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EGG PRODUCTION POTENTIALS OF PROGENIES OF NIGERIAN LOCAL CHICKENS WITH EXOTIC ABOR ACRE FEMALES RAISED IN THE HUMID TROPICS

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ABSTRACT

This research was carried out to evaluate the egg production potentials of progenies from Nigeria local chickens with exotic female Abor Acre (AA). The research was carried out at the Department of Animal Science Teaching and Research Farm, Nnamdi Azikiwe University Awka. The local male lines used include Naked Neck (NN), Frizzle Feather (FF) and Normal Feather (NF) cocks that were sourced from Awka, Anambra State. Fifty (50) exotic Abor acre female line were purchased from CHI farms Ibadan, Oyo State, Nigeria. The crossing generated three (3) genotypes thus (NN x AA = NNAA, FF x AA = FFAA, NF x AA = NFAA) giving rise to three (3) experimental units. The AA chickens were raised to point of lay and at the laying stage were inseminated with semen from NN, FF and NF males. Each treatment had a total of Ninety (90) crossbred chickens and was replicated into four (4). The crossbred chickens were raised to point of lay and egg was collected for evaluation at 32weeks of age. Data was collected on egg external (AH, AWT, YW, AW, YH, YWT) quality traits and egg internal (EW, EWT, EH, SW) quality traits. Data collected were subjected to statistical test using JMP student's edition 18.2.2, statistical means were separated using All pairwise comparism-Turkey HSD at $P<0.05$ significance level. All the studied traits (internal and external egg quality traits) were significantly ($P<0.05$) influenced by genotype. The FFAA recorded the highest significant ($P<0.05$) egg weight (EW) while the NNAA recorded the highest significant ($P<0.05$) values in egg width (EWT), egg height (EH) and shell weight (SW). The NNAA recorded significant ($P<0.05$) higher values in albumen height (AH), albumen width (AWT), yolk height (YH) and yolk width (YWT) and the FFAA had significant ($P<0.05$) better YW and AW. The result showed strong egg quality traits from NNAA and FFAA. The FFAA can be selected for better egg improvement in EW, YW and AW. The NNAA can be selected for improvement in EWT, EH, SW, AH, AWT, YH, And YWT.

Keywords: Eggs, internal and external qualities, crossbred chickens.

1. INTRODUCTION

Egg production is important in Nigeria's food security, nutrition, rural livelihoods and agricultural economy (Alabi *et al*, 2020). It provides affordable animal protein, generates substantial income and employment, contributing significantly to agricultural gross domestic product (GDP) and poverty reduction especially in rural areas (Smith *et al*, 2013 and Chatterjee *et al*, 2022).

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Nigeria has the largest annual egg production in Africa and one of the largest poultry populations in the continent, reflecting the central place of eggs in Nigeria. Poultry production in Nigeria involves commercial and numerous small holder farmers, with layer's enterprise being the main source for egg production, cash flow and protein supply (Erdaw and Beyene, 2022).

Eggs are recognized as one of the most nutrient-dense and complete animal-source foods. It provides high quality protein with essential amino acids, as well as vitamins A, D, E, B–complex and minerals such as iron, selenium and phosphorus, which are important for children and pregnant women (Sahar and Rahman, 2018). In Nigeria where protein-energy malnutrition and micronutrient deficiencies remain prevalent, poultry eggs should be advocated to help cushion malnutrition and micronutrient deficiencies as an affordable option as eggs improves household diet quality (Opeyemi, 2025). Poultry eggs supply animal protein that is relatively affordable and can be produced at scale within short production cycles thereby ensuring food security. Small-scale and backyard egg production enhances household food security by providing direct consumption and a buffer that can be sold quickly in exchange of cash to meet other food needs (Youseff *et al*, 2026).

