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Clinical Evaluation of Rocket Leaves Extract (Kyoh®) on Hair Density and Follicular Parameters in Subjects with Hair Loss

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Abstract

Background: Hair loss is a multifactorial condition influenced by aging, oxidative stress, hormonal regulation, and nutritional status. Nutraceutical supplementation has emerged as a potential strategy to support hair follicle function. This study evaluated the clinical efficacy of a nutraceutical ingredient (Kyoh®) at two concentrations versus placebo in individuals with hair loss. **Methods**: A randomized, parallel-group study was conducted in 150 volunteers aged 30–60 years. Participants received a high-dose (Kyoh BB-01), low-dose (Kyoh BB-02), or placebo (Kyoh BB-03) for 84 days. Hair parameters were assessed by digital trichoscopy at baseline, day 56, and day 84. Endpoints included hair density, follicular unit density, hair diameter, and hairs per follicular unit. Hair shedding was evaluated by comb test, and subjective perception by questionnaires. **Results**: The high-dose group showed significant increases in hair density and follicular unit density at days 56 and 84, as well as higher hairs per follicular unit at day 84. The low-dose group also improved these parameters to a lesser extent. No significant changes were observed in the placebo group. Hair diameter and shedding remained unchanged. Subjective results supported instrumental findings. **Conclusion**: The nutraceutical improved key hair growth parameters, with greater efficacy at higher dose.

Keywords: hair loss; nutraceutical supplementation; hair density; follicular unit density; digital trichoscopy; HairMetrix; hair growth; dietary supplements

1. Introduction

Hair loss is a common dermatological condition affecting both men and women and may significantly impact psychological well-being and quality of life. Studies consistently link hair loss to feelings of anxiety, helplessness, and diminished self-esteem, with a psychological burden comparable to or exceeding that of other common dermatoses [1,2]. The most prevalent forms of non-scarring hair loss include androgenetic alopecia and telogen effluvium, both of which are characterized by alterations in the hair growth cycle, progressive follicular miniaturization, and dysregulation of follicular activity [3]. Hair follicle biology is governed by a complex interplay of genetic, hormonal, metabolic, and environmental factors, including oxidative stress, inflammation, and nutritional status [4,5]. In particular, androgens such as dihydrotestosterone (DHT) play a central role in follicular miniaturization in genetically predisposed individuals through androgen receptor-mediated shortening of the anagen phase [6].

Hair follicles are among the most metabolically active mini-organs in the human body and require a continuous supply of micronutrients and bioactive compounds to sustain keratin synthesis and maintain normal hair cycling [7]. Hair cycle progression — from the active growth phase (anagen) through the regression phase (catagen) to the resting phase (telogen) — is coordinated by a

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network of signaling pathways including Wnt/β-catenin, Sonic Hedgehog, and Bone Morphogenetic Protein cascades, all of which represent potential targets for therapeutic intervention [7,8]. Nutritional deficiencies involving vitamins, trace elements, amino acids, and antioxidants have been associated with impaired hair growth and increased hair shedding [3,4]. Consequently, nutritional supplementation has gained increasing attention as a complementary strategy to support hair follicle function and improve hair-related outcomes. Among plant-derived candidates, extracts from Eruca sativa (rocket) have recently gained attention due to their high content of bioactive compounds, particularly flavonols [9], which have been associated with beneficial effects on hair growth, including antioxidant and anti-inflammatory activities and modulation of androgen-related pathways [10,11]. A flavonol-rich rocket extract has been previously characterized and shown to promote dermal papilla cell proliferation and upregulate key hair growth-related genes, including VEGF, FGF7, and NRF2, in vitro, suggesting a potential role in modulating pathways involved in hair follicle function.

