunburn and irritation, vit.A, Vit. C, Vit. E.[16]

Carrot

Botanical name: Daucus carrot

Kingdom: Plantae

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Order: Apiales

Family: Apiacae

Genus: Daucus

Species: Carrot

Parts used: Friut

Uses: Vit.C, Antioxidant, Skin whitening, skin healing.[17]

Neem

Leaves colour -vibrate green

Odour -garlic like odour

Test -bitter

Botanical name: Azadirachta Indica

Kingdom: Plantae

Order: Sapindales

Family: Meliaceae

Genus: Azadirachta

Species: A.Indica

Parts used: leaves

Uses: Anti bacterial, Moisturing, reducing inflammation, treating skin aging, balancing oil production, glowing skin.[18]

Beet root

Botanical name: Beta pulgaris L.

Kingdom: Plantae

Order: Caryophyllales

Family: Amarantachaceae

Genus: beta

Species: b. Vulgirs

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Parts used: friut

Uses: Hydration, Brightening, Anti aging.[19]

Coconut Oil

Botanical name: Cocus nucifera

Kingdom: Plantae

Order: Commelinids

Family: Arecaceae

Genus: Cocus L

Species: C. Nucifera

Parts used: oil

Uses: Treats skin conditions like eczema, psoriasis, reduces stretch mark, relief from Sunburn.[20]

Sodium hydroxide

IUPAC name: Sodium hydroxide

Other names: lye, caustic soda

Molecular formula: 39.997 g/mol

Chemical formula: naoh

Appearance: white, waxy, opaque crystals

Boiling Point: 1388 °C

Odor: odorless

Melting point: 318 °C

Solubility: Soluble in water, glycerol, negligible in ammonia and insoluble in ether.

Uses: Use as lye in soap formlation. Naoh when combined with fats/oils produces

Saponification reaction. [21]

Menthol

IUPAC name: 5-Methyl-2-(propan-2-yl)cyclohexan-1-ol

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Other names: 2-Isopropyl-5-methylcyclohexan-1-ol
2-Isopropyl-5-methylcyclohexanol
Peppermint camphor
Molecular formula: 156.269 g/mol
Chemical formula: $C_{10}H_{20}O$
Appearance: White or colorless crystalline solid
Boiling Point: 214.6 °C
Odor: mint-licorice
Melting point: 36–38°C
Solubility: Slightly soluble in water
Uses cooling sensation.[22]

Steric acid

IUPAC name: Octadecanoic acid
Other names: steric acid
Molecular formula: 39.997 g/mol
Chemical formula: $C_{18}H_{36}O_2$
Appearance: White solid
Boiling Point: 361°C
Odor: Pungent, oily
Melting point: 69.3°C
Solubility: : soluble in alkyl acetates,alcohol, methyl formate, phenyls, carbon disulfide, carbon tetrachloride.
Uses: : hardening[24]

Sodium laureth sulfate

IUPAC name: α-Sulfo-ω-(dodecyloxy)-poly(oxyethane-1,2-diyl)
Other names: Sodium lauryl ether sulfate
Sodium laureth sulphate Sodium lauryl ether sulphate
Molecular formula: 421 g/mol
Chemical formula: CH3(CH2)11(OCH2CH2)NOSO3NA
Appearance: White solid
Boiling Point: 288.4°C
Odor: Odorless

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Melting point: 206°C

Solubility: : Miscible in water

Uses: foaming[23]

Glycerin

IUPAC name: Propane-1,2,3-triol

Other names Glycerin

Molecular formula: 92.094 g·mol−1

Chemical formula: C3H8O3

Appearance: Colorless hygroscopic liquids

Boiling Point: 290 °C

Odor: Odorless

Melting point: 206°C

Solubility: : Miscible in water

Uses: : humectant. [25]

