Losses and dry matter recovery of Pioneiro grass (*Pennisetum purpureum* Schumach) and maize silages in mixtures

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Introduction

Forages ensiled with high moisture content produce increased quantities of effluents losing highly digestible nutrients (McDonald 1981). The ensilage process usually involves gaseous and effluent losses which are strictly related to the moisture content of the plants used for conservation. The addition of materials with high dry matter content and materials which improve the fermentation pattern has been an alternative to reduce these effluent losses. The maize plant and maize grain, by their physical and fermentative characteristics, may represent alternatives to reduce the losses in the process (Anaya-Ortega *et al.* 2009). This work was carried out with the aim to evaluate the effect of whole plant maize and maize grain addition to silages of Pioneiro grass as way to control dry matter losses.

Methods

The research was carried out at the Federal University of Paraná, Palotina Campus, Palotina, Brazil. The materials under study were the Pioneiro grass (*Pennisetum purpureum* Schumach) 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, with four treatments and eight replicates. The treatments involved four types of silage mixtures: Pioneiro grass 100%; Pioneiro grass 90% + Whole plant maize 10%; Pioneiro grass 98% + Maize grain 2%; Whole plant maize 100%. The addition of whole plant maize and maize grain to the treatments was set on the fresh mass basis.

Losses by gases (GL) and effluents (EL), and the dry matter recovery (DMR) of the silages were measured. The dry matter recovery was calculated by the following equation:

DMR = [(smso x dmso) / (sme x dme)] x 100

where: smso= silage mass at silo opening (g); dmso = dry matter at silo opening (%/100); sme = silage mass at ensiling (g); and dme = dry matter at ensiling (%/100).

Table 1. Mean values of gaseous losses (GL), effluent losses (EL) and dry matter recovery (DMR) of Pioneiro grass and maize silages in mixtures. (P: Pioneiro grass; PWPM: Pioneiro grass with whole plant maize; PMG: Pioneiro grass with maize grain; M: maize).

	P	PWPM	PMG	M
GL % DM	11.14 a	8.65 b	0.69 c	1.25 c
EL kg/t of silage	2.36 a	0.17 a	0.00 a	0.00 a
DMR%	88.78 d	91.30 c	99.30 a	97.49 b

Different letters in the same row differ by SNK test (P<0.05).

Statistical analysis was performed using the GLM procedure and test of multiple comparison of means (SNK) at 5% of significance by the SAS software (version 9.0).

Results

Table 1 presents the average percentages of gaseous and effluent losses and the dry matter recovery of materials used in the study. A significant effect (P<0.05) of maize and Pioneiro grass and their mixtures was found to gaseous losses and dry matter recovery. The whole plant maize silage and Pioneiro grass silage with maize grain had lower gaseous losses and, although not significant compared between treatments, no losses by effluents. The largest losses of Pioneiro grass silage and Pioneiro grass silage with whole plant maize are likely due to lower carbohydrates and higher moisture of these silages. Although the effluent losses were not significant, the Pioneiro grass silage showed the lowest dry matter recovery.

Conclusion

The addition of maize in Pioneiro grass silages was effective in reducing gaseous losses and improving the dry matter recovery. Although the Pioneiro grass silage with whole plant maize resulted in a lower dry matter recovery compared with silage containing maize grain, this silage is still better than the silage made exclusively from Pioneiro grass.

References

Anaya-Ortega JP, Garduño-Castro G, Espinoza-Ortega A, *et al.* (2009) Silage from maize (*Zea mays*), annual ryegrass (*Lolium multiflorum*) or their mixture in the dry season feeding of grazing dairy cows in small-scale dairy production systems in the highlands of Mexico. *Tropical Animal Health and Production* **41**, 607-616.

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