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Research Article

Impacts of Feeding Graded Levels of Baobab Seed Meal Instead of Concentrate on Growth Performance and Feed Utilization of Broiler Chicks

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Abstract

In order to determine the effect of feeding graded levels of baobab seed meal instead of concentrate on feed intake, growth rate, feed conversion rations, and physical properties of carcass of broiler chicks, one hundred and forty four day old mixed-sex of broiler commercial hybrid chicks Ross (308) were purchased. The chicks were randomly allocated to six treatments groups A, B, C, D, E, and F. Each treatment allocated 24 chicks and eight chicks per replicate in a completely randomized design (CRD). The inclusion level of replaced concentrate in the diets were 0% (control), 1%, 2%, 3%, 4% and 5% of baobab seed meal; for groups A, B, C, D, E and F respectively.

Birds were weighed at prior the study and then weekly up to the end of the experiment at 6 weeks of age. Three birds per replicate were randomly selected for blood samples and carcass physical characteristics measurements. Results showed significant ($p \leq 0.05$) lower live body weight, weekly body weight gain, feed intake and feed conversion rations for group F compared to other groups. However there were no differences existed between treatments for pH, lightness and yellowness, significant ($p \leq 0.01$) high cooking loss percentage and increased value of redness were recorded for birds in group F compared to birds in other groups.

The gross margin analysis showed that the use of baobab seed meal as alternative of broiler concentrate in broiler chick diets economically reduced the total feed cost. Thus as a valuable local cheap ingredient it could be used up to 4% in broiler diets instead of concentrate which improve the chicks weighed gain that lead to maximize financial returns and gave a healthy growth of the hybrid chicks Ross (308).

Keywords: Baobab; Broiler; Carcass; Growth Rate and Financial Return

Introduction

Poultry industry is considered as the second largest industry in many African countries [1]**.** Most of the chicken eaten today comes from broiler chickens which are grow very rapidly and have been selected for traits that are desirable for meat production [2]. Poultry is now by far the largest livestock species worldwide accounting for more than 30% of all animal protein produced. However, the high cost of animal products that is being witnessed in most African countries is attributed to high cost of livestock feed which generally accounts for 60 - 70 percent of the total cost of production [3]. Utilization of non-conventional feedstuffs especially when it encourages shift to other ingredients such as leaf meals, and tree

seed cakes that are not edible by man but readily available will reduce the cost of feed and maximize the returns from poultry farming. Research on low-cost and locally available indigenous feed resources is fundamental, particularly those which do not attract competition with human beings and ever expanding intensive livestock production. One to potential alternative in this use of local indigenous multipurpose tree products and by products, such as seeds, cakes, and leaf meals of baobab [4]. It produces seeds that are not only rich in protein (20-36% CP) and energy (1 898 - 4 465 k Cal/kg) but also provides some necessary fiber, vitamins, minerals and amino acids, particularly, lysine and methionine which are limited in most cereals but essential for livestock growth and development [5]. The two major factors for a successful and economic broiler production are fast growth rate, feed efficient and feed conversion [6]. In other hand the development of broiler chickens dependent on optimal feed intake during the growing period therefore feed intake is dependent on a number of factors such as environmental temperature, diet nutrient density, and physical form of diet [7]. (mash, pellet) that is important factor in growth performance of broiler chickens, according to the study of [8] body weight of birds of mash, pellet and crumble group from 4th to 8th weeks of age showed significant differences but the initial body weight of the birds did not differ significantly. The success of poultry meat production has been strongly related to improvements in growth and carcass yield, mainly by increasing breast proportion and reducing abdominal fat [9] found that reasing system of broiler chickens it can be effect on cracass and organs weight (e.x reasing broiler in outdoor can be result on lower weight than reasing in intensive system [10]. The purpose of this study was therefore to assess the effect of different levels of baobab seed meal on feed utilization and growth rate in broiler chickens, to determine the effect of using graded levels of baobab seeds meal on carcass characteristics in broiler chickenso determine the optimum inclusion of baobab seed meal in broiler diets and to compare the carcass yield and physio-chemical quality of meat of broiler chickens.

Materials and Methods

Study area

The experiment was conducted in the poultry farm, Department of Animal Production, University of Kordofan, in North Kordofan state, Elobeid, Sudan during the period from 2018 to 2019.

Collection of baobab seeds

Seeds were collected from traditional juice shops as residual products in Elobied town. Seeds was washed and completely sunny dried. The seeds was crushed to obtain the baobab meal. Baobab meal was subjected to chemical analysis to estimate the approximate nutrients.

