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THEME: DEVELOPMENT OF A RESILIENT LIVESTOCK INDUSTRY FOR NATIONAL ECONOMIC GROWTH

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BOOK OF PROCEEDINGS

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Development of a Resilient Livestock industry for National Economic Growth

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Effect of Roselle (*Hibiscus sabdariffa*), Ginger (*Zingiber officinale*) and Garlic (*Allium sativum*) Extracts on Meat Quality of Broiler Chickens

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Abstract: An eight weeks experiment was conducted using 200-day-old broiler chicks to determine the effect of Roselle, Ginger and Garlic extracts on meat yield and meat quality of broiler chickens. The birds were assigned to five treatment groups, four replicates each and ten birds per replicate in a completely randomized design. The treatments were designed as T1, T2, T3, T4 and T5 with each treatment having four replicates, and each replicate contained 10 birds. T1 was designed as the control and birds on T1 were administered 100 % water and no plant extracts; T2, 4 g of roselle per litre of water; T3, 4 g of roselle and 4 g of ginger per litre of water; T4, 4 g of roselle and 2 g of garlic per litre of water and T5, 4 g of roselle, 4 g of ginger and 2 g of garlic per litre of water.Formulated diets were given both at the starter and finisher phases *ad libitum*. At the end of the experiment, Fourbroiler chickens per treatmentwere slaughtered to evaluate meat yield and meat quality characteristics. Results obtained show that carcass parameters were not significantly ($p>0.05$) influenced across the treatments except breast, drumstick, lungs and abdominal fat %. There were significant ($p<0.05$) differences in the result of pH, WHC, cooking yield and cooking loss across the treatments. The proximate composition of the meat of broiler chicken were not significantly ($p>0.05$) different. It was therefore concluded that inclusion of 4 g Roselleg extracts in the drinking water of broiler chickens produced better meat yield and meat quality characteristics.

Keywords: Effect, Roselle, Ginger, Garlic extracts, Meat quality, Broiler chickens

DESCRIPTION OF THE PROBLEM

Poultry which offers meat and egg (protein of animal origin) on account of its short generation interval and handy size, is expected to play a major role in providing adequate protein for the teeming populace (1). Apart from the fact that the total protein supply is insufficient, the quality of dietary protein available is low in developing countries compared to that consumed in developed countries. It is therefore necessary that farmers increase the production of livestock and its products to meet the basic needs of animal protein requirements in terms of quality and quantity (2). Meat quality is one of the economically important traits in chickens. According to Mcafee *et al*. (3), the major determinants of meat quality consist of toughness, tenderness, juiciness and flavour. Guan *et al*. (4) identified other factors that affect meat quality, such as, genetics, nutrition and environment. These factors integrate to give an overall assessment of meat quality by the consumer. Meat quality traits of poultry include proteins, total lipids, pH, colour, water holding capacity, texture, and sarcomere length (5). Additives in poultry diets are primarily included to improve efficiency of the bird's growth, prevent diseases and improve feed utilization. Therefore, this study was conducted to evaluatethe effect of Roselle (*Hibiscus sabdariffa*), Ginger (*Zingiberofficinale*) and Garlic (*Allium sativum*) extracts on meat quality of broiler chickens.

MATERIALS AND METHODS

The study was carried out at the Department of Animal Production Teaching and Research Farm, Federal University of Technology, Minna; which is the capital city of Niger State and lies within the Guinea Savannah zone of Nigeria. It is located within latitude 9°37' North and longitude 6°33' East (Niger State Agricultural Development Project, 2009). The plant parts used to obtain the plant extracts were purchased dried except garlic. The cloves were carefully removed and oven dried in the laboratory using an electric oven at 100°C for 24 hours. The ginger and rosellewere also oven dried at 80°C for 24 hours to ensure that they were properly dried. The

materials were later on crushed using an attrition mill and administered to the birds as five treatments as follows:T1 was the Control and was made up of 100 % water and no plant extracts; T2 was 4 g of roselle per litre of water; T3 was 4 g of roselle and 4 g of ginger per litre of water, T4 was 4 g of roselle and 2 g of garlic per litre of water and T5 was 4 g of roselle, 4 g of ginger and 2 g of garlic per litre of water. The treatments were prepared daily by adding all the required ingredients in water, boiling for about 20 minutes and sieving after cooling. A total of two hundred (200) day-old chicks were purchased from Chi Farms Ibadan, Oyo State. The birds were acclimatized for a week before they were randomly allotted to the five treatments (T1- T5), with four replicates per treatment, and each replicate made up of 10 birds. The birds were fed standard formulated diets of 24 % crude protein and about 3000 kcal/kg ME at the starter phase and 20 % crude protein and about 3000 kcal/kg ME at the finisher phase. The birds were fed ad libitum and administered the treatments in their drinking water for seven weeks. At the end of the experiment, four broiler chickens whose weight were closer to the average were selected from the treatments. The birds were fasted for 12 h, weighed individually, slaughtered by cutting the jugular veins, defeathered by dipping in boiling water of about 75°C and eviscerated. Carcass was cut into parts and weighed using a weighing balance (camry®). Internal organs were separated and weighed using satorius® electronic scale. Weights of the carcass cut and internal organs were expressed as percentage of dressed and live weights respectively. Proximate composition of meat samples and pH were determined according to AOAC (6) methods. Cooking yield and water holding capacity were determined according to the methods ofCason *et al.* (7). Thawing loss was determined by calculating the difference in the pre-freezing and post-thawing weights. Data obtained on the meat yield and meat quality characteristics were pooled and subjected to one-way analysis of variance using SAS version (8).

