EFFECTIVENESS TEST OF GAMAL LEAF EXTRACT

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EFFECTIVENESS TEST OF GAMAL LEAF EXTRACT (*Gliricidiasepium*(JACQ.)KUNTH EX.)AGAINST ARMYWORM MORTALITY (*Spodopteraexigua* H.) ON SHALLOT PLANTS (*Allium ascalonicum* L.) LOKANANTA VARIETY

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Abstract
The research aimed to determine the effect of concentrations of gamal leaf extract (Gliricidiasepium (Jacq.) Kunth ex.) on the mortality of Spodopteraexigua H. and to obtain the right concentration of gamal leaf extract to kill/kill Spodopteraexigua H. on a laboratory scale.This research was carried out for three months, from February to April 2021, from searching for larvae samples, rearing the larvae, and giving treatment to collecting the final data. The research location was at the Laboratory of the Faculty of Agriculture, University of 17 Agustus 1945, SamarindaThis researchused a Completely Randomized Design (CRD) consisting of 5 concentrations of gamal leaf extract, namely: p0 = without gamal leaf extract (control)/ten armyworms, p1 = 10% (10 ml extract solution + 90 ml distilled water)/ten armyworms, p2 = 20% (20 ml of extract solution + 80 ml of distilled water)/ten armyworms; and p3 = 30% (30 ml of extract solution + 70 ml of distilled water)/ten armyworms. Each treatment was repeated five times. Data analysis used variance and continued with the Least Significant Difference test at the 5% level. The results showed that the treatment of gamal leaf extract had a very significant effect on the mortality rate of armyworms at the age of 24 and 48 hours after the treatment, and the treatment with a concentration of 30% gamal leaf extract (p3) resulted in the highest mortality of armyworm pests both at the age of 24 hours and 48 hours of age, namely 88% and 99%

Keywords: Gamal Leaf Extract, Armyworm,

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I. Introduction

Agricultural development in the food crops sub-sector, especially horticultural commodities, must be able to grow rapidly, so that functionally it will be increasingly able to play a role in supplying industrial raw materials, increasing farmers' income, creating jobs and increasing foreign exchange earnings through exports of horticultural crops.

Shallot (*Allium ascalonicum* L.) is one of the main vegetable commodities in Indonesia and has many benefits. Onions are included in the group of non-substituted spices which function as food seasonings and traditional medicinal ingredients. Based on data from the National Database, shallots contain carbohydrates, sugars, fatty acids, protein and other minerals needed by the human body (Askari and Pessarakli, 2019; Nining et al., 2019; Waluyo and Sinaga, 2015; Thamrin and Wardania, 2003).

The total shallot production in Indonesia in 2016 reached 1.45 million tons and increased in 2017 by 1.47 million tons or 1.58 percent (Central Bureau of Statistics, 2018). Even though Indonesia can produce its shallots until now, Indonesia is still a net importer of shallots.

One of the obstacles in cultivating shallots in Indonesia is due to the attack of the main plant disturbing organisms, namely the onion caterpillar (*Spodopteraexigua* H.) (Soumia et al., 2020; Resmayeti and Samudera, 2015; Setiawan and Achmad, 2014; Ueno, 2015). If not controlled, these pest attacks can cause crop failure (Ahmad, et al., 2020;Moekasan et al., 2012).

One alternative that can be used to control pests is to utilize plant-derived metabolites as vegetable pesticides (Rahayuningtiasand Wiwik, 2017; Ramli and Sumartina, 2013; Satya, et al., 2012).

Gamal leaves (*Gliricidiasepium* (Jacq.) Kunth ex. Contain active chemical compounds such as alkaloids, terpenoids, steroids and tannins, which have the potential as vegetable pesticides, so they are perfect

for overcoming and controlling armyworm attacks (*Spodopteraexigua* H.). (Hastuti et al., 2016;;Moekasan et al., 2013;Selawa et al., 2013).

Gamal leaf extract affects pest mortality in several plants, the most effective of which is at a concentration of 20% within 24 hours with a mortality rate of 74% (Lebang et al., 2016; Nukmal et al., 2017).

This research aims to determine the effect of concentrations of gamal leaf extract (*Gliricidiasepium* (Jacq.) Kunth ex.)on the mortality of *Spodopteraexigua* H.

II. Research Methods

A. Place and Time

This research was carried out at the Laboratory of the Faculty of Agriculture, University of AgustUA 17, 1945 Samarinda and planting land. A sampling of shallot crop pests in farmer's land, Jl. SalikiSempaja Utara, City of Samarinda, East Kalimantan from February to April 2021.

