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Potential herbicidal metabolites from *Fusarium venenatum* against major parasitic weed branched broomrape *Phelipanche ramosa* (L.) Pomel

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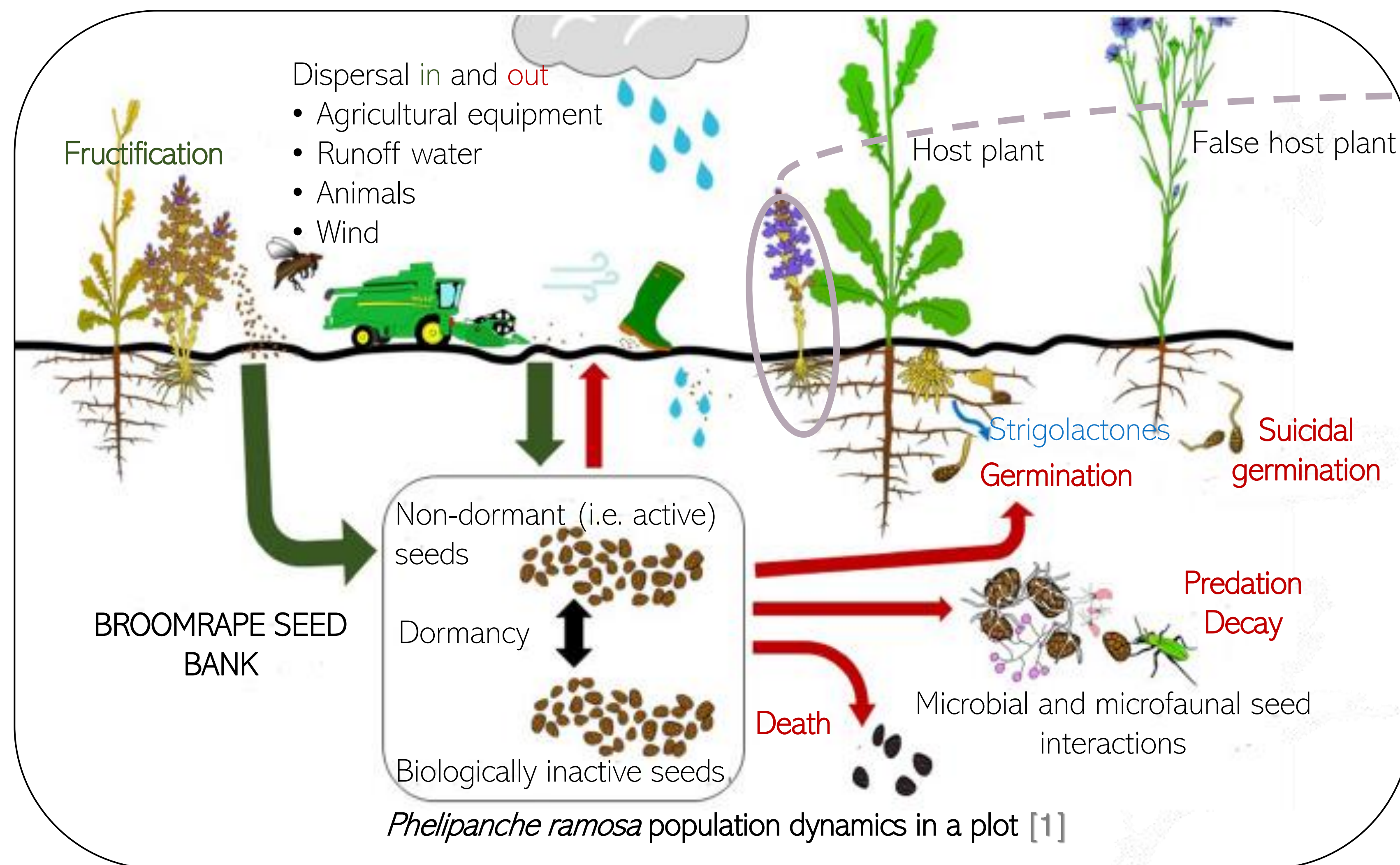
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CONTEXT and RESEARCH QUESTION

