BUL 1090

Iris Yellow Spot Virus: A Threat to Seed- and Bulb-Onion Crops in Idaho

Christian Joseph R. Cumagun
Plant Pathologist, University of Idaho Extension, Parma Research and Extension Center

Mike Thornton
Professor, Department of Plant Sciences, University of Idaho, Parma Research and Extension Center

Stuart Reitz
Director, Entomology Program, Oregon State University

James W. Woodhall
Associate Professor, Entomology, Plant Pathology, and Nematology, University of Idaho Extension, Parma Research and Extension Center

Contents

University of Idaho Extension

Introduction

Iris yellow spot virus (IYSV, Tospoviridae: Orthotospovirus) is one of the greatest constraints to onion production in the Treasure Valley of eastern Oregon and southwestern Idaho. The virus weakens the onion plant and can drastically slow growth, both of which are key factors for onion bulb size and quality. It was first reported on onions in the Treasure Valley in 1989 and has since emerged in other western states in the United States, including Arizona, California, Colorado, New Mexico, Oregon, Utah, and Washington, leading to major crop losses and higher production costs. This bulletin aims to provide the onion industry with important information on the detection of IYSV in plants and thrips as virus vectors, including effective disease management strategies.

Host Range

In addition to onions (*Allium cepa*), the disease also affects garlic (*A. sativum*), bunching onion (*A. fistulosum*), leek (*A. ampeloprasum*), iris (*Iris* spp.), and lisianthus (*Eustoma grandiflorum*). Weed hosts include jimsonweed (*Datura stramonium*), tobacco (*Nicotiana* spp.), redroot pigweed (*Amaranthus retroflexus*), puncture vine (*Tribulus terrestris*), kochia (*Kochia scoparia*), prickly lettuce (*Lactuca serriola*), and common lambs-quarters (*Chenopodium album*).

Impact

Iris yellow spot virus typically does not move in the plant nor kill plants; however, the virus reduces plant vigor and bulb size. Additionally, the virus weakens plants, making them more susceptible to other diseases, pests, and environmental stresses. The severity of the disease depends on the plant's overall health at the time of infection and the growth stage of the crop. Infection when the crop is young

can lead to severe losses compared to crop losses when infection occurs at later growth stages. Under light disease pressure, healthy plants may show few symptoms and maintain decent growth. Plants under high thrips pressure and environmental or cultural stress may show severe symptoms, resulting in significant economic losses.

The timing of infection and symptom development determines how IYSV infections affect bulb yield. Losses from 10% to 100% of marketable yield have been reported for crops with severe infection prior to bulbing. Even at later phases of development, infection can still result in large losses because of reduced quality. The virus also affects onion seed production, causing the seed-bearing stems to bend or break (lodging), reducing the quality and quantity of seeds.

Symptoms

Symptoms of IYSV include eyespot to diamond-shaped, yellow, light-green, or straw-colored local lesions on the leaves and scapes of onions and other *Allium* species. Lesions have the shape of oval, concentric rings in the early stages of infection. It is possible to see some green islands within the necrotic lesions (Figure 1). Lesions typically develop at a thrips feeding site. Later in the growing season, severely infected plants collapse and dry up before necks mature and fall over (Figure 2).

Figure 1. Classical diamond-shaped lesions of IYSV on onion leaves appear near thrips feeding sites.

Figure 2. Upright tops with dead foliage due to symptoms caused by IYSV before the plant reaches maturity.

Vector

The only known vector of the disease in the Pacific Northwest and in many other states is onion thrips (*Thrips tabaci*, Thysanoptera: Thripidae) (Figure 3). Tobacco thrips (*Frankliniella fusca*) can also transmit IYSV but at a lower efficiency than *T. tabaci*. Other common thrips species, such as western flower thrips (*Frankliniella occidentalis*), do not transmit the virus. The virus is transmitted by both larvae and adults, but only larvae that acquire the virus from infected plants can later transmit the virus as an adult. Adult thrips can acquire the virus but cannot transmit it. Virus transmission is persistent; once a thrips larva has acquired the virus, it transmits the virus for the remainder of its lifetime. The virus has the potential to spread rapidly in fields with large numbers of infected thrips. The distribution of IYSV-infected plants in the field is associated with the feeding activity of the infected thrips.

