Bioeksperimen: Jurnal Penelitian Biologi
Volume 12, Issue 1, March 2026, pp. 109 – 122
p-ISSN: 2460-1365, e-ISSN: 2527-2799
https://journals2.ums.ac.id/bioeksperimen

Insect diversity at vegetative maize phase (*Zea mays* L.) in caturharjo village

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How to cite:
Putri, D. S. M., & Putra, I. L. I. (2026). Insect diversity at vegetative maize phase (Zea mays L.) in caturharjo village. *Bioeksperimen: Jurnal Penelitian Biologi*, *12*(1), 109–122. https://doi.org/10.23917/bioeksperimen.v12i1.15963

Article info

Article History:
Received: 29 January 2026, Revised: 23 February 2026, Available Online: 31 March 2026

Keywords:
Diversity, Dominance, *Lathrobium* sp., *Paederus fuscipes*, Predators

Abstract

This study aims to analyse the diversity and dominance of insect species in maize fields in Caturharjo Village, Sleman District, Yogyakarta. The research was conducted from March to August 2025 on 1,000 m² of maize fields divided into three plots, each measuring 10 × 15 m. Light traps were installed in the centre of each plot, and insects were captured manually (direct capture) every three days. Species diversity was calculated using the Shannon-Wiener Index, dominance using the Simpson Index, and the data were analysed for correlation with abiotic factors. The results showed that the total number of insect individuals in the vegetative phase of maize plants was 19,874 individuals, consisting of 6 orders, 24 families, and 30 species. The largest proportion of insects were predators (33.33%), followed by herbivores (26.67%), maize pests (16.67%), visitors (10%), detritivores (10%), and pollinators (3.33%). The insect diversity index was (H') = 0.83, which was classified as low diversity, and the dominance index was (D) = 0.18, indicating low dominance. The conclusion of this study is that the insect species diversity at the study site was low, with no dominant species found, and a total of 30 insect species found.

Introduction

The role of insects in agricultural ecosystems is very diverse, ranging from natural enemies to pollinators (Aveludoni, 2021). The role of insects is inseparable from their activities, which are divided into two categories: diurnal and nocturnal insects (Aveludoni, 2021). Diurnal insects are synonymous with their role as natural enemies (Nugroho et al., 2021) and pollinators (Nugroho et al., 2021). Meanwhile, nocturnal insects are synonymous with their role as pests (Aveludoni, 2021). Although not all nocturnal insects act as pests, there are also nocturnal insects that act as natural enemies (Neher & Barbercheck, 2019) or decomposers (Neher & Barbercheck, 2019).

Several insects are known to be pests of maize plants, especially in the vegetative phase, such as seed flies (*Atherigona oryzae*), leaf borers (*Spodoptera* spp., *Mythimna separata*, *Chrysodeixis chalcites*), stem borers (*Ostrinia furnacalis*) and cob borers (*Helicoverpa armigera*) (Subiadi & Sipi, 2019). The presence of insect pests in maize fields is one of the factors that can threaten maize productivity (Aji et al., 2018). Some of the damage and losses caused by insect pests include *S. frugiperda* and *S. litura*, which cause 25-50% damage to leaves and stems, thereby reducing yields by 58% (Hutasoit et al., 2020). Furthermore, if the population of these two pests is high, they can damage maize cobs (Hutasoit et al., 2020), resulting in a decline in maize prices and a decrease in farmers' income (Hutasoit et al., 2020).

The high level of damage is due to the fact that their feeding activity occurs at night (Ilham et al., 2021), making monitoring of feeding activity and control of the insect's adult population less efficient as these activities have traditionally been carried out during the day (Ilham et al., 2021). The damage that occurs during this phase not only hinders plant development but can also reduce the quantity and quality of the harvest, which has a direct impact on farmers' income (Ilham et al., 2021). In addition, understanding the interaction between the vegetative phase and pest attacks is very important for formulating effective control strategies, including the use of resistant varieties and cultivation techniques that can reduce plant susceptibility to these pests (Ilham et al., 2021).