B. Materials and Tools

The materials used include gamal leaves, *Spodopetraexigua* pests. The tools include measuring cups, beakers, Erlenmeyer, digital scales, stirrers, glass funnels, dropper pipettes, blenders, basins, trays, white jars, filter paper, cotton swabs, scissors/cutters, glass bowls, labels, rubber bands, stationery, camera.

C. Research Object

The research object was the armyworm pest (*Spodopetraexigua* H.) which entered the third instar, which was treated with gamal leaf extract with a total of 4 treatments and five replications, so the number of instar armyworms needed was 4 × 5 = 20 experimental units, in one treatment and repetition there will be ten armyworms instar III, meaning there are 20 × 10 = 200 armyworms which will be sampled in this study.

Figure 1. Intact Gamal Leaves

Figure 2. Gamal Leaves that have been Mashed

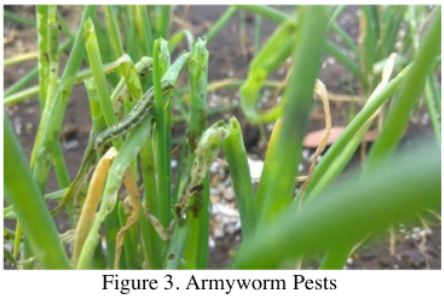

Figure 3. Armyworm Pests

D. Experimental design

This research used a completely randomized design (CRD) consisting of 5 concentrations of gamal leaf extract, namely: p0 = without gamal leaf extract as control/10 armyworms, p1 = 10% (10 ml extra solution + 90 ml distilled water))/ten armyworms, p2 = 20% (20 ml of extract solution + 80 ml of distilled water)/10 armyworms; and p3 = 30% (30 ml of extract solution + 70 ml of distilled water)/10 armyworms. Each treatment was repeated five times.

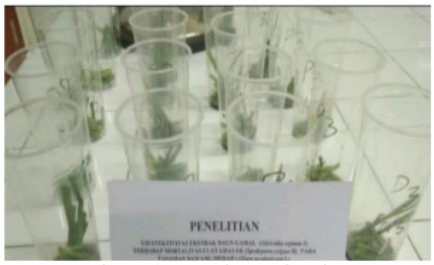

Figure 4. Experimental Unit

E. Research Procedures

The stages of the research were as follows: (1) Propagation of *Spodopetraexigua* Larvae, preparation of gamal leaf extract, (3) treatment, (4) observation, (5) data collection, (6) data analysis, and (7) reporting

F. Data Collection

Observations in this research study were carried out directly by observing and recording according to the existing symptoms, namely mortality and death rates of armyworm pests in each treatment and repetition.
Spodopetraexigua H. larvae mortality was observed 24 and 48 hours after applying gamal leaf extract. The mortality of the test larvae is calculated using the following formula (Rusdy, 2010):

$$Mortalitas = (a / b) \times 100\%$$

Information: M = percentage of deaths; a = number of dead *Spodopetraexigua* H. larvae; and b = number of initial larvae.

G. Data Analysis

Research data were analyzed using analysis of variance, and if the results of variance in the treatment had a significant effect F-Count > F-Table 5% and had a very significant effect (F-Count ≥ F-Table 1%), then a follow-up test was carried out to compare the two means the average treatment level using the Least Significant Difference (LSD) test at the 5% level.

III. Results And Discussion

A. Armyworm Insect Mortality

The analysis of variance results showed that the treatment with gamal leaf extract (*Gliricidiasepium* J.) significantly affected the mortality rate of armyworms at 24 and 48 hours after administration of the extract treatment.
The research results on the mortality rate of armyworms at 24 hours after applying gamal leaf extract treatment are presented in Table 1.

Table 1. Average Mortality of Army Caterpillars (*Spodopteraexigua* H.)at 24 Hours After Treatment(%)

Treatments (P)	Replication					Average treatment*
	I	II	III	IV	V	
Control (P0)	0,00	0,00	0,00	0,00	0,00	0,00 d
10% (p1)	70,00	60,00	70,00	70,00	60,00	66,00 c
20% (p2)	80,00	70,00	70,00	80,00	80,00	76,00 b
30% (p3)	100,00	90,00	80,00	80,00	90,00	88,00 a

*). The mean number followed by the same lowercase letter is not significantly different based on the LSD test results at the 5% level.

