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SYSTEM OF REARING AND ITS EFFECT ON FERTILITY AND HATCHABILITY OF WHITE BREASTED PEARL GUINEA FOWL

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ABSTRACT
Two hundred and eighty eight Guinea fowls were reared in three types of rearing systems. Ninety six Guinea fowls each were housed in well ventilated cage, wire and deep litter respectively, with a sex ratio of 1:3. Both males and females belonged to the same hatch. Each treatment was divided into four replicates of 24 birds in each replicate; they were provided feed and water *ad libitum.* Hatching eggs from three different rearing systems (cage, wire floor and deep litter) were collected twice a day in separate filler flats identified by varying colours for each treatment and kept apart after initial fumigation. The eggs were later incubated in a forced draft automatic chicken incubator. After 24 days of incubation, the eggs were transferred from setter to hatcher and eggs were placed in pedigree boxes in replicate and treatment wise, to record the respective fertility and hatchability. Birds reared on deep litter system of management recorded significantly ($P<0.01$) maximum fertility (70.68% ±0.12). Deep litter system of rearing recorded highest fertility (70.68% ±0.02) followed by birds reared in cages and wire floor respectively. Early embryonic mortality percent was significantly ($P<0.01$) low in birds reared on deep litter, while late embryonic mortality was significantly ($P<0.01$) low in cage reared Guinea fowl. Late embryonic mortality was lower in cage reared birds and also the percent weak chicks were lower.

KEY WORDS: Guinea fowl, hatchability, fertility.

INTRODUCTION

In India, Guinea fowl rearing was only a sporadic rural occupation of weaker sections in many states. More interest in Guinea fowl rearing has been observed in the last two decades due to it being considerably less susceptible to heat stress and highly resistant to dietary aflatoxins. These two characteristics alone make them immensely suitable to the rural conditions prevailing in India. Despite its immense suitability for commercial farming, the advantages have not been capitalised to study Guinea fowl production on scientific lines. Guinea fowl is a promising genetic resource for evolving a low input grain saving poultry alternative for production in the developing world. Rearing of Guinea fowl is a potential alternate poultry farming system. However, fertility and hatchability are major constraints in Guinea fowl production. Not much literature could be traced on various rearing systems employed in Guinea fowl rearing. Dearth of literature on the effect of rearing systems on hatchability and fertility in Guinea fowl has lead to this study. White breasted Guinea fowl is a strain developed from the common Pearl guinea fowl and this bird is being widely accepted among Guinea fowl farmers due its size and laying capacity. Many farmers want to raise guinea fowl in cages. Not much work has been taken up on the fertility and hatchability of these birds, nor any work on raising these birds in cages hence this study to provide a base data on this strain of bird.

MATERIALS & METHODS

Two hundred and eighty eight Guinea fowls were reared in three types of rearing systems. Ninety six Guinea fowls each were housed in well ventilated cage, wire and deep litter respectively, with a sex ratio of 1:3. Both males and females belonged to the same hatch. Each treatment was divided into four replicates of 24 birds in each replicate; they were provided feed and water *ad libitum.* Breeder mash contained 14% crude protein with 2900 Kcal of metabolizable energy/kg and 3.2 % of calcium. These breeder experimental birds were provided with natural light of about 12 hours between 06.00 to 18.00 hours and 4 hours of artificial light, 16 hours of total photoperiod was provided for these breeder birds throughout the study period. Hatching eggs from three different rearing system (Cage, Wire floor and Deep litter) were collected twice a day in separate filler flats identified by varying colours for each treatment and kept apart after initial fumigation. The eggs were later incubated in a forced

draft automatic chicken incubator. The temperature and relative humidity in the setter and hatcher were maintained at 37.5°±0.3°C (99.5°±0.5°F), 37.0°±0.3°C (98.5°±0.5°F) and 60, 70 % respectively. Eggs in the setter were turned by 45° angle on either side at hourly interval until they were transferred to the hatcher. After 24 days of incubation, the eggs were transferred from setter to hatcher and eggs were placed in pedigree boxes in replicate and treatment wise, to record the respective fertility and hatchability. Fumigation was carried out at 1X concentration on the 25th day, immediately after transferring the eggs to the hatcher. The hatch was pulled out on day 28. Other standard hatchery sanitation procedures were followed uniformly throughout the experiment.

