

Orange blossom wheat midge (*Sitodiplosis mosellana*) biology and management in western Canada

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Agricultural Concern¹

- Originating in Europe, now distributed throughout the world.
- First North American discovery in Quebec City 1819;⁴ Western Canada: Brandon, MB, 1901; and a serious pest in MB, 1955.⁹
- All wheat classes are strongly susceptible to wheat midge damage.
- Significant invasive problem in western Canada, and some U.S. states.
- Infestations can reduce crop yield over 15% and lower grade of harvested grain.
- Also attacks other grasses (Barley, Rye); although not enough to warrant control.

Identification²

- Small, fragile orange fly 2-3 mm in length.
- Two black eyes cover most of head.
- Three pairs of long legs relative to body size.
- Transparent wings, oval-shaped wings with fine hairs.
- Not to be confused with the Lauxanid fly (right).



Shelley Barkley, AARD
Female midge looking for ovipositing site on wheat.



Lifecycle

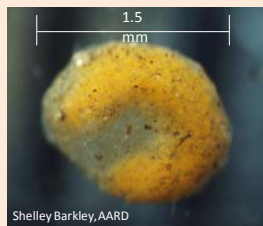
1. Adult⁴

- Emerge from pupal stage in late June – early July with 50% emerging after 784 DD (+/-2.5 days)³ accumulated with males emerging a few days before females.
- Usually begin laying eggs on second day of emergence.
- Females lay an average of 80 eggs over their 7 day lifespan.

2. Eggs

- Eggs usually laid after 8pm, when wind is <10km/h, and temperature >15°C.⁴
- Laid either on florets, within grooves of florets, or on external surface of glumes.¹
- Usually laid in clusters of 3-4 eggs.²

Lauxanid,
Camptoprosopella borealis



Shelley Barkley, AARD
Wheat midge larvae in overwintering cocoon (about size of canola seed).

Cultural controls

Crop Rotation

- Crop rotation can help reduce wheat midge populations.
- Switch to other crops (pulse or oilseed) upon a wheat midge infestation.

Seeding Date

- Studies examining the effect of seeding date on wheat midge have yielded mixed results; depending on wheat variety, soil type, and other factors.¹
- Early seeding of early maturing varieties has been shown to greatly reduce wheat midge damage since wheat flowers emerge before midge egg-laying.⁶
- Additional testing required to determine optimal actions.¹
- Utilizing resistant varieties (see **Virulence and Technology** panel).

Biological controls²

- *Macroglenes penetrans*, a small parasitic wasp, is the only significant wheat midge predator.
- lays eggs inside wheat midge eggs: both hatch at similar times and the juvenile wasp grows slowly within midge larvae; destroying midge larvae the following spring.
- Parasitized midge larvae still damage crops and parasitism benefits are not realized until the following year.

http://www.ag.ndsu.edu/archive/entomology/ndsucpr/Years/2008/July/3/wm_parasitoid.jpg



M. penetrans

3. Larvae⁵

- Hatch after 4-7 days depending on environmental conditions; especially temperature and move from outer surface of wheat head inward to feed upon developing wheat kernels.
- Larvae develop into 3 instars over 2-3 weeks growing 2-3mm in length.
- Upon growth completion, larvae drop and bury to 5 cm in soil, forming a protective cocoon to overwinter.

4. Pupae¹

- With adequate moisture and temperature, larvae move to near soil surface to pupate, but may exist for two years in soil if conditions poor.



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Chemical controls¹

- Insecticide application recommended when there is one adult midge for every 4-5 wheat heads, which would reduce yields 15%. Evening application recommended, when wheat midge is most active.
- Application during advanced stages of flowering is discouraged, since the larvae inside wheat florets are unlikely to be affected, and the wheat is not susceptible to additional attack.
- Insecticides containing chlorpyrifos or dimethoate are registered for wheat midge control in Canada.

Dimethoate

- Dimethoate affects only wheat midge adults.
- Should be applied within 24 hours of reaching the action threshold.

Chlorpyrifos

- Chlorpyrifos affects adults and eggs.
- Application should be delayed up to and no more than 4 days after action threshold in order to maximize the number of emerged wheat heads.
- Uniform insecticide coverage of wheat heads is essential for egg control.

Issues

- Insecticides can have a negative effect on wheat midge parasites.
- Can be dangerous: wheat fields should not be re-entered for at least 48 hours upon the spraying of Chlorpyrifos.

Virulence and Seed Technologies⁷

- Certain wheat varieties have an Sm1 gene which are resistant to wheat midge.
- This provides a 14.8% yield advantage over non-resistant varieties.⁸
- A small proportion of wheat midge are unaffected by the Sm1 gene and are considered virulent. Thus, growing only resistant varieties would cause virulent midge selection, compromising Sm1 gene resistance.
- Therefore, 10% of a seed lot needs to be non-resistant to act as a refuge.
- An evenly spaced refuge variety allows susceptible midge to survive and mate with virulent midge, keeping the virulent midge population from becoming dominant (non-virulence is the dominant trait).
- A Midge Tolerant Wheat Stewardship Agreement must be signed to be able to grow midge tolerant varieties which states: farmers cannot use the seed past certified seed more than one generation to ensure there is enough refuge seed within the tolerant seed so that virulent midge strains do not reach high levels.

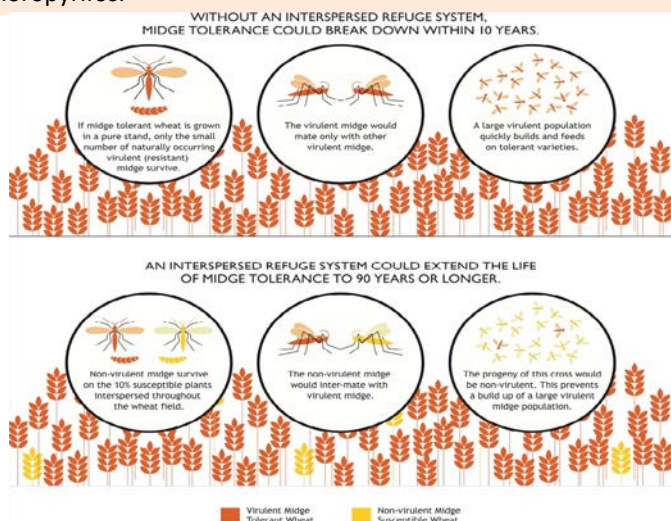


Diagram courtesy of The Midge Tolerant Stewardship Team
@ www.midgetolerantwheat.ca



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