Golden Apple Snail, *Pomacea canaliculata* (Lamarck) in Indonesia

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Introduction

The history of the golden apple snail (GAS), *Pomacea canaliculata* (Lamarck) as rice pest in Indonesia similar to the history in other countries. The golden apple snail (GAS) was introduced to Indonesia as aquarium fauna to Yogyakarta in 1981 (Wahyu, 1996), but became popular in 1985-1987. Until 1990, there were still two views about GAS. The first view was that GAS will became a rice pest, while the second view was to consider GAS as an export commodity. Until 1992, there were no reports about being a pest. However, the golden apple snail was reported very often from Java and Sumatra islands. Universities or Indonesian Institute of Sciences (LIPI) and Agency for Agricultural Research and Development (AARD) did research on the golden apple snail. Attention to GAS on research as well as control was not as focused compared with other rice pests. Only in last two years, GAS is considered as a serious rice pest. This paper reviews farmer control methods; studies and action to be taken in the future to control GAS.

Popular farmer control methods

The farmers at Northern Coastal of West Java recently became aware of the damage due to GAS. The author observed that the most common control method done by farmers is picking GAS. They collect GAS only when GAS began causing damage. If there is very little plant damage, they do not bother collecting GAS. If there are many missing hills due to GAS, they collect GAS two days after transplanting requiring 2 to 4 man days/ha. If heavy infestation occurred, 10 to 20-man days/ha are required to collect GAS 3 to 4 times. Besides, farmers prepare more seedlings for replanting. In recent years, the population of GAS got higher and collecting GAS was not sufficient in controlling. Farmers used 20 kg/ha

saponin (waste product of tea plant imported from Taiwan), costing about 6-7 US$/ha. This material is usually used for controlling wild fish in lobster ponds. Other methods used planting older seedlings. When the plant is older, the field looks good, and that may be one reason the Regional Agriculture Agency pays less attention to GAS.

In some areas, farmers use GAS as duck and catfish feed. Some small duck and catfish growers buy GAS, but the population of the GAS is so high that surpassing the GAS demand. Farmers sometime consume local snails, but they do not prefer GAS as food for many reasons. One use of the GAS is to use as bait for rat and rice bug. If large GAS was collected and killed, its rotten and bad smell sometime attract rice bug. During fallow period, put acute rodenticide on dead GAS and this could be used as chemical control of the rat.

Studies on the GAS

GAS was found in 1987 at Java, Sumatra, Sulawesi and Irian Barat (Marwoto, 1988). There were no reports of GAS in Indramayu and Subang in rice field; GAS was only in small ponds around the houses (Hendarsih, 1992 unpublished). The occurrence in West Java, since 1996 was documented by Protection Center for Food Crops. In 1995, only 12 districts in West Java had rice fields attacked by GAS and in 1999 rose to 16 districts. In the four districts, which have good irrigation system in lowland in the Northwest Java, GAS population increased very fast (Table 1). Within 3 years the area attacked by GAS multiplied by 5 to 170 times. The distribution GAS became larger; not only in ill-drained fields but also in good regulated irrigation system fields.

Table 1. Rice fields attacked by the Golden Apple Snail (GAS) in West Java districts. *

District	Rice field attacked by the Golden Apple Snail (ha)	
	1996	1999
Karawang	33	5.548
Bekasi	120	842
Subang	50	604
Indramayu	65	365

Source: Plant Protection Center for Food Crops, West Java, 1996, 1999.

There are three species of GAS which were of South America origins: *Pomacea canaliculata*, *Pomacea insularum*, and *Pomacea paludosa* (Marwoto, 1997).

Gajah Mada University jointly did studies and Rice Institute for Rice in Central Java in year 2000 found that:

- Under field condition, 12 GAS/2m2 causing 10.78% damage and yield reduction of about 15%, and causing damage until 50 days after transplanting.

- Effect of drying on two soil types showed that the mortality of the snail on light soil was higher than that in heavy soil. However, the plant damage on the light soil was higher than in heavy soil, and rice yield was lower in light soil.

