

Understanding botanical oils for cosmetics

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Ancestral use of botanicals supports veracity of qualities preached about them for care of physical wellness, both internally and externally. All ancient civilisations inhabiting our planet have provided us with countless examples and knowledge about use of fruits, seeds, flowers, whole plants or different extracts of them; either as medicinal remedies, culinary ingredients or for enhancement of external appearance. At the same time, the most recent scientific investigations identify active substances responsible for their traditionally known properties, while they reveal and prove new bioactivities.

Genetic variability of flora on Earth generates a huge phytochemical diversity from which we can profit from the nutritional, sanitary and cosmetic points of view. Vegetable oils are greasy extracts from botanical origin, obtained from oleaginous seeds or fruits, and they constitute a valuable type of raw material for the cosmetic industry; not merely as emollients in a formulation, but also with a therapeutic role in many cases.

Diversity of origins of vegetable oils is extremely wide, as they may come from

Abstract

Plants offer us plenty of beneficial substances for health and beauty, as supported by its ancient use. Scientific research allows identification of the active substances present in plants, proving their properties, and discovering new bioactivities.

This article gives insight into the botanical origins of vegetable oils and explains their composition. Quality criteria are described, and the different categories of vegetable oils are explained. Essential oils, although also from botanical origin, are not considered true vegetable oils. However, they are regarded as very special ingredients of cosmetic products, as highlighted in the present article. We finally summarise the advantages of all kind of vegetable oils in cosmetic formulations, and their cosmetic benefits that make them the choice for natural and sustainable cosmetics.

virtually any plant ecosystem on our planet, and from all climate zones, from tropical to desert. Edaphic factors and climatic particularities of terrestrial geographical regions have forced and directed evolution for adaption of plants to extreme conditions, giving as a result a metabolic diversity with a vast biological potential, still not completely explored.

Composition

A vegetable oil is mainly composed of triglycerides (esters of fatty acids and glycerol). The so-called fatty acid profile is

the characteristic composition of an oil, measured as the percentage content of each type of fatty acid, constituting a footprint of the identity of a given oil. Knowing the relative distribution of these compounds is interesting to evaluate not only quality and identity of vegetable oils, but also their potential cosmetic benefits derived from the diversity and abundance of the different fatty acids and their action on skin.

Vegetable oils are also composed of a non-glyceridic, unsaponifiable minor fraction (between 1%-5%). Basically, this



fraction contains phenols and sterols that show multiple bioactivities, as antimicrobial, antioxidant, antitumoral or anti-free-radical properties, among others. Liposoluble vitamins are also naturally present, mainly vitamins A (retinol) and E (tocopherol) at small proportions.

Quality

Besides fatty acid profile, to assess quality of a vegetable oil and fitness to be incorporated in a cosmetic formulation, there are also other parameters that must be analysed, as density, absorbance, refractive index, peroxide index, acidity, saponification value or moisture, among others.

Another fundamental aspect of quality of plant oils is control of lipid oxidation, since this is one of the main causes of damage, given that it affects sensory traits and notably reduces its utility. A great variety of methods have been developed to evaluate resistance to oxidation of vegetable oils, all of them making use of high temperature, in order to study behaviour of oils in forced conditions. Hence, an accelerated ageing is mimicked, intentionally causing oxidation of fatty acids, to delimit the shelf life period of an oil (considering other factors altogether).

Categories

Two categories of vegetable oils can be distinguished, depending on downstream processing after extraction: virgin or refined. Refining is a treatment to purify the oil, while thoroughly controlling colour, odour, acidity and reduction of oxidation. It combines mild physical and chemical processes not altering structure nor composition of lipid compounds, as it preserves, to the greatest extent possible, presence of natural antioxidants, such as tocopherol. By refining, only certain plant compounds responsible

for some organoleptic properties are removed, resulting in a 100% natural plant oil, free from some minor compounds giving undesired colour and odour. During refining, gums, waxes, phosphatides and non-esterified free fatty acids are also removed. This way, the oil acquires a uniform hue and gets rid of odour that might be considered unpleasant, gaining also functionality and stability.

Virgin oils are those obtained only by mechanical means or other physical procedures, under conditions not causing any alteration, generally by first cold pressing. Application of this extraction method without a subsequent refining keeps unsaponifiable fractions virtually intact, preserving bioactive substances with cosmetic benefits, as well as liposoluble vitamins.

Organic certified oils can be found among virgin oils, those obtained with production standards respectful to ecological principles, and further not having undergone a refining treatment. Refined oils holding an organic certification also exist, only if the refining process has been performed conforming to protocols accepted by the certifying body. Organic certifications are issued by accredited entities with international recognition, and some of their agricultural production standards refrain from pesticide use, artificial fertilizers, growth hormones, antibiotics and transgenic organisms.

