ANIMAL PRODUCTS &PROCESSING TECHNOLOGY

MEAT QUALITY OF BROILER CHICKEN FED DIET SUPPLEMENTED WITH VARYING LEVEL OF FENUGREEK AND GINGER POWDER BLEND

Okanlawon E. O[1]., Rafiu, T. A[1]., Hammed, O.O[1]., Ademolue, R.O[2]., Owolabi, O. O[1]., Ajayi, A. A[1]., Salawu, T. K[1]., Akintoye, S. A[1]., and Liadi, K. O[1].

[1]Department of Animal Production and Health, Faculty of Agricultural Science, Ladoke Akintola University of Technology Ogbomoso, Nigeria.

[2]Federal College of Agriculture, Moor Plantation Ibadan. Oyo State. Nigeria

Corresponding Author: Email: eookanlawon@lautech.edu.ng, +2348056813070

ABSTRACT

A total of one hundred sixty (160) unsexed day-old broiler chick (Ross 308) were used to determine effect of fenugreek and ginger powder blend on meat quality. They were randomly allotted to four dietary treatments groups which include T1- control diet, T2-2g/kg, T3-4g/kg and T4-6g/kg of 40 bird per treatment and (4) replicates of 10 birds and were arranged in a completely randomized design. Data were collected on meat quality such as water absorptive power, cook loss, refrigeration loss, sensory evaluation and proximate composition. Highest ($p<0.05$) crude protein (24.06) was recorded with broiler chicken fed diet containing 6g/kg of fenugreek and ginger blend while broiler chicken fed control diet had least (21.39). Moisture content recorded highest ($p<0.05$) value (68.55) with broiler chicken fed diet containing 2g/kg while the least (66.34) with broiler chicken fed diet that contained (66.34). Highest ($p<0.05$) aroma (2.22) was obtained with broiler chicken fed diet that contained 4g/kg of fenugreek and ginger blend while broiler chicken fed control diet had least (1.40). It was concluded that the use of 4g/kg of fenugreek and ginger powder in the diet improves meat quality.

Keywords: Fenugreek, Ginger, Broiler Chicken, Meat Quality.

DESCRIPTION OF PROBLEM

The cost, accessibility, and culinary diversity of poultry meat make it a popular choice in society. The chicken business has become a major global supplier of nutrient-dense animal proteins, offering a number of advantages over other animal-based food sources due to their superior protein content, amino acid balance, energy, and micronutrients (1). Antibiotics are frequently used in the chicken business to improve meat production by preventing illnesses and lowering mortality rates. Antibiotics' detrimental impact on populations of beneficial intestinal microflora and the emergence of drug-resistant bacteria have prompted several nations to outlaw their use in animal feed. It is clear from these detrimental effects that this area needs to be improved (3).

Fenugreek and ginger are used as natural feed additives in poultry nutrition (5). These additives are known as phytogenic feed additives and are used as replacements for antibiotic growth promoters (6). Ginger and fenugreek are organic growth enhancers. Its supplementation improves feed palatability and raises blood serum and antioxidant levels when added to diets. It also enhances appetite, improves nutritional utilization, and increases the flow of gastric juice (7) and (8). To improve stability and guarantee complementary activity that contributes to better meat quality, the test component (fenugreek and ginger powder) must be used in combination.

Experimental site

The experiment was carried out at the Poultry Unit of Teaching and Research Farm, Ladoke Akintola University of Technology Ogbomoso, Oyo State Nigeria. The area is in derived savannah zone of Nigeria. It lies on longitude 4.5^0 east of greenish meridian and latitude 8.5^0 North-East towards Ibadan the capital of Oyo State. The mean annual rainfall is 1247mm while relative humidity is between 75% and 95%. It is situated at about 300-600 matters above the sea level with a mean annual temperature of 27^0C (9).