Research on insect diversity in maize plants, especially during the vegetative phase, has been conducted in several locations. Research from (Chirinos et al., 2024) along the Ecuadorian coast found that 44.2% of nocturnal insects were plant feeders and 55.8% were natural enemies. Research (Amiruddin et al., 2023) in Tojo Una-Una, Central Sulawesi, Indonesia, found 21 insect species belonging to 4 orders. Another study from (Permana et al., 2024) in Tamansari District, Tasikmalaya City, found 14 insect species divided into 6 orders. However, there is one location that is one of the maize production centers in Sleman Regency that has never been studied for insect diversity on maize plants in that location. This location is Caturharjo Village, Sleman District, Sleman Regency, Special Region of Yogyakarta. Maize is an important agricultural commodity in Sleman Regency, with a harvested area of 4,585 hectares and production exceeding 33,000 quintals in 2024, indicating its significant contribution to regional agriculture. At the village level, Caturharjo Village is one of the main maize production areas in Sleman Subdistrict, with a harvested area of approximately 167 hectares and total production reaching 1,153 tons in 2021 (BPS Sleman, 2022). These figures highlight the importance of Caturharjo Village as a representative maize production site. Despite its importance, studies on insect diversity associated with maize plants in this location have not yet been conducted.

Research on insects, particularly on maize plants, has been conducted in the area regarding natural enemies, especially the parasitoid *S. frugiperda* by (Nurkomar et al., 2024) alternative hosts of *S. frugiperda* (Putra et al., 2024). Previous studies in this area primarily focused on parasitoids and the population dynamics of *S. frugiperda* as a major maize pest. However, these studies did not assess the overall insect community structure, including species composition, diversity index, and dominance index during the vegetative phase of maize plants. Therefore, this study addresses this knowledge gap by analysing the diversity and dominance of the entire insect community associated with maize fields, providing a more comprehensive understanding of the agroecosystem, and the population and attack rate of *S. frugiperda* (Nurkomar et al., 2024). Therefore, this research is important to understand the role of insects in agricultural ecosystems, especially on maize plants. The objective of this study is to analyse the level of diversity and dominance of insect species in maize fields in Caturharjo Village, Sleman District, Yogyakarta. This study is expected to provide identify potential natural enemies such as predators and parasitoids that can contribute to biological control of maize pests, support the development of integrated pest management (IPM) strategies, and provide a scientific basis for reducing excessive use of chemical pesticides, thereby promoting more sustainable and environmentally friendly pest management practices for farmers in Caturharjo Village.

Materials and methods

1. Materials (if necessary)

The materials that used in this study were insects caught in light traps (Klaper-X), 70% alcohol, 32x64 mm label paper (Phoenix), and liquid detergent (Rinso). The 70% alcohol used was technical alcohol with a concentration of 70% (v/v), manufactured by OneMed, Indonesia. The label paper used was Phoenix brand label paper, manufactured by Phoenix Paper, Indonesia. The liquid detergent used was Rinso liquid detergent, manufactured by PT Unilever Indonesia Tbk., Indonesia, with a standard commercial formulation available on the market. All materials were used according to the manufacturer's specifications without further modification.

2. Method and research design

Determination of Sampling Location

Sampling was conducted in Sleman District, Sleman Regency, Yogyakarta. The land used was at least 1000 m² in size. The land was then divided into three plots, each measuring 10 x 15m.

Measurement of Abiotic Factors

The abiotic factors that measured in the study were wind speed using an Benetech GM816 digital anemometer (Benetech, China) and air temperature and humidity using a HTC-1 digital thermohygrometer (HTC Instruments, China). Abiotic data measurements were taken three times at each sampling location, with repetitions every seven minutes.

Insects Sampling

Insect samples were collected directly and indirectly. Direct collection was carried out using hand capture, while indirect collection used light traps. Light traps were chosen to capture insects that are active at night (nocturnal). One light trap was installed in the center of each plot (Figure 1), resulting in a total of three light traps installed in the sampling area. Sampling was conducted by two researchers in each plot. Observations were carried out for 30 minutes per plot. The insect search was conducted using a systematic search pattern by slowly walking across the entire plot area from one side to the other. Plants were visually examined on the leaves, stems, and surrounding plant areas to ensure thorough and consistent observation in each plot.

