Irrigated spring wheat fields favor wheat midge and its parasitic wasp

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It should not be surprising for Montana small grain producers that spring wheat crops need the right amount of moisture for the growth, development, and obviously for attaining optimal yield and quality. The question here is whether crop insect pests and their natural enemies such as predator and parasitic wasp populations can also be influenced by soil moisture level or not? This is the story of wheat midge (*Sitodiplosis mosellana*) (also called as orange wheat blossom midge) and its black tiny parasitic wasp (*Macroglenes penetrans*); does moisture level influence their population levels in dryland and irrigated spring wheat cropping systems?

Wheat midge is a serious spring wheat pest in Montana and other wheat growing areas in North Americas; although, it is a major winter wheat pest in Europe where it originated. What does wheat midge look like and how does it cause damage to spring wheat? Wheat midges are tiny flying insects that are about half the size of a mosquito and bright orange in color (Figure 1). Adults emerge from soil during summer, mate and the female lay eggs on wheat heads, usually in the evening and early morning. Eggs hatch in four to seven days, and larvae feed on the surface of newly developing kernels for two to three weeks, causing them to shrivel, crack, or become distorted. Wheat midge damage generally reduces wheat yield up to 30 %; however, if the damage level is severe, the yield loss can occur up to 100 % in absence of control measures.

Figure 1. Wheat midge adult (Photo Credit: Saskatoon Research Centre, Canada)

In Montana, wheat midge is a serious economical insect pest mainly in the Northwestern area and Northcentral area (Golden Triangle); but it is also gradually spreading to other regions in recent years (see https://pestweb.montana.edu/). Presently, Montana wheat producers are managing midge problems by spraying a synthetic chemical. In Pondera County alone around 3000 acres of spring wheat fields (out of 40,000 acres) are treated every year with insecticides (Lorsban and Warrior) for wheat midge management. In the past heavy midge infestation

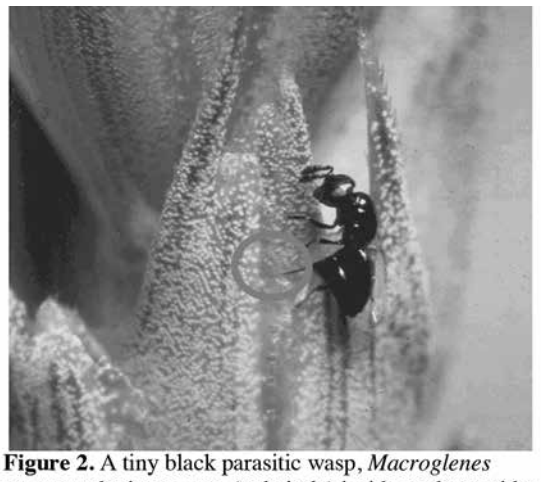

Figure 2. A tiny black parasitic wasp, *Macroglenes penetrans* laying an egg (red circle) inside a wheat midge egg (Photo Credit: Saskatoon Research Centre, Canada)

years were reported that 12000-15000 acres of spring wheat were treated with synthetic chemicals for midge management. In current management practices, it is recommended that spring wheat producers should scout the field particularly at heading stage of crop and especially in the evening time when there is no wind. The threshold level for chemical spray is 1 wheat midge adult for 4-5 wheat heads. However, producers are discouraged for chemical spray after 75 % advance flowering stage of spring wheat since wheat heads appear to be no longer susceptible to wheat midge, and it further helps to conserve natural parasitic wasps.

A tiny black parasitic wasp, called *Macroglenes penetrans*, is known as an important natural wheat midge control in Canada and Europe. These parasitic wasp adults usually begin to emerge (from the soil) about 6-10 days after midge emergence. The wasp females can lay their eggs inside midge eggs and/or larvae. For the same reason, it is called as egg and larval parasitoid. Once wasp eggs hatch, the larvae feed on developing midge larvae and then eventually kill the midges. In Canada, this wasp species is providing about 40 % wheat midge control. It has helped to reduce or save Canadian producers the expense of insecticide and application for wheat midge control. To replicate this similar natural wheat midge management technique that can fit for Montana conditions, MSU-WTARC wheat midge biocontrol research team headed by Dr. Reddy (principal investigator) bought 750 parasitic wasp adults from Canada and released in several spring wheat grower fields in Pondera County, Golden Triangle. From 2015 and 2016 parasitic wasp monitoring data, it is apparent now that this tiny black wasp has made a home in Golden Triangle, Montana.

To further continue our research work on a parasitic wasp in 2017, MSU-WTARC wheat midge research team did field surveys testing whether two spring wheat cropping systems, irrigated and dryland, have an impact on the wheat midge and its parasitic

