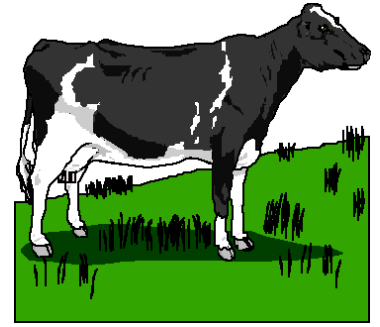


# DELAWARE DAIRY REPORT

Newsletter From the University of Delaware  
Animal and Food Science Department  
and Cooperative Extension



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## Educational Opportunities for Delaware Dairy Farmers in 2004

*Gordon Johnson, UD Extension, Kent County*

Dairy farmers in Delaware will have several opportunities to attend meetings, classroom sessions, on-farm workshops, and other programs in 2005. A Calendar of Events follows:

January 13 Delaware Pesticide Conference, Modern Maturity Center, Dover

January 19 Delmarva Ag. Safety and Health Conference, Capital Grange, Dover

January 18,19,20 Your Land, Your Family, Your Future – Equity Alternative Analysis; County Extension Offices

January 18 & each Tuesday for 8 wks New Horizons in Ag. Enterprises – Direct Marketing and Producing Value Added Farm Products , Polytech, Woodside

January 26-27 Delaware Agronomy and Technology Conference; Delaware State Fairgrounds, Harrington

January 27 Women in Agriculture Conference, Atlantic Sands Hotel, Rehoboth Beach

January 31 Automated Milking Systems Meeting, Hartly Fire Hall, Hartly, DE

February 16 Delmarva Dairy Day, Hartly Fire Hall, Hartly, DE

March 16 DE DHIA Banquet and Dairy Princess Contest, Felton Fire Hall, Felton, DE

April 2 Spring Dairy Expo, DE State Fairground

July 2-3 4-H & FFA Cow Camp, DE State Fairground

## Focus on Dairy Workshops

*Gordon Johnson, UD Extension, Kent County*

We will be initiating a Dairy Focus Series in 2005. Due to Avian Influenza these workshops were cancelled last winter. We will try again this year. These on-farm workshops will focus on a particular area of concern to dairy farmers. They will be held in February and March (notices will be sent of time and places). Included in this series will be:

- Focus on foot problems and lameness
- Focus forage quality and forage feeding
- Focus on cow comfort

Workshops will be taught by Dr. Limin Kung, Dr. Robert Dyer, Gordon Johnson, and other invited resource persons.

## **Automated Milking System Meeting Scheduled for Hartly, DE January 31, 2005. Are you going to “do the robot”?**

*Dr. Robert Peters, University of MD Extension*

More and more Dutch and Danish dairy farmers are switching to automated milking systems (AMS) with great success. But is robotic milking for you? Find out at one of four one-day meetings being offered early next year by Extension faculty from the University of Maryland and Pennsylvania State University.

We are fortunate in Delaware to be able to be one of the locations for this meeting. Details and program follows:

### Would An Automated Milking System Help Your Business Thrive in the 2000's?

Date: Monday, January 31, 2004

Location: Hartly Fire Hall, Hartly, DE

8:30 a.m. Registration and Electronic Trade Show

9:30 a.m. Automated Milking Systems – What is it?  
(Bob Graves, Penn State Univ.)

- World trends
- Commercial Products Available
- Components of the System
- Housing Issues, New vs. existing facilities
- Mindset – Managing information vs. cows
- Management to optimize milk production

10:15 a.m. The Cost of Automated Milking Systems  
(Jeff Hyde, Penn State Univ./Dale Johnson, Univ. MD  
Coop Ext.)

- Economic climate that precipitated adoption of AMS in NL and DK
- Assumptions – Cost, herd size, production level, milk price, etc
- Payback

10:45 a.m. Break

11:00 a.m. Milk Quality and PMO Considerations  
(Bob Peters, Univ. of MD/John Tyson, Penn State  
Coop Ext.)

- Teat cleaning capabilities of AMS
- Impact of AMS on Milk Quality
- Managing abnormal milk using AMS

- Teat dipping capabilities of AMS
- PMO considerations

11:30 a.m. Animal Welfare and Behavior Considerations (Mark Varner, Univ. of MD)

- Address concerns of using new technology from public perception standpoint
- Impact on health and behavior
- Using scorecard for animal welfare concerns

12:00 Noon Lunch, Electronic Trade Show with Lely, Boumatic, and DeLaval. Mike Bell and Stan Fultz (Univ. MD Coop. Ext.) Slide Show: International Exposé on AMS – Real World Experience in Netherlands and Denmark

1:00 p.m. Producer Experience with AMS  
Neil Rowe, England

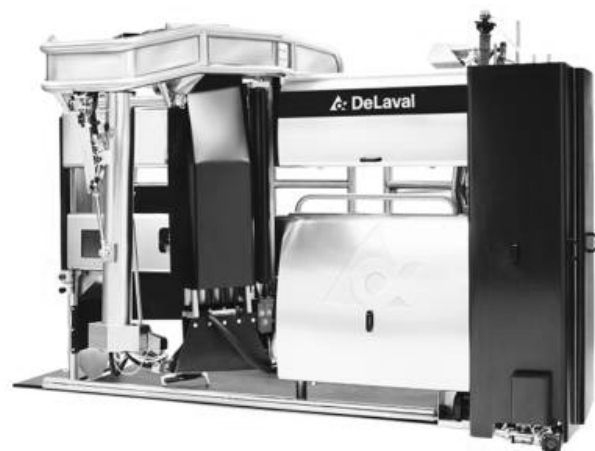
- Mr. Rowe has operated an AMS unit with a registered dairy herd that initially emphasized purebred dairy cattle and high production. He transitioned to a crossbred herd where the calves suckle 50% of the herd. He now markets organic milk and beef and finds his business is more profitable than with the conventional dairy.

