

## Study of the possibilities of mixed grazing by cattle and sheep in conditions of the Czech Republic

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### Abstract

Mixed grazing by beef cows and mutton ewes with their offspring was conducted on an undersown lucerne-grass mixture for three grazing seasons. The proportion of sheep on the pasture was 20% by live weight.

Grazing pressure was more favourable in the second and third seasons when the young animals were weaned during the grazing season, this improved forage utilisation from 63 to 94%. Lower pasture yields reduced total liveweight gains per hectare from 643 to 481 kg. Performance of lambs was significantly higher in the second and third seasons than in the first.

Gastrointestinal (GIN) helminthoses of sheep and cattle during mixed grazing present the same health problems as by a single species (mono-grazing) and require effective helminth control. The optimal pattern for helminth control of ewes is before turnout to pasture, in early July for ewes and lambs and in the autumn after the grazing season. Helminth control carried out before turnout to grazing and after the end of the grazing season was sufficient for cattle. Helminth control in the autumn ensures minimal infestation during winter housing.

The results showed that mixed grazing by cattle and sheep did not increase the prevalence or intensity of parasitoses and that there is no danger of interspecific transfer of helminthoses. Compared with mono-grazing, it is not necessary to increase the number of helminth controls. © 1999 Elsevier Science B.V. All rights reserved.

**Keywords:** Mixed grazing; Cattle; Sheep; Production; Parasitoses

### 1. Introduction

The headlong restructuring of agricultural primary production in the Czech Republic from 1990 to 1997 resulted in, among others, a 48% reduction of cattle, and a 72% reduction in numbers of sheep. Technologies for low-cost utilisation of land released from intensive farming and respecting the non-mar-

ket function of agriculture are required. Long-term foreign experiences with mixed cattle and sheep grazing confirm the favourable effect on plants and animals in the agricultural landscape. When studying mixed grazing by cattle and sheep Nolan and Connolly (1989) found that outputs increased 7–10%, the stock carrying capacity 13–15%. Walker (1994) sees the main advantage in a more friendly impact on agricultural ecosystems. According to Abaye et al. (1994), mixed grazing offers more opportunities to influence grazing pressure during the period of vegetation growth.

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As an aftermath of the previous period of single-species specialised large-scale production in the Czech Republic, people are still afraid that in mixed grazing systems the demands for the prevention of parasitoses will be much higher and they also doubt that the effect of mixed grazing systems on herbage utilisation and composition will be favourable. Jordan et al. (1988) and Nolan and Connolly (1990) found that the occurrence of helminths in ewes and lambs grazing together with cattle was lower than in mono-grazing. Quintana et al. (1987) observed that helminth infestation was lower in lambs grazing after cattle than in lambs grazing only with the mothers. Hintz (1991) reported a lower occurrence of parasitoses when cattle, sheep and goats grazed together.

The main objective of the pilot experiment was to prove whether the level of nutrition of animals grazing lucerne-grass forage which had been under-sown during operation with a pasture mixture was satisfactory and whether the costs for prevention and therapy of parasitoses would have to be increased.

## 2. Materials

Experiments were conducted at the School Farm of Mendel University of Agriculture and Forestry at Brno in Zábčice (altitude 182 m, annual sum of precipitation 470 mm and average temperature +9°C). The animals were housed in stanchionless sheds on deep litter. During the grazing season they had free access to the pasture. The pasture land was permanently fenced and divided into enclosures with portable electric fencing. In 1995, grazing began on pasture herbage of the following botanical composition: grass 52% (*Lolium multiflorum* Lamk. × *Lolium perenne* L. 50%, other 2%), leguminous plants 43% (*Medicago sativa* L. 42%, *Trifolium repens* L. 1%) and other herbage 5%. At the end of the experiment in 1997 the composition was as follows: grass 82% (perennial 77%, hybrid 4%; *Poa pratensis* L. and *Festuca rubra* L. 1%), leguminous plants 8% (*Trifolium repens* L. 6% and *Medicago sativa* L. 2%), other herbage 10%. Rotational grazing involved three and/or four enclosures. The numbers of animals in the experimental years were: 1995 — 28, 1996 — 36 and 1997 — 42 beef cows with calves. Sheep: 29, 46 and 46 ewes and 39, 62

and 63 born lambs and young sheep, respectively. Pasture loading was 1654 kg live weight/ha in 1995 at the beginning of the experiment, 1608 kg in 1996, and 1740 kg in 1997. In the 1995 grazing season the numbers and composition of animals were not changed much. In 1996 and 1997 later lambing was arranged, the lambs were weaned and sold during the grazing period enabling regulation of grazing pressure. The age of lambs and calves (in days) coming to the pasture in 1995, 1996, 1997 was  $83.34 \pm 4.57$ ,  $50.91 \pm 2.49$  and  $19.98 \pm 1.43$ , respectively, for lambs, and  $138.17 \pm 17.37$ ,  $118.18 \pm 12.73$  and  $92.27 \pm 11.73$  for calves.