Fertility was computed as per the following formula.

$$\text{Percent Fertility} = \frac{\text{Total no. of fertile Guinea fowl eggs}}{\text{Total no. of Guinea fowl eggs set}} x\ 100$$

Hatchability was computed as per the following formula.

$$\text{Percent Total Hatchability} = \frac{\text{Total no. of healthy Guinea fowl chicks}}{\text{Total no. of Guinea fowl eggs set}} x\ 100$$

$$\text{Percent Fertile Hatchability} = \frac{\text{Total no. of healthy Guinea fowl chicks}}{\text{Total no. of fertile Guinea fowl eggs}} x\ 100$$

Identifying fertile and infertile eggs in guinea fowls during candling was not possible due to the thick shell; therefore unhatched eggs were collected and broke open at their broad end. It was considered that eggs without any visible growth or changes as infertile, a dark spot on yolk with area of pellucida and area opaca as early embryonic mortality, a fully grown embryo with feathers that had not hatched as dead-in-shell and rest with visible growth as late embryonic mortality. All the statistical analyses were performed by using SPSS (IBM Corp. Release 2011) software. The data obtained for various parameters were subjected to statistical analysis as per complete randomized design (Snedecor and Cochran, 1989). The significant mean differences were sort out as per Duncan's multiple range (Duncan, 1955) tests.

RESULTS &DISCUSSION

Per cent fertility, hatchability and embryonic mortality of Guinea fowl eggs observed in three system of rearing is presented in Table 1. The average fertility percentage of eggs from different system of rearing viz. cage, wire, and deep litter ranged from 65.97% ±0.46 to 70.68% ±0.12, a highly significant (P<0.01) difference was observed in the fertility percentage among the treatment groups; birds reared on deep litter system of management recorded significantly (P<0.01) maximum fertility (70.68%±0.12). Overall percent fertility in Guinea fowl was 67.88%±0.32.

Hatchability percent on total number of eggs set was significantly (P<0.01) higher for Guinea fowls reared on deep litter (61.57% ±0.26); however, no significant difference in percent hatchability on total fertile eggs set was observed among the treatment groups. Overall hatchability and fertile hatchability in Guinea fowls were 58.54% ±0.39 and 86.22% ±2.22 respectively.

TABLE 1: Effect of System of Rearing on fertility, hatchability and embryonic mortality in Guinea Fowl

Parameter	Rearing system				
	Cage	Wire	Deep litter	Over all	F value
Total eggs set	2002	1334	2873	6209	
Fertility** (%)	66.99^{b}±0.38	65.97^{c}±0.46	70.68^{a}±0.12	67.88±0.32	48.81
Total hatchability **(%)	57.64^{b}±0.55	56.44^{b}±0.58	61.57^{a}±0.26	58.54±0.39	29.60
Fertile hatchability NS (%)	86.01±0.53	85.54±0.57	87.11±0.38	86.22±0.22	2.53
Early embryonic mortality** (%)	6.06^{b}±0.04	6.61^{c}±0.06	5.56^{a}±0.03	6.08±0.08	111.85
Late embryonic mortality** (%)	4.39^{a}±0.03	5.53^{c}±0.02	4.67^{b}±0.05	5.0±0.07	157.58
Dead in shell NS(%)	1.19±0.02	1.18±0.02	1.26±0.02	1.21±0.15	2.90
Weak chicks NS (%)	1.11±0.01	1.15±0.07	1.17±0.19	1.14±0.08	4.27

**Highly Significant (P <0.01) NS Non Significant

Highly significant (P<0.01) variations were observed between rearing systems in early and late embryonic mortality. Early embryonic mortality percent was significantly (P<0.01) low in birds reared on deep litter, while late embryonic mortality was significantly (P<0.01) low in cage reared Guinea fowl. No significant variation was observed between treatments for dead-in-shell or weak chicks. The overall early, late embryonic mortality and dead-in-shell percent were 6.08%±0.08, 5.0%±0.07, 1.21%±0.15 respectively.

