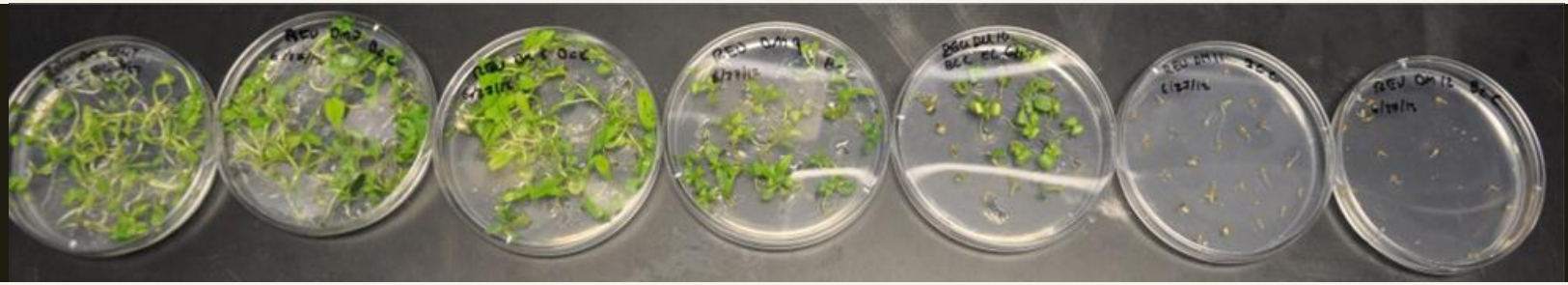
Impact of salt stress on *Camelina sativa*



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Introduction

- Need for biofuel
- Marginal land/salinization

http://www.instablogsimages.com/1/2011/11/14/biofuel_airplane_lger3.jpg

http://upload.wikimedia.org/wikipedia/commons/thumb/b/b0/Salinity.jpg/250px-Salinity.jpg

http://upload.wikimedia.org/wikipedia/commons/thumb/b/b8/Camelina_sativa_eF.jpg/220px-Camelina_sativa_eF.jpg

