WEEDS AS ALTERNATE HOSTS OF PIERCE'S DISEASE: THEIR ROLE IN PLANT DISEASE

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The plant disease triangle summarizes the complex conditions required for Pierce's disease (PD): insect vectors, the plant pathogenic bacteria *Xylella fastidiosa*, a susceptible crop, and other environmental factors, including weeds that are insect breeding hosts or alternate hosts for the bacteria. *X. fastidiosa* multiplies to high populations (up to 10 million live bacteria per gram of plant material) in plant xylem and is acquired by insect vectors, primarily sharpshooters, during feeding. Vectors can acquire *X. fastidiosa* in a single feeding and remain infective for the rest of their adult lives. Control of PD focuses on reducing vector populations through targeted insecticide sprays and habitat modification to keep vectors from entering vineyards.

The severity and distribution of PD depends on the sharpshooter species present. In the north and central coast, blue-green sharpshooters (BGSS), breeding on certain riparian plants spread PD to vineyards adjacent to streams. In the Central Valley, red-headed (RHSS) or green sharpshooters (GSS) cause disease adjacent to irrigated pasture or weedy alfalfa fields. The glassy-winged sharpshooter (GWSS) is established in southern California and multiplies on citrus and irrigated ornamentals. In the north coast, guidelines for habitat modification to reduce blue-green sharpshooter breeding habitat are available (http://nature.berkeley.edu/xylella/north/info.htm).

Weeds serve as both insect breeding and feeding hosts as well as reservoirs for *X. fastidiosa*. Plants such as wild grapevine, Himalayan blackberry, and periwinkle that are both breeding hosts of the BGSS and support systemic bacterial populations are of particular importance. In greenhouse and field tests, *X. fastidiosa* survives to some degree in many riparian plants (Purcell and Saunders) and ornamentals (Wong and Costa). We tested common vineyard weeds in Central Valley vineyards to identify likely hosts in areas newly-infested with GWSS. Weeds were greenhouse-grown and sampled 1, 3, and 9 weeks after inoculation to obtain population data over time. Eight of 29 species tested (horseweed, sunflower, sacred datura, fava bean, annual bur-sage, poison hemlock, common cocklebur, and common morning glory) were frequently infected by sharpshooters in the greenhouse. Another 19 species were inconsistently or rarely hosts. In general, populations peaked at 6 weeks at 1.9 million live bacteria per gram of plant tissue.

When plants that had been sharpshooter-inoculated were grown concurrently in the field and in the greenhouse, fewer field-grown transplants maintained detectable infections compared to greenhouse-grown weeds, and field plants had lower *X. fastidiosa* populations in both summer and winter.

PD control begins with identifying the diseased area, the insect vectors, and their habitat in your area, by monitoring with sticky traps. Insects enter vineyards or orchards from outside vegetation. Where sharpshooters are endemic, remove plants that are spring breeding hosts for the insects. Host lists generated in greenhouse studies are a good first screen but should be used with caution since *X. fastidiosa* survives at much lower rates in the real world, and the risk posed by a particular plant depends on how often and when sharpshooter vectors feed on it as does the ability of the plant to host *X. fastidiosa*.

REFERENCES:

GWSS Host List: www.cdfa.ca.gov/phpps/pdcp/index

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Purcell Lab Web Site: www.nature.berkeley.edu/xylella
Riparian Vegetation Management Guide: http://nature.berkeley.edu/xylella/north/info