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Original Research Article

Evaluation of dried poultry dropping as a feed ingredient in the diets of rabbits

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Abstract: This study was conducted to investigate the growth performance, digestibility, carcass traits and blood biochemical parameters of rabbits fed on different levels of dried poultry dropping. Twenty four of New Zealand White rabbits of averaged 950 g body weight (6 weeks of age) were divided into four groups, of six each. The first group was fed a basal diet (without dried poultry dropping) and considered as control, while the other three groups were fed the basal diet after substituting part of the diet with at 50, 100 and 150 g/kg diet, respectively. Rabbits group fed on the diet contained 15% dried poultry dropping was significantly ($P<0.05$) reduced in weight gain and feed conversion compared with other treatment and control one. There was significant ($P<0.05$) increased in feed intake of rabbits groups fed on dried poultry dropping compared to the control. There was no significant differences in the feed conversion between treatment groups fed on 50 and 100 g/kg diet dried poultry dropping and control one, while significantly ($P<0.05$) decreased with group fed 150 g/kg diet dried poultry dropping. There were significant ($P<0.05$) differences in the digestion coefficients of dry matter, crude protein and ether extract between rabbits groups fed on diets containing 100 and 150 g/kg diet dried poultry dropping and control one. Rabbits group fed on 150 g/kg diet dried poultry dropping diet recorded the highest values of total serum protein and uric acid, while no significant ($P>0.05$) differences in urea concentration as compared with those fed control diet. The dressing percentage and weight percentages of liver, kidneys, heart and lungs of rabbits fed on dried poultry dropping were strikingly similar to that of the control ration. It could be concluded that dried poultry dropping could be included up to 100 g/kg in the diets of rabbits without any adversely affect in addition to reduced cost of diets and alleviate pollution.

Keywords: Dried poultry dropping, feed ingredient, diet, rabbits.

INTRODUCTION

In most of developing countries like Egypt, the livestock industry keeps having difficulty in supplying the much needed animal protein by populace. This has largely been due to the high costs of livestock feeds. Generally, feed accounts for upward of 60% of the total costs of raising farm animals. Shortage of the conventional feedstuffs like maize and soybeans is occasioned by the competition between man and animals for these feed sources (Van der Zijpp, A.J. 1997; Emenalon, O.O. 2004). Current research efforts in most developing countries are towards both animal waste and crop residue recycling is motivated by both economic (waste to wealth) and environmental (reducing environmental pollution) considerations. An excellent example of nutrient recycling is the feeding or incorporation of processed poultry droppings into animal feeds in which nutrients in the waste is converted into edible animal products for man's consumption (Bello, A.A. 2015). Such could be cheap and available for compounding livestock rations as it will reduce or remove the competition between man and animal, and among livestock for feed sources. Poultry manure promises to be of great use in solving the problem of feedstuff for animals as it is relatively available and is not consumed by human. Much effort is being made to study the possibilities of utilizing poultry wastes in the nutrition of animals including poultry and rabbits (Henuk, Y.L., & Dingle, J.G. 2002; Ominisi, P.A., & Omage, J.J. 2006). This can lead to a reduction of traditional feed ingredients such as maize, wheat and soybeans that can be consumed by humans and considered as animal feeds (El-Boushy, A.R.Y., & Van der Poel, A.F.B. 2000). Dried poultry waste after proper treatment could be used as a feedstuff because it contains undigested feed, metabolic excretory products

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and residues resulting from microbial synthesis. Microorganisms in poultry excreta convert some of uric acid to microbial protein which can be utilized by poultry (El-Boushy, A.R.Y., & Vink, F.W. 1977). Records abound that poultry litter; a low-cost material, contains appreciable quantity of nutritive growth factors such as 16.5 to 25.00% crude protein (Bello, A.A. 2015; Ogunsipe, M.H., 2011; Ogunsipe, M. H. 2014; Onu P.N. *et al.,* 2011; Ominisi, P.A., & Omage, J.J. 2006; and Owen O.J. *et al.,* 2008), total ash 21.24% (Ogunsipe, M. H. 2014) minerals particularly calcium (Ca) and phosphorous (P) (Owen O.J. *et al.,* 2008) and fibre content (19.2 to 21.90%) (Bello, A.A. 2015; Ogunsipe, M. H. 2014; Onu P.N. *et al.,* 2011; Ominisi, P.A., & Omage, J.J. 2006).

