Golden Apple Snail in Viet Nam

M. S. Huynh Kim Ngoc

Postal Address: 299/6 Le Quang Sung, P.6, Q.6,

Ho Chi Minh City. Viet Nam

E-mail: hkngoc@hcm.fpt.vn

GAS in Viet Nam

In Viet Nam, according to the final report of the project "Integrated Pest Management of GAS on rice in Viet Nam" in 1998, GAS was imported into Viet Nam in 1988 by various ways without thorough quarantine. Before 1988, information on newspapers referred some news from foreign businessmen bringing into Viet Nam some GAS that have miraculous characteristics such as: easy to raise, rapid growth, strong reproduction, high nitrogen level… especially, a source of news reported that many commercial companies could buy a large amount of GAS for export (Plant Protection Sub-Department of Ho Chi Minh City, 1995).

By 1990-1993, GAS was promoted, publicized on Media as "A new food industry could bring prosperity for farmer" (Plant Protection Department, 2000). So, in a short time, many people asked, inquired and rushed to find some GAS to raise and reproduce in ponds, lakes, etc in their houses with the unique purpose of getting profit.

Up to January 1991, based on many research documents, there were about 20 centers selling GAS and thousands of GAS raising houses in Mekong Delta River. In 1990, Liksin Company, a printing and paper company in HCMC invested on large–scale GAS raising enterprise in HCMC. From this place, GAS started to broaden nation wide. At the same time, 1990-1991, there were two enterprises foreign investment that raised GAS on a large-scale area for exporting purposes: One in Taân An Hoi, HCMC and the other in Kien Giang province.

In 1992, from South Viet Nam, GAS started infesting to Central and North Viet Nam (*Report of the Project TCP/VIE/6611(T), 1998*).

However, after a long time, there was less interest to buy GAS for export and local market. GAS flesh was not as good and delicious as local snails. As a

result, no one wanted to continue to raise GAS. The end of the miraculous story was similar to the Philippines. From the private ponds, lakes, GAS started to invade ditches, canals and then the rice fields (*PPD of HCMC, 1995*).

Damage by GAS on rice was first recognized in Kien Giang province in 1994. Many rice fields had to be re-sown 2 or 3 times because of the ravages of GAS (*PPD, 1995*). In Thu Duc and Hoc Mon district, HCMC, in 1994, GAS seriously damaged water morning glory (*Ipomoea aquatica*).

According to statistics, in 11/1994, GAS only infested 38 provinces and damaged 1.678 ha/rice, 140 ha/vegetable. After 4 years in 1998, infestation increased to 57/61 provinces, cities, 304/534 districts on the whole country with different infestation levels. Many provinces in the North and Central Viet Nam recognized the presence of GAS but less damage on rice was reported (Hung, Tran Quy, 1999). On the contrary, in Mekong Delta River, South Viet Nam with about 1.826.000 ha of rice field, were infested because of favorable climatic conditions, rich of food source, sowing year-round, interlock river system, and flooding every year. As a result, GAS could reproduce freely and infestation area increased greatly especially in years of floods. In Ca Mau, Bac Lieu, Kien Giang, Soc Trang, Dong Thap, Vinh Long GAS density per square meter was very high. In some districts in HCMC, GAS population density reached 50-200 snails per square meter (PPD of HCM, 1994). Generally, GAS infestation area increased yearly mainly on rice and vegetable (*Ipomoea aquatica*).

Table1. GAS infestation area from 1994-1997.

Year	GAS infestation area (ha)			
	Rice (ha)	*I. aquatica* (ha)	Ponds, lakes (m^2)	Canals, ditches (km)
1994	1,678	140	/	/
1995	3,872	205	8,723	1,050
1996	57,863	2,087	12,923	2,744
1997	109,715	3,479	15,182	3,886

(Source: Plant Protection Department, 2000)

Table 2. Statistics on GAS infestation area in some provinces of Viet Nam.

Province	Date	Infestation area (ha)	Infestation area on rice (ha)
Ca Mau	5/1999	61.685	12.150
Kien Giang	5/1999	/	6.385
Dong Thap	3/1999	339	315
Bac Ninh	3/1999	575	458
Ho Chi Minh City	11/1999	509	327

(Source: Saigon Economics Times, 9/6/1999)

Some Investigations and Comments on GAS in Viet Nam.

1. Size and Shape:
   - Compared to the past records, the present GAS is smaller with a black shell (or black with yellow stripes) but harder than before. Eggcluster is still pink/reddish.
   - GAS on vegetable field is bigger than the one in rice field
2. Habitat:
   - At 0.5% salty water, GAS is normally still alive.
   - At 0.6%, GAS could be affected.
   - At 0.8 %, 100% GAS died after 3 days (in pot testing) (*H. K. Ngoc, 1997*).

     (In Nha Be–CanGio district in nearby HCMC, during dry season, GAS could not be found because of salty water (around 0.6%).
   - In artificial drought condition in basin, GAS showed that they buried themselves in moist mud and dig at the average depth of 8 cm after one month (*H. K. Ngoc, 1998*).

3. Male/Female rate:

Table 3. Male/Female rate in some provinces in Viet Nam.

Investigating site	Male/Female rate	GAS Density/m2
ThuaThien-Hue (Central VN)	1 / 5.5	4.0
Quang Ngai (Central VN)	1 / 1.4	0.2
Nghe An (Central VN)	1 / 2.6	0,7
Hai Phong (North VN)	1 / 1.1	0.4
HCMC (South VN)	1 / 2.2	5.0

(Source: Le Duc Dong, 1998; H.K. Ngoc, 1997)

4. Feeding habit:

- In Viet Nam, according to the investigations of PPD, more than 20 kinds of vegetables, rice, water fern are the food of GAS.
- On rice, GAS prefers direct-seeded rice to transplanted rice.
- On vegetable, *I. aquatica*, GAS only eats roots, stems under water and young leaves.
- Observing 16 GAS per square meter, GAS could eat 100% newly sown rice and 20% newly transplanted rice within 1 day (*PPD, 2000*).

