FUDMA Journal of Agriculture and Agricultural Technology
ISSN: 2504-9496
Vol. 8 No. 2, December 2022: Pp. 48-55.

Doi: https://doi.org/10.33003/jaat.2022.0802.07

DIETARY EFFECT OF MIXED SAWDUST AS A SUBSTITUTE FOR WHEAT OFFAL ON INTERNAL ORGANS WEIGHT AND CARCASS YIELD OF BROILER STARTER

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ABSTRACT

Effect of dietary substitution of sawdust for wheat offal on internal organs weight and carcass yield of broiler starter was conducted using 99 broilers. Broiler chicks were allocated to three dietary treatments and replicate thrice with eleven (11) broilers per replicate. Three dietary treatments were formulated with sawdust substituting for wheat offal at 0, 40 and 80%. Experiment lasted for three weeks in a Completely Randomized Design (CRD). Data obtained was analyzed using ANOVA. There were significant ($p<0.05$) differences in all internal organs weight and carcass yield across dietary treatments. Broiler fed on 80% had highest liver weight (3.59%) while least (2.44%) was recorded from 0%. Heart showed lowest $p<0.05$ (0.37%) from 80% while highest (0.55%) was obtained from 40%. Lowest ($p<0.05$) kidney (0.38%) was recorded from 0% while highest (0.48%) was observed from 80%. Lung gave least weight (0.42%) in the broiler fed 0% while highest weight (0.66%) was observed from 80%. Higher (1364.50g) live weight was obtained from 80% while least (1066.50g) was obtained from 0%). Dressed weight followed the same trend with highest (1282.00g) noticed from 80% while least (978.50g) was noticed from 0%. 80% gave highest wings (8.94%), back (15.02%), drumstick (10.88%) and breast (17.88%) respectively while wings had least $p<0.05$ of 8.01% from 40% back had 13.30% from 0%, drumstick (10.06%), breast (17.18%) from 40% respectively. It could be concluded that sawdust can be successfully replaced wheat offal in the broiler starter up to 80% without adverse effect on internal organs weight and carcass yield

Keywords: Internal organs, broiler, mixed saw dust and wheat offal.

INTRODUCTION

The poultry industry in recent years occupied a leading position among agricultural industries in the world. Poultry meat and eggs serve as important sources of high quality animal protein in those areas of the world that have protein insufficiency. In the past decade, the poultry industry has undergone very rapid development and it is expected that this development will be more pronounced in developing countries than in developed regions of the world Daghir,1995. This is because most developed countries have already reached self-sufficiency, while developing countries have not. Intensive poultry production was introduced into Nigeria over fifty years ago and has developed rapidly especially in the last few decades as an important livestock enterprise in the country (FAO 2000). Poultry make a significant contribution to human nutrition and economic sustenance. They provide substantial amount of high quality protein in form of meat and table eggs. Feed is a very important component in determining the content of poultry survival and profitability (Olugbemi, 2010). According to Okorie (1983), Oluyemi and Roberts (1988) poultry yield the quickest return of investment compared to other livestock species. Broiler is a meat-type of poultry that has ability to grow fast and reach market weight faster than ruminants (Madubuike and Ekenyem, 2001).They are efficient converters of feed, meat and eggs within short period of time. Apart from their use as source of food, poultry provide useful by-product for manufacturing industry. The feathers are used in making pillows and mattresses; their dropping is used as manure, which is very rich in plant nutrients. Of all poultry production technologies, none has received attention and interest of animal scientists as nutrition especially the utilization of non-conventional feed (NCF) sources for the feeding of poultry (Babatunde, 1998). However with the increasing concentration of poultry in Nigeria has come the need to better appreciate the influence of non-conventional feed ingredient which these birds are fed with. In Southeastern Nigeria, saw dusts are easily obtained from sawmills at little or no cost and used as non-conventional feed ingredient. The use of this material has been hinged purely on their availability and price, without any consideration for the comfort of the birds. Based on these premise, it becomes imperative to evaluate saw dust as component of broiler feed ingredient.

