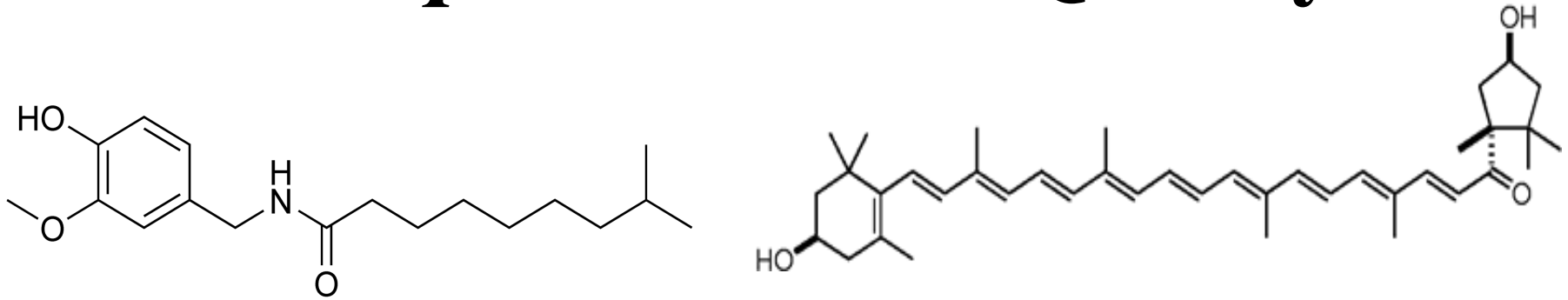


The Effect of Saline Irrigation on *Capsicum* Fruit Quality



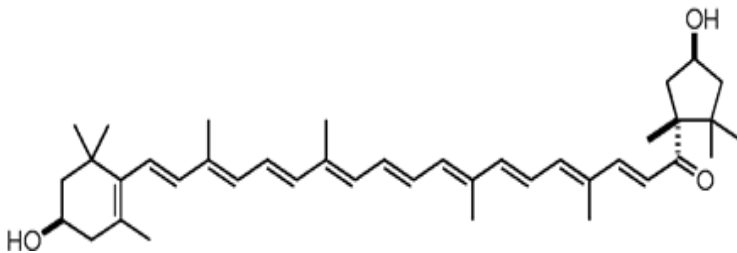
Barry Dungan

Plant and Environmental Sciences

Chile Products

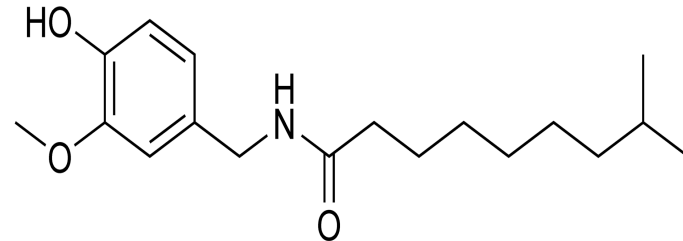
- Chile is an versatile crop for New Mexico
- Chile produces two commercially valuable secondary metabolites:

Carotenoids extracted for oleoresin production.



Color

Capsaicinoids extracted for spices, medicinal creams, and pepper spray.



Pungency

New Mexico Agriculture Issues

- Quality and abundance of water is an issue in New Mexico
 - semi-arid climate
 - Agriculture crops
 - Drought periods
- Approximately $\frac{3}{4}$ of the groundwater in New Mexico is saline (Reynolds, 1962)
- This study will compare the metabolite production in three chile cultivars irrigated with three different levels of saline water.

Objectives

- Determine the effect of saline irrigation on fruit quality traits in *Capsicum* species
- Characterize the expression of genes on the capsaicinoid and carotenoid biosynthetic pathway

Materials and Methods



Takanotsume



NuMex Garnet



Early Jalapeno

- Germinated in a growth chamber, transplanted to the greenhouse
 - 2 gallon pots
 - Metro Mix 360 soil

Materials and Methods

- Saline water treatments
 - Control (potable water)
 - 750 PPM/TDS
 - 1500 PPM/TDS
- 1.5 L every other day
- ~2 month period
- Fruit/Flower development monitored by tagging



Salt Profile

- Water collected from Geothermal well AC19373 near the NMSU golf course.
- 930 mg/L Na_2SO_4
- 105 mg/L KCl
- 150 mg/L MgSO_4
- 489 mg/L CaCO_3
- pH 6.5-6.8