Essential oils

Among vegetable extracts commonly known as oils, essential oils are usually included, despite the fact they are not truly greasy vegetable oils constituted by triglycerides.

Essential oils are hydrophobic liquids composed of volatile aromatic chemicals, generally obtained by distillation, as they

occur in minimal proportions. In nature, their role is to protect plants from diseases, predator insects or to attract beneficial insects, by means of their intense aroma, characteristic of each botanical species.

Essential oils possess an enormous therapeutic potential, with a wide spectrum of biological activities, being also a sort of raw material of great value in a cosmetic formulation. It is fundamental to remark that essential oils must not be directly used on skin, but diluted in greasy vegetable oils, or in other hydrophobic ingredients as a vehicle, to prevent irritant effects or contact allergy. Standing out among their properties, we find antimicrobial activity – against bacteria, viruses and fungi generally – as well as their antioxidant, antitumoral and anti-free-radical actions. Thanks to these qualities, essential oils offer interesting applications in fields such as pharmacy, aromatherapy or perfumery. They are also used in the food industry (as flavouring agents and/or preservatives).

Advantages

Vegetable oils intended for cosmetic formulations provide the final product with naturalness and quality, and thanks to the diversity of their triglyceride and phenolic composition, they offer multiple cosmetic qualities, useful for formulators.

Pharmacopeia also considers use of vegetable oils as excipients for active principles, or to improve absorption of lipophilic drugs. In this pharmaceutical compendium, monographies listing conditions and parameters that specific oils must accomplish to be incorporated in a pharmaceutical product can be found.

Cosmetic formulations using vegetable oils as the oily phase, besides supplying a valuable source of natural fats and phenolic compounds, offer additional remarkable advantages, such as:

Harmless

Vegetable oils may be directly applied on skin, with total compatibility. Moreover, thanks to the structure of their fat molecules, these easily penetrate through skin pores, nourishing it as they allow lipid replenishing. This makes a basic difference versus certain products derived from petroleum, as petrochemical fats do not penetrate skin, forming an occlusive layer that hinders skin oxygenation.

Stability

Absence of water in their composition prevents microbial growth inside, making vegetable oils a stable raw material from the microbiological point of view. Therefore, they do not require preservative addition, as long they are not incorporated in an aqueous formulation. Besides, this natural stability avoids risk of pathogen transmission.

Sustainability

They are obtained from renewable resources, and they constitute a respectful choice for the environment, compared to other cosmetic ingredients of fossil origin.

Ethical treatment of animals

The use of vegetable raw materials makes the inclusion of materials from animal origin

unnecessary, hence avoiding their exploitation and mistreatment for such purposes. Another advantage of circumventing the use of ingredients for coming from animals is eluding danger of transmission of pathogens infectious to humans, able to cross the species barrier.

Cosmetic benefits

Human skin is the interface between our body and the environment. In mammals, prevention of water loss and electrolyte leakage through the body surface is achieved by the horny layer of skin (stratum corneum). A healthy dermal barrier is an important protector against dehydration, penetration of microorganisms, allergens, irritants, reactive oxygen species and radiation.

This barrier is embedded in an extracellular matrix rich in lipids, that mediates permeability, prevents excessive loss of body fluids, and protects from external pathogens. In humans, it is known that esters of linear long-chain fatty acids are an essential component in barrier function of skin. These esters, in combination with cholesterol and triglycerides, form stable structures in skin, lowering water permeability. The fatty acids lost by action of environmental agents or simply by ageing, can be easily

replenished, supplied by vegetable oils.

Epidermis has great protective and antioxidant abilities, due to the presence of free-radical scavengers as vitamin E (tocopherol), released on the skin surface through sebum. This small molecule penetrates the horny layer, soothing and helping to maintain moisture, accelerating epithelization and contributing to photoprotection.

Natural presence of tocopherol i vegetable oils, those incorporated in a cosmetic formulation, would allow increasing levels of this vitamin in the stratum corneum, reinforcing protection.

A proper moisturising treatment involves repairing the lipid barrier of skin, restoring its ability to attract, retain and redistribute water; keeping this way integrity and appearance of skin. Ideally, a moisturising product should be effective not only in terms of prevention of water loss, but also as a good emollient, softening and increasing flexibility, while respectful to sensitive skin, hypoallergenic, fragrance-free, noncomedogenic, affordable and long-lasting. Given that oils from botanical origin gather these properties, they are raw materials particularly suited to formulating quality moisturising cosmetics and any other hygiene or personal care product. PC



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