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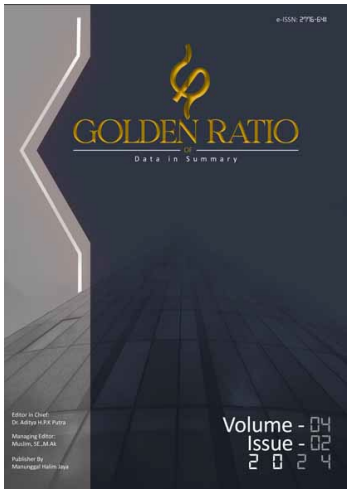

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DESCRIPTIVE OF QUANTITATIVE DATA | SUPPLEMENTARY

Population of Fruit Flies (Diptera: Tephritidae) on Various Fruit Plants in Sumuri District, Teluk Bintuni

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Abstract: Most of the people of Sumuri District make a living as farmers, especially fruit and vegetable farmers. Local fruit plants that are commonly cultivated include bananas, papaya, mangoes, oranges, rambutan, pineapple and water guava. One of the obstacles experienced by the community is the presence of pests that attack the fruit, causing poor fruit and even crop failure. This prompted a field survey of fruit flies in community fruit plantations. The field survey was conducted in October-December 2023 in Tofoi Village, Materabu Jaya Village and Forada Village, Sumuri District, Bintuni Bay. The survey was conducted using the trapping method with Steiner model traps that have been modified from mineral water bottles and the addition of native fruit samples and Methyl Eugenol (ME) with petrogenol trademark. Traps were set for three days and then identification and collection of fruit fly samples were carried out. The results showed that the highest population of fruit flies was in pineapple (Annanas commosus), which was 738 and the least in water guava (Syzygeum aqueum), which was 324. There were nine fruit fly species identified from this study, including: Bactrocera umbrosa (Fabricus), B.carambolae (Drew and Hancock), B.dorsalis (Hendel), B.curreyi (Drew), B.curvifera (Walker), B.emittens (Walker), B.papayae (Drew and Hancock), B.tryoni (Froggatt) and Procecidochares connexa (Macquart).

Keywords: Fruit Flies, Populations, Fruit Crops.

1. INTRODUCTION

Sumuri is a district in the Teluk Bintuni Regency, West Papua. It is located along the coast of Teluk Bintuni, where the local community primarily engages in agriculture, particularly in cultivating vegetables and fruits. The commonly grown fruits include starfruit, water guava, oranges, papaya, bananas, and mangoes. These fruit crops are susceptible to various pests and diseases from growth to post-harvest stages (Evrizal et al., 2004). One of the significant pests affecting fruit crops in the Sumuri area is the fruit fly (Diptera: Tephritidae) (Isnaini, 2013). This pest is a notable Plant Pest Organism (PPO) in horticultural crops, which can disrupt fruit distribution. Fruit flies are prevalent in tropical climates like Indonesia (Muryati et al., 2007). The damage caused by fruit fly infestations not only reduces the quality of the fruits but also decreases the quantity of the yield (Putra et al., 2006). Fruit flies target fruits with thin skins and soft flesh (Ditlintan, 2008). The eggs laid inside the fruit hatch into larvae that consume the fruit's flesh as a nutrient source. This infestation leads to rapid fruit decay and premature dropping or shedding before ripening (Boopathi, 2013). The damage caused by fruit flies on fruit crops in Sumuri is a recurring problem faced by farmers each fruiting season, necessitating control measures. Furthermore, there is currently no data on the fruit flies affecting various fruit types in Sumuri and its surroundings. Therefore, this study aims to conduct fundamental research on the population of fruit flies on several fruit plants in Sumuri District, Teluk Bintuni Regency.

