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## OPTIMIZATION OF THE FORMULATION PARAMETERS OF A PARAPHARMACEUTICAL 100% BIO CREAM

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### Abstract

The extraction of the aromatic fraction (hydrolat, essential oil) fresh aerial part of *Lavandula vera* was accomplished by steam distillation. The average yield of essential oil is 1-2%. The anti-inflammatory cream BIO obtained has interesting dermal properties. This cream is endowed with remarkable healing properties and anti-infectious. It leads to dermatological applications and opens the way eventually fruitful research. During this work we have formulated an anti-inflammatory cream 100% BIO whose active ingredient is the essential oil of lavender with these attractive properties. Optimization of formulation parameters made it possible to have a stable cream. Physicochemical analysis, sensory (with diagram properties

evaluation) and comparative study with a reference cream (conventional) was able to show the qualities of our BIO cream.

## Keywords

Formulation, Emulsion, Essential Oil, BIO Cream, Safety Testing

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## 1. Introduction

The history of the humanity seems inseparable of the cosmetics. Always, these were the allies of the women and, often also the men. In the course of times, engines and habits showed themselves of course very different, but cosmetics were always present.

The cosmetic product is not any more this product which owed everything to the artificial, to the sham with the aim of giving the illusion of a reality or rather hiding this reality. The beauty care becomes a science, leaning on precise facts of biological and physicochemical order and this new conception was definitively imperative (Poche & Reynier, 2006).

However, more and more consumers, worried further to the numerous media campaigns to create a discharge of synthetic substances, turn to the biological cosmetics. In the face of this craze, the arrival of big actors of the cosmetic sector on the BIO market reports the progress of the request. Any time the concepts of the formulation of conventional cosmetics raise a problem when components are totally substituted by natural products. Consequently research laboratories work with the aim of finding solutions, BIO cosmetics products answering all the criteria as conventional cosmetic product (stability, quality criteria).

In this study, we have tried to optimize a formulation of a cosmetic care cream typically protective. It is of type water in the oil (water/oil) where the essential oil (EO) of lavender is then added as an active ingredient.

The essential oil as defined by the ISO standards (ISO 9235, :2013) possesses more pharmacological properties (anti-infective, anti-inflammatory), very interesting dermatological properties (acne, insect bites, cellulite, boils, dermatosis, eczema, inflammation, psoriasis, burns of the sun, dry skin, herpes, oily skin, mycosis, candida and healing) (Rota, Carraminand, Burillo & HERRERA, 2004). It is important to mention that Africa has a large amount of plant resources with an estimated number of species between 40,000-45,000, on which 5000 species are used for medical purposes (Mohamoodally, 2013).

The plant which was the subject of our study is the lavender (*Lavandula vera*) which is a perfume plant widespread in Algeria. The value of its aromatic secondary metabolites offers new perspectives in the industry.

The extraction of the essential oil was made by hydrodistillation from the flowery leading experts dry of the plant and then incorporated afterward in the formulation of a BIO healing cream.

The criteria of qualities and stability of our BIO cream were the objective of our work, for this diagrams were established.

## 2. Materials and Methods

The interest in the formulation of BIO cosmetic product is the reduced number of raw materials, knowing that every one of it had a role in breasts of this formulation. The raw materials used during the formulation of our cream as well as their role are cited in table 2.1.

**Table 2.1** *Materials used in the formulation of the cream*

Compounds	Latin name	Chemical nature	Role
essential oil of lavender	Lavandula angustifolia	monoterpeneol, terpene esters	Active ingredients Healing activity
Sweet Talmond oil	Amygdalus dulcis L. var. dulcis	Mixtures of terpenes	Skin hydration
Beeswax	Cera alba.	Mixture of acide and esters	Filmogenic effect and fed the skin. Forming effect and nourishes the skin.
Shea butter	Butyrospermum parkii.	Phosphatidyl-gliceride vegetable	Soothes protects nourishes and softens the skin.
Soya lecithin	Glycine soja Siebold et Zucc.	Phosphatidyl-gliceride	Emulsifier

## 3. Extraction of the essential oil

The extraction of the essential oil was made by hydrodistillation from the flowery leading experts dry of the plant, so the essential oil obtained is kept away from light and moisture: the flask must be opaque, consisted of tinted glass or aluminum and it must ensure always to close the flask after its use (CROUZET, 1998). The characterization of this oil was made by physicochemical analysis (density, acidity index, refractive index, rotatory power at 10°) (AFNOR, 20006), also to determine the structural composition a characterization by gas chromatography was carried out (GPC).

