Performance of broilers fed with snail (*Pomacea caniculata*) meal as substitute to fish meal or meat and bone meal.

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Summary

Snail meal was used as a substitution to fish meat and bone meal in broiler rations. Final weight and feed conversion efficiency of the birds, profit and return on investment differed significantly among treatments. Feed consumption and production costs were comparable.
Results show that snail meal can replace fish or meat and bone meal in broiler diets.

Résumé

La farine d'escargot a été comparée à la farine de poisson et à la farine de viande et d'os dans des rations pour poulets. Le poids final, l'efficacité de la conversion alimentaire, le bénéfice et le taux de rentabilité ont différé significativement d'un traitement à l'autre. La consommation d'aliments et les coûts de production ont été comparables.
Les résultats montrent que la farine d'escargot peut remplacer celles de poisson ou de viande et d'os dans les rations pour poulets.

Introduction

The poultry industry in the Philippines is dependent largely on imported feedstuffs particularly the protein and energy feeds. This has caused an increase in the cost of producing poultry and consequently, on the price of poultry meat and eggs in the market. The utilization of cheap and locally available protein feeds which are cost-effective will reduce production cost and the price of livestock and poultry meat. Several non-conventional sources of protein feeds have been tried such as earthworm meal (2,4) and toad meal (1,3). One of these available protein feed resources that may substitute for fish and meat and bone meal is the golden snail, locally known as «kuhol».

Golden snail (*Pomacea caniculata*) belongs to the snail family (*Pelidae*) that lives only in or close to fresh water. It thrives in ponds, swamps, irrigated fields, canals and waterlogged areas and multiplies rapidly, thus becoming a major pest since it destroys newly transplanted rice and seedlings. Its shell covering is muddy light brown and has a tasty creamy white to golden pinkish and orange-yellow meat. Snail meal has 90% DM, 7.8% ash, 8.6% ether extract and 27.68% NFE (5). On dry matter basis, it contains 51% crude protein.
The study aimed to evaluate the performance of broilers fed with varying levels of snail meal (SM) as compared to the performance of broilers fed with conventional protein feed sources: fish meal (FM) or meat and bone meal (MBM).

Material and Methods

Golden snail was collected in the month of December at the onset of the dry season when succulent plants and other soft leaves used as feed by the snails have become scarce. The cost of the snail was determined based on the quantity collected. The snails were boiled for 5 min. to kill the organisms and other pathogens and to facilitate the removal of the snail meat from the shell. Then the snail meat was weighed, dried under the sun for 2-3 days and weighed again to determine the approximate percentage of dry matter. The dried snail meat was ground. The snail meal consisted of fleshy tissue of the snail with or without operculum and without the shell. It was used in Treatments A_1, A_2 and A_3 at 4%, 8% and 12% levels, respectively. Fish meal was used in Treatments B_1, B_2 and B_3 and MBM in Treatments C_1, C_2 and C_3 at the same levels as SM.

The 180 day-old broiler chicks were distributed into 10 dietary treatments replicated three times with six birds per replicate following the Randomized Complete Block Design (RCBD). Table 1 shows the feed and calculated nutrient composition of the diets. The control group was fed broiler ration sold in the market, sometimes referred to as commercial ration.

All rations except for the control were made approximately isonitrogenous with 22% crude protein (CP) and isocaloric with 2800 kcal/kg feed. The diets were fed to the birds for 45 days.

The data gathered were subjected to analysis of variance of RCBD and differences between treatment means were determined using Duncan's Multiple Range Test (DMRT).

Return on investment (ROI) analysis was also done to determine cost-benefit of the diets used. ROI refers to the

$$\frac{\text{Profit (Net Income)}}{\text{Production Cost}} \times 100$$

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TABLE 1

Feed and calculated nutrient composition of diets used.