1:45 p.m. Questions for Mr. Rowe.

2:00 p.m. My Experience with Foot and Mouth Disease, Mad Cow, and New Biosecurity Controls. Neil Rowe, England

2:30 p.m. Adjourn

Pre-registration is due one week before the meeting, and the cost is \$20 per person. For more information or to register, call (302) 730-4000.



## **Delmarva Dairy Day Scheduled for Hartly, DE on February 16.**

*Gordon Johnson, UD Extension, Kent County*

Delmarva Dairy Day has been scheduled for February 16, 2005. Last years event was cancelled due to the Avian Influenza outbreak. We hope to have better luck this year.

Topics will include:

- Dairy diets and phosphorus
- BSE and animal identification updates
- Johne's disease program updates in DE and MD
- Composting dairy mortalities
- Aerobic stability of TMR's
- Optimum days dry
- Alternative forages for the Mid-Atlantic
- Dairy risk management programs
- Housing considerations and cow comfort
- Dairy health topics

## **Supplemental Income Opportunities for Dairy Farms: Value Added, Direct Sales, and Agritourism** ***Build a business plan for your idea in upcoming workshops.***

*Gordon Johnson, UD Extension, Kent County*

One of our largest resources in Delaware is people. There are hundreds of thousands of residents and over a million visitors to the state. Many of our Delaware Dairy Farmers are interested in exploring ways to tap into these markets.

In Delaware we have the great example of Woodside Farm Creamery in Hockessin, DE (<http://www.woodsidefarmcreamery.com> is their website). The Mitchell family has taken advantage of their location to develop an ice cream business that has grown dramatically over the years serving thousands of customers.

I have been fortunate to have arranged a number of tours as well as to hear a number of speakers on this topic in the past 3 years. There are many success stories that Delaware farmers can look to as examples. This includes on-farm bottling;

production of value-added products such as yogurt, cheese, ice cream, butter, and flavored milk; raw milk sales (in states where that is allowed); cow leasing to consumers; on-farm stores; ice cream stands; milk routes; farm tours and educational activities; on-farm bed & breakfasts and lodging; dairy farm based vacations; animals as an agritourism attraction; farm festivals; and much more.

If you are interested in exploring any of these ideas or other ways to supplement your income, the University of Delaware Extension service is offering an 8 week workshop series to help you solidify your ideas and develop a business plan. This workshop is entitled: New Horizons in Agricultural Enterprises – Selling directly and producing value-added products.

This workshop series will be held every Tuesday evening starting on January 18 from 6-9 PM at the Adult Education Center at Polytech High School in Woodside, DE (South of Dover). Call (302) 730-4000 to register.

You will come out of these sessions with a completed business plan for your new enterprise that can be used to help develop your business, take to lenders, and inform your business contacts.



## **Update on the Johne's Disease Program at the Delaware Department of Agriculture.**

*Gordon Johnson, UD Extension, Kent Co.*

Last spring, the Delaware Department of Agriculture started an aggressive Johne's disease control program for the State. Dr. John Ricker was

hired to administer this program. This program was launched with an educational workshop featuring Dr. Robert Whitlock, a nationally recognized Johne's disease expert from the University of Pennsylvania Vet School. Dr. Richer also organized an advisory group of dairy farmers, beef producers, and University representatives to help direct the program.

After intensive training on Johne's disease and control programs, Dr. Richer spent several months visiting dairy and beef cattle farms in the state, educating farmers about the disease and doing initial assessments.

The next step was to adopt program elements from the national Johne's control program recommendations. These elements will be used to design a program that works for Delaware.

All Delaware dairy farmers should consider working to eliminate Johne's disease from their herds. This often silent disease is robbing dairies of income by reducing production and increasing cull rates. Potential ties to the human Crohn's disease has also raised concerns in the Dairy industry with possible effects on future milk sales. There is an industry-wide effort underway to address this disease and work toward elimination in US herds.

To get involved in this program, contact Dr. John Ricker at the Delaware Department of Agriculture (302) 698-4500.

## **Rumensin Approved for Lactating Dairy Cows**

Rumensin has been used in beef cattle and heifer diets for many years but it has recently gained approval for use in diets for lactating dairy cows. It is the only FDA-approved feed ingredient that can claim an improvement in milk production efficiency, i.e. more milk per unit of DM consumed. Rumensin alters rumen fermentation causing an increase in the production of propionic acid that is ultimately converted to glucose and used for energy by the cow. Rumensin can be incorporated into the diet at a range of 11 to 22 gm per ton of TMR dry matter. With increasing levels of rumensin, DM intake slightly decreases while milk production slightly increases. These changes result in an increase in the conversion of feed to milk. Feed efficiency may improve from +2 to +4% within this dose range. There is no withdrawal time for its use. At higher levels of use, there may be some depression in milk fat test. However, the increase in milk production efficiency offsets this result. On average, the research data suggests a 5:1 return on investment throughout the entire lactation cycle when feeding rumensin. Work with your nutritionist to see if rumensin can be used for your lactating cows.

