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Studying the chemical composition and nutritive value of silage of camel's thorn (Acacia erioloba) processed with additives

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ABSTRACT: This study was carried out to evaluate nutritional value of *Alhagi Persarum* silage by adding of enzyme, urea and molasses. For this aim *Alhagi persarum* forage were harvested and chopped. Then were mixed with the enzyme (3 g/kg DM), urea(%5) and molasses (%10) and ensiled in 5 Kg plastic baskets. The silages were opened after 45 days and chemical compositions inculuding dry matter (DM), organic matter (OM), ash, crude protein (CP), ether extract (EE), cell wall and cell wall without hemicelluloses were measured according to the standard procedure and dry matter degradability nylon bags methods. Results showed that urea significantly increased in pH, CP, ADF and NDF content and decreased EE **.** molasses caused a significant increased in EE and CP content and decreased ADF and NDF content**.** enzyme caused a significant decreased ph and EE content and significant increased cp content. Also, results of *in vitro* gas production revealed that in all incubation times after adding urea amount of gas production decreased but with adding molasses it was increased and with adding enzyme expect in time 2, 4, 6 and 8 gas production value was decreased. In conclusion results this study, it can be recommendation that the use of supplements urea and molasses can be used to make good *Alhagi persarum* silage.

Keywords**:** *Alhagi persarum,* Nutritive value, Silage, Enzyme Ravabio.

INTRODUCTION

In recent years because of limited range and increased costs, breeding cattle has encountered problems and in dry areas of activity ranchers has reduced (Bashtini. J, 2007) because the cost of livelihood composes the most costs of a production unit, obviously providing the nutritional requirements of animals in their living area, reduce costs and increase manpower (5). Due to the abundance of pastures in the Sistan region, there should be an appropriate method to optimize the use of these plants, and proposed cutbacks. (Hashemi, S. 1986). Camel thorn is one of the plants that is of appropriate nutritional value and has good digestion coefficients (Hormozi Pour, H., 2009). This forage with valuable nutrients and chemicals is suggested to feed ruminants, replacing it instead of a mixture of wheat straw and alfalfa hay. (5). It is possible to silage camel thorn with additives. Use of additives while silage, improves the fermentation and increases palatability. Enzymes (xylanase and cellulase), increase bacterial and fungal fermentation and animal performance (Bowman, GR. 2002). The use of urea in maize silages resulted in higher acidity than the control silages (Makkar, HPS. 1999). Molasses increases fermentable carbohydrates in the silo and provides good carbohydrate source for microorganisms and reduces the pH (Yassin, ELJP. 1991). It also increases the dry matter of silage (Valizadeh, R, 2004). The purpose of this study was to identify the best additive to increase the nutritional value of camel thorn and introduce the best treatment to herders.

MATERIALS AND METHODS

To do this research camel thorn was collected from different areas of Sistan and was taken to animal feed laboratory of Zabol University. After transferring the samples to the laboratory, they were chopped up and silage was done using rovabio enzyme (3 g rovabio enzyme per kg of dry matter) (group 2) and urea (5%) (group 3) and molasses (10%) (group 4) and group 1 was used without additives as control group.

After 6 weeks at the lab temperature of open silos and 3 replications were provided for each treatment and pH was measured immediately. Then silos were put into oven to dry for 48 hours at 60 ° C and then dry mater was determined and samples were milled. Then chemical compounds such as dry matter, crude protein, crude fat, and ash was measured with standard method and digestibility of organic matter and metabolizable energy by gas production method. To determine NDF and ADF Van Sost and colleagues' method was used. To determine the components of gas production p = b (1-e-CT) relation was used in which b is the potentially biodegradable part (ml), and c is gas production rate (ml per hour) which were calculated using Fitcurve software. The volume of gas produced by the treatments studied at different times of incubation times (ml per 200 mg of dry matter) is calculated.

RESULTS AND DISCUSSION

The results of estimating the chemical compounds are shown in Table 1. The highest percentage of dry matter was in treatment 4 and the least was in treatment 3. There was no significant difference between treatments from dried matter percentage point of view (P>0.05). Urea reduced dry matter in silage. Due to the lack of carbon dioxide produced in the first days after the addition of urea caused plant cells to stop breathing fast (AOAC.1990, Soper, IG, Owen, FG. 1977). In producing of camel thorn with molasses, dry matter percentage was significantly increased that can be related be related to high content of dry matter of molasses (75%) which are consistent with the results of other researchers' results (Arbabi, S. 2007). highest pH percentage was related to treatment 3 and the lowest to group 4. Adding enzyme to silage decreased pH. Producing forage with urea increased pH and nitrogen (Yassin, ELJP. 1991). According to Table 1, the maximum amount of raw ash was related to treatment 3 and the minimum to treatment 2. Adding enzymes to silage reduced the amount of ash.

