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QUALITY ASSESSMENT OF BROILER AND PULLET DAY-OLD CHICKS HATCHED IN IBADAN, OYO STATE

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ABSTRACT: *The quality of day-old chicks determines the foundation and performance of a flock on the farm. This study randomly selected five-day-old chicks from 8 commercial hatcheries within the Ibadan metropolis to assess the quality of day-old broilers and pullets produced. The chicks were subjected to physical examination and microbial screening. Physical parameters checked include chick weight, chick length and agility, while organ swabs cultured produced the following microbes viz., coliform and non-coliform bacteria, Escherichia coli, Shigella sp, Salmonella sp and Proteus sp.` The result shows that there were significant effects (P<0.05) of sources on chick body weight, with highest (39.66±0.54g) and lowest (31.80±0.54g), chick body length with highest (17.10±0.17cm) and lowest (13.70±0.17cm), and chick agility with lowest time (0.20±0.03min) and highest time (0.50±0.03min). In most of the hatcheries surveyed, microbial isolates are too numerous to count, which is an indication of contamination due to poor hygiene and sanitation in and around the hatcheries. This will have a negative effect on the quality of the chicks produced and hence their performance. It is hereby recommended that hatcheries should improve on-farm and hatchery hygiene and biosecurity.*

KEYWORDS: Chicks quality, Hatchery, Ibadan, Microbes, Physical Parameters

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INTRODUCTION

The poultry industry serves as one of the major and fastest means of correcting the shortage of animal protein in Nigeria (de Vries-Ten Have et al., 2020). The growth in population all over the world has increased the demand for animal protein also sourced from poultry (Koteeswaran *et al*., 2004). Poultry meat is highly nutritious and contains all the essential amino acids required by the human body (Lester, 2003). Among these poultry species, chicken and turkey are common in Nigeria (Fairchild, 2005). As with every production system, the quality of day-old chicks as the primary input has a big effect on the overall performance of the flock. However, until recently, day-old chick quality has received little attention, as there has been no universally established method for quality assessment (Tona *et al*., 2005). Currently, the determination of chick quality is mainly based on observations such as whether the navel is completely sealed and on the presence or absence of deformities. While these are prerequisites to good performance, there are chicks that can be dry and have completely sealed navels with no deformities, which will still perform poorly (Fairchild, 2005). Development of the poultry sector in Nigeria is hampered by a number of factors, of which diseases are considered one of the major factors (Das *et al*., 2005). Diseases of poultry such as Salmonellosis, Mycoplasma and Avian Encephalitis (Samad, 2000), which can be transmitted vertically, especially from hatcheries, have been incriminated for a high percentage of morbidity and mortality in poultry production. Hence, the need to assess the present status of broiler day-old chicks used in poultry production in Ibadan.

MATERIALS AND METHODS

This study was carried out in Oyo state, which is located in the South-West geopolitical zone of Nigeria with the coordinates of 8.1196ºN, 3.4196ºE, and covers a total of 28,454 square kilometres of land mass. It consists of 33 Local Governments and 29 Local Council Development Areas.

Day-old chicks from eight (8) different commercial hatcheries located in Ibadan were used for the study. Five (5) day-old broiler chicks were randomly collected from each hatchery, making a total of forty (40) day-old chicks and then taken to the laboratory for analysis. The hatcheries that were visited were tagged with the following codes: A, B, C, D, E, F, G, H.

The study was carried out at the microbiology laboratory of Chi farm, Ibadan, Oyo state, from July to August 2019 and lasted for a total period of seven (7) weeks.

For isolation and identification of bacteria, the yolk sac, liver, lung, cloacal swab, tracheal swab and kidney were collected from the birds.

Materials used included Post mortem trays, Post mortem set, Test tube, Test tube wrack, Hand gloves, Petri dishes, Conical flasks, measuring cylinder, Glass slides, Cotton swabs, Bijou bottle, Autoclave, Wire loop, op Microscope, Weighing scale, Ruler, Stopwatch.

Media used in the experiment were Saboraud Dextrose agar, Eosine methylene blue (EMB) agar, Brilliant green agar, MacConkey agar, Nutrient broth, Cetrimide agar, Xylose Lysine Deoxycholate (XLD). Reagents used included Crystal violate, Safranin solution, Methyl red and Volges-Proskauer broth (MR-VP broth), Phenol red, Methyl red, 10% KOH, Tetrathionate

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broth, Hydrogen peroxide, Potassium iodide, Kivac's reagent, Peptone water, Acetone alcohol, 50% glycerol etc.

