Pollinating insects on bitter melon plant flowers (*Momordica charantia* L.)

Oktaviani[1*] and Desi Isnani[2]

[1]Department of Plant Protection Study ProgramPlant Pests and Diseases Faculty of Agriculture, Sriwijaya University, Indralaya, Ogan Ilir, South Sumatra 30862, Indonesia
[2] Department of Agroecotechnology Study ProgramAgricultural Cultivation, Faculty of Agriculture, Sriwijaya University, Indralaya, Ogan Ilir, South Sumatra 30862, Indonesia

[*]Corresponding author. Email: oktaviani@unsri.ac.id

Received: November 23th, 2023 / Accepted: March 20th, 2024

ABSTRACT

Bitter melon plant (Momordica charantia L.) is a potential commercial plant if intensively cultivated in agribusiness, this plant can be very beneficial if it produces high levels of fruit production, it cannot be separated from insect pollination activities. Insects that visit bitter melon plant flowers are actually beneficial and can be harmful. This field practice aims to determine the relationship of visitor insects associated with bitter melon flowers (M. charantia L.), by using the scan sampling method (direct observation) in the field, which counts the number of species and individual insect's visitors then will be identified in the Plant Pest Entomology Laboratory. Observations were carried out for 5 weeks. Every week took 2 days of observation, and in those 2 days there were observations on the same day and time which was on Tuesday and Thursday at 06:00: 30 - 08:30 AM (morning) and 04:00 - 05:30 PM (afternoon). What was observed s the insects who visited the bitter melon flowers of 6 orders including Hymenoptera, Coleoptera, Thysanoptera, Lepidoptera, Hemiptera, and Araneae as well as 8 families and 12 species of the orders. Insect visitors associated with bitter melon flowers have different roles including pollinators, predators, visitors and pests. The behavior also varies, especially in taking nectar or pollen as a source of nutrition. Insect visitors associated with bitter melon flowers have different roles including pollinators, predators, visitors and pests. The behavior also varies, especially in taking nectar or pollen as a source of nutrition. Insect visitors associated with bitter melon flowers have different roles including pollinators, predators, visitors and pests. The behavior also varies, especially in taking nectar or pollen as a source of nutrition.

Keywords: *bitter melon flowers, pollinating insects , visitor insects.*

INTRODUCTION

The agricultural sector in Indonesia has great potential to be developed as one of the main pillars, considering the increasing need for food. Currently, existing natural resources have not been utilized optimally, so food self-sufficiency has not been fully achieved (Kuncoro, 2018). One aspect that deserves attention is the production of vegetables, which are horticultural crops with high nutritional content. According to Liska *et al.* (2023), consumption of vegetables can meet human nutritional needs because they contain minerals and vitamins which are important for maintaining health, so demand for vegetables continues to increase.

One of the horticultural crops currently experiencing an increase is bitter melon (*Momordica charantia* L.). To optimize commercial bitter melon cultivation, intensive pollination by insects is required because this plant cannot pollinate itself (Clarisa and Kasmara, 2016). Insects that interact with bitter melon plants can act as pollinators, predators or pest parasitizes (Yulianto *et al.*, 2022). This relationship can be considered a mutualistic symbiosis, where the plant provides a food source and shelter for insects, while the plant benefits from pollination which produces bitter melon fruit (Suhri *et al.*, 2022).

Insects also have an important role in agricultural ecosystems, adapting to dynamic and less stable ecosystem changes Susilawati (2016). The interact of insects with plants can be classified into three groups: pest insects, natural enemies, and beneficial pollinator insects. Pollinating insects, such as *Trigona* spp. and bees, have a role as plant pollinators (Brigitha *et al.*, 2017).

The process of pollination, namely the meeting of pollen with the stigma, is very important in agriculture, and about 80% of agricultural crops depend on this pollination (Zuraida, 2019). Pollinator visits to flowers greatly influence crop yields, and these insects are attracted by factors such as color, size and number of flowers (Leksono, 2017). The color of the flower is an attraction for insects, which visit the flower in search of food, and through this activity, pollination occurs. The visiting behavior of insects looking for food from one flower to another can also influence plant pollination (Tanjung *et al.*, 2019).

