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The Effect Concentration Plant Extracts Bintaro*(CarberaManghas)*Against Mortality Hama armyworm *(Spodopteralitura)*

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ABSTRACT

This study aims to determine the effect of combined treatment plant extracts bintaro and giving the extract concentration on the mortality of armyworm pests. While the research method used factorial experiments conducted with a completely randomized design (CRD). Treatment Factor I was the Bintaro plant organs extracted consisting of 4 levels consisting of 4 combinations of Bintaro organs and 5 combinations of extract concentrations so that there were 20 combinations and 1 control (without giving the extract) so that a total of 21 treatments were repeated 3 times, a total of 63 units. trial. The experimental unit was using a jar with a height of 6 cm, a diameter of 12.5 cm with 8 instar 1 tails, so it needed 504 instar 1 caterpillars. Caterpillar feed is sunflower leaves that are added / replaced every day. The results showed that there was an insignificant effect of the combination of the treatment of Bintaro plant organ extracts and the concentration of Bintaro plant organ extracts with the mortality rate (%) of armyworms, where observations on days 4, 8, 12 and 16 showed a significant value> 0, 05 with the highest R Square achievement on the 16th day of observation of 0.0675 (6.75%), meaning that only a 6.75% mortality rate (%) of armyworms was affected by the combination of the above treatments. The insignificant effect at all levels of treatment factors was the concentration of Bintaro plant's organ extract (K), but the K5 treatment (12.5% extract concentration) showed a tendency to be better than the K1, K2, K3, and K4 treatments with an R Square value of 0, 418370978 (41.84%) means a number of 41.85% mortality (%) armyworms due to K5 treatment (12.5% extract concentration), the remaining 58.15% due to external factors and insignificant influence at all factor levels treatment of Bintaro plant organ extract (B), but treatment B1 (leaf organ extract) showed a better tendency than treatment B2, B3, and B4 with a significant value of F (0.264002509> 0.05) and R Square of 0.296443348 (29.64%).

Keywords: Pests, Grayak Caterpillars, Bintaro and Bintaro Leaf Extract

1. INTRODUCTION

In plant cultivation, one of the main obstacles that inhibits production both in quality and quantity is the attack of plant pests, especially caterpillars. One of the pests that attack crop cultivation is armyworms (Spodoptera litura F.). Armyworms are important leaf pests because they have a wide host range, including soybeans, peanuts, mustard greens, cabbage, sweet potatoes, potatoes. Grayak caterpillars attack cultivated plants in the vegetative phase, namely eating young plant leaves so that only the leaf bones are left (Sari et al., 2020).

Pest and disease attacks are one of the losses experienced by the Indonesian agricultural sector so that they can reduce agricultural productivity. Based on data from the Central Statistics

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Agency, East Java has an area of 6.8 hectares of armyworm attacks. In controlling plant pests, farmers generally prefer to apply pesticides because they are considered very effective, practical and fast in killing pathogens and pests. This has had a negative impact, including the resistance of pests and plant diseases to pesticides. An economic analysis of farming in Brebes also shows that 51% of the cost of production facilities (including labor) is used only to spend on pesticides. In line with the government program in terms of plant protection, the Integrated Pest Management technique is applied in accordance with Presidential Instruction No. 3 of 1998, an alternative that needs to be developed is vegetable pesticides, which are natural products that are environmentally friendly and do not cause residue (Susilo et al., 2019).

Facing the seriousness of these obstacles, most Indonesian farmers use chemical insecticides, these efforts provide fast and effective results, but the excessive use of chemical insecticides has a negative impact on the environment and humans (Djunaedy, 2009). The negative impact of chemical insecticides is increasingly felt by the community, especially due to the unwise use of chemical insecticides. The many negative impacts of chemical insecticides, efforts are needed to minimize the use of chemicals from chemical insecticides, namely by using alternative materials that are more environmentally friendly, such as the use of botanical insecticides that utilize natural ingredients from plants (Martono et al., 2004).

Biopesticides are materials derived from nature, such as plants that are used to control Plant Pest Organisms or are also known as biological pesticides. Biopesticides are one of the environmentally friendly solutions in order to reduce the negative impact due to excessive use of non-biological pesticides. Currently, many biopesticides have been developed in the community, especially farmers. However, not many farmers have used biopesticides as an antidote and pest control for the purpose of maintaining production. Biopesticides are not as toxic as chemical pesticides, so they are safe for the environment (Iman & Handoko, 2011).

