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THE EFFECTIVENESS OF ALOE VERA EXTRACT AS A NATURAL INGREDIENT IN REDUCING HAIR LOSS

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ABSTRACT

Hair loss is a common condition affecting many individuals, particularly teenagers and women who wear the hijab. Aloe vera contains various bioactive compounds, including vitamins, proteolytic enzymes, and amino acids, which nourish the scalp and stimulate hair growth. This study aims to evaluate the effectiveness of Aloe vera extract in various hair care formulations, including shampoos, hair tonics, serums, and pomades, for treating hair loss. A qualitative descriptive literature review analyzed 30 relevant national and international scientific articles published between 2016 and 2025. The findings indicate that Aloe vera has the potential to reduce hair loss, promote hair growth, and support scalp health.

Furthermore, combining Aloe vera with other herbal ingredients, such as candlenut, celery, and lime, may enhance its efficacy. Products based on Aloe vera are also reported to have good physical stability, be safe for use, and be compatible with various scalp types. The study concludes that Aloe vera is a promising natural ingredient for developing safe, effective, sustainable herbal hair care products.

Keywords: *Aloe vera*, Herbal hair care, Natural active ingredients, *Stability of the preparation, Hair Loss*

Introduction

Beauty has become an essential aspect of modern women's lives that is not only oriented to outward appearance, but is also closely related to psychosocial factors, such as self-confidence, self-image, and social perception in the surrounding environment (Kaziga, R., et al. 2021 & Mohammed, G. F., et al. 2025). One of the essential elements in supporting such appearance and confidence is hair health, which is often referred to as the "crown" for women (Clarke-Jeffers, P., Keyte, R., & Connabeer, K., 2024 & Nkimbeng, M., et al., 2023). Healthy, dense, and well-groomed hair symbolizes femininity and is essential to forming a person's personal and social identity (Daniels, G., et al. 2025). Therefore, various hair problems, especially hair loss, are often a serious concern for many individuals, especially among adolescent girls and adult women, including women in hijab.

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Hair loss is among the most common complaints experienced by women and men in different age groups (Gokce, N., et al. 2022 & Gupta, A.K., et al. 2022). In a psychological context, hair loss impacts aesthetics and can decrease quality of life, cause stress, and cause confidence disorders (Malta Jr, M., & Corso, G., 2025). Based on Pravitasari's (2021) report, hair loss and thinning conditions are often a source of anxiety that encourages individuals to look for treatment solutions that are not only effective but also safe and suited to the condition of their respective scalps. Meanwhile, a survey in Indonesia shows that around 45% of women experience hair loss and thinning, a significant number, and indicates the urgency of appropriate intervention to address these problems. This problem is reinforced by the findings of an international study by L'Oréal, which involved thousands of female respondents in various countries. The study's results stated that as many as 88% of women consider hair loss a big problem that directly impacts their confidence (Stephani, 2018). This condition becomes increasingly complex for groups of women wearing hijab. Prolonged use of hijab and strict wearing can cause limited air circulation on the scalp and trigger excess moisture, ultimately creating a less-than-optimal environment for hair health.

Data from cross-sectional research in Indonesia shows that as many as 26.8% of women who wear hijab experience telogen effluvium, which is a type of hair loss caused by disturbances in the hair growth phase, which is higher than 18.1% in women who do not wear hijab (Wahyuni, 2020). In another study by the Faculty of Medicine, University of Muhammadiyah Palembang, on 117 hijab-wearing students, it was found that there was a significant relationship between hijab wearing factors—such as the duration of daily wear, the tightness of the tie, and the hairstyle behind the hijab—and the intensity of hair loss. As many as 34.6% of respondents admitted directly that the loss they experienced was related to the wearing of hijab, with more than 70% wearing hijab for 7 to 9 hours every day. As public awareness of the importance of using natural ingredients in body and hair care increases, aloe vera (Aloe vera) is one of the herbal plants that has received special attention due to its various benefits (Bouissane, L., et al., 2025). Aloe vera has long been known as a versatile plant rich in bioactive compounds such as vitamins A, C, and E, proteolytic enzymes, minerals, and essential amino acids that nourish the scalp, strengthen hair roots, and stimulate new hair growth. Another advantage is its soothing and moisturizing properties, making it suitable for various skin types, including sensitive scalps.

