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Article

Fauna and distribution of house dust mites in two northern districts of Kerala, India

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ABSTRACT
This preliminary survey of house dust mites was carried out in two districts in Northern Kerala *i.e.*, Malappuram and Kozhikkode. The study was conducted from December 2021 to November 2022. Collection of dust samples was done from a total of 160 houses, which were randomly selected 40 rural houses and 40 urban houses from each of the districts. A total of 6382 mites were collected from 147 houses. The most abundant species obtained from all the collected sites was the *Dermatophagoides pteronyssinus* (Trouessart) (67.69%) followed by the species *Blomia tropicalis* Bronswijk, Cock & Oshima (27.5%). Other species obtained were *Sturnophagoides* sp., *Cheyletus eruditus* (Schrank), *Cheyletus malaccensis* Oudemans, *Glycycometus* sp., *Tyrophagus putrescentiae* (Schrank), *Chortoglyphus arcuatus* (Troupeau), *Suidasia* sp. The mean number of mites present in Malappuram and Kozhikode districts showed a statistically significant difference. Also, the mean number of mites present between urban houses and rural houses differed significantly. A statistical test (Fischer's exact test) was performed to analyze the influence of weather parameters, viz., temperature and relative humidity on the presence of mites in the surveyed houses revealed that the mite population is dependent on relative humidity and independent of temperature.

KEYWORDS: *Blomia tropicalis*, *Dermatophagoides pteronyssinus*, relative humidity, temperature, urban and rural.

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INTRODUCTION

House dust forms the habitat of many things including algae (Bernstein and Safferman 1970), viable molds (Davies 1960), fungi (Sinha *et al*. 1970) besides dust mites. Thus, house dust serves as a constant food source of mites, which mainly are, shed human skin scales colonized by molds, yeast and bacteria (Colloff 2009). Dust mites have been reported from a variety of habitats like human dwellings, especially on mattresses (Charlet *et al*. 1978; Bigliocchi and Maroli 1995), carpets (Chew *et al*. 1999), kindergartens (Soleimani-Ahmadi *et al*. 2017), child car seats (Clarke *et al*. 2015), train seats (Colloff 1987), libraries (Solarz 1998), hotels (Soleimani and Rafinejad 2008), etc. Since pyroglyphid mites are usually labelled as permanent house dust occupants, many storage mites also have been reported in settled dust in various sites of the houses (Solarz 2006).

According to Colloff and Stewart (1997), houses next door to each other may vary in the distribution and abundance of dust mites; even the same-designed houses may not be uniform. The extent of mite infestation in different sites of houses is usually related to the prevailing

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microenvironment contributed mainly by the life ways and habitat of man and outside climactic conditions (Arlian 1975).

Temperature and humidity were found to be important factors affecting the mite population. The variations in temperature and humidity throughout the year can affect the species diversity, evenness and richness of house dust mites (Soltani *et al*. 2011, Podder *et al*. 2021). Often the bedding in houses occupies most of the dust mites (Maunsell *et al*. 1968, Sesay and Dobson 1973) because a highly humid environment and constant food supply are available in these places. Besides, many other factors play more or less important roles in the growing population of dust mites such as the altitude of the places where the houses are located (Spieksma *et al.* 1971; Vervloet *et al*. 1982; Aykut *et al.* 2016).

Dust mites have been identified as one of the major allergens in house dust (Voorhorst *et al*. 1967; Miyamoto *et al.* 1968; Alani *et al.* 1972; Fernández-Caldas 1997) that result in asthma, atopic dermatitis, allergic rhinitis, kerato conjuctivitis (Colloff *et al*. 1992; Colloff 2009; Li *et al.* 2018). Exposure to storage mite allergens either by ingestion or inhalation may lead to life threatening anaphylactic reactions (Hughes 1976). Antigenicity in the dust is mainly contributed by the dust mite *Dermatophagoides pteronyssinus* (Trouessart) (Voorhorst *et al.* 1967; Brown and Filer 1968; Bernecker 1970) and also other mites *D. farinae* Hughes, *Euroglyphus maynei* (Cooreman), *Blomia tropicalis* Bronswijk, Cock & Oshima, *Lepidoglyphus destructor* (Schrank), *Tyrophagus putrescentiae* (Schrank) and *Glycyphagus domesticus* (De Geer) are important allergen sources (Arlian *et al*. 2002; Thomas *et al*. 2004; Podder *et al.* 2010). Cunnington and Gregory (1968) reported bed making as a possible reason that makes mites on the mattresses air-borne and also their fecal pellets, which constitute a more serious allergen source. Mite feces were found to be a major source of house dust allergen (Tovey *et al.* 1981).