A mixture of swab samples in buffered peptone was enriched using a special medium, Tetrathionate broth, for 18-24hrs and incubated at 37°C. Subcultures from the enrichment broths were performed by re-culturing in a selective medium such as Brilliant green agar for *Salmonella*, Eosine methylene blue agar for *E.coli*, MacConkey agar for *Proteus, Coliform* and *non-coliform* bacterials, Cetrimide agar for *Pseudomonas*, Xylose Lysine Deoxycholate agar for *Shigella* and Sabouraud dextrose agar for *Fungi* which were incubated for another 24 hours.

The chicks were assessed for physical qualities based on the following parameters; chick weight, chick length, navel closure, physical deformity and time taken for a chick to stand on its feet when placed on its back (agility).

Sterile swab sticks were used to take samples from the yolk sac, liver, lung, kidney, cloaca swab and trachea swab and pre-enriched in buffered peptone water for 4-6hrs.

A mixture of swab samples in buffered peptone was enriched using a special medium, Tetrathionate broth, for 18-24hrs and incubated at 37°C. Subcultures from the enrichment broths were performed by re-culturing in a selective medium such as Brilliant green agar for *Salmonella*, Eosine methylene blue agar for *E.coli*, MacConkey agar for *Proteus, Coliform* and *non-coliform* bacteria, Cetrimide agar for *Pseudomonas*, Xylose Lysine Deoxycholate agar for *Shigella* and Sabouraud dextrose agar for *Fungi* which were incubated for another 24 hours. The organisms were sub-cultured using different media for confirmation of the organisms earlier. Biochemical tests were performed to aid the characterisation of the isolates. The gram staining technique employed was done to identify the different bacteria present by their gram reaction. The slides were viewed under a Microscope using x 100 magnification or oil immersion.

The data collected were subjected to descriptive statistics (such as mean, standard deviation and variance) and ANOVA.

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RESULTS AND DISCUSSION

RESULTS

The descriptive values for the physical parameter of broiler day-old chicks are shown in Table 1. The study revealed a mean value of (35.60±3.41g), (15.16±1.09cm) and (0.35±0.15min) for body weight, body length and chick vitality, respectively. The table shows a minimum value of (30.00±3.41g), (13.50±1.09cm) and (0.10±0.15min) for body weight, body length and vitality, respectively while there is a maximum value of (40.50±3.41g), (17.70±1.09cm) and (0.70±0.15min) for body weight, body length and vitality respectively.

Table 1: Descriptive values for the physical parameters of the day-old chicks

Variables	Mean	Variance	Min	Max	Range
Body weight(g)	35.60± 3.41	11.60	30.00	40.50	10.50
Body length(cm)	15.16± 1.09	1.18	13.50	17.70	4.20
Vitality (min)	0.35±0.15	0.21	0.10	0.70	0.60

Min- Minimum

Max- maximum

Physical observations on physical qualities of broiler day-old chicks

The Physical observations on physical qualities of broiler day-old chicks are shown in table 2. The result shows that there were significant effects ($P<0.05$) of sources on chick body weight, chick body length and chick vitality, respectively. The highest body weight of the chick was obtained from hatchery B (39.66±0.54g), while the lowest body weight was obtained from hatchery E (31.80±0.54g). The result also shows that the highest body length of chicks was obtained from hatchery B (17.10±0.17cm), while the shortest body length was obtained from hatchery H (13.70±0.17cm). The highest chick vitality was obtained from hatchery B (0.20±0.03min), while the lowest chick vitality was obtained from hatchery G (0.50±0.03min). For all the parameters, there was no significant difference ($P>0.05$) in all hatcheries with the same superscripts, as shown in Table 2.

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Table 2: Physical observations on physical qualities of broiler day-old chicks

	Sources								
Variables	A	B	C	D	E	F	G	H	SE
Body weight (g)	36.20^{b}	39.66^{a}	32.00^{d}	39.20^{a}	31.80^{d}	39.00^{a}	34.52^{c}	32.40^{d}	0.54
Body length (cm)	15.80^{b}	17.10^{a}	14.10^{e}	16.00^{b}	14.80^{d}	15.30^{c}	14.50^{d}	13.70^{f}	0.17
Vitality (min)	0.30^{c}	0.20^{c}	0.40^{a}	0.30^{c}	0.40^{a}	0.30^{c}	0.50^{a}	0.40^{c}	0.03

a, b, c, d, e, f- means with different superscript on the same horizontal row differ significantly suggesting significant difference in parameters tested. (P< 0.05)

