GENETIC VARIABILITIES OF BODY TEMPERATURE AND RESTING BEHAVIOUR IN THREE STRAINS OF EGG-TYPE CHICKEN

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ABSTRACT

The study was conducted to ascertain the body temperature and resting behaviours of three strains of egg-type pullet chickens (exotic [ISA brown], improved native [Alpha] and Native chickens). A total of 90 egg-type pullets aged 12 months and their day old, non-inbred progeny pullets numbering 90 were used for the study. Both the parents and their progeny were housed at 10 per pen and 3 replicates per genotype and their progeny. The parents were fed and watered ad-libitum between 52 – 63 weeks period of the experiment. The progeny of each genotype were kept for 0 – 12 weeks, during which time, chicks were fed and watered ad-libitum as in the parents and data were collected. During this period, body temperature and resting behaviour were collected with respect to the birds and their progeny. The result showed no significant (P > 0.05) genotype effects in the body temperature of both the parents and their progeny. This implies that neither progeny nor generation had effect on body temperature. The Alpha strain exhibited more resting behaviour than did the exotic and the pure native types. Majority of the birds rested in the afternoon at 2.00 pm. This could be attributed to the fact that at 2.00 pm the weather is hot and birds search for a quiet and cool place to reduce thermal stress.

Keywords: Genetic variabilities, Body temperature, Resting behaviour, Strains, Egg-type chicken

INTRODUCTION

Poultry, though a significant contributor to the nutritional and economic well being of many Nigerians, little attention is paid to understand its behaviour and general welfare in relation to environmental, feeding and management changes (Nwankwo and Omeje, 2008). To boost the production of this group of livestock, it is imperative that all factors that contribute to low performance should be studied and avoided. External behaviour of animals is usually an index of the internal state of such animals (kilgour and Dalton, 1983). Increase in conditions that sustain normal behaviour improves meat and egg production capacities and *vice-versa.* One of these observable behavioural characteristics that have effect on productivity is resting behaviour. Hockings *et al.* (1993), Keer-Keer (1996) and Akani *et al.* (2008) reported that broiler breeds spend more time resting and less time standing than the layer when fed *ad-libitum.* Udeh (2003) also observed that heavier strains of birds have higher resting tendencies than native light weight chickens. A similar trend was reported by Omeje *et al*. (1997) and Omeje *et al.* (2001). According to them broiler birds rested more at night than during the day. The Nigerian environment is characterized by high temperature and relative humidity typical of a tropical climate (Yakubu and Omeni, 2007) as such, animals are therefore highly susceptible to heat stress. Day temperature averaging 35 ± 5 ^{0}C in the Southern Nigeria and 42 ± 8 ^{0}C in the Northern Nigeria during the months of December to March have been reported (Longe, 2000). Poultry birds in Nigeria, therefore encounter thermal stress in addition to other stressors which affect their physiological and productive activities. The adverse effect of stressors are additive and every attempt should be made to lessen the number and intensity of such stressors (Butcher and Miles, 2004). The body temperature of domestic chicken is 38.9^{o}C ± 5^{o}C, though Oluyemi and Roberts (2007) reported a range 38.9 – 43.6^{o}C. Most birds maintain their body temperature at 40 ± 2^{o}C (Eekeren, 1995; Campbell *et al.* 2001). Domestic fowls may pant when kept under high environmental temperature (Orusiebo, 2004). Low temperature makes the birds to reduce surface area, fluff out their feathers and huddle to increase insulation, tuck their heads under wings, increase feed intake and increase activities (Oluyemi and Roberts, 2007). These physiological changes in one way or the other affect production of layers. Like many other traits, behavioural characteristics may be associated with genetic composition of animals. This study therefore investigated the effect of genotype and generation on the resting behaviour and body temperature of exotic, improved and native chickens and their F1 progeny.

MATERIALS AND METHODS

The study was carried out at the Poultry Breeding and Genetics Research Centre of the Department of Animal Science, Delta State University Asaba Campus. A total of 90 exotic (ISA Brown), Alpha (Crossbred) and Native layer birds aged 12 months and their 90 progeny pullets (at day old) were used for the study. These comprised of 30 parent birds from each genotype and 30 day old progeny from the birds. Ten parent birds from each genotype were randomly selected and assigned into three pens to ensure three replicates of the experimental unit for each genotype. The progeny birds were similarly allotted into ten chicks per pen and three replicates per experimental unit. A floor space of 1.45 square meter per bird was allowed as recommended by Adejoro (2000). Appropriate feed for the parents (Layers Marsh, Top Feed, Nigeria Limited) and chicks (Starter Marsh, Top Feed, Nigeria Limited) as well as water was provided *ad-libitum* throughout the 12 week period of the experiment. All birds were subjected to similar managerial and sanitary conditions throughout the experiment. All necessary vaccinations were also administered at appropriate ages. In order to minimize errors in the experiment, stress factors such as diseases, harsh weather, poor ventilation, poor lighting were adequately monitored and controlled in line with the guidelines of Duncan (1981).

