Examples of these plants are *gogo* (bark), *tubing-kamisa* leaves, *sambong* leaves, *tuba-tuba* leaves, *lagtang* leaves, *tobacco* leaves *calamansi* leaves, *tubli* roots, *makabuhai* leaves, red pepper fruit, star flower leaves, neem tree.

3. Use of attractants such as leaves of gabi/taro, banana, papaya, trumpet flower, and newspaper in canals to facilitate collection of GAS.

4. During last harrowing, construct deep strips (at least 25 cm wide and 5 cm deep) in the paddies and along the edges of the paddies.

5. Place a wire or woven bamboo screen on the main irrigation water inlet and outlet to prevent entry of hatchlings and adults. This also facilitates collection of trapped GAS.

B. During and after transplanting

1. Follow the standard seeding rate and distance to have plants with sturdy stems.

2. Transplant 25-30-day-old seedlings of early maturing varieties if GAS is really a problem.

3. Put up bamboo stakes in the paddy for GAS to lay eggs. This allows easy collection and crushing of eggs.

4. Maintain shallow paddy water level of 2-3 cm deep starting 3 days after transplanting.

5. Flood and drain water alternately to hinder snail mobility and feeding activity.

6. Collect, crush and feed GAS to duck and pigs.

7. Use tolerant or high-tillering varieties to compensate damage.

8. Herd ducks 30-35 days after transplanting for early-maturing varieties and 40-45 days for late-maturing varieties. However, do not herd ducks when they shed their feathers (see figure 16.4)

Figure 16.4 Herding ducks into rice paddies help reduce GAS population

C. After harvesting

1. Herd ducks in rice paddies immediately after harvest up to the last harrowing for the succeeding crop.

V. Biological control agents (predators natural enemies) of GAS

a. Red ants and long-horned grasshopper feed on eggs of GAS.

b. Ducks eat GAS both live in the field and as feeds after hand collections.

c. Humans are the best predators.

d. Some PSB varieties least preferred by GAS such as; PSB Rc28, Rc 36, Rc40, and Rc 68.

e. Basal application of complete fertilizer and urea incorporated with the soil at recommended rate during the last harrowing reduced GAS population up to 54%.

f. Spot-treatment of GAS egg masses with niclosamide 250EC reduced cost for GAS management and environmental pollution.

Source:

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Philippine Rice Research Institute (PhilRice)
Science City of Muñoz, 3119 Nueva Ecija
Tel: (044) 456-0113, -0258, -0277
Tel/Fax: (044) 456-0112; -0651 local 512;
-0652 local 515
E-mail: prri@philrice.gov.ph
Website: http://www.philrice.gov.ph

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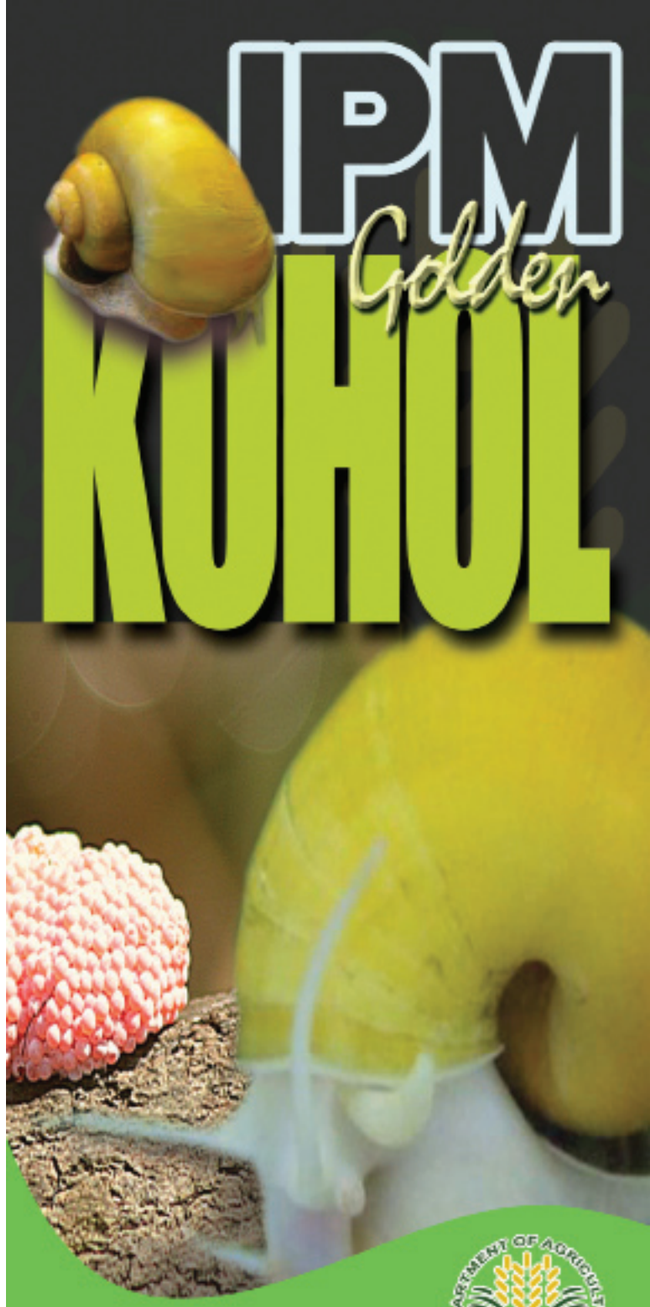
IPM Golden KUHOL



