Effect of different ensiling periods on sorghum silage quality

T.J. Tonin[1*], J. Viégas[2], S. N. Pereira[3], L. T. Rocha[3], L.Cauduro[3], J. V. Leonardi[4], L. Sebastiany[4], L. Schumacher[4]

1-Autor: Programa de Pós Graduação em Zootecnia - Universidade Federal de Santa Maria, Email: tiagojtonin@gmail.com 2- Doctor, Professor at Departamento de Zootecnia, NUPECLE – Universidade Federal de Santa Maria 3- Programa de Pós Graduação em Zootecnia - Universidade Federal de Santa Maria4- Curso de Zootecnia - Universidade Federal de Santa Maria

Keywords: Starch, soluble sugars, fermentation

Introduction Sorghum (*Sorghum bicolor L. Moench*) is generally considered more tolerant to drought and grown under more limiting conditions than corn. Experiments conducted on lactating cows have proven that the total replacement of corn silage with sorghum silage did not affect milk yield. To achieve high quality on sorghum silage, cares with ensiling process especially fermentation period need to be taken. An extended ensiling period may increase losses through effluent and gases, and impairs on neutral detergent fiber and starch digestibility. With the aim of evaluate the effect of different ensiling periods on sorghum silage quality this experiment was carried out.

Materials and Methods The experiment was carried at the Núcleo de Pesquisa e Extensão da Cadeia Leiteira (NUPECLE) located at the Universidade Federal de Santa Maria. The sorghum (Advanta® ADV 2499) was sown on January 2015 and was fertilized with 30 kg ha-1 of nitrogen (N). Plants were harvested and then chopped at an average particle size of 2 cm, so 48 mini-silos weighing 10 kg each one were made. The filling, compressing and sealing of the mini-silos were performed in a 10-L plastic buckets that were internally coated with plastic bags. The treatments consisted of three different ensiling periods (20, 40 and 60 day of fermentation), After opening the silos, samples were collected and analyzed by near-infrared spectroscopy (NIRS). For the pH analysis, it was used a digital phmeter. Dry matter recovery (DMR), losses through gases (LG) and effluents (LE) were estimated by the equations described by Jobim et al. (2007). The experimental design was a completely randomized with 3 treatments with 16 replications per treatment. The data were subjected to analysis of variance and an alpha level of 0.05 was used to test the statistical significance. Means were compared by the Tukey test. All statistical analyss were performed using the statistical software SAS (2001).

Results and Discussion The pH (Table 1) was not affected by different ensiling periods ($P>0.05$) indicating that a good production of lactic acid was achieved very soon. The alteration in this variable is related with the conservation of the ensiled material. A quick reduction in silage pH will help to limit the breakdown of protein in the silo by inactivating plant proteases and stops the growth of undesirable anaerobical microorganisms (Muck & Bolsen, 1991). In addition, the observed values are within the range considered as desirable for silage conservation. The starch content was also not affect by treatments, corroborating with results described by Orosz and Bellus (2012) that did not observe significant differences for higher fermentation periods. On ensiling process, only soluble sugars are fermented for the production of lactic acid which do not

includes starch. The results for dry matter (DM) and acetic acid were higher in treatment 60D when compared with 20D or 40D. Silos opened at 20 days presented higher values (P<0.05) of soluble sugars, which indicates that lactic acid production still persist after this storage period. The losses by effluents and gases, dry matter recovery and lactic acid content were not affected by treatments (P> 0.05). The proportion of butyric acid was higher (P< 0.05) in the silages with lower time of closing, coinciding with the lower DM content in this treatment. According to Bernal (2015), reducing the butyric acid production avoid dry matter losses and preserve the silage nutritional value. Ammonia levels were significantly higher (P <0.05) in the silages that remained stored for a longer period.

Conclusions Ensiling periods of 40 and 60 days are capable to improve silage quality when compared with 20 days. This occurs probably because this short storage period was not sufficient for adequate silage fermentation which can be noted by high sugar level in this treatment.

Table 1 Quantitative and qualitative variables for sorghum silage submitted to different ensiling periods

	Treatment[1]			
	20D	40D	60D	Probability
pH	4.03	4.01	3.97	0.50
Dry matter, %	28.45[a]	31.35[a]	31.49[b]	<001
Starch, %	21.97	21.99	21.06	0.56
Sugar, %	1.19[a]	0.33[b]	0.36[b]	<001
Effluent losses, kg/ton	7.28	6.78	7.76	0.37
Gases losses, , % of DM	2.47	2.87	2.60	0.48
Dry matter recovery, %	96.71	96.73	97.55	0.73
Lactic acid, % of DM	4.68	4.82	4.62	0.95
Acetic acid, % of DM	0.00[b]	0.06[ab]	0.25[a]	0.04
Butyric acid, % of DM	0.146[a]	0.01[b]	0.01[b]	<001
Ammonia, % of DM	2.30b	5.18a	5.11a	<001

a–b Means within a row with different superscripts differ (P < 0.05) by Tukey test; 1 Treatment: 20D 20 ensiling days, 40D 40 ensiling days, 60D 60 ensiling days