MANAGEMENT OF SMALL RUMINANTS IN EXTENSIVE AGICULTURAL AREAS FROM A WELFARE PERSPECTIVE

Paweł Górski[1], Roman Niżnikowski[2], Ewa Strzelec[2], Dominik Popielarczyk[2], Agnieszka Gajewska[1], Halina Wedrychowicz[1,3], Jarosław Groberek[2]

[1]*Department of Parasitology, Faculty of Veterinary Medicine, Ciszewskiego 8, PL-02-786 Warszawa, Poland*

[2]*Department of Sheep and Goat Breeding, Faculty of Animal Sciences, Warsaw Agricultural University, Ciszewskiego 8, PL-02-786 Warszawa, Poland*

[3]*Witold Stefański Institute of Parasitology, Polish Academy of Sciences, Twarda 51/55, PL-00-818 Warszawa, Poland*

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Introduction

Animals' welfare is a component of small ruminant breeding under extensive production systems for most of indigenous sheep and goat breeds. Therefore, there is possibility of using these breeds in landscape, wastelands and reclaimed areas management. Aspects concerning health and adaptation to environmental conditions by small ruminants have become more and more important (Groberek et al., 2004ab). This paper shows results of the research conducted in Poland concerning several issues of environmental monitoring during vegetative period, data concerning feeding behavior and the productivity components. Moreover, aspects concerning animals' health under those environmental conditions are described in this study.

Feeding behavior of sheep

The influence of season on dislocation time (Tab.1) was significantly different in July, August and October. Sheep were less active on pasture in June and September (GROBEREK et al., 2004a). There was no correlation between climatic factors and analyzed pasture behavior traits (Fig.1) - correlation coefficients were not significant. Statistically non-significant correlations were noticed only for total monthly amount of rainfall with time of pasture grazing (-0,495) and with distances made by sheep on pasture (-0,501). Both values of these correlation coefficients showed downward tendency of feeding activity and upward tendency of total monthly amount of rainfall. In spite of increase of rainfall amount animals were grazing on pasture, however, less intensively. Possibly it was an effect of environmental conditions in the area.

Generally the results indicated changes of grazing behavior traits depending on year of research. Alternations of daily time of grazing, distances made by sheep and dislocation time of sheep on pasture were observed. The highest values of dislocation time were noticed in July, August and October and its changes were statistically significant during vegetative period. The present study showed also negative influence of the total monthly rainfall on time of grazing and distances made by sheep during grazing.

The quality and nutritive value of pasture grass on wastelands

The results of botanical composition of pasture grass in 2001-2002 (GROBEREK et al., 2004b) are shown in table 2. Grasses (*Poaceae*) were the predominant plant group and horsetails (*Equisetaceae*), sedges and rushes (*Cyperaceae, Juncaceae*) were at the lowest estimate level which could influenced on decreasing nutritive value of feed (GROBEREK et al., 2003a, GROBEREK and NIŻNIKOWSKI 2003). The other groups of plants were at the average level according to plants' extreme nutritive values.

The results of metabolizable energy content are shown in figure 2. Experiment indicated decreasing trend of this factor during successive months and the highest values were noticed in June. Such tendencies of changes in botanical composition and metabolizable energy content lead to changes in nutritive values of pasture grass during months of pasture grazing, (GROBEREK et al., 2003a, GROBEREK and NIŻNIKOWSKI 2003).

The results of pasture yield and feed intake are shown in table 3. Productivity of pasture on the wasteland was in close correlation with climatic conditions during experimental period (Fig 1). According to these values of pasture yield in successive months of vegetative period experiment indicated decreasing trend, and the lowest values were noticed in September. The level of feed intake was the lowest in July and August.

The results of digestibility of feed nutrients are presented in table 4. According to ether extract this values were even negative, which indicated great excretion of this nutrient as an endogenic lipids. The similar explanation could be in case of crude ash and crude protein and such tendency required additional research to explain that problem in more extended way.

The animal response on feeding conditions during vegetative period is shown in table 6. There were no changes in body weight of adult animals at the beginning and at the end of experimental period. However growing animals – ewe-lambs were significantly heavier at the end of vegetative period, which indicated convenient feeding conditions on the wasteland.

Generally speaking wasteland could be used as a feeding base in sheep nutrition and its nutritive values are appropriate not only for adult sheep but also for growing animals (ANTCZAK et al., 2002, NIŻNIKOWSKI et al., 2002). Such conclusion could be also the result of appropriate stocking rate on a pasture connected with changes in sheep grazing rate (GROBEREK et al., 2003b) during vegetative period.

