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Original Research Article

Evaluating the hair regenerative potential of plant-based hair serum formulation: a comparative study

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ABSTRACT

Background: Hair loss, a multifactorial condition influenced by factors such as aging, hormonal imbalances, and genetics, has traditionally been treated with synthetic products like minoxidil and finasteride. However, these treatments often come with significant side effects, highlighting the need for safer and more effective alternatives. This study investigates the efficacy and safety of OZiva+ advanced hair growth serum, a formulation containing 3% Redensyl® and 1% Lindera root extract, as a potential treatment for hair loss.
Methods: The serum's hair growth-promoting effects were evaluated using the *ex vivo* Philpott test, involving hair plucks from androgenetic alopecia patients, and its safety was assessed through a clinical patch test on human volunteers.
Results: The results demonstrated a significant increase in hair follicle length with the OZiva+ advanced hair growth serum, comparable to 1% minoxidil. Additionally, the serum showed no irritation during the patch study, indicating its safety for use.
Conclusions: The findings suggest that OZiva+ advanced hair growth serum is a promising alternative to traditional hair loss treatments, offering comparable efficacy with fewer side effects. This natural formulation, supported by the synergistic action of Redensyl® and Lindera root extract, holds potential for further development as a safer, more effective solution for hair regrowth and overall hair health.

Keywords: OZiva, Redensyl, Lindera, Hair, Serum, Scalp

INTRODUCTION

Unlike skin aging, which has been a focus in dermatology for many years, hair aging has only recently gained attention, primarily driven by the cosmetic industry. While androgenic alopecia has been a subject of research for some time, the broader concept of hair health and appearance with age is now being highlighted on various platforms. The science and treatment of hair issues can therefore be divided into two main approaches: one that targets the aesthetic aspects of aging-related hair changes (non-androgenic hair loss) and another that addresses the underlying biological mechanisms, such as hormonal imbalances, stress, and genetic factors.[1]

Today, several therapies exist for hair regrowth. For instance, including new forms of application for minoxidil, finasteride, and dutasteride that may have excellent performance. Finasteride, a 5-apha reductase type-2 inhibitor, in systemic forms is associated with several drawbacks and in its topical form it may still exhibit fewer and less severe side effects.[2] Minoxidil, a vasodilator, used to relax vascular smooth muscles presented with a side effect of hypertrichosis and is since then promoted for hair growth. However, its long-term usage is associated with scalp pruritus, scaling, and hypertrichosis, and in some rare cases contact dermatitis.[3,4]

Prostaglandins have long been believed to promote the anagen phase of hair growth, but achieving the necessary

concentration to increase hair thickness often comes at a high cost. Platelet-rich plasma therapy, while effective in some cases, shows inconsistent results, raising questions about its universal applicability. On the other hand, hair transplantation demands skilled surgical expertise and is also an expensive procedure.[5]

Considering the cost, time, and side effects associated with traditional hair-treatment options, a safer and efficient method for restoration of hair is warranted. Also, it is critical to derive the underlying mechanism to ensure delivery, safety, and effectivity of such actives. Several metabolites including flavonoids, and phenol, have been extensively studied in the past for their hair growth promoting ability. Multiple mechanisms have been targeted to understand and comprehend the remedy for hair loss and hair ageing.

In the current study, a product OZiva+ advanced hair growth serum was tested for its ability to promote hair growth using *ex vivo* Philpott test and its safety was evaluated with clinical patch test. The *ex vivo* Philpott test was conducted on hair plucks from androgenic alopecic patients. This serum product contains a blend of 3% Redensyl® and 1% Lindera root extract. Redensyl® is a blend from *Larix europea* wood extract and *Camellia sinensis* along with zinc and glycine.[6] It has been tested clinically, an 84-day double-blinded clinical trial involving 26 subjects (aged 18 to 70) evaluated the efficacy of a 3% Redensyl® formula for hair growth. Results showed an average increase of 17 hairs/cm² (representing +10,200 hairs for a 600 cm² scalp surface), with some participants observing up to 28,200 new hairs. The top three results indicated an average increase of 23,800 new hairs. Hair density improved by 8%, with a 29% boost in the anagen/telogen ratio. The anagen phase increased by 9%**,** while the telogen phase decreased by 17%**.** Additionally, 71% of volunteers reported thicker, stronger hair and reduced hair loss**.** Redensyl® has two patented active ingredients dihydroquercetin glucoside (DHQG) and epigallactocatechin gallate-glucoside (EGCG2).[6] These stabilized polyphenols target the outer sheath root cells and dermal papillae to promote hair growth and have been tested clinically to promote hair growth.[6] 1% Lindera root extract is shown promote hair health by decreasing the microbiota of scalp involved in the pathogenesis of androgenic alopecia.[7]

