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Full Length Research

Economics of production of laying Japanese quails fed with different energy sources in semi-arid environment of Gashua, Yobe State, Nigeria

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ABSTRACT: An experiment was conducted to assess the economics of production of laying Japanese quails fed millet and sorghum as alternatives to maize. Three hundred (300) day old quails were sourced form National Veterinary Institute Jos. The birds were brooded for two weeks and randomly allotted to three (3) different energy sources i.e. maize, millet and sorghum designated as treatment 1, 2 and 3 respectively. The birds were fed with experimental diets for six months. The economics of production were determined based on the prevailing market price as of the time of experiment. Results showed that hen day egg production (80.21-84.51%), feed cost (₦169.67-174.00), total number of eggs produced (2246-2366), total price of eggs (₦ 67,380.00-70.980.00), revenue (₦ 92,780.42-95,621.51) and gross margin (₦ 57,105.40-61,900.09) were not affected by the different energy sources. It can be concluded that millet and sorghum can be alternative to maize without depressed in egg production, reduction in cost of production and higher gross margin.

Keywords: Cost of production, economics of production, gross margin, hen day, quails.

INTRODUCTION

Nigerian livestock industry has been greatly affected by high cost of feed which is reported to account for 60-80% of the total cost monogastric production (Sanni and Ogundipe, 2005). This high cost of feeds has necessitated the search of alternative energy sources for quail production (Maidala *et al.,* 2021). Commercial quail production depends heavily on maize as the major energy source which poses a major challenge to quail farmers (Masenya *et al*. 2021). Therefore, any cereal or root and tubers that can be alternatives to maize in the poultry feed industry could be one of the immediate solutions to reduce the cost of quail production and ensure sustainability. The use of alternative energy sources for maize are documented to a greater extent in some regions (Odunsi *et al*., 2007 in South western Nigeria; Edache *et al*., 2018 and Khaleel *et al*, 2021 in North western Nigeria). However, it has not been documented in Yobe State of North Eastern Nigeria and variation in the nutrient content of the ingredients is an important consideration in animal nutrition. The cost of feeding quails will affect economics of production. Japanese quails are small game birds that are suitable for meat and egg production on a commercial scale, they have lower disease resistance. Quail birds have a small body size, they come to egg production between five to six weeks of their life. They are early maturing, hardy and prolific. The eggs are small, multicoloured and weigh between 8 and 10 g (Musa *et al.,* 2008). The meat is tasty, nutritious and have a gamy flavour that is rich in essential nutrients such as protein, vitamins and minerals and has low fat and cholesterol content. Quail meat has higher monosaturated fat than chicken meat, which is essential for human growth

and development. Quail meat contain essential fatty acids such as oleic, linoleic, palmitic and steric acids. Quail meat can be used as a source of immune supportive nutrients to boost human health (Mnisi *et al*., 2021). Quail egg is an excellent source of nutrients such as protein, lipids, vitamins and minerals. It contains other substances such as lysosome, ovomucoid and cystatin that have therapeutic effects. The protein quality of quail eggs are characterized by high amount of essential amino acids such as leucine, lysine and valine. It also has non-essential amino acids such as aspertatic acid, serine and alanine which are important for forming several compounds that are involved in metabolic process in the body (Mnisi *et al*., 2021). Increased production of this bird with adequate nutrition will ensure constant availability of meat to teaming consumers. Therefore, the objective of this study was to determine the effect of different energy sources on economics of egg production of Japanese quails in semi-arid environment of Gashua, Yobe State.

MATERIALS AND METHODS

Study area

The study was conducted in the Teaching and Research farm of Federal University Gashua, Yobe State. Bade Local Government lies between latitude 10° and 11° east of Greenwich and longitude 13° and 12° north of the equator. It has an area of 772 km^2, with a population of 125,1817. The hottest moths are in March and April with temperature ranges of 38-40°C, with rainfall of 500-1000 mm (Yobe State Government).

Sources and processing of ingredients

The millet and sorghum were purchase in Bade Central Market. The supplements were purchase from Animal Care, Kano State. The millet and sorghum were used to formulate the experimental diets which are isonitrogenous and isocaloric and meet the nutritional requirements of quails in the tropics. The compositions of the experimental diets are shown in Table 1 and 2 respectively.

Experimental birds and management

Three-hundred-day old quail chicks were sourced from National Veterinary Research Institute Vom, Plateau State. The birds were brooded for two weeks. The birds were randomly allotted to three dietary treatments, there are one hundred birds per treatment replicated five times (twenty birds per replicate) in a completely randomized design (CRD). The experiment lasted for six months.