Therefore, to increase the yield of bitter melon fruit, it is necessary to observe the insects that visit the bitter melon plant flowers. This research aims to determine the number, role and behavior of insects interacting with the flowers of the bitter melon plant (*M. charantia* L.).

DOI: https://doi.org/10.21107/agrovigor.v17i1.22721

Agrovigor: Jurnal Agroekoteknologi
http://journal.trunojoyo.ac.id/agrovigor
ISSN: 1979-5777 (*Print*), 2477-0353 (*Online*)

MATERIALS AND METHODS

2.1. Equipment and Materials

For this research, several equipment was used such as stationery, vials, stereo microscopes, plastic bags, cameras, and name labels. Meanwhile, the materials used include 70% alcohol and collected insect specimens.

2.2. Implementation Method

The method applied in this research is scan sampling, which involves direct observation in the field to count the number of species and individual insect visitors. After collecting the insects, these insects were placed in vials and then taken to the Entomology laboratory, Department of Plant Pests and Diseases, Faculty of Agriculture, Sriwijaya University, Indralaya for identification of the type of insect.

2.3. Location Determination

The research location was chosen by looking for horticultural agricultural land that was flowering, so that insects visiting the flowers could be observed. This research was carried out at the Agribusiness Clinic, Faculty of Agriculture, Sriwijaya University, Indralaya.

2.4. Sampling

Sampling begins by determining the number of ridges (where plants grow) and the number of plants in each ridge. There are eight mounds with different numbers of plants. Of the eight mounds, four mounds were selected and each had ten mound plants, so that a total of 40 plant samples were observed. Each bund has a size of 1 x 22 meters with a distance between bunds of 0.5 meters.

2.5. Implementation Stage

The research implementation phase lasted for five weeks, with observations carried out two days a week. Observations were carried out twice a day, on Tuesday and Thursday, at 06:30 - 08:30 WIB (morning) and 16:00 - 17:30 WIB (afternoon). During observations, insects visiting bitter melon plant flowers were observed by surrounding each planting area for 1-2 minutes. After that, the visible insects are photographed and put into a vial as a sample. The samples were then given 70% alcohol and identified the type of insect at the Entomology Laboratory, Department of Plant Pests and Diseases, Faculty of Agriculture, Sriwijaya University, Indralaya.

2.6. Identify Pests of Bitter Gourd Plants

Identification of insect pests on bitter melon plants was carried out using a microscope at the HPT Entomology Laboratory, Faculty of Agriculture, Sriwijaya University, Ogan Ilir, South Sumatra. Identification is carried out based on the morphology of the pest insect, including antenna segments, body color, wing shape, type of mouthparts and leg segments. Identification of insect pests is based on key identification books, such as "The Insect of Australia" by Anderson (1996) and "Pest of Crops in Warmer Climates and Their Control" by Hill (2008), as well as with support from related journals.

2.7. Observation Parameters

The parameters observed included the type and number of insects collected, as well as the role and behavior of visiting insects that interacted with bitter melon plant flowers.

1.8. Data analysis

Data regarding insects obtained from direct observation of bitter melon plant flowers at the Agribusiness Clinic, Faculty of Agriculture, Sriwijaya University, Indralaya, will be presented in tabular form and analyzed descriptively.

RESUTLS AND DISCUSSION

3.1. Visitor Insects Associated with the Flowers of Bitter Melon Plants

This research was conducted at the Agribusiness Clinic, Faculty of Agriculture, Sriwijaya University, Indralaya. The results obtained identified the existence of 6 insect orders, namely Hymenoptera, Coleoptera, Thysanoptera, Lepidoptera, Hemiptera, and Araneae, and succeeded in identifying 8 families and 12 species from these orders. Details of the results of these observations can be found in Table 1.

