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GROWTH AND DEVELOPMENT OF MUSCLES, BONES AND FAT OF GUINEA FOWL *(NUMIDA MELIAGRIS GALEATA)*

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ORIGINAL ARTICLE

ABSTRACT: *This study was conducted to evaluate the growth pattern of muscles, bones and fat of guinea fowl. Eighteen day old chicks were reared for 22 weeks and serial slaughters were done every four weeks for evaluation. Results showed that the feed conversion ratio was 1:5, highest feed intake at 13-14 weeks of age and highest weight gain at 8-10 weeks. Carcass yield was 69%. The great mass of muscle was found in the thorax, highest bone percentage was found in the pelvis and the flank had high percentage of fat. Thorax and hind limb had high growth rate when compared with pelvis, wing, neck and flank.*

Key words: *carcass yield, body regions, serial slaughter*

INTRODUCTION

Growth is often measured as live weight gain per unit time, (Berg and Butterfield, 1976). Live weight could be a useful measure of growth as it is highly predictive of the amount of desirable edible products such as muscles. Carcass weight is more useful than live weight and the components of the carcass when measured, give a true picture of the benefit from the animal. Carcass composition is measured by the proportion of components, muscles, bones, fat and connective tissues.

Factors that affect carcass composition are slaughter weight; breed or genetic differences, sex and plane of nutrition, Nheta et al. (1997) said that sex has no effect on the growth rate of birds. The carcass is the most important unit in meat studies, since it finally settles the value of the meat animal, both for the farmer and the butcher, (Callow, 1948). The muscle is the most important tissue in the animal; because it is most desired by the consumers and superior carcasses have a maximum yield of muscle, minimum of bone and an optimum amount of fat (Berg and Butterfield, 1976). Hammond (1932) stated that during their lives animals have two sets of muscles; early developing and late developing ones. So there must be causes for the changes in the proportion of individual muscles as animals grow. The growth of muscles can be measured by comparison of weights of the individual muscles on serial animal slaughters, and dissected throughout the lifespan of homogenous animals (weight, breed and sex) raised on a similar plane of nutrition. This method compares the percentage values of weight of individual muscles or muscle groups relative to total muscle weight at various stages of development (Berg and Butterfield, 1976). The growth patterns of the tissues show that the bones growing at a steady, but slow rate, the muscle grow relatively fast, so that the ratio of muscle to bone increases. In poultry the first ossification takes place 12 – 24 hours later in the form of laminae of bone which eventually fuse to form a thin, compact cylinder which is the periosteal bone collar (Hall, 1987). Long bone growth is a complex process which takes place in the growth plates located at the end of these bones; it consists of cartilage cells which form a template over which bone is laid. Fat is the most variable tissue in the carcass and it varies even in its partitioning among various depots and alters markedly throughout growth; therefore it has the greatest influence on both the amount of each of the other tissues in the carcass at any particular weight and the proportionate size of cuts. Fat comprises a relatively small amount of the carcass at birth and then increases so that it approaches and occasionally in very fat animals surpasses muscle tissues in absolute amount, (Berg and Butterfield, 1976).

The production of guinea fowl commercially has gained momentum in many countries, for poultry wild meat is a profitable enterprise in various parts of the world. Some surveys indicated that interest in guinea fowls meat in the United States of America appears to be increasing (Hughes, 1980). In order to be successful, efficient ways of production must be sought. To produce guinea fowls as meat bird, we have to know and understand their growth

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characteristics and patterns to allow the design of optimum management practice. The wild guinea fowls of West Africa is regarded as the original of the domestic stock. There are two common varieties, the Pearl and the White. The birds rarely weigh over three and half bounds although appearing larger. The carcass of Guineas produces a relatively large amount of meat. There is good demand for guinea fowls in the large markets (Platt, 1997). Guinea fowl as a meat bird has proven to be a viable and profitable enterprise, thus providing opportunity for commercialization in many parts of the globe. A survey run by Nahashon et al. (2004) indicated that the interest in guinea fowls as an alternative to poultry and especially broilers in the United States, appears to be increasing

MATERIALS AND METHODS

Twenty three day-old Guinea fowl (*Numida meliagris galeata*) chicks were obtained by fertilized egg collection and incubation in a small capacity (100 eggs) incubator. Hatched chicks (23-25 days) were brooded for one week. Chick mortalities were five percent. Eighteen chicks were chosen for the experiment on basis of health, activity and homogeneity in weights. The birds were lodged in a pen of dimensions 1.5X2.0X2.0 m. divided equally to three compartments. The birds were divided to three groups each of six birds to ease management. The pen sides were guarded by a mesh-wire of fine openings set over a half-meter brick wall up to the roof which was made of corrugated zinc sheets. The ground was concrete with sand bedding. The pen was equipped with chick and then poultry feeders and waterers. The birds were phase-fed. For two weeks as an adaptation period with starter broiler ration (crude protein 20% and metabolizable energy 11.65 Mj/kg), phase after the grower ration (crude protein 17.11%, metabolizable energy 8.58Mj/ kg), was fed for 16 weeks of age. A finisher ration (crude protein 16%, metabolizable energy 6.01 Mj /kg) was fed for four weeks till the experimental feeding was concluded. Feed offer frequency and intake records followed that of the first experiment.

