Jurnal Kedokteran dan Kesehatan: Publikasi Ilmiah Fakultas Kedokteran Universitas Sriwijaya
Volume 13, No 3. 2026/DOI: 10.32539/JKK.V13i3.903
p-ISSN 2406-7431; e-ISSN 2614-0411
Page: 318 - 328

SPECIES DIVERSITY AND DENSITY OF FLIES (DIPTERA) AT PADANG SELASA TRADITIONAL MARKET, PALEMBANG: A DESCRIPTIVE CROSS-SECTIONAL STUDY

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ARTICLE INFO

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Kata kunci:
Lalat
Musca domestica
Kepadatan lalat
Pasar tradisional

Keywords:
flies
Musca domestica
Fly density
Traditional market

Original submission:
January 19, 2026;

Accepted:
July 22, 2026;

Published:
September 20, 2026

ABSTRAK

Pasar tradisional merupakan lingkungan yang mendukung keberadaan lalat akibat kelimpahan bahan organik sebagai sumber makanan. Lalat dapat berperan sebagai pembawa parasit (vektor mekanik) pada bahan organik yang dihinggapinya, sehingga dapat menyebabkan penyakit pada manusia. Penelitian ini bertujuan untuk menggambarkan keanekaragaman spesies dan kepadatan lalat di Pasar Tradisional Padang Selasa, Kota Palembang. Studi deskriptif potong lintang dilakukan dengan penangkapan lalat menggunakan sweeping net dan pengukuran kepadatan menggunakan fly grill di beberapa area pasar. Identifikasi spesies dilakukan berdasarkan morfologi. Sebanyak 399 lalat berhasil dikoleksi, didominasi oleh *Musca domestica*. Kepadatan tertinggi ditemukan di area penampungan sampah sementara. Kondisi lingkungan menunjukkan suhu dan kelembapan yang mendukung aktivitas lalat.

ABSTRACT

Species Diversity And Density Of Flies (Diptera) At Padang Selasa Traditional Market, Palembang: A Descriptive Cross-Sectional Study. As mechanical vectors, flies may contribute to the transmission of infectious diseases. This study aimed to describe species diversity and fly density at the Padang Selasa Traditional Market in Palembang City. A descriptive cross-sectional study was conducted using sweep nets to collect flies and fly grills to measure density across several market areas. Species were identified based on their morphological characteristics. A total of 399 flies representing four species were identified, with *Musca domestica* being the dominant species. The highest fly density was observed at the temporary waste storage area (TPS) and was classified as a high fly density category. Environmental conditions ranged from 27.7–30.2°C and 69.8–77.9% relative humidity, supporting fly activity. These findings emphasize the need to improve environmental sanitation and waste management in traditional markets to reduce fly populations and the risk of disease transmission.

INTRODUCTION

Flies are insects belonging to the order Diptera, characterized by a high level of species diversity and a wide, cosmopolitan distribution.[1] Diptera generally have soft bodies and play an important ecological and sanitary role due to their close association with human activities.[2] To survive, flies are attracted to environments with strong odors and abundant organic matter, leading them to seek unsanitary locations for food and breeding.[3] Such conditions are commonly found in areas with intense human activity, particularly traditional markets.[4] Padang Selasa Traditional Market is one of the markets in Palembang City with daily trading from morning to midday, including meat, fish, vegetables, and other food products. These activities generate large amounts of organic waste that are often not managed immediately, resulting in unpleasant odors, standing water, and moist conditions.[5,6]

In addition to waste accumulation at temporary waste disposal sites, food residues are commonly found around trading areas, particularly at meat and fish stalls, resulting in dirty, wet market conditions.[7] These environmental conditions support fly activity for feeding and breeding, ultimately increasing fly density within the market environment.[8] Previous studies have shown that traditional markets are generally dominated by certain fly species, such as *Musca domestica* and members of the family Calliphoridae, which are well adapted to environments with high human activity and abundant organic matter.[3,9]

