

## Comparative methodology for assessing natural antifungal metabolites compared to synthetic compounds in grapevine

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### INTRODUCTION & AIM

Grapevine (*Vitis vinifera*) is a highly valuable fruit crop but is vulnerable to fungal pathogens like *Botrytis cinerea*, which threaten both yield and quality. Traditional management relies on synthetic fungicides, but their safety is questioned due to environmental impact, resistance development, and chemical residues on grapes. In contrast, microbial volatile organic compounds (mVOCs) present a promising solution (Choińska et al., 2020), as they have shown the ability to effectively inhibit harmful fungi while being environmentally friendly and free from residues (Li et al., 2024).

Despite this, comprehensive methodologies for comparing the effectiveness of mVOCs with conventional fungicides are currently lacking. This study seeks to establish a standardized approach for evaluating and contrasting the antifungal properties of selected mVOCs against synthetic fungicides. By doing so, we aim to promote the adoption of sustainable and eco-friendly disease management practices in viticulture.

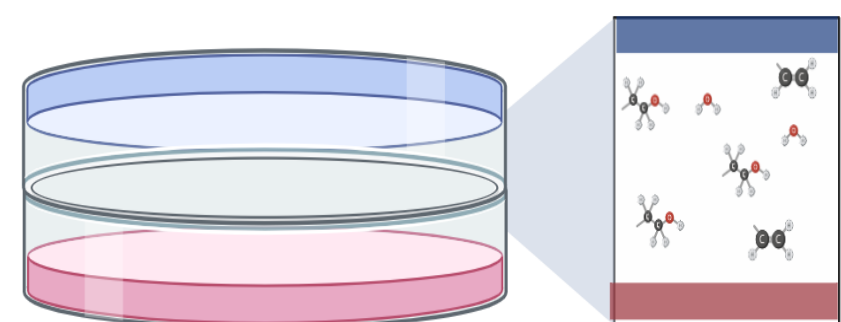
### METHOD

The antifungal activity of pure mVOCs and synthetic fungicides was tested *in vitro* (double-petri dish) and *ex vivo* (grape cv. *Petit Verdot*) against *B. cinerea*. mVOCs (ethyl acetate, isoamyl acetate, 2-phenethyl acetate, and 2-phenethyl alcohol) were compared with Teldor® and Folicur® (1–2000 ppm). Inoculated grapes were exposed to mVOCs in sealed tubes, and disease severity was rated on a 0–4 scale from “no symptoms” to “sporulation.”

