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A review on diseases and management problems affecting reproductive performance in semi-intensive raised local guinea fowl (*Numida meleagris*)

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ABSTRACT: Investigations based on field records and experiences at the Guinea Fowl Production Research Unit of the Kainji Lake Research Institute have shown that some diseases management conditions which include: yolksac, fungal infections, collibacillosis, helminthiasis, management problems in particular inbreeding, moulting, heatstroke and nutritional deficiencies affect significantly the reproductive organs, egg laying and hatchability. The direct or indirect effects due to lameness, starvation, pyrexia, diarrhoea, inflammation of reproductive organs, weight losses and changes in physiology and behaviour of birds also contribute to poor reproductive performance. The various effects of these major disease problems are highlighted.

Key Words: Local guinea fowl, Reproductive performance; Management problems; Inbreeding; Heatstroke.

Introduction

As in other poultry species, the performance of guinea fowl depends on its nutrition and health status (Okaeme, 1982; Okaeme, 1983). Compared to other poultry guinea fowl are hardly but still succumb to diseases that affect the organs of reproduction and thus reduced productivity. Disease and poor management can also lead to inadequate feel intake leading to starvation, weight loss, and inflammation of reproductive organs. The overall consequences are low egg reproduction, poor fertility and hatchability. This paper examines conditions that affect laying, fertility, hatchability and guinea fowl keets as mitigating factors in the reproductive performance and survival of guinea fowl.

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Methodology

Records of disease incidence, hatchability records, mortalities and post-mortem results in guinea fowl (*Numida meleagris*) at the Kainji lake research Institute (KLRI) (guinea fowl research production programme) were examined and evaluated to ascertain factors contributing to the reproductive and breeding problems in guinea fowl.

In another experiment, physical examinations were conducted on 12 each males and females of selected active (laying females and mating males) and non-active (non laying females and non mating males) to ascertain their status and conformation, which will enable categorise the birds into good quality laying, non-laying, good sperm and poor sperm producers. A total of 48 birds (20-30 weeks) in cages were examined. Also a general review of the literature and reports on diseases and management problems in guinea fowl were appraised.

Results and Discussion

The disease conditions, which were, identified as affecting the reproductive performance either directly the reproductive organs, or indirectly fertility, hatchability and behavioural changes. The characteristic of quality layersbased on morphology and behaviour changes are summarized (Table 1). Because the problems of low fertility, hatchability, mating behaviour and those affecting directly the reproductive organs are not mutually exclusive, the following results highlights the prevalence (Table 2), and clinical symptoms of some of those specific disease problems that can be readily diagnosed.

Table 1: Observed reproductive qualities based on selected guinea fowls (*Numida meleagris*).

Qualities	Laying guinea fowl	Non-laying guinea fowl	Good sperm producing guinea fowl	Poor sperm producing guinea fowl
Distance between public bone	6.5-7.5cm (3-4 fingers)	4.5-6cm (2-3 fingers)	6.5-7cm (3-4 fingers)	4-5cm (2-3 fingers)
Distance between public bone and keel	14-15.5cm	10-12cm	11-15cm	11.5-17.5cm
Body girth	34-37.5cm	24-27.5cm	33-38cm	28-34cm
Abdominal girth	8.5-9cm	3.6-8cm	9-10cm	8-9cm
Head	Fresh	Ruffled	Fresh	Ruffled
Beak	Strong, brownish	Strong, brownish	Strong, brownish	Strong, brownish
Eye	Clean and bright	Clean	Clean and sharp	Clean and dull
Comb	Fresh and bright 10-15x17-12mm	Dull and brownish 10-12mmx7-12mm	Fresh bright red 15-17x20-25mm	Dull and brownish 15-15.4x10mm
Warttle	Reddish edge, pliable 25-37.5x20-25mm	Reddish not pliable 25.5x20-40mm	Reddish and fresh 35-40x25-30mm	Dull reddish 30-35x25-28mm
Back of neck	Fresh, soft, hair	Dry skin with hair	Fresh with soft hair	Dry skin
Feather	Fresh and groomed	Ruffled	Fresh and groomed	Ruffled
Temperature	Calm and flighty	Flighty and restless	Aggressive	Non-aggressive
Cloaca area	Soft, moist, large cloaca vent	Dry, small cloaca	Mosit cloaca vent	Very dry hard cloaca vent.

Table 2: Estimated Annual Prevalence rate (%) of some disease associated with guinea fowl production based on Kainji Aviary experiences.

