

FORMULATION AND EVALUATION OF POLYHERBAL ANTI-DANDRUFF SHAMPOO**Archana Kaushik, Satyajit Sahoo*, Sohan Patel, Rashmi Rajeghorpade, Tejas Patel,
Yagnesh Modi****Pioneer Pharmacy College, Vadodara, Gujarat, India - 390019***Corresponding Author's E mail: satyajitppdc@gmail.com

Received 21 Sept. 2024; Revised 25 Sept. 2024; Accepted 03 Oct. 2024, Available online 20 Oct. 2024



Cite this article as: Kaushik A, Sahoo S, Patel S, Rajeghorpade R, Patel T and Patel Y. Formulation and Evaluation of Polyherbal Anti-Dandruff Shampoo. Asian Journal of Pharmaceutical Education and Research. 2024; 13(4): 43-55.

<https://dx.doi.org/10.38164/AJPER/13.4.2024.43-55>**ABSTRACT**

The essential component of human beauty is hair. Shampoos are products that are mostly used to clean the scalp and hair. Since ancient times, people have used herbs to clean, style, and manage their hair. A hair care solution called shampoo is used to remove various contaminants that progressively accumulate in hair, such as oils, dirt, skin particles, dandruff, and pollutants from the environment. This article aims to educate readers on the several herbs that are used to cure dandruff as well as the causes and treatments of dandruff formation. The advantages of herbal shampoo versus synthetic shampoos are also discussed in this article. Dandruff is a prevalent scalp ailment that is often caused by a combination of many host variables and *Malassezia furfur*. Dandruff can only be adequately controlled; it cannot be completely eradicated. Synthetic products are less effective, have more adverse effects, and increase the risk of symptom recurrence. Because the scalp is among the body's most absorbent tissues, items given to it enter the bloodstream without passing through any sort of filter. Therefore, it's critical to comprehend the consequences of the components employed in shampoo compositions. The composition makes use of a variety of herbs, including Amla, Shikakai, Aritha, Curry leaves, Hibiscus, and other components to prepare a base shampoo that effectively fights dandruff, leaving hair glossy and smooth, and conditions and encourages hair development. Different characteristics, such as physical parameters, pH, viscosity, percentage of solid content, dirt dispersion, and wetting time Evaluations were conducted on foam stability, foaming capacity, cleaning action, etc.

Keywords: Anti-dandruff shampoo, Polyherbal Formulation, Evaluation.**INTRODUCTION**

Plants are made up of a variety of chemical components that perform a range of biological tasks required for disease resistance or treatment of several illnesses. The fungus *Malassezia* causes dandruff, a skin ailment that affects the scalp and leaves it oily and unpleasant. A common scalp condition that affects about half of the population is dandruff. During the development of dandruff,

keratinocytes are crucial for the expression and production of immune responses. Winter time makes dandruff more severe. Dandruff was treated with a variety of speciality shampoos, including herbal and synthetic formulations ¹. Shampoo is a hair care product that is used to clean hair. It often takes the shape of a thick liquid. Shampoo is used to clear away undesired buildup between hair strands without eliminating excessive sebum and causing the hair to become unmanageable. In order to make shampoos, a surfactant (usually sodium lauryl or sodium laureate sulphate) and a co-surfactant (usually cocamidopropyl betaine) are usually combined in water. Scientific studies have been conducted on herbal anti-dandruff shampoos in response to the ineffectiveness and increased side effects of synthetic products ². Herbal shampoos are cosmetic preparations that cleanse the hair and scalp similarly to ordinary shampoos by utilising traditional ayurvedic herbs ³. They are employed to get rid of grease, dandruff, pollutants in the environment, etc. It is critical to assess cosmetics in order to understand their efficacy, quality, and performance. It is imperative to verify if the products have any adverse or hazardous effects on human health. The Bureau of Indian Standards' guidelines for analysing cosmetic items were followed in the completion of the job. Therefore, if the marketed product does not meet the requirements established by the Bureau of Indian requirements, it may cause a number of adverse consequences, including heavy metals, protein precipitation, skin irritation, and inflammation of the eyes and skin. Avoiding the use of commercially accessible synthetic or chemical treatments is the main goal of the current inquiry. A number of herbal components that are anti-dandruff and encourage hair growth were employed. These ingredients also leave hair feeling soft and shiny. Most importantly, these preparations don't cost a lot of money. Many plants, including hibiscus, neem, tulsi, reetha, bhringraj, and shikakai, were added in the formulation ⁴.

