Towards cosmetic product of satisfying performance: reformulation using general factorial experimental design with replicates

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INTRODUCTION

In addition to stability, cosmetic product should meet the requirements for safety and efficacy, as well as the consumers' criteria for the choice of product, which are mainly based on the sensorial characteristics (1). Cosmetic products, already on the market, are often reformulated due to the products' innovation (new, attractive actives and raw materials) or compliance with legislation (restriction of certain substances).

The aim of our study was to investigate the influence of several factors on the characteristics of creams' formulation, where some of them are linked with certain sensorial attributes, using the experimental design.

MATERIALS AND METHODS

Materials

A natural emulsifier, hydroxystearyl alcohol and hydroxystearyl glucoside (Simulgreen™ 18-2, Seppic, France) was used for samples' preparation. Components of the cream samples' oil phase were: caprylic/capric triglyceride (Levate, Italy), prunus amygdalus dulcis (Sweet Almond) seed oil, isopropyl myristate (A&AFratelli Parodi, Italy) and mineral oil (RA.M. Oil S.p.A., Italy). Creams also contained tocopheryl acetate (BASF, Germany), glycerin (BASF, Germany) and xanthan gum (Gum Technology, Arizona). All samples were suitably preserved.

Methods

To study the effects of cosmetic active addition (0,4% Alp rose stem cells in liposomes (ARSC-liposomes) and 1% or 6% olive oil squalene), the type of used stirrer (propeller, Ultra Turrax) and their interactions on certain cream characteristics (droplet size, consistency, index of viscosity, firmness, cohesiveness, hysteresis loop area value, maximal and minimal apparent viscosity, elastic (G') and viscous modulus (G") and G"/G'), a general factorial experimental design with replicates was applied.

To investigate efficacy (skin hydration (SCH), transepidermal water loss (TEWL) and viscoelasticity) of selected samples (placebo-F1p, cream with 0,4% ARSC-liposomes-F1a and cream with 1% of squalene-F1s) after reformulation, non-invasive skin biophysical measurements were performed prior to, and after 21-day treatment on healthy skin of 36 consented volunteers.

RESULTS AND DISCUSION

The generated factorial models for all monitored responses were found to be significant, indicating that not only factors alone, but also their interactions had significant effect on cream characteristics.

Addition of squalene, for example, significantly affected all monitored responses, suggesting that it will also have an impact on certain sensory attributes (texture - pick up phase and slipperiness – rub in phase).

Regarding efficacy, after 21 days the SCH increase was significant for active creams (F1a, F1s), while there was no significant changes in viscoelastic properties of the skin for any tested sample. The TEWL values were significantly decreased only for the cream F1s, whereas the cream F1p (placebo) significantly increased TEWL (Fig. 1).

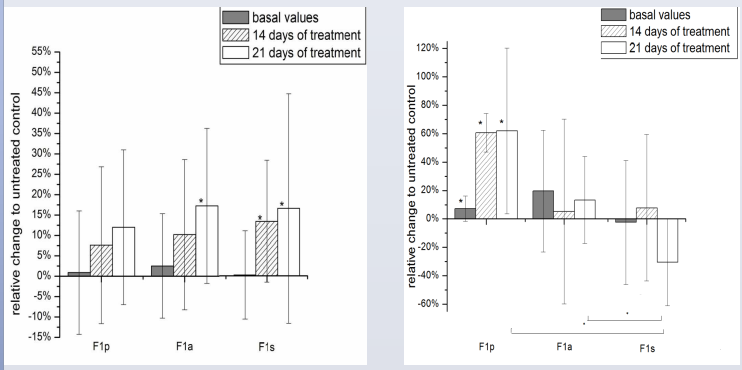

Figure 1. The effect of the topical application of the samples F1p, F1a and F1s on SCH (left) and TEWL (right), related to the untreated control (percentage change).

CONCLUSIONS

Experimental design can give us valuable information regarding interactions of multiple factors and as such it could be a suitable tool for reformulation of satisfactory cosmetic products.

REFERENCES

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