

EFFECT OF DIETARY REPLACEMENT OF MAIZE WITH MILLET (PEARL MILLET) ON THE PERFORMANCE OF BROILER CHICKENS

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Abstract

An experiment was conducted to evaluate the growth performance of broiler chickens fed diets containing millet as a replacement for maize. Five diets containing 0%, 25%, 50%, 75% and 100% were formulated and designated as diet 1, 2, 3, 4, and 5 respectively. 120 days old Anak 2000 broiler chicks were randomly allotted to five dietary treatments in a completely randomized design (CRD) and each treatment was replicated three times. Feed and water were provided *ad libitum* and the feeding trials lasted for eight weeks. At the starter phase no significant differences ($P>0.05$) in Initial Weight, Daily weight Gain and Feed Conversion Ratio among the treatment means. However, Final body weight (1937.7 -2231.7 g; $P<0.05$) and Daily Feed intake (47.17 -51.66 g; $P<0.05$) were significantly influenced by the dietary treatments. At the finisher phase no significant differences ($P>0.05$) were observed in daily feed intake and feed conversion ratio respectively. While Daily weight gain (39.12 - 46.16 g) differ among the treatment means. At overall phase Daily feed intake and Daily weight gain were not affected. While Feed Conversion Ratio were affected ($P<0.05$) by the experimental diets. Birds on T3 diet (50%) had a better performance in terms of feed intake, weight gain and feed conversion ratio. It can be concluded that millet can replace maize in the diet of broiler chickens without deleterious effect.

Keywords: Broiler, millet, maize, performance

Introduction

Poultry industry is one of the most important, dynamic and rapidly expanding segments of our livestock economy. The most important component of poultry production is the feed which constitute about 60-80% of the whole cost of poultry production (Talha and Yaqoub, 2008), maize which form the major source of energy in poultry diet is very expensive due to low production and intense competition for it usage by man and other livestock species (Hamzat *et al.*, 2003), maize remain the cheap source of energy in compounded feed and constitute about 50-55% of poultry diet (Afolayan, *et al.*, 2002).

Pearl millet is accepted to be the most widely grown species of millet around the globe. It is generally accepted that the crop is originated from Africa (Tornekan *et al.*,

2009). The proximate composition of the pearl millet has shown that the grain has about 11.50% crude protein and 2900 kcal/kg metabolizable energy which are close to maize (9% crude protein and 3330 kcal metabolizable energy). Therefore, pearl millet provides a very good alternative for maize in poultry feed as there is close resemblance in their nutrient composition (Prasad and Panwar, 1997). Millet has been reported to contain 5-7% oil, higher protein and minerals than maize and also free from anti- nutritional factors phytate and tannins (NRC, 1996). The objective of this study is to evaluate the growth performance of broiler chickens fed millet as a replacement for maize.

Materials and Methods

Experimental site: This experiment was conducted at the Poultry Unit of the Teaching and Demonstration Farm, Aminu Saleh College of Education, Azare Bauchi, Nigeria. Azare is in Katagum Local Government Area of Bauchi state. Katagum is situated on the northern part of Bauchi state, Nigeria. It is located between latitudes $11^{\circ} 42'$ and longitude $10^{\circ} 31'$ and $10^{\circ} 01'$ east. (Anon, 2009). It shares common boundary with Itas/Gadau local government in the North west, Jama'are to the west, Dambam to the east, Misau to the Southwest, Azare, I. M, (2013). It has a land mass of 1,120 square kilometers (NPC, 2009). The climate of the study area affecting the farming system are temperature and rainfall, the annual rainfall ranged between $22-33^{\circ} \text{C}$ from April to May (Bashir *et al.*, 2001). The study area is in the Sudan Savannah and the soil in the study area is aerosol with sandy and loamy sand texture and a high percolation rate.

Sources of Experimental Materials

The millet used for the study was purchased within Azare market in Katagum local Government Area of Bauchi state.

Experimental Design and Management of Birds

One hundred and twenty days old Anak 2000 breed of broiler chicks were obtained from *Amor* Limited Ibadan, the chicks were brooded for the period of one week on deep litter. They were fed *ad libitum* on commercial diet throughout the brooding period. Water and feed were supplied *ad libitum* during the period of the trial. Routine management, vaccines and medications were administered according to the methods of (Oluyemi and Roberts, 2007). After brooding

period of about one week the birds were randomly allotted to five dietary treatments with 24 birds per treatment and each treatment was replicated three times with 8 birds per replicate, in a completely randomized design (CRD). The birds were fed experimental diets for four weeks during the starter phase and four weeks during the finisher phase.