A persistent scalp ailment known as dandruff is characterised by an excessive shedding of dead skin cells from the scalp. It is brought on by a yeast infection called *Malassezia globosa*, formerly known as *Pityrosporum*, and a fungus known as *Malassezia restricta*. Excessive loss of dead skin cells from the scalp is the cause of dandruff. The scalp's skin regenerates approximately once every month. Dead cells are normally shed by the scalp in an almost imperceptible manner, but occasionally an abnormally high rate of cell turnover results in the visible flakes known as dandruff. Poor personal hygiene, crowded living conditions, and warm, humid environments all encourage the spread of *Malassezia* ⁵.

CAUSES OF DANDRUFF: The fungus *Pityrosporum ovale*, which is naturally found on the scalp and other areas of the skin, may be the cause of dandruff. This fungus usually does no harm. However, the scalp will create more oil in response to hormonal fluctuations, stress, and weather changes, which will lead to the fungus *P. ovale* multiplying. The fungus's growth will cause the skin cells on the scalp to become itchy, as well as cause hair follicles to fall out and cause 'dandruff'. It is currently thought that the precise process of dandruff development is caused by the production of lipases, an enzyme. These are the enzymes that the fungus *Malassezia* uses to convert sebum to oleic acid. When oleic acid reaches the epidermis, it increases skin cell turnover in those who are vulnerable. This consequently results in flakes of dandruff and occasionally irritation and redness ⁶.

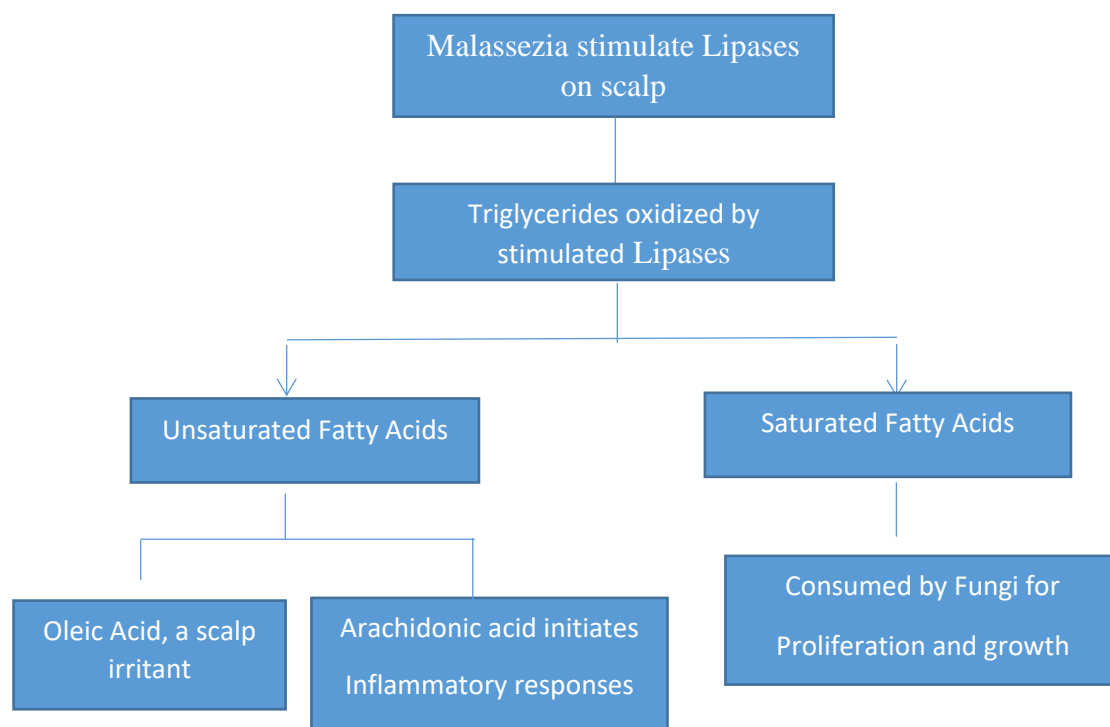


Fig.1. Represents the mechanism by which malassezia furfur causes dandruff

CLASSIFICATION OF DANDRUFF: Dandruff is classified in to two types:

1. Oily Dandruff
2. Dry Dandruff

1) **Oily Dandruff:** Another name for it is pityriasis steatites. It comes onto the scalp when sebum is produced. On the scalp, oily, dirty-yellow scales appeared accompanied with varying degrees of inflammation. In this disorder, hair loss is most common. This kind of dandruff most commonly affects the scalp, armpits, above the breastbone, and behind the ears.