However, information on fly species diversity and fly density at Padang Selasa Traditional Market in Palembang City remains limited. Therefore, this study is important for describing variations in fly species, fly density levels, and environmental conditions that support their presence, as a basis for improving sanitation management and fly control in traditional markets. This study aimed to identify species diversity and fly density at the Padang Selasa Traditional Market in Palembang City and to assess the environmental conditions associated with fly activity. This study was approved by the Research Ethics Committee of the Faculty of Medicine, Universitas Sriwijaya

METHODS

This study was a descriptive cross-sectional study. The research was conducted from September to October 2025 at Padang Selasa Traditional Market, Ilir Barat I District, Palembang City. Species identification and laboratory examinations were carried out at the Bio Optics Laboratory, Faculty of Medicine, Universitas Sriwijaya.

The study population consisted of all flies present in the environment of Padang Selasa Traditional Market. The samples comprised flies captured at several sampling points representing different market areas, namely the temporary waste disposal site (TPS), meat-selling area, fish-selling area, vegetable-selling area, and dry food-selling area. Fly sampling was conducted once in the morning between 08:00 and 10:00 a.m. using an insect net (sweeping net). Data were analyzed descriptively. No inferential statistical analysis was performed.

The samples comprised flies captured at several sampling points representing different market areas, namely the temporary waste disposal site (TPS), meat-selling area, fish-selling area, vegetable-selling area, and dry food-selling area. Fly sampling was conducted once in the morning between 08:00 and 10:00 a.m. using an insect net (sweeping net). This sampling period was selected because it coincided with peak market activities, when fly activity and human–fly interactions were expected to be highest.

The captured flies were placed in containers corresponding to their sampling locations and subsequently euthanized by applying chloroform to cotton inside the containers. All fly samples

were then transported to the laboratory for identification. Species identification was performed based on external morphological characteristics using the *Pictorial Key to Common Feedlot Flies*[10], with the aid of a magnifying glass and a flashlight. Identified flies were grouped according to species and capture location. Every ten flies of the same species were combined into one pooled sample, while fewer than ten individuals were also classified as a single pool. Pooling was performed to prepare specimens for subsequent parasitological examination to detect helminth eggs. However, the present study reports only the findings on fly species diversity, fly density, and environmental conditions.

Fly density was measured at each sampling location using the fly grill method. The fly grill was placed at the observation point, and the number of flies landing on the grill was counted over a 30-second interval. Measurements were repeated ten times at each location with variations in grill placement. Fly density was calculated as the average of the five highest counts and subsequently classified according to the fly density index.

During the fly density measurement, physical environmental conditions, including temperature, humidity, and light intensity, were also assessed. Temperature and humidity were measured with a hygrometer near the observation point, and light intensity with a lux meter. Environmental condition data were recorded at each sampling location to support the analysis of the study results.

RESULTS

The results of fly species identification collected at the Padang Selasa Traditional Market, Palembang City, are presented as follows

Table 1. Distribution of Flies by Capture Location (n = 399), TPS (Temporary Waste Disposal Site) APD (Meat Selling Area), API (Fish Selling Area), APS (Vegetable Selling Area), AMK (Dry Food Selling Area)

Location	Fly Species				Total n (%)
	M. domestica **n (%)**	***C. megacephala*** **n (%)**	***Lucilia sp.*** **n (%)**	***Sarcophaga sp.*** **n (%)**	
TPS	149 (66,5)	75 (33,5)	0 (0)	0 (0)	**224 (56,1)**
APD	60 (38,4)	67 (42,9)	10 (6,4)	19 (12,1)	**156 (39,1)**
API	9 (47,4)	10 (52,6)	0 (0)	0 (0)	19 (4,7)
APS	0 (0)	0 (0)	0 (0)	0 (0)	**0 (0)**
AMK	0 (0)	0 (0)	0 (0)	0 (0)	**0 (0)**
Total	**218 (54,8)**	**152 (38)**	**10 (2,5)**	**19 (4,7)**	**399 (100)**

Notes:
Percentages in each market area represent the proportion of each fly species within that specific sampling location, whereas percentages in the Total row represent the proportion of each species relative to the total number of flies collected (n = 399).

