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# Seasonal changes in house dust mites

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Seasonal changes in house dust mites were studied in five different houses of Vilnius region. Eighteen mite species were described. Most abundant and frequent were mites *Dermatophagoides pteronyssinus* and *D. farinae* of the family Pyroglyphidae. The highest alive mite density was detected in wooden houses. The relative humidity of dwellings was more important than temperature for mite survival. There were two peaks in pyroglyphid mite numbers: in winter (December) and spring-summer (July).

**Key words:** house dust mites, seasonal changes

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## INTRODUCTION

Mites that commonly subsist in human dwelling and provide a major source of multiple potent allergens are referred to as house dust mites [3, 12]. Highest concentrations of house dust mite species are usually found in beds, overstuffed furniture where shed skin scales collect and serve as a food source.

Mite density most of all depends on seasonal changes in various climatic regions [15, 16]. In temperate regions mite density shows a seasonal cycle that parallels similar seasonal changes in relative humidity (RH) [2, 5, 10]. High mite levels occur during the humid season (summer, autumn). During the heating season when RH is low, mite density drops. Few or even no living mites can be found in dust samples, because active mites die from dehydration [4].

Analysis of house dust from U. S. Europe and other parts of the world shows that many species of mites occur in house hold dust [1, 11–14]. In most homes in geographical areas in which house dust mites are prevalent, *D. farinae*, *D. pteronyssinus* and *E. maynei* constitute 90 to 100 per cent of the mite population found in mattresses and 70 to 95 per cent of the mite population in carpets and overstuffed furniture dust [3]. Other mite species – predators, stored product mites found in homes are also sources of allergens, but they are less important because of their limited prevalence in homes [7–9].

In a house dust mite seasonal variation research made in 1984–85 in two districts (Vilnius and Pabradė) [14] alive mites, most of all *Glycyphagus cadaverum* (the family Glycyphagidae) were found only from September to March. The highest numbers

were obtained in November (about 500 mites/g of dust) and in December (200 ind./g).

The present paper describes seasonal changes and house dust mite abundance in different houses of Vilnius district.

## MATERIALS AND METHODS

Dust samples were obtained once a month from September 1999 till August 2000, from mattresses of beds and couches in five randomly selected houses.

One hundred and twenty dust samples were collected with a portable vacuum cleaner into a special sack for the dust; 1 m<sup>2</sup> surface area at each sampling site was vacuumed for 1 min. The dust samples were placed in a plastic bag, weighted and analysed for mites as described by E. V. Dubinina [13]. All mites were removed, mounted on slides, and the species and life stage were determined with the aid of stereoscopic microscope. Mite density was reported as mean number per gram of dust. During the sampling period, room relative humidity and temperature in each house were measured and recorded.

In every house dust from two bed mattresses or couches was vacuumed. A short characteristic of each house and of one of the examined places is presented.

A. A wooden new house in the country. A bed about 35 years old, is placed in the mansard. It is used only at weekends, more frequently in summertime. The room is not heated, temperature and RH depend on changes of the environmental RH and temperature fluctuations.

C. An apartment on the fourth floor of a block house. The room is cold and damp in winter and

sunny and warm in summer. A bed 13 years old is used every night.

F. A new stone house with hermetic windows. An old (about 40 years) coach is used in a living room. Constant temperature (19 °C) and RH (about 64%) are maintained.

G. A stone house heated with gas and stove, rather damp room on the first floor. A 5 years old bed is sometimes used for sleeping.

J. A warm apartment on the first floor of a block house. Average air temperature about 20 °C, RH during heating season – 59.5%, in summertime – 68.3%. An old cotton mattress is used every night for about 20 years. A person living in this room is ill with idiopathic rhinitis and is sensitive to house dust and house dust mites.

Inhabitants of the first four houses have no allergic problems.

## RESULTS AND DISCUSSION

Eighteen mite species were found in dust samples from five houses (Table 1). Six Pyroglyphidae family mite species were analysed according to seasonal changes.