Based on the results of observations that have been identified, there are six orders of insects, namely Hymenoptera, Coleoptera, Thysanoptera, Lepidoptera, Hemiptera, and Araneae. A total of eight families and twelve species of insects were identified with their respective roles, as listed in Table 1. The insect that dominates visits to bitter melon flowers is the *C. carnelius* ant from the order Hymenoptera: Formicidae, which acts as a visitor or even as a potential pollinator. The bees *A. mellifera* and *Trigona* spp. *T. spinipes* (Hymenoptera order: Apidae) also acts as a pollinator for bitter melon flowers, with a high visitation rate. The Hymenoptera order dominates the number of visits because various types of insects from this order look for nectar and pollen.

Flower morphology also plays an important role in attracting the types of pollinating insects that visit the flower. Usually, insects are first attracted by the color of the flower crown, because insects have a tendency to like striking colors (Campbell *et al.*, 2010). These characteristics influence the type and visiting behavior of pollinating insects when these insects search for nectar or pollen. Bee visits to flowers during their search for food show certain behaviors that are influenced by the amount and quality of nectar in the flowers. The frequency of visits by bees from one flower to another increases if flower nectar is abundant, but conversely, if the nectar quantity is low, frequency of visits tends to decrease (Nugroho and Soesilohadi, 2015).

Table 1. Visitor insects associated with bitter melon plant flowers obtained from direct observation (scan sampling)

Order	Family	Species	Average number (tails)		Acquired phase	Role
			Morning	Afternoon		
Hymenoptera	Apidae	*Apis mellifera*	78	25	Imago	Pollinator
		*Trigona*spp.	100	61	Imago	Pollinator
		Trigona spinipes	102	36	Imago	Pollinator
	Formicidae	*Camponatus carnelius*	234	190	Imago	Visitors
Coleoptera	Chrysomelidae	*Aulacophora similis*Oliver.	16	15	Imago	Pest
		Aulacophora lewisii.	7	6	Imago	Pest
	Coccinelidae	*Henosepilachna vigintioctopunctata*	2	1	Imago	Pest
		*Anatis*sp.	1	0	Larvae	Predators
Thysanoptera	Thripidae	*Thrips tabaci*	13	23	Imago	Pest
Lepidoptera	Noctuidae	*Spodoptera litura*	3	5	Larvae	Pest
Hemiptera	Miridae	*Nesidiocoris tenuis*	7	3	Imago	Pest
Araneae	Thomisidae	*Thomisus tenuis*	2	0	Imago	Predators

From the results, during 5 weeks of observations, the average number of visitors to bitter melon plant flowers was obtained in the morning and evening (Table 1). The number of insects obtained during morning observations was greater than observations in the afternoon. According to this, this was due to the volume of nectar in the flowers, high in the morning and continues to decrease until the afternoon, thus affecting insect visits to plants. Naturally, the insect visiting process is influenced by environmental factors such as temperature, humidity and weather conditions (Sulistuyowati and Putra, 2016). The temperature at the location during observation ranged from 26-29ºC with humidity around 65% in the morning while in the afternoon the temperature ranged from 30-34ºC with humidity around 90-95%. Rainfall also affects insect visits to flowers. If it rains there is little chance for insects to visit flowers.

3.2. Behavior of Visitor Insects in Relation to Bitter Melon Plant Flowers

Some insects that visit bitter melon flowers do not involve themselves in the act of pollination, and not all of them have the capacity to visit all types of flowers. Factors such as shape, color and size of flowers play an important role in attracting insects. This characteristic also determines the type and behavior of pollinating insects when these insects search for nectar or pollen (Hasan and Atmowidi, 2017).

Insects that function as pollinators have beneficial behavior, such as bees that visit flowers to get the honey located at the base of the flower. When bees collect pollen with their feet, this pollen can fall on the stigma or other parts of the flower, resulting in pollination assisted by the insect. Bees do not differentiate between flowers they have visited before and those they have not, and the insects spend about 3-5 seconds on each flower before moving on to the next. On the other hand, visitor insects that function as pests and predators have a much longer visit duration, ranging from 2-4 minutes or even more per flower.

