Complexity of the tripartite interaction in the rhizosphere: case of soil-borne pathogenic fungi with the holoparasitic plant Phelipanche ramosa and its host plant

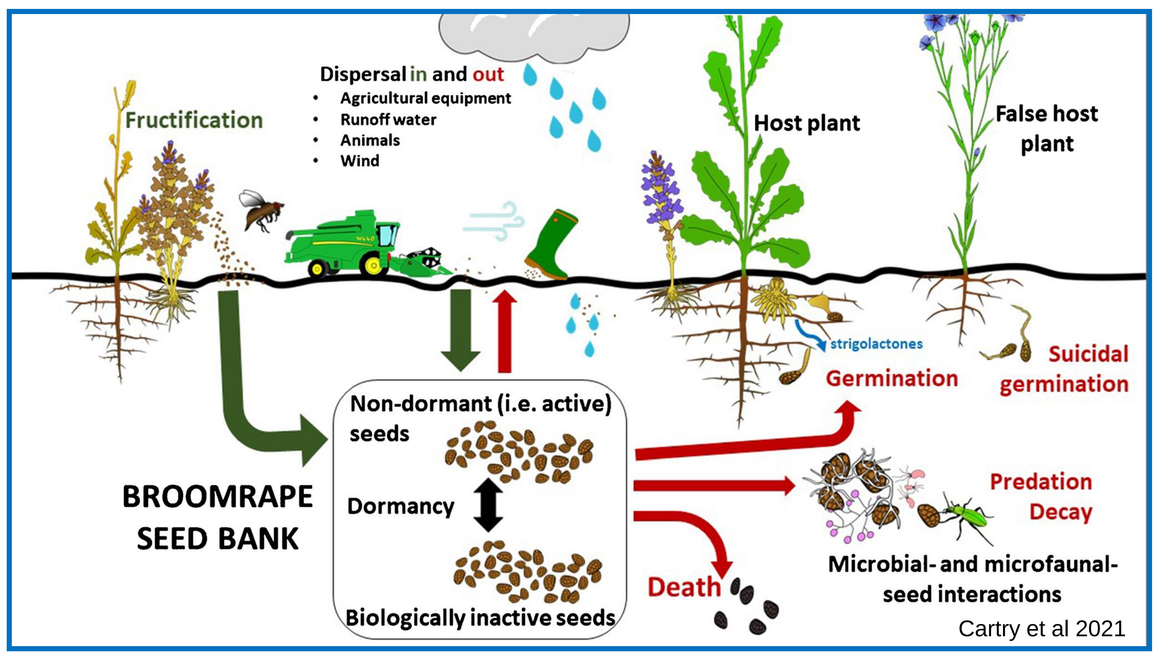
Dinïa Cartry, Stéphanie Gibot-Leclerc, Véronique Edel-Hermann, Christian Steinberg

Financé par :

Complexity of the tripartite interaction in the rhizosphere: case of soil-borne pathogenic fungi with the holoparasitic plant *Phelipanche ramosa* and its host plant.

D. Cartry [1], S. Gibot-Leclerc [2], V. Edel-Hermann, C. Steinberg [1]

[1] INRAE, UMR Agroécologie, 17 rue Sully, 21000 Dijon, France; [2] Institut Agro, 21000 Dijon, France



