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J. G. Zhang

South China Agricultural University, China

Y. Cai

National Institute of Livestock and Grassland Science, Japan

H. Kawamoto

National Institute of Livestock and Grassland Science, Japan

Y. Aoki

National Institute of Livestock and Grassland Science, Japan

A. Yamad

National Institute of Livestock and Grassland Science, Japan

See next page for additional authors

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Presenter Information

J. G. Zhang, Y. Cai, H. Kawamoto, Y. Aoki, A. Yamad, and M. Kamo

Effects of two lactic acid bacteria strains on the fermentation and aerobic stability of corn silage

J.G.ZHANG¹, Y.CAI², H.KAWAMOTO², Y.AOKI², A.YAMAD² and M.KAMO²

¹Department of Grassland Science, South China Agricultural University, Guangzhou 510642, China, E-mail: zhangjg@scau.edu.cn, ²National Institute of Livestock and Grassland Science, Tochigi 329-2793, Japan

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Introduction Silage is increasingly becoming important to the animal production. However, in practice it is usually difficult to obtain a good silage in the fermentation quality and aerobic stability only by a natural fermentation. To improve silage fermentation quality, homofermentative lactic acid bacteria (LAB) have often been used at silage making, but such inoculated silages are liable to aerobic deterioration when the silo is opened (Zhang and Kumai 2000). Recently, it has been confirmed that *Lactobacillus buchneri*, a heterofermentative LAB, could inhibit yeast growth and improve the aerobic stability of silages (Muck, 1996). In the present study, the roles of two other LAB strains, isolated from silage by the authors, were studied.

Materials and methods Two LAB strains were *Lactobacillus* sp. TM1 and *L. brevis* TM2, isolated from the grass silage by the authors. They are both heterofermentative and neither belongs to *L. buchneri*. Whole crop corn (*Zea mays* L.), chopped to approximately 1cm lengths, was treated with TM1, TM2 or commercial inoculant - *L. buchneri*, and the control was made without LAB inoculation. The treated material was packed into a plastic film bag and the bags were degassed, sealed and kept at ambient temperature. The bag silos were opened after ensiling for 5 months and the fermentation quality and aerobic stability of silages were investigated.

Results All the silages, either the control or LAB inoculation, were well preserved. They had low ammonia-N contents (< 3.5% TN) and no butyric acid was detected, especially for the control and TM2 treatments with high lactic acid contents (>55 g/kg DM) and low pH values (< 4.0). TM1, TM2 and *L. buchneri* inoculations obviously inhibited yeast growth (Table 1) and improved the aerobic stability of silages (Figure 1). TM1 and *L. buchneri* inoculations increased acetic acid contents greatly, TM2 inoculation had a few effect on the acetic acid production.

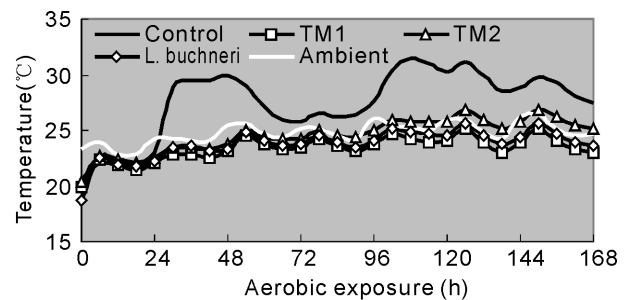


Figure 1 Effect of LAB inoculation on the temperature of silages during aerobic exposure.

Table 1 Characteristics of LAB inoculated silages.

	Control	TM1	TM2	<i>L. buchneri</i>
pH	3.91	4.43	3.96	4.36
Lactic acid (g/kg DM)	60.0	18.6	55.2	18.6
Acetic acid (g/kg DM)	14.8	27.2	16.9	26.6
Butyric acid (g/kg DM)	nd	nd	nd	nd
NH ₃ -N (% TN)	3.0	3.3	2.9	3.1
Yeasts (cfu/g FM)	3.2 × 10 ⁴	nd	nd	nd
Moulds (cfu/g FM)	nd	nd	nd	nd

nd : not detected.

Conclusion Two LAB stains of TM1 and TM2 had no great effect on the fermentation quality but could improve the aerobic stability of corn silage due to inhibiting the yeast growth. The mechanism of inhibiting yeast growth by the isolated LAB strains requires further study.

References

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