

FORMULATION AND EVALUATION OF DRY POWDER FACEWASH

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Abstract

Face washes are multifunctional skincare formulations designed to cleanse the skin while providing additional benefits such as acne prevention, moisturization, wrinkle reduction, and complexion enhancement. Skin-lightening agents incorporated into such formulations primarily act by inhibiting melanin synthesis within melanocytes, thereby reducing melanin production and regulating its metabolic pathways in the skin.

The selected herbal ingredients in the present formulation possess significant therapeutic and cosmetic properties. Lemon peel is a rich source of vitamin C and flavonoids, which promote skin brightening and aid in the removal of dead skin cells. Fenugreek seeds contain mucilage and various bioactive constituents that exhibit moisturizing, anti-inflammatory, and skin-soothing effects. Multani Mitti (Fuller's earth) functions as a natural absorbent, effectively removing excess sebum, dirt, and other impurities from the skin. Rose petals provide cooling, soothing, and antioxidant properties while imparting a pleasant natural fragrance to the formulation. Reetha (Soapnut), owing to its high saponin content, serves as a natural surfactant that provides effective cleansing and desirable foaming characteristics.

The present study focuses on the formulation and evaluation of a herbal face wash using lemon peel, Multani Mitti, Reetha, rose petals, and fenugreek seeds as the principal ingredients. The raw materials were authenticated, shade-dried, and finely powdered using a mechanical grinder. The powdered materials were subsequently subjected to preliminary phytochemical screening to detect the presence of alkaloids, flavonoids, tannins, glycosides, and carbohydrates through standard qualitative chemical tests. Thin-layer chromatography (TLC) was also performed to characterize the phytochemical constituents.

The herbal face wash formulations were prepared by blending the selected ingredients in different concentrations to obtain optimized formulations. The developed formulations were evaluated for their physicochemical properties, including pH, irritancy, foaming ability, and spreadability. Furthermore, pharmacological evaluation was carried out by assessing the antioxidant activity of the prepared herbal face wash, thereby determining its potential effectiveness as a natural skincare product.

Keywords: Lemon peel, Fenugreek, Dry face wash formulation, Evaluation parameters, Antioxidant Activity.

How to cite this article: Sheela Thorat* Poonam Suryavanshi Vaishnavi Zimal Karuna Shinde Aditya Kumbhar Nikhil Jadhav Ankita Sapate. FORMULATION AND EVALUATION OF DRY POWDER FACEWASH. Int J Drug Deliv Technol. 2026;16(78s):1135-1147. DOI: 10.25258/ijddt.16.78s.126

Introduction

Maintaining proper hygiene is essential for healthy skin. Everyday exposure to environmental factors such as sunlight, dust, microorganisms, and pollution can negatively affect the skin, leading to problems like dullness, irritation, and reduced elasticity. Since the skin acts as the body's outer protective layer, it is continuously influenced by external conditions including UV rays, temperature changes, and humidity variations. Continuous contact with polluted surroundings may disturb the skin's natural balance, resulting in blocked pores, irritation, and early signs of aging.

Clear and healthy skin is a common goal, and it can be achieved through regular skincare practices.

Among these, facial cleansing is one of the most important steps, as it helps eliminate dirt, excess oil, and impurities that accumulate on the skin. Various products such as cleansing milk, creams, solutions, and face washes are commonly used for this purpose. Simply rinsing the face with water is not enough, as it cannot effectively remove oil-based impurities or environmental pollutants.^[1]

Face washes are commonly formulated to provide multiple skincare benefits such as cleansing, reducing wrinkles, preventing acne, moisturizing the skin, and improving complexion. Skin-lightening agents function by inhibiting the formation of melanin within melanocytes, thereby decreasing melanin levels and influencing its

synthesis and metabolic processes in the skin. Because these agents exhibit minimal toxicity to melanocytes, compounds like propanediol, Evodia rutaecarpa fruit extract, arbutin, kojic acid, and vitamin C along with its derivatives are widely incorporated into cosmetic products designed for skin whitening.

