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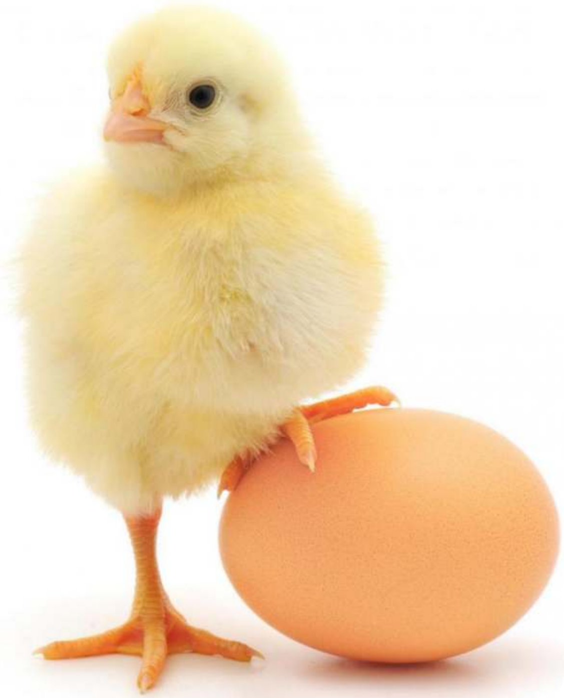

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Growth Performance of Guinea Fowl Keets Fed Graded Levels of Baobab Seed Cake Diets

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Abstract: The effect of feeding graded levels of baobab seed cake on the growth performance of guinea fowl keets was evaluated. The inclusion levels of baobab seed cake in the diets were 0, 5, 10 and 15%. Observations on feed consumption, live weight and mortality were made weekly for each replicate. Feed intake and body weight gain of keets were high in birds fed control and 5 % baobab seed cake diets and they both increased with age ($P < 0.05$). Although, there was no clear trend observed across diets, keets' feed conversion ratio decreased with age from week 1 to 5 ($P < 0.05$). Mortality was highest in week 6 ($P < 0.05$). It was concluded that baobab seed cake can be included in guinea fowl keets diets up to 5% without compromising growth performance. Further research should evaluate the effects of high baobab seed cake inclusion levels in adult guinea fowl diets and other poultry species.

Key words: Baobab seed cake, feed conversion ratio, feed intake, keets, live-weight

Introduction

Poultry industry in developing countries improves the sustainability of rural economies and significantly contributes towards gender equity (Gueye, 2000). In Zimbabwe, poultry provide protein and is a ready source of cash for smallholder farmers (Saina *et al*., 2005; Mapiye *et al*., 2008). Guinea fowl (*Numida meleagris*) production is one of the most important poultry enterprises in low income and poor resourced communities (Saina *et al*., 2005). This is because they have low input requirements, greater capacity to scavenge for food and high meat quality (Hamm *et al*., 1982; Agwunobi and Ekpenyong, 2006). Guinea fowls also have better resistance to common diseases and parasites, short reproduction cycles and limited cultural barriers on consumption (Saina *et al*., 2005; Nahashon *et al*., 2006). Despite the invaluable importance of guinea fowls to the rural livelihoods, their production is severely hampered by poor nutrition especially during the dry season (Saina, 2003).

Most of the poultry feeds available in the scavenging feed resource base are of poor quality and in short supply during the dry season (Farrel, 1997; Saina *et al*., 2005). Shortage of feed resources is worsened by competition with humans and expanding intensive livestock production (Robinson and Singh, 2001). This has resulted in price increases of the conventional poultry feed resources, especially protein sources. Research on low-cost and locally available indigenous feed resources is, therefore, fundamental. One such potential alternative is use of multipurpose baobab (*Adansonia digitata*) tree. The baobab tree is native to the semi-arid areas of Zimbabwe and largely available during the dry season (Swanapoel, 1993). It produces seeds that are rich in protein (20-36 % crude protein), energy (1898-4465 kCal/kg), vitamin C, amino acids (lysine and thiamine), calcium and iron (Booth and Wickens, 1988; Obizoba and Amaechi, 1993; Venter and Venter, 1996; Glew *et al*., 1997; Murray *et al*., 2001; Nkafamiya *et al*., 2007). Baobab seed cake contains anti-nutritional factors such as oxalate, phytate, saponins and tannins, but their levels are generally assumed to be below the established toxic levels for most poultry species (Nkafamiya *et al*., 2007). Despite its high nutritive value, there is little information on the potential of baobab seed cake as a source of protein for poultry species, particularly guinea fowls. The objective of this study was, therefore, to determine growth performance of guinea fowl keets fed graded levels of baobab seed cake.

Materials and Methods

Study area: The experiment was carried out at Henderson Research Station located 30 km north of Harare, Zimbabwe. It lies in Mazowe valley at an altitude of 1 200 m above sea level. Mean annual rainfall at the station is 880 mm and the mean annual temperature range is 20-30^{o}C (Henderson Research Station, 2005).

