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Hatching and growth performances of guinea fowl under intensive management system

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Abstract

Present study was carried out to evaluate the hatching and growth performances of guinea fowls (*Numida meleagris*) kept under intensive rearing system at the Bangladesh Agricultural University Poultry Farm, Mymensingh. To develop a base population of guinea fowls at BAU Poultry Farm, a good number of hatching eggs were collected from different regions of the country. In first phase, the physical features of hatching eggs, their incubation period, care and handling of eggs during incubation, their fertility and hatchability were investigated. Eggs were hatched in a home incubator incubator at BAU Poultry Farm. In second phase, brooding management of the keets, growth performances, prevention and control of diseases and mortality of the birds were observed. All the activities were performed at the Laboratory of Poultry Science and the Poultry Farm of Bangladesh Agricultural University. Brooding of keets was performed under full intensive system in a littered floor. Broiler starter feed was supplied during the brooding period. Results showed that the shape of egg was top like and both white and spotted cream color shell was found. The average egg weight was 38g per egg and shell thickness was 0.52 mm. The incubation period was 28 days. Fertility and hatchability on set eggs were 80 and 68%, respectively. Dead in shell and dead in germ were 15 and 4%, respectively. The average day-old keet weight was 25.8 g. Average feed intake per bird per day during 0-4, 5-8 and 9-11 weeks of age were 10.22, 30.91 and 52.6 g with the feed conversion ratios were 3.25, 3.05 and 2.88, respectively. The keet's mortality up to 11 weeks was 10%. Economic feasibility should be taken into consideration with the observation of egg production and other associated parameters keeping guinea under complete free-range rearing system.

Key words: Growth, feed conversion ratio, mortality, hatchability, fertility

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Introduction

Deficiency of poultry meat and eggs are huge, as reported 78.91% and 65.38 % per person per year respectively (FAO/APHCA, 2008; Saleque, 2010; Das *et al*., 2014). Poultry production both at commercial farming as well as indigenous rural poultry keeping in Bangladesh is therefore the effective and efficient ways to bridge the gap in a faster rate than the production of any other animal protein sources. This indicates the urgency of rapid expansion of poultry enterprises both at commercial level as well as rural or in semi-urban areas of Bangladesh.

It is evident that indigenous chicken produce about 75% of the eggs and 78% of poultry meat consumed domestically (Bhuiyan, 2005). Since 3-4 decade of journey, the poultry industry in private sector has got a good industrial shape having an investment of Tk. 15,000/- crores with the annual turnover of Tk. 20,000/- to Tk. 25,000/- and employed almost six millions people directly or indirectly (Chowdhury,

2013). In the scale of production competition among various poultry species available in Bangladesh, the commercial chicken production has received attention duly by the investors, researcher and producers however the other species of poultry such as duck, quail, geese, pigeon, guinea fowl etc. were ignored and as the consequences their population is not increased as per expectation. Moreover populations of few species have been decreased noticeably. Indigenous chicken, duck, pigeon or geese are the most important provider of cheaper animal protein to the rural poor and the birds are being kept by rural households for many centuries and seems to be maintained decades after decades. Some of the species such as guinea fowl, quail, some breeds of pigeon, turkey etc. are not our native but had been incorporated into the local stocks for many years before and therefore the species, as like as our native birds, are well adapted to poor nutrition, harsh environment and managemental condition in rural areas of Bangladesh (Hussain *et al*., 1998; DLS, 1990; Khan, 1983). Thus, the significance of rearing specialized poultry species such as guinea fowl, geese, turkey, pigeon etc. which have been incorporated to our native stocks should be considered with utmost concern as these birds are still being the suppliers of good quality but cheaper sources of animal protein to the rural family. In such a situation, it may be pertinent to focus on the rearing of alternative *gallinaceous* species. Thus, one of the best choices may be guinea fowl, as because of this species can thrive well under harsh nutritional and environmental conditions and also a good converter of scavengeable feedstuffs to high quality meat and eggs.

