Annales Universitatis Paedagogicae Cracoviensis
Studia Naturae, 11: XX–XX, 2026
ISSN 2543-8832
DOI: 10.24917/25438832.10.x

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Plants used in hair growth-supporting cosmetics

Abstract

Hair growth is a cyclical process regulated by complex molecular and cellular mechanisms occurring in the hair follicle. Recent years have seen a growing interest in cosmetics containing plant extracts and isolated bioactive compounds, which are believed to potentially stimulate the anagen phase, improve scalp microcirculation, and modulate inflammatory and oxidative processes. This publication presents the results of analyses of the ingredients of 60 selected cosmetic products designed to support hair growth (shampoos, conditioners, masks, and lotions). Cosmetic formulations were analysed to compile a list of plant species used in the production of these cosmetics. The scientific evidence supporting the claimed effects of the most commonly used plant ingredients was then evaluated based on a review of the available publications. The most popular plant ingredient was *Urtica dioica* extract, while the most frequently used bioactive compound was caffeine. It was found that for most commonly used ingredients, data were primarily available from preclinical studies, while clinical evidence regarding the effectiveness of topical preparations in stimulating hair growth had so far been presented only for *Salvia rosmarinus* and *Serenoa repens* extracts and for caffeine. The review indicates a discrepancy between the frequency of use of certain substances in cosmetic products and the level of evidence for their effectiveness in scientific studies. The results of the study emphasize the need for further experimental and clinical research on the mechanisms of action of popular plant active ingredients in the context of promoting hair growth.

Keywords: hair growth, plant ingredients, bioactive compounds, hair follicles, cosmetics, dermocosmetic formulations
Received: [2026.07.30]
Accepted: [2026.10.13]

Introduction

Hair (gr. *trichos*) is a specialised structure of the skin that performs protective, thermoregulatory, and sensory functions. In addition, its appearance is of considerable aesthetic and psychosocial importance, influencing individuals' self-esteem and overall quality of life (Dhami, 2021; Flament et al., 2025; Lalitha et al., 2025). Disorders of hair growth, including

excessive hair shedding and various forms of alopecia, are among the most common dermatological and cosmetological issues. Androgenetic alopecia, the most common form of hair loss, is of particular clinical and social significance. It affects both women and men and is characterised by the progressive miniaturisation of hair follicles, driven by androgenic activity in genetically predisposed individuals (Randall, 2008; Cuevas-Diaz Duran et al., 2024). Hair-related concerns have led to increasing interest in cosmetic products designed to support the maintenance of normal scalp function and to improve hair quality.

Hair growth is a complex and dynamic biological process that occurs within the hair follicle. The hair follicle is a miniature organ that undergoes cyclical changes comprising three principal phases: anagen – the active growth phase, catagen – the regression phase, and telogen – the resting phase. The normal progression through the successive stages of the hair cycle depends on the coordinated interplay of multiple cellular structures, particularly hair follicle stem cells and dermal papilla cells, as well as the activity of numerous molecular mediators (Stenn, Paus, 2001; Martel et al., 2024). This process is regulated by several signalling pathways, including the Wnt/*β*-catenin, Sonic Hedgehog, transforming growth factor-*β* (TGF-*β*), insulin-like growth factor 1 (IGF-1), and fibroblast growth factor (FGF) signalling pathways (Paus, Cotsarelis, 1999; Schneider et al., 2009).

Disruption of the balance between the processes regulating the hair cycle may result in shortening of the anagen phase, premature transition of the hair follicle into the telogen phase, and a gradual decline in the regenerative capacity of the hair follicle. Factors that adversely affect hair growth include genetic predisposition, hormonal disturbances, chronic inflammation, oxidative stress, nutritional deficiencies, and unfavourable environmental factors (Trüeb, 2018; Almohanna et al., 2019; Natarelli et al., 2023). Oxidative stress is considered to play a particularly important role, as it may impair hair follicle function and contribute to premature follicular ageing through cellular damage and the induction of inflammatory responses (Trüeb, 2009; Du et al., 2024).

Contemporary cosmetic products intended for hair and scalp care increasingly contain active ingredients designed not only to improve the appearance of the hair shaft but also to support the maintenance of a healthy biological environment of the scalp. Although cosmetic formulations do not replace pharmacological therapies used in the treatment of specific forms of alopecia, they may contribute to improving the health of the scalp through antioxidant effects, and moisturising effects, as well as by supporting normal scalp function (Draelos, 2021). Natural ingredients are of particular interest to cosmetic manufacturers, owing both to growing consumer demand for products based on plant-derived raw materials and to the potential biological activity of the bioactive compounds they contain (Bandyopadhyay et al., 2026).

Plants are a source of numerous bioactive substances, including polyphenols, flavonoids, terpenoids, saponins, alkaloids, phytosterols, and fatty acids, which may influence processes associated with hair follicle function. The antioxidant, anti-inflammatory, and cell response-regulating properties demonstrated in scientific studies have contributed to the frequent use of plant extracts in cosmetic products intended for scalp care and the support of hair growth. Their mechanisms of action include, among others, the reduction of oxidative stress, modulation of signalling pathways involved in the hair cycle, effects on scalp microcirculation, and the potential regulation of processes associated with androgen metabolism (Daniels et al., 2019; Choi et al., 2024).

Due to the potential influence of numerous plant-derived ingredients on processes associated with hair growth, they are widely used in cosmetic products claiming to stimulate hair growth. This study aims to compile a list of plant species whose raw materials are utilised in the aforementioned group of cosmetics. However, it is important to assess the extent to which the properties attributed to these products are supported by scientific evidence. Therefore, the objective of this article is also to analyse selected formulations of cosmetic products intended to support hair growth and to evaluate the scientific basis for the use of their plant-derived ingredients in relation to the claimed effects.

Material and methodology

The materials for this study were collected through an analysis of the compositions of cosmetic products with declared hair growth-supporting effects. The selected products were readily available in online shops or drugstores in Poland. Only products containing plant-derived compounds were included in the analysis. No cosmetic product lacking plant-derived ingredients was considered in the study. In total, the formulations of 60 different products were analysed, including shampoos, conditioners, masks, and scalp treatments.

In the first stage, an analysis of the International Nomenclature of Cosmetic Ingredients (INCI) compositions of the selected cosmetic products was performed. Based on this analysis, a list of plant species whose constituents were used in the production of the examined cosmetics was compiled. The most frequently occurring plant extracts, plant oils, and bioactive compounds that were identified as having, or potentially having, a plant-derived origin were determined. In the second stage, a review of the scientific literature was conducted, including *in vitro*, *ex vivo*, *in vivo*, and clinical studies investigating the effects of the most frequently identified plant-derived ingredients on hair growth. Scientific articles available in the Google Scholar, PubMed, and Europe PMC databases were used as sources.

The functions of individual plant-derived ingredients and bioactive compounds were assigned according to the official database developed and maintained by the European Commission – CosIng (Cosmetic Ingredients Database) (https://ec.europa.eu/growth/tools-databases/cosing/) and based on information provided by Cosmile Europe (https://cosmileeurope.eu/). The nomenclature of plant species was adopted according to *WFO* (2026).

Results

Plant-derived ingredients identified in the analysed cosmetic products originated from 155 species belonging to 71 families. The functions of individual ingredients are presented in Tab. 1 – Appendix 1. The most abundantly represented families in cosmetics supporting hair growth were: Asteraceae – 15 species, Fabaceae – 12 species, and Lamiaceae – 11 species; slightly less numerous were representatives of Rosaceae – 7 species, Brassicaceae – 7 species, and Poaceae – 6 species. Among the identified plant species, non-native species, not naturally occurring in Europe, were clearly predominant (Fig. 1), including many species growing in tropical and subtropical regions. Some of these plants serve as sources of herbal raw materials in Europe (e.g. *Calendula officinalis*, *Melissa officinalis*, *Mentha* ×*piperita*, *Thymus vulgaris*), whereas others are cultivated for fruit production (e.g. *Malus* ×*domestica*) or as vegetables (e.g. *Capsicum annuum*, *Eruca vesicaria* subsp. *sativa*, *Raphanus sativus*).

