

# Polyherbal Anti-dandruff Shampoo: Basic Concept, Benefits, and Challenges

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## Abstract

The objective of this review article is to provide information about various herbs used in dandruff treatment along with causes and remedies of dandruff formation. This article also highlights the benefits of herbal shampoo over synthetic shampoos. The hair is an integral part of the way to feel about the self-appearance, and when the hairs are lost, it can be damaging to self-esteem and self-confidence. One common reason is dandruff; a very common scalp disorder with high prevalence in population is caused by numerous host factors in conjunction with *Malassezia furfur*. Most of the commercially available anti-dandruff hair shampoos contain some form of antifungal agents that appear to reduce the incidence of the disease. Synthetic product has poor efficacies, more side effects, and gives scope for recurrence of symptoms. As the scalp is one of the most absorbent parts of the body, products applied to the scalp go directly to the blood, without being filtered in any way. Hence, it is very important to know and understand the effects of ingredients used in shampoo formulations.

**Key words:** Dandruff, evaluation of shampoo, herbal shampoo, shampoo formulation

## INTRODUCTION

Cosmeceuticals have become the fastest-growing segment of the personal care industry. About 25 years ago, Dr. Albert Kligman of the University of Pennsylvania originally coined the term “cosmeceutical,” describing a hybrid category of products found on the spectrum between drugs and cosmetics that exert a pharmaceutical therapeutic benefit but not necessarily a biological therapeutic benefit.<sup>[1]</sup> There are approximately 400 cosmeceutical manufacturers including companies that supply the cosmeceutical chemicals and/or manufacture the products in the U.S. market. The largest companies in the industry for finished products are Procter and Gamble, Johnson and Johnson, L’Oréal, Estée Lauder, Avon, and Allergan, which together represent nearly one half of the U.S. market.<sup>[2]</sup> Domestication of plants by man started since the dawn of civilization to meet his basic needs of food, shelter, and clothing. Besides, these requirements nature has provided plants for health care, healing, and other comforts.<sup>[3]</sup> An estimate suggests that about 13,000 plant species worldwide are known to have use as

drugs.<sup>[4]</sup> Nowadays, herbal extracts and herbal powders are used in the preparations to enhance beauty and increase the attractiveness of the person. These herbal preparations are used as sunburn, complexion brighter, and hair growing. Cosmetics that include herbs can be classified on the behalf of dosage form such as powder, cream, soaps, and solutions and according to organ or part of the body to be applied for such as cosmetics for skin, hair, nail, teeth, and mouth.<sup>[5]</sup>

The hair follicle is one of the characteristic features of mammals serves as a unique miniorgan [Figure 1]. In humans, hair has various functions such as protection against external factors, sebum, apocrine sweat and pheromones production, and thermoregulation. The hair also plays important roles for the individual’s social and sexual interaction.<sup>[6,7]</sup> The hair follicle serves as a reservoir for epithelial and melanocyte

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stem cells, and it is capable of being one of the few immune privileged sites of human body. Hair follicle development is related to the interactions between epithelial and mesenchymal cells.<sup>[8-10]</sup>

### Normal hair growth cycle

The approximate growth of hair is 10 cm per year. Hair follicle undergoes three phases of growth in a cyclic manner.

#### Anagen

It is growth phase which may vary from 2 to 8 years and determines the length of the hair.

#### Catagen

It is transitional or regression phase which lasts about 10 days. At the end of the growth phase, the hair enters into this phase. The hair follicle shrinks and detaches from the dermal papilla.

#### Telogen

It is known as resting phase, which lasts about 5–6 weeks [Figure 2]. This phase comes after the transitional phase. The hair follicle along with the dermal papilla remain in the resting phase. Both of them join and new hair growth begins at the end of this stage. This new hair pushes the