Clinical and experimental evidence supports the potential of oral nutraceutical supplementation to improve hair density, hair thickness, and overall hair quality [12,13]. Several mechanisms have been proposed to underlie these effects, including the attenuation of oxidative stress, stimulation of dermal papilla cell activity, and prolongation of the anagen phase of the hair growth cycle [5,14,15]. Among the molecular pathways implicated, vascular endothelial growth factor (VEGF)-mediated perifollicular angiogenesis has been identified as a key regulator of hair follicle growth and cycling, with VEGF overexpression shown to accelerate hair regrowth and increase follicle size in preclinical models [16]. Furthermore, oxidative stress has been increasingly recognised as a contributor to both hair follicle ageing and cycle disruption, highlighting antioxidant capacity as a relevant therapeutic target [5,17]. These converging lines of evidence have driven the development of multi-component nutraceutical formulations targeting follicular metabolism as complementary interventions for individuals experiencing hair thinning or loss.

Despite the growing interest in nutraceutical approaches for hair health, comparative clinical data evaluating the same bioactive compounds at different concentrations under controlled conditions remain scarce. Most published studies have assessed fixed-dose formulations without a dose-ranging component [12–14], limiting the ability to establish concentration-dependent effects. Digital trichoscopy, as implemented through systems such as HairMetrix®, provides a reliable and non-invasive approach for the objective quantification of hair density, follicular unit density, and scalp morphology, and has become an established tool for monitoring treatment efficacy in clinical hair growth research [18]. The integration of such imaging methodology with a placebo-controlled, dose-comparative design represents a robust framework for evaluating nutraceutical interventions.

Therefore, the aim of the present study was to evaluate the clinical efficacy of a commercial rocket leaves extract administered at two different concentrations compared with a placebo in volunteers experiencing hair loss. Hair growth parameters, including hair density (hairs/cm²), follicular unit density (units/cm²), mean hair shaft diameter (μm), and hairs per follicular unit, were assessed using digital trichoscopy over an 84-day supplementation period, together with hair shedding analysis and subjective consumer evaluations.

2. Materials and Methods

2.1. Study Design

A randomized, parallel-group clinical study was conducted to evaluate the efficacy of rocket leave extract (Kyoh®) in two different doses (Kyoh BB-01 and Kyoh BB-02), and placebo (Kyoh BB-03) on hair growth–related parameters in volunteers presenting hair loss concerns. The intervention period lasted 84 days. A total of 150 volunteers were enrolled and randomly assigned to three groups (n = 50 per group), each receiving one of the tested formulations. Hair parameters were assessed at baseline (D0), after 56 days (D56), and after 84 days (D84) of supplementation.

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This clinical study was conducted in accordance with the principles of the Declaration of Helsinki and complied with Good Clinical Practice (ICH-GCP) guidelines and the Scientific Committee on Consumer Safety (SCCS) guidance for human studies. The protocol was reviewed and approved by the Secretaría Técnica del Comité de Ética de la Investigación con medicamentos del CEIM – Hospital Universitario y Politécnico La Fe. All participants provided written informed consent prior to enrollment, acknowledging the study purpose, procedures, potential risks, and benefits. This study was registered at ClinicalTrials.gov (Identifier: NCT07302789).

2.2. Tested Products

Three nutraceutical formulations were evaluated in this study:

- Kyoh BB-01: formulation containing a higher dose of rocket leave extract (300 mg Kyoh®).
- Kyoh BB-02: formulation containing a lower dose of rocket leave extract (100 mg Kyoh®).
- Kyoh BB-03: placebo formulation without the active ingredient.

The product evaluated in this study was a dried commercial powdered extract of rocket, branded as Kyoh® and standardized in erucosides®, as the sum of the bioactive compounds present in the product [9]. The sample was provided and produced by the company Pharmactive Biotech Products S.L.U. through a proprietary extraction and manufacturing process registered as ActiveNature™ Tech. All formulations were distributed to volunteers prior to the start of the intervention. Participants were instructed to ingest one tablet per day for 84 days, preferably at the same time each day. The inclusion of both low- and high-dose formulations together with a placebo group allowed the evaluation of dose-dependent effects of the active compound on hair growth parameters.

