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Nutrient Digestibility, Carcass Yield and Production Economics of West African Dwarf Goats Fed Pleurotus Tuber-Regium Biodegraded Rice Straw and Maize Offal -Brewer Yeast Slurry Mixture

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ABSTRACT

This study was conducted to evaluate the effect of feeding Pleurotus Tuber-regium biodegraded rice straw (PTTRS) and maize offal-brewer yeast slurry mixture (MOBYS) on nutrient digestibility, carcass yield and production economics of West African Dwarf Goats. Twenty four WAD goats, allotted to six groups of four goats per treatment in a completely randomized design were used in the study. The six dietary treatment groups were fed varying levels of MOBYS, and ad libitum, untreated rice straw (UTRS) and Pleurotus tuberregium treated rice straw (PTTRS) thus: T1= 100 g MOBYS and UTRS ad libitum, T2=100 g MOBYS and PTTRS ad libitum, T3=200 g MOBYS and UTRS ad libitum, T4=200 g MOBYS and PTTRS ad libitum, T5=300 g MOBYS and UTRS ad libitum, and T6=300 g MOBYS and PTTRS ad libitum in an experiment that lasted for 90 days. In the last week of the study, two goats per treatment were transferred to metabolic cages for digestibility study. Weighed quantities of the feeds and water were offered to the goats on a daily basis, and faeces were collected and dried. At the end of seven days, the faeces were oven dried to constant weight and then bucked by treatment and samples sent for proximate analysis. Apparent nutrient digestibility coefficients were calculated using results of proximate analysis of the faeces. After the 90 days feeding period, two animals from each treatment were selected and used for carcass analysis. They were fasted for 24 hours during which they were given plenty drinking water, and sacrificed by severing the jugular vein, bled and the following carcass cuts obtained: neck, shoulder, flank, loin, rib and thigh. The following carcass by products and visceral organs were also obtained: head, feet, skin, empty gut, abdominal fat, heart, lungs, liver, kidney and spleen. The economics of production was assessed using the net farm income (NFI) budgeting technique based on cost of feed consumed, feed cost per weight gain, cost of goat purchase, total variable cost, sale value of goat and income from goat sale. Based on the results obtained, it was concluded that combined feeding of the test inputs to the WAD goats enhanced nutrient digestibility, resulted in normal carcass characteristics and offal as well as considerable reaping of economic benefits depending on the levels of the test materials fed.

Keywords: *Nutrient-digestibility; carcass-yield; production-economics, goats, rice-straw, brewer-yeast-slurry; maize-offal;*

INTRODUCTION

Increase in global human population has introduced the challenge of providing quality animal protein for their feeding. In recent years, there has been growing interest in identifying potentially important feedstuffs to supplement the available low nutrient feeds (Tona et al., 2014) for ruminant feeding in the tropics. Thus, animal nutritionists are continuously evaluating forages and other feed resources so as to provide solutions to problems arising from practical feeding of livestock in specific situations and on a year round basis (Wuanor, 2014). As these efforts continue, there is the need to continue assessing performance of animals exposed to such feeding as well as quantity and quality of products and economic benefits. Rice straw, a residue of the rice plant arising from rice farming, is produced in copious quantities worldwide annually but its fibrous nature limits voluntary intake, reduces degradability by ruminal micro organisms thus hindering its effective utility as a livestock feed (Wuanor, 2017). Other lignocellulosic materials like rice straw have been upgraded as quality feedstuff after biological treatment (Akinfemi et al., 2010). Feed ingested by an animal becomes useful only when it has been digested and absorbed by the animal body. The potential value of a feed for supplying a particular nutrient can be determined by chemical analysis, but the actual value of the feed to the animal can be arrived at only after making allowances for the inevitable losses that occur during digestion, absorption and metabolism (McDonald et al., 1995). The authors also reported that factors affecting nutrient digestibility include chemical composition, stage of growth, plant fractions such as proportion of leaves and climate. The increasing need to improve on the supply of animal protein in the diet for man at the least cost has resulted in the search for various alternative feed inputs to replace conventional feeds .The choice of which livestock to use for meat production is also important.

