Saprophytic survival of Fusarium graminearum in crop residues

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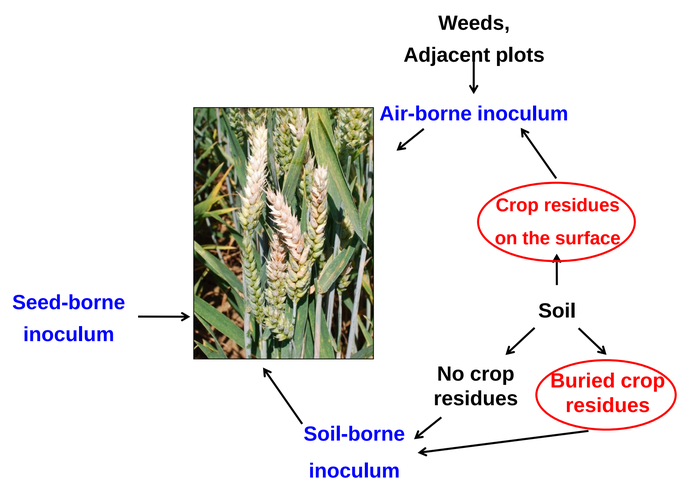
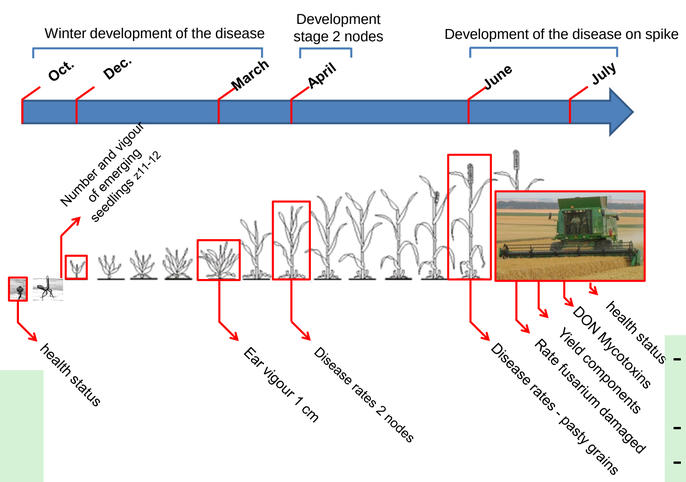
Fusarium Head Blight (FHB) is one of the most important disease altering wheat crops.
A field experiment was conducted i) to better understand the saprotrophic development of *Fusarium graminearum* and its consequences on FHB, ii) to characterize the relative importance of the different sources of FHB inoculum and the accumulation of mycotoxins in grains and subsequently, iii) to determine early indicators of future disease development on ears and accumulation of mycotoxins in grains.

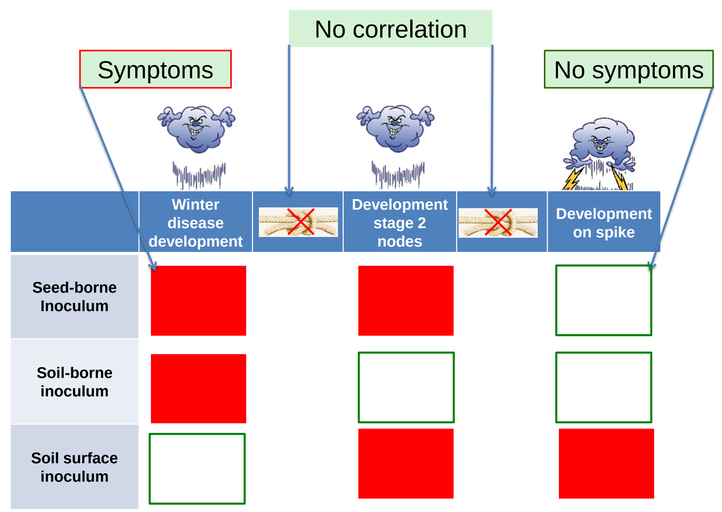
Relative contribution of different sources of inoculum in the development of Fusarium diseases



- Three wheat varieties (susceptible to resistant to FHB)
- Various sources of inoculum of *F. graminearum* (seed, soil, buried and non buried crop residues)
- 3 replicates/treatment, bioassay was performed two consecutive years
- Measurements (field and lab) were carried out throughout the duration of the culture



