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# Optimization and stabilization of lightening serum formulation containing natural extract and acid

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## Introduction:

For the cosmetic industries, the development of products that in addition to beautifying give effects that improve the characteristics of the skin quickly is increasingly demanded by users. The incorporation of face serum into daily skin care routine can give noticeable difference within four weeks. Face serum is a highly concentrated cosmetic product which consists of small molecules that allow better penetration into the skin thus deliver instant noticeable results. Nevertheless, the stability of face serum formulation needs to be maintained to ensure its effectiveness to the skin.

The purpose of this study was to determine optimal lightening serum formulation in efficacy on facial skin as well color stability since it is known that effective lightening actives such as vitamin C, hydroxycinnamic acid as example, are highly unstable, tending to oxidize obtaining a dark and brown or intense yellow coloration.

## Materials & Methods:

**Sample preparation:** Several lightening Serum formulation were prepared using the ingredients show in the table 1, 2 and 3.

Table 1.Formula base composition

| Ingredient | Function |
|---|---|
| Water (Aqua) | Vehicle |
| Xanthan Gum | Thickener |
| Glycereth-26 | Moisturizer |
| PPG-26-Buteth-26, PEG-40 Hydrogenated Castor Oil | Solubilizer |
| Phenoxyethanol, Ethylhexylglycerin | Preserservative |
| Fragrance | Fragrance |
| Triethanolamine | pH adjuster |

Table 2 : Lightening ingredients tested

| Ingredient | % w/w | Mechanisms of Action |
|---|---|---|
| Niacinamide | 5 | Interferes with melanosomes transfer from melanocytes to keratinocytes and possesses antioxidant activity |
| Ascorbyl Sodium Phosphate | 2 | Decreases melanin synthesis |
| Rumex Occidentalis extract | 2 | Tyrosinase inhibition |
| Hydroxycinnamic acid 20% | 6 | Tyrosinase inhibition & inhibitors of MITF (microphthalmia-associated transcription factor) involved in the regulation of the development of many cell lineages including melanocytes |
| Rhamnosa 2.5% | 5 | Prevents melanin overproduction and therefore protects the skin from age spots |

Table 3. Antioxidants tested

| Antioxidant | % w/w |
|---|---|
| Tocopherol Acetate | 0.50 |
| BHT | 0.10 |
| Diethylhexyl Syringylidenemalonate | 0.15 |

### Evaluation of formulations

**Stability monitoring**
Formula stability was observed at 24 hr & 700 Wm2 in suntest XLS + ATLAS chamber, room temperature and 45°C during one week. Differents paramethers were checked: Color, pH and viscosity. Formulations prepared with 5 diferent lightening ingredients without antioxidant and formulas containg tocopheryl acetate, BHT and diethylhexyl Syringylidenemalonate as antioxidant were tested with this method.

**Accelerated stability testing**
Formula stability was observed at 40°C/ 75% RH, 25°C/60%RH and 5°C for six months. Various physical characteristics were monitored: pH, viscosity, appearance / colour and odour. The formulation contaning the two lightening ingredients with the best performance in color stability was evaluated with this method.

**Microbial challenge testing**
The efficacy of the preservatives was evaluated according to the method of United States Pharmacopoeia (USP 35); Chapter 51 Antimicrobial effectiveness testing. The formulation contaning the two lightening ingredients with the best performance in color stability was tested with this method.

**Efficacy & Human Repeat Insult Patch Testing**
The efficacy test was conducted by cosmetologist in Double blind study with half face treatment in 10 female volunteers for 4 weeks twice daily application using a self perception questionnaire.The Human Repeat Insult Patch Testing was conducted according to the *Shelanski-Shelanski test* (Shelanski and Shelanski, 1951; Shelanski, 1953). The formulation contaning the two lightening ingredient with the best performance in color stability was evaluated with these methods.

