ARIZONA AND NEW MEXICO DAIRY NEWSLETTER

COOPERATIVE EXTENSION
The University of Arizona
New Mexico State University

AUGUST 2005

THIS MONTH'S ARTICLE:

Edible Covers for Bunker Silos

Larry L. Berger, Ph.D., Nathan Pyatt, Ph.D., and Jason Sewell, M.S.
University of Illinois

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Registration Information Online for the 2005 Arizona Dairy Production Conference

Visit our website at http://cals.arizona.edu/extension/dairy/conferences/2005/registration.html to download a registration form that may be mailed or faxed to us, or register online using your Visa, Mastercard or Discover credit card. If you need assistance, call Laura Rittenbach at (520) 626-9382, or email ljr22@ag.arizona.edu.

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4th Annual Arizona Dairy Production Conference

Tuesday, October 11, 2005

Sheraton Phoenix Airport Hotel
1600 South 52nd Street
Tempe, Arizona
(480) 967-6600

Conference Program

9:00 a.m.	Registration
9:30 a.m.	Welcome and Introduction
9:45 a.m.	***Dollars and Sense of Excellent Calf Management*** **Samuel Leadley, PH.D., PAS** Attica Veterinary Associates
10:25 a.m.	***Reducing Clinical Mastitis on Dairies: Experiences with Failure...and Success*** **Keith Sterner, DVM** Sterner Veterinary Clinic
11:10 a.m.	Break
11:25 a.m.	***Rumen Acidosis, Heat Stress and Laminitis*** **Jan Shearer, DVM, MS** University of Florida
12:05 p.m.	Lunch served
12:45 p.m.	***State of the Department Address*** **Bob Collier, Ph.D.** The University of Arizona
1:00 p.m.	***Systematic Synchronization and Resynchronization Systems for Lactating Dairy Cows*** **Paul Fricke, Ph.D.** University of Wisconsin
1:40 p.m.	***Effect of Increased Milking Frequency During Early Lactation on Health and Performance Parameters of Lactating Dairy Cows*** **Matthew VanBaale, Ph.D.** The University of Arizona
2:20 p.m.	Conference Concludes - Ice Cream Reception

For more information, contact Laura Rittenbach at
ljr22@Ag.arizona.edu or (520) 626-9382

Register at www.ag.arizona.edu/extension/dairy/conferences/2005

2005 Conference Registration Form

Registration fee: $30.00 X _____ = $_____
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For addidtional information call 520-626-9382 or email ljr22@ag.arizona.edu

Berger et. al., 2005. Proc. Southwest Nutr. Conf.: 119-123.

Edible Covers for Bunker Silos

Larry L. Berger Ph.D, Nathan Pyatt Ph.D., and Jason Sewell M.S.

University of Illinois

Introduction:

Bunker silos and drive-over piles offer several advantages for large dairies and feedlots. Low initial cost, low maintenance, high storage capacity, and rapid filling are common advantages over upright silos or silo bags. However, proper management of these structures is key to optimizing forage preservation and animal productivity.

Covering the bunker or drive-over pile shortly after filling the silo is an essential step to proper preservation. Bolsen et al., (1993) reported that dry matter losses in the top 1 to 3 ft. can exceed 50% when the silo is not properly covered. Plastic film and tires are the most common method of covering most large silos. However, this method has several disadvantages. First, several people are required to cover most large silos with plastic and tires. Labor is also required to remove the plastic and tires. Secondly, proper disposal of the plastic is a real concern in many states. Split tires are often required because whole tires make excellent breeding ground for mosquitoes, thus increasing the risk of West Niles virus. Finally, deer, raccoons, and vermin can tear the plastic allowing air to penetrate increasing localized spoilage. Holthaus et al., (1995) reported that organic matter losses in the top 18 inches of silos covered with plastic and tires averaged approximately 25%.

Because of these challenges there are producers who have decided not to cover their silos. Kansas State researchers have estimated that the value of the silage lost from not covering bunker silos in the High Plains regions was between 5 and 10 million dollars per year. There are many factors that can affect the return on investment for plastic and tires. Bolsen (1997) estimated that the value of the lost silage averaged about four times the cost of the plastic and tires, and labor to apply and remove both.