Experimental diets

Five diets containing different levels of 0%, 25%, 50%, 75% and 100% for the broilers was formulated to feed the experimental groups T_1 , T_2 , T_3 , T_4 and T_5 at the starter and finisher phase respectively. The diets were formulated to supply approximately 3000Kcal/kg ME, 23 and 20% crude protein for both starter and finisher phases respectively. The ingredient, chemical composition and calculated analysis of the experimental diets for both starter and finisher phases are shown in Tables 1 and 2 respectively. The birds were randomly allocated into five experimental groups in a completely randomize design (CRD) with 24 birds per treatment. Each treatment had three replicates with eight birds per replicate.

Data collection

Data on feed left over and body weights were recorded weekly. Observations on mortality were done daily. Feed intake, weight gain and feed conversion ratio were calculated at the end of each of the phases.

Statistical analysis

Data collected were subjected to analysis of variance (ANOVA) and Duncan Multiple Range Test (DMRT) was used to separate means that were significant (SAS

Table 1: Ingredients Composition of the experimental diets fed to broiler at the starter phase (0-4weeks)

Ingredient	Dietary treatments				
	0%	25%	50%	75%	100%
Maize	45.32	33.99	22.66	11.33	-
Millet	-	11.33	22.66	33.99	45.32
Soyabean	35.18	35.18	35.18	35.18	35.18
Wheat offal	10	10	10	10	10
Fishmeal	5.0	5.0	5.0	5.0	5.0
Bonemeal	2.0	2.0	2.0	2.0	2.0
Limestone	1.5	1.5	1.5	1.5	1.5
Salt	0.25	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25	0.25
Lysine	0.20	0.20	0.20	0.20	0.20
Methionine	0.30	0.30	0.30	0.30	0.30
Total	100	100	100	100	100
Calculated analysis	21.00	21.09	21.44	22.00	22.00
Crude protein ME(Kcal/kg)	2872.9	2822	2800	2810.10	2820
Crude fibre	4.05	4.48	4.91	6.58	5.77
Ether Extracts	8.52	8.95	8.86	8.77	8.68
Calcium	1.55	1.55	1.56	1.56	1.56
Phosphorus	0.89	0.89	0.89	0.89	0.89
Lysine	1.26	1.26	1.26	1.26	1.26
Methionine	0.41	0.41	0.40	0.39	0.39

*Vitamin-Mineral premix (Bio-mix) provided per Kg the following: Vitamin A 12,000,000 iu, Vitamin D3 3,000,000iu; Vitamin E, 30,000mg; Vitamin K3, 2,500mg; Vitamin B1, 2,000mg; Vitamin B2, 5,000mg; Vitamin B6, 3,500mg, Vitamin B12. 20mg; Folic acid 1,000mg; Niacin, 40,000mg; Calpan, 10,000mg; Biotin, 80mg; Antioxidant, 125,000mg; Cobalt, 250mg; Selenium, 250mg; Iodine, 1,200mg; Iron, 40,000mg; Manganese, 70,000mg; Copper, 8,000mg; Zinc, 60,000mg; Choline chloride, 200,0

Table 2: Ingredients Composition of the experimental diets fed to broiler at the finisher phase (5-8weeks)

Ingredient	Dietary treatments				
	0%	25%	50%	75%	100%
Maize	49.99	37.49	24.99	12.50	-
Millet	-	12.50	24.99	37.49	49.99
Soyabean	27.00	27.00	27.00	27.00	27.00
Wheat offal	15	15	15	15	15
Fishmeal	3.0	3.0	3.0	3.0	3.0
Bonemeal	2.5	2.5	2.5	2.5	2.5
Limestone	1.5	1.5	1.5	1.5	1.5
Salt	0.25	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25	0.25
Lysine	0.20	0.20	0.20	0.20	0.20
Methionine	0.30	0.30	0.30	0.30	0.30
Total	100	100	100	100	100
Calculated analysis	20.00	20.00	20.00	20.00	20.00
Crude protein	2911.96	2955.96	2999.7	2944	2938
ME(Kcal/kg)					
Crude fibre	4.24	4.71	5.18	5.66	6.14
Ether Extracts	7.86	7.76	7.66	7.56	7.46
Calcium	1.66	1.66	1.60	1.60	1.60
Phosphorus	0.91	0.95	0.91	0.91	0.92
Lysine	1.03	1.03	1.03	1.03	1.03
Methionine	0.35	0.36	0.33	0.32	0.32

