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The use of vegetable oils to prevent skin aging

O uso dos óleos vegetais na prevenção do envelhecimento da pele

El uso de aceites vegetales para prevenir el envejecimiento de la piel

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Abstract
Theoretical framework: Vegetable oils in the cosmetics market are gaining more and more notoriety because they contain mainly antioxidants as bioactive substances. Free radicals are one of the main responsible for skin aging, which is characterized by the set of inevitable changes that occur progressively in our body and is classified as intrinsic and extrinsic aging, leading to visual changes in both the epidermis and dermis due to the decrease in fibers collagen, elastic and glycosaminoglycans. Although it is currently impossible to prevent or reverse genetic processes of intrinsic aging, the changes caused by free radicals that trigger extrinsic aging can be prevented naturally with the use of oil-based cosmeceuticals. Objective: To review studies in the literature on the use of vegetable oils to prevent skin aging. Material and Methods: A qualitative review of the narrative-type literature was carried out, consulting scientific articles indexed in the electronic databases, SCIENCE DIRECT, SciELO, LILACS, MedLine and PubMed. Results: A current trend in the market for increasingly safer, biocompatible and effective cosmetics is to combine vegetable oils with antioxidant characteristics with other natural and / or synthetic actives in order to provide different functions and associated effects, such as combating premature aging and provide elasticity, firmness, hydration, among other benefits. Conclusion: Brazil has become a primordial country due to the abundance of natural resources in its forest, offering plant ingredients made up of bioactive compounds to the world scenario that work to combat the damage caused by free radicals.
Keywords: Vegetable oils; Antioxidants; Cosmeceuticals; Skin aging.

Resumo
Marco teórico: Os óleos vegetais no mercado de cosméticos estão ganhando cada vez mais notoriedade por conterem principalmente antioxidantes como substâncias bioativas. Os radicais livres são um dos principais responsáveis pelo envelhecimento cutâneo, que se caracteriza pelo conjunto de alterações inevitáveis que ocorrem progressivamente em nosso organismo e é classificado como envelhecimento intrínseco e extrínseco, levando à alterações visuais tanto na epiderme quanto na derme devido à diminuição em fibras de colágeno, elásticas e glicosaminoglicanas. Embora atualmente seja impossível prevenir ou reverter processos genéticos de envelhecimento intrínseco, as alterações causadas por radicais livres que desencadeiam o envelhecimento extrínseco podem ser evitadas naturalmente com o uso de cosmecêuticos à base de óleo. Objetivo: Revisar os estudos na literatura sobre o uso dos óleos vegetais na prevenção do envelhecimento da pele. Material e Metódos: Foi realizada uma revisão qualitativa da literatura do tipo narrativa, consultando artigos científicos indexados nas bases eletrônicas, SCIENCE DIRECT, SciELO, LILACS, MedLine e PubMed. Resultados: Uma tendência atual no mercado para obtenção de cosméticos cada vez mais seguros, biocompatíveis e eficazes é combinar óleos vegetais com características antioxidantes a outros ativos naturais e / ou sintéticos de forma a proporcionar diferentes funções e efeitos associados, como combater o envelhecimento precoce e proporcionar elasticidade, firmeza, hidratação, entre outros benefícios. Conclusão: O Brasil torna-se um país primordial devido à abundância de recursos naturais em sua floresta oferecendo ao cenário mundial ingredientes vegetais constituídos por compostos bioativos que atuam no combate dos danos causados pelos radicais livres.
Palavras-chave: Óleos vegetais; Antioxidantes; Cosmecêuticos; Envelhecimento da pele.

