

Herbal Medicines Used in the Treatment of Alopecia

Mr. Kishor S Vajir¹, Miss. Prerita S Waghmare², Miss. Sadhana G Vaidya³, Mr. Ujjwal S Tayade⁴,

Mr. Rushikesh D Talekar⁵, Miss. Dhande M. R⁶

Prerna Institute of Pharmacy, Parbhani

Abstract—Alopecia is a condition that causes patchy scalp and hair loss. It is a medical disorder that causes hair loss, often from the scalp or head skin. There are several factors that might contribute to hair loss, including genetics, environment, pollutants, different drugs, nutritional deficiencies, etc. The condition affects every age group and is prevalent in all types. Two major types Of Alopecia Androgenetic Alopecia (AGA), which causes Continuous thinning of hair and Alopecia Areata, an autoimmune condition that leads to patchy hair loss. Modern treatments like minoxidil and finasteride may help temporarily but often come with side effects and don't prevent regrowth. Alopecia is a widespread hair-loss disorder that affects men and women of all ages and often leads to significant emotional stress and reduced quality of life. Although modern treatments such as minoxidil, corticosteroids, and finasteride can provide temporary relief, they are commonly associated with side effects, limited effectiveness, or recurrence of hair loss after discontinuation. As a result, many individuals are turning toward herbal medicines as safer, long-term alternatives. This review explores a variety of medicinal plants traditionally used for promoting hair growth and managing different forms of alopecia, including aloe vera, amla, bhringraj, fenugreek, onion, pumpkin seed, neem, tulsi, coconut, shikakai, and ginseng. These herbs contain beneficial phytochemicals—such as antioxidants, flavonoids, saponins, and phytosterols—that may help reduce scalp inflammation, improve blood circulation, prevent follicle damage, regulate hormones like DHT, and stimulate the growth cycle of hair follicles. Although existing laboratory and small-scale clinical studies show encouraging results, the scientific evidence is still not fully conclusive. Variations in plant quality, lack of standardized dosages, and limited long-term human trials present challenges to their broad clinical use. Therefore, more rigorous research is needed to validate their safety, effectiveness, and mechanisms of action.

Index Terms—Alopecia, Hair s, treatment, herbal treatment,

I. INTRODUCTION

Hair is one of the characteristics of Humans and animals performs various functions such as protection against external factors such as heat, cold, water etc. Hair is an important part of the body and serves as a protective attachment to the body as well as a supporting structure for mixing, oily and sweat glands. The main parts of the hair are the bulb, the root and the shaft 1. Hair loss, dandruff, lice, split ends and gray hair are some of the common hair problems 2. Hair may look simply, but it is one of the most complex structures in the body. Hair Follicle: The hair follicles are the starting point of hair growth and the places where hair is shed. This causes the production of moisture that begins in the pores. It is believed in dehydration. The fold is surrounded by an outer inner layer that covers and protects the expanding skin, which is finished before the fat cells are created.

Hair shaft

The hair shaft is the part of the hair that contain of three layers of keratin.

1. Inner layer: This is called medulla. Depending on the type of hair, the original is not always available.
2. Middle layer: This layer that covers most of the hair shaft is called the cortex.
3. Outer layer: Also called cuticle which consists of tightly packed scales in a layered rooflike structure.

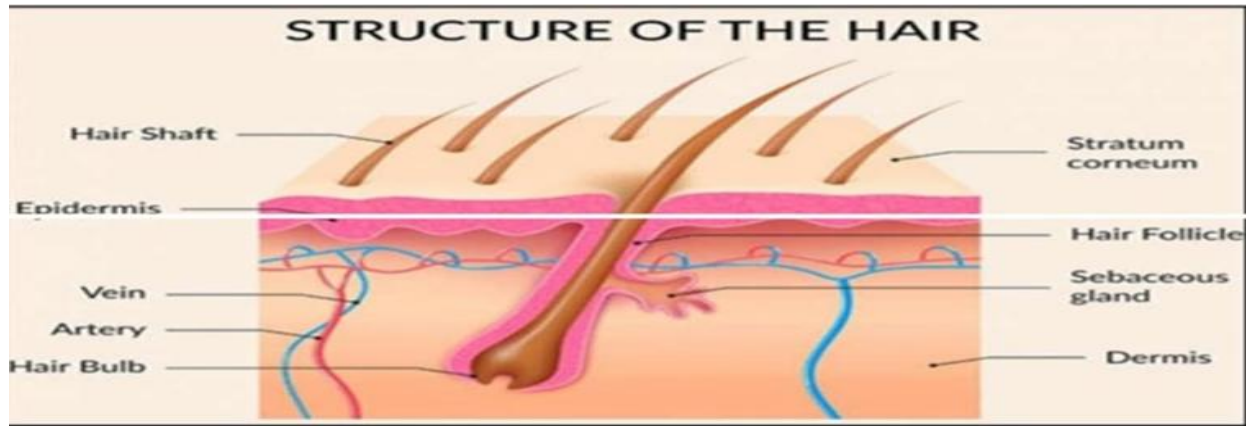


Fig. 1: Structure of the hair

Hair type mainly depends on the curls. The number of hair follicles contributes to the hair follicle count. Genetics plays a role in determining hair type and is acknowledged for establishing a classification system that categorizes hair into four types based on its curling patterns such as Straight category, Wavy category, Curly category, Coily category.

