

Character Displacement of Annual Crops in Monocultures and Mixtures

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1 Introduction

- In natural ecosystems, increasing species richness has positive effects on ecosystem functioning. These effects stem from changes in plant interactions with increasing diversity; in particular, complementarity effects (i.e. niche differentiation and facilitation) are expected to be higher in diverse communities compared to monocultures.
- Character displacement in monocultures and mixtures compared to single plants growing without plant interactions can indicate the strength of such complementarity effects and their underlying drivers.

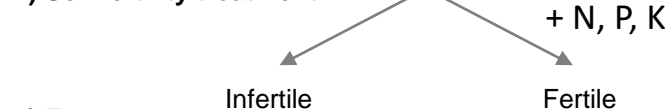
2 Methods

Field experiment

1) Diversity treatment



2) Soil fertility treatment



3) Ecotype



Traits measurements

Traits were measured at flowering stage in early June. In each plot, three individuals of eight annual crop species were randomly chosen and the following traits were measured:

- Vegetative plant height
- Specific Leaf Area (SLA)
- Leaf Dry Matter Content (LDMC)

3 Results

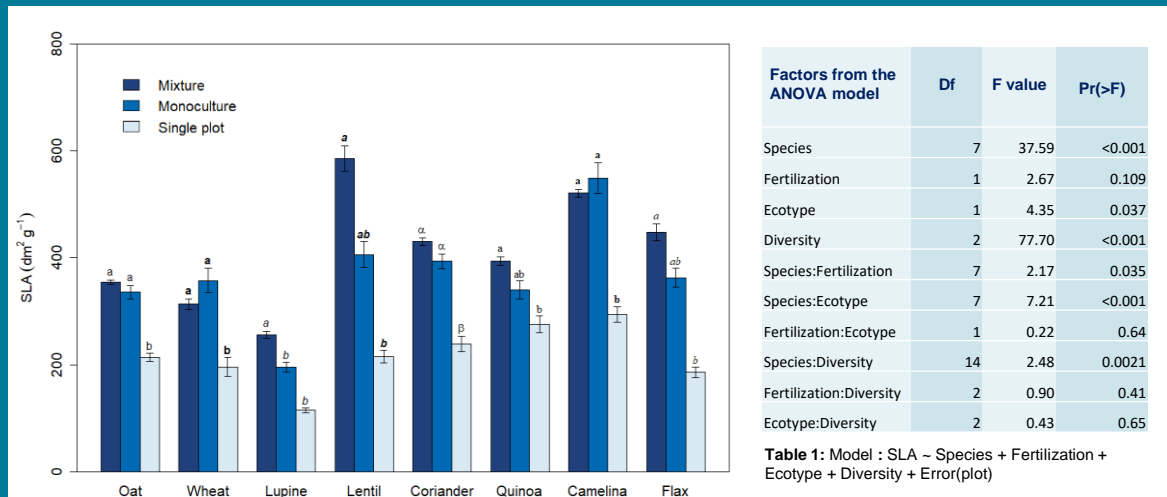


Fig. 1. Plant SLA in single plots, monocultures and mixtures for each species. Different letters indicate significant differences between the diversity levels.

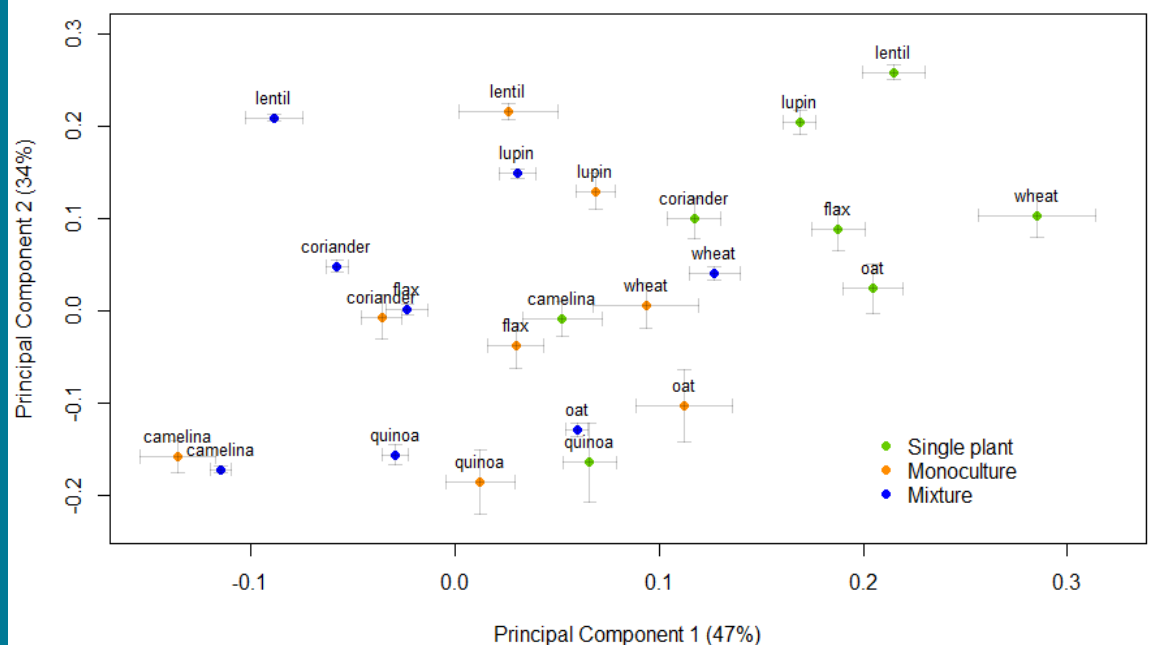


Fig. 2. Principal Component Analysis including plant height, SLA and LDMC.

Trait Ordination Scores	PC1	PC2
Height	0.7958	- 5.4662
SLA	- 4.7218	0.4223
LDMC	4.5858	1.3834

Table 2. Principal Component Analysis scores. PC1 correlates with SLA and LDMC, while PC2 correlates with height. Together, the components explain 81% of the total variability.

4 Discussion and conclusion

- Three out of eight crop species grew taller in mixtures than in single plots, indicating that only oat, camelina and flax reacted to changes in light availability in mixtures by growing taller. SLA and LDMC between single and mixture plots were different for all species, suggesting that all species responded to changes in nutrient and water availability.
- Character displacement in response to neighbours were stronger in mixtures compared to monocultures, suggesting more pronounced complementarity effects in mixtures than monocultures.
- We expect that the stronger complementarity effects in mixtures would result in increased resource use efficiency and higher community-level productivity compared to monocultures.