

Hessian Flies in South Dakota

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Introduction

The first report of Hessian fly, *Mayetiola destructor* (Say) (Diptera: Cecidomyiidae) in the United States originated from New York in 1779 (Pauly 2002). Hessian flies are a pest of wheat in most of the production areas throughout the world as well as the U.S. (Ratcliffe and Hatchett 1997, Ratcliffe et al. 2000). There are numerous wild grass species as well as cultivated small grains (i.e., barley, rye, and wheat) that can serve as hosts for Hessian fly, which include barley, rye, and wheat (Harris et al. 2001). Of these cereal crops, wheat is the preferred host, followed by rye and barley, and is the most suitable for successful population growth (Harris et al. 2001, Chen et al. 2009). Although Hessian fly infestations are sporadic in South Dakota, there have been documented infestations that resulted in economic loss in recent years.

Identification

Adult (Figure 1) (VanDuyn et al. 2003, Foster and Hein 2009)

- Brown or black in color, females may be reddish-brown due to carrying orange eggs
- Females are approximately 3 mm in length with males being smaller
- One pair of wings that are gray
- 12-16 antennae segments
- Legs longer than the body



Figure 1. Female Hessian fly. Courtesy: Scott Bauer, USDA Agricultural Research Service, Bugwood.org.

Egg (Flanders et al. 2013)

- Elliptical shape and orange in color (look like rows of hot dogs)
- Very small and typically present in the grooves on the upper side of leaves

Larva (Figure 2) (Gagné and Hatchett 1989, Flanders et al. 2013)

- Cylindrical shaped body
- Initially red in color then turn semi-translucent white in color with a green stripe down the middle of the back when mature
- Three instars
- Approximately 4 mm at the end of the second instar
- Third instar larvae develop in the cuticle of the second instar (i.e., no additional growth in size) and begin turning brown



Figure 2. Hessian fly larvae on a wheat stem. Courtesy: Peggy Greb, USDA Agricultural Service, Bugwood.org.

Pupa (Figure 3 and 4) (Gagné and Hatchett 1989)

- Approximately 4 mm in length
- Dark brown in color with an oval shape resembling a flax seed



Figure 3. Hessian fly pupal case. Courtesy: Pest and Diseases Image Library, Bugwood.org.



Figure 4. Pupae inside of a wheat stem. Courtesy: John C. French Sr., Retired, Universities: Auburn, GA, Clemson and U of MO, Bugwood.org.

Life Cycle

There are two generations of Hessian flies each year in the Northern Great Plains (Chirumamilla and Knodel 2022). Adults emerge in the spring (April or May) from the previous year's stubble when temperatures maintain at around 70 °F (Foster and Taylor 1975). Once adults emerge, they live for 1-4 days (Bergh et al. 1990, Harris and Rose 1991). During their short lifespan, they mate, and the mated females will lay eggs on suitable host plants (Bergh et al. 1990). Each female may lay 250-300 eggs (Flanders et al. 2013). The eggs are typically laid end-to-end between the veins (grooves) of young wheat leaves (Flanders et al. 2013).

Depending on the temperature, the larvae will hatch after 3 to 10 days (Flanders et al. 2013). The larvae then move down the wheat leaf and enter the plant where the sheath and stem meet (Hamilton 1966). Once inside the stem, the first and second instar larvae feed on the tissue for approximately 2 to 3 weeks (Foster and Hein 2009). The third instar larvae do not feed but turn into the pupae, with this stage and pupation taking between seven and 35 days depending on weather conditions (Foster and Taylor 1975).

Depending on environmental conditions, either the adults emerge (i.e., population that will infest seedling winter wheat), or diapause (dormancy) to overwinter (i.e., population that will infest seedling spring wheat) (Flanders et al. 2013). The second-generation Hessian fly adults emerge in the fall (August or September), mate, and lay eggs on winter wheat where the cycle begins again.

It's important to note that not all Hessian fly individuals from a generation will emerge at the same time. In fact, some generations may continue to emerge one year later depending on environmental conditions. As a result, the active generation may be comprised of several different generations of Hessian flies (Wellso 1991).

Injury

Plants infested with Hessian fly larvae will often be darker green to almost blue-green color (Whitworth et al. 2009). Infested seedlings will occasionally have increased tillering, but prolonged feeding results in decreased growth of these tillers (Stuart et al. 2012). When wheat is infested and fed upon during stem elongation, the stems are weakened, and lodging is likely to occur (Schwartz et al. 2016). Yield loss associated with Hessian fly feeding prior to stem elongation is due to stunted growth, loss of tillers, and reduced stands (Schmid et al. 2018). Yield loss associated with Hessian fly feeding after stem elongation is due to harvest difficulties associated with lodged plants, aborted seed heads, reduction in the seeds per spike, and decreased seed weight (Schwartz et al. 2016).

Scouting

The most effective method of scouting for Hessian fly activity is by using the female sex pheromone baited traps to collect males (Knutson et al. 2017). Although these traps can identify populations of male Hessian flies, captures can't be used to determine the economic impact of the observed population. Active scouting (i.e., sweep netting) is not usually performed for Hessian flies as it is only an indicator of the population already present in the wheat (Schmid et al. 2018). Because an economic threshold has not been developed for Hessian flies, management typically relies on calendar-based management (i.e., fly free planting dates) or historical infestations of a field (Shukle 2008, Schmid et al. 2018).

Management Options

There are several options for Hessian fly management. One option is crop rotation, which is effective because larvae have a limited host range and will starve in fields rotated away from wheat, barley, and rye. However, this option relies on the removal of volunteer winter wheat, which could encourage early infestations of Hessian fly (Buntin et al. 1991). Although reducing the available green bridge will potentially reduce Hessian fly infestations, stubble from the previous crop may still harbor the pupae (Schmid et al. 2018).

Another management option is delaying planting date or waiting to plant until after the fly-free date for South Dakota. At this time, an official fly-free date has not been developed for wheat production in South Dakota. An approximate fly-free date based on neighboring states would be September 30th for the northern half of South Dakota and October 7th for the southern half of South Dakota. These dates are approximations and not based on observations.

Foliar insecticides are generally not recommended due to the extended emergence period of adult Hessian flies and the input costs of treatment (Knutson et al. 2017). Insecticide seed treatments can provide approximately 30 days of protection after planting and are more effective for managing fall infestations (Whitworth et al. 2009).

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