

PERFORMANCE OF BROILER CHICKENS FED DIETS CONTAINING VARYING LEVELS OF MILLET AS A SUBSTITUTE FOR MAIZE

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ABSTRACT

The effect of replacing maize with millet was evaluated using one hundred and sixty-eight (168) day old Anak broiler chicks allocated to four (4) dietary treatments. Millet was used to replace maize at 0, 50, 75 and 100% levels coded as diets 1,2,3 and 4 respectively. The experimental design was completely randomized design with three (3) replicates per diet and fourteen (14) birds per replicate. Feed and water were supplied *ad libitum* and the experiment lasted for eight (8) weeks. The results showed that at the starter phase the daily feed intake values of 85.67 and 93.0g on diets 4 and 2 respectively were significantly different ($p<0.05$) while there was no significant difference in the body weight gain. The values ranged from 20.70-24.20g in birds fed diets 1 and 4 respectively. The FCR (3.53) of broilers fed diets 4 (100% millet) was significantly ($p<0.05$) better than the values on other diets. The performance at the finisher phase showed a non significant ($p>0.05$) treatment effect for all parameters. The pooled performance showed broilers fed diet 4 (100% millet) recorded significantly higher daily feed intake ($p<0.05$) and weight gain compared to the other diets. All the carcass characteristics measured were not influenced by the dietary levels of millet. The cost per kg gain was lowest on diet 4 (#30). These findings showed that millet can replace maize at 100% with better results and at reduced cost.

Keywords- Millet, Maize, Broiler, Economy, Performance.

INTRODUCTION

Maize is the most common feed stuff of choice as a major supplier of energy in monogastric animal diets. It is cultivated throughout the tropics where ever there is adequate rainfall. Conventional energy sources like maize have become very scarce and expensive due to multiple uses for human, animal feed and industries (Aduku, 2004). This competition has worsened the feed situation for monogastric animals. Maize alone accounts for about 50-70% of the total feed ingredients in broiler ration (Ojewola and Olugbemi 2011). The national demand for maize is estimated at 15.5 million metric tonnes, while current domestic production stands at 10.5 million tones annually. Several attempts have therefore been made to reduce the cost of feed production by replacing parts of the maize in diets with industrial by products and others (Akintola *et al* 2003, Okere and Akinseyiwa, 2011) such as millet. Millet is a cereal widely grown in drier areas of the tropics. It grows in areas not favourable to maize cultivation and it can be used in poultry diets. Millet resembles maize in composition and feeding value but is considerably higher in protein content. Banerjee (2013) reported CP of 8-12% and 10% for millet and maize respectively. According to Nnenna (1998) millet has a nutritive value comparable to other cereals with a CP of about 11% and sometimes up to 23%. It also has a higher fibre (8.6%) and carbohydrate with ash and fat similar to other cereals. Millet being an early maturing crop is more readily available and cheaper during the middle of the rainy season (July-August) when most other cereals are still in the field.

Abubakar *et al* (2006) fed graded levels of whole millet to broilers and reported cost reduction and no significant reduction in performance of broilers fed millet as a replacement for maize, this they attributed to higher level of crude fibre and anti nutritional factors like tannins present in millet. This study aimed to evaluate the effect of replacing maize with millet in the diet of broiler chickens.

MATERIALS AND METHODS.

Experimental site: the experiment was conducted at the Abubakar Tafawa Balewa University (ATBU) poultry research farm Bauchi. Bauchi is located within the Northern Guinea Savannah on latitude 10¹. 17^N longitude 9⁰ 49¹ E at an altitude of 690.2m above sea level. Bauchi has an annual rainfall of 600mm in the north and 130mm in the south.

Experimental Birds.

One hundred and sixty eight day old Anak broiler chicks were used for the experiments. The birds were brooded for one week there after were divided into four groups of 42 birds each. Each group of 42 birds were divided into 3 replicates of 14 birds per pen. They were weighed and randomly allocated to the 4 dietary treatments in a completely randomized design (CRD). Feed and water were provided *ad libitum*. Routine vaccinations were carried out as when due. The experiment lasted for eight (8) weeks.

Experimental Diets

Four (4) experimental diets were formulated arising from the replacement of maize with 0, 50, 75 and 100% of millet. The diets were isonitrogenous with 23 and 21% CP for the starter and finisher phases respectively (Table 1 and 2).

Gross Performance Analysis:-

The birds were weighed at the beginning of the experiment and thereafter on a weekly basis. Feed intake was measured daily, records of mortality were also taken as they occur. The cost of the four (4) diets were computed from the prevailing market prices of ingredient at time of the study. These were then used to calculate the cost of feed consumed per kg live weight gain of the experimental birds.