Some producers are tempted to feed the spoiled silage with the good assuming that it will be diluted to the point of not affecting the animals. However, feeding silage contaminated with mycotoxins can cause reduced milk production, missed breeding cycles, abortions, increased veterinary fees, and require the feeding of additives to bind the mycotoxins. The exact cost of feeding mycotoxin-contaminated silage is difficult to determine, but Thomas et al., (1998) estimated that it cost the Vermont dairy industry between 4.5 and 9 million dollars per year. Kansas State data showed that feeding a 75:25 normal:spoiled corn silage mixture reduced organic matter, crude protein, NDF and ADF digestibilities by 5.0, 4.1, 7.2 and 9.9 percentage units, respectively (Bolsen, 2004). These researchers reported that feeding 25% spoiled silage partially or totally destroyed the mat phase in the rumen.

Previous Edible Coverings:

Because of the challenges associated with using plastic and tires there have been several attempts to develop an edible covering for bunker silos. Bolton and Holmes (2004) summarized the data evaluating alternative covers for bunker silos. These include lime, earth, a roof, candy, molasses and molasses-based products (Cargill Liqui-Seal), small

grains, sod, Nutri-Sheild, sawdust, chopped straw, and composted manure solids. Savoie et al., (2003) evaluated apple pulp and peanut butter as alternative covers for laboratory silos. The bottom line is that of all the alternative coverings tested, none were as effective as the conventional plastic covering.

Criteria of a Plastic Replacement:

The following criteria have been used in developing our alternative bunker cover: 1) provide effective protection, 2) be edible, 3) provide essential nutrients, 4) be palatable, 5) easy to apply, and 6) cost effective. For an alternative covering to be successful it must be equal or superior to plastic in its ability to protect the silage and minimize surface spoilage. The product should be edible or significant cost will be incurred in the removal and disposal of an inedible covering. If the product provides essential nutrients then a portion of the cost is offset by its feeding value. The product must be palatable so that when included in the TMR intake is not impaired. Ease of application is critical to acceptance by the end user. Finally, the total benefits must be greater than the cost.

The original idea for this product resulted from my wife who made home-made play dough for our kids. After observing the physical properties and ingredient composition, the first series of experiments was to evaluate its potential to protect large hay bales. We found that it shed water well and was consumed by the cattle when salt was removed from their diet. This lead to a series of experiments with bunker silos.

Initial Bunker Silo Experiments:

The objective of the first experiment was to determine whether the starch-salt matrix could serve as an edible covering for bunker silos that would simultaneously reduce spoilage and serve as a nutrient source. Whole plant corn silage (40% DM) was chopped and packed into six side-by-side mini-bunkers 12 ft long x 6 ft wide X 6 ft deep. Equal amounts (3,455 lbs DM) of chopped whole-plant corn were weighed into each bunker, leveled and packed with a small tractor. The three treatments were uncovered, covered with six-mil plastic or covered with the starch-salt matrix. The starch-salt matrix was mixed in a motar mixer with boiling water added to gelatinzed the starch. The matrix was applied by hand to achieve a 0.5-.75 in. thick layer using a cement trowel. After 3 days of curing, paraffin wax was melted and a thin layer applied with a paint roller. The forage was allowed to ensile for 92 days. Hand separation was used to sort the spoiled and good silage prior to feeding. A wooden frame 1 ft by 5 ft was used to measure the spoilage under a fixed area. The measurements were made at 3 locations on each silo. Surface spoilage under the frame averaged 31.5, 36.0, and 2.6 lbs DM ($P < 0.05$) for the uncovered, plastic and starch-salt covering, respectively. Forty-eight Angus heifers were allotted by weight to 12 pens. Two pens of heifers were randomly assigned to each minibunker. Silage DM fed was 1549, 1951, and 2684 lbs ($P < 0.05$) for the uncovered, plastic and starch-salt covering, respectively. These are relatively low recovery rates because of the small size silos with a large surface area to volume ratio. In addition, the forage at harvest was drier than optimum for bunker silos. Animal days per bunker were 140, 152, and 212 ($P < 0.05$). During the feeding study the starch-salt matrix was removed from the silage prior to feeding. For the last 6-days, heifers fed the starch-salt matrix silage were fed the covering at the rate of 2.0 lbs (as-fed) per day. After collecting the orts, it was determine that heifers consumed approximately 91% of the covering offered.

The ash content of the pre-ensiled forage and spoilage from uncovered, plastic and starch-salt matrix treatments averaged 5.8, 11.4, 8.7 and 18.3% ($P < 0.05$), respectively

These data suggest that a portion of the salt diffused into the silage immediately under the covering. Cai et al., (1997) showed that some strains of lactic acid bacteria are salt tolerant. A combination of the air-tight covering and preservative effects of the salt helped to minimize surface spoilage. Also, the salt containing silage did not inhibit intake when it was mixed with the normal silage below it.

