Functional and Sensorial Plant Wax Butters

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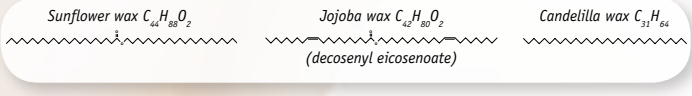
INTRODUCTION

Texturing agents such as powders and silicone polymers are added to many formulations to bring specific sensorial properties. The increasing naturality trend amongst cosmetics has led to a particular interest in **naturally occurring texturing agents** such as plant waxes. However, because of their high melting point, hardness and strong crystallization, waxes are not easy to use directly in formulations. A study has been carried out on sustainable vegetable waxes, using transesterification with polyglycerol in order to adapt the physico-chemical properties of the waxes and **solve formulation challenges**.

MATERIALS AND METHODS

Hydrophilized waxes were produced by transesterification between a defined mixture of a liquid and solid plant waxes and polyglycerol. Liquid wax used in the study was **jojoba** and solid plant waxes included **candelilla, rice bran, sunflower, carnauba, and mimosa waxes**.

Structures of main compounds of common plant waxes.



The properties of the wax derivatives were evaluated by measuring the hardness with a penetrometer (Indelco DGGS dynamometer) for the wax mixture and corresponding wax derivative. The solid-fat index was determined (Perkin Elmer diamond DSC), and the water absorption was evaluated. Several wax derivatives were then studied in formulation in both anhydrous formula and emulsions to evaluate their influence on crystallization and stability. The sensory properties during application were evaluated by a trained panel.

RESULTS

1 - Penetrometry

Penetrometry studies demonstrated that the hardness of the waxes is reduced by the generation of new compounds thanks to randomisation of fatty acids with fatty alcohols and polyglycerol. The **hardness is lower** when the waxes are reacted together compared to the blending of each wax reacted separately.

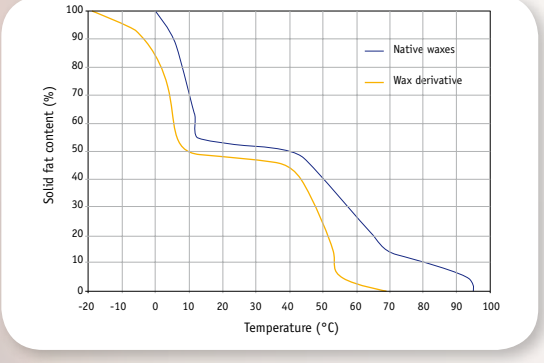
Table I: Hardness as measured by the depth of penetration of a plot applied with a force of 2N.

	Penetration
Jojoba, Candelilla and Rice waxes blended then modified with polyglycerol-3	4.4 mm +/- 0.7
Jojoba, Candelilla and Rice waxes each modified with polyglycerol-3 then blended	2.4 mm +/- 0.2

2 - Solid Fat Index

The modification of the waxes leads to a **change in the melting properties** (Figure 1). The wax derivative melts over a more narrow temperature range than the native waxes.

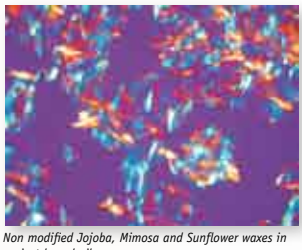
Fig. 1 : SFI of wax blend compared with the waxes after modification with polyglyceryl-3.



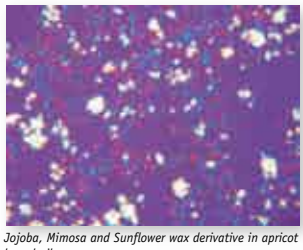
3- Crystallization properties

The behaviour of a wax derivative in a cosmetic oil, such as a vegetable oil, compared to the initial blend of waxes (non modified) is different. The solubility of the wax derivative is improved, the crystal size following recrystallization is smaller and formulation is facilitated.

Fig. 2



Non modified Jojoba, Mimosa and Sunflower waxes in apricot kernel oil



Jojoba, Mimosa and Sunflower wax derivative in apricot kernel oil

4 - Water absorption

The reaction of polyglycerol with a blend of jojoba, rice bran and candelilla waxes was shown to increase dramatically the water absorption power. The modified waxes were shown to **absorb 6 times their weight in water**, significantly more than lanolin which absorbs 2 times. Similar results are obtained by replacing the rice bran or candelilla wax by sunflower, mimosa or carnauba wax.

Fig. 3

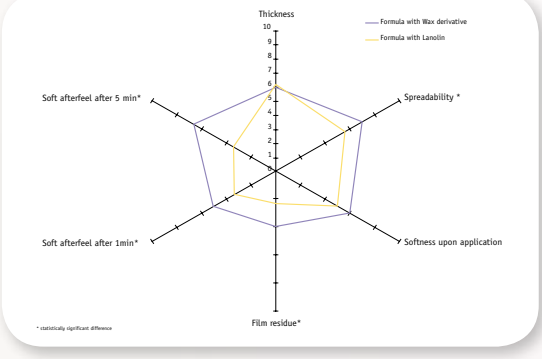
Lanolin + water (left) and Jojoba-Rice-Candelilla wax derivative + water (right)

5 - Formulation

The differences in hardness and in melting properties are highly visible when the waxes are formulated in an emulsion. As regards **sensorial properties** of the emulsion, the **dragging effect**, characteristic of vegetable waxes, is **reduced** and the **skin feel is soft**. The spreadability of the formulations are improved. The waxes are **easier to formulate** and present **less crystallization problems**.

Due to its lanolin-like properties (figure 3), it is interesting to compare the wax derivative with lanolin at 5% in a "natural" O/W emulsion. The softness upon and especially after application are improved.

Fig. 4: Sensory profiles



CONCLUSION

Using **transesterification** of a composition of **sustainable liquid and solid plant waxes with polyglycerol**, it is possible to obtain wax derivatives with particularly interesting properties in formulation. The **hardness is reduced** and the crystallization properties are improved. The wax derivatives show considerable interest in cosmetic applications as they are **capable of absorbing up to several times their weight in water**.

These new wax derivatives improve the feeling of "natural" cosmetics, and open up new ways to use vegetable waxes in personal care.