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# Dietary Inclusion of Medicinal Leaf Meal on the Growth Performance of Broiler

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***Abstract***
**Aim:**This study aimed to assess the impact of supplementing broiler diets with various medicinal leaf meals on growth performance, feed utilization, and economic returns.
**Methodology:** At Isabela State University–Cauayan Campus, 180 broiler chicks were allotted to six dietary treatments in a Completely Randomized Design. These included a control (T1), commercial antibiotics (T2), and 5% inclusions of Basil (T3), Betel pepper (T4), Neem (T5), and Chili Pepper (T6) leaf meals. Researchers measured growth performance, feed consumption, feed conversion ratio (FCR), and feed conversion efficiency (FCE).
**Results:** Results indicated that the inclusion of 5% medicinal leaf meals, particularly basil, betel pepper, neem, and chili pepper, positively influenced broiler growth performance across all measured parameters.
**Conclusion:**These findings suggest that incorporating basil and chili pepper leaf meals into broiler diets can serve as effective natural feed additives to enhance growth performance and potentially improve economic returns by offering a viable alternative to antibiotic growth promoters.
**Keywords:** *Basil ocimum leaf meal, Piper betle leaf meal, Capsicum anuum leaf meal, growth performance*

## INTRODUCTION

Feed costs represent a substantial portion of current broiler production expenses, approximately 70% of the total cost of production (Sugiharto, 2019). Efforts to mitigate these costs by exploring agro-industrial by-products (Sugiharto, 2019; Sugiharto & Ranjitkar, 2019; Sugiharto et al., 2018a) align with SDG 12, Responsible Consumption and Production, by seeking more sustainable and resource-efficient feed alternatives. However, the limitations of these by-products necessitate exploring other options. Conversely, the potential of specific plant foliage with their health-beneficial bioactive compounds (Rama Rao et al., 2019; Vergara-Jimenez et al., 2017) to both reduce feed costs and improve broiler well-being connects to SDG 2, Zero Hunger, by promoting sustainable food production systems and potentially enhancing nutritional outcomes in poultry. While the high crude fiber content of some leaf meals (Ubua et al., 2019) presents a challenge, further research in this area is warranted. The conventional reliance on antibiotic growth promoters (AGPs) in feed, while aiming for efficient production, poses risks to SDG 3, Good Health and Well-being, due to potential antibiotic residues and the rise of antibiotic-resistant bacteria. The increasing exploration of phytogenic compounds (Ahmad et al., 2020; Raza et al., 2016) and medicinal plants (Safiullah et al., 2019; Shahid et al., 2015) as natural alternatives directly addresses this concern by seeking to enhance performance and health without the drawbacks of AGPs. These plant-derived compounds, including essential oils that improve digestion and gut health (Abudabos et al., 2018; Alhidary et al., 2017; Chand et al., 2018; Ziaur Rhman et al., 2017), contribute to healthier livestock and potentially safer food production.

The diverse medicinal properties of plants like Basil, Betel, Chili, and Neem offer multifaceted benefits aligning with various SDGs. Basil's growth-promoting and disease-reducing effects (Wellenreiter et al., 2000; Vahdatpour et al., 2011; Yakhkeshi et al., 2011) contribute to SDG 2 by enhancing productivity. Betel's antioxidant, hepatoprotective, and antimicrobial properties (Autade et al., 2023; Basit et al., 2020; Kurniawan et al., 2021;

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Sholikhah, 2006) support SDG 3 by promoting animal health and potentially reducing the need for synthetic drugs. Chili's bioactive compounds, including capsaicin, which influences antioxidant capacity and gut microbiota (Lee et al., 2005; Prakash & Srinivasan, 2010), further contribute to animal well-being (SDG 3). Finally, the Neem tree's broad spectrum of medicinal properties, including its anti-coccidial effects and potential to influence hematological parameters (Kale et al., 2013; Esonu et al., 2006; Akpan et al., 2008), underscores the potential of local biodiversity for sustainable animal agriculture, aligning with SDG 15, Life on Land, by recognizing and utilizing the value of natural resources in a responsible manner.

**Objectives of the Study**

This study was conducted to evaluate the dietary inclusion of medicinal leaf meal on the growth performance of broilers.