The growth process is divided into three phases:

- a) The Anagen phase: This phase extends over a period of two to six years. The hair pushes the new hair that has fallen out to prevent it from coming out of the braid line.
- b) Catagen Phase: Catagen Phase is a headache and is always in this phase. This time duration two to three days.
- c) Telogen phase: The telogen phase lasts for two to three months, in the telogen phase the hair is supported and the albatross is fully formed.



Types of Hair Loss in Alopecia

Types of Hair Loss in Alopecia

a) Alopecia Areata (primary stage)

An autoimmune condition known as alopecia areata frequently causes hair loss on the scalp. When one or more tiny, round, faultless, smooth patches are typically the first to appear. Alopecia areata is a relatively brief condition in which patients have recurrent episodes of hair loss; nevertheless, it does not progress to Alopecia Totalis or Universalis.

b) Temporary Alopecia Areata Smooth, spherical patches that go fully bald over a few weeks and most

frequently grow back over a few months are typical in people with alopecia areata.

b) Ophiasis Alopecia Areata

Strips of hair are lost due to peristaltic alopecia areata. It frequently arises in the occipital region of the head, which is progressive, and is harder to treat because most medications promote dementia. A course of action in these areas. d) Alopecia Totalis Hair loss throughout the whole scalp. Removal of all body hair, including eyelashes and eyebrows. Trichotillomania-

This kind of hair loss is characterised by the patient's obsessive or dull self-pulling.

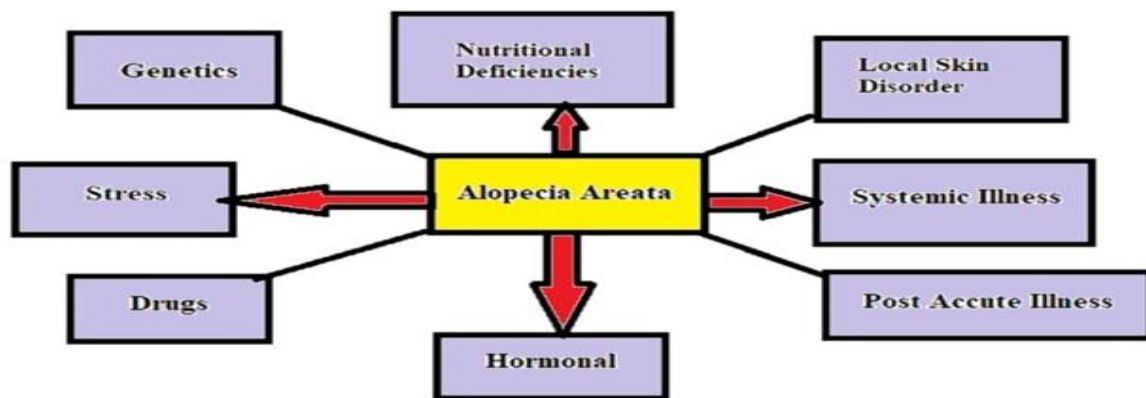
Causes Of Alopecia : Hair loss is typically related to one or more of the following factors

- **Family History (Heredity):** A hereditary disease that develops with ageing is the most frequent cause of hair loss. Male hormonal alopecia, male pattern baldness, and female pattern baldness are all terms used to describe this illness. It often occurs gradually and in predictable patterns, with women experiencing thinning hair above the head and males experiencing receding hairlines and bald patches.
- **Hormonal Changes and Medical Conditions:** Permanent or temporary hair loss can result from a number of circumstances, including hormonal changes

brought on by pregnancy, childbirth, menopause, and thyroid issues. Alopecia areata, which affects the immune system and results in patchy hair loss, ringworm infections of the scalp, and trichotillomania, a disorder characterised by compulsive hair pulling, are examples of medical illnesses.

- **Medications and Supplements:** Some drugs, including those for cancer, arthritis, depression, heart issues, gout, and high blood pressure, can cause hair loss as adverse effects.

- **Radiation Therapy to the Head Hair** may not regrow as quickly as it formerly did. Many people experience hair thinning months after a physical or mental shock, which is a highly upsetting occurrence. Temporary hair loss results from this kind.



Flowchart no. 1

MODERN PERSPECTIVE

Androgenetic Alopecia (AGA), also known as pattern hair loss, is a genetically influenced condition characterized by progressive thinning of scalp hair. It affects both sexes, though it is more prevalent and severe in males. The condition is driven by the action of dihydrotestosterone (DHT) on genetically susceptible hair follicles, leading to reduction and subsequent hair loss. AGA typically follows a recognizable pattern—frontal recession and vertex thinning in men, and diffuse thinning over the crown in women. Psychological distress is common, regardless of age or severity. Alopecia Areata (AA), on the other hand, is an autoimmune disorder where the body's immune system falsely attacks the hair follicles, particularly during the growth phase. This leads to sudden, patchy hair loss, often with emphatic hairs at the margins. AA can affect any hair behavior area and has an unpredictable course, with spontaneous decrease and repetition. The underlying

mechanism involves T-cell-mediated inflammation and cytokine imbalance, often triggered by stress, infections, or genetic predisposition. Conventional treatments for both conditions include topical and systemic corticosteroids, minoxidil, immunotherapy, and finasteride. While these may offer temporary symptomatic relief, they are often associated with adverse effects such as skin atrophy, weight gain, hypertension, and recurrence upon discontinuation. This has led to growing interest in alternative, holistic approaches.