During the 12 week period of the experiment, resting behaviour of birds was observed for 30 minutes at 9.00 am, 12.00 noon and 2.00 pm each day. The number of birds resting was recorded each time. Resting was described as birds observed lying down, standing but immobile, squatting, sleeping provided such birds were not displaying any motion (Omeje *et al.* 2001). Percentage resting was calculated as: number of birds resting divided by total number of birds x 100. The body temperature was determined using clinical thermometer as the mouth, cloaca and armpit temperatures of the birds on weekly basis and the mean temperature was recorded for an individual bird.

The experimental design adopted was a completely randomized block design (CRBD) (SAS, 2001). In accordance with Steel *et al.* (1997), age, genotype and generation were the main sources of variation, respectively. All data collected were subjected to analysis of variance (ANOVA) in one way classification. Duncan's New Multiple Range Test was used to separate means where ANOVA showed significant effects. The effects of genotype, generation and age of birds on the parameters

Table 1: Genetic variability in body temperature of three strains of egg-type chicken

Genetic Variability		Temperature °C		
		Mouth	Cloaca	Armpit
Exotic	**Parent**	40.51 ± 0.07^{ns}	40.80 ± 0.40^{ns}	40.48 ± 0.22^{ns}
	Progeny	40.00 ± 1.00^{ns}	40.62 ± 0.23^{ns}	40.14 ± 0.80^{ns}
Alpha	**Parent**	40.50 ± 0.05^{ns}	40.90 ± 0.10^{ns}	40.36 ± 0.23^{ns}
	Progeny	40.96 ± 0.20^{ns}	40.74 ± 0.16^{ns}	40.38 ± 0.14^{ns}
Native	**Parent**	40.26 ± 0.11^{ns}	40.28 ± 0.70^{ns}	40.31 ± 0.45^{ns}
	Progeny	40.20 ± 0.60^{ns}	40.20 ± 0.40^{ns}	40.70 ± 0.30^{ns}

ns = Not significant ($p > 0.05$)

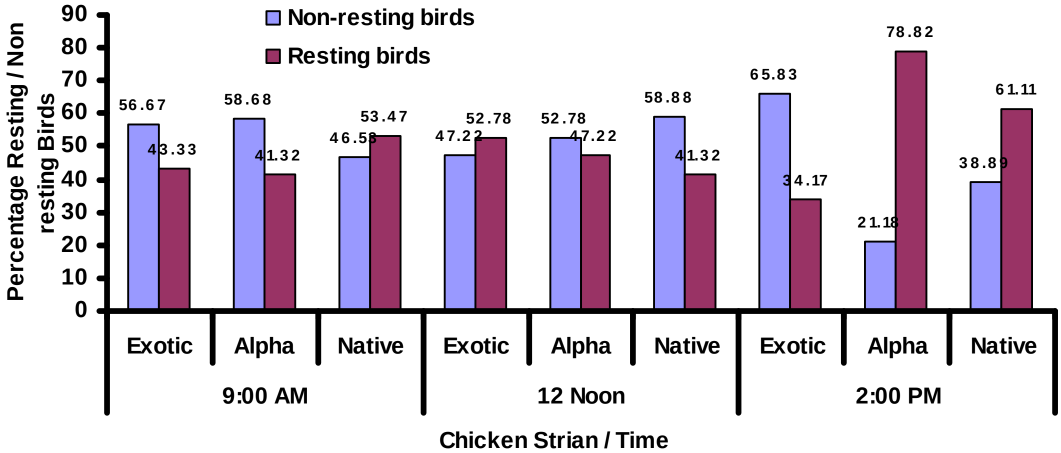

Figure 1: Genetic variability in resting behaviour of three strains of egg-type chicken parents

