Aerobic stability of Pioneiro grass silages with addition of maize grain or whole maize plant

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Introduction Silages have been an important alternative to ruminant nutrition due to the seasonality of pasture growth in different regions. Maize, although regarded as an ideal crop for conservation due to its high quality in silage production (McDonald et al., 1991), is a plant known by its low tolerance to climate changes. To minimize the effects of seasonal climatic variations on forage allowance, some cultivars of *Pennisetum purpureum* have been used due to their perennity, drought tolerance and increased forage yield, sometimes yielding up to three times more dry matter than the maize plant.

One of the challenges found in the silage use is the process of aerobic degradation where the presence of oxygen into the silage mass triggers the growth of undesirable microorganisms causing increased temperature and nutritional losses (Bernardes et al., 2007). To track the changes on silage quality during feed out phase, the temperature variation has been a useful measurement to show the start of silage spoilage. Thus, a trial was carried out with the aim to study the correlation between thermal changes and aerobic stability on pure and mixed silages of Pioneiro grass and maize.

Materials and Methods The research was carried out at the Federal University of Paraná, Palotina, Brazil. The materials under study were the Pioneiro grass (*Pennisetum purpureum* Schumach) and Maize (*Zea mays*). All plants were chopped to 20mm particles and placed into experimental silos under 600 kg of fresh mass/m^3. It was used a completely randomized design within a split plot scheme, with ensilage processes as main plots and times of aerobic exposure as subplots, with eight replicates. It were tested four ensilages (Pioneiro grass 100%; Pioneiro grass 90% + Whole plant maize 10%; Pioneiro grass 98% + Maize grain 2%; Whole plant maize 100%) and four periods of aerobic exposure (0, 5 10 and 15 days after silo opening). The addition of maize was set on the fresh mass basis. The environmental and silo temperatures were monitored regularly using thermo sensors inserted into the silage mass and connected to data loggers. The aerobic stability was considered as the time elapsed so that the temperature of the silage increased two degrees Celsius when compared to the environment, after the silo was opened. The statistical analysis was performed using the GLM procedure and multiple comparisons of means (SNK) by the SAS software (version 9.0) at a level of 5% significance.

Results and Discussion It was observed significant differences in the temperature variations for aerobic exposure and silages, but without effects of interaction between these variables (Table 1). Although the days used in the statistical analysis of aerobic stability have not demonstrated the breakdown of the stability, probably due to the nesting effect of silages at each evaluation date, the exploratory analysis of the daily individual temperature variations until the 15th day allowed the identification of aerobic stability breakdown for maize silage from the 9th day after silo opening (Figure 1).

Despite Pioneiro grass silages had not their aerobic stability impaired by the addition of maize, it is shown that the silage containing maize grain had its thermal oscillation very close to

the limit for the breakdown (Figure 1). The association of both plants in a mixture of forages (Pioneiro grass + whole maize plant) resulted in silages with lower temperature variation during the aerobic exposure.

Conclusion The addition of maize as grain or whole plant to Pioneiro grass silages is effective in keeping the aerobic stability of the silage mass. These mixtures can be used to produce higher yield of more stable silages, but the choice of maize grain to Pioneiro grass mixed silage still has the advantage to release more field space to increase the total silage yield at farm scale.

Table 1 Temperature changes between silages and times during aerobic exposure. (P: Pioneiro grass; PWPM: Pioneiro grass + whole plant maize; PMG: Pioneiro grass + maize grain; M: Maize).

	Silage			
	P	PWPM	PMG	M
Temperature (^{o}C)	0.62b	0.54b	0.89ab	1.54a
	Time of aerobic exposure (days)			
	0	5	10	15
	-0.07b	1.03a	1.17a	1.47a

Means with same small letters in the rows are not different (P>0.05) by SNK test.

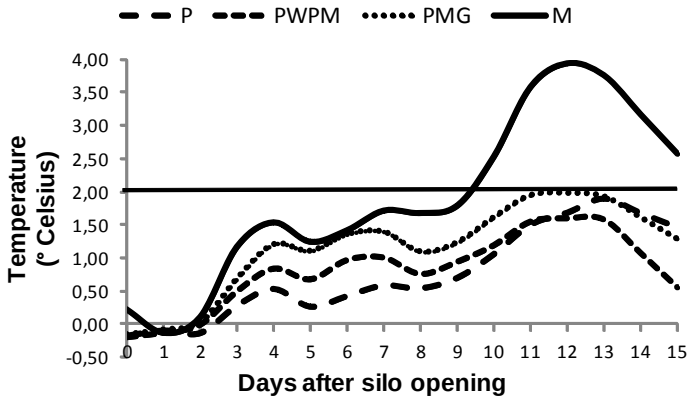

Figure 1 Temperature variations during aerobic stability of Pioneiro grass and maize as pure and mixed silages. (P: Pioneiro grass; PWPM: Pioneiro grass + whole plant maize; PMG: Pioneiro grass + maize grain; M: Maize). Ambient temperature set as the control.

References

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