Aerobic stability of wet brewers waste ensiled with different nutritional additives

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Introduction The use of agroindustrial residues in animal feed allows minimizing production costs, improve productivity and minimize environmental impacts caused by their improper destination. The use of silage wet brewery waste (WBW) has emerged for its nutritional quality and availability during the year. The high water content of the WBW is limiting for ensiling, being necessary the drying process or the inclusion of absorbent additives. After opening the silos, exposure to oxygen contributes to the growth of microorganisms that deteriorate the silage. According to Oude Elferink et al. (2000), the aerobic stability can be defined as resistance to temperature increase of silage in panel of the silo and during supply to the animal at the trough. Thus, the objective was to evaluate the aerobic stability of wet brewers waste, ensiled with different nutritional additives.

Materials and Methods The experiment was conducted in Marechal Cândido Rondon, Paraná, Brazil (24°33'40"S 54°04'12"W). The wet brewery waste (BWB) was ensiled in PVC silos (100mm), 50 cm height and 10 cm diameter, with a capacity of approximately 3.00 kg of waste. The silage was compacted and the silos were sealed with PVC cover adapted to allow free escape of gases through Bunsen valves. The experiment design was a subdivided plot, where the treatments were: ensiled wet brewery waste (EWBW), WBW with wheat bran (EWBW + WB), EWBW with corn grits (EWBW + CG) and EWBW with soybean hulls (EWBW + SH). The silos opening was after 52 days of fermentation, and there were taken temperature and pH (time 0) values. After opening the silo, the material was placed in plastic trays, about 1.5 kg, staying for 10 days for aerobic stability evaluation. Trays with the samples were kept in a closed room, monitoring the temperature with digital thermometer in each sample twice daily (8a.m. and 8 p.m.). The pH of samples was monitored according to the methodology proposed by Cherney and Cherney (2003). The aerobic stability was calculated as the time, in hours, to raise the temperature 2ºC higher than the room temperature (Kung Jr. et al., 2000). Data were subjected to analysis of variance and means compared by Tukey test at 5% probability.

Results and Discussion The aerobic stability was not affected ($P > 0.05$) by the treatments tested. There was no heating until about 40 hours after opening the silos, indicating that evaluated silages have good stability. However, according to Siqueira et al. (2010), the interpretation of the results of aerobic stability considering additives should be undertaken with caution. The variable days to achieve the maximum temperature of the ensiled mass was also unaffected by the different nutritional additives. The maximum temperature reached, discounting the environment temperature, was higher ($P<0.05$) for silage EWBW + SH, and the lowest temperature of the silage was presented by EWBW without additional additives. The temperature measurements taken twice a day can be a critical factor in the accuracy of the information. The maximum value of pH (pHmax) was observed in silage EWBW + SH. However, the number of days to achieve the maximum pH (DpHmax) on this silage was higher than the others. The values of pH in the silo opening, although different among silages, showed to be next, within the range considered standard (Rotz and Muck, 1994). According to the model of aerobic deterioration of Muck et al.

(1991), several factors affect silage stability, including pH, acids, residual soluble carbohydrates and initial population of yeasts and filamentous fungi. The temperature alone is not the most appropriate parameter for characterizing aerobic stability.

Conclusion The aerobic stability of wet brewery waste silage was not affected by adding nutritional additives at the time of ensiling.

References

Kung L.J. 2001. Microbial and chemical additives for silage: effect on fermentation and animal response. In: Workshop SOBRE MILHO PARA SILAGEM, 2., 2001, Piracicaba. Anais... Piracicaba: Fundação de Estudos Agrários Luiz de Queiroz. p.53-74.

Cherney, J.H.; Cherney, D.J.R. 2003. Assessing Silage Quality. In: Buxton *et al.* Silage Science and Technology. Madison, Wisconsin, USA. p.141-198.

Oude Elferink, S.J.W.H.; Driehuis, F.; Gottschal, J.C. *et al.* Silage fermentation process and their manipulation. In: FAO ELETRONIC CONFERENCE OF TROPICAL SILAGES, Rome, 1999. Silage making in the tropics with emphasis on smallholders. **Proceedings…** Rome: FAO, 2000, p.17-30.

Rotz, C.A.; Muck, R.E. 1994. Changes in forages quality during harvest and storage. **In:** National Conference on Forage Quality, Evaluation, and Utilization Held at The University of Nebraska, 1994, Lincoln, 828 – 868.

Table 1. H 2°C values (time in hours to raise temperatures by 2°C); DTmax (number of days to reach the maximum temperature), Tmax (maximum temperature reached by the silage mass); pH 0 (pH measured at the time of silo opening); pHmax (maximum pH); DpHmax (number of days to reach the maximum pH)

Variables	Treatments				CV %
	EWBW	EWBW + WB	EWBW + CG	EWBW + SH	
H 2°C, hours ^{ns}	39.00	48.00	48.00	48.00	19.67
DTmax, days ^{ns}	6.00	3.75	4.25	5.25	30.73
Tmax, °C	26.10c	29.30ab	27.20bc	30.15a	4.13
pH 0	3.52c	3.81a	3.65b	3.82a	0.23
pHmax, pH	6.19c	7.44b	6.12c	8.54a	3.92
DpHmax, days	9.50ab	9.50ab	8.50b	10.00a	5.33

^{ns} P>0.05;

Means followed by same letter in row did not differ (P> 0.05) by Tukey test.