Production and Utilization of Conserved Barley and Oat Grass as Fodder for Merino Sheep

P.E. Mosebi*, M.P. Ntakatsane, P.A. Matebesi-Ranthimo, R. Makata

Department of Animal Science, Faculty of Agriculture, National University of Lesotho, Roma 180 Lesotho.

***Corresponding author:** Phone: (+266) 5670 0610; E-mail: pe.mosebi@nul.ls

Abstract: Barley (*Hordeumvulgare*) and Oat (*Avenasativa*) are cultivated cereal foragesadapted to dry season conditions. Conserved cereal forages provide nutritious fodder for sheep in winter and spring months. The objective of this study was to evaluate nutritional composition of conserved barley and oat and assess performance of merino sheep fed conserved fodder. The experiment was conducted from February to December 2017, in a complete randomized block design with three replications. Treatments consisted of two conserved forages barley and oats.Six Merino sheep ewes(Body weight = 25±3.25kg) were given 300g in separate feeders daily. Conserved forage were analysed for nutritional composition represented by dry matter, crude protein, neutral detergent fibre (NDF) and acid detergent fibre (ADF). Body weight gain was measured for merino sheep performance.Dry matter and crude protein of conserved oat forage was significantly higher than that of conserved barley forage. Neutral detergent fiber and acid detergent fiber were lower in conserved oat compared to conserved barley. The body weight gain values obtained by sheep fed oats were higher than those fed barley. The results of this study indicate that conserved oat forage had an impact on nutritional composition and body weight gain of merino sheep.

Keywords: Barley, Oats, Merino sheep, Nutritional composition, Body weight gain.

1. Introduction

Merino sheep is of great importance to Lesotho prosperity for both economic and social reasons. Sheep are kept primarily for production of wool and mutton. Most of country's output of mutton or lamb is consumed locally. Wool sheep produces about 3500 tons of raw wool annually for export and granting employment opportunities to hundreds of inhabitants [1].Sheep are also used for such social obligations as payment of bride price, payment to traditional healers, burial and wedding ceremonies. Sheep have played a significant part in the education of the rural people as live sheep and/or wool is sold to raise money for school fees. Use of dung as manure is apparently common in the regions where there is relatively more crop farming [2]. The major constraints to increasing merino sheep production in Lesotho include scarcity & fluctuating of yield and quality of year round forage supply. Most Lesotho sheep producers do not have productive pastures and currently graze their animals on poor and undeveloped grasslands. Inadequate feeding is a major limiting factor to merino sheep production especially during winter season, when grazing areas have limited quantities of forage. Moreover, winter forage is of poor nutritional value due to the unfavourable weather conditions. Introduction of planted forages especially temperate (cool season/C_3) grasses in dry season is very beneficial to increase productivity of forage supply. Barley (*Hordeumvulgare l*) and Oats (*Avenasativa*) are temperate (cool season/C_3) grasses and generally categorized as grasses that thrive in cooler climates or during cooler seasons [3]. Temperate grasses are an excellent choice for winter pastures or fodder fields, a cover crop, and adapted to a wide range of soil and weather conditions. Temperate grasses would be productive in response to the situation of weather conditions in Lesotho because of the cooler temperatures during autumn, winter or spring season. The objective of this study was to evaluate nutritional composition of conserved barley and oat fodder, and impact of conserved fodder on body weight gain of merino sheep.

2. Material and Methods

Study area:

The study was conducted at the National University of Lesotho, Experimental Farm in Roma, Lesotho. The area is located at altitude of 1500m above sea level with an average annual rainfall and temperature of

750mm and 22^{0}C, respectively. The predominant soil type of this region includes yellow brown loamy soil with medium to coarse textured.

Production of fodder:

Soil was tested in February 2017 to determine the lime and fertilizer requirements to ensure good barley and oats establishment. A seedbed was prepared from existing improved grassland of 1 ha area. Two temperate grassesbarley (*Hordeumvulgare l*) and oats (*Avenasativa*) were planted on February 2017. Fodder was harvested at booting stage for hay making. Fodder materials were collected and store in form of hay rolls. The harvested hay was stored for a period of 30 days before merino sheep utilization.

