Soybean Vein Necrosis Virus

CROP BULLETIN

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KEY POINTS

- Soybean vein necrosis is the most widespread viral disease of soybeans in the United States.
- Soybean vein necrosis virus is primarily transmitted by soybean thrips, which pick up the virus by feeding on infected plants and then spread the virus to other plants.
- Neither thrip feeding nor plant disease associated with soybean vein necrosis virus typically cause economic levels of damage in soybeans.

VIRAL DISEASE OF SOYBEANS

- Soybean vein necrosis virus is a viral pathogen first identified in soybeans in Arkansas and Tennessee in 2008 (Tzanetakis et al., 2009).
- The relatively low genetic diversity of the virus and inefficien-cy of its spread in soybean suggest that it originated in a dif-ferent host species and was introduced to soybean relatively recently (Zhou and Tzanetakis, 2013; 2019).
- Since its discovery, soybean vein necrosis virus has been re-ported throughout the major soybean-producing areas of the U.S. and Canada (Zhou et al., 2011).

DISEASE HOSTS AND TRANSMISSION

- Viruses are obligate pathogens that must always pass from living host to living host.
- Viral diseases in crops are typically spread via an insect vec-tor that picks up the virus by feeding on an infected plant and then spreads the virus to other plants.
- Soybean vein necrosis virus belongs to the genus Orthoto-spovirus, a group of plant viruses transmitted by thrips.
- Soybean vein necrosis virus is primarily transmitted by soy-bean thrips (Neohydatothrips variabilis), but may also be spread by eastern flower thrips (Frankliniella tritici) and to-bacco thrips (F. fusca) (Zhou and Tzanetakis, 2013; Keough et al., 2016).
- Several alternate host species have been identified, some of which can host the virus without displaying any symptoms of disease (Table 1).
- Kudzu may be the most important host species for soybean vein necrosis virus. It is a perennial weed prevalent through-out the Southeastern U.S. that could serve as a major reser-voir for the virus and an early-season habitat for thrips (Zhou and Tzanetakis, 2019).

Figure 1. Symptoms of soybean vein necrosis virus begin as light green to yellow (chlorotic) patches near main leaf veins, which can enlarge and eventually become necrotic.

Table 1. Known host species for soybean vein necrosis virus (Zhou and Tzanetakis, 2013; 2019).

Common Name	Scientific Name
Pigeon pea	*Cajanus cajan*
Muskmelon	*Cucumis melo*
Field pumpkin	*Cucurbita pepo*
Chrysanthemum	*Dendranthema grandiflorum*
Buckwheat	*Fagopyrum esculentum*
Soybean	*Glycine max*
Ivy-leaved morning glory	*Ipomoea hederacea*
Entireleaf morning glory	*I. hederacea var. integriuscula*
Pitted morning glory	*I. lacunose*
Medicago	*Medicago truncatula*
Kudzu	*Pueraria montana*
Benth	*Nicotiana benthamiana*
Tobacco	*N. tabacum, N. glutinosa*
Mung bean	*Vigna radiata*
Cowpea	*V. unguiculate*

SOYBEAN THRIPS

- Soybean thrips (Neohydatothrips variabilis) are a very common insect pest of soybeans.
- Thrips have rasping and piercing mouthparts that they use to puncture plant cells and feed on the contents.
- They usually feed along the veins on the undersides of leaves, leaving tiny, pale-colored scars.

Soybean thrip (Image credit: Adam Sisson, Iowa State University, Bugwood.org)

- Populations go through multiple overlapping generations each year and adults are present throughout the growing season.
- Thrips can cause visible damage to soybeans, particularly when heavy feeding occurs early in the growing season, but they are not generally considered an economic pest of soybean.
- Higher levels of thrip damage can occur with hot and dry conditions.

SYMPTOMS AND CROP IMPACT

- Soybean vein necrosis virus causes localized infection in soybean. The virus is restricted to the area around the point of infection and is not systemic in the plant.
- Early symptoms are light green to yellow (chlorotic) patches near main leaf veins, where thrips feed (Figure 2).
- Chlorosis progresses to necrotic (dead) tissue, which may eventually lead to leaf death (Figure 3). Browning of veins may be noticeable on the undersides of leaves.
- Vein necrosis symptoms are more common during hot, dry summers when thrip activity is increased.
- Soybean vein necrosis virus typically does not cause significant yield loss but may reduce seed oil content (Anderson et al., 2017).
- Soybean varieties may differ in their susceptibility to soybean vein necrosis virus.
- Research indicates it is unlikely that soybean vein necrosis virus is transmitted via seed (Zhou and Tzanetakis, 2019).

Figure 2. Early symptoms of soybean vein necrosis virus are light green to yellow (chlorotic) patches near main leaf veins, where thrips fed.

Figure 3. Later symptoms of soybean vein necrosis virus. Infected patches on the leaves have turned necrotic.

MANAGEMENT

- No management recommendations currently exist.
- Management practices for similar viral diseases have generally focused on host plant resistance and managing vector populations.
- Neither thrip feeding nor plant disease caused by soybean vein necrosis virus typically cause economic levels of damage in soybeans.

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