- At Magellan district in Central Java in the Dry Season, GAS was in irrigated areas only, while they were not found in rainfed areas. In the rainfed area, the snails begin to be active as soon as the first rain in the wet season, and lay egg cluster right away (Sudjono et. al. 2000).

Molluscicides are expensive and are not readily available in the market. Studies on application of insecticide to promote recovery of the damage plant in 1999 showed that seed treatment as well as seedling dipping with insecticides could reduce damage hill and consequently gave higher dry unhulled rice 14 to 18% higher than control. The less damage occurred in seed treatment with fipronil 2.5 gai/kg seed, this treatment also produced higher yield ($P < 0.05$) (Usyati *et.al* 2000).

Many studies have been done to explore plant as chemical control for the GAS. The extract sambong leaves (*Blumea balsamia)* was effective against young snail (Kardinan and Iskandar, 1997). Recent studies on ground sambong leaves showed effectivity only against young snail, but not on the larger or older snail. It caused more plant damage, because small dosage made the snail to feed more. Neem leaves was not effective while the extract of neem was moderately effective (Hendarsih, 2002).

Extract of root of rotenone (*Derris eliptica*) was very toxic to GAS. LC50 of rotenone was 400 ppm, it was less toxic than metaldehyde, but was not as effective ovicidal on the GAS egg cluster (Kardianan & Iskandar 1997). Tobacco (*Nicotiana tabacum*) was toxic under greenhouse experiment but was not effective under field experiment. Rerak fruit (S*apindinus rerak*), Pinang seeds (*Areca catechu* Linn), showed effective both in green house experiment as well as in the field. In the market, saponin was introduced as a pesticide for controlling undesirable fish in the fish and lobster ponds. Studies showed that under laboratory experiment the saponin was effective (Hendarsih 2002, unpublished.)

As an effort to control the GAS, lime (CaO) was evaluated; at concentration 15 gr. CaO/10 l water causing young and old GAS to die within 26 hours, at 10 gr. CaO/10 l water. Before the GAS died they were not active (Wahyu, unpublished). Recent experiment in the field showed that the CaO at 50 kg/ha was moderately effective (Hendarsih, 2002 unpublished). Application of lime may not be very effective on the high population. In low population, CaO could be recommended, because it deters GAS feeding in early transplanting, beside lime will not harm rice plant. Botanical pesticides as well as lime are more effective if applied before transplanting (Table 2).

Table 2. Effect of application of botanical pesticides on plant damage by Golden Apple Snail (GAS), Sukamandi, 2001. *

Botanical pesticide	Plant damage at 1 week after transplanting (%)	
	Applied before transplanting	Applied 2 days after transplanting
Saponin	11.67 b	11.67 c
Tobacco	50.00 a	72.77 a
Rerak (*Sapindinus rerak*).	13.89 b	42.22 b
Pinang seed (*Areca catechu* Linn),	47.66 a	58.33 ab
Niclosamide	8.34 b	-
Lime	30.55 ab	-
Control	-	77.77 a

Source: Hendarsih, unpublished 2002.

Aside from predators reported from elsewhere, the rats become predators of the GAS during dry season. Common carp (*Cyprinus carpio*) could consume young GAS voraciously; a 150-g fish could consume about 40 young GAS. Nile tilapia (*Oreochromis niloticus*), silver barb (*Puntius gonionotus*), and mujaer (*Oreochromis mossambicus)* also could feed on the GAS though not as voracious as the common carp (Hendarsih et. al. 1994)

Future actions of controlling the GAS

In the future to avoid populations built up and spread of GAS there are two points to consider:

1. To encourage farmers to execute the control technologies such as collecting, trapping, and other cultural controls. Local extension services should actively ask farmers within one irrigation area to practice year-round-control even when the population in low.

2. Do researches on socioeconomic loss due the GAS. Explore local substance that may kill or alter the GAS feeding, possible natural diseases or parasites in Indonesia and long effect of toxic plant substances or synthetic molluscicide on local snail as well as on water faunas.

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