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Effect of Molasses and Urea on Nutritive Value of *Cenchrus Biflorus* Roxb (Indian Sandbur) Grass in Silage Quality for Desert Sheep

Abu Bakr Omer Ismail[1], Erneo B. Ochi[2], Elhadi O. Ahmed[3], Ishraga Mohammedain[4], Sita Ghimire[5], Mohammed Fatur[6]

[1]University of Juba, School of Natural Resources and Environmental Studies, Juba, South Sudan
[2]University of Juba School of Veterinary Medicine, Juba, South Sudan
[3]Ennhod Desert Sheep Research Station, North Kordofan State, Sudan
[4]University of Bahri, College of Natural Resources and Environmental Studies, Sudan
[5]The Biosciences, Eastern and Central Africa, International Livestock Research Institute, Nairobi, Kenya
[6]College of Animal Production, University of Bahri, Sudan

ABSTRACT

Silage production is imperative for alleviating animal feed shortage, increasing animal production and productivity, and generating income to smallholders' farms. This study was conducted to produce quality silage from *Cenchrus biflorus* (Indian sandbur) grass using different level of molasses and urea for Desert sheep in Ennhod Locality of North Kordofan State, Sudan. Five treatments were used in a complete randomized block design (CRBD) of three replicates each. Molasses and Urea were used as 0.0% as control treatment (T_5), while Urea was constantly used as 0.5%, added to molasses ratio which was kept changing as of 0.0%, 5%, 10% and 15% for the other four treatments, consecutively. Each treatment was ensilaged for 30 days using plastic bags buried in a soil to ensure a complete fermentation and high-quality silage. Chemical analysis revealed that the increase in molasses percentage (%) decreases the crude protein percentage (CP %), and consequently the crude fiber percentage (CF %) increases. Dry matter percentage (DM %) remains more or less constant with an increase of molasses percentage to the silage. Results revealed that 5% molasses additives improve CP% in rangeland grass as such, could be recommended for improvement of grassland. Seemingly, molasses additives to *C. biflorus* grass above 5% level are not recommended for silage production during the grazing season for pasture animals. Nitrogen-free extract percentage (NFE %) showed no significant differences throughout all the treatments. The use of urea alone as an additive to improve *C. biflorus* grass is recommended as a second alternative to 5% molasses level for quality silage production.

KEYWORDS: *Cenchrus biflorus, Molasses, Urea, Nutritive Value, Silage Quality*

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1. INTRODUCTION

Livestock constitute important sources of animal protein (Murphy and Allen, 2003) and play a key role in the livelihoods of rural households in developing world (Herrero *et al.*, 2012). As such livestock are utilized for mitigation and reduction of poverty in India (Deshingkar *et al.*, 2008) and in Uganda, Kenya, Tanzania and Malawi (Ellis and Freeman, 2004). Let alone an effective contributing to economic development in South Sudan (Onyango *et al.*, 2015). In North Kordofan State of Sudan, livestock constitute an important source of animal protein, draft power animals for crop production and cash generating asset. Moreover, they provide investment, employment, and risk reduction opportunities. Generally speaking, in semi-arid regions, livestock serve as a "saving account" and provide an economic security against frequent crop failure (Ismail, 2009). Moreover, most of the livestock graze in arid or semi-arid and mixed rain fed rangelands (Thornton *et al*., 2002).

Not surprisingly, these rangelands favour the existence of Indian sandbur grass; *Cenchrus biflorus* (Jank *et al*., 2014). It has been reported that only 2% of the livestock production is practised under the irrigated systems mainly in arid zones of the Sudan and Egypt (AARNET/ASARECA, 2005). In North Kordofan region of the Sudan, desert sheep are mainly raised as agricultural farming system for enhancing the livelihoods of the local dwellers. However, this noble practice has been faced by a couple of challenges including a scanty and uncertainty of rainfalls as well as a shortage of watering points in the region, leaving most of the sheep raisers depend on the use of rangeland as the major sources of feed for grazing animals. *C. biflorus* has been viewed and reviewed as a blessing or curse plant in arid ecosystems, but it is a widely used forage plant in arid area (Peerzada *et al*., 2017)