2.3. Study Population

The study population consisted of 150 volunteers, equally distributed across the three treatment groups (n = 50 per group), with a balanced allocation of female (n = 30) and male (n = 20) participants in each group. Baseline demographic characteristics were comparable among groups, with mean ages ranging from 43.8 to 49.8 years. Hair type distribution was also consistent across treatment groups, with the majority of participants presenting straight hair, followed by a smaller proportion of individuals with wavy hair. Curly hair was minimally represented in the study population. Overall, no relevant differences in baseline characteristics were observed between groups, supporting the comparability of the study cohorts prior to treatment initiation.

Table 1. Baseline demographic characteristics and hair type distribution of the study population. Participants were evenly distributed across treatment groups with comparable age and hair type profiles. Hair type was classified as straight, wavy, or curly based on visual assessment at baseline.

	Kyoh BB-01		**Kyoh BB-02**		**Kyoh BB-03 (Placebo)**	
	Female (n=30)	Male (n=20)	Female (n=30)	Male (n=20)	Female (n=30)	Male (n=20)
Total (n)	30	20	30	20	30	20
Mean age (years)	45.2	43.8	47.5	48.0	48.8	49.8
Hair type (n)						
Straight hair	28	19	28	16	28	17
Wavy hair	2	1	2	2	2	3
Curly hair	0	0	0	2	0	0

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2.4. Inclusion Criteria

Participants had to meet the following criteria: age between 30 and 60 years, presence of hair loss–related concerns, any hair type, ability to understand the study procedures and provide written informed consent.

2.5. Exclusion Criteria

Participants were excluded if they presented any of the following conditions: major haircut or hairstyle changes during the study period, dermatological treatments for hair loss (PRP, mesotherapy, hair transplantation), use of oral or topical products targeting hair growth (e.g., Finasteride, Dutasteride, caffeine treatments, or vitamin supplements for hair growth), pregnancy, breastfeeding, or postpartum period (<6 months), thyroid disorders or hormonal therapy initiated within 6 months before study inclusion, chronic pharmacological treatments started within 6 months before enrollment, systemic diseases potentially affecting hair growth, nutritional deficiencies such as iron deficiency or vitamin deficiencies or extreme obesity (BMI ≥ 30 kg/m²). Participants were withdrawn from the study if any adverse reactions related to the supplementation occurred during the intervention period.

2.5. Hair Growth Assessment by Digital Trichoscopy

Hair growth parameters were evaluated using digital trichoscopy (HairMetrix® system). Measurements were performed at the vertex area of the scalp, where hair thinning is typically most evident. The following parameters were quantified: hair density (hairs/cm²), follicular unit density (follicles/cm²), average number of hairs per follicular unit, mean hair shaft diameter (μm) and terminal-to-vellus hair ratio.

Measurements were obtained at baseline (D0) and after 56 days (D56) and 84 days (D84) of supplementation. Digital trichoscopy images were acquired and analyzed using the HairMetrix software to quantify the different hair parameters.

2.6. Comb Test

Hair shedding was evaluated using a standardized comb test procedure, which provides complementary information regarding hair loss and hair fiber strength.

Volunteers were instructed not to wash or comb their hair for at least 24 hours prior to the test. During the procedure, hair was gently combed from the scalp to the ends using a standardized comb over a white collection surface. A fixed number of strokes was applied to ensure consistency across volunteers. The hairs shed during the procedure were collected and counted, allowing quantitative assessment of hair shedding under controlled conditions.

2.7. Self-Assessment Questionnaire

Subjective efficacy and consumer perception were evaluated using a self-assessment questionnaire completed by each volunteer after 56 days and 84 days of treatment. Participants evaluated several hair-related parameters including hair strength, perceived hair density, hair growth stimulation, reduction in hair loss and overall product satisfaction. Responses were scored using a four-point scale: 0 = totally disagree, 1 = disagree, 2 = agree and 3 = totally agree. Positive satisfaction was defined as scores between 2 and 3.

2.8. Standardized Imaging

High-resolution standardized images of the scalp were obtained before treatment and after 56 and 84 days using a Nikon digital camera and/or the HairMetrix® imaging system. Images were captured following a standardized protocol to ensure reproducible positioning, lighting conditions, and magnification across visits.

