

# Growth And Egg Production Performance of Dekalb Layers (*Gallus gallus domesticus*) supplemented with Cassava Leaf Meal (*Manihot esculenta* Crantz)

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## Abstract

A feeding trial was done to determine the best level of supplementation of cassava leaf meal (CLM) on the growth, productivity and egg quality of Dekalb layers at Salikneta Farm, San Jose del Monte, Bulacan, Philippines. The treatments were control (no CLM), T1 (3% CLM supplement), T2 (5% CLM supplement) and T3 (7% CLM supplement). The study was laid in a single factor Completely Randomized Design, with three replicates, consisting of ten birds per replicate. Results show highest feed consumption of birds at T3 ( $p < 0.05$ ) compared to control, T1, and T2. Weight gain was not affected by CLM supplementation. However, the FCR, percentage egg production, and cumulative number of eggs per bird in T1, and albumen height in T2 and T3 were higher ( $p < 0.05$ ) compared to the control group. Likewise, the supplementation of CLM up to 7% has no adverse effect on the health of the birds. Results revealed that 3% supplementation of CLM can improve FCR, percent egg production, and the cumulative number of eggs per bird. Moreover, increasing the level of CLM to 5% and 7% supplement may further improve birds' performance in terms of egg weight, yolk color, and albumen height.

**Keywords:** Cassava leaf meal, Dekalb layers, Egg quality, Productivity, Salikneta Farm

## Introduction

The increasing demand for eggs can be attributed to the egg as an affordable protein-rich food. However, one of the major constraints that hinders the country's egg producers to address this huge demand efficiently is the high cost for animal feeds. Considering that animal feeds account for 70-75% of the cost of production, providing high quality feeds is essential in determining the quality of animal produce, specifically

for poultry (Aderinola et al., 2013). Thus, it is important that cheap and easily obtainable resources containing essential nutrients be tapped in order to improve the performance and productivity of layers. Cassava (*Manihot esculenta* Crantz) leaves are the by-product of cassava root production and is either thrown away or is utilized as a fertilizer or compost. It is estimated that 10 tons of dry cassava foliage is produced per one hectare of cassava production area (Morghan and Choct, 2016). The leaves possess a



relatively high crude protein and essential amino acids required for nutrition (Iheukwumere et al., 2008). Although cassava leaves also contain compounds that can be toxic to human and other animals like the glucosinolate linamarin, it can still be utilized by detoxification process through drying or turning the leaves into a meal (Dolan et al., 2010).

Cassava leaf meal has been demonstrated to be an efficient feed source for poultry. While several studies had been conducted on the effects of cassava leaf meal (CLM) on broilers, only a few studies in the recent years had reported effects of CLM on layers' performance, productivity and egg quality (Oludare, 2006; Zanu et al., 2012).

The present study was conducted to assess the value of cassava leaf meal as a supplement to the layers' diet. Cassava leaf meal is a feed that is affordable, readily available and efficient, and can be utilized as well to improve the growth performance, productivity and quality of eggs produced. The use of cassava leaf meal can be adopted and can be integrated with cassava root production, thus minimizing waste in farm operations. Furthermore, the study aimed to generate new knowledge by exploring the potential of cassava leaves as feeds for layers.

## Materials and Methods

**Cassava Leaf Meal Preparation:** Mature cassava leaves were collected from the cassava plantation area at Salikneta Farm. After collecting, the leaves were shredded using a shredding machine and were subjected to sun drying for 3-4 days. The dried leaves were crushed to produce a fine cassava leaf meal. The leaf meal was stored in perforated sacks in a dry place.

**Feeding Management and Production Monitoring:** The layers were acquired at 18 weeks of age and were used when they were 29 weeks old. The commercial feed Robina™ layer crumble, which has a composition of 17% crude protein, 17% crude fat, 5% crude fiber, 12% moisture, 3.8-4.2% calcium and 0.7% phosphorus, was used. For the nine-week feeding trial, a total of 756 kg of commercial feed was used. The feed was mixed with cassava leaf meal. Feeding of the layers was done twice a day: in the early morning and afternoon. Half of the formulated feed was given in the morning, and the other half in the afternoon. During early morning, cleaning of the feed trough was done to collect the feed refusal. Clean and fresh water was provided *ad libitum* using the installed drip drinkers. Production of each bird was monitored and recorded.

Eggs were collected in the afternoon post-feeding. The collected eggs were placed in trays and individual egg weights were recorded using the digital weighing scale and classified using the commercial egg scale.

