

## PRELIMINARY STUDY ON THE OCCURRENCE AND SPECIES COMPOSITION OF ASTIGMATIC MITES (*ACARI: ASTIGMATA*) IN SAMPLES OF DUST, DEBRIS AND RESIDUES FROM FARMING ENVIRONMENTS IN POLAND

Krzysztof Solarz, Piotr Szilman, Ewa Szilman

Department of Biology and Parasitology, Silesian Medical Academy, Katowice, Poland

Solarz K, Szilman P, Szilman E: Preliminary study on the occurrence and species composition of astigmatic mites (*Acari: Astigmata*) in samples of dust, debris and residues from farming environments in Poland. *Ann Agric Environ Med* 1997, **4**, 249-252.

**Abstract:** Twenty one samples of various materials (organic dust, litter, debris and residues) from farming environments (cowsheds, stables, barns, chaff-cutters, lofts, poultry houses and pigeon houses) were subjected to acarological examination. The samples were collected in Solarnia (near Lubliniec), Kokotek vicinity (province Częstochowa), Łazy (near Książ Wielki; province Kielce) and Lesko (province Krosno), all located in southern Poland. A total of 890 mites were isolated including 225 (25.3%) specimens from the order *Astigmata* (16 species) which comprised species considered as allergenic (e.g. *Lepidoglyphus destructor* and *Glycyphagus domesticus*). Species of the family *Glycyphagidae* (*G. domesticus*, *Glycyphagus privatus*, *Ctenoglyphus plumiger* and *L. destructor*) have been found as numerically dominant among astigmatic mites.

**Address for correspondence:** Krzysztof Solarz, PhD, Department of Biology and Parasitology, Silesian Medical Academy, Medyków 18, 40-752 Katowice, Poland.

**Key words:** farming, storage mites, allergy, occupational biohazards, *Glycyphagus*, *Lepidoglyphus*.

### INTRODUCTION

The term storage mites includes a variety of mites, but especially certain astigmatic species from the families *Acaridae*, *Glycyphagidae* and *Chortoglyphidae* [1, 11, 14]. Mites of the genera *Acarus*, *Tyrophagus* (*Acaridae*), *Lepidoglyphus* and *Glycyphagus* (*Glycyphagidae*) are most often found in the ecological studies of hay, straw and other vegetable products in farming environments throughout the world [1, 5, 7, 8, 9, 11, 12, 14, 19]. The storage mites are commonly found in different stored food products, in granaries, barns and other farming and occupational environments, but also in samples of house dust. The most abundant and most often reported are species: *Acarus siro*, *A. farris* and *Tyrophagus putrescentiae* from *Acaridae*, *Lepidoglyphus destructor*, *Glycyphagus domesticus* and *Gohieria fusca* from *Glycyphagidae* and

*Chortoglyphus arcuatus* from *Chortoglyphidae* [1, 2, 3, 5, 7, 9, 11]. These mites are sources of clinically important allergens and the causes of occupational allergy (known as allergy to storage mites) among farmers, grain-storage workers and other agricultural workers. They are also considered as an important occupational hazard for bakers, pastry-cooks, shopkeepers, millers, store-keepers, cheese-makers, horseriders, dockers, transport workers, upholsterers, miners and some other occupational categories [3, 4, 6, 8, 10, 15, 17, 18].

The interest in storage mite allergy has increased over the past few years. It is known that the storage mites have their natural habitats in the open field [5, 9, 11, 16]. Part of this field population is most probably brought with the crops into the stores or barns, where the mites continue their developmental life cycles, when conditions are appropriate [9]. It was also suggested that stored products