The average length of the pasture season was  $197 \pm 8$  days. The yields of herbage dry matter in 1995, 1996 and 1997 were 12.14, 7.62 and 6.33 t/ha, respectively. Winter feeding was based on production from the farm's arable land.

## 3. Methods

The experimental animals were weighed regularly once a month. Dry matter production and quality of the grazed herbage were evaluated before and after the grazing cycle. The methods used for fertilisation and re-vegetation were not the objective of the present study.

During the three grazing seasons, parasitological examinations were carried out. Faeces sampling was individual, on a monthly basis during weighing, on average from 80–90% of the animals. Samples were examined using the flotation and larvoscopic methods, and quantitatively by determination of eggs in 1 g of faeces (EPG). Infectious larvae (La III) of gastrointestinal nematodes (GIN) were cultivated. The incidence of coccidia oocysts of the genera *Eimeria* and *Cryptosporidium* and *Giardia* sp. cysts was recorded. Helminth control was carried out in cattle and sheep before and after the grazing season and additionally in sheep, during grazing. IVOMEC inj. (0.2 mg/kg l.w. of ivermectin) and VERMITAN susp. 2.5% (7.5 mg/kg l.w. of albendazole) were used for cattle; for sheep VERMITAN susp. 2.5% (5 mg/kg l.w. of albendazole). From October 1996 to September 1997, 15 ewes grazing together with cattle were studied individually, and 15 ewes grazing separately. The dynamics of excretion of

GIN and *Monexia* spp. eggs were compared in monthly intervals.

Results were evaluated statistically using the UNISTAT system non-parametric methods.

#### 4. Results

In the second and third years, the pasture yields decreased by 37% due to the weather and restructuring of the stands from seeded to perennial forage. The regulation of grazing pressure during the grazing season increased the utilisation of green matter (Table 1). Table 1 shows that the changed herbage was reflected in lower liveweight increments per unit area by 17 and/or 25%. This trend is in accordance with intentions to reduce the use of some areas in the Czech Republic.

The growth rate of the animals, particularly the lambs, was greater in seasons 2 and 3 (Table 2) and allowed earlier weaning.

In the 3-year experiment the live weight of lambs at weaning was comparable, i.e.  $39.23 \pm 1.95$ ,  $38.10 \pm 1.27$  and  $38.35 \pm 1.08$  kg, respectively; because of their lower age at the beginning of grazing, the higher increments in 1996 and 1997 were statistically significant.

The growth rate of calves was also satisfactory (Table 2). Due to the lower number of studied animals and the effect of the individuality of the mothers in the groups, the increased growth rate was not statistically significant.

No negative aspects were observed in the development of the condition of mothers. The average liveweight increment of cows up to the 5th month of pregnancy was  $50.32 \pm 6.36$  kg for the grazing

Table 2  
Daily gains of young animals (kg)

Indicator	Year			
	1995 (A)	1996 (B)	1997 (C)	
Calves	n	5	10	11
	$\bar{x}$	0.983*	1.083*	1.139*
	Sx	0.049	0.037	0.115
	v	11.09	16.65	33.44
Lambs	n	35	54	56
	$\bar{x}$	0.190* <sup>ab</sup>	0.251 <sup>***</sup>	0.228 <sup>***</sup>
	Sx	0.011	0.008	0.009
	v	28.67	22.54	30.15

Significance of tests: \* $P < 0.05$ , <sup>†</sup> $P > 0.05$ ; or 'small letters' between the respective groups according to Scheffe's method of multiple comparison; <sup>††</sup> $P > 0.01$ , or 'capital letters' *ditto*.

season. The increment of ewes was  $8.68 \pm 0.70$  kg, the  $10.28 \pm 0.89$  kg increment in 1996 was significantly better than the  $5.35 \pm 0.87$  kg increment in 1995.

