

# Influence of *Trichanthera (Trichanthera gigantea)* Meal on the Egg Production Performance of Philippine Mallard Ducks (*Anas platyrhynchos*)

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## Index Terms:

Mallard duck, Meal, Itik pinas, Supplementation, *Trichanthera gigantea*

**Abstract.** The rising cost of commercial feeds and the increasing emphasis on sustainable poultry production have stimulated interest in alternative feed resources for Philippine Mallard Ducks (Itik Pinas). This study evaluated the nutritional composition of *Trichanthera gigantea* foliage meal and its effects on the laying characteristics of Philippine Mallard Duck (PMD) layers. A total of 160 PMD were assigned to four dietary treatments following a Completely Randomized Design, with four replicates per treatment and ten ducks per replicate (2 drakes and 8 layers). The experimental diets were formulated as follows: T0 (100% commercial mash), T1 (90% commercial mash + 10% *T. gigantea* meal), T2 (80% commercial mash + 20% *T. gigantea* meal), and T3 (70% commercial mash + 30% *T. gigantea* meal). Prior to the feeding trial, the proximate composition, calcium, phosphorus, and metabolizable energy contents of *T. gigantea* meal were determined. Results revealed that increasing dietary inclusion of *T. gigantea* meal significantly influenced laying traits. Egg size was significantly enhanced ( $p < 0.03$ ), while laying rate increased progressively with higher inclusion levels of *T. gigantea* meal, with the highest response observed in T3 ( $p < 0.0001$ ). In contrast, changes in live body weight of PMD layers were not significantly affected by dietary treatments during the seven-week feeding period ( $p > 0.05$ ), indicating that body weight maintenance was not compromised by partial replacement of commercial feed. These findings revealed that *T. gigantea* foliage meal is a nutritionally suitable and sustainable alternative feed ingredient for PMD layers. Inclusion levels of up to 30% can enhance laying traits and egg size without adverse effects on body weight, providing a cost-effective and environmentally sound feeding strategy for duck production systems in the Philippines.

## Introduction

The duck enterprise plays an important role for egg production in the Philippines, with ducks ranking in second to chickens in terms of egg and meat production. However, various issues limit the industry's expansion, including inadequate space for free-range operations, the requirement for quality breeder ducks, insufficient supply of ready-to-lay pullets, high feed costs, shifting egg prices, and a lack of research on duck raising (Agriculture, 2016). These problems have led to a decline in production volume over the past five years, with the decreasing percent of 5.42 (PCAARRD, 2016).

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Despite these challenges, there is a bright future for this industry due to rising demand for duck products. In response, the Philippine Mallard Duck (PMD) or "itik pinas" was developed by ongoing selection and breeding of the original Pateros duck (Berdos et al. 2019 & Takács et al. 2025). However, the development of PMD desire suitable diets and feeding techniques for ensuring a constant egg quality and production efficiency.

Traditionally, duck diets were supplemented with protein during egg production. However, traditional protein sources like snails and tiny shrimp are becoming rare. Thus, there is a need to investigate possible locally accessible leguminous plants as alternative protein sources in order to lower feed costs and improve duck raiser profits (De Angelis et al. 2021). *Trichanthera gigantea*, commonly referred to as "Madre de Agua," is a fodder tree that thrives in the Philippines and other tropical nations and can be grown alongside fields. *Trichanthera* is an effective choice for supplementation due to its high calcium levels and protein content (Rosales, 1997; Mishra et al., 2023). Hence, this study was to evaluate the influence of varying levels of *Trichanthera gigantea* on egg production when added to the Philippine Mallard Duck ration during early lay performance.

## Methodology

### *Experimental and Treatment Design*

A total of 160, 25-week-old PMD with an average weight of 1.50 kg were used in the study. They were randomly assigned to four experimental treatments following Completely Randomized Design (CRD). Each treatment had four replicates with 10 ducks (2 drakes and 8 ducks) per replicate. The experimental treatments were: T0 – 100% Commercial Feeds (CF) only; T1 – 90 % CF + 10% *Trichanthera* Meal /duck/day; T2 - 80 % CF + 20% *Trichanthera* Meal /duck/day and T3 - 70 % CF + 30% *Trichanthera* Meal /duck/day.

### *Preparation of Supplementation Diet and Laboratory Analysis*

Green *Trichanthera* leaves were gathered using pruning shear. After harvest, the leaves were immediately chopped, dried and offered together with the commercial feeds. The basal diet (Table 1) was the nutritional analysis to contain the recommended nutrients for laying ducks for optimal performance (Berdos et al. 2019 & Diego et al. 2021). The diet was in mash form and was mixed manually.

Dried sample meals of 200g *Trichanthera* were placed in separate zip-lock plastic bags marked and sealed and were sent by courier service to Fast Lab - Mandaue City, Cebu Philippines for proximate analyses.