**Table 1.** List of mite species found in the farming environment in Poland.

Mites	Number of specimens						Total	% (Total)
	Cowsheds	Stables	Barns	Chaff-cutters	Lofts	Poultry & pigeon houses		
<b>ASTIGMATA (Total)</b>	125	1	87	2	10		225	25.28
<b>Acaridae</b>								
<i>Tyrophagus palmarum</i>	2						2	0.22
<i>T. longior</i>			1				1	0.11
<i>Acarus immobilis</i>			4				4	0.45
<i>A. farris</i>			2	1			3	0.34
<i>Rhizoglyphus echinopus</i>			1				1	0.11
<b>Glycyphagidae</b>								
<i>Glycyphagus domesticus</i>	44		9		1		54	6.07
<i>G. privatus</i>	9		38		1		48	5.40
<i>Glycyphagus</i> sp.	1	1	1		1		4	0.45
<i>Glycyphagus</i> sp. (hypopus)			2				2	0.22
<i>Lepidoglyphus destructor</i>	23		6				29	3.26
<i>L. fustifer</i>	1		2				3	0.34
<i>Lepidoglyphus</i> sp. (hypopus)			12		7		19	2.13
<i>Ctenoglyphus plumiger</i>	39		3				42	4.72
<i>C. canestrinii</i>			2				2	0.22
<b>Chortoglyphidae</b>								
<i>Chortoglyphus arcuatus</i>	2			1			3	0.34
<b>Saproglyphidae</b>								
<i>Nanacarus minutus</i>			2				2	0.22
<b>Pyroglyphidae</b>								
<i>Gymnoglyphus longior</i>	1		2				3	0.34
<i>Hirstia passericola</i>	3						3	0.34
<b>ACTINEDIDA (Total)</b>	33	17	81	1	20	11	163	18.31
<b>Cunaxidae</b>	10	15	18			1	44	4.94
<b>Bdellidae</b>			10	1			11	1.24
<b>Tydeidae</b>	2		32		1		35	3.93
<b>Cheyletidae</b>	1		13		2	5	21	2.36
<b>Tetranychidae</b>	19	1	3		2	2	27	3.03
<b>Trombiculidae</b>					10		10	1.12
Other <i>Actinedida</i>	1	1	5		5	3	15	1.69
<b>TARSONEMIDA</b>	3	4	58				65	7.31
<b>ORIBATIDA</b>	10	63	191	4	4		272	30.56
<b>GAMASIDA</b>	2	28	94		5	36	165	18.54
Total	173	113	511	7	39	47	890	100

as grain, seed, flour, straw and hay are a secondary source of exposure of the agricultural workers to allergenic storage mites, because there is an exposure in the open field and in dwellings [2, 9]. The aim of the present study was to determine the species composition of storage mites in samples of organic dust, litter, debris, residues and other materials posing the potential sources of mite allergens in farming environment.

## MATERIALS AND METHODS

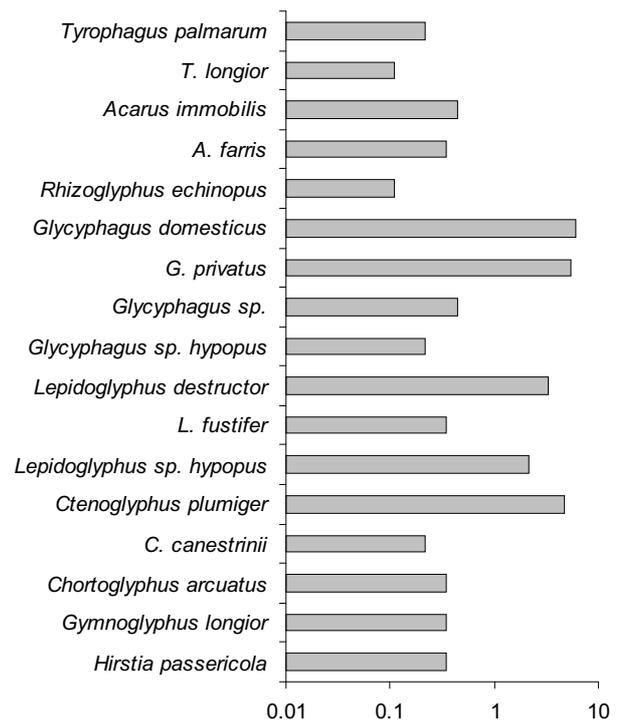
The study was carried out from 15 June 1992 – 24 September 1994. A total of 21 samples from certain farming environments, such as cowsheds, stables, barns, chaff-cutters, lofts, poultry houses and pigeon houses, were analysed. These samples were taken in Solarnia (near Lubliniec), in Kokotek and vicinity (Częstochowa province), in Łazy (near Książ Wielki; province Kielce) and in Lesko (Krosno province), all localities from the southern part of Poland. The mites were extracted using the “Berlese method” [17] and preserved in 70% ethanol. For identification, the mites were mounted in Hoyer's medium [5] on microscope slides.

