

Richness of unsown plant species in a sown ley crop

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Introduction

Increased community diversity and evenness have been found to reduce the abundance of unsown species in the harvested biomass. In this study I examined the relationship between community diversity and evenness of a sown ley crop and the number and identity of colonising unsown species. I also analysed the relationship between functional groups sown and the functional identity of unsown species.

Methods

The experimental set-up was a simplex design sown at two densities, with a total of 48 plots. All mixed plots contained red clover (legume), timothy and perennial ryegrass (grasses) and either chicory or lucerne (deep-rooted forb).

The plots were established in 2007, and no herbicide was applied. They were harvested three times in 2008 and four times in 2009. Colonising species identity was recorded in the field by repeated inspections (four times each harvest year) of the area between the first and the third sown row along each plot (c. 2.85 m²). The species identity was classified into annual and perennial grasses (GSP), annual and perennial legumes (LSP) and other forbs (classified into annuals + biennials (ABF) and perennials (PF)). A simple model was fitted to the numbers of unsown species within the respective functional groups and total unsown species number (TCSP). The significance of the diversity effect at the centroid was estimated.

Conclusions

- The sampling effect was strong – perennial ryegrass had a major influence on unsown species numbers
- The diversity effect was also significant
- The identity of the sown species affected the identity of the unsown species that established



Pure stand of perennial ryegrass

Table 1. Estimated cumulative unsown species numbers in the respective pure stands

| Parameter | GSP | LSP | ABF | PF | TCSP |
|--------------------|--------------------|---------------------|----------------------|--------------------|----------------------|
| Timothy | 2.32 ^a | 1.60 ^{ac} | 14.69 ^{acd} | 4.42 ^a | 23.04 ^{ade} |
| Perennial ryegrass | 1.93 ^a | 2.12 ^a | 7.56 ^b | 3.76 ^a | 15.38 ^b |
| Red clover | 3.58 ^{bd} | 0.46 ^{bcd} | 13.28 ^c | 3.31 ^b | 20.64 ^c |
| Chicory | 3.81 ^b | 0.76 ^c | 16.03 ^d | 4.50 ^{ab} | 25.09 ^d |
| Lucerne | 3.41 ^d | 0.25 ^d | 13.50 ^c | 3.41 ^{ad} | 20.57 ^e |

Numbers with different superscripts within each column are significantly different at $P < 0.05$



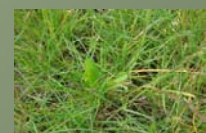
Trifolium dubium



Trifolium repens



Taraxacum in timothy



Taraxacum in perennial ryegrass

Table 2. Estimated unsown species numbers in centroid mixtures

| | GSP | LSP | ABF | PF | TCSP |
|--------------------------|---------------------|--------------------|---------------------|--------------------|----------------------|
| Without diversity effect | | | | | |
| T+PRG+RCL+C | 2.91 | 1.24 | 12.89 | 4.00 | 21.04 |
| T+PRG+RCL+L | 2.81 | 1.11 | 12.26 | 3.73 | 19.91 |
| With diversity effect | | | | | |
| T+PRG+RCL+C | 1.40 ^{***} | 0.53 [*] | 11.13 [*] | 2.87 ^{**} | 15.94 ^{***} |
| T+PRG+RCL+L | 1.00 ^{**} | 1.00 ^{ns} | 7.00 ^{***} | 2.00 [*] | 11.00 ^{***} |

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$. ns = no significant diversity effect