- 2) **Dry Dandruff:** Another name for it is pityriasis simplex, which is characterised by an excessive amount of microscopic scales forming on the scalp. This kind of dandruff doesn't cause a lot of hair loss. There is no sign of skin irritation. The middle of the scalp is where the scales initially appear, and they later extend to the frontal, parietal, and occipital regions.



ADVANTAGES OF HERBAL SHAMPOO:

Herbal shampoos are made of natural substances that are used to cleanse hair without the use of artificial additives or surfactants, which can cause negative side effects.

- 1 Herbal shampoos for hair development help to strengthen the hair follicle by providing necessary oils and nutrients to the root and follicles. This promotes both hair growth and the formation of fresh, healthy hair roots.
- 2 If you use herbal shampoos on a daily basis, they can do wonders for your hair. For strong, beautiful hair, our scalp needs to maintain the proper oil to pH ratio.
- 3 If you use herbal shampoos on a daily basis, your hair will benefit greatly from them. To have strong, glossy hair, our scalp needs to maintain the perfect balance of oil to pH.
- 4 Herbal shampoos have the ability to preserve and even improve the natural colour of your hair, especially when used frequently. They also take meticulous care of their hair.
- 5 Herbal shampoos are biodegradable and kind to the environment.
- 6 It shouldn't irritate the skin or eyes.
- 7 They are composed of essential disinfection properties that are known nationwide, protecting the hair and scalp from UV radiation damage and preventing skin infections ⁷.

Role of Herbs or Herbs Used in the preparation of Polyherbal antidandruff shampoo:

Sr. No.	Herbs	Biological Source	Structure	Chemical Constituents	Uses
1.	Amla	It consist of fresh fruits of plant <i>Emblica officinalis</i> Gaerth (Phyllanthus emblica Linn.), belonging to family Euphorbiaceae .		Gallic acid, Ellagic acid and phyllembin	It is an effective hair regenerator since it strengthens, stimulates the roots, and encourages hair growth by activating the hair follicles.
2.	Aritha	It consists of fruits of the plant <i>Sapindus Mukorossi</i> , belonging to the family Sapindaceae.		Diosgenin, Gitogenin, Chlorogenin and Rusogenin	Shows cooling effect and excellent cleansing effect on the skin, prevent the scalp from drying
3.	Curry leaves	These are obtained from the plant, <i>Murraya Koenigii</i> belonging to the family Rutaceae.		Mahanimbine, Girinimbine	Curry leaves are loaded with properties that can work wonders for hair and lead to hair growth. These neutralize the free radicals and keep your hair healthy and strong.

4.	Shikakai	These are obtained from <i>Acacia concinna</i> Family: Leguminosae		Lupeol, Spinasterol, acacic acid, lactone, Oxalic acid, Tartaric acid, Citric acid, Calyctomine and Nicotine	Make hair Soft and shiny, Work as hair cleanser ,Boosts Hair Growth, Fight Dandruff
5.	Hibiscus	It is the flowering plant of <i>Hibiscus sabdariffa</i> , belonging to family Meliaceae		L- Ascorbic acid, Xyloseanthocyanin, Beta-carotene, Beta-sitosterol, citric acid	Used for the growth of hair, regrowth, and hair loss, carries amino acids, Vitamin A, C and alpha hydroxyl acids along with other nutrients that are highly beneficial for hair and scalp and minimize the chances of dandruff from hair.

MATERIALS AND METHODS

COLLECTION OF RAW MATERIALS: All the different parts of plant were selected for the study having hair care property. The plants are Amla (*Emblia officinalis Gaerth*), (Aritha *Sapindus Mukorossi*), Shikakai (*Acacia concinna*) were collected from Herbal garden in Vadodara and Curry leaves (*Murraya Koenigii*), Hibiscus (*Hibiscus sabdariffa*) were collected from Herbal garden in PPDC. Collected plant parts were washed with tap water and shade dried. Shade dried material was powdered and stored in air tight container for further use. They are responsible to provide the nutrition to the body. The selection of active ingredients for hair care powder is often based on the

ability of the ingredient to prevent damage to the hair as well as to improve the quality of the skin by way of cleansing, nourishing and protecting the hair.

