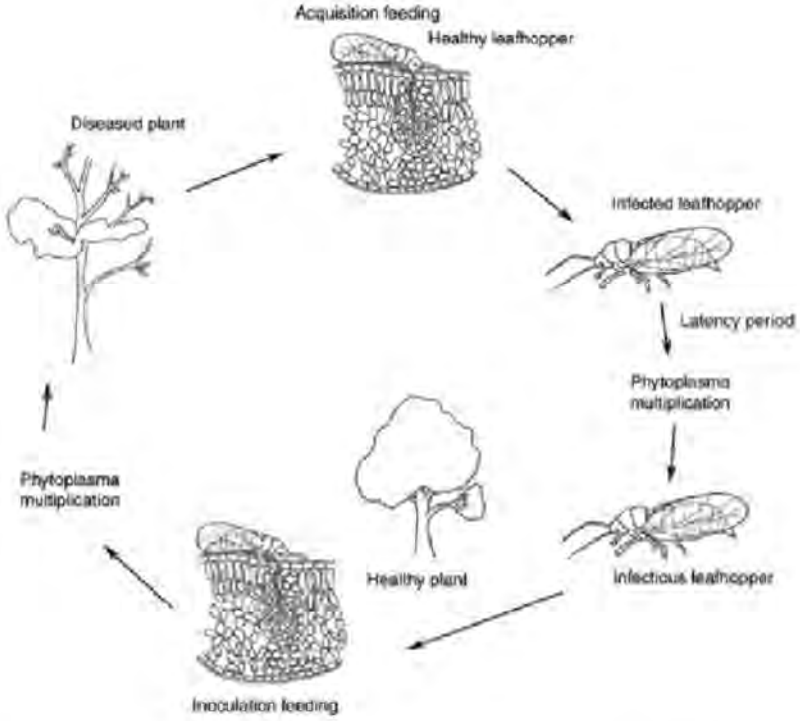
Aster Leafhopper In

What Is It and How Do Y

By Zsofia Szendrei, Kenneth Frost and Russell Groves

Aster leafhopper is an important pest of fresh market vegetables primarily because it transmits aster yellows phytoplasma, which is a diseases of celery, carrots, lettuce and, occasionally, onions and potatoes. Disease symptoms vary from crop to crop, but affected plants typically have distorted, discolored foliage and a bitter taste and are therefore unmarketable.

Leafhoppers pick up the phytoplasma after extended feeding (hours to days) on infected plant tissues. The phytoplasma circulates in the insect body and multiplies during a two-three week latent period, during which time the insect cannot transmit the pathogen. Once the leafhopper becomes infectious, it may infect healthy plants for the rest of its life, and this transmission process only takes a few minutes to a few hours of feeding. Once plants acquire the phytoplasma, nothing can be done to cure the plant; control efforts should prevent further spread of the disease by stopping aster leafhoppers from feeding on healthy plants.



The drawing shows the aster yellows leafhopper and phytoplasma lifecycle. (1) Healthy leafhopper feeds on phytoplasma-infected plant. (2) Phytoplasma multiplies within the insect. (3) Infective leafhopper spreads phytoplasma to healthy plants.

(Drawing from Christensen et al., 2005.)

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ou Use It?

The **aster yellows index** is used to determine the need for insecticide applications against the leafhopper. The index is calculated as follows:

% infected leafhoppers × number of leafhoppers in 100 sweep-net samples = [index value]

This number is then compared to a predetermined treatment threshold value, which depends on the susceptibility of a given crop species/variety to the phytoplasma. The treatment threshold for susceptible carrots is 50, for intermediately susceptible carrots, 75, and for resistant carrot varieties, 100. If the index value surpasses the treatment threshold, a treatment for the leafhopper is recommended. The index is calculated by multiplying two numbers, therefore the index value can exceed the treatment threshold for to two main reasons: (1) the total number of leafhoppers in 100 sweeps is relatively low, but the number of infected leafhoppers is high, or (2) the number of leafhoppers is high, although infective leafhopper numbers are low.

Determining the Percent of Infected Leafhoppers Important

Correctly determining the '*percent infected leafhoppers*' is crucial for attaining an accurate index value and deciding on recommendation for insecticide treatment. Currently, field collected leafhoppers are examined with molecular diagnostic tools to determine the percentage of leafhoppers that carry the phytoplasma (i.e.: leafhoppers positive for phytoplasma). This number is then used to calculate the aster yellows index and make management decisions.

Although the current molecular diagnostic tool far supersedes the traditionally used bioassay method in precision and speed of determination of '*percent infected leafhoppers*', we are still faced with a few challenges. The number of infected leafhoppers fluctuates within a growing season, from year to year and among nearby locations and this variability is a major concern for the reliability of the index and monitoring in general. The reasons for these inconsistencies must be understood and incorporated into a model for a more precise estimation of the proportion of infective leafhoppers. The following are two reasons for the variability and what we need to do to improve our understanding:

There are two major sources for infected leafhoppers: migratory and native. Leafhoppers migrate from the southern U.S., and can pick up the phytoplasma either during or after migration. Leafhoppers can also overwinter in Michigan and pick up the phytoplasma from plants in and around the carrot field. We need to understand where leafhoppers pick up the phytoplasma before arrival to the carrot fields and the role of local inoculum sources (both cover crops and weeds) in fields and field edges in phytoplasma acquisition by the leafhopper.

A better understanding of host plant preference and feeding behavior of the

(continued on next page)

Dr. Zsofia Szendrei, New Vegetable Entomologist at MSU

Dr. Zsofia Szendrei was recently hired as the new vegetable entomologist at Michigan State University. The Michigan Vegetable Council and the Michigan Potato Industry Commission were instrumental in refilling this position in the midst of current economic hardships.

Following her hiring in August 2009, with the help of MSU Extension agents, she visited vegetable growers across Michigan to ask them about their insect problems, and what kind of research help she could provide.

Dr. Szendrei is presently developing collaborations with entomology and other departments, due to the fact that many of insect pest problems are regional, national, or international. Currently, she is initiating new collaborations with researchers in Maryland, Vermont and Canada, as well as continuing research collaborations started by Dr. Grafius with colleagues in Wisconsin, Maine and Virginia. Keeping in touch with chemical company representatives is another important part of her program and Adam Byrne is providing invaluable technical assistance in this. She also is working on generating funding to support her research program, once the "start-up" package is spent. The researcher can be contacted by phone at: (517) 974-8610 or by e-mail at: szendrei@msu.edu. For more information, check http://vegetable.ent.msu.edu/.

Zsofia Szendrei, MSU, checking a field for aster leafhoppers.

leafhoppers and their subsequent spread into carrot fields will help us to design area-wide management tactics that, for example, minimize phytoplasma infection of carrots by focusing elimination efforts on certain crops or weeds from the vicinity of the carrot fields. Determining infectivity rates in source populations will provide us with a forecasting tool on the severity of infection if and when leafhoppers move into carrot fields.

Leafhoppers that carry the disease do not always transmit it to plants, so there is no direct relationship between the proportion of *infected* and *infective* leafhoppers. To accurately calculate the number of *infective* individuals, we must be able to measure the amount of phytoplasma in the insect, estimate phytoplasma growth rate in the insect and evaluate the relationship between the amount of phytoplasma in the insect and the insect's ability to infect a plant.

Correctly evaluating the relationship between "leafhoppers positive for phytoplasma" and "leafhopper transmitting a virus to a healthy plant" will help us calculate the index more precisely, thus provide more accurate recommendations for treatment.

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