International Journal of Latest Research in Humanities and Social Science (IJLRHSS)
Volume 07 - Issue 06, 2024
www.ijlrhss.com || PP. 125-128

Identification of Fruit Flies (Diptera: Tephritidae) in Oil Palm Plantations in Sumuri District, Teluk Bintuni

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Abstract: Most of the people of Sumuri District, Teluk Bintunimake their living as farmers and oil palm plantation workers. However, the plants in their garden were attacked by fruit fly pests, reducing fruit production and resulting in reduced income. Fruit flies are an important pest both on fruit crops and horticultural crops. The aim of this research was to identify fruit fly species in oil palm plantations in Sumuri, Teluk Bintuni. The research was carried out in November - December 2023. The research method was carried out by field observation using a Steiner type trap which had been modified and added with the attractant methyl eugenol. The research results show that there are six species of fruit flies from the genus Bactrocera, including *Bactrocera umbrosa* Fabricius, *Bactrocera curvifera* Walker, *Bactrocera cucurbitae* Coquillete, *Bactrocera dorsalis* Hendel, *Bactrocera trivialis* Drew, and *Bactrocera carambolae* Drew & Hancock. The fruit fly species with the fewest number of individuals was *Bactrocera trivialis* Drew (2 individuals) and the most numerous was *Bactrocera umbrosa* Fabricius (991 individuals). Of the six species found, there are two species that are very rarely found, namely *Bactrocera curvifera* Walker and *Bactrocera trivialis* Drew. The suggestion for this research is to expand the sampling locations so that it is possible to find new fruit fly species in oil palm plantations in Sumuri District, Teluk Bintuni.

Keywords: Identification, Fruit Flies, Palm Oil Plantations, Bintuni Teluk, West Papua

Introduction

Sumuri District is in Teluk Bintuni Regency, West Papua, where some of the people make their living as farmers. The plants cultivated by the community vary from fruit plants, vegetables, horticulture and food plants as well as medicinal plants. Fruit and vegetable plants are the most popular commodities because apart from being used as a natural food source, they can also be processed into various food ingredients. The types of fruit most commonly planted by the community are local fruit plants such as bananas, papaya, mango, soursop, jackfruit, oranges and water guava. These fruits are the favorites on the market because of the public's need for a source of vitamins from fresh/natural fruit. The problem faced by farmers is a lack of fruit production due to suspected attacks by fruit fly pests. Fruit fly pests attack from young fruit until ripe fruit. So when the fruit is harvested the results are not good, and they even rot before harvest (Sahputra & Fitria Lizmah, 2022). This causes a decrease in people's purchasing power due to poor fruit quality and has an impact on farmers' income. Other research states that the losses caused by fruit fly attacks not only reduce the quality of the fruit but also reduce the number or quantity of fruit produced (Badan Pusat Depkes RI, 1991).

This is because fruit flies reproduce by laying eggs in the flesh of the fruit. Fruit fly puncture marks leave black spots on the surface of the fruit skin. Generally, the targets of fruit fly attacks are types of fruit with thin skin and soft flesh (Astriyani, 2014). Fruit fly attacks can be anticipated by controlling them, one of which is by spraying insecticide and wrapping the fruit before it is ripe. However, the use of pesticides is not recommended because the remaining substances do not decompose easily and are easily absorbed into plant tissue, so they can disrupt growth (Odum, 1996). Damage to fruit plants caused by fruit flies in the Sumuri area is always a problem faced by farmers every fruit season so control efforts need to be carried out. It is hoped that this research can provide information to fruit farmers about the types of fruit flies that attack fruit in the Sumuri area and as basic data in efforts to control fruit fly pests in the future.

