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Identification and Community Structure of Pests on Eggplant (*Solanum melongena* L.)

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ABSTRACT
The eggplant (Solanum melongena L.) is an important horticultural crop whose productivity is often reduced by insect pest infestations. This study aimed to identify pest species and analyze their relative abundance, diversity, evenness, and dominance in an eggplant field at the Educational Farm of Samudra University, Langsa, Aceh, Indonesia. The research was conducted in October 2025 using a survey method with yellow sticky traps as insect sampling tools. Observations were carried out twice a week, and insects were identified based on their morphological characteristics. The results revealed six pest species belonging to four orders, with a total of 95 individuals recorded. Bactrocera dorsalis was the most abundant species (48.42%), followed by Siphanta acuta (38.95%). The pest community exhibited moderate diversity (H' = 1.12), moderate evenness (J' = 0.63), and moderate dominance (C = 0.39). These findings indicate that the pest community was influenced by a small number of dominant species, resulting in an uneven distribution of individuals among species. The study provides baseline information on pest community structure that may support the development of integrated pest management strategies in eggplant cultivation.

KEYWORDS: *Bactrocera dorsalis,* Horticulture, Evenness, d\Dominance, Diversity

ABSTRAK
Terong (Solanum melongena L.) merupakan salah satu komoditas hortikultura penting yang produktivitasnya sering menurun akibat serangan hama serangga. Penelitian ini bertujuan untuk mengidentifikasi spesies hama serta menganalisis kelimpahan relatif, keanekaragaman, kemerataan, dan dominansi hama pada pertanaman terong di Kebun Percobaan Universitas Samudra, Langsa, Aceh, Indonesia. Penelitian dilaksanakan pada bulan Oktober 2025 menggunakan metode survei dengan perangkap kuning lengket (yellow sticky trap) sebagai alat pengambilan sampel serangga. Pengamatan dilakukan dua kali seminggu, dan serangga yang tertangkap diidentifikasi berdasarkan karakteristik morfologinya. Hasil penelitian menunjukkan bahwa terdapat enam spesies hama yang termasuk dalam empat ordo, dengan total 95 individu yang berhasil dikoleksi. Bactrocera dorsalis merupakan spesies yang paling melimpah (48,42%), diikuti oleh Siphanta acuta (38,95%). Komunitas hama menunjukkan tingkat keanekaragaman sedang (H' = 1,12), kemerataan sedang (J' = 0,63), dan dominansi sedang (C = 0,39). Temuan ini mengindikasikan bahwa komunitas hama dipengaruhi oleh sejumlah kecil spesies dominan sehingga distribusi individu antarspesies tidak merata. Hasil penelitian ini menyediakan informasi dasar mengenai struktur komunitas hama yang dapat mendukung pengembangan strategi pengendalian hama terpadu pada budidaya terong.

KATA KUNCI: *Bactrocera dorsalis*, Hortikultura, Kemerataan, Dominansi,, Keanekaragaman

1. INTRODUCTION

Eggplant (Solanum melongena L.) is one of the most widely cultivated horticultural commodities in Indonesia (Ramadhan et al. 2024). This crop has high economic value. However, it is frequently threatened by pest infestations. These infestations can reduce its productivity (Siam et al., 2024). Pest infestations in this crop can damage leaves, stems, flowers, and fruits, consequently leading to significant reductions in both yield and product quality (Szpyrka et al. 2025). Eggplant is often subject to infestation by several major pests, including green planthopper (*Siphanta acuta*) (Himalaya et al. 2021). The biological characteristics of pests, including their mobility, feeding preferences, and reproductive capacity, determine their distribution and dominance within the crop system (Magurran 2004; Krebs 2014).