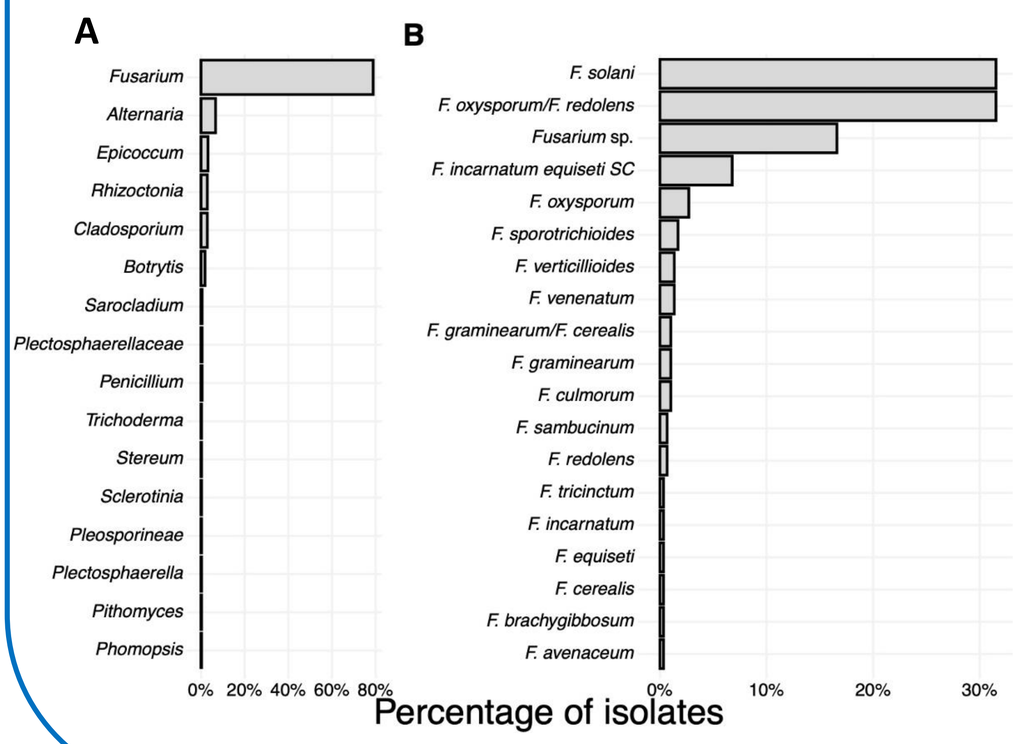
Cartry et al 2021

Branched broomrape (*Phelipanche ramosa* (L.) Pomel) is an achlorophyllous root parasitic plant with a wide host range. Its complex management is leading to the abandonment of tobacco or oilseed rape cultivation in the most affected regions in France. Among broomrape regulation factors [1], soil fungi could be a relevant biocontrol lever.

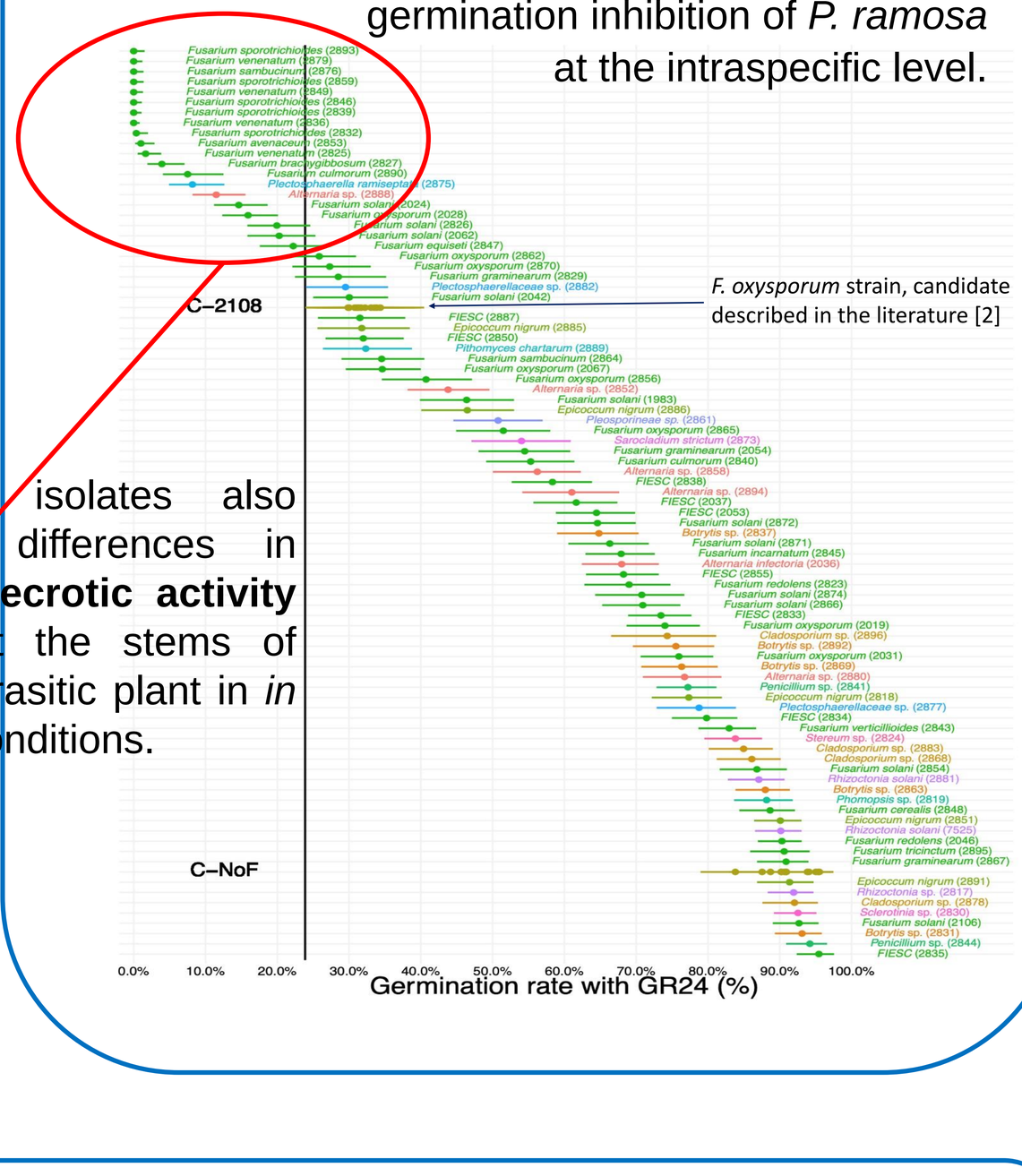
Hypotheses: i) symptomatic broomrapes are indicators of a pathogenic fungus ii) the later will negatively impact broomrape's growth at young phenological stages but not rapeseed and iii) the biological candidate colonizes both plants but with a pathogenic action in broomrape, not rapeseed

