Macadamia nut oil is a unique botanical that produces one of the most stable natural emollients available. Melanie Cummings, Kelley Dwyer and Robert Kleiman of International Flora Technologies and John Reinhardt of Reinhardt Consultants explain.

Macadamia nut (Macadamia integrifolia) nut oil has been available to cosmetic formulators since 1985 with early applications in the emerging range of 'liposome' products.

The oil was erroneously thought to have the same typical oxidative stability problems as other triglyceride oils from botanical sources. However, macadamia nut oil's stability is just the opposite. This unique botanical produces one of the most stable natural emollients available.

The inclusion of mixed, natural tocopherols augments macadamia nut oil's stability even further. Superior oxidative stability, particularly in the presence of certain pigments and sunscreen additives, combined with its exceptional emollient properties, elegant skin feel and consumer appeal, makes macadamia nut oil an excellent choice for a range of skin treatments, sunscreens, aromatherapy oils, lipsticks and decorative products.

**Oxidative stability**

The total unsaturated fatty acid content of macadamia nut oil is typically greater than 85%. Since the unsaturated fatty acids present in the oil are almost entirely mono-unsaturated and not polyunsaturated, macadamia nut oil has excellent oxidative stability (i.e. an unusually high resistance to rancidity). This is verified through the use of an oxidative stability instrument (American Oil Chemists' Society Method Cd 12b-92).

The oxidative stability index (OSI) of macadamia nut oil has always rated high (OSI of 20-25 hours) relative to other naturally-derived oils (OSI of 2-15 hours). When 500ppm natural tocopherols are added to macadamia nut oil, the OSI more than triples, increasing to about 70 hours. Adding 1000ppm tocopherols can increase the OSI to more than 100 hours and the use of synthetic antioxidants can boost the OSI stability of macadamia nut oil to even higher values.

Hawaiian macadamia nut oil ranks very high on the list of stable cosmetic oils, ahead of oils such as squalane, sesame oil, almond oil, hybrid safflower oil and hybrid sunflower oil.

Figure 1 illustrates the relative oxidative stability of several oils commonly used by the cosmetic industry, including mink oil. Mink oil is...
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Most of the sunscreen agents tested increased the already high oxidative stability of macadamia nut oil. Combining 10% titanium dioxide with macadamia nut oil containing mixed natural tocopherols increased the oxidative stability of the oil by 100%. This information may be useful for sunscreen formulators and serves as an aid in selecting emollients in sunscreens to promote the oxidative stability of finished products.

Colour cosmetics (lipstick, eye shadow, foundation) are currently undergoing exceptional growth in many world markets. Certain pigments are known to promote oxidative instability in colour cosmetics, especially when used in high concentrations. Macadamia nut oil was found to be affected as well, but not as drastically as other natural oils commonly used in colour cosmetics. Figure 3 illustrates this finding.

The addition of 10% iron oxide pigment to control oils (containing 1000ppm mixed natural tocopherols) caused a decrease in the oxidative stability of all the tested oils.

However, the stability of macadamia nut oil containing iron oxide was higher than the stability of other tested oils. Similar results were found in the presence of 10% zinc oxide. Hybrid sunflower oil also exhibited good stability in the presence of 10% iron oxide pigment.

Macadamia nut oil has also been found to act as an emollient oil in skin whitener formulations. Skin whiteners sometimes develop rancid colours within a short period of time. In our laboratory, we mixed either 1% kojic acid, 7% a-hexin or 3% magnesium ascorbyl phosphate (MAP) into macadamia nut oil and other botanical oils (containing 1000ppm mixed natural tocopherols).

We determined the oxidative stability of these control oils and compared the results with the same oils containing the whitener. Results are presented in Figure 4. Overall, macadamia nut oil exhibited significantly greater oxidative stability in the presence of whiteners than other oils tested. Hybrid sunflower oil also exhibited good stability. Kojic acid extended the oxidative stability of macadamia nut oil (20%) and hybrid sunflower oil (17%).

The expanded use of AHAs and BHAs warranted a study of the effect these types of ingredients have on the oxidative stability of natural oils. A number of the control oils were tested containing 1000ppm mixed natural tocopherols. To each oil was added 1% malic acid or 2% salicylic acid. The oxidative stability of these oils was then tested.

Malic acid was chosen because it is considered to be an alpha hydroxy acid (AHA), while salicylic acid is...
beta hydroxy acid (BHA). Figure 5 illustrates that malic acid improved the oxidative stability of macadamia nut oil and hybrid sunflower oil. Traditional sunflower oil and almond oil lost oxidative stability in the presence of malic acid.

The addition of salicylic acid generated improvements in the oxidative stability of macadamia nut oil, hybrid sunflower oil and sesame oil. As with malic acid, traditional sunflower oil and almond oil lost oxidative stability in the presence of salicylic acid. Attempts to measure the effect of glycolic acid on the oxidative stability of botanical oils were not successful.

Among botanical emollients, macadamia nut oil is functionally one of the most oxidatively stable emollient oils available to the cosmetic formulator. In addition to its functional benefits, consumer perception of macadamia nut oil is of an upscale, high-end, high quality product. This is reinforced by the high price that macadamia nuts command in the retail market. This safe, plant-derived oil is from a renewable resource and comes from a stable and increasing supply base. Its rich, 'cushiony' skin feel makes macadamia nut oil an excellent choice for skin care and lip care products.

References

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Reprinted from SPC May 1999