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Original Article

Feeding performance of broiler chicken fed diets with varying levels of pinto peanut *(Arachis pintoi)* leaf meal

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ABSTRACT

To evaluate the effect of pinto peanut leaf meal (PPLM) on the growth performance of broilers, 120-day old broiler Cobb 500 were divided to 4 groups and assigned to one of the 4 treatments with 0, 3, 6 and 9% PPLM following Completely Randomized Design. Significant ($P< 0.05$) results were obtained in terms of broilers' body weight on the 4th up to 6th weeks of the study, gain in weight, feed consumption, feed conversion ratio and efficiency (FCR and FCE). Treated birds with PPLM as fed diet were the most efficient feed converter and have the potential to increase rapid growth and improve vitality and livability of broiler chickens. Percentage rate of growth and dressing percentage with and without giblets were revealed to be insignificant. No statistical differences on the liver and pancreas weight were observed which indicates that there were no serious toxicity problems with the test diet. The Red Blood Cells (RBCs) analysis of the broiler chickens fed with PPLM was not significant across the treatments which fall within the normal range. In terms of the return over feed and chick cost, the broilers fed diet with 6% PPLM (T_3) produced the highest return amounting to PhP 79.17 per broiler, followed by the use of 9% PPLM (T_4), amounting to PhP 44.86 and followed by 3% PPLM (T_2) gaining PhP 39.50. The study suggested that PPLM at 6% inclusion can safely be used as feed ingredients to the broilers without any deleterious effect on the growth performance of broilers.

KEYWORDS: *Broiler, Growth Performance, Leaf Meal, Pinto Peanut*

1 INTRODUCTION

Poultry farming has been constantly increasing over the past decades due to high demand for nutritional supply and as a means to increase income among the inhabitants. Poultry is one of the most efficient and effective means of supplying protein requirements in the society in the form of meat and egg.

High cost of commercial feeds and feed ingredients is one of the major problems in livestock production. Feed additives have been used widely in the poultry industry for a long time as a tool to increase animal's performance. About 80% of domestic animals have been fed synthetic compounds for the purpose of either medication or growth promotion (Lee *et al.,* 2001). The use of locally available feed ingredients can be of help to address the ever-increasing price of commercial feeds. Plant leaf meal found in the locality can be used for poultry production since poultry are natural scavengers and they can utilize leaf and use for their diets. These leaf meals when supplemented to poultry diets can play a role in supporting both performance and health status of the animal (Manzanilla *et al.,* 2001).

Broiler production plays an important role in augmenting income of raisers. Nevertheless, the income or profit derived from broilers production depends upon the feed cost inputs of the use of commercial feeds aggravates the price per kilo of broiler produced.

One of the challenges of tropical pastoral ecosystems is to source out of high-protein or nitrogen-rich sources of forage within the plant community. Fresh pinto peanut forage has a protein content ranging from 18 to 25 % DM as many authors reported, Ferreira *et al.,* (2012), Silva *et al.,* (2010), Hess *et al.,* (2003), Ladeira *et al.,* (2002) Khamseekhiew *et al.*, (2001). Protein-rich feed ingredients are the costliest components of a complete livestock feed ration.

Pinto peanut is favourable due to its innate ability to fix nitrogen from the atmosphere, adaptability to a wide range of environmental conditions, persistence due to a strong root system, seeding ability, and no twining growth characteristic. It is valuable forage, easy to establish, persistent, and combines well in mixtures under a wide range of climate and soil conditions, including heavy grazing (Khamseekhiew *et al.,* 2001).

The utilization of pinto peanuts as addition to the feeds of broiler chicken at the different levels/ percentage of mixture were studied to gain a more commonly used feed supplement in the poultry production. Several studies were conducted on ruminants using this plant protein source as animal feed. However, published articles regarding the utilization of

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this plant protein source in broiler chicken diet was limited. Hence, this was conducted to evaluate the growth performance of broiler chicken fed with different levels of mixture pinto peanut leaf meal in terms of the body weight, gain in weight, and feed consumption, feed conversion ratio and efficiency (FCR/FCE), growth rate, dressing percentage with and without giblets, liver and pancreas weight, red blood cells count and return over feed and chick cost to determine the economic profitability.

