New bio-weapon shows promise against weeds

NEWS

DEC 18, 2015 By JASON CAMPBELL, WLJ CORRESPONDENT (BY-AUTHOR-193-1.HTML)

A wildfire fueled by invasive cheatgrass burns fragile sage steppe habitat.
USDA/NRCS

For more than a century, ranchers and land managers have fought against the invasion of cheatgrass on their ranges. For most of that time, the weed—noted for reducing forage quality while increasing the frequency and severity of fire—has been winning. From its introduction in the late 19th century, cheatgrass has grown to dominate millions of acres across the West.

While the battle against cheatgrass has been largely a losing one, a recent discovery by a soil scientist in Washington state has led to a product that has the potential to level the playing field for ranchers, and may provide the first step in finally bringing cheatgrass to heel.

The product is a soil-dwelling bacterium that inhibits root growth in cheatgrass. For Ann Kennedy, a soil scientist with USDA's Agricultural Research Service (ARS) and the bacteria's discoverer, identifying a microbe with these attributes has been a 30-year undertaking. In 1986, Kennedy was looking at poor growth of winter wheat in the early spring, and trying to identify the cause.

"We found a bacteria that was colonizing the roots of the wheat and actually suppressing it," she says. While this ultimately proved to be of little interest to wheat producers, the discovery led Kennedy to wonder if similar interactions existed between bacteria and weed species. Determined, she set out to find a bacteria that was cold tolerant, would inhibit the root growth of cheatgrass, and that would leave desirable plant species unharmed. Three decades and 25,000 bacterial isolates later, she found it.

In addition to cheatgrass, the bacteria also suppresses root growth in medusahead, another winter annual that invades western ranges, as well as jointed goat grass, a long-time scourge to wheat producers. It works by producing a compound that suppresses root growth, thus reducing the weed's competitive edge. According to Kennedy, the effect is specific to these three grass species, something that she points out is key in developing any type of biocontrol product.

"The EPA won't let it out if it inhibits anything else," she explains, referring to the Environmental Protection Agency. "There can't be any inhibition of crops, natives, or any other plants."

The bacteria, she says, was also screened to ensure that there was no effect on birds, mammals, or insects. "This is why it has taken us 30 years," she adds. "We did all this screening up front. This organism is extremely safe."

The bacteria is also cold tolerant, and performs best during the cooler fall months, which is the same time cheatgrass and medusahead are accelerating their root growth. During the warmer months, the bacteria grows dormant and, according to Kennedy, dies out completely after four or five years. "We made sure that these bacteria don't compete well in the soil," she explains. "With any type of biological control, we want these organisms to come in, do their thing, and then get out of the way."

Once cultured, says Kennedy, the bacteria can be sprayed either from the ground or aerially, as well as coated on seeds prior to planting of more desirable grasses. Because the bacteria is a live material, she warns, it has to be applied correctly in order to survive.

“We put it on in the fall with the rain,” she explains. “If we put it on too long before the rain and it sits on the surface, it can die.” In addition, because the bacteria needs time to reproduce, there is a lag time before any effect becomes visible. “It’s not like an herbicide, where you see a response two weeks after you put it on,” says Kennedy. “We won’t see much inhibition the first year. The bacteria has to get into the soil, and we have to sit on our hands for quite some time.”

While the results are not instantaneous, indicates Kennedy, they are impressive. “Over about 100 studies, we’ve seen a 50 percent reduction of the weed within three years,” she says. “In most cases, the whole seed bank is gone in five years.” Many of these banked seeds, she explains, will never even get a chance to establish.

“As the plant root comes out of the seed, that’s when tiller initiation occurs in grasses,” says Kennedy. “If the bacteria is on that seed, the root tells the shoot that there are very few resources in the soil, and it doesn’t put out any tillers. What you end up with is a tiny plant that isn’t producing very many seeds. Not only are we reducing the establishment of the cheatgrass, but there are less seeds produced each year that the bacteria is there.”

According to Kennedy, her strain of bacteria, known as ACK55, is currently awaiting EPA approval as a biocontrol herbicide, a move that is not expected until fall of 2016. In the meantime, however, this delay in approval is not preventing one company from making a product accessible to the public. Working closely with Kennedy, Caldwell, ID-based Biowest Ag Solutions has developed their own strain of the same bacteria, called MB906. While they cannot sell it as a biocontrol herbicide, they have obtained approval to sell it in several states as a soil amendment.

“I can’t use the term herbicide, suppressant, or any of that type of terminology,” explains Dave Lister of Biowest. “Basically all I can say is that this product contributes to the biodiversity of soil, that’s all that label is going to tell you. But we do have a legal registered product that we can put out with an expected impact on cheatgrass, medusahead, and jointed goat grass.”

So far, says Lister, Biowest’s product has been applied to roughly 25,000 acres. The results, he says, are already becoming apparent. “It’s pretty clear cut what the potential of this stuff is,” he says. “This could be game changing for every body.”

Currently, Biowest’s product is available only as a liquid, to be applied at the rate of one gallon per acre. The cost to the producer is $8.52 per acre, delivered virtually anywhere in the west. Because the bacteria is self-replicating, only a single application is typically required, though Kennedy indicates it can be repeated in five years if all or some of the weeds remain. Shipping bacteria in a liquid solution, admits Lister, can create some logistical issues that must be overcome.

“It’s a live material, so there’s no real shelf life,” he says. “Once we ship it, you’ve got two to three weeks to get it on the ground.” Despite these hurdles, Lister indicates that Biowest is up to the challenges of production and distribution. “Our motivation in this game is to get this stuff on the ground where it can help,” he says. “We’ve invested about half a million dollars into our production line, so we’re in this for the long haul.”

Once the bacterium has taken hold, says Kennedy, it is important to have a plan in place for reestablishing desirable plants. “If you take out the cheatgrass and medusahead, and do nothing else, the broadleaf weeds come in,” she says. “We can’t just put the bacteria out and walk away.”

The best course of action for reestablishment, she says, depend on site conditions. “It’s not a silver bullet,” she says. “It’s part of a longterm management scheme.”

While this bacterium represents the first of Kennedy’s experiments to reach the consumer market, it is unlikely to be the last. In addition to cheatgrass and medusahead, Kennedy continues to screen bacteria looking for effects on ventenata, bulbous bluegrass, Italian rye, and numerous other grassy weeds affecting both crops and rangelands. “Now that I understand the process, and we have a company on board that can produce in large quantities, it’s gotten much easier,” she says. “We know those organisms are out there, all we have to do is go out and find them.” — **Jason Campbell, *WLJ* Correspondent**