JOURNAL OF AGRICULTURE AND AGRICULTURAL TECHNOLOGY (JAAT)

VOL. 2 (2) DECEMBER, 2009

ISSN: 1597-5460

A PUBLICATION OF
SCHOOL OF AGRICULTURE
AND
AGRICULTURAL TECHNOLOGY
FEDERAL UNIVERSITY OF
TECHNOLOGY MINNA
P.M.B. 65.

TABLE OF CONTENTS

FERTILITY AND HATCHABILITY OF WILD INDIGENOUS GUINEA FOWL (*Numida meleagris galeata*) EGGS AT THREE DIFFERENT PERIODS USING KEROSENE TYPE INCUBATOR

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ABSTRACT
The study was conducted to examine the fertility and hatchability of Wild indigenous guinea fowl eggs at three different periods (April-June, 2009) using kerosene type incubator, which lasted for 12 weeks. A total of 710 eggs were collected and incubated in batches. The parameters observed include number of egg set ,number of eggs fertile ,number of eggs hatched, number of dead embryos ,and percentage hatchability of fertile eggs , percentage hatchability of all eggs set , .analysis of the result showed a significant difference ($p<0.05$) between the period of incubation .It was observed that the percentage hatchability of fertile eggs in the month of May, gave higher results with average temperature of 28.8°C and average rainfall of 6.8mm than April with temperature of29.9°C and rainfall of 3.0mm and June with average temperature of 28.4°C with average rainfall of 3.6mm respectively. Percentage hatchability in May was 93.93% followed by April with 59.63%, while June 19.05% respectively. From the result of this study, it could inferred that fertility and hatchability of wild indigenous Guinea fowl eggs at three different periods using kerosene type incubator in this zone is more effective when eggs are collected in May, and under similar weather conditions.

INTRODUCTION

One of the parameters for measuring successful poultry programme or the propagation of a species of poultry is the ability of that specie to multiply. In the context of guinea fowl management, good hatchability plays an important role to increase its population. A number of factors have been reported to affect the fertility, hatchability and dead in shell embryos of the guinea fowls. The factors include nutrition especially manganese level (Offiong and Abed, 1980; Offiong, 1983), season (Ayorinde, 1984) sex ratio (Gonzalez and Kleini,1974) variety (Ayorinde, 1984a), method of insemination (Ayorinde and Ayeni, 1984) and stocking rate (Ayorinde, 1983) respectively.

Although guinea fowl are essentially seasonal breeders, eggs might be obtained during the off season period, (Aire *et al.*, 1979). The fertility and hatchability of their eggs are seriously reduced and percent dead embryos increased during such periods (Ayorinde, 1984a). This is probably as a result of depressed libido which could reduce semen production by the male. Fertility and hatchability of eggs are reported to be low at the beginning of the breeding season, but get to peak about three months later (Ayorinde, 1984a).

There are two main methods used to incubate guinea fowl eggs depending on the type of production. These are natural and artificial methods. Most small holder farmers use chicken and turkey hens to hatch guinea fowl eggs, and guinea hens will often leave the nest after a few guinea keets have been hatched (Anonymous, 2001). Natural incubation is more reliable for small flock sizes as there is electricity power cuts, which is a major problem with artificial incubation, although the later method is more preferred for large flocks.(Kabera,1997). The eggs of guinea fowls will be hatched within 26 -28 days after incubation (Belshau ,1985; Embury, 2001)