2. RESEARCH DESIGN AND METHOD

The field survey was conducted from October to December 2023 in three villages: Kampung Tofoi, Kampung Materabu Jaya, and Kampung Forada, in Sumuri District, Teluk Bintuni Regency, using trapping methods. Six traps were set up at each location. The survey utilized traps made from modified mineral water bottles known as "Steiner traps." The necessary materials included the attractant Methyl Eugenol (ME) and cotton. The equipment used consisted of fresh fruit samples, including Annanas commosus (pineapple), Musa paradisiaca (banana), Citrus sp. (orange), Syzygium aqueum (water guava), Mangifera indica (mango), Nephelium lappaceum (rambutan), and Carica papaya (papaya). Other materials included wire, 1500mL mineral water bottles, scissors, pliers, plastic syringes, tweezers, tissues, white HVS paper, a 5-liter bucket, gloves, hot glue, tape, and masks. The data collection process involved three stages: preparation, implementation, and data analysis. In the preparation stage, modified Steiner traps were constructed using materials like mineral water bottles, wire, cotton, scissors, syringes, and raffia strings. The traps, made from 1500 mL mineral water bottles containing fresh fruit samples and the attractant Methyl Eugenol (ME), were set up in community orchard areas. The traps were left in place for three days, followed by counting and identification of the trapped fruit flies.The fruit fly samples collected from various fruits were placed in labeled collection bottles and stored in a freezer for identification and classification at the Biology Laboratory of Unipa. The population of fruit flies was counted, and the data were presented in table format (Jusmanto et al., 2019). Species identification was conducted using a XSP 12 Light Microscope and the Magnifier and Microscope app, referencing the "The Australian Handbook for The Identification of Fruit Flies Version 3.1" (2018), "Pedoman Identifikasi Hama Lalat Buah" by Faperta UGM (2006), and "Taxonomy and Bioecology of Important Fruit Flies Bactrocera spp. (Diptera: Tephritidae) in Indonesia" (2004).

3. RESULT AND DISCUSSION

3.1 Fruit Fly Population

The data on the fruit fly population are presented in Table 1 below:

Table 1. Total Number of Fruit Flies Trapped on Each Fruit Type at Three Locations

No.	Fruit Type	I	II	III	Total (individuals)	Average
1	*Annanas commosus* (pineapple)	252	243	243	738	246
2	*Carica papaya* (papaya)	51	64	259	374	125
3	*Citrus* sp. (orange)	303	188	220	711	237
4	*Mangifera indica* (mango)	94	214	142	450	150
5	*Musa paradisiaca* (banana)	212	90	212	514	171
6	*Nephelium lappaceum* (rambutan)	105	127	162	394	131
7	*Syzygium aqueum* (water guava)	31	156	137	324	108
Total (individuals)		1048	1082	1375		

Source: Primary Data

Based on the data in Table 1, it is evident that the number of trapped fruit fly species varies. The highest number was observed in Annanas commosus (pineapple) with 738 individuals, while the lowest was in Syzygium aqueum (water guava) with 324 individuals. According to Wahyunita (2019), pineapples contain volatile compounds that attract fruit flies. These compounds can spread widely when exposed to sunlight, making it easier for flies to find them. The distinct aroma of pineapples also acts as a signal to attract fruit flies, as it resembles a sex pheromone (Rowan, 2011). Data on the number of fruit fly species trapped at each location are presented in Table 2 below:

Table 2. Fruit Fly Population in Kampung Tofoi

No.	Fruit Type	Trap Number						Total
		1	2	3	4	5	6	
1	*Annanas commosus (pineapple)*	14	12	67	52	41	64	252
2	*Carica papaya* (papaya)	5	14	10	6	14	2	51
3	*Citrus sp* (orange)	15	14	31	232	11	0	303
4	*Mangifera indica* (mango)	16	21	25	31	8	0	94
5	*Musa paradisiaca* (banana)	40	32	11	32	18	79	212
6	*Nephelium lappaceum* (rambutan)	8	13	37	41	6	1	105
7	*Syzygium aqueum* (water guava))	3	2	16	8	2	0	31

Source: Primary Data

Table 3. Fruit Fly Population in Kampung Materabu Jaya

No.	Fruit Type	Trap Number						Total
		1	2	3	4	5	6	
1	*Annanas commosus (pineapple)*	33	47	51	10	102	0	243
2	*Carica papaya* (papaya)	17	16	15	2	16	0	64
3	*Citrus sp* (orange)	68	30	51	23	15	0	188
4	*Mangifera indica* (mango)	56	42	20	58	48	0	214
5	*Musa paradisiaca* (banana)	9	11	2	33	35	0	90
6	*Nephelium lappaceum* (rambutan)	12	53	11	35	13	0	127
7	*Syzygium aqueum* (water guava))	24	17	53	38	27	0	156

Source: Primary Data

Table 4. Fruit Fly Population in Kampung Forada

No.	Fruit Type	Trap Number						Total
		1	2	3	4	5	6	
1	*Annanas commosus (pineapple)*	52	38	90	31	31	1	243
2	*Carica papaya* (papaya)	60	53	68	32	46	0	259
3	*Citrus sp* (orange)	55	39	28	33	42	23	220
4	*Mangifera indica* (mango)	35	31	9	26	42	0	142
5	*Musa paradisiaca* (banana)	63	11	83	18	32	2	212
6	*Nephelium lappaceum* (rambutan)	58	17	40	18	29	0	162
7	*Syzygium aqueum* (water guava))	46	42	14	8	42	1	137