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2 MATERIALS AND METHODS

The experimental procedures used in this feeding trial were approved by the Department of Animal Science and Animal Husbandry, College of Agriculture and the Research Department, Isabela State University, Echague Isabela and were in compliance with recommended guidelines and protocols.

A total of 120-day-old broiler chicks of a commercial meat-type strain (Cobb 500) were purchased from Santiago City, Isabela where they have been vaccinated against Newcastle disease. The experimental birds were allotted into four (4) treatments which contained 0, 3, 6 and 9% Pinto Peanut Leaf Meal (PPLM) and replicated thrice with 10 birds per replication following the completely randomized design.

The broiler chicks were kept for 5 days and brooding temperatures were maintained. Ideal light was provided daily throughout the experimental period. The chicks were brooded at 31 - 35°C during the first week and thereafter; the temperature was reduced by 3°C every week until the temperature reached at 26°C.

Relatively young leaves of pinto peanuts were collected within the vicinity of Echague, Isabela. The fresh leaves were detached from the vines and were air dried separately in a well-ventilated room for 5 days until they can 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 ration based on the nutritional requirements for broiler- type chicken based on the Feed Reference Standards for Broilers, Philippine Society of Animal Nutritionist (PhilSAN, 2003).

Four isonitrogenous (20 % crude protein) and isocaloric (metabolized energy (kcal) of 2807.96 to 2866.96) experimental diets were formulated incorporating the different levels of PPLM and the without PPLM (Table 1). 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

Table 1. The nutrient analysis of formulated ration used in the study

Ingredients	T_1	T_2	T_3	T_4
Pinto Peanut Leaf Meal	-	3.00	6.00	9.00
Rice bran (D)	10.00	7.00	4.00	1.00
Fish meal	5.00	5.00	5.00	5.00
Soybean meal	25.60	25.60	25.60	25.60
Corn meal	55.00	55.00	55.00	55.00
Salt	0.50	0.50	0.50	0.50
Molasses	1.30	1.30	1.30	1.30
Dicaphos	0.80	0.80	0.80	0.80
Limestone	1.00	1.00	1.00	1.00
Methionine	0.10	0.10	0.10	0.10
Min./Vit. Premix	0.50	0.50	0.50	0.50
Antioxidant	0.20	0.20	0.20	0.20
Total	100.00	100.00	100.00	100.00

NUTRIENT ANALYSIS	T_1	T_2	T_3	T_4
Crude Protein (%)	20.11	20.12	20.13	20.08
Metabolized Energy (kcal)	2,866.96	2,824.80	2,830.84	2,807.96
Calcium (%)	0.86	0.82	0.82	0.82
Phosphorous (%)	0.42	0.42	0.41	0.41
Lysine (%)	1.10	1.09	1.07	1.04
Methionine (%)	0.42	0.41	0.40	0.39

Based on the Feed Reference Standards, Philippine Society of Animal Nutritionist (PhilSAN), 2003.

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period of time until the broilers reach 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 *Ad libitum*. 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 made up of lumber and amazon screen and supplied by 25 watts incandescent bulb at 24h light regimen. Throughout the experimental period for the month of December 2018, recorded air temperature was maintained at 21.4˚C to 27. 1˚C. The relative humidity for the month with a mean value ranging from 87 to 97 from 8:00 am to 2:00 pm and the rainfall amount with a mean value of 7.4 (mms) millimeter per second (Isabela State University, Echague, Isabela, Agrometeorology Station). All the birds were generally healthy and strong as manifested by their movement and clean feathers. Development of comb and wattles were similar among birds in all treatment groups and feathering was completed in the third week of the study. Pigmentation of skin and shank were similar in all treatments. Two birds from each replicate were slaughtered to calculate the dressing percentage as per standard procedure.