Allergic diseases are of major health concern in present India, dust mites being one of the several sources (Dar and Gupta 1979; Dey *et al*. 2019). In Kerala state, dust mite fauna is poorly known. Lakshmi and Haq (1999) reported 17 species of mites belonging to 13 genera and 8 families associated with dust in Calicut University Campus. Among them, *Blomia tropicalis* was recorded as the most abundant mite species. In other parts of central and South Kerala, the mites reported of skin sensitization potential were *Blomia tropicalis*, *Dermatophagoides pteronyssinus*, *Dermatophagoides farinae* and *Tyrophagus putrescentiae* (Dey *et al*. 2019). The present study aims to investigate the occurrence of house dust mite fauna in urban and rural houses of two northern districts, Malappuram and Kozhikkode in Kerala. This preliminary study reveals the acaro fauna of both rural and urban houses and their relationship with the temperature and relative humidity.

MATERIALS AND METHODS

A total of 160 houses from two districts in Northern Kerala viz, Malappuram and Kozhikkode were selected as the collection sites. A random selection of 40 houses each from urban and rural areas was made from both districts. The study was conducted from December 2021 to November 2022 and prior consent was obtained from all the houses. Dust samples were collected from different sites of each house viz, sofa, carpets, bedroom floor, kitchen floor and mattresses. The sampling areas were vacuumed for about two minutes in a 1 m^2 area using a portable vacuum cleaner (Eureka Forbes, 700W with Hepa filter). The same vacuum cleaner was used for every sampling and it was cleaned after every use. The dust samples were immediately removed from the filter and kept in plastic vials, which were then brought to the laboratory for further observation. The temperature and relative humidity of the houses were recorded while collecting the dust samples, using a thermo hygrometer.

From the collected dust samples, 1 gram each was taken for the detection of mites. Mites were isolated manually by handpicking method, counted and preserved in 70% alcohol. The mites were then made into temporary slides using glycerin and permanent slides using a PVA medium. The

identification of the collected specimens was done using appropriate literature and available keys (Hughes 1976; Colloff and Spieksma 1992).

Statistical analysis

Statistical tests were carried out to analyze the relationship between the number of mites obtained and the sites of collection (Malappuram and Kozhikkode), urban and rural houses, temperature and relative humidity. Descriptive analysis was done for the total number of mites collected from both the districts, urban and rural, using minimum, maximum, mean and standard deviation. A Mann-Whitney U test was performed for the comparison of the data obtained from the two districts as well as from urban and rural houses. The analysis was performed in SPSS software (version 25). For the analysis of the relationship between temperature, relative humidity and the number of mites, a Fisher's exact test was used. The temperatures were grouped into three: T1 (22–25 °C), T2 (25.1–29 °C) and T3 (29.1–33 °C). Likewise, relative humidities were also grouped into three: RH1 (50–65%), RH2 (66–81%) and RH3 (82–95%). A p-value < 0.05 is considered to be statistically significant.

RESULTS

The results of the total faunistic survey of house dust from 160 urban and rural houses of the two districts revealed that 147 houses (91.88%) were found to be mite positive. A total of 6382 mites were recovered in this study, which belong to two orders, Sarcoptiformes and Trombidiformes. From these orders, Pyroglyphidae, Echymyopodidae, Aeroglyphidae, Chortoglyphidae, Suidasidae, Acaridae and Cheyletidae were the families obtained. Among these families, a total of nine species of dust mites were collected (Table 1). The most dominant mite species was *Dermatophagoides pteronyssinus* (67.69%) in all the positive samples, followed by the species *Blomia tropicalis* (27.5%). The total distribution of the dust mites collected from both the study sites can be expressed in the order *Dermatophagoides pteronyssinus* > *Blomia tropicalis* > *Sturnophagoides* sp. > *Cheyletus eruditus* > *Tyrophagus putrescentiae* > *Chortoglyphus acuratus* > *Glycycometus* sp. > *Suidasia* sp. > *Cheyletus malaccensis.*

Table 1. Occurrence of house dust mites in Malappuram and Kozhikkode districts.

