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Research Article

Profitability of Broiler Production on Diets Containing Ground Peanut *(Arachis hypogaea)* Shell as a Potential Alternative Feed Ingredient

Analyn M. Moniño[1], Roger Y. Ibañez, Jr. [1]*, Primitivo D. Moniño, Jr.[2]

[1]Dr. Emilio B. Espinosa Sr. Memorial State College of Agriculture and Technology, 5411, Philippines
[2]Philippine Coconut Authority-Masbate Field Office, 5400, Philippines

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**Corresponding author:*
E-mail:
ryibanez@debesmscat.edu.ph

ABSTRACT

The study investigated the effects of incorporating ground peanut shells into broiler diets on growth performance, feed conversion efficiency, and production cost. The results showed that broilers fed diets with ground peanut shells had improved growth performance and body weight compared to those without. Moreover, the inclusion of ground peanut shells in broiler diets improved feed conversion efficiency, indicating a reduction in the amount of feed required for broiler growth. The findings suggest that ground peanut shells can be used as a safe and effective feed ingredient for broilers without compromising their health and survival. The utilization of agricultural by-products such as peanut shells in the poultry industry can have significant benefits. Incorporating ground peanut shells into broiler diets can reduce production expenses while providing essential nutrients for human consumption. This can result in an increase in income for households involved in poultry raising. Furthermore, the use of agricultural by-products can contribute to reducing environmental waste, leading to a more sustainable and environmentally friendly poultry industry. The study highlights the potential of utilizing agricultural by-products such as peanut shells in the poultry industry. Incorporating ground peanut shells into broiler diets can reduce production costs, increase income for households involved in poultry raising, and provide essential nutrients for human consumption.

Keywords: *Broiler diet, Ground peanut shell, Inclusion, Profitability*

Introduction

Poultry raising is a popular industry worldwide, especially in the Philippines, due to the fast multiplication, quick growth, and efficient conversion of feed to meat and eggs of poultry species, particularly chicken (Dagaas, 2012). This industry is a vital source of protein, minerals, and vitamins essential for human health (Marangoni et al., 2015). Additionally, poultry raising can provide a supplementary source of

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income to farmers as part-time employment (Wong et al., 2017). However, the cost of feed accounts for 60% of the total cost of production in broiler raising, making it the most expensive aspect of the industry (Ahiwe et al, 2018).

Agricultural by-products such as peanut shells, which contain nutrients essential for animal growth and development, are often discarded and contribute to environmental waste (Zhao et al., 2011). However, peanut shells have been found to contain antioxidants, such as luteolin and phenolic compounds, and nutrients such as crude protein, crude fat, fiber, and various vitamins and minerals after grinding and processing (Win et al, 2011). The fiber content of peanut shells can help with the digestion of food and reduce the risks of constipation while also absorbing water to regulate body temperature and aid in growth and development (Arya et al, 2016). Peanut hulls are primarily composed of fiber, with a crude fiber content that frequently surpasses 60% of DM, and a lignin content ranging from 6-45% of DM. The study also indicates that due to the existence of kernel fragments, peanut hulls have small, yet noteworthy, fluctuating quantities of protein (7% of DM on average) and oil (2% of DM) (Heuze et al, 2017). The shells of peanuts have the potential to serve as a source of natural antioxidants and functional compounds for various industrial uses. (Adhikari et al., 2019).

This study aims to investigate how to reduce the production expenses of broilers by incorporating ground peanut shells into their diets as feed ingredients. The use of ground peanut shells can provide crude protein, fat, fiber, and various vitamins and minerals in a cost-effective manner, which can increase the income of households involved in poultry raising. Furthermore, research has shown that the inclusion of ground peanut shells in broiler diets can enhance their growth performance and development (Sarbaz et al., 2018).

Poultry production is a significant industry worldwide that provides essential nutrients for human consumption. However, the high cost of feed is a challenge for poultry farmers, and agricultural by-products such as peanut shells are often discarded and contribute to environmental waste. Incorporating ground peanut shells into broiler diets can reduce production expenses while providing essential nutrients, resulting in an increase in income for households involved in poultry raising. This study aims to investigate the effectiveness of ground peanut shells as a cost-effective feed ingredient for broilers.

Methods

Research Design

The research design used in this study was a Complete Randomized Design (CRD). The experimental birds used were 96 straight-run day-old Starbro broiler chicks, randomly assigned to three treatments replicated four times. Each replicate consisted of eight birds housed in a cage. The use of a CRD design in this study provided an unbiased and systematic approach to evaluate the treatment effects and ensure the validity of the results.

