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Utilization of Areca Nut Extract on the Control of the Golden Snail Pest *(Pomacea canaliculata L)*, Growth and Production of Rice *(Oriza sativa L).*

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ABSTRACT: This study aims to determine the effectiveness, the right dose to control the golden snail pest and the impact of its application on rice production. The study was conducted in Teupin Raya Village, Peusangan Siblah Krueng District from September to November 2022. The design used in this study was a non-factorial Randomized Block Design (RBD) with 7 treatments and 3 replications. The factor tested was areca nut extract with the following treatment: P0: Control, P1: Dose of 100 gr/ha P2: Dose of 150gr/ha P3: Dose of 200 gr/ha P4: Dose of 250 gr/ha P5: Dose of 300 gr/ha P6 : Dose of 350 gr/ha. Parameters observed were golden snail mortality, golden snail mortality, attack intensity, plant height (cm), number of tillers, panicle length (cm), and grain weight (g). The results showed that the treatment of various doses of areca extract on mortality, intensity and yield of rice plants had a very significant effect on plant height at 15 and 45 DAP, number of tillers at 15, 30, 45 DAP, panicle length, and grain weight and not significant effect on plant height at the age of 30 HST. The best treatment for the dose of areca extract on the effectiveness, growth and yield of rice plants was obtained in the P6 treatment at a dose of 350 g/plot.

KEYWORDS: Death, Grain weight, mortality, Vegetative

INTRODUCTION

Rice (Oryza sativa L.) is an important food crop which is the staple food for more than half of the world's population because it contains the nutrients the body needs. the carbohydrate content of milled rice was 78.9%, protein 6.8%, fat 0.7% and others 0.6%. Rice as a food crop is consumed by approximately 90% of the total Indonesian population for daily staple food. Today, with the increasing population of Indonesia from year to year, the need for rice continues to increase.

In increasing rice production by the government, it is carried out through an agricultural revitalization program that maximizes the role of plant protection in agribusiness systems to increase the quantity and quality of products, maintain agricultural productivity, ensure the success of planting, reduce production costs and increase production efficiency so that prices can compete, improve product safety. and reducing the content of pesticide/heavy metal residues, as well as developing and implementing environmentally sound technologies (Sulistiono, 2010).

The low productivity of rice plants is caused by several factors, namely plant disturbing organisms (OPT) in the form of weeds, diseases and pests (Djojosumarto, 2000). One of the pests that attack rice plants is the golden snail (Pomacea canaliculata Lamarck). The golden snail is a freshwater snail which was introduced to Indonesia in 1981 as an ornamental animal. Some of the golden snails that were released into the rice fields multiplied rapidly so that their population increased in a short period of time. This high population causes damage to rice plants which increasingly worries farmers. Therefore, the golden snail has changed its status from an ornamental animal to a rice pest. The golden snail is included in the list of Mollusca which is an invasive alien species in Indonesia (Sugianti et al., 2014). The golden snail damages rice plants from the nursery until the rice plants are under 4 weeks after planting. The golden snail attacks by cutting the base of the young rice stems which causes the rice clump to break and die (Yunidawati et al., 2011).

The golden snail has become a major pest in Aceh, especially in irrigated rice fields. Attacks can occur in nurseries until the plants are under four weeks after planting. Disruption of the golden snail occurs in every tiller, both productive and unproductive tillers resulting in a decrease in the number of tillers, this is caused by stagnant water so that the golden snail easily eats young or newly sown rice plants (Carlsson, 2009).

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As for how to deal with the development of pests broadly, it is necessary to apply appropriate, effective and environmentally friendly control technologies. One way to control pests is through the application of organic pesticides derived from plants in the form of areca nut extract. Areca nut is a palm-like plant. The part of areca nut that is most widely used as a vegetable insecticide is young areca nut because the highest active ingredient is found in young areca nut (Haditomo, 2010). The areca nut used is in the form of areca nut extract which is used as fertilizer to add calcium which is reduced due to harvesting, erosion and for loose soil. This is because areca nut has phytochemical compounds such as tannins, flavonoids, saponins and alkaloids which are useful as molluscicides, contain arecoline, a type of alkaloid or nicotine which is a metal-tetrahydromethyl-nicotinic ester which is in the form of a strong alkaline oil which is toxic and causes paralysis and respiratory arrest. Besides that, other active ingredients from areca nut seeds are phenolic compounds in relatively high quantities which are toxic and proanthocyanidins which can inhibit growth, appetite and are toxic.

