Journal of Agriculture and Agricultural Technology 9(1): 111-120, 2018

GROWTH AND EGG LAYING PERFORMANCE OF GROWING TURKEYS FED DIETS CONTAINING VARYING LEVELS OF HONEY

Malik, A. A., Ijaiya, A. T., Tsado, D. N., Kudu, Y. S. and Iwalaiye, R.
Department of Animal Production, Federal University of Technology, Minna, Niger State, Nigeria.
Corresponding Author's e-mail: delemalik@gmail.com
Phone: +2348030637763

ABSTRACT
An eighteen weeks feeding trial was conducted in two phases to determine the effects of feeding varying levels of honey, as a nutritive additive, on the growth and egg laying performance of growing turkeys. A total number of 90 twelve-weeks-old growing turkeys with an initial mean body weight of 1,760.81 g and of mixed sexes were used for the study. During the first phase, the birds were randomly allotted to three dietary treatments designated as T_1, T_2 and T_3 containing 0, 2 and 4 % of honey respectively; with 30 birds per treatment, each replicated thrice with 10 birds per replicate in a completely randomized design experiment. Nutrient digestibility trial was conducted at the end of the 9^{th} week of the experiment. During the second phase, 54 twenty-two-weeks old growing turkey were randomly allotted to three treatments, which were standard diets for laying turkey containing 0, 2 and 4 % of honey respectively, and replicated three times with six birds in each replicate in a completely randomized design experiment. With the onset of egg laying, eggs were collected daily and the number recorded per replicate. Results show that there were no significant ($p>0.05$) differences in daily feed intake, body weight gain and feed conversion ratio (FCR) among growing turkeys fed the different treatment diets. Also, there were no significant ($p>0.05$) differences in nutrient digestibility among the treatment groups, except in nitrogen free extracts where birds on Diet T_3 (4 % honey) had significantly ($p<0.05$) higher values. For laying turkeys, FCR and HDP (hen day production) were significantly ($p<0.05$) improved as the dietary levels of honey increased, with the best values obtained at 4 % dietary inclusion level.Hence, 4 % honey should be included in the diets of both growing and laying turkeys for optimum growth performance, nutrient digestibility and egg production.

KEYWORDS: Growth, egg laying performance, honey, growing turkey.

INTRODUCTION
Poultry production is an age long occupation. Emphasis on commercial poultry production in the past had been on the use of broilers and laying chickens for the production of meat

and eggs respectively. However, these have proved inadequate in meeting up the animal protein demand with increasing human population in Nigeria (Ugwuene and Onwudike, 2010).

Turkey is a more efficient converter of dietary protein into edible meat protein than broiler chickens, and its breast meat has relatively higher value (Case *et al*., 2010). There is the need to increase turkey production in Nigeria; to take advantage of these attributes and other merits of the bird such as its large size, fast growth rate and high fecundity. Turkey breast is whitish in colour and packed with more flavour than chicken (Odunsi, 2006).

There are several feed additives in use in the poultry industry today, most of which like antibiotics are artificial in nature. These additives are used in addressing the dietary deficiencies affecting the growth and development of poultry birds. However, they have health and welfare implications; these include bacteria resistance, long withdrawal time and residual effects (Kizilaslan and Kizilaslan, 2007). To avoid these risks in the use of antibiotics as growth promoters, the discovery and use of prebiotics and probiotics, having no withdrawal time and no residual effect, have become necessary. Hence, there is a paradigm shift towards the use of natural prebiotics and probiotics. One of such prebiotics is honey. Honey is a sweet natural product widely available worldwide (Malacalza *et al*., 2005). Apart from its ability to reduce multiplication of some pathogens, it is a powerful aphrodisiac and a valuable antibacterial wound dresser (Kizilaslan and Kizilaslan, 2007). Also, honey improves the palatability of feed, serves as a feed binder and improves the growth rate of animals, in addition to the fact that it improves the nutritive value, digestibility and feed efficiency of livestock feeds and acts as an antioxidant against rancidity in feeds (Adebolu, 2015). Therefore, the aim of this research study was to evaluate the growth and egg laying performance of growing turkeys fed diets containing varying levels of honey.