Species	No of mites (%)			
	Malappuram		Kozhikkode	
	RURAL	URBAN	RURAL	URBAN
Dermatophagoides pteronyssinus	1112 (**25.74**)	856 (**19.81**)	1408 (**32.6**)	944 (**21.85**)
Blomia tropicalis	46 (**2.63**)	101 (**5.75**)	1396 (**79.54**)	212 (**12.08**)
***Sturnophagoides* sp.**	9 (**4.21**)	28 (**13.08**)	58 (**27.10**)	119 (**55.61**)
Cheyletus eruditus	11 (**32.35**)	8 (**23.53**)	11 (**32.35**)	4 (**11.77**)
Cheyletus malaccensis	0	0	5 (**100**)	0
***Glycycometus* sp.**	3 (**33.33**)	0	4 (**44.45**)	2 (**22.22**)
Tyrophagus putrescentiae	11(**47.83**)	0	2 (**8.7**)	10 (**43.47**)
Chortoglyphus arcuatus	0	0	0	15 (**100**)
***Suidasia* sp.**	0	0	6 (**85.71**)	1 (**14.29**)

District-wise analysis of mite distribution

Dust samples from the Malappuram district were collected from 40 urban houses and 40 rural houses. Among the urban houses, 38 houses were found to be mite positive and among the rural

houses, 35 houses were found to be mite positive, which constitute 95% and 87.5% respectively. Of 2185 mites extracted from 80 houses in the district, 1192 mites (54.55%) were from rural houses and the remaining 993 mites (45.44%) were from urban houses. The mean number of mites obtained from the rural area was 29.7 mites/gram of dust and the mean number of mites obtained from the urban area was 24.8 mites/gram of dust. The most abundantly detected mite species in every house was *Dermatophagoides pteronyssinus* (90.06%). The number of *D. pteronyssinus* in rural areas was much higher (1112) than that in urban areas (856) (Fig. 1). Following *D. pteronyssinus*, species such as *B. tropicalis* (6.72%), *Sturnophagoides* sp. (1.69%), *Cheyletus eruditus* (0.86%), *Tyrophagus putrescentiae* (0.50%), *Glycycometus* sp. (0.13%) were found in Malappuram district.

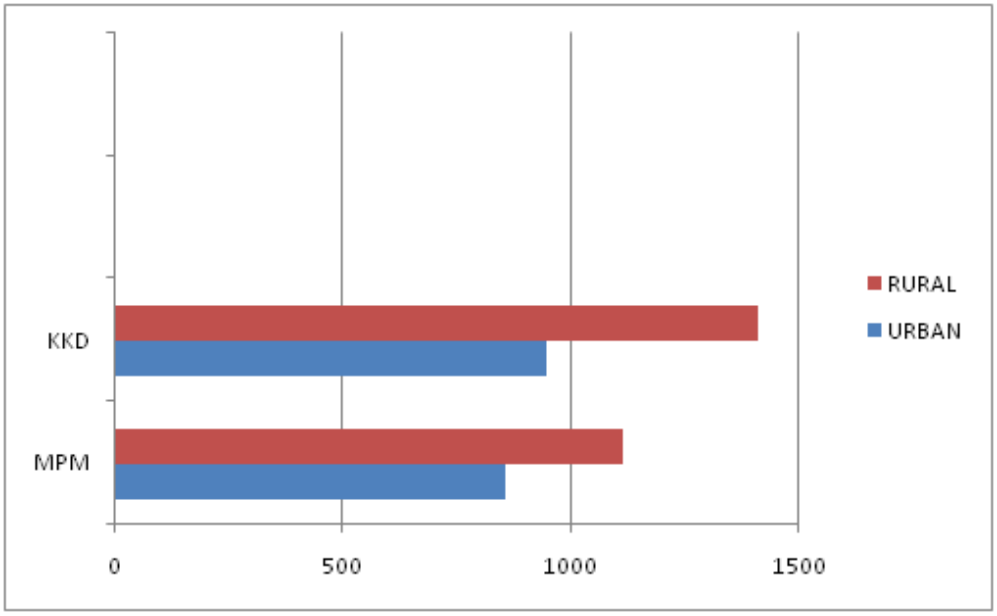

Figure 1. The distribution of mite *Dermatophagoides pteronyssinus* in rural and urban areas of Malappuram and Kozhikkode districts.

In the rural area of Kozhikkode district, all 40 (100%) houses were found to be mite positive whereas, in the urban area, only 34 (85%) houses were found to be mite infested. Out of 4197 mites obtained from the district, 2890 mites (68.85%) were extracted from rural houses and 1307 mites (31.14%) from urban houses. The mean number of mites obtained from the urban area was 32.67 mites/gram of dust and the mean number of mites obtained from the rural area was 72.17 mites/gram of dust. In Kozhikkode, the species which was found dominant is also *D. pteronyssinus* (56.04%) in both rural and urban houses. However, the number varied in both these areas such that it was higher in rural houses (1408) compared to urban houses (944) (Fig. 1). The other species obtained from the district were *B.tropicalis* (38.3%), *Sturnophagoides* sp. (4.21%), *Cheyletus eruditus* (0.35%), *Chortoglyphus arcuatus* (0.35%), *Tyrophagus putrescentiae* (0.29%), *Glycycometus* sp. (0.14%), *Cheyletus malaccensis* (0.11%), *Suidasia* sp. (0.16%).