SYNTHETIC DRUGS USED IN TREATMENT

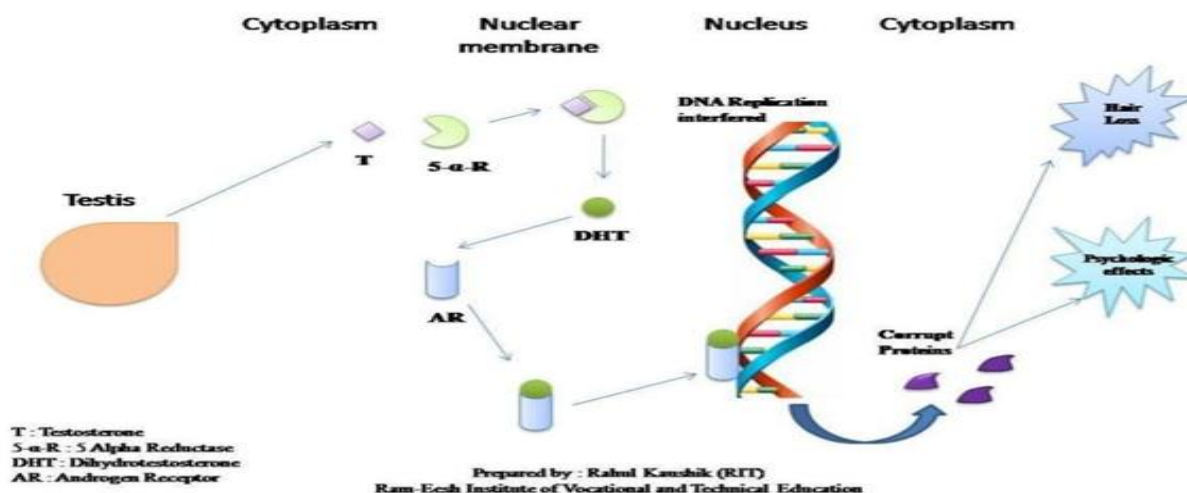
Topical Minoxidil

The topical minoxidil solution (1% and 5%) is an adjunct therapy and has better results in mild cases; it is a direct-acting arteriolar vasodilator, which is explicitly used to open the potassium channels to increase the amount of intracellular Ca^{2+} , which in turn upregulates the enzyme adenosine triphosphate

(ATP) synthase to promote stem cell differentiation that plays a key role in the facilitation of hair growth . An El Taieb et al. study found that minoxidil is effective in 81% of cases with patchy AA . Minoxidil induces side effects like headaches, allergic and irritant contact dermatitis, and hypertrichosis . The

increase in minoxidil's adverse reactions leads to treatment discontinuity and hampers patients' compliance with the treatment, limiting its therapeutic success . Moreover, the low solubility of minoxidil induces a challenge in producing a non-irritant and effective

PROPOSED MECHANISM OF ACTION OF DHT BLOCKERS AND 5-A-REDUCTASE BLOCKERS



HERBAL DRUGS USED IN TREATMENT OF ALOPECIA

| | | |
|-----|---------------|---|
| 1. | Aloe vera | Aloe barbadensis miller |
| 2. | Amla | Phyllanthus emblica (syn. Emblica officinalis) |
| 3. | Onion | Allium cepa |
| 4. | Garlic | Allium sativum |
| 5. | Bhringraj | Eclipta alba or Eclipta prostrata |
| 6. | Tea | Camellia sinensis |
| 7. | Fenugreek | Trigonella foenum-graecum |
| 8. | Coconut | Cocos nucifera |
| 9. | Almond | Prunus dulcis |
| 10. | Tulsi | Ocimum sanctum or Ocimum tenuiflorum |
| 11. | Ginseng | Panax ginseng (Asian), Panax quinquefolius (American) |
| 12. | Pumpkin Seed | Cucurbita pepo |
| 13. | Henna | Lawsonia inermis |
| 14. | Ashwagandha | Withania somnifera |
| 15. | Sesame Oil | Sesamum indicum |
| 16. | Neem | Azadirachta indica |
| 17. | Pudina (Mint) | Mentha arvensis or Mentha piperita |
| 18. | Shikakai | Acacia concinna |
| 19. | Shatavari | Asparagus racemosus |
| 20. | Camphor | Cinnamomum camphora |
| 21. | Reetha | Sapindus mukorossi |



1) ALOE VERA

Aloe vera, also known as *Aloe barbadensis* Miller, belongs to the family Liliaceae (or Asphodelaceae in updated classifications).

Biological Source: The plant yields two main products mucilaginous gel from the inner leaf pulp and bitter latex from pericyclic cells beneath the leaf surface.

Phytochemical Constituents:

Anthraquinones (Latex): These are phenolic compounds that act as laxatives. Key examples are Aloin (Barbaloin) and Aloe-emodin. **Polysaccharides (Gel):** Notably Glucomannans (like Acemannan), which are responsible for moisturizing and immunomodulatory effects.

Vitamins: A (beta-carotene), C, E (antioxidants), B12, Folic acid, Choline. **Uses in Alopecia (Hair Loss)**

- Moisturizing and Conditioning properties.
- Anti-inflammatory effects, which can soothe the scalp.
- Potential to improve blood quality and nutrient delivery to hair follicles

2) AMLA

Amla, is scientifically known as *Phyllanthus emblica* Linn. or *Emblica officinalis* Gaertn., and belongs to the family Euphorbiaceae.

Phytochemical Constituents:

Organosulfur compounds: Allicin, diallyl disulfide, S-allyl cysteine

Flavonoids: Quercetin, kaempferol

Phenolics: Ferulic acid, gallic acid **Others:** Saponins, vitamin C, selenium, potassium, and volatile oils like allyl propyl disulfide

Use in Alopecia:

Onion juice or oil is applied topically to promote hair regrowth, especially in alopecia areata. Quercetin reduces follicular inflammation; sulfur enhances keratin production and scalp circulation. Often combined with coconut or almond oil for synergistic effects.

