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The Personal Care Almanac

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Oily, Natural Skin Lightener from Botanical Origin

Victoria Donat, Anna Martí

ABSTRACT: We have developed a novel skin depigmenting agent in oily base, able to replace other synthetic actives and provide care to skin. We aimed the product to hold additional qualities, as safety, naturalness, preservative absence and thermal stability. With this goal, we identified different vegetable oils and botanical extracts, able to lead to a lipid solution with lightening, hydrating and nourishing activities. The product obtained, EVOIL® HYDRACARE LIGHTENING, was submitted to efficacy and safety assays, and physico-chemical characterization. Depigmenting activity tests performed with reconstructed human epidermis showed a 47% reduction of melanin production *versus* negative control, in the conditions assayed. Efficacy and safety were proven by means of dermatological assays, and certain key physicochemical parameters were determined, revealing full suitability of EVOIL® HYDRACARE LIGHTENING for cosmetic use, with a high depigmenting ability.

Introduction

Melanin is the natural pigment of human skin, and tyrosinase is the enzyme responsible of this pigmentation, sometimes undesired [1, 2]. Effects of ultraviolet (UV) radiation on skin are beneficial and harmful at the same time. Solar radiation induces synthesis of vitamin D, pathogen killing, and improves some disorders as psoriasis. On the other hand, it causes an oxidative stress provoking photoaging and skin cancer, as it alters at the cellular level [3]. Although melanin has mainly a photoprotective role on human skin, excessive accumulation of epidermal pigmentation may become an aesthetic problem [1, 4, 5, 6].

In Western culture, a tanned hue is still considered desirable. In spite of warnings about the consequences of excessive exposure to sun or UV rays, the habit of artificial tanning has considerably raised in the last decades. However, in Eastern culture, a long centuries tradition exist, that considers a light complexion as equivalent to youth and beauty. In the last years, the interest in skin lightening has enormously grown [4]. Traditionally, skin depigmentation has been performed with aggressive chemical agents. Treatment of hyperpigmented lesions and overall brightening in a safe way are current challenges of cosmetic industry [7, 8, 9]. Main cellular target of depigmenting agents is tyrosinase, having identified several inhibitors of this enzyme, either from natural or synthetic sources [4, 6, 10, 11].

Botanical products are gaining importance in the last times, as active ingredients for cosmetic formulations, due to their protective effect on skin against endogenous or exogenous harmful substances [1, 3, 5, 8]. Use of plant products as photoprotective and/or antioxidant agents has attracted attention of researchers, as well as consumers, that posi-

tively perceive inclusion of these ingredients in cosmetic formulations. Conversely, classical skin whiteners as hydroquinone, kojic acid or mercury compounds may act as carcinogens or cause other damages [1, 12-15] and, in many cases, they are banned in some markets and restricted in others [16, 17].

In this scenario, we planned to create a novel raw material to replace synthetic alternatives, seeking as well for additional qualities in terms of skin care. With this aim, we selected several oily plant ingredients, depending on its ability to inhibit tyrosinase described in scientific literature. We prepared a lipid composition using such extracts, subsequently examining the same at different levels, in order to determine its efficacy, harmlessness and suitability for cosmetic formulation. Assays of inhibition of melanin production displayed remarkable results. Patch Test, organoleptic and physicochemical analysis proved that the composition was safe and suitable to be included in a personal care product.

Experimental Procedure and Results

Formulation

Selected oily extracts from *Aloe barbadensis*, *Rheum rhaponticum*, carotenoids, glabridin, natural tocopherol isolated from *Helianthus annuus*, and up to a 0.1 % of dimethylmethoxychromanyl palmitate were sourced from accredited suppliers and dissolved in fixed vegetable oils, until total homogeneity and clearness of lipid solution.

Efficacy assays

Whitening activity was evaluated ex vivo in reconstructed tissues of pigmented human skin (phototypes II, IV and VI) **(Fig. 1)**. Different grades of colouration of these constructs correspond macroscopically to three different phototypes of human skin **(Fig. 2)**. Lipid sample and positive controls were topically applied on five tissue replicates simultaneously. Four applications were made for each experiment, at 100 % concentration, using untreated tissues as a negative control. Ascorbic acid was chosen as a positive control, as it showed skin whitening effects, previously demonstrated [18], using a concentration higher than that commonly employed in commercial skin lightening products, to ensure reliable results.