Weekly body weights were recorded to the nearest 0.5 g at 7:00 am before feeding, using a small pressure balance. One bird from each of the three groups was selected for slaughter every four weeks for further carcass analysis and muscle groups study. The bird was controlled by tying its legs. The slaughter procedure followed the Muslim practice using a sharp knife to cut the right and left jugular veins and carotid arteries. The blood was collected and weighed after the bleeding was complete. After immersion in tepid water, the feathers were plucked and the skin was removed. The head was removed at its articulation. The abdomen was eviscerated and thorax was opened, (Griffiths and Purcell, 2008). Carcass data was taken. The hot carcass was divided into right and left halves and the left side was divided into six regions (hind limb, pelvis, flank, thorax, neck and wing) and their muscles were separated.

RESULTS AND DISCUSSION

Average performance values of the guinea fowls are shown in Table (1) Final weight was (1.256±0.11 kg) and the feed conversion ratio was approximately 1:4.8.

Nahashon et al. (2006) describe the growth patterns of the French Guinea fowl and reported the maximum growth rate 0.22 kg at the 9th week of age, and the weight of the body at this level was found to be 2.05 kg. In this study, the average weight gain per week was 0.115 at the 10th week of age, and later the rate of weight gain declined gradually. Adeyemo and Oyejola (2004) found that the weight gain in guinea fowls reared for about 30 weeks was 0.834 (0.28 kg per week). This result was similar to that of this study. The different result obtained by Nahason et al. (2006) in this respect may be due to the different breed of guinea fowls.

Feed conversion ratio of guineafowl was 1:4.8, and this result was quite low when compared with that obtained by Adeyemo and Oyejola (2004) which was a range between 2.56 to 2.86. This may be due to the level and quality of protein content of the ration in the study.

Table 1 - Average performance values of Guinea fowls raised to 22 weeks of age

Item	Value
Initial weight (kg)	0.280±0.001
Final weight (kg)	1.256±0.110
Daily weight gain (kg)	0.009±0.005
Daily feed intake (kg)	0.043±0.010
Feed conversion ratio	1: 4.80

Figure 1 shows average values of feed intake and weight gain (kg) of Guinea fowls raised to 22 weeks of age. The highest feed intake was at weeks 13 and 14 (average of 0.37 kg). The highest gain in weight was achieved from the eighth to the tenth week of age (average of 0.115 kg) and the lowest gains were during the first and the 22nd weeks of age which were 0.014 and 0.011 respectively. The feed intake of the guinea fowls (*Numeda m. galeata*) gradually reached the peak (0.371 kg) at 13 to 14 weeks of age before it dropped gradually. The lowest feed intake was in the first week of age which was 0.112 kg. Nahashon et al. (2005) found that the average feed intake of French guinea fowls was 0.142 kg during the first week of age, and then it increased gradually until it

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reached 0.518 kg at the 8th week of age. The difference between the results may be due to the energy protein ratio in the ration.

The slaughter weights of the six slaughters (of three birds each) are shown in Figure (2) The slaughter weights of the six slaughters were 0.068±0.003, 0.401±0.009, 0.853±0.015, 1.138±0.020, 1.324±0.116 and 1.256±0.11 kg.

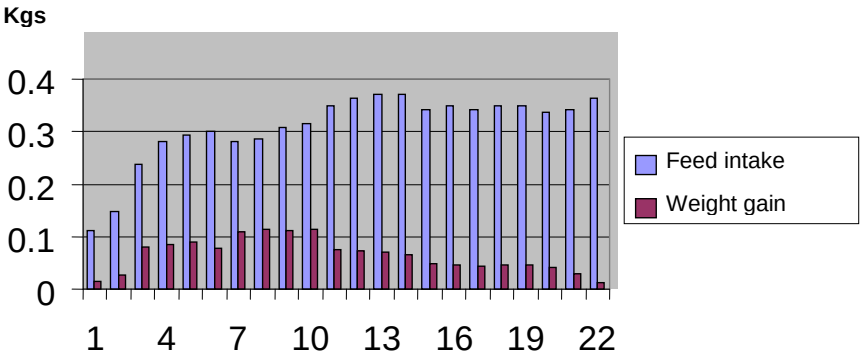

Figure 1 - Average values of feed intake and weight gain (kg) of guinea fowls raised to 22 weeks of age