MATERIALS AND METHODS

Experimental site: This research work was carried out at the Poultry Unit of the Department of Animal Production Teaching and Research Farm, Federal University of Technology, Minna, Niger State, Nigeria. Minna is located within the Southern Guinea Savanna vegetational zone of Nigeria, lying between latitude 9^0 28′N to 9^0 37′N and longitude 6^0 23′E to 6^0 33′E, with mean annual rainfall of 1000 – 1500 mm (FUTMIN, 2012).

Sources of feed ingredients and the experimental diets: Honey used for this study was purchased from the Office of the Agricultural Development Project (ADP), Minna, Niger State, Nigeria. The viscosity of the honey was lowered by heating it slowly on a low flame for 10 minutes at 60^0 C, in order not to impair or distort its flavour and volatile aroma and to ease its mixing with the feed (Obun *et al*., 2010). This was then added to the diets at 0, 2 and 4 % dietary inclusion levels to form Diet T_1, T_2 and T_3 respectively. Other ingredients used for compounding the feed were obtained at feed ingredients depots within Minna. The composition of the experimental diets formulated to contain 3, 000 Kcal/kg metabolizable energy (ME) and 20 % crude protein (CP) for the growing phase and 3, 000 Kcal/kg ME and 15 % CP for the laying phase are shown in Table 1 and Table 2 respectively.

Management of experimental birds and the experimental design: Ninety (90) twelve-weeks-old grower turkeys were randomly allotted to three treatment groups, made up of three replicates and 10 birds per replicate in a completely randomized design experiment. They were fed the experimental diets *ad libitum* for 10 weeks. At the laying phase, 54 female turkeys that were 22 weeks old were used. They were fed the experimental laying diets *ad libitum* during the laying phase. Each treatment had 18 turkeys, made up of three replicates of six turkeys per replicate, in a completely randomized design experiment. The birds were raised on deep litter system. Management practices such as sanitation and vaccination were strictly adhered to, to prevent the outbreak of any poultry disease. Routine management operations such as cleaning of drinkers, feeders and the environment were carried out.

Data collection: Parameters measured were feed intake and body weight gain. Weighed quantities of feed were supplied to turkeys in each replicate and the quantity consumed per day was obtained by subtracting the quantity of the left-over from the quantity supplied. The initial weights of the birds were recorded. Subsequently, average weekly body weight gain was obtained by subtracting the body weight of the previous week from the body weight of the present week. Feed conversion ratio (FCR) was determined by dividing the quantity of feed consumed by the body weight gain of the birds in each replicate. At the laying phase, FCR was determined in terms of feed consumed per gramme of egg laid (Malik *et al*., 2010).

Digestibility trial was conducted at the 9^{th} week of the experiment. Six birds per treatment were randomly selected

and placed in special metabolism cages for five days, for the birds to adjust to the conditions in the cages; thereafter, faecal samples were collected for four days using the total collection method. Faecal droppings were collected in aluminium foils and oven dried at 80 ^{0}C for 24 hours. The obtained samples were analysed for their proximate composition using the procedures of AOAC (1990) and the results used to calculate the digestibility coefficient as outlined by Lamidi *et al*. (2008).

During the laying phase, eggs were collected per replicate and the quantities collected were used to calculate hen day production (HDP) using the formula of Bawa *et al*. (2010) thus:

$$\text{Hen day production (\%)} = \frac{\text{Number of eggs produced}}{\text{Number of birds x Number of days in lay}} \times 100$$

Chemical analysis: The proximate composition of honey, the experimental diets and the collected faecal droppings were determined using the standard procedures of AOAC (1990).

Statistical analysis: Data collected were subjected to analysis of variance (ANOVA) at 5 % probability level using Statistical Package for Social Scientists (IBM SPSS, version 21). Where means were significantly different, they were separated using Least Significant Difference (LSD).