SE- Standard error

Microbial Assessment of Sampled Broiler Day-old Chicks

The microbiological assessments of sampled broiler day-old chicks are shown in Table 3. In the microbiological assessment, the chicks were screened for eight different microbes (*Escherichia coli, Coliforms, Non-coliforms, Salmonella spp, Shigella spp, Proteus spp, Fungi (yeast/mould)* and *Pseudomonas spp*) while a total number of five microbes (*Coliforms, Non-coliforms, Escherichia coli, Salmonella spp* and *Proteus spp* were isolated. The result shows that there were significant effects (P< 0.05) of sources on the number of *Coliforms, Non-coliform, Salmonella and E.coli,* while there was no significant effect (P>0.05) of sources on the number of *Shigella, Proteus*, *Pseudomonas* and *Yeast/mould*.

Salmonella colonies showed pink/red colour with red hallow on the agar as a non-lactose fermenter. *E. coli* colonies showed dark colour with a metallic green sheen on the agar, indicating a lactose fermenter. Proteus showed a cream to colourless colouration with swarming characteristics on the agar. *Coliform* bacteria, which are pink in colour are lactose fermenters, and *non-coliform* bacteria show a cream-colourless appearance on the agar, indicating that they are non-lactose fermenters.

From all sources that showed the presence of *Coliform, non-coliform, E. coli, salmonella and Proteus* bacteria, the highest number of *coliforms* was obtained from hatchery B, E and F (TNTC) while the lowest number of *coliforms* was obtained from hatchery D (17cfu). The highest number of *non-coliforms* was obtained from hatchery G (156cfu), while the lowest number of *non-coliforms* was obtained from hatchery F (15cfu). The presence of *E. coli* was highest in hatcheries E and G (TNTC), while the minimum number of *E. coli* was obtained from hatchery D (27cfu). The highest *salmonella* presence was obtained from hatchery G (89cfu), while the lowest number of Salmonella was obtained from hatchery D. All sources showed no presence of *Shigella, Pseudomonas* and *Yeast* (0.00±0.00). The presence of *Proteus* was obtained from hatchery F (4.8±0.23), while all other sources showed no traces of Proteus (0.0±0.23).

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Table 3: Microbial assessment of sampled broiler day-old chicks

Variables	Sources A	B	C	D	E	F	G	H
Coliforms (cfu)	52	TNTC	72	17	TNTC	TNTC	102	107
Non-coliform (cfu)	29	-----	39	25	-----	15	156	-----
E. coli (cfu)	47	40	29	27	TNTC	206	TNTC	207
Salmonella (cfu)	27	-----	39	15	-----	-----	89	-----
Proteus (cfu)	-----	-----	-----	-----	-----	24	-----	-----
Shigella (cfu)	-----	-----	-----	-----	-----	-----	-----	-----
Pseudomonas (cfu)	-----	-----	-----	-----	-----	-----	-----	-----
Yeast/Mould (cfu)	-----	-----	-----	-----	-----	-----	-----	-----
Total plate count (cfu)	81	TNTC	TNTC	32	TNTC	TNTC	TNTC	197

Keys:

TNTC- Too numerous to count

CFU- Colony forming unit

SE- Standard error

00 colonies/plates--- Excellent

1-20 colonies/plates----Good

21-50 colonies/plates---- Fair

51-120 colonies/plates----Unsatisfactory

121 and above colonies/plates---- poor

(Albert and Bruce,1994)

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Physical appearance of the body (whether deformed or not deformed) of sampled broiler day-old chicks from different hatcheries.

The physical appearance of the body of sampled broiler day-old chicks from different hatcheries is shown in Fig 2. It shows that hatcheries A, B, D, E and F had no deformity. One chick out of five from hatcheries C and H had a record of deformity, while two chicks were deformed from hatchery G.

