EVALUATION OF MIXED FUNGAL TREATED COWPEA HUSK AS FEED FOR GOATS

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ABSTRACT
Studies were conducted to access changes in the chemical composition and *in vitro* digestibility of mixed culture of *Pleurotus ostreatus* and *P. florida* in cowpea husk. The resultant substrates were oven-dried and their chemical composition and in vitro digestibility determined using standard methods. The result obtained shows variation in their chemical composition and in vitro gas production characteristics. The Crude protein (%) ranged from 12.05 (T1) to 17.62 (T4), Crude fibre 27.08 (T4) to 39.01 (T1), Ether extract 3.88 (T1) to 11.08 (T2), Cellulose 17.22 (T2) to 24.88 (T1), Hemicellulose 17.22 (T2) to 24.88 (T1). The estimated organic matter digestibility, short chain fatty acid and metabolisable energy differed significantly ($p<0.05$). From the results obtained in this experiment, mixed fungal treatment influenced positively the potential of sorghum threshed top as feed for ruminants.

INTRODUCTION
Large amount of cowpea husk is generated from cowpea production in Nigeria. The cowpea husk are often used as ruminant feed, burnt or left in the farm to rot. However feeding of cowpea husk to ruminants has its inherent low available nutrient resulting in low voluntary intake and digestibility. Beside this, the nitrogen and energy content of cowpea husk is low because of its lignin content. Fungal treatment of agricultural wastes is encouraged in recycling of cowpea husk to value added ruminant feed. In the present study, a mixed culture of *Pleurotus ostreatus* and *P. florida* was used to upgrade the nutrient content of cowpea husk to such a level that the resultant product will be useful in a complete feed mixture of goats. This process is important to cater for shortage of ruminant feed.

MATERIALS AND METHODS
Culture of oyster mushroom: *Pleurotus ostreatus* and *Pleurotus florida* were obtained from Department of Botany and Microbiology, University of Ibadan, Nigeria and maintained on petri dishes of potato dextrose agar (PDA). The substrate, Sorghum threshed top was collected from the Teaching and Research Farm, Yaba College of Technology and subsequently milled. The milled substrates were moistened and weighed separately into Jam bottles in triplicates and thereafter sterilized in autoclave at 121°C for 15mm. after cooling, each sterilized bottlewas inoculated at the centre of the substrate with 6mm (diameter) mycelia disc and kept in the cupboard in the laboratory at 30°C and 100% RH. After 21 days of inoculation, the experimental bottles were autoclaved again to terminate the mycelia growth. Samples biodegraded and the control samples were oven dried to constant weight for chemical analysis and in vitro digestibility were determined using standard methods (AOAC, 2012 and Van Soest *et al*.,1991).

RESULTS AND DISCUSSION
The fungal treatment improves the chemical composition of cowpea husks (Table 1). The mixed fungal altered the NDF concentration due to the effect of the fungal extracellular enzymes on the cell wall constituents (Chen *et al*., 1995). The impact of the fungal treatments is also observed in the CF and ADL contents of the cowpea husk where the enzymes produced by the fungi used decreased

significantly ($p<0.05$) the CF and ADL. Increment in the CP of the treated sample could be the result of the addition of the fungal mycelium to the substrates. (Akinfemi *et al*.,2010). The outcome of the impact of fungal treatment on the invitro gas production characteristics and the estimated parameters (Table 2) differed significantly ($p<0.05$). the higher the short chain fatty acid obtained in the treated substrate is an indication of energy availability to the animal, a higher value in the treated substrate implies more energy propensity to the ruminants (Akinfemi, 2010). Fungal treatment of cowpea husk, from the result obtained in this study, holds a great potential as feed resources for goat.

Table 1: Chemical composition (g/100g DM) of cowpea husk treated with mixed culture of *Pleurotusostreatus* and *Pleurotusflorida*

Parameter	***T1***	***T2***	***T3***	***T4***	***SEM***
DM	*86.26^{a}*	*86.65^{a}*	*82.38^{b}*	*86.72^{a}*	*0.24*
Crude Protein	*12.05^{d}*	*13.98^{b}*	*17.62^{a}*	*13.25^{c}*	*0.32*
Ether Extract	*3.88^{d}*	*11.08^{a}*	*4. 96^{c}*	*5.39^{b}*	*0.59*
Ash	*25.25^{a}*	*21.93^{d}*	*22.26^{c}*	*24.59^{b}*	*0.32*
Crude Fiber	*39.01^{a}*	*38.75^{b}*	*34.33^{c}*	*27.08^{d}*	*0.23*
Nitrogen Free Extract	*6.07^{c}*	*2.55^{d}*	*8.36^{b}*	*14.26^{a}*	*4.47*
Neutral Detergent Fiber	*79.26 ^{a}*	*62.45^{c}*	*70.14^{b}*	*60.18^{d}*	*0.003*
Acid Detergent Fiber	*54.38^{a}*	*45.23^{c}*	*47.57^{b}*	*42.50^{d}*	*0.005*
Acid Detergent Lignin	*22.55^{a}*	*14.18^{c}*	*20.10^{b}*	*12.11^{d}*	*0.004*
Cellulose	*24.88^{a}*	*17.22^{c}*	*22.67^{b}*	*17.68^{b}*	*0.005*
Hemicellulose	*24.88^{a}*	*17.22^{c}*	*22.67^{b}*	*17.68^{b}*	*0.003*