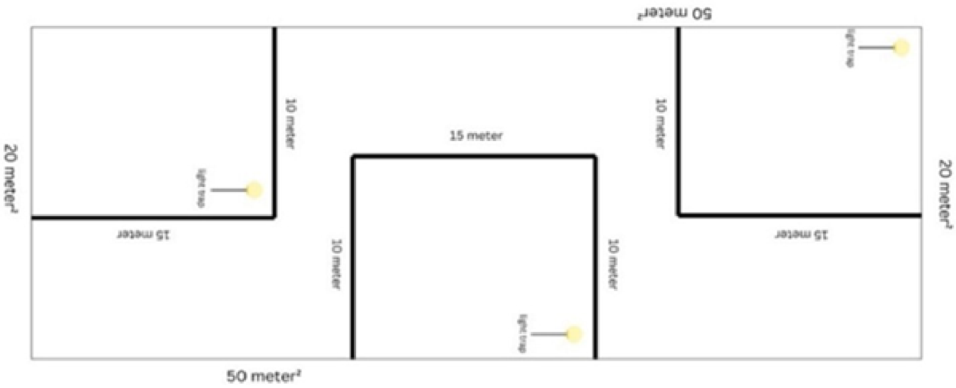

Figure 1. Schematic diagram of the research area and sampling plot

Insects were captured directly in each sampling plot. Sampling was carried out manually. Insects found in the research plot were collected by hand and placed in plastic bottles filled with 70% alcohol. Direct capture was carried out between 07:30 and 09:30 WIB.

Indirect insect capture using light traps. Light traps (Figure 2) were installed in the morning and left to charge during the day, so that the lights on the traps will turn on at night. The light traps are powered by solar panels, so that they charge during the day and turn on automatically when it gets dark. This reduces the bias of catching insects during the day that were attracted to the light. The bottom of the lamp was fitted with a tray containing soapy water (1:1) to kill the trapped insects. The soapy solution was prepared by mixing liquid detergent and water at a ratio of 1:1 (v/v), consisting of 500 mL Rinso liquid detergent mixed with 500 mL clean water, resulting in a total volume of 1000 mL solution. This solution was used to assist in capturing and preserving insect specimens. The traps were installed during the vegetative phase of the maize, and the insects in the tray were collected in the morning during direct capture, sampling was conducted over a total period of five weeks during the vegetative phase of the maize plants. Insect collection was carried out every three days, which is equivalent to approximately two sampling events per week. Therefore, over the five-week period, a total of 10 sampling events were conducted in each plot. and the soapy water in the tray was refilled. The insects in the tray were then transferred to plastic bottles for identification down to the species level in the laboratory.

Figure 2. Light trap

3. Insects Identification

The insects that collected from the field were then taken to the Ecology and Systematics Laboratory at Ahmad Dahlan University to be identified to species level. First, the insects were removed from the plastic bottles and washed with running water to remove any traces of detergent used to kill them. The washed insects were then placed in plastic bottles filled with 70% alcohol. The insects were identified to species level by observing their morphological characteristics, namely the wings, head, body pattern, body shape, antenna segments, leg segments, and body colour. Insect identification was carried out using books from (Ruslan, 2024) and (Ruslan, 2015). In addition to books, identification was also carried out using identification journals from [(Aji et al., 2018), (Amiruddin et al., 2023), (Shahabuddin et al., 1970)]. The identified insects were then photographed and counted to determine the abundance of each species.

4. Calculation of Diversity Index

The number of individuals from each insect species obtained was then used to calculate the diversity index. The formula for the species diversity index used in a community according to (Odum, 1996) in (Sirait et al., 2018) is as follows:

$$H' = \sum_{i=1}^{S} \text{pi In (pi)}$$

Notes:

H’ = Shannon diversit index

pi = The proportion of the number of individuals i to the total number of individuals

The criteria for the Shannon–Wiener diversity index value according to (Odum, 1996)in (Sirait et al., 2018) (Table 1) are as follows:

Table 1. The criteria of Shanon-Wienner diversity index

Criteria	H’
Low	H’ < 1
Moderate	1 < H’< 3
High	H’ > 3

The range of diversity index values, according to (Odum & Gary, 1993), describes the stability of a community. The range of values is divided into three criteria based on the H' index, namely: (1) if H' < 1: The community is unstable or has low diversity with an uneven number of individuals and one species is dominant; (2) if 1 < H' < 3: The community is moderately stable or has moderate diversity with an uneven number of individuals of each species but no dominant species; and (3) H' > 3: The community is stable or has high diversity with an even number of individuals of each species and no dominant species.

5. Calculation of Simpson Dominance Index

The Dominance Index was calculated using Simpson formula of dominance index according to (Odum & Gary, 1993) in (Sirait et al., 2018):

$$D = \sum (Pi)^2$$

Notes:
D = Dominance index
pi = The proportion of the number of individuals i to the total number of individuals

According to (Krebs, 1972) in (Hoek, 1997), the range of dominance index values is as follows: (1) if 0.00 < D < 0.50, species dominance is low; (2) if 0.50 < D < 0.75, species dominance is moderate; and (3) if 0.75 < D < 1.00, species dominance is high.