The Nigerian local chickens are low in productivity, producing just 60 to 100 eggs per year which is very low compared to the amount laid by egg producing chickens. They are broody and takes about 21days to sit on their eggs and within this period egg production is halted. Sexual maturity takes about 24months and they are seasonal layers characterized with small egg size. These limitations call for improvement in local chickens (Yero, 2019; Bamidele *et al*, 2020; Kpomasse *et al*, 2023)

Crossbreeding indigenous males with exotic female lines will leverage the superior hardiness of local breeds and high production capacity especially in egg size of the exotic line. Crossbreds show better performance (heterosis), and combines the high productivity (egg production) of the sire and dam (Bedru, 2021; Negash, 2023).

Crossbreeding Nigerian indigenous male chickens with exotic lines has targeted meat production improvement more with less information on egg production performance of progenies from local males and exotic female line. In line with this, this study evaluated egg production traits of progenies from Nigerian local chickens with exotic female lines.

2. MATERIALS AND METHODS

This research was carried out at the Department of Animal Science Teaching and Research Farm, Nnamdi Azikiwe University Awka, Anambra State. The study site lies on latitude 6.2459^{o}N and longitude 7.1164^{o}E. (Ejikeme *et al*, 2023). The region has a humid tropical climate with distinct wet and dry seasons. The vegetation is characterized by a tropical rainforest ecosystem with features like lush, dense forest with diverse plant species including hardwood and softwood trees (Gratius, 2023).

Experimental Birds.

Fifty (50) day old broiler breeder chicks (Abor Acre) were purchased from CHI hatchery in Ibadan Oyo State, Nigeria. The Nigerian ecotype chickens, three (3) for each ecotype which included Frizzle feather, Naked neck and Normal feather were sourced from Awka, Anambra state in Southeast Nigeria.

Each genotype had a total number of Ninety (90) crossbred chickens. Thirty (30) birds were housed in each well-ventilated 10m^2 deep litter pen ensuring adequate day-light. The brooding stage lasted for 4 weeks for the broiler strains and crossbred chickens. From 4weeks, each pen

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was equipped with three wooden feeders measuring 90cm x 20cm, three (3) 10litre drinkers and two lightening points. A charcoal pot of 30cm deep and 25cm wide was provided at the brooding stage. Two weeks before the arrival of the birds, the experimental pens were thoroughly washed, cleaned and disinfected and left empty for one week after cleaning so as to break the life cycle of any disease causing organisms.

The birds were vaccinated with lasota vaccine on the 1st, 14th, 23rd day and subsequently once every month. Gumboro vaccine was given on the 7th and 18th day. Fresh wood shavings were spread on the floor as beddings and were changed first on the 10th day, 20th day and subsequently every four (4) days to avoid wet liter and disease emanating from the wet liter.

Crossbred progenies were generated by using semen of males of Naked neck (NN), Normal feather (NF), and Frizzle feather (FF) to inseminate females of Abor Arce (AA) at 34 weeks.

They were combined in the following treatment groups to generate three genotype as follows:

Treatment 1: NN x AA = NNAA

Treatment 2: NF x AA = NFAA

Treatment 3: FF x AA = FFAA

Each treatment were replicated 3times, having 30 crossbred chicken in each replicate.

All chicks were served a formulated starter diet that contain 22% crude protein and 2800Kcal/Kg ME. It lasted from week 1- week 6. After week 6, a formulated grower ration that contained 18% crude protein and 3000Kcal/Kg ME was given to the birds until the hens started laying eggs. At the laying stage, a layers diet containing 16% crude protein and 3200Kcal/Kg ME wias given to the hens.

Statistical Analysis:

Data obtained were subjected to analysis of variance using JMP student edition 18.2.2 in a complete randomized block design (RCBD) using the procedure of general linear model and comparing of means. Significant means were separated ($P<0.05$) using All Pairwise Comparisms – Turkey HSD.

Data Collection.

Data were collected on egg production. External egg qualities measured included: egg weight, egg width, egg height and shell weight

The internal egg qualities measured are: Albumen height, Albumen width, York weight, Albumen weight, Yolk height, and Yolk width.

Egg Weight (g) was measured using an electronic sensitive scale.

Egg length (mm) and egg width (mm) was measured using Vernier caliper.

Shell weight (g) was measured using a sensitive scale.

Albumen height (mm) was measured with a Vernier caliper.