The goat has been identified as a useful ruminant (Jones et al., 2017), its meat is the most frequently consumed in the world even as meat goats value efficiently as converters of low quality for ages into quality products for meat specialty type markets (Tony, 2014). According to Penn State Extension service (2017), goat meat is unique in flavour and palatability while a number of factors that affect how much meat that can possibly be harvested from a slaughtered animal include how much fed the animal ate, and how much mud or fibre it had on its body (Cornell Small Farms Programme, 2017). However, goat performance has been hindered over the years by the non availability of good quality and quantity of feeds (Onwuka, 1999). Promotion of income generating activities continues to gain widespread support in rural development discourse in developing countries. Goat production has been identified as having the potential to provide employment and increase the income level of farmers (Baba *et al*., 2013). It has been asserted by Mendell (2017) that it is possible to make profit raising goats and the three most important factors affecting profitability of the goat enterprise are feed cost, percentage calf crop and market prices. The reasoning among most livestock managers and marketers is that if the feed is well digested by the animal's body, it should translate to deposition of body weight which can be assessed as carcass after the animal is slaughtered, all of which should translate to reaping of economic benefits if the enterprise is to be self sustaining and make meaning to the investors. The aim of the study was to evaluate nutrient digestibility, carcass yield and production economics of West African Dwarf goats fed *Pleurotus Tuber-regium* biodegraded rice straw (PTTRS) and maize offal-brewer yeast slurry mixture (MOBYS)

METHODOLOGY

Preparation of Feed Materials

Gathering and Processing Rice Straw

Rice straw was gathered from rice farms around University of Agriculture, Makurdi environs after rice was harvested and threshed. It was baled and kept in store to prevent rain water from possibly wetting and spoiling it. Later, the rice straw was milled using a blur mill to reduce its particle size and create a greater surface area for microbial activity. The milled straw was then put in sacks and stored until required for use.

Mass Composting of Rice Straw for Experimental Feeding of Goats

Preparation of Inoculation Rooms

Floors, walls and doors of the inoculation room were swept, washed and disinfected using Dettol disinfectant in water at the rate of one litre Dettol to four litres of water. The floors were then mopped free of water and the doors left open for one week to enable drying of the room.

Composting of Milled Rice Straw

The milled rice straw was wetted with water at the rate of one kg straw to two litres of water and thoroughly mixed to enable complete wetting of the straw. Then the straw was heaped in one place and covered using polyethylene sheets to create an airtight environment suitable for composting (Oei 1996). The straw heap was turned inside out every other day for a total period of seven days after which the heap was spread out to enable cooling of the composted straw.

Fungal Inoculation of the Straw

Tubers of *Pleurotus tuberregium* (PTR), obtained from dealers were weighed, washed and soaked in water for one hour after which they were removed and put in white transparent buckets and covered for two days to enable spore formation of the tubers. After two days, the PTR were removed and dissected to smaller bits carrying the spores. The composted straw was loaded on three tier wooden trays of dimension 1.5 m x 1.2 m x 0.75 m (height, breadth and width) constructed using 2x2″ wood and wire mesh base. The base of the wooden tray was covered with white transparent polyethylene sheet disinfected using methylated spirit soaked cotton wool. Spores of PTR were then inoculated into the composted rice straw at the rate of one kg spores to five kg straw. The ends of the polyethylene sheets were then brought together and sealed using masking tape to create an airtight environment. Water was then poured on the room floor and some left in buckets after which doors of the inoculation room were closed. After 30 days, the mass of composted straw now colonized by mycelium of the fungi showing whitish growths was taken out of the inoculation trays from the inoculation room and sun dried to terminate growth of the fungi and dry the material. The material was then sun dried and then put in sacks and stored until required for use.

Maize Offal: Brewer Yeast Slurry Mixture (MOBYS) Preparation

Maize offal was bought from mills, sun dried stored in sacks. Brewer yeast slurry was collected from Benue Brewery Limited, Makurdi, Nigeria, moved to the drying site and mixed with maize offal in the ratio of 1:1 by weight and sun dried with constant turning to prevent lumps from following. After sun drying, the MOBYS was then put in sacks and stored.

