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Growth Performance of Broilers Fed Diet with Pelleted Phytobiotic Feeds

Jennifer T. Manibog[1], **Mark Joker L. Marcos**[2]
Department of Agriculture-Philippine Carabao Center, Cagayan, Philippines [1]
Isabela State University, Echague, Isabela, 3309, Philippines [2]
manibogjennifer322@gmail.com

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ABSTRACT

To evaluate the effect of pelleted phytobiotic feeds on the growth performance of broilers, 150 – day old broilers were divided into five groups and assigned to one of the five treatments with 0%, 2% commercial antibiotics, and each 5% of lagundi, oregano, and guava leaf meal following the Completely Randomized Design. Based on the result of the study, the use of pelleted phytobiotics as feedstuff for broiler chicken has no significant effect on their growth performance in terms of body weight, weight gain, percentage rate of growth, feed consumption, feed conversion ratio, and efficiency. In addition, the broilers fed with pelleted phytobiotic feeds with 5% guava leaf meal produced the highest return of investment; hence, it is recommended and can be safely used as feed ingredients to the broilers without any deleterious effect on the growth performance. Further study should also be done on the histopathological effects of phytobiotics on the gut of the broiler.

Keywords: *feed conversion ratio, growth performance, pellet feeds, phytobiotics, broilers*

Introduction

There are several reasons today that can cause infections in the Philippines' chicken industries. The performance of the chicken, particularly in broiler, breeding, growth rate, food conversion, and meat/egg production, is affected by old techniques that have a high disease-inducing rate. Although three primary factors might cause the poultry system to become unwell, one infection agent is living organisms that cause diseases and illnesses, such as germs, external and internal parasites, and other pathogens. Second, there are environmental factors such as extreme temperature, physical stress, poor air quality, and injuries. Moreover, extreme physical stress might weaken the body's ability to fight off diseases brought by inadequate shelter and tainted food and water supplies.

In addition, plant products have been used for centuries by humans as food and medicine. Natural medicinal products originating from herbs and spices have also been used as feed additives for farm animals to improve the performance of agricultural livestock (Fallah et al., 2013).

Growth promoters are the substances that are added to a nutritionally balanced diet and elicit response towards the exploitation of maximum genetic potential of the broiler, in terms of growth as well as improvement in feed conversion efficiency. The use of growth promoters has been accepted in the broiler industry and they are usually

included in feeds in minimal quantities. Many antibiotics are used in animal and poultry feeds as growth promoters to improve the health and well-being of animals and as prophylactic agents for promoting growth (Bampidis et al., 2005).

Phytobiotics have been used because of their preservative as well as medicinal properties along with the characteristic of imparting aroma as well as flavor to food. Nowadays, natural products obtained from plants and fungi are gaining the interest of consumers as natural additives (Toghyani et al., 2010). Compared with antibiotics or inorganic chemicals, these plant-derived products have proven to be natural, less toxic, and are thought to be the ideal feed additives in the feed of poultry.

Hence, this was conducted to evaluate the growth performance of broiler chicken fed with pelleted phytobiotics feeds in terms of their body weight, gain in weight, feed consumption, feed conversion ratio, and efficiency (FCR/FCE), growth rate, dressing percentage with and without giblets, and return over feed and chick cost to determine economic profitability.

Methods

The experimental procedure used in this feeding trial was approved by the Central Graduate School, Isabela State University, Echague Isabela, and was deemed compliant with the recommended guidelines and protocols.

A total of 150-day-old broiler chicks of a commercial meat-type strain were purchased from Santiago City, Isabela where they have been vaccinated against Newcastle disease. The experimental birds were assigned to five treatments: 0% (control), 2% commercial antibiotics, and 5% each of lagundi, oregano, and guava leaf meal. Each treatment was replicated three times with 10 broilers per replication, following a Completely Randomized Design.

The broiler chicks were kept for five days and brooding temperatures were maintained. Ideal light was provided daily throughout the experimental period. The chicks were brooded at 31 to 35°C during the first week and thereafter; the temperature was reduced by 3°C every week until the temperature reached 26°C.

Furthermore, relatively young leaves of phytobiotic leaves were collected within the vicinity of San Agustin, Isabela. The fresh leaves were detached from the vines and were air-dried separately in a well-ventilated room for five days until they could be milled to powder form. The dried leaves were milled using a hammer mill with a sieve size of 2mm to produce leaf meal, which was incorporated into diets. This was mixed with other basal feed ingredients to make a formulated ratio based on the nutritional requirements for broiler-type chicken based on the Feed Reference Standards for Broilers (Philippine Society of Animal Nutritionists, 2003).