Disease Conditions	**Annual Prevalent Rate (n=5 years)**	**Mean Prevalent Rate**
Yolk sac infection	10-70	28.0
Collibacillosis	3-70	29.7
Enteritis	50-70	60
Dead in shell	25-60	42
Omphalitis	10-35	21
Septicemia	3-25	12.6
Arthritis	5-22	12.8
Oviduct Prolapse	4-10	6.6
Fungal infection	4-56	27.6*
Cocidiosis	10-70	40.4*
Helminthiasis	45-75	54.0*
Nutritional problems	2-10	5.4**
Cage stress	3-8	5.6
Management problem	2-100	75.5*
*Inbreeding	100	100
*Molting	100	100
*Heat stroke	20-30	26.6

* - Obvious problem; ** - Major but subterranean.

(i) Yolksac infection:

The signs in keets include watery fluid and congestion in yolk resulting in swollen stomach. It is also responsible for some dead in shell and early mortality of keets. Mortality rate recorded 10-30% with prevalent rate of 10-70% in incubated eggs. Bacteria isolates responsible include *Escherichia coli* and *Staphylococcus aureus*. Yolksac infection is an indication of egg and incubator contamination. The control of infection requires proper disinfecting and fumigation of the incubator. In laying guinea fowl, similar infection of the yolk filled ova is occasionally observed. The signs include loistlessness, congestion and extensive peritonitis of the abdominal organs. The predisposing factor is when guinea fowls are disturbed and frightened resulting in rupture of ova into abdominal cavity and subsequent secondary bacteria infection.

(ii) Paracolon arizon infection

In keets, the disease is manifested by anorexia, huddling diarrhea and lethargy with mortality of 2-10%. However in adult birds (20 weeks and above), it is difficult to diagnose because it appears symptomless. It was first isolated at the KLRI aviary during an outbreak of aflatoxicosis. The sign in adult hens include prolonged drastic reduction in egg production and low hatchability rate. The production and hatchability may be as low as 2% and 20% respectively. Infection are acquired through egg and or feed contamination.

(iii) Collibacilosis

Coliform organisms that are normal flora of the gut system become very invasive affecting all ages of birds under stress conditions. Such stress conditions observed to trigger the disease include poor nutritional status, hot weather 9dry season) and cold (harmattan) and over-crowded guinea fowl environment. The organisms most invasive include *E. coli* and *Staphylococcus aureus*. The symptoms manifested depend on the organs invaded and the following conditions were recorded in guinea fowl, as a result of collibacilosis (Table 2) and include:

Enteritis: Severe debilitates diarrhoea that tends to be chronic in adult birds. The wasting disease affects overall egg production.
Dead embryo in shell: This is up to 25-60% of fully formed embryos may die in the shell, due to trans-ovarian infection as a result of problem associated with reproductive organs.
Peritonitis: It is usually sporadic and affects the visceral organs. It leads to mortality in acute conditions. In active guinea fowls, the consequences are drastic drop in egg production and reduced libido in the cock.
Air embolism: This is also sporadic with signs of air sacculitis in distention and cheesy materials under the subcutaneous tissue, adult guinea fowl thus affected loose weight rapidly, with cessation of laying and breeding activities. It is usually not a flock problem.
Septicemic condition: Leads to debility and in acute situations may result in mortality of apparently healthy guinea fowls. It has similar effects as in peritonitis except that the course of the disease is usually chronic.
Omphalitis: Characterized by messy, cheesy infection of the navel of keets. Bacteria isolates associated with it are *Straphlococcus aureus, Pseudomonas sp.* and *E.coli*. Flock problem may reach 10-35%.
Arthritis: Results in recumbency starvation and death. Adult birds affected would not be able to mate. Prevalent rate was 5-22%.
Salpingitis: This occurs sporadically involving mainly the oviduct. It is usually a mild inflammatory reaction that would not completely stop egg laying but the danger in shell and early keet mortality. In more chronic situations, eggs and laying guinea fowl are affected. There are also septicaemia conditions and high mortality off-springs. The bacteria, *Pseudomonas sp., E. coli, Staphlococcus aureus, Proteus sp.* were incriminated. Culling of birds is the best treatment. Colibacillosis is therefore an important breeding disease because it either affects directly reproductive organs, or organs that may aid breeding. It also affects the eggs, keets and reduces the breeding potentials of locks.

(iv) Oviduct Prolapse:

This is usually sporadic and has been associated with severe watery diarrhea, excess fat in the visceral organs. The entire oviduct and part of the intestine usually protrude from the cloaca. It has a low prevalent rate of 4-10%.

