Can managed grasslands enhance pollinators in intensively farmed areas?

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Introduction

Lack of flower resources is thought to be one of the major causes of decline of pollinators (Goulson *et al.* 2015). Botanically diverse grasslands on arable farms may support a range of wild pollinators, enhancing pollination services of crops. The overall objective of the Multiplant project (2014-2018) is to develop multi-functional seed mixtures for grasslands. One of the aims was to test if perennial mixtures targeted for bio-energy, feed protein and biodiversity, could be developed and managed in order to provide flowers for pollinators. We specifically investigated if yield (biomass production) and floral resources for pollinators could be optimized simultaneously by varying botanical composition of mixtures and cutting frequency of the grasslands.

Materials and Methods

The experiment was set up as a split-plot randomized block design with four replicates. Within each block, three cutting strategies (no cut, two cuts and four cuts) were assigned to the main plots. Within the plot, different seed mixtures were assigned to sub-plots. Plots were visited once every 2-4 weeks throughout the flowering season. On every observation date, flower abundance and flower richness was monitored, and flower-visiting insects of flowering plants were observed. Biomass production was measured as annual herbage yield.

Results

Accumulated flower abundance is in most cases higher when the grassland is cut twice per year compared to four times per year (Fig. 1, upper panel). However, accumulated flower abundance was not significantly reduced under the two-cut strategy compared to no cut.

Pollinator profiles (composition of functional groups) are plant species specific. Generally legume species support mainly large bees, except for lucerne *(Medicago sativa)*, which also attracts butterflies (Fig. 2). On the other hand, non-leguminous forbs mainly supports non-bees, in particular flies.

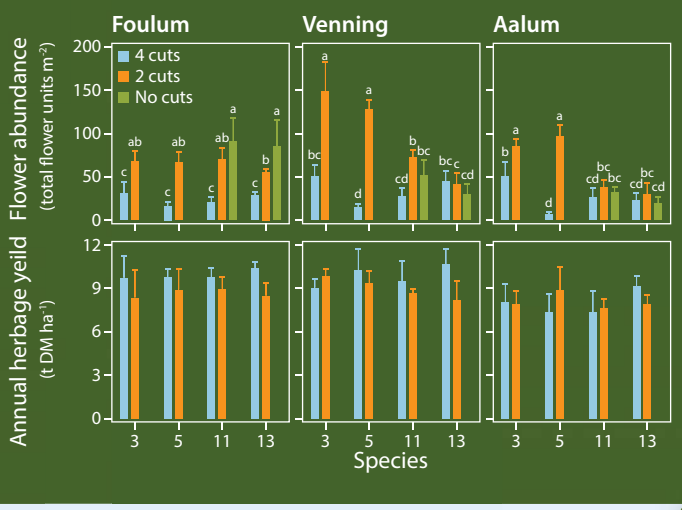

Figure 1. Floral abundance (upper panel) and herbage yield (lower panel) of the four mixtures under three cutting strategies at three sites. Data are mean ± SD.

Figure 2. Pollinator profiles of three legume and three forb species. Size of the pies is proportional to the total number of visits observed during all observation dates.

Discussion

Species composition of mixtures and cutting strategy highly influences richness and availability of flowers for pollinators. Our results suggest that multi-species grassland mixtures can be designed to support a higher diversity of pollinators without compromising herbage yield. In particular, adding forbs to the grass-legume mixtures and using a two-cut strategy rather than four cuts per year, may increase flower resources available for a larger range of wild pollinators.

References

Goulson, D., Nicholls, E., Botias, C., Rotheray, E.L., 2015. Bee declines driven by combined stress from parasites, pesticides, and lack of flowers. Science 347, 1255957. DOI: 10.1126/science.1255957

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