



Formulation And Evaluation Of Antidandruff Shampoo From *Carica Papaya* Peel Powder

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Abstract

Dandruff is a common scalp condition characterized by flaking, Itching & irritation, often caused by fungal overgrowth, excessive oil production or dry skin & discomforts. This study potential of *carica papaya* peel powder as a natural ingredient in antidandruff shampoo formulation. These component may help reduce malassezia fungal overgrowth remove dead skin cells & smooth scalp imitation. The formulation aim to provide an effective, ecofriendly alternative to chemical based shampoo. This study utilizing natural fruit by products in personal care formulation for sustainable & effective dandruff treatment.

Keywords : *Carica papaya*, *caricaceae*, papaya, antidandruff shampoo.

1. INTRODUCTION :-

Papaya :- Papaya tree (*carica papaya*) Commonly known as papaya, pawpaw & melon tree, is a small, evergreen tree with broad leaves belonging to *Caricaceae* family. It is a tropical plant known for its fast-growing nature g large, fragrant fruit. It Typically reaches 10 to 15 feet in height & has a distinct, palm-like appearance with large deeply lobed leaves. The *carica papaya linn* occurs naturally in native to Central America, the papaya tree thrives in warm, sunny climates & producing sweet , juicy fruits that rich in vitamin A & C, along with digestive enzymes like papain. The tree is commonly cultivated for both its fruit & its leaves, which are sometimes used in traditional medicines. The *carica papaya linn* are rich in papain, carotenoids, flavonoids, phenolic compounds, alkaloids, minerals, enzymes. The leaves, fruit, peel, seed, roots, & barks.

The *carica papaya linn* commonly used to treat diabetes, accidents, wounds healing, fungal infection, fertility, dengue fever, diuretic activities. Pharmacological studies conducted on ethanolic extract of *carica papaya linn* leaf show no adverse effect on the rats during the 180 days oral administration period, affirming its potential safety for prolonged usage⁽¹⁾. The ethanolic extract of *carica papaya* leaves shows anti inflammatory activity⁽²⁾. the green extract of *carica papaya peel* shows antibacterial activities,

chemical compounds of efficacy of food model system⁽³⁾. The ethanolic fruits peel extract of *carica papaya* in an alloxan-induced diabetic rats shows hypoglycaemia & antihyperlipidemic effect⁽⁴⁾. The ethanolic extract of *carica papaya* seeds shows antioxidant & antibacterial activity⁽⁵⁾. The ethanolic extract of *carica papaya* leaves shows anti microbial activity⁽⁶⁾. The ethanolic extract of *carica papaya* seed shows wound healing activity⁽⁷⁾.

Nutritional Value:

1. Rich in: Vitamins A and C, potassium, and fiber
2. Antioxidants: Papaya contains various antioxidants, including flavonoids and carotenoids
3. Enzymes: Papaya contains proteolytic enzymes, such as papain and chymopapain

Cultivation and Uses:

1. Cultivation: Papaya is widely cultivated in tropical and subtropical regions
2. Uses: Fresh fruit, juice, smoothies, desserts, and cosmetics
3. Medicinal uses: Papaya has been used to treat various health conditions, including digestive issues and skin problems.

Advantages

1. Nutritious
2. Medicinal
3. Versatile
4. Economic

Disadvantages

1. Perishable
2. Allergic
3. Messy
4. Susceptible
5. Invasive

(1.1) ANTI-DANDRUFF PRODUCT

Anti-dandruff products are used to prevent or treat dandruff, which is small, white flakes of dead skin that fall from the scalp. Anti-dandruff products can be shampoos, tonics, or other treatments.

Example of anti-dandruff agent :-

Zinc pyrithione and selenium sulfide.

(1.2) How do anti-dandruff products work?

- Antimicrobial agents: Reduce the formation of dandruff by killing the yeast that causes it
- Anti-mitotic agents: Slow the growth of the yeast that causes dandruff
- Exfoliating agents: Remove dead skin cells that flakes are stuck to

Advantages:

- ✓ Effective in reducing dandruff
- ✓ Soothes and calms the scalp
- ✓ Prevents fungal growth
- ✓ Easy to use
- ✓ Variety of options
- ✓ Can help to reduce inflammation

Disadvantages:

- ✓ Can be harsh on hair
- ✓ May not be suitable for all hair types
- ✓ Can cause scalp irritation.

