



## Introduction

*Fusarium* root rot (FRR) is an important disease in many soybean production areas and is caused by various *Fusarium* species, the *Fusarium graminearum* (Fg) that is associated with *Fusarium* head blight (FHB) in cereals, is a potential threat for soybean as wheat-soybean rotation is widely practiced and Fg has been recently confirmed to cause soybean root rot. While defense mechanisms of wheat against the FHB agent Fg have been investigated in length in wheat, no such studies were reported in soybean. To better understand this soybean-Fg interaction, we evaluated the expression of ten defense-related genes associated with either the salicylic or jasmonic acid defense signaling pathways: *PAL2*, *ICS1*, *ICS2*, *AOS2*, *OPR3*, *JAR1*, *NPR1*, *PR-2*, *PR-3*, and *PR-4*. These genes were selected because they are in general associated with the salicylic and jasmonic acids defence signalling pathways.

## Methods

Two cultivars of soybean (susceptible (S) and moderately resistant (MR) and two highly aggressive Fg isolates was used to evaluate the expression of ten defense-related genes, *PAL2*, *ICS1*, *ICS2*, *AOS2*, *OPR3*, *JAR1*, *NPR1*, *PR-2*, *PR-3*, and *PR-4*. Expression levels of these genes were assessed in soybean roots at 6,12 and 24 hpi.

## Results

- A gradual increase in *PAL2* gene expression, with significant induction observed at 24 hpi in MR cultivar (Fig. 1a)
- *ICS1* showed much higher expression in the MR cultivar than in the susceptible one (Fig. 1b) at 6hpi
- *OPR3* induced with a higher expression at 24hpi in the MR cultivar than in the susceptible one (Fig. 1c)
- *AOS2* gene expressed at 6hpi in both cultivars but was induced highly at 24hpi in MR cultivar only (Fig. 1d). Data is not included for the rest of genes.

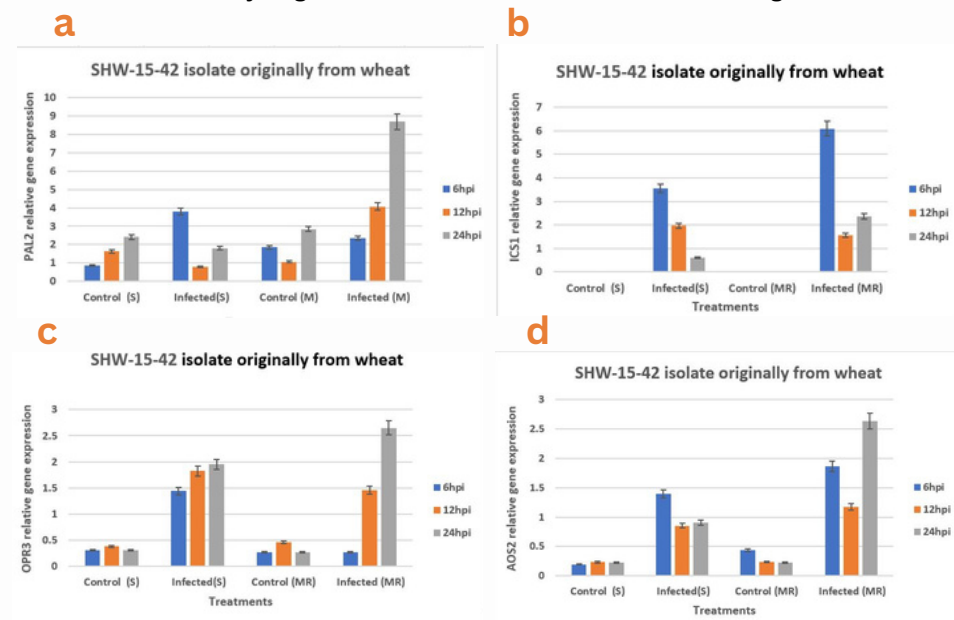


Fig.1. Gene expression analysis of(a) *PAL2*,(b) *ICS1*,(c) *OPR3* and (d) *AOS2* in roots of two soybean cultivars at 6,12, and 24 hpi (hours post inoculated): (control S) noninoculated roots of susceptible (S); (infected S) roots of susceptible cultivar inoculated with isolate of *F. graminearum*; (control MR) noninoculated roots of moderately resistant (MR); (infected MR) roots of moderately resistant (MR) cultivar inoculated with isolate of *F. graminearum*.

## Conclusion

- The expression of the selected genes in this study was more pronounced in the moderately resistant cultivar compared to the susceptible one.
- *PAL* and *ICS* enzymes work together in soybean defense against Fg, suggesting a cooperative role in catalyzing the necessary reactions.
- Salicylic and jasmonic acids pathways are also involved in soybean defense against Fg and add to the data gathered to elucidate the signaling mechanisms in this host-pathogen interaction
- These data may contribute to reducing the effect of FRR on soybean yield.

## Acknowledgments

- Libyan ministry of high education
- University of Manitoba.
- Manitoba Pulse and Soybean Growers.
- Natural Sciences and Engineering Research Council of Canada (NSERC).