The present study was conduct to evaluate the effect of different levels of dried poultry droppings on the performance, nutrient digestibility, carcass traits in addition to some biochemical parameters of blood in growing rabbits.

MATERIAL AND METHODS

Processing of poultry droppings

Care was exercised in collecting the droppings of the birds (Cage layer droppings) to exclude extraneous material. The droppings were collected daily on polyethylene sheets. The droppings were air-dried for 24 hours at 30-35 °C (El-Boushy, A.R.Y., & Vink, F.W. 1977), and then subjected to dry heat for 2 hours in hot air oven at a temperature ranges between 102–105 °C (Trakulachang, N. *et al.,* 1975).

Animals, Treatment and Management

Twenty four of New Zealand White rabbits of averaged 950 g body weight (6 weeks of age) were divided into four groups, of six each. Each treatment was assigned to one of four dietary treatments: 50, 100 and 150 g/kg diet dried poultry dropping (DPD). All rabbits were housed individually in galvanized wire cages that allowed separation of feces and urine. Rabbits were kept under standard hygienic conditions and were subjected to a prophylactic vaccination and pharmacological program against viral and bacterial diseases.

Table 1. Composition of the experimental diets

	Dried poultry dropping (g/kg diet)			
	0	**50**	**100**	**150**
Physical composition				
Corn, ground	319.5	319.5	319.5	319.5
Soybean meal	115.0	95.0	72.5	51.5
Wheat bran	115.0	115.0	112.5	53.5
Dried poultry dropping	000.0	50.0	100.0	150.0
Berseem hay	390.0	362.5	335.0	365.0
Molasses	50.0	50.0	50.0	50.0
Common salt	5.0	5.0	5.0	5.0
Methionine	2.5	2.5	2.5	2.5
Premix [1]	3.0	3.0	3.0	3.0
Chemical composition (g/Kg DM)				
Dry matter	887.9	887.2	886.4	886.2
Crude protein	162.2	162.4	162.3	162.3
Crude fibre	133.5	131.2	128.9	136.3
Ether extract	28.3	29.1	28.4	26.6
Nitrogen free-extract	591.5	585.1	580.6	563.9
Calcium	6.1	9.1	12.9	17.1
Phosphorus	4.4	5.4	6.4	6.8
DE(Kcal/kg diet) [2]	2669	2689	2709	2649

[1] Egavet premix: Each 3 kg contain: vitamin A, 12.000.000 IU; vitamin D, 2.500.000 IU; vitamin E, 10.000 mg; vitamin K_3, 1000 mg; vitamin B_1, 1000 mg; vitamin B_2, 5000 mg; vitamin B_6, 1500 mg; niacin, 30.000 mg; biotin, 50 mg; folic acid, 1000 mg; pantothenic acid, 10.000 mg; Mn, 60.000 mg; Zn, 50.000 mg; Fe, 30.000 mg; Cu, 5.000 mg; Se, 100 mg; Co, 100 mg; Mn, 250.000 mg; $CaCo_3$, up to 3kg.
[2] Provided by calculation

The first group was fed a basal diet (without DPD) and considered as control, while the other three groups were fed the basal diet after substituting part of the diet with dried poultry dropping at 50, 100 and 150 g/kg diet respectively as shown in Table 1. All experimental diets were isocaloric and isonitrogenous and formulated as recommended by NRC (1977) to meet the requirement of growing rabbits and were pelleted. The diets were fed ad-libitum and clean water was continuously available throughout the experimental period. The feeding trial was carried out for 8 weeks during which the rabbits were weighed at weekly intervals. Feed consumption was estimated on individual basis during the experimental period.

