UTILIZATION OF GRADED LEVELS OF CORN COBS AND COWPEA HUSK ON GROWTH PERFORMANCE OF WEST AFRICAN DWARF EWES

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ABSTRACT

Corncob (CC) and cowpea husk (CH) are by – products of maize and cowpea production respectively. They can be used as alternative feed resources for ruminants especially during the dry season. A 70d study was conducted to determine the effects of CC and CH based diets on performance of WAD rams. Sixteen ewes were allotted to four feeding regimes: A (100% CC), B (66.7% CC + 33.3%CH), C (33.3% CC + 66.7% CH) and D (100% CH). The sheep were randomly allotted to four diets with four animals per treatment. Digestibility was conducted using metabolic cages which allowed for separate collection of faeces and urine. Samples were analyzed for crude protein and fibre fractions: {acid detergent fibre (ADF), neutral detergent fibre (NDF) and acid detergent lignin (ADL) using standard procedures. Dry matter intake (DMI), live weight changes (LWG), feed conversion ratio (FCR) and nutrient digestibility were the parameters assessed. DMI ranged from 22.04 kg to 41.07 kg with significant ($P < 0.05$) differences and LWG ranged from 4.14 gd^{-1} to 41.71 gd^{-1} across the diets. Also, FCR ranged from 14.06 in diet C to 45.68 in diet A with significant ($P < 0.05$) differences across the diets. CP digestibility was highest in diet D (88.01%) and lowest in diet A (72.06%) while ADF, NDF and ADL were highest in diet C and lowest in diet B. However, nutrients digestibility increased with increasing level of cowpea husk in the diets. The result show that highest weight gain and efficient utilization was achieved at 66.7% CH and 33.3% CC inclusion levels.

Key words: *WAD ewes, Growth, Digestibility, Cowpea Husk, Corncob*

INTRODUCTION

Nsahalai et al., (1998) reported that poor nutrition is one of the main constraints of livestock productivity in Sub-Saharan Africa as feed resources are limited in quality and quantity. Also, dry season feeding of livestock especially ruminants in the tropics has always been a challenge to farmers since there are scarcity of pastures, hence, performance of these animals are seriously impaired. However, Odeyinka (2001) observed that one possible way to alleviate this challenge and maintain production in the tropics is feeding agro industrial by-products which are regarded as wastes by man but can be converted by ruminants into desirable human food. This will reduce the cost of animal production without a decrease in productivity.

Corncobs and cowpea husk are by-products of maize and cowpea production respectively and may be used as alternative feed resources for ruminants especially during dry seasons. Cowpea husk are important crop residue used by livestock farmers to supplement fodder during the dry season. In this regard, Olorunju et al., (1996) reported that small holder farmers in sub-humid zone of West Africa prefer late maturing cultivars to early maturing types. In the same vein, it was observed that cowpea husk when used as feedstuff can bring about appreciable weight gain thereby checking the characteristic weight losses during dry season (Aderolu, 1997). Similarly, corncob is one of the relatively available and abundant agricultural wastes; a major limiting factor in the utilization of this agricultural waste is its low digestibility and relatively poor nutrient composition (Kategile, 1981).

Williamson and Payne (1987) noted that small ruminants seem to be the best in the utilization of coarse feedstuffs for the production of meat, preferring feedstuffs relatively rich is crude fibre. However, information is scarce on the combination of several agricultural wastes to give optimal performance to small ruminants. The present study was therefore designed to investigate the performance of West African dwarf (WAD) ewes fed graded levels of cowpea husk (CH) and corncob (CC).

MATERIALS AND METHODS

Study location

The experiment was conducted at the Sheep Unit, University of Ibadan Teaching and Research Farm. The location of the farm is between Latitude 7.27 ^{0}N and Longitude 3.54 ^{0}C and is 200 m – 300 m above sea level.

Experimental animals and management

Sixteen WAD ewes aged between 12 and 18 months and weight ranged between 8.00 kg and 14.00 kg were used for the study. On arrival, the animals were kept in the pens for proper routine

management. All the sheep were given (Oxytetracycline L/A) @ 1mL/10kg while Ivomectin injection @ 1mL/25kg body weight was administered to control both the endo and ecto parasites. Concentrate feed and guinea grass was served during the period of adaptation. Clean water was made available *ad libitum*.

Experimental diets

Guinea grass (*Panicum maximum*) was fed as basal diet after wilting and chopping while four experimental diets comprising cowpea husk (CH) and corncob (CC) at various inclusion levels were:

(i)Diet A - 100% CC
(ii) Diet B - 33.3% CH + 66.7% CC
(iii) Diet C - 66.7% CH + 33.3% CC
(iv) Diet D – 100% CH

Experimental studies

Growth study

In a 70d trial, sixteen ewes were randomly allotted into the experimental pens with one animal per pen. Initial weight changes were measured at the commencement of the experiment and at 7d interval throughout the period of the experiment. Experimental diets were given at 5 % of body weight. Left over of feed was measured and subtracted from the feed offered to the animals to determine the quantity of feed consumed.