All birds in each replicate were weighed at the start of the feeding trial and once a week for the period of the feeding trial. Daily egg collection was carried and sample of eggs from each replicate was weighed weekly to record mean egg weight. The initial weight of birds and the final weight of the birds at the end of the experiment was taken.

Feed intake (g)

The birds were offered weighed amount of feed daily and the corresponding left over weighed are recorded the following day.

Production parameters measured

Hen day egg production

This was measured as the total number of eggs laid divided by the number of hens in the house multiplied by 100. This is given as;

$$\text{HDEP } \% = \frac{\text{Number of eggs produced}}{\text{Number of live birds}} x100$$

Hen housed egg production

This was measured as the total number of eggs laid divided by the number of hens originally housed (dead, culled etc. inclusive) multiplied by 100.

$$\text{HHEP } \% = \frac{\text{Number of eggs produced}}{\text{Number of birds originally housed}} x100$$

Egg weight was measured as the average weight of individual egg (g).

Estimation of economics of production

The following parameters were used to estimate economics of production:

Cost of feed per kilogram (N/kg)

This was computed using the prevailing market price of ingredients.

Cost of production/bird

The cost of production was estimated as sum of cost of birds, feed, medications, kerosene, charcoal, wood shaving, electric bulbs, measuring cylinder, labour and housing divided by the number of birds in a treatment.

Table 1. Percentage composition of experimental diets fed to quails.

Ingredients	T_1 (Maize)	T_2 (Millet)	T_3 (Sorghum)
Maize	52.03	00.00	00.00
Millet	00.00	52.03	00.00
Sorghum	00.00	00.00	52.03
Full fat soybean	29.07	29.07	29.07
Wheat offal	10.00	10.00	10.00
Fishmeal	5.00	5.00	5.00
Bone meal	3.00	3.00	3.00
Lysine	0.20	0.20	0.20
Methionine	0.20	0.20	0.20
Salt	0.25	0.25	0.25
Premix*	0.25	0.25	0.25
Total	100.00	100.00	100.00
Calculated analysis			
Crude protein (%)	21.00	21.00	21.00
Metabolizable energy (kcal/kg)	2879	2745	2725

*****Each kilogram contains Vit A 3600, 000 IU. Vit. D_3 600.000 IU. Vit E 4.000.000mg. Vit B_1-B_6 640, 1600, 600, 4.00mg. Panthothenic acid 2000mg, Biotin 300mg. Manganese 16000mg. Manganese 16000mg. Selenium80mg. Vit. K_3 600mg. Cobalt 80mg. Copper1200mg. Zinc 12,000mg. Folic acid 200mg. Choline chloride700000mg. Antioxidant 500mg.

Table 2. Percentage composition of experimental diets fed to laying quails.

Ingredients	T_1 (Maize)	T_2 (Millet)	T_3 (Sorghum)
Maize	70.46	00.00	00.00
Millet	00.00	70.46	00.00
Sorghum	00.00	00.00	70.46
Full fat soyabean	10.14	10.14	10.14
Wheat offal	10.00	10.00	10.00
Fishmeal	5.00	5.00	5.00
Lysine	0.20	0.20	0.20
Methionine	0.20	0.20	0.20
Bone meal	2.00	2.00	2.00
Limestone	1.5	1.5	1.5
Salt	0.25	0.25	0.25
Premix*	0.25	0.25	0.25
Total	100.00	100.00	100.00
Calculated analysis			
Crude protein (%)	16..00	16.00	16.00
Metabolizable energy (kcal/kg)	2700	2645	2625

*****Each kilogram contains Vit A 3600, 000 IU. Vit. D_3 600.000 IU. Vit E 4.000.000mg. Vit B_1-B_6 640, 1600, 600, 4.00mg. Panthothenic acid 2000mg, Biotin 300mg. Manganese 16000mg. Manganese 16000mg. Selenium80mg. Vit. K_3 600mg. Cobalt 80mg. Copper1200mg. Zinc 12,000mg. Folic acid 200mg. Choline chloride700000mg. Antioxidant 500mg.

Revenue

The revenue was calculated as price per mature bird plus eggs plus the manure harvested in that treatment.

Gross margin/bird

This was calculated as the total revenue generated minus the total cost of production.

