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Growth and Egg production performances of Scavenging koekoek chicken supplemented with Taro (*Colocasia esculenta*), Cassava (*Manihot esculenta*) and Noug seed (*Guizotiaabyssinica*) cake at Sodo Zuria, Ethiopia

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Abstract

The study was carried out with the objectives to evaluate the effect of supplementing maize, taro and cassava as energy feed and Noug seed cake as protein feed on the growth and laying performance of dual purpose koekoek chicken under scavenging condition.Participant farmers were selected purposely on the basis of willingness to construct poultry house, to cover all the associated package costs and record the required data. Accordingly, two months age of 300 dual purpose (koekoek) chicken irrespective of their sexes were used for this experiment. The selected 12 farmers were randomly assigned to the four experimental treatments, so that 3 farmers were having a chance to receive similar treatments that is a replication and each to receive 25 birds in a completely randomized design. Four treatment diets (T) containing 30g cassava & 30g noug cake (T1), 10g maize, 10g taro, 10g cassava &30g noug cake (T2), 30g taro & 30g noug cake (T3) and 30g maize & 30g noug cake (T4). Feed was offered daily on group basis in two halves; first half in the morning after the refusal was collected and weighed while the second half offered in the afternoon. The results indicated that the effect of supplmentation on ADG was siginificantly different ($P < 0.05$) for T_1, T_3 and T_4. Average daily weight gain of chicken was 13.47 g, 11.38 g and 14.93 g for T_1, T_3 and T_4, respectively. Average daily body weight gain of chicken in T_1 and T_2 was not significantly different. Average daily weight gain was 13.47 g and 13.79 g for chicken in T_1 and T_2, respectively. That is chicken in T_1 supplemented with 30 g of cassava and 30 g of nougseed cake and in T_2 supplemented with 10 g of cassava, 10 g of taro and 10 g of maize and 30 g of nougseed cake. The current work indicated that up to 100% of maize replaced with cassava root meal and equal amount of taro, cassava and maize in the diet did not show significant effect in the growth performance and there was no adverse effect on laying performances as well as egg weight. Cassava and mixing of equal amount of cassava, maize and taro could then completely and economically replaced maize in dual purpose “Potchefstroom Koekoek” chickenration for supplementation when maize is expensive and scares.

Keywords: Egg production, Growth, Koekoek, Scavenging, Supplementation

Introduction

Energy feed sources (maize and sorghum) are expensive feedstuff, constituting about 50-55% of the formulated poultry diets. Maize as a major component of feed is expensive; the production is low which means it does not meet its demand as food for human as well as feed for livestock (Agbede*et al.*, 2002, Hamzat *et al*. 2003, and Okereke *et al*.,2006). The livestock producer appears most hit in terms of serious scarcity and high cost of feed (Babatunde *et al*., 1975). With the present trend of rising prices of animal feed stuff all over the world, greater attention is being paid to the search for safe and cheap local feed stuff (including unexplored feed-stuff, by-products of agriculture and industry); specially in the developing countries that cannot afford the expensive diets for livestock. Ethiopia like most other developing countries suffer greatly from a constant shortage of livestock feeds, in particular to those supplying nutrients of protein and energy. Scavenging birds' intake of nutrients from scavenging feed resource base is sufficient only for their maintenance requirement and the production of eggs per year is low, but for increased production additional inputs are needed. So, a supplementary feeding regime needs to be developed to increase the egg production of scavenging chickens to the point of economic optimum. It was possible to attain hen-day egg production of about 30% from local chickens by supplementing a combination of 15g maize and 15g Noug (*Guizotia abyssinica*) cake/bird/day in the short rainy and dry seasons (Tadelle and Ogle, 1996). Supplementing 30g maize alone resulted in 28% production while about 20% production was attained with supplementation of 30g noug seedcake/bird/day during this period while non-supplemented local birds under a similar environment produced only about 14% from scavenging only. Under these conditions, supplementation of 30g/head/day of a mixture of equal proportions of maize and nougseed cake increased annual egg production of local hens by about 100%. Even more remarkable success was attained with higher levels of supplementation using improved breeds.

