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Sustainable Control of Olive Anthracnose: Can Algae Be the Solution?

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INTRODUCTION & AIM

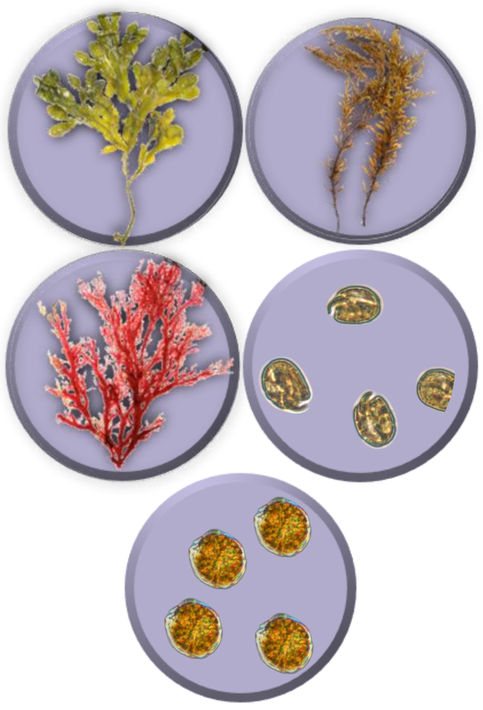
The olive tree (*Olea europaea* L.) is one of the most economically important fruit crops in Mediterranean regions [1]. Anthracnose, caused by *Colletotrichum* spp., significantly compromises fruit productivity and quality [2].

Despite their widespread use in controlling anthracnose, copper-based fungicides have variable efficacy and raise environmental concerns and are subject to increasing regulatory restrictions in the European Union [3].

Algae, rich in bioactive compounds with antimicrobial activity [4], show high potential for the development of sustainable antifungal solutions for controlling olive tree anthracnose.

METHOD

Aqueous and hydroethanolic (EtOH:H_2O, 75:25, v/v) solid–liquid extractions were carried out, along with the collection of exudate from the following marine algae:



Aqueous extracts:

- *Fucus vesiculosus*
- *Sargassum muticum*

Exudate:

- *Asparagopsis armata*

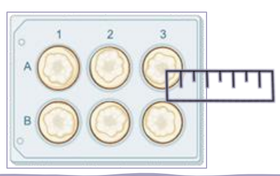
Hydroethanolic extracts:

- *Asparagopsis armata*
- *Amphidinium carterae*
- *Coolia monotis*

Extracts tested against an isolate of *Colletotrichum* sp. in the following *in vitro* and *in vivo* assays:

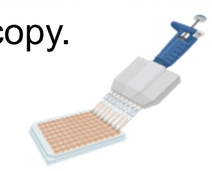
Mycelial growth Inhibition

Extracts at 0.1, 0.5 and 1 mg/mL.
Radial growth measured daily.



Spore germination Inhibition

Extracts at 0.1, 0.5 and 1 mg/mL.
Germination evaluated by microscopy.

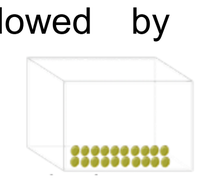


Phytotoxicity assay

Extracts at 0.1, 0.5 and 1 mg/mL.
Leaf damage/necrosis assessed after incubation.

In vivo assay on olives

Extracts at 1 mg/mL (*F. vesiculosus*, *S. muticum*, exudate of *A. armata*).
Pre-treatment with olive extract followed by spore inoculation.



RESULTS

The most significant results obtained in the assays performed are presented below.

Mycelial growth inhibition

The extract that showed the greatest inhibition of mycelial growth was that of *F. vesiculosus* (0.5 mg/mL), with 27% inhibition after 24 hours.