2. PLANT PROFILE:**A. Papaya tree :**

Papain is the dried and purified latex of the green fruits and leaves of *Carica papaya*. Belongs to Family *Caricaceae*.

i. Scientific Classification:-

- Name of The Plant :- papaya
- Scientific name: *Carica papaya*
- Kingdom: Plantae
- Division:- Magnoliophyta (Angiosperms)
- Class: Magnoliophyta
- Family: *Caricaceae*
- Genus: *Carica*
- Species : *C.papaya*
- Common name of The Plant: papaya
- Synonym: papai, papaya, *Carica papaya*

ii. Chemical Constituents :-

Phenolic compounds like caffeic acid, p-coumaric acid, ferulic acid, gallic acid, and quercetin, along with vitamins like vitamin A and C, fiber, minerals like potassium, antioxidants like beta-carotene and lycopene, and enzymes such as papain and chymopapain

iii. Uses

Digestion, Boosts immunity, Inflammation, Diabetes, Weight loss, Cancer, Heart health, For Skin, Improves eyesight



Fig No.1: Papaya Tree

iv. PHARMACOLOGICAL ACTIVITY

- ✓ Antioxidant
- ✓ Anti-inflammatory
- ✓ Antibacterial
- ✓ Anticancer
- ✓ Anti-diabetic
- ✓ Anti-fertility effects
- ✓ Antidandruff

3. SHAMPOO :

A liquid or semi-solid preparation containing surfactants, foaming agents, and other additives, intended for topical application to the hair and scalp to clean, nourish, and protect the hair and scalp

PHARMACEUTICAL FORMS

Shampoos can be formulated as:-

1. Liquid shampoos
2. Semi-solid shampoos (e.g., cream shampoos)
3. Solid shampoos (e.g., shampoo bars)
4. Medicated shampoos (e.g., containing antifungals or antibacterials)



Fig No.2 : Marketed shampoo products

TYPES OF SHAMPOO

There are many types of shampoo, including moisturizing, volumizing, clarifying, color protecting, and dry shampoo. The best type of shampoo for you depends on your hair type and what you want to achieve.

i. Moisturizing shampoo

- Cleanses and moisturizes hair
- lightweight oils or hydrating ingredients like hyaluronic acid
- Good for dry hair, and can help with frizz and fly a ways

ii. Volumizing shampoo

- Adds body and bounce to hair
- Works by lifting the roots
- Contains proteins like keratin to strengthen hair and add volume

iii. Clarifying shampoo

- A deep cleanser that uses heavier surfactants to remove grease and product residue
- Good for oily hair

iv. Colour protecting shampoo

- A mild shampoo that nourishes and protects hair, and helps prolong hair colour
- Usually a sulfate-free shampoo

v. Dry shampoo

A powder that reduces hair greasiness without the need for water

vi. Anti-dandruff shampoo

- Contains ingredients like pyrithione zinc to reduce the inflammation-causing yeast on your scalp.
- May also contain hydrating ingredients like shea butter

vii. Curly hair shampoo

- A deeply hydrating or moisturizing shampoo that soothes frizz
- Good for curly hair, which tends to be dry and get tangled easily

4. MATERIALS AND METHODS :-

a) MATERIALS :

- ✓ Papaya peel powder: Promotes hair growth
- ✓ Hibiscus petals powder: Controls hair fall
- ✓ Reetha powder: Conditions hair
- ✓ Aloe vera juice: Moisturizes hair
- ✓ Liquorice root: Surfactant
- ✓ Gum tragacanth: Thickener
- ✓ Menthol: Coolant
- ✓ Jasmine oil: Fragrance

b) APPARATUS :

- ✓ Sieves
- ✓ Measuring cylinder
- ✓ Beaker
- ✓ Stirrer
- ✓ pH meter
- ✓ Test tube
- ✓ Density bottle
- ✓ Stalagmometer
- ✓ China dish
- ✓ Hot air oven

5. PREFORMULATION STUDY :-

1. Bulk density
2. Tapped density
3. Porosity
4. Carr's index
5. Hausner's ratio
6. Angle of repose
7. % Ash Value
8. Solubility
9. Pharmacognastic test

➤ Bulk density

The bulk density of a powder is the ratio of the mass of an untapped powder sample and its volume including the contribution of the inter-particulate void volume.

$$\text{BULK DENSITY} = \frac{\text{MASS}}{\text{BULK VOLUME}}$$

➤ Tapped density

The tapped density is an increased bulk density attained after mechanically tapping a container containing the powder sample.

$$\text{TAPPED DENSITY} = \frac{\text{MASS}}{\text{TAPPED VOLUME}}$$

➤ Porosity

Porosity or void fraction is a measure of the void (i.e., "empty") spaces in a material, and is a fraction of the volume of voids over the total volume, between 0 and 1, or as a percentage between 0% and 100%.

$$\text{POROSITY} = (\text{VOLUME OF VOIDS})/(\text{TOTAL VOLUME}) \times 100$$

➤ Carr's index

Carr's Index of any solid is calculated for compressibility of a powder which is based on true density and bulk density.

