

## **Research and Extension on Integrated Biological and Cultural Management of Canada Thistle**

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Canada thistle (*Cirsium arvense*) is a vigorous creeping perennial that affects many environments due to its extensive root system, its capability for vegetative reproduction, and its tendency to make thick, dense stands. Current Canada thistle weed management strategies are mostly based on single-method practices. However, the integration of chemical and biocontrol tactics may increase management efficiency and efficacy. We are conducting greenhouse and field studies to 1) evaluate Canada thistle response to an herbicide, an insect, and a pathogen (glyphosate, *Hadroplontus litura* and *Pseudomonas syringae* pv. *tagetis*, respectively), and 2) assess the main biological and environmental parameters conditioning Canada thistle emergence and growth.

In the greenhouse study, relative to the control a 5.5 lb ai/A rate of glyphosate did not affect aboveground biomass, but decreased belowground biomass by 80% and decreased shoot survival by 35%. The largest change occurred when the biocontrol agents were combined with glyphosate at a rate of 0.92 lb ai/A. These treatments reduced aboveground biomass by 90 to 100%, reduced belowground biomass by 96 to 100%, and reduced shoot survival by 80 to 97%. These results indicated increased control using a multi-faceted management approach and suggest the possibility of synergistic interactions among management practices.

In a field study, a total of 1008 roots of known size and weight were buried at three different depths (2 cm, 10 cm, and 20 cm). Emergence and growth are currently being measured on a regular basis. Emerged plants were randomly assigned to 4 different treatments: control, glyphosate at 5.5 lb ai/A, glyphosate at 0.72 lb ai/A, and glyphosate at 0.72 lb ai/A plus insect and pathogens biocontrol. Preliminary results indicate that depth significantly affected emergence with 3.0%, 17% and 4.3% of the plants emerging from the 2 cm, 10 cm, and 20 cm, respectively.

### **Peer-reviewed publication**

Collier, T., S. Enloe, J. Sciegienka, and F. Menalled, and Joanna. *In press*. Combined impacts of *Ceutorhynchus litura* and herbicide treatments for Canada thistle suppression. *Biol. Control*.

### **Research presentations in professional meetings**

Enloe S, Collier, T, Sciegienka, J and Menalled, F. 2007. Integrating the Stem Mining Weevil (*Hadroplontus litura*) with Herbicides for Canada Thistle Control: How

useful is it? Western Society of Weed Science Annual Meeting. Portland, Oregon.

Sciegienka, JK, Menalled FD, Miller PR, Zidack NK, and Blodgett SL. 2007. Canada thistle growth and physiological response to a pathogen, insect, and herbicide. Western Society of Weed Science Annual Meeting. Portland, Oregon. 2<sup>nd</sup> prize in the graduate student contest. Category: weeds of agronomic crops.

### **Extension publication**

Jacobs, J., J. Sciegienka, and F. Menalled. 2006. Ecology and Management of Canada thistle [*Cirsium arvense* (L.) Scop.] NRCS Technical Bulletin.

### **Extension presentations**

Results of this research were partially used in the following extension presentations:

4-Jan-07. Bozeman, Montana. Montana State University Crop and Pest Management. Research update. 45 minutes.

17-Jan-07. Helena, Montana. Montana Weed Control Association. Weed community dynamics in croplands. 25 minutes

14-Feb-07. Billings, Montana. Alfalfa seed growers association. Integrated management of Canada thistle. 30 minutes