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EKSPLORASI KEANEKARAGAMAN SERANGGA MUSUH ALAMI PADA PERKEBUNAN CENGKEH *(Syzygium aromaticum)* DI KECAMATAN TEUPAH SELATAN KABUPATEN SIMEULUE, ACEH

EXPLORATION OF DIVERSITY OF NATURAL ENEMY INSECTS ON CLOVE PLANTATIONS (Syzygium aromaticum) IN SUB-DISTRICT SOUTH TEUPAH DISTRICT SIMEULUE, ACEH

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ABSTRAK

Salah satu sub-sektor pertanian di Indonesia yang perlu terus dikembangkan adalah sub sektor perkebunan cengkeh, Kabupaten yang ada di Provinsi Aceh yang membudidayakan tanaman cengkeh adalah Kabupaten Simeulue. Kabupaten Simeulue terdiri dari sepuluh Kecamatan, yaitu Kecamatan Teupah Barat, Teupah Tengah, Teupah Selatan, Simeulue Timur, Simeulue Tengah, Simeulue Barat, Simeulue Cut, Salang, Teluk Dalam, dan Alafan. Wilayah Kabupaten Simeulue merupakan daerah yang sangat berpotensial dangan berbagai usaha pertanian dan perkebunan. Penelitian ini di lakukan untuk mengetahui keanekaragaman serangga musuh alami pada perkebunan cengkeh (*Syzygium aromaticum*) di Kecamatan Teupah Selatan Kabupaten Simeulue, Aceh. Penelitian ini menggunakan metode purposive sampling pada tiga desa yang berada di Kecamatan Teupah Selatan, yaitu Desa Ulul Mayang, Desa Batu Ralang, dan Desa Kebun Baru. Pengambilan serangga musuh alami dengan menggunakan perangkap. Hasil penelitian yaitu indeks keanekaragaman serangga musuh alami yang didapatkan diketiga tempat tersebut seimbang sebesar 2,26 (Desa Ulul Mayang), 2,14 (Desa Kebun Baru), dan 2,06 (Desa Batu Ralang); dengan nilai Indeks kemerataan tertinggi dengan nilai 1,0 di desa Ulul mayang, dan di ikuti Desa Kebun baru dengan nilai 0,98 serta Desa Batu Ralang dengan nilai 0,98 dengan arti kemerataan sedang, Serta indeks dominasi dari ketiga desa dengan indeks 0,06 ini menunjukkan bahwa dari ketiga desa tidak ada serangga mendominasi. Ditemukan juga 10 jenis serangga hasil identifikasi yang menjadi musuh alami pada perkebunan cengkeh yaitu *Aphidius* sp., *Brachymeria* sp., *Polistes* sp., *Tenodera* sp., *Priocnemis* sp., *Aphidiinae* sp., *Acarozumia* sp., *Sericophorus* sp., *Serangium* sp., *Mordellina* sp., yang terdiri dari 3 parasitoid, 6 predator dan 1 serangga pollinator.

KEYWORDS:

Diversity, exploration, insect, natural enemy

ABSTRACT

One of the agricultural sub-sectors in Indonesia that needs to be continuously developed is the clove plantation sub-sector, the District in Aceh Province that cultivates clove plants is District Simeulue. District Simeulue consists of ten Sub-Districts, namely West Teupah, Central Teupah, South Teupah, East Simeulue, Central Simeulue, West Simeulue, Simeulue Cut, Salang, Teluk Dalam, and Alafan. The District Simeulue area is a very potential area with various agricultural and plantation businesses. This study was conducted to determine the diversity of natural enemy insects in clove plantations (Syzygium aromaticum) in South Teupah Sub-District, Simeulue District, Aceh. This study used the purpose sampling method in three villages in South Teupah Sub-District, namely Ulul Mayang Village, Batu Ralang Village, and Kebun Baru Village. Natural enemy insects were collected using traps. The results of the study are the diversity index of natural enemy insects obtained in the three places are balanced at 2.26 (Ulul Mayang Village), 2.14 (Kebun Baru Village), and 2.06 (Batu Ralang Village); with the highest evenness index value with a value of 1.0 in Ulul Mayang Village, followed by Kebun Baru Village with a value of 0.98 and Batu Ralang Village with a value of 0.98 with the meaning of moderate evenness, and the dominance index of the three villages with an index of 0.06 shows that from the three villages there are no dominant insects. Also found 10 insects species identified as natural enemies in clove plantations, namely Aphidius sp., *Brachymeria* sp., *Polistes* sp., *Tenodera* sp., *Priocnemis* sp., *Aphidiinae* sp., *Acarozumia* sp., *Sericophorus* sp., *Serangium* sp., *Mordellina* sp., *consisting of 3 parasitoids, 6 predators and 1 pollinator insect.*

