

# Montana IPM Bulletin



MONTANA  
STATE UNIVERSITY

EXTENSION

Spring 2016

## Pestweb: The Montana Orange Wheat Blossom Midge Monitoring Project

### 2015 Year End Summary

*Bob Stougaard, Superintendent, Northwestern Agricultural Research Center*

#### Background

The Orange Wheat Blossom Midge (Figure 1), hereafter referred to as wheat midge, first caused economic damage during 2006 in Flathead County, with spring wheat yield losses estimated at 1.5 million dollars (Figure 2). Since the initial outbreak, the wheat midge was also found in Lake County, but its exact distribution in the rest of the state was largely unknown. As such, a pilot project was initiated to monitor for the presence of this pest in the Golden Triangle area.

Pondera County first reported low wheat midge numbers in 2008, but it wasn't until 2013 that economic levels of this pest were found, and over 12,000 acres had to be treated. The season of 2013 also found low wheat midge populations in Chouteau, Glacier, Liberty and Toole Counties, while wheat midge damage was suspect in Daniels County. This dramatic increase in the distribution of wheat midge served as the initiative behind the development of the MSU Pestweb site (<http://pestweb.montana.edu/>).

The MSU Pestweb site is partially funded by a grant from the Montana Wheat and Barley Committee and serves as an early warning system to help producers track wheat midge adult emergence and distribution throughout the state of Montana on a field scale basis.

#### 2015 Activities

Monitoring for the wheat midge was accomplished using pheromone traps. These traps attract wheat midges and contain them

so researchers can estimate their population sizes at sites across Montana. Faculty at six Research Centers participated in monitoring fields. The Research Centers also served as the regional hubs for distributing over 100 pheromone traps to 31 MSU Extension agents. In turn, some Extension agents served as the distribution point for an additional 200 pheromone traps for use by area farmers and crop consultants, while some individuals purchased traps directly from suppliers.

In all, 44 volunteers in 31 counties aided in monitoring for the presence of the wheat midge in a total of 275 fields during 2015. The information the volunteers obtained was posted on the MSU Pestweb site (<http://pestweb.montana.edu/>). This information was made available to the general public so that small grain growers throughout the state were able to see if wheat midge populations were present in their immediate area and to determine if the numbers warranted scouting their fields.

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FIGURE 1. Orange wheat blossom midge larvae feeding on a developing wheat kernel. Photo credit NW Agricultural Research Center.

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FIGURE 2. Damage to wheat kernels by orange wheat blossom midge larvae. Photo credit NW Agricultural Research Center.

While pheromone traps can indicate whether or not wheat midge adult emergence has occurred, their use is generally considered as an early warning system. Scouting should be initiated as soon as wheat midge adults are found in the pheromone traps to determine if a field is at an economic threshold for wheat midge damage. In short, this project not only served to document the distribution of the pest problem, but was utilized to guide scouting efforts and IPM practices.