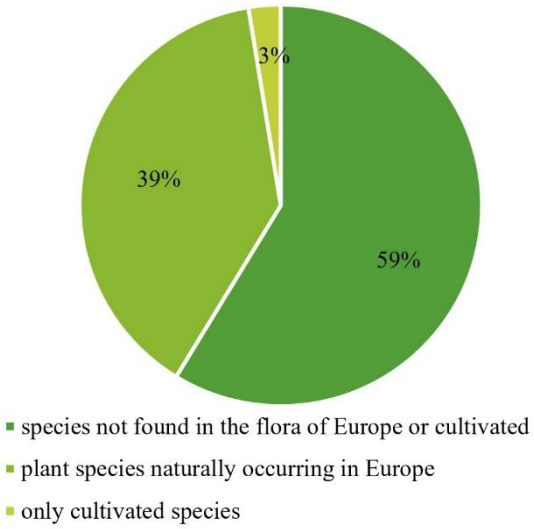


Fig. 1. Comparison of the proportion of plant species naturally occurring in the European flora (including species of foreign origin) and alien species (including exotic and tropical plants), occurring in Europe only as cultivated species, and exclusively cultivated species, used in the production of cosmetics supporting hair growth

In the case of most plants used in the production of cosmetics intended to stimulate hair growth, extracts (79%) obtained from various plant organs are utilised, whereas oils are applied less frequently (24%). Within the analysed group of products, the most frequently occurring ingredients were derived from well-known medicinal plant species, such as *Urtica dioica*, *Ricinus communis*, *Salvia rosmarinus*, *Aloe vera*, and *Equisetum arvense* (Fig. 2).

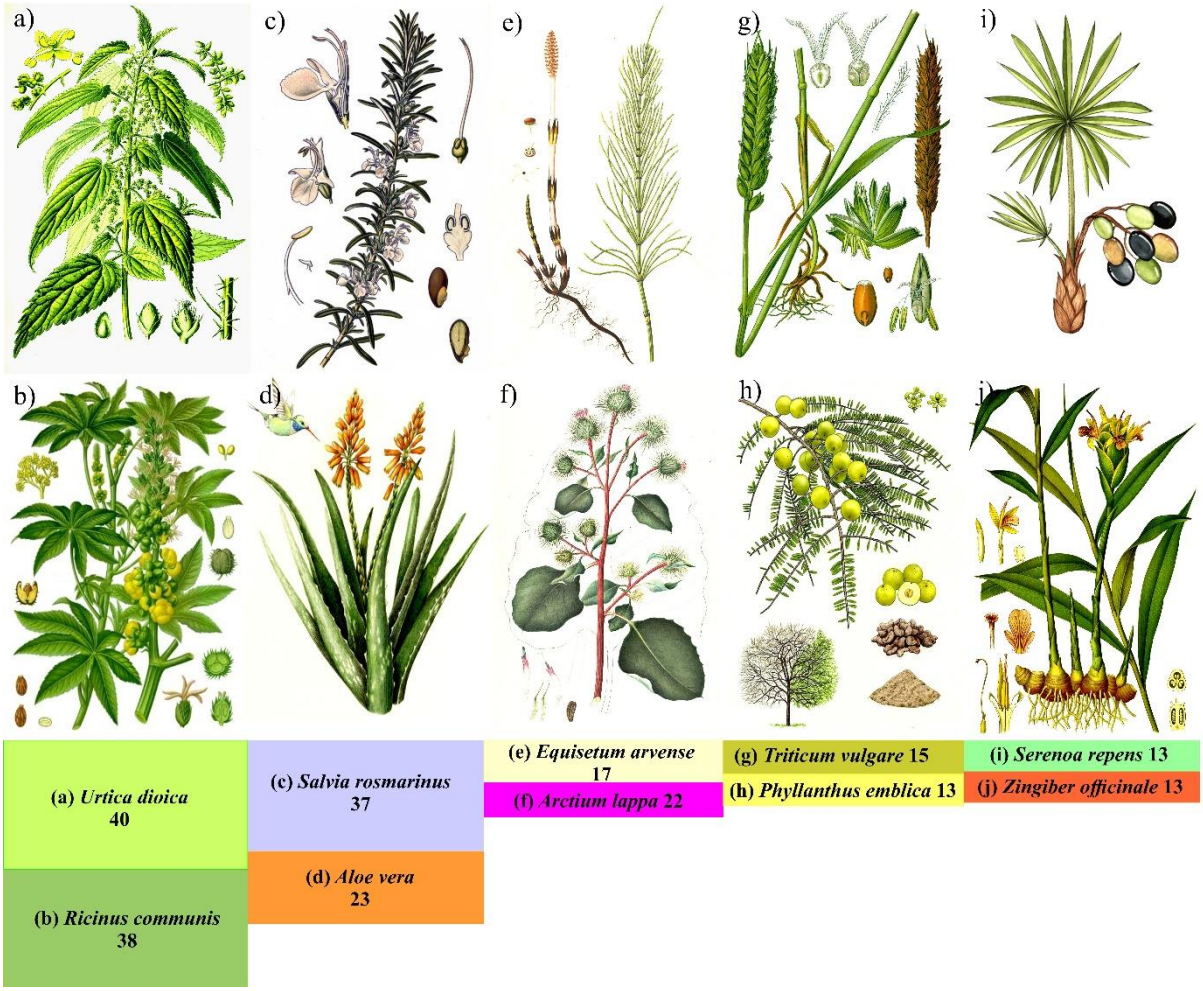


Fig. 2. Percentage share (%) of the most frequently used plant species in the analysed hair growth cosmetics; plant figures are for illustrative purposes only and have been sourced from public domain resources, available primarily on Wikimedia Commons

The majority of the plant-derived ingredients used exhibit skin-conditioning properties (Tab. 1 – Appendix 1).

Based on a review of the available scientific literature, including *in vitro*, *ex vivo*, *in vivo*, and clinical studies, it was found that the efficacy of the most frequently occurring plant species, in relation to the claimed effects of the analysed cosmetics, was not always supported by scientific evidence.

The positive effects of topical application of ingredients derived from individual plant species have been demonstrated primarily on the basis of *in vitro* and *in vivo* studies conducted using animal models (Tab. 2 – Appendix 1). The highest number of publications concerning the potential hair growth-supporting effects was identified for *Salvia rosmarinus*, *Urtica dioica*, and *Serenoa repens*. Clinical evidence regarding the efficacy of topically applied preparations in the context of hair growth stimulation has so far been reported only for two of the species analysed in this study – *Salvia rosmarinus* and *Serenoa repens*. For *Salvia rosmarinus*, both preclinical and clinical studies were available. The efficacy of *Serenoa repens*-containing preparations has been documented based on several clinical studies. In the case of *Urtica dioica*, the available data derived from *in vitro*, *ex vivo*, and *in vivo* studies focused primarily on the antiandrogenic activity of extracts and their influence on processes associated with hair follicle function. For the other most frequently recorded analysed species – *Ricinus communis*, *Aloe vera*, *Equisetum arvense*, *Arctium lappa*, *Triticum aestivum*, *Phyllanthus emblica*, and *Zingiber officinale* – the available evidence also originated mainly from *in vitro* studies and animal models. These studies indicated the potential significance of these species in maintaining scalp condition, protecting hair follicle cells, or supporting regenerative processes. However, no clinical studies confirming the direct efficacy of these species in stimulating hair growth were identified. For some plants, available literature reviews were also considered to explain the positive effects of their application on overall hair or scalp condition.