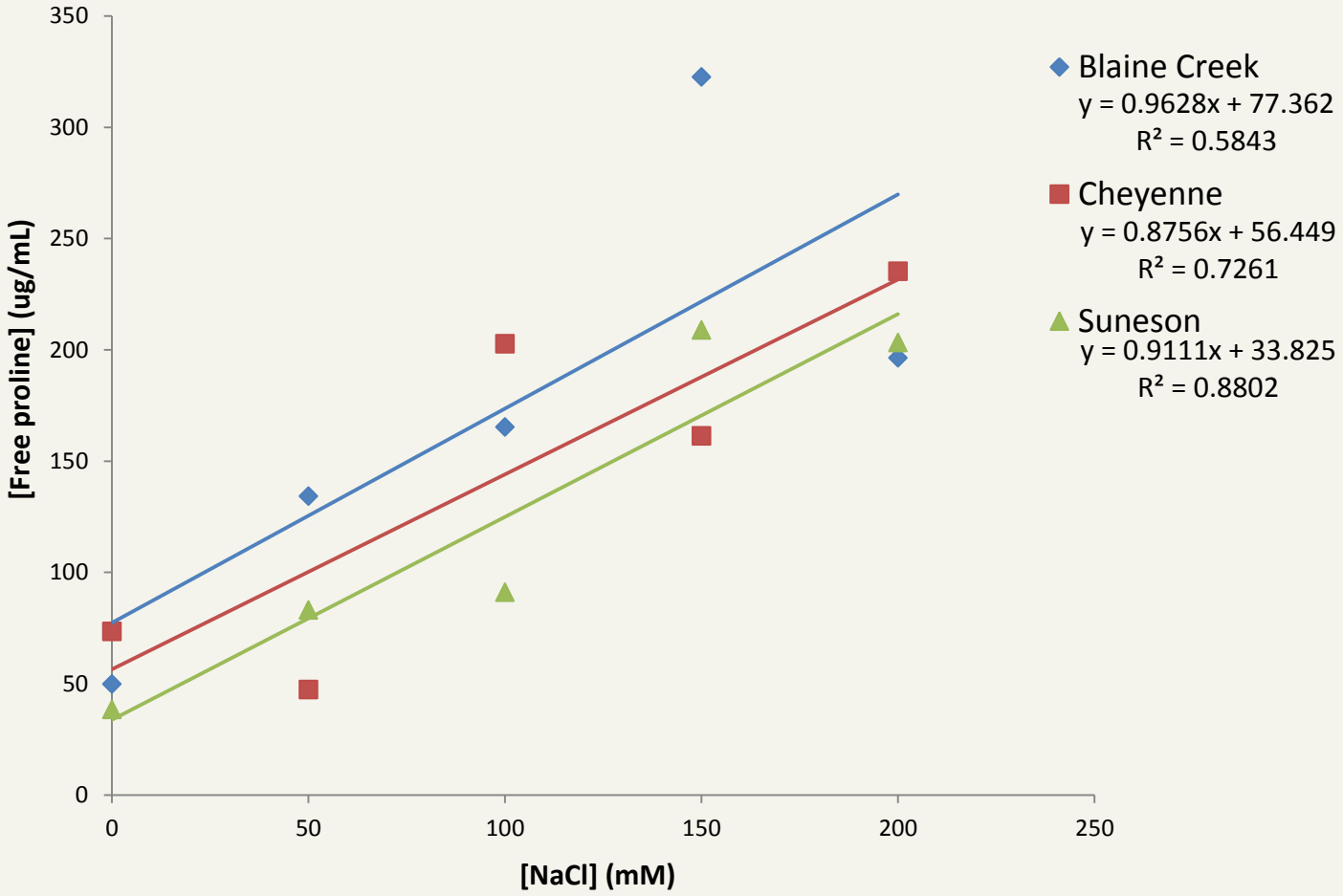
Objective

- To assess the potential of *Camelina sativa* to grow on land marginalized by salt, plants were grown *in vitro* in a treatment of NaCl and measured for select biochemical and morphological changes.

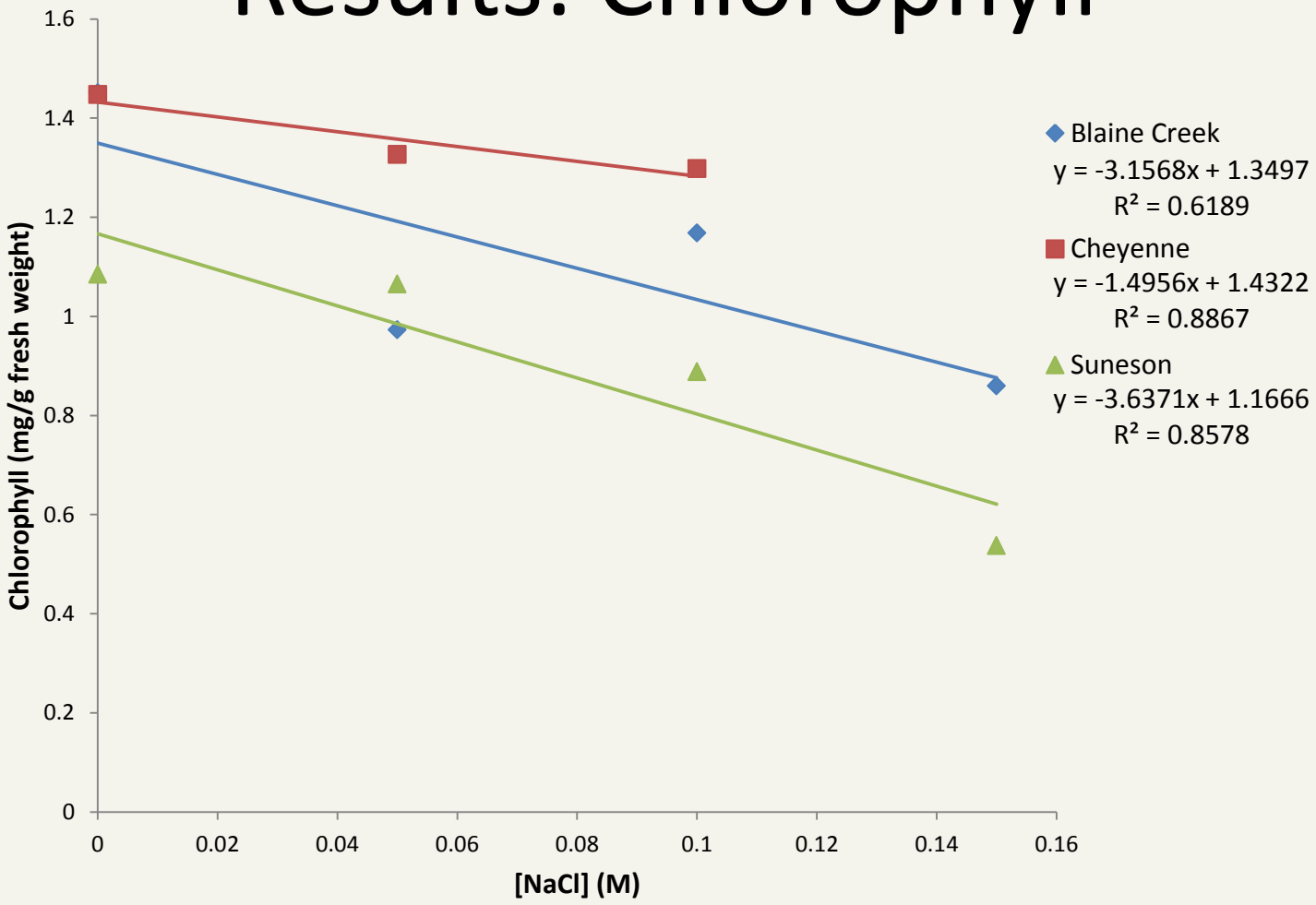
Methods and Materials

- Three cultivars– Suneson, Blaine Creek, Cheyenne
- Growth media – (4.43 g/L Murashige and Skoog salts + vitamins, 30 g/L sucrose, and 7 g/L agar) with range of NaCl concentration from 0 to 300 mM
- Grown with a 16 hour photoperiod for 3 weeks
- Proline estimation (Bates, 1973)
- Chlorophyll estimation (Holden et al. 1960)
- Cell cycle analysis (Otto, 1990)
- Stomata observations
- Wet and dry weight
- Length