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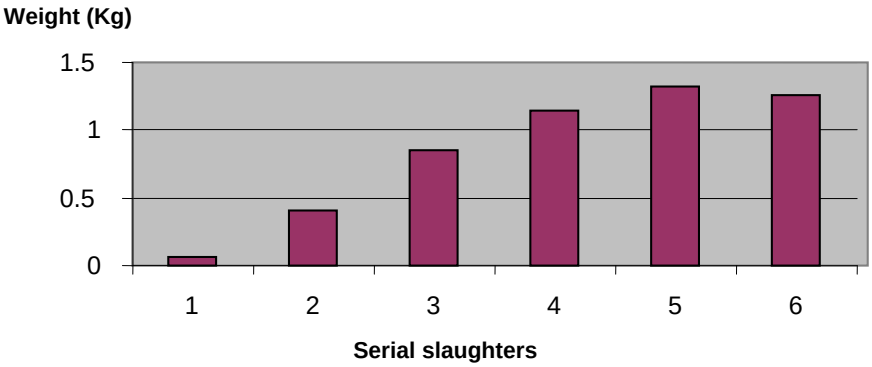

Figure 2 - Slaughter weights (kg) of the six slaughters of the Guinea fowl

The hot carcass weights (kg) of the six serial slaughters of the guinea fowls are shown in Figure 3. Hot carcass weights were 0.027±0.002, 0.256±0.005, 0.535±0.016, 0.772±0.026, and 0.834±0.053 and 0.667±0.222 kg. Roberson et al. (2003) found the carcass yields (dressing percentage) of Guinea fowl to average 76.6% at the 16th week of age and 75.9% at 18th week of age. This study showed that the carcass yield of Guinea fowl was 69% at 22nd week of age and 63% at 18th week of age. The differences follow those occurring in the weight gains.

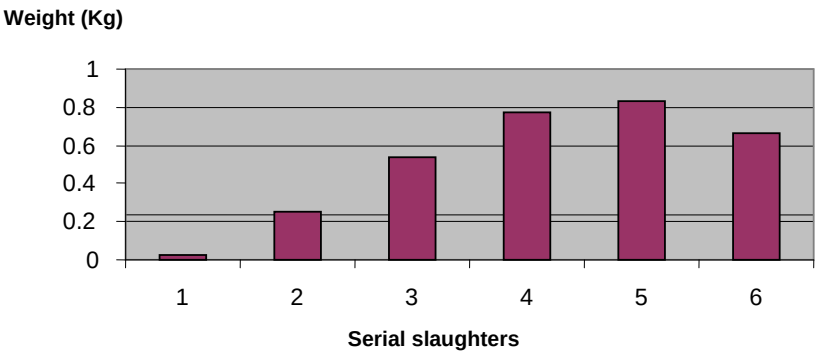

Figure 3 - Hot carcass weights (kg) of the six serial slaughters of the Guinea fowls

Table 2 shows body regions absolute weights (kg) and their percentages from the left side weight and body region tissues percent of the left side region weight at terminal slaughter. The thorax comprised the highest percentage from the left side of the carcass (42%) followed by the hind limb (32%) and the flank had the lowest percentage (1%). The thorax and the hind limb had a great mass of muscle (83 and 80% respectively). The highest bone percentage was obtained from the pelvis (51%). No bones were dissected in the flank, but high percentage of fat.

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Table 2- Body regions absolute weights (kg) and their percentages from the left side weight and body region tissues percent of the left side region weight at terminal slaughter

Region	Weight	Percentage	Muscle %	Bone %	Connective tissues %	Fat %
Pelvis	0.026±0.001	6	42	51	5	0
Thorax	0.167±0.003	42	83	14	1	1
Flank	0.006±0.001	1	59	0	37	4
Hind limb	0.128±0.002	32	80	15	2	3
Wing	0.040±0.002	10	52	41	5	3
Neck	0.034±0.002	8	50	45	3	0

Figure 4 shows the average values (kg) of different body region weights of Guinea fowls raised to 22 weeks of age. Regions thorax and hind limb have higher growth rates when compared to other regions. This may be due to the high musculature in these two regions.

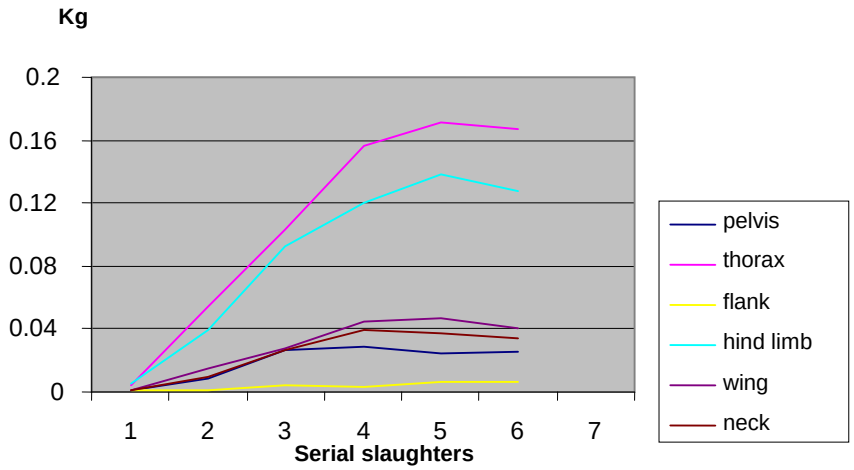

Figure 4 - Average values (kg) of different body region weights of guinea fowls raised to 22 weeks of age.

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