A total of 399 flies were collected at Padang Selasa Traditional Market. Four fly species were successfully captured and morphologically identified, namely *Musca domestica*, *Chrysomya megacephala*, *Lucilia* sp., and *Sarcophaga* sp. Although *Fannia* sp. was observed in the vegetable-selling area during sampling, no specimens were successfully captured for identification and were therefore excluded from the analysis. The dominant species was *M. domestica* (54.8%), followed by *C. megacephala* (38%). The remaining species were present in much smaller proportions.

Based on location, the highest number of flies was found at the temporary waste disposal area (56.1%), followed by the meat-selling area (39.1%) and the fish-selling area (4.8%). Although flies were observed in the vegetable and dry food selling areas, no specimens were successfully captured at these locations; therefore, the total number of samples analyzed remained 399 flies.

Musca domestica

The house fly (*Musca domestica*) has a grayish-black body approximately 5–8 mm long. The dorsal surface of the thorax shows four distinct dark longitudinal stripes without pale markings. The abdomen is yellowish in color. Other characteristic features include a sharply curved fourth wing vein toward the third vein, as well as a pair of large red compound eyes.

Chrysomya megacephala

The green bottle fly has a relatively large body size, measuring approximately 8–14 mm in length. The compound eyes are red, with sexual dimorphism: males have holoptic eyes and females have dichoptic eyes. The thorax is shiny metallic green, while the abdomen is bluish green with transverse bands. The thorax is sparsely covered with stiff bristles and bears a pair of transparent wings.

Lucilia sp.

The green blowfly (*Lucilia* sp.) is relatively smaller than other green blowflies, with a body length of approximately 9 mm. This species has red compound eyes and a shiny, metallic-green thorax and abdomen.

Sarcophaga sp.

The *Sarcophaga* sp. species is characterized by a distinctive checkered pattern on the abdomen. The body length generally exceeds 9 mm and is gray. The thorax shows three distinct longitudinal stripes, and the species has a pair of red compound eyes.

The observations showed that the highest fly density was found at the temporary waste disposal site (TPS), with a mean value of 43, categorized as very high density. A high fly density was also observed in the meat-selling area, with a mean value of 15, classified as high density. The fish-selling area exhibited a moderate fly density with a mean value of 5. In contrast, the vegetable-selling and dry food–selling areas showed low fly densities, with mean values of 1.6 and 0.2, respectively.

Based on Table 3, the ambient temperature at all sampling locations ranged from 27.7 to 30.2°C, with the lowest temperature recorded at the Temporary Waste Storage Area (TPS) (27.7°C) and the highest at the dry food selling area (30.2°C). Light intensity varied markedly across locations, with the highest at the TPS (2416 lux) and the lowest at the fish selling area (20 lux). Air humidity ranged from 69.8% to 77.9%, with the highest humidity recorded at the TPS and the lowest at the dry food selling area

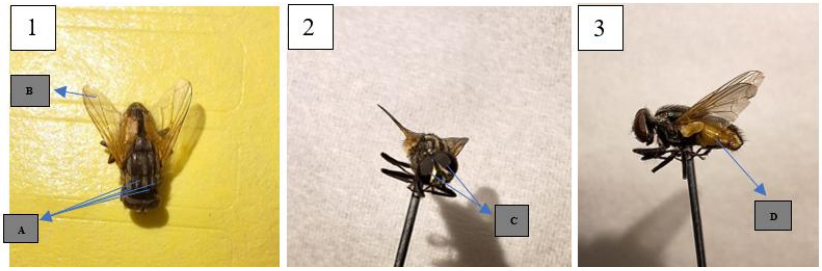

Figure 1. *Musca domestica*. (1) Dorsal view showing four dark longitudinal stripes on the thorax (A) and the curvature of the fourth wing vein toward the third vein (B); (2) anterior view showing a pair of large red compound eyes (C); (3) lateral view showing a yellowish abdomen (D).

