



Aerobic stability and fermentation quality of round bale silage treated with inoculants or propionic acid

Introduction

High dry matter (DM) silage (haylage) is a widely used feed for horses.

Due to the high DM concentration haylage is prone to heating and to aerobic deterioration. This may compromise the health of horses.

High intake of water soluble carbohydrates (WSC) has been attributed as a potential cause of laminitis. Thus, also well-preserved haylage may cause problems since low water activity restricts fermentation and most of the WSC remains intact in haylage.

The aim of the present experiment was to study the effects of inoculants and propionic acid on the fermentation quality and aerobic stability of high DM bale silage.

Methods

Experimental silages:

- First-cut timothy (*Phleum pratense*) - meadow fescue (*Festuca pratensis*) sward
- Wilted to DM concentrations of 440 (DM1), 560 (DM2) and 643 (DM3) g kg⁻¹
- Harvested as round bales, 3 bales/treatment
- Wrapped using white 750 mm stretch film, six layers

• Additive treatments:

- 1) Without additive (UT)
- 2) Propionic acid (43%) + ammonium propionate (27%), 8 l Mg⁻¹ (PA)
- 3) *Lactobacillus rhamnosus* 5 x 10⁵ cfu g⁻¹ (LR)
- 4) *L. plantarum* 10⁶ cfu g⁻¹ + *L. buchneri* 10⁵ cfu g⁻¹ (LP + LB)
- 5) *L. plantarum* 10⁶ cfu g⁻¹ + sodium benzoate (300 g Mg⁻¹) (LP + SB)

• After six months, silages were analyzed for fermentation quality and aerobic stability



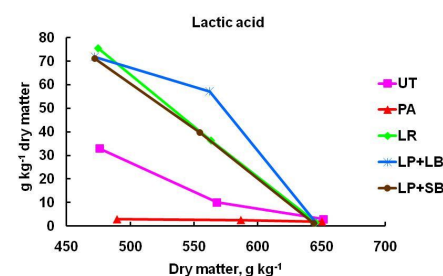
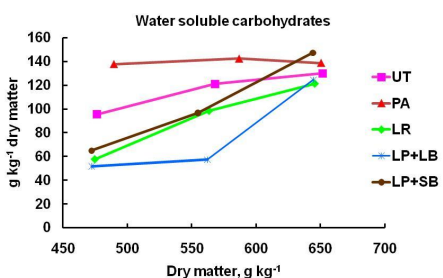
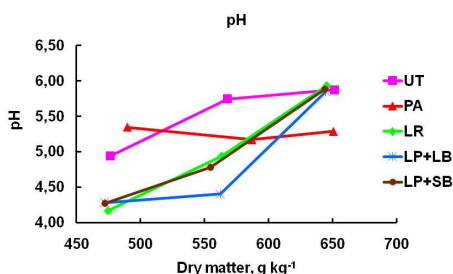
Results

Fermentation in DM1 and DM2 silages

- Inoculants stimulated lactic acid fermentation => lower pH and WSC concentration as compared to untreated and propionic acid treated silages
- *L. plantarum* + *L. buchneri* increased acetic acid concentration as compared to *L. plantarum* + sodium benzoate

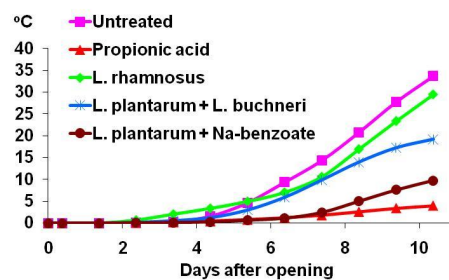
Fermentation in DM3 silages

- Fermentation was suppressed resulting in high WSC and low lactic acid concentrations
- Propionic acid lowered pH as compared to other treatments



Aerobic stability

- Except for *L. rhamnosus* treated DM2 silage, all other silages were stable for four days after opening the bales
- Thereafter propionic acid was more efficient in preventing silage heating than the inoculants
- The combinations of *L. plantarum* and sodium benzoate, and *L. plantarum* and *L. buchneri* were effective in DM1 and DM2 silages, sodium benzoate being more efficient than *L. buchneri*



Aerobic stability (cumulative temperature difference, sample temperature minus ambient temperature) of the silages averaged over three dry matter concentrations (1, 2, 3).

Conclusions

- Efficient inoculants stimulate fermentation and decrease pH and water soluble carbohydrate concentration of silage in DM concentrations up to 600 g kg⁻¹.
- In untreated and propionic acid treated silage water soluble carbohydrates remain intact in DM concentrations higher than 450 g kg⁻¹.
- Buffered propionic acid is an efficient additive for maintaining aerobic stability in high DM silage
- *L. buchneri* or sodium benzoate together with *L. plantarum* improves aerobic stability only in DM concentrations below 600 g kg⁻¹.

