

Texture enhancement from olive richness

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Nature has always been the major source of inspiration for the cosmetic world, and this remains especially true for the olive tree, traditionally and worldwide well-known since ancient times for its range of safe components, particularly suited for skin and body care.

During human history, it was used as a symbol of culture and purity. Many legends tell about olive: one of them is from Greek origin and tells the story of an olive tree coming from the world's boundaries and a harvest by Hercules. The sacred grove of Zeus was born in this legendary place, from whose branches were woven wreaths for the winners of the Olympic Games.

Since ancient times, the beneficial effects of olive and its derivatives have been reported in the nutraceutical, medicinal and dermatological cosmetic fields.

Related to cosmetic benefits, olive oil presents a high dermo-compatibility thanks to the presence of triglycerides, elements naturally present in human skin. This compatibility translates to an exceptional skin tolerance and functionality.

Other beneficial effects of olive and its derivatives are widely reported thanks to the presence of its main and most known principles: phytosterols and their esters, waxes, triterpene alcohols, squalene, α -tocopherol or vitamin E, vitamin A and vitamin K, β -Carotene and chlorophyll, polyphenols (including hydroxytyrosol and tyrosol) as well as long-chained fatty acids and alcohols, mono-, di- and tri-glycerides.

These numerous components are present in olive oil: the saponifiable fraction represented by triglycerides and fatty acids, and the unsaponifiable content, even if present only in small amount (0.5 – 2.0%), is very important for oil stability and flavour.

Fatty acids: especially represented by oleic acid, and in lower proportions palmitic stearic or linoleic acids. These components allow to regulate skin natural hydration system by repairing the protective hydrophilic film.

Squalene: naturally present in human skin and produced by sebaceous glands, it

Abstract

This article is designed to prove the added value brought by a production process based on circular economy model: re-valorization of agro-food by-products to develop performing cosmetic ingredients. A range of sustainable esters has been developed through the valorization of Italian richness in agricultural heritage.



constitutes a key component for hydrophilic film (responsible for integrity, through a protective barrier, and healthy appearance of skin surface). It limits water loss by perspiration; it is an excellent skin-moisturising agent; it prevents against entrance of microorganisms, and gives a specific elasticity to the skin.

Antioxidants: especially represented by vitamin E (tocopherol), vitamin A, vitamin K and polyphenols. In particular, hydroxytyrosol is one of the key compounds that helps to prevent free radical damage. All these precious components are able to neutralise the free radicals that cause skin damage and which allow olive oil to act as a skin moisturiser and protector.

Other components: represented by numerous compounds, traditionally known for their benefits.

Olive oil is used as a key ingredient in a wide variety of soaps, creams, lotions, shampoos and other cosmetic products. It acts as a perfect skin moisturiser (if applied to face or body, olive oil penetrates deeply into the skin and provides a long-lasting shield of hydration, for a supple and smooth skin), it is a simple solution for dry nails and cuticles, it can effectively remove makeup without irritating the skin and it can be also considered as a deep hair conditioner and a dandruff controller, leaving hair shiny and strengthened.

Development: sustainable esters from non-edible olive oil

ROELMI HPC chose, for its path of growth and production, to pursue sustainable development in the continuing study and research of ingredients that meet the NIP®

(No Impact In Progress) criteria in regards to:

- Efficacy (high-performance ingredients tested and appreciated for their technological or efficient aspect)
- Safety for the people (key component of our philosophy: our ingredients are subject to stringent controls ensuring consumer's safety)
- Safety for the environment (informing on the importance to choose, when possible, eco-friendly ingredients ensuring lower impact on the environment).

To investigate the benefits of using Olive Oil by-products in cosmetics, high-quality raw materials, coming from a transparent, circular economy model and traceable Italian supply chain, where only soft technologies, which maintain a natural profile, are selected.

The result is a range of high performance ingredients (Olifeel® Line), with specific cosmetic functions, obtained from high purification of fractions of *Olea europaea*. Each element of the line results in such purity that allows formulators working with complete freedom in choosing a natural ingredient with high versatility thanks to its chemical nature, which provide a wide variety of applications.

Olifeel Line is based on standardised substances, specifically rebuilt similar to olive oil for cosmetic purpose. They are not directly extracted or taken from olive oil derivatives, but designed to get the best performance.

The main bricks of this line of ingredients are basic molecules that could be obtained by all olive oil by-products. The fundamental step is ROELMI HPC know-



how on their assembly to obtain specific ingredients.

Impurities coming from by-products are really reduced in the final ingredients of this line, thanks to production steps which take advantage only of selected molecules, isolating them from the rest.

The process of olive fraction purification happens once they have already exited the food production chain. Results are: (i) natural touch and stabilising rheology modifier and (ii) natural actives carrier and skin-feel enhancer.

Inspired by nature and recognising the

excellent properties of olive oil on the skin, ROELMI HPC has broken down and recreated a line of olive-oil-like ingredients to reach the best sustainability without losing any property of nature perfection.