Branched broomrape (*Phelipanche ramosa* (L.) Pomel) a damaging parasitic weed that could be managed by fungal metabolites



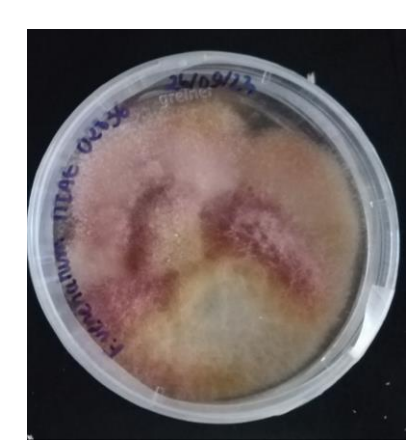
Nationwide collection of symptomatic broomrapes and isolation of *Fusarium* sp. strains inhibiting seed germination and causing necrosis on stems [2]

Major role played by *Fusarium* sp. in the appearance of lethal necrotic symptoms [3]. Metabolites?

Fusarium venenatum = promising candidate for a biocontrol of branched broomrape [2]. How to identify *Fusarium venenatum* metabolites having a phytotoxic activity towards *Phelipanche ramosa*?

Material and Methods

Fusarium venenatum MIAE2836 suspension (10⁵ spores/mL)



Phelipanche ramosa mixed with glucose-free liquid minimum medium (0.1 g/mL)

Sampling in Erlen (20 mL) :

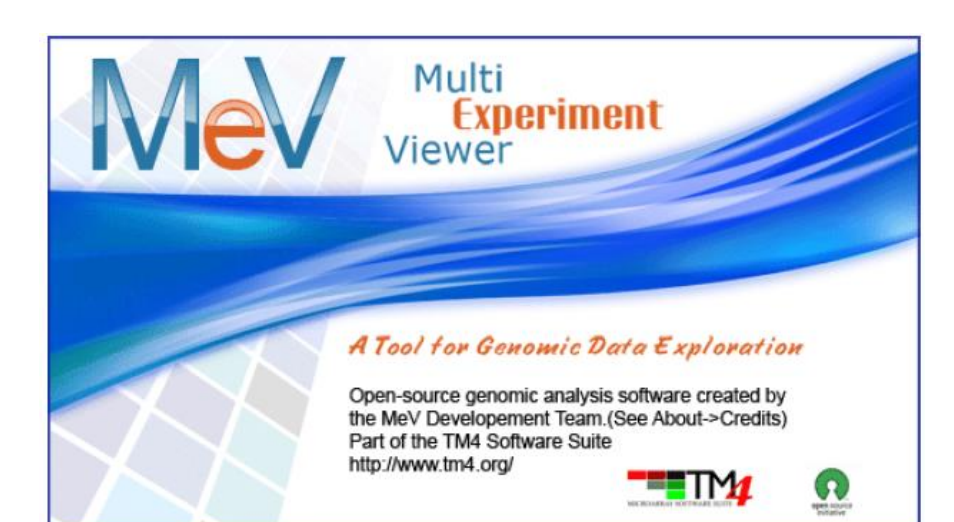
- Blank : LMM (x4)
 - Broomrape alone (x4)
 - Fungus alone (x4)
 - Interaction (x4)
- Shaker incubator (25°C, 125 rpm, 24h)



