



Formulation, Evaluation, and Antioxidant Properties of Herbal Soap for Anti-Acne Treatment

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Abstract -

For generations, people have utilised herbal soap, a mild and natural cleaning solution, to enhance the health and wellbeing of their skin. With an emphasis on the antibacterial, anti-inflammatory, and skin-protective qualities of herbal soap, this research seeks to provide an overview of the body of research on these therapeutic qualities. A thorough examination of several herbal extracts that are frequently used to make soap, like neem oil dragon pulp and aloe vera, shows that they have the ability to protect against skin infections, relieve irritations, and moisturise the skin. The benefits of herbal soap for various skin problems, such as dermatitis, eczema, and acne, are also covered in the article. According to the research, using herbal soap as an adjuvant therapy can help manage a variety of skin conditions and preserve healthy skin. Prospects for future investigation and consequences for the creation of herbal soap

Key words - herbal soap, dragon fruit, skin, antiacne, antioxidant

Introduction –

The formulation of dragon fruit into a solid body wash or bar soap is covered in this paper. This product has the potential to support the sustainability movement and encourage a healthier way of living. The findings of this study are really valuable for developing as a thing that a community is able to produce. Peel from dragon fruit has a lot of antioxidants. because it contains polyphenols and other vital components that are good for your health. This dragon fruit peel's composition makes it an excellent choice to utilize as an ingredient in soap bar. In an effort to create a healthier product, there is currently a rise in interest in the manufacture of soap based on waste material (Hennessey-Ramos et al., 2019; Thirunavukkarasu et al., 2023; Wahyuni, 2021) and other goods based on dragon fruit. In 2020, Dewi et al. and Madane et al. One method of producing soap is saponification. Producing the oil neutralization in just two days, a procedure that can be understood by a community.

Skin :

The body's greatest sense organ is the skin. It collects sensory information from the environment and acts as a barrier to safeguard the body's organs. It also helps to maintain the body's temperature. at a sensible quantity. There are various unique cells and structures. under the skin. The three layers are the dermis, epidermis, and hypodermis. principal strata. Every layer adds something different to the way the skin overall composition [1]. Since skin gives the body a certain function wellbeing, we must avoid it in order to prevent skin conditions and alignments. Skin diseases are a common type of illness. It damages individuals of various age groups, from young children to the elderly, and does so in multiple in many ways. allergies, infections, and sun exposure, wounds, and more variables can all cause skin

problems [2]. People have used medicinal plants as a means of treatment since the beginning of time. The leaves, stems, and roots of several medicinal plants have been used as a natural remedy to treat a variety of illnesses and problems. Although numerous plant-based remedies have been supplanted by artificial substitutes, herbal remedies however, distinguish themselves by their efficacy and security. Many herbs have properties that include being antioxidant, antibacterial, cytotoxic, antimicrobial, hypotensive, anti-diuretic, anti-inflammatory, anti-spasmodic, anti-diabetic, anti-hemorrhagic, and antihelminthic. found to have a high nutritious content. Due of their advanced medical value, affordability, accessibility, and suitability, Adding natural components to a preparation aids in the treatment almost all illnesses and skin conditions [4]. The active ingredients that give these plants their medicinal properties are separated and applied topically to skin conditions in the form of lotions, soaps, oils, and ointments. ailments including ringworms, eczema, acne, and wounds both antimicrobial and cosmetic uses. The medicinal advantages of Plants are utilized in many different forms for both medicinal and for aesthetic reasons [5]

According to a WHO research, skin diseases account for an astounding 34% of all occupational disorders. Data from 2020 showed that the number of skin disease-related deaths in India was 17,857, or 0.21% of all deaths. Thus, The best course of action to address the situation is to include potentials of herbs in the recipe which have fewer adverse effects and offer beneficial treatment alternatives that are safer and less invasive. Thus, the creation of medicinal herbal teas is the main emphasis of this endeavor. soap that uses the active potentials of many plants, producing it soap that is both antibacterial and antioxidant that may be used regularly soap for bathing.