Various studies have shown the effectiveness of Aloe vera in addressing hair loss and improving overall hair health (Allam, A. T., et al. 2025 & Shakeena, D., et al. 2021). In the world of cosmetics and the hair care industry, aloe vera extract is widely used in various product preparations such as shampoos, hair tonics, serums, hair masks, and pomade (PATEL, S. D. 2024 & Varpe, B. D., Kulkarni, A. A., & Mali, A. S. 2021). Each product has a different working mechanism. Hair tonic, for example, is applied directly to the scalp to provide deeper penetration of the active ingredients—shampoo functions as a cleanser and a medium to deliver daily nutrients for the hair and scalp. Meanwhile, hair masks provide intensive treatments aimed at deeply improving and revitalizing the condition of the hair. Although the potential of Aloe vera is very promising, its effectiveness in overcoming hair loss in each form of product preparation is still not comprehensively mapped, especially in the context of adolescent users. On the other hand, many hair care products are chemically based on chemicals that can cause side effects such as irritation, dry scalp, and allergic reactions. Therefore, it is essential to develop and test the effectiveness of natural ingredients that are

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safer and more sustainable, especially for adolescents and hijab-wearing women who have special care needs.

In the formulation process of Aloe vera-based products, several technical aspects need to be considered to ensure the stability and comfort of the product when used. One of the critical factors is the pH of the product. Safe and comfortable hair care products generally have a pH between 5.0 and 5.5, corresponding to the natural pH of the human scalp. This pH range helps maintain the protective layer of the scalp (acid mantle), prevents the growth of pathogenic microorganisms, and creates an environment conducive to healthy hair growth. In addition, organoleptic tests (color, odor, and texture), viscosity, dispersibility, and other physical stability tests are also required to ensure the quality of the product before it is widely marketed.

Biological effectiveness testing is essential to evaluate the real effect of Aloe vera preparations on hair loss. These tests can include observing the amount of hair loss before and after use, measurements of hair length or weight growth, and dermatological testing to see how the scalp reacts to the use of the product. The data obtained from these various tests can be statistically analyzed using a t-test or ANOVA to determine the significance of the effect of Aloe vera on the reduction of hair loss. A significance value (p-value) of less than 0.05 indicates that the result is statistically significant and can be used as a basis for decision-making.

Seeing the potential and urgency of the existing problem, this study was conducted as a scientific effort to examine the effectiveness of Aloe vera in various forms of hair care preparations—especially hair tonics, shampoos, and masks—in overcoming hair loss. The focus of the research is on adolescents who are prone to experiencing hair problems due to hormonal changes, lifestyle, and treatment patterns that are not optimal. This study is expected to be a reference in the development of natural hair care products that are effective, safe, and in accordance with the needs of the community, especially in the era of the trend of returning to natural ingredients (back to nature). In addition, the results of this research are also expected to make a theoretical and practical contribution to the development of herbal cosmetics and encourage the sustainable use of the potential of local Indonesian plants. Using a literature review approach to the latest scientific sources, this study will not only highlight the effectiveness of Aloe vera in terms of its active content and mechanism of action but also review how the product's form affects users' performance and comfort. Therefore, this research is essential in supporting the development of hair care product innovations that are more environmentally friendly, ethical, and beneficial to public health.

Materials and Methods

Method

This study employed a qualitative descriptive literature review method to evaluate the effectiveness of Aloe vera extract in various hair care products aimed at reducing hair loss. The literature search was conducted systematically using electronic databases such as Scopus, Google Scholar, and Garuda (Indonesian journal portal), covering publications from 2016 to 2025.

The following keywords were used in combination using Boolean operators (AND/OR): *“Aloe vera”, “hair loss”, “hair care product”, “natural ingredients”, “herbal shampoo”, “hair tonic”, “serum”, and “pomade”*. The initial search yielded 53 articles, which were screened based on inclusion and exclusion criteria.

Inclusion criteria:

- Articles published between 2016 and 2025
- Research focusing on Aloe vera in hair care formulations
- Studies involving serum, shampoo, hair tonic, or pomade

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- Peer-reviewed journal articles in English or Indonesian

Exclusion criteria:

- Articles not available in full text
- Studies not directly related to Aloe vera and hair loss treatment
- Duplicates and opinion papers without empirical data

After screening, 30 articles were selected (15 national and 15 international) for in-depth analysis. The selected studies were evaluated based on the type of formulation, active compound content, "effectiveness on hair loss", "pH stability", and "applicability for scalp health". No formal quality assessment tool was used; however, all articles were assessed for scientific credibility by considering their publication sources, research designs (e.g., experimental, pre-experimental, quasi-experimental), and statistical significance where applicable. The findings were synthesized narratively to compare the performance of Aloe vera across different product types.

