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GROWTH PERFORMANCE AND SLAUGHTER PARAMETERS OF GUINEA FOWL KEETS (NUMIDA MELEAGRIS) FED DIFFERENT LEVELS OF PROTEIN AND ENERGY

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Abstract: *Purpose*: The purpose of this paper is to investigate the growth performance, carcass and non-carcass components of guinea fowl keets.
Design/methodology/approach: One hundred and fifty day-old guinea fowl (*Numida meleagris*) keets were divided by stratified random sampling into five equal groups. The groups were assigned at random to five rations: A, B, C, D and E, for eight weeks. Five experimental diets were formulated as A (20.5% CP, 2990 kcal ME), B (high protein 26%: high energy 3150 kcal), C (high protein 26 per cent: low energy 2800 kcal), D (low protein 16 per cent: high energy 3150 kcal) and E (low protein 15 per cent: low energy 2750 kcal). Group (A) served as the control ration. Five birds from each group were slaughtered and carcass and non-carcass components at the end of the experiment were assessed.
Finding: The final live weight in groups B (656.82±0.01) and C (735.11 ±0.01) and the weight gain in group B (600.98+0.01) and C (678.98+0.01) were not

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significantly (P>0.05) higher than the other treatment groups. Feed intake in group D (917.47+0.010) was not significantly lower than the other groups. The feed conversation ratios (FCR) of group D (3.035 +0.007) and E (3.06 +0.003) were similar. There was no significant difference (P>0.05) and no variations in dressing-out percentages between the control (72.5±0.9) and the test groups, except for group D (69.8±0.72).
Originality/value: The guinea fowl fed with a diet of 26 per cent cp and 2800ME kcal/kg have a higher dressing-out percentage, higher meat protein content and lower fat content. The level of protein had a role in guinea fowl performance and the study indicates that the optimum protein and energy levels for starting guinea fowl is 26 per cent crude protein and 2800 ME kcal/kg. These findings are in agreement with the results of Nahashon, Adefope, Amenyenu and Wright (2005), who conducted a study to assess dietary CP and ME concentrations for optimum growth performance and carcass characteristics of French guinea broilers. They found that birds on a 25 per cent CP diet consumed about 3-4 per cent more than 23 per cent CP, and 3-6 per cent more than 21 per cent CP.

Keywords: *Guinea fowl; Performance carcass dressing; Carcass cuts.*

INTRODUCTION

The helmeted guinea fowl *Numida meleagris galeata* Pallas is part of the native fauna of West Africa. It is distributed from Senegambia to Cameroon and is also found in parts of western Zaire. It is a terrestrial game bird belonging to the order Galliformes, family Numididae, genus *Numida* and species *meleagris*. All species of the family Numididae are inhabitants of Africa (Prinsloo, 2003). There are several wild species and genera of guinea fowl in west and east Africa, notably *N. meleagris meleagris* in sudan and Ethiopia, but apparently only *N. meleagris galeata* has been domesticated (Blench and MacDonald, 2000). Information on the nutrition of guinea fowl is scanty barring a few systematic studies (Agwunobi and Ekpenyong, 1990; Blum *et al.,* 1975; Hughes and Jones, 1980). Domestic guinea fowl are rarely fed but generally allowed to find their own food. Their diet is a mixture of seeds and other vegetable matter and insects. Ayeni (1983) gives a breakdown of the typical diet of wild guinea fowl in the lake Kainji region of north western Nigeria. Guinea fowl meat was served at banquets and in hotels in the Americas as far back as 1939, and has sometimes been used as stock game in England (Anon, 1976). Guinea fowl are also highly prized as food birds in Africa, which was why they were threatened by hunters as game birds during the dry season and with egg collection during the rainy season (Ayeni, 1978). Guinea fowl have their highest protein requirements between five and ten weeks of age, and protein requirements of females are lower than those of males up to ten weeks of age, after which the situation is reversed (Sales and Du Preez, 1997).

