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THE EFFECT OF MOWING ON MOSS MITES (ACARI, ORIBATIDA) OF XEROTHERMIC RESERVE GRUCZNO

Abstract

The xerothermic plant communities mowing with different frequency and the brushwood of blackthorn overgrowing the not mowing surface of reserve were investigated. Populations of Oribatida were more numerous in the mowing terrains than in the brushwood. The number of species of Oribatida and the Shannon Index were similar in the investigated plots. In the swards surfaces the occurrence of the xerophilous species of Oribatida was found.

Keywords: oribatid mites, xerotherm, mowing

Introduction

The xerothermic swards are the plant communities, which have survived in Poland until now, as a relict of the warmer and drier climatic periods (Wysocki, Sikorski 2002). This communities germinate steep slopes of the southern and south – west exhibition, shallow soils and pH neutral or alkaline (Matuszkiewicz 2001). They were used as a low efficient meadows and pastures, what prevented

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the germinating by shrubs and trees. Actually their survival is possible thanks to active reserve protection. One of this type of plants reserve are „Ostnicowe parowy Gruczna", where the active protection of plant communities is carried out. It consists on repeated mowing every few years, which prevents germinating of terrain by the shrubs.

Te aim of this study was to investigate if there is an effect of swards mowing on the populations of soil mites.

Material and methods

The investigation was performed in the reserve of xerothermic plants „Ostnicowe parowy Gruczna". Reserve at the area of about 25 ha is located on the slope of the Vistula Valley, in the terrain of the Gruczno city about 5km from Świecie.

The xerothermic plants community mowing with the different frequency and the brushwood of blackthorn (*Prunus spinosa* L.) overgrowing the not mowing surface of reserve were investigated. Three plots were investigated. Plot one (1) was overgrown by the association of *Rubo fruticosi-Prunetum spinosae* Web. 1974 n. niv. Wittig 1976. Strong density of blackthorn shrubs caused almost complete elimination of the layer of herbaceous plants under them. Plots two (2) and three (3) were overgrown by the association – *Potentillo-Stipetum capillatae* Libb. 1993 em. Krausch 1960 – with the participation of the *Stipa joannis* L. Plot 2 was mowing the year before the investigations and the plot 3 – five years before the investigations. Names of plant species follow Rutkowski (2005) and names of plant association follow Matuszkiewicz (2001).

Soil samples of 50cm^3 were selected in April and September of 2008 from each plot in 10 replicates. In the meadow's plots the soil and the lower part of plants were selected and in the brushwood only the soil samples were selected. Generally 100 samples were selected.

Oribatid mites were extracted in high gradient Tullgren funnels, conserved in 70% ethyl alcohol and determined to species, including the juvenile stages. Names of oribatid species follow Weigmann (2006) and partly Subías (2004). The populations of oribatid species were characterized with the abundance (*A*) and constancy (*C*) indices, while the mite communities were compared with the Shannon *H* index (Odum 1971). In statistical calculations the Tukey HSD (ANOVA/MANOWA) test was used.

Results and discussion

The brushwood of blackthorn, which overgrow the steep slopes prevent soil erosion, especially creating of landslides. Overgrowing the frontier areas of reserve acts the role of the protecting barrier against the penetration of segetal plant species from fields on this terrain (Matuszkiewicz 2002; Wysocki, Sikorski 2002). Blackthorn colonizes but also areas of swards in the reserve. To protect the relict herbaceous plants the swards should be mowing at least once every few years. Mowing eliminates the arborescent vegetation, but saves most of grasses, which spreading low above the ground (Falińska 1996). Soil fauna of meadows and pastures are large, between 50 thous. indiv./m^2 on acid xerothermic grasslands and 300 thous. indiv./m^2 on the meadows, thickly overgrown roots and rich in organic matter (Bardgett, Griffiths 1997). On the investigated plots were less fertile soil and had a slightly alkaline pH. Oribatid mites prefer acidic soil, which may be the reason for the small density.

The number of mites and Shannon index of Oribatida in the investigated plots was very low, usually density of Oribatida in grassland ecosystems varies widely, from 6 thous. indiv./m^2 grasslands in the meadows, to 200 thous. indiv./m^2 in the plains and peat bogs (Petersen 1982). In the lawn subjected to strong anthropopressure and surfaces overgrown with the ruderal vegetation is much lower and amounts usually several thous. indiv./m^2 (Bukowski 2008; Bukowski, Chachaj 2008; Zabrocka et al. 2006).