Energy sources, especially maize are the most important and expensive feedstuffs, which account for about 50-55% of poultry diet (Afolayan *et al*., 2002). High cost of maize has been observed to result from declining production condition and keen competition for its use by man and animals (Agbede *et al*., 2002; Hamzat *et al*., 2003). Hence, in seeking replacement for maize in animal nutrition, cost implication of the use of the potential non-conventional feedstuffs should be considered. Taro, cassava and their products are an example of such an alternative. However, Oruwari *et al*. (2003) stated that with proper protein balance, cassava corn meal could completely replace maize in poultry diets. The use of cassava as an alternative to conventional energy feed stuffs like maize could help to reduce feed costs (Ukachukwu, 2005). Several researchers had earlier confirmed the suitability of cassava for animal feeding including poultry and the potential of cassava meal as a feed substitute for maize, for all classes of monogastric animals (Adesehinwa, 2008). The results of the previous studies revealed that taro corn meal is a cheap source of carbohydrates in animal nutrition (Onu and Madubuike, 2006; Adejumo and Bamidele,2012). Aderolu*etal*. (2009) also concluded that there was economic decrease in price of feed with the inclusion of cocoyam meal. Abdulrashid and Agwunobi (2009) revealed that cocoyam corn meal with proper processing will effectively replace maize at 50% level of inclusion as a major source of energy in finishing diet of broiler birds for maximum profit. With these points in mind, the present study was carried out with the following objectives:

- ✓ To evaluate the effect of supplementing maize, taro and cassava as energy feed and Noug seed cake as protein feed on the growth and laying performance of dual purpose koekoek chicken under scavenging condition.
- ✓ To evaluate the effect of supplementation of the test diets on the partial budget.

Materials and Methods

Farmers selection and Training

Participant farmers were selected purposely based on the basis of willingness to construct poultry house,to cover all the associated package costs and record the required data. Accordingly, 12 model farmers were selected and training was given on poultry local house construction and housing management, health care, feeding and data recording. Monitoring and evaluation were undertaken by the team of poultry research from Areka Agricultural Research Center (AARC) and development agents of the respective kebele's selected for this experiment.

House construction

The selected farmers were trained or commented to prepare the house 2.5m by 2.5m suitable for poultry to conduct the research. The house was constructed from locally available materials(straw for the roof, mud blocks, eucalyptus poles and bamboo). Nests, also made out of mud and cartoon, was placed along an outside wall in each room. Feeders and drinkers were prepared from used oil cans and each room was provided with one drinker and two or three feeders according to the requirements for the treatment. Deep litter system prepared by sawdust with the 5cm thickness was used in the house.

Experimental feed preparation

The taro and cassava flour were processed by peeling the tuber. The tubers then sliced into small pieces and direct sun-dried on mats for one week depending on the weather and the size of pieces so that the cyanide content was reduced to the amount safe for feeding. The slice was turned regularly to prevent uneven drying and possible decay. The dried tuber was then milled using a hammer mill or ground with hand by using locally available grinding materials like mortar and pestle. Maize and nougseedcake were purchased and mixed in the form used for treatment.

Table 1. Experimental treatments

No.	Ingredients (g)	Treatments			
		T_1	T_2	T_3	T_4
1	Maize	0	10	0	30
2	Taro	0	10	30	0
3	Cassava	30	10	0	0
4	Noug cake	30	30	30	30
5	Scavenging	Scavenging	Scavenging	Scavenging	Scavenging

T_1: contained 30g cassava & 30g noug cake, T_2: 10g maize, 10g taro, 10g cassava &30g noug cake, T_3: 30g taro & 30g noug cakeand T_4: 30g maize & 30g noug cake.

Experimental birds and management

According to the experimental plan a two months age of 300 dual purpose (koekoek) chicken irrespective of their sexeswere used for this experiment. The chickswere sourced from Debre Zeit Agricultural Research Center (DZARC). The selected 12 farmers were randomly assigned to the four experimental treatments, so that 3 farmers were having a chance to receive similar treatments that is a replicationand each to receive 25 birds in a completely randomized design. Four treatment diets (T) containing 30g cassava & 30g noug cake (T1), 10g maize, 10g taro, 10g cassava &30g noug cake (T2), 30g taro & 30g noug cake (T3) and 30g maize & 30g noug cake (T4).

Table 2. Experimental plan

Description	Treatment	Treatment	Treatment	Treatment
Number of birds in each replication	25	25	25	25
Number of households (no. of replicates)	3	3	3	3
Total Number of birds in each treatment	75	75	75	75

T_1: contained 30g cassava & 30g noug cake, T_2: 10g maize, 10g taro, 10g cassava &30g noug cake, T_3: 30g taro & 30g noug cakeand T_4: 30g maize & 30g noug cake.

Data Collection

Feed was offered daily on group basis in two halves; first half in the morning after the refusal was collected and weighed while the second half offered in the afternoon. Samples of the feed offered and refused was taken daily for chemical analysis. Data was collected in collaboration with the farmers and the development agent in the villages. Data for egg production and mortality was collected daily. Feed refusal was collected daily. Egg weight was recorded on a monthly basis with 5 eggs per treatment per household randomly selected each month. Data on body weight was also weighed at the beginning of every week and end of the experimental period.

