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RESEARCH ARTICLE

Guinea Fowl Keets Performance under Improved and Extensive Conditions in Anthony Patience Farms, Atta - Ikeduru, Imo - State, Nigeria

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ABSTRACT

An experiment carried out in Anthony Patience Farms in Atta – Ikeduru, Imo – State, Nigeria showed that the management of keets (young guinea fowl) at village level had an influence on their performance. Keets confined in a pen, receiving medicaments and commercial feed expressed better growth performance and survivability than keets subjected to extensive management system. The growth performance was almost similar (2.5 gm/d) during the first two weeks. It reached 5.5 gm/d during the third to the fourth week and the seventh to the eighth week for the keets under improved conditions. The growth rate slowed down between the third to fourth weeks and also between the fifth and sixth week for the extensively managed groups and improved groups respectively. The feed conversion ratio increased over the experimental period and ranged from 3.4 to 25.1 gm feed / gm body gain. The mortality was higher in the extensively managed group of keets than in the improved group, after six weeks of keeping. Supplemented keets subjected to improve the profitability in keets rearing under village conditions.

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INTRODUCTION

Guinea fowls are notably kept in Obinze, Imo State, Nigeria in an extensively managed farming system where mature birds scavenge for feed around the farm yard and require little attention from the owners. While adults thrive well in rural conditions, keets rearing is not performed without any difficulties. Although more attention is being given to their keeping, young guinea fowl remain sensitive and susceptible to many diseases as opposed to the adult guinea fowls which appear more robust to the environment. One of the advantages of guinea fowl rearing is the low cost of production, generating substantial incomes for smallholder farmers because the birds roam freely for feed in the farmyard. However, the development of such an activity is impeded by the low survivability of the keets in rural conditions. Many studies have shown a lot of difficulties associated to keets production and these include low fertility of the eggs, poor hatchability and high mortality of the young birds (Savadogo, 1995; Bessin *et al.*, 1998; Hien, 2000). The potential of guinea fowl to increase income, meat production and egg production has not been investigated under free conditions. Many attempts have been made to study performances of guinea fowl in terms of growth rate and egg production in semi-improved systems when subjected to modern poultry practices (Hien, 2000; Carlier 2000; Laurenson, 2002), but the results obtained under such conditions have varied (Dehoux *et al.*, 1995; Hien, 2000). Egg sale becomes during the rainy season, one of the income generating activities used by the farmer to bridge the income and food gap before harvests. Despite the importance of guinea fowl farming, both at farm and country economic levels, guinea fowl breeding is still performed in an extensive way, with traditional equipments and practices.

It is important to compare the performance of guinea fowl in two different production systems (improved and extensive system) in order to increase knowledge in guinea fowl production, fitting to our environmental and

economics realities. The objective of this study was to evaluate the body weight, growth rate, mortality and feed conversion ratio of young guinea fowls reared in two different production systems.

MATERIALS AND METHODS

The experiment was set up in Atta, Ikeduru Local Government Area in Imo State, Nigeria. Atta lies between latitude $5^0\ 36^1 00^{11}$ and $40^0\ 78^1\ 00^{11}$N and longitudes $7^0\ 7^1\ 00^{11}$ and $39^0 55^1\ 00^{11}$E at an elevation of about 90m above sea level, within the South Eastern Agricultural zone of Nigeria. The average annual rainfall, temperature and relative humidity of Atta are 2500mm, 27°C and 75% respectively (Ofomata, 1975). This zone is at the limit of perennial vegetation and it is dominated by shrub steppe. The shrubs and trees are much in size because of the favourable climatic conditions.

Animal material

The experiment was carried out using day old keets obtained by artificial incubation from Anthony and Patience Farms. Eggs laid by the guinea fowl layers in the farm were gathered, stored in a basket and kept in a cool secluded place for three consecutive days. The eggs were weighed and then placed in the incubator to be incubated at the hatchery section of the farm. Candling was done one week after setting the eggs.

Management of the experiment

One hundred and twelve (112) unsexed day old keets were weighed and randomly allocated to two groups of each 56 birds. They were kept in a poultry house measuring 12m x 6m = $72m^2$. The house was divided by an internal wall to give four pens of each 6m x 3m = $18m^2$. Only two pens were used for the experiment. The feeders used were round plastic plates 15 cm in diameter and 2 cm deep. The drinkers were round plastic bottles of 5 litres. The improved group pen was provided with two feeders and one drinker. The improved keets group was vaccinated against Newcastle disease (NCD), dewormed (Table 1) and confined in the pen, provided with warm at night and received a commercial feed (Pfizer) purchased from a feed vendor at Eke Atta market square in Ikeduru Local Government Area of Imo State. The ones kept under extensive conditions were without any special treatment. During the day the extensively managed groups were released to scavenge freely in the nearby shrub and grass range with the foster hen. They returned to their pen in the evening.

