INFLUENCE OF SHEEP AND GOATS ON THE NATURAL SUCCESSION

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ABSTRACTS

A study was conducted to examine the effect of extensively-grazed pasture on the botanical composition. The trails were carried out in the year 1992 to 1995. For the study different breeds of sheep with the stocking rate of 30 sheep with their lambs / 2.6 ha were used. For the mixed-grazing a ratio of 20 sheep and 10 goats with their lambs / 2.6 ha were used.

It is not possible to control all problem species with the help of sheep-grazing only. In contrast to that, it was concluded that goats grazed off all problem species quite effectively. Botanical composition has changed, resulting in an remarkable increase of herbs and legumes.

KEYWORDS

Sheep, botanical composition, ecological number, sociological behaviour, preference

INTRODUCTION

Rangeland is very heterogeneous pasture land with multistratified distribution of forage resources. The grazing of domestic animals on open rangeland has a long tradition all over the world. In extensive grazing systems, animals graze in common areas and compete for food resources. According to Squires (1982), Schwartz et al (1986) and Meuret et al. (1991), sheep generally select a diet higher in nitrogen and lower in fiber than do cattle, whereas goats are more efficient converters of fibrous forages than other domestic ruminants. In practice, it may be desirable to control unwanted plants through the combined grazing of sheep and goats. According to Lippert (1987), there is a considerable potential complementarity between sheep and goats in the grazing management of rangelands, such that undesirable plant species can be controlled and in some cases eliminated. This paper examines the effects of sheep and goat grazing on botanical composition, with special reference to the ecological number and the sociological behavior, as well as the abundance and degree of coverage of plant species on extensive grazing management following the methods of Ellenberg (1992) and Braun-Blanquet (1951) respectively.

MATERIALS AND METHODS

The trials were carried out in the years 1992 to 1995. The pasture was grazed each year from May until January. The study area is situated in the state of Brandenburg in the Federal Republic of Germany. For the experiment, different breeds of sheep were used, with a stocking rate of 30 sheep and their lambs/2. 6 ha. Trials were also conducted to investigate the merits of mixed grazing. For this, a ratio of 20 sheep to 10 goats was used. The botanical structure was examined using the combined estimate of abundance and degree of coverage of Braun-Blanquet (1951). The assessment of the examined species of plants with respect to their sociological behaviour and their ecological value was conducted following the methods of Ellenberg et al. (1992). For the purposes of vegetation charting an area of 5m*200m (1 ha) was used.

RESULTS AND DISCUSSION

Change in Botanical Composition. In the course of the years of the study (1992 to 1995), between 68 and 99 plants were established. Of plants which were present in the trial area, "Anthropo-Zoogenous heather and lawn" dominated, making up between 16.5 and 20.8 % of the total, followed by "herb vegetation of frequently disturbed areas", with 11.2 to 13.4 %. "Freshwater and marshland vegetation" represent between 2 and 5.3%, while "deciduous woods and related bushes" and "saltwater and sea-strand vegetation" were of negligible significance for the study area (s. Tab. 1).

On the basis of the Ellenberg's (1992) ecological numbers, 36% of the plants found in the study area have a reaction number of between 6 and 8. In contrast to the less common basophil types (RZ=9), there appeared several acidophile types with an RZ of $\leq$3. Both the unusual basophile (RZ=9) and the unusual acidophile (RZ$\leq$3) were of limited occurrence in some paddocks (s. Tab. 2). The nitrogen number in a predominant number of types (over 50%) was between 5 and 7; i.e. the nitrogen supply of the ground was from moderate to substantial, while the nitrogen-avoiding types (NZ$\leq$2) were, with a percentage of 4%, in the minority. The nitrogen number of the most frequently occurring types (NZ=6) indicates a moderate to high nitrogen content in the ground.

The greater proportion of the plant types were categorizable, considering their light number, as half-light plants (LZ=7). The rest of the plants, with light numbers of 6 (half-light plants) and 8 (light plants) made up between 18 and 26 % of the plants (s. Tab. 2).

As regards the moisture number, a great variation in ecological behavior was to be observed, from those plants indicating dryness (FZ=2) to water plants (FZ=11). 82% of the species had numbers which varied between 4 and 11, while 42% of the species were typical for ground with medium to high moisture content, but not for wet ground (s.Tab.2).

With regard to the temperature number, a considerable portion (58%) of the plant types indicated moderate to substantial warmth (TZ=5 to 7, s.Tab.2).

The following types, with a value of 1 or more, occurred through the years of the experiment (1992-1995) and made up the greater part of the pasture land cover (following the Brauen-Blanquet method, 1951):

Achillea millefolium, Agropyron repens, Alopecurus pratensis, Bromus hordaceus, Dactylis glomerata, Festuca pratenis, Glecoma hederacea, Holcus lanatus, Lolium perenne, Phalaris arundinacea, Potentilla reptans, Poa pratensis, Phleum pratense, Poa trivialis, Plantago lanceolata, Ranunculus repens, Trifolum repens, Taraxacum officinal.

The other species occurring in the experimental area, with a lower coverage rate, were extremely sparse.

With respect to the percent of coverage for the most frequently occurring species in the study area during the years of the experiment, it can be established that Alopecurus pratensis, Festuca pratenis, Holcus lanatus, Lolium perenne, Poa trivialis, Phleum pratense, Ranunculus repens and Trifolum repens demonstrates a comparatively high degree of coverage, while a general reduction in the degree of coverage may be observed in the case of Achillea millefolium, Agropyron repens, Bromus hordaceus, Cirsium arvense, Dactylis glomerata, Glecoma hederacea, Poa pratensis, Plantago lanceolata and Potentilla reptans.