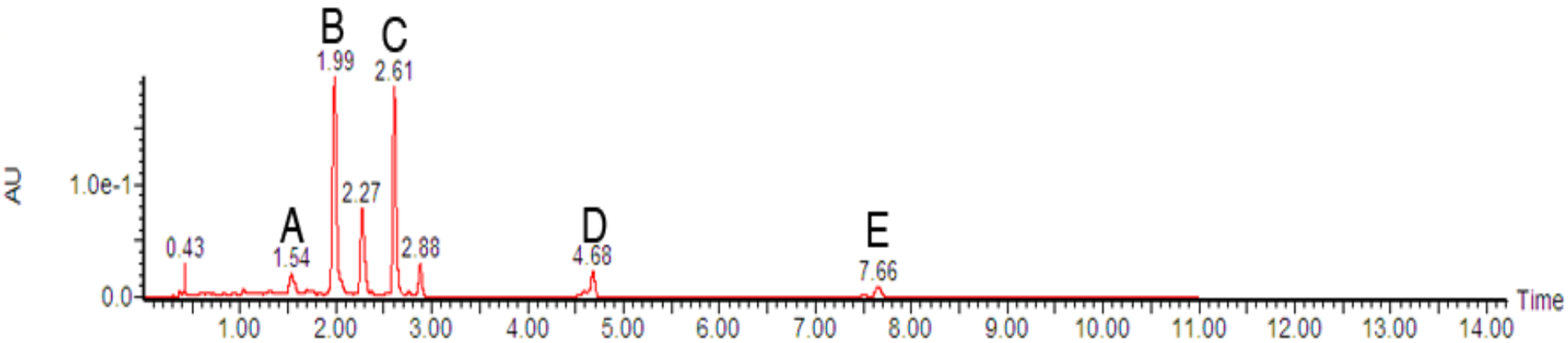
Data Collection

- Upon harvest the fruit was grouped by age, weighed.
- Half of the fruit was placed in a forced air oven for capsaicinoid and carotenoid analysis.
- Half of the fruit was placed at -80° for RNA analysis.

Metabolite Extraction

- Capsaicinoids:
 - 1g dry material sonicated in isopropanol 30 minutes, vortexed
- Carotenoids:
 - 2g dry material was sonicated in isopropanol 30 minutes
 - Saponified using Methanolic Potassium Hydroxide

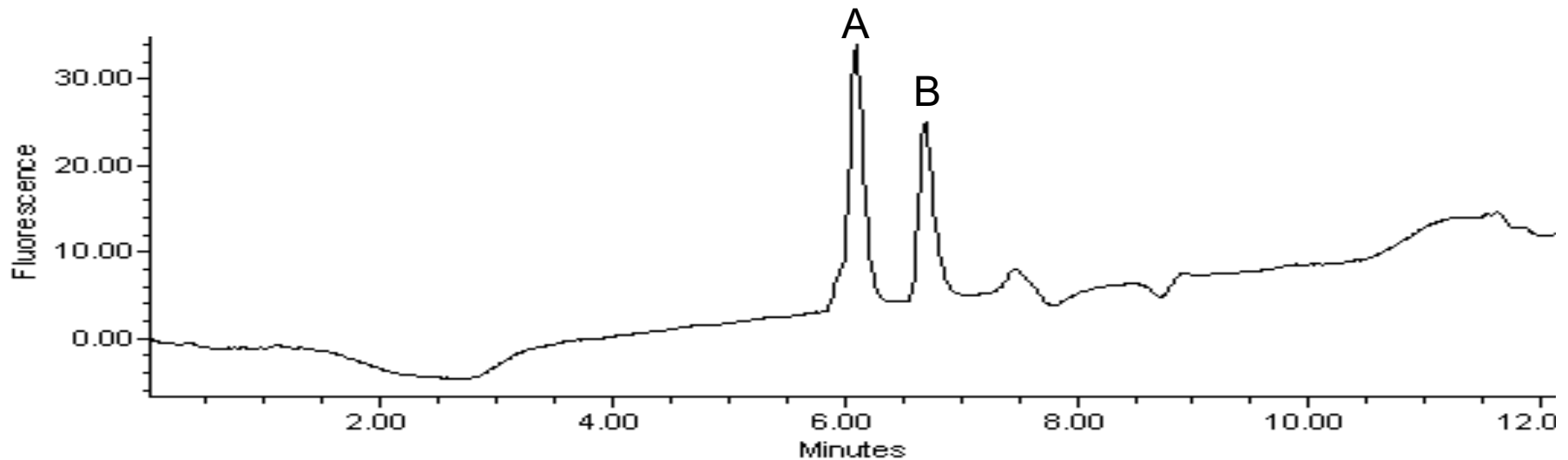
UPLC Chromatogram



Ultra Pressure Liquid Chromatography was used to identify 5 carotenoids

Peak A	Peak B	Peak C	Peak D	Peak E
Capsanthin	Capsorubin	Zeaxanthin	β-Cryptoxanthin	β-Carotene

