IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Formulation And Evaluation Of A Polyherbal Shampoo by using Bacopa Monnier.

Potjale Manmath Shivraj, Patil Sharda Anil, Pawar Shivani Rajesh, Pawar anjali udhav, Punde Pandurang Udhavrao And Ghodge Karan

Student

D K Patil institute of pharmacy

ABSTRACT :-

Hair plays a vital role in human attractiveness and reflects internal health. Since ancient times, herbs have been used for cleansing and maintaining hair. Herbal shampoo powders made from ingredients like brahmi, reetha, shikakai, amla, aloe vera, fenugreek, and neem are preferred due to their safety and effectiveness. These natural formulations help remove dirt, sebum, and dandruff while promoting hair growth, strengthening, and conditioning without causing damage. Shampoo primarily cleanses the scalp and hair by removing accumulated impurities. Compared to synthetic products, herbal shampoos are gaining popularity as they nourish hair and improve its health, offering a natural and gentle alternative for hair care.

Keywords: Polyherbal shampoo, Natural ingredients, Herbal powder, Anti-dandruff, Organoleptic properties, Cleansing ability, Conditioning agent.

INTRODUCTION:-

Hair-care products may be defined as the preparation which is meant for removal of dirt, excessive oil, dandruff from the hair and scalp. Hair cares products also provide nourishment to the hair and giving the healthy look to hairs. The real technology of cleaning the hair and scalp was developed in this century by the introduction of cake soap which was followed by the production of shampoo products.[1] The shampoo is a world derived from the Indian subcontinent.

It dates to 1762 and is derived from Hindi champo which means head massage with the mean of hair oil.[2] Herbal products have negligible side effects. Shampoos are of various types, like powder shampoo, clear liquid shampoo, lotion shampoo, solid gel shampoo, a medicated shampoo, liquid herbal shampoo etc. As far as herbal shampoos are concerned instability criteria.

According to the nature of the ingredients they may be simple or plain shampoo, antiseptic or antidandruff shampoo and nutritional shampoo containing vitamin, amino acids proteins hydrolysate[3]

❖ **Hair anatomy:-**

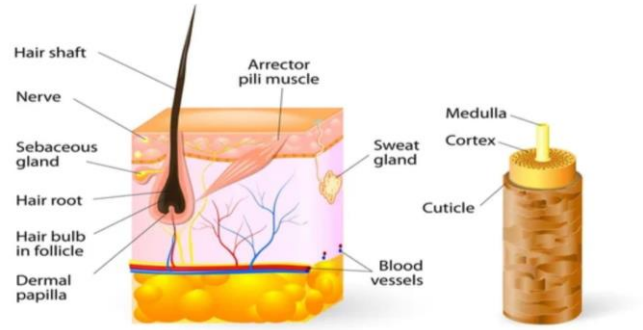


Fig.1.*Hair anatomy.*

Hair anatomy involves the hair shaft, the visible part made of the outer cuticle, the middle cortex, and the inner medulla, and the hair root, embedded in the hair follicle within the skin. The hair follicle is the sheath and the source of new hair, connected to a sebaceous gland for oil, a tiny arrector pili muscle for standing hair, and a network of nerves. The dermal papilla at the follicle's base provides blood and nutrients, with actively dividing cells in the hair matrix forming the new hair. The hair follicle are identical to the dermal nerve network including sensory afferents and autonomic sympathetic nerves. Smaller nerve fibers form a circular layer around the bulge area of terminal follicles and the bulb area of vellus follicles. There are several types of nerve endings associated with the hair follicle: free nerve endings, lanceolate nerve endings. Merkel cells and pilo-Ruffini corpuscles. Each nerve ending responds to distinct stimulus, Free nerve endings transmit pain, lanceolate nerve endings detect acceleration, Merkel cells responsible of pressure sensation and pilo-Ruffini corpuscles detect tension. Perifollicular nerves related neuromediator and neuropeptides, that is, substance P. calcitonin gene-related peptide influence follicular keratinocytes and hair follicle cycling.