Goat Pen Preparation

The goat pen having cages for individual housing and feeding of the goats were used. The individual cages were constructed using 2x2″ wood with lockable doors. Dimensions of the cages were 1.27 m x 1.2 m x 0.7 m (height, breadth and width). The cages were thoroughly swept, washed, disinfected and left to dry. The entire pen was then fumigated using Sniper (2, 3 – dichlorovinyl dimethyl phosphate) and Marshal (Lambda – cyhalothrin 2.5 EC) at the rate of 3 ml to 200 ml water and 20 ml to 20 liters water respectively. The feeding troughs were constructed using wooden planks and were of the dimension 0.25 m x 0.25 m x 0.30 m (height, breadth and width).

Acquisition of Goats/ Acclimatization

24 Young WAD bucks weighing 8.05 kg on the average were sourced from areas of the state where vaccination against PPR had been carried out and conveyed to the farm. They were then exposed to a 30 day acclimatization period during which they were given prophylactics against endo and ectoparasites and a general antibiotic cover thus: Terramycin (long acting) @ 1.0 ml per goat, Eagle vitaflash @ 0.5 ml per goat, Pour on @ 1.0 ml per goat administered at backline of the goats, ivermectin @ 1.0 ml per 10kg live weight and iron Dextrant @ 1.0 ml per goat.

They were then randomly allocated to the six dietary treatments and caged individually.

Animal Feeding

After acclimatization period, the goats were then exposed to the following dietary treatments for 90 days:

T1 = 100 g MOBYS and untreated straw (RS) *ad libitum*

T2 = 100 g MOBYS and *Pleorotus tuberregium* treated rice straw (PTRRS) *ad libitum*

T3 = 200 g MOBYS and RS *ad libitum*

T4 = 200 g MOBYS and PTRRS *ad libitum*

T5 = 300 g MOBYS and RS *ad libitum*

T6 = 300 g MOBYS and PTRRS *ad libitum*

Four goats were used per treatment with each goat forming a replicate. The goats were also served water and Yalama Blogu Royal Mineral Licking Block *adlibitum*. Their drinking water and MOBYS were put in poultry chick drinkers and inserted into the feeding troughs while the untreated rice straw and PTTRS were served directly in the feeding troughs.

Parameters Assessment

Nutrient Digestibility Study

In the last week of the study, two goats per treatment were transferred to metabolic cages for digestibility study. Dimensions of the metabolic cages were 1.26 m x 1.05 m x 0.75 m (height, breadth and width) with the distance between floor to base of the cage being 0.7 m. Weighed quantities of the feeds and water were offered to the goats on a daily basis, feces collected and dried. At the end of seven days, the faeces were oven dried to constant weight and then bucked by treatment and samples sent for proximate analysis. Apparent nutrient digestibility coefficients were calculated using the formula

$$\%\ \text{digestibility} = \frac{\text{Amount of nutrient consumed} - \text{Amount of nutrient in feces}}{\text{Amount of nutrient consumed}} \times 100$$

Carcass Yield Determination

After the 90 days feeding period, two goats from each treatment were selected and used for carcass analysis. They were fasted for 24 hours during which they were given plenty drinking water, and sacrificed by severing the jugular vein, bled and the following carcass cuts obtained: neck, shoulder, flank, loin, rib and thigh. The following carcass by products and visceral organs were also obtained: head, feet, skin, empty gut, abdominal fat, heart, lungs, liver, kidney and spleen.

Assessment of Production Economics

The economics of production was assessed using the net farm income (NFI) budgeting technique based on cost of feed consumed, feed cost per weight gain, cost of goat purchase, total variable cost, sale value of goat and income from goat sale.

RESULTS

The apparent nutrient digestibility coefficients of the WAD goats are shown in Table 1. Dry matter digestibility ranged from 80.20 % (T1) to 88.70 % (T6) and showed significant difference ($P<0.05$). Values of T6 and T5 were the highest and similar to each other, followed by those of T4 and T3 which were also similar to each other but significantly higher than those of T2 and T1 which were similar to each other. Organic matter digestibility ranged from 70.70 % (T1) to 76.75 % (T6) and showed significant difference ($p<0.05$). Values of T5 and T6 were highest and similar, but significantly ($P<0.05$) higher than the other treatments, followed by those of T4 and T3 which are also similar to each other but significantly ($P<0.05$) higher than values of T2 and T1 which were similar to each other. Crude protein and crude fibre digestibility showed similar pattern where highest values were recorded for T5 and T6, being significantly different ($P<0.05$) from the rest of the treatments, followed by T3 and T4 which were also significantly different ($P<0.05$) from T1 and T2 which were similar to each other. Ether extract digestibility of T1, T4 and T5 were significantly higher ($P<0.05$) than the rest while T2 and T6 were similar to each other but significantly higher ($P<0.05$) than T3. Nitrogen free extract digestibility was significantly highest in T1, followed by T2, then T4 and T3 while T5 and T6 recorded the least values and were similar to each other. Ash digestibility of T5 and T6 was significantly higher than the other treatments, followed by T4 and then T3 while T1 and T2 were similar to each other.

