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Potential of *Dittrichia viscosa* (L.) Greuter (Asteraceae) as a biopesticide for controlling *Bradysia* spp. (Diptera: Sciaridae) in nurseries of aromatic plants

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INTRODUCTION & AIM

***Bradysia* spp.** (Diptera: Sciaridae), commonly known as fungus gnats, are among the most important damaging pests in nursery production, especially in propagation systems based on semi-hardwood cuttings. The larvae feed on vascular tissues (Fig. 1), causing significant losses, particularly in aromatic plants.

Conventional control methods are limited due to the lack of effective products, increasing resistance among pest populations, and reduced availability of biological control agents.

Figure 1: Larvae, Pupae and Adult of *Bradysia* spp.

Botanical extracts represent a promising and eco-friendly alternative, accessible even to small-scale producers. Potential sources include food industry by-products and underutilized plant species.

Dittrichia viscosa (Asteraceae), a Mediterranean shrub, has demonstrated insecticidal activity against several pest species and could serve as a local, low-cost alternative.

This study aimed to evaluate the potential of *D. viscosa* extract as a botanical insecticide against *Bradysia* spp. and to assess the susceptibility of five commonly cultivated aromatic plant species in Portugal.

MATERIAL & METHOD

Experimental Setup

The trial was conducted in a greenhouse at the Agrarian School of Santarém, Portugal. Two trays (Fig. 2), were prepared, each containing cuttings of five aromatic species:

- White-flowered *Rosmarinus officinalis* (AB);
- Purple-flowered *R. officinalis* (AR);
- *Santolina rosmarinifolia* (Sant);
- *Thymus vulgaris* (Tom);
- *Lavandula angustifolia (*Alf*).*

Figure 2: Tray with the assay

Cuttings were placed in water with the agent “Promi-root” to stimulate root development (Fig. 3).

Figure 3: cuttings preparation and “Promi-root” application

Pest Infestation and Treatment

To ensure pest exposure, a plant heavily infested with ***Bradysia spp***. was positioned near both trays.

- One tray was sprayed with a 2% (w/w) aqueous extract of ***Dittrichia viscosa***.
- The other tray served as an **untreated control**.

Figure 4: *D. viscosa* plant

Figure 5: Dried and mowed *D. viscosa*

Figure 6: *D. viscosa* extract

The extract was prepared by infusing dried, ground *D. viscosa* in distilled water at 90°C for 5 minutes, then filtering and storing it refrigerated (Fig. 4-6). Sprays were applied every 15 days.

Data Collection and Analysis

Plant mortality was recorded weekly. Dead cuttings were examined under a microscope to confirm *Bradysia spp*. Presence Fig. 7)

Survival data were analyzed using the **Log-Rank (Kaplan–Meier)** test to assess:

- The susceptibility of each plant species.
- The effectiveness of the D. viscosa extract
- in reducing mortality.

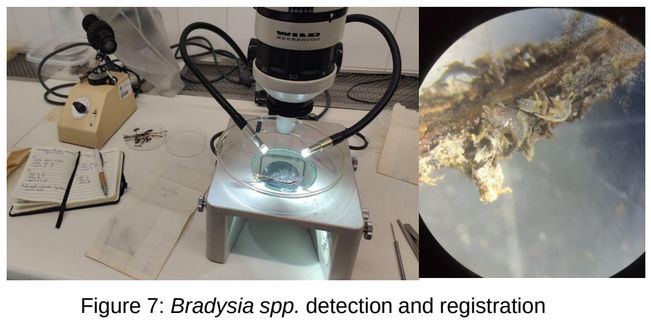

Figure 7: *Bradysia spp.* detection and registration

RESULTS & DISCUSSION

Susceptibility of aromatic plants to *Bradysia* spp.

