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Effect of Corot (*Dioscorea hispida* Dennst.) Extract Against Insect Pests of Lowland Rice

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ABSTRACT

This study compared the effects of corot extracts and commercial insecticide on insect pests and yield of lowland rice. Five (5) treatments namely: (T_1 - Control (No spray); T_2 - 30% corot tuber extract + 70% tap water; T_3 – 30% corot leaves extract + 70% tap water; T_4 – 30% corot stem extract + 70% tap water, and T5 – commercial insecticide, with three (3) replications were used in the study.

Rice plants treated with commercial insecticide and 30% corot tuber extract had significantly lowered the number of larval insect pest (stemborer larvae) and flying insect pests (rice bugs and rice black bugs) and average number of unfilled grains due to insect feeding compared to the 30% corot leaves extract, 30% corot stem extract, and the untreated plants. Likewise, plants treated with commercial insecticide and 30% corot tuber extract had significantly higher insect pest mortality compared to the other treatments. However, commercial insecticide is more effective than 30% corot tuber extract. Furthermore, the use of commercial insecticide had significantly higher yield than the rest of the treatments. The other treatments have comparable results.

Keywords: corot, Dioscorea hispida, flying insect pests, lowland rice

INTRODUCTION

Rice (*Oryza sativa* Linn.) locally known as "palay" is the main food of many Filipinos. The brown rice has a high caloric value and is a good source of vitamins, minerals and protein. Rice and its by-products are used in varied ways as food, feed and source of industrial products.

In 2005, the total rice production of the Philippines was 15,109,000 tons which utilized a total land area of 4,163,000 ha. Furthermore, Filipinos have consumed a total of 10,722,000 tons rice in the same year.

In order to meet the demand of rice, farmers must fully maximize their harvest from their land but their production is constantly constrained by many factors like pests and diseases. To solve the problems on pests and diseases, farmers rely on the use of inorganic pesticides. However, the use of inorganic pesticides is coupled with high cost, development of insect resistance and greater concern for environmental protection, thus other alternatives have to be considered. Botanical pesticides offer an alternative to synthetic pesticides. Botanical pesticide fitted very well into the concept of sustainable agriculture since it came from renewable resources and can be grown by the farmers themselves right in their backyard.

Yam (*Dioscorea hispida* Dennst.) locally known as "corot' is abundant here in Palawan. This plant is a wild crop that does not need any intensive care. It is a climbing plant with a prickly stem twinning to the left with trifoliate heavy leaves. The tuber contains a toxic substance, hence it must be detoxified first before it can be cooked as food. It is for this reason that the researcher would like to test its toxicity against rice insect pest.

This study specifically aimed to: 1) determine the effect of corot extracts against rice insect pests; 2) determine what part of the corot plant is effective for the control of rice insect pests; 3) compare the efficacy of corot extracts from commercial pesticides for the effective control of rice insect pests; and 4) compare the yield between rice plants treated with the extracts of different parts of corot and commercial insecticides.

METHODOLOGY

Complete Randomized Design (CRD) was followed in this study with five (5) treatments and three (3) replications per treatment. The treatments used were: Treatment 1 – control - no spray, Treatment 2 – 30% corot tuber extract(CTE) + 70% tap water, Treatment 3 – 30% corot leaves extract (CLE) + 70% tap water, Treatment 4 – 30% corot stem extract (CSE) + 70% tap water and Treatment 5 – commercial insecticides . Five plants per plot served as sample plants.

Land preparation. An area of 160 square meters was plowed and harrowed thoroughly to incorporate weeds and rice stubble with mud for further decomposition. The area was divided into three (3) blocks and each block was further subdivided into five plots, measuring 2 x 2 meters each. A one-meter leeway between blocks and plots and one meter border was provided.

Seed preparation. An area of 20 square meters was cleared, plowed and harrowed thoroughly. After harrowing, the bed was elevated and leveled properly. Water was drained before seed sowing.

Seed treatment and seeding. Two kilograms of rice seeds put inside a plastic sack was soaked in water for 24 hours and was incubated for another 24 hours in a shady place. The germinated seeds were broadcasted evenly in seedbed.

Fertilizer application. Seven hundred fifty (750) grams complete fertilizer during the final harrowing and 10 days after sowing (DAS) were applied to the seedbed. Complete fertilizer was applied at the rate of 50 kg/ha or 5 grams/square meter as basal. Area was top dressed with urea at the rate of 150 of 150 kg/ha or 15 grams/plot, a week before panicle initiation or 55 days after transplanting.

Transplanting and replanting. Twenty-one days after sowing, the seedlings were pulled and transplanted at a distance of 20 x 20 cm and at the rate of one seedling per hill. Replanting of missing hills was done 3-5 days after transplanting to avoid uneven maturity.