Amino acids determination

Amino acids content of baobab meal was determined using HPLC, according to AOAC (2000) protocol; additionally minerals contents were determined.

Formulation of experimental rations

Six rations was formulated A, B, C, D, E and F for each starter diet and finisher which presented in table 1 and 2. Rations should be iso-nitrogenous and iso-caloric (similar in energy and crude protein). Ration A was considered as a control with 2.5% super concentrate and 0% baobab seed meal, ration B with 2% concentrate and 0.5% baobab seed meal, ration C with 1.5% concentrate and 1% baobab seed meal, ration D with 1% concentrate and 1.5% baobab seed meal, ration E with 0.5% concentrate and 2.0% baobab seed meal and ration F with 0% concentrate and 2.5% baobab seed meal.

Ingredients %	A (%)	B (%)	C (%)	D (%)	E (%)	F (%)
Sorghum	60	60	60	60	60	60
Groundnut cake	30	30	30	30	30	30
Wheat bran	4.5	4.5	4.5	4.5	4.5	4.5
Salt	0.5	0.5	0.5	0.5	0.5	0.5
Concentrate	5	4	3	2	1	0.0
Boabab meal	0	1	2	3	4	5
Total	100	100	100	100	100	100

Table 1: Gross composition of the experimental diets starter.

Ingredients %	A (%)	B (%)	C (%)	D (%)	E (%)	F (%)
Sorghum	65	65	65	65	65	65
Ground nut cake	25	25	25	25	25	25
Wheat bran	4	4	4	4	4	4
Salt	0.5	0.5	0.5	0.5	0.5	0.5
DCP	0.5	0.5	0.5	0.5	0.5	0.5
concentrate	5	4	3	2	1	0.0
Boabab meal	0.0	1	2	3	4	5
Total	100	100	100	100	100	100

Table 2: Gross composition of the experimental diets finisher.

Experimental birds

One hundred and forty four day old mixed-sex of broiler commercial hybrid chicks was purchased. All Chicks were vaccinated against Newcastle and Comboro diseases. Chicks were fed the same diet for a week at the beginning as adaptation period. Birds were divided randomly into six groups A, B, C, D, E, and F. The groups were fed with formulated rations A, B, C, D, E, and F consecutively.

Housing and experimental procedure

The birds were raised in open sided-deep litter floor house 11x5x3.5m. The house was divided internally into six sections 2x5m to accommodate the six groups A, B, C, D, E and E. The groups were internally divided to three sub groups as shown in table 3; for each group six floor pens were provided with plastic containers for water and rectangular trough feeders. The house was provided with florescent lambs to give continuous artificial light for 24 hours. Furthermore, the birds were weighted after one week of age as initial weight and thereafter at weekly interval, up to the end of the experimental period. The diet also was weighted weekly early in morning; therefore, the remaining feed was weighted again at the end of the week to determine the feed consumption.

Treatments	Replications	No. of birds/unit
A	3	8
B	3	8
C	3	8
D	3	6
E	3	8
F	3	8

Table 3: Experimental design and bird management (lay out).

Carcass characteristics procedures

At the end of the experiment (6weeks of age) a representative samples of 18 (3 chicken from each group) were selected randomly for slaughter and dissection. Samples of blood were taken from selected chicken to determine the level of cholesterol. Head, feet, viscera, and shanks were removed. Moreover, non-carcass fat, abdominal fat, including fat surrounding gizzard, heart fat, fat trimmed from alimentary tract ,visceral fat, and pad fat were removed and weighed. Carcass yield dressing percentage was obtained by expressing the dressed carcass weight as a percentage of live body weight. In each carcass the skin and subcutaneous fat was removed from the surface of the superficial muscles and intramuscular fat was removed from the indentation of their origin and insertion.

Data collection

The data recorded during the experimental period are growth performance, live body weight gain, feed consumption, feed conversion ratio, carcass characteristics and meat quality.

Statistical analysis

The data collected analyzed by using Statistical Analysis System (SAS) to determine the significant differences between and within the measured parameters and then the results were tabulated.

Result and Discussion

Feed intake and feed conversion ration

Feeding of graded levels of baobab seed meal in instead of concentrate from 1-4% to broiler starter had no significant effect on

feed intake [6] found similar report, except feeding level of baobab seed meal 5% had significant in treatment F (5%) of baobab they consumed lower than other groups of treatments may be due high content of fiber in the diet (highest feed consumed was 399.98 ± 0·36/and lowest 208.33 ± 0.21g/bird/week respectively).

Feed conversion rations the result of this study indicate that there were some differences but not significant except treatment F was significantly differ from other treatments this result different from what have been report by [6].