Carcass and Gut Characteristics:

Two birds per replicated were randomly selected at the end of the feeding trial. They were starved overnight, slaughtered, plucked and eviscerated. Live weight, dressing percentage and weight of cut parts and internal organs were recorded. Weight of cut parts relative to live weight were expressed as percentages.

Data Analysis:-

All empirical data generated were subjected to analysis of variance using SPSS (2012) and significant differences were separated using Duncan Multiple Range Test of the same package.

RESULTS AND DISCUSSIONS

The performance of the broilers fed millet as replacement for maize were as presented in Table 3. The birds on diet 4 (100% millet) recorded significantly ($P < 0.05$) lower daily feed intake and FCR compared to the control and others during the starter phases. Values for the daily weight gain were however similar across the treatments. All the parameters measured also showed a non significant treatment effect during the finisher phases. The overall pooled performance of the broilers showed that those on millet based diet had significantly higher values of daily feed intake and weight gained compared to the control. This finding contradicts those of Ojewola and Olugbemi (2011) who reported significant reduction in performance when broilers were fed millet as a replacement for maize. The better feed efficiency for birds fed diet 4 (100% millet) agrees with the findings of Adamu *et al* (2001) who reported that the use of millet in broilers feeding was more rewarding than maize on account of feed utilization. The better results on the millet based diet compared to the control could be attributed to the higher protein quality of millet compared to maize.

The carcass characteristics and organ weight as replacement for maize showed a non significant treatment effect for all the parameters measured. The highest mortality recorded was 7.1% on diet 2 which perhaps is an indication that millet as source of energy in broilers diet may not be detrimental

The cost analysis (Table 4) showed decrease in feed cost with higher level of millet in diets from #121.88/kg for diet 1 (0% millet) to #90.49 for diet 4 (100% millet). Total feed cost per kg weight gained followed the same trend. This is in agreement with the reports of Adamu *et al* (2001) and Abubakar *et al* (2006) who also observed cost reduction of broiler chickens fed millet as replacement for maize. This reduction in feed cost could be due to lower cost of pearl millet when compared to maize during the course of this study.

CONCLUSION

Based on the result obtained, it can be deduced that millet can completely replace maize as source of energy in broiler chickens diets at both starter and finisher phases without any detrimental effect on performance and carcass quality. There was also a decrease in feed cost with increasing inclusion levels of millet. The use of millet is thereby advocated as an alternative energy source for maize to reduce competition especially during harvest period when it would be cheaper than maize.

Table 1: Percentage Composition of Millet Based Diets Fed to Broiler Chickens at Starter Phase (1-4 weeks)

Ingredients	Replacement Levels of Millet			
	1(0%)	2(50%)	3(75%)	4(100%)
Maize	44.00	22.00	11.00	0.00
Millet	0.00	22.00	33.00	44.00
Soyabean meal	25.49	25.49	25.49	25.49
Groundnut cake	15.00	12.00	11.51	11.01
Wheat offal	10.20	10.70	11.20	11.70
Fish meal	3.00	3.00	3.00	3.00
Bone meal	2.00	2.00	2.00	2.00
Limestone	2.00	2.00	2.00	2.00
Premix	0.30	0.30	0.30	0.30
Salt	0.30	0.30	0.30	0.30
Lysine	0.10	0.10	0.10	0.10
Methionine	0.10	0.10	0.10	0.10
Total	100	100	100	100
Calculated Analysis				
Crude Protein(%)	23.00	23.00	23.00	23.00
ME(Kcal/kg)	2830	2791	2758	2738
Crude Fibre(%)	4.3	5.4	6.08	6.75
Ether Extract(%)	3.90	3.29	3.93	3.27

*Premix supplied the following additional nutrients per kg of diet

Vit. A= 10,000iu, D₃= 1020iu, E=10iu, K= 0.02mg, B₂=9mg B₆=400mg, B₁₂=0.03mg; Nicotinic acid 50mg; C=40mg; calcium D pantothenate=1602; minerals: chloride=4002mg Mn=200mg, Fe=100mg, Cu=4.8mg, Co=0.4mg; Se=0.12mg

Table 2: Percentage Composition of Millet Based Diets Fed to Broiler Chicken at Finisher Phase(5-8 weeks)