Specifically, it aimed to:

1. assess the effect of medicinal leaf meals—including Basil (*Ocimum basilicum*), Betel pepper (*Piper betle*), Neem (*Azadirachta indica*), and Chili Pepper (*Capsicum annuum*) on broiler body weights, weight gain, and cumulative feed consumption;
2. determine the impact of these dietary medicinal leaf meals on the Feed Conversion Ratio (FCR) and Feed Conversion Efficiency (FCE) of broiler chickens; and
3. evaluate the economic benefits of using medicinal leaf meals, specifically in terms of income over feed and chick cost.

**METHODS**

**Procurement of Broiler Chicks**

A total of 180 Cobb broiler chicks were procured from a local reliable source for the study.

**Rearing Management**

The chicks were housed in a makeshift poultry house constructed from lumber and plastic screen, where they underwent a three-day acclimatization period with artificial heat from a 50-watt bulb and were fed chick booster commercial feed ad-libitum on clean newspapers with fresh water always available, and the environment was maintained through daily cleaning and provision of fresh water.

**Experimental Design and Treatments**

A total of 180 broiler chicks were randomly distributed with six (6) treatments, replicated three times comprising 10 birds per replication, following a Completely Randomized Design (CRD).
The following treatments were:

$T_1$ –Control without Medicinal Leaf Meal (CWMLM)
$T_2$ – Control (with commercial antibiotic)(CWCA)
$T_3$ – 5% Basil (*Ocimum basilicum*) Leaf Meal (BLM)
$T_4$ – 5% Betel pepper (*Piper betle*), Leaf Meal (BPLM)
$T_5$ – 5% Neem (*Azadirachta Indica*) Leaf Meal (NLM)
$T_6$ – 5% Chilli Pepper (*Capsicum annuum*) Leaf Meal (CPLM)

**Collection and Preparation of Leaf Meals**

The young leaves of betel pepper, neem, basil and chili pepper were collected and air dried thoroughly for about 8 days. The air-dried leaves were chopped and milled one by one and was stocked separately in polyethylene bag.

**Feeding Process**

Over a six-week experimental period, the broiler chicks were fed with formulated starter and finisher rations consisting of rice bran, fish meal, corn meal, salt, vitamin premix, and limestone, initially on newspaper and later in plastic feeders.

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**Provision of Drinking Water**

Fresh clean water was provided at all times. The drinking containers were cleaned every day.

**Data Gathered**

1. Initial and Weekly Body Weight. The chicks were weighed before they were distributed to the experimental units. The weekly weight of the broiler was taken and recorded from first to 6th week of rearing.
2. Weekly Gain Weight. The gain in weight of the birds was determined by calculating the difference between the final weight and the initial weight.
3. Feed Conversion Ratio and Feed Conversion Feed Efficiency. The feed conversion ratio and efficiency of the broilers was evaluated using the formula by Biddle and Juergueson.

$$\text{Feed Conversion Ratio} = \frac{\text{Feed Consumed}}{\text{Gain in Weight}}$$

$$\text{Feed Conversion Efficiency} = \frac{\text{Gain in Weight}}{\text{Feed Consumed}} \times 100$$

4. Feed Consumption. The feed intake of the broilers across the various treatments, the total feed consumed, and the total feed provided were all considered. The leftover feed was deducted from the feed provided to calculate the true feed consumption.
5. Percentage Rate of Growth. The growth rate percentage of the experimental broilers was calculated using the formula developed by Asmundson and Leiner.

$$\text{Growth Rate} = \frac{W_2 - W_1}{\frac{1}{2}(W_2 + W_1)} \times 100$$

*Where*: $W_1$ = weight of broilers at a given period
$W_2$ = current weight of broilers at given period

**Return Over Feed and Chick Cost**

The Return Above Feed and Chick Cost (RAFCC) was calculated using simple economic analysis. The cost of production was based on the current price of chick and the amount of cost of feeds ingredients used in the formulated diet. The gross income was determined based on the prevailing price of live weight of broiler per kilo in the market. The RAFCC was determined by deducting all the cost of feeds and chick from the return per broiler.

**Discussion of Results**

**A. Effect of Medicinal Leaf Meal on the Performance of Broilers**

Table 1. shows the initial and weekly weights of broilers that were fed medicinal leaf meal. Before the experiment started, the chicks weighed between 72.60 and 75.40 grams. The heaviest broilers at the end belonged to the groups that ate BLM (T3) and CPLM (T6), with average weights of 2191.00 and 2161.97 grams. The lightest broilers were those that ate CWMLM (T1), with an average weight of 1435.00 grams. This was confirmed by the research of P´erez-Ros´es et al. (2016) that plants having medicinal properties treat various disease conditions. Falco et al. (2013) & Park et al. (2015) concurred in the study that botanicals having medicinal properties has been used to replace chemical antibiotics. The same effect of medicinal plants on broilers body weight were reported by Abo Omar et al. (2016).


