Wheat Stem Sawfly in Colorado – Frequently Asked Questions

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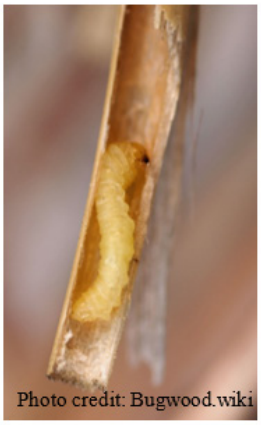
Q: What type of insect is wheat stem sawfly?
A: Wheat stem sawfly is not a fly but a wasp! They belong to a group of insects called Hymenoptera alongside ants, bees, and wasps. These wasps cannot sting. The name "sawflies" comes from the saw-like appearance of the ovipositor, which the females use to cut into the plants where they lay their eggs. Males lack this trait.

Q: How do I know if I have wheat stem sawfly in my field and what do they look like?
A: Starting in early to mid-May, look for small yellow and black wasps (7-12mm) on wheat plants along the edges of the field. Resting sawflies will sit on the stem facing the ground. There are insects that are similar in appearance, but they would not have this resting posture or be abundant in field edges. In mid to late-June, stems can be cut open to look for the white, S-shaped larvae or the sawdust like material resulting from their feeding.



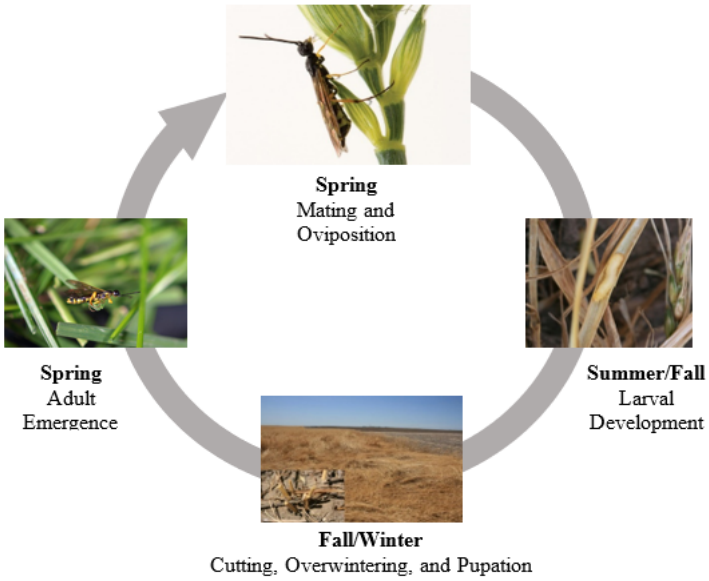
Adult female wheat stem sawfly sitting facing the ground (left). Wheat stem sawfly larvae in stub (right).

Q: What does wheat stem sawfly damage look like?
A: Before the stems dry, you can cut open stems to look for larvae, as well as the sawdust-like material resulting from their feeding. When the larvae finish feeding, they cut the insides of the stems near the soil, making them prone to lodging, especially after strong winds. Unlike stems lodged from other causes, cut stems are no longer connected to the plant.

Q: Do we find wheat stem sawfly in all wheat-producing counties?
A: Yes, as of 2020 wheat stem sawfly has been found in wheat in all wheat-producing counties in Eastern Colorado. Most damaging infestations have been found in North-Central Colorado, with a few lighter infestations occurring as far south as Baca County. Economically significant infestations are spreading to the south and east.

Q: What is the life cycle of wheat stem sawfly?
A: Wheat stem sawfly has a single generation per year. Adult wheat stem sawflies emerge from previous year's stubble from May to June and females lay their eggs inside wheat stems. Although several eggs may be laid within a stem, only a single larva survives to maturity. As the plant matures the larva moves down to the base of the stem and chews a notch around the inside of the stem. The notch usually causes the stem to break, producing a stub that remains anchored in the ground. This stub is then filled with frass, which creates a protective chamber

where the larva overwinters and undergoes pupation. The new adult either chews through the frass plug or the side of the wheat stub to start the cycle again.