Source and preparation of test ingredients

The test ingredient fenugreek seed (*Trigonella foenum-graecum L*.) and ginger were purchased from an open market in Ogbomosho, Oyo State. Ginger only was washed using clean water to remove the dirt since they are rhizome. It was poured into clean basket to drain off water and was sliced into flakes in order to increase the surface area to aid drying. Thereafter, it was air dried until the weight remained constant. Ginger was reduced using a mortar and pestle to a lentil-size portion, then both the fenugreek seed and ginger were grounded using an electric blender to a fine powder. After that, it was sieved and kept until use in an airtight container as describe.

Experimental birds and management

One hundred and sixty (160) unsexed day-old Ross 308 chicks were purchased from a reputable hatchery and was used for the experiment. The birds were randomly allotted to four (4) dietary treatments of 40 birds per treatment with four (4) replicates each in a complete randomized design (CRD). Diets 1 serve as control while 2,3 and 4 will be supplemented with ratio 1:1 combination of fenugreek and ginger powder blend at 2g, 4g, and 6g per kilogram of feed respectively. T1 (control), T2 (1gFP and 1gGP), T3 (2gFP and 2gGP) and T4 (3g FP and 3g GP). All routine management practice were strictly adhered to; however, Feeds and water were given *ad-libitum* throughout the experimental period. The experiment lasted for six (6) weeks.

Data Collection

Proximate Analysis of meat

Proximate analysis such as dry matter and moisture content, ash, crude fat, crude fibre, crude protein, total cholesterol, high density lipoprotein and low density lipoprotein will be determined according to the procedures described by (10).

Determination of Water Absorptive Power of Meat

20g of four meat sample from each treatment were weighed and placed in clean test tubes; 10mls of distilled water was poured in and left for an hour. After the time elapsed, each sample were removed and reweighed. The increase in the weight of the sample indicated the volume of water absorbed. WAP (g) = Final weight (g) – Initial weight (g)

Determination Meat Refrigeration Loss

20g of four meat sample from each treatment were weighed and labelled before refrigeration at 4^{o}C and weighed again after 24hours of refrigeration to determine the chilling loss as follows:

Refrigerated loss (g) = Weight before refrigeration (g) – weight after refrigeration (g)

Determination of Meat Cook Loss

A sample of 200g of four meat sample were weighed, wrapped in an individual airtight polythene bag, and cooked for 30 minutes at 70^{0}C in a water bath. After cooking, all meat samples had any remaining moisture removed, and they will be allowed to cool to room temperature. The meat samples were reweighed accordingly and difference in weight was obtained as cooking weight loss.

Cook loss (g) = Weight before cooking (g) – weight after cooking (g)

Meat Sensory Evaluation

Two hundred gram (200g) of four breast meat sample according to treatment and replicate were collected and washed in clean water, packed in a transparent polythene bag and tagged for identification accordingly. After that, they were cooked for 45 minutes in a water bath at 70 degrees Celsius, cooled to room temperature, and then were served to the panelists who had received training. For the purpose of sensory evaluation, twenty (20) panelists were used. The trained panelists were given at room temperature, bite-sized portions of boiled meat samples. Every panelist had to masticate one sample for each treatment and then repeat in the following categories, ranking their preference: color, aroma, taste and overall acceptability and then awarded scores using a 9-point Hedonic. Dislike extremely, Dislike very much, Dislike moderately, Dislike slightly, Intermediate, Like slightly, Like moderately, Like very much and Like extremely

Data analysis

Data collected were analysed using ANOVA as contained in Kim *et al*. (11). Significant means

were separated using Duncan Multiple Range Test.

RESULTS AND DISCUSSION

Table 1 shows effect of fenugreek and ginger powder blend on cook loss, water absorptive power and refrigeration loss of broiler chicken meat**.** No significant (P>0.05) differences were obtained on cook loss, water absorptive power and refrigeration loss. It was observed that the value of cook weight and refrigeration weight decreases because of the increasing value of the water absorptive power of meat with the inclusion of the blend. Reduced cooking loss is often associated with better meat quality and juiciness, as confirmed by research by Choi *et al.* (12). Higher water absorption levels, as seen in T3, are associated with improved meat juiciness and tenderness, as reported by Choi *et al.* (12), supporting the notion that herbs can enhance water-binding capacity at higher inclusion levels.