Herbal powder face wash has gained popularity as a chemical-free, eco-friendly, and skin-friendly cleansing solution.^[3]

These eco-friendly formulations avoid harsh synthetic chemicals, instead offering antioxidant and antibacterial properties that suit all skin types. Key benefits include deep pore cleansing, reducing acne, and removing dead skin cells without stripping natural oils. It acts as a deep cleanser, gentle exfoliator, and nutrient source, removing excess sebum, dirt, and acne-causing bacteria without using synthetic preservatives.^[4]

Herbal cosmetics have become increasingly popular due to their natural origin, safety, and therapeutic benefits. Herbal powder face wash is a traditional formulation prepared by blending dried plant materials in powdered form, offering a chemical-free alternative to synthetic cleansers. These formulations are widely accepted for their ability to cleanse, rejuvenate, and maintain healthy skin without causing irritation or adverse effects.^[5]

The skin is constantly exposed to environmental pollutants, dust, and ultraviolet radiation, which can lead to conditions such as acne, dullness, and premature aging. The use of plant-based ingredients rich in bioactive compounds helps protect the skin from such damage. In the present formulation, lemon peel (*Citrus limon* (L.) Osbeck), fenugreek (*Trigonella foenum-graecum*), and multani mitti (Fuller's earth) are selected due to their well-known dermatological benefits.

Lemon peel is rich in vitamin C and flavonoids, which exhibit antioxidant and skin-brightening properties while helping to remove excess oil and dead skin cells. Fenugreek contains mucilage, proteins, and nicotinic acid, providing anti-inflammatory and moisturizing effects that help soothe irritated skin and reduce acne. Multani mitti acts as a natural absorbent, effectively removing impurities, excess sebum, and toxins from the skin, thereby improving skin texture and complexion.^[6]

The combination of these ingredients results in a synergistic effect, enhancing cleansing, exfoliation, and skin nourishment. Herbal powder face wash formulations not only maintain the natural pH balance of the skin but also support eco-friendly and sustainable skincare practices. Thus, this formulation represents a safe, effective, and economical approach to modern skincare based on traditional herbal knowledge.^[7]

Materials and Methods

Materials

Sr	Materials	Uses
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no		
1.	Lemon peel	Moisturizing & Anti-inflammatory
2.	Fenugreek	Moisturizer
3.	Multani mitti	Absorbent
4.	Reetha	Natural Surfactant
5.	Rose petals	Soothing & cooling effect

Table no 1 List of

Materials

Chemicals : silica gel, Distilled water, Chloroform, Methanol, Glacial acetic acid, Iodine (iodine chamber), Fehling solution A & B, Dilute HCl/ Concentrated HCl, Mayer's reagent, Wagner's reagent, Dragendorff reagent, alpha-naphthol, Ferric chloride, lead acetate.

Equipment's

pH meter, Freezer, Weighing balance, Hot air oven

Preparation of Herbal Powder Face Wash

Collection and Cleaning of Raw Materials

The herbal ingredients, namely lemon peel (*Citrus limon* (L.) Osbeck), fenugreek seeds (*Trigonella foenum-graecum*), Multani Mitti (Fuller's earth), rose petals, and Reetha (*Sapindus mukorossi*), were procured from the local market. All materials were carefully cleaned to remove dust, dirt, and other foreign impurities before processing.

Drying

The cleaned plant materials were shade-dried to preserve their phytochemical constituents. When required, drying was completed in a hot air oven maintained at 40–50°C until a constant weight was obtained.

Powdering

The dried ingredients were pulverized separately using a mechanical grinder to obtain fine powders.

Sieving

Each powdered ingredient was passed through **Sieve No. 60** to obtain a uniform particle size suitable for formulation.

Weighing and Formulation

The sieved powders were accurately weighed according to the formulation compositions shown below.

Table 1. Batch F1 Formulation

Ingredient	Quantity (%)
Lemon Peel	50
Fenugreek	20
Multani Mitti	10
Rose Petals	10
Reetha	10

Formulation

Table 2. Batch F2

Ingredient	Quantity (%)
Lemon Peel	50
Fenugreek	20
Multani Mitti	20
Rose Petals	5
Reetha	5

Formulation

Table 3. Batch F3

Ingredient	Quantity (%)
Lemon Peel	30
Fenugreek	20
Multani Mitti	20
Rose Petals	10
Reetha	20

Mixing

The accurately weighed powders were blended thoroughly in a clean, dry mortar and pestle to obtain a homogeneous herbal powder face wash formulation. Care was taken to ensure uniform distribution of all ingredients.