Feed intake (bird /week) gm					
Treatment	**W_2**	**W_3**	**W_4**	**W_5**	**W_6**
A	399.98^{a}± 0·26	600.00^{a} ± 0·29	700.00^{a} ±0·35	769.57^{a} ± 0·45	991.30^{a} ±0·26
B	362.46^{a}± 0·26	616.67^{a} ± 0·21	713.64^{a} ± 0·25	759.00^{a} ± 0·10	972.73^{a} ±0·32
C	399.98^{a} ± 0·36	595.83^{a} ± 0·49	626.09^{a} ± 0·35	786.36^{a} ± 0·51	995.45^{a} ± 0·87
D	299.95^{ab} ± 0·85	536.67^{a} ± 0·90	668.18^{a} ±0·53	763.36^{a} ± 0·79	963.64^{a} ±0·75
E	385.33^{a} ± 0·15	525.00^{a} ± 0·72	581.81^{a} ±0·20	722.73^{a} ± 0·43	904.54^{a} ±0·71
F	208.33^{b} ± 0·21	241.67^{b} ±0·81	247.83^{b} ± 0·35	321.74^{b} ±0·42	486.95^{b} ± 0·50

Table 4: Feed intake ($\bar{x}$ ± sd) gm for bird/week of the experimental broiler chicks fed on graded levels of baobab seed meal rations.

* A, B, C, D, E and F are birds fed 0%, 1%, 2%, 3%, 4% and 5% baobab meal instead of concentrate in broiler starter and finisher rations, respectively.* W_2, W_3, W_4, W_5 and W_6 are live body weight at second, third, fourth, fifth and sixth weeks of age, respectively.

* Figure with different superscripts in same column are significantly differ (DMRT 1%).

Weekly live body weight and weight gain

The results presented in table (5) illustrate the body weight of birds of different treatments from 2th to 6th weeks of age which showed significant differences ($P < 0.01$) nevertheless, the initial body weight of the birds didn't differ significantly; similar observations reported by [8] who report on feeding broiler mash diets had not significantly in initial weight. In terms of weight gain (Table 5) per bird of different groups was also significant ($P < 0.01$) differences (Saulawa., *et al.* 2015) who recorded similar observations feeding raw baobab seed meal up to 10% have significantly different but different from study of (Oladunjoye., *et al.* 2014). Who recorded final weight and average daily gain (ADG) of the rabbits that received 5% and 10% baobab seed meal were not different.

Feed conversion ration

The result of this study was indicate that there were no significant difference ($P > 0.01$) between treatments in second, fourth, and fifth of age of the experiment.

Therefore' there were no significant difference in weeks third, and sixth of age between treatments except treatment F.

Body weight gain in week

From the results of body weight gain in the figure one shown that treatment A starts growing fast from the beginning of the experiment and the chicks had the highest gain in week five, then the curve start dropped at the end of experiment, for treatment B start gaining normal form the beginning of the experiment then got the maximum weight gain in week five same as treatment A. Therefore' treatment C the result had shown that chickens in this group start growing while the age increased, then had higher gain in age of fourth week; then gain maximum weight at fifth week of age, then the weighed dropped at the end of experiment, however' chickens in group D from this result shown that body weight had started gaining and had highest weight in the fifth week of age; then continue gaining weight. For treatment E the weight gain of birds continue gaining and had maximum of weight gain after week fourth then had dropped in week 6 at the end of the experiment. Birds in group F it is completely different from all other treatments in body weight aging, the result in this figure had shown that curve of growth started very slow in body weight gain, then had dropped in week three after week three start increased in weight until had a maximum gain in age of week four then the growth had dropped at week six at the end of the experiment.

Treatment	W_1	W_2	W_3	W_4	W_5	W_6
A	161.45 ± 1.45 (24)	344.47^{a} ± 26.25 (24)	606.37^{a} ± 35.24 (24)	946.27^{a} ± 27.14 (23)	1293.60^{a} ± 58.06 (23)	1616.30^{a} ± 62.66 (23)
B	164.6 0 ± 3.76 (24)	324.90^{a} ± 10.78 (22)	551.70^{ab} ± 17.56 (22)	902.27^{ab} ± 25.00 (22)	1243.10^{a} ± 12.81 (22)	1534.00^{ab}± 49.52 (22)
C	163.30 ± 2.60 (24)	302.20 ^{ab} ± 16.36 (24)	477.57^{b} ± 43.56 (23)	751.47^{c} ± 67.24 (22)	1041.33^{b} ± 80.23 (22)	1332.17^{c} ± 54.10 (22)
D	142.60 ± 4.81 (22)	302.37^{ab} ± 13.80 (22)	478.37^{b} ± 47.01 (22)	747.90 ^{c} ± 45.27 (22)	1073.53^{b}± 75.59 (22)	1431.13^{bc} ± 85.63 (22)
E	164.43 ± 5.35 (24)	318.07^{a} ± 30.51 (22)	513.13^{ab} ± 57.01 (22)	773.90^{bc} ± 93.94 (22)	1093.30^{b} ± 51.39 (22)	1405.00^{bc} ± 52.45 (22)
F	154.70 ± 7.25 (24)	240.37^{b} ± 40.77 (24)	287.73^{c} ± 29.55 (23)	366.37 ^{d} ± 46.69 (23)	487.20^{c} ± 8.41 (23)	600.10^{d} ± 42.12 (23)