Life cycle of wheat stem sawfly. Photo credits: Bugwood.wiki, Kelsey Dawson

Q: Where are the wheat stem sawflies coming from?
A: The wheat stem sawfly is native to Colorado and was first discovered in 1872 on non-cultivated grasses. Many believe that the insect adapted to wheat as European settlers began large-scale cultivation of cereal crops. It has long been a threat to spring wheat production in the Northern Plains and has become a significant pest of winter wheat as well.

Q: How do weather patterns impact sawfly movement and would severe cold temperature kill off larvae?
A: Dry weather favors wheat stem sawflies and excessively wet conditions tend to be detrimental to both sawfly and parasitic wasp populations and activity. Severe cold as seen during the winter storm in 2020 will not affect the wheat stem sawfly populations as they are known to tolerate much colder temperatures in Canada.

Q: Why are we starting to have wheat stem sawfly problems now?
A: There is no good answer to this question, but it likely is due to some combination of the changes in the wheat stem sawfly's preference for wheat, changes in production practices (e.g., reduced tillage), and changes in climate.

Q: What is the estimated crop loss due to wheat stem sawfly in Colorado?
A: The annual economic loss in Colorado is conservatively estimated at $30M.

Q: How fast can wheat stem sawflies spread?
A: According to CSU survey results, damage in wheat was mostly limited to the New Raymer area in 2012. By 2020, wheat stem sawfly was found in all eastern Colorado wheat-producing counties. As of 2020, heavily damaging populations can be found as far south as I-70, with most hotspots centering in the north-central part of the state.

Q: Can we predict wheat stem sawfly infestations ahead of time?
A: According to Canadian guidelines, greater than 10-15% cutting in wheat stems from the previous year indicates that adjacent fields should be planted to something other than wheat or to a resistant variety.

Q: What are the hosts of wheat stem sawfly?
A: The cultivated hosts of wheat stem sawfly are limited to cereal grains with similar life cycles to wheat (winter/spring wheat, triticale, barley, rye). Wheat stem sawfly is not known to reproduce in oats or flax. The list of native and non-native grass hosts of the wheat stem sawfly is extensive and includes bromegrasses, wheatgrasses, wild ryes, and many other species commonly found in the state.

Q: What rotation crops can reduce the level of wheat stem sawfly infestation?
A: Common rotational crops (corn, proso millet, sorghum, sunflower) are not affected by wheat stem sawfly. It is very important to plan rotations to avoid planting new wheat immediately adjacent to stubble infested during the previous crop. Crop rotation also has disease and pest management, and soil fertility benefits.

Q: How long do I have to stay out of wheat to reduce the problem so I can go back to wheat with minimal loss of yield?
A: Wheat stem sawfly infests a wheat crop in May and June and will remain in the stubble from that crop until adults emerge the next spring. At that time, adult sawflies will disperse from the field looking for new wheat to infest, so that field could be planted to wheat that fall without risk of infestation by the sawflies from the prior year. However, sawflies from adjacent fields or from even greater distances may infest this new crop, and sawfly can host in nearby native grasses.

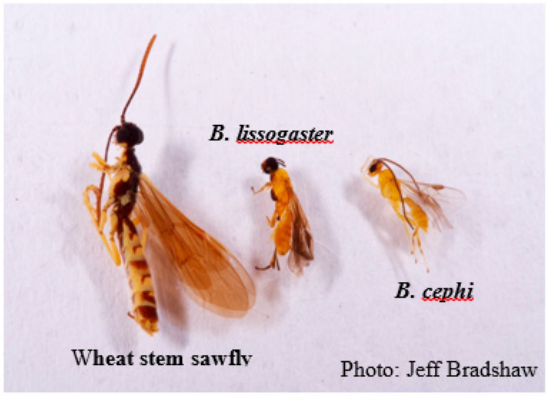
Q: How effective is tillage in controlling the wheat stem sawfly?
A: Both fall and spring tillage have been used to expose crowns containing overwintering larvae to moisture and temperature extremes, but it has not been effective. Also, tillage will negatively impact the natural enemies that also overwinter in the stubble.