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Methodology

This research was carried out for 2 months, from November – December 2023 in an oil palm plantation in Sumuri District, Teluk Bintuni. The research was carried out using the field observation method by installing traps at three locations in the oil palm plantation area. Each research location was installed with 60 traps. The trap installation was repeated three times. Traps were installed in the oil palm plantation area for three days, then the number of individual fruit flies trapped was counted and then identified in the laboratory. The identified fruit fly specimens were preserved in the refrigerator so that the wings were not damaged. The tools and materials used were attractant (*methyl eugenol*), cotton wool, a modified Steiner type trap, microscope, camera, identification book and writing tools.

Results and Discussion

Identify Fruit Fly Species

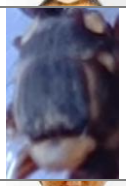
There were six species of fruit flies found in this study, all of which came from the genus Bactrocera. These species include *Bactrocera umbrosa* Fabricius, *Bactrocera curvifera* Walker, *Bactrocera cucurbitae* Coquillete, *Bactrocera dorsalis* Hendel, *Bactrocera trivialis* Drew, and *Bactrocera carambolae* Drew & Hancock. Of the six species found, there are two species that are very rarely found, namely *Bactrocera trivialis* Drew and *Bactrocera curvifera* Walker. Both species have special characteristics on the wings, namely there is a black spot on the tip of the wing.

The morphological characteristics of *B. papayae* include wings with black bands on the flanks and anus with very light b-c cells, black chest scales with yellow bands on the sides, and bright segments on the abdomen, especially on tergite 3 and the sera have horizontal lines. In addition, *B. carambolae* has a wing-shaped head like a fishing rod, scales are mostly black with yellow stripes on the sides, and an orange-brown belly with a light pattern. The *B.dorsalis* fruit fly has elongated yellow spots at the base of the wings, the scales on the thorax are mostly black, and the abdomen is brick brown in a light T shape (Table 1.).

B.umbrosa is the easiest fruit fly to recognize because it has wings with three horizontal stripes, black chest scales with a yellow stripe on the side, and a yellow-brown abdomen. In fact, *B.umbrosa* is a type of fruit fly that is often found in fruit cultivation areas such as jackfruit, mango and guava, causing B.umbrosa to be classified as the dominant type of fruit fly (White, & Elsonharris, 992).

The influencing factor is thought to be the availability of host plants at the research location. As is known, *B.umbrosa* is a fruit fly that is polyphagous, meaning it has many host plants, both of which produce fruit throughout the season (Magurran, 1988). The dominance of certain types and the uneven distribution of species cause the value of species evenness to become smaller (Muryati, & de Kogel, 2007). The dominance of certain species will affect species diversity. The abundance of fruit flies is related to weather patterns (dry season and rainy season). Apart from environmental factors, there is also a close connection with the fruit ripening period and during this period fruit flies lay their eggs in half-ripe fruit.

Table 1. Morphological structure of fruit flies in Sumuri

Species	Wing	Toraks	Abdomen
Bactrocera umbrosa			
Bactrocera curvifera			
Bactrocera carambolae			
Bactrocera dorsalis			
Bactrocera cucurbitae			
Bactrocera trivialis			

The high or low abundance of fruit fly species found in an area is generally influenced by the environmental carrying capacity for the survival of fruit flies (Nugroho *et al*., 2013). The high abundance of fruit flies is related to weather patterns (dry and rainy). Fruit fly numbers increase in cooler climates, higher humidity, and windless conditions (Asaad. 2007) Apart from that, there is also a close connection with the fruit ripening period and during this period fruit flies lay their eggs in half-ripe fruit. Lack of nutrition can reduce the number of eggs produced and slow growth. Fruit flies that lack food also produce small larvae and pupae, which often fail to develop into adults or produce adults that produce only a few eggs. The factor that influences the reproductive ability of fruit flies is the varying availability of host plants at the research location. As is known, *B. umbrosa* is a fruit fly that is polyphagous, meaning it has more than one host plant, both plants whose fruit is seasonal or throughout the season.

