MOLLUSCICIDALEFFECTOFTUBA-TUBA(*JATROPHACURCAS*LINN) EXTRACTS ON GOLDEN APPLE SNAIL(*POMACEACANALICULATA*LAMARCK)

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ABSTRACT

This experimental research primarily aimed to determine the molluscicidal effect of "tuba-tuba"*(Jatrophacurcas* Linn)on golden apple snail *(Pomaceacanaliculata*Lamarck)using extracts from the leaves,nuts,roots,and bark of the experimental plant. Experimental evidence shows "tuba-tuba"leaf extract was able to attain a 100% mortality rate after 180 minutes of observation time, thus, was considered comparable to the commercial preparation(Porsnail®) andis therefore, the most effective part of the plant as a molluscicide. This claim is borne out by a one-way ANOVA and confirmed by the Scheffe's test. It was also shown that the extracts affected the internal organs of the test animals, which manifested perforation of reproductive organs, inflamed intestine and collapsed lungs. Other manifestations of toxicity observed were spittle formation (salivation)and poor balance. Based on these findings,it is concluded that"tuba-tuba" was effective against the golden apple snail, with the leaves being the part of the pant whose extract was most effective as a molluscicide, although other parts were also found to also have molluscicidal effect; the root and nut extracts however,were not significantly different in its effects with the negative control. the gross effect of the plant extracts was manifest destruction of the snail's internal organs. It is recommended that future research should focus on evaluating the efficacy of mature nuts, its minimum lethal concentration and the phytochemical analysis of the plant extracts.

KEYWORDS:*molluscicidal effect, tuba-tuba extract, Jatrophacurcas, Pomaceacanaliculata*

INTRODUCTION

The golden apple snail, popularly known as "golden kuhol" [*Pomaceacanaliculata* Lamarck], is originally a native of South America, has a high rate of reproduction (laying eggs up to 1000 to 1200 per month), is extremely tough, and matures sexually at 2 months old. It can live for about four to sixyears, surviving even in drought conditions, pollution, and low oxygen. They are usually found in many plant matters, ponds, swamps, irrigated fields, canals and water-logged areas(Mohan,2002). Itwasin the1980s when golden apple snail was introduced to Asia as a food source for human sand as aquarium pet.It also provides food fornatural predators such as ants, birds, spiders, field rats, and fish. Aquatic snails are said to be good bio-indicators for water pollution, such as the presence of pesticides and trace metals(Leocadio,2001).However, despite their ecological importance, golden apple snails have destroyed about1.2 to1.6 million hectares of the rice fields in the Philippines. It also has destroyed plants which are the primary source of food, and affect the food web, which lead to damage and economic loss. Human health threats are also associated with this species for it could be a vectorof parasites such as lung worm ,which may cause the fatal *Eosinophilic meningoence phalitis* disease in humans. Aside from fatal diseases, it also contributes toski n irritations by being intermediate host to associated trematodes(Mohan,2002).

Linneaus (1753)first named the physicnutas *Jatropha curcas*L., and according to the binomial nomenclature, it is still valid to date. The plant, known as "tuba- tuba" or "tubing bakod" in the Philippines, is a small tree of the plant tribe *Oannesieae* of *Crotonoideae*in the *Euphor biaceae* family that has approximately 170 known species worldwide (Dehgan and Webster 1979).*Jatropha* is a drought-resistant perennial shrub with aneconomic life of up to 35 years and can even extend upto 50 years. The shrub has a smooth, gray bark which exudes whitish colored, watery latex when cut. The size of the leaves ranges from 6-15 cm in length and width. It sheds leaves in the dry season and rejuvenates during the rainy season (Mixph,2013).

Acda (2009) reported that extracts and crude oil from the seeds of *J. curcas*have traditionally been used as an insect repellent, molluscicide, and rodenticide (Duke, 1985). Toxicity of *J. curcas*seeds is attributed to several components, including *saponins, lectin (curcin), phytates, protease inhibitors, curcalonic acid,* and *phorbol esters* (Adolf, *et al*., 1985; Makkar, *et al*., 1997; Martinez-Herrera, *et al*., 2004). However, reports have identified *phorbol esters* as the main toxic agent responsible for the insecticidal and molluscicidal activities of *J. curcas*oil (Makkar and Becker, 1997a,1997b;Liu,*et al*., 1997).*Phorbol esters* are tetracyclic diterpenoids that mimic the action of diacyl glycerol, an activator of protein kinase C that interferes with different signal transduction pathways and other cellular metabolic activities (Bershadsky ,*etal.*,1990;Goel, *et al*., 2007). Phorbol esters are also known purgative, skin irritants, and tumor promoters, but are not mutagenic or carcinogenic themselves (Adolf, *et al*.,1984;Hirota,*et al*., 1988).

This study therefore, was conducted to test the molluscicidal effect of *Jatropha curcas*L. on *Pomaceacanaliculata*L. And find a way to limit Golden Apple snail populations using tuba-tuba extracts, which may contain toxins that would help control the spread of this gas tro pod pest.

METHODOLOGY

Tuba-tuba plant was collected from Barangay Macagtas, while the golden apple snails were collected from the ricefields of Barangay Bang kerohan, Catarman, Northern Samar. To ensure consistency of results, the experimental method of research was used in this study. ANOVA was used to analyze the differences among group means. This study used 3 experimental animals in each treatment with three(3)replications, corresponding to thefollowing:T_1=100%leafextract; T_2=100%nutextract; T_3=100%rootextract; T_4=100%barkextract; T_5=negative control(dH_2O); and, T_6=Positive control(Porsnails®)

The Completely Randomized Design (CRD) with six (6) treatments in three(3)replications was used in this study, while the golden apple snails were put in 250mLglass containers for experimentation.

