Improve Shelf Life of Finished Formulations

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The inherent stability of an emollient is important in ensuring the shelf stability of the finished product. Natural and synthetic oils, fats and waxes degrade over time due to oxidation. The elapsed time in which a material will degrade is influenced by a number of factors, including the degree of saturation, presence of antioxidants or pro-oxidants, and prior stress (UV exposure, excessive heating, repackaging etc.).

Oxidative instability is primarily the process of oxygen attacking points of unsaturation. As oxidation progresses shorter chain acids, aldehydes, and ketones are formed. These oxidation products degrade the original texture, odor, consistency and sensory attributes of both the emollient, and finished product. Minimizing oxidation is key to preserving finished product attributes.

Oxidative stability index (OSI) indicates the oxidative stability of an emollient. The OSI is expressed in hours and is measured by an Oxidative Stability Instrument.* **Figure 3** contains many common emollients and their respective OSI (hours).

Polyunsaturates and Instability

The OSI of emollients is inversely correlated with the degree of unsaturation. Inexpensive vegetable oils often contain high amounts of polyunsaturates, and other undesirable elements which are oxidatively unstable, (see **Figure 1**).

Emollients containing high levels of polyunsaturates have a significantly lower OSI, and are inherently unstable. Conversely, emollients with low unsaturation are inherently stable.

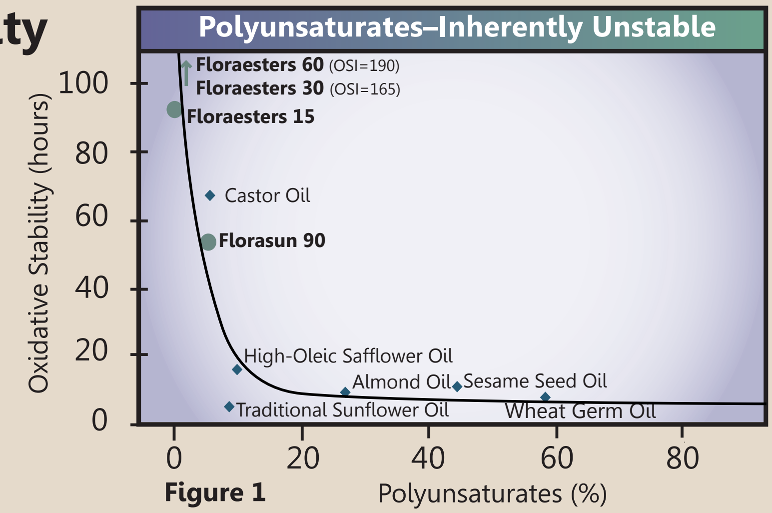

Figure 1

Shelf Life: More Antioxidants Are Not The Answer

Formulators often attempt to remedy emollients' instability by adding antioxidants. Interestingly, antioxidant efficacy is positively correlated with an emollient's inherent stability. **Figure 2** shows that the OSI of inherently unstable emollients such as high-oleic safflower oil and apricot oil may only be slightly improved by the addition of tocopherols.

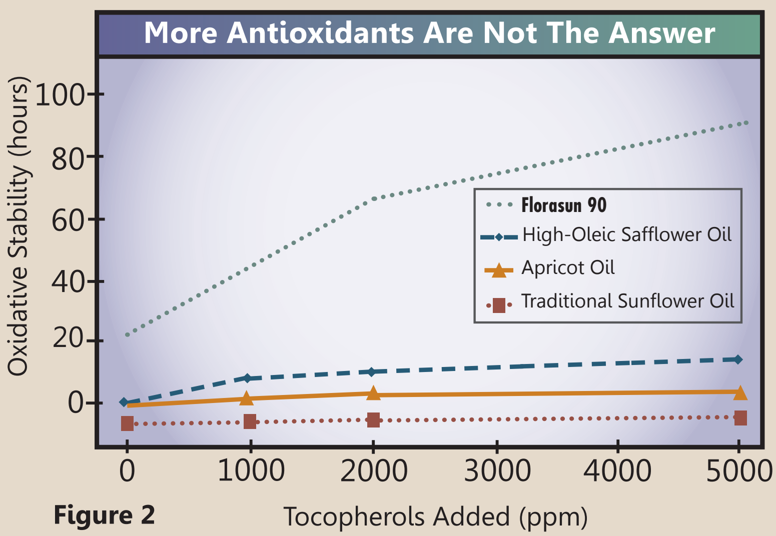

Figure 2

Conversely, the OSI value of inherently stable emollients such as Florasun 90 are significantly improved by the addition of tocopherols. This relationship, though counterintuitive, holds true for most natural emollients: Stable emollients improve significantly with the addition of antioxidants while unstable emollients do not.

Formulators who wish to achieve an oxidatively stable formulation are well advised to use inherently stable emollients.

* OSI method - AOCS Cd 12b-92

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Figure 3 contains many common emollients and their respective Oxidative Stability Index (OSI) measured in hours.

An OSI less than 20 hours is generally considered unstable.

The original oxidative state of an emollient is important for ensuring stability of the finished product.

Highly stable emollients contribute to highly stable finished products.

Unstable Emollients

(OSI Value Less Than 10 Hours)

Almond Oil, Argan Oil, Borage Oil, Canola Oil, Cottonseed Oil, Evening Primrose Oil, Grape Seed Oil, Mango Butter, Olive Oil, Rice Bran Oil, Rose Hip Seed Oil, Sesame Seed Oil, Soybean Oil, Mid-Oleic Sunflower Oil (65% Oleic), Traditional Sunflower Oil (30% Oleic), Walnut Oil, and Wheat Germ Oil.