Vegetable insecticides are single or compound active ingredients derived from plants that can be used to control pests. This vegetable insecticide can function as insect repellents, anti-fertility (barriers) and insect killers. Various types of plants have been known to have potential as vegetable pesticides because they contain bioactive compounds, including saponins, tannins, alkaloids, alkenyl phenols, flavonoids, and terpenoids. Some plants are known to have a mortality effect on insects, so they can be used as an alternative to vegetable insecticides (Susilo et al., 2019). One of them is the Bintaro plant (Cerbera manghas). C. manghas or commonly known by the community as Bintaro is currently widely used for reforestation, city decoration, medicinal plants, vegetable pesticides, as well as raw material for dried flower handicrafts. This plant can be used among other things as a laxative, treat fish stings, and fight cancer cells. All parts of the

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Bintaro plant are poisonous because they contain alkaloid class compounds, which are repellent and antifeedant. The seeds contain carberin, which can block calcium ion channels in the heart muscle (Amalia & Fakhri, 2016).

Bintaro plants can be used as an alternative to vegetable insecticides to reduce agricultural product losses due to very large pests, especially in food and horticultural crops. Pests that are considered important that attack and harm food and horticultural crops are armyworms (Spodoptera litura). Bintaro plant (Cerbera manghas) as a botanical insecticide extract from its leaf organs because leaf organs can be found in abundance compared to the fruit and bark. Based on this, it is necessary to carry out further research to test the potential of botanical insecticides from the leaf extract of Bintaro (C. manghas) against S.litura F larvae, by determining the concentration of the solution which can affect the development of S. litura larvae. by using sunflower leaf feed.

2. RESEARCH METHOD

Using factorial experiments conducted with a completely randomized design (CRD). Treatment Factor I was the Bintaro plant organs extracted consisting of 4 levels consisting of 4 combinations of Bintaro organs and 5 combinations of extract concentrations so that there were 20 combinations and 1 control (without giving the extract) so that a total of 21 treatments were repeated 3 times, a total of 63 units. trial. The experimental unit was using a jar with a height of 6 cm, a diameter of 12.5 cm with 8 instar 1 tails, so it needed 504 instar 1 caterpillars. Caterpillar feed is sunflower leaves that are added / replaced every day.

3. RESULTS AND DISCUSSION

Mortality Rate (%) of armyworms

The statistical results with regression analysis showed that the relationship between the concentration of Bintaro plant's organ extract concentration as the independent variable and the mortality rate (%) of armyworms as the dependent variable showed insignificant effect at all observed observations. On the 4th day observations after the treatment showed a significant F of (0.60855> 0.05) with an R Square value of 0.0141 (1.41%); observations on the 8th day after treatment showed a significant F of (0.5295> 0.05) with an R Square value of 0.0211 (2.11%); then observations on the 12th day after treatment showed a significant F of (0.5372> 0.05) with an R Square value of 0.0204 (2.04%); Furthermore, observations on the 16th day after treatment showed a significant F of (0.25529> 0.05) with an R Square value of 0.0675 (6.75%) meaning that only 6.75% mortality rate (%) of armyworms influenced by the concentration of Bintaro plant organ extract concentrations, the remaining 93.25% is influenced by factors outside the extract

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concentration. The regression equation obtained on the 4th day of observation is **y = 0.1128x + 3.7592**; observation on the 8th day, namely **y = 0.1665x + 5.5573;** while the observation on the 12th day, namely **y = 0.2548x + 12.664,** then the 16th day of observation is **y = 0.8527x + 20.1**. The table below presents the mortality rate (%) of armyworms due to the combined effect of theand the concentration of the organ extract is presented in table. Bintaro plant organ extract treatment1.

Table 1: The mortality value of armyworm (%) due to the combination of treatment of Bintaro plant organ extracts and concentration of organ extracts. With the Mortality Rate (%) of armyworms at various ages of observation (days).

