The Use of Papaya (*Carica papaya*) Leaf Extract as a Natural Insecticide to Controlling Flies (*Stomoxys sp.*) in Cattle at Manokwari West Papua

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Abstract

This study aims to determine the effect of using papaya leaf extract (*Carica papaya*) as a natural insecticide in controlling flies (*Stomoxys sp.*) and to determine its potential as a natural insecticide in terms of economic aspects. The results of this study can be a source of information and contribute to the handling of cage flies as vectors of disease spread in cattle that are environmentally friendly, inexpensive and easy to obtain. This research was conducted at Campus II of the Manokwari Agricultural Development Polytechnic Teaching Factory Unit, Anday. The material used 15 cattle which were grouped into 5 groups and each group consisted of 3 cattle. Each group was given negative control/clean water (P_0), papaya leaf extract 100% (P_1), papaya leaf extract 75% (P_2), papaya leaf extract 50% (P_3), and positive control or synthetic insecticide (P_4). The method of using the treatment is by spraying it on the cattle on the neck and shoulders. The result showed that the treatment P_4 had the longest resistance to being infested by flies compared to other treatments, followed by treatments P_1, P_2, P_3, and P_0. The most effective administration of papaya flies in cattle was treatment P_1, because it had a lower fly perch than treatment P_2, P_3 and P_0.

Keywords : papaya leaf extract, natural insecticide, flies, economic, cattle.

Introduction

West Papua is one of the province in eastern Indonesia with one of the main commodities is papaya fruit. In 2015 West Papua Province produced 4,107 tons of papaya fruit (BPS, 2015). People in West Papua generally like to consume papaya fruit, flowers and leaves either directly or processed into food. Almost every house found papaya trees cultivated by people in this place.

Papaya plant (*Carica papaya*) is a plant that has medicinal properties that have papain enzyme components, saponin compounds, flavonoids and tannins which are toxic to insect (Rohma & Wikanta, 2021). Several studies related to papaya leaves have been carried out to overcome insect pests or pesticides. Papaya leaves also contain papain compounds that come from the sap in the leaves. Papain compounds are believed to function as vegetable pesticides (Akunne, Obiefuna, & Ononye, 2014)

Cattle have an important role in people's lives in Indonesia but in practice, there are many obstacles in the management of cattle rearing. One of them is the infestation of external parasites such as stable fly (*Stomoxys sp*.) The stable fly is a carrier factor (vector) in disease transmission in livestock (Afriyanda, Hadi, & Soviana, 2019). The

stable fly (*Stomoxys sp*.) is one type of fly that attacks livestock and generally beef cattle by biting and sucking the blood of livestock so that it has a negative impact on the growth and health of livestock (Hidayah, Zayadi, & Hayati, 2018).

The study aims to determine the effectiveness of papaya leaf extract as a natural insecticide on stable flies (*Stomoxys sp*.) It is hoped that this research can be used as an applicable solution to controlling stable flies by utilizing its abundant potential.

Materials and Methods

This research was carried out for 1 month in January 2022 and this research was carried out at Campus II of the Manokwari Agricultural Development Polytechnic Teacing Factory Unit in Anday, South Manokwari District, Manokwari Regency, West Papua Province. The tools used are scales, buckets, spraying (capacity 1.5 liters), blender, 5 liter jar capacity, filter, stopwatch on mobile phone. While the materials used were 15 cattle, papaya leaves, clean water, and synthetic insecticide.

The procedures carried out in this study are :

a. Making papaya leaf extract :
   Papaya leaves as much as 0.5 kg are pounded, mashed and mixed with 2.500 ml and soaked a day and night. The filter results obtained 100% papaya leaf extract. Furthermore, the plant extract was diluted to obtain concentrations of 50% and 75%.
b. Application on cattle
   Cattle were grouped into five group consisted of three cattle. Each group was given the following treatment:
   T0 : negative control (spraying with PDAM water)
   T1 : spraying with 100% papaya leaf extract
   T2 : spraying with 75% papaya leaf extract
   T3 : spraying with 50% papaya leaf extract
   T4 : positive control (spraying with synthetic insecticide)
   Spraying on cattle was carried out from the neck to the shoulder of the cattle and each group was observed for 24 hours.
c. Data analysis
   The data obtained were then categorized and analyzed descriptively to see the number of flies that perch on cattle.

Results and Discussion

Data from observations for 24 hours to see the number of flies that perches on cattle farms in each treatment are presented in Table 1. The results of observations of the number of flies that perches within 10 minutes showed that in the treatment P_1 (spraying with 100% papaya leaf extract), P_2 (spraying with 75% papaya leaf extract), P_3 (spraying with 50% papaya leaf extract) and P_4 (spraying with synthetic insecticide) there were no flies that the perch on the cattle, while in the P_0 treatment (spraying with water), many flies has perched. This indicates that the number of flies in the P0 treatment within 10 minutes was higher than in the other treatment. Spraying cattle

using water within 10 minutes will attract flies faster than cattle that have been sprayed using papaya leaf extract and synthetic insecticides. Papaya leaf extract contains chemical compounds in the form of alkaloids, carbohydrates, saponins, glicosides, proteins and amino acids, phytosterols, phenolic compounds, flavonoids, terpenoids, tannins and papaya leaves also contain enzymes papain and kinopapain which are toxic to insects (Fajri, Heiriyani, & Susanti, 2017).

