



University of Kentucky
UKnowledge

International Grassland Congress Proceedings

XXI International Grassland Congress / VIII
International Rangeland Congress

The Effect of Ensiling Rice Straw with or without Bacterial Inoculants on Fermentation Quality, Chemical Composition and Nutritive Value

Chuncheng Xu
China Agricultural University, China

Yimin Cai
National Institute of Livestock and Grassland Science, Japan

Lujia Han
China Agricultural University, China

Xian Liu
China Agricultural University, China

Zengling Yang
China Agricultural University, China

See next page for additional authors

Follow this and additional works at: <https://uknowledge.uky.edu/igc>



Part of the [Plant Sciences Commons](#), and the [Soil Science Commons](#)

This document is available at <https://uknowledge.uky.edu/igc/21/15-1/40>

The XXI International Grassland Congress / VIII International Rangeland Congress took place in Hohhot, China from June 29 through July 5, 2008.

Proceedings edited by Organizing Committee of 2008 IGC/IRC Conference

Published by Guangdong People's Publishing House

This Event is brought to you for free and open access by the Plant and Soil Sciences at UKnowledge. It has been accepted for inclusion in International Grassland Congress Proceedings by an authorized administrator of UKnowledge. For more information, please contact UKnowledge@lsv.uky.edu.

Presenter Information

Chuncheng Xu, Yimin Cai, Lujia Han, Xian Liu, Zengling Yang, and Norio Yoshida

The effect of ensiling rice straw with or without bacterial inoculants on fermentation quality, chemical composition and nutritive value

Chuncheng Xu¹, Yimin Cai², Lujia Han¹, Xian Liu¹, Zengling Yang¹ and Norio Yoshida²

¹China Agricultural University, Beijing 100083, P. R. China, E-mail: xucc@cau.edu.cn. ²National Institute of Livestock and Grassland Science, Nasushiobara, Tochigi 329-2793, Japan

Key words: dry matter intake, fermentation, *Lactobacillus plantarum* Chikuso-1, nutritive value, rice straw silage.

Introduction Rice straw is an important forage for ruminants in many rice-producing countries. The annual yield of rice straw is about 900 million tonnes in Japan. The main nutritional constraints of rice straw as a ruminant feed are its low protein, high silica and slow rate of fiber digestion. Physical, chemical and biological pretreatments have been widely used to increase the nutritional value of rice straw. The purpose of this study was to compare the ensiling characteristics, dry matter intake and nutritive value of rice straw round bale silages with or without addition of a selected strain of lactic acid bacteria, *Lactobacillus plantarum* Chikuso-1.

Materials and methods Rice straw was chopped to the length of 20 cm by a rice harvester, and put in a baler, and wrapped with six layers of 0.025 mm white plastic film so that each of the bales in sealed condition. The diameter and width of the bales were approximately 80 and 90 cm. The bales were stored outdoor for 8 months.

Table 1 Fermentation quality and chemical composition of rice straw silages.

	Control	LAB
pH	5.35 ^a	3.98 ^b
Dry matter, %	32.1	31.9
Lactic acid, %DM	0.90 ^a	3.86 ^b
Acetic acid, %DM	0.37 ^a	0.82 ^b
Propionic acid, %DM	nd	nd
Butyric acid, %DM	0.06	nd
Ammonia N, %TN	0.14 ^a	0.03 ^b
Crude protein, %DM	5.6	5.7
Neutral detergent fiber, %DM	62.1	61.3
Acid detergent lignin, %DM	5.8	5.8
Cellulose, %DM	32.1	32.0
Hemicellulose, %DM	24.2	23.5

^{a,b} Values within each row with different superscript letters differ significantly (P < 0.05).

Table 2 Intake, digestibility and nutrient contents of rice straw silages.

	Control	LAB
Intake, g/kg W ^{0.75} /day	15.2	29.4
Digestibility, %		
Dry matter	58.2	59.3
Organic matter	63.1	64.4
Crude protein	76.5	76.6
Ether extract	66.3	67.6
Neutral detergent fiber	57.7	57.9
Acid detergent fiber	56.8	57.0
Cellulose	61.5	61.3
Hemicellulose	59.2	59.3
Gross energy	61.3	63.2
Nutrient contents		
TDN, %DM	53.7(41.7)	55.1(43.2)
DE, MJ/kg DM	9.9(7.71)	10.2(7.98)

Results After 8 months of fermentation, silage treated with strain *Lactobacillus plantarum* Chikuso-1 had a lower pH and higher lactic acid content than the control. The mold-generating portion in the treated and control silages were 0 and 30% on a fresh matter basis, respectively. There was higher voluntary feed intake by sheep in the treated silage than the control. The treated silage also showed a tendency for higher contents of total digestible nutrient (43.2 vs. 41.7%) and digestible energy (7.98 vs. 7.71 MJ/kg DM) than the control silage.

Conclusion It is concluded that the addition of strain *Lactobacillus plantarum* Chikuso-1 can improve fermentation quality, dry matter intake and nutritive value of round bale silage of rice straw.

Reference

Xu, C., Y. Cai, J. Zhang, and M. Ogawa. 2007. Fermentation quality and nutritive value of a total mixed ration silage containing coffee grounds at ten or twenty percent of dry matter. *J. Anim. Sci.* 85: 1024-1029.