Storage and incubation condition are important for hatchability of guinea fowl eggs. The recommended storage condition s are 10-18°C with relative humidity of 70-80% (Belshau, 1985; Binali and Kanengoni, 1998). It is not recommended to store guinea fowl eggs intended for incubation for more than 7 days, because hatchability of guinea fowl eggs decreases rapidly with storage time (Nwagu, 1997; Binali and Kanengoni, 1998). The incubation conditions for artificial incubation vary from temperature of 37.5-37.8°C and 55-60% relative humidity(RH) for the first 23-25 days, 37.4°C and 70% RH for the next 2days and 36.4oc and 98%RH for the last days until final hatching is achieved. (Belshau, 1985; Bilani and Kanengoni, 1998).Incubation doors should be adjusted to increase ventilation. These factors are constraints in guinea fowl production, because the cocks have smaller testicular size (1-9g) than chicken cock (14-16g), thus putting the guinea fowl at disadvantage. (Belsheu, 1985; Nwagu and Alawa, 1995). Semen production is usually associated with the size of testis in poultry (Ayorinde *et al.*, 1989). However Nwagu and Alawa (1995) found out that low RH, low rainfall and high temperature result in a reduction of semen production. This is associated with sperm concentration, a high percentage of sperm abnormality and a high dead to live spermatozoa ratio (Saina, 2005).The fertility of guinea fowl eggs ranges from 49-58% in naturally mated flock, while using artificial insemination result in egg fertility ranges from 70-80% (Ayorinde *et al.*, 1989). The low fertility in naturally mated flock is also associated with monogamous sexual behaviour of the guinea fowl in addition to the fertility constraint with the mate (Saina, 2005). On the the other hand, handling of eggs before incubation and period of storage greatly affect the hatchability of eggs. Nwagu and Alawa (1995) reported that for every day of storage, the hatchability deteriorated by nearly 4%. Hatchabiliy rates of 67% and 70-75% have been achieved under artificial insemination (Kabera, 1997). The primary aim of this research is to determine the fertility of guinea fowl eggs collected from the wild in the middle belt zone of Nigeria, determine the hatchability of the guinea fowl eggs collected at three different periods. (April-June 2009) and evaluate the efficiency of kerosene type incubator in the hatching of these guinea fowl eggs.

MATERIALS AND METHODS

The experiment was conducted at the Teaching and Research farm of the Department of Animal Production, School of Agriculture and Agricultural Technology, Federal University of Technology, Minna. The indigenous guinea fowl eggs were collected from Lapai area of Niger State and the type of incubator used was locally fabricated by the National Veterinary Research Institute, Vom, Plateau State.

Eggs for incubation were carefully selected by removing broken, dirty, misplaced, small sized and cracked ones from the whole lot. A total of seven hundred and ten eggs were incubated in different batches. There were two hundred and seventy eggs in the first batch, one hundred and twenty eggs in the second batch and three hundred and twenty eggs in the third batch. Each batch was hatched separately.

Incubator stove tank was filled with 4-5 litres of kerosene and the stove was fixed underneath the heating unit attached to the body of the incubator. This lighted up the wick which was adjusted until clean blue flame was emitted. A kidney shaped container attached to the heating unit was always filled with water so that the cloth inside was constantly wet to serve as humidifier.

Egg candling was done using locally fabricated Candler which consists of a small wooden box with an egg size opening on top. A 60 watts bulb inside the box provided illumination. Candling was done on the seventh, fourteenth and twenty first day of incubation. Infertile eggs that started developing but died before the growth was completed were rejected. The eggs were turned seven times daily during the first 23 days of incubation. This was observed to prevent the embryo from sticking to the shell membranes. Each egg was marked 'X' which made it possible to know the next turning direction. The eggs were observed for hatching by checking of the eggs either longitudinally or by spot cracking. The keets began to come out of their shells by the end of the twenty sixth and twenty eight days of incubation.

The temperature readings were taken five times daily at four hourly intervals. The percentage hatchability was calculated from the total eggs that were candled and the percentage of eggs that were hatched. The percentage fertility and hatchability were calculated using the formula of Oluyemi and Roberts (1979).

$$\text{Percentage fertility} = \frac{\text{number of eggs fertile}}{\text{Total number of eggs set}} \times 100$$

$$\text{Percentage hatchability of fertile eggs} = \frac{\text{number of chicks}}{\text{number of fertile eggs}} \times 100$$

Data collected were analysed using ANOVA.

