Sjournals
Scientific Journals
Scientific Journal of Animal Science (2015) 4(10) 117-123
ISSN 2322-1704
doi: 10.14196/sjas.v4i10.1951

Contents lists available at Sjournals
Scientific Journal of Animal Science
Journal homepage: www.Sjournals.com

Original article

Nutrients digestibility of rice milling waste (RMW) and soyabean meal residue (SMR) combination fed to Yankasa ram lambs in a fragile ecosystem Nigeria

M.G. Garba*, L.A. Saulawa, A. Aruwayo
Department of Animal Production and Health, Federal University Dutsin-MA, Katsina State, Nigeria.

*Corresponding author; Department of Animal Production and Health, Federal University Dutsin-MA, Katsina State, Nigeria.

A R T I C L E I N F O

Article history,
Received 16 Sep 2015
Accepted 19 Oct 2015
Available online 27 Oct 2015

Keywords,
Digestibility
Yankasa
Sheep
Rams
Lambs
Rice milling waste (RMW)
Soyabean meal residue (SMR)

A B S T R A C T

This experiment was conducted at Bayero University Kano, to determine the Utilization and digestibility of Soyabean meal Residue (SMR) and Rice Milling Waste by Yankasa ram lambs. The 20 animals were fed with a complete diet containing graded levels of SMR and RMW at 0, (A)5 (B), 10 (C), 15(D) and 20% (E). The trial lasted for 21 days (14 days for adaptation and 7 days for collection of faecal samples). Harness bags were used for the collection of faecal samples, which was fitted in the last 7 days of adaptability. Results obtained revealed that DM digestibility (%) was significantly higher (P<0.05) for treatment E (78.69%) compared to the rest of the values obtained for treatments B (71.12%), C (70.61%) and D (70.29%) whose values did not differ significantly (P>0.05) between each other. Value obtained for treatment E were comparable (P>0.05) with treatment A. CP digestibility, value for treatment E (89.95%) was significantly higher (P<0.05) than those for treatments A (81.31%) and D (85.24%) accept the others (P>0.05). Treatments B (84.36%) and C (86.37%) were similar (P>0.05) but significantly higher than those for treatments A (81.31%) and D (85.24%) with the lowest value in treatment D. The EE digestibility values obtained were significantly higher (P<0.05) for treatments D (46.16%) and E (53.42%) compared to the rest of the values for treatments A (32.75%), B (41.58%) and C (38.22%) whose values did not differ significantly (P>0.05) between each other. Similarly, values for treatments B, C and D were similar (P>0.05). Ash digestibility values for treatments A (62.27%), B (56.59%) and C (58.27%) did not differ significantly (P>0.05) between one another but were significantly lower (P<0.05) than those for treatments D (67.34%) and E (70.31%) whose values did not differ significantly between each other. Therefore, feeding combination of RMW and SMR to growing Yankasa ram lambs up to 20% inclusion improved digestibility and performance and reduce cost of production. It is recommended that more trial should be conducted with higher inclusion level and with different breeds of Sheep.

1. Introduction

In Nigeria, waste recycling has received little attention over the years and conventional animal feeds have remained unaffordable to low income livestock farmers because of high cost (Smith, 1988). High cost of feeds stimulates the search for alternative feed resources that can economically replace the conventional feed ingredients used in ration formulation without any adverse effect on health and performance of animals (Smith, 1988). Similarly, (Etela et al., 2008) stated that conventional feeds for ruminant livestock show marked variation in availability, cost, and quality, while crop residues capable of serving as alternate feed resources have not been fully utilized. The increasing cost of conventional feedstuffs coupled with high demand of grains for human consumption has stimulated interest in the use of unconventional, readily available, and cheaper sources of feedstuff in animal ration.

A combination of Rice milling waste (RMW) and Soyabean meal residue (SMR) would yield a better result in terms of performance considering the fact that Rice Milling Waste (RMW) though a poor source of protein provides bulkiness and to some extent energy in addition to its cheapness. Rice is principally produced for human consumption, and large amount of straw are left on the field after harvest. The production target for rice in Nigeria by the year 2010 is 11.5 million tonnes (Shuaib, et al., 1997). Rice milling waste is obtained from rice milling centres in areas where rice is produced in large quantity. In order to improve the digestibility of RMW and enhance its utilization, it could be fed in combination with legume such as soyabean meal residue. Invariably, Soyabean meal residue (SMR) is rich in protein and readily available. Extracted soyabean meal has an average protein content of 44% and the protein is well balanced in amino acids compared to other vegetable protein sources (Feltwell and Fox, 1980). Same authors reported that soyabean meal is made from the whole beans following extraction of the oil. The yield of soyabean meal from the whole beans amounts to about 60%.

