Trans. Nat. Acad. Sci. & Tech. (Phils.)
1989.11:189-198

FRESH COCONUT MEAT IN POULTRY RATIONS*

Bernabe B. Cocjin**, Fe C. Evangelio*** and Rola Brizuela Salidaga***

***West Visayas State University, Iloilo City*
****Visayas State College of Agriculture, Leyte*

ABSTRACT

Almost 1/4 of all the coconuts in the world is produced in the Philippines. During periods of high supply of coconuts it would be better to feed coconut meat to farm animals for conversion into meat and eggs.

Three studies were conducted at the Visayas State College of Agriculture from April, 1983 to April, 1985 to determine the response of Mallard ducks, Muscovy ducks and broilers to fresh coconut meat supplementation in their diets.

Results showed that Mallard ducks on ration with coconut meat performed similarly with those on ration without coconut meat. Feed cost per dozen eggs was reduced by 28-30% with coconut meat. Feed cost per unit gain of Muscovy ducks was reduced by 32-37% by coconut meat supplementation. With broilers feed conversion, gain in weight and breast weigh were significantly improved by coconut meat supplementation. Return-above-feed cost increased with increasing level of coconut meat in the ration.

INTRODUCTION

The Philippines produces almost 1/4 of all the coconut in the world with 377 million coconut trees producing 12 billion nuts per year (Banzon and Velasco, 1982). When there is a considerable drop in the price of copra, as in 1981-82, farmers tend not to harvest the nuts for processing. This situation of low price of copra, which has been cyclical, contributes to the misery of the rural poor.

One way of alleviating the situation is to feed the fresh nuts to farm animals for conversion into high-priced animal products like meat and eggs which are saleable in the market. It is common knowledge that coconut residue either as meal, flour or presscake ("sapal") is used as feed ingredient, but its large scale incorporation in non-ruminant's diet is limited due to its low digestibility (Hagensity, 1977), Gerpacio and Castillo (1974)) analysed the proximate composition of "sapal" or

---

*Paper presented at the 11th Annual Scientific Meeting of the National Academy of Science and Technology, July 12, 1989, Metro Manila.

**Professor III and Director of Research, West Visayas State University, Iloilo City;
***Instructor and Research Assistants, respectively, Visayas State College of Agriculture, VISCA, Leyte.

"presscake" to be 90% dry matter, 6.1% crude protein, 5.0% ether extract, 34.7% crude fiber, 1.5% ash and 24.3% nitrogen-free extract.

In this study, whole grated mature coconut meat was tested as part of the rations of Mallard and Muscovy ducks while presscake or "sapal" was used as part of the rations of broilers. Mallard and Muscovy ducks were used because these are commonly raised in the rural areas and they belong to the species of poultry long neglected by research and development activities. Broilers were also used as test animals because of the potential of coconut meat as part of the broiler finishing rations.

Time and Place of the Study

This study was condcucted from April, 1983 to April. 1985 at the Department of Animal Science and Veterinary Medicine, Visayas State College of Agriculture (VISCA), Leyte.

OBJECTIVES

The objectives of this study were:

1. To determine the effect of supplementing layer ration with mature coconut meat on the egg production of Mallard ducks *(Anas boscas* Linn.).
2. To evaluate the effect of supplementing rations with mature coconut meat on the growth performance of Muscovy ducks *(Cairina moschata* Linn.).
3. To determine the growth response, carcass cut-up yield and financial returns from broilers fed rations supplemented with two levels of fresh coconut meat.

Materials and Methods

Study I.

A total of 120 Mallard ducks layers, around 10 to 14 months of age, were used. They were distributed among 4 treatments replicated 6 times with 5 birds per pen. A pen is equivalent to one experimental unit. The floor dimension of a cage was 2 x 5 feet or an allowance of 2 square feet per bird.

The treatments used were:

A – Commercial layer ration (30 birds);
B – 50% Commercial ration + 50% Coconut meat (30 birds);
C – Formulated layer ration with 17% C. P. (30 birds);
D – 30% Formulated ration + 50% Coconut meat (30 birds)

Grated mature coconut meat was used. The milk was not extracted to shorten processing time before feeding the coconut meat. Samples of the coconut meat were analyzed for proximate composition. The period of feeding was 53 days. Feed and water were given *ad libitum*. The data gathered were statistically analyzed using the analysis of variance in a randomized complete block design. Treatment mean comparisons on parameters whose "F" values were significant at 5% level of probability were done using the DMRT (Gomez and Gomez, 1976).

Study II.

A total of 120 Muscovy ducklings (*Cairina moschata*) were distributed to 4 treatments replicated two times with 15 birds per experimental unit. The floor dimension of the cage was 2 x 8 feet, or an allowance of a little more than one square foot per bird.

