EFFECTS OF AQUEOUS PLANT EXTRACTS ON THE HAEMATOLOGICAL INDICES OF PURE AND CROSSBRED CHICKENS

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ABSTRACT
The effect of neem and ginger extracts on the haematological indices of Noiler, Heavy Ecotype chicken and their crossbred was investigated. A total of 360 one-day-old chicks from 3 genetic groups consisting; 120 chicks from a cross between Noiler cocks × Noiler (NN) hens, 120 chicks from a cross between Heavy Ecotype cocks × Heavy Ecotype (HH) hens and 120 chicks from a cross between Noiler cocks × Heavy Ecotype (NH) hen were used for the study. The chicks from each genetic group were randomly assigned to 4 treatments with 30 birds per treatment as follows: T1: No plant extracts, T2: 200 ml neem, T3: 200 ml ginger and T4: 100 ml neem + 100 ml ginger. The result indicated that haemoglobin (HB), packed cell volume (PCV), Platelets, white blood cells (WBC) and its differential showed significant treatment effect (P<0.05) except red blood cell (RBC), mean cell volume (MCV), mean cell haemoglobin (MCH) and mean cell haemoglobin concentration (MCHC). From the result, it was concluded that 200 ml of ginger extract and the combined effect of neem and ginger extracts can be used to improve the blood parameters and general health of the birds.
Keywords: Neem, ginger, haematology, Noiler, Heavy Ecotype

INTRODUCTION

In developing countries like Nigeria, where poultry production is experiencing gradual development, genetic improvement of well adapted strains of avian and livestock species is of great importance and should also contribute to their conservation (Obike *et al.,* 2016). The genetic improvement of the Nigerian indigenous local chickens can help to alleviate the problems of animal protein shortage especially in the rural areas where they are kept by the natives, principally as a source of protein and income (Egahi *et al.,* 2010). Heavy ecotype chicken is one of the indigenous local chickens from the dry Savannah (Guinea and Sahel Savannah), montane regions and cattle kraals of the North, whose mature body weight ranges from 0.9-2.5 kg at maturity (Momoh *et al.,* 2010). They also lay small sized eggs, grow slowly and can adapt to the local environment better than the exotic types. On the other hand, the Noiler chicken is a hybrid chicken developed in Nigeria by Amo Farm Sieberer Hatchery after successfully crossing a male broiler with an exotic pullet (Agrikhub, 2018). It went through several testing procedures under the African Chicken Genetic Gains (ACGG) project. Nweke *et al.* (2022) in his experiment revealed that the Noiler breeds had higher values for all the short-term egg production characteristics of the four strains of chickens studied and this could serve as baseline information for future improvement and selection. These improved indigenous breeds (Noiler) with distinct genetic characteristics could be used to boost local chicken productivity.

Consequently, the Poultry industry is assuming responsibility towards alleviating the health challenges associated with the consumption of poultry product. This has prompted researchers to consider alternatives to antibiotics growth promoters. Among the potential alternatives are phytogenic plant extracts of medicinal plants such as neem leaf and ginger which are safe, cheap and rich in various bioactive chemicals or secondary metabolites (Oluwafemi *et al.,* 2020). Beneficial effects of extracts of medicinal plants in animal nutrition include the stimulation of appetite and feed intake, the improvement in endogenous digestive enzyme secretion, activation of immune response and antibacterial, antiviral and antioxidant actions (Egbeyale *et al.,* 2021). Neem tree is a widely researched tree that has attracted worldwide recognition due to its vast range of medicinal potentials like antibacterial, antiviral, antifungal, antiprotozoal, hepatoprotective and anticoccidal effect in poultry and other animals (monogastric and ruminant species. The leaf extract contains nimbin, nimbinene, 6-desacetylnimbiene,

nimbadole, nimbolide and quercetin (Miltra *et al.,* 2000). The most important bioactive components of ginger responsible for its pungent taste and pharmacological activities were shown to be gingerols, including 6-, 8-, 10-gingerol, etc (Alsherbiny *et al.,* 2019). Gingerols were proven to alleviate oxidative stress of animals induced by mycotoxins, heavy metals, aging, etc (Li *et al.,* 2019). Ginger has immunostimulant effect that activates the cell mediated immune response and therefore, creates an enhanced response to any future challenges that may be caused by disease organisms. Thus, the objective of this study was to determine the effect of neem leaf and ginger extracts on the Haematological indices of Noiler, Heavy Ecotype chicken and their crossbred.

