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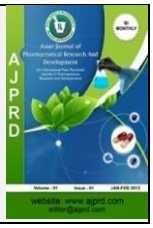

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Research Article

Formulation and Evaluation of Polyherbal Anti-Tanning Soap

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ABSTRACT

Among the three formulations, F3 showed the most Polyherbal soaps are topical formulations prepared using natural plant-based ingredients that offer both cleansing and therapeutic benefits for the skin. The present study focuses on the formulation and evaluation of a polyherbal soap incorporating herbal constituents such as Aloe Vera, Curcuma longa (turmeric), neem (Azadirachta indica), papaya (Carica papaya), and lemon (Citrus lemon). These herbs are well known for their antimicrobial, antioxidant, anti- inflammatory, and skin-nourishing properties. The soap was prepared using a melt-and-pour method, where a soap base was melted and blended with herbal extracts, essential oils, and excipients to obtain a uniform mixture, which was then poured into molds and allowed to solidify.The anti-tanning potential of the formulated soap was evaluated using B16F10 melanoma cells. Melanogenesis was induced by α-MSH stimulation, and the effects of soap extract on cell viability, intracellular melanin content, and cellular tyrosinase activity were assessed. The expression of melanogenesis-related proteins (MITF, TYR, TRP-1, and TRP-2) was also evaluated.

Balanced overall performance with good texture, pleasant odour, satisfactory pH, high foam height, and good washability. F2 also exhibited acceptable characteristics but had a slightly higher pH. F1 was more skin-friendly in terms of pH and foam retention; however, its rough texture and poor washability reduced its overall acceptability.

Keywords: Polyherbal soaps, Anti-Tanning Soap, natural plant-based ingredient

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INTRODUCTION:

Polyherbal anti-tanning soap is formulated using natural ingredients with skin-protective, antioxidant, and depigmenting properties.The formulation typicallyi ncludes herbal extracts such as turmeric (Curcuma longa), neem (Azadirachta indica), aloe Vera (Aloe barbadensis), and sandal wood (Santalum album),combined with a suitable soap base prepared by saponification of oils like coconut oil and castor oil using sodium hydroxide.(1) These herbs help reduce melanin formation, removetan, and protect the skin from UV-induced damage. Additives such as glycerin are incorporated to enhance moisturization, while essential oils improve fragrance and therapeutic value. The evaluation of the prepared soap involves physicochemical and functional tests. Parameters include pH (ideally 8–10 for skin compatibility), foam height and stability, moisturecontent,total fatty matter (TFM), and hardness.(2) Skin irritation testsare conducted to ensure safety, and antimicrobial activity may be assessed due to the presence of herbal constituents. Stability studies are also performed under different temperature conditions to evaluate shelflife.Overall, polyherbal anti-tanning soap offer sasafera lternative to synthetic products, with minimal side effects and added therapeutic benefits for maintaining healthy and glowing skin.(3).

SOAP:

Soap is a cleansing agent widely used for personal hygiene and skincare. It is typically prepared by the process of saponification, in which fats or oils react with an alkali such as sodium hydroxide to produce soap and glycerin. (4) Soaps play an essential role in removing dirt, sweat, microorganisms, and excess oils from the skin, thereby maintaining cleanliness and preventing infections. Depending on their composition, soaps can also provide additional benefits such as moisturizing, exfoliating, and antimicrobial action.Traditionally, soaps were made using animal fats and

natural plant oils, but modern formulations often incorporate synthetic additives, fragrances, and preservatives to enhance their performance and shelf life. (5) In recent years, there has been growing interest in herbal and polyherbal soaps, which utilize plant-based ingredients like aloe Vera, neem, turmeric, and essential oils. These natural components are valued for their skin-friendly properties and reduced risk of side effects. (6) Overall, soap is not only a basic hygiene product but also an important cosmetic preparation that contributes to skin health, protection, and overall well-being. (7)

HERBAL SOAP:

Anti-tanning herbal soap is a natural skincare formulation designed to protect the skin from the harmful effects of sun exposure and reduce tanning. Prolonged exposure to ultraviolet (UV) rays can lead to skin darkening, dryness, premature aging, and uneven complexion. Herbal soaps provide a safer and more skin-friendly alternative to chemical-based products, as they utilize plant-derived ingredients known for their therapeutic and protective properties. (8)These soaps are typically enriched with natural extracts such as aloe Vera, turmeric, neem, papaya, andlemon, which possess antioxidant, anti-inflammatory, and skin-brightening effects. Aloe Vera helps in soothing and moisturizing the skin, while turmeric and neem offer antimicrobial and healing properties. Papaya contains enzymes that aid in gentle exfoliation, and lemon acts as a natural bleaching agent to reduce pigmentation and tanning.(9)The growing awareness of the side effects of synthetic cosmetics has increased the demand for herbal formulations. Anti- tanning herbal soaps not on lycleanse the skin butalsonourish, repair, and enhanceits natural glow without causing irritation. There fore, they are widely preferred for maintaining healthy, radiant, and even-toned skin in a natural and eco-friendly manner.(10)

TYPES OF SOAP:

1. Natural/Herbal Soap
2. Liquid Soap
3. Moisturizing Soap
4. Anti-bacterial Soap
5. Chemical Free Soap
6. Foam Soap
7. Bar Soap
8. BodySoap(11)

APPLICATION:

Itisareliable andsafesubstitutefortraditional soap.

1. Severalepidermaldysfunctionsaretreatedwith Herbalsoap.
2. Psoriasis,acne,andeczemaallcontributeto Enhancing the immune response in the skin tissue Impacted by these conditions.
3. Acleansing agent used toeliminateoil and debris fromthe skin. (12)

MATERIAL AND METHOD:

1. AloeVera

DerivedfromatropicalcactusoftheAloegenus,Aloe Veraisknownforitshealingand soothing properties. The name comes from Arabic “Alloeh” (shining bitter substance) and Latin “Vera” (true). It belongs to the Asphodelaceae family.

Figure 1: Aloe Vera

Scientific Classification:

- Kingdom:Plantae
- Order:Asparaguses
- Family:Asphodelaceae
- Genus:Aloe
- Species:Vera

Chemical Constituents: Contains lignin’s, phytosterols, polyphenols, acetyl atedmannans, anthraquinones (like Emodin), and lectins, known for their biological activities.

Uses: Moisturizes, soothes, and heals the skin (13)

2. Curcumalonga (Turmeric/Haldi)

Figure 2: Curcumalonga

Aperennial herb from the Zingiberaceae family,Turm ericiswidelycultivatedin tropical and Subtropical regions, especially in India and China. It is known for its yellow rhizomes and Powerful medicinal properties.

Scientific Classification:

- Kingdom:Plantae
- Family:Zingiberaceae
- Genus: Curcuma
- Species: longa

Chemical Constituents:

Richincurcuminoids(curcumin,demethoxycurcumin,bisdemet hoxycurcumin)andessential Oils like turmerone, atlantone, and zingiberene.

Uses:

- Promotesanti-aging, moisturizing, scarreduction, and skin brightening
- Support sacnetreatment and wound healing(14)

3. Neem

- BiologicalSource:Azadirachtaindica
- Family:(Meliaceae)
- Usefulpart :leaves

- ChemicalConstituents:Azadirachtin, glycerides,Polyphenols,triterpenes
- Uses:CombatsskinInfections,soothes Irritation (15)

Figure 3: Neem

4. Papaya

- Biologicalsource:PapayaCaricaPapaya
- Family:(Caricaceae) Chemical Constituents: alkaloids, glycosides,tannins, saponins,
- Synonym: Caricaceae
- Useful part: Leaves
- Chemical constituents: Papain, flavonoid, Alkaloids,Vitamin A & C Uses: Anti-Tanning(16)

Figure 4: Papaya

5. Lemon

- Biologicalname:Citruslemon*(L.) Osbeck
- Family: Rutaceae
- synonyms:Lemon, Nimbu
- usefulpart: Fruit (juiceand peel)
- Uses: Richin vitamin C,used for digestion, immunity, flavouring, skincare, and as antiseptic
- Chemical constituents: Citric acid, ascorbic acid (vitaminC), flavonoids, limonene, essential oils
- History: Originatedin Southeast Asia; use dinancient India, China, and later Europe for medicine, scurvy prevention, and culinary purposes (17)

Figure 5: Lemon

Materials

Collection of ingredients:

This thesis deals with the formulation and evaluation of poly-herbal soap by using herbal ingredients i.e., Neem, Lemon juice, Honey, Turmeric, Saffron, Aloe Vera gel, Papaya leaves, and. Neem leaves were collected from local area and extracted through decoction process. Lemon, and Aloe Vera were purchased from local market and juice was collected. Turmeric and was purchased inthe form of powder.Saffron, coconut oil were also purchased from local market. (18)

MELT THE SOAP BASE:

Cut the soap base into small pieces and melt it in a double Boiler. Stir the soap base until it has melted to a smooth Consistency

Polyherbal soap formulation procedure:

To prepared poly-herbal soap, measure out the required amount of soap base into a 500 ml beaker and keep it heated over a water bath without stirring. Next, a liquid will be created out of the soap's foundation. Add to the above-mentioned mixture all of the ingredients.(19) You need to boil the mixture over a water bath without mixing it to get the proper combination. The soap-containing moulds were frozen for two to three hours after the mixture was poured into them. Remove the soap moulds from the freezer and let them sit for 5 minutes; the soap will develop in two to three hours. (20).

Composition of Formulation F1, F2, and F3:

Table 1: Quantity of ingredients

Sr.no	Ingredient	F1	F2	F3	Uses
1.	Papaya Leaves	2gm	2gm	1gm	Antioxidant
2.	AloeVera	10gm	5gm	5gm	Antibacterial
3.	TurmericPowder	1gm	1gm	0.5gm	Antiaging
4.	NeemPowder	5gm	3gm	2.5gm	Anti-Tanning
5.	LemonJuice	2ml	2ml	1ml	ReducesDarkSpots
6.	RoseOil	5 drop	7-8drop	9-10drop	FlavouringAgent
7.	VitaminECap	400mg	400mg	400mg	DeepMoisturizing
8.	SoapBase	50gm	70gm	90gm	Toformbase

EVALUATION PARAMETERS:

Physicalevaluation:

Organolepticcharacterslikeshape,odour,colour,appearancewas determined.

PH:

1gm of the soap was dissolved in10ml of Distilled water and the pH was determined using a digital pH.

Foam Height:

A sample of soap weighing 0.5 grams was obtained and mixed with 25 ml of distilled water. After that, pour it into a 100 ml measuring cylinder and add water until the volume reached 50 ml. After 25 strokes, the aqueous volume was measured up to 50 ml, and the foam height was measured above the aqueous volume.

Foam Retention:

A100mlgraduatedmeasuringcylinderwasfilledwith25mlofthe1 %soapsolution.Topofthe measuringcylinder was closed with our palm and shaken for4 minutes, the volume offoam was measured at one- minute intervals.

Skin irritation test:

Soapwasapplied overtheskin for10minutesandthereactionwas observedand recorded.

Determination of Total Fatty Matter:

By estimating the fatty acids that were produced when soap and acid reactedin the presence of hot water, TFM was computed.150 ml of distilled water was used to dissolve 10 g of the prepared soap,which was then heated.This was heated to produce a clear solution, then 20mlo f 15% H_2SO_4 was added. The surface fatty acids in the resultant solution are solidified byheating it again and adding 7 g of beeswax. Cake was formed. The cake thus obtained was dried and weighted to determine TFM by the following formula. % TFM = (Weight of the cake– Weight of the wax) in/Weight of the soap in g×100.(21)

Determination of total moisture content:

About 5g of the soap was taken in a petridish and dried in a hot-air oven at 105°C for 2 hours. Then it was heated, cooled and weighed. The difference in weight indicates moisture content.

Water content = m/Mx100 m=loss in mass of the material after drying = mass of sample taken.

Determination of percentage – Free alkali:

About 5 grams of soap and 50 ml of neutralized alcohol were taken in a conical flask .It was boiled in a water bath for 30 minutes by reflux method. It was allowed to cool at room temperature and 1ml of phenophthale in solution was added.It was then titrated with 0.1NHCl. Alcohol insoluble matter: About 5 grams of the soap was taken in a conical flask which is shaken with 50 ml of ethanol. It was then filtered and 20 ml of ethanol was added through the filter paper and it was dried then weighted. Percentage alcohol insoluble matter=Weight of the residue /Weight of sample x 100. The free alkali content decreased from F1 to F3. The optimized batch F3 showed the lowest free alkali value (0.10%), indicating better saponification and improved skin compatibility. Lower free alkali content reduces the risk of skin irritation and reflects the superior quality of the polyherbal anti-tanning soap.(22)

RESULT:

Polyhedral soap's organoleptic characteristics, includingcolour, order, appearance, and pH, were measured. The table presents the results of calculated parameters, which include total fatty matter, percentage-free alkali, alcohol insoluble matter, moisture content, foam height and foam retention. The soap doesn't cause any irritation to the skin.