The treatments used were:

A – Commercial broiler starter (22% C.P.) (30 birds);
B – 50% Commercial ration + 50% Coconut meat (30 birds);
C – Formulated broiler starter (22% C.P.) (30 birds);
D – 50% Formulated ration + 50% Coconut meat (30 birds)

Grated coconut meat was also used. Milk was not extracted. The feeding period was 90 days. Feed and water were given *ad libitum*. Analysis of variance in RCDO was the statistical tool used. The formulated rations in Studies I and II are found in Table 1.

Table 1. Formulated rations used in Studies I and II

Feed Ingredients	*Parts by weight (kg.)*	
	Layer ration	*Broiler ration*
Rice bran	34.1	28.4
Cassava meal	38.6	32.8
Fish meal	14.5	20.0
Meat and Bone meal	6.0	11.5
Ipil-ipil leaf meal	5.0	5.0
Oyster shell	0.5	0.5
Vitamin-Mineral pre-mix	1.0	1.0
Salt	0.3	0.3
TOTAL	100.0	100.0
Calculated Analysis:		
Crude protein, %	16.97	22.00
M. E., cal./kg.	2406.52	2402.12
Cost/kg., ₱	3.39	4.22

Study III.

A total of 135 day-old straight-run Pilch broiler chicks were used. These were distributed among 3 treatments replicated 3 times with 15 birds per pen. The floor dimension of the pens used was 2 x 5 feet, or a floor space allowance of 1.5 square feet per bird.

The treatments used were:

A – Control (Broiler ration without coconut meat) (45 birds);
B – Broiler ration with 30% coconut meat (45 birds);
C – Broiler ration with 50% coconut meat (45 birds).

The birds, from 7 to 49 days of age, were fed with the ration treatment. Milk-extracted coconut presscake ("sapal") was used because of the availability of this material from a study on the barangay-based wet method of coconut oil production from coconut milk. Feed and water were provided to the birds *ad libitum*. The ration treatments used in Study III are found in Table 2.

Table 2. Ration treatments used in Study III

Feed Ingredients	*Parts by weight (kg.)*		
	T_0	T_1	T_2
Ground yellow corn	50	22	10
Rice bran	20	14	5
Soybean oil meal	8	15	15
Ipil-ipil leaf meal	5	5	5
Fish meal	8	10	10
Meat and Bone meal	8	3	4
Vitamin-Mineral pre-mix	1	1	1
Coconut meat (presscake)	0	30	30
TOTAL	100	100	100
Calculated Analyses:			
Crude protein, %	20.51	21.19	20.56
M. E., kcal/kg.	2784.10	2716.78	2708.20
Calcium, %	1.19	0.98	1.09
P (avail.), %	0.88	0.68	0.55
Price/kg. ration, ₱	6.40	5.95	5.87

At the end of the study, 9 birds per treatment were dressed for the measurements of carcass and cut-up data.

The data were statistically analyzed using the analysis of variance in RCBD. Treatment mean comparisons were done using Duncan's Multiple Range Test (DMRT) (Gomez and Gomez, 1976).

Observations and Results

Study 1.

Table 3 shows the results of the proximate composition of the mature coconut meat submitted for analysis in the laboratory.

It appears that the technicians at the laboratory dried the samples submitted before conducting the analysis. Fresh mature coconut meat usually contains an average of 30% moisture, while the result showed an average of only 3.80% moisture. On dry matter basis, the crude protein content of the samples submitted was 2.34%, whereas the calculated crude protein content of the fresh mature coconut meat given to the birds was 1.64% (as-fed basis).

Table 3. Average composition of proximate analyses of mature coconut meat (as-analyzed basis)

Composition	*Average*
Moisture, %	3.80
Crude Protein, %	2.25
Crude Fat, %	61.30
Crude Fiber, %	8.80
Ash, %	2.00

Table 4 shows the average feed consumed, percent egg production (hen-day), average egg production per bird, feed conversion, gain in weight and weight of eggs of Mallard ducks fed with the experimental rations.

