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Comprehensive Review for The Management of Alopecia with Natural Alternatives

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ABSTRACT:
Alopecia is a common disorder affecting both men and women, influenced by various factors, including genetic, environmental and medical conditions, as well as other unknown causes. It is a disputed issue, as there is no broad consensus on the fundamental causes of hair loss. Different components contributing to balding include hereditary predisposition, hormonal factors, and disease states, for example, typhoid, malaria, jaundice and the use of chemotherapy. It is a dermatologic issue, and the search for characteristic compounds with hair-growth-promoting properties is ongoing. The primary focus of this study is to address alopecia, a condition characterised by unpredictable hair loss. While there are different types of allopathic drugs, like minoxidil, available for treating hair loss, they often come with many side effects. Approximately 70% of people prefer herbal medications due to their easy availability, their beneficial effects and fewer or no side effects compared to allopathic medicine. Herbal formulations are used both internally and topically to promote hair growth and alleviate alopecia in males and females. Many polyherbal mixtures are used globally as hair tonics, conditioners, growth promoters, cleansing agents, anti-dandruff agents, and treatments for alopecia. This section of the review presents scientific evidence on the hair-growth-promoting activities of plants, their use in extracts and formulations, and their underlying mechanisms. Alopecia is a significant concern for both men and women in urban areas. This review article concludes that many herbal drugs have the potential to treat alopecia effectively.

INTRODUCTION

The hair structure of an adult comprises three parts: the shaft, root, and bulb. The shaft is the outer visible part of the hair follicle, while the root is located within the follicle and is usually not visible. It lies in the skin between the opening of the follicle and the point where the arrector pili muscles attach. The chemical composition of hair includes sebaceous gland keratin, lipids, pigments and minerals. Keratin is a protein found in the cortex of the hair. Alpha keratin, which is fibrous and has a low sulphur content, is the most abundant protein in hair. In Ayurveda, hair is considered a side effect of bone development. The tissue responsible for bone development is likewise accountable for hair growth. In the past, patients used home remedies to treat alopecia, both at home and elsewhere. Natural medications, such as juice, latex, or dried powder, were utilised. [1,2,3]

It is a disputed issue, as there is no broad consensus on the fundamental factors that cause hair loss. Different components contributing to balding include hereditary predisposition, hormonal factors, and disease states, for example, typhoid, malaria, jaundice and the use of chemotherapy. [4,5]

The hair follicles undergo a natural cycle that begins with the anagen phase, progresses to the catagen phase (a phase of regression), and concludes with the telogen phase (a non-growing stage).Fig.1

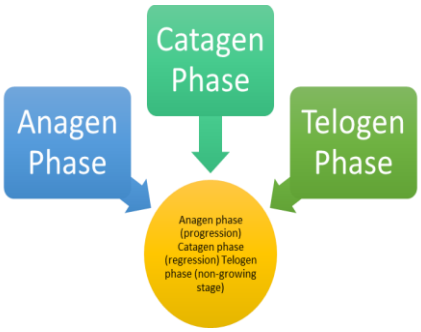

Figure 1: Hair Growth Cycle

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1. Anagen Phase

The anagen phase is the period during which the follicles regenerate and start to grow. This phase involves high mitotic division (proliferation) and active hair growth. The follicles enlarge during this phase as new cells are developed, supporting longer hair growth. Pigmentation only occurs during the anagen phase. The anagen phase typically begins between 2 and 7 years old, marking a stage of intense hair growth. [6,7,8]

2. Catagen Phase

The catagen phase, a crucial stage in the hair growth cycle, is characterised by apoptosis, decreased mitotic activity, and Bcl-2 suppression. Lasting approximately two weeks, this phase sees the hair follicle resting on the dermal papilla, which slows down cell production. The melanocytes contract, and melanin production ceases, all vital processes in the hair growth cycle. [6,7,8]

3. Telogen Phase

In this phase, the follicle enters a resting phase called telogen, which lasts approximately months. During this phase, the follicle is in a state of quiescence between follicular regression and the beginning of the anagen phase. [6,7,8]

MATERIALS AND METHODS

We searched for publications focusing on the treatment of alopecia in PubMed, Web of Science, EMBASE, and Google Scholar. We included the search terms “herbs used in alopecia” and “5-alpha reductase inhibitors” for articles up to June 2025. Abstracts were highly screened in all aspects, and relevant articles supporting the treatment of alopecia were reviewed to conclude the report.

RESULTS AND DISCUSSION

Treatment of Alopecia includes the following options: Herbal remedies and supplements are used to stimulate hair growth, reduce inflammation, and improve overall hair health. Various treatment therapies to supplement established therapeutic approaches, providing an additional layer of support in the management of this condition.

