

Differentiating Insect Damage to Sunflower Seeds

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March, 2026

Introduction

In the Dakotas, sunflower production is challenged by numerous insect pests that, if not properly managed, reduce yield and seed quality. The most economically important insect pests that feed directly on developing seeds in the head are the red sunflower seed weevil, the banded sunflower moth, and the sunflower moth. The larvae of these pests feed directly on the developing kernel within the seed coat. This feeding damage results in decreased test weight and oil content, and increases the risk of pathogen infection or marketing rejection.

Of these pests, the red sunflower seed weevil causes the most severe damage in North Dakota and South Dakota (Cluever et al. 2025). Banded sunflower moths can be a more serious pest problem for sunflower production in North Dakota than in South Dakota. In both states, the sunflower moth is a migratory, sporadic insect pest because it must be carried northward on prevailing southerly winds during the growing season. Although gray sunflower seed weevil larvae also feed on sunflower kernels, limited observations of this species in recent years suggest it is not an economic issue for sunflower production in the Dakotas.

Scouting for adult activity is crucial for making informed pest management decisions for these insect pests. However, to determine the effectiveness of pest management strategies for mitigating insect damage, sunflower seeds should be examined for exit holes or signs of feeding injury at the end of the growing season and after a hard frost, which forces the larvae to exit the seed for overwintering in the soil. Due to differences in

the sizes and locations of feeding holes and the feeding habits of these insects' larvae, it is possible to determine which insect pest caused the damage to the seed.

Red sunflower seed weevil females lay eggs in the seeds (Oseto and Braness 1979). When the larvae hatch, they begin feeding on the developing kernel within the seed. (Oseto and Braness 1979). Larvae of red sunflower seed weevils chew holes through the pericarp during the last larval stage and drop down to the soil to overwinter (Peng and Brewer 1995).

The female banded sunflower moth and sunflower moth lay eggs on the bracts and florets, respectively (Charlet et al 1987, Charlet and Gross 1990). Upon hatching, the larvae of these pests begin feeding on pollen before chewing into the pericarp (shell of the seed). Once through the pericarp, the larvae of both species feed on the kernel (Peng and Brewer 1995).

The physical differences in insect feeding injury and behavior allow identification of the pest species that is damaging sunflower seeds.

Identification of Kernel Feeding and Exit Holes

Red Sunflower Seed Weevil (Peng and Brewer 1995):

- The exit holes are approximately 25-50% of the distance from the broad (distal) end of the sunflower seed, and are typically located on the side of the seed (Figure 1)
- Occasionally, the exit hole can be closer to the narrow end (Figure 2)

- Exit holes are small, approximately 0.93 mm in diameter and irregularly shaped
- Kernels are partially fed on, about 1/3 of the kernel is consumed (Figures 3, 4, 5)
- If sampled too early, exit holes will not be present, but it's possible to find a mature white weevil larva with a brown head capsule (about 3 mm long) when splitting seeds (Figure 6)
- Excrement (frass) in the seed is always present



Figure 1. Red sunflower seed weevil exits a hole on the side of the seed near the broader end. Photo courtesy of Connie Tande, SDSU Plant Diagnostic Clinic.



Figure 2. Red sunflower seed weevil exits through a hole near the narrow end of the sunflower seed. Photo courtesy of Connie Tande, SDSU Plant Diagnostic Clinic.

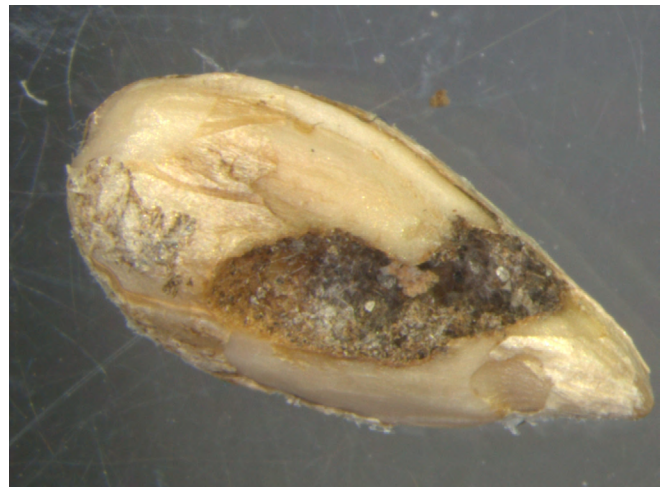


Figure 3. Sunflower kernel with red sunflower seed weevil larval feeding injury and brown excrement (frass). Photo courtesy of Connie Tande, SDSU Plant Diagnostic Clinic.



