APRW -44

Haematology and Serum Lipid Profile of Weaner Pigs Fed African Porridge Plant (*Tetrapleura tetraptera*) Pod Meal

J. Ezea and J.C. Ezike
Department of Animal Breeding and Physiology, Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria
Corresponding author: J. Ezea; E-mail: jonas96ezea@gmail.com/ Tel: +2347069745125

Abstract
An experiment which lasted 56 days was conducted to study the haematology and serum lipid c of eighteen 42-day-old, Large White-Duroc cross-bred weaned piglets fed 0.00%, 1.00% and 1.50% *Tetrapleura tetraptera* pod meal (TPM). The piglets were randomly assigned to three experimental diets; each treatment was replicated thrice, in a completely randomized design. There were significant ($p<0.05$) reductions in RBC, PCV, Hb and MCH of the plasma of piglets fed TPM. Total andVLDL cholesterol were higher ($p<0.05$) in the sera of TPM-fed than those on 0.00% TPM. Higher ($p<0.05$) LDL and triglycerides were obtained in piglets fed 1.50% TPM. HDL cholesterol was significantly ($p<0.05$) reduced in piglets fed TPM as the inclusion level increased. It was concluded that 1.00% and 1.50% dietary inclusions of TPM depressed RBC, PCV, Hb and MCH but enhanced the serum lipids except the HDL cholesterol of weaned piglets.

Keywords: Haematology, lipid profile, weaner pigs, African Porridge plant, dietary.

Introduction
One of the numerous options being explored as alternatives to pharmaceutical antibiotic growth promoters in swine production is the application of phytogenics. Phytogenics are feed additives of plant origin and include spices, herbs and botanicals. Explorative and demand-drivenresearches on application of phytogenics have been on the increase in recent times. The reason is not far-fetched. Antibiotic drug use is limited by the development of resistance by microbes. There is also heightened pressure from consumers to eliminate non-plant xenobiotics from the diets of animals reared for food (Kumar *et al*., 2014). The importance of phytogenic feed additives, no doubt, is linked to the abundance of secondary metabolites (phytochemicals) inherent in the plants and or plant parts of interest. Plant-derived additives possess a plethora of active principles which affect biological processes in various ways (Frankic *et al*., 2009; Kumar *et al*., 2014). On a general note, phytogenics have been credited with potentials to stimulate digestive processes (Srinivasan, 2005), regulate microbial growth (Windisch *et al*., 2008), forestall inflammation (Manjunatha and Srinivasan, 2006), prevent oxidative processes and stimulate immune responses, among others, in biological systems (Fasseas *et al*., 2008). African porridge plant (*Tetrapleura tetraptera*) pod is a source of nutritive spice used in West Africa folkmedicine (Kuate *et al.,* 2015). The pod contains polyphenols (tannins, flavonoids), saponins, phytate, triterpenoid, scopoletin, phenols, triterpene glycoside (aridanin) (Jeszka-Skowroma *et al*., 2014). According to Kuate *et al*. (2015), Tetrapleura tetraptera pod extract possesses cardiovascular, anti-inflammatory, hypoglycaemic, hypolipidemic, hypotensive, antimicrobial, antiparasitic properties, among others. Reduction in plasma cholesterol in vivo by naringenin, an isolate of *Tetrapleura tetraptera* pod was reported by Wilcox *et al.* (2001).

The need to document the effect of dietary intake of the pod meal of this pod on haematology and serum lipids of weaner pigs informed this research.

Materials and Methods
The experiment was conducted at the Piggery Unit of the Livestock Teaching and Research Farm, Michael Okpara University of Agriculture, Umudike, Abia State. Umudike is on co-ordinates 05°29'N and 07 ° 33' E; and on about 122 m above sea level. Annual rainfall is in the range of 1700 – 2100 mm; minimum and maximum temperatures range from 18 - 23°C and 26 - 36°C, respectively, while relative humidity is between 57% and 91%. Eighteen weaned pigletsof the Large White-Duroc crossbreeds, aged about 42 days and of about 10kg average live weight, sourced from the Teaching and Research Farm of Michael Okpara University of Agriculture, Umudike, were used for the study. Three diets were formulated to include ground dried pulp of *Tetrapleura tetraptera* pod (TPM) at 0.00%, 1.00% and 1.50% , respectively. The piglets were randomly divided into three equal treatment groups. Each treatment was replicated three times in a completely randomised design.

The piglets were housed in concrete floor pens. The experiment lasted 56 days. Table 1 shows the percentage composition of the ingredients that made up the experimental diets.

Blood was sampled from the cephalic vein into heparinised and sterile bottles for haematology and serum lipid studies, respectively. Data were subjected to ANOVA using SPSS version 22. Mean separation was by Duncan's Multiple Range Test.

Table 1: Ingredient composition (%) of experimental weaner pig diets

Ingredient	0.00%TPM	1.00% TPM	1.50%TPM
Maize	42.00	42.00	42.00
Soya bean meal	20.00	20.00	20.00
Palm kernel meal	18.00	17.00	16.50
Wheat offal	14.30	14.30	14.30
Fish meal	3.00	3.00	3.00
TPM	-	1.00	1.50
Bone meal	1.50	1.50	1.50
Oyster shell	0.50	0.50	0.50
Vitamin/Mineral premix	0.20	0.20	0.20
Methionine	0.01	0.01	0.01
Lysine	0.04	0.04	0.04
Salt	0.45	0.45	0.45
Total calculated	100	100	100
Crude protein (%)	21.20	21.05	20.97
Digestible energy (kcal/kg)	3059.87	3037.86	3026.85

TPM: *Tetrapleura tetraptera* pod meal

Results and Discussion

The effect of dietary inclusion of *Tetrapleura tetraptera* pod meal (TPM) on haematological indices of weaner pigs is presented in Table 2. There were significant differences in Red blood cell counts (RBC), Packed cell volume (PCV), haemoglobin (Hb), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC).