The term "guinea fowl" is the common name of the seven species of gallinaceous birds of the family *Numididae*, which is native to Africa. The strains are descended from the helmeted guinea fowl, (*Numida meleagris)*. The potential for guinea fowl production in the world as alternative poultry is a promising enterprise (Nahashon *et al.,* 2006). Guinea fowl has a high socio-economic importance in the rural society where it is mainly kept to supply meat and eggs for the income generation to rural poor farmers (Schwanz, 1987; Bonkoungou, 2005).

In many parts of the world, guinea fowls are raised mainly for their gamey flesh and eggs. The young guinea meat is tender and of especially fine flavor, resembling that of wild game bird. The meat is relatively lean and rich in essential fatty acids compared to chicken or duck meats. Many people also raise them for their unique ornamental values. Of the three domestic varieties of guinea fowl (i.e. pearl, white and lavender), purplish colored pearl is the most common and spread all across the globe. Fani *et al.,* (2004) reported that hatchability and fertility of guinea fowl is 75-80% and incubation period of guinea fowl egg is varying within 26-28 days. The average weight of a keet at one-day-old is 24.62 g (Fani *et al*., 2004; Moreki, 2009).

In comparison with its scavenging chicken counterpart, the guinea fowl's advantages are: low production cost, premium quality meat, greater capacity to scavenge for insects and grains, better ability to protect itself against predators and better resistance to common poultry parasites and diseases (Microlivestock, 1991). Feed intake of guinea fowl is between 25-30g, 50-60g and 70-80g per bird per day, between the ages of 0-6, 6-12 and 12-16 weeks of rearing (Ayeni, 1981). Good foraging ability, hardiness and minimal production input requirements of guinea fowl are usually lead reasonable profit to the farmers. Moreover, guinea fowl has a unique ability to free range and is tolerant to most common diseases of chicken (Bonds, 1997; Dieng *et al.,* 1999; Mandal *et al*., 1999). This indicates that there is potential for smallholder farmers to improve guinea fowl production in order to increase household protein supply and increase family income.

To author's concern, the statistics on guinea fowl population in Bangladesh is not available at the livestock department, institute, university data base or even in the internet search. No comprehensive research works have yet been conducted on the characterization of guinea fowl species available in Bangladesh, their production status and extension works. Why the population of guinea fowl has noticeably declined in Bangladesh still remains unclear. Taking all above facts in consideration, the present study was therefore undertaken to focus the status of guinea fowl production in Bangladesh,

collection of hatching eggs and/or birds from different parts of country and observe some key parameters on their reproductive and productive performances at BAU Poultry Farm keeping birds in complete confinement rearing system.

Materials and Methods

Collection of hatching eggs

Firstly hatching eggs were collected from the farmers in Madhupur, Tongi, Rajshahi, Dhaka and brought the eggs to BAU poultry Farm. Eggs were selected with the visual observation of its size, shape, color, weight, cleanliness, uniformity etc. Prior to collection, it was confirmed that the male and female birds kept together at farmer's house from where the eggs were collected. Eggs were hatched at BAU Poultry Farm by artificial incubation using a home type incubator (Brinsea Octagon 250, UK). All necessary requirements were maintained properly for incubation. Fertility and hatchability of eggs and abnormality of hatched keets were recorded accordingly.

Brooding of keets

Brooding of day old keets was performed in semi-monitored house at BAU Poultry Farm. Before transferring the keet brooder house was cleaned with broom to take it free from dust, dirt and all kinds of unexpected materials. The house was washed thoroughly with tap water and disinfected using TH_4^+ (Manufactured by-Sogeval, France). After drying, the experimental house was wire netted for brooding and growing areas as per requirement. Rice husks were purchased from the local market and used as litter materials at a depth of 2 cm. Gunny bags were used over the litter for 4 weeks. During brooding, once the litter materials become wet by the droppings or drinking water, it was partially replaced by dry litter to avoid cake formation. After 4 weeks the gunny bag was removed and previous litter was stirred to prevent ammonia gas and maggot formation.