In the past, a clinical study has proven the benefits, safety, and efficacy of Redensyl® containing formula to better performance as compared to 5% minoxidil. Redensyl®, Capixyl, and Procapil (RCP) containing formulation was compared against 5% minoxidil in human volunteers. The subjects receiving RCP showed significantly higher score in global photographic evaluation and better self-evaluation score as compared to minoxidil-treated group. The authors claimed RCP as an alternative, effective, and innovative approach for hair growth.[8]

In a randomized, single-blinded, vehicle-controlled study conducted on volunteers with androgenetic alopecia, a topical lotion was used with active ingredients as Redensyl® and Sepicontrol A5. Redensyl® is the same blend of actives as mentioned before in this article. Whereas, Sepicontrol A5 contains capryloyl glycine, sarcosine, and *Cinammomum zeylanicum.*[9] This article proposes an alternative approach to hair growth as compared to several hormone modifiers or biological response modifiers including minoxidil, and finasteride, available in the market.[10] The volunteers were evaluated after 3- and 6-months post treatment, and the anagen-telogen ratio increased from 2.25 to 6.02 at the end of 6 months.[9]

In another study conducted by Merja et al, a test product containing Redengil™ (Redensyl®, AnaGain, Procapil, *Capilia longa*) with 5KDa hyaluronic acid, was evaluated for hair growth promoting effect. In the 60-day clinical study, the growth rate increased by 31.62%, hair growth increased by 487.31 μm/day, and hair growth improved by 1.5 times.[6]

Other than Redensyl®, another active ingredient, present in the OZiva+ advanced hair growth serum is *Lindera strychnifolia* root extract. In a study conducted by Filaire et al, the Lindera root extract 1% and placebo lotions (half-head) in AGA patients. The microbiota of the scalp of the Lindera root extract treated side versus placebo was compared with health subjects with no treatment. There was decrease in *Cutibacterim acnes/Staphylococcus epidermidis* ratio for the area treated with 1% Lindera extract as compared to day 0. There was also increase *Cutibacterim acnes/Staphylococcus epidermidis* in AGA patients as compared to healthy adult volunteers indicating involvement of *Cutibacterim acnes*/*Staphylococcus epidermidis* in the pathogenesis of AGA.[7]

The current study focussing on evaluating the efficacy and safety of OZiva+ advanced hair growth serum.

METHODS

Ex vivo Philpott test

The study was conducted as per the methodology given by Philpott et al in LifeSenz Laboratory, Maharashtra, India.[11] The experiment is based on the observation by Philpott et al that the human hair follicle can grow *in vitro* upto 10 days by producing keratinized hair fibre as observed in *in vivo*. The hairs were plucked from alopecic male donors and were transferred to the laboratory for further testing. The plucked hairs were maintained in a 12-well plate in DMEM: F-12 media containing insulin, 1% FBS, hydrocortisone, bFGF, and EGF. The sample was prepared at 1% in DMEM: F-12 media with insulin, 1% FBS, hydrocortisone, bFGF, and EGF. Minoxidil powder was used as a positive control and was prepared at 1%. The plate was incubated at 37 ºC and 5% CO_2. The hair shafts were measured before the treatment (day 0) and at the end

of the treatment (day 10). The increase in hair growth in µm was reported and compared across the controls.

In vivo patch test in healthy human volunteers

Study type

The patch test was a single-centric, evaluator blind study conducted to test the skin compatibility of the products by a single 24-hour patch test in healthy adult volunteers (18-65 years) with non-sensitive skin.

Study period and ethical consent

The study was conducted in the months of October to December 2024 NovoBliss Research Pvt Ltd, Ahmedabad, Gujarat. All the volunteers were informed about the procedures of the study and they signed an informed consent. The study was approved by ACEAS independent ethics committee.

