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Diversity and potential impact of insect pest on parijoto plant (*Medinilla* sp.) cultivation in Colo, Kudus

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A B S T R A C T

The parijoto plant (*Medinilla* sp.) is an iconic and culturally significant species in Colo, Kudus, where many local farmers cultivate it. Based on preliminary interviews with farmers, several insect pests such as grasshopper and caterpillars havae been reported to cause damage to the plants. The study aimed to identify potential insect pests of the parijoto plant, asses their diversity and abundance, and analyze environmental factors that may influence their presence. The research was conducted in November 2022 using a survey method with three sampling periods. Insect collection was carried out using insect net and aspirators, while sample bottles were used for temporary storage before identification. Environmental parameters, including light intensity, air humidity, soil pH, and soil temperature, were also measured. A total of 11 potential insect pest species were identified, with the majority belonging to the orders Lepidoptera and Orthoptera. These findings provide valuable insight into the insect pests associated with *Medinilla* sp. in Colo, Kudus, which may help farmers develop better pest management strategies.

Keywords: Potential insect pests, parijoto plant (*Medinilla* sp.), insect diversity

1. INTRODUCTION

The parijoto plant (*Medinilla* sp.) is a widely distributed tropical rain forest species in Indonesia, particularly in Colo Village, Kudus (Widjanarko, 2013). While naturally found in forest areas, this plant can also be cultivated by local farmers (Elfrida, 2015). In Colo, many farmers grow parijoto due to its various benefits, particularly in the medical field.

The parijoto fruit, which resembles grapes with a striking red-purple colour, contains bioactive compounds such as saponins, cardenolins, tannis and flavonoids. These compounds have been reported to contribute to fetal health (Zuhud, 2014) and enhance male fertility by increasing antioxidants levels, which in turn support sperm motility (Musfirah, 2016). Additionally, antioxidants found in anthocyanins, phenols and tannin play a crucial role in preventing degenerative diseases (Wachidadh, 2013; Ameliawati, 2018). Research by Febrilian and Pujiastuti (2017) also suggest that parijoto extract can reduce hyperglycemia and regulate glucose levels diabetic animals.

Given its medicinal and economic significance, the parijoto plant is widely cultivated in Colo, either in forested areas or as ornamental plant due to its vibrant fruit colour (Widi, 2014). It can be propagated through cuttings or seedlings. However, several challenges arise in its cultivation, one of which is the presence of insect pests.

Grassoppers and Caterpillars are among the most common insect pest affecting parijoto (Welianto, 2020). These pests cause visible damage, such as torn leaves, by feeding on plant tissue (Bakoh, 2015). Caterpillars, in particular, consume young leaves tissues, leading to extensive defoliation. Understanding the diversity and roles of insects associated with parijoto is crucial, as environmental factors significantly influence insect population dynamics. Gathering data on these potential insect pests will help develop effective biological control methods, ensuring that parijoto cultivation in Colo remains sustainable and productive.

Previews research on parijoto insect pests has been conducted in other regions, such as Tawangmangu where caterpillars, grasshoppers, and bugs were identified as major pests (Welianto, 2020). However, there is a lack of specific data on the diversity and abundance of insect pests affecting parijoto in Colo, Kudus. Identifying these pests is essential to prevent severe damage and ensure the continued health and productivity of parijoto plants in the region.

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2. MATERIAL AND METHODS

2.1 Study area

This research is study conducted in November 2022 with three sampling periods. The method used was a survey approach. The research took palce in Colo, Kudus which is located 18 km north from Kudus city center. An altitude of 1,600 m above sea level. parijoto plants in this area grow on sloping land and reach approximately 2 m in height. The field used for the study belongs to a local farmer.

2.2 Data collection

The research involved five key steps: (1) Interview. Interviews were conducted with parijoto farmers to gather primary data and determine the best research locations. An Interview is a structured discussion between two or more individuals to obtain specific information; (2) Site survey. A field survey was conducted in collaboration with the parijoto field owner. During this step, research spots were mapped for subsequent procedures; (3) Insect sampling (inventory). Insect sampling was performed three times using a survey method. The tools used included an insect net, aspirator, sample bottles, labels, a camera, and a hygrometer. The collected insect specimens were counted to asses species diversity; (4) Identification. Captured insects were photographed for identification. However, due to limitations in photo clarity, physical specimens were also collected to aid in accurate identification; (5) Environmental parameters were measured including light intensity, air humidity, soil acidity, and soil temperature.

