Effect of sodium formate and lactic acid bacteria inoculant on silage and ruminal fermentation characteristics and energy balance of cattle

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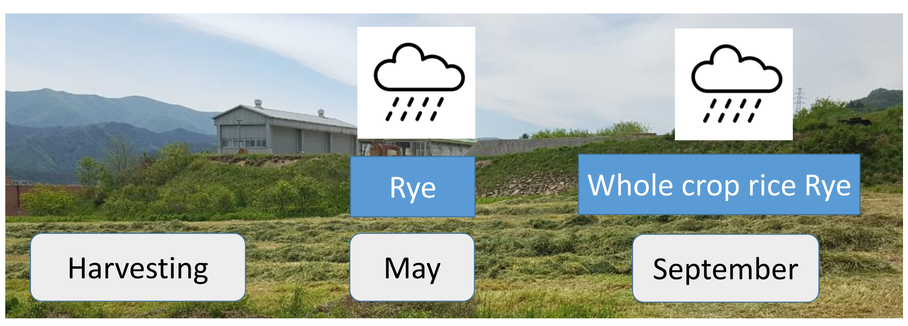
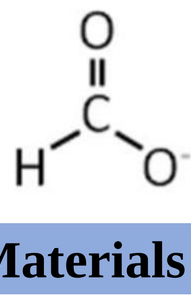
Background



Sodium formate (Chemical treatment)

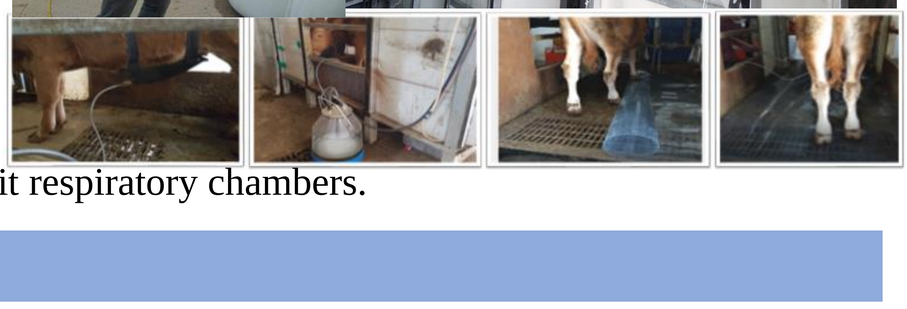


Lactic acid bacteria inoculant (Biological treatment)

Depending on live microbes

Materials and Methods

- Rye was harvested before flowering stage and six baled silages were produced for each treatment
  - without additive (control), with either LAB inoculant or Na-FA.
- Silage fermentation quality evaluation
  - 4 bale silages were selected from each treatment after 8 weeks of fermentation and a total of 9 core samples obtained from each bale silage using a sampler.
- Feeding trial
  - Hanwoo steers group 1 (average body weight 275±8.4kg, n= 3) and group 2 d (average body weight 360±32.1kg, n=3) were used in a replicated 3×3 Latin square design. .
  - Steers fed 2.7% of fresh silage and 0.2% of concentrate, as a fed basis, based on average live body weight in the morning (09:00) and evening (06:00), respectively.
  - Energy balances for steers fed three different silages were measured using three indirect open circuit respiratory chambers.