Treatment	Bintaro ExtractConcentration (%)	Average Mortality armyworm (%) On Various Age Observation			
		4 Day	8 Day	12 Day	16 Day
B0K0	0	4.17	4.17	12.5	16.67
B1K1	2.5	8.33	12.5	16.67	25
B2K1	2.5	0	4.17	25	29.17
B3K1	2.5	0	0	0	0
B4K1	2.5	4.17	12.5	12.5	29.17
B1K2	5	8.33	8.33	25	54 , 17
B2K2	5	4.17	4.17	20.83	33.33
B3K2	5	4.17	4.17	8.33	25
B4K2	5	4.17	4.17	4.17	12.5
B1K3	7.5	12.5	12 , 5	12.5	33.33
B2K3	7.5	0	0	4.17	16.67
B3K3	7.5	4.17	8.33	8.33	12.5
B4K3	7.5	4.17	8.33	8.33	12 , 5
B1K4	10	0	4.17	25	41.67
B2K4	10	8.33	12.5	25	29.17
B3K4	10	4.17	4.17	4.17	16.67
B4K4	10	4.17	4.17	29.17	45 , 83

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B1K5	12.5	4.17	8.33	8.33	37.5
B2K5	12.5	0	0	12.5	25
B3K5	12.5	4.17	12.5	12.5	20.83
B4K5	12.5	12, 5	12.5	25	33.33
R Square		0.014072355	0.021133534	0.020367378	0.067526626
Significance F		0.608550095	0.529514125	0.537152417	0.255294372
Effect of treatment		tn	tn	tn	tn

Bintaro (*Cerbera manghas L*) is commonly grown as a green plant, city decoration, medicinal plants, vegetable pesticides, and dried flower handicraft materials. All parts of the Bintaro plant are poisonous because they contain alkaloid compounds that are *repellent* and *antifeedant*. Biopesticides are materials derived from nature, such as plants that are used to control Plant Pest Organisms or are also known as biological pesticides. Biopesticides are one of the environmentally friendly solutions in order to reduce the negative impact due to excessive use of non-biological pesticides. Currently, many biopesticides have been developed in the community, especially farmers. However, not many farmers have used biopesticides as an antidote and pest control for the purpose of maintaining production. Biopesticides are not as toxic as chemical pesticides so they are safe for the environment (Kartimi, 2015).

Bintaro Plant Organ Extract Concentration

The statistical results of the regression analysis at each concentration of Bintaro plant organ extract (K) with the mortality rate (%) of armyworms at the end of the 16th day of observation indicated that there was an insignificant effect on all treatment levels of the extract concentration, including the significant F (0.80778625> 0.05) on the treatment factor K1 (extract concentration 2.5%) with an R Square value of 0.02296 (2.296%); significant value of F (0.510553345> 0.05) on the treatment factor K2 (5% extract concentration) with an R Square value of 0.155970879 (15.597%); significant value of F (0.863160099> 0.05) on the K3 treatment factor (7.5% extract concentration) with an R Square value of 0.011595472 (1.56%); significant value of F (0.340139386> 0.05) on the treatment factor K4 (10% extract concentration) with an R Square value of 0.299090571 (29.91%); then the significant value of F (0.238161058> 0.05) in the treatment factor K5 (12.5% extract concentration) with an R Square value of 0.418370978 (41.84%) meaning that it is 41.85% due to the effect shown by variable mortality (%) armyworms due to K5 treatment (12.5% extract concentration), the remaining 58.15% due to external factors.

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The table that presents the mortality value of armyworms (%) based on the concentration group of Bintaro plant organ extracts (K) on various observations on days 4, 8, 12, and 16 can be seen in table 2.

Table 2: The value of armyworm Mortality (%) Based on the Bintaro Plant Organ Extract Concentration Group at Various Observation Ages (Days).

