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Formulation and evaluation of polyherbal hair gel formulation

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Abstract

Dandruff is a skin condition with symptoms includes flaking and sometimes mild itchiness cause to the scalp. They are many bacteria, fungus causing scalp infections which lead to further hair problems or skin issues. There is one of the common conditions candidiasis which is typically caused on the skin or mucus membrane caused by candida. Herbal extract of gauva 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 shows antibacterial and antifungal activity on gram positive and gram negative bacteria. Vitamin C present in Amla which is 20 times more than that of orange; which prevents premature graying of hairs, it also provides luster to hairs and strengthen follicles. Gauva leaves extract was evaluated by Cup and plate method against the fungus *C. albicans* and bacteria *S. aureus*. Herbal Gel was formulated and evaluated by using Carbopol 934, triethanolamine etc. A polyherbal hair gel was found to be effective against candidiasis along with this it nourished the hair and prevent premature graying.

Keywords: Candidiasis, hair gel, gauva leave extract, cup and plate method

Introduction

Hair Scalp Infection

Dandruff is a skin condition with Symptoms includes flaking and sometimes mild itchiness cause to the scalp [1]. There are many bacteria, Fungus causing scalp infections which leads to further hair problems or skin issues. There is one of the common conditions candidiasis which is typically caused on the skin or mucus membrane caused by candida. As skin is the protective layers of body against infection but this yeast leads to skin conditions and if it multiplies it can become pathogenic. This fungus thrives mostly in moist, warm and sweaty conditions, There been some subdivisions in case of Candidiasis based on the areas of body and also consist of approx 150 species among these *Candida albicans* is most prevalent, This yeast is supposed to be present in healthy people. The symptom varies on basis of body location, focusing on the scalp problem the symptoms such as rash and white flaky substance over affected area is formed. There are many allopathic formulation treatments for this infection [2].

Malassezia most commonly present in patients with higher levels of sebaceous secretion because of malassezia feed off of lipids [3].

Folliculitis is a skin syndrome which is commonly found in population and cause inflammation to the skin. Several microbial agents act as causative agents, but *Staphylococcus aureus* is found in most of patients with Folliculitis [4].

Candida albicans and *S. Aureus* are opportunistic microbes. The frequency of this infection is more and cause hair problems on regular basis in unhygienic conditions or lower immunity towards them. Many such treatments are available in market but compared to any other treatment, Herbal treatment is always a better option. Even after complete cure, the infection can cause recurrence.



Fig 1: Difference between Candidiasis and Folluculitis

Herbal Treatment

1. Guava

Guava fruits and leaves both give some good effect in consideration of health. Guava fruits are rich antioxidant, Vitamin C, potassium, fiber and leaves have commonly known benefits such as Anti diarrheal, Reduce cholesterol level, Controls diabetes, helps in good vision, used for healing acne, helps in losing weight due to the fibre content present. The leaves are also rich in Vitamin B & C that helps in nourishing hair and also aids hair growth. As it have contents which give effects such as antimicrobial, anti inflammatory, antioxidant which helps to relieve hair fall problem and strengthen the hairs. The leaves show presence of tannins, saponins, terpenoids, alkaloid, phenol compounds which mostly act as the antifungal compounds which can help in treating fungal infections can be favourable for some of the formulations topically.⁶Guava leaves shows antibacterial and antifungal activity on gram positive and gram negative bacteria^[7].

2. Aloe Vera

The biological source of *Aloe Vera* gel is dried latex which is obtained from *Aloe barbadensis* Miller belonging family Liliaceae which is succulent plant having total 420 species. The name *Aloe Vera* is derived from the Arabic name "alloeh" and Latin word "Vera". It is popular for treatment of many conditions in which huge popularity for beauty and skin care purpose. *Aloe Vera* contains inner gel which is made up of 99% of water and amino acids, sterols, lipids and vitamins and middle layer i.e. yellow layer latex containing glycosides and anthraquinones^[8].

