ANTIFUNGAL ACTIVITY OF ESSENTIAL OIL AND NANOEMULSION OF *Baccharis reticularia* ON *Aspergillus sp.*

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Introduction

Global hunger data is alarming, estimating that 733 million people in the world were in a situation of hunger in 2023, practically the same number indicated in the 2022 edition: 735 million people [1]. Despite advances in agriculture, contamination of grains by fungi, such as the Aspergillus genus, results in large food losses and represents a significant health risk. Aflatoxins, produced by these species, are highly toxic mycotoxins that cause acute and specific damage, affecting involved organs and contributing to diseases such as cancer [2][3]. The intersection between hunger and health is evident, as food insecurity not only affects nutrition but also aggravates diseases and impedes the healthy development of health. In addition, the concern for more sustainable alternatives searches for environmentally friendly pesticides is essential.

Given that antifungal activity has already been documented in plants of the *Baccharis* genus, and that studies on nanoemulsified essential oils have shown enhanced stability and biological activity [3][4], this work aims to evaluate the antifungal activity of both the essential oil (EO) and the nanoemulsion (NE) of *Baccharis reticularia* DC.

Material and Methods

The essential oil from the aerial parts of *B. reticularia* from the Parque Nacional da Restinga de Jurubatiba was extracted by hydrodistillation for 3h in a Clevenger-type device. Chemical characterization was carried out by gas chromatography coupled with mass spectrometry. The nanoemulsion was obtained by the phase inversion composition method. Deionized water was dripped into the oil phase with constant homogenization. The nanoemulsion was prepared with the following composition: 91% (w/w) of aqueous phase and 9% (w/w) oil phase. The oil phase was provided by polysorbate 80, sorbitan monolaurate, and *B. reticularia* essential oil 8:1:1 proportion. The strains used were both reference strains, *A. flavus* RC 2054 and *A. parasiticus* NRRL 2999, which were incubated on plates at 27.5 ± 2.0 ºC for 96 hours with daily measurements of colony diameter.

Results and Discussion

The EO yielded 0.33% and allowed the identification of 12 substances, totaling 89.75% of the oil. The sesquiterpene β-Caryophyllene (26.37%) was the predominant compound, followed by the sesquiterpene bicyclogermacrene (16.43%) and the monoterpene limonene (13.52%). The NE presented a translucent appearance with a bluish reflection characteristic of nanostructures. Dynamic light scattering (DLS) analysis showed an average droplet size (nm) of 108.6 ± 0.33. The polydispersity index (PdI) was 0.211 ± 0.020.

The biological assay, adapted from Pinto et al. (2023), revealed no fungicidal activity and only fungistatic activity, especially in *A. flavus* at 24 hours. However, after 96 hours of observation, the results indicated growth stimulation rather than the expected inhibition.

Conclusion

The development of a stable nanoemulsion using essential oil from *Baccharis reticularia* was successful. Although the nanoemulsion did not exhibit the desired biological activity, its initial fungistatic properties indicate potential applications against other microorganisms. However, its unexpected growth-stimulatory effects open up new avenues for innovation in the field of product biotechnology.

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