

ADOPT Final Report-Project #20100363

Project Identification

1. **Project Title:** Hay Preservatives for High Moisture Bales
2. **Project Number:** 20100363
3. **Producer Group Sponsoring the Project:** Saskatchewan Forage Council (SFC)
4. **Project Location(s):**
 - Yorkton - Reinhold Kulscar
 - Dalmeny -Cynthia and Dennis Wesselingh
 - Rosetown -Grant Anderson
5. **Project start and end dates:** May 2011 to January 2012
6. **Project contact person and contact details:**

Leanne Thompson, Executive Director
Saskatchewan Forage Council
PO Box 87, Ceylon SK S0C 0T0
p. 306.969.2666
e. office@saskforage.ca

Objectives and Rationale

7. Project Objectives

Hay made under high moisture conditions (>18%) is prone to mold, mycotoxins and decreased forage quality. Mold and mycotoxins are anti-nutritional factors that generally reduce the quality of feed for animals. They can cause serious health problems in livestock, including impaired growth and muscle formation, reduced fertility, decreased milk production and in some cases death. However, harvesting hay at low moisture levels increases leaf loss, thereby reducing protein levels and overall quality of the baled forage.

Hay preservatives are products that allow hay to be baled at higher moisture due to their ability to limit the growth of molds in high-moisture forages. There are three main types of preservative: organic acids, bacterial inoculants and anhydrous ammonia.

The objective of the project is to demonstrate to producers the use and relative effectiveness of various types of hay preservatives.

8. Project Rationale

This project demonstrated the use of hay preservative as well as the effectiveness of these products in high moisture bales. Producers were able to observe the results of preservative application on bale and forage quality through field days and workshops, information posted on the Saskatchewan Forage Council website, and in a video clip produced at the field days. This demonstration provided producers with first-hand information, from producers who are using the products, to determine if this practice would be useful in their own operation.

Methodology and Results

9. Methodology

Background:

Treatments used included HaySaver (BioAgronics™); Silo Guard® (ISF); and Buchneri Inoculant (Lallemand Animal Nutrition).

Excerpt provided by Cattle Care Vet Consultants from the Lallemand Animal Nutrition website (<http://www.biototal.com/>):

Buchneri Hay 40788 contains live viable cells of Lactobacillus buchneri 40788 at a level to deliver 1,200,000 CFU/g hay. Additionally, it has a proprietary mixture of specific enzymes in a balanced mixture of nutrients, flow enhancers and stabilizers with an indicator dye. This ensures: shelf life stability; optimum flow characteristics; easy dispersion in cold water; rapid activation of ingredients; viability following rehydration.

The microbial approach to hay preservation uses the theory that lactobacilli produce acid, reduce pH and thus reduce mold growth. Microbial inoculants have been shown to improve fermentation in silage and improve animal performance, thus encouraging development of products for use with high moisture hay (Limin Kung, Hay Preservatives: Propionic Acid and Microbials, http://ag.udel.edu/anfs/faculty/kung/articles/hay_preservatives.htm).

Details for Silo Guard® from the International Stock Foods (ISF) website (<http://www.isfcanada.ca>):

Silo Guard®II is a forage additive that contains a patented combination of sulfur compounds and amylase that may help remove oxygen in the forage mass as well as help reduce the amount of yeast and mold. It is available as a dry granular product or a ready to use liquid. With typical use: increases average daily gain and feed efficiency in beef heifers fed corn silage ensiled at 65 to 75% moisture; improves the conservation of dry matter in alfalfa silage at 60 to 75% moisture; improves the conservation of dry matter in hay at 20 to 25% moisture.

The sulphur compound (NaHSO₃) binds to the oxygen molecule in water to form SO and SO₂. This process dissipates free moisture as well as forms mild sulphur gases which create conditions not conducive to mold growth, thereby acting as preservatives.

BioAgronics™ provides the following information in a brochure describing the Hay Saver product:

Hay Saver is a 100% organic product, produced through a natural fermentation process for the treatment of high moisture hay during baling and for the treatment of all feeds during winter feeding. Hay Saver is produced from

high quality food and feed grade ingredients. It contains lactofermented solubles. During the fermentation process lactic acid and beneficial compounds are produced. Lactic acid is well recognized in the industry for its preservation effects. Hay Saver enables the producer to put up hay at higher moisture content and prevent spoilage. Hay Saver will also aid in the conversion of feed and help maintain herd health. Hay Saver will make poor quality feeds more palatable.