Feeding and feed analysis

Commercial feed and water were provided *ad libitum* to the improved group of keets throughout the experimental period. Water was provided to the extensively managed birds in plastic drinkers. The ingredient and chemical compositions of the compound feed used during the experiment are shown in Table 2. The experimental diet was analysed at the laboratory of nutrition at the Department of Animal Science Technology, Federal University of Technology Owerri, and Imo State, Nigeria.

Table 1: Prophylaxis programme applied to the improved keets group during the experiment

Age (d)	Designation	Drugs	Dosage Water
1 – 4 d	Anti-stress	Vita mix	5g/litre
14 d	Deworm	Worm care	5g/litre
21 d	Newcastle Vaccine	Lasota	0.5 ml/keet
42 d	Deworm	Worm care	10g/litre

Table 2: Ingredient composition of the experimental diet

Ingredients	(%)
Maize	57.6
Wheat bran	10
Cotton seed cake	14.92
Fish meal	15
Oyster shell	2
Nacl	0.3
Vitamin compound	0.1
Iron sulphate ($FeSO_4$)	0.08
Total	100
Chemical composition	
Parameters	(%)
Dry matter	92.6
Ash	18.1
Crude protein	19.1
Fat	4.9
Carbohydrate	50.5
Gross energy (kJ/kg)	14 610 (kJ/kg)

Data Recording

The keets were weighed individually every two weeks from day old up to eight weeks of age. Feed was provided *ad libitum* but the daily remnants were collected during two weeks before being weighed to evaluate daily feed intake in the improved group of keets. The growth rate and the feed conversion ratio were also estimated. Dead keets were recorded in order to calculate the mortality during the experiment.

Economic Analyses

Cost and benefit analysis was performed considering the total cost to keep the keets in the improved system where the keets were confined up to 8 weeks of age. All the costs were taken into account in the economic evaluation: Poultry house construction cost, Feeding and medicine cost, Day old keets (DOK) cost, and the Poultry worker salary. The sex ratio was 1:2 and the real mortality was 60%.

The Net Present Value (NPV) was used to evaluate the profitability.

Where,

$$NPV = \Sigma \frac{Bt - Cti}{(1+d)} \quad \text{Where}$$

*B*t is the benefit in year t

*C*t is the costs in year t

d is the rate of discount

The discount rate was estimated to 10%

If the NPV > 0, then the activity is profitable but if NPV <0, the project is not Profitable

Statistical analysis

The egg weight and growth rate gathered during the experiment were managed in Excel. Statistical analyses were performed by means of the MIXED procedure in SAS, version 8.2 (SAS Institute Inc., 2001).

The model used was:
$yij = \mu + \alpha i + \varepsilon ij$ where
yij is the production parameter involved (egg weight, growth rate)
μ is the general mean of the analyzed parameter and
αi is *ith* effect of the egg set rank (egg weight) or the effect of the system (growth rate)
εij = random error

RESULTS

Artificial incubation

The average eggs weight in the two periods of eggs set differed significantly (P<0.05), 38.7 and 42.6 g were obtained respectively in June and July (Table 3).

Average weights of day old keets did not differ significantly (P>0.05) and they were 26.0 and 28.0 g, respectively for the first and second set of incubation. Hatching keets weights were 67% of the egg weight in the two periods.

Egg fertility observed in this study ranged from 77.3 to 78.6% and varied only slightly between periods. The period did not influence the fertility significantly but it was slightly lower in July than in June.

Feeding experiment

The average body weight was 27.9 and 28.0 g for the two groups at the beginning of the experiment and 62.6 and 63.9 g at the second week respectively for the improved and scavenging group (Fig. 1). After another two weeks, a significant difference (P<0.05) in body weight was observed: keets in the improved group weighed 140.1 g and the scavenging keets weighed 56 g less. Mean body weights of the improved group birds at six (6) and eight (8) weeks of age were 159.4 and 235.6 g, respectively. Table 4 shows the daily weight gain of the keets in the two production systems. The growth rate was similar during the two first weeks (2.5 and 2.6 g/d) and increased rapidly in the improved system reaching 5.5 g/d for the two subsequent weeks. The growth rate slowed down in the scavenging system from the second to the fourth week (1.5 g/d).