Treatments	Nutritional Composition						
	Moisture (%)	Crude Protein (%)	Crude Fat (%)	Crude Fiber (%)	Nitrogen-Free Extract (%)	Ash (%)	Metabolizable Energy (Kcal/kg)
T <sub>0</sub>	12.0	18.0	4.0	5.0	53.0	8.00	2800
T <sub>1</sub>	12.2	17.8	3.9	5.3	52.7	8.10	2750
T <sub>2</sub>	12.4	17.6	3.8	5.6	52.4	8.20	2700
T <sub>3</sub>	12.8	17.2	3.6	6.0	52.0	8.40	2650

*Table 1. Nutritional Analysis of Feed Diets.*

### *Data Collection*

To calculate the overall ADG and uniformity, PMD were weighed individually at d 0 (beginning of the research study) and at day 49 (end of the research study). The uniformity of the PMD was determined at the initial and final day of the study. It was calculated by getting the weight of the ducks plus or minus 10% of the mean body weight over the number of ducks weighed multiplied by 100. Total feed offered and feed refusal at the end of each period was also weighed. Additionally, feed refused from the drinkers and feeders were recovered to calculate for overall ADFI. To calculate for overall ADFI of *Trichanthera*, leaves left at the end of the day were weighed. FCR was calculated by dividing ADFI with the egg mass. Egg

mass was calculated by multiplying egg weight by hen-day egg production. Egg composition and egg quality were estimated based on hen-day egg production, albumen height, yolk color score and weight, shell weight and albumen weight. A total of 1789 eggs were collected every 7:00 am Philippine time and weighed to estimate the egg weight. Egg composition and egg quality of PMD was evaluated in the last two weeks (post-peak production) of the study.

*Statistical Analysis*

Data gathered were analyzed using ANOVA of Statistical Tool for Statistical Package for Social Sciences (SPSS). The least-significant differences (LSD) test was used to determine significant differences between treatment means at P-Value = 0.05.

**Results and Discussion**

*Feed Intake and Weights of PMD*

Table 2 presents the performance and feed intake of Philippine Mallard Duck fed with different levels of *Trichantera gigantea* into animal diets compared to a control group fed solely on commercial feeds. The treatments ranged from T0, representing 100% commercial feeds, to T3, comprising 30% *Trichantera gigantea* and 70% commercial feeds. The study revealed a reduction in intake of feed with increasing levels of TG meal inclusion. Although not statistically significant (p-value = 0.10), the finding aligns with Gimenez et al. (2009); Moreno et al. (2009), who found that the high fiber content of TG might reduce total intake of feed. The lower feed intake might possibly be attributed to the TG meal's bulkiness and high fiber content, which could lead to quick fullness in ducks. Berdos et al. (2019) discovered that alternate high-fiber diets can affect feed intake behaviors by increasing gut fullness and slowing passage rates. The incorporation of TG meal in the diet had no significant effect on the overall weight of the ducks across all treatments (p-value = 0.125). This observation is consistent with the results published by Leeson and Summers (2005), who discovered that moderate amounts of alternative feed ingredients had no adverse effect on fowl weight. The maintenance of body weight implies that TG meal has sufficient nutrients to ensure normal growth and development, which agrees with Carbone et al. (2019) nutritional adequacy.

Parameters	Treatments				p-value
	0	1	2	3	
<b>Performance</b>					
ADFI + Trichantera, g/day	633.33	564.33	553.00	524.00	0.010
Egg weight, g	68.87	66.98	67.98	68.95	0.029
Egg mass, g	53.94	51.99	56.69	58.82	0.013
<b>Body Weights</b>					
Initial Weight, g	1498	1465	1580	1605	0.060
Final Weight, g	1587	1498	1435	1369	0.032
Weight Gain, g/day	9.86	8.14	3.40	2.45	0.058

Means within column with dissimilar letter superscripts are significantly different (p<0.05)  
ns Not significant \*\* Significant

*Table 2. Feed Intake and Performance of Mallard duck fed with various levels of Trichantera gigantea meal at different substitution levels*

These findings suggest that the observed changes are not statistically significant, there may still be beneficial in incorporating *Trichantera gigantea* into animal diets. Notably, *Trichantera gigantea* has been recognized for its promising nutritional attributes, which is high in protein and minerals and may improve animal health and production. Sarwatt et al. 2026, highlighted in their work the nutritional value of *Trichantera gigantea* for cattle, as well as its potential advantages in improving PMD growth and its involvement in sustainable agricultural practices.

For instance, Getahon et al. (2025) conducted a thorough evaluation of the nutritional composition and possible advantages of *Trichantera gigantea* as a livestock feed additive, highlighting its high protein content and digestibility. Additionally, Paguaia et al. (2024) found that incorporating *Trichantera gigantea* into animal meals improved growth performance and nutrient utilization. Furthermore, Buragohain, 2016; Getahon et al. 2025 & Shah et al. 2025, investigated the sustainable advantages of using leaf meals supplementation in livestock production, emphasizing its function in lowering reliance on conventional feed sources and promoting environmental sustainability.

*Egg Quality and Performance of Mallard Duck*

Table 3 shows how *Trichantera gigantea* supplementation in PMD diets affects several aspects of egg quality and performance. The results showed that there were significant differences in the height of albumen across treatments, with Treatment 1 (10% TG) having the highest albumen height as well as being significantly different from the treatment fed with commercial feeds alone (p-value = 0.036). The current study's findings are consistent with those of Yalveh et al. 2026; Eisen et al. 1962, who found that dietary treatments, particularly those containing high-protein and high-fiber components, can increase albumen quality in eggs.

