HAEMATOLOGY AND SERUM BIOCHEMISTRY PROFILE OF GROWING RABBITS FED DIETS SUPPLEMENTED WITH ALLIGATOR PEPPER (*AFRAMOMUM MELEGUETA)* SEED MEAL

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ABSTRACT
The ban on the use of antibiotics in livestock production has necessitated the use of alternatives such as plant materials (herbs and spices) to increase feed conversion, enhance growth rate, nutritive value and health status of farm animals. Thirty six rabbits were used to evaluate the haematological and serum biochemical parameters of rabbit fed diets supplemented with Aframomum melegueta. There were four dietary treatments consisting of 0, 0.5, 1 and 1.5% Aframomum melegueta, and the experiment lasted for 49 days. The experiment was performed in three replicates with three per replicate. The rabbits were balanced for weight and complete randomized design (CRD) was used. Parameters measured for this study include Packed cell volume, Red blood cells, mean corspuscular haemoglobin concentration (MCHC), mean cell volume, mean cell haemoglobin, White blood cells, haemoglobin, granulocytes, lymphocytes, monocytes, Total protein, albumin, globulin, Aspartate aminotransferase, Alanine aminotransferase, creatinine and cholesterol. The result revealed that the MCHC and monocytes were significantly influenced (P<0.05) by the dietary treatment in the blood parameters investigated. Of all the serum metabolite parameters measured only the total protein, creatinine and cholesterol were significantly (P<0.05) affected by the dietary treatment. It was concluded that the addition of Aframomum melegueta to diets of rabbit does not pose any adverse effect on the blood parameters of the rabbit and could be an indication that their addition enhances optimum nutrient intake by the rabbits.
Keywords: *Aframomum melegueta*, Alligator pepper, serum biochemical, haematological, supplementation

INTRODUCTION

Rabbit production is regarded as an important source of protein, income, food security, and employment generation in sub-Saharan African countries, including Nigeria (Tembachako and Mrema, 2016; Oseni and Lukefahr, 2014). In Nigeria, many of the available crop and animal protein sources are usually not sufficiently produced to meet the minimum daily protein needs of an average adult (Tembachako and Mrema, 2016). Hence, the reliance on rabbit production as a source of cheap animal protein in solving malnutrition cannot be overemphasized. Also the need to reduce cost of production of meat has necessitated the use of plant materials with medicinal properties as feed additives capable of minimizing the influence of pathogenic microbes and improving performance of the animal. Herbs and spice mixtures are now added to monogastric animal diets to improve their nutritive value, boost animal growth rate, enhance feed conversion efficiency and maintain health (Odoemelam *et al*., 2013) due particularly to the worldwide ban on the use of antibiotics in livestock production. With increasing industry standards and consumer awareness as well as increase in demand for healthy food products of animal origin, the pressure is on the livestock industry for more natural and non-residual alternatives than the conventional feed additives used till recently. Hence this study is carried out to assess the effects of alligator pepper (*Aframomum melegueta*) seed meal on the hematological and serum biochemical profile of rabbit.

MATERIALS AND METHODS

The study was conducted at the rabbit section of the Teaching and Research Farm Directorate of Federal College of Agriculture, Akure, Ondo State, Nigeria. The details description of weather pattern of the study area was reported by (Arotolu *et al.,* 2015). The *Aframomum melegueta* pod were collected within Akure metropolis and the seeds were extracted from the epicarp and milled into fine powder (*Aframonum melegueta* seed meal). Four diets were formulated and supplemented with the

Aframonum melegueta seed meal (AMSM) at 0%, 0.5%, 1% and 1.5% for T_1, T_2, T_3 and T_4 respectively. 100g of the feed were given to animals daily which was later increased to 150g, this was done so as to reduce wastage. However, the rabbits were offered 50g of *Tridax procumbens* for easy digestibility of the concentrates. Water was provided *ad-libitum* and the experiment lasted 7weeeks.
A total of 36 weaners rabbits of mixed sex and breeds were used for this experiment. They were randomly allotted into four dietary group of nine rabbits each. Each treatment had three replicates of three rabbits each. Composition of experimental diets is shown in Table 1.
At the end of the experiment, one rabbit per replicate was randomly selected, weighed and slaughtered. Blood samples were collected from the rabbits by severing the jugular veins allowing free flow of blood into ethylene-diamine tetracetic acid (EDTA) bottle and plain bottle for serum (total protein, cholesterol, alanine aminotransaminase (ALT), aspartate aminotransferase (AST), creatinine, albumin). All data were subjected to analysis of variance (ANOVA) using SAS (2002) while the Duncan Multiple Range Test was used to separate means of the parameter measured.