Resumen
Marco teórico: Los aceites vegetales en el mercado cosmético están ganando cada vez más notoriedad porque contienen principalmente antioxidantes como sustancias bioactivas. Los radicales libres son uno de los principales

responsables del envejecimiento cutáneo, que se caracteriza por el conjunto de cambios inevitables que se producen de forma progresiva en nuestro organismo y se clasifica como envejecimiento intrínseco y extrínseco, provocando cambios visuales tanto en la epidermis como en la dermis debido a la disminución de fibras. colágeno, elástico y glicosaminoglicanos. Aunque actualmente es imposible prevenir o revertir los procesos genéticos del envejecimiento intrínseco, los cambios causados por los radicales libres que desencadenan el envejecimiento extrínseco pueden prevenirse de forma natural con el uso de cosmecéuticos a base de aceite. Objetivo: Revisar los estudios en la literatura sobre el uso de aceites vegetales para prevenir el envejecimiento cutáneo. Material y métodos: se realizó una revisión cualitativa de la literatura de tipo narrativo, consultando artículos científicos indexados en las bases de datos electrónicas SCIENCE DIRECT, SciELO, LILACS, MedLine y PubMed. Resultados: Una tendencia actual en el mercado de cosméticos cada vez más seguros, biocompatibles y efectivos es combinar aceites vegetales con características antioxidantes con otros activos naturales y / o sintéticos con el fin de brindar diferentes funciones y efectos asociados, como combatir el envejecimiento prematuro y aportan elasticidad, firmeza, hidratación, entre otros beneficios. Conclusión: Brasil se ha convertido en un país primordial por la abundancia de recursos naturales en su bosque, ofreciendo al escenario mundial ingredientes vegetales compuestos por compuestos bioactivos que trabajan para combatir el daño causado por los radicales libres.
Palabras clave: Aceites vegetales; Antioxidantes; Cosmecéuticos; Envejecimiento de la piel.

1. Introduction

The use of vegetable oils in cosmetics market is gaining more and more notoriety in society, as it contains nutrients that promote softness, hydrate the skin, prevent skin aging and reduce inflammatory processes that trigger the body's natural cellular metabolism. Among these nutrients, antioxidants stand out as natural substances of the human body neutralizing free radical molecules, protecting it from oxidative stress action and giving the skin its elasticity. Free radicals are reactive oxygen species continuously produced by cellular metabolism which may cause skin diseases, damage its structures, such as lipids, proteins and DNA, and premature aging, among others (Draelos, 2010; Graf, 2010; Silva & Brito, 2017).

Aging can be characterized by the set of inevitable changes that occur progressively in our organism throughout our lives and can be classified in two basic ways: intrinsic and extrinsic aging, leading to visual changes in both epidermis and dermis. Evolution in technology has allowed innovations in several industrial areas, including the production of more effective and stable cosmetic formulations, solving aesthetic problems such as premature aging (Pereira et al., 2013; Pereira et al., 2019). In this sense, Brazil is distinguished by the great variety of raw materials, mainly those from the Amazon, being an advantage in the market due to the interest in inputs produced in this region and the development of phytocosmetics or green cosmetics, which associate technology and natural ingredients. Thus, the objective of the present study is to carry out a bibliographic review on the use of vegetable oils to prevent skin aging.

2. Methodology

This study is a qualitative review of the narrative-type literature (Pereira et al., 2018), carried out by researching scientific articles with the following descriptors “vegetable oils”, “antioxidants”, “cosmeceuticals”, “skin aging”, “Açaí (*Euterpe oleracea Mart.*)”,“Andiroba (*Carapa guianensis Aublet.*)”,“Buriti (*Mauritia flexuosa L.*)”,“Brazil nut (*Bertholletia excelsa*)”,“Cupuaçu (*Theobroma grandiflorum*)”,“Murumuru (*Astrocaryum murumuru*)”,“Aloé (*Aloe vera spp*)”,“Oats (*Avena sativa*)”,“Jojoba (*Simmondsia chinensis*)”,“Soya (*Glycine max*)”,“Guava (*Psidium guajava L*)” in the bibliographic bases SCIENCE DIRECT, SciELO, LILACS, MedLine and PubMed. They are considered scientific articles published between the years 2010 and 2021, investigated from August to January 2021. The works were chosen due to their relevance and scientific evidence in order to facilitate the understanding of the scientific community on the researched topic.