3. Amla

Amla fruit usually juiced for their extracts for its antioxidant content and dried into powder to use in capsule for same. Studies have shown its nutrient content to have phenols, flavonoids, and tannins, along with a wide range of other antioxidants. Vitamin c present in amla which is 20 times as an orange which prevents premature graying of hairs. Other benefits of amla for hairs are amla oil provide luster to hairs and strengthen follicles^[9].

In traditional medicines many formulation are made up of by using different plant extracts as a ingredient for the treatment

of fungal infections. The greatest potential of herbs is having more than one affect in same herb which can increase efficacy of the formulation extraction, distillation, purification, concentration treatments use for the purpose of obtaining extract for preparation of herbal medicines. Also the herbs can be used for various reasons in the formulation for its scent, flavour or therapeutic properties; they are also used as type of dietary supplements. Benefits of herbal preparation such as lower adverse effects, safe to use, cheap and Eco-friendly. Even in longer duration of treatment it show low side effect.

Topical agents like creams, lotions, ointments has many disadvantages like they are sticky causing uneasiness to the patient when applied. They also exhibits the problem of stability. Due to all these factors, within the major group of semisolid preparations, the use of transparent gel has increased in Pharmaceutical preparation because gel is basically dispersed molecule of a liquid within a solid medium. It has general benefits for application over other formulation such as it is easy to formulate as controlled release formulation. Gel also has good adherence property to site of application.

Hair gel provides better application property and stability compare to creams and lotions. It gives non greasy and non-sticky application. Gels have good spreading property Compare to shampoo and other products Gels are not time consuming application. Gels are used for styling hairs so it has multiple uses.

Material and Method

1) Guava

Biological source: Powder of dry leaves of *Psidium guajava*
Family: Myrtaceae

Collection of plant

We collected guava leaves from Botanical Garden KGRDCP&RI Karjat and kept for sundry for 3 days. After sun drying grind it to coarse powder for further extraction process.

Extraction process

Phytochemical extract of *Psidium guajava* is obtained by using maceration extraction method. Leaves are washed with distilled water and then kept for drying 3-4 days. A dried leaves grinds into fine powder for further extraction process. Now powdered plant material was dissolved in 70% ethanol, 80% methanol, ethyl acetate and hot water (1:10); 1 g sample should be dissolved in 10 ml of solvent. Those four Mixtures were kept in the dark place to avoid sun exposure for 3 days at room temperature. Beakers use for storage are sterilized and wrapped with aluminium foil to avoid evaporation. After 3 days of maceration process, mixtures were filtered by using What man no.1 filter paper and allow for solvent evaporation at 37 °C. Now all mixtures were dissolved in DMSO. The best result is shown with the methanolic extract that is with 20g of powder in 200 ml of methanol gave 1.780g of extract.

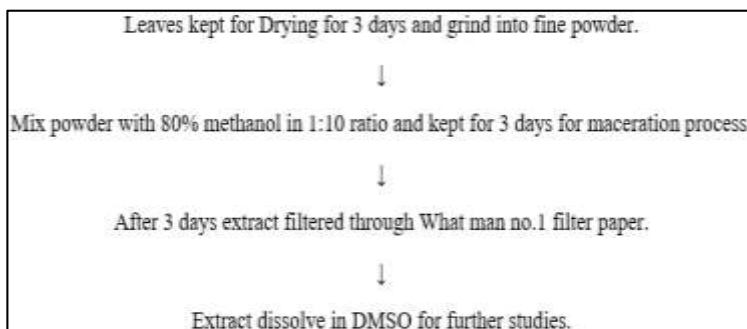


Fig 2: Extraction process in flow chart *Psidium guajava*



Fig 3: Guava leaves Extract

Phytochemical Test

Methanolic extract of Guava leaves were perform for Phytochemical tests gives positive test for the presence of

Saponins, Phenols, Tannins, Terpenoids, Glycosides, Flavonoids.