Areca nut has a very strong poison against the golden snail. Application with the lowest concentration of crude betel nut extract (0.5 g/l) has caused 100% mortality of the test golden snail (Lestari, 2009). Wiwik and Bakti, 2011 from their research showed that the administration of areca nut extract can increase the mortality of golden snail pests, with a 100% mortality rate of golden snail pests occurring at a concentration of areca nut extract of 40 cc/l water (E3).

Based on the results of the background description above, it is necessary to conduct research on the efficacy of areca nut extract (Areca catechu L.) on the mortality of the golden snail (Pomacea canaliculata Lamarck) and the effect of areca nut extract on the growth and production of rice plants (Oryza sativa L.)

MATERIALS AND METHODS

This research was conducted in Teupin Raya Village, Peusangan Siblah Krueng District, Bireuen Regency from September to November 2022. The materials used were areca nut, water, golden snail, rice seeds, soursop leaves, while the tools used were buckets, tank spray gun, meter, digital scale, machete, stationery camera, transparent plastic, wood, pounder, and filter. The design used in this study was a non-factorial Randomized Block Design (RBD) with 7 treatments and 3 replications.

The factors tested were areca nut extract with the following treatments: P0: Control, P1: Dosage of areca nut extract 100gr/ha, P2: Dose of areca nut extract 150gr/ha, P3: Dose of areca nut extract 200gr/ha, P4: Dose of areca nut extract 250gr/ha ha, P5: Dosage of areca nut extract 300gr/ha, P6: Dose of areca nut extract 350gr/ha. Thus overall there are 21 treatments, then the data is analyzed using the following mathematical model:

$$\mathbf{Y_{ij} = \mu + \beta i + \tau j + \sum_{ijk}}$$

If the results of the F test show a significant effect between treatments, then proceed with the Least Significant Difference Test at the 5% opportunity level (BNT 0.05) and to compare the average treatment using the formula:

$$\mathbf{BNT0{,}05 = t\alpha\ (db\ galat\ )}\sqrt{\frac{2\ KTG}{r}}$$

Research procedure

1. Making Areca Extract
2. Land Preparation
3. Experimental Plots
4. Provision of Golden Conch
5. Seed Preparation
6. Preparation of seedling plots
7. Research Plot Preparation
8. Planting
9. Fertilization
10. Application of Areca Extract
11. Maintenance by holding good irrigation and controlling pests and diseases
12. Harvesting

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RESULT AND DISCUSSIONS

1. Symptoms of the Golden Snail Death

From the results of visual observations, it was shown that the golden snail that died as a result of the application of areca seed extract showed early symptoms, which was marked by the discharge of mucus from the surface of the body and over time the body slowly detached from its shell which resulted in the golden snail dying. The mucus that comes out of the body is caused by the body's reaction from the snail due to the presence of toxic compounds contained in the areca seed extract. The golden snail moves to find food by opening its operculum and moving its legs. Its activity in moving to look for food results in body contact with the sown extract, as a result the extract accumulates in the golden snail's legs, causing it to secrete mucus, however, excessive mucus discharge indirectly inhibits its breathing process and causes death.

2. Mortality of the dead golden snailnumbers since 1, 3, 6, 9 (HSA) %

The application of areca seed extract had a very significant effect on the mortality of the golden snail pest on days 1, 3, 6 and 9 HSA. Areca seed extract which showed an increase in mortality according to the increase in the concentration of vegetable mollucicides. The effect of areca seed extract on golden snail mortality can be seen in Table 1.

Table 1. Average Mortality of the Golden Snail at 1, 3, 6, and 9 HSA Due to Areca Nut Extract

Treatment	Mas Snail Mortality			
	1 HST	3 HST	6 HST	9 HST
P_0(Control)	0^a	0^a	0^a	0^a
P_1(100 gr/ plot)	6.66^b	24.44^b	33.33^b	37.77^d
P_2(150 gr/ plot)	6.66^b	26.66^c	33.33^c	33.33^c
P_3 (200 gr/plot)	11.10^c	33.33^d	42.22^d	13.33^b
P_4 (250 gr/plot)	13.33^d	40^e	33.33^d	13.33^b
P_5(300 gr/ plot)	17.77^e	46.66^f	24.44^d	13.33^b
P_6(350 gr/plot)	20^f	53.33^g	11.10^e	15.55^b
$BNT_{0,05}$	4.40	2.98	5.45	4.56

Information : Numbers followed by the same letter in the same column are not significantly different in the 0.05 BNT test

Table 1 shows that the administration of areca seed extract has a very significant effect on the mortality of the golden snail. The more doses given, the more the golden snail will die. This proves that the higher the level of concentration, the higher the active ingredients it contains, thus the higher the killing power. The initial death of the golden snail infected with areca nut seeds was marked by a change in the behavior of the golden snail, that is, its body changed color from bright yellow to blackish yellow. From the above observations, it shows that the crude extract of areca nut contains a compound that has a fairly high toxicity to the golden snail. Areca nut contains alkaloid compounds, namely norrorecaidine, norroricoline, arecaidine, arecaine, arecolidine, gufacine, gufacoline, and isoguacine (Wijayakusuma, 2019).

