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Performance of Broiler Chickens Fed Two Varieties of Guinea Corn and Millets as Replacement for Maize

Research Article

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ABSTRACT

The study was carried out to evaluate the effects of complete replacement of maize with two varieties of guinea corn and two varieties of millets on the growth performance and nutrient retention in broiler chickens. Five isonitrogenous and isocaloric diets for the broiler starter (23.5% CP; 2800 kcal/ME) and finisher (21.5% CP; 2900 kcal/ME) phases were formulated. Diet 1 consisted on a maize based diet and it served as the control while diets 2, 3, 4 and 5 were white guinea corn, yellow guinea corn, pearl millet and finger millet based diets, respectively. A total of 225 day old Marshal broiler chickens were randomly assigned to the five experimental diets. Each treatment consisted of 45 birds and 3 replicates of 15 birds each in a completely randomized design. Final body weight (BW) and daily body weight gain (BWG) were higher ($P<0.05$) in birds fed pearl and finger millet diets at the starter and finisher phases. Pearl millet based diet recorded the best ($P<0.05$) feed conversion ratio (FCR) and the lowest ($P<0.05$) feed cost per unit of BWG. Feed intake (FI) at the starter phase was higher in birds fed yellow guinea corn diet than in those fed maize diet. Birds fed white guinea corn diet showed the lowest ($P<0.05$) BW, BWG, FI and FCR at the finisher phase. To conclude, complete replacement of maize with millets or with yellow guinea corn in broilers diet did not impair FI, BW, FCR and nutrient retention.

KEY WORDS broiler chickens, finger millet, growth performance, guinea corn, maize replacement diets, pearl millet.

INTRODUCTION

The need to source, harness, process and utilise alternative feed stuff otherwise known as unconventional feed ingredients in the diets of poultry birds is more critical now than ever. This is because feed cost accounts for over seventy percent of the cost of producing edible meat and eggs (Aduku, 1992; Aduku, 2004). There is a need to expand the ingredient base to provide an array of alternative feedstuffs for poultry feed formulation (Dawfang and Shwarmen, 1996; Dawfang, 2006). The rising cost of poultry feeds have continued to be a major problem in developing countries as feed cost is about 60 to 70% (Nworgu *et al.* 1999; Conolly, 2012) compared to about 50 to 60% in developed countries (Tackie and Flenscher, 1995). There has been a steady increase in the cost of conventional feed ingredients such as energy and protein which is the most expensive portion of the feed and it is conventionally sourced from maize, groundnut cake, soyabean meal and fish meal in the past years which led to the increase in the prices of animal protein sources (Onu and Madubuike, 2007; Adejinmi *et al.* 2007; Defang *et al.* 2008). Cereal grains especially maize which forms the bulk of energy in poultry feeds are in short supply as a result of industrial, livestock and human needs. This has resulted in competition between human and animal for available feed resources, and hence high cost of animal

production (Oluyemi and Roberts, 2000; Agbede *et al.* 2002; Aderolu *et al.* 2007). However, green plants, forages and cereals have been recognized for many years as the most abundant potential source of proteins and carbohydrates (energy) because of their ability to provide amino acids from a wide range of unlimited and readily available primary materials (D'Mello and Devendra, 1995). The study was carried out to evaluate the effects of complete replacement of maize with two varieties of guinea corn and two varieties of millets on the growth performance and nutrient retention of broiler chickens.