Collection and preparation of corot extract. Collected tubers, leaves and stems of corot from Tigman, Aborlan, Palawan were cleaned and chopped into small pieces with a sharp knife and pounded thoroughly with mortar and pestle. The pounded plant materials were soaked in tap water for 24 hours in 1:1 ratio (1 kg plant material + 1 L tap water). After soaking, the different plant materials were squeezed with cheese cloth to separate the juice from the meat. The extracted juice served as the stock solution.

Application of extracts. Five days after transplanting, the rice plants were sprayed with different corot extracts and commercial insecticide (Karate). Karate insecticide was sprayed following the rates on its label. Spraying was done early in the morning at 7 days interval until 3 weeks before harvesting the rice.

Irrigation and drainage. Three days after sowing, the seedbed was irrigated at a depth of 2 centimeters and increased gradually up to 5 cm depending on the height of the seedlings. The plots were irrigated at a depth of 3 centimeters. The level of water was gradually decreased at hard dough stage. The field was totally drained 15 days before harvesting.

Weeding. Hand weeding was done when weeds are observed growing in the area during the first 40 days from transplanting.

Control of pests and diseases. The seedbed was enclosed with a 4 x 5 x 1 m screen net to prevent insect pest infestation during the seedling stage. Mollusks were handpicked and fungicide was sprayed when rice plants show fungus infections. Rodents were captured using traps and nylon was used to drive away birds.

Harvesting. The rice panicles were harvested at 80-85% physiological maturity. Harvesting was done manually with a sickle. Sample plants were harvested first.

Threshing, weighing and drying. The grains were threshed manually. After threshing, harvest from each plot was weighed. Weighed palay were placed in plastic sacks and sun dried until it reached 14% moisture content. The dried grains were placed in labeled plastic bags.

The data collected were the mean number of larval and flying insect pests, mean number of plants damaged by insect pests, mean number of insect mortality, mean number of unfilled grains, plot yield and computed yield per hectare. The computed yield per hectare was derived by multiplying the quotient of 10,000 sq. m.and plot area in sq. m. to the yield per plot.

Data gathered were subjected to Analysis of Variance (ANOVA) and Duncan's Multiple Range test (DMRT) to test the differences between treatment means.

RESULTS AND DISCUSSION

Mean number of larval insect pests (Stemborer larvae) infesting rice plants

The lowest mean number of stemborer larvae (12.00) was observed in rice plants treated with commercial insecticide (T_5). This is followed by those treated with 30% corot tuber extract (T_2), 30% corot leaves extract (T_3) and 30% stem extract (T_4) with the mean stemborer larvae of 13.67, 24.33 and 26.33, respectively. On the other hand, the untreated plants (T_1) obtained the highest number of stemborer larvae with a mean of 27.67 (Table 1). DMRT showed that rice plants treated with commercial insecticide and 30% corot tuber extract had statistically lower number of stemborer larvae compared to those rice plants treated with 30% corot leaves extract and 30% corot stem extract and the untreated rice plants. This indicates that the 30% corot tuber extract has insecticidal properties that is comparable to commercial insecticide.

Mean number of flying insect pest infesting the rice plants

Rice plants treated with commercial insecticides (T_5) had the lowest number of rice black bugs and rice bugs with a mean of 42.3 , followed by those treated with 30% corot tuber extract (T_2) with a mean of 51.7. Rice plants treated with 30% corot stem extract (T_4) and 30% corot leaves extract (T_3) had a mean of 64.3 and 67.3 rice black bugs and rice bugs respectively while those untreated or control plants (T_1) obtained the highest number of rice black bugs and rice bugs with a mean of 79.0 (Table 1).

Table 1. Mean number of larval insect pests, flying insect pests, plant damaged by insect pests, insect pests' mortality, unfilled grains due to insect feeding and the plot yield in kilograms.

Treatment	Mean number of larval insect pests	Mean number of flying insect pests	Mean number of plant damaged by insect pests	Mean number of insect pests' mortality	Mean number of unfilled grains due to insect feeding	Plot yield in kilograms
T_1 – Control (No spray)	27.67^{a}	79.0^{a}	20.00^{a}	0^{c}	61.87^{a}	1.759^{b}
T_2 - 30% CTE + 70% tap water	13.67^{b}	51.7^{b}	16.87^{a}	12^{b}	28.67^{bc}	1.509^{b}
T_3 – 30% CLE + 70% tap water	24.33^{a}	67.3^{ab}	18.80^{a}	0^{c}	46.47^{ab}	1.508^{b}
T_4 – 30% CSE + 70% tap water	26.33^{a}	64.30^{ab}	17.33^{a}	0^{c}	51.47^{a}	1.515^{b}
T_5-Commercial insecticides	12.00^{b}	42.3^{b}	9.40^{b}	22^{a}	22.73^{c}	2.232
F value (treatment)	22.35	8.374^{**}	21.24^{**}	53.14^{**}	17.65^{**}	16.46^{**}

Note: Means having the same letter superscript are not significantly different at 0.01 level based on DMRT.
ns – not significant
** - highly significant

ANOVA showed highly significant differences among the treatment means. Treatment 5 (commercial insecticide) and Treatment 2 (30%) corot tuber extract) are significantly lower than Treatment 1 (no spray). However, it did not differ significantly from Treatment 4 and Treatment 3. Likewise, Treatments 1, 3 and 4 did not differ significantly.