Etological observations confirmed that a habituation period was necessary at the beginning of mixed grazing, i.e. the animal species had to get accustomed to each other and to the lucerne-grass herbage. The mothers stabilised the group. For both species the position of the cows was dominant. At the beginning of the grazing period, cattle and sheep grazed separately, in groups, the offspring with their mothers. Later grazing was dispersed. Sound fencing of the pasture land is necessary if mixed grazing is to be successful.

Studies of parasitoses showed that helminthoses of the digestive system present serious health problems. GIN egg counts increased rapidly as early as the first months of grazing. In 1995 the maximal average EPG counts were 550 in lambs and 200 in ewes and yearlings. Early July helminth control reduced the intensity of infestation to nearly zero. Re-growth of GIN continued in the summer months. Findings of GIN eggs decreased markedly during 1996 (maximal count of EPG eggs in lambs was 340, in ewes and yearlings 160) and 1997 (180 and 90, respectively).

In 1995 the maximal prevalence of tapeworms of the genus *Monexia* in lambs, ewes and yearlings was 59% and 25%, in 1996 it was 24% and 11%, and in 1997 18% and 6%, respectively. Due to autumn helminth control, infestation of sheep was minimal during winter housing.

Table 1  
Utilisation of pasture herbage

Indicator	Year		
	1995	1996	1997
From the total herbage yields			
grazed (%)	62.64	84.00	94.57
harvested for hay (%)	30.24	14.97	1.91
left ungrazed (%)	7.12	1.03	3.52
Body increments			
total per ha (kg)	643	535	481
of which sheep (%)	22	33	35

The prevalence of GIN eggs in cattle was the highest in summer and autumn. EPG egg counts were low, the highest amounts were 30–75. Tapeworm eggs appeared in 1995 and 1996, in both cases only in one heifer.

In 1996 and 1997 a group of ewes grazing with cattle (A) was compared with ewes grazing separately (B). The difference in the incidence of gastrointestinal nematodes was highly significant (non-parametric Mann-Whitney  $U$ -test = 7345.5,  $P < 0.0001$ ) in favour of ewes grazing together with cattle (Fig. 1).

Faeces samples were analysed larvoscopically (La III); 8–10 species, and/or genera of GIN, i.e. *Nematodirus*, *Ostertagia*, *Trichostrongylus* and *Chabertia*, were discovered in lambs and ewes, and *Ostertagia* and *Cooperia* in cattle. Customary parasites of lambs and ewes during housing were coccidia of the genus *Eimeria*. After turning out to pasture, the prevalence and excretion of oocysts rapidly decreased. *Eimeria bovis* and *E. zuernii* were found sporadically in cattle. Oocysts of the genus *Cryptosporidium* were found sporadically in lambs during the first month of age and also cysts of *Giardia* sp. in lambs younger than 2 months.

## 5. Discussion and conclusion

In practice, mixed grazing by cattle and sheep increased the proportion of grazed herbage which enabled a reduction of technological interventions. This is associated with the findings of Abaye et al. (1994) that grazing cattle and sheep together increases the balance between forage growth and animal requirements. In accordance with the present findings, Hodgson et al. (1985) reported that cattle were much less tolerant to their own faeces than sheep which tolerated both. Abaye et al. (1994) confirmed the good growth capacity of lambs during mixed grazing. The authors reported that the average daily increment of lambs was 0.23 kg, final weight 43 kg, total increment 23 kg, the latter being achieved 14 days earlier than during mono-grazing. Fatyga (1989) found that the average daily increment of lambs during mixed-grazing by heifers and sheep in a mountainous area increased 8 g. Elly and Glenn (1977) confirmed the importance of the habituation period.