In addition, five isonitrogenous (20 % crude protein) and isocaloric (metabolized energy (kcal) of 2811.96 to 2824.80) experimental diets were formulated incorporating the commercial antibiotic, phytobiotic leaf meal, and the without leaf meal. The feed ingredients used were corn meal, rice bran, fish meal, and salt, vitamins, and limestone which were purchased at Santiago Luzon Trading Inc. The formulated ration was used for a period of time until it reached the slaughter weight. For the first week, the feed was placed in an old newspaper. For the rest of the experimental period, it was placed in an automatic plastic feeder. Water and feed were provided. Husbandry management practices were carried out according to regular practice. The broilers were raised on a confinement system and each cage measured 1.0m by 1.0m and was made up of lumber and Amazon screen and supplied by 25 watts incandescent bulb at 24h light regimen.

Throughout the experimental period, recorded air temperature was maintained at 21.4˚C to 27. 1˚C. The relative humidity during the month ranged from 87% to 97%, measured between 8:00 AM and 2:00 PM, while the average rainfall was 7.4 millimeters (mm) per second, based on data from the Agrometeorology Station of Isabela State University, Echague, Isabela. All the birds appeared generally healthy and strong, as indicated by their active movement and clean feathers. Development of comb and wattles was similar among birds in all treatment groups, and feathering was completed on the third week of the study. Pigmentation of skin and shank was similar in all treatments. Two birds from each replicate were slaughtered to calculate the dressing percentage as per standard procedure.

The growth performance of the broiler chicken was evaluated in terms of weekly body weight and feed consumption. The gain in weight, feed conversion ratio and efficiency (FCR/FCE), percentage rate of growth, and dressing percentage with and without giblets were also determined and the income above feed cost was calculated

to determine the economic profitability.

All data gathered were subjected to Analysis of Variance of a Completely Randomized Design and the comparison of treatment means was done using the Least Significant Difference (LSD) Test. Analysis was carried out using the Statistical Tool for Agricultural Research (STAR).

Results and Discussion

Body Weight

This section presents the broilers' initial weekly body weight. A key element in evaluating broiler chicken productivity is growth performance. Table 1 displays the experimental broiler chickens' initial and weekly body weights. The broilers' starting body weights showed no discernible variations. The experimental broilers' initial body weight ranges from 102.33 grams to 101.52 grams on average. The non-significant finding shows that the experimental units were homogeneous or uniform.

Likewise, no significant difference between the treatment means was observed on the first, second, third, fourth, and sixth weeks of the trial. However, in the fifth week of the trial, broilers fed with phytobiotic diets showed a substantial difference. The broilers fed with pelleted phytobiotics of 5% grams had the lowest body weight, with a mean value of 1512.50 grams, while Treatment 2, which was supplemented with antibiotics, obtained the maximum body weight of 1578.00 grams.

However, it is noteworthy that the inclusion of 5% pelleted phytobiotic meals had an impact on body weight as indicated by the numerical advantage of the treated broilers in the study. The treated birds' numerical advantage demonstrates the possibility of local feed resources as an alternate growth booster and antimicrobial.

Table 1. Initial and Weekly Body Weight (g) of Broiler Chicken Fed with Pelleted Phytobiotics Feeds

Treatments	Weekly Body Weight (g)						
	Initial	First	Second	Third	Fourth	Fifth	Sixth
T1	102.33	345.30	630.50	980.07	1112.91	1512.50^{ab}	1719.69
T2	102.33	359.50	630.00	982.83	1146.83	1578.00^{a}	1791.67
T3	102.33	343.33	634.61	931.30	1023.11	1434.91^{b}	1672.94
T4	102.33	349.17	624.5	938.96	1069.15	1469.33^{b}	1680.13
T5	102.33	349.67	621.5	971	1121.83	1514.00^{ab}	1721.67
ANOVA	ns	ns	ns	ns	ns	**	ns
C.V	0.2821	2.15	2.37	3.63	4.57	3.17	3.76
LSD 0.01						86.73	

Note: Means with common letters shown are not significantly different.
ns = not significant
*** = highly significant at 1% level*

Gain in Weight

Table 2 displays the weekly and annual weight gains for broiler-fed diets with pelleted phytobiotic feeds. From the first week until the completion of the trial, no discernible variations were observed in the weight growth of the broiler chickens. Even though broiler weight gain was not appreciably increased, phytogenic substances may specifically improve the functions of digestive juices and nutritional absorption.

On the other hand, the broilers' overall weight gain, which ranged from 1570.60 grams to 1619.33 grams on average, did not significantly differ between treatments.

