Assessing the importance of flowering weeds in agricultural landscapes

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Introduction

The homogenization and intensification of agricultural landscapes has led to a decline in the abundance and diversity of **flowering species**. Because these species provide a wide range of regulating ecosystem services that are of high value to society, there are calls for the restoration of flowering weed species in agricultural landscapes.

Objective

The objective of this study was to evaluate the **effectiveness of four agri-environmental measures** to promote flowering plant communities. Specifically, flowering species were monitored on perennial and annual fallows and flowering fields (AL5a-d) in an agricultural landscape in Saxony (Germany). Species richness, species diversity and functional diversity were assessed.

Field work and data analyses

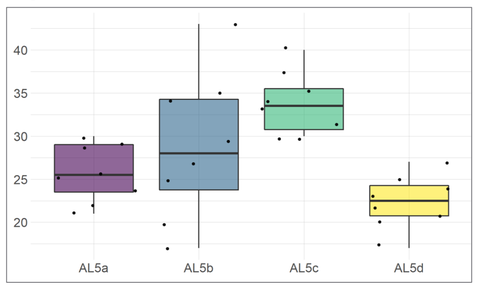
Four agri-environmental measures were selected:

Main research question:
How effective are these measures in supporting the diversity of flowering plant communities?

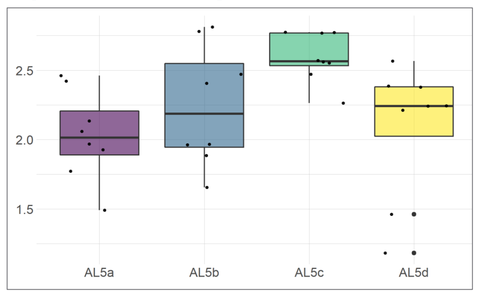
- **Species abundance** was mapped on four fields per measure, using two 25m² (Braun-Blanquet) plots per fields.
- **Species richness and diversity** were calculated per plot (n=32). Diversity was calculated by using the Shannon index.
- **Functional diversity** per plot (n=32) was calculated as Rao's quadratic entropy (RaoQ) based on seven functional traits (root depth, vegetative height, leaf area, life form, life span, flowering time and flower class) gathered throug TRY, LEDA, BiolFlor and Ecoflora.

Results

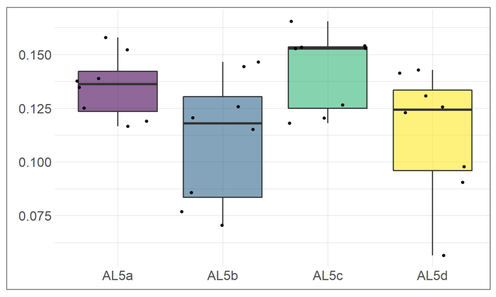
Species richness



Species diversity



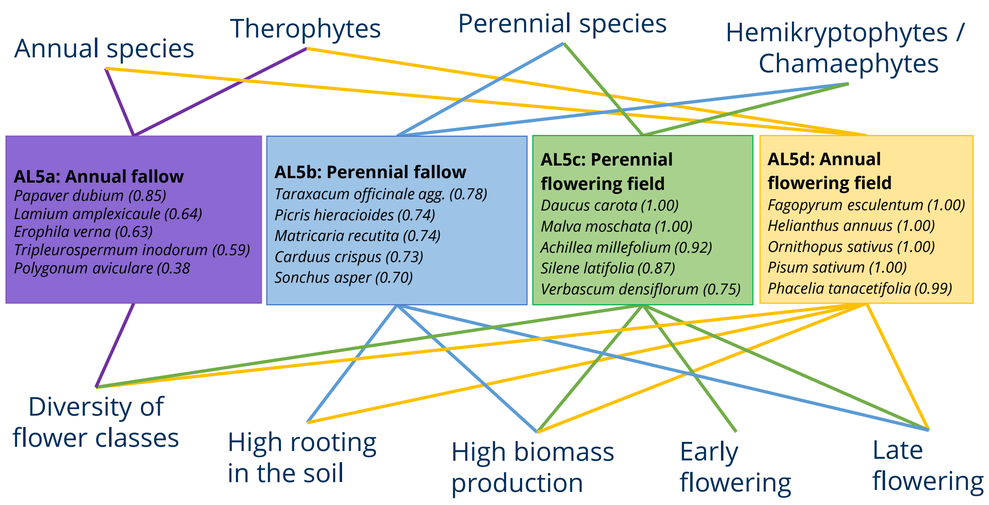
Functional diversity



Main result:
Perennial flowering fields (AL5c) had the highest species richness, species diversity and functional diversity.

The type of measure had a significant effect on species richness, species diversity and functional diversity (ANOVAs, $p < 0.005$). **Significant differences in species richness and species diversity** were found between annual fallows (**AL5a**) and perennial flowering fields (**AL5c**), while there were no significant differences in functional diversity of the measures ($p < 0.005$).

Indicator species and their functional traits



* Relation between the agri-environmental measures and specific functional traits, based on five indicator species per agri-environmental measures and their.

Discussion

Perennial flowering areas (AL5c) have the greatest diversity, but protect a different set of species and thus ecosystem services than fallows (AL5a-b) or annual flowering areas (AL5d). The **ecological value of plant communities in agricultural fields** must also be assessed in terms of their contribution to ecosystem services, such as biomass production, soil fertility and pollination. This can be achieved trough the assessment of functional traits.

Outlook

We will continue the plant surveys, analyse the effects of influential parameters (e.g., soil parameters), calculate an **index of ecological value** per agri-environmental measure based on Fanfarillo & Kasperski (2021) and discuss our results with **local conservation experts and farmers** of the study region.

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