Feeding and watering

Just after hatching, keets were supplied with a dextrose monohydrate solution containing glucose, galactose and electrolytes (Glucovet). Temperature was maintained at 90˚F as brooding temperature which was decreased gradually in subsequent weeks @ 5ºF/week until 4 weeks of age. When required the keets were given additional heat with electric bulb for first 4 weeks of age.

There is no specific or recommended feeding standard in formulation of diet for farmed guinea fowl. However, some published reports are available elsewhere describing nutrients requirement for the particular type of guinea fowl. Since the observation of growth performance was key objectives in present study, experimental birds were fed commercial broiler diets to obtain better body growth. Broiler starter diet was fed up to 14 days and thereafter broiler grower diet was supplied until end of the study period. *Ad-libitum* feed and water were supplied throughout the experimental period. Chemical composition of feed supplied to the keets is shown in (Table 1). Egg shell thickness also measured using shell thickness meter at BAU Poultry Science Laboratory.

Table 1. Composition of the diet supplied to birds

Nutrients	Chemical composition
Metabolizable energy (ME)	2950 (Kcal/kg)
Crude protein	21.0 %
Crude fibre	5.0 %
Calcium	1.0 %
Phosphorus	0.54 %
Methionine	0.48 %
Lysine	1.15 %

Available from composition given by the manufacturer (Nourish Poultry and Hatchery Ltd. Valuka, Mymensingh)

Results and Discussion

Physical characteristics of hatching eggs, their incubation, fertility and hatchability

Egg shape and color

Egg shape of guinea fowl is unique and differed from the eggs of any other poultry species. It was mentioned previously that the hatching eggs were collected from different regions of the country. There

are two types of shell color such as spotted cream and white (Table 2) were recorded. Shell color of the eggs collected from different areas was observed followed by the collection. Although both the shell colors were found, however, spotted cream color were abundant compared to white color.

Shell thickness

Average egg shell thickness of the guinea fowl eggs found in the present study 0.52 mm (Table 2). The shell thickness recorded in the present study was bit higher than the previous reports of Obike *et al*., (2011), who found an average thickness of 0.48 mm in Pearl type guinea eggs. Guinea fowl egg shells are stronger and thicker than the egg shell of chicken and duck.

Egg weight

Egg size is usually related with the body size of the laying hens (Obike *et al*., 2011). In present study the weight of guinea fowl eggs ranges from 32 g to 42 g per egg, while the average egg weight was 38 g/egg. Published reports also suggest the egg weight of guinea fowl ranges between 38 to 45 g/egg (Ayorinde *et al.,* 1989; Fani *et al.,* 2004). Based on the plumage color and other morphological characteristics, it has been assumed that the guinea fowl under present study was characterized as the Pearl type, which has a moderate body size and therefore their egg size was also found in medium.

Incubation period

Methods of incubation are most important factors to be considered as these directly affect the hatchability of eggs. Unlike the chicken, duck or even some other species of poultry, guinea fowls are not considered as a good mother. Thus, the guinea eggs should better to hatch either by broody chicken or artificial incubator. Electricity power cuts are the major problem in artificial incubation. The incubation period of guinea, as has been reported by many authors was 28 days (Belshaw, 1985; Anonymous, 1998; Smith, 2000; Fani *et al.,* 2004). In the current study, almost 90% eggs were hatched at day 28, but few of the eggs took somewhat longer period for hatching.

Incubator operator should be very careful and must be in close observation just prior to hatch out the keets to avoid unnecessary complexity in hatching. Both in natural or artificial incubation, technician/responsible person should take necessary care in hatching the keets, even at the end of incubation once the embryos fail to hatch out because of thicker egg shell, the operator may need to break down the eggs manually for smooth hatching.

