

EXTRACTION AND SPECTROPHOTOMETRIC ASSAY OF BETA-CAROTENE IN SUNSCREEN AND TANNING PRODUCTS

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Beta-carotene is a fat-soluble pigment from the group of carotenoids, proven to be beneficial for the nourishment and the protection of the skin exposed to UV radiation, as well as for the enhancement of the tanning process. Although it can be added to the formulations of cosmetic products in both its synthetic and natural forms, herbal extracts or oils are most frequently used. Manufacturers often emphasize its presence in their cosmetic lines, while there is no available data about the allowed or recommended concentration in cosmetic products (1,2). The aim of this study was the determination of beta-carotene in different formulations of sunscreens and tanning products, available in local pharmacies and drugstores, in order to confirm the presence and determine the concentration of beta-carotene in final formulations of these products. Furthermore, the optimal method of extraction for the pretreatment of cosmetic creams, lotions and oils was developed for the purpose of their spectrophotometric analysis. Seven different commercial sunscreen and tanning products were analyzed. Sample preparation was carried out by extraction using different mixtures of organic solvents. Analysis of the prepared samples was performed using a UV-Vis spectrophotometer at a wavelength of 453 nm and a calibration curve method. The solvent extraction efficiency was tested for eight combinations of mixtures of organic solvents. Solvent mixture dichloromethane: absolute ethanol (7:3, v/v) has proven to be the most appropriate and effective for the extraction of beta-carotene from analyzed cosmetic products. The content of beta-carotene was in the range from 9.43±0.77 mg/100 g to 85.86±4.17 mg/100 g. In general, tanning products contained larger amounts of beta-carotene than products mainly made for protecting the skin from UV radiation. Notable differences were also found depending on the type of the formulation and the form of added beta-carotene. Cream and lotion preparations contained more beta-carotene than oil-based preparations, and its highest content was achieved by combined addition of enriched herbal extracts and synthetic beta-carotene. The proposed methods for extraction and spectrophotometric analysis were successfully applied for beta-carotene determination in all analyzed samples, but its content in cosmetic products available on the market varies significantly. For the purpose of ensuring more detailed confirmation of their efficacy and quality, further research should be focused on the determination of optimal concentrations of beta-carotene in cosmetic products.

References

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EKSTRAKCIJA I ODREĐIVANJE BETA-KAROTENA U KOZMETIČKIM PREPARATIMA ZA ZAŠTITU OD SUNCA I BRŽE TAMNENJE KOŽE

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Beta-karoten je pigment iz grupe karotenoida, dokazano koristan u nezi, zaštiti i poboljšanju potamnivanja kože izložene UV zracima. U formulacijama kozmetičkih preparata se može dodati u prirodnom ili sintetskom obliku, pri čemu se kao izvori beta-karotena najčešće koriste biljni ekstrakti ili ulja. Proizvođači često ističu njegovo prisustvo u svojim kozmetičkim linijama, ali podaci o dozvoljenoj ili preporučenoj koncentraciji beta-karotena u kozmetičkim preparatima ne postoje u dostupnoj literaturi (1,2). Cilj ovog rada je bio određivanje sadržaja beta-karotena u nekim formulacijama kozmetičkih preparata za zaštitu od sunca i brže tamnjenje kože, dostupnih u lokalnim apotekama i drogerijama, radi potvrđivanja prisustva i utvrđivanja koncentracije beta-karotena u finalnim formulacijama ovih preparata. Pored toga, razvijena je i optimalna metoda ekstrakcije u predtretmanu kozmetičkih krema, losiona i ulja u svrhu njihove spektrofotometrijske analize. Za analizu je korišćeno sedam različitih komercijalnih preparata za zaštitu kože od sunca i brže potamnivanje, nabavljenih u lokalnim apotekama i drogerijama. Priprema uzoraka za analizu izvršena je ekstrakcijom pomoću različitih smeša organskih rastvarača. Analiza pripremljenih uzoraka je vršena pomoću UV/VIS spektrofotometra na talasnoj dužini od 453 nm, korišćenjem metode kalibracione prave. Efikasnost ekstrakcije je testirana za osam kombinacija smeša organskih rastvarača. Smeša rastvarača dihlormetan: apsolutni etanol (7:3, v/v) pokazala se kao najprikladnija i najefikasnija za ekstrakciju beta-karotena iz analiziranih kozmetičkih proizvoda. Sadržaj beta-karotena bio je u rasponu od $9,43 \pm 0,77$ mg/100 g do $85,86 \pm 4,17$ mg/100 g. Uopšteno, proizvodi namenjeni bržem tamnjenju kože sadržali su veće količine beta-karotena od proizvoda čija je primarna svrha zaštita kože od UV zračenja. Značajne razlike nađene su i u zavisnosti od tipa formulacije, kao i od oblika dodatog beta-karotena. Preparati tipa krema i losiona sadržali su nešto veće količine beta-karotena od preparata tipa ulja, a najveće količine su postignute kombinovanim dodavanjem obogaćenih biljnih ekstrakata i sintetskog oblika beta-karotena u preparat. Predložene metode ekstrakcije i spektrofotometrijske analize uspešno su primenjene za određivanje beta-karotena u svim analiziranim uzorcima, ali njegov sadržaj u kozmetičkim proizvodima dostupnim na našem tržištu značajno varira. Radi osiguranja i detaljnije potvrde njihove efikasnosti i kvaliteta, dalja istraživanja bi trebalo usmeriti ka utvrđivanju optimalnih koncentracija beta-karotena u kozmetičkim preparatima.

Literatura

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