Table 5: Live body weight ($\bar{x}$ ± sd) gm.

* A, B, C, D, E and F are birds fed 0%, 1%, 2%, 3%, 4% and 5% baobab meal instead of concentrate in broiler starter and finisher rations, respectively.

* W_1, W_2, W_3, W_4, W_5 and W_6 are live body weight at first, second, third, fourth, fifth and sixth weeks of age, respectively.

* Figures between brackets are number of birds.

* Figure with different superscripts in same column are significantly differ (DMRT 1%).

Feed conversion ratio (feed/gain Kg)						
Treatment	W_2	W_3	W_4	W_5	W_6	Average
A	2.19	2.29^{a}	2.20	2.21	3.07 ^{a}	2.39
B	2.26	2.77^{a}	2.03	2.22	3.34 ^{a}	2.52
C	2.87	3.54^{a}	2.28	2.71	3.42 ^{a}	2.96
D	1.88	3.05^{a}	2.47	2.34	2.79 ^{a}	2.50
E	2.51	2.69^{a}	2.23	2.26	2.90 ^{a}	2.51
F	2.43	5.09^{b}	3.21	2.65	4.31 ^{b}	3.54

Table 6: Feed conversion ratio (feed/body weight gain Kg) of the experimental broiler chicks fed on graded levels of baobab seed meal.

* A, B, C, D, E and F are birds fed 0%, 1%, 2%, 3%, 4% and 5% baobab meal instead of concentrate in broiler starter and finisher rations, respectively.

* W_2, W_3, W_4, W_5 and W_6 are feed conversion rations at second, third, fourth, fifth and sixth weeks of age, respectively.

* Figure with different superscripts in same column are significantly differ (DMRT 1%).

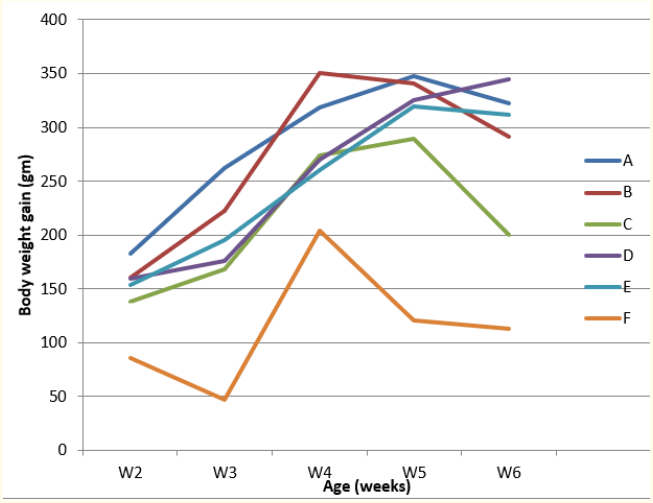

Figure 1: Body weight gain in week.

Where A, B, C, D, E, and F were groups of chicks fed graded levels of baobab seed meal.

Where: W1, W2, W3, W4, W5, and W6 age of experimental chicks.

Conclusions

Findings from this study show that the treatment (A) of broiler chick fed control diet 0% baobab seed meal perform better than other groups of treatments in terms of feed intake, growth rate, and carcass quality although have high cost of feeding. The commercial broilers chicken in treatment (A) consumed about twice more feed than treatment (F) fed diet content 5% of baobab seed meal in place of concentrate. This was closely associated to their superior body mass. However, treatments B, C, D were perform better than treatment F in terms of feed consumed, body weight gain, and carcass quality. The gross margin analysis showed that the use of baobab seeds meal as alternative of broiler concentrate in broiler chick diets economically reduced the total feed cost. Thus as a valuable local cheap ingredient it could be used up to 4% in broiler diets instead of concentrate to maximize financial returns.

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