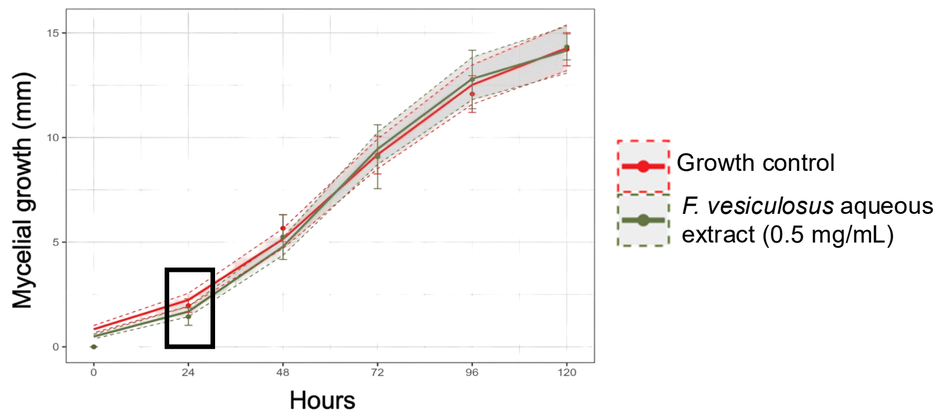
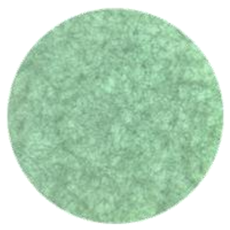


Figure 1. Radial growth of *Colletotrichum* sp. in the presence of aqueous extract of *Fucus vesiculosus* (0.5 mg/mL).

Spore germination Inhibition

No inhibitory effect observed



Phytotoxicity assay

The aqueous extract of *F. vesiculosus* did not show phytotoxicity at the concentrations tested.

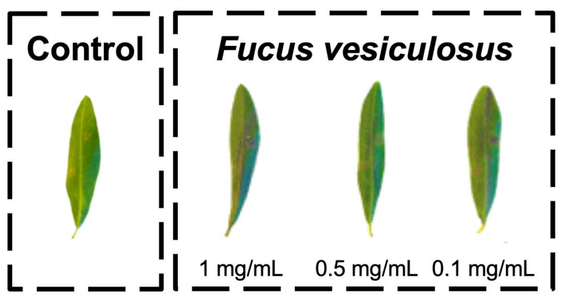


Figure 2. Phytotoxicity of the aqueous extract of *Fucus vesiculosus* on olive leaves at 0.1, 0.5 and 1 mg/mL.

In vivo assay on olives

F. vesiculosus (aqueous) reduced *Colletotrichum* sp. infection by 36%.

CONCLUSION

The aqueous extract of *Fucus vesiculosus* proved to be the most promising, showing approximately 27% inhibition of mycelial growth, no phytotoxicity in leaves and fruits, and an approximate 36% reduction in *Colletotrichum* sp. infection in the *in vivo* assay.

FUTURE WORK

In the future, it will be important to chemically characterise the most promising extract, optimise experimental parameters such as application frequency, and conduct field trials to validate its effectiveness under real conditions.

REFERENCES

[1] International Olive Council, "IOC news." Accessed: Nov. 12,2025. [Online]. Available: https://www.internationaloliveoil.org/
[2] I. Gouvinhas, P. Martins-Lopes, T. Carvalho, A. Barros, and S. Gomes, "Impact of *Colletotrichum acutatum* Pathogen on Olive Phenylpropanoid Metabolism," *Agriculture*, vol. 9, no. 8, Aug. 2019, doi: 10.3390/agriculture9080173.
[3] P. Avramidis, P. Barouchas, T. Dünwald, I. Unkel, and D. Panagiotaras, "The influence of olive orchards copper-based fungicide use, in soils and sediments - the case of Aetoliko (Etoliko) lagoon western Greece," *Geosciences (Basel)*, vol. 9, no. 6, p. 267, Jun. 2019, doi: 10.3390/geosciences9060267.
[4] T. F. L. Vicente, M. F. L. Lemos, R. Félix, P. Valentão, and C. Félix, "Marine macroalgae, a source of natural inhibitors of fungal phytopathogens," *Journal of Fungi*, vol. 7, no. 12, Nov. 2021, doi: 10.3390/jof7121006.

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