Site Methodology:

At each of the two (2) sites where the project was completed, four treatments were applied to alfalfa-brome grass hay. A minimum of five high moisture (20-30% moisture) alfalfa-brome grass bales were subjected to each of two hay preservative treatments at each location. Treatments included both organic acids and bacterial inoculants, and were chosen based on discussion with regional forage specialists and producer cooperators. At each location one high moisture control bale with no preservative and two dry control bales with no preservative were made from the same field as the treated bales. Originally three sites were chosen for this project; however the Rosetown site was not completed. The Rosetown site cooperator did make use of one hay preservative product, but did not contact the site Supervisor so there was not sufficient data to report on this site.

Hay was baled during the 2011 and 2012 growing seasons and hay preservatives were applied as per label directions for use. Bales were then stored during the summer and fall months as per usual producer practice. Core samples were taken from both the treated and control bales at least 90 days post baling and tested for both forage quality and presence of mold. Test results were reviewed in consultation with Livestock and Forage Specialists from the Saskatchewan Ministry of Agriculture and are summarized in the results section of this report. Bales were opened and visually inspected at field days held over the winter months. The table below provides a general summary of treatments:

ADOPT Hay Preservatives for High Moisture Bales: project site and treatment summary

Site Location	Treatment (# of bales)	Forage Type	Cutting Date	Baling Date
Yorkton, SK	HaySaver (5)	Alfalfa-Meadow Brome	Aug 8/2011	Aug 10/2011
	Buchneri inoculant (5)	Alfalfa-Meadow Brome	Aug 8/2011	Aug 10/2011
	High moisture control (1)	Alfalfa-Meadow Brome	Aug 8/2011	Aug 10/2011
	Dry control (2)	Alfalfa-Meadow Brome	Aug 7/2011	Aug 10/2011
Dalmeny	Silo Guard (5)	Alfalfa-Brome*	Aug 15, 2012	Aug 21, 2012
	Buchneri inoculant (5)	Alfalfa-Brome	Aug 15, 2012	Aug 21, 2012
	High moisture control (1)	Alfalfa-Brome	Aug 15, 2012	Aug 21, 2012
	Dry control (2)	Alfalfa-Brome	Aug 15, 2012	Aug 21, 2012

*2012 crop was weedy, containing curled dock and sow thistle

10. Final Results

Yorkton Site-Reinhold Kulscar

The Yorkton site demonstration took place from August 2011 to December 2011. An alfalfa-meadow brome hay field was cut (August 8, 2011) and baled (August 10, 2011) by the producer at this location. The bales were estimated to be approximately 1300 pounds. All baling was done in the afternoon or early evening when the temperature was about 27° Celsius, with a slight breeze. The moisture range for the hay is due mainly to the hot temperature, resulting in the swaths drying very quickly on top.

The HaySaver product was applied at too high a rate due to complications with setting the applicator to the correct pressure level and calibrating the equipment. This complication caused more liquid to be added to the bale than recommended, and may have contributed to the high mold count in the bales. Per label recommendations, the final solution (water plus HaySaver) applied to the hay should be approximately 3.5 to 4.5 liters of liquid per tonne. Slightly over five liters of liquid was applied per tonne of hay using the HaySaver product at the Yorkton site. The Buchneri product was also applied at too high a rate (about twice the recommended rate), again due to complications with setting the correct pressure rate, but only 2.7 liters (0.6 gallons) of solution were applied per bale in the Buchneri hay.

The Yorkton cooperator had to move to a different field to bale hay for the dry control. This field had a lower proportion of alfalfa in the stand, and this may explain the lower crude protein result for these bales.

ADOPT Hay Preservatives Demonstration: Yorkton Site Treatment Results (2011)

	Dry Control	High Moisture Control	HaySaver	Buchneri Hay
Cutting Date	Aug 7/2011	Aug 8/2011	Aug 8/2011	Aug 8/2011
Baling Date	Aug 10/2011	Aug 10/2011	Aug 10/2011	Aug 10/2011
No. of Bales	2	1	5	5
Moisture Content of Bales (%)	14.5-17.5	18-23	14.5-32 (most avg. 18-23)	14.5-30
Product Application				
Product Form	-	-	Liquid	Powder
Recommended Rate of Application	-	-	15 oz/tonne	2 L/tonne* 3 L/tonne
Actual Rate of Application	-	-	36.4 oz/tonne	4.84 L/tonne
Feed Test Results				
Total Digestible Nutrients (%)	57.5	57.4	57.2	57.9
Crude Protein	9.70	12.33	12.30	13.60
Relative Feed Value	96	96	93	103
ADIN (% of CP)	42.21	48.80	38.47	39.20
Mold (cfu/gram)	5000	700	15000	1500
Adjusted Crude Protein	6.56	7.55	8.80	9.64

