



## Abstract

- Aphids are the most common vectors of plant viruses known, and mosaic viruses are easily spread through them [2].
- Corn leaf aphids (*Rhopalosiphum maidis*) can be found nearly worldwide, effecting corn and wild cereal growth.
- Mosaic viruses effect an array of plants, such as sorghum (*Sorghum bicolor*), one of Kansas' main crop produced. These viruses can cause necrosis in the foliage, and can reduce yields.
- The Potyviruses tested in this experiment were Sugarcane Mosaic Virus, Maize Dwarf Mosaic Virus, Sorghum Mosaic Virus, and Johnsongrass Mosaic Virus.
- With over 100 different species, Potyviruses are the largest genus ssRNA plant viruses transmitted in a non persistent manner by their vectors [1].
- Potyviruses are exclusively transmitted by aphids [3].
- Studying the the attraction of *Rhopalosiphum maidis* to Potyvirus infected plants can help better the understanding of plant virus transmission and behavior of aphids, leading to improved pest management processes, and benefitting agriculture as a whole.

## Objectives and Expectations

- OBJECTIVE:** To determine if *R. maidis* are more attracted to healthy sorghum plants, or ones infected with mosaic viruses.
- QUESTION:** Are *R. maidis* more attracted to healthy or infected sorghum plants over a 12 hour period?
- HYPOTHESIS:** Studies show that Potyvirus infected plants attract different aphid species, therefore similar results are expected for our experimental setup with *R. maidis*.

## Study System

### Corn leaf aphids - *Rhopalosiphum maidis*

Aphids are soft bodied pests that feed on plant sap. They are one of the most destructive insect pests in temperate climate areas, most notably to agriculture and forestry. They are capable of asexual reproduction and can reproduce at rapid rates, and can also spread by wind dispersion. They are plant feeders, and have sucking mouthparts to extract sap from plants. They transmit Potyviruses by storing them in their stylet mouthparts.



### Sorghum - *Sorghum bicolor*

Sorghum is a cereal grain that can be found all over the world. It is commonly used for food, animal fodder, alcoholic beverages, and biofuels. Kansas is the largest grain sorghum producing state.



## Methods and Experimental Design

Sorghum was grown in trays with potting mix for 2 weeks. After those 2 weeks, sorghum plants were infected with viruses by brushing on a solution containing carborundum powder and virons solubilized in PBS buffer. Plants were allowed to grow for another 2 weeks for symptom development and virus propagation (Figure 1) before the experiment.



Figure 1: Four week old seedlings showing symptoms (enlarged regions) of viral disease.

Ten aphids starved for 1 hour were placed on top of a mesh square in equal distances from an infected and non-infected blade of sorghum (Figure 2). They were then enclosed in a transparent petri dish so they could not escape. Counts were taken after 30, 60, 120 and 720 minutes after cages were infested.

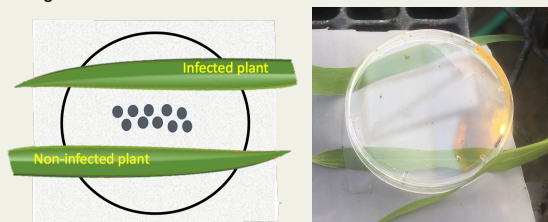


Figure 2: The setup of the two-choice experiment and schematic example.

After 720 minutes, five paired plant samples of infected and non-infected plants were tested for the presence of Potyvirus particles by ELISA assay (Figure 3).

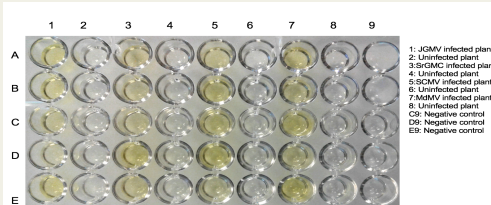


Figure 3: ELISA test results showing five infected and non-infected plant pairs used in aphid choice test. Yellow color confirms the presence of virions.

## Results and Conclusions

Even numbers of aphids occurred on non-infected plants and plants infected with JGMV and SCMV after 30 minutes, but they migrated to infected plants over time. Plants infected with SrMV showed a greater migration over time compared to the other mosaic viruses. There was no difference in the number of aphids on control plants or plants infected with MDMV at 120 or 720 minutes after infestation.

This data shows that aphids tend to gravitate towards plants infected with a mosaic virus, excluding the results of MDMV.

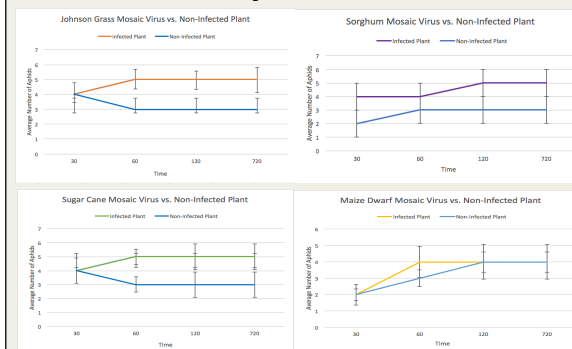


Figure 4: Graphs showing average number of aphids over time with standard deviation.

## Future Directions

For further research into this subject, I would suggest having a complete control group by having a choice test between two sets of non-infected plants. It will give more accurate results because the results may have been skewed due to the aphid/plant positioning, rather than plant health. I would have also liked to test the attraction between certain strains of the viruses, rather than just infected and non-infected to see which strain was the most attractive. Finally, I would like to research the causes to why aphids are more attracted to the mosaic virus-infected plants, and then prevention of their destructive relationship.

## Acknowledgement and References

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