*Dr. L. Kung, Jr., UD*

## **Delaware DHIA Banquet and Dairy Princess Contest**

The annual Delaware DHIA banquet and Dairy Princess Contest has been set for Wednesday, March 16 at the Felton Fire Hall in Felton, DE. This is one of the most enjoyable family events with good food, recognition of top producers, and great entertainment ending in the crowning of the next DE Dairy Princess to represent the dairy industry in the state for the coming year. For more information contact Rebecca Johnson (Dairy Princess Portion of the event) or the Kent County Extension office (for tickets and general information).



## Managing High Moisture Co-Product Feeds For Improved Aerobic Stability

**Summary.** High moisture, co-product feeds such as brewer's and distiller's grains can be economical feeds for ruminants. However, two major factors limit the use of these types of feeds. First, their high moisture content (approximately 50-70%) limits the distance that they can be economically shipped from their sources of production (perhaps 75 to 100 miles). Second, the aerobic stability of these feeds can be extremely poor (two to seven days) in warm weather limiting delivery to small quantities that must be fed quickly. Spoiled grains are extremely unpalatable and cause reductions in nutrient intake when fed to livestock. This paper will describe the microbial ecology of wet grains and discuss various methods to improve their aerobic stability.

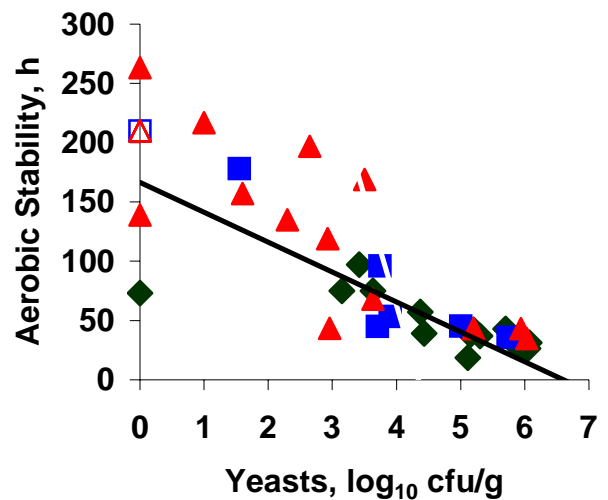
**Introduction.** Wet co-product feeds such as brewer's and distiller's grains can be economical feeds for ruminant because they are high in protein, fat, and digestible fiber. Specifically, the supply of distiller's grain is increasing with the opening of more plants for the production of ethanol as an alternative source of fuel. For simplicity, we will generally center on the use wet distiller's grains (WDG) as an example of all high moisture co-product feeds for the remainder of this paper.

During the production of ethanol a significant amount of heat is used to gelatinize the starch that, also kills many undesirable microorganisms. Distiller's grains are essentially sterile after processing but may have low numbers of residual yeasts. After processing, the grains are hot (70-80°C), have a low pH (< 4) and have low residual amounts of soluble sugars and starch.

**Microbial Ecology of WDG.** There is little published research on the microbial ecology of wet grains. Thus, some of the following discussion is based on internal research studies from Kemin Industries and on known information on silages.

Inoculation of the WDG by spoilage microorganisms occurs quickly and comes from a variety of sources including processing equipment, spoiled feed around the storage pad, the general

environment, and transportation equipment. The initiators of spoilage are usually yeasts that are not readily discernable by eye. Even a low number of yeasts can result in poor aerobic stability because they often have generation times of about one hour. If WDG were contaminated with 100 ( $10^2$ ) yeasts per gram of wet grain, under optimal conditions, their population could increase to more than 100,000 ( $10^5$ ) cfu/g in less than ten hours. In an additional four hours, the population could increase to more than 1,600,000 ( $10^6$ ) cfu/g. Species of yeasts



**Figure 1. The relationship between yeasts and aerobic stability in corn silage. (Kleinschmit, 2004 M.S. Thesis Univ. of DE)**

that have been identified specifically in WDG include *Kluyveromyces*, *Pichia*, *Candida*, and *Debaryomyces* (Kemin Industries, 2003 unpublished data). Species of the later three are also often responsible for initiating aerobic spoilage in silages. For example, in corn silage, numbers of yeasts are highly and negatively correlated with aerobic stability. In a summary of published studies (Figure 1), the data show that when there are more than  $10^6$  cfu of yeast per gram of corn silage, the aerobic stability of that silage is extremely poor (Kleinschmit, 2003 MS Thesis University of Delaware). In contrast, if no yeasts were present, corn silage would be stable for more than 150 hours. As spoilage progresses for WDG, molds that are often easily identified by eye, continue the process followed by further spoilage by

bacteria. Species of molds that have been identified in WDG include *Aspergillus* sp., *Geotrichum* sp., *Mucor* sp., *Paeliomyces* sp., *Fusarium* sp., *Botrytis* sp., and *Penicillium* sp. (Kemin Industries, 2003 unpublished data). Several of these species have been implicated in the production of a variety of toxins that could have negative effects on animal health. Wadhwa (1995) reported mycotoxicosis in buffalo fed brewer's grains contaminated with *Aspergillus flavus*.

The rapidity of growth for yeasts and molds on WDG is dictated by a variety of factors. Temperature can have a profound effect on the growth of yeasts because most grow well between temperatures of 25 to 40°C. In cool weather, their metabolism is slowed. For example, Savard et al. (2002) reported that a species of *Saccharomyces* from fermented vegetables increased in numbers from 10<sup>3</sup> cfu/ml to 10<sup>5</sup> cfu/ml in less than 3 days in juice with a temperature of 30°C, where as it took about 30 days for a similar increase if the temperature was at 3°C. Reports from the field generally agree that the problem of poor aerobic stability for WDG is greatly reduced during cold weather.

