



# Formulation Of Polyherbal Hair Gel

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**Abstract:** Herbal hair gels enriched with natural extracts present a promising approach to scalp health and nourishment. This study explores a unique formulation incorporating guava, amla, and aloe vera, which has demonstrated effectiveness against fungal infections such as candidiasis while enhancing hair strength and shine. Guava leaves possess antifungal properties that may inhibit the candida growth, a common contributor to dandruff, while their rich vitamin C and A content supports hair vitality. Amla, known for its exceptionally high vitamin C levels, aids in preventing premature greying and strengthens hair follicles. Aloe vera gently cleanses and conditions the scalp, reducing hair breakage and improving moisture retention. The formulation utilizes Carbopol 934 and triethanolamine to ensure a stable polyhedral gel structure, effectively nourishing the hair while combating fungal infections. Although guava-based hair gels are not widely commercialized, their potential benefits highlight a compelling natural solution for holistic scalp and hair care.

**KEYWORDS:** Herbal hair gel, Natural antifungal remedy, Guava leaf benefits, Amla for hair health, Aloe vera scalp care, Polyherbal formulation, Dandruff treatment, Eco-friendly hair products.

## 1. INTRODUCTION

Hair, an important part of our body, not only possesses aesthetic significance in our culture, but also offers protection. Hair fibres have a typical hierarchical structure similar to other  $\alpha$ -keratin materials, such as wool, nails, claws, and horns present in mammals. A typical hair fibre has a diameter of 50-100  $\mu\text{m}$  and is covered by an outermost layer, the cuticle. The cuticle consists of thin overlapping scales. Each scale has an average length of 60  $\mu\text{m}$  and a thickness of about 0.5  $\mu\text{m}$ .

Furthermore, 5-1 such scales overlap to create a total thickness of  $\sim 5 \mu\text{m}$ . The morphology of the cuticle edges is thought to be affected by weathering, combing and brushing, with more severe damage seen on long hair fibres. Hair care is essential for maintaining healthy, strong, and beautiful hair. It helps prevent damage and breakage, supports scalp health, promotes hair growth, and improves hair texture and appearance. Every human being desire to have healthy hair and scalp. However, due to various conditions like imbalanced diet, environmental pollutants and improper hair care, individual's scalp may get affected.

Dandruff is a scalp disorder which is characterized by excessive shedding of skin cells, itchy-flaky skin and invisible inflammation. Human beings are more prone for occurrence of dandruff at puberty to middle age. Dandruff medically described as Pityriasis capitis caused by Malassezia species which is lipophilic, dimorphic opportunistic yeast causing skin and hair infection. It is a chronic, non-inflammatory skin condition characterized by flaking and sometimes itchiness of the scalp. It's a form of seborrheic dermatitis that primarily affects the scalp.

Dandruff is a condition characterized by the flaky white to yellowish scales seen on the scalp and less frequently on the nasolabial folds, behind the ears, eyebrows, and intertriginous areas. It is common constant relapsing inflammatory condition affecting the areas rich in sebaceous glands.

The most common cause of dandruff is Candidiasis typically caused on skin and mucous membrane by candida species. Candida albicans was found in healthy people and flourish mostly in moist, warm and

sweaty conditions. Malassezia most commonly present in patients with higher levels of sebaceous secretion because of malassezia feed off of lipids. For dandruff cause by candidiasis there are many allopathic formulations available in market but as compared to any other treatments herbal formulations is mostly preferred by consumers. Herbal extract of guava leaves, amla and aloe found to be effective in treating Candidiasis. Guava leaves are rich in Vitamin B & C that helps in nourishing hair and also aids hair growth. Guava leaves show antibacterial and antifungal activity on gram positive and gram-negative bacteria.



Figure 1



Figure 2



Figure 3

## 2. RESEARCH METHODOLOGY

### 2.1 Guava (*P. guajava*):

**Sample collection and Processing:** The leaves were collected of *P. guajava* L (guava) from the premises of R.M. Dhariwal Inst. of Pharmaceutical Education & Research, Chinchwad Pune. The leaves were rinse with distilled water properly and dried under the sunlight and blended into powder. Then power was stored in airtight container.

