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BIOPESTICIDES FROM PAPAYA LEAVES AND TEMBELEKAN LEAVES TO CONTROL ARMYWORM PESTS (*Spodoptera Litura F*)

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ABSTRACT

Biopesticides made from papaya leaves and tembelekan leaves to control armyworm pests (Spodoptera litura F) have been carried out, these two plants are relatively easy to find around us and contain active compounds that have the potential as insecticides. Plant extracts are obtained by maceration using ethanol solvent p.a, then evaporated to separate the extract and solvent so that an extract is obtained. The variables of the study conducted were the composition of P100: T10, P90: T10, P80: T20, P70: T30, and P0: T100. Soaking time 1-4 days and applied to armyworm (Spodoptera litura F) for 2 hours. The results of the study reached the quality of P100:T0 and P90 biopesticides; T10 with a soaking time of 1-3 days obtained an average armyworm mortality of 88.6%. The characteristics of biopesticides produced from tannin levels and flavonoid levels have a positive correlative relationship with the mortality power of gryak caterpillars (Spodoptera litura F), P100: T0 there are 0.0366% tannin levels and 1.58% flavonoid levels with 76% mortality power and P90:T10 there are 0.03725 tannin levels and 1.6394% falvonoid levels with 100% mortality power.

Keywords: Biopesticides, Mortality, and *Spodoptera litura F*

INTRODUCTION

WHO (World Health Organization) notes that every year there is synthetic pesticide poisoning between 44,000-2,000,000 people in developing countries around the world. The use of synthetic pesticides can leave chemical residues on agricultural products and in the soil even carried to water sources so that they can poison beneficial organisms and poison the surrounding environment. Therefore, an environmentally friendly alternative pesticide is needed.

Because of the development of technology, an alternative pest exterminator from plants has been found, namely biopesticides. Biopesticides are relatively easy to make with simple technology. Natural raw materials make biopesticides easily decomposed (biodegradable) in nature so that they do not pollute the environment and are relatively safe for humans because the residues are easily lost and can replace the role of synthetic pesticides.

Plants that can be used as biopesticides include papaya leaves and tembelekan. Both plants contain active compounds that have the potential as insecticides (pest killers). The results of papaya leaf extract research with saponin content (0.02%) and tannins (0.05%) at a concentration of 85% papaya leaf extract can kill armyworms as many as 8 out of 10 heads for 14 days [2]. This is due to the presence of active compounds in papaya leaves can inhibit the growth of armyworm pests. The leaves, stems and roots of the tembelekan plant contain chemical compounds including starch, phenols, alkaloids, steroids, flavonoids, saponins, tannins, catachin and antraquinone [3][5]. In phytochemical testing of the combination of papaya leaf extract and tembelekan leaves, it can increase pest motility by 96.7% [4.]

Biopesticides are pesticides made from plants or plants that can control pests and contain toxins. In general, there are several advantages of biopesticides, including [6]:

1. Biodegradable in nature.
2. Relatively safe for humans and applied plants or plants.
3. The raw materials are easy to find.
4. Cheap and easy to make by farmers.
5. The residue is easily decomposed so it does not last long on plants or plants.
6. The use of biopesticides can add value to raw materials.
7. Does not cause immunity in pests

RESEARCH METHODOLOGY

1) Materials and tools

a. Materials

Papaya leaves = 2 Kg, tembelekan leaves = 1 Kg, armyworm = 100 heads, Ethanol 96% = 6 L, Ethanol 95%, Aquades, potassium permanganate 0.1 N, $AlCl_3$, Sodium oxalate, H_2SO_4 4 N, Quercetin, Methanol, Sodium acetate, and cotton.

b. Tools

A series of evaporators, A series of UV-VIS spectrophotometers, A series of acid-base titration tools, Analytical balances, Basins, Blenders, 45 mesh/355 μm sieves, Glass funnels, Filter paper, Beaker glass, Spatulas, Aluminum foil paper, 100 mL, 250 mL and 1000 mL measuring flasks, 25 mL ball pipettes, Drip pipettes, 500 mL Erlemeyer and Sprey bottles.

