COMPARATIVE EFFECTS OF SUPPLEMENTATION OF GROWTH PROMOTERS IN BROILER CHICKEN DIETS ON GROWTH PERFORMANCE, CARCASS AND MEAT CHARACTERISTICS

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ABSTRACT
This study compared the effects of two growth promoters on the performance, carcass and meat characteristics as well as their retention in meat of broiler chickens. A total of 100 birds were used for this study. The chicks were brooded for 20 days, on a basal control diet ad libitum and at 21 days 90 birds were randomly allocated two dietary treatments and a control treatment, each treatment was replicated thrice with 10 birds per replicate. The birds were fed starter diet from day 1-28 and finisher diet from day 29-56. The experimental diets were arranged thus: T1 = Control diet, T2 = Antibiotic (Oxytetracycline 0.15%), T3 = Diet with Probiotic (Probioenzyme 0.15%). The study was conducted with randomized design experiment and analysed with analysis of variance (ANOVA) and Duncan multiple range test was used to separate the means at p = 0.05. There were significant (p<0.05) differences in the performance, carcass profile and offal characteristics of birds fed antibiotic and probiotic with birds fed probiotic having higher values. Birds fed diet with probiotic (T3) furnished meat with higher (p<0.05) water holding capacity (61.94%), and cooking yield (89.66%) with lower (p<0.05) losses and shortenings than meat from birds fed antibiotic (T2) diet. The fat content and pH of meat from birds fed diet T3 were lower (p<0.05) compared with those obtained in meat from birds fed diet T2, hereas birds fed diet T2 retained residues, mostly, which were higher (p<0.05) in internal organs than in the muscles when compared with birds in T3. All the sensory properties of meat tested, with the exception of tenderness were higher (p<0.05) in meat from birds fed diet T3 and the meat were highly accepted than meat samples from birds fed diet T2. This study was limited to the use of chicken and inclusion of antibiotic and probiotic in diets to compare the efficacy of probiotic with the view to adapting for use in livestock production. It was concluded that birds fed diets with probiotic performed better than those fed antibiotic. It was recommended that probiotic at 0.15% could be included in broiler diets for high efficacy and lower residual effect in meat for safe consumption.

Keywords*: Broiler chicken, carcass, diet, growth promoter, meat, performance.*

INTRODUCTION
The increase in demand for meat and animal products has led to an increase in production of livestock products particularly poultry, as it remains one of the potential avenues to achieve sustainable and rapid production of high quality protein to meet the increasing demand for animal protein (1, 2). Nutrition is the most expensive factor in poultry production and improvement of feed efficiency is very important to reduce the cost of raising birds, and the use of additives as growth promoters is one of the many ways to accomplish this goal (3) feed additives have

been included in poultry diets for decades to promote growth, good health and to maximize the genetic potentials of modern broilers, turkey and layers of these additives antibiotics have been used widely (4). Antibiotics exert their effect by stabilizing the intestinal microbial flora thereby preventing proliferation of specific intestinal pathogens (5). The continuous exposure of antibiotics of livestock has led to serious health problems in humans that consumed animal products including carcinogenic effects.(6). The challenges posed by the use of antibiotics in livestock had led to research for alternative natural growth promoters (NGPs) which include organic acids, immune stimulants, acidifiers prebiotics, phytobiotics probiotics, feed enzymes and antioxidants (7). Probiotics are viable microorganisms (bacteria or yeast) that exhibit beneficial effect on health of the host when ingested (8). Since probiotics can exert beneficial effects on livestock without serious effect on human health, this study aimed at determining the implications of using probiotic in replacement of antibiotics as feed additive on growth, carcass and meat characteristics, as well as an investigation of the residual effect of both antibiotics and probiotics in various parts and organs of broiler chickens.