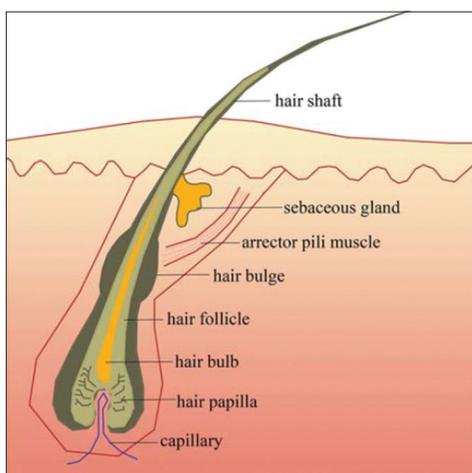


Figure 1: Diagram of an anagen follicle<sup>[8]</sup>

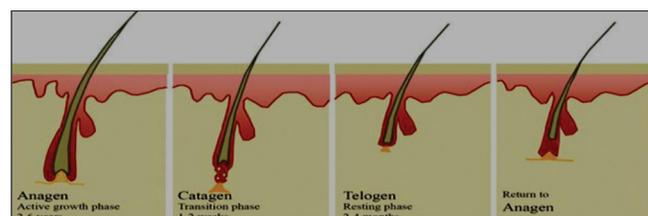


Figure 2: The hair cycle<sup>[12]</sup>

old one out and hair follicle enters in the growth phase again.<sup>[10,11]</sup>

## DANDRUFF

Dandruff is a chronic scalp condition, which involves excessive shedding of dead skin cells from the scalp. It is caused by a fungus called *Malassezia restricta* and *Malassezia globosa*. *Malassezia* formerly called *Pityrosporum* is a yeast causing infection of skin and scalp.<sup>[13]</sup>

Dandruff is caused due to excessive shedding of dead skin cells from the scalp. It affects 5% of the population and mostly occurs after puberty, between 20 and 30 years, and dandruff affects males more than females.<sup>[14]</sup> The skin of scalp renews itself about once a month. Usually, scalp sheds dead cells in nearly invisible way, but sometimes cell turnover becomes unusually rapid and dead cells are shed as visible flakes called dandruff. Warm and humid atmosphere, overcrowding, and poor personal hygiene promote the growth of *Malassezia*.<sup>[15]</sup>

### Causes of dandruff

One explanation for dandruff is that the fungus *Pityrosporum ovale*, which is naturally present on the scalp and other parts of the skin. Typically, this fungus causes no damage. However, with the weather changes, hormonal, and stress, the scalp will produce more oil, causing the fungus *P. ovale* to proliferate. With the proliferation of the fungus, itchiness of the scalp skin cells and also the loss of hair follicles and so-called dandruff will come. The exact mechanism of dandruff formation is now believed to be the result of the formation of enzymes called lipases. The *Malassezia fungus* break down sebum to oleic acid by using these enzymes [Figure 3]. The oleic acid then penetrates the top layer of skin and causes increased skin cell turnover in susceptible people. This, in turn, causes dandruff flakes and sometimes itching and redness.

### Symptoms of dandruff mainly include the following

- Presence of fragments (scaling)
- Itching of the scalp
- Redness around the scalp.<sup>[16]</sup>

The spectrum of dandruff is troublesome to define because it blurs with seborrheic dermatitis and few different scaly conditions.<sup>[17]</sup>

## CLASSIFICATION OF DANDRUFF

According to the symptoms, dandruff is classified into two

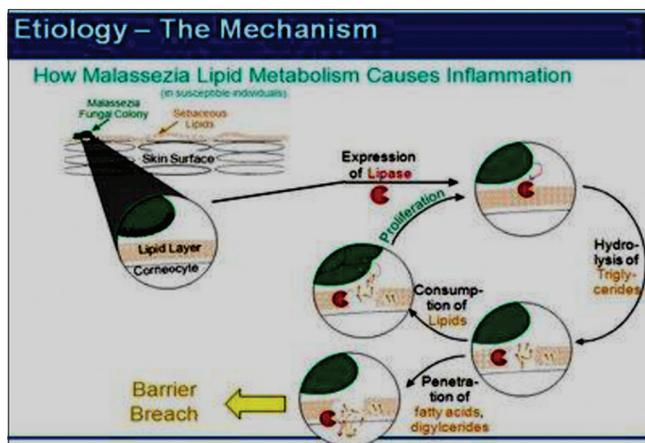


Figure 3: Etiology of dandruff formation<sup>[18]</sup>



Figure 4: Scalp with dry dandruff<sup>[19]</sup>



Figure 5: Scalp with oily dandruff<sup>[19]</sup>

types shown in Figures 4 and 5.

- Dry (common) and
- Oily dandruff.

## TREATMENT OF DANDRUFF

### Shampoo

The formulation of keratin protein in shampoo will protect human hair from the insults of environmental and chemical damage showed that shampoo compositions are for cleaning the head and body, softening the hair, giving a rinsing effect, and improving atopic dermatitis many people buy and use a hair product.<sup>[20]</sup>

- It should effectively and completely remove the dust,

excessive sebum, dandruff, etc.