3) ONION

Biological Source Botanical name: *Allium cepa*

Family: Amaryllidaceae

Part used: Bulb (onion) **Phytoconstituents** Sulfur compounds (main for hair growth) Flavonoids (Quercetin) Vitamins (Vitamin C, B vitamins) Minerals (Zinc, Selenium) Phenolic compounds

Uses in Alopecia

Helps stimulate hair growth Improves blood circulation to hair follicles Acts as anti-inflammatory Has antimicrobial action (helps reduce dandruff & scalp infections) Useful in Alopecia Areata (promotes regrowth) Strengthens hair roots due to sulfur

4) GARLIC

Garlic, is a perennial herb belonging to the family Amaryllidaceae. Its botanical name is *Allium sativum* Linn., and it is widely cultivated for its pungent bulbs.

Biological Source: The drug consists of the dried or fresh bulbs of *Allium sativum* Linn., which are rich in medicinal compounds.

Phytochemical & Chemical Constituents:

Garlic contains potent organosulfur compounds such as allicin, ajoene, and diallyl disulfide, along with flavonoids like quercetin. It also provides vitamins B6 and C, selenium, calcium, and saponins, contributing to its broad pharmacological activity.

Uses in Alopecia:

Garlic is used topically in the form of oil or gel to stimulate hair regrowth in alopecia areata. Allicin improves scalp circulation and reduces follicular inflammation, while sulfur compounds support keratin synthesis. It is often blended with carrier oils like coconut or almond to reduce irritation.

5) BHRINGRAJ

Bhringraj, is a small annual herb belonging to the Asteraceae family. Its accepted botanical name is *Eclipta prostrata* Linn., though it is also referred to as *Eclipta alba* in some texts.

Biological Source: The drug consists of the whole aerial parts of *Eclipta prostrata* Linn., collected during the flowering season.

Phytochemical & Chemical Constituents:

Coumestans: Wedelolactone, demethylwedelolactone

Flavonoids: Luteolin, apigenin

Alkaloids: Ecliptine

Triterpenoids: Ursolic acid

Others: Polyacetylenes, phytosterols, essential oils, and tannins

Uses in Alopecia:

Bhringraj oil is traditionally massaged into the scalp to stimulate hair follicles, improve blood circulation, and reverse hair loss. Wedelolactone and flavonoids help reduce follicular inflammation and oxidative damage. Often combined with coconut or sesame oil for enhanced absorption and nourishment.

6) TEA

Tea, is an evergreen shrub botanically known as *Camellia sinensis* (syn. *Thea sinensis*), belonging to the family Theaceae. It is cultivated for its young leaves and buds.

Biological Source: The drug consists of the prepared leaves and leaf buds of *Camellia sinensis*, used in various forms such as green tea, black tea, and oolong tea.

Phytochemical & Chemical Constituents:

Polyphenols: Catechins (EGCG, epicatechin), theaflavins, tannins

Alkaloids: Caffeine, theobromine, theophylline

Flavonoids: Quercetin, kaempferol

Others: Amino acids (L-theanine), volatile oils, vitamins (C, E), minerals (potassium, manganese)

Uses in Alopecia:

Tea polyphenols, especially EGCG, help inhibit DHT, a hormone linked to hair loss. Antioxidants reduce scalp inflammation and promote follicle health. Green tea extracts are used in shampoos, serums, and scalp tonics for alopecia management.

7) FENUGREEK

Fenugreek, is an annual herbaceous plant of the Fabaceae (Leguminosae) family, botanically known as *Trigonella foenum-graecum* Linn.

Biological Source: The drug consists of the dried ripe seeds of *Trigonella foenum-graecum* Linn., though leaves are also used in culinary and medicinal contexts.

Phytochemical & Chemical Constituents:

Saponins: Diosgenin, yamogenin

Alkaloids: Trigonelline, choline

Flavonoids: Vitexin, isovitexin

Amino acids: 4-hydroxyisoleucine (insulinotropic)

Others: Mucilage, fixed oils, galactomannan, vitamins A, C, B-complex, iron, calcium

Uses in Alopecia:

Fenugreek seed paste or oil is applied to the scalp to strengthen hair follicles, reduce dandruff, and prevent hair fall. Saponins and mucilage nourish the scalp, while flavonoids reduce inflammation. Often used in combination with coconut oil, yogurt, or aloe vera in hair masks.

8) COCONUT

Coconut, is a tall palm tree botanically known as *Cocos nucifera* Linn., belonging to the family Arecaceae. It is often referred to as the “tree of life” due to its wide-ranging uses. Biological Source: The drug consists of various parts of *Cocos nucifera*, including the kernel (copra), coconut water, oil, milk, and shell.

Phytochemical & Chemical Constituents:

Fatty acids: Lauric acid, capric acid, caprylic acid (medium-chain triglycerides)

Phenolic compounds: Ferulic acid, p-coumaric acid

Sterols: Sitosterol Proteins & Amino acids: Albumin, globulin

Others: Tocopherols (Vitamin E), minerals (potassium, magnesium), cytokinins (in coconut water)

Uses in Alopecia:

Coconut oil is applied to the scalp to moisturize, reduce inflammation, and strengthen hair follicles. Its fatty acids penetrate the hair shaft, reducing protein loss and improving texture. Often used as a carrier oil with botanicals like bhringraj, fenugreek, or onion for enhanced anti-alopecia effects.