Table. Occurrence of mites in the dust from 5 houses			
Species or group	Rate of	Number occurrence (%)	%
<i>Dermatophagoides pteronyssinus</i>	93.33	2682	74.29
<i>D. farinae</i>	34.29	568	15.73
<i>D. evansi</i>	6.66	53	1.47
<i>D. chelidonis</i>	10.47	42	1.16
<i>D. sp.</i>	1.9	2	0.06
<i>Euroglyphus maynei</i>	9.52	23	0.64
<i>Acarus siro</i>	15.24	20	0.55
<i>Acaroidea sp</i>	6.66	10	0.28
<i>Rhizoglyphus echinopus</i>	0.95	1	0.03
<i>Chortoglyphus arcuatus</i>	0.95	2	0.06
<i>Glycyphagus domesticus</i>	10.47	56	1.55
<i>G. cadaverum</i>	3.81	10	0.28
<i>G. destructor</i>	2.86	7	0.19
<i>Gohieria fusca</i>	0.95	1	0.03
<i>Xenoryctes krameri</i>	0.95	1	0.03
Oribatei	1.9	2	0.06
<i>Cheyletus eruditus</i>	10.47	126	3.49
Gamasina	3.81	4	0.11
Total		3610	100

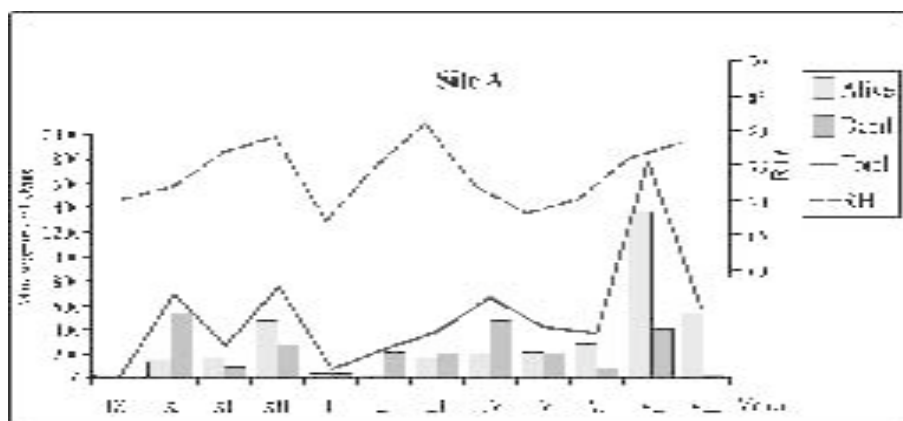


Fig. 1. Seasonal abundance of alive and dead Pyroglyphidae mites in site A

In A house dust samples live *D. pteronyssinus* mites were found all year round. Their number changed depending on room temperature and RH changes (Fig. 1). Most abundant *D. pteronyssinus* are in July and August (1370 and 544 individuals/1 g of dust, respectively). It is interesting that in December, when the room temperature was +7 °C and RH 79%, there were 475 ind./g alive mites and in March when the room temperature was only +3 °C, RH 81%, there were 175 ind./1 g of dust active mites. From April, when RH was high and room temperature was rising, live *D. pteronyssinus* mite density was gradually increasing. In this house also only a few *Cheyletus eruditus* and Acarid mites were found.

Mites in C house where found all year round, except in May; 99% of all mites were *D. pteronyssinus*. More mites are abundant in spring–summer period (April – 320, July – 216, August – 304) and winter (December – 81, February – 127 individuals/g of dust) (Fig. 2).

*D. pteronyssinus*, *D. farinae* and *Ch. eruditus* mite species were found in site F. More dermatophagoid mites survive only in July and August (258 and 104 ind./1 g of dust respectively). From December to May no active mites were found (Fig. 3).

In site G, seven mite species were found. Together with four Pyroglyphidae family mite species (*D. pteronyssinus*, *D. farinae*, *D. chelidonis* and *Euroglyphus maynei*), *Acarus siro*, *Glycyphagus domesticus* and Gamasida group mites were present. Active mites were found in small ranges in May, July and August (14.29; 3.33; 21.05 mites per 1 g of dust, respectively). There were no

