

Brief Report

Daily use of a bakuchiol and squalane-containing face serum impacts skin esthetics

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ABSTRACT

Objectives: The objective is to determine the impact of an oil-based face serum containing bakuchiol and squalane in improving skin esthetics such as texture and tone upon daily use.

Material and Methods: A non-comparative, single-arm study on 50 females (aged 18–50 years) with Fitzpatrick skin types III and IV was conducted for four weeks. The impact of the formulation on skin-related parameters was determined by instrumental analysis and dermatologist evaluation. Cosmetic acceptability and safety of the preparation were recorded through self-evaluation questionnaires.

Results: The formulation was safe and well tolerated throughout the study duration. A significant reduction in the appearance of age/dark spots (ITA°), Δ ITA° = 38.28% compared to baseline, was observed in two weeks. Up to 11.9% improvement in skin elasticity was noted in four weeks of usage. The continuous once-a-day application also helped in reducing the transepidermal water loss throughout the study.

Conclusion: Regular use of facial oil serum can help improve skin texture and tone.

Keywords: Face serum, Skin elasticity, Skin brightness, Cosmetic acceptability, Product safety

INTRODUCTION

Bakuchiol and squalane are commonly present in marketed face oils and have seen a growing trend in the last five years, as consumers search for active-based products. Reports on the safety and efficacy of face oils and serums are limited. Bakuchiol, first isolated from the seeds of *Psoralea corylifolia*, was shown to have retinol-like activity in the regulation of collagen I, III, and IV genes, hyaluron, and aquaporin-3 (AQP3) synthesis *in vitro*. In clinical studies, 0.5% bakuchiol was found to reduce wrinkle depth and skin pigmentation intensity and area with twice-a-day usage for 12 weeks.^[1,2]

Squalene is one of the constituents of sebum lipids and is known to act as a moisturizer and antioxidant and improve skin smoothness.^[3] Squalene present in sebum gets readily converted to squalene peroxides that accumulate in the skin causing uneven pigmentation, wrinkles, clogged pores, and exacerbation of acne.^[4-8] The level of sebum squalene reduces with age resulting in loss of skin smoothness and texture.^[3,4] The hydrogenated form of this triterpene squalane retains the same moisturizing properties of squalene with a more robust chemistry and has become a popular emollient in skin care.^[9] Squalane is now produced from oil seeds, for example, olive and amaranth as well as biotechnologically through sugarcane.^[9-11]

In the present study, a combination of bakuchiol and squalane in an oil-based face serum has been studied for impact on skin moisture retention, tone, and texture in a four-week clinical assessment.

MATERIAL AND METHODS

Study plan and outcome

A single-arm, non-comparative clinical evaluation of the face serum was carried out between March 1, 2022 and July 1, 2022. Fifty female subjects aged 18–50 years with a Fitzpatrick phototype III–VI and healthy facial skin were selected for the study. All participants signed and approved informed consent before study-related procedures. Subjects were informed not to participate in a similar study or be on any medications such as retinols, corticosteroids, anti-histaminic, and anti-inflammatory agents topically or orally. They were required to be non-expecting, non-breastfeeding or having stopped breastfeeding three months before the study. Specific exclusion criteria included no medical treatment for hyperpigmentation, use of whitening agents, beauty treatments (tanning, exfoliation, physical, and chemical peels), and sun-tanning during the study duration. Subjects should not have cutaneous hypersensitivity, allergies or any surgeries at the site of product application. During the study, subjects were informed not to vary their cosmetic habits or apply any other product or makeup apart from the test products. Strict photo-protection and avoidance of water activities, for example, swimming and practice sports, were expected to be followed.

About 0.25 g (4–5 drops) of the test serum was to be applied once at night after cleansing for four weeks. Face cleansing was suggested twice a day with the provided sulfate-free face wash. In the morning, subjects were advised to use a basic moisturizer provided with the study after cleansing. Cosmetic acceptability and safety of the product were established by the dermatologist through the grading on the whole face for clinical signs (erythema, edema, dryness, scaling, and peeling) and functional signs (felt by the subjects and reported to the dermatologist – itching, redness, and tingling) at all-time points and scored on a four-point scale.