Parasitic invasions in goats and sheep

Small domestic ruminants can have numerous gastrointestinal parasites, which many of them are shared by both goats and sheep. The parasitofauna of those animals includes protozoa (coccidia), trematodes (flukes), cestodes (tapeworms) and nematodes (lung- and gastrointestinal roundworms). The most important worldwide parasites of small ruminants are probably nematodes from *Trichostrongylidae* family, but intensive invasion of any parasites can cause health problems. Parasitic invasions can cause diarrhea, loss of appetite and body weight, anemia and even death. Young animals are much more susceptible than adults. Compared to sheep, which develop a strong natural immunity around 12 months of age, goats acquire a lower level of immunity to gastrointestinal parasites, so they have greater populations of adult parasites. In experimental infections with gastrointestinal nematodes (*Teladorsagia circumcincta*) MACALDOWIE et al., (2003) found that goats carried higher worm burdens than lambs.

According to our observations in Poland as many as 80,6% of goats and 97% of sheep are infected with at least one genus/species of parasite. These results support the opinion that goats acquire a lower level of immunity to gastrointestinal parasites than sheep and those parasitic infections are in Poland more prevalent in goats than in sheep (GORSKI et al., 2004a). Goats showed higher than sheep prevalence of *Eimeria spp* and *Muellerius capillarius* (lungworm) infections. With the latter, goats were 15 times more frequently infected than sheep. Liver fluke (*F. hepatica*) eggs were found only in sheep (with prevalence 10,9%). Also tapeworm infections were more frequent in sheep as well as gastrointestinal nematode invasions (Fig.3). Also differences between breeds of host species have been shown. The most susceptible to parasitic infections seems to be White Improved Goats (100% of infected) and the least susceptible – Alpen Goats (prevalence of 58,8%). The highest prevalence of parasitic infections was observed in three breeds of sheep: Polish Mountain Coloured Sheep, Zelazna Sheep and Swiniarka (100%, 89.2% and 81% respectively) (GORSKI et al. 2004b). Some differences in prevalence of internal parasite infections in small domestic ruminants have been found between different regions of Poland (Fig.4).

Prevention, rather than cure, is the philosophy used in developing control programs against gastrointestinal nematodes. It should be assumed that worms cannot be eradicated from the environment and livestock will continually be reinfected. However, infections can be limited to the extent that they will not cause substantial economic loss to the producer. A combination of treatment and management is usually necessary to achieve control. Antihelmintics should be used at a time when most of the total worm population is within the hosts and not on the pasture, such as when animals are moved from a contaminated pasture to a parasite-free or nearly free pasture. Pastures become parasite-free when they have been tilled or given prolonged rest at a suitable time of year or were grazed by animals which are not satisfactory hosts for the target parasite species.

Gastrointestinal nematode infections can be treated by antihelmintic chemotherapy however, treatment is expensive and drug resistance has evolved in all major parasite species (BALICKA-RAMISZ at al., 1999, ROOS 1997). Because of increasing drug resistance among parasites and growing concerns of pesticide residues in food and the environment, it is very important to develop adjuncts to current control procedures. One of the ideas is to identify the genetic basis for naturally occurring resistance of some breeds of sheep and goats against parasitic infections.

Table 1. The influence of season on pasture behavior traits (GROBEREK et al., 2004a)

Traits:		Season:				
		June (A)	July (B)	August (C)	September (D)	October (E)
Number of observations:		8	9	8	7	7
Daily grazing time on pasture (min.)	LSM	419,61	296,77	398,33	409,05	342,77
	Se	34,98	32,39	34,98	37,40	37,40
Distance made by sheep during grazing (m)	LSM	4873,00	4633,11	6831,50	4920,11	6219,77
	Se	621,81	575,68	621,81	664,74	664,74
Dislocation time of grazing sheep (m/min.)	LSM	$11,78^{bcE}$	$16,10^{ad}$	$16,65^{ad}$	$11,74^{bcE}$	$18,20^{AD}$
	Se	1,42	1,32	1,42	1,52	1,52

A,B,C,D,E - P≤0,01; a,b,c,d,e - P≤0,05

Figure 1 Changes of dislocation time (P≤0,05) of sheep on pasture according to climatic data and a season of observations (GROBEREK et al., 2004a).