- It should leave the hair non-dry, soft, and lustrous with good manageability
- It should produce a good amount of foam
- It should be easily removed by rinsing with water
- It should impart a pleasant fragrance to the hair
- It should not cause irritation to skin or eye.<sup>[21]</sup>

### Composition of shampoo

- Surfactant
- Anti-dandruff agents
- Conditioning agents
- Pearlescent agents
- Sequestrants
- Thickening agents
- Colors, perfumes, and preservatives.

### Types of shampoo

Shampoos are of the following types:

- Powder shampoo
- Liquid shampoo
- Lotion shampoo
- Cream shampoo
- Jelly shampoo
- Aerosol shampoo.

### Specialized shampoo

- Conditioning shampoo
- Anti-dandruff shampoo
- Baby shampoo
- Two-layer shampoo.<sup>[22]</sup>

## FORMULATIONS OF SHAMPOO

### Detergents

These are surfactants that combine and emulsify and wash off the grease and dirt (soil). Various types of surfactants are formulated to cleanse different types of hair laurel/laureth sulfates, triethanolamine lauryl sulfate, diethanol lauryl sulfate, and sodium olefin sulfate. Furthermore, detergent, to be very effective in cleansing the hair, would also strip the hair of sebum, leaving them dry.

### Foaming agents

These are very popular in shampoos, as historically people equate efficacy with foaming of the shampoo. Greasy hair will require repeated washing with shampoo, until the shampoo foams properly.

## Conditioners

An effective cleanser will strip the hair of all grease, thus leaving it dry and dull. Hence, shampoos incorporate various ingredients that can coat the cuticle to improve shine, slip, and easy combability.

## Thickeners and opacifiers

These appeal to the esthetic sensibilities of the user but do not add to the cleansing effect. They have to be compatible with the surfactants. Although alkanol amides were the early agents used, they have been replaced with various aqueous and non-aqueous agents.

## Sequestering agents

A detergent, when used with hard water, leaves a sticky residue on the surface. This scum renders the hair dull and unmanageable. This is often seen when soap is used to cleanse the hair. Sequestering agents prevent the formation of this scum by chelating the calcium and magnesium ions from hard water.

## pH adjusters

Damaged hair can swell with alkaline detergents; hence, when formulating suitable shampoos for such hair, an acidic pH adjustment is done. The substances used include citric and lactic acid.

## Additives

Various additional agents are added to shampoos to either give better conditioning or to term them as a natural or an herbal shampoo depending on the nature of the detergent use, shampoos are targeted for various hair types. Proper shampooing involves wetting the hair completely taking a good amount of shampoo in the palm and then applying it along the head and length of hair. Hair should not be piled up on top of the head before applying the shampoo as this can lead to matting of hair.<sup>[23]</sup>

## ANTI-DANDRUFF SHAMPOO

Anti-dandruff shampoo is a type of shampoo which contains anti-dandruff agent and it is mainly used to prevent or treat dandruff from the scalp of hair. Two types of anti-dandruff shampoos are commercially available.

- A. Synthetic anti-dandruff shampoos (based on ingredients of chemical origin) [Table 1]
- B. Herbal anti-dandruff shampoos (based on plant ingredients) [Table 2]

**Table 1: Marketed synthetic anti-dandruff shampoos**

Name of anti-dandruff shampoo	Active ingredients
Head and shoulders	Zinc pyrithione
All clear	Zinc pyrithione
Garnier Fructis Fortifying	Zinc pyrithione
Pantene pro-V	Zinc pyrithione
Salisia-KT	Salicylic acid ketoconazole
Cipla-8X	Zinc pyrithione ciclopirox

**Table 2: Marketed herbal anti-dandruff shampoos**

S. no.	Marketed product	Key ingredients
1	Himalaya herbal anti-dandruff shampoo	<i>Rosmarinus officinalis</i>
2	Vaadi anti-dandruff shampoo	Tulasi, neem, tea tree oil
3	Lumina herbal shampoo	<i>Acacia sinuata</i>
4	SORIG shampoo	<i>Embllica officinalis</i> , <i>Santalum album</i>

## Synthetic anti-dandruff shampoos

These formulations include therapeutic use of anti-dandruff agents that are classified into three groups according to their mechanism of action.