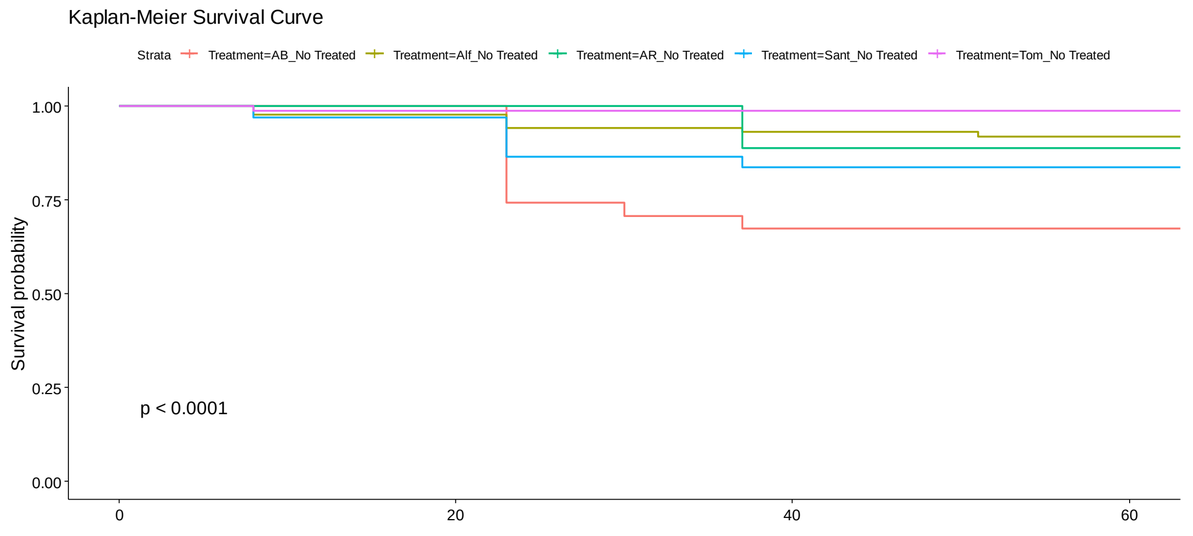

Figure 8: Survival of white *R. officinalis* (AB), *L. angustifolia* (Alf), purple *R. officinalis* (AR), *S. rosmarinifolia* (Sant), and *T. vulgaris* (Tom) infested by *Bradysia* spp. and untreated during 60 days after infestation.

Significant differences in plant survival rates were observed among aromatic plant species infested by *Bradysia* spp. (Fig. 8). *Rosmarinus officinalis* with white flowers was the most susceptible, showing a survival rate of only 75% at 60 days after infestation. In contrast, *T. vulgaris* showed lower susceptibility, with a survival rate of 98%.

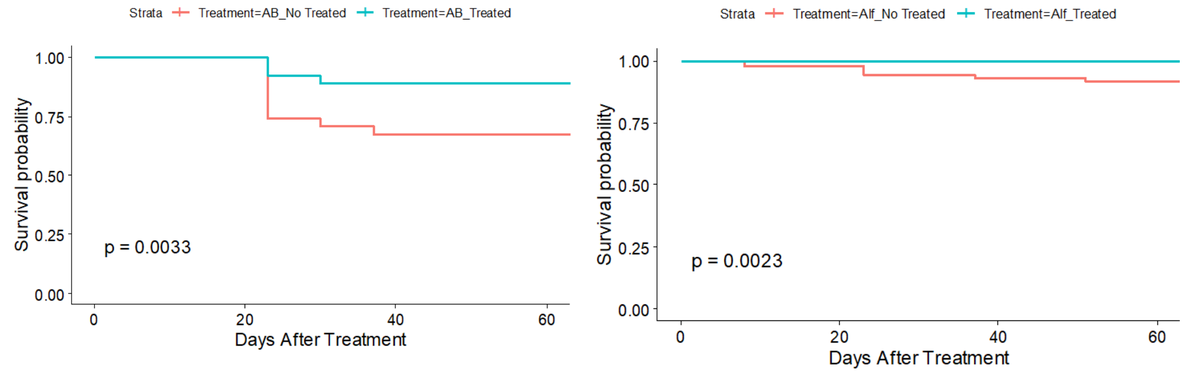

Figure 9. Survival of white *R. officinalis* (AB) and *L. angustifolia* (Alf) treated with *D. viscosa* (2% v/v) extract or untreated (NoTreated).

Application of the aqueous extract of *D. viscosa* (2% w/w) led to statistically significant improvements in plant survival in only two species: white-flowered *R. officinalis* (p = 0.0033) and *Lavandula angustifolia* (p = 0.0023), suggesting a potential insecticidal effect of the extract in these cases (Fig. 9). This outcome aligns with previous research, such as Lampiri et al. (2020), which reported effective insecticidal activity of *D. viscosa* against Coleoptera pests. This efficacy was attributed to the presence of α- and γ-costic acid isomers, as identified by Rotundo et al. (2019).

CONCLUSION AND FUTURE PRESPECTIVES

The results suggest that *D. viscosa* extract has potential as a botanical insecticide against *Bradysia spp.* in aromatic plant nurseries. Although significant effects were observed only in certain species, the use of this natural biopesticide may offer a promising strategy for sustainable pest management in cutting propagation systems.

Future trials should standardize both the host plant species and the concentration of *D. viscosa* extract to ensure consistent and reproducible results. Additionally, it will be important to identify and quantify the specific bioactive compounds responsible for the insecticidal activity.

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Rotundo, G., Paventi, G., Barberio, A., De Cristofaro, A., Notardonato, I., Russo, M. V., & Germinara, G. S. (2019). **Biological activity of Dittrichia viscosa (L.) Greuter extracts against adult Sitophilus granarius (L.) (Coleoptera, Curculionidae) and identification of active compounds**. *Scientific Reports*, *9*(1), 6429. https://doi.org/10.1038/s41598-019-42886-4

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