Microbiological evaluation of wet brewer's grain silage at different opening periods

P. G. Ribeiro[1], F. Jacobs Dias[1], A. L. Cardoso[2]
[1]*Federal University of Amazonas, Department of Animal and Vegetal Production, Manaus, Amazonas, Brazil*
[2]*Federal University of Amazonas, Manaus, Amazonas, Brazil*
Email: pamyribeiro@gmail.com

Introduction The searching for alternative foods in order to assure the efficiency in animal diets through the periods of weather changes (such as winter or a dry season) is relevant. Nowadays, the wet brewer's grain (WBG) plays an important role because of its high nutritional quality and availability. On the other hand, there are limitations on the use of this byproduct in animal feed, which are mainly related to the typical low dry matter (DM) content, compromising the transport and storage. In general, given good management and the improved equipment available today, silage fermentation offers the best means to maximize and preserve the nutritive value of a given material (Pahlow et al., 2003). It must be noted that the microbial population of a particular product is not the same as that found during the ensiling process and depends, among other factors, on pH and dry matter content found in silage. The present study aimed to perform microbiological evaluations of wet brewer's grain (WBG) submitted to different ensiling periods, through the counts of aerobic bacteria, filamentous fungi, *Bacillus cereus* and *Escherichia coli*.

Materials and Methods The trial was carried out in Manaus, AM, Brazil and consisted of five treatments (10, 17, 24, 31 and 38 days of ensiling) with three replications. The material was ensiled in PVC experimental silos (10 cm diameter x 50 cm) with capacity of approximately 4 kg of fresh weight. The samples were taken of WBG *in natura* and at the time the silos were opened according to the different storage periods to evaluate the fresh and ensiled microbial quality of the WBG. In the sample collection it was considered only the middle portion of the silos. The partial dry matter (DM) values were determined in comparison to the DM amounts obtained with the microwave oven method. The DM content, total DM losses (Schmidt, 2006) and pH in silages were also evaluated. The microbial population has been shown to vary with the pH range. Data obtained from DM, pH and DM losses of WBG were submitted to variance analysis using a completely randomized design and the means were compared by the Tukey test.

Results and Discussion Mean DM content (Table 1) are not appropriated for silage, however they are between the variations (9% to 30%) found for this product. Probably the behavior seen, about the pH values, can be attributed to insufficient production of lactic acid, since this may not have been produced at inhibitory levels to keep the pH low. However, the initial pH value (5.65) was suitable for the material ensiling. After 10 days, mean DM losses reached 7.45% which indicates a trend of increased losses strongly linked to the low DM content (23.99 %). It was considered appropriate to use the microwave oven to determine the DM content of WBG silages, due to the similarity of values obtained with oven drying (Table 1).The effect of opening day ($P<0.05$) was observed at 38 days when the results have shown satisfactory silage quality. Silage fermentation was able to reduce the population of aerobic bacteria and filamentous fungi in silages at 10 days (Figure 1), which explains the importance of the rapid decline in pH. Between 31 and 38 days of ensiling the counts observed were close to those found in the original samples for *Bacillus cereus* and *Escherichia coli* that can be related to the growth of lactic acid bacteria (LAB) and decrease in pH.

Conclusion The microwave oven can be used to obtain the DM content of WBG silage in 12 minutes. The DM losses are considered normal at the level of experimental silos. The silages in T5 (38 days) presented better quality. Silage promoted a significant reduction of mesophilic aerobic bacteria, filamentous fungi, *Bacillus cereus* and *Escherichia coli* compared to the fresh material.

References

Pahlow, G., R. E. Muck, F. Driehuis, S. J. W. H O. Elferink, and S. F. Spoelstra. 2003. Microbiology of ensiling. In.: Buxton et al. Silage Science and Technology. Madison, Wisconsin, USA. 11-79.

Schmidt, P. Perdas fermentativas na ensilagem, parâmetros digestivos e desempenho de bovinos de corte alimentados com rações contendo silagens de cana-de-açúcar. 2006. 228f. Tese (Doutorado em Agronomia)-Universidade de São Paulo, Escola Superior de Agricultura Luiz de Queiroz.

Table 1. WBG silage fermentation variables according to different days of ensiling

	Variable[1]				
Days of ensiling	DM, %	DMmw, %	DMo, %	pH	DM losses, %
0*	23.93^{b}	24.01^{d}	25.77^{ab}	5.64^{a}	0.0^{d}
10	23.99^{b}	25.20^{cd}	25.04^{b}	3.56^{c}	7.45^{c}
17	23.16^{ab}	27.76^{ab}	26.51^{ab}	3.99^{b}	8.37^{c}
24	25.08^{ab}	26.67^{bc}	26.17^{ab}	4.34^{b}	10.70^{b}
31	25.07^{ab}	27.02^{abc}	26.72^{a}	4.33^{b}	13.22^{a}
38	25.29^{a}	28.86^{a}	27.18^{a}	4.0^{b}	12.03^{ab}
CV, %[2]	1.90	2.88	2.29	3.32	8.90

Means followed by different letters in the same column differ (P<0.05) by Tukey test.
*WBG *in natura*.
[1]DMmw = dry matter obtained with microwave oven; DMo = dry matter determined with oven drying.
[2]CV = coefficient of variation.

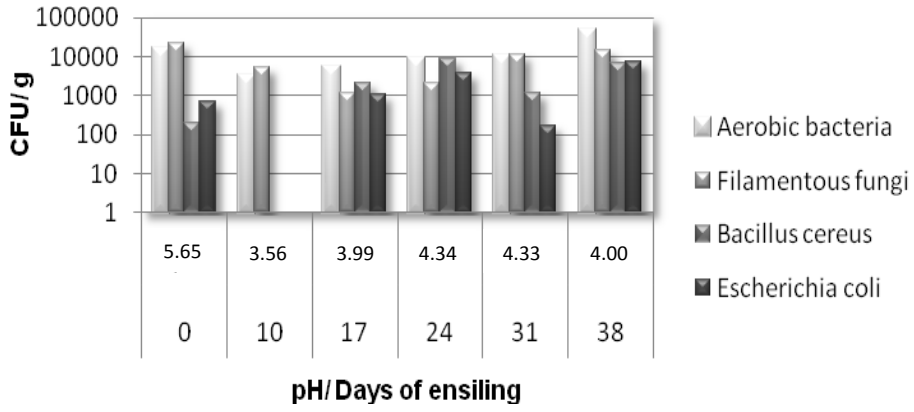

Figure 1. Colony forming units (CFU/g) of aerobic bacteria, filamentous fungi, *B. cereus* and *E. coli* found in the WBG silages related to the pH range and days of ensiling.