PJN
ISSN 1680-5194

PAKISTAN JOURNAL OF NUTRITION

ANSInet
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
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Pakistan Journal of Nutrition 12 (1): 85-88, 2013
ISSN 1680-5194

Performance and Digestibility of Corncob and Cowpea Husk Diets by West African Dwarf Sheep

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Abstract: In the tropics, dry season is characterized by shortage of feeds and staggered growth pattern of ruminants. Corncob (CC) and Cowpea Husk (CH), the by-products of maize and cowpea production respectively may be used as alternative feed resources for ruminants especially during dry season. Therefore, a ten week study was conducted to determine the effects of CC and CH based diets on performance of WAD sheep. In a randomized complete block design, sixteen WAD sheep were allotted to four dietary treatments: A (100% CC), B (66.7% CC + 33.3% CH), C (33.3% CC + 66.7% CH) and D (100% CH). The sheep were allotted to any of the four diets with four animals per treatment. Parameters measured include: dry matter intake, live weight changes, feed conversion ratio and nutrient digestibility. Results showed significant ($p<0.05$) differences in dry matter intake (22.04 kg in diet A to 41.07 kg in diet C) and LWG (4.14 g/day in diet A to 41.71 g/day in diet C) of sheep across the diets. Also, there were significant ($p<0.05$) differences in FCR across the diets. The FCR ranged from 14.06 in diet C to 45.68 in diet A. Nutrients digestibility increased with increasing level of cowpea husk in the diets. The DM digestibility value ranged from 65.24% in diet B to 85.04% in diet D. The CP digestibility was also 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. Optimum weight gain and efficient utilization was achieved at 66.7% CH and 33.3% CC inclusion levels.

Key words: WAD sheep, growth, digestibility, cowpea husk, corncob

INTRODUCTION

Poor nutrition is one of the main constraints of livestock productivity in Sub-Saharan Africa as feed resources are limited in quality and quantity (Nsahlai *et al*., 1998). Also, dry season feeding of livestock especially ruminants in the tropics has always been a challenge to farmers since there are little pastures, hence performance of these animals are seriously impaired. One possible way to alleviate this challenge and maintain production in the tropics is to feed crop residues which cannot be consumed 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 (Odeyinka, 2001).

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 season. Cowpea husk are important crop residue used by livestock farmers to supplement fodder during the dry season. In this regard, small holder farmers in sub-humid zone of West Africa prefer late maturing cultivars to early maturing types (Olorunju *et al*., 1996). In the same vein, Aderolu (1997) o bserved that cowpea husk when used as feedstuff can bring about appreciable weight gain thereby checking the characteristic weight losses during dry season. 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).

Small ruminants seem to be the best in the utilization of coarse materials for the production of meat, preferring feedstuffs relatively rich is crude fibre (Williamson and Payne, 1987). 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) sheep 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°N and Longitude 3.54°C and is 200-300 m above sea level.

Experimental animals and management: In a randomized complete block design, sixteen WAD female

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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 (ME kcal/kg)	973.99	841.99	709.99	577.99

Table 2: Proximate 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

sheep aged between 12 and 18 months and weight ranged between 8.00 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 antibiotic injection (Oxytetracycline L/A) while Ivomec injection was administered to control both the endo and ecto parasites. Concentrate feed and Guinea grass was fed to the sheep during this period of adaptation. Clean water was made available *ad libitum*.

Experimental diets: Guinea grass (*Panicum maximum*) was fed as basal diet for the sheep 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 70-day trial, sixteen WAD sheep were randomly allotted into the experimental pens with one animal per pen. Initial weights of the animals were taken and recorded before the commencement of the experiment. Experimental diets were given at 5% of body weight. Remnant was measured to determine the quantity consumed. Animals were weighed weekly to determine differences in weight.

Digestibility study: Digestibility trial was carried out using twelve ewes. Digestibility of the feed was carried out by separate collection of feaces and urine. Animals were weighed and confined in individual metabolic cages as the study lasted fourteen days. During the last three days, total feed refused, feaces and urine were collected.

Chemical analysis: Samples of feeds and faeces were dried in the oven at 105°C for 48 hours to determine dry matter. Samples were later milled to analyze for crude protein and fibre fractions (ADF, NDF and ADL) as described by AOAC (1990).

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

RESULTS AND DISCUSSION

Table 4 shows the 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. DM intake of animals on diets C, D were significantly ($p<0.05$) different from diets A and B respectively. DM intake increased with increasing levels of cowpea husk in the diets. The values of DMI increased consistently with the increasing levels of cowpea husk inclusion. DM 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 weights of animals were 0.57 kg, 1.88 kg 2.92 kg and 1.85 kg for diets A, B. C and D respectively.

