

Weed Suppressive Bacteria for Cheatgrass

The naturally occurring soil-borne bacteria *Pseudomonas fluorescens* was observed several decades ago affecting growth of winter wheat in eastern Washington. Since then, Dr. Ann Kennedy, a research scientist with USDA-Agricultural Research Service in Pullman, WA, has been isolating and testing strains of *P. fluorescens* that target specific weedy grasses. Three strains are being developed as bio-herbicides for cheatgrass (*Bromus tectorum*): D7, ACK55, and MB906. All three strains are cold-loving organisms that are applied in fall with cool temperatures, overcast skies, and rain. Strains D7 and ACK55 stunt root growth and overall vigor of cheatgrass by colonizing intercellular spaces in grass roots and producing compounds that inhibit cellular growth in seedlings. In addition to cheatgrass, the strains inhibit growth of medusahead (*Taeniatherum caput-medusae*) and jointed goatgrass (*Aegilops cylindrica*).



Pseudomonas fluorescens D7 was registered in 2014 as a bio-herbicide under the trade name D7® by Verdesian Life Sciences, LLC, Cary, NC. D7 is registered for use on wheat, barley, triticale, oats, and rangeland, and was recently registered in Montana. D7 is a freeze-dried powder that is dissolved in water and applied as a spray solution. Suggested application rate is 2 grams/acre, and it can be applied up to four times in a 12 month period for a maximum application of 8 grams/acre. D7 has been shown to inhibit some native grasses, especially when plants are stressed due to other environmental factors.

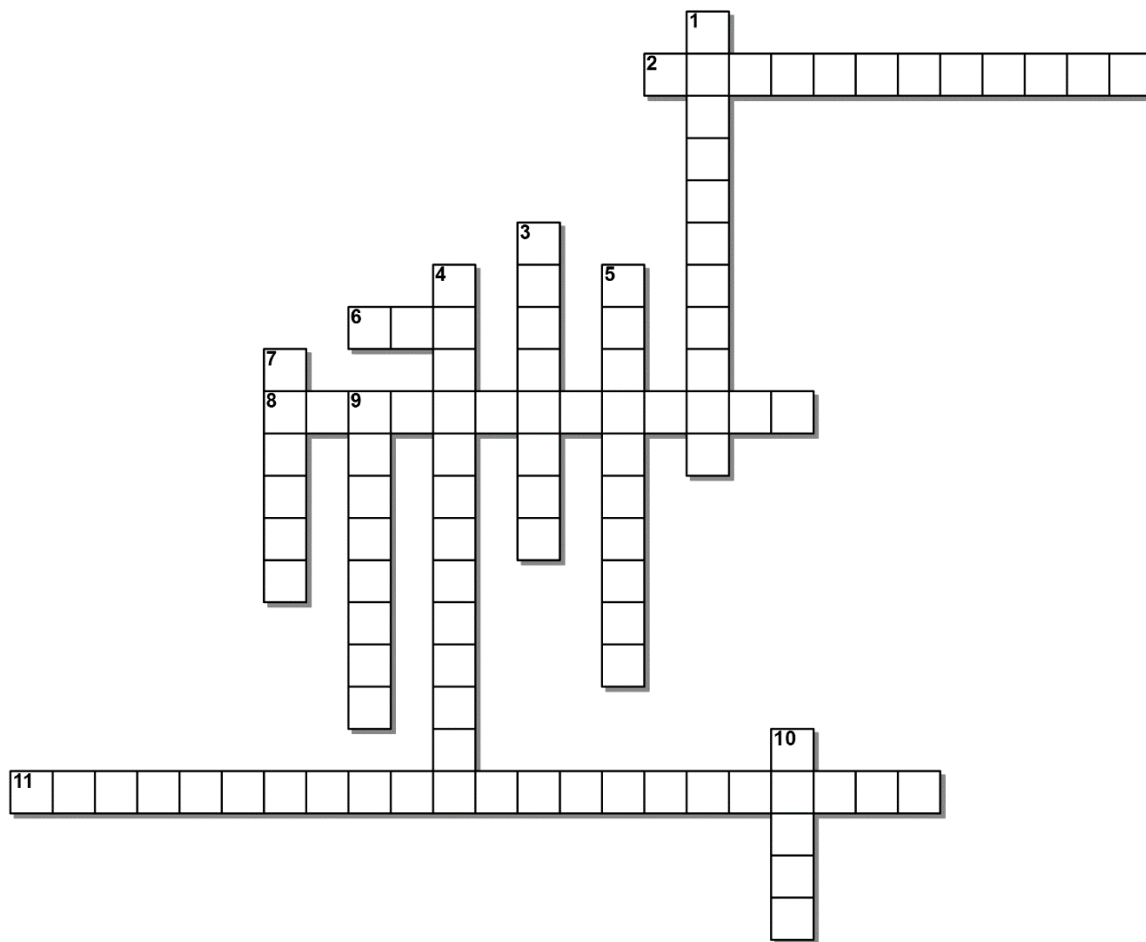


Pseudomonas fluorescens ACK55 was submitted to the EPA for review in 2015 and remains under review. ACK55 has shown greater suppressive activity and grass selectivity than D7. It is not on the market at this time and not readily available for widespread application.

Both D7 and ACK55 were initially tested and evaluated in the Pacific Northwest, Nevada, Utah, and Wyoming. To date, there are no peer-reviewed publications demonstrating effectiveness nor lack thereof in field trials in the Northern Rocky Mountain region. Montana State University is part of a statewide field study testing ACK55. ACK55 was applied at seven sites (plus one site in Wyoming) in December 2014. Plots have been monitored for two years, and preliminary data do not indicate any difference between treated and non-treated plots. Because bacteria suppress cheatgrass and reduce the seed bank and seedling vigor over time, effects may not be realized until three to five years post-application.

The third strain of *P. fluorescens* is MB906, currently marketed as a liquid soil inoculant by BioWest Ag Solutions, Nampa, ID. The label indicates that MB906 enhances soil biodiversity, and no herbicidal claims are made. It is labeled for "agricultural use only." Application of MB906 is typically made with the addition of a cheatgrass-appropriate herbicide such as imazapic. *Pseudomonas fluorescens* MB906 is currently undergoing review by the EPA to be registered as a bio-herbicide; it may be available as a bio-herbicide as early as fall 2017. It remains available on the market as a soil inoculant. Similar to D7 and ACK55, no peer-reviewed field research in the Northern Rocky Mountain region has been published on the effects of this soil inoculant.

Word Scramble: Test your knowledge of weed suppressive bacteria for cheatgrass



Across:

- 2 biologically-based control agent for weeds
- 6 agency responsible for registering bio-herbicides (abbreviated)
- 8 MB906 is sold as this amendment
- 11 scientific name of weed suppressive bacteria

Down:

- 1 crop where *P. fluorescens* was first observed
- 3 infectious organism, e.g. *P. fluorescens* D7 or ACK55
- 4 some of these can be inhibited by D7
- 5 don't look at this invasive annual grass which is also susceptible to *P. fluorescens* or you'll turn to stone!
- 7 this strain is registered as a bioherbicide but not readily available
- 9 herbicide often applied for cheatgrass control
- 10 strain of *P. fluorescens* being tested in replicated trials at 7 sites in Montana, 1 site in WY

Solutions are posted to the MSU Extension Invasive Rangeland Weed website:

http://www.msuinvasiveplants.org/extension/monthly_weed_post.html