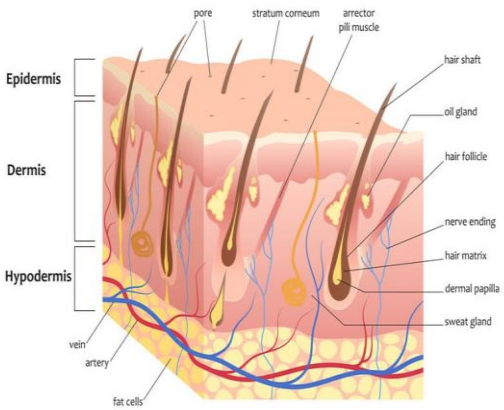


Fig.2.*Hair structure*

The hair root is in the skin and extends down to the deeper layers of the skin. Each hair follicle is attached to a tiny muscle (arrector pili) that can make the hair stand up. Many nerves end at the hair follicle too. These nerves sense hair movement and are sensitive to even the slightest draft. New hair cells are constantly being made in the hair bulb, close to the papilla.

➢ **Ideal characteristics of shampoo:-**

- Should effectively and completely remove the dirt and excessive build-ups between hair and sebum.
- Should improve the softness, lustre with good manageability.
- Should be easily removed by rinsing with water.
- Should impart pleasant fragrance to the hair.
- Should not make the hand rough and chapped.
- Should not have any side effects.
- Should not irritate the skin and eyes.

➢ **Advantages of shampoo:**

- Reduced hair fall and controls damage.
- Improved hair growth and scalp health by balancing pH and oil levels.
- They are generally milder.
- Skin-friendly.
- Free of harmful synthetic chemicals.

- **Disadvantages of shampoo:**

- Skin irritation
- Dryness
- Allergic reactions
- Milder Effectiveness
- Possible Incompatibility with Other Hair Products.

PLANT PROFILE:-

❖ **Brahmi**

- **Synonyms**: Herpestis monniera, Water hyssop, JalBrahmi, Nirbrahmi, Indian pennywort.
- **Biological Source:** Brahmi consist of dried whole plant of *Bacopa monnieri.*
- **Family**: *Plantaginaceae*

➢ **Chemical Constituent:**

A. Bacosides

- Bacoside A and B are the most important active saponins.

B. Alkaloids

- Brahmine
- Herpestine

C. Saponins

- Inhancing nerve impulse transmission.

Fig:- 3 *Brahmi*

➢ **Uses:**

1. Promotes hair growth
2. Prevents split ends
3. Act as a natural conditioner
4. Prevents dandruff
5. Helps with hair fall
6. Prevents greying of hair
7. Helps soothe burns

➢ **Pharmacological Activity:**

1. Nootropic (Memory Enhancer) activity
2. Anxiolytic (Anti-anxiety) activity
3. Anti-inflammatory activity
4. Antidepressant activity

❖ **Reetha:-**

- **Synonym:-** Soapnut Soapberry Aritha / Areetha Indian Soapnut
- **Biological Source:-** Reetha consists of the dried fruit of *Sapindus mukorossi gaertn.*
- **family**:- *Sapindaceae.*

Fig. 4 : *Reetha*

➢ **<u>Chemical Constituents</u>:**

- Triterpenoid saponin (foaming and cleansing)
- Fatty acids

➢ **Uses:**

- Used in washing silk and wool as it does not damage hairs.
- Act as a detergent.
- Provide shining and silky hair.
- Used as a natural cleanser and foaming agent.

➢ **Pharmacological activity:**

- Anti-inflammatory
- Antimicrobial
- Anti-cancer
- Cytotoxic

❖ Shikakai:-

- **Synonym**:- Soap Pod Acacia concinna Seeka pods Cheenikaya Shikakai
- **Biological Source**:- Shikakai consists of the dried pods of *Acacia concinna Linn*.
- **Family**:- *Fabaceae (Leguminosae).*

Fig: 5: *Shikakai*

➢ **Chemical Constituents:-**

- Saponins
- Tannins (Tighten scalp tissues)
- Flavonoids (Rutin, quercetin)

➢ **Uses:-**

- Controls hair fall.
- Prevents dryness.
- Cleans scalp.
- Promotes faster hair growth.
- Make hair soft and shiny.

