

# Formulation And Evaluation of Herbal Orange Peel Soap

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**Abstract**— The primary objective of the current study was to formulate and evaluate an herbal soap incorporating orange peel powder. The soap was developed using the melt and pour technique with ingredients including a soap base, turmeric, vitamin E, orange peel powder, and rose water. The prepared formulation underwent comprehensive evaluation based on various parameters such as physical appearance, pH, foam height, foam retention, color, fragrance, and alcohol-insoluble matter. The soap demonstrated a neutral pH and was found to be non-irritating to the skin. Foam production and stability were observed to be satisfactory, indicating good lathering properties. The final product exhibited a dark brown coloration with a pleasant orange aroma. Results suggest that the inclusion of orange peel powder significantly enhances the soap's cleansing and anti-aging capabilities. Additionally, the presence of glycerin and vitamin E contributed effectively to the moisturizing effect, making the formulation beneficial for routine skincare.

**Index Terms**— Orange peel soap, Natural ingredients, Antibacterial activity, Antioxidant properties, Skin cleansing.

## I. INTRODUCTION

Cosmetics are products used to clean, product, and improve the appearance of the body. The word “cosmetic” comes from the Greek word “kosmos” which means beauty and decoration. Cosmetics are applied to the skin, hair, nails, lips, and teeth to make a person look fresh, attractive, and healthy. According to the Drugs and Cosmetics Act 1940, cosmetics are substances that are rubbed, poured, sprinkled, or sprayed on human body for cleansing, beautifying, or changing appearance. Herbal cosmetics are formulations prepared using plant-derived ingredients that contain bioactive compounds beneficial for skin health and cleanse, nourish, protect the skin.

Among various herbal ingredients, orange peel is widely used in cosmetic preparations due to its rich content of Vitamin C, antioxidants, flavonoids, and essential oils. Orange peel possesses antibacterial, anti-inflammatory, antioxidant, and skin-brightening properties that help improve overall skin health. Research studies have reported that orange peel can reduce acne, remove dead skin cells, control excess oil, and improve skin glow and texture. (1)



Figure 1: -Orange peel soap

Research studies have shown that orange peel soap has good cleansing, moisturizing, and exfoliating properties without causing skin irritation. Therefore, herbal orange peel soap is considered an effective, economical, and eco-friendly cosmetic product for healthy skin. (1)

Skin: -

The skin is the largest organ of the body that covers approximately 2 m/sq. surface area. It acts as a permeability barrier against the transdermal absorption of various chemical and biological agents. The skin has the thickness of about 2.97-0.23 mm. (1)

The structure of skin is divided into three main layers:

- a. Epidermis: - The Epidermis is a self-renewing stratified squamous epithelium covering the entire outer surface of the Body.

- b. Dermis: -It is the middle layer and present between the epidermal and hypodermal layer of the skin. It is four times thicker than the epidermis.
- c. Hypodermis: -The Hypodermis or subcutaneous fat tissue supports dermis and epidermis. It is a fat storage area. (1)

➤ Structure of skin: -

The skin consists of three major layers: epidermis, dermis, and hypodermis. The epidermis acts as the outer protective barrier, while the dermis provides strength, elasticity, and nourishment through blood vessels and connective tissues. (1)

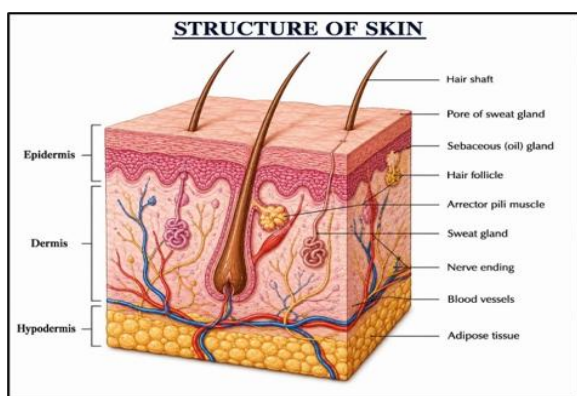


Figure 2: - Structure of skin

The hypodermis contains adipose tissue that helps in insulation, energy storage, and mechanical protection.