*Vitamin-Mineral premix (Bio-mix) provided per Kg the following: Vitamin A 12,000,000 iu, Vitamin D3 3,000,000iu; Vitamin E, 30,000mg; Vitamin K3, 2,500mg; Vitamin B1, 2,000mg; Vitamin B2, 5,000mg; Vitamin B6, 3,500mg, Vitamin B12. 20mg; Folic acid 1,000mg; Niacin, 40,000mg; Calpan, 10,000mg; Biotin, 80mg; Antioxidant, 125,000mg; Cobalt, 250mg; Selenium, 250mg; Iodine, 1,200mg; Iron, 40,000mg; Manganese, 70,000mg; Copper, 8,000mg; Zinc, 60,000mg; Choline chloride, 200

Table 3: Productive Performance of Broiler chickens fed millet as replacement for maize

	Diets					
Parameter	0%	25%	50%	75%	100%	SEM
Starter phase	1	2	3	4	5	
Initial weight	129.84	125.00	129.17	116.67	112.50	NS
Final weight(g)	1937.7 ^c	2038.8 ^{ab}	1955.2 ^b	1993.5 ^b	2231.7 ^a	*
Daily feed intake(g)	47.17 ^d	51.37 ^{ab}	51.66 ^a	49.07 ^c	50.80 ^b	*
Daily weight gain(g)	24.93	15.17	17.94	16.80	22.35	NS
Feed conversion ratio	2.56	3.41	2.81	2.94	2.28	NS
Mortality		1		2		
Finisher phase						
Daily feed intake(g)	118.08	126.42	129.17	122.68	126.99	NS
Daily weight gain(g)	39.12 ^d	39.35 ^d	46.16 ^a	45.63 ^b	44.37 ^c	*
Feed conversion ratio	3.01	3.23	2.80	2.73	2.85	NS
Mortality	1			1		
Over all phase						
Daily feed intakes(g)	82.66	89.22	90.41	85.21	88.89	NS
Daily weight gain(g)	32.06	25.04	32.04	31.21	33.36	NS
Feed conversion ratio	3.21 ^{ab}	3.31 ^a	2.80 ^c	2.83 ^b	2.56 ^d	***
Mortality	1	1		3		

a, b, c means in the same row with different superscript are significantly different.
 *= (P<0.05), ** = (P<0.01)

Results and Discussion

The calculated composition of millet and maize is shown in Table 1 and 2 respectively. The energy and crude protein contents of the experimental diets at both starter and finisher phases met the requirements for broiler chickens under tropical conditions Oluyemi and Roberts, 2007). The results in Table 3 indicated that there were no significant differences (P>0.05) in initial weight, Daily weight Gain and Feed Conversion Ratio among the treatment means. The results are at variance to those reported by Tornekar, 2009; Samuel, 2018 but agreed with Yunusa 2014) in their separate studies using millet based diet as replacement for maize. However, Final body weight and Daily Feed intake were significantly (P<0.05) higher for birds fed diet 5 (2231.7g) compared to those fed control maize based diets (1937.7 g). Daily feed intakes of birds fed diet 3 (51.66g) was higher compared to other treatments groups. The values of Daily Feed Intake are within the range (94.0 100.71g) reported by

Clement, 2010) who fed broiler chickens with sorghum or millet as a replacement for maize.

At the finisher phase no significant differences (P>0.05) were observed in daily feed intake and feed conversion ratio respectively. However, Daily Weight Gain was significantly (P<0.05) higher for birds fed diet 3 (46.16g) as compared to diet1 control which has the lowest value (39.12 g). The results of Daily Weight Gain are in agreement to (34.44 43.17g) those reported by Clement, 2010) when broiler chickens were fed sorghum or millet based diet as a replacement for maize.

At the overall phase no significant differences (P>0.05) was observed in daily feed intake and daily weight gain in birds fed experimental diet. Significant differences (P<0.001) was observed in feed conversion ratio. It was observed that better FCR was obtained inT3 (2.80) compared to other treatment groups. The results agree with the report of Bulus *et al.* (2014) when broiler chickens were fed two varieties each of

sorghum and millet as a replacement for dietary maize.

Conclusion

Based on the results of the study, birds on T3 diet (50%) had a better

performance in terms of feed intake, weight gain and feed conversion ratio. It can be concluded that pearl millet can replace maize in the diet of broiler chickens without deleterious effects.

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