

UTILIZATION OF BEE PRODUCTS AND TRÁS-OS-MONTES AROMATIC PLANTS ON THE DEVELOPMENT OF COSMETIC FORMULATIONS

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Introdução/Introduction

In this work we use, bee products, vegetable oils and plant material from the region of Trás-Os-Montes to develop a cosmetic formulation for the treatment and daily moisture of the skin. As shown in the figure 1, the beeswax was chose in this work among the other bee products for its versatile properties and well-known characteristic's. *Salvia officinalis* and *Salvia elegans* were use as origin of active principles namely polyphenols, described as compounds with anti-inflammatory, and antiaging activity; a thyme plant, *Thymus zygis zygis*, endemic from this region, was used as a source of natural preservatives. Since cosmetic formulations includes oily compounds as hydrant, in this work two oils were use; olive oil and almond oil for their benefits for the skin, and also for their ability to dissolve fats and terpenes, and create an emulsion.

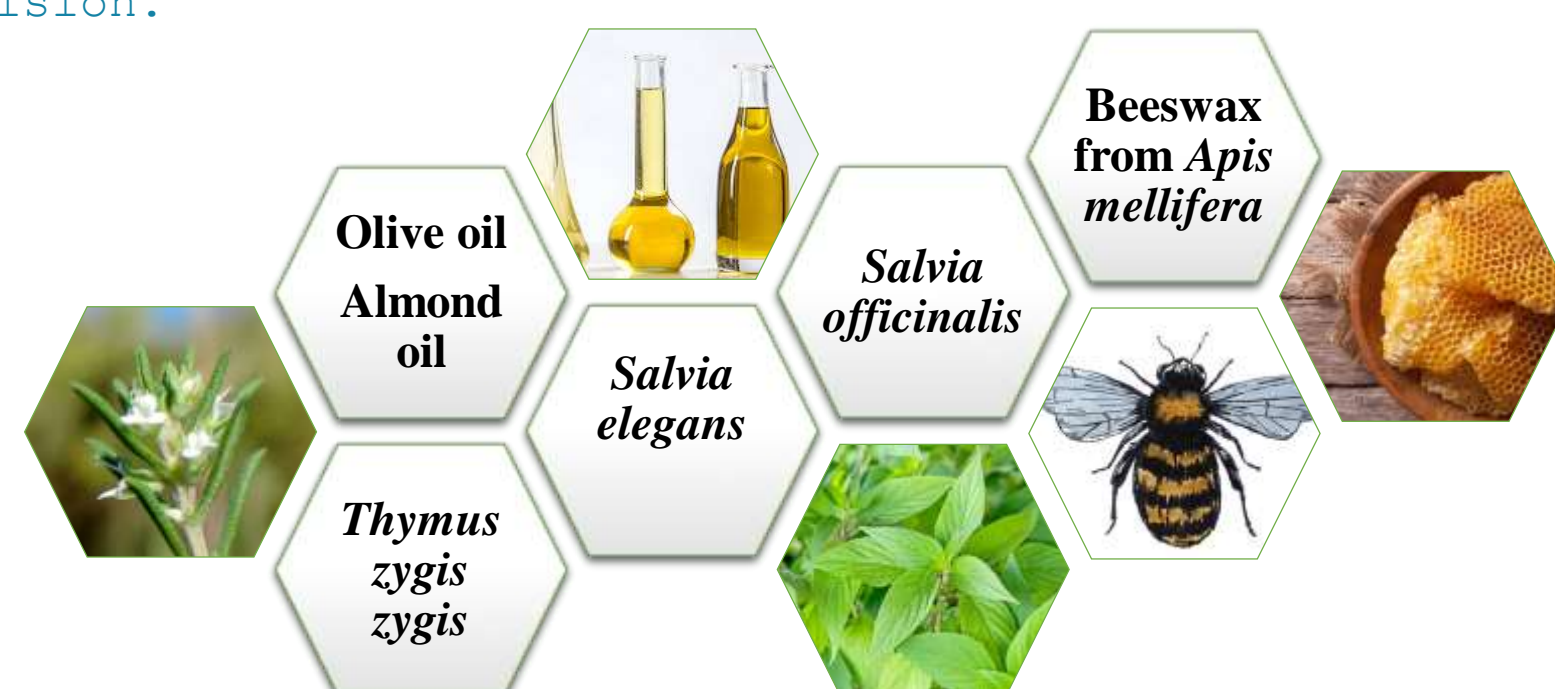


Figure 1: Elements intended for use in the formulation of the cream

Objetivos/Objectives

In this project, the main objective was to analyze plant material extracts to identify their bioactive compounds and their properties in order to incorporate them in several formulations. Once the desired qualitative criteria were reached, stability essays were performed and one of the formulations (the one that most closely matches the coveted criteria) was chosen and tested by several categories of individuals according to their skin type (mature or juvenile, oily or dry, etc.). Then, in order to evaluate the effectiveness of the product, post use questionnaire were developed.