Soap:

A fatty acid salt called soap is utilized in many lubricating and cleaning goods. Surfactant soaps are typically used for bathing, washing, and other kinds of cleaning services.[2] Soaps are used to wash away debris, such as dust microbe that draws out odors from the body.[3] Toxic mercury is typically present in commercial soap. polymers, bisphenol, barium, aluminum, and other substances that enter the body through internal organs from the chemicals' vaporization as well as skin absorption with unfavorable side consequences.[4]

Herbal soap

Herbal soap is a remedy with antibacterial, anti-aging, anti-oxidant, and anti-septic effects. It is made from plant parts such as seeds and rhizomes. nuts and pulps to treat an injury or sickness attain health.

Dragon fruit is used in traditional Asian medicine to prevent and treat ailments (Sofowora et al. 2013). The pulp and The peels have high water content, are rich in fibers. They contain several nutrients, including a significant amount The number of vitamins, minerals, and antioxidants (Nurliyana et al. 2010; Perween et al. 2018). The dragon fruit plant has long days. It is a member of the family Cactaceae and genus *Hylocereus* (Morton 1987). Figure 3 displays the dragon fruit's systematic location Numerous names for the plant exist, including Belle of the Night, Cinderella plant, night-blooming cereus, dragon fruit, pitaya, and pitahaya (Perween et al. 2018). It is known as Thanh Long (Green) in Vietnam. Dragon). Among the names listed above, one of the most commonly The word pitaya, which means "scaly fruit" in Haitian, is used. due to the fruit's epidermis having bracts or scales (OrtizHernández and Carrillo-Salazar 2012).

Systematic classification of Dragon fruit :

Domain: Eukaryota

Kingdom: Plantae (Haeckel 1866)

Subkingdom: Tracheobionta Superdivision: Spermatophyta (Seed plants) (Willkomm 1854)

Division: Magnoliophyta (Flowering plants) (Cronquist et al. 1966)

Class: Magnoliopsida (Dicotyledons) (Cronquist et al. 1966)

Subclass: Caryophyllidae (Takhtajan 1966)

Order: Caryophyllales (Jussieu 1789 ex Berchtold and Presl 1820)

Family: Cactaceae (Cactus family) (Jussieu 1789)

Subfamily: Cereoideae (Schumman 1898 published in Schumann 1899)

Tribe: Hylocereeae (Buxbaum 1958)

Genus: Hylocereus (A. Berger) (Britton and Rose 1909)

.For millennia, people have utilized and appreciated aloe vera for its medical, cosmetic, and skin-care qualities. Aloe vera is now most commonly utilized in the field of cosmetics. There are 75 possibly active aloe vera components.

Curcuma longa offers UV protection, anti-aging, anti-wrinkle, moisturizing, antioxidant, astringent, anti-microbial, and anti-inflammatory benefits. Recent research show that curcumin is good. for wrinkles and can decrease the irritation. Formation of free radicles. [10]

For centuries, people have used almond oil to cure psoriasis and eczema, two disorders of the dry skin. The oil could improve acne scarring, lessen cell growth and repair solar damage [12] Cellular harm may arise from the increasing and frequent use of synthetic hand washing products during the COVID-19 epidemic. The use of artificial ingredients in soap has raised serious health issues for both people and the ecosystem. Consequently, the polyherbal soap made from natural resources to lessen the impact on the environment and enhance general health.

Materials And Method

Materials:

Active substances were gathered from local markets and various manufacturing companies. Morpheme Remedies Pvt.Ltd. - Neem oil. Almond grease bought from Oilex S.A., Rosewater bought from Vishal Personal Care Pvt. Ltd. bought some aloe vera gel. from Yours Essentially Pvt.Ltd. Turmeric and Multan clay are acquired from the neighborhood market.

Pharmacognostical Profile Of Active Ingredients

Table no 1: The active components' pharmacognostic profile.

Sr No	Name	Biological source	Parts	Chemical constituent	Uses
1	Dragon fruit	Selenicereus undatus	pulp	betacyanin, lycopene, vitamins (vitamin C mainly), dietary fiber, flavonoids, amino acids, phenolic acids, sugars and organic acids	Rich in antioxidants, skin whitening property.
2	Neem	Azadirachta indica (Meliaceae)	Seed	Azadirachtin, glycerides, poly phenols, triterpenes	Anti-bacterial, anti-septic
3	Aloe Vera	Aloe barbadensis (Liliaceae)	Pulp	Polymannans, anthroquinone, Cglucosides.	Moisturizer and anti- ageing
4	Almond	Prunus communis linn(Rosaceae)	Nuts	Protein, lipid, tannins, linolenic acid, amino acids.	Anti-oxidant
5.	Turmeric	Curcuma longa(Zingiberaceae)	Rhizome	curcumin, zingiberine	Anti-septic and anti-inflammatory.