- (1)
- Orange: -



Figure 3: - Orange Fruit

Name	Orange peel
Synonyms	Citrus sinensis
Family	Rutaceae
Biological source	The orange peel is the fresh or dried outer part of the pericarp of Citrus Aurantium Linn.
Chemical constituent	Rich in pectin, cellulose, and hemicellulose
Application	Vitamin C in the peels helps cleanse your skin deeply and unclogs pores by Removing excess oil and grime (2)

Table No - 1




## II. INGREDIENT PROFILE

<p style="text-align: center;"><b>Orange Peel Powder: -</b></p> <ul style="list-style-type: none"> <li>• Synonyms: - Citrus sinensis</li> <li>• Family: - Rutaceae</li> <li>• Biological source: - orange peel consists of the fresh or dried outer pericarp of the ripe fruit of citrus sinensis</li> <li>• Chemical constituent: - The main active constituents are limonene, vitamin c, flavonoids, and essential oils</li> <li>• Use: - It helps in skin cleansing, reduces oily skin.</li> </ul>	
<p style="text-align: center;"><b>Glycerin Soap Base: -</b></p> <ul style="list-style-type: none"> <li>• Chemical name: - Glycerin soap base</li> <li>• Class: Transparent soap base</li> <li>• Biological source: Prepared from glycerin, vegetable oils, fatty acids, and soap-forming agents.</li> <li>• Chemical constituent: Glycerol, fatty acids, sorbitol</li> <li>• Use: - Used for moisturizing dry skin.</li> </ul>	

Figure 4: - orange peel powder

Figure 5: - Glycerin soap base

<p style="text-align: center;"><b>Coconut Oil</b></p> <ul style="list-style-type: none"> <li>• Synonyms: - <i>Cocos nucifera</i></li> <li>• Family: - <i>Arecaceae</i></li> <li>• Biological source: - Coconut oil is the oil expressed from dried solid part of endosperm of coconut, <i>cocos nucifera</i> Linn, belonging to family <i>arecaceae</i>.</li> <li>• Chemical constituent: - Saturated fatty acid, caprylic acid, capric acid, lauric acid.</li> <li>• Use: - Used for skin moisturizing, has antimicrobial properties</li> </ul>	 <p style="text-align: center;">Figure 6: - Coconut oil</p>
<p style="text-align: center;"><b>Castor Oil</b></p> <ul style="list-style-type: none"> <li>• Synonyms: - <i>Ricinus communis</i></li> <li>• Family: - <i>Euphorbiaceae</i></li> <li>• Biological source: - Castor oil is obtained from the seeds of <i>Ricinus communis</i>.</li> <li>• Chemical constituent: - Ricinoleic acid, triglycerides, oleic acid, linoleic.</li> </ul> <p>Use: - Used as laxatives, moisturizer, anti-inflammatory agent.</p>	 <p style="text-align: center;">Figure 7: - Castor oil</p>
<p style="text-align: center;"><b>Aloe Vera Gel</b></p> <ul style="list-style-type: none"> <li>• Synonyms: - <i>Aloe barbadensis</i> Miller</li> <li>• Family: - <i>Liliaceae</i></li> <li>• Biological source: - Aloe Vera gel is obtained from the fresh leaves of <i>Aloe barbadensis</i> miller.</li> <li>• Chemical constituent: - Aloin, aloe-emodin, polysaccharides, vitamin.</li> <li>• Use: - used for wound healing, moisturizing, anti-inflammatory action.</li> </ul>	 <p style="text-align: center;">Figure 8: - Aloe vera gel</p>
<p style="text-align: center;"><b>Rose Water</b></p> <ul style="list-style-type: none"> <li>• Synonyms: - <i>Rosa damascena</i></li> <li>• Family: - <i>Rosaceae</i></li> <li>• Biological source: - Rose water is prepared by distillation of fresh petals of <i>Rosa damascena</i>.</li> <li>• Chemical constituent: - Citronellol, geraniol, flavonoids.</li> <li>• Use: - Used as an antioxidant, anti-inflammatory, skin toner and soothing agent for irritated skin.</li> </ul>	 <p style="text-align: center;">Figure 9: - Rose Water</p>