According to Hasan and Atmowidi (2017), the behavior of visiting insects that interact with bitter melon plant flowers is also influenced by the length of their visit. From the results of our observations, we can see variations in the behavior of visiting insects associated with bitter melon flowers.Each insect that visits flowers has varying behaviors and goals (Table 2).

The types of flowers visited by insects are often places where these insects search for food, and many bees also visit wild plants around bitter melon plants. According to research Susilawati (2016), the existence of a complex environment around plants can increase the diversity of flower-visiting insects, including pollinators. Restrictions on pollinator visitation can result in up to a 50% reduction in crop yields (Arwati, 2018). Apart from pollinating insects, there are also visitor insects that act as pests, such as *A. similis* Oliver, *A. lewisii*, *H. vigintioctopunctata*, *Thrips tabaci*, *S. litura*, and *N. tenuis* in small quantities

Table 2. Behavior of visitor insects associated with bitter melon plant flowers.

Species	Behavior
Apis mellifera	*A. mellifera*has a yellow abdomen, wings length 0.8-0.95 cm. Stroke length 0.55-0.71 cm. There are many species of bees that act as pollinators of plant flowers, one of which is A. mellifera, an insect that is beneficial for farmers. These bees settle on the flowers of the bitter melon plant because they have behavior aimed at taking nectar, pollen or both, which are attracted by the fragrant smell and honey liquid produced by the flowers. By sticking out its sucking mouth, this insect sucks the honey liquid at the base of the flower jewellery. At that time, pollen can stick to the bee's body. By shaking the body and rubbing the hind legs, the pollen can be released. If this pollen falls on the stigma, pollination occurs (Botanical Research and Development Center, 1987)**.**

Table 2. Behavior of visitor insects associated with bitter melon plant flowers (continuous)

Species	Behavior
*Trigona*spp.	*Trigona* spp. black and small in size, with a body length of between 3-4 mm, and a wingspan of 8 mm. This bee has no sting. Likewise with the bee *A. mellifera*, *Trigona* spp. also acts as a pollinator. By means of insects landing on one flower, then landing on another flower carrying pollen from the previous flower, it is permanent because every time there are these insects visiting the flowers of the bitter melon plant.
Trigona spinipes	*T. spinipes* bees have the same characteristics as *Trigona* spp. The only difference is that the legs are orange and have a round shape. Basically, almost all pollinating insects do the same thing in picking up pollen from plant flowers, that is, when they stick to a flower, they take food, after they leave the flower, the pollen on that flower sticks to their feet and when they look for food on other flowers, the pollen The juice that sticks to the legs will pollinate the pistils. This insect acts as a pollinator which helps pollination and is permanent because it visits the flowers of the bitter melon plant every time, but the number is less than *Trigona* spp.
Camponotus carnelius	The *C. carnelius* ant has the characteristics of long antennae, is black and brown in color, has a body size of 0.2 – 0.3 cm long, the body is pitch black, the abdomen is oval and bluntly rounded, has a round mouth shape and has a type of mouth. sucker Suriana, 2017)**.**An ant can be said to be a pollinator if, when collecting pollen nectar, its body hits the pollen and when it travels the pollen from its body hits the stigma, the ant helps in the process of pollinating the plant. *C. carnelius* is sedentary because every time this insect visits bitter melon flowers.
Aulacophora similis Oliver	This insect is a pest of bitter melon plants, better known as oteng-oteng *A. similis* Oliver. Adults measure 0.7 cm and have a shiny brownish yellow back, and have antennae that are half as short as their body. This insect pest causes the plant to wilt when eaten by beetles, in heavy attacks it can cause many holes in the leaves and sometimes only leaves the bones of the leaves, the aim of this insect pest is in the flowers, they want to eat parts of the flower and are able to inhibit pollination. *A. similis* Oliver. It is temporary/not permanent because this insect is a pest.
Aulacophora Lewisii	This insect pest is shaped like a beetle which is in the same family as the oteng-oteng pest, only it has a different species and the color of its back is shiny black. This beetle is black, with a golden yellow head. This insect also attacks the leaves of bitter melon plants, causing damage to plant parts. The aim of these insect pests is in the flowers, they want to eat parts of the flowers and be able to inhibit pollination. It is temporary/not permanent because this insect acts as a pest, which only visits at certain times in not very large numbers.
Henosepilachna vigintioctopunctata	This insect acts as a pest. Adult *H. vigintioctopunctata* is about 7-8 mm long, with 13 black dots on each elite wings. The beetles eat plant leaves. This insect is not permanent, only visiting at certain times with the aim of eating the crown of the flower.
Larvae of *Anatis* spp.	Larvae of the beetle *Anatis* spp. hairy body and has 6 legs. The length of the larval phase varies between 10 – 21 days. This koksi beetle is active during the day. The role of adult koksi beetles and their larvae is that they are predators of soft-bodied insects, such as aphids which are insects similar to aphids. It is not permanent, only seen occasionally when visiting bitter melon flowers.
Thrips tabaci	This insect is small, approximately 0.5 -1.5 mm long. Thrips pests attack plants by sucking plant fluids from young leaves and flowers. Symptoms resulting from thrips pest attacks can be seen on the lower surface of leaves or flowers. This pest acts as a pest that does not settle on flowers because of its nature.
Spodoptera litura	*Spodoptera litura* including pests that damage plants. Adult insects have a body length of 20 - 25 mm, have black triangular spots and yellowish stripes on their sides, these insects act as pests because they eat the leaves and fruit of horticultural plants which cause damage, the same as those in flowers. damaging parts of the flower, it is temporary and not permanent, because this insect pest only visits the flowers of the bitter melon plant.