FEEDSTUFFS	TREATMENTS									CONTROL
	A_1	A_2	A_3	B_1	B_2	B_3	C_1	C_2	C_3	
Yellow corn	43.00	41.00	40.20	40.00	43.00	48.55	40.00	39.40	40.00	COMMERCIAL RATION
Rice bran	10.00	12.30	11.50	11.35	11.20	8.50	10.50	14.30	13.50	
Copra meal	3.00	4.00	3.80	3.75	3.70	3.50	3.50	4.70	4.35	
Snail meal	4.00	8.00	12.00	-	-	-	-	-	-	
Fish meal	-	-	-	4.00	8.00	12.00	-	-	-	
Meat & bone meal	-	-	-	-	-	-	4.00	8.00	12.00	
Soya bean meal	33.60	27.85	24.00	33.50	28.20	23.50	33.75	28.50	24.75	
Veg.oil	3.80	4.70	6.00	4.10	3.25	1.60	4.55	4.50	4.25	
Salt	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	
Dical PO_4	1.85	1.70	1.75	1.30	0.80	0.80	0.70	-	-	
Limestone	-	-	-	1.25	1.10	0.80	2.25	0.25	0.50	
Afsillin (Vit-Min. Mix)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	
TOTAL	100.00	100.30	100.00	100.00	100.00	100.00	100.00	100.00	100.00	
Calculated Nutrient Composition										
Crude Protein (%)	22.34	22.04	22.14	22.23	22.24	22.34	22.10	22.17	22.24	NLT 21.00
Metabolizable Energy (Kcal/kg)	2819	2798	2893	2816	2808	2847	2808	2813	2801	
Ca (%)	1.21	1.12	1.30	1.02	1.02	1.10	1.06	1.04	1.54	
Avail P (%)	0.52	0.51	0.51	0.51	0.51	0.59	0.52	0.58	0.77	
Cost/kg of Ration (₱)*	7.30	7.17	7.26	7.62	7.71	7.80	7.49	7.48	7.53	8.50

*Exchange rate: 1 U.S.$ = ₱ 25.00

Results and Discussion

Processing of Snail Meal.

A kg of snail with shell, when washed and unshelled, yielded 250 g of fresh snail meat (with and without operculum), and 100 g of dried snail meat. The fresh snail meat was approximately 25% of the whole snail and on dry matter basis, about 10%.

A can of snail weighing approximately 17 kg costs Pesos (₱)* 6.12 or ₱ 0.36/kg. At the recovery rate given, a kg dried snail meat was calculated to cost ₱ 3.60. Fuel and labor costs for boiling, de-shelling and grinding 240 kg of snail meat was ₱ 20.00. The finished dried snail meal cost ₱ 4.40/kg.

Weight, Feed Consumption and Feed Conversion Efficiency of Birds

The mean final weight of birds at 45 days is shown in Table 2. Increasing the level of the protein feeds from 4% to 8% and 12% SM, FM or MBM in broiler diets yielded significantly heavier birds. Birds fed the diets with 8% and 12% SM had comparable weights with those fed the same levels of FM and MBM.

Birds fed the ten dietary treatments did not vary significantly in their feed consumption. It appeared that rations with 4%, 8% and 12% SM were similarly acceptable to the birds as the diets with 4%, 8% and 12% FM and MBM. This implies that SM can be used as substitute to FM and MBM.

Feed conversion efficiency (FCE) improved significantly as the levels of SM, FM and MBM were raised to 8% and 12% in the experimental rations. Birds fed with 8% SM, however, had comparable FCE to those given 12% FM or MBM. The feed efficiency of birds fed diets with 4% SM, 4% and 8% FM or 4% and 8% MBM and the control diet were comparable. However, these were significantly poorer than the FCE of birds fed with 8% and 12% SM and birds fed with 12% FM and 12% MBM. The result suggests that it takes a lower

TABLE 2

Final weight, feed consumption and feed conversion efficiency (FCE) of broilers.

Treatment	MEAN		
	Final Weight (kg)	Feed Consumption (kg)	FCE (F/G)
A_1 - 4% SM	1.39 b	2.91	2.17 a
A_2 - 8% SM	1.58 a	2.93	1.91 b
A_3 - 12% SM	1.72 a	3.46	2.05 b
B_1 - 4% FM	1.37 b	3.02	2.29 a
B_2 - 8% FM	1.55 a	3.20	2.12 a
B_3 - 12% FM	1.55 a	2.85	1.88 b
C_1 - 4% MBM	1.32 b	3.03	2.37 a
C_2 - 8% MBM	1.47 a	3.13	2.21 a
C_3 - 12% MBM	1.61 a	2.97	1.90 b
Control	1.36 b	2.98	2.29 a

Means in the same column followed by the same letter are not significantly different at 1% level of significance, using DMRT.

TABLE 3

Production cost, profit above feed, stock and other costs and return on investment.

