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Incidence of abnormalities in hatched day-old chicks of a commercial hatchery in Ogbomoso, Oyo-State, Southwest Nigeria

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Abstract

Apart from optimizing hatchability, an important aim of a hatchery operator is to deliver quality day-old chicks. This trial was conducted to assess egg fertility, hatchability and incidence of day-old chicks abnormalities in a commercial hatchery. A total of 183,019 fertile eggs were collected over a six-week period and incubated. From the resultant incubations, one hundred and seventeen thousand, one hundred and sixty eight (117168) hatched day-old chicks were examined and ranked (normal or abnormal) while deformed chicks were classified as Scattered legs, Impaired feathers, Head tumor, Extra legged chicks, Disoriented beaks, Unhealed navels, Eye issues and Runts.. Data collected were analyzed using descriptive statistics. Results indicated that egg fertility and hatchability were 81.3 and 82.5% respectively at the hatchery. Abnormal chicks based on fertile eggs were 0.93%. Type of abnormality revealed higher incidence of scattered legs, runts, impaired feathers and unhealed navel which were 0.22%, 0.23%, 0.24% and 0.14%, respectively while disoriented beak, head tumour and eye issues were at a lower incidence of 0.03%, 0.05%, and 0.04% respectively. Occurrence of three or more legged chicks was 0.002%. In conclusion, chick abnormalities were at a low incidence indicating optimum hatchery and breeder stock management practices. However, there is a need for proper monitoring and evaluation of hatcheries based on actual saleable day-old chicks.

Keywords: Day-old chicks; Fertility; Hatchability; Deformities; Incubation

Description of Problem

The quality of hatched out day-old chicks is an important criterion for successful hatchery operations and ultimately its profitability. The major goal is to maximize hatchability with a great number of high quality, saleable chicks needed by poultry producers for their viability, growth and egg production potentials (1). It is sometimes assumed that the success of hatching and quality of day-old chicks are linked and that high hatchability will translate into optimal chick quality. However, (2, 3) reported that the hatchability of an egg does not necessarily correlate with the quality of chick. Quality of the chick is dependent on factors such as the breeder's age, period and storage conditions of egg before incubation, incubation conditions, design and type of incubator, feed variations and farm source of eggs (4, 5, 6, 7). Similarly, egg fertility is affected by conditions directly related to the breeding hen and cock (8, 9, 10).

Modern electric incubators are equipped with automatic devices and generally used by the commercial hatcheries for hatching chicken eggs to meet the huge demand for quality chicks all over the world, particularly in the developed countries. However, despite an increasing demand for quality chicks, the hatchery operation in most of the developing

countries is not well organized. Major constraints to this include irregular or intermittent electric supply, lack of stand-by generators to combat power failure, lack of adequate training of personnel, inadequate supply of day-old chicks and lack of hatchery standards (11). In Nigeria, information is limited on abnormalities in day-old chicks and scientific data on grading of day-old chicks (7, 12) despite frequent reported cases of supply of low quality or deformed day-old chicks (13). This study was, thus, conceived with the following objectives: to evaluate the hatchability traits (fertility, hatchability, dead-in-shell, embryonic mortality, normal and abnormal chicks) and quantify the type of abnormality in day old chicks from a commercial hatchery in Oyo State of Nigeria.

Materials and Methods

The study was conducted in a commercial farm, Ogbomoso, Oyo State, Southwest, Nigeria. The total fertile eggs (183,019) used were collected weekly from the breeding section of the Hatchery. They were sorted, fumigated and stored in the egg storage facility where they were allowed to stand for 3-5 days. Before setting the eggs, the incubator was properly cleaned, disinfected and fumigated by using potassium permanganate and formaldehyde as per recommendations. The procedures for egg setting, candling at 7^{th} and 14^{th} day of incubation to determine the fertility and early embryonic mortality of hatching eggs were followed. The recommended temperature, relative humidity, ventilation and turning were followed according to standard practices on the farm. The hatching eggs were transferred from the setting trays to the hatching trays on the 18^{th} day of incubation. At the end of day 21 of each hatch (over a 6 weeks period), the incubator was opened. The number of hatched chicks including the normal, weak, abnormal chicks, dead in shell; dead chicks after hatch, un-hatched eggs and pips were carefully counted and recorded. The hatched chicks (117, 168) were carefully observed for various abnormalities, including runts, scattered legs, poor feathers (wet, rough feather and featherless chicks), head tumor, extra-legged chicks (three or more), disoriented beak, impaired navel and eye issues. Estimation of fertility, hatchability, embryonic mortality, dead in shell, normal and abnormal chicks hatched were recorded and calculated thus:

Fertility (%) = Total number of fertile eggs/ Total no of eggs set x 100%

Hatchability on fertile eggs (%) = No of eggs hatched out/Total no of fertile eggs x 100

Hatchability on set eggs (%) = No of eggs hatched out/Total no of eggs set x 100

Normal Chicks (%) = Total normal chicks/ Total chicks hatched x100

Abnormal chicks (%) = Total number of abnormal chicks/ Total number of chicks hatched x 100.

Data collected were analyzed using descriptive statistics.

