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Review Paper

A Review on Herbal Cosmetic Soap Formulation from Opuntia (*Ficus Indica*)

Pooja Sawant*, Vijay Shewale, Deepak Sonawane, Sunil Mahajan

Department of Pharmacognosy, Shreeshakti Shaikshanik Santhas, Divine college of pharmacy, Satana, Affiliated to Savitribai Phule Pune University, Pune, Maharashtra 423301, and India.

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ABSTRACT

This review looks at the amazing properties within the Opuntia Ficus-indica also known as A cactus and the prickly pear species that has drawn a lot of attention from the cosmetics sector because of its hardiness and rich bioactive profile. Opuntia is renowned for growing well in arid environments and has a special physiology that allows it to hold onto moisture and withstand harsh weather. Since moisture and antioxidant protection are crucial for skincare, these qualities translate into significant advantages. A wealth of vitamins, polyphenols, and essential fatty acids found in prickly pear fruit are proven to calm, shield, and revitalise skin. These natural substances also offer a safe, efficient substitute for synthetic additives, lowering the risk of irritation or negative side effects. This review explores the cultivation methods, extraction processes, and chemical composition of Opuntia, which makes it a perfect ingredient for herbal cosmetic soaps. It highlights the cactus's potential in a variety of applications, including hydration, anti-inflammatory action, and antioxidant support—all of which are essential for maintaining healthy, radiant skin. Considering the rising need for plant-based skincare items that are both sustainable and effective, Opuntia offers a promising avenue for developing efficient and long-lasting cosmetic formulations. Through examining the actual many Advantages of this hardy plant, this paper advances our understanding of how Opuntia Ficus-indica can support the skin's natural functions, promoting more research and innovation in natural cosmetics. The results highlight the versatility and promise of Opuntia as a foundation for future herbal cosmetic formulations that focus on both environmental consciousness and skin health.

INTRODUCTION

Herbal cosmetics derived from plant-based components have become more and more popular

***Corresponding Author:** Pooja Sawant

Address: Department of Pharmacognosy, Shreeshakti Shaikshanik Santhas, Divine college of pharmacy, Satana, Affiliated to Savitribai Phule Pune University, Pune, Maharashtra 423301, and India.

Email ✉: pooja.sawant1102002@gmail.com

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as a result of consumer demand for safer and greener products. The *Ficus indica*, or *Opuntia*, or prickly pear is, a kind of Cacti is a belonging to the family Cactaceae of cactus, which has been used for centuries in traditional medicine and beauty. In recent years, the cosmetics industry has become interested in its fruit because of its potent bioactive ingredients. Its high content of vitamins, polyphenols, and essential fatty acids, which have anti-inflammatory, antioxidant, and moisturising properties, makes *Opuntia* fruit an excellent addition to herbal cosmetic compositions. *Opuntia* fruit extract is a natural alternative to synthetic chemicals in soap manufacturing since it supports skin health while reducing the likelihood of irritation and adverse effects. This study examines the makeup of herbal cosmetic soap that contains *Opuntia Ficus-indica* fruit extract in order to better understand the extract's potential advantages for enhancing skin hydration and reducing oxidative stress.[1] The *Opuntia* is the biggest and the genus with the greatest distribution in the *Opuntioideae* subfamily. Only 10 to 12 species of the cactus pear the largest and most widely distributed genus are utilised for a range of purposes, such as fruit, soft leaves, colour extraction, fodder, etc. Among the most widely utilised cactus fruit species These include *Opuntia hyptiacantha*, *Opuntia amyclae*, and *Opuntia robusta*; wild species include *Opuntia Ficus-indica*, *Opuntia leucotricha*, *Opuntia xoconostle*, *Opuntia megacantha*, and *Opuntia streptacantha*. One of the species that is the majority of widely grown is *Ficus indica*, or *Opuntia* which has several applications. Owing to their enhanced as well as effective water utilisation, *Opuntia* species are commonly called plants with a Crassulacean Acid Metabolism (CAM) system. In the order to preserve the water content, CAM plants' stomata close opens during