Mann-Whitney U test showed a significant difference in the mean number of mites in both Malappuram and Kozhikode districts (Table 2) as well as a significant difference in the mean number of mites in urban houses and rural houses (p-value < 0.05) (Table 2).

Table 2. Mann-Whitney U test showing the difference in the mean number of mites.

	Malappuram and Kozhikkode districts				
	District (M/K)	**N**	**Mean Rank**	**Sum of Ranks**	**p-value**
Total no. of mites	Malappuram	80	90.87	7269.5	
	Kozhikkode	80	70.13	5610.5	0.005
	Total	160			
	Urban and rural houses				
	Area (U/R)	**N**	**Mean Rank**	**Sum of Ranks**	**p-value**
Total no. of mites	Urban	80	68.92	5513.5	
	Rural	80	92.08	7366.5	0.002
	Total	160			

The present survey took place across various ranges of temperature and relative humidity, 22 to 33 °C and 50 to 95%, respectively. Table 3 represents the different categories of temperature, its corresponding number of mites and the occurrence of mites under each temperature from 160 houses (both urban and rural). Mites were present in all ranges of temperatures T1, T2 and T3. One exception to this case was, at T3 (29.1–33 °C), none of the urban or rural houses showed ≥ 200 mites. A maximum of 100 mites were found in every range of temperature and it was observed in 140 houses. The highest number of occurrences of mites could be seen at T2 (25.1–29 °C) and the lowest at T1 (22–25°C).

Table 3. Relationship between temperature (T) and number of mites.

No. of mites	**Mite occurrence in different temperature ranges**			**Total**	**p-value**
	T1 (22–25 °C)	**T2 (25.1–29 °C)**	**T3 (29.1–33 °C)**		
0–100	31 (22.1%)	78 (55.7%)	31 (22.1%)	140 (100%)	0.82
101–200	2 (13.3%)	9 (60%)	4 (26.7%)	15 (100%)	
201–300	1 (20%)	4(80%)	0 (0%)	5 (100%)	
Total	34 (21.3%)	91 (56.9%)	35 (21.9%)	160 (100%)	

The different ranges of relative humidity of the houses RH1, RH2, and RH3, the corresponding number of mites obtained and the number of occurrences in the houses are shown in Table 4. The maximum number of houses showed the presence of 0–100 mites per gram of dust examined. The occurrence of mites showed the highest in RH2 (66–81%) and the lowest in RH1 (50–65%).

Table 4. Relationship between relative humidity (RH) and number of mites.

No of Mites	**Mite occurrence in different relative humidity ranges**			**Total**	**p-value**
	RH1 (50–65%)	**RH2 (66–81%)**	**RH3 (82–95%)**		
0–100	47 (33.6%)	44 (31.4%)	49 (35%)	140 (100%)	0.015
101–200	1 (6.7%)	11 (73.3%)	3 (20%)	15 (100%)	
201–300	1 (20%)	1 (20%)	3 (60%)	5 (100%)	
Total	49 (30.6%)	56 (35%)	55 (34.4%)	160 (100%)	

Fischer's exact test revealed a p-value of 0.82, which is > 0.05 and showed that temperature has no significant role in the number of mites present (Table 3). At the same time, analysis of the dependence of relative humidity on the number of mites present in the houses showed a significant relationship with a p-value of 0.015 (Table 4).

DISCUSSION

The present study was conducted among 160 houses out of which 147 houses (91.88%) were found to be mite positive. Similar studies carried out in different states of India (Dar and Gupta 1979) namely Delhi, Uttar Pradesh and Punjab showed varying percentages of occurrence of dust mites, 54.9%, 64.3% and 61%, respectively. A contrary observation from West Bengal, Kolkata (Modak *et al*. 2004; Podder *et al*. 2021) reported a cent percent mite infestation in all the dust samples. This variation in the occurrence of mites might be due to regional changes and different household characteristics including hygiene practices.

An exceptionally large number of dermatophagoides mites in the house dust samples were reported in West Bengal (Modak *et al*. 2004; Podder *et al*. 2021), India. They also revealed that among the different species of Pyroglyphidae, the most abundant was *D. pteronyssinus* (69%) followed by *D. farinae* (14%). This finding is in conformity with the occurrence of *D. pteronyssinus* (69.03%) in our study, but contrary in the case of *D. farinae*, as the species was almost absent. Similar research from various parts of the world (Sesay and Dobson 1973; Mumcuoglu 1976; Terra *et al*. 2004; Malainual *et al*. 1995; Feldman-Muhsam *et al*. 1985; Aykut *et al*. 2013) disclosed the dominance of *D. pteronyssinus* in house dust samples. However, contrary results were observed in other parts of the globe (Yoshikawa and Bennett 1979; Bigliocchi and Maroli 1995; Ree *et al*. 1997; Kosik Bogacka *et al*. 2010, Sun *et al*. 2013) where *D. farinae* in the house dust exceeded the number of *D. pteronyssinus*. The influence of local and regional climactic differences might have contributed to the different species distribution between areas.