1. Nutritional Support

Minerals are essential elements for improving hair health. Mineral deficiencies directly affect blood circulation regulation, which can hinder healthy hair growth and development. Minerals also regulate thyroid hormones, which can help prevent dry hair and hair loss. Chromium, iodine, Calcium, copper, zinc, and magnesium are necessary for maintaining healthy hair growth. [9,10,11]

Food sources: curd and soy, onion, dark green vegetables, Carrots, whole grain products, essential fatty acids, nuts and seeds. Many other foods can help prevent hair loss and promote hair growth, including fruits, eggs, spinach, and broccoli. [12] Fig.2

Figure 2: Nutritional support for hair growth

2. DHT Blockers and 5-α-Reductase Blockers

Around 50% of men experience hair loss, with the DHT hormone being a significant cause. DHT is a vital part of male sexual development and can also contribute to hair loss in both men and women. DHT levels are higher among men than women because men naturally have more testosterone. A higher level of DHT may contribute to hair loss. However, this can be naturally curbed and supplemented.

DHT hormone binds to androgen receptors on hair follicles, leading to follicle miniaturisation, reduced hair growth, and a hindrance to the hair growth cycle. A high level of DHT can shorten the hair growth cycle and reduce hair density. DHT or Dihydrotestosterone is a hormone produced from testosterone in the testes, prostate, and other tissues. It is an important hormone, but it can contribute to hair loss. Dihydrotestosterone

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hormone, which is derived from testosterone and, after the action of the enzyme 5-alpha reductase, affects the prostatic growth. The body converts approximately 10% of testosterone into DHT daily.

Once we understand the established role of Dihydrotestosterone in hair loss, we should use herbs with noticeable DHT or 5-α-reductase-blocking activity to treat Alopecia, especially androgenetic Alopecia. Some herbs have proven DHT-blocking activity and have the potential to inhibit 5-α-reductase, such as Green Tea (Camellia sinensis), Dodder seed (Cuscuta reflexa), and Panax ginseng, among others. [13]

3. Herbs Used in the Treatment of Alopecia:

Synthetic drugs that produce dilation in the blood vessels of hair follicles. Their efficiency and safety are in doubt, and they take a while to take effect. As a result, there is now increased interest in adopting herbal and plant-based remedies to combat hair loss. Various plants and extracts used worldwide have hair growth-promoting properties. Some plants reported to have hair-growth-promoting activity are listed in Table 1.

Table 1: List of herbs used in the promotion of hair growth

Sr.no	Botanical name	Common name	Chemical constituents	Mechanism of action	Reference
1	Simmondsia chinensis	Jojoba Oil	Palmitic Acid, Lignoceric Acid	Improve the skin hydration and natural sebum in the skin.	14,15
2	Persia americana	Avacado	Isoflavonoid, Terpanoids	5-α reductase type 1 inhibitor and Sebum secretion Inhibitor	16,17,18
3	Bacopa monnieri Linn	Brahmi	Alkaloids	Activate proteins	19,20
4	Acacia concinna	Shikakai	Terpenoids	Pod extract is used as hair cleanser	21,22
5	Nardostachys jatamansi	Jatamansi	Nardal, Jatamansic Acid	Prolongation of the anagen phase	23,24,25
6	Arnica montana	Arnica	Terpenoids	Flower extract is used in hair tonic material	26,27,28
7	Trigonella foenum graecum	Fenugreek	Alkaloids, Polyphenol	5-α reductase inhibitor	29,30,31,32
8	Allium cepa	Onion	Terpenoids	For hair dyeing	31,34,35
9	Hibiscus rosa-sinensis Linn	Gurhal	Polyphenol	5-α reductase inhibitor	36,37,38,39
10	Betula pendula	Birch	Polyphenol	Extract of leaves used as anti-dandruff.	40,41
11	Polyporus umbellatus	Umbrella Polypore.	Polysaccharide And Sterol	Prolongation of the anagen phase	42,43
12	Brassica spp.	Mustard	Tannin, Flavonoids	Seed oil is used as hair nourishment	44