Table 1: Composition (%) of Experimental Basal Diet

Ingredients	%
Maize	50.00
Fish meal (72%)	1.00
Wheat offal	26.20
Soyabean	7.00
Groundnut cake	10.00
Bone meal	3.00
Oyster shell	2.00
Methionine	0.20
Lysine	0.10
Salt	0.25
Vitamin and Mineral premix	0.25
Total	100.00
Calculated Analysis	
Metabolizable Energy (Kcal/kg)	2497.20
Crude Protein	17.64
Calcium	1.49
Phosphorus	0.78
Lysine	0.86
Mehionine	0.47
Crude fiber	11.57

RESULTS AND DISCUSSION

Haematological Values

Table 2 depicts the haematological parameters of rabbits fed Alligator pepper seed meal. Result from the study revealed across the treatment that there was significant ($P<0.05$) influence on mean corpuscular haemoglobin concentration and monocytes (%). However, Red blood cell and monocytes (%) were the highest in rabbits fed diet 1 containing (0% AMSM). Packed cell volume, mean corpuscular haemoglobin concentration, haemoglobin and granulocytes (%) were the highest in rabbits fed diet 2 containing 0.5% AMSM, while white blood cell, granulocytes (x10^9/L), and monocyte (x10^9/L) were the highest in rabbits fed diet 3 containing 1% AMSM. Mean cell volume, mean corpuscular haemoglobin, lymphocyte (x10^9/L), lymphocyte (%), were the highest in rabbit fed diet 3 containing 1.5% of AFSM.

Table 2 Haematological Values of Rabbits fed with Alligator Pepper (*Aframomum*)

	Level of Supplementation				
	0%	0.5%	1%	1.5	
Parameters	**Diet 1**	**Diet 2**	**Diet 3**	**Diet 4**	**±SEM**
Packed cell volume (%)	44.67	46.33	44.00	36.64	1.68
Red blood cell (x10^6/L)	6.50	6.40	5.60	4.40	0.40
MCHC (g/dl)	32.07^{b}	33.10^{a}	32.57^{ab}	32.73^{ab}	0.15
Mean cell volume (fL)	72.51	73.17	80.52	83.60	3.64
MCH (pg/cell)	24.17	24.39	26.84	27.86	1.21
Haemoglobin (Hbg/dl)	14.89	15.44	14.66	12.22	0.56
White blood cell (x10^9/L)	7.13	9.20	11.70	10.57	0.88
Granulocytes (x10^9/L)	3.92	6.41	7.69	4.79	0.66
Granulocytes (%)	54.67	69.33	68.00	46.33	4.15
Lymphocytes (x10^9/L)	2.98	2.73	3.68	5.61	0.61
Lymphocytes (%)	42.00	30.00	29.33	52.00	4.01
Monocytes (x10^9/L)	0.23	0.06	0.33	0.17	0.05
Monocytes (%)	3.33^{a}	0.67^{b}	2.67^{ab}	1.67^{ab}	0.40

a, b, ab = means across the treatments are significantly (P<0.05) different.
KEY: MCHC: Mean corpuscular haemoglobin concentration, MCH: Mean corpuscular haemolobin.

Report from Aletor and Egberonge (1992) and further corroborated by Aletor *et al*., (1998) indicated that blood variable most commonly affected by dietary treatment are the Red blood cell (RBC), packed cell volume (PCV), and haemoglobin (Hb). The result obtained in this study for blood parameters (Table 2) showed that results obtained for the packed cell volume (PCV) in this study (36.67-46.43%) fell within the range (31.0-50%) reported by Zimmerman *et al*., (2010) and also fell within the range (30-50%) reported by Research Animal Resources (2009). PCV measurement can be used as an assay of nutritional anemia (dietary deficiency of iron, copper, vitamins and amino acids). Since the values obtained for PCV falls within the normal range values, it can be interpreted that the dietary treatment did not cause any nutritional anemia and can supply the needed nutrients to the rabbits. The percentage of the volume of whole clotted blood occupied by the Red Blood Cell (RBC) is a useful prognotic indicator in dehydration or excitement when the PCV is abnormally high and it aids in the diagnosis of anemia when it is low (Blood and Studdent, 1999). Anemia occurs when there is reduction in RBC count in circulation, haemoglobin increased RBC content and PCV. Decreased RBC is usually associated with low quality and quantity of protein in the diet but since the value obtained for diet 4 with 1.5% *Aframomum melegueta* (A.M) in this study (4.40x10^6/L) does not fall within the normal range (5.22-7.94 x10^6/L) reported by Zimmerman *et al*., (2010), but is within the range (3.55-6.15 x10^6/L) reported by Hassan *et al*., (2021) where rabbit were fed with garlic which belongs to the same family as A.M. It could be deduced that diet4 had no adverse effect on the RBC.
Results obtained from this study with values of white blood cell (7.13-11.70 x10^9/L) falls within the normal range (5.5-12.5 x10^9/L) as reported by Zimmerman *et al*., (2010) and also within the range (2.5 – 12.5 x10^9/L) reported by Post Graduate Committee on Veterinary Sciences (PGCVS) (1990). White blood cells count seldom elevated due to infection in rabbit but it is more related to blood collection methods and various stress factors (Jenkins, 2008; Melillo, 2007; Silva *et al*., 2005). Rabbits kept alone possess higher WBCs count than those fed in groups (Fuentes and Newgren, 2008). Post Graduate Committee on Veterinary Sciences (PGCVS) (1990) reported a standard WBC range of (2.5 – 12.5x10^9/L). Reilly (1993) opined that normal range of values for WBC indicated that the animals were healthy because decrease in number of WBC below the normal range is an indication of allergic conditions, anaphylactic shock and certain parasitism. This suggests that the dietary treatment had no adverse effect on the WBC. Results obtained for the lymphocytes (%) in this study (29.33-52.00%) falls within the normal range (28-52.1%) reported by Zimmerman *et al*., (2010). In rabbits, increased monocyte counts can be associated with chronic bacterial infection, the values for monocytes (%) obtained for diet with *Aframomum melegueta* across the treatment in this study (0.67-3.33%) was decreased and does not fall within the normal range (4-13.4%) reported by Zimmerman *et al*., (2010). This shows that the dietary treatment had a positive effect on the rabbit's monocytes.

