Using the Cropping Systems Model APSIM to Assess Sowing Strategies for Faba Bean Infested with the Parasitic Weed *Orobanche crenata* — A Simulation Study

Jan Grenz[1], Ahmad M. Manschadi[1], Joachim Sauerborn[1], Holger Meinke[2]

[1] *University of Hohenheim, Department of Agroecology in the Tropics and Subtropics, Germany*
[2] *Agricultural Production Systems, Research Unit, Australia*

Abstract

The angiosperm root parasite *Orobanche crenata* inflicts considerable damage on the production of grain legumes such as faba bean, lentil and pea, in Mediterranean countries. Numerous counter measures have been tested, but no single method proved to be both effective and practicable on its own. It has therefore been suggested that *O. crenata* can only be controlled by an integrated strategy combining several methods.

Delayed sowing of host crops is a potential element of *O. crenata* control strategies, as it has traditionally been known and been experimentally confirmed as a means to reduce *O. crenata* parasitism. However, experimental results cannot be simply extrapolated to other, not yet studied, field situations, as factors determining the behaviour of the host-parasite system, namely weather conditions, cultivar properties and parasite soil seed bank, vary between locations and seasons. An experimental evaluation of all possible sowing strategies would be highly labour- and time-consuming, yet results would be site-specific. A mechanistic competition model of the host-parasite association taking into account all relevant factors can be a valuable tool in predicting the effects of alternative sowing strategies.

In this study, the Faba Bean module and the newly developed Parasite Module of the Agricultural Systems Simulator (APSIM), a cropping systems model, were parameterised and evaluated using data from field trials conducted in the Cukurova region of Southern Turkey. The investigated experimental factors included sowing date, parasite seed density and faba bean cultivar. The evaluated model was then employed to carry out simulations using historic weather data to simulate expected faba bean seed yields as influenced by a range of sowing windows and different levels of parasite infestation under the conditions of a mediterranean-continental (Tel Hadya, Syria) and a coastal mediterranean (Adana, Turkey) environment. Our results illustrate how optimum sowing dates as well as attainable yields depend on both parasite seedbank and site conditions.

Keywords: Orobanche simulation, APSIM, weed management

Contact Address: Jan Grenz, University of Hohenheim, Department of Agroecology in the Tropics and Subtropics, Garbenstraße 13, 70599 Stuttgart, Germany, e-mail: jan.grenz@gmx.de