

# ACTION IN AGROFORESTRY

monthly newsletter of The Center for Agroforestry at the University of Missouri (UMCA)

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Michael Gold and Paige Pritchard, editors

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## Buffer success leads to new direction

Article by Zoe Martin, originally printed March 8 in the Missouri Farmer Today. It can be viewed on the publication's website at [http://www.missourifarmertoday.com/news/regional/buffer-success-leads-to-new-direction/article\\_f371728c-688c-11e1-9733-0019bb2963f4.html](http://www.missourifarmertoday.com/news/regional/buffer-success-leads-to-new-direction/article_f371728c-688c-11e1-9733-0019bb2963f4.html)



University of Missouri researchers are looking to teach old vegetative buffers new tricks. Keith Goyne, Robert Lerch and Chung-Ho Lin have been exploring buffers' use in filtering herbicides from surface water since the late-1990s. Now, the team is looking to use them to filter livestock antibiotics contained in field-manure applications.

"It depends on the animal and depends on the antibiotic, but up to 90 percent of the dose can make it through the animal unaltered," said Goyne, an associate professor of soil and environmental chemistry. He said runoff from manure-fertilized fields could carry these excess antibiotics into bodies of water, turning them into incubators for resistant bacteria. Backed by the USDA Agricultural Research Service and the Missouri Center for Agroforestry, the research progressed to antibiotic testing about 2006 after their success in filtering herbicides.

"The objective morphed, but the idea of using grasses as a bioremediation tactic or treatment, that hasn't changed," said Lerch, a USDA soil scientist and adjunct assistant professor at MU.

Goyne said Missouri presents an extreme for the research. Claypan soils in the state trap water in the top 5- to 10-inch layer of soil, above an impermeable layer of clay. This means limited water-holding capacity and high runoff potential. If the buffers work with this soil, they have promise in other regions with better infiltration, he added. Lin, a research assistant professor with the Center for Agroforestry, emphasized the research is site specific. Buffers' effectiveness depends on the local water-holding capacity and soil properties. They won't work on drained land where tiling bypasses filters.

Vegetative buffers work in two ways against contaminants. Surface water moves into the soil at a greater rate over a plant buffer, obstructing the contaminants and trapping sediment. The team's question was whether those compounds would remain in the subsoil or if vegetation actually could help break down the antibiotics. Lin said preliminary results indicate buffers enhance degradation, and some types work better than others.

"Degradation is species dependent," he said. "We have been screening different plant species to see which species can help

enhance the breakdown of a certain compound."

The scientists have set up lab tests and in-field experiments at the Bradford Research and Extension Center near Columbia during the past six years. They sprayed samples of antibiotics including sulfamethazine and tetracycline onto 50-x-5-foot plots and experimented with different vegetation,

such as poplar trees, switchgrass, Eastern gamagrass, fescue, and mixtures of grass and trees.

"This is an optimizing thing," Lerch said. "You're not going to find one tree or one plant that degrades everything."

"A 'superplant,'" Lin added.

They're looking for a system that combines species with different chemical behaviors to do the most good, such as a mixture of warm- and cool-season species. Buffer width also plays a role in optimizing filtration.

"There's another design component, not only what grass to put in there but how big does that buffer have to be — the source area to the size of the buffer," Lerch said. "And, I think we're pretty darn close on that one." The team developed relationships between buffer width and percent reduction in antibiotics, looking at source-to-buffer ratios from 1:1 to 8:1. Then they took this equation and inserted real-world scales of 20:1 or 50:1 field areas.

"We can extrapolate and say this is what we'd get in the real world," Lerch said. "And, we figured 20 to 40 percent reductions if you use 20:1, somewhere in that range."

Next, the researchers plan to dig channels in the plots to simulate gullies and apply actual manure to source areas. They had been spraying antibiotics alone. Lin also is involved in new research to identify which genes are responsible for breaking down certain pollutants. He said mapping these genes could help farmers find which field areas are most vulnerable to contaminants, so they can build buffers and spray accordingly.

