Philipp J Vet Anim Sci 2020 46(1):76-81

RESEARCH NOTE

EFFECTS OF VARYING DIETARY ENERGY LEVELS ON PRODUCTION PERFORMANCE, CARCASS AND SENSORY CHARACTERISTICS OF *BANABA* CHICKENS RAISED IN CONFINEMENT

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ABSTRACT

Diets with different levels of energy were fed to *Banaba* chickens (n=180) for 49 days to evaluate its growth performance, carcass and sensory characteristics. Diets were formulated to contain similar levels of crude protein and other nutrients with varying energy levels of 2900, 3000, 3100, and 3200 ME kcal/kg. Following a Completely Randomized Design, chickens were divided into 4 groups with 5 replications having 9 animals each. Carcass and sensory performance were done at 72 days of age. *Banaba* chickens fed diets with 2900 ME kcal/kg had the highest weight gain (*P*=0.0406), lowest energy intake (*P*=0.0001) among all treatments, and better feed conversion (*P*=0.0258) and caloric conversion (*P*=0.0072) compared to those fed diets with 3000 kcal ME/kg. Average daily feed consumption, carcass and sensory performance were not influenced by energy level.

Key words: *Banaba* chicken, carcass yield, dietary energy, growth performance, sensory

INTRODUCTION

Banaba is a native chicken in the Philippines found and developed in Batangas (Lambio *et al*., 2000). It is one of the four recognized breeds under the Philippine Native Animal Development program of the Department of Agriculture. It has yellow to reddish plumage with black tail and wing feathers (Lambio *et al*., 2000; Santiago *et al*., 2016).

One of the limiting factors in formulating feeds for native chicken diet is the lack of information about its nutrient requirement which is one of the reasons for its slow growth (Resnawati, 1998; Lisnahan *et al*, 2014). The energy level is usually the starting point in formulating the diet of animals and also the basis for setting most nutrient concentrations (Jackson *et al*., 1982). According to Leeson *et al*. (1996), energy intake can affect not only the growth rate but also the carcass characteristics of the animals, therefore, controlling it is important.

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There are limited reports on the effect of energy in the diet on indigenous chickens (Resnawati, 1998; Mbajiorgu *et al*., 2011; Perween *et al*., 2016). In the Philippines, information on the allowable energy in the diet of *Banaba* chicken is warranted. Hence, the study was done to determine the effect of different levels of dietary energy on the production performance, carcass yield and sensory characteristics of *Banaba* chicken raised in confinement.

MATERIALS AND METHODS

One hundred eighty day-olds unsexed *Banaba* chickens from Brgy. Dayapan, Ibaan, Batangas were procured and housed in the National Swine and Poultry Research and Development Center (NSPRDC), Brgy. Lagalag, Tiaong, Quezon. Animals were caged on 26 slatted floor pens each measuring 1.5m^2. One plastic feeder and waterer in each cage allowed *ad libitum* access to feeds and water. Brooding and hardening were done for 30 days before starting the feeding trial and chickens were fed with commercial chick booster feeds.

A 49-day feeding trial was done after brooding. Chickens were randomly allotted to one of the four treatment diets and were replicated five times having nine birds per replicate following a completely randomized design (CRD). Initial and weekly body weights were recorded to determine the average daily gain and average daily feed intake. Feed wastage was collected and weighed every afternoon of every end of the week.

Experimental diets were formulated (Table 1) with 20% CP but with different energy levels: 2900 ME kcal/kg (T1), 3000 ME kcal/kg (T2), 3100 ME kcal/kg (T3) and 3200 ME kcal/kg (T4). The control diet used was based on the recommendation of NRC (1984).

Five *Banaba* chickens at 72 days of age per treatment were subjected to slaughter, carcass and sensory evaluations. Weights of carcass, breast meat, drumstick, thigh, wings, and back were determined. For color, flavor, tenderness, juiciness and general acceptability of the meat, a 9-point/5-point hedonic scale was used. All data gathered were analyzed by one-way Analysis of Variance using Completely Randomized Design procedure of the Statistical Analysis System v.9 (SAS, 2002). Least significant difference was used to compare the treatment means and significance is reported at $P<0.05$ level. Results are presented as mean ± SEM.