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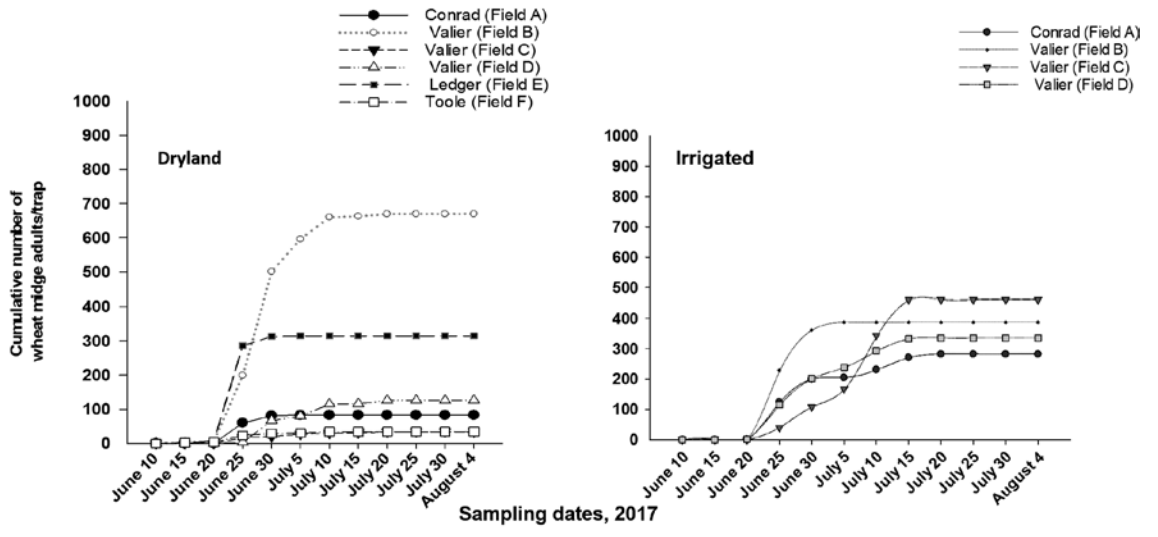

Figure 3. Wheat midge adult activity based on pheromone trap catch in dryland and irrigated spring wheat fields

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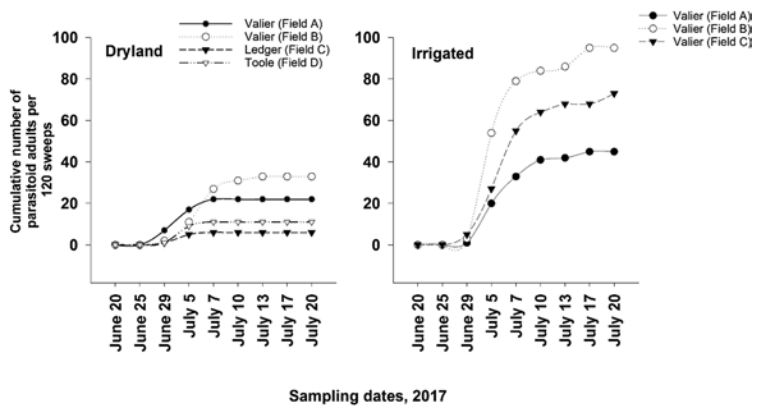

Figure 4. Wheat midge parasitoid, *Macroglenes penetrans* adult population levels in dryland and irrigated spring wheat fields, 2017.

wasp populations level in the Golden Triangle, Montana. The research team sampled wheat midge and its parasitic wasp throughout the spring wheat growing period at the Valier and Ledger locations in Pondera County. Four irrigated and five dryland fields were surveyed. Wheat midge populations were sampled using a delta pheromone trap (pheromone lures (2S, 7S)-nonadiyl dibutyrate) that attracts adult males. The parasitoid population was sampled using the sweep net method. About 120 sweeps were made per field per sampling time and the collected samples were stored at -4°F until processing. Since the wheat midge adults emerge early in the season, the midge population was monitored a week earlier than the parasitoid population. Both wheat midge and its parasitic wasp were monitored at 2-3 day intervals.

As expected, wheat midge populations were overall higher in irrigated fields than dry land spring wheat fields (Figure 3). It is also noteworthy to mention that some dryland fields had a similar level of the population when compared to irrigated fields. It is likely because some dryland fields were adjacent to irrigated fields, thereby influencing midge populations. With both systems, the emergence of wheat midge occurred almost at the same time but emergence in irrigated fields continued for longer periods (Figure 3). Similarly, parasitoid populations were higher in irrigated fields compared to dryland (Figure 4). In summary, our survey indicated that irrigated spring wheat fields favor wheat midge and also, it's natural enemy. For more information, visit our MSUWTRC website- http://agresearch.montana.edu/wtarc/news.html or contact Wheat Midge Research and Extension Team Members: Govinda Shrestha or Gadi VP Reddy

USDA investing millions in wildfire and water

The U.S. Department of Agriculture (USDA) will invest nearly $32 million this year to mitigate wildfire risk, improve water quality and restore healthy forest ecosystems in 24 states and Puerto Rico. More than $690,000 of that funding will support the Capital 360 forestry project in Montana.

Since 2013, USDA has invested $176 million in 56 Joint Chief's Landscape Restoration Partnership projects, which focus on areas where public forests and grasslands intersect with privately-owned lands.

"Through Joint Chiefs, the Natural Resources Conservation Service (NRCS) works with agricultural producers and forest landowners to improve forest health using available Farm Bill conservation programs, and the Forest Service enhances forest health on public lands -- stitching together a larger footprint of healthy ecosystems in priority areas," said Tom Hedt, NRCS acting state conservationist in Montana

Along with mitigating fire risk, Joint Chiefs' projects work to improve water quality by restoring healthy forests and grasslands.

In Montana, the funding will support the Capital 360 project in the Helena-Lewis & Clark National Forest. The Capital 360 effort builds on prior successful, smaller-scale fuels reduction projects to improve forest health in the Upper Tenmile Creek watershed and portions of the Prickly Pear, which supply water to Helena and East Helena.

Private woodland owners in these project areas may be eligible for financial assistance from the NRCS to perform forest conservation practices on their land. Contact a local USDA Service Center to learn more.

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Two choices for Dinner Tonite…take it OR leave it !