MATERIALS AND METHODS

Location of Study

This study was carried out at the Poultry Unit of the Teaching and Research Farm (T&RF), College of Agricultural Sciences, Olabisi Onabanjo University, Ayetoro Campus, Ogun State, Nigeria. Ayetoro is located at latitude 12^0N and longitude 20^0E in the tropical region of Nigeria. The mean annual rainfall is 1250mm with an average temperature of 26^0C (9)

Experimental birds and management

A total of 100-day-old chicks were purchased and used for this study. They were brooded for 20days and fed *ad-libitum* on basal control diet. At day 21, 90 birds were randomly allocated to three dietary treatments, each treatment was replicated three times with 10 birds per replicate. The experimental treatment diets were arranged thus: T1 = Control diet (No feed additive), T2 = Control diet + antibiotics (Oxytetracycline 0.15%), T3 = Control diet + Probiotics (Probio enzymes 0.15%).

The percentage composition and the chemical composition of the experimental diets are shown in Tables 1 and 2 respectively.

Growth Performances measurement

Indices of performance measured included daily feed intake (DFI), weight gain and feed conversion ratio (FCR) according to (2).

Carcass measurements

At day 56, three birds from each replicate across treatments with body weights close to the mean of the group were randomly selected, starved for 8hrs weighed, bled, scalded at 80^0c for 2 seconds, defeathered and eviscerated. Hot carcass weight, dressing percentage, external and internal offal weights and weights of primal cuts were determined (10).

Measurement of meat characteristics

The physical characteristics of meat measured included Water Holding Capacity (WHC) following the procedures of (11). An approximately 1g of intact meat from breast was placed in between two pieces of Whatman filter paper No.1 previously desiccated and weighed and placed between two Plexiglas plates, and pressed with a weight of 2kg for 5 minutes. The amount of water released from meat samples was measured indirectly by taking the area of filter paper wetted relative to the area of pressed meat samples. Thus

$$WHC = \frac{100 - (Aw - Am) \times 9.47}{Wm \times Mc} \times 100$$

Where

Aw = Area of water released from meat samples (cm^2)
Am = Area of meat samples (cm^2)
Wm = Weight of meat samples (g)
Mc = Moisture Content of meat samples (%)
9.47 = Constant factor

Drip loss

This was determined following the procedures of (12). 30g of sliced breast meat were cut and suspended parallel to the fibre direction of 30g in weight and were suspended in polythene bags sealed under atmospheric pressure. The samples

Table 1: Percentage Nutrient Composition of Experimental Diets

Ingredient	Percentage Composition Diet 1 (Starter Diet)	 Diet 2 (Finisher Diet)
Maize	56.00	53.30
Soyameal	24.00	15.00
GNC	-	20.00
PKC	-	-
Wheat offal	12.00	6.00
Bone meal	2.00	2.00
Oyster shell	4.00	2.00
Broiler Premix	0.25	0.25
Salt	0.25	0.25
Lysine	0.10	0.10
Methionine	0.10	0.10
Fish meal	1.30	-
Total	100.00	99.00
Calculated values		
Crude protein (%)	22.48	20.72
Crude fibre (%)	8.30	9.87
Metabolizable energy (kcal/kg)	2950.23	2987.05

**Premix to supply vitamin A (10,000mg), Vitamin D (2,000mg), Vitamin E (10mg), Vitamin K (2,000mg), Vitamin B_{12} (10,000mg) Pantothenic acid (10,000mg), Niacin (26,000mg), Folic acid (1,000mg), Biotin (100,000mg), Choline (150,000mg), Anti-oxidant (125,000mg), Manganese (10,000mg), Zinc (50,000mg), Cobalt (250mg), Iron (40,000mg), Copper (6,000mg)*

Table 2: Chemical Composition of Experimental Diets

Ingredient	Experimental Diets Diet 1 (Starter Diet)	 Diet 2 (Finisher Diet)
Moisture Content	53.27	55.10
Crude Protein	22.40	20.34
Ether Extract (fat)	8.00	7.20
Ash	6.30	7.40
NFE	10.03	9.96
Crude fibre	8.34	10.00

NFE = Nitrogen Free Extract

were held at 4°C for 48 hours and reweighed. The drip loss was expressed as a percentage of the initial sample weights.