Statistical Analysis

Data were analyzed using the general linear model procedures of Statistical Analysis Systems software with the model containing treatments. Daily body weight gain was analyzed by one between-subject one within-subject factor repeated measure ANOVA. Differences between treatment means were separated using Tukey Kramer test (SAS, 2009). Significant differences were declared at ($p<0.05$).

The following model for Daily body weight gain (DBWG**)** was used for the analysis:

$Y_{ijkl}= \mu + T_i + S_j + \delta_{1(ij)} + Ak + (T * A)_{ik} + (S * A)_{jk} + (\delta * A)_{1(ij)k}$

Where: Y_{ijkl} is the response variable of the l^{th} bird in the i^{th} dietary treatment
μ, general mean
T_i, effect of the i^{th} dietary treatment (T_1 = containing 30g cassava & 30g noug cake, T_2 = 10g maize, 10g taro, 10g cassava &30g noug cake, T_3 = 30g taro & 30g noug cakeand T_4 = 30g maize & 30g noug cake)
$S\,j$, effect of the j^{th} sex of birds (male and female)
$\delta_{1(ij)}$, effect of the *lth* bird within i^{th} dietary treatment and j^{th} sex (error term for dietand sex)
A_k, effect of the *kth* week of the experimental period (1, 2, 3... 13)
$(T * A)_{ik}$, interaction effect of the i^{th} dietary treatment and k^{th} week of theexperiment
$(S * A)_{jk}$, interaction effect of the j^{th} sex of birds and *kth* week of the experiment
$(\delta * A)_{1(ij)k}$, interaction effect of the l^{th} bird within i^{th} diet and j^{th} sex and *kth* weekof theexperiment (error term for age)

Results and Discussion

The results of measured values on average daily weight gain (ADG) due to the effect of supplementation is presented in Table 3.The results indicated that the effect of supplmentation on daily weight gain was siginificantly different ($P < 0.05$) for T_1, T_3 and T_4. Average daily weight gain of chicken was 13.47g, 11.38g and 14.93g for T_1, T_3 and T_4, respectively. This is in agreement with the reports of Eruvbetine*et al.* (1996) that;the replacement of maize with other unconventional feeds, like cassava meal and taro meal in the diet of dual purpose and layer chicken results in reduced egg production and growth performance. This slight variation in the body weight gain performance indicated that feed intake decreased as the level of substitution of maize with cassava increased from 0 to 100% that is also supported by the reportsofOjewela*et al.* (2006).

Average daily body weight gain of chicken in T_1 and T_2 was not significantly different. Average daily weight gain was 13.47g and 13.79g for chicken in T_1 and T_2, respectively. That is chicken in T_1 supplemented with 30g of cassava and 30g of nougseed cake and in T_2 supplemented with 10g of cassava, 10g of taro and 10g of maize and 30g of nougseed cake.

Table 3. Growth performance of chickens fed different diets (g/chick/day)

Parameters	Treatment				SEM	P-value
	1	2	3	4		
ADG (g/chick/day)	13.47^{b}	13.79^{ab}	11.38^{c}	14.93^{a}	0.47	0.0053

$^{a-c}$Means with the same superscripts are not significantly different; ADG: Average daily gain; SEM: Standard error of the mean; T_1: contained 30g cassava & 30g noug cake, T_2: 10g maize, 10g taro, 10g cassava &30g noug cake, T_3: 30g taro & 30g noug cake and T_4: 30g maize & 30g noug cake.

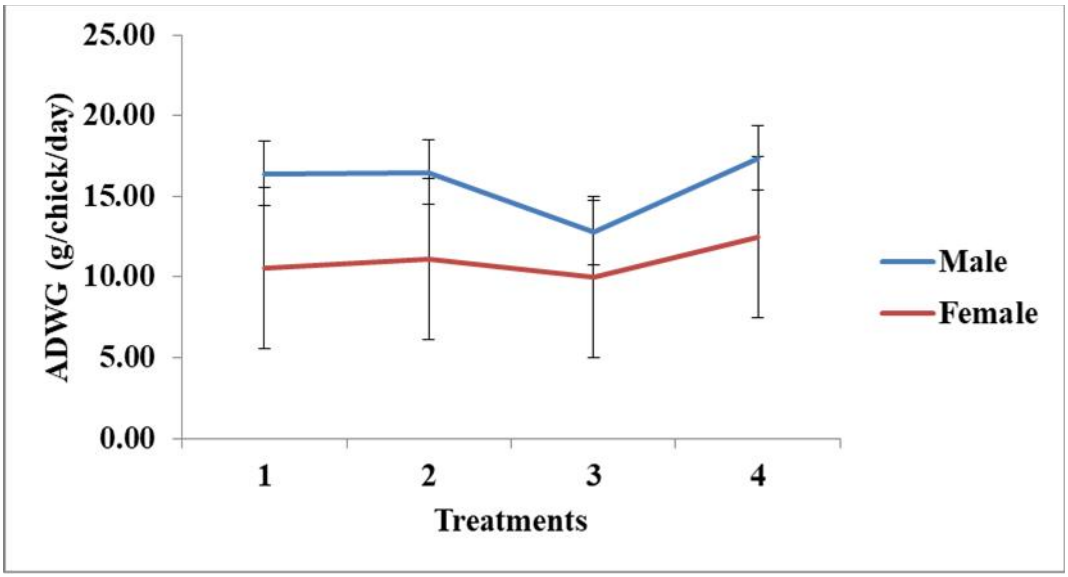

Figure 1. The trend in average body weight gain of the different treatments used in the experiment