"This is getting down to sub-field-level management, which is something we'd like to get farmers to think about more," Lerch said. He said the group hopes the results also could introduce more flexibility into buffer design. The Missouri Natural Resources Conservation Service requires 66-foot-wide buffers for cost-sharing construction, frustrating farmers who can't set that much land aside. The new research could be used to alter design criteria to be smaller but equally effective.

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## Outreach

The University of Missouri Extension website recently published an article by UMCA economist **Dr. Larry Godsey**. The article, "What are your trees worth?" focuses on establishing a timber tax basis to save money when selling timber this time of year. Godsey provides advice on establishing a tax basis, which is basically the amount initially invested in the asset. "A lot of woodland owners don't know (their basis), and that means they could be selling their timber for too little, and paying too much in taxes" Godsey says in the article. The entire article can be read online at <http://extension.missouri.edu/news/DisplayStory.aspx?N=1348>.

## Research

Thomas, A.L., Applequist, W.L., Rottinghaus, G.E. and Miller, J.S. 2011. Black cohosh rhizome and phytochemical production in response to shading, spacing, and age. *Acta Hort.* (ISHS) 925:175-183.

**Edited Abstract:** Black cohosh (*Actaea racemosa*; *Cimicifuga racemosa*) is a perennial woodland herb native to eastern North America. Its common use as a dietary supplement to treat menopausal symptoms has increased **interest in its cultivation. Two studies were conducted in a shadehouse in southwest Missouri, USA.** The first study quantified concentration of four phytochemicals across three harvest

seasons and in response to three shading treatments. The second study evaluated the concentration of two phytochemicals in mature plants in response to two plant spacings and three shading treatments. In the first study, content of cimracemoside A in rhizomes was higher in those grown in full sun (641 mg/kg) compared with those under 80% shade (492 mg/kg), and content of 23-epi-26-deoxyactein was higher under 40% shade (3,109 mg/kg) than under 0 or 80% shade (2,421 and 2,324 mg/kg, respectively). Two-year-old plants had higher content of cimracemoside A and 23-epi-26-deoxyactein in rhizomes and roots than did one- or three-year-old plants. In the second study, 23-epi-26-deoxyactein content was significantly higher under 0 and 40% shade (2,842 and 2,779 mg/kg respectively), compared with 80% shade (2,224 mg/kg). The variable responses of phytochemicals to the treatments in these studies suggest that horticultural, temporal, and other influences on phytochemical production are complex. Harvest of two-year-old material might be economically advantageous under certain conditions, although further research into this alternative is required.

## COMING SOON...

Apr. 4 & 5

"European Black Truffle Biology and Cultivation in the Central U.S"  
The Columbia Area Career Center  
Rm. 118  
6:30 p.m. - 8:30 p.m.  
Cost: \$69

**MU Extension and Heart of Missouri Master Gardeners 'Hands On' Fruit Care Workshop Series. For complete information see flier at [http://mg.missouri.edu/pdf/2012\\_Hands\\_On\\_Fruit\\_Care\\_Workshop.pdf](http://mg.missouri.edu/pdf/2012_Hands_On_Fruit_Care_Workshop.pdf) or contact Frankie Anderson at [andersonfr@missouri.edu](mailto:andersonfr@missouri.edu) or at 573-445-9792.**

Apr. 13

Disease and insect pest control of fruit planting  
4:00 p.m. - 6:00 p.m.  
\$25

On March 15, Eridu Farms of Harstburg, MO held a one-day mentoring workshop for growers interested in learning more about cultivating elderberry crops. The workshop lasted from 8:00 a.m. to 4:00 p.m. Attendees gathered in the morning as Eridu Farms co-owner **Terry Durham** (top photo) gave a presentation introducing elderberries and the implementation of a commercial orchard. Durham then went on to discuss business plans and returns on investments. The afternoon offered a more hands-on approach as attendees tested two methods to propagate elderberry plants (bottom two photos). Each attendee was sent home with a flat of elderberry plants on which they could apply the methods they learned during the mentoring workshop.



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