Blood samples were collected to monitor the red blood cells count of the chicks after the conduct of the study. Hematological values were carried out three days before the termination of the study. At each sampling period, a quantity of 1ml of blood from the wing vein of each chicken was drawn out with the use of a 21-gauge needle being fixed to a 1ml syringe. Soon after the blood sample was taken out it was immediately transferred to a glass tube containing EDTA and then shaken thoroughly to mix both sample and EDTA together. The RBCs were analyzed using standard hematological techniques.

Growth performance of the broiler chicken was evaluated on the weekly body weight and feed consumption. Gain in weight, feed conversion ratio and efficiency (FCR/FCE), percentage rate of growth, dressing percentage with and without giblets, liver and pancreas weight, and red blood cells count was 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 Completely Randomized Design and comparison of treatment means was done using Least Significant Difference (LSD) Test. Analysis was carried out using the Statistical Tool for Agricultural Research (STAR) 2.0.1.

3 RESULTS AND DISCUSSION

Growth performance is a primary factor for determining the productivity of broiler chicken. The initial and weekly body weights of the experimental broiler chicken are presented in Table 2. Statistically, insignificant differences among treatments on their initial body weight of the birds with a mean ranging from 43.23 to 45.07 grams. The insignificant result indicates homogeneity or uniformity of the experimental units. However, the different levels of PPLM fed on broilers have significantly ($P < 0.05$) affects the growth performance during the 4th, 5th and 6th weeks on body weight of the experimental birds. It was observed that broilers fed with 6% PPLM obtained the highest final body weight (1608.68 grams) at six weeks of age and lowest on broilers without PPLM (1138.17 grams). This is due to the fiber rich nutritional value of pinto peanut which is good for broilers and additional feeds for rural poultry (Centro Internacional de Agricultura Tropical (CIAT), 1994).

Table 2. Initial and weekly body weight (g) of broilers fed diets with PPLM

TREATMENT	INITIAL and WEEKLY BODY WEIGHT (g)						
	Initial	1	2	3	4	5	6
T1	43.77	92.67	167.37	330.89	523.29^{b}	840.04^{b}	1138.17^{b}
T2	45.07	106.49	212.18	431.15	704.95^{a}	942.26^{b}	1302.45^{b}
T3	43.67	93.93	192.83	442.29	812.52^{a}	1165.42^{a}	1608.68^{a}
T4	43.23	100.75	202.96	408.07	719.22^{a}	971.44^{b}	1295.11^{a}
F test	ns	ns	ns	ns	*	*	*
CV (%)	3.77	7.65	12.17	12.74	11.19	9.85	10.22

Means with the same letter are not significantly different.
ns not significant
** = significant at P< 0.05*

The average weekly and cumulative feed consumption is revealed in Table 3. No significant variation on the first three weeks of the study in terms of their feed consumption. However, during the 4th and 5th weeks of the study, significant ($P< 0.05$) results were obtained. Moreover, birds supplemented with 6% PPLM have the highest cumulative feed consumption with a mean of 4070.87 grams and the lowest is on the broilers fed without PPLM with a mean value of 3198.03 grams.

The percentage rate of growth of the broilers is presented in Table 4. The broilers fed with different levels of PPLM have significantly affected the rate of growth during the 3rd and 4th weeks of the study. The significant differences which were attributed to the feed intake and the growth rate are considered normal as

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Table 3. Weekly and cumulative feed consumption of broilers fed diets with PPLM

