The effect of additives on mixed silage quality of sugar beet and corn stalks

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Introduction

Sugar beet is a main economic crop in the northeast region of China. Ensilaging sugar beet mixed with other forages, provides green feedstuff for livestock in spring and winter. The ensilaging could avoid mildew and rot of fresh forages and would decrease environmental pollution (Liu 1996).

The aim of this study was to evaluate the influence of silage additives on mixed silage quality of corn stalks and sugar beet.

Methods

Corn stalks (*Zea may* L.), sugar beet (*Beta vulgaris* L.), and three bio-additives (Lalsia Fresh (LF), beet pulp and cellulase) were used in this study. Corn stalks were cut into 2~3cm particles by a straw chopper, and sugar beet was shredded by a rubbing filament machine, and then both materials were mixed in the ratio of 3:1. The mixed material was ensiled in plastic pots with no additives, LF(5 g/t fresh matter (FM)), cellulase (2.5 g/t FM), beet pulp (5 g/t FM), LF + cellulase (7.5 g/t FM), and cellulase + beet pulp (7.5 g/t FM), respectively. Each treatment had three replicates (Liu and Yang 1992). Each treatment was stored for 30 d at room temperature, then to analyze the contents of acid detergent fiber(ADF), neutral detergent fiber(NDF), crude fiber (CF), crude protein(CP), ether extracts(EE), and the organic acid of acetic acid, propionic acid, butyrate and lactic acid. The data were processed and analyzed by Microsoft Office Excel 2003 and Tukey test of ANOVA by SAS 9.0 (SAS Institute Inc., Cary, NC, USA, 2002).

Results

The CP content of all mixed silage was significantly higher than that of the raw material (P<0.05). The silage with cellulase was the highest CP content (10.23%) and was 1.84% higher than that of the raw material. The CF content of the silage with LF and LF + cellulase was lower than that of the raw material (P<0.05). The NDF content of the silage with all additives and the ADF content of the silage with CK and LE were lower than those of the raw material (P<0.05). The EE content of the silage with CK (P<0.05) was higher than that of the raw material, however, the EE content of the silage with cellulase was lower than of the raw material (P>0.05) (Table 1).

The lactic acid content of the silage with LF + cellulase and LF was respective 92.4% and 90.2%; which was higher than that of the silage with CK (P<0.05). In contrast, other remaining silage included lower lactic acid than that of the silage with CK (P<0.05). The acetic acid content of the silage with cellulase and cellulase + beet pulp was higher than that of the silage with CK (P<0.05). The silage with cellulase included the highest acetic acid and was 7.46% higher than that of the silage with CK. The propionic acid content of LF + cellulase treatment was 3.32% lower than that of the silage with CK (P<0.05); however, the silage with beet pulp include higher propionic acid than that of all

Table 1. The effect of different silage additives on the quality of mixed silage of corn stalks and sugar beet.

Treatment	CP	CF	ADF	NDF	EE
Raw material	8.39±0.13 g	24.67±0.18 c	34.99±0.04 a	64.73±0.04 a	0.55±0.09 bc
CK	9.67±0.03 cd	26.11±0.01 a	32.03±0.04 b	63.20±0.03 c	0.64±0.07 a
LF	9.72±0.09 c	23.42±0.06 e	32.40±2.74 b	61.40±0.06 g	0.50±0.04 cd
Beet pulp	9.52±0.09 f	25.37±0.04 b	34.51±0.07 a	63.53±0.04 b	0.57±0.04 abc
LF + cellulase	10.05±0.03 b	23.98±0.1 1d	34.05±0.07 a	62.97±0.10 d	0.59±0.02 ab
Cellulase	10.23±0.07 a	24.78±0.11 c	34.06±0.09 a	62.52±0.06 e	0.46±0.01 d
Cellulase + beet pulp	9.61±0.01 de	24.71±0.01 c	34.94±0.20 a	61.96±0.09 f	0.55±0.09 bc

Note: CP: crude protein, CF: crude fat, NDF: neutral detergent fiber, ADF: acid detergent, EE: ether extract. Different small letters in each column shows significant differences (P<0.05).

Table 2. The effect of different silage additives on organic acids in the mixed silage of corn stalks and sugar beet.

Treatments	pH	Acetic acid	Propionic acid (%)	Butyric acid (%)	Lactic acid (%)
CK	3.86	16.43 c	5.23 e	0	78.33 c
LF	3.79	3.76 f	6.04 b	0	90.20 b
LF+ cellulase	3.93	5.67 e	1.91 f	0	92.42 a
Cellulase	3.70	23.89 a	5.90 c	0	70.21 f
Cellulase+beet pulp	3.90	16.61 b	5.56 d	0	77.75 d
Beet pulp	3.76	15.72 d	8.63 a	0	75.65 e

other silage (P<0.05) (Table 2). The pH value of the silage with cellulase treatment (pH =3.7) was lower than that of the silage with LF + cellulase treatment (pH=3.93) (P<0.05); however, the pH of the silage with LF and beet pulp was lower than that of the silage with CK (P<0.05).

Conclusion

The mixed silage kept enough quality and would be appropriate for livestock feed without any additives. The silage additives decreased pH value and lactic acid content in the conclusions were that the silage additives could improve mixed silage of corn stalks and sugar beet, potentially leading to extension of the storage period of the silage. The fermentation quality of the mixed silage of corn stalk and sugar beet and potentially decreased the production cost.

References

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