Experimental design:

The experiment was conducted in a complete randomized block design with three replications. Treatments consisted of two conserved forages barley and oats. Two merino sheep group, with three merino sheep per group randomly allocated to two treatments barley and oats fodder housed in separate kraals.

Animals:

Six merino sheep ewes with initial average live weight of 25±3.25kg were used. Merino sheep randomly fed barley and oats fodderwere housed in separate kraals for a period of 60 days. The conserved fodders were given at the rate of 300g twice daily in the morning & afternoon. Fresh water was provided on daily basis and routine medication was also adhered to strictly.

Nutritional composition:

Conserved forage were analysed for nutritional composition represented byDry matter (DM), Crude protein (CP),Neutral detergent fibre (NDF) and Acid detergent fibre (ADF). Samples were randomly taken from selected conserved barley and oats. Conserved fodder samples were submitted tothe Department of Animal Science Laboratory for analysis. The samples were oven dried to constant temperature of 105^{0}C for 24 hours to determine dry matter content. Crude protein (CP) based on DM was calculated by multiplying the Nitrogen (N) content by 6.25 determined using Kjeldahl method [4]. NDF based on DM was measured by boiling a forage sample using neutral detergent under neutral pH conditions. ADF was determined using acid detergent under low pH condition [5].

Body weight gain:

Body weight gain of each merino sheep from all the treatments was measured on weekly basis using an electronic scale.

Statistical analysis:

Plant and animal data were subjected to ANOVA using Statistical Analysis Systems Software Version 9.1 [6]. Differences were considered significant at P≤0.05 and means were separated using a Fisher's protected Least Significant Difference (LSD) test. Tukey's multiple range test was conducted for mean comparison.

3. Results and Discussion

Nutritional composition- Dry matter yield:

Dry matter yield of conserved oat and barley fodder is presented in Figure 1. There was a significant difference among fodder dry matter yield for the conserved oat and barley. Dry matter yield was significantly higher in conserved oats fodder than conserved barley fodder. This difference is likely to be associated with spatial use of resources, roots for water and nutrients, leaves for carbon dioxide and light, which made oats able to efficiently utilize and convertthose natural resources into growth attributes. Previous studies reported a similar response of more dry matter yield from oats than barley [7,8].

Chemical composition:

Chemical composition of conserved barley and oats fodder is presented in Figure 2. Fodder chemical composition data indicated that there was significant difference among treatments of conserved oats and barley. Maximum crude protein (CP) content was obtained from conserved oats and the lowest from conserved barley fodder. Neutral detergent fibre (NDF) and acid detergent fibre (ADF) was significantly higher in conserved barley than in conserved oats. The results showed that conserved oats produced higher crude protein content than conserved barley fodder, which could be the result of efficient utilization of soil nutrients and moisture. Conserved oats fodder has low

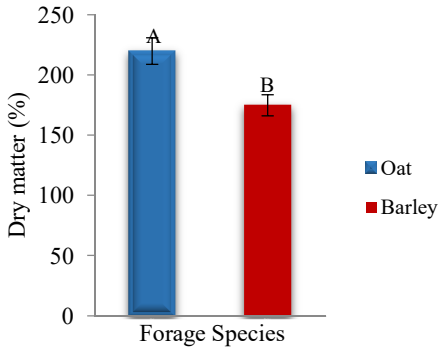

Figure 1. Dry matter of oat and barley fodder.

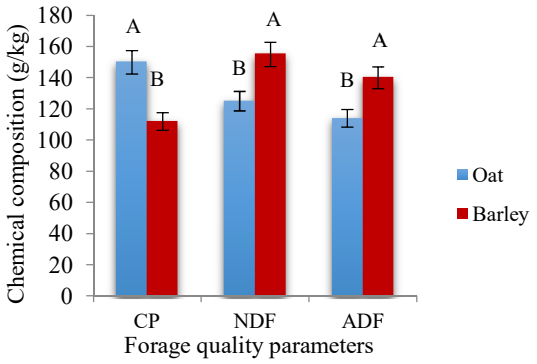

Figure 2. Chemical composition of oat and barley fodder.