Table 1: Phytochemical screening of extract

Sr. No	Name of test	Procedure	Observation	Inference
1	Test for Saponins	Extract was placed in a test tube and shaken vigorously	Formation of stable foam	Present
2	Test for Phenols and Tannins	Extract was mixed with 2 ml of 2% solution of FeCl ₃	A blue-green or black coloration	Present
3	Test for Flavonoids (Shinoda Test).	Extract was mixed with magnesium ribbon fragments, and concentrated hydrochloric acid was added drop wise	Orange, red, pink, or purple coloration	Present
4	Test for Glycoside	Extract was mixed with 2 mL of glacial acetic acid containing 2 drops of 2% FeCl ₃ . The mixture was poured into another tube containing 2 mL of concentrated sulphuric acid	A brown ring at the interphase indicates the presence of glycosides	Present
5	Test for terpenoids	Take 5ml of aqueous extract and then add 2ml chloroform followed by addition of 3ml conc. sulphuric acid	Reddish brown interface	Present

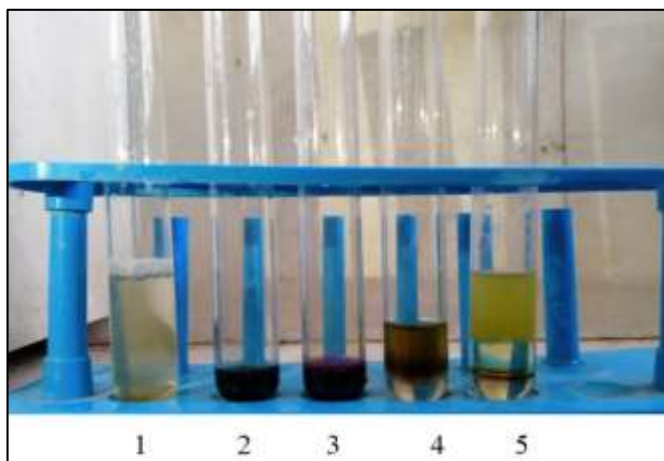


Fig 4: Phytochemical Screening of extract

Chemical Constituents of Guava Leaves

Phenolic compounds present, namely gallic acid, catechin and quercetin present in guava leaves extract. Psiguadials A and B, two novel sesquiterpenoid-diphenyl methane mero terpenoids with unusual skeletons, along with psidial A and guajadial which are epimer were isolated from the leaves of *Psidium guajava*. Guavinoside A, B, C glycosides present in guava leaves. Other constituents of guava leaves are xanthine, asparagine, narengenin, citric acid, glutamic acid. And also present Rutin and Kamferol [15].

Microbial Assay

After 3 days of maceration process of guava leaves powder, mixtures were filtered through what man no. 1 filter paper and kept for evaporation in 37 °C to completely remove solvent. Now all mixtures were dissolved in DMSO (Dimethyl

sulfoxide). The fungus *C. albicans* and bacteria *S. aureus* obtain from the microbiology/biotechnology department KGRCP & RI, Karjat. The concentration of 0.5, 1, 2, 5 mg/ml were used for microbial assay and obtained result as per the table given below and the perfect result was obtained at 2mg/ml concentration of methanolic extract of guava leaves.