## RESULTS AND DISCUSSION

All of the 21 samples contained mites. A total of 890 mite specimens were isolated including 225 mites from the order *Astigmata* (25.3% of the total count). The astigmatic mites were found in 71.4% of the total samples examined. The species composition and abundance of the total mite fauna found in the samples examined is given in Table 1. As may be seen in the Table, all of the astigmatic mites (16 species) collected during the survey belonged to five families: *Acaridae*, *Glycyphagidae*, *Chortoglyphidae*, *Saproglyphidae* and *Pyroglyphidae*. Among the astigmatic mites, the following four species from the family *Glycyphagidae* (glycyphagid mites) have been found as numerically dominants: *G. domesticus* (6.1% of a total mite population and 24.0% of all astigmatic mites), *G. privatus* (5.4% and 21.3% of all mites and of all astigmatic mites collected, respectively), *C. plumiger* (4.7% of a total count and 18.7% of *Astigmata*) and *L. destructor* (3.3% of a total count and 12.9% of all *Astigmata*). *Lepidoglyphus fustifer* and *Ctenoglyphus canestrinii* were distinctly less abundant and formed 0.3% and 0.2% of the total mites, respectively. Moreover, six unidentified mites *Glycyphagus* spp. (including two motile hypopi; 0.7%) and 19 motile hypopi of the genus *Lepidoglyphus* (2.1%) were isolated.

Members of the family *Acaridae* (acarid mites) were distinctly less abundant than glycyphagids and constituted approximately 1.2% of all mites collected. The acarid mites were represented by the genera *Acarus*, *Tyrophagus* and *Rhizoglyphus* (Tab. 1 and Fig. 1).

Two species belonging to the family *Pyroglyphidae* were found: *Gymnoglyphus longior* and *Hirstia passericola*. Both species commonly occur in nests of passeriform



**Figure 1.** Rate of dominance of astigmatic mite species in samples examined (percent of all mites collected).

birds [5]. The former species occurs also in dust from dwellings but plays a lesser role in the house dust mite allergy [1, 5]. *G. longior* was also recorded from the dust and debris of a granary in the UK and Canada, and from the litter of a poultry house in Switzerland [5, 11, 13]. In the present study this species was found in debris of a cowshed and in barn litter, whereas the mite *H. passericola* was found for the first time in the farming environment (in cowshed debris). The pyroglyphid mites formed 0.7% of the total mite population (Tab. 1). The remaining part of the astigmatic mite fauna consisted of the following two species - *Ch. arcuatus* (*Chortoglyphidae*) (0.3%) and *Nanacarus minutus* (*Saproglyphidae*) (0.2%).

Among the astigmatic mites isolated from the examined samples were found some potentially pathogenic species and genera evoking allergic reactions. The species *L. destructor*, *G. domesticus*, *Acarus siro* complex, *Tyrophagus* spp. and *Ch. arcuatus* possess strong allergenic properties and represent the main cause of the storage mite allergy, according to many authors [1, 5, 9, 12, 14, 18, 19].

The total composition of the mite fauna of the examined samples (Tab. 1) was characterized by the dominance of oribatid mites which formed 30.6% of the total count, whereas the *Astigmata* were the second most numerous group of mites. Among the isolated mites only the astigmatic species and/or genera could be identified. The remaining part of the mite fauna consisted of the following taxa: *Tydeidae* (3.9%), *Cunaxidae* (4.9%), *Tetranychidae* (3.0%), *Cheyletidae* (2.4%), *Bdellidae* (1.2%), larvae of *Trombiculidae* (1.1%), other unidentified

*Actinedida* (1.7%), *Tarsonemida* (7.3%) and *Gamasida* (18.5%). Generally, the actinedid mites constituted 18.3% of the total mite population.

*Astigmata* and *Actinedida* were most common and numerous in cowsheds and barns, whereas *Oribatida* and *Gamasida* in stables and barns. *Gamasida* were also the dominant mites in poultry and pigeon houses (Tab. 1). Among the most abundant astigmatic mites, the species *G. domesticus*, *L. destructor* and *C. plumiger* were found mainly in cowsheds whilst *G. privatus* in barns (Tab. 1).