Storage

The prepared formulations were transferred into clean, dry, airtight containers and stored at room

temperature in a cool and dry place. The formulations were allowed to stabilize for **3–5 days** before further evaluation.

Evaluation Test

1. Determination of pH^[8]

Procedure

Approximately 1 g of the herbal powder face wash was accurately weighed and dissolved in 10–20 mL of distilled water. The solution was stirred thoroughly to obtain a uniform dispersion.

The pH meter was switched on and allowed to stabilize before use. The electrode was rinsed with distilled water, gently dried using tissue paper, and calibrated using standard buffer solutions of pH 7.0 followed by pH 4.0 or pH 9.0.

After calibration, the electrode was rinsed with distilled water and immersed in the prepared sample solution. The pH was recorded after the reading became stable. The measurement was performed in triplicate, and the average value was reported.

2. Foaming Ability^[9]

Procedure

About 1 g of the herbal powder face wash was dispersed in 10 mL of distilled water and transferred into a 100 mL graduated measuring cylinder. The total volume was adjusted to 100 mL with distilled water.

The cylinder was tightly stoppered and shaken vigorously 10 times in a vertical direction. After standing for 1 minute, the total volume (liquid and foam) was measured, and the foam volume was recorded. Foam stability was evaluated by measuring the foam volume again after 5 minutes.

Observations

- Initial foam height (after 1 minute)
- Foam height after 5 minutes
- Foam stability

3. Cleansing Action

Hand Cleansing Test^[10]

Procedure

A small amount of oil and dust was applied uniformly on the hands to simulate surface impurities. The required quantity of the herbal powder face wash was mixed with distilled water to prepare a smooth paste. The paste was gently rubbed onto the hands for **1–2 minutes** and then rinsed thoroughly with water.

Observation

The cleansing efficiency was evaluated based on the removal of oil, dirt, and impurities and the feel of the skin after washing.

4. Skin Irritation Test^[11]

Procedure

A small area of skin, preferably the inner forearm or behind the ear, was selected and cleaned with water. The formulation was applied directly or as a 1% aqueous solution, depending on the study requirement.

A small quantity of the sample was placed on a sterile cotton or gauze patch and applied to the selected skin area. The patch was secured with adhesive tape and left undisturbed for 24 hours. After removal, the test site was examined for signs of erythema, itching, edema, burning sensation, or any other irritation.

Observation

The formulation was considered non-irritant if no visible signs of irritation were observed.

5. Spreadability Test^[12]

Procedure

A small quantity of the herbal powder face wash was placed on the palm, and a few drops of distilled water were added to prepare a smooth paste. The paste was applied to the back of the hand and spread gently using circular finger movements.

Observation

The ease of spreading, smoothness of application, and uniformity of distribution were visually assessed.

6. Stability Study^[13]

Procedure

Approximately **1 g** of the prepared herbal powder face wash was weighed accurately and divided into **three equal samples**. Each sample was transferred into separate labeled containers as follows:

- **Sample A:** Freezer condition (2–8°C or below 0°C)
- **Sample B:** Room temperature (approximately 25°C)
- **Sample C:** Hot air oven (40–60°C)

The samples were stored under their respective conditions, and the temperature was recorded daily using a thermometer. The formulations were periodically examined for changes in color, odor, texture, moisture content, and overall appearance.

Observation

The formulations were evaluated for their physical stability under different storage conditions.

7. Thin Layer Chromatography (TLC)

Procedure

Preparation of Sample Solution

Approximately **0.5 g** of the herbal powder face wash was extracted with **10 mL of methanol or ethanol**. The mixture was shaken thoroughly and allowed to stand for **10–15 minutes**, followed by filtration through Whatman filter paper to obtain a clear filtrate.