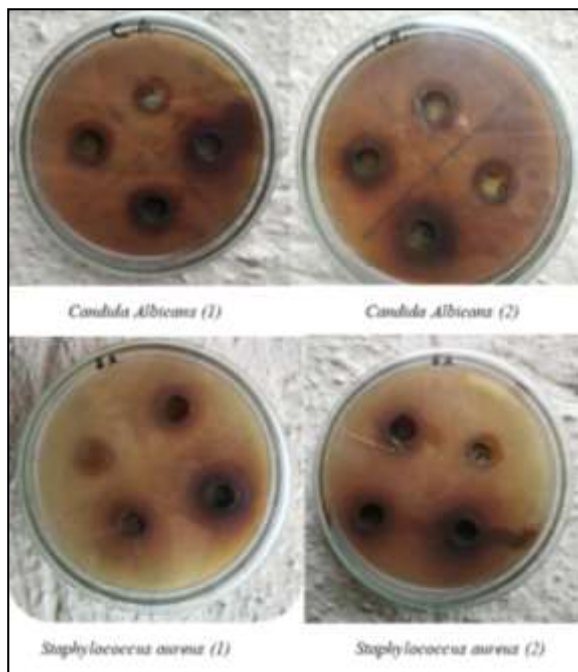


Fig 5: Microbial Assay of extract

Table 2: Microbial Assay of extract

Species	ZOI (0.5mg/ml)	ZOI (1mg/ml)	ZOI(2mg/ml)	ZOI(5mg/ml)
<i>C.albicans</i> (1)	7 mm	10 mm	13 mm	14 mm
<i>C.albicans</i> (2)	8 mm	9 mm	10 mm	12 mm
<i>S.aureus</i> (1)	7 mm	10 mm	14 mm	16 mm
<i>S.aureus</i> (2)	6 mm	7 mm	11 mm	12 mm

Other Ingredient

2. Aloe Vera

Biological source: juice obtained from leaves of *Aloe barbadensis*
Family: Liliaceae

Collection of plant

The fresh leaves of *Aloe Vera* were collected from the

botanical garden of KGRDCP and RI, Karjat.

Extraction

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 and grind it into the mixer to form liquid foam. This liquid was filtered to remove any remaining particles. Then it was boiled at 70°C to form the uniform gel and also it removes any remaining content of yellow sap if present.



Fig 6: Aloe Vera extract

3. Amla

Biological source: *Phyllanthus emblica*

Family: Phyllanthaceae

Extraction

The fresh Amla was collected and cut into small pieces. It was crush by using some required amount of water with the help of motor and pestle and then this whole was filtered through a clean cotton cloth and the Amla Juice was obtained.



Fig 7: Amla Extract

Formulation of Gel

Table 3: Formula of Polyherbal Hair Gel 50g (Guava Leaves Extract 2mg/ml and 5mg/ml)

Ingredients	Quantity taken 2mg/ml	Quantity taken 5mg/ml	Category
Guava leaves extract	1g	2.5g	Anti bacterial and antifungal
Aloe extract	1g	1g	Moisturizer
Carbopol 940	0.45g	0.45g	Gelling agent
Amla juice	1g	1g	Hair nourishment
Propylene glycol	10.4g	10.4g	Humectants
Propyl paraben and methyl paraben	0.1g	0.1g	Preservative
Triethanolamine	1-2 drops	1-2 drops	pH adjuster
Water	QS	QS	Vehicle

Preparation of 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 and then start stirring at 1200 rpm by using mechanical stirrer for 30 min.

3. Solution A: Take 1g or 2.5g of Guava extract and add in 5 ml of Propylene glycol in one beaker and stirred properly.
4. Solution B: Add Aloe juice, Amla juice, methyl Paraben and Propyl paraben in 5 ml propylene glycol in another beaker.
5. Disperse Solution A and B in Carbopol 940 with constant stirring.

- Finally add remaining ml of distilled water to make up 50 ml of formulation and add Triethanolamine drop wise to the formulation until pH become neutral and gel get required consistency.



Fig 8: Polyherbal Hair Gel

Evaluation

1. Organoletic Properties

- Colour- dark green
- Odour- distinctive
- Appearance-smooth and homogeneous

2. pH Measurement-neutral

- Viscosity:** Viscosity of gel was determined using Brookfield Viscometer at 25 °C with rotation at 12 rpm

- Appearance and Homogeneity:** Evaluation done by Visual Perception. Gel was homogeneous and smooth appearance.

- Spread ability:** 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 requires to move upper plate over lower for 10 cm is recorded. Those Formulation shows lower sliding time having better spread ability.

Results and Discussion

Guava leaves generally have many benefits in real life. The vitamins B and C found in the leaves help to nourish the follicles and aid hair growth. As guava leaves have such good benefits, it is favourable for formulation. In addition are also show activities such as antimicrobial, antioxidant as well as antifungal. On basis of the known theory we performed microbial assay on *Candida* and the perfect result was obtained at 2mg/ml concentration of methanolic extract of guava leaves. Phytochemical test performed showed the presence of tannins, saponins, Terpenoids, alkaloids, glycosides and phenol compounds which are antifungal compounds, the inhibition activity on microbial assay we performed also gives additional proof. By using 5 mg /ml concentration we prepared formulation of guava leaves for hair problems because of all it's good activity. The gel was formed with consideration of all standard parameters of evaluation. We conclude that from above results that we can use guava leaves extract for hair problem in form of hair gel.

