Academic Journal of Nutrition 3 (2): 19-21, 2014
ISSN 2309-8902

DOI: 10.5829/idosi.ajn.2014.3.2.85245

Comparison of Nutritive Value of Alfalfa, Rhodes Hay, Cynodon Pasture and Linseed Cake –Maize Mixture at Hawassa College of Agriculture, Ethiopia

[1]Belay Duguma, [2]Getachew Eshete, [3]Tessema Zewdu and [4]Adugna Tolera

[1]Department of Animal Science, Jimma University, Jimma, Ethiopia
[2]SOS Sahel, SNNPR, Hawassa, Ethiopia
[3]Department of Animal Science, Haramaya University, Ethiopia
[4]Department of Animal Science, Hawassa University, Hawassa, Ethiopia

Abstract: This study was conducted at Hawassa College of Agriculture to evaluate the chemical composition of alfalfa, Rhodes hay, Cynodon pasture and linseed cake-maize mixture. The results of the analysis of the chemical composition of the different feedstuffs showed that alfalfa had the highest crude protein (23.6%) and the lowest NDF (49%) content than the other feed samples, whereas Rhodes hay had the highest NDF (81%) and the lowest crude protein (7.5%) content. It can be concluded that alfalfa can be used as strategic protein supplementation in ruminant feeding such as critical classes of cattle, particularly lactating female when other protein rich feeds are unavailable.

Key words: Alfalfa · Cynodon · Hawassa · Linseed Cake · Maize · Rhodes

INTRODUCTION

Ethiopia was home for an estimated 53.4 million cattle, 22.8 million goats, 25.5 million sheep, 49.3 million chicken and 1.1 million camels [1]. Poor nutrition is one of the constraints to livestock production In Ethiopia.

This is because animals thrive predominantly on high fiber feeds (straws, stovers and native pasture) which are deficient in nutrients essential for microbial fermentation. Consequently, the digestibility and intake of digestible nutrients are unavoidably low. Supplementing roughage diets with feeds containing the deficient nutrients can partly mitigate these deficiencies. Feeding practices developed in temperate countries are often inappropriate when applied to ruminant production systems in the tropics because temperate animals are fed straw as bulk in high density diets [2].

According to Alemu and Gizachew [3] more than 90% of the livestock feed in Ethiopia is natural pasture which consists of a wide range of grasses, legumes and other herbaceous species and crop residues. The feedstuffs are grossly inadequate in amount and nutritional values to sustain animal production [4]. Profitable livestock production depends upon feeding of quality roughage which is high in energy, protein, digestibility, palatability and acceptability [5]. Feed stuffs differ considerably in chemical composition and physical characteristics depending on their species and feeding procedures [6]. Schank and Chynoweth [7] indicated that both digestibility and dry matter production are important in forage and energy biomass calculations.

Feed stuffs vary in nitrogen, energy and mineral content. It is, therefore, important to evaluate feeds to determine the nutrients available to animals. The objective of this study was to derive information on the chemical composition of different feed stuffs at Hawassa College of Agriculture animal feed laboratory.

MATERIALS AND METHODS

Study Area: The study was conducted at College of Agriculture (7°04' N and 38°31' E; 1650 m above sea level) in southern Ethiopia. The main rainy season extends from April to September interrupted by some dry spells in May or June with annual precipitation ranging between 1000 and 1200mm. The average minimum and maximum temperatures of the area are 12° and 27°C, respectively.

Corresponding Author: Belay Duguma, Department of Animal Science, Jimma University, Jimma, Ethiopia.

Sample Collection and Chemical Analysis: Samples of feed were collected from the college livestock farm. Sample of alfalfa forage was collected from the soil which was fertilized by dung. During sample collection the stand was at the stage of about ten percent of flower. Rhodes hay sample was taken from the stalk of belled hay in sheep barn. Small patches of samples were taken from different bells and mixed. Cynodon was collected from natural pasture and was at about full flowering stage by the time of collection and was highly fertilized with dung. Linseed cake-maize mixture was obtained already made from poultry ration stalk. All samples were dried in an oven at 60°C for 72 hours to a constant weight and ground in a Willey mill to pass through a 1mm sieve and were equilibrated to room temperature for 24 hours. The ground samples were kept in airtight plastic bags prior to analysis for chemical composition.

Crude protein (CP) and crude fiber (CF) was determined according to AOAC [8] methods. The dry matter (DM) was determined by an oven drying at 105°C overnight and ash content was determined by igniting the dry samples in a muffle furnace at 550°C for 6 hours to burn off all the organic material. The inorganic material which does not volatilized at that temperature is ash. The difference between sample DM and ash gives the organic matter (OM). Neutral detergent fiber (NDF) and acid detergent fiber were analyzed according to Goering and Van Soest [9]. For nitrogen (N) analysis, the Kjeldhal method was used and crude protein (CP) content was estimated from the N content by use of a multiplier of 6.25 [8].