Table 1 Composition of the experimental diets fed to grower turkeys

	Varying dietary levels of honey (%)		
Ingredients	0	2	4
Maize	58.00	56.00	54.00
Groundnut cake	29.00	29.00	29.00
Honey	0.00	2.00	4.00
Palm oil	2.00	2.00	2.00
Wheat offal	4.90	4.90	4.90
Fish meal	2.00	2.00	2.00
Lysine	0.30	0.30	0.30
Methionine	0.30	0.30	0.30
Bone meal	3.00	3.00	3.00
*Premix	0.25	0.25	0.25
Salt	0.25	0.25	0.25
Total	100.00	100.00	100.00
Calculated nutrients composition			
Metabolizable energy (Kcal/kg)	3059	3067	3075
Crude protein (%)	20.30	20.29	20.28
Crude fibre (%)	3.19	3.13	3.08
Lysine (%)	1.08	1.08	1.07
Methionine (%)	0.50	0.56	0.55
Calcium (%)	1.34	1.34	1.34
Phosphorus (%)	0.94	0.93	0.93

*Each 2.5 kg of the premix contain the following: Vitamin A, 7500 IU; vitamin E, 1,000 IU, vitamin B_1, 375 mg; vitamin B_2, 125 mg; vitamin B_3, 500 mg; vitamin B_6, 150 mg; vitamin B_{12}, 2.5 mg; vitamin K, 15 mg; vitamin C, 10 mg; folic acid, 150 mg; pantothenic acid, 14.4 mg; Ca, 12.5

mg; Cu, 8.0 mg; Fe, 32 mg; I, 0.8 mg; Se, 100 mg; Mg, 0.25 mg and Cl, 250 mg.

Table 2 Composition of the experimental diets fed to laying turkeys

	Varying dietary levels of honey (%)		
Ingredients	0	2	4
Maize	60.00	58.00	56.00
Groundnut cake	15.00	15.00	15.00
Honey	0.00	2.00	4.00
Palm oil	3.00	3.00	3.00
Wheat offal	4.90	4.90	4.90
Fish meal	2.50	2.50	2.50
Lysine	0.50	0.50	0.50
Methionine	0.50	0.50	0.50
Bone meal	4.00	4.00	4.00
Limestone	6.00	6.00	6.00
*Premix	0.25	0.25	0.25
Salt	0.25	0.25	0.25
Total	100.00	100.00	100.00
Calculated nutrients composition			
Metabolizable energy (Kcal/kg)	2942	2954	2958
Crude protein (%)	14.98	14.97	14.96
Crude fibre (%)	3.62	3.57	3.51
Lysine (%)	1.09	1.08	1.08
Methionine (%)	1.25	1.24	1.24
Calcium (%)	4.03	4.03	4.03
Phosphorus (%)	1.09	1.09	1.08

*Each 2.5 kg of the premix contain the following: Vitamin A, 7500 IU; vitamin E, 1,000 IU, vitamin B_1, 375 mg; vitamin B_2, 125 mg; vitamin B_3, 500 mg; vitamin B_6, 150 mg; vitamin B_{12}, 2.5 mg; vitamin K, 15 mg; vitamin C, 10 mg; folic acid, 150 mg; pantothenic acid, 14.4 mg; Ca, 12.5 mg; Cu, 8.0 mg; Fe, 32 mg; I, 0.8 mg; Se, 100 mg; Mg, 0.25 mg and Cl, 250 mg.

RESULTS AND DISCUSSION

The result of the proximate composition of honey used in feeding the turkeys both at the growing and laying phases is presented in Table 3. The dry matter, crude fibre and ash content of honey were similar to that reported by Nweze and Ekwe (2008) and Obun *et al*. (2010), showing that honey has an appreciable quantity of protein (8 %), no fibre (0 %) and very rich in nitrogen free extracts (73.06 %).

The result of the growth performance of growing turkeys fed diets containing varying levels of honey is presented in Table 4. Daily feed intake, body weight gain and feed conversion ratio (FCR) were not significantly ($p>0.05$) influenced by the varying inclusion levels of honey in the diets of the growing turkeys. This differs from the report of Obun *et al*. (2010) who observed improved feed intake and growth performance of broiler chickens as the dietary levels of honey increased. The improved feed intake was attributed to its palatability, its ability to reduce

dustiness in the feed and its capability to bind all the nutrients together leading to reduced wastage and proper utilization of feed. This was not well manifested in this research study with growing turkey.