Albumen Weight (g): the yolk and albumen was placed in a petri dish on an electronic scale and the weight of the albumin was determined by calculating the difference.

Yolk height (mm) was determined using Vernier caliper

Yolk Diameter (mm) was measured using a Vernier caliper as the width of the yolk.

Yolk Weight (g) was determined by separating the yolk from the albumen and then placing it on a weighed petri dish on an electronic scale and the weight of the yolk will be the difference.

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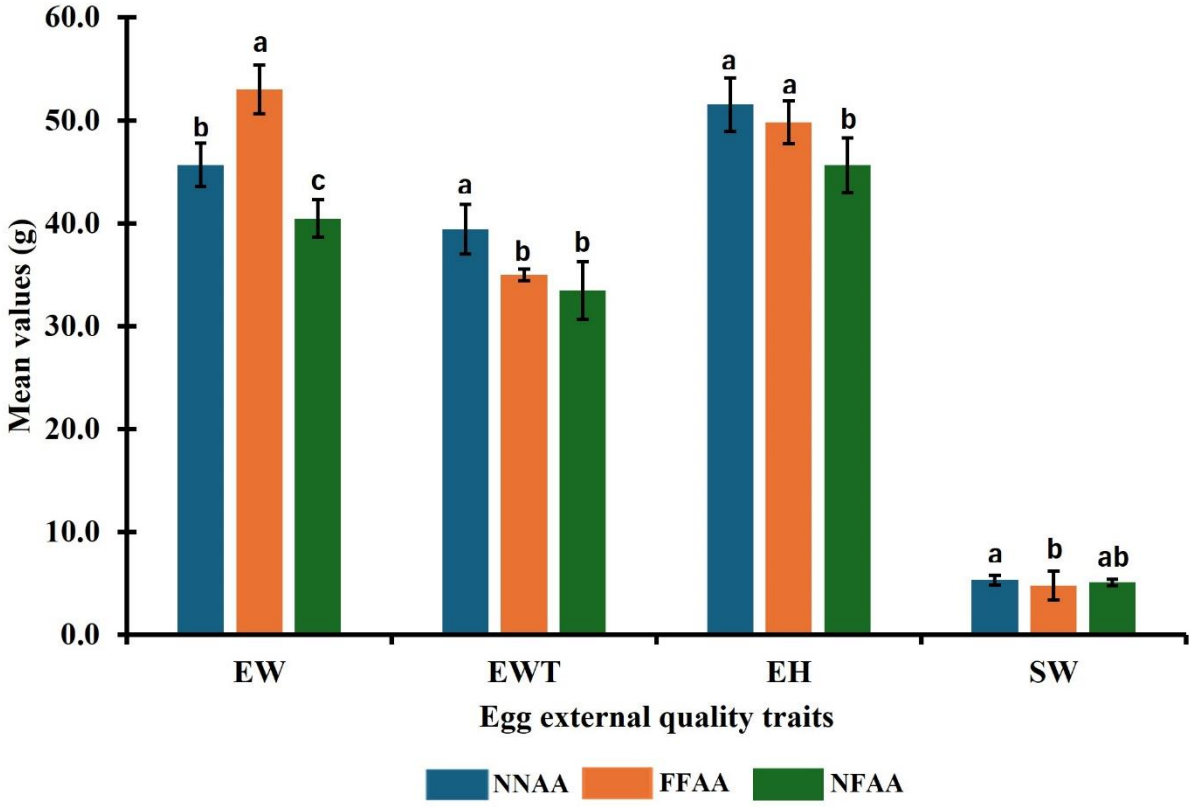
3. RESULTS AND DISCUSSION



Bars bearing different letters are significantly different at P<0.05. EW = Egg weight, EWT = Egg width, EH = Egg height, SW = Shell weight.

Figure 1: Egg External Qualities of the Crossbred Chickens at 32weeks of age.