## Results

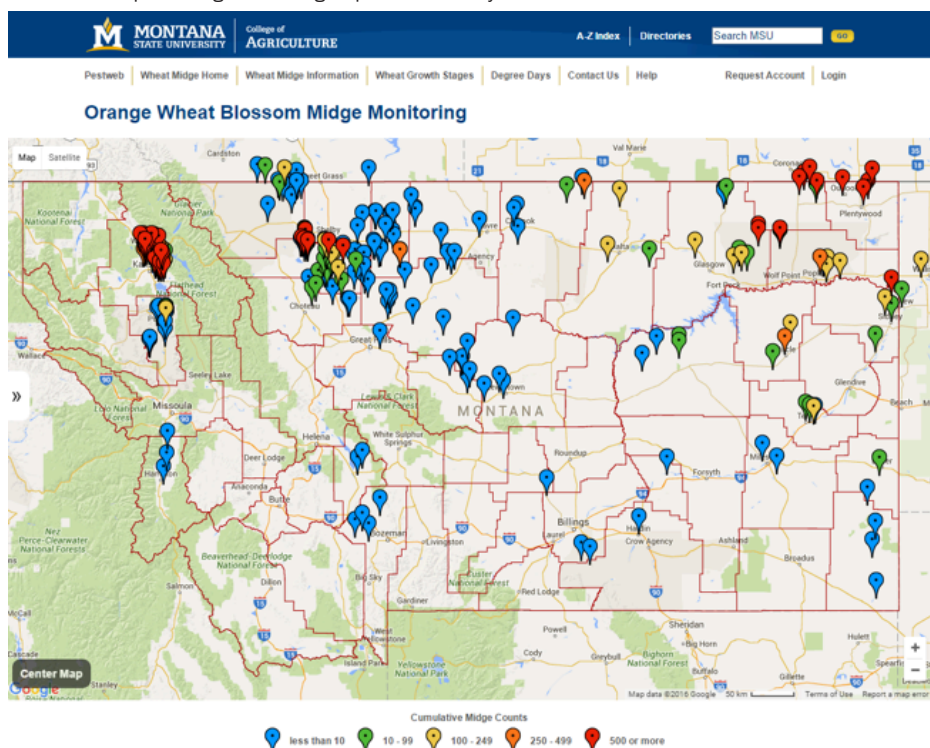
A total of 17 counties reported presence of the wheat midge in 2015 (Table 1). Thus far, wheat midge infestations appear to be concentrated in the northwestern, northcentral and northeastern tier of counties (Figure 3). Wheat midge had previously been reported in Blaine, Chouteau, Daniels, Flathead, Glacier, Hill, Lake, Liberty, Phillips, Pondera, Prairie, Richland, Roosevelt, Sheridan, Teton, Toole, Valley and Wibaux Counties, and the 2015 monitoring project verified this fact. However, three additional counties have now documented presence of the wheat midge as a result of the 2015 efforts. The new counties include, Garfield, Judith Basin and McCone. These results indicate wheat midge populations are spreading throughout Montana, and that continued vigilance is warranted.

For more information about the Orange Wheat Blossom Midge Monitoring Project, the new wheat midge MontGuide, or Pestweb, contact your local MSU Extension agent, your local MSU Agricultural Research Center or the following individuals: Brooke Bohannon (brooke.bohannon@montana.edu), Dan Picard (daniel.picard@montana.edu), Gadi Reddy (reddy@montana.edu), Bob Stougaard (rns@montana.edu), or Kevin Wanner (kwanner@montana.edu).

TABLE 1. Results of orange blossom wheat midge monitoring in 2015.

Participating County	Number Of Traps	Total Trap Count	Average Count Per Trap	Participating County	Number Of Traps	Total Trap Count	Average Count Per Trap
Flathead	55	34403	626	Toole	3	5	2
Pondera	44	14373	327	Judith Basin	5	1	0
Sheridan	4	5541	1385	Bighorn	1	0	0
Valley	13	4605	354	Blaine	6	0	0
Richland	6	1843	307	Broadwater	2	0	0
Liberty	25	892	36	Carter	5	0	0
Roosevelt	4	799	200	Cascade	2	0	0
McCone	3	706	235	Chouteau	14	0	0
Daniels	5	700	140	Custer	2	0	0
Phillips	3	471	157	Fergus	5	0	0
Glacier	15	351	23	Gallatin	4	0	0
Lake	14	299	21	Hill	10	0	0
Prairie	4	208	52	Ravalli	4	0	0
Teton	7	41	6	Treasure	1	0	0
Garfield	4	29	7	Yellowstone	3	0	0

FIGURE 3. Map showing monitoring traps and intensity of infestations



## EPA Proposing Strong Steps to Prevent Poisoning from Paraquat

*Cecil Tharp, Montana State University Pesticide Education Specialist*

Paraquat is one of the most widely used herbicides in the United States, commonly sold in such formulations as Devour®, Firestorm®, Helmquat 3SL®, Gramoxone SL®, Cyclone SL 2.0®, Bonedry®, Willowood Paraquat 3SL®, Paraquat Concentrate® and Parazone 3SL Herbicide®. Paraquat is a photosynthesis inhibitor and acts as a non-selective contact herbicide.

Use of paraquat in Montana has increased in recent years due to glyphosate resistance in kochia. The pesticide active ingredient, paraquat, enables applicators to mix their modes of action in an effort to reduce glyphosate resistance while managing a wide array of weeds. Paraquat also is useful as a desiccation aid in various crops.