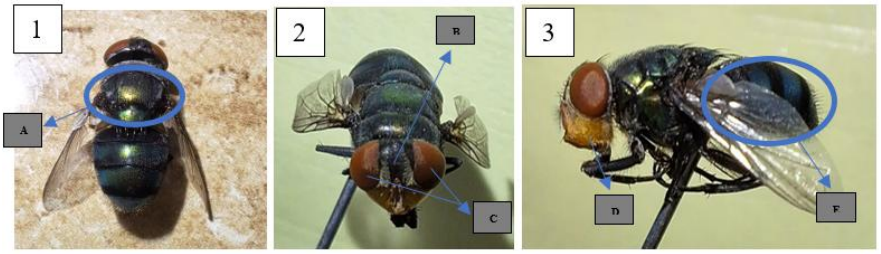

Figure 2. *Chrysomya megacephala*. (1) Dorsal view showing metallic green coloration on the thorax (A); (2) Anterior view showing a pair of separated red compound eyes (B, C); (3) Lateral view showing yellowish-orange mouthparts (D) and bluish-green coloration on the abdomen (E).

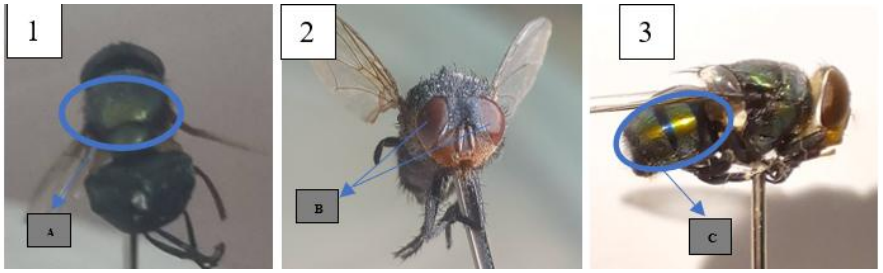

Figure 3. *Lucilia* sp. fly: (1) Dorsal view showing metallic green coloration of the thorax (A); (2) Anterior view showing red compound eyes (B); (3) Lateral view showing metallic green coloration of the abdomen (C).

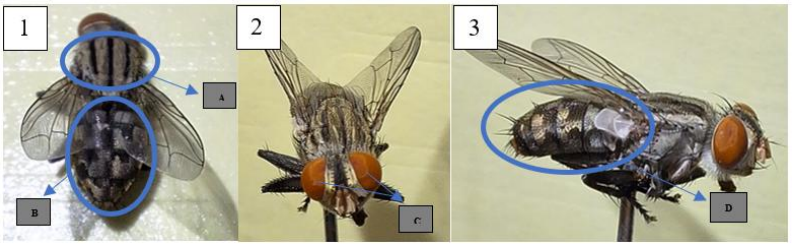

Figure 4. *Sarcophaga* sp. fly. (1) Dorsal view showing three longitudinal stripes on the thorax (A) and a checkered pattern on the abdomen (B); (2) Anterior view showing a pair of red compound eyes (C); (3) Lateral view showing a checkered pattern on the abdomen (D).

Table 2. Distribution of the Mean Number and Density of Flies Based on Sampling Points at Several Capture Locations

Sampling Number	TPS	APD	API	APS	AMK
I	22	10	4	0	1
II	41	15	0	0	0
III	31	11	5	3	0
IV	28	17	3	1	0
V	29	13	0	0	0
VI	22	9	6	2	0
VII	27	14	7	0	0
VIII	45	14	1	1	0
IX	41	15	1	1	0
X	57	12	0	0	0
Mean of The Five Highest Counts	**43**	**15**	**5**	**1,6**	**0,2**
Category	**Very High Density**	**High Density**	**Moderate Density**	**Low Density**	**Low Density**

Table 3. Distribution of Physical Environmental Conditions Based on the Mean of the Five Highest Fly Counts

Sampling Location	*Mean of the 5 Highest Counts*	Temperature (°C)	Light Intensity (Lux)	KHumidity (%)
TPS	43	27,7°C	2416	77,9%
APD	15	28,7°C	37	77,6%
API	5	29,4°C	20	76,2%
APS	1,6	30,1°C	24	71,2%
AMK	0,2	30,2°C	23,86	69,8%

