Effects of Lactic Acid Bacteria and Cellulases on the Quality of Ensiled Wheat Straw

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Introduction The production of crop straw in the world is 2-3 billion tons , an enormous resource which isn't utilized . Because of the high fiber content and the low crude protein content in the straw , the great majority of straw is burned in field or used as living fuel . Very little is fed to livestock . Considering the importance of wheat straw as a feed and the availability of ensiling techniques for the conservation , this experiment was undertaken to study the effects of lactic acid bacteria and cellulases on the quality of ensiled wheat straw .

Materials and methods Harvested wheat straw was ensiled with lactic acid bacteria (2 .5g/t) , cellulases (2 .5g/t) , and lactic acid bacteria+cellulases (2 .5g/t+2 .5g/t) and a control wheat straw silage with no additives . The silages were stored at room temperature for 60 days and sampled for fermentation quality and chemical composition n analyses .

Results The Dry Matter (DM) content (g/kg DM) , Water Soluble Carbohydrates (WSC) content (g/kg DM) and crude protein (CP) content (g/kg DM) in wheat straw material were 800 , 24 .6and 57 .4 , respectively . The wheat straw silage had a low WSC content (Table 1) . The pH and the content of butyric acid and Ammonia-N in the ensiled wheat straw treated with additives was significantly lower than the content of the control but the content of lactic acid and acetic acid was significantly higher ($p<0.01$) in some treatments than in the control . The fermentation quality of LAB+CE treatment was the best in the experiment . There was significantly lower DM and neutral detergent fiber (NDF) and significantly higher CP in the silages treated with bio-additives compared with the control ($p<0.01$) (Table 2) .

Table 1 *The chemical composition of the wheat straw .*

Item	DM (g/kg)	WSC (g/kg DM)	CP (g/kg DM)	NDF (g/kg DM)	ADF (g/kg DM)	ADL (g/kg DM)
Wheat straw	800	24 .6	57 .4	692 .7	395 .6	42 .5

Table 2 *The quality of the ensiled wheat straw .*

treatments	pH	LA %DM	AA %DM	BA %DM	NH_3-N (%total N)	DM (g/kg)	WSC (g/kg DM)	CP (g/kg DM)	NDF (g/kg DM)	ADF (g/kg DM)	ADL (g/kg DM)
CK	5 .6 ^{a}	0 .3 ^{d}	0 .3 ^{b}	0 .5 ^{a}	19 .9 ^{a}	568 .3 ^{a}	5 .8 ^{c}	53 .3 ^{d}	710 .6 ^{a}	428 .2^{a}	47 .3
LAB	4 .2 ^{b}	1 .7 ^{c}	0 .1 ^{c}	0 ^{b}	7 .8 ^{b}	507 .5 ^{b}	11 .7 ^{a}	63 .3 ^{c}	667 .0 ^{b}	357 .3 ^{d}	46 .9
CE	4 .0 ^{c}	2 .5 ^{b}	0 .3 ^{bc}	0 ^{b}	9 .3 ^{b}	483 .6 ^{c}	5 .5 ^{c}	66 .2 ^{b}	678 .8 ^{b}	403 .0 ^{b}	64 .3
LAB+CE	3 .9 ^{d}	4 .7^{a}	0 .6^{a}	0 ^{b}	6 .7^{b}	516 .2^{b}	8 .7 ^{b}	69 .5 ^{a}	656 .1 ^{b}	384 .7 ^{c}	42 .3
SE	0 .01	0 .08	0 .04	0 .02	0 .67	3 .9	0 .4	0 .6	6 .9	17 .6	16 .9

Means in the same row with different letter is differ ($p<0.01$) ; CK : Control ; LAB : lactic acid bacteria (2 .5g/t) ; CE : cellulases (2 .5g/t) ; LAB+CE : lactic acid bacteria+cellulases (2 .5g/t+2 .5g/t)

Conclusions The silage without additives does not improve the quality of wheat straw . When the ensiled wheat straw treated with lactic acid bacteria , cellulases and lactic acid bacteria+cellulases , the quality of silage was improved . The bacteria+cellulases treatment produced the best quality in the experiment .