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(Paraquat, continued from page 2)

Since paraquat is a highly toxic active ingredient that can be fatal at extremely low doses, the Environmental Protection Agency (EPA) is reviewing the implications of widespread use of this product. According to EPA, 17 deaths have been reported since 2000. This number includes three children that accidentally ingested paraquat as a result of the pesticide being transferred to beverage containers. Even a sip is fatal to a child, and there is no antidote. The EPA reports three additional pesticide worker deaths and many severe injuries caused by paraquat absorption through the skin or eyes.

To reduce poisonings to children and workers who mix, load and apply paraquat, EPA is proposing:

- New closed-system packaging designed to allow removal of pesticide only into proper application equipment
- Special training for certified applicators using paraquat
- Changes to the pesticide label to highlight toxicity and risks
- Prohibiting application from hand-held and backpack equipment
- Restricting use to certified pesticide applicators only (individuals working under the supervision of a certified applicator would be prohibited from using paraquat)

### Submitting Comments on this Proposal

EPA is asking for public comment over a 60-day period. Comments must be received on or before May 9, 2016. Submit your comments, identified by docket identification (ID) number EPA-HQ-OPP-2011-0855, by one of the following methods:

- Federal eRulemaking Portal: Go to docket EPA-HQ-OPP-2011-0855 at
- <http://www.regulations.gov>. Follow online instructions for submitting comments. Do not submit electronically any information you consider to be confidential business information or other information whose disclosure is restricted by statute.

- Mail: OPP Docket, Environmental Protection Agency Docket Center (EPA/DC), (28221T), 1200 Pennsylvania Ave. N.W., Washington, DC 20460-0001.
- Hand Delivery: To make special arrangements for hand delivery or delivery of boxed information, please follow the instructions at <http://www.epa.gov/dockets/contacts.html>.

### Precautions when Using Paraquat Products

Applicators should use paraquat products with care as it is classified as a category 1 substance with the signal word 'Danger – Poison.' This signal word implies that this pesticide product is highly toxic through multiple routes of entry. When using paraquat products applicators should remember to:

- Have buffers between the pesticide application and sensitive areas (livestock, people, and pets).
- Follow all re-entry and pre-harvest requirements on the pesticide product label.
- Wear proper personal protective equipment.

Personal protective equipment (PPE) requirements are usually on the first or second page of the product label under Precautionary Statements. Table 2 represents the PPE requirements for applicators while using the paraquat formulation known as Paraquat

Concentrate®. This includes protective eyewear, long sleeve shirt and pants, protective eyewear, chemically resistant gloves and the use of a NIOSH approved particulate filtering respirator with any N, R or P filter with an approval prefix of TC-84A. Mixers and loaders must also wear a chemical resistant apron and face shield (Table 2).

### For further information

For details regarding the proposed action see the EPA website at [www.epa.gov](http://www.epa.gov). For questions regarding implications in Montana, contact Cecil Tharp, Pesticide Education Specialist (406-994-5067; [ctharp@montana.edu](mailto:ctharp@montana.edu)). For technical questions or further details regarding commenting, contact Michelle Arling, [arling.michelle@epa.gov](mailto:arling.michelle@epa.gov).



CECIL THARP, MONTANA STATE UNIVERSITY, 2004

TABLE 2. Personal protective equipment requirements for Paraquat concentrate.

<p><b>Applicators and other handlers (other than mixers and loaders) must wear:</b></p> <p>Long-sleeved shirt and long pants; Chemical resistant gloves – Category A (e.g., barrier laminate, butyl rubber, nitrile rubber, neoprene rubber, natural rubber, polyethylene, polyvinyl chloride (PVC) or viton); Shoes plus socks; Protective eyewear; NIOSH-approved particulate filtering respirator equipped with N, R or P class filter media. The respirator should have a NIOSH approval number prefix TC-84A. It is recommended that you require that respirator wearer to be fit tested, and trained in the use, maintenance and limitations of the respirator.</p> <p><b>Mixers and loaders must wear:</b></p> <p>Long-sleeved shirt and long pants            Chemical resistant gloves – Category A (e.g., barrier laminate, butyl rubber, nitrile rubber, neoprene rubber, natural rubber, polyethylene, polyvinyl chloride (PVC) or viton)            Shoes plus socks            Chemical resistant apron            Face shield            NIOSH-approved particulate filtering respirator equipped with N, R or P class filter media. The respirator should have a NIOSH approval number prefix TC-84A. It is recommended that you require that respirator wearer to be fit tested, and trained in the use, maintenance and limitations of the respirator.</p>
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# All thistles are not created equal

