IBJ
Indonesian Biodiversity Journal
http://ejurnal.unima.ac.id/index.php/ibj

indonesian. biodivers.j.
Vol. 3, No. 2 : 16-24
ISSN : 2722-2659

IDENTIFICATION OF INSECT SPESIES ASSOCIATED WITH AVOCADO SEEDS (*Persea americana* Mill)

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Received: June 16, 2022 *Accepted: August 20, 2022*

Abstract

Avocado (*Persea americana* Mill) is a fruit plant that has high nutritional value and is relatively economical. Efforts to increase the production of avocado seeds (*Persea americana* Mill) are still often constrained by pests and diseases. This study aims to determine the types of insects associated with avocado seeds (*Persea americana* Mill) and the level of damage to avocado seeds (*Persea americana* Mill) due to insect pests in Seeds Garden of the Melati Women Farmer Group 2, Ranowulu District, Bitung City. This study used a survey method, namely direct observation (visual) of pests that attack avocado seeds (*Persea americana* Mill). This research is a descriptive research with survey method. Observation activities by direct observation on avocado plant seeds (*Persea americana* Mill). Insects were identified using an insect identification book guide. The results of identification and direct observation at the Seeds Garden of the Melati Women Farmers Group 2, Ranowulu District, Bitung City, found 3 orders consisting of 4 insects, namely the Ordo Orthoptera Wood Grasshopper (*Valanga nigricornis*) and Green Steamed Grasshopper (*Atractomorpha crenulata*), Ordo Homoptera White Dompolan Tick (*Planococcus citri*), Ordo Hemiptera Bapak Pucung (*Dysdercus cingulatus).* The results showed that the percentage of seeds attacked by insect pests in the Seeds Garden of the Melati Women Farmer Group 2, Ranowulu District, Bitung City with a seedling age of 1-10 months was 36.66% and a damage rate of 26.97% of the total seeds of the 30 seeds that had been observed and included in the moderately damaged category.

Key words: *Insects, Avocado Seedlings, Pests, Damage Rate*

INTRODUCTION

Avocado (*Persea americana* Mill) is a fruit plant with high nutritional value and is relatively economical. This plant can be found in various countries in the world, both tropical and subtropical. Indonesia is a country rich in natural resources. One of the horticultural crops is avocado. The avocado plant has the Latin name *Persea americana* and is a woody tree plant that develops chronically (Indriani & Suminarsih, 1997). Indonesians often consume avocados because they contain several vitamins and minerals that are nutritious for the body. In general, this plant is suitable for cool and wet climates. This

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plant does not tolerate low or high temperatures, low humidity during flowering and harsh winds at the time of fruit formation. In Indonesia, avocado plants (*Persea americana* Mill) grow at an altitude between 1-1,000 meters above sea level (Prawita, 2012, Tamalia *et al*., 2019)

High-quality Avocado (*Persea americana* Mill) seeds in large quantities, with little time and affordable prices, are the first step and a significant factor in supporting the success of avocado cultivation. The need for avocado (*Persea americana* Mill) continues to increase yearly, with prices that continue to soar. However, this need is separate from increased production (Khasanah, 2011 in Tairas & Mamahit, 2017). Efforts to increase the production of avocado seeds (*Persea americana* Mill) are still often constrained by pests and diseases (Hidayati & Nurrohmah, 2017). Nurseries of various plants (polyculture) in nursery areas provide abundant feed for insects supported by the state of young seedlings (seedling stage), which is the preferred food for insects (Kartika *et al*., 2020; Mista, 2017).

Insect aggression that attacks avocado seeds (*Persea americana* Mill) threatens avocado (*Persea americana* Mill) cultivation techniques. According to field observations, it is necessary to research identifying the types of insects associated with avocado (*Persea americana* Mill) plants and calculate the damage to avocado seeds (*Persea americana* Mill). One of the efforts for handling is knowing the types of insects that have the potential to become pests for seedlings so that future maintenance can be further improved. This is so that the avocado seeds (*Persea americana* Mill) that will be distributed have guaranteed health and are safe to be planted in the planting area and produce quality fruit.

Insect identification is an introduction process to determine the types of insects more clearly and completely and can be justified scientifically. This research activity was carried out in the nursery of the Melati Women Farmer Group 2, Ranowulu District, Bitung City.