9) ALMOND

Almond, is a deciduous tree of the Rosaceae family, botanically classified as *Prunus dulcis* Mill. D.A. Webb. It produces edible seeds enclosed in a hard endocarp.

Biological Source: The drug consists of the dried seeds (kernels) of *Prunus dulcis*, obtained from both sweet (var. *dulcis*) and bitter (var. *amara*) almond varieties.

Phytochemical & Chemical Constituents:

Fatty acids: Oleic acid (~76%), linoleic acid (~15%)

Phytosterols: β -sitosterol Flavonoids: Quercetin, kaempferol

Phenolic compounds: Gallic acid, vanillic acid

Others: Vitamin E (α -tocopherol), proteins, minerals (magnesium, calcium), amygdalin (in bitter almonds)

Uses in Alopecia: Almond oil is applied to the scalp to nourish hair roots, reduce dryness, and strengthen follicles. Rich in vitamin E and fatty acids, it improves scalp circulation and reduces oxidative damage. Often used as a base oil with botanicals like bhringraj, fenugreek, or onion in anti alopecia formulations.

10) TULSI

Tulsi, is a herbaceous, aromatic plant belonging to the Lamiaceae (formerly Labiatae) family. Its accepted botanical name is *Ocimum sanctum* Linn., with variants like *Ocimum tenuiflorum* also recognized.

Biological Source: The drug consists of the fresh and dried leaves of *Ocimum sanctum* Linn., often harvested during flowering for maximum phytochemical content.

Phytochemical & Chemical Constituents:

Volatile oils: Eugenol, methyl eugenol, carvacrol

Triterpenoids: Ursolic acid, oleanolic acid

Flavonoids: Luteolin, apigenin

Others: Rosmarinic acid, tannins, saponins, vitamin C, zinc

Uses in Alopecia: Tulsi leaf extracts or oil are applied to the scalp to reduce inflammation, detoxify follicles, and stimulate hair growth. Its antioxidants protect against environmental damage and oxidative stress.

Often combined with coconut oil, bhringraj, or fenugreek in anti-alopecia formulations.

11) GINSENG

Ginseng, is a slow-growing perennial herb of the Araliaceae family. The most studied species is *Panax ginseng* C.A. Mey (Asian or Korean ginseng), though other species include *Panax quinquefolius* (American ginseng) and *Panax notoginseng* (Chinese ginseng).

Biological Source: The drug consists of the dried roots of *Panax ginseng* and related species like *Panax japonicus*, *Panax pseudoginseng*, and *Panax quinquefolius*.

Phytochemical & Chemical Constituents:

Ginsenosides (triterpenoid saponins): Rg1, Rb1, Rg3, Re

Polysaccharides: Panaxans Flavonoids: Kaempferol, quercetin

Others: Peptides, essential oils, vitamins B1, B12, and minerals like zinc and manganese

Uses in Alopecia:

Ginseng root extract is used in shampoos, serums, and oils to stimulate hair follicles, increase dermal blood flow, and reduce follicular inflammation. Ginsenosides promote hair regrowth by prolonging the anagen (growth) phase and reducing DHT-induced damage.

12) PUMPKIN SEEDS

Pumpkin seeds, is a trailing annual herb of the Cucurbitaceae family. The seeds of *Cucurbita pepo* Linn. are widely used for their nutritional and medicinal properties. Biological Source: The drug consists of the dried, ripe seeds of *Cucurbita pepo* Linn., obtained after removing the pulp from mature fruits.

Phytochemical & Chemical Constituents:

Fatty acids: Linoleic acid, oleic acid, palmitic acid

Phytosterols: β -sitosterol, stigmasterol

Tocopherols: Vitamin E (α -, γ -tocopherol) Minerals: Zinc, magnesium, selenium, iron

Others: Cucurbitin (amino acid), flavonoids, squalene, polyphenols

Uses in Alopecia: Pumpkin seed oil is applied to the scalp or taken orally to inhibit 5 α -reductase, reducing DHT levels linked to androgenic alopecia. Zinc and phytosterols support hair follicle health and regeneration. Often used in hair serums, oils, or capsules for hair loss management.

13) HENNA

Henna, is a medium-sized shrub of the Lythraceae family, botanically known as *Lawsonia inermis* Linn. It is cultivated for its leaves, which yield a natural reddish-orange dye.

Biological Source: The drug consists of the dried leaves of *Lawsonia inermis*, collected during flowering and processed into powder or paste.

Phytochemical & Chemical Constituents:

Naphthoquinones: Lawsone (2-hydroxy-1,4-naphthoquinone) – main coloring agent

Flavonoids: Luteolin, apigenin

Tannins: Gallic acid, ellagic acid

Others: Coumarins, xanthenes, essential oils, β -sitosterol

Uses in Alopecia:

Henna paste is applied to the scalp to strengthen hair shafts, reduce dandruff, and soothe inflammation. Lawsone binds to keratin, improving hair texture and reducing breakage. Often combined with oils like coconut or almond to reduce dryness and enhance absorption.

14) ASHWAGANDHA

Ashwagandha, is a small woody shrub of the Solanaceae family, botanically known as *Withania somnifera* Linn. Dunal. It is classified as a rasayana (rejuvenative) herb in Ayurveda.

Biological Source: The drug consists of the dried roots and stem bases of *Withania somnifera* Linn., harvested during the flowering season.