Formulation for Soap Base

Table No. 2: Ingredient list for soap base

Sr no	Ingredients	uses
1	Glycerine	Moisturizer
2.	Coconut oil	Anti aging ,Moisturizer
3.	Caster oil	Manage acne,moisturizing, reducing inflammation
4.	Sorbitol, propylene glycol, citric acid	Increase moisture retention in skin

Cold process method:

Pour 75 milliliters of coconut oil into a 500 milliliter beaker to prepare the soap base. Put it on the water bath and bring the liquid to a boil so that a strong thickness at 40–45 degrees Celsius while stirring, and use to keep an eye on the temperature thermos. After that, weigh out some sodium hydroxide or Lye and add it to a clean beaker with purified water. Once more, use thermos. When the base consistency forms, add this solution to the coconut mixture and boil it between 40 and 45 degrees Celsius. After that, the mixture can be poured into soap. molds, then place it in the freezer for two to three hours. Remove the soap containing mold after two to three hours. take out of the freezer and give it five minutes without disruption, soap will eventually form.[17]

Poly Herbal Soap Formula

Table No. 3: Polyherbal Soap Formula

Sr no	Ingredients	B1	B2	B3	Uses
1.	Soap base(gm)	50	60	70	Remove dirt from skin
2.	Dragon fruit pulp(gm)	20	25	30	Antioxidant, skin whitening property
3.	Aloe vera gel (gm)	2	2	2	Antioxidant, antibacterial
4.	Neem oil(ml)	1	1.5	1	Skin conditioner, antibacterial
5.	Almond oil(ml)	1	1.5	1	Anti oxidants
6.	Turmeric (gm)	0.5	0.5	0.5	antiseptic
7.	Rose oil (ml)	5	5	5	Perfume

The procedure for formulating polyherbal soap

In order to make polyherbal soap, gather the necessary quantity of soap base in a 500 ml beaker and keep it there how hot the soap base should be heated bath of water without stirring. Next, the soap slurry will be becomes liquid Incorporate all of the ingredients into the mixture mentioned above. To get the right mixture, bring the mixture to a boil over a water

bath. without moving. Next, the blend was added to the soap. molds, then freeze the soap that has the molds for up to two three hours. After a couple of hours, take out the soap molds from After five minutes of freezing, soap will be developed.[17]



Soap base



Dragon fruit and other ingredients slurry



Preparation



Moulding



Marketed soap



Formulated soap

Analyzation Factors

1.Color and shape: The naked eye was used to examine the color and shape.

2.Odor: To test the formulation's scent, a preparation was applied to the hand and a perfume scent was detected.

3.pH: To measure the pH of the freshly made soap, one way was to touch a pH strip to it and another way was to dissolve one gram in ten milliliters of water using the digital pH meter's assistance.[18]

4.Foam Height: A sample of 0.5 grams of soap was obtained and mixed with 25 milliliters of distilled water. After that, put it in a 100 ml measuring cylinder and increased the volume to 50 ml in water. There were 25 blows administered, and they continue until up to 50 ml of aqueous volume was measured, and the It was measured how high the foam was above the aqueous volume.

5.Foam Retention: A 100 ml graduated measuring cylinder was filled with 25 ml of the 1% soap solution. Ten times, the cylinder was shaken while being covered with hands. The the amount of foam after four minutes at one-minute intervals was noted.[1]

6. Irritation: To treat it, wash your skin with soap for ten minutes. It is regarded as a non-irritating product if there is no irritation.[20]

Antioxidant Activity :

Determination of Anti-oxidant activity

Antioxidant activity in the sample compounds was estimated for their free radical scavenging activity by using DPPH (1, 1-Diphenyl-2, Picryl-Hydrazyl) free radicals (George et al., 1996). 100 μ L of test compounds water were taken in the micro titer plate. 100 μ L of 0.1% methanolic DPPH was added over the samples and incubated for 30 minutes in dark condition. The samples were then observed for discoloration; from purple to yellow and pale pink were considered as strong and weak positive respectively and read the plate on Elisa plate reader at 490nm. Radical scavenging activity was calculated by the following equation:

DPPH radical scavenging activity (%) =

$$\left[\frac{(\text{Absorbance of control} - \text{Absorbance of test sample})}{(\text{Absorbance of control})} \right] \times 100$$
 Antiacne activity :

MEDIA AND REAGENTS PREPARATION:

Antibiotic Assay Medium No. 19 (pH is 6.1 \pm 0.2):

Ingredients: Peptone 9.4, Yeast Extract 4.7 g, Beef Extract 2.4 g, Sodium Chloride 10.0 g, Dextrose 10.0 g, Agar 23.5 g, Water 1000 ml, pH after sterilization 6.1 \pm 0.1.

Prepared of medium Antibiotic Assay Medium No. 19 in 600 ml of purified water, heat boiling to dissolve the medium completely check the pH of media. If required add sufficient 1 M sodium hydroxide or 1 M hydrochloric acid, distributed in 200 ml flasks as required so that after sterilization as quantity as per required for analysis., sterilized by autoclaving it at 15 lbs pressure (121°C) for 15 min.

Preparation of the sample solution

Weigh 5.00 mg /10 mg of each sample and dissolve/dilute with 1 ml DMSO in volumetric flask. Vortex for 1-2 min to effect the dissolution use directly 100 μ l to inoculate.

Preparation of the STD solution

Weigh 1 mg of each sample and dissolve/dilute with 1 ml DMSO in volumetric flask. Vortex for 1-2 min to effect the dissolution use directly 100 µl to inoculate

Preparation of Test organism and suspension:

Test organisms

Propionibacterium acne ATCC no.11827

***Propionibacterium acne* ATCC no.11827**

Streak a loopful of suspension ATCC. 11827 on two slants of pre incubated Nutrient agar. Incubate the slants at 30-35°C for 24 hours in an incubator After incubation pick up the growth from incubated slant and inoculate in 3 ml of saline solution and vortex to prepare the uniform suspension. Adjust the O.D. of culture to approx. 60-70 % OD at 530 nm using sterile saline and calorimeter. After adjusting O.D. store the test organism in refrigeration at 2-8°C Note: Approximately viable count is 10⁹ to 10¹⁰ cfu/ml against 60-70 % O D at 530nm

Plate Preparation for analysis:

After the suspension is prepared, use each 2 ml of culture suspension of *Propionibacterium acne* is to inoculate separately in 200 ml of sterile molten and cooled medium at 40°C - 45°C Antibiotic Assay Medium No. 19. 15-20 ml of Sterilized agar medium is poured into a sterile Petri plate with the help of sterile measuring cylinder give a depth of 3 to 4 mm. Allow to cool at room temperature by placing the dishes or plates on a level surface. Keep plates in refrigerator for 15 to 20 minute for hardening. Ensure that the layers of medium are uniform in thickness. Make 4-5 agar cups on each plate using 8-10 mm SS borer. Label the plates for sample, standard and negative control samples and analysis details.

Analysis:

The volume of solution added to each cylinder or cavity must be uniform and sufficient almost to fill the holes when these are used.

Add 100 µl 1mg/ml Solution A to agar cup labeled as STD.

Add 100 µl 1mg/ml = Solution B to agar cup labeled for each compound ID labeled on plate.

Add 100 µl DMSO to agar cup labeled as N (Negative).

Leave the dishes or plates standing for 15-20 min. at 2-8°C or as appropriate, as a period of pre- incubation diffusion to minimize the effects of variation in time between the applications of the different solutions. Incubate them for about 24-48 hours at the temperature 30-35°C for bacteria and 20-25°C for yeast and mould. After completion of incubation accurately measure the diameters or areas of the circular inhibition zones and record the results.

Result and discussion :

The color, scent, form, pH, irritation, foam height, and foam retention of the polyherbal soap are all described in the table above. Each of the five formulations' colors were brownish-yellow. Each of the five formulations' aromas possessed an aroma. Each of the five formulations had a certain shape. round. According to assessment test formulation B3, this could be the most common formulation in contrast to others given that formulation B3's pH is 7.2, which is probably near the pH of the skin, and aside from froth, there is no irritation B3's retention and foamability may be significantly improved. compared to alternative formulations.