Results and Discussion

Research Results

Based on the analysis of the journals carried out, various types of herbal ingredients that are commonly used in hair care cosmetics were obtained. Aloe vera extract contains several bioactive compounds, such as vitamin A, vitamin C, essential amino acids, copper (Cu), inositol, enzymes, and various minerals that are beneficial as antioxidants in maintaining the health of the scalp and hair follicles. These bioactive compounds also act as biological stimulants that can support the process of hair cell proliferation and regeneration and have effective anti-inflammatory properties in inhibiting androgenetic activity of alopecia, which is one of the main pathophysiological mechanisms that can cause hair loss (Rusdiana, 2018).

Table 1. Results of Literature Review of National Journal

Title	Author and Year	Research Methods	Result
Meningkatkan Kepercayaan Diri Remaja Melalui Edukasi Perawatan Rambut Dengan Hair Tonic Lidah Buaya (Aloe Vera L.)	Nofita, Dinda Sefta Firguna, Farhan Herdi Pratama, Intan Deswita Sari, Sinta Purnamasari (2025)	This activity was carried out through oral information delivery with the help of pamphlets and questionnaires as supporting media.	Based on the analysis of pretest and posttest data, it is known that 49.67% of people used aloe vera as a natural ingredient for making hair tonic before the implementation of counseling. After the counseling, an average assessment of 91.61% was obtained. The results obtained showed an increase, which was a marker of the compiler's success in conducting counseling.
Efektivitas Penggunaan Ekstrak Lidah Buaya dan Kemiri untuk Rambut Rontok	Shally Ayu Chintya, Siti Khomsatin, Dini Febriyanti (2024)	This activity was carried out through oral information delivery with the help of pamphlets and questionnaires as supporting media.	The study's results after using aloe vera and hazelnut extracts obtained a p-value of 0.005, a mean difference of -0.600, a standard error difference of 0.189, and the lowest 95% confidence interval value of -0.996 and the highest -0.204. This study concludes that the use of aloe vera and hazelnut extracts is effective in overcoming hair loss problems.

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Formulasi dan Uji Stabilitas Hair Tonic Ekstrak Lidah Buaya (*Aloe vera* L.) dan Seledri (*Apium graviolens L.)* Untuk Perawatan Rambut Rontok	Fajar Indriyani dan Susi Endrawati (2021)	This type of research is experimental research.	The ANOVA test determines the viscosity and type weight difference between the three hair tonic formulas. The results show a significance value < 0.001, meaning a significant difference exists. The preparation has a pH of 4, which is still within the ideal range of scalp pH (4.5–5.5), making it safe and effective in helping to overcome hair loss. This pH supports the absorption of active substances from aloe vera and celery, which strengthen the hair roots and nourish the scalp.
Pengaruh Penambahan Lidah Buaya (Aloe Vera) Terhadap Sifat Fisik Shampo Rambut Rontok Berbahan Dasar Lerak (Sapindus Rarak)	Yuliana Rahmawati (2019)	This type of research is experimental research.	The results of a single ANOVA test showed that adding aloe vera significantly affected the aroma, color, foam, preference, and pH of the shampoo (overall significance values of 0.000 < 0.05). This means that aloe vera affects the physical properties and quality of shampoo in a real way. The content of proteolytic enzymes, vitamins A, C, and E in aloe vera plays a role in nourishing the scalp, strengthening roots, and stimulating hair growth. The best formula is the X9 product with 9 ml of aloe vera, pH 5.01, a viscosity of 2.21 cP, and the highest preference level. The pH value is within the ideal standard (5–9), so it is an effective shampoo for hair loss treatment.
Pemanfaatan Bahan Alami Lidah Buaya (Aloe Vera) sebagai Perawatan Rambut Rontok di SMA Negeri 17 Medan	Sofia Elia Sari Bangun, Zola Efa Harnis, Jhan Saberlan Purba, Dian Fachrunnisa, Agnes Clara (2024)	The method used is counseling.	The results in this study show that using aloe vera as a natural ingredient can help overcome hair loss because its enzymes, vitamins, and anti-inflammatory compounds nourish the scalp.
Efektivitas Serum Lidah Buaya (*Aloe vera*) terhadap Perawatan Rambut Rontok	Bella Sasmiyandri, Erwin Samsul, Niken Indriyanti (2019)	This type of research is experimental research.	Aloe vera serum that has been organoleptically and physically tested is stable and effective. A pH between 5.7 and 6.1 is still considered safe and supports the serum's effectiveness in dealing with natural hair loss.
Perbandingan Efektifitas Ekstrak Gel Lidah Buaya (*Aloe Vera* L.) Terhadap Perawatan Rambut Rontok	Puji Larasati Masyithoh, Astika Widy Utomo, Endang Mahati, Muflihatul Muniroh (2019)	Experimental research with posttest only control group design.	The results showed that giving aloe vera to test animals could reduce hair loss. However, the results of the ANOVA test showed a significance value of p = 0.069 (p > 0.05), which is not statistically significant. However, visually, the group that was given aloe vera showed lower shedding than the other groups. This effect is