HPLC Chromatogram



High Pressure Liquid Chromatography was used to identify 2 major capsaicinoids

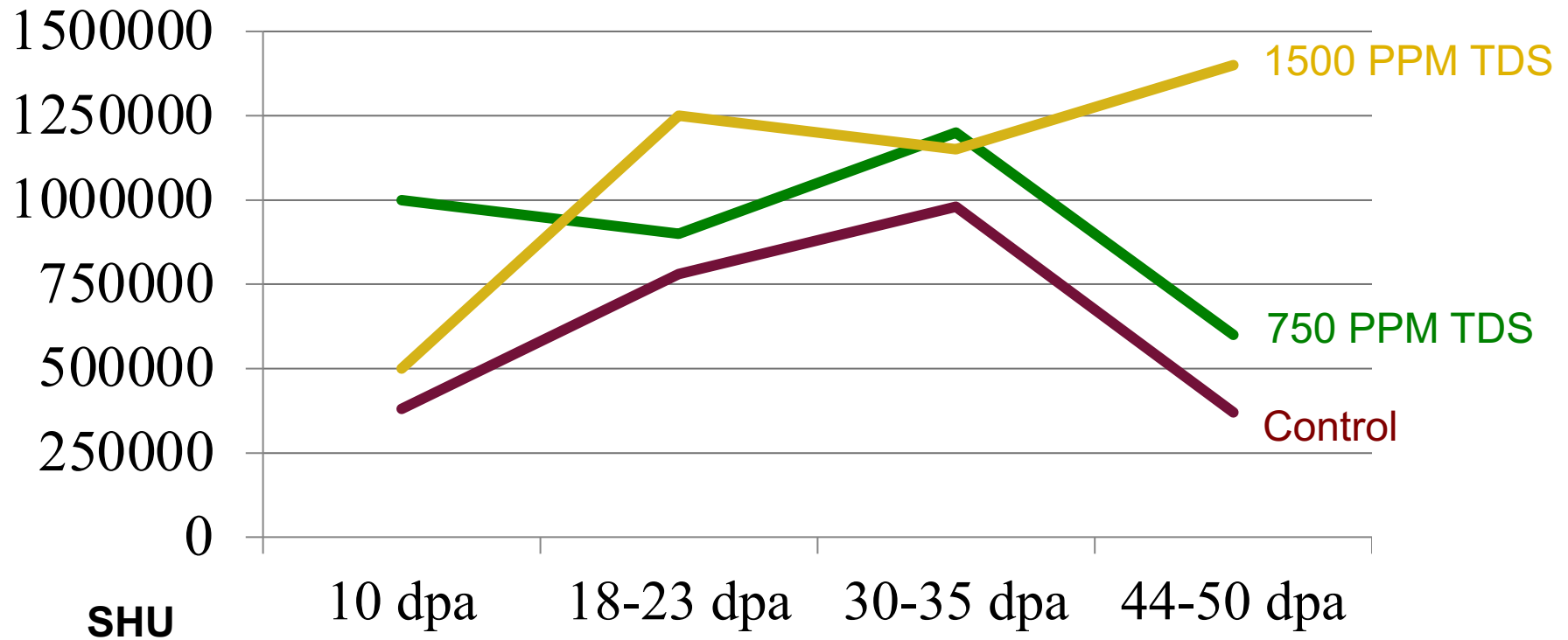
Peak A

Capsaicin