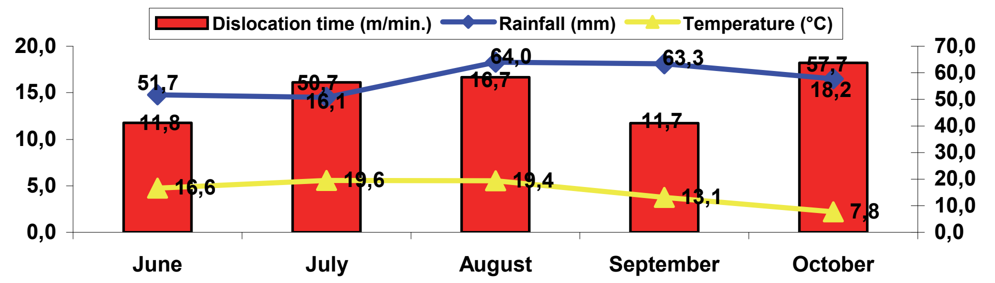
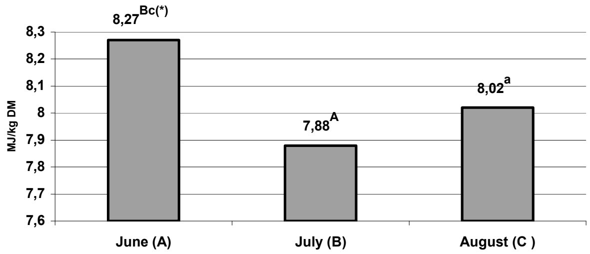


Table 2. Botanical composition of pasture grass in 2001-2002 (%) (GROBEREK et al. 2004b)

Plant's group:	N	LSM	SE
Grasses (A)	30	$60,43^{BCDEF}$	1,31
Legumes (B)	27	$13,09^{ADEF}$	1,31
Complex (C)	30	$13,25^{AEF}$	1,31
Other species of *Dicotyledoneae* (D)	30	$10,60^{AEF}$	1,31
Horsetails (E)	30	$0,61^{ABCD}$	1,31
Sedges and Rushes (F)	21	$1,35^{ABCD}$	1,31

A,...,F – P ≤ 0,01; a,…,f – P ≤ 0,05

Figure 2. Average values of metabolizable energy in pasture grass during vegetative period in 2001-2002 (MJ/kg DM) (N=14) (GROBEREK et al. 2004b)



A,...,C – P ≤ 0,01; a,…,c – P ≤ 0,05

Table 3. Pasture yield (t/ha) during vegetative period and pasture grass intake by sheep (g/day/sheep) (GROBEREK et al., 2004b)

	Pasture yield (t/ha)		Pasture grass intake (g/day/sheep)	
	Fresh grass	Dry matter	Fresh grass	Dry matter
Average	7,90	3,10	1278	527

Figure 3. Prevalence of protozoa, trematode, tapeworm and nematode infections in goat and sheep in Poland (GÓRSKI et al., 2004a)

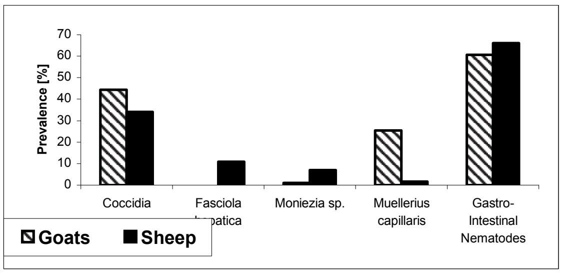


Figure 4. Prevalence of internal parasite infections in goats and sheep in different parts of Poland (GÓRSKI et al., 2004a)

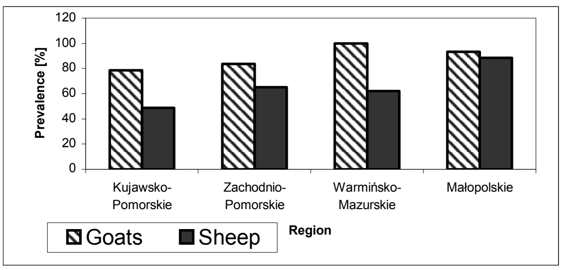


Table 4. Digestibility of pasture grass nutrients (%) during vegetative period (GROBEREK et al., 2004b)

	Digestibility of pasture grass nutrients (%)					
	Crude Ash	Crude Protein	Ether Extract	Crude Fibre	N-free extracts	Dry matter
Average	32,35	52,01	21,01	76,71	76,22	68,20

Table 5. Means of body weight of ewe lambs and ewes at the beginning and at the end of pasture vegetative period (kg) (GROBEREK et al. 2004b)

Sheep	Heads	Body weight at the beginning		Body weight at the end		Average body weight	
		LSM	SE	LSM	SE	LSM	SE
Ewe lambs	20	24,87*	0,56	30,40*	0,56	27,63	0,56
Ewes	77	$38{,}13^{NS}$	0,43	$39{,}14^{NS}$	0,43	38,64	0,43

Differences: (*) statistically significant (P≤0,05) or NS - not significant

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