Research Seeks Better Control Of Resistant Weeds

COLUMBIA, MO.

Brett Craigmyle snipped off shoots of brown and wilted waterhemp one at a time, weighing the plants to determine how dead they really are.

For the University of Missouri weed science graduate student, this is just one step in a research project looking at how best to control herbicide-resistant weeds, which present an ever-escalating challenge in farm fields across Missouri and the country.

The point is to find the best chemical mix that controls weeds and works well with newly developed herbicide-resistant seeds.

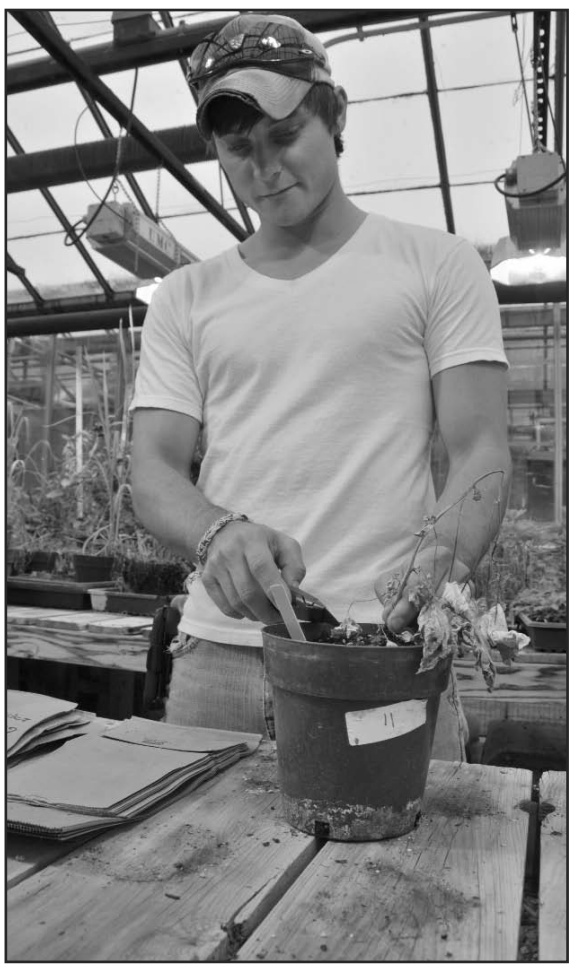

Photo by Roger Meissen
Brett Craigmyle, a University of Missouri Weed Science graduate student, cuts off the remains of a weed to see how much live tissue still exists in the plant. His research aims to find better tank mixes for 2,4-D and dicamba to use on cropland.

"What we're doing here is evaluating different chemistries together, where one herbicide previously had only been used as a pre-emergent burndown and now will be able to be applied after weeds germinate," Craigmyle said. "We spray weeds in the greenhouse at 6-inch and 12-inch heights, rate how much injury they have and then harvest, weigh and dry them to see how much living tissue remains in their system."

Increasing resistance is reducing the effectiveness of go-to herbicides like glyphosate. MU researchers are working to fill the void. New combinations of herbicides use different modes of actions, attacking weeds in different ways. For example, one herbicide can hurt a weed by manipulating its hormones while another can hinder photosynthesis.

"These alternative tank mixes can control glyphosate-resistant weed species," said Kevin Bradley, an MU Extension weed scientist and associate professor in the MU College of Agriculture, Food and Natural Resources. "We have to do a better job at managing weed populations and not just controlling weeds with one herbicide."

Current tests focus on the best tank mixes for 2,4-D and dicamba in waterhemp, giant ragweed, cocklebur and a variety of other weed species. By pairing those chemicals with different amounts of other herbicides like glyphosate and glufosinate (often known by the brand names Roundup and Liberty, respectively), they hope to give farmers better control of the problem weeds in their fields.

"Our No. 1 thing is we have to move away from spraying just one herbicide over and over and get a different mode of action out there," Bradley said.