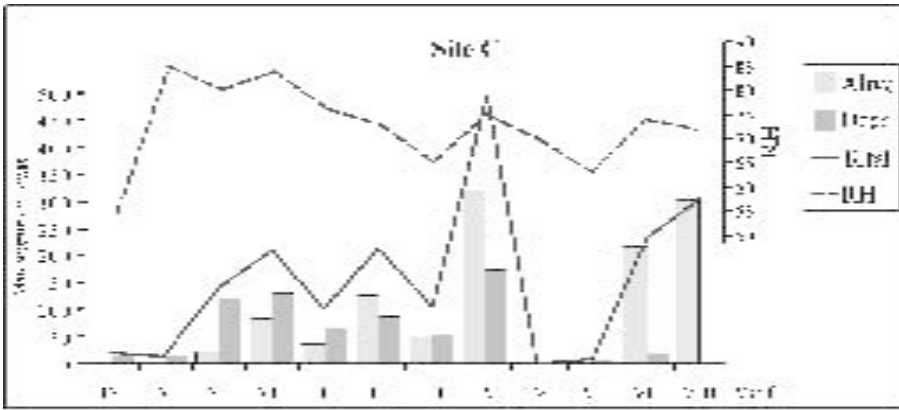


Fig. 2. Seasonal abundance of alive and dead Pyroglyphidae mites in site C

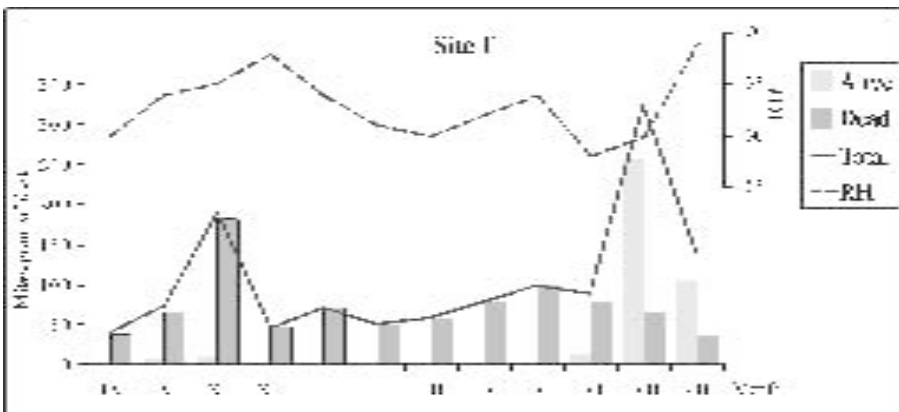


Fig. 3. Seasonal abundance of alive and dead Pyroglyphidae mites in site F

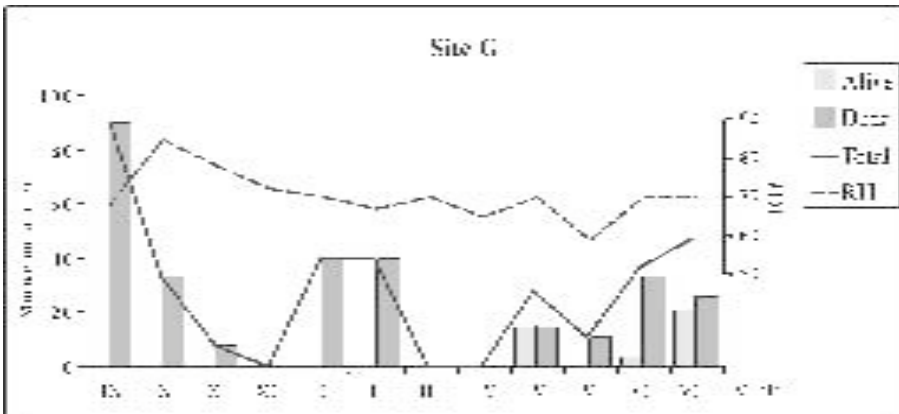


Fig. 4. Seasonal abundance of alive and dead Pyroglyphidae mites in site G

mites in dust samples gathered in December, March and April (Fig. 4).

Of all mites found in site J, 95% were formed by five *Dermatophagoides* genus species. *D. farinae* was prevalent in this house (68.82%), and *D. pteronyssinus* formed 25.29% of all *Dermatophagoides*. The predator *Ch. eruditus* was presented by 4.5% of all collected mites. The number of obtained live mites was less in comparison with inactive mites. The highest

density of active mites (460 ind./1 g of dust) was found in June (Fig. 5).

Our data show that pyroglyphid mites are widely spread in all types of houses. The presence of alive mites depends first of all on the room RH, temperature and presence of food [6]. In old mattresses and coaches used for many years a lot of dust and skin flacks are concentrating and, in a favourable relative humidity, mites can survive for a long time.

