



Tropentag, September 20 - 22, 2023 in Berlin

Evaluation of contact toxicity of essential oils for *Sitophilus zeamais* control

Talia Silva Ribeiro⁽¹⁾, Gisele Lopes de Oliveira⁽²⁾, Taina Soraia Muller⁽²⁾, Luanna Chácara Pires⁽²⁾

⁽¹⁾Master's Degree Programme in science, health and biodiversity, Federal University of the South of Bahia, Brazil;
⁽²⁾ Professor at Federal University of the South of Bahia, Brazil.



Introduction

The study was conducted in the extreme south of the state of Bahia, in the northeast of Brazil (Figure 1). A region known for its large number of small farmers, which makes production losses even more impactful for the local economy.

The maize weevil, *Sitophilus zeamais* (Coleoptera: Curculionidae), is a pest responsible for significant damage to stored grains worldwide. Currently, it is managed through chemical control. Due to their insecticidal properties, essential oils, extracted from aromatic plants, can represent a valid solution. The studied species are native to remaining areas of the Atlantic Forest and of great importance in the biome.

This study aimed to evaluate the effectiveness of *Cordia verbananacea* and *Protium heptaphyllum* resin essential oils, and *Piper macedoi* hydrolate in controlling *Sitophilus zeamais* adults.

Material and Methods

In the first bioassay:

Petri dishes containing 13 adult insects each, were submitted to a 20 µl dosage of the corresponding essential oil *Protium heptaphyllum* *Cordia verbananacea* and *Piper macedoi* hydrolate. Evaluated after 0, 12, 24, and 48 hours of incubation.

In the second bioassay:

Petri dishes containing 20 adult insects and 10 g of maize were used, to test four different dosages of *P. heptaphyllum* essential oil (62.5, 125, 500, and 1000 ppm) (Figure 2).

- Positive and negative controls were performed for both assays.
- The data obtained were analyzed with R® software.

Results and Discussion

In the first bioassay:

The essential oil of *P. heptaphyllum* resin presented 38.5% efficacy in controlling *S. zeamais* compared to the essential oil of *C. verbananacea* and *P. macedoi* hydrolate (Figure 3).

In the second bioassay:

No statistically significant differences ($p > 0.05$) were observed in the insecticidal effect among the dosages tested for *P. heptaphyllum* oil, although it was evident after 48 hours of incubation and gradually increasing until 96 hours. During the first hours of exposure, a repellent effect was observed, evidenced by the insect's behavior, similar effects were collected by Jairoce et al. (2016).

The insect repellent action of *S. zeamais* adults is proven via initial behavior in the tests, relating to the major compounds of the essential oil of *P. heptaphyllum*, such as limonene (62.26%). Corroborating with Restello and collaborators (2009) who obtained superior results when evaluating the repellent and insecticide activity for essential oil of *Tagetes patula*.

Conclusion

It led to the conclusion that *P. heptaphyllum* resin essential oil has toxic action against *S. zeamais* adults. However, further investigation is required to determine the ideal concentration of that essential oil for *S. zeamais* control.