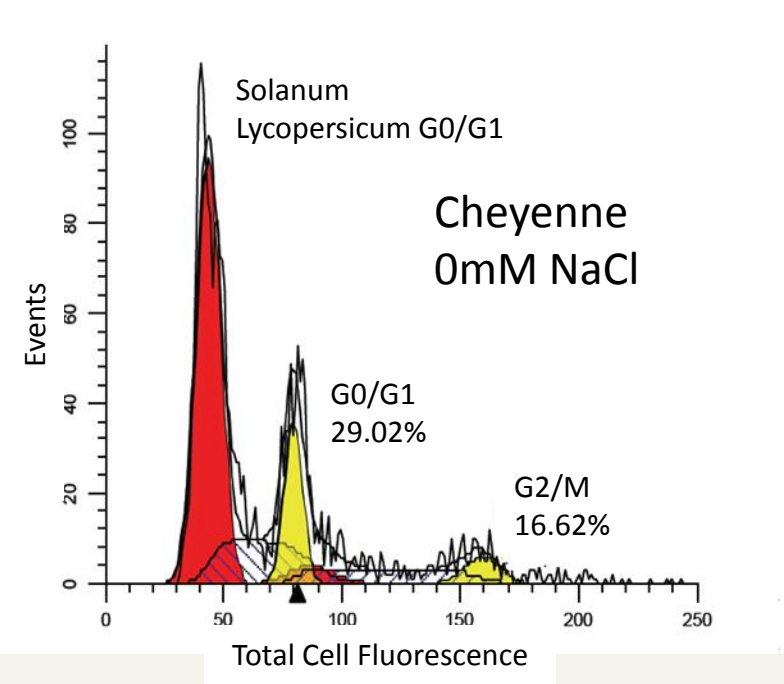
Results: Free Proline

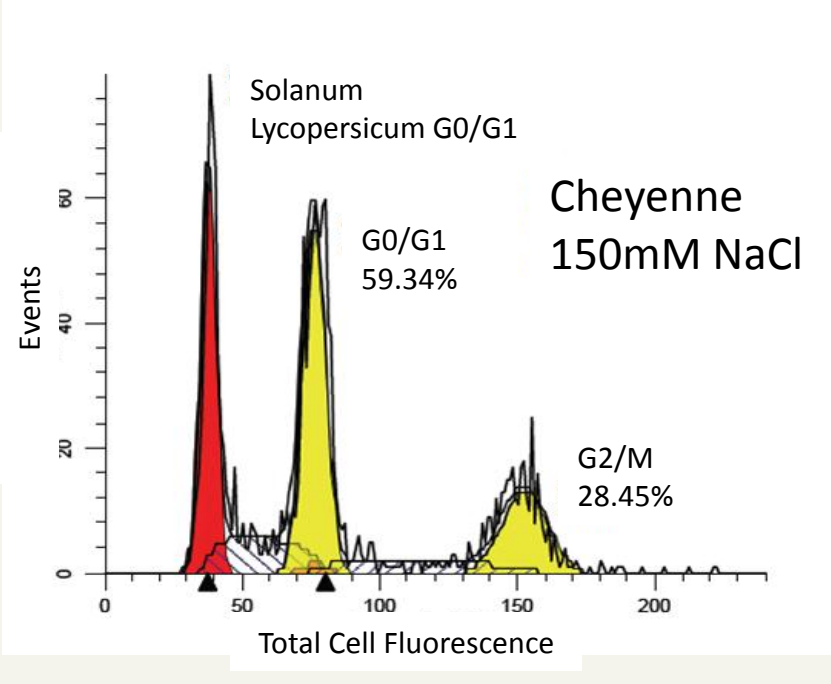


Results: Chlorophyll

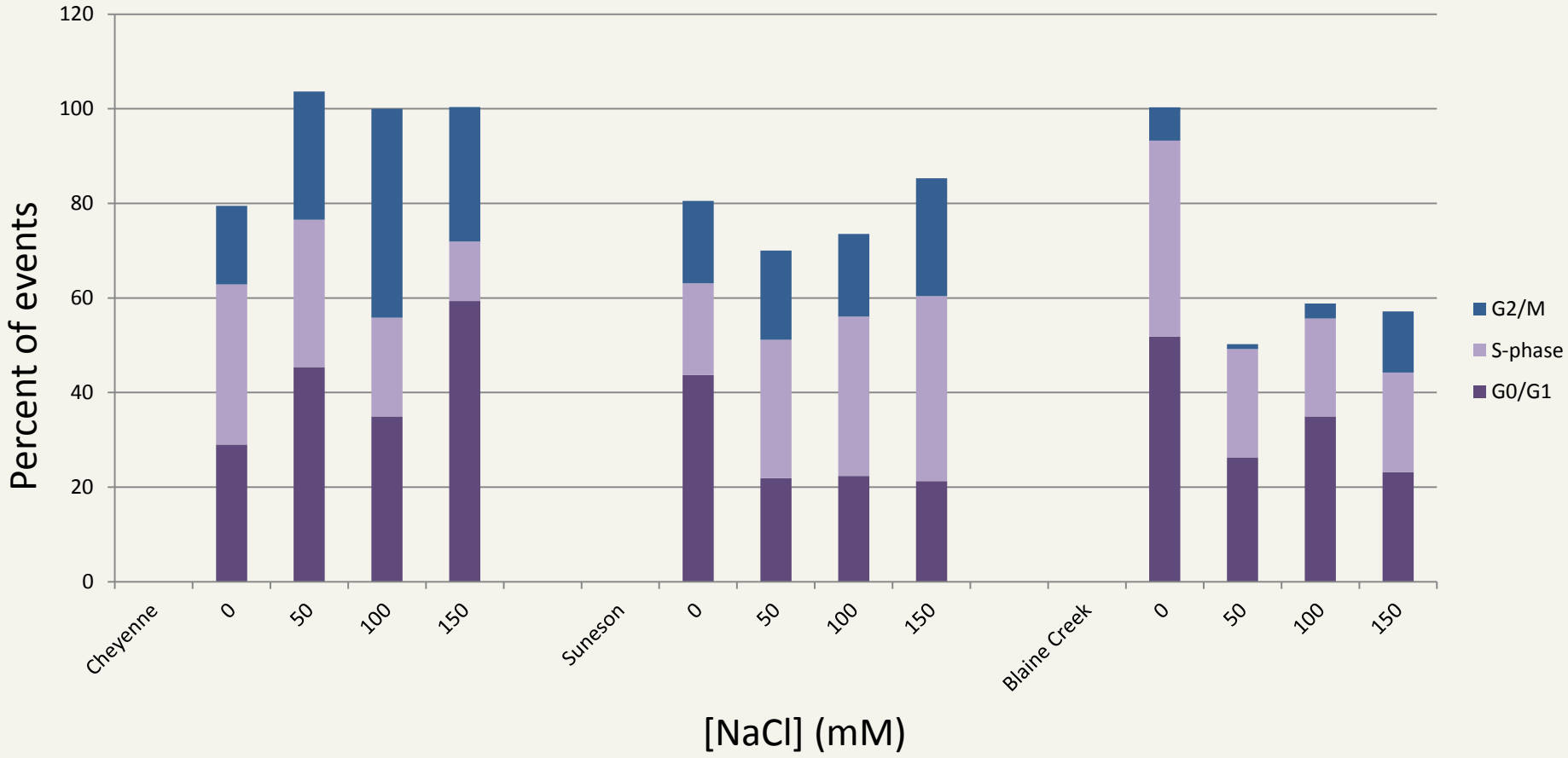


Results: Cell Cycle Analysis



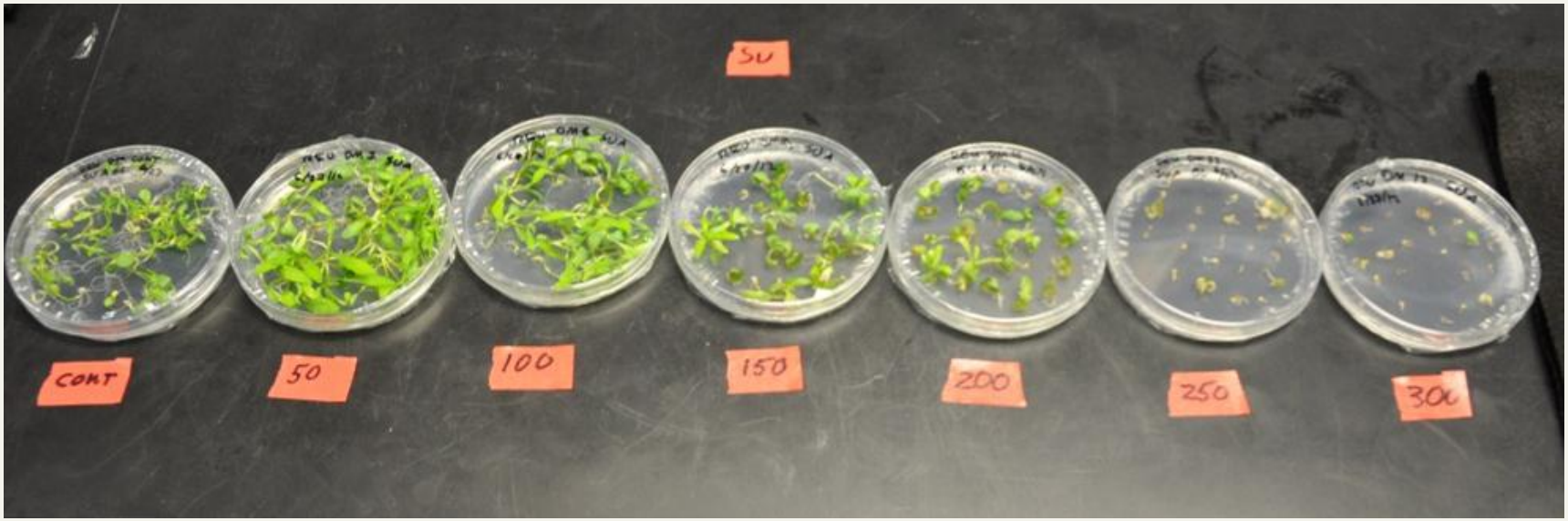


Results: Cell Cycle Analysis



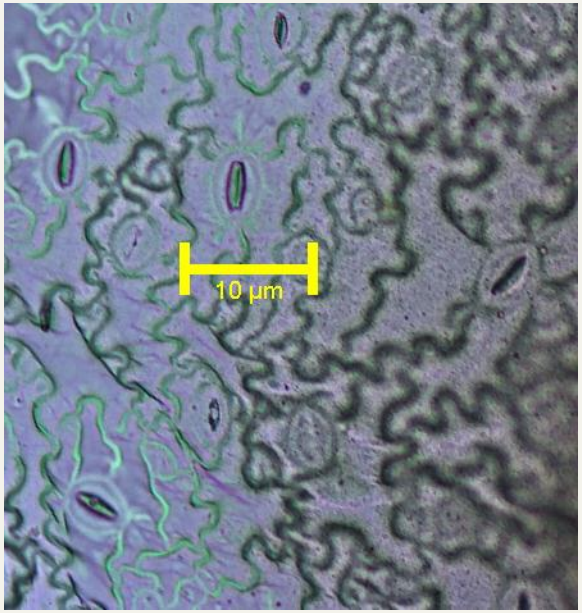
Results: Morphology

Sample plates of Suneson