1. Fungicidal substances, for example, zinc pyrithione and imidazoles
2. Cytostatic substances, for example, selenium sulfide, tar, and Octopirox
3. Keratolytic substances, for example, salicylic acid and sulfur compounds.

## Herbal anti-dandruff shampoos

Herbal anti-dandruff shampoos are the cosmetic formulations which contain herbal ingredients such as plant extracts and essential oil. These herbal shampoos are generally used to remove the dandruff, to add natural color to the hair, to remove the extra oil content of the hair, for the healthy growth of the hair, to remove the dust, dirt, and scales of the scalp, to prevent hair falling, to impart softness and smoothness to the hair shaft, etc. It is assumed that they can penetrate to the root shafts, stimulate the sebaceous glands, enhance the blood circulation and impart greater strength to the hair root and the shaft. They are also used against alopecia, thinning, clubbing, and graying of hair and hair shaft roughness and breaking. There are large numbers of plants which have beneficial effects on hair and are commonly used in shampoos [Table 3].<sup>[24]</sup>

## Advantages of herbal shampoo over chemical shampoo

Nowadays, traditional herbal shampoos are most widely used hair products. Because it is believed that these products are

**Table 3:** Herbs used in treatment of dandruff<sup>[25-43]</sup>

Plants	Common name	Family	Plant parts used	Remarks (pattern of using botanicals)	Figure
<i>Piper betle</i>	Paan	Piperaceae	Leaf	Juice made from the leaves of Paan is used on the head	
<i>Hibiscus rosa-sinensis</i>	Gurhal	Malvaceae	Flower	Latex obtained from ground flowers is applied on the head as anti-dandruff	
<i>Lawsonia inermis</i>	Mehndi	Lythraceae	Leaf	Leaves are ground well to make juice with water and applied on the head	
<i>Datura metel</i>	Datura	Solanaceae	Fruit	Fruits are ground well with water. The paste is applied against dandruff	
<i>Mangifera indica</i>	Mango	Anacardiaceae	Kernel	Kernels are ground and mixed with milk and used overhead against dandruff	
<i>Nyctanthes arbor-tristis</i>	Harsingar	Oleaceae	Seed	Seeds are made powder and it is spread on the head	

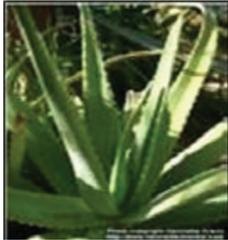
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Table 3: (Continued)

Plants	Common name	Family	Plant parts used	Remarks (pattern of using botanicals)	Figure
<i>Camellia sinensis</i>	Tea	Theaceae	Leaf	Leaves are boiled and applied on head after adding some lemon juice to prevent dandruff	
<i>Vitex negundo</i>	Chaste tree	Verbenaceae	Leaf	Juice from the leaves is mixed with oil and is applied on the head	
<i>Citrus aurantifolia</i>	Nimbu	Rutaceae	Juice	Juice is mixed with castor oil and is used against dandruff	
<i>Phyllanthus emblica</i>	Amla	Phyllanthaceae	-	-	
<i>Ocimum sanctum</i>	Holy basil	Lamiaceae	-	-	
<i>Allium sativum</i>	Garlic	Liliaceae	-	-	

(Contd....)

Table 3: (Continued)

Plants	Common name	Family	Plant parts used	Remarks (pattern of using botanicals)	Figure
<i>Eclipta alba</i>	Bhringraj, false daisy	Asteraceae	-	Petroleum ether extract of <i>Eclipta alba</i> can be used	
<i>Centella asiatica</i>	Pennywort, jala brahmi	Apiaceae	-	-	
<i>Menthe piperita</i>	Mint	Labiatae	-	-	
<i>Cinnamomum camphora</i>	Karpoor	Lauraceae	Oil	-	
<i>Zingiber officinalis</i>	Ginger	Zingiberaceae	Root extract	Root extract can be used for the treatment of dandruff	
<i>Aloe vera</i>	Aloe	Liliaceae	Juice	Juice can be applied	

(Contd....)