RESULTS AND DISCUSSION

Dry Matter and Ash: Table 1 shows the DM and ash contents of the feed stuffs analyzed. The dry matter content of the four feed samples (Alfalfa forage, Rhodes grass hay, Cynodon pasture and Linseed cake-maize mixture) was analyzed. It was found that alfalfa and Cynodon forages had the lowest percent DM (20.6 and 30%, respectively) while linseed cake-maize mixture gave the highest DM percent (96.4%) followed by Rhodes grass hay (85.4%). The DM content of Rhodes grass hay found in the present study was lower than the findings of Adugna (2008), who reported DM percent of 92.3%. With respect to the ash content of feed stuffs alfalfa forage and Rhodes hay found to contain the highest ash content (10.5 and 10.2%, respectively) and linseed cake-maize mixture provided the lowest value (6.25%).

Table 1: Average DM, OM and ash percent of feed samples at Hawassa College of Agriculture

Type of feed sample	%DM	%Ash	%OM
Alfalfa	20.6	10.45	10.15
Rhodes hay	85.4	10.2	76.2
Cynodon pasture	30	10	19.9
Linseed cake-maize mixture	96.9	6.2	90

Table 2: The average NDF, ADF, ADF-ash and CP content of the feed samples collected from Hawassa College of Agriculture

Types of feed samples	%NDF	%ADF	%ADF-ash	%CP
Alfalfa	49	30.2	1.3	23.6
Rhodes hay	80.8	46	2.97	7.49
Cynodon pasture	71.9	30.5	1.73	13.22
Linseed cake-maize mixture	-	-	-	17.12

Fiber Content: The average NDF, ADF, ADF-ash and CP content of the feed samples are shown in Table 2. Rhodes hay showed the highest NDF followed by Cynodon pasture (80.8 and 71.9%, respectively). It was reported that cell wall (NDF) comprises 20-80% of forage dry matter weight [11]. Results of the current study were within the range varying from 49-80.8% DM. With respect to percent ADF Rhodes hay has the highest ADF fraction (46%) and alfalfa showed the lowest ADF (30.2%). Rhodes hay showed the highest ADF-ash content.

Of the four feed samples viz. alfalfa, Rhodes hay, Cynodon pasture and linseed cake-maize mixture, alfalfa was found to the highest in CP content (23.6%) and Rhodes hay had the lowest CP content (7.49%). In both cases of ADF and NDF determination the amount found in linseed cake-maize mixture could not be found. It is because of the inability of the hot water and acetone washing procedures to solubilize and wash. Most probably it is the highest content of oil and protein in the linseed that could create a lump and/or adhere to the pores making them impermeable during washing.

ACKNOWLEDGEMENTS

We would like to thank Prof. Adugna Tolera for his guidance to undertake this work as fulfillment of the course animal feed analysis he taught us. The laboratory assistance of Tadesse Bokore is appreciated.

CONCLUSION

The results of the analysis of the chemical composition of the different feedstuffs showed that alfalfa had the highest crude protein content and the lowest NDF than the other feed samples, showing its higher nutritive

value for improving animal productivity. Rhodes hay had the highest NDF and the lowest crude protein content, showing that the hay was harvested at late maturity. It can be concluded that alfalfa can be used as strategic protein supplementation in ruminant feeding such as critical classes of cattle, particularly lactating female when other protein rich feeds are unavailable.

REFERENCES

1. Central Statistical Agency (CSA), 2011. Agricultural Sample Survey. Report on Livestock and Livestock Characteristics (Private Peasant Holdings). Volume II. Addis Ababa, Ethiopia, pp: 9-26.
2. Osuji, P.O., I.V. Nsahlai and H. Khalili, 1993. Feed evaluation. ILCA Manual 5. ILCA (International Livestock Research Center for Africa), Addis Ababa, Ethiopia, pp: 40.
3. Alemu, T. and L. Gizachew, 1990. Botanical composition and productivity of natural pasture in Arjo Awraja, western Ethiopia. Proceeding of the fourth national livestock improvement conference held at Addis Ababa. 13-15 Nov. 1991. pp: 205-210.
4. Daniel, K., 1990. Effects of management on Rhodes grass and Lucerne pasture with special reference to development stages at cutting and associated changes in nutritional quality. PANESA/ARNAB. Utilization of research results on forage and agricultural by-product material as animal feed resources in Africa. Proceedings of the first joint workshop held in Lilongwe. 5-9 December 1988. PANESA/ARNAB, Addis Ababa, Ethiopia, pp: 705-735.
5. Miller, D.A., 1984. Forage Crops. McGraw-Hill, inc, U.S.A.
6. Kidane, G.M., 1993. Effects of cutting dates on botanical composition and nutritive value of native pasture in the Ethiopian highlands MSc. Thesis. Alemaya University of Agriculture, Alemaya, Ethiopia.
7. Schank, S.C. and Chynoweth, 1993. The values of Triploid and hexaploid napier grass derivatives as biomass and/or forage. Tropical Agriculture, 70(1): 83-87.
8. AOAC (Association of Official Analytical Chemists), 1995. Official Methods of Analysis, (16th Edition, Washington DC).
9. Van Soest, P. J. and J.B. Robertson, 1985. Analysis of forages and fibrous foods: A laboratory manual for Animal Science 613. Department of Animal Science, Cornell University, Ithaca, New York, USA, pp: 202.
10. Adugna, T., 2008. Feed resources and feeding management: A manual for feedlot operators and development workers. Addis Ababa, Ethiopia, pp: 38.
11. Wilson, J.R., 1994. Cell wall characteristics in relation to forage digestion by ruminants. J. Agric. Sci. (Camb.)., 122: 173-182.