Species	Behavior
Nesidiocoris tenuis	The imago of this pest measures ± 3.37 mm in length and is slightly brownish green in color and has vase eyes. According to Budiman *et al.*, (2010) the length of the front legs and middle legs is 1.5 mm and the back legs are 2.5 mm. *N. tenuis* has a slender body shape with black spots on the body and a brownish green color (Kotambunan *et al.*, 2012)**.** Population and Attack Level *N. tenuis* attacks flowers so the plant's flowers fall easily or quickly. Thus, *N. tenuis* can interfere with the reproduction and development of bitter melon fruit. Nymphs and imago suck plant fluids at the base of the flower stalk in circles, causing symptoms in the form of circular black spots on the flower stalk (Rante and Dien, 2012).
Thomisus tenuis	*Thomisus tenuis* measuring 3-8.5 mm, the body is flat and resembles a crab, the first two pairs of legs are larger than the other legs for catching prey. This insect acts as a predator, this spider is known as the flower crab spider, because it feeds on insects that visit flowers, moves like a crab and the way this insect holds its front legs in a stance is reminiscent of a crab spreading its claws as a threat.

3.3. Results of Identification and Direct Observation of Bitter Gourd Flowers

The results of the identification of visitor insects associated with bitter melon flowers indicate the dominance of the Hymenoptera order, the Apidae family, and the species *A. mellifera*, *Trigona* sp., *T. spinipes*, and the Formicidae family with the species *C. carnelius* (visitor ants) in their visits to the plant flowers. bitter melon (Figure 1).

Based on observations, it was found that various types of pollinator and predator insects visited the flowers of bitter melon plants, each with different behavior. Various insect visitors associated with bitter melon flowers have their respective roles, including the role of pollinators, pests, predators, visitors, and have various behaviors during each visit to the bitter melon flowers.

Observations of insects such as *A. similis* Oliver, *A. lewisii*, or oteng-oteng took place around the flower crown, approaching the pollen (Figure 2), then the insects flew to other parts of the plant. Among these insects there are also predators such as *T. tenuis* (crab spider) and larvae of *Anatis* spp., which provide benefits to plants. During observations in the morning and evening, the insect that consistently visited many flowers was *C. carnelius*, which is included in the ant group.

