INFLUENCE OF INOCULANT ON FERMENTATION OF WINTER TRITICALE AT LOW DRY MATTER

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ISC 2025
XX INTERNATIONAL
SILAGE CONFERENCE

Introduction

Winter triticale (*Triticosecale spp.)* grown and harvested at flag leaf as a high quality, high yielding, premier dairy forage, is rapidly expanding its acreage across the Northeast, Midwest, and deep into the Southern United States and Canada. The higher yields, above 2.7 tonnes of dry matter (DM)/ha, have presented some challenges drying to 35% DM ideal for ensiling while still preserving nutritional quality. Cool spring temperature and spring rains often forces farms to ensile at lower than desired DM levels. Same day ensiling is critical for preserving the very high sugar and digestible components of the forage. Farmers are presented with ensiling silage from 20 to 35% dry matter, sometimes in the same field. Using the same practices as with other similar crops, the desire is to have the same success preserving the quality when the proper inoculant is used (Muck *et al*., 2018).

Homofermentative inoculants improve fermentation via lactic acid production which may decrease storage losses and curtail undesirable fermentation, whereas heterofermentative inoculants should decrease losses at feedout (Oude Elferink *et al*., 2001). The preferred inoculant, homofermentative or heterofermentative, has not been researched with low dry matter *Tritosecale spp*.

Objectives

To determine whether a homofermentative or heterofermentative inoculant would be more advantageous to use on Winter triticale (DM <24%) in the absence of an aerobic stability test.

Materials and methods

A stand of high yielding winter triticale forage (*X tritosecale*, var. Trical Flex 719) was established at 112.1 kg of seed/ha in northern New York. Preplant fertilizer applications included 280 kg/ha 6-24-24 and 130 kg/ha 39.75-0-0. Preplant fertilizer was broadcast applied with a drop gandy. Spring top-dress fertilizer of 366 kg/ha 39.75-0-0 was applied on April 5. At flag leaf stage, the crop was harvested by cutting without conditioning with a sickle bar mower on May 24 and 6 replicate samples were collected at each 0, 2, 4, 6, 24 and 30 hours after cutting. At each time after mowing, samples for each treatment were taken, chopped at 1 inch, and treatments were applied. The treatments were water mist for control, homofermentative inoculant (MC, (*Lactiplantibacillus plantarum* (DSM16568), *Enterococcus lactis* (DSM22502) and *Lactococcus lactis* (NCIMB30117)) SiloSolve® MC, Novonesis, Lyngby, Denmark) or heterofermentative inoculant (FC, (*Lactococcus lactis* (DSM11037) and *Lentilactobacillus buchneri* (DSM22501), SiloSolve® FC, Novonesis, Lyngby, Denmark). Inoculants were applied at 150,000 CFU/g of fresh matter. Each treated sample was vacuum sealed and allowed to ferment for three weeks. Following 21 d of fermentation the samples were sent to Cumberland Valley Analytical Services, Waynesboro, PA 17268 USA. Each sample was analyzed for NIR+ which gave nutrient analyses (i.e., DM, CP, ADICP, starch, sugar, etc.), and calculated values for variables of interest to be fed to lactating dairy cows (i.e., adjusted and available protein, NEl, NEm, etc.,). A fermentation analysis was run to determine the impact of inoculant on the resulting silage. All data was statistically analyzed by Statgraphics software.