Water available for metabolic activity ( $a_w$ ) is also a factor that affects the growth of spoilage microorganisms. The fact that is  $a_w$  limiting in dry feeds is the reason that they resist spoilage. Dried distiller's grains can be stored for prolonged periods of time with little fear of spoilage. In contrast, WDG have sufficient  $A_w$  that allows for rapid growth of microbes. Yeasts are also primarily aerobic microorganisms and thus exposure to air stimulates their growth. Residual amounts of sugars and some starch in distiller's grains provide sufficient nutrients for this to occur. Unlike many bacteria, yeasts are very tolerant of low pH. In fact, depending on the acidifying agent, some yeast can grow well even when the pH is below 2. Thus, although WDG has a pH below 4, yeasts and molds can thrive in this environment.

A variety of factors can affect the population of spoilage organisms on WDG by the time it reaches the farm. For example, the grains may sit on a pad at the ethanol plant for 30 min up to 3 days prior to delivery to the farm. The numbers of yeasts and molds on WDG sampled at ethanol plants vary

based on the location and time of sampling relative to it leaving the process line. If sampled after storage on a pad, numbers of yeasts may be as high as 10<sup>4</sup> to 10<sup>5</sup> cfu/g. In contrast, in eight samples of WDG treated with a preservative during the summer in Midwest ethanol plants, there were less than 10 cfu/g and 10<sup>3</sup> cfu/g of molds and yeasts, respectively in these freshly treated samples (Kemin Industries, 2003 unpublished data).

*Methods to Improve the Aerobic Stability of WDG.*

*Organic acids.* Weak organic acids such as propionic, sorbic, and benzoic acids act as uncoupling agents in fungal cells. Of the three acids, sorbic and benzoic acid are effective at inhibiting the growth of yeasts and molds. Propionic acid is more effective at inhibiting the growth of molds than yeasts although its ammoniated form is relatively active in inhibiting the later. Undissociated acids are more potent because they readily pass through the cell membranes and liberate their protons, thus acidifying the cytoplasm and decreasing the proton gradient. Thus, the majority of acids have poor antifungal activity at a neutral pH. Note that in the common acids listed below (Table 1) lactic acid that is commonly the major acid in silages is only mildly dissociated (15%) at pH of 3.5. This explains why a low pH in silages is not a good indicator of the degree to which silage will be stable when exposed to air.

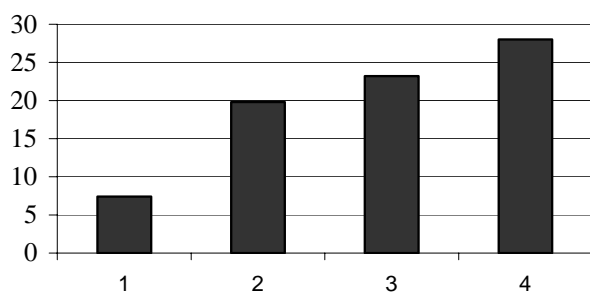
Table 1. Undissociation of acids as affected by pH. (Modified from DeBoer and Nielsen (1995).

| Preservative   | pKa  | % undissociated acid at pH |     |     |     |
|----------------|------|----------------------------|-----|-----|-----|
|                |      | 2.5                        | 3.5 | 4.5 | 5.0 |
| Acetic acid    | 4.74 | 99                         | 95  | 63  | 33  |
| Lactic acid    | 2.74 | 64                         | 15  | 1.7 | 0.5 |
| Benzoic acid   | 4.19 | 98                         | 83  | 33  | 13  |
| Propionic acid | 4.87 | 100                        | 96  | 70  | 43  |
| Sorbic acid    | 4.76 | 99                         | 95  | 65  | 37  |

In contrast, acetic, propionic and sorbic acids are highly undissociated at a pH of 3.5 (close to the pH

of wet distillers grains as it leaves the plant). Anion toxicity has also been suggested as an explanation for antifungal properties of weak acids. In addition, alteration of cell membrane transport and inhibition of NADH oxidation have also been suggested as mechanisms for antifungal activity. The degree of antifungal strength is also based on solubility. For example, potassium sorbate and sodium benzoate are more soluble than their respective counterparts. Propionic acid and potassium sorbate have both been used to stabilize wet brewer's grains (Schneider et al., 1995; Wyss, 2002). Other compounds such as antibiotics, herbs, antioxidants, spices, essential oils and other chemicals have been used with varying success to control yeasts and molds in foods. However, there is little information on their use to stabilize WDG.

## Days Until Visible Mold



**Figure 2. Days to mold in WDG treated with an organic acid preservative. Kemin Industries. Fact Sheet 42003.**

Combinations of antifungal agents have been shown to sometimes be more effective than single agents alone. Thus, many aerobic stabilizers used for silages have multiple active ingredients (Kung et al., 2003). A preservative designed specifically for use on high moisture grains was tested in a laboratory study (Figure 2). The preservative contained a blend of organic acids and antioxidants. Treatments were with 0, 6, 12, or 18 lb of preservative/ton of a modified WDG (50% moisture). Samples were placed in Styrofoam coolers and were exposed to air at room temperature (~ 25°C) for 28 days. Visible mold was observed within 7 days on untreated WDG but increasing amounts of treatment resulted

in less rapid development of molds. These data show that the aerobic stability of WDG can be improved with organic acid-based preservatives.