Ostensibly, livestock contributes 95% of the family income and livelihood security in this region, while the increasing rate of rangeland degradation and political and economic instability has prompted some sheep raisers to preserve natural grasslands as silage or hay to be utilized during the dry season. Nowadays livestock feeding is encountered with a series of serious difficulties related to the quantity and quality provision of nutrients (McDonald *et al*., 2002). This has been exacerbated by continuous rocketing prices of feedstuff. Moreover, climate change has led to frequent and extended drought periods complicating the situation. As such, Desert sheep in Ennhod area have been raised under this devastating condition of grazing on degraded rangelands that offer a low-quality fibrous feedstuff such as cereal straws and stubbles. Nutrient contents of these feeding sources are so low and unbalanced such that the provision of supplements is very crucial for sustainable development of livestock (Lukuyu *et al*., 2011).

Livestock production is constrained by inadequate quantity and quality of feeds and thus integrating of silage production is likely to bridge this gap, improve ruminant livestock productivity and human livelihoods (Njarui *et al*., 2011). Thus, improved feeds such as concentrates have been recommended to mitigate and reduce such shortages. However, the impact of such supplementation strategy on livestock performances is often unsatisfactory and too expensive for small holders. Especially when the forage sources are being obtained from irrigated forage sources (Ernst *et al*., 2014). Apparently, a wide range of alternative feed sources including fodder shrubs and some agro-industrial by-products and some natural compounds such as tannins and seasonings, have proved to be efficient in improving sheep performance (Ernst *et al*., 2014). Alternatively, improvement of natural grasslands to increase animal performances has been reported as crucial (Bolsen, 1999) and or reduction of feeding cost are to make wide range benefits from these alternative natural feed resources; their impact on digestion and production and reproductive performances of sheep. As such this study displays the use of additives (molasses and urea) to improve the nutritive value of these grasslands being used as silage.

Therefore, the purpose of this study is to expedite the improvement of nutritive value of *Cenchrus biflorus* grass using molasses and urea for the production of quality silage.

2. Materials and Methods

2.1. Study Area

The study was conducted at the Desert Sheep Research Station (DSRS) in Ennhod Locality of North Kordofan State, Sudan (Fig.1). It lies at latitude 12°42′ N and longitude 28°25′ E in a poor savanna area with lower annual rainfall ranging between (250-450 mm). Rainfall is low and erratic with a large part of the year being dry. Consequently, these areas have marginal to low potential for crop production. Nevertheless, livestock as an important source of livelihoods thrive in these zones. In the central and western north highlands of western Sudan, soils vary from shallow sandy clay of high fertility in the lowlands and mid-attitude eastern region to very low fertility arid soils in the highlands (Abdalla, 2012).

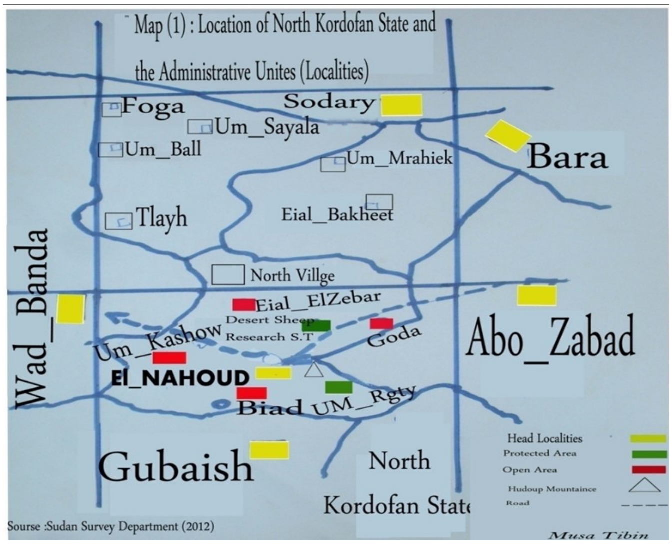

***Figure 1. Map of* Ennhod Desert Sheep Research Station, North Kordofan State, Sudan**

2.2. Experimental Design

A Complete randomized block design (CRBD) was used to evaluate the chemical composition of *C. biflorus* grassland with different levels of molasses and urea in five treatments; (T_1, T_2, T_3 T_4, and T_5).