**Preparation of guava leaf extract:** The guava leaf powder (20 g) was boiled at 90 °C in 100 ml of double distilled water in sterile Erlenmeyer flask (150 mL) for 30 min. The mixture was centrifuged at 4000 rpm for 10 min. The supernatant was separated and stored at 4 °C for further studies.



Figure 4

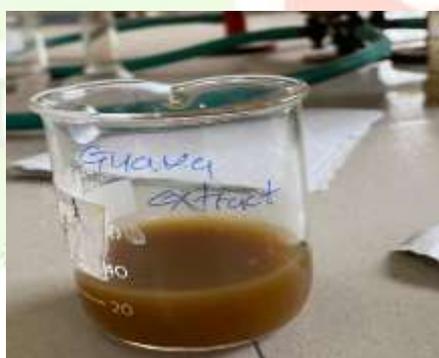


Figure 5



Figure 6

### 2.2 Aloe Vera (*Aloe barbadensis* Mill):

**Sample collection and processing:** The aloe vera was collected from the premises of Rasiklal M. Dhariwal Inst. Of Pharmaceutical Education & Research, Chinchwad Pune. The aloe was washed with distilled water and cleaned with white dry cloth.

**Preparation of aloe vera extract:** The aloe leaves were cleaned and placed upright in a beaker for 15-20 min to drain out all the yellow sap present. The pulp from the aloe leaf was collected & grinds it into the mixer to form liquid foam. This liquid was filtered to remove any remaining particles.



Figure 7

### 2.3 Amla (*Phyllanthus emblica*):

**Sample collection & Extraction:** The fresh amla was collected from the premises of Rasiklal M. Dhariwal Inst. of Pharmaceutical Education & Research, Chinchwad Pune and then cut into small pieces.

**Preparation of amla extract:** It was crushed by using some required amount of water with the help of motor & pestle and then whole was filtered through a clean cotton cloth & the amla juice was obtained.

Table 1

INGREDIENTS	F1	F2	USES
Guava extract (aq extract)	1 ml	1.5ml	Antibacterial, Antifungal
Carbopol 940	0.45	0.4g	Gelling agent
Amla juice	1ml	1.5ml	Hair nourishment
Aloe extract	1ml	1.5ml	Moisturiser
Propylene Glycol	10ml	10ml	Humectant
Propyl and methyl paraben	0.1g	0.1g	Preservative
Triethanolamine	1-2drops	3-4drops	PH adjuster
Water	Q.S	Q.S	Vehicle

### 3. PREPARATION OF POLYHERBAL HAIR GEL:

- 1) Weigh required quantity of Carbopol 940 and dispersed in 25 ml of distilled water in beaker.
- 2) Keep beaker aside for half an hour to swell Carbopol 940 & then start stirring at 1200 rpm by using mechanical stirrer for 30 min
- 3) **Formulation A:** Take 1g or 2.5g of guava extract & add in 5ml of propylene glycol in one beaker & stirred properly.
- 4) **Formulation B:** Add aloe juice, Amla juice, Methyl paraben & propyl paraben in 5ml propylene glycol in another beaker.
- 5) Disperse solution A & B in Carbopol 940 with constant stirring.
- 6) Finally add remaining amount of distilled water (i.e. makeup the solution) to make 50ml of formulation & add triethanolamine dropwise to the formulation until pH becomes neutral and the gel get required consistency.

#### 4. EVALUATION PARAMETERS:

1. **Physical properties:** The physical appearance was visually checked for the appearance, colour and the odour application of prepared base gel formulations.
2. **pH determination:** The pH of all hair gel formulations was determined by using the digital pH meter. One gram of gel was dissolved in 100 ml distilled water and stored for two hours. Electrodes were completely dipped into the hair gel formulations and pH was noted. The measurement of pH of each formulation was done in triplicate and average values were calculated.
3. **Viscosity:** Viscosity of gel was determined using Brookfield Viscometer at 25 degree Celsius with rotation at 12 rpm.
4. **Spreadability:** Area of extent to which topical application spread on skin is called as spread ability. Topical formulations need to spread over surface of site for their therapeutic action so their efficacy depends upon its spreading value. Spreading value determination done by placing excess of sample (3g) in between two glass plates and compressed to uniform thickness by placing 1 kg weight over it for 5 minutes. At the end weight (50g) was added to the pan and the top plate was subjected to pull with the help of string attached to the hook. The time required to move upper plate over lower for 10 cm is recorded. Those formulation shows lower sliding time having better spreadability.
5. **Washability:** The prepared hair gel formulation is applied on the skin and then ease and extent of washing with water is checked normally.
6. **Anti-bacterial test:** Prepare nutrient agar plate (MacConkey agar medium) into petriplate & allow it to solidify.

