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# Crushed Chicken Eggshells As An Agricultural Pesticide Against Golden Apple Snails (*Pomacea Canaliculata*)

Rice (*Oryza sativa*) is a staple food in the Philippines and comprises 35% of an average Filipino's daily calorie intake. Being an agricultural country, rice is a common crop in the Philippines especially in the northern parts yet the country continues to depend on importing rice in order to meet the demand. Known rice pests include rats, insects, nematodes, but most especially golden apple snails. Over half of the rice fields in the Philippines, around 1.2 to 1.6 million hectares are infested with golden apple snails. The snails have brought around PHP 60M worth of economic losses in the Philippines. According to the Global Invasive Species Database, golden apple snails are recognized as one of the 100 worst invasive species.

To control these pests, many farmers resorted to the massive use of expensive chemical pesticides, which may cause health problems such as nerve, skin, eye irritation and damage and headaches. Other methods were adopted like manually picking snails from plantations and confining snails in small canals with leaves of plants that are toxic to them such as starflower (*Calatropis gigantea*), neem tree (*Azadirachta indica*), and asyang (*Mikania cordata*) While these options are more environment-friendly, these methods are time and energy-consuming. Mallard ducks were introduced as biological control agents but were also proven to damage rice seedlings.

"Evaluation of different duck varieties for the control of the golden apple snail (*Pomacea canaliculata*) in transplanted and direct seeded rice. "

## Crop Protection

Crushed eggshells were claimed to act as deterrents against insects, snails, and slugs in a similar manner as diatomaceous earth. Diatomaceous earth is a siliceous material obtained from the fossilized remains of microscopic aquatic organisms known as diatomite that ruptures cell cuticles and drains bodily fluids. Calcium carbonate, which comprises 95% of a dry eggshell, was observed to decrease the number of live red scales (*Aonidiella auranti*) on Takan plants.

In powdered form, calcium carbonate also effectively controlled red flour beetle (*Tribolium castaneum*) on stored paddy for the typical storage duration of 3 months without affecting the quality of the grain. This application was deemed to be more suitable to farmers, whose small-scale operations can be more easily controlled.

The study aims to determine the efficacy of calcium carbonate from crushed chicken eggshells against golden apple snails. Specifically, it shall identify the exposure time to calcium carbonate, which work best in exterminating golden apple snails.

## Methodology

### Removal of the Inner Membrane and Pulverization of the Chicken Eggshells

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Chicken eggshells will be collected by the researcher himself. Then, the eggshells will be rinsed with tap water and then left out to be air-dried. The inner membrane of the eggshells will be peeled before crushing. The eggshells will be crushed into coarse powder using a coffee grinder, stored in glass containers, and placed into a room with a temperature of 21° C.

## **Assembly of Housing Set-up**

The snails will be housed in 9 separate new glass aquariums measuring 25 cm x 25 cm x 46 cm. The aquariums will be filled with mud 10 cm deep to mimic the presence of soil on a farm. The snails will be stored outdoors under a transparent roof and subjected to a natural setting. Lettuce and water spinach leaves will be fed to the snails throughout the duration of the experimentation. The housing and feeding techniques of the project are adapted from a study by Ghesquiere. The sample population of golden apple snails will be divided into 12 groups. All of the groups (Groups A to L) will be composed of 10 snails in one aquarium.

## **Application of Eggshell Powder on the Golden Apple Snails**

Eggshells will be sprinkled by hand near and around the snails. The amounts of chicken eggshells to be sprinkled are shown in the following table and figure. Groups A, B, and C will serve as the control group while the rest of the groups will serve as the experimental groups. The dosage for the crushed chicken eggshells was taken from a study by the company Flyte so Fancy Ltd.

## **Tallying Exterminated Snails**

The aquariums will be observed within 72 hours intermittently observed every 24 hours. To confirm the death of the snails, the snails were observed if the bodies are out of or hanging out of the shells and if no resistance is exhibited when the researcher pulls their operculum or “trap door”.

The snails will also be placed in water after the experimentation for researchers to be able to determine which ones are alive and which are dead. Those that float will be considered deceased and those that don't will be considered alive. The observation will both done physically, with the researchers revisiting the aquariums and checking if the snail is alive, and through the observation of the video taken by the cameras. The number of snails that are found dead per setup will be tallied for each group determine the amount of crushed chicken eggshells is best at decimating golden apple snails (*Pomacea canaliculata*). The number of dead snails per group will be measured and then compared to determine which amount of crushed chicken eggshells and exposure time is best for exterminating golden apple snails. The data will then be interpreted by researchers with the help of the STAR Nebula program to help analyze variance, statistical significance, and normality of data. D. Risk and Safety Powdered eggshells may cause skin inflammation or hives, nasal congestion, runny nose sneezing (allergic rhinitis), cramps, nausea vomiting, coughing, wheezing, chest tightness, or shortness of breath which are commonly caused by an egg allergy or asthma. Contact with golden apple snails (*Pomacea canaliculata*) may trigger allergic reactions such as skin irritations, rashes, and nausea. The use of a coffee grinder may pose threats if not used appropriately, such as wounds from the blades inside the grinder. To prevent the harmful effects of powdered eggshells gloves will be used. Gloves will be used during crushing, application, and observation of the effect of crushed

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chicken eggshells on golden apple snails.

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