*Blomia tropicali*s was the second dominant mite species we collected from the northern districts of Kerala followed by *D. pteronyssinus.* Podder *et al*. (2021) revealed a similar observation where *B. tropicali*s comes after *D. pteronyssinus* in the sampled dust. Our result contradicts the study of (Lakshmi and Haq 1999; Mariana *et al*. 2000; Gill and Kaur 2014), which reported that *B. tropicali*s is more abundant than *D. pteronyssinus.* This may be because of differences in indoor and outdoor climactic factors that exist, which in turn are responsible for the population growth of the individual mite species.

The number of mites obtained from rural areas was much higher when compared to urban houses in this study. The findings of Miranda *et al*. (2002) confirm that the diversity of mites in dust samples is higher in rural houses than in urban houses in Panama, with 22 species in rural and 18 species in urban houses. Also, a study of dust samples from occupational environments in Croatia revealed no mites from urban areas, whereas dust samples from the rural area showed the presence of mites (Macan *et al*. 2003). Rural dust samples were more mite positive than the dust samples from urban houses as reported by Yahia and Metwally (2019). They also revealed a statistically significant relationship between rural residences and the number of mites. During the present study, it was observed that the number of occupants in rural houses was more in number than in urban houses and the lifestyle of people residing in those houses might have contributed to the increase in the number of mites.

Air humidity is a limiting factor for house dust mite populations, a 45% relative humidity at 20 °C creates a larger population of dust mites (Hart 1998). In our findings, though temperature was found to be independent, relative humidity of the houses tended to control the proliferation of mites. A study in Israel (Feldman-Muhsam *et al*. 1985) supports this idea, where they isolated a maximum number of mites from highly humid areas and 75% of the collected mites were identified as *Dermatophagoides pteronyssinus*. Our results are in concordance with the findings of Bigliocchi and Maroli (1995) and Dautartiene (2001), Arlian *et al*. (2002), Soltani *et al*. (2011), which emphasizes the role of relative humidity over temperature on the mite population. Yoshikawa and Bennett (1979) pointed out that in the homes of Columbia, where the humidity index is low, the number of mites is higher, and they could not consider humidity as a limiting factor for the development of mites.

CONCLUSION

We were able to recover house dust mites from 147 out of 160 houses in the Malappuram and Kozhikkode districts of Northern Kerala. The presence of mites revealed a favorable condition inside every house. Though our study has been initiated to study the relation between mite population and environmental factors such as temperature and humidity, other factors such as house characteristics, mattress and furniture type and its age, number of occupants, frequency of cleaning, etc., might also contribute to the establishment of HDM population, which is scope for further investigation.

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REFERENCES

Alani, M.D. & Haarlov, N. (1972) The house-dust mite: a possible source of allergen in the environment of patients with atopic dermatitis. *Journal of the National Medical Association*, 64(4): 302–304.

Arlian, L.G. (1975) Dehydration and survival of the European house dust mite, *Dermatophagoides pteronyssinus*. *Journal of Medical Entomology*, 12(4): 437–442. DOI: 10.1093/jmedent/12.4.437

Arlian, L.G., Morgan, M.S. & Neal, J.S. (2002) Dust mite allergens: ecology and distribution. *Current Allergy and Asthma Reports*, 2: 401–411. DOI: 10.1007/s11882-002-0074-2

Aykut, M., Erman, O.K. & Doğan, S. (2013) Seasonal changes of house dust mite population in Bitlis and Muş provinces of Turkey. *Turkiye Parazitoloji Dergisi*, 37: 11–37. DOI: 10.5152/tpd.2013.26

Aykut, M., Erman, O.K. & Doğan, S. (2016) Variability in population density of house dust mites of Bitlis and Muş, Turkey. *Journal of Medical Entomology*, 53(3): 513–518. DOI: 10.1093/jme/tjw009

Bernecker, C. (1970) The antigenicity of house dust and mites. *Allergy*, 25(5–6): 392–403. DOI: 10.1111/j.1398-9995.1970.tb01276.x

Bernstein, I.L. & Safferman, R.S. (1970) Viable algae in house dust. *Nature*, 227(5260): 851–852. DOI: 10.1038/227851a0

Bigliocchi, F. & Maroli, M. (1995) Distribution and abundance of house-dust mites (Acarina: Pyroglyphidae) in Rome, Italy. *Aerobiologia*, 11: 35–40. DOI: 10.1007/BF02136142

