

The Use of Golden Snail (*Pomacea* sp.) as Animal Feed in the Philippines

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Summary

The golden snail is introduced to the Philippines in early 80's for culture as food source. This herbivorous snail, a voracious feeder of live and fresh plant materials become a serious rice pest. Its elimination in the ecosystems is impossible. To use them as animal feed is much better alternative for their control and more environmentally friendly than the use of chemicals. Thus, this mini review paper aimed to collate any existing information on the use of golden snail as animal feed. The different meal forms that can be extracted are golden snail meal (30% calcium and 15% crude pro-

tein), golden snail meat meal (62% crude protein and 3336 kcal/kg) and golden shell meal (35% calcium). Feeding trials indicate that golden snail meal can be a part of swine and chicken layer diets up to 15%. Golden snail meat meal can be a part of broiler chicken diet up to 12%. Feeding fresh and ground golden snail to ducks can replace 50% of their diet under total confinement system. Whereas, golden snail meat meal (75% of the diet) plus rice bran can be beneficially fed to tilapia. With the information collated, golden snail can be a promising animal feed in the Philippines.

Introduction

The golden snail or golden apple snail commonly called golden kuhol became popular to Filipinos in the early 80's as human food and source of income. Introduced to the country by private sectors from Florida, U.S.A. and Taiwan, it was commercially popularized and farmed in concrete tanks, ponds and other controlled environments.

Its scientific name is *Pomacea insularis* as reported by workers of Freshwater Aquaculture Centre, Central Luzon State University, Philippines (Cagauan and Yambot, (7) while Barcelo and Barcelo (4) used the name *Pila leopoldvilensis*. However, the International Rice Research Institute (IRRI) identified it as *Pomacea canaliculata* (7). FAO and the Department of Agriculture, Phil. (11) adapted the latter in their handbook for the integrated control management of the snail in a rice farm. All of them, however, are voracious feeders of live and fresh plant materials and with phenomenal reproductive capacity and fast growth rate.

The popularity of the golden snail had to the Filipino people brought a tremendous physical movement throughout the country. The golden snails were stocked in water ponds, concrete tanks and other rearing facilities. These escaped and found their way to water channels and eventually to ricefields. It was on the second half of the last decade that the farmers saw and felt the devastation made by the golden snails to

their rice plants. Majority of the farmers resorted to chemical control as immediate solution to the problem. However, the high cost of these inputs coupled with the hazards they pose to the users, draught animals and the environment, prompted the development of more practical strategies. Workers at IRRI, DA and Philippine Rice Research Institute (PHILRICE) recommended collection of snails and eggs clusters, use of traps or screen in water inlets, proper water management as control measures of golden snails (5, 13). Others looked at the potential usage of golden snail as animal feedstuffs supplement. Thus, this paper aimed to discuss its extraction rate, nutrient composition and its level of inclusion in the animal's diet.

Extraction rate

The different meal forms that could be derived from golden snail are: cooked and uncooked golden snail meal (GSM), cooked golden snail meat meal and golden snail shell meal. The extraction rate of cooked and uncooked GSM are almost the same, with a mean value of 20.6 and 20.8%, respectively (unpublished data). However, other feedstuffs revealed relatively lower extraction rate, especially golden snail meat meal with a mean value of 4.7% while golden snail shell is about 16.6%. Therefore, the golden snail meal could be divided into a golden snail meat meal and golden snail shell meal by 22 and 78%, respectively.

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Nutrient composition

Golden snail meal. The nutrient composition of GSM for cooked and uncooked (8) are presented in Table 1. Uncooked GSM had crude protein (CP) about 2.5% higher than the cooked GSM with a mean value of 14.62%. This could be attributed to possible destruction of some protein of the meal due to cooking. Nevertheless, both meals showed relatively higher CP value when compared to snail meal, *Paludina angularis* (11.7%) as reported by Gerpacio and Castillo (12). Gross energy (GE) values, however, were quite low, 605.61 and 671.45 kcal/kg for cooked and uncooked GSM, respectively. Except for the ash content, other nutrient fractions such as ether extract (EE), crude fiber (CF) and nitrogen-free extract (NFE) were practically low. The ash content of cooked and uncooked GSM was 81.07 and 78.40%, respectively. Further evaluation of its mineral value showed the following: 30.87% calcium (Ca) and 0.3% phosphorus (P) for cooked GSM while the uncooked was slightly lower, 28.55% Ca and 0.26% P. This proved that this GSM can be a good source of Ca and P although there is much to desired on its ratio.