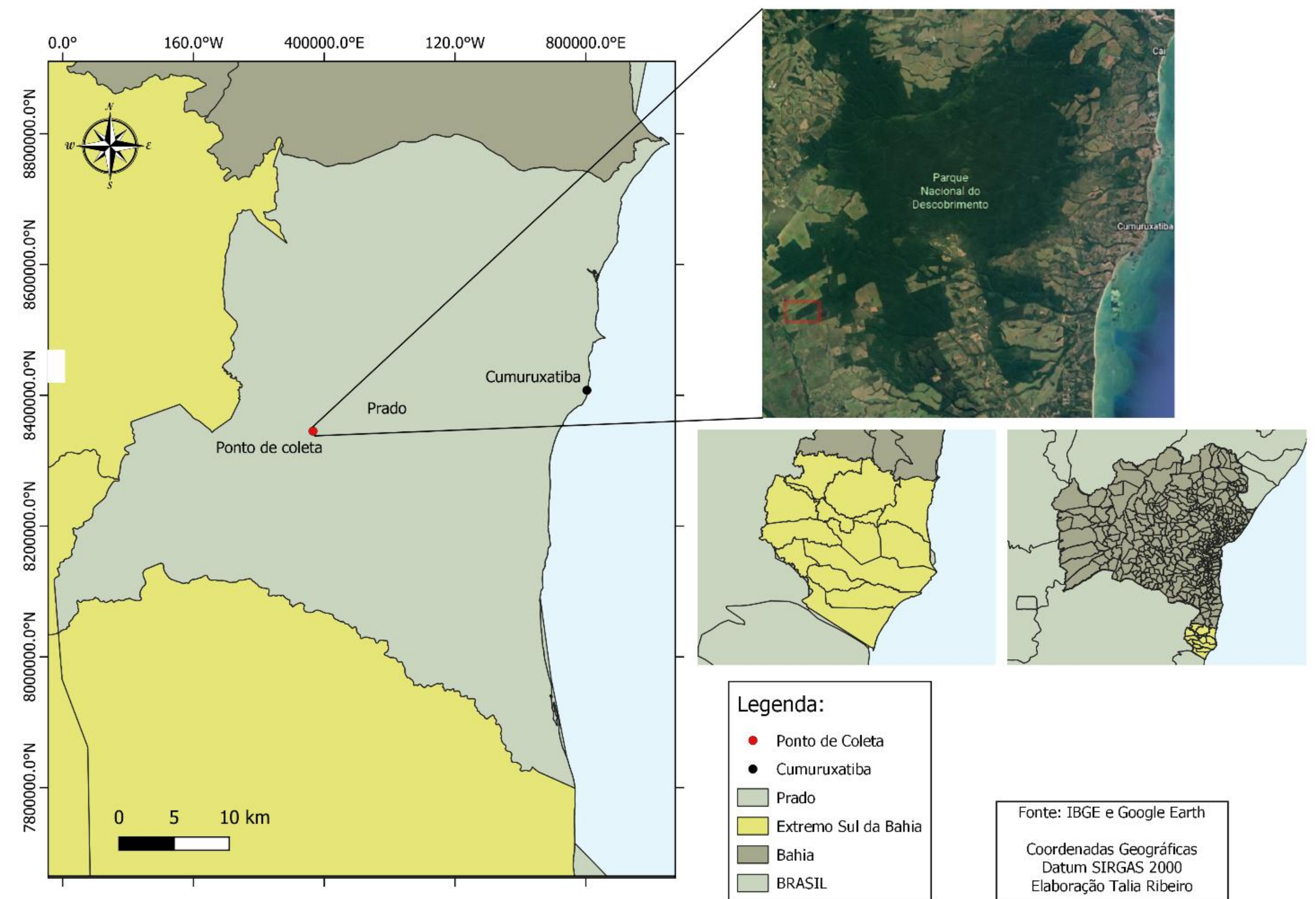


Figure 1. The species *P. heptaphyllum* and *C. verbananacea* were collected in the National Park of Discovery, in the municipality of Prado, Bahia.