Source: Primary Data

Based on Tables 2, 3, and 4, it can be observed that the number of fruit flies trapped in each location varies across different fruit types. In Kampung Tofoi, nearly every trap captured fruit fly species. In Kampung Materabu Jaya, the sixth trap, which did not contain the attractant Methyl Eugenol (ME), did not capture any fruit flies. According to Pujiastuti (2020), ME is used to attract male fruit flies because they require this compound as a para-pheromone, a substance that enhances their desirability to female fruit flies as potential mates. The presence of ME attracts male fruit flies, leading them to congregate around the product or trap containing the attractant. Manurung et al. (2010) also noted that male fruit flies are drawn to the scent released by female fruit flies, with methyl eugenol serving as a volatile chemical compound that emits a fragrant aroma.

The data indicate that different types of fruits attract varying numbers of fruit flies at the three surveyed locations. In Kampung Tofoi (Location I), the fruit with the highest number of trapped fruit flies was Citrus sp. (orange), totaling 303 individuals, while the least was Syzygium aqueum (water guava) with 31 individuals. In Kampung Materabu Jaya (Location II), Annanas commosus (pineapple) attracted the most fruit flies, with 243 individuals, and Carica papaya (papaya) attracted the fewest, with 64 individuals. In Kampung Forada (Location III), Carica papaya (papaya) was the most favored, attracting 259 individuals, while Syzygium aqueum (water guava) attracted 137 individuals.

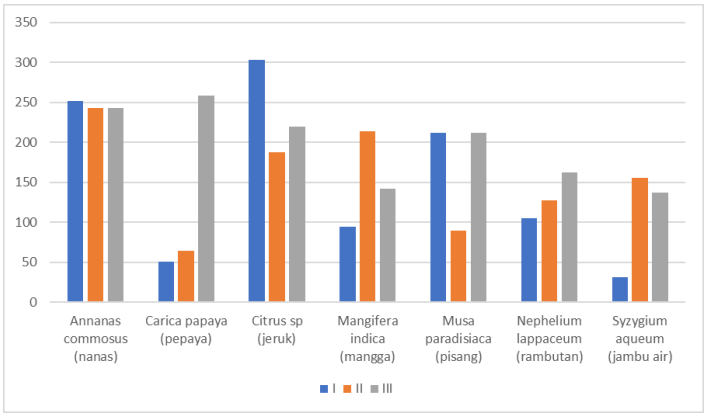

Figure 1. Number of Fruit Fly Species Trapped at Each Location

These findings suggest that different types of fruit are more attractive to fruit flies in each location. However, the preference for specific fruit types does not necessarily indicate a consistent attraction to certain fruit across all locations. The common characteristic of the most attractive fruits—such as Citrus sp., Annanas commosus, and Carica papaya—is that they have thick flesh, thin skin, and are generally juicy. The varying numbers of fruit flies found at the research sites reflect the level of infestation among the seven sampled fruit types. According to Pujiastuti (2007), the level of infestation largely depends on the fruit fly population in the field. A higher fruit fly population typically correlates with increased infestation rates. Moreover, the presence of fruit flies in a location is influenced by various biotic and abiotic factors, including temperature, humidity, light, wind, host plants, and natural predators. Siwi (2005) notes that factors influencing fruit fly life include temperature, humidity, light, wind, host plants, and natural enemies. Temperature affects the lifespan and mortality rate of fruit flies.

3.2 Fruit Fly Species Identification

The study identified nine fruit fly species: Bactrocera umbrosa (Fabricus), B. carambolae (Drew and Hancock), B. dorsalis (Hendel), B. curreyi (Drew), B. curvifera (Walker), B. emittens (Walker), B. papayae (Drew and Hancock), B. tryoni (Froggatt), and Procecidochares connexa (Macquart). The identification was based on morphological characteristics such as wing venation type, lateral postsutural vittae type, scutum color, and abdominal patterns. *Bactrocera umbrosa* is characterized by a wingspan ranging from 5.5 mm to 8.1 mm, with three transverse bands running from the costal band to the posterior edge of the wing. Its scutum is black with yellow lateral bands, and its abdomen is brown with various patterns. Male flies have a pecten on the third abdominal tergite (Putra, 1997). B. carambolae infests a wide range of host plants, including starfruit, water guava, jackfruit, chili peppers, guava, and mango (Hasyim et al., 2014). Its distinguishing features include black bands on the costa and anal lines and an apex wing pattern resembling a fishing hook. The scutum is typically dull black, with yellow stripes on the lateral sides. The postpronotum is yellow or orange, and the anepisternum has yellow spots. Female flies have black or dark brown spots on the apical thighs. The abdomen is orange-brown with distinct patterns (Siwi et al., 2006).

