

**NSAP****47th Annual
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(JOS 2022)****CONFERENCE
PROCEEDINGS**THEME
**SECURING ANIMAL
AGRICULTURE AMIDST
GLOBAL CHALLENGES****HAEMATOLOGY AND SERUM CHEMISTRY VALUES OF PRE-PUBERTAL BOARS
FED AIDAN (*Tetrapleura tetraptera*) POD MEAL****Ezea, J., Ezike, J. C. and Nathaniel, J.**Department of Animal Breeding and Physiology,
Michael Okpara University of Agriculture, Umudike, Abia State.
jonas96eza@gmail.com**ABSTRACT**

A total of 18, 6-week old crossbred (Large White x Duroc) weaner boars, averaging 9.47kg were used to evaluate the effect of the inclusion of *Tetrapleura tetraptera* pod pulp meal (APM) on their haematological and serum chemistry profiles for a period of 12 weeks. The boars were randomly assigned to three treatment groups of 6 animals each; treatment one (control) had 0.00% APM, while APM was included in the basal diet at 2.50% and 5.00% to constitute treatments two and three, respectively. Each treatment was replicated thrice, with 2 animals in a replicate in a completely randomized design. Data were collected for haematology and serum chemistry indices. Results indicated significant ($P < 0.05$) increase in erythrocyte and platelet counts with serum albumin in APM-fed boars. There were significantly ($P < 0.05$) higher packed cell volume, high-density lipoprotein and total cholesterol at 2.5% APM as white blood cell and mean cell haemoglobin concentration were significantly lowered by the same level of APM. Mean cell volume, mean cell haemoglobin and triglycerides were reduced significantly by APM. While serum glucose and globulin were increased significantly at 5.0% APM, total protein, AST, ALT and creatinine followed a reverse trend. It was concluded that APM enhanced the haematology, serum albumin, globulin and glucose; and moderated the liver and kidney metabolites, especially at 5.0%, indicating a positive influence on hepatic and renal efficiencies.

Keywords: Pre-pubertal boars, Aidan, Haematology, Serum chemistry, Lipid profile**INTRODUCTION**

There is growing interest in application of herbs, spices and botanicals in the production of food animals. They are potential alternatives to the use of pharmaceutical antimicrobial growth promoters. Antibiotic growth promoters, which are routinely included in feed/water for animal feeding have got some limitations (Hunters *et al.*, 2010). Increased exploration of herbal feed additives is also linked to consumer pressure to eliminate the use of all non-plant xenobiotic agents from the diets of farm animals (Kumar *et al.*, 2014). According to Frankic *et al.* (2009), herbal extracts stimulate appetite and enhance digestion of feed. Aidan pod is a rich source of phytochemicals such as polyphenols (tannins, flavonoids), saponins, phytate, triterpenoid, coumarin (scopoletin), phenols (caffeic and cinnamic acids) and triterpene glycoside (aridanin) (Jezska-Skowroma *et al.*, 2014). The presence of these substances tends to support the reported biological and pharmacological activities of the plant, which include hypoglycaemic and hypolipidaemic, among others (Kuate *et al.*, 2015). Reduction in plasma cholesterol *in vivo* by naringenin, an isolate of the pod, was reported by Wilcox *et al.* (2001). Changes in blood cells and metabolites have been found useful in assessing the quality of whole feeds and feed additives of interest in animal nutrition, physiology and biochemistry researches. (Maxwell *et al.*, 1990). The aim of this work was to explore the blood profile of young boars fed pod pulp meal of *Tetrapleura tetraptera*.



MATERIALS AND METHODS

The research was carried out at the Piggery Unit, Livestock Teaching and Research Farm, Michael Okpara University of Agriculture, Umudike, Abia State. Umudike lies on co-ordinates 05°29' N and 07° 33'E, with an altitude of 122m above sea level. The average annual rainfall ranges from 1700 to 2100 mm. Minimum and maximum temperatures are in the ranges of 18-23° C and 26-36° C, respectively; while relative humidity is 57-91% (NRCRI, 2017).