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2.9. Statistical Analysis

For HairMetrix measurements and comb test analysis, one experimental value per volunteer was obtained at each timepoint. All measurements obtained at baseline (D0) and after treatment (D56 and D84) were analyzed using repeated-measures two-way ANOVA, followed by Sidak's multiple comparisons test to evaluate statistical significance. Normalization was performed by expressing post-treatment values relative to baseline values for each volunteer. Results were reported as percentage change relative to baseline, with error bars representing the standard error of the mean (SEM). To compare treatment groups, either an unpaired t-test or a Mann–Whitney test was applied depending on the results of the Shapiro–Wilk normality test. Statistical significance was defined as $p < 0.05$.

3. Results

3.1. Hair Density

Hair density is a key quantitative parameter reflecting hair growth and follicular activity. Digital trichoscopy analysis revealed that supplementation with the high-dose formulation (Kyoh BB-01) resulted in a significant increase in hair density compared with baseline values. Hair density increased by 5.9 ± 1.4% after 56 days and 9.1 ± 1.4% after 84 days of treatment ($p < 0.0001$), indicating a progressive increase throughout the supplementation period. The low-dose formulation (Kyoh BB-02) also produced a significant increase in hair density, although the magnitude of the effect was lower than that observed for the high-dose formulation. Hair density increased by 3.3 ± 1.4% on day 56 and 5.0 ± 1.4% on day 84 compared with baseline values. In contrast, the placebo formulation (Kyoh BB-03) did not show statistically significant changes in hair density during the study period. Overall, the results indicate that supplementation with the tested product increased hair density, with a more pronounced effect observed at the higher concentration.

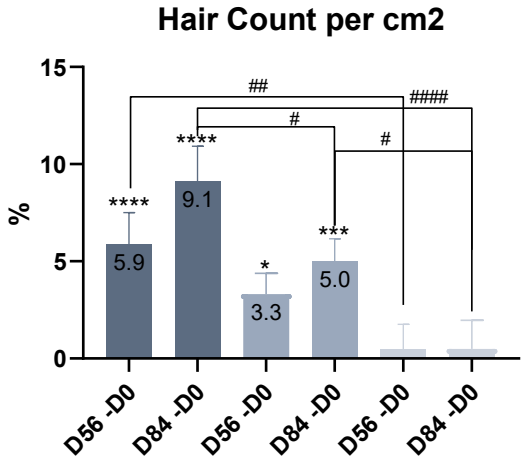

Figure 1. Graphical representation of hair count per cm^2, expressed as percent change. Dark grey represents treatment with BB-01; medium-light grey represents treatment with BB-02 and light grey represents treatment with BB-03. The Mean and Standard Error of the Mean (SEM) are shown. * showed statistical significance related to T0 and # showed statistical significance in comparation between groups. **** *p-value* < 0.0001; *** *p-value* < 0.001 and * *p-value* < 0.05. #### *p-value* < 0.0001, ## *p-value* < 0.01 and # *p-value* < 0.05.

3.2. Follicular Unit Density

Follicular unit density represents the number of follicular units per square centimeter and provides an additional parameter to evaluate hair follicle distribution and scalp follicular activity. Both the high-dose formulation (Kyoh BB-01) and the low-dose formulation (Kyoh BB-02)

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significantly increased follicular unit density during the supplementation period. Treatment with Kyoh BB-01 increased follicular unit density by 5.3 ± 1.2% after 56 days and 6.3 ± 1.2% after 84 days compared with baseline values. Kyoh BB-02 produced a comparable response, with increases of 7.0 ± 1.2% on day 56 and 6.6 ± 1.2% on day 84 relative to baseline measurements. In contrast, the placebo formulation (Kyoh BB-03) did not induce statistically significant changes in follicular unit density during the study period. These results indicate that supplementation with the rocket leaves ingredient was associated with increases in follicular unit density compared with baseline values.

