INTRODUCTION

Chilling tolerance in Asian rice (Oryza sativa) is a polygenetic trait. The transcription factor OsMADS27 has previously been shown to help in stress response to salt (Chen et al., 2018) and has been implicated in the chilling stress response. From unpublished RNAseq data done on OsMADS27 overexpression Indica plants from the Schläppi Lab, peroxidase (POX) genes that may contribute to chilling tolerance, based on preliminary data, were observed to be upregulated. However, these results have yet to be validated for both subspecies due to technical difficulties with expression quantification. Furthermore, previous studies have only examined the phenotypes of one subspecies of Asian rice, Japonica, overexpressing OsMADS27. In this study we investigated plants of both subspecies overexpressing OsMADS27.

METHODS

Transgenic overexpression rice plants, from both subspecies (Indica and Japonica), were grown. Root and shoot length were measured for all transgenic plants at 7, 10, 12, and 14 days from germination. After 2 weeks, cuttings from leaves of transgenic plants were taken for either DNA extraction for genotyping or for RNA extraction to measure gene expression levels. Leaves from wild type plants of both subspecies were also taken and their RNA extracted for control purposes.

RESULTS

<table>
<thead>
<tr>
<th>Japonica (Krasnodarskij 3352)</th>
<th>Indica (Kasalath)</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Average shoot length after 14 days of growth for overexpression and wild-type Japonica and Indica plants" /></td>
<td><img src="image2" alt="Average root length after 14 days of growth for overexpression and wild-type Japonica and Indica plants" /></td>
</tr>
<tr>
<td><img src="image3" alt="Average shoot length after 14 days of growth for overexpression and wild-type Japonica and Indica plants" /></td>
<td><img src="image4" alt="Average root length after 14 days of growth for overexpression and wild-type Japonica and Indica plants" /></td>
</tr>
</tbody>
</table>

Discussion

- Japonica phenotype observations reflect previous studies (Chen et al. 2018), but the observed Indica phenotype has not been previously reported.
- Observed differences between subspecies could be due to differing targets of OsMADS27 and/or due to the OsMADS27 used in the overexpression lines were from a Japonica backround and have an amino acid substitution (Thr230Ala) compared to the native OsMADS27 from Indica plants used in this study.

CONCLUSION & FUTURE DIRECTION

- OsMADS27 overexpression appears to induce differing phenotypes in the two subspecies of Asian rice.
- More molecular biology work is needed to understand the targets of OsMADS27 and how they contribute to chilling tolerance.
- More phenotyping work, such as electrolyte leakage and low temperature seedling survivability, is needed to fully understand the effects OsMADS27 overexpression has on Asian rice.

ACKNOWLEDGEMENTS

This work was done through Marquette’s Biological Sciences Department’s Summer Research Program. Thanks to Danielle Barrett and Miriam Schwabe for their help during genotyping.