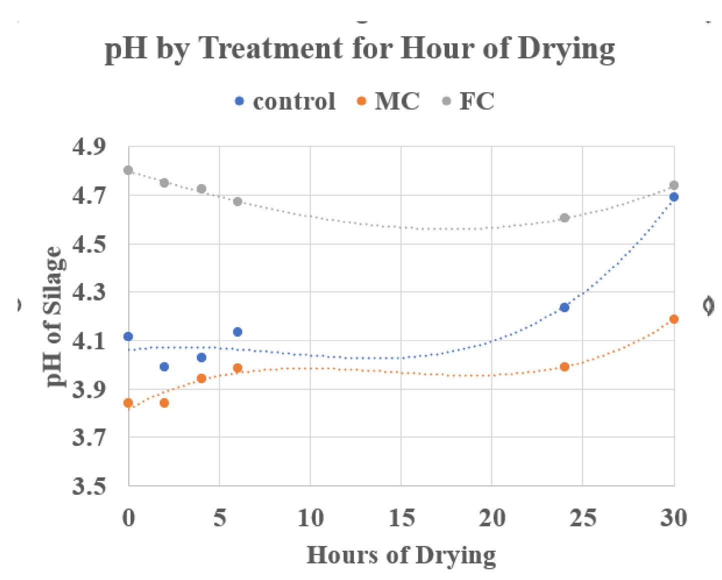
Results

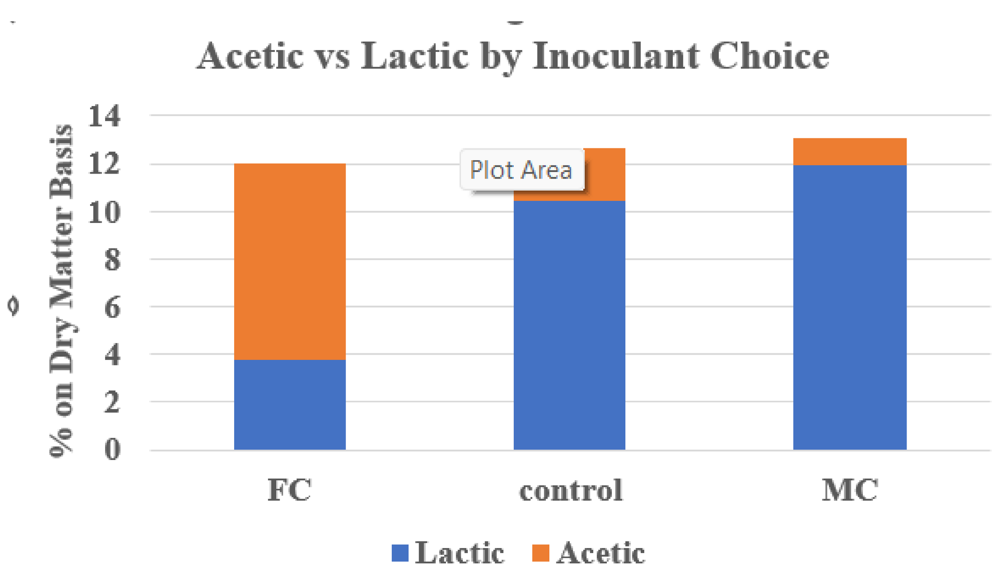
Wilting time (drying rate) was significantly slower than what we had experienced previously with this crop (Kilcer, personal communication). The low temperature at night slowed the impact of photosynthesis on drying the crop naturally. As temperature has a logarithmic impact on biological rate of activity, the below normal temperatures had a major impact. As shown in Table 1, even after 30 hours of drying, the crop was still well below ideal for ensiling.

Table 1. Mean dry matter (DM%) across treatments based on wilting time.

Wilting time (h)	**0**	**2**	**4**	**6**	**24**	**30**
Triticale DM (%)	14.24[a]	16.03[b]	17.66[c]	19.34[d]	21.16[e]	23.81[f]

Figure 1 (left): The pH of fresh Triticale by time and inoculant.
Figure 2 (right): Lactic and acetic acid content (% DM basis) by inoculant.





Discussion

Winter Triticale harvested at flag leaf stage is increasing across the US and in Canada. It is the earliest mechanically harvested forage but is difficult to dry when yields exceed 2.7 tonnes of DM/ha. Forages with less than ~35% DM can be challenging to ensile. Based on the results herein, the homofermentative inoculant (SiloSolve® MC) would be the logical recommendation. However, although not evaluated in the present study, waiting until mid-summer to start feeding a very high NDFd forage can become challenging due to aerobic instability, rapid spoilage, and additional DM losses. If ensiled Triticale feeding is targeted for that time, it is clear that the greater acetic production of the heterofermentative inoculant (SiloSolve® FC) may be the logical choice for ensiling. Future research with Triticale should investigate more broadly the impact of homo- vs. heterofermentative inoculants across a variety of DM levels and ensiling conditions.

References:
Muck, R.E.; Nadeau, E.M.G.; McAllister, T.A.; Contreras-Govea, F.E.; Santos, M.C.; Kung, L. Silage review: recent advances and future uses of silage additives. *J. Dairy Sci.* 2018, *101,* 3980–4000.
Oude Elferink, S. J. W. H., J. Krooneman, J. C. Gottschal, S. F. Spoelstra, F. Faber, and F. Driehuis. 2001. Anaerobic conversion of lactic acid to acetic acid and 1,2-propanediol by *Lactobacillus buchneri*. Appli. Environ. Microbiol. 67: 125-132.

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