6. Data Analysis

The data obtained was analyzed using correlation tests to examine the relationship between abiotic factors and the abundance of insects found.

Results and discussion

1. Result-1

Insects Species in The Vegetative Phase of Maize Plants in Caturharjo Village, Sleman, Yogyakarta.

The results of research and discussion contains the results of the analysis is the answer of the question/ problem of research. The results of this study identified insect species in the vegetative phase of maize plants consisting of 6 orders, 24 families, and 30 species (Table 2). The most abundant insects were from the order Coleoptera, consisting of 8 families and 11 species. The species found in abundance were *Lathrobium* sp. with 5,301 individuals, *Culicoides* sp. (4,773 individuals), and *Paederus fuscipes* (3,020 individuals).

Table 2. Insect species of maize plants in Caturharjo Village, Sleman, Yogyakarta

Orders	Families	Species	Abundance (individual)	Ecological function
Coleoptera	Staphylinidae	*Lathrobium* sp.	5301	Predator
		Paederus fuscipes	3020	Predator
	Carabidae	*Clivina* sp.	1911	Predator
		Stenolophus sp.	1629	Predator
		Licinus punctatulus	47	Predator
	Coccinellidae	*Coccinella transversalis*	2	Predator
	Brentidae	*Cylas formicarius*	22	Herbivore
	Scarabaeidae	*Anomala albopilosa*	19	Herbivore
	Chrysomelidae	*Aulacophora nigripennis*	8	Herbivore
	Cetoniiae	*Protaetia fusca*	1	Maize pest
	Phalacridae	*Stilbus* sp.	295	Detritivore
Hymenoptera	Formicidae	*Anoplolepis gacilipes*	2144	Predator
		Pachycondyla harpax	93	Predator
	Vespidae	*Eumenes* sp.	1	Predator

Orders	Families	Species	Abundance (individual)	Ecological function
	Apidae	*Apis mellifera*	1	Pollinator
Hemiptera	Miridae	*Deraeocoris lutescens*	10	Predator
	Lygaeidae	*Nysius* sp.	3	Herbivore
	Pentatomidae	*Nezara viridula*	17	Maize pest
Lepidoptera	Crambidae	*Scirpophaga* sp.	36	Herbivore
	Pieridae	*Leptosia nina*	12	Herbivore
	Eribidae	*Utethesia* sp.	4	Herbivore
	Arctiidae	*Creatonotos gangis*	1	Herbivore
	Pyralidae	*Pyralidae* sp.	268	Maize pest
		Pyralidae sp1.	7	Maize pest
	Noctuidae	*Spodoptera frugiperda*	158	Maize pest
Diptera	Ceratopogonidae	*Culicoides* sp.	4773	Visitors
	Sciaridae	*Sciarid* sp.	14	Visitors
	Bibionidae	*Plecia ruficollis*	1	Visitors
	Calliphoridae	*Chrysomya megacephala*	34	Detritivore
Blattodea	Termitidae	*Macrotermes gilvus*	42	Detritivore

Based on the results obtained, the insect with the highest abundance at the study site was *Lathrobium* sp. from the Staphylinidae family (Figure 3). This species is a predatory insect that preys on various types of larvae and imagoes of small insects and several soil arthropods (Ardiyanti et al., 2018). Recent studies confirm that rove beetles (Staphylinidae) are generalist predators that feed on various soil-associated invertebrates, including nematodes, mites, springtails (Collembola), and dipteran larvae, rather than exclusively targeting adult flying insects (Stocker et al., 2022). Furthermore, several Staphylinidae species have been documented as soil-dwelling predators that attack immature stages of insects such as pupae and larvae in the soil or organic substrate, supporting their role as important biological control agents in agroecosystems. In addition, species within the genus Lathrobium are described as soil-inhabiting beetles associated with leaf litter and soil microhabitats, where they interact with other soil invertebrates and function as predators within the soil ecosystem (Senda, 2023). These findings indicate that their predatory behavior is primarily directed toward soil-dwelling organisms and immature insect stages rather than adult Diptera. The ecological role of *Lathrobium* sp. is now described more accurately as a generalist soil predator feeding on small soil-dwelling arthropods and immature insect stages.

A B C

Figure 3. The most abundance insects that found in Caturharjo Village, Sleman, Yogyakarta. Lathrobium sp., (B) Culicoides sp., (C) P. fuscipes.