Digestibility study

Digestibility trial was carried out using twelve ewes. Digestibility of the feed was carried out in metabolic cages which allowed for separate collection of faeces and urine. Animals were weighed and confined in individual metabolic cages as the study lasted fourteen days. During the last three days data on total feed refused, and faeces voided were collected.

Chemical analysis

Samples of feeds and faeces were dried in the oven at 105 ^{0}C for 48 hours to determine dry matter. Samples were later milled to analyze for crude protein, crude fibre, ash, ether extract and fibre fractions (ADF, NDF and ADL) as described by AOAC (1990).

Statistical analysis

All the parameters were subjected to statistical analysis using S.A.S (1999) where statistical significance were observed, means were compared using Duncan Multiple Range test of the same package.

RESULTS AND DISCUSSION

The gross composition (%) of experimental diets is presented in Table 1. Apart from CC and CH, brewers spent grains and salt were added to make up to 100 % for each diet.

Table 2 shows the chemical composition (%) of the diets. The DM decreases with increasing inclusion of CH. Diet A recorded the highest value for DM (92.24 %) while Diet D had the lowest (87.06 %). The CP content however, increases with increased inclusion of CH with Diet D being the highest value (18.04 %) and Diet A having the lowest value (5.22 %). The reason for this cannot be far-fetched as can be observed in Table 3. The same trend as that of CP is seen for ADF, NDF and ADL. The CH supplied more protein when compared to CC as seen in Table 3 and as evident in Table 2 for chemical composition of the diets.

Table 5 shows the dry matter intake (DMI), LWG and FCR of sheep fed corncob and cowpea husk based diets. The DMI of the animals were 26.04 kg, 33.18 kg, 41.07 kg and 39.26 kg for diets A, B, C and D respectively. The DM intake of animals on diets C, D were significantly ($P < 0.05$) different from diets A and B respectively. The values of DMI increased consistently with the increasing levels of cowpea husk inclusion. Dry matter intake is an important factor in the utilization of feed by ruminants and is a critical determinant of energy and performance in small ruminants (Devant et al., 2000). Uwechue (2000) observed that the changes could be as a result of improvement in the protein status of the feed which enhances rumen micro-organism proliferation and so encourages a more rapid and thorough digestion of ingesta leading to stimulation.

The mean live weight gains of animals were 0.57 kg, 1.88 kg 2.92 kg and 1.85 kg for diets A, B, C and D respectively. Animals on diet C had the highest live weight gain of 2.92 kg. There were significantly differences ($P < 0.05$) in the live weight gain across the diets. However, the mean values obtained for animals on diets B and D were comparable.

Highest value for live weight gain of animals on diet C (33.3% CC + 66.7% CH) was supported by the fact that cowpea husk, when used as feedstuff can bring about appreciable weight gain and it can be used to check the characteristic weight losses during dry season. The FCR were: 45.68, 17.64, 14.06 and 21.22 for animals on diets A, B, C and D respectively. There were significant ($P < 0.05$) differences in the feed conversion ratio of animals across the diet. The result revealed the ability of animals on diet C to efficiently convert the feed consumed to weight gain. The highest feed intake recorded for animals on diet C is consistent with the report of Morgan and Lewis (1961) which stated that the voluntary feed intake of any animals is a primary determinant of the nutritional status and productivity.

Shown in Table 4 is nutrient digestibility of WAD sheep fed graded levels of CC and A, B, C and D respectively. DM digestibility increased with increasing level of CH in the diets; there were no significant ($P > 0.05$) differences in DM digestibility in diets A and B respectively. The digestibility coefficient were comparable to 78 % – 79 % and 78 % – 80 % DM digestibility observed by Hadjipanayioutu (1990) respectively for sheep and goats fed supplements with concentrates as well as those reported elsewhere Murphy et al., (1994) who fed concentrates at restricted intakes to lambs in complete diet. In the same trend, CP digestibility ranged from 72.00 % in Diet A to 88.01 % in diet D respectively. CP digestibility for diets A and B were significantly ($P < 0.05$) different from diets C and D. This observation is consistent with Giri et al, (2000) and Aregheore, (2000) who affirmed that digestibility of nutrients varies with nutrient composition. The result obtained for NDF digestibility ranged from 73.70% in Diet A to 87.11% in diet C. Significant ($P < 0.05$) differences were observed in diets A, B, C and D respectively. The higher NDF digestibility observed in sheep on diets C and D might be due to longer retention of the diet in the digestive system, hence the higher digestibility obtained. This may be related to changes in the rate of ingesta from the rumen (Badamana 1992). Also, ADF digestibility was 76.70 %, 74.96 %, 88.07 % and 88.00 % for animals on diets A, B, C and D respectively. There were significant ($P < 0.05$) differences in diets A, B and diets C and D respectively. Animals on diet C had the highest ADF (88.07%). The value obtained in this study agreed with the range of 63.3 – 78.4% obtained by Olorunnisomo and Ososanya, (2002) who fed maize offal and sorghum brewers grain as supplement to WAD goats. Ash digestibility ranged from 68.07% (diet A) to 86.80% (diet D). There were significant ($P < 0.05$) differences for ash digestibility in diets C, D and A, B respectively.