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			supported by the content of enzymes and vitamins in aloe vera, which can strengthen the hair roots. With a natural pH close to the scalp's pH, aloe vera still has the potential to be a natural ingredient in hair loss care.
Formulation of shampoo preparations from pecan oil (Aleurites moluccana L.) With aloe vera (Aloe Vera) as a hair loss treatment	Muhammad Furqan and Baihaqqi (2023)	This type of research is experimental research, which is a research by conducting experimental activities.	The results showed that shampoo with a pH of 5–6.2 was homogeneous and safe because it did not irritate. Hair activity tests in rabbits showed increased hair growth, especially on formulas II and III. Thus, shampoos made from hazelnut oil and aloe vera extracts have the potential to be effective as a hair loss treatment.
Formulasi Dan Uji Stabilitas Pomade Lidah Buaya (Aloe vera var.chinensis) Untuk Perawatan Rambut Rontok	Ruby Abdillah Mujiono (2020)	The research method was conducted experimentally.	The 50% aloe vera (FII) pomade formulation is qualified because it is a semi-solid form that is soft, milky white, and has a distinctive aroma of oleum menthae. The test results show a pH of 5, which is ideal for the scalp and effective in dealing with hair loss. When used, the formulation is also homogeneous, so this aloe vera pomade is considered stable and feasible as a hair loss care product.
Kelayakan Shampo Berbahan Dasar Lidah Buaya Dan Jeruk Nipis Untuk Perawatan Rambut Rontok	Hilda Wanti, Syakira Kurnia Sari, Fharadita Ariyani, Fidella Eriza Putri, Nadia Lasmi (2024)	Experimental research with nine panelists, including two lecturers, three members of the general public, and five students.	The Fr 3 formula received the most positive response from panelists regarding color, aroma, and foam, with the highest preference rate of 55.55%. The aloe vera content in this formula also supports its benefits in strengthening hair roots and reducing hair loss. With good organoleptic results and natural active ingredients, Fr 3 has the potential to be developed as a hair loss treatment product.
Formulasi dan uji aktivitas tonik rambut dengan kombinasi ekstrak air lidah buaya (Aloe vera L.) dan akar manis (Glycyrrhiza glabra L.) Untuk Perawatan Rambut Rontok	Shelly Taurhesia (2018)	This type of research is experimental research.	A hair tonic containing 7.5% aloe vera extract, 2.5% liquorice, and 15% ethanol shows the most optimal results in stability and physical characteristics. This tonic has a pH of 5.5, which corresponds to the scalp, and an ideal viscosity and specific gravity. The content of aloe vera and liquorice provides a nourishing effect, strengthens roots, and reduces hair loss. With good physical properties and natural active ingredients, this tonic has the potential to be an effective solution for hair loss treatment.
Uji Aktivitas Kombinasi Ekstrak Air Lidah Buaya(*Aloe*	Sulistiorini, Teti Indrawati, Shelly Taurhesia (2016)	This type of research is experimental research.	In animal tests, the combination of 2.5% liquorice water extract and 7.5% aloe vera was proven effective