Table1. *Apparent Nutrient Digestibility Coefficients of Wad Goats Fed Fungal Treated Rice Straw Supplemented With Maize Offal: Brewer Yeast Slurry Mixture*

Nutrient	T1	T2	T3	T4	T5	T6	SEM±
DM	80.20^{c}	80.80^{c}	85.30^{b}	85.50^{b}	88.40^{a}	88.70^{a}	0.58
OM	70.70^{c}	70.85^{c}	74.20^{b}	74.90^{b}	76.30^{a}	76.75^{a}	0.58
CP	71.60^{c}	71.90^{c}	76.30^{b}	76.50^{b}	78.40^{a}	78.80^{a}	0.19
CF	65.30^{c}	66.00^{c}	69.30^{b}	69.80^{b}	70.80^{a}	71.30^{a}	0.25
EE	75.60^{a}	73.90^{b}	72.80^{c}	74.10^{a}	74.40^{a}	73.50^{b}	0.16
NFE	75.30^{a}	74.20^{b}	72.10^{d}	72.80^{c}	71.60^{e}	71.80^{e}	0.13

a, b, c, d, e, f---- Means on same row with different superscripts vary significantly (P<0.05)

T1, T3 and T5 fed MOBYS and untreated rice straw

T2, T4 and T6 fed MOBYS and Pleurotus tuberregium treated rice straw

DM = dry Matter OM = Organic Matter CP = Crude Protein CF = Crude Fibre EE = Ether Extract

NFE= Nitrogen free extracts

Values of carcass cuts are shown in Table 2, while values of carcass by-products and visceral organs are presented in Table 3. There was no significant difference ($P>0.05$) in all carcass cuts. Apart from body weight at slaughter, slaughter weight, shoulder and thigh, higher values were obtained for the PTTRS fed compared to the RS fed goats in all other carcass cuts. Results of carcass by-products and visceral organs showed no significant difference ($P>0.05$) for head, feet, skin, full gut, empty gut, heart, lungs, liver, kidney and spleen. Abdominal fat values ranged from 0.48 % (T1 and T2) to 0.58 (T6), the value for T6 was higher and significantly different ($P<0.05$) from the other treatments. This was followed by values of T5, T4, and T3, in that order and were significantly different ($P<0.05$) from each other and also from those of T1 and T2 which were similar to each other. Apart from T1 and T2, abdominal fat values were higher for PTTRS than RS fed goats within MOBYS intake groups.

Table2. Carcass Characteristics of WAD Goats Fed Fungal Treated Rice Straw Supplemented with Maize Offal: Brewer Yeast Slurry Mixture cuts. Apart from body weight at slaughter, slaughter weight, shoulder and thigh, higher values were obtained for the PTTRS fed compared to the RS fed goats in all other carcass cuts. Results of carcass by-products and visceral organs showed no significant difference (P>0.05) for head, feet, skin, full gut, empty gut, heart, lungs, liver, kidney and spleen. Abdominal fat values ranged from 0.48 % (T1 and T2) to 0.58 (T6), the value for T6 was higher and significantly different (P<0.05) from the other treatments. This was followed by values of T5, T4, and T3, in that order and were significantly different (P<0.05) from each other and also from those of T1 and T2 which were similar to each other. Apart from T1 and T2, abdominal fat values were higher for PTTRS than RS fed goats within MOBYS intake groups.