The addition of urea also increased the amount of ash that was consistent with studies of other researchers. Molasses decreased ash in the silo. The minimum amount of organic matter was in treatment 4 and maximum in treatment 2. Impact of all treatments on organic matter was significant (P<0.01). Adding enzyme increased the organic matter silage. In the treatments that urea had been added to, the percentage of silage of organic matter increased and other studies also confirmed this. The greatest percentage of crude protein was in treatment 3 and the lowest was in treatment 1. Impact of all treatments on the protein was significant (P<0.01). Adding enzymes increased the amount of crude protein. Among the treatments that urea was added to the silo straw, it was found that by adding urea protein increased. This increase due to the breakdown of urea to ammonia is logical and it was confirmed in existing reports (Lessard, JR. 1978, Lopez, J. 1971 and Xing, L. 2008). Adding molasses slightly increased protein percentage, but the difference was not statistically significant compared to control. As Table 1 indicates the highest amount of fat was for treatment 4 and the lowest was in treatment 4 (2) was observed. These tests showed that the enzyme reduced the amount of fat in silage. And also in treatments that urea was added, there was no significant change in the amount of crude oil. On the other hand molasses increased silage crude oil. Impact of all treatments was significant on crude oil (P<0.01). According to Table 1, the maximum amount of ADF was in treatment 3 and the lowest was in group 4. Adding enzyme reduced the ADF. On the other hand, urea increased silage ADF. Molasses reduced cell wall, which was consistent with the findings of other researchers. The effect of treatment with enzyme on the ADF was not significant (P>0.05), but other treatments had significant impact on cell walls (P<0.01). The highest cell wall was in group 3 and the lowest was in group 4. In the treatments that urea was added to the silo (group 3) cell wall increased. This increase may be due to the influence of ammonia on the cell wall and loosening of the lignocellulosic bonds. Treatment with enzymes had no effect on the cell wall (P>0.05). Urea increased NDF which was consistent with the experiments of other researchers. Adding molasses reduced NDF. As is seen in Table 2 shows the highest rate of gas production and b section was in treatment 4 and the lowest was in group 2. Impact of all treatments on b was significant (P<0.01). Figure 1 shows that by increasing the incubation period to 96 hours, gas production has been increased for all treatments (Mansouri, H. . 2003). In a study on the nutritional value of alfalfa hay, it was shown that enzymes significantly increased the volume of gas produced compared to control treatment. And the moderate amount of enzyme had the greatest effect in terms of the volume of gas produced on the grass hay (Baghbanzadh, B, A. 1999). The largest amount of gas produced in 96 hours was in treatment, 4 and the lowest was in treatment 2. This is due to the reduction of cellulosic compounds in the treatment 4 and increased cellulosic compounds in treatment 2. According to Figure 1, the largest gas production after 24 hours is for treatment 4 and the lowest is for treatment 2. The results of Table 2 show that the highest organic matter digestibility (OMD) is in treatment 4 and the minimum is in treatments 3. Impact of additives on OMD was significant (P<0.01). NDF and lignin's being less in plants can increase OMD (Zhu, Y., . 1999). It is found that with increase in gas production, digestibility of dry matter increases, too (5). It has also been found that there is a positive correlation between CP and EE with metabolizable energy content of feeds (Lopez, J., . 1971). The highest amount of organic matter digestibility of dry matter (DOMD) was for treatment was 4, and the lowest was for treatment 3. High (DOMD) in treatment 4 is due to low cellulosic compounds that increases gas production. The amount of metabolism energy in related to treatment 4 and the highest is related to treatment 2. The impact of all additives on (ME) was significant (P<0.01). The results of these tests indicate that camel thorn silage with additives is of high nutritional value and can be replace the mixture of wheat straw and alfalfa hay.

Table 1. Average of percentage of chemical composition (%) of camel thorn silage with additives

Treatment	DM	OM	ASH	EE	CP	ADF	NDF	pH
1	44.40^{c}	89.47	10.52^{b}	1.66^{dc}	12.46^{g}	39.83	55.40	5.76
2	47.31^{bc}	89.68^{a}	10.33	1.57	12.83	34.83	55.16^{d}	5.59
3	42.41^{bc}	89.58^{b}	10.50	1.63^{d}	17.8^{c}	47	63.73	6.29
4	48.18^{ab}	88.87^{d}	10.43^{e}	1.72^{d}	12.56	30.66	49.23	5.23
SEM	0.4166	0.0014	0.00011	0.00082	0.0083	0.1333	0.1017	0.0016

Numbers with dissimilar letters in each column are, statistically, significantly different (P<0.05), SEM: standard error of the mean, DM: dry matter, ASH: crude ash, OM: organic matter, EE: crude oil, ADF : acid soluble in detergent fiber, NDF: neutral detergent in soluble fiber, CP: crude protein, treatment 1: control (no additives), treatment 2 (3 g enzyme), treatment 3 (5% urea), treatment 4: (10% molasses)

Table 2. gas production parameters

Treatment	b	C	DOMD	OMD	ME
1	36.19^{c}	0.10	38.58^{b}	43.12^{c}	6.32^{b}
2	34.48^{e}	0.11	37.84^{c}	42.87^{d}	6.13
3	34.80^{d}	0.08^{b}	37.35^{d}	41.72^{e}	6.14
4	37.79^{a}	0.10^{d}	40.06^{a}	45.23^{a}	6.61^{a}
SEM	0.031	0.000024	0.047	0.0066	0.0054

Numbers with dissimilar letters in each column are, statistically, significantly different (P<0.05), b: potentially biodegradable part (percent), c: speed of gas production (per cent), OMD: the amount of organic matter digestibility (percent), DOMD: digestion of organic matter in dries matter (%) and ME: metabolic energy (MJ kg).

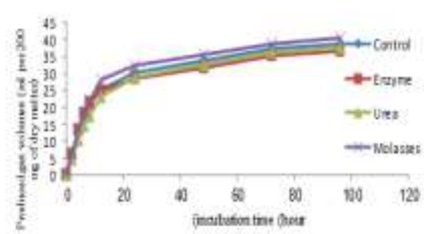

Figure 1. The effect of different treatments on the volume of gas produced at different times of incubation experiment

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