Focus on Forage

Wisconsin TEAM Forage

Lactobacillus buchneri for Silage Aerobic Stability

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Introduction

Lactobacillus buchneri is a bacterial inoculant approved for use in grass silages, corn silage, legume silage and high moisture grains. *Lactobacillus buchneri* has been demonstrated to improve aerobic stability of silages by reducing the growth of yeasts. The net result is that silages inoculated with *L. buchneri* are more resistant to heating at feed out (exposed to air) as compared to untreated silages.

What is *L. buchneri*?

L. buchneri was originally isolated from naturally occurring aerobically stable silages. *L. buchneri* is a heterofermentative bacteria that produces lactic and acetic acid during fermentation. Silages treated with an effective dose (up to 5 x 10^5 CFU/gram of fresh material) of *L. buchneri* have higher concentrations of acetic acid and lower levels of lactic acid than untreated silages.

How is *L. buchneri* different form other bacterial silage inoculants?

Most bacterial silage inoculants produce primarily lactic acid during the fermentation process. The most common lactic acid producing bacteria used in silage inoculants are *Lactobacillus plantarum, L. acidophilus, Pediococcus cerevisiae, P. acidilactici* and *Enterocccus faecium*. These organisms have been demonstrated to increase the rate of pH decline during fermentation, decrease losses of silage DM, and in many cases, animal performance is improved. However, silage fermentation products produced by homofermentative bacterial inoculants sometimes can result in silage that is less stable when exposed to air than silages that have not been inoculated. This is possible because lactic acid produced by homofermentative bacteria can be readily metabolized by some species of yeast and mold upon exposure to oxygen.

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When applied at the time of ensiling at the rate of up to 5 x 10^5 per gram of fresh material, *L. buchneri* has been demonstrated to improve aerobic stability of high moisture corn, corn silage, alfalfa silage and small grain silages relative to untreated controls.

The beneficial impact of *L. buchneri* appears to be related to the production of acetic acid. Although the precise mechanism has not yet been determined it is likely that aerobic stability is improved because acetic acid inhibits growth of specific species of yeast that are responsible for heating upon exposure to oxygen.

In research trials yeast and mold growth in silage treated with *L. buchneri* has been lower at feed-out than for untreated control silages. Yeast and mold levels in silage inoculated with *L. buchneri* also do not increase as rapidly as in untreated controls when exposed to air. As a result, the temperature of silage inoculated with *L. buchneri* does not readily rise upon exposure to air and tends to remain similar to ambient temperature for several days, even in warm weather.

When would *L. buchneri* be most effective?

Treating silage with *L. buchneri* most likely would be beneficial under circumstances where problems with aerobic instability are expected. Corn silage, small grain silage and high moisture corn are more susceptible to spoilage once exposed to air than legume or grass silage, and therefore *L. buchneri* inoculation may be a benefit. *L. buchneri* can also be applied to legume silage if aerobic stability is a problem.

It should be remembered that high ambient temperatures, slow filling, improper packing, low surface removal rate and poor feed bunk management are all factors that can decrease aerobic stability of silage. It is likely that *L. buchneri* would improve aerobic stability in circumstances where untreated silage or silage treated with lactic acid producing bacteria have a history of heating at feed out. It is unlikely that *L. buchneri* will improve silage quality in situations where silage has a history of being aerobically stable at feed out. In fact, under such circumstances, the potential reduction in silage dry matter recovery due to this organism's heterofermentative fermentation may actually make *L. buchneri* a less desirable silage inoculant than homofermentative bacterial inoculants.

Does *L. buchneri* affect feed intake or milk production?

Acetic acid can reduce feed intake in ruminants. It is not clear at this time whether enough acetic acid is produced in silages treated with *L. buchneri* to affect feed intake. We found in a recently completed lactation trial that feed intake and milk production were similar when cattle were fed total mixed rations containing untreated or *L. buchneri* inoculated high moisture corn. Corn inoculated with *L. buchneri* had higher concentrations of acetic acid and was aerobically more stable than untreated corn.

University of Delaware researchers have also reported that acetate levels were elevated in alfalfa silage and barley silage inoculated with *L. buchneri* compared to untreated controls. Milk production and feed intake were not different when dairy cows were fed TMR's containing either treated or untreated alfalfa silage, or treated or untreated barley silage.

Summary

Forages and grains treated with *L. buchneri* at a rate of at least up to 5 x 10^5 CFU/gram of fresh material at ensiling results in silages that have elevated concentrations of acetic acid and lower levels of lactic acid than untreated controls.

Yeast counts tend to be reduced in silage inoculated with *L. buchneri*. As a result, silage inoculated with *L. buchneri* resist heating when exposed to air, when compared to untreated silages or silages inoculated with lactic acid producing bacteria.

Research conducted to date has not shown that animal performance is improved when cattle are fed silages inoculated with *L. buchneri*. Intake and milk production have been similar in trials where cattle have been fed diets containing either *L. buchneri* treated or untreated high moisture corn, alfalfa silage or barley silage.

It appears that inoculation of silage with *L. buchneri* has the potential to dramatically improve aerobic stability of ensiled feeds and may significantly reduce feed waste in circumstances where heating and molding of feeds are an ongoing problem. The economic benefit of using this product will depend on how much feed can be saved by reducing losses associated with aerobic instability.

References

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