Table 1: Effect of Fenugreek and ginger powder blend on cook loss, water absorptive power and refrigeration loss of broiler chicken meat

Parameter	T1(0g/kg)	T2(2g/kg)	T3(4g/kg)	T4(6g/kg)	SEM
Initial cook loss (g)	200.00	200.00	200.00	200.00	0.00
Final cook loss (g)	132.00	139.00	144.00	142.00	1.24
Total cook loss weight (g)	68.00	61.00	56.00	58.00	1.24
Initial WAP weight (g)	20.00	20.00	20.00	20.00	0.00
Final WAP weight (g)	21.33	21.33	22.33	21.33	0.23
Total WAP weight (g)	1.33	1.33	2.33	1.33	0.23
Initial refrigeration loss (g)	20.00	20.00	20.00	20.00	0.00
Final refrigeration loss (g)	18.00	17.67	17.33	17.67	0.22
Total refrigeration loss (g)	2.00	2.33	2.67	2.33	0.22

SEM: Standard Error of Mean

Table 2 shows Effect of Fenugreek and ginger powder blend on meat proximate composition of broiler chicken. Significant (p<0.05) differences were obtained on crude protein, moisture, ash and ether extract. Highest (p<0.05) crude protein (24.06) was recorded with broiler chicken fed diet containing 6g/kg of fenugreek and ginger blend while broiler chicken fed control diet had least (21.39). Moisture content recorded highest (p<0.05) value (68.55) with broiler chicken fed diet containing 2g/kg while the least (66.34) with broiler chicken fed diet that contained 6g/kg. These results were in agreement with the report of Jacob *et al*. (13) which stated that garlic bulb and garlic husk (2 and 4%) supplementation resulted in a higher protein content and lower fat content in thigh muscle of chicks compared with muscle from birds fed non supplemented diets. Purwanti (14) observed that 3 per cent garlic powder effectively increased the crude protein.

Table 2: Effect of Fenugreek and ginger powder blend on meat proximate composition of broiler chicken

Parameter (%)	T1(0g/kg)	T2(2g/kg)	T3(4g/kg)	T4(6g/kg)	SEM
Crude protein	21.39^{b}	23.83^{ab}	22.50^{ab}	24.06^{a}	0.45
Moisture content	66.90^{b}	68.55^{a}	67.52^{ab}	66.34^{b}	0.32
Ash	0.54	0.58	0.51	0.53	0.01
Ether extract	5.70	5.85	5.80	6.00	0.04
Crude fibre	0.15	0.10	0.15	0.15	0.01

^{ab}: means in the same row by factor with different superscripts differ significantly (p<0.05), SEM: Standard Error of Mean.

The effect of fenugreek and ginger powder blend on sensory evaluation of broiler chicken meat is shown in Table 3. Significant (p<0.05) difference was obtained on aroma. Highest (p<0.05) aroma (2.22) was obtained with broiler chicken fed diet that contained 4g/kg of fenugreek and ginger blend while broiler chicken fed control diet had least (1.40). Blend had no significant effect on appearance, taste and overall acceptability. There was preference for the meat that contained the

blend which is as a result of the active ingredient that was contained in the blend which has been proven to give good aroma, over all acceptability, colour and taste and this is in agreement with the report of Purwanti **(**14) who stated that the inclusion of turmeric and ginger in the diet of broiler were capable as an additive to increase the physical and sensory qualities of broiler meat and the blend also contain flavonoid that help to improve quality of meat and also enhance eating quality.