Table 1: Inclusion levels (%) of ingredients in keet diets

Ingredients	Diet 1 (%)	Diet 2 (%)	Diet 3 (%)	Diet 4 (%)
DL Methionine	0.18	0.18	0.18	0.18
Limestone	1.72	1.70	1.65	1.65
Maize	58.70	54.13	44.64	44.48
Monocalcium phosphate	1.35	1.44	1.54	1.63
Soyabean meal	32.40	31.43	30.48	29.32
Sunflower Cake	5.09	5.00	5.60	5.60
Salt	0.25	0.20	0.25	0.25
Soyabean oil	0.26	0.87	1.61	1.80
Baobab seed cake	0.00	5.00	10.00	15.00
Lysine HCl	0.05	0.05	0.05	0.05

The soils are well drained red clays with a pH of 4.8. The station is renowned for poultry research.

Keets and management: Two hundred and fifty fresh guinea fowl eggs were incubated for 28 days in an automatic incubator at a temperature between 37 and 37.5°C and a relative humidity range of 55 and 60%. After a week, the eggs were removed and candled for fertility detection. About 50 eggs were discarded and 200 were returned in the incubator. A hatchability of 60% was attained. This resulted in 120 keets being used for the experiment.

During the first 3 weeks, keets were brooded in ring boxes of 1 m diameter under a deep litter system. Thereafter, each replicate was allocated its own compartment measuring 1.2 m x 3 m. The grass hay of a depth of 0.1 m was used as bedding. During the first week the brooder temperature was maintained between 30 and 32.5°C and thereafter reduced gradually every week by 2°C until week 6. Heat was provided using infrared lamps. Ventilation within the compartments was maintained by switching off electrical power and adjusting the height of infrared lamps and side-wall plastic covers. The area surrounding the fowl run was fenced and had footbaths containing formalin at each entrance. Keets were vaccinated against infectious bursal disease (Gumboro). Antibiotics and vitamin-mineral supplements were administered during the brooding phase.

Diets: As indicated in Table 1, there were four experimental diets, which had the baobab seed cake; inclusion levels of 0, 5, 10 and 15%. These diets were formulated using the feed mix computer software and were made iso-nitrogenous (25.5% CP). Keets were offered 2 kg of treatment diet from day 1 to day 14 and 3 kg thereafter up to the end of the experiment. Cool clean fresh water was provided ad-libitum throughout the experimental period.

Experimental design: A completely randomized design was used where the diets containing 0, 5, 10 and 15% of baobab seed cake were randomly assigned to four groups of 15 keets each. The treatments were replicated twice and the groups were balanced for sex.

Table 2: The effect of diet and age on keets feed intake

Diet (g/bird/week)	Mean ± Std
Control	122.33[a]
5% baobab seed cake	114.90[a]
10% baobab seed cake	103.89[b]
15% baobab seed cake	106.12[b]
Mean standard error	3.178

[ab]Least square means with different superscripts in a column are significantly different at $P < 0.05$.

Measurements: Keets body weight (BW) and feed consumption were measured weekly from hatch to week 6. Feed intake was determined as the difference between the amount of feed offered and refusals. Feed conversion ratio (FCR) was calculated by dividing feed consumption with BW gain weekly for each replicate Mortality was recorded as it occurred.

Statistical analyses: Feed intake, live weight gain, feed conversion ratio and mortality data was subjected to analysis of variance using General Linear Model (GLM) of SAS (2005). The model fitted the effect of diet and age and their interaction on keets growth performance. Least Square means were used for the separation of means.

Results and Discussion

Keets fed 10 and 15 % baobab seed cake (BSC) based diets had significantly lower feed intake compared to those fed control and 5 % BSC-based diets (Table 2). This can be attributed to high fat content of the baobab seed cake. Baobab seed contain high energy (3000-4500 kCal/kg (Murray *et al.*, 2001; Nkafamiya *et al.*, 2007). Lesson (2000), Veldkamp *et al.* (2005) and Nahashon *et al.* (2006) reported that birds consume feed to primarily meet their energy requirement. Birds on high-energy diets, often due to relatively high fat content, have, on average, lower feed consumption due to the reduced rate of passage of digesta through the gastrointestinal tract (Nahashon *et al.*, 2006). Plavnik *et al.* (1997) and Nahashon *et al.* (2005) have also suggested that as dietary energy increases, birds satisfy their energy needs by decreasing feed intake. Decrease of feed intake with high energy in diets is supported by Veldkamp *et al.* (2005) that feed intake decreases linearly as dietary energy increases.