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References

- Tucker D, Masood S. Seborrheic Dermatitis. 2020 Oct 3. In: Stat Pearls [Internet]. Treasure Island (FL): StatPearls Publishing 2020. PMID: 31869171.
- Fortuna MC, Garelli V, Pranteda G, Carlesimo M, D'Arino A, Rossi A. Scalp infection by *Candida albicans* in an immunocompetent patient: a description of a rare case. *J Chemother* 2018;30(5):316-317. Doi: 10.1080/1120009X.2018.1518200. PMID: 30843775.
- Elewski BE. Clinical diagnosis of common scalp disorders. *J Investing Dermatol Symp Proc.* 2005;10(3):190-3. Doi: 10.1111/j.1087-0024.2005.10103.x. PMID: 16382661.
- Fortuna MC, Garelli V, Pranteda G, Carlesimo M, D'Arino A, Rossi A. Scalp infection by *Candida albicans* in an immunocompetent patient: a description of a rare case. *J Chemother* 2018;30(5):316-317. Doi: 10.1080/1120009X.2018.1518200. PMID: 30843775.
- Ana Cristina Laureano, Robert A. Schwartz, Philip J Cohen. Facial bacterial infections: Folliculitis, *Clinics in Dermatology.* 2014;32(6):711-714,ISSN 0738-081X, <https://doi.org/10.1016/j.clin>
- Vijayakumar R, Muthukumar C, Kumar T, Saravanamuthu R. "Characterization of *Malassezia furfur* and its control by using plant extracts". *Indian Journal of Dermatology*2006;51(2):145-148.
- Beatriz, Padrón-Márquez, Viveros- Valdez, Ezequiel Oranday, Azucena Carranza-Rosales, Pilar. Antifungal activity of *Psidium guajava* organic extracts against dermatophytic fungi. *Journal of medicinal plant research.*2012;6:10.5897/JMPR12.240.
- Biswas B, Rogers K, McLaughlin F, Daniels D, Yadav A. Antimicrobial activities of leaf extracts of guava (*Psidium guajava* L.) on two gram-negative and gram-positive bacteria. *Int. J Microbiol*2013, 746165
- Dal'Bel SE, Gaspar LR, Berardo PM, Campos GM. Moisturizing effect of cosmetic formulations containing *Aloe Vera* extract in different concentrations assessed by skin bioengineering techniques. *Skin Research and Technology.* 2006;12(4):241-246.
- Mielke H. Lead-based hair products: Too hazardous for household use. *J Am Pharm Assoc.* 1997, 85-9.
- Gupta R. Amla: A Novel Ayurvedic Herb with its Health Benefits. 2017;6(6):923-7.
- Gavazzoni Dias MF. Hair cosmetics: An overview. *IntJou Trichology* 2015;7(1):2.
- Wu JW, Hsieh CL, Wang HY, Chen HY. Inhibitory effects of guava (*Psidium guajava* L) leaf extracts and its active compounds on the glycation process of protein. *Food Chem* 2008;113:78-84.
- Matsuzaki K, Ishii R, Kobiyama K, Kitanaka S. New benzophenone and quercetin galloyl glycosides from *Psidium guajava* L. *J Nat Med* 2010;64:252-256.
- Kim SH, Cho SK, Hyun SH, Park HE, Kim YS *et al.* Metabolic profiling and predicting the free radical scavenging activity of guava (*Psidium guajava* L.) leaves according to harvest time by 1H-nuclear magnetic resonance spectroscopy. *Biosci Biotechnol Biochem* 2011;75:1090-1097.
- Barbalho, Sandra, Machado, Flávia. *Psidium guajava* (Guava): A Plant of Multipurpose Medicinal Applications. *Medicinal & Aromatic Plants*, 2012, 01. 10.4172/2167-0412.100