Study protocol

The selected volunteers were an adequate representative of varied skin types including dry, normal, non-sensitive, oily, and combination. The sensitive versus non-sensitive skin type was distinguished using lactic acid stinging test. The patch with serum/saline/SLS (0.04 ml) was applied on day 1 between the scapula and waist region on the backs. OZiva+ advanced hair growth serum was applied directly, SLS was prepared at 1% w/v and used as a positive control, while 0.9% saline suspension (injection IP) was used as a negative control. On day 2, the patch was removed and screened for skin irritation in the form of erythema, oedema, and scaling immediately (30±5 min). Further, on day 3, a 24±2-hour irritation score after 24 hours of patch removal was evaluated. The irritation score was recorded by the dermatologist validated master scorer using Draize scale.

Statistical analysis

All the measurements were recorded as average±SD. For the *ex-vivo* studies one-way analysis of variance (ANOVA) was performed and p value >0.05 was considered as statistically significant.

RESULTS

Ex vivo hair growth promoting efficacy

At the end of 10 days, the OZiva+ advanced hair growth serum showed 28.6 µm increase in the hair length and it was comparable to 1% minoxidil (28.4 µm). The 1% OZiva+ advanced hair growth serum showed increases hair growth by 65% compared to untreated control and effect observed was similar to the 1% minoxidil, the positive control. As per one-way ANOVA test, the advanced sample and minoxidil showed significant increase in the hair growth as compared to the untreated control with a p value of 0.001 (Figures 1 and 2).

Primary irritation patch test

The demographics of the population is presented in Table 1.

Table 1: Demographics of the population (n=26).

Parameters	Females	Males
Oily (percent of total)	5 (19.23)	2 (7.69)
Dry (percent of total)	3 (11.53)	3 (11.53)
Normal (percent of total)	3 (11.53)	4 (15.38)
Combination (percent of total)	2 (7.69)	4 (15.38)
Total	13 (50)	13 (50)
Mean age (years) ±SD	38.69±11.86	40.84±8.91
Median age (years)	41	40
Mean height (cm) ±SD	151.73±5.54	169.09±7.07
Median height (cm)	153	170.2
Mean weight (kg) ±SD	66.49±13.53	71.63±13.39
Median weight (kg)	67	68

As per the clinical patch study conducted in human volunteers (N=26), the OZiva+ advanced hair growth serum was found to be non-irritant for a 24- hour PIPT test (Table 2).

Figure 1: Increase in hair follicle length upon treatment with 1% OZiva+ advanced hair growth serum on day 0 and day 10.

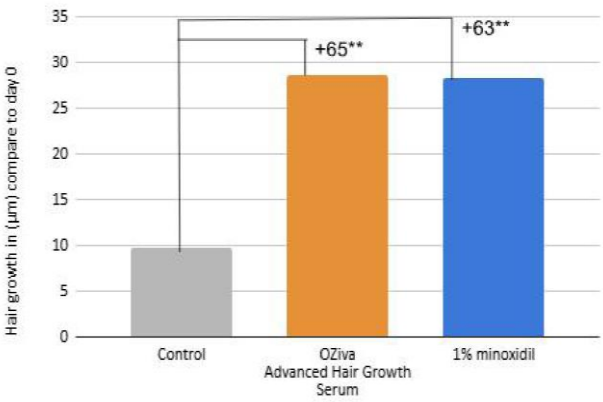

Figure 2: Increase in hair follicle length using Philpott test.

Table 2: 30 min and 24-hour irritation score for OZiva+ advanced hair growth serum.

Products	Irritation score 30 min post-patch removal	Irritancy	Irritation score 24 min post-patch removal	Irritancy
OZiva+ advanced hair growth serum	0.00	Non-irritant	0.00	Non-irritant
Positive control (1%w/v sodium lauryl sulphate)	3.19	Mild-irritant	2.62	Mild-irritant
Negative control (0.9% w/v isotonic saline solution)	0.00	Non-irritant	0.00	Non-irritant

Interpretation: 2.0/8.0 non-irritant; up to 4.0/8.0 mild irritant; above 4.0/8.0 irritant

DISCUSSION

The current study focuses on evaluating the safety and efficacy of a plant based serum, OZiva+ advanced hair growth serum, (3% Redensyl® and 1% Lindera root extract) for hair care. The product showed a significant increase in the length of the hair follicles as compared to the control. The product also showed activity comparable to 1% minoxidil. As per the patch study data conducted on human volunteers, there was no irritation observed indicating safety of OZiva+ advanced hair growth serum.

