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Effect of different levels of sugar – beet tailings silage (STS) replaced with maize silage on buffalo male calves performance

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An experiment was conducted to determine the effect of different levels of sugar beet waste (tailings) silage substituted with maize silage on buffalo performances. Sixteen river male buffalo calves, aged 6 months old and 120 ± 5 kg body weight were used in a completely randomized design with 4 treatments, i.e.; 0 (T1, control), 25 (T2), 50 (T3) and 75% (T4) of STS substituted with maize silage and 4 replications of four animals per each replicate. Mean body live weigh, daily weight gain, dry matter intake and feed conversion efficiency were determined and the results showed that there was no significant differences between control group, T2 and T3 ($P>0.05$) for all traits, but they showed significant differences with T4 ($P<0.05$). As the amount of replacement increased above 50% and reached to 75% all the traits were decreased and buffaloes showed negative performances that might be due to low feed intake. Therefore it is recommended that up to 50% of STS can be replaced with maize silage in diet of buffalo male calves.

Key words: Buffalo, Silage, Sugar beet, waste

Introduction

Food comprises 60- 70% of the cost of buffalo meat production. In developing countries the shortage and expense of conventional feed resources are the major problem for increasing productivity of livestock. With rising feed prices, producers are looking for new ways to reduce production cost and restore profit margins. In Khuzestan province of Iran there are about 120 thousand buffaloes and also there exists a largely untapped potential for utilizing alternative feeds for them. These alternatives so called unconventional feeds are produced in large amount as by-products of the industrial processing products at low prices.

One such by – product is sugar beet tailings or roots which after washing the main tubers are cut and thrown away as waste materials. Beet tailings

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consist of small beets, broken or damaged beet and other materials not suitable for sugar production (Lardy and Anderson, 1999).

In Khuzestan annually about 14000 tons (3000 tons as dry matter basis) beet tailings are obtained from sugar factories with a low cost and farmers are utilizing them directly as a portion of diet for their animals without any enrichment. Different results were reported for the effect of STS on animal performances. Studies showed that using urea in sugar beet tops silage increased CP and reduced fungal growth, and also adding molasses as a source of carbohydrates reduced the pH of silage and increased its palatability. Beet tailings depending on soil contamination have about 80% moisture and 4% crude protein (McDonald, 1995).

Therefore, the objectives of this study were determination of chemical composition of treated STS, the proper level of replacement with maize silage and its effect on fattening of buffalo male calves.

Materials and methods

This experiment was conducted on 16 male buffalo Calves, aged 6 months old and 120±5 Kg body live weight for a period of 180 days in a completely randomized design with 4 treatments, 0, 25, 50 and 75% of STS treated with 1% urea and 3% molasses substituted with maize silage.

Table 1. Ingredient constitutes (%) and nutrient composition (as percent in dry matter) of experimental diets

Experimental diets (%)				
Ingredients	O	25	50	75
Maize silage	66.66	49.36	33.00	16.48
STS	-	16.32	33.00	49.50
Alfalfa[1]	16.00	16.32	16.32	16.21
Concentrate[2]	17.34	17.68	17.68	17.59
Total	100	100	100	100
Calculated nutrient composition				
ME(Mcal/kg)	8.09	8.05	8.00	8.00
CP (%)	12.50	12.34	12.15	12.10
Ca (%)	0.37	0.38	0.37	0.32
P (%)	0.31	0.30	0.30	0.30

1- Alfalfa was dehydrated as 95% dry matter

2- Concentrate includes barley 4%, wheat bran 35%, dry beet-pulp 9%, Cotton seed meal 15% and Salt 1%.

In this experiment different traits such as feed consumption (dry matter intake), initial and final body live weight, daily body weight gain and feed conversion efficiency were studied on buffalo male calves. The chemical composition (DM, CP, ME, Ca and P) of beet tailings before and after treating and ensiling were calculated (A.O.A.C., 1984).In vitro digestibility of organic matter of samples (Tilley and Terry, 1963) were measured to estimate samples metabolizable energy Using ME (Mj/kgDM) =0.016×DOMO (Mc Donald *et al*., 1995).Tailings were collected from sugar-beet factory and transferred to the Safyabad animal Science research station.

They were sun-dried and turned constantly for 3-5 days to decrease the moisture content. The pH of silage was measured two weeks interval. After 45 days Silo was opened and silage was of good quality. The main experiment started and animals adapted to the silage for 15 days gradually. Different traits such as final live weight, daily weight gain, dry matt intake/days and feed conversion efficiency were measured during experiment. At last all data were analyzed statistically using SAS procedure (1985), and the means were compared by Duncan test (1955).