the day and at night. when the outside temperature decreases. As a result, At night the CAM plants fix CO₂ and store it like malic acid which is then converted to CO₂ for photosynthesis during the day. Research into cactus fruit's chemical composition and nutraceutical properties has been conducted for a long time. Fruit that has 85% moisture, 15% sugar, 0.3% ash, and 1% protein tastes pleasant and has no particular smell. For every 100 grammes of calories, the fruit offers about 50 kcal. Dietary fibre has Vitamin C, 14% DV has DV of 23%, and The mineral magnesium has 21% DV. The amino acids found in cactus fruit include Aspartic and glutamic acids were discovered, together with arginine, alanine, aspartic, and glutamic to be greater, at about 200 mg/kg of *Opuntia Ficus-indica*. Many compounds, including flavonoids, ascorbic acid, pectin, carotenoids, and betalains, are responsible for the well-known antioxidant properties of *Opuntia* fruit. Because they include polyphenolic chemicals, which have more stable radicals than vitamins and reduce the body's oxidative damage to proteins, lipids, and DNA, flavonoids are mostly responsible for the antioxidant activity present in cactus fruit. Apart from flavonoids, betalacain is Among the crucial nutraceuticals present in fruit from cacti. Antioxidant action of cactus fruit is, also due to pigments that dissolve in water called betalains, especially betacyanin (from red to violet) and betaxanthins (from yellow to orange). [2] Additionally, several genera, like *Opuntia* and *Nopales*, have economically significant plant components. Cacti are used for a variety of purposes, including human consumption, cattle feed, raw materials for plywood, soap, dyes, glue, and adhesives; pharmaceuticals for the treatment of blood sugar and other conditions; and cosmetics like as body lotions, shampoos, and creams.[3]



Fig.1

Methods of collection and cultivation

Cultivation of Opuntia (Prickly Pear)

- **Climate & Soil Requirements:** Opuntia plants can survive in a variety of soil types, including sandy, rocky, and low-quality soils, and they flourish in arid and semi-arid areas with little water requirement. Nonetheless, for best growth, well-drained soils with a pH of 6.0 to 7.5 are required.
- **Propagation:** Opuntia is often propagated vegetatively, mostly by cladodes, also known as pads. Before being planted in damp soil, these pads are separated from the mother plant and let a week or so to heal (callus). Although this process is slower, seeds can also be utilised.
- **Plant Spacing:** Plants are usually grown three to five meters apart for commercial purposes in order to provide ample space for growth and facilitate harvesting.
- **Watering & Irrigation:** Opuntia tolerates drought, however fruit yield and pad quality are enhanced by sporadic irrigation during dry spells. It is best to avoid overwatering in order to avoid root rot.
- **Fertilization:** In general, opuntia needs very little fertiliser. However, to increase fruit yield, low-nitrogen fertiliser or some organic compost may be used during the growing season.
- **Pest & Disease Management:** Common pests like mealybugs and cochineal insects can be managed with organic insecticides or natural

predators. By preventing overwatering and making sure drainage is adequate, diseases like rot can be reduced.

Harvesting of Opuntia Fruit

- **Season:** Depending on the area, the fruit is usually picked in late summer or early fall.
- **Protective Gear:** Harvesters avoid the fruit's spines and tiny, hair-like glochids by wearing gloves and using long-handled tongs. Because glochids can irritate the skin, care must be taken
- **Harvesting Tools:** Harvesting by hand is the most popular technique. Without harming the plant, the fruit is twisted and separated from the pads using specialised instruments like fruit pickers or tongs. Large-scale tasks may occasionally be carried out using mechanised tools.
- **Maturity Indicators:** Depending on the variety, the fruit is deemed ripe when its skin becomes vividly red, yellow, or purple and becomes slightly softer to the touch. Fruit that is too ripe may break or fall off the plant.
- **Post-Harvest Processing:** The remaining glochids and spines are removed from the fruit with a gentle brush after it has been collected. Next, the fruit is arranged according to its quality and size. To ensure freshness, it is kept in cool, dry conditions until being consumed or processed into juice, jams, or other goods. [4,5,6].