Table 1
Nutrient composition of different feedstuffs derived from golden snails ⁽¹⁾

Item	Golden Snail Meal (Cooked)	Golden Snail Meal (Uncooked)	Golden Snail Meat Meal	Golden Snail Shell Meal
DM, %	90.30	89.90	86.10	98.60
GE, kcal/kg	605.61	671.45	3336.27	
	%DM			
CP	14.62	17.15	62.48	4.30
EE	0.88	0.56	3.48	0.50
CF	3.43	3.45	4.65	3.00
NFE		0.44	13.36	0.90
Ash	81.07	78.40	16.03	91.30
Ca	30.87	28.55	3.40	35.05
P	0.30	0.26	1.22	0.01

¹ Analyzed by the procedures of AOAC (2); adapted from Catalma et al. (8).

Golden snail meat meal. Contrary to the previous feed materials from golden snail, meat meal showed better CP and GE values (Table 1). Similar to other

feedstuffs from animal tissues, CP content was about 62.48%. This could be compared to the CP value of Peruvian fish meal, 61.2% and meat meal, 66% (12). However, the CP values of raw and cooked golden snail meat meal obtained by Barcelo and Barcelo (4) were slightly lower (53.2 and 52.2%). Likewise, as an excellent source of energy, it had a GE value of approximately 336.3 kcal/kg. Other nutrient components also indicated an appreciable level of EE, NFE, and Ca. Its Ca and P contents were 3.40 and 1.22%, respectively, and Ca:P ratio of 2.8:1. These data implied that the golden snail meat meal is a potential source of organic as well as inorganic matter compared to other feed extract golden snail.

Golden snail shell meal. The nutrient composition of the golden snail shell meal is also shown in Table 1. Its inorganic or ash content was very high, 91.30%. This feedstuff could be an excellent source of Ca (35.05%) like that of oyster shell meal (32.3% Ca) (12). Other nutrient fractions of this meal (CP, EE, NFE and CP) were considered trace which came from the remains of the snails tissue during processing.

Feeding studies (summarized in Table 2)

Swine. Feeding trials were conducted on growing-finishing swine (8) utilizing uncooked GSM. The uncooked GSM was supplemented to swine diet at 0, 5, 10 and 15% levels. The trial was started at a mean weight of 24.2 kg and ended at a mean weight of 87 kg. All the response criteria, average daily gain (ADG), average daily feed consumption (DFC) and average feed to gain ratio (FGR), showed no statistical differences among the different treatment means. The range of data obtained were: ADG, 0.5 - 0.6 kg; DFC 2.4 - 2.4 kg; and FGR, 3.9 - 4.4. The results suggest that inclusion of uncooked but fresh GSM in the swine diets up to 15% is beneficial, however, cooking the GSM is recommended to prevent any contaminants.

Poultry. Feeding of uncooked GSM was also tried in native chicks (9). A 10% inclusion in a simple chick's diet showed a 31% increased in total gain in weight and 35% improvement in feed efficiency than the chicks fed without GSM. Crushed golden snail was also fed to White Leghorn chicken layer as supple-

Table 2
Summary of feeding trials using golden snail and its different meal forms