**Experimental Set-up:** One hundred and twenty Single Comb White Leghorn Dekalb layers were randomly chosen and allocated to four different treatments and laid in a single factor Completely Randomized Design experiment. Each treatment consisted of 30 birds and three replicates, with 10 birds each replicate. The following treatments were used: Control -Commercial Layer Feeds only (100g/day); T1 - Commercial Layer Feeds (100g/day) + 3% Cassava Leaf Meal (3g); T2 - Commercial Layer Feeds (100g/day) + 5% Cassava Leaf Meal (5g) and T3 - Commercial Layer Feeds (100g/day)+ 7% Cassava Leaf Meal (7g).

**Data Collection:** The following parameters for growth and productivity were obtained: (1) Feed consumption (g) = feed provided – feed refusal; (2) Weight gain (g) = final weight – initial weight; (3) FCR= total amount of feed consumed ÷ (# of eggs x mean egg weight); (4) % Egg production = (# of eggs ÷ # of housed layers) x 100; (5) Cumulative number of eggs per bird = total # of eggs/treatment ÷ 30; (6) Mean egg weight = sum of egg weights ÷ # of eggs weighed; and (7) Mortality rate = (# of dead birds ÷ # of housed birds) x 100. For the assessment of egg quality, random samples of eggs were chosen from each treatment. Egg samples were cracked on a Petri dish. Using the DSM™ Yolk Color Fan, yolk samples were assessed and recorded. After evaluating the intensity of the yolk color, albumen height was measured. The height of the thick albumen and shell thickness were measured using a Vernier wheel type calliper. The conduct of the study is summarized in Figure 1.



**Figure 1:** Flowchart of methodology used in the study

*Statistical Analysis:* The data recorded for each parameter were statistically analyzed using Analysis of Variance (ANOVA) and differences among the means obtained were evaluated using Duncan's Multiple Range Test (DMRT).

## Results and Discussion

Birds fed with CLM consumed more feed and had higher egg production compared to the control (Table 1). A direct relationship is conveyed between the amount of CLM supplementation and the feed consumed. This is because the higher the amount of CLM mixed in the diet, more feed is made available to the layers. Contrary to the results of the feed

consumption, T2 and Control recorded the highest gain in weight (Table 1). Layers supplemented with CLM recorded a higher egg production and cumulative number of eggs per bird compared to the control. T1 consistently recorded the highest values for the two parameters throughout the nine weeks of feeding trial. Meanwhile, T2 consistently recorded the heaviest egg weight. There is a similar trend for the eggs produced by the birds fed with CLM, which steadily increased reaching the peak on Week 7, after which the egg weights started to decrease.

Current observations do not align with the established direct correlation between daily feed intake and body weight (Pérez-Bonilla et al., 2012). Bird mortality was negligible.

**Table 1:** Comparison of the productivity and egg quality characteristics of layers fed with various amounts of cassava leaf meal (CLM).

Parameters	Control	T1 (3%)	T2 (5%)	T3 (7%)
<b>Feed Consumption (g)</b>	99 ± 0.13 <sup>b</sup>	101 ± 1.85 <sup>b</sup>	100 ± 1.83 <sup>b</sup>	105 ± 0.63 <sup>a</sup>
<b>Weight Gain (g)</b>	203 ± 53	170 ± 43.59	207 ± 33.29	195 ± 52.35
<b>FCR</b>	2.27 ± 0.25 <sup>a</sup>	1.96 ± 0.29 <sup>b</sup>	2.03 ± 0.075 <sup>ab</sup>	2.07 ± 0.023 <sup>ab</sup>
<b>Percent Production (%)</b>	80.44 ± 8.47 <sup>b</sup>	92.33 ± 1.80 <sup>a</sup>	86.55 ± 6.10 <sup>ab</sup>	89.63 ± 1.85 <sup>ab</sup>
<b>Cumulative # of eggs/bird</b>	51 ± 5.57 <sup>b</sup>	58 ± 1.15 <sup>a</sup>	54 ± 3.79 <sup>ab</sup>	57 ± 1.53 <sup>ab</sup>
<b>Egg weight (g)</b>	55.04 ± 1.02 <sup>b</sup>	55.92 ± 0.53 <sup>ab</sup>	57.39 ± 0.98 <sup>a</sup>	56.81 ± 0.94 <sup>a</sup>
<b>Yolk color</b>	9 ± 0.58 <sup>b</sup>	9 ± 0.58 <sup>ab</sup>	10 ± 0.58 <sup>a</sup>	10 ± 0 <sup>a</sup>
<b>Albumen height (cm)</b>	0.68 ± 0.0076 <sup>b</sup>	0.69 ± 0.013 <sup>b</sup>	0.72 ± 0.019 <sup>a</sup>	0.74 ± 0.01 <sup>a</sup>
<b>Shell thickness (cm)</b>	0.0364 ± 0.00076 <sup>a</sup>	0.0391 ± 0.0025 <sup>a</sup>	0.0389 ± 0.001 <sup>a</sup>	0.0392 ± 0.00138 <sup>a</sup>
<b>Mortality (%)</b>	3.33 ± 5.78	0	3.33 ± 5.78	0