Phytochemical & Chemical Constituents:

Steroidal lactones: Withanolides (withaferin A, withanolide D)

Alkaloids: Somniferine, anaferine, tropine

Saponins: Withanoside IV and V Others: Iron, flavonoids, amino acids, and phytosterols

Uses in Alopecia:

Ashwagandha root extract is used orally and topically to reduce stress-induced hair loss, improve scalp circulation, and stimulate follicular regeneration. Withanolides help modulate hormonal imbalance and reduce inflammation linked to alopecia. Often combined with bhringraj, tulsi, or fenugreek in anti-alpecia formulations.

15) SESAME OIL

Sesame oil, is an annual herbaceous plant of the Pedaliaceae family. The oil is derived from the seeds of *Sesamum indicum* Linn., cultivated for its high oil content and medicinal value.

Biological Source: Sesame oil is a fixed oil obtained by cold pressing or solvent extraction from the seeds of *Sesamum indicum* Linn.

Phytochemical & Chemical Constituents:

Fatty acids: Oleic acid (~40%), linoleic acid (~40%), palmitic acid

Lignans: Sesamin, sesamolin, sesamol (antioxidant and anti-inflammatory)

Tocopherols: Vitamin E (α - and γ -tocopherol)

Phytosterols: β -sitosterol

Others: Lecithin, minerals (calcium, magnesium), phenolic compounds

Uses in Alopecia:

Sesame oil is applied to the scalp to nourish hair roots, reduce dandruff, and improve circulation. Lignans and vitamin E help protect follicles from oxidative damage and support keratin synthesis. Often used as a carrier oil with bhringraj, fenugreek, or onion in anti-alpecia blends.

16) NEEM

Neem, is a fast-growing evergreen tree of the Meliaceae family, botanically known as *Azadirachta indica* A. Juss. It is revered in Ayurveda and Unani medicine for its broad spectrum therapeutic effects.

Biological Source: The drug consists of various parts of *Azadirachta indica*, including leaves, bark, seeds, flowers, and oil, each with distinct medicinal properties.

Phytochemical & Chemical Constituents:

Limonoids: Azadirachtin, nimbin, nimbolide, salannin

Flavonoids: Quercetin, rutin

Triterpenoids: Gedunin, meliacin Others: Tannins, saponins, fatty acids, essential oils, polysaccharides

Uses in Alopecia:

Neem oil and leaf paste are applied to the scalp to reduce dandruff, follicular infections, and inflammation. Azadirachtin and nimbolide help detoxify the scalp and stimulate healthy follicle function. Often combined with coconut or sesame oil in anti-alpecia formulation.

17) MINT

Mint, refers to a genus of aromatic herbs in the Lamiaceae family. Common species include *Mentha piperita* (peppermint), *Mentha spicata* (spearmint), and *Mentha arvensis* (Japanese mint), each valued for its essential oil profile.

Biological Source: The drug consists of the fresh or dried aerial parts, especially leaves, of various *Mentha*

species, harvested during flowering for maximum oil yield.

Phytochemical & Chemical Constituents:

Essential oils: Menthol, menthone, isomenthol, carvone (in spearmint)

Flavonoids: Luteolin, hesperidin

Phenolic acids: Rosmarinic acid, caffeic acid Others:

Tannins, terpenes, vitamin C, iron, calcium

Uses in Alopecia:

Mint oil or extract is applied to the scalp to stimulate blood flow, reduce itching, and refresh follicles. Menthol provides a cooling effect and may help reduce inflammation and dandruff. Often used in shampoos, hair masks, or combined with coconut or sesame oil for enhanced absorption.

18) SHIKAKAI

Shikakai, is a climbing shrub of the Fabaceae (Leguminosae) family, botanically known as *Acacia concinna* DC. It is traditionally used in India as a natural shampoo and scalp cleanser.

Biological Source: The drug consists of the dried pods, leaves, and bark of *Acacia concinna* DC., harvested during the fruiting season.

Phytochemical & Chemical Constituents:

Saponins: Acacinin A, B, and C (natural surfactants)

Flavonoids: Luteolin, apigenin Tannins: Gallic acid, ellagic acid

Others: Alkaloids, ascorbic acid (vitamin C), oxalic acid, and mucilage

Uses in Alopecia:

Shikakai powder or decoction is applied to the scalp to cleanse follicles, reduce dandruff, and stimulate hair growth. Saponins act as gentle cleansers without stripping natural oils, preserving follicular health. Often combined with reetha (soapnut), amla, or bhringraj in anti-alpecia hair packs.

19) SHATAVARI

Shatavari, is a climbing, thorny shrub of the Asparagaceae family, botanically known as *Asparagus racemosus* Willd. It is classified as a rasayana (rejuvenative) herb in Ayurveda.

Biological Source: The drug consists of the dried roots and tubers of *Asparagus racemosus*, harvested during the post-monsoon season. Phytochemical & Chemical Constituents: Steroidal

saponins: Shatavarins I–IV (major bioactive compounds) Flavonoids: Quercetin, rutin Alkaloids:

Asparagamine A Others: Mucilage, tannins, vitamins A, C, E, and minerals like calcium and zinc

Uses in Alopecia:

Shatavari root extract is used orally and topically to reduce stress-induced hair loss, balance hormones, and support follicular regeneration. Saponins and flavonoids help nourish the scalp, reduce inflammation, and promote hair growth. Often combined with bhringraj, ashwagandha, or fenugreek in anti-alpecia formulations.

20) CAMPHOR

Camphor, is a volatile compound derived from the wood of *Cinnamomum camphora* L., a large evergreen tree of the Lauraceae family. It is also produced synthetically from turpentine oil.

