



AGRONOMIC SPOTLIGHT



ALLIUM LEAFMINER ON ONION

- » The Allium leafminer can cause substantial damage to the leaves and bulbs of onions.
- » Allium leafminer feeding damage can increase rotting caused by fungal and bacterial pathogens.
- » Insecticide applications can be used to help manage Allium leafminer on onions.

The Allium leafminer (*Phytomyza gymnostoma*) is native to Europe, first described in Poland in 1858. The insect is now widespread in continental Europe and the United Kingdom, and it has been found in Turkey and Turkmenistan.^{1,2,3} Allium leafminer was first detected in North America in Pennsylvania in 2015 and has since been found in Connecticut, Maryland, Massachusetts, New Jersey, and New York. It is likely that the insect was introduced into North America several years before it was detected, and it probably came in on infested bulbs.³

The Allium leafminer only infests cultivated and wild species of *Allium*, and it causes damage on chive, garlic, leek, onion, ramps, scallion, wild onion, and wild garlic.^{2,4} Reported crop losses in Europe and the U.S. have been as high as 100%. Allium leafminer larvae feed on leaves, stems, and bulbs, resulting in plant damage, increased levels of secondary infection, and rejection of product in the marketplace.^{1,4,5}

The adult allium leafminer is a gray to black fly with a colored head (Figure 1). The face is yellow with black behind the eyes, and the top of the head is a lighter color. The wings are clear with dark veins. Eggs are small (0.5 mm), white, and slightly curved. Eggs are laid on Allium leaves. Larvae are white to yellowish and up to (8 mm) long (Figure 2). Larvae feed on tissue from within the leaf. Pupae are reddish to dark brown, oval, and (3.5 mm) long. Pupae are usually found inside of bulbs or in nearby soil.¹



Figure 1. Adult Allium leafminer flies. Lawrence Barringer, Pennsylvania Department of Agriculture, Bugwood.org.



Figure 2. Larvae of the Allium leafminer on onion. Lawrence Barringer, Pennsylvania Department of Agriculture, Bugwood.org.

DAMAGE

Damage occurs from the feeding of both larvae and adults of the Allium leafminer and from egg-laying (ovipositing) by the adult female.¹ When the adult female lays eggs, she uses her ovipositor to puncture the leaf surface leaving linear puncture wounds along the leaf (Figure 3). Male and female adults then feed on the exudates that come from these wounds, causing additional damage to the leaf.^{1,2,3}

When larvae hatch from eggs in the leaf tissue, they begin feeding on (mining) leaf tissues leaving trails that widen as the larvae move downward towards the base of the leaf.^{1,4} Larval feeding causes the most direct damage to the plants. Adult and larvae feeding can also cause curly, wavy, twisted distortions of leaves to form.^{1,2,3} Leaf damage and distortion reduce the marketability of crops such as leeks and scallions, where the leaves are a part of the harvested product.⁴

Feeding wounds can also be a window for infection by bacterial and fungal pathogens, leading to rotting of leaf and bulb tissue in the field or storage. Internal damage may not be noticed on inspection, but bulbs can rot from the inside once in storage.³ Increased levels of white rot, caused by the fungus *Sclerotinia cepivorum*, can occur in the field as the fungus colonizes the plant through wounded, senescing tissues.⁴

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Figure 3. Linear puncture wounds resulting from egg-laying. Lawrence Barringer, Pennsylvania Department of Agriculture, Bugwood.org.

LIFE CYCLE

The Allium leafminer overwinters as pupae in cultivated species, such as leeks, in wild Allium species, and in the soil.^{1,2} There are typically two generations of Allium leafminer per year. Adults emerge from the overwintered pupae in the spring (March through early May). The adults mate, and the females lay eggs, from which the larvae hatch. The larvae molt through several instars and pupate in June. The pupae can be found between the leaves, within the bulbs, and in nearby soil during this time. Second-generation adults emerge in the fall (September) and lay eggs through early November. The second-generation larvae feed on leaves and then form the pupae that will overwinter until the next season.^{1,2,3,4}