Table 4. Biological responses of Mallard duck layers to rations with and without fresh coconut meat (53 days feedings)

Ration Treatments	*Average Feed Consumed Kg.*	*% Egg Prodn. (hen-day)*	*No. of Eggs Produced per bird*	*Feed Conversion*	*Gain in wt. kg.*	*Average wt. of Eggs gm.*
Commercial	9.15[a]	35.66[ns]	18.9[ns]	1.23[ns]	0.43[ns]	62.10[ns]
50% Commercial + 50% Cocomeat	9.10[a]	23.20	12.3	1.36	0.86	61.30
Formulated	7.50[b]	31.13	16.5	1.55	0.01	56.22
50% Formulated + 50% Cocomeat	8.10[b]	24.89	11.3	1.76	0.08	59.98

Table 4. Continuation

Ration Treatments	*Average Feed Consumed*	*% Egg Prodn. (hen-day)*	*No. of Eggs Produced per bird*	*Feed Conversion*	*Gain in wt. kg.*	*Average wt. of Eggs gm..*
C.V., %	1.87	16.46	14.2	15.45	36.78	5.51

abValues in column with different superscripts vary significantly from each other (P0.05).
nsNo significant differences between values in column (P0.05).

The data showed that rations with 50% coconut meat were as palatable as one without coconut meat. Commercial feed-based rations were more palatable than the counterpart formulated feed-based ones. Percent egg production on hen-day basis did not vary significantly between treatments. Likewise, statistical analysis did not show significant differences in the number of eggs produced per bird, feed conversion, gain in weight and average weight of the eggs of Mallard ducks between treatments. The high coefficient of variation in gain in weight is expected of Mallard ducks which are egg-type birds.

Table 5 shows the percent broken eggs produced from Mallard ducks fed with the ration treatments.

Table 5. Percent broken eggs produced from Mallard ducks fed rations with and without fresh mature coconut meat

Ration Treatments	*Average & Broken Eggs*
Commercial	2.25
50% Commercial	5.88
Formulated	17.19
58% Formulated	4.62

ns Values in column are not significantly different from one another (P20.05).

Although the values for the average broken eggs did not vary significantly between treatments because of limited number of observation, the data demonstrate the impairment of calcium metabolism due to the high fat content of diets supplemented with fresh coconut meat.

Study II.

Table 6 shows the average feed consumption, gain in weight and feed efficiency of Muscovy ducks fed ration with and without fresh coconut meat.

Statistical analyses showed that there were no significant differences between treatments on average feed consumption, gain in weight and feed efficiency of Muscovy ducks fed ration with or without fresh coconut meat. It was observed however, that feed consumption per bird increased from an average of 5.00 kg. in the first 45 days to 10.49 kg. in the second 45 days of feeding. Average gain in weight was 33.6 grams per day during the first 45 days and 11.2 grams per day during the second 45 days.

Feed efficiency was much better for birds fed during the first 45 days (3.33) than during the second 45 days (10.60).

Table 6. Average food consumption, gain in weight and Feed efficiency of Muscovy ducks fed ration with and without coconut meat (90 days)

Ration Treatments	*Ave. Feed Consumption kg.*	*Ave. Gain in Weight kg.*	*Ave. Feed Efficiency*
Commercial	8.34[na]	1.46[na]	6.56[ns]
50% Commercial + 50% Cocomeat	8.30 8.30	1.34 1.34	7.16 7.16
Formulated	7.18	1.10	7.34
50% Formulated + 50% Cocomeat	7.27	1.18	6.78
C. V., %	2.32	3.38	2.69

[ns]Values in column do not differ significantly from one another (P50.05).

COST ANALYSIS:

Table 7 shows the feed cost to produce a dozen eggs of Mallard ducks and kilogram gain in weight of Muscovy ducks.

Table 7. Feed cost analyses on Mallard and Muscovy ducks performance as influenced by fresh mature coconut meat incorporation

Ration Treatments	*Cost to Produce a Dozen Mallard Ducks Eggs (₱ –)*	*Cost to Produce a kg. Gain of Muscovy Ducks (₱)*
Commercial	6.77	38.84
50% Commercial + 50% Cocomeat	4.76	26.56

Table 7. Continuation

Ration Treatments	*Cost to Produce a Dozen Mallard Ducks Eggs (₱–)*	*Cost to Produce a kg. Gain of Muscovy Ducks (₱)*
Formulated	5.25	30.98
50% Formulated + 50% Cocomeat	3.79	19.39

N.B. Based on the observation that 3 nuts = 1 kg. meat; commercial layer ration = ₱5.50/kg; commercial broiler ration = ₱5.92/kg; 1 nut = ₱0.50

It was demonstrated that at the prevailing prices of the feeds used, supplementing the feeds with 50% coconut meat resulted in economical feed cost to produce a dozen eggs or a kilogram gain of Muscovy ducks. Based on the performance of the Mallard ducks, the price of the nut must be ₱1.48 each for the supplemented commercial ration to equal the cost of producing a dozen eggs by birds on all-commercial ration. In the case of the Muscovy ducks, the price of the nut must be ₱1.64 each for the supplemented commercial ration to equal the cost of producing a kilogram gain. In the case of formulated rations, the price of the coconut must be ₱0.86 per nut in the layer ration and ₱1.41 in the Muscovy duck ration for the cost of the supplemented rations to equal the feed cost of production of all-mesh formulated rations.