Preparation of TLC Plate

A pre-coated silica gel TLC plate was used. A light pencil line was drawn approximately 1–2 cm above the lower edge to serve as the baseline.

Sample Application

The sample extract was applied onto the baseline using a capillary tube. The spot was allowed to dry, and the application was repeated 2–3 times to obtain a concentrated spot.

Mobile Phase

The solvent system consisted of:

Toluene: Ethyl acetate : Formic acid (5:4:1)

Development

The mobile phase was poured into a TLC developing chamber and allowed to saturate for 10–15 minutes. The TLC plate was placed carefully inside the chamber with the sample spot above the solvent level. The solvent was allowed to migrate to approximately three-fourths of the plate length.

Drying and Visualization

The developed plate was removed, and the solvent front was immediately marked. After drying, the chromatogram was observed under UV light (254 nm and 366 nm) and further visualized using iodine vapour as the detecting reagent.

Calculation of R_f Value

The retention factor (R_f) was calculated using the following equation:

$$R_f = \frac{\text{Distance travelled by the compound}}{\text{Distance travelled by the solvent front}}$$

The distances travelled by each spot and the solvent front were measured, and the R_f values were calculated accordingly.

Phytochemical test

Test	Procedure	Observation
Alkaloid test 1. Mayer's test 2. Dragendorff's test 3. Wagner's test	2ml filtrate + Mayer's reagent 2ml filtrate + Dragendorff reagent 2ml filtrate + Wagner reagent	Cream/white precipitate Orange/red dish-brown precipitate Reddish-brown precipitate
Carbohydrate test 1. Molisch test 2. Fehling Test	2ml filtrate + 2/3 drop Molisch reagent + conc H ₂ SO ₄ Fehling	Violet/purple ring at junction Brick red precipitate

	A & B solution + sample solution + Heat the solution	
Lead Acetate Test 1. lead acetate test	2ml filtrate + lead acetate solution + mix well	Black precipitate
Phenolic Test 1. Ferric chloride test	2ml filtrate + few drop of ferric chloride + mix well	Black /Green /Violet precipitate
Saponin Test	0.5ml filtrate + add 10ml distilled water, shake for 30 second. Let it stand for 10-15 minutes.	Persistent stable foam layer
Flavonoid Test	2ml extract + add few magnesium turnings + add conc. HCL drop wise	Development of pink colour
Glycosides Test	2ml extract + 1ml glacial acetic acid + few drop of FeCl ₃ + add conc. H ₂ SO ₄ along the	Formation of brown ring at interface

	side of the test tube	
Emulsion Test	2ml extract + 2ml distilled water+ shake well	Formation of stable milky emulsion
Steroid Test	2ml extract + 2ml chloroform + conc. H ₂ SO ₄ + along the side of the test tube	Formation of reddish – brown colour in lower layer

Table no 3 Phytochemical

Analysis

DPPH Activity

Antioxidant activity study by DPPH-scavenging assay:

The scavenging activity of herbal face wash formulation was tracked by using 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical by the scavenging method.[1] The reaction mixture included 1 mL of respected samples of different concentrations (20 µg/ml to 100 µg/ml of Facewash formulation solution) with 2 mL of 1.0 mmol L⁻¹ DPPH radical solution prepared in methanol and incubated further for 30 min. in dark at 37 °C. The absorbance of the mixture was recorded at 570 nm using a spectrophotometer (UV-1800, Shimadzu, Japan). The ability to scavenge the DPPH radical was calculated using the following equation.

$$\% \text{ of Radical Scavenging} = \frac{\text{control-sample}}{\text{control}} \times 100 \text{ [2]}$$

The obtained results were summarised in the form of a graph, in this ascorbic acid kept as control (1000µg/ml)[Graph 1]

