Frontiers in Life Sciences and Related Technologies 6(2) (2025) 131-134

Contents lists available at Dergipark

Frontiers in Life Sciences and Related Technologies

Journal homepage: http://dergipark.org.tr/en/pub/flsrt

Research article

Mechanical vector potential of houseflies (*Musca domestica*) for mites

Rahmi Yildiz[1], Milad Afsar[2], Fethi Barlik[3], Medeni Aykut[4], Selahattin Aydemir*[2], Abdurrahman Ekici[2]

[1] *Van Yuzuncu Yil University, Gevas Vocational School, 65080, Van, Türkiye*
[2] *Van Yuzuncu Yil University, Faculty of Medicine, Department of Parasitology, 65080, Van, Türkiye*
[3] *Van Yuzuncu Yil University, Van Health Services Vocational School, 65080, Van, Türkiye*
[4] *Dicle University, Ziya Gökalp Faculty of Education, Department of Science Education, 21280, Diyarbakir, Türkiye*

Abstract

Houseflies (*Musca domestica*), which live in common areas with humans, can be mechanical vectors of many pathogens. Mites are an extremely diverse community of organisms that occupy various microhabitats, and many species are harmful to human health. This study aimed to detect the presence of mites in the washing water of houseflies and assess the potential role of these flies in mite transmission. Houseflies collected from households within the boundaries of the Tatvan district in Bitlis were included in this study. Houseflies were gathered from 80 households, with 43 located in urban areas and 37 in rural regions, within the study's scope. After washing with PBS, the collected wash water was meticulously scrutinized under a light microscope to detect the presence of mites. Mites were found in 15 (18.7%) of the 80 samples, 8 (21.6%) of the rural samples, and 7 (16.3%) of the urban samples (P=0.544). It was determined that 40% of the identified mites belonged to the order Trombidiformes, 40% to Astigmata, and 20% to Mesostigmata. In conclusion, we believe that house flies act as vectors, play a role in the spread of mite populations, and can carry certain mites into homes that can affect the health of humans.

Keywords: *Acaridae; Bitlis; home dust; mesostigmata; mite; stroge mite*

1. Introduction

Houseflies (*Musca domestica*) are one of the most widespread species of flies worldwide, associated with humans, and can complete their entire life cycle close to human settlements (Adenusi et al., 2018; Park et al., 2019). They pose a threat to public health by mechanically vectoring pathogenic microorganisms. Flies that come into contact with garbage, sewage, and various contaminated environments can transfer pathogens to food via their mouthparts and other body surfaces, thereby mechanically transmitting disease agents (Ali et al., 2024; Lhoak and Al-Awadi, 2024). Mites can also be transported through mechanical transmission, and insect-mediated dispersal is a common mode of spread among mites (Michalska et al., 2023).

Mites represent a highly diverse assemblage of organisms that occupy a variety of distinctive microhabitats. Some species inhabit the nasal passages of mammals, the tracheae of insects, human and other mammalian hair follicles (such as *Demodex* spp.) (Rychlik et al., 2025), the skin of mammals (such as scabies mites (Aydemir et al., 2025), feathers of birds, and skin scales of reptiles. In addition, many species are plant parasites, and some are significant pests of crops, such as citrus, apple, strawberry, bean, and wheat (Arlian and Platts-Mills, 2001; Kilinc et al., 2024). Mites found in house dust can trigger allergic reactions in humans, leading to allergic diseases such as asthma and atopic dermatitis (Wan et al., 2024). Food and storage mites can infest foodstuffs such as cereals, flour, nuts,

* Corresponding author.
E-mail address: saydmr23@gmail.com (S. Aydemir).
https://doi.org/10.51753/flsrt.1674545 Author contributions
Received 12 April 2025; Accepted 25 July 2025
Available online 30 August 2025

and cheese, potentially causing food damage and allergic responses in humans (Bergmann, 2022; Akdemir et al., 2023).

This study aimed to evaluate the role of houseflies in the spread of mites by investigating the presence of mites in the water used to wash houseflies.