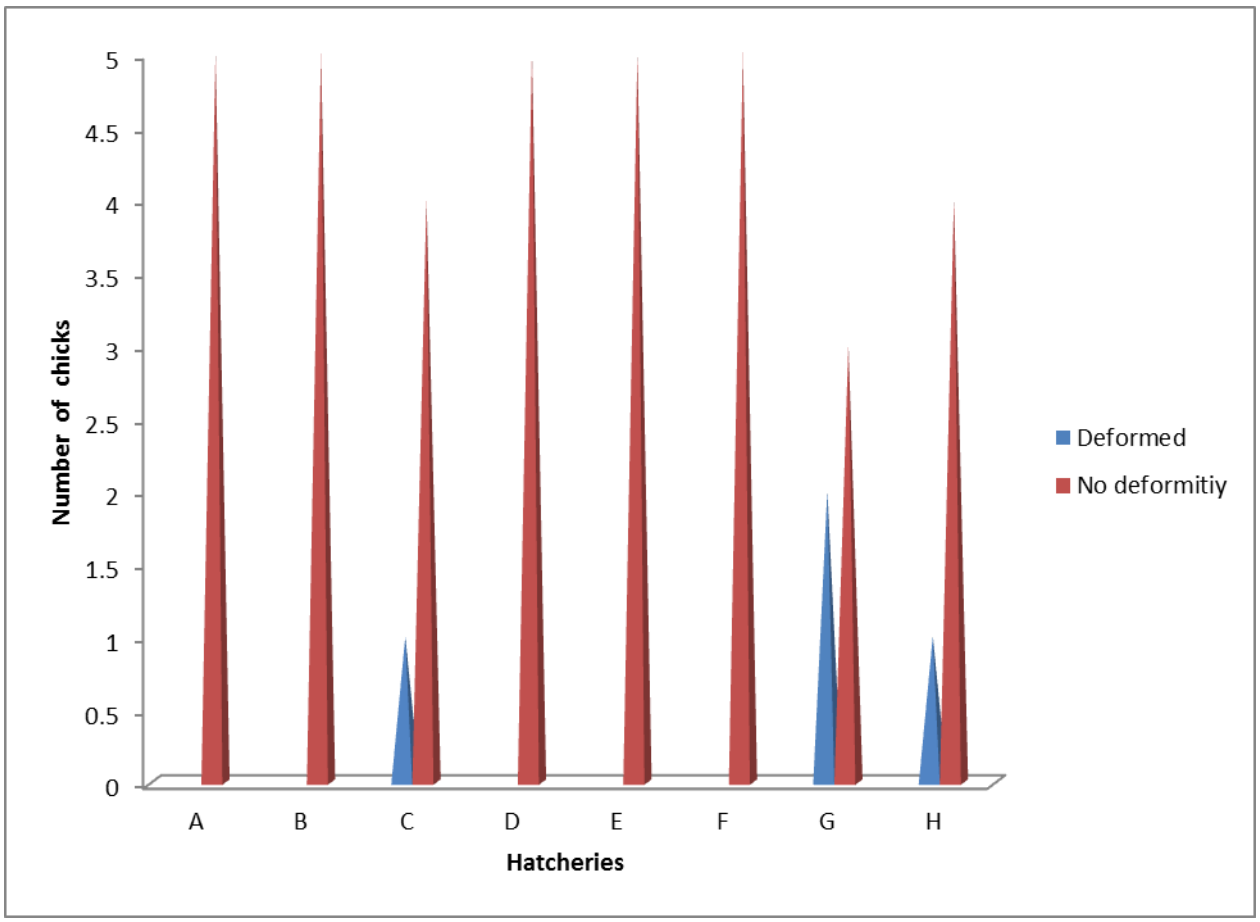

Fig 1: The physical appearance of the body (whether deformed or not deformed) of broiler day-old chicks from different hatcheries.

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DISCUSSION

This study was carried out in Ibadan using both quantitative and qualitative chick quality assessment parameters. Tona *et al.* (2005) suggested that though some unknown factors can be involved in chick quality definition, quantitative (weight or length) and qualitative assessments of day-old chick quality are relevant and related to performance. In this study, a significant difference ($p<0.05$) was observed in the body weight of the day-old chicks from the different sources, with source B showing the highest mean body weight (39.66±0.54g), which is contrary to the standard of 42g as recommended by Molenarr *et al.,* (2008). Though body weight is an easy and highly objective measurement, the value is relative. Day-old chick weight is highly correlated with egg weight but does not give a good indication of chick development (Meijerhof, 2005). This is because chick weight contains the real egg weight. So, it is the amount of egg that is transformed into the chick tissue and remaining yolk residue. Embryos use the fat in the yolk as fuel for their development, and therefore, the deviation between real chick weight (without remaining yolk sac) and yolk residue is an indicator of development. If a lot of yolk is left over, then lesser body weight should be expected (Meijerhof, 2005). Under practical conditions, many birds have access to feed only 36-48h after hatching of the batch, and during this time, body weight decreases speedily (Noy and Sklan, 2004). Several studies reported an inverse relationship between the duration of holding time (at the hatchery and the transportation duration) after hatch and the chick's subsequent growth (Decuypere *et al.,* 2001).