*Ensiling and storing.* Wet distiller's grains alone do not undergo a robust ferment because low numbers of naturally occurring lactic acid bacteria, a low pH that retard the growth of fermentative bacteria and sometimes marginal amounts of fermentable substrates. Variable results were obtained when wet brewer's grains were ensiled with bacterial inoculants (Schneider et al. 1995). Wet brewer's grains have been combined with other feeds that have supplied more fermentable substrates and ensiled well. Combining wet grains with drier feeds also decreases the moisture content and helps to decrease the potential for excessive amounts of seepage. Mills and Grant (2002) reported that it was practical for wet corn gluten feed to replace from 10 to 30% of corn forage (DM basis) at the time of ensiling and that there were no negative effects on the subsequent silage fermentation. Partial replacement of corn forage with wet corn gluten feed also increased packing density of the silage. Kalcheur et al. (2003) reported that a 50:50 mixture of corn forage and WDG ensiled in bag silos fermented well and had a low pH and moderate amounts of acetic acid. Schneider et al. (1995) successfully ensiled wet brewer's grains with beet pulp.

In warm weather, bagging or covering WDG with a tarp on a pad to minimize its exposure to air can improve its aerobic stability (perhaps an added 7 to 14 d or more). However, care must be taken to not over pack bag silos or they will split. In addition, bags must be managed during feed out to minimize the contact between feed and air. Storing WDG in a location out of direct sunlight to minimize heating may also help to retard spoilage during warm weather.

*Conclusions.* High moisture co product grains are excellent feeds for ruminants. However, their short shelf life in warm weather is a drawback to their use. Only a limited amount of research has been undertaken to understand the microbial ecology of wet distiller's grains and factors affecting its aerobic stability on farm. Use of organic acid-based

preservatives to improve the aerobic stability of high moisture grains appears promising. Overall, more research is needed in order to better understand the factors related to enhancing the aerobic stability of high moisture co product grains.

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Authors: Dr. Limin Kung, Jr., Univ. of Delaware and Carol Myers, Kemin Industries. This presentation was made at the 2004 Mid Atlantic Nutrition Conference, Timonium MD. March 24-25, 2004.

## Research Summaries From the University of Delaware. What Have We Been Up To?

### The Effect of Essential Plant Oils on Milk Production and Composition From Lactating Dairy Cows and on Silage Fermentation and Aerobic Stability of Corn Silage.

Alternative feed additives have been studied and the use of plant secondary compounds is a promising option. These compounds have broad antimicrobial activity but are not classified as antibiotics. A blend of essential oil components (CRINA Ruminant, CRINA S.A., Switzerland) was fed to lactating cows to study its effect on intake and milk production. Cows were fed a total mixed ration (TMR) of 15% alfalfa silage, 10% alfalfa hay, 25% corn silage, and 50% concentrate (DM basis). For a 2-wk pretreatment period all cows were fed 50 g of a limestone/CRINA blend that was mixed into the TMR to provide a daily intake of 0.6 g of CRINA/cow/d. At the start of an 8 wk treatment period cows were blocked on lactation number, pretreatment milk production and days in milk, and randomly allocated to one of two treatments: 1) 100 g of limestone or 2) 100 g of limestone/CRINA (1.2 g CRINA/cow/d). Cows fed CRINA ate 4.2 lb more DM/d and produced 5.9 more lb of 3.5% FCM/d than did cows fed the control diet ( $P < 0.05$ ). Milk composition was unaffected by treatment. CRINA was also added to chopped corn forage (30% DM) to evaluate its effect on silage fermentation and aerobic stability. Treatments were: 1) no additive, 2) 2.5 g of CRINA/25 kg of wet forage, 3) 5.0 g CRINA/25 kg of wet forage, or 4) a buffered propionic acid based product, 4 lb/ton of wet forage (Kemin Industries, West Des Moines, Iowa). After ensiling, addition of CRINA had no effect on silage fermentation or the aerobic stability of corn silage. As expected, addition of the buffered propionic acid based product increased the concentration of propionic

acid ( $P < 0.05$ ) and decreased the yeasts in silage (4.45 vs. 5.16 log cfu/g,  $P < 0.05$ ) but only numerically improved aerobic stability (47.5 vs. 59.5 h) when compared to untreated silage. The findings of this study show that CRINA was unable to affect silage fermentation or aerobic stability but it increased DM intake and milk production in dairy cows.

The bottom line: Natural compounds associated with plant oils have the ability to improve DM intake and milk production in lactating cows. Such compounds are currently being used in Europe because of the ban on antibiotic use there. There is potential for these compounds to be sold in the US market in the near future. R. J. Schmidt, D. H. Kleinschmit, J. M. Ladd, J. E. Lynch, and L. Kung Jr. 2004. *J. Dairy Sci.* 87(Suppl. 1):1219.

The Effects Of Lactobacillus Buchneri 40788 And Damage To The Corn Ear On The Fermentation, Aerobic Stability, And Production Of Mycotoxins In Corn Silage.