Biological Source:

The drug consists of crystalline ketone ($C_{10}H_{16}O$) obtained by steam distillation of camphor wood or synthesized from turpentine. Natural camphor is optically active, while synthetic camphor is racemic.

Phytochemical & Chemical Constituents: Terpenoids:

Camphor (main constituent), borneol, cineole

Ketones: 2-Bornanone Others: α -pinene, limonene, camphene, safrole (trace), essential oils

Uses in Alopecia:

Camphor is used in hair oils and scalp tonics to stimulate microcirculation, reduce inflammation, and enhance follicular oxygenation. Often combined with coconut oil, bhringraj, or onion extract to improve efficacy. Helps reduce dandruff and scalp infections that contribute to hair loss.

21) REETHA

Reetha, is a medium to large deciduous tree of the Sapindaceae family, botanically known as *Sapindus trifoliatus* Linn. It is widely recognized for its soap-like cleansing properties.

Biological Source: The drug consists of the dried fruit pericarp of *Sapindus trifoliatus*, collected during the fruiting season and sun-dried for medicinal use.

Phytochemical & Chemical Constituents: Saponins:

Trifolioside, sapindoside A & B (natural surfactants)

Flavonoids: Quercetin, kaempferol

Tannins: Gallic acid, ellagic acid

Others: Sugars, mucilage, fatty acids, and essential oils

Uses in Alopecia:

Reetha powder or decoction is applied to the scalp to cleanse follicles, reduce dandruff, and stimulate hair

growth Saponins act as gentle cleansers without stripping natural oils, preserving follicular health. Often combined with shikakai, amla, or bhringraj in anti-alopecia hair packs.

II. LIMITATIONS OF PHYTOCHEMICALS

Phytomedicine, a significant source of medication since antiquity, now accounts for almost half of all effective drugs. Its rising use is attributed to its superior therapeutic effectiveness and fewer adverse effects when compared to allopathic drugs. However, phytomedicines have a poor in vivo efficacy due to their low water solubility, lipophilicity, and molecular size. Creating nanoparticles containing herbal extracts is known as “green technology” since it does not require harmful chemicals. Green techniques primarily use harmless biomolecules, such as carbohydrates, DNA, enzymes, proteins, and plant extracts, to make biocompatible. Recently, nanotechnology has developed delivery methods tailored to improve natural bioactive compounds’ therapeutic efficacy. Indeed, Pharmaceuticals 2025 nanocarriers have received increased interest as viable alternatives to classic formulation procedures that reduce toxicity, increase bioavailability, and allow for a site-specific targeted delivery.

III. SAFETY AND REGULATORY CONCERNS OF PHYTOCHEMICALS

While many phytochemicals are mostly considered harmless, some have been accompanied by some adverse effects. Aloe vera is generally safe when applied topically, but its oral consumption is harmful and has been regulated by the FDA for many years. While amla is generally considered safe when used moderately. However, extreme use may cause gastrointestinal problems, such as bloating or diarrhea, due to its high vitamin C content. Amla is typically regulated as a food supplement and must adhere to appropriate dosage guidelines. Onions may cause contact dermatitis. Garlic may cause bleeding risk (antiplatelet effect), GI upset, and allergic reactions. Onion and garlic are generally recognized as safe by the FDA. Bhringraj has limited toxicity data, but it may cause potential hepatotoxicity at high doses and is not FDA-evaluated. Tea has caffeine, which may cause insomnia, hypertension, and liver toxicity (green

tea extracts), as well as tannins, which may inhibit iron absorption. Tea is regulated as a food product by the FDA. Fenugreek may cause hypoglycemia, allergic reactions, and uterine stimulation and should be avoided in pregnancy. It is generally recognized as safe in the US, but it is restricted in some EU countries. Coconuts contain high amounts of saturated fats, which may cause heart problems. It is generally recognized as safe by the FDA. Raw bitter almonds contain toxic cyanogenic glycosides. Sweet almonds are approved, while bitter almonds are restricted. Tulsi contains Eugenol, which may cause liver toxicity at high doses. It is regulated as a dietary supplement in the US and as a traditional medicine in Ayurveda..

IV. CONCLUSION

Alopecia Areata (AA) is a chronic, immune-mediated disorder characterized by T-cell-driven collapse of the hair follicle’s immune privilege, influenced by genetic predisposition and environmental triggers, and while traditional therapies such as corticosteroids remain in use, the therapeutic paradigm is shifting with the advent of targeted immunomodulators, most notably the FDA-approved Janus Kinase (JAK) inhibitors baricitinib and ritlecitinib, which represent the first systemic treatments specifically designed for severe AA; however, despite these advances, no therapy offers a definitive cure and relapse rates remain high, highlighting the need for next-generation approaches targeting pathways such as IL-2, IL-17, and antibody therapies like dupilumab, alongside the development of personalized medicine strategies through genetic and molecular profiling to optimize patient response, and ultimately, a holistic model of care that integrates medical innovation with counseling and psychological support to address the profound quality-of-life burden associated with the disease.