➢ **Pharmacological activity:-**

- Antioxidant
- Anti inflammatory
- Anti microbial
- Uv protective

❖ Amala:-

- **Synonym:-** Indian Gooseberry, Emblic myrobalan**,** Amlaki, Nellikai, Amlika / Dhatri.
- **Biological Source:-** Amla consists of the dried or fresh fruits of *Phyllanthus emblica* Linn.
- **Family:-** *Phyllanthaceae*

Fig.6. *Amala*

➢ **Chemical Constituents:-**

- Vitamin C (Ascorbic acid) – main active constituent (supporting immune function)
- Tannins: Emblicanin A & B

➢ **Uses:-**

- Treats Hair Fall
- Dandruff Treatment
- Hair Growth
- Shields Hair From External Damage
- Reduces For Hair Loss

➢ **Pharmacological activity:-**

- Anti oxidant
- Anti inflammatory
- Anti microbial
- Anti dandruff

❖ Fenugreek:-

- **Synonym:** Greek clover, *Trigonella foenumgraecum*. herb, herbaceous plant.
- **Biological Source:** the dried seeds of the plant *Trigonella foenum-graecum.*
- **Family:** *Fabaceae.*

Fig.8. *Fenugreek.*

- **Chemical Constituents:**
  - Saponins
  - Trigonelline
- **Uses:**
  - Treating scalp problems.
  - Treating dandruff.
  - Dryness of the scalp.
  - Clogged pores.
  - Oily texture.
- **Pharmacological activity:**
  - Antioxidant
  - Antimicrobial
  - Anti dandruff

❖ Neem:-

- **Synonym:** *Azadirachta*, Margosa tree, Indian Lilac
- **Biological Source:** Neem consists of the dried leaves, bark, seeds, or oil obtained from the plant *Azadirachta indica* A.
- **Family:** Meliaceae.

Fig.9. *Neem.*

- **Chemical Constituents:**
  - Limonoids
  - Azadirachtin
  - Nimbin
  - Nimbidin (Antibacterial and Antifungal)
- **Uses:**
  - Treat dandruff
  - Antifungal
  - Preservative
  - Antibacterial
- **Pharmacological activity:**
  - Antioxidant
  - Antibacterial
  - Antifungal
  - Anti-oxidant.

MATERIALS AND METHODS :-

❖ MATERIALS :-

Sr.no.	Ingredient	Part of plant	Uses
1)	Brahmi	Flower, leaves & pods	Promote hair growth & Prevent dandruff
2)	Reetha (Soapnut)	Fruit	Provide shining & silky hair, detergent
3)	Shikakai	Leaves & Pods	Nourish the scalp, heal damage
4)	Amla (Indian Gooseberry)	Pulp	Darkening of hair & hair growth promoter
5)	Fenugreek (Methi)	Seeds	Antifungal & Antibacterial
6)	Neem	Leaves	Reduce hair loss
7)	Distilled Water / Decoction Base	Liquid base	Soothed sensitive scalps
8)	Castor oil	Oil base	Preservative

❖ APPARATUS :

- ✓ Beaker
- ✓ Measuring cylinder
- ✓ Stirrer
- ✓ China dish
- ✓ Morter pestle
- ✓ pH meter
- ✓ Test tube
- ✓ Sieve
- ✓ Hot air oven

❖ PREFORMULATION STUDY :-

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

$$\text{FORMULA: } \textbf{BULK DENSITY} = \frac{\textbf{MASS}}{\textbf{BULK VOLUME}}$$

➢ Tapped density

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

$$\text{FORMULA: } \textbf{TAPPED DENSITY} = \frac{\textbf{MASS}}{\textbf{TAPPED VOLUME}}$$

➢ 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.

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

- **Hausner's ratio**

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

FORMULA: $\textbf{HAUSNER'S RATIO} = \frac{\textbf{Tapped density}}{\textbf{Bulk density}}$

- **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.

FORMULA: $\emptyset = \textbf{tan}^{-1}(\boldsymbol{h/r})$

Where,

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

- **% Ash value**

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

FORMULA: $\%\ \textbf{ASH} = \frac{\textbf{W2} - \textbf{WO}}{\textbf{W1}} \times \textbf{100}$

- W_2: weight of crucible + ash
- W_O: 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.