Given the potential side effects associated with long-term use of minoxidil or finasteride-based products, it is crucial to investigate, verify, and promote alternatives that offer comparable safety and effectiveness to replace these formulations. Numerous studies have highlighted the hair growth-promoting benefits of natural extracts, including flavonoids, phenols, polyphenols, amino acids, glycine, minerals, and herbal extract blends. These alternatives present a promising direction for safer and potentially more effective treatments for hair loss.

As mentioned before, OZiva+ advanced hair growth serum is formulated using Redensyl® and 1% Lindera extract. The active ingredient of Resendyl® is DHQG and EGCG2, which in monomeric forms have been tested extensively in the past for hair growth promoting effects. Similarly, Lindera extract is rich in polyphenols including catechin and tannin. All these classes of flavonoids have been proven to mechanistically improve hair growth.

For instance, EGCG has been evaluated in the past for its mechanism involving prevention of hair loss. It has been proven to stimulate hair growth by a dual mechanism of proliferating human follicle dermal cells and its anti-apoptotic action by increasing Bcl-2/Bax ratio via upregulation of phosphorylated extracellular signal-regulated kinase (Erk) and Akt often referred as protein-B kinase.[12] The mitogen activated protein kinases (MAPK) and phosphatidylinositol 3-kinase PI3K/AKT are signalling cascades and are crucial in proliferation and hair-inducing ability of DP cells.[13] This mechanism was also highlighted in the past for epidermal growth factor. EGF is involved in the proliferation of hair follicle-mesenchymal cells (HF-MSCs) by activation of ERK and AKT phosphorylation and signalling.[14] This proves that the mechanism of action represented by EGCG via upregulation of ERK and AKT phosphorylation is a characteristic indication of its hair growth promoting ability.

In another study, a topical delivery of quercetin was shown to have the potential to target hair follicle as a strategy to promote hair growth in regenerative medicine. The topical delivery of quercetin transformed the hair follicles from the resting state to rapidly growing follicles with increased proliferation of keratinocytes and replenished perifollicular microvasculature.[15]

Another flavonoid, like quercetin and dihydroquercetin, taxifolin, has shown positive hair growth promoting effects *in vitro*. IGF-1 plays a crucial role in sustaining the anagen phase of the hair growth cycle. However, oxidative stress can reduce its levels, contributing to hair loss. Conversely, TGF-β has long been recognized as a key factor in the development of hair loss, as its presence inhibits hair growth. Increased levels of TGF-β, especially in the presence of oxidative stress (such as from H_2O_2), contribute to hair loss. Taxifolin, a flavonoid mitigated hair loss by enhancing IGF-1 levels and reducing TGF-β level under oxidative stress conditions (H_2O_2).[16]

These plant metabolites and their derivates are present in the OZiva+ advanced hair growth serum, that underscore the serum's potential to stimulate hair growth. This study demonstrates the serum's efficacy at the cellular level via Philpott test, its hair growth-promoting effects in comparison to minoxidil, and its safety profile in human volunteers, contributing valuable insights to the existing body of research.

Limitations

The formulation OZiva+ advanced hair growth serum for the first time has combined two interesting ingredients Redensyl® and 1% Lindera extract. This blend to promote hair growth and scalp microbiota, as the ingredient claims, is yet to be tested clinically. Their combined activity may, because of their underlying mechanism, can surpass their individual abilities to promote hair and scalp health. A detailed *in vitro* and clinical study is warranted.

CONCLUSION

Overall, this study establishes the efficacy of OZiva+ advanced hair growth serum as an effective hair growth solution comparable minoxidil emphasizing the potential of natural and plant-based alternatives for safer, more effective management of hair loss. Further investigation and validation in larger, long-term clinical trials will be essential to fully explore the long-term benefits and safety profile of this promising formulation.

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