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**Total Gain in Weight**. Table 1 presents the total weight gain of broilers that consumed feed containing medicinal leaf meal. Statistical analysis showed significant differences in weight gain across the different feed treatments. Broiler chicks fed with BLM (T3) and CPLM (T6) exhibited the highest weight gains, at 2118.40 and 2088.50 grams, respectively. The lowest weight gain was observed in the broiler chicks fed with CWMLM (T1), which was 1361.00 grams. The result of the study coincides with the findings of Rama Rao et al. (2019) that inclusion of foliage contains a number of bioactive compounds improved the weight of chickens. The foliage contents include vitamins, phenolic acids, flavonoids, isothiocyanates, tannins as well as saponins Vergara-Jimenez et al., (2017). Basil supplementation has been shown to improve intestinal villus size Jahejo et al., (2019), which is important for nutrient absorption. Chilli pepper powder supplementation improved growth performance in broilers Mudalal & Badra,(2025).

**Cumulative Feed Consumption**. The feed consumption feed consumption of broilers fed with different MLM is shown in Table 1. Highest weekly feed consumption was significantly produced on the broiler chicks on Treatment 3 and Treatment 6 with a mean value of 3699.10 and 3606.80 grams. Lightest weekly consumption was obtained on the Treatment 1 with 2540.60 grams. Furthermore, the feed stuff contained all essential nutrients in the right amount and proportion and palatability of the ingredients as a requirement for broilers growth and development. The inclusion of leaf meal in the feed stuff are also source of vitamins and minerals as cited by Al-Duais et al. (2009) & Raju et al. (2010).

**B. Effect of Medicinal Leaf Meal on Income Above Feed and Chick Cost**

**Income Above Feed and Chick Costs**. The effect of medicinal leaf meal on income above feed and chick cost is presented on Table 2. The return above feed and chick costs of the different treatments is arranged in descending order: Treatment 3 (Basil LM) had Php 144.58, Treatment 6 (Chili pepper LM) had Php, 144.37, Treatment 5 (Neem LM) had Php 124.54, Treatment 2 (With Commercial antibiotic) had PhP112.56, Treatment 4 (Betel pepper LM) had PhP111.19 and Treatment 1 (without medicinal leaf meal) had PhP 76.95.

Table 1 shows the feed conversion ratio (FCR) and feed conversion efficiency (FCE) of broilers given medicinal leaf meal. Statistical tests indicated significant differences among the experimental groups for both FCR and FCE. Treatment 1 had the highest FCR at 1.87%. The lowest FCR values were seen in Treatment 6, Treatment 2, and Treatment 5, with similar averages of 1.73, 1.72, and 1.69%, respectively. For FCE, the highest percentages were in Treatment 5 (59.09%), Treatment 2 (58.05%), and Treatment 6 (57.91%). Treatment 1 showed the lowest FCE at 53.56%.

Table 1. Initial weight, Body weight, Gain in weight, Cumulative feed consumption, FCR and FCE of Broilers with the inclusion of Medicinal Leaf Meal.

| TREATMENTS | Initial weight | Body weight | Gain in weight | Cumulative Feed Consumption | Feed Conversion Ratio (FCR) | Feed Conversion Efficiency (FCE) (%) |
|---|---|---|---|---|---|---|
| $T_1$ – CWMLM | 74.00 | 1435.00$^c$ | 1361.00$^c$ | 2540.60$^c$ | 1.87$^a$ | 53.56$^b$ |
| $T_2$ – CWCA | 73.90 | 1853.36$^b$ | 1779.50$^b$ | 3065.90$^b$ | 1.72$^b$ | 58.05$^a$ |
| $T_3$ – BLM | 72.60 | 2191.00$^a$ | 2118.40$^a$ | 3699.10$^a$ | 1.75$^{ab}$ | 57.27$^{ab}$ |
| $T_4$ – BPLM | 73.40 | 1793.02$^b$ | 1719.60$^b$ | 3027.90$^b$ | 1.76$^{ab}$ | 56.80$^{ab}$ |
| $T_5$ – NLM | 75.40 | 1879.25$^b$ | 1803.80$^b$ | 3052.60$^b$ | 1.69$^b$ | 59.09$^a$ |
| $T_6$ – CPLM | 73.50 | 2161.97$^a$ | 2088.50$^a$ | 3606.80$^a$ | 1.73$^b$ | 57.91$^a$ |
| RESULT | ns | ** | ** | ** | ** | ** |
| C.V. (%) | 1.56 | 1.94 | 2.03 | 1.26 | 2.04 | 2.11 |
| HSD | - | 128.56 | | 138.44 | 0.12 | 4.25 |