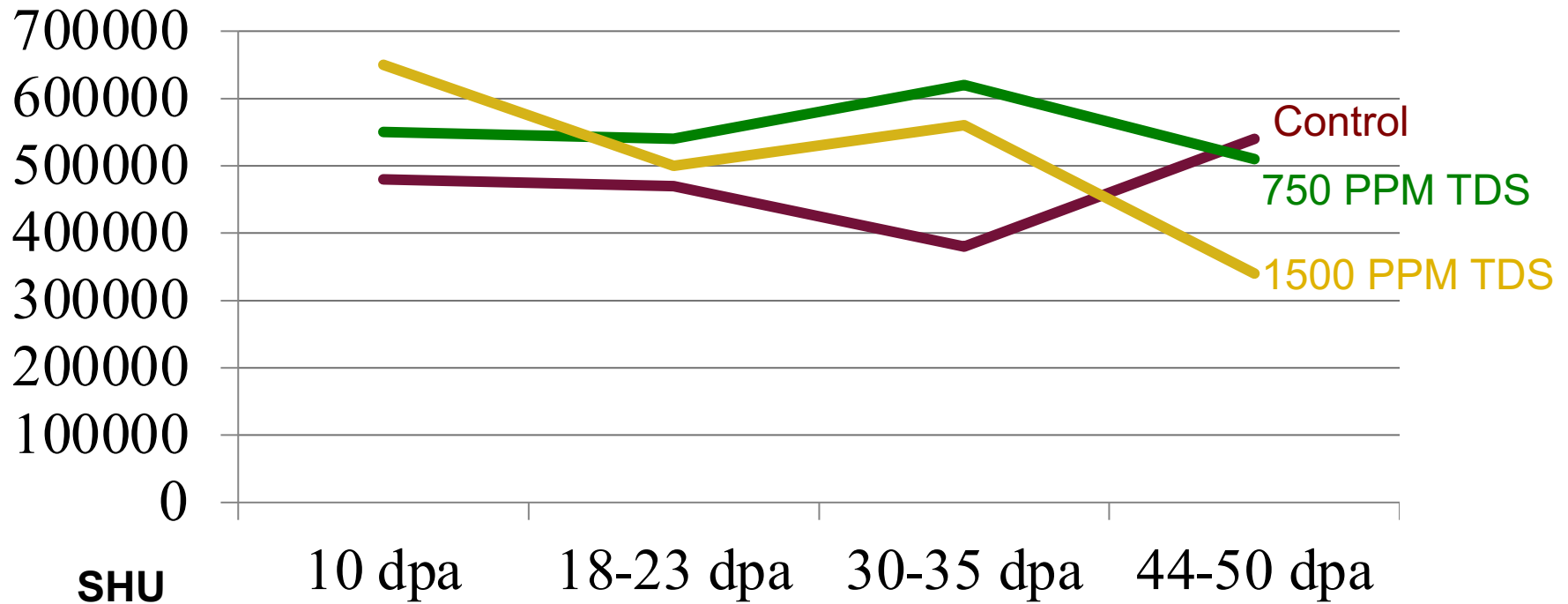
Peak B

Dihydrocapsaicin

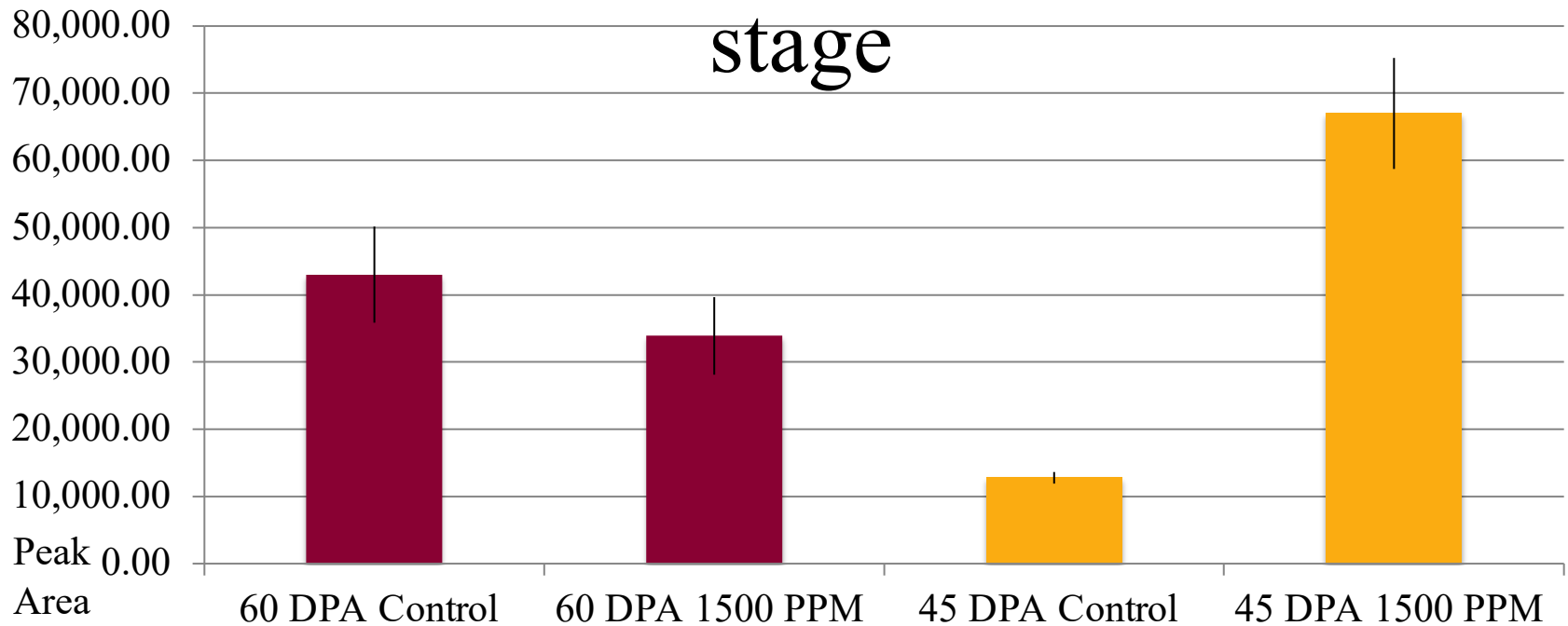
Accumulation of capsaicinoids in the fruit of Early Jalapeno