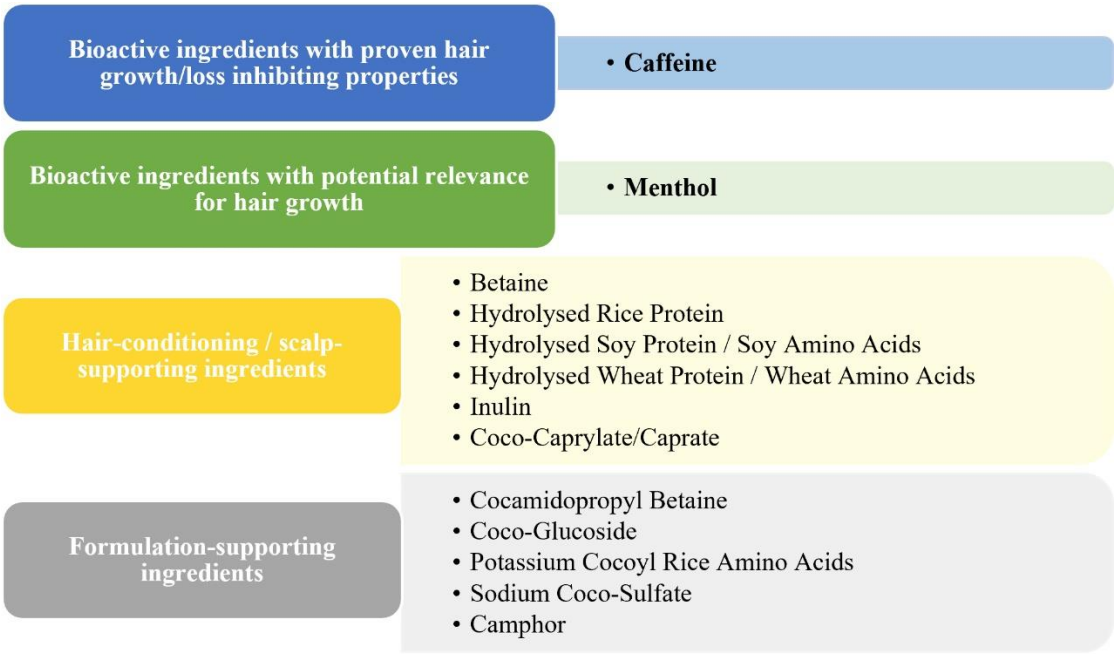


Fig. 3. Bioactive compounds in the analysed hair growth-supporting cosmetics

Within the scope of the present analyses, 13 bioactive compounds were identified that had or potentially had plant-derived and semi-synthetic (chemically modified) origins (Tab. 3 – Appendix 1). These compounds were classified into four groups of ingredients, as presented in the scheme below (Fig. 3). Among the analysed compounds, clinical study results confirming the supportive effects of caffeine on hair growth and the reduction of hair loss are available only for caffeine. For menthol, only potential effects have been demonstrated to date, based mainly on the results of preclinical studies (Tab. 3 – Appendix 1).

Discussion

The conducted analysis demonstrated a high diversity of plant-derived ingredients used in cosmetic products that are claimed to promote hair growth. The presence of 155 species belonging to 71 families (Tab. 1 – Appendix 1) indicates the extensive utilisation of plant-derived raw materials within this group of products. The predominance of non-native species, including those originating from tropical and subtropical regions, reflects the global trend towards the use of plants as sources of active ingredients in modern cosmetic formulations, as well as the growing interest in natural raw materials and plant-based products (Barbulova et al., 2015; Bandyopadhyay et al., 2026).

In the analysed preparations, plant extracts were used considerably more frequently than oils. The predominance of extracts may result from their potential for standardisation with respect to marker compounds or biologically active substances, which facilitates the maintenance of consistent composition and quality of the raw materials used in cosmetic production. Standardisation also reduces the impact of variability resulting from plant origin, cultivation conditions, drying processes, and subsequent extraction procedures (Bonati, 1991; Ong, 2004; Garg et al., 2012).

The results of the conducted review indicate that the plants most frequently used in cosmetics do not always represent the best-documented species in terms of their hair growth-supporting effects (Tab. 2 – Appendix 1). This was particularly evident in the case of *Urtica dioica*, which was the most frequently identified species in the analysed cosmetic formulations. Despite its widespread cosmetic use, only preclinical studies have been conducted to date on nettle, focusing mainly on its potential antiandrogenic activity and the effects of extracts on hair follicle cells. These studies demonstrated, among other effects, the inhibition of 5α-reductase activity (Nahata, Dixit, 2012; Pekmezci, Türkoğlu, 2023), as well as the beneficial effect of an ethanol extract on hair matrix cell proliferation and the inhibition of the catagen phase (Myagmar et al., 2018).

A different situation was observed for *Salvia rosmarinus*, whose presence in the analysed products was justified by a relatively high level of scientific evidence. Preclinical studies indicate that rosemary extracts and rosemary essential oil (*Rosmarini aetheroleum*) may influence processes involved in the regulation of the hair cycle, among other by modulating the androgen pathway and reducing the activity of dihydrotestosterone. The results of clinical studies suggest the possibility of improving selected hair parameters following the topical application of preparations containing rosemary essential oil, although the number of available studies remains limited (Murata et al., 2013; Panahi et al., 2015).

A similar relationship was observed for *Serenoa repens*, whose mechanism of action is primarily associated with modulation of the androgen pathway, particularly through the inhibition of 5α-reductase activity. Available clinical studies have demonstrated beneficial effects of preparations containing extracts from this plant on selected hair growth parameters; however, interpretation of the results requires caution due to differences in extract types, dosages, and routes of administration (Prager et al., 2002; Rossi et al., 2012; Wessagowit et al., 2015).

In the case of other frequently utilised species, such as *Ricinus communis*, *Aloe vera*, and *Equisetum arvense*, the results indicate primarily their potential significance in maintaining normal scalp and hair fibre condition rather than their direct stimulation of hair growth. Castor oil (*Ricini oleum*) is widely used in cosmetics due to its emollient and conditioning properties (Phong et al., 2022; Girdler et al., 2026). However, there is a lack of evidence confirming its effect on hair follicle activation or an increase in hair density. Similarly, *A. vera* and *E. arvense* exhibit anti-inflammatory, antioxidant, or skin barrier-supporting properties (Feily, Namazi, 2009; Soni et al., 2012). In the study by Indriaty et al. (2018), it was demonstrated that a preparation containing *A. vera* extract (7.5%), in combination with *Glycyrrhiza glabra* extract (2.5%) and ethanol, supported hair growth in an experimental model. However, due to the use of a multi-component formulation, it is not possible to determine the individual contribution of *A. vera* to the observed effect.

Interesting findings have been obtained for species whose potential effects may be associated not with direct stimulation of the hair follicle itself, but rather with improvement of the scalp microenvironment or protection of hair follicle cells. An example is *Arctium lappa*, for which the protective effect of arctiin ($C_{27}H_{34}O_{11}$; Fig. 4A) on human dermal papilla cells subjected to oxidative stress has been demonstrated (Bae et al., 2014).

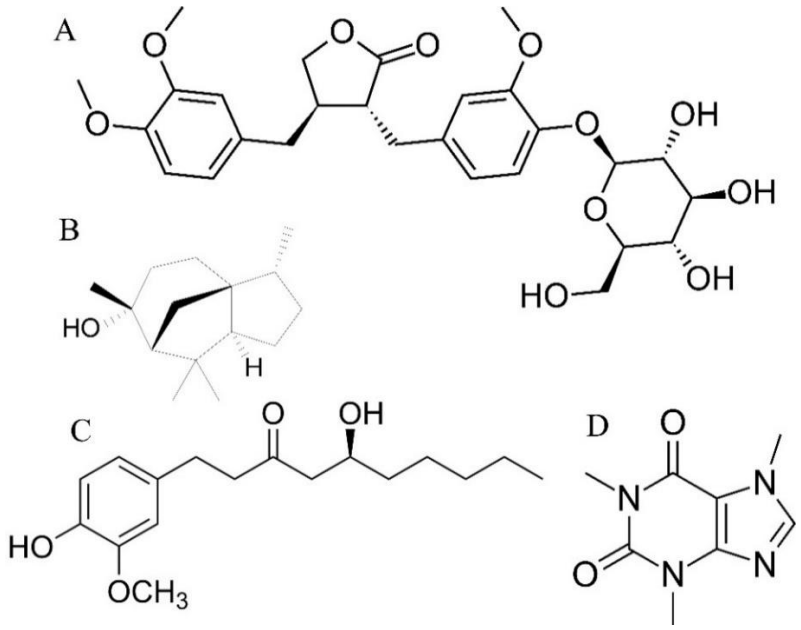


Fig. 4. Structural formulas of: arctiin (A), cedrol (B), 6-gingerol (C), and caffeine (D)

Similarly, extracts from *Triticum aestivum* have demonstrated the ability to support keratinocyte proliferation and skin regenerative processes. These findings indicate the potential role of these species in maintaining a favourable environment for hair growth; however, they do not confirm their direct efficacy as ingredients stimulating hair regrowth (D'Agostino et al., 2020).