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Vera L.) Dan Akar Manis (Glycyrrhiza Glabra L.) Sebagai Perawatan Rambut Rontok			in treating hair loss. Over 28 days, this combination resulted in an average hair growth of 2.97 cm and a hair weight of 0.13 grams. These results show great potential as a safe, natural treatment, particularly for adolescents, in reducing hair loss and stimulating growth.
Peningkatan Kesejahteraan Keluarga Dengan Pemanfaatan Lidah Buaya Untuk Perawatan Kulit Kepala Dan Rambut Rontok	Neneng Siti Silfi Ambarwati (2020)	This type of research is experimental research.	The test results showed regular and homogeneous distribution of data, with a tcal value (3.38) > ttable (1.86), which means that the use of aloe vera gel masks affects reducing hair loss. The average reduction in hair loss was higher in the aloe vera group (0.800) than in the control group (0.699). These findings support using aloe vera as a natural solution that benefits hair health and family well-being.
Pengaruh Pemanfaatan Cream Creambath Lidah Buaya Terhadap Perawatan Rambut Rontok	Suci Mukhti (2016)	This research is a pre-experimental type with a one-group pretest-posttest design.	The test results indicated that the data were normally distributed (significance value = 0.692, > 0.05) and exhibited homogeneity of variance (F_{count} = 4, < F_{table} = 6.39). The independent samples t-test revealed a statistically significant difference in hair loss reduction after using the *Aloe vera* cream bath, with a t-value of -6.325 and a p-value of 0.003 ($p < 0.05$). These findings demonstrate that *Aloe vera* has a significant effect and supports its potential as an effective natural ingredient in treating hair loss.

Table 2. Results of Literature Review of International Journals

Heading	Author and Year	Research Methods	Result
Natural Hair Growth Tonic: Avemor (*Aloe vera* and Moringa oleifera) for Thickening Hair and Anti-Lickness	Iin Suhesti, Dinar Azizah, Marcela Lexi Putri Kurniawan, Nila Efa Sulistiana, Anastasia Ananda Nur Fitroh, Maudy Nur Alfiani (2022)	This type of research is experimental research.	Natural Hair Growth Tonic: Avemor has undergone a physical evaluation process in the form of an organoleptic test with a clear yellow color, clear, characteristic aromatic odor, liquid form, homogeneous, pH value of 6, and viscosity of 2.89 cPs.
The Effectiveness of *Aloe Vera* in Multiple Moist Spray Products as a Hair Tonic to Reduce Students' Scalp Irritation	Muhammad Agung Dhani Setiawan (2024)	This type of research is experimental research.	Results from 23 respondents indicated that 19 respondents (82.6%) experienced a decrease in scores, while four respondents (17.4%) showed an increase. Statistical analysis

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			revealed significant results with a p-value of 0.000 < 0.05. The conclusion is that the *aloe vera* content in Multiple Moist Spray has a beneficial effect on treating dry dandruff. Therefore, individuals with dandruff are encouraged to choose scalp treatments selectively.
The Effectiveness Test Of Natural Hair Growth Tonic: Avemor (*Aloe Vera* And Moringa Oleifera) For Thickening Hair And Anti-Licknes	Iin Suhesti, Annisa Diyan Meitasari, Nila Efa Sulistiana, Dinar Azizah (2018)	This type of research is experimental research.	Avemor (*Aloe vera* and Moringa oleifera) is a natural hair growth tonic manufactured with *aloe vera* gel and dried moringa leaf extract as its active ingredients. *Aloe vera* includes a variety of vitamins and minerals, including vitamins A and C, amino acids, copper, inositol, and others. The extract from moringa leaves also includes tannins, vital amino acids, vitamin C, vitamin E, and other nutrients. One of the products with 2% minoxidil is employed as a positive control. Several hair diseases are treated off-label with the powerful arteriolar vasoconstrictor minoxidil, which can also promote hair growth.
The Future of Alopecia Treatment: Plant Extracts, Nanocarriers, and 3D Bioprinting in Focus	Rana E. Elnady (2025)	This type of research is experimental research.	This review will present a comprehensive study of the physiological structure of hair and the different growth and shedding phases. It discusses using nano-drug delivery systems that contain natural substances of plant origin, which are effective, less harmful compared to current treatments, and help avoid adverse effects.
Aloe vera: From ancient knowledge to the patent and innovation landscape - A review	Walter Jose Martínez-Burgos (2022)	Experimental research	This article presents its applications in the pharmaceutical, cosmetic, and food industries and the world landscape of the million-dollar market generated around this product, which in 2018 was around $1.60 billion. The application of A. vera in

