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Formulation of an Extended-Release Oral Suspension Based on the Essential Oil of *Borago Officinalis*

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ABSTRACT

This study contributes to the formulation of an extended-release oral suspension based on the essential oil of *Borago officinalis*. Borage essential oil was obtained through hydrodistillation with a yield of 1.8%. Antioxidant activity confirmed the remarkable antioxidant effect of our essential oil. Antimicrobial activity demonstrated the effectiveness of the essential oil against the studied microorganisms. The chosen matrix for the development of essential oil suspensions involves two polysaccharides, sodium alginate, and chitosan. The mechanism adapted to highlight the extended release of the active ingredient (essential oil) is in situ gelation. This mechanism was achieved by solubilizing chitosan in the acidic environment of the stomach, leading to the formation of alginate gel after its polyelectrolyte complexation by cations. This indicates the feasibility of achieving extended release (time > six hours) for most formulations.

Keywords: Essential oil, Antioxidant activity, Antimicrobial activity, Extended release.

1. Introduction

Recently, medicinal formulations have incorporated plants in their preparation [1]. *Borago officinalis* L., a prominent member of the Boraginaceae family [2], has traditionally been cultivated worldwide for culinary and ancient medicinal purposes [3].

2. Experimental

Formulations highlighting natural substances such as essential oils present a promising alternative to mitigate the use of toxic compounds like parabens and silicone. These formulations are currently the subject of numerous studies across various fields, particularly within the pharmaceutical industry. Following an in-depth bibliographic research and in collaboration with Mr. Hachama, Mr. Khadraoui, and Mrs. Djedri within our research team, we proposed the development of an orally administered extended-release suspension. This proposal is based on encouraging results obtained from evaluating the antimicrobial and antioxidant activities of our essential oil. To accomplish this, we employed the Clevenger apparatus for extraction, Dissolutest and visible spectrophotometer in our experimental approach.

3. Results and Discussion

The extraction process was conducted for approximately thirty samples, yielding an The efficiency of extraction reached 1.8%, which is considered noteworthy given that typical yields for essential oils generally do not surpass 3%. The assessment of antibacterial effects employed a diffusion antibiogram method based on the classification by Moreira et al. The examination conducted for borage essential oil (EO), expressed in terms of disc diameter, produced results detailed in Table I. The outcomes for the EO, expressed as a percentage of free radical DPPH inhibition, confirmed its remarkable antioxidant effect, figure 1. Dissolution tests, illustrated in Figure 2, reveal that the maximum release was observed for samples N°1 and N°8, with respective rates of 79.94% and 72.99%. Conversely, samples N°5 and N°10 exhibited minimal releases, registering rates of 39.87% and 32.39%, respectively.



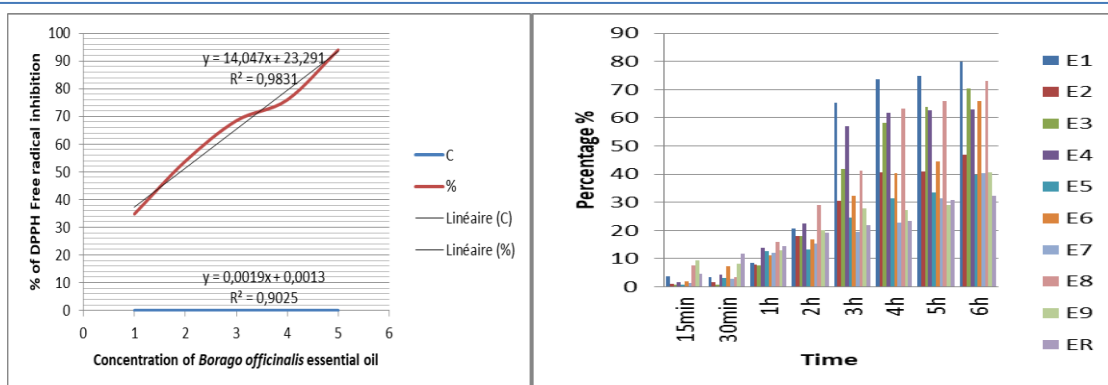


Figure 1: The inhibition percentages of *Borago officinalis*. **Figure 2:** Prolonged release rate of the oral suspension

Table I: *The sensitivity test*

Bacterial strains	Sensitivity of EOB	ATB sensitivity
<i>Escherichia coli</i> ATCC 25922	+++	+++
<i>Staphylococcus aureus</i> ATCC 25923	+++	+++
<i>Bacillus subtilis</i> ATCC 25633	++	+++
<i>Peusodo aeruginosa</i> ATCC 27853	+	+++

4. Conclusions

The yield rate reaches 1.8%, a value considered appreciable, given that generally, essential oil yields do not exceed 3%. The antioxidant activity confirmed the remarkable antioxidant effect of our essential oil, while the antimicrobial activity demonstrated its effectiveness against the studied microorganisms. Release tests conducted on Dissolutest indicate that, for certain suspensions, the release does not exceed 33% over a monitoring period of 6 hours. This release could extend further if the time is prolonged.

5. Acknowledgements

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References

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