

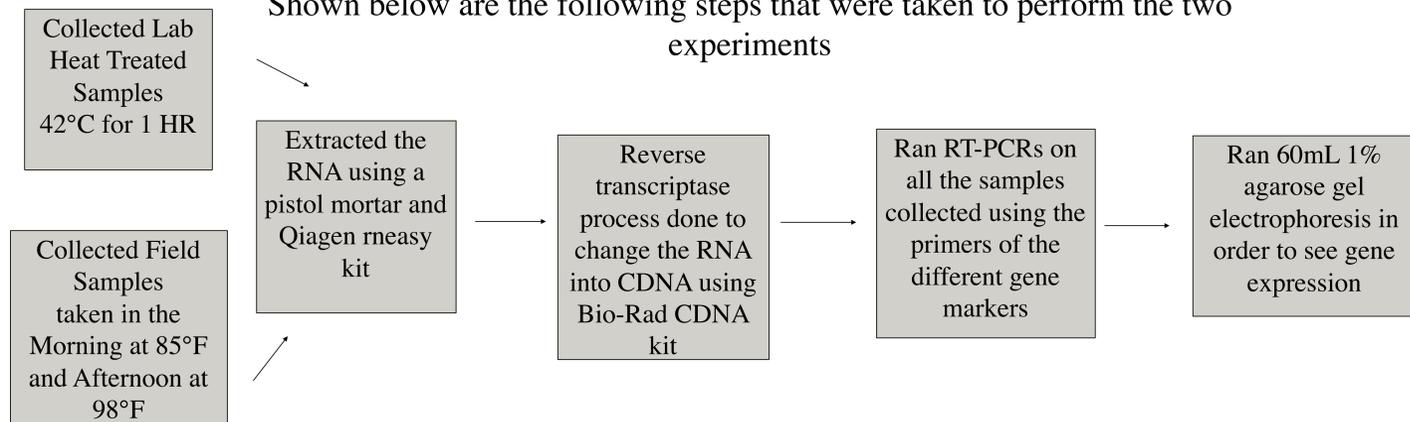
Hannah Talton, Dr. Stephen H. Howell, Dr. Renu Srivastava