To summarize, the stated prevalence of oribatids and glycyphagids in farming environment is not in accordance with an earlier data by Hallas [7] and Terho *et al.* [19]. The abundance of acarids was smaller than that found in dust samples from byres and hay and grain stores of 11 farms in Eastern Finland [19], or in samples of dust and organic debris from five coal mines in Upper Silesia (Poland) [15]. The number of astigmatic mite species found in this study was higher than in farming environments in Finland [19] and Iceland [7, 8] or in coal mines in Poland [15]. Moreover, the pyroglyphid mites were not found in farming environments in Finland and Iceland [7, 8, 9, 19]. The present results confirm the occurrence of allergenic mites in cowsheds, barns and poultry houses [5, 11, 13, 19], and reveal the occurrence of mites in the remaining places examined. Thus, all these locations should be regarded as a potential source of storage mite allergens in the farming environment. As the occurrence and concentration of mites in samples from different farming environments may vary to a considerable extent, further studies are highly desirable.

## REFERENCES

1. Arlian LG: House-dust-mite allergens: A review. *Exp Appl Acarol* 1991, **10**, 167-186.
2. Arlian LG, Rapp CM, Fernandez-Caldas E: Allergenicity of *Euroglyphus maynei* and its cross-reactivity with *Dermatophagoides* species. *J Allergy Clin Immunol* 1993, **91**, 1051-1058.
3. Arlian LG, Vyszynski-Moher DAL, Fernandez-Caldas E: Allergenicity of the mite, *Blomia tropicalis*. *J Allergy Clin Immunol* 1993, **91**, 1043-1050.
4. Dutkiewicz J, Jabłoński L, Olenchock SA: Occupational biohazards. *Am J Ind Med* 1988, **14**, 605-623.
5. Fain A, Guerin B, Hart BJ: *Mites and Allergic Disease*. Allerbio, Varennes en Argonne 1990.
6. Hage-Hamsten M van, Johansson SGO: Storage mites. *Exp Appl Acarol* 1992, **16**, 117-128.
7. Hallas TE: Mites of stored hay in Iceland. *J Agr Res Icel* 1981, **13**, 61-67.
8. Hallas TE, Gudmundsson B: Mites of stored hay in Iceland. Related to quality of hay and the storage duration. *J Agr Res Icel* 1985, **17**, 31-37.
9. Hallas TE, Iversen M: Sources of exposure to storage mites in the farming environment. *Ann Agric Environ Med* 1996, **3**, 9-12.
10. Hallas TE, Iversen M, Korsgaard J, Dahl R: Number of mites in stored grain, straw and hay related to the age of the substrate (*Acar*). *Ent Meddr* 1991, **59**, 57-60.
11. Hughes AM: *The Mites of Stored Food and Houses*. HMSO, London 1976.
12. Korsgaard J, Dahl R, Iversen M, Hallas T: Storage mites as a cause of bronchial asthma in Denmark. *Allergol Immunopathol* 1985, **13**, 143-149.
13. Mumcuoglu KY, Lutsky I: A prevalence survey of poultry house mites in Israel. *Acarologia* 1990, **31**, 51-56.
14. Revsbech P, Dueholm M: Storage mite allergy among bakers. *Allergy* 1990, **45**, 204-208.
15. Solarz K, Solarz D: The allergenic mites in coal-mine dust from coal mines in Upper Silesia (Poland). *Ann Agric Environ Med* 1996, **3**, 49-55.
16. Solarz K, Szilman E, Szilman P: Allergenic mites from the order *Acaridida* of agricultural environments. Abstracts of Communications. *The Seventh Congress of the Polish Parasitological Society, Gdynia, September 15-17 1994*, 81. Instytut Medycyny Morskiej i Tropikalnej. *Biuletyn Metodyczno-Organizacyjny*, **27**, Gdynia 1994.
17. Śpiewak R, Bożek A, Solarz K, Masłowski T, Brewczyński PZ: Das Prurigo-Asthma Syndrom infolge beruflicher Exposition gegen Mehlallergene. *Allergologie* 1995, **18**, 102-106.
18. Tee RD: Allergy to storage mites. *Clin Exp Allergy* 1994, **24**, 636-640.
19. Terho EO, Leskinen L, Husman K, Kärenlampi L: Occurrence of storage mites in Finnish farming environments. *Allergy* 1982, **37**, 15-19.