Instrumental assessment was carried out at T0 before product application and at T+7 days (T+7d), T+14 (T+14d), and T+28 days (T+28d) visit to determine the change in parameters. Measurements were done post-20-min acclimatization in a controlled temperature ($22.5 \pm 2.5^\circ\text{C}$) and relative hygrometry ($50 \pm 10\%$). Transepidermal water loss (TEWL) through Tewameter and elasticity by Cutometer[®] MPA 580 (Courage + Khazaka electronic GmbH, Germany) and skin color analysis by Chromameter (CR-400 (Konica Minolta, Japan) was carried out.^[12] Subjects were asked to answer a self-evaluation questionnaire (school self-

evaluation) at all visits to evaluate their overall opinion and their attitude toward the safety and efficacy of the product.

Statistical analyses

Values were expressed as the mean and standard error of the mean. The normality of the distributions was checked using the Shapiro–Wilk test with a threshold of 1%. The statistical analysis of the evolution of the measured parameters during the study was performed using the Student *t*-test (normality of distributions checked) or with the Wilcoxon test (normality of the distributions rejected). A $P < 0.05$ was considered statistically significant. Statistical analysis output was reported as follows: Ns: Not significant, * $P < 0.05$ ** $P < 0.01$, and *** $P < 0.001$.

RESULTS

A total of 47 healthy Indian female subjects, 18–49 years, (mean = 29 ± 8.9 years; median = 28 years) completed the study. Once-a-day usage of the face serum resulted in a statistically significant reduction in TEWL. Mean variation in inherent skin moisture levels were -2.61 , -3.39 , and -3.76 g/h/m² at 7, 14, and 28 days of treatment, respectively, compared to baseline ($P < 0.001$). Significant change in TEWL was noted on day 7 versus days 14 and 28 ($P < 0.01$ and $P < 0.001$, respectively). No significant difference was noted in TEWL values on days 14 versus 28 suggesting that continuous product application helped in maintaining skin barrier integrity ($P = 0.12$) [Figure 1a].

More than 80% of the subjects showed improvement in gross skin elasticity measured as a reduction in R2 value over the study duration. Results showed that the overall skin elasticity improved during the study [Figure 1b]. Skin elasticity significantly increased after 7, 14, and 28 days of treatment compared to basal conditions (T0). Mean skin elasticity was 0.798 au at T0, 0.863 au at 7 days, 0.870 au at 14 days, and 0.894 au or +11.9% at 28 days ($P < 0.001$ against baseline, T0).

A statistically significant increase in mean skin lightness (L^*) was observed on 7, 14, and 28 days of treatment compared to the baseline conditions (T0). The increase in skin lightness was 0.36 au (0.68%) on day 7, 0.76 au (1.45%) on day 14, and 1.07 au (2.06%) on day 28. 96% of the population showed improvement in skin lightness with 14 days of continuous use of the product [Figure 1c]. In five subjects, reduction or no further improvement in L value was found on day 28 compared to day 14.

ITA[°], determined as a change in dark spots on the skin, was also found to increase like lightness (L^*), suggesting lighter and/or more even skin tone.^[12] ITA[°] ranged from -15.4° to 16.6° , equivalent to tan-brown distribution.^[13] The values continued to increase by 1.05 (17.95%) in week one, 2.18 (38.28%) and 2.87 (50.32%) in weeks two and four, respectively. This