When the price of the nuts is lower than that in the conditions cited above, then it would be advisable to supplement 50% fresh coconut meat in the rations for Mallard and Muscovy ducks.

Study III.

Table 8 shows the biological and economic responses of broilers to ration treatments with different levels of fresh mature coconut meat (presscake).

The data show that final liveweight, gain in weight, feed consumption and feed efficiency were better obtained from broilers fed with rations with the presscake of mature coconut meat (sapal) than these fed with the control ration (sapal). There were no significant differences in carcass weight, dressing percentage, weight of gibblets (liver, gizzard plus proventriculus and heart), and weight of back with rib and tail, thigh, drumstick, feet, and heart, and neck observed between treatments.

However, significant differences were observed in the weights of breasts and the wings of the broilers. Weights of breasts and wings of birds given ration containing presscake of mature coconut meat (sapal) were significantly higher than those in the control treatment.

The incorporation of the coconut meat in the ration of broilers also reduced the cost of the formulated ration; thus, it was observed that the return-above-feed cost per live and dressed bird was highest in birds given ration with 50% presscake of fresh coconut meat (sapal).

Table 8. Biological and economic responses of broilers to ration treatments with different levels of fresh mature coconut meat (milk-extracted)

Parameters	*Treatments*			
	Control	*30% Cocomeat*	*50% Cocomeat*	*C. V. %*
Final liveweight, kg.	0.91[b]	0.99[a]	1.03[a]	1.50
Gain in weight, kg.	0.79[c]	0.86[b]	0.91[a]	1.32
Carcass weight, kg.	0.72[ns]	0.79	0.82	5.39
Feed consumed, kg.	2.26[b]	2.40[a]	2.49[a]	1.15
Feed efficiency, F/G	2.86[c]	2.79[b]	2.74[a]	0.55
Dressing percentage	71.66[ns]	72.98	73.96	1.47
Percent Livebility	97.77[ns]	95.55	97.77	4.58
Weight of meat cuts:				
Back (rib + tail), gm.	127.88[ns]	137.99	136.44	6.15
High, gm.	109.88[ns]	118.44	124.33	8.15
Drumstick, gm.	90.99[ns]	98.10	102.22	8.45
Feet, gm.	54.88[ns]	55.33	54.99	8.31
Head and neck, gm.	92.88[ns]	94.22	97.22	9.17
Breast, gm.	151.77[b]	191.33[a]	194.66[a]	4.41
Wings, gm.	79.66[b]	87.88[a]	92.44[a]	4.08
Return-above-feed cost per bird, ₱	0.48	2.60	3.67	

[abc]Means in the row with different letter superscript vary significantly from one another ($P<0.05$)

[ns]Means in the row are not significantly different from one another ($P>0.05$).

It is very profitable therefore to incorporate the presscake of fresh mature coconut meat (sapal) in broiler rations, provided the formulated ration meets the requirements of the birds for crude protein and energy.

Recommendations

The results show that it was most economical to add even up to 50% fresh mature coconut meat in the rations of Mallard ducks, Muscovy ducks and broiler chickens. However, the impairment of calcium was evident in the poor shell quality of the eggs laid by the Mallard ducks fed with 50% coconut meat in the ration.

The development of the breast and wings of the broilers was improved at higher levels of coconut meat (presscake) supplementation. Returns per broiler raised on rations with fresh coconut meat (presscake) increased with increasing level of coconut meat in the ration. It is advisable, however, to start feeding the fresh mature coconut meat to broilers at the age of three weeks.

Literature Cited

Banzon, J. A. and J. R. Velasco. 1982. *Coconut Production and Utilization.* The Philippine Coconut Research and Development Foundation, Inc., Amber Avenue, Pasig, Metro Manila, Philippines. pp. 221, 311.

Gerpacio, A. L. and L. S. Castillo. 1974. *Nutrient Composition of Some Philippine Feedstuffs.* UPLB College of Agriculture, College, Laguna, Philippines. p. 2.

Gomez, K. A. and A. A. Gomez. 1976. *Statistical Procedures for Agricultural Research with Emphasis on Rice.* IRRI, College, Laguna, Philippines. pp. 97, 103.

Hagenmaier, R. 1977. *Coconut Aqueous Processing.* University of San Carlos, Cebu City, Philippines. pp. 30, 146-147.

Hagenmaier, R., M. Glisendorf and K. Mattil. 1976. "The Residue from Aqueous Extraction of Fresh Coconuts: An Analysis". *The Phil. J. of Coconut Studies.* 1:37-40.