Fertility of guinea eggs

Fertility of guinea fowl eggs observed in the present study was almost 80% (Table 2), which is close to the previous reports of Fani *et al.* (2004). Natural mating or artificial insemination may affect the fertility. Ayorinde *et al.* (1989) investigated laying characteristics and reproductive performance of four indigenous helmeted guinea fowl varieties (*Numidia meleagris*) in Nigeria and found that the egg fertility ranges between 49 to 58% in naturally mated stock. In other reports by Galor (1983) and Ayorinde *et al. (*1989) however stated that the fertility of guinea eggs under artificial insemination was found much higher than that of natural mating. In present study, although the breeder stock of guinea fowl subjected to natural copulation however the egg fertility resulted 80%, which was almost comparable to the egg fertility observed by Surai and Wishart (1996) in artificially inseminated birds. It is well documented that the guinea fowls are monogammy in nature, and as a result egg fertility usually should be higher if birds kept 1:1 male-female ratio compared to provide more number of females against a male.

Hatchability of guinea eggs

In present study, artificial incubation was practiced for hatching of guinea eggs. Hatching eggs were collected from two sources, either from scavenging birds kept by rural farmers at different regions of the country or from the own parent breeder stocks kept at BAU Poultry Farm. Hatchability of the eggs collected from scavenging birds and own breeder stocks were found 68% and 60%, respectively. Published reports suggest a wide variation in hatchability of guinea eggs. The actual reason for such wide variation in hatchability remains unclear however it may be assumed that the thickness of egg shell, improper storage of eggs, improper turning in

incubators etc. might be factors usually affect the hatchability.

Table 2. Physical characteristics, fertility, hatchability and incubation period of guinea fowl eggs

Sl No	Parameters	Results
1	Egg shape	Top like
2	Egg colour	Spotted cream and white
3	Shell thickness (mm)	0.52
4	Average egg weight (g/egg)	38.0
5	Fertility of egg (%)	80.0
6	Hatchability of (scavenging rearing) eggs (%)	68.0
7	Hatchability of (intensive rearing) eggs (%)	60.0
8	Incubation period (days)	28.0

Brooding and growing of guinea fowls

Brooding management

Brooding management of newly hatched keets is almost equal to the management of newborn chicken, ducks or turkey. All necessary brooding requirements, humidity, temperatures, house preparation are similar to those used in chicken or ducks. Few reports suggested to keep the keets on gunny bags at early stage of brooding. Once the keets are brooded on smooth surface or even on the daily newspaper, it may enhance the problems of leg paralysis at early stage, particularly on the day of 12-14 in brooding.

Live weight

Live weight is one of the important factors directly related to the profitability of guinea farming, as because the efficiency of reproduction and market price of birds (as meat purpose) are determined by the body weight. In present study, average live weight of guinea fowl observed at 10 and 20th weeks of age were 640 and 1695 g respectively, which were close to the previous reports of Mundra *et al*. (1993) and Saina *et al.* (2003). Dahouda *et al*. (2005) however recorded the body weight of Pearl type guinea fowl at 10 and 20 weeks of age were 450 g and 1100 g, respectively kept at poor farmers' house in Benin under free range rearing with some grain supplements, which were lower than the body weights observed in current study. As stated in materials and methods section that there is no specific feeding standard for guinea fowl, the experimental birds were fed commercial broiler diet for better growth performance. Therefore, the better growth and body weight found in present study might be because of the dietary nutrients.