1. INTRODUCTION

The District Simeulue area is a very potential area with various agricultural and plantation businesses. Plantations such as clove plants that are in accordance with the climate and soil structure that are in accordance with the growing requirements of the clove plant (Silvia, 2022). Based on existing data, the need for cloves in Indonesia is around 120 thousand tons per year. The largest community plantation clove plants in Aceh Province are still centered in Simeulue District covering an area of 15,960 Ha or 63.59 percent of the total clove plantation area in Aceh Province of 25,091 Ha (BPS Aceh Province, 2020). In 2019, it was known that Simeulue Regency contributed to the total production of community plantation cloves of 3,719 tons or 70.08 percent of the total production of community plantation cloves in Aceh Province, which was 5,315 tons (BPS Aceh Province, 2020). with the number of Immature Plants (TBM) 2,287, Mature Plants (TM) 6,045 Ha and the number of Damaged Plants (TR) with a total of 7,669 Ha in 2020 (Distanbun, 2022).

According to Wahid *et al*., (2024) the types of insects found on clove plants (*Syzygium aromaticum* L.) in Ternate District consist of 15 types, namely weaver ants (*Oecophylla smaragdina*), black garden ants (*Dolichoderus thoracicus*), fire ants (*Solenopsis invicta*), small black ants (*Monomorium minimum*), brownish ants (*Anoplolepis gracilipes*), wood ants (*Polyrhachis pruinosa*), flies (Musca domestica), grasshoppers (Atractomorpha crenulata), brown butterflies (Melanitis *leda*), black butterflies (*Troides hypolitus*), yellow butterflies (*Eurema candida*), termites (*Macrotermes gilvus*), horned beetles (*Oryctes rhinoceros*), red beetles (*Coccinella sexmaculata*), and antlers (*Myrmeleon formicarius*). Pest attacks in large-scale nursery or plantation areas can slow down the growth process and even cause death in clove plants. Inhibited clove plant growth results in low production both in quality and quantity. The decline in clove production caused by pest attacks can reach 10% to 25% (Trianto *et al*., 2020).

This beetle usually attacks clove flowers, which can cause damage to the reproductive structure of the plant, disrupting the flowering process and seed formation. and clove fruit flies, these flies usually attack ripe clove fruit. Attacks by fruit flies can damage the fruit and accelerate decay (Cahyaningrum *et al*., 2023). According to research conducted by Johan et al. (2022), on clove plants in Gampong Meunasah Beutong, Lhoknga Sub-district, Aceh Besar Regency, a greater number of natural enemy species were found compared to pest species, namely *Thrip* sp., Apis sp., *Liriomyza huidobrensis*, *Coonatus* sp., *Dolichaderus thoracicus*, *Doru lineare*, *Coptotermes carvignatus*, *Anax imperator, Polister fuscatus, Coscus cossus, Nazera viridula, Coccinella transversalis, Valanga nigrikormis, Chrysochroa fulminans, Gryllus bimaculatus*, and *Anobium punctatum*. According to the research results of Nuraini (2019), insect species of *Crematogaste, Anoplolepis, Xylocopa, Vespa, Drosophila, Stomorhina, Lucilia, Chrysomya, Musca, Camptomyia, Orchestes, Carpophilus, Stagmomantis,* and *Ligocoris, Aphaenogaster* and *Anoplolepis, Coptotermes gestroi, Coptocercus* sp, *Hexamitodera* were found in clove plants.

