Wheat Stem Sawflies in South Dakota Wheat

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Introduction

The wheat stem sawfly, *Cephus cinctus* (Norton) (Hymenoptera: Cephidae), is a pest of wheat, *Triticum aestivum* (L.), throughout the Northern great plains. Wheat stem sawflies were first detected in 1872 from native prairie grasses in Colorado (Norton 1872). Historical specimens in the South Dakota State University Severin-McDaniel Insect Research Collection suggest that wheat stem sawflies were once widespread in South Dakota (Bhusal et al. 2026). Reports from surveys conducted in the early 2000's suggest that wheat stem sawflies are no longer widely dispersed but instead common only in the northwestern South Dakota counties (Shanower and Waters 2006). A recent survey of wheat across all of South Dakota confirmed that only small populations were detected in two northwest counties, Harding and Perkins, during 2023 and 2024 (Bhusal et al. 2026).

Identification

Adult wheat stem sawflies are slender in shape with black and yellow banded bodies (Figure 1) (Ainslie 1920). The antennae are slightly clavate (clubbed), the legs are primarily yellow in color, and the wings are dark gray in color (Ainslie 1920). The adults are approximately 10 mm in length and have grayish to smoky-brown wings. Female wheat stem sawflies tend to be larger in size than the males (Ainslie 1920). In addition, female wheat stem sawflies possess a modified stinger (i.e., ovipositor) that they use to lay eggs. The ovipositor sticks out slightly past the end of the abdomen (Figure 2). Wheat stem sawfly eggs are approximately 1 mm in length. The eggs are crescent-shaped, and creamy white in color (Ainslie 1920). The larvae are initially pale in color but become cream colored as they mature with final stage larvae reaching approximately 14 mm in length (Figure 3) (Ainslie 1920). Larval bodies are textured and wrinkled in appearance, and they have a brown head capsule (Ainslie 1920). They can be easily distinguished by the "S" shape they form while both inside and outside of the host stem. The larva moves within the stem using a caudal horn that is present at the end of the body (Ainslie 1920). The pupae are approximately 12 mm and is initially white but will turn black as the adults develops (Ainslie 1920).

Figure 1. Female wheat stem sawfly adult. Courtesy: Patrick Wagner

Figure 2. A) Male wheat stem sawfly adult. Courtesy: Pest and Diseases Image Library, Bugwood.org.

Figure 2. B) Female wheat stem sawfly adult. The ovipositor sticks out slightly from the end of the abdomen. Courtesy: Pest and Diseases Image Library, Bugwood.org.

Figure 3. A wheat stem sawfly larva inside of a wheat stem. Courtesy: Frank B. Peairs, wiki.bugwood.org.

Lifecycle

Wheat stem sawflies have a lifecycle known as complete metamorphosis with four distinct stages (i.e., egg, larva, pupa, adult). There is only one generation of wheat stem sawflies per year in South Dakota. Figure 4 presents a pictorial representation of the wheat stem sawfly lifecycle.

During May, or when temperatures exceed 62 °F, adult wheat stem sawflies chew their way out of plugged wheat stubble and begin to emerge (Morrill and Kushnak 1996, Perez-Mendoza et al. 2006). This emergence occurs over a period of three to six weeks with adults only living for approximately seven days after emergence (Ainslie 1920, Wallace and McNeal 1966). Males attract females to wheat fields and mating usually occurs within 60 seconds (Ainslie 1920, Cossé et al. 2002). If mating does not occur, the unmated females will produce male eggs while mated females produce female eggs (Smith 1938). Females lay eggs into the stems of wheat plants, however, due to cannibalism, only one larva survives per plant (Ainslie 1920).

After hatching, the sole surviving wheat stem sawfly larva feeds within the wheat stem while undergoing four to five growth stages (i.e., instars). As the larvae reach maturity and the wheat stem begins to dry out, they migrate down to the bottom of the stem (Holmes 1975). Once at the bottom of the stem, the mature larvae chew a V-shaped notch and then plug up the hole above them (Ainslie 1920). With the plug securely in place, wheat stem sawfly larvae empty the contents of their gut and secrete a protective wax layer (Ainslie 1920). At this point, the larvae enter diapause and can survive temperatures as low as -11.2 °F (Morrill et al. 1993). Once spring arrives, overwintered larvae will begin to pupate, which takes approximately three weeks (Perez-Mendoza and Weaver 2006). After pupation is complete, adult sawflies chew a hole through the plug in the stem and emerge to begin the lifecycle again (Ainslie 1920).