Observations regarding the types and behavior of insects that visit flowers can be useful in efforts to increase the role of pollinating insects and the production of these plants. The daily availability of nectar and pollen can influence the diversity of insects that visit these flowers. Many insects from the order Hymenoptera feed on nectar and pollen, so insects from this order often visit flowers (Khairiah *et al.*, 2012).

Ants have a dual role as visitors and pollinators. The presence of ants on plants, especially flowers, has a positive impact, such as pollinating several types of flowers and improving the nutrient cycle in the soil (Hasyimuddin *et al.*, 2017)., while Figure 2 depicts the behavior of insect pests visiting flowers.

CONCLUSION

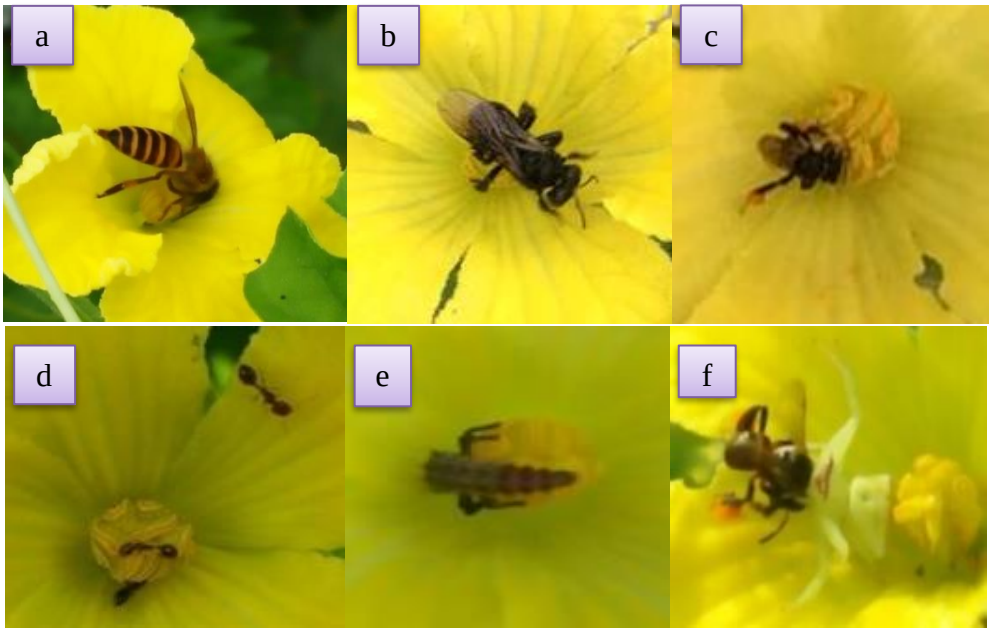
There are 12 species of insects belonging to 6 different orders were identified on bitter melon plant flowers, namely Hymenoptera, Coleoptera, Thysanopterap, Lepidoptera, Hemiptera, and Araneae. Apart from that, 8 insect families were found to act as visitors in the morning. The roles of visitor insects associated with bitter melon flowers vary greatly, including the roles of pollinators, predators, visitors and pests. The behavior of these visiting insects involves taking nectar or pollen from flowers as a source of nutrition. The interactions that occur between insects and bitter melon flowers can be categorized as mutualistic interactions.

ACKNOWLEDGMENTS

We would like to express our gratitude to the presence of Allah SWT who has provided smoothness during the writing of the article so that it can be completed and run well. The author is also grateful to the Head of the Department and Coordinator of the Entomology-Nematology, Plant Protection Laboratory, UNSRI, who has provided adequate facilities to carry out the research.