Abstract

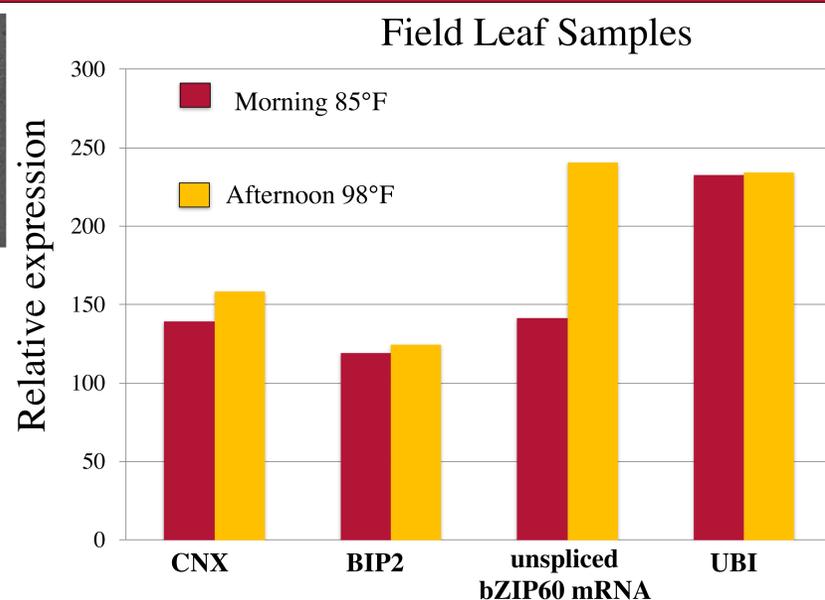
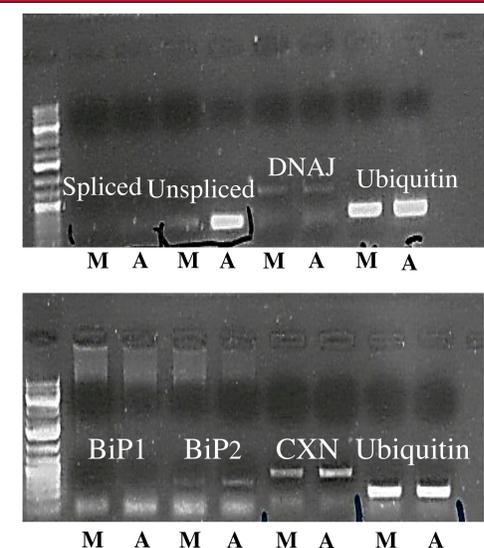
Crops are impacted by many different abiotic and biotic factors. Under adverse environmental conditions plants show signs and symptoms of stress. One form of stress is called ER stress which is due to the accumulation of misfolded proteins in the endoplasmic reticulum. ER stress elicits the unfolded protein response (UPR) that sends stress signals to the nucleus. One of the components of the UPR signaling pathway is IRE1, an unconventional RNA splicing enzyme that splices bZIP60 mRNA to produce a powerful transcription factor. The production of bZIP60 brings in the reinforcements by upregulating the expression of many stress response genes to restore a homeostatic balance. Many of the upregulated genes assist in protein folding, such as: DNAJ, calnexin (CXN), BiP1 and BiP2. These different genes and also the spliced and unspliced forms of bZIP60 mRNA were tested in both lab and field conditions to identify what bio markers would be best to use when assessing the ER stress response in plants. DNAJ, CNX, and unspliced form of bZIP60 mRNA showed to be the most promising bio markers to use for future analysis of ER stress and the UPR in maize.

