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# SOIL ORIBATID MITES (ACARI, ORIBATIDA) IN THE PLOTS OF GRASS COLLECTION IN IHAR BYDGOSZCZ

## Abstract

The population of soil oribatid mites in 14 plots of grass collection in IHAR in Bydgoszcz was investigated. Abundance of Oribatida population ranged 0.8–46.7 thousand indiv./$m^2$. Number of species of Oribatida ranged from 3 to 6 and the Shannon index was low. There were no influence of height and manner of spreading of grasses on oribatid population.

**Keywords:** Oribatida, grass, *Eupelops*, *Scheloribates*

## Introduction

Institute of Plant Breeding and Acclimatization in Bydgoszcz gathers a collection of plants, both in the form of seeds and in the form of crops. Abundance and species composition of soil mites population is dependent on the microhabitat conditions. The effect on conditions in the soil have, among other things, plants overgrowth, the soil and the tillage treatments (Rajski 1961; Seniczak 1978).

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The aim of this study was to establish whether the various species of grasses of different heights and a way of spreading, influence on the populations of soil mites.

## Material and methods

The investigation was performed in the terrain of IHAR garden, in Myślęcinek part of Bydgoszcz. Grasses were cultivated in the plots of 1 x 1 m, under very intensive care (ground preparing, soil scarification, hand weeding, mowing).

Investigated material was taken from 14 plots sown with grasses of different heights and a way of spreading. The following species were investigated: 1. *Anthoxanthum odoratum* L., 2. *Nardus stricta* L., 3. *Deschampsia caespitosa* (L.) P. Beauv., 4. *Festuca airoides* Lam., 5. *Corynephorus canescens* (L.) P. Beauv., 6. *Molinia caerulea* (L.) Moench, 7. *Arrhenatherum elatius* (L.) P. Beauv. ex J. Presl et C. Presl, 8. *Alopecurus pratensis* L., 9. *Holcus lanatus* L., 10. *Phleum pratense* L., 11. *Sesleria tatrae* (Degen) Deyl, 12. *Agrostis capillaris* L., 13. *Calamagrostis pseudophragmites* (Hall.) Koel. and 14. *Phalaris arundinacea* L.

Soil samples of 50 $cm^3$ each (3 cm deep) were taken in April and September of 2008 from each plot in 5 replicates. Samples were selected from the lower part (3 cm high) of plants and the soil. Generally 140 samples were studied. Oribatid mites were extracted in high gradient Tullgren funnels, conserved in 70% ethyl alcohol and determined to species level, including the juvenile stages. Names of oribatid species follow Weigmann (2006) and partly Subías (2004). Names of plant species follow Rutkowski (2005). 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).

Results were statistically analyzed using a spreadsheet Microsoft Excel 2007 and Statistica 6.0 package. Basic descriptive statistics were carried out, and after a logarithmic transformation of data was performed using the statistical analysis of the U Mann-Whitney test and Tukey test, with a significance of $P < 0.05$ (Berthet, Gerard 1965; Łomnicki 2000).

**Results and discussion**

The abundance of mites in the investigated plots ranged from 4.5 to 50.9 thous. indiv./m$^2$. Oribatida ranged in the investigated plots from 19% to 92% of the all mites population (Tab. 1).

The observed abundance of mites (including oribatid mites) in the investigated plots was similar for the abundance of different types of grasslands found by other authors (Rajski 1961; Seniczak et al. 1993; Hubert et al. 2004).

In soils with strong anthropogenic pressure, fields and lawns the abundance of mites is low (Skubała et al. 2000; Bukowski, Chachaj 2008; Bukowski 2008; Zabrocka et al. 2006).

The Shannon index (*H*) of the population of oribatid mites in the investigated plots was low. In the most of investigated plots the population of mites prefers the soil layer than the lower part of plants (Tab 2). This tendency was less clear in the population of oribatid mites. Similar results obtained Seniczak et al. (2005) investigating the relatively dry meadows soils.

The analysis determined the statistical significance of differences between Oribatida group at most studied plots (Tab. 3).