PREPARATION OF PLANT EXTRACT: The crude plant materials were collected and washed under tap water, cut into pieces, air dried and pulverized into fine powder in a grinding machine. The powder separately mixed with 100 ml distilled water and kept for boiling till water gets reduced to one quarter. After boiling, the extract was cooled at normal room temperature and then filtered with muslin cloth to get the final filtrate ⁸.

PREPARATION OF HERBAL SHAMPOO: To formulate a clear shampoo base, four samples, designated as F-1, F-2, F-3 and F-4 were prepared by incorporation of 10%, 10%, 7%, 15% w/w extract in 7%, 10%, 12% and 12% w/w of sodium lauryl sulphate respectively. The volume was completed with distilled water to 100mL.

Ingredients and quantity of drugs utilized for preparation of herbal shampoo:

Table 1: Ingredients and quantity of drugs utilized for Preparation of Extract

Sr. No.	Ingredient	Scientific Name	Part Used	Quantity
1	Amla	Phyllanthus emblica	Fruit	5 gm
2	Aritha	Sapindus mukorossi	Fruit	20 gm
3	Shikakai	Acacia concinna	Fruit	10 gm
4	Curry Leaves	Murraya koenigii	Leaves	5gm
5	Hibiscus	Hibiscus rosa-sinensis	Leaves	10 gm

Table 2: Composition of the Prepared Herbal Shampoo

Ingredients(%w/w)	F1	F2	F3	F4	Role
Extract	10	10	7	15	Herbal anti-dandruff agents
Glycerin	5	5	7	5	Humectant
EDTA	0.15	0.15	0.15	0.15	Preservative
Gum	1	1	1	0.5	Stabilizer
Sodium Lauryl Sulphate (SLS)	7	10	12	12	Surfactant
Beat juice	5	5	5	5	Anti-inflammatory properties
Levender Oil	2 drops	2 drops	2 drops	2 drops	Flavouring Agent
Distilled water(mL)q.s.	100	100	100	100	Diluent/vehicle

EVALUATION OF HERBAL SHAMPOO:

1. Physical appearance: Every sample was examined for physical characteristics. The created formulations were assessed for fluidity, clarity, and capacity to produce forms. Like any other cosmetic product, shampoos are typically evaluated primarily based on their outward look, therefore physical appearance matters ^{9,10}.

2. Determination of pH: The pH of shampoo solution in distilled water was determined at room temperature. The pH was measured by pH paper ^{10,11}.

3. Percentage (%) of solid components: Five grams of the prepared shampoo were added to a clean, dry evaporating dish. The weight of the dish and shampoo was determined. The liquid portion of the shampoo was evaporated by placing on a hot plate. Then the weight of the shampoo solid contents after complete drying was determined ^{11,12}.

4. 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 1% w/v and the stopwatch started. The time required for the disc to begin to sink was measured accurately and noted as the wetting time ^{12,14}.

5. Dirt dispersion: Two drops of shampoo were added in a large test tube contain 10 ml of distilled water. One drop of ink was added; the test tube was Stoppard and shacked for ten times. The amount of ink in the foam was estimated as None, Light, Moderate, or Excellent ^{13,15}.

6. Foaming ability & foam stability: Cylinder shake method with slight modification was used for determining foaming ability. 50ml of the 1% shampoo solution was put into a 250ml graduated measuring cylinder and covered with hand. Measuring cylinder was shaken for 1 minute. The total volume of the foam content after 1 minute shaking was recorded. The procedure was continued for 5 minutes ^{14,15}.

7. Cleaning action: 5 grams of wool was added in grease and it was placed in flask containing 200 ml of water with 1 gram of shampoo. Temperature of content in the flask was maintained at $30 \pm 2^\circ\text{C}$. The flask was shaken for 4 minutes at the rate of 50 shakes per minute. The solution was removed and sample was taken out, dried and weighed. The amount of grease removed was calculated by using the following equation ¹⁵:

$$DP=100(1 - T/C)$$

In which, DP= percentage of detergency power,

C= weight of Sebum in the control sample and

T= weight of sebum in the test sample

RESULTS

1. Physical appearance: As any other cosmetic products, the attractiveness of shampoos for consumers tends to be judged visually, thus having physical appearance is important. The colour of our shampoo formulation was brown and impenetrable. It can produce foam with good efficiency. In terms of colour and clarity, it was found that the created shampoo differed significantly from commercial shampoo.