Table 2. Gain in Weight (g) of Broiler Chicken Fed with Pelleted Phytobiotics Feeds

Treatments	Weekly and Total Gain in Weight (g)						
	First	Second	Third	Fourth	Fifth	Sixth	Total
T1	242.97	387.53	592.53	483.47	1013.96	705.73	1617.35
T2	257.17	372.83	610.00	536.83	1041.17	750.5	1689.33
T3	241.00	384.48	546.81	476.30	958.61	714.33	1570.61
T4	246.83	377.67	561.30	507.85	961.48	718.65	1577.80
T5	247.33	374.17	596.83	525.00	989.00	732.67	1619.33
ANOVA	ns	ns	ns	ns	ns	ns	ns
C.V	3.09	4.08	4.82	8.7	4.64	7.98	3.99

ns- not significant

Feed Consumption

Table 3 displays the broilers' weekly feed consumption. With mean values ranging from 226.33 grams to 575.33 grams, broilers fed with pelleted phytobiotic feeds showed no discernible change in feed consumption.

The total amount of feed consumed also did not differ significantly. In terms of weight, the broiler in Treatment 2 consumed 3,145.50 grams of feeds, while Treatment 3 (5% lagundi) had the lowest mean value at 3042.83 grams. The outcome suggested that feed consumption was impacted by diets in all groups, whether they contained phytobiotics or not. The lower feed intake could be that the leaf meal imparted an unpalatable taste to the feed, which consequently inhibited the birds from consuming adequate quantities, and this was also observed by Iheukwumere et al. (2008). The findings of the study agree with the literature that monogastric cannot fully utilize high crude fiber diets efficiently.

Table 3. Weekly and Cumulative Feed Consumption of Broiler Chicken Fed with Pelleted Phytobiotics Feeds

Treatments	Weekly and Cumulative Feed Consumption (g)						
	First	Second	Third	Fourth	Fifth	Sixth	Cumulative
T1	231.83	393.67	661.02	673.37	566.85	591.94	3118.69
T2	229.67	410.46	672.39	672.04	565.26	595.69	3145.50
T3	226.33	395	651.33	648.5	545.83	575.83	3042.83
T4	238.33	395.87	656.67	658.00	550.00	575.33	3074.20
T5	229.33	394	674.50	669.19	566.85	592.93	3126.80
ANOVA	ns	ns	ns	ns	ns	ns	ns
C.V	1.83	2.97	4.9	4.347	4.81	4.65	3.76

ns-not significant

Percentage Rate of Growth

Table 4 displays the broilers' weekly growth rate. Except for the third week of the trial, when a significant result was seen, there was no significant difference in the percentage rate of growth of the broilers fed with pelleted phytobiotic feeds. In terms of growth rate, the broilers in the T5 acquired the greatest result (43.88 a), followed by T2 (43.73 a), and T1 (43.39 a). The broiler growth rate resulted in the expected pattern of descending order, peaking in the first week and then steadily declining for the duration of the trial. The decreasing pattern of growth rate follows the standard growth rate pattern in broiler chickens under intensive systems of management with high growth rates during the first two weeks and gradually decreases towards maturity. The result of this study is similar to the findings of Reyes (2005) that the growth rate diminishes as chickens grow older.

Table 4. Weekly Rate of Growth (%) of Broiler Chicken Fed with Pelleted Phytobiotic Feeds

Treatments	Percentage Rate of Growth (%)					
	First	Second	Third	Fourth	Fifth	Sixth
T1	77.5	58.49	43.39a	12.71	30.41	12.84
T2	80.93	54.63	43.73a	15.43	31.64	12.71
T3	77.06	59.54	37.86b	9.21	33.69	15.22
T4	78.5	56.54	40.18ab	12.94	31.55	13.37
T5	78.61	55.98	43.88a	14.42	29.75	12.83
ANOVA	ns	ns	**	ns	ns	ns
C.V	2.42	5.21	5.09	22.52	10.62	17.17
LSD 0.01			3.86			

Note: Means with common letters shown are not significantly different.
ns = not significant
*** = highly significant at 1% level*

Feed Conversion Ratio and Efficiency

Table 5 displays the results of the feed conversion ratio and the effectiveness of the birds under varied conditions. The feed conversion ratio of the broilers showed no significant change, according to the results. The findings demonstrated that each treatment consumed statistically the same amount of feeds to create a kilogram of weight growth; the mean varied from 1.86 to 1.95 kilograms. The efficiency of feed conversion also followed the same pattern.

The results showed that statistically speaking, all of the four treatments had feed efficiency values ranging from 51.33% to 53.84%. According to the study by Alagawany et al. (2018), using oregano extracts in poultry diets improved feed intake and feed conversion efficiency, improved digestion and expanded productive performance, decreased disease incidence, and reduced economic losses. The results are not consistent with this. The measured feed efficiency and feed conversion ratio showed the potential of local feed resources as an alternative feed and as an antibiotic replacement that improves the vigor and viability of broiler chicken.