TREATMENTS	WEEKLY AND CUMULATIVE FEED CONSUMPTION (g)						
	1	2	3	4	5	6	Cumulative
T1	89.44	264.03	384.72	558.35^{b}	751.41^{c}	1175.08	3198.03^{b}
T2	95.00	284.20	519.03	709.69^{a}	903.96^{ab}	1163.96	3675.76^{ab}
T3	83.33	288.01	514.58	825.00^{a}	1029.44^{a}	1340.50	4070.87^{a}
T4	90.34	343.29	569.63	732.64^{a}	868.78^{bc}	1067.47	3638.64^{ab}
F test	ns	ns	ns	*	**	ns	*
CV (%)	11.04	15.31	14.86	10.24	6.26	8.33	8.31

Means with the same letter are not significantly different.
ns not significant
* = *significant at P*< 0.05
**= *significant at P*< 0.01

Table 4. Weekly percentage rate of growth (%) of broilers fed diets with PPLM

TREATMENTS	WEEKLY PERCENTAGE RATE OF GROWTH					
	1	2	3	4	5	6
T1	71.43	57.56	65.61^{b}	41.69^{b}	41.83	27.13
T2	85.23	66.32	67.80^{b}	48.20^{b}	27.68	24.89
T3	72.88	67.98	78.70^{a}	60.19^{a}	36.13	32.77
T4	79.69	66.93	67.15^{b}	51.31^{ab}	33.77	25.89
F test	ns	ns	*	**	ns	ns
CV (%)	10.64	10.17	6.08	7.22	22.80	26.36

Means with the same letter are not significantly different.
Ns not significant
* = *significant at P*< 0.05
**= *significant at P*< 0.01

indicated in the decreasing pattern which was in congruence in the observation of Reyes (2005), wherein the growth rate of the broilers normally experienced a downward trend.

In a cool environment, broilers will eat more feed but many of the calories obtained from the feed will be used to sustain normal body temperature. When the calories are burned, they are not converted to meat. Optimum temperature allows the broilers to convert nutrients into growth rather than using the calories for temperature regulation.

FCR is used to determine the performance of animals. A good FCR is a good indication of high- quality feed. The analysis of variance (ANOVA) revealed significant results (P< 0.05) in terms of the FCR.

The amount of feeds consumed to produce a kilogram of meat has a mean ranging from 2.61 to 2.93 kilograms.

In terms of the feed efficiency of the broilers, significant results (P< 0.05) were noted. Birds in Treatment 3 had better feed efficiency than those in Treatment 2, Treatment 4 and control group with a feed efficiency ranging from 38.41% to 34.21%.

The significantly better FCR and FCE clearly demonstrated the potential of the PPLM as a feed supplement that increased the vitality and livability of broiler chicken.

Table 5. Gain in weight (g), feed conversion ratio (kg) and efficiency (%) of broilers fed diet with PPLM

TREATMENTS	Gain in Weight (g)	FCR (kg)	FCE (%)
T_1 – Control	1094.41^{b}	2.93^{a}	34.21^{b}
T_2 –Formulated feeds with 3% PPLM	1274.05^{b}	2.89^{a}	34.61^{b}
T_3 – Formulated feeds with 6% PPLM	1565.02^{a}	2.61^{b}	38.41^{a}
T_4 - Formulated feeds with 9% PPLM	1271.88^{b}	2.86^{a}	34.88^{b}
F test	*	*	*
CV (%)	10.39	3.90	4.04

Means with the same letter are not significantly different.
* = *significant at P*< 0.05

The gain in weight, feed conversion ratio and efficiency of broilers fed diet with PPLM are presented in Table 5. Significant result (P< 0.05) was recorded on the average gain in weight of broilers in which broilers fed with 6% PPLM had the highest weight gained of 1565.02 grams.

The dressing percentage is a trait of economic importance, the higher the dressing percentage the better the economic returns. Results showed insignificant differences among treatments in terms of dressing percentage with and without giblets.

