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

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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.

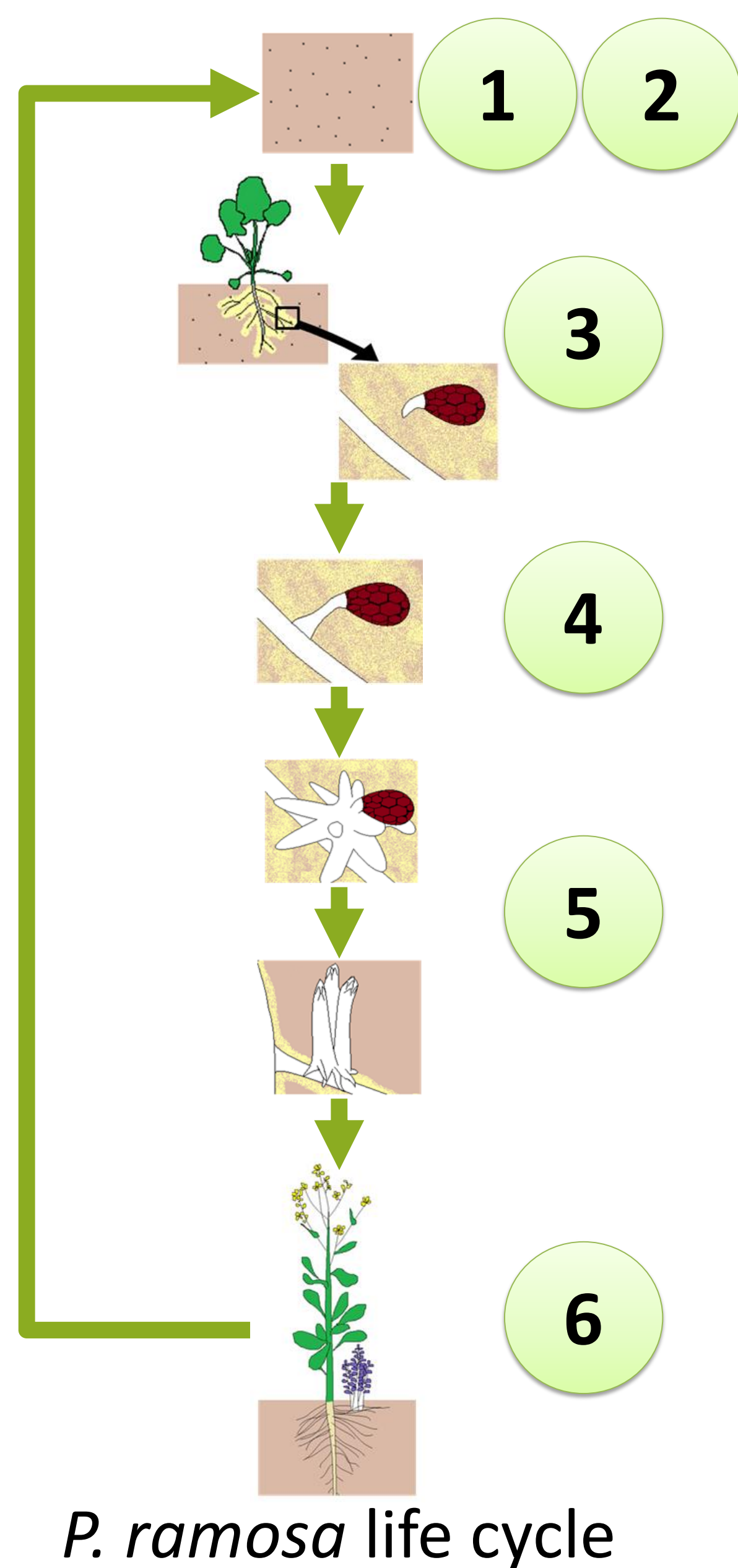
→ **Objectives** : To model the effects of cropping systems on *P. ramosa* dynamics in interaction with weeds and crops in order to design efficient pest management strategies.