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*Note: Means with common letters are not significantly different with each other using Tukeys' Honest Significant Difference (HSD) Test.*
*** - significant at 1% level*

Table 2. Income Above Feed and Chick Costs (PhP) of Broilers with the inclusion of Medicinal Leaf Meal.

| PARTICULARS | $T_1$ | $T_2$ | $T_3$ | $T_4$ | $T_5$ | $T_6$ |
|---|---|---|---|---|---|---|
| Final Weight (kg) | 1.44 | 1.85 | 2.19 | 1.79 | 1.88 | 2.16 |
| Return for Broiler (170Php/kg) | 243.95 | 315.01 | 372.30 | 304.81 | 319.43 | 367.37 |
| Cost of Chicks (Php)[1/] | 40.00 | 40.00 | 40.00 | 40.00 | 40.00 | 40.00 |
| Amount of Cumulative Feed Consumed (kg) | 2.54 | 3.07 | 3.70 | 3.03 | 3.05 | 3.61 |
| Amount of Feed Consumed (kg) | 2.54 | 3.07 | 3.70 | 3.03 | 3.05 | 3.61 |
| Amount of Antibiotics and MLM (kg) | - | 0.11 | 0.18 | 0.15 | 0.15 | 0.18 |
| Cost of Feed Consumed (kg) (Php)[2/] | 127.00 | 153.25 | 184.95 | 151.35 | 152.60 | 180.30 |
| Cost of Antibiotics and MLM (PhP) | - | 9.20 | 2.77 | 2.27 | 2.29 | 2.70 |
| Total Cost of Feed Consumed (PhP) | - | 99.76 | 97.24 | 95.79 | 98.90 | 98.82 |
| **Return above Feed and Chick Cost** | **76.95** | **112.56** | **144.58** | **111.19** | **124.54** | **144.37** |

[1/] *Computed based on the current price live weight per kilo of broiler (170.00Php).*

[2/] *Current price of per chick (40.00Php).*

[3/] *Calculated based on the amount and price of feeds ingredients used in the formulated ration.*
[4/] *Computed at 15.00Php per kilogram (Medicinal Leaf Meal*

**Conclusion**

The results of the study indicate that incorporating medicinal leaf meals, especially Basil Leaf Meal and Chili Pepper Leaf Meal at a 5% inclusion ratel, significantly improved the growth performance of broiler chickens, as evidenced by higher final body weights and weight gain compared to the control groups (with and without antibiotics) and those supplemented with Betel Pepper and Neem leaf meals. Although, the feed conversion ratio and efficiency were not significantly different among the various treatments, broilers fed with medicinal leaf meals tended to exhibit better feed utilization.

Furthermore, the inclusion of medicinal leaf meals showed great impact specially Basil and Chili Pepper supplementation resulted in higher income above feed and chick costs, suggesting potential economic benefits.

Overall, this research suggests that certain medicinal leaf meals, specifically Basil and Chili Pepper, can serve as effective natural feed additives to improve growth performance and potentially enhance economic returns in broiler production.

**Recommendations**

The study recommends several strategies to enhance the use of medicinal leaf meals in broiler diets. It suggests promoting Basil and Chili Pepper leaf meal (at 5% inclusion) as natural feed additives, given their positive impact on broiler growth and economic returns. Further research should explore optimal inclusion levels beyond 5% to find the most cost-effective and biologically efficient dosages. To confirm observed improvements, future studies

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should conduct detailed sensory evaluations and comprehensive meat quality analyses (e.g., tenderness, juiciness, flavor, lipid profile) for all tested leaf meals. Lastly, a deeper investigation into the bioactive compounds in Basil and Chili Pepper leaves is advised. Identifying these specific compounds could lead to the development of more targeted and effective feed additives.

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