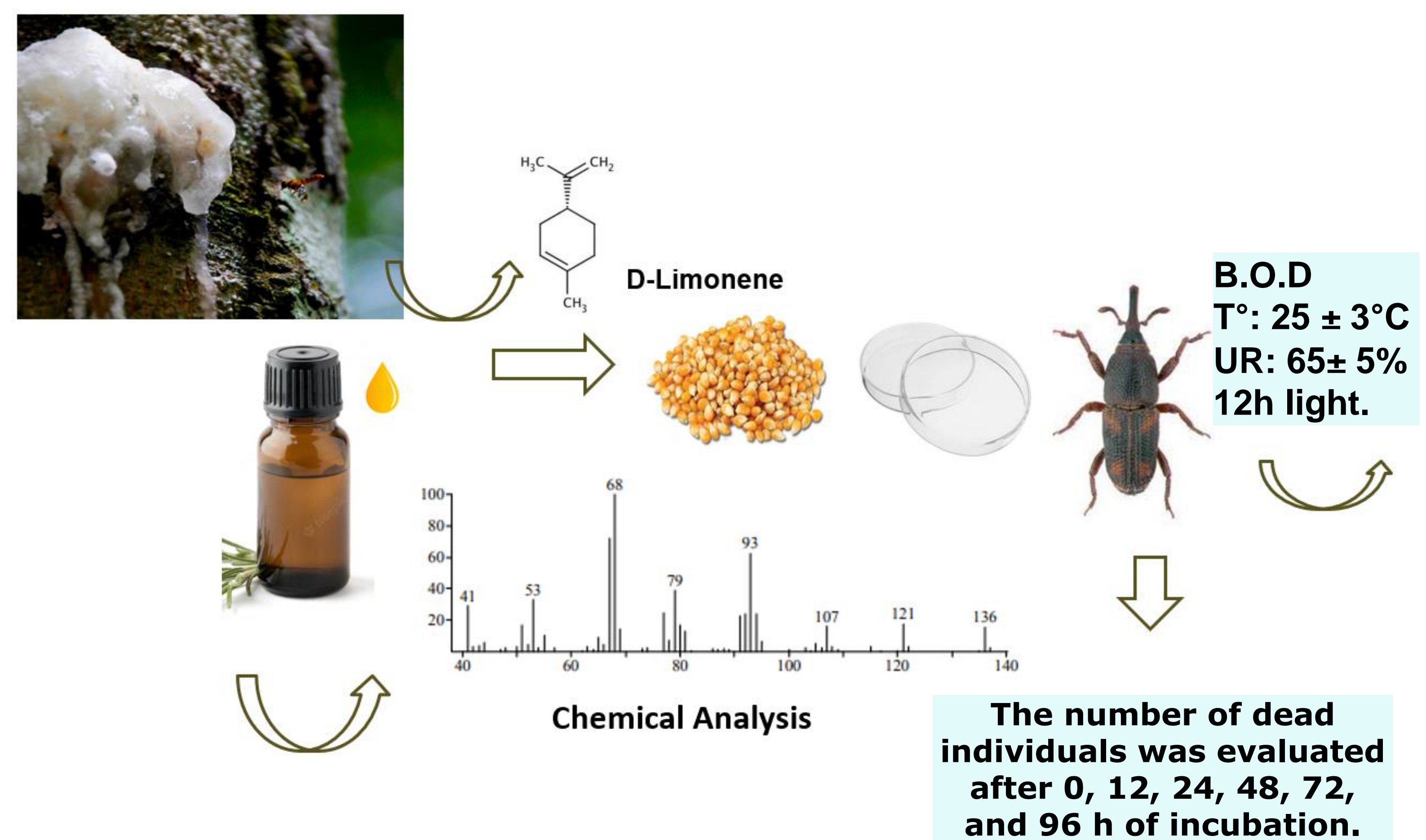


Figure 2. Description of the stages of the second bioassay with the essential oil of *P. heptaphyllum*.