Parasitological examinations of faeces samples proved the high intensity and prevalence of GIN and tapeworms in lambs and sheep. Virtually only GIN

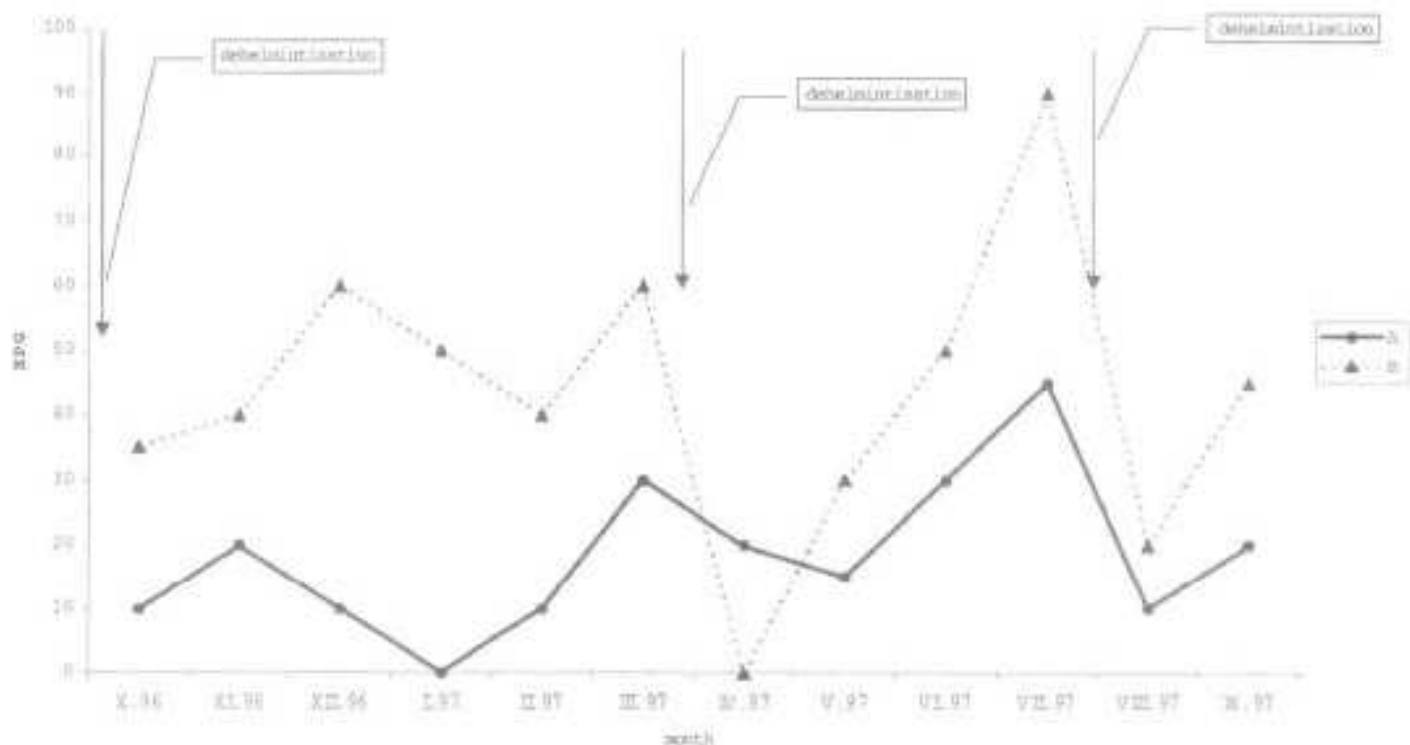


Fig. 1. Dynamics of ovescopical findings of gastrointestinal nematodes (EPG) in ewes grazing together with cattle (A) and separately (B).

were found in cattle and their intensity was low during the whole period of investigations.

The results confirmed our previous findings (Chroust, 1995; 1996; Chroust et al. 1997) that the excretion of eggs by sheep and cattle is very dynamic during the year. The rapid increase of the curve of prevalence and intensity as early as the first 2 months of grazing also confirmed that infestation of the pasture land was very rapid and that lambs were more sensitive than ewes. Helminth control before and after the grazing season, aimed at suppressing the peaks of infection during grazing, showed that albendazole was very effective against both GIN and tapeworms. In the present experiments helminth control before turning out to pasture and after the end of the grazing season was sufficient for cattle. Individual helminth control was necessary only when *Monezia* spp. tapeworms were found. After two seasons of mixed grazing with sheep, the incidence of parasites in cattle was minimal, and at the beginning of 1997 no helminth control was necessary.

The results showed that mixed grazing by cattle and sheep did not increase the prevalence or intensity of parasitoses and that there is no danger of inter-specific transfer of helminthoses. Compared with mono-grazing, it is not necessary to increase the number of helminth controls.

#### Acknowledgements

This study was funded by the Grant Agency of the Czech Republic (Grant No. 507/95/1284) and the Czech Ministry of Agriculture (Grant No. EP 7281).

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