Exploring the interaction of susceptible and tolerant Inbred lines of Corn (Zea mays L.) with *Clavibacter michiganensis* subsp *nebraskensis*, the causal agent of Goss’s Wilt

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**Abstract**

Two corn lines, CO447 and CO450, screened as susceptible and tolerant to Goss’s wilt, respectively, were inoculated with *Clavibacter michiganensis* subsp *nebraskensis* (CMN) isolates possessing different levels of aggressiveness. Both inoculated and control plants were scored over a 10-day period for lesion length, disease severity, and Total AUDPC. Total AUDPC calculation was based on lesion length over time, and the disease severity progress exhibited statistical differences between the two corn lines with all of the tested isolates. The highly aggressive CMN isolates (CMN14-5-1 and CMN15-18-2) produced severe symptoms in corn line CO447, which started with water soaked areas, and rapidly developed into necrotic lesions. However, these isolates produced less severe symptoms on corn line CO450, which exhibited chlorosis with small necrotic lesions that did not progress beyond the initial 4 day lesion size. Statistical differences amongst the tested isolates within and across the two corn lines were significant. Based on the results produced by these experiments, analysis of gene expression and metabolomics will be performed on the tested treatments in order to explore potential resistance determinants among the two corn lines.

**Objectives**

- Study *Clavibacter michiganensis* subsp *nebraskensis* - corn interaction by evaluating the level of corn tolerance against Goss’s wilt disease

**Results**

- AUDPC was best for measuring lesion length, as it better reflected the progress of lesion development on the leaf. In Figures 2 and 4 there is a clear separation between the corn lines and the effects of the different isolates. Figure 3 shows a significant difference between the two lines of corn inoculated with CMN 14-5-1, but not with the other isolates.
- For disease severity AUDPC did not reflect what was shown in the greenhouse, so instead the data was broken down on a day to day basis comparing CMN 14-5-1 in the two corn lines. As it is shown on Figure 1 CO450 has a higher disease severity rating overall 2, 4, and 6 DPI. After 6 DPI, disease severity on CO447 overcomes that on CO450, which remained the same for the rest of the experiment.

![Figure 1: Average of disease severity of corn lines inoculated with isolate Cmn14-5-1. (A) Disease progress over time from 2-10 DPI. (B) Average disease severity score at the same time period.](image)

![Figure 2: Total AUDPC for lesion length during March 2016.](image)

![Figure 3: Total AUDPC for lesion length for July 2016.](image)

![Figure 4: Total AUDPC for lesion length for August 2016.](image)

**Materials and Methods**

- Two Corn lines from AAFC Ottawa, CO447 and CO450 were used in this study.
- Three CMN isolates ranging from weakly aggressive (DOAB 232) to highly aggressive (CMN15-18-2, and CMN14-5-1).
- Leaf inoculation method was used to evaluate the total AUDPC based on lesion length, and the disease severity (0-6 scale).

**Conclusions**

- There are significant differences between CMN 14-5-1 and DOAB 232 in terms of their aggressiveness towards the corn lines.
- There is also a significant difference in how each line reacts to CMN inoculations in terms of lesion formation.
- These results provide us with a good comparative model to further explore the mechanisms of interaction between corn and CMN.

**Future Works**

- Run qRT-PCR analyses on genes related to disease suppression in corn and compare them across susceptible vs. tolerant lines and highly vs. weakly aggressive isolates.
- Use phytochemical techniques to compare secondary metabolite concentrations between the corn lines after inoculation with the different isolates.

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