2.3. Methods

Following the harvest at 5cm height above the ground level, the grass sample was chopped into small pieces using an electric machine. Two kgs for each sample was weighed and the different levels of molasses and urea percentages were added to each treatment as follows: T1= (molasses=0 and urea=0.5%), T2= (molasses=5% and urea=0.5%), T_3= (molasses=10% and urea=0.5%), T_4= (molasses=15% and urea=0.5%), and T5= (molasses= 0 and urea=0).

Pits were designed in a well-elevated landscape at a depth of 50 cm and width of 50 cm for each replicate to avoid rain damages. Plastic bags containing samples were placed randomly in the pits for the 5 treatments and they were covered with sand for 30 days to produce silage. Silage samples were shed dried to ensure complete drying. Pinches for another 2 weeks to complete drying. Following the drying, the samples were grinded to a fine and powder form, The herbage was ground to pass through a 1-mm screen in a Willey mill (Udy Corporation, Fort Collin, CO) and a subsequent laboratory analysis was made.

2.4. Data management and analysis

The DM%, CP%, CF%,NDF%%,EE% and Ash % were managed in spread sheet Microsoft excel and analyzed using two-ways analysis of variance (ANOVA), stat view 2020. Level of significance was made at $P < 0.05$ and highly significant difference ($P < 0.01$). Differences between treatments means were separated using the least significant difference (LSD).

3. Results and Discussions

Production of quality silage using different level of molasses shows a highly significant difference ($P<0.01$) among the five treatments (Table 1 and Fig. 2). T_5 was significantly better than all other treatments in Dry Matter (DM) production yielding (molasses=zero and urea=0- 94.20) DM compared to T_1 (molasses=0 and urea=0.5%),T_2 (molasses=5% and urea=0.5%), T_3(molasses=10% and urea=0.5%) and T_4 *(Molasses=15% and urea=0.5%)* with an average production of 79.20, 72.30, 69.73 and 58.60 respectively significantly high. It seems that the zero levels of both molasses and urea in T_5 release of more DM could be attributed to fresh sample with no additives. This is in line with the findings of Thairu and Tessema (2004*)* in forages made to silage in which the DM yield almost is higher than the same sample when treated with additives. Muck (2011) has reported that quality silage could be expected to improve natural grazing forages nutritive value.

Crude Protein percentage (CP %) revealed a highly significant difference ($P < 0.01$) among the five treatments. However, T_2 (molasses=5% and urea=0.5%)was significantly better with 22.31 % (CP) compared to T_1 (molasses=0 and urea=0.5%),- 15.42%), T_3 (molasses=10% and urea=0.5%)- 18.20%), T_4 (molasses=15% and urea=0.5%) - 16.28%), and T_5 (molasses=zero and urea=0)- 2.22 % CP) suggesting that an increase in the molasses level decreases the CP % in the silage. This is in line with the findings of Baytok *et al.* (2005) and Burghardi *et al.* (2004).

Crude Fiber percentage (CF %) revealed a significant difference ($P < 0.05$). However, T_5 was significantly higher in CF% than other treatments, yielding 27.02% CF compared to T_1 (24.35%), T_2 (21.78%), T_3 (19.38%) and T_4 (17.81% CF). Seemingly, it could be attributed to the zero levels of both molasses and urea in T_5 this result gives the same justification issued by Bolsen et al. (2004).

Ether Extract percentage (EE %) revealed a significant difference ($P < 0.05$). T_5 was significantly higher ($P < 0.01$) than other treatments in EE% production yielding 2.90% EE compared to T_2, T_4, T_3 and T_1 with an average production of 1.60%, 1.20%, 1.00% and 0.80% EE, respectively. Ostensibly, changes in the molasses and urea levels in the silage improvement revealed no significant difference ($P > 0.05$) among the five treatments. T_1, T_2, T_3, T_4 and T_5 with the average production of 7.98%, 7.56%, 7.25%, 7.15%, 7.07 % for Ash, respectively. This is in line with the findings of Harrison *et al.* (2010) who reported that in silage management the feed additives had showed no increase in the Ash content of the silage being produced.

No significant difference revealed among the five treatments in Nitrogen-free Extract (NFE). T_1, T_5, T_4, T_3, and T_2 with the average production of 22.91, 25.09, 23.16, 25.65, and 22.05% for NFE, respectively. This is in line with the findings of Owen (2011), who reported that some additives would not improve the NFE value of the some forages.

Table 1: Proximate chemical analysis of the fermented *Cenchrus biflorus* treated with Urea and different levels of Molasses.