In the investigated plots only 10 taxa of oribatid mites were found and the number of species ranged from 3 to 6 taxa. This low number of species of Oribatida was observed in habitats with strong anthropogenic pressure, or especially those, where were few dead organic matter (Seniczak et al. 2000a, 2000b; Domek et al. 2006; Sokołowska et al. 2006; Sokołowska, Seniczak 2005).

In the investigated plots relatively abundant were *Eupelops occultus* – species characteristic for meadows and pastures, *Scheloribates laevigatus* – species characteristic for meadows, *Scutovertex sculptus* – xerophilous species and *Tectocepheus velatus* – eurytopic species (Chachaj, Seniczak 2005; Klimek et al. 1991).

Acari are very abundant in the meadows. There were no statistically significant relationships between the amount or way of spreading of particular species of grasses and the abundance of mites and species composition of oribatid mites.

Differences between populations of mites in the investigated plots could be caused by other factors, including quantity and quality of vegetable matter and the intensity of tillage treatments.

Table 1. Characteristics of grass, mite abundance (*A* in thousand indiv./m$^2$), number of species of Oribatida (*S*), Shannon index (*H*), grass spread system: sl – slack, c – clump, st – stolons, grass height: l – low, a – average, h – high

| | | Grass species | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| Way of spreading | | c | c | c | c | c | c | sl | sl | sl | sl | sl | st | st | st |
| Heights | | l | l | a | l | l | h | a | h | l | h | l | a | h | h |
| Total Acari | A | 50.9 | 27.0 | 18.7 | 12.4 | 10.8 | 4.9 | 43.9 | 11.8 | 9.6 | 7.0 | 4.5 | 15.4 | 14.6 | 8.5 |
| Oribatida | A | 46.7 | 16.1 | 11.4 | 9.5 | 3.1 | 1.7 | 34.1 | 6.9 | 6.7 | 3.8 | 0.8 | 11.7 | 4.1 | 3.0 |
| | S | 5 | 5 | 5 | 6 | 5 | 5 | 6 | 5 | 6 | 6 | 3 | 4 | 6 | 3 |
| | H | 0.883 | 1.142 | 1.149 | 1.125 | 1.218 | 1.260 | 0.981 | 0.819 | 1.167 | 1.138 | 0.656 | 0.649 | 1.163 | 0.774 |
| Eupelops occultus (C.L. Koch. 1835) | A | 31.4 | 7.9 | 2.1 | 5.1 | 1.4 | 0.8 | 15.3 | 5.2 | 0.8 | 1.4 | 0.7 | 8.9 | 2.5 | 2.4 |
| | C | 90 | 90 | 80 | 80 | 70 | 70 | 90 | 60 | 40 | 70 | 50 | 90 | 80 | 90 |
| Trichoribates incisellus (Kramer. 1897) | A | | | | | 1.1 | | | | 0.1 | | | | | |
| | C | | | | | 40 | | | | 10 | | | | | |
| Liebstadia humerata Sellnick. 1928 | A | 0.5 | 5.8 | 0.1 | 0.1 | 0.2 | 0.1 | 1.3 | 0.1 | | | | | | |
| | C | 10 | 90 | 10 | 10 | 10 | 10 | 20 | 10 | | | | | | |
| Micreremus brevipes (Michael. 1888) | A | | | | | | | | | | | | 0.1 | | |
| | C | | | | | | | | | | | | 10 | | |
| Oppiella nova (Oudemans. 1902) | A | | 0.4 | 5.7 | 0.3 | | 0.5 | 0.2 | | 0.7 | 0.1 | | 0.2 | 0.5 | 0.1 |
| | C | | 10 | 70 | 20 | | 30 | 10 | | 30 | 10 | | 30 | 30 | 10 |
| Punctoribates punctum (C.L. Koch. 1839) | A | | | | | | | | | | 0.1 | | | 0.6 | |
| | C | | | | | | | | | | 10 | | | 10 | |
| Scheloribates laevigatus (C. L. Koch. 1835) | A | 11.7 | | | 0.1 | | | 16.3 | 0.7 | 4.0 | 0.2 | 0.1 | | 0.3 | |
| | C | 80 | | | 10 | | | 100 | 50 | 20 | 30 | 10 | | 50 | |
| Scutovertex sculptus Michael. 1879 | A | 1.6 | 1.3 | | 1.1 | 0.1 | 0.3 | 0.1 | 0.2 | 0.1 | 1.9 | | | 0.1 | |
| | C | 30 | 30 | | 20 | 10 | 30 | 10 | 30 | 10 | 40 | | | 10 | |
| Suctobelba sp. | A | | | 0.4 | | | | | | | | | | | |
| | C | | | 40 | | | | | | | | | | | |
| Tectocepheus velatus Michael. 1880) | A | 1.3 | 0.7 | 3.3 | 2.8 | 0.4 | 0.1 | 1.0 | 0.7 | 1.0 | 0.2 | 0.1 | 2.5 | 0.6 | 0.2 |
| | C | 40 | 40 | 80 | 80 | 30 | 10 | 50 | 40 | 20 | 30 | 20 | 90 | 30 | 10 |