Treatment	Bintaro ExtractConcentration (%)	Average Mortality armyworm (%) On Various Age Observation			
		4 Day	8 Day	12 Day	16 Day
B0K0	0	4.17	4.17	12.5	16.67
B1K1	2.5	8.33	12.5	16.67	25
B2K1	2.5	0	4.17	25	29.17
B3K1	2.5	0	0	0	0
B4K1	2.5	4.17	12.5	12.5	29.17
R Square					0.022966317
Significance F					0.80778625
Effect of treatment					tn
B0K0	0	4.17	4.17	12.5	16.67
B1K2	5	8.33	8.33	25	54.17
B2K2	5	4.17	4.17	20.83	33.33
B3K2	5	4.17	4, 17	8.33	25
B4K2	5	4.17	4.17	4.17	12.5
R Square					0.155970879
Significance F					0.510553345
Effect of treatment					tn
B0K0	0	4.17	4.17	12.5	16.67
B1K3	7.5	12.5	12.5	12.5	33.33
B2K3	7.5	0	0	4.17	16.67

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B3K3	7.5	4.17	8.33	8.33	12.5
B4K3	7.5	4.17	8.33	8.33	12.5
R Square					0.011595472
Significance F					0.863160099
Effect of treatment					tn
B0K0	0	4.17	4.17	12.5	16.67
B1K4	10	0	4.17	25	41.67
B2K4	10	8.33	12,5	25	29.17
B3K4	10	4.17 4.17		4.17	16.67
B4K4	10	4.17	4.17	29.17	45.83
R Square					0.299090571
F Significance					0.340139386
Effect of treatment					tn
B0K0	0	4, 17	4.17	12.5	16.67
B1K5	12.5	4.17	8 , 33	8.33	37.5
B2K5	12.5	0	0	12.5	25
B3K5	12.5	4.17	12.5	12.5	20.83
B4K5	12.5	12.5	12.5	25	33.33
R Square					0.418370978
Significance F					0.238161058
Effect of treatment					tn

Based on the data above, the K5 treatment, namely the POC concentration of 12.5%, showed a tendency for the armyworm mortality rate (%) to be higher than the K1, K2, K3, and K4 treatments even though in all treatments the K concentrations studied showed insignificant differences.

Bintaro Plant Organs

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The statistical results of the regression analysis on each organ extract of Bintaro (B) with a mortality rate (%) of armyworms at the end of the 16th day of observation indicate that there is no significant effect at all levels of treatment of Bintaro plant organ extracts, including the significant F value. (0.264002509> 0.05) on the treatment factor B1 (leaf organ extract) with an R Square value of 0.296443348 (29.64%); significant value F (0.716073386> 0.05) on treatment factor B2 (stem bark organ extract) with an R Square value of 0.036722093 (3.67%); significant value of F (0.48052536> 0.05) in the treatment factor B3 (fruit flesh organ extract) with an R Square value of 0.131151567 (13.16%); Furthermore, the significant value of F (0.27917112> 0.05) in the treatment factor B4 (seed organ extract) with an R Square value of 0.281162867 (28.12%) means that it is 28.12% due to the effect shown by the mortality variable (%) armyworms due to B4 treatment (seed organ extract), the remaining 71.88% was due to external factors. The table that presents the armyworm mortality value (%) based on the Bintaro plant organ extract group (B) on various observations on days 4, 8, 12, and 16 can be seen in table3.

Table 3: The value of armyworm Mortality (%) Based on the Bintaro Plant Organ Extract Group at Various Observation Ages (Days).

Treatment	Bintaro ExtractConcentration (%)	Average Mortality armyworm (%) On Various Age Observation			
		4 Day	8 Day	12 Day	16 Day
B0K0	0	4.17	4.17	12.5	16.67
B1K1	2.5	8.33	12.5	16.67	25
B1K2	5	8.33	8.33	25	54.17
B1K3	7.5	12.5	12.5	12.5	33.33
B1K4	10	0	4.17	25	41.67
B1K5	12.5	4.17	8 , 33	8.33	37.5
R Square					0.296443348
Significance F					0.264002509
Effect of treatment					tn
B0K0	0	4.17	4.17	12.5	16.67
B2K1	2.5	0	4.17	25	29.17
B2K2	5	4 , 17	4.17	20.83	33.33