$$\text{Drip loss: } \frac{Mwt_1 - Mwt_2}{Mwt_1} \times 100$$

Cooking loss

Meat cooking loss was determined by cutting 10g and 6cm of breast meat samples wrapped in airtight polythene bags and boiled in water in a preheated pressure pot for 20 minutes until 72°C doneness by inserting a probe thermometer (13). The meat samples were removed, placed in a clean container to equilibrate to room temperature (27^0C) and were reweighed. Cooking loss was calculated thus:

$$\text{Cooking loss} = \frac{Wrm - Wcm}{Wrm} \times 100$$

Wrm = Weight of raw meat,
Wcm = Weight of cooked meat

Cold Shortening (after 24 hours**)**

This variable was measured by cutting a 6cm length of meat sample from breast of carcasses of each treatment and wrapped in polythene bags, chilled at 4°C for 48 hours. The meat samples were removed and remeasured. The difference in length was calculated according to (14).

$$\text{Cold Shortening} = \frac{Lm2 - Lm1}{Lm1} \times 100$$

Where;
Lm1 = Initial Length
Lm2 = Final Length

Thermal Shortening

Thermal shortening of meat samples was determine with the same meat samples used for measuring cooking loss. The length of the meat samples which was initially 6cm was re-measured after cooking for 20 minutes and cooling them to room temperature (27°C) (15).

$$\text{Thermal Shortening} = \frac{Lrm - Lcm}{Lrm} \times 100$$

Lrm = Length of raw meat,
Lcm = Length of cooked meat

Proximate composition and pH of meat

The proximate characteristics of meat samples from breast cut i.e moisture content, crude protein, ether extract (fat) and ash were determined following the procedures described by (16). The pH of the meat samples was determined using portable pH meter (Model H18434 Microcomputer, Havanna instrument, Romania) according to the procedures of (17), while the Nitrogen free extract (NFE) was deduced by calculation (100 – proximate).

Residues retention analysis

Residues retention of growth promoters in meat was analysed using three plate test and disc assay methods following the procedures described by (18). Three species of bacteria were used viz: *Escheria Coli* (ATCC25922), *Staphylococcus aureaus subaureus* (ATCC29213) and *Bacillus subtilis* (DSM618). Sterilized nutrient agar plates inoculated with a loop full of freshly prepared suspension of each bacterium were made. An incision was made in each issue sample using a clean sterile forceps, a sterile paper disc was placed into the incision and left until it was soaked and the disc was transformed onto the agar surface. The plates were then inverted and incubated at 37 – 38°C for 18 – 24 hours. The presence of antibiotic and probiotic residues in the meat samples was indicated by the presence of inhibition zone of diameter of 2 mm or more, while the absence of antibiotic and probiotic residues was indicated by the absence of inhibition zone around the growth or the presence of a zone of less than 2 mm.

Sensory evaluation of meat samples

This was conducted using a semi-trained 10-member taste panel according to the procedures of (19). The taste panelists were drawn from the Students and Staff of the Department of Animal Production of the University in the age range of 21 – 30years. They were provided unsalted biscuits and water for use win between treatment meat samples. The meat samples tested were coded after boiling for 20 minutes in labeled polythene bags to an internal temperature of 72°C with probe thermometer and cooled to room temperature (27°C). Meat samples from each treatment were evaluated independently of each other and the panellists rated the meat sam-

ples on a 9-point hedonic scale on which 1 = disliked extremely and 9 = liked extremely for colour, flavour, tenderness, juiciness, texture, and overall acceptability.

Experimental design and statistical analysis

This study was carried out based on completely randomized design (CRD) and at the end of the study period all data collected were subjected to analysis of variance (ANOVA) using linear model procedures of (20), while the differences in the means were separated with Duncan's multiple range test at $p<0.05$.

