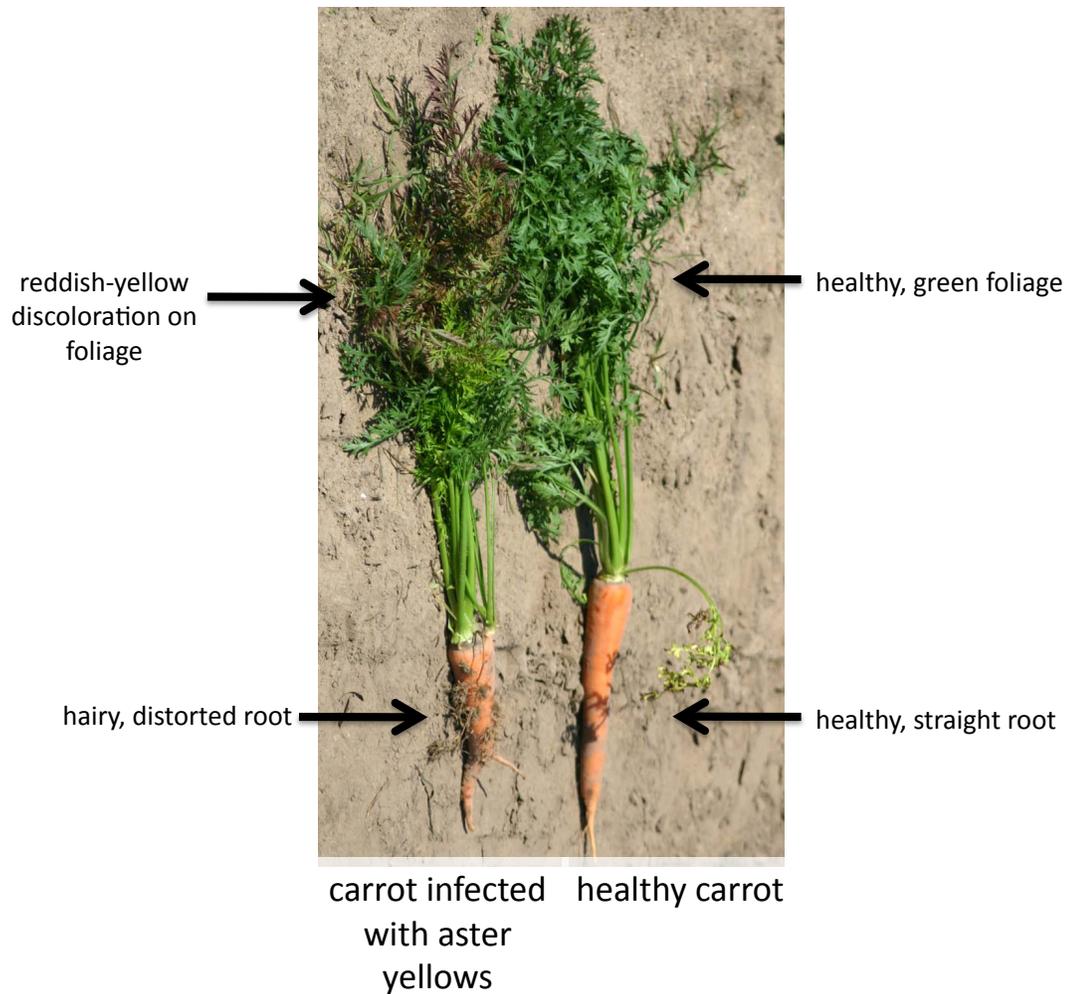


**Aster leafhopper integrated management in carrots**  
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Aster leafhoppers are a significant insect pest of carrots, primarily because they transmit *aster yellows phytoplasma*. Disease symptoms vary from crop to crop, but affected plants typically have distorted, discolored foliage, taste bitter, and are therefore unmarketable (Fig. 1).