The egg external qualities of the crossbred chickens at 32weeks of age is presented on Fig 1. The FFAA recorded the highest significant (P<0.05) egg weight than NNAA and NFAA. In egg width, the NNAA had a significant (P<0.05) higher egg width than FFAA and NFAA. The NNAA and FFAA had a significant (P<0.05) higher egg height than NFAA. The shell weight of NNAA was significantly (P<0.05) higher than FFAA and NFAA. The result of this study is in agreement with Hanusova *et al* (2015) who reported that genotype (breed) significantly affected egg external qualities. This work is also in agreement with the report of Nwaogwugwu *et al* (2009) who stated that the frizzle and naked neck gene exhibited the highest values for egg weight. Isidahomen *et al* (2013) also reported that external egg quality traits, specifically Egg Weight, Egg Length, and Egg Width were significantly affected by genotype in line with the findings of this study. For overall egg external quality, the NNAA should be selected for improvement but for egg weigt alone the FFAA should be selected at 32weeks of age.

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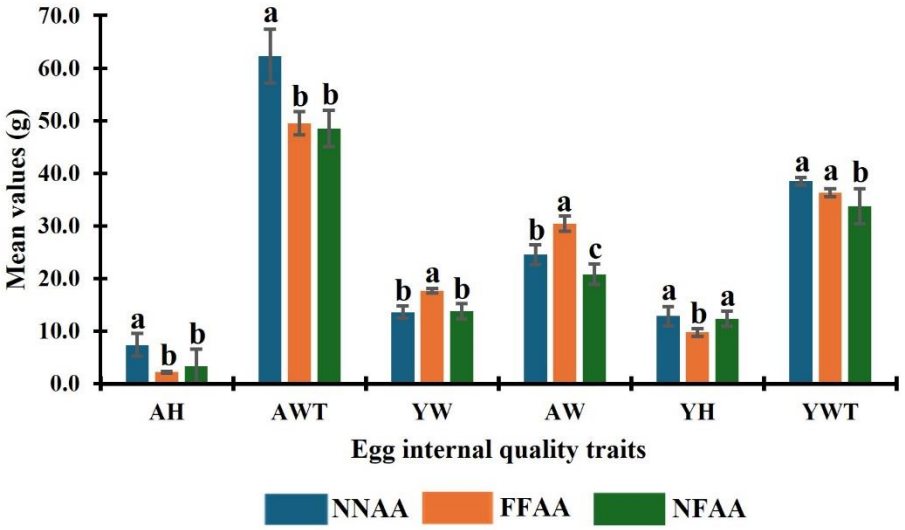

Bars bearing different letters are significantly different at P<0.05. AH = Albumen height, AWT = Albumen width, YW = Yolk weight, AW = Albumen weight, YH = Yolk height, YWT = Yolk width.

Figure 2: Egg Internal Qualities of the Crossbred Chickens at 32weeks of age.

The egg internal qualities of the crossbred chickens at 32weeks of age is presented on Fig 2. In albumin height, the NNAA recorded a high significant (P<0.05) albumen height than FFAA and NFAA. The NNAA maintained a higher significant (P<0.05) albumen width than FFAA and NFAA. In yolk weight, the result differed with FFAA having a significant (P<0.05) higher yolk weight than NNAA and NFAA. The FFAA also had a significant (P<0.05) higher albumen weight than NNAA and NFAA. In yolk height, the NNAA recorded a significant (P<0.05) higher yolk height than FFAA and NFAA. The yolk width of NNAA was significantly higher than FFAA and NFAA.

Eshetie *et al* (2024) reported that genotype significantly affected internal egg qualities. High albumen height depicts high quality (), NNAA recording high albumen height shows it is of high quality. The high width in albumen may be a genetic or nutritional effect rather than deterioration. The FFAA having a high yolk weight shows that it has more mature and nutritionally dense. This work is in agreement with Dunga *et al* (2025) who reported that frizzle gene recorded superiority in yolk weight and diameter. High albumen weight shows good egg quality, the FFAA maintained its high quality. This result is in agreement with Adomako *et al*, (2014) that reported superiority in F1 frizzle genes. The superiority of yolk weight and yolk height in NNAA is agreement with Dunga *et al*, (2025)

Conclusion.

The NNAA and FFAA showed better egg quality traits and can be selected for improvement.

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