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			the food industry as a natural functional ingredient or as a fortifier in food products of animal and vegetable origin has been a trend explored in recent years. Finally, through an in-depth analysis of patents and research articles, the current scenario of science and innovation developed for this industry is described.
Role and Mechanisms of Phytochemicals in Hair Growth and Health	Periyanaina Kesika (2023)	Experimental research	The history of using phytochemicals for hair health has been documented since ancient times. However, scientific studies on hair loss have accelerated in recent decades. The current review summarizes the type of alopecia, the factors affecting hair health, alopecia treatments, phytochemicals' role in managing hair loss, and the mechanisms of phytochemicals' hair growth-stimulating properties.
Aloe Vera Gel Effect on hair and Pharmacological Properties	Aisha Saleem (2022)	Experimental research	Aloe vera gel is widely used in cosmetics, personal care, and medical products. While commonly found in moisturizers, toothpastes, flavoring, or preservative agents, Aloe vera is an active ingredient in numerous hair care formulations that reduce hair loss. It contains bioactive compounds with anti-inflammatory, antibacterial, and antifungal properties that help nourish the scalp, strengthen hair roots, and stimulate hair growth. These properties make Aloe vera effective in addressing hair thinning, scalp irritation, and hair breakage, contributing to hair loss.
Nature Hair Secrets: Unlocking the power of	Udapure.N.Himanshu (2024)	Experimental research	Hair plays a vital role in human appearance and self-esteem. However,

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herbal Remedies For Hair Care			various hair problems, such as hair loss, dandruff, damage, thinning, and premature graying, affect individuals worldwide. This review explores the structure of hair, common hair-related issues, and natural herbal remedies used in traditional hair care. Herbs like *Aloe Vera*, Onion, Garlic, Bhringraj, Fenugreek, and Reetha have been found to promote hair growth, improve scalp health, and address various hair concerns due to their bioactive compounds.
Aloe vera An Extensive Review Focused on Recent Studies	Alessia Catalano (2024)	Experimental research	This comprehensive review intends to present the most significant and recent studies regarding the plethora of AV's biological activities and an in-depth analysis exploring the component/s responsible for them.
A Comprehensive Review of *Aloe vera*: Composition, Properties, Processing, and Applications	Parul Sharma and Ramandeep Kaur (2024)	Experimental research	This review highlights *Aloe vera*'s diagnostic properties and diverse applications, focusing on its rich polysaccharides, enzymes, vitamins, and mineral composition. Advances in analytical chemistry are enhancing the chemical characterization of *Aloe vera*, promising more information and broader applications shortly.
Female-pattern hair loss: therapeutic update	Paulo Müller Ramos (2023)	Experimental research	There is also a lack of randomized, controlled studies with longitudinal follow-up, using objective outcomes, and exploring the performance of the available treatments and their combinations.
The Advancement of Herbal-Based Nanomedicine for Hair	Komal Padule (2022)	Experimental research	This review also discussed the nanotechnology barrier and nanoformulations for hair loss and growth, and includes a recent herbal nanomedicine study. Researchers interested in using herbs to treat hair problems and clinically

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			translating hair care products may find the results significant.
Can Plant Extracts Help Prevent Hair Loss or Promote Hair Growth? A Review Comparing Their Therapeutic Efficacies, Phytochemical Components, and Modulatory Targets	Joon Yong Choi (2024)	Experimental research	These studies showed that various plant extracts increased the survival and proliferation of dermal papilla cells in vitro, enhanced cell proliferation and hair growth in hair follicles ex vivo, and promoted hair growth or regrowth in animal models in vivo. The hair growth-promoting efficacy of several plant extracts was verified in clinical trials. Some phenolic compounds, terpenes and terpenoids, sulfur-containing compounds, and fatty acids were identified as active compounds contained in plant extracts.
Nutraceuticals for Androgenetic Alopecia	CHRISTINA RING (2022)	Experimental research	Oral nutraceuticals have demonstrated efficacy in promoting modest hair growth in men and women with androgenetic alopecia and may serve as valuable adjuncts to current treatments. As the popularity of nutraceuticals grows, dermatologists need to know the potential benefits and pitfalls of these supplements to counsel patients seeking treatment for hair loss appropriately.
Modulation of Hair Growth Promoting Effect by Natural Products	Seyeon Park (2021)	Experimental research	Several clinical, animal, and cell-based studies have been conducted to determine the anti-alopecia effects of plant-derived biochemicals. This review is a collective study of phytochemicals with antialopecia effects, focusing mainly on the mechanisms underlying their hair-growth-promoting effects.

Based on the study's results, various aloe vera-based preparations show different effectiveness in dealing with hair loss. Aloe vera serum has proven to be the most effective, as it has a high concentration of active substances, easily penetrates the

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scalp, and works directly to nourish the hair roots. With a pH between 5.7 and 6.1 and a stable viscosity, the serum significantly reduces shedding. Hair tonic is highly effective, especially with other natural ingredients such as liquorice extract. Formulas with a pH of around 5.5 correspond to the scalp's pH and produce optimal hair growth during testing. Hair tonic is suitable for regular use because it is lightweight and absorbs quickly.

