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Liver Function Indices of Weaned Pigs Reared on Concrete, Woodshaving and Clay Floors

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Abstract: Providing beddings are husbandry aspects intended to improve pig welfare, thus research was conducted to evaluate the liver function indices of weaned pigs reared on concrete, woodshaving and clay floors. Twenty-seven (27) crossbred (Largewhite X Landrace) weaned pigs aged eight weeks were used for the study. The pigs were randomly assigned to the three treatment group of nine animals per treatment and six pigs per replicate. The three treatments used were concrete (T1), Woodshaving (T2) and Clay (T3). The concrete floor was made from gravel, sand, granite and water while woodshaving was gotten in dried form from sawmills within Ibadan metropolis and pebbles, dirts, iron metals and broken bottles were removed and spread on cemented floor to make woodshaving floor. The clay floor was gotten from termite hill within the university premises and spread on cemented floor to make clay floor. 3ml of blood were collected from three (3) animals per treatment for the analysis of biochemical indices into plain bottles to determine the serum enzymes. The results revealed that there was significant ($P<0.05$) difference for aspartate aminotransferase, alanine aminotransferase and blood urea nitrogen while alkaline phosphate and creatinine showed no significant ($P>0.05$) difference. Aspartate aminotransferase, alanine aminotransferase and blood urea nitrogen was highest (52.33u/l, 42.00u/l and 20.17) respectively in the concrete floors than the mean value obtained in the bedded floors. Pigs reared on the concrete floor compared favourably for alkaline phosphate and creatinine. It was concluded that rearing pigs on bedded floors have no deleterious effects on hepatic functions.

Keywords: Floors, Liver, Pigs, Serum.

Introduction

In an effort to mitigate the environmental and animal welfare issues swine production experts explore alternative housing systems in pig production [1]. Bedded flooring system is one of such alternative methods. [2] reported that good bedding and flooring provide comfortable areas for animals to take rest and it also helps to improve health and productive performance. Bedding improves the physical comfort of the floor [3]. It provides comfort to animal, encourage resting, contribute to milk quantity and quality and also help in subsidizing injury and fatique. Bedding materials has an important effect on health, life and production of pigs since they are in contact with bedding. The purpose of using bedding material is to absorb moisture from pigs manure in order to keep the floor reasonably dry and ensure comfortable conditions for pigs. It also gives pigs a suitable medium on which feeding, watering and other management practices are carried out. Sawdust, rice husk, woodshaving, sand, paper, chopped straw, sugarcane bagasse amongst others are the common types of bedding used in piggery throughout Nigeria [4]. Good bedding material should be nontoxic to the pigs and free of contaminants such as pesticides and metals, be very absorbent with a short drying time and be readily available and relatively inexpensive [4]. Economic losses associated with poor bedding materials include lameness, respiratory infections, Poor weight gain [5]. Bedding quality is a major concern in pig production not only because if affect the flock health and productivity [6] but it may act as potential reservoir and transmission vehicle for pathogens and potential pathogens [7]. Types of bedding materials can significantly affect the efficiency of pigs' immune system and its growth [7,8] opined that blood is an important material for the assessment of animal health status and blood examination is usually done to diagnosis illness in farm animals [9].

Pig production is one of the avenues through which Africa can meet its need for animal protein and also contribute to global needs through export. Africa contributes 1.67% of global pigmeat production [10]. Pig production is an important aspect of the livestock sub-sector of Agriculture in Africa. The contribution of pig production to the sustenance of livelihood in the continent through the provision of nutritious source of protein, job and means of generating income cannot be overemphasized. Pork has high biological value, contains essential amino acids and it is easily digestible. Pork shared the nutritional qualities of red and white meats thus, it is regarded as "pink meat" [11].

Materials and Methods

The experiment was carried out at the piggery unit of the Teaching and Research Farm of the Oyo State College of Agriculture and Technology, Igboora, Nigeria. The experimental areas lies in savannah forest zone on latitude 7^0 43N and longitude 3^0 28E in an elevation of 140m above sea level. The average minimum temperature is about 21.5^{0}C and maximum average temperature of about 32.5^{0}C [12]. Twenty-seven (27) crossbred weaned pigs (Largewhite X Landrace) with an average weight of 9.0kg in their eight weeks of age were purchased from the piggery unit of the college. 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 animal age increased while water was supplied *ad libitum*. The animal was kept and monitored for one week for acclimatization before the commencement of the experiment for proper adaptability and the animals were fed twice daily morning by 7.30am and evening by 4.00pm. The experiment lasted for eight weeks. The pigs were restrained and bled through the anterior vena cava as described by [13] into plain bottles without anticoagulant. The blood samples were analyzed for the following parameters, Aspartate aminotransferase (AST), Alanine aminotransferase (ALT), Akaline phosphate (ALP), Blood Urea Nitrogen (BUN) and Creatinine. Data collected was subjected to analysis of variance using software [14]. Means were separate using Duncan's Multiple Range Test of the same statistical software.

Results and Discussion

The result of serum enzymes of crossbred weaned pigs on concrete, woodshaving and clay floors are presented in Table 1.