Feed intake and feed conversion ratio

Average feed consumption and feed conversion ratio are presented in Table 3. Data indicates that feed intake was gradually increased with age and highly correlated with body size. Up to 4 weeks feed consumption was lower but conversion ratio was higher. After 4 weeks feed consumption was increased but not satisfactory as compared to previous reports. The FCR values observed in present study was higher than the previous report of Seabo *et al. (*2011) and lower than the report of Batty (1992). But feed intake in the present study coincides with the observation of Tewe (1983). The differences in FCR values between present study and previous reports might be because of bird's age, different diets fed to the birds, management regime and also environmental factors. Feed wastages are categorically reported higher in guinea fowl because of bird's behavior such as scooping and picking of feeds, which is not common in other species.

Survivability

Keet's survival is essential for successful guinea fowl production. In the present study, keet's mortality was noticeable, as recorded 10%, which might be one of the major factors caused higher mortality at early stage of life, usually observed at 12- 14 days of brooding. Previous reports also suggested the problems of leg paralysis at the particular age which leads early keet's mortality (Fani *et al*., 2004). The symptoms of leg paralysis usually appear as one of legs stand before and another leg is behind. Why the leg paralysis appeared in early stage of keets remains unclear, however, some managemental practices such

as increasing brooding temperature at 1st and 2nd weeks and inclusion of protein or even synthetic amino acid during brooding period may improve the problems of leg paralysis.

Table 3. Feed consumption, body weight and FCR of guinea fowl at different stages

Age (wk)	Feed intake (g/bird/wk)	Body weight (g/bird/ week)		Body weight (g/bird/day)	FCR
		Initial	Final		
1	62.23	25.8	41.5	5.93	1.50
2	67.0	41.5	54.23	7.75	2.38
3	56.84	54.23	64.8	9.26	2.87
4	100.1	64.8	88.0	12.57	3.25
5	131.11	88.0	117.5	16.79	3.55
6	218.4	117.5	189.0	27	3.36
7	240.1	189	274.8	39.26	3.19
8	275.8	274.8	377.0	53.86	3.05
9	320.6	377.0	512.0	73.14	2.88
10	371.7	512.0	640.0	91.43	2.88
11	401.8	640.0	779.6	111.37	2.88
12	366.0	779.6	850.71	121.53	3.07
13	450.0	850.71	1142.42	163.20	2.68
14	462.0	1142.4	1364.8	194.97	2.85
15	462.0	1364.8	1450.56	207.22	3.00
16	499.94	1450.6	1492.8	213.26	3.25
17	502.04	1492.8	1529.61	218.52	3.50
18	508.13	1529.6	1674.79	239.26	3.50
19	526.16	1674.8	1680.5	240.07	3.80
20	567.00	1680.5	1695.84	242.26	4.10

Conclusions and future remarks

Based on the results of present study it can be concluded that the phenotypic characteristics of the guineas were unique and resembled with the Pearl type-a very common variety observed in rural areas of Africa and Asia. Hatchability and fertility were satisfactory. Growth performance at the rearing period was also satisfactory under intensive rearing system and comparable with the previous reports. Early keet's mortality was problem may be noticed often however it can be overcome with providing increased brooding temperature and supplementation of slightly higher level of protein during the early stage of brooding period. Looking back in the past history, one can easily assume that the 'helmeted guineas' were very common in free-range rearing system with the native chicken in Bangladesh. However, their population has remarkably declined in recent days and the birds are seldom observed in rural areas. Despite the unique qualities and advantages in rearing over the other species of poultry, now-a-days rural farmers are reluctant to keep guinea fowls. Wild behavior of the guinea fowls, their foolish attitudes, careless behavior of broody guinea hens in rearing keets, early keet's morality, lack of awareness of the farmers regarding premix quality of guinea meat and eggs are thought to be major drawbacks attributed significant decreased of their population in Bangladesh. Addressing the issue mentioned above, strategic plan should be chalked out for the production, conservation and extension of guinea fowl to re-establish the species as a part of native poultry in Bangladesh. Since the guinea fowl has tangible meat and egg production potentials, it may have different significance as a component part of rural poultry production to supply family protein partially for the masses and also could be a part of today's environment friendly diversified eco-agriculture system.

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