EFFECT OF HOUSING SYSTEM ON BEHAVIOUR AND WELFARE STATUS OF COCKEREL CHICKENS

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ABSTRACT
A total of one hundred and eighty 8-week old cockerel chicks were used to evaluate the effect of different housing types on the performance of Isa brown cockerels. Sixty birds each were assigned to three housing types; deep litter (DL), deep litter with outdoor access (DLOA) and free range (FR) in a completely randomized design with each housing type serving as a treatment and having 4 replications of 15 cockerels each. Data were collected on behavioural and welfare parameters. All data generated were subjected to statistical analysis. The results showed that cockerels on the DL housing stood and drank more and sat less compared to the FR group. The DL group were more aggressive than the DLOA group. The DLOA group forage more than the DL group. Level of fear and stress were not influenced by housing as tonic immobility was similar amongst the housing types. It can be recommended that management systems that give outdoor access can be used to rear male layer type chicken to encourage positive behaviours and reduce the negative behaviours without adverse effect on their fear levels.
Keywords: Housing, cockerels, behaviour, welfare, tonic immobility

INTRODUCTION

Current intensive poultry production systems mainly aim to maximize profit and offer new solutions which increase productivity ignoring the natural needs of birds (El-Kazaz, 2018). Ignoring welfare of the birds is not only an ethical issue but it also affects directly weight gain, health and behaviour of birds (El-Kazaz, 2018). Sosnowka-Czajka *et al.* (2007) highlighted the public concern for the welfare of animals and recommended free range system as an alternative that could take welfare of birds into consideration by allowing the expression of their normal behaviour and thus becoming more popular. There is therefore increase in efforts by producers to meet growing sensitivity of consumers of agricultural commodities to animal welfare. One of the concepts designed to meet animal welfare is to guarantee the "five freedoms" proposed by the Farm Animal Welfare Council in 1997 as reported by Appleby *et al.* (2004) and Sossidou *et al.* (2011). Welfare could be monitored in different housing systems by measuring some physiological parameters that are used for estimating stress such as Heterophil and lymphocyte ratio (HLR), tonic immobility and behavioural data (El-Kazaz, 2018). Good animal welfare as summarized by Campbell *et al.* (2022) would be achieved when an animal is allowed to display natural behaviours (natural living), be healthy and function normally (basic health and functioning), and experience a generally positive emotional state (affective state). This study was conducted to evaluate the effect of housing system on behaviour and welfare status of ISA Brown cockerel chickens.

MATERIALS AND METHODS

A total of 180 cockerel chicks were used for the study. The birds were sourced from a reputable hatchery. The birds were reared on deep litter with all routine management practices adhered to in the first eight weeks. At the end of the eighth week, three housing types namely; deep litter (DL), deep litter with outdoor access (DLOA) and free range (FR) were used to rear the birds. Sixty birds each were assigned to the three housing types; DL, DLOA and FR in a completely randomized design. Each housing type served as a treatment. Each treatment had 4 replications of 15 cockerels each. The DL group were reared indoors. The DLOA group had an indoor pen that opened onto an outdoor area, which was surrounded by net fencing. The FR group were taken out in the morning and only returned into the deep litter pens in the evening. The diet used was formulated according to recommendations by Ogundipe *et al.* (2022) of 16.00% crude protein and 2700.00 ME kcal/kg for grower 1. All the birds were given feed and water *ad libitum*.

Data Collection

Behavioural observations

Behavioural observations of birds in each pen were made at 8 and 16 weeks of age as outlined by Zandbergen (2016). Focal sampling was used to measure the frequency of behavioural events. The observations were carried out by observers who stood in front of each replicate with the first five minutes used for adaptation of hens to their presence. After the adaptation period, each observer took frequency of the various behaviours for 5 minutes in each pen. Data were summed and the percentage of each behaviour was computed.

Tonic Immobility

Tonic immobility was carried according to the procedure reported by Mahboub *et al.* (2004). Tonic immobility was induced as soon as a bird was caught by placing the animal on its back. The bird was restrained for 10s. The observer sat in full view of the bird, about 1 m away, and fixed his/her eyes on the bird because of the fear-inducing properties of eye contact. If the bird remained immobile for 10 s after the experimenter removed his/her hands, a stopwatch was started to record latencies until the bird rights itself. If the bird righted itself in less than 10s, then tonic immobility was considered not to have been induced and the restraint procedure was repeated. If the bird did not show a righting response over the 15-min test period, a maximum score of 900s was given for righting time.

All data generated were subjected to analysis of variance using the General Linear Model (GLM) procedure of Statistical Analysis System (SAS) package Version 9.0 software (Statistical Analysis System, 1994, SAS Institute Inc., Cary, NC, USA) and statistical significance was set at $P<0.05$. Statistical differences between means were separated using Duncan's Multiple Range Test method in the software (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

Effect of different housing on behavioural observations of ISA Brown cockerels

The results on the effect of different housing systems on behavioural observations in Table 1.