Table 2: Gas production characteristics, estimated short chain fatty acid and metabolisable energy

Parameter	***T1***	***T2***	***T3***	***T4***	***SEM***
Methane	*10.00^{a}*	*8.00^{b}*	*7.00^{c}*	*6.00^{d}*	*0.66*
b (ml)	*37.33^{c}*	*40.00^{b}*	*40.5^{b}*	*42.16^{a}*	*0.18*
c (h^{-1})	*0.0002^{c}*	*0.0003^{b}*	*0.0003^{b}*	*0.0005^{a}*	*0.00*
In vitro digestibility					

OMD (%)	*46.49*^{d}	*63.41*^{b}	*60.98*^{c}	*69.54*^{a}	*0.76*
ME (MJ/Kg DM)	*19.42*^{a}	*17.38*^{b}	*17.80*^{b}	*19.08*^{a}	*0.12*
SCFA (mmol)	*0.163*^{d}	*0.569*^{c}	*0.619*^{b}	*0.689*^{a}	*0.01*

^{abc}Means with different superscript along the same row in significantly different (P< 0.05).

T1= untreated cowpea husk (control), T2= cowpea husk treated with *Pleurotus ostreatus*, T3= cowpea husk treated with pleurotusflorida, T4= cowpea husk treated with *Pleurotus ostreatus* and *P. florida, b*= fermentation of the insoluble but degradable fraction, c= gas production rate constant, OMD= organic matter digestibility, ME= metabolisable energy, SCFA= shaort chain fatty acid.

CONCLUSION

From the results obtained in this experiment, mixed fungal treatment influenced positively the potential of sorghum threshed top as feed for ruminants.

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NSAP 47th Annual Conference (JOS 2022) CONFERENCE PROCEEDINGS
THEME: SECURING ANIMAL AGRICULTURE AMIDST GLOBAL CHALLENGES

GROWTH PERFORMANCE AND CARCASS CHARACTERISTICS OF WEST AFRICAN DWARF SHEEP FED CONCENTRATE DIETS CONTAINING MAIZE LEAVES FERTILIZED WITH DIFFERENT MANURE SOURCES

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Abstract
The effects offertilized maize leaf concentrate (MLC) diets as feed supplements on the growth performance and carcass characteristics of the West African dwarf (WAD) breed of sheep were evaluated in a 90-day experiment. Twenty-five (25) WAD sheep were assigned to 5 dietary treatments of concentrate made from maize leaf fertilized with different manure sources namely poultry, swine, sheep for treatments 1 to 3 while NPK and the control made up treatments 4 and 5, respectively. Data were obtained on feed intake, weight gain and carcass characteristics.Results showed that manure fertilized MLC had a positive effect ($P<0.05$) on dry matter (DM) intake and weight gain of sheep. Among treatments, animals supplemented with sheep manure MLC showed better DM intake (466.79g/day), weight gain (46.44g/day), feed conversion ratio (10.06). Carcass traits varied ($P < 0.05$) across treatments with sheep fed manure MLC having better values. Dressing percentage varied ($P < 0.05$) from 50.58 to 58.86% in sheep fed sheep manure MLC and the control treatment, respectively. It was concluded that sheep offered manure fertilized MLC improved performance with sheep fedsheep manure MLC having the highest growth rates and carcass traits.

Keywords: Sheep, maize leaves, manure, dry season, performance, carcass

INTRODUCTION

In Nigeria, the inadequacy of all year-round feed which is occasioned by seasonality of the major feed resource and protracted dry season has hampered sheep productivity. This has been a major problem to smallholder farmers as very little pasture exists during the season. Moreover, the use of crop residues as alternative and strategic cheap source of feed has been attempted over the years to alleviate the problem of feed shortage in ruminant production (Chukwuka *et al.*, 2010).

Maize is a common crop cultivated year in year out in quantum in most communities in Nigeria. They generate a lot of underutilized leaves which remains under-exploited as feed materials. Moreover, if well harnessed, these leaves could be capitalized on for the enhancement of sustainable agriculture, and bridge the forage scarcity of annual dry seasons, thereby serving as cheap sources of nutrients especially dietary energy and fermentable products for sheep production.Though maize leaves have been used as fodder for ruminants, its nutrient potential can further be improved upon when fertilized with farmyard manure which has been reported to increase growth parameters and yield of maize (Okoroafor *et al.*, 2013).