Table2. Carcass Characteristics of WAD Goats Fed Fungal Treated Rice Straw Supplemented With Maize Offal: Brewer Yeast Slurry Mixture

Parameter	T1	T2	T3	T4	T5	T6	SEM
Body weight at slaughter (kg)	9.50	9.53	10.08	10.12	10.78	10.68	0.09
Slaughter weight (Kg)	9.05	9.18	9.63	9.65	10.20	10.18	0.09
Dressed weight (Kg)	7.16	7.29	7.61	7.76	8.11	8.30	
Eviscerated weight (Kg)	3.85	3.95	3.95	4.26	4.34	4.37	0.08
Dressing percent (%)	42.54	43.03	41.02	44.15	42.55	42.93	0.49
Neck (%)	5.78	6.70	5.90	6.13	5.51	6.57	0.36
Shoulder (%)	9.99	11.57	11.12	11.29	11.42	11.15	0.66
Flank (%)	4.21	4.49	3.82	3.88	3.93	3.88	0.37
Loin (%)	7.88	7.84	6.60	7.76	7.55	7.24	0.44
Rib (%)	3.70	3.74	3.48	4.84	4.24	3.99	0.48
Thigh (%)	13.15^{c}	12.68^{d}	11.81^{b}	13.87^{b}	13.05^{cd}	14.53^{a}	0.97

a, b, c, d, e, f---- Means on same row with different superscripts vary significantly (P<0.05)

T1, T3 and T5 fed MOBYS and rice straw

T2, T4 and T6 fed MOBYS and Pleurotus tuberregium treated rice straw

Table3. *Carcass by- Products and Visceral Organs of WAD Goats Fed Fungal Treated Rice Straw Supplemented With Maize Offal: Brewer Yeast Slurry Mixture*

Parameter	T1	T2	T3	T4	T5	T6	SEM
Head (%)	9.99	9.73	9.38	9.35	9.42	8.71	0.29
Feet (%)	3.67	3.74	4.17	3.23	4.24	3.27	0.28
Skin (%)	7.24	7.21	7.04	7.01	6.91	6.70	0.03
Full gut (%)	23.61	22.71	23.54	22.38	22.65	24.52	0.99
Empty gut	3.40	3.33	3.84	3.99	3.42	3.48	0.23
Abdominal fat (%)	0.48^{e}	0.48^{e}	0.50^{d}	0.51^{c}	0.52^{b}	0.58^{a}	0.01
Heart (%)	0.63	0.64	0.72	0.62	0.55	0.63	0.08
Lungs (%)	1.27	1.28	1.33	1.42	1.42	1.29	0.14
Liver (%)	2.18	2.10	3.10	1.94	2.26	1.63	0.12
Kidney (%)	0.53	0.58	0.58	0.46	0.49	0.57	0.04
Kidney (%)	0.53	0.58	0.58	0.46	0.49	0.57	0.04
Spleen (%)	0.21	0.16	0.23	0.20	0.19	0.18	0.02

a, b, c,---- Means on same row with different superscripts vary significantly (P<0.05)

T1, T3 and T5 fed MOBYS and rice straw

T2, T4 and T6 fed MOBYS and Pleurotus tuberregium treated rice straw

The economic production performance parameters of the WAD goats are presented in Table 4. Cost of feed/kg increased as MOBYS intake increased. Cost of feed consumed was a reflection of cost of feed/kg, increasing with increased MOBYS intake and being higher for the PTTRS than the

RS fed goats within MOBYS intake groups. Feed cost/weight gain increased as MOBYS intake increased and within MOBYS intake groups, was higher for the PTTRS fed than the RS fed animals. Purchasing cost per individual goat was uniform across the treatments. Cost of goat purchase was a reflection of the body weights of the goats at purchase. Other cost incurred on the goats was uniform across the treatments, but higher for T2. Total cost increased with increased MOBYS intake. Sale value of goat was uniform across treatments. Income from goat sale was lowest for T1 (N5,574:=) and highest for T5 (N6,372:=); it increased with increased MOBYS intake and within the MOBYS intake groups, was higher for the PTTRS than the RS fed groups, though T6 was an exception to this trend.

