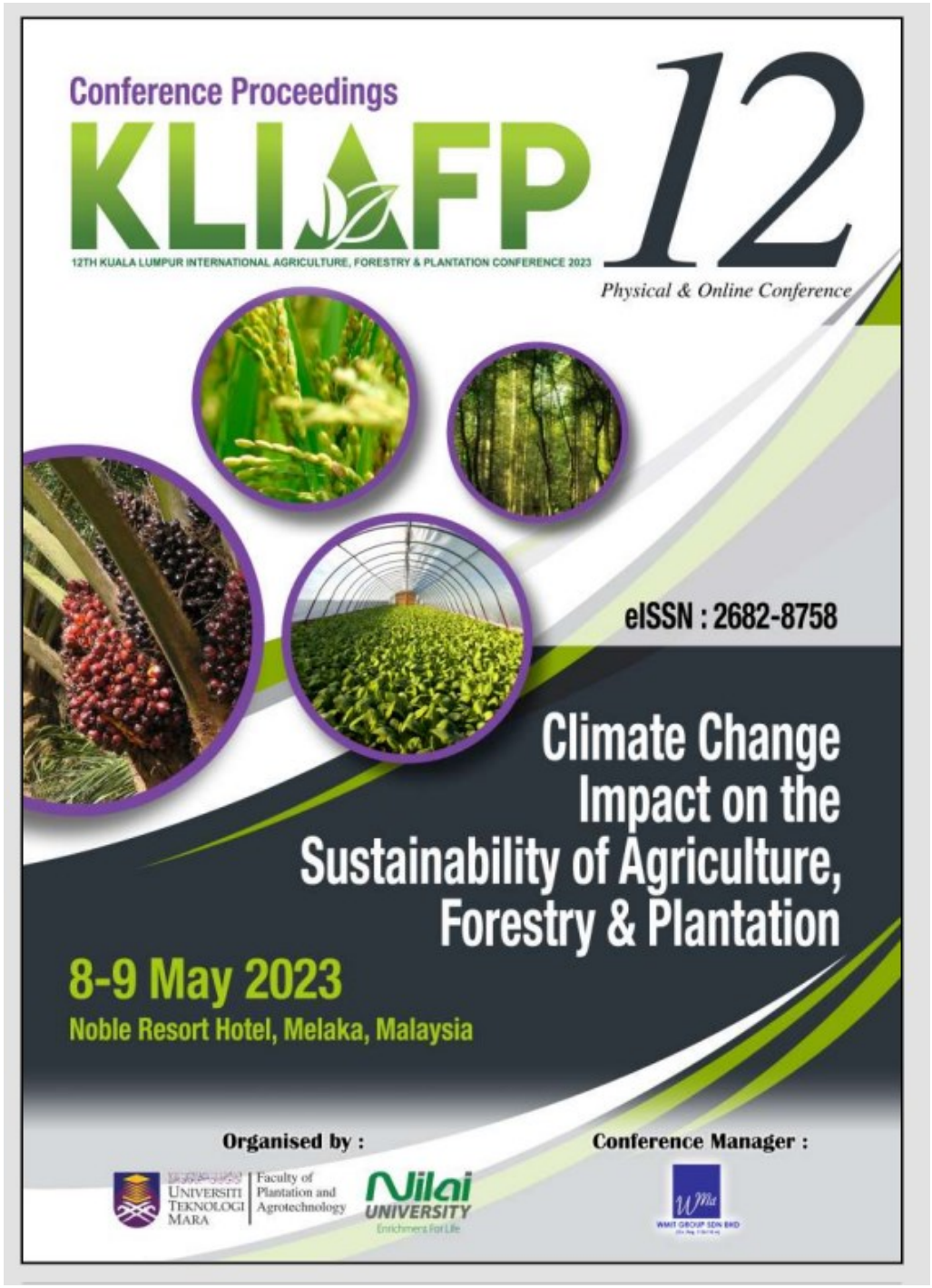

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002-002

MOLLUSCICIDAL ACTIVITY OF AQUEOUS EXTRACT FROM FIVE PLANTS SPECIES AGAINST GOLDEN APPLE SNAILS (*Pamocea canaliculata*)

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ABSTRACT

The quest for botanicals with molluscicidal activity became essential research when the Golden Apple Snails (*Pomacea canaliculata*) became a pest that invaded rice fields and resulted in a significant decrease in rice harvested in Malaysia. This study was conducted to screen the aqueous extracts of leaves of *Acacia mangium* (Fabaceae), *Allamanda cathartica* (Apocynaceae), *Catharanthus roseus* (Apocynaceae), *Euphorbia hirta* (Euphorbiaceae) and *Stachytarpheta jamaicensis* (Verbenaceae) as potential molluscicides. For each plant species, one kg of freshly crushed leaves was blended with 5000 ml of water and soaked at room temperature. After 24 hours, it was filtered, and this extract was named 100% aqueous extract. The two diluted concentrations of extracts, i.e., 10% and 50%, were prepared based on a 100% extract. Ten adult snails were treated at each concentration for molluscicide testing for 24 hours. Then it was replaced with chlorine-free water and left for 24 hours. Snails were considered mortal when they remained motionless if stimulated by a needle or if the body emerged from the shell or remained within it. The results showed that the most potent extracts were *Stachytarpheta jamaicensis* leaf extracts, followed by *Allamanda cathartica*, *Acacia mangium*, *Euphorbia hirta* and *Catharanthus roseus*. Therefore, this study suggested that *Stachytarpheta jamaicensis* warrants further investigation of the molluscicidal effect on controlling Golden Apple Snails.