Table 3: Physical Appearance of the Formulated preparation:

Formulations	Colour	Odour
F1	Light Brown	Characteristics
F2	Brown	Characteristics
F3	Brown	Characteristics
F4	Pale yellow	Characteristics

2. Determination of pH: Product's pH balances are crucial because they have an impact on surfaces and skin when they are being utilised. The results were reported in table (4). It is noted that formulated shampoo is slightly acidic.

Table 4: pH of the Formulated preparation:

Formulations	F1	F2	F3	F4
pH	5	6.89	6.2	6.0

3. Percentage (%) of solid components: If the shampoo has too many solids it will be hard to work into the hair or too hard to wash out. The result of percentage of solids contents is tabulated in table (5).

Table 5: Percentage of solid contents of Formulated preparation:

Formulations	F1	F2	F3	F4
% solid contents	12.4	3.92	20	16.6

4. Wetting time: Wetting time of a substance is a function of its concentration. Drave's test is the official test but generally canvas disc method is used as it is easy and time saving. Comparison results are shown in Table (6).

Table 6: The wetting parameter of Formulated preparation:

Formulations	F1	F2	F3	F4
Wetting Time	53±3.33	47.66±0.66	160±5	68.66±6.34

5. Dirt Dispersion: Shampoo that causes the ink to concentrate in the foam is considered poor quality. Dirt that stays in the foam will be difficult to rinse away. It will be re deposit on the hair. The amount of ink in the foam of F1, F2, F3, and F4 formulations of herbal shampoos were evaluated and were ranged foam moderate and excellent respectively Table (7).

Table 7: The dirt dispersion parameters of all the Formulated preparation:

Formulations	F1	F2	F3	F4
Dirt dispersion	Light	Light	Light	Light

6. Foaming ability & foam stability: All the shampoo showed similar foaming characteristics in distilled as well as in hard water. The total foam volume of herbal shampoo after 1 minute shaking ranged from mild to good was recorded. The average percentage foaming stability and capacities for F1, F2, F3 and F4 formulations for a time period of 5 minutes were observed and reported in Table (8) and Table (9).

Table 8: The Foaming stability of Formulated Preparation

Formulation	F1	F2	F3	F4
Foaming ability	Good Foam	Good Foam	Mild Foam	Good Foam

Table 9: The Foaming capacity of Formulated Preparation

Time (Min)	Foam Volume(ml)			
	Formulations			
	F1	F2	F3	F4
0	13.56±1.94	13.33±0.17	11.5±0.5	14.13±1.37
1	11.16±0.84	9.83±0.17	8.83±1.17	11.66±0.34
2	10.43±0.57	8.93±0.37	8.43±0.8	10.66±0.34
3	10.03±0.2	8.16±0.34	7.5±0.5	10.23±0.27
4	9.46±0.04	7.5±0.00	7±0.5	9.43±0.37
5	9.06±0.14	7±0.2	6.5±0.5	8.63±0.37

7. Cleaning action: Cleaning action was tested on wool in grease. Although cleaning or soil/ sebum removal is the primary aim of a shampoo, experimental detergency evaluation has been difficult to

standardize, as there is no real agreement on a standard soil, a shampoo should ideally remove. As seen from the results, there is a significant difference in the amount of sebum removed by the different shampoos. The cleaning action of F1, F2, F3 and F4 formulations were reported in Table (10).