2) Biopesticide Manufacturing Procedure

1. Wash papaya leaves and tembelekan leaves each 2 Kg and 1 Kg.
2. Slicing each raw material, then drying in the sun
3. The dried sample is mashed with a blender to obtain powder, then sift the powder with a size of 45 mesh (355 μm).

a. Maceration Method Extraction

1. Put each sample into a beaker glass and add 96% ethanol solvent (papaya leaf extract = 4 L and tembelekan leaf extract = 2 L)
2. Beaker glass is covered with aluminum foil, so that evaporation does not occur during the extraction process.
3. Soaking the sample extract according to time variables (1 day, 2 days, 3 days and 4 days).
4. Gently insert the sample extract into a funnel that has been given filter paper on a measuring cup to separate the filtrate from the residue.
5. Then each filtrate (papaya leaf and tembelekan leaf) is evaporated.

b. Evaporasi Vacuum Evaporator

1. Putting water into the waterbath.
2. Before the sample solution is inserted, first apply Vaseline at the end of the flask, either a round flask base or a solvent holding flask.
3. Inserting the sample solution to be evaporated into a roundbed flask.
4. Heating the waterbath according to the solvent temperature of 55-60°C.
5. A round base flask containing the sample is attached to the end of the rotor.
6. Then cooling water is flowed and the vacuum pump is run.
7. The rotor button is rotated at a certain speed (2-3 turns).
8. The required time is 45 minutes.
9. Record the results obtained from round bottom flasks and solvent holding flasks.

3) Test Procedures

a. Pest Mortality Test (Grayak Caterpillar)
   1. Prepare the armyworm, then place the caterpillar on a table covered with clear plastic.
   2. Spray biopesticides onto armyworms until evenly distributed.
   3. Observe armyworm reactions for up to 2 hours

b. Tanin level

Approximately 2 g of carefully weighed extract heat with 50 mL of boiling water on a water rod for 30 minutes stirring. Let stand for a few minutes and then pour through a lump of cotton into the same measuring flask. Repeat the extraction several times until the solution when reacted with iron (lll) ammonium sulfate does not show the presence of tannins. Cool the liquid and add enough water to 250 ml. Pipette 1 mL of solution into Erlemeyer 500 mL, plus 400 mL of Aquades, titrate with 0.1125 N Potassium permanganate to 0.1125 N pink violet solution equivalent to 0.004157 gr of tannins. do a blank experiment.

c. Flavonoid levels using UV-Visible spectrophotometry
   1. Determination of the maximum wavelength (λ) of quercetin

      A total of 10 mg of quercetin (comparison) was weighed and dissolved in 100 mL of methanol as a stock solution. Then dilution of quercetin with a concentration of 20, 30, 40, 50, 60 ppm is made as a solution of quercetin. A total of 0.5 mL of comparison solution (quercetin) was diluted with 1.5 mL of methanol then added 0.1 mL of Aluminum(III) chloride10%, 0.1 mL Sodium acetate 1 M and 2.8 mL Aquadest. After incubating for 30 minutes, the absorbance of the comparison solution was measured with a visible light UV spectrophotometer at wavelengths of 400-800 nm.
   2. Measurement of Total Flavonoid Levels in Biopesticides

      A total of 20 mg samples were weighed and dissolved in 10 mL of methanol so that a concentration of 2000 ppm was obtained. A total of 0.5 mL of test samples were added with 1.5 mL methanol, 0.1 mL of 10% Aluminum(III) chloride, 0.1 mL of 1 M Sodium acetate and 2.8 mL of Aquades. After incubating for 30 minutes. Absorbance was measured using a UV-Vis Spectrophotometer at a wavelength of 430 nm.

RESULT DAN DISCUSSION

The biopesticides used in this study were made from papaya leaves and tembelekan leaves. After preparing the raw materials, dried in the sun, then reduced in size with a blender, then sifted (no 45 mesh / 355 μm). then extracted. The purpose of the extraction process is to attract active compounds contained in papaya leaves and tembelekan leaves. The extraction method used is maceration, because the method is simple, easy and without heating so that the active compounds contained in the leaves are not damaged. This process aims to penetrate the leaf cell wall and enter the cell cavity containing the active substance because of the difference in concentration between the active substance and those outside the cell, then the active substance is pushed out, this happens repeatedly until there is a balance of concentration between inside and outside the cell.