DISCUSSION:

1. Organoleptic Test

Table 2: Organoleptic of Anti-tanning soap

Sr. No.	Parameter	F1	F2	F3
1	Colour	Dark greenish	Earthy brown	Earthy brown
2	Odour	Odour less	More floral	Creamy scent
3	Texture	Rough	Smooth	Smooth

The organoleptic evaluation showed noticeable differences among formulations. F3, the optimized batch, exhibited an earthy brown colour, pleasant creamy scent, and smooth texture. These characteristics indicate better consumer acceptability, improved aesthetic quality, and superior overall performance compared to F1 and F2.

Table 3: Physical evaluation

Sr.No.	Parameter	F1	F2	F3
1	Size	5cm.l & 3cm.w	6cm.l & 4cm.w	8cm.l & 6cm.w
2	Shape	Elliptical solid bar	Oval	Elliptical solid bar
3	Thickness	2.5cm	2.7cm	3.8cm

The physical evaluation of herbal anti-tanning soap formulations showed differences in size, shape, and thickness. Optimized batch F3 exhibited the largest dimensions (8 × 6 cm) and greatest thickness (3.8 cm), with an elliptical solid-bar shape, indicating improved appearance, handling, and consumer acceptability.

1. pH

Table 4 :pH evaluation result

Sr.No.	Batches	pH
1	F1	5.5
2	F2	6.8
3	F3	7.5

The pH evaluation of polyherbal anti-tanning soap formulations showed values of 5.5 (F1), 6.8 (F2), and 7.5 (F3). Batch F3 exhibited a near-neutral pH, making it more suitable for skin compatibility, stability, and user acceptability; therefore, it was selected as the optimized formulation.

2. Skin irritation

Table 5: Skin irritation

Sr.No.	Batches	Skin irritation
1	F1	No irritation
2	F2	No irritation
3	F3	No irritation

The skin irritation study showed that all three formulations (F1, F2, and F3) produced no signs of irritation on the skin. This indicates that the polyherbal anti-tanning soap is safe for topical application. F3 was selected as the optimized batch due to its overall superior evaluation results.

3. Foam Retention Foam Height

Table 6: Foam height

Sr. No	Batches	Foam retenti	Foam heig
1	F1	2.5min	3cm
2	F2	3.0min	2.5cm
3	F3	3.5min	4cm

The foam retention and foam height studies showed that formulation F3 exhibited the highest foam retention (3.5 min) and foam height (4 cm) among all batches. These results indicate better foaming ability, stability, cleansing performance, and user acceptability, making F3 the optimized batch

4. Washability

Table 7: Washability

Sr. No	Batches	Washability
1	F1	Poor
2	F2	Good
3	F3	Good

The washability test was performed to evaluate the ease of removal of the soap from the skin after application. F1, the trial batch, showed poor washability, indicating difficulty in rinsing. F2 showed good washability. The optimized batch, F3, also exhibited good washability, ensuring better user convenience and acceptability.

5. Total fatty matter & Total moisture content

Table 8: Total fatty matter & Total moisture content

Sr.No	Batches	Fatty matter	Moisture content
1	F1	70	17-18%
2	F2	75	15-16%
3	F3	78	10-12%

The table shows the fatty matter and moisture content of three polyherbal anti-tanning soap formulations. F1 and F2 were trial batches, while F3 was the optimized batch. F3 exhibited the highest fatty matter (78%) and lowest moisture content (10–12%), indicating better soap quality, hardness, stability, and skin-conditioning properties.

CONCLUSION

The formulated polyherbal anti-tanning soap showed satisfactory physicochemical properties, good cleansing ability, stable foam, and skin-friendly pH. Herbal ingredients provided anti- tanning, moisturizing, and antimicrobial effects without causing irritation. The study concluded that the soap is a safe, effective, economical, and eco-friendly herbal cosmetic product suitable for regular skin care

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