1. *Anthoxanthum odoratum* L., 2. *Nardus stricta* L., 3. *Deschampsia caespitosa* (L.) P.Beauv., 4. *Festuca airoides* Lam., 5. *Corynephorus canescens* (L.) P.Beauv., 6. *Molinia caerulea* (L.) Moench, 7. *Arrhenatherum elatius* (L.) P. Beauv. ex J. Presl et C. Presl, 8. *Alopecurus pratensis* L., 9. *Holcus lanatus* L., 10. *Phleum pratense* L., 11. *Sesleria tatrae* (Degen) Deyl, 12. *Agrostis capillaris* L., 13. *Calamagrostis pseudophragmites* (Hall.) Koel. and 14. *Phalaris arundinacea* L.

Table 2. Vertical distribution of mites in the investigated plots (indiv./100 cm$^3$)

| | | Plots | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| Total Acari | P | 136 | 58 | 28 | 22 | 16 | 5 | 53 | 17 | 16 | 7 | 8 | 28 | 17 | 12 |
| | S | 33 | 32 | 34 | 19 | 20 | 11 | 93 | 22 | 16 | 16 | 7 | 34 | 31 | 17 |
| Oribatida | P | 129 | 30 | 16 | 17 | 6 | 1 | 39 | 8 | 11 | 5 | 2 | 16 | 7 | 4 |
| | S | 26 | 23 | 22 | 15 | 4 | 4 | 75 | 15 | 11 | 8 | 1 | 22 | 7 | 6 |

P – lower part of plants, S – soil.

Table 3. Significant differences between the Oribatida on studied plots, x – at $P < 0.05$

| | Plots | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| Plots | 1 | - | x | x | x | x | x | x | x | x | x | x | x | x | x |
| | 2 | x | - | | x | x | x | x | x | x | x | x | | x | x |
| | 3 | x | | - | | x | x | x | | | x | x | | x | x |
| | 4 | x | x | | - | x | x | x | | | x | x | | x | x |
| | 5 | x | x | x | x | - | x | x | x | x | | x | x | | |
| | 6 | x | x | x | x | x | - | x | x | x | | | x | | |
| | 7 | x | x | x | x | x | x | - | x | x | x | x | x | x | x |
| | 8 | x | x | | | x | x | x | - | | x | x | | | x |
| | 9 | x | x | | | x | x | x | | - | x | x | | | x |
| | 10 | x | x | x | x | | | x | x | x | - | x | x | | |
| | 11 | x | x | x | x | x | | x | x | x | x | - | x | x | x |
| | 12 | x | | | | x | x | x | | | x | x | - | x | x |
| | 13 | x | x | x | x | | | x | | | | x | x | - | |
| | 14 | x | x | x | x | | | x | x | x | | x | x | | - |

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## MECHOWCE (ACARI, ORIBATIDA) GLEBOWE NA POLETKACH KOLEKCJI TRAW IHAR W BYDGOSZCZY

### Streszczenie

Zbadano populacje mechowców glebowych na 14 poletkach kolekcji traw IHAR w Bydgoszczy. Liczebność populacji Oribatida wahała się od 0,8 do 46,7 tysięcy osobn./m$^2$. Liczba gatunków Oribatida wahała się od 3 do 6, a indeks Shannona był niski. Nie stwierdzono wpływu wysokości i sposobu krzewienia się traw na populacje Oribatida.

**Słowa kluczowe:** mechowce, trawy, *Eupelops*, *Scheloribates*

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