Eighteen crossbred (Large White x Duroc), 6-week old weaner boars weighing 9.47kg on the average were used for the experiment. They were stocked, allowed 2 week-quarantine period during which they were administered Ivermectin injectable solution (1%) via the subcutaneous route at 0.25ml/12.5 kg body weight, against internal and external parasites. The boars were tagged and divided into three treatment groups of six animals. Each treatment was replicated thrice, two boars constituting a replicate in a completely randomized design. They were reared in pens with hard and non-slippery concrete floor. The pens were cleaned daily throughout the experiment. They were fed for 12 weeks. The two soft 'wings' of dry pods were peeled off with a sharp kitchen knife and subsequently crushed with a hammer mill for easy mixing with the other feed ingredients. Aidan pod pulp meal (APM) was added as a spice at 0.0% (control), 2.50% and 5.0%, respectively, in the diets of the boars.

Blood Sampling and Analyses

Two millilitres each of blood samples were taken from the cephalic vein of the fore limb of the boars at 18 weeks of age, for haematology and serum chemistry studies, respectively. Samples for haematological studies were collected in bottles treated with Ethylene Diamine Tetra-acetic Acid (EDTA) while those for serum chemistry were collected in anticoagulant-free bottles to allow for clotting and harvesting of sera. Haematological parameters were determined according to Jain (1986); while serum chemistry indices were in line with Schmidt and Schmidt (1963). Total cholesterol, triglycerides and high-density lipoprotein were determined using Randox commercial kit (Randox Co. UK.). Low-density lipoprotein (LDL) and very low-density lipoprotein (VLDL)

LDL was calculated according to Friedwald *et al.* (1972) equations as follows:

$$\text{LDL (mg/dl)} = \frac{\text{Total cholesterol (mg/dl)} - \text{Triglycerides (mg/dl)} - \text{HDL (mg/dl)}}{5}$$

Very low-density lipoprotein (VLDL) (mg/dl) was calculated as:

$$\frac{\text{Triglycerides (mg/dl)}}{5}$$

Statistical data were subjected to one-way analysis of variance (ANOVA) procedure, according to Steele and Torrie (1980). Significantly different means were separated using Duncan's New Multiple Range Test (DNMRT) (Duncan, 1955).

RESULTS AND DISCUSSIONS

Table 1: Haematological parameters of pre-pubertal boars fed APM

Parameter	Treatments			SEM
	0.0% APM	2.5% APM	5.0% APM	
Red Blood Cell ($\times 10^{12}/\text{l}$)	6.56 ^b	7.33 ^a	7.50 ^a	0.19
Packed Cell Volume (%)	41.56 ^b	43.30 ^a	42.55 ^{ab}	0.35
Haemoglobin (g/l)	10.89	10.98	11.32	0.14
White Blood Cells ($\times 10^9/\text{l}$)	15.7 ^a	13.88 ^b	15.99 ^a	0.36



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Platelets (x10 ⁹ /l)	194.33 ^b	200.33 ^a	202.00 ^a	1.51
Mean cell volume (fl)	63.70 ^a	58.13 ^b	56.94 ^b	1.61
Mean cell haemoglobin (pg)	16.63 ^a	14.98 ^b	15.15 ^b	0.37
Mean cell haemoglobin concentration (g/l)	26.21 ^a	25.36 ^b	26.58 ^a	0.40

^{a, b} Means on the same row with different superscripts are significantly (P<0.05) different.
SEM = standard error of the mean, APM = Aidan pod pulp meal

There were significantly lower numbers of red blood cells and platelets in boars fed 0.0% APM than those fed APM. Packed cells occupied smaller (P<0.05) volume in the blood of boars fed 0.0% APM than their peers fed 2.5%. Haemoglobin concentration did not vary across the treatment groups. Number of white blood cells per litre of blood was lowered (P<0.05) in boars fed 2.5% APM but did not vary between the control and 5.0% APM-fed boars. Average volume of red cells (MCV) in the whole blood was lower (P<0.05) in the APM-fed groups than those fed without the test ingredient. The amount of haemoglobin per red blood cell (MCH) followed the same trend as in MCV. The percentage of red blood cell mass attributable to haemoglobin (MCHC) was lower (P<0.05) in pre-pubertal boars fed 2.5% APM.