Table 1: Effect of Different Housing on Behavioural observations of ISA Brown Cockerels (%)

Parameters	DL	DLOA	FR	SEM
Sitting	10.47[b]	14.52[ab]	15.75[a]	0.89
Standing	17.77[a]	13.94[ab]	14.49[b]	0.90
Feeding	22.18	17.58	19.69	1.36
Drinking	6.82[a]	4.81[ab]	4.51[b]	0.35
Aggression	5.99[a]	3.66[b]	4.96[ab]	0.59
Preening	7.36[a]	7.12[ab]	5.77[b]	0.31
Foraging	15.30[b]	18.64[a]	16.71[ab]	1.02
Walking	13.44	18.12	16.86	3.17
Dust bathing	0.66	1.61	1.17	0.49

[a, b, c] means in a row with different superscript(s) differ significantly ($P<0.05$); SEM – standard error of mean; DL- Deep litter; DLOA- Deep litter with outdoor access; FR- Free range

The results showed no significant ($P>0.05$) differences on feeding, walking and dust bathing. Sitting, standing, drinking, aggression, preening and foraging were significantly affected ($P<0.05$) by housing system. The cockerels in free-range housing type sat more than ($P<0.05$) cockerels in deep litter. Rearing cockerels on deep litter with run made them stand more ($P<0.05$) compared to rearing in free range. Cockerels reared on deep litter with run exhibited similar ($P>0.05$) standing behaviour with both cockerels reared deep litter or free range. Birds reared on deep litter engaged more ($P<0.05$) in drinking than those reared on free range. Drinking behaviour of birds reared on deep litter with run was similar ($P>0.05$) with that of those on deep litter or free-range. Cockerels reared in deep litter were more aggressive than those reared on deep litter with run. Aggression in free-range cockerels was similar to that of reared in deep litter or deep litter with run. Cockerels reared on deep litter preen more ($P<0.05$) often than those reared on free range. Preening in, deep litter with run was similar ($P>0.05$) to both free-range and deep litter. Cockerels housed in deep litter with run foraged more ($P<0.05$) than those reared on deep litter but not more than ($P>0.05$) those reared on free range. Free range and deep litter reared cockerels showed similar ($P>0.05$) foraging behaviours as observed in this

experiment. Behaviour describes the activities of birds and tells a lot about their wellbeing which can impact greatly on their performance (FAI, 2019). What is often called activity can be broadly described as behaviour of the flock (FAI, 2019). Performing certain behaviours can be rewarding for two reasons. Firstly they can directly receive something they value from performing the behaviour such as uncovering a loose bit of food. Secondly, they are able to satisfy an instinct to perform that behaviour (FAI, 2019). Observation of behaviour helps to determine whether housing conditions are good and subsequently assess the wellbeing of the flock. Observing a change in behaviour can be a first indicator that something is wrong. In the current study, feeding, walking and dust bathing were not influenced by housing type while sitting, standing, drinking, aggression, preening and foraging were significantly affected. Similar to these findings, Fortomaris *et al.* (2007) reported that housing type had significant effect on preening and aggressive behaviours of broiler chickens reared on floor or in cages. As observed in this study, all husbandry systems appear to allow expression of preening and aggressive behaviours. Preening behaviour usually occurs in response to peripheral stimulation from feather disarray and as displacement activity in mild frustrating or conflict situations or parasite infestations (Fortomaris *et al.,* 2007). Aggressive behaviour was higher in deep litter groups compared to those on free range. Restriction in the deep litter group may be one of the reasons for the increased aggressive behaviour. Fortomaris *et al.* (2007) reported that laying hens have demonstrated higher incidence of aggressive behaviour in cages most possibly due to the restriction of movement, which results in close proximity of subdominant and dominant birds. As shown in this study, foraging is negatively correlated to aggression. Huber-Eicher and Wechsler (1997) stated that foraging activity was inversely related to the rate of feather pecking. Based on that, free-range systems that promote foraging behaviour are effective in reducing and preventing feather pecking. Tong *et al.* (2014) reported that birds assigned to the free-range treatment were much more active, while the indoor birds stay around the feeder or rested instead of exercising. In general, birds assigned to free-range treatment for more days can achieve optimal production performance because of increased activity, which improves bird comfort and welfare. The ability of birds to scratch the litter and dust bathe indicates good litter quality (FAI, 2019).

Effect of different housing types on tonic immobility of ISA Brown cockerels

The tonic immobility of ISA brown cockerels reared under different types of housing is shown in Table 2.

Table 2: Tonic Immobility of ISA Brown cockerels reared under different housing types

Housing	Tonic Immobility
DL	61.25
DLOA	54.25
FR	73.75

Tonic immobility duration was not significantly affected (P>0.05) by the housing type. It was however slightly lower in cockerels reared on deep litter with outdoor access (54.25sec) compared to those reared on deep litter (61.25 sec) or free range (73.75 sec). The values obtained in this study were lower than 82.88s and 135.77s reported by Campbell *et al.* (2022) for Bovan Brown laying hens reared in enriched floor pens and conventional cages respectively. El-Kazaz (2018) showed that housing system of broilers was higher in cages than floor system, which can be interpreted as higher level of fear in caged birds and therefore a lower welfare and more stressed conditions of poultry in cage systems. Fear is defined as an emotional state that arises from negative stimulus leading to behavioural and physiological changes that help the animal to cope with the stimulus. Traditionally, this has been assessed by the duration of tonic immobility reaction. Tonic immobility test, as a measure of fear and stress levels, is an important indicator of birds' welfare. Tonic immobility can be influenced by housing type and is therefore used in evaluating welfare of birds kept in different housing systems El-Kazaz (2018). Long durations of tonic immobility are believed to be indicative of high levels of fearfulness (Jacob *et al.,* 2018; Mahboub *et al.,* 2004).

CONCLUSION AND RECOMMENDATIONS

Based on the results of this study, it can be concluded that the DL group stand and drank more and sat less compared to the FR group. The DL group were more aggressive than the DLOA group. The

DLOA group forage more than the DL group. Level of fear and stress were not influenced by housing as tonic immobility was similar amongst the housing types. It can be recommended that management systems that give outdoor access can be used to rear male layer type chicken to encourage positive behaviours and reduce the negative behaviours without adverse effect on their fear levels.

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