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## Pea traits for agroecological weed management in pea-wheat intercrops

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## 20<sup>TH</sup> EUROPEAN WEED RESEARCH SOCIETY SYMPOSIUM

Lleida, 1-4 July 2025

### Joint Approaches for Sustainable Weed Management





**S01-O1. Pea traits for agroecological weed management in pea-wheat intercrops**

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**Keynote session**

**Background and objectives.** Pea (*Pisum sativum* L.) is a key diversification crop but current pea varieties are not very competitive against weeds. Intercropping pea with cereals reduces weed infestation. However, past pea varieties were bred for sole crops. The objective of this study was to identify, depending on the type of cropping system and weed flora, (1) the key pea parameters that drive crop production and weed control in pea intercropped with wheat (*Triticum aestivum* L.), (2) optimal combinations of pea and wheat parameter values ("ideotypes") to maximise these goals.

**Material and methods.** Virtual experiments were run with FLORSYS. This mechanistic individual-based 3D model simulates daily crop–weed seed and plant dynamics over the years, from cropping system, weather and soil, focusing on plant–plant competition for light. FLORSYS includes 5 winter pea and 3 winter wheat varieties. Virtual varieties (5 pea and 10 wheat) were created by randomly combining variety-parameter values according to a Latin Hypercube Sampling (LHS) plan, respecting parameter ranges and correlations observed in the actual varieties. A global sensitivity analysis was run, using another LHS plan to combine pea and wheat varieties, crop rotations and management techniques. Further simulations were run with only sole crops. Simulated data were analysed with classification and regression trees (CART).

**Results.** Intercropping reduced pea yield loss due to weeds (by up to 30%) and field infestation (by up to 14%). Key pea parameters for potential (weed-free) yield and competitiveness against weeds were biomass allocation rate to leaves, increased plant width per unit biomass when shaded, frost tolerance. The best pea ideotypes had a small root system to prioritise above-ground plant growth and light interception, except in no-till where a large superficial root system left less soil moisture for superficial weed seeds. In summary, a high pea yield in weedy intercrops required a pea variety with a high yield potential combined with a weed-suppressive wheat variety and weed-preventive management.

**Conclusions.** The present pea-parameter rules provide guidelines for farmers to choose their pea varieties in cereal–legume intercrops and for breeders to screen existing germplasm collections and to identify traits to guide breeding.

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