#### In vitro

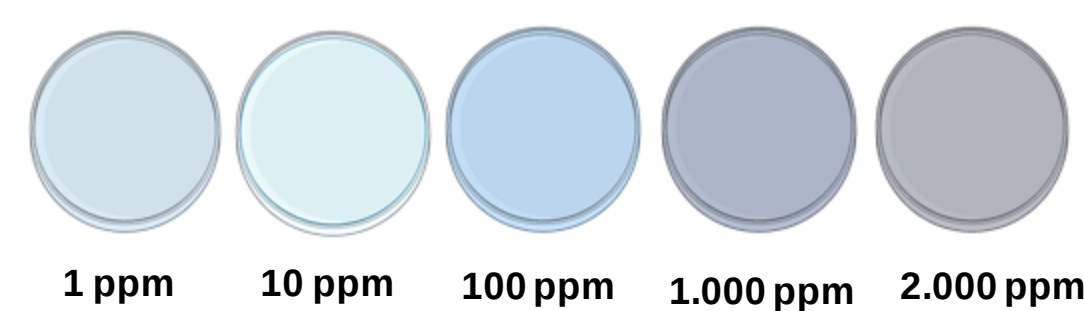
#### Fungicides

10<sup>6</sup>spores/mL of *B. cinerea*



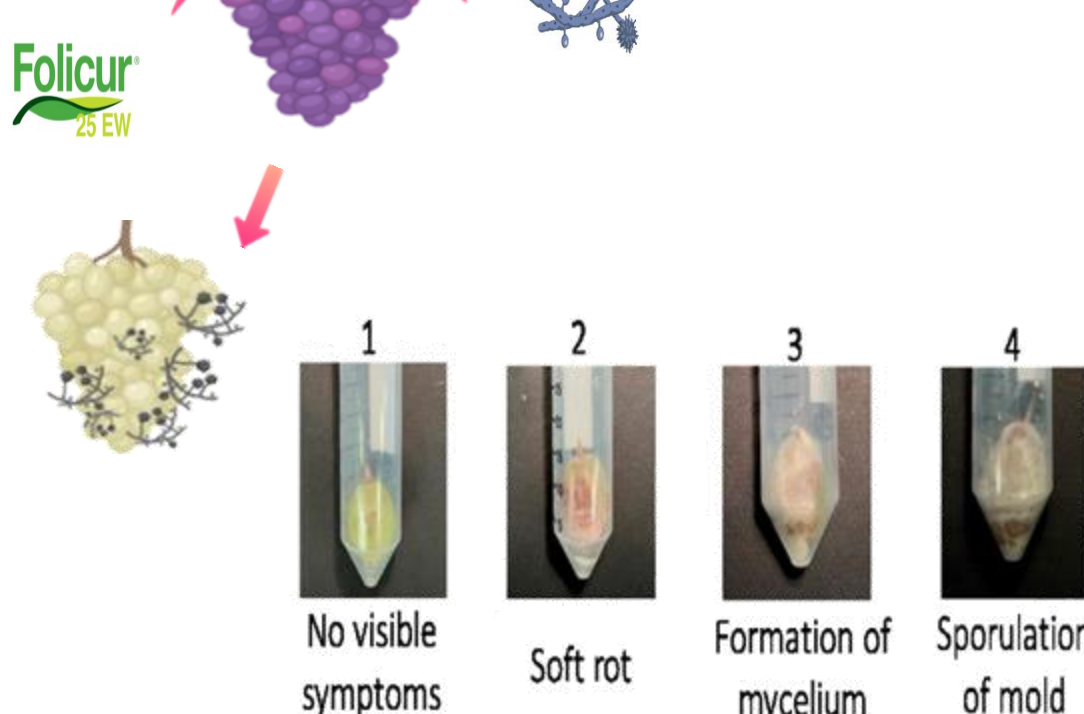
Pure mVOCs or Biological Agent control

Application dosis 1.333 ppm Folicur® 25 EW Application dosis 1.000 ppm



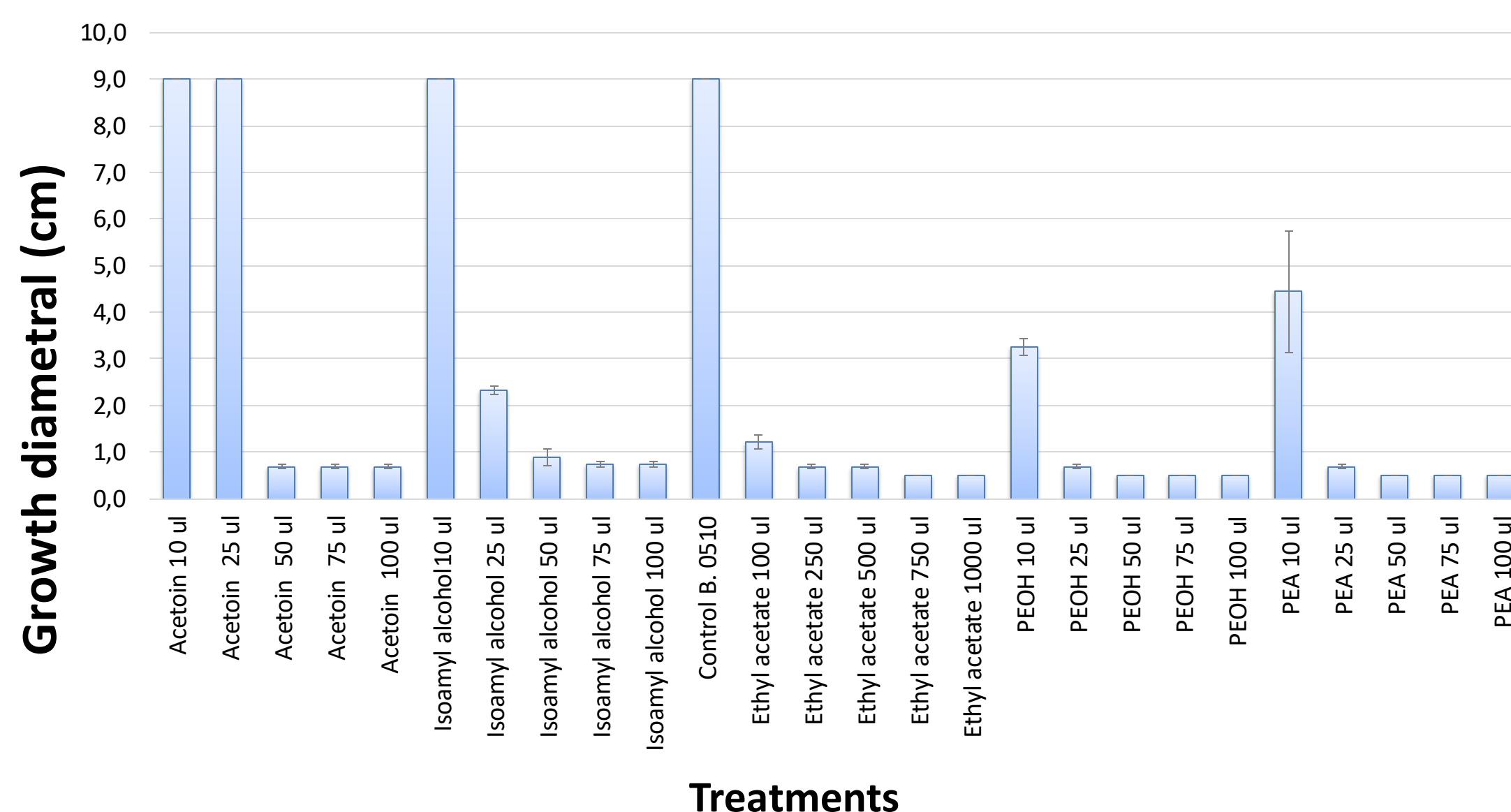
#### Ex vivo

10<sup>6</sup>spores/mL of *B. cinerea*



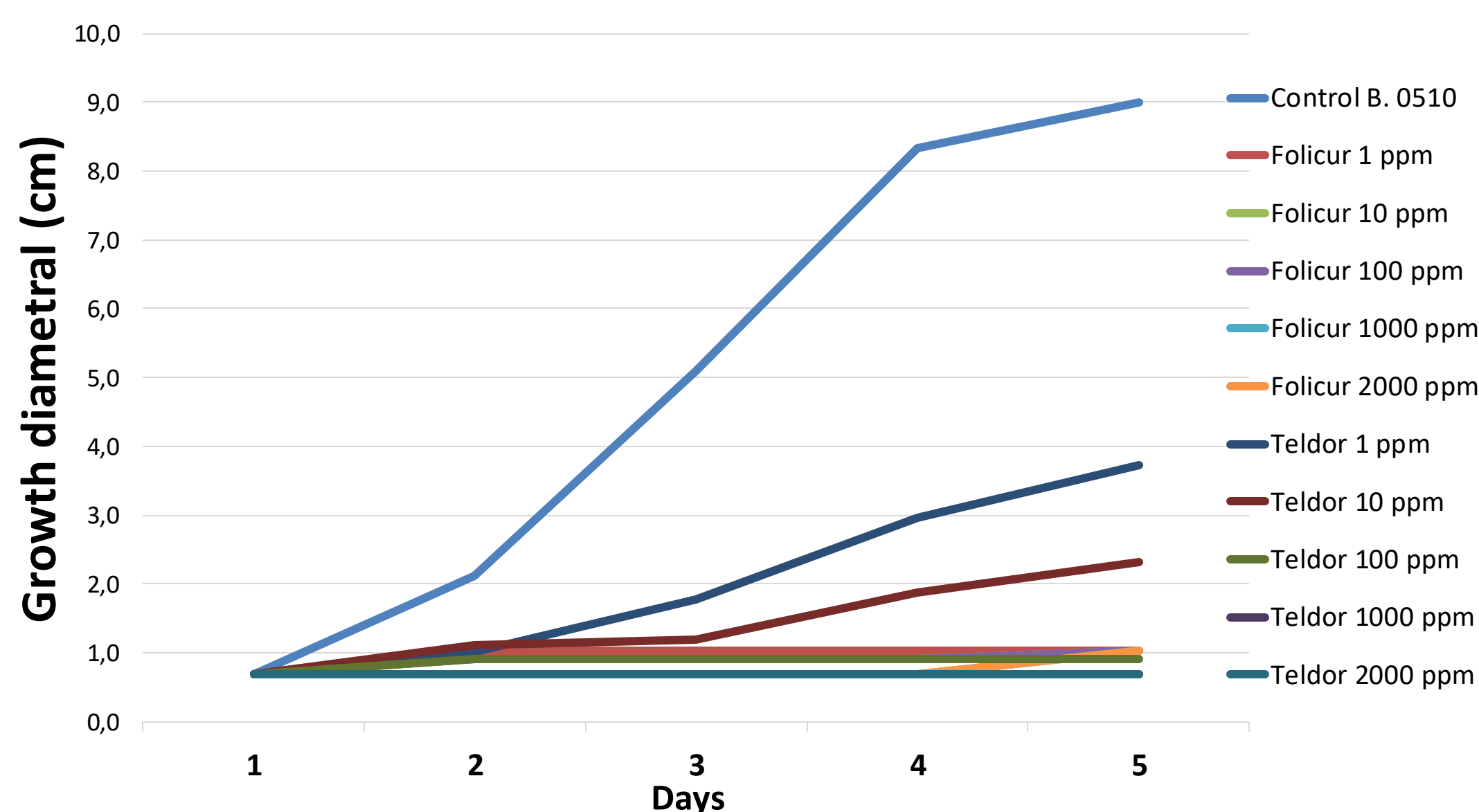
### RESULTS & DISCUSSION

#### In vitro evaluation of mVOC's



Treatments

#### In vitro evaluation of fungicides



### CONCLUSION

PEA and PEOH showed complete inhibition of *B. cinerea* at 0.5 g/L in both *in vitro* and *ex vivo* assays, demonstrating their strong antifungal potential. The proposed comparative methodology effectively evaluates natural metabolites alongside synthetic fungicides, providing a reliable framework for future studies. These results highlight the promise of mVOCs as sustainable, residue-free alternatives for integrated disease management in viticulture.

### REFERENCES

- Choińska R, Piasecka-Jóźwiak K, Chabłowska B, et al (2020) Biocontrol ability and volatile organic compounds production as a putative mode of action of yeast strains isolated from organic grapes and rye grains. *Antonie Van Leeuwenhoek* 113:1135–1146. <https://doi.org/10.1007/s10482-020-01420-7>
- Li N, Wang B, Cui X, et al (2024) Biocontrol activities of grey mould of grapes with the volatile organic compounds generated by yeast HXMG-1 isolated from grapes. *J Plant Dis Prot* (2006). <https://doi.org/10.1007/s41348-024-00920-2>

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