Table 5. Feed Conversion Ratio and Efficiency of Broiler Chicken Fed with Pelleted Phytobiotic Feeds

Treatment	Feed Conversion Ratio	Feed Conversion Efficiency (%)
T1	1.93	51.96
T2	1.86	53.84
T3	1.94	51.64
T4	1.95	51.33
T5	1.93	51.84
ANOVA	ns	ns
C.V.%	6.23	6.27

ns-not significant

Dressing Percentage with and without Giblets

Economic returns improve with larger dressing percentages, which is a characteristic of economic significance. Table 6 displays the dressing percentage with and without giblets weights. The percentage of giblets dressed, which varied from 76.85 to 81.18 percent, did not significantly differ across treatments.

The percentage of dressing without giblets, which ranged from 57.80 to 61.91 percent, also yielded non-significant findings. The findings of the current study are consistent with those found by Sultana (2014), who found

that adding neem, nishyinda (*Vitex negundo*), and turmeric to broilers' diets had no discernible impact on the dressing percentage values of the birds. This finding suggests that adding 5% of LLM, OLM, and GLM as feed ingredients to the diet is safe and will not have a negative impact on the broiler's performance.

Table 6. Dressing Percentage with and without Giblets for Broiler Chicken Fed with Pelleted Phytobiotics Feeds

Treatment	Dressing Percentage with Giblet (%)	Dressing Percentage without Giblet (%)
T1	77.91	58.84
T2	81.18	61.91
T3	76.85	57.80
T4	77.75	58.47
T5	78.75	59.37
ANOVA	ns	ns
C.V.%	2.52	2.62

ns- not significant

Income over Feed and Chick Costs

Table 7 shows the surplus over feed and chick costs. The income was calculated using the broiler's final weight multiplied by their current price of Php140.00 per live weight, less the feed, day-old chick, and leaf meal of lagundi, oregano, and guava expenditures. The return above feed cost for each treatment is as follows, from highest to lowest: T5 = Php84.77, T4 = Php81.80, T3 = Php80.63, T2 = Php74.50, and T1 = Php74.11. The calculated income from broilers given a diet including 5% oregano, guava, and lagundi leaf meals can lower feed costs and give non-conventional feedstuffs that are typically discarded an economic value.

Table 7. Income over Feed and Chick Costs

Item	Treatments				
	T1	T2	T3	T4	T5
Final Weight per Broiler	1.91	1.99	1.86	1.87	1.91
Price of Broiler (PHP)	267.40	278.60	260.40	261.80	267.40
Amount of Booster Feeds Comsumed (Kg)	0.16	0.16	0.16	0.16	0.16
Amount of Starter Feeds Comsumed (Kg)	1.84	1.88	1.83	1.84	1.85
Amount of Finisher Feeds Comsumed (Kg)	2.62	2.62	2.53	2.55	2.61
Cost of the Feeds per Kg (Booster)[2]	45.00	45.00	45.00	45.00	45.00
Cost of the Feeds per Kg (Starter)[2]	33.00	35.00	31.00	31.00	31.00
Cost of the Feeds per Kg (Finisher)[2]	29.00	33.00	28.00	28.00	28.00
Price of Booster Feed Consumption (PHP)	7.20	7.20	7.20	7.20	7.20
Price of Starter Feed Consumption (PHP)	60.72	65.80	56.73	57.04	57.35
Price of Finisher Feed Consumption (PHP)	79.98	86.49	70.84	71.40	73.08
Price of Day-Old Chicks	45.00	45.00	45.00	45.00	45.00
Total Cost of Feed Consumed (PHP)	192.9	204.49	179.77	180	182.63
Return Above Feeds (PHP)	**74.50**	**74.11**	**80.63**	**81.80**	**84.77**

[1]Computed based on the current price of broiler at 140/kg live weight.
[2]Computed based on the prevailing price of each ingredient.

Conclusion and Future Works

The dietary supplementation of pelleted phytobiotic feeds on the diet of the broiler chicken can improve the growth performance in terms of their body weight, gain in weight, percentage rate of growth, dressing percentage, and efficient feed converter. In addition, the broilers fed with pelleted phytobiotic feeds with 5% guava leaf meal produced the highest return of PhP 84.77, hence, it is recommended and can be safely used as feed ingredients to the broilers without any deleterious effect on the growth performance. Further study should also be done on the histopathological effects of phytobiotics on the gut of the broiler.

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Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.