Mixed saw dusts are small discontinuous particles or small fragments of wood produced during production of logs of timber into saleable sizes. It is a by-product of sawmilling industries that produced in very large quantities in most developing nations as a result of ever rising demand for building materials and furniture (ElLadan and Olofin, 2013). The small fragments flow from the cutting edges of the saw blade to the floor during sawing operation, therefore, they are considered as a nuisance and waste to man and its environment (Olusola and Omojola, 2013). However, researchers have identified saw dusts as raw materials for the production of biogas, packaging fillers, as lagging materials (Ogunleye and Awogbemi, 2007; Ogunleye and Awogbemi, 2012). Agbim and Omaliko (1993) observed that there was a great concern about the accumulation of sawdust, and its environmental hazard. A general attribute of this and other wastes, is the large quantity generated and the high costs of effective disposal, especially if long hauls are undertaken (El-Ladan and Olofin, 2013). For most sawmilling industries, the best and most popular means of disposing sawdust is by open-air burning, although a little percentage is used as fuel, poultry litter and other purposes (Ebhodage, 1993). Studies in the management of sawdust as waste are not new in Nigeria, but most of these studies focused on utilizing the waste as a soil amendment material with promising results. Ibrahim (2003) attempted a study on exploring the potentials of sawdust as a livestock feed ingredient and reported encouraging results. However, escalating cost of the conventional feedstuffs motivated the nutritionists to search for alternative feedstuffs (Adeniji, 2001).

MATERIALS AND METHODS

Experimental site

Experiment was carried out at Teaching and Research Farm, Oyo State College of Agriculture and Technology, Igboora, Nigeria. Experimental area lies in savannah forest zone on latitude $7^{o}15^{I}$N and longitude $3^{0}30^{I}$E, with an elevation 140m above sea level. The average minimum temperature is about 20.5^{o}C and maximum average temperature of about 32.50^{o}C. The average humidity in the study area is 58.0%. The double maximum rainfall is about 314.3mm in June and 165.2mm in September. (Sanusi, 2011).

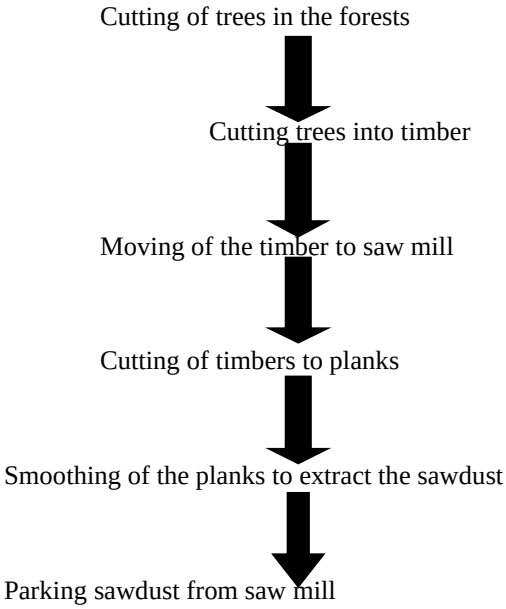
Experimental materials

Mixed saw dust, knife, tape, sensitive scale, coal pot, pot, scalpel blade, scalpel blade holder etc

Experimental ingredient

Saw dust used in the experiment was obtained from the local saw mill in Ibarapa Local Government area, Igboora, Oyo State, Nigeria.

Saw dust processing



Experimental birds and management

A total of 99 day old broiler chicks were obtained from Zartech Farm Nigeria Limited. They were moved to the Teaching and Research Farm, Oyo State College of Agriculture and Technology, Igboora where the experiment was conducted. The brooding pens were washed and cleaned thoroughly with disinfectant. Pen was also fumigated with potassium permanganate and formalin prior to the arrival of the chicks. The birds were weighed individually and allocated into nine (9) replicate. Each replicate housed eleven (11) birds and were offered one of the three dietary treatments such that 3 replicate assigned to each dietary treatment. Each replicate contained two chick's feeder plate and two chick's drinkers. Birds were maintained on a 24 hours constant light schedule during brooding. On the arrival of the birds, they were treated with neoceryl plus soluble powder against stress and bacteria. Birds were vaccinated against infectious Bursal disease and Newcastle disease using Gumboro vaccine (7^{th} and 21^{st} days) and ND Lasota vaccine on the (14^{th} and 32^{nd} days) by dissolving 100 doses of each vaccine into 2 litres of chlorine free water. The birds were also treated against coccidiosis using proccoc at 100g per 120 liters of water at 24^{th}- 28^{th} day for 5days and were fed *ad-libitum* throughout the experimental period. The birds were managed under a deep litter system of management with wood shavings as bedding materials. At the 2^{nd} week the birds were moved to the rearing unit which house 11 broilers chickens per treatment and they were offered one of the three dietary treatments for the duration of the experiment.

Experimental diets

Three experimental diets were formulated for the starter phase and were fed for the duration of 3 weeks. Sawdust was substituted for wheat offal at 0%, 40% and 80% and tagged as T1, T2 and T3 respectively as shown in the Table 1.