Noelle Orloff, Plant Identification Diagnostician, and  
Jane Mangold, Rangeland Weed Specialist



FIGURE 4. Meadow or elk thistle (*Cirsium scariosum*). Photo by Matt Lavin, Montana State University

The Montana countryside is turning green and soon the hillsides will be dotted with colorful wildflowers, including thistles. In Montana, we have both exotic weedy thistles and beneficial thistles native to our state. The most visible and abundant thistle species are often exotic thistles like Canada thistle (*Cirsium arvense*) and bull thistle (*Cirsium vulgare*). These exotic thistles are often invasive and included on state and county noxious weed lists (Table 3). While you may think, “the only good thistle is a dead thistle,” thistles native to Montana such as elk thistle (*Cirsium scariosum*) (Figure 4) are better off alive than dead due to their benefits including beautiful flowers and foliage and resources they provide for wildlife, especially pollinators. From an economics perspective, it makes sense to focus limited resources on controlling only those thistles that may pose a true threat, namely exotic, invasive thistles.

Fifteen thistle species grow in Montana. Ten of these species are native while five are exotic and considered weedy or invasive (Table 3). Identifying exotic thistles and differentiating them from natives before

attempting to control them with herbicides or by other means is critical. Invasive exotic thistles can spread quickly and form dense stands with disturbance (Figure 5), they have poor forage value, and their sharp spines can limit recreational activities and injure livestock. Compared to exotic thistles, native thistles do not spread quickly with disturbance, are rarely or never reported as invasive, and are important for wildlife. For example, birds eat thistle seed, and some may time their nesting around thistle flowering, using plumes on seeds to line their nests. Bees, wasps, flies and beetles feed on thistle pollen and become food sources for other wildlife. For some large ungulates like elk, native thistles are a source of forage.

From a weed management perspective, differentiating among exotic thistles is important because a perennial rhizomatous thistle will require different control measures than a taprooted annual or biennial species. For example, taprooted species such as bull thistle may only live for a year or two, and simply cutting them with a hoe below the soil surface may kill them. In contrast, a patch of rhizomatous, perennial Canada thistle will require a long-term management plan to target its extensive root system.

Here are some key features used to identify thistles and a few tips to help determine if you have a native or exotic thistle.

- **Bracts on flowering head.** Bracts are tiny, leaf-like structures that form a cup around the base of flowers. They are an important diagnostic feature of thistles. Often the size of individual bracts, height or width of bracts collectively, or structures that appear on bracts such as spines provide evidence if the thistle is exotic or native.

- **Structures along the stem.** Some exotic thistles have spiny wings that extend along the entire length of the stem. Native thistles may have short sections of the stem that appear winged, but wings will not extend along the entire length of the stem.
- **Root system and growth habit.** Canada thistle is an exotic rhizomatous thistle that is on the Montana noxious weed list. Rhizomatous species spread by underground shoots that develop some distance from the mother plant. No native thistles are rhizomatous, and they will generally not be found in extensive dense patches.
- **Habitat characteristics.** In general, native thistles grow in less disturbed areas than exotics do. However, some native thistles can also colonize disturbed areas like roadsides. Habitat alone is not a satisfactory way to tell native from exotic thistles, but it can be a clue.

These tips are adapted from *Guide to Exotic Thistles of Montana and How to Differentiate from Native Thistles*, a publication from Montana State University Extension that is designed to help identify exotic, invasive thistles and verify whether a thistle is native or exotic, thus helping to determine if control strategies are necessary (Parkinson and Mangold 2015, publication EB0221). The publication includes a tutorial of how to use a simplified dichotomous key and a brief description and photos of the important anatomical features and terms that are needed to successfully identify the thistle. Photos



FIGURE 5. Musk thistle (*Carduus nutans*) infestation along a road. Photo by Jane Mangold, Montana State University.