2. Materials and methods

In this study, house flies collected from 80 households, including 43 from the district center of Tatvan in Bitlis, Türkiye, and 37 from rural areas, were examined between June and July 2024. These flies were captured from inside the houses, with each household contributing between 10 and 15 specimens that were then placed in a 15 ml tube. Subsequently, they were transported to the Parasitology Laboratory at Van Yüzüncü Yıl University's Faculty of Medicine for examination of mite presence.

The collected samples were examined morphologically using a stereomicroscope (Olympus SZ61, Japan), and the species were identified based on the characteristics described in the literature (Nihei and Carvalho, 2007). Flies identified as *Musca domestica* were included in the study.

The methods described by Hamoo and Alnuri (2019) and Förster et al. (2009) were modified and applied for mite identification. To each centrifuge tube, 10 ml of PBS (1M, pH = 7.01) was added, and the contents were vortexed for approximately one minute. After vortexing, the flies were removed using a tweezer and discarded. The remaining liquid was centrifuged at 5000 rpm for five minutes. The supernatant was removed using a Pasteur pipette, leaving approximately one ml of liquid at the bottom of the tubes. After homogenizing the remaining liquid using a Pasteur pipette, a drop was placed on a microscope slide, covered with a coverslip, and examined under a light microscope using 10X and 40X objectives. Mites were identified using published identification keys (Spieksma, 1990; Colloff and Spiekma, 1992).

A Z-ratio test was used to compare the prevalence of mites between urban and rural households. Data tabulation was performed using the Minitab software package (version 14).

3. Results

In this study, mites were detected in 15 out of 80 samples (18.7%), including 8 of 37 samples from rural households (21.6%) and 7 of 43 samples from urban (central) households (16.3%). There was no statistically significant difference in mite detection rates between urban and rural dwellings (p=0.544). Of the detected mites, 6 (40%) belonged to the order Trombidiformes and 3 (20%) to the order Mesostigmata (Fig. 1). Additionally, three mites belonging to the order Astigmata were classified under the family Histiostomatidae (Fig. 2), and another three mites were identified as members of the family Acaridae (Fig. 3).

Fig. 1. A mite belonging to the order Mesostigmata.

Fig. 2. A mite belonging to the family Histiostomatidae.

4. Discussion

Houseflies typically feed on waste such as feces and animal manure, as well as decaying organic material such as carrion, in their natural behavior pattern. When they feed on these substances, pathogens can adhere to their mouthparts, wings, and legs, allowing them to potentially transport these microorganisms into human settings (Khamesipour et al., 2018; Gul et al., 2024). The house fly is considered a potential mechanical vector for over 200 pathogens (D'Arco et al., 2024). The isolation of pathogens from the body of houseflies strongly suggests their role as mechanical vectors (Khamesipour et al., 2018). Previous studies have found fungi (Ysquierdo et al., 2017), bacteria (Bahrndorff et al., 2014), viruses (Haddow et al., 2017), and parasites (Eke et al., 2016) in houseflies, indicating their potential to transmit various diseases through vectors.. In this study, mites were detected in the washing water of 18.7% of flies. Therefore, we believe that house flies play a role as mechanical vectors in the spread of mites, similar to other pathogens.

Fig. 3. A mite belonging to the family Acaridae.

Approximately 40,000 mite species have been identified to date (Akpinar et al., 2015). Mites found in human environments are generally classified as either house dust mites or storage mites (Wong et al., 2011). Exposure to house dust mites has been shown by various studies to be positively associated with the development and severity of allergic diseases such as asthma, allergic rhinitis, atopic dermatitis, and atopic eczema (Cevik et al., 2024; Klain et al., 2024; Wan et al., 2024).