MATERIALS AND METHODS

One hundred and fifty day-old guinea fowl (*N. meleagris galeata*) keets were obtained from a private farm (Sheikh Sultan Bin Zayed Farm, Abu Dhabi) and were used and raised under typical poultry intensive system pens. The Keets were weighed and randomly allotted to five groups A, B, C, D and E, each with 30 birds. Feed and water were provided *ad libitum*. The feeding period was continued up to seven weeks, allowing for an initial ten days adaptation period. The experimental diets were formulated to meet the nutrient requirement of broiler chicks according to the National Research Council (NRC, 1984). Crumbled five diets A, B, C, D and E were formulated as in Table 1. The level of protein and energy were set as high protein high energy, high protein low energy, low protein high energy and low protein low energy for diets B, C, D and E respectively. Diet A served as the control diet. Feed and water were provided *ad libitum*. The daily feed intake and weekly live weight were recorded throughout the experimental period. At the end of the feeding period, five birds were randomly picked from each treatment group, and slaughtered. The live slaughter weight was determined before slaughter. The birds were dressed, the breasts were split and the tissues and organs—heart, lung and trachea, full and empty gizzard and intestines, liver, kidneys and spleen—were weighed individually. The empty body weight (EBW) was obtained by subtracting the alimentary tract fill from the slaughter weight. The warm carcasses were weighed and chilled overnight at 4°C before being subjected to further analysis.

Item	Diets				
Ingredient	A	B	C	D	E
Yellow corn	59.80	39.70	33.46	61.35	58.70
Soybean meal	32.00	46.20	50.34	24.63	21.24
Fishmeal	03.0	03.20	_	_	_
Wheat (grains)	_	_	07.0	05.0	5.00
Wheat bran	_	_	_	_	11.20
Vegetable oil	01.50	06.90	05.1	04.42	_
Mineral	03.60	03.90	04.0	04.50	03.76
Vitamins	0.10	0.10	0.10	0.10	0.10
Total	100	100	100	100	100
Components					
Dry matter	88.0	89.0	89.0	88.0	88.0
Crude protein	20.50	26.0	26.0	16.0	15.0
Crude fat	04.20	09.00	05.80	07.0	02.70
Crude fibre	02.70	02.00	02.90	02.60	03.60
Ash	06.50	07.00	10.50	06.20	05.80
Energy ME (Kcal/kg)	2990	3150	2800	3150	2750

Table 1: Per cent inclusion rate (by weight) of ingredients and chemical composition (on dry matter bases) of experimental diets.

The cold carcass was weighed and prepared for analysis by removal of the skin and neck and weighed individually. The cold carcass was then split along the vertebral column into right and left halves. The left side was cut into wing, drumstick, thigh, breast, tail and rib backs. Each cut was weighed and dissected into muscle, bone and fat tissues.

Statistical analysis: Results were statically verified by the un-paired student t-test to evaluate differences between mean values in performance and treatment groups compared with the control. One-way analysis of variance was applied in carcass and non-carcass meat values (Snedecor and Cochran, 1967).

RESULTS

The performance of guinea fowl keets is presented in Table 2. Initially, all treatment groups started at similar ($p>0.05$) body weights. The final weight value of group C (735.11 +0.01) was higher ($p>0.05$) than the other groups, while the final weight value of group D was lower than the other groups. Weight gain values of groups B (600.98+0.01) and C (678.98+0.01) were not significantly ($p>0.05$) higher than other treatment groups D (302.09+0.026) and C (383.08+0.01). Feed intake in group D was lower ($p>0.05$) than the other groups. The feed conversation rate of groups D and E were similar ($P>0.05$).

Items	Mean ± standard deviation				
	A	B	C	D	E
Initial weight(g)	55.5 ±0.01	55.83 NS ±0.01	56.12 NS ±0.01	55.43 NS ±0.01	**55.24 NS ±0.01**
Final weight(g)	688.36 ±0.01	656.82 NS ±0.01	735.11 NS ±0.01	357.53 NS ±0.01	**438.32 NS ±0.01**
Weight gain(g)	632.86 ±0.03	600.98 NS ±0.01	678.98 NS ±0.01	302.09 NS ±0.026	**383.08 NS ±0.01**
Feed intake(g)	1586.78 ±0.01	1614.67 NS ±0.021	1733.32 NS ±0.005	917.47 NS ±0.01	**1173.38 NS ±0.005**
Feed conversion rate	**2.51 ±0.01**	**2.68 NS ±0.0051**	**2.55 NS +0.02**	**3.035 NS ±0.007**	**3.06 NS ±0.003**

A: Control ration, B: High protein high energy ration
C: High protein low energy ration, D: Low protein high energy ration
E: Low protein low energy ration
NS = Non-significant mean difference (P>0.05)

Table 2: Average (mean ± SD) performance values (g) of guinea fowl chicks fed experimental rations for 8 wks

Table 3 shows average weight of body components expressed as a percentage of empty body weight. All the body components of the test groups were not-significantly (P>0.05) different except the head, liver and gizzard. The head and gizzard weight of group D and E were significantly higher than the control weights, while the liver and intestine weight of the same groups were not significantly higher.