3. Results and Discussion

3.1 Skin and its aging process

The pace of changes in organic functions varies not only from organ to organ but also among people of the same age; facts that are part of the aging process. Continuously undergoing renewal, the skin is often divided into epidermis, dermis and hypodermis. The skin plays an important role in maintaining the body's homeostasis, however, over time it is subjected to daily aggressions that threaten its balance, its functions and its beauty through chemicals, pollution, stress and infrared (IV) and ultraviolet (UV) radiations. Consequences can be both invisible and visible through inflammation, burns, edema and premature aging (Lopes et al., 2017).

Skin aging is divided into two types, intrinsic aging that results from the process of natural senescence, depends mainly on hereditary traits and hormonal regulation; and extrinsic aging, which is dependent on external factors, among the main ones are solar radiation, tobacco and pollution. Intrinsic aging occurs in parallel with the aging of all organs, depends on time and results from endogenous damage caused by the temporal accumulation of free oxygen radicals, but also and mainly from individual genetic characteristics, with a degeneration of tissue function, with several significant changes at the structural level of the skin. The aging process comes from a series of events such as: decreased capacity for cell division, reduced synthesis of the dermal matrix, decreased collagen fibers, significant reduction of glycosaminoglycans such as dermatan sulfate and hyaluronic acid because despite a large reinforcement of defense mechanisms, oxygen free radicals lead to significant damage at the membrane, enzymatic and genetic level, leading to changes at the DNA level. Visual manifestations are presented by the appearance of wrinkles, flaccidity, loss of elasticity and expressions, and in some cases benign melanomas, seborrheic dermatitis and angiomas may appear (Lopes et al., 2017; Pereira et al., 2019; Souza et al., 2019).

Extrinsic aging is a type of skin aging in which the influencing factors are not age, but external factors to the body. Initially, it was called photoaging, as it was believed that the main causal agent was radiation (UV and IV). However, there are numerous known and proven factors which influence and generate significant changes on the skin, leading to clinical manifestations of aging, namely factors such as tobacco, environmental pollution, lifestyle (physical exercise, food, consumption of alcohol), physiological and physical stress, causing collagen fiber decrease, almost total degeneration of elastic fibers and complete loss of their structure and function (elastosis) and loss of glycosaminoglycans. This type of aging is also related to free radicals, since a cell acts as a scale, with a balance between oxidizing species and antioxidant species. However, in most organisms, this balanced scale is easily lost, leading to the well-known process called oxidative stress (Dunn & Koo, 2013; Souza et al., 2019).

3.2 Vegetable oils in skin care

The association of vegetable-oil based cosmetic products is a growing trend to meet consumer demands for anti-aging products. Anti-aging cosmetic products act on several fronts, as they reinforce the antioxidant defense, stimulate cell renewal of the skin, promote epidermis hydration, offer photoprotection, stimulate the synthesis of macromolecules such as collagen and elastin, and attenuate wrinkles, providing a youthful skin appearance. Thus, technology combined with new active ingredients increases the effectiveness and tolerance of cosmetic products. The combination with other prevention methods for the treatment of facial skin aging is essential to maintain the results, as these products contain different types of substances and / or active ingredients used to prevent and treat facial skin aging (Baril et al., 2012).

Among these active ingredients, vegetable oils stand out, since they are water-insoluble substances formed predominantly by triacylglycerol esters. The oils can be extracted from grains, almonds and pulps by cold pressing or solvent extraction (Santos Costa et al., 2014). Cold pressing is an extraction method in which the oilseed parts of the species are crushed and the final product has no physical-chemical changes. In solvent extraction, the vegetable is crushed and dissolved

before adding it to the product, which as it is a nonpolar organic compound will penetrate inside the seeds, easily dissolving the oil without reaching other components (Carvalho et al., 2016).