Table 1. **Gross composition of experimental broiler starter diets (2-4 weeks)**

Ingredients (%)	T1 (0%)	T2 (40%)	T3 (80%)
Maize	56.00	56.00	56.00
Soybean meal	34.00	34.00	34.00
Wheat offal	5.00	3.00	1.00
Saw dust	0.00	2.00	4.00
Lime stone	2.00	2.00	2.00
Bone meal	2.00	2.00	2.00
Broiler premix	0.25	0.25	0.25
Salt	0.25	0.25	0.25
DL-Methinionine	0.25	0.25	0.25
L-Lysine	0.25	0.25	0.25
Total	100.00	100.00	100.00
Calculated values			
Metabolizable energy (Kcal/kg)	2934.79	2900.98	2987.17
Crude protein (%)	21.75	21.62	21.49

A kg premix contains vitamin A; 110,000,000iμ Vitamin D; 2,500,00iμ, Vitamin E; 20,000mg Vitamin K_3; 3000mg, Vitamin B_3; 3.00mg Vitamin B_2; 7000mg, Vitamin B_6; 500mg Vitamin B_{12}; 25mg, Panthotenic acid; 10,000mg, folic acid; 800mg, Biotin; 50mg Manganese; 80,000mg, Iron; 40,00mg, Zinc; 60,000mg, Copper; 800mg, Cobalt; 250mg, Iodine; 1,000mg, Selenium (1%); 150mg, Chlorine, 200,000mg and Anti oxidant; 100,00mg.

Computation of parameters measured

Organ weight as % of live weight = $\frac{\text{Organs weight}}{\text{Live weight}} \times 100$

Carcass yield = $\frac{\text{Carcass yield}}{\text{Live weight}} \times 100$

Experimental design

Completely Randomized Design (CRD)

Statistical Analysis

Data obtained in the study were arranged in a Completely Randomized Design (CRD) and subjected to one way Analysis of Variance (Nousis., 1999), mean value of variables showing significant ($p<0.05$) difference were separated using Duncan's multiple range test (Duncan; 1955).

Statistical Model

$Yij = \mu + T1 + \sum ij$

Yij= Dependent variable

μ= Population mean or intrinsic factor

Ti= Effect of dietary substitution of mixed saw dust for wheat offal.

∑ij= Residual error

RESULTS

Proximate composition of mixed saw dust used in compounding diets of this study is shown in Table 2. Result showed 86.60% of dry matter, 10.50% crude protein, 18.99% crude fibre, 18.90% ether extract, 3.00% ash, 13.40% moisture content, 35.21% nitrogen free extract and 3184.48kcal/kg metabolizable energy.

Table 2: Proximate composition of saw dust

Component	Percentage (%)
Dry matter	86.60
Crude protein	10.50
Crude fibre	18.99
Ether extracts	18.90
Ash	3.00
Moisture content	13.40
NFE	35.21
ME	3184.48kcal/kg

Nitrogen free extracts (NFE), Metabolizable energy (ME).

Internal organs weight of broiler starter fed mixed saw dust as a substitute for wheat offal is as presented in Table 3. There were significant ($p<0.05$) differences in all parameters measured across dietary treatments. Highest significant ($p<0.05$) value (3.59%) of liver was observed from broiler fed on T3 (40%) while least value (2.44%) was obtained from T1 (0%). Heart revealed higher ($p<0.05$) value (0.55%) from birds placed on T2 (40%) while least (0.37%) was noticed in the broiler fed on T3 (80%). Whole gizzard showed higher ($p<0.05$) value (6.09%) in the birds fed on T1 (0%) while least value (4.14%) was observed from T3 (80%). Higher (3.00%) significant ($p<0.05$) different was noticed from T1 (0%) while least value (2.34%) obtained from T2 (40%). Higher significant ($p<0.05$) value (0.48%) of kidney was observed in the broiler starter placed on T3 (80%) while least (0.38%) was observed in the broiler starter placed on T1 (0%). Lung showed higher significant ($p<0.05$) value of 0.66% on T4 (80) while least value of 0.42% was noticed from T1 (0%). Proventriculus had higher (0.68%) significant ($p<0.05$) different from T2 (40%) while least value (0.62%) was noticed from T3 (80%). Spleen had 0.03 (0%) on both T1 (0%) and T2 (40%) while higher significant ($p<0.05$) different value (0.07%) was observed from T3 (80%). Higher significant ($p<0.05$) value (0.09%) of bile was noticed in the broiler starter fed on T2 (40%) while least value (0.05%) was noticed from T1 (0%).