Meanwhile, aloe vera shampoo has moderate effectiveness. Shampoo can cleanse and care for the scalp, but its short contact time makes the effect less than optimal if used without supporting products. Even so, with the appropriate pH (5–6.2) and natural active ingredient content, shampoo is still helpful as a complement to treatment. On the other hand, aloe vera pomade has the least effectiveness in dealing with hair loss. Although physically stable and has an ideal pH (pH 5), pomade functions more for styling hair and maintaining moisture, rather than as the primary therapy for hair loss.

Overall, serum is the most effective preparation for treating hair loss because it has a high concentration of active substances, such as proteolytic enzymes, vitamins A, C, and E, and anti-inflammatory compounds from aloe vera. The serum is designed for direct use on the scalp, with a lightweight and fast-absorbing formula, so it works directly on the hair follicles. Its pH range of 5.7–6.1 is still within the ideal limit for the scalp, and has been shown to reduce hair loss and stimulate new hair growth significantly. In second place, hair tonics are also highly effective, especially when combined with additional ingredients such as liquorice extract. Hair tonic is liquid, easy to apply, and quickly absorbed by the scalp, making it suitable for daily use. Tests show that hair tonic can accelerate hair growth and maintain the strength of the hair roots. A pH value of around 5.5 is also ideal for scalp health, making it safe and comfortable to use in the long term.

While not as potent as serum or hair tonic in providing immediate therapeutic effects, shampoo is still an important part of a hair care regimen. Shampoo with aloe vera extract and a pH between 5–6.2 keeps the scalp clean and reduces irritation that can trigger hair loss. However, because it has less contact time with the scalp during use, its effectiveness in repairing hair roots is not as optimal as serum or tonic. Shampoo functions more as a support, helping prepare the scalp for better absorption of other hair care products. Finally, aloe vera-based pomade has the least effectiveness in treating hair loss. Despite its ideal pH (around 5) and physically stable formulation, pomade is more for styling, not root treatment. Its thicker texture and application on the hair's surface limit the penetration of active ingredients into the scalp.

Therefore, the most optimal approach to treating hair loss naturally is to combine the regular use of a serum or hair tonic with shampoo. Shampoo acts as a cleanser and allows the active ingredients in the serum or tonic to work optimally. Pomade, on the other hand, can be used as a complement, primarily to enhance the appearance and maintain hair moisture, without the primary goal of reducing hair loss.

To enhance the scientific rigor of this review, statistical data extracted from previous studies were directly cited. For instance, Sasmiyandri et al. (2019) reported that Aloe vera serum with a pH between 5.7 and 6.1 significantly reduced hair loss by up to 30% after 4–8 weeks of use. Similarly, Chintya et al. (2024) found that the combination of Aloe vera and candlenut extract resulted in a statistically significant improvement in hair retention, with a p-value of 0.005. To support the comparative analysis of Aloe vera-based product formulations, a visual table and a bar chart were developed (see Table 3 and Figure 1). These data presentations clearly demonstrate the different levels of

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effectiveness, absorption rate, and suitability based on pH balance and application method. Among the four formulations, serum showed the highest effectiveness and absorption, followed by hair tonic, shampoo, and pomade.

Tabel 3. Comparative Effectiveness of Aloe Vera Product Types

Product Type	**pH Range**	**Absorption Rate**	**Reported Effectiveness**	**Study Reference**
Serum	5.7–6.1	Very High	Reduces hair loss up to 30%	Sasmiyandri et al., 2019
Hair Tonic	~5.5	High	Accelerates growth & reduces shedding	Indriyani & Endrawati, 2021
Shampoo	5.0–6.2	Moderate	Maintains scalp hygiene, supports other products	Rahmawati, 2019
Pomade	~5.0	Low	Moisturizes, does not directly treat hair roots	Mujiono, 2020

