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Research Article

Sawdust in the Diet of Crossbred Weaned Pigs: Effects on Serum Lipid Profile

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Abstract

Background and Objective: Sawdust is a waste product derived from sawmill industries which constitutes nuisance to the environment and it can be included in swine diet in order to reduce competition between man and animal. Thus a 56 day of feeding trial was conducted in a completely randomized design to determine serum lipid profile of crossbred (large white x landrace) weaned pigs fed sawdust based diets. **Materials and Methods:** Eighteen weaned pigs were randomly allotted into three dietary treatment groups: T1 (0% control), T2 (5%) and T3 (10%) with each treatment comprising 3 replicates of 6 pigs/triplicate; parameters measured include cholesterol, triglyceride, high density lipoprotein and low density lipoprotein using spectrophotometer. **Results:** The result revealed that there were significant ($p < 0.05$) difference in the values obtained for cholesterol, high density lipoprotein and low density lipoprotein. There were no significant ($p > 0.05$) difference for values obtained in triglycerides across the dietary treatments. The highest statistical value (40.33 mg dL^{-1}) of high density lipoprotein was observed in pigs fed diet 3 while diet 1 and 2 had the least value 37.33 mg dL^{-1} and 38 mg dL^{-1} , respectively. Diet 1 had the highest value (22.73 mg dL^{-1}) of low density lipoprotein while the least value was obtained in pigs fed the T_3 . **Conclusion:** Based on this result, it can be concluded that inclusion of sawdust in the diet of crossbred weaned pigs up to 10% has no deleterious effect on the serum lipid profile of crossbred weaned pigs.

Key words: Sawdust, weaned pigs, serum, lipids, spectrophotometer

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Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

In an attempt to boost pig production, nutritionists have tried to harness and utilize agro-industrial by-products that are not directly utilized by man¹. A large number of alternative feedstuffs that have potential as pigs feed ingredients abound in Nigeria². It has been stated that research into the use of cheaper industrial by-products and wastes have been intensified in the last few years to determine the efficiency of their utilization in terms of growth and production¹. The search for cheaper sources of feed ingredients for livestock feeding in Nigeria and many developing countries will continue, as long as the protein requirement in human diet has not been met². One alternative novel feed ingredient that is receiving attention is sawdust. However, feeding pig present a great challenge to the farmers and nutritionist in Nigeria³ and several tropical countries. Unfortunately, this therefore call for rethink and expansion of resources based that can accommodate some unconventional feed ingredient that have comparative nutrient potentials like convention ingredient. There is therefore, need to explore alternative source of feeding ingredient which are less competitive and available within the environment⁴.

The pig industry in Nigeria is an important arm of the livestock sub-sector in overall agricultural sector. This assertion derives from the fact that porcine production, among other species as the high potential to contribute to high economy gain in three ways. First, the pigs have high fecundity, high feed conversion efficiency, early maturity, short generation interval and relatively small space requirement⁵. Sawdust is tiny piece of wood that fall as powder from wood as it is cut by a saw. Sawdust is basically a waste of small particles available in saw-milling industries, pulp plant and paper industries as well as wood processing industries⁶. The exorbitant price and marked shift in availability of conventional feed ingredients particularly dietary energy source for the pig industry³ implied exploring a wider range of alternative feedstuffs in formulating diets for pigs⁷. Meat from pig (Pork) is one of the preferred meat in the world, ranking first in per capita meat consumption in the world. The presence of fats, saturated fatty acids, cholesterol and carcinogenic substances has exposed meat to great criticism. The association between animal fats and atherosclerosis has been studied and recommendations range from total exclusion to moderate consumption due to essential role of fat in human body were provided⁸. Lipids are indispensable part of everyday live which exist in the living tissues (i.e., plants and animals)⁹. Lipids are rich in energy and contain more than twice the caloric value of equivalent amount of carbohydrates¹⁰. Cholesterol is synthesized by the liver, adipose tissue and the intestine and released into the

bloodstream¹¹. Triglycerides are chain of high-energy fatty acids necessary for providing energy for cells to function¹². High density lipoprotein is good cholesterol because of its ability to protect heart attack and reduced the build up and formation of plaques¹³. Low density lipoprotein is referred to as bad cholesterol because it leads to the plaque formation in the inner walls of the arteries that feed the heart and brain. This research was carried out to evaluate the effects of graded levels of sawdust based diet on serum lipid profile of crossbred weaned pigs.

MATERIALS AND METHODS

The experiment was carried out at the piggery unit of the Teaching and Research Farm of Oyo State, College of Agriculture and Technology, Igboora, Nigeria. The research was conducted from July-August, 2019. The experimental area lies in Savannah forest zone on latitude 7°43' N and longitude 3°28' E with an elevation of 140 m above sea level. The average minimum temperature is about 21.50°C and maximum temperature of about 32.5°C. Eighteen crossbred (Large white x Landrace) weaned pig of 8 weeks of age was used and the animal were purchased from the piggery farm of the Teaching and Research Farm of the Oyo State College of Agriculture and Technology, Igboora. The pigs were dewormed and fed 4% of their body weight as feed per day at the beginning of the experiment and increased as the animals age increased while water was supplied *ad libitum*. The pigs were randomly assigned to three dietary treatments comprising 0% control, 5 and 10% of sawdust based diet. Each treatment was replicated thrice with two pigs per replicate. The pigs were housed in pen equipped with individual feeding and drinking facilities. The design of the experiment was completely randomized design and the experiment lasted for 8 weeks. The sawdust was collected freely from a sawmill located in Igbo-Ole quarter of Igboora in Oyo state and other concentrates was purchased from a feedmill. Proximate analysis of the test ingredient was carried out by the methods of WHO⁹. At the end of the feeding trial, blood sample were collected from three pigs per treatment from the heart with the use of syringe and needle. About 5 mL of blood was collected in the morning before feeding from each pig into sample bottle vials without Ethylene Diamine Tetra Acetic (EDTA) acid for the determination of cholesterol, triglyceride, high density lipoprotein and low density lipoprotein using spectrophotometric method. Data collected were subjected to one way analysis of variance (ANOVA) using¹⁰ and where differences exist between the means Duncan multiple range test was used to separate the means at 5% level of probability¹¹.