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(Thistles, continued from page 4)

of all 15 thistles found in Montana and brief descriptions of habitat are included. Printed copies of the thistle publication are free and can be ordered from Montana State University Extension Publications at (406) 994-3273, or at <http://store.msuextension.org/>. Additionally, an electronic version can be downloaded from the Extension store at <http://store.msuextension.org/>.

As always, if you have a question about thistle identification or need help with identification of any plant, contact your county or reservation Extension agent or the Schutter Diagnostic Lab ([www.diagnostics.montana.edu](http://www.diagnostics.montana.edu)) for assistance.

TABLE 3. Fifteen thistle species in Montana.

Species	Native or Exotic?
Bull thistle ( <i>Cirsium vulgare</i> )	Exotic
Canada thistle ( <i>Cirsium arvense</i> )*	Exotic
Clustered thistle ( <i>Cirsium brevistylum</i> )	Native
Eaton's thistle ( <i>Cirsium eatonii</i> )	Native
Flodman's thistle ( <i>Cirsium flodmanii</i> )	Native
Graygreen thistle ( <i>Cirsium canovirens</i> )	Native
Longstyle thistle ( <i>Cirsium longistylum</i> )	Native
Meadow or Elk thistle ( <i>Cirsium scariosum</i> )	Native
Musk thistle ( <i>Carduus nutans</i> )**	Exotic
Plumeless thistle ( <i>Carduus acanthoides</i> )**	Exotic
Prairie thistle ( <i>Cirsium canescens</i> )	Native
Scotch thistle ( <i>Onopordum acanthium</i> )**	Exotic
Wavyleaf thistle ( <i>Cirsium undulatum</i> )	Native
White or Elk thistle ( <i>Cirsium hookerianum</i> )	Native
Wyoming thistle ( <i>Cirsium pulcherrimum</i> )	Native

\*on Montana's state noxious weed list.

\*\*on at least one county noxious weed list in Montana.

## PEST MANAGEMENT TOOL KIT

**Bighorn County Initial Private Applicator Training Program.** June 16th. Harden, Montana. This program prepares and licenses private pesticide applicators to apply restricted use pesticide products on land they own, rent or lease. Contact Molly Hammond at (406)665-9770 for more information.

**2016 Pest Management Tour.** The MSU Pesticide Education Program is offering multiple 6-credit program opportunities throughout eastern Montana in early October 2016. Region 4 private applicators must have 6 recertification credits prior to the December 31, 2016, deadline to qualify into the next cycle. This may be the last chance for private applicators to accumulate credits prior to the December 31 deadline in eastern Montana. By August 2016, you may pre-register or see the online agenda at [www.pesticides.montana.edu](http://www.pesticides.montana.edu) by selecting '2016 Pest Management Tour.' Contact your local Extension office for more information as October approaches.

**In December 2015, Montana State University Extension held the first MSU Extension Climate Science Conference.** The conference included presentations from stakeholders in the fields of agriculture, natural resources, families, youth, and community; as well as, basics of climate science and several excellent keynote speakers. If you are interested, the conference video can be viewed at the MSU Extension website <http://cms.msuextension.org/climate/2015ConferenceVideo.html>.

### Three new weed-related publications from MSU Extension:

- *Pipeline Reclamation* provides step-by-step instruction for managing risks associated with pipeline development, with a special focus on weed management and revegetation. Publication MT201602AG.
- *Tall Buttercup: Identification, Biology, and Integrated Management* describes the biology and ecology of this exotic perennial forb and offers management recommendations. Publication MT201502AG.
- *Watch out for Phragmites* provides information about the invasive grass Phragmites and gives tips to help identify native versus exotic Phragmites. Publication 4611.

All three publications (plus many more) are available at the Montana State University Extension store (<http://store.msuextension.org/>). Search by publication number or title.

**MSU Extension Level 2 Noxious Weed Management Workshop**, September 28-30, 2016, Comfort Inn, Bozeman, MT. Visit <http://www.msuextension.org/invasiveplants/extensionsub.html> for more information.

**Northern Rockies Invasive Plant Council conference**, October 17-20, 2016, at the Boise Centre, Boise, ID. Visit [www.nrpic.org](http://www.nrpic.org) for more information.