Phyllanthus emblica and *Zingiber officinale* also deserve attention, as experimental data are available for these species. The extract from *P. emblica* demonstrated the ability to stimulate the proliferation of human dermal papilla cells (Luanpitpong et al., 2011), whereas cedrol ($C_{15}H_{26}O$; Fig. 4B) – a compound isolated from the rhizome of *Z. officinale* – promoted hair regeneration in an animal model by modulating pathways associated with cell survival and hair cycle regulation (Li et al., 2024).

The example of ginger demonstrates that the potential effects of a plant-derived raw material cannot be assessed solely on the basis of species affiliation, as individual compounds present within the same plant may exhibit different biological effects. 6-Gingerol ($C_{17}H_{26}O_4$; Fig. 4C), one of the major bioactive constituents of *Zingiber officinale*, demonstrated inhibitory effects on hair growth in experimental studies by reducing dermal papilla cell proliferation, inhibiting hair shaft elongation in human hair follicle cultures, and prolonging the telogen phase in an animal model (Miao et al., 2013). These findings indicate that the presence of a plant extract in a cosmetic formulation is not equivalent to a confirmed hair growth-supporting effect, and that the biological outcome depends on the phytochemical composition of the raw material and the predominant active compounds.

Among the analysed bioactive compounds, caffeine ($C_8H_{10}N_4O_2$; Fig. 4D) was of particular importance, as it was the most frequently identified plant-derived active compound (Tab. 3 – Appendix 1). Caffeine used in cosmetic preparations may originate from plant raw materials, such as *Coffea arabica*, *Camellia sinensis*, or *Paullinia cupana* (Watts et al., 2024), and may also be obtained synthetically. Due to its high purity, consistent quality, and favourable technological properties in cosmetic formulations, synthetic caffeine is frequently used; chemically, it is identical to naturally derived caffeine (Heckman et al., 2010; Herman, Herman, 2013).

The potential effects of caffeine in the context of supporting hair growth result from its influence on hair follicle activity. *In vitro* studies have demonstrated that caffeine may stimulate the proliferation of hair follicle cells and counteract the inhibitory effect of testosterone on hair growth, which is associated, among other mechanisms, with phosphodiesterase inhibition and an increase in cyclic AMP levels (Fischer et al., 2007).

In contrast to most of the analysed plant-derived ingredients, numerous clinical data are available regarding the topical application of caffeine. For example, in a randomised clinical study by Dhurat et al. (2017), the efficacy of a 0.2% caffeine solution applied topically in men with androgenetic alopecia was evaluated in comparison with a 5% minoxidil solution. After 6 months of treatment, the caffeine-containing preparation demonstrated comparable efficacy in terms of selected hair growth assessment parameters, and its tolerability was good. These findings indicate the potential of topical caffeine application as an adjunctive approach in AGA management; however, they cannot be directly extrapolated to the efficacy of all cosmetic formulations containing caffeine, as the study concerned a standardised medicinal-cosmetic preparation with a defined concentration of the active compound. It should also be noted that a recent review of clinical studies investigating the efficacy of caffeine in anti-hair loss cosmetics demonstrated that, among 1121 publications, only 9 met the inclusion criteria for analysis (a total of 684 participants). All studies indicated a beneficial effect of topical caffeine; however, the authors of the review highlighted methodological limitations, including the lack of randomisation in some studies, the absence of placebo or control groups, and differences in the composition of the tested formulations (Szendzielorz, Spiewak, 2025).

Menthol, identified in the analysed formulations as a bioactive ingredient with potential relevance to the scalp and hair follicles, is primarily used due to its cooling and refreshing properties resulting from the activation of TRPM8 receptors (Bautista et al., 2007). However, in the context of supporting hair growth, the available data are mainly of a preclinical nature. In a mouse model, L-menthol contained in peppermint oil (*Menthae piperitae aetheroleum*) was shown to stimulate hair growth by increasing hair follicle activity and enhancing the

expression of markers associated with the anagen phase (Oh et al., 2014). Nevertheless, no clinical studies confirming the efficacy of topical menthol application in humans have been reported to date; therefore, its effects should currently be regarded as potential and requiring further verification.

Conclusions

The analysis of 60 cosmetic formulations whose claimed effect is to promote hair growth demonstrated that plant-derived ingredients are widely used in this category of products, with extracts from 155 plant species representing 71 botanical families identified. Although many of the most frequently used species have been investigated for their potential effects on hair follicles, the available evidence is based predominantly on *in vitro* and animal studies.

A clear discrepancy was observed between the frequency of use of particular plant ingredients in cosmetic formulations and the level of scientific evidence supporting their effectiveness. Of the most popular plant species analysed, clinical evidence for the topical promotion of hair growth is currently available only for *Salvia rosmarinus* and *Serenoa repens*, while among the identified bioactive compounds only caffeine is supported by clinical studies demonstrating beneficial effects on hair growth. Most of the remaining ingredients appear to contribute primarily to improving scalp condition, protecting hair follicle cells, or enhancing hair fibre quality rather than directly stimulating hair growth.

These findings indicate that the inclusion of botanical ingredients in hair growth cosmetics is often based on promising experimental data rather than robust clinical evidence. Future studies should focus on well-designed randomised clinical trials and on the standardization of plant extracts to better establish their efficacy, mechanisms of action, and optimal use in cosmetic formulations.

Conflict of interest

The author declares no conflict of interest related to this article.

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Tab. 1. Alphabetical list of plants found in hair growth cosmetics and the basic effects of their ingredients

No.	Name of the species	Family	Type of plant ingredient	Functions/Effects	Occurrence in analysed cosmetics (%)
1.	*Achillea millefolium*	Asteraceae	extract	anti-seborrheic, cleansing, fragrance, refreshing, skin conditioning, soothing, tonic	3
2.	*Acmella oleracea*	Asteraceae	extract	protects the skin against external factors	2
3.	*Acorus calamus*	Acoraceae	root extract	skin conditioning, perfuming	2
4.	*Actinidia chinensis*	Actinidiaceae	fruit extract	keeps the skin in good condition, softens and smoothes the skin	2
5.	*Aesculus hippocastanum*	Sapindaceae	seed extract/ hydrolysed extract	skin conditioning	3
6.	*Allium cepa*	Amaryllidaceae	bulb extract	skin conditioning	5
7.	*Aloe vera*	Asphodelaceae	leaf juice/leaf juice powder	skin conditioning	23
8.	*Althaea officinalis*	Malvaceae	root extract	skin conditioning	2
9.	*Angelica archangelica*	Apiaceae	root extract/oil	fragrance, skin conditioning, perfuming, tonic	8
10.	*Angelica dahurica*	Apiaceae	root extract	skin conditioning	2
11.	*Angelica gigas*	Apiaceae	root extract	skin conditioning	2
12.	*Arctium lappa*	Asteraceae	root extract	skin conditioning	22
13.	*Armoracia rusticana*	Brassicaceae	root extract	fragrance	5
14.	*Artemisia argyi*	Asteraceae	leaf extract	skin conditioning, hair conditioning	2
15.	*Aspalathus linearis*	Fabaceae	leaf extract	skin conditioning	2
16.	*Attalea speciosa*	Arecaceae	seed oil	softens and smoothes the skin	2
17.	*Avena sativa*	Poaceae	kernel extract	abrasive, antioxidant, keeps the skin in good condition, softens and smoothes the skin, peeling	2
18.	*Azadirachta indica*	Meliaceae	seed oil/bark extract	skin conditioning	5
19.	*Bambusa vulgaris*	Poaceae	leaf/stem extract	skin conditioning, maintains and retains moisture in cosmetic products	2
20.	*Betula pendula*	Betulaceae	leaf extract/bud extract	astringent, cleansing, fragrance, skin conditioning, soothing, tonic	10
21.	*Boehmeria nivea*	Urticaceae	leaf extract	skin conditioning, hair conditioning	2
22.	*Brassica oleracea*	Brassicaceae	seed oil	skin conditioning, skin protecting	3
23.	*Brassica rapa* subsp. *oleifera*	Brassicaceae	seed extract/seed oil	skin conditioning	2
24.	*Calendula officinalis*	Asteraceae	flower extract	fragrance, skin conditioning, perfuming	8
25.	*Calophyllum inophyllum*	Calophyllaceae	seed oil	antimicrobial, antioxidant, hair conditioning, skin conditioning, UV absorber	2
26.	*Camellia sinensis*	Theaceae	leaf extract	antimicrobial, antioxidant, astringent, keeps the skin in good condition, softens and smoothes the skin, maintains and retains moisture in cosmetic products, fragrance, skin protecting, tonic, tightens the	7