RESULTS AND DISCUSSION

The results of serum lipid profile of crossbred weaned pigs fed sawdust based diets are presented in Table 1. There was significant ($p < 0.05$) difference in the mean values obtained for all the parameters measured. The value obtained increased as the level of inclusion of the experimental diets increased. Cholesterol was highest (66 mg dL^{-1}) in pigs fed the control diet while the lowest value was recorded in pigs maintained on the 10% inclusion of experimental diet. Blood cholesterol levels are determined by genetic factors and environmental conditions including nutrition¹². Researchers opined that multiple factors such as; gender, age, degree of marbling, subcutaneous fat thickness, animal breed, diet, feeding treatments (restricted diet or *ad libitum*) and muscle location affect the cholesterol content of meat¹³. The mean cholesterol content of $64.33\text{--}66 \text{ mg dL}^{-1}$ recorded in this study was lower than 200 mg dL^{-1} which is according to Gordon *et al.*,¹⁴ and could lead to heart attack, stroke and artery diseases in man. This value was however lower than the value of $70 \text{ mg}/100 \text{ g}$ reported by AOAC¹⁵ and this was an indication that pork from this study was leaner. The low cholesterol profile could also be as a result of the fact that Nigeria pig farmers in an attempt to reduce the cost of production now used agro industrial by-product which was high in fibre to reduce fat content; Triglyceride follow the same pattern of cholesterol with the pigs on control diet had the highest value (29 mg dL^{-1}) while pigs on 5% inclusion of sawdust based diet recorded the lowest value (27.67 mg dL^{-1}). It is reported that increase fibre level in a diet lead to increase in the level of triglycerides¹. According to researcher, triglycerides are the most common form of fat in the animal body and are digested to provide the energy required for metabolism¹⁶. However, at high concentrations, it could be at risk factor for atherosclerosis, the narrowing of arteries with the build-up of fatty plaques in humans¹⁴. The values obtained are far below 150 mg dL^{-1} that could trigger cardiovascular diseases in man¹⁴. Pigs fed 10% inclusion of sawdust based diet recorded the highest value (40.33 mg dL^{-1}) of high density lipoprotein while the lowest value (37.33 mg dL^{-1}) was obtained in pigs fed the control diet. Feeding regimes contributed to highly significant and significant difference in high density lipoprotein. The level of high density lipoprotein was highest in pigs fed the experimental diet with increased crude fibre. It could be explained that a higher crude fibre level in the diet influence a growing level of high density lipoprotein. According to reports high density lipoprotein facilitates the removal of tissue cholesterol via the reverse

Table 1: Serum lipid profile of crossbred weaned pigs fed sawdust based diet

Parameters	T1 (0%)	T2 (5%)	T3 (10%)
Cholesterol (mg dL^{-1})	66.00 ± 8.72^a	64.67 ± 4.73^b	64.33 ± 4.04^b
Triglyceride (mg dL^{-1})	29.69 ± 4.62^a	27.67 ± 4.62^b	28.00 ± 1.73^a
HDL (mg dL^{-1})	37.33 ± 7.57^b	38.00 ± 4.58^b	40.33 ± 2.52^a
LDL (mg dL^{-1})	22.73 ± 0.23^a	21.13 ± 4.01^a	18.40 ± 3.30^b

^{a,b}Means on the same row but with different superscripts are statistically ($p < 0.05$) significant, HDL: High density lipoprotein, LDL: Low density lipoprotein

cholesterol pathway and or by competing with low density lipoprotein for non specific binding of cells, thereby reducing the uptake of low density lipoprotein and enhance its removal¹⁷. From the result, high density lipoprotein profile in the blood pigs were higher and this suggested that the pork may be more health beneficial to human. Low density lipoprotein was highest (22.73 mg dL^{-1}) in the pigs on the control diet while pigs on the 10% inclusion of sawdust based diet recorded the least value (18.40 mg dL^{-1}). Accordingly, low density lipoprotein is regarded as bad cholesterol that triggers the development of atherosclerosis in man¹⁸. In the present study, the value investigated had low density lipoprotein range value of $18.40\text{--}22.73 \text{ mg dL}^{-1}$. This value is below the range of $130\text{--}159 \text{ mg dL}^{-1}$ that is positively correlated with the formation of atherosclerosis in man¹⁹. This may be an indication that pigs were safe to human consumers in terms of risk of development of atherosclerosis arising from their low density lipoprotein contents.

CONCLUSION

The impact of dietary fibre on pig nutrition and health is determined by the fibre properties and may differ considerably between fibre sources. This study has demonstrated that inclusion of sawdust at 10% in the diet of crossbred weaned pigs has no adverse effect on the serum lipid profile of pigs; hence sawdust in the diet of pigs will lead to production of pork with little or no fat.

SIGNIFICANCE STATEMENT

This study discovered that inclusion of sawdust in the diets of crossbred weaned pigs at varying graded level results into the production of pigs with little or no fat and this was good for final consumers as the ethics now was toward consumption of lean meat. It will enable the researcher to discover the nutrient potentials of sawdust in feeding swine though limited in capacity to digest fibre, also the study aiming at reducing the negative impact of sawdust in the society as they lead to erosion by blocking soil pores, eliminate waste and reduce the environmental pollution.

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