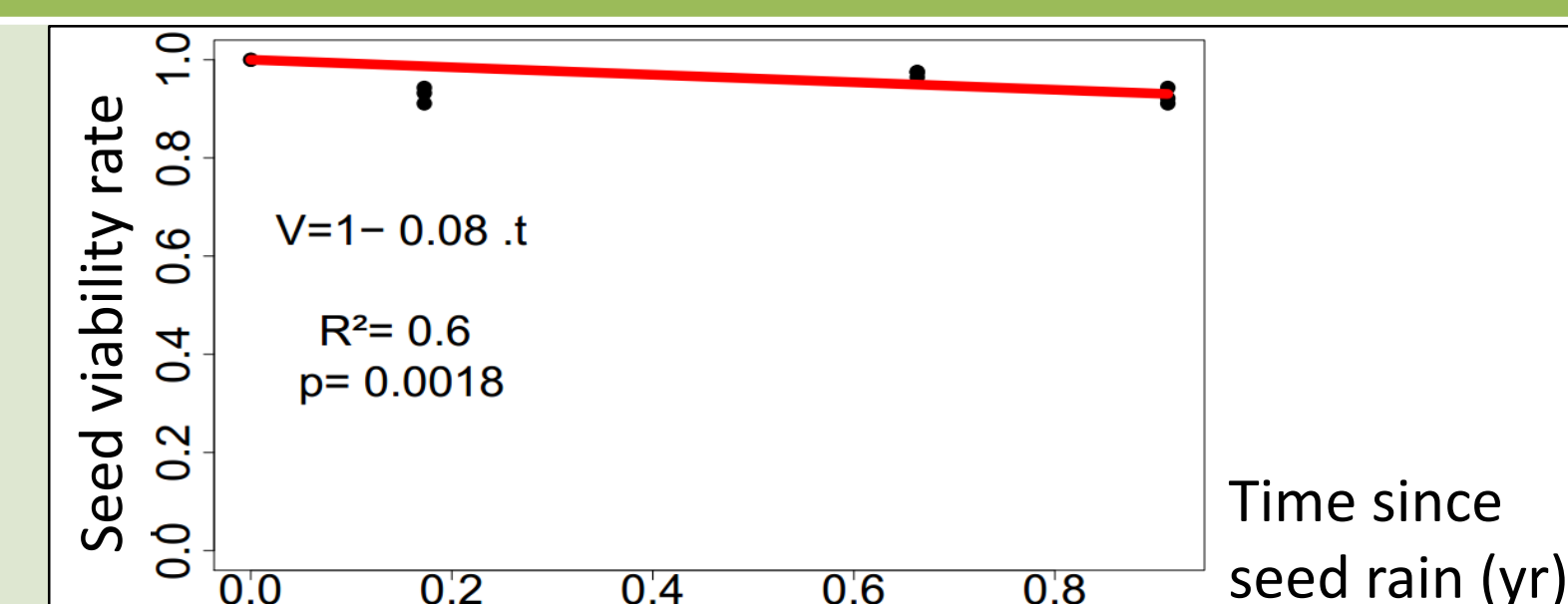
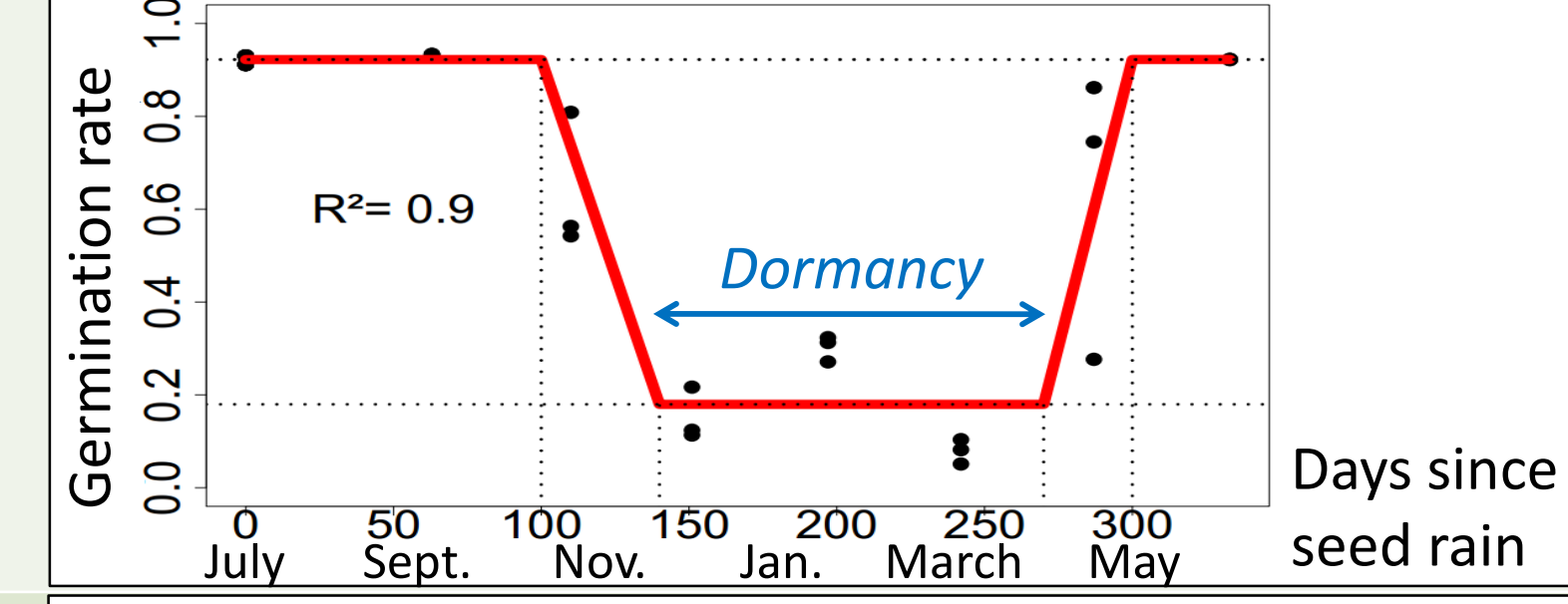
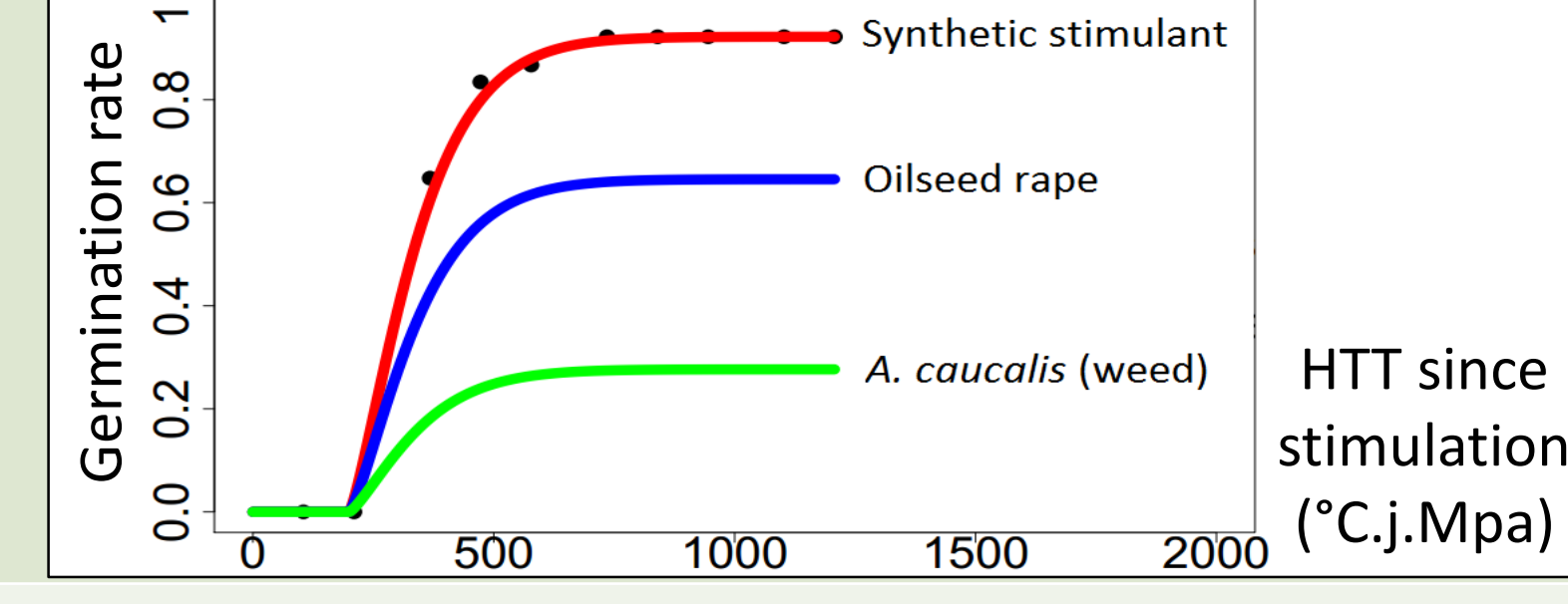
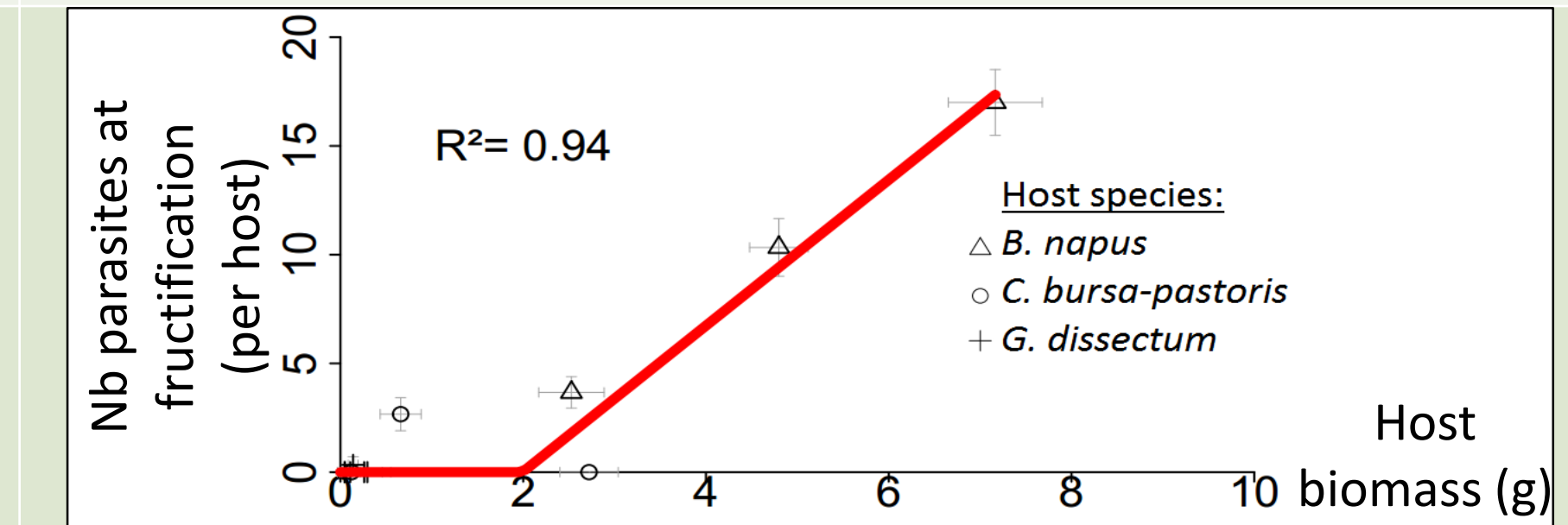