Other Rose essence & distilled water

PROCESS OF EXTRACTION

- Extraction Of Carrot And Neem Powder Was Done By Decoction Method Taking Ethanol As A Solvent.
- In A Conical Flask 10 Gm Of Each Powder Was Added.
- For 24 Hr, It Was Extracted With Occasional Stir With Magnetic Stirrer And Extract Was Collected In The Container.
- Papaya And Beet Root Juice Obtained By Using Mixer Grinder;
- After Grinding Juice Was Kept In The Store In Refrigerator For Further Use.
- Separated By Using A Filter Paper And Collected Into Beaker, Stored For Further Use.[9]

III. METHOD OF PREPARATION

Formulation of soap containg active plant potentials was carried out using cold saponification method.

1. Preparation of Solutions

In the first beaker, combine 7 grams of sodium hydroxide (naoh) with 10 milliliters of ethanol.

In second beaker, add 10 milliliters of coconut oil and beeswax.

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2. Heating and Stirring

Heat both beakers to 55-60°C using a magnetic stirrer.

Continuously stir the contents of both beakers during the heating process.

3. Combining Solutions

Once both solutions are heated and well-stirred, pour them into a single beaker.

Maintain continuous stirring and heating during this step.

Add remaining Ethanol

4. Adding Ingredients

Papaya juice

Carrot juice extract

Beetroot juice

Neem juice extract

Glycerine

Steric acid

Sodium lauryl sulfate (SLS)

Menthol

Distilled water as per required

Rose essence

5. Final Step

Continue stirring and heating as you add the ingredients.

Once everything is thoroughly mixed, pour the resulting mixture into a soup mold.

Store well proper for 24 hr.[9]

TABEL OF INGREDIENT

	Ingredients	F1	F2	F3	USES
1	NaOH	7gm	7gm	7gm	Lye
2	Coconut oil	10ml	10ml	10ml	Fat
3	Bees wax	2gm	5gm	-	Hardner
4	Ethanol	30ml	30ml	30ml	Solvent
5	Papaya juice	10ml	10ml	5ml	Vit.A, vit.C, vit.E, Anti inflammatory,moisturization, Nourishment
6	Carrot juice extract	5ml	5ml	10ml	Antioxident
7	Beetroot juice	-	1ml	5ml	Anti aging, skin blemishes
8	Neem juice extract	1ml	2ml	-	Antibacterial
9	Glycerine	5ml	8ml	5ml	Humactant,Anti aging
10	Steric acid	4gm	4gm	4gm	Hardner
11	Sodium lauryl sulfate (SLS)	3gm	4gm	4gm	Foaming agent
12	Menthol	0.5gm	0.5gm	0.25gm	Cooling sensation
13	Distilled water	Q.s	Q.s	Q.s	Vehicle
14.	Rose essence	2-3	2-3	-	Fragrance and colour

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		drops	drops		

IV. EVALUATION TEST

1. Colour: Colour was checked against a white background by naked eye. [10]
2. Odour: Odour was checked by smelling. [10]
3. Appearance/shape: Checked by eye, it will be round, circle, rectangular shape. [10]
4. Weight determination: The weight is determined by using of digital weighing balance.[11]
5. Ph: ph is determined by using of ph meter. The ph was found to be in nature. Prepared formulation dissolved in 100ml distilled water and kept for 2hr. Ph measure of solution was done using a previously calibrated ph meter. [12,13]
6. Washing capability: Washing capability was checked using of water. [14]
7. Irritation of skin: The soap was applied on hand and mark this site, area and time noted. After 24 hr checked.Irritant effect, erythema, and edema on the surface of the skin. [10]
8. Moisture content: A soap sample weigh 10gm and note down as weight of wet sample (initial weight) take place in oven for some time at 115°c. After cooling weigh again (dry weight).[13]