The entire prey of this species was found in abundance at the research site, which may have contributed to the high number of *Lathrobium* sp. individuals in this study. This is consistent with the statement in (Anggraini et al., 2020), which states that the population size of predators follows the number of prey found in a location. In addition, the research site was adjacent to rice fields, which also contributed to the abundance of this species. According to (Shahabuddin et al., 1970) *Lathrobium* sp. can usually be easily found in rice fields because it follows its prey, which are leafhoppers. This is in accordance with the study by (Shahabuddin et al., 1970), which found *Lathrobium* sp. in adjacent rice fields and maize fields.

The next species found in abundance in this study was *P. fuscipes* (Figure 3), which also belongs to the Staphylinidae family. The discovery of this species in abundance in this study was possible because the maize fields were adjacent to rice fields. *Paederus fuscipes* itself is the main predator of leafhoppers in rice fields and is a keystone species that regulates the dynamics of the leafhopper population in rice fields (Ritanti & Haryadi, 2021). The location of the rice fields adjacent to the maize fields allows this species to move when there is no prey in the rice fields. In addition to preying on leafhoppers, this species can also prey on the eggs and early larvae of *S. frugiperda* (Karundeng et al., 2024), the larvae of *A. albopilosa* and the larvae of *Scirpophaga* sp. [(Atmowidi et al., 2016) ; (Sutiharni et al., 2023)]. The discovery of these prey in this study resulted in this species being found in the maize fields where the study was conducted.

The last species found in abundance in this study was *Culicoides* sp. (Figure 3), which belongs to the Ceratopogonidae family. *Culicoides* sp. was commonly found in maize plantations during the vegetative phase because the environmental conditions during this phase were very conducive to the life cycle and activity of this species. The vegetative phase of maize is generally characterised by high soil moisture, availability of organic matter, and low vegetation, resulting in a relatively open soil surface (Darodjah et al., 2024). These relatively open soil conditions will cause an abundance of weeds in the form of grasses that can grow around maize plants. These grasses can be used by this species as a habitat, according to a study (Kameke et al., 2021) that found *Culicoides* sp. in large numbers in grasslands.

In addition to counting the number of insects, this study also obtained information about the ecological roles of the insects found. Based on the results of the study, the roles of the insects found can be classified as herbivores, maize pests, predators, visitors, detritivores, or pollinators. The most common role of insects found in this study was as predators (33.33%) (Figure 4). Other insect roles found in this study were herbivores (26.67%), maize pests (16.67%), visitors (10.00%), detritivores (10.00%), and pollinators (3.33%).

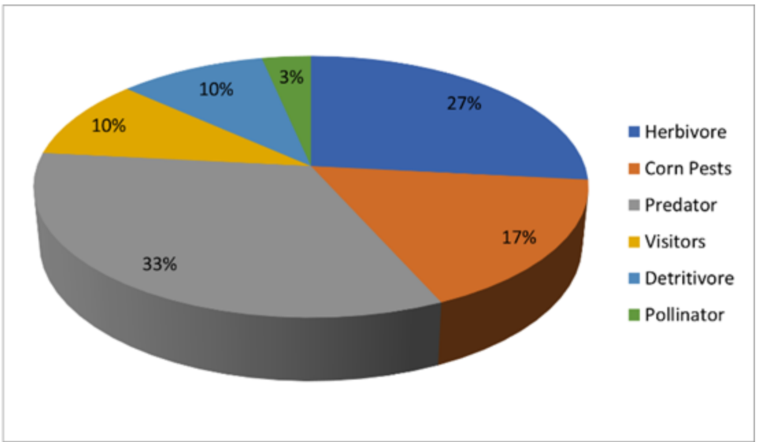

Figure 4. The composition of insect ecological function in this study.

The results of this study are consistent with the findings of (Melhanah et al., 2020), which found that insects with an ecological role as predators dominated the insects found in maize crops. This may be because during the vegetative phase of maize crops, there is a high population of pests, providing an abundant food source for predators (Jannah et al., 2023). These conditions led to the highest number of insect species found to play a role as predators in this study. Predators play an important role in controlling pest populations that attack maize plants in the early stages of growth (Abtar et al., 2013) ; (Ainun et al., 2023)]. In addition, several predators from the Staphylinidae and Formicidae families are often found to be active at nigh (Ainun et al., 2023) t. The large number of nocturnal insects found to be predators is due to their activity at night, which is opposite to the activity of herbivorous insects, which are mostly active during the day (Melhanah et al., 2020).