We examined the effects of damaging ears of corn and microbial inoculation on the fermentation, aerobic stability, and production of mycotoxins in whole plant corn silage. Ears of corn on several plants were slashed, exposing damaged kernels to the environment. Seven days later, whole plant corn was harvested at 35% DM and ensiled in 20-L laboratory silos (packing density of 14 lb/ft<sup>3</sup>) in quadruplicate as one of the following treatments: 1) no inoculation and undamaged ears of corn (CC), 2) inoculation with *L. buchneri* 40788 (400,000 cfu/g of fresh forage) and *Pediococcus pentosaceus* (100,000 cfu/g) (Lallemand Animal Nutrition, Milwaukee, WI) and undamaged ears of corn (IC), 3) no inoculation and damaged ears of corn (CD), 4) inoculation and damaged ears of corn (ID). After 126 d of ensiling, regardless of damage to the ear, inoculated silages had a higher concentrations of acetic acid (1.59 vs. 0.87%,  $P < 0.05$ ), lactic acid (4.39 vs. 3.47%,  $P < 0.05$ ), and 1,2 propanediol (0.87 vs. 0.0%,  $P < 0.05$ ) than did uninoculated silages. Inoculated silages had fewer yeasts (0.61 vs. 3.33 log cfu/g) and thus were more aerobically stable (74 vs. 43.3 h,  $P < 0.05$ ) than were uninoculated silages. Although initial numbers of yeasts and molds and concentrations of deoxynivalenol (DON) and fumonisin B1 (FBI)

toxins were not different in fresh corn forage between forage with damaged and undamaged ears, silage with damaged ears had higher concentrations of DON (3872 vs. 1009 ppb,  $P < 0.05$ ) and FBI (9.05 vs. 4.07 ppm,  $P < 0.05$ ). Silages made from corn with damaged ears tended to have higher concentrations of ethanol (5.40 vs. 4.31,  $P < 0.06$ ). Addition of *L. buchneri* 40788 and *P. pentosaceus* altered silage fermentation and improved the aerobic stability of the corn silage regardless of damage to the ear before ensiling, but it was not able to prevent an increase in the production of mycotoxins during ensiling.

The bottom line: This study showed that mycotoxins can be produced during the ensiling period when corn ears have been damaged in the field. Damage to ears in the field should be prevented. On going research is studying ways to prevent the production of mycotoxins in the silo. Teller, R. S., R. J. Schmidt, and L. Kung, Jr. 2004. *J. Dairy Sci.* 87(Suppl. 1): 129.

A Comparison of Processed Conventional Corn Silage to Unprocessed and Processed Brown Midrib Corn Silage on Intake, Digestion, and Milk Production by Dairy Cows

We studied the effects of mechanical processing and type of hybrid on the nutritive value of corn silage for lactating cows. Treatments were brown midrib (BMR) corn silage that was unprocessed (U-BMR), BMR corn silage that was processed (P-BMR), and a conventional corn silage that was processed (P-7511). All silages were harvested at a theoretical chop length of  $\frac{3}{4}$  inch. The chemical compositions of the silages were similar among treatments except that BMR silages were lower in lignin and higher in protein than P-7511. Brown midrib silages had greater 30 h in situ and in vitro NDF digestion than did P-7511 and processing had no effect on 30 h in situ and in vitro fiber digestion but it increased in situ starch digestion after 3 and 18 h of incubation. Both processed silages had a smaller proportion of particles  $> 1.91$  cm and fewer whole corn kernels compared to unprocessed silage. Lactating cows were fed TMR consisting of 42% of each silage type, 40% concentrate, 10% alfalfa silage and 8% alfalfa hay (DM basis). Cows fed TMR containing P-BMR ate more DM (57 versus 51.5 lb/d) and produced more

milk (97.5 versus 91.1 lb/d) than cows fed P-7511. At feeding, the TMR containing U-BMR had a larger proportion of particles >1.91 cm when compared to the TMR of cows fed processed silages and after 24 h the difference was even greater indicating that cows fed unprocessed corn silage sorted more. Cows fed TMR with P-7511 and P-BMR had greater total tract digestibility of OM, CP, and starch compared to cows fed U-BMR. In vivo digestibility of NDF was greatest for cows fed P-BMR when compared to the other treatments.

The bottom line: Mechanical processing of corn silage hybrids, increases the availability of starch from the corn kernels for digestion. This results in improved utilization of energy and subsequently improved milk production. Feeding processed corn silage (regardless of hybrid type) resulted in cows that sorted their feed less but only between 18 and 24 h of access to the diet. These findings show that mechanical processing of BMR corn silage increases its nutritive value and when fed to lactating cows, it results in greater milk production when compared to cows fed a conventional hybrid that was not processed. *T. L. Ebling and L. Kung, Jr. 2004. J. Dairy Sci. 87:2519-2527.*

Effect of Cutting Date on Nutritive Value and Yield of Triticale Forage.

A plot of triticale forage was Fall seeded at the University of Delaware and harvested the next spring at various cutting dates. As seen on the table below, you will see that the nutritive value of the crop is very high at the first two cutting dates (5/15 and 5/19). At these times, the plant is relatively low in lignin, high in CP but DM yield is relatively low. Note that at the 5/28 harvest and thereafter, that the NDF and lignin content increase substantially while the CP content drops from 18.1 to 11.3%. As expected, DM yields are significantly higher with later harvests.

The bottom line: Harvest triticale based on your needs. Earlier harvests result in high quality forage but lower yields. This should be done if you have ample forage inventories and if this feed is targeted to high producing cows. If you are short of forage

or if this feed is targeted to dry cows or heifers, then a later harvest may be acceptable. However, realize that although DM yield has increased, that the nutritive value is considerably lower in late harvested triticale. *B. Stockinger, B. Uniатовski, and L. Kung, Jr., 2003. Univ. of Delaware, unpublished data.*