3. RESULTS AND DISCUSSION

3.1 Potential insect pests

Based on the insect sampling data, it was found that there were 11 destructive insect pests from four different orders. Here are the table data of the destructive insect pests found in Colo, Kudus.

Table 1. Destructive insect pests in Colo, Kudus.

Number	Number of Species	Order
1	6	Lepidoptera
2	2	Orthoptera
3	1	Hemiptera
4	2	Hymenoptera

Species 1 is included into Lepidoptera order. This species has 2 pairs of scaly wings which are very easy to be broken. The color of the wings are brown with blackspots on the edge of the wings. Each blackspot has a white ring around it. This species is included into Nymphalidae family. The size of this species is medium. This kind of characteristic matches with the statement from Baskoro (2018), common characteristic of Nymphalidae is having brown color wings with blackspots. It has white vertical line on the backside of the wings. The habitat of this butterfly is in the forest, so this matches with the sampling location in Colo, Kudus. This species flies quite low around the grass, but sometimes it flies quite high and perched on the branches of parijoto plant. This is the type of closed wing position butterfly when it perched.

Figure 1. Species 1

Butterfly is a complete metamorphosis insect. When it is in a caterpillar phase, it needs to eat leaf tissue. This condition makes butterfly becomes a potential insect pest. There were 7 individuals of on the first week of sampling. The existence of this species shows us that one of potential insect pests in parijoto field here in Colo is caterpillar. It matches with the previews interview data from the farmers that said that one of destructive insects on their field is caterpillar. The caterpillar is also causing damage in the parijoto stem and flower. It causes withered flowers, so the fruit production will be decreased. It matches with the statement of Mardiningsih (2008), caterpillar is one main insect pest of plants, especially in crop field.

Species 2 that was found was from Nymphalidae family too, but it has different pattern with Species 1 even they are in the same family. This species has brown colour. It has blackspot with small white spot inside. The blackspot is surrounded by white line. The destruction caused by this species is irregular torned leaf. The torn leaf will easily be infected by fungi. This infected leaf will be rotten after that.

Figure 2. Species 2

Species 3 that was found was also from Nymphalidae family. This species has a dark brown colour with no spots on its wings. The front wings have no pattern but the other pair of wings have white pattern. This butterfly flies quite high, but sometimes it flies down low around the grass. There were only 4 individuals during the research that can be observed.

Figure 3. Species 3

Species 4 that was found was in caterpillar phase. Researcher was difficult to identify due to the lack of references. The characteristics of the caterpillar that was found are having white fur around its body; it has black and yellow colour with straight line on its dorsal part. The antenna has black color with white color on its edge. This caterpillar perched on parijoto flower when it was found. To make sure the name of this species, it is needed to be learned more with more references about caterpillar.

Figure 4. Species 4

Species 5 that was found was also in caterpillar phase, so researcher was difficult to identify due to the lack of references. The characteristics that can be observed are, this caterpillar has a small size. The body is green with yellow color near its edge. The caput is black and the other edge of this insect has a brown color. This caterpillar ate the leaf of parijoto when it was found. The interesting thing about this caterpillar is, that this caterpillar is actively excreted feces while it is eating the leaf tissue.

Figure 5. Species 5

Species 6 that was found was included into Lepidoptera order too. It has brown colour without any spots or other pattern. It matches with the statement of Baskoro (2018) that said that this kind of butterfly has dark brown colour wings, but it has pale colour on the marginal part of the wings (Figure 6).

Figure 6. Species 6

The next species is Species 7. It is included into Orthoptera order. The color of the body is brown to black with short antenna. The hind limbs are bigger than the front limbs. It matches with the statement of Suheriyanto (2008), grasshopper has black caput and brown color on its body. The antenna is short and it is located near the its eyes. The abdomen color is black. The size of the hind limbs is bigger than the front limbs to help them jump.

Figure 7. Species 7

Grasshoppers cause damage for the leaf by placing their eggs inside the leaf tissue. Based on Setiawan (2008), the egg of grasshopper will be placed 5-8cm inside the soil and it will be covered with foam mass to protect it. The broken leaf will be easily infected by fungi. The leave may turn into yellow color before all the

tissues damaged. The destruction by this species can be seen in figure 9. The leaf has yellow color with brown bases indicating tissue death.

Figure 8. Broken leaf **Figure 9**. Fungus-infected leaf

Species 8 that was observed is included into Orthoptera order too. The body color is brown, it has short antenna, the thorax size smaller than the species 7. The limbs have black-brown color. The femur size is big because it can help the grasshopper jump. The destruction caused by this species is just the same with species 7.