Some species of ladybugs, such as green lacewings, eat the eggs and larvae of insect pests. Ladybug larvae are known as very effective predators and are often used in biological pest control (Puspitarini, 2021). Several types of wasps, such as parasitoid wasps from the families Ichneumonidae and Braconidae, are common parasitoids in controlling pest insect populations. They lay their eggs in or around the eggs or larvae of pest insects, and when the eggs hatch, the parasitoid larvae will eat their hosts (Wahyuni *et al*., 2021).

Until now, information about the types of pests on clove plants in Simeulue District is still very limited, especially in Ulul Mayang Village, Kebun Baru and Batu Ralang. In fact, indirectly, information about the spread of clove pests in plantation areas can be an illustration for farmers in the process of controlling and managing pests. So this research was condacted to provide information regarding the types of insect pests on clove plants (*Syzygium aromaticum*) in District Simeulue.

2. MATERIAL AND METHOD

The research method used in this study is the purpose sampling method to three villages, namely Ulul Mayang Village, Kebun Baru Village, and Batu Ralang Village in South Teupah District. Determination of the research location was obtained by purposive sampling (sampling intentionally), by looking at the potential area or plantation to be surveyed and the environment that allows and the age of each clove plant (10-15) years, production centers, the area of clove farmers' land has ± 100 m. The following is a map of the research location.

Insect data collection on clove plantation land with a land area of ±100 m^2 using traps, namely yellow pan traps, pitfall traps, sweep net traps. Insects that are caught are immediately put into a collection bottle that has been filled with 70% alcohol.

Diversity index is a very useful parameter to determine the state of succession or community stability. Then the diversity index is calculated for 8 weeks. The formula for the diversity of Shannon-Wiener species (Elisabeth *et al*., 2021)

$$H' = -\Sigma \, pi \ln pi \qquad pi = \frac{ni}{N} \qquad (1)$$

Note: H = Shannon-Wiener diversity index; ni = Number of individuals of a species; N = Total number of individuals of all species.

The magnitude of the species diversity index according to Shannon-Wiener is defined as follows: (a) H value > 3 indicates that the species diversity on a transect is highly abundant; (b) H value 1 ≤ H ≤ 3 indicates that the species diversity on a transect is moderately abundant; (c) H value < 1 indicates that the species diversity on a transect is low.