Untargeted metabolomics analysis by UHPLC/Q-ToF

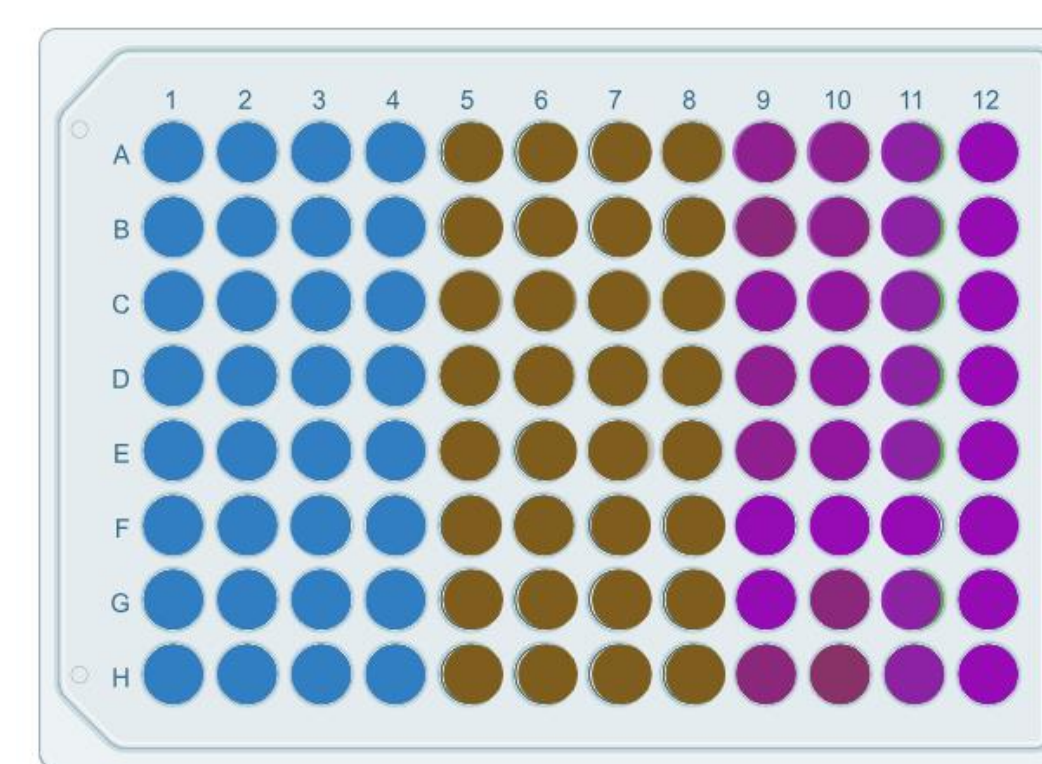
MZmine 3
1. Data processing

MetGem
2. Construction of molecular networks



3. Statistical analysis

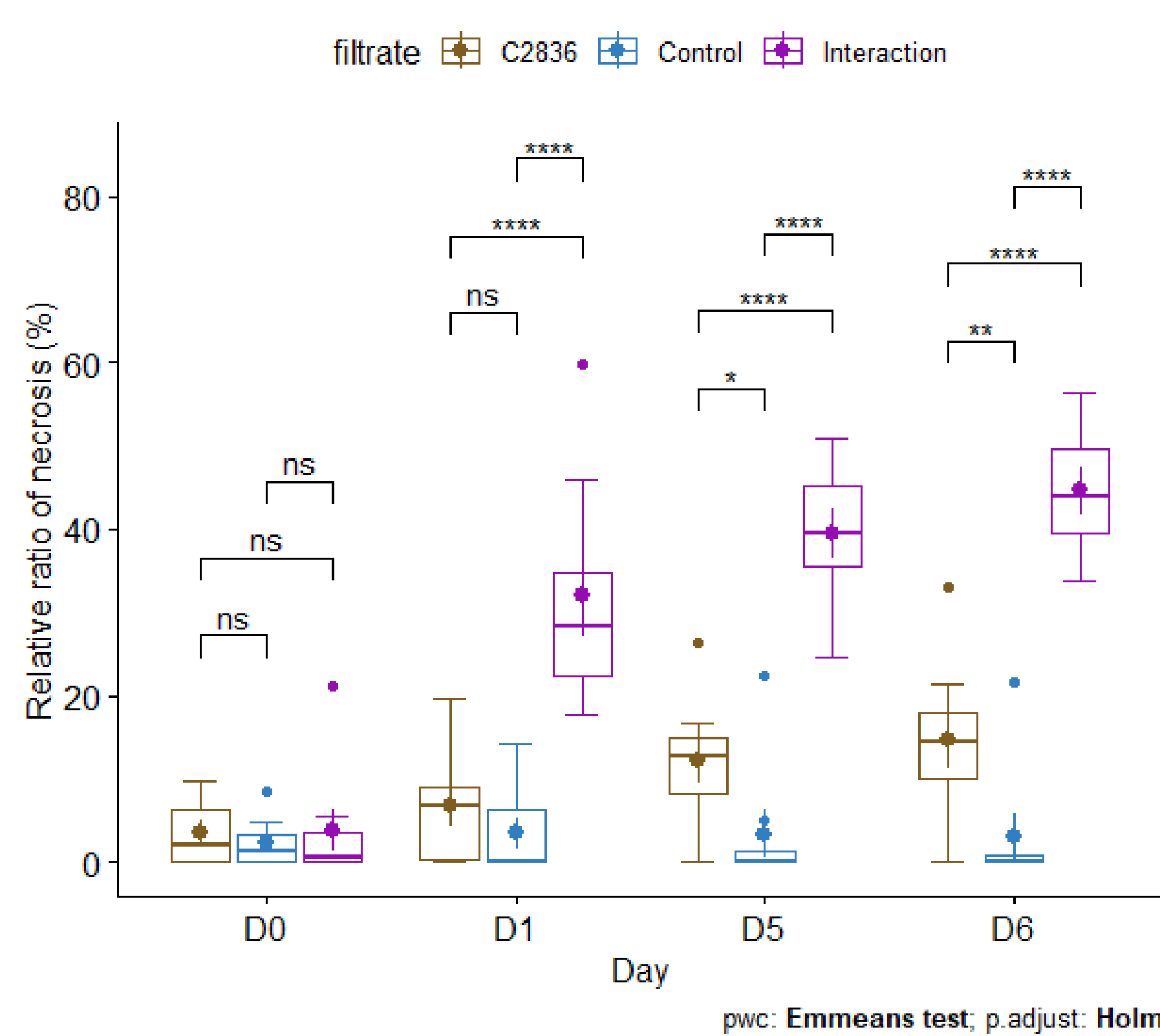
Phytotoxicity tests on microcalli and image analysis



- Negative control (100 µL of sterile distilled water)
- Fungus alone (filtrate/water (50/50 µL))
- Interaction (filtrate/water (50/50 µL))