| Date Cut  | NDF <sup>1</sup> , % | ADL <sup>2</sup> , % | 48 hr IVNDF <sup>3</sup> , % | CP <sup>4</sup> , % | Plant Height, inches | Tons DM/Acre      |
|-----------|----------------------|----------------------|------------------------------|---------------------|----------------------|-------------------|
| 5/15/2003 | 46.6 <sup>c</sup>    | 2.71 <sup>c</sup>    | 66.8 <sup>a</sup>            | 18.5 <sup>a</sup>   | 27.9 <sup>e</sup>    | 1.60 <sup>c</sup> |
| 5/19/2003 | 47.4 <sup>c</sup>    | 3.44 <sup>b</sup>    | 65.6 <sup>a</sup>            | 18.1 <sup>a</sup>   | 33.7 <sup>d</sup>    | 2.54 <sup>b</sup> |
| 5/28/2003 | 60.6 <sup>b</sup>    | 5.11 <sup>ab</sup>   | 50.9 <sup>b</sup>            | 11.3 <sup>b</sup>   | 41.6 <sup>c</sup>    | 2.66 <sup>b</sup> |
| 6/1/2003  | 65.2 <sup>a</sup>    | 6.69 <sup>a</sup>    | 53.9 <sup>b</sup>            | 11.7 <sup>b</sup>   | 51.4 <sup>b</sup>    | 3.43 <sup>a</sup> |
| 6/3/2003  | 65.4 <sup>a</sup>    | 5.49 <sup>a</sup>    | 50.8 <sup>b</sup>            | 9.6 <sup>b</sup>    | 56.0 <sup>a</sup>    | 3.98 <sup>a</sup> |

abcdeMeans in columns with unlike superscript differ (P < 0.05).

<sup>1</sup>Neutral detergent fiber

<sup>2</sup>Acid detergent lignin

<sup>3</sup>In vitro NDF digestion

<sup>4</sup>Crude protein

## High Somatic Cell Counts Are Robbing You of Income

What is your yearly average somatic cell count at? The following table shows that even when SCC are below 284,000 there is a potential loss of milk production and income. Producers should strive to keep SCC low in order to maximize production and income.

| SCC Score | SCC Range (x 1000) | Milk Loss (lb/d) | \$ Loss/yr for 100 cows | \$ Loss/yr for 200 cows | \$ Loss/yr for 400 cows |
|-----------|--------------------|------------------|-------------------------|-------------------------|-------------------------|
| 0         | 0-18               | 0                | 0                       | 0                       | 0                       |
| 1         | 19-35              | 0                | 0                       | 0                       | 0                       |
| 2         | 36-71              | 0                | 0                       | 0                       | 0                       |
| 3         | 72-141             | 1.5              | 11,498                  | 22,996                  | 45,992                  |
| 4         | 142-283            | 3                | 22,995                  | 45,990                  | 91,980                  |
| 5         | 284-565            | 4.5              | 34,492                  | 68,984                  | 137,968                 |
| 6         | 566-1,130          | 6                | 45,990                  | 91,980                  | 183,960                 |
| 7         | 1,131-2,262        | 7.5              | 57,487                  | 114,974                 | 229,948                 |
| 8         | 2,263-4,523        | 9                | 68,985                  | 137,970                 | 275,940                 |
| 9         | 4,524-9,999        | 10.5             | 80,482                  | 160,964                 | 321,928                 |

\*based on \$14/cwt milk

Adapted from Peters, 2002

Dr. L. Kung, Jr., University of Delaware

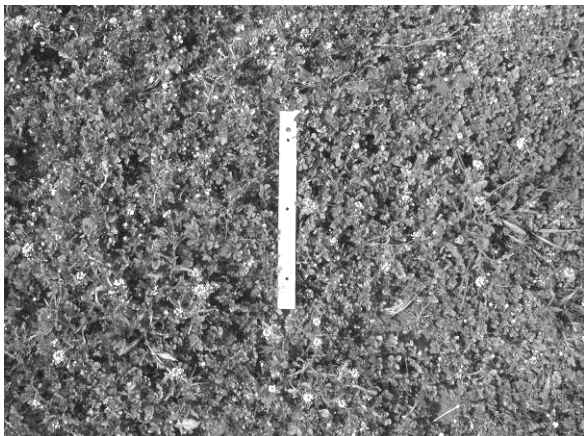
## Making a Decision on Alfalfa Stand Density

Dr. Richard W. Taylor, Extension Agronomist, UD

Farmer experience has shown that if soil fertility levels are adequate or high and weed problems are minimal, alfalfa stands of 4 to 5 plants per square foot can yield as much as a stand with 10 to 15 plants per square foot (Photo 1 and 2). This is a result of an individual alfalfa plant's response to decreasing stand density. Decreasing stand density causes an increase in the number of stems produced per plant. This effect helps the crop compensate for fewer plants and maintains yield potential.



**Photo 1. Alfalfa crowns beginning spring growth in an older stand (Photo by R. Taylor).**



**Photo 2. New Stand alfalfa beginning spring growth in fall seeded field (Photo by R. Taylor).**

Research from Wisconsin conducted by Dr. Dennis Cosgrove showed that stem number rather than plant number is a more accurate determination of when to plow down or interseed an alfalfa stand. Cosgrove suggests using a value of 55 or more stems per square foot for production of maximum yields. A reduction in stem number per square foot to 40 stems or less will result in a 25 percent yield reduction. Cosgrove further suggests that this level is the critical point when alfalfa fields begin to lose profitability and should be rotated out of alfalfa. Again, interseeding a very high-quality productive grass should add one or more additional production years, but can speed up the loss of alfalfa plants from the stand.

The number of stem or stand counts you make depends on the size of the field and the uniformity of stand reduction. In general, the larger or less uniform a field, the greater the number of counts. For uniform fields 20 to 30 acres in size, count about 20 randomly chosen square foot areas and average the results.

