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Researcher expects to solve puzzle of why cattle won't eat leafy spurge

MARY BRASHIER

"The problem is not in getting the cattle to eat leafy spurge. It's in getting them to eat it the second time."

Some chemical in the spurge turns cattle off, said Scott Kronberg of SDSU's Department of Animal and Range Sciences. "Cattle are game to try it once. But then some chemical kicks in, their cortisone levels go way up, and they are physiologically stressed. They remember that. It takes just one experience with leafy spurge for them to develop an aversion to it."

Each type of ruminant has a different response to leafy spurge, Kronberg said. "Cows eat the grass, leave the spurge. Sheep eat everything, grass and spurge. Goats eat the spurge, leave the grass."

Thinking that ensiling might neutralize the aversive compound, graduate student Jill Heemstra fed 50 percent spurge-50 percent grass haylage to cattle. Again, they ate it once. "Then the only way we could get them interested was to mix it with oatlage, and they still sorted," Kronberg said.

In contrast, sheep offered leafy spurge haylage by Kronberg and fellow researcher Lowell Slyter ate it even more readily than sheep receiving oat haylage, and both groups of lambs gained .36 pound per day during the trial.

And there are the stories from other states where sheep are a more popular method of spurge control. "After 6 years of running sheep, there's a rancher in North Dakota who is now able to restock cattle. There are sheep people in Montana who are complaining they're losing their spurge," Kronberg said.

Identifying the aversive compound is the key to using cattle to control leafy spurge and improve range condition, Kronberg believes. He is the only one out of a large group of researchers in northern plains states who is trying this approach. He feels his South Dakota team is close. "By the end of this summer, maybe."

"Then, once we know exactly what we're dealing with, the chemists tell me they will have some options to explore, like making an enzyme to degrade the compound."

Leafy spurge, introduced into the U.S. in the nineteenth century, has infested great portions of the Northern Great Plains. "North Dakota has more spurge than anywhere else

in the world," Kronberg said. "If you go up around Sisseton in July, the Prairie Coteau is yellow, and it's not sweet clover or mustard you're looking at."

Andy Canham, Miller, S.D., is Hand County weed and pest supervisor and president of the South Dakota Weed Supervisors Association. Weed supervisors annually estimate infestations in their counties, and "this year," Canham said, "the total leafy spurge infestation is 250,000 acres. That's a loss in income, based on crop and livestock values, of around $8 million per year," he said.

The yellow-flowered noxious weed grows primarily in untilled land-pastures, range, hayland, ditches, parks, and lawns. It begins growth earlier in the spring than most plants, which gives it the competitive edge over other weeds and crops.

It can, with great effort, be controlled on cropland. But large pasture and range tracts normally can not support enough cattle to justify the expense of herbicide treatments, especially when it may take 15 or more years of spraying before any positive increases in grazing are noticed.

What makes the weed acceptable to sheep and aversive to cattle?

Kronberg thinks cattle may already have the microbes that degrade the aversive compounds in their rumens. "But perhaps not in the numbers that sheep and goats have. So maybe we need to change the environment for these microbes, make them more comfortable in cattle rumens so they increase their populations and deal with the spurge better and faster. Then the animals wouldn't get negative feedback. Or another option might be to genetically engineer spurge-degrading microbes. It doesn't work to take rumen microbes from goats and stick them in other species. I tried that."

Fathi Halaweish, visiting professor from Egypt, is working in Jim Rice's lab in the Department of Chemistry and Biochemistry to identify the compound. His funding is a grant that Kronberg obtained from USDA. "He specializes in natural products chemistry. He looks at native plants used by native peoples for medicinal purposes. If anybody can find out what's in leafy spurge, he can," Kronberg said.

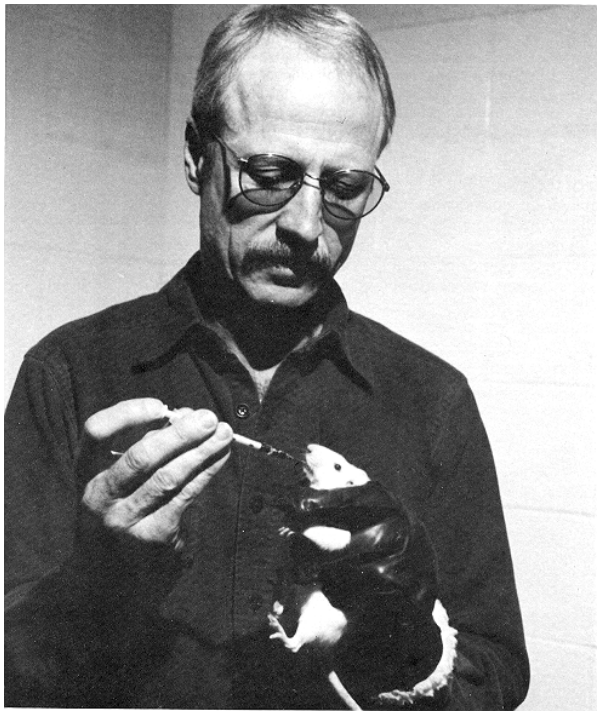
"Everybody says the compound is in the sap," Kronberg said. "But we think it's in the leaves, not the latex." When the chemists find something new from the spurge, Kronberg runs an aversion trial, using rats because they have the same distaste for spurge that cattle do.

Last fall, Kronberg approached another set of cattle with oatlage as the novel food. He followed the first offering of oatlage with petroleum ether extract of leafy spurge. The next day the cattle refused the oatlage outright.

Blood samples were collected from the cattle before, during, and after the trial. Regg Neiger, Department of Veterinary Science, found no evidence of toxicosis in any samples. 'He speculates that there might be some kind of transitory irritation to cells in the gastrointestinal tract," Kronberg said. "A half hour later they could look normal."

"But we're pretty confident now that the aversive substance for cattle is in the petroleum ether extract,"

Kronberg said. “After fractionating that particular extract, we got 20 different subfractions, and each was tested on rats. Three were aversive and one was highly aversive. So you see why I say we're getting close.”



Rats serve as stand-ins for cattle in early aversion tests because the rodents don't care for “extract of leafy spurge” either. Scott Kronberg gives a rat a compound isolated from spurge after presenting it a tasty drink it's never had before. The rat will make the connection between drink and chemical, and if the chemical causes stress will avoid the drink when it is offered again.

Can the plant be held in check by methods other than cattle grazing?

The black dot flea beetle was introduced into North America in 1983 for biological control of leafy spurge. Larvae of the beetle feed on spurge roots, and according to Sharon Clay of the Plant Science Department, they have dramatically reduced leafy spurge infestations in some areas.

But not all flea beetles are equal, she added. Some prefer drier climates, some wetter. Even with beetles adapted to South Dakota, things can still go wrong.

“Flea beetles have low dispersal rates on their own, so we must collect them annually for distribution to uncolonized sites,” Clay said. “The wrong timing on our part produces an unbalanced proportion of males and females. We've found that about 6 weeks following emergence is optimum for peak female insemination rates and egg development.”

Clay has also tried black mulch, different mowing cycles, and various chemical applications to control leafy spurge. So far, no method alone has worked well enough to be economical. "It'll probably be a combination," she said.

And Kronberg agrees. “I don't think we can pin our hopes on any one approach-not herbicides, not flea beetles, not sheep or goats. I still have to think that identifying the aversive compound will be our best shot eventually. I sure want South Dakota to be the place where that compound is found and named.”