*2 L/tonne application rate: hay up to 22% moisture content

3 L/tonne application rate: hay over 22% moisture content

Mold count results were counter-intuitive, with the lowest results for cfu/gram (colony forming units per gram) resulting from the high-moisture control bale. Mold count numbers would be more meaningful if colonies could be cultured to better understand which particular molds were present in the hay. It is likely that the composition of the mold colonies differ from sample to sample. According to information from Dairyland Laboratories, mold counts of 10 to 10,000 cfu's are considered relatively safe, while mold levels from 10,000 to 100,000 are in the transition zone between safe and caution advised in feeding (Dave Taysom, *Midwest Forage Quality: How are we Doing?*

<http://www.ars.usda.gov/sp2UserFiles/Place/36553000/publications/4statePDFs/MidwestForageQuality.pdf>).

Using this information, it appears that all the hay sampled at the Yorkton site is considered relatively

safe, with the possible exception of the HaySaver forage, which was in the low end of the transition zone. As described above, without knowing which species of mold or fungi are present in the sample, we cannot say for sure if feeding this hay might be detrimental to animal health.

Participants at the field day observed the hay from all four treatments. The high moisture control and the two preservative treatment samples did appear to be dustier than the dry control bale. All bales appeared fairly green and looked like good hay on initial observation. Producers commented that there was a mouldy smell to the high moisture bale and that the preservative treated hay seemed “softer” than the untreated dry control and the high moisture bale.

The dry control bales showed lower crude protein levels than the high moisture control and the treated bales, however TDN and relative feed values were similar to other samples. As described above, this is likely due to the reduced percentage of alfalfa in the dry bales as the producer switched fields in order to bale the dry control hay. The variations in crude protein levels were more subtle for the high moisture and treated bales, ranging from 12.3 to 13.6. TDN was also similar for most of the samples.

Of interest at the Yorkton site were the results for ADIN (Acid Detergent Insoluble Nitrogen). Alberta Agriculture and Rural Development’s “*Know Your Feed Terms*” fact sheet ([http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/agdex4521/\\$file/400_60-2.pdf](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex4521/$file/400_60-2.pdf) , July 2006) provides the following information on ADIN:

ADIN is a measure of the nitrogen remaining in the acid detergent fibre residue of a feed sample. While some ADIN occurs naturally in all plant material, it is usually considered to be an indicator of heat damage that can occur during storage or processing. Excessive heating of forages and grains causes some of the nitrogen to become irreversibly bound in the fibre. Nitrogen in excessively heated samples is usually indigestible or poorly digested by rumen microbes. It has been estimated that as much as 70 per cent of the protein bound with the fibre is unavailable to the animal. Feed labs may report acid detergent fibre protein (ADF-P%) or acid detergent insoluble protein (ADIP% or ADICP%), which can be expressed as a per cent of total dry matter or as a percentage of total nitrogen/protein. The concentration of ADIN is used to determine protein availability in heated feeds.

Based on this information, the ADIN results indicate that these samples were heated considerably and as a result, protein values in the hay would be significantly reduced. Adjusted crude protein values for each treatment are reported in the table above and indicate the reduction in available protein due to heating. It appears that there was a benefit to using hay preservatives in this situation, as protein availability was higher for both the HaySaver and Buchneri hay than in the high moisture control. Whether this gain is economically worthwhile would depend on the price of hay and protein supplements at the time of production as well as the cost of purchasing the hay preservatives. The lowest crude protein availability resulted from the dry control hay as shown above. Although the ADIN number was high, indicating that heating occurred in this hay as well, the use of a different field for this hay makes it difficult to determine what the net (dis)advantage is as compared to the higher moisture hay. Moisture conditions made it difficult to put up dry hay in the Yorkton area in the 2011 growing season.

When considering adopting a new practice, producers must be aware of the economics of that practice. Whether there is sufficient benefit associated with the use of hay preservatives is an important consideration. Buchneri inoculant costs approximately \$6/tonne of hay to apply if used according to the directions. The HaySaver cost is comparable to the Buchneri cost at \$6/tonne of hay when purchased as a ready-to-use liquid product.