**Montana Realtor Noxious Weed Training online course.** This 5-module course is specifically designed to provide realtors with fundamental knowledge about noxious weeds. It includes modules on noxious weed basics, plant and weed identification, the county noxious weed control act, and integrated weed management. Register for the online course at <http://MNWECRealtorTrainingSeries.digitalchalk.com>

# ASK THE EXPERT

**Q: I've heard the Environmental Protection Agency is requiring Montana private applicators to adhere to higher educational requirements. I heard this includes accumulating more credits per cycle, meeting categorical requirements and a shorter certification cycle. Is this true?**

**Cecil Tharp says:** Yes and No. The EPA has proposed changing the minimum requirements for private applicators through a proposed change in federal rule (40 CFR 171). In Montana the proposal, if finalized, would move the private applicator certification cycle from a 5-year to a 3-year certification cycle, require 6 credits per cycle in core and 3 credits in each category certified (if the category is required), require applicators to accumulate half the credits in the last half of the cycle, and would require categorical training in certain subject areas (non-soil fumigation, soil fumigation, M-44, aerial and aquatic). There are many more changes proposed that can be reviewed at <https://www.epa.gov/> by searching 'EPA proposed pesticide rule changes.' Applicators should keep in mind that this is a proposal, not the final rule. EPA is reviewing comments prior to posting the final decision around October 2016. Stay tuned for an alert from MSU Extension Pesticide Education regarding EPA's final decision.

**Q: Last year I applied Varro™ to control weeds in my durum wheat. I had good results but in areas under drought conditions I noticed severe crop stress. Do you have any advice?**

**Fabian Menalled says:** Varro™ (thien carbazon-methyl) is a post emergence herbicide that provides control of certain grasses and broadleaf weeds including barnyardgrass, green foxtail, yellow foxtail, and wild oat and it can be used in winter wheat and spring wheat (including durum). One of its advantages is that it can be

rotated to pulses in a relative short amount of time (9 months for lentils and peas). However, under drought conditions, late applications of Varro™ tank-mixed with emulsifiable concentrate (EC) formulations resulted in crop damage in durum wheat. Because of that, the new Varro™ label for Montana indicates that this product should be applied to all wheat from first leaf stage up to jointing stage. Also, you should avoid tank mix combinations with EC products on durum wheat if temperatures are below 32°F or above 85°F.

For more information about this product including rotation intervals, please consult the label at [http://www.agrian.com/pdfs/Varro\\_Label.pdf](http://www.agrian.com/pdfs/Varro_Label.pdf).

**Q: We have two Russian olive trees growing on our property. How do their seeds spread and what is the best way to get rid of these two trees? They are about 15 feet tall.**

**Jane Mangold says:** Russian olive is a regulated plant on the Montana noxious weed list. This means it is unlawful to intentionally plant Russian olive, but a landowner is not mandated by law to control it. However, Russian olive has potentially significant negative impacts, especially in riparian areas, so getting rid of the trees on your property will probably make your neighbors and county weed coordinator very happy. Russian olive seeds are encased in the fruit or "olive" and are spread primarily by wildlife that eats the fruits. Seeds can also be dispersed by water. The best way to control your trees is the cut-stump method: cut the tree down as close to the ground as possible then coat the stump with herbicide. Concentrated glyphosate, triclopyr, or imazapyr is recommended. You must apply the herbicide within minutes of cutting, otherwise Russian olive will re-sprout. Consult the herbicide label for specific directions as sites and uses vary by product.

**Q: Are seed treatments needed in wheat and peas?**

**Mary Burrows says:** Seed treatment fungicides are very important for mitigation of seedborne and soilborne plant pathogens. In cereals, the smuts and bunts have been virtually eliminated since the introduction of systemic seed treatment fungicides. For pulse crops, it is important to use seed treatments for numerous seedborne fungi, especially those with long-lived survival structures such as *Sclerotinia* white mold, *Botrytis* grey mold, and *Fusarium* wilt. Seed testing and the use of seed treatment fungicides has helped us manage the threat of *Ascochyta* blight for many years. With increasing acres in pulse production and limited seed availability in 2016, many poor-quality seed lots are likely to be planted. Using a fungicide can help reduce the risk of disease and/or delay disease development.