RESULTS AND DISCUSSION

Growth of experimental birds

The results of performance characteristics of experimental birds are presented in Table 3. The final weight, gain in weight and feed intake were significantly ($p<0.05$) higher in birds fed diet containing probiotic (T3), feed conversion ratio was lower in birds fed diet T3. There were significant differences in the performance of birds fed antibiotic (T2) and Probiotic T3 diets which was obvious in the feed conversion ratio that was lower in birds fed diet T3 indicating that the birds were able to convert feed intake to higher muscle build up. This finding was in line with the reports of previous workers who found out that birds fed probiotic consumed more feed than those on antibiotic probably because of possible enlargement in the gastro intestinal tract of the birds fed probiotics which might have improved the growth performance of the birds hence, increase in weight (21; 22; 23; 2).

Carcass Characteristics

The results of carcass analysis of experimental birds are shown in Table 4. The bled weight, dressed carcass weight and carcass yield (percentage) were higher ($p<0.05$) significantly in birds fed diet with probiotic (T3) closely fol-

Table 3: Performance characteristics of experimental birds

Variable	Treatments Diets			SEM
	T1 (Control)	T2 (0.15%OTC)	T3 (0.15%PBT)	
Initial wt.(g/b)	534.00	550.00	550.00	22.60
Final wt(g/b)	1827.00^{c}	2,000.00^{b}	2,037.00^{a}	48.50
Weight gain (g/b)	1293.00^{c}	1450.00^{b}	1486.40^{a}	92.60
Total feed intake (g/b)	5800.00^{c}	5865.00^{b}	5878.00^{a}	70.20
FCR	4.74	4.18	4.09	0.17

Means on the same row with different superscripts are statistically significant ($p<0.05$)
FCR = Feed Conversion Ratio

Table 4: Carcass profile of experimental birds

Variable	Treatment Diets			
	T1 (Control)	**T2** (0.15%OTC)	**T3** (0.15%PBT)	SEM
Live $wt_{(g)}$	1827.00^{c}	2,000.00^{b}	2,037.00^{a}	47.00
Bled Carcass $wt_{(g)}$	1725.00^{c}	1927.00^{b}	1912.00^{a}	0.78
Dressed carcass $wt_{(g)}$	51.87^{c}	62.70^{b}	89.73^{a}	1.54
Carcass yield (%)	284^{b}	314^{b}	441^{a}	1.10

Means on the same row with different superscripts are statistically significant ($p<0.05$)

lowed by those birds fed diet containing antibiotic (T2) and least ($p<0.05$) in carcasses of birds fed control diet. The dietary treatments significantly affected the dressed carcass weight and the highest value 89.73g was recorded for carcasses of birds fed diet T3 as well as carcass yield (4.41%). These results could be due to high performance of birds fed diet T3 because they consumed more feed which culminated in development of muscle in the birds. In this study probiotic increased carcass yield significantly but it is at variance with the findings of (6) who reported that carcass yield was not affected by antibiotic and probiotic.

Chicken Primal cut profile of birds's carcasses

The primal cuts profile results of carcasses of experimental birds are recorded on Table 5. Carcasses of birds in Treatment 3 elicited higher ($p<0.05$) primal cuts weights followed by carcasses of birds fed diet T2 while the primal cuts weights were significantly lower ($p<0.03$) in carcasses of birds fed control diet, this could be as a result of consuming more of the experimental diet resulting in the absorption of more nutrient to increase the growth of birds in that treatment group (2).

Breast cut had the highest value of 203.70g for birds fed antibiotic and 214.00g for birds fed probiotic. The findings of this study on effect of antibiotic and probiotic in diet on primal cuts of bird's carcasses did not agree with the finding of (2)

Organs and Offals of birds carcasses

There were significance ($p<0.05$) difference in the internal and offals of the experimental birds with birds fed diet T3 having higher full and empty GIT (Gastrointestinal tract) but lower abdominal fat and feather weights (Table 6), while other organs and offal were significantly higher in weights of birds fed diet T3. These results were the demonstration of the fact that probiotic induced higher increase of these organs/offals of birds in group T3 and reduced both gut contents or aided ease elimination of the gut contents and reduction of abdominal fat probably due to fibre nature of probiotics (10.00). The additive (probiotic) might have also aided the birds in group T3 to consume more of the feed due to increase in their GIT compared with those on antibiotic and control diets. The reports of other previous workers indicated that probiotic induces both increase in organs/offals and feed consumption of broiler chickens (24; 25; 26; 27). Table 6 shows the results of both internal and external offals measurement of the experimental birds. All the offals weights of birds fed diet T3 were significantly ($P<0.05$) higher than those of birds fed diet T2 and control diet.