Data Gathering Procedure

1. *Preparation of Tuba-tuba Extracts*

The preparation of extracts was done at the College of Science, University of Eastern Philippines. Each plant part was washed thoroughly to remove dirt and other contaminants, the nit was chopped into small pieces using a sharp bolo before extracting the juice using a manual juicer.

2. *Preparation of Commercial Molluscicide*

Approximately 1gram(0.83 gram to be exact)of Porsnail®, a commercially-prepared molluscicide powder was dissolved in seventy five milliliters (75mL)of water, and was divided into three replications of twenty five milliliters(25mL) each.

3. *Preparation of the Distilled Water*

Seventy five millilitres (75mL)of distilled water was poured in to a beaker and was divided into three, giving each replication twenty fivemilliliters (25 mL) of distilled water.

4. *Treatment of Experimental Animals*

Twenty five milliliters (25 mL)of thetuba-tuba(leaves, nuts, bark,and roots)extracts were poured in to a glass container with the experimental animals, as well as the positive control(Porsnail®)and the negative(dH_20)control, once while the golden apple snails were feed with young rice plants through out the study.

5. *Dissection*

After the study duration,one of the snails in each treatment was dissected to determine if there were changes in the gross morphology of the internal organs of the test animal.

RESULTS AND DISCUSSION

This study attempted to determine which part of the tuba- tuba plant(*Jatrophacurcas*Linn) has a molluscicidal effect, and compare it to acommercial molluscicide. This also observed the changes that happen to the internal organs of the experimental animals, and the general behavior upon the administration of the test extracts.

Snails were continuously observed360 minutes (6hours), at 30-minute intervals, from the application of the experimental extracts. After three trials, results show that the leaves produced the most effective extract, which on average manifested its strongest effect almost three hours (160 minutes) after application, whereas Porsnail® (positive control) has taken only about half the time (80 minutes) to exhibit its effect. Extracts from other plant parts

(bark, roots, and nuts) manifested their mortality effects in about 300 – 320 minutes after application, and as was to be expected, the negative control (T_5 = dH_2O) did not have any effect on the experimental animals. At the end of the experiment, all of the experimental animals, except those in T_5, were dead, confirming the molluscicidal effect of the plant extracts, implying that extracts from tuba-tuba could substitute for commercial molluscicides.

At the end of the experiment, one snail from each treatment was dissected in order to observe thechanges that occurred to its internal organs, and result show that the lungs had collapsed, the intestines were in flamed, and there were perforations in the female reproductive organs. Such gross anatomical changes are concrete manifestations of the molluscicidal effect of the plant extracts and the commercial preparation.

Table 1. Anatomical Changes in the Internal Organs of the Snails After Treatment

Organsaffected	**Treatment**						**Changes**
	T_1	T_2	T_3	T_4	T_5	T_6	
Lungs	+	+	-	+	-	+	Collapsed
Intestine	+	+	-	-	-	+	Swollen
Reproductive	-	-	-	-	-	+	Perforated

Legend: + =Positive Observation
-=Negative Observation

Other symptoms manifested by the animals after administration of the test extracts were poor balance and mucus secretion (spittle formation manifested by frothing), which occurred in all trials.

Table2 .Othersymptomsmanifestedbythegoldenapple snail.

Symptoms	**TREATMENTS**					
	T_1	T_2	T_3	T_4	T_5	T_6
PoorBalance	+	+	+	+	-	+
Mucus Secretion	+	+	-	+	-	+

Legend: += Positive Observation
- = Negative Observation

Statistical analysis of data utilizing the One-Way Analysis of Variance (ANOVA) showed significant differences among the six treatments in terms of their molluscicidal efficacy at 0.05 level of significance. Results imply that the extracts manifested molluscicidal effects on the test animals which were somehow comparable to the effect of the commercially prepared product. This further implies that the plant can be utilized as an effective bio control agent against the golden apple snails.

It is evident that some of the treatments show no significant difference in the molluscicidal effect in the three trials of the experiment, clearly showing that the source of the extract (leaves, nuts, barks, or roots) have almost similar efficacy when compared with the positive control (Pornail®), while the extracts were significantly different in their effects when compared with the negative control. However, across treatments and trials, Treatments 2 and 3 constantly showed no significant difference in effect when compared with Treatment 5, which may be interpreted as being statistically the same, simply saying that the extracts (T_2andT_3)have no effect, if at all, on the golden apple snail.

CONCLUSIONS AND RECOMMENDATIONS

After evaluating the molluscicidal effect of the extracts from tuba-tuba leaves, nuts, bark, and roots, it can be concluded that the plant is effective in killing the experimental animals, with the leaf extract being the most effective, exhibiting 100% mortality after 160 minutes, which was comparable to the commercial product Porsnail ® at 120 minutes.

The study also revealed changes in the internal organ soft he animals, such as the collapse of the lungs, inflammationof the intestines, and the perforation of there productive organs of the female golden apple snail. Such conditions led to the death of the animals, thus providing an avenue for the decline of natural snail populations.

It is thus recommended that a similar investigation be done to test the efficacy of mature nuts, determine the lethal concentration (LC50) and/or lethal dose (LD50) of extracts from different plant parts, and their possible effects on humans, animals, or the environment.

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