**NOTE:** Before pouring into petriplate incubate the agar medium and petriplate in incubation chamber for 15 mins. After solidification create wells in the agar using sterile nichrome wire loop or pipette tip. Apply the test sample (hair gel), positive control (antibiotic) & negative control (sterile water) into separate wells. Incubate the plates at 37°C for 18- 24 hrs.

#### 5. RESULTS AND DISCUSSION

##### 5.1 Preliminary test:



Figure 8

Table 2

1	Alkaloid	<b>Test: Mayer's Test</b> Add a few drops Mayer's reagent (potassium mercuric iodide) to the extract	White or creamy precipitate formation.	Present
2	Tannins and Phenols:	<b>Test: Ferric Chloride test</b> Add a few drops of ferric chloride (FeCl <sub>3</sub> ) to the extract.	Blue, green, or black coloration	Present
3	Saponin	<b>Test: Froth Test</b> Shake the extract vigorously.	Stable froth formation.	Absent
4	Flavonoids:	<b>Test: Alkaline Reagent Test:</b> Add a few drops of sodium hydroxide (NaOH) to the extract.	Intense yellow colour that disappears with the addition of acid.	–
5	Reducing Sugars:	<b>Test: Benedict's Test:</b> Add Benedict's reagent and heat.	Formation of a green, yellow, or brick-red precipitate	Present

### 5.2 Organoleptic properties:

The formulated hair gel is evaluated for organoleptic parameter like,

- 1) Colour: transparent white gel.
- 2) Odour: Fresh rosemary with hint of sweet note.
- 3) Appearance: smooth and homogenous.

**5.3 Washability:** The gel was applied on skin and spread ability was found to be good and then extend of washing off with water was manually checked.

**5.4 pH determination:** The gel was found to be neutral confirmed with pH paper determination (Approx. 7)

**5.5 Viscosity:** The gel viscosity was determined using Brookfield viscometer at 20 rpm with 99.1%, 12rpm with 95% & 3 rpm with 80%.



Figure 9



Figure 10



Figure 11

**5.6 Skin irritation test:** The Hair gel was applied on skin to check its irritation, redness or rashes.

**5.7 Stability study:** The formulation was kept in batches of varies conditions of temperature. The system was stable at 25°C & no changes were noticeable when kept at room temperature (30±2°C) & 2nd batch was kept at refrigerated (4±2°C). No changes were found in pH, viscosity, homogeneity, & spread ability.

**5.8 Anti-bacterial test:**Then observation found is no microbial growth in the plates.

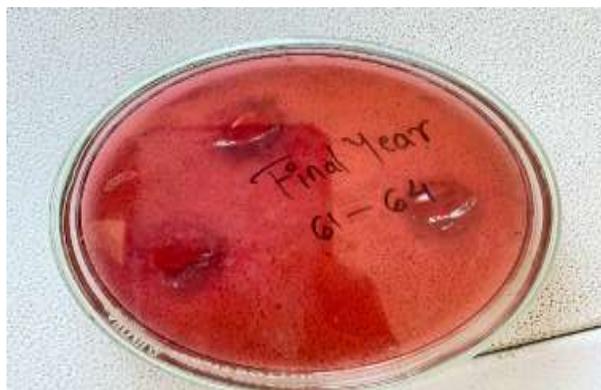


Figure 12

Table 4

Sr. No	EVALUATION PARAMETER	OBSERVATION
1.	Organoleptic properties	Transparent, fresh rosemary, smooth & homogenous
2.	Washability	Positive
3.	PH determination	Neutral
4.	Viscosity	Positive
5.	Skin irritation	No reaction on skin
6.	Anti-bacterial test	No microbial growth

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