   %weight=a-b/b×100

   A=initial weight b=dry
9. Foam forming ability: Take 1 gm of soap and dissolved in distilled water about 50 or 100 ml in graduated measuring cylinder. Shake measuring cylinder for 2-3 minutes and allowed to stand for 10 minute and check the height of the foam. Record the observation for three time and mean was take.[10]
10. Foam retention time: Prepared soap solution transferred into 100 ml measuring cylinder. Cylinder was shake for 10 times and foam volume was recorded at 4 to 5 minutes. [11]
11. Alcohol insoluble matter: 5gm of soap was take in conical flask, add 50 ml warm ethanol and shake until soap was dissolved. Solution was filtered using tarred filter paper with 20 ml of warm ethanol and dry at 105°c at 1 hour. Weight the dried paper with residue was taken. [11]

    % alcohol insoluble matter= weight of residue/weight of sample ×100
12. Determination of tfm (total fatty matter): 10 gm soap was dissolved in 150 ml distilled water and heat. 20ml solution of 15% h2so4 add while heating until clear solution was obtained. Fatty acid that are present onthe surface of the resulting into solution are solidified by add 7 gm beeswax and heat again. Cake removed and dry. Weight the sample. [15]

    % tfm= (weight of cake- weight of beeswax) in gm / weight of soap ×100

V. RESULT

	Parameters	F1	F2	F3
1	Color	Light pink	Pink	Brown
2	Odour	Rose	Rose	Aroma
3	Appearance/shape	Circle	Rectangular	Rectangular
4	pH	8.00	8.33	8.01
5	Foam hight	5cm	4.8cm	5cm
6	Irritation	Non Irritation	Non Irritation	Non Irritation
7	Weight determination	35gm	38gm	41gm
8	Moisture content	5.40%	5.10%	4.3%
9	Washing capability	Good	Good	Good
10	Alcohol insoluble matter	1.12	1.50	1.45
11	Determinitation of Total fatty matter	55%	48%	46%

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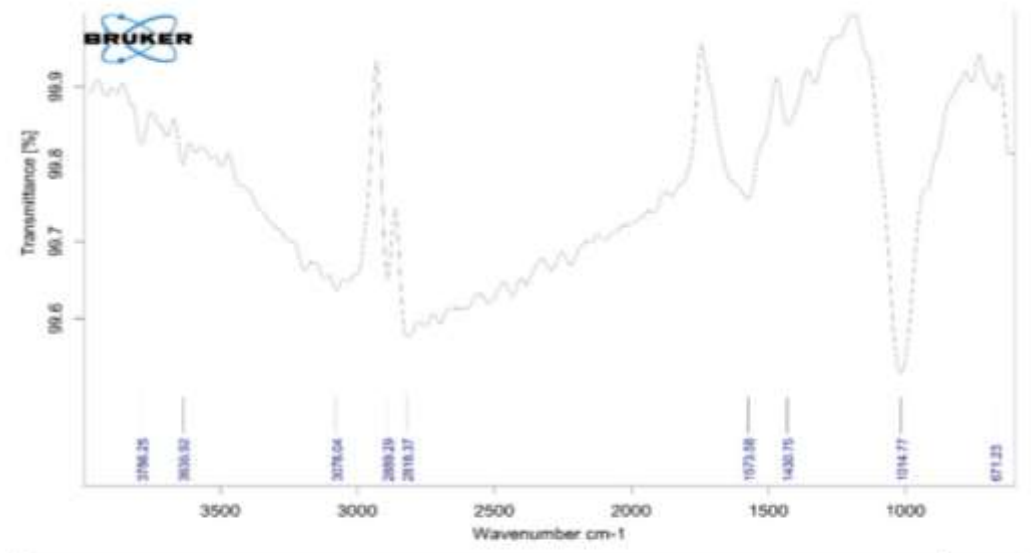
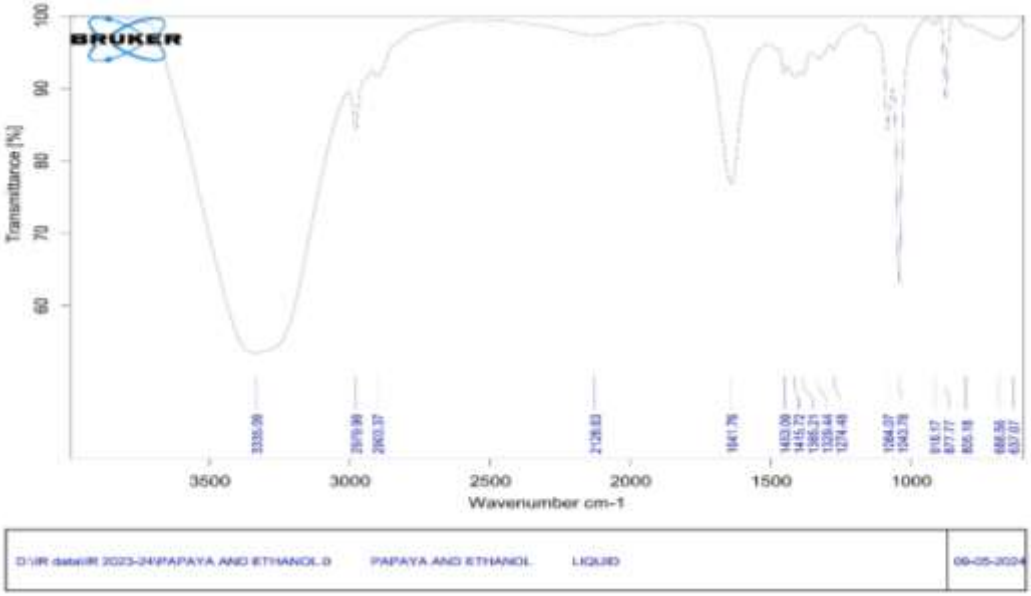
(F1) **(F2)** **(F3)**