Table 3:- Dietary effect of substituting wheat offal for saw dust on internal organ of broiler starter phase

Organs weight (% live weight)	T_1 (0%)	T_2 (40%)	T_3 (80%)	SEM ±
Liver	2.44^{c}	2.94^{b}	3.59^{a}	0.27
Heart	0.52^{ab}	0.55^{a}	0.37^{c}	0.05
Gizzard	6.09^{a}	4.43^{b}	4.14^{bc}	0.50
Empty Gizzard	3.00^{a}	2.34^{c}	2.53^{b}	0.16
Kidney	0.38^{c}	0.47^{ab}	0.48^{a}	0.03
Lung	0.42^{c}	0.51^{b}	0.66^{a}	0.06
Proventiculus	0.66^{b}	0.68^{a}	0.62^{c}	0.01
Spleen	0.03^{b}	0.03^{b}	0.07^{a}	0.01
Bile	0.05^{c}	0.09^{a}	0.07^{b}	0.01

^{a,b,c} means on the same rows with different superscript differ significantly ($p<0.05$)

Dietary effect of substituting mixed saw dust for wheat offal on carcass yield of broiler starter is presented in Table 4. Result showed significant ($p<0.05$) differences on all parameters measured (live weight, plucked weight, dressed weight, dressed percentage, head, neck, back, wing, drum stick, thigh, breast and shank percentage).Higher (1364.50g) significant ($p<0.05$) live weight was observed from

broiler starter fed on T3 (80%) while least (1066.50g) was observed from birds fed on T1 (0%). Plucked weight had highest (88.00g) significant ($p<0.05$) different from T1 (0%) while least (80.50g) was obtained from T2 (40%). Highest (1282.00g) significant ($p<0.05$) value was obtained from birds placed on T3 (80%) while least (978.50g) weight was observed fromT1 (0%). Dressed percentage gave highest (93.95%) significant ($p<0.05$) value from birds placed on T3 (80%) while least (91.75%) was noticed from T1 (0%). Birds on T2 (40%) had higher ($p<0.05$) head while T4 (80%) gave least (3.38%)

significant ($p<0.05$) different. Neck of birds fed on T2 (4%) showed highest (4.99%) significant ($p<0.05$) different while T3 (80%) had least value (4.40%). Highest significant ($p<0.05$) different (15.02%) of back was obtained from birds fed on T1 3 (80%) while least (13.30%) was obtained from birds fed on T1 (0%).Higher significant ($p<0.05$) different (8.94%) of wing was observed from birds placed on T3 (80%) while least value (8.01%) was observed from birds placed on T2 (40%). Drumstick showed highest significant ($p<0.05$) different (10.88%) from birds fed on T3 (80%) while least (10.06%) was obtained from T2 (40%). Thigh gave higher (9.59%) significant ($p<0.05$) different from T2 (40%) while T3 (80%) gave least (8.72%). Breast indicated highest (17.66%) significant ($p<0.05$) different while T2 (40%) had least (17.18%). Higher (4.74%) shank was obtained from birds fed on T1 (0%) while least (4.48%) was obtained from birds fed on T2 (40%).

Table 4: Dietary effect of substituting saw dust for wheat offal on carcass yield of broiler starter phase

Parameters	T1 (0%)	T2 (40%)	T3 (80%)	SEM
Live weight (g)	1066.50^{c}	1173.00^{b}	1364.50^{a}	71.19
Plucked weight (g)	88.00^{a}	80.50^{c}	82.50^{b}	1.83
Dressed weight (g)	978.50^{c}	1092.50^{b}	1282.00^{a}	72.27
Dressed percentage (%)	91.75^{c}	93.14^{b}	93.95^{a}	0.52
Cut parts (% live weight)				
Head (%)	3.47b^{c}	3.67^{a}	3.38^{b}	0.05
Neck (%)	4.78^{b}	4.99^{a}	4.40^{c}	0.14
Back (%)	13.30^{bc}	13.47^{b}	15.02^{a}	0.45
Wing (%)	8.35^{b}	8.01^{c}	8.94^{a}	0.22
Drum stick (%)	10.31^{b}	10.06^{c}	10.88^{a}	0.20
Thigh (%)	9.10^{b}	9.59^{a}	8.72^{c}	0.21
Breast (%)	17.39^{b}	17.18^{c}	17.55^{a}	0.09
Shanks (%)	4.74^{a}	4.48b^{c}	4.54^{b}	0.06

^{a,b,c} means on the same rows with different superscript differ significantly ($p<0.05$)

DISCUSSION

The value of crude fibre obtained in this study was higher than result reported by Oke and Oke., 2007 as well as crude fibre obtained from conventional wheat offal. The difference in the value of crude fibre in this study and above mentioned researcher could be as a result of processing and production of timber as well as storage of saw dust. Types and species of trees sawn could also caused differences in the fibre composition of the mixed saw dust of this study with other researchers (Sowande *et al.*, 2002 and Belewu and Banjo, 1999).

