INDUSTRY NEWS

Research Briefs

► **Summaries** of current **beef cattle** research

Helping stored alfalfa keep its protein

Scientists with the Agricultural Research Service (ARS) recently discovered an environmentally friendly way to reduce the protein breakdown that occurs when forage crops like alfalfa are processed into silage.

Because it's high in protein, alfalfa is an ideal crop for livestock. Unfortunately, when its clippings are processed by storing and fermenting in silos, up to 85% of alfalfa's protein breaks down into nonprotein nitrogen (NPN), which can't be used as efficiently by cows' bodies.

ARS plant physiologist Ronald Hatfield, agricultural engineer Richard Muck and molecular biologist Michael Sullivan have found — in red clover and potato skins — an answer to the problematic breakdown of protein. The scientists work at the U.S. Dairy Forage Research Center in Madison, Wis.

Red clover contains large amounts of an enzyme called polyphenol oxidase (PPO). When red clover is chopped, its cells release PPO. When the PPO is exposed to oxygen, it reacts with caffeic acid naturally present in the clover and forms o-quinone molecules. These molecules bind to enzymes that cause the breakdown of red clover's protein, thereby keeping more protein intact.

Alfalfa has significantly lower levels of PPO. So to take advantage of this PPO-caffeic acid combination to protect alfalfa's protein, Sullivan and ARS plant pathologist Deborah Samac "borrowed" the PPO gene from red clover and inserted it into alfalfa plants. When the altered alfalfa plants were chopped and treated with caffeic acid, they had 15% less protein degradation after two weeks than untreated alfalfa plants.

Caffeic acid is present in high concentrations in a variety of fruits and vegetables, most notably potato skins, a common ag waste product. The scientists are working with different potato processing plants to see how easy it would be to extract large amounts of caffeic acid from leftover skins.

For more about the research visit *www.ars.usda.gov/is/AR/archive/dec03/silage1203.htm.*

K-State researchers tracking bacteria near round-bale feeders

After 60 days, fecal bacteria tend to concentrate in a 10-foot (ft.) area circling stationary round-bale feeders, Kansas State University (K-State) researchers say. That's good news, because it means that the buildup of fecal bacteria is confined to an area small enough to make cleanup practical for producers.

Bacteria buildup around hay feeders "is not a permanent problem," says Twig Marston, a beef specialist with K-State Research and Extension. "During winter feeding, bacteria are found within 100 feet of the feeder. But, over time, 60 days after we quit feeding cows, the concentration of bacteria has gone way down."

Where fecal bacteria are found, there often are other bacteria that cause disease. As well as being a health risk to cattle, that poses a risk to the nearby environment, especially to rivers or streams that may border pastures.

But, two months after removing cattle from feeding areas, researchers could not culture any fecal bacteria at 100 ft. from the feeder, says Joel DeRouchey, K-State's northeast area livestock specialist. "Three months after feeding, we couldn't culture bacteria at 40 feet. That bacteria died over time."

The often muddy, 10-ft. circle around the feeder is where fecal bacteria survive well after three months.

"The important thing about these findings is that we didn't see an increase in the levels further away from the feeder," DeRouchey says. "It leads us to believe that runoff is not a significant contributor to bacteria at winter-feeding sites."

DeRouchey says the findings indicate that producers should move feeders throughout a field, if possible. Moving the feeder means bacteria don't form in large concentrations, and most of the bacteria die within 60 days.

If feeders can't be moved, producers still can focus cleanup and disposal efforts to the 10-ft. circle around the feeder.

In 1997, K-State Research and Extension reported that in south central Kansas, 72% of producers used large round bales as their primary hay package, and another 18% used both round and square bales.

— by Pat Melgares, *K-State Research and Extension*

Hay rake design had no effect on nutritional value of mixed or alfalfa hay

Ohio State University (OSU) researchers compared three types of hay rakes (bar, rotary and wheel) for drying efficiency and nutritional value of round-baled hay. First and second cuttings were taken from a mixed orchard grass-alfalfa, as well as a straight alfalfa field. Samples were taken prior to raking and within 24 hours after baling.

There tended to be a loss in nutritional value during the raking and baling processes for alfalfa hay [5.0% lower crude protein (CP) and 6.4% higher neutral detergent fiber (NDF)]. However, rake design had no significant effect on dry matter (DM), CP or NDF content of either mixed or alfalfa baled hay.

— by Harlan Ritchie, Steven Rust and Daniel Buskirk, *Michigan State University (Greene et al. 2003. J. Anim. Sci. 81 [Suppl. 1]: 354.)*

Studying the differences in watersheds

A decade-long ARS study of two Midwestern watersheds confirms that soil differences affect how water and ag chemicals, particularly nitrate fertilizer and atrazine herbicide, move through the soil. Those two chemicals were measured in the study of watersheds in Iowa and Missouri from 1992-2001.

Soil scientists Gene Alberts and Robert Lerch of the ARS Cropping Systems and Water Quality Research Unit in Columbia, Mo., studied the Goodwater Creek watershed in north-central Missouri. Dan

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Jaynes, research leader at the ARS National Soil Tilth Research Laboratory in Ames, Iowa, studied central Iowa's Walnut Creek watershed. Watersheds are geographic areas where the land "sheds" water to a common outlet.

Researchers learned that two watersheds, closely located geographically, can have significantly different water quality issues. Chemical movement depends on their physical properties and how water moves off the land and through the soil. These watersheds have significantly different water movement pathways because their soils vary.

