INDUSTRY NEWS

Research Update

► **Summaries** of current **beef cattle** research compiled by Shauna Rose Hermel

Connecting the dots for alkaloids, toxicosis symptoms

New research from Agricultural Research Service (ARS) scientists and their university colleagues is shedding light on the relationship between chemical compounds and fescue toxicosis — a disease that affects grazing animals and costs the U.S. cattle industry an estimated $600 million annually.

Fescue toxicosis is a major problem for producers whose herds graze on tall fescue. A major forage grass in many states, tall fescue can cause toxicosis in cattle and other ruminants if it's infected with endophytic fungus. The disease causes lameness and reduced production efficiency, and can even be fatal if infected animals are subjected to stressful situations, such as extreme heat or long-distance transport.

Scientists believe many symptoms of toxicosis are caused by chemical compounds known as ergot alkaloids, but much is still unknown about how they cause clinical signs to develop. Led by ARS animal scientist James Klotz, scientists at the ARS Forage Animal Production Research Unit in Lexington, Ky., and the University of Kentucky are investigating the physiological responses of ruminants to tall fescue alkaloids.

One sign of toxicosis is a narrowing of blood vessels. Using a model that predicts changes in blood flow in the limbs of cattle, Klotz and his colleagues examined the influence of specific alkaloids — both individually and in combination.

Of the three alkaloids tested, ergovaline was the most effective at making the veins contract. The others, N-acetylloline and lysergic acid, had little effect on vein contraction. The results also showed that combining two alkaloids did not increase the toxicity of either — at least in terms of vein contraction.

Further research is under way to determine how these alkaloids influence other tissues, organs and physiological systems. In one study, the scientists showed that ergovaline, but not lysergic acid, can bioaccumulate in vitro, suggesting that ergovaline may be more likely to induce toxicosis.

Research like this is essential for understanding exactly how endophyte-infected tall fescue influences grazing animals. Eventually, this information could help scientists determine which compounds are most toxic and how to protect cattle from them.

These studies were published in the *Journal of Animal Science.*

— by Laura McGinnis, ARS News Service

Spraying herbicide on invasive weeds doesn't always pay, study shows

It may not always pay for ranchers to use herbicides to kill exotic invasive weeds such as leafy spurge, according to a 16-year study by the ARS and colleagues.

Rangeland ecologist Matt Rinella at the ARS Fort Keogh Livestock and Range Research Laboratory in Miles City, Mont., and colleagues conducted the study. Data they collected 16 years after a one-time aerial spraying of herbicide showed that the invasive leafy spurge (*Euphorbia esula L*) may have ultimately increased due to spraying. Conversely, several desirable native forbs were still suffering the effects of spraying 16 years after the application.

Although the herbicide would have dissipated within a few years, it seemed to cause a long-term plant community shift.

Any increase in grass production from the herbicide spraying only lasted a year or two.

The study was done on the N-Bar Ranch in Montana. Each plot was either grazed and sprayed, grazed but not sprayed, not grazed but sprayed or not grazed or sprayed. Cattle grazing helped maintain native plant numbers when herbicide was used.

Cattle grazing can help native forbs thrive because cattle prefer grasses over forbs, and cattle trample soil, loosening soil for seeds that the animals inadvertently plant when seeds are caught in their hooves or fur. With that said, when herbicide wasn't used, most native forbs did as well with or without cattle grazing.

Herbicide caused the native plants Missouri goldenrod and yarrow to become rarer over the 16-year study period. Barring herbicides, these two species proved capable of co-existing indefinitely with the exotics.

Four native perennials became rarer in sprayed plots, but only when grazing was excluded: velvety goldenrod, white prairie aster, vetch and prairie sagewort. Herbicide spraying caused no long-term harm to four other native perennials. Rockjasmine and other plants belonging to the *Androsace spp.* group were not affected by the herbicide, even initially.

The study suggests that applying herbicides over large areas of land containing herbicide-sensitive native plants is sometimes ill-advised.

The research was published in the journal *Ecological Applications.*

— by Don Comis, ARS News Service

Researchers identify inhibitor that controls fungal pathogen

A key bacterial compound that inhibits the growth of the plant pathogen *Fusarium verticillioides* has been identified by ARS scientists. The compound could help protect plants, livestock and poultry from fusarium infection.

The compound is produced by *Bacillus mojavensis* strain RRC101. Finding better controls for *F. verticillioides* is important because fumonisin mycotoxins, especially fumonisin B1, are toxic to livestock and poultry.

Microbiologist and research leader Charles Bacon and his team at the ARS Toxicology and Mycotoxin Research Unit in Athens, Ga., identified Leu7-surfactin as the inhibiting compound that controls *F. verticillioides.* The research team includes microbiologist Dorothy Hinton, chemist Maurice Snook and technician Trevor Mitchell. Their study was published in the April 2009 issue of the *Journal of Agricultural and Food Chemistry.*

B. mojavensis is a plant-residing bacterium that can be used to control fungal diseases in corn and other plants. Though *B. mojavensis* is known to work as a biocontrol agent, the specific substance responsible for inhibition of fusarium was not identified until recently.

The Leu7-surfactin was isolated from growing the bacterium in liquid cultures. In lab tests, the compound proved effective in inhibiting growth of the fungus. Surfactin has a detergent-like activity that dissolves the lipid membranes inside the fungus, eventually killing it.

In Bacon's tests, Leu7-surfactin was effective at controlling *F. verticillioides* at very low concentrations of 20 micrograms per liter of liquid, making it more efficient to use. In addition to its antibiotic effects, surfactin can be used in textile manufacturing,

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environmental remediation and fossil fuel recovery. This compound's properties create great potential for biotechnological and biopharmaceutical applications.

Bacon and his colleagues examined all currently available strains of *B. mojavensis* and found that all of the strains are endophytic-living within the plant — and all were active against *F. verticillioides* and other fungi in lab tests. The genus *Bacillus* is known for the production of more than 24 antibiotics, several of which are fungicidal with the potential to control plant diseases.

— by Sharon Durham, ARS News Service