IR Spectroscopy

IR spectroscopy of herbal samples identifies characteristic functional groups, detects contaminants, quantifies key compounds semi-quantitatively, and ensures quality and Authenticity Through Spectral Analysis**.**





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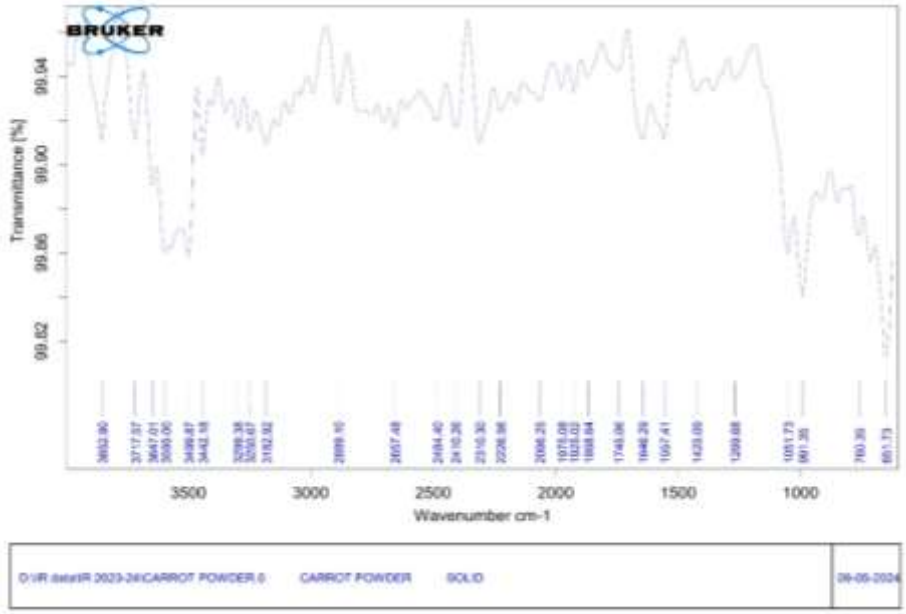