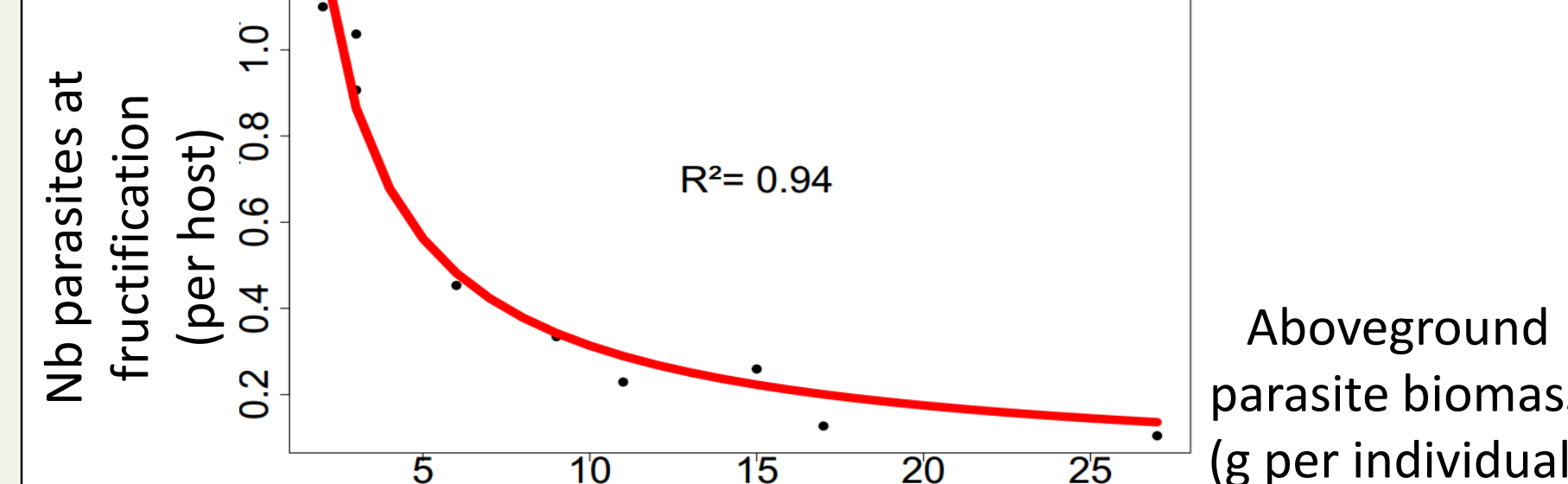
Materials & Methods

- 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 *PHElipanche RAMosa* dynamics in cropping SYStems in interaction with weeds



| 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 exudates) | • 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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