Digestibility Trials

The daily fecal matter excreted from each animal was collected during the collection period (last 5 days of the experiment) to plastic bags then weighed, sampled, mixed, dried at 60 °C, ground and stored to be analyzed for different nutrients. The feed ingredients used, experimental diets and feces collected were sampled, dried, ground, mixed thoroughly and analyzed for determination of different nutrients (A.O.A.C. 1984). From the analysis of the diets and fecal matter excreted, the digestion coefficient of dry matter and other nutrients were calculated according to the following equation (Maynard, L.A. 1979):

$$\text{D.C of any nutrient} = \frac{\text{Amount of nutrient intake} - \text{amount of nutrient in feces}}{\text{Amount of nutrient intake}} \times 100$$

Carcass Traits and Blood Samples

At the end of the experiment, three rabbits from each group were weighed then slaughtered after fasting 12 hours (Lukefahr, S.D *et al.,* 1992). Blood samples were collected and sera were separated and kept at -20 °C till further biochemical analysis. The blood serum parameters including total protein, cholesterol, urea and uric acid were determined by Spectrophotometer using standard test kits supplied by Biomerieux (Baines/France). After complete bleeding (within 30 minutes), pelts, viscera and tail were removed. The eviscerated carcass was weighed and the dressing percentage was calculated.

Chemical Analysis

The feed ingredients used, experimental diets and feces collected were sampled, dried, ground, mixed thoroughly and analyzed for determination of dry matter, crude protein, crude fibre, ether extract and ash (A.O.A.C. 1984).

Statistical Analysis

All data were subjected to one-way analysis of variance (ANOVA) using the lines model of Statistical Analysis System (SAS, 1998), and differences ($P<0.05$) among treatments were tested using Duncan's multiple test (Duncan, D.B. 1955).

Results

Performance of Rabbits

The results obtained for rabbit performance in term of body weight, feed intake, weight gain and feed conversion are presented in Table 2. Rabbits group fed on the diet contained 150 g/kg dried poultry dropping was significantly ($P<0.05$) reduced in weight gain and feed conversion compared with other treatment and control one.

Table 2. Performance and economical evaluation of rabbit under different treatments

	Dried poultry dropping (g/kg diet)			
	0	**50**	**100**	**150**
Initial weight (g)	950±35.5 [a]*	945±25.1 [a]	852±29.8 [a]	948±32.1 [a]
Final weight (g)	2294±45.2 [a]	2339±43.5 [a]	2284±40.3[a]	2020±35.9[b]
Total weight gain (g)	13.44±30.3 [a]	1394±35.17 [a]	1332±29.7[a]	1072±25.8[b]
Daily weight gain (g)	24.0±0.32 [a]	24.89±0.25 [a]	23.79±0.35[a]	19.14±0.50[b]
Daily feed intake (g)	94.80±1.78[c]	107.03±1.50[b]	106.58±1.80[b]	114.46±2.10[a]
Feed conversion	3.95±0.01 [a]	4.30±0.03 [a]	4.48±0.18 [a]	5.98±0.03[b]

*Figures in the same row having the same superscripts are not significantly different ($P>0.05$)

Digestion coefficient of nutrients

Digestion coefficients of nutrients and nutritive values of the diets were increased significantly ($P<0.05$) with increasing level of DPD (Table 3).

Table 3. Nutrient digestibility and feeding values (g/kg) of the different treatments

	Dried poultry dropping (g/kg diet)			
	0	**50**	**100**	**150**
Digestibility				
Dry matter	702.0±11.5 [b]*	719.0±12.0 [b]	786.1±13.0 [a]	764.3±15.0 [a]
Crude protein	742.0±14.5 [b]	735.0±13.0 [b]	802.0±15.3 [a]	781.0±16.4 [a]
Ether extract	811.0±18.0 [b]	803.0±20.1 [b]	877.7±17.0 [a]	862.5±16.0 [a]
Crude fibre	385.0±15.9 [a]	374.5±15.2 [a]	324.0±1.70 [b]	303.8±13.5 [b]
Nitrogen free-extract	737.0±17.2 [a]	758.0±16.5 [a]	721.0±18.1 [a]	719.0±13.9 [a]
Feeding values				
Total digestible nutrients	589.7±10.5 [b]	665.6±11.5 [a]	647.9±12.0 [a]	670.8±11.0 [a]
Digestible crude protein	112.6±5.0 [b]	125.9± 6.7 [ab]	136.7±8.0 [a]	143.0±9.2 [a]

*Figures in the same row having the same superscripts are not significantly different ($P>0.05$).