Crops of leeks and scallions are affected by the first and second generations of Allium leafminer, as their foliage is present when the adult and larval stages are feeding. Transplanted onions are usually only susceptible to damage from the first-generation in April and May. Direct-seeded onions are often only susceptible to damage for a short time in late May because of the limited overlap of egg deposition, larval feeding, and the presence of foliage. Generally, no damage from Allium leafminer occurs on onion in the fall.²

MANAGEMENT

Scouting for the Allium leafminer should be done when leaves are susceptible to feeding damage. For onions, this is in the spring, mainly in April and May. Inspect crops for signs of egg-laying and feeding damage and the presence of eggs, larvae, and pupae. Damage and the presence of insects are often most prevalent along the edges of fields. It is best to scout early in the morning or during periods for cooler weather for best results. Traditional trapping methods, such as the use of yellow sticky cards, are not very effective for detecting the presence and population levels of Allium leafminers.³

The primary method of control has been the application of insecticides. Treatment with conventional insecticides have been effective for managing the Allium leafminer. Management

is more challenging, and damage has been greatest for organic production operations.^{1,2,3,4}

In a study published in 2020, insecticides with 14 different active ingredients were evaluated for their effectiveness in managing the Allium leafminer.⁴ In this study, insecticides containing dinotefuran, cyantraniliprole, and spintoram were found to be the most effective against the Allium leafminer for conventional production system when applied as foliar treatments. Other active ingredients that significantly reduced damage included: abamectin, acetamiprid, cyromazine, imidacloprid, lambda-cyhalothrin, methomyl, and spinosad. Insecticides containing spinosad and azadirachtin were found to be useful for controlling the insect in organic production systems.^{4,5} The application of dinotefuran or cyantraniliprole through drip irrigation (chemigation) did not effectively control the pest.

Not much work has been done to evaluate the effectiveness of using cultural control strategies to help manage the Allium leafminer. Cultural practices that may provide some control include row covers, delayed planting, crop rotation, and trap cropping.² The Allium leafminer appears to be most problematic in areas where Allium crops are continuously produced. A host-free period may be effective if wild alliums are not common in the area. Crop rotation may be effective in areas where Allium crops are not continuously grown. Delaying the planting of spring crops until after the flight of the first-generation adults can minimize chances of infestation. Infested plant material should not be transported in order to limit the spread of the insect.^{2,3} Natural enemies (parasitoids) have been identified in Europe, but no evidence of parasitism has been observed in the U.S. No onion varieties are known to have resistance against the Allium leafminer.²

Sources:

¹ Allium Leafminer. Pennsylvania Department of Agriculture. https://www.agriculture.pa.gov/Plants_Land_Water/PlantIndustry/Entomology/Pages/ALLIUM-LEAFMINER.aspx.

² Nault, B., Fleischer, S., Grundberg, E., Rusinek, T., Roberts, D., and Elkner, T. 2018. Biology and management of *Phytomyza gymnostoma*: a new invasive pest of Allium crops in the eastern U.S. PowerPoint presentation.

³ Barringer, L. E., Fleischer, S. J., Roberts, D., Spichiger, S.-E., and Elkner, T. 2018. The first North American record of the Allium leafminer. *Journal of Integrated Pest Management* 9:1-8.

⁴ Nault, B. A., Iglesias, L. E., Harding, R. S., Grundberg, E. A., Rusinek, T., Elkner, T. E., Lingbeek, B. J., and Fleischer, S. J. 2020. Managing Allium Leafminer (Diptera: Agromyzidae): An Emerging Pest of Allium Crops in North America. *Journal of Economic Entomology* 113:2300-2309.

⁵ Elkner, T., Fleischer, S., and Lingbeek, B. 2020. Recommendations for managing Allium leafminer in Pennsylvania. *Hortscience* 55:S442-S442.

Websites verified 5/21/2021

For additional agronomic information, please contact your local seed representative.

Performance may vary from location to location and from year to year, as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible and should consider the impacts of these conditions on the grower's fields. The recommendations in this article are based upon information obtained from the cited sources and should be used as a quick reference for information about onion production. The content of this article should not be substituted for the professional opinion of a producer, grower, agronomist, pathologist and similar professional dealing with this specific crop.

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