MATERIALS AND METHODS

The study was conducted at the poultry unit of the Department of Animal Science, Faculty of Agriculture, Ahmadu Bello University, Zaria, Nigeria located within the Northern Guinea Savannah zone on latitude 11˚ 9' 45'' N and longitude 7˚ 38' 8''E, at an altitude of 610 m above sea level. The guinea corn (white guinea corn and yellow guinea corn) and millet (pearl millet and finger millet) grains used in these studies were purchased from the local farmers in Samaru-Zaria and Manchok while other ingredients were sourced from Rebson feed mill, Zaria, Kaduna State. Five isonitrogenous and isocaloric diets for the broilers starter (23.5% CP; 2800 kcal/kg ME) and finisher (21.5% CP; 2900 kcal/kg) phases were formulated as it is showed in Tables 1 and 2. A total of 225 day-old Marshal broiler chickens (mixed sex) were separated into five groups of 45 birds per group according to treatment. Each group was subdivided into 3 replicates of 15 birds in a completely randomized design. Each group was randomly assigned to the 5 experimental diets: 1) maize, 2) white guinea corn, 3) yellow guinea corn, 4) pearl millet and 5) finger millet, respectively. All necessary and routine management practices and the recommended vaccinations were strictly observed throughout the period of this study. Feed (100 g to 800 g per day at the starter phase and 1200 g to 1800 g per day at the finisher phase) and water were provided *ad libitum* during the trial period.

Data collection

The birds were weighed at the beginning of the experiment and weekly thereafter. Data collection was based on initial and final body weight (BW), average daily body weight gain (BWG) and feed intake (FI). Residual feeds were also calculated and mortality rate was recorded as it occurred. The experiment lasted 8 weeks.

Statistical analysis

All the data collected from the experiment were statistically analyzed using the General Linear Model Procedure of SASe package (SAS, 2002). Significant differences between treatments means were established by Duncan Multiple Range Test. The model used for this design was, as follows:

$$Y_{ij} = \mu + t_i + e_{ij}$$

Where:
Y_{ij}: individual observation.
μ: overall mean.
t_i: effect of treatment diets.
e_{ij}: experimental error.

Nutrient retention trial

At the end of the feeding trial, four birds from each of the five treatment groups were randomly selected from each replicate and then transferred into metabolic cages for faecal collection. The birds were placed in metabolic cages with facilities for feed and water. They were allowed to acclimatize for a period of three days. Each group was fed their respective experimental diet. Known quantities of the diets were served to calculate FI of birds and the leftover feeds were properly accounted. Thereafter, total faecal collection was made for seven days by means of clean trays placed under the cages. Collected faecal samples were immediately oven-dried to constant weight at 60^{o}C for 48 hours. The faecal collections for each diet fed were bulked and ground to fine particles and analyzed for proximate composition: dry matter (DM), crude protein (CP), nitrogen free extract (NFE), ether extract (EE), crude fibre (CF) and Ash at the biochemical laboratory of the department of animal science, Ahmadu Bello University, Zaria using the methods described by AOAC (1990). The percentage of nutrient retention was calculated using the equation below:

Nutrient retention= [(nutrient intake-nutrient in excreta) / (nutrient intake)] × 100

Where:
Nutrient intake (g)= dry feed intake × nutrient in diet
Nutrient output (g)= dry faecal output × nutrient in faeces

RESULTS AND DISCUSSION

The results of the proximate analysis of compositions and the anti-nutritional factors found in the test ingredients are presented in Tables 5 and 6, respectively. From the results of the proximate analysis, it was observed that maize diet was higher in NFE and in ME (kcal/kg) when compared with guinea corn and millets diets, respectively. Percent of CP and CF were higher in guinea corn and millets diets. Percent of ash was lower in pearl millet diet compared to others. The values recorded for tannins were within the range of 0.10-0.16 g/kg.

