

Cheatgrass Biocontrol: A Primer

Cheatgrass (*Bromus tectorum*) is one of the most significant invasive plants in the western U.S. and Canada where it currently infests over 100 million acres. The most extensive infestations have historically been in the Great Basin, but its distribution has been expanding in Montana, Wyoming, Colorado, and southern Canada as well. Because cheatgrass often forms extensive infestations of hundreds to thousands of acres, biological control is an attractive option. Below is a summary of three naturally occurring soil borne organisms that are being researched as potential biological control agents. These organisms are under development and not yet commercially available. However, you may be familiar with them due to recent media coverage (first two discussed below) or first-hand experience (third discussed below).



Cheatgrass infestation. Photo by Noelle Orloff, MSU

***Pseudomonas fluorescens* strain D7** *Pseudomonas fluorescens* strain D7 is a bacterium. It selectively inhibits cheatgrass and some other *Bromus* spp. as well as medusahead and jointed goatgrass. Cheatgrass typically overwinters as a seedling and begins root growth in early spring before native range grasses and grassy crops like winter wheat resume growth. During this time, *P. fluorescens* D7 colonizes cheatgrass roots and produces root-suppressive compounds that decrease seedling vigor and the number of tillers and seeds produced. Over time, the overall competitive ability of cheatgrass is reduced which allows neighboring desired grasses to out-compete cheatgrass. To date, studies have occurred primarily in Washington, Oregon, and Nevada by researchers from USDA-Agricultural Research Service and colleagues at Washington State University. In fall 2014, field plots were established in several locations in Montana. This organism may be commercially available in the near future.

Pyrenophora semeniperda *Pyrenophora semeniperda* is a fungus that infects seeds in the soil seed bank. This is in contrast to *P. fluorescens* strain D7 which affects seedlings that have already germinated from seeds. The fungus has been nick-named “the black fingers of death” due to black, finger-like growths that occur on the seed. Cheatgrass is a prolific seed producer and accumulates thousands of seeds in the seed bank; one of the appeals of *P. semeniperda* is that it can reduce seeds in the seed bank. This is appealing for situations where cheatgrass forms solid stands and revegetation is required, but seeded species must compete with cheatgrass seedlings emerging from the seed bank. While *P. semeniperda* has been found to infect the seeds of grass species other than cheatgrass (it is a “generalist”), research has shown that seeds of desired grasses can be protected with a fungicidal seed treatment. The application of *P. semeniperda* has been tested primarily by researchers in Utah, Idaho, and Washington. Studies are also being conducted at Montana State University as well.



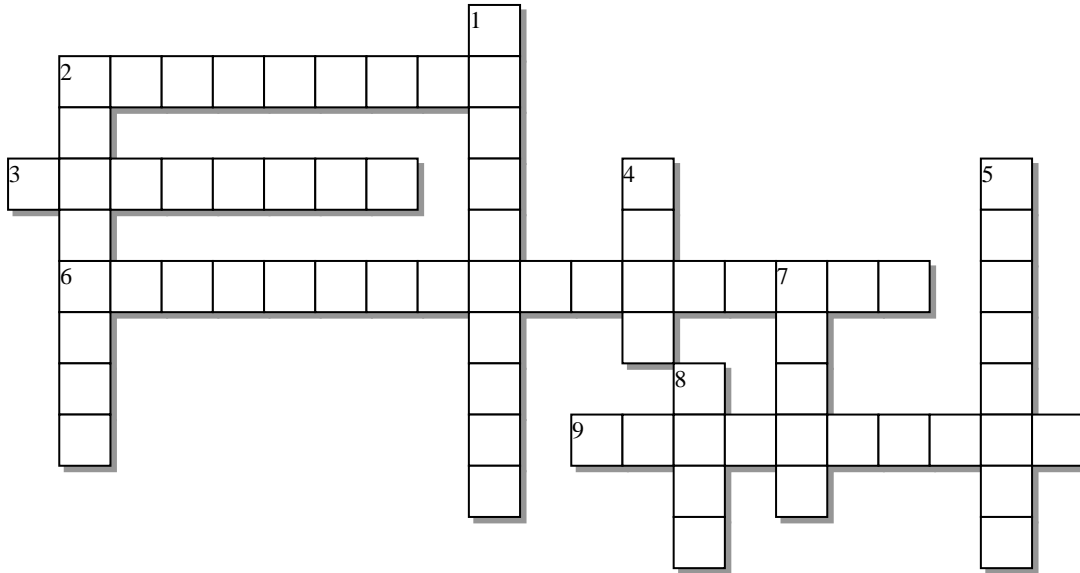
Cheatgrass seeds with “black fingers of death.” Photo by Krista Ehlert, MSU

Ustilago bullata *Ustilago bullata*, or head smut, is a fungal pathogen that results in cheatgrass producing black, powdery smut in place of seeds, thereby reducing or even eliminating seed production of affected populations. This organism has not received as much attention as the two described above. However, you may be most familiar with this organism because it is commonly encountered in the field, showing up as black powder that covers your pants and shoes when you walk through a patch of infected cheatgrass.



Cheatgrass infected with *Ustilago bullata*. Photo by Krista Ehlert, MSU

Test your knowledge of cheatgrass biocontrol



Across:

- 2 - If you don't like to get dirt under your fingernails, cheatgrass biocontrol is not for you because the potential agents are all this
- 3 - If you've ever walked through a patch of cheatgrass and come away with black pants and shoes, you have probably encountered this (common name)
- 6 - Because cheatgrass is widespread and occurs in very large infestations, this integrated weed management tool is very appealing
- 9 - This region of the U.S. has been especially vulnerable to cheatgrass invasion in the past

Down:

- 1 - This term is used to describe a pathogen that is not a picky eater
- 2 - *Pyrenophora semeniperda* may be used to reduce the _____ of cheatgrass
- 4 - The four letter acronym for *Pyrenophora semeniperda*'s scary nickname
- 5 - Baby, it's cold outside! Cheatgrass typically overwinters in this stage of growth
- 7 - *Pseudomonas fluorescens* strain D7 colonizes this portion of a cheatgrass plant and reduces seedling vigor
- 8 - The fungal pathogen *Ustilago bullata* causes cheatgrass to produce black, powdery smut in place of _____

Solutions are posted to the MSU Extension Invasive Rangeland Weed website:
<http://www.msuextension.org/invasiveplantsMangold/extensionsub.html>