Physicochemical analysis of opuntia fruit

1. Physical properties

Opuntia fruits are typically oval-shaped and slightly elongated; in technical terms, they are called fleshy berries. It weighs between 67 and 216 grammes per fruit. Colours of Opuntia fruit vary by species and include Purple, white, red, orange, and yellow. The amount of betalain that the Opuntia fruit contains determines its colour. The thick pericarp, which has tiny barbed spines, makes up the fruit of the Opuntia. The fruit's pulp includes tiny, inedible seeds. Thus, There are three types of fruit main sections: the pulp, seeds, and peel. Depending on the species, the seeds come in a range of sizes and shapes. Some cactus fruit species are devoid of seeds and spines. Opuntia varieties without spines are the fruits of these cacti. Every component of cactus fruit has multiple uses and applications. Pulp is the portion of the cactus fruit that can be eaten. A crucial consideration in industrial processing is the fruit pulp's yield. In the cactus fruit, the pulp content varied between 39 and 67%, the peel content between 30 and 55%, and the seed content between 2 and 10%. Depending on the type of Opuntia fruit, the pulp: peel: seed ratio varies.[2]

2. Chemical composition

The non-climacteric fruit of Opuntia plants is abundant in minerals, vitamin C, dietary fibre, and phytochemicals, which add to its nutritious content. Water makes up the majority of cactus fruit, despite the fact that water is essential in areas that are arid or semi-arid. The thick mucilaginous peel of the apple protects this water. The chemical

makeup of opuntia fruit differs between species and even depends on where it comes from. Opuntia fruit research has been conducted for many years. Various research sources' comparative analyses of the chemical contents of opuntia fruit pulp are shown in Table Opuntia fruit has a moisture content ranging from 84 to 94%, based on the data gathered. Because of their high moisture content, fresh fruits only last two to three at room temperature for many days. As a result, fresh fruit from a cactus marketing is extremely challenging. The protein content of opuntia fruit ranges from 0.2% to 1.6%. The fruit of the cactus contains amino acids that are unbound and known to include every important amino acid, according to earlier research. Proline is the most abundant of the essential amino acids (883.4–299.1 mg/L), followed by taurine (323.6–407.3 mg/L), glutamine (98.3–574.6 mg/L), and serine (130.6–392.6 mg/L). The amount of fat or lipids in cactus fruit pulp varies between 0.3% to 1%. Compared to the flesh, The Opuntia fruit's seeds have a significantly higher fat content. 98.8 g of total lipids are produced from one kilogramme of seed. As the linoleic acid main polyunsaturated acid found within pulp and seed oil. The cactus fruit's ascorbic acid content might vary from 1 to 41 mg/100g. Because of its ability to scavenge free radicals, ascorbic acid shields the body from oxidative stress. According to research, ascorbic acid accounts for between 30% and 40% of the fruit's overall antioxidant activity.[2]

Table no.1

Sr. No.	parameter	Value per 100g
1.	Moisture	83-95
2.	Protein	0.2-1.6 g
3.	Fat	0.09-1.7 g
4.	Ash	0.3-0.51 g
5.	Fiber	0.02-3.1 g
6.	Total sugars	8-17 g
7.	Ca	12.8-59 g
8.	Mg	16.1-98.4 g
9.	Na	0.6-1.1 mg



10.	K	90-217 mg
11.	Pe	15-32.8 mg
12.	Fe	0.4-1.5 mg
13.	Acid	1-41 mg
14.	°Bx	11.5-17
15.	pH	5.0-7.1
16.	Tritable acidity (%)	0.01-0,25

1. **Moisture Content:** Opuntia fruit has a relatively high moisture content, usually between 80% and 90%, which adds to its refreshing properties and low-calorie density. Its nutritional profile and consumer attractiveness are significantly influenced by its high moisture content.[7]
2. **Carbohydrates:** The percentage of carbohydrates ranges from 6% to 12%, with simple sugars like fructose and glucose making up the majority. Because of its low glycaemic index, opuntia fruit is a good choice for people who are watching their blood sugar levels.[8]
3. **Fiber:** About 3 to 6 grammes of dietary fibre are present in 100 grammes of fresh opuntia fruit, making them an important source of fibre. Prickly pears' soluble fibre can help control cholesterol levels and facilitate digestion.[9]
4. **Vitamins:** Vitamins, particularly vitamin C, are abundant in the fruit, with 14–30 mg per 100 grammes. B vitamins, such as thiamine, riboflavin, and niacin, are also present and are necessary for a number of metabolic functions.[10]
5. **Minerals:** Potassium levels in opuntia typically range from 200 to 300 mg per 100 grammes, while other essential minerals include calcium, magnesium, potassium, and iron. It is advantageous to maintain electrolyte balance with this mineral composition.[11].
 - **Total Ash Content:** Using a specific technique, the extract was carefully weighed after being ignited and tarred in a crucible to ascertain the total amount of ash present. Then, in a muffle furnace, the material was spread out uniformly and heated gradually to 600°C until it turned white, indicating the absence of carbon. The crucible was weighed after cooling in a desiccator.[12]. The total amount

of ash in the dry materials was calculated as follows:

$$\text{Total Ash} = \frac{\text{Total Ash Weight}}{\text{Sample Weight}} \times 100$$