Although not all herbivorous insects are diurnal, most herbivorous insects found in this study are active during the day. Therefore, at night, predatory insects find it easier to catch their prey, which is resting (Melhanah et al., 2020). This activity is a form of energy efficiency practised by predatory insects. This is in line with the statement (Novriyanti et al., 2024), which states that one form of energy efficiency in predatory insects is by preying on their prey while they are resting. The ease of finding prey is what causes many predatory insects to be active at night (Novriyanti et al., 2024). In addition, the vegetative phase of maize is a phase that provides abundant food for predatory insects, namely maize pests (Izza et al., 2021). This is the factor behind the high percentage of insects with an ecological role as predators found in this study. According to Amrullah (2019) the presence of nocturnal insects that act as predators is very significant in maintaining the balance of agricultural ecosystems because they can suppress pest populations, such as *S. frugiperda*, which are also active at night. Thus, these predatory insects can reduce crop damage without the need for chemical insecticides. In addition, research (Melhanah et al., 2020) also found that the ecological role of predatory insects in maize fields was 62.50%.

The lowest role of insects in this study was found to be as pollinators. This low role was found in this study because most pollinators are active during the day (Schulz et al., 2020) In addition, maize flowering or opening also occurs during the day (Schulz et al., 2020) This is what caused the role of insects as pollinators to be found with a low percentage in this study. According to (Landoni et al., 2024), maize flowers are pollinated by pollinators from 09:00 to 17:00 WIB. In addition, maize flowers are easily shed and the male and female flowers are separated, which also causes fewer pollinating insects to visit and pollinate them (Landoni et al., 2024). According to (Begcy et al., 2024), some pollinating insects that visit maize plants usually have the ability to perch on maize flowers, so they do not cause shedding on maize plants. In addition, according to (Landoni et al., 2024), maize plant flowers also do not have sufficient nutritional content for pollinating insects, resulting in few pollinators visiting maize flowers.

In addition to the factors mentioned above, the number of insects in this study was also influenced by abiotic factors at the study site. The abiotic factors measured in this study were air temperature (°C), air humidity (%), and wind speed (m/s). The results of the abiotic factor measurements can be seen in Table 3 below.

Table 3. Abiotic factors that measured in the field

Time of measurement	Air temperature (°C)	Air humidity (%)	Wind speed (m/s)
M1	26	60	1
M2	28	57	0.8
M3	30	72	1
M4	29	74	1
M5	28	75	1

Notes:
M: Week of measurement

Based on Table 3, the results of abiotic factor measurements at the research site indicate environmental conditions suitable for insect activity, namely an air temperature range of 26–30°C, with air humidity ranging from 57–75%, and wind speed of 0.8–1 m/s. These abiotic factor measurements are still within the optimal conditions for insects to live. According to (Setiarno et al., 2022), the optimal temperature for insect survival ranges from 25 to 45°C. In addition, the optimal air humidity for insect survival ranges from 50 to 75% (Setiarno et al., 2022). Based on the measurement results, it was found that the temperature and air humidity still support insects to reproduce at the research location, so that the abundance of insects found is also high.

In addition to air temperature and humidity, wind speed also affects the insect population in a location (Begcy et al., 2024). The optimal wind speed for insect movement and migration ranges from 0.8 to 1.65 m/s, so the wind speed measured at the study site still supports optimal conditions for insects to live in that location. According to (Begcy et al., 2024), wind speeds that are not too high allow insects to actively move around in search of food or shelter, which supports the survival of insects in a location. The results of the abiotic factor measurements were then tested using a correlation test to see whether there was a relationship between abiotic factors and insect abundance at the research site. The results of the correlation test can be seen in Table 4 below.

Table 4. Correlation test of abiotic factors with insect abundance in the field

Correlations						
			Insect abundance	**Air temperature**	**Air humidity**	**Wind speed**
Spearman's rho	**Insect abundance**	Correlation Coefficient	1.000	-.103	.500	.707
		Sig. (2-tailed)	.	.870	.391	.182
		N	5	5	5	5
	Air temperature	Correlation Coefficient	-.103	1.000	.308	.181
		Sig. (2-tailed)	.870	.	.614	.770
		N	5	5	5	5
	Air humidity	Correlation Coefficient	.500	.308	1.000	.707
		Sig. (2-tailed)	.391	.614	.	.182
		N	5	5	5	5
	Wind speed	Correlation Coefficient	.707	.181	.707	1.000
		Sig. (2-tailed)	.182	.770	.182	.
		N	5	5	5	5

Based on the results of the correlation test between the number of insect individuals obtained and abiotic factors, there was no correlation between the number of individuals obtained and the abiotic measurement results. This means that there is no significant relationship between abiotic factors and the number of insect individuals found, so it is likely that the main factor affecting insect abundance comes from biotic factors found at the study site. These biotic factors include food availability, competition between species, and the presence of predators and parasitoids that can control insect populations. In addition, plant biodiversity and habitat structure also play a very important role in determining insect abundance and distribution, as they provide shelter, food sources, and suitable living space (Allifah et al., 2019).