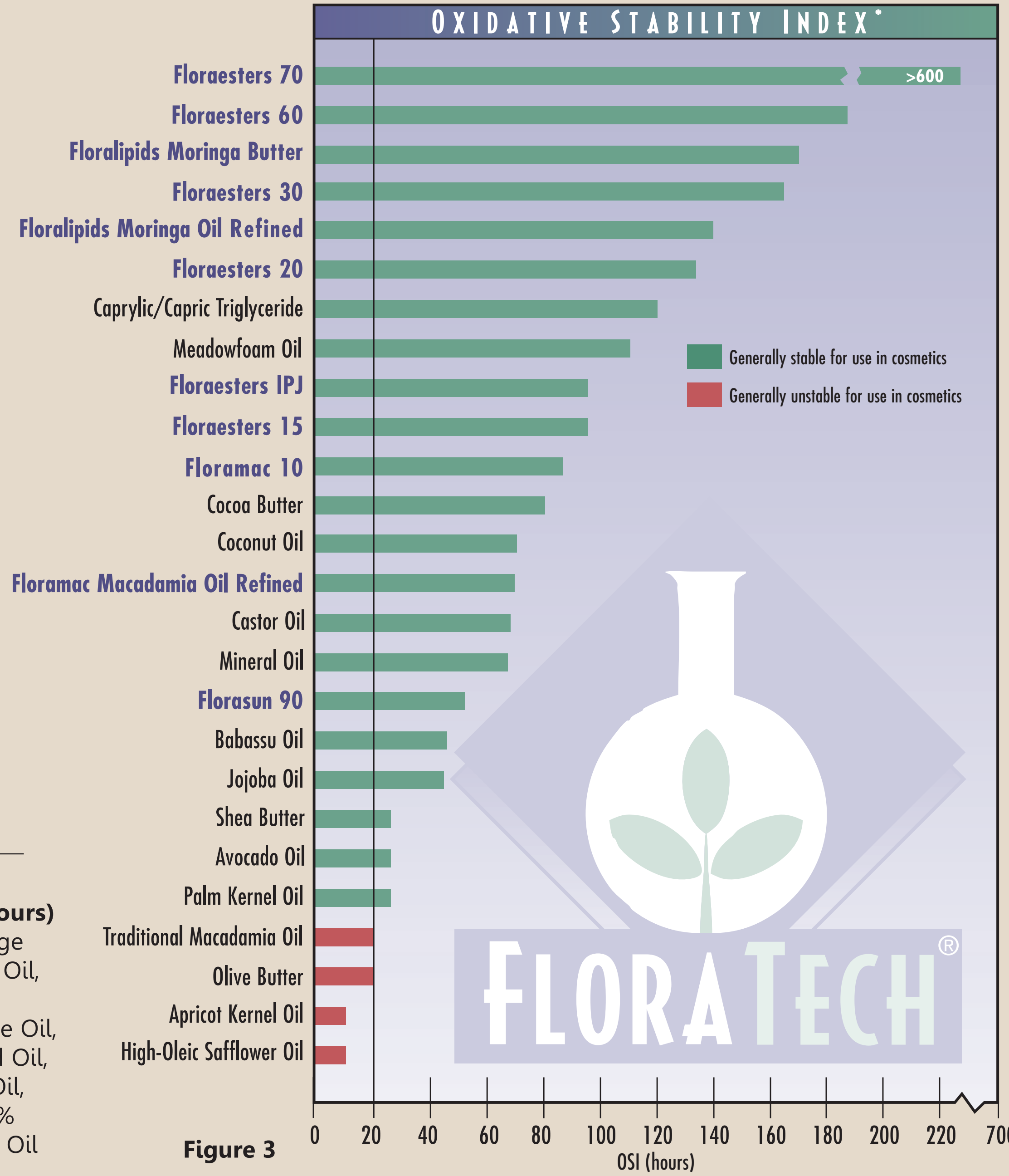

Figure 3

Measuring Oxidative Stability

To measure the OSI of an emollient, a sample of material is heated to 110°C under constant airflow, (see A on **Figure 4**). The exposure to the oxygen and heat simulates an accelerated passage of time. As oxidative degradation of the material begins, volatile short chain fractions break away from the molecule, are entrained in the airflow, captured in distilled water, and are detected by a conductivity probe, (see B on **Figure 4**).

The inflection point (the time at which conductivity values rise rapidly) determines the OSI in hours and indicates the point at which the oil becomes rancid.

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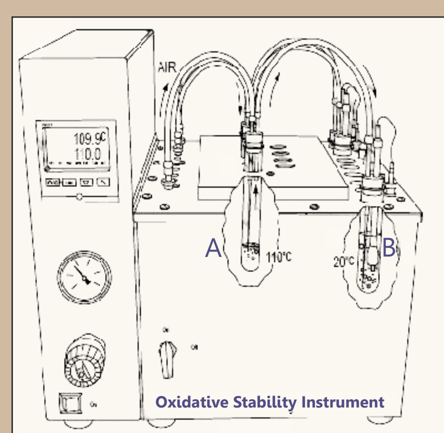

Figure 4

*OSI method - AOCS Cd 12b-92

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