Treatment diets were analyzed for proximate, Ca and P contents following standard procedures of AOAC (1995) at Animal Feed Analysis Laboratory (AFAL) Veterinary Laboratory Division of the Bureau of Animal Industry, Visayas Ave., Diliman, Quezon City.

RESULTS AND DISCUSSION

Treatment diets had no significant effects on the daily feed intake of *Banaba* chickens (Table 2). Feed intake of birds depends on their body conformation (Mendes *et al*., 2011). It was reported that energy content in the diets did not affect feed intake of the broiler in the study of Tooci *et al*. (2009) comparing concentrate diets having 3010, 3150, and 3200 ME kcal/kg for starter, grower, and finisher respectively with the diluted diets having 2800 ME kcal/kg.

Increasing the level of dietary energy would also increase energy intake. Diet with 2900 ME kcal/kg had the lowest energy intake ($P<0.0001$) and caloric efficiency ($P=0.0072$). Difference in energy intake can be attributed to similar feed consumption of *Banaba*

Table 1. Composition of experimental diet for *Banaba* chicken raised in confinement.

Items	Treatment			
	1	2	3	4
Ingredients, %				
Corn, Yellow (local)	62.32	61.62	59.61	56.76
Soya, US Hi Pro	31.90	32.00	32.40	32.80
MDCP	1.60	16.00	15.80	16.00
Rice Bran D1	1.00	1.20	1.20	1.10
Limestone	1.20	1.20	1.20	1.30
Coconut Oil	0.50	1.00	2.93	5.30
Copra Meal	0.90	0.80	0.50	0.54
Salt	0.30	0.30	0.30	0.30
Mineral Premix	0.10	0.10	0.10	0.10
Toxin Binder	0.10	0.10	0.10	0.10
DL-methionine	0.05	0.05	0.05	0.07
Vitamin Premix	0.03	0.03	0.03	0.03
Total	100.00	100.00	100.00	100.00
Calculated Nutrient Composition				
Crude Protein, %	20.04	20.04	20.02	20.00
Crude Fat, %	3.67	4.16	5.93	8.19
Crude Fiber, %	2.60	2.59	2.54	2.50
Calcium, %	1.10	1.10	1.09	1.13
Phosphorus (avail), %	0.40	0.40	0.40	0.40
ME Poultry, kcal/kg	2909.00	3000.00	3100.00	3200.00
Dig Lys, %	0.97	0.97	0.98	0.98
Dig M+C, %	0.65	0.65	0.65	0.66
Dig Thr, %	0.67	0.67	0.67	0.67
Dig Try, %	0.22	0.22	0.22	0.22

chickens with different energy levels. According to Leeson *et al*. (1996), energy intake depends on the energy level available in the diet.

On the other hand, *Banaba* chickens fed diets with 2900 ME kcal/kg had the highest weight gain (P=0.0406) among all treatments and better feed conversion (P=0.0258) compared to those fed diets with 3000 kcal ME/kg. This result may be because *Banaba* chickens already met their energy requirement that any additional energy level in the diet did not contribute much to the growth of the chickens (Mbajiorgu *et al*., 2011). The same results were obtained by Resnawati (1998) and Afab (2009) using energy levels lower than those used in this study, where higher body weight gain and better feed consumption ratio were observed at 2900 ME kcal/kg. On the other hand, Niu *et al*. (2009), Alabi *et al*. (2013) and Miah *et al*. (2014) reported the improved weight gain and feed conversion ratio as energy

Table 2. Effect of varying dietary energy levels on the initial weight, ADG, ADFI, and FCR of *Banaba* chicken raised in confinement.