## 4. Formulation of the cream

We have made several tests for the formulation of the cream by varying the proportions of the components, for that purpose, the one-dimensional scanning method is used to modify the system formulation in a controlled manner (Salager & Antoin, 1999). For this study we have varied the wax quantity beeswax (CA) and shea butter (BK), however the sum of both constituents should be equal  $(CA+BK) \leq 10\%$ , the percentage of the sweet almond oil HAD was fixed at 30% and that of the surfactant TA = 0.1%. Our emulsion (cream) was obtained once pouring the aqueous phase into the oily phase. A mechanical agitation was able to insure the good homogenization of both phases. The essential oil of lavender (1%) was introduced afterward maintaining the agitation until cooling of the mixture at approximately 20 to 25 °C.

## 5. Results and discussion

### 5.1 Physicochemical characterization

The physicochemical criteria were measured and compared with those given by the Afnor standards, the results are given in table 5.1.

**Table 5.1:** Physicochemical indices of the essential oil of *lavandula angustifolia*.

<i>Indices</i>	<i>Relative density</i>	<i>acid value</i>	<i>refractive index</i>	<i>Optical rotation at 10°</i>
<b>Value</b>	0.885	0.927	1.461	-10.5°
<b>AFNOR Standards</b>	0.880- 0.890	< 1	1.458 -1.464	- 11.5° – 7.0°

According to the obtained results we notice that the values of the physicochemical criteria are in accordance with the Afnor standards.

### 5.2 Structural characterization of essential oil

The analysis of the essential oil of *Lavandula officinalis* by CPG has shown that 49 components representing the sum of the percentages of the obtained components were identified. Among these components 67.29% are monoterpenics oxygenated by-products and 15.3% are monoterpenics hydrocarbons. The major components of this oil are: acetate of linalyle (15.26%), linalool (10.68%), 1,8-cineole (10.25%),  $\gamma$ -terpinene (11.2%) and camphor (11.25%).

According to these results, we notice that the chemical composition of the essential oil of the species *Lavandula officinalis* cultivated in this north region of Algeria is different from those obtained in numerous works on the same species (Sun Kim & Sun Lee, 2002), with an ascendancy of monoterpenics compounds in most of the cases, but in different proportions.

This difference of composition is probably due to diverse conditions in particular the environment, the genotype, the geographical origin, the period of harvest, the place of drying, the temperature and the duration of drying, the parasites and the method of extraction (Svoboda & Hampson, 1999).

### 5.3 Optimization of parameters of the formulation of the cream

The optimization of the parameters of formulation was made by the destability tests. The obtained creams were then centrifuged at 6000 rev/min during 15 min. The most stable formulations were taken for characterization. The rheological study in flow of creams shows a Newtonian plateau at low shear rate then a rheofluidifying behavior at strong shear rate. what it is looked for is the Newtonian zone which assures that the formulation undergoes no modification of the viscosity during its manipulation (taken of cream) then the spreading is assured by the rheofluidifying behavior (brutal decrease of the viscosity) which offers to the cream its rheological quality. Rheological curves allow us to find the viscosities of stable formulated creams by using the models of Casson and Carreau. It should be noted that the values of the viscosity are in relation to the quantity of the essential oil and the wax quantity used. It was also important to know the pH of the stable formulated creams as the latter is directly put in touch with the skin, the latter is in accordance with the standards and all the creams have a pH between 5.5 and 5.8 (Lambers. Piessens. Bloem. Pronk & Finkel. 2006) (see table III).

**Table 5.2** Plan of mixture; viscosity and pH ( $V = 10 \text{ rev/min}$ ;  $T = 20 \text{ }^\circ\text{C}$ ),  $HE = 1\%$ ,  $TA = 0.1-1\%$ .

N° try	Composition			Viscosity (Pa.s)	pH
	HAD	CA	BK		
1	30-40	2-5	2-5	20478	5.5
2	25-30	3-6	3-6	40222	5.5
3	20-25	4-7	4-5	18656	5.6
4	30-35	4-6	4-6	37745	5.8

## 5.4 Sensory Analysis

The sensory analysis is a very important parameter bound directly to the affinity of every consumer. In order that this analysis has a more value, it is necessary to reproduce it on the maximum of possible people. So, the sensory analysis consists in studying in an orderly and structured way the properties of a product to be able to describe it, classify it or improve it in an extremely objective and rigorous way.