The claims from manufacturers of hay preservatives are that they save money by increasing feed efficiency and gains through improved hay quality (less leaf loss and spoilage), and that cattle stay healthier due to less exposure to the mold and mycotoxins associated with high-moisture hay.

Alberta Agriculture and Rural Development’s CowBytes® ration balancing program allows producers to use the information from feed tests and their own herds to ensure they are providing the proper nutrition to their livestock. The table below illustrates the results when using hay from the four treatments at the Yorkton site to create a basic beef ration to determine if there is a cost difference between treatments. In all rations listed, the hay represents 99.8% of the total ration (only salt and minerals added). Rations were created using the adjusted protein values to account for the effects of heating and decreased protein availability. Rations are based on a 1200 lbs beef cow of British/continental breed, 8 months pregnant, in average body condition and fed under winter conditions. Alfalfa-brome hay was priced at \$65/tonne.

Yorkton Site Ration Comparison for Four Treatments

Hay Type	Treatment	As Fed (lbs/head/day)	Cost of ration** (\$/head/day)	Ration Cost when Preservative Cost Removed (\$/hd/day)
Alfalfa-brome hay	Dry Control *	31	\$0.92	\$0.92
Alfalfa-brome hay	High Moisture Control	32	\$0.95	\$0.95
Alfalfa-brome hay	HaySaver	31	\$1.01	\$0.92
Alfalfa-brome hay	Buchneri	32	\$1.04	\$0.95

**Dry control hay was from a different field than all other samples*

***All rations include 0.01 lbs/hd/day 1:1 mineral and 0.06 lbs/hd/day blue salt. Cost of salt and minerals is \$0.01/head/day and is included in above totals. Costs also include the hay preservative cost/tonne (where required).*

As illustrated by the table above, there is not a substantial cost savings to using any one of the treatments demonstrated at the Yorkton site. The dry control hay is difficult to compare, as any differences are more likely due to plant composition in the field baled than to the difference in treatment. The high moisture control, Buchneri and HaySaver samples differ very little in terms of cost. Whether there are other economic benefits in terms of animal health/fertility/milk production from the use of the hay preservatives would require further inspection of the mold count results. Although higher, the actual cost of the hay preservative doesn’t appear to have a strong economic impact when considered as part of the entire ration.

Dalmeny Site-Sask Valley Farm Ltd (Cynthia and Dennis Wesselingh)

At the Dalmeny site, alfalfa-brome grass hay was cut on August 15, 2012. Baling was done on August 21, 2012 in late morning and early afternoon. The weather conditions were sunny with a slight breeze on the day the hay was baled.

The cooperators at this site found the Silo Guard® product difficult to apply at the correct rate. The smallest nozzles possible were used and tractor speed was increased but the product was over-applied in spite of this. The cooperators also noticed a sulphate smell on the bales, which they considered was likely the smell of the actual product. No difficulty was reported with application of the Buchneri product.

Bale moistures, product information and summarized feed test results for the Dalmeny site can be found in the table below:

ADOPT Hay Preservative Demonstration: Dalmeny Site Treatment Results (2012)

	Dry Control	High Moisture Control	Silo Guard	Buchneri Hay
Cutting Date	Aug 15/2012	Aug 15/2012	Aug 15/2012	Aug 15/2012
Baling Date	Aug 21/2012	Aug 21/2012	Aug 21/2012	Aug 21/2012
No. of Bales	2	1	5	5
Moisture Content of Bales (%)	10 (20 in one wet spot)	18-22	13-20	14-20
Product Application				
Product Form	-	-	Liquid	Powder
Recommended Rate of Application	-	-	15 oz/tonne	2 L/tonne* 3 L/tonne
Actual Rate of Application	-	-	Over-applied at possibly 30 oz/tonne	2 L/tonne
Feed Test Results				
Total Digestible Nutrients (%)	56.73	53.89	55.34	52.82
Crude Protein (%)	10.49	9.78	10.10	9.85
Relative Feed Value	84	71	77	69
ADIN (% of CP)	15.76	19.23	16.88	21.88
Mold (cfu/gram)	22000	19000	19000	13300
Adjusted Crude Protein (%)	9.89	8.88	9.41	8.68

**2 L/tonne application rate: hay up to 22% moisture content
3 L/tonne application rate: hay over 22% moisture content*

Mold count numbers were again higher in the dry control bale. All mold test results from the Dalmeny site fell within the transition zone between relatively safe and caution advised as described by Dairyland Laboratories. The lowest mold counts were seen in the Buchneri Hay. Although all baling was done in the same field, variations in plant composition and the presence of weeds within a field may have affected these numbers.