Keywords: *Pomacea canaliculata*, molluscicidal, *Stachytarpheta jamaicensis*, pest.

INTRODUCTION

The non-native golden apple snail (*Pomacea canaliculata*) is a fresh water gastropod that has caused severe damage to Malaysia's rice industry by attacking and destroying the stems and young leaves of the plant and can eat up to 24 paddy saplings per day (Azmi *et al*., 2022). Damage to the snail significantly reduced paddy production. The problem becomes more severe because the snail population can increase rapidly in water and enough food. Chemical pesticides are widely used to control snails (Rohaizad Md Rejab *et al*., 2022). Although effective, using chemicals is not recommended as they have long-term toxicity effects on humans and the environment, polluting water resources and subsequently affecting ecosystems. Moreover, the costs associated with chemical molluscicides are unaffordable for farmers (Wang *et al*., 2022).

An alternative to nature's relatively "friendly" control of snails is to use biopesticides derived from naturally occurring plant compounds, which have a pronounced and affordable molluscicidal effect (Rosli *et al*., 2021). Ongoing efforts are still to find the most potent organic biological agents to minimize their invasion and attack. The strategy is to choose a plant that contains saponin, which can kill them (Bala & Singh, 2017). According to Akinpelu et al. (2012), plant derived saponins were targeted on muscles, hemolysis, bowel and hepatopancreas gland poison of the freshwater snail. Specifically, saponin able to inhibit the activity of acetylcholinesterase in the nervous system of the snail (Abubakar *et al*., 2017).

Saponin occurs in many local plants (Cheok *et al*., 2014). These plants include *Acacia mangium (*Rangra *et al., 2019)*, *Allamanda cathartica (*Khairun Nur *et al*., 2019*)*, *Catharanthus roseus* (Pham *et al*., 2019), *Euphorbia hirta* (Nyeem *et al*., 2017) and *Stachytarpheta jamaicensis* (Egharevba *et al*., 2019). Therefore, this study aims to screen the particular plant with the activity of powerful molluscicids as a candidate for the development of a new natural molluscicidal agent against the golden apple snail.

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MATERIALS AND METHODS

Golden apple snail
Adult Golden Apple Snails with shell lengths ranging from 25 to 35 mm were obtained from rice fields in the Ketereh District of Kota Bharu, Kelantan. The snails were raised in a chlorine-free 90-liter aquarium with fresh cabbage. Within a week, snails were assigned for molluscicidal testing.

Plants and extraction
One kg of leaves of *Acacia mangium*, *Allamanda cathartica*, *Catharanthus roseus*, *Euphorbia hirta* and *Stachytarpheta jamaicensis* were collected at Jeli District, Kelantan in July 2022, respectively. Separately, plant leaves were ground using an electric blender, extracted with 5000 ml of chlorine-free water for 24 hours, and filtered using filter paper. This liquid form of extract was named the 100 %(v/v) of extract, and used for molluscicidal assay within 24 hours.

Molluscicidal assay
The molluscicidal assay was conducted according to the method described by Prabhakaran *et al*., (2017). Snails were treated with three extract solutions, i.e., 10 % (v/v), 50 %(v/v) and 100%(v/v). Negative control only contains chlorine-free water. The final volume of extract and control was 300 ml. The assays were conducted in triplicate using a 500 ml aquarium with ten snails per extract concentration. Snails were left submerged in their respective extracts concentration for 24 hours. Then, the extract solution was removed, and the snails were washed three times using chlorine-free water and placed in 300 ml of chlorine-free water. After 12 hours, the number of dead snails were determined. The was considered dead if one or more of the following observations: (i) the snail's body remains in the shell, and usually, the non-dead snail will constantly move; (ii) the snail's body remains outside the shell when pierced slowly with a needle. The molluscicidal activity of the plant extracts were reported as median lethal concentration (LC_{50}) of snail sample. The LC_{50} was calculated by Probit analy

RESULT AND DISCUSSION

The molluscicidal potential of five different plant species was investigated
apple snails as the test subject.The strength of molluscicidal activity of plan
(Figure 1). Basically, the low LC_{50} indicates strong molluscicidal activity co
that the most potent molluscicidal activity against golden snails was the extra
± 0.38 %(v/v)) followed by the extract of *Allamanda cathartica* (14.38 ± 1.3
± 6.36 %(v/v)), *Euphorbia hirta* (33.79 ± 1.53 %(v/v)) and *Acacia mangium* (

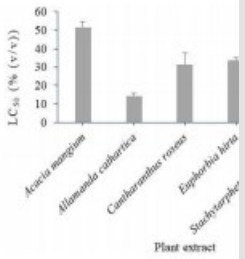

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Figure 1: Molluscicidal activity (LC_{50} value) of five plants extract against golden apple snail.

This study was the first report the molluscicidal activity of water extract of leaves of *Stachytarpheta jamaicensis*, *Catharanthus roseus* and *Acacia mangium*. The molluscicidal activity of *Allamanda cathartica* toward golden apple snail was previously reported by the researcher from Thailand (Chobchuenchom *et al*., 2004); however, the study was shallow and no other reports were found. Sison *et al*. (2013) was reported the potential of *Euphorbia Hirta* ethanolic leaves extract as molluscicide against this snail adn the LC_{50} was 10.9 ppm. A study by Joseph *et al*., (2016) showed that the LC_{50} of the acacia mangium ground bark and water mixture to the golden snail was 25 mg/ml. No additional information on molluscicide activity of *Acacia mangium* is reported. In conclusion, these results have resulted in the selection of *Stachytarpheta jamaicensis* as a potential candidate for the continued development of natural molluscicides.

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