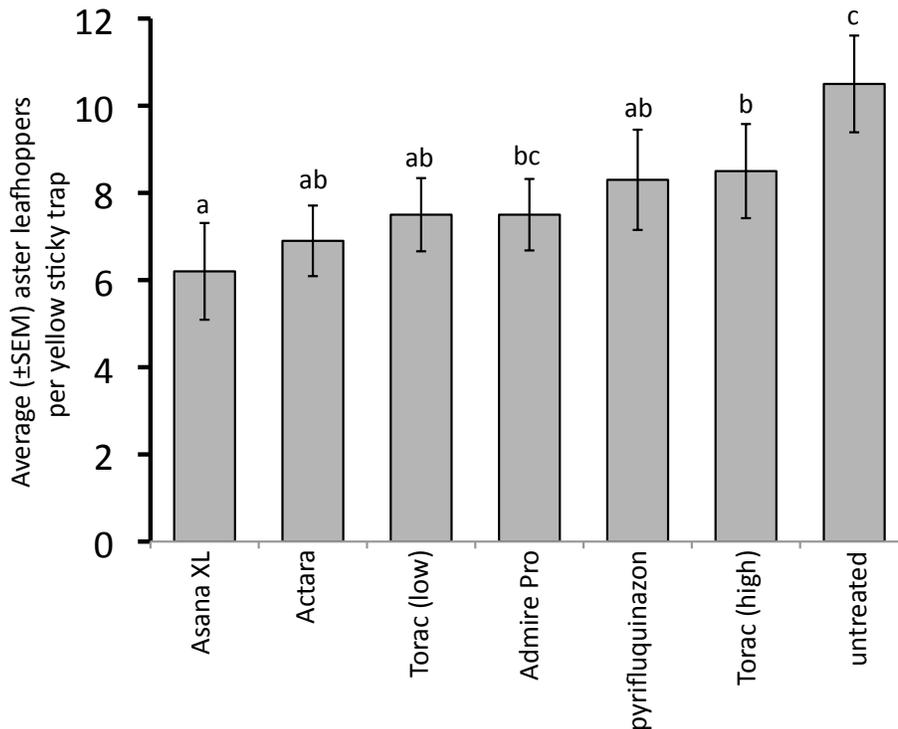
**Figure 1.** Carrot on the left showing signs of aster yellows and healthy carrot on the right.