According to the results submitted here an increase in the proportion of grasses, herbs and legumes was detected (s.Tab.3). Giving up the use of nitrogen fertilizer is tied, according to Heerden et al. (1994), with an increase in the proportion of clover and a decrease in the yield of dry matter. The advantages of predominantly herb and legume plants is to supply the ecosystem of the grazing area with a cost-free source of nitrogen (Spatz, 1994; Gerhold, 1994). Breternitz (1992) was able to demonstrate the spread of white clover in a

pasture which had been grazed continuously. The results presented here have established an increase of white clover in the course of the studies. In earlier studies as well, a remarkable spread of white clover on extensively-used pasture lands was reported (Gajda, et al., 1989, Hochberg et al., 1993).

Preferences in feed plants and problem types. Leaving out those species in the case of which could be observed that a higher quantity of feed was left over in the experimental area in the course of the grazing periods, such as Agropyron repens, Achillea millefolium, Bromus hordaceus, Cirsium arvense, Dactylis glomerata, Deschampsia cespitosa, Glecoma hederacea, Holcus lanatus, Phalaris arundinacea, Potentilla reptans and Trifolium repens, the other plant types were very readily eaten by the experimental animals. And with the exception of Agropyron repens, Achillea millefolium, Cirsium arvense, Bromus hordaceus, Deschampsia cespitosa and Holcus lanatus, even in the case of those plants which were not fully bitten through, seed pods were extremely hard to find. It must be emphasized that all problem species were cut shorter by goats, who were able quite effectively to bite through Cisium arvense as well as Deschampsia cespitosa.

Examining the plants specified as types of problems species here with regard to the index of preference (PI) for sheep (0=refused, 8=highest preference) established by Gaubmann et al (1994), it should be noted that, in spite of the higher index of preference from Bromus hordaceus (PI=5,7) and Trifolium repens (PI=4,9), these species were avoided, while the other species set out in table 4 have been grazed off in accordance with their PI. Cirsium arvense and Deschampsia cespitosa were grazed off by the goats to a much higher extent than was to be presumed an account of the PI listed for sheep.

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Table 1
The classification of vegetation along sociological lines after grazing by sheep and goats (Ellenberg's method, 1992)

Number of species and year of studies				Sociological classification of plants
1992	1993	1994	1995	
3	7	10	11	Freshwater and marsh vegetation
1	1	1	1	Saltwater and seaside vegetation
20	31	23	25	Herb vegetation in frequently disrupted areas
31	44	36	34	Anthropo-zoogenous heather and lawn
1	3	1	1	Deciduous forests and bushes
12	13	12	13	Unclassified species
68	99	83	85	Total number of species

Table 2
Proportion of plant types occurring in the experimental area, with selected ecological numbers, arranged by year of experiment (%)

VJ	LZ	4	5	6	7	8	9	FZ	2	3	4	5	6	7	8	9	10	11	.
1992		1,4	2,9	20,0	42,9	27,1	5,7	.	.	4,3	17,1	24,3	20,0	11,4	7,1	1,4	.	1,4	.
1993		2,0	4,0	19,2	40,4	24,2	7,1	.	1,0	4,0	18,2	25,3	15,2	9,1	7,1	2,0	1,0	1,0	.
1994		1,2	3,6	17,9	41,7	26,2	7,1	.	.	.	9,5	25,0	16,7	11,9	11,9	6,0	2,4	1,2	.
1995		1,2	2,4	16,5	44,7	24,7	7,1	.	.	2,4	12,9	25,9	16,5	10,6	8,2	7,1	2,4	1,2	.
	RZ	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**NZ**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
1992		.	1,4	4,3	4,3	8,6	21,4	8,6	1,4	.	.	5,9	10,3	5,9	17,6	14,7	20,6	8,8	1,5
1993		1,0	3,0	4,0	5,1	9,1	20,2	8,1	2,0	.	2,1	3,1	11,3	6,2	14,4	14,4	20,6	9,3	2,1
1994		.	3,6	4,8	2,4	8,3	21,4	7,1	.	.	.	6,1	7,3	7,3	18,3	12,2	19,5	9,8	3,7
1995		.	3,5	4,7	4,7	8,2	21,2	5,9	2,4	.	.	4,9	11,1	6,2	14,8	13,6	18,5	11,1	3,7

VJ (YS) = Year of study **LZ** (LN)= Light number **FZ** (MN)= Moisture number
RZ (RN)= Reaction number **NZ** (NN)= Nitrogen number

Table 3
Proportion of grasses, herbs and legumes arranged by year of studies

Year of studies	1992	1993	1994	1995	The change of the sward from 1992 to 1995 (%)
Total number of species	68	99	83	85	25
Grasses	20	25	26	26	30,0
herbs	42	61	52	50	19,0
legumes	6	13	5	9	33,3

Table 4
Selected plant species along their Preference-index (PI) according to Gaußmann et al (1994)

Plant Species	PI	Plant Species	PI
Cirsium arvense	0,55	Glecoma hederacea	1,80
Deschampsia cespitosa	1,21	Dactylis glomerata	6,61
Agropyron repens	7,11	Holcus lanatus	6,18
Bromus hordaceus	5,67	Trifolium repens	4,86
Achillea millefolium	1,82	Potentilla reptans	2,18
Phalaris arundinacea	4,5		