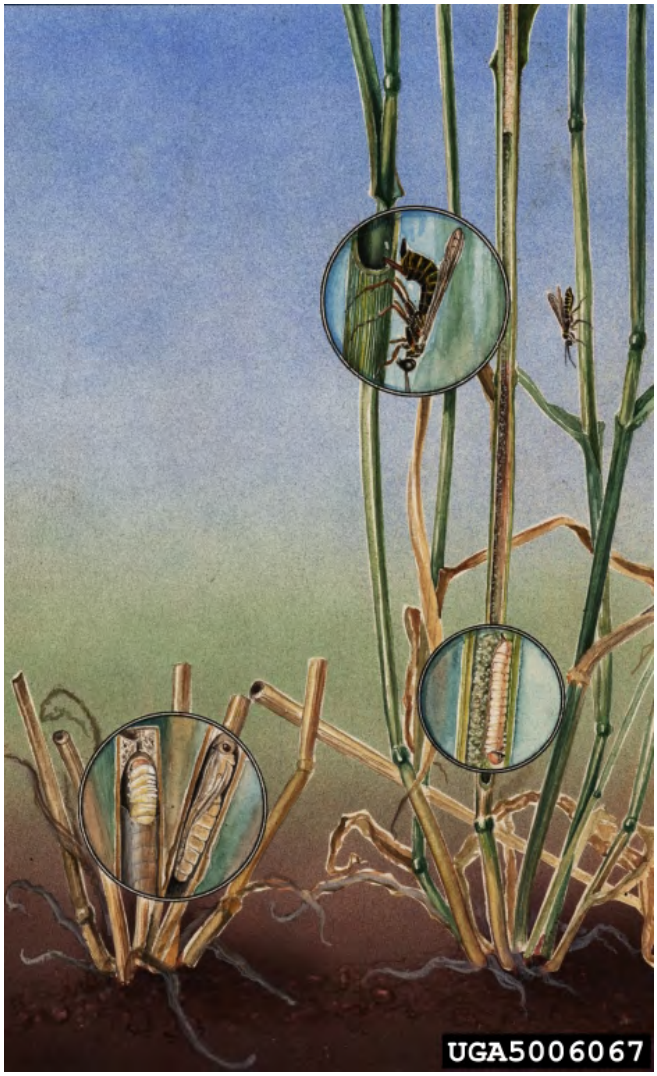

Figure 4. Wheat stem sawfly life cycle illustration. Courtesy: Art Cushman, USDA Systematics Entomology Laboratory, Bugwood.org.

Injury

Wheat stem sawfly larvae feed on the vascular tissue in the wheat stem (Delaney et al. 2010). This feeding can reduce yields by 10-25% with losses increased during drought stress (Delaney et al. 2010). When wheat stem sawfly larvae reach the base of the stem they cut a V-shaped notch along the perimeter of the stem (Ainslie 1920, Peirce et al. 2024). The notch in the stem creates a weak point and weather events (i.e., high winds) can cause lodging to occur.

Scouting

Routine scouting for wheat stem sawflies is important, as relatively small populations can increase rapidly during subsequent years. This is especially true if wheat acreage in the detection area increases (Holmes 1982, Rand et al. 2014). McCullough et al. (2020) determined that sweep net scouting can be effective for identifying wheat fields with adult wheat stem sawfly activity. To sample for wheat stem sawfly, use a 15-inch diameter sweep net and conduct 20 pendulum sweeps between the field edge and approximately 30 feet into the field during June and July (McCullough et al. 2020). This should be repeated for each side of the field to determine if wheat stem sawflies are present and provide an estimate of their population size.

Prior to or harvest, stems can be sampled and split to determine if wheat stem sawfly larvae are present. However, previous studies have determined that these methods are less economical than sweep net sampling (McCullough et al. 2020).

Management

Insecticide management of wheat stem sawflies is not recommended due to their prolonged emergence window and limited insecticide efficacy (Knodel et al. 2009). Other methods of management include tillage, but this requires precise timing to reduce the survival of the overwintering larvae and is not recommended for use in areas with adoption of no-till (Morrill et al. 1993).

There are two parasitoid wasps known to attack wheat stem sawfly in wheat. They are *Bracon cephi* (Gahan) and *Bracon lissogaster* (Muesebeck) (Morrill et al. 1994). These parasitoids and host plant resistance can cause 28% to 84% mortality of the wheat stem sawfly larvae (Buteler et al. 2015). For areas with severe wheat stem sawfly infestations, the use of solid stem wheat varieties is recommended (Wallace et al. 1973). However, solid stem varieties yield less than hollow stem varieties and should only be implemented in areas with economically significant wheat stem sawfly populations (Peirce et al. 2024).

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