## Results & Discussion:

### Lightening serum formulation without Antioxidant ingredients

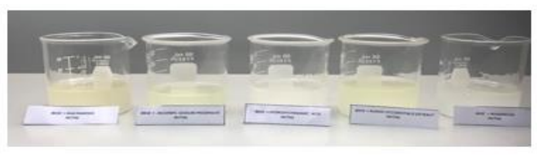


**Figure 1:** Color of sample after preparation base formulation with differents actives from left to right Niacinamide, Ascorbyl Sodium Phosphate, Hydroxycinnamic acid, Rumex Occidentalis Extract, Rhamnosa

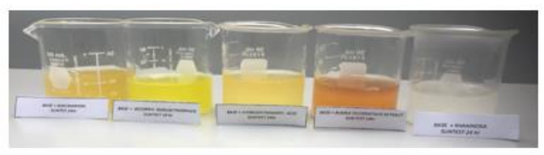
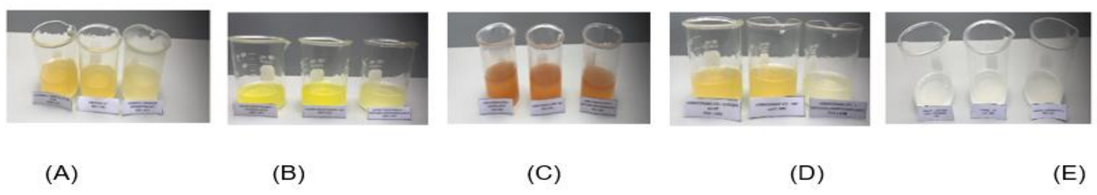


**Figure 2:** Samples after 24 hr & 700 Wm2 in suntest XLS + ATLAS; from left to right Niacinamide, Ascorbyl Sodium Phosphate, Hydroxycinnamic acid, Rumex Occidentalis Extract, Rhamnosa

### Lightening serum formulation containing antioxidant ingredients

Table 4. Results obtained from formulas with different lightening ingrediens and antioxidants

| Lightening ingredient | Niacinamide | | Ascorbyl Sodium Phosphate | | Rumex Occidentalis extract | | Hydroxycinnamic acid | | Rhamnosa | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Antioxidant** | **Suntest** | **45°C** | **Suntest** | **45°C** | **Suntest** | **45°C** | **Suntest** | **45°C** | **Suntest** | **45°C** |
| Tocopherol Acetate | Intense Yellow | Intense Yellow | Intense Yellow | Intense Yellow | Amber | Amber | Intense Yellow | Intense Yellow | Fait | Fait |
| BHT | Intense Yellow | Intense Yellow | Intense Yellow | Intense Yellow | Amber | Amber | Intense Yellow | Intense Yellow | Fait | Fait |
| Diethylhexyl Syringylidenemalonate | Intense Yellow | Yellow | Intense Yellow | Yellow | Amber | Amber | Fait | Fait | Fait | Fait |



(A) (B) (C) (D) (E)

**Fugure 3:** Pictures (A) Niacinamide, (B) Ascorbyl Sodium Phosphate, (C) Rumex Occidentalis Extract, (D) Hydroxicinnamic Acid, (E) Rhamnosa. From left to right is showed the color of each lightening serum formulation containing Tocopherol Acetate, BHT and Diethylhexyl Syringylidenemalonate as an antioxidants after stability at 45 °C for one week.

### Lightening serum formulation with the best performance in color stability

Lightening serum formulation containing Hydroxycinnamic acid 6% and Rhamnosa 5% as a lightening ingredients and Diethylhexyl Syringylidenemalonate 0.15% as antioxidant ingredient showed good performance in the accelerated stability test, after six months of test there were no significant change in color , viscosity and pH.

Antimicrobial effectiveness testing in this formulation were approved.

Afther four weeks of twice daily application 10 female volunteers observed even skin tone and 7 of 10 observed reduction of the color intensity of skin spots. No adverse events were observed in the Human Repeat Insult Patch Test.

According to this results it seem that was confirmed that the most successful whitening treatments stake on synergy and usually combine two or more complementary modes of action[4]

## Conclusions:

During the present study we were able to evaluate the stability of five different lightening ingredients obtaining a stable lightening serum formulation containing a natural extract and acid with good acceptability in a self perception test.

## Aknowledgments:

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## References:

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