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B2K3	7.5	0	0	4.17	16.67
B2K4	10	8.33	12.5	25	29.17
B2K5	12.5	0	0	12.5	25
R Square					0.036722093
Significance F					0.716073386
Effect of treatment					tn
B0K0	0	4.17	4.17	12.5	16.67
B3K1	2.5	0	0	0	0
B3K2	5	4.17	4.17	8.33	25
B3K3	7.5	4.17	8 , 33	8.33	12.5
B3K4	10	4.17	4.17	4.17	16.67
B3K5	12.5	4.17	12.5	12.5	20.83
R Square					0.131151567
Significance F					0.48052536
Effect of Treatment					tn
B0K0	0	4.17	4.17	12.5	16.67
B4K1	2.5	4.17	12.5	12.5	29.17
B4K2	5	4.17	4.17	4.17	12.5
B4K3	7.5	4 , 17	8.33	8.33	12.5
B4K4	10	4.17	4.17	29.17	45.83
B4K5	12.5	12.5	12.5	25	33.33
R Square					0.281162867
Significance F					0.27917112
Effect of Treatment					tn

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Based on the data above, the B1 treatment, namely leaf organ extract, showed a tendency for the mortality rate from the regression analysis (%) of armyworms to be higher than the treatment B2 (3.67%), B3 (13.16%), and B4 (28.12%).) although in all treatments the organ extracts of Bintaro were not significantly different.

The results of the research by (Sa'diyah et al. 2014) show that leaf extracts added to feed can inhibit the growth and development ofpupae *Spodoptera litura F* (armyworms on cayenne pepper leaves). (Prayuda, YE, 2014) research results on the leaves, fruits and bark of Bintaro plants containing saponins, the leaves and fruit contain polyphenols which are known to be very toxic to insects and can inhibit the activity of eating pests, and the bark contains tannins. The seeds contain *cerberin* which can inhibit the work of the heart muscle, even rats do not dare to approach Bintaro fruit after they smell the bintaro fruit. Bintaro seed extract has antibacterial, cytotoxic, alkaloid and saponin properties as depressants, saponins and polyphenols are toxic to insects and *antifeedants* because they inhibit the work of digestive enzymes to absorb food. Steroids inhibit the molting of insect larvae, tannins reduce the activity of the protease and amylase enzymes, so that they interfere with protein absorption.

The statistical results with regression analysis showed that the relationship between the concentration of Bintaro plant's organ extract concentration as the independent variable and the mortality rate (%) of armyworms as the dependent variable showed insignificant effect at all observed observations. On the 4th day observations after treatment showed a significant F of (0.60855> 0.05) with an R Square value of (1.41%); observations on the 8th day after treatment showed a significant F of (0.5295> 0.05) with an R Square value of (2.11%); then observations on the 12th day after treatment showed a significant F of (0.5372> 0.05) with an R Square value of (2.04%); Furthermore, observations on the 16th day after treatment showed a significant F of (0.25529> 0.05) with an R Square value of (6.75%) meaning that only 6.75% mortality rate (%) of armyworms was affected by the administration of the concentration of Bintaro plant organ extract, the remaining 93.25% is influenced by factors outside the extract concentration. The regression equation obtained on the 4th day of observation is **y = 0.1128x + 3.7592**; observation on the 8th day, namely **y = 0.1665x + 5.5573;** while the observation on the 12th day, namely **y = 0.2548x + 12.664,** then the 16th day of observation is **y = 0.8527x + 20.1**

4. CONCLUSION

From the results of the study it can be concluded that there is no significant effect of the combination of treatment of Bintaro plant organ extracts and the concentration of Bintaro plant organ extract results with mortality rates (%) of armyworms, where observations on days 4, 8, 12

and 16 show Significant value> 0.05 with the highest R Square achievement on the 16th day of observation of 0.0675 (6.75%), meaning that only a 6.75% mortality rate (%) of armyworms was affected by the combination of the above treatments. There was an insignificant effect on all levels of treatment factors, the concentration of Bintaro plant's organ extract (K), but the K5 treatment (12.5% extract concentration) showed a tendency to be better than the K1, K2, K3 and K4 treatments with an R Square value of 0 , 418370978 (41.84%) means 41.85% mortality (%) of armyworms due to K5 treatment (12.5% extract concentration), the remaining 58.15% due to external factors and the insignificant effect on all level of treatment factor for Bintaro plant organ extract (B), but treatment B1 (leaf organ extract) showed a better tendency than treatment B2, B3, and B4 with a significant value of F (0.264002509> 0.05) and R Square of 0, 296443348 (29.64%).

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