Table 3: Effect of Fenugreek and ginger powder blend on sensory evaluation **of broiler chicken meat**

Parameter	T1(0g/kg)	T2(2g/kg)	T3(4g/kg)	T4(6g/kg)	SEM
Aroma	1.40[b]	2.00[a]	2.22[a]	2.20[a]	0.11
Appearance	1.80	2.00	1.90	1.60	0.12
Taste	2.00	2.00	2.10	1.30	0.16
Overall acceptability	2.10	2.10	2.50	2.20	0.13

[ab]: means in the same row by factor with different superscripts differ significantly ($p<0.05$), SEM: Standard Error of Mean.

CONCLUSION AND APPLICATION

The study concluded that inclusion of 4g/kg of ginger and fenugreek powder blend in the diet will help to improve the quality of broiler chicken meat.

REFERENCES

1. Bohrer, B.M. (2017). Review: Nutrient density and nutritional value of meat products and non-meat foods high in protein. Trends in Food Science & Technology, 65: 103-112. DOI: https://www.doi.org/10.1016/j.tifs.2017.04.016
2. Andremont A (2000). Consequences of antibiotic therapy to the intestinal ecosystem. Annales Francaises d'anesthesie et de Reanimation, 19(5): 395-402.
3. Selaledi LA, Mohammed Hassan Z, Manyelo TG, and Mabelebele M (2020). The current status of the alternative use to antibiotics in poultry production: African perspective. Antibiotics, 9(9): 594.
4. Gaikwad DS, Fulpagare YG, Bhoite UY, Deokar DK, and Nimablkar CA (2019). Effect of dietary supplementation of ginger and cinnamon on growth performance and economics of broiler production. International Journal of Current Microbiology and Applied Science, 8(3): 1849-1857.
5. Ademola, S.G., Farimu, G.O. and Babatunde, G.M. (2009). Serum lipid, growth and haematological parameters of broilers fed garlic, ginger and their mixtures. *World Journal of Agricultural Science,* 5(1): 99-104.
6. Olayeni, T.B, Okanlawon, E.O. and Akilapa, T.P. (2024). Effect of Dietary Fenugreek Powder on Growth Performance, Carcass Characteristics and Serum Biochemistry of Broiler Chicken at Starter and Finisher Phase. *Cognizance Journal of Multidisciplinary Studies. doi 10.47760/cognizance.2024.v04i05.023.*
7. Ayinla, A.K. and Odetoye, A.S. (2015). Climatic pattern and design for indoor comfort in Ogbomoso, *Nigeria. Journal of environmental and health science*. 17:481-485.
8. AOAC. Official methods of analysis -14th Edn. Association of Official Analysis Chemists. Washington; D.C, 2005.
9. Statistical Analysis System User's guide (SAS, 2002). Statistics. SAS Institute Inc,cary. No 27513 U.S.A.
10. Walker, C. E., Murdock, R., and Thompson, J. (2020). Cooking loss in broiler meat: The impact of herbal dietary inclusion. *Journal of Culinary Science and Technology*, 19(4), 281-293.
11. Kim, Y.J., Jin, S.K., and Yang, H.S. (2008). Effect of dietary garlic bulb and husk on the physicochemical properties of chicken meat. Poult. Sci. 2008; 88:398-405.
12. Choi, I.H., Park, W,.Y, Kim, Y.J. (2010). Effects of dietary garlic powder and α-tocopherol supplementation on performance, serum cholesterol levels, and

meat quality of chicken. Poult. Sci. 89:1724-1731.

13. Jacob, O. A., Akinyinka, A. and Jacob, O. A. (2018). Extractive Value and Phytochemical Screening of Ginger (*zingiber officinale*) and Turmeric (*curcuma longa*) Using Different Solvents. *International Journal of Traditional and Natural Medicines*,8(1): 13-22.
14. Purwanti, S. (2018). Physical and Sensory Quality of Broiler Meat as Influenced by Dietary Supplementation of Turmeric (Curcuma longa), Garlic (*Allium sativum*) and in Combinations as a Feed.