Figure 4. Close-up of a sunflower kernel showing feeding injury from the red sunflower seed weevil larva located in the middle of the broad end of the kernel. Photo courtesy of Connie Tande, SDSU Plant Diagnostic Clinic.

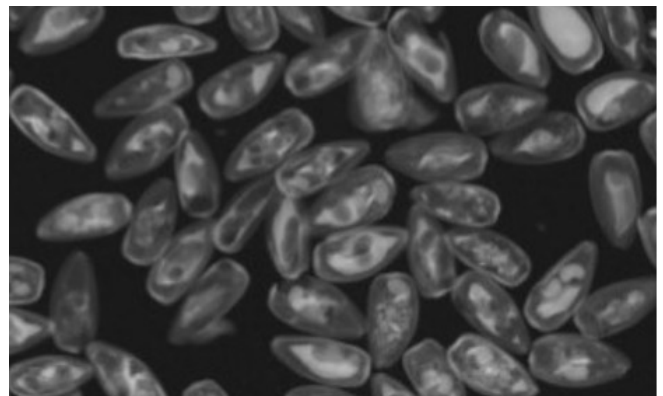


Figure 5. Radiograph of sunflower seeds with red sunflower seed weevil damage. Kernels appear as lighter parts compared to the darker eaten parts. Photo courtesy of Jarrad Prasifka, USDA-ARS.



Figure 6. Red sunflower seed weevil larva feeding on a sunflower kernel with brown excrement (frass) on the kernel. Photo courtesy of Frank Peairs, Colorado State University, Bugwood.org.

Banded Sunflower Moth (Peng and Brewer 1995):

- The feeding hole is at the broad distal end of the seed (Figure 7)
- The exit hole is considerably larger than 0.93 mm in diameter and is circular with smooth edges
- 50-100% of the kernel is typically consumed (Figure 8)
- Silken, webbing material (wax sheets) is often present around exit holes (Figure 9)
- Excrement (frass) is usually absent inside the seed



Figure 7. Banded sunflower moth caterpillar feeding holes near the broad (distal) end of the seed. Photo courtesy of Patrick Beauzay, North Dakota State University.

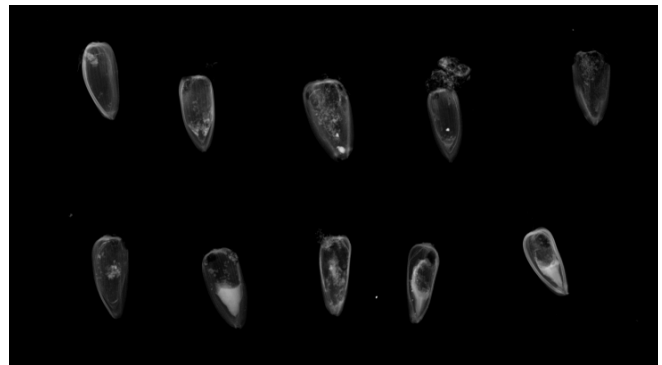


Figure 8. Radiograph of sunflower seeds with 50-100% damaged kernels caused by the banded sunflower moth larva. Photo courtesy of Jarrad Prasifka, USDA-ARS



Figure 9. Mature banded sunflower moth larvae (red to blue-green) with wax sheets on top of the seed near the feeding hole and located on the broad end of the seed. Photo courtesy of North Dakota State University Extension Entomology.

Sunflower Moth (Peng and Brewer 1995):

- A feeding crack that runs the length of the seed is often present (Figure 10)
- Silken, webbing material is often present around the kernel (Figure 11)
- Partial to 100% of the kernel is consumed



Figure 10. Sunflower moth feeding damage to sunflower seed. Photo courtesy of Janet Knodel, North Dakota State University.



Figure 11. Sunflower moth larva feeding on a sunflower kernel with webbing present inside the pericarp. Photo courtesy of Frank Peairs, Colorado State University, Bugwood.org.

Acknowledgments

This publication was developed through support from the National Sunflower Association, the South Dakota State University Extension, the National Institute of Food and Agriculture, Crop Protection and Pest Management, Applied Research and Development Program grant 2024-03471-43498 (South Dakota State University), and the National Institute of Food and Agriculture, Crop Protection and Pest Management - Extension Implementation Program grant 2024-70006-43752 (North Dakota State University).

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