Significant increases in pest infestation intensity in horticultural crops are closely associated with changes in agroecosystems and climate change (Reddy et al., 2024). Environmental conditions also contribute to increased pest reproductive rates. These conditions include optimal temperature and humidity. They also facilitate pest spread (Skendži et al. 2021). In addition, monoculture cropping systems (Kaur et al., 2024), The imbalanced application of chemical inputs and minimal biodiversity can promote the expansion of significant pest populations in agricultural fields (Elouattassi et al. 2023). Yellow sticky traps were used because many flying insect pests exhibit a strong attraction to yellow visual stimuli. The color yellow effectively induces landing behavior, resulting in higher capture rates compared with other colors. Therefore, yellow traps are widely employed for monitoring insect abundance and diversity in agricultural ecosystems (Sampson et al., 2018)

Previous studies on eggplant have reported the diversity and abundance of insect pests in several regions of Indonesia. For example, research conducted in Jambi identified 15 insect pest species associated with eggplant cultivation and found *Bactrocera dorsalis* to be the most abundant species (Johari et al., 2024). Ecological data describing insect pest community structure in eggplant fields in Langsa, Aceh, are still limited. Therefore, this study was conducted to provide baseline information on pest species composition, relative abundance, diversity, and dominance in eggplant cultivation, which may serve as a scientific basis for developing location-specific pest management strategies.

Accurate pest identification is considered to be a fundamental step in the development of effective and sustainable integrated pest management strategies (Zhou et al., 2024). Information regarding the composition of pest species and their dominance levels at varying plant growth stages is crucial for identifying targeted and effective control techniques (Amin et al. 2018). Pest infestations in eggplant can lead to reduced yields by interfering with the optimal growth and development processes of the plant (Asri et al., 2022). The objective of this study was to ascertain the species composition, relative abundance, diversity level, and dominance of insect pests in eggplant (*Solanum melongena* L.) cultivation.

2. MATERIALS AND METHODS

This research was conducted in an eggplant (*Solanum melongena* L.) field at the experimental farm of Samudra University, Langsa, Aceh, Indonesia which is located at an altitude of approximately 6 meters above sea level (4.45784° N; 97.96706° E) in October 2025. During the study period, the average daily temperature ranged from 24.8°C to 28.2°C. Rainfall varied considerably throughout the month, ranging from 0 to 81 mm day^{-1}. The study employed a survey method. It installed yellow traps in the eggplant field. The traps were used as insect pest sampling tools. Observations were carried out twice a week, and the captured insects were identified based on their morphological characteristics. Relative abundance was calculated based on Deb dan Ram, (2024). The Shannon–Wiener diversity index (H') was calculated according to Whittaker dan Whittaker (1972), the evenness index (J') following (Pielou 1966), and the Simpson dominance index (D) based on Simpson (1949); Magurran (2004); Krebs (2014).

1. Relative abundance (RA) was calculated using the following formula:

$$\text{Relative abundance (RA)} = \frac{\text{Abundance of a given species}}{\text{Total abundance of all species}} \text{ X } 100\% \qquad (1)$$

2. The Shannon–Wiener diversity index (H') was calculated using the following formula:

$$(H') = -\sum_{n=1}^{n} \left(\frac{ni}{N}\right) ln \left(\frac{ni}{N}\right) \qquad (2)$$

Description:
H' : Shannon–Wiener diversity index
ni : number of individuals of the *i*th species

N : total number of individuals of all species
ln : natural logarithm

Criteria for the Shannon–Wiener diversity index (H’):**
H’ < 1: indicates low diversity
1 < H’ ≤ 3: indicates moderate diversity
H’ > 3: indicates high diversity

3. The evenness index (J’) was calculated using the following formula:

$$(J') = \frac{H'}{\ln(S)} \tag{3}$$

Description:
H’ : Shannon–Wiener diversity index
S : total number of species recorded
ln : natural logarithm

4. The Simpson dominance index (C) was calculated using the following formula:

$$(C) = \sum_{i=1}^{s}\left(\frac{ni}{N}\right)^2 \tag{4}$$

Description:
C : Simpson dominance index
ni : number of individuals of the ith species
N : total number of individuals
S : total number of species
i : species index