DISCUSSION

Identification of Fly Species and Sample Abundance

The results of this study showed that the dominant fly species in Padang Selasa Traditional Market, Palembang City, was *Musca domestica* with a total of 218 individuals (54.8%), followed by *Chrysomya megacephala* with 152 individuals (38%), *Sarcophaga* sp. with 19 individuals (4.7%), and *Lucilia* sp. with 10 individuals (2.5%). The dominance of *M. domestica* is consistent with studies by Trianto et al. and Subagyo et al., which reported this species as the most common fly in traditional markets, particularly in temporary waste disposal areas (TPS).[11,12] These findings further support that TPS is the location with the highest fly abundance and serves as the primary habitat for *M. domestica*.

The absence of *Fannia* sp. in this study is consistent with the findings reported by Muthmainnah et al. (2021), but differs from studies conducted by Putri et al. (2018) and Wahyudi et al. (2015), which identified this species in traditional markets.[3,13,14] The absence of *Fannia* sp. in the present study is likely due to sampling-related technical issues, as this species was observed in the vegetable-selling area but could not be captured because of its rapid movement. Consequently, it was included in the exclusion criteria.

The dominance of *M. domestica* is associated with its high reproductive capacity, short life cycle, and cosmopolitan omnivorous behavior, allowing it to utilize a wide range of abundant organic waste in market environments, particularly at temporary waste disposal sites (TPS).[15,16] In contrast, *C. megacephala* prefers moist animal-derived waste, such as meat and fish, has a narrower environmental tolerance and a longer life cycle, resulting in slower population growth compared to *M. domestica*.[17,18]

The lower abundance of *Lucilia* sp. is presumed to be related to its limited adaptability to diverse substrates and competition with more dominant species, particularly *M. domestica* and *C. megacephala*.[19] Meanwhile, the presence of *Sarcophaga* sp. in meat-selling areas is consistent with its ecological behavior, as this species prefers fresh animal-derived organic matter and is larviparous, making such environments ideal habitats for its development.[20]

The predominance of *Musca domestica* and the presence of other synanthropic fly species pose a public health concern because these flies are recognized as mechanical vectors capable of carrying a wide range of pathogenic microorganisms, including parasites, bacteria, viruses, and fungi. Their frequent contact with organic waste and food products in traditional markets increases the potential risk of disease transmission to humans.[6]

Identification of Fly Density

The results showed that the highest fly density was in the temporary waste disposal area (TPS), classified as very high, whereas the lowest was observed in the vegetable and dry food selling areas. These findings are consistent with the study, which reported high fly densities in several traditional markets in Kupang City, as well as studies by Kurnia et al. (2023)[15] in Pasar Baru, Bintan Regency, and Subagyo et al. (2014)[12] in Pasar Wage and Pasar Manis, Purwokerto, all of which identified TPS as the location with the highest fly density.[21]

The high fly density in the TPS is attributed to abundant nutritional sources and environmental conditions that favor fly breeding. Accumulated food waste, such as meat, fish, and vegetables, provides optimal protein and carbohydrate sources for adult flies, as well as suitable substrates for egg deposition and larval development.[22] In addition, waste collection carried out only once daily leads to waste accumulation and strong odors, thereby increasing fly attraction.[22] These conditions also help maintain the humidity required for larval survival.[23]

The meat and fish selling areas exhibited relatively high fly densities due to the presence of wash water and animal organic waste rich in protein.[16] In contrast, the vegetable and dry-food selling areas showed low fly densities due to their limited protein content and lack of strong-smelling organic fluids, making these locations less favorable for fly activity.[24]