Table 2: Mean haematological parameters of experimental piglets

Parameter	0.00% TPM	1.00% TPM	1.50% TPM	SEM
Red Blood Cells ($x10^{12}/mm^3$)	6.73^a	6.00^b	5.57^b	0.19
Packed Cell Volume (%)	46.33^a	39.33^b	37.67^b	1.39
Haemoglobin(g/dl)	13.77^a	11.43^b	10.37^b	0.53
White Blood Cells($x10^9/L$)	12.90	8.70	10.47	0.85
Platelets($x10^9/L$)	37.90	33.97	33.83	1.49
MCV (fl)	67.19	65.65	67.61	0.52
MCH (pg)	20.24^a	19.20^b	18.60^c	0.25
MCHC(g/dl)	29.72^a	29.04^{ab}	27.51^{bc}	0.41

^{abc}Means on the same row with different superscripts are different ($p<0.05$); SEM: Standard error of the mean

In all the parameters, the highest values were obtained in piglets fed 0.00% TPM. The RBC, PCV and Hb values obtained with inclusions of 1.00% and 1.50% TPM were similar. The numerical values nevertheless, reduced with a higher level of TPM. RBC counts (5.57 - 6.73 x $10^{12}/mm^3$) and the Hb (10.37 - 13.77 g/dl) fell within the normal range (5.3 - 8.0 x $10^{12}/mm^3$ and 9.0 - 14.0 g/dl, respectively) as reported by Cooper *et al*. (2014) for weaner pigs. PCV (37.67- 46.33%) was higher than the range (28.30 - 42.70%) reported by Cooper *et al*. (2014). MCH was also highest (20.24 pg) ($p<0.05$) among the piglets fed 0.00% TPM. The lowest ($p<0.05$) value (18.60 pg) was obtained among piglets fed 1.50% TPM; those on 0.00% and 1.00% TPM had similar MCHC. The MCH and MCHC were within the ranges (14-21P*g* and 32 – 36 g/dl, respectively) submitted by Friendship *et al*. (1984). There is a paucity of information on the effect of dietary inclusion of TPM on weaner pigs. Nonetheless, the results under discussion negated the submissions of Nweze *et al*. (2011) that *Tetrapleura tetraptera* fruits fed broilers via feed; and as cold and boiled water decoctions, respectively, boosted their serum

RBC, Hb and PCV. The results of this study is, in part, in line with the findings of Odesanmi *et al*. (2010), who observed a significant decrease in the RBC of male Dutch White rabbits administered ethanolic extract of *Tetrapleura tetraptera* pod. The reduction in haematological parameters could suggest the presence of haemolytically active principles in the TPM. The dry fruit of *Tetrapleura tetraptera* contains up to 20% saponins (Akin-Idowu *et al.,* 2011), which have been reported to be haemolytic (Sodipo *et al*., 2000; Okwu, 2005).

Table 3: Mean serum lipid profile of experimental piglets

Parameter	0.00% TPM	1.00% TPM	1.50% TPM	SEM
Total cholesterol (mg/dl)	100.72[b]	112.12[a]	108.69[a]	1.88
HDL cholesterol (mg/dl)	66.97[a]	63.80[b]	58.43[c]	1.32
LDL cholesterol (mg/dl)	29.99[b]	29.81[b]	31.27[a]	0.26
VLDL cholesterol (mg/dl)	3.76[b]	18.50[a]	18.99[a]	2.75
Triglycerides (mg/dl)	149.67[b]	148.78[b]	155[a]	1.24

[abc]Means on the same row with different superscripts are different (p<0.05); SEM: Standard error of the mean

Total cholesterol was higher (p<0.05) in the TPM fed piglets than those on the control diet. Low-density lipoprotein (LDL) cholesterol was higher (p<0.05) in piglets fed 1.50% TPM than those fed 0.00% and 1.0% TPM. Very-low density lipoprotein (VLDL) cholesterol was the same for all the TPM- fed piglets; and were superior (p<0.05) to that obtained in the 0.00% TPM-fed piglets. Triglycerides were higher (p<0.05) in 1.50% TPM-fed piglets than in the other treatments; which differed not. There was significant (p<0.05) reduction in high-density lipoprotein (HDL) cholesterol as the level of TPM increased. The dietary inclusion of TPM enhanced the serum lipid profile of the piglets, except for the HDL cholesterol. This could be a result of possible anti-oxidative effect of some phytochemicals in *Tetrapleura tetraptera* pod. Butein (2', 4', 4-tetrahydroxychalcone) and Naringenin (4', 5, 7-trihydroxy-flavanone) are isolate compounds from the pod of *Tetrapleura tetraptera* that were reported to exhibit potent anti-oxidant properties (Ali and El Kadder, 2004). This agrees with the findings of Isidahomen (2016), who recorded enhanced serum lipid profile in broilers fed graded levels of ginger.

Conclusion

The results of this study showed depressed haematological indices and enhanced serum lipid profile of weaned piglets at the two inclusion levels (1.00% and 1.50% TPM) studied.

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