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Effect of replacing dietary maize with millet on production performance of laying birds

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ABSTRACT: The study was conducted to determine the effect of replacing dietary maize with millet on production performance of laying birds. The study was conducted between May and August 2018 at the Poultry Production Unit of Sokoto State Veterinary Center, Aliyu Jodi Road, Sokoto. Two hundred and forty black Bovan Nera layers of 23 weeks of age (averaging 1.3 kg live weight) were used in a completely randomized designed to evaluate the performance of laying chickens fed diets containing different levels of protein. Eggs were collected in the evening (5.00 – 6.00 pm). Egg weight was monitored on weekly basis. Feed intake, number of eggs, minimum and maximum temperatures of the pen and mortality were recorded on daily basis. The data was subjected to analysis of variance (ANOVA), using Statview Analytical Computer Package. There were no significant differences in feed intake between the treatments ($p>0.05$) even though birds on the millet-based diets consumed slightly higher amount of feed (100 – 102 g/b/d) compared to those on the maize-based diet (99 g/b/d). Hen – day egg production was similar between the treatments (59 – 61%). Egg weight was also not significantly ($p>0.05$) affected by the dietary treatments (46 – 48 g). The study concludes that egg mass decrease when maize is replaced with dietary millet.

Keywords: Black Bovan Nera layers, maize, millet.

INTRODUCTION

In Nigeria, increasing cost of conventional feed ingredients such as maize, soybean, groundnut cake and fish meal has been recognized as the major factors affecting the development and expansion of poultry enterprise. This high cost particularly, of maize in Nigerian markets resulting from its competition with human diet has led to its scarcity (Abubakar *et al.*, 2021), which keeps affecting profitability of poultry production negatively and thus, resulted in inadequate protein intake among Nigerians (Afolayan *et al.,* 2014) since it is one of the major source of bridging the protein gap in Nigeria (Usman and Aljameel, 2021). The cost of feed in poultry production constitute of about 70 to 80 percent of total production cost and out of these about 95 percent is meant for meeting the energy and protein requirement of the diet (Akinmutimi, 2003). The increased cost of feeds is due to the high costs of maize and SBM which are the main raw materials used in the production of broiler chicken feed. In view of this, there is increased interest by Nigerian livestock farmers on the search for nonconventional feed ingredients of comparable feed quality that are not competed for in man's dietary needs and are believed to be cost effective, non-toxic and readily available as energy sources. In Nigeria, one of such by-products is millet processing waste which is a sievate of wet milling of millet after obtaining the flour (pap) which is prepared by milling and sieving millet soaked in water for 24 hours. The sievate is relatively available in large quantities in both the rural and urban communities in Nigeria and often discarded as waste. This millet processing waste can be good alternative to replace maize in laying birds' diets. The study aims to evaluate effects of replacing dietary maize with millet on performance of laying birds.

MATERIALS AND METHODS

Experimental site

The study was conducted between May and August 2018

Table 1. Gross composition of experimental diet.

Ingredients	Treatments			
	T_1 [Maize (18%CP)]	T_2 [Millet (16% CP)]	T_3 [Millet (18%CP)]	T_4 [Millet (20%CP)]
Maize	30.30	0.00	0.00	0.00
Millet	0.00	35.00	30.10	26.00
GNC	15.60	10.00	14.50	19.40
Wheat offal	42.50	43.30	44.80	44.10
Limestone	9.70	9.70	8.70	8.70
Bone meal	1.20	1.20	1.20	1.20
Vitamin/mineral premix*	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Methionine	0.12	0.12	0.12	0.12
Lysine	0.60	0.14	0.06	0.10
Cost of feed (N/kg)	40.88	37.88	37.66	38.42

Vitamin A: 8500IU, D3: 1500mg, E: 1000mg K3: 1500IU, B1:45mg, B2: 15000mg, niacin:45000mg, pantothenic acid:3000mg, B6:1500mg, B12: 600mg, folic acid: 500mg, biotin H_2: 17500mg, cholin chloride: 200mg, cobalt:3000mg, copper: 1000mg, iodine:20,000mg, iron:40,000mg, manganese: 30,000mg, selenium: 12500mg, zinc: 200mg, antioxidation: 600mg.

at the Poultry Production Unit of Sokoto State Veterinary Center, Aliyu Jodi Road, Sokoto. The state is located between latitude 12° and 13°5'N and longitude 4°8' and 6°4'N, in the northern part of Nigeria, at an altitude of 350 m above sea level (Ajaegbu *et al.,* 2000).