1. Attack Intensity Since 1, 3, 6, 9 (HSA) %.

The results of the study showed that the intensity of the golden snail attack had a significant effect on rice plants on days 1, 3, 6, and 9 HSA of areca seed extract. Table 2 indicates that the average number of golden snail pest attack intensities during observations showed development varied in each treatment. Starting from observations 1, 3, 6, and 9 the HSA of areca nut extract shows that the average attack intensity fluctuates up and then down according to the amount of areca nut extract applied. Observations proved that the best treatment was found at P6 while the lowest treatment was found at treatment P0 . The results of the statistical analysis showed that the use of areca nut extract had a very significant effect on the percentage of infected plants. The more concentrated the concentration, the lower the percentage of infected plants.

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Table 2. Average Intensity of Snail Attack On Days 1, 3, 6, and 9 HSA Due to Areca Nut Extract

Treatment	Intensity of Attack of the Golden Snail			
	1 HST	3 HST	6 HST	9 HST
P_0(Control)	11.10^{d}	52.08^{f}	37.5^{f}	0^{a}
P_1(100 gr/ plot)	7.29^{bc}	5.20^{f}	4.16^{d}	3.64^{f}
P_2(150 gr/ plot)	5.02^{bc}	4.68^{e}	3.64^{cd}	3.12^{e}
P_3 (200 gr/plot)	4.85^{b}	4.16^{d}	3.12^{bc}	2.60^{d}
P_4 (250 gr/plot)	4.68^{a}	3.64^{c}	2.60^{ab}	2.08^{d}
P_5(300 gr/ plot)	4.16^{a}	3.29^{b}	2.60^{ab}	1.56^{c}
P_6(350 gr/plot)	4.16^{e}	2.60^{a}	2.08^{a}	1.04^{b}
$BNT_{0,05}$	4.91	2.83	3.86	0.70

Information : Numbers followed by the same letter in the same column are not significantly different in the 0.05 BNT test

At the beginning of the growth of the rice plants in the 1st, 3rd and 6th observations of the HSA of areca nut extract, the observed number of golden snail pest attack intensities increased in all treatments P0 then decreased on day 9 because the rice plants had been eaten by the golden snail. The level of damage caused by the golden snail is very dependent on the number of population, 10 snails per one meter x one point two meters of rice plants actually reduces yields significantly. Hendarsih and Kurniati (2015), stated that snail pests have caused damage to thousands of hectares of rice plantations.

2. Plant Height (cm)

For plant height, areca nut extract was also used, the results of which had a very significant effect on plant height at the age of 15 and 45 HST, no significant effect at 30 HST. The effect of areca nut extract on rice plant height can be seen in table 3. Table 3 shows that at age 15 and 45 HST the effect of applying areca extract was very significant on rice plant height, but had no significant effect at 30 HST. The highest value of rice plants was found in treatment P6 while the lowest value was found in treatment P2, at 15 HST. This is caused by 2 factors, external factors and internal factors. Where in the composting process there are obstacles or erosion occurs when it rains so that leaching occurs. Observation of rice plants aged 30 HST had no significant effect because in this phase there was continuous rain so that erosion or leaching occurred which resulted in the carrying of nutrients in the soil, whereas at 45 HST the highest value was shown at P6 and the lowest value was at P1.

Table 3. Average Plant / Clump Height on Days 15, 30, and 45 HST Due to Areca Nut Extract

Treatment	Plant Height (CM)		
	15 HST	30 HST	45 HST
P_0(Control)	0^{a}	0^{a}	0^{a}
P_1(100 gr/ plot)	27.16^{b}	59.63^{ab}	$72,24^{b}$
P_2(150 gr/ plot)	26.77^{b}	60.24^{abc}	$72,94^{c}$
P_3 (200 gr/plot)	27.12^{b}	60.60^{abc}	$73,94^{d}$
P_4 (250 gr/plot)	27.55^{bc}	61.24^{abce}	$74,3^{de}$
P_5(300 gr/ plot)	28.02^{cd}	61.63^{abcef}	$74,47^{e}$
P_6(350 gr/plot)	28.30^{ce}	61.94^{abcefg}	$74,91^{f}$
$BNT_{0,05}$	1.60	631.63	0.33

Information : Numbers followed by the same letter in the same column are not significantly different in the 0.05 BNT test

This is because the P6 treatment was the highest dose of areca nut extract so that it became a food source for micro and macro organisms in the soil which is beneficial for maintaining soil health and acts as an organic fertilizer which is useful for the growth of rice plants. The height of the rice plants treated with areca nut extract was influenced by the N and P elements contained in the composted areca nut extract. If the P nutrient is good, root development will also be good, thus helping in the absorption of

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other macro and micro nutrients, especially the N nutrient.