The chicks from source B showed significantly ($p<0.05$) higher mean chick length values (17.10±0.17 cm) than the chicks from the other sources, which is also below the standard of 18.5cm as recommended by Molenarr *et al.,* (2008). Meijerhof (2005) reported the importance of chick length as a more practical way to measure chick development. The length of the chick is a rather accurate and repeatable way of measuring development. Large samples of chicks can be checked in a relatively short time frame which can be taken by stretching the chick and taking the length from the tip of the beak to the middle toe. This has been reported to positively correlate with performance (Merjorhof, 2005).

A vital day-old chick is an active chick that has the physiological potential to grow at the best rates with the lowest feed conversion rates (Fairchild, 2005). Vitality results from optimum differentiation, growth and the maturation of all organs and physiological controlling circuits. The chicks from source B showed a significantly ($p<0.05$) higher vitality than chicks from other sources when placed on their back.

Tona (2003) and Tona *et al.* (2005) established the correlations between several of the qualitative parameters that have been included in determining chick quality. Also, other conditions that contributed to the number of chicks with subnormal conditions (deformity) include the amount of retracted yolk, remaining membrane, lameness, blindness, deformed beak and general appearance. Although, only a few sources (C, G and H) had a record of deformed chicks.

The day-old chick quality depends mainly on broiler breeder's age due to hatching egg weight changes and egg quality characteristics. It is reported that as broiler breeders get older, egg weight increases, shell thickness decreases and the proportion of yolk increases (Peebles *et al.,* 2000). Hatching eggs obtained from younger breeders have better albumen quality and thicker shells. The chicks hatched from these eggs have a higher percentage of better-quality day-old chicks (Tona *et al.,* 2004a). Old breeder flocks produce a greater number of heavier chicks due

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to an increase in egg weight (O'Dea *et al.,* 2004). The percentage of subnormal quality chick, however, increases in older broiler breeder flocks (Tona *et al.,* 2001; Boerjan, 2002; Tona *et al.,* 2004a).

The microbiological quality assessment indicates the presence of five different bacteria organisms (*Escherichia coli, Coliforms, Non-coliforms, Salmonella spp and Proteus spp*) from the different chicks sampled. The microbes were isolated from the chicks' yolk sac, liver, lung, kidney, cloaca swab and trachea swab. Although some of the organisms isolated are normal micro-flora, the high number of organisms isolated from the chicks is an indication of poor hatchery hygiene. *Escherichia coli* and *Coliforms* (*Klebsiella, Citrobacter, Enterobacter*) were isolated from all sources. Strains of *Escherichia coli* normally predominate at the intestinal tract, and most of them are not pathogenic. Certain serotypes, however, can be associated with yolk sac infection (Omphalitis), which is frequently accompanied by an infected or unabsorbed yolk sac (Geidam *et al.,* 2008). *Salmonella species* are intracellular pathogens and they usually invade only the gastrointestinal tract and cause salmonellosis (Su and Chiu, 2007). *Proteus spp* has been reported to cause yolk sac infection either on its own or, more commonly together with *Escherichia coli* (Matsuyama *et al.,* 2000). The poor microbiological quality of chicks from a particular source will be compounded if the chicks have poor navel closure. This is because the bacterial organisms might gain entrance through the open navel, which can lead to yolk sac infection even by organisms that are thought to be normal flora.

In addition, the high level of these organisms also indicates that the breeder parent stock might have been infected or exposed to contamination, thus aiding the vertical transmission of the organisms to the chicks. Contaminated breeder feed and water are very good routes for introducing these infectious agents to a flock. Hence, effective hygiene at this level of poultry management is very important.

CONCLUSION AND RECOMMENDATION

It can thus be concluded that the day-old chicks hatched in Ibadan have varying qualities. A source with good physical qualities does not guarantee good microbiological quality. Hence, farmers should be particular about the history of hatcheries and eggs hatched in order to ascertain good delivery of quality chicks.

Farmers should, therefore, check on past records of the performance of the hatchery before purchasing day-old chicks.

History of vaccination and proper treatment of breeders' stock against infectious agents that are transmitted vertically should be noted.

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