Table 1 Feed ingredients and nutrient composition of the starter diets (0-4 weeks)

Ingredients (%)	Experimental diets				
	Maize	White guinea corn	Yellow guinea corn	Pearl millet	Finger millet
Maize	48.50	0.00	0.00	0.00	0.00
White guinea corn	0.00	47.50	0.00	0.00	0.00
Yellow guinea corn	0.00	0.00	47.50	0.00	0.00
Pearl millet	0.00	0.00	0.00	49.50	0.00
Finger millet	0.00	0.00	0.00	0.00	49.50
Maize offal	5.00	5.00	5.00	5.00	5.00
Groundnut cake	24.75	24.85	24.85	21.00	21.00
Soya cake	12.00	12.00	12.00	12.00	12.00
Fish meal	4.00	4.00	4.00	4.00	4.00
Limestone	0.60	0.60	0.60	0.60	0.60
Bone meal	3.00	3.00	3.00	3.00	3.00
Palm oil	1.10	2.00	2.00	3.05	3.05
Salt	0.25	0.25	0.25	0.25	0.25
Vitamins and mineral premix*	0.30	0.30	0.30	0.30	0.30
L-lysine	0.25	0.25	0.25	0.25	0.25
DL-methionine	0.25	0.25	0.25	0.25	0.25
Total	100	100	100	100	100
Nutrient composition					
Metabolizable energy (kcal/kg)	2882	2881	2881	2882	2882
Crude protein (%)	23.50	23.50	23.50	23.50	23.50
Ether extract (%)	5.68	6.03	6.03	7.75	6.11
Crude fibre (%)	4.10	4.16	4.16	4.64	4.59
Calcium (%)	1.30	1.31	1.31	1.34	1.36
Available P (%)	0.69	0.68	0.71	0.74	0.75
Lysine (%)	1.28	1.29	1.29	1.31	1.31
Methionine (%)	0.46	0.46	0.47	0.46	0.47
Methionine + cysteine (%)	0.93	0.90	0.90	0.97	0.97

* Premix provided to chicks with: vitamin A: 1000 IU; vitamin D_3: 500 IU; vitamin E: 5.75 IU; vitamin K_3: 0.5 mg; vitamin B_1: 0.45 mg; vitamin B_2: 1.25 mg; vitamin B_6: 0.75 mg; vitamin B_{12}: 0.00375 mg; Niacin: 6.875 mg; Pantothenic acid: 1.875 mg; Folic acid 0.1875 mg; Biotin H_2: 0.015 mg; C Choline chloride: 75 mg; Cobalt: 0.05 mg; Copper: 0.75 mg; Iodine: 0.25 mg; Iron: 5 mg; Manganese: 10 mg; Selenium: 0.05 mg; Zinc: 7.5 mg and Antioxidant: 0.3125 mg.

Table 3 shows the performance of broiler chickens feeding the experimental diets during the starter phase. There were differences (P<0.05) in the final BW, daily BWG, daily FI and FCR of broiler chickens. Birds fed yellow guinea corn diet showed the highest (P<0.05) value of FI compared to those fed other diets. Birds fed control diet had similar (P>0.05) values of FI as those fed pearl millet and finger millet diets, respectively. Feed intake of birds fed millets diets was higher (P<0.05) when it was compared with birds fed white guinea corn diet. For the pearl and finger millet diets, there were no differences (P>0.05) in final BW (580.44 and 573.33 g, respectively) and average daily BWG (19.20 and 18.95 g, respectively) compared to the values of BW observed in birds fed maize (520 g), white guinea corn (478.33 g) and yellow guinea corn (536.00 g) with an average daily BWG of (17.04, 15.56 and 17.64 g, respectively). The birds fed white guinea corn diet had (P<0.05) lower mean value of daily BWG compared to those fed other diets. The FCR of birds feeding pearl and finger millet diets was lower (P<0.05) (2.18 and 2.19, respectively) when compared with that of birds feeding maize, white guinea corn and yellow guinea corn diets (2.50, 2.34 and 2.52, respectively).