Brown, H.M. & Filer, J.L. (1968) Role of mites in allergy to house dust. *British Medical Journal*, 3(5619): 646–647. DOI: 10.1136/bmj.3.5619.646

Charlet, L.D., Mulla, M.S. & Sanchez-Medina, M. (1978) Domestic Acari of Colombia: Population trends of house dust mites (Acari: Pyroglyphidae) in homes in Bogota, Colombia. *International Journal of Acarology*, 4(1): 23–31. DOI: 10.1080/01647957808683095

Chew, F.T., Yi, F.C., Chua, K.Y., Fernandez-Caldas, E., Arruda, L.K., Chapman, M.D. & Lee, B.W. (1999) Allergenic differences between the domestic mites *Blomia tropicalis* and *Dermatophagoides pteronyssinus*. *Clinical & Experimental Allergy*, 29(7): 982–988. DOI: 10.1046/j.1365-2222.1999.00543.x

Clarke, D., Gormally, M., Sheahan, J. & Byrne, M. (2015) Child car seats–a habitat for house dust mites and reservoir for harmful allergens. *Annals of Agricultural and Environmental Medicine*, 22(1): 17–22. DOI: 10.5604/12321966.1141362

Colloff, M.J. (1987) Mite fauna of dust from passenger trains in Glasgow. *Epidemiology & Infection*, 98(1): 127–130. DOI: 10.1017/S095026880006180X

Colloff, M.J. (2009) *Dust mites*. CSIRO Publishing, Collingwood, Australia & Springer, Dordrecht, The Netherlands, 583 pp. DOI: 10.1007/978-90-481-2224-0

Colloff, M.J., Ayres, J., Carswell, F., Howarth, P.H., Merrett, T.G., Mitchell, E.B. & Woodcock, A.A. (1992) The control of allergens of dust mites and domestic pets: a position paper. *Clinical and Experimental Allergy*, 22: 1–28. DOI: 10.1111/j.1365-2222.1992.tb01763.x.

Colloff, M.J. & Stewart, G.A. (1997) House dust mites. *Asthma*, 2: 1089–1103.

Colloff, M.J. & Spieksma, F.T.M. (1992) Pictorial keys for the identification of domestic mites. *Clinical & Experimental Allergy*, 22(9): 823–830. DOI: 10.1111/j.1365-2222.1992.tb02826.x

Cunnington, A.M. & Gregory, P.H. (1968) Mites in bedroom air. *Nature*, 217: 1271–1272. DOI: 10.1038/2171271a0

Dar, N. & Gupta, V. (1979) Studies on the house dust mites of India and their role in causation of bronchial asthma and allergic rhinitis Part I. The mites. *Oriental Insects*, 13(3–4): 261–298. DOI: 10.1080/00305316.1979.10433620

Dautartiene, A. (2001) Seasonal changes in house dust mites. *Ekologija*, 2: 3–7.

Davies, R.R. (1960) Viable moulds in house dust. *Transactions of the British Mycological Society*, 43(4): 617-630.

Dey, D., Saha, G.K. & Podder, S. (2019) A review of house dust mite allergy in India. *Experimental and Applied Acarology*, 78: 1–14. DOI: 10.1007/s10493-019-00366-4

Feldman-Muhsam, B., Mumcuoglu, Y. & Osterovich, T. (1985) A survey of house dust mites (Acari: Pyroglyphidae and Cheyletidae) in Israel. *Journal of Medical Entomology*, 22(6): 663–669. DOI: 10.1093/jmedent/22.6.663

Fernández-Caldas, E. (1997) Mite species of allergologic importance in Europe. *Allergy*, 52(4): 383–387. DOI: 10.1111/j.1398-9995.1997.tb01016.x

Gill, N.K. & Kaur, H. (2014) A study on the occurrence, prevalence and species composition of mite fauna in human dwellings of Patiala city, Punjab (India). *Indian Journal of Scientific Research*, 8(1): 91–97.

Hart, B.J. (1998) Life cycle and reproduction of house-dust mites: environmental factors influencing mite populations. *Allergy*, 53: 13–17. DOI: 10.1111/j.1398-9995.1998.tb04990.x

Hughes, A.M. (1976) *The mites of stored food and houses*. 2nd edition, Her Majesty's Stationery Office, London, 400 pp.

Kosik-Bogacka, D.I., Kalisinska, E., Henszel, L. & Kuzna-Grygiel, W. (2010) Acarological characteristics of dust originating from urban and rural houses in northwestern Poland. *Polish Journal of Environmental Studies*, 19(6): 1239–1247.

