PERSONAL CARE
INGREDIENTS • FORMULATION • MANUFACTURE

Natural emulsifier with texture and skin care benefits
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Emulsun® (INCI: Hydrogenated Sunflower Seed Oil Polyglyceryl-3 Esters (and) Hydrogenated Sunflower Seed Oil Glyceryl Esters (and) Cetearyl Alcohol (and) Sodium Stearoyl Lactylate) is a sunflower-derived o/w emulsifier, in particle form, that can be utilized in skin and hair care applications. This versatile, natural emulsifier helps create stable, aesthetically pleasing emulsions.

Emulsun (now referred to as ‘the sunflower-derived emulsifier’) comes in easy to handle spherical particles. The free flowing particles improve dosing precision from bench-top formulations to large scale production lines. This unique particle form also offers an increased surface area compared to flakes or pellets, allowing the sunflower-derived emulsifier to be efficiently melted and blended. This characteristic improves throughput, lowers heating requirements, and results in a greener production process.

The sunflower-derived emulsifier is compatible with natural and synthetic oils, esters, silicones, ethanol, sunscreens, and thickeners. The sunflower-derived emulsifier is composed of monoesters of sunflower oil, which contain high amounts of stearic and palmitic acid. The sunflower oil used to create it undergoes an innovative refining process to preserve the sunflower wax-ester and fatty alcohol components. Sunflower wax-esters have a unique botanical composition with carbon lengths C38-C50. The associated fatty alcohols are equally unique and range from C16-C30 in chain length. These help increase formulation stability and contribute to skin and hair emolliency.

Other formulation benefits of the sunflower-derived emulsifier include: PEG-free, HLB independent, non-ionic, preservative-free, biodegradable, and low cost.

Liquid crystal structure
The sunflower-derived monoglycerides and polyglyceride esters form a synergetic crystalline structure that can create microemulsions without shear mixing. The specific combination of the hydrophilic and hydrophobic structures in the sunflower-derived emulsifier generates a self-aggregating hexagonal liquid crystal phase with oil in water formulations that can be witnessed during cooling.

These tightly packed liquid crystal aggregates decrease surface tension and strongly promote emulsification.

Clinical study
In double-blind, vehicle-controlled, randomized clinical studies, the sunflower-derived emulsifier produced the following benefits:

- Increased skin hydration up to 1.2 times more than other emulsifiers (Fig 1)
- Reduced TEWL up to 6.4 times more than other emulsifiers (Fig 2)
- Allowed for a variety of product aesthetics by changing the loading level (Fig 3)
- Allowed for the inclusion of sunscreen actives with minimal effect on product aesthetics (Fig 4)

Study objective
The purpose of this investigation was to evaluate the sunflower-derived emulsifier in an o/w emulsion compared to other emulsifiers for its ability to increase skin hydration and reduce TEWL.
hydration, reduce TEWL, and provide a variety of product aesthetics.

Increased skin hydration and reduced TEWL
Skin hydration measurements using a Corneometer and TEWL measurements using a Tewameter were taken before and after a single test article application. Emulsifiers were compared within an o/w emulsion with 20% oil for skin hydration and TEWL (n=18). The results are shown in Figures 1 and 2. The lotion containing 6% of the sunflower-derived emulsifier increased skin hydration up to 1.2 times more and decreased TEWL up to 6.4 times more than the other emulsifiers.

Consumer perception
The sunflower-derived emulsifier was evaluated by female consumers (n=24-26) on a 1-5 scale for initial product observations and skin feel immediately after application. The higher the score, the more the listed attribute was perceived by consumers (e.g. a score of 5 for moisturization indicates moisturized skin, whereas a score of 1 indicates dry skin). For the texture attribute, a higher score indicates a thicker product. The results appear in Figures 3 and 4 and show that the sunflower-derived emulsifier enabled the creation of a medium texture lotion to a heavy cream without affecting the stickiness or greasiness of the product.

Formulations study
The texture (e.g. thickness, silkiness, slip, and spread) of a formulation can be adjusted in numerous ways. The sunflower-derived emulsifier was evaluated with a variety of emollients, different loading levels, and with and without the use of thickeners to demonstrate the versatility of compatibilities and achievable textures.

- The sunflower-derived emulsifier is compatible with a diverse assortment of emollients which produce different textures in the finished formulation (Fig 5).
- The viscosity of a formulation can be tailored by adjusting the loading of the sunflower-derived emulsifier (Fig 6).
- The texture of a formulation containing the sunflower-derived emulsifier can be altered with a wide selection of thickeners (Fig 7).

Figure 3: Emulsun allowed for the creation of a medium texture lotion to a heavy cream without affecting the stickiness or greasiness of the product.

Figure 4: Emulsun allowed for the inclusion of organic sunscreens without noticeably affecting product aesthetics.

Figure 5: Emulsun can be used to create stable formulations with a variety of emollients with a range of rHLBs from 4-9.

Figure 6: Emulsun is versatile and gives formulators a variety of rheology options for stable formulations.

Figure 7: Although Emulsun does not require a thickener to create a stable formulation like many other natural emulsifiers, it is compatible with natural and synthetic thickeners.
**Formula: Hydrating Silicone-Free Day Cream with L22 and Emulsun**

This lightweight, hydrating facial cream is delicate enough for daytime wear under makeup and powerful enough to provide all day moisturization. The sunflower-derived emulsifier, a versatile naturally-derived PEG-free emulsifier, allows for viscosity and product feel customization, while also adding skin hydration and barrier function benefits. The use of Floramac 10 in this formulation imparts the skin with radiance, while L22 delivers its patented lipid profile of a healthy 22 year old. Additionally, the Floratech emollients (Florasun 90, Floraesters 15, and Floraesters 60) provide the moisturization and emolliency benefits to this excellent formulation.

**Conclusion**

Emulsun is a botanical, low-cost, PEG-free emulsifier which forms liquid crystal emulsions without shear mixing. It is a versatile sunflower-derived o/w emulsifier delivered in easy to handle particles. Emulsun offers formulators the flexibility to achieve target viscosity without the use of secondary emulsifiers and is therefore an excellent choice to create stable, aesthetically pleasing emulsions. Emulsun performs well in a wide range of skin care applications allowing for effective viscosity modification and the formation of a pleasing texture without a white residue. Emulsun also contributes to additional benefits, including increasing hydration and decreasing TEWL, all while maintaining excellent sensory attributes.

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