RESEARCH METHODS

This research was conducted in the nursery of the Melati Women Farmer Group 2, Ranowulu District, Bitung City. This research was conducted in January - March 2022. Observations were carried out in the morning (07.00- 09.00 WIB), afternoon (14.00-16.00 WIB) and evening (18.00-19.00 WIB). The materials used in this study were: Avocado plant seeds (*Persea americana* Mill), captured insects, cotton and 70% alcohol. The tools used in this study were: tweezers, killing bottles, documentation tools, stationery, notebooks, styrofoam, magnifying glass (loupe), insect determination books/keys and traps such as insect nets (Trap Insect).

This study used a survey method: direct observation (visual) of pests that attack avocado seeds (*Persea americana* Mill). This research is descriptive research with a survey method. Observation activities by direct observation of avocado plant seeds (*Persea americana* Mill). This observation was carried out on three lines of avocado seeds (Persea americana Mill) with 30 seeds. In one lane, there were ten seeds of avocado plants (*Persea americana* Mill). This research was conducted in 3 stages, namely: 1). Catching insects associated with avocado seeds (*Persea americana* Mill) were then identified using the insect determination book Kanisius, 1991.

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Catching insects using insect nets and tweezers and catching them directly by hand, insect samples are then taken home for identification. 2). Observing avocado (*Persea americana* Mill) seeds to see symptoms due to insect pests. 3). Recording the symptoms that appear on Avocado plant seeds (*Persea americana* Mill) with the types of insects found in the nursery. The percentage of damage and the level of damage to avocado (*Persea americana* Mill) seedlings for the category of plant assessment due to insect attack is seen in (Table 1).

Table 1 Criteria and categories for plant assessment due to insect pests based on the type of damage seen.

Score	Damage Alert	Category
0	Good development, green leaves, healthy and fresh. Some leaves are healthy and lacking at the base of the stem.	Healthy
1	Bag Part of the plant leaf perforated, curled, folded, Stem hollow and peeling, 1%-25%	Light
2	The leaves are folded in folds, curled into holes, and Damage to the young shoots, bitten so that the leaves turn yellow, 25%-50%	Currently
3	Plants were severely damaged. More than half of the plants were broken and bald. Root necks were cut off, nearly died. Plants died and were severely damaged by 50%-100%.	Heavy

Source : (Directorate of Plant Protection, 2000 in Riona, Suryantini & Herawatiningsih, 2019)

Data analysis

The data taken in this study consisted of primary data and secondary data (Ginawan et al., 2019).

a. Primary data is the damage data and the level of damage data on Avocado (*Persea americana* Mill) plants.
b. Secondary data in this study is the main data in the form of insect pest catches obtained in this study.

- Calculation of the percentage of plants affected by each path

$$P = \frac{a}{N} \times 100\%$$

Information :

P = percentage of affected plants

= Number of affected plants

N = number of plants observed

- The level of damage in each observation path

$$I = \frac{\sum(ni \times Vi)}{ZN} \times 100\%$$

Information:

I = Damage rate on each path

N = Number of plants in each lane

ni = Number of plants based on attack criteria

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Vi = Criteria value for pest attack

Z = Highest value of pest attack criteria

- The damage rate of the entire observation path

$$Y = \frac{\sum I}{N}$$

Information :

Y = Total damage rate

I = Damage level of each path

N = Number of paths

RESULTS AND DISCUSSION

Types of insects associated with avocado seeds (*Persea americana* Mill)

The results of the identification and direct observation at the nursery for the women's jasmine farmer group 2, Ranowulu District, Bitung City, found 3 orders consisting of 4 insects, the insects obtained were insects associated with the Avocado plant (*Persea americana* Mill).

Table 2. Types of insects associated with avocado seeds (*Persea americana* Mill) in the nursery of the Jasmine Farmer Women's Group 2, Ranowulu District, Bitung City.

Order	Family	Species	Indonesian name	Plant part attacked
Orthoptera	Acrididae	*Valanga nigricornis*	Belalang Kayu	Leaves and Tops
	Pyrgomorphidae	*Atractomorpha crenulata*	Belalang Kukus Hijau	Leaves and Tops
Homoptera	Pseudococcidae	*Planoccocus citri*	Kutu Dompolan Putih	Leaves and bone leaves
Hemiptera	Pyrrhocoridae	*Dysdercus cingulatus*	Bapak Pucung	Leaf

Catching insects is done directly in the field using insect nets, and catches directly by hand. Insects associated with avocado (*Persea americana* Mill) were found to be 4 insects from the order Orthoptera, Families Acrididae and Pyrgomorphidae, order Homoptera, Families Pseudococcidae and order Hemiptera, Families Pyrrhocoridae.

1. Order Orthoptera

a. Belalang Kayu *(Valanga nigricornis)*.