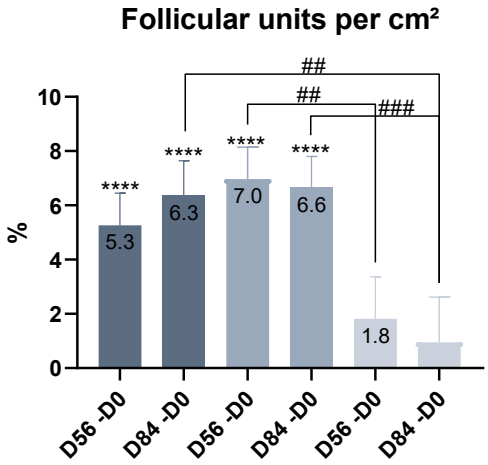

Figure 2. Graphical representation of follicular units per cm², expressed as percent change. Dark grey represents treatment with BB-01; medium-light grey represents treatment with BB-02 and light grey represents treatment with BB-03. The Mean and Standard Error of the Mean (SEM) are shown. * showed statistical significance related to T0 and # showed statistical significance in comparation between groups. **** *p-value* < 0.0001. ### *p-value* < 0.001 and ## *p-value* < 0.01.

3.3. Average Number of Hairs per Follicular Unit

The average number of hairs per follicular unit was evaluated as an indicator of follicular productivity. Treatment with the high-dose formulation (Kyoh BB-01) resulted in a significant increase in the average number of hairs per follicular unit after 84 days of supplementation, with an increase of 3.9 ± 1.3% compared with baseline values. Group comparison analysis revealed significant differences between treatments. After 56 days, the average number of hairs per follicular unit was 4.5% higher in the Kyoh BB-01 group compared with the Kyoh BB-02 group. At day 84, the Kyoh BB-01 group showed increases of 5.7% compared with Kyoh BB-02 and 5.2% compared with the placebo group (Kyoh BB-03). No significant changes were observed for the placebo formulation during the study period.

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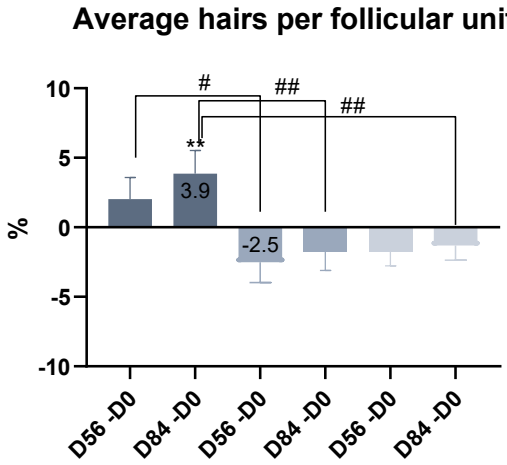

Figure 3. Graphical representation of average hairs per follicular unit, expressed as percent change. Dark grey represents treatment with BB-01; medium-light grey represents treatment with BB-02 and light grey represents treatment with BB-03. The Mean and Standard Error of the Mean (SEM) are shown. * showed statistical significance related to T0 and # showed statistical significance in comparation between groups. * *p-value* < 0.05. ## *p-value* < 0.01 and # *p-value* < 0.05.

3.4. Hair Shaft Diameter

Analysis of hair shaft diameter did not reveal statistically significant changes for any of the tested formulations during the study period.

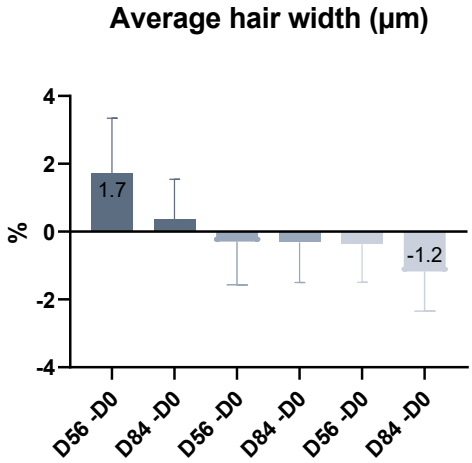

Figure 4. Graphical representation of average hair width, expressed as percent change. Dark grey represents treatment with BB-01; medium-light grey represents treatment with BB-02 and light grey represents treatment with BB-03. The Mean and Standard Error of the Mean (SEM) are shown.