The lowest number observed in the plot 1 (brushwood of blackthorn) and the highest in the plot 2 (mowing the one year before the investigations) (Tab. 1). On this structure influence mainly Oribatida, which accounted from 70% to 75% of the population of all mites in the investigated plots. In the investigated terrain 19 taxons of Oribatida was found, and the 5 of them occurred in the all investigated plots. Population of oribatid mites in the meadow mowing 5 years before the investigations was the most numerous. The highest density was on plot 3 probably the period of 5 after 5 years of regrowth vegetation creates better conditions for the development of oribatid (Bukowski 2008). The population of Oribatida in the meadow mowing the 1 year before the investigations was less numerous and differentiated.

Table 1. Abundance of mites (*A* in thous. indiv./m^2)

		Plots		
		1	2	3
Acari total	A	2.8	7.0*	10.7*
Oribatida	A	2.1	5.0*	7.5*
	H	1.499	1.752	1.893
	S	11	13	12
Achipteria coleoptrata (L.)	A	0.1	0.1	
	C	10	20	
Ceratozetes gracilis (Michael)	A		0.1	
	C		10	
Damaeus spp.	A			0.1
	C			10
Eupelops occultus (C.L. Koch)	A	0.2	0.2	2.2*
	C	20	30	90
Eupelops subuliger (Berlese)	A		0.3	
	C		30	
Galumna lanceata (Oudemans)	A	0.1	0.1	1.1*
	C	20	10	90
Liacarus coracinus (C.L. Koch)	A	0.1		0.5
	C	10		50
Licnodamaeus pulcherrimus (Paoli)	A		0.1	
	C		10	
Liebstadia humerata Sellnick	A		1.0*	0.4
	C		70	20
Nothrus borussicus Sellnick	A	0.1		
	C	10		
Oppiella nova (Oudemans)	A			0.2
	C			20
Platynothrus peltifer (C.L. Koch)	A			0.1
	C			10
Punctoribates punctum (C.L. Koch)	A			0.4
	C			70
Scheloribates laevigatus (C.L. Koch)	A	0.4	1.3*	1.6*
	C	40	70	90
Scutovertex sculptus Michael	A	0.2	1.0*	0.4
	C	20	70	30
Tectocepheus velatus (Michael)	A	0.2	0.1	0.1
	C	30	20	10
Trhypochthonius tectorum (Berlese)	A	0.1	0.2	
	C	10	30	
Trichoribates incisellus (Kramer)	A	0.5	0.4	0.4
	C	40	60	50
Trichoribates novus (Sellnick)	A	0.1	0.1	
	C	10	10	

C – constancy, number of species (*S*) and the Shannon index (*H*) of Oribatida.

* – significantly different at $P < 0.05$.

Conditions in soil microhabitats are largely related with plants, which cover the soil. Vegetation is the source of death organic matter, changes the soil structure, regulates the thermals and humidity. In the investigated plots the numerous in population were the meadow *Eupelops occultus*, *Scheloribates laevigatus* and eurytopic species *Tectocepheus velatus*. Also xerophilous species were found *Scutovertex sculptus*.

The number of mites on the surfaces of both investigated swards was higher in the soil than in the lower part of plants, what probably is connected with searching by this arachnids the habitat at optimal humidity and temperature (Tab. 2) (Rajski 1961). Factors strongly limiting the number of population and species diversity of Oribatida were probably large diurnal temperature fluctuations, low soil humidity and low soil organic matter content (Seniczak 1978; Rajski 1961). There is a close correlation between the abundance and composition of the fauna of this group and the quantity and quality of humus (Kajak 1989). Brushwood of blackthorn in the terrain of reserve not only drove the sward plants but also strongly influenced on the abundance and species composition of mesofauna.

Mowing of xerothermic swards caused changes in plant cover, number of mites and species composition of Oribatida.

Table 2. Vertical distribution of mites (indiv./100 cm^3)

	Plots				
	1	2		3	
	S	G	S	G	S
Acari total	8	5	13	14	20
Oribatida	5	3	9	10	13

S – soil, G – grass.

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WPŁYW KOSZENIA NA ZGRUPOWANIA MECHOWCÓW (ACARI, ORIBATIDA) REZERWATU KSEROTERMICZNEGO W GRUCZNIE

Streszczenie

W pracy przedstawiono wyniki badań nad mechowcami (Acari, Oribatida), z rezerwatu kserotermicznego „Ostnicowe parowy Gruczna". Do badań wybrano powierzchnie koszone i nie koszone, które porosła śliwa tarnina. Większe zagęszczenie mechowców

stwierdzono na powierzchni koszonej niż w zaroślach. Liczba gatunków i wskaźnik ogólnej różnorodności gatunkowej były podobne. Na badanych powierzchniach stwierdzono występowanie sucholubnych gatunków mechowców.

Słowa kluczowe: mechowce, murawy kserotermiczne, koszenie

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