As was noted in the Weekly Crop Update last year, alfalfa stands were very often severely injured by a number of factors such as annual grass invasion, ponding water, ice sheeting in both last winter and this winter, and other problems such as potato leaf hopper injury and compaction issues. If your fields are mostly light sandy soils and you want to replant alfalfa in late summer/early fall, you should decide on whether to destroy the current stand early this spring. For this type decision, base your decision on either the 4 to 5 plants per square foot threshold level or the 40 stems per square foot threshold (Photo 3). If you plan to reseed a year or more from now and a decision can be made during the growing season, use below 40 stems per square foot as the threshold value.



**Photo 3. Old stand of alfalfa beginning spring growth, note the sparse number of crown shoots (Photo by R. Taylor).**

### **Weed Control in Seedling Alfalfa**

*Dr. Mark VanGessel, Extension Weed Specialist, UD*

Getting seedling alfalfa off to a good start is critical for a long-term quality stand. The following herbicide suggestions are for pure alfalfa stands. Gramoxone or Roundup can be used prior to planting to kill emerged weeds. Balan or Eptam can be used pre-plant incorporated for control of small-seeded broadleaves such as pigweed or lambsquarters and most annual grasses. Residual control of either Balan or Eptam is only a few weeks. Butyrac, Bucril, Pursuit, Raptor, and others can only be used after the alfalfa has emerged and developed trifoliolate leaves. Fall postemergence treatments include Butyrac 200 (2 to 4 alfalfa trifoliolates), Bucril (at least 4 trifoliolates), Kerb, Poast Plus, Select, or Pursuit or Raptor (at least 2 trifoliolates). Pursuit or Raptor provides the broadest spectrum of control, and can be tank-mixed with Bucril or Butyrac to improve control. The addition of Bucril to Pursuit will improve German moss, lambsquarters, and henbit control. Kerb will provide the best common chickweed control, but it must be applied when soil temperatures are 50 degrees or less and requires rainfall for activation. Applications to small weeds are critical for effective control. Poast Plus and Select are effective only on grasses, and cannot be used on alfalfa plus grass stands. Most of the labeled herbicides can cause some crop injury to the alfalfa.

## **Composting: A Treatment Alternative for Dairy Cattle Mortalities**

*Dr. Lewis E. Carr, University of Maryland*

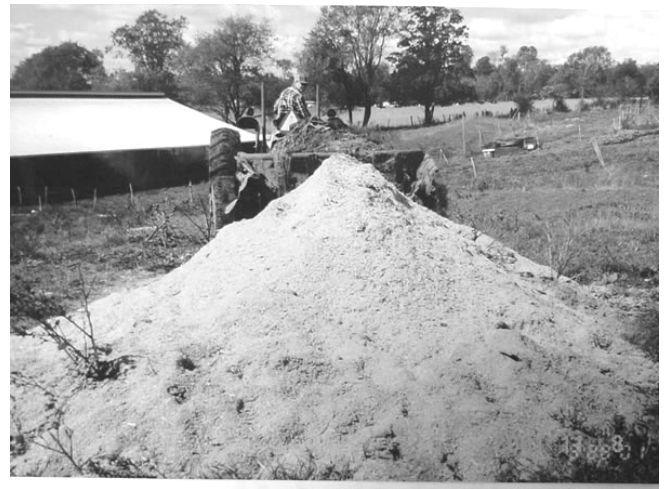
The management and proper disposal of animal and poultry mortalities is a normal part of livestock and poultry production. Until recently, disposal was limited to burial at the farm, using a landfill (if the landfill would accept the carcass), on-farm incineration (poultry), and renderer pickup. But renderer pickups are vanishing as a disposal alternative. And burial, the other likely option, may create surface and groundwater pollution.

Composting, however, is an efficient alternative for carcass disposal. During composting, microorganisms create a "slow cook" process that causes the carcass to degrade. Microorganisms are considered the work horses of the composting process. For the microorganisms to do their job, a proper environment has to be established. Environment can be defined as influences and conditions that affect life. A compost mixture, which is very much alive, needs the right balance of water, nutrients, carbon, and air to allow the compost process to start and to continue at a rate that produces enough heat to kill pathogens in the compost mix.

The compost mix should have a carbon-to-nitrogen (C:N) ratio of 20-35:1. The animal carcass supplies the nitrogen. Sawdust, woodchips, chopped straw, chopped corn stalks, and other fibrous material supply carbon. Sawdust and woodchips are the preferred carbon source because they provide an excellent contact surface for the animal carcass. The carcass should contain enough water to meet the 40- to 60-percent mixture required for composting.



With a dairy animal buried in sawdust 15 to 18 inches deep on all sides the microbes begin their work. If the C:N ratio, moisture, and oxygen are at the proper levels, thermophilic aerobic microorganisms will cause the compost mix to heat to temperatures ranging from 135 to 150°F. A good composting temperature ranges from 135 to 145°F. To monitor the temperature, use a 36-inch composting thermometer. As the mix goes through the "slow cook" process, carbon dioxide and water vapor are given off.



The compost mix won't heat properly if it's too dry or too wet. It's important, therefore, that the mix doesn't become saturated with rain water or melting snow. Crowning an encapsulated dairy animal with 15 to 18 inches of sawdust or old compost will limit water infiltration into the compost mix. It takes up to 6 months for composting to degrade a mature cow. Although the major bone structure will remain, the bones will soften as long as they are in the active compost process.

*From Maryland Dairy Talk Newsletter, Summer, 2004,  
University of Maryland*

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## Delaware Dairy Report

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