As with the Yorkton site, the Dalmeny site bales tested over 10% ADIN, meaning that some heating did occur and thus available crude protein levels will be affected. ADIN numbers at the Dalmeny site were lower than at the Yorkton site, so did not have as big an impact on crude protein availability. Adjusted

crude protein levels are reported in the Dalmeny site results and were lowest for the high moisture hay and the Buchneri Hay. The dry control hay showed the highest crude protein availability at the Dalmeny site and had the highest TDN number as well. The Silo Guard® hay showed slightly higher TDN and crude protein levels, as well as available protein when compared to the high moisture control. Based on the feed test results, there did not appear to be an advantage to applying the Buchneri product in terms of maintaining nutritional quality in the hay.

Again the cost of using hay preservatives is important to consider along with differences in feed quality. The Buchneri inoculant costs \$6/tonne of hay and the liquid, ready-to-use Silo Guard® II product used at the Dalmeny site costs \$6.76/tonne of hay. The cost of the granular version of Silo Guard® II is considerably less, at \$4.60/tonne of hay as recommended by International Stock Foods (ISF).

Using Alberta Agriculture and Rural Development’s CowBytes® ration balancing program to help determine the cost/benefit of using the hay preservative products, the table below illustrates the results when using hay from the four treatments at the Dalmeny site to provide 99.8% of a basic beef ration (only salt and minerals added). This comparison was done based on the mixed hay used in this demonstration. Rations are based on a 1200 lbs beef cow of British/continental breed, 8 months pregnant, in average body condition and fed under winter conditions. Alfalfa-brome hay was priced at \$65/tonne.

Dalmeny Site Ration Comparison for Four Treatments

Hay Type	Treatment	As Fed (lbs/head/day)	Cost of ration* (\$/head/day)	Ration Cost when Preservative Cost Removed (\$/hd/day)
Alfalfa-brome hay	Dry Control	31	\$0.92	\$0.92
Alfalfa-brome hay	High Moisture Control	38	\$1.13	\$1.13
Alfalfa-brome hay	Silo Guard	37	\$1.21	\$1.10
Alfalfa-brome hay	Buchneri	36	\$1.17	\$1.07

**All rations include 0.01 lbs/hd/day 1:1 mineral and 0.06 lbs/hd/day blue salt. Cost of salt and minerals is \$0.01/head/day and is included in above totals. Costs also include the hay preservative cost/tonne (where required).*

The Dalmeny site hay was generally more costly in a ration than the hay at the Yorkton site. These higher costs are due to the requirement to feed more forage in order to provide sufficient energy and TDN. The three treatments using high moisture hay had relative feed values scoring below 80. When balancing the ration, increased volumes of hay needed to be fed in order to provide for the nutritional needs of the cow. Both the Buchneri hay and the high moisture hay provided higher than necessary (but not excessive) levels of protein and dry matter, while the Silo Guard ration was high in protein but not in dry matter. The dry control hay ration is not balanced, as the protein was too high but was left as-is for comparison purposes. The ration could be balanced by reducing the hay fed and adding a high TDN, low protein supplement such as oat hulls. When hay was decreased to 29 lbs./head/day and 2 lbs./hd/day of oat hulls were added, the ration balanced and the cost also decreased to \$0.90/hd/day.

The cost of the preservatives in the above ration at the Dalmeny site was \$0.11/hd/day for Silo Guard and \$0.10/hd/day for Buchneri Inoculant. Even without these costs, all treatments using high moisture hay were more costly to feed than the dry control sample. There does not appear to be an economic

benefit to using hay preservatives in this situation. It is important to note that benefits from reduced levels of specific molds or mycotoxins were not able to be identified as individual species of mold and fungi were not cultured as part of this analysis.

It should also be noted that there may be additional benefits to using hay preservatives that are not obvious from feed test results alone. The producer cooperator at the Dalmeny site has been using the Buchneri inoculant for a number of years now and claims that it makes the hay less dusty while allowing him to bale at slightly higher moisture levels. The Dalmeny site producer did note that one drawback to using the Buchneri product is that once mixed it must be used within a day. When using the inoculant product, producers must only mix what they can use as any extra will therefore be wasted, which will add to the cost of usage. On examination at the field tour in January 2013, the hay from the Buchneri treatment did appear to be less dusty than the high moisture control bale. All hay at the Dalmeny site appeared very green and visually appealing upon inspection.