Replacement levels of millet				
Ingredients	1(0%)	2(50%)	3(75%)	4(100%)
Maize	48.00	24.00	12.00	0.00
Millet	0.00	24.00	36.00	48.00
Soyabean meal	20.49	20.49	20.49	20.49
Groundnut cake	8.51	8.01	7.01	6.01
Wheat offal	15.20	15.70	16.20	17.70
Fish meal	3.00	3.00	3.00	3.00
Bone meal	2.00	2.00	2.00	2.00
Limestone	2.00	2.00	2.00	2.00
Premix	0.30	0.30	0.30	0.30
Salt	0.30	0.30	0.30	0.30
Lysine	0.10	0.10	0.10	0.10
Methionine	0.10	0.10	0.10	0.10
Total	100	100	100	100
Calculate Analysis				
Crude protein(%)	21.70	21.8	21.6	21.00
ME(Kcal/kg)	2936	2922	2872	2857
Crude fibre(%)	4.65	5.49	5.94	6.48
Ether extract(%)	3.80	3.80	3.80	3.90

*Premix supplied the following additional nutrients per kg of diet

Vit. A= 10,000iu, D₃= 1020iu, E=10iu, K= 0.2mg, B₆=4mg, B₁₂=0.03mg; Nicotinic acid 50mg; C=40mg; calcium D pantothenate=16.0mg; minerals: chloride=4.8mg; iodine=1.55mg, Co=0.41mg, Se=0.12mg

Table 3: Performance of Broilers Fed Graded Levels of Millet Based Diets

Replacement levels of millet					
Parameters	1(0%)	2(50%)	3(75%)	4(100%)	SEM
Starter phase					
Daily feed intake (g)	90.33 ^{ab}	93.00 ^a	88.67 ^{ab}	85.67 ^b	1.44*
Daily weight gain(g)	20.70	21.50	22.47	24.20	0.79 NS
Feed conversion ratio	4.37 ^a	4.33 ^a	3.90 ^b	3.53 ^c	0.17 *
Finisher phase					
Daily feed intake (g)	126.00	148.70	138.00	153.00	11.39NS
Daily weight gain (g)	40.33	42.33	42.33	46.00	1.32 NS
Feed conversion ratio	3.13	3.10	3.47	3.33	0.16 NS
Pooled phase					
Daily feed intake(g)	108.30 ^b	112.70 ^{ab}	113.70 ^{ab}	119.70 ^a	2.15*
Daily weight gain(g)	30.57 ^b	31.93 ^{ab}	32.43 ^{ab}	35.13 ^a	0.60*
Feed conversion ratio	3.80	3.73	3.70	3.43	0.00 NS
Mortality (%)	4.80	7.10	4.10	4.80	0.00

*Means in the same row bearing different superscript differ significantly (P<0.05)
NS= Not Significant statistically (P<0.05) SEM= Standard Error of Mean

Table 5: Carcass Characteristics (% body weight) of Broilers Fed Replacement Levels of Millet

SEM	Replacement levels of millet				
	1(0%)	2(50%)	3(75%)	4(100%)	
Live weight (kg)	2.27	2.27	2.33	2.33	0.08 NS
Plucked weight (kg)	2.92	2.40	2.27	2.20	0.19 NS
Eviscerated weight (kg)	1.87	1.87	1.90	1.87	0.06 NS
Carcass weight(kg)	1.67	1.70	1.70	1.67	0.06 NS
Dressing%	73.61	75.03	72.88	71.35	1.32 NS
Gizzard	2.29	2.04	1.97	2.09	0.10 NS
Abdominal fat	1.38	1.46	1.32	2.10	0.28 NS
Liver	2.04	2.00	2.33	2.00	2.24 NS
Heart	0.52	0.47	0.54	0.48	0.05 NS
Lungs	0.79	0.49	0.64	0.57	0.13 NS
Shank	3.34	3.20	4.07	3.63	0.21 NS
Head	2.93	2.55	2.77	2.90	0.25 NS
Small intestine	3.20	4.09	3.51	3.85	0.34 NS
Large intestine	0.14	0.20	0.14	0.15	0.03 NS
Spleen	0.16	0.16	0.16	0.13	0.04 NS
Pancrease	0.27	0.23	0.27	0.25	0.03 NS
Kidney	0.20	0.17	0.25	0.22	0.05 NS
Ceaca	0.70	0.64	0.69	0.49	0.08 NS

NS= No significant difference ($p>0.05$), SEM= Standard error of means**Table 4: Economic Analysis of Millet Based Diets for Broilers Production.**

Parameters		Replacement levels of millet			
		1(0%)	2(50%)	3(75%)	4(100%)
Total feed intake(kg)		6.06	6.30	6.37	6.70
Total weight gain(kg)		1.70	1.79	1.80	1.97
Feed cost(#/kg)		121.88	92.57	91.53	90.49
Total feed cost(#)		738.39	583.19	583.05	606.28
Feed cost/kg gain (#)		463.46	345.29	338.92	307.76
Cost saving/kg gain	—		117.85	124.48	152.75

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