Results

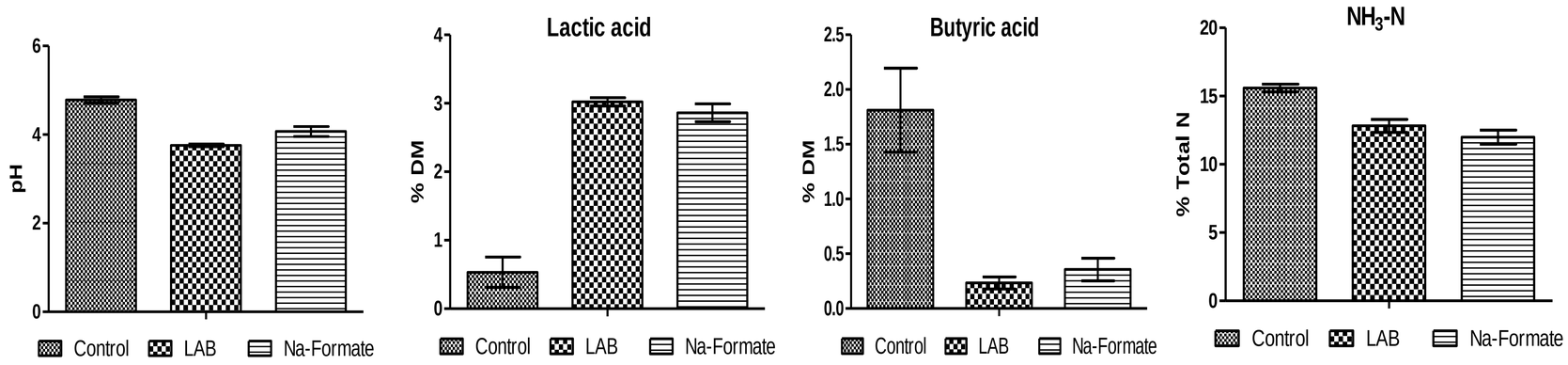


Figure 1. Fermentation characteristic of each treatment Rye silage

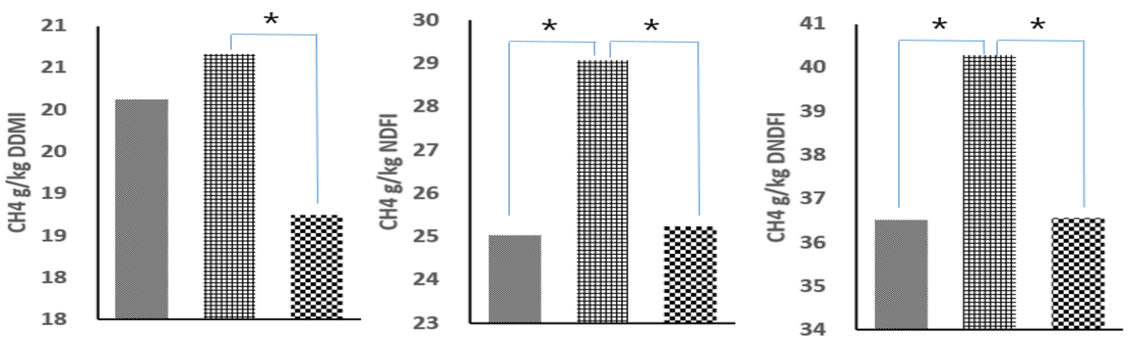


Figure 2. CH_4 production from enteric fermentation

Item	Control	LAB	Na-FA	SEM	p value
Gross energy (GE) intake, Mcal/d	20.3	20.4	20.82	0.33	<.0001
Energy loss, Mcal/d					
Feces	6.16	5.36	5.89	0.37	0.183
Urine	2.28	2.79	2.55	0.26	0.386
Methane	1.50	1.57	1.60	0.15	0.650
Heat	8.62	9.29	7.99	0.44	0.045
Digestible energy (DE), Mcal/d	14.1	15.0	14.9	0.67	0.083
Metabolisable energy (ME), Mcal/d	10.3	10.7	10.8	0.57	0.267
Net energy (NE), Mcal/d	2.80	5.79	2.79	0.56	0.010
Feces, % GE	30.7	26.4	28.3	2.73	0.387
Urine, % GE	11.2	13.8	12.3	1.91	0.363
Methane, % GE	7.42	7.69	7.71	1.07	0.992
Heat, % GE	42.4	45.4	38.4	2.07	0.049
Proportion, % GE					
DE	69.3	73.6	71.7	2.56	0.387
ME	50.7	52.2	51.6	0.21	3.583
NE	13.6	6.72	13.3	0.32	0.009

Table 1. Energy balance for steers fed each treatment Rye silage

Conclusion

LAB and Na-FA silages showed significantly higher values (P <0.05) of propionate concentration when compared to the control. There were no differences in nutrient total tract digestibility between Na-FA and LAB silages but Na-FA silage showed lower trend of CH_4 yield (g/kg NDF intake) and significantly (P<0.01) higher net energy balance. This is the first study in Korea suggesting the potential benefits of Na-FA as a silage additive compatible with the LAB inoculant, especially in temperate zone of Asia where silages have prepared often from moderately poor material because forages are harvested in rainy season.