



SLUGS AS PESTS OF FIELD CROPS

Several species of slugs are common in Pennsylvania gardens, yards, and farms. While slugs can be pests in each of these settings, this fact sheet is geared toward the field crop grower. Nonetheless, the information here may also be useful for vegetable growers and home gardeners. In field crops, slugs are particularly prevalent in no-till or reduced-till fields with heavy residue and little soil disturbance. They can eat virtually all crops and inflict most of their damage during crop establishment and early growth in the spring and fall. This damage tends to be most severe under cool, wet conditions, which slow crop growth and favor slug activity. Slugs typically feed at night and hide in residue or soil during the day. The increased adoption of no-till methods in recent years, as well as the limited control options available to no-till farmers, has elevated the importance of slugs as pests of field crops in Pennsylvania.

DESCRIPTION:

Of the 20 or so slug species that occur in Pennsylvania, four are common in field crops: the gray garden slug (*Deroceras reticulatum*, Fig. 1, 2), the marsh slug (*Deroceras laeve*, Fig. 3), the dusky slug (*Arion subfuscus*, Fig. 4), and the banded slug (*Arion fasciatus*, Fig. 5). While the relative importance of each species is not well understood, the gray garden slug often occurs in the largest numbers and is most often associated with crop damage. This is a medium-sized, light to dark gray slug that produces sticky, white mucus when disturbed. All of these slug species were introduced from Europe with the exception of the marsh slug, which is thought to have mixed native and introduced populations.



Figure 1: A juvenile gray garden slug (*Deroceras reticulatum*) on soybean. Photo by Nick Sloff



Fig 2. A gray garden slug (*Deroceras reticulatum*) with characteristic markings (though pattern can vary) Photo by Margaret R. Douglas



Fig 3. The marsh slug (*Deroceras laeve*) Photo by Margaret R. Douglas



Figure 4: The dusky slug (*Arion subfuscus*) Photo by Nick Sloff



Figure 5: The banded slug (*Arion fasciatus*) Photo by Nick Sloff

Slugs are close relatives of snails - essentially snails without a shell. They are legless, soft-bodied creatures with four front tentacles and a covering of slimy mucus all over the body. They secrete this mucus wherever they go, leaving a characteristic “slime trail” that can be a valuable clue of their presence. Different species vary in color and pattern, but all are various earth tones such as gray, brown, or orange. Again varying by species and age, slugs can range in size from a fraction of an inch to several inches. Juvenile slugs resemble adults but are smaller. Slug eggs are small, gelatinous spheres or ovals found under residue or in the soil (Fig. 6). The eggs are often found in clumps but may also occur singly.

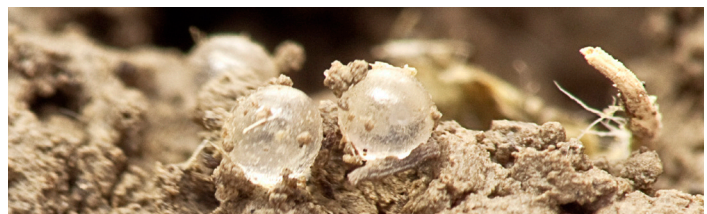


Figure 6: Slug eggs in the soil. Photo by Nick Sloff

LIFE CYCLE:

All slugs are hermaphrodites, meaning individuals have both male and female reproductive organs, but they usually mate with one another to reproduce. Mating, egg-laying, hatching, and development are not well synchronized even within a single species, so slugs of various stages of development can be found at many times of year. This makes slug activity difficult to predict reliably. Slugs can overwinter in all stages, except in extremely cold winters when adults and juveniles may be killed, but thick snow packs can insulate slugs against the cold. Timing of the life cycle varies by species and is somewhat unclear in Pennsylvania.

The gray garden slug appears to have a more synchronized life cycle than some other species. Large numbers of eggs of this species hatch in mid-spring and are often associated with crop damage. Juveniles produced from spring egg hatch grow through the spring and summer, mature in the late summer or early fall, mate, and lay eggs in the fall. These are the eggs that overwinter and hatch the following spring. In some parts of Great Britain, a second egg-hatch occurs in the fall, from eggs that were laid in the spring by slugs that overwintered as juveniles or adults. We do not know if this occurs in Pennsylvania, but it is certainly possible. A single gray garden slug can lay several hundred eggs in its lifetime. Slugs die soon after laying eggs.