## MANAGING THE ASTER YELLOWS - ASTER LEAFHOPPER COMPLEX

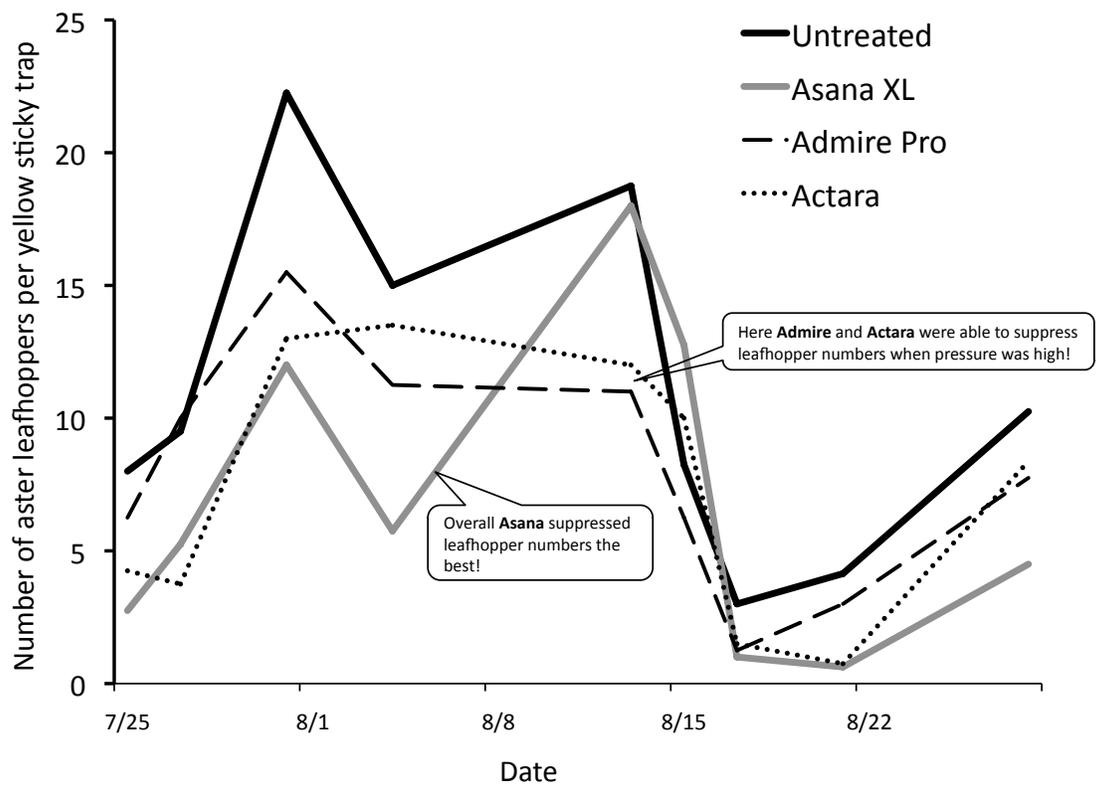
### A. 2012 Insecticide trial results

1. The cornerstone of aster yellows management is the reduction of aster leafhopper pressure.
2. Insecticides are applied based on thresholds, where available. **Thresholds are determined based on the level of phytoplasma in the insects → the higher the infectivity the lower the threshold.**
3. Thresholds are crop species dependent, for example lettuce is more sensitive than celery, and celery is more sensitive than carrots. So carrots typically have the highest threshold out of these three crops.
4. The level of infectivity in the leafhoppers is measured in a chemical reaction in the MSU Plant Diagnostic Lab. The typical turnaround for a sample from submission to results is 2-4 days. Crop scouts and extension personnel then use this to inform growers whether their fields are below or above threshold.
5. Thresholds from the diagnostic lab are given as follows: 4 leafhoppers / 100 sweeps.

Insecticides are an integral part of aster leafhopper management, so it's important to evaluate both registered and experimental compounds for their control. Because growers are often forced to make many applications during the growing season, a combination of products may be needed. In 2012, we tested five different insecticides at the MSU Muck Soils Research Farm in Bath, MI. Products were applied twice in the season, on 24 July and 15 August 2012. All compounds performed better than the untreated plots (Fig. 2). Most of the chemicals did not differ from one another, except for Asana, which significantly reduced aster leafhoppers compared to Admire Pro and the high rate of Torac. As leafhopper numbers started to increase two weeks after the first application, Admire Pro and Actara were still performing well to suppress leafhopper numbers (Fig. 3).



**Figure 2.** Average number of aster leafhoppers per yellow sticky trap in a field trial conducted at the MSU Muck Soils Research Farm. Products were applied at the following rates: Asana XL (9.6 fl oz/A), Actara (3 oz/A), Torac (low) (8 fl oz/A) + Induce (0.25% v/v), Admire Pro (1.2 fl oz/A), pyriproxyfen (3.2 fl oz/A) + Induce (0.25% v/v), and Torac (high) (16 fl oz/A) + Induce (0.25% v/v).