Table 3. Performance of laying Japanese quails fed different energy sources.

Parameters	T_1 (Maize)	T_2 (Millet)	T_3 (Sorghum)	SEM
Initial weight (g/bird)	2.39	2.22	2.31	0.473 NS
Final weight (g/bird)	490.88	508.74	521.61	0.723 NS
Hen day egg production (%)	80.21	84.51	82.11	0.631 NS
Hen housed egg production (%)	71.21	75.51	73.11	0.521 NS
Feed/dozen eggs (₦)	174.00	170.83	169.67	0.431 NS
Feed intake (g/bird)	11.60	11.39	11.31	0.951 NS
Mortality	2.00	00.00	2.00	0.262 NS

Table 4. Economics of production of laying Japanese quails fed different energy sources.

Parameters	T_1 (Maize)	T_2 (Millet)	T_3 (Sorghum)	SEM
Feed intake (g/bird/day)	11.60	11.39	11.31	0.981 NS
Total feed intake (kg)	2.08	2.05	2.03	0.539 NS
Price of eggs (Tray of eggs ₦)	900	900	900	0.127 NS
Feed cost (₦ /kg)	174.00	170.83	169.67	0.718 NS
Final body weight (g/bird)	490.88	508.74	521.61	0.628 NS
Total number of eggs produced	2246	2366	2299	0.782 NS
Total price of eggs produced	67,380.00	70, 980.00	68,970.00	0.521 NS
Total cost of production (₦)	35,675.00	33,721.42	35,867.62	0.921 NS
Revenue (birds + eggs + manure ₦)	92,780.42	95,621.51	93,920.61	0.921 NS
Gross margin (₦)	57,105.40	61.900.09	58,053.40	791 NS

Statistical analysis

Data obtained were subjected to one way analysis of variance (ANOVA) and where significant differences were observed, means were separated using Duncan's Multiple Range Test (Duncan, 1955) as described by Steel and Torrie (1980).

RESULTS AND DISCUSSION

Results on the performance of female Japanese quails fed different energy sources are presented in Table 3. Results showed that final weight increased from the control diet (490.88 g) to quails fed sorghum diets (521.61 g) and the results were statistically similar ($p>0.05$) and these findings are in agreement with the earlier reports of Masenya *et al.* (2021) on heavy weight quail fed millet and sorghum as alternative energy source and reported no adverse effects on performance. The feed intake varies between (11.31 g) on birds fed sorghum to (11.60 g) on quails fed maize diet and the values were statistically similar ($p>0.05$). This reaffirms the earlier report of Reddy *et al.* (2006) for Japanese quails fed millet and sorghum as alternative energy sources and reported no significant difference. The total feed intake followed the same trend and the values were not affected ($p>0.05$) by different energy source and this report concord with the earlier reports of Khaleel *et al*. (2021) who reported that sorghum can replace maize in quail diets. The hen day egg production varied between (80.21%) in the maize based diet to (84.51%) in quails fed millet based diet and the difference between the values were statistically similar ($p>0.05$). This is in line with earlier reports of Edache *et al.* (2018) who fed peeled and cooked cassava as energy source and report no significant difference between the values.

The economics analysis of laying hens fed with different energy sources were presented in Table 4. The feed cost ranged between (₦ 169.67) in millet based diet to (₦ 174.00) in the maize based diet and the difference between the va*l*ues were statistically similar ($p>0.05$). The total number of eggs produced varied between (2246) in maize based diet to (2366) in quails fed millet based diet and the values were not affected by the different energy sources ($p>0.05$) and this can be attributed by the fact that quails utilized millet and sorghum energy sources as they utilized maize. The total price of eggs produced varied between (67,380.00) in maize based diet to (70,980.00) in millet-based diet and this is a reflection of feed cost and total price of the eggs reported in this study. Revenue generated varied between (92,780.42) in maize based diet to (95, 621.51) in millet based diet and the values were statistically similar ($p>0.05$). The feed cost ₦/dozen of

eggs was least for quails fed sorghum (₦169.67) which as an advantage of producing cheaper eggs over millet and maize. The gross margin varied between (57,105.40) in maize based diet to (61,900.09) in millet-based diet and the difference between the values were not affected by the different energy source ($p>0.05$).

Conclusion

Considering the results of feed intake, hen day egg production, feed/dozen egg, total price of eggs, number of eggs produced, revenue and gross margin. Millet and sorghum can be used as substitute for maize without adverse effect and more revenue will be generated.

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