DAMAGE:

Slugs eat a wide array of broadleaf plants and grasses, including most crops and many weeds. They harm crops both by killing seedlings outright, causing poor stands, and by damaging leaves on young plants. They feed by scraping the surface of their food, which can include seeds, roots, stems, and leaves. The appearance of their damage varies by crop. In wheat, slugs feed on recently-planted seeds, hollowing them out and killing them. In corn and many small grains, slugs scrape strips in the leaves, leading first to window-pane damage, and then to leaf shredding (Fig. 7). In soybeans, slugs create craters in the cotyledons (Fig. 1), and then ragged holes in the leaves. Similar ragged holes are seen on slug-damaged canola, alfalfa, and other broadleaf crops (Fig. 8). Slime trails are often seen in close association with their damage. Seedlings are especially at risk when the seed slot



Figure 8: Slug damage to canola. Photo by Margaret R. Douglas

is left open, creating a dark, cool slug “highway” leading right to the next seedling.

Slugs have also been documented to eat fungi, plant residue, organic matter, and occasionally one another or other invertebrates. The importance of these alternative foods in their diet in crop fields is unknown.

SCOUTING:

Economic thresholds are not available to guide slug control decisions, but scouting for slugs can help predict when a problem is imminent. In spring prior to seeding, slug eggs and overwintered slugs can be found by looking under crop residue, especially on mild days soon after rain. Another approach to find slugs is to place artificial shelters in the field, such as roofing shingles (Fig. 9), old boards, wet cardboard, or anything that will create a dark, cool, moist environment. Several days after putting them out, slugs can be found under the shelters during the day. Once crops have emerged, slugs can be found by inspecting crops in the evening with a flashlight. With all of these methods, be sure to look closely as juvenile slugs can be very small.

MANAGEMENT:

Unfortunately, management options for slugs are limited. Moreover, recognized tactics are occasionally ineffective; therefore, an integrated management approach that relies on several control tactics is preferred. Most growers who experience slug problems are committed to no-till or reduced-till practices, so



Figure 7: Slug damage to corn. Photo by Margaret R. Douglas



Figure 9: A piece of roofing material used as an artificial slug shelter. Photo by Margaret R. Douglas

while tillage will certainly help control slugs, it may not be an option. Nevertheless, it is clear that tactics that reduce the amount of surface residue will decrease slug populations. For example, shallow disking (three inches deep) or “turbo tilling” can significantly decrease slug populations.

Because older crop plants are not as susceptible to slug feeding as young plants, several management tactics aim to foster early plant growth to get crops growing as quickly as possible to try to “outrun” the slug threat. For example, early planting may give crops a jump on slugs if crops emerge before eggs hatch in large numbers. Also, using row cleaners on the front of planters to move crop residue away from the row allows sunlight more access to the soil, increasing temperatures and improving emergence. Growers can further contribute to better early growth by selecting crop varieties that are rated “excellent” for emergence and seedling vigor. Good agronomic practices such as ensuring seed slots are closed can mitigate some slug damage as can choice of crop rotation and cover crop, but these factors have been little explored.

Slugs do have predators including ground beetles (Fig. 10), rove beetles, centipedes, harvestmen (aka daddy longlegs), firefly larvae (aka glow worms), soldier beetle larvae, birds, and frogs. Invertebrate predators of slugs can be conserved by increasing crop diversity, using cover crops, and using insecticides sparingly (e.g., banding insecticides directly over the row rather than broadcasting it over the entire field) and in accordance with IPM principles.

Few chemical controls are available for slugs. Metaldehyde-based baits (e.g., Deadline products) can be used in many crops, but are often not economical and significant rains can wash away much of the product. Pellets based on iron phosphate (e.g., Slug-go) are also available and are OMRI-listed for organic systems. These are also expensive on a large scale. Because slug control can be frustrating, some growers have experimented with home remedies. Chief among these is spraying crops at night with nitrogen solutions, which act as a contact poison and burn slugs. A common approach is to use a 30% urea-based nitrogen solution, mix it with an equal amount of water, and apply 20 gallons per acre. This tactic should be repeated a few nights in a row to maximize its effectiveness, because nitrogen solutions provide no residual control and all slugs in a field will not receive a killing dose in a single application. Some farmers are experimenting with different strategies involving cover crops or companion plants to reduce the amount of feeding on the focal crop, often corn. Much research remains to be completed to develop better slug management options.

See the Penn State Agronomy Guide for details on slug management products.

WARNING:

Pesticides are poisonous. Read and follow directions and safety precautions on labels.



Figure 10: *Pterostichus melanarius*, a slug-eating beetle. Photo courtesy of The Canadian Biodiversity Information Facility (www.cbif.cg.ca)

Handle carefully and store in original labeled containers out of the reach of children, pets, and livestock. Dispose of empty containers right away, in a safe manner and place. Do not contaminate forage, streams, or ponds.

REFERENCES AND FURTHER READING:

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