

How to Recognize Symptoms of Aster Yellows in Watercress

Yellowing in watercress due to an uncertain cause was first reported by a farmer in September, 2000. After extensive efforts, including laboratory analyses and greenhouse and field tests, CTAHR's virology laboratory identified a phytoplasma in watercress in October, 2001. This pathogen appears to be closely related to two other phytoplasmas, western North American aster yellows and onion yellows from Asia. Phytoplasmas are a group of microscopic organisms that cause over 700 diseases in plants. Phytoplasmas grow and multiply within host plants and insect vectors. In host plants, phytoplasmas are found only in the phloem tissue of leaves, stems, and roots. When the concentration of phytoplasmas within the plant reaches a certain level, it is believed to cause hormonal imbalance, resulting in the development of symptoms such as chlorotic leaves, stunting, flower petals changing to a green color (phyllody or virescence), and witches-broom (shoot proliferation). This is the second phytoplasma to be identified in Hawai'i; the first was on a native forest tree, 'a'ali'i, *Dodonaea viscosa*.

In October 2001, the Hawaii Department of Agriculture confirmed the presence of a recently introduced leafhopper vector of phytoplasma in watercress. This leafhopper is known locally as the watercress leafhopper. It has not been formally identified but appears to be closely related to the aster yellows leafhopper, *Macrostelus fasciatus*.

The leafhopper feeds by inserting its mouthparts into the watercress phloem tissue. After a noninfected leafhopper feeds on a phytoplasma-infected watercress plant, it takes about 2–4 weeks for the insect to become a persistent vector. Then this leafhopper can infect other noninfected watercress plants. It may take several weeks or longer before plant symptoms such as chlorosis or shoot proliferation appear on a newly infected plant, and during this time, noninfected leafhoppers can acquire the phytoplasma by feeding on the symptomless infected plant. Because watercress plants can be infected without showing symptoms, watercress from the Aiea-Waipahu production areas should not be used as planting material for other areas on Oahu or the Neighbor Islands. Also, these plants can carry leafhopper eggs within the leaves, petioles, and stems.

Phytoplasmas can spread via (1) watercress leafhoppers, (2) using infected planting material, (3) grafting, and (4) parasitic plants (e.g., dodder). Phytoplasmas cannot be transmitted by rubbing sap from infected plants onto healthy plants or by cutting tools used in farming practices. Phytoplasmas are not known to be transmitted by seeds.

Best Management Practices

- 1) Start with noninfected planting material.
- 2) Manage and completely control the watercress leafhopper in the watercress and in borders surrounding the field.
- 3) Aggressively rogue infected watercress plants.
- 4) Control all known weed hosts of the phytoplasma both within and around the borders of the farm (see weed host photos, far right).
- 5) Fertilize periodically with a high-nitrogen, slow-release fertilizer.
- 6) Do not transport watercress planting material outside of the Aiea-Waipahu watercress production area.
- 7) Backyard gardeners and new growers should not plant watercress unless they know that the planting material is free of the phytoplasma and the leafhopper.

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Leafhopper photos:

Walker Nagamine and Ron Hew, Hawaii Department of Agriculture

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	Healthy	Infected
Field		
Leaves		
Roots		
Shoots		

Insect Vector

watercress leafhopper
(side view)

watercress leafhopper
(top view)

actual size: 2 mm

Weed Hosts

parrot's feather
Myriophyllum brasiliense

Flora's paintbrush
Emilia sonchifolia

sow thistle
Sonchus species

broadleaved plantain
Plantago major

amaranth
Amaranthus species

false daisy
Eclipta prostrata