Identification of Environmental Conditions in the Market

During the assessment of fly density, physical environmental conditions, including temperature, humidity, and light intensity, were also measured. The results showed that ambient temperatures ranged from 27.7–30.2°C, with humidity levels between 69.8% and 77.9%. These ranges are comparable to the findings of Maulida et al. in Pasar Sehat Soreang, Bandung, and Irmayana in Pasar Ceger, South Tangerang, which reported market environmental temperatures of 26.5–34.8°C with moderate to high humidity.[25,26] Similar conditions were reported by Subagyo et al. in traditional markets in Purwokerto, with temperatures ranging from 28–30.8°C and humidity exceeding 80%.[12]

Light intensity at the study sites varied considerably, ranging from 20 to 2416 lux. The highest value was recorded in the temporary waste disposal area (TPS), which is more open, while the lowest value was recorded in the fish-selling area, which tends to be shaded. These findings are consistent with studies that reported low light intensity in enclosed market corridors and higher values in areas exposed to direct sunlight.[12,27] Differences in light intensity among locations were influenced by the physical characteristics of the observation areas, with the more open TPS receiving greater light exposure than the relatively enclosed fish-selling area. Variations in environmental conditions between locations were also likely related to non-simultaneous measurement times. Sequential data collection revealed changes in temperature, light intensity, and humidity over the course of the day, thereby affecting the measurement outcomes at each site.[28]

According to the Directorate General of PPM and PLP (2001), fly density increases at temperatures of 21–32°C and decreases at extreme temperatures. Although temperatures at the study sites were outside the optimum range, they remained within tolerance limits for fly activity, resulting in persistently high fly densities.[12] An inverse relationship between temperature and humidity was also observed, in which an increase in temperature was followed by a decrease in humidity.[29] High humidity strongly supports the survival of fly eggs and larvae and enhances reproductive activity. Therefore, locations with moist environmental conditions, such as the temporary waste disposal area (TPS) and meat-selling areas, exhibited higher fly densities.[30]

In addition, flies exhibit positive phototropism and are more active under moderately bright lighting, while avoiding direct sunlight. Fly activity is influenced more strongly by temperature and humidity than by light intensity alone. Environments with moderate lighting, combined with suitable temperature and humidity, support increased fly activity and reproduction.[12,29]

This study has several limitations. Fly sampling was conducted only once in the morning (08:00–10:00 a.m.), which may not fully capture temporal variation in fly species diversity and density throughout the day or across sampling days. In addition, environmental conditions were measured sequentially rather than simultaneously at all observation sites, which may have contributed to variations in temperature, humidity, and light intensity among locations. Nevertheless, the sampling period was selected because it coincided with peak market activities, when fly activity and exposure to organic waste were expected to be relatively high. Future studies involving repeated sampling at different times of the day and across multiple sampling occasions

are recommended to provide a more comprehensive assessment of fly populations and their associated environmental conditions.

The predominance of *Musca domestica* and *Chrysomya megacephala* in the present study has important public health implications because both species are recognized mechanical vectors capable of transmitting enteric pathogens, including bacteria, viruses, parasites, and helminth eggs. Their frequent contact with organic waste and exposed food in traditional markets may facilitate contamination of the food they consume.[6] Diarrhoeal diseases, typhoid fever, and soil-transmitted helminth infections remain important public health problems in Indonesia, and poor environmental sanitation continues to contribute to their transmission, highlighting the importance of effective environmental sanitation and fly control measures in traditional markets.[31]

CONCLUSION

This study identified four fly species at Padang Selasa Traditional Market in Palembang: *Musca domestica*, *Chrysomya megacephala*, *Sarcophaga* sp., and *Lucilia* sp., with *M. domestica* as the predominant species. The highest fly density was observed at the temporary waste disposal site (TPS), followed by the meat and fish selling areas, whereas the vegetable and dry food selling areas showed the lowest fly densities. Environmental conditions, including temperature, humidity, and light intensity, were within ranges that support fly activity and reproduction. These findings suggest that traditional market environments, particularly areas with accumulated organic waste, provide favorable conditions for fly proliferation and may increase the potential risk of mechanical transmission of pathogenic microorganisms. Future studies involving repeated sampling across seasons and market locations, molecular confirmation of species identification, and pathogen detection are recommended to provide a more comprehensive assessment of the public health risks associated with synanthropic flies.

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