MATERIALS AND METHODS

Experimental animals and managements: The study was conducted at the Poultry Unit, Department of Animal Science Teaching and Research Farm, University of Nigeria, Nsukka, Enugu State, South Eastern Nigeria. A total of 360 one-day-old chicks from 3 genetic groups consisting; 120 chicks from a cross between Noiler cocks × Noiler (NN) hens, 120 chicks from a cross between Heavy Ecotype cocks × Heavy Ecotype (HH) hens and 120 chicks from a cross between Noiler cocks × Heavy Ecotype (NH) hens were randomly assigned into 4 treatments with (30) birds per treatment. Each treatment group consisted of 3 replicates (n=10), with uniform body weight as follows: T1: No plant extracts, T2: 200 mL neem, T3: 200 mL ginger and T4: 100 mL neem + 100 mL ginger. The temperature was kept at 22 ^{o}C until the end of the experiment. Light day duration was on 23 h of light and 1 h of dark. Humidity in the first week was 70-75%, and after the second week was 55-65%. The experimental design used was a 3×4 factorial arrangement of treatments in a Completely Randomized Design (CRD). Fresh experimental diets and clean water were made available *ad libitum* for the birds throughout the experimental period. All the management practices and ethics associated with animal use for experimentation in the University of Nigeria were strictly adhered to.

Methodology of Blood Assay: At the end of the study, three birds were randomly selected from each treatment for blood analysis. About 3 ml of blood was collected from the wing vein of the birds using syringe and needle and emptied directly into ethylene diamine tetra-acetate (EDTA) sample bottles for the determination of haematological indices. Haemoglobin (HB), red blood cell (RBC), white blood cell (WBC), packed cell volume (PCV), platelet, mean cell volume (MCV), mean cell haemoglobin (MCH), mean cell haemoglobin concentration (MCHC) and differential leukocytic counts were done according to the routine haematological procedures for avian (Ladokun *et al.,*2008).

RESULTS AND DISCUSSION

The interaction effects of aqueous plant extracts on the haematological indices of pure and crossbred chickens is shown in Table 1. Results of the haematological indices showed that haemoglobin (HB), packed cell volume (PCV), Platelets, white blood cells (WBC) and its differential showed significant treatment effect ($P<0.05$). Changes in blood hematological and biochemical metabolites help to monitor and assess an animal's physiological, nutritional, and pathological conditions (webb *et al.,* 2022). The interaction of main cross on T3 had the highest HB (11.40 g/dL) followed by the heavy ecotype birds on T3 (10.20 g/dL), T4 (10.20 g/dL) and main cross on T4 (10.20 g/dL) and then the Noiler which had the least mean HB values. Main cross on T3 and heavy ecotype on T3 and T4 had the highest PCV values among the treatment which is similar to main cross on T4, heavy ecotype on T2 and Noiler on T3. Main cross and heavy ecotype on T3 and T4 had the highest WBC compared to other treatment groups. These results were in line with Vivian *et al.* (2015) who opined that the increase in the vital hematological constituents like PCV, Hb, RBC, and WBC in birds fed with the herbal ingredients ginger is an indication of improved oxygen carrying capacity of the cells which translated to a better availability of nutrients for utilization to the birds consequently affecting their well-being with an active immune system. The reason behind the immunity-boosting effect of ginger might be due to the anti-oxidation effects as well as natural aromatic active constituents such as gingerol and shogoals (Khan *et al.,* 2012). Ali *et al.* (2008) also noticed that certain anti-inflammatory and anti-oxidation activity containing components were found in ginger which indirectly enhanced the birds' immunity. Combine administration of ginger and neem extract numerical reduced the platelets in the blood. Muhammed and Lakshmi (2007) opined that inhibiting the transformation of arachidonic

acid to thromboxane and decreasing the sensitivity of platelets to aggregating agents may be possible with the administration of ginger in fatty diets. This implies that ginger could be potentially useful in improving blood circulation on account of its inhibitory effects on platelet aggregation. The non-significant (P>0.05) effect observed on the major haematological indices of the birds (RBC, MCV, MCH, MCHC) is an indication that the plant extracts is not detrimental to the formation, function of the blood cells and their constituents, though the values obtained fell within the ranges of reference values for clinically normal chickens (1.35-3.50 x10^9/L RBC; 89.59-154.94% MCV; 24.05-34.75 pg MCH; 23.21-37.71 g/dL MCHC). MCV **and MCHC reflect the hemoglobin contents in RBCs, thus showing the enhanced oxygen carrying capacity and better health.** Normal MCV values obtained in this study are an indication of the absence of macrocytic anaemia which is often caused by dietary deficiencies in vitamin B12, folate and other causes. All haematological parameters of birds decreased significantly (P<0.05) in all neem treated groups probably due to depressive effect of triterenoid present in neem leaf.

