ÖKOLOGISCHER PFLANZENSCHUTZ | UNIKASSEL VERSITÄT | ORGANIC AGRICULTURAL SCIENCES

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 727217

ReMIX Species mixtures for redesigning European cropping systems

Experimental screening of pea and wheat genotypes for mixture-performance in a baking-wheat cropping system

Timaeus, J.[1], Weedon, O.[1] Kurz, A.[1] & Finckh, M. F.[1]

Winter wheat-pea mixtures as research system

- Wheat-pea mixtures increase nitrogen efficiency of wheat and reduce lodging of pea
- Plant plasticity: influence on yield of species in mixtures (Wu et al. 2017).

Research questions: plant plasticity

- What is the degree of wheat plasticity in mixed v.s. pure stands?
- Is there genetic variation in plasticity to select and breed cultivars for species mixtures?

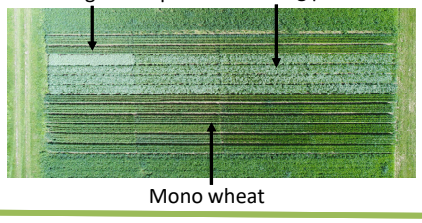
Increased shading in lower canopy areas, on-farm research field 2019

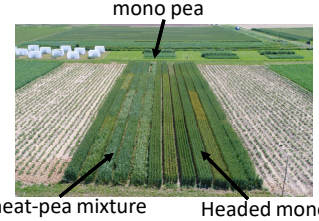
[1] Kassel University, Department of Ecological Plant Protection, Nordbahnhofstr. 1a, 37213 Witzenhausen

Corresponding author: Timaeus, Johannes, johannes.timaeus@uni-kassel.de

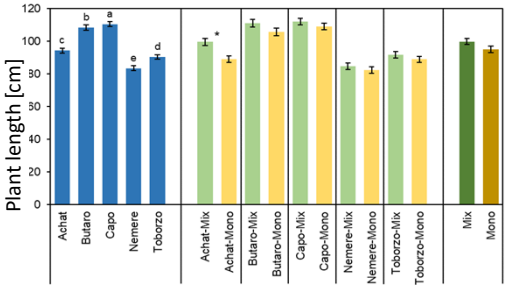
Methods

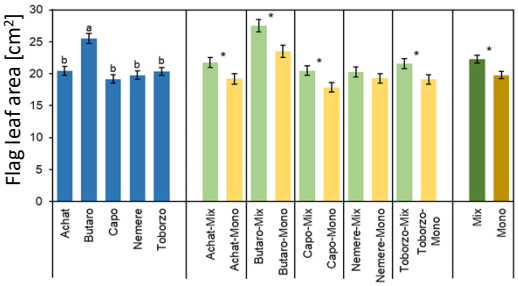
- Split plot design (+/-peas), four replicates, five wheat varieties, one pea variety.
- Measurements (Wheat): 20 plants per plot, plant length, flag leaf length/breath, F-1 length/breath
- Analysis: linear mixed effect models

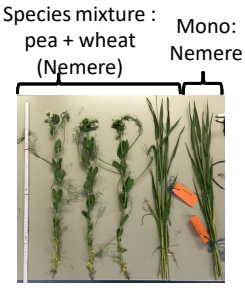


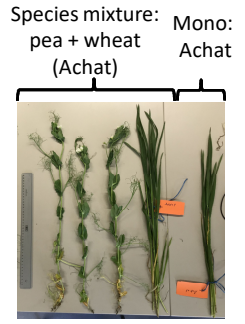


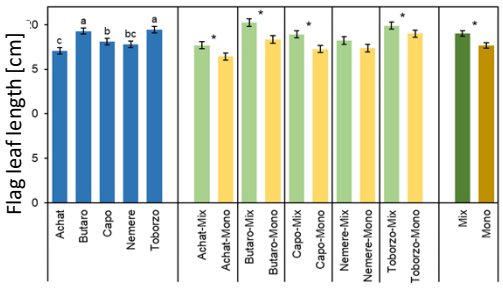
Results

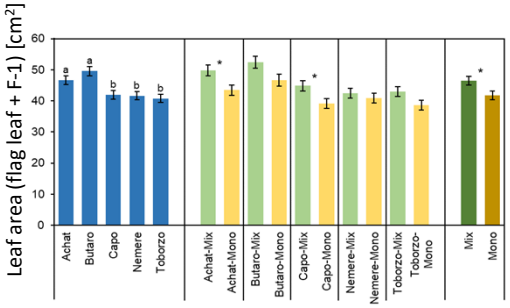












Discussion and conclusions for research and breeding

- Clear impact of mixtures on wheat growth: increased growth habitus
- Possible explanations:
  - Shade avoidance syndrome (increased stem/internode length, decreased stem diameter) induced by reduced red/far-red light ratio caused by neighbouring plants (Franklin 2008).
  - Increased nitrogen availability in species mixture per wheat plant
- Different reactions of genotypes indicates genetic variability in plasticity for breeding
- Next steps: how do the varieties actually perform (yield, health, quality)

Breeding nursery, University Kasssel

Literature

Franklin, Keara A. „Shade avoidance". New Phytologist 179, Nr. 4 (2008): 930–944.

WU et al.. „Shade adaptive response and yield analysis of different soybean genotypes in relay intercropping systems". Journal of integrative agriculture 16, Nr. 6 (2017): 1331–1340.

PARTNERS IN ReMIX