The existence of a wide range of vegetable oils, especially oils extracted from native plants from the largest source of biodiversity on the planet, the Amazon, makes their natural properties intensely valued, thus offering advantages in the most varied applications in the pharmaceutical and cosmetic industries. Oils and fats are composed of 90% fatty acids, which can be found free or, preferably, combined. In combined form, their derivatives are found as monoacylglycerides, diacylglycerides and triacylglycerides, the main compounds of oils and fats. There is a widespread misconception in society that oils come from vegetables, and fats come from animal sources. According to resolution RDC 270/2005, the classification of fatty lipids in oils and fats does not depend on the nature of the oil source, but only on the melting point of the mixture at a temperature of 25 ºC. According to this resolution, at 25 °C oils are liquid and fats are solid or semi-solid. For example, most fish produce oils, such as cod-liver oil, and many vegetables produce fats, such as palm and pequi fats (Ramalho & Suarez, 2013). Among the various oilseed species, the following species stand out with significant action for the purposes of the study:

Assai (*Euterpe oleracea Mart.*)

Assai oil presents itself as a new cosmetic ingredient, originated in the Amazon Forest, which offers numerous benefits for maintaining skin balance. Its structure is mainly composed of anthocyanins, phytosteroids and essential fatty acids. Among the phytosteroids present in assai oil, beta-sitosferol, stigmasterol and campesterol stand out, being widely used by the cosmetic industry, as antioxidants to prevent skin aging. In assai, in addition to the action of the aforementioned antioxidants, which neutralize the damaging action of free radicals on cell membranes, its lipid composition may be involved in reducing the inflammatory process and nociception (perception of pain) (Favacho et al., 2011). The high concentration of polyphenols in the pulp has a high capacity for eliminating superoxide and peroxyl radicals, proposing that assai has anti-aging properties that can be used in the manufacture of cosmetic bioproducts (Lima Yamaguchi et al., 2015; Loureiro Contente et al., 2020). Some cosmetics brands, with natural, organic and biocosmetic certificates are available on the Brazilian market or, at least, with a strong natural appeal that use assai as a raw material for the development of their products. Among some brands Herbia Cosméticos Orgânico stands out, located in Santa Catarina, which uses in its formulations assai oil (*Euterpe oleracea*) for skin treatment aiming to provide softness, consistency and vitality without allowing facial skin to become oily (Tozzo et al., 2012; Yamaguchi et al., 2015)**.**

Andiroba (*Carapa guianensis Aublet*.)

The highest percentage of fatty acid found in andiroba is the oleic acid (52%). Oleic acid is an essential fatty acid (omega 9), which participates in our metabolism, playing a fundamental role in the synthesis of hormones. It is widely used as an additive on soap base and soaps, giving lubricity and emollience. It is also widely found in creams and cosmetic emulsions due to its emollient properties and to restore oiliness to dry skin and scaling problems. In addition, it is used in production of suntan lotions, solar and after-sun products due to its ability to protect and regenerate the skin from damage and burns caused by sun's rays. Traditional Amazonian communities use *Carapa guianensis* seed oil soap to treat skin diseases, arthritis, rheumatism, infections, wounds, bruises and as an insect repellent. Several studies have pointed out anti-inflammatory, analgesic and antiallergic activities of this oil (Silva et al., 2010; Silva et al., 2019).

Buriti (*Mauritia flexuosa L.*)

The chemical composition of buriti contains oleic and palmitic acids, ascorbic acid and carotenoids (Ferreira et al., 2011). Buriti oil acts as an enhancer for sun protection and as a source of carotenoids (prevents cardiovascular diseases), pro-

vitamin A and vitamin E, natural antioxidants in cosmetic, hair and pharmaceutical products. In addition to being a great source of iron, calcium, oil and fibers, it is considered a functional food. Buriti oil has the function of lubricating and regenerating the hydrolipidic barrier of the skin frequently subjected to injuries. When used in after-sun products, buriti oil also prevents damage caused by UV radiation, precisely because it has photoprotective properties (Silva et al., 2010).

Brazil Nut (*Bertholletia excelsa*)

Its chemical constituents are: alpha-linoleic acid, linoleic acid, oleic acid, palmitic acid, stearic acid, antimony, calcium, cerium, cesium, scandium, sterols, europium, stearine ether, excelsin, iron, phosphorus, iodine, ytterbium, lanthanum, lutetium, olein, proteins, samarium, selenium, tantalum, tugnesium and vitamin B. It has a humectant property, which forms a film that prevents water loss from the skin. The oil is rich in unsaturated fatty acids, contains vitamins A, B, C and E, minerals and oligoelements. Used in cosmetics such as moisturizing lotions, bath oils, soaps, etc. In the skin, it can be used as an antioxidant to fight free radicals preventing skin aging effects (Pires et al., 2017).