The results of performance characteristics of broiler finisher birds are presented in Table 4. There were differences (P<0.05) between treatment means on final BW, daily BWG, FI and FCR. Feed intake were higher (P<0.05) in birds feeding pearl and finger millet diets compared to those feeding maize and guinea corn diets. Birds fed maize diet had similar FI (P>0.05) to those fed yellow guinea corn diet. However, FI was higher (P<0.05) in birds fed yellow guinea corn diet than in those fed white guinea corn diet. There were significant differences (P<0.05) in BWG of birds feeding the experimental diets. Final BW and average daily BWG showed that birds fed pearl and finger millet diets showed better (P<0.05) growth performance to those fed other diets. Feed conversion ratio (FCR) of birds fed pearl and finger millet diets were (P<0.05) lower and better (2.41 and 2.51) respectively compared to those of birds fed maize, white guinea corn and yellow guinea corn diets (with 2.85, 3.61 and 2.95, respectively). Table 7 shows the results of DM, CP, CF, EE Ash and NFE retentions (%) in broilers fed the experimental diets for 7 days. There were significant (P<0.05) differences in all the parameters analyzed except for percent of EE retention between the treatments.

Table 2 Feed ingredients and nutrient composition of the experimental broiler finisher diets (5-8 weeks)

Ingredients (%)	Experimental diets				
	Maize	White guinea corn	Yellow guinea corn	Pearl millet	Finger millet
Maize	53.74	0.00	0.00	0.00	0.00
White guinea corn	0.00	54.20	0.00	0.00	0.00
Yellow guinea corn	0.00	0.00	54.20	0.00	0.00
Pearl millet	0.00	0.00	0.00	54.90	0.00
Finger millet	0.00	0.00	0.00	0.00	54.90
Maize offal	5.00	5.00	5.00	5.00	5.00
Groundnut cake	22.50	21.00	21.00	18.40	18.40
Soya cake	10.00	10.00	10.00	10.00	10.00
Fish meal	3.00	3.00	3.00	3.00	3.00
Limestone	0.65	0.65	0.65	0.65	0.65
Bone meal	3.00	3.00	3.00	3.00	3.00
Palm oil	1.05	2.10	2.10	4.00	4.00
Salt	0.25	0.25	0.25	0.25	0.25
Vitamins and mineral premix*	0.30	0.30	0.30	0.30	0.30
L-lysine	0.25	0.25	0.25	0.25	0.25
DL- methionine	0.25	0.25	0.25	0.25	0.25
Total	**100**	**100**	**100**	**100**	**100**
Nutrient composition					
Metabolizable energy (kcal/kg)	2932	2933	2933	2933	2933
Crude protein (%)	21.50	21.50	21.50	21.50	21.50
Ether extract (%)	5.48	5.92	5.92	9.06	9.06
Crude fibre (%)	3.91	3.96	3.96	5.49	5.49
Calcium (%)	1.25	1.25	1.25	1.25	1.25
Available P (%)	0.65	0.65	0.67	0.69	0.71
Lysine (%)	1.15	1.14	1.14	1.17	1.17
Methionine (%)	0.46	0.46	0.47	0.47	0.46
Methionine + cystine (%)	0.87	0.84	0.84	0.92	0.92

* Premix provided to chicks with: vitamin A: 1000 IU; vitamin D_3: 500 IU; vitamin E: 5.75 IU; vitamin K_3: 0.5 mg; vitamin B_1: 0.45 mg; vitamin B_2: 1.25 mg; vitamin B_6: 0.75 mg; vitamin B_{12}: 0.00375 mg; Niacin: 6.875 mg; Pantothenic acid: 1.875 mg; Folic acid 0.1875 mg; Biotin H_2: 0.015 mg; C Choline chloride: 75 mg; Cobalt: 0.05 mg; Copper: 0.75 mg; Iodine: 0.25 mg; Iron: 5 mg; Manganese: 10 mg; Selenium: 0.05 mg; Zinc: 7.5 mg and Antioxidant: 0.3125 mg.