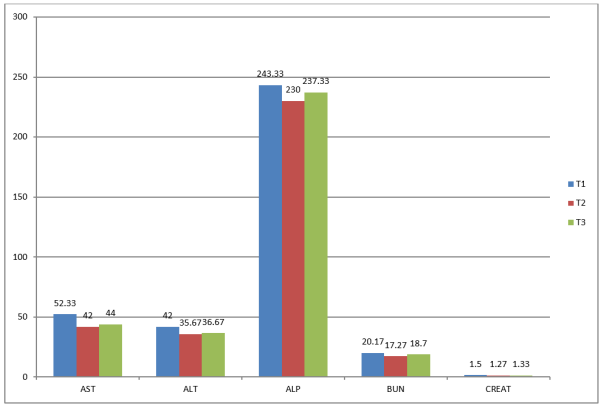
Table 1: Serum enzymes of weaned pigs reared on concrete and bedded floors

Parameter	T1 (Concrete)	T2 (Woodshaving)	T3 (Clay)	SEM
AST(U/L)	52.33^a	42.00^b	44.00^b	0.23
ALT(U/L)	42.00^a	35.67^b	36.67^{ab}	0.25
ALP(U/L)	243.33	230.00	237.33	0.60
BUN (mg/dl)	20.17^a	17.27^b	18.70^{ab}	0.11
CREAT (mg/dl)	1.50	1.27	1.33	0.04
Superscripts (^{a,b,c}) within the same row indicate significant differences (P < 0.05).				

Abbreviations

SEM: Standard Error of Mean
AST: Aspartate aminotransferase
ALT: Alanine aminotransferase
ALP: Alkaline phosphate
BUN: Blood Urea Nitrogen
CREAT: Creatinine

Comparison of Serum Enzyme Levels in Weaned Pigs Reared on Different Flooring Systems



There were significant (P<0.05) differences in the AST, ALT and BUN while there was no significant (P>0.05) difference in the mean value of ALP and Creatinine. Pigs reared on concrete floors had the highest (52.33U/L) of AST while pigs on woodshaving and clay floors had (42.00U/L) and (44.00U/L) respectively. ALT values ranged from (35.67U/L) in pigs kept on woodshaving floors to (42.00U/L) in pigs maintained on concrete floors. The values of ALP ranged from (230.00U/L) in pigs reared on woodshaving floor to (243.33U/L) in pigs maintained on concrete floor. Pigs on concrete floors compared favourably with those pigs reared on bedded floors for ALP. Pigs reared on concrete floors recorded the highest value (20.17mg/dl) of blood urea nitrogen while the lowest mean value (17.27mg/dl) was obtained in pigs kept on woodshaving floors. Pigs reared on concrete floors recorded the highest (1.50mg/dl) of creatinine while the lowest value (1.33mg/dl and 1.27mg/dl) were recorded in pigs kept on woodshaving and clay floors respectively. The aspartate aminotransferase catalyses the interconversion of aspartate and alpha ketoglutarate to oxaloacetate and glutamate. The increased in mean value of aspartate aminotransferase in pigs reared on concrete floor might be as a result of liver stress resulting from absence of bedding materials which could serve as enrichment materials that could prevent the expression of vice behaviours. It could also be as a result of the age of the animals as reported by [15]. Pigs reared on concrete floor had the highest mean value of alanine aminotransferase and this could be due to increase liver or bone metabolism. The alanine aminotransferase catalyses the interconversion of glutamate and pyruvate to alpha-ketoglutarate and alanine. The increase in serum aspartate aminotransferase and alanine aminotransferase activities indicate release of the aminotransferase from cytoplasm which is probably due to liver and other tissues damage. Alkaline phosphate is used to detect bone and liver health and increased in serum alkaline phosphate level has been attributed to metabolic changes in the liver developed during administration of toxin, cirrhosis of the liver and hepatitis as well as liver cancer [16]. The lower (P>0.05) alkaline phosphate in pigs on woodshaving and clay floors meant that bedding materials did not elicit any toxic effect within the liver parenchyma of pigs. The similarity of values obtained in pigs reared on concrete, woodshaving and clay floors for alkaline phosphate indicates no severe liver damaged, suggesting all litter types were generally safe for hepatic function. The creatinine is the simplest way to measure renal function [17] and depends on the quality and quantity of protein supply [18]. Creatinine is a chemical waste molecule that is generated from muscle metabolism [19] which is produced at a fairly constant rate by the body depending on muscle mass [20]. The kidney maintained the blood creatinine in a normal range. The non- significant (P>0.05) values obtained for creatinine in the experiment revealed inconsequential muscular wastage. Similar trend was obtained by [19].

Conclusion

The findings of this study indicate that the use of woodshaving and clay flooring materials does not adversely affect the hepatic function of weaned pigs. Pigs reared on concrete floors recorded significantly higher AST, ALT, and BUN values, which may be associated with increased physiological or liver stress due to the absence of bedding materials that contribute to comfort and enrichment. In contrast, pigs housed on woodshaving and clay floors showed comparatively lower enzyme values, suggesting improved welfare and reduced metabolic stress. The non-significant variations observed in ALP and creatinine across treatments further confirm that bedding materials did not impair liver or renal function. Therefore, woodshaving and clay floors can be considered suitable and welfare-friendly alternatives to concrete flooring in swine production systems without compromising health or organ function.

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