Comparison amounts of gas production in fresh and oven dried silage in orange pulp silage by *in vitro* gas production

S lashkari[1] and A Taghizadeh[2]

1- Msc Student of Animal Science, University of Tabriz, Iran
2- Department of Animal Science, Faculty of Agriculture, University of Tabriz, Iran

Abstract

In this study the *in vitro* gas production was used to study the difference of gas production between fresh and dried silages. The composition of silages were as follows: 1) 73% orange pulp + 27% straw (control), 2) 74% orange pulp + 12% straw + 14% poultry by-product meal (OSP) and 3) 63% orange pulp + 25% straw + 3% urea solution (OSU). A semi-selective lactobacilli medium (MRS) was used for the isolation and enumeration of lactic acid bacteria (LAB). Blends silage were ensiled for 90 days in triplicate. Dried samples (300 mg) and fresh samples (1000 mg) placed into 100 mL serum vial and each sample was incubated in 6 replicates with 20 mL of rumen liquor and buffer solution (1:2). Amounts of Cumulative gas production were recorded at 2, 4, 6, 8, 10, 12, 16, 24, 36, 48, 72 and 96 h of incubation. The means of gas production (mL/g of DM) and counts of LAB (log cfu/g silage) were compared using Duncan's multiple range comparison tests. The pH Values in control, OSP and OSU were 4.14, 4.29 and 8.43, respectively. The means of LAB counts (log cfu/g fresh silage) in control, OSP and OSU were 3.45, 3.48 and 3.38 respectively. The mean of LAB population were higher ($P < 0.05$) in control and OSP than in OSU. The amounts of gas production in control silage for all time points were significantly ($P < 0.05$) higher in fresh than dried silage with exception of 24 and 96 h. The amounts of gas production at 2, 4 and 6 h were significantly ($P < 0.05$) higher in fresh with compared to dried OSP, whereas in 96 h was lower ($P < 0.05$) in fresh OSP. Values of gas production in all time points for OSU were significantly ($P < 0.05$) lower in fresh than dried OSU exception of 48 h. It will be evident that in the silages with low pH, LAB is predominant. The LAB can survive in *in vitro* incubation. This LAB can be contain the probiotic effects in *in vitro* fermentation and cause to higher gas production in fresh silages than dried silages. But in OSU with higher pH, because of less numbers of LAB this effect was not observed. These results showed that LAB in fresh silages has the potential to influence on rumen fermentation and undried samples ferment differently in *in vitro* than dried samples.

Introduction

Increased cost values of feedstuffs in many parts of the world have increased attending in utilization of citrus by-product feedstuffs as specific feeds for ruminants. This by-product contains high amount of pectin and soluble carbohydrates that is high in energy and low in CP (approximately 7%) and NDF (approximately 23%); some properties are similar to roughage and promote relatively high ruminal pH. But high moisture content is main problem in using of this feeds. One of the citrus by-products that produced exceedingly is orange pulp. Additionally utilization with high moisture as well as due to high sugar content human and animal health is exposure at risk because of spoiling, fungi and mold. For eliminate those problems, using of ensile citrus pulp is cheap and can be easily performed by the farmer.

Weinberg et al. (2003, 2004) demonstrated that lactic acid bacteria can survive in vitro rumen incubation, shifting in vitro fermentation and volatile fatty acid composition. In vitro gas production techniques have been developed to estimate rate and extent of ruminal DM degradation (Schofield and Pell, 1995). The objective of this study was to compare the differences of amounts gas production between dried silages and fresh silages.

Material and Method

In this experiment fresh orange pulp without any processing after juicing was used. The orange pulp was chopped to 5 cm pieces and combined with straw. The chemical composition of the raw material was determined. This feed ingredient was completely mixed after addition of protein additives as follows: (1) control (Orange pulp + straw), (2) Orange pulp + straw + urea and (3) Orange pulp + straw + poultry by-product meal. Orange pulp was ensiled for 90 days in 12-kg plastic buckets (triplicate per treatment).The ensiled samples were dried in a forced air oven at 55 ◦C for 48 h. enumeration of microorganisms were provided from fresh silage with semi-selective lactobacilli medium (MRS) as described by Zahiroddini *et al*. (2004).

Dried samples (300 mg) and fresh samples (1000 mg) placed into 100 mL serum vial. Rumen fluid was obtained from two fistulated wethers fed twice daily. Samples were incubated in 6 replicates with 20 mL of rumen liquor and buffer solution (1:2). Amounts of Cumulative gas production were recorded at 2, 4, 6, 8, 10, 12, 16, 24, 36, 48, 72 and 96 h of incubation.

Results

Amounts of gas production in dried and fresh silages were presented in Table 1. The mean of LAB population were higher ($P < 0.05$) in control and OSP than in OSU. The amounts of gas production in control silage for all time points were significantly ($P < 0.05$) higher in fresh than dried silage with exception of 24 and 96 h. The amounts of gas production at 2, 4 and 6 h were significantly ($P < 0.05$) higher in fresh with compared to dried OSP, whereas in 96 h was lower ($P < 0.05$) in fresh OSP. Values of gas production in all time points for OSU were significantly ($P < 0.05$) lower in fresh than dried OSU exception of 48 h. the amounts of gas production between 36, 72 and 96 h in fresh and dried OSU were not significant (0.05).

Discussion

The LAB can survive in *in vitro* incubation. This LAB can be contain the probiotic effects in *in vitro* fermentation and cause to higher gas production in fresh silages than dried silages. But in OSU with higher pH, because of less numbers of LAB this effect was not observed. These results showed that LAB in fresh silages has the potential to influence on rumen fermentation and fresh samples ferment differently in *in vitro* than dried samples.

Table 1. Cumulative gas production amounts in dried and fresh silages. Within a row, means followed by different letters differ ($P < 0.05$).

Time point	silages					
	Fresh control	Dried control	Fresh OSP	Dried OSP	Fresh OSU	Dried OSU
2	34.76[b]	25.74[a]	28.65[b]	25.9[a]	4.69[a]	18.49[b]
4	68.21[b]	51.29[a]	65.85[b]	58.31[a]	13.51[a]	36.44[b]
6	85.10[b]	70.26[a]	75.04[b]	69.74[a]	30.88[a]	52.15[b]
8	97.90[b]	79.73[a]	84.31[a]	82.03[a]	33.44[a]	54.68[b]
10	115.48[b]	90.37[a]	96.52[a]	96.39[a]	36.56[a]	57.28[b]
12	134.82[b]	102.04[a]	112.74[a]	109.43[a]	45.51[a]	60.76[b]
16	160.30[b]	125.31[a]	139.03[a]	133.83[a]	60.12[a]	74.24[b]
24	215.69[a]	182.17[a]	182.04[a]	181.71[a]	82.42[a]	96.16[b]
36	257.72[b]	221.88[a]	223.13[a]	221.43[a]	139.78[a]	142.64[a]
48	289.93[b]	254.63[a]	249.51[a]	249.00[a]	210.443[b]	185.16[a]
72	323.56[b]	292.28[a]	286.95[a]	274.68[a]	240.05[a]	229.48[a]
96	337.78[a]	315.98[a]	287.00[a]	309.79[b]	260.43[a]	261.11[a]