Table 3 Performance characteristics of broilers fed maize, guinea corn and millet diets (0-4 weeks)

Parameters	Experimental diet					SEM
	Maize	White guinea corn	Yellow guinea corn	Pearl millet	Finger millet	
Initial weight (g/bird)	42.69	42.66	42.69	42.62	42.60	0.14
Final weight (g/bird)	520.00^{b}	478.33^{c}	536.00^{b}	580.44^{a}	573.33^{a}	17.93
Av. total body weight gain (g/bird)	477.31^{b}	435.67^{c}	493.97^{b}	537.83^{a}	530.73^{a}	17.93
Av. daily body weight gain (g/bird/d)	17.04^{b}	15.56^{c}	17.64^{b}	19.20^{a}	18.95^{a}	0.64
Total feed intake (g/bird/d)	1188.27^{b}	1019.91^{c}	1244.20^{a}	1177.40^{b}	1167.78^{b}	27.65
Daily feed intake (g/bird/d)	42.43^{b}	36.42^{c}	44.43^{a}	42.05^{b}	41.70^{b}	0.99
Feed conversion ratio	2.50^{c}	2.34^{b}	2.52^{c}	2.18^{a}	2.19^{a}	0.07
Mortality rate (%)	4.44	6.67	6.60	2.22	4.44	3.52

The means within the same row with at least one common letter, do not have significant difference (P>0.05).
SEM: standard error of the means.

The values obtained of DM, CP, CF Ash and NFE retention were significantly (P<0.05) lower for birds fed white guinea corn diet compared to those fed other diets. From the results of the proximate analysis of the test feedstuff, maize had higher metabolizable energy (ME) (3451.68 kcal/kg) compared with white and yellow guinea corn (3379.79 and 3403.13 kcal/kg) and pearl and finger millets (3280.94 and 3120.85 kcal/kg) diets, respectively.

This agrees with Olomu (1995) who also reported a higher ME of maize (3510 kcal/kg) than sorghum (3270 kcal/kg) and millet (2555 kcal/kg).

Crude protein (CP) content was higher in millets (12.02 and 12.14%) and guinea corn (10.04 and 10.27%) than maize (8.60%).

Olomu (1995) also reported higher CP in millet (12.0%) and sorghum (9.50%) than maize (8.80%).

Table 4 Performance characteristics of broilers fed maize, guinea corn and millet diets (5-8 weeks)

Parameters	Experimental diet					SEM
	Maize	White guinea corn	Yellow guinea corn	Pearl millet	Finger millet	
Initial body weight (g/bird)	819.58	819.47	819.67	819.43	819.53	0.08
Final body weight (g/bird)	2051.7^{b}	1810.8^{c}	2037.0^{b}	2451.0^{a}	2343.7^{a}	90.87
Av. Total body weight gain (g/bird)	1232.1^{b}	991.2^{c}	1217.3^{b}	1631.7^{a}	1524.1^{a}	90.84
Av. daily body weight gain (g/bird/d)	44.00^{b}	35.40^{c}	43.47^{b}	58.27^{a}	54.43^{a}	3.24
Total feed intake (g/bird/d)	3506.6^{b}	3574.4^{b}	3596.8^{b}	3885.2^{a}	3811.1^{a}	47.23
Daily feed intake (g/bird/d)	125.23^{b}	127.66^{b}	128.46^{b}	138.75^{a}	136.11^{a}	1.69
Feed conversion ratio	2.85^{b}	3.61^{c}	2.95^{b}	2.41^{a}	2.51^{a}	0.13
Mortality rate (%)	2.22	4.40	4.20	2.10	2.21	2.81

The means within the same row with at least one common letter, do not have significant difference (P>0.05).
SEM: standard error of the means.