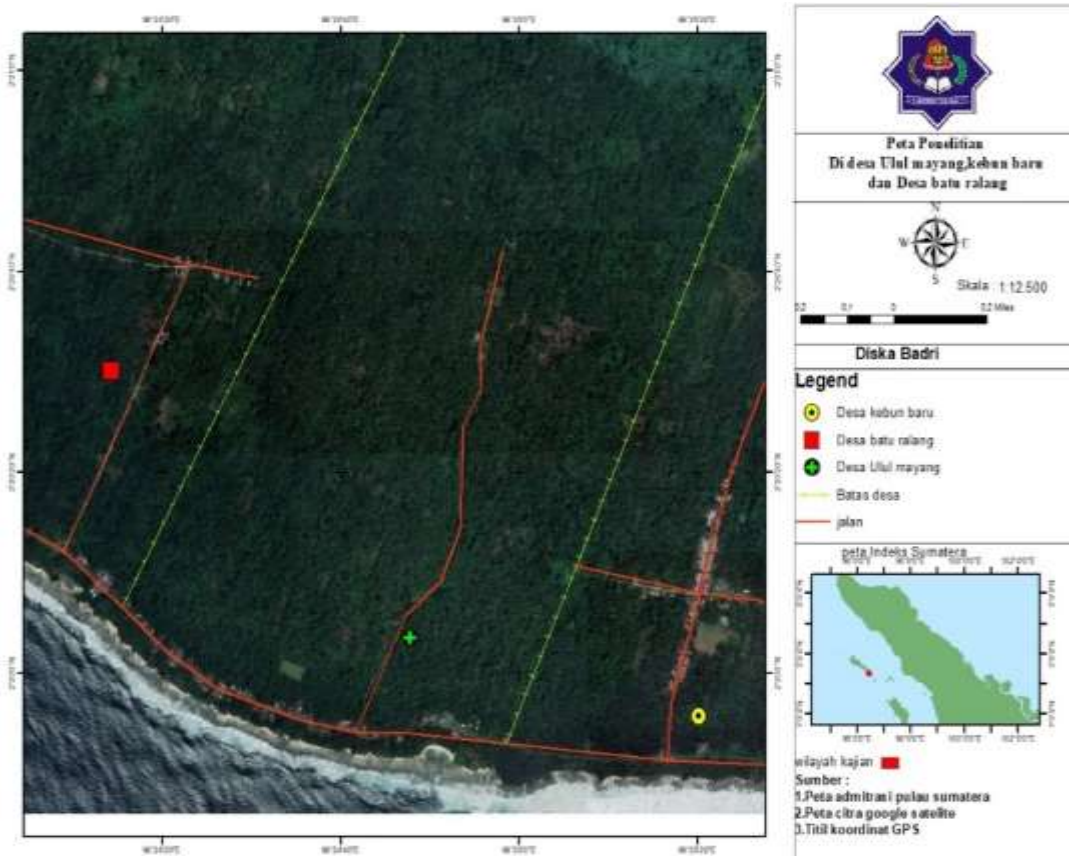

Figure 1. Research location map.

3. RESULT AND DISCUSSION

3.1 Natural Enemy Insect Population

Population and status data of insects on insect diversity in clove plantations (*Syzygium aromaticum*) in Teupah Selatan District, Simeulue Regency can be seen in Table 1. Insects that act as natural enemies include: *Aphidius* sp., *Brachymeria* sp., *Polistes* sp., *Tenodera* sp., *Mordellina* sp., *Priocnemis* sp., *Aphidiinae* sp., *Acarozumia* sp., *Sericophorus* sp., *Serangium* sp..

Table 1. Insect Population.

Figure	Species	Population			Type
		Ulul mayang	Batu ralang	Kebun baru	
	*Aphidius* sp.	16	14	8	parasitoid
	*Brachymeria* sp.	12	10	10	parasitoid
	*Aphidiinae* sp.	24	12	15	parasitoid
	*Polistes* sp.	10	8	7	Predator
	*Tenodera* sp.	13	13	12	Predator
	*Sericophorus* sp.	13	0	6	predator
	*Serangium* sp.	10	0	0	predator

	*Priocnemis* sp.	14	10	10	predator
	*Acarozumia* sp.	11	11	11	predator
	*Mordellina* sp.	18	15	18	polinnator
	Amount	125	93	97	

In Table 1. can be seen that in Ulul Mayang village the largest population of insects was found at 125 and followed by Kebun Baru village with 97 and the smallest number in Batu Larang village with 93. There are 10 types of natural enemy insects in clove plantations, namely *Aphidius* sp., *Brachymeria* sp., *Polistes* sp., *Tenodera* sp., *Priocnemis* sp., *Aphidiinae* sp., *Acarozumia* sp., *Sericophorus* sp., *Serangium* sp., which consist of 3 parasitoids, 6 predators and 1 pollinator insect, this is because in clove plantations there are many flowers or flowering plants that live around clove plantations (Winarno *et al*., 2019). This is due to environmental factors which cause insect populations to vary as in the attachment, the average rainfall in Teupah Selatan District Average 890.673 at the research location. This is reinforced by the statement from Arifah (2021), Physical factors including rainfall and humidity that make pests inhabit plantations diverse.

The Hymenoptera order has 3 types of parasitoids, namely *Aphidiinae* sp., *Brachymeria* sp., *Aphidius* sp., and 4 types of predators, namely *Sericophorus* sp., *Acarozumia* sp., *Polistes* sp., *Priocnemis* sp., can be seen in (Table 1) if the parasitoid insect has a piercing and sucking mouth, if the pollinator is a licking-sucking, This is reinforced by Sari *et al*., (2024) insects are generally parasitoid insects that are smaller than their hosts. Parasitoid insects will slowly kill the host, by piercing the host and sucking the host's body fluids and laying eggs on the host's body. Parasitoids can reach adulthood by only requiring one host by sucking the host's body fluids.

A small number of insect populations not native to clove plantations were also found, such as *Coccinellidae* sp., *Rhagoletis* sp. and *Mordellidae* sp. This is due to the presence of vegetation surrounding the clove plantation area, namely coconut, areca and mango trees. As stated by Lizmah *et al*., (2020) if a habitat has more diverse vegetation, this will attract pests and natural enemies to the area.