				skin and/or has an astringent effect, UV absorber	
27.	*Cananga odorata*	Annonaceae	flower oil	enhances the scent of the product and/or perfumes the skin	2
28.	*Cannabis sativa*	Cannabaceae	hydrolysed seed extract/flower/ leaf/stem extract	keeps the skin in good condition, softens and smoothes the skin, maintains and retains moisture in cosmetic products	3
29.	*Capsicum annuum*	Solanaceae	fruit extract	anti-seborrheic, antimicrobial, antioxidant, astringent, hair conditioning, skin protecting	8
30.	*Capsicum frutescens*	Solanaceae	resin	cleansing, fragrance, tonic	2
31.	*Carica papaya*	Caricaceae	fruit extract	skin conditioning	2
32.	*Carthamus tinctorius*	Asteraceae	flower extract	skin conditioning	2
33.	*Cedrus atlantica*	Pinaceae	bark oil	fragrance, skin conditioning, perfuming	2
34.	*Centella asiatica*	Apiaceae	leaf extract	skin conditioning	5
35.	*Ceratonia siliqua*	Fabaceae	hydrolysed seed extract	skin conditioning	2
36.	*Chamaemelum nobilis*	Asteraceae	flower extract	fragrance, skin conditioning, perfuming	3
37.	*Cinchona pubescens*	Rubiaceae	bark extract	makes hair easier to comb, improves its elasticity, softness and shine and/or adds volume; keeps the skin in good condition	5
38.	*Cinnamomum verum*	Lauraceae	bark extract	antimicrobial, antioxidant, protects the skin against external factors, maintains and retains moisture in cosmetic products, enhances the scent of the product and/or perfumes the skin, keeps the skin in good condition, softens and smoothes the skin, tightens the skin and/or has an astringent effect	2
39.	*Citrus ×aurantium*	Rutaceae	peel oil/leaf oil/ fruit extract	skin conditioning, fragrance	8
40.	*Citrus junos*	Rutaceae	fruit extract	skin conditioning	2
41.	*Citrus limon*	Rutaceae	fruit extract/peel extract/peel oil	enhances the scent of the product and/or perfumes the skin, keeps the skin in good condition, delays the evaporation of water from the skin surface, protects the skin from external factors, softens and smoothes the skin, tonic	10
42.	*Cocos nucifera*	Arecaceae	oil/oil glycereth-8 esters	facilitates combing, improves hair elasticity, softness and shine and adds volume, fragrance, perfuming, skin conditioning/ cleanses the skin and hair	8
43.	*Coffea arabica*	Rubiaceae	fruit extract/seed oil	antioxidant, keeps the skin in good condition	3
44.	*Coptis japonica*	Ranunculaceae	root extract	skin conditioning	2
45.	*Cucumis sativus*	Cucurbitaceae	fruit extract	keeps the skin in good condition, softens and smoothes the skin	2
46.	*Cucurbita pepo*	Cucurbitaceae	seed extract	skin conditioning	2
47.	*Curcuma longa*	Zingiberaceae	callus culture conditioned media	antioxidant, skin conditioning, skin protecting	2

48.	*Cyamopsis tetragonoloba*	Fabaceae	gum	binding, emulsion stabilising, film forming, fragrance, viscosity controlling	2
49.	*Cynara scolymus*	Asteraceae	leaf extract	skin conditioning	2
50.	*Cyperus scariosus*	Cyperaceae	root extract	perfuming	2
51.	*Echinacea angustifolia*	Asteraceae	root extract	facilitates combing of hair, improves its elasticity, softness and shine and/or adds volume; skin and nails conditioning	3
52.	*Eclipta prostrata*	Asteraceae	leaf extract	skin conditioning	2
53.	*Equisetum arvense*	Equisetaceae	leaf extract	softens and smoothes the skin, tonic, relieves skin and scalp discomfort (e.g. itching), tightens the skin and/or has an astringent effect	17
54.	*Eruca vesicaria* subsp. *sativa*	Brassicaceae	hydrolysed leaf	antioxidant, protects the skin against external factors, keeps the skin in good condition, softens and smoothes the skin	3
55.	*Eucalyptus globulus*	Myrtaceae	leaf oil	skin conditioning, perfuming	2
56.	*Ficus carica*	Moraceae	fruit extract	maintains and retains moisture in cosmetic products	2
57.	*Fragaria ×ananassa*	Rosaceae	fruit extract	skin conditioning	2
58.	*Gardenia taitensis*	Rubiaceae	oil	skin conditioning, skin protecting, hair conditioning	3
59.	*Gaultheria procumbens*	Ericaceae	leaf oil	fragrance, perfuming	2
60.	*Ginkgo biloba*	Ginkgoaceae	leaf extract	skin conditioning	2
61.	*Glycine max* ssp. *soja*	Fabaceae	germ extract	keeps the skin in good condition	8
62.	*Glycyrrhiza glabra*	Fabaceae	root extract	brightens the shade of hair or skin, keeps the skin in good condition, softens and smoothes the skin, relieves discomfort of the skin and scalp	3
63.	*Hamamelis virginiana*	Hamamelidaceae	water/leaf extract	astringent, hair conditioning, skin conditioning, soothing	3
64.	*Hedera helix*	Araliaceae	leaf extract	skin conditioning	3
65.	*Helianthus annuus*	Asteraceae	seed oil	keeps the skin in good condition, softens and smoothes the skin, prevents water loss	2
66.	*Heterotheca inuloides*	Asteraceae	flower extract	fragrance	2
67.	*Hibiscus sabdariffa*	Malvaceae	flower extract	skin conditioning	2
68.	*Hippophae rhamnoides*	Elaeagnaceae	extract	fragrance, skin conditioning	2
69.	*Humulus lupulus*	Cannabaceae	cone extract	antimicrobial, antiperspirant, hair conditioning, fragrance, skin conditioning, skin protecting	10
70.	*Ilex paraguariensis*	Aquifoliaceae	leaf extract	hair conditioning, skin conditioning, perfuming	2
71.	*Juglans regia*	Juglandaceae	hydrolysed extract	astringent, antioxidant, hair conditioning, skin conditioning	3
72.	*Juniperus communis*	Cupressaceae	fruit extract/fruit oil	skin conditioning, perfuming/fragrance, astringent	7
73.	*Lamium album*	Lamiaceae	extract	astringent, fragrance	3
74.	*Larix sibirica*	Pinaceae	wood extract	skin conditioning, humectant	2
75.	*Lavandula angustifolia*	Lamiaceae	flower extract/flower water/oil	cleansing, deodorant, fragrance, refreshing, tonic, skin conditioning	5
76.	*Lawsonia inermis*	Lythraceae	extract	antimicrobial, antioxidant, hair conditioning, hair dyeing	2
77.	*Lepidium meyenii*	Brassicaceae	root extract	skin conditioning	3

