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MDPI

# CLOVE ESSENTIAL OIL (*Eugenia Caryophyllata*) AS A BIOCONTROL AGENT FOR THE PHYTOPATHOGENIC FUNGI *Penicillium brevicompactum* Y *Penicillium expansum*

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## INTRODUCTION AND AIM

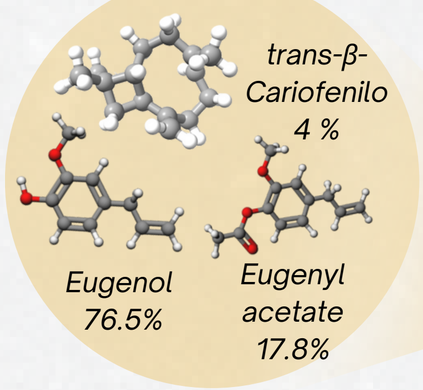
***P. expansum*** ***P. brevicompactum***

Fungal attacks are one of the main causes of crop losses during post-harvest and storage. *Penicillium brevicompactum* severely affects grains such as wheat and corn, while *Penicillium expansum* damages fruits such as apples, pears, and cherries [1]. Essential oils have demonstrated remarkable antifungal capacity due to the diversity of their components.

IIn particular, clove essential oil (Eugenia caryophyllata) (C.E.O) is presented as an ecological alternative for the control and inhibition of phytopathogenic fungi. This study analyzes the impact of C.E.O. on the growth of these fungi through growth dynamics and the observation of possible morphological changes through light microscopy, exploring its potential as a biocontrol agent [2].

***Clove essential oil (Eugenia caryophyllata)***

## METHOD



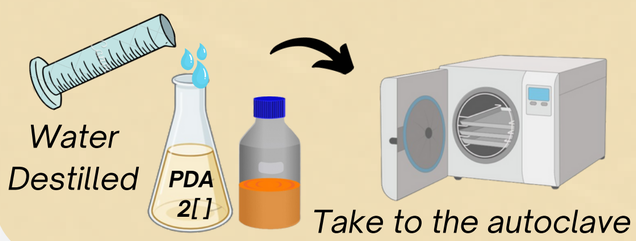

### Characterization of Clove Essential Oil

*CG-MS*

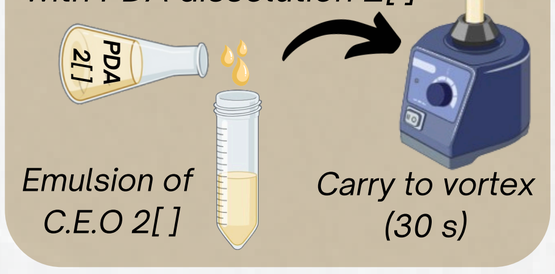
### *In* vitro test

1. *Preparation of the Emulsion C.E.O 2[ ]*


2. *Preparation of the PDA to 2[ ]*




3. *Mixing the emulsion with PDA dissolution 2[ ]*



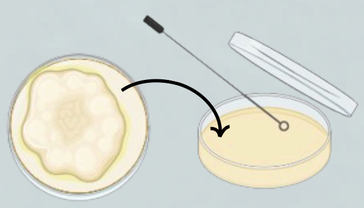

4. Serving culture medium with treatment

*Dilution in agar*

5. *Formulations for the culture medium*

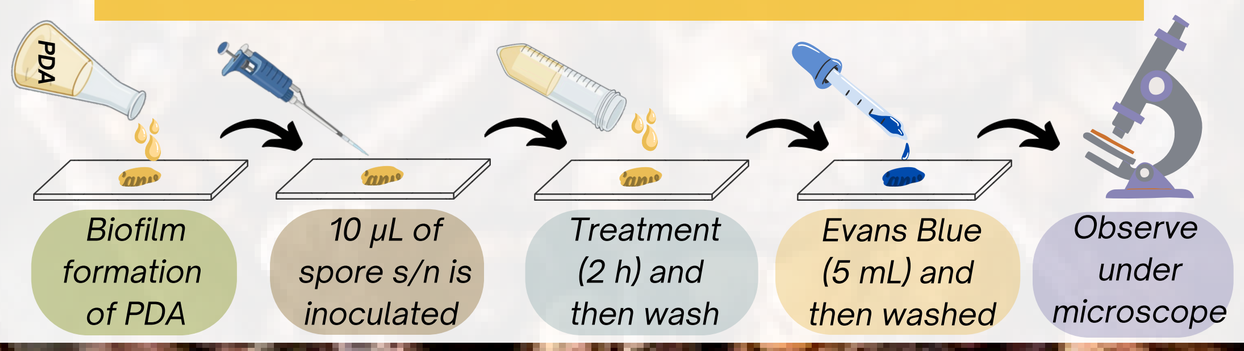
*F1: 1,250 (µL/mL)*
*F2: 0,625 (µL/mL)*
*F3: 0,312 (µL/mL)*
*F4: 0,156 (µL/mL)*