REFERENCES

- [1] Sadhan. Blumeyer A, Tosti A, Messenger A, Reygagne P, Del Marmol V, Spuls PI, et al. Evidence-based (S3) guideline for the treatment of androgenetic alopecia in women and in men. J Dtsch Dermatol Ges. 2011; 9(Suppl 6): S1–57. doi: 10.1111/j.1610-0379.2011.07802.x. IJAPR | June 2025 | Vol 13 | Issue 6 79 Int. J. Ayur. Pharma Research, 2025;13(6):75-80

- [2] Kaliyadan F, Nambiar A, Vijayaraghavan S. Androgenetic alopecia: An update. *Indian J Dermatol Venereol Leprol.* 2013; 79: 613–25. doi: 10.4103/0378-6323.116730.
- [3] Olsen E, Clinical tools for assessing hair loss, in Olsen E(ed): disorders of hair growth: Diagnosis and treatment. New York, McGraw –Hill, 2003, p.g.75-85.
- [4] Sushruta. Sushruta Samhita Nidana Sthana 13/34 with the Nibandhasangraha commentary by Dalhanacharya. Chaukhamba Surbharati Prakashan, Varanasi: 2023. p 565–567.
- [5] Vagbhata. Ashtanga Hridaya Samhita Uttara Sthana 23/24–25 with English translation by Srikantamurthy K.R. 4th ed. Krishnadas Academy, Varanasi: 2000. p-222
- [6] Sharma RK, Bhagwan Dash. Caraka Samhita (Eng. Translation) Vol. II Chikitsasthana 26/132 Varanasi; Chaukhamba Sanskrit Series Office; p.g 510 7. Olsen EA, Hordinsky MK, Price VH, Roberts JL, Shapiro J, Canfield D, et al. Alopecia areata investigational assessment guidelines – Part II. National alopecia areata foundation. *J Am Acad Dermatol* 2004; 51: 440-
- [7] Cite this article as: 8. Sushruta. Sushruta Samhita Sutra Sthana 13/3 with English translation by Srikanta murthy K.R. 4th ed. Krishnadas Academy, Varanasi: 2000. P.g 78
- [8] Hillmer, A.M. et al.: Genetic Variation in the Human Androgen Receptor Gene Is the Major Determinant of Common Early Onset Androgenetic Alopecia, *Am. J. Hum. Genet.* 77 (2001): 140–148.
- [9] Trueb RM: Oxidative stress in ageing of hair. *International Journal of Trichology* 2009; 1(1) .3. Hamilton JB.: Patterned loss of hair in man; types and incidence, *Ann N Y Acad Sci.* 1951; 53(3) :708-28.
- [10] Camacho, F.M., et al: Psychological features of androgenetic alopecia. *J Eur Acad Venerol*, (2002), 71: 115-121.
- [11] Norwood OT: Male pattern baldness: classification and incidence, *South Med J.* 1975; 68(11):1359-65.
- [12] Olsen, EA. Female pattern hair loss. *J Am Acad Dermatol* 2001; 45 (Suppl):S70-80.
- [13] Griffin JE, Wilson JD: The androgen resistance syndromes: 5 alpha-reductase deficiency, testicular feminization and related syndromes. In: Scriver CR, Beaudet AL, Sly WS, Valle D, editors. *The Metabolic Basis of Inherited Disease*, 6th ed. New York: McGraw-Hill; 1989:1919-44.
- [14] Chen W, Zouboulis CC, Orfanos CE. The 5 alpha-reductase system and its inhibitors. Recent development and its perspective in treating androgen-dependent skin disorders. *Dermatology.* (1996); 193(3):177-84.
- [15] Marty E Sawaya and Vera H Price: Different Levels of 5 Reductase Type I and II, Aromatase, and Androgen Receptor in Hair Follicles of Women and Men with Androgenetic Alopecia, *Journal of Investigative Dermatology* (1997) 109 :296–300.
- [16] Stephan Steckelbroeck et al.: Characterization of the 5-Alpha Reductase-3 Hydroxysteroid Dehydrogenase Complex in the Human Brain. *The Journal of Clinical Endocrinology & Metabolism* (2001) 86(3):1324-1331.
- [17] Henry G. Greenish: A Text Book of Materia Medica, Being an Account of the More Important Crude Drugs of Vegetable and Animal. J. & A. Churchill publishers, Third edition, 1920.
- [18] Hay IC, Jamieson M and Ormerod AD: Randomized trial of aromatherapy. Successful treatment for alopecia areata. *Archives of dermatology* 1999 May; 135(5):602-3.
- [19] Sharquie KE and Al-Obaidi HK: Onion juice (*Allium cepa* L.), a new topical treatment for alopecia areata. *The Journal of dermatology* 2002 Jun; 29(6):343-6.
- [20] Zohreh Hajheysari, Mojgan Jamshidi, Jafar Akbari and Rezaali Mohammadpour: Combination of topical garlic gel and betamethasone valerate cream in the treatment of localized alopecia areata: A double blind randomized controlled study; *Indian J Dermatol Venereol Leprol* 2007 Jan-Feb; 73(1), 29-32. Kaushik et al., *IJPSR*, 2011; Vol. 2(7): 1631-1637 ISSN: 0975-8232 Available online on www.ijpsr.com 1637
- [21] Liao S and Hiipakka RA: Selective inhibition of steroid 5α reductase isozymes by tea epicatechin-3-gallate and epigallocatechin-3-gallate. *Biochemical and Biophysical Research Communication* 1995; 25:214; 833-838.
- [22] Prager N, Bickett K, French N and Marcovici G: A randomized, double-blind, placebo-controlled trial to determine the effectiveness of botanically

derived inhibitors of 5 alpha reductase in the treatment of androgenetic alopecia. Journal of alternative and complementary medicines (New York, N.Y.) 2002 Apr; 8(2):143-52.

- [23] Esfandiari A and Kelley P: The effects of tea polyphenolic compounds on hair loss among rodents. Journal of the National Medical Association 2005 Jun; 97(6):816-8.