The haematological indices fell within the reference ranges reported by RAR (2009), in the blood of feeder pigs. The RBC, MCH and MCHC obtained in this work were however, lower than those recorded by Eze *et al.* (2010) among boars reared in the south-eastern Nigeria.

Table 2: Serum chemistry parameters of pre-pubertal boars fed APM

Parameter	Treatments			SEM
	0.0% APM	2.5% APM	5.0% APM	
Glucose (mg/dl)	74.28 ^a	70.62 ^{ab}	67.99 ^b	1.25
Total protein (mg/dl)	6.43 ^b	6.92 ^b	7.53 ^a	0.19
Albumin (mg/dl)	3.48 ^b	3.69 ^a	4.20 ^a	0.13
Globulin (mg/dl)	2.96 ^b	3.23 ^b	3.33 ^a	0.09
Aspartate aminotransferase(u/l)	51.67 ^a	45.00 ^a	30.67 ^b	3.42
Alanine aminotransferase(u/l)	31.67 ^a	29.00 ^a	22.00 ^b	1.56
Urea (mg/dl)	14.99 ^b	21.01 ^a	15.73 ^b	0.96
Creatinine(mg/dl)	1.23 ^a	0.90 ^{ab}	0.69 ^b	0.12

^{a, b} Means on the same row with different superscripts are significantly (P<0.05) different.

SEM = standard error of the mean, APM =Aidan pod pulp meal

There were significant reduction and increase of glucose and total protein, respectively with addition of 5.0% APM. Albumin was increased (P<0.05) by addition of APM, whereas globulin appreciated (P<0.05) only at 5.0% APM. Aspartate aminotransferase (AST) and alanine aminotransferase (ALT) were both significantly reduced at 5.0% APM. Changes in urea were irregular, increasing significantly at 2.5% and decreasing at 5.0% APM. Creatinine was significantly reduced at 5.0%, though not differing (P>0.05) from what obtained at 2.5% APM. Serum chemistry indices obtained in this work were within the ranges of values reported in feeder pigs by Friendship *et al.* (1984). Significantly reduced levels of liver enzymes studied could be indicative of enhanced hepatic health. Reduced creatinine showed that the boars' welfare was not compromised; that is to say they were not subsisting/surviving by breaking down their muscle mass to generate energy.



Table 3: Mean lipid profile (mg/dl) of pre-pubertal boars fed APM

Parameter (mg/dl)	Treatments			
	0.0% APM	2.5% APM	5.0% APM	SEM
High-density lipoprotein	61.51 ^b	67.72 ^a	59.91 ^b	1.37
Low-density lipoprotein	10.96	15.17	12.81	1.64
Very low-density lipoprotein	30.60	28.50	27.73	0.96
Triglycerides	153.02 ^a	142.50 ^b	138.67 ^c	2.21
Total cholesterol	102.87 ^b	111.39 ^a	100.45 ^b	1.69

^{a-c} Means on the same row with different superscripts are significantly ($P < 0.05$)

Total cholesterol and high-density lipoprotein were higher ($P < 0.05$) in boars fed 2.5% APM than in either of the other groups; which varied not. Low-density and very low-density cholesterol did not vary among the experimental boars. Triglycerides were highest ($P < 0.05$) in the control boars; and decreased gradually with increase in the test ingredient.

The negative association between the quantity of APM and serum triglycerides at this phase of the growth of the animals seems to agree with Kuate *et al.* (2015), who attributed hypolipidaemic property to a hydro-ethanolic extract of Aidan pod. The implication of this is a tendency to depletion of the fat stores in the growing pigs. Aidan pod pulp treatment might have negatively influenced anabolic processes that favour lipogenesis; placing the animals in a net lipolytic state, with lipolysis having upper hand in the entire lipid metabolic process.

CONCLUSIONS AND RECOMMENDATIONS

It was concluded that APM enhanced the haematology, serum albumin, globulin and glucose; depleted triglycerides and moderated the liver and kidney metabolites, especially at 5.0%, indicating a positive influence on hepatic and renal efficiencies.

APM should be added at 2.5% to grower pigs for improved haematology. Up to 5% of APM could be added for low subcutaneous fat deposition leading to production of lean pork.

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