Table4. *Production Economics of WAD Goats Fed Fungal Treated Rice Straw Supplemented With Maize Offal: Brewer Yeast Slurry Mixture*

	Treatments					
Parameter	**T1**	**T2**	**T3**	**T4**	**T5**	**T6**
TFI (Kg)	20.18	19.06	26.58	27.65	34.70	35.65
COF/Kg (N)	28.47	35.45	37.53	42.50	43.55	47.44
COFC (N)	574.45	675.60	997.50	1175.25	1511.1	1691.25
FC/WG (N)	482.92	577.44	570.00	628.48	637.59	690.31
AIBW (Kg)	8.10	8.25	8.20	8.15	8.25	8.10
PCOG (Kg /N)	300	300	300	300	300	300
COGP (N)	2430	2475	2460	2445	2475	2430
OVC (N)	330	380	330	330	330	330
TVC (N)	3334.45	3530.6	3787.5	3950.25	4316.1	4451.25
AFBW (N)	9.29	9.42	9.95	10.02	10.62	10.55
ATWG (N)	1.19	1.17	1.75	1.87	2.37	2.45
SVOG/Kg (N)	600	600	600	600	600	600
IFGS (N)	5574	5652	5790	6012	6372	6330

T1, T3 and T5 fed MOBYS and untreated rice straw

T2, T4 and T6 fed MOBYS and Pleurotus tuberregium treated rice straw

TFI= total feed intake; COF= cost of feed; COFC= cost of feed consumed; FC/WG(N)= feed cost per weight gain; AIBW= average initial body weight; PCOG= purchasing cost of goat COGP= cost of goats purchase; OVC= other variable cost; TVC= total variable cost; AFBW= average final body weight; ATWG= average total weight gain; SVOG= sale value of goat; IFGS; income from goat sale

Discussion

The DMD values showed significance difference and values agree with reports of Ngi, 2005; Sodeinde *et al*., 2007; Bamikole and Ikhatua, 2007; Fajemisin, 2013, but contradict other workers reports (Ahamefule *et al*., 2007; Olatunji et al. 2007; Okeniyi *et al*., 2010). The OMD pattern was reasoned to be a response to MOBYS intake. This report agrees with those of Adepoju *et al*. (2011) and Ngi (2012).The CPD was also reasoned to be caused by MOBYS intake. This report contradicts works of Olatunji *et al*. (2009) Okeniyi et al. (2010) Ahamefule *et al*. (2007) but agrees with works of Fajemisin *et al*. (2010) and Sodeinde *et al*. (2007).

The CFD was attributed to rising MOBYS intake. The significance agrees with works of Anigbogu *et a* l. (2007) and Fajemisin *et al.* (2010) but contradicts works of Ngi (2005) and Ahamefule *et al*. (2007). The improved CFD contrary to report by Ngi (2005) is attributed to effect of MOBYS. Drake *et al*. (2003) and Sarklong et al. (2010) had reported that RS is of low digestibility. The EED significance agrees with works of Ngi (2005), Ahamefule *et al*. (2007) and Sodeinde *et al*. (2007) but contradicts reports of Olatunji *et al*. (2007). The NFED significance agrees with results of Ngi (2005) and Anigbogu *et al*. (2007) but contradicts reports of Olatunji *et al*. (2007) and Ngi (2012).

Values of dressing percent reported herein agree in magnitude and statistical non significance with works of Ifut *et al*. (2011) and Ngi (2012) using WAD goats in the same locality. They also agree with work of Attah (1998) who also stated that DP increases as weight of animals increase. The lack of significance of the present work however contradicts works of Okello *et al*. (1996) and Oktay *et al*. (2011), but note is also taken of difference in goat breeds used by these other authors.

Neck percent values in this study agree with the non significance reported earlier by Ukanwoko and Onuoha (2011) and Ngi (2012), though percentages herein are higher. The neck percentages would have guaranteed more capable carriage of the head and its structures, necessary for survival of the animals.Shoulder percent values herein agree with values reported by Ngi (2012) in the same environment but disagree with report of Attah (1998). Loin percent values appear lower than those of Attah (1998) but agree with those of Ngi (2012). Rib percent values agree with those of Ngi (2012) and are interpreted to be capable of providing strong protection for vital organs of the thoracic cavity.