The daily feed intake increased over the experiment duration and it ranged from 8.2 to 49.6 g / keet / d. The FCR was stable during the first four weeks and attained a highest value of 25.1 between the fifth and sixth week (Table 4).

Mortality

In general, the cumulative mortality was lower in the improved system than under the extensively managed conditions (Table 5). The two first weeks of keets life were characterized by a low mortality of 9% observed for the improved group whereas the extensively managed groups showed a high mortality of 34%. All the scavenging keets died between the fifth and sixth week (100%) while in the improved group only half of the birds remained.

Economic analysis

The results of the economic analysis are shown in the Table 6. The cost-benefit analysis showed that the first year, the net revenue was negative and became positive from the second year. The economic results indicated that such a poultry activity based on the improved system was only profitable from the fifth year because the Net Present Value (NPV) was positive from that year. The NPV was negative from year 0 to the fourth year.

Table 3: Eggs weight, day old keet (DOK) weight and fertility

	Egg weight (g)			DOK weight (g)			Fertility (%)
Set	No	Mean	SE	No	Mean	SE	
June	870	38.7[a]	0.12	75	26.0[a]	1.81	79
July	216	42.6[b]	0.25	112	28.0[a]	1.49	77

Mean values with different superscript in the same column differ significantly (P<0.05)

Table 4: The daily growth rate (g/d) of the keets in the two production systems and the daily feed intake (g DM/d/keet) and feed conversion ratio (FCR, g feed / g gain) of the confined group of keets

Period	Production system Improved (confined)			Extensively Managed
	Growth rate	Feed intake	FCR	Growth rate
W1-2	2.5	8.2	3.4	2.6
W3-4	5.5	22.3	4.3	1.5
W5-6	1.4	33.9	25.1	-
W7-8	5.5	49.6	9.1	-

Table 5: Cumulative mortality (%) of the keets kept in two production systems

System	Period			
	$Week_{1-2}$	$Week_{3-4}$	$Week_{5-6}$	$Week_{7-8}$
Improved	9	27	55	59
Extensively Managed	34	77	100	-

DISCUSSION

Average egg weight for the 2 sets was 35.5 g and it increased from the first to the second set by 10%. The gradual increase in egg weight as well as in keet weight with period was possibly in line with the general climatic conditions and feeding as shown in many studies (Nwagu and Alawa, 1995). In June corresponding to the beginning of the rainy season, the feedstuffs available in nature for the birds was not as diversified as in July when vegetable matters and insects contribute to improve feeding quality (Ayorinde, 1991). The egg weight is also influenced by the age of the hen, and it has been stated by Etches (1996) that at the onset of lay, egg weight is much smaller than in the subsequent weeks. Our findings are close to those indicated by Oke et *al.* (2003), which varied from 33.5 to 34.9g. However, higher average egg weights have been reported by researchers (Ayeni, 1983; Ayorinde, 1991; Adeyemo and Oyejola, 2004).

The fertility obtained during this study is higher than 16.2-61.9% fertility reported by Ayorinde and Ayeni (1986), respectively in the dry/hot season and in rainy season. They attributed the poor fertility occurring in the dry hot season to sexual rest or poor libido while the highest fertility is favoured by active spermatogenesis observed in the rainy season. The higher fertility found in this study could be explained by the production system adopted by the farmers where a higher number of males were kept at the beginning of the breeding season. Many females could be mated during this period before males had been removed from the flock. The protein contents in the diet used in this experiment were 10 to 20% lower

Table 6: The cost-benefit analysis of the effect of improved system on keet keeping in Atta, Ikeduru, Local Government Area, Imo – State, Nigeria (x # 1500 Naira)

Number of Years	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Construction	0	1	2	3	4	5	6	7	8	9	10
- Materials	50	5	5	5	5	5	5	5	5	5	5
- Salaries	20	5	5	5	5	5	5	5	5	5	5
DOK	100	10	10	10	10	10	10	10	10	10	10
Feed and Medicines	50	25	25	25	25	25	25	25	25	25	25
Local worker	30	30	30	30	30	30	30	30	30	30	30
Bird sale	-	22. 4	62. 4	80	80	80	80	80	80	80	80
Egg sale	-	56	100	100	100	100	100	100	100	100	100
Net revenue, Naira	-	250	3.4	87. 4	105	105	105	105	105	105	105
Net revenue, #	-	381	5	133	160	160	160	160	160	160	160
NPV	-	250	246. 9	174. 7	95.8	24.1+41 1	100 4	154 3	203 3	247 8	288 2

