OLIVE OIL DERIVATIVES PREVENT HAIR DAMAGE

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Stefania Abbattista, Alain Thibodeau, Sergio Amari – Italy This article examines the efficacy of olive oil derivatives in preventing hair damage that can be caused by brushing. Olea Europea (olive) leaf extract, water* is an active ingredient extracted from the leaves of the olive (Olea Europaea) tree having antiradical, antioxidant and bacteriostatic activities.

The natural product presents very interesting properties due to the synergistic effect of its flavonoid and polyphenolic components, mainly Oleoeuropeine.1 When incorporated into a shampoo at concentrations ranging between 0.5 to 1%, the olive leaf extract shows an important soothing effect demonstrated by extrapolation of the data obtained with an in-vitro alternative use to assess eye irritation potential.

Results have shown that the addition of Olea Europaea (Olive) Leaf Extract, Water reduces the irritation index of the control shampoo formula by 1.4-fold and 2.2-fold when present at concentrations of 0.5 and 1.0%, respectively.2

Hydrogenated Olea Europaea, Olea Europaea (Olive) Fruit Oil, Olea Europea (Olive) Oil Unsaponifiables** is a natural wax obtained from refined olive oil that contains the unsaponifiable fraction of olive oil itself. The presence of that fraction renders the wax highly compatible with the human skin giving emollient and restructuring properties.3,4

Hydrogenated Olea Europaea, Olea Europaea (Olive) Fruit Oil, Olea Europea (Olive) Oil Unsaponifiables is also widely used in hair-care products, in particular hair-masks and hair-conditioners, where, thanks to the presence of the unsaponifiable fraction, it provides an appreciable softening action.4

The interesting properties displayed by those two olive oil derivatives position them as unique ingredients for hair-care products.

Shampoo and rinse-off conditioner products were formulated with and without those ingredients (leaves extract and olive wax) to verify their efficacy in protecting the hair structural integrity from brushing and cleansing treatment induced mechanical and chemical stress, respectively.

Hair morphological was assessed by digital image acquisition using Scanning Electron Microscopy (SEM).

Formulations tested

The formulations tested were those of a shampoo and a rinse-off conditioner (Table 1).

Treatments

All cosmetic treatments were applied on homogeneous set of natural swatches having equal circumferences.

The swatches were kept under controlled conditions between treatments and SEM analyses to avoid mechanical damage to the hair structure.

The following treatments were performed:

Treatment 1: Water.

Treatment 2: Placebo shampoo.

Placebo rinse-off conditioner.

Treatment 3:

Shampoo with 0.5% of Olea Europaea (olive) leaf extract, water.

Rinse-off conditioner with 0.5% of Olea Europaea (olive) leaf extract, water and 1% of olive oil, Olea Europaea (olive) fruit oil, Olea Europaea (olive) oil unsaponifiables.

Experimental protocol

Washing (with a water temperature of 32+2°C) and brushing (temperature 20+2°C; relative humidity 50+5%) were performed for two consecutive days with the following procedure:

Day one:

- First shampoo + conditioner application for 15 minutes. Rinsing-off and drying with hairdryer for 3 minutes (medium temperature).
- Second shampoo (two hours after the first) + conditioner application for 15 minutes. Rinsing-off and drying with hairdryer for 3 minutes (medium temperature)

Day two:

- Third shampoo + conditioner application for 15 minutes. Rinsing and drying with hairdryer for 3 minutes (medium temperature).
- Fourth shampoo (two hours after the third one) + conditioner application for 15 minutes. Rinsing-off and drying with hairdryer for 3 minutes (medium temperature).

After the application of the last treatment, each swatch was divided in two parts: one was brushed (100 strokes of medium hardness), while the other one was not brushed (control).

Analysis with scanning electron microscope (SEM)

At the end of the experimental procedure described above, the following hair samples were obtained (Table 2 and Fig. A).

Preparation of the samples for SEM analyses

For SEM analyses, segments of hair of the same length and cut at the same height within the swatches were used. Digital pictures were obtained by SEM, at a magnification of 800x (SEM LEO 1430, Japan).

Results

The effects of the different hair treatments and the protection provided by the olive wax and the olive leaf extract were evaluated on images photographed at various stages. The presence of buckled cuticles and signs of abrasions was particularly scrutinised.