3. Bioactive compounds

- **Antioxidants:** Bioactive substances that have antioxidant qualities, including flavonoids, phenolic acids, and betalains, are found in opuntia fruit. These substances are necessary for lowering the body's levels of inflammation and oxidative stress.[13].
- **Anti-inflammatory Properties:** Opuntia fruit extracts have been found to have anti-inflammatory properties, suggesting a possible use in the prevention and treatment of chronic illnesses.[14].

Important physical and chemical characteristic of cactus pear fruit

Prickly pear, tuna, or fico d'india are other names for the cactus pear fruit, which is an oval, elongated berry weighing between 67 and 216 grammes. According to betalains, they come in a variety of colours, including white, yellow, orange, red, and purple. They are composed of roughly 85% water, 15% sugar, 0.3% ash, and less than 1% protein. With 150–300 inedible seeds and a luscious pulp, the thick pericarp is coated in tiny, sharp spines. On a weight basis, the latter make up 3–7%, followed by the edible pulp (39–64%), the pericarp, and the mesocarp (36–48%). The seeds, peel, and pulp of cactus pear fruits can therefore be separated into three parts that can be used for commercial processing.

Seeds

Endosperm seed polysaccharides that have been separated and purified exhibit the presence of either

free arabinan or arabinan-rich polysaccharides linked to rhamnogalacturonan type I blocks.

Peel

According to reports, the peel often has a higher acidity than the pulp, with pH levels ranging from 5.4 to 5.8.

Pulp

Natural acids and sugars Glucose and fructose are the main carbohydrates in a ratio of roughly 1:1, depending on invertase activity, and total soluble solids vary from 12 to 17°Brix. This bland taste is caused by the pulp's high sugar content, which results in sugar: acid ratios between 90:1 and 490:1, which is far from the sensory-pleasing ratio of 10 to 18.

Cactus pears are classified as low-acid foods (pH > 4.5) due to their high pH, which ranges between 5.6 and 6.5 in completely ripe fruits, resulting in a relatively low acidity of roughly 0.05% to 0.18% citric acid.

The main organic acid in cactus pear is citric acid (62.0 mg/100 g fruit weight), which is followed by malic acid (23.3 mg/100 g), quinic acid (19.1 mg/100 g), and shikimic acid (2.8 mg/100 g). Oxalic acids are also common. Only trace amounts of isocitric, fumaric, glycolic, and succinic acids were detected.

Vitamins and minerals

Fruits of many *Opuntia* species often contain significant levels of ascorbic acid, ranging from 10 to 410 mg/kg. Ascorbic acid levels in the most widely grown *Opuntia Ficus-indica* (L.) Mill. range from 180 to 300 mg/kg. As a result, cactus pear has more ascorbic acid than other common fruits like apples, pears, grapes, and bananas. However, it may only contain trace amounts of other vitamins like niacin, thiamine, carotenoids, and riboflavin. Calcium (up to 59.0 mg/100 g) and magnesium (up to 98.4 mg/100 g) are abundant in cactus pear pulp, but sodium, potassium, iron, and phosphorus levels are within the normal range for fruits.

Polyphenols

Recent reports have indicated that the pulp contains polyphenols. It was discovered that the main flavonoids in cactus pear pulp were quercetin, kaempferol, and isorhamnetin derivatives. Nevertheless, additional thorough research should be planned in order to completely evaluate the phenolic

makeup of cactus pear fruits that have been overlooked thus far.

Pigments

The pigment contents of cactus pear pulps range from 66 to 1140 mg/kg of fruit pulp, and their betalains give them a variety of colours, from white to purple. Both red betacyanins and yellow betaxanthins are present in cactus pear fruits, with betaxanthin: betacyanin ratios ranging from 0 to 11.7, producing a range of colour hues. Remarkably, fruits that only contain betaxanthins.[15].