Results and discussion

The chemical composition and feed values of the experimental diets are presented in Table 2. Different percentage of maize silage was replaced by treated beet tailing silage and the amounts of other ingredients of the diet were almost similar. The collocated nutrient composition shows that all levels of experimental diets were more or less isocaloric and isonitrogenous.The samples of two silages were tested twice a week and after 45 days both silos were opened and the quality of silages such as (65% dry matter) colour, lactic acid, smell and PH were similar and had a very good appearance.

Table 2. Chemical analyses of the sugar-beet tailings before and after silage, maize silage, alfalfa and concentrate

Chemical analyzes					
Ingredients	DM (%)	CP (%)	ME(Mcal/kg)	Ca (%)	P (%)
Sugar-beet tailings	25	7.75[a]	2.14[a]	1.56	0.29[a]
Sugar-beet tailings silage	68	8.30[b]	2.44[b]	1.85	0.80[b]
Maize silage	65	8.5	2.53	0.70	0.95
Alfalfa	92.5	14.5	2.96	1.13	0.39
Concentrate	95	17	2.60	0.18	0.84

a-b Means in each row with different superscripts are significant (P< 0.05)

As it is indicated from table 2, The CP and ME of tailings before and after treating and ensiling increased from 7.75 to 8.3% and 2.14 to 2.44 Mcal/ Kg (P< 0.05) respectively. Calcium didn't show any significant differences but Phosphorous increased from 0.29 to 0.80 percent (P< 0.05). The Chemical composition of STS and maize silage was almost the same. The only problem of silage making was chocking the big pieces and high amount of water in tailings that by pressing and adding 10% wheat straw as Reisian zadeh *et al.* (1996) suggested for tops silage, this problem has been solved. Lardy and Anderson (2003) also demonstrated that the main problems of tailings are high moisture (80%), big pieces and the cost of transportation.

Effects of different treatments on buffalo male calves performances are shown in Table 3. There were no significant differences (P> 0.05) between T1, T2 and T3 for final live weight, but the differences between these three treatments and T4 were significant (P< 0.05).The final live weight for T1, T2, T3 and T4 was 216.25, 216, 215.5 and 194.5 kg respectively.

Table 3. Effects of different treatments on buffalo male calves performances

Traits	**Treatments (Composition %)**			
	T1	T2	T3	T4
Initial live weight (kg)	120.25 [a]	120.25 [a]	120.75 [a]	120.25 [a]
Final live weight (kg)	216.25 [a]	216.00 [a]	215.50 [a]	194.50 [b]
Daily body weight fain (g)	532.75 [a]	530.00 [a]	521.75 [a]	409.75[b]
Daily dry matter intake (kg)	4.15 [a]	4.14 [a]	4.14 [a]	4.10[b]
Feed conversion efficiency	7.80 [a]	7.77 [a]	7.85 [a]	9.97 [a]

a-b Means in each row with different superscripts are significant (P< 0.05)

The same results were obtained for daily body weight gain and T4 was not significant with T1, T2 and T3 (P< 0.05), but T2 and T3 showed no differences with control group (P> 0.05). Daily dry matter intake for T4 was 4.1 kg which showed significant differences with control group (4.15 kg). The

results of T2 and T3 with T1 were the same and differences were not significant (P> 0.05). There was no significant difference between all treatments for feed conversion efficiency (P> 0.05).

According to all results the ME was increased from 2.14 to 2.44 Mcal, and it seams treating of tailings has increased the amount of lignin, cellulose and hemicelluloses of cell wall. Jackmola *et al*. (1993) reported the improvement of organic matter of bagasses in sugarcane treated with urea and molasses was 24 to 56 percent, and also increased protein percentage from 7.75 to 8.3%. Kardooni *et al.* (1997) reported that for achieving good silage with 1% urea, the best amount of molasses is 3% (DM). Addition of molasses to forage silage which has less than 6-8% soluble sugar was reported by Church (1988). Reisian zadeh, and et al., 1996 reported that the moisture of a good silage of beet tailings should not be more than 70%, and as the moisture of tailings are high so it is better to add 10% straw to the silage for reduction of silage moisture.

As it is obvious from all results obtained from body live weight, daily weight gain, dry matter intake and also feed conversion it can be calculated that up to 50 percent substitution of maize silage with beet tailing silage is recommended and more than that as McDonald (1995) reported in his book due to its amount of oxalic acid which is banded with calcium and prevent the passage from the body, is not suggested and therefore reduce the growth and feed intake. However it is concluded that 50% of sugar beet tailings can be replaced with maize silage for fattening of buffalo male calves.

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