Based on direct observations in the field, showed that the Wood Grasshopper / belalang kayu (*Valanga nigricornis*), which was found to be brownish black and brownish green, had coloured spots on the back femur and abdomen, 4-5 cm long body, had two (pairs) of facet eyes, Tarsis three-segmented, a pair of antennae, enlarged forelimb fermur, and short ovipositor. The wood locust (*Valanga nigricornis*) was found in the afternoon in the field.

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The Wood Grasshopper / Belalang Kayu (*Valanga nigricornis*) is generally active in the morning and evening, based on field observations. The damage caused the leaves and shoots of the avocado (*Persea americana* Mill) seeds to be perforated and damaged. The Wood Grasshopper (*Valanga nigricornis*) is often known as a dangerous herbivore.

Figure 1. Wood Grasshopper / Belalang Kayu (*Valanga nigricornis*)
Source: Personal Documents

b. Belalang Kukus Hijau (*Atractomorpha crenulata*)

The Green Steamed Grasshopper / belalang kukus hijau (*Atractomorpha crenulata*) was found to be green with black spots on the abdomen, a pair of antennae, 3 pairs of legs and a pair of facet eyes. This insect was found in the afternoon in the 2nd jasmine nursery, Ranowulu District, Bitung City. The damage caused by the Green Steamed Grasshopper (*Atractomorpha crenulata*) causes holes in the leaves of the Avocado plant (*Persea americana* Mill) due to bite marks.

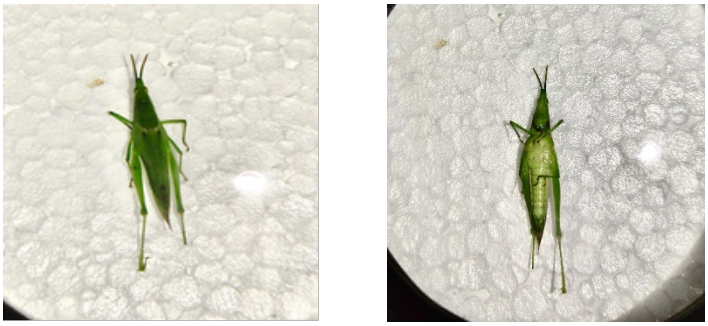

Figure 2. Green Steamed Grasshopper / Belalang Kukus Hijau (*Atractomorpha crenulata*)
Source: Personal Documents

2. Order Homoptera

Kutu Dompolan Putih *(Planococcus citri)*

Based on the observations of the White Dompolan Lice / Kutu Dompolan Putih (*Planococcus citri*) which were found to attack the leaves and stems of the avocado (*Persea americana* Mill) plant seeds, they were yellowish white in color, the body was coated with waxy secretions such as white flour, had a pinching and sucking mouth type. The results of observations of the White Dompolan Flea (*Planococcus citri*) are associated with the help of wind and ants. Avocado plant seeds (*Persea americana* Mill) that are attacked will be damaged and affected by plant diseases (Riona *et al*., 2019).

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According to (Ditjen Plantation 2019 in Sugiarti, 2019) Attacks cause chlorosis, stunting, leaf malformations, young leaves and fruit fall and even cause death so that it can cause high economic losses.

Figure 3. Kutu Dompolan Putih (*Planococcus citri*)
Source: Personal Documents

3. Order Hemiptera

Bapak Pucung *(Dysdercus cingulatus*)

Based on the observations of Bapak Pucung (*Dysdercus cingulatus*) which was found on the leaves of the avocado plant seed, it had a red color with black transverse lines, had an antenna with 4 segments, had a black pattern on the abdomen, a proboscis with 4 segments and had a sucker mouth tool in the form of a stylet. Bapak Pucung (*Dysdercus cingulatus*) associates through the grass around the nursery and attacks the leaves of avocado (*Persea americana* Mill) seedlings. These insects attack by piercing and sucking the leaves until they dry.

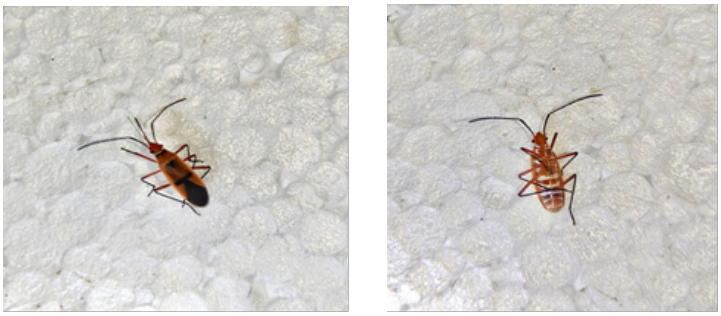

Figure 4. Bapak Pucung (*Dysdercus cingulatus*)
Source: Personal Documents

Percentage of Insect Infected Seeds

The results of field observations that were observed on 3 observation lines for avocado seeds (*Persea americana* Mill) obtained the level of damage and the percentage of seeds that were attacked by destructive insect pests.

