INFLUENCE OF DRINKER-TYPES AND WATER TEMPERATURE ON SELECTED PHYSIOLOGY, WATER AND FEED INTAKE OF BROILER CHICKENS REARED DURING HOT SEASON

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Abstract
This study was carried out to determine the influence of bell and bowl drinkers and water temperature (cold (28.81°C) and ordinary (30.75°C)) on rectal temperature (RT), respiratory rate (RR), heart rate (HR), water and feed intake of broiler chickens reared during hot season (January–March). One hundred and twenty eight (3 weeks old) broiler chickens were randomly allotted to four treatments (cold and ordinary water supply using bell and bowl drinkers) in a 2x2 factorial arrangement. Data were collected on RT, RR HR, water and feed intake and analysed using ANOVA. Highest (P<0.05) RT (41.02°C) was obtained with broiler served ordinary water with bell drinker while broilers on ordinary water with bowl drinker had least (40.72°C). Highest (P<0.05) daily water intake (379.53ml/b) was recorded with broilers on cold water in bell drinker while least water intake (349.92ml/b) was recorded with those on ordinary water in bell drinker. Feed intake of broiler chickens was not (P>0.05) influenced by water temperature and drinker-types. The study concluded that bowl drinker was suitable in broiler production during hot season where optimum water intake is desired without detrimental effect on rectal temperature, respiratory and pulse rates.

Keywords: broiler, drinker, water and rectal temperature, feed and water intake

Introduction

Broiler chickens are reared primarily for meat. They have large appetites and water intake which had been reported to be twice or more than feed intake depending on the season and weather condition (Fairchild and Ritz, 2012). Water temperature is an important factor affecting feed consumption in broilers. In hot climates, water consumption will be significantly reduced as the water temperature increases (Jones and Waterkins 2009). It is usually common for birds to consume more water when ambient and body temperature increases (Fairchild and Ritz, 2012) as one of the main ways birds regulate body temperature particularly when the water temperature is lesser than the body temperature.

Water management is a function of the water quantity, quality and ease access for adequate water intake for maximum body functioning and performance. In view of the importance of water in the physiology of poultry in general and broiler chickens in particular, the poultry industry has introduced modifications in the design of water equipment, including drinkers for easy access and to maximize efficient water utilization (Bruno *et al.*, 2011). Such drinkers present some advantages over others. They have been reported to require less labour, waste less water and improve health aspects (Macari, 1996). Therefore, drinkers that enable higher and easy accessibility to water has been recommended for use in broiler production especially at high environmental temperatures (Silva *et al.*, 2005).

Different drinker types are available in the market. They include drinking trough, bell drinker (500ml-10l), automatic drinkers (20litters of water or according to size), nipple, cup drinkers (Mark *et al.*, 2013) etc. without prejudice to suitability to the efficiency and environmental conditions. This study therefore aimed to determine the influence of drinker types and water temperature on rectal temperature, respiratory and heart rates, and feed and water intake of broiler chickens reared during hot season.

Materials and Methods

The experiment was carried out at the poultry unit of Ogun-Osun River Basin Development Authority (ORBDA) between the month of January and March. The farm is located along Alabata road in Odeda Local Government Area of Ogun State. The area lies in the south-western part of Nigeria. The vegetation represents an interphase between the tropical rain forest and the derived savannah.

A total of one hundred and twenty eight (3weeks old) broiler chickens were used. They were allotted

to the four treatments and each treatment was replicated four times. The treatments comprised of two drinker-types (Bell and Bowl) and two water temperature (cold (28.81°C) and ordinary (30.75°C)) in a 2x2 factorial in a deep litter system.

Feed was provided for the birds *ad libitum* every day. The drinkers were filled with water which was measured before serving the birds. In the afternoon (13hour), before administering cold water, analogue thermometer was used to measure the temperature of the water in each drinker. Thereafter, cold water was added to treatments 1 (Bell drinker, cold water) and 3 (Bowl drinker, cold water) and the temperature was measured again at 30, 60, 90 and 120minutes per treatment and replicate. Control was set up alongside each treatment and replicate outside each pen where the birds could not gain access to determine evaporative loss and accurate water intake daily. All recommended vaccinations and medications were administered.

Data were collected on physiological parameters such as rectal temperature, respiratory rate and heart rate. Rectal temperature was measured by inserting a digital thermometer in the rectum of the birds and it was measured on 3 birds per replicate. Respiratory rate was measured as the number of breathe per minute (bpm). Heart rate was measured with aid of stethoscope and it was also measured on 3 birds per replicate. Daily feed and water intake were determined as the balance between feed and water supplied and respective left-over.