than those reported by Blum *et al.* (1975). These authors recommended a protein concentration ranging from 24 to 26% for the starter (0 to 4 weeks of age) and from 19 to 20% for the growers keets (4 to 8 weeks of age), whereas Hughes and Jones (1980) found that the starter diet should contain at least 21% protein and the finisher diet should contain at least 17% protein. The energy content was about 16% higher 8 NPV: Net Present Value than Blum *et al*. (1975) recommend- dations for guinea fowl keets. Ayanwale and Kusu (1998) tried four level of protein (18, 22, 24 and 26%) in guinea fowl feeding and they concluded that feeding guinea fowl at 18% protein is inadequate at growing stage (8-20 weeks). Unexpectedly, these authors concluded that guinea fowls should be fed on diet containing 24% protein at starter stage and 26% protein at grower stage. The protein concentration observed in our experimental diet was low because this diet was formulated for chickens, which were considered to have low protein requirement than guinea fowl. The high ash content seemed to indicate that the experimental diet was intended for chickens especially for layers. At two weeks of age, there was no effect of the production system on the live weight as it was in the fourth week. Unfortunately, it was not possible to compare live body weight due to high losses occurred among the scavenging keets after four weeks of keeping. Anyhow the findings on growth performance in the improved system are close to those obtained in many countries under scavenging conditions. Savadogo (1995) has demonstrated that keets grow faster when they are allowed to scavenge for feed in nature. This author obtained an average live body weight of 233.1 g for birds subjected to scavenging compared to a live body weight of 155.6 g achieved at eight weeks of age with birds kept in modern conditions. During the two first weeks, the absence of significant difference between the two groups in terms of mean weight could be explained by the abundance of feedstuff (grass, insects, worms, maggot) prevailing in the nature which benefited the scavenging group of keets. The protein content of the experimental diet did not seem to fit keet requirement in confined conditions, and the high ash content might influence the growth performance of the improved group of keets. Unfortunately, after two weeks the growth rate of the scavenging birds declined showing a low growth performance. This could be due to a disease outbreak, which has negatively affected the growth performance leading to supremacy of the improved group that suffered less by the disease effect. However, during the disease outbreak, also the growth rate of the improved group keets receiving a medication slowed down to 1.4 g/d between the fifth and sixth week, showing that although they had been treated they did not escape disease stress.

Several studies have shown that FCR increases when the protein content of the diet is not optimal (Agwunobi and Ekpenyong, 1990; Agwunobi and Ekpenyong, 1991; Blum *et al.*, 1975). The protein concentration of the experimental diet was below the protein requirement of guinea fowl as recommended in the literature. The increase of the FCR between the fifth and sixth week, in comparison with the previous and following periods, showed a feed wastage; the birds consumed more feed and grew less during that period than in the others. This was expressed by the low daily growth rate during this period. Thus, the increase of the FCR showed that the growth performance of the keets was interfered with the disease stress. Mortality of keets was higher during the first two weeks of life among the scavenging birds and reached 100% after six weeks. However, at the eighth week the mortality was 59% for the improved group of birds. The higher mortality in the scavenging system in this study was due to a disease outbreak in the village during the experimentation. Another study carried out in Burkina Faso ended up with similar results with high mortality of keets during the first week of their life (Hien, 1999).

The economic analysis was not performed in the extensively managed system due to the losses occurring during the experiment. In the improved system, although the net revenue was positive (3,400 CFA, F) from the second year, the project would only be profitable from the fifth year when the NPV became positive. The results obtained in the growth performance study showed that the feeding costs could be limited and the project might be more profitable if the birds were supplemented. If the mortality was reduced to 40% or less the economic results should be better than with 60% mortality.

Conclusion

Improving the production system by heating and giving improved feed to the keets seemed to have a positive effect on keets survivability as this experiment has indicated. In spite of this improvement, the keets appeared to have the same growth rate than keets kept under scavenging conditions during the first weeks of life. Unfortunately, though the rainy season seems to be favourable to the hatchability and growth rate, this period is unfavorable for keets reared in scavenging conditions

due the high mortality, which might reach 100% as observed during this study. At this time the mature birds thrive well at these conditions where feeds were available. More investigations are needed to determine whether this phenomenon is due to the quality of the feed resources available in the nature or to the management system. The high losses encountered under scavenging conditions recommended a health care in this situation and more work on keets diseases and their epidemiology under improved conditions.

By applying a medication program in the scavenging system such as providing vaccination against NCD, deworming the birds, providing improved feed and heating the keets, the performance of keets could be improved. Though the traditionally practiced management of the keets in scavenging conditions is advantageous from a feeding point of view, such a practice became disadvantageous, exposing the keets to losses due to disease.

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