Cupuassu (*Theobroma grandiflorum*)

Cupuassu is rich in long-chain fatty acids such as stearic, arachidonic and berrenic and also has a large number of antioxidants and metabolic bioactive compounds (Faria et al., 2013). Due to its composition, along with presenting nutraceutical characteristics and the ability to guarantee the stability and quality of food, it has a long-lasting power in humectance, pleasant touch, softness, hydration and reduces trans-epidermal water loss. Therefore, it is currently used in creams, lotions, lipsticks, bath oils, hair conditioners and masks, aftershave emulsions, sticks, creamy deodorants and sunscreens (Silva da Costa et al., 2019).

Murumuru (*Astrocaryum murumuru*)

Murumuru is extracted in the form of fat and currently there are products in the market that use oils extracted from its fruits as raw material, such as *Cheysoap*, a product that gathers saponified triglycerides from palm trees of the genus *Astrocaryum*, using them as additives in soap formulations. The oil extracted from its seed is white and remains in a solid state at room temperature (Burlando et al., 2010). Seed butter can be added to skin care products, shampoos and conditioners because the oil has a water holding capacity (Pires et al., 2017).

Aloé (*Aloe vera spp*.)

Rich in anthracene derivatives (aloin, barbaloin and emodine), vitamins (B complex, vitamins C and E) and minerals. Milks containing 10% glycolic extract are applied as moisturizers and as facial cleansers. Creams with 10% gel have calming, anti-inflammatory, moisturizing and revitalizing actions, useful in sensitive, dry and dehydrated skins (Freitas et al., 2014; Silva et al., 2021). Creams rich in aloesin, a glycosylated compound of aloe, which inhibits melanin synthesis, act in the depigmentation of age spots and melasma. Creams and lotions containing 20% gel can be applied 2 to 3 times a day in the treatment of 1st and 2nd degree burns, sunburns and heat (as protectors of UV rays and skin softeners), in skin irritation, healing of wounds, cuts, calluses and for alopecia treatment (Freitas et al., 2014; Alesa Gyles et al., 2020;).

Oat (*Avena sativa*)

Oil composed of antioxidants, phenolic and hydroxyphenolic compounds and tocopherol isomers, proteins and amino acids, hemicellulose and mineral salts, rich in silica and magnesium. Creams and lotions containing micronized extract are applied to sensitive or inflamed skin, due to its anti-inflammatory, moisturizing and toning action. Seeds cooked at 20% in

compresses may be applied to inflamed skin, with or without itching, or may be included in a warm water cosmetic bath, to obtain the same effect. Poultice obtained from seed flour and hot water (even consistent paste) can be applied to the skin to reduce inflammation or irritation, especially in the presence of itching. Exfoliating facial creams with about 10% of seed flour benefit from the flour's emollient action, obtaining better results in cleaning the skin, preventing it from becoming irritated (Malanchen et al., 2019).

Jojoba (*Simmondsia chinensis*)

In jojoba wax, the wax ester resulting from the esterification of alcohols and unsaturated acids predominates, in addition to the corresponding free alcohols, hydrocarbons and phytosterols that constitute the unsaponifiable. Jojoba oil is derived from the cold pressing of seeds, which when expressed, provide about 50% of liquid wax (jojoba oil), an extract widely used in cosmetic preparations not only as a humectant, but also as a protective filmogen to the skin, that maintains its hydration. In addition to the properties mentioned, the oil also shows analgesic, anti-inflammatory, antioxidant, antipyretic and antibacterial properties. Ointments and creams with a high amount of jojoba wax are indicated for dry and scaly skin, preventing skin aging, protecting and moisturizing the skin. Jojoba wax is widely used in hand creams in order to replace the hydrolipidic film when it suffers aggressions, like the use of products with detergent action. Creams containing jojoba wax are also useful for preventing and fighting wrinkles (Al-Obaidi et al., 2017).