Table 5 Chemical composition of maize, guinea corn and millet grains

Nutrients	Maize	White guinea corn	Yellow guinea corn	Pearl millet	Finger millet
Dry matter (%)	94.10	90.31	91.86	91.76	89.13
Crude protein (%)	8.60	10.04	10.27	12.02	12.14
Ether extract (%)	3.82	3.06	3.19	3.78	3.54
Crude fibre (%)	3.20	4.69	4.78	6.01	6.30
Ash (%)	1.81	1.86	1.89	1.62	3.24
Nitrogen free extract (%)	80.60	78.80	78.92	72.20	68.06
Metabolizable energy (kcal/kg)	3451.68	3379.79	3403.13	3280.94	3120.85

Table 6 Antinutritional factors in feed ingredients and their concentrations (g/kg)

Parameters	Maize	White guinea corn	Yellow guinea corn	Pearl millet	Finger millet	SEM
Tannin	0.10^{b}	0.16^{a}	0.16^{a}	0.11^{b}	0.10^{b}	0.02
Phytate	0.33^{c}	0.68^{a}	0.66^{ab}	0.33^{c}	0.36^{b}	0.15
Cyanide	3.60^{a}	1.36^{c}	1.48^{c}	0.16^{d}	2.88^{b}	0.08
Oxalate	6.72^{d}	13.44^{a}	7.84^{b}	7.77^{c}	7.84^{b}	0.02

The means within the same row with at least one common letter, do not have significant difference (P>0.05).
SEM: standard error of the means.

Table 7 Nutrient retention of broilers fed maize, guinea corn and millet diets

Parameters	Experimental diet					SEM
	Maize	White guinea corn	Yellow guinea corn	Pearl millet	Finger millet	
Dry matter (%)	89.29^{a}	80.90^{b}	87.09^{ab}	89.86^{a}	88.40^{a}	3.86
Crude protein (%)	93.88^{ab}	88.40^{b}	92.71^{ab}	97.07^{a}	95.41^{ab}	4.01
Crude fibre (%)	80.38^{a}	65.64^{b}	79.56^{ab}	87.38^{a}	82.24^{a}	7.00
Ether extract (%)	94.60	91.08	92.46	95.33	94.96	2.89
Ash (%)	90.53^{a}	84.67^{b}	84.67^{b}	90.86^{a}	92.79^{a}	2.98
Nitrogen free extract (%)	86.06^{a}	78.31^{b}	84.13^{ab}	88.59^{a}	85.71^{a}	5.01

The means within the same row with at least one common letter, do not have significant difference (P>0.05).
SEM: standard error of the means.

Abubakar *et al.* (2006) also reported a higher CP in sorghum (10.48%) than maize (9.65%). The values recorded for tannins were within the range of 0.10-0.16 g/kg which was below 2.6 g/kg reported by Reza and Edriss (1997) for low tannins guinea corn diet without adverse effects on broilers performance.

Oxalates were found to be high in white guinea corn diet (13.44 g/kg) compared to maize (6.72 g/kg), yellow guinea corn (7.84 g/kg), pearl millet (7.77 g/kg) and finger millet (7.84 g/kg) diets, respectively. Feed itake was not different in birds fed maize diet and on those fed pearl and finger millet diets. It agrees with the reports of Rama Rao *et al.* (2002) who reported similar values of FI in broilers fed millets and maize diets.

This observation is not surprising since the ME concentration of the diets was similar as birds eat to satisfy their energy requirements. The high FI recorded in birds feeding yellow guinea corn diet agrees with the reports of Nagra *et al.* (1990) who showed higher FI in broilers feeding yellow guinea corn diet at the starter phase compared to the maize-fed counterparts. The decrease in daily FI observed in the birds fed white guinea corn diet may be due to the high level of oxalates found in white guinea corn grains which resulted in low performance of birds. This finding agrees with the reports of Ibitoye *et al.* (2012) who observed low FI in broilers fed diets containing white guinea corn as replacement for maize. The poorer growth rate and FCR observed in birds fed white guinea corn based diet could be