Material e Métodos /Material and Methods

- Extraction of *Thymus zygis* essential oil by Cleverger apparatus [1]
- Chemical analysis of *Thymus zygis* essential oil by Gas chromatography-mass spectrometry (GC-MS) [2]
- Microbial stability of *Thymus zygis* essential oil

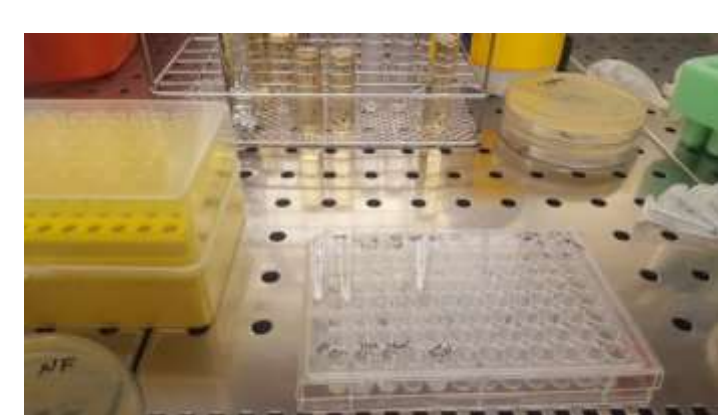


Figure 2 : Tests of inhibition of microbial growth (microdilution technique)



Figure 3 : Microbial contamination test (Agar diffusion)

- Hydroalcoholic extraction of *Salvia elegans* and *Salvia officinalis* by solid-liquid extraction with an 96% ethanol solution



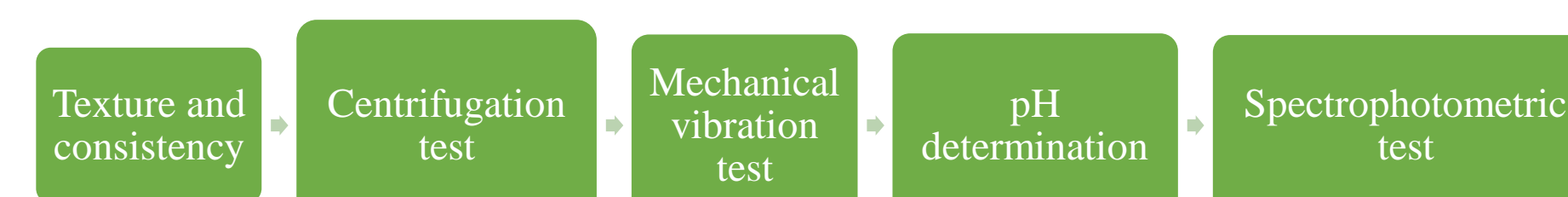
Figure 4: Preparation of extracts

- Chemical analysis of *Salvia elegans* and *Salvia officinalis* hydroalcoholic extracts by (UHPLC -DAD-ESI/MSn) [3]
- Preparation of cream formulation

Table 1 : Cream ingredients

Ingredients	Function
Methylcellulose gel	Excipient
Olive oil	Oily material
Almond oil	
Beeswax	Source of natural active substances
<i>Salvia elegans</i> hydroalcoholic extract	
<i>Salvia officinalis</i> hydroalcoholic extract	
Tween 80	
Starch	Thickening agent
<i>Thymus zygis</i> oil	Preservative