Total polyphenolic contents

TPC was calculated using the Folin-Ciocalteu reagent using a modified technique. In a test tube, 500 µl of distilled water, 125 µl of Folin-Ciocalteu reagent, and 125 µl of *Opuntia* extract were mixed together. Following three minutes, 1250 µl of 7% Na₂CO₃ was added, and three millilitres of distilled water were used to adjust. Three hours were spent incubating this combination at room temperature in the dark. Next, at 760 nm, the absorbance was measured. The results were reported as gallic acid equivalent (GAE) in milligrammes per gramme of dried plant extract. The outcomes were tested in triplicate.[16].

Total flavonoids contents

Using the aluminium chloride approach, TFC was calculated. In short, 150 µl of AlCl₃ and 6H₂O were added after 250 µl of *Opuntia* extracts and 75 µl of NaNO₂ (5%) had been incubated for 6 minutes at room temperature. Following five minutes of incubation, 500 µl of NaOH (1 M) was added to the mixture. Distilled water was added to the solution until the volume reached 2500 µl. At 430 nm, the total flavonoid concentration was measured using spectrophotometry, and the results were reported as mg of catechin equivalent/g of dry extract. Three duplicates of the test were conducted.[17]

Tannin contents

Tannin contents were calculated using the techniques with few alterations. 3 ml of vanillin (4% in methanol) and 1.5 ml of HCl were combined with 300 µl of extract. Following a 15-minute incubation period, the absorbance at 500 nm was measured. In milligrammes of catechin per gramme of dried extract, the results were reported. The findings were conducted in triplicate.[18].



Medicinal uses of opuntia fruit

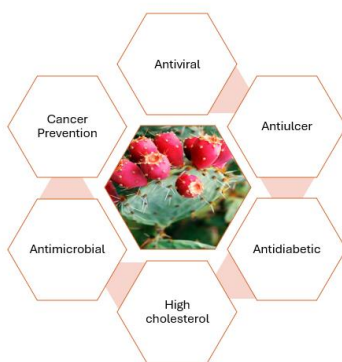


Fig.No.2

Extraction of crude drug Procedure

1. Preparation of Fruit

- Washing and Cleaning: Wash the Opuntia fruit well to get rid of any impurities, grime, or spines.
- Peeling: The pulp can be accessed by carefully removing the skin.
- Pulp Collection: The betalain pigments are found in the pulp, which is removed by cutting the fruit open.

2. Pulp Grinding

- Blending: Put the pulp in a blender or grinder and process until a smooth puree is formed. In order to better release the pigments, this phase aids in the breakdown of the cell walls.

3. pH Adjustment for Stability

- Buffer Solution: The pH of the buffer solution should be kept between 5 and 6, since betalains are best stable in slightly acidic environments. In order to keep betalain from degrading during extraction, pH adjustment is essential.

4. Aqueous Extraction

- Solvent Addition: A ratio of roughly 1:3 (one part pulp to three parts water) should be used when adding deionised water to the pulp. This

aids in the extraction of betalains because they dissolve in water.

- Maceration: To improve pigment release, let the mixture remain at room temperature for 30 to 60 minutes, swirling or shaking occasionally.

5. Filtration

- Filtration: To separate the liquid extract from the pulp remnants, pass the mixture through a centrifuge, filter paper, or fine sieve. It is advised to centrifuge (for example, 4000 rpm for 10 minutes) in order to eliminate fine particles and enhance clarity.

6. Optional Solvent Addition for Stability

- A modest amount of ethanol or methanol (5–10%) added to the extract can help maintain the betalains by decreasing microbial activity and improving pigment stability if longer-term stability is needed.

7. Concentration

- Rotary Evaporation (if needed): Reduce the volume using a rotary evaporator at low temperatures and low pressures to produce a more

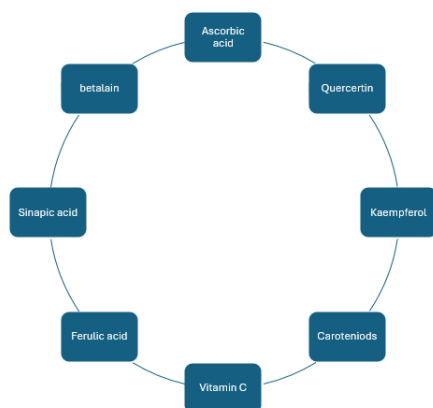
concentrated extract. This process could intensify the pigment.

