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# Plant pathogen effects on Hemipteran Settling Behavior

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## Abstract

Plants in agricultural systems are often subject to many harmful pathogens, including fungal and bacterial diseases, viruses, and mollicutes. Once a plant senses a stressor, many will begin to produce various secondary metabolites such as phytoalexins which can alter the plant's physiological state. In previous work, it has been established that these compounds' presence can affect the feeding behaviour of herbivorous species. Past studies have shown that plants infected with a pathogen can have decreased levels of amino acids and sugar compounds when compared to uninfected plants, which can consequently contribute to decreased insect attraction to infected plants.

Aster Yellows Phytoplasma (AYP) is a mollicute that infects a very wide variety of hosts, many of which are important to the agricultural sector in Canada. Research into the pathosystem involving AYP, insect vectors, and the host plant is needed to understand to what degree infected plants might influence insect behaviour and disease dynamics. This study used healthy Canola plants (*Brassica napus*) along with plants infected with Aster Yellows Phytoplasma in no-choice and two-choice bioassays to evaluate the effects of pathogen infection has on vector settling behaviour, developmental time, rate of oviposition, and probing activity. This same process will be repeated with Cucumber Mosaic Virus and Turnip Mosaic Virus \ to determine if a viral infection will result in similar effects.

## Purpose

Previous work has shown that vector preference can change significantly depending on the infection status of the insect vector. This theory is usually referred to as "Conditional Vector Preference" where one may expect an uninfected vector to prefer an infected plant, and an infected vector may prefer an uninfected plant. The purpose of this research was to test if this school of thinking applies to the Aster leafhopper-AYP-Canola pathosystem.

## Materials and Methods

Plants:

- 40 canola seeds were planted. 20 were to become infected and the remaining 20 were left alone to be healthy.
- Plants were watered every three days, with the addition of 20-20-20 water soluble fertilizer.
- Plants were grown in a chamber at 21°C degrees during the day (18 hours), and 17°C during the night (6 hours).

Leafhoppers:

- Uninfected insects were reared on barley at identical conditions as the plants.
- Infected insects were reared on infected barley and periwinkle at 24°C to ensure phytoplasma survival.

Infection:

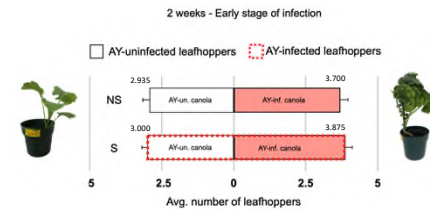
- 3 male and 3 female leafhoppers from infected colonies were added to each of the 20 plants for 10 days to infect the plants.

Two-choice bioassay:

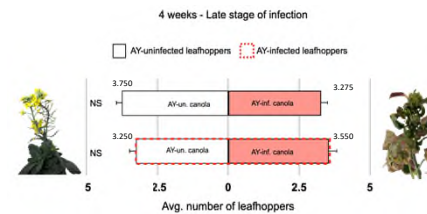
- 5 male and 5 female uninfected leafhoppers were added to each 10 choice cages and allowed 24 hours to acclimate among an uninfected plant and an infected plant. This procedure was repeated using infected leafhoppers.
- Leafhopper position was recorded daily for 96 hours. The positions were defined as (1) uninfected plant, (2) Infected plant, or (3) Off the plants.



## Results



The uninfected leafhoppers did not seem to have a preference that was of statistical significance with an average of 2.935 leafhoppers on the uninfected canola and 3.700 leafhoppers on the infected canola. In contrast, the infected leafhoppers did have a significant preference in favor of the infected canola with an average of 3.875 leafhoppers on the infected plants, and 3.000 leafhoppers on the uninfected plants.



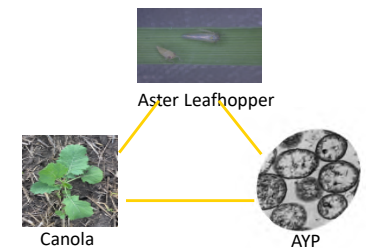
Unfortunately, the data that was recorded was considered statistically insignificant, but it still helped shed some light on the leafhopper settling behavior.

AYP uninfected leafhoppers had an average of 3.750 leafhoppers settling on the healthy canola, and 3.275 leafhoppers settling on the infected canola.

Aster yellows phytoplasma infected leafhoppers showed similar settling behavior with 3.750 and 3.375 leafhoppers on the healthy and infected canola, respectively.

## Conclusions

With the mixed results that included both significant and insignificant figures, further work must be done to examine this pathosystem. Interestingly, the infected leafhoppers ended up having a preference towards the infected canola plants which was the opposite of what was expected. This experiment may be repeated to verify these results since they are not what was expected.



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