INTERACTION EFFECT OF GENOTYPE AND DIETARY TREATMENT ON HAEMATOLOGICAL INDICES OF PULLET CHICKENS

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ABSTRACT
An eight-week experiment was carried out to determine the interaction effect of genotype and dietary treatment on haematological indices of pullet chickens. 144 one-week pullet chicks (72 Isa brown and 72 FUNAAB alpha) were assigned to three treatments (antibiotic group, 1 % bitter leaf meal and 2 % bitter leaf meal) consisting of 3 replicates of 8 birds each, in a completely randomized design. Feed and water were given ad libitum accompanied with standard management procedures. At the end of the eight weeks' experimental period, blood samples were collected for haematological analysis. Data were analyzed using Fit Model of JMP Pro 15 and significant means were separated using Tukey HSD Test at 5 % level of probability. Results showed no significant ($p>0.05$) genotype × diet interaction effect on all the haematological indices evaluated. The absence of significant differences in the haematological indices in both FUNAAB Alpha and Isa brown is an indication of the similarity in the genetic constitution of both genotypes. However, the PCV, Hb and RBC values from the interaction of bitter leaf and FUNAAB alpha genotype were within the normal range while most of the PCV, Hb and RBC values from the interaction of bitter leaf and Isa brown genotype were not within the normal reference range. The findings of this study revealed insignificant genotype by dietary treatment interaction effect on the haematological indices of pullet chickens.

INTRODUCTION
Literature evidence suggests bitter leaf as a promising alternative to antibiotics in influencing growth and blood parameters in poultry due to its rich phytochemical composition (Owen and Amakiri, 2011). Haematological constituents reflect the physiological responsiveness of the animal to its internal and external environments which include feed and feeding (Madubuike and Ekenyem, 2006) as well as drugs (Iheukwumere *et al.,* 2007). Genotype × environment interaction describes the situations where different genotypes (e.g. breeds, lines, strains, progeny groups) react differently to different environments such as diet, housing, location, season, production system, medication, sanitation, weather conditions (Hagan *et al*., 2022). The aspect of genotype × environment interaction in broiler production that is best known to influence phenotypic and economic performance is that of genotype × diet interaction (Alagawany *et al*., 2022).

MATERIALS AND METHODS
Study Location
The study was carried out at the Livestock Teaching and Research Farm, Prince Abubakar Audu University, Anyigba. Anyigba is located in the Derived Savannah zone of Nigeria on latitude 7°15 and 7°29N of the equator and longitude 7°11 and 7°32E of the Greenwich meridian with an average altitude of 420metres above sea level. Daily temperature range is 25°C-35 °C while annual rainfall ranges from 1400-1500 mm (Aderibigbe *et al*., 2022).

Experimental Animals and Management
A total number of 144 one-week pullet chicks (72 Isa brown and 72 FUNAAB alpha) were procured from two accredited hatcheries in Oyo State, Nigeria and assigned to three dietary treatments (antibiotic group, 1 % bitter leaf meal and 2 % bitter leaf meal) consisting of three replicates of eight birds in a completely randomized design. Prior to arrival of the birds, the pens were properly cleaned, washed with soap and formaldehyde in water solution and allowed to rest for one week. The chicks were brooded on deep litter system using charcoal pot and electric bulb alternatively to supply heat. Feed and water were given *ad libitum* accompanied with standard management procedures. The antibiotic treatment was Oxytetracycline hydrochloride administered at 1g/ 4 litres of water according to the manufacturer's instruction.

Data collection and Analysis

At the end of the eight weeks' experimental period, blood samples were collected from the wing vein of one bird per replicate with the aid of needle and syringe for haematological analysis. A 2.0 ml sample of blood from each chicken was collected and transferred into a set of bottles with anti-coagulant for haematological analysis. The values of packed cell volume (PCV), Haemoglobin (Hb) count, Red blood cell (RBC) count and White blood cell count (WBC) were analyzed according to Lamb (1991). Mean corpuscular volume (MCV), Mean corpuscular haemoglobin (MCH) and Mean corpuscular haemoglobin concentration (MCHC) were calculated. The data collected were subjected to analysis of variance technique in a completely randomized design using Fit Model of JMP Pro 15 while significant difference between means was separated using Tukey HSD Test at 5 % level of probability.