At Walnut Creek, tile drains are needed to grow row crops. The drains intercept rainfall, moving it rapidly into the creek. This results in more rainfall percolating downward through the soil. Because of nitrate's soil mobility, it moves with the percolating water, resulting in high contamination levels of nitrates from fertilizer use.

In Goodwater Creek soils, tile drains do not work well and are not needed for row crop production. Soils within this watershed have a natural clay layer that limits downward percolation of rainfall, resulting in higher levels of surface runoff. Unlike nitrate, atrazine stays near the soil surface where it moves with runoff. This resulted in high atrazine levels in Goodwater Creek, but lower nitrate levels.

Atrazine is a pre-emergence herbicide that is applied to bare soil, which means that it's more susceptible to being washed away without crops to hold it in place.

Crop rotation, cover crops and a nitrogen management plan can be beneficial in central Iowa. In Missouri, surface runoff control practices and a pesticide management plan that includes pesticide incorporation or the use of low-rate pesticides can help reduce contamination levels.

— by ARS News Service

Ammoniate tall fescue to create 'ideal feed alternative' in drought

The drought of 2003 caused many Missouri farmers to wonder what to feed their livestock. The answer lies in the tall grass, a University of Missouri (MU) forage specialist said.

Tall fescue treated with anhydrous ammonia is "the ideal feed alternative" for drought, MU agronomist Craig Roberts says. "If you make tall fescue silage and feed it to livestock, you'll have all those toxicosis

problems. But if you ammoniate it, it's like endophyte-free fescue or orchard grass."

Most tall fescue in Missouri pastures is infected with an endophyte that releases alkaloid toxins, which sicken livestock. When Roberts and MU agronomist Rob Kallenbach treated baled tall fescue with ammonia gas, they found that the endophyte toxins almost disappeared, Roberts says. "The toxins fall well below the thresholds necessary to cause fescue toxicosis."

A wet spring 2003 led to an abundant tall-fescue supply, much of which was harvested when fully mature, Roberts says. "The people who put it up as hay may think it's worthless, stemmy stuff — and it is. But it becomes valuable if you treat it."

Ammonia breaks down the cell walls in low-quality plant material like stems and straw, Roberts explains. "You'll sometimes see people ammoniating wheat straw and crop stubble to feed their animals in very dry years.

"When you do that with tall fescue, it's got a double whammy," he says. "It not only makes it easily digestible — a nutritional function — but it performs a toxicological function by destroying or deactivating the endophyte toxins."

The ammoniation process takes about two weeks and costs about $12 per 1,000-pound (lb.) bale — half for the ammonia and half for the plastic to cover the bales.

Typically, farmers ammoniate hay or other forages by covering stacked large round bales with heavy plastic and sealing the plastic at the bottom with a berm of dirt. A web of ropes attached to old tires, concrete blocks or other weights can be used to secure the plastic in windy conditions.

Anhydrous ammonia gas, normally used for crop fertilizer, is injected into the stack and allowed to permeate the bales overnight. Previous MU research recommends injecting 3% of the forage's dry matter (DM) weight, or 30 lb. of anhydrous ammonia per 1,000-lb. bale. Wear proper safety equipment when handling anhydrous ammonia.

"At $12 a bale, it's not free, but it's well worth it," Roberts says.

He admits the practice has not been commonly recommended, but he says recent research results from MU could change that. "I'd do it every year," he says. "You can never count on cutting your hay on time in Missouri because of the uncertain weather. So, why not let it mature

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fully, cut it so you have a whole bunch, then treat it to make it into good hay?"

— by Forrest Rose, *MU information specialist*

New, quicker tests identify *E. Coli* strains

New tests that more quickly identify dangerous strains of *E. coli* bacteria are being developed by ARS scientists in Wyndmoor, Pa. ARS microbiologist Pina Fratamico, at the agency's Eastern Regional Research Center (ERRC), is working with Pennsylvania State University (Penn State) to develop tests that quickly identify *E. coli* strains.

Certain *E. coli* strains, such as O157:H7, cause serious diseases, including bloody diarrhea and hemorrhagic colitis. Infections may result in serious health complications, including kidney failure. Other *E. coli* serogroups, including *E. coli* O26, O111 and O121, also cause gastrointestinal illnesses in humans.

Currently, scientists commonly use a procedure called serotyping to distinguish between different types of *E. coli* — some harmful, others harmless. However, this procedure is time-consuming and labor-intensive.

Fratamico, with ERRC's Microbial Food Safety Research Unit, and her team are developing both conventional and real-time polymerase chain reaction (PCR) tests. These chemical procedures generate enough of a bacterium's genetic material so that it can be studied and identified. With one real-time PCR reaction, four products can be amplified simultaneously and detected in "real time" as they multiply.

Scientists have little information about some individual *E. coli* serogroups; therefore, the number of diseases these organisms cause is likely underestimated. Fratamico is targeting genes in the *E. coli* O-antigen gene clusters so researchers can detect and identify specific serogroups and increase knowledge about each one's potency.

In one study, a real-time PCR assay was more sensitive than other detection methods. According to Fratamico, the U.S. Department of Agriculture (USDA) Food Safety and Inspection Service (FSIS) has expressed interest in the new PCR tests for detection and confirmation of not only *E. coli* O157:H7, but of other *E. coli* strains as well.

— by ARS News Service

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