Storage mites, often overlooked in daily clinical practice, represent a more common respiratory allergen in children than previously assumed (Kaya et al., 2025). Species belonging to the families Pyroglyphidae, Glycyphagidae, and Acaridae are commonly observed in house dust (Akyazi et al., 2019). Many species from the families Glycyphagidae and Acaridae are known to occur as storage mites (Huppertz et al., 2020). Red mites (Trombiculidae), belonging to the order Trombidiformes, are small larval mites that cause red mite dermatitis (trombiculosis). The main hosts of these mites are wild animals, and more than 50 species have been reported to infest humans, with approximately 20 species capable of causing diseases in both humans and animals (Sykes, 2022). Mites of the Histiostomatidae family typically inhabit the surface of moist organic matter, where they are presumed to subsist on bacteria and other microorganisms using their highly specialized palps and chelicerae. Nevertheless, a case report by El-Arfaj et al. (2007) documented an instance in which a histiostomatid mite was implicated in causing human autoacaridosis. In this study, mites belonging to the family Acaridae, which includes species recognized as both house dust and storage mites, were detected in house flies collected from the dwellings. Additionally, mites from the orders Mesostigmata and Trombidiformes, as well as from the family Histiostomatidae, were also identified. We suggest that this taxonomic diversity may be attributed to the ability of the flies to move freely between indoor and outdoor environments.

Many species of the family Acaridae are known to affect human health. *Acarus siro*, commonly found in flour and cheese, is a significant pest of stored foods. Contact with this mite can lead to dermatitis and allergies, whereas ingestion may cause intestinal and urinary tract diseases and malnutrition (Barbosa et al., 2022). *Tyrophagus putrescentiae* is one of the most important pests of stored food, infesting a wide range of products, including cereals, flour, nuts, dried fruits, cured meats, and cheese. It is also the most clinically relevant allergen-producing storage mite species associated with allergic respiratory diseases (Zhou et al., 2022). *Lepidoglyphus destructor* has also been shown to cause allergies in humans (Matos Semedo et al., 2024). Based on these findings, we suggest that the role of house flies in the transmission of mites from the Acaridae family is of significant concern for human health.

The major limitation of this study is that the species of mites could not be determined, as the mites in the preparations could not be identified using Hoyer's solution.

In conclusion, houseflies serve as mechanical vectors for the dissemination of mite populations and possess the capability to transport mites that may affect human health. While the role of houseflies as mechanical vectors for microorganisms has been extensively investigated, their potential as mite carriers has been explored in only a limited number of studies. This constitutes a significant knowledge gap, as mites on flies could facilitate the spread of parasitic infestations among animals, contaminate food products, and influence epidemiological dynamics in both the public health and veterinary domains. Understanding this interaction is crucial, particularly for developing comprehensive control strategies in environments where houseflies and mites coexist in substantial numbers.

Conflict of interest: The authors declare that they have no conflict of interests.

Informed consent: The authors declare that this manuscript did not involve human or animal participants and informed consent was not collected.

References

Adenusi, A. A., Akinyemi, M. I., Akinsanya, D. (2018). Domiciliary cockroaches as carriers of human intestinal parasites in Lagos Metropolis, Southwest Nigeria: Implications for public health. *Journal of Arthropod-Borne Diseases, 12*(2), 141.

Akdemir, C., Karaman, U., Cebeci Guler, N., Direkel, S., Uzunoglu, E., Ozturk, G., & Keles, I. (2023). Prevalence of house dust mites and presence of Der p 1 and Der f 1 in Ordu, Giresun, Trabzon and Rize provinces. *Türkiye Parazitoloji Dergisi, 47*(3), 179-183.

Akpinar, S., Canbakan, S., Mungan, D., Baser, Y., & Akpınar, E. E. (2015). Storage mite sensitivity and related factors in asthmatic patients. *Tuberküloz ve Toraks, 63*(2), 71-78.

Akyazi, R., Soysal, M., Klimov, P. B., & Altunç, Y. E. (2019). House dust mite species in Ordu, Turkey. *Journal of Agricultural Sciences, 25*(4), 417-426.

Al-Arfaj, A. M., Mullen, G. R., Rashad, R., Abdel-Hameed, A., Oconnor, B. M., Alkhalife, I. S., & Dute, R. R. (2007). A human case of otoacariasis involving a histiostomatid mite (Acari: Histiostomatidae). *The American Journal of Tropical Medicine and Hygiene*, *76*(5), 967-971.