The appropriate statistical model used was:

$Yijk = \mu + (GR)\ ij + \varepsilon ijk$

Yijk = observation on kth population, of ith genotype by jth dietary treatment

μ = common mean

(GR)ij = Fixed effect of strain x dietary treatment interaction

εijk = error term

RESULTS AND DISCUSSION

Table 1 shows non-significant (p>0.05) genotype × diet interaction effect on haematological parameters of Isa brown and FUNAAB alpha pullet chickens. The results of this study implied that there was absence of joint effect of genotype and dietary treatment on birds' haematological traits; that is, the two factors acted independently of each other as explained by Olawumi *et al*. (2012). Hence, the two pullet chicken genotypes did not differ in the indices evaluated for. This suggests that farmers may keep any of the two genotypes on any of the three dietary treatments. Contrary to these findings, Iyaode *et al.* (2020) observed significant (p<0.05) strain × diet interaction for Hb, WBC, RBC, MCV, MCH and MCHC.

Table 1: Effect of genotype × dietary treatment interaction on haematological indices of pullet chickens

Parameter	FA×AG	FA×1%BL	FA×2%BL	IB×AG	IB×1%BL	IB×2%BL	SEM
PCV (%)	29.53	29.07	29.90	17.47	12.73	25.43	5.64
Hb (g/dl)	12.73	12.27	12.67	7.86	5.30	10.90	2.24
RBC (× 10^6 mm^3)	2.58	2.52	2.57	1.59	1.29	2.21	0.52
MCV (fl)	80.80	113.63	115.70	110.73	114.30	114.93	14.52
MCH (pg)	49.40	48.67	49.23	49.90	49.70	49.30	0.72
MCHC (g/dl)	43.33	42.97	42.33	45.10	43.60	42.90	1.15
WBC (× 10^3 mm^3)	51.48	56.78	54.96	36.98	23.73	57.93	13.71

a,b,c Means in the same row with different superscripts are significantly different (p< 0.05), SEM = standard error of mean, PCV=packed cell volume, Hb=heamoglobin, WBC = White blood cell, MCH: mean corpuscular volume; MCHC: mean corpuscular haemoglobin concentration, FA = FUNAAB alpha, IB = Isa brown, BL = bitter leaf meal

The normal ranges of the haematological parameters in chickens are RBC: 2.5-3.5 x106 µl, PCV: 22-35 %, Hb: 7-13 g/dl and WBC: 12-30 x 103 µl (Bounous and Stedman, 2000). The MCV is used to calculate the average erythrocyte size, the MCH to measure haemoglobin amount per blood cell and the MCHC to know the amount of haemoglobin relative to the size of the cell per red blood cell. Their normal ranges are MCV: 90-140 fL, MCH: 33-47 pg/cell and MCHC: 26-35 g/dl (Bounous and Stedman, 2000).

The interaction of bitter leaf meal with FUNAAB alpha at 0%, 1% and 2% had PCV, Hb and RBC values were within the normal reference range (Bounous and Stedman, 2000). In contrast, Isa brown interacting with Bitter leaf meal at 0% and 1% had PCV values lower than the normal range (Bounous and Stedman, 2000) except 2% bitter leaf meal. Similarly, Isa brown interacting with 1% bitter leaf meal recorded Hb values lower than the normal range (Bounous and Stedman, 2000). In the same vein, Isa brown interacting with bitter leaf meal at 0%, 1% and 2% had RBC values lower than the normal range (Bounous and Stedman, 2000). These findings align with previous research indicating that genetic

factors contribute to differences in haematological parameters among chicken strains (Adewole *et al*., 2021).

All the MCV values observed in this study were within the normal range except for 0% bitter leaf meal × FA. The MCH values observed were above the normal range. The values observed for WBC in this study were above the normal range except for IB × 1% bitter leaf meal. Aregheore *et al*. (1998) suggested that the presence of some phytochemicals in bitter leaf extract induces the animal to respond as if it has infection. Thus, increase in WBC could also be attributed to the presence of anti-nutritional compounds in *Vernonia amygdalina*.

CONCLUSION

The findings of this study revealed insignificant strain by dietary treatment interaction effect on all the haematological indices of pullet chickens studied. This is an indication that both FUNAAB alpha and Isa brown pullet chickens reacted in a similar manner to the dietary treatments offered. However, the PCV, Hb and RBC values from the interaction of bitter leaf and FUNAAB alpha strain were within the normal range while most of the PCV, Hb and RBC values from the interaction of bitter leaf and Isa brown strain were not within the normal reference range.

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