Swatch 1: Control (Fig. 1)
The control swatch (not treated and not rinsed) shows a good morphological integrity. The hair surface appears uniform and characterised by compact cuticles with homogeneous borders.

Swatch 2: Treated with water (Fig. 2)
Hair treated with water shows a particular difference respect to the control. It is possible to underline the presence of a normal morphological profile.

Swatch 3: Treated with water and then brushed (Fig. 3)
Hair treated with water and then brushed is particularly damaged. It is possible to observe the presence of many eroded and deformed scales with irregular edges.

Swatch 4: Treated with shampoo and conditioner without active ingredients (Fig. 4)
Hair treated with shampoo and conditioner lacking active ingredients is not different with respect to the control swatch.

Swatch 5: Treated with shampoo and conditioner without functional ingredients and then brushed (Fig. 5)
Hair treated with shampoo and conditioner lacking active ingredients and then brushed is different with respect to the control swatch. Deformed scales and grooves along the hair axis can be detected.

Swatch 6: Treated with "active" shampoo and conditioner (Fig. 6)
Hair treated with shampoo and conditioner containing the functional ingredients mentioned above does not display alterations or morphological differences with respect to control swatch.

Swatch 7: Treated with "active" shampoo and conditioner and then brushed (Fig. 7)
Hair treated with shampoo and conditioner containing the functional ingredients mentioned above does not exhibit significant change. The scales are regularly oriented and characterised by homogeneous borders. There is no groove along the hair long axis.

Conclusions

The pictures (Fig. 2–8) obtained with SEM show clear differences between swatches washed using different treatments and then subjected to a physical stress (brushing).

Treatments containing shampoo and conditioner made with or without functional ingredients have shown to be superior in protecting hair morphological integrity when compared to water treatment alone.

The results could be partially explained by the substantive effect of the conditioner that provides consistency and shine to the hair and eases combing.5

The protection provided by those "non-functional" shampoos and conditioners are, however, not complete as non-homogeneous cuticles presenting indented borders and grooves can be observed.

The treatment with "active" shampoo and conditioner containing Olea Europaea (olive) leaf extract, water and hydrogenated olive oil, Olea Europaea (olive) fruit oil, Olea Europaea (olive) oil unsaponifiables performed a total protection of hair morphology.

In this case, no superficial alterations or signs of abrasion were observed. This protective effect can be attributed to the properties of the ingredients Olea Europaea (olive) leaf extract, water and hydrogenated olive oil, Olea Europaea (olive) fruit oil, Olea Europaea (olive) oil unsaponifiables.

The former is a natural extract containing phenolic substances with antioxidant activity, especially Oleoeuropeine, a glucoside made by elenolic acid and dihydroxyphenylethanol. The two ossidrilic groups of Oleoeuropeine (in position 3 and 4 with respect to the ethoxylic chain) determine a resonance condition that stabilises the intermediate phenoxy-radical through an intermolecular hydrogen bound. This creates an antioxidant action by blocking the chain reactions due to the highly unstable free radicals molecules.6,7

As a result of the free-radical scavenging effect and lower oxidative potential, it is possible to prevent the alterations due to external insults that can damage the hair morphology. Swatches treated with antioxidant and free-radical scavenging substances are less sensitive to mechanical and chemical stress and become protected against the aggressive action of brushing.

The second ingredient, hydrogenated olive oil, Olea Europaea (olive) fruit oil, Olea Europaea (olive) oil unsaponifiables, is a wax with excellent reticular properties. Thanks to this characteristic, the product creates emulsions facilitating the active ingredients transit into the hair structure. Furthermore, hydrogenated olive oil, Olea Europaea (olive) fruit oil, Olea Europaea (olive) oil unsaponifiables contains the olive oil unsaponifiables fraction that has an important role in protecting hair structure, with a conditioning and restructuring effect. More specifically, this molecule creates a lipidic "film" around the piliferous structure further adding to the physical protection.

Therefore the synergic activity of hydrogenated olive oil, Olea Europaea (olive) fruit oil, Olea Europaea (olive) oil unsaponifiables and Olea Europaea (olive) leaf extract, water plays a fundamental role in the piliferous morphological structure protection, making these products especially indicated to create a range of leave-on and rinse-off conditioning formulas.

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