This study therefore explores the effect of manure fertilized maize leaf concentrate diets as a supplementary source of dry season feed on the growth performance and carcass traits of West African Dwarf sheep.

Materials and Methods

Animal management

Twenty-five (25) West African Dwarf (WAD) yearling rams selected from the flock of the Small Ruminant unit of the Teaching and Research farms, Federal University of Agriculture, Abeokutaand subjected to a 90-day growth trail and carcass characteristics evaluation. The animals were housed individually in pens and assigned to 5 dietary supplementary treatments of concentrate made from maize leaf fertilized with different sources of manure.The manure treatments were made up of poultry, swine, sheep for treatments 1 to 3 while NPK and the control made up treatments 4 and 5, respectively. Each treatment was replicated 5 times with animals balanced for body weights in a completely randomized design. The animals were allowed to adapt to the experimental diets for two weeks before starting the feeding experiment. Concentrate feed was offered

daily at 200g/animal with a basal diet of *Panicum maximum* provided *ad libitum*. Data on feed offered and refusals were taken daily while the animals were weighed weekly. Average daily intake and average daily gain was calculated over the 90-day experimental period.

At the end of the experiment, the animals were slaughtered after starving for 20hours according to the local method by severing the jugular vein and the carotid arteries. After thorough bleeding, the hair was scalded from the skin using boiling water. Empty body weight was computed and the hot carcass weight weighed as described (Fasae *et al.,* 2014). The carcasses were cut into retail and each part was weighed and the dressing percentage calculated. Data collected was subjected to analysis of variance and differences separated using Duncan multiple range test (SAS, 1999).

Results and Discussion

The result of the chemical composition of the experimental concentrate and *Panicum maximum* diets fed to WAD sheep is shown in Table 1. The dry matter (DM) obtained in the concentrate diets across treatments falls within the range of 86.50 to 94.54% reported for concentrate diets fed to ruminants for optimal performance (Adamu *et al.,* 2015). The crude protein content of concentrate diets varied from 14.25 to 15.92% DM which is above the 8% CP recommended as the critical level required by ruminant animals, necessary for proper rumen function (Norton, 2003). The variation in CP content observed in the control diets indicates the non - inclusion of unfertilized maize leaves in comparison to the other diets. Wilson (1993) reported increased crude protein content of forages with the application of fertilizer in the field, which was brought about by stimulating new growth of tissue and by accumulation of NPN compounds in the tender region of the plant.

Table 1: Chemical composition (%) of experimental diets fed to West African Dwarf sheep

Parameters	PMLC	SWMLC	SHMLC	NPKMLC	UMLC	PM	SEM
Dry matter	87.78	88.01	87.74	87.91	88.28	71.29	1.83
Crude protein	15.12	15.38	15.92	15.31	14.25	8.01	1.21
Ether extract	11.29	11.36	11.31.	11.56	11.28	11.25	1.19
Ash	7.43	7.52	7.73	7.46	7.45	5.63	0.52
Neutral detergent fibre	43.97	43.03	40.91	41.56	42.79	61.21	1.62
Acid detergent fibre	29.15	28.26	27.64	27.64	28.54	35.53	1.43
Acid detergent lignin	5.18	5.16	4.63	5.98	5.31	8.82	0.44

PMLC- Poultry manure maize leaf concentrate; SWMLC- Swine manure maize leaf concentrate; SHMLC - Sheep manure maize leaf concentrate; NPKMLC- Nitrogen Fertilizedmaize leaf concentrate; UMLC - Unfertilized maize leaf concentrate; PM – *Panicum maximum*

Table 2 shows the performance characteristics of WAD sheep fed the experimental diets. Intake values obtained for the animals varied ($P < 0.05$) across treatments and ranged between 402.05 to 466.79g/day, with animals consuming all the concentrate mixture given to them. Total DM intake were however better ($P < 0.05$) in sheep fed manure fertilized maize, which is an indication that the sheep were well adjusted to the experimental diets.

The better performance observed in sheep fed concentrate consisting of maize fertilized with sheep manure could be attributed to the higher nutrient composition of these leaves in the concentrate diets which could be more consumed by animals compared to the other treatments. Søresen *et al.* (2003) reported that the application of manure interferes differently with plant growth and development than chemical fertilization which has been observed to produce better growth and development of plants, due to the provision of various elements and nutrients during mineralization processes of the manure.