Figure 10. Species 8

Species 9 that has been found is included into Hemiptera order. Generally, people call it Walang sangit. The wings are in a form of membrane. It has long-thin limbs. The color is brown to black. The antenna is quite long with brown color. This species a common insect pest in a crop field, especially in rice field. They like to fly around the grass under the parijoto, but sometimes they like to perch on the parijoto leaf.

Figure 11. Species 9

Species 9 and 10 are included into Hymenoptera order. The body size of the 10th species is bigger than the 11th one. Both have a black color. The antennae are also black in color. The plant organ that will be damaged by this species is the flower bud. It will decrease the production of parijoto fruit.

Figure 11. Species 10

3.2 The diversity index and abundance of potential insect pests

Based on research made in Colo, Kudus, it was found that the diversity index of insect pests is 1,96. It can be categorized into medium level. While the abundance data of each species shows variety results. The abundance of Species 1 and 2 are categorized into subdominant taxa. It is because the abundance is between 3,2% - 9,9%. These two species are included into Lepidoptera order, where the larvae of this order are major pest to some crops by giving extensive damage to the leaves. Because of their feeding habits, these herbivore insects are regarded into one of the most vexing crops (Sruthi, et.al, 2024). The abundance of Species 3,4,5, and 6 are categorized into resident taxa. While the rest species are all categorized into dominant taxa. They come from Orthoptera, Hemiptera and Hymenopthera order. One of the most vexing pests on parijoto plant is Orthoptera. Both yound and adult species from Orthoptera order can cause some severe attacks on the leaves (Bakoh, 2015). Hymenopthera plays a big role as a natural enemy for some herbivorous insects. It is widely distributed across various agricultural lands or other places that have food sources Anguiar, et al, 2013). The abundance number of this order is categorized into dominant taxa; it indicates the possibility of a high number of their prey. All details data of the diversity index and the abundance number can be seen in Table 2.

3.3 Physical factors of the environment

Physical factors were also observed by measuring the air humidity, light intensity, soil acidity and soil temperature. The result of the physical factors measurement can be seen in Table 3. The existence of the insect is influenced by the physical factors of the environment because it may affect to the life cycle of reproduction and the activity of the insect. Insect is a cold-blooded animal that is really influenced by the environmental factors like the temperature. It may affect the reproduction cycle and the metabolism of the insect. Temperature is significantly affected the insect nymphal development (Sun, et al, 2022).

Table 2. The diversity index and abundance of potential insect pests

No	Class	Order	Family	Species	Insect Pests Number								
					Week			Σ	ni/N	Di	ln (ni/N)	H'	e
					1st	2nd	3rd						
1	Insecta	Lepidoptera	Nymphalidae	Species 1	7	5	6	18	0,06	5,50	-2,90	0,16	0,82
2				Species 2	5	2	3	10	0,03	3,06	-3,49	0,11	
3				Species 3	2	1	1	4	0,01	1,22	-4,40	0,05	
4				Species 4	4	1	1	6	0,02	1,83	-4,00	0,07	
5				Species 5	2	1	1	4	0,01	1,22	-4,40	0,05	

6		Hesperiidae	Species 6	1	1	2	4	0,01	1,22	-4,40	0,05
7	Orthoptera	Acridiidae	Species 7	21	16	6	43	0,13	13,15	-2,03	0,27
8			Species 8	17	14	8	39	0,12	11,93	-2,13	0,25
9	Hemiptera	Alydidae	Species 9	18	15	20	53	0,16	16,21	-1,82	0,29
10	Hymenoptera	Formicidae	Species 10	35	27	33	95	0,29	29,05	-1,24	0,36
11			Species 11	21	15	15	51	0,16	15,6	-1,86	0,29
Total (N)							327				1,97

Table 3. Physical factors of the environment

Environmental Parameters	1st Week				2nd Week				3rd Week			
	1	2	3	average	1	2	3	average	1	2	3	average
Light Intensity (lux)	3436	2994	3176	3202	2774	2982	2990	2915	3214	2884	3027	3042
Air Temperature (celcius)	26	26	26	26	24	25	24	24,3	26	26	25	25,7
Air Humidity (%)	65	64	65	64,7	67	65	65	65,7	65	65	66	65,3
Soil pH	7	7	7	7	7	7	7	7	7	7	7	7
Soil Temperature (Celcius)	20	21	20	20,3	18	18	19	18,3	20	20	20	20

The average light intensity during the research is 3053 Lux. Light intensity is one of the physical factors that can affect arthropods development and reproduction. According to Taradipha (2019), According to Taradipha et al. (2019), light intensity can affect on the increasing air temperature, larval development, influencing flying activity, foraging for food, mating activity, laying eggs and insect metabolic processes. High light intensity has a negative correlation with species diversity and species evenness. The appropriate light intensity for insects is not too low and not too high. Other physical factors are measured, such as air humidity, soil pH and soil temperature. All detail data can be seen in Table 3.