Thigh percent values reported herein are in agreement with values reported by Ukanwoko and Onuoha (2011) and Ngi (2012). It is interpreted that the experimental diets encouraged development of thigh muscles as is consistent with the WAD goat breed, thus the similarity of this result with that of others. Head percent values of this work agree with works of Ukanwoko and Onuoha (2011) and Ngi (2012) but disagree with Oktay *et al*. (2011), but it is noted that the latter workers used a different breed of goat. Feet percent values in thie work generally agree with works of Attah (1998), Ukanwoko and Onuoha (2011) and Oktay *et al*. (2011).

Full gut and empty gut percent values in this study are lower than those reported by Ukanwoko and Onuoha (2011). This could be attributed to the feed fed the goats, which may have passed out of the guts quicker leading to less remaining after the 12 hours fasting period preparatory for the slaughtering.

Internal fat percent values of this work agree with those of Ukanwoko and Onuoha (2011) and Ngi (2012). The significant difference is adduced to be due to effect of MOBYS and PTTRS. PTTRS fed goats were significantly fatter (except T2), and increasing MOBYS intake also caused significantly fatter internal fat. Skin percent values of this work agree with values of other workers (Attah, 1998; Ngi, 2012), but differ in significance with other workers (Ukanwoko and Onuoha, 2011). This translates to harvesting the needed value from the skin as well, as the percent was neither too small nor too big compared to previous reports for the WAD goat breed. Heart percent values in this work agree with works of Attah (1998), Ukanwoko and Onuoha (2011) and Ngi (2012) and means absence of a factor in the diets that could have caused abnormal size of the heart and also different heart percentage from reported values.

Lungs percent values in this work agree with works of Attah (1998), Ukanwoko and Onuoha (2011) and Ngi (2012) and means that there was no serious challenge to the oxygen supplying function of the blood or carbon dioxide removal. Liver percent values in this work agree with works of Attah (1998), Ukanwoko and Onuoha (2011) and Ngi (2012) and means there was no challenge to the liver caused by the dietary treatments and also connotes absence of injury to the liver. Kidney percent values in this work agree with works of Attah (1998), Ukanwoko and Onuoha (2011) and Ngi (2012) and mean the diets did not cause any challenge to the kidney. Spleen percent values in this work agree with works of Attah (1998), Ukanwoko and Onuoha (2011) and Ngi (2012) and means that the dietary treatments did not affect the size of this organ, and by extension, its function in the body of helping to destroy old red blood cells, form lymphocytes and store blood.

The cost of feed/kg reflected cost of constituent feed inputs. The dietary treatments that had more of the straws (RS and PTTRS) recorded lowest cost of feed/kg (T1 and T2) than those in which MOBYS formed a greater proportion. This was largely because the straws were less costly, N5:00 and N15:00 for RS and PTTRS while MOBYS cost was N60:00/kg. Cost of feed inputs has a direct relationship with protein content; MOBYS was the most costly, followed by PTTRS and lastly RS. This trend of cost contradicts result of Ikurior and Akem (1998) who reported that BYS mixture effected, significantly less cost, but agrees with the assertion by Okagbare and Akinsoyinu (1998) that in preparation of goat ration, the protein source is one of the most expensive ingredients.

Feed cost/weight gain, being a function of cost of feed consumed and total weight gain gave a picture of performance of feed cost efficiency. That the cost was generally lower for the groups fed less MOBYS and more for the PTTRS fed than the RS fed goats also implicates high cost of MOBYS and PTTRS than RS which incidentally did not elicit corresponding weight gain.

The total revenue (TR) was more dependent on total body weight gain because the unit price of goat live weight was uniform across the dietary treatments. The total revenue trend also shows a response to higher MOBYS intake, and showed that PTTRS intake attracted more revenue than RS intake. This trend is expected hence the higher MOBYS intake and the PTTRS fed encouraged greater body weight gain than the RS fed groups.

Conclusion

It is concluded that combined feeding of the test inputs enhanced nutrient digestibility, produced normal carcass characteristics, offal and considerable increase in economic benefits depending on the levels of the test materials used.

Recommendation

Rice straw should be treated with fungi before feeding to goats to encourage nutrients digestibility, carcas yeild and for economic benefits. Large scale mixing of maize offal with brewer's yeast slurry should be explored to produce affordable feed concentrates as supplements for goat farmers. The use of maize offal- brewer's slurry mixture for goat feeding will reduce the environmental hazards attendant upon disposal of the spent brewer yeast slurry by breweries.

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