3.5. Hair Shedding

Hair shedding was evaluated using a standardized comb test. No statistically significant reductions in hair shedding were observed for any of the tested formulations during the intervention period.

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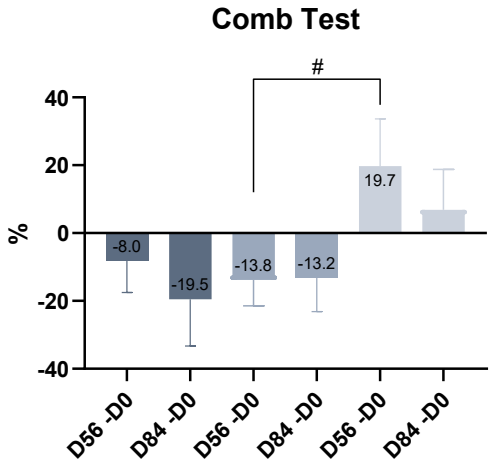

Figure 5. Graphical representation of comb test, expressed as percent change. The Mean and Standard Error of the Mean (SEM) are shown. Dark grey represents treatment with BB-01; medium-light grey represents treatment with BB-02 and light grey represents treatment with BB-03. The Mean and Standard Error of the Mean (SEM) are shown. # showed statistical significance in comparation between groups. # *p-value* < 0.05.

3.6. Consumer Perception

Consumer perception analysis revealed high levels of product acceptance and satisfaction among participants. After 56 days of treatment, overall product acceptance was reported as: 81% for Kyoh BB-01, 75% for Kyoh BB-02 and 70% for Kyoh BB-03. After 84 days, acceptance values increased to: 87% for Kyoh BB-01, 84% for Kyoh BB-02 and 78% for Kyoh BB-03. Participants reported perceived improvements in hair density, hair strength, and overall hair quality.

4. Discussion

The present randomized, parallel-group clinical study investigated the effects of oral supplementation with a nutraceutical commercial extract of rocket leaves (Kyoh®), administered at two concentration levels, on objective and subjective hair growth parameters in volunteers with hair loss concerns over an 84-day period. Both active formulations produced statistically significant improvements in hair density and follicular unit density relative to baseline, whereas the placebo group showed no meaningful changes in any of the primary endpoints. These findings extend the existing body of evidence supporting the efficacy of oral nutraceutical supplementation for hair growth outcomes [12–14,19,20] by demonstrating a concentration-dependent response multi-component ingredient standardized in specific flavonols. Notably, to the best of our knowledge, this is the first clinical study demonstrating the efficacy of an oral rocket-derived supplement on hair growth parameters, whereas previous evidence was limited to preclinical findings, such as the positive effects of arugula seeds oil on hair health in animal models [21].

Among the tested formulations, the high-dose formulation (Kyoh BB-01) produced the most consistent improvements across multiple indicators of follicular activity, including hair density, follicular unit density, and the average number of hairs per follicular unit. The progressive nature of these gains — with greater effects observed on day 84 than on day 56 for most parameters — suggests a cumulative mechanism of action rather than an acute response, which is consistent with the known biology of the hair growth cycle. Full progression through the anagen phase typically requires several months [7], and the trajectory of improvement observed here indicates that a longer supplementation period may yield further benefits.

Hair follicle function depends on the coordinated interaction of multiple physiological pathways, including stem cell activation, dermal papilla signaling, perifollicular vascularization, and the attenuation of oxidative stress [7,8]. Nutritional bioactive compounds can modulate several of

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these processes simultaneously, which may explain why multi-component nutraceutical formulations have shown efficacy across different hair growth parameters in clinical studies [19,20]. In the present study, improvements in both hair density and follicular unit density suggest that the active compound may act at the level of follicular recruitment or reactivation — processes known to be influenced by VEGF-mediated angiogenesis [16] and antioxidant status [17] — rather than exclusively on individual fibre quality. These clinical findings are consistent with our previously published in vitro data, which demonstratedthat the bioactive compounds present in the ingredient regulate the gene expression of VEGF, Nrf2, and FGF7, promote proliferation of human follicle dermal papilla cells (HFDPCs), and may contribute to the attenuation of oxidative stress through activation of Nrf2-dependent pathways [9]. Together, these mechanisms support a role in modulating key molecular pathways involved in hair growth and follicular health. In this regard, both VEGF autocrine signaling in dermal papilla cells and its upstream regulation by follicular keratinocytes during anagen have been documented as key drivers of perifollicular vascularization [22,23].