(v) Fungi infection:

Thrush, by *Candida albicans* (Okaeme, 1983); *Aspergillus flavus* and aflatoxicosis (Okaeme, 1999) are the two common fungal infections that were recorded in guinea fowl at Kainji Lake Research Institute. Both affect adult breeding birds and the common signs include anorexia, weight loss, lethargy and severe drop in egg production. The infection by *C. albican* is chronic in nature and directly reduces food intake due to pathology of the crop. The symptoms of aflatoxin are varied and include inflammation of the oviduct, fallopian tube and other visceral organs. Affected grower guinea fowls may take 12-16 weeks to reach their reproductive potential.

(vi) Protozoa infection:

A number of protozoa have been isolated in guinea fowl (Ayeni et al., 1983) which directly or indirectly affect their breeding potential.

Blood parasites: These include *Leucocytozoan sp., Plasmodium sp.,* and *Aegytianella pullorum*. Signs include anorexia, retarded growth and low egg production in adult laying guinea fowl. These signs are

however usually manifested only at levels of very high parasitemia. It is therefore a transient or debilitating disease.

Intestinal Ciliates: There are several unidentified enteric ciliates found in guinea fowl. Severe watery diarrhea has been associated with *Hexamita sp*., other signs include weight loss, ruffled feather, wastage due to listlessness and death. As aforementioned, some reproductive problems such as oviduct prolapsed and poor libido are due to predisposition to this severe diarrhea caused by intestinal ciliates.

Eimeria sp: It is a common knowledge that in the presence of *Eimeriasp*., which affects all ages of bird, egg production is lowered. *Eimeria numida*, and *E. grenieri* affect in general the productivity of guinea fowl due to the burden of severe enteritis, anorexia and loss of energy to breed (Davies et al., 1963; Long and Milliard, 1978). The prevalent rate is 10-70% and a very important disease problem affecting reproductive performance in guinea fowl.

(vii) Helminthes infection:

A heavy infestation of intestinal helminthes affects the productivity of breeding flocks (Okaeme, 1984). This is because some parasitic helminthes compete with host for essential nutrients, resulting in deficiency signs. The signs include unthriftiness, gastro-intestinal implication, starvation, delayed growth and sexual maturity, weight loss and low egg production. *Ascaridia numida* from experience at Kainji aviary is known to occasionally migrate from the intestine to the oviduct and fallopian tube at high levels of helminthiasis, thus reducing egg laying. The helminthes species incriminated include *Ascaridia numida; A. gall* and *Raillietina sp.*

(viii) Nutritional Disease

Deficiency problems due to vitamins, minerals, protein and energy levels are such that they complement each other thus making the diagnosis difficult to identify in the field. The nutritional deficiency signs in guinea fowl based on KLRI aviary experience include curly leg, arthritis, beak deformation, soft egg shell, abnormal small egg size and shape, poor egg laying and dead in shell. These have been associated tentatively to complexes of vitamins and mineral deficiencies in particular calcium, phosphate and magnesium deficiencies. However, there are no confirmation of the specific mineral, vitamin and micronutrient causing these deficiencies at KLRI aviary. However observed deficiencies in keets manifested early with symptoms of deformed beak and curly legs between 1-8 weeks of life. For adults that survive they may be outright poor breeders because the reproductive organs are affected. Post-mortem findings in affected adult revealed degenerative or atrophic organs. Other signs are retarded growth, low egg production, poor fertility and hatchability rate.

(ix) Heat Stroke

High calorific diet (60-70%) have been found to lead to excessive laying of fat in the abdominal cavity and along reproductive organs thereby reducing their normal function. The additional effect of excessive energy is that during the period of high ambient temperature (42-44°C) as experience during the dry season (February-April) in Nigeria loss of birds due to heat stroke becomes a dry season crises in the arid regions. Excessive heat stress due to high dietary energy level in extreme environmental temperature are observed to adversely affect reproductive activities, sperm production and egg laying.

Breeding stock therefore with history of low fertility, low egg production, congenital defect of keets, weak and retarded growing keets should be investigated for deficiency signs and where necessary culled and restocked.

(x) Management Problems

Cage stress: Guinea fowls are naturally feral range birds, thus under cage confinement it is stressful. They are prevented from exhibiting their range habits of gregation laying, monogamic and ritual mating behaviour, and sand bathing resulting in physiological stress. The symptoms include, listlessness, weightless and sudden death.

Deformities: Deformities either congenital or due to mechanical injuries affect mating under range conditions. Those guinea fowls with leg injuries have poor breeding qualities. The qualities include being docile and inability to participate in aggressive territorial mating behaviours (Ayeni, 1980). The affected females are usually not attractive to the males and because of the high selectivity and monogamous behaviours of mating in guinea fowl compared to local chickens (Ayeni, 1980), affected guinea fowls have poor breeding qualities (Table 1) and thus will not attend reproductive potential.