4. CONCLUSION

Based on the research made in Colo, Kudus, there were 11 potential insect pest species with the majority belonging to the orders Lepidoptera and Orthoptera. These findings offer valuable insight into the insect pests associated with *Medinilla* sp. in Colo, Kudus, which may help farmers develop better pest management strategies. The physical factors of the environment were measured. The highest light intensity was in the first week of sampling. The highest air humidity was in the second week of sampling. All the pH of the soil was 7.

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REFERENCES

Ameliawati, R. 2018. Pengaruh umur panen dan jenis pelarut terhadap kandungan total fenolik, antosianin dan aktivitas antioksidan ekstrak buah parijoto (*Medinilla speciosa* Blume). Yogyakarta: SKRIPSI-Fakultas Teknologi Pertanian UGM.

Anguiar, A.P., Deans, A.R., & Engel, M.S. 2013. Order Hymenopthera. *Zootaxa*, 3703 (1): 51-62. https://doi.org/10.11646/zootaxa.3703.1.12

Bakoh, B. 2015. *Serangan Belalang Kembara Di Kabupaten Bone, Sulawesi Selatan.* Accessed from http://ditjenbun.pertanian.go.id

Elfrida, E. 2015. *Uji Efek Anthihiperlipidemia (Medinilla speciosa B*lume) terhadap Jaringan hati tikus jantan. UIN Syarif Hidayatullah, Jakarta.

Febrilian, O.V., & Pujiastuti, E. 2017. Ujo Efektivitas Ekstrak Buah Parijoto (*Medinilla speciosa* Blume) terhadap Kadar Glukosa Darah pada Tikus Putih Wistar yang dibebani Sukrosa. *PROSIDING HEFA, p. 341-346.*

Musrifah, dkk. (2016). Potensi Ekstrak Etanol 70% Akar, Saluang Balum (Layanga sarmentosa blume kurtz) Terhadap Kualitas Dan Viabilitas Sperma Mencit*, Pharmaciana,* Vol 6 (2) hal 131-138. https://doi.org/10.12928/pharmaciana.v6i2.4037

Sruthi, A.B., Ibrahim, S.M., Anandhabhairavi, N., & Jayapal, P. 2024. Caterpillars in Crops; Management Partices. Accessed from https://www.researchgate.net/publication/379256612_chapter_4_caterpillars_in_crops_managem ent_ practices

Suheriyanto Dwi. *Ekologi Serangga.* Malang: UIN-Malang Press, 2008, h.132

Sun, J., Tan, X., Li, Q., Francis, F., & Chen, J. 2022. Effects of Different Temperatires on the Development and Reproduction of *Sitobion miscanthi* from Six Different Regions in China. *Ecology and Evolution*. https://doi.org/10.3389/fevo.2022.794495

Taradipha, M.R.R., Rushayati, S.B., & Haneda, N.F. 2019. Karakteristik Lingkungan terhadap Komunitas Serangga. *Journal of Natural Resources and Environmental Management*, 9 (2): 394-404. DOI: http://dx.doi.org/10.29244/jpsl.9.2.394-404.

Wachidah, L.N. 2013. Uji aktivitas antioksidan serta penentuan kandungan fenolat dan flavonoid total dari buah parijoto (Medinilla speciosa Blume). Jakarta: SKRIPSI UIN Syarif Hidayatullah Jakarta.

Welianto, Ari. 2020. *Hama dan Penyakit Pada Tumbuhan.* Accessed from https://hama-dan-penyakit-pada tumbuhan-arti-jenis-dan-contohnya.

Widi, M. 2014. *Napak Jejak Pemikiran Sunan Muria* . Kudus: LPS Fikro, hal.30-33.

Widjanarko, M. 2013. *Jelajah Muria, Muria Research Center, Kudus.* Page 2

Zuhud, E, A.M., Sinroyo, Sandra, E., Hikmat, A., dan Adhiyanto, E. 2014. *Buku Acuan Umum Tumbuhan Obat Indonesia Jilid VI.* Dian Rakyat, Jakarta.