The low-dose formulation (Kyoh BB-02) also produced statistically significant improvements in hair density and follicular unit density, though with a smaller effect size than the high-dose formulation. Notably, the inter-group comparisons for follicular unit density on day 56 and day 84 revealed significant differences between the two active formulations, reinforcing the existence of a dose-dependent relationship. This pattern is of clinical relevance, as it suggests that the bioactive compounds exert their effects in a concentration-sensitive manner, and that optimizing dosage may be key to maximizing therapeutic outcomes. Dose-response relationships have been observed with other nutraceutical compounds targeting hair growth, though direct comparisons are limited by the heterogeneity of formulations and study designs in the existing literature [13,14].

The absence of significant changes in the placebo group across all primary endpoints provides important evidence that the improvements observed in the active arms are attributable to the pharmacological activity of the tested compound rather than to non-specific factors such as natural hair cycle variation, seasonal fluctuation, or regression to the mean. This finding strengthens the internal validity of the study and is consistent with previous placebo-controlled nutraceutical trials in which control groups showed stable or slightly declining hair parameters over comparable time periods [12,19].

A noteworthy finding was the absence of significant changes in mean hair shaft diameter across all groups. This dissociation between improvements in follicular density and the lack of effect on fibre calibre suggests that the primary action of the supplementation may be related to the recruitment of dormant follicles or the prolongation of the anagen phase rather than to structural changes within individual hair fibres [8]. Hair shaft thickening, which reflects cortex keratinocyte proliferation and matrix cell activity, may require either a longer treatment period or a different pharmacological target to be meaningfully affected. This interpretation is consistent with findings from other nutraceutical studies in which density gains preceded or outpaced diameter changes [14,20].

Hair shedding assessed by the standardized comb test did not show statistically significant reductions in any group, though an inter-group difference approaching significance was observed for Kyoh BB-01 on day 84. The comb test is a coarser and more variable endpoint than trichoscopic measurements [18], and its sensitivity may be limited over an 84-day window, particularly for compounds whose primary effect appears to be on follicular recruitment rather than on reducing the telogen-to-exogen transition. The overall pattern of results — significant gains in density and follicular unit counts without a corresponding reduction in shedding — is consistent with a mechanism centred on anagen re-entry or prolongation, which would increase the active follicle pool without necessarily altering the rate at which telogen hairs are released [7,8].

The integration of objective trichoscopic measurements with self-assessed consumer perception strengthens the clinical relevance of the findings. Participants receiving the active formulations reported improvements in perceived hair density, hair strength, and overall hair health, with acceptance rates increasing from 81% and 75% on day 56 to 87% and 84% on day 84 for Kyoh BB-01 and Kyoh BB-02, respectively. The convergence between instrumental data and subjective evaluation

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is clinically meaningful, as patient-reported outcomes are increasingly recognised as important endpoints in dermatological research [1,3]. Notably, even the placebo group reported relatively high acceptance rates (70–78%), which may reflect a general positive response to participating in a supervised care programme, underscoring the importance of including an appropriate control arm.

Several limitations of this study should be acknowledged. First, the supplementation period of 84 days, while sufficient to detect statistically significant changes in several hair growth parameters, does not capture the full dynamics of the hair cycle, which spans approximately three to seven years for the anagen phase alone [7]. Longer follow-up studies are needed to determine whether the observed benefits are sustained and whether additional improvements emerge beyond 12 weeks. Second, the study population, while balanced in terms of sex and age, was relatively homogeneous in hair type, with the majority of participants presenting straight hair. The generalizability of the results to populations with a higher prevalence of wavy or curly hair, in whom trichoscopic norms may differ, remains to be established. Finally, the absence of molecular or biochemical endpoints — such as serum markers of oxidative stress, VEGF levels, or scalp biopsy data — prevents a mechanistic interpretation of the observed effects and represents an area for future investigation [16,17].