Soaking the composition of P and T with 96% p.a ethanol solvent for 1, 2, 3, and 4 days and then every 24 hours stirred, because the solvent is polar which is volatile so it is good to use as an extract solvent. Then evaporated to separate the extract and solvent so that a concentrated extract is obtained. Evaporation is a solution concentration process consisting of volatile solvents and non-volatile solutes. Evaporation is the process of thickening a solution by evaporating a solvent based on boiling point.

Mortality tests were carried out on armyworms (Spodoptera litura F), armyworms that had been placed on a plastic table and then sprayed on each treatment of 5 caterpillars with biopesticides until evenly distributed then observed the death of armyworms (Spodoptera litura F) for 2 hours. The research results can be seen in Table 1.

TABEL 1 RESEARCH RESULTS

The composistion of raw material P : T (%)	Soaking duration (days)	Mortality (tail)	Tanin level (%)	Flavonoid level (%)
100 : 0	1	5	0,0315	1,58
	2	5	0,0351	
	3	5	0,0361	
	4	4	0,0444	
90 : 10	1	5	0,0322	1,6394
	2	5	0,0345	
	3	5	0,0351	
	4	5	0,0372	
80 : 20	1	5	0,0243	1,4552
	2	5	0,0314	
	3	4	0,0337	
	4	4	0,0351	
70 : 30	1	3	0,043	0,5515
	2	3	0,0374	
	3	3	0,0405	
	4	3	0,0397	
0 : 100	1	2	0,0383	0,5221
	2	3	0,0383	
	3	3	0,0374	
	4	4	0,0407	

Result of Mortality Test

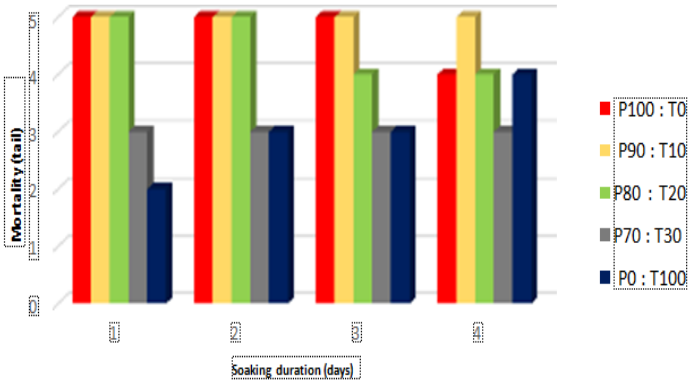


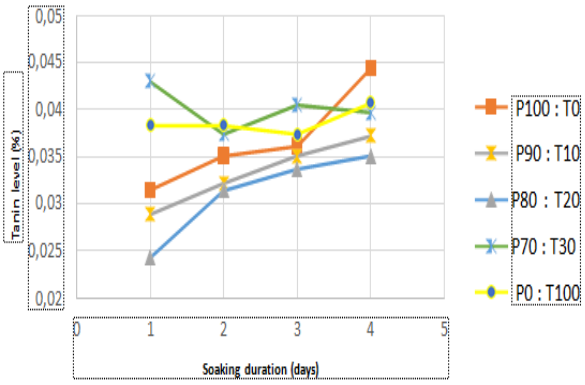
Figure 1 Mortality

From the results of the mortality test in figure 4.1, it can be seen that each composition has a different influence on armyworm mortality and soaking time. The composition of P100:T0 can be at 1-3 days soaking time with 76% mortality power, P90:T10 at 1-4 soaking time with 100% mortality power, and P80:T20% at 1-2 days soaking time with 80% mortality power. This shows that the composition that meets the quality of biopesticides to control armyworm pests (*Spodoptera litura F*) is found at P100: T0, P90: T10, and P80: T20%, where the mortality power affects the length of immersion. This research is in accordance with previous research [7]. P70:T30 and P0:T100 do not meet the quality of biopesticides, this shows that the lack of mortality of armyworm pests (*Spodoptera litura F*).

