Round-bale silage preparation of rice straw

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Introduction Rice straw is an important feed resource for ruminants. In Japan, rice straw cannot be fully dried due to the usually humid autumn season, which leads to about 70% of the production being ploughed back or incinerated. Therefore, the development of techniques to enhance the long-term preservation and quality of rice straw is of great importance. In this work, a new lactic acid bacterium was used as a silage inoculant, and its effect on round-bale silage preparation from fresh rice straw was examined.

Materials and methods Fresh rice straw of Koshihikari cultivar was obtained from a field in Saitama, Japan, on October 2002. Silage was prepared using a round-bale system. Chikuso-1 (*Lactobacillus plantarum*, Brand seed Ltd., Sapporo, Japan; Cai *et al*., 2003) was used as an inoculant.

Table 1 Fermentation quality of rice straw silage

	Silage ensiled for 65 days		Silage ensiled for 300 days	
	Control	Chikuso-1	Control	Chikuso-1
pH	5.67[b]	3.77[a]	5.75[b]	3.85[a]
Dry matter (%)	65.73	65.97	64.56	63.24
Lactic acid (% FM)	0.17[a]	2.06[b]	0.22[a]	1.86[b]
Acetic acid (% FM)	0.16	0.18	0.35	0.27
Propionic acid (% FM)	nd	nd	nd	nd
Butyric acid (% FM)	0.14	nd	0.35	nd
Ammonia N (g/kg FM)	0.28[b]	0.09[a]	0.45[b]	0.10[a]

FM, fresh matter; nd, not detected. Chikuso-1: *Lactobacillus plantarum* ; a,b Values are means of three silage sample Means in the same silage row with different superscripts are significantly different ($P < 0.05$)

Results The moisture content of the fresh rice straw after harvest was 65%. Its content of water-soluble carbohydrates and crude protein were 5% and 4% of dry matter, respectively. The inoculant strain Chikuso-1 was a Gram-positive and catalase-negative rod that did not produce gas from glucose, formed L(+) and D(-) lactic acid and grew under a low-pH condition. After storage for 65 and 300 d, silages inoculated with Chikuso-1 were well preserved and exhibited significantly ($P<0.05$) lower pH, butyric acid and ammonia-nitrogen, and significantly ($P<0.05$) higher lactic acid content, as compared to control silages (Table 1). During silage fermentation, the control silages displayed mould growth, whereas in Chikuso-1-inoculated silages, moulds were at or below the detectable level.

Conclusions These results showed the growth potential of *Lactobacillus plantarum* Chikuso-1 and its beneficial effects on rice-straw silage, suggesting that this strain could help achieve higher quality and longer preservation of this type of silage.

Reference

Cai Y., M. Fujita, M. Murai, M. Ogawa & N. Yoshida (2003). Application of Lactic acid bacteria (*Lactobacillus plantarum* Chikuso-1) for silage preparation. *Grassland Science*, 49, 477-485.