DEPARTMENT OF AGRICULTURE
Regional Field Unit IX
Zamboanga City

IPM
GOLDEN APPLE SNAIL

This module discusses the introduction of the golden apple snail (GAS), or golden kuhol, into the country, its life cycle and habitat, the damage it causes the rice plants, and its management.

Because of its voracious feeding habits resulting in rapid growth and reproduction, it became a major pest attacking rice seedlings (direct-seeded rice are more susceptible). It is essential, therefore, to manage and control GAS in major activities of rice production.

Introduction of the GAS into the Philippines

a. The golden apple snail (Pomacea caniculata), belongs to the snail family Ampullariidae.
b. It is locally known as the "golden kuhol" and was introduced in the Philippines between 1982 and 1984.
c. It came from South America (Argentina and Brazil) via Taiwan. GAS was introduced in the Philippines by civic-minded organizations as a supplement to the protein-deficient diet as of Filipinos, and as an export potential to the gourmet restaurant trade. Additionally, there was no market outlet for the GAS. These reasons prompted the loss of the snails' commercial value that caused the abandonment of the GAS. The abandoned GAS escaped, dispersed in waterways and ultimately invaded the rice fields.

The biology of the GAS

A. Eggs

1. Bright pink-red in color, laid in clusters which are usually oval in shape , with 50-500 eggs/clusters and turn light pink to light brown tinged when about to hatch

2. They are usually laid very early in the morning or late in the evening on any vegetation or objects above the water surface.

3. One female can lay around 1000-1200 eggs in a month.

4. Hatch in 7-14 days after egg laying; hatchability is around 80%.

B. Hatchlings

1. Newly hatched snails cling on objects above the water surface.

2. They grow fast and reach maturity in 15-25 days.

3. They are voracious feeders

C. Grown-up to adults

1. Growing period is 44-59 days.
2. Reproductive period is 60 days to 3 years (see figure 16.2)

3. Adults mate for more than 3 hours anytime of the day at 3-4 times/week where there is water and thick vegetation.

D. Habitat

1. Freshwater ecosystem (slow-moving or stagnant water in lowland swamps, ponds, ditches,canals, lakes, and rivers).

2. If field is drained, they bury themselves under the soil and continuously dig deeper as the dry season progresses.

3. Can aestivate for more than 4 months under the soil and go out and become active when water is available; this is one reason for the occurrence of many GAS at the start of land preparation.

4. Can survive harsh environmental conditions such as pollutants in the water.

E. Feeding habits and host range

1. Macrophytophagous and zoophagous.

2. Can feed a wide range of plants – azolla, duck weed, water lily, rice seedlings, and other plants that are succulent.

3. They prefer young plant parts because they feed by scraping the plants surface with their rough tongue.

4. Feed also on decaying organic matter.

III. Damage done by GAS.

a. It is considered a serious pest and can destroy 3.5% of the total area planted to rice. The problem of GAS infestation in rice farming systems include damage to the rice plant, yield losses, additional expenses, side effects of chemicals and destructive effects on native snails.

b. The extent of damage to the rice crop depends on the snail size, population density and growth stage. GAS with a shell height of 1.3 cm feed on young plants up to four weeks old, while those with shell height of 6.5 cm feed on young plants up to nine weeks old.

c. Plants at two weeks after transplanting are most vulnerable to damage by GAS.

d. Damage increases with GAS density. At a density of 1 snail/m^2 with shell height of 2-3 cm, the number of tillers could be reduced by 19% at 30 days after transplanting. This loss can be up to 98% when GAS density increases to 8 snails/m^2.

e. Signs of GAS infestation are missing hills and floating cut leaves (which can be mistaken from rat damage). GAS devour at the base of the young seedlings and can consume a whole plant in a paddy overnight.

IV. Management of the GAS

A. During land preparation

1. Before final harrowing, handpick GAS from rice paddies in the morning and late afternoon when they are most active and easy to find.
2. Construct small canals to confine snails and place plants that contain toxic substances against GAS.