Insignificant differences were observed in terms of

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the liver weight of the experimental broilers with a mean ranging from 33 grams to 49 grams. Moreover, the physical activities and volume and its reduction indicates anemia. In this study, there was no clinical state of anemia. This result is an indication that the inclusion of

Table 6. Dressing percentage, liver and pancreas weight (grams) of broilers fed diet with PPLM

TREATMENTS	Dressing Percentage		Liver Weight (g)	Pancreas Weight (g)
	With Giblets	Without Giblets		
T_1 – Control	78.93	66.49	40.83	4.17
T_2 –Formulated feeds with 3% PPLM	81.49	65.70	49.00	5.00
T_3 – Formulated feeds with 6% PPLM	80.20	64.52	40.00	4.83
T_4 - Formulated feeds with 9% PPLM	74.27	67.07	33.00	3.17
F test	ns	ns	ns	ns
CV (%)	1.18	0.88	15.06	24.71

ns = not significant

Table 7. Red blood cell analysis of broilers fed diet with PPLM

TREATMENTS	RBC's/µL
T_1 – Control	2,630,000.00/µL
T_2 –Formulated feeds with 3% PPLM	2,526,667.00/µL
T_3 – Formulated feeds with 6% PPLM	1,916,667.00/µL
T_4 - Formulated feeds with 9% PPLM	2,090,000.00/µL
F test	ns
Normal range	1.58 – 3.82 x 106/µL

ns = not significant

Table 8. Income over feed and chick costs

ITEMS	TREATMENTS			
	T1	T2	T3	T4
Average Final Weights of the Birds (kg)	1.14	1.30	1.61	1.30
Return per Broiler (PhP)[1]	122.40	145.20	193.20	150.00
Cost per Chicks (PhP)	33.00	33.00	33.00	33.00
Cost per Kilogram of Feeds (PhP)[2]	19.88	19.85	19.91	19.82
Cost of Feed Consumed	63.62	73.05	81.03	72.40
Number of Feeds Consumed	3.20	3.68	4.07	3.64
Income Above Feed and Chicks Costs	25.78	39.50	79.17	44.86

Computed based from the current price of broiler at 120/kg live weight
Computed based on the prevailing price of the feed ingredients

pancreas weight of the treated birds was comparable to those with the control diets with a mean ranging from 3.17 grams to 5.00 grams. This observation clearly indicates that the inclusion of PPLM on the diet of the bird is safe to use as feed ingredients without any detrimental effect on the performance of the broilers.

The red blood cell analysis of the broilers fed diet with PPLM is shown in Table 7. The red blood cell analysis (RBCs) was not significant across the treatments ranging from 1.91 x 106/µL to 2.63 x 106/µL. All the RBC with a mean ranging across the treatments and fall within the normal range (1.58 x10^6/µL to 3.82 x10^6/µL) as reported by Mitruka and Rawnsely (1977), for healthy chicken and as described by Awoniyi *et al*., (2000). The RBC analysis according to Swenson (1990), influenced among other factors by nutrition, PPLM had no negative effect on the blood parameters but instead has the ability to improve these parameters. This similarity in the blood parameters between treatments and their normal range are indications of nutritional adequacy of all the diets, since the blood profile offers a valuable investigation and explanatory tool in nutritional assessment and health implications (Olorede *et al*., 1995; Odunsi and Longe, 1995).

The return over feed and chick cost is shown on Table 8. Based on the results, the broilers fed formulated ration with 6% PPLM (T_3) produced the highest return amounting to PhP 79.17 followed by the use of formulated ration with 9% PPLM (T_4), amounted to PhP 44.86, followed by formulated ration with 3% PPLM (T_2) gained PhP 39.50 while T_1 with formulated ration

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without PPLM got the lowest return with Php 25.78.

4 CONCLUSIONS

The dietary supplementation of PPLM 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. The RBCs of the broilers revealed insignificant which fall within the normal range. In addition, the broilers fed with formulated ration with 6% PPLM produced the highest return of PhP 79.19. Therefore, it is suggested that PPLM at 6% inclusion can safely be used as feed ingredients to the broilers without any deleterious effect on the growth performance of broilers.