Ali, R. M. M., Bashir, M. H., Haq, S. U., Ali, B., Akbar, F. A., Fatima, H., ... & Mehmood, K. (2024). The housely (*Musca domestica* L.): A comprehensive review of biology, genetics, disease vector potential, and methods of control. *European Chemical Bulletin*, *13*, 10-25.

Arlian, L. G., & Platts-Mills, T. A. (2001). The biology of dust mites and the remediation of mite allergens in allergic disease. *Journal of Allergy and Clinical Immunology, 107*(3 Suppl), S406-S413.

Aydemir, S., Kul, Z., Barlik, F., Saygin, M., Ekici, A., Demir, B., & Kaya, O. (2025). Increase in scabies cases and permethrin nonresponse in Türkiye. *Indian Journal of Public Health, 69*(1), 63-66.

Bahrndorff, S., Gill, C., Lowenberger, C., Skovgard, H., & Hald, B. (2014). The effects of temperature and innate immunity on transmission of *Campylobacter jejuni* (Campylobacterales: Campylobacteraceae) between life stages of Musca domestica (Diptera: Muscidae). *Journal of Medical Entomology, 51*(3), 670–677.

Barbosa, M. F., Corrêa, A. S., & Moraes, G. J. (2022). *Acarus siro* L.(Astigmatina: Acaridae): First confirmed record for Brazil based on morphological and molecular characterization. *Journal of Stored Products Research, 97*, 101958.

Bergmann, K. C. (2022). Biology of house dust mites and storage mites. *Allergo Journal International, 31*(8), 272-278.

Colloff, M., & Spiekma, F. T. M. (1992). Pictorial keys for the identification of domestic mites. *Clinical & Experimental Allergy, 22*(9).

Çevik, S., Altas, U., & Özkars, M. Y. (2024). Retrospective evaluation of clinical characteristics of children with cat sensitivity. *Pediatric Practice and Research, 12*(3), 72-76.

D'Arco, S., Maistrello, L., Hubbard, C. B., Murillo, A. C., & Gerry, A. C. (2024). Use of the proboscis extension response assay to evaluate the mechanism of house fly behavioral resistance to imidacloprid. *Insects, 15*(3), 168.

Eke, S., Idris, A., Omalu, I., Otuu, C., Ibeh, E., Akinbo, F., & Hassan, H. (2016). Relative abundance of synanthropic flies with associated parasites and pathogens in Minna Metropolis, Niger State, Nigeria. *Nigerian Journal of Parasitology, 37*(2), 142-146.

Förster, M., Klimpel, S., & Sievert, K. (2009). The house fly (*Musca domestica*) as a potential vector of metazoan parasites caught in a pig-pen in Germany. *Veterinary Parasitology, 160*(1-2), 163-167.

Gul, S., ur Rehman, F., Taj, M. K., Gul, S., Khan, M. A., Jamil, M., & Ahmad, N. (2024). The house flies *Musca domestica* as mechanical vector and its management to control in Quetta City, Balochistan. *Pak-Euro Journal of Medical and Life Sciences, 7*(3), 437-448.

Haddow, A. D., Nasar, F., Schellhase, C. W., Moon, R. D., Padilla, S. L., Wollen-Roberts, S. E., Tesh, R. B., & Weaver, S. C. (2017). Low potential for mechanical transmission of Ebola virus via house flies (*Musca domestica*). *Parasites & Vectors, 10*(1), 218.

Hamoo, R. N., & Alnuri, A. I. (2019). Isolation and identification of parasites from housefly (*Musca domestica*) in Mosul City, Iraq. *Advances in Animal and Veterinary Sciences, 7*(8), 711-714.

Huppertz, T., Schmidtmann, I., Becker, S., & Haxel, B. R. (2020). Characterization of a cohort of storage mite sensitized subjects. *Allergo Journal International, 29*(1), 1-8.

Kaya, M. A., Kocacik Uygun, D. F., Celik, E., & Bingol, A. (2025). The role of climate and residency in storage mite sensitivity among children with allergic diseases in the Mediterranean region. *International Archives of Allergy and Immunology*, 1-16.