There are seed treatment options for organic producers, but there is very little efficacy data available to make judgements on whether or not they will be useful. On chickpea in Montana, five biological controls available in the mid-2000s were tested, but none were effective against damping off in the field or greenhouse. Desi chickpeas are naturally more resistant to damping off than kabuli chickpeas.

Seed treatment fungicides protect seedlings against soilborne plant pathogens such as *Pythium*, *Rhizoctonia*, and *Fusarium* damping off and root rot for 2-3 weeks after planting, depending on the fungicide used. Efficacy data for cereals can be found in the *Small grain seed treatment guide*, MSU Extension Publications MontGuide MT199608AG, available online at <http://store.msueextension.org/publications/AgandNaturalResources/MT199608AG.pdf>. A summary table for pulse crop seed treatments is currently on the Montana AgAlert website at <http://www.mtagalert.org/alertDocs/Fungicides%20for%20Pulse%20Crop%20Seed%20Treatment%202.192.pdf>

# Glyphosate-resistant *Conyza canadensis* (marestail, horseweed) confirmed in NE Montana

Timothy Fine, Richland County Extension Agent,  
and Fabian Menalled, Cropland Weed Extension Specialist

Biotypes of *Conyza canadensis* (marestail, horseweed, or Canadian horseweed) with up to a five-fold increase in resistance to glyphosate, the active ingredient of Roundup® and other herbicides, have recently been confirmed in Richland County, Montana.

Marestail is an annual plant belonging to the Asteraceae family, and it is native to North America. As a winter or summer annual species, marestail emerges in fall or early spring, but it also can germinate in midsummer if growing conditions are adequate. In general, marestail plants start to bolt in April/May, begin to flower in July, set and disperse seed from August to October, and then die. Marestail plants can produce up to 200,000 seeds that are transported by wind, providing for effective spread of herbicide-resistant populations. Reports indicate that marestail seeds can easily travel more than 100 miles in a single flight with moderate wind speeds.

As a native to temperate regions, marestail plants can be found throughout southern

Canada, the United States, and tropical America. In recent years, due to the spread of resistant biotypes, marestail has become a challenging weed to manage in reduced-till and non-till cropping systems. In Montana, marestail has primarily been reported in Richland, Valley, and Phillips Counties where it colonizes croplands, disturbed meadows, grasslands, and roadsides.

In the U.S. glyphosate resistance in marestail was first confirmed in 2000 in Delaware. Since then glyphosate-resistant marestail has been documented in more than one-third of the continental U.S. In all cases, the evolution of glyphosate resistance in marestail occurred in row crop systems, including cases of multiple herbicide resistance. This is the first confirmation of glyphosate-resistant marestail in Montana.

Herbicide resistance is defined by the Weed Science Society of America as “the inherited ability of a plant to survive and reproduce following exposure to a dose of herbicide normally lethal to the wild type. In a plant, resistance may be naturally occurring or induced by such techniques as

genetic engineering or selection of variants produced by tissue culture or mutagenesis.” The full distribution of herbicide-resistant marestail biotypes in Montana and the mechanisms driving this resistance are still unknown. Whether glyphosate resistance was selected in Montana or it moved from other states, its selection occurred due to the over-reliance of glyphosate and the failure to develop effective integrated weed management programs.

MSU Extension offers the MontGuide, *Preventing and Managing Herbicide-Resistant Weeds in Montana*, which is available free at county and reservation Extension offices or online at [ipm.montana.edu/cropweeds](http://ipm.montana.edu/cropweeds). The website [weeds.cscience.org](http://weeds.cscience.org), from the International Society of Weed Scientists, is also an excellent resource for more information on herbicide-resistant weeds.

If you have questions on preventing or managing herbicide-resistant weeds, please contact your local Extension office or Fabian Menalled at (406) 994-4783 or [menalled@montana.edu](mailto:menalled@montana.edu).

## Meet Your Specialist

### Jessica Rupp, Extension Potato, Sugar beet, and Pulse Crop Pathology



#### Where/when did you receive your degrees?

I began my studies in the field of biochemistry and cellular and molecular biology. I received a double Bachelor's from Pittsburg State University in 2009. From there, I moved to Manhattan, Kansas to pursue a Ph.D. in Plant Pathology at Kansas State University.

#### What is your field of interest (scholastic and research)?

My responsibilities here at MSU encompass seed potato, sugar beet, and pulse crops.