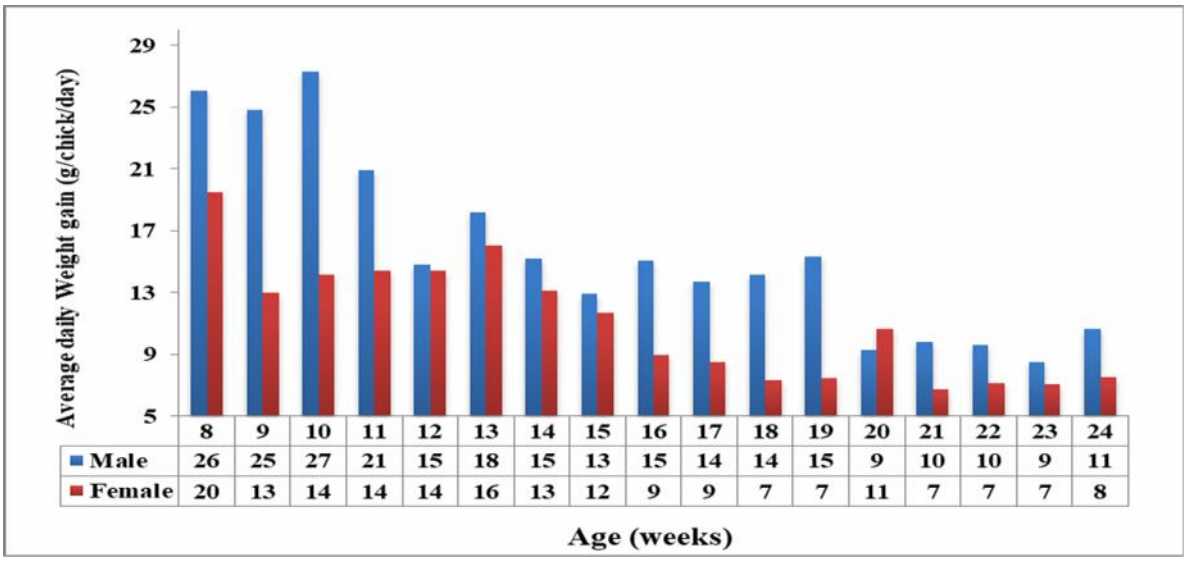

Figure 2. Average daily gain of experimental birds during brooding period

Egg production

Mean egg weight at 5% production for T_1, T_2, T_3 and T_4 was 43.4g 44.2g, 42.8g and 46.8g, respectively that presented in Table 4.Mean egg weight at 50% production for T_1, T_2, T_3 and T_4 was 48.3g, 51.1g, 47.5g and 54.7g, respectively.

Table 4. The Average egg weight of chicken fed on different diet at different production stage

	T_1	T_2	T_3	T_4
Average egg weight at 5%production	43.4g	44.2g	42.8g	46.8g
Average egg weight at 50% production	48.3g	51.1g	47.5g	54.7g

T_1: contained 30g cassava & 30g noug cake, T_2: 10g maize, 10g taro, 10g cassava &30g noug cake, T_3: 30g taro & 30g noug cake and T_4: 30g maize & 30g noug cake.

The feed cost per kg decreased with replacing the maize with unconventional feed like taro (*Colocasia esculenta*) and cassava root meal (*Manihot esculenta*). The highest cost per kg of supplementary feed was obtained with diet in treatment diets of T_4that containing maize and the lowest cost with diet in T_3 containing taro root meal. This is in agreement with the report by Salami and Odunsi (2003) and Anaeto and Adighibe (2011) who indicated that the replacement of maize in the diets of layers with cassava led to reduction of feed cost and efficiency of conversion of feed to eggs, respectively.

Conclusion

The current work indicated that up to 100% of maize replaced with cassava root meal and equal amount of taro, cassava and maize in the diet did not show significant effect in the growth performance and there was no adverse effect on laying performances as well as egg weight. Cassava and mixing of equal amount of cassava, maize and taro could then completely and economically replaced maize in dual purpose *"Potchefstroom Koekoek"* chickenration for supplementation when maize is expensive and scares.

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