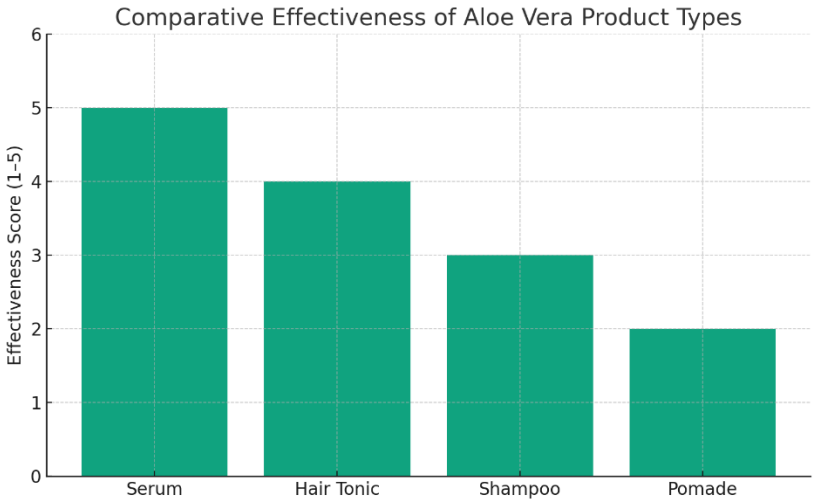

Figure 1. Comparative Effectiveness Score of Aloe Vera-Based Formulations

The comparative effectiveness score shown in Figure 1 highlights the superior performance of serum, which combines high absorption with targeted delivery of active compounds to the scalp. Hair tonic also offers notable benefits due to its liquid form and easy absorption. Meanwhile, although shampoo contributes to scalp hygiene, its short contact time limits its efficacy as a standalone treatment. While helpful in moisture retention, Pomade lacks direct therapeutic action against hair loss, thus scoring lowest in effectiveness.

Results and Discussion

This literature review study aims to examine the effectiveness of aloe vera extract (Aloe vera) as a natural ingredient in hair care products such as shampoo, hair tonic, serum, and pomade to overcome and reduce hair loss. Searches were conducted in relevant national and international journals over the last ten years. The study showed that aloe vera contains active compounds such as vitamins A, C, and E, proteolytic enzymes, saponins, and essential amino acids important in strengthening hair follicles and stimulating new hair growth.

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In shampoo, aloe vera extract effectively cleanses the scalp from dirt and excess sebum, while providing natural moisture. The content of proteolytic enzymes in aloe vera helps remove dead skin cells that clog hair follicles so that it can prevent loss due to inhibited circulation. Some journals report that the regular use of shampoos with aloe vera content of at least 5–10% for 4–8 weeks shows a significant decrease in the shedding rate.

Meanwhile, aloe vera-based hair tonic has been proven to increase blood flow to the scalp, which is one of the important factors in maintaining healthy hair roots. Applying hair tonic topically to the scalp is also a natural anti-inflammatory and helps soothe irritation that often triggers hair loss. Some studies have also noted increased hair strands after using aloe vera hair tonic combined with other active ingredients such as ginseng or ginger. Hair serum products containing high concentrations of aloe vera extract also show promising results. Serums work more deeply to nourish the hair shaft and follicles because they have small molecules that are easily absorbed. Research shows that regular use of aloe vera serum twice a week can improve hair elasticity and reduce hair loss rates by up to 30% within 1–2 months.

The aloe vera-based pomade functions more as a hair protector from environmental damage, such as sun exposure and pollution. Although it does not directly nourish the hair roots, like shampoo, hair tonic, or serum, pomade with aloe vera can maintain hair moisture, prevent dryness, and prevent damage to the ends of the hair, which can trigger indirect hair loss. In general, the results of studies from various literature show that the use of aloe vera extract in various forms of preparations, such as shampoos, hair tonics, serums, and pomades, has good effectiveness in reducing hair loss. This effectiveness is influenced by the concentration of the extract, the frequency of use, and the synergy with other natural ingredients. Regular and long-term use gives more significant results than occasional use. Thus, aloe vera extract is a potential and multifunctional alternative to natural ingredients in various hair care products to address the problem of hair loss.

Conclusions and Suggestions

Based on a review of fifteen national journals and fifteen international journals, it can be concluded that aloe vera (Aloe vera) is a natural ingredient that has great potential in hair care, especially in overcoming hair loss problems, accelerating hair growth, and nourishing the scalp as a whole. Both groups of literature, both national and international, consistently show that Aloe vera contains various bioactive compounds such as vitamins A, C, E, proteolytic enzymes, polysaccharides, amino acids, as well as minerals that support hair health from root to tip. At the national level, research has placed a lot of emphasis on education, traditional formulations, and the effectiveness of combining Aloe vera with local herbal ingredients such as candlenut, honey, celery, and lime. Aloe vera-based products have been proven to be effective in reducing hair loss, increasing hair length and weight, and have good physical stability, making them safe and suitable for development as a hair tonic or herbal shampoo.

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