3.2 Diversity Index of Natural Enemy Insect

The diversity index (Table 2) showed that evenness index and dominance index are found in clove plantations in Ulul Mayang, Batu Ralang and Kebun Baru villages. In table 2 the natural enemy diversity index is in Ulul Mayang village 2.26, in Batu Ralang village 2.06, and in Kebun Baru village 2.14 with the meaning of the moderate diversity index indicating that natural enemy insects are in a balanced state in the ecosystem. The diversity index is a very useful parameter for determining environmental factors that influence or disrupt the community (Hasibuan, 2020).

Table 2. Diversity Index of Natural Enemy Insect.

Index	Ulul Mayang	Batu ralang	Kebun baru
Natural enemy diversity index (H')	2,26	2,06	2,14
Evenness index (E)	1,0	0,98	0,98
Dominance index (C)	0,06	0,06	0,06

It can be seen that Ulul Mayang village has the highest diversity with a value of 2.26 due to the high vegetation and types of vegetation that inhabit clove plantations such as coconut, areca nut and nutmeg trees, this is reinforced by the statement of Elisabeth *et al*., (2021) that insect diversity in a plantation ecosystem will be related to the abundance of plant sources, especially food sources such as pollen and nectar as sources of protein and sugar for the continuation of the life of the insect population.

If insect diversity is moderate, it means that it is heading towards a good one where pests and natural enemies in the field are in an almost balanced category, so that no treatment is needed to control insect pests. The calculation of the evenness index of Ulul Mayang village is 1.0, Batu Ralang village is 0.98 and Kebun Baru village is 0.98 which means that the evenness index of Ulul Mayang village is high and from Kebun Baru and Batu Ralang villages with a moderate evenness index, this is caused by environmental conditions of ecological factors that affect insects, including habitat types, prey, and insecticide use. As expressed by Ravelia *et al*., (2021) that the evenness of prey will attract predators to come and live in that place, then followed by an increase in the predator's ability to prey. The same thing was also conveyed by According to Akbar (2022), that the evenness of insects in a habitat is determined by the diversity and evenness of food and other resources available in that habitat. This is in accordance with Sari *et al*., (2024) that the existence of an organism in a place is influenced by environmental and food factors.

The availability of food with suitable quality and sufficient quantity for an organism will increase the population rapidly. Insect dominance index on clove plantations in Batu Ralang village with a value of 0.06 and in Ulul Mayang village with a value of 0.06 and the dominance value of Kebun Baru village with a value of 0.06 The dominance index is determined on a scale of 0-1 based on the results of the Simpson index calculation where the smaller the dominance index value, the less dominant species there are. The lowest dominance index is at a value of 0.001 which indicates that the value is at the lowest dominance in the Agroecosystem (Ramadhan *et al*., 2023). The absence of dominant insects in the clove plantation area is influenced by the number of each insect species which is not much different, so it can be concluded that there are no dominant insects in the plantation area (Wahid *et al.*, 2024).

4. CONCLUSION

The conclusion of this study is that the diversity index of natural enemy insects was found to be 2.26 in Ulul Mayang Village, 2.14 in Kebun Baru Village, and 2.06 in Batu Ralang Village. This means that the diversity of natural enemy insects found had an index value of <3, indicating that the ecosystem within the clove plantation area remains balanced. Similarly, the evenness index remains in the moderate category, whilst the dominance index of 0.06 also indicates that no single insect species dominates within the clove plantation area.

5. REFERENCES

Akbar, S.S. 2022. Keanekaragaman laba-laba tanah pada agroforestri kopi sederhana dan agroforestri kopi kompleks di Kecamatan Wonosalam Kabupaten Jombang. *Disertasi*. Universitas Islam Negeri Maulana Malik Ibrahim.

Arifah, N. 2021. Karakteristik serangga diurnal di perkebunan kakao (*Theobroma Cacao L.*) Kecamatan Meureudu sebagai materi pendukung pembelajaran keanekaragaman hayati di SMAN 1 Meureudu Kabupaten Pidie Jaya. *Disertasi*. UIN Ar-Raniry Banda Aceh.