The mite number is highest in wooden houses. Alive mites are found all year round. *D. pteronyssinus* form nearly all mite population. Stone houses with constant temperature and RH are not favourable for mite development. A rather low RH (60%) acts as a limiting factor. In a new stone house *D. pteronyssinus* was prevalent (88.71%) over *D. farinae* (11.29%), while in an old stone house, pyroglyphid fauna was more heterogeneous, but less abundant in numbers. In block houses, according to conditions which directly influence the reproduction capability of mites, the number of active mites can be different. In C house alive mites were not found in October (RH 85%, +15 °C) and May (70%, +23 °C), although

conditions for their survival were really favourable. No active mites were obtained in J house from November till February (when RH was about 60% and the temperature +21 °C) and in May (58% RH, +19 °C).

According to our, data pyroglyphid mites can survive all year round. Their average amount is about 40–60 ind./g dust in autumn, 200 mites /g of dust in winter (December). During heating season

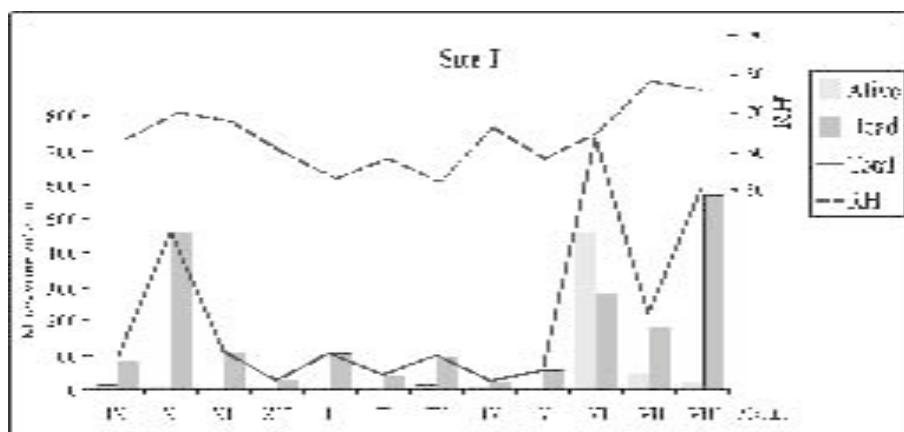


Fig. 5. Seasonal abundance of alive and dead Pyroglyphidae mites in site J

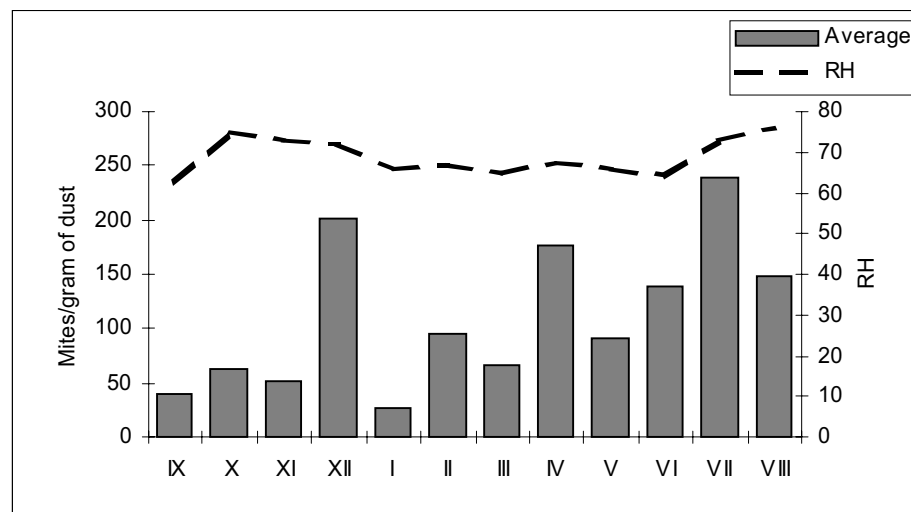


Fig. 6. Average alive Pyroglyphidae mites abundance per 1 gram of dust

when dwelling RH declines, mite density is lower. From April the mite numbers are increasing and in July reach the highest average values – 240 mites/1 g dust (Fig. 6). Undoubtedly, for every separate site, mite numbers differ. They depend on the individual conditions of every place: type of the house, age of the bed, their usage, dust vacuuming frequency, temperature, air humidity and food.

Seasonal changes in house dust mites in Vilnius region dwelling houses had several peaks: in winter (December) and spring–summer period, especially in July.

## CONCLUSIONS

1. Pyroglyphid mites can survive all year round.
2. Mite numbers differ depending on individual conditions of a place.
3. Pyroglyphid mites are widely spread in all types of houses.