8. Storage

- o Dark, Cool Storage: To shield it from light, store the finished betalain extract in amber containers and preserve it at 4°C. Betalain pigments are susceptible to degradation by heat and light, thus proper storage conditions are crucial. [19,20,21].

Antioxidant compounds present in Opuntia Fruit

The antioxidant properties of opuntia fruit are also well-known. Vitamin C and a number of bio compounds, including flavonoids, phenolic compounds, and betalains, are responsible for the antioxidant action of opuntia fruit. Glycosylated flavanols, dihydro flavanols, flavanones, and flavanols are among the flavonoids found in Opuntia fruit. According to research on phenolic compounds and flavonoids, flavonoids have higher antioxidant activity than vitamins because they can produce stable radicals that can postpone the pro-oxidative effects on lipids, proteins, and DNA. The body is known to benefit from the antioxidant activity found in cactus fruit.



FigNo. 3

The violet-red colour of cactus fruit is mostly attributed to the presence of betalains. Water-soluble colouring pigments known as betalains have a reddish-violet hue. The sources of betalains, such as amaranth and beetroot root, are extremely limited. Cactus fruit is therefore one of them. Betacyanin, which is reddish-violet, and betaxanthins, which are yellow, are both found in cactus fruit. Betanin content in beetroot root is about 50 mg/100g, while purple cactus pear juice has 100 mg/100g of fresh weight. Some cactus fruit species, such as *O. stricta*, had a betacyanin level of 80 mg per 100 g of fresh weight. It is well

known that betalains exhibit greater antioxidant activity than rutin, ascorbic acid, and catechin. Compared to ascorbic acid, its antioxidant value is two to three times higher. In of antioxidant activity, cacti outperform apples, pears, tomatoes, bananas, and white grapes. They are also in the same order as pink grapefruit, oranges, and red grapes. Three highly important flavonoids found in cactus fruit include isorhamnetin, kaempferol, and quercetin. The flavonoids listed above are the main source of the antioxidant effect in cactus fruit.[2].

Table no. 2 [22,23,24,25]

Antioxidant Compound	Category	Function/Effect
Betalains	Pigments-based Antioxidants	Anti-inflammatory, free radicals' scavenger
Betacyanin	Betalain Subcategory	Red-purple pigments Antioxidant enhance cellular protection
Betaxanthins	Betalain Subcategory	Yellow pigments, Antioxidants, Support enzymatic activity
Ascorbic Acid (vitamin C)	Vitamin based Antioxidant	Enhance immune function, protects against oxidative stress
Polyphenols	Phenolic Compounds	Reduces oxidative stress, improve heart health
Flavonoids	Subcategory of polyphenols	Anti-inflammatory, supports cellular health
Tannins	Subcategory of polyphenols	Antimicrobial, helps in cellular repair
Carotenoids	Pigments based Antioxidant	Protects skin, improves vision antioxidant
Alpha Tocopherols (Vitamin E)	Vitamin-based Antioxidant	Prevents lipid peroxidation, protects cells from free radicals

Methods of preparation

- Put the required quantity of soap base in a beaker.
- Adjust and maintain the temperature while using a water bath to heat the soap base.
- Heating the soap base will turn it into a liquid.
- The ingredients indicated in the formulation table should then be added.

- Heat the mixture in a water bath until it boils
- Make sure you have the right mixture without stirring.
- This mixture is poured into the soap mould.
- It cooled at room temperature for a few hours

Formulation of opuntia fruit

Table no. 3

Sr. No.	Ingredients	Roles
----------------	--------------------	--------------

1.	Opuntia extracts	Antioxidant, Anti-inflammatory
2.	Glycerine soap base	Radiant Complexion
3.	Honey	Moisturizing
4.	Turmeric	Antiseptic
5.	Vitamin E oil	Preservative
6.	Rose water	Fragrance

Evaluation parameter Determination of Organoleptic Characteristics:

The colour and clarity were examined visually on a white backdrop, and the fragrance was detected.

Determination of size and shape:

In order to prepare soap bars, a round soap with a diameter of 8.4 cm and a thickness of 2.6 cm was used. Since this size is perfect for frequent application to the body's afflicted skin areas, it was selected.

Weight determination:

A digital weighing balance was used to determine the weight.

Foam Height:

25 ml of distilled water was used to dissolve 0.5 g of the soap sample. Once in a 100 ml measuring cylinder, it was filled with water to reach a volume of 50 ml. 25 strokes were administered, followed by standing until the aqueous fluid reached 50 ml and the foam height above the aqueous volume was measured.