3. HASIL DAN PEMBAHASAN

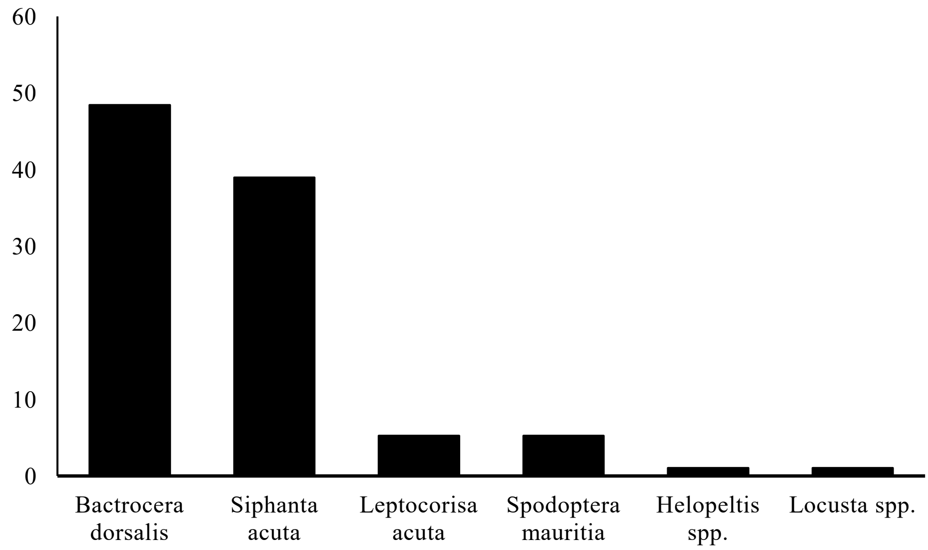
3.1. Pest Identification

The observation results identified six pest species belonging to four orders: Diptera, Hemiptera, Lepidoptera, and Orthoptera. Hemiptera had the highest species count, and *Bactrocera dorsalis* (Diptera: Tephritidae) was the most abundant species in terms of individual abundance, with a relative density of 48.42%. This high relative density indicates that the fruit fly plays an important role as the primary pest in eggplant cultivation at the research site. Table 1 describes the composition and relative density of the pest species.

Tabel 1. Species Composition and Relative Density of Pests on Eggplant (*Solanum melongena* L.)

No	Scientific Name	Order	Family	Common Name	Individuals	Relative Abundance (%)
1	*Bactrocera dorsalis*	Diptera	Tephritidae	Lalat buah	46	48.42
2	*Siphanta acuta*	Hemiptera	Flatidae	Wereng hijau	37	38.95
3	*Leptocorisa acuta*	Hemiptera	Coreidae	Walang sangit	5	5.26
4	*Spodoptera mauritia*	Lepidoptera	Noctuidae	Ulat grayak	5	5.26
5	*Helopeltis* spp.	Hemiptera	Miridae	Kepik penghisap buah	1	1.05
6	*Locusta* spp.	Orthoptera	Acrididae	Belalang kembara	1	1.05
			Total		95	100

Fruit flies (*Bactrocera* spp.; *Diptera*: *Tephritidae*) are major pests of various horticultural crops, including fruits and vegetables, in tropical and subtropical regions. They cause yield losses through oviposition and damage to fruit, as well as the deterioration of the quality of harvested produce (Setiawan et al., 2024). The dominance of Bactrocera dorsalis may be associated with its biological characteristics as an active flying insect and its preference for horticultural crops, especially during fruit development and ripening. Additionally, the use of yellow traps likely contributed to the high number of fruit flies captured, given their strong attraction to the color yellow. Yellow traps are more effective at attracting fruit flies than other colors, such as red, blue, or neutral tones. This increases the number of flies caught (Fathoni et al., 2023). These pests are of quarantine importance and can be monophagous, oligophagous, or polyphagous (Fathoni et al., 2023).