Results and Discussion



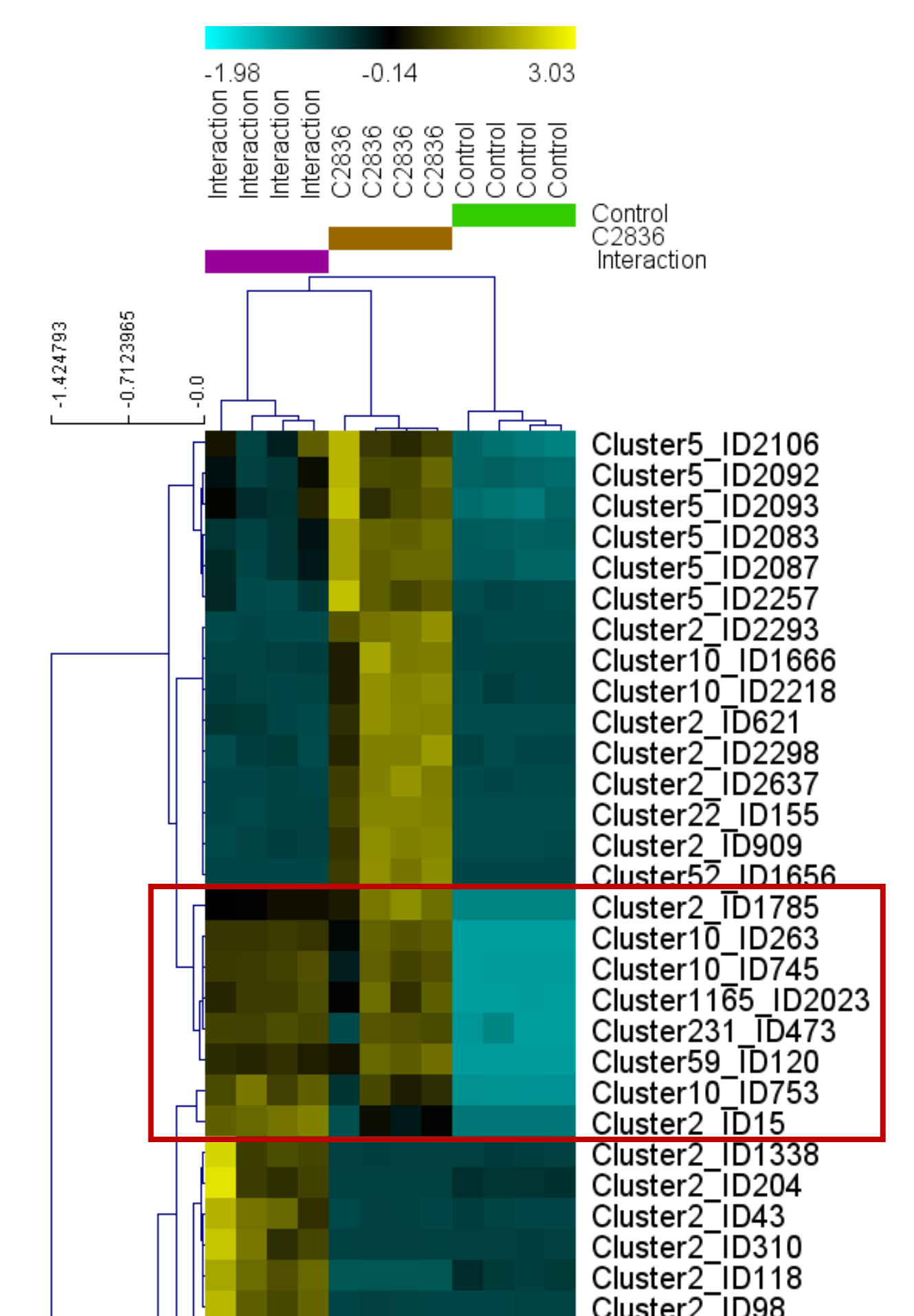
A phytotoxic activity of fungal filtrates towards microcalli highlighted

- Necrosis development as early as D1 with fungal filtrates
- Quantification by image analysis of necrosis due solely to fungal filtrates

Fusarium venenatum MIAE02836, a promising candidate to biocontrol *Phelipanche ramosa*

- Phytotoxic activity towards the early development stages of the plant
- Dual ability to inhibit germination and cause stem necrosis [2]
- Potential of the metabolites to reduce seed bank = a major issue to control *P. ramosa* [4]

Several fungal metabolites accumulated during the interaction: potential phytotoxic fungal metabolites? Several fungal metabolites known to be phytotoxic to weeds and parasitic weeds [4-5] -> need to characterize and identify molecules of interest



Conclusion and Perspectives

✓ Tests on microcalli, image analysis and untargeted metabolomic analysis confirmed the phytotoxic potential of *Fusarium venenatum* MIAE2836 towards the early development stages of *P. ramosa*.

Medium term goal: pursue to acquire knowledge on the pathogenic interaction by a multi-omic approach aiming at identifying the producing genes and the phytotoxic fungal metabolites

Bibliography :

- [1] Cartry *et al.* 2021. DOI: [10.1007/s13593-021-00669-0](https://doi.org/10.1007/s13593-021-00669-0)
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- [3] Cartry. 2023. <https://www.theses.fr/s217673>
- [4] Evidente. 2023. DOI: [10.3390/microorganisms11040843](https://doi.org/10.3390/microorganisms11040843)
- [5] Bendejacq-Seychelles *et al.* 2023. DOI: [10.1002/ps.7813](https://doi.org/10.1002/ps.7813)

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