RESULTS AND DISCUSSION

Table 1: Carcass characteristics of broiler chickens fed Roselle, Ginger and Garlic extracts

Parameter	T1	T2	T3	T4	T5	SEM
Live weight (g)	1150.00	1083.33	1183.33	1140.00	1083.33	19.47NS
Slaughter weight (g)	1103.31	1041.11	1092.33	1100.67	1046.71	0.76NS
Dressed weight (g)	915.31	896.99	890.14	902.44	903.83	5.80NS
Dressed (%)	82.96	86.24	81.49	81.99	86.35	7.80NS
Breast (%)	14.46[a]	13.42[ab]	12.78[ab]	10.88[b]	14.03[a]	0.46*
Back (%)	5.33	5.00	5 19	5.18	5.38	0.19NS
Thigh (%)	6.32	6.28	5.98	5.97	6.09	0.79NS
Drumstick (%)	4.78[ab]	4.42[b]	4.52[ab]	4.73[ab]	5.11[a]	0.99*
Wings (%)	5.59	5.45	5.39	5.50	5.53	0.15NS
Heart	0.43	0.65	0.54	0.54	0.62	0.39NS
Liver	1.30	1.60	1.79	1.04	1.75	0.13NS
Lungs	0.40[c]	0.74[a]	0.59[ab]	0.43[c]	0.56[bc]	0.37*
Gizzard	2.29	2.83	2.43	2.68	2.09	0.13NS
Intestines	5.42	5.97	5.32	5.51	5.25	0.23NS
Abdominal fat	1.04[ab]	0.54[ab]	0.28[b]	1.19[a]	0.56[ab]	0.13*

[abc] Means within the same row with different superscripts are significantly different (p<0.05)SEM: standard Error of Mean, T1: Water only, T2: 4grams of roselle extract, T3: 4grams of roselle and 4grams ginger extracts, T4: 4grams of roselle and 2grams of garlic extracts, T5: 4grams of roselle, 4grams ginger and 2grams garlic extracts.

Table 2: Meat quality of broiler chicken given Roselle, Ginger and Garlic extracts

Treatments	T1	T2	T3	T4	T5	SEM
pH	5.51[e]	5.91[a]	5.63[c]	5.68[b]	5.58[d]	0.36*
Cooking yield	30.00[b]	31.00[a]	29.00[c]	29.50[bc]	28.00[d]	0.29*
WHC	50.00[d]	70.00[a]	55.00[c]	50.00[d]	60.00[b]	2.01*
Thawing loss	20.00[c]	38.00[b]	50.00[a]	20.00[c]	15.00[d]	3.55*

a b c d e Means within the same row with different superscripts are significantly different (p<0.05) SEM: standard Error of Mean, T1: Water only, T2: 4grams of roselle extract, T3: 4grams of roselle and 4grams ginger extracts, T4: 4grams of roselle and 2grams of garlic extracts, T5: 4grams of roselle, 4grams ginger and 2grams garlic extracts.

Table 3: Proximate composition of the meat of broiler chicken given Roselle, Ginger and Garlic extracts

Treatments	T1	T2	T3	T4	T5	SEM
Dry matter	92.80	95.00	94.65	93.10	94.75	0.44NS
Crude protein (%)	71.05	70.50	69.84	69.35	70.00	0.39NS
Lipid content (%)	10.00	10.55	12.50	12.50	12.00	0.48NS
Ash content (%)	6.25	6.25	6.50	6.50	8.00	0.43NS

SEM: standard Error of Mean, T1: Water only, T2: 4grams of roselle extract, T3: 4grams of roselle and 4grams ginger extracts, T4: 4grams of roselle and 2grams of garlic extracts, T5: 4grams of roselle, 4grams ginger and 2grams garlic extracts.

The results of carcass characteristics of broiler chickens supplemented with Roselle, Ginger and Garlic extracts are shown in Table1-. The higher significant (P<0.05) differences in T5 for both the breast and drum stick percentage might be because of high dressing percentage. This could be dependent on the dose and preparation. The relative weight of abdominal fat was significantly higher for broilers fed Roselle and Garlic extracts compared to other treatments. However, (9) and (10) reported that mixtures of garlic and ginger in broiler diet effectively reduced abdominal fat. Meat quality characteristics of broiler chicken given roselle, ginger and garlic extracts shown (Table2). The results revealed significant (P<0.05) differences in all the parameters measured. pH, cooking yield and water holding capacity were significantly (P<0.05) higher in T2. Thawing loss was significantly (P<0.05) higher in T3. The significant difference in pH, water holding capacity, cooking yield and thawing loss agrees with the findings of (11) who reported a significant effect of pH on cooking loss. In relation to this study, it was stated that poultry meat with low pH has been associated with low water holding capacity, which results in increased cooking loss and drip loss (12).

CONCLUSION

It was concluded that inclusion of roselle (4 g) as a growth promoter and antioxidant improved the breast, drumstick weights and meat quality characteristics of broiler chicken.

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