attributed to the lower FI and the poor utilization of nutrients as a result of high levels of oxalates found in the grains. This finding is in agreement with the reports of Adeola (2006) who observed poor performance on broilers fed 100% white guinea corn diet as a replacement for maize. Also, Oke (1969) and Oboh (1986) observed that oxalates affects calcium and magnesium metabolism and react with protein to form complexes which have an inhibitory effect on peptic digestion. The observed improvement (P<0.05) in BWG of birds fed pearl and finger millet diets agrees reported that BWG in broilers was directly related to FI. This might be due to more balanced nutrient combination in millets diets since adequate amount of the essential amino acids is necessary for protein synthesis which results in increased BWG. It corroborated the assumptions of Rooney (1990) who reported that millets contain higher CP content and a well-balanced amino acid than other common cereal grains which enhance growth, FI and FCR. Similarly, Davis *et al.* (2003) stated that at day 1 to 42, birds fed 100% pearl millet diet had greater BW and FCR than birds fed maize and guinea corn based diets. The FCR of birds fed pearl and finger millet diets were significantly (P<0.05) better than the birds fed maize and guinea corn diets. This means that pearl and finger millet diets were properly utilized by the birds. This finding agrees with the reports of Jambunathan and Subramanian (1988) and Rooney (1990) that reported that millets contain higher CP content and better balanced amino acid content than other common cereal grains which enhance growth, FI and FCR. Better FCR in millet fed birds was also reported earlier (Hoseney *et al.* 1987; Rooney and McDonough, 1987; Serna Saldivar *et al.* 1990; Sullivan *et al.* 1990). The mortality rate of the birds was not significantly (P>0.05) affected by the dietary treatments. Hence, it indicates that the use of test ingredients in broiler rations is not lethal as to challenge the survival of broilers.Final BW and average daily BWG were higher (P<0.05) in birds feeding pearl and finger millet diets than in those feeding other diets. This finding agrees with the reports of Luis, (1980) and Andrews and Kumar (1992), who showed that birds feeding millet diet gave better performance than those feeding maize and sorghum diets. The significant reduction (P<0.05) in BWG of birds fed white guinea corn diet compared to birds fed other diets is probably due to poor nutrient retention and utilization due to the high level of oxalates found in white guinea corn grain. This finding is in agreement with the report of Cao *et al.* (1998), who stated that digestibility of nutrients was low for soft sorghum (white guinea corn), medium for red or yellow and high for cream sorghum. Birds fed yellow guinea corn diet had similar (P>0.05) FI and BWG than those fed maize diet. This observation is not surprising since the metabolizable energy concentration of the diets was similar as birds eat to satisfy their energy requirements. This finding is in agreement with the reports of Nagra *et al.* (1990), Rama Rao *et al.* (2002) and Tyagi *et al.* (2003). These works reported that replacement of maize on broiler chickens diets for low tannin guinea corn did not reduce BW, BWG, FI and FCR. FCR of birds fed pearl and finger millet diets were better (P<0.05) compared to those of birds fed other diets. This may have contributed to the observed enhanced BWG of the birds fed these diets. This observation agrees with the reports of Davis *et al.* (2003), who showed that birds fed 100% pearl millet diet had greater BW, FI and FCR than those fed maize.

There were no significant differences in the percent of EE retention across the treatment diets. The values obtained for percent of DM, CP, CF, Ash and NFE retention were significantly (P<0.05) lower for birds fed white guinea corn diet when compared with those fed other diets. This might have contributed to the poor performance observed in birds fed white guinea corn diet. This finding is in agreement with the report of Cao *et al.* (1998), who stated that digestibility of nutrients was low for soft sorghum (white sorghum), medium (red or yellow) and high (cream) sorghum. Similarly, Oke (1969) and Oboh (1986) observed that oxalates affects calcium and magnesium metabolism mainly by reducing the utilization of the protein and the activity of the digestive enzymes.

CONCLUSION

Based on the findings of this study, it is showed that maize can be completely replaced by pearl millet in diet of broiler chickens at the starter and finisher phases.

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