Khamesipour, F., Lankarani, K. B., Honarvar, B., & Kwenti, T. E. (2018). A systematic review of human pathogens carried by the housefly (*Musca domestica* L.). *BMC Public Health, 18*(1), 1049.

Kilinc, A., Uysal, M., & Sahbaz, A. (2024). Harmful Insect and Mite Species and Natural Enemies in Strawberry Fields of Halkapinar (Konya) District. *Selcuk Journal of Agriculture & Food Sciences/Selcuk Tarim ve Gida Bilimleri Dergisi, 38*(2).

Klain, A., Senatore, A. A., Licari, A., Galletta, F., Bettini, I., Marseglia, G. L., & Ciprandi, G. (2024). The prevention of house dust mite allergies in pediatric asthma. *Children, 11*(4), 469.

Lhoak, H. A., & Al-Awadi, A. H. (2024). Role of house fly, *Musca domestica* (Diptera: Muscidae) as a mechanical vector of pathogenic bacteria in Thi Qar Province. *Medicra (Journal of Medical Laboratory Science/Technology)*, *7*(1), 13-18.

Matos Semedo, F., Martins, C., Tomaz, E., Cardoso, B., Farinha, S., Pires, G., & Pereira, A. M. (2024). Clinical relevance of *Lepidoglyphus destructor* sensitisation in allergic rhinitis: Nasal provocation test as in vivo assessment. *International Archives of Allergy and Immunology, 185*(5), 436-448.

Michalska, K., Mrowińska, A., & Studnicki, M. (2023). Ectoparasitism of the flightless *Drosophila melanogaster* and *D. hydei* by the mite *Blattisocius mali* (Acari: Blattisociidae). *Insects, 14*(2), 146.

Nihei, S. S., & de Carvalho, C. J. B. (2007). Phylogeny and classification of Muscini (Diptera: Muscidae). *Zoological Journal of the Linnean Society, 149*(4), 493-532.

Park, R., Dzialo, M. C., Spaepen, S., Nsabimana, D., Gielens, K., Lievens, B., Van Campenhout, L., & Carleer, R. (2019). Microbial communities of the house fly *Musca domestica* vary with geographical location and habitat. *Microbiome, 7*(1), 147.

Rychlik, K., Sternicka, J., Nowicki, R. J., Bieniaszewski, L., & Purzycka-Bohdan, D. (2025). Significance of *Demodex folliculorum* and *Demodex brevis* in pathogenesis of dermatological diseases—Current state of knowledge. *Medicina, 61*(4), 660.

Sykes, J. E. (2022). *Greene's infectious diseases of the dog and cat* (5th ed.). Elsevier Health Sciences.

Spieksma, F. T. M. (1990). Identification of house-dust mites. *Aerobiologia, 6*(2), 187-192.

Wan, M., Sun, Y., Luo, S., Hou, J., & Norbäck, D. (2024). Associations between house dust mite concentrations in bedroom dust in Northern China and childhood asthma, rhinitis and eczema. *Building and Environment, 247*, 110952.

Wong, S. F., Chong, A. L., Mak, J. W., Tan, J., Ling, S. J., Lim, Y. A. L., & Chua, K. H. (2011). Molecular identification of house dust mites and storage mites. *Experimental and Applied Acarology, 55*(2), 123-133.

Ysquierdo, C. A., Olafson, P. U., & Thomas, D. B. (2017). Fungi isolated from house flies (Diptera: Muscidae) on penned cattle in South Texas. *Journal of Medical Entomology, 54*(3), 705-711.

Zhou, Y., Li, Q., Pan, R., Wang, Q., Zhu, X., Liu, Y., & Chen, H. (2022). Regulatory roles of three miRNAs on allergen mRNA expression in *Tyrophagus putrescentiae*. *Allergy, 77*(2), 469-482.

Cite as: Yildiz, R., Afsar, M., Barlik, F., Aykut, M., Aydemir, S., & Ekici, A. (2025). Mechanical vector potential of houseflies (*Musca domestica*) for mites. *Front Life Sci RT*, *6*(2), 131-134.