Ruminant animal feeding in the dry season especially in the semi-arid zone is a challenging issue. This single factor has a lot of negative effect on the productivity of the animals. One of the major and cheap sources of feeding ruminant in the dry season is by using agro-industrial by-products mainly obtained from cereal grain processing. (Muhammad, 2005) Reported that Rice milling waste is an agro-industrial by-product found in large quantities in areas where rice is produced abundantly. Kano is one of the areas where rice is produced in large quantities and most of the rice is processed within the area. Accumulation of rice milling waste will pose environmental problem such as blockage of drainages in areas where it is processed, resulting in flood, especially during rainy season.

Rice husk and Rice bran constitute 15.7 and 6 – 10 % respectively of the paddy depending on the efficiency of the milling (Devendra, 1989). RMW was analysed and found to contain substantial amount of nutrients. The crude protein and energy contents were 11.5% and 2100 kcal/kg, respectively with 12.5% fibre (Abubakar, 2003). In another report, (Obeke, 1985) stated that Rice Milling Waste has a crude protein content of 6.2%, crude fibre 37.0%, ash content of 20.2% and energy value of 1131kcal/kg metabolizable energy. Soyabean Meal Residue is the by-product of soyabean after all the milk has been removed. The report on the utilization of Soyabean Meal Residue is limited (Feltwell and Fox, 1980). In their raw state soyabeans are unsuitable for animal feeding because of the presence of growth-inhibiting factors. However, the factors can be overcome by proper processing such as soaking or roasting (Feltwell and Fox, 1980). In view of this, the study is designed to determine the digestibility of Yankasa Rams Lambs fed RMW and SMR combination in the semi-arid zones, Nigeria.

2. Materials and methods

The trial was conducted at the Livestock Teaching and Research Farm of Bayero University, Kano. The Farm is located at the New Campus of the University in Ungogo Local Government Area (LGA) of Kano State. Kano lies between longitudes 90 30' and 120 30' North and Latitudes 90 30' and 80 42' East. The area is characterized by tropical wet and dry climates and vegetation, which is composed of a variety of trees (Ahmed, 1998). The wet season is from May to September and the dry season starts in October and ends in April. Annual rainfall and temperatures (minimum and maximum) ranges from 787 mm to 960 mm and 210C and 390C, respectively (knarda, 2001).

2.1. Experimental animals and their management

Twenty (20) growing un-castrated Yankasa Rams Lambs with an average live weight of 14.3kg±0.03 were used for the study. The animals were selected from the University sheep flock. Before the commencement of the study, the experimental animals were flushed with groundnut hay for two weeks and dewormed with albendazole bolus (12.5mg/kg body weight) and sprayed with asuntol against the ecto parasites. The animals were housed individually in a face out stall barn.

2.2. Experimental feed preparation

Rice Milling Waste (RMW) and Soyabean Meal Residue (SMR) were purchased from Rice processing centres in Kano State and local soyabean cheese makers, respectively. Both ingredients were sun dried and packed in sacks for future use. Other feed ingredients such as cotton seed cake, groundnut hay, maize, wheat offal, cowpea husk, bone meal, and salt were purchased from different centres in Kano metropolis.

2.3. Experimental diet formulation

Five experimental diets were formulated to contain RMW and SMR at different inclusion levels of 0, 5, 10, 15 and 20%. The experimental diets were designated as treatments A, B, C, D and E, respectively. The gross composition of the experimental diets is shown in Table 1.