78.	*Linum usitatissimum*	Linaceae	seed oil	skin conditioning, perfuming	2
79.	*Lithospermum erythrorhizon*	Boraginaceae	root extract	skin conditioning	2
80.	*Litsea cubeba*	Lauraceae	fruit oil	fragrance, tonic, perfuming	2
81.	*Lupinus* sp.	Fabaceae	hydrolysed seed extract	skin conditioning, hair conditioning	2
82.	*Lycium chinense*	Solanaceae	fruit extract	antioxidant	3
83.	*Malus ×domestica*	Rosaceae	fruit extract	antioxidant, skin conditioning	5
84.	*Malva sylvestris*	Malvaceae	extract	keeps the skin in good condition, softens the skin, smoothing, soothing, attenting	2
85.	*Matricaria chamomilla*	Asteraceae	flower extract	fragrance, skin conditioning	10
86.	*Medicago sativa*	Fabaceae	leaf extract	skin conditioning	2
87.	*Melaleuca alternifolia*	Myrtaceae	leaf oil	antioxidant, fragrance, perfuming, skin protecting, skin conditioning	7
88.	*Melaleuca leucadendra*	Myrtaceae	leaf oil	perfuming	2
89.	*Melissa officinalis*	Lamiaceae	leaf extract	skin conditioning	3
90.	*Mentha ×piperita*	Lamiaceae	leaf oil/herb oil	fragrance, skin conditioning, perfuming	8
91.	*Mentha arvensis*	Lamiaceae	leaf oil/leaf extract	fragrance, refreshing	8
92.	*Mimosa zimapanensis*	Fabaceae	bark extract	skin protecting, soothing	2
93.	*Moringa oleifera*	Moringaceae	seed extract/ seed oil	keeps the skin in good condition, softens and smoothes the skin	3
94.	*Morus alba*	Moraceae	root extract/ bark extract	skin conditioning	3
95.	*Musa ×paradisiaca*	Musaceae	fruit extract	skin conditioning	2
96.	*Myrothamnus flabellifolia*	Myrothamnaceae	callus culture extract	antioxidant, hair conditioning, humectant, skin conditioning, skin protecting	2
97.	*Nardostachys jatamansi*	Caprifoliaceae	root extract	skin conditioning	2
98.	*Nasturtium officinale*	Brassicaceae	extract	skin conditioning, perfuming	3
99.	*Nelumbo nucifera*	Nelumbonaceae	callus culture extract	antimicrobial, antioxidant, humectant	2
100.	*Nigella sativa*	Ranunculaceae	seed oil	keeps the skin in good condition, softens and smoothes the skin, perfuming	2
101.	*Olax dissitiflora*	Olacaceae	root oil	tonic	2
102.	*Olea europaea*	Oleaceae	oil/callus culture lysate	skin conditioning	3
103.	*Oreocome striata*	Apiaceae	root extract	antioxidant	2
104.	*Origanum majorana*	Lamiaceae	leaf extract	anti-sebum, refreshing, tonic	3
105.	*Oryza sativa*	Poaceae	extract/callus culture extract	abrasive, absorbent, bulking, hair conditioning, skin conditioning	12
106.	*Palmaria palmata*	Palmariaceae	extract	skin protecting	3
107.	*Panax ginseng*	Araliaceae	root extract	softens and smoothes the skin, hair conditioning, skin protecting, tonic	12
108.	*Paullinia cupana*	Sapindaceae	fruit extract	skin conditioning	2
109.	*Pelargonium graveolens*	Geraniaceae	oil	fragrance, perfuming	2
110.	*Persea americana*	Lauraceae	oil	skin conditioning	5
111.	*Phyllanthus emblica*	Phyllanthaceae	fruit extract	skin conditioning	13
112.	*Pinus palustris*	Pinaceae	leaf extract/bud extract	tonic	2

113.	*Pinus sylvestris*	Pinaceae	bud extract/leaf extract	tonic, perfuming	5
114.	*Piper nigrum*	Piperaceae	fruit extract	perfuming	2
115.	*Platycladus orientalis*	Cupressaceae	leaf extract	antimicrobial, antioxidant, skin protecting	2
116.	*Prunus amygdalus*	Rosaceae	oil	skin conditioning	3
117.	*Punica granatum*	Lythraceae	fruit extract	skin conditioning	2
118.	*Quercus robur*	Fagaceae	bark extract	astringent	2
119.	*Raphanus sativus*	Brassicaceae	root extract	astringent, skin conditioning	3
120.	*Reynoutria multiflora*	Polygonaceae	root extract	skin conditioning	3
121.	*Ricinus communis*	Euphorbiaceae	seed oil/ hydrogenated castor oil (chemically modified)	fragrance, skin conditioning, perfuming/surfactant – emulsifying and cleansing	38
122.	*Rosa damascena*	Rosaceae	extract/essential oil	fragrance, tonic, skin conditioning	3
123.	*Rosa moschata*	Rosaceae	seed oil	keeps the skin in good condition, softens and smoothes the skin	2
124.	*Rubus coreanus*	Rosaceae	fruit extract	skin conditioning	2
125.	*Rubus fruticosus*	Rosaceae	fruit extract	astringent, fragrance, tonic	2
126.	*Ruscus aculeatus*	Asparagaceae	root extract	astringent, refreshing, skin conditioning, soothing, light stabilizer, tonic	2
127.	*Saccharum officinarum*	Poaceae	extract	moisturising, skin conditioning	3
128.	*Salix alba*	Salicaceae	bark extract	astringent, hair conditioning, skin conditioning, soothing, tonic	2
129.	*Salvia officinalis*	Lamiaceae	leaf extract	anti-seborrheic, cleansing, skin conditioning, tonic	8
130.	*Salvia rosmarinus*	Lamiaceae	leaf oil/leaf extract	fragrance, skin conditioning, antimicrobial	37
131.	*Saponaria officinalis*	Caryophyllaceae	extract	skin conditioning	5
132.	*Schisandra sphenanthera*	Schisandraceae	fruit extract	skin conditioning	2
133.	*Scutellaria baicalensis*	Lamiaceae	root extract	astringent, humectant, soothing	12
134.	*Serenoa repens*	Arecaceae	fruit extract	skin conditioning	13
135.	*Sesamum indicum*	Pedaliaceae	seed oil	keeps the skin in good condition, softens and smoothes the skin, hair conditioning, fragrance	3
136.	*Sideroxylon spinosum*	Sapotaceae	kernel oil	keeps the skin in good condition, softens and smoothes the skin	8
137.	*Simmondsia chinensis*	Simmondsiadaceae	seed oil	keeps the skin in good condition, softens and smoothes the skin, hair conditioning	7
138.	*Sophora flavescens*	Fabaceae	root extract	antioxidant, skin conditioning	3
139.	*Symphytum officinale*	Boraginaceae	leaf extract	skin conditioning	2
140.	*Syzygium aromaticum*	Myrtaceae	bud oil	fragrance, perfuming	2
141.	*Taraxacum platycarpum*	Asteraceae	callus culture extract	skin conditioning	2
142.	*Terminalia chebula*	Combretaceae	fruit extract	skin conditioning	2

143.	*Thymus vulgaris*	Lamiaceae	flower/leaf/stem extract	fragrance, skin conditioning, tonic	8
144.	*Trifolium pratense*	Fabaceae	leaf/ flower extract	antioxidant, skin conditioning/astringent, fragrance	5
145.	*Trigonella foenum-graecum*	Fabaceae	seed extract	skin conditioning, perfuming	5
146.	*Triticum aestivum*	Poaceae	germ extract	skin conditioning, skin protecting	15
147.	*Tropaeolum majus*	Tropaeolaceae	flower extract	skin conditioning	3
148.	*Tussilago farfara*	Asteraceae	leaf extract	astringent, keeps the skin in good condition, softens and smoothes the skin	2
149.	*Urtica dioica*	Lamiaceae	leaf extract	skin conditioning	40
150.	*Vanda falcata*	Orchidaceae	callus culture extract	skin conditioning	2
151.	*Vitellaria paradoxa*	Sapotaceae	nut extract, butter	keeps the skin in good condition, softens and smoothes the skin, increases or decreases the viscosity of cosmetic products	3
152.	*Vitis vinifera*	Vitaceae	seed extract, fruit meristem cell culture	anti-seborrheic, antimicrobial, antioxidant, skin protecting, UV absorber	5
153.	*Withania somnifera*	Solanaceae	root extract	skin conditioning	2
154.	*Zea mays*	Poaceae	oil	surfactant – emulsifying, hair conditioning, fragrance, skin conditioning, perfuming	2
155.	*Zingiber officinale*	Zingiberaceae	root extract	fragrance, skin conditioning, tonic, perfuming	13