Li, L., Qian, J., Zhou, Y. & Cui, Y. (2018) Domestic mite–induced allergy: Causes, diagnosis, and future prospects. *International Journal of Immunopathology and Pharmacology*, 32. DOI: 10.1177/2058738418804095.

Lakshmi, R. & Haq, M.A. (1999) Survey on dust mites of Calicut University campus. *Journal of Acarology*, 15(1, 2): 55–63.

Mariana, A., Ho, T.M., Sofian-Azirun, M. & Wong, A.L. (2000) House dust mite fauna in the Klang Valley, Malaysia. *The Southeast Asian Journal of Tropical Medicine and Public Health*, 31(4): 712–721.

Malainual, N., Vichyanond, P. & Phan-Urai, P. (1995) House dust mite fauna in Thailand. *Clinical and Experimental Allergy*, 25(6): 554–560. DOI: 10.1111/j.1365-2222.1995.tb01094.x

Maunsell, K., Wraith, D.G. & Cunnington, A.M. (1968) Mites and house-dust allergy in bronchial asthma. *The Lancet*, 291(7555): 1267–1270. DOI: 10.1016/S0140-6736(68)92289-7

Modak, A., Saha, G.K., Tandon, N. & Gupta, S.K. (2004) Faunal diversity and habitat preference of house dust mites in West Bengal in relation to nasobronchial allergic disorders. *Records of the Zoological Survey of India*, 102(1–2): 137–146.

Miyamoto, T., Oshima, S., Ishizaki, T. & Sato, S. (1968) Allergenic identity between the common floor mite (*Dermatophagoides farinae* Hughes, 1961) and house dust as a causative antigen in bronchial asthma. *Journal of Allergy*, 42(1): 14–28. DOI: 10.1016/0021-8707(68)90128-7

Macan, J., Kanceljak, B., Plavec, D. & Milković-Kraus, S. (2003) Differences in mite fauna between the continental and Mediterranean climates of Croatia: microscopy and DustscreenTM test findings. *Allergy*, 58(8): 780–783. DOI:10.1034/j.13989995.2003.00210.x

Miranda, R.J., Diomedes, Q.A. & Almanza, A. (2002) House dust mites from urban and rural houses on the lowland Pacific slopes of Panama. *Systematic and Applied Acarology*, 7(1): 23–30. DOI: 10.11158/saa.7.1.3

Mumcuoglu, Y. (1976) House dust mites in Switzerland I. Distribution and taxonomy. *Journal of Medical Entomology*, 13(3): 361–373. DOI: 10.1093/jmedent/13.3.361

Podder, S., Biswas, H. & Kumar Saha, G. (2021) A faunistic survey of house dust mites of Kolkata, West Bengal, India. *Acarological Studies*, 3(1): 22–31. DOI: 10.47121/acarolstud.786681

Podder, S., Gupta, S.K. & Saha, G.K. (2010) Incrimination of *Blomia tropicalis* as a potent allergen in house dust and its role in allergic asthma in Kolkata Metropolis, India. *World Allergy Organization Journal*, 3(5): 182–187. DOI: 10.1097/WOX.0b013e3181df4d4f

Ree, H.I., Jeon, S.H., Lee, I.Y., Hong, C.S. & Lee, D.K. (1997) Fauna and geographical distribution of house dust mites in Korea. *The Korean Journal of Parasitology*, 35(1): 9–17. DOI: 10.3347/kjp.1997.35.1.9

Sun, J.L., Shen, L., Chen, J., Yu, J.M. & Yin, J. (2013) Species diversity of house dust mites in Beijing, China. *Journal of Medical Entomology*, 50(1): 31–36. DOI: 10.1603/ME12036

Sesay, H.R. & Dobson, R.M. (1973) Studies on the mite fauna of house dust in Scotland with special reference to that of bedding. *Acarologia*, 14(3): 384–392.

Sinha, R.N., Van Bronswijk, J.E. & Wallace, H.A. (1970) House dust allergy, mites and their fungal associations. *Canadian Medical Association Journal*, 103(3): 300–301.

Solarz, K. (1998) The allergenic acarofauna of house dust from dwellings, hospitals, libraries and institutes in Upper Silesia (Poland). *Annals of Agricultural and Environmental Medicine*, 5(1): 73–85.

Solarz, K. (2006) Allergenic mites in habitats associated with man in Poland. *Biological Letters*, 43(2): 299–306.

Soleimani, M. & Rafinejad, J. (2008) House dust mite contamination in hotels and inns in Bandar Abbas, south of Iran. *Journal of Environmental Health Science & Engineering*, 5(3): 207–210.

Soleimani-Ahmadi, M., Zare, M., Abtahi, S.M. & Khazeni, A. (2017) Species identification and prevalence of house dust mites as respiratory allergen in Kindergartens of the Bandar Abbas City. *Iranian Journal of Allergy, Asthma and Immunology*, 16(2): 133–139.