❖ **PRE-FORMULATION STUDY:**

Table No. 1. Bacopa monnieri

Sr. No.	Drug	Bacopa monnieri		
	Sieve no. #	**80 #**	**100 #**	**120 #**
1	Bulk Density	0.35g	0.35g	0.35g
2	Tapped Density	0.90g	0.94g	0.55g
3	Carr's Index	61	62	36
4	Hausne's Ratio	2.57	2.68	1.57
5	Angle Of Repose	47°9`	47°4`	44°4`
6	% Ash Value	47%		

Table No. 2. Shikakai

Sr. No.	Drug	Shikakai		
	Sieve no. #	**80 #**	**100 #**	**120 #**
1	Bulk Density	0.98g	0.89g	0.90g
2	Tapped Density	1.08g	1g	1.06g
3	Carr's Index	9	11	15
4	Hausne's Ratio	1.10	1.12	1.17
5	Angle Of Repose	47°7`	46°6`	41°
6	% Ash Value	51%		

Table No. 3. Reetha

Sr. No.	Drug	Reetha		
	Sieve no. #	**80 #**	**100 #**	**120 #**
1	Bulk Density	0.89g	0.92g	0.92g
2	Tapped Density	1.06g	1.04g	1.02g
3	Carr's Index	16	11	9
4	Hausne's Ratio	1.19	1.13	1.10
5	Angle Of Repose	41°9`	37°9`	39°6`
6	% Ash Value	67%		

Table No. 4. Amla

Sr. No.	Drug	Amla		
	Sieve no. #	**80 #**	**100 #**	**120 #**
1	Bulk Density	0.90g	0.96g	0.66g
2	Tapped Density	1.11g	1.11g	0.90g
3	Carr's Index	18	13	26
4	Hausne's Ratio	1.23	1.15	1.36
5	Angle Of Repose	37°2`	41°6`	42°9`
6	% Ash Value	50%		

Table No. 5. Fenugreek

Sr. No.	Drug	Fenugreek		
	Sieve no. #	**80 #**	**100 #**	**120 #**
1	Bulk Density	0.96g	0.84g	0.84g
2	Tapped Density	1g	0.92g	0.90g
3	Carr's Index	4	8	6
4	Hausne's Ratio	1.04	1.09	1.07
5	Angle Of Repose	49°9`	43°8`	43°5`
6	% Ash Value	58%		

Table No. 6. Neem

Sr. No.	Drug	Neem		
	Sieve no. #	**80 #**	**100 #**	**120 #**
1	Bulk Density	0.90g	0.45g	0.49g
2	Tapped Density	1g	0.98g	1g
3	Carr's Index	10	54	51
4	Hausne's Ratio	1.11	2.17	2.04
5	Angle Of Repose	39°6`	36°5`	41°
6	% Ash Value	51%		

❖ PHARMACOGNOSTIC TEST:-

Table no. 7: Pharmacognostic test of Bacopa monnieri

Sr. No.	TEST	OBSERVATION	RESULT
1	Tannis test: (Ferric chloride test) 1% Ferric chloride + Alcohol solution	Greenish black	Present
2	Carbohydrate test: (Fehling test) Fehling solution A + sample solution	Purple or violet colour	Present
3	(Molish test) α – napthol + Sample solution	Violet / purple reddish	Present
4	Lignin test:(Cellulose test) Sample + Iodine solution + Sulfuric acid	Turn blue violet	Absent
5	Glycoside test: (Baljet test) Sod. Pictrat + Alkaline + sample	Yellow to orange	Present
6	Flavenoids test :(Lead substance test) sample solution + lead acetate	Yellow colour	Present