He hopes that U.S. agriculture can avoid measures taken by other countries that have previously experienced these resistance problems. "In countries like Australia, they've had to adopt different crops, they've had to move towards a greater reliance on tillage for weed control, they've had to develop new types of machinery to remove weed seeds from fields, all as a result of herbicide-resistant weed problems. We haven't had to even think about doing those kinds of things-yet."

New developments will soon make 2,4-D and dicamba tank mixes all the more important.

MU recently partnered with Dow AgroSciences to engineer and field test soybean plants that tolerate 2,4-D. The chemical, developed during World War II, is one of the cheaper herbicides on the market, and 2,4-D-resistant seed would work in much the same way as Roundup Ready soybeans and corn.

Regulated testing started in MU field plots last year, Bradley said.

While 2,4-D-resistant seed won't hit the market for several years, it's important for farmers to learn now from the mistakes made during the Roundup heyday, he said. "Growers might look at 2,4-D- or dicamba-resistant soybean technologies and think it will be the next silver bullet, just like Roundup Ready. If we have that mindset we'll lose these technologies to resistance, too."

He says the days of one chemical solving all weed problems are over, and farmers will need to be smarter and timelier to control problems.

"What we're seeing with waterhemp and even with giant ragweed is multiple herbicide resistance, so now some weeds are resistant to three or four different modes of action all in one plant," he said. "We're starting to run out of options to control those species with herbicides we have, and while that's not widespread yet, we're seeing this as a growing problem."

The solution is a balanced approach, he said. Farmers should spray fields while weeds are small, use herbicides that have different modes of action and even use traditional control techniques involving crop rotation and tillage.

That's especially important for farmers looking to eke out a few more bushels per acre.

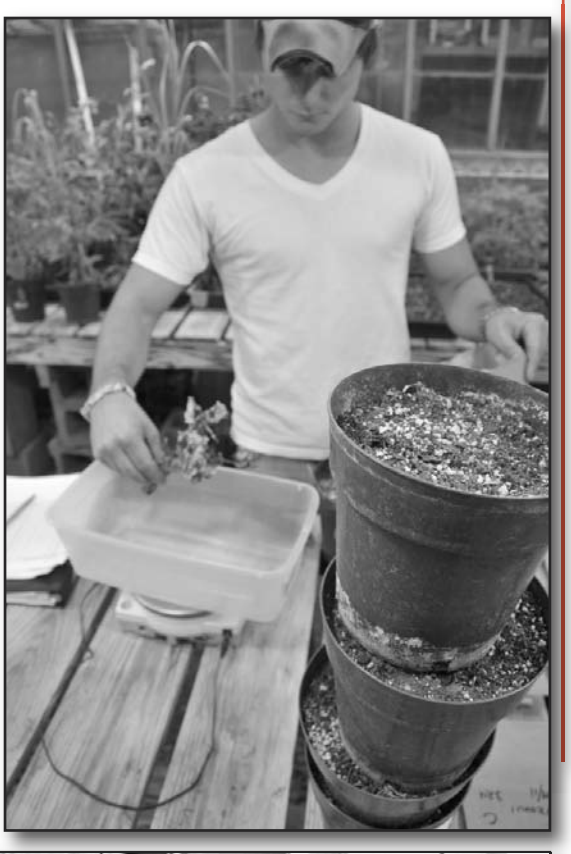

Photo by Roger Meissen
Brett Craigmyle, an MU Weed Science graduate student, weighs weed remains as he determines the best mixture of herbicides to kill pests like waterhemp, giant

Photo by Roger Meissen
University of Missouri Weed Scientist Kevin Bradley examines a waterhemp weed previously sprayed in greenhouse tests. This weed shows strong resistance to the herbicides used and represents a significant problem in farm fields.

"Yield loss from weeds can be astonishing if the proper measures aren't taken to control them," Craigmyle said. "In the end it's all about farmers making that dollar to get by and feed the world.

"With the growing population, we need every edge we have, and controlling weeds is just one part of it." Δ