BIOACTIVITY OF *Eucalyptus cinerea* ESSENTIAL OIL AGAINST ADULTS OF *Ulomoides dermestoides* INSECTS

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Introduction

The concept of sustainability is not exclusive to the environment, as it permeates several areas, including political, economic, social, cultural, technological [1], and health sustainability, among others. Food production on a global scale is a subject that draws attention to environmental and food sciences. The population increase predicted for the coming years will require efficient strategies from countries so that future generations do not suffer from food shortages [2]. Any proposal that does not include poverty and hunger cannot be considered sustainable [3]. The reduction of post-harvest loss is an important factor in the production chain of these inputs. In the case of grains, this loss can vary from 5 to 30%. According to Food and Agriculture Organization (FAO), simple and good storage practices can improve food and nutrition security [4,5]. In this context, arthropods threaten quality standards in food storage, which lose their nutritional value when attacked [6]. Among the insects that attack stored grains, *Ulomoides dermestoides*, pose a risk to commerce because they feed on stored grains [7]. Besides, *Eucalyptus* cultivation in Brazil is carried out on naturally mineral-poor soils [8], which suggests sustainable management in degraded areas. The species of this genus have high production of essential oil (EO) [9]. The objective of this work is to know the chemical profile and major component of *Eucalyptus cinerea*'s EO and verify its biological activity and major component against adults of *Ulomoides dermestoides*.

Material and Methods

The essential oil (EO) from fresh leaves of *Eucalyptus cinerea* F. Muell ex Benth was supplied by rural producer Carla Guinancio Emrich, IE: 72,019,350, collected in the municipality of Nova Friburgo, RJ, Alto das Braunes, Bela Vista Farm, Mirante Real, 22º17´12"S - 42º29´43"W, at 1060 msm. Gas Chromatography performed chemical analysis (GC) coupled to a Mass Spectrometer (MS) (Shimadzu) using electronic ionization. The identification of compounds was performed by comparing the Arithmetic Index (AI), determined about retention times, comparing their retention index and mass spectra with those reported in the literature [10]. *Ulomoides dermestoides* (Coleoptera, Tenebrionidae) insects are created as study models at the Laboratory of Insect Biology in the Department of General Biology of Universidade Federal Fluminense (LABI/GBG/UFF) under registration A855382 of the Genetic Heritage Management Council (SISGEN). To determine the biological activity of the EO and its major component, three groups of 15 adults were randomly separated to be exposed by contact application. The trial had eight treatments, described below: negative control (no treatment); solvent control (acetone); pure oil without dilution; 1,8 cineole; dilution with acetone at the following concentrations: 500 µL/mL; 250 µl/ml; 125 µl/ml; 62.5 µL/mL.

Results and Discussion

The chemical profile of the EO from fresh leaves of *E. cinerea* revealed 5 substances identified, being 9.75% of monoterpenes and 86.28% of oxygenated monoterpenes. The total number of substances

identified was 96.03%. The major component present in the EO was 1,8-cineole, with 76.8% of the compounds found. Among the 700 species of *Eucalyptus* known in the world, 500 produce EOs. The chemical composition of the oils of the genus varies according to the year's season, the origin and the species, and these oils have different biological activities. *E. baueriana*, *E. smithii*, *E. globulus*, and *E. polybractea* are the main species known to have cineole as a major component of their essential oils. Although *E. cinerea* is a less explored species, it is known to have the highest content of 1.8 cineole, better known as eucalyptol [11].

It was the first time *E. cinerea* EO and 1,8 cineole were tested against the species *U. dermestoides*. EO and 1.8 cineole caused 100% mortality on the first day of the experiment. A certain mortality rate was also observed in the first two dilutions on the first day. In the other dilutions, mortality occurred from the 7th day of the experiment. There were no deaths in any of the control groups. The LC50 (55.20 µg/cm^2) and LC90 (101.51 µg/cm^2) were calculated on the 20th day of this experiment with a confidence interval of 95%. A bioassay was performed by fumigating EOs from *Salvia officinalis*, *Elettaria cardamomum*, and *Lippia origanoides* to verify the mortality of *Ulomoides dermestoides* and *Tribolium castaneum*. The highest percentage of mortality was obtained for the EO of *Lippia origanoides*, which presented a rate of 40±0.36% in 48 hours for *U. dermestoides* [6].

Conclusion

The present proposal, unprecedented, as it uses species tested for the first time for this purpose, based on natural products, may represent a new and promising alternative tool in the arsenal of actions already known and implemented in facing enormous challenges. In this way, it is expected to contribute, through science, to improving the quality of life of populations that have lived with health and well-being adversities based on local biodiversity resources for centuries.

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