Objectives: i) to identify soil fungi as potential biological agents ii) to evaluate their pathogenicity against broomrape and iii) to understand the tripartite interaction between broomrape, rapeseed, and pathogenic fungi.

A **fungal** collection was made from **symptomatic** broomrape. Among the **374** collected isolates (A), nearly 80% belonged to **19 *Fusarium*** species (B).

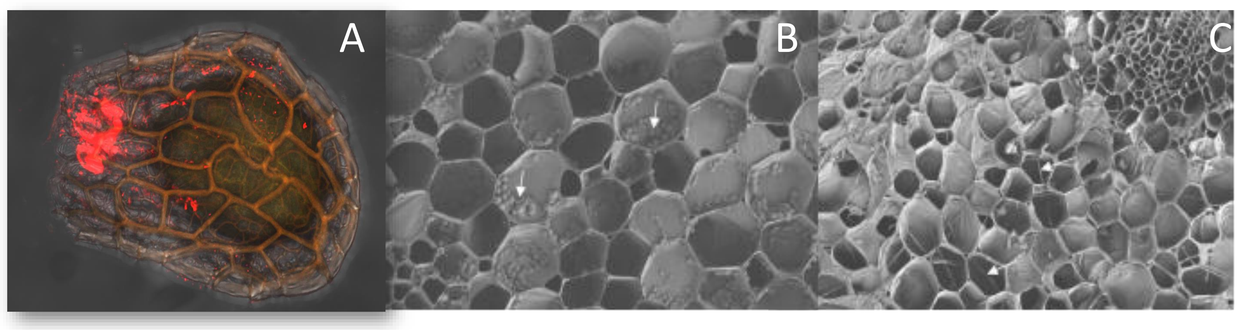


87 isolates representative of this diversity showed **functional diversity** by **inhibiting seed germination** of the parasite - The 20 best-performing isolates showed differences in germination inhibition of *P. ramosa* at the intraspecific level.



These isolates also show differences in their **necrotic activity** against the stems of the parasitic plant in *in vitro* conditions.

Fusarium venenatum isolates showed dual competence, i.e. germination inhibition and necrotic activity, and were non-pathogenic to tobacco.



Cytological observations confirm that the fungi colonize the broomrape tissues (mycelium colored in red on photo A) and uses the starch reserves of the plant to ensure its colonization (see arrows, photo B, C).

Conclusions: The results highlight different and complex biotic interactions possible between broomrape, host plant and pathogenic fungi, more specifically *Fusarium* sp. in the rhizosphere [3]. A **metabarcoding** approach will enlighten the colonization mode of the fungus to understand its pathogenic virulence against broomrape. Understanding the *Fusarium* pathogenicity in this **tripartite interaction is essential to implement an integrated control solution**.

[1] Cartry et al (2021) doi:10.1007/s13593-021-00669-0 ; [2] Boari et al (2004) doi:10.1016/j.biocontrol.2003.12.003; [3] Gibot-Leclerc et al. (2022) doi:10.1093/femsec/fiac024