

Effect Of Combination Of Extracts Of Several Rhizomes On Mortality Of Armyworm (*Spodoptera* sp.) On Sweet Potato Plants (*Ipomoea batatas* L.)

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ABSTRACT. The use of a mixture of rhizome extracts of red ginger, turmeric, and kencur to control armyworms (*Spodoptera litura* F.) is an important prospect in increasing the yield of sweet potato crops, because plant-based pesticides can be used in single or mixed forms. The study aimed to determine the influence of various mixed effects of different concentrations of extracts of several rhizomes on the mortality of Grayak caterpillar pest (*Spodoptera litura* F.) on sweet potato plants (*Ipomoea batatas* L.). As well as determining the concentration of rhizome extract mixture that is more effective in controlling Grayak caterpillar pests (*Spodoptera* sp.) on sweet potato plants (*Ipomoea batatas* L.). This study used a method with a Group Random Design (RAK) consisting of 5 treatments and 5 replicates. The treatment is: 1. Control (sterile water application), 2. A mixture of red ginger, turmeric, and kencur rhizome extracts 40%, 50%, 60%, 70%, 80%, 90% through food (Stomach poison). The experiment was arranged in a complete randomized design of four replicates each using instar 2 larvae of *Spodoptera* sp. as many as 280 heads. Research Results The observation results showed that there was an influence of each concentration tested on the pest *Spodoptera* sp. through food (Stomach poison) against the larvae of the second instar where the level of attack caused in the instar is very high, so the concentration used is 40%-90%. All concentrations showed a real effect on the larvae of the two instars, at a concentration of 40% a mortality rate of 11.50%, and the highest concentration was 90% with a mortality rate of 80%..

Keywords : *Rhizome extracts of red ginger, kencur, turmeric, sweet potato, Grayak caterpillar (Spodoptera sp.)*

INTRODUCTION

Sweet potatoes are one of the alternative sources of carbohydrates to replace rice. In addition, sweet potatoes contain nutrients that can balance the nutrients found in wheat and rice. However, various factors such as pests, diseases, the environment, and weather caused a decrease in sweet potato production. The low productivity of sweet potato plants is a disturbance of environmental factors, plant genetics, pests and plant diseases.

Armyworm (*Spodoptera litura* F.) is a polyphage (common pest) that has a wide range of hosts so that it has the potential to become a pest on various types of food crops, vegetables, fruits and plantations. One of the host plants of armyworms is sweet potato plants. In addition, other host crops of armyworms are chili, rice, corn, tomatoes, sugarcane, chickpeas, oranges, tobacco, onions, eggplants, potatoes, beans (soybeans, peanuts), kale, spinach, bananas, and ornamental plants (Marwoto and Suharsono, 2008).

Plants that are toxic usually come from medicinal plants where they are able and proven in pest control (Dharma, 1987). Each plant of the Zingiberaceae family contains biologically active ingredients that are able to affect the life of insects. Turmeric (*Curcuma domestica*) also contains compounds that have medicinal properties that include curcumin, desmethoxycurcumin 10% and bisdesmethoxycurcumin 1-5% as well as compounds that have benefits. The benefits of essential oils in insects can be repellent, attracting, contact toxic, respiratory toxic, reduce appetite, inhibit egg laying, inhibit growth, decrease fertility and as an anti-insect vector (Hartati, 2012).

Red ginger has the potential as a plant-based pesticide because it contains oleoresin compounds that give ginger a spicy taste, as well as essential oil compounds that contain many components including, zingiberene, zingiberol, kaemferol and bisabolene (Kusumaningati, 2009).

Kencur contains essential oils, substances that are widely studied are in the rhizome, namely containing essential oils ranging from 2.4-3.9%, cinnamyl, aldehyde, methyl p-cumaric acid, annamyl acid and ethyl acetate, in addition to the rhizomes of kencur contain cineol paraumarin, anisic acid, gum, starch, 4.14% and minerals 13.73% as well as alkaloid compounds that function as a protector from pest attacks (Herlin, 2011).

The use of a mixture of rhizome extracts of red ginger, turmeric, and kencur to control armyworms (*Spodoptera litura* F.) is an important prospect in increasing the yield of sweet potato crops, because plant-based pesticides can be used in single or mixed forms.

MATERIALS AND METHODS

The data type consists of primary data and secondary data. Primary data is the main data/main data taken from the results of observations during the study, namely the mortality rate of armyworms in the form of a percentage (%). Secondary data is companion data/research supporting data, namely journals of previous research results related to this research, and research documentation. The research design uses a Complete Random Design (RAL) of 7 treatments and 4 replicates so that there are 28 experimental units.