4. In Vilnius region dwelling houses, seasonal changes in dust mites have two peaks: in winter and spring–summer period.

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## References

1. Arlian L. G., Bernstein I. L., Johnson C. L. et al. Ecology of house dust mites and dust allergy. *Recent Advances in Acarology*. 1979. Vol. II. P. 185–195.
2. Arlian L. G., Woodford P. J., Bernstein I. L. Seasonal population structure of house dust mites, *Dermatophagoides* spp. (Acari: Pyroglyphidae). *Journal of Medical Entomology*. 1983. Vol. 20. P. 99–102.
3. Arlian L. G. Biology and Ecology of house dust mites, *Dermatophagoides* spp. and *Euroglyphus* spp. *Immunology and Allergy Clinics of North America*. 1989. Vol. 9 (2). P. 339–356.
4. Arlian L. G. Water balance and humidity requirements of house dust mites. *Experimental and Applied Acarology*. 1992. Vol. 16. P. 15–35.
5. Bronswijk J. E. van. *Dermatophagoides pteronyssinus* (Trouessart, 1897) in mattress and floor dust in a temperate climate (Acari: Pyroglyphidae). *Journal of Medical Entomology*. 1973. Vol. 10. P. 63–66.
6. Bronswijk J. E. van. House-dust as an ecosystem. *Recent Advances in Acarology*. 1979. Vol. II. P. 167–172.
7. Cuthbert O. D., Brostoff J., Wraith D. G. et al. "Barn allergy": Asthma and rhinitis due to storage mites. *Clinical Allergy*. 1979. Vol. 9. P. 229–234.
8. Fain A. Mites of medical and veterinary importance. *International course of Acarology. Practical manual*. 1989. Vol. 4. Dept. of Pure and Applied Zoology. University of Reading. UK.
9. Hart B. J., Fain A. Morphological and biological studies of medically important house dust mites. *Acarologia*. 1988. Vol. 19 (3). P. 285–295.
10. Lustgraaf B. V. D. Seasonal abundance of xerophilic fungi and house-dust mites (Acarida: Pyroglyphidae) in mattress dust. *Oecologia*. 1978. Vol. 36. P. 81–92.
11. Solarz K. The review of the data on the occurrence of allergenic mites Pyroglyphidae (Acari: Acaridida) in Poland. *The Acari. Physiological and Ecological Aspects of Acari-Host Relationships*. Warszawa, 1995. P. 289–294.

12. Wharton G. W. House dust mites. Review article. *Journal of Medical Entomology*. 1976. Vol. 12. No. 6. P. 577–621.
13. Дубинина Е. В., Плетнев Б. Д. *Методы обнаружения и определения аллергенных клещей домашней пыли*. Ленинград: Наука, 1977. 49 с.
14. Канчурин А. Х., Вайцекаускайте Р. Л. *Аллергия к клещам*. Вильнюс. 1988. 119 с.
15. Иванов Л. Н., Петрова Ю. И. Сезонное изменение численности клещей семейства Pyroglyphidae в жилых домах города Чебоксары. *Биологические науки*. 1986. Т. 4. С. 50–52.
16. Петрова Ю. И., Жёлтикова А. Д. Сезонное изменение численности популяций аллергенных клещей (Acariformes, Pyroglyphidae) в пыли жилых помещений города Москвы. *Биологические науки*. 1990. Т. 10. С. 37–45.

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#### **NAMŲ DULKIŲ ERKIŲ SEZONIŠKUMO TYRIMAI**

**S a n t r a u k a**

Namų dulkių erkių sezoniškumo tyrimai buvo atlikti penkiuose skirtinguose Vilniaus rajono namuose. Rasta 18 erkių rūšių. Iš 6 Pyroglyphidae šeimos erkių rūšių dvi (*Dermatophagoides pteronyssinus* ir *D. farinae*) buvo gausiausios ir dažniausiai sutinkamos. Daugiausia gyvų pyroglyfidinių erkių rasta mediniame name. Patalpų santykinė oro drėgmė yra svarbesnis aplinkos veiksnys, lemiantis erkių paplitimą, nei temperatūra. Nustatyti du namų dulkių erkių kiekio sezoniniai padidėjimai: žiemą (gruodžio mėnesį) ir pavasario–vasaros laikotarpiu (ypač gausu gyvų erkių liepos mėnesį).

**Raktažodžiai:** namų dulkių erkės, sezoniniai pokyčiai