CONCLUSION

The low productivity of sheep results from inadequate nutrition in terms of the availability of feeds in the right quality and quantity. During the dry season, grasses and pasture available fail to meet the protein and energy requirement of sheep. This leads to loss of weight and death in severe cases. It is therefore necessary to look for other sources of feed, which are of no dietary importance to man but useful as sources of nutrient in supplements for sheep. Therefore agricultural wastes like cowpea husk and corncobs are considered. These will reduce the cost of sheep production by livestock farmers. The performance of the animals in this study, therefore, recommends that corncob and cowpea husk can be applied in sheep production ventures as supplement without adverse effects at 33.3 % CC and 66.7 % CH inclusion levels.

Table 1: Gross composition (%) of experimental diets

Ingredients	A (100% CC)	B (33.3% CH+66.7% CC)	C (66.7 CH+33.3% CC)	D (100% CH)
Cowpea Husk (CH)	-	25.00	50.00	75.00
Corncobs (CC)	75.00	50.00	25.00	-
Brewers dry grain	23.00	23.00	23.00	23.00
Salt	2.00	2.00	2.00	2.00
Total	**100.00**	**100.00**	**100.00**	**100.00**
Energy (MEKcal/kg)	973.99	841.99	709.99	577.99

Table 2: Chemical composition (%) of the diets

Parameter	A	B	C	D
Dry matter (DM)	92.24	90.44	87.24	87.06
Crude protein (CP)	5.22	6.44	14.88	18.04
Ash	4.40	4.54	5.30	6.01
Acid detergent fibre (ADF)	39.00	36.01	42.40	54.22
Neutral detergent fibre (NDF)	73.00	78.01	80.25	84.00
Acid detergent lignin (ADL)	9.80	8.00	12.00	16.23

Table 3: Proximate composition (%) of corncob and cowpea husk

Proximate Value %	Corn cob	Cowpea husk
DM	90.00	87.30
CP	3.00	14.24
CF	36.00	30.00
EE	1.80	9.60
Ash	3.20	5.65
NFE	56.00	40.51

DM – Dry matter; CP – Crude protein; CF – Crude fibre; ADF - Acid detergent fibre; NDF - Neutral detergent fibre; ADL - Acid detergent lignin

Table 4: Nutrient digestibility of WAD sheep fed graded levels of corncob and cowpea husk based diets

Inclusion rate	A (100% CC)	B (33.3% CH+66.7% CC)	C (66.7% CH+33.3% CC)	D (100% CH)	SEM
Parameter					
DM	69.96^{b}	65.24^{b}	83.98^{a}	85.04^{a}	2.17
CP	72.06^{b}	72.33^{b}	86.40^{a}	88.01^{a}	2.20
ADF	76.70^{b}	74.96^{b}	88.07^{a}	87.00^{a}	2.04
NDF	73.70^{b}	71.70^{b}	87.01^{a}	87.00^{a}	1.50
ADL	76.19^{b}	69.35^{b}	87.07^{a}	85.92^{a}	1.94
Ash	68.07^{b}	73.87^{b}	85.23^{a}	86.80^{a}	1.66

a, b, c: Means in the same row with different superscript are significantly different ($p<0.05$).
DM – Dry matter; CP – Crude protein; ADF - Acid detergent fibre; NDF - Neutral detergent fibre; ADL - Acid detergent lignin

Table 5: Body weight changes of WAD sheep fed graded levels of corncob and cowpea husk based diets

Parameter	A (100% CC)	B (33.3% CH+66.7% CC)	C (66.7% CH+33.3% CC)	D (100% CH)	SEM
Total dry matter intake (kg)	26.04^{b}	33.18^{ab}	41.07^{a}	39.26^{a}	1.57
Initial live weight (kg)	10.62	10.62	10.75	10.62	3.24
Mean final live weight (kg)	11.19	12.50	13.67	12.47	3.66 -
Mean live weight gain (kg)	0.57^{c}	1.88^{b}	2.92^{a}	1.85^{b}	0.86
Average weekly gain (g)	57.00^{d}	188.25^{b}	292.00^{a}	185.00^{c}	62.24
Average daily gain (g/day)	8.14^{c}	26.89^{b}	41.71^{a}	26.42^{b}	12.72
Percentage mortality (%)	50.00^{a}	25.00^{b}	0.00^{c}	0.00^{c}	0.08
Feed conversion ratio	45.68^{a}	17.64^{c}	14.06^{d}	21.22^{b}	8.62

a, b, c, d, means in the same row with different super scripts are significantly different ($P < 0.05$).

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