❖ FORMULATION TABLE :-

Table no. 8: Formulation of Bacopa monnieri

Sr. No.	INGRIDENTS	F1	F2	F3	F4
1	Bramhi flower powder	25g	25g	**25g**	25g
2	Reetha fruit powder	4g	5g	**8g**	5g
3	Shikakai leaves powder	5g	3g	**4g**	4g
4	Amla pulp powder	5g	5g	**3g**	8g
5	Fenugreek seeds powder	3g	8g	**5g**	5g
6	Neem leaves powder	8g	4g	**5g**	3g
7	Caster oil	0.25ml	0.25ml	**0.25ml**	0.25ml
8	Water	Up to 150ml	Up to 150ml	**Up to 150ml**	Up to 150ml

❖ **METHOD :-**

1. Collection of plant materials:

- Bramhi
- Reetha
- Shikakai
- Amla
- Fenugreek
- Neem

2. Drying: drying dried in shade in shade for 5 days.

3. Grinding: all the dried leaf grinded into fine powder.

4. Weighing: all the powder herbs were weighted on digital weight machine according to formulation

5. Sieving: all the powder herbs were passed through sieve no. 80,100,120, to obtain very fine powder particles.

Fig no.10: Sieving.

6. Mixing: Mix all The Powder Herbs Together.

Fig no.11: Mixing.

7. Packaging and labelling: the formulation of dry shampoo was well stored into an air tight container and labeled.

Fig no.12: Batches of powder shampoo.

❖ 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, griety.

- **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.

- **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.

- **Wetting time:**

The canvas was cut into 1 inch diameter discs having an average weight of 0.44 g. The disc was floated on the surface of shampoo solution of 1 % w/v and the stopwatch started. The time required for the disc to begin to sink was measured acutely and noted as the wetting time

- **Skin /Eye irritation test:**

The eye and skin irritation tests revealed that the herbal shampoo powder shows no harmful effect on skin and eye. This is due to the absence of synthetic surfactants. Most of the synthetic surfactants produce inflammation of the eyelid and corneal irritation.

- **Stability studies:**

Stability and acceptability of organoleptic properties (Odour and color) of formulations during the storage period studies for few days at room temperature.

❖ **EVALUATION TESTS :-**

Table no. 9: Organoleptic character for powder shampoo

Sr. No.	TEST	OBSERVATION
1	Colour	Light brown
2	Odor	Characteristic
3	Form	Powder
4	Appearance	Brown coloured powder
5	Texture	Fine powder

Table no. 10: Evaluation test for powder shampoo

Sr. No.	Evaluation Test	F1	F2	F3	F4
1	Solubility	Partially soluble	Partially Soluble	**Partially Soluble**	Partially soluble
2	Foaming ability(cm)	3	2.5	**2**	1.5
3	Washability	Easily washable	Easily Washable	**Easily Washable**	Easily washable
4	pH	5.5	5.5	**6**	5.5
5	Dirt Dispersion	Good	Good	**Excelant**	Fair
6	Wetting time	12.20	11.30	**11.17**	12
7	Skin Irritation Test	No	No	**No**	No

