

Modelling the effects of cropping systems on the dynamics of a parasitic weed, *Phelipanche ramosa*, in interaction with the non-parasitic weed flora

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Modelling the effects of cropping systems on the dynamics of a parasitic weed, *Phelipanche ramosa*, in interaction with non-parasitic weeds

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Introduction. The current decrease in herbicide use may increase and diversify weed flora in crops as well as companion bioaggressors spreading via weeds. Among these bioaggressors is *Phelipanche ramosa*, a parasitic plant which is very harmful on oilseed rape.

Aim. To develop a model (called PHERASYS) of the effects of cropping systems on parasite dynamics, in interaction with non-parasitic weed hosts.

Model structure (Fig. 1)

- processes common to parasitic and non-parasitic weeds were based on FLORSYS (e.g. seed movements during tillage)
- stages specific to parasite were based on literature (e.g. seed germination stimulated by host root exudates)
- FLORSYS output variables are used as PHERASYS input variables

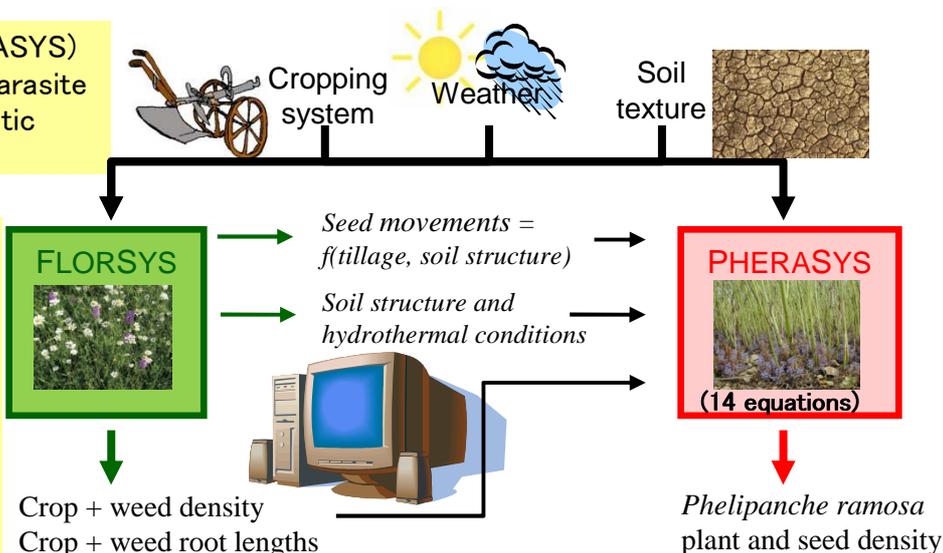


Figure 1. Input and output variables of the newly developed PHERASYS model predicting the dynamics of the parasitic weeds *Phelipanche ramosa*, in interaction with soil environment and weed variables predicted by the existing FLORSYS model developed for non-parasitic weeds (Colbach *et al.*, 2010)

Simulation results

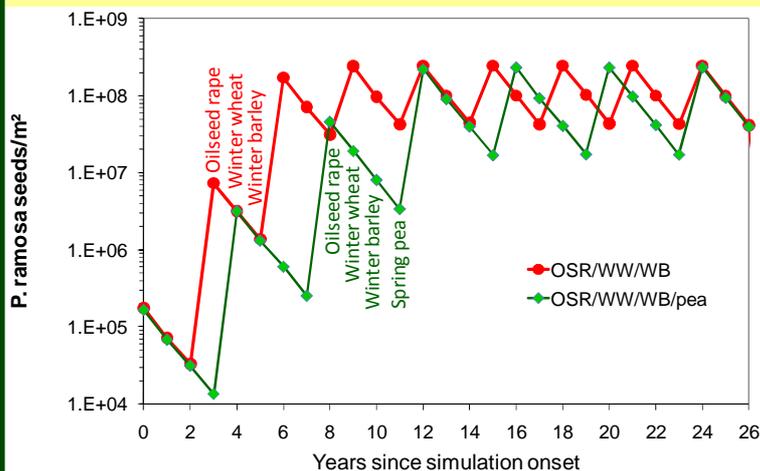


Figure 2. Density of *Phelipanche ramosa* soil seed bank after crop harvest with time simulated with PHERASYS for 2 different rotations in the absence of non-parasitic weeds

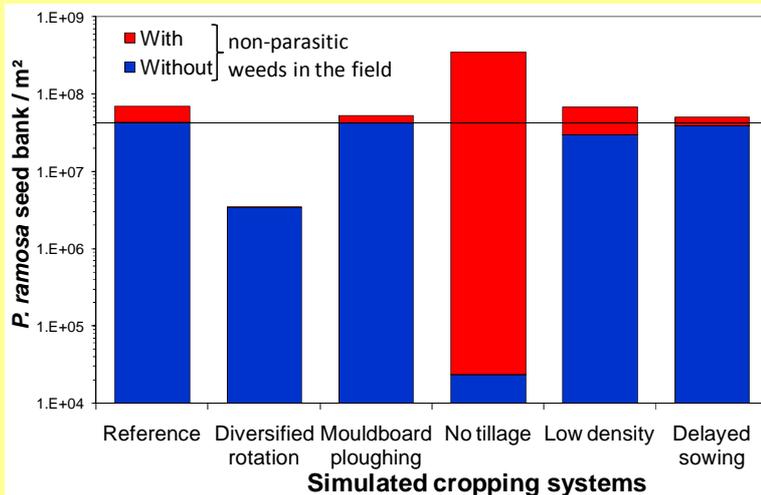


Figure 3. *Phelipanche ramosa* soil seed bank before oilseed rape in different cropping systems with an oilseed rape/winter wheat/winter barley rotation after 12 years of simulation with PHERASYS, either with or without non-parasitic weeds

Conclusion

- Mechanistic models of cropping systems effects on the dynamics of parasitic weeds are feasible
- Need for models predicting crop root growth
- Need for knowledge on parasite fixation, emergence and reproduction on different crop and weed species

Literature:

Colbach N., Gardarin A., Munier-Jolain (2010) FLORSYS: a mechanistic model of cropping system effects on weed flora based on functional relationships with species traits. *Proc. 15th International EWRS Symposium, 12-15 July 2010, Kaposvár, Hungary* 157-158