Table 3: Analysis of variance and average (mean ± s.d) weight of body components expressed as percentage of empty body weight

Item	F-value#	A	B	C	D	E
Head	16.72	3.78±0.3	3.56±0.36 NS	3.52±0.08 NS	4.74±0.2*	4.48±0.4*
Skin	1.92	5.28±0.5	5.5±0.87 NS	4.68±0.88 NS	6.26±1.3NS	5.3±0.87 NS
Neck	1.24	3.52±0.3	3.4±0.34 NS	3.28±0.25 NS	3.42±0.5NS	3.1±0.16 NS
Shank	1.55	3.32±0.1	3.3±0.49 NS	3.22±0.22 NS	3.58±0.3NS	3.54±0.11 NS
Heart	2.76	0.56±0.1	0.54±0.17 NS	0.64±0.06 NS	0.76±0.2 NS	0.72±0.16 NS
Liver	8.44	2.2±0.31	1.7±0.19*	1.82±0.13 NS	2.44±0.5 NS	2.46±0.11 NS
Gizzard	16.03	2.26±0.2	2.28±0.28 NS	2.42±0.24 NS	3.28±0.2*	3.42±0.53*
Intestine	4.02	3.2±0.38	2.64±0.23 NS	3.26±0.43 NS	3.8±0.5 NS	3.56±0.76 NS

# with (4,20) degrees of freedom
NS = Non-significant difference means (P>0.05)

The carcass yield of helmeted guinea fowl on the diets containing different levels of protein and energy are shown in Tables 4 and 5. The carcass cuts (wing, thigh, drum stick, breast, rib back, tail, back) and cold and hot carcass values of all treatment groups were not significantly different (P>0.05).

Items	F-value, #	A	B	C	D	E
Wing	1.33	16.32± 1.5	16.8± 1.6 NS	15.44± 0.89 NS	16.54± 0.8 NS	17.16± 0.35 NS
Thigh	0.18	14.96± 1.8	15.22± 1.5 NS	15.76± 1.17 NS	15.32± 1.9NS	15.22± 1.12 NS
Drum stick	1.65	12.42± 0.8	11.74± 0.7 NS	12.2± 0.4 NS	12.32± 0.9 NS	12.84± 0.59 NS
Breast	0.59	33.26± 3.6	30.18± 1.2 NS	31.88± 3.7NS	31.88± 4.44 NS	32.36± 2.16 NS
Rib-back	1.21	8.64± 1.6	8.64± 1.7 NS	9.64± 3.15 NS	7.2± 0.73 NS	7.9± 1.14 NS
Tail-back	2.33	12.34± 0.9	16.08± 2.3 NS	13.94± 2.6 NS	12.82± 2.47 NS	14.86± 2.37NS

# with (4,20) degrees of freedom
Ns = Non-significant difference means (P>0.05)

Table 4: Average weights of carcass cuts expressed as percentages of total left side weight

Items	F-value#	A	B	C	D	E
Hot dressing carcass %	1.14	72.5± 0.9	70.64± 5.5 NS	72.18± 0.57 NS	69.8± 0.72 NS	70.06± 1.12 NS
Cold dressing carcass %	2.37	71.66± 0.9	69.72± 5.8 NS	71.54± 0.72 NS	68.08± 0.46 NS	67.72± 0.96 NS

# with (4,20) degrees of freedom
Ns = Non-significant difference means (P>0.05)

Table 5: Average values of hot and cold dressing percentage of treated group

Table 6 shows average weights of total muscle, bone tissue weight and percentages from total selected cuts. The total selected cuts values of group B (110±11.3) and C (122.8±9.65) were not significantly different, while the values of selected cuts of group D (68±7.87) and E (87±15.8) were significantly lower than the control value. The value of total muscle of selected cuts (96±5.92) for group C was not significantly (P>0.05) higher than the control value (94±6.52), while the value of total bone of selected cuts for the control (24.4±3.05) and group C (24±2.55) were not significantly (P>0.05) similar. Changes in absolute values as well as per cent values show a similar trend, i.e., decreasing successively with tests group B, D, and E with a rise in the values of group C when compared to the control values. The proportion of carcass muscle to bone ratio of group B was higher (P>0.05) than the control group.