This initial research showed promise, but there were several significant huddles to overcome. First, this product required boiling water to gelatinize the starch, a costly and awkward requirement on a large scale. Secondly, wheat flour was used as the starch source. A cheaper more easily obtained source of starch was needed. Finally, a more practical means of application was needed.

Several of these issues were addressed in the laboratory involving the testing of approximately 40 different formulations. All of the modifications still allowed us to meet the original criteria. We found that finely ground wheat could replace the flour. By adding additional feed-grade ingredients we could eliminate the boiling water and still achieve a starch-salt matrix that was adhesive and flexible. Achieving a product that was able to be sprayed on and not crack upon drying required additional reformulations.

Alternative Application Methodology:

The goal of this research was to develop a commercially feasible application method to cover bunker silos with an edible covering. The previous formulation had a bread-dough consistency, and had to be modified so that it could be sprayed. After evaluating several pieces of equipment a commercial CEJCO concrete pump, model CSS 2489 with a vertical shaft mixer and screw pump was used. A 50 ft. x 3 in. diameter hose was used to apply the product. On the end of the hose a spray nozzle was connected to a 110 CFM Ingersoll-Rand industrial air compressor for atomizing the product as it was applied. Approximately 700 lbs of dry ingredients were added to the mixing chamber and water was added to bring the final product to approximately 30% moisture. This unit was chosen because it could be powered by the hydraulic system of a farm tractor. This approach was used to cover mini-bunkers and small drive-over piles. The wax was applied as described above. When the silos were opened, surface spoilage was similar to what had been observed in the original experiment.

Protective Coatings for the Edible Covering:

The objective of this research was to develop a protective covering for the edible starch-salt matrix that was easier to apply than the paraffin wax. A control 6-mil black plastic covered with 2-3 inches of soil was compared to the starch-salt matrix coated with a sprayable wax emulsion, molten paraffin applied with a paint roller, or wax paper. The wax paper is made by Georgia-Pacific Paper Company (Clatskanine, OR) and is food grade so that it can be fed to animals. The sprayable wax emulsion has the advantage of eliminating the need for equipment and fuel to melt the paraffin wax. The wax paper could be applied directly behind the spraying apparatus and bound to the starch-salt matrix by running small press wheels on top the paper. The wax paper has the potential advantage of holding the starch-salt matrix in place on steep slopes of bunkers or drive-over piles.

Eight 7 ft wide X 24 ft long by 4 ft deep mini-bunker silos were filled with 21,330 lbs of chopped whole corn plant (39.1% DM). The silos were sealed on September 11, 2003 and opened after 117 days of ensiling. The silage was packed with a tricycle IH farm tractor. Less weight on the rear wheels resulted in less compaction next to the walls

and more spoilage along the walls. Spoiled and good silage was hand separated. The DM fed for the plastic control, sprayable wax, paraffin wax, and wax paper treatments were: 4759, 4378, 5861, and 5493 lbs, respectively. Less DM was fed from the sprayable wax silos than the plastic controls ($P < 0.05$). The DM fed from the paraffin and wax paper treatments was 23 and 15% greater, than what was fed from the plastic control silos. Again, low DM recoveries are due to the high surface to volume ratio for these silos.

Current research is aimed at the development of a low-profile vehicle that could drive over the piles and apply the starch-salt matrix in swaths. A feeder hose would be hooked to the unit from a screw-type concrete pump. Research is being done to determine if the dry ingredients and water could be mixed in a typical feed mixing unit and unloaded into the screw pump powered by its own hydraulic pump.

Conclusion

There are three reasons why the starch-salt matrix sealed with wax is superior to plastic in reducing surface spoilage. First the starch-salt matrix forms and air-tight seal. The starch-salt matrix doesn't just lay on top of the forage like plastic, rather it bonds to the forage particles without air-layer interface. In addition, the salt diffuses into the top 10-15 inches of silage and acts as a preservative to prevent mold growth. These qualities allow the starch-salt matrix to meet our first criteria of providing effective protection.