Gambar 1. Relative Abundance of Various Pest Species in Eggplant Cultivation

The species with the second highest dominance was *Siphanta acuta* (Hemiptera: Flatidae), with 37 individuals and a relative density of 38.95%. This indicates the important role of the order Hemiptera within the community as sap-sucking herbivores. This pest can adapt to a wide range of host plants. Its ability to consume a wide variety of plants makes it a generalist phytophagous species that may have a negative impact on plant health and productivity. Therefore, it should be included in integrated pest management strategies (Bahder et al., 2018). *Leptocorisa acuta* and *Spodoptera mauritia* exhibited low abundance (5.26%), while Helopeltis spp. and Locusta spp. showed the lowest relative density (1.05%). These species contributed only a small proportion of the total individuals collected and therefore had a limited influence on the overall community structure. Species dominance is often associated with superior adaptation to local environmental conditions, efficient resource utilization, and high reproductive capacity. These characteristics enable certain species to attain greater abundance and exert a significant influence on community composition and ecosystem functioning (Avolio et al., 2019).

3.2. Diversity Index (H'), Evenness Index (J'), and Dominance Index (C) of the Insect Community

The insect community observed consisted of six species with a total of 95 individuals. The Shannon–Wiener diversity index (H' = 1.12) indicates a moderate level of species diversity, reflecting that the community is not homogeneously structured and is still influenced by the presence of a few species with high relative abundance. The moderate diversity value suggests that the insect community was characterized by a limited number of species, with two species (*B. dorsalis* and *S. acuta*) accounting for nearly 87% of all individuals collected. Table 2 presents the diversity index (H'), evenness index (J'), and dominance index (C) of the insect community.

A previous study reported the presence of 10 insect species belonging to 8 families, with a low diversity index (H' = 0.56). The study also found that *Bemisia tabaci* exhibited the highest dominance index, indicating that this species strongly dominated the insect community (Rahayu, 2022).

Tabel 2. Shannon–Wiener Diversity Index (H'), Evenness Index (J'), and Dominance Index (C) of Insects

No	Scientific Name	Number	Pi	ln(pi)	Pi ln(pi)	H'	J'	C
1	*Bactrocera dorsalis*	46	0.484	-0.725	-0.351	1.12	0.63	0.39
2	*Siphanta acuta*	37	0.389	-0.943	-0.367			
3	*Leptocorisa acuta*	5	0.053	-2.944	-0.155			
4	*Spodoptera mauritia*	5	0.053	-2.944	-0.155			
5	*Helopeltis spp.*	1	0.011	-4.554	-0.048			
6	*Locusta spp.*	1	0.011	-4.554	-0.048			

The evenness index (J = 0.63) indicates a moderate distribution of individuals among species, meaning the individuals are not yet evenly distributed. This is evident from the differences in the number of individuals per species, particularly the dominance of *Bactrocera dorsalis* and *Siphanta acuta*, which have the highest relative densities compared to other species. The evenness index is an important parameter for evaluating community stability because it reflects whether individuals are distributed evenly or concentrated in a few dominant species (Jost, 2010).

The Simpson's dominance index (C = 0.39) indicates a moderate level of dominance. This confirms that, although some species are dominant, their dominance is not extreme and the community is supported by the presence of other species in smaller numbers. Higher dominance values suggest a greater likelihood of community domination by a few species, while lower dominance values indicate a more evenly distributed community supported by a larger number of species (Kitikidou et al., 2024). Overall, the values of H', J, and C indicate that the insect community structure exhibits moderate levels of diversity and evenness, with dominance that is not overly strong. Given the predominance of *B. dorsalis* and *S. acuta* in the present study, integrated pest management strategies should prioritize these species while maintaining overall agroecosystem sustainability.