Methods

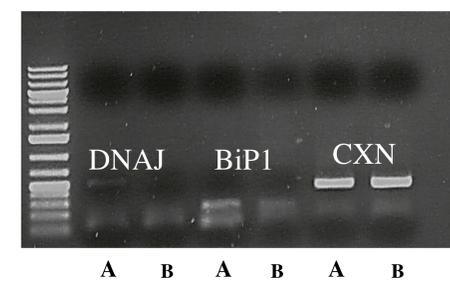
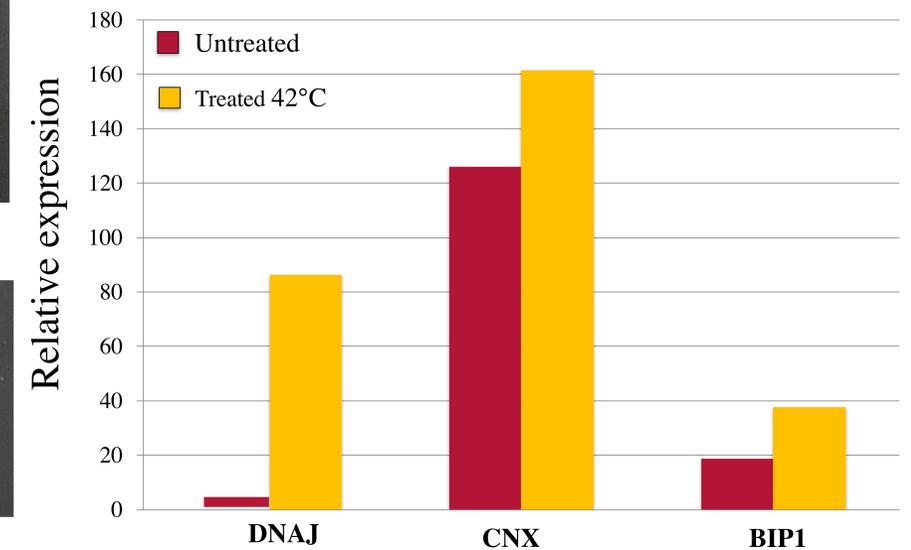
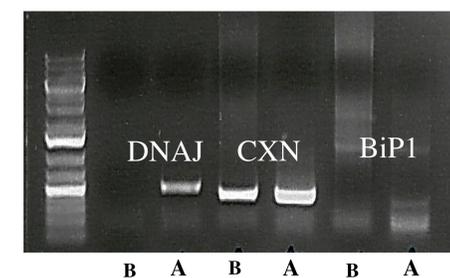
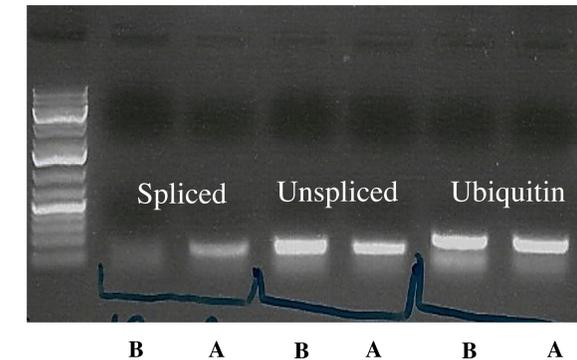
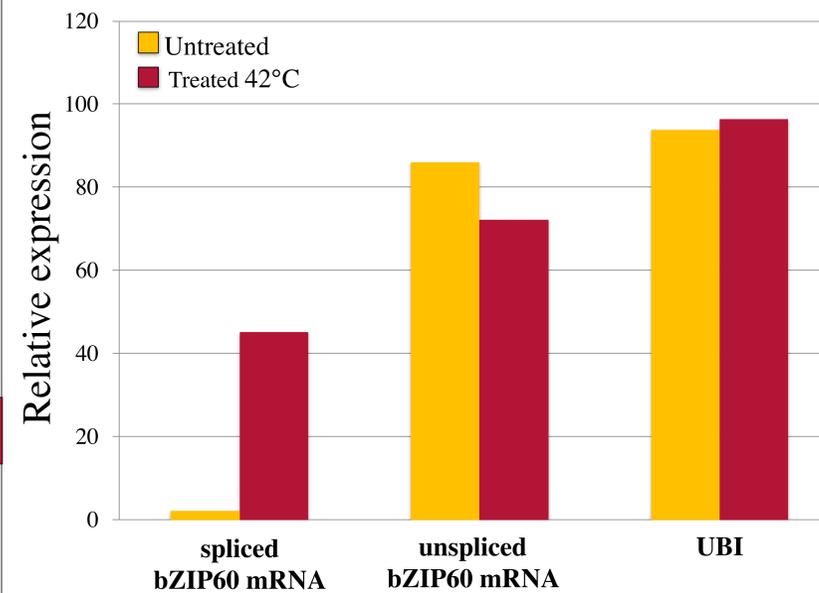
Shown below are the following steps that were taken to perform the two experiments



Results



Lab Root Samples



Conclusion

In performing this experiment I was able to identify different biomarkers that could be used to assess heat stress in maize both under laboratory and field conditions.

References

- Liu JX, Howell SH: Endoplasmic reticulum protein quality control and its relationship to environmental stress responses in plants. *Plant Cell* 2010, 22(9):2930-2942.
- Liu JX, Srivastava R, Che P, Howell SH: Salt stress responses in Arabidopsis utilize a signal transduction pathway related to endoplasmic reticulum stress signaling. *Plant J* 2007, 51(5):897-909.
- Liu JX, Howell SH: bZIP28 and NF-Y transcription factors are activated by ER stress and assemble into a transcriptional complex to regulate stress response genes in Arabidopsis. *Plant Cell* 2010, 22(3):782-796
- Liu J-X, Howell SH. Managing the protein folding demands in the endoplasmic reticulum of plants. *New Phytol.* 2016; Doi: 10.1111/nph.13915