The results of the research in Table 1 show that giving gamal leaf extract at a concentration of 30% is proven to kill armyworms within 24 hours compared to other smaller extracts. The results showed that the higher the concentration of gamal leaf plant extract, the higher the death rate of armyworms. Statement of Farahani et al. (2011); and Syahfari, H. et al. (2021) that the higher the concentration of insecticides, the higher the content of active compounds, so the mortality rate is greater.

This proves that the extract of the gamal leaf plant effectively increases the death rate of armyworms because the active compounds in gamal leaves work effectively. As stated by Moekasan et al. (2012), the higher the concentration, the more the active substance enters/is exposed to the insect.

The results of the research on the mortality rate of armyworms at the age of 48 hours after administration of the gamal leaf extract treatment are presented in Table 2.

Table 2. Average Mortality of Army Caterpillars (*Spodopteraexigua* H.)at 48 Hours After Treatment(%)

Treatments (P)	Replication					Average treatment*
	I	II	III	IV	V	
Control (P0)	0,00	10,00	10,00	10,00	20,00	8,00 c
10% (p1)	80,00	70,00	80,00	90,00	100,00	84,00 b
20% (p2)	70,00	80,00	80,00	80,00	80,00	78,00 b
30% (p3)	100,00	100,00	100,00	90,00	100,00	98,00 a

*). The mean number followed by the same lowercase letter is not significantly different based on the LSD test results at the 5% level.

At 24 and 48 hours after administration of gamal leaf extract, the highest mortality rate of armyworms was produced in the 30% (p3) treatment, namely 88.00% and 98.00%. In contrast, the lowest mortality rate was found in the control treatment at only 0.00% and 8.00%. This is due to toxic secondary metabolite compounds that produce killing power against organisms. One of them is a flavonoid compound known to have the potential as an insecticide. Flavonoid compounds provide various effects on various types of organisms. According to research conducted by Lebang et al.,2016 and Nukmal et al., 2019, gamal leaf extract affects pest mortality in several plants, the most effective of which is at a concentration of 20% within 24 hours with a mortality rate of 74%. Suryaet al.,2017stated that high concentrations during initial exposure would force the body to continue to defend itself from toxic substances. Still, with long exposure times, these toxic substances would accumulate in the body resulting in chronic poisoning and death.

Furthermore, it was that the content of secondary metabolites in gamal plants, such as flavonoid glycosides are stomach poisons, which work if these compounds enter the insect's body and interfere with their digestive organs. Kuspianto, (2021) suggested that flavonoid compounds can irritate the skin after insects directly contact the extract. Flavonoid compounds provide various effects on various types of organisms. Flavonoids can work as strong inhibitors of the respiratory process.

The armyworms in the control treatment did not experience mortality because they were only sprayed with water which did not contain active ingredients that were antifeedant against insects, so the armyworms did not experience a decrease in their body functions and survived during the research process. The influence of several factors, including the concentration of the extract, the immune system of the test animals, and the length of time of exposure. Low concentrations will have a soft toxicity effect (Zuo et al., 2019).

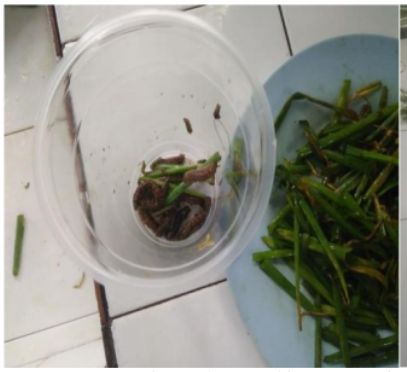

Figure 5. Tested insects Given Treatment

Figure 6. Tested insects Given Gamal Leaf Extract

IV. Conclusions And Recommendations

A. Conclusion

Based on the results of the research and discussion, it can be concluded as follows:

1. The treatment of gamal leaf extract significantly affected the armyworm's mortality rate (Spodopteraexigua H.) at the age of 24 and 48 hours after administration of the extract.
2. Treatment with a concentration of 30% gamal leaves (p3) resulted in the highest armyworm pest mortality both at 24 hours and 48 hours, namely 88% and 99%.

B. Suggestion

1. For future researchers, it is hoped that they can conduct more research on the concentration of gamal leaf extract against armyworm pests in different life cycles or instars. Develop research on parts of the leaves and other organs of the gamal plant.
2. For the community and farmers to use natural ingredients to make insecticides because they are more effective and environmentally friendly.

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