Number of Fruit Fly Individuals Found in Research

The results of the research show that there is a diversity of fruit fly species in the Sumuri oil palm plantation. Overall *B. umbrosa* dominates with a total of 991 individuals. In this garden there are minority species, numbering one each, namely *B. trivialis* and *B. curvifera*. Each plot is dominated by a different species. The number of individuals of each species found at the research location can be seen in Table 2.

Table 2. Number of Fruit Fly Individuals in Sumuri Oil Palm Plantations

Species	Plot I	Plot II	Plot III	Total
B. umbrosa	39	854	98	991
B.carambolae	25	449	105	579
B.dorsalis	27	486	90	603
B.cucurbitae	48	34	157	239
B.trivialis	1	0	0	1
B.curvifera	0	0	1	1

Plot 1 was dominated by B. cucurbitae with 48 individuals. What makes this plot unique is that there is one species that is not found in other plots with one individual, namely *B. trivialis*. In plot 2 the numbers of *B. carambolae* and *B. dorsalis* were almost the same, namely half the number of *B. umbrosa* each. Meanwhile, the dominant species in plot 3 was *B. dorsalis* with 603 flies and there was the only species that was not found in the other plots, namely *B. curvifera*, one fruit. Of the total of nine species, the species *B.umbrosa* and *B.carambolae* dominate both the oil palm plantation and non-oil palm plantation habitats in Sumuri District, causing the distribution of the number of individuals in each zone to be uneven. One of the fruit fly species most commonly found in Indonesia is *Bactrocera carambolae* (Sauers-Muller, 2005) The diversity of fruit fly species in an area is influenced by the diversity of hosts available in that area (Novotny *et al*., 2005).

The fruit fly species in oil palm plantations with the highest number is *B.umbrosa* (991 individuals) and the lowest are *B.trivialis, B.curvifera, and B.apicalis* (1 individual each). The two species with the fewest number of individuals (*B.trivialis and B.apicalis*) are non-dominant species and are species that are rarely found so their abundance is small. The influencing factor is thought to be because this species is a species that settles and forages in a habitat. Apart from that, another factor is that perhaps the fruit fly species is only an incidental (non-permanent) explorer of adjacent habitats or perhaps even just a migratory species (White and Elsonharris, 1992).

The difference in the number of individuals between the three fruit flies is very striking. This is because *B.umbrosa* is a species of fruit fly that is commonly found in fruit growing areas, such as jackfruit, mango and water guava, so it is classified as the dominant fruit fly species [13]. The most dominant number of fruit fly individuals in oil palm plantations is those found in the Varita plot, namely, the *B.umbrosa* species (854 individuals). The abundance of fruit flies is an indicator that the ecosystem conditions in that location tend to be evenly distributed because the types of fruit fly species found tend to be few and not diverse. Similar research states that a community or ecosystem that has many species will have a small number of individuals in each species (Odum, 1996).

Host plants whose fruit fluctuates seasonally have an important role as a limiting factor for the number of fruit fly populations due to competition, but on the other hand, competition plays no role in limiting fruit fly populations if fruit or food is available in abundance throughout the year (Soesilohadi dan Hidayat, 2002). Lack of nutrition can reduce the number of eggs produced and slow growth. Fruit flies that lack food also produce small larvae and pupae, which often fail to develop into adults or produce adults that produce only a few eggs. The level of fruit maturity also influences the life of fruit flies. More ripe fruit is preferred by fruit flies for laying eggs than fruit that is still green. This is because it is related to the content of amino acids, vitamins, minerals, water and carbohydrates (Siwi, *et al*., 2006).

Conclusion

The conclusion of this research is that there are six species of fruit flies in oil palm plantations in Sumuri, Teluk Bintuni. These species include *Bactrocera umbrosa* Fabricius, *Bactrocera curvifera* Walker, *Bactrocera cucurbitae* Coquillete, *Bactrocera dorsalis* Hendel, *Bactrocera trivialis* Drew, and *Bactrocera carambolae* Drew & Hancock.

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