<p style="text-align: center;"><b>Vitamin E Capsule</b></p> <ul style="list-style-type: none"> <li>• Chemical name: - Tocopherol (Vitamin E)</li> <li>• Family/ Class: - Fat-Soluble vitamin</li> <li>• Biological source: - Obtained from vegetable oils, nuts, seeds, and green leafy plants.</li> <li>• Chemical constituents: - Alpha- Tocopherol</li> <li>• Use: - Used as an antioxidant, skin protectant, moisturizer, and for reducing skin damage caused by free radicals.</li> </ul>	 <p style="text-align: center;">Figure 10: - Vitamin E capsule</p>
<p style="text-align: center;"><b>Orange Essential Oil</b></p> <ul style="list-style-type: none"> <li>• Synonyms: - Citrus sinensis</li> <li>• Family: - Rutaceae</li> <li>• Biological source: - Orange essential oil is obtained from the peel of fresh fruits of Citrus sinensis.</li> <li>• Chemical constituent: - Limonene, myrcene, linalool, citral</li> <li>• Use: - Used for antimicrobial, antioxidant, anti-inflammatory, and skin-refreshing properties. It also helps reduce stress and improve skin appearance.</li> </ul>	 <p style="text-align: center;">Figure 11: - orange essential oil</p>
<p style="text-align: center;"><b>Turmeric</b></p> <ul style="list-style-type: none"> <li>• Synonyms: - Curcuma longa</li> <li>• Family: - Zingiberaceae</li> <li>• Biological source: - Turmeric is obtained from the dried rhizomes of Curcuma longa.</li> <li>• Chemical constituent: - Curcumin, turmerone, volatile oils</li> <li>• Use: - Used for anti-inflammatory, antimicrobial, antioxidant, and wound-healing properties. It is also used in treatment of acne and skin infections.</li> </ul>	 <p style="text-align: center;">Figure 12: - Turmeric</p>

### III. FORMULATION TABLE

Ingredient Quantity of Trial Batches (Batch 1 to Batch 3):

Ingredients	F1 (100g)	F2 (100g)	F3 (100g)	Uses
Glycerin soap base	88.4 g	86.4 g	85.4 g	Exfoliating
Orange peel powder	4 g	4 g	5 g	Cleansing
Coconut oil	1 ml	2 ml	2 ml	Nourishing
Castor oil	1 ml	1 ml	1 ml	Lathering
Lemon oil	0.5 ml	0.5 ml	0.5 ml	Antibacterial
Aloe vera gel	2 ml	3 ml	3 ml	Soothing

Rose water	1 ml	1 ml	1 ml	Refreshing
Vitamin E capsule	1 capsule	1 capsule	1 capsule	Antioxidants
Olive oil	0.5 ml	0.5 ml	0.5 ml	Moisturizing
Orange essential oil	2 drops	2 drops	2 drops	Fragrance
Turmeric	0.5 g	0.5 g	0.5 g	Brightening

Table No.: - 2

Ingredient Quantity of Trial Batches (Batch 4 to Batch 6): -

Ingredients	F4 (100g)	F5 (100g)	F6 (100g)	Uses
Glycerin soap base	89.4 g	87.4 g	85.4 g	Exfoliating
Orange peel powder	3 g	4 g	4 g	Cleansing
Coconut oil	3 ml	2 ml	1 ml	Nourishing
Castor oil	2 ml	1 ml	1 ml	Lathering
Lemon oil	0.5 ml	0.5 ml	0.5 ml	Antibacterial
Aloe vera gel	2 ml	3 ml	3 ml	Soothing
Rose water	1 ml	1 ml	1 ml	Refreshing
Vitamin E capsule	1 capsule	1 capsule	1 capsule	Antioxidants
Olive oil	0.5 ml	0.5 ml	0.5 ml	Moisturizing
Orange essential oil	2 drops	2 drops	2 drops	Fragrance
Turmeric	0.5 g	0.5 g	0.5 g	Brightening

Table No.: - 3

Ingredient Quantity of Trial Batches (Batch 7 to Batch 9): -

Ingredients	F7 (100g)	F8 (100g)	F9 (100g)	Uses
Glycerin soap base	88.4 g	88.4 g	87.4 g	Exfoliating
Orange peel powder	5g	4 g	3 g	Cleansing
Coconut oil	1 ml	2 ml	2 ml	Nourishing
Castor oil	1 ml	1 ml	1 ml	Lathering
Lemon oil	1 ml	0.75 ml	0.5 ml	Antibacterial
Aloe vera gel	1 ml	3 ml	3 ml	Soothing
Rose water	1 ml	1 ml	1 ml	Refreshing
Vitamin E capsule	1 capsule	1 capsule	1 capsule	Antioxidants
Olive oil	0.5 ml	0.5 ml	0.5 ml	Moisturizing
Orange essential oil	2 drop	2 drop	2 drop	Fragrance
Turmeric	0.5 g	0.5 g	0.5 g	Brightening

Table No.: - 4

#### IV. METHOD OF PREPARATION

##### ➤ Preparation of Orange Peel Powder: -

1. Fresh orange peels were collected and washed properly.
2. The peel was dried under sunlight until moisture was removed
3. Dried peels were ground into fine powder using a grinder
4. The powder was sieved and stored in an airtight container.