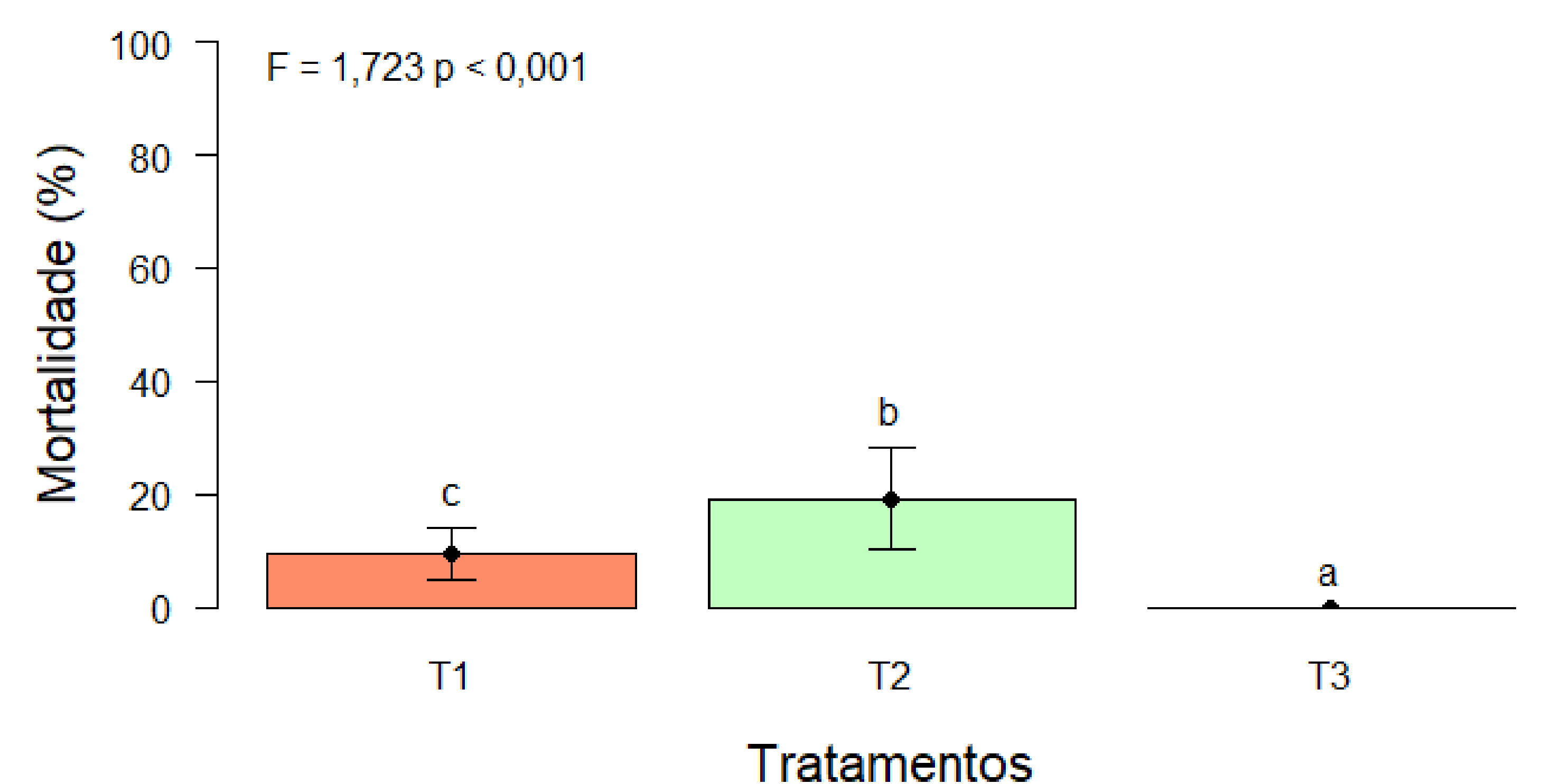


Figure 3. Bar graph of the analysis of variance in the first bioassay, comparing the means by the F test ($p > 0.05$) of the essential oils of *C. verbananacea* (T1), *P. heptaphyllum* (T2) and *P. macedoi* hydrolate (T3).

References

- JAIROCE, Carlos F. et al. Insecticide activity of clove essential oil on bean weevil and maize weevil. *Brazilian Journal of Agricultural and Environmental Engineering*, v. 20, p. 72-77, 2016.
- RESTELLO, Rozane Maria; MENEGATT, Cristiane; MOSSI, Altemir José. Effect of *Tagetes patula* L.(Asteraceae) essential oil on *Sitophilus zeamais* Motschulsky (Coleoptera, Curculionidae). *Brazilian Journal of Entomology*, v. 53, p. 304-307, 2009.

Supported by the