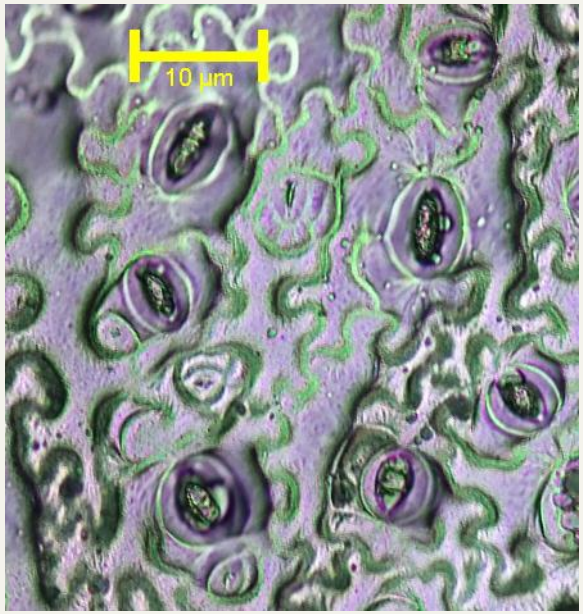


Results: Stomata

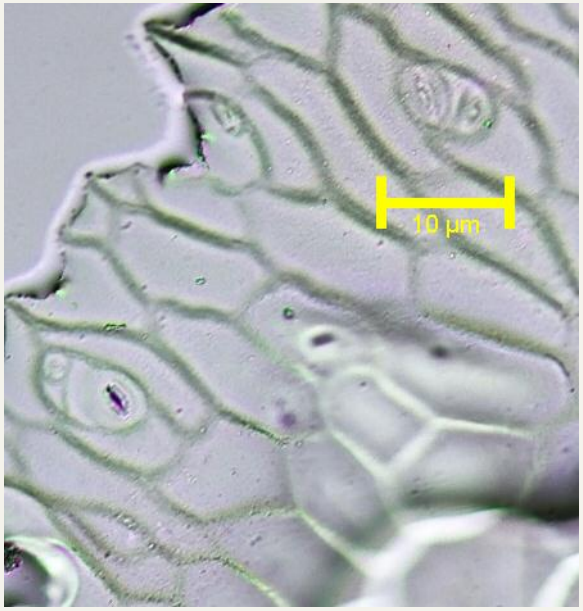
Cheyenne 0mM NaCl



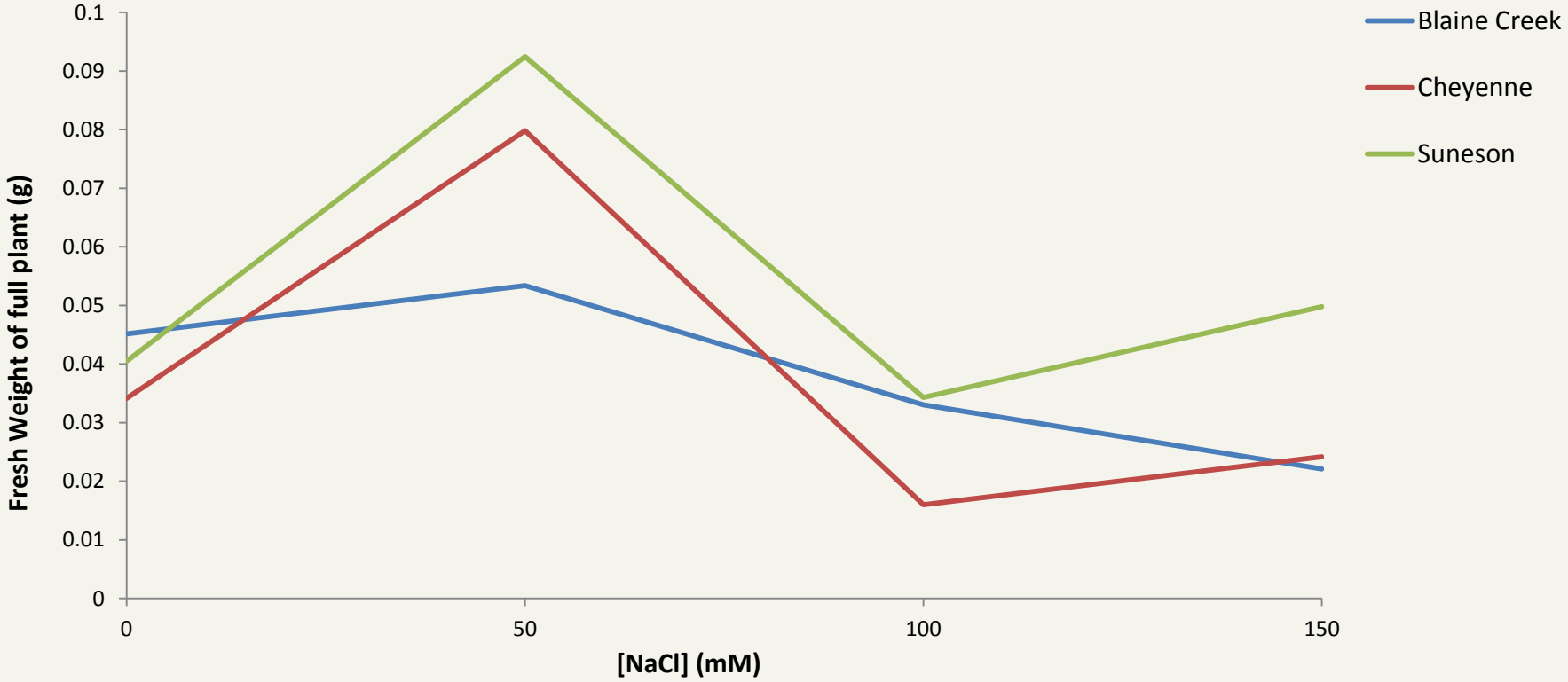
Cheyenne 50mM NaCl



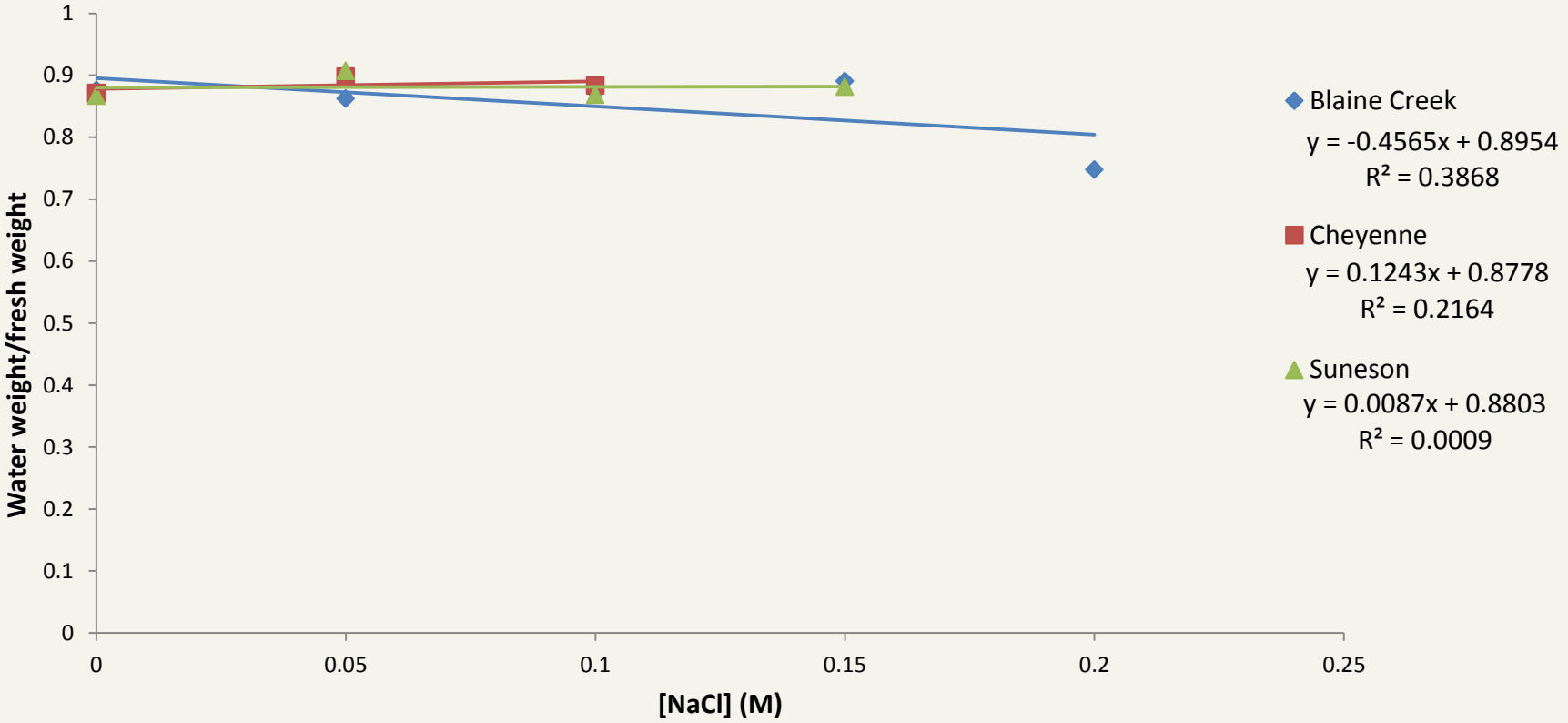
Cheyenne 150mM NaCl



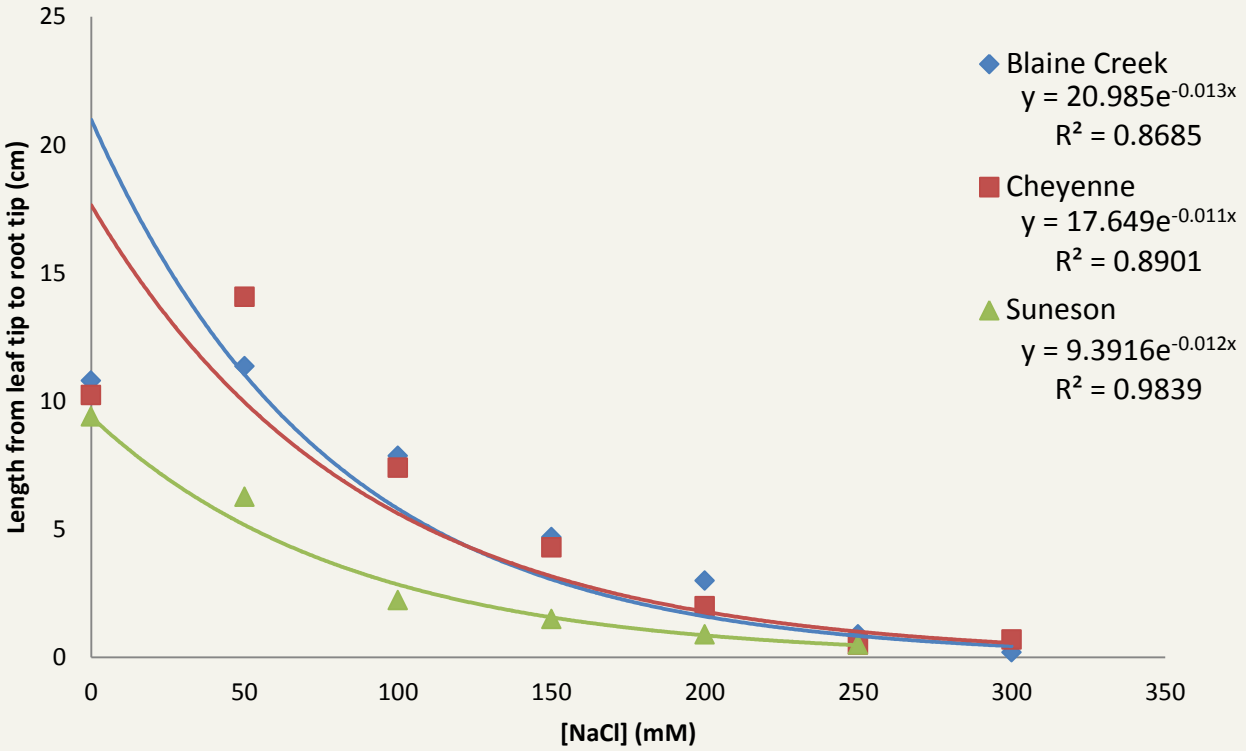
Results: Fresh Weight



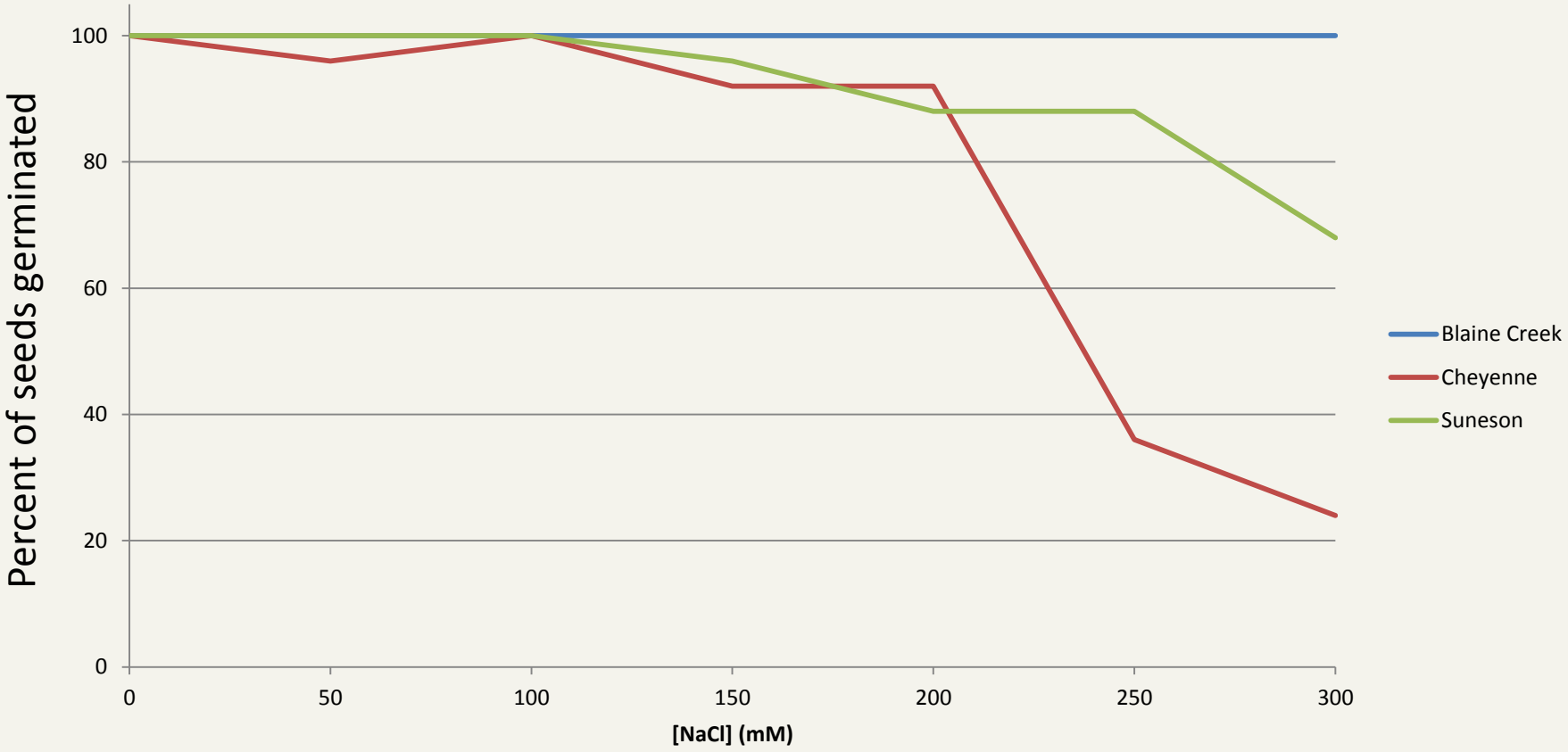
Results: Moisture Content