Treatment	DM%	CP%	CF%	EE%	Ash%	NFE%
T_1	79.20^b	15.42^b	19.38^d	0.98^b	7.98	22.91
T_2	72.30^c	22.31^a	17.81^e	1.05^b	7.56	22.05
T_3	69.73^c	18.20^b	21.78^c	1.00^b	7.25	25.65
T_4	58.60^d	$16.28a^b$	24.35^b	1.02b	7.15	23.16
T_5	94.20^a	2.22^c	27.02^a	2.90^a	7.07	25.09
Overall Mean	74.00	15.69	22.07	1.50	7.08	23.37
±SEM	0.46	1.50	0.07	0.26	0.08	1.45
LSD	**	**	*	*	NS	NS

T_1= (molasses=0 and urea=0.5%), T_2= (molasses=5% and urea=0.5%), T_3= (molasses=10% and urea=0.5%), T_4= (molasses=15% and Urea=0.5%) while T_5= (molasses=zero and urea=0), NS = Not Significant ($P > 0.05$), *= Significant ($P < 0.05$), **= High Significant ($P < 0.01$) LSD = Least Significant Difference, ± SEM = Standard Error of the Mean

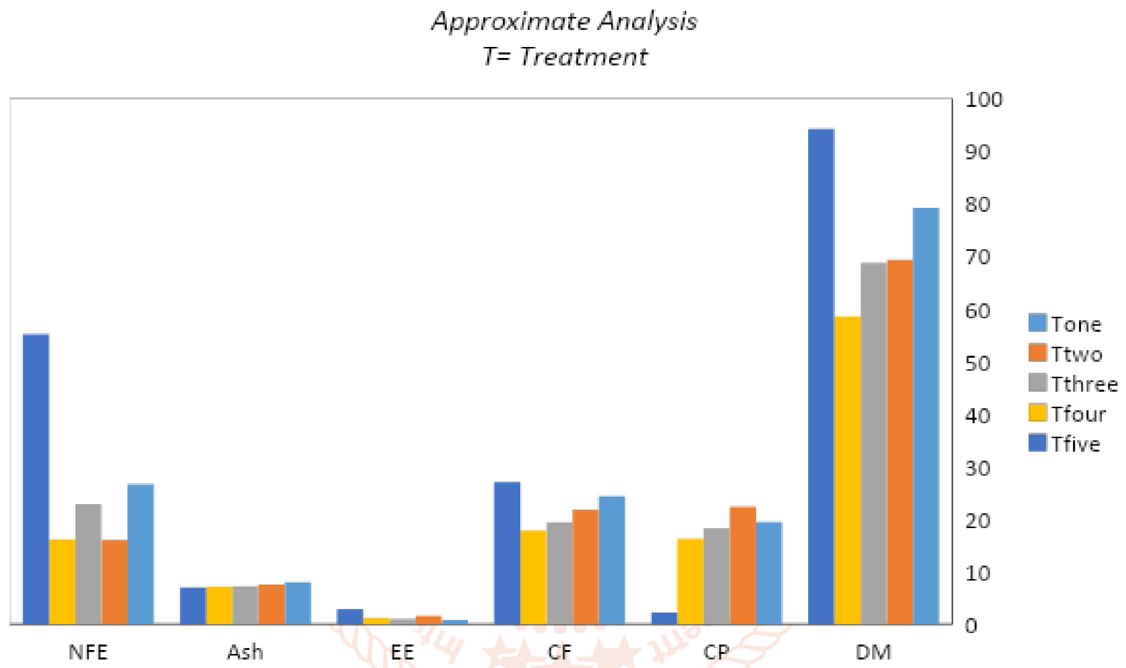

Figure 2: Chemical constituents and diagrammatic representation among the five treatments

4. Conclusions

Addition of 5% molasses plus 5% urea has improved the silage quality for *C. biflorus* grass. Moreover, it enhances the raising of Desert sheep at Ennhod Locality. The increment of Molasses beyond 5% may result in the reduction of CP% of the grass when fed as silage particularly during the dry season. Therefore, the use of urea alone as an additive is recommended to improve *C. biflorus* grass as the second alternative to 5% molasses level in silage production for sustainable development of livestock at Ennhod Locality of North Kordofan State, Sudan.

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Conflict of Interest

The authors have declared no conflict of Interest

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