REPEATABILITY ESTIMATES OF FEEDING BEHAVIOURS IN ARBOR ACRES CHICKEN

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ABSTRACT
This study aimed at estimating repeatability of feeding behaviours in Arbor Acres chicken. A total of 72 birds reared for day-old were used in the experiment. The birds were assigned into four groups in a completely randomized design with three replicates per group. Each replicate comprised six (birds) of equal sexes. The birds were housed on deep litter system while commercial feeds and water were given *ad libitum*. From the 4th to the 8th week of the experiment, two feeding behaviours of individual birds were monitored using a digital camera installed in individual pens. The feeding behaviours included the hourly number of feeder visits (HNFV) and the hourly time spent at feeder (HTSF) (8-9 am in the morning and 3-4 pm in the afternoon). The components of variance were estimated using the PROC VARCOMP option of restricted maximum likelihood (REML) method of the General Linear Model (GLM) of IBM-SPSS procedure to generate repeatability coefficients. The results obtained indicated that repeatability estimates were low in both HNFV (R =0.05) and HTSF (R = 0.07). The present information provides a guide to future studies on genetic analysis of feeding behaviours using large sample size.
Keywords: Feeding behaviours, Variance components, Repeatability, Arbor Acres chicken

INTRODUCTION
Feeding behaviour is a fundamental activity of all animals that can be modulated by internal energy states or external sensory signals. It plays a decisive role in animal growth, reproduction and promotes the expression of biological functions that are meaningful to animal welfare (Yan *et al.,* 2019; Li *et al*., 2023). Chickens have the instinct to feed for energy, and feeding behaviour is dominated by alternating hunger and satiety. Understanding poultry feeding behaviour is crucial for ensuring optimal growth, maintaining health and welfare, improving feed efficiency, managing economic implications, implementing appropriate nutritional management, and reducing the environmental impact of broiler production (Nasiri *et al*., 2023).
Investigating feeding behaviour traits in broiler chickens provides relevant data for guiding selection programs toward favorable feeding strategies according to different management conditions (Li *et al*., 2020a; Nasiri *et al*., 2023). For instance, selecting animals that visit feeders less frequently and have high consumption per visit could help prevent potential feed competition in conventional production systems that use fast-growing broiler lines. In Nigeria, there is dearth of information with respect to broiler chickens' feeding behaviour especially the estimation of genetic parameters. Therefore, this study aimed at estimating repeatability and heritability of feeding behaviours in Arbor Acres chicken.

MATERIALS AND METHODS
A total of 72 birds reared for day-old were used in the experiment. The birds were assigned into four groups in a completely randomized design with three replicates per group. Each replicate consisted of six (birds) of equal sexes. The birds were housed on deep litter system, fed with commercial feeds (Broiler starter from day-old to four weeks of age and broiler finisher from week 5-8 weeks of age). Water was given *ad libitum.* Broiler chickens rarely eat during the dark period (Li *et al*., 2020). Therefore, the feeding behaviours of broilers were monitored only during the lighting period (from the 4th to the 8th week of rearing). Two feeding behaviours for individual birds were examined. The first was the hourly number of feeder visits (8-9 am in the morning and 3-4 pm in the afternoon), while the

second was the hourly time spent at feeder (8-9 am in the morning and 3-4 pm in the afternoon) (Table 1) as described by Li *et al*. (2021). The behavioural traits were recorded using a digital camera installed strategically in the pens.

Table 1: The definition of behaviour responses

Behaviour responses	Unit	Definition
Hourly number of feeder visits (HNFV)	times/bird/hour (times b^{-1} h^{-1})	Number of visits to feeder(s) per bird per pen within an hour.
Hourly time spent at feeder (HTSF)	minutes/bird/hour (min. b^{-1} h^{-1})	Overall time spent at feeder(s) per bird per pen within an hour

Variance components for repeatability estimates were obtained using the PROC VARCOMP of restricted maximum likelihood (REML) method of the General Linear Model procedure of IBM-SPSS (2015). The linear additive model used was:

$Y_{ij} = \mu + \alpha_i + e_{ij}$

where,

Y_{ij} = Observation on the j^{th} independent variables (number of hourly visits of birds and time spent at feeder) of the i^{th} age of birds.

μ = Overall population

α_i = fixed effect of age of birds (4, 5, 6, 7 and 8 weeks of age)

e_{ij} = error term

Repeatability indicates the ratio between individual components to the total phenotypic variance which measures the correlation between repeated measurements of the same individual as indicated below (Falconer and Mackay, 1996*)*:

$R = V_G + V_{Eg} / V_P$

where,

R = repeatability

V_G = genotypic variance

V_{Eg} = general environmental variance

V_P = phenotypic variance

Computationally, R was derived using the method of Becker (1984) as follows:

$R = \sigma^2_B / \sigma^2_B + \sigma^2_W$

where,

σ^2_B = between bird's variance component

σ^2_W = within bird's variance component (error)

RESULTS AND DISCUSSION

With respect to the repeatability of HNFV, variance component of the pooled ages of the birds was 0.062 while that of error was 1.301. The repeatability coefficient was 0.05. As regards the repeatability of HTSF, variance component of the pooled ages of the birds was 0.082 while that of error was 1.098. The repeatability coefficient was 0.07. Repeatability estimate was higher in HTSF compared to HNFV. In a related study, Alves *et al*. (2024) reported heritability estimates of 0.49 and 0.32 for number of meals and number of visits per meal. Monitoring the feeding behaviours of broiler chickens can assist in ensuring an appropriate diet to support their growth (Nasiri *et al*., 2023). Also, observing feeding behaviors can provide insights into the health and welfare of broiler chickens. According to Kyriazakis (2011), identification of traits relating to feeding behavior may aid in continued progress in the poultry industry and allow optimization of selection strategies for feed efficiency. However, published repeatability estimates of HNFV and HTSF in the broiler chickens could not be obtained to compare with our results. This calls for more genetic studies in this area.

CONCLUSION

As the variance components obtained are positive, the inclusion of feeding behaviour traits in breeding programmes opens possibilities to explore different strategies for feeding management

in broiler production systems. However, for better repeatability estimates, a broad-based study with a larger sample size should be carried out.

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