Sward structure measurements to monitor the effect of grazing in nature management situations

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Abstract

In Denmark, private farmers under contract with the society manage many nature conservation areas on low-lying organic soils. In the contracts the grazing system is poorly defined in relation to the goals and there is a lack of monitoring instruments for practical use in natural areas. Thus there is a need to define grazing system indicators, which should make it possible to evaluate effect from grazing and provide a feed-back to obtain the goals. To describe the effect of grazing on the vegetation structure, detailed measurements of sward heights, species composition, species phenology, distance to flowering specimens of *Juncus effusus* L. or *J. conglomeratus* L. were carried out in paddocks grazed by 1st year steers at two different levels of plant species diversity and at two levels of grazing intensity. The aim was to identify variables able to expose the effect of the different treatments.

Keywords: *Juncus effusus, Juncus conglomeratus, Deschampsia caespitosa*, semi-natural grassland, steers

Introduction

When grazing permanent grasslands for nature management purposes the number and type of plant species can be used as target values and for amenity the number of flowering forbs. From the farmers point of view the feeding value of the sward is of interest. The digestibility of *Juncus effusus* L., *J. conglomeratus* L., and *Deschampsia caespitosa* (L.) Beauv. is low compared to other common species in such swards (Nielsen and Søegaard, 2000). Therefore, in low-lying riparian areas with relatively wet organic soil there may be a joint interest from both a botanical and an agricultural point of view to keep the amount of these three species at a relatively low level and make space for many other different species. Consequently, it is of interest to know how these species are affected by different grazing intensity.

Materials and Methods

Grazing was carried out in two adjacent areas: E with a low botanical diversity, W with a high botanical diversity (Table 1). The *Juncus* spp. and *D. caespitosa* had their preferential sites (Table 1). Half of the paddock was cut for hay in July. The following year it was the other half. Grazing was carried out from late May to the beginning of October with young steers and performed at a high and a low grazing intensity aiming at a sward height at high intensity of 6 cm measured as compressed sward height (CSH). The number of steers per ha at low grazing intensity was half the number at high grazing intensity.

Table 1. The frequency of *J. effusus, J. conglomeratus, D. caespitosa* and number of species from analysis in 5 circles of 1 m^2 at the beginning of the experiment. Average of 8-12 records per area.

Area	Number of species	Frequency of *J. eff.*	Frequency *J. con.*	Frequency *D. cae.**
E	13	2	0	35
W	21	10	15	5

* Only *D. cae.* in area E had a sign. difference between high and low grazing intensity paddocks.

Sward structure was examined in July in the fourth year of grazing in the half of the paddock with hay cutting the previous year. Along a diagonal, four sections were placed at random and in 13 points per section height measurement as CSH and height of highest vegetative parts (green height) were carried out. The six most dominant species were recorded in a 30x30 cm square, whether the species were generative or vegetative, bitten by the steers or not, and the distance to the nearest flowering *J. eff.* or *J. con.* was measured.

Results and Discussion

The number of flowering forbs was not related to sward height in general but in the sward with a high botanical diversity more flowering forbs were observed at low compared to high grazing intensity (Table 2). While heavy grazing led to increased species density at low initial density (area E), heavy grazing at high initial density led to decreased species density (Hald, 2000). Green sward height seemed more sensitive to grazing intensity than CSH at swards with low diversity, but was a more laborious method. In plots with bitten *D. cae.* in E-Low CSH was signif. lower (11cm) than in plots with unbitten plants (20 cm). A similar difference was not found for *J. eff./J. con.* Grazing intensity significantly changed the distance to nearest flowering *J. eff.* or *J. con.* (Table 3).

Perspectives

A support system for grassland management in nature conservation areas should be developed to include different types of swards and target situations. An optimal system will include botanical and zoological interest combined with specific plant trait measurements in the sward as well as animal performances.

Table 2. Number of flowering forbs, CSH and Green height (cm), and frequency of bitten *J. effusus* / J. *conglomeratus* and *D. caespitosa* (and frequency of the species) measured in the 30x30 cm squares at the fourth year of grazing.

Area	Grazing intensity	Flowering forbs	----Sward height----		--------Freq. bitten (freq. of species)--------			
			CSH	Green	*J. eff./J. con.*		*D. caespitosa*	
E	High	0.13	9.2	15.0	100	(9.6)	100	(17.3)
	Low	0.08	10.9	25.2	100	(1.9)	83	(78.9)
LSD		ns	ns	6.1	-	ns	ns	(29.5)
W	High	0.51	7.3	14.4	50	(7.7)	-	(0)
	Low	1.22	12.8	25.9	63	(31.3)	-	(0)
LSD		0.29	2.3	4.7	ns	ns	-	-

Table 3. Distance to nearest flowering *J. effusus* or *J. conglomeratus* in area W.

Grazing intensity	0-25 cm	25-50 cm	50-100 cm	100-200 cm	>200 cm	Number of observations
High	2	3	10	9	27	51
Low	17	11	5	12	6	51

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References

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