Diversity (H') and Dominance (D) Indexes of Insect at Vegetative Phase of Maize in Caturharjo Village, Sleman, Yogyakarta.

Based on the results of the analysis, the diversity index (H') was found to be 0.83 (Table 5). Based on the Shannon Weiner diversity index (H') criteria, a diversity index value <1 indicates that insect species diversity is low, and the species dominance value obtained was 0.18. This value falls into the low dominance category. This means that no single insect species dominates the ecosystem.

Table 5. Correlation test of abiotic factors with insect abundance in the field

Species	Abundance (individual)	Pi	Log Pi	Pi. Log Pi (H')	D
Anomala albopilosa	19	0.0009560229	-3.019531685	-0.002886742	0.0000009140
Protaetia fusca	1	0.000050316997	-4.298285285	-0.000216277	0.0000000025
Coccinella transversalis	2	0.000100634	-3.99725529	-0.00040226	0.0000000101
Paederus fuscipes	3020	0.151957331	-0.818278343	-0.124343393	0.0230910305
Lathrobium sp.	5301	0.266730402	-0.573927481	-0.153083908	0.0711451071
Cylas formicarius	22	0.001106974	-2.955862605	-0.003272063	0.0000012254
Aulacophora nigripennis	8	0.000402536	-3.395195298	-0.001366688	0.0000001620
Stenolophus sp.	1629	0.081966388	-1.086364201	-0.08904535	0.0067184888

Species	Abundance (individual)	Pi	Log Pi	Pi. Log Pi (H')	D
Clivina sp.	1911	0.096155781	-1.017024598	-0.097792795	0.0092459343
Licinus punctatulus	47	0.002364899	-2.626187428	-0.006210668	0.0000055927
Stilbus sp.	295	0.014843514	-1.82846327	-0.02714082	0.0002203299
Chrysomya megacephala	34	0.001710778	-2.766806368	-0.004733391	0.0000029268
Culicoides sp.	4773	0.240163027	-0.619493851	-0.148779519	0.0576782796
Sciarid sp.	14	0.000704438	-3.15215725	-0.002220499	0.0000004962
Plecia ruficollis	1	0.0000503170	-4.298285285	-0.000216277	0.0000000025
Deraeocoris lutescens	10	0.00050317	-3.298285285	-0.001659598	0.0000002532
Nezara viridula	17	0.000855389	-3.067836364	-0.002624193	0.0000007317
Nysius sp.	3	0.000150951	-3.821164031	-0.000576808	0.0000000228
Apis mellifera	1	0.0000503170	-4.298285285	-0.000216277	0.0000000025
Anoplolepis gracillipes	2144	0.107879642	-0.967060504	-0.104326141	0.0116380171
Pachycondyla harpax	93	0.004679481	-2.329802337	-0.010902265	0.0000218975
Eumenes sp.	1	0.0000503170	-4.298285285	-0.000216277	0.0000000025
Spodoptera frugiperda	158	0.007950086	-2.099628199	-0.016692224	0.0000632039
Pyralidae sp.	7	0.000352219	-3.453187245	-0.001216278	0.0000001241
Pyralidae sp.1	268	0.013484955	-1.870150491	-0.025218896	0.0001818440
Scirpophaga sp.	36	0.001811412	-2.741982785	-0.00496686	0.0000032812
Utethesia sp.	4	0.000201268	-3.696225294	-0.000743932	0.0000000405
Creatonotos gangis	1	0.0000503170	-4.298285285	-0.000216277	0.0000000025
Leptosia nina	12	0.000603804	-3.219104039	-0.001943708	0.0000003646
Macrotermes gilvus	42	0.002113314	-2.675035995	-0.005653191	0.0000044661
Total	**19874**	**1.0000000000**	**-7.3178169700**	**-0.838883572**	**0.1800247568**