The natural touch and stabilising rheology modifier

Olifeel® Pearls (C10-18 Triglycerides) is a potent and versatile rheology modifier/gelling agent, able to thicken any anhydrous oily system at different percentages, showing different characteristics versus classic triglycerides: it is solid, white, odourless, and shows a higher melting point (not melting in contact with body heat). Triglycerides are fully saturated, without double bonds. Indeed, they show a peculiar configuration, inferring a precise and repeatable conformation at the molecular level, promoting molecular interactions by hydrogen bridge bonds (i.e. especially strong dipole-dipole attractions). Its olive unsaponifiable content can also help anti-oxidation and emollience for a dual 'function and care' nature.

This rheology modifier/gelling agent shows a superior compatibility with the majority of cosmetic lipophilic ingredients, even from different origins (natural, mineral or synthetic). Though its performance is not exclusive, it is interesting to note that the affinity is also very good for silicones, esters and other hydrophobic substances. With mineral oils, the affinity seems to depend more on the length of the carbon chain. The longer the chain is, the higher the viscosity is, the better affinity is (please refer to Figure 1).

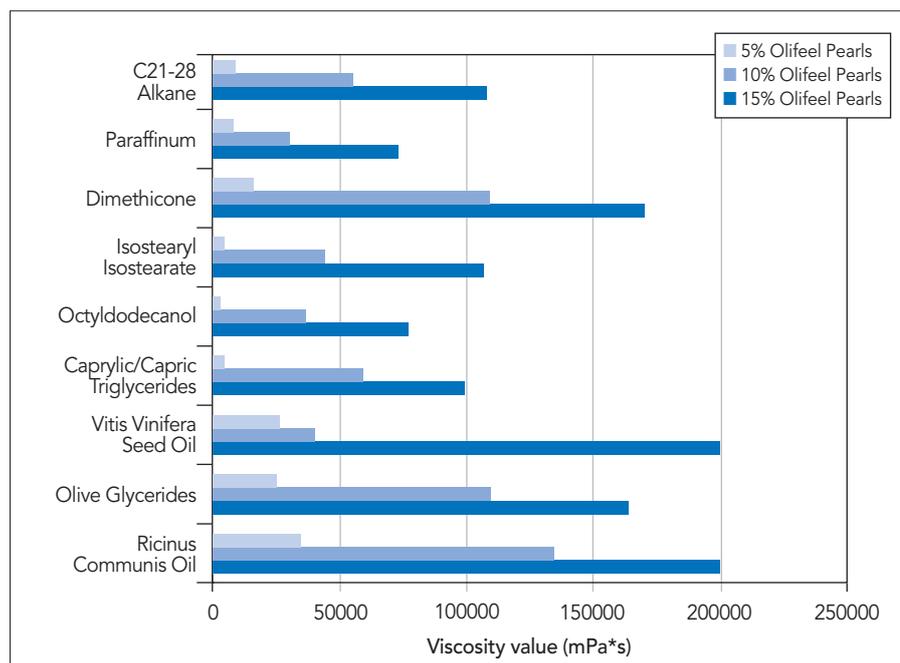


Figure 1: Gelling effect.

Thinking about the Water Free trend, this rheology modifier/gelling agent combined with esters can be used as binder for powders giving the possibility to create anhydrous formulas such as lipstick, eyeshadows, foundation and many others.

Furthermore, it is demonstrated (data not shown) that Olifeel Pearls is able to significantly increase the measure of viscosity for a simple emulsion in a dose-dependent manner starting from just 0.5% of dosage.

This ingredient proved to help the stability of the formula, increasing the viscosity during the test period both at room temperature as well as in warm room (40°C).

It also brings to the finished formula an exceptional multi-dimensional effect, from technical to a sensorial point of view:

- Important viscosity increase in every type of finished product.
- More compact and homogenous structure helping to reach a more stable formulation.
- Cosmetic benefit by giving to the final formulation a nicer appearance, together with triglyceride emolliency & creamy, comfortable not-greasy touch with a soft, nourishing skin-feel.

Moreover, this ingredient is available in an easy-to-manipulate colourless pearls form with a regular shape, optimising a safe manipulation by operators and minimising the risk of environmental contamination, hence reaching the company criteria of sustainability ("No Impact in Progress®" program).

The natural actives carrier and skin-feel enhancer

Olifeel SKin (Triolein, Glycerol Dioleate), thanks to its unique composition and glyceride nature, is different from other natural oils. It has been developed through:

A 75% skin affinity focus (triglycerides are naturally present in human skin, therefore they confer to this ingredient a light and evanescent film and a perfect skin biocompatibility, acting as a carrier of lipophilic ingredients);

A 25% formula affinity focus (diglycerides help to stabilise the formulas thanks to their polar nature and can give to the finished product interesting stable feel). The genuine skin-feel is a key feature that reveals its natural origin without greasiness or tackiness, as it is strongly dermo-compatible with human skin.