5. Egg:

- Investigations on 10 sites in HCMC, the average egg numbers / eggcluster is 224. (*H. K. Ngoc, 1998*).
- The average egg number / eggcluster on vegetable is higher than on rice.
- In pot testing, one GAS could lay 1580 eggs in one month (*H. K. Ngoc, 1998).*

6. Damage:

- In direct-seeded rice, the most vulnerable stage is the first 2-week.
- Little damage is seen on transplanted rice.

- Damage by GAS seen especially on vegetable mainly on *I. aquatica.*
- In Viet Nam, GAS mainly damages during the rainy season: from June to December (especially in August-November).

7. Natural enemies:

Egg period:

- Black ants: Very active, appear at newly laid eggcluster, normally 1 –2 ants / eggcluster. One ant could attack many eggs. Black ants are potential biocontrol agents (*H.K. Ngoc, 1998*).

Young GAS period:

- Rats
- Ducks
- Snakes
- Fishes--Carp, Black carp, catfish. In South Viet Nam, catfish is more favorable. Testing in Can Tho showed that raising carp, black carp, catfish with the density of 3 fishes / m2, result observation after 12 weeks showed that GAS population decreases 80 – 96% compared to the first record. They mainly eats young GAS (< 1cm) but catfish could eat both (young and mature GAS by eating flesh inside. Catfish is well suited to South Viet Nam condition (*Can Tho Extension Center, 1998*) while in North Viet Nam, carp and black carp are more important. They can eat 73-87% GAS (*PPD of Quang Binh, 1998*). Raising fish in rice field do not affect rice yield but help farmers to increase income by selling fish (*Report of the project : GAS IPM on rice in Viet Nam, 1998*)

Mature GAS period:

- Ducks
- Humans: Nowadays, hand picking GAS is the most effective, economic way to control GAS in Viet Nam. GAS can be used for human food but mainly sold to duck, fish, python, shrimp farm. 1 kg GAS costs about 1,500 VND (= 10 cent USD). By picking GAS, income of farmers could improve considerably. In Ca Mau province only from 1-5/1999 about 2,686 tons of GAS, 67 tons of eggcluster were picked (*Source: Saigon Economic Times, No.46, 9/6/1999*).

Result of Control GAS in HCM from 1994-2000.

From 1994 to the present, GAS control measures has been implemented in HCMC with various aspects as follows:

- Farmer meeting: more than 200 GAS IPM classes for 11.000 farmers were organized.
- Broadcasting 140.000 GAS leaflets for farmers and pupils in high school and 5,000 posters with the content:" GAS is the disaster of farmer, Let's control GAS, Save rice."
- Cooperating with HCMC TV, Newspaper to propagandize GAS catastrophe.

Table 4. Result of GAS control campaign in HCMC (From 1994-2000).

Year	Result (Handpicking)	
	GAS (kg)	Eggcluster (kg)
1994	103.160	1.679
1995	155.567	5.076
1996	58.306	431
1997	/	/
1998	36.125	20
1999	26.950	/
2000	27.782	/

(Source: PPD of HCM, 2000)

Control measures of GAS in Viet Nam:

1. Handpicking:

- Up to now, this is the most effective, economical, practical way to control GAS in Viet Nam. Collecting GAS by hand can help farmers and pupils in countryside earn money. In only one collection day, they can earn normally USD 2-5.

2. Pesticide: There are many kinds such as: Padan 4G (Cartap), Deadline Bullets (Metaldehyde), Thiodane/Endosol (Endosulfan). However, generally in Viet Nam, pesticide use is not popular because of many reasons:

- Expensive : Deadline Bullets (6 kg/ha)
- Very toxic : Thiodane, Endosol(1L/ha)
- Inconvenient (use with big amount of pesticide): Metaldehyde (30 kg/ha)
- Only control young GAS : Padan 4G (20 kg/ha)

3. Lime: Very effective to control GAS: Broadcast 200kg/1000m2 (before sowing or right after harvesting), keep water level 2-5 cm within 2-3 days and then drain. (H K Ngoc, 2000).

4. Copper sulphate ($CuSO_4$): Use 5 kg $CuSO_4$ + 5 L water + 30 kg sand and then broadcast on rice field, keep water level 5 cm within 3-5 days (Nguyen Xuan Niem, 2000).

5. Pig bran: Broadcast pig bran on water surface to attract GAS and then catch them.

6. Biological control:
   - *Nerium oleander* L: 30-40 kg / ha(leaf)
   - *Melia azedarach* L: 20-30 kg / ha(grain)
   - *Derris elliptica*: 30-40 kg / ha (root)

(Source: PPD, 1998)

   - *Ocimum basilicum* L: In pot testing, an active ingredient in a kind of basil *O. basilicum* (1 kg leaf + 5L water) gave good efficacy to control GAS, 100% GAS (8) died after 24 hours after treatment (H. K. Ngoc, 2000).
   - Attractant plants: *Carica papaya* (leaf and stem), *Manihot esculenta* (leaf and stem)

7. Ploughing and harrowing: Before planting do at the same time with applying fertilizer or after harvesting.

8. Adjust low water level: Maintain low water level (0-3 cm) from sowing to 15 days after sowing to limit movement and damage of GAS.

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