Table 10: The Cleaning Evaluation parameter

Formulated Preparation	F1	F2	F3	F4
Cleaning Action (%)	92.30	98.57	95	86.29

CONCLUSION

The primary goal of the polyherbal anti-dandruff shampoo's formulation was to prevent dandruff and its infection. Polyherbal anti-dandruff shampoo was prepared, with the goal being to create a stable and functionally successful anti-dandruff shampoo without the use of any kind of synthetic ingredients. All of the ingredients which was used during preparation of herbal shampoo are safer than synthetic conditioning agents like silicones and polyquaterniums,. They are also significantly lessen the loss of hair or protein when combing ^[16]. We have used Shikakai, Amla, Aritha, Hibiscus, Curry leaves to provide the conditioning effects instead of using cationic conditioners . The pH of the formulated polyherbal antidandruff shampoos was near to the neutral which shows that the formulations were non-irritant to the skin. Several tests were performed to evaluate physicochemical properties of herbal shampoo. The results showed that the formulation F2 of anti-dandruff herbal shampoo was the best formulation. Formulation F2 contains all the good characters of an ideal shampoo and found to be harmless, cost effective. The present research gives promising anti-dandruff effect.

References:

- 1 Gyanesh Kumar Sahu., et al. "Formulation and Evaluation of Herbal Anti-Dandruff Shampoo". *Acta Scientific Pharmaceutical Sciences*. 2024; 8(6): 60-63.
- 2 Gazi AS, Ruksar, Shahid K and SalwaOwais M. Formulation and Evaluation of Herbal Anti Dandruff Shampoo. *IJIRT*. 2022; 9(1): 2349-6002.

- 3 Lodha G. Formulation and Evaluation of Polyherbal Shampoo to Promote Hair Growth and Provide Antidandruff Action. *Journal of Drug Delivery & Therapeutics*; 2019;9(4-A):296-300.
- 4 Dandekar VR, Pote PD, Kore PS and Garhwani YD. Formulation and Evaluation of Polyherbal Anti-Dandruff Shampoo. *International Journal of Ayurvedic Medicine*; 2022;13(2):365-369.
- 5 Kothari S, Patidar K and Soanki R. Polyherbal Anti-dandruff Shampoo: Basic Concept, Benefits, and Challenges. *Asian Journal of Pharmaceutics* 2018;12(3):849-858.
- 6 Bhojane R, Deurmalle S, Jaiswal P and sufi B. Formulation and Evaluation of Herbal Anti-Dandruff Shampoo. *IJNRD*;2023; 8(6); 2456-4184.
- 7 Gadge SS, Wankhade SP, Tapare S, Kalaskar SM and Holey SD. Formulation and evaluation of polyherbal antidandruff shampoo. *Journal of Pharmacognosy and Phytochemistry*.2023; 12(4): 35-41.
- 8 Sahoo S and Pradhan D. Natural flavonoids obtained from the flowers of *butea monosperma* inhibits cyclooxygenase-2 and 5-lipoxygenase inflammation in various models. *Asian Journal of Pharmaceutical Education and Research* 2012;1(2), 107-120.
- 9 Badi KA and Khan SA. Formulation, evaluation and comparison of the herbal shampoo with the commercial shampoos. *University Journal of Basic and Applied Sciences*. 2014;3(4):301-305.
- 10 Makone KS, Rani MD and Salve M. An Overview on Herbal Shampoo Formulation and Development. 2023; 5(11): 2582-5208.
- 11 Yadav AR and Mohite SK. Formulation and Evaluation of Antidandruff Shampoo. *Research J. Topical and Cosmetic Sci*. 2020; 11(2):55-58.
- 12 Alam F, Das S, Kalita P, Pathak BJ, Judder MI, Dasgupta D and Sarkar D. Development and Evaluation of Natural Anti-dandruff Shampoo. *Journal of Natural Remedies*. 2023; 23(3), 1125–1134.
- 13 Rashmi C, Islam S, Anowar A, Ambiya A, Rafid M and Shiyas MP. Formulation and Evaluation of Herbal Anti-Dandruff Shampoo, *Int. J. in Pharm. Sci*. 2023; 1(11): 473-483.
- 14 Khandagale SS, Supekar AV, Sarukh VS, Bhasme PS, et al. Formulation and Evaluation of Herbal Neem Anti-Dandruff Shampoo. *International Journal of Ayurveda and Pharma Research*, 2023; 10(12): 36-41.

- 15** Manju M Nair, Gogula Bhargava, Kavitha PN and Saraswati CD Preparation and evaluation of herbal antidandruff shampoo. National Journal of Pharmaceutical Sciences. 2022; 2(1): 10-16.
- 16** Zoya M, More B and Shah G. Anti-dandruff activity of synthetic and herbal shampoos on dandruff causing isolate: Malassezia. International Journal of Applied Research. 2016; 2. 80-85.