Physical Properties of Meat

The results of physical properties of meat from experimental birds are presented on Table 7. All the meat physical properties were significantly ($P<0.05$) higher in birds fed diet T2 except cooking yield and water holding capacity (WHC) which were significantly higher in T3 fed birds.

Table 5: Primal cuts profile of experimental birds

Variable	Treatment Diets			SEM
	T1 (Control)	T2 (0.15% OTC)	T3 (0.15% PBT)	
$Thigh_{(g)}$	101.00^{c}	114.30^{b}	125.30^{a}	1.36
$Drumstick_{(g)}$	113.40^{c}	124.70^{b}	136.00^{a}	1.36
$Back_{(g)}$	163.70^{c}	187.20^{b}	198.00^{a}	1.04
$Breast_{(g)}$	192.00^{c}	203.70^{b}	214.00^{a}	1.17
$Wing_{(g)}$	82.50^{c}	94.00^{b}	104.80^{a}	1.36

Means on the same row with different superscripts are statistically significant ($p<0.05$)

The results of birds meat physical properties on Table 7 showed that meat samples from birds fed diet T3 elicited water holding capacity of 61.94% and cooking yield 89.66% against that of antibiotic with 52.83% and 73.30%. This was evident in higher cooking loss 26.70% of antibiotic meat while probiotic meat had only 10.34% cooking loss value. All other physical properties of meat except cooking yield and WHC were very low in meat samples from birds fed T3 diet, this could be due to the fact that probiotic has the ability to retain much of moisture or juices in the meat than antibiotic. These results were in resonance with the findings of (28) who compared the effects of different growth promoters on performance and carcass characteristics of boiler chickens.

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Table 6: Organs/ Offals measurement of the experimental birds

Variable (g)	Treatment Diets T1 (Control)	T2 (0.15% OTC)	T3 (0.15% PBT)	SEM
Internal offals				
Full GIT	15.30^{c}	17.50^{b}	19.53^{a}	0.49
Empty GIT	12.50^{c}	15.40^{b}	18.50^{a}	0.47
Large intestine	0.54^{c}	0.67^{b}	0.85^{a}	0.04
Large Intestine$_{(cm)}$	57.57^{c}	68.33^{b}	71.63^{a}	1.30
Small Intestine	0.44^{c}	0.56^{b}	0.68^{a}	0.04
Small Intestine$_{(cm)}$	61.00^{c}	72.21^{b}	77.32^{a}	1.08
Heart	0.50^{c}	0.70^{b}	0.80^{a}	0.06
Lung	0.30^{c}	0.50^{b}	0.63^{a}	0.07
Liver	0.40^{c}	0.60^{b}	0.72^{a}	0.04
Gizzard	13.50^{c}	5.00^{b}	6.40^{a}	0.42
Crop	0.34^{c}	0.46^{b}	0.59^{a}	0.02
Spleen	0.05^{c}	0.08^{b}	0.12^{a}	0.01
Abdominal fat	3.60^{a}	2.53^{b}	1.45^{c}	0.09
External offals				
Head	2.60^{c}	4.10^{b}	5.50^{a}	0.07
Shank	3.20^{c}	5.40^{b}	6.50^{a}	0.18
Feather	5.30^{a}	4.15^{b}	3.10^{c}	0.15

Means on the same row with different superscripts are statistically significant ($p<0.05$)
GIT = Gastro intestinal tract