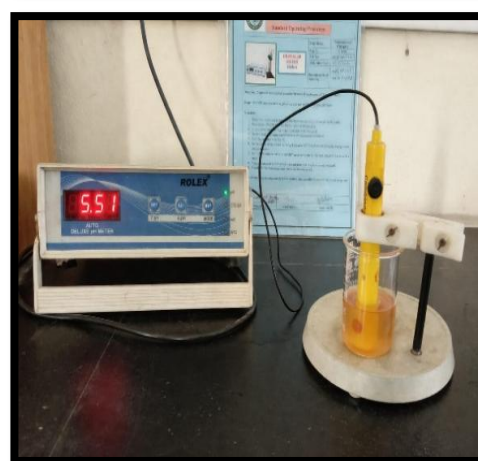
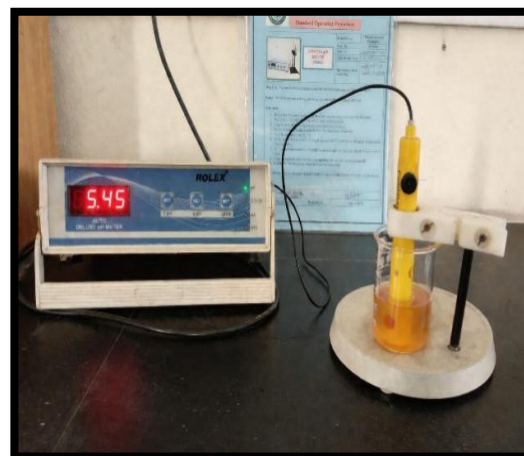
Result & Discussion

Determination of pH

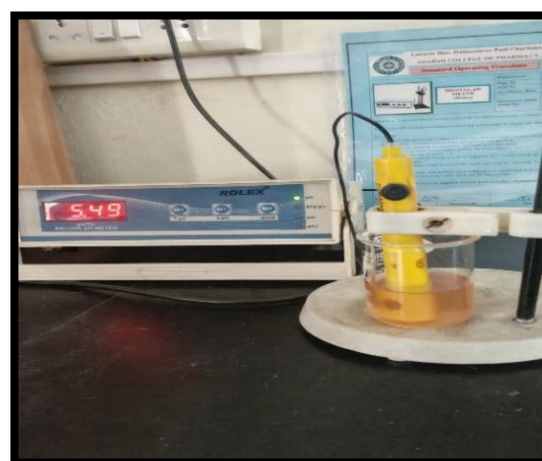
Sr.No	Samples	pH values
1	Batch 1	5.45
2	Batch 2	5.51
3	Batch 3	5.49

Table no 4 Determination

of pH

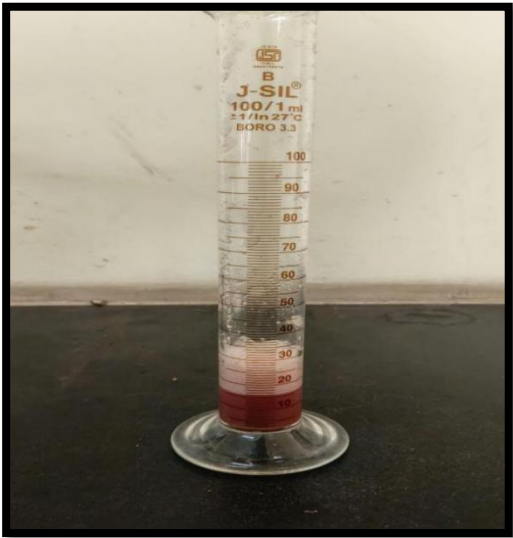
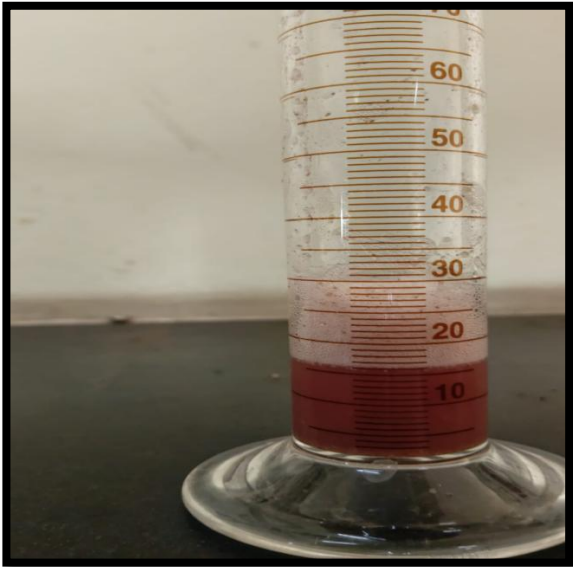
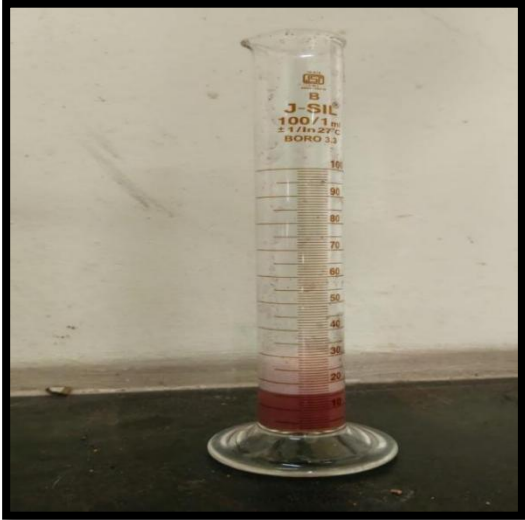