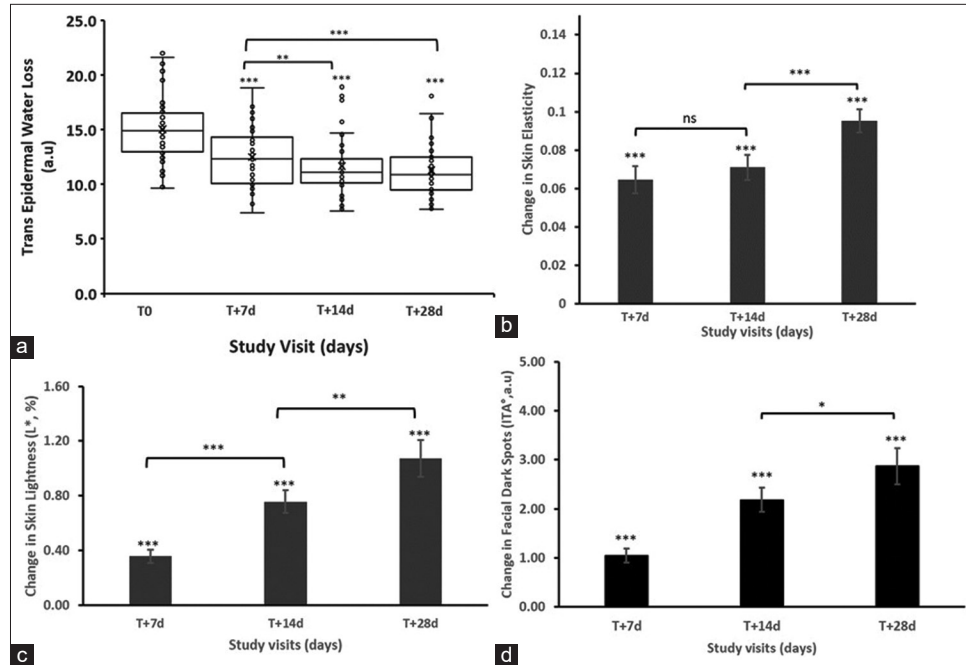


Figure 1: (a) Changes in skin moisture content measured as transepidermal water loss, initial and post-product application for 28 days presented as quartiles with mean and outliers. Change in (b) skin elasticity from baseline over 28 days, (c) skin lightness (L^*) and (d) ITA° showing a reduction in dark spots from baseline over four weeks of once-a-day product usage presented as difference of mean \pm standard error of the mean in arbitrary units (a.u.). Statistical significance reported for mean value on visit days compared to mean baseline, considered: * $P < 0.05$, ** $P < 0.01$, and *** $P < 0.001$.

corresponded to 85% of the population showing improved uniformity in skin tone in the first week and 94% and 91% in weeks two and four, respectively, [Figure 1d].

Volunteers felt that their skin was looking brighter, more even-toned, firmer, and smoother with routine application. Benefits were perceived within the first week and were maintained throughout the test duration.

DISCUSSION

The topical application of bakuchiol has been extensively studied in the last decade. Bakuchiol has been shown to upregulate collagen type I and IV genes in DNA microarray studies, also established by increased collagen content at dermal-epidermal junction in 3D tissue and fibroblasts. The study also showed up to 20% reduction in wrinkle depth determined through profilometry.^[2] This has also been observed in the current trial where the R2 value denoting improvement in skin elasticity showed 8.07% and 8.87% increase in weeks one and two and a considerable enhancement of 11.9% by week four from the baseline [Figure 1b].

In a double-blind study, 0.5% bakuchiol showed similar activity to 0.5% retinol in minimizing wrinkles and hyperpigmentation with improved tolerability in a 12-week study.^[1] Our current study showed 2.06% and 50.32% improvement in L and

ITA° [Figure 1c and d], which was comparable to previous reports.^[14] The change in ITA° was, however, remarkably higher in our study compared to the previous reports warranting an extended trial with a vehicle control.

In a series of multiple trials, a combination bakuchiol serum was shown to reduce TEWL and maintain skin hydration.^[14] Bakuchiol has also been reported to increase AQP3 expression, thus enhancing water regulation in the skin.^[2] In a separate study, olive oil squalene has been shown to alleviate dryness in a concentration-dependent manner.^[15] Since squalene is structurally similar to squalene,^[3,9] we expect similar benefits from the former. Daily application of the test product resulted in maintaining skin barrier integrity measured as reduced TEWL on all time points [Figure 1a].

The formulation was considered to have an appealing texture and fragrance, cosmetically acceptable, non-greasy, and quickly absorbing. All subjects reported enhanced glow, smoothness and firmness, and even skin tone. No itching or irritation was found due to the test product. Only two volunteers reported a mild burning sensation immediately after the first application in the clinical study, which subsided during their visit.

Overall, the test article was found to be safe and showed improved skin tone, elasticity, and smoothness on continuous use.

CONCLUSION

The face oil serum composed of bakuchiol and squalane showed promising results in a reduction in TEWL and improvement in skin tone and texture.

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Ethical approval

Approved by the ETHOS Institutional Ethics Committee at Mumbai, India; Approval No – IEC/GN/2022/356 dated 21/4/2022.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Conflicts of interest

There is no conflict of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

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