There may be an advantage in terms of convenience for the producer being able to bale hay at higher moisture that is difficult to quantify economically as well. Putting hay up at slightly higher moisture levels may be of benefit in years with frequent showers during haying where a missed opportunity to bale may result in hay being left in swaths through multiple showers or significantly longer than is desirable. This type of weather occurred in many parts of Saskatchewan during the 2012 growing season, and Ministry of Agriculture forage specialists report that a great deal of low quality hay was produced in 2012 as a result of weather conditions.

Rosetown Site-Grant Anderson

As describe above, the demonstration was not completed at the Rosetown site. The intention for this site was to use the powdered product Gemdust that the producer has been using in past haying seasons in addition to Buchneri bacterial inoculant. Rain showers interrupted haying in this region, and the cooperator reported that when the hay was drying, hot weather meant the hay dried very quickly. The cooperator was unable to contact the supervisor in a timely manner to involve him in application of the hay preservative product. Although some product may have been applied, documentation of timing, application and which hay was treated was insufficient to provide accurate data for the ADOPT project.

Discussion

Excessive moisture during haying season can pose a problem for producers in Saskatchewan, particularly in central and northern areas of the province. Using hay preservatives to bale hay at high moisture levels (over 18%) is an attractive option, but producers need to be assured that mold growth will be inhibited and hay will be safe for livestock consumption. In reviewing the feed tests for the two demonstration sites, it is unclear whether mold growth was suppressed by the hay preservatives. The higher levels of mold in the dry control bales at each site, as well as the lowest colony forming units (cfu) number being found in the high moisture control at the Yorkton site make the results difficult to interpret.

When making a decision about whether to use hay preservatives, the cost of hay must also be considered by producers. The best returns would be achieved when preservatives are used on high quality, high-priced hay. If hay prices rise and if hay supplies decrease there may be an economic advantage to maintaining the quality of hay. Although there did not appear to be economic gains from

using hay preservatives at the two sites in this project, other considerations may make it advantageous for a producer to adopt this practice. The Dalmeny site cooperator has been using Buchneri Inoculant on hay for a number of years and feels strongly that it results in decreased dust in the hay as well as an opportunity to bale hay when it is slightly higher in moisture. He feels that these benefits are worth the cost and effort of using the hay preservative, and this may hold true for other producers as well. In a dairy setting, such as the Dalmeny site, preservation of hay quality in higher-priced feeds such as alfalfa may be worthwhile in terms of milk yields and feed savings.

In the article “Hay Preservatives: Propionic Acid and Microbials” (Limin Kung Jr., University of Delaware), Kung describes a report in which a bacterial inoculant was used on high moisture hay and was shown to improve visual assessments such as colour and odor but ultimately had no effect on the chemical composition of the hay. The differing test results noted at the sites in the current demonstration, give a strong indication of how much variation in forage quality can occur within one field and how visual observation of hay is not an adequate substitute for feed testing. For example, at the Dalmeny site, crude protein varied from a low of 9.78 to a high of 10.49 and relative feed value ranged from 69 to 84. The differences in hay nutrient values as well as an understanding of the ADIN number and its impact on crude protein lend credence to the importance of feed testing in order to meet an animal’s nutritional requirements.

Producer cooperators at both sites reported difficulty in applying both the Silo Guard and Hay Saver products, with less difficulty in applying the Buchneri inoculant. Incorrect volumes of water and concentrations of hay preservatives due to complications with settings may have made the results from the high moisture bales with preservatives less than ideal. It is important to remember that these results represent real producers using the product under normal haying conditions and this makes the information more valuable for other producers considering the use of hay preservatives for his/her own operation. First-time users of these products might consider assistance with calibration of application equipment from someone knowledgeable about these products to make the process easier and more effective.