Animal	Meal form	Type of diet	Reference
Growing-finishing swine	uncooked golden snail meal	up to 15% replacement of mixed feed	Catalma et al. (8)
Native chick	uncooked golden snail meal	10% inclusion in the diet	Catalma et al. (9)
White Leghorn chicken layer	crushed golden snail	20 g bird ¹ d ¹ supplementation	Ancheta et al. (1)
Broiler chicken	raw and cooked golden snail meal	12% inclusion in the diet	Barcelo and Barcelo (4)
Duck	crushed golden snail	equal ratio of snail, rice bran, broken corn	Tacio (15)
	whole golden snail	2:1 snail and rice bran <i>ad libitum</i> snail and minimal rough rice	Serrano (14) Aquino (3)
		25-50% replacement of mixed feed	Datuin et al. (10)
Tilapia	golden snail meat meal	75-100% snail meat meal + rice bran	Cagauan and Doria (6)

ment to commercial laying mash (1) Results showed that 20 g bird⁻¹d⁻¹ of crushed golden snail gave a 88% mean hen-day egg production rate as compared to zero supplementation which gave a 84.3%. A follow-up study was made to utilize ground golden snail as replacement in the diet of White Leghorn chicken layer (9). The mean hen-day egg production rate was 84% for the layer without supplementation and 72% for layers fed with a diet either 11.11 or 25% replacement. The other response criteria, DFC, FGR, average shell thickness and albumen height were not statistically different except for egg color intensity. Higher value of eggs from layers fed with a diet of ground golden snail was obtained.

The feeding value of golden snail meat meal was also tried in broiler chicken (4). Raw snail meat meal and cooked snail meat meal were compared to fish meal, the incorporation in the diet was 11.9, 12.2 and 10%, respectively. The CP of the different diets was 21 %. Results showed that birds fed the fish meal had the highest FGR (2.0) followed by the birds fed the cooked and raw golden snail meat meal, 2.3 and 2.4, respectively. The gain in weight of the birds fed the cooked golden snail meat meal had comparable gain in weight with the birds fed the fish meal.

Ducks are the most common poultry species being utilized by the farmers in controlling the population of golden snail in the ricefields. Both the Mallard (*Anas platyrhynchos*) and Muscovy (*Cairina moschata*) ducks are being used although the former is being preferred by the farmers. For the farmers to utilize the ducks in controlling the golden snail population, they pasture the ricefields before the rice transplanting, 30-45 days after transplanting and after rice harvest. Under the total confinement system, ducks are also being fed with golden snail. Fresh ad crushed golden snails are mixed with rice bran and broken corn at a ratio of 1.1: 1. The diet resulted in a 60-70% egg production rate of Mallard ducks (15). Serrano (14) observed the actual farm practice of 2:1 of fresh golden snail and rice bran. The work of Aquino (3) used minimal rough rice and *ad libitum* fresh golden snails

resulted in 68% egg production rate. Another feeding system used was combination of golden snail and commercial duck layer feeds at a ratio of 1: 1-3 which resulted in optimum egg production rate and low production cost (10).

Tilapia. Cagauan and Doria (6) conducted a 87-day feeding study on Nile tilapia (*Oreochromis niloticus*) using golden snail meat meal or fish meal plus rice bran. Results indicated that pure golden snail meat meal and 3:1 golden snail meat meal and rice bran diets gave better growth rate of 0.12 g/day than 1: 1, 1: 3 golden snail meat meal and rice bran and 1:3 fish meal and rice bran which gave growth rate of 0.09 to 0.1 g/day.

Conclusion

Based on literature reviewed, the following conclusions could be derived:

1. Extraction rate of golden snail meal is 21%. The golden snail meat meal and golden shell meal has 22 and 78%, respectively.
2. Golden snail meal is rich in Ca (30%) and CP (15%).
3. Golden snail meat meal is a proteinaceous concentrate with 62% CP. It also possess a high energy value, 3336 kcal/kg. This feedstuff could replace possibly meat meal or fish meal in animal's diet.
4. Golden snail shell meal is mainly Ca-source feedstuff, 35%. This feedstuff could replace oyster shell meal in animal's diet.
5. Initial results showed that golden snail meal could be a part of swine and chicken layer diets up to 15%. While golden snail meat meal could be a part of broiler chicken diet up to 12%.
6. Feeding fresh and ground golden snail to ducks could replace 50% of their diet under total confinement system.
7. Feeding tilapia with golden snail meat meal at 75% of the diet in combination to rice bran is beneficial.

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