The H' value obtained in this study was low (H' < 1). This low H' value may have been caused by several factors related to the conditions at the study site. One of the main factors was the availability of food at the study site, which tended to be specific or limited, so that only a few insects were able to make optimal use of these food sources. The total number of insect individuals obtained was relatively high, namely 19.874, but their distribution was uneven due to accumulation in only a few species. This situation indicates an imbalance in the structure of the insect community at the research site, where the very high abundance of a few species causes a low H' value, while the existence of other species remains, but their numbers are much lower so that their contribution to community diversity is small. The H' value is influenced by two parameters, namely the number and type of insects obtained (Nisa et al., 2025). The fewer types of insects obtained and the higher the number of individuals of a type found, the smaller the H' value will be (Nisa et al., 2025).

Low H' values are also influenced by environmental factors such as erratic rainfall, which reduces insect activity as they tend to seek shelter to avoid raindrops. High soil moisture due to erratic rainfall can increase the risk of fungal and bacterial diseases in plants and animals, thereby suppressing the population of species that are not resistant to such conditions. The results of this study are in line with study (Nisa et al., 2025) related to insect diversity in maize crops in the rice fields of Randupadangan Village, Gresik Regency, East Java Province, which produced a diversity index (H') of 0.24. The study found that the low H' value was due to heavy rainfall flooding the soil, which caused the death of soil insects, as well as the eggs and nymphs of insects on plant stems being washed away by the rain. Another negative impact on insects is that when it rains, high air humidity and wind help spread insects, contributing to a decline in insect abundance. Temperature has a limiting effect on the growth of organisms when humidity is extremely high or low, but humidity has a more critical effect on organisms at high or low humidity levels. The smaller the number of species and the variation in the number of individuals per species, the smaller the diversity of an ecosystem. This situation can cause an imbalance in the ecosystem if a disturbance occurs.

Based on Table 5, the dominance value of insect species obtained is 0.18. Low dominance values can occur due to stable environmental conditions, allowing many species to coexist without any one species dominating excessively. The availability of sufficient and diverse resources can support the existence of various species with different ecological needs so that no species dominates. In addition, the presence of plants other than maize planted around the research area increases the food choices available to insects. The more food available, the less likely it is that any species will dominate the location (Putriyani et al., 2024). This is in line with statement (Basna et al., 2017), which states that plant diversity as producers can suppress the dominance of a species in a particular ecosystem. The results of this study are consistent with the results of a study by (Nisa et al., 2025), which obtained a dominance index calculation result showing that the dominance index value was 0.0002. Judging from the dominance index, if the value obtained is close to 0, it can be said that the dominance index is low. According to (Wijayanti et al., 2021), the results are good if the dominance value in the insect community is low because it can be interpreted that there is uniformity in insect types and the potential for environmental balance in maintaining insect conservation.

In addition, the large number of predators found in this study can also reduce the dominance of a species. Predators usually do not have only one prey (Idris et al., 2023), although there are also specialist predators (Idris et al., 2023). The discovery of many predators in this study can suppress the population of herbivorous insects so that they do not dominate an ecosystem through predation (Idris et al., 2023). As stated in (Winarni et al., 2020), the presence of predators prevents herbivores from dominating a particular area because their populations will always be naturally controlled. In addition to controlling the population of herbivorous insects, predators can also control the population of other predatory insects through competition (Winarni et al., 2020). Competition within a species or with other species in an ecosystem can prevent the predator population from increasing or dominating the ecosystem (Hanizah, 2021). This is in line with the statement (Winarni et al., 2020) that competition among second-level consumers or higher can help maintain the population density of a carnivore below a certain threshold.

Conclusion

Six orders, 24 families, and 29 species of insects were found in the vegetative phase of maize in Caturharjo Village, Sleman. The order with the highest number of families and species was the Coleoptera order, with the highest number of individuals found in the species *Lathrobium* sp. The H' value obtained in this study was low, with no species dominating the insect community. This finding is important as a basis for understanding the structure of the insect community, which can support the sustainable management of the maize agricultural ecosystem.

Author Statements

Acknowledgements and funding statements: not applicable.
Competing of interest: The authors declare no competing interests.
Author's contributions: ILIP designed the research and methodology, DSMP collect the sample, DSMP and ILIP identified the samples, DSMP and ILIP analyze the data, DSMP and ILIP write the manuscript, ILIP approved the final version of the manuscript.
Generative AI: not applicable.
Data availability: All data supporting the findings of this study are available within the paper.

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