The state is in the dry Sahel, with an annual average temperature of 28.3°C. Maximum daytime temperatures are generally under 40°C for most part of the year, and the dryness makes the heat bearable. The rainy season is from June – October, with mean annual rainfall of 700 mm and evapo-transpiration of about 162 mm. The cool season extends from late October to February, a period dominated by the Harmattan wind blowing dust from the Sahara (Reuben, 1981).

Experimental design and management of birds

Two hundred and forty black Bovan Nera layers of 23 weeks of age (averaging 1.3 kg live weight) were used in a completely randomized designed to evaluate the performance of laying chickens fed diets containing different levels of protein. They were randomly allotted to four treatment groups: Birds in Treatment 1 were fed a maize-based diet containing 18% CP. Bird in Treatments 2, 3 and 4 were fed millet-based diets containing 16,18 and 20% CP, respectively. Each treatment had six replicates with ten birds per replicate, making a total of 60 birds per treatment. The gross composition of the experimental diets is shown in Table 333.1. All the diets contained 2400 kcal ME/kg. They contained same levels (%) of other nutrients – i.e. calcium: 3.6, phosphorus 0.4, lysine 0.8 and methionine 0.4.

Feed and water were provided *ad libitum*. The experiment lasted for sixteen weeks. The birds were fed once a day in the morning (8.00 – 9.00 am). Eggs were collected in the evening (5.00 – 6.00 pm). Egg weight was monitored on weekly basis. Feed intake, number of eggs, minimum and maximum temperatures of the pen and mortality were recorded on daily basis.

Percentage egg production (hen-day) was obtained by dividing the number of eggs produced by the number of birds and multiplies by 100 as outlined by Oluyemi and Roberts (2000). Feed conversion ratio (FCR) was calculated as feed intake divided by egg mass. The cost of experimental diets was computed using the price of the feed ingredients during the experimental period.

Data analysis

The data was subjected to analysis of variance (ANOVA), using Statview Analytical Computer Package (Version 5) (SAS, 1998).

RESULTS AND DISCUSION

The performance characteristics of laying birds fed millet as replacement for maize is presented in Table 2. There were no significant differences in feed intake between the treatments ($p>0.05$) even though birds on the millet-based diets consumed slightly higher amount of feed (100 – 102 g/b/d) compared to those on the maize-based diet (99 g/b/d). Hen-day egg production was similar between the treatments (59 – 61%). Egg weight was also not significantly ($p>0.05$) affected by the dietary treatments (46 – 48g). However, egg mass was higher for the maize-based diet (T_1) (5.2 g/b/d compared to the other treatments (4.2, 4.1 and 4.3 g/b/d for T_1, T_2 and T_3 respectively). FCR was better for T_1 (3.7) compared to the other treatments (average of 4.2). Mortality was higher for T_4 (0.5%)

Table 2. The performance characteristics of the birds fed the experimental diets shown.

Parameters	Treatments				SEM
	T_1 [Maize (18%CP)]	T_2 [Millet (16% CP)]	T_3 [Millet (18%CP)]	T_4 [Millet (20%CP)]	
Feed intake (g/b/d)	99.21	102.83	100.39	102.72	1.53
Hen-day egg production (%)	60.84	58.70	61.44	60.65	0.80
Hen-housed egg production (%)	53.23	55.06	54.92	53.83	0.20
Egg weight (g)	47.3	46..97	46.30	46.71	0.20
Egg mass (g/b/d)	5.18^a	4.23^b	4.09^b	4.26^b	0.50
FCR	3.65^a	4.90^b	4.88^b	4.83^c	1.20
Mortality	0.38^b	0.19^c	0.39^b	0.52^a	0.37
Total cost of feed consumed/₦	452.2	429.7	423.4	442.01	0.10
Cost of feed/egg (₦)	12.67	10.02	9.86	9.76	1.20

compared to the other treatments (0.4, 0.2 and 0.4% for T_1, T_2 and T_3 respectively). Results of the current study however, are contrary to the observations of Tornekar *et al*. (2009) who reported that there was a significant effect on feed intake when pearl millet replaced 50% of dietary maize in broiler chicken diets. Mehri *et al*. (2010) reported significantly higher feed intake in layer chicken fed on diets containing 75-100% millet. Cost of feed consumed did not differ significantly between the treatments, even though it was slightly higher for the maize-based diet (₦61/kg/d) compared to the values obtained for the millet-based diets (₦60.57 and ₦59/kg/d for treatment 2, 3, and 4 respectively). Similarly cost of feed per egg was slightly higher ($p>0.05$) for the maize-based diet compared other treatments (₦10.0).

Conclusion

The study concludes that millet at 20% CP can be incorporated in the diet of laying birds as better feed conversion ratio were recorded.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interests.

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