The average daily weight gain (g/day) ranked the same ($P>0.05$) in animals fed manure fertilized MLC which were significantly higher compared to the other treatments, and could be attributed to the better utilization of MLC which has led to a better performance. However, the live weight gain of sheep on all the diets were

within the range of 32.5 to 47.5g/day earlier reported for the same breed of sheep fed concentrate and forages (Fasae *et al.*, 2012).

Table 2: Performance indices of West African Dwarf sheep fed manure fertilized maize leaf concentrate diets

	Dietary Treatments					
Parameters	PMLC	SWMLC	SHMLC	NPKMLC	UMLC	SEM
DM Intake (g/day)						
Concentrate intake (g/day)	200.00	200.00	200.00	200.00	200.00	1.23
Grass intake (g/day)	244.68^{ab}	237.52 ^{ab}	266.79^{a}	202.05^{b}	219.06^{b}	2.71
Total DM intake (g/day)	444.68^{ab}	427.52^{ab}	466.79^{a}	402.05^{b}	419.06^{b}	3.03
Initial weight kg)	10.97	11.69	11.16	11.01	10.85	0.91
Final weight (kg)	14.61^{b}	15.45^{a}	15.34^{a}	14.40^{b}	13.90^{b}	1.15
Weight gain (kg)	3.64^{b}	3.76^{b}	4.18^{a}	3.39 ^{b}	3.05^{b}	0.67
Daily weight gain (g/day)	40.44^{b}	41.78^{b}	46.44^{a}	37.67^{bc}	33.88^{c}	2.62
Weight gain (W $^{0.75kg}$)	16.04^{b}	16.43^{ab}	17.15^{a}	15.21^{b}	14.04^{c}	1.13
Feed conversion ratio	10.99^{b}	10.23^{bc}	10.06^{c}	10.67^{b}	12.36^{a}	1.31

^{abc}*Means in the same row with the same superscripts are significantly different (P<0.05)*
PMLC- Poultry manure maize leaf concentrate; SWMLC- Swine manure maize leaf concentrate; SHMLC - Sheep manure maize leaf concentrate; NPKMLC- Nitrogen Fertilizermaize leaf concentrate; UMLC - Unfertilized maize leaf concentrate

Feed conversion ratio were best in animals fedMLC fertilized with sheep manure compared to the other treatments; thereby suggesting better feed utilization compared to the other treatments, hence a higher body weight gain.The highest daily gain in weight and feed conversion ratio showed by animals fed MLC fertilized with sheep manure suggest the adequacy of the nutritional plane for such an outstanding performance.
The comparison of the carcass characteristics of West African dwarf (WAD) sheep fed manure fertilized maize leaves concentrate are shown in Table 3. The carcass components observed varied ($P < 0.05$) among treatments with sheep fed manure fertilized MLC having higher ($P < 0.05$) values relative to the other treatments. The carcass yield of WAD sheep in this study is comparable to that obtained for the same breed of sheep fed concentrate and forage but lower compared with those reported for some tropical sheep breeds (Adu and Brinckman 1981; Kawas *et al.*, 2007), which could be attributable to the breed, management system and nutrition. The dressing percentage observed for WAD sheep in this study is comparable to those reported for the same breed of sheep under zero grazing (Alkoiret *et al.*, 2007; Fasae *et al.*, 2011).

Table 3: Carcass characteristics of West African dwarf fed manure fertilized maize leaf concentrate diets

	Dietary Treatments					
Components	PMLC	SWMLC	SHMLC	NPKMLC	UMLC	SEM
Slaughtered weight	14.61^{b}	15.45^{a}	15.34^{a}	14.40^{b}	13.90^{b}	1.15
Empty body weight	13.28^{b}	14.37^{a}	14.01^{a}	13.30 ^{b}	12.49^{b}	1.60
Hot carcass weight	11.77^{b}	12.83^{ab}	13.63 ^{a}	12.13^{b}	11.14^{b}	1.72
Cold carcass weight	8.01^{ab}	8.36^{a}	9.03^{a}	7.53^{b}	7.03^{b}	1.05
Dressing percentage (%)	54.82^{ab}	54.11^{ab}	58.86^{a}	52.29^{b}	50.58^{b}	3.22

^{a,b} *mean values in the same row with the same superscripts are not significantly different (P>0.05)*
PMLC- Poultry manure maize leaf concentrate; SWMLC- Swine manure maize leaf concentrate; SHMLC - Sheep manure maize leaf concentrate; NPKMLC- Nitrogen Fertilizedmaize leaf concentrate; UMLC - Unfertilized maize leaf concentrate

Conclusion
It was concluded that concentrate diets from maize leaves fertilized with different types of manure had a positive effect on the performance of the experimental sheep with sheep manure fertilized maize leaf concentrate diets

resulting in better weight gain, feed conversion ratio and carcass traits of WAD sheep.

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