Generally, weekly feed intake of keets increased with age from week 1 to 6 ($P < 0.05$). The low feed intake of the diets in the early growth stages (week 1 and 2) could be attributed to the under-developed gastro-intestinal tract and adaptation of keets to new feed. Research has shown that the digestibility of nutrients in young poultry increases with age (Sell, 1996; Corless and Sell, 1999). Protein and energy requirement for growth and development increases with age (Pal and Singh, 1997) thus keets increase their feed intake to meet this requirement.

Table 3: The effect of diet and age on body weight gain (g/bird) of keets

	Diet (Mean ± Std)			
Age (Weeks)	Control	5% BSC	10% BSC	15% BSC
1	28.0^{a1}	27.5^{a1}	27.5^{a1}	28.0^{a1}
2	54.5^{a2}	50.0^{a2}	50.0^{a2}	53.5^{a2}
3	83.0^{a3}	75.5^{b3}	69.5^{b3}	75.5^{b3}
4	133.5^{a4}	130.0^{a4}	115.0^{b4}	123.0^{b4}
5	181.0^{a5}	178.0^{a5}	155.0^{b5}	162.0^{b5}
6	237.0^{a6}	244.0^{a6}	222.0^{b6}	216.0^{b6}
Mean standard error	2.415	2.415	2.415	2.415

^{ab}Least square means with different superscripts in a row are significantly different at P < 0.05. ^{123456}Least square means with different superscripts in a column are significantly different at P<0.05.

Table 4: The effect of diet and age on FCR of keets

	Diet (Mean ± Std)			
Age (Weeks)	Control	5% BSC	10% BSC	15% BSC
1	2.81^{a1}	2.87^{a1}	2.85^{a1}	2.61^{a1}
2	2.46^{ab12}	2.65^{a1}	2.91^{a1}	2.77^{a1}
3	2.61^{a1}	2.40^{b2}	2.35^{b2}	2.76^{a1}
4	2.28^{b2}	2.36^{b2}	2.75^{a1}	2.73^{a1}
5	2.39^{b2}	2.45^{ab12}	2.23^{b2}	2.67^{a1}
6	2.78^{a1}	2.52^{ab12}	2.30^{b2}	2.53^{ab12}
Mean standard error	0.137			

^{ab}Least square means with different superscripts in a row are significantly different at P < 0.05. ^{12}Least square means with different superscripts in a column are significantly different at P < 0.05.

There was a significant interaction between diet and age of keets on live weight gain. As shown in Table 3, body weight gain of keets was high in birds fed control and 5 % baobab seed cake diets and increased from week 1 to 6 (P<0.05). This may be attributed to high feed intake values reported for these diets. Feed intake is the major factor that influences both the body weight gain and feed efficiency in meat-type poultry (Nahashon *et al.,* 2006; Nkafamiya *et al.,* 2007).

A significant interaction was observed between diet and age of keets for feed conversion ratio (P<0.05). Although, there was no clear trend observed across diets, FCR tended to decrease with age from week 1 to 5 (Table 4). This may be due to the fact that heavy birds use increasing quantities of feed to maintain their body weight and less is used for growth (Lesson, 2000). Feed conversion ratios of 2.23-2.91:1 (Table 4) recorded in the current study are lower than the recommended values; 3.5-4.5:1 (Lesson, 2000). Nwagu and Alawa (1995) argued that the wildly behaviour of guinea fowls; the characteristic timid, but very active, flighty and noisy temperament contributes to poor feed conversion efficiency through high energy output.

Keets fed 5% BSC had higher mortality (1 ± 0.10) than other diets (0.08 ± 0.10) (P < *0.05*). Mortality was higher (1 ± 0.13) in week 6 compared to other weeks with zero mortality (P < 0.05). Since birds fed 5 % BSC had the high feed intake, the observed mortalities can be attributed to cumulative effect of anti-nutritional factors to toxic levels. Baobab seed cake contains anti-nutritional factors such as oxalate, phytate, saponins and tannins (Nkafamiya *et al.,* 2007). However, the effect of these anti-nutritional factors on growth and meat quality of guinea fowls is scarce and merits investigation. Overall mortality rate throughout the study period was 5 %. In Nigeria, Adeyemo and Oyejola (2004) obtained similar results. Contrary to findings of this study, Nwagu and Alawa (1995) reported about 50 % mortality of keets from day old to eight weeks. Low mortality rate can be ascribed to proper care of the birds through out the experimental period. Embury (2001) pointed out that the survival rate of keets is remarkably improved through proper brooding and feeding.

Conclusion: Feed intake and body weight gain of keets was significantly high in birds fed control and 5% baobab seed cake diets. It can be concluded that baobab seed cake can be included in keets diets up to 5 % without compromising growth performance. Further research should evaluate the effects of high baobab seed cake inclusion levels in adult guinea fowl diets and other poultry species. Assessing the yield and quality of meat and eggs of guinea fowls fed baobab seed cake is crucial.

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