$$\text{CARR'S INDEX} = \frac{\text{TAPPED DENSITY} - \text{BULK DENSITY}}{\text{TAPPED DENSITY}} \times 100$$

➤ Hausner's ratio

Hausner ratio is defined as the ratio of a powder's tapped bulk density to its poured (loose) bulk density

$$\text{HAUSNER'S RATIO} = \frac{\text{Tapped density}}{\text{Bulk density}}$$

➤ Angle of repose

Angle of repose powder poured from a vessel forms a cone-like pile. The angle of repose- the angle between the slope of the pile and the horizontal correlates with the strength of particle- particle interactions and, therefore, is measured to infer flow ability.

$$\emptyset = \tan^{-1}(h/r)$$

Where,

- h : the height in cm
- r : the radius in cm
- \emptyset : the angle of repose

➤ % Ash value

The ash values usually represent the inorganic residues such as phosphates, carbonates and silicates present in herbal drugs

$$\% \text{ASH} = \frac{W_2 - W_0}{W_1} \times 100$$

Where,

- W_2 : weight of crucible + ash
- W_0 : weight of crucible
- W_1 : weight of sample

➤ Solubility

Solubility is the ability of a solid, liquid, or gaseous chemical substance (referred to as the solute) to dissolve in solvent (usually a liquid) and form a solution. We are going to check solubility of our sample in water, acidic and alkaline solution.

1. Preparation of Shampoo

a) Preparation of extract

1. 25gm pieces of fresh papaya peel powder were boiled in 75ml of water and filtered.
2. 25gm Hibiscus powder of dried Flower was boiled in 75ml of water and filtered.
3. 25ml of juice of Aloe barbadensis (Aloe) was removed from leaves.
4. 25gm powder of dried fruits of Spindus mokerossi (Reetha) was boiled in 75ml of Water and filtered.

b) The process typically involves the following steps:

1. **Weigh ingredients:** Weigh all ingredients according to the formula.
2. **Prepare decoctions:** Boil the ingredients in water.
3. **Filter:** Strain the mixture through a muslin cloth.
4. **Mix:** Combine the decoctions.
5. **Add thickening agent:** Add Tragacanth gum to maintain the desired consistency.
6. **Add preservatives and perfume:** Add preservatives and perfume to maintain the shampoo's texture and fragrance.



Fig No.3: Extracts of All Powders

❖ FORMULATION TABLE

Table no. 1: Formulation of Antidandruff shampoo

Sr. No.	INGRIDENTS	F1	F2	F3	F4
1	Papaya Peel Powder	12ml	10ml	8ml	6ml
2	Hibiscus Powder	18ml	15ml	12ml	10ml
3	Reetha fruit powder	12ml	10ml	9ml	8ml
4	Aloe vera juice	12ml	10ml	8ml	6ml
5	Liquorice root	2.5ml	2ml	1.5ml	1ml
6	Tragacanth gum	1.5gm	1gm	1gm	0.5gm
7	Fragrance	q.s.	q.s.	q.s.	q.s.
8	Water	Up to 100 ml	Up to 100ml	Up to 100ml	Up to 100ml

6. EVALUATION PARAMETERS OF SHAMPOO

➤ Organoleptic character :

This is the very first step of evaluation of shampoo in which colour, odour, appearance, all physical parameter are check.

➤ Texture :

In this evaluation test the texture of shampoo is checked like smooth, gritty.

➤ **pH :**

The pH test is done by using digital pH meter to measure what is pH of formulation and it is suitable for hair or not.

➤ **% Solid Content :**

The percentage of solid substance was determined by weighing about 4 g of shampoo in a dry, clean, and evaporating dish. To confirm the items, particular tests were performed for surface tension, foam volume, foam stability, and wetting time using standard protocol.

➤ **Foam Volume & stability :**

Foaming ability was determined by using cylinder shake method. Briefly, 10 ml of the herbal shampoo solution was placed into a graduated cylinder. It was covered with one hand & shaken 10 times. The total volume of foam content after 1 min of shaking was recorded. Foam stability was evaluated by recording the foam volume after 1 min & 4min of shake test.

➤ **Density :**

1. Clean thoroughly the specific gravity bottle with chromic acid or nitric acid
2. Rinse the bottle at least two to three times with distilled water.
3. If required, rinse the bottle with an organic solvent like acetone and dry.
4. Take the weight of empty dry bottle with capillary tube stopper (w1).
5. Fill the bottle with unknown liquid and place the stopper, wipe out excess liquid from outside the tube using tissue paper.
6. Weight bottle with unknown liquid on analytical balance (w2).
7. Calculate weight in grams of unknown liquid (w3) = (w2-w1).