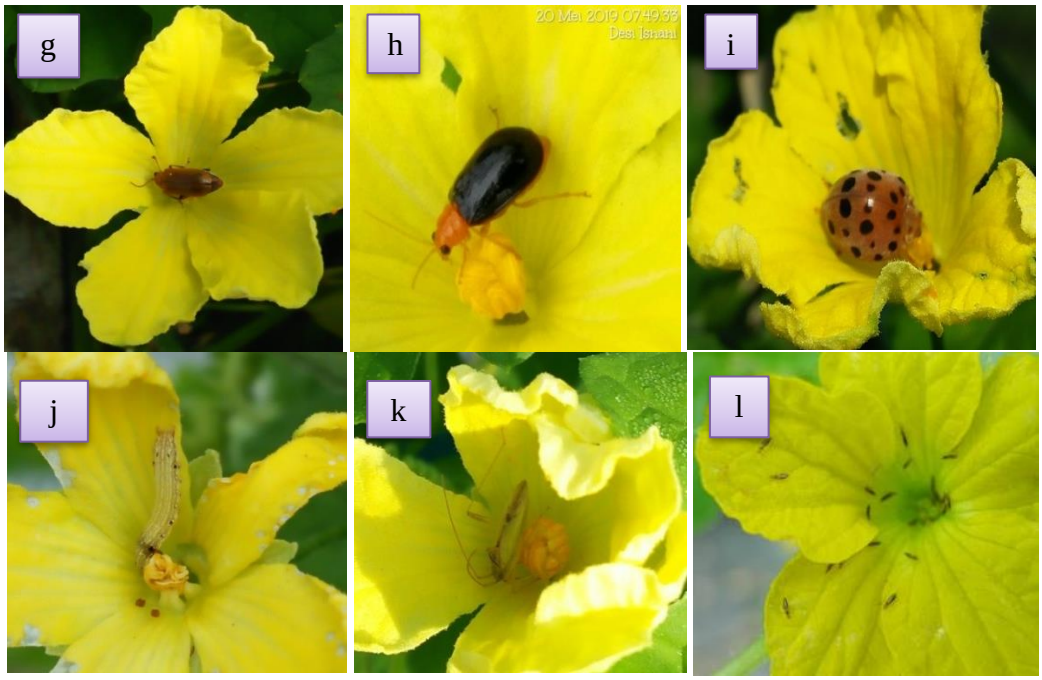
AUTHORS CONTRIBUTIONS

O and DI consider and plan the experiment. Starting from determining the location, observing and identifying insects found in the field. O and DI collected observation data and also carried out data analysis. O and DI interpret the data. O prepares the script. The author provides responses and comments on the research flow, data analysis, and interpretation and form of the manuscript. All authors have read and approved the final manuscript.



Source: Personal documentation

Figure 1. Behavior of insects visiting bitter melon flowers which act as pollinators and predators



Source: Personal documentation

Figure 2. Behavior of visitor insects that act as pests on bitter melon plant flowers.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

Arwati, S. 2018. Introduction to Sustainable Agriculture Science - Google Books. In Introduction to Sustainable Agricultural Science.

Institute for Botanical Research and Development. 1987. Pollination of Rambutan (*Nepheuum Lappaceum* L. Var. *Lappaceum*) Test Resistant. Journal Suppl. Ber. Biol. 3: 31–34.

Brigitha MG, Tairas RW, Mamahit JM E. 2017. Insects Associated with Curly Chili Plants (*Capsicum Annum* L.) in Kakaskasen Ii Village, North District.*Sam Ratulangi University Journal*: 847–854.

Budiman, AA DT Sembel, M.Tulung, V.Memah, M.Meray, M. Ratulangi, M. Hamming, G.Carner and BM Shepard. 2010. Biology and Attack Levels of *Nesidiocoris Tenuis* Reuter on Tomato Plants in North Sulawesi. Eugenia Journal. 16(1): 1 -12.

Campbell RD, Bischoff RD, Lord LM and Robertson AW, 2010. Flower color influences insect visitation in Alpine New Zealand. Ecology. 9(91): 2638-49.