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REFERENCES

Awoniyi, T.A.M., Aletor, VA, Adebayo, I.A., Oyekunle, R.O. (2000). Observations on some erythrocyte indices of broiler chickens raised on maggot meal-based diets. In: Ukachukwu SN, Ibeauchi JA, Ibe SN, Ezekwe AG, and Abasiekong, SF (Eds). Animal Production in the New Millennium: Challenges and Options.pp.132–134. Proceedings of the 25th Annual Conference of Nigerian Society of Animal Production, Michael Okpara University of Agriculture, Umudike, Nigeria, 19-23 March

Centro Internacional de Agricultura Tropical (CIAT). (1994). Biology and Agronomy of Forage Arachis. CIAT Publication 240. Edited by P.C. Kerridge and B. Hardy. Centro Internacional de Agricultura Tropical, Cali (Colombia), 209p.

Ferreira, A. L.; Mauricio, R. M.; Fernandes, F. D.; Carvalho, M. A.; Ramos, A. K. B.; Guimaraes, R. (2012). Ranking contrasting genotypes of forage peanut based on nutritive value and fermentation kinetics. Anim. Feed Sci. Technol., 175 (1-2): 16-23.

Hess, H. D.; Monsalve, L. M.; Lascano, C. E.; Carulla, J. E.; Diaz, T. E.; Kreuzer, M. (2003). Supplementation of a Tropical Grass Diet with Forage Legumes and *Sapindussaponaria* fruits: Effects on *in Vitro* Ruminal Nitrogen Turnover and Methanogenesis. Aust. J. Agric. Res., 54 (7): 703-713.

Khamseekhiew, B.; Liang, J. B.; Wong, C. C.; Jalan, Z. A. (2001). Ruminal and intestinal digestibility of some tropical legume forages. Asian-Aust. J. Anim. Sci., 14 (3): 321-325.

Ladeira, M. M.; Rodriguez, N. M.; Borges, I.; Goncalves, L. C.; Saliba, E. D. S.; Brito, S. C.; de Sa, L. A. (2002). Evaluation of *Arachispintoi* hay using in vivo digestibility trial. Rev.Bras.Zootec., 31 (6): 2350-2356.

Lee, M. H., Lee, H. J., Ryu, P. D. (2001): Public risk: chemical and antibiotic residues review. *Asian-Aust. J. Anim. Sci*., 14: 402-413.

Manzanilla, E.G., F Baucells., C Karnel., J Morale., J Perez., J Gasa. (2001). Effects of plant extracts on the performance and lower gut microflora of early weaned Piglets *J Anim. Sci. Suppl., 1:473.*

Mitruka, B.N., Rawnsley, H.M. (1977). In clinical, biochemical and haematological reference values in normal experimental animals. Mason publishing USA. Inc. pp. 134-135

Odunsi, A.A., Longe, O.G. (1995). Cocoa bean cake in poultry diets. I. chemical composition and nutritive value of cocoa bean cake in pullet chick diets. J. Appl. Anim. Res. 7:91-97.

Olorede, B.R., Ajagbonna, O.P., Babatunde, G.M. (1995). Comparison of air-dried and oven-dried poultry droppings in broiler rations. Effect of performance, organ weights and haematological parameters. Int. J. Ani. Sci. 10:289-293.

Reyes, J.L., (2005). Upgrading of native chicken by crossing with exotic breeds. CVARRD RDE Journal pp. 1-15.

Silva, V. P.; de Almeida, F. Q.; Morgado, E. D.; Rodrigues, L. M.; dos Santos, T. M.; Ventura, H. T. (2010). In situ caecal degradation of roughages in horses. Rev. Bras. Zootec., 39 (2): 349-355

Swenson MJ (1990). Duke's physiology of domestic animals, 9th ed. Comestock publishing Co. UK., pp. 15-40.

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