All data collected were subjected to analysis of variance of 2x2 factorial and the means were separated using Duncan's multiple range test as contained in SAS (2002).

Results and Discussion

Interactive effect of drinker-types and water temperature on RT, RR and HR of broiler chickens is shown in Table 1. Drinker-types and water temperature had significant ($P<0.05$) influence only on RT. Birds on ordinary water served with bell drinker recorded highest RT or body temperature (BT) (41.02°C) while those on ordinary water served in bowl drinker recorded least (40.72°C). Water temperature below body temperature helps with heat dissipation and body temperature regulation (Jones and Watkins, 2009). Since cold water in this study had lower temperature (28.81°C) compared with ordinary (30.75°C) it was therefore not impossible that cold water intake was responsible for the low RT (BT) recorded in this study as opined by Jones and Watkins (2009). However, RT of the birds irrespective of the drinker and water temperature were still within the normal range (40.6-43.0°C) recommended for healthy chicken (Robert, 2004). **Water temperature** plays a major role in water intake of birds (Puma *et al.*, 2001; Butcher and Miles, 2003). According to Jones and Watkins (2009) birds drink cold water that is near freezing in temperature and will suffer from extreme thirst rather than drink water that is a degree or two above their body temperature. However, the result (Table 1) revealed that similar ($P>0.05$) RT was recorded among birds on cold (28.81°C) or ordinary (30.75°C) water served through bell drinker and those on cold (28.81°C) water served through bowl drinker. This implied that either bell or bowl drinker could be used in broiler production during hot season in as much as the birds have free and easy access to the water therein. This opinion was in consonant with that of May and Lott (1992) who reported that adequate availability of the water in drinker systems at high temperatures was more important than the drinker systems. Therefore, the availability of good quality, cool and clean water is of paramount importance in broiler production under hot climatic conditions.

Interactive effect of drinker-types and water temperature on feed intake and water intake of broiler chickens reared during hot season is shown in Table 2. Interaction between drinker-types and water temperature had no significant ($P>0.05$) effect on feed intake of the birds. The findings of Feddes *et al.* (2002) who reported that water nipple density had no effect on broiler performance and Abioja *et al.* (2011) who reported no significant effect of feed intake of broiler with water temperature gave credence to this result. Water intake is related with feed intake and thus any decrease in water consumption due to failure in the water supply or lack of watering space would result in decreased consumption of feed (Lott *et al.*, 2003). In this study, water intake was more than double feed intake. It implied that there was adequate water supply and watering space. Significantly ($P<0.05$) higher water intake was observed with broiler reared during the period of study. Broilers on cold (28.81°C) water served using bell drinker had highest daily water intake (379.53ml/b) while birds on bowl drinker with cold water (28.81°C) had the least (349.92ml/b). This result was not unexpected as broilers had been reported to have higher intake of cold water during hot weather (Fairchild and Ritz, 2012). Nevertheless, this result was at variance with the finding of Abioja *et al.* (2011) who reported no ($P>0.05$) relationship between water intake with

water temperature.

Conclusion and Recommendation

The study concluded that bowl drinker type could be used in broiler production during hot season where adequate water intake is desired without detrimental effect on rectal temperature, respiratory and pulse rates.

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Table 1: Interactive effect of drinker -types and water temperatur e on rectal temperature, respiratory and heart rates of broiler chickens reared during hot season

Parameter	Drinker-Type and Water Temperature				SEM
	Bell/Cold	Bell/ Ordinary	Bowl/Cold	Bowl/Ordinary	
Rectal Temperature (°C)	40.98[a]	41.02[a]	40.91[a]	40.72[b]	0.06
Respiratory Rate (bpm)	40.60	40.54	40.64	40.51	0.15
Heart Rate (bpm)	112.115	112.11	112.03	112.03	0.21

[a,b] means on the same row with different value altered significantly ($p<0.05$).
SEM- standard error of mean

Table 2: Interactive effect of drinker -types and water temperature on feed and water intake of broiler chickens reared during hot season

Parameters	Drinker-Types and Water Temperature				SEM
	Bell/Cold	Bell/Ordinary	Bowl/Cold	Bowl/Ordinary	
DWI (ml/bird)	379.53[a]	349.92[b]	373.72[a]	360.26[ab]	6.88
DFI (g/bird)	113.57	113.57	118.57	112.12	0.00

[a,b] - on the same row with different values altered significantly ($p<0.05$)
DWI- Average daily water intake
DFI- Average daily feed intake
SEM-Standard error of mean