- Stability essays of the cream formulation



- Questionnaire after use

Resultados/Results

- Chemical composition of *Thymus zygis* essential oil

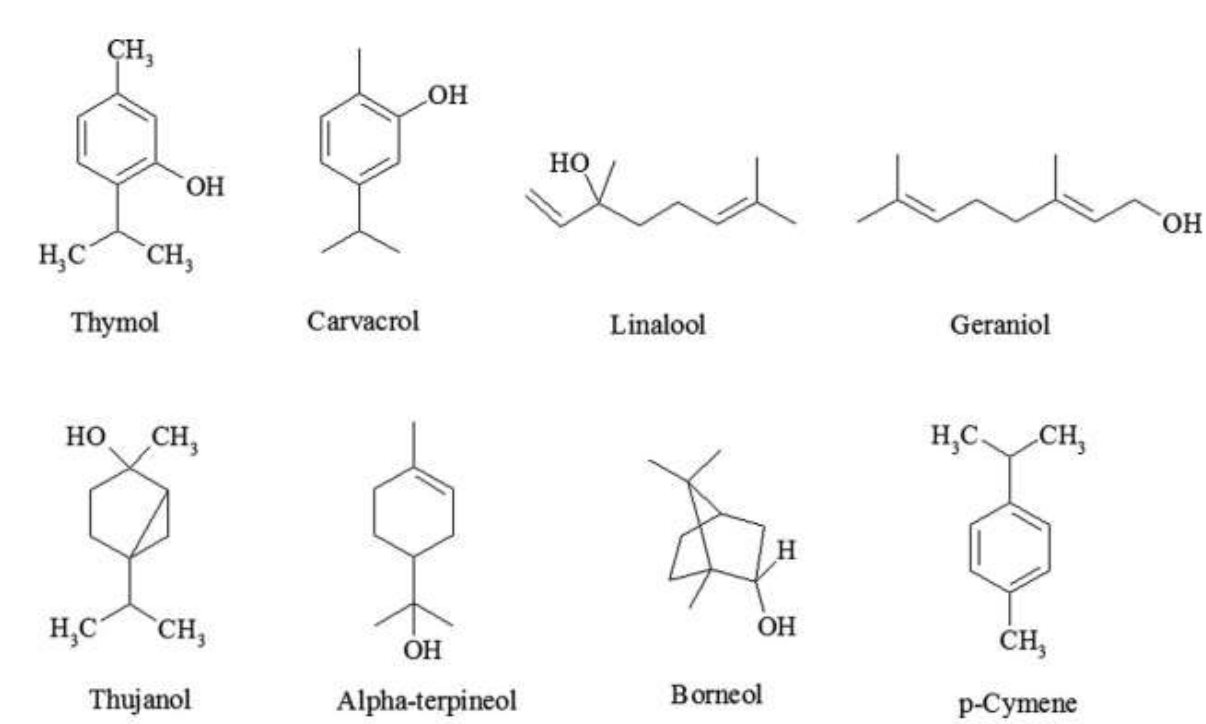


Figure 4 : Chemical structure of the main substances occurring in genus *Thymus* plants: thymol, carvacrol, linalool, geraniol, thujanol, α -terpineol, borneol, and p-cymene [4]

The chemical composition analysis also highlighted the presence of grouped components with a high percentage:

- Oxygen-containing monoterpenes 49,8 %
- Monoterpenes hydrocarbons 49,6 %
- Carvacrol 43 %
- Cymene 24,10 %
- Trans-sabinene 15,8 %



- Microbial stability of *Thymus zygis* essential oil

Table 2 : Test of inhibition of microbial growth

	MIC	MBC
<i>Escherichia coli</i>	1,25 %	1,25 %
<i>Pseudomonas sp</i>	0,31 %	0,31 %
<i>Staphylococcus aureus</i>	< 0,031 %	< 0,031 %

Table 3 : Microbial contamination test

Oil concentration	Inhibition zone for <i>Candida albicans</i>
2,5%	9,5 mm
1,25%	6 mm
0,625%	2 mm
0,31%	-

- Chemical analysis of *Salvia elegans* and *Salvia officinalis* hydroalcoholic extracts