Pest management in eggplant (Solanum melongena L.) requires an integrated and sustainable approach. Integrated pest management (IPM) is an effective strategy that combines cultural, mechanical, biological, and chemical practices. Techniques such as crop rotation, pheromone traps, reflective mulches, and the use of natural enemies suppress pest populations, reduce reliance on synthetic insecticides, maintain agroecosystem balance, and minimize the risk of resistance (Siam et al., 2024). The judicious use of pesticides in the field is important. It is crucial to protect the environment from hazardous contamination. This requires balancing timely pest control with the level of crop damage that remains within tolerable limits. This balance can only be achieved by determining and applying appropriate economic threshold levels (Lala dan Das 2022).

4. CONCLUSIONS

The insect pest community associated with eggplant cultivation consisted of six species and exhibited moderate diversity, evenness, and dominance. The community structure was largely influenced by the high abundance of *Bactrocera dorsalis* and *Siphanta acuta*, which together accounted for most of the individuals collected. These results indicate that pest distribution was uneven among species within the study area. However, because the study was conducted over a limited sampling period, the findings should be interpreted as site-specific. Further studies with longer observation periods and broader sampling coverage are needed to improve understanding of pest community dynamics in eggplant agroecosystems.

REFERENCES

Avolio, M. L., Forrestel, E. J., Chang, C. C., La Pierre, K. J., Burghardt, K. T., & Smith, M. D. (2019). Demystifying dominant species. *The New Phytologist*, *223*(3), 1106–1126. https://doi.org/10.1111/nph.15789

Bahder, A. B. W., Halbert, S., Mou, D., Helmick, E. E., & Soto, N. (2018). Establishment of the Sea Grape Flatid , Petrusa epilepsis (Hemiptera : Fulgoroidea : Flatidae), in Florida Establishment of the sea grape flatid , Petrusa epilepsis (Hemiptera : Fulgoroidea : Flatidae), in Florida. *Florida Entomologist*, *101*(4), 634–641.

Deb, A., & Ram, V. (2024). Weed dynamics and its interference in pea Arindam. *Indian Journal of Hill Farming*, *37*(1), 07–18. https://doi.org/10.56678/iahf-2024.37.01.2

Elouattassi, Y., Ferioun, M., & Ghachtouli, N. E. L. (2023). Agroecological concepts and alternatives to the problems of contemporary agriculture : Monoculture and chemical fertilization in the context of climate change. *JAEID*, *117*(2), 41–98. https://doi.org/10.36253/jaeid-14672

Fathoni, A. A., Armita, D., & Iqbal, A. (2023). Perbandingan efektivitas perangkap lalat buah (Bactrocera sp .) melalui indikator warna di Balai Besar Pelatihan Pertanian (BBPP) Batangkaluku. *Filogeni: Jurnal Mahasiswa Biologi*, *3*(1), 1–5.

Himalaya, G., Mehrwar, V., & Uniyal, V. P. (2021). Insect pest diversity of standing crops and traditional pest management in agricultural areas of the Mandakini Valley ,. *IJHAF*, *5*(4), 1–9.

Johari, A., Rahmah, N., Wulandari, T., Munif, M., & Naswir, M. (2024). Investigating insect pest diversity and feeding preferences on eggplants in Jambi, Indonesia. *Journal of Entomological Research*, *48*, 152–156. https://doi.org/10.5958/0974-4576.2024.00031.X

Jost, L. (2010). The Relation between Evenness and Diversity. In *Diversity* (Vol. 2, Issue 2, pp. 207–232). https://doi.org/10.3390/d2020207

Kaur, S., Bedi, M., Singh, S., Kour, N., Bhatti, S. S., Bhatia, A., Kumar, M., & Kumar, R. (2024). Chapter Eight - Monoculture of crops: A challenge in attaining food security. In A. Sharma, M. Kumar, & P. B. T.-A. in F. S. and S. Sharma (Eds.), *Environmental Challenges in Attaining Food Security* (Vol. 9, pp. 197–213). Elsevier. https://doi.org/https://doi.org/10.1016/bs.af2s.2024.07.008