Table 6: Average weights of total muscle, bone tissue and their percentages of total selected cuts

Items	F-value#	A	B	C	D	E
Total selected cuts	23.8	121.2± 7.5	110± 11.31 NS	122.8± 9.65 NS	68.0± 7.87**	**87.0± 15.8****
Total muscle of selected cuts	21.83	94.0± 6.52	86.6± 11.84 NS	96.0± 5.92 NS	50.4± 7.57**	**67.4± 12.7****
Total bone of selected cuts	7.29	24.4± 3.05	20.63± 3.65 NS	24.0± 2.55 NS	16.2± 3.19**	**17.6± 2.7****
Total muscle % of total selected cuts	2.06	77.56± 2.3	78.58± 4.06 NS	78.27± 1.86 NS	73.93± 3.93 NS	**77.38± 1.09 NS**
Total bone % of total selected cuts	2.207	19.29± 1.7	20.6± 3.65 NS	19.53± 1.29 NS	23.81± 4.03 NS	**19.68± 2.31 NS**
Muscle / bone ratio	**2.95**	**3.89± 0.48**	**4.55± 1.12 NS**	**4.03± 0.33 NS**	**3.18± 0.56 NS**	**3.82± 0.36 NS**

with (4,20) degrees of freedom
* * Denotes F-value significant at (P<0.01)
NS Denotes non-significance

Table (7) and Table (8) explained the average weights of muscle and bone tissue in selected carcass cuts expressed as percentages of total muscle and bone weight in selected carcass cuts. Both show non-significant (P>0.05) differences in all tests when compared to the control.

Items	F-value#	A	B	C	D	E
Breast	0.4356	56.56± 5.13	55.08± 2.71 NS	55.98± 2.83 NS	57.6± 3.18 NS	55.23± 3.1 NS
Thigh	0.4035	25.28± 3.45	26.12± 2.27 NS	26.67± 2.80 NS	24.8± 1.68 NS	25.5± 2.34 NS
Drum stick	1.391	18.16± 1.85	18.8± 1.26 NS	17.35± 0.86 NS	17.6± 1.53 NS	19.26± 1.86 NS

# with (4,20) degrees of freedom
Ns = Non-significant difference means (P>0.05)

Table 7: Average weights of muscle tissue in selected carcass cuts expressed as percentages of total muscle weight in selected carcass cuts

Items	F-value #	A	B	C	D	E
Breast	0.23	47.56± 8.73	43.56± 7.06 NS	44.76± 4.24 NS	44.92± 10.43 NS	46.84± 5.71 NS
Thigh	0.46	23.16± 4.05	25.38± 4.06 NS	24.24± 4.06 NS	25.63± 3.77 NS	23.98± 2.67 NS
Drum stick	0.12	30.28± 7.33	31.07± 3.97 NS	30.99 3.88 NS	29.45± 6.83 NS	29.18± 4.60 NS

# with (4,20) degrees of freedom
Ns = Non-significant difference means (P>0.05)

Table 8: Average weights of bone tissue in selected carcass cuts expressed as percentages of total bone weight in selected carcass cuts