Analysis on yolk color ratings of eggs from the control and experimental groups revealed no appreciable difference (Figure 2). An earlier study reported that cassava leaves possess carotenoids that increase yolk pigmentation (Montagnac et al., 2009). Egg albumen height increased with increasing levels of CLM supplementation. The differences in the albumen height may be explained by the presence of high crude protein content brought about with increasing levels of CLM supplementation as clearly noted in T3. The thicker shells of eggs given CLM supplement can be attributed to the greater availability of calcium, which is the primary component of egg shell (An et al., 2016). It was also emphasized that calcium content is 100 times more concentrated in cassava leaves than in roots (Montagnac et al., 2009).



**Figure 2:** Egg samples for yolk color evaluation

In summary, the supplementation of CLM to the feed ration of Dekalb layers was better in terms of feed conversion ratio, percent production, number of eggs per bird, egg weight, yolk color and albumen height, and shell thickness, compared to the control group. The study also found no adverse effects on the livability of the layers up to 7% supplementation of CLM, as cassava leaves are often discouraged as a supplement due to high content of linamarin and lotaustralin (Chauynarong et al., 2009). Present data revealed that food of layers supplemented with 3-7% CLM produced better and acceptable results relative to the control, with the most desirable results for egg productivity and FCR in T1 (3% CLM) and enhanced egg quality characteristics in T3 (7% CLM). With the present findings, the incorporation of CLM as a feed supplement alongside the conduct of a follow-up study

on the use of higher proportion of supplementation is recommended.

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## References

- Aderinola OA, Rafiu TA, Akinwumi AO, Alabi TA and Adeagboo OA, 2013. Utilization of *Moringa oleifera* as feed supplement in broiler diet. *Int. J Food Agri. Vet. Sci.* 3: 94-102.
- An SH, Kim DW and An BK, 2016. Effects of Dietary Calcium Levels on Productive Performance, Eggshell Quality and Overall Calcium Status in Aged Laying Hens. *Asian Australas. J. Anim. Sci.* 29:1477-1482.
- Chauynarong N, Elangovan AV and Iji PA, 2009. The potential of cassava products in diets for poultry. *Worlds Poult. Sci. J.* 65: 23-36.
- Dolan LC, Matulka RA and Burdock GA, 2010. Naturally Occurring Food Toxins. *Toxins* 2: 2289-2332.
- Iheukwumere FC, Ndubisi EC and Etusiim PE, 2008. Performance, nutrient utilization and organ characteristics of broilers fed cassava leaf meal (*Manihot esculenta* Crantz). *Pakistan J. Nutr.* 7: 13-16.
- Morgan NK and Choct M, 2016. Cassava: Nutrient composition and nutritive value in poultry diets. *Anim. Nutr.* 2: 253-261.
- Montagnac JA, Davis CR and Tanumihardjo SA, 2009. Nutritional Value of Cassava for Use as Staple Food and Recent Advances for Improvement. *Compr. Rev. Food Sci. Food Saf.* 8: 181-194.
- Oludare FA, 2006. Protein replacement value of cassava (*Manihot esculenta* Crantz) leaf protein concentrate (CLPC): effects on egg quality, biochemical and haematological indices in laying birds. *J. Food, Agri. and Env.* 4:54-59.

Pérez-Bonilla A, Novoa S, García J, Mohiti-Asli M, Frikha M and Mateos GG, 2012. Effects of energy concentration of the diet on productive performance and egg quality of brown egg-laying hens differing in initial body weight. *Poult. Sci.* 91: 3156-3166.

Zanu HK, Kagya-agyemang JK and Avukpor CM, 2012. Effects of enzyme supplementation on the performance of laying hens fed diets containing different levels of cassava leaf meal (*Manihot esculenta* Crantz). *Online J. Anim. Feed Res.* 3: 9-14.