➤ **Dirt Dispersion :**

Two drops of shampoo was added in a large test tube contain 10ml of distilled water. 1ml of India ink was added; the test was stoppered and shaken as 10 times. The amount of ink in the foam was estimated as None, Light, Moderate or Heavy.

7. RESULT AND DISCUSSION

A. PROCUREMENT: A Papaya peel is collected from fresh papaya from local market of Nanded and other ingredients from laboratory and ayurvedic shop.

B. AUTHENTICATION:

The sample was authenticated by Dr. V. R. Marathe, HOD (Botany dept.) of NES Science College, Nanded.

C. PREFORMULATION TABLE:**Table no. 2: Pre formulation of Papaya peel sample**

BATCH	A	B	C	D
1. Bulk density	0.25g/ml	0.43g/ml	0.47g/ml	0.45g/ml
2. Tapped density	0.35g/ml	0.50g/ml	0.55g/ml	0.50g/ml
3. Carr's index	00.28 %	00.14 %	00.14 %	00.10 %
4. Hausner's ratio	1.4	1.16	1.17	1.11
5. Angle of repose	27 ⁰ 92'	31 ⁰ 00'	18⁰26'	15 ⁰ 10'
6. % Ash value	18 %	18 %	18 %	18 %

In this pre formulation study of Papaya peel sample we observed that, the **Batch C** has good flow Property and other parameter then can be utilized have final preparation of Shampoo.

D. PHARMACOGNOSTIC TEST:**Table no. 3: Pharmacognostic of Papaya peel sample**

Sr. No.	TEST	OBSERVATION	RESULT
1	Tannis test: (Ferric chloride test) 1% Ferric chloride + Alcohol solution	Brownish green colour	Absent
2	Carbohydrate test: (Fehling test) Fehling solution A + sample solution	Red precipitation	Present
	(Molish test) α - naphthol + Sample solution	Radish Violet / purple	Present
3	Lignin test:(Cellulose test) Sample + Iodine solution + Sulfuric acid	Turn blue violet	Absent
4	Glycoside test: (Baljet test) Sod. Pictrat + Alkaline + sample	Yellow/Orange colour	Absent
5	Flavenoids test :(Lead substance test) sample solution + lead acetate	Yellow Colour	Absent

E. SOLUBILITY:**Papaya peel sample****Table no. 4: Solubility of Papaya Peel Sample**

BATCH	Solubility in water	Solubility in NaOH (0.1N)	Solubility in Ethanol
A	Sparingly soluble	Sparingly soluble	Slightly soluble
B	Sparingly soluble	Sparingly soluble	Slightly soluble
C	Sparingly Soluble	Sparingly Soluble	Slightly Soluble
D	Slightly soluble	Poorly soluble	Poorly soluble

In this study of Papaya peel sample we observed that Batch C Sample was Slightly Soluble in water, 0.1N NaOH and Ethanol. While other batches are Slightly soluble or Sparingly soluble

F. EVALUATION TESTS**Table no. 5: Organoleptic character for antidandruff shampoo**

Sr. No.	TEST	OBSERVATION
1	Colour	Brownish
2	Odor	Pleasant
3	Form	Semi-solid
4	Appearance	Turbid
5	Texture	smooth

Table no. 6: Evaluation test for antidandruff shampoo

Sr. No.	Evaluation Test	F1	F2	F3	F4
1	Density(g/ml)	1.03	1.11	1.09	1.03
2	Foaming ability(cm)	3	2.5	2	1.5
3	% solid content(%)	36.5	31.5	22.1	30
4	pH	5.5	5.5	5.5	5.5
5	Dirt Dispersion	Good	Good	Excellent	Fair
6	Surface tension (dyne/cm)	68.92	52.55	52.02	63.06
7	Consistency	Smooth	Smooth	Smooth	Smooth
8	Skin Irritation Test	No	No	No	No

From above evaluation study we observed that **batch F3** qualified all the evaluation test.



Fig no. 4 : Batches of shampoo

8. CONCLUSION :

From Current research work, we come to know that, the *Carica papaya linn* can be converted to herbal antidandruff shampoo & having good organoleptic properties. We also Find out from the initial powder batch C (Sieve 60) has good flow property, bulk density, tapped density, car's index, hausner's ratio, angle of repose, % ash value was performed. After that, we have used this batch C (Sieve 60) for final preparation. We have again prepared 4 batches by using Batch C (F1, F2, F3, F4). then, we come to the conclusion that, batch F3 qualify all the evaluation test like dirt dispersion, surface tension, foam ability, etc.

9. FUTURE PROSPECTIVES:

We can continue this project by changing it's dosage form and performing animal study

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