Effect of a new microbial strain as an inoculant on the quality of maize silage

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Introduction Lactic acid bacteria play a key role in making silage from forage, and lactic acid bacteria selected from good silage could be expected to be suitable inocula for making good silage. Thus, the purpose of this study was to examine the such novel lactic acid bacteria for making high quality maize silage.

Materials and methods Maize was harvested at the ripe stage. It was ensiled in experimental silos (20 l capacity) with or without microbial additives (C3-2, C11-4, B13-1, B14-1, C9-1) and stored at room temperature for 60 d. Crude protein (CP) was determined by the Kjeldahl method (AOAC, 1995), and acid detergent fiber (ADF) and neutral detergent fiber (NDF) by the method of Goering & Van Soest (1970). A pH meter was used to measure pH (HI 9024; Hanna Instrument Inc. UK; Kim *et al*., 2000). Volatile fatty acids were analysed by gas chromatography Model 3400; Varian Co., USA) and lactic acid by HPLC(HP-1100 ; Hewlett-Packard Co., USA).

Results Chemical composition of the silage is shown in Table 1. All silages were well preserved. The pH value and acetic acid contents of additive-treated silages were lower and lactic acid content was higher than those of the control. There was a trend for acetic acid contents to be lowest and lactic acid to be highest with B13-1 and C9-1. Generally, additives decrease the butyric acid content of silage, but the butyric acid content of this experiment control silage was lower than that of treatments. Crude protein contents of the silages were increased, but ADF and NDF contents of the silages did not differ between treatments. The most common change in the chemical composition of forage during ensiling is reduction of CP and increase of structural carbohydrates (ADF and NDF). In this experiment, CP content showed the general trend, but ADF and NDF content were decreased in comparing with fresh material. Dry matter content was increased in comparison with the fresh material.

Table 1 Acidity (pH), organic acid, , dry matter (DM), crude protein (CP), acid detergent fiber (ADF) and neutral detergent fiber (NDF) content of fresh maize and maize silage with or without inoculant treatment

Microbes	pH	Organic acid (% of DM)			DM (%)	CP (%)	ADF (%)	NDF (%)
		Acetic	Butyric	Lactic				
Fresh material	-	-	-	-	30.4	8.3	32.4	50.3
Control	3.69	1.16	0.15	3.94	34.5	6.8	29.3	45.3
C3-2	3.67	0.93	0.32	5.79	31.5	7.9	30.2	47.7
C11-4	3.74	1.06	0.14	4.72	35.4	7.7	26.9	44.7
B13-1	3.66	0.80	0.30	8.64	33.0	7.8	31.2	49.2
B14-1	3.62	1.06	0.30	8.39	33.1	7.2	29.9	49.1
C9-1	3.69	0.87	0.29	8.61	34.0	7.3	31.1	50.1
Mean	3.68	0.98	0.25	6.68	33.6	7.5	29.8	47.7
LSD (0.05)	0.81	0.22	0.16	2.58	2.5	0.4	NS	NS

* “C” originated from maize silage. “B” is originated from barley silage. The number is area code.

Conclusions These results indicate that *L. plantarum* C9-1 was effective as an inoculant for maize silage. This culture was named NLRI 201 and registered in the Korea Agricultural Culture Collection (KACC-91067).

References

Association of Official Analytical Chemists (1995). Official Methods of Analysis.16th ed. AOAC, Arlington, Virginia.

Goering, H. K. & P. J. Van Soest (1970). Forage fiber analysis. Agricultural Handbook 379, U.S. Government. Printing Office, Washington, DC.