Foam Retention:

The 1% soap solution was prepared in 25 millilitres and then put into the 100-millilitre measuring cylinder. The cylinder was then shaken ten times. For four to five minutes, the foam volume was measured at one-minute intervals.

pH Test:

All of the formulations underwent the pH test. A digital pH meter was used to measure the pH of each soap solution formulation after it had been dissolved in 20 millilitres of distilled water. All of the formulations' pH values were measured using the previously calibrated pH meter.

Alcohol insoluble matter:

To dissolve the 5g of soap, 50ml of warm ethanol was poured to a conical flask, and the mixture was agitated rapidly. The solution was dried for one hour at 105 °C after being filtered through tarred filter paper with 20 millilitres of warm ethanol. The dry paper containing residue was weighed.

Formula: % Alcohol insoluble matter = $\frac{\text{Wt. of residue} \times 100}{\text{wt. of sample}}$

High-temperature stability:

For one-week liquid soap was kept at 50°C. Liquid soap's stability was noted during this time. It was determined that the sample that was homogenous and stable after standing was stable, whereas the sample that had crystals that were roughened and precipitation that resulted in liquid soap was unstable.

Anti-microbial test:

The agar well diffusion standard cup plate method was used to screen for antimicrobials in the produced soap. *P. aeruginosa*, *S. aureus*, and *E. coli* were the organisms employed. Five millilitres of sterile water were combined with one gramme of soap.[27].

Skin Irritation test:

To determine the irritancy test, apply the soap sample to clean skin and watch for irritation symptoms like burning, redness, or itching. The scenario was tracked for 24 hours.[28].

CONCLUSION:

Opuntia ficus-indica, also known as prickly pear, has great potential as a main component of herbal cosmetic soap since it has antioxidant, calming, and moisturising properties. Because of its natural

bioactive ingredients, it is a safe and efficient substitute for artificial chemicals, meeting the increasing need for environmentally friendly skincare products. Opuntia's adaptability is highlighted in this assessment, which also urges more creativity in creating plant-based, sustainable cosmetic formulas.

REFERENCES

- Butera D, Tesoriere L, Di Gaudio F, Bongiorno A, Allegra M, Pintaudi AM, et al. Antioxidant activities of Sicilian prickly pear (*Opuntia Ficus indica*) fruit extracts and reducing properties of its betalains: Betanin and Indica xanthin. *J Agric Food Chem*. 2002;50(23):6895–6901.
- Patil KV, Dagadkhair AC. Physicochemical characteristics and antioxidant potential of *Opuntia* fruit: A review. *Seeds*. 2019; 2:10.
- Singh G. General review of *Opuntias* in India. *Journal of the professional association for cactus development*. 2003 Jan 1; 5:30-46.
- Barbera G, Inglese P, Pimienta-Barrios E. Argo-ecology, cultivation, and uses of cactus pear. *FAO Plant Production and Protection Paper 132*. Rome: Food and Agriculture Organization of the United Nations; 1995.
- Nobel PS. *Cacti: Biology and uses*. Berkeley: University of California Press; 2002.
- Felker P, Moss JR. Production, use and development of cactus (*Opuntia* spp.). *J Arid Environ*. 1996;33(3):345–54.
- Silva R, Pires T, Pereira M, Lima D, Azevedo F. Physicochemical properties of *Opuntia ficus-indica*: A review. *Cienc Agrotecnol*. 2020; 44:1-13.
- Hernández-Ledesma B, Hincapié M, Amigo-Benavent M. Cactus pear (*Opuntia* spp.) as a source of functional ingredients: a review. *Food Res Int*. 2015; 76:44-56.
- Pino J, Márquez J. Prickly pear (*Opuntia*) as a functional food: a review of its nutritional and health-promoting properties. *Cienc Agrotecnol*. 2022; 46:215-227.
- Giner S, Pérez-Alonso J, Morales C, et al. Nutritional composition of prickly pear fruits: A comparative study of different cultivars. *Food Chem*. 2015; 178:261-267.
- Salgado-Ceballos H, García-Pérez J, Martínez-Ayala A. Physicochemical and sensory characterization of prickly pear (*Opuntia*) jam. *Rev Mexicana de Ciencias Alimentarias*. 2021;14(3):256-265.
- Departemen Kesehatan RI. Direktorat Jendral Pengawasan Obat dan Makanan. Parameter Standar Umum Ekstrak Tumbuhan Obat. 2000.
- Espinosa-Pérez J, López-Basave R, Hernández-Munoz J. Functional properties of prickly pear (*Opuntia* spp.) seed oil: a review. *J Food Sci*. 2018;83(4):959-970.
- Badran M, Amrani-Alaoui M, Houssaini S, et al. Bioactive compounds and functional properties of prickly pear (*Opuntia Ficus-indica*) extracts: A review. *Food Function* 2020;11(10):9503-9518.
- Moßhammer MR, Stintzing FC, Carle R. Cactus pear fruits (*Opuntia* spp.): A review of processing technologies and current uses. *Journal of the Professional Association for Cactus Development*. 2006 Jul; 8:1-25.
- N. Cicco, M.T. Lanorte, M. Paraggio, M. Viggiano, V. Lattanzio, A reproducible, rapid and inexpensive Folin-Ciocalteu micro method in determining phenolics of plant methanol extracts. *Microchem. J*. 91, 107–110 (2009).
- I. Palacios, M. Lozano, C. Moro, M. D'Arrigo, M.A. Rostagno, J.A. Martínez, A. García-Lafuente, E. Guillamón, A. Villares, Antioxidant properties of phenolic compounds occurring in edible mushrooms. *Food Chem*. 128, 674–678 (2011).



