

The effect of sheep grazing at two stocking rates on the seedling recruitment of grassland forbs

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Keywords: oversowing wildflower seeds, seedling establishment, sward management

Introduction Limitations for seedling recruitment are major constraints to maintain and enhance plant species diversity in productive grasslands (Bakker & Berendse 1999). Grass sward condition plus species-specific requirements for germination and survival determine the recruitment success. Therefore, a field experiment investigated the establishment of oversown seeds from wildflower forbs in relation to grass sward management.

Materials and methods A blend of freshly ripened seeds from wildflower species (100 seeds/species per m² in 9m² subplots) was broadcast in late summer over a species-poor permanent grassland dominated by *Lolium perenne* and *Trifolium repens*. The sward management treatments were (three replications): (1) Sheep grazing at a low stocking rate, target compressed sward height (CSH) 12 cm, 1.2 standard livestock units (SLU)/ha; (2) sheep grazing at a moderate stocking rate (target CSH 6 cm, 2.8 SLU/ha; (3) no grazing, control treatment, two cuts/yr. Sheep were stocked continuously from April to October and animal numbers were adjusted weekly according to CSH. No fertiliser was applied. Established seedlings were counted one year after sowing. The yield share of sown species was determined in the standing crop 3 years after sowing.

Results Seedling establishment from oversown seed was generally low (Table 1) but sward management had significant effects. Averaging over of all species, seedling establishment was much higher at the moderate stocking rate compared to both the low stocking rate and the cutting treatment (control). At moderate stocking, percentage of short grass patches (<6 cm sward height) varied from 21-59 % during the season while it was only 2-18 % for the low stocking rate. Reduction of the competitive strength of the existing grass sward by frequent defoliation has been shown to be of overriding importance for the survival of emerging seedlings (Hofmann & Isselstein 2004). Surprisingly, this holds true irrespective of the species because species like *Daucus carota*, *Tragopogon pratensis* or *Centaurea jacea*, which are susceptible to frequent defoliation at later stages of their life, also were dependent on frequent defoliation at the seedling stage. The long-term establishment of the oversown species was evaluated according to their contribution to the harvestable yield 3 years after sowing. The yield percentage of oversown species summarized over all species was 7, 165, and 62 g/kg standing crop dry matter for the low stocking, the moderate stocking, and the control treatment, respectively. There was a tendency that in the cutting treatment, species that are common on infrequently defoliated grasslands produced higher yields compared to the number of established seedlings than in the grazed treatments.

Table 1 Established seedlings (% of sown seed) of grassland forbs one year after oversowing of the seeds

Treatment [#]	<i>Centaurea jacea</i>	<i>Daucus carota</i>	<i>Lathyrus pratensis</i>	<i>Leontodon autumnalis</i>	<i>Lotus corniculat.</i>	<i>Plantago lanceolata</i>	<i>Tragopog. pratensis</i>	<i>Trifolium pratense</i>	mean
Low	0	0.7	6.7	0	0.4	0	0	0.4	1.0
Moderate	3.7	18.9	33.3	52.6	10.4	53.0	34.1	27.0	29.1
Control	0	4.1	16.7	1.1	0	3.7	2.2	2.6	3.8
<i>p</i> ^s	0.022	0.057	0.365	0.021	0.035	0.023	0.035	0.030	0.038

[#]Treatment: low/moderate stocking rate, control=no grazing, two cuttings/yr

^sLevel of significance, Kruskal-Wallis-Test

Conclusions To establish wildflower species from seed by oversowing, grass swards should be adapted to a frequent defoliation for up to one year after the oversowing. Management after that should consider the requirements of the adult plants, i.e., frequent defoliation for pasture species, infrequent for hay meadow species.

References

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