Treatment	MEAN		
	Production cost (₱)	Profit (₱)	ROI (%)
A_1 - 4% SM	41.13	11.56 ab	28.11 ab
A_2 - 8% SM	40.90	19.14 ab	46.80 a
A_3 - 12% SM	45.01	20.48 a	45.50 ab
B_1 - 4% FM	45.94	6.25 b	13.60 b
B_2 - 8% FM	44.61	14.42 ab	32.32 ab
B_3 - 12% FM	42.19	16.93 ab	40.21 ab
C_1 - 4% MBM	42.60	7.43 ab	17.44 ab
C_2 - 8% MBM	43.35	12.38 ab	28.56 ab
C_3 - 12% MBM	42.29	18.76 ab	44.37 ab
Control	45.22	6.46 b	14.28 b

Means followed by the same letters are not significantly different at 1% level of significance, using DMRT.

* Exchange rate: 1 U.S. $ = ₱ 25.00

level of SM (8%) to effect a feed conversion efficiency comparable to the FCE of birds given 12% FM or 12% MBM.

Cost of Production, Profit and Return on Investment

Table 3 shows the cost of production, profit above production costs and return on investment (ROI).

Cost of Production.

Cost of production included the cost of feed, cost of day-old broiler chicks and medicine, labor, housing, and electricity used. The cost of day-old chick was ₱ 14.00. Terramycin powder dissolved in the drinking water of the chicks for two weeks during the brooding period was ₱ 0.53/bird; labor was ₱ 3.45/bird calculated from two-hour daily labor at the prevailing wage of ₱ 55.00/day of farm hands in the locality.

Cost of housing was estimated at ₱ 20.00/treatment and cost of electricity, ₱ 0.83/bird. The cost of the feed was based on the consumption of the birds in each dietary treatment. Cost of the experimental diets/kg is shown in Table 1. The cost of producing the broilers did not differ significantly.

Profit Above Feed, Stock and Other Costs.

Birds fed with 12% SM diet yielded significantly the highest profit but was comparable with the profits of birds fed with 4% and 8% SM, 8% and 12% FM and 4%, 8% and 12% MBM. Birds fed with 4% FM and the control diet gave significantly lower profit but did not differ from the profit earned from birds in all the other seven experimental diets. Increasing the level of protein feed in the rations given to broilers resulted in higher profit. The result implies that the use of even as low as 4% SM in broiler rations would yield a profit comparable to that earned from birds fed with 8% and 12% FM or 8% and 12% MBM. Increasing the level of SM in the diet to 12% significantly increased the profit. However, 8% SM in the diet did not effect significantly better profit than birds fed with 8% and 12% FM or MBM. Snail meal can replace FM or MBM in terms of profit from broilers at 45 days.

Return on Investment (ROI).

ROI was between 13.59% to 46.80%. Birds fed with a diet of 8% SM had the highest ROI while those fed the control diet and 4% FM had the lowest.

Birds fed with 4% and 12% SM, 8% and 12% FM and the three levels of MBM have comparable ROI. Birds fed with 4% FM and the control diet had significantly poorer ROI than birds fed with 8% SM, but these did not significantly differ from the ROI of birds fed with 4% and 12% SM, 4%, 8% or 12% FM or MBM. Snail meal showed comparable performance with FM and MBM as a protein feed in terms of ROI. This result showed that at 4% level, SM-fed birds could yield a ROI similar to 8% and 12% FM or 4%, 8% and 12% MBM.

Conclusions and Recommendations

Based on the results of the study, the following conclusions were obtained:

1. Broilers given higher than 4% of the three protein feeds (SM, FM or MBM) in their diet gained significantly higher weight at 45 days.
2. Feed consumption and production costs of broilers did not differ significantly. Feed conversion efficiency of broilers improved when the level of SM was increased from 4% to 8% and 12% and the level of FM or MBM to 12% level in the diet.
3. Profit from birds fed all three levels of SM, 8% and 12% FM and the three levels of MBM were comparable and significantly higher than the profit recorded from birds fed with 4% FM and the control diet.
4. The ROI of broilers fed with 4%, 8% and 12% SM, 8% and 12% FM, and 4%, 8% or 12% MBM did not differ significantly. However, birds fed 8% SM had significantly higher ROI than those fed with 4% FM and the control diet.

Recommendations

1. Incorporation of from 4% to 12% SM in home-made broiler diets is recommended.
2. A feasibility study on the commercial production along with proper control and management of the golden snail (*Pomacea sp.*) is suggested.

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