

Bakuchiol – a plant-based retinol. The review article

Bakuchiol – roślinny retinol. Przegląd literatury

ABSTRACT

Bakuchiol is a plant-derived substance that is more and more used by cosmetics manufacturers as an ingredient of anti-aging preparations.

The aim of the article was to compare the structure and action of bakuchiol to retinol, as well as to present its effect on the skin based on already published research.

Due to its properties, bakuchiol becomes an alternative ingredient to retinol, hence is also known as vegetable retinol.

Keywords: bakuchiol, cosmetics, plant-based retinol

STRESZCZENIE

Bakuchiol to substancja pochodzenia roślinnego, coraz częściej wykorzystywana przez producentów kosmetyków jako składnik preparatów o działaniu przeciwstarzeniowym.

Celem artykułu było porównanie budowy i działania bakuchiolu do retinolu, a także zaprezentowanie jego wpływu na skórę przy wykorzystaniu opublikowanych badań.

Ze względu na swoje właściwości, bakuchiol staje się składnikiem alternatywnym dla retinolu, stąd jego nazwa – retinol roślinny.

Słowa kluczowe: bakuchiol, kosmetyki, retinol roślinny

INTRODUCTION

Bakuchiol is a meroterpene phenol found mainly in the seeds of the Indian plant called *Psoralea corylifolia*-Babci, but also found in other plants like *Psoralea glandulosa* (an herb of the legume family), *Pimelea drupaceae* (cherry rice), *Ulmus davidiana* (David's elm), *Otholobium pubescens* and *Piper longum* (long pepper). The seeds of these plants contain compounds such as flavonoids mainly antioxidants and coumarins with anti-inflammatory and antibacterial [1-7].

According to literature reports, bakuchiol exhibit antiproliferative, anti-inflammatory, antioxidant, antibacterial, anti-acne, and anti-pigmentation effects [8-12].

BAKUCHIOL VS. RETINOL

Although retinol and bakuchiol do not show structural similarities (Fig. 1), research studies published by Chaudhuri and Bojanowski in 2014 [13] showed that retinol and bakuchiol have a similar gene expression profile, especially in some key anti-aging genes and proteins (this applies to the effects after their application) (Fig. 2).

Bakuchiol, unlike retinol, has excellent photochemical and hydrolytic stability, a good safety profile, and ease of

formulation in cosmetics, thanks to its miscibility with a wide range of emollients and solubilizers [14]. In addition, bakuchiol can be used during the day due to its photostability [13]. Interestingly, bakuchiol turns out to be an excellent stabilizer of retinol in the photooxidation process, it also stabilizes singlet oxygen [13]. However, this information needs to be confirmed by in vivo studies.

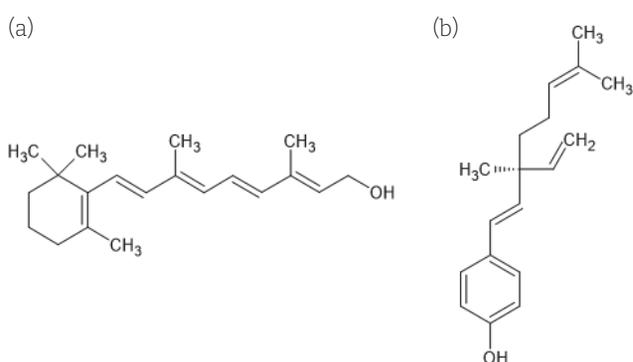


Fig. 1 Comparison of the chemical structure of retinol (a) and bakuchiol (b).

Source: Own study by ChemSketch program.

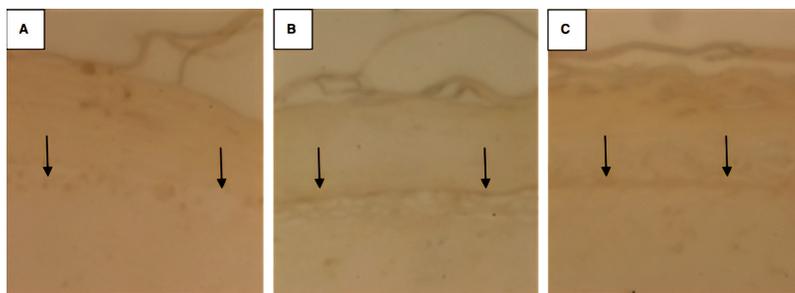


Fig. 2 Effect of retinol (B) and bakuchiol (C) on type IV collagen expression compared to control (A) in the EpidermF tissue model. Arrows point to the basement membrane where type IV collagen is located. The darker band in (B) and (C) compared to (A) indicates greater expression of type IV collagen.

Source: [13]

ANTI-ACNE EFFECT

In 2015 111 people with juvenile acne were tested [11]. In 55 of them, a combined preparation containing bakuchiol, ginkgo biloba leaf extract and mannitol (BGM complex, the content of individual components was not specified) and adapalene (a third-generation retinoid) in the form of a 0.1% gel was used. In the remaining 56 people, adapalene (0.1% gel) and a neutral carrier cream were used to facilitate penetration of the preparation and create an occlusive layer (composition: *water (aqua), glycerin, hydroxyethyl acrylate/sodium acryloyldimethyl taurate copolymer, isohexadecane, titanium dioxide, phenoxyethanol, chlorphenesin, polysorbate 60, alumina, stearic acid*). The clinical trial lasted 2 months. In the first group of people using the BGM complex and adapalene, a reduction in seborrhea and inflammation were observed. It turned out that the BGM complex containing bakuchiol enhances the anti-inflammatory effect of adapalene, soothes irritations after using this retinoid, and is effective against *P. acnes* bacteria.