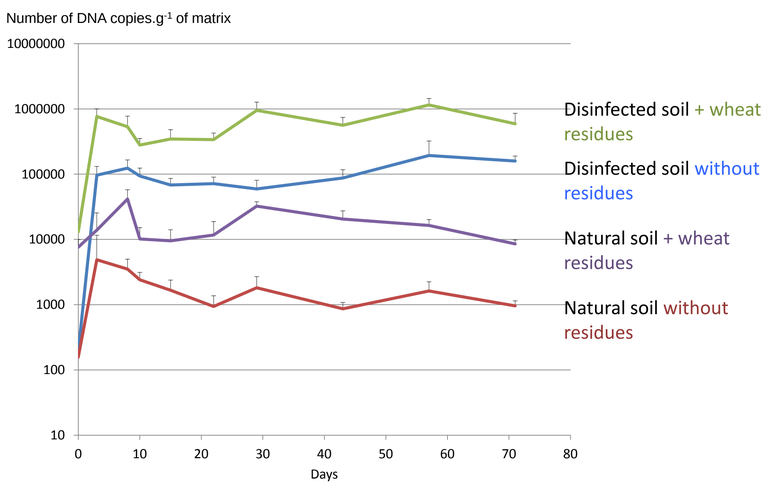
Relationship between early symptoms and the severity of Fusarium Head Blight



- No correlation between early symptoms and FHB => **No early indicators**
- Climate plays a decisive role
- Image analyses (not shown here) of spikes and spikelets revealed a positive correlation between symptoms and mycotoxin contents
- Air borne inoculum was not taken into account in this study.
- **Crop residues left on the surface are the main source of FHB symptoms => they need a specific focus !**

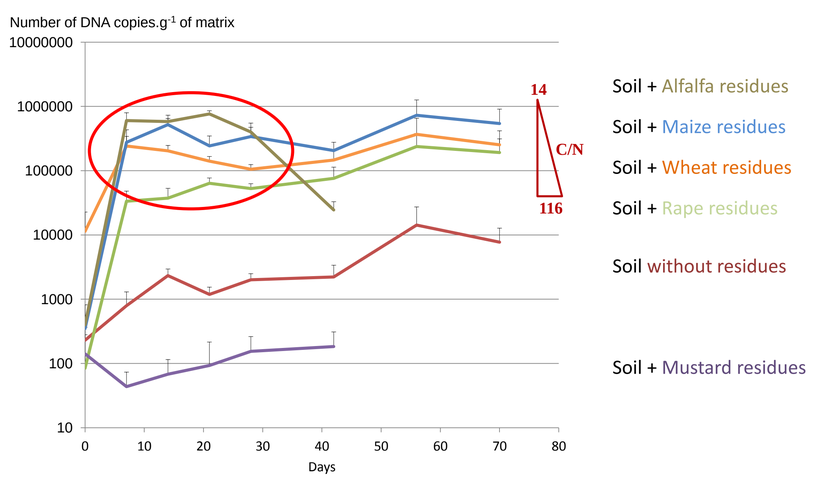
Saprophytic survival of *Fusarium graminearum* in soil in presence of various crop residues

Population dynamics of *F. graminearum* were assessed in controlled conditions (small microcosms) by Q PCR measurements



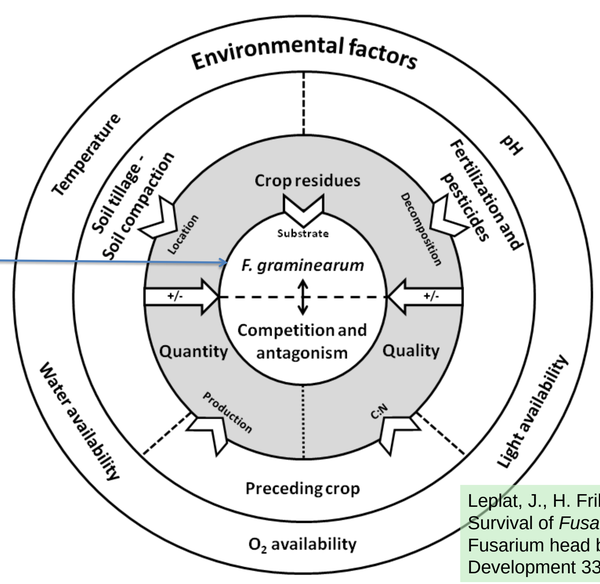
The soil-borne biota limits *F. graminearum* development

The wheat residues provide exploitable resources for *F. graminearum* and consequently promote its saprotrophic survival.



The exploitation of trophic and spatial resources provided by the crop residues depends on their nature (previous crop and C/N) : maize stubbles provide a greater carrying capacity than wheat straw and rapeseed residues while mustard has a suppressive effect for the fungus.
The growth promoting effect of Alfalfa for *F. graminearum* is likely due to the rich N content of the residues but this effect is short-lived because its decomposition is probably also facilitated by the presence of N

Conclusion :
There is no early indicators enabling to predict and control FHB.
Part of the life cycle of *F. graminearum* relies on a saprotrophic phase during which the fungus seems to exhibit weakness.
Therefore, the management of crop residues appears as the key point to control the development of FHB. A strong emphasis should be placed on the biological decomposition of crop residues at the soil surface or/and on the use of suppressive intermediate crops such as mustard to limit the soil inoculum potential of saprotrophic *F. graminearum*.



Leplat, J., H. Friberg, M. Abid, and C. Steinberg. 2013. Survival of *Fusarium graminearum*, the causal agent of Fusarium head blight. A review. Agronomy for Sustainable Development 33:97-111.