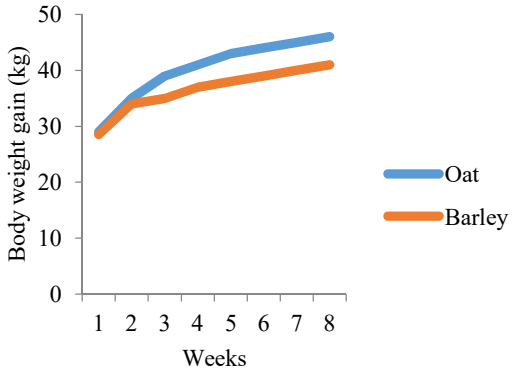

Figure 3. Body weight gain of merino sheep fed oat and barley fodder.

NDF and ADF values whereas conserved barley fodder has high value. High NDF and ADF values could be partly due to insufficient use of natural resources such as atmospheric gases, sunlight and soil nutrients. These results are in line with the findings of other studies, which reported that optimum use of nitrogen, carbon dioxide, solar energy, moisture, soil micronutrients and macronutrients by plant increases crude protein and lower neutral detergent fibre and acid detergent fibre [9,10].

Body weight gain:

Body weight gain of merino sheep fed conserved oat and barley fodder is given in Figure 3. Body weight gain data revealed that there was significant difference among treatments for period of eight weeks. The body weight gain values obtained by merino sheep fed conserved oats were higher than those fed conserved barley. This higher body weight gain values of merino sheep fed conserved oats fodder might be due to high levels ofdry matter yield and crude protein available in oats fodder. It has been reported that level of protein and dry matter availability in fodder dietsefficiently interacted to give the highest total weight gainfor lactating ewes [11]. Other study work reported that there was a decline in daily weight gain as the high levels of neutral detergent fibre and acid detergent fibre were noted in the fodder treatment diets [12].

4. Conclusions

Results obtained from this study showed that conserved oat fodder had better dry matter yield and chemical compositionthan conserved barley fodder. Conserved oat fodder promoted higher body weight gain in merino sheep than conserved barley fodder. Considerable efforts have to be made to improve feeding regimes for merino sheep through established forage crops.

5. References

1. FAOSTAT; The Food and Agricultural Organisation's Statistical Database; 2013.
2. F. Lewis, J. McCosh, C. Pringle, I. Bredin and Z. Nxele; Lesotho Climate Change Adaptation Project Ecosystems, Agriculture and Livelihoods in the Lesotho Highlands: Likely Futures and the Implications of Climate Change; Scottsville, South Africa 2011.
3. C.D. Morris, N.M. Taintoi and S. Boleme; Classification of the eastern alpine vegetation of Lesotho; African J. Range Forage Sci. **10**(1) 1993 47-53.
4. Association of Official Analytical Chemists (AOAC); Official Methods of Analysis, 11th ed. AOAC Washington DC 1980 125.
5. H. Goering and P. Van Soest; Forage Fiber Analysis: Apparatus Reagents, Procedures, and Some Applications; Agriculture Handbook U.S. Government Printing Office, Washington DC 1979 379.
6. Statistical Analysis System Institute; SAS or STAT User's Guide; Ver 9.1; SAS Institute, Cary, NC 2003.
7. J. Bagg and P. Johnston; Seeding oats for forage. J. Field Crop **20** 2013 53-65.
8. E.J. Stevens, K.W. Armstrong, H.J. Bezar, W.B. Griffin and J.G. Hampton; Fodder oats: An overview (Chapter II). 2004. In: J.M. Suttie and S.G. Reynolds; Fodder oats: A world overview; Plant Production and Protection Series No. 33, FAO, Rome 2004.
9. E.S. Jensen; Grain yield, symbiotic N fixation and inter-specific for inorganic N in pea-barley intercrops; J. Plant Soil. **182** 1996 25-38.
10. H. Bothe, S. Ferguson and W.E. Newton; Biology of the nitrogen cycle; Botanical Institute, University of Cologne, Koln, Germany 2006.

11. G.A. Pulina, N.P. Nudda, G. Macciotta, S.P.G. Battacone, S.G. Rassu and A. Cannas; Non-nutritional factors affecting lactation persistency in dairy ewes: A review; Ital. J. Anim. Sci. **6** 2007 115-141.

12. J.C. Lopes; Nutrient composition and fibre digestibility measurements of tropical forages collected from intensively managed rotational grazing systems; Thesis. University of Wisconsin, Madison 2011.