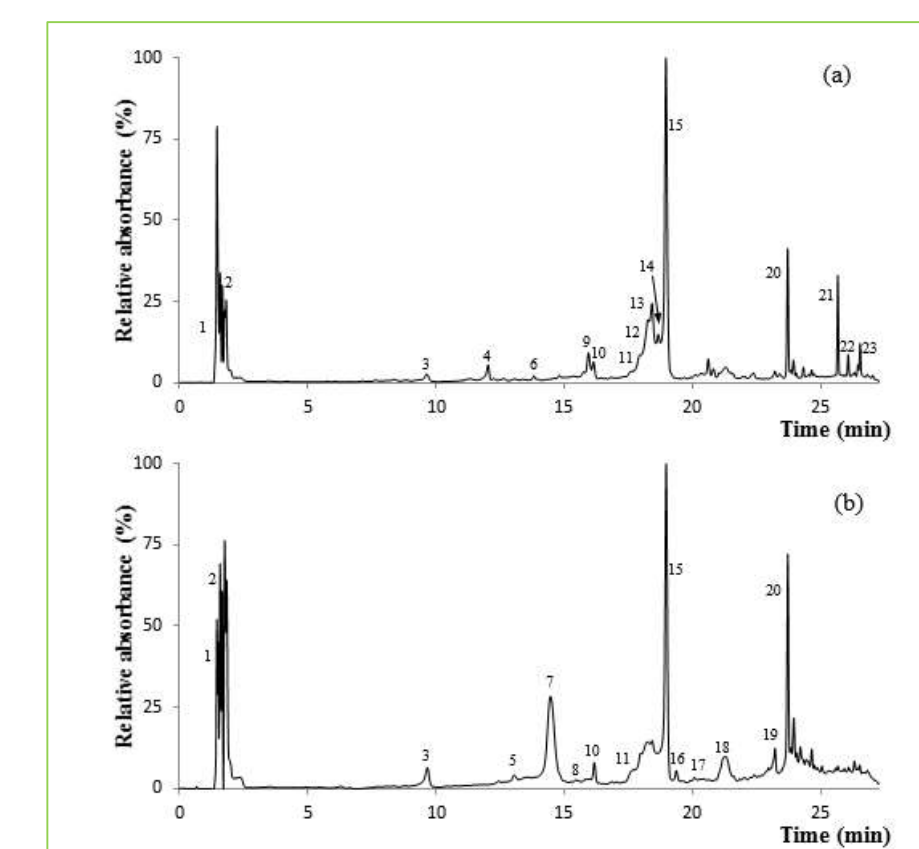


Figure 5 : Chromatographic representation of *S. officinalis* (a) and *S. elegans* (b) hydroethanolic extracts at 280 nm

(a) *S. officinalis* hydroethanolic extract :
Rosmarinic acid (peak 15)
Apigenin-O-glucuronide (peak 13)
Scutellarein-O-glucuronide (peak 9)
Luteolin-7-O-glucuronide (peak 10)

(b) *S. elegans* hydroethanolic extract :
Rosmarinic acid (peak 15)
Salvianolic acid K (peak 7 and 8)
Luteolin-7-O-glucuronide (peak 10)
Caffeic acid (peak 3)

- Preparation of cream formulation

Table 4 : Types of formulations obtained

Olive oil formulation	Almond oil formulation
Control formulation	Control formulation
5% <i>Salvia elegans</i>	5% <i>Salvia elegans</i>
2,5% <i>Salvia elegans</i>	2,5% <i>Salvia elegans</i>
1,25% <i>Salvia elegans</i>	1,25% <i>Salvia elegans</i>
5% <i>Salvia officinalis</i>	5% <i>Salvia officinalis</i>
2,5% <i>Salvia officinalis</i>	2,5% <i>Salvia officinalis</i>
1,25% <i>Salvia officinalis</i>	1,25% <i>Salvia officinalis</i>

- Stability essays of the cream formulation

	$\rho = \frac{m}{V_1 - V_2}$ (g)

The domain in which the obtained pH values vary (6.5 ± 0.3 and 6.7 ± 0.2) is close to neutrality that may therefore have no effect on the ski microbiota

