Comparison of isolation rates of Tarsonemid mites in house dust between two mesh-size sieves

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Abstract: The common method of isolation of house dust mites from house dust has been done by using 0.075 mm-mesh sieve. In the present study, we tried to isolate house dust mites, especially Tarsonemid mites, by using 0.053 mm-mesh sieve in addition to 0.075 mm-mesh sieve, and the isolation efficiency was compared with that using 0.075 mm-mesh sieve only. As the result, 78.4% of Tarsonemid mites was found on the 0.053 mm mesh, and the total number of Tarsonemid mites was far different from the number of mites on the 0.075 mm mesh. Tarsonemid mites were also found in high rates (12.9–39.5%) in the houses surveyed in this study.

INTRODUCTION

Recently, the biology of house dust mites has been investigated in many different parts of the world, since patients susceptible to mite allergy have been increasing (WHO, 1988). It is clear that Pyroglyphid mites are predominant in house dust in Okinawa as well as in other prefectures of Japan (Kishimoto and Higa, 1991; Toma *et al.*, 1993).

The common method of isolation of house dust mites from house dust has been done by using 0.075 mm-mesh sieve (Moriya, 1988; Natuhara, 1989; Sakaki *et al.*, 1991; Toma

et al., 1993). In the present study, we tried to isolate house dust mites, especially Tarsonemid mites, by using 0.053 mm-mesh sieve in addition to 0.075 mm-mesh sieve, and the isolation efficiency was compared with that using 0.075 mm-mesh sieve only.

MATERIALS AND METHODS

The dust samples were collected monthly on the fourth Sunday from September 1993 to August 1994 in “futon” (Japanese mattress) of four houses (A–D) located in Okinawa Prefecture. After removing the sheet from the “futon,” dust was collected by a vacuum cleaner fitted with a domestic tissue filter for 30 sec/m². Each “futon” had been used on a “tatami” (straw-mat)-floor. Table 1 shows the location of the houses, filling materials of the “futon” and power of each vacuum cleaner. The residents of house D

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Table 1 Sampling place, material of "futon" and power of vacuum cleaner.

House	A	B	C	D
Location of the house	Naha City	Ginowan City	Ginowan City	Urasoe City*
Filling material of "futon"	Wool and polyester	Cotton	Cotton and polyester	Cotton and polyester
Sampling area (m ²)	4.4	5.0	4.0	4.0
Vacuuming power (W/hr)	210	210	340	200

* Sampling was stopped in Urasoe City after March 1994 and continued in Miyagi Prefecture.

Table 2 The average number of house dust mites collected on two kinds of sieves.

Kind of sieve	Mite family	House studied							
		A		B		C		D	
		Number/m ²	%	Number/m ²	%	Number/m ²	%	Number/m ²	%
0.075 mm mesh	Pyroglyphidae	795.9	71.1	939.0	70.6	1,548.3	76.6	331.3	49.7
	Tarsonemidae	22.0	2.0	73.4	5.5	84.3	4.2	25.8	3.9
	Others	44.1	3.9	19.4	1.5	89.0	4.4	9.0	1.3
0.053 mm mesh	Pyroglyphidae	99.8	8.9	116.4	8.7	117.5	5.8	60.8	9.1
	Tarsonemidae	150.9	13.5	179.8	13.5	177.0	8.7	237.8	35.7
	Others	6.6	0.6	2.2	0.2	5.3	0.3	1.8	0.3
Total		1,119.3	100.0	1,330.2	100.0	2,021.4	100.0	666.5	100.0

Collections from "futon" were carried out 12 times in A, B and C, and 11 times in D.

moved to Miyagi Prefecture in mainland Japan in March 1994, and after that, house dust was sent to our laboratory by airmail.

House dust mites were isolated by the method of Toma *et al.* (1993) modified as follows. The dust in the tissue filter was washed away into a jar by tap water. The contents of the jar were poured through a series of two kinds of sieves, the upper with 0.075 mm mesh and the lower with 0.053 mm mesh, after the contents were stirred with a small quantity of surfactant to ensure uniform dispersion. The fine dust on each sieve was poured into a beaker by 80% ethanol.

A few drops of methylen-blue solution were added in the beaker. The fine dust in the beaker was dispersed uniformly on filter paper with lines at intervals of 5 mm through a Buchner funnel. The mites on the filter paper were counted under a stereomicroscope ($\times 20$ –30) and the mite family was identified. When identification was difficult, the mites

were transferred by a fine needle onto a micro slide glass for identification into families under an optical microscope. The isolated mites in each "futon" were recorded as the number per square meter.

RESULTS

The average number of mites collected from each "futon" is shown in Table 2. Tarsonemid mites were discovered from all "futon" throughout the year. However, in each house the number of Tarsonemid mites varied every month. In addition to Pyroglyphid and Tarsonemid mites, the mites of Glycyphagidae, Cheyletidae, Oribatei and so on, were also found in small numbers in the house dust. Figure 1 shows the mean rate of the monthly number of mites collected on two kinds of sieves, 0.075 mm-mesh and 0.053 mm-mesh sieves. The rate of the mites on the 0.053 mm-mesh sieve was 23.0% of

Fig. 1 The average rate of house dust mites collected from "futon" in four houses (A-D) by two kinds of sieves.