RESULTS AND DISCUSSION

The average weather conditions from April to June (Table 1) indicates that there was significant difference ($p<0.05$) in the mean rainfall, relative humidity, wind velocity and sunshine amongst the periods. The average weekly temperature variation during egg incubation from the month of April to June (Table 2) indicates that there was no significant different ($p<0.05$) during the month of incubation. Table 3a shows the overall performance during the month of April. A total of 270 eggs were set inside the incubator; 161 eggs were fertile amounting to 59.63% and 96 eggs were hatched amounting to 59.63% while 65 eggs were dead in shell amounting to 40.37%. Table 3b shows the overall performance during the period of May. About 120 eggs were set inside the incubator. Out of this, 80eggs were fertile and percentage fertile egg was 66.67% while 75 eggs were hatched (i.e 93.75% hatchability). Five eggs were dead representing 6.25% dead. Table 3c shows the overall performance of June. About 320 eggs were set inside the incubator out of which 290 eggs were fertile and percentage fertile egg was obtained as 90.63%, 105 were hatched representing 36.21% hatched while 85 eggs were dead representing 63.79% dead.

The significant difference ($p<0.05$) observed in the average weather condition from April – June (2009) revealed that under excessively high or low temperature, low hatchability and death embryo could be observed (Oluyemi and Roberts, 1979). Although no significant ($p>0.05$) difference was observed in the temperature at the various turning times (Table 2), a higher hatchability was observed in the month of May with an average rainfall of 6.8mm and average temperature of 28.8°C with average relative humidity of 74.4 which tend to favour the findings of Nwagu and Alawa (1995)

Table 1: Average weather condition from April to June 2009

Month	Temperature (°C)	Rainfall (mm)	Sunshine (hours)	Rel. Humidity (%)	Vapour Pressure (Mb)	Dew point (°C)	Wind (Km/24 hours)
April	29.9	3.00^a	7.00^a	68.50^a	27.20	22.50	1107.70^a
May	28.8	6.80^c	7.10^a	74.50^b	28.10	22.90	825.40^b
June	28.4	3.60^b	5.20^b	78.40^b	27.50	22.60	813.40^b

abc: means with different superscript along the same column are significantly ($p<0.05$) different

Table 2: Average weekly incubator temperature variations for the periods from April to June (°C)

Batches	1	2	3	4	LS
April	39.08	38.95	38.98	38.94	
May	38.71	38.68	38.84	38.94	
June	38.66	38.62	38.80	38.67	
Total	116.45	116.25	116.62	116.55	
Mean	38.83±0.24	38.75±0.38	38.87±0.44	38.85±0.60	Ns

Table 3a: Parameters of collected eggs

Parameters	April	May	June
Number of egg set	270	120	320
Number of egg fertile	161	80	290
Hatchability	96	75	105
Dead embryo	65	5	85

Table 3b: Percentage of fertile eggs, hatchability and dead in shells

Months	% fertile	% hatchability	% dead in shells
April	59.63^a	35.56^b	40.37^b
May	66.67^b	93.75^c	6.25^a
June	90.63^c	19.05^a	80.95^c

abc – superscript along the same column are statistically significant ($P<0.05$)

seen in Table 3a and 3b. Aremu and Shiawoya (1998) have made similar observations with particular reference to seasonality that under wet conditions hatchability tends to be better. The result of this experiment is in agreement with their findings, although they used electrically motorized incubators. The highest percentage of dead in shell was noticed in the month of June with the least rainfall of 3.6mm and average temperature of 28.4°C. The period was equally characterised with high relative humidity (78.4%). This tends not to favour incubation because an air inflow rate (vi) is expected to be 0.51/(hour.egg) which was considered to be sufficient (Aire *et al.*, 1979). Table 3d shows a significant difference among the parameters measured. The highest hatchability of 93.75% was obtained in May, closely followed by April, while the least was observed in June. This result tends to agree with Nwagu and Alawa (1995) Ayorinde *et al.* (1998) and Aremu and Shiawoya (1998) who reported that seasonality affect hatchability.

CONCLUSION AND RECOMMENDATION

From the results obtained guinea fowl producers wishing to embark on large scale production in the southern guinea savanna, may wish to collect their eggs when rain fall has fairly been established. It can be inferred from the result of this study, that small scale poultry farmers could obtain their eggs when rainfall has fairly been established, and because of erratic power supply, kerosene type incubator should be used. The temperature range and relative humidity levels should be maintained, because dead in shells could be attributed to either too low temperature or too high temperature and unfavourable relative humidity.

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