Parameters	Treatment				SEM	*P*-Value
	1	2	3	4		
Initial weight, g	288.67	285.33	288.00	292.44	12.49	0.8420
Final weight, g	992.67[a]	912.89[b]	967.78[ab]	978.67[a]	42.32	0.0434
Average daily gain, g	14.37[a]	12.81[b]	13.87[ab]	14.00[a]	0.86	0.0406
Average daily feed intake, g	102.55	103.44	102.81	102.05	1.19	0.3474
Feed Conversion Ratio	7.17[b]	8.09[a]	7.424[b]	7.32[b]	0.45	0.0258
Energy Intake, kcal/kg	0.297[d]	0.310[c]	0.319[b]	0.327[a]	3.63	<0.0001
Caloric Conversion	20.79[b]	24.26[a]	23.01[a]	23.42[a]	1.38	0.0072

[a,b]Means in the row not sharing a common superscript are different ($P<0.05$)

level increased up to 3000 ME kcal/kg. Diet with 3000 ME kcal/kg had the lowest initial body weight. This could be the reason why it also had the lowest weight gain. Mendes *et al*. (2011) reported that light chickens at the beginning of the experiment did not recover their weights under the same production management with heavy birds.

Meat quality of *Banaba* chickens at 72 days of age showed no significant ($P>0.05$) differences in dressing percentage and carcass yield (Table 3), indicating that these variables were not influenced by energy in the diet. *Banaba* chicken may have already reached the maximum growth and carcass yield at dietary energy of 2900 ME kcal/kg. Results did not corroborate with those obtained by Alabi *et al*. (2013) and Miah *et al*. (2014), who reported that carcass characteristics improved as energy increased. On the other hand, other studies) showed no effects on carcass yield with increasing energy levels (Niu *et al*., 2009; Infante-Rodriguez *et al*., 2016).

As for the sensory evaluation (Table 4), levels of energy in the diet had no influence on the mentioned variables. Although there were no previous reports found on the effect of dietary energy level on sensory evaluation of *Banaba* chickens, the results of this study

Table 3. Effect of varying dietary energy levels on the carcass yield (g) and dressing percentage (%) of *Banaba* chicken raised in confinement.

Parameters	Treatment				SEM	*P*-Value
	1	2	3	4		
Dressing percentage	83.54	82.19	82.08	82.39	2.12	0.7174
Breast meat	287.60	267.40	280.00	255.40	52.10	0.7760
Drumstick	168.40	142.80	148.40	127.40	36.17	0.3790
Thigh	187.80	155.60	183.00	146.00	37.63	0.2580
Wings	124.80	114.20	116.20	101.00	20.11	0.3420
Back	244.60	226.20	255.60	201.20	50.41	0.3720

Table 4. Effect of varying dietary energy levels on the sensory evaluation of *Banaba* chicken using nine-point/five-point hedonic scale*.

Sensory Parameters	Treatment				SEM	*P*-Value
	1	2	3	4		
Color	7.10	7.23	6.97	7.17	0.67	0.127
Flavor	6.53	6.70	6.50	6.67	0.62	0.415
Tenderness	2.93	3.30	3.27	3.00	0.93	0.132
Juiciness	2.20	2.60	2.43	2.22	0.84	0.207
General Acceptability	6.57	6.83	6.70	6.83	0.66	0.346

*Hedonic scale: 1 - None Perceptible/Dislike Extremely; 5 - Very Perceptible; 9 - Like Extremely

showed relatively close values with that obtained in the study done by Bueno *et al*. (2015) comparing native, free-range and commercial chickens.

In summary, at a constant dietary protein level, *Banaba* chickens fed with diets containing 2900 ME kcal/kg had the highest weight gain and lowest energy intake among all treatments. It also had better feed conversion and caloric conversion compared to birds fed with 3000 kcal ME/kg. Energy level did not influence the feed intake, dressing percentage, carcass yield and sensory evaluation. It is recommended to conduct more studies using lower or higher levels of energy than what was used in this study.

ACKNOWLEDGEMENT

This work was supported by the Bureau of Animal Industry. Feed formulation in this study was made with the help of Ms. Princess Joy Esureña.

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