Results

The total eggs set, fertility, hatchability, dead embryo, dead-in-shell or pips and percentage of normal or abnormal chicks on a weekly basis is shown in Table 1. The average number of eggs set per week was 30,594 with the highest value of 42,123 during week 5 and least value of 23,237 during week 6. The percentage fertility and infertility were 81.3% and 19.2% respectively. The hatchability based on set eggs and fertile eggs was 65.2% and 80.1% respectively. The percentage occurrence of abnormal chicks was 0.93% while percentage saleable chicks was 99.07%. The actual un-saleable chick based on fertile eggs was calculated as 19.82% over the six weeks of data collection. The result on type of abnormality (Table 2) showed that scattered

legs, runts and impaired feathers (wet, rough feathers and featherless) had incidence levels of 23.3, 24.7 and 23.6% respectively. Chicks with unhealed navel were 14.7% while the least incidence was observed for chicks with three or more legs (0.18%).

Table 1: Observations on weekly hatchability traits of eggs set

	Weeks						
Parameter (%)	1	2	3	4	5	6	Average
Total eggs set, no	27704	24898	25447	39610	42123	23237	30594
Fertility	83.3	80.8	80.7	82.3	77.4	83.4	81.3
Infertility	16.7	19.2	19.3	17.7	25.6	16.6	19.2
Hatchability on set eggs	71.4	61.4	69.1	62.6	54.4	72.4	65.2
Hatchability on fertile eggs	85.7	76.1	85.6	76.1	70.2	86.8	80.1
Dead embryo	9.97	18.5	9.49	14.6	14.5	8.03	12.5
**Dead-in-shell/pips	4.34	5.48	4.87	9.29	9.20	5.16	6.39
*Normal chicks	98.91	99.0	98.98	98.92	98.88	99.72	99.07
*Abnormal chicks	1.09	1.00	1.02	1.08	1.12	0.28	0.93

*As a percentage of hatched/examinable chicks at day-old

** Include dead-in-shell chicks, piped shells and weak chicks

Table 2: Classifications on abnormalities associated with hatched alone day-old chicks

Type of Abnormality	Frequency	% Abnormality[1]	%Abnormality[2]/Total chicks examined
Scattered legs	260	23.3	0.22
Impaired Feathers	276	24.7	0.24
Head Tumour	62	5.55	0.05
Extra legged Chicks	2	0.18	0.002
Disoriented beak	38	3.41	0.03
Unhealed Navel	164	14.7	0.14
Eye issues	52	4.66	0.04
Runts	263	23.6	0.23
Total	1117		

[1]based on fertile eggs

[2]based on total chicks examined

Discussion

The productivity of a poultry breeding operation can be evaluated through the number of quality chicks hatched. Maximizing hatchability and chick quality is therefore a crucial step in optimizing poultry production efficiency. The fertility of an egg is affected by the factors directly related to the breeding hen and cocks such as mating ability, sperm storage capacity, quantity and quality of semen deposited, male and female mating ratio, age, preferential mating, lighting and finally ability of the broody hen to produce a suitable environment for embryo formation and development (10, 14, 15). In this study, 81.3% fertility and 80.1% hatchability of fertile eggs obtained were lower than the 90.9% and 89.3% hatchability recorded by (16) with electric incubators. Fertility, hatchability of total egg set and hatchability of fertile eggs of over 80% from two farms in North Central Nigeria were recorded by (7). Fluctuations in incubator environmental factors, nutrition of the breeding hens, genetic constitution of the

embryo, disease, egg size, age and shell quality were the usual causes of reduced hatchability (16, 17), which is a common phenomenon in farms domiciled in less developed countries. The value of 12% recorded for dead embryo was higher than 5.5% obtained (16) but less than that of (7). Percentage of normal chicks was about 98%, which was similar to the values of 98.9, 99.6 and 97.9% reported from broody hen, rice husk incubator and electric incubator respectively (16). However, the percentage of normal chicks based on fertile eggs dropped to 80%, which was similar to the observation by (7).

The major types of abnormality observed were scattered legs, impaired feathers and runts. Occurrence of scattered legs and impaired feathers could be associated with poor nutrition of breeder hens, high incubator temperature, inbreeding and, smooth bottom hatching tray (9, 18, 19). Runts are usually attributed to setting eggs of low weight (20), while unhealed navels are due to high temperature in the incubator. Occurrence of cross or twisted beak and three or more legged chicks have been reported to be due to genetic or hereditary factors (13). Eye issues could be caused by elevated incubator temperature and/or too low oxygen level during incubation in days one to three. It was concluded (7) that farm source of hatchable eggs has effect on the type and magnitude of reproductive failures or egg abnormalities that occurred during incubation. Even though, the percentage of abnormal chicks appeared low and tolerable in this study, it should be established that the figures are bound to be higher if the more stringent Tona score or Pagar score (21, 22) were used. There is a need for commercial hatcheries in Nigeria to develop or adopt current day old chick scoring methods (15, 23) that will eliminate sale of day-old chicks of substandard quality.

Conclusions and Applications

Based on the findings obtained, the following observations were made:

1. Despite the advances in technology, improved management of breeder stock and hatchery operations, there are still incidences of abnormal day-old chicks.
2. There is need to improve on factors that impact positively on quality of day old chicks which, includes using appropriate breeder's age, good flock health, strain, egg quality, storage and incubation conditions, management practices and nutrition.
3. Standards should be established for commercial hatcheries in Nigeria by the relevant regulatory bodies
4. Hatchability should be based on actual saleable day-old chicks instead of the current use of number of hatched chicks.
5. Higher incidents of abnormalities in day-old chicks will significantly affect the economic efficiency of the hatchery, because it will result in financial loss and will also reduce profit. This is why it is necessary for hatcheries to do it right in order to prevent or reduce its occurrence.

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