Total Accumulative Losses during the Fermentation of Pioneiro Grass (*Pennisetum purpureum* Schumach) Silages with Addition of Whole Plant Maize and Maize Grain

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Presenter Information

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Introduction

Pioneiro grass (*Pennisetum purpureum* Schumach) has gained importance in silage production mainly due to its robust habit, perenniality and high yield capacity, although its typically high moisture content may influence negatively its potential for ensiled conservation. High moisture content at the time of ensilage has resulted in increased losses by gases and effluents (Balsalobre *et al*. 2001, Nussio 2005). Despite these losses, the high yields of tropical forages still justifies their use and study as roughage and silage in ruminant nutrition.

Although tropical forages present an interesting alternative for conservation, maize silage still has widespread use across different systems because of its set of favorable natural characteristics for fermentation resulting in production of high quality silage (Anaya-Ortega *et al*. 2009). An experiment was conducted to evaluate the individual and combined effect of maize and Pioneiro grass on the total losses of the silages.

Methods

This research was carried out at the Federal University of Paraná, Palotina Campus, Palotina, Brazil. Thematerials under study were the Pioneiro grass and Maize. All plants were chopped to 20mm particles and placed into PVC experimental silos under 600 kg of fresh mass/m^3. The silos were provided with upper Bunsen valves to escape of gases and bottom valves to effluent drainage.

A completely randomized design was used within a split plot scheme, with ensilage processes as main plots and times of evaluation as subplots, with eight replicates. It tested four ensilages (Pioneiro grass 100%; Pioneiro grass 90% + Whole plant maize 10%; Pioneiro grass 98% + Maize grain 2%; Whole plant maize 100%) and twelve periods of fermentation (0, 1, 2, 3, 4, 5, 6, 7, 14, 21, 28 and 35 days).

The addition of whole plant maize and maize grain to the treatments was set on a fresh mass basis. In each one of the twelve periods of evaluation, the effluent harvested was discounted from the weight of silos to proper adjustment of losses.

Table 1. Means of total accumulated losses (% fresh matter) of different silages during fermentation (P: Pioneiro grass; PWPM: Pioneiro grass with whole plant maize; PMG: Pioneiro grass with maize grain; M: maize). Different letters in the same row differ by Tukey test (*P*<0.05).

Time (days)	Total accumulated losses (% FM)			
	Silages			
	P	PWPM	PMG	M
0	0.00 a	0.00 a	0.00 a	0.00 a
1	0.05 b	0.06 ab	0.17 ab	0.24 a
2	0.08 b	0.11 b	0.19 ab	0.29 a
3	0.14 b	0.17 ab	0.27 ab	0.34 a
4	0.20 a	0.18 a	0.30 a	0.36 a
5	0.21 a	0.20 a	0.31 a	0.37 a
6	0.22 a	0.20 a	0.33 a	0.38 a
7	0.28 ab	0.21 b	0.36 ab	0.41 a
14	0.39 ab	0.27 b	0.44 ab	0.48 a
21	0.47 a	0.29 a	0.45 a	0.49 a
28	0.54 a	0.32 a	0.52 a	0.49 a
35	0.63 a	0.34 b	0.55 ab	0.53 ab

Statistical analysis was performed using the GLM procedure, multiple comparison of means (Tukey) and an exponential model adjusted to the losses during fermentation. All tests were performed using the SAS software (version 9.0) at a level of 5% significance.

Results

There was an interaction (P<0.05) between the types of silage and evaluation times in relation to the total accumulated losses. Table 1 and Figure 1 show the average values of total losses accumulated during the period of study.

The addition of moisture absorbing components (maize grain) improved the fermentation conditions, possibly by reducing the moisture content and increasing the carbohydrates to fermentation. As maize plants had a dry matter content slightly higher than the Pioneiro grass, improvements on fermentation pattern in the combination of the two roughages were also observed.

The biggest difference in the total accumulative losses

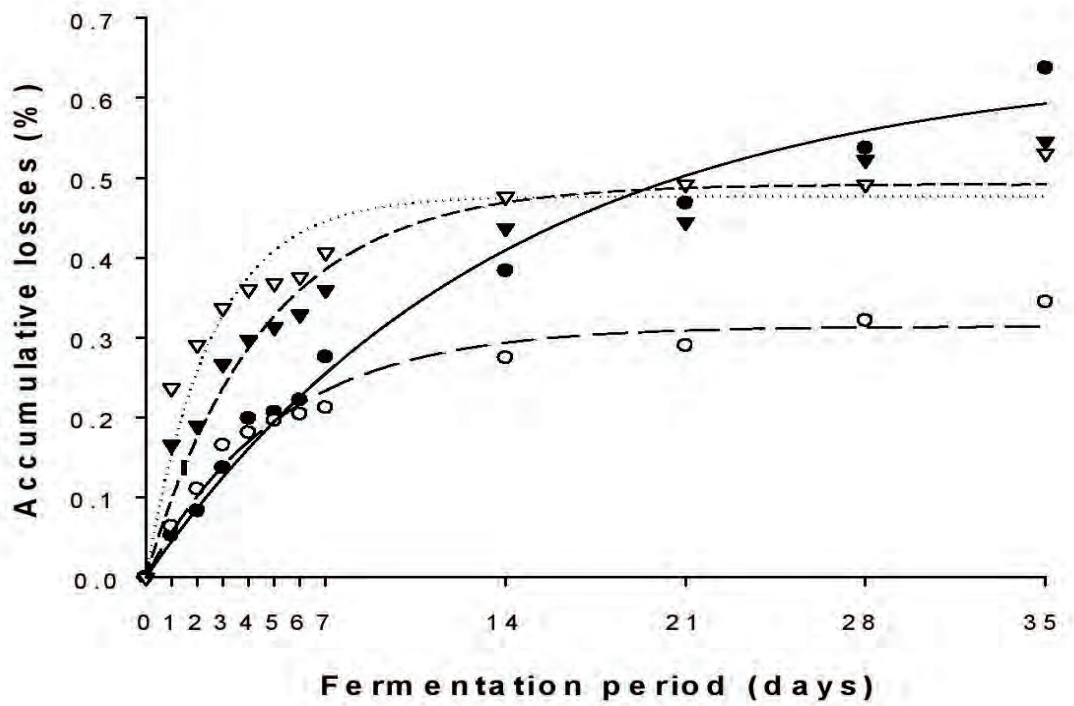

Figure 1. Total accumulated losses during the period of fermentation of single and mixed silages of Pioneiro grass and maize. —— (Pioneiro grass) Y=0.6445(1 – $e^{-0.0720x}$); — — (Pioneiro grass with whole plant maize) Y=0.3141(1 – $e^{-0.1948x}$); – – –(Pioneiro grass with maize grain) Y=0.4920(1 – $e^{-0.2185x}$); ····· (Maize) Y = 0.4768(1 – $e^{-0.3901x}$).

was observed between Pioneiro grass silage and Pioneiro grass silage mixed with whole plant maize, at 35 days (Table 1). Although maize may be considered the best forage for ensiled conservation, its total losses were not very different from the Pioneiro grass silages, particularly from seven days of fermentation.

Although the maize silage stabilized earlier (seven days) than other silages containing Pioneiro grass, the combination of Pioneiro grass with whole plant maize allows stabilization of losses from 14 days of fermentation with lower total accumulated losses (Fig. 1).

Conclusion

The faster stabilization of losses in maize silage can be offset by lower total accumulated losses of silage when Pioneiro grass is associated with whole plant maize, especially if the high dry matter production of the Pioneiro grass is taken into account.

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