

Leafhoppers: Vectors of Aster Yellow Disease Monitoring Protocol

Host Plants: Aster yellows can infect a wide variety of crops, including canola, alfalfa, flax, sunflower, echinacea, caraway, coriander, carrot, pea, ornamental plants, and weeds and, to a lesser extent, cereals.

Aster yellow Disease: Aster yellow is caused by a phytoplasma, a plant pathogenic micro-organism which inhabits the phloem of infected plants. The disease is carried from plant to plant by sap-sucking leafhoppers.

The pathogen can overwinter in crops and weeds providing a disease source for the next year, but most infections are carried north from the United States by migrating leafhoppers. In western Canada, the primary vector of the aster yellow phytoplasma is the aster leafhopper, also known as the six-spotted leafhopper *Macrostelus fascifrons* (Stal) (Figure 1). Several other leafhopper species might also be involved in the transmission of aster yellow.

Aster Leafhopper Adult: Adults of aster leafhopper are 3.5 to 4 mm long, light green to yellowish-green in color, and have six black spots arranged in three rows on the front of the head. Their wings held roof-like over the abdomen.



Figure 1: Adult

Aster leafhopper Nymphs: Leafhoppers undergo a series of nymphal stages before reaching adulthood. Nymphs resemble a wingless adult but are much smaller, ranging in size from 0.6mm to 3mm.

Adults and nymphs are sucking insects with piercing mouthparts. **Migratory leafhoppers follow the air currents up from the south-eastern and central United States and onto the Canadian prairies from mid May to mid-June**, but this may vary depending on the prevailing winds. Leafhoppers tend to take flight only when the air

temperature exceeds 15°C. Cooler temperatures or rain will delay their migration. Due to the leafhoppers' poor flying ability, aster yellow tends to proliferate in patches along the edge of a field.

There have been reports of adult aster leafhoppers appearing in the spring, suggesting that they may be able to overwinter as adults. While this has not been confirmed, it could help explain the significant increase in aster yellows in recent years. In Saskatchewan, leafhopper populations increase quickly and remain relatively high all summer.

Monitoring

The objectives of the survey are to establish a checklist of the leafhopper species present in canola crops, to monitor their population and to identify the insect species that carry phytoplasma. The study will provide information essential for the development of technologies for early-warning systems and pest management strategies.

Aster yellows symptoms can be confused with injury caused by nutrient deficiencies, some herbicides, drought or other environmental stresses. For example, nitrogen deficiency in echinacea will usually result in the yellowing of older leaves. The rest of the plant will appear normal.

In canola, purpling is caused by anthocyanin production as a result of stress. Although aster yellows can cause purpling, a purple plant does not necessarily indicate an aster yellows infection.

Percentage of symptomatic plants observed in canola crops is usually less than 1%, but have reached 5-12% in canola crops in some years.

When to sample:

Three sampling periods if possible: **rosette (stage 3.2), early flowering (stage 4.1) and late flowering (4.3-4.4), the two first ones being the most important.**

Insect sampling consists of taking sweeps with a 37 cm diameter sweep net at five locations along a transect within each field: 0 m (grass at the edge of the field), 5 m, 10 m, 20 m and 50 m into the canola field away from the edge. The transect can start from any edge of a field and go straight in the middle of the field (avoid field corner). At each of the five locations along the transect, take 20 sweeps (180 °) and place all the insects in a plastic bag and label the bag (date, land location and stage of canola development), 1 bag per location (or 5 bags per field).