Soy (*Glycine max*)

Seeds are rich in fatty oil with glycolic esters of unsaturated fatty acids, phospholipids (45-60%) (phosphatidylethanolamine, phosphatidylcholine, phosphatidylinositol) and unsaponifiable (lecithins, sterols, fat-soluble vitamins A, E and K), isoflavone glucosides (genistein), proteins, phytic acid and mineral salts. The oil has emollient, moisturizing and protective properties on the skin, having a nourishing and protective action on the epidermis. Creams and lotions with extract containing isoflavones may be applied to aged skin, since they are useful in stimulating skin tissue. The lotions are also applied in case of hair loss due to androgenic alopecia in menopause, granting an anti-aging effect (Foppa et al., 2013).

Guava (*Psidium guajava L*)

It is a fruit rich in fiber, lycopene, vitamin C and phenolic compounds; it has a pleasant and intense flavor, providing remarkable nutritional, functional and sensory properties (Flores et al., 2015). It is a rich source of polyphenols, especially ellagic acid, gallic acid, rutin and catechin, which contributes to a greater use of this fruit as a functional, additive food and also for pharmaceutical products (Santos et al., 2017). The fruit is rich in carotenoids, 80% of which is represented by lycopene, a powerful antioxidant that can maintain the youth of the cells for a longer time, with various cosmetic developments such as anti-wrinkle creams based on guava oil that play an important role in maintaining the quality and health of the eyes, skin, teeth, bones and mucous membranes (Haida et al., 2015).

Currently, it is impossible to prevent or reverse the genetic processes of intrinsic aging, however, changes caused by extrinsic aging are possible to prevent. Therefore, it is necessary to increase the level of antioxidant substances and stop the degradation of the three primary structural constituents such as collagen, elastin and hyaluronic acid, since they decrease with age**.** This prevention can be done via topical application of active ingredients with anti-aging properties or by surgical techniques or dermatological treatments (Henrique & Lopes, 2017).

Cosmetics based on plant products are a trend, in addition to being economically viable, as they find inputs in abundance in the country from renewable resources obtained through sustainable processes, they act naturally in combating the damage caused by free radicals. Oils have as components substances that can be grouped into two major categories: glycerides and non-glycerides. Glycerides are defined as products of the esterification of a glycerol molecule with up to three fatty acid molecules. Non-glycerides are found in small amounts in all oils. Some examples of non-glyceride groups are phosphatides (lecithins, cephalins, phosphatidyl inositol), sterols (stigmasterol), waxes (cetyl palmitate), insoluble hydrocarbons (squalene), carotenoids, chlorophyll, tocopherols (vitamin E), lactones and methyl ketones (Calle et al., 2009). The components justify precisely, in many cases, the cosmetic use of these types of oils, since besides the hydrophobic and protective actions, they have an eutrophic activity that can improve the characteristics of dry and desquamating skins, forming extremely occlusive films on the skin (Miguel, 2011).

4. Conclusion

Cosmetic industry has been gaining prominence in the manufacture of products where it combines technological innovation with plant ingredients to solve various aesthetic problems that range from traditional moisturizers, anti-wrinkles, to those for treatments aimed at preventing cellulite, stretch marks and premature aging. A current trend in the market to obtain increasingly safe, biocompatible and effective cosmetics is the combination of vegetable oils with antioxidant characteristics to other natural and / or even synthetic actives, in order to provide different functions and associated effects, in addition to combat premature aging, it can provide elasticity, firmness, hydration, among other benefits to the skin. Brazil becomes paramount due to the abundance of natural resources in its forest offering to the world scenario, plant ingredients constituted by bioactive compounds which act in the fight against damages caused by free radicals.

Thus, it is observed that in addition to enhancing the national raw materials, the use of vegetable oils can have diverse applications in the cosmetic and / or pharmaceutical area, highlighting its performance against premature aging, thanks to its antioxidant bioactive compounds, which can be used as the main asset or precursors in the development of emulsions, organogels, hydrogels, among other types of carriers. These pharmaceutical forms can have their therapeutic properties enriched with the use of vegetable oils, since among several benefits they are able to promote greater absorption of the active through the layers of the skin, providing the development of topical products to combat in a more practical and agile way the skin disorders.

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