

## Microbial changes and aerobic stability in high moisture maize silages inoculated with *Lactobacillus buchneri*

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**Introduction** Oxygen exposure changes microbial and chemical profiles of silages after silo opening. Yeast and fungi are the main active microorganisms responsible by consumption of nutrients and fermentative residual products, which increases temperature in the ensilaged mass. The *Lactobacillus buchneri* (*L. buchneri*) has been considered an aerobic stability controller. This work aimed to evaluate the effect of *L. buchneri* in ensilage process of high moisture maize.

**Material and methods** High moisture maize was harvested with 70% of DM. Five doses of *L. buchneri* (NCIMB 40788) (in cfu per g of fresh maize) were used: control, LB1 ( $5 \times 10^4$ ), LB2 ( $1 \times 10^5$ ), LB3 ( $2 \times 10^5$ ) and LB4 ( $4 \times 10^5$ ). Ensilage period was 68 days. At silo opening was determined: % DM, DM recovering (DMR), pH and ammonia level in relation to total nitrogen (N). After silo opening, aerobic stability was determined (h) according to Taylor & Kung (2002) and after 5 and 10 days of aerobic exposure yeast and fungi were counted (Taylor & Kung, 2002). Four silos per treatment (plastic bucket with 20.0 cm height, 21.6 cm diameter, 5.0 kg of silage and 1,000 kg/m<sup>3</sup> density) were used. Means were compared by Tukey test ( $P < 0.05$ ).

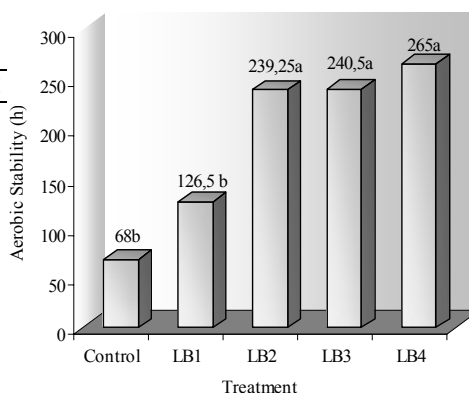
**Results** No DMR and pH changes and small alterations in % DM and ammonia:N ratio were observed during fermentation with *L. buchneri* (Table 1). During aerobic exposure, from LB2 dose no significant increments were observed in relation to temperature increase (Figure 1). This effect was proved by the control of yeast and fungi. In relation to yeast counting, at day 5 of aerobic exposure (120 h) the control and LB1 silages showed 6.6 and 6.2 log cfu/g of silage, respectively. However, other treatments showed a lower number (4.4 log cfu/g silage). Only at day 10 (240 h) silages LB2, LB3 and LB4 had yeast counting around 6 log cfu/g silage. Fungi were identified in LB1 silages from day 5 and in all silages from day 10. Taylor & Kung (2002) related the yeast and fungi control to acetic acid production by *L. buchneri*.

**Table 1** Parameters evaluated in silages of high moisture maize inoculated with *L. buchneri*

| Item                   | Control           | LB1                | LB2                 | LB3               | LB4                | SEM  |
|------------------------|-------------------|--------------------|---------------------|-------------------|--------------------|------|
| DM (%)                 | 66.5 <sup>a</sup> | 65.3 <sup>bc</sup> | 65.6 <sup>abc</sup> | 64.9 <sup>c</sup> | 65.9 <sup>ab</sup> | 0.22 |
| DMR (%)                | 98.3 <sup>a</sup> | 98.4 <sup>a</sup>  | 98.5 <sup>a</sup>   | 98.3 <sup>a</sup> | 98.7 <sup>a</sup>  | 0.59 |
| Ammonia/N              | 9.3 <sup>ab</sup> | 7.4 <sup>b</sup>   | 8.5 <sup>ab</sup>   | 8.3 <sup>ab</sup> | 9.7 <sup>a</sup>   | 0.45 |
| pH                     | 4.1 <sup>a</sup>  | 4.1 <sup>a</sup>   | 4.2 <sup>a</sup>    | 4.2 <sup>a</sup>  | 4.2 <sup>a</sup>   | 0.03 |
| Yeast (0) <sup>1</sup> | 2.7 <sup>a</sup>  | 3.5 <sup>a</sup>   | 4.0 <sup>a</sup>    | 3.4 <sup>a</sup>  | 3.9 <sup>a</sup>   | 0.33 |
| Yeast (5)              | 6.6 <sup>a</sup>  | 6.2 <sup>ab</sup>  | 4.2 <sup>ab</sup>   | 4.4 <sup>ab</sup> | 1.9 <sup>b</sup>   | 0.99 |
| Yeast (10)             | 6.6 <sup>a</sup>  | 6.8 <sup>a</sup>   | 6.8 <sup>a</sup>    | 6.3 <sup>a</sup>  | 6.1 <sup>a</sup>   | 0.47 |
| Moulds (0)             | ND                | ND                 | ND                  | ND                | ND                 | -    |
| Moulds (5)             | ND                | 3.5 <sup>a</sup>   | ND                  | ND                | ND                 | -    |
| Moulds (10)            | 5.2 <sup>a</sup>  | 5.2 <sup>a</sup>   | 5.4 <sup>a</sup>    | 3.2 <sup>a</sup>  | 3.9 <sup>a</sup>   | 0.93 |

<sup>a,b,c</sup> Means with different letters in rows are different ( $P < 0.05$ ).

<sup>1</sup>log cfu/g silage at silo opening and after 5 and 10 days of aerobic exposure.



**Figure 1** Effect of *L. buchneri* on aerobic stability (h)

**Conclusions** The *L. buchneri* (from dose  $1 \times 10^5$  cfu/g fresh maize) was efficient for controlling yeast and fungi growth and, consequently, temperature during aerobic exposure.

### References

Taylor, C.C. & L. Kung Jr. (2002). The effect of *Lactobacillus buchneri* 40788 on the fermentation and aerobic stability of high moisture corn in laboratory silos. *Journal of Dairy Science*, 84,1149–1155.