Fig. 2 House dust mites collected from "futon" in four houses (A-D).

all mites collected from the "futon" of A (maximum rate, 39.1% in September), 22.4% of B (42.7% in August), 14.8% of C (38.2% in August) and 45.1% of D (81.0% in April) as shown in Fig. 1a. Of all Pyroglyphid mites collected from all the "futon," 9.8% were found on the 0.053 mm mesh (Fig. 1b), and the total number of Pyroglyphid mites on both sieves was almost the same as that on the 0.075 mm mesh. However, with respect to Tarsonemid mites, 78.4% of them was found on the 0.053 mm mesh (Fig. 1c), and the total number of Tarsonemid mites was far different from the number of mites on the 0.075 mm mesh.

The mite fauna in each "futon" of the four houses is shown in Fig. 2. The rates of

Tarsonemid mites collected on both sieves were 15.5% in A, 19.0% in B, 12.9% in C and 39.5% in D, respectively (Fig. 2a). On the 0.075 mm-mesh sieve, the rates were 2.6% in A, 7.1% in B, 4.9% in C and 7.0% in D, respectively (Fig. 2b).

In "futon" of D, the number of mites on the 0.053 mm mesh was small before the move to Miyagi Prefecture, and the average rate for all mites collected on both sieves was 15.5%. However, after the move to Miyagi Prefecture, the rate was increased to 71.3% (figure not presented).

At the same time, the rate of Tarsonemid mites for all mites increased from 5.0 to 70.2%. Figure 3a shows the seasonal change of mites in "futon" of D collected on both

Fig. 3 The monthly composition rate of house dust mites collected from "futon" of house D.

sieves, and Fig. 3b shows only that on the 0.075 mm mesh. The rate of Tarsonemid mites was minimum in November (0.8%) and was maximum in April (82.8%) as shown in Fig. 3a. Before the move, the rate of mites in each family on both sieves was almost the same as that on the 0.075 mm mesh. However, after change of residence, the rates of Tarsonemid mites on both sieves were large, at least more than 30% on the 0.075 mm mesh in each month.

DISCUSSION

The rate of Tarsonemid mites collected in the dust increased apparently from 2.6 to 15.5% in A, from 7.1 to 19.0% in B and from 4.9 to 12.9% in C, as the 0.053 mm-mesh sieve was used instead of the 0.075 mm-mesh sieve. In D, the average rate of Tarsonemid mites from April to August was very high, 70.2%. The mite fauna changed significantly due to differences in climate, indoor and outdoor environments and "kakebuton" (Japanese quilt) after change of residence. If the 0.053 mm-mesh sieve had not been used for isolation of house dust mites, this increase could not have been recognized correctly. In the present method, it was clear that Tarsonemid mites could not sufficiently be caught on the 0.075 mm-mesh sieve.

Some of the mites passing through a 0.075

mm-mesh sieve kept their complete shape with 4 pairs of legs. However, the mites could not be identified with certainty as *Tarsonemus granarius*. The Tarsonemid mites found in the dust might have included not only *T. granarius* but also a few other species. The surfactant used in the process of mites isolation might help them to pass easily through the sieve and, in addition, water pressure probably forced the mites out. It is also suggested that the high density of mites in "futon" might have reduced them into smaller sizes than the size described in the literature (Ehara, 1980; Ito, 1981).

Shimomura *et al.* (1982) attempted to isolate each stage of Pyroglyphid mites with sieves of different mesh sizes and reported that Pyroglyphid mites could be caught on 0.075 mm-mesh sieve. In the present study, it was also clear that Pyroglyphid mites could sufficiently be caught on this sieve.

It has been reported that the house dust mite species, *Dermatophagoides pteronyssinus* and *Dermatophagoides farinae*, are predominant in mainland Japan except in newly-built houses (Miyamoto and Ouchi, 1976; Suto *et al.*, 1992; Takaoka and Okada, 1984; Takaoka and Fujimoto, 1985). In Okinawa Prefecture, *D. pteronyssinus* is reported as the predominant species of house dust (Kishimoto and Higa, 1991; Toma *et al.*, 1993) and *Bloom tropicalis* is sometimes dominant

in May and September in the dust from "tatami"-mats (Kishimoto and Higa, 1992). *Tarsonemus granarius* is known as a common species in Tarsonemidae from house dust. However, the number of mites reported is small in Okinawa as well as in mainland Japan (Kishimoto and Higa, 1991; Miyamoto and Ouchi, 1976; Suto *et al.*, 1992; Takaoka and Okada, 1984; Takaoka and Fujimoto, 1985; Toma *et al.*, 1993). In the present experiment, the authors found that Tarsonemid mites were detected in large numbers in the house dust of Okinawa and Miyagi Prefectures.

It is a well known fact that *D. pteronyssinus* and *D. farinae* are significant inducers of allergic disease. The importance of Tarsonemidae as allergen should be studied, as Tarsonemid mites were also found in high rates (12.9–39.5%) in the houses surveyed in this study.

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摘 要

異なるふるいによる室内塵からの
ホコリダニの検出

通常 200 メッシュ (0.075 mm) のふるいで集められた細塵からダニの分離が行われている。今回、界面活性剤を用いて塵を水に分散させてから、二つのふるい (上 200 メッシュ, 下 280 メッシュ (0.053 mm)) を通す方法を用い、塵から分離したダニを両ふるいで比較検討した。その結果、280 メッシュを用いるとホコリダニの検出率が飛躍的に高まった。また、ホコリダニが布団のダニの優占種として存在する場合があることもわかった。