Q: Are there varieties that are resistant to wheat stem sawfly?
A: Yes, there are sawfly resistant varieties that have a trait called “solid stem”. Solid stem varieties of wheat have been shown to be effective in impeding larval development and movement, thus reducing larval survival. CSU has released a semi-solid variety, Fortify SF, a medium maturity variety with wheat curl mite resistance and a similar yield potential to Byrd under normal field conditions. It is not highly resistant, but it is substantially more resistant than other adapted varieties. Breeding for WSS resistance is a high priority for CSU.

Q: What is known about the consistency of expression of stem solidness, or degree of resistance conferred by the new semi-solid varieties?
A: Reports from Montana and Canada suggest that certain environmental conditions, such as lower light intensity from increased cloudiness or lower elevation, may result in reduced expression of solidness. We do not yet know for certain how much of an issue this will be here in Colorado with our higher light intensities. The level of expression of semi-solidness observed has provided significant reduction in stem cutting in field trials.

Q: Is there a yield drag with the new semi-solid varieties?
A: There is a yield drag based on the Elite trials last year, comparing the unreleased semi-solid vs. solid stemmed lines. The yield drag was about 4.5% in the absence of wheat stem sawflies. Semi-solid varieties should outyield susceptible varieties if both are infested with sawflies.

Q: Does the wheat stem sawfly have any natural enemies?
A: A few insect species feed on wheat stem sawfly. The most important of these are two parasitic wasps, Bracon cephi and Bracon lissogaster, whose larvae can be found feeding on wheat stem sawfly larvae inside wheat stems.



Comparison of wheat stem sawfly and its parasitoids.

Q: How important are these parasitic wasps in Colorado?
A: To date, very few of either wasp species have been found feeding on wheat stem sawfly larvae infesting winter wheat. They are more easily found on wheat stem sawfly larvae infesting non-cultivated grasses. These wasps are considered to be important in the Northern Plains, which have a longer history of wheat stem sawfly infestations in wheat.

Q: Are there practices that will encourage the parasitic wasps to attack wheat stem sawfly?
A: These parasitic wasps are expected to become more important as they adapt to wheat stem sawfly infestations in wheat. Tillage and swathing are two practices known to affect them negatively. However, if provided with sugar resources, such as flowers, adult wasps can live longer and produce more offspring. Research has shown that incorporating buckwheat into cover crop mixes could enhance parasitoid performance.

Q: Can wheat stem sawfly be controlled with insecticides?
A: The egg, larval, and pupal stages are found within the stem, making them inaccessible to insecticides. To date, no insecticides have been found to be effective at controlling wheat stem sawfly, however more research into the topic is being done.

Q: Will swathing my wheat reduce losses to wheat stem sawfly?
A: Wheat can be swathed before stem cutting starts. Disadvantages to swathing include the cost of an extra field operation and negative effects on the parasitic wasps that are feeding on sawfly larvae. Costs can be reduced by only swathing field margins, where infestations are usually more severe. Effects on natural enemies can be reduced by leaving the lower third of the stem intact.

Q: What is the best way to recover cut stems during harvest?
A: Stem cutting can be reduced by swathing. Stripper headers are better at picking up cut stems than traditional headers.

Q: Can the wheat stem sawfly be eradicated?
A: No. To date, we have no appropriate management methods that can eliminate this insect from even a single field. Further, this insect is native to Colorado and well adapted to our environment. Finally, you would need to eradicate them from non-cultivated grasses as well as from wheat, which would be next to impossible!

Q: How do I prevent wheat stem sawfly infestations in my wheat?
A: Current preventive measures include planting semi-solid varieties, reducing the amount of wheat in your rotations to avoid planting new wheat next to previous crop stubble, and planting larger blocks to minimize the relatively severe infestations found in field edges.

Q: What research is being conducted at CSU in response to the wheat stem sawfly outbreak?
A: CSU is emphasizing the development of high quality, productive wheat varieties resistant to wheat stem sawfly. Other research projects include screening for novel sources of resistance in wild wheat species, improved biological control, trap crops, new approaches to chemical control and surveys to track the spread of this pest.

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Additional Resources:
https://wiki.bugwood.org/HPIPM:Wheat_Stem_Sawfly
https://extension.colostate.edu/topic-areas/insects/wheat-stem-sawfly-a-new-pest-of-colorado-wheat-5-612/
https://www.ag.ndsu.edu/publications/landing-pages/crops/wheat-stem-sawfly-e-1479