My work and research are split between two different avenues. First, I am committed to supplying growers with the information they need in the field. That means my lab is focused on applied field research emphasizing some of the greatest challenges my stakeholders encounter. Second, my lab is pursuing precision genome editing to create potato and sugar beet lines that lack genes that ultimately make them susceptible to a pathogen. We are just delving into this new area and we're looking forward to seeing the system up and running in the lab.

#### When did you arrive in Bozeman?

I arrived in Bozeman in September 2015. It was an exciting time to arrive. My first

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(Meet your Specialist, continued from p. 7)

day of work was spent on the beet harvester in Huntley with my predecessor, Dr. Barry Jacobsen. Around that time, potato growers were harvesting as well. Bozeman is wonderful, and there are many times I just look around to remind myself of where I live!

#### **Where are you from originally?**

I am originally from southeast Kansas. Those of you that have met me, know I have an accent! I was born and raised in a small college town called Pittsburg. Today Pittsburg is famous for the Pittsburg State University Gorillas, the most winning football team in the state, and fried chicken. My dad was a professor, and I was raised a Gorilla. I didn't plan on moving to another college town named after a different town, but I ended in Manhattan, KS, "The Little Apple." A fun fact is that I lived on Montana Street in Kansas!

#### **What are some important areas of focus in your field?**

Many important diseases affect potato and sugar beet. My current focus in potato centers on Potato virus Y (PVY). PVY is the type member of the potyvirus family.

Potyriviruses are fascinating because they have so few genes, and yet we cannot solve this problem! Additionally, we need to be ever mindful of Late Blight of potato. Montana is a seed producing state, so it is imperative we are taking all the IPM steps to ensure our top quality potatoes in the market. Sugar beet has some struggles as well. Between foliar problems, like Cercospora leaf spot, and root problems, like Rhizoctonia root and crown rot, there is a lot to tackle.

#### **What are some of your current projects?**

I am continuing studies that Dr. Jacobsen began with Dr. Ken Kephart using seed treatments for sugar beet. Additionally, Dr. Kephart and I will be investigating the role that application method plays in disease control. I am also planning on testing some seed treatments for Rhizoctonia on potato. In the lab, we are using techniques of precision genome editing of potato and sugar beet to try and get resistance. A key feature of our method is that it isn't considered transgenic. With the current climate of GMO's being what it is, I think that we should be pursuing every avenue we can to help growers.

#### **How can farmers use your research to their benefit?**

Timing is a key element for farmers. They juggle so many things, I hope my research can provide them with more peace of mind. I want to fine tune optimal timing conditions with as many tools as growers have available. If I can give them more time to get an application on the field I will have done something great. I also hope to provide them with materials that make planning and decision making easier.

#### **What projects would you like to focus on in the future?**

I would like to work on projects that anticipate the future as much as I am able. I plan to look at disease complexes and not just single diseases. Pathogens are out there fighting to get established, so they are not just fighting the plant and the environment, but each other, too! I plan to continue applied field research and precision genome editing. I have more ideas up my sleeve, but folks will just have to wait and see how those pan out in the future.

### **DO YOU HAVE A COMMENT OR QUESTION REGARDING THE MONTANA IPM BULLETIN?**

Send your questions or suggestions to:

*Cecil Tharp*  
Pesticide Education Specialist  
P.O. Box 172900  
Montana State University  
Bozeman, MT 59717-00  
Phone: (406) 994-5067  
Fax: (406) 994-5589  
Email: [ctharp@montana.edu](mailto:ctharp@montana.edu)  
Web: [www.pesticides.montana.edu](http://www.pesticides.montana.edu)

*Jane Mangold*  
Invasive Plant Specialist  
P.O. Box 173120  
Montana State University  
Bozeman, MT 59717-3120  
Phone: (406)994-5513  
Fax: (406)994-3933  
Email: [jane.mangold@montana.edu](mailto:jane.mangold@montana.edu)  
Web: [www.landresources.montana.edu](http://www.landresources.montana.edu)

Common chemical and trade names are used in this publication for clarity by the reader. Inclusion of a common chemical or trade name does not imply endorsement of that particular product or brand of herbicide. Recommendations are not meant to replace those provided in the label. Consult the label prior to any application.



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