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Total accumulative losses during the fermentation of Pioneiro grass (*Pennisetum purpureum*) silages with addition of whole plant maize and maize grain

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Introduction

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

However, maize silage is still used widely across different systems because of its 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 effects of maize and Pioneiro grass on the total losses from the silages during the ensiling process.

Methods

This research was carried out at the Federal University of Paraná, Palotina Campus, Palotina, PR, Brazil. Pioneiro grass and whole maize plants were chopped to 20 mm segments and placed into PVC experimental silos with 600 kg of fresh mass/m^3. The silos were provided with upper Bunsen valves to allow escape of gases and bottom valves for 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 8 replicates. Four silage types (Pioneiro grass 100%; Pioneiro grass 90% + whole plant maize 10%; Pioneiro grass 98% + maize grain 2%; whole plant maize 100%) at 12 periods after ensiling (0, 1, 2, 3, 4, 5, 6, 7, 14, 21, 28 and 35 days) were examined.

The addition of whole plant maize and maize grain to the treatments was calculated on a fresh mass basis. In each treatment, the effluent harvested was discounted from the weight of silos for proper adjustment of losses.

Statistical analysis was performed using the GLM procedure, with 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.

Table 1. Means of total accumulated losses (% fresh matter, FM) of different silages during fermentation (P: Pioneiro grass; PWPM: Pioneiro grass with whole plant maize; PMG: Pioneiro grass with maize grain; M: whole plant maize). Values within rows followed by different letters differ by Tukey test (P<0.05).

Time since ensiling (days)	Total accumulated losses (% FM) of 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

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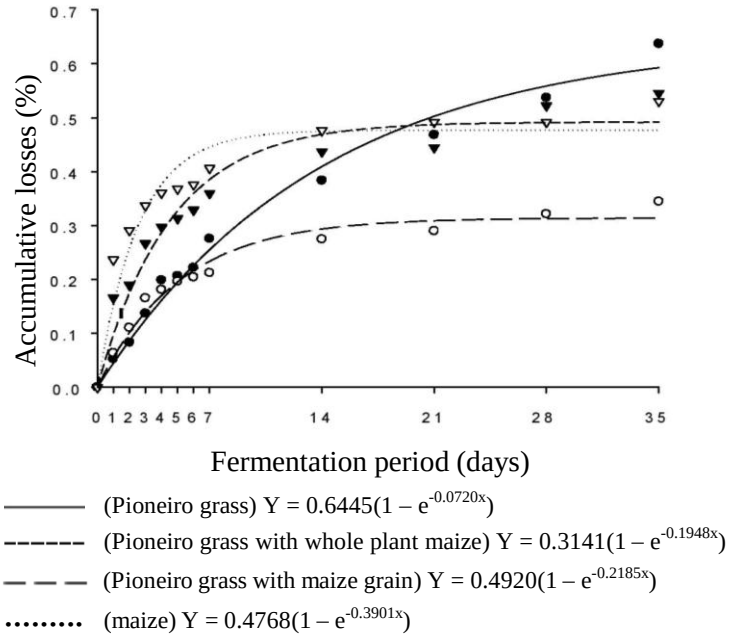

Figure 1. Total accumulated losses during the period of fermentation of single and mixed silages of Pioneiro grass and maize.

Results

Accumulated losses were very low throughout (<1% FM). There was an interaction (P<0.05) between the types of silage and time since ensiling in relation to the total accumulated losses (Table 1; Figure 1). While losses from the Pioneiro silage were lower than from whole plant maize silage during the first 3 days after ensiling, there were no differences between these treatments at 35 days. Overall, losses from the mixture of Pioneiro grass and whole plant maize were lower than from Pioneiro grass alone.

The addition of a moisture-absorbing component (maize grain) failed to affect the fermentation losses.

Conclusion

Although maize may be considered the best forage for conservation as silage, the similar losses to Pioneiro during the process of fermentation mean that other factors like differences in nutritive value, and higher yield of Pioneiro grass need to be considered in making a choice of what forage to ensile. Combinations of the two forages may have lower losses but the differences in magnitude of the losses might not justify the additional effort involved.

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