All the ingredients in the formulation are GRAS and feed grade, making it totally safe to feed. The ingredients in the starch-salt matrix also provide essential nutrients that would normally be added to the diet. The covering will blend with the other ingredients in a diet in a normal feed mixer. At subzero temperature there may be a few clods that don't breakdown immediately. But when combined with the "warmer" ingredients they will break apart and not be easily sorted by the cattle. We have fed the covering at 2.5% of the diet (DMB) and not observed any reduction in intake. Seldom will the covering be at a higher proportion of the diet because we are only applying it at 0.5 to 0.75 in. If the silage is over three feet deep, the covering will be less than 2.5% of the mixture. In addition, usually the silage does not make up the total diet.

Ease of application is the focus of much of our current research. We see this being done on a custom basis where the same equipment can be used on numerous silos per year. The dry ingredients would be delivered in bulk and loaded into a feed mixing truck. Water would be added to achieve the desired consistency and then unloaded into a screw pump that would deliver the mixture to the spraying machine.

Obviously, the technology will only be adopted if it is cost effective. We are optimistic because most of the cost of the original ingredients will be recovered when they are fed. Thus application cost is the main item that needs to be paid for by the reduced spoilage and avoidance of plastic disposal and tire handling problems. Although there are significant application issues that need to be solved, we have made real progress in addressing these issues and are optimistic that this product has a future in helping large dairies and feedlots managed their silage more effectively.

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HIGH COW REPORT
JULY 2005

MILK

Arizona Owner	Barn#	Age	Milk	New Mexico Owner	Barn #	Age	Milk
* Mike Pylman	349	03-05	37,730	* Pareo Dairy	9837	5-04	41,477
* Stotz Dairy	14644	05-10	37,530	* Providence Dairy	8157	-----	40,970
* Stotz Dairy	16973	04-01	36,490	* Providence Dairy	9864	4-04	40,050
* Mike Pylman	2524	03-02	36,410	* Providence Dairy	9903	4-04	39,640
Parker Dairy	9376	08-07	36,080	* Providence Dairy	9541	4-06	39,030
* Mike Pylman	2423	03-02	35,960	* Providence Dairy	9982	4-04	38,320
* Mike Pylman	2969	04-04	35,420	* Pareo Dairy	8548	4-10	38,286
* Mike Pylman	1744	05-07	35,240	Red Roof Dairy	4542	5-07	37,141
* Stotz Dairy	16296	04-08	35,090	* Pareo Dairy	3747	4-02	36,356
* Mike Pylman	21521	04-05	35,080	* Providence Dairy	5582	3-04	36,070

FAT

* Stotz Dairy	16296	04-08	1,615	* Tallmon Dairy	630	7-04	1,621
* Stotz Dairy	19497	07-03	1,606	* Pareo Dairy	8548	4-10	1,474
* Shamrock Farms	5017	04-01	1,542	* Providence Dairy	9864	4-04	1,431
* Shamrock Farms	U270	06-07	1,469	* Providence Dairy	9541	4-06	1,399
* Mike Pylman	2335	04-01	1,404	* Pareo Dairy	9837	5-04	1,381
* Shamrock Farms	2651	05-00	1,403	* Providence Dairy	8501	5-01	1,364
* Mike Pylman	1744	05-07	1,374	* Pareo Dairy	9747	5-09	1,339
* Stotz Dairy	16049	04-10	1,364	* Pareo Dairy	4445	3-08	1,325
* Shamrock Farms	8252	03-02	1,347	* Tallmon Dairy	732	4-00	1,322
* Shamrock Farms	5800	03-11	1,338	* Providence Dairy	9903	4-04	1,304
				* Pareo Dairy	329	7-11	1,304

PROTEIN

* Stotz Dairy	18043	03-05	1,086	* Pareo Dairy	8548	4-10	1,190
* Mike Pylman	2524	03-02	1,077	* Pareo Dairy	9837	5-04	1,182
* Mike Pylman	349	03-05	1,075	* Tallmon Dairy	630	7-04	1,175
* Stotz Dairy	16296	04-08	1,070	* Providence Dairy	9864	4-04	1,171
* Stotz Dairy	16973	04-01	1,051	* Pareo Dairy	9747	5-09	1,151
* Mike Pylman	6754	04-08	1,028	* Tallmon Dairy	732	4-00	1,149
* Stotz Dairy	14644	05-10	1,026	* Providence Dairy	9903	4-04	1,139
* Mike Pylman	6744	04-09	1,011	* Providence Dairy	9982	4-04	1,138
* Stotz Dairy	17063	04-00	1,007	* Providence Dairy	8442	5-03	1,134
* Stotz Dairy	16048	04-09	1,004	* Pareo Dairy	3713	4-02	1,123