(Suwarto et al, 2021) states that nutrient N must always be available in sufficient condition because it is very important in the process of photosynthesis so that plant growth is good, and the formation of the vegetative parts of plants that the dose of N fertilizer has a very significant effect on rice growth, dry weight biomass, and grain yield.

Composted areca nut extract contains higher K than other organic fertilizers, where K serves to help root growth, strengthen plant stems and affect plant quality. The K element contained in composted areca nut extract plays a role in the opening and closing of stomata resulting in the entry of CO2 into plant tissues during the process of photosynthesis.

3. Number of tillers/clump Plant height/clump (cm).

The application of areca nut extract has a very significant effect on the number of tillers/clumps at the age of 15, 30 and 45 HST. The effect of areca nut extract on rice plant tillers can be seen in Table 4. Table 4 shows that at ages 15, 30, 45 HST the effect of applying areca extract was very significant on rice plant tillers, the highest values of rice plant tillers were found in the P6 treatment while the lowest values were found in treatment P1. This was due to the fact that areca nut extract given at a dose of 350 g/plot in the P6 treatment had sufficient nutrients to support growth. The nutrient content in areca nut extract due to composted organic fertilizer varies in number; the greater the amount of areca extract applied, the greater the amount of organic fertilizer produced and vice versa. Notodarmojo (2015), said that decomposed areca nut extract functions for bioremediation, is hydrophilic and can increase the soil's ability to hold water and also contains relatively high element C as a source of microbial energy.

Table 4. Average Number of Saplings / Clumps on Days 15, 30, and 45 HST Due to Areca Nut Extract

Treatment	Sapling Plants (CLUM)		
	15 HST	30 HST	45 HST
P_0(Control)	0^{a}	0^{a}	0^{a}
P_1(100 gr/ plot)	6.77^{b}	13.55^{b}	$24,52^{b}$
P_2(150 gr/ plot)	7.30^{c}	14.16^{bc}	$26,30^{c}$
P_3 (200 gr/plot)	8.08^{d}	14.86^{bcd}	$27,913^{d}$
P_4 (250 gr/plot)	8.60e	16.63^{cde}	$28,41^{d}$
P_5(300 gr/ plot)	9.11^{f}	18.24^{de}	$29,66^{e}$
P_6(350 gr/plot)	9.49^{g}	16.24^{e}	$30,41^{f}$
$BNT_{0,05}$	0.29	4.70	1,08

Information : Numbers followed by the same letter in the same column are not significantly different in the 0.05 BNT test

4. Length of panicle / clump (cm).

In measuring panicle length with the application of areca nut extract, it had a significant effect. The effect of areca nut extract on the panicle length of rice plants shows that rice plants with areca nut extract, the longest panicles were in treatment P6, while the lowest were found in treatment P1. The higher the treatment given, the longer the panicle length of the rice plant. This is because the areca nut extract which undergoes decomposition contains high P nutrients and K nutrients, which play a major role during generative growth, namely during the formation of panicle weight and length, enlarging the fruit grain.

5. Weight of Grain/Clump (g)

The application of areca nut extract has a very significant effect on grain weight. The use of areca nut extract from rice plants that the P6 treatment was the best treatment compared to the other treatments because it had the heaviest grain weight per clump. From the observation table it is known that the higher the dose of the areca nut extract given, the greater the weight of the rice grain obtained and has a very significant effect on the weight of the rice plant grain.

Sudjijo (2013) states that the amount of nutrients absorbed by plants is determined by the fertilizer given, which will be used for the process of forming carbohydrates which will ultimately affect growth and production.

CONCLUSION

The use of various doses of areca nut extract on mortality, intensity and yield of rice plants had a very significant effect on plant height at 15 and 45 DAP, number of tillers at 15, 30, 45 DAP, panicle length, and grain weight, and had no effect significant

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effect on plant height at 30 HST. The best treatment for the dose of areca extract on the effectiveness, growth and yield of rice plants was found in the P6 treatment with a dose of 350 g/plot.

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