Table 3: (Continued)

Plants	Common name	Family	Plant parts used	Remarks (pattern of using botanicals)	Figure
<i>Tridax procumbens</i>	Jayanti veda	Compositae	Leaves	-	
<i>Rosmarinus officinalis</i>	Rosemary	Labiatae	-	-	
<i>Azadirachta indica</i>	Neem	Meliaceae	-	-	
<i>Acacia concinna</i>	Shikakai	Mimosaceae	Pods	Pod extract is used for hair cleansing and to control dandruff	

(Contd....)

safe and free from side effects. Chemical shampoos might appear to be improving hair texture along the length but eventually end up with damaging the roots and cause:

- Scalp dryness and itchiness
- Premature aging, graying of hair
- Split ends and excessive hair loss.

To overcome all such problems, it is best to switch to a herbal shampoo which will make up for the loss of nutrients and nullify the damage way.<sup>[44]</sup>

## EVALUATIONS OF HERBAL SHAMPOOS

### Foam and foam stability

Although foaming action is not a measure of cleaning action, foaming in shampoo is necessary for consumer acceptance

some of the non-ionics give excellent results so far as cleansing is concerned but produce little or no foam. Good wetting agents generally have unstable foams.

Ross-miles foam column is an accepted method for measuring foam light and foam stability in this method 200 mL of a shampoo solution fall through an orifice into a glass column containing 50 mL of the same shampoo solution. Height of the column is measured at specified times, for example, height can be measured immediately after the shampoo solution has passed through the apparatus and 5 min thereafter. The height of column considered to be proportional to volume. The effect of hard water can also be studied by this method.

### Detergency and cleaning action

Since shampoo is used for cleaning, cleaning action would be a measure of property of a shampoo. Cleaning action can

be tested on wool yarn in grease human hair clippings from beauty parlor gave a wide variation in result and such has not been considered suitable for test.

Barnet and powers test place 5 g of wool yarn in grease in 200 mL of water containing 1 g of shampoo in flask. Temperature of water should be 35°C shake the flask for 4 min at the rate of 50 times a minute. Remove the solution and take out the sample. Dry the sample and weigh it. Calculate the amount of soil removed under experiment conditions.

### Wetting action

The Draves-Clarkson test is a standard method to determine the effectiveness of wetting of cotton skeins. This test was originally developed for evaluating products meant assisting in dyeing cotton yarns and fabrics. Although there is no relation between dyeing of cotton yarn or fabric and shampooing, this test can be used to study wetting action.

### Oral toxicity

Oral toxicity can be given in terms of its lethal dose 50, i.e., number of g of the material per kg of body weight required to kill half of the test animal used. In general, to perform this test, rats are used. Fasting cages animals are taken and dosing is accomplished with the help of stomach tube. Lower the LD/50, the greater the toxicity.

Soap-based shampoo is more effective in pH of 9.0–10.0 synthetic detergent-based shampoo is effective in pH range of 6.0–9.0. It is advisable to adjust the pH of shampoo in this pH ranges during manufacture the pH of shampoo should be found out and adjusted to the desire pH using acid or alkali pH can be measured with the help of pH meter.

### Eye irritation test

Animals (albino rats) were collected from animal house. About 1% of shampoo solutions were dripped into the eyes of six albino rabbits with their eyes held open with clips at the lid. The progressive damage to the rabbit's eyes was recorded at specific intervals over an average period of 4 s. Reactions to the irritants can include swelling of the eyelid, inflammation of the iris, ulceration, hemorrhaging (bleeding), and blindness.<sup>[45]</sup>

### Determination of pH

The pH of 10% shampoo solution in distilled determined at room temperature 25°C.

### Percent of solids contents

A clean dry evaporating dish was weighed and added 4 g of shampoo to the evaporating dish. The dish and shampoo were

weighed. The exact weight of the shampoo was calculated only and put the evaporating dish with shampoo was placed on the hot plate until the liquid portion was evaporated. The weight of the shampoo only (solids) after drying was calculated.<sup>[46]</sup>

## CONCLUSION

Many people's suffer from hair disorders such as dandruff, alopecia, and dermatitis. Shampooing is the best treatment for this type of disorders. The present review focus on the potential of herbal extracts from cosmetic purposes. The awareness and need for cosmetics with herb in on rise, as it is strongly believed that these products are safe and free from side effect. It is seen that many product natural claims are still based on extensively on synthetic functional ingredient. The present review focus on the use of herbal ingredient in place of synthetic ingredient instead of using cationic conditioners we can use shikakai, hibiscus, and other plant extracts to provide conditioning effect. Herbal-based shampoos are more effective in terms of safety and ease of manufacturing and in economic point of view.

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Author Queries???

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