*all or part of lactation is 3X or 4X milking

ARIZONA - TOP 50% FOR F.C.M.[b]
JULY 2005

OWNERS NAME	Number of Cows	MILK	FAT	3.5 FCM	DO
* Stotz Dairy West	2,094	26,927	970	27,367	172
* Triple G Dairy, Inc.	4,468	25,149	934	26,015	138
* Joharra Dairy	1,407	25,649	887	25,469	114
* Del Rio Dairy, Inc.	1,135	24,886	888	25,155	134
* Red River Dairy	5,296	24,746	864	24,706	138
* Mike Pylman	5,496	24,224	867	24,529	165
* Zimmerman Dairy	1,141	23,785	859	24,209	159
* Stotz Dairy East	1,066	23,873	848	24,069	215
* Arizona Dairy Company	5,643	23,267	818	23,320	192
* Goldman Dairy	2,239	22,984	803	22,955	149
* Dairyland Milk Co.	3,141	22,800	803	22,875	141
* Shamrock Farm	8,494	22,952	776	22,503	155
* Danzeisen Dairy, Inc.	1,323	22,190	792	22,433	173
Parker Dairy	4,091	22,010	796	22,420	171
* Withrow Dairy	5,053	23,492	754	22,380	168
Paul Rovey Dairy	176	21,555	792	22,159	135
* Dutch View Dairy	1,648	21,809	773	21,961	163
* DC Dairy, LLC	1,034	21,497	780	21,939	149
* RG Dairy, LLC	1,101	21,159	756	21,404	164
Lunts Dairy	600	20,542	767	21,315	145
* Saddle Mountain Dairy	2,907	22,048	707	20,994	149

NEW MEXICO - TOP 50% FOR F.C.M.[b]
JULY 2005

OWNERS NAME	Number of Cows	MILK	FAT	3.5 FCM	DO
* Tallmon Dairy	478	26,887	938	26,837	151
* Pareo Dairy #1	1,479	26,398	947	26,771	159
* Providence Dairy	2708	25,322	853	24,781	133
Ken Miller	399	24,929	850	24,563	170
* Macatharn	998	23,821	841	23,938	144
* Pareo Dairy #2	3,317	23,376	843	23,778	135
* Vaz Dairy	1,682	23,107	846	23,710	158
* Do-Rene	2392	24,152	809	23,562	139
* Milagro	3368	23,521	824	23,532	151
* New Direction Dairy 2	1919	22,708	839	23,424	148
* Goff Dairy 1	4366	22,825	810	23,004	133
* SAS Dairy	1,887	23,212	785	22,766	141
* Flecha Dairy	2117	21,911	816	22,707	117
* Baca Linda Dairy	1222	22,145	784	22,289	121
* New Direction Dairy	40	21,320	801	22,208	208
Caballo Dairy	3401	21,683	776	21,959	141

* all or part of lactation is 3X or 4X milking

[b] average milk and fat figure may be different from monthly herd summary; figures used are last day/month

ARIZONA AND NEW MEXICO HERD IMPROVEMENT SUMMARY FOR OFFICIAL HERDS TESTED JULY 2005

		ARIZONA	NEW MEXICO
1.	Number of Herds	42	28
2.	Total Cows in Herd	60,644	57,934
3.	Average Herd Size	1,444	2,069
4.	Percent in Milk	88	87
5.	Average Days in Milk	214	199
6.	Average Milk – All Cows Per Day	57.2	64.9
7.	Average Percent Fat – All Cows	3.5	3.4
8.	Total Cows in Milk	60,707	50,321
9.	Average Daily Milk for Milking Cows	65.4	74.8
10.	Average Days in Milk 1st Breeding	84	72
11.	Average Days Open	158	146
12.	Average Calving Interval	14.0	14.0
13.	Percent Somatic Cell – Low	86	80
14.	Percent Somatic Cell – Medium	9	14
15.	Percent Somatic Cell – High	5	5
16.	Average Previous Days Dry	62	65
17.	Percent Cows Leaving Herd	32	34
		STATE AVERAGES	
	Milk	21,996	22,646
	Percent butterfat	3.55	3.51
	Percent protein	2.92	3.07
	Pounds butterfat	782	799
	Pounds protein	634	694

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UPCOMING EVENTS:
Arizona Dairy Production Conference
Tempe, Arizona
October 11, 2005