EFFECT OF GENOTYPE ON EGG FERTILITY, HATCHABILITY AND CHICK WEIGHT IN TRANSYLVANIAN NAKED NECK CHICKENS AND THEIR CROSSES WITH NIGERIAN INDIGENOUS CHICKENS

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ABSTRACT
Egg fertility, embryonic mortality, hatchability and chick weight were compared among Transylvanian naked neck (TNN; 100T) chickens and the crosses with Nigerian indigenous (NI) chickens containing 75% (75T), 50% (50T) and 25% (25T) TNN genes. No significant (p>0.05) effect of genotype were observed in the egg fertility and embryonic mortality in TNN chickens and their crosses with NI chicken. Hatchability of set and fertile eggs were not significantly (p>0.05) affected by the genotype. However, chick weight was significantly (p<0.05) influenced by the genotype. The 100T chickens had the highest chick weight (32.3g), though not different from those of 75T. The crossbred chicks (50T and 25T) recorded only 23 and 11% reduction in weight compared to 100T chicks respectively. Crossing TNN chickens with NI chickens may not affect hatching results, except egg weight. Day-old weight of NI chicks could be improved by crossbreeding with TNN chickens.
Keywords: Transylvanian naked neck, Thermotolerance, Embryonic development, Crossbred chicks, Genotype

INTRODUCTION

Poultry production, especially chicken, is one area of animal production with a significant contribution to human food production (Eshiette and Okere,1990). The products are preferred by the majority of people in Nigeria because of the pigmentation, leanness, taste and the suitability of various species of poultry (Horst,1991). However, the prevailing high environmental temperature in the tropical regions has been a bane to the productivity and welfare of the chickens. Indigenous African chickens are hardy, adaptable and able to survive under harsh environmental conditions but have low body weight and egg production (Adenokun and Sonaiya, 2001; Yakubu *et al.*, 2008). The productivity of the Nigerian indigenous chicken could be improved by selective breeding, good management practices (Ruffo and Oseni, 2018) and crossbreeding with exotic strains. Transylvanian naked neck (TNN) chicken from Hungary, otherwise known as *Turken*, lacks feathers on the neck and breast, is heavy, meaty, and prolific in laying large and light brown eggs. The bird is also known to possess high thermotolerance (Pârvu *et al.*, 2007; Roberts, 2008; Abioja *et al.*, 2020). Omotara *et al.* (2020) compared the egg fertility and hatchability in Nigerian indigenous and TNN chickens and found that there was no difference, though TNN laid heavier eggs which resulted in chicks with higher body weight at day-old. The TNN chicks were 66% heavier than Nigerian indigenous chicks.
Efforts have been geared towards improving the productivity of the local chickens with exotic chickens in Nigeria. Ajayi *et al.* (2008) and Adeleke *et al.* (2012) once studied the effect of crossbreeding on fertility, hatchability and embryonic mortality of Nigerian indigenous and exotic broiler chickens. However, there is need to investigate the effect of genotype on egg fertility, hatchability and chick weight in Transylvanian naked neck chickens and their crosses with Nigerian indigenous chickens. It becomes imperative to determine what effects crossbreeding of TNN and Nigerian indigenous chickens would have on egg fertility, embryonic development, hatchability and chick weight. Hence, the need for the present study.

MATERIALS AND METHODS

Experimental site: The rearing of the birds was carried out at the Poultry Unit of the University Farms, Federal University of Agriculture, Abeokuta (latitude 7° 13'N; longitude 3° 26'E (Google Earth, 2024) and altitude 76 m above sea level). The location falls within the rain forest of the south-

western Nigeria with mean temperature of between 27 and 28ºC and annual rainfall of 1217.27mm (Adepitan *et al.*, 2017).

Experimental animals and management: A flock of laying chickens comprising of Nigerian indigenous (NI) chickens (n=50; 25 males and 25 females), a newly-introduced Transylvanian naked neck (TNN) chickens (n=50; 25 males and 25 females) and their crossbreed NIxTNN chickens (n=50; 25 males and 25 females) aged 52 weeks were used for this study. The chickens, reared up in battery cages in traditional open-sided wire-netted housing units, were fed on maize-soybean-based ration containing 16.5% crude protein, 4% ether extract, 5% crude fibre, 2500 kcal/kg metabolizable energy, 3.5% calcium and 0.45% available phosphorus in mash form (NRC, 1994). Lightning program was 12L:12D throughout the experiment. Vaccination programs described in MSD veterinary manual was followed for the birds. Fresh and cool water was made available *ad libitum*. The birds were crossed in such a way to obtain eggs with 100% (100T), 75% (75T), 50% (50T) and 25% (25T) genes. Artificial insemination was used twice weekly in the flock to ensure good fertility rate.
Egg collection and incubation: Fertile eggs from birds were collected according to the treatment groups, labelled, and transferred to cold room for storage in egg tray under 16±1.5ºC and 75±1.5ºC relative humidity conditions. All the eggs were set at the same time in a 2-stage incubator (N.V. Petersime® EV1/EN2 Incubator, *Belgium*) after the storage period and kept under uniform conditions of 29.5 and 37.5°C wet-bulb and dry-bulb temperature.
Experimental design: The birds were in four genotype groups (100T, 75T, 50T and 25T) with each genotype divided into 3 replicates of 15 birds each. All genotypes were given the same treatments.
Data Collection: At candling, percentage fertility was determined as the ratio of fertile to set eggs in percentage. Infertile eggs after candling and unhatched eggs were broken to determine the embryonic mortality during early (embryonic day (ED) 1-7), mid (ED 8-14) and late incubation (ED 15-21). Hatchability of set and fertile eggs were calculated as the ratio of the hatched to set eggs and fertile eggs respectively for each genotype.
Statistical Analysis: Data collected were analyzed using one-way analysis of variance (ANOVA) using Minitab Statistical Software while significant means was compared using Tukey in the package.