Table 1
Gross composition of the experimental diets**.**

	Experimental diets				
Ingredient(%)	**A**	**B**	**C**	**D**	**E**
RMW	0.0	5.0	10.0	15.0	20.0
SBMR	0.0	5.0	10.0	15.0	20.0
Maize	9.0	10.0	10.0	9.0	7.0
Wheat offal (WO)	30.0	26.0	23.0	17.0	16.0
Cowpea husk	15.0	10.0	5.0	4.0	0.0
Cotton seed cake (CSC)	22.0	19.0	17.0	18.0	15.0
Groundnut hay	22.0	23.0	23.0	20.0	20.0
Bone meal (BM)	1.0	1.0	1.0	1.0	1.0
Salt	1.0	1.0	1.0	1.0	1.0
Total	100	100	100	100	100
Cost (N/kg)	34.08	33.43	32.58	30.07	30.01

2.4. Experimental design

Randomized complete block design (RCBD) was used for the experiment. The 20 animals were divided into five treatment groups of four animals each and balanced for body weight with variation of ± 0.03 during the allotments. Each group of animals was assigned to one of the five treatments. Experimental diets were fed *ad-libitum* daily in the mornings and evenings for twelve weeks. Water and salt lick were also offered *ad-libitum*.

2.5. Data collection

2.5.1. Feeding and weighing of animals

The animals were weighed prior to commencement of the experiment and at two weeks intervals thereafter throughout the experimental period. Weighing was carried out between 8:00 am and 9:00 am after an overnight fasting. Daily feed intake of the animals was determined by weighing the feed given and the leftover the following morning throughout the period of the feeding trial.

2.5.2. Digestibility trial

Digestibility trials were conducted using the four animals from each treatment. Animals were fed the same experimental diets as in the feeding trial. The trial lasted for 21 days (14 days for adaptation and 7 days for collection of faecal samples). Harness bags were used for the collection of faecal samples, which was fitted in the last 7 days of adaptability. During the period, daily feed intake was recorded. Total faecal output from each animal was also recorded on daily basis. About 10% representative sample of the total faecal output was oven dried at 1050C for dry matter determination and subsequent chemical analysis.

2.5.3. Chemical analysis

Thoroughly mixed representative samples of the five experimental diets, Rice Milling Waste (RMW), Soyabean Meal Residue (SBMR) and faecal samples were analysed for proximate composition as outlined by (AOAC, 1990).

Table 2
Chemical composition of experimental diets and test ingredients.

	Treatments						
Parameter (%)	**A (0)**	**B (5)**	**C(10)**	**D(15)**	**E(20)**	**RMW**	**SBMR**
Dry matter (DM)	93.00	92.70	91.10	91.80	92.00	89.90	96.26
Crude protein (CP)	16.23	16.30	16.19	16.15	16.20	4.38	17.50
Crude fibre (CF)	22.10	21.80	21.50	22.20	22.10	43.28	26.89
Ether extract (EE)	7.50	7.00	8.80	8.04	9.15	25.03	15.55
Ash	12.00	10.00	10.00	11.00	9.50	17.40	6.99
Nitrogen free-extract (NFE)	42.17	44.90	43.50	45.60	43.05	14.29	33.07

2.5.4. Statistical analysis

Results obtained from digestibility trials were managed using Microsoft excel (2007) software. Data thus generated were analysed using the general linear model of statistical analysis system (SAS, 1999) Least Significance Difference (LSD) was used to separate the means.

3. Results and discussion

Results obtained on the nutrients digestibility of growing Yankasa ram lambs are shown in Table 3. DM digestibility (%) was significantly higher (P<0.05) for treatment E (78.69%) compared to the rest of the values obtained for treatments B (71.12%), C (70.61%) and D (70.29%) whose values did not differ significantly (P>0.05) between each other. Value obtained for treatment E (78.69%) did not significantly differ (P>0.05) from that of treatment A (73.52). Likewise, values in treatments A, B, C and D were significantly similar (P>0.05). In terms CP digestibility, value for treatment E (89.95%) was significantly higher (P<0.05) than those for treatments A (81.31%) and D (85.24%) whose values did not differ significantly (P>0.05) between each other. Values for treatments B (84.36%) and C (86.37%) were similar (P>0.05) but significantly higher than those for treatments A (81.31%) and D (85.24%) with the lowest value in treatment D.

The EE digestibility values obtained were significantly higher (P<0.05) for treatments D (46.16%) and E (53.42%) compared to the rest of the values for treatments A (32.75%), B (41.58%) and C (38.22%) whose values did not differ significantly (P>0.05) between each other. Similarly, values for treatments B, C and D were similar (P>0.05). Ash digestibility values for treatments A (62.27%), B (56.59%) and C (58.27%) did not differ significantly (P>0.05) between one another but were significantly lower (P<0.05) than those for treatments D (67.34%) and E

(70.31%) whose values did not differ significantly between each other. However, values for treatments A and D were similar (P>0.05). The NFE digestibility values were similar (P>0.05) for treatments A (86.52%) and E (89.31%) but significantly (P<0.05) higher than those for treatments B (79.88%), C (82.39%) and D (79.65%) whose values did not differ significantly (P>0.05) between each other.