Figure 3. An adult thrip (*Thrips tabaci*), the insect vector of IYSV, on an onion leaf surface.

Disease Cycle

When a virus-carrying onion thrips larvae or adult feeds on healthy plants, viral particles are deposited in in leaf cells and the virus replicates at the site of inoculation, causing infection. The IYSV and thrips survive in volunteer onions and in areas where overlapping bulb crops, seed crops, or both are produced year-round. Other hosts for the virus include ornamentals, weeds, and onion transplant seedlings. There is no remedy once the plant has been infected. An infected plant can act as an inoculum source for infecting subsequent generations of thrips, which can then move the virus to adjacent plants. The IYSV is not known to be transmitted through seed.

Associated Diseases

Stemphylium leaf blight is a fungal disease that affects onion leaves following damage from IYSV. The symptom begins as small, tan to dark-brown lesions. As the disease progresses, further necrosis and defoliation may result in IYSV lesions (Figure 4). Consequently, dual infection with both IYSV and Stemphylium leaf blight may further lower onion yield due to synergistic effects, leading to severe symptoms.

Figure 4. Stemphylium infection in IYSV lesions on an onion leaf.

The virus's lesions can be colonized by other fungal pathogens, such as *Alternaria porri* (purple leaf blotch) and, if conditions are right, *Peronospora destructor* (downy mildew). Additionally, storage decay pathogens like *Botrytis allii*, the causal agent of neck rot, can take advantage of the open-neck architecture associated with rapid death of the plant foliage prior to natural maturity (Figure 2) to infect the bulbs, leading to higher losses in storage.

Management

The best way to manage the disease caused by IYSV is to take preventive measures because once a plant is infected, there is no way to eliminate the infection. The IYSV requires integrated pest management approaches that incorporate phytosanitary, cultural, chemical, and biological control. Management of the disease is also dependent on chemical and cultural control of the onion thrips vector early in the growing season before it acquires and transmits IYSV.

Cultural Practices

- Before planting, eliminate the main inoculum sources, such as weeds and volunteer onions, either through tillage or herbicide to reduce reservoirs of IYSV and viruliferous thrips.
- Use only virus-free transplants and rotate host crops with nonhost ones such as alfalfa, corn, oats, barley, wheat, potato, dry beans, melons, and sugar beets to help prevent the spread of the virus within an area because the thrips vector has a relatively limited host range.
- Separate onion bulb and seed fields to break the green bridge that allows the IYSV inoculum to spread between fields by thrips. Within a field, dense and uniform plant populations also lower the incidence of disease.
- Plant onion cultivars that are less attractive to thrips. Yellow-green-leafed onion cultivars are less likely to be infected with IYSV and have less disease incidence than blue-green-leafed onion cultivars under high vector and disease pressure.
- After planting, regularly monitor the field for disease and thrips and manage them early in the season.

- Mulch onion plants with straw to conserve soil moisture and to help reduce thrips populations.
- Use overhead irrigation to suppress thrip numbers and to lower disease incidence and severity.

Chemical Control

- Application of insecticides to reduce vector populations early in the season provides some level of disease control. Start insecticide applications early (when thrips populations are less than three per plant) and continue through the time of peak thrips abundance to keep IYSV suppressed.
- Rotate the class (or mode of action) of insecticides used during the season to reduce the selection of resistant thrips populations that lead to a reduction in their control.

Further Reading

Gent, D. H., L. J. du Toit, S. F. Fichtner, S. K. Mohan, H. R. Pappu, and H. F. Schwartz. 2006. "Iris Yellow Spot Virus: An Emerging Threat to Onion Bulb and Seed Production." *Plant Disease* 90(12): 1468–80.

Schwartz, H. F., ed. 2013. *Onion Health Management and Production*. Fort Collins: Colorado State University. 109 p.

Schwartz, H. F., and S. K. Mohan. 2007. *Compendium of Onion and Garlic Diseases and Pests*. 2nd ed. St. Paul, MN: The American Phytopathological Society.

BUL 1090 | Published February 2025 | © 2025 by the University of Idaho