Kitikidou, K., Milios, E., Stampoulidis, A., Pipinis, E., & Radoglou, K. (2024). Using Biodiversity Indices Effectively: Considerations for Forest Management. In *Ecologies* (Vol. 5, Issue 1, pp. 42–51). https://doi.org/10.3390/ecologies5010003

Krebs, C. J. (2014). *Ecological Methodology* (3rd ed.). Harper & Row.

Lala, A., & Das, A. (2022). Importance of Economic Levels in Integrated Pest Management. *Indian Farmer*, *9*(05), 150–154.

Magurran, A. E. (2004). *Measuring Biological Diversity*. Blackwell Publishing.

MR, A., MS, M., H, R., NP, N., & MKA, B. (2018). Functional and Group Abundance of Insects on Eggplant. *Bangladesh J. Agril. Res.*, *43*(4), 647–653.

Pielou E.C. (1966). Shannon's Formula as a Measure of Specific Diversity: Its Use and Misuse. *The American Naturalist*, *100*(914), 463–465. https://doi.org/https://doi.org/10.1086/282439

Rahayu, S. (2022). Identification of Insect Pests of Green Eggplant (Solanum melongena L) in Generative Phase at Agricultural Zone of Pandak , Bantul , Yogyakarta. *Proceeding International Conference on Religion, Science and Education*, *1*, 589–593.

Ramadhan, R. G., Adam, D. H., & Mustamu, N. E. (2024). Increasing the Growth and Production of Eggplant (Solanum melongena L) by Providing Wood Biochar. *JUATIKA*, *6*(2), 616 – 621.

Reddy, G. P., Singh, J. K., Kumar, B. V., Madhava, M. C., Nikhil, J., Naik, B. V., & Kalyanapu, V. (2024). *An Introduction to Climate Change and Agriculture and Horticulture Ecosystem* (Pravin Khaire, C. Sawant, & V. Naik (eds.)). Narendra Publishing House.

Sampson, C., Covaci, A. D., Hamilton, J. G. C., Hassan, N., Al-Zaidi, S., & Kirk, W. D. J. (2018). Reduced translucency and the addition of black patterns increase the catch of the greenhouse whitefly, Trialeurodes vaporariorum, on yellow sticky traps. *PloS One*, *13*(2), e0193064. https://doi.org/10.1371/journal.pone.0193064

Siam, M. A. H., Arafeen, M. S., Dey, D., & Owaresat, J. K. (2024). Review Article Biology and Management of Eggplant (S olanum melongena L .) Shoot and Fruit Borer : A Review. *Journal of Bangladesh Agricultural University*, *22*(3), 267–276.

Simpson, E. H. (1949). Measurement of diversity. *Nature*, *163*, 688. https://doi.org/10.1038/163688a0

Skendži, S., Zovko, M., & Pajaˇ, I. (2021). The Impact of Climate Change on Agricultural Insect Pests. *Insects*, *12*(440), 1–31.

Szpyrka, E., Migdal-pecharroman, S., & Ksi, P. (2025). Biological Strategies and Innovations in Pest Control and Fruit Storage in Apple Orchards : A Step Towards Sustainable Agriculture. *Agronomy*, *15*(2373), 1–30.

Whittaker, A. R. H., & Whittaker, R. H. (1972). Evolution and Measurement of Species Diversity Published by. *Taxon*, *21*(2/3), 213–251.

Zhou, W., Arcot, Y., Medina, R. F., Bernal, J., Cisneros-zevallos, L., & Akbulut, M. E. S. (2024). Integrated Pest Management : An Update on the Sustainability Approach to Crop Protection. *ACS Omega*, *9*, 41130–41147. https://doi.org/10.1021/acsomega.4c06628