

EVOLUTION OF SUNFLOWER DOWNY MILDEW IN FRANCE

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P. halstedii is monitored for 30 years in France

- Professional organizations: seed production & certification, breeders, farmers, plant protection companies, Terres Inovia, Inrae, GEVES,...
- Aims :
 - assess downy mildew pressure,
 - monitor the spread of existing pathotypes,
 - detect the emergence of new pathotypes,
 - monitor the evolution of strains resistant to fungicide seed treatment
- Since 2019, *P. halstedii* no longer included in the list of quarantine pests but still regulated (NQRO, non-quarantine regulated organism)

→ ongoing monitoring !

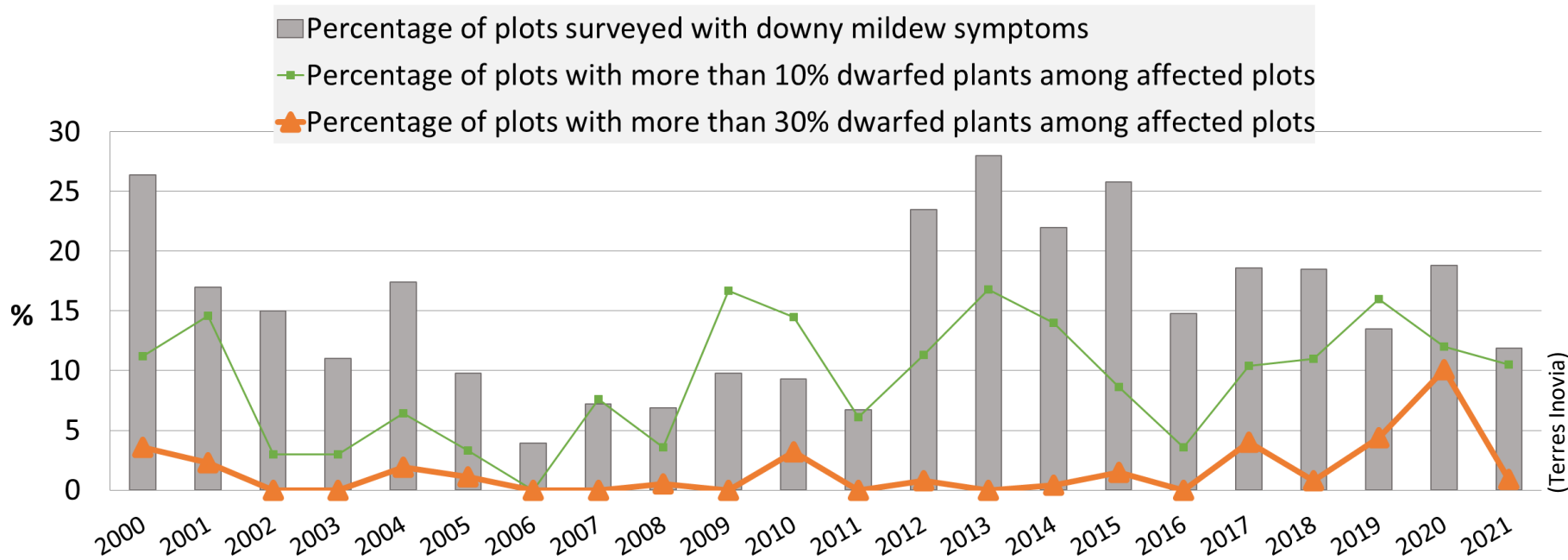
P. halstedii is monitored for 30 years in France

- A survey on more than 500 plots on all sunflower cropping areas each year
- 20 to 50 isolates analyzed (mainly on resistant varieties)
- Set of 9 differential lines (Tourvieille de Labrouhe *et al.*, 2000)
+ 2 additional lines : RHA340 (*Pl*8) and PSC8 (*Pl*2)
- 10 seedlings / line
- a 1-7 rating scale, to observe the type II responses (Mouzeyar *et al.*, 1993)



An overall well-controlled disease

- 2000-2021 : 860 plots observed / year
- From 4 to 28% of infected fields, depending on spring weather conditions
- Less than 10% of severe attacks (>30% dwarfed plants)



Since 2018, resistance overcoming of expected resistant varieties...



Departments where resistance overcoming was observed from 2018 to 2021 (> 10% of dwarfed plants):
[number of cases; number of varieties concerned]
(Terres Inovia)

- 77 cases on 28 varieties resistant to 100, 304, 307, 314, 334, 703, 704, 710 & 714
 - % dwarfed plants : [10%-100%], mean=39%
 - Short crop rotations, intensive use of resistant varieties
- Isolates of type « 334 », « 704 » and « 714 », some 714 isolates overcome *P/8* (cf. Martin-Sanz *et al.* 2020)
 - 3 types of 714 overcoming isolates identified by GEVES



Probably several concomitant overcoming events

These resistance overcoming phenomena affect many countries...

- They require:
 - the expansion of the set of differential lines in a concerted way
(*e.g.*, Ban *et al.*, 2021; Gilley *et al.*, 2020; Iwebor *et al.*, 2021; Sedlářová *et al.*, 2016; Tourvielle *et al.*, 20212 ; Trojanová *et al.*, 2018)
 - and the harmonization of the bio-testing protocol
(Trojanová *et al.*, 2017; Spring, 2019)
- They underline the key role of such monitoring:
 - For breeders
 - For producers
 - For researchers

Different research topics on both sunflower & *P. halstedii* to initiate or to reinforce

- Modes of action of *Pl* genes and optimization of their exploitation
- Understanding the evolutionary mechanisms of the pathogen (virulence, fungicide resistance)
- Impacts of the simultaneous use of genetic and chemical protection
- Quantitative resistance
- Impact of climate change on downy mildew.

An idea...

- Organization of a working meeting dedicated to downy mildew:
 - To share informations on recent resistance overcoming events
 - To define an enlarged and shared differential set at the international level
 - To work on the nomenclature of *Pl* genes
- Videoconference
- Let me know if you're interested in being an **active** participant !



See you at the poster session!

Thank you for your attention !