Egg Incubation: To achieve high hatchability in guinea fowl depends on egg fertility and proper management of the incubators. The evaluation of egg (Table 3) was based on use of Western incubator managed by trained poultry scientist. Results show that in general, fertility is low in guinea fowl raised under semi-intensive condition and varied from 9.30% to 69.02%, but hatchability using Western incubator developed for chicken is good, 43-81%. However, the major problem is dead in germ and embryo in shell during incubation resulting in low hatchability 4-5%. Thus these factors must be considered in the management of guinea fowl because it affects overall reproductive performance.

Table 3: Evaluation of egg incubation (Western ®) of Numida meleagris at KLRI Aviary.

No. of eggs	**% Fertility**	**% Hatchability**	**% Embryo dead in shell**	**% Dead germ**	**% Hatch efficiency**
103	15.50	43.75	10.75	12.50	6.80
160	46.00	58.60	5.55	8.70	16.90
156	37.18	70.60	5.14	8.60	26.23
166	40.35	71.60	6.36	2.90	28.90
24	33.33	50.00	5.50	10.50	16.70
52	9.30	42.90	9.10	00	4.00
91	34.10	54.80	5.15	00	18.60
86	43.00	81.03	3.97	00	34.80
92	51.04	65.35	2.76	00	36.64
135	40.00	50.00	9.00	00	20.00
164	25.00	56.03	20.40	19.46	14.00
711	56.54	67.41	13.83	11.44	38.12
539	69.02	72.31	7.53	4.04	50.00
160	58.75	78.72	9.77	5.32	46.30
Total	X				

Wing Dropping: Wing clipping of flight feathers in order to reduce flightiness has been found to remove the prehensile function of these feathers and upset balancing of the males during mating. It is therefore not advisable to remove flight feather of males in the breeding flock particularly for breeding stock except if artificial insemination is the breeding method to be adopted in the management.

Age: Guinea fowls reach their breeding maturity at about 30 weeks of age but egg laying and libido in male begin to drop rapidly after 100 weeks of age.

Monogamy: Guinea fowls have an inherent preferential mating behaviour (Ayeni, 1980). Maintaining a mating ratio of 1 male to 3 or 4 female's results in satisfactory egg fertility rate where artificial insemination is not practiced. This is because compared to laying chicken reduced photo-period, with-holding of feeding for 12-14 days, water for 2 days and any management problems that induces severe stress and starvation encourages on-set molting, reduction in egg production, low egg weight, fertility and hatchability. Thus in guinea fowl proper feeding, watering and increasing light in their enclosures, and improved management will reduce frequency of molting.

Inbreeding: Cross breeding and mating of closely related flock reduces the variant diversity, early mortality of keets, low fertility rate (Table 3) and poor breeding record (Ayorinde, 1987).

Extremes of temperature: Ambient temperatures of above 40°C usually result in reduced feed intake, poor reproductive performance (egg laying, low fertility and low sperm production). In the tropics therefore, the house where breeding guinea fowls are kept should be constructed and designed in such a way that heat stress in pen is reduced.

Disturbance: Guinea fowls need some privacy in their reproductive behaviour because they are shy birds compared with chickens. Mating is preferred in shaded and hidden environment away from observation. Fertility is reduced in pens where there is heavy human traffic, noise and other disturbances.

Disturbance is manifested by prevalence of smaller than normal sized eggs.

Natural Molting: molting is often observed to occur in intensively kept guinea fowl toward the end of the production season and may last for about 6-8 weeks. During the dry season of each year, partial molting is common. Molting in chicken has been associated with inert response, restricted light, poor feed and water, stress and hormonal changes (Wolford, 1984). Signs in guinea fowl include ruffled feather, loss of feather and reduced egg laying as low as 10-30%. An understanding of molting pattern in guinea fowl, its frequency, seasonality and influence on egg laying is very helpful in management practices that will enhance optimum reproductive performance.

Records: Records on disease problems, egg laying pattern, fertility rate, hatchability, dead germ, dead embryo in shell (table 3) are required in order to provide the basis for diagnosing low production, poor fertility and hatchability.

The proper keeping of good farm record will serve as a database for proffering solutions to reproductive problems in guinea fowl production.

Conclusion

Reproductive performance in guinea fowl is affected by a complex of factors, which include management and disease problems. However, these problems can be reduced by keeping of good farm records which will be most helpful in determining trends and diagnosis of specific problem militating reproductive performance in guinea fowl.

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