 Batch
Batch : 2

:1


 Batch: 3
Foaming test

Sr. no	Batch	Liquid volume	Foam volume
1	Batch 1	10ml	30ml
2	Batch 2	10ml	32ml

3	Batch 3	10ml	35ml
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Batch
Batch 2

1

Cleansing Test		
Sr. no	Batch	Cleansing action
1	Batch 1	Good cleansing
2	Batch 2	Excellent cleansing
3	Batch 3	Good cleansing

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Batch 1



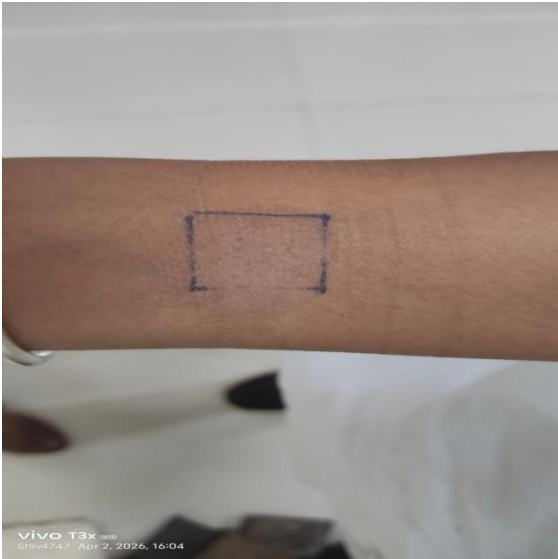
Batch 2

S r. n o	Applicat ion area observat ion	Redne ss	Itchi ng	Irritati on	Resu lt
1.	Skin appeared normal after washing	Absen t	Abse nt	No irritatio n	Safe

2.	No visible change in skin	Absen t	Abse nt	No irritatio n	Safe
3.	Skin remained smooth and irritation free	Absen t	Abse nt	No irritatio n	Safe



Batch 1



Batch 3

Spread ability Test

Sr.no	Batch	Observation	Spread ability
1.	Batch 1	Better spreading	Good spread ability
2.	Batch 2	Better spreading	Good spread ability
3.	Batch 3	Better spreading	Good spread ability

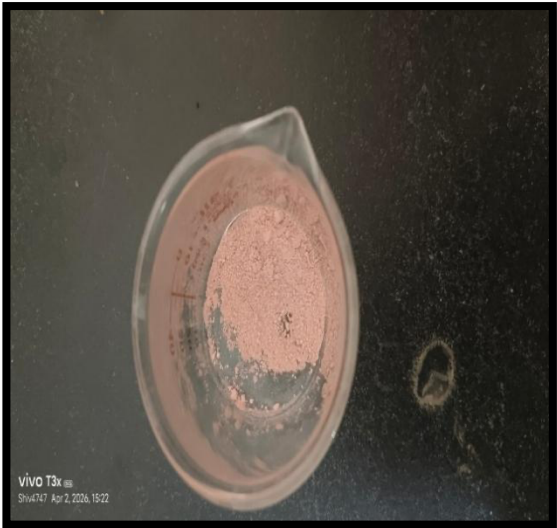


Batch
Batch 2



Batch 3
Stability Testing

Sr.no	Storage Conditions	Room Temp.	Refrigerator [low temp.]	Hot air oven [high temp.]
1.	Batch 1	No change	No change	Slightly change
2.	Batch 2	No change	No change	Significant change
3.	Batch 3	No change	No change	No change