The haemoglobin value (12.22-15.44 g/ld) obtained in this experiment were within the normal range as reported by Zimmerman *et al*., (2010). Haemoglobin value for rabbit fed diet 1 containing 0.5% *Aframomum melegueta* was the highest while diet 4 with 1.5% *Aframomum melegueta* had the least. The pepperish taste of *Aframomum melegueta* could cause reduction in appetite to eat in the rabbit, so resulting to decreased blood hemoglobin concentration (Oguwike *et al*., 2020).

Serum Biochemicals

The values for the Serum biochemical parameters are presented in Table 3. The result obtained in this study for serum biochemical indices showed that the treatment had no significant difference (P>0.05) on Asparate aminotransferase (AST), Alanine aminotransferase (ALT), Albumin and Globulin, while Total protein, Creatinine and Cholesterol were significantly different (P<0.05). The value for cholesterol was within the range (3.28-3.76mmol/l). The Creatinine value obtained in this study (85.60-118.50mmol/l) were sigificantly (P<0.05) influenced by the treatment. Creatinine value for rabbits fed 0% *Aframomum melegueta* (AMSM) was higher (118.50mmol/l) while diet with 1.5%A.M had the least (85.60mmol/l). However, the trend seems to decrease as the level of supplement of *Aframomum melegueta* increases across the treatment.

Creatinine is a nitrogenous waste product formed from the metabolism of creatinine in skeletal muscle. Measurement of creatinine is used as a test of kidney function and high level signifies impaired kidney function. High creatinine indicates poor utilization of nutrients due to muscle wastage (Udoyong *et al*., 2010). The values obtained in this study (85.60-118.50mol/l) is an indication that *Aframomum melegueta* had no detrimental effect on the rabbit's kidney function and does not result in muscle wasting in rabbit. The values of total protein from this study (63.50-83.70g/l) were within the normal reference range (45-122g/l) reported by Ozkan (2009). This suggests that normal protein metabolism occurred in rabbits, since protein synthesis is related to the amount of protein available in the diet (Iyayi and Tewe, 1998).

Table 3 Serum biochemical Values of Rabbits Fed with Alligator Pepper (*Aframomum melegueta*)

	Level of Supplementation				
	0%	0.5%	1%	1.5%	
Parameters	**Diet 1**	**Diet 2**	**Diet 3**	**Diet 4**	**±SEM**
AST (IU/L)	183.23	1 86.77	193.10	193.10	2.66
ALT (IU/L)	96.23	96.10	113.13	105.47	3.43
Total protein (g/l)	63.50^{a}	70.03^{a}	77.93^{b}	83.70^{b}	2.29
Creatinine (mmol/l	118.50^{c}	104.20^{bc}	94.37^{ab}	85.60^{a}	4.14
Cholesterol (mmol/l)	1 3.76^{b}	3.35^{ab}	3.28^{a}	3.51^{ab}	0.08
Albumin (g/l)	25.53	42.23	22.50	31.23	4.10
Globulin (g/l)	39.97	27.80	55.43	52.47	4.86

a, b = mean of similar superscript along row are not significantly (P>0.05) different

KEY: AST: Asparate Aminotransferase, ALT: Alanine aminotransferase.

CONCLUSION

The study, showed thatsupplementing about 1.5% *Aframomum melegueta* in the diet of rabbit did not have detrimental effect on the blood and serum indices of rabbits. There was improvement in haematological and serum parameters (White blood cell, packed cell volume, red blood cell, creatinine and cholesterol). The use of *Aframomum melegueta* will definitely improve the health of rabbit and also enhance nutrient intake by the rabbits.

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