In summary, the results of this study support the potential of the tested nutraceutical (Kyoh®) to improve key parameters of hair follicle activity, particularly follicular density and productivity, in a dose-dependent manner. These findings contribute to a growing body of evidence indicating that targeted nutritional supplementation represents a viable complementary strategy for individuals experiencing non-scarring hair loss [12,13,19,20]. Future studies should aim to extend the follow-up period and incorporate mechanistic endpoints to confirm in vivo whether the pathways suggested by prior in vitro findings mediate the observed clinical benefits.

5. Conclusions

In conclusion, this randomized, placebo-controlled clinical study demonstrated that oral supplementation with the tested commercial extract significantly improved hair density, follicular unit density, and hairs per follicular unit in volunteers with hair loss concerns over an 84-day period. The high-dose formulation (Kyoh BB-01) produced the most consistent and pronounced improvements across all evaluated parameters, while the low-dose formulation (Kyoh BB-02) also yielded statistically significant gains, together establishing a dose-dependent relationship. The absence of meaningful changes in the placebo group strengthens confidence in the specificity of the observed effects. The lack of effect on hair shaft diameter and comb-test shedding points to a mechanism primarily involving follicular recruitment or anagen prolongation rather than structural fibre modification. Subjective evaluations corroborated the trichoscopic findings, with high participant acceptance rates in both active groups at study end. These results support the potential of this nutraceutical approach as a complementary strategy for non-scarring hair loss and underscore the importance of dosage optimization in future formulation development. Longer-duration trials with mechanistic endpoints are warranted to fully characterize the clinical and biological profile of this intervention.

Author Contributions: Conceptualization; E.B., M.M., M.I.M-V. Methodology; E.B., M.M. Validation; E.B., M.M. Formal Analysis; E.B., M.M. Investigation; E.B., M.M. Resources; E.B., M.M. Data Curation; M.M., E.B. Writing—Original Draft Preparation; M.M. Writing—Review and Editing; M.M., E.B, M.I.M-V., A.M-G Supervision; E.B., M.M., M.I.M-V., M.D.-M, Project Administration; E.B., M.M. Funding acquisition; M.I.M-V., M.D.-M.

Funding: This research received no external funding.

Institutional Review Board Statement: This clinical study was conducted at the facilities of Bionos Biotech S.L. The standard protocol and test conditions were submitted to and approved by the Ethical Committee of HOSPITAL UNIVERSITARIO Y POLITÉCNICO LA FE (Date 24/04/2025 and Code number 0050-2025). [NOTE TO AUTHORS: Please verify approval number — the Methods section lists “2025-0034-1” while this section lists

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"0050-2025". Only one is correct.] The study protocol, including the inclusion/exclusion criteria, is in accordance with the Scientific Committee on Consumer Safety (SCCS) guidance. It meets all international standards for research studies involving human subjects, the Good Clinical Practices (ICH-GCP), and World Medical Association.

Informed Consent Statement: Informed consent was obtained from each volunteer prior to initiating the study describing reasons for the study, possible adverse effects, associated risks and potential benefits of the treatment, and their limits of liability. The panelists signed and dated the informed consent document to indicate his authorization to proceed and acknowledge his understanding of the contents before the start of the study.

Data Availability Statement: The datasets generated during the current study are available from the corresponding author on reasonable request.

Acknowledgments: The authors thank the study participants for their involvement and the clinical staff for their assistance in data collection.

Conflicts of Interest: Since this work was carried out in collaboration with Pharmactive Biotech Products S.L.U., authors from this company may have a conflict of interest. All the experiments have been performed by researchers from Bionos, who do not have conflicts of interest.

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