Data Collection and Analysis

Data collection was carried out by taking the initial weights of all the experimental birds on a lot basis at the 14th day of age using a 10-kilogram capacity weighing scale. Subsequent weights were taken at 28 and 35 days of feeding. Body weight, feed consumption, body weight gain, feed conversion efficiency, livability, and income over feed and chick costs were collected to determine the performance of broilers fed with ground peanut shells. Statistical analysis of the data was conducted using analysis of variance (ANOVA) in a Complete Randomized Design. If significant results were obtained, a Least Significant Difference (LSD) test was applied to test for further significant differences among the control treatment. This statistical method enabled the researchers to evaluate the effects of the inclusion of varying levels of ground peanut shells in the diets of broilers on their growth performance.

Preparation of the treatment

Before the start of the study, a ground peanut shell meal was prepared. Ground peanut shells were purchased in Milagros and Mandaon. The shells were properly cleaned and dried under the heat of the sun for 1 to 2 days until it reaches 14% to 18% moisture content. Dried ground peanut shells were crushed and

ground using a hammer mill, then sieve and were mixed with other feed ingredients such as; yellow corn, soybean meal, rice bran D1, coco oil, limestone, salt, and fish meal. The rate of ground peanut shell meal per treatment per replication was presented in the experimental diets section under materials. Ground peanut shells were made into powder and were submitted for laboratory analysis to identify the protein and fiber contents.

Analytical methodology for peanut shell content

Ground peanut shells were made into powder and were submitted for laboratory analysis to identify the protein and fiber contents. Protein and crude fiber are important in the feed formulation because it helps with the proper growth and development of the birds.

Results and Discussion

Body Weight

The presented data in Table 1 shows that the inclusion of varying levels of ground peanut shells in broiler diets enhanced their growth performance. The broilers fed diets with 2% and 4% ground peanut shells had a significantly increased body weight compared to those fed control diets at the end of the study. The average body weight of broilers fed diets with ground peanut shells was higher at 28 and 35 days than those without peanut shells in their diets.

The increased body weight of broilers fed diets with ground peanut shells can be attributed to the insoluble fiber content of peanut shells, which aided in water intake, regulating body temperature, and digestion of food nutrients for the growth and development of broilers (Scott, 2010). The nutrient content of the calculated feeds with ground peanut shells and their fiber content also contributed to the increased body weight of broilers at the end of the study.

Based on these results, broiler diets can be formulated with the inclusion of ground peanut shells to enhance their growth performance. This finding suggests that ground peanut shells can be used as a safe and effective feed ingredient for broilers to improve their growth and development without compromising their health and survival.

Table 1. Average body weight of broilers fed diets with varying levels of ground peanut shell in grams

Treatment	Feeding Period		
	Initial	28 days	35 days
Diets without peanut shell	414.06	1273.44	1679.69
Diets with 2% peanut shell	403.13	1326.56	1835.94**
Diets with 4% peanut shell	412.50	1385.94	1885.94**

** Means in column with the same superscript is significant at (P<0.01>)

Growth performance, feed consumption, and feed conversion efficiency

Table 2 showed the growth performance and feed conversion efficiency of broilers fed diets with varying levels of ground peanut shell. The findings suggested that the inclusion of ground peanut shells in the diet had a significant effect on the body weight gain of broilers. Broilers fed diets with varying levels of ground peanut shell had significantly higher body weight gain compared to those fed control diets. This finding was consistent with previous studies that had reported the positive effect of including peanut shells in the diet of broilers on their growth performance (Scott, 2010).

The slightly lower feed consumption of broilers fed diets with ground peanut shells, but not significantly lower, could be attributed to the high fiber content of peanut shells (Costa et al., 2001). The fiber content of peanut shells could absorb water and help in the digestion of food by slowing down the passage of food through the small intestine and colon. This suggested that peanut shells could be used as a feed ingredient to reduce feed consumption without compromising the growth performance of broilers.

Table 2. Growth performance, feed consumption, and feed conversion efficiency of broilers fed diets with varying levels of ground peanut shell

Treatment	Body Weight Gain (g)		Feed Consumption (g)		Feed Conversion Efficiency (g)	
	28 days	35 days	28 days	35 days	28 days	35 days
Diets without peanut shell	859.38	406.25	1375.31	726.25	1.61	1.79
Diets with 2% peanut shell	923.44	509.38**	1334.38	728.75	1.45	1.44**
Diets with 4% peanut shell	973.44	500.00**	1355.94	723.91	1.40	1.46**

** Means in column with the same superscript is significant at (P<0.01>)

Moreover, the significantly better feed conversion efficiency of broilers fed diets with ground peanut shells could be attributed to their significantly higher body weight gain compared to those fed control diets. The data indicated that broilers efficiently converted nutrient-fed diets with ground peanut shells into body weight gain. This suggested that peanut shells could be used as a cost-effective feed ingredient in broiler diets to improve feed conversion efficiency.