The research variables consisted of independent variables (X), bound variables (Y), and control variables. The free variable was a combination of red ginger, turmeric, and kencur rhizome extracts with concentrations of 40%, 50%, 60%, 70%, 80%, 90%. The bound variable is the mortality of armyworms in the form of percentage (%) which can be calculated by $M = a/b \times 100\%$, M = Mortality, a = the number of dead caterpillars, b = the number of caterpillars tested. The control variables in this study were the type of feed given, namely sweet potato leaves, feeding time, amount of feed given, and method of applying a combination solution of red ginger extract, turmeric, and kencur by immersion of feed into the extract solution, as well as 0% extract solution.

RESULTS AND DISCUSSION

Mortality Rate of Grayworm (*Spodoptera litura* F.)

The average mortality rate of armyworm (*Spodoptera litura* F.) showed that the mortality rate of armyworm (*Spodoptera litura* F.) combined rhizome extracts of red ginger, turmeric, and kencur tried through sweet potato leaves by soaking for 5 minutes showed varying results with a concentration of 40%-90% which can be seen in Table 1.

Table 1. Average Mortality Rate (%) of Grayworm (*Spodoptera litura* F.) in the combined treatment of rhizome extracts of red ginger, turmeric, and kencur

Combination Treatment of Extracts	Pest Mortality
0 %	0.00 ^a
40 %	11.50 ^b
50 %	34.00 ^c
60 %	54.00 ^d
70 %	56.50 ^d
80 %	69.00 ^e
90 %	79.00 ^e

Description: The average value followed by the same letter does not differ significantly on the scale (0.05) with the BNT test.

From the data in Table 2. showed that the mortality rate of Grayak caterpillars (*Spodoptera litura* F.) at each concentration showed different results, where at concentrations 40% and 50% showed a real difference of 12.50% and 35.00% at concentrations 60% and 70% did not show a real difference, and at concentrations 80% and 90% did not show a real difference, thus it can be seen that the highest mortality rate was at concentrations of 80% - 90%. Meanwhile, the lowest mortality rate is found at a concentration of 40%. Figure 1 shows a graph of the mortality of armyworm (*Spodoptera* sp) on the application of a combination of rhizome extracts of red ginger, turmeric, and kencur through stomach poison at each concentration.



Figure 1. Graph of Grayworm Mortality (*Spodoptera litura* F.) at various concentrations of rhizome extract combinations.

From the graph above, it shows that the highest mortality rate in the application using a combination of red ginger, turmeric, and kencur rhizome extracts is found at a concentration of 90% with a mortality of 80%. And the lowest is found at a concentration of 40% with a mortality of 12.50%. Turmeric (*Curcuma domestica*) also contains compounds that have medicinal properties that include curcumin, desmethoxycurcumin 10% and bisdesmethoxycurcumin 1-5% as well as compounds that have benefits. The benefits of essential oils in insects can be repellent, attracting, contact toxic, respiratory toxic, reduce appetite, inhibit egg laying, inhibit growth, decrease fertility and as an anti-insect vector (Hartati, 2012).

This is in line with (Kusumaningati, 2009), red ginger has the potential as a vegetable pesticide because it contains oleoresin compounds that give ginger a spicy taste, as well as essential oil compounds that contain many components including, zingiberene, zingiberol, kaemferol and bisabolene Kaemferol acts as a strong respiratory inhibitor for insects that are able to block the olfactory organs in the insect's body, so that the insect respiratory system is disturbed zingiberene compounds are able to provides a decrease in insect feeding activity.

Kencur contains essential oils, substances that are widely studied are in the rhizome, namely the content of essential oils ranging from 2.4-3.9%, cinnamal, aldehyde, motyl p-cumaric acid, annamat acid and ethyl acetate, in addition to that kencur rhizomes contain sineol, paraumarin, anisic acid, gom, starch 4.14% and minerals 13.73% as well as alkaloid compounds that function as a protector from pest attacks (Herlin, 2011).

CONCLUSION

1. The combination of red ginger, turmeric, and kencur rhizome extracts with various concentrations through Stomach Poison can kill the Grayak caterpillar pest (*Spodoptera* sp).
2. Of the various combinations of red ginger, turmeric, and kencur rhizome extracts applied against the Grayak caterpillar pest (*Spodoptera* sp), the most lethal concentration is 80% and 90%.

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