Clarisa D, Dan Kasmara H. 2016. Diversity of insect pollinators of cucumber plants (*Cucumis sativus* L.) at the Vegetable Crops Research Institute (Balitsa), Lembang, West Java. Proceedings of the National Mathematics and Natural Sciences Seminar. 158–163.

Hasan PA and Atmowidi T. 2017. Relationship between types of pollinating insects and flower morphology in tomato and mustard greens (*Brassica Juncea* Linn.). Scientific Journal. 3(1):77–82.

Hasyimuddin, Syahribulan, & Usman, AA 2017. The ecological role of soil insects in the Patallassang plantation, Patallassang District, Gowa Regency, South Sulawesi. Proceedings of the National Seminar on Biology for Life, 1(10).

Khairiah N and Syamsuardi D. 2012. Types of Insects Visiting Water Henna Flowers (*Impatiens Balsamina* Linn.: Balsaminaceae). Andalas University Biology Journal. 1(1): 9–14.

Kotambunan E, Tulung M, Kandowangko D. 2012. Population Development of Ladybugs (*Nesidiocoris Tenuis* and *Lygus* sp.) on Potato Plants in Linelean Village, Modoinding District. E-Journal:1–11.

Kuncoro, Ikrimah Ekowahyu. 2018. Cultivation of Bitter Gourd Plants (*Momordica Charantia* L.) Using Bokashi Fertilizer Treatment. Thesis at Sebelas Maret University, Surakarta.

Leksono, AS 2017. Arthropod ecology. In UB Press.

Liska, Novita I, Masithoh S. 2023. Analysis of the exchange rate of chili (*Capsicum Annum* L.) farmers and the factors that influence it during the Covid-19 pandemic. Agriscience Journal. 9(1). https://doi.org/10.30997/jagi.v9i1.8257

Nugroho RB and Soesilohadi R H. 2015. Foraging Activities of Worker Bees, *Trigona* sp. (Hymenoptera: Apidae) in Gunungkidul. Biomedicine Journal. 8(1): 1–5.

Rante CS, Dan Dien M F. 2012. Population and Attack Levels of *Nesidiocoris Tenuis* Reuter. Eugenia Journal. 18(1): 9-15

Suhri AGMI, Soesilohadi RCH, Putra RE, Raffiudin R, Purnobasuki H, Agus A, Kahono S. 2022. The Effectiveness of Stingless Bees on Pollination of Bitter Melon Plants *Momordica charantia* L. (Cucurbitaceae). Journal of Tropical Biodiversity and Biotechnology. 7(3): 1–9. https://doi.org/10.22146/jtbb.69124

Sulistiyowati TI And Putra R E. 2016. Behavior of Insects Visiting Red Dragon Fruit (Hylocereus Polyrhizus). Proceedings of the National Seminar From Basic Science to Comprehensive Education. 205-212.

Suriana. 2017. Morphological Description and Taxonomic Status of Ants from the Mangrove Community on Hoga Island in the Wakatobi National Park Area. Biowallacea Journal. 4(2): 602–610.

Susilawati. 2016. Diversity and Abundance of Insects Visiting Cucumber Flowers in Different Landscape Structures. Thesis. Bogor Agricultural Institute Bogor : Bogor

Tanjung T R., Dahelmi and Mairawita. 2019. Insect Visitor Activity on Salak Flowers (Salacca Sumatrana Becc.) in Tapanuli Regency. Journal of Education and development. 7(2): 233–235.

Yulianto DC, Asra R, Adriadi A. 2022. Study of the Pollination Systems of Several Arecaceae Genus Based on Inflorescence Morphology. Biospecies. 15(2). https://doi.org/ 10.22437/biospecies.v15i2.14662

Zuraida ZED. 2019. Relationship Relationships of Plants in the Cucurbitaceae Family Based on Morphological Characters in Pidie Regency as a Learning Resource for Higher Plant Botany. Agroristek Journal. 2(1). https://doi.org/10.47647/jar.v2i1.88.