The mortality of armyworms (Spodoptera litura F) against biopesticides is caused by spraying on caterpillars so that biopesticide liquid hits the dorsal surface of the armyworm's body. Some of the biopesticide liquid attached to the leaves will hit the surface of the armyworm's body ventral when the armyworm walks. Insecticides that enter through the surface of the body can pass through thin cuticles such as the nexus of body pores. The mechanism of absorption of insecticides in addition to through the skin can also be through the digestive tract, biopesticides have a toxic effect on the stomach, which is the main organ in insect digestion because the digestive tract is an organ that absorbs nutrients and secretes

enzymes [8]. If the secretion of enzymes is disrupted, the armyworm digestion process will lack energy and over time will experience death. Active compounds contained in biopesticides accumulated in the armyworm's body will act as toxic because armyworms are cold-blooded. The toxic will be distributed to all body cells through the armyworm circulatory system.

Result of Tanin Level Test



The results of the analysis of tannin levels of each composition showed that P100:T0 with a soaking time of 1 day contained tannins of 0.0315%, soaking on 2 days contained tannins of 0.0351%, soaking on 3 days contained tannins of 0.0361%, and soaking on 4 days contained tannins of 0.0444%.

At P90:T10 with a soaking time of 1 day contains a tannin content of 0.0289%, soaking on 2 days contains a tannin content of 0.0322%, soaking on 3 days contains a tannin content of 0.0351%, and soaking on 4 days contains a tannin content of 0.0372%.

At P80:T10 with a soaking time of 1 day contains a tannin content of 0.0243%, soaking on 2 days contains a tannin content of 0.0314%, soaking on 3 days contains a tannin content of 0.0337%, and soaking on 4 days contains a tannin content of 0.0351%.

At P70:T30 with a soaking time of 1 day contains a tannin content of 0.0430%, soaking on 2 days contains a tannin content of 0.0374%, soaking on 3 days contains a tannin content of 0.0405%, and soaking on 4 days contains a tannin content of 0.0397%.

At P0:T100 with a soaking time of 1 day contains a tannin content of 0.0383%, soaking on 2 days contains a tannin content of 0.0383%, soaking on 3 days contains a tannin content of 0.0374%, and soaking on 4 days contains a tannin content of 0.0407%.

This shows that the composition of biopesticides to control armyworm pests at P100: T0, P90: T10 and P80: T10 tannin levels affect the duration of soaking and mortality of armyworms. This research is in accordance with previous research [9].

Result of Flavonoid Test

Determination of total flavonoid levels was carried out using quercetin standard solutions of 20 ppm, 30 ppm, 40 ppm, 50 ppm and 60 ppm. Absorbance measurements were performed using a UV-Vis Spectrophotometer with a wavelength of 430 nm. To calculate the total flavonoid content, first the sample absorbance results were entered into the linear line equation y = 0.0095x-0.0675 with a correlation coefficient of 0.986 so that the total content of biopesticide flavonoids was obtained in the composition of P100: T0 with the mortality power of 5 armyworms which was 1.58%, at P90: T10 with the mortality power of 5 armyworms which was 1.6394%, at P80: T20 with mortality power of 5 armyworms is 1.4552%, at P70: T30 with mortality power of 3 armyworms is 0.5515%, at P0: T100 with mortality power of 4 armyworms is 0.5221% [10][11].

This shows that flavonoid levels are related to armyworm mortality *(Spodoptera litura F)* because good flavonoids are P100: T0 = 1.58% and P90: T10 = 1.6394% with mortality of 5 armyworms, and P80: T20 = 1.4552% with mortality of 5 armyworms.

CONCLUSION

Based on the research conducted, it can be concluded that:

1. The composition of biopesticide quality against the mortality power of armyworm (Spodoptera litura F) is P90:T10.
2. Biopesticide soaking time for 1-3 days still meets the quality of biopesticides in terms of the average mortality power of 88.6%.
3. Biopesticide characteristics resulting from tannin levels and flavonoid levels have a positive correlative relationship with the mortality power of armyworms (*Spodoptera litura F*).

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