In conclusion, the inclusion of ground peanut shells in broiler diets had a positive effect on their growth performance and feed conversion efficiency. This study provided evidence that peanut shells could be used as a feed ingredient to improve the production performance of broilers. Further research was needed to investigate the optimal inclusion rate of peanut shells in broiler diets to achieve the best growth performance and feed conversion efficiency.

Survivability of the Chicken

The data presented in Table 3 indicated that the inclusion of ground peanut shells in the diets of broilers did not have a significant effect on their livability rate. The livability rate remained at 100% for all treatments, including those with different levels of ground peanut shell. This result suggested that adding ground peanut shells to broiler diets was safe and did not pose a risk to the health and survival of broilers.

The absence of mortality throughout the experiment supported this finding. The high livability rate of broilers fed diets with ground peanut shells could be attributed to the antioxidant properties of peanut shells. The antioxidants present in peanut shells protected the body from fungal infections and free radicals, which could cause cellular damage and jeopardize the health and survival of broilers (Yen et al., 1993).

Furthermore, the lack of significant difference among treatment means supported the conclusion that the inclusion of ground peanut shells in broiler diets did not affect their livability rate. This finding indicated that peanut shells could be used as a safe and effective feed ingredient for broilers without compromising their health and survival.

In summary, the data presented in Table 3 demonstrated that the inclusion of ground peanut shells in broiler diets did not significantly affect their livability rate. The high livability rate of broilers fed diets with ground peanut shells could be attributed to the antioxidant properties of peanut shells. Therefore, peanut shells could be considered a safe and effective feed ingredient for broilers.

Table 3. Average livability rate of broilers fed diets with varying levels of ground peanut shell

Treatment	Livability Rate
Diets without peanut shell	100.00
Diets with 2% peanut shell	100.00
Diets with 4% peanut shell	100.00

Income over feed and chicks costs

The presented data in Table 4 showed that the utilization of ground peanut shells as a feed ingredient in broiler diets resulted in significantly higher net income compared to control diets. The net profit for broilers fed diets with ground peanut shells was higher due to their lower feed cost and higher gross sales resulting from their higher body weight compared to those in the control treatment. The higher body weight of broilers fed with ground peanut shells can be attributed to the nutrient content of peanut shells as cited by some authors (Scott, 2010)

The total cost of feed and chicks in all treatments was the same, but the inclusion of ground peanut shells in diets B and C resulted in a total cost of peanut shells. Despite this additional cost, the net profit for treatments B and C was still higher than for treatment A. Treatment B, which included 2% ground peanut shell in the diet, had a net profit of 135.09 PhP, while treatment C, which included 4% ground peanut shell, had a net profit of PhP 140.25. In contrast, treatment A, which did not include ground peanut shells in the diet, had a net profit of PhP 113.11.

In conclusion, the data presented in Table 4 suggested that the utilization of ground peanut shells as a feed ingredient in broiler diets can result in significantly higher net income compared to control diets. The higher net profit from broilers fed with ground peanut shells is due to their lower feed cost and higher gross sales resulting from their higher body weight. The nutrient content of peanut shells also contributed to the higher body weight of broilers.

Table 4. Average income over feed and chick costs of broilers fed diets with varying levels of ground peanut shell

Cost	A	B	C
Cost of chick (PhP)	36.00	36.00	36.00
Cost of Feed/Kilogram (PhP)			
Booster	31.00	31.00	31.00
Starter	23.72	24.13	24.92
Finisher	22.36	22.63	23.46
Total Feed Consumption/Chick (Kg)			
Booster	0.52	0.52	0.52
Starter	1.38	1.31	1.30
Finisher	0.73	0.71	0.70
Total Cost of Feed (PhP)	65.18	63.80	64.94
Cost of Peanut Shell/kg (PhP)	0.00	5.00	5.00
Total Peanut Shell Consumed/chick (kg)	0.00	0.04	0.08
Total Cost of Peanut Shell (PhP)	0.00	0.20	0.40
Cost of Vitamin/Medicine (PhP)	4.11	4.11	4.11
Total Cost (PhP)	105.29	104.11	105.45
Return			
Average Body Weight (kg)	1.68	1.84	1.89
Price/kilogram live weight (PhP)	130.00	130.00	130.00
Gross Income (PhP)	218.40	239.20	245.70
Less Total Cost (PhP)	105.29	104.11	105.45
Net Profit (PhP)	113.11	135.09	140.25

Conclusion and Recommendations

Based on the results obtained from this study, it can be concluded that incorporating different levels of ground peanut shells in broiler diets positively impacts body weight, body weight gain, and feed efficiency. These findings suggest that the use of ground peanut shells in broiler diets can be beneficial for improving broiler performance and overall production.

To maximize the benefits of incorporating ground peanut shells in broiler diets, it is recommended to use proper management practices. Furthermore, further research should be conducted on the utilization of ground peanut shells in diets for other types of livestock and poultry, including laying chickens, to determine the optimal level of inclusion for achieving the best results.

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