Extension/Promotion Activities

The following extension activities were completed to communicate results and raise awareness of this demonstration:

- Signs placed at each of the sites
 - Field day was held at Yorkton site on December 1, 2011 as part of “From the Field to the Cow-Hay and Nutrition Workshop” hosted by the Saskatchewan Ministry of Agriculture and the Saskatchewan Forage Council with 40 people in attendance (Appendix B)
 - Site field day was held at Dalmeny in cooperation with the University of Saskatchewan Stockmen’s Club on January 22, 2013, with 6 in attendance (Appendix B)
 - Saskatchewan Forage Council ADOPT Video will be produced from video taken during both field days. A link to this video will be posted on the SFC website.
 - Information regarding this project has been included on the Saskatchewan Forage Council website (average hits of 1500+ per month). Information will also be included in upcoming editions of the SFC Forage and Livestock eNews as well as other Saskatchewan Forage Council publications
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11. Conclusions and Recommendations

The objective of this project was to demonstrate to producers the use and relative effectiveness of various types of hay preservatives. The demonstrations at both sites allowed for evaluation of the costs and benefits of three different hay preservative products as compared to control samples of dry and high moisture hay. The field days and the video clip provide useful contrasts for the visual observation of the hay versus the actual feed test results.

The feed test results indicate there may be an advantage to using hay preservative products in terms of maintaining feed quality in some cases. At the Yorkton site, the hay treated with Buchneri Inoculant was highest in crude protein, total digestible nutrients and had the highest overall relative feed value. Hay treated with HaySaver resulted in higher adjusted protein levels than the untreated controls, but had significantly higher mold count numbers than all other hay at the Yorkton demonstration. At the Dalmeny site, the best hay quality resulted from the dry control bale. Also at the Dalmeny site, there did appear to be an advantage to using Silo Guard® in terms of maintaining crude protein and relative feed value under high moisture conditions when compared to the control bale. The lower mold count and reduced dust observed in the Buchneri hay appear to show an advantage over baling high moisture hay with no preservative at the Dalmeny site.

Upon visual inspection, there did appear to be slightly less dust in the hay treated with preservatives at both sites as compared to the untreated high moisture hay. Odor of the preservative treated hay was also more appealing at both sites. Another consideration that is not readily apparent from the feed test results is the possible advantage in baling hay at slightly higher moisture with hay preservatives for the convenience of the producer or to avoid leaving hay in the swath when it will be rained on and quality will deteriorate quickly. In conclusion, it appears that in situations where there is no opportunity to put up dry hay, there may be an advantage to using hay preservatives to maintain forage quality. To gain the best possible advantage, producers must understand the application rates and techniques for using forage preservatives.

After viewing hay and test results firsthand at field days and on the video posted on the Saskatchewan Forage Council website, producers will be able to consider the pros and cons of hay preservatives and decide whether these products might be a good fit for their own operations. Understanding the challenges the producer/cooperator faced when using preservatives will also aid those using these products for the first time. The information resulting from this demonstration project also underlines the importance of testing feed in order to ensure that livestock nutritional requirements are being met.

Supporting Information

12. Acknowledgements

The Ministry's support for the project was acknowledged on signage displayed at each site and in all communication/extension materials.

Industry/co-operator support has also been noted all project site signage and in all communication/extension materials.

Industry Support – Cattle Care Vet Services provided the Buchneri inoculant (Lallemand Animal Nutrition) for all sites.

In-kind support was provided by Saskatchewan Ministry of Agriculture Regional Forage Specialists to oversee these demonstration sites.

13. Appendices

Appendix A – Site Photos

Appendix B – Project Extension Activities

Abstract

14. Abstract

With the assistance of ADOPT funding, the Saskatchewan Forage Council collaborated with two cooperators to demonstrate the use of and relative effectiveness of three hay preservative products: Buchneri Inoculant; HaySaver and Silo Guard®. Alfalfa-bromegrass hay was baled at high moisture (>18%) and two hay preservative treatments were compared at each site as well as untreated high moisture control and dry control bales. A site located near Yorkton used Hay Saver and Buchneri Inoculant, while a site near Dalmeny used Silo Guard® and Buchneri Inoculant. Feed test results from the Yorkton site revealed the Buchneri inoculated hay to be highest in crude protein, total digestible nutrients and relative feed value. At the Dalmeny site, the best hay quality resulted from the dry control bale. There did, however appear to be an advantage to using Silo Guard® in terms of maintaining crude protein availability and relative feed value under high moisture conditions when compared to the dry control bale. In conclusion, it appears that in situations where there is no opportunity to put up dry hay, there may be an advantage to using hay preservatives to maintain forage quality. Difficulties reported in product application by producer cooperators illustrated the importance of understanding application rates and techniques for using forage preservatives to gain the most from these products. Communication of demonstration results was carried out through field days, with over 40 people viewing these project sites in person. Video taken at both demonstrations will allow further sharing of outcomes through an ADOPT video clip posted on the Saskatchewan Forage Council website. This project will assist producers in evaluating costs and benefits of using hay preservatives, while emphasizing the importance of testing feed to ensure the nutritional requirements of livestock are being met.

