Dry matter losses and aerobic stability of whole plant corn silo inoculated with Lactobacillus buchneri CNCM I-4323

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Keywords Lactobacillus buchneri, dry matter losses,aerobic stability, silage, corn

Introduction The whole plant corn (WPC) silageis the most widespread ingredient used in livestockand dairyfarms in Argentina.Once opened the silage for supply, it is exposed to oxygen deterioration due to aerobic microbial activity, which could influence negatively in quantity and quality of the silage. The inoculation with heterofermentative bacteria, such as *Lactobacillus buchneri*appears as an answer to increase the acetic acid in corn silages, to subsequently reduce the presence of molds, yeasts and silage deterioration (Kung, 2001).The objective of this study was report the effects of *L. buchneri*, strain CNCM I - 4323, on dry matter losses (DML), aerobic stability (AS) and yeast and molds population of WPC silage.

Materials and Methods Corn DK 390, 110 days since sowing, was hand harvested, processed and ensiled in 20-liters plastic buckets provided with valves for gas release and a device for effluent collection, according to the methodology proposed by (Queiroz, 2006; Pedroso et al., 2008). The following treatments were applied to the fresh forage before ensiling: 1) untreated (control), 2) urea ($CO(NH_2)_2$) at 1% of fresh weight (FW), 3) Bacterial inoculant with heterolactic bacteria (LAB) *Lactobacillus buchneri* strain CNCM I-4323 (1×10^5 CFU g^{-1} of FW). Laboratory silos were kept at ambient temperature. Four repetitions were made for each treatment andSilos were sampled at 120 days after ensiling (DAE). For AS evaluation, samples of approximately 3.5 kg of each replicate were transferred to 10-liters plastics buckets kept at room temperature. Temperature was recorded every three hours through thermometers positioned at the geometric centre of the forage mass. Datawere analyzed as a completely randomized design and subjected to ANOVA by InfoStat® software (Di Rienzo et al. 2011). Differences among means were tested using Tuckey's test ($p < 0.05$).

Results and Discussion Reduction in the total DML in the anaerobic stage was observed in favor of the treatment with LAB at 120 DAE ($P < 0.01$), with respect to the control and the urea treatments. There is a strong reduction in the gases losses (GL) ($P < 0.01$), and effluent production (EP) ($P < 0.01$) for this treatment (Table 1). A correlation is observed between GL and EP and molds and yeasts population detected during the anaerobic stage. The differential values between treatments could be caused by the action against microbial population of fermentative profile obtained with the LAB.

Table 1. Dry matter lossesparameters and microbial population of whole plant corn silages, sampled 120 days after ensiling,treated with and without additives.

	Treatments		
Parameter	Control(1)	Urea(2)	LAB(3)
DML (%)(4)	17,18[a]	16,26[a]	12,29[b]
GL (% DM) (5)	14,13[a]	13,62[a]	10,03[b]
EP (kg/t FW) (6)	29,49[a]	35,24[b]	25,45[c]
Molds ($log_{10}CFUg^{-1}$)	2,29[a]	4,28[b]	2,01[c]

Yeast ($log_{10}CFUg^{-1}$)	$1,90^{a}$	$3,55^{b}$	$1,45^{c}$

[a,b,c,] Means in the same row with unlike superscripts differ ($p<0.05$). [(1)] WPC silage with no additive (control). [(2)] WPC silage inoculated with urea ($CO(NH_2)_2$ (1 % FF). [(3)] WPC silageinoculated with heterolactic bacteria *Lactobacillus buchneri*CNCM I - 4323 (1×10^5 CFU g^{-1} of FW).[(4)] Total dry matter losses. [(5)] Gaseous losses. [(6)] Effluent production.

The AS results show significant differences among the three treatments, with better values in LAB treatment ($P < 0.01$): 84 hours of AS at 120 DAE (Table 2). The treatment with LAB showed better values of acidity ($P < 0.01$) and about the time to get the maximum temperature ($P < 0.01$) during the AS trial as well.

Table 2. Aerobic stabilityparameters of whole plant corn silages, sampled 120 days after ensiling,treated with and without additives.

	Treatments		
Parameter	Control	Urea	LAB
AS (h)[(1)]	66^{a}	69^{a}	84^{b}
TTmax (h) [(2)]	81^{a}	84^{a}	96^{b}
pH – 10 [(3)]	$5,55^{a}$	$8,18^{b}$	$4,53^{c}$

[a,b,c,] Means in the same row with unlike superscripts differ ($p<0.05$). [(1)] Aerobic stability. [(2)]Time to get maximum temperature in aerobic stability trial. [(3)] Silage pH after ten days of air exposure in aerobic stability trial.

Conclusions It can be stated that inoculation of whole plant corn silage with heterolactic bacteria such as the one used in this trial, results in lower losses of dry matter and lower production of gases and effluents, compared to the others treatments of this assay. The addition of a silage additive composed of *Lactobacillus buchneri*CNCM I-4323reduces the deterioration of whole plant corn silages when they wereexposed to oxygen.

Acknowledgments This research and the tested additive were supported by Lallemand Animal Nutrition.

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