Table 4: Body weight changes of WAD sheep fed graded levels of corncob and cowpea husk based diets

Parameter (%)	A	B	C	D	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 ($p<0.05$). A (100% CC); B (33.3% CH + 66.7% CC); C (66.7% CH + 33.3% CC); D (100% CH)

Table 5: 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					
Dry Matter (DM)	69.96^{b}	65.24^{b}	83.98^{a}	85.04^{a}	2.17
Crude Protein (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. ADF - Acid detergent fibre; NDF - Neutral detergent fibre; ADL - Acid detergent lignin

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, there were no significant difference ($p>0.05$) in the live weight gain of animals on diets B and D.

Highest value for live weight gain of animals on diet C (33.3% CC + 66.7%CH) was supported by Aderolu (1997) that cowpea husk when used as feeding stuff 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 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 5 is nutrient digestibility of WAD sheep fed graded levels of CC and CH based diets. The DM digestibility was 69.96%, 65.24%, 83.98% and 85.04% for Diets A, B, C and D respectively while the 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 Hadjipanayiotu (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, the crude protein digestibility ranged from 72.00% in diet A to 88.01% in diet D respectively. The 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 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% for animals on diets A, B, C and D respectively. There were significant ($p<0.05$) differences in diet A, B and 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.

REFERENCES

Aderolu, A.Z., 1997. Maize grit and sorghum dried brewer's grain as feeding stuffs for Sokoto Gudali. M.Sc. Project Department of Animal Science, University of Ibadan.

AOAC, 1990. Official method of analysis, Association of Official Analytical Chemists. Washington, DC. 15th Edn.

Aregheore, E.M., 2000. Chemical composition and nutritive value of some tropical by-products feedstuffs for small ruminant's *in-vitro* and *in-vitro* digestibility. Anim. Feed Sci. Technol., 85: 99-109.

Badamana, M.S., 1992. Some factors affecting diet digestibility in goats. Bull. Anim. Prod., 40: 267-274.

Devant, M., A. Ferret, S. Calsamiglia and R. Casal, 2000. Effect of protein concentration and degradability on performance, ruminal fermentation and nitrogen metabolism in rapidly growing heifers fed high concentrate diets from 100-230 kg body weight. J. Anim. Sci., 78: 1667-1676.

Giri, S.S., A. Sahon and N.N. Pathak, 2000. Feed intake, digestibility plane of nutrition and live weight gain by crossbred growing bull fed on grainless diets containing different nitrogen sources. Anim. Feed Sci. Technol., 88: 195-203.

Hadjipanayiotu, M., 1990. Effect of grain on the performance of early weaned lambs and kids. Anim. Prod., 51: 565-572.

Kategile, J.A., 1981. Digestibility of low quality roughages supplemented with concentrate. Proc. of Workshop, held in Arusha, Tanzania, AUN Agricultural Development Report. Norway, AUS. NLH.

Morgan, J.T. and D. Lewis, 1961. Nutrition of pigs and poultry. William Clowes and Son Ltd., London.

Murphy, T.A., S.C. Loerch and F.E. Smith, 1994. Effects of feeding high concentrate diets at restricted intakes on digestibility and nitrogen metabolism in growing lambs. J. Anim. Sci., 72: 1583-1590.

Nsahlai, I.V., M.L.K. Bonsi, N.N. Umunna, Z. Sileshi and S. Bediye, 1998. Feed utilisation strategies for improved ruminant production in the arid region. Ann. Arid Zone, 37: 283-310.

Odeyinka, S.M., 2001. Effects of feeding varying levels of *Leuceana leucocephala* and *Gliricidia sepium* on the performance of West African Dwarf goats. Nig. J. Anim. Prod., 28: 61-64.

Olorunju, P.E., B.R. Ntare, O.A. Babalola and O. Alabi, 1996. In proceeding of a workshop on nationally co-ordinated Groundnut Research Project. 25-29 September, 1995, Zaria, Nigeria, IAR/ABU, Zaria and ICRISAT, Kano, Nigeria, pp: 47.

Olorunnisomo, O.A. and T.O. Ososanya, 2002. Feed intake, digestibility and nitrogen balance of West African Dwarf goat fed maize offal and sorghum brewer's grain. Trop. Anim. Prod. Invest., 5: 211-218.

SAS, 1999. Statistical analysis system. SAS Institute Inco. Raleigh. New Cary, USA.

Uwechue, N.F., 2000. Performance of carcass quality of West African Dwarf Sheep Fed Siam Weed (*Chromelaena odorata*) based diets. Ph.D Thesis, Department of Animal Science, University of Ibadan.

Williamson, G. and W.J.A. Payne, 1987. An introduction to animal husbandry in tropics, 3rd Edn., ELBS series. Longman, London, pp: 463-484.