

Pea breeding for intercropping with cereals

Problem

Pea is a high-yielding feed and food grain legume. However, especially in autumn, sowing tends to be severely out-competed in intercropping with cereals.

Solution

Genetically, by selecting pea varieties with greater competitive ability under severe competition with cereals. Agronomically, by reducing nitrogen (N) fertilization and/or increasing pea sowing density.

Outcome

Pea lines evaluated under pure stand (PS) and mixed stand (MS) revealed wide genetic variation for competitive ability. PS was only moderately reliable to select for MS.

Applicability box

Geographical coverage

Temperate and Mediterranean regions

Application period

Autumn sowing

Required time

No additional time required compared to usual cropping

Period of impact

Duration of crop

Equipment

Standard machinery

Practical recommendations

- Care must be taken to match the phenology between pea and the cereal and enable a synchronous maturity for grain harvest. Pea is generally earlier than wheat or triticale, but early variants of these cereals can be found.
- Identifying pea lines with greater competitive ability is feasible by selecting in MS under conditions that favour severe competitive stress for pea (moderate N; 50:50 pea/cereal sowing densities relative to species densities in PS). Use a mixture of different early-maturing cereal testers to breed pea for general compatibility.
- An alternative breeding strategy might be an indirect selection in PS based on a selection index that integrates pea grain yield with traits that improve pea competitive ability such as pea plant height at flowering (for which, genetic variation occurs within semi-dwarf pea germplasm). Pea selection based solely on pea grain yield in PS can be useful only when targeting conditions of modest competitive stress for pea.



Figure 1: Comparison of pea lines and cereal cultivars for plant height and phenology



Figure 2: Selection of pea lines under severe competition in mixed stand conditions

Practical testing/Farmers' experiences

While developing new pea varieties specifically selected for intercropping, the varieties that can be used in intercropping should have similar maturity time (i.e., early heading cereals), preferring pea cultivars with tall stature or taller variants within the semi-dwarf pea plant type.



Further information

- Annicchiarico P, RP Collins, AM De Ron, C Firmat, I Litrico, H Hauggaard-Nielsen (2019) Do we need specific breeding for legume-based mixtures? *Advances in Agronomy* 157, 141-215. doi: [10.1016/bs.agron.2019.04.001](https://doi.org/10.1016/bs.agron.2019.04.001)
- Annicchiarico P, N Nazzicari, T Notario, B Ferrari, C Monterrubio Martin, M Romani, L Pecetti. Pea breeding for intercropping with cereals: variation for competitive ability and associated traits, and assessment of phenotypic and genomic selection strategies (in preparation).
- Wiki: http://vm193-134.its.uni-kassel.de/En.DiversiWiki/index.php/Mixture_practice_for_farmers_and_advisors
- Check the [Organic Farm Knowledge Platform](#) for more practical recommendations.

About this abstract

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ReMIX is a H2020 multi-actor project that will allow designing cropping systems based on agro-ecology for the benefit of farmers and the whole EU agricultural community. ReMIX will exploit the benefits of species mixtures to design more diversified and resilient agro-ecological arable cropping systems. Based on a multi-actor approach, ReMIX will produce new knowledge that is both scientifically credible and socially valuable in conventional and organic agriculture. The project will tackle practical questions and co-design ready-to-use practical solutions. The project will span from the specification of end-user needs and the co-design of in-field and on-farm experiments to demonstrations with evaluation of new varieties and practices. ReMIX will contribute to the adoption of productive and resilient agricultural systems. The project is running from May 2017 to April 2021

Website: www.remix-intercrops.eu