Table 3 Proximate composition of honey fed to the experimental birds

Parameter	% Composition
Dry matter	89.98
Crude protein	8.81
Crude fibre	0.00
Ether extract	5.97
Ash	2.14
Nitrogen free extract	73.06

Apparent nutrient digestibility of dry matter, crude protein, crude fibre, ash and ether extract were not affected ($p>0.05$) by the inclusion of honey in the diets of the turkeys while that of nitrogen free extracts was enhanced ($p<0.05$) in birds fed honey (Table 5). The greater values observed for nitrogen free extracts (NFE) digestibility in turkeys fed honey based diets might be attributed to the higher sugar content of the diets. Obun *et al.* (2010) also reported significant ($p<0.05$) NFE digestibility

Table 4 Growth performance of growing turkeys fed diets containing varying levels of honey

	Dietary inclusion levels of honey (%)				
Parameters	0	2	4	SEM	LOS
Initial body weight (g)	1714.44	1768.56	1799.44	90.81	NS
Final body weight (g)	2926.10	3055.56	3218.33	1.62	NS
Daily feed intake (g)	151.31	150.85	152.90	5.27	NS
Daily body weight gain (g)	25.07	25.82	28.39	157	NS
Feed conversion ratio (FCR)	6.86	6.69	6.39	0.53	NS

SEM = Standard error of means, LOS = Level of significance, NS = Not significant ($p>0.05$)

Table 5 Apparent nutrient digestibility of growing turkeys fed diets containing varying levels of honey (%)

	Dietary inclusion levels of honey (%)				
Parameters	0	2	4	SEM	LOS
Dry matter	92.40	91.15	92.43	0.58	NS
Crude protein	91.62	90.25	92.19	0.66	NS
Crude fibre	84.39	77.46	84.79	1.77	NS
Ether extract	91.25	90.96	92.38	0.61	NS
Ash	76.32	64.91	69.42	2.63	NS
Nitrogen free extracts	82.25^{ab}	85.75^{b}	87.76^{a}	0.38	*

[ab] Means in the same row with different superscripts were significantly ($p<0.05$) different. SEM = Standard error of means, LOS = Level of significance, NS = Not significant ($p>0.05$), * = Significantly different ($p<0.05$)

Table 6 Performance of laying turkeys fed diets containing varying levels of honey

	Dietary inclusion levels of honey (%)				
Parameters	0	2	4	SEM	LOS
Initial weight (g)	3083.33	3133.33	3162.50	52.93	NS
Final weight (g)	3862.50	3758.33	3795.83	80.61	NS
Feed intake (g/day)	191.75	193.41	195.55	2.50	NS
FCR (g feed/g egg)	3.97^{b}	2.24^{a}	1.61^{a}	2.51	*
No. of eggs produced/bird	87.33^{a}	94.33^{a}	107.67^{b}	2.36	*
Hen day production (%)	13.12^{c}	17.90^{b}	28.76^{a}	2.31	*

[ab] Means in the same row with different superscripts were significantly ($p<0.05$) different. SEM = Standard error of means, LOS = Level of significance, FCR = Feed conversion ratio, NS = Not significant ($p>0.05$), * = Significantly different ($p<0.05$)

in broilers. The enhanced digestibility of NFE in birds fed honey could also be linked to the presence of enzymes and vitamins in honey. According to Farrel and Hardakar (2001), vitamins such as ascorbic acid, thiamine, riboflavin, pyridoxine and pantothenic acid from floral sources; and proline content of honey could contribute positively to the enhancement of the efficiency of feed digestibility.

The performance of laying hens fed diets containing varying levels of honey is presented in Table 6. The results show that there were no significant ($p>0.05$) differences in initial body weight, final body weight and feed intake among birds fed the different dietary treatments; only FCR and hen day production (HDP) showed significant ($p<0.05$) differences among the treatments. As in the growing phase, FCR at the laying phase was significantly ($p<0.05$) improved as the dietary level of honey in the diet increased, with the best value (1.61) obtained at 4 % dietary inclusion level of honey. This could be due to the antibiotic properties of honey as corroborated by Nweze and Ekwe (2008) and Obun *et al*. (2010). For HDP, results show that values obtained for birds fed 4 % honey (28.76 %) was significantly ($p<0.05$) higher than the values obtained for birds fed 2 % (17.90 %) and 0 % (13.12 %) honey respectively. This could be due to the fact that honey as a prebiotic beneficially affects the host farm animal by selectively stimulating the growth and

activity of one or limited number of bacteria in the colon (Gibson and Roberfroid, 1995). Hence, honey and other fermentable sugars improves the useful microbial population of the GIT, alter the immune system, prevent colon cancer and reduce pathogen invasion thereby translating into better performance in farm animals (Cummings and Macfarlane, 2002).