6. *Inoculation*



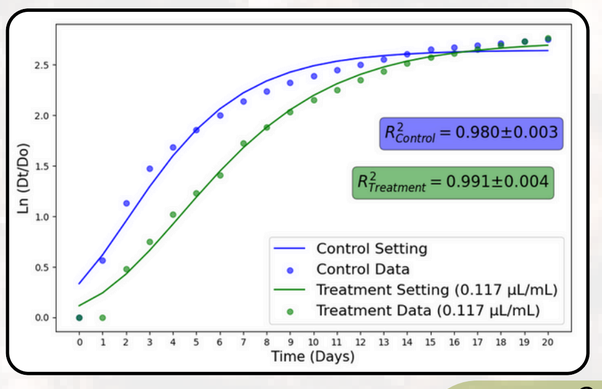
*Seeded in disk [3]*

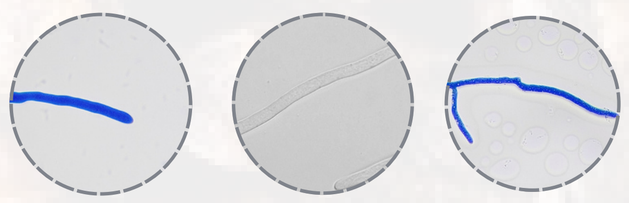
### Permeability in the membrane and cell wall




## RESULTS AND DISCUSSION

### Growth dynamics and cell wall permeability in *P. expansum*



***MIC 0,156 µL/mL*** ***Control*** ***Treatment 0,117 µL/mL***

*MIC = 0,156 µL/mL*
*%Inhibition D.3 = 51,7 ± 3,2*

*Control*
*A = 2,635 ± 0,003 (cm)*
*µm = 0,355 ± 0,009 (1/days)*
*λ = 0,361 ± 0,208 (days)*

*Treatment (0,117 µL/mL A.E.C)*
*A = 2,733 ± 0,026 (cm)*
*µm = 0,270 ± 0,021 (1/days)*
*λ = 1,595 ± 0,126 (days)*

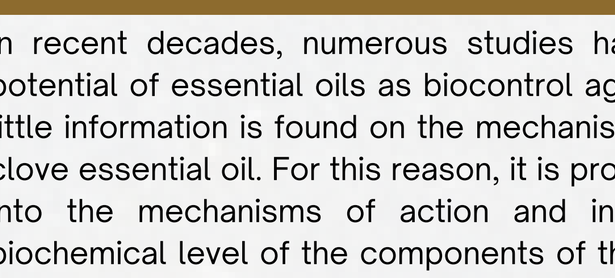
### Growth dynamics and cell wall permeability in *P. breviconpactum*

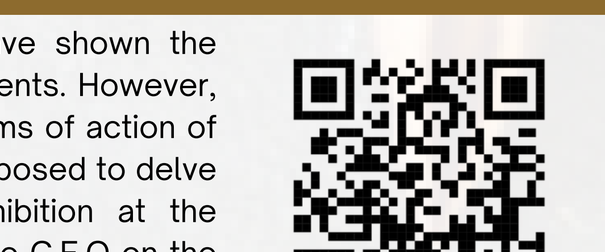
*Treatment (0,156 µL/mL A.E.C)*
*A = 1,038 ± 0,037 (cm)*
*µm = 0,344 ± 0,005 (1/days)*
*λ = 1,571 ± 0,041 (days)*

*Control*
*A = 1,928 ± 0,021 (cm)*
*µm = 0,343 ± 0,003 (1/days)*
*λ = 0,265 ± 0,027 (days)*

*MIC = 0,312 µL/mL*
*%Inhibition D.12 = 58,3 ± 2,8*

***Treatment 0,156 µL/mL*** ***Control*** ***MIC 0,312 µL/mL***






## CONCLUSION

The impact of clove essential oil, evaluated on the growth of the fungi Penicillium brevicompactum and Penicillium expansum, demonstrated a minimum inhibitory concentration (MIC) of 0.312 µL/mL and 0.156 µL/mL, respectively. On the other hand, it was possible to show that sublethal concentrations of 0.117 µL/mL, with an inhibition percentage of 51.7 ± 3.2 % for *Penicillium expansum* and 0.156 µL/mL, with an inhibition percentage of 58.3 ± 2.8 % for *Penicillium brevicompactum*, slowed the growth of microorganisms and affected the permeability of the fungal wall and membrane.

## FUTURE WORK / REFERENCES

In recent decades, numerous studies have shown the potential of essential oils as biocontrol agents. However, little information is found on the mechanisms of action of clove essential oil. For this reason, it is proposed to delve into the mechanisms of action and inhibition at the biochemical level of the components of the C.E.O on the enzymatic machinery of microorganisms.