ACTION AGAINST SIGNS OF SKIN AGING

So far, only two scientific articles on this topic have been published. Chauduri and Bojanowski studied a group of 17 women who used a cream containing 0.5% bakuchiol twice a day for 12 weeks [13]. After this time, an improvement in the smoothness of the skin and a reduction in the visibility of fine wrinkles were observed. With topical application of tretinoin (retinoic acid, available on prescription), such results can be seen after 3-6 months [14], and according to many patients even after 6 months of treatment [15]. However, the results of the study bring doubts because the authors did not include a control sample that could have a significant impact on the results of the study. The bakuchiol carrier certainly also had occlusive and moisturizing properties, which could also result in an improvement in the condition of the skin and a reduction of aging signs. It is also difficult not to mention the small number of people tested.

In the other study, the effect of a cream containing 0.5% bakuchiol and a cream with 0.5% retinol was compared on the condition of the skin of 44 people [17]. The observation lasted

12 weeks. Both bakuchiol and retinol significantly reduced the visibility of fine facial wrinkles after 12 weeks of use. No significant differences were observed between bakuchiol and retinol.

However, the research is burdened with a few errors - only 44 people were tested, and the final assessment concerned only changes on the surface of the skin, but it is not known how the preparations used affected, for example, the level of collagen in the skin, hence it cannot be categorically confirmed that the use of bakuchiol brings better or the same effects like using retinol. Further research is required.

EFFECT ON SKIN HYPERPIGMENTATION

In vitro studies conducted on mouse skin melanoma cells (B16 cells) proved that the alcoholic extract of long pepper (*Piper longum*) showed a strong potential to inhibit the secretion of α -melanotropic hormone, which is responsible for the increased production of melanin [18]. Fractionation of the extract allowed the isolation of three prenylated phenolic compounds responsible for this inhibitory effect: bakuchiol, bavachin, and isobavachalcone (Fig. 3). Due to structural similarities, all three compounds were found to have a similar mode of action, inhibiting melanin biosynthesis.

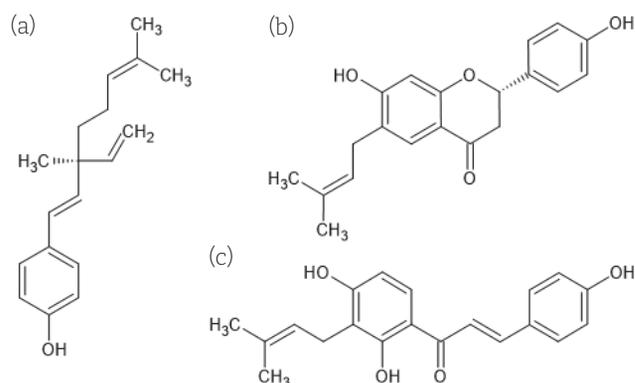


Fig. 3 Chemical structures of bakuchiol (a), bavachin (b) and isobavachalcone (c).

Source: Own study using the ChemSketch program, based on [19-21].

BAKUCHIOL AS AN ANTIOXIDANT

Oxidative stress caused by both internal metabolic processes and external environmental factors contributes significantly to skin aging. Bakuchiol activates erythroid nuclear factor 2 - (Nrf2) - a transcription factor that plays a significant role in preventing cells from oxidation [22]. In addition, its antioxidant features include the ability to "scavenge" oxygen free radicals and prevent lipid peroxidation in the mitochondria [23].

APPLICATION OF BAKUCHIOL ON SENSITIVE SKIN

The study, conducted on 60 women, lasted 4 weeks [24]. 1/3 of them suffered from atopic dermatitis, another 1/3 from rosacea, the skin of the remaining women showed intolerance to many cosmetics. The group used a skin cleanser and an anti-aging moisturizer, both with bakuchiol. None of the 60 women tested had problems with bakuchiol tolerance. What's more, their skin was visually smoother and brighter. Only 10% of the subjects (mainly with eczema) experienced minimal stinging immediately after applying the preparation, which then subsided. Probable reason of such an event was a dysfunction of the skin's protective barrier.

The measured values of transepidermal water loss (TEWL) did not change from the beginning of the study to the 4th week of its duration, indicating no damage to the protective barrier in people with sensitive skin. Corneometry also showed promising results - skincare products containing bakuchiol applied to the skin resulted in a highly statistically significant increase in skin hydration by 16% ($p < 0.001$). The results of these studies suggest that it is an active ingredient suitable for sensitive skin.

SUMMARY

Bakuchiol seems to be an interesting alternative to retinol, especially for people with sensitive skin. However, it is not a substitute for retinol, also in chemical terms, both substances have little in common, although their seoregulating, anti-wrinkle and brightening effects overlap somewhat. Bakuchiol, however, has a broader spectrum of activity - it is also an antioxidant. Besides, it does not sensitize the skin, unlike retinol, does not require gradual adaptation of the skin when introducing it to care, and can be used during pregnancy. This allows us to assume that its popularity as an ingredient in cosmetics will continue to increase.

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