Highly significant (P<0.01) difference was observed in percent fertility of Guinea fowls raised under different systems of rearing; with deep litter system of rearing recording highest fertility (70.68%±0.02) followed by birds reared in cages and wire floor respectively. Many authors (Awotwi 1987; Saina *et al.* 2005; Agbolosu *et al.* 2012b; and Ahaotu *et al.* 2013) observed a similar percentage of fertility in Guinea fowl, ranging from 70% to 85% under deep litter system. Agbolosu *et al.* (2012a) observed lowered hatchability of 43% to 74% in Guinea fowls reared in cages. This agrees with our findings were birds raised in cages had fertility percent of 66.9%±0.38. No literature studying the effect of wire floor on per cent fertility in Guinea fowl could be traced. Fertility percent was lowest in birds reared on wire floor. However, in broilers, Masey (2002) observed higher fertility percent on slat floor than in cages.

It has been observed by Aire *et al.* (1979) that low fertility in Guinea fowls was due to the smaller testicular size, confinement which had reduced libido and loss in permanent pairing. Although the space provided was minimal in cages, fertility seemed to be second highest, next to deep litter system. Most probably the freedom of expressing their natural behaviour on deep litter must have facilitated better mating in these birds. In cages, where floor space was limited birds were limited in their feral behaviour. Appleby *et al.* (2004) also attributed poor fertility in Japanese quails reared in cages, to the insufficient space to stand, walk and to express natural behaviour. On the contrary, Narahari *et al.* (1988) observed no significant difference in the fertility of Japanese quail for birds reared in cages or deep litter. Although, birds were not limited in floor space as those kept in cages; lowest fertility on wire floor could be attributed to uneven resting of the foot pad of the male bird while mating and this could have made the male shy away from mating. Percent hatchability in Guinea fowls reared under deep litter system of management was found to be significantly higher (P<0.01) than those reared in cage and wire floor. Better hatchability of Guinea fowl eggs is only a sequelae of better fertility of birds reared on deep litter.

Other than Kusina *et al.* (2012) and Gono *et al.* (2013) who had observed a hatchability of 64% in Guinea fowls under extensive system of management, all other authors had reported higher hatchability than what has been recorded in this study (58.54%±0.39) in Guinea fowls reared on deep litter. Narahari *et al.* (1988) noticed no significant difference in the hatchability of Japanese quail eggs from breeders reared in cages and deep litter. Kabera (1997) and Galor (1983) reported higher percent of hatchability of 67% and 70 to 75% respectively in artificially incubated eggs from Guinea fowls reared in cages. These values are far above what has been recorded (57.64%±0.55). Galor (1983) who had worked on hybrid French Guinea fowl, observed higher percent hatchability in birds reared in cages and attributed it to developed genetic material. Although much work has been done on the effect of cage density in chicken breeders, little research has been addressed on the effect of cage rearing and its effect on the performance of breeder Guinea fowl. Management practices such as optimum cage density to increase productivity and improve well being is lacking in Guinea fowl. As mentioned earlier, hatchability is a sequelae to fertility and causes for the same has been discussed explicitly. Dodu and Czirjak (2012) had observed an average embryonic mortality rate of 27.3% in guinea fowls reared on deep litter. Nevertheless, the embryonic mortality recorded in Guinea fowl reared on deep litter in this work is only 11.48%. This agrees with the findings of Jayeola (2007) who observed embryonic mortality of 11.72% in range reared Guinea fowl. Early and late embryonic mortality was significantly (P<0.01) different between rearing system. Both early and late embryonic mortality was highest in wire floor reared Guinea fowls. Late embryonic mortality was lowest in cage reared guinea fowl.

CONCLUSION

Guinea fowls were observed to have the best fertility and hatchability on floor rather than in the other two systems of rearing, although cage rearing came at a close second. Rearing guinea fowl on wire floor should be avoided. These birds needed more space to loiter around unlike the chicken and therefore floor rearing enhanced the fertility and hatchability in these birds. Late embryonic mortality was lower in cage reared birds also the percent weak chicks was lower. We could provide this information to farmers who do not have much land area to rear guinea fowl on floor and allow them to rear guinea fowl in cages.

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