Table 7: Physical properties of experimental birds' meat

Variable (%)	Treatment Diets			SEM
	T1 (Control)	T2 (0.15% OTC)	T3 (0.15% PBT)	
Cooking loss (%)	14.40[b]	26.70[a]	10.34[c]	5.13
Cold loss (%)	13.30[b]	15.60[a]	12.10[c]	9.07
Drip loss (%)	8.00[b]	10.00[a]	5.00[c]	12.83
Cold Shortening (%)	12.66[b]	16.88[a]	11.26[c]	2.26
Thermal shortening (%)	10.30[b]	13.33[a]	9.23[c]	0.01
W.H.C (%)	55.53[b]	52.83[c]	61.94[a]	0.41

Means on the same row with different superscripts are statistically significant ($p<0.05$)
W.H.C = Water Holding Capacity

on performance and carcass characteristics of boiler chickens.

Proximate Composition of Meat

There were no significant ($p>0.05$) differences in the moisture, crude protein and ash contents of broiler chickens meat fed control (T1) antibiotic (T2) and probiotic (T3) containing diets as shown on Table 8. Ether extract (fat) was significantly ($p<0.05$) lower in meat from birds fed diet T3 compared to those fed control diet, while pH was significantly ($p<0.05$) higher in meat from birds fed both T1 and T2 diets. NFE was lower ($p<0.05$) in meat from birds fed control diet than meat from those fed diets T2 and T3 respectively. There were no significant differences in moisture, crude protein and ash contents of meat across the three treatments (Table 8). However, it was observed that the fat content of meat from birds fed diet with Probiotic was very low compared with the other two treatments. Though the birds in T3 recorded higher weight gain, they did not accumulate fat in their muscles (Marbling), but the level of the fat could be enough to enhance high juiciness of the meat. The pH of the meat decreased from birds fed

Table 8: Proximate composition and pH of experimental birds meat

Variable (%)	Treatment Diets			SEM
	T1 (Control)	T2 (0.15% OTC)	T3 (0.15% PBT)	
Moisture content (%)	70.13	69.23	70.02	0.22
Crude protein (%)	19.73	20.10	19.70	0.19
Ether Extract (fat) (%)	6.70[a]	5.30[b]	3.53[c]	025
Ash Content (%)	2.76	3.03	2.65	0.08
NFE (%)	0.68[c]	2.34[b]	4.10[a]	0.05
pH	6.50[a]	6.30[a]	5.50[b]	0.34

Means on the same row with different superscripts are statistically significant ($p<0.05$)
NFE = Nitrogen Free Extract

diet T1 to T3, which had the lowest ($p<0.05$) value of 5.50. This value tend towards normal pH value and very appropriate for a good shelf life of the meat from birds fed diet T3 while meat from birds fed diets T1 and T2 could be more prone to spoilage especially meat from birds fed diet T1 due to lower acidic medium This result is very close to the findings of (29) and (28) who reported on the effects of different growth promoters on performance and carcass characteristics of broiler chickens.

Percentage residues retention in muscle and offals

Table 9 shows the results of percentage retention of antibiotic (Oxytetracycline) and probiotic (Probioenzyme) in the meat samples from birds fed control diet T1, test diets T2 and T3. The results indicated that antibiotic was retained in all the carcass parts investigated, while probiotic was only retained in the Wing, Gizzard and intestine and the percentage of probiotic (T3) retained in these parts was significantly ($p<0.05$) lower than the antibiotic retained (T2). The results of antibiotic and probiotic retention in muscle and offals indicated that birds fed diet T3 did not retain any residues of probiotic in the muscle and offals except in the wing, gizzard and intestine and the values were very low compared with those obtained for muscles and offals of birds fed diet T2 that retained antibiotic residues in all the muscles and offals investigated (Table 9). The results from this study were consistent with the reports of various studies that were conducted in the past, that residues of antibiotic growth promoter (AGPs) were left in the tissue of the birds fed these AGPs (30; 31; 32). The residues were highest in the intestine and gizzard of the experimental birds probably because these are the site for feed metabolism and subsequent assimilation into the body and whatever end products of metabolism that could not be absorbed by the body is left in the intestine with highest value of residues (62.2%) compared with that of heart (6.66%) and breast muscle (11.13%). In overall, residues retention was lower in muscle than in the offals in this study which corroborated the findings of (33) who reported lower residues of AGPSs in the muscle. However, (32) reported higher percentages of residues of AGPs in muscle and liver which was contrary to the finding of this current study.