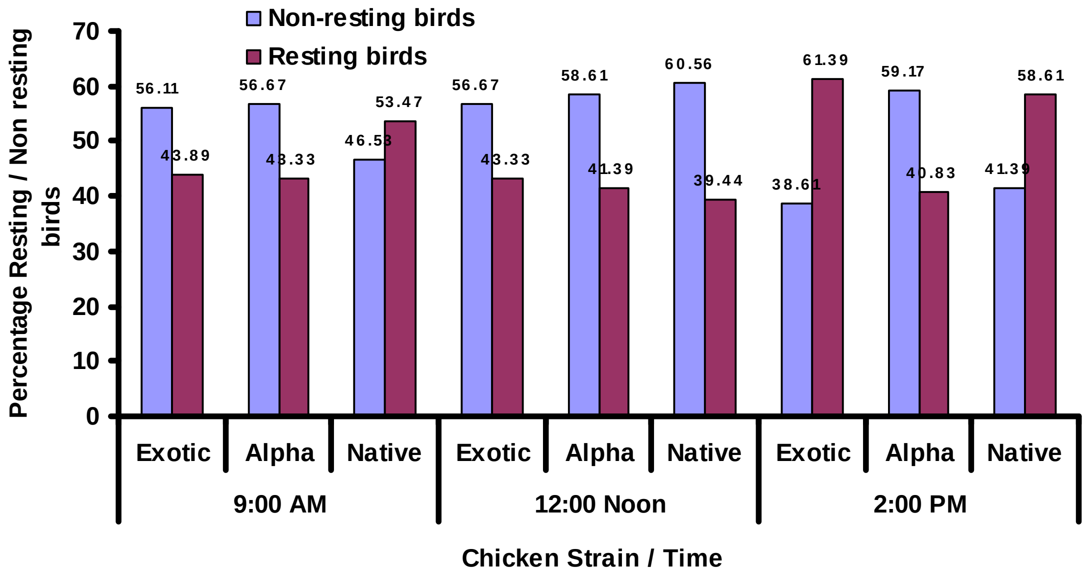

Figure 2: Genetic variability in resting behaviour of three strains of egg-type chicken progeny

monitored were estimated using linear model: $X_{ijk} = \mu + T_i + B_j + E_{ijk}$, where X_{ijk} = An observation made on the kth bird belonging to the ith genotype during the jth age period, μ = the overall population mean common to all observation, T_i = the effect of the ith genotype (1 = 1,2), B_j = the effect of the jth week of age (j = 1, 2, 3, ….. 12) and E_{ijk} = random error associated with the experiment.

RESULTS AND DISCUSSION

There was no significant genotype effect ($P > 0.05$) on body temperature of both parents and progeny birds (Tables 1). The mean body temperature ranges of 40.2 – 41.0 ^{o}C reported by Oluyemi and Roberts (2007) was similar to our finding. Our data also confirmed the findings of Campbell *et al.* (2001) that birds maintain their body temperature at 40.0 ± 2 ^{o}-C. Our findings were also in support of the findings of Eekeren (1995) that constant body temperature for birds ranged between 40.5 – 42.5 ^{o}C. The mean body temperature of the parents and their progeny were similar (Figures 1 and 2) ($P > 0.05$). Our findings contradicted earlier report of Campbell *et al.* (2001), who reported that smaller birds may have higher temperature than bigger ones. In the 95% confidence interval, among the parents, the native varied more, followed by the Alpha and the exotic, while in the progeny, the natives varied more followed by the exotic and the alpha. It implied that the more varied the interval, the better the genetic improvement in the body temperature.

The resting behaviour of birds in each genotype and their progeny indicated that at 9.00 am and 12.00 noon among the parents, the exotic breed rested more than the alpha and the native while at 2.00 pm the alpha rested more than the exotic and the native, respectively. Among the progeny groups at 9.00 am, 12 noon and 2.00 pm, the exotic rested more followed by the alpha and lastly the native chickens. Majority of birds rested at 2.00 pm with the following values 78.47%, 61.39%, 78.82%, 59.17%, 61.11% and 58.61% for exotic, alpha and native parents and their progeny, respectively (Figures 1 and 2). This implied that heavier strains of birds have more tendencies for resting than the lighter strains. A similar observation was made by Omeje *et al.* (2001) and Udeh (2003). Hockings *et al.* (1993) and Keer-Keer *et al.* (1996) reported that broilers spend more time resting and less time standing than layers when fed *ad-libitum*. The tendency of the birds to rest at 2.00 pm may be attributed to the fact that at 2.00 pm, the weather is hotter and as a result they search for a quiet and cool place to rest.

Conclusion: Non-significant ($p > 0.05$) differences were recorded in body temperature among parents and their progeny genotypes. It implied that neither genotype nor generation had effect on body temperature. In the resting behavior, observations were made that most of the birds rested at 2.00 pm and a lesser percentage at 9.00 am and 12.00 pm respectively. The exotic and alpha strains rested more than their native counterparts.

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