Note: The functions/effects of plant ingredients are described based on online databases: https://ec.europa.eu/growth/tools-databases/cosing/ and https://cosmileeurope.eu/

Tab. 2. A review of studies on the plant species most frequently used in the analysed formulations of cosmetics supporting hair growth

Name of plant	Type of extract/Active compound	Part of the plant used	Methods	Results	References
Urtica dioica	petroleum ether and ethanolic extracts	roots	*in vitro* and *in vivo*	Inhibited 5*α*-reductase activity *in vitro* and reduced testosterone-induced benign prostatic hyperplasia in a rat model, indicating antiandrogenic activity. No direct effects on hair growth or hair follicle stimulation were evaluated.	Nahata, Dixit, 2012
	ethanol extract	aerial part	*in vitro* and *ex vivo*	Ethanol extract from *U. dioica* stimulated hair growth, inhibited catagen and increased the proliferation of hair follicle matrix cells (Ki-67+).	Myagmar et al., 2018
	alcoholic extract	leaves (dried)	*in vitro*	Nettle extract reduced the expression of the 5α-reductase type II gene in human skin cells (HaCaT), which may reduce the action of DHT, a hormone associated with androgenic alopecia.	Pekmezci, Türkoğlu, 2023
Ricinus communis	castor oil (fixed oil)	seeds	review	Castor oil is widely used in cosmetic formulations because of its emollient and conditioning properties. However, no direct *in vitro*, *in vivo* or clinical studies confirm stimulation of hair follicle growth or increased hair density.	Phong et al., 2022; Girdler et al., 2026
Salvia rosmarinus	ethanol extract	leaves	*in vivo*	Rosemary extract showed improvement in hair growth in AGA mice, showed potent inhibitory effects on receptor 5a-reductase and inhibited the binding of dihydrotestosterone to androgen receptors.	Murata et al. 2013
	methanolic extracts	aerial parts	*in vivo*	The time required for the onset and completion of hair regrowth was shorter in mice treated with a 1% hair lotion containing *S. rosmarinus* extract than in those treated with 2% minoxidil.	Begum et al. 2023
	individually: essential oil, hydrolate, alcoholic extract, and in combination (shampoo and hair tonic)	leaves	*in vivo*	The groups of mice treated with essential oil, extract, and hydrolate showed statistically better growth than the control groups. The extracts used in this study stimulate hair growth to a greater extent than the drug minoxidil.	Aljorna-Molero et al. 2026
	rosemary oil	no detailed information	clinical trial	A significant increase in hair count was observed after 6 months of rosemary oil use, with results comparable to those obtained with minoxidil.	Panahi et al.. 2015
	rosemary extract as an ingredient of Trust tonic (with Capixyl, Procapil)	no detailed information	clinical trial	Hair growth improvement in the group treated with Trust tonic was five times greater than that observed in the minoxidil group.	Eslahi et al. 2022
	rosemary oil (in combination with lavender oil and with castor oil)	no detailed information	clinical trial	Rosemary–lavender and rosemary–castor oils showed a significant beneficial effect on hair growth parameters. Their ability to increase hair thickness, density, and length while reducing hair loss suggests that they may represent a promising natural alternative for promoting hair regrowth.	Patel et al. 2025

Aloe vera	gel	leaves	review	May support scalp health through anti-inflammatory, antioxidant, and wound-healing properties. However, no direct *in vitro*, *ex vivo*, *in vivo*, or clinical evidence demonstrates stimulation of hair growth or hair follicle activity.	Feily, Namazi, 2009
	aqueous extract in powder dosage form (combined with *Glycyrrhiza glabra* extract and other ingredients)	not specified	*in vivo*	A hair tonic containing *Aloe vera* extract (7.5%), *Glycyrrhiza glabra* extract (2.5%), and ethanol (5–15%) promoted hair growth in the experimental model. However, the contribution of *A. vera* alone cannot be determined due to the combined formulation.	Indriaty et al., 2018
Arctium lappa	ethanolic extract	roots	*in vitro*	Arctiin protected human dermal papilla cells against H_2O_2-induced oxidative stress by reducing senescence and apoptosis through modulation of microRNA expression. These findings suggest a potential protective effect on hair follicle cells; however, direct stimulation of hair growth was not evaluated.	Bae et al., 2014
	extract	roots	clinical trial	Topical application improved scalp parameters, including reduction of microbial load and sebum levels. The study did not directly evaluate hair density or hair growth stimulation.	Lee et al., 2015
	ethanolic extract	roots	review	Reported antioxidant and anti-inflammatory properties that may contribute to maintaining scalp and follicle health; however, evidence for direct hair growth promotion remains limited.	Chan et al., 2011
Equisetum arvense	aqueous extract	aerial parts	review	No direct experimental studies evaluating hair growth promotion by *E. arvense* extract was identified. Potential benefits for hair health are attributed to silica content and antioxidant properties, which may support hair structure and scalp condition; however, evidence for stimulation of hair follicle growth is lacking.	Soni et al., 2012
Triticum aestivum	aqueous extract	whole germinated plant	*in vitro*	Promoted human keratinocyte proliferation and migration, enhanced extracellular matrix remodelling, and positively modulated biomarkers involved in tissue repair (MMP-2, MMP-9, collagen I, elastin, integrin αV, aquaporin 3). These regenerative effects may support scalp condition; however, direct stimulation of hair follicle growth was not evaluated.	D'Agostino et al., 2020
	aqueous extract (pharmaceutical-grade extract)	whole germinated plant	*in vitro*	Accelerated wound repair by promoting fibroblast and keratinocyte activity, increasing extracellular matrix deposition and modulating inflammatory responses. No direct effects on hair follicle growth or hair density were assessed.	Tito et al., 2020

Phyllanthus emblica	extract	fruits	*in vitro*	Stimulated proliferation of human dermal papilla cells in a concentration-dependent manner, while showing minimal effects on keratinocytes. The results suggest a potential role in promoting hair growth through stimulation of dermal papilla cell activity and possible prolongation of the anagen phase; however, molecular pathways and direct hair shaft growth were not evaluated.	Luanpitpong et al., 2011
	oral fruit preparation (amla syrup)	fruits	clinical trial	Amla supplementation increased the anagen-to-telogen hair ratio in women with female androgenetic alopecia after 12 weeks of treatment and improved physician- and patient-reported outcomes. Further studies are required to confirm efficacy of isolated *P. emblica* preparations.	Akhbari et al., 2024
Serenoa repens	lipidosterolic extract combined with β-sitosterol	fruits	clinical trial	The botanical formulation improved hair growth in men with androgenetic alopecia. However, the independent effect of *S. repens* could not be determined because the formulation contained β-sitosterol.	Prager et al., 2002
	extract	fruits	clinical trial	Topical application increased total and terminal hair counts and was well tolerated. The absence of a placebo control limits the strength of the evidence.	Wessagowit et al., 2015
	oral lipidosterolic extract	fruits	clinical trial	Treatment improved hair growth parameters in men with mild-to-moderate androgenetic alopecia. Clinical efficacy was lower than that observed with finasteride (improvement in approximately 38% vs. 68% of patients, respectively).	Rossi et al., 2012
	oral standardised bioactive fatty acid extract (SEREVELLE)	fruits	clinical trial	Daily treatment significantly increased terminal, vellus and total hair counts, improved hair density and reduced hair shedding compared with placebo. The findings apply to a proprietary standardised extract (SEREVELLE), and generalization to other *S. repens* extracts should be made with caution.	Ablon, 2025
Zingiber officinale	cedrol (sesquiterpene compound isolated from ginger); oral administration and external administration	rhizome	*in vitro* and *in vivo*	Cedrol promoted hair regeneration in a mouse model of cyclophosphamide-induced alopecia areata. Oral administration of cedrol showed stronger hair growth-promoting effects than external administration. The antioxidant and anti-apoptotic properties of cedrol protected hair follicle cells against cyclophosphamide-induced immunosuppressive damage. Cedrol modulated the JAK3/STAT3 signalling pathway and activated the Wnt3α/β-catenin pathway involved in hair growth regulation. Further clinical studies are required to confirm its potential application as a hair growth-promoting ingredient.	Li et al., 2024