Sensory Properties of meat

The results of organoleptic characteristics of meat from birds fed control diet (T1), antibiotic (T2) and probiotic (T3) containing diets are shown on Table 10. Colour of meat from birds fed diet T3 diet was significantly ($p<0.05$) higher, compared to all other treatments The flavour

Table 9: Percentage retention of antibiotic and probiotic in selected muscles and offals of experimental birds

Variable (%)	Treatment Diets			SEM
	T1 (Control)	T2 (0.15% OTC)	T3 (0.15% PBT)	
Thigh	-	13.33^{a}	0.00^{b}	0.00
Drumstick	-	13.33^{a}	0.00^{b}	0.00
Back	-	13.33^{a}	0.00^{b}	0.00
Breast	-	11.13^{a}	0.00^{b}	0.33
Wing	-	17.80^{a}	8.86^{b}	0.47
Heart	-	6.66^{a}	0.00^{b}	0.00
Liver	-	20.00^{a}	0.00^{b}	0.57
Gizzard	-	48.86^{a}	11.13^{b}	0.47
Intestine	-	62.20^{a}	17.80^{b}	0.47

Means on the same row with different superscripts are statistically significant ($p<0.05$)

Table 10: Organoleptic characteristics of meat from experimental birds

Variable (%)	Treatment Diets			SEM
	T1 (Control)	T2 (0.15% OTC)	T3 (0.15% PBT)	
Colour	6.00[b]	5.00[c]	7.00[a]	0.90
Flavour	6.53[b]	5.20[c]	7.80[a]	0.81
Tenderness	7.30[a]	6.27[b]	6.20[b]	1.21
Juiciness	6.57[a]	5.30[c]	6.73[a]	0.77
Texture	7.43[b]	6.25[c]	8.50[a]	0.54
Overall Acceptability	6.37[b]	5.00[c]	7.50[a]	0.72

Means on the same row with different superscripts are statistically significant ($p<0.05$)

of meat samples from birds fed control (T1) and (T3) diets were higher ($P<0.05$) and significantly similar, while that of meat from birds fed T2 was lower. Tenderness, juiciness, texture scores of meat from birds fed diet T3 were significantly ($p<0.05$) higher than those of other treatments (Control and T2), the overall acceptability of meat from birds fed control and T3 diets was higher ($p<0.05$) and similar, while the acceptability of meat sample from birds fed diet T2 was significantly ($p<0.05$) lower. The first factor that influences the acceptability of meat by consumers is the colour (34; 15) as shown in the results of this study (Table 10). The colour of meat from birds fed diet T3 was higher as well as other factors – flavour, juiciness and texture al combined would have been responsible for higher overall acceptability of cooked meat from birds fed diet T3 with the value of 7.50 score above other meat samples from two other treatments. The overall acceptability of meat from birds fed diet T3 could also be influenced by the fact that the meat was moderately tender (6.20) compared with that of treatment T1 which was tenderer (7.30) and according to (35) and (15) an average population in Nigeria and other developing countries prefer moderately tough meat for longer chewing as reflected in this present study. The results also revealed that meat from birds fed diet T2 was least accepted probably due to more residues which might have affected the colour and flavour of the meat as well as juiciness which are some of major factors for consumers acceptability of meat.

CONCLUSION

It can be concluded from the results obtained from this study that birds fed diet containing probiotics performed better than those fed diet with antibiotic. Also, carcass, primal cuts and offal values as well as meat properties were higher in birds fed diets 3 and the meat from the same birds was highly accepted by the taste panelist. Therefore, probiotic at 0.15% is recommended for use in poultry production as it is efficacious and its residual effect in the meat is relatively compared to that of antibiotic.

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