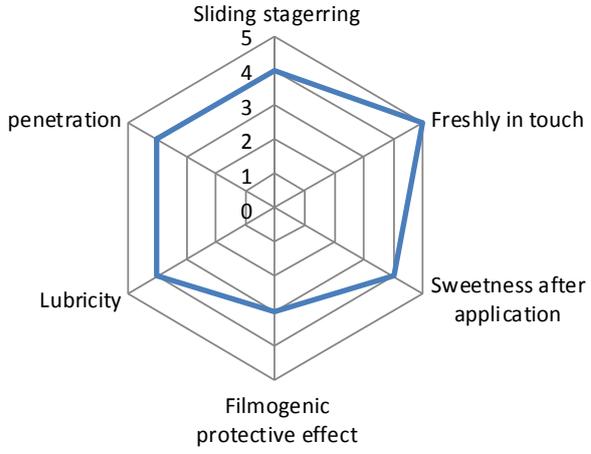
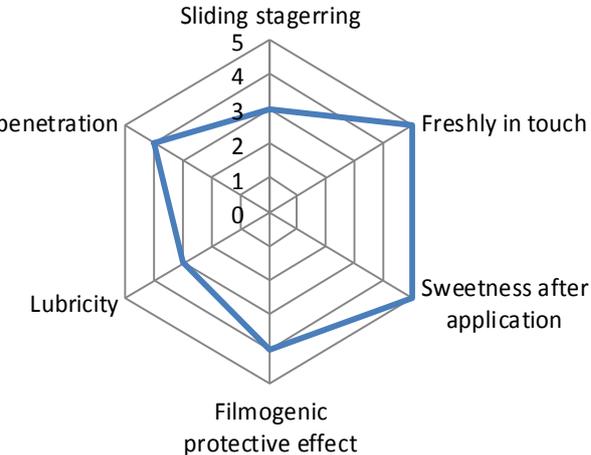
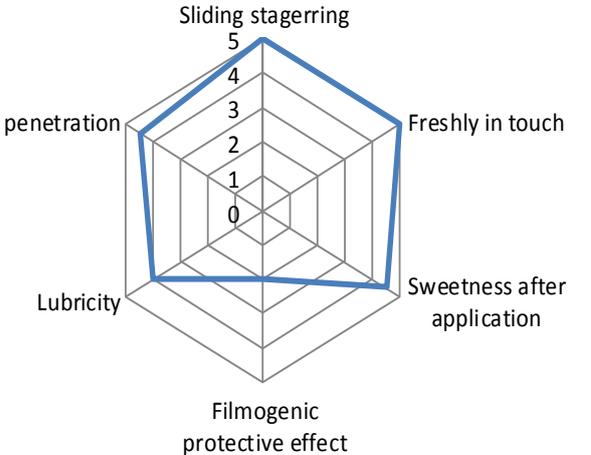
For this every formulation was to make out a will on 20 peoples, an average of the notation attributed for every criterion (freshness, penetration, spreading, unctuousness, filmogenic effect and sweetness after application), the results are grouped in table IV. Then, we have established a sensory profile which consists in synthesizing, by a graph; all the information cleared by the sensory analysis of every product, the latter allows seeing more clearly the formulation which gives the best criteria. All the diagrams are represented in table 5.3.

In order to value the healing activity of our care cream it was tested on volunteers, 70% of the latter judged that the cream has a healing effect after a short trial period, however approximately 30% were dissatisfied and perceived not much healing effect. The example taken on a satisfied volunteer is presented by the figure 1.



**Figure 1:** *Effect after ten days of application.*

**Table 5.3:** Sensory study of the quality criteria of formulated creams

N°	Result	Sensory profile
1	Slightly thick , slippery and ve penetrating cream <b>Appearance:</b> homogeneous <b>Smell:</b> fresh lavender <b>Color:</b> light yellow	
2	Slightly thick, smooth, very touched, little sticky cream <b>Appearance:</b> homogeneou: <b>Smell:</b> fresh lavender <b>Color:</b> yellowish white	
3	Slightly thick, very fresh in t fast penetration, little sticky <b>Appearance:</b> homogeneous <b>Smell:</b> fresh lavender <b>Color:</b> white	

## 6. Conclusion

The Algerian flora possesses numerous aromatic plants; these establish an immense source for the elaboration and the development of new actives molecules. The study of the effect of the essential oil of lavender has allows us to report its utility to face the problem of scar without using synthetic molecules. The obtained creams were stable with physicochemical parameters comparable to conventional cream with viscosities varying between 18000 and 40000 Pa.s. The sensory study has shown the existence of the choice criterion found in the test N°1 with a good effect for freshness, penetration, spreading, unctuousness and a considerable filmogenic effect. The therapeutic effect showed an important efficiency as for the healing of more than the other effects which can be brought by the existence of the beeswax. Neither at least toxicological examination must complete this study.

## 7. Acknowledgments

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