Results of this finding confirmed Ogungbenro *et al.*, (2016) who reported significant ($p<0.05$) differences in all the internal organs weight of broiler fed mixed sawdust experimental based diet. This study showed that the broiler fed T1 (0%) recorded lowest value (2.44%) of liver and was increasingly across dietary treatments, therefore in line with Akinwusi *et al*., (2007) who reported an increased organs weight in rabbit fed 10% cashew nut meal based diet (unconventional feed ingredient). The study showed that broiler fed T3 (80%) recorded highest (3.59%)significant ($p<0.05$) liver, which means liver in the birds placed on test ingredient in this study detoxified anti-nutrients that impaired digestion and led to its inflammation than birds placed on control diet. Heart weight fluctuated across dietary treatments. It also negate findings of Oluokun and Olaolu (1999) who reported that increased heart weight of rabbit fed 10% cashew nut meal residue based diet increased metabolic activities of liver. The study disagreed with the findings of Ojewola and Ewa (2005) who reported that the quality and fat content of the cashew kernel meal (15.54%) elicited increased activity in the heart of the chicken fed diet four, thus leading to increase observed in the weight of heart in birds fed diet four which is numerical and respectively above those of diets 5, diet 3, 2 and 1 respectively. The broiler fed 0% mixed saw dust

recorded the lowest kidney value of 0.38% while the highest kidney value 0.48% was obtained in the broiler starter fed T3 (80%) mixed saw dust based diet which is an unconventional feed ingredient. This result supports the findings of Odunsi (1999) who observed higher value of kidney and can be attributed to the increase in the activity of kidney enzymes to detoxify the available anti-nutritional factors present in the test ingredients. Weights of the gizzard decreased with increasing level of mixed saw dust in the diets. This could be due to slow route and digestibility rate caused by the increased crude fibre contents of mixed saw dust, this report on gizzard is in line with Nsikan *et al*.,(2016) who reported decreased in the weight of gizzard as test ingredients levels increased, suggesting that feeding mixed saw dust up to 80% inclusion level did not affect the function of the gizzard grinding fibre which may result in increased weight of gizzard.

There were significant ($p<0.05$) differences in all the parameters measured across dietary treatments with the exception of head, neck, back, wing, drumstick, thigh, breast and shank. Highest dressed weight (1282.00g) was recorded from broiler fed T3 (80%) while lowest dressed weight (978.50g) was observed from broiler fed T1 (0%). The result of this study corroborated with findings of Hayse and Marison (1973), who reported that heavier birds produced a greater eviscerated yield. It also confirmed the findings of Kumuyi (2016) who submitted that dietary fiber aids a healthier digestive process and supports the muscles and nerves. The highest breast weight (17.55%) obtained in the broiler starter fed T3 (80%) while lowest value (17.18%) observed in the broiler fed T2 (40%) showed the ability of test diets to support tissue deposition to particular parts. This result established the finding of Bamgbose *et al*., (1998) who reported that, birds fed diet 3 gave the highest value (36.19%) for chest cavity while birds fed diet 1,2,4 and 5 gave the less value for chest cavity. The highest drumstick weight as percentage of live weight (10.88%) obtained in the broiler starter fed T3 (80%) while lowest value (10.06%) observed from T2 (40%). The lowest value observed with T2 (40%) could be attributed to different abilities of the test diet to differently induce tissue lay down for drumstick. The result of this study indicated that higher live weight was directly proportional to the dressed weight. This result confirmed finding of Sogunle *et al*., (2006) who opined that broiler fed with higher inclusion of cashew nut meal (fiber source) gave highest live weight and higher dressed weight and also in agreement with finding of Fanimo *et al*., (2003) who reported that the rabbit fed highest inclusion of cashew apple waste recorded highest final live weight and highest dressed weight. Interestingly, this finding showed that up to 80% level of mixed saw dust could increase the dressed weight of broiler starter.

CONCLUSION

It could be concluded that sawdust can be successfully replaced wheat offal in the broiler starter up to 80% without adverse effect on internal organs weight and carcass yield

RECOMMENDATION

Based on the result of this research, it could be recommended that trained extension officer should be encouraged to have on farm demonstration of the use of mixed saw dust as a substitute for wheat offal in broiler production. This will ease the adoption of this alternative feed resource by farmers as its use will lead to increased profitability of broiler production.

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