Tab. 3. Functional ingredients of possible plant origin identified in hair growth-supporting cosmetics: cosmetic functions and relevance for hair and scalp health

No.	Name of ingredient (INCI)	Origin in cosmetic formulations	Plant source	Role in formulation	Cosmetic function	Evidence-based relevance for hair/scalp	Occurrence in analysed cosmetics (%)	References
1.	Betaine	plant-derived / synthetic	*Beta vulgaris*	humectant/ conditioning ingredient	hair conditioning, humectant, viscosity controlling	Supports hydration and scalp barrier function; no evidence for direct stimulation of hair growth.	10	Burnett et al., 2018; Draelos, 2021
2.	Caffeine	plant-derived / synthetic	*Coffea arabica* (and also *Camellia sinensis, Paullinia cupana*)	bioactive ingredient	hair conditioning, scalp care	Experimental evidence indicates stimulation of human hair follicle activity and potential prolongation of anagen phase.	22	Fischer et al., 2007; Herman, Herman, 2013
3.	Camphor	plant-derived / synthetic	*Cinnamomum camphora*	functional active/ fragrance ingredient	fragrance, denaturant	Provides cooling and sensory effects; insufficient evidence for hair growth stimulation.	3	Green, 1990; Selescu et al., 2013
4.	Cocamidopropyl Betaine	semi-synthetic (plant-derived fatty acids + synthetic processing)	Coconut-derived fatty acids (*Cocos nucifera*)	surfactant	cleansing, foam boosting, viscosity control, antistatic	Cleanses the hair and scalp by removing dirt, sebum, product residues, and dead skin cells; provides foaming properties; no evidence for direct influence on hair growth.	30	Ananthapadmanabhan et al., 2004; Draelos, 2010
5.	Coco-Caprylate/ Caprate	plant-derived / chemically modified	*Cocos nucifera*	emollient	skin conditioning	Improves sensory properties and lipid phase of formulations; no evidence for hair growth stimulation.	3	Draelos, 2021
6.	Coco-Glucoside	plant-derived / biotechnology -derived	Coconut derivatives (*Cocos nucifera*) + glucose	surfactant	cleansing, foaming	Removes dirt, sebum, styling product residues, and desquamated skin cells from the hair and scalp; provides foaming properties, enhancing the perceived cleansing performance of the shampoo; no evidence for direct biological activity related to hair growth.	15	Ananthapadmanabhan et al., 2004; Draelos, 2010

7.	Hydrolysed Rice Protein	plant-derived	*Oryza sativa*	conditioning ingredient	hair and skin conditioning, antistatic	Improves hair fibre surface properties and cosmetic appearance; no evidence for stimulation of follicle growth.	3	Gavazzoni Dias, 2015 Draelos, 2021
8.	Hydrolysed Soy Protein / Soy Amino Acids	plant-derived	*Glycine max* subsp. *soja*	conditioning ingredient	hair and skin conditioning, antistatic	Improves hydration, elasticity and mechanical properties of hair fibre; no direct effect on hair cycle demonstrated.	8	Gavazzoni Dias, 2015 Draelos, 2021
9.	Hydrolysed Wheat Protein / Wheat Amino Acids	plant-derived	*Triticum aestivum*	conditioning ingredient	hair and skin conditioning, antistatic	Supports hair fibre strength and moisture retention; no evidence for follicular stimulation.	10	Gavazzoni Dias, 2015 Draelos, 2021
10.	Inulin	plant-derived	*Cichorium intybus*	conditioning/ prebiotic ingredient	skin conditioning	Potential role in maintaining scalp microbiome balance and barrier function; direct evidence for hair growth unavailable.	7	Tripodo, Mandracchia, 2019; Gibson et al., 2017
11.	Menthol	plant-derived / synthetic	*Mentha* × *piperita*	functional active/ fragrance ingredient	cooling agent, fragrance, refreshing	Activates TRPM8 receptors, producing cooling and sensory effects on the scalp; preclinical studies indicate that L-menthol and menthol-containing peppermint oil may promote hair growth in mice; however, clinical evidence confirming hair growth effects in humans remains insufficient.	12	Bautista et al., 2007; Patel et al., 2007; Oh et al., 2014; Ahn et al., 2020
12.	Potassium Cocoyl Rice Amino Acids	plant-derived / chemically modified	*Cocos nucifera*, *Oryza sativa*	surfactant	cleansing, emulsifying, foam boosting	Cleanses the hair and scalp by removing dirt, sebum, product residues, and dead skin cells; provides foaming properties; no evidence for direct hair growth effects.	3	Ananthapadmanabhan et al., 2004; Draelos, 2010
13.	Sodium Coco-Sulfate	plant-derived / chemically modified	*Cocos nucifera*	surfactant	cleansing	Removes dirt, sebum, styling product residues, and desquamated skin cells from the hair and scalp; no evidence for direct influence on hair growth.	3	Ananthapadmanabhan et al., 2004; Draelos, 2010

Note: The functions of individual compounds were assigned according to the European CosIng Database (https://ec.europa.eu/) and based on the information contained on the Cosmile Europe website (https://cosmileeurope.eu/); grey indicates evidence-supported hair growth activity, green indicates potential hair growth-supporting effects

Rośliny wykorzystywane w kosmetykach wspomagających wzrost włosów

Streszczenie

Wzrost włosa jest procesem cyklicznym, regulowanym przez złożone mechanizmy molekularne i komórkowe zachodzące w mieszku włosowym. W ostatnich latach obserwuje się wzrost zainteresowania kosmetykami zawierającymi ekstrakty roślinne oraz wyizolowane związki bioaktywne, którym przypisuje się potencjalne działanie stymulujące fazę anagenu, poprawiające mikrokrążenie skóry głowy oraz modulujące procesy zapalne i oksydacyjne. W publikacji zawarto wyniki analiz składów 60 wybranych produktów kosmetycznych przeznaczonych do wspomagania wzrostu włosów (szamponów, odżywek, masek oraz wcierek). Przeanalizowano formulacje kosmetyczne w celu sporządzenia wykazu gatunków roślin, które są wykorzystywane do produkcji tej grupy kosmetyków. Następnie dokonano oceny naukowych podstaw stosowania najczęściej występujących składników roślinnych w kontekście deklarowanego działania na podstawie przeglądu dostępnych publikacji. Najczęstszym składnikiem roślinnym był ekstrakt z *Urtica dioica*, natomiast najczęściej stosowanym związkiem bioaktywnym – kofeina. Stwierdzono, że dla większości najczęściej stosowanych składników dostępne są głównie dane z badań przedklinicznych, natomiast dowody kliniczne dotyczące skuteczności preparatów stosowanych miejscowo w stymulacji wzrostu włosów przedstawiono dotychczas jedynie dla ekstraktów z *Salvia rosmarinus* i *Serenoa repens* oraz dla kofeiny. Przeprowadzony przegląd wskazuje na rozbieżność między częstością stosowania określonych substancji w produktach kosmetycznych a poziomem potwierdzenia ich skuteczności w badaniach naukowych. Wyniki pracy podkreślają potrzebę dalszych badań eksperymentalnych i klinicznych nad mechanizmami działania popularnych roślinnych składników aktywnych w kontekście wspomagania wzrostu włosów.

Słowa kluczowe: wzrost włosów, składniki roślinne, związki bioaktywne, mieszki włosowe, kosmetyki, formulacje dermokosmetyczne

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