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13	Rosmarinus officinalis	Rosemary	Volatile Oil, Rosmarinic Acid	5-α reductase inhibitor	45,46
14	Camellia sinensis	Green Tea	Catecchins Epicatechins	5-α reductase inhibitor	42,47
15	Boehmeria nipononivea	Ramie	unsaturated fat	5-α reductase inhibitor	48
16	Calendula officinalis	Marigold	Flavonoids	Flower extract is used in hair creams for smoothing effect	49
17	Buxus wallichiana	Papri	Alkaloids	5-α reductase inhibitor	42,50
18	Capsicum annum	Pepper	Isoflavones	Nerve stimulents	31,51
19	Ginkgo biloba	Maiden hair-tree	Polyphenol	Improving the inflammatory response	42,52
20	Centella asiatica	Mandukparni	Essential Oil	Whole plant for hair growth and maintenance	42,53
21	Citrullus colocynthis	Indrayan	Glycosides	Hair follicles in anagenic phase	15,31,42
22	Cocos nucifera	Nariyal	Alkaloids, Essential Oil	Aromopathy	15,42,54
23	Panax ginseng	Korean ginseng	Glycosides, Flavonoids	Antiapoptotic effects	15,32,55
24	Eclipta alba	Bringraj	Glycosides	Anagen phase enlargement	31,32,56,57
25	Salvia officinalis	Sage Oil	Essential Oil	Aromopathy, 5-α reductase inhibitor	42,58
26	Phyllanthus embelica	Amla Henna	Vitamin C	Oil is used in hair growth	15,21,31,32,59
27	Ocimum sanctum	Basil	Essential Oil, Vitamin K	Revitalizing hair follicles	42,60
28	Lawsonia inermis	Bringraj	Terpenoids	Promotes hair growth	61,62
29	Lygodii spora	Climbing fern	Oleic, Linolenic & Palmitic Acids	5-α reductase inhibitor	42,63
30	Cuscuta reflexa	Akashbel	Flavonoids, Steroids	5-α reductase inhibitor	30,32,42,64
31	Polygonium multiflorum	Tuber fleece flower	Flavonoids, Glycosides	5-α reductase inhibitor	31,32,65
32	Tridax procumbens	Ghamra	Alkaloids, Flavonoids	Enhanced microcirculation around hair follicles.	42,67

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33	Thujae occidentalis	Arbor vitae	Essential Oil, Flavonoids	5-α reductase inhibitor	32,68,69
34	Pueraria thunbergiana	Kudzu	Alkaloids, Flavonoids	5-α reductase inhibitor	32,70,71
35	Asiasari radix	Maek	Terpenoids, Glycosides	Induction of the anagen phase	31,32,72
36	Punica granatum	Pomegranate	Polyphenols, Iron, Flavonoids, Vit,	Transition from the telogen to the anagen phase.	32,73,74
37	Acanthopanax koreanum	Acanthopanax root bark	Acanthoic Acid Acankoreoside.	Regulating the hair cycle	32,75
38	Coffea arabica	Coffee	Caffeine, Sterols, Diterpenes	Prolongation of the anagen phase	32,75,76
39	Crataegus pinnatifida	Mountain hawthorn	Terpenoids, Quercetin, Steroids,	Induce the anagen phase	32,77,78,79
40	Carthamus tinctorius	Safflower	Flavonoids, Oleic & Linoleic Acids,	5-α reductase inhibitor	80,81,82
41	Malus pumila	Apple	Procyanidin B2, sterols,Vit	Increase in keratin production	32,83,84
42	Juglans regia	Walnut	Alkaloids, Flavonoids	Increases blood circulation and oxygen supply	15,85,86
43	Cicer areitinum	Chickpeas	Alkaloids, Flavonoid, Steroid	Hair nourishment	87
44	Moringa oleifera	Sahjan	Flavonoid, Vit A, quercetin, Vit C	Inhibit 5 alpha reductase enzymes	88,89,90,91
45	Musa acuminata	Banana flower	Proanthocyanidin	Inhibit DHT production	92,93,94

SUMMARY

Alopecia is one of the main problems amongst urban people due to stress, heredity and environmental problems. With the help of this review article, we conclude that many herbal drugs have potency for curing alopecia with no side effects. There are various types of allopathic medicines to treat hair loss disorders, but they have many side effects along with the results. Herbs are the starting material for any research on medication. Herbal drugs help treat hair problems through various mechanisms. Today, approximately 80% of the population recommends herbal formulations due to their beneficial effects and fewer side effects compared to synthetic drugs. Some herbal marketed preparations include oils, Shampoos, gels, and emulsions containing herbs such as Amla, onion, Gurhal, walnut, Bhringaraj, Sage, Brahmi, Moringa, and Guduchi. The natural system provides a wealth of nutrition, antioxidants, various oils, proteins, terpenoids, and many of the most essential oils.

CONCLUSION

The audit may provide a case for addressing the troubling and upsetting issue of balding within the global network through standard solutions. Our current approach utilises various therapies, including aromatherapy, mesotherapy, hair transplantation, acupuncture, and dietary management, as well as 5-alpha reductase inhibitors,

which play a significant role due to their antiandrogenic effects and favourable safety and efficacy profiles. 5-alpha reductase inhibition is the primary non-surgical therapeutic strategy for promoting hair growth. In alopecia, male- and female-pattern baldness are effects of androgen receptor activation; therefore, reducing DHT levels also reduces hair loss in both.

List of Symbols and Abbreviations:

DHT- Dihydrotestosterone

DPC- Dermal Papilla Cells

AA- Alopecia Areata

VEGF – Vascular Endothelial Growth Factor

IGF- Insulin-Like Growth Factor

HGF- Hepatocyte Growth Factor

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CONFLICTS OF INTEREST

The authors declare no conflict of interest

AUTHOR'S CONTRIBUTION

SS: Conceived the idea, collected literature and wrote the first draft;

GPM: Critically reviewed the manuscript; All authors read and approved the submission.

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