This study provides insights into the diversity of fruit fly species attacking fruit crops at the three locations. The diversity of these species is influenced by factors such as the presence of host plants, temperature, humidity, rainfall, light, wind, topography (highlands and lowlands), trap placement, and the type of traps used (Pusat Karantina Pertanian, 2003). The presence of alternative hosts around crops can attract more fruit flies, as they are polyphagous, attacking various types of fruits and vegetables (Kalshoven, 1981).

4. CONCLUSION

Based on the research data, the fruit types most favored by fruit flies, in descending order, are Annanas commosus (pineapple) with 738 individuals, Citrus sp. (orange) with 711 individuals, Musa paradisiaca (banana) with 514 individuals, Mangifera indica (mango) with 450 individuals, Nephelium lappaceum (rambutan) with 394 individuals, Carica papaya (papaya) with 374 individuals, and Syzygium aqueum (water guava) with 324 individuals. The highest fruit fly populations by location were found in Kampung Forada (1375 individuals), followed by Kampung Materabu Jaya (1082 individuals), and Kampung Tofoi (1048 individuals). The study identified nine fruit fly species: Bactrocera umbrosa (Fabricus), B. carambolae (Drew and Hancock), B. dorsalis (Hendel), B. curreyi (Drew), B. curvifera (Walker), B. emittens (Walker), B. papayae (Drew and Hancock), B. tryoni (Froggatt), and Procecidochares connexa (Macquart).

REFERENCES

Drew, R. A. I., dan D. L. Hancock. (1994). The Bactrocera Dorsalis Complex Fruit Flies (Diptera: Tepritidae: Dacinae) in Asia. Bul of Entomol ReS upp (2): 68.

Evrizal E, Budidarsono S & Prasmatiwi FE. (2004). Land Use History, Land Use Intensity and Sosioeconomic background of Lampung Benchmark Area, Sumberjaya Window, Indonesia. CSM BGBD Project Report, Bandar Lampung.

Hasyim, A., Sudarmo., Nurhadi., M. Agus. (2008). Identifikasi, status dan pengelolaan lalat buah di Indonesia. Badan Penelitian dan Pengembangan Pertanian (BPTP). J. Hortikultura. Surabaya

Isnaini, Y. (2013). Identifikasi Spesies dan Kelimpahan Lalat Buah Bactrocera spp Di Kabupaten Demak. Univesitas Negeri Semarang.

Jusmanto, Nasir B, Yunus M. (2019). Daya tarik metil eugenol terhadap populasi lalat buah (Bactrocera sp.) pada berbagai ketinggian dan warna perangkap pada pertanaman cabai berah. Jurnal Agrotekbis. 7 (1): 10–19.

Kardinan A. (2019). Prospek insektisida nabati berbahan aktif Metil Eugenol (C12H24O2) sebagai pengendali hama lalat buah Bactrocera spp. (Diptera: Tephritidae) Prospect of Methyl Eugenol (C12H24O2) as Active Ingredient of Botanical Insecticide for Fruit Flies Control Bact. Perspektif. 18 (1):16.

Pujiastuti Y. (2020). Keanekaragaman dan pola keberadaan lalat buah (Diptera: Tephritidae) di Provinsi Sumatera Selatan. Jurnal Entomologi Indonesia. 17 (3): 125.

Putra, N. S. (1997). Hama Lalat Buah dan Pengendaliannya. Kanisius. Yogyakarta.

Rowan, D. D. (2011).Volatile metabolites. Review. Jurnal Metabolites 1: 41-63

Wahyunita. (2019). Respons Serangga Terhadap Senyawa-Senyawa Velotil yang Bersumber. Dari Buah Nenas (Ananas comosus L Merr.) Dan Nangka (Artocarpus heterophyllus L.) Di Perkebunan Kelapa Sawit. Medan: Universitas Sumatera Utara.