Table 3
Nutrients digestibility by Yankasa ram lambs fed a combination of RMW and SBMR.

	Treatments					
Parameter (%)	**A (0)**	**B (5)**	**C (10)**	**D (15)**	**E (20)**	**LSD**
DM digestibility	73.52^{ab}	71.12^{b}	70.61^{b}	70.29^{b}	78.69^{a}	5.41
CP digestibility	81.31^{d}	84.36^{bc}	86.37^{b}	83.24^{cd}	89.95^{a}	2.95
CF digestibility	43.69^{c}	55.90^{ab}	56.19^{ab}	47.81^{bc}	64.74^{a}	8.93
EE digestibility	32.75^{c}	41.58^{bc}	38.22^{bc}	46.16^{ab}	53.42^{a}	11.24
Ash digestibility	62.27^{bc}	56.59^{c}	58.27^{c}	67.34^{ab}	70.31^{a}	7.32
NFE digestibility	86.52^{a}	79.88^{b}	82.39^{b}	79.65^{b}	89.31^{a}	3.26

abcd: meansin the same row with different superscript are significantly different (P<0.05).

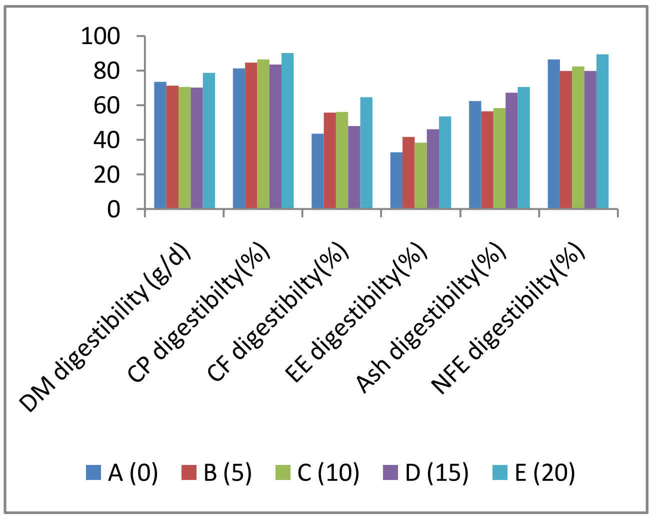

Fig. 1. Bar chart showing nutrients digestibility by Yankasa ram lambs.

Results obtained revealed that inclusion of both Soyabean meal residue and Rice milling waste at 20% improved nutrients digestibility by Yankasa ram lambs, and did not interfere with DM and CP digestibility. This better digestibility could be linked to adaptability of ruminant animal to high fibre diet which RMW is known for (McDonald et al., 1995). It could also be associated to the physiology of the ruminants (McDonald et al., 1995). It is a known fact that, rumen microorganisms have the ability to synthesize microbial protein from nitrogenous substances and carbon skeletons originating from the diet (McDonald et al., 1995). Inclusion of RMW up to 20% did not affect the digestibility of feeds. This agrees with the findings of (Abubakar, 2003) that RMW can be fed up at 30% inclusion level to even in layers without any adverse effect to the animal.

EE digestibility obtained (32-53%) in this work was lower than 58-72% reported by (Maigandi, 2001) when he fed varying levels of fore-stomach digesta to fattening rams. The relatively lower EE digestibility recorded could be related to the combination of ingredients used in this study however, it did not affect the performance of the animals. In the same manner, the NFE digestibility ware not severely affected.

NFE digestibility values (79-89%) obtained in this study can be favourably compared with the values (68-93%) reported by (Maigandi, 2001) and better than 68-72% reported by (Muhammad et al., 2006). The reason for the improved digestibility reported in this research work more especially for DM, CP, CF, and NFE could be associated with the physiology of ruminant animals (Muhammad et al., 2006). It is known that rumen microorganisms have the ability to synthesize microbial protein from nitrogenous substances and carbon skeleton originating from the diet (McDonald et al., 1995). The microorganisms could also synthesize some vitamins especially vitamin B complex. The presence of these nutrients in RMW could modify the degree of utilization of diet containing RMW (Muhammad et al., 2006).