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Table 3. Percentage of Damage due to Insect Attacks associated with Avocado (*Persea americana* Mill) seedlings.

Observation Path	Number of Plants Observed	Number of Damaged Plants	Percentage of Affected Plants (%)
1	10	6	60%
2	10	2	20%
3	10	3	30%
	Total		110%
	Average		36,66%

Based on observations, the number of seeds observed was 30 avocado seeds (*Persea americana* Mill), and 11 avocado seeds (*Persea americana* Mill) were attacked. Table 3 shows that from the three observed paths, it is known that all paths are categorized as moderately damaged, with a range of damage between 60% to 20% with an average yield of 36.66%.

In each lane, the avocado (*Persea americana* Mill) seeds that insects attacked had different proportions. Direct observations in the field showed that lane 1 had a higher insect attack rate than in lanes 2 and 3. This is because L lane 1 Avocado (*Persea americana* Mill) seeds are closer to other plant seeds, and their conditions are not too exposed to sunlight.

The percentage yield of avocado (*Persea americana* Mill) seedlings attacked in the KWT nursery. Melati 2 is included in the moderate category. This is due to the nursery staff's maintenance of seeds. Maintenance is carried out weekly by spraying and weeding seedlings in each lane. This maintenance is done to keep the plant seeds' damage from worsening and prevent further damage.

Damage Level

From the results of observations of damage to avocado seedlings (*Persea americana* Mill) at the observation location, the level of damage was calculated for each (Table 4). The analysis shows that the level of damage for each observation line is between 42.06% to 22.85%, including the moderate damage category with average damage of 26.97%. The category of damage level can be seen in (Table 4. Avocado plant seeds (*Persea americana* Mill) aged 1-10 months are very susceptible to pest attacks, and sustainable food availability can affect the population of destructive pests.

Table 4. Number of damaged Avocado (*Persea americana* Mill) seedlings and the level of damage due to insect attack.

Observation Path	Number of Plants observed	Damage Level (%)	Damage Level Category
1	10	42,06%	Moderate
2	10	16,00%	Mild
3	10	22,85%	Mild
	Quantity	80,91	
	Average	26,97%	Moderate

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Moderate damage to avocado (*Persea americana* Mill) seedlings was caused by seed management carried out by nursery officers, namely spraying plants, thinning the seeds and weeding the beds. This maintenance action is taken to prevent more serious damage and reduce the number of pests. (Roshet Koetal, 2015 in Koteng, 2019) In addition, it has been found that sustainable food availability has a strong impact on pest population size.

Another thing that causes moderate damage to avocado seeds (*Persea americana* Mill) in nurseries is food competition. There are other plant seeds in the KWT jasmine two nurseries, Ranowulu District, Bitung City, which can distract insects so that insects not only eat avocado (*Persea americana* Mill) seeds but also eat other plant seeds.

The damage that occurred was classified as moderate, but the damage was not significant and is expected to cause serious damage (Flint and Bosch, 1990 in Koteng, 2019). Therefore, it is necessary to carry out preventive efforts with a silvicultural system, namely setting the distance between plant seeds, seed care, spraying and weeding seeds.

CONCLUSION

Based on observations at the Nursery of the Melati Women Farmer Group 2, Ranowulu District, Bitung City, the researchers found four types of insect pests associated with avocado (*Persea americana* Mill) seeds, insects of the order Orthoptera, wood locust (*Valanga nigricornis*), and green steamed grasshopper (*Atractomorpha crenulata*). the order Homoptera of the White-headed Lice Insect (*Planococcus citri*) and the Hemiptera Order of Bapak Pucung (*Dysdercus cingulatus*).

The percentage of seeds attacked by insect pests in the nursery group of women farmers in jasmine 2 Ranowulu District, Bitung City, with a seedling age of 1-10 months, was 36.66%, including in the moderately damaged category. As for the level of damage to seeds attacked by destructive insect pests on Avocado (*Persea americana* Mill) plant seeds in the Nursery of the Melati 2 Women's Farmer Group, Ranowulu District, Bitung City, with seeds aged 1-10 months, 26.97% of the total seeds were 30 seedlings. that have been observed and fall into the moderately damaged category.

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