CONCLUSION AND RECOMMENDATION

Results from this study show that honey can be included up to 4 % in the diets of both growing and laying turkeys with no deleterious effects on their growth performance and nutrient digestibility. Rather, FCR and HDP were improved in laying turkeys fed the 4 % honey when compared to the other diets. Hence, 4 % honey should be included in the diets of both growing and laying turkeys for optimum growth performance, nutrient digestibility and egg production.

REFERENCES

Adebolu, T. T. (2015). Effect of natural honey on local isolates of diarrhoea causing bacteria in South Western Nigeria. *African Journal of Biotechnology, 4: 1172-1174.*

AOAC (1990). Association of Official Analytical Chemists. *Official Methods of Analysis,* 15th edition, Washington DC.

Bawa, G. S., Lombin, L. H., Karsin, P., Musa, U., Payi, E. and Shamaki, D. (2010). Response of Japanese breeder quails to varying dietary protein levels in the tropics. *Nigerian Journal of Animal Production, 13(2): 43-45.*

Case, L. A., Miller, S. P. and Wood, B. J. (2010). Factors affecting breast meat yield in turkeys. *World Poultry Science Journal, 66: 189-199.*

Cummings, J.H. and Macfarlane, G.T. (2002). Gastrointestinal effects of prebiotics. *British Journal of Nutrition, 87 (suppl. 2): S145-151.*

Farrel, D. J. and Hardakar, J. B. (2001). The effect of dietary energy concentration on growth rate and conversion of energy to weight gain in broiler chickens. *British Poultry Science Journal, 14: 329-340.*

FUTMIN (2012). Federal University of Technology, Minna Postgraduate School Prospectus, 2012.

Gibson, G.R. and Roberfroid, M.B. (1995). Dietary modulation of the human colonic microbiota: Introducing the concept of prebiotics. *Journal of Nutrition, 125: 1401-1412.*

Kizilaslan, H. and Kizilaslan, N. (2007). Factors affecting honey production in apicultures in Turkey. *Journal of Applied Sciences Research, 3(10): 983-987.*

Lamidi, A. W., Fanimo, A. O., Eruvbetine, D. & Biobaku, W. O. (2008). Effect of graded levels of pineapple (*Ananas comosus* L. Meer) crush waste on the performance, carcass yield and blood parameters of broiler chicken. *Nigerian Journal of Animal Production, 35(1), 40-47.*

Malacalza, N. H., Caccavari, M. A., Fagundez, G. and Lupano, C. E. (2005). Unifloral honey of the province of Buenos Aires, Argentina. *Journal of Science, Food and Agriculture, 85: 1389-1396.*

Malik, A. A., Balogun, O. O. and Dikko, A. H. (2010). An evaluation of the effect of storage of a locally produced natural vitamin premix on the performance of laying hens. *Journal of Agriculture, Forestry and the Social Sciences, 8(1): 208-214.*

Nweze, B. O. and Ekwe, O. (2008). Effect of honey water on finishing broilers raised on deep litter system. *Proceedings of the 13th Annual Conference of the Animal Science Association of Nigeria held between 15th - 17th September, 2008 at Ahmadu Bello University, Zaria, Nigeria, pp. 273-275.*

Obun, C. O., Yahaya, O. A. O., Olafadehan, A. S., Kehinde, O. A., Adeyemi, I. U., Farouk, R. and Allison, D. S. (2010). Effect of honey flavoured diets on the performance and relative organ weight of finisher broiler chickens. *Nigerian Journal of Animal Production, 37: 64-72.*

Odunsi, A. A. (2006). Effect of different vegetable protein sources on growth and laying performance of poultry birds in a Derived Savanna zone of Nigeria. *World Applied Science Journal, 3(5): 567-571.*

Ugwuene, M. C. and Onwudike, O. C. (2010). Replacement value of dietary palm kernel meal for maize on the haematology and serum chemistry of local broiler turkeys. *Proceedings of the 35th Annual Conference of the Nigerian Society for Animal Production held between 14th – 17th March, 2010 at University of Ibadan, pp. 250-251.*