This implies that the use of the 30% corot tuber leaves and stem extract are comparable to the commercial insecticides in repelling rice black bugs and rice bugs from infesting the rice plants. This conforms with Hu and Yao (2001) and Su *et. al.* (2003) that *Dioscorea* has toxic content that kills cancer cell lines.

Mean number of plants damaged by insect pests

Rice plants treated with commercial insecticide (T_5) obtained the lowest number of rice plants damaged by insect pests with a mean of 9.40. Those treated with 30% corot tuber extract (T_2), 30% corot stem extract (T_4) and 30% corot leaves extract (T_3) and the untreated or control plants (T_1) obtained the mean insect pests damaged rice plants of 16.87, 17.33, 18.80, and 20.00, respectively (Table 1)

ANOVA showed highly significant differences among the treatments. DMRT revealed that rice plants treated with commercial insecticide had statistically lower number of plant damaged by insect pest than Treatments 1, 2, 3, and 4.

This implies that the different corot extracts were not as effective as the commercial insecticides in preventing insect pest from damaging the rice plants.

Mean number of insect pest's mortality

The highest number of insect pests mortality was observed on rice plants treated with commercial insecticide (T_5) with a mean of 22, followed by rice plants treated with 30% corot tuber extract (T_2) with a mean of 12. Plants treated with 30% corot leaves extract (T_3) and 30% corot stem extract (T_4) and the untreated or control plants (T_1) obtained zero insect pest mortality (Table 1).

ANOVA revealed highly significant differences among treatment means. Treatment 5 (commercial fertilizer) was significantly different from the rest of the treatments. Treatment 2 had significantly higher insect pests' mortality than Treatments 1, 4 and 3 but significantly lower than Treatment 5.

This implies that among the corot extracts, only the 30% corot tuber extract is effective in causing mortality to rice insect pests.

Mean number of unfilled grains due to insect feeding

The highest number of unfilled grains was obtained from the untreated or control plants (T_1) with a mean of 61.87. This is followed by those treated with 30% corot stem extract (T_4), 30% corot leaves extract (T_3) and 30% corot tuber extract (T_2) with mean unfilled grains of 51.47, 46.47 and 28.67 respectively. Those treated with commercial insecticide (T_5) got the lowest number of unfilled grains with a mean of 22.73 (Table 1).

ANOVA showed that differences among treatment means were highly significant. DMRT showed that commercial insecticide application is significantly lower than other treatments but comparable to plants sprayed with 30% corot tuber extract (T_2). Treatment 2 is comparable to Treatment 3 while Treatment 3 is comparable to Treatment 1.

This implies that 30% corot tuber extract and commercial insecticide are equally effective in repelling insect pests (rice black bugs and rice bugs) that feed on rice plant, hence, lesser unfilled grains were observed.

Plot yield

Rice plants treated with commercial insecticide (T_5) obtained the highest plot yield with a mean of 2.232 kgs, followed by the rice plants treated with 30% corot stem extract (T_4), 30% corot tuber extract (T_2), and 30% corot leaves extract (T_3) with the means of 1.515, 1.509 and 1.508 kgs, respectively. The untreated or control plants (T_1) obtained the lowest plot yield with a mean of 1.459 kgs (Table 1).

ANOVA showed that differences in plot yield among treatments are highly significant. DMRT showed that Treatment 5 (commercial insecticide) differed significantly from the rest of the treatments. On the other hand, Treatments 1, 2, 3 and 4 are statistically the same.

This implies that the different extracts of corot did not affect the plot yield of rice. Likewise, the result implies that the use of commercial insecticide reduced the number of insect feeding on rice hence, better yield was obtained in this treatment compared to those rice plants treated with different corot extract.

Computed yield per hectare

Rice plants treated with commercial fertilizer (T_5) obtained the highest computed yield with a mean yield of 5.580 tons/ha, followed by those plants treated with 30% corot stem extract (T_4), 30% corot leaves extract (T_3) and 30% corot tuber extract (T_2) with means of 3.7875, 3.770, 3.7725 tons/ha, respectively. The lowest yield was obtained from the untreated or control plants (T_1) with an average yield of 3.6475 tons/ha (Table 2).

This implies that the use of commercial insecticides repel insect pests from infesting the plants, hence higher yield was obtained compared to the rest of the treated plants.

Table 2. Computed yield per hectare

Treatment	Average Yield/ha(tons)
T_1 – Control (No spray)	3.6475
T_2 - 30% corot tuber extract	3.7725
T_3 – 30% corot leaves extract	3.7700
T_4 – 30% corot stem extract	3.7875
T_5 – Commercial insecticide	5.5800

Conclusion

Based on the result of the study, it can be concluded that the application of 30% corot tuber extract is as effective as that of commercial insecticide in controlling and/or repelling rice insect pests.

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