Thanks to its specific properties, the ingredient provides a multi-benefit action to finished formulas: a very good compatibility with both skin and formula, a better resistance to oxidation as well as a higher stability enhanced with a quick skin penetration. A soft touch and a gliding effect linked to a non-greasy skin-feel

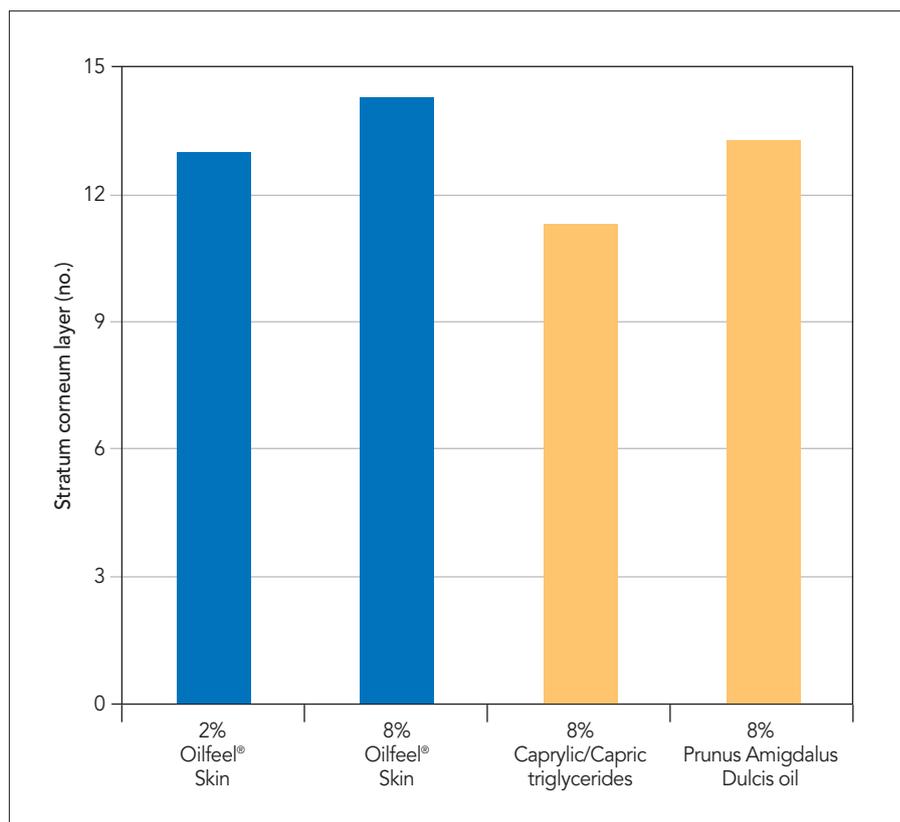


Figure 2: Skin penetration.

complete the ingredient profile.

The efficacy of the ingredient in enhancing the skin absorption of the emulsion was carried out by means of the skin stripping technique by using Corneofix® foil on 10 female subjects (aged 18-65 years old). Results confirmed the quick effectiveness in time (30 min) and at low dosage. Triolein, Glycerol Dioleate enhances the emulsion absorption when compared to the benchmarks: up to +26.5% than caprylic/capric triglycerides and up to +7.5% than Almond Oil (please refer to Figure 2).

It brings to the finished formula a highly satisfying sensorial experience: a light balanced film-forming property, a nice soft feel, a quicker emulsion penetration and a higher comfort to the skin, which remains perfectly and gently smoothed (ideal for skin care, body care and baby care applications). It is possible to use Triolein, Glycerol Dioleate in a wide range of makeup products thanks to its emolliency properties, matte aspect as well as for its ability to disperse pigments, or to carry a particular lipophilic active, acting as a real booster of penetration.

Inserted into toiletries, rinse-off products (bath and shower gel), Triolein, Glycerol Dioleate provides long lasting protective effect after towel drying, skin moisturisation, excellent skin conditioning leaving a very light and discrete film and a pleasant and silky skin-feel.

When used into hair care formulations

(shampoo, conditioner, hair mask), Triolein, Glycerol Dioleate improves hair look, feel and manageability. It exerts a rich emollient action that conditions the hair and makes it easy to comb.

Olifeel SKin shows a soft touch, increasing skin penetration thanks to its dermo-compatible nature. With a light and balanced film-forming effect, it brings a nice and soft feel to the skin. With a unique matte aspect, perfect for skin care, it sets new trends for makeup. Its low tackiness confirms the high absorption benefit as well as a velvetier touch.

Conclusions

Rising interest towards natural beauty should take into consideration the related impact on environment of the ingredients involved. The present work demonstrates that circular economy adapted to cosmetics opens the possibility to minimise the impact: non-competition with food supplies keep them precious for humankind and create value for the industry.

In fact, Olifeel ingredients demonstrated to be an ethical source for cosmetic applications looking for concrete action towards sustainability.

Those innovative ingredients link two different concepts: innovation and sustainability. Innovation characterised by proved performances in enhancing formula texture together with other beneficial effects and sustainability linked to the circular economy models supported. PC