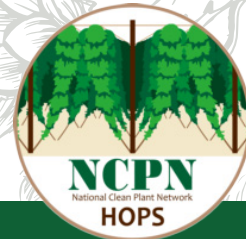


# FACT SHEET

## National Clean Plant Network



*Start clean, stay clean.*



## Hop Stunt Viroid

Hop stunt viroid is a sub-viral pathogen that causes a serious disease of cultivated hop. Originally reported in Japan, it has been found in hop-growing regions in Europe, Australasia, and North America.

### Symptoms

The type and severity of symptoms produced by hop stunt viroid is dependent on the hop cultivar infected, and environmental conditions. This viroid delays or slows the growth of bines early in the growing season, and infected plants often have pale foliage (Fig. 1). Later in the season the effect is more pronounced with the infected bines being up to 50% shorter than healthy bines, although the extent of stunting is cultivar specific and more severe in hot climates. Infected bines also have smaller cone mass and shorter lateral branches. In some cultivars, infected leaves may droop or curl downwards, or show yellow speckling around the leaf veins (Fig. 3). Symptoms may take three to five growing seasons to appear after the initial infection of mature plants, and this long latency period can lead to the propagation and distribution of infected material.

### Transmission & Spread

Propagation of hop stunt viroid infected plants is the primary mode of introduction into hop plantings. Mechanical transmission can occur in the hop yard by transferring virus-containing sap from plant to plant on cutting tools during pruning, or larger farm equipment when hedging, thinning or leaf stripping. Mechanical transmission is most likely to occur in the spring, when sap pressure is high, or during summer, when viroid titer peaks. Hop stunt viroid has a greater tendency to move along rows rather than across rows, suggesting that transmission by bines rubbing together on a wire is inefficient, although root grafting between neighboring plants in a hop yard is suspected. There is no conclusive evidence of seed, pollen, or vector transmission of hop stunt viroid in hops. Hop stunt viroid can remain infectious in dry plant debris in the field for up to three months, but it is unknown if this contributes substantially to transmission of the viroid (Figs. 2, 3).

### Management

Since propagation is the major route of hop stunt viroid spread, the use of virus-tested planting material free of this pathogen is the best means of limiting its distribution. If a small number of plants are symptomatic, they should be removed promptly, taking care to remove as much root tissue as possible. In addition, as Hop stunt viroid infections remain latent for several seasons, neighboring plants near the symptomatic plant should also be removed as a precaution. If larger numbers (>20%) of symptomatic plants are found, the block should be removed. Plants to be removed



*Pale green and yellow leaves on Willamette associated with Hop stunt viroid. (Fig. 1)*



should be treated in late summer with a systemic herbicide to kill the roots, and sites should be allowed to lay fallow for one season so that any remaining volunteer plants can be identified and treated; soil fumigation may also be helpful in killing infected root pieces that remain after rouging. Precautions should be employed to limit spread within a hop yard and between yards. Contact herbicides should be used for spring pruning and removing basal vegetation later in the season by chemical means also reduces the risk of transmission. Thorough washing of farm equipment to remove plant residue and sap helps reduce the likelihood of transmission to new fields, as does cleaning knives and cutting tools with a disinfectant solution such as 10% sodium hypochlorite (bleach) for 10 minutes.

### At a Glance

- Use only virus-tested planting stock when establishing new yards.
- If a small number of plants are infected, promptly remove to minimize spread. If larger numbers are infected, remove the yard.
- Thoroughly kill all volunteer plants when replanting hop yards.
- Use contact herbicides rather than mechanical pruning to control basal growth to reduce mechanical transmission to adjacent plants.
- Thoroughly wash farm equipment to remove plant residue and sap, and disinfect knives and cutting tools to reduce transmission.

### Reference:

Eastwell, K.C. (2015). Hop stunt viroid. In D.B. Walsh, D.H. Gent, J.D. Barbour, R.A. Boydston, A.E. George, D.G. James, & J.R. Serrine (Eds.), *Field Guide for Integrated Pest Management in Hops* (3th ed., p. 40). Hop Growers of America, Yakima, WA.



*Reduced growth and sidearm development of Willamette due to Hop stunt viroid. (Fig. 2)*



*Prominent yellow speckling along and between leaf veins associated with infection by Hop stunt viroid. (Fig. 3)*