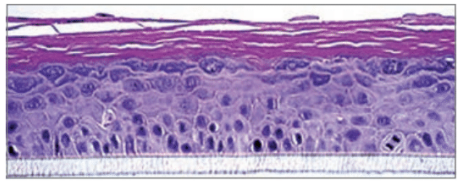

Fig. 1 Skin tissue model (RHPE). The test was performed on reconstructed *in vitro* epithelia, containing fibroblasts and keratinocytes

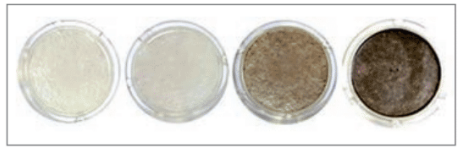

Fig. 2 From left to right: tissue without melanocites; phototype II tissue; phototype IV tissue and phototype VI tissue

Then, three tissue replicates of sample and controls were processed, respectively, to quantify melanin in a 490 nm spectrophotometer, using synthetic melanin as a standard [19]. Results were expressed as optical density and as mg/ml melanin. **Fig. 3** represents melanin quantification on treated tissues (negative control, positive control and samples). Average and standard deviation of the three tissues were calculated, detecting a 47 % reduction of melanin quantity *versus* negative control for the lipid solution; and a 34 % for positive control, *versus* negative.

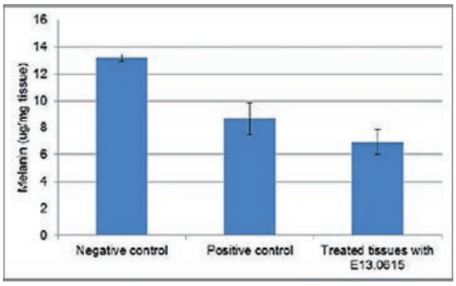

Fig. 3 Melanin quantification in treated tissues of reconstructed human skin. Melanin quantity in average value of the three treated tissue replicates

Safety assays

A Patch Test was carried out with the product to determine primary tolerance on human skin, after a single application under semi-occluded patch, during 48 hour in 11 volunteers. Under experimental conditions of this study, the product is considered non-irritant regarding its primary skin tolerance.

Physico-chemical characterization

Acidity index, peroxide index, saponification, density, fatty acid quantification and viscosity were analyzed by methods established by European Pharmacopeia **(Table 1)**. Organoleptic properties were noted by visual inspection. Oxidative Stability Index (OSI) was determined using a Rancimat instrument, at 100 °C and 110 °C, according to ISO 6886 (1996) procedure "Animal and vegetable fats and oils. Determination of oxidation stability". Oxidation induction periods obtained were 6.87 h at 100 °C, and 3.39 h at 110 °C, values that may be extrapolated by means of Rancimat software, giving an average useful life of 24 months. This predicts a good stability for a vegetable oil intended to be commercialized as a cosmetic raw material, as long it is properly handled and stored, as per reccommendations provided by the manufacturer upon supply.

CONCLUSIONS

EVOIL® HYDRACARE LIGHTENING, developed in the present work, attained the pursued objectives. Composed 99.9 % of vegetable oils and natural actives, ingredients were specially selected for optimal lightening properties, an intensive skin care and autopreservation.

Table I Results of organoleptic and physico-chemical characterization

Parameter	
Appearance	Oily liquid with slightly fruity odour
Acidity (mg KOH/g)	0.25 - 0.30
Peroxide index (meq O_2/kg)	max. 14
Saponification	170 - 185
Density (20 °C)	0.910 - 0.915
Viscosity	66,6 cps
Oleic acid	35 - 50 %
Linoleic acid	20 - 35 %

Undiluted combination of selected oils and bioactive botanical extracts exhibited depigmenting activity after 4 doses, reducing 47 % melanin production *versus* negative control, under experimental conditions described. This brightening product is safe and may be directly applied on skin, since efficacy assays have been carried out with original product; as well, result of Patch Test is non-irritant, performed in 11 human volunteers.

EVOIL® HYDRACARE LIGHTENING has been formulated in oily base, unlike the majority of depigmenting products in the market – in aqueous base – hence excluding the presence of water, to prevent microbial degradation and warrant stability, even in absence of preservatives. In order to offer a more advantageous safety profile, inclusion of aggressive chemical agents has been avoided, usually present in classical brighteners and often causing undesired secondary effects.

Incorporating lipid phase and active principles simultaneously, our formulation allows cosmetic manufacturers to replace some raw materials and synthetic actives by a plant ingredient already including actives, in a single step. Addition of chemical skin whiteners is unnecessary and might be detrimental of naturality and harmlessness of the product, without significantly improving its efficacy, or even potentially causing a competitive inhibition that might damage its effectiveness.

In conclusion, we have developed a new oily depigmenting agent from vegetable origin, with a promising potential in skin depigmentation and intensive care.

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