4. Conclusion

Though RMW was fed alongside with SMR in this study, its effect still follows the report of (AFRIS, 2004) that feeding ammoniated rice hulls (a rice milling by product) to sheep does not impair its digestibility. (Badr and Akkadar, 1983) Also reported that feeding ground rice hulls improved digestibility of nutrients and increased feed intake in sheep.(McDonald et al., 1995) pointed out that the fibre fraction of a food as well as the specie and age of the animal involved have the great influence on digestibility.

Acknowledgement

I wish to thank my respected mentor and supervisor in person of Prof. S. A. Maigandi for his tireless contribution and constructive criticisms during the conduct of this research. To my tutor and farther Prof. I. R. Muhammad, I say thank you and May Allah reward you abundantly.

References

Abubakar, A., 2003. Influence of yeast supplementation on the performance of broiler and layer chickens fed diets with high levels of rice bran. Ph. D. Thesis, Department of Animal Science, Usmanu Danfodiyo University, Sokoto.

AFRIS, 2004. Animal Feed Resources Information System.

AOAC, 1990. Association of official analytical chemists. Official methods of analysis (15thed.) Arlington, Virginia, 1, 69-84.

Badr, T., Akkadar, W. 1983. Straw as feed for growing cattle. Proceedings of workshopon Applied Research, Alexendria, Egypt. 14th -17th March.

Devendra, C.M., 1989. Goat production in the tropics. 92, 305-317.

Etela, I., Adekunle, O., Orji, U.I., Kalio, G.A., Tona, G.O., 2008. Sweet potato forage versus dried brewers grains as supplements for lactating Bunaji cows. In: Bawa, G.S., Akpa, G.N., Jokthan, G.E., Kabir, M., Abdu, S.B., (eds.) Repositioning animal agriculture for the realization of national vision 2020. Proceedings of the 13th Annual conference of Animal Science Association of Nigeria held at Ahmadu Bello University, Zaria, Kaduna State, Nigeria: 253-255

Feltwell, R., Fox, S., 1980. Practical poultry feeding ELBS low price edition, GreatBritain, 302.

http//www.Foa.org./ag/agap/afris/defawt/htm.

KNARDA, 2001. Kano agricultural and rural development authority meteorological station reports, temperatures record book and management Unit. 11, 1-3.

Maigandi, S.A., 2001. Quantification and utilization of fore-stomach digesta in the diet for growing and fattening of sheep Ph. D Thesis. Department of Animal Science, Usmanu Danfodiyo University, Sokoto Nigeria, 125.

McDonald, P., Edward, R.A., Greenhalgh, J.F.D., 1995. Animal Nutrition(5thed.Low price) ELBS Longman Group Ltd. London, UK. 543.

Muhammad, N., 2005. Assessment of quantity, quality and utilization of rice milling waste in the diet of growing sheep. M. Sc. Dissertation, department of animal science, faculty of agriculture, Usmanu Danfodiyo university, Sokoto, 76.

Muhammad, N., Maigandi, S.A., Hassan, A.W., Daneji, A.I., 2006. Nutrient digestibility and utilization by growing sheep fed rice milling waste (RMW). Proc. of the 31stConfr., Nig. Soc. Anim. Prod. March 12th -16th.Bayero University, Kano, Nigeria. 434-438.

Obeke, E.A., 1985. Nutritive evaluation of Rice offal in the diets of growing pullet and Layers. M. Sc. Thesis, Department of Animal Science, Ahmadu Bello University, Zaria.

SAS, 1999. Statistical Analysis System. 16.0 SAS Inc. 1999.

Shuaib, B., Adedipe, N.O., Aliyuand, A., Jr, M.M., 1997. Integrated agricultural production in Nigeria: Strategies and mechanisms for food security. Nati. Agr. Res. Proj. Monograph, (5).

Smith, O.B., 1988. Studies on the Feeding value of agro industrial by products. Effect of supplementation on the utilization of cocoa pod diets by ruminants. J. Anim. Product. Res. 8(1), 1-14.
Workshopon Applied Research, Alexendria, Egypt. 14th -17th March.