Modelling cropping system effects on branched broomrape dynamics in interaction with weeds

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écophyto2018 – Réduire et améliorer l'utilisation des phytos : moins, c'est mieux

Branched broomrape (*Phelipanche ramosa* (L.) Pomel) is a parasitic plant that infects many crop and weed species. It is a major pest of winter oilseed rape in France.

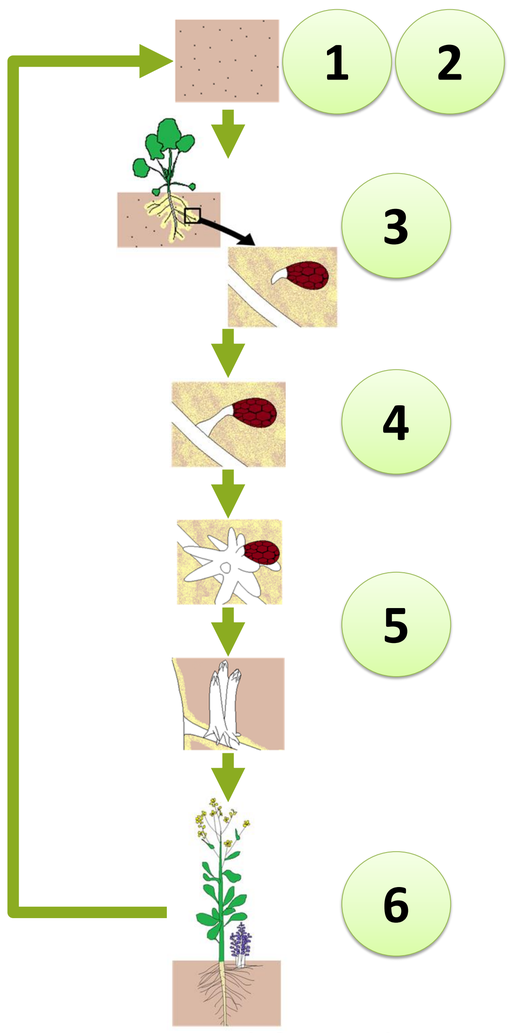
➔ **Objectives :** To model the effects of cropping systems on *P. ramosa* dynamics in interaction with weeds and crops in order to design efficient pest management strategies.

Materials & Methods

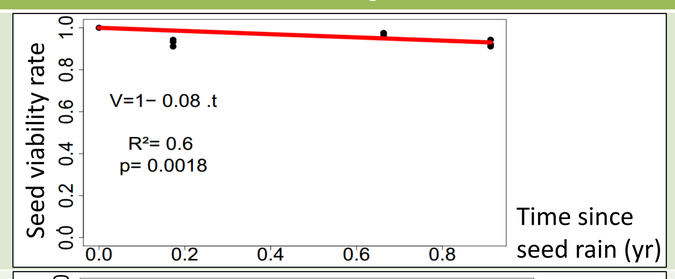
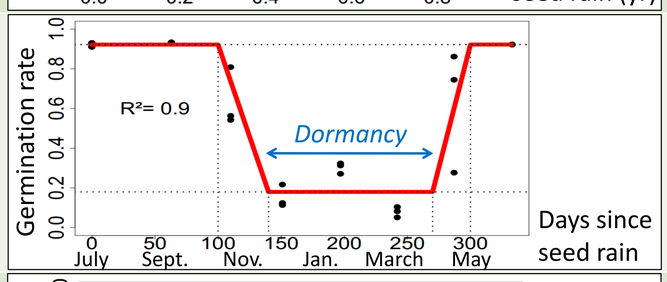
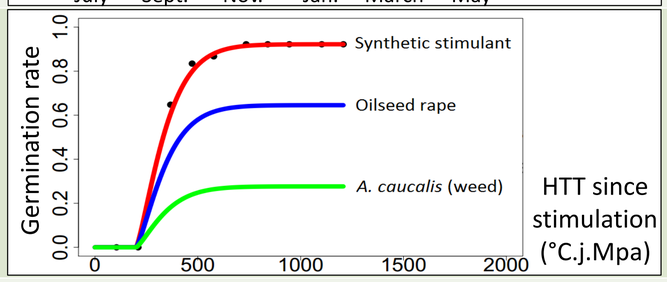
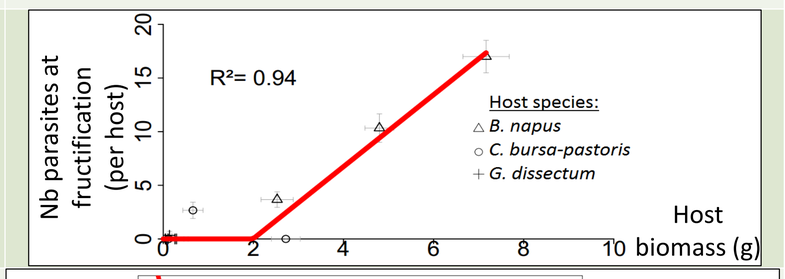
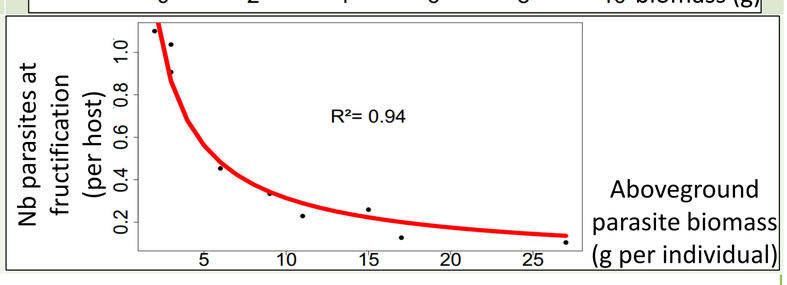
- Process-based modelling of *P. ramosa* dynamics as a succession of processes of its life-cycle
- Daily time-step
- Functions and parameters based on literature and experiments

Results

PHERASYS = model of *PHE*lipanche *RA*mosa dynamics in cropping SYStems in interaction with weeds



P. ramosa life cycle

	Process	Modelled as a function of	Example
1	***In situ* seed mortality**	• Time since seed rain • Seed age	
2	**Seed dormancy**	• Days since seed rain • Soil temperature and water potential	
3	**Germination** (stimulated by host root exsudates)	• Stimulating species • Distance from host root • Hydrothermal time (HTT) since stimulation	
4	**Attachment** on host root	• Distance from host root	
5	**Survival** on the host to fructification	• Nb. of parasites attached on the host • Host biomass	
6	**Seed production and release**	• Parasite biomass • Seed/total biomass ratio	

Discussion

- PHERASYS points to potential management improvements:
  - *P. ramosa* seeds display dormancy during winter → delayed crop sowing could reduce infestation
  - Very low annual seed mortality (6-8%) → burying seeds by soil tillage does not deplete seed bank
- Perspectives: to validate the model with field data and to predict parasite effect on crop yield

References

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