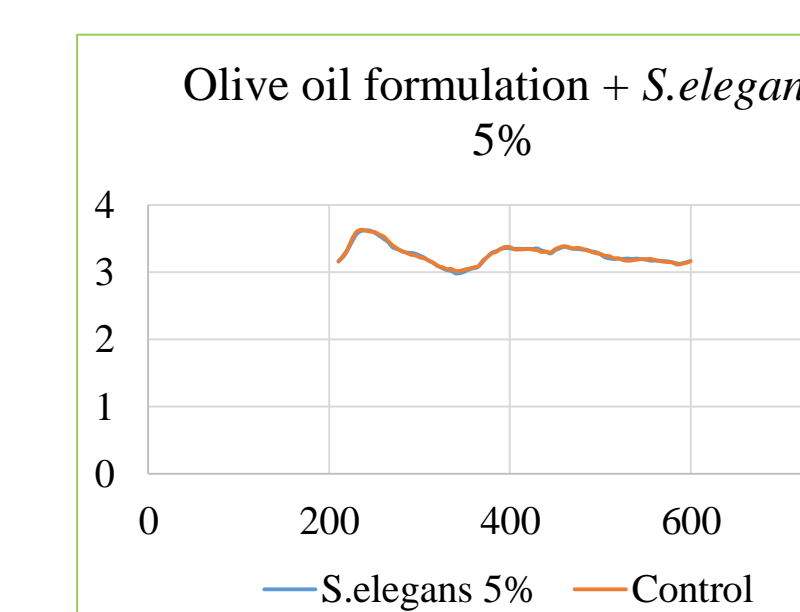
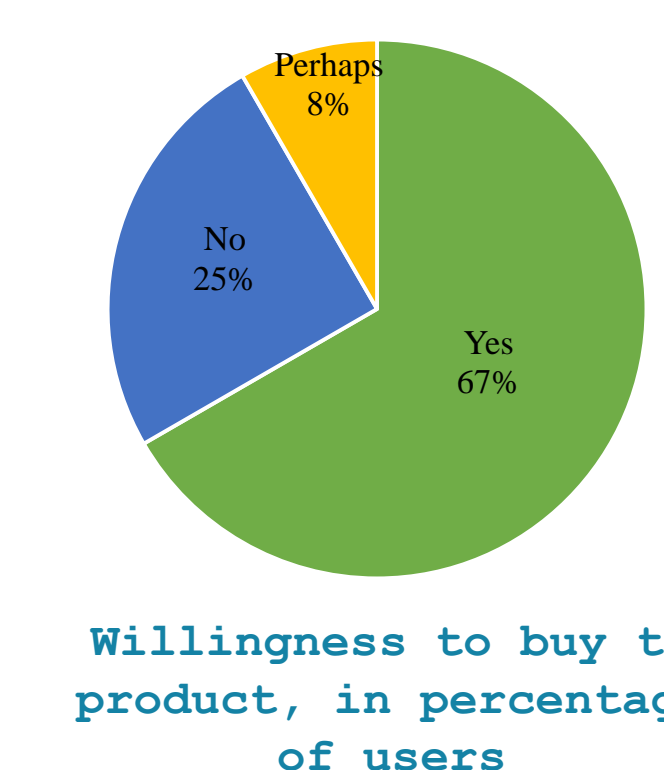


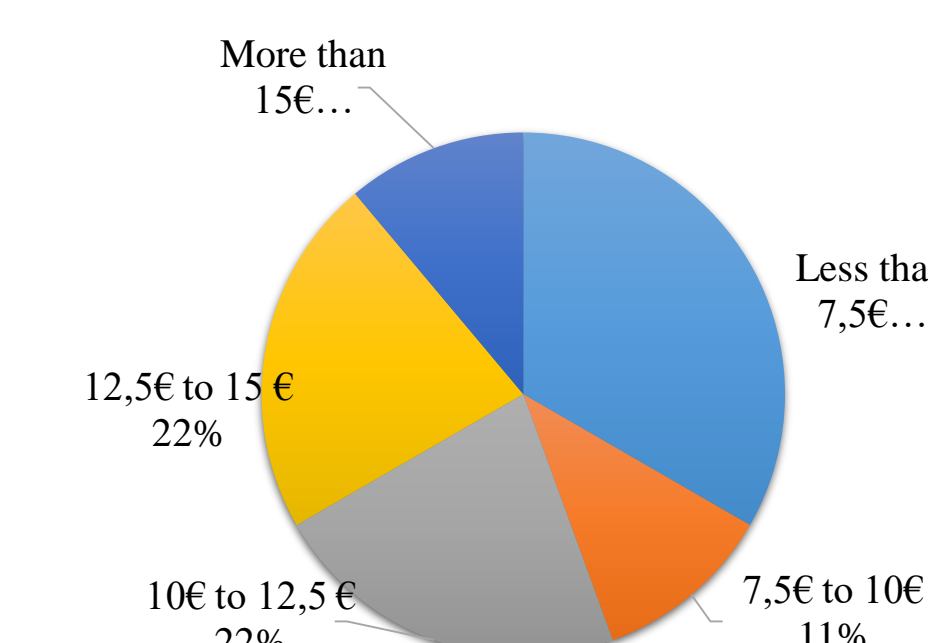
Figure 5 : Spectrophotometric profile of olive oil formulation + 5% *S. elegans* hydroalcoholic extract

According to this stability criterion this sample was selected to be tested

- Questionnaire after use



Willingness to buy the product, in percentage of users



Willingness to pay for 50ml of product, in percentage of willing users

Conclusões/Conclusions

- Physico-chemical stability of the different types of formulations
- Bactericidal power against *E. coli*, *Pseudomonas sp* and *S. aureus* and inhibitory power of *C. albicans* of Thyme oil
- Chemical analysis of *S. elegans* and *S. officinalis* hydroalcoholic extracts showed rich phenolic profiles
- The olive oil formulation containing 5% of *S. elegans* hydroalcoholic extract showed the best organoleptic criteria, hydrating power and photo stability profile
- Positive performance of the cream

Referências/References

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