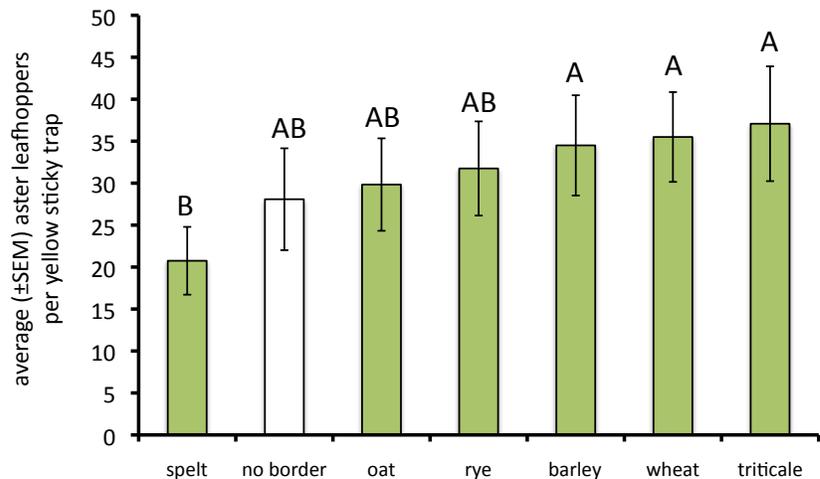
**Figure 3.** Number of aster leafhoppers per yellow sticky trap over time.

## B. Interaction of aster leafhoppers with non-crop plants

Both the aster leafhopper and the aster yellows phytoplasma can use many plant species as hosts. Cover crops, as well as the weeds, provide alternative hosts for the leafhoppers and a source for picking up the aster yellows, therefore its important to understand how the presence of these non-carrot plants affect leafhopper abundance in the carrot crop.

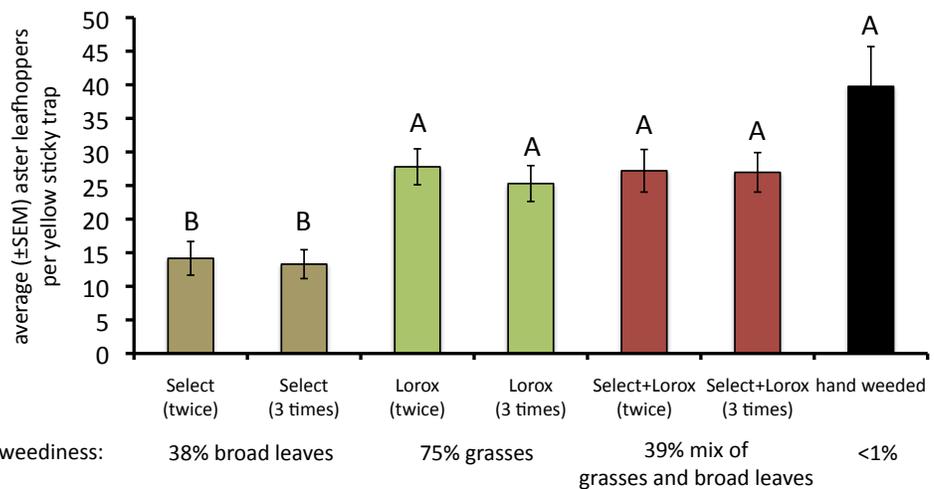
### The effect of cover crop border treatments on aster leafhopper abundance in carrots

Oat, rye, barley, wheat, and triticale borders increased the numbers of leafhoppers in the carrot plot relative to the no-border treatment. Carrot plots with spelt borders had the fewest leafhoppers on average, and this number was significantly less when compared to barley, wheat and triticale border treatments. The presence of triticale almost doubled the average number of leafhoppers in the carrot plot relative to the spelt.



### How do aster leafhoppers respond to different types of weeds?

Aster leafhoppers were most abundant in hand weeded plots, which did not have weeds. Plots that were hand weeded had similar leafhopper abundance as plots that had grassy weeds. Eliminating grasses but leaving broad-leaved weeds in the plots significantly reduced the abundance of leafhoppers in carrots, when compared to all of the other treatments.



**SUMMARY:** These findings taken together mean that cereal cover crops likely attract more leafhoppers to the field early in the season when the plants are most sensitive to picking up the disease and that during the course of the season broad-leaf weeds are not likely to attract more leafhoppers to the field.