18. Zourgui MN, Hfaiedh M, Brahmi D, Affi W, Gharsallah N, Zourgui L, Amri M. Phytochemical screening, antioxidant and antimicrobial activities of *Opuntia streptacantha* fruit skin. *Journal of Food Measurement and Characterization*. 2020 Oct;14:2721-33.
19. Castellar, R., Obón, J. M., Alacid, M., & Fernández-López, J. A. (2003). "Color properties and stability of betacyanins from *Opuntia* fruits." *Journal of Agricultural and Food Chemistry*, 51(9), 2772-2776. doi:10.1021/jf021066i.
20. Stintzing, F. C., & Carle, R. (2005). "Cactus pear: A source of pigments, vitamins, and antioxidants." *Trends in Food Science & Technology*, 16(9), 429-435. doi:10.1016/j.tifs.2005.07.005.
21. Tesoriere, L., Allegra, M., Butera, D., & Livrea, M. A. (2005). "Absorption, excretion, and distribution of dietary antioxidant betalains in LDLs: Potential health effects of betalains in humans." *The American Journal of Clinical Nutrition*, 82(5), 1156-1162. doi:10.1093/ajcn/82.5.1156.
22. Butera, D., Tesoriere, L., Di Gaudio, F., Bongiorno, A., Allegra, M., Pintaudi, A. M., Kohen, R., & Livrea, M. A. (2002). Antioxidant activities of Sicilian prickly pear (*Opuntia ficus indica*) fruit extracts and reducing properties of the purified betalain indicaxanthin in human low-density lipoproteins. *Journal of Agricultural and Food Chemistry*, 50(23), 6895–6901.
23. Castellar, M. R., Obón, J. M., Alacid, M., & Fernández-López, J. A. (2006). Color properties and stability of betacyanins from *Opuntia* fruits. *Journal of Agricultural and Food Chemistry*, 54(2), 717–723
24. Kutí, J. O. (2004). Antioxidant compounds from four *Opuntia* cactus pear fruit varieties. *Food Chemistry*, 85(4), 527–533.
25. Aruwa, C. E., Amoo, S. O., & Kudanga, T. (2018). Phenolic compound profile and biological activities of Southern African *Opuntia ficus-indica* fruit extracts. *LWT*, 95, 311–318.
26. Arun SK. FORMULATION AND EVALUATION OF HERBAL SOAP. *World Journal of Pharmaceutical Research*. 2023 Apr 10;12(9):2136-47.
27. Devi AS, Sivani DV, Anusha D, Sarath G, Sultana SM. Formulation and Evaluation of Antimicrobial Herbal Soap. *International Journal of Pharmaceutical Sciences Review and Research*. 2021;71(2):122-5.
28. Talreja S, Tiwari D, Bharti A. Formulation and evaluation of herbal soap by using *Moringa oleifera* as main active constituents. *European Chemical Bulletin*. 2023; 12:2121-41.

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