BPS Provinsi Aceh. 2020. *Aceh Dalam Angka 2019*. Banda Aceh: bps.go.id.

Cahyaningrum, A.O. & R. Riyanto. 2023. Keanekaragaman serangga hama dan serangannya pada tumbuhan suku Myrtaceae. *Bio-Edu: Jurnal Pendidikan Biologi*. 8(1): 50-58.

Elisabeth, D., J.W. Hidayat, & U. Tarwotjo. 2021. Kelimpahan dan keanekaragaman serangga pada sawah organik dan konvensional di sekitar rawa pening. *Jurnal Akademika Biologi*. 10(1): 17-23.

Hasibuan, I.P.S. 2020. Keanekaragaman serangga di perkebunan kelapa sawit Desa Padang Garugur Jae Kec. Aek Nabara Barumun Kabupaten Padang Lawas Sumatera Utara. *Disertasi*. Universitas Islam Negeri Sumatera Utara.

Johan, J., A. Tjoa, & I. Madauna. 2022. Pertumbuhan bibit cengkeh (*Syzygium aromaticum L.*) pada beragam media pupuk kandang. *Agrotekbis: E-Jurnal Ilmu Pertanian*. 10(6): 1012-1019.

Lizmah, S.F., & A. Agustinur. 2020. Keanekaragaman hama dan musuh alami pada tanaman pala (*Myristica fragrans Houtt*.) di Aceh Selatan. *Jurnal Agrotek Lestari*. 4(2): 40-46.

Nuraini, M. Trianto, Sukmawati, & F. Marisa. 2020. Keanekaragaman sumber pakan dan perilaku mencari pakan lebah *Tetragonula laeviceps* (*Hymenoptera: Meliponini*) di Kecamatan Parigi Selatan. *Jurnal BIO-EDU*. 5(3): 173-184.

Puspitarini, R.D., & I. Fernando. 2021. Keanekaragaman serangga bermanfaat. *Jurnal Bioekologi Serangga dan Tungau Entomo-Acarifag*. 5(3): 173-184.

Ramadhan, R.A.M., I.S. Amalia, D.N. Azizah, & S. Nurhidayah. 2023. Keragaman dan dominasi serangga nokturnal di inkubator Fakultas Pertanian Universitas Perjuangan Tasikmalaya. *Agroscript: Journal of Applied Agricultural Sciences*. 5(2): 101-114.

Ravelia, W.Z., J.W. Hidayat, & M. Hadi. 2021. Perbandingan keanekaragaman dan kelimpahan insekta pada sawah organik dan sawah semi organik di sekitar Danau Rawa Pening, Ambarawa. *Jurnal Akademika Biologi*. 10(1): 6-11.

Sari, P.M., L. Oviana, & A. Siti. 2024. Implementasi of refugia crops in soybean cultivation as useful insect microhabitat in tsunami affected land, Aceh Barat. *Jurnal Agrotek Tropika*. 12(1): 29-34.

Silvia, S. 2022. Tinjauan hukum islam terhadap jual beli cengkeh di Kecamatan Teupah Barat Kabupaten Simeulue. *Disertasi*. UIN Ar-Raniry.

Trianto, M., & F. Marisa. 2020. Diversity of bees and wasp (Hymenoptera) in cowpea (*Vigna sinensis L.*) in agricultural area at Martapura District, Banjar Regency, South Kalimantan. *Journal of Science and Technology*. 9(2): 29-33.

Wahid, K., S. Suparman, B. Bahtiar, & T.D. Nur. 2024. Keanekaragaman jenis serangga pada tanaman cengkeh (*Syzygium aromaticum L.)* di Kecamatan Pulau Ternate. *Jurnal Bioedukasi*. 7(1): 358-364.

Wahyuni, D., S.K.M. Makomulamin, & N.P. Sari. 2021. *Buku Ajar Entomologi dan Pengendalian Vektor*. Deepublish. Pp.156.

Winarno, G.D., S.P. Harianto, N.W. Masruri, & A. Bintoro. 2019. *Buku Ajar Pengelolaan Hasil Hutan Bukan Kayu Andalan Lampung*. Graha Ilmu. Lampung.