Soltani, A., Azizi, K., Saleh, V. & Dabaghmanesh, T. (2011) The fauna and distribution of house dust mites in residential homes of Bandar Abbas District, Southern Iran. *Experimental and Applied Acarology*, 54: 269–276. DOI: 10.1007/s10493-011-9436-6

Spieksma, F.T.M., Zuidema, P. & Leupen, M. (1971) High altitude and house-dust mites. *British Medical Journal*, 1(5740): 82–84. DOI: 10.1136/bmj.1.5740.82

Terra, S.A., Silva, D.A.O., Sopolete, M.C., Mendes, J., Sung, S.J. & Taketomi, E.A. (2004) Mite allergen levels and acarologic analysis in house dust samples in Uberaba, Brazil. *Journal of Investigational Allergology and Clinical Immunology*, 14: 232–237.

Thomas, W.R., Smith, W.A. & Hales, B.J. (2004) The allergenic specificities of the house dust mite. *Chang Gung Medical Journal*, 27(8): 563–569.

Tovey, E.R., Chapman, M.D. & Platts-Mills, T.A.E. (1981) Mite faeces are a major source of house dust allergens. *Nature*, 289(5798): 592–593. DOI: 10.1038/289592a0

Vervloet, D., Penaud, A., Razzouk, H., Senft, M., Arnaud, A., Boutin, C. & Charpin, J. (1982) Altitude and house dust mites. *Journal of Allergy and Clinical Immunology*, 69(3): 290–296. DOI: 10.1016/S0091-6749(82)80006-7

Voorhorst, R., Spieksma, F.T.M., Varekamp, H., Leupen, M.J. & Lyklema, A.W. (1967) The house-dust mite (*Dermatophagoides pteronyssinus*) and the allergens it produces. Identity with the house-dust allergen. *Journal of Allergy*, 39(6): 325–339. DOI: 10.1016/0021-8707(67)90045-7

Yahia, S.H. & Metwally, A.S. (2019) Effect of some housing criteria and seasonal variations on indoor prevalence and distribution of dust mite populations in Sharkia Governorate, Egypt. *Life Science Journal*, 16(7): 59–68. DOI: 10.7537/marslsj160719.10.

Yoshikawa, M. & Bennett, P.H. (1979) Brief note House dust mites in Columbus, Ohio. *Ohio Journal of Science*, 79(6): 280–282.

فون و پراکنش هرناهای گرد و غبار خانگی در دو ناحیهٔ شمالی کرالا، هند

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چکیده

این بررسی اولیه از کنه‌های گرد و غبار خانگی در دو ناحیه در شمال کرالا یعنی مالاپورام و کوژیکود انجام شد. این مطالعه از دسامبر ۲۰۲۱ تا نوامبر ۲۰۲۲ انجام شد. نمونه‌برداری از گرد و غبار در مجموع ۱۶۰ خانه انجام شد که به‌طور تصادفی ۴۰ خانه روستایی و ۴۰ خانه شهری از هر یک از بخش‌ها انتخاب شدند. در مجموع ۶۳۸۲ کنه از ۱۴۷ خانه جمع آوری شدند. گونهٔ فراوان به دست آمده از تمام محل‌های جمع‌آوری *Dermatophagoides pteronyssinus* (Trouessart) (۶۷/۶۹٪) و پس از آن گونه *Blomia tropicalis* Bronswijk, Cock & Oshima (۲۷/۵٪) بود. گونه‌های دیگر به دست آمده *Sturnophagoides* sp.، *Cheyletus eruditus* (Schrank)، *Cheyletus malaccensis*، *Glycycometus* sp. Oudemans، *Tyrophagus putrescentiae* (Schrank)، *Chortoglyphus arcuatus* (Troupeau) و *Suidasia* sp. بودند. میانگین تعداد هرناهای موجود در ناحیهٔ مالاپورام و کوژیکود از نظر آماری تفاوت معنی‌داری نشان داد. همچنین میانگین تعداد هرناهای موجود بین خانه‌های شهری و روستایی تفاوت معنی‌داری داشت. آزمون آماری (آزمون دقیق فیشر) برای تجزیه و تحلیل تأثیر آماره‌های آب و هوا، یعنی دما و رطوبت نسبی بر حضور هرناها در خانه‌های مورد بررسی، نشان داد که جمعیت آن‌ها وابسته به رطوبت نسبی و مستقل از دما است.

واژگان کلیدی: *Blomia tropicalis*، *Dermatophagoides pteronyssinus*، رطوبت نسبی، دما، شهری و روستایی.

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