The increased albumen height in ducks offered TG diet indicates greater protein consumption and overall egg quality. However, no significant differences were observed in the weight of albumen and yolk showing that moderate quantities of TG meal have no adverse impacts on these parameters.

This finding was confirmed by Gerber 2006; Abebe et al. 2023, who discovered that TG meal is an effective protein source, however it does not significantly affect the weight components of eggs when added at a moderate levels in the diet.

Treatment 2 (20% TG) had the largest egg shell thickness, which was significantly different from the other treatments (p< 0.05). According to Antar et al. 2004; Safaa et al. 2008 & Pelicia et al. 2009 dietary fiber and calcium in TG meal might contribute to firmer eggshells. TG meal's high mineral content most likely contributes to improved shell thickness and stability. Significant differences were found in egg weight, with the control group having the highest egg weight (p< 0.03). This might be attributed to the higher energy content of commercial meals vs TG meal. However, the eggs from the treatments with TG meals fed to ducks met acceptable weight criteria, suggesting that TG meal can be a feasible substitute diet without significantly reducing egg weight.

The proportions of medium, big, and extra-large eggs differed significantly between treatments. Treatment 3 had the largest amount of TG meal and produced the smallest average egg size, indicating that excessive TG inclusion may have an adverse effect on egg size. This discovery raises questions about the processes that relate dietary variables and egg size, which merits additional investigation. Previous research has highlighted the complicated nature of egg size control, which involves age (Ahn et al. 1997), genetics (Bhavisha et al. 2025), nutrients and management (Antar et al. 2024).

Treatment 1 (10% TG) produced considerably more eggs than the other groups, indicating that TG inclusion is ideal for maximum production. This supports the findings of Aquino (1997) and Pizarro et al. (2018), who highlighted the advantages of different diets in improving poultry performance. The increased production rates at 10% TG inclusion may be due to the TG meal's balanced nutritional composition, which increases overall duck health and productivity.

Parameters	Treatments				p-value
	0	1	2	3	
Egg quality and composition					
Height of Albumen, mm	8.36 <sup>b</sup>	8.92 <sup>a</sup>	8.33 <sup>bc</sup>	8.13 <sup>c</sup>	0.036 <sup>ns</sup>
Weight of Albumen, g	41.35	41.22	41.08	41.03	0.096 <sup>ns</sup>
Weight of Yolk, g	24.85	24.33	23.95	23.45	0.253 <sup>ns</sup>
Egg shell thickness (mm)	0.56 <sup>b</sup>	0.64 <sup>a</sup>	0.47 <sup>c</sup>	0.52 <sup>bc</sup>	0.05 <sup>**</sup>
Egg Weight (g)	61.89 <sup>a</sup>	59.59 <sup>ab</sup>	59.40 <sup>b</sup>	57.67 <sup>c</sup>	0.03 <sup>**</sup>
Egg Sizes					
Pewee (40 - 44g)	0.35	0.25	0.10	0.00	0.68 <sup>ns</sup>
Small (50 - 54g)	3.04	3.10	3.85	3.75	0.55 <sup>ns</sup>

Medium (55 - 59g)	28.29	34.65	36.19	33.15	0.43
Large (60 - 64g)	67.35	65.72	66.23	63.98	0.92
Extra-Large (65 - 69g)	31.84	24.15	30.26	28.48	0.80
Jumbo (70g ≤)	0.91	0.20	0.58	0.32	0.37

Means within column with dissimilar letter superscripts are significantly different ( $p < 0.05$ )  
<sup>ns</sup> Not significant \*\* Significant

Table 3. The laying performance of Philippine Mallard Ducks fed with various levels of *Trichanthera gigantea* meal supplementation.

## Conclusion and Implications

The results of this study demonstrate that dietary inclusion of *Trichanthera gigantea* (TG) meal significantly affects egg production performance and egg quality traits in Philippine Mallard ducks. A 10% inclusion level produced the most favorable outcomes in terms of egg production, albumen height, and eggshell thickness, indicating improved internal quality and shell integrity. Conversely, increasing the inclusion level to 20% significantly enhanced egg weight, reflecting greater nutrient utilization and egg mass deposition. These findings confirm that TG meal can be incorporated into duck diets at appropriate levels without compromising productive performance.

From a research and practical standpoint, the study provides evidence that TG meal is a viable alternative feed ingredient with potential nutritional and economic advantages, particularly under Philippine production conditions. Its utilization may reduce dependence on conventional feed resources while maintaining acceptable egg quality and productivity. The results support the adoption of TG meal as a locally available, cost-effective feed component and provide a scientific basis for its inclusion in sustainable duck feeding programs. Further studies may be conducted to evaluate its long-term effects on laying performance and economic efficiency.

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## Competing Interests Statement

The authors have not declared any conflict of interests.

## Data Availability Statement

Data sharing is not applicable to this article as no new data were created or analyzed in this study

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## **Appendices**

No appendices are included in this article.