Sr.no	Parameters	B1	B2	B3
1.	colour	Purple	purple	purple
2.	odour	Aromatic	Aromatic	Aromatic
3.	shape	Circular	Circular	Circular
4.	pH	6.8	6.9	7.2
5.	Foam Height	2.0 cm	2.5cm	2.7cm
6.	Foam retention	2min 40 sec	2 min 56 sec	3 min 14 sec
7.	Irritation	No irritation	No irritation	No irritation


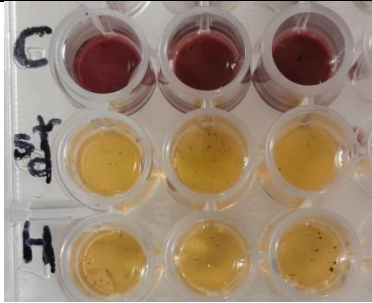


Sr. no	Sample	Concentration	Zone of inhibition (mm) <i>Propionibacterium acne</i>
1	Standard (acnestar soap)	1 mg	32
2	Herbal soap	5mg	04
		10 mg	10

Sr.no	Sample	Concentration	Absorbance (O.D)	Mean	Percent inhibition
1.	Control	-	2.015	2.016	-
			2.016		
			2.018		
2	Standard Ascorbic acid	1mg/ml	0.368	0.369	81.69
			0.369		
			0.372		
3.	Herbal soap	1mg/ml	0.475	0.477	76.33
			0.478		
			0.479		

Acne is a chronic skin disease that can occur in individuals of all ages, from neonates to adults, but the highest prevalence is observed during adolescence, with a peak incidence in 14-17-year-old females and 16-19-year-old males. The primary factors contributing to the development of acne include increased sebum production, follicular hyperkeratinization, colonization by the bacterium *Propionibacterium acnes*, and the occurrence of inflammation. One potential solution to address acne is the development of herbal-based medicines. Herbal plants have attracted a lot of attention because they have solved many problems related to several skin diseases caused by autoimmune factors. Indonesia, renowned for its diverse cultural heritage and abundant plant biodiversity, has a longstanding tradition of utilizing traditional remedies known as Jamu for a variety of beauty and health applications (Sugiarti et al., 2020)(Batubara & Mitsunaga, 2013). In this study, we aimed to evaluate the antiacne activity of a herbal soap formulation against the key acne-causing bacterium, *Propionibacterium acnes*. The herbal soap was developed using a combination medicinal plants known for their anti-acne properties.

The antioxidant activity of natural products has gained significant attention due to their potential health benefits and ability to mitigate oxidative stress (Pisoschi et al., 2009) (Pereira et al., 2022). One widely used method to assess the antioxidant capacity of a product is the DPPH (2,2-diphenyl-1-picrylhydrazyl) assay (Pereira et al., 2022). This method determines the ability of a compound to sequester free

radicals, based on the capture of the DPPH radical by antioxidants, producing a decrease in absorbance at 515 nm (Pereira et al., 2022) , In that study sample showed 76% antioxidant property as compared to ascorbic acid

 <p>Anti acne activity of herbal soap using <i>propionibacterium acne</i></p>	 <p>Antioxidant activity of herbal soap using DPPH method</p>
 <p>pH determination of herbal soap</p>	 <p>Formulation of herbal soap</p>

Conclusion :

Using a cold process approach, the obtained polyherbal soap was created with antibacterial and antioxidant properties. The antioxidant and antibacterial qualities may show signs because acemannan is present. Amygdalin and azadirachtin. The planned formulation B3, which included 2 grams of Aloe barbadensis gel, 2 milliliters of Azadirachta indica oil, and 70grams of soap base, was discovered to be a potential antibacterial polyherbal soap as well as antioxidant qualities. The additional clinical research Using this mixture can improve the use of polyherbal soap. The primary factor that makes polyherbal soap have the advantage of being chemical-free and superior to synthetic soaps. Therefore, the prepared polyherbal soap in this study work has anti-oxidant and antibacterial qualities that make it useful for a beauty regimen.

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