Figure 13: - preparation of orange peel powder

- Formulation of Soap: -
  1. First weigh all ingredients accurately
  2. Required quantity of glycerin soap base was weighed and cut into small pieces.
  3. The soap base was melted using a double boiler method with continuous stirring.
  4. Orange peel powder and turmeric were added slowly into the melted base and mixed properly.
  5. Required oils such as coconut oil, castor oil, olive oil, lemon oil, and orange essential oil were added according to the formulation batch.
  6. Aloe vera gel, rose water, and Vitamin E capsule were added and mixed thoroughly to obtain a uniform mixture.
  7. The prepared mixture was poured into clean and dry soap molds.
  8. Air bubbles were removed by gentle tapping of the molds.
  9. The soap was allowed to cool and solidify at room temperature.
  10. After hardening, the soap bars were removed from the molds and stored in a cool and dry place for further evaluation.



Figure 14: - Final Product

#### V. EVALUATION TEST OF SOAP

- pH Determination: -The surface of the prepared orange peel soap was moistened using a few drops of distilled water. The soap was rubbed gently to produce a thin lather on the surface. A pH paper was placed directly on the soap surface/lather. The color developed on the pH paper was compared with the standard PH color or chart. The pH value of the prepared soap was observed and recorded.



Figure 15: - pH Determination Test



Figure 16: - Foam Height Test

- Observation: - All batches showed pH values Between 6.8 – 7.3 indicating good skin compatibility and final batch 9 pH occurs at range 7 which is neutral
- Foam Height Test: - 1gm of sample in 15 ml distilled water and transfer to 50 ml measuring cylinder and make the volume to 50 ml with water and shakes 20 strokes. Keep it aside for few min. the foam minute and foam height above the aqueous volume was measure fig. foam height. (1, 2)

- Observation: - The Foam height was 5.7 cm in Batch 9.

- Skin irritation test: - Wash your skin properly then apply the soap sample on skin and observe the any irritation or burning, itching. (2)



Figure 17: - Skin Irritation Test

- Observation: - All Formulation (Batch 1 to Batch 9) was found to be non- irritation on skin.
- Appearance: - The prepared orange peel soap was visually examined under normal light. The soap showed a uniform color, smooth texture, pleasant appearance, and was free from cracks or foreign particles. (3)
- Observation: All batches (F1 – F9) showed acceptable appearance with uniform color, proper shape and satisfactory texture.
- Uniformity of Weight Test: - A digital weighing balance was used to determine the weight. (1)

## VI. RESULTS

The orange peel soap was formulated using varied concentrations of ingredients across nine distinct trial batches (Batch 1 to Batch 9). Preliminary physical and qualitative evaluations were recorded as follows: - Evaluation Parameter (Batch 9)

### Physical Examination (Batch 9): -

Sr no.	Parameter	Observation
1	Color	Light Brown
2	Odor	Fragrant
3	Texture	Smooth
4	Shape	Circle

Table No.: - 5

### Evaluation result (Batch 9): -

Sr no.	Evaluation test	Observation
1	pH (paper)	7 (pass)
2	Foam Height	25
3	Skin Irritation test	No Irritation
4	Appearance	Good
5	Fragrance Test	Pass

Table No.: - 6



Figure 18: - Uniformity of Weight Test

- Observation: - The highest average weight of batch 9 is 99.46g.

## VII. CONCLUSION

The present study successfully formulated and evaluated herbal orange peel soap using natural ingredients such as glycerin soap base, orange peel powder, coconut oil, castor oil, aloe Vera gel, rose water, olive oil, vitamin E, turmeric, and essential oils.

Orange peel was selected as the main ingredient because of its antibacterial, antioxidant, exfoliating, and skin-brightening properties.

The prepared soap showed good physical characteristics such as acceptable color, pleasant odor, smooth texture, proper hardness, and good foaming ability. The pH of the soap was found to be 7 for final best batch suitable for skin application, indicating that the formulation is safe and skin friendly. The presence of natural oils and aloe Vera provided moisturizing and soothing effects, while orange peel and turmeric helped improve cleansing action and reduce oily skin and acne.

The study also demonstrated that herbal ingredients can be effectively used in cosmetic preparations to reduce the side effects commonly associated with synthetic soaps. The formulated orange peel soap was economical, eco-friendly, and beneficial for maintaining healthy and glowing skin. Therefore, herbal orange peel soap can be considered a promising natural cosmetic product for daily skin care.

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