CONCLUSION

The differences in haematological indices observed among the genetic groups indicate differences in their genetic makeup. It can be concluded that 200 ml of ginger extract and the combined effect of neem and ginger extracts can improve haematological indices of main cross and heavy Ecotype without any detrimental effect.

TABLE 1: Interactions of Genotype groups and Levels of Plant Extracts on the Haematological Indices of Birds

	NOILER CHICKS				HEAVY ECOTYPE CHICKS				MAIN CROSS				
Parameter	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	SEM
HB (g/dL)	7.40^{e}	8.85^{cd}	8.00^{de}	9.00^{c}	7.05^{e}	7.15^{e}	10.20^{b}	10.20^{b}	7.20^{e}	8.65^{cd}	11.40^{a}	10.20^{b}	8.77
PCV (%)	21.85^{d}	29.80^{bc}	31.93^{abc}	27.50^{cd}	28.81^{c}	30.94^{abc}	36.20^{a}	36.69^{a}	28.78^{c}	29.32^{bc}	36.40^{a}	35.53^{ab}	31.14
RBC (x 10^9/L)	1.75	2.45	2.35	1.35	3.00	3.50	3.35	3.05	2.85	3.45	3.35	3.10	2.79
MCV (%)	146.19	148.65	154.94	198.15	96.86	97.23	96.85	123.56	104.14	92.01	89.59	116.04	122.02
MCH (pg)	29.95	31.71	28.51	30.17	24.12	22.22	26.46	34.75	25.34	27.26	24.05	33.16	35.64
MCHC (g/dL)	33.86	28.05	31.56	37.71	24.69	23.21	28.45	27.85	25.74	29.45	26.83	28.67	28.84
WBC (x 10^9/L)	9.00^{bc}	7.95^{c}	8.10^{c}	8.80^{bc}	8.65^{bc}	9.85^{b}	13.10^{a}	12.25^{a}	7.55^{c}	10.00^{b}	11.65^{a}	12.20^{a}	9.92
Platelets (x 10^9/L)	45.20^{d}	70.95^{b}	58.35^{c}	85.50^{a}	53.30^{cd}	55.55^{c}	67.85^{b}	88.50^{a}	55.65^{c}	63.05^{bc}	68.30^{b}	85.65^{a}	66.48
Neutrophils (%)	36.00^{f}	49.00^{b}	56.00^{a}	40.00^{def}	43.50^{bcd}	47.50^{bc}	49.00^{b}	57.50^{a}	41.50^{def}	37.50^{ef}	47.50^{bc}	42.50^{cde}	45.63
Lymphocytes (%)	37.00^{de}	47.50^{abc}	49.00^{ab}	37.50^{de}	42.50^{bcde}	35.00^{e}	41.00^{cde}	50.50^{a}	35.00^{e}	37.50^{de}	40.00^{cde}	43.50^{abcd}	41.33
Eosinophils (%)	1.00^{e}	3.00^{a}	3.00^{a}	1.50^{d}	2.00^{c}	2.00^{c}	2.00^{c}	1.50^{d}	2.00^{c}	3.00^{a}	3.00^{a}	2.50^{b}	2.21
Monocytes (%)	0.00^{c}	2.00^{a}	2.00^{a}	0.50^{d}	1.00^{c}	1.00^{c}	1.00^{c}	1.50^{b}	1.00^{c}	2.00^{a}	2.00^{a}	1.50^{b}	1.29
Basophils (%)	0.00^{c}	1.00^{a}	1.00^{a}	0.00^{c}	0.00^{c}	0.00^{c}	0.00^{c}	0.50^{b}	0.00^{c}	1.00^{a}	1.00^{a}	0.50^{b}	0.42

$^{a,b,c,d, e}$– Means in the same row with different superscripts are significant at 5 or 1 % (* P <0.05; ** P< 0.01)

T1: No plant extracts, T2: 200 ml neem, T3: 200 ml ginger, T4: 100 ml neem + 100 ml ginger

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