Effects of wilting and addition of microbial additive and common salt on fermentation profile, dry matter losses and aerobic stability of elephant grass silages

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Introduction The use of supplementary forage on dry season is essential to achieving greater productivity, being one of the options the use of tropical grass silages, such as elephant grass (*Pennisetum purpureum* Schum.). Recently introduced in Brazil the elephant grass Paraiso is an inter-specific hybrid resulted of crossing of elephant grass with millet [*Pennisetum glaucum* (L.) R.Br.], being propagated by seeds, which facilitates its establishment. Due to the low content of dry matter (DM), ensilage of elephant grass requires wilting or microbial additives to improve the fermentation process. However, some farmers from the northwest region of the São Paulo state have used common salt (NaCl) as additive, with obtaining elephant grass silages with good appearance and animal feed intake, although research findings suggest that the use of this additive does not promote improvements in the quality of the silage. The objective of this study was to evaluate the effects of wilting and addition of microbial inoculant and common salt on elephant grass ensilage.

Materials and Methods This study was conducted at Nossa Senhora Aparecida farm in Andradina (20°53'46"S and 51º22'46"W), situated in Northwest of the São Paulo state, at an average altitude of 405 m. The elephant grass cultivars Napier and Roxo and the elephant grass Paraíso were cut with 12 weeks of growth, in June 2010. After harvesting, the material was exposed to sunlight for about 6 hours to wilting. The chopped material was subjected to treatments: control, application of microbial additive and adding common salt (NaCl) at doses of 0.5, 1.0 and 1.5% (fresh matter basis). The inoculant Lausil® CL (Lallemand) was diluted with distilled water (2 mg/mL) and applied at the rate of 1 mL/kg of forage to provide *Lactobacillus plantarum* (1.0×10^5 cfu/g of fresh forage) and *Pediococcus acidilactici* (3.0×10^4 cfu/g of fresh forage). The forage was ensiled in experimental silos (plastic buckets with a capacity of 10 liters, containing 2 kg of sand). At ensiling and silo opening (60 days of storage), samples were collected for DM determination in an oven (at 55°C) and subsequently milled. The buffering capacity to hydrochloric acid was determined on forage dried samples. Subsequently, 25 g of fresh samples (at the time of ensiling and opening the silos) were added to 225 mL of deionized water and processed in industrial blender for one minute. The pH was determined through direct reading using pH meter. Then the extract was filtered (filter paper of medium filtering), the filtrate obtained was stored in a freezer (-20°C) for later determination of water-soluble

carbohydrates concentrations. The silos were properly weighed at closing and opening to determine the dry matter losses, gas losses and effluent production. To determine aerobic stability, immediately after the opening of the silos, portions of about 1.5 kg of silage were transferred to plastic buckets, which were maintained at ambient temperature conditions. The temperatures were recorded every 12 hours (19:00 PM and 07:00 AM) for 5 days. Aerobic stability was calculated as a rate of temperature rise (°C/h) using the maximum observed temperature (°C) divided by time (in hours) required to reach maximum temperature. The experimental design was completely randomized in a factorial 3 x 6, three grasses and six treatments, with three replications. The results were submitted to analysis of variance by PROC GLM of SAS and means were compared by Tukey test at 5% probability.

Results and Discussion The DM contents in fresh forages were 24.50%, 30.18% and 20.34% for Paraíso, Roxo and Napier cultivars ($P<0.05$), respectively. This large difference observed for the same growth period (12 weeks) can be attributed to the growing conditions of each forage. These high DM values may be related to low rainfall observed during the experiment (dry season). Differences in DM led to alterations in silage densities, which was higher for the Napier cultivar (666.22 kg/m³) and lower for the Roxo cultivar (454.42 kg/m³). In turn, wilting also resulted in a greater DM ($P<0.05$) for the three forages evaluated. In general the buffering capacity of the elephant grass Paraíso was higher ($P<0.05$) than that of Roxo and Napier cultivars. For all forages, NaCl reduced the buffering capacity, especially for the dose 1.0%. Water-soluble carbohydrates content was higher ($P<0.05$) in Napier cultivar (12.01% DM) than in other cultivars (8.08 and 8.66% DM for Paraíso and Roxo, respectively). The treatments did not affect water-soluble carbohydrates concentrations. Despite the differences observed for DM and water-soluble carbohydrates, as well as for buffering capacity, the pH values obtained for all silages are within the optimal range (3.8 to 4.2), indicating that the fermentation process was adequate. It was also observed that the pH values of silages from Napier cultivar were significantly lower, despite the lower DM content at ensiling, probably because the higher content of water-soluble carbohydrates. Although wilting raise ($P<0.05$) the silage pH compared to control treatment (3.92 vs. 3.83, respectively), for all cultivars, gas losses and total dry matter losses were not affected by wilting. The use of 1.0% NaCl decreased ($P<0.05$) these losses only for silages made with Napier cultivar. Regarding the aerobic stability, wilting was effective only for Paraíso cultivar, providing the lowest rate of temperature rise (0.0213°C/h) that differed ($P<0.05$) from other treatments. The silages of elephant grass cultivar Roxo had the lowest rates of temperature rise, compared to other cultivars. The addition of common salt did not affect aerobic stability parameters for any of the cultivars. Furthermore, the use of inoculant was not effective to improve the fermentation process as well as aerobic stability.

Conclusions Under the conditions in which the experiment was conducted, it is concluded that: 1) wilting would be recommended only for elephant grass Paraíso silage, 2) inoculation was not effective for ensiling the grasses evaluated, 3) the addition 1.0% of common salt could be recommended for ensiling elephant grass cultivar Napier, and 4) elephant grass cv. Roxo silages showed the best aerobic stability.