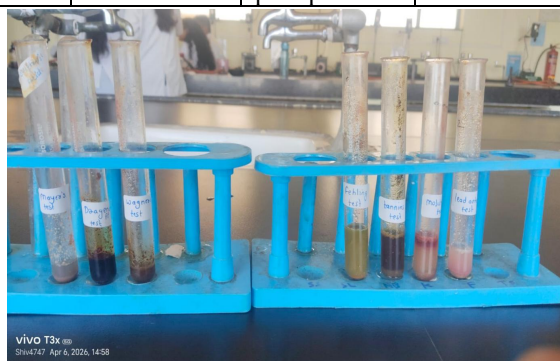
Batch 1
Batch 2



Batch 3

Phytochemicals Test

Sr.no	Phytochemical test	Observation	Result
1.	Alkaloid test		
	a) Mayers test	Crème / White precipitate	Alkaloid Present
	b) Dragendroff test	Orange/Reddish brown precipitate	Alkaloid Present
	c) Wagners test	Reddish brown precipitate	Present
2.	Carbohydrate test		
	a) Molisch test	Violet purple ring at junction	Carbohydrates Present
	b) Fehling test	Brick red precipitate	Carbohydrates Present
3.	Lead Acetate test		
	a) Lead Acetate test	White precipitate	Tannin Present
4.	Phenolic test		
	a) Ferric chloride test	Black / violet precipitate	Phenol Present

**Phytochemical****Test**

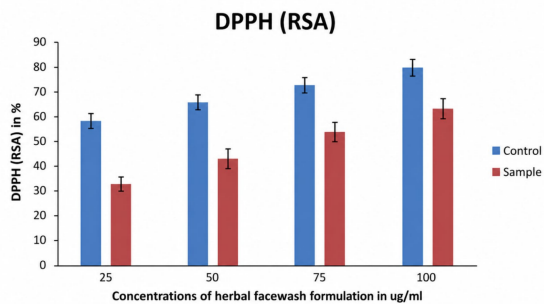
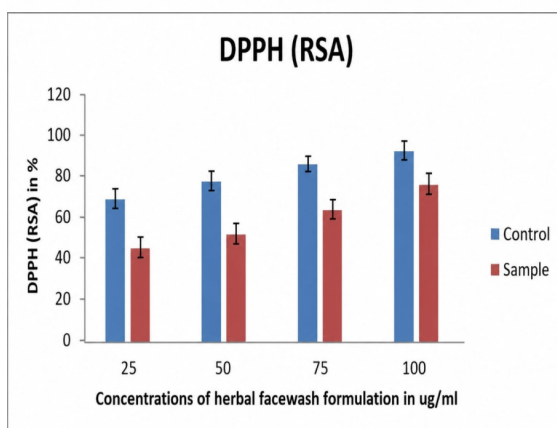
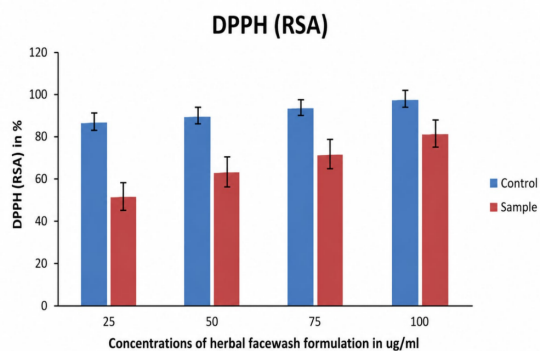
TLC

Fenugreek

Sr no	Spot no	Distance travelled by spot (cm)	RF value
1	1	2.5	0.50
2	2	3.5	0.70



Fig no Thin layer chromatography of fenugreek powder



Reference

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