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

RESULT AND DISCUSSION :-

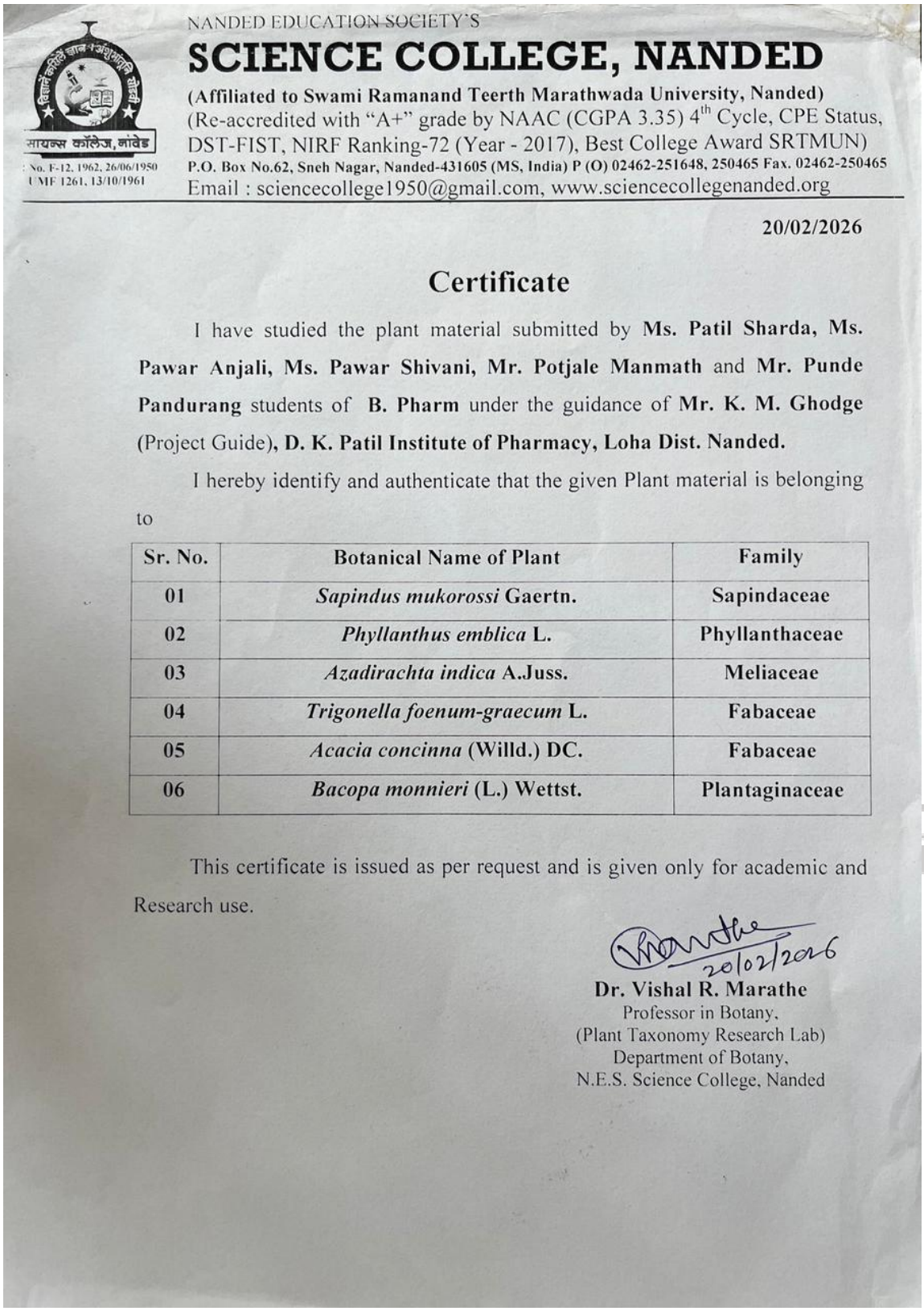
A. PROCUREMENT: Bacopa monnieri and other ingreadients are collected from botanical garden.

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

CONCLUSION :

From Current research work, we come to know that, the *Bacopa monnieri* can be converted to poly herbal powder shampoo & having good organoleptic properties. We also Find out from the initial powder batch C (Sieve 100) 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 100) 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,wetting time foam ability, etc.

ACKNOWLEDGMENT:



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20/02/2026

Certificate

I have studied the plant material submitted by **Ms. Patil Sharda, Ms. Pawar Anjali, Ms. Pawar Shivani, Mr. Potjale Manmath** and **Mr. Punde Pandurang** students of **B. Pharm** under the guidance of **Mr. K. M. Ghodge** (Project Guide), **D. K. Patil Institute of Pharmacy, Loha Dist. Nanded.**

I hereby identify and authenticate that the given Plant material is belonging to

Sr. No.	Botanical Name of Plant	Family
01	*Sapindus mukorossi* Gaertn.	Sapindaceae
02	*Phyllanthus emblica* L.	Phyllanthaceae
03	*Azadirachta indica* A.Juss.	Meliaceae
04	*Trigonella foenum-graecum* L.	Fabaceae
05	*Acacia concinna* (Willd.) DC.	Fabaceae
06	*Bacopa monnieri* (L.) Wettst.	Plantaginaceae

This certificate is issued as per request and is given only for academic and Research use.

20/02/2026

Dr. Vishal R. Marathe
Professor in Botany,
(Plant Taxonomy Research Lab)
Department of Botany,
N.E.S. Science College, Nanded

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