Finances

15. Expenditure Statement

	Year 1 (\$)	Year 2 (\$)	Total (\$)	Budgeted(\$)
Salaries and Benefits				
• Students				
• Postdoctoral / Research Associates				
• Technical / Professional Assistants	\$322.46	\$480.87	\$803.33	\$1050.00
Consultant Fees & Contractual Services	\$463.65	\$352.67	\$815.32	\$780.00
Rental Costs				
• Rentals	\$150.00	\$150.00	\$300.00	\$450.00
Materials / Supplies	\$150.00	\$150.00	\$300.00	\$450.00
Project Travel				
• Field Work				
• Collaborations/consultations				
Other				
• Field Day	\$489.36	\$621.99	\$1111.35	\$600.00
• Administration	\$22.33	\$144.67	\$167.00	\$167.00
• Miscellaneous				
Total			\$3497.00	\$3497.00

Salaries – SFC personnel to co-ordinate with project co-operators, data tabulation, report compilation and prepare communication materials

Contractual services – feed test analysis, mold analysis, including shipping

Rentals – preservative equipment and baling equipment from cooperators

Materials/Supplies – hay preservative, compensation for high moisture bale

Field Day – food, hall, refreshments, SFC travel and accommodation to attend field day, rental costs for field day buses

Administration – project management, financial administration

Note: This project was completed on budget. Contractual services were over budget as we had to add in additional analysis (ADIN) to feed tests. Field day costs were also over budget as SFC staff had to travel to both field days and accommodation was required in one case. However, this allowed video footage to be taken at both field days and compiled into uTube clips that will provide valuable information and increased exposure for the project.

Appendix A – Site Photos



Field day Yorkton Site
Dec 1, 2011
Participants inspect
bales and applications
equipment



Field Day at Dalmeny
January 22, 2013
Participants observed bales
and discussed test results



Dalmeny field day January 22
Viewing adaptations made to
baler to apply hay
preservative



Dalmeny field day January 22
When Buchneri treated hay was
compared to untreated high moisture
hay it did appear greener in colour.

Appendix B – Project Extension Activities

Field day poster from the Yorkton Site



FROM THE FIELD TO THE COW

Hay & Nutrition Workshop

Thursday, December 1, 2011

St. Gerard's Hall, 125 3rd Ave N, YORKTON, SK

AGENDA

10:30 a.m. Registration

11:00 a.m. Field Tour – Hay Preservatives for High
Moisture Bales

*Agricultural Demonstration of Practices and
Technologies Project*

12:00 p.m. Lunch

1:00 p.m. Harvesting High Quality Forage

Charlotte Ward, Regional Forage Specialist,

Ministry of Agriculture

- Timing of harvest
- Dealing with high moisture forage



Workshop in Partnership
with the Saskatchewan
Forage Council

1:45 p.m. What is Hay Worth This Year?

Saskatchewan Forage Council

- Pricing & selling hay
- What are markets doing this year?

2:30 p.m. Feed Testing & Meeting Your Cow's
Requirements This Winter

Naomi Paley, Regional Livestock Specialist,

Ministry of Agriculture

- The basics of cow nutrition
- CowBytes & ration balancing software
- Supplemental feeding

\$10 Registration Fee
Please Pre-Register by
November 24, 2011
by calling (306) 786-1531



Saskatchewan
Ministry of
Agriculture

LIVESTOCK

AGRICULTURE

Field day poster from the Dalmeny Site



Hay Preservatives for
High Moisture Hay
Saskatchewan Forage
Council
ADOPT Project Field Tour



Tuesday, January 22, 2013 at 3:30PM

View four different hay treatments:

- Buchneri Inoculant
- SiloGuard
- High moisture bales with no treatment
- Dry control bales

Feed test and mold count results will be available. Producers from Sask Valley Farms will be on site to discuss their experience with application of hay preservatives.

Contact Kyle at 306-784-7650 or Laura at 306-969-4616
by Jan 18, 2013 to register

Transportation available from U of S to Dalmeny Site

Funding for this project provided the Agricultural Demonstration of Practices and Technology (ADOPT) program under the Canada-Saskatchewan Growing Forward agreement.