Blood parameters and carcass traits

Total serum protein were increased significantly (P<0.05) in the serum of rabbits fed on high level of dried poultry dropping (150 g/kg diet) compared to control group as shown in Table 4.

Table 4. Serum parameters and carcass traits of rabbits for different treatments

	Dried poultry dropping (g/kg diet)			
	0	**50**	**100**	**150**
Serum parameters				
Total serum protein (g/dl)	6.95±0.20 [b]*	7.32±0.13 [b]	7.30±0.10 [b]	8.75±0.25 [a]
Urea (mg/dl)	13.15±0.36 [a]	13.50±0.50 [a]	14.01±0.65 [a]	15.02±0.84 [a]
Uric acid (mg/dl)	0.13±0.01 [b]	0.14±0.03 [b]	0.16±0.01 [b]	0.20±0.02 [a]
Carcass traits				
Pre-slaughter weight (g)	2245±40.1[a]	2286±45.01[a]	2269±39.6 [a]	2007±30.1[b]
Dressed carcass (g)	1246±25.8 [a]	1282±30.1[a]	1248±35.2 [a]	1101±28.7[b]

*Figures in the same row having the same superscripts are not significantly different (P>0.05)

DISCUSSION

There was no significant difference between rabbits groups fed on diets contained 50 or 100 g/kg dried poultry dropping and control one. Rabbits fed 100 g/kg dried broiler manure diets had significantly heaver final live body weight and daily body weight gain, while the lowest values with rabbits fed on 150 g/kg (Abdel-Azeem, F. *et al.,* 2007). There was significant (P<0.05) increase in feed intake of rabbits groups fed on dried poultry dropping compared to the control. These results are agreed with that reported; feed consumption was increased with higher levels of poultry manure in the diet of growing rabbits (Balogun, S.T., & Balogun, T.F. 1980). There was no significant (P>0.05) differences in the feed conversion between treatment groups fed on 50 or 100 g/kg diet dried poultry dropping and control one, while significantly (P<0.05) decreased with group fed 150 g/kg. It was reported that rabbits fed 80-250 g/kg poultry litter showed no significant differences (P>0.05) in their feed conversion efficiencies (Auxilla, M.T. *et al.,* 1982). Dried pigeon dropping can be used up to the rate of 120 g/kg with satisfactory results and with no adverse effect on body gain and feed conversion (NRC. 1977). In addition, when dried poultry dropping exceeds a level of 150 g/kg or more may had adverse effect due to the increasing levels of uric acid which is not utilized and may be toxic (Coach, J.R. 1974).

Concerning the results of nutrient digestibility cleared that, there were significant (P<0.05) differences in the digestion coefficients of dry matter, crude protein and ether extract between rabbits groups fed on diets containing 100 or 150 g/kg diet dried poultry dropping and control one. These agreed with reported by Abdel-Azeem *et al.,* (2007) who reported that digestion coefficients of nutrients were significantly (P<0.05) improved for rabbits fed on diets containing 100 or 150 g/kg of either dried broiler manure or dried layer manure than those fed the control diet. On contrary, the digestion coefficient of crude fibre was significantly (P<0.05) decreased by high level of dried poultry dropping. Results of nutritive values as total digestible nutrients and digestible crude protein as affected by dried poultry dropping levels revealed that control diet had the significantly (P<0.05) lowest values, while diet have 150 g/kg showed the highest values.

Total serum protein, urea and uric acid values revealed that rabbits group fed on 150 g/kg dried poultry dropping diet recorded the highest significant (P<0.05) values of total serum protein and uric acid, while no significant differences (P>0.05) in urea concentration as compared with those fed control diet as that found by Abdel-Azeem *et al.,* (2007). There was significant (P<0.05) differences in the dressed carcasses between different treatment groups. With increasing dried poultry dropping levels, there was slight decrease in the weight of dressed carcass (Martina, C. *et al.,* 1987).

CONCLUSION

It could be concluded that dried poultry dropping could be included in the diet of rabbit up to 100 g/kg without adversely effects on the performance, digestibility and carcass traits of growing rabbits in addition to alleviating the pollution.

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