DISCUSSION

It was clear from the use of a high concentrate diet with different levels of protein and energy affecting guinea fowl growth rates that a good efficiency gain was observed when feeding guinea fowl with a concentrate ration with 26 per cent CP and 2800kcal/kg ME. These findings are in agreement with the results of Nahashon, et al. (2005) who found a higher feed intake for birds on higher CP diets, and birds of diet on 3,100 and 3,150 kcal ME/kg at 0 to 4 week of age exhibited greater body weight gain, lower feed consumption and feed conversion ratios (FCR). These results indicate that the optimum protein and energy levels for starting guinea fowl is 26 per cent crude protein and 2800kcal/kg ME diet. The growth rate was more rapid in intensively reared than free ranging stock and the daily weight gain increased in intensive management (Saina, 2005). The findings of dressing-out percentage ranging from 72.5±0.9, 70.64±5.51, 72.18±0.57, 69.8±0.72 and 70.06±1.12 are comparable to those reported for poultry, but lower than that recorded by Agwunobi and Ekpenyong (2006) (76 and 74 % for guinea fowl and broiler respectively). Warriss (2000) reported a dressing-out percentage of 50, 53, 72 and 75 per cent for sheep, cattle, broiler chicken and pigs respectively. Saina (2005) reported a dressing-out percentage of 75.4 and 71.6 per cent for guinea fowl raised in the intensive and semi-intensive management systems respectively. The variation in dressing-out percentage from these different studies may be associated with the birds' strains, diets and birds' management system.

BIOGRAPHY

Zohair Magzoub Mohamed Elhag received his Bacalore from the Faculty of Veterinary Science, Khartoum University, Sudan (1989). He worked as a Veterinary Officer in Butana

Dairy Farm, Khartoum Dairy Production CO. LMD (1990-1993), then joined Gabis Veterinary Services (1993-1997). He joined the Agricultural Department, Veterinary Section, Al Ain-United Arab Emirates in 1999 and was assigned to H. H. SH. Sultan bin Zayed Private Department as wildlife supervisor until 2007. He has held his current position in Abu Dhabi, United Arab Emirates, as a wildlife consultant on Dorsch Gruppe since 2007. He attained his MSc (Wildlife Science) from the Department of Fisheries and Wildlife Biology, College of Animal Production Science and Technology, Sudan University of Science and Technology. He is a member of Sudan Veterinary Council and the Wildlife Disease Association (WDA).

Dr. Aisha Elfaki Mohamed received her Bacalore from Zagazig University, Egypt (1984) in veterinary surgery. She worked as a Veterinary Officer until 1988, when she joined Wad Elmagboul Poultry Project, Ministry of Agriculture and Animal Resources, Khartoum, as Production Manager. Meanwhile she attained her MSc in Animal Production at the Faculty of Animal Production, Khartoum University, Sudan, and her PhD in Ratite Medicine at the Faculty of Veterinary Science, University of Khartoum, Sudan. She joined the Wildlife Research Center as assistant researcher in 1998, became a researcher in 1999, assistant professor from 2001-2006 and has been an associate professor since 2006. She was appointed Head of the Department of Wildlife Diseases, Breeding and Production at the Wildlife Research Center, Sudan 2003-2009. Her current position is Associate Professor, Director of Wildlife Research Centre, Animal Resources Research Corporation, Federal Ministry of Animal Resources, Fisheries and Range. Her research has covered wild animal health and production, wild bird diversity and red-necked ostrich Struthio camelus camelus nutrition, diseases, behaviour, meat yield and quality, captive ostrich diseases and affection, and genetic diversity in the Sudanese ostrich. She has authored numerous publications including work on promoting poultry nutrition, wildlife diseases, and ostrich breeding and management. She is a member of the Sudan Veterinary Union, 1987, Sudan Veterinary Council, 2000, Sudan Wildlife Society, 2001, Third World Organization for Women of Science (TWOWS), 2003, World Poultry Science Association (WPSA), 2005, Ratite Working Group, 2005, Secretariat General of Consultancy Board, Ministry of the Cabinet, Sudan, 2008, and the Research Coordination Council Livestock Research, Sudan Academy of Science.

Prof. Ali Saad Mohamed graduated from the University of Khartoum in 1971 as a veterinary surgeon. He was promoted to District Veterinary Officer in 1973 and worked as a Zoo Veterinary Officer from 1973-1975. In 1975 he was admitted to the college of Forestry and Natural Resources, Colorado State, USA, where he was awarded his MSc in 1977. He joined Sudan Agricultural Corporation and was promoted to associate research scientist in 1991. He attained his PhD (1994) from the Gezira University, Sudan. In 1997 he joined Sudan University of Science and Technology, where he was promoted to professor status in 2000. He has published about twenty-five papers in the field of wildlife and supervised four PhD candidates and ten MSc candidates. He is a member of the Sudan Veterinary Association, Sudan Environmental Society and Sudanese Wildlife Society.

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