Results: Plant Length



Results: Germination Data



Summary/Conclusion

- Under salt stress:
  - Proline levels ⇧
  - Chlorophyll levels ⇩
  - Cell cycle analysis
  - Stomata size ⇩
  - Moisture Content =
  - Plant growth ⇩
  - Germination ⇩

Future Research

- DNA Microarray
- *In vivo* testing
- Compare oil yields and composition
- Genetic diversity
- Investigate 50mM growth phenomon

Acknowledgements

- National Science Foundation for REU funding.
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References

- Bates, L. S. (1973). Rapid determination of free proline for water-stress studies. *Plant and Soil (0032-079X)*,39 (1): p. 205-207
- Burssens S., Himanen K., Van de Cotte B., Beeckman T., Montagu M. (2000). Expression of cell cycle regulatory genes and morphological alterations in response to salt stress in *Arabidopsis thaliana.* Planta (2000) 211: 632-640.
- Delauney, A. J. and Verma, D. P. S. (1993). Proline biosynthesis and osmoregulation in plants. *The Plant Journal*, 4: 215–223. doi: 10.1046/j.1365-313X.1993.04020215.x
- Ehrensing, D. T., & Guy, S. O. (2008). Camelina. *Oregon State University Extension Services Catalog*, 1-7.
- Otto, F. (1990). DAPI staining of fixed cells for high resolution flow cytometry of nuclear DNA. *Methods in Cell Biology*, 105-110. Shonnard, D. R., Williams, L. and Kalnes, T. N. (2010), Camelina-derived jet fuel and diesel: sustainable advanced biofuels. *Environmental Progress & Sustainable Energy*, 29: 382–392. doi: 10.1002/ep.10461

Questions?