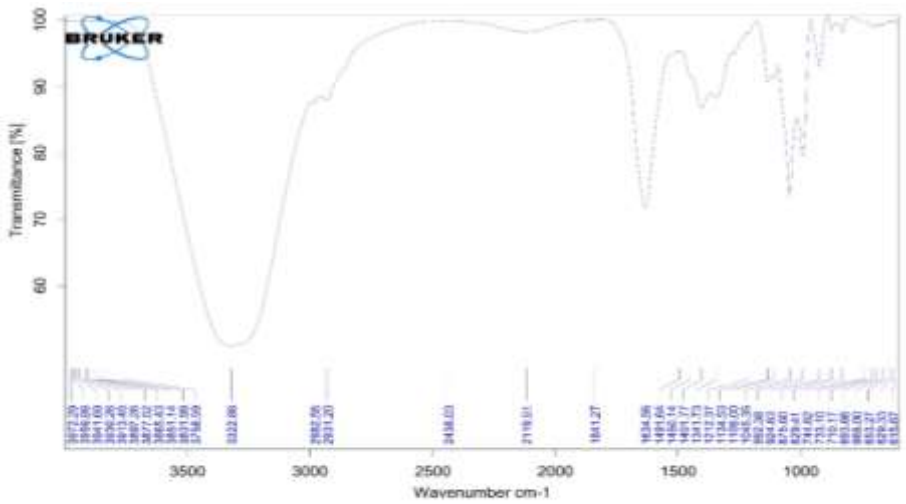

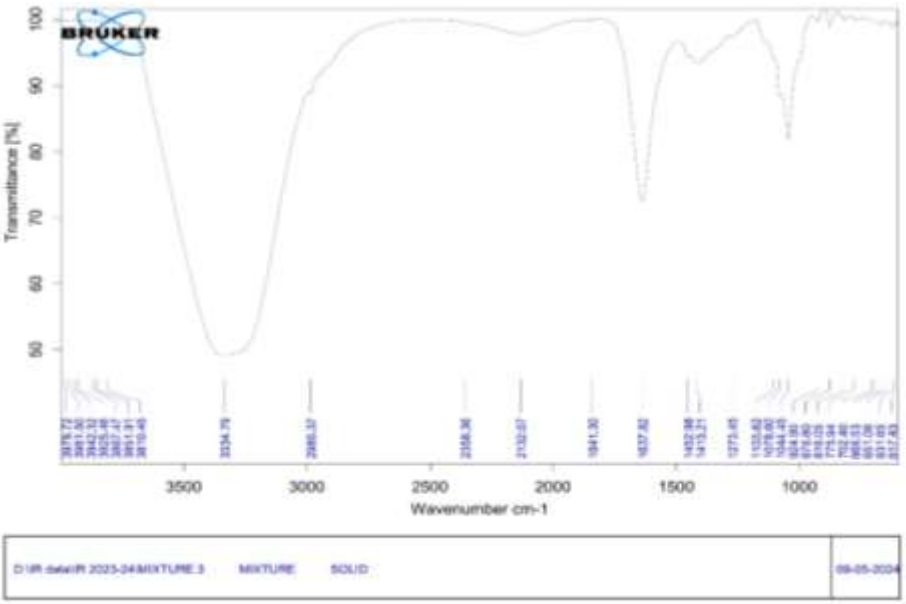

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VI. CONCLUSION

- Extraction Of Carrot And Neem Powder Using The Decoction Method With Ethanol As A Solvent.
- Made By The Cold Process Of Saponifiantion.
- Used polyherbal materials for the multi purpose use of soap.
- The Herbal Formulations F1 has light pink Colors And circular Shapes.
- Rose-like Fragrance.
- They Maintained A Neutral To Slightly Alkaline pH Around 8.
- Good Foaming Properties.
- Non-irritating Qualities,.

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