RESULTS
The results of egg fertility and embryonic mortality in Transylvanian naked neck chickens and their crosses with Nigeria Indigenous chickens are shown in Table 1. No significant ($p>0.05$) effect of genotype were observed in the egg fertility and embryonic mortality in Transylvanian naked neck chickens and their crosses with Nigeria Indigenous chicken. Table 2 shows the results of egg hatchability and chick weight as affected by genotype. Hatchability of set and fertile eggs were not significantly ($p>0.05$) affected by the genotype. However, chick weight was significantly ($p<0.05$) influenced by the genotype. The 100T chickens had the highest chick weight (32.3g), though not different from those of 75T. The crossbred chicks (50T and 25T) recorded only 23 and 11% reduction in weight compared to 100T chicks respectively.

Discussion
Egg fertility, embryonic development and hatchability are factors that influence the number of chicks farmer eventually obtains. In the present study, it was discovered that genotype did not influence egg fertility and embryonic mortality. This is in line with the findings of Islam *et al*. (2002) who found no significant breed differences in embryonic mortality among barred plymouth rock, white leghorn, Rhode Island red and white pock hens studied.
The significant effect of genotype on hatchability egg set, fertile egg and chick weights obtained between Transylvanian naked neck chickens and their crosses with Nigerian local chickens in this study are supported by several reports. One of the most used indicators of chick quality is chicks weight (Decuyprere *et al.,* 2002). Chick weight and egg ratio in genotypes showed similar patterns, with lighter chicks from Nigerian local chicken eggs and heavier Transylvanian naked neck chicks, similar to Jabber *et al*. (2017). Chick weight and egg ratio in genotypes showed similar patterns, with lighter chicks from Nigerian local chicken eggs and heavier. The report by Jabber *et al*. (2017) suggests that weight and yield significantly impact post-hatchability performance in Transylvanian naked neck chicks.

Genotype had no significant effect on egg fertility, early embryonic mortality, mid embryonic mortality, late embryonic mortality and total embryonic mortality their crosses with Nigerian local chickens. Genotype only affected chick weight in Transylvanian naked neck chicken and their crosses with Nigerian local chickens. Transylvanian naked neck chickens and Nigeria local chickens are both good sources of protein and their meat and eggs are recommended for food in human diet. Purebred Transylvanian naked neck chicken is hereby recommended because of their heavier day-old chick weight.

Table 1: Egg fertility and embryonic mortality in Nigeria Indigenous chicken, Transylvanian Naked Neck and their crosses

Parameters	100T	75T	50T	25T	SEM	P value
Egg fertility (%)	52.30	70.13	80.03	71.20	8.09	0.186
Early embryonic mortality (%)	3.70	5.80	8.70	4.80	4.15	0.893
Mid embryonic mortality (%)	3.70	3.80	0.00	5.80	1.89	0.256
Late embryonic mortality (%)	14.30	13.40	18.40	5.30	3.16	0.097
Total embryonic mortality (%)	21.70	23.10	26.40	15.90	5.61	0.625

[abc]*Means within same row having different superscripts differ significantly (p<0.05)*

Table 2: Egg hatchability and chick weight in Nigerian indigenous chicken, Transylvanian naked neck and their crosses

Parameters	100T	75T	50T	25T	P value
Hatchability of egg set (%)	28.0±11.0	48.9±11.0	58.3±11.0	51.0±11.0	0.316
Hatchability of fertile egg (%)	53.0±11.7	69.3±11.7	72.9±11.7	68.6±11.7	0.651
Chick weight (g)	32.3±0.90[a]	29.9±0.57[ab]	26.2±0.60[c]	29.0±0.60[b]	0.000

[a,b,c]*Means within same row having different superscripts differ significantly (p<0.05)*

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