Table 1. Observation data on the number of flies that perch on cattle

time (minute)	Treatment				
	P0	P1	P2	P3	P4
10	+++	-	-	-	-
20	+++	-	-	+	-
30	+++	-	+	++	-
40	+++	-	+	+++	-
50	+++	-	++	+++	-
60	+++	+	+++	+++	-
70	+++	++	+++	+++	-
80	+++	+++	+++	+++	-
90	+++	+++	+++	+++	+
…....	+++	+++	+++	+++	+
after 24 H	+++	+++	+++	+++	+++

Description: no fly perch, + : the number of flies that perch 1-5 tails, ++ : the number of flies that perch 6-10 tails, +++ : the number of flies that perch >10 tails

The workings of papaya leaf extract as a natural insecticide can be repelling the presence of insects, this property arises because of the smell of natural pesticides which is quite stinging (Glio, 2017). The flavonoids contained in papaya have a very sharp odour, taste bitter and are soluble in water and organic solvents, and can be decomposed at high temperatures (Rahmat, 2009). Saponins have the ability to form foam when shaken with water will produce a bitter taste that can reduce surface tension so that it can damage insect cell membrane (Mulyana, 2002). Tannin compounds are toxic which play a role inhabiting the activity of digestive enzymes, have ability to tan the skin (Harborne, Sudiro, & Padmawinata, 1996).

The results of the observation of the number of flies that perch within 20 minutes showed that in treatment P_3 (spraying with 50% papaya leaf extract) cattle had begun to be infested by flies, while in treatment P_1, P_2, and P_4 flies were still not infested. This show that the use of 50% papaya leaf extract is less effective at repelling the presence of flies for more than 20 minutes.

The number of flies that perches within 30, 40 and 50 minutes showed that in treatment P_2 (spraying with 75% papaya leaf extract) cattle had begun to be infested with flies and in treatment P_3 (spraying with 50% papaya leaf extract) many stable flies had perched in cattle, while in treatment P1 flies were still not infested. This shows that the use of papaya leaf extract 75% is less effective to repel the presence of flies for more than 30 minute, while the use of papaya leaf extract 100% can still maintain its

repellent properties because the higher the concentration of papaya leaf extract, the greater the content of compounds and enzyme in it.

The results of observations on the number of flies that perches within 60 minutes showed that in the P_1 treatment (spraying with 100% papaya leaf extract spraying) cattle had started to be infested by fewer flies and the number of flies that perches increasing number at 70, 80, 90 and 120 minutes. This indicates that the P_1 treatment was less effective in rejecting the presence of flies for more than 60 minutes. From the observation for 24 hours, it shows that the perching power of flies decreases with the increase in the concentration of papaya leaf extract. Papaya sap contained in papaya leaves is known to contain papain enzymes and compounds belonging to the group of alkaloids, terpenoids, flavonoids and non protein amino acids which are highly toxic to insects (Julaily & Setyawati, 2013).

The control treatment, in this case the negative control (P_0), has a very high perching power of flies, as evidenced by the observation for 10 minutes, the number of flies that perch is very large, inversely proportional to the positive control (P_4), the longest perching power of flies compared to other treatment. In this experiment, the concentration of 100% papaya leaf extract was said to be the most effective for reducing fly perch on cattle compared to other papaya leaf extract treatments.

The estimated production costs of using papaya leaf extract as a natural insecticide against synthetic insecticides are presented in Table 2.

Table 2. Estimation of potential production costs using papaya leaf extract as a natural insecticide against synthetic insecticides

Type of pesticides	Cost estimation	Economic impact on the environment	Literature
Independent natural insecticide:			
100% papaya leaf extract 75% papaya leaf extract 50% papaya leaf extract	Rp.500/head Rp.375/head Rp.250/head	Environmentally friendly	
synthetic insecticides contains Deltamethrin	Rp.1.200/head	Toxic to fish and aquatic invertebrates	World Health Organization, 1990

Based on Table 2, the estimated potential production cost of using papaya leaf extract as a natural insecticide compared to synthetic insecticides is that the use of papaya leaf extract is relatively cheaper than using synthetic insecticides which can pollute the environment and cause death in fish and aquatic invertebrates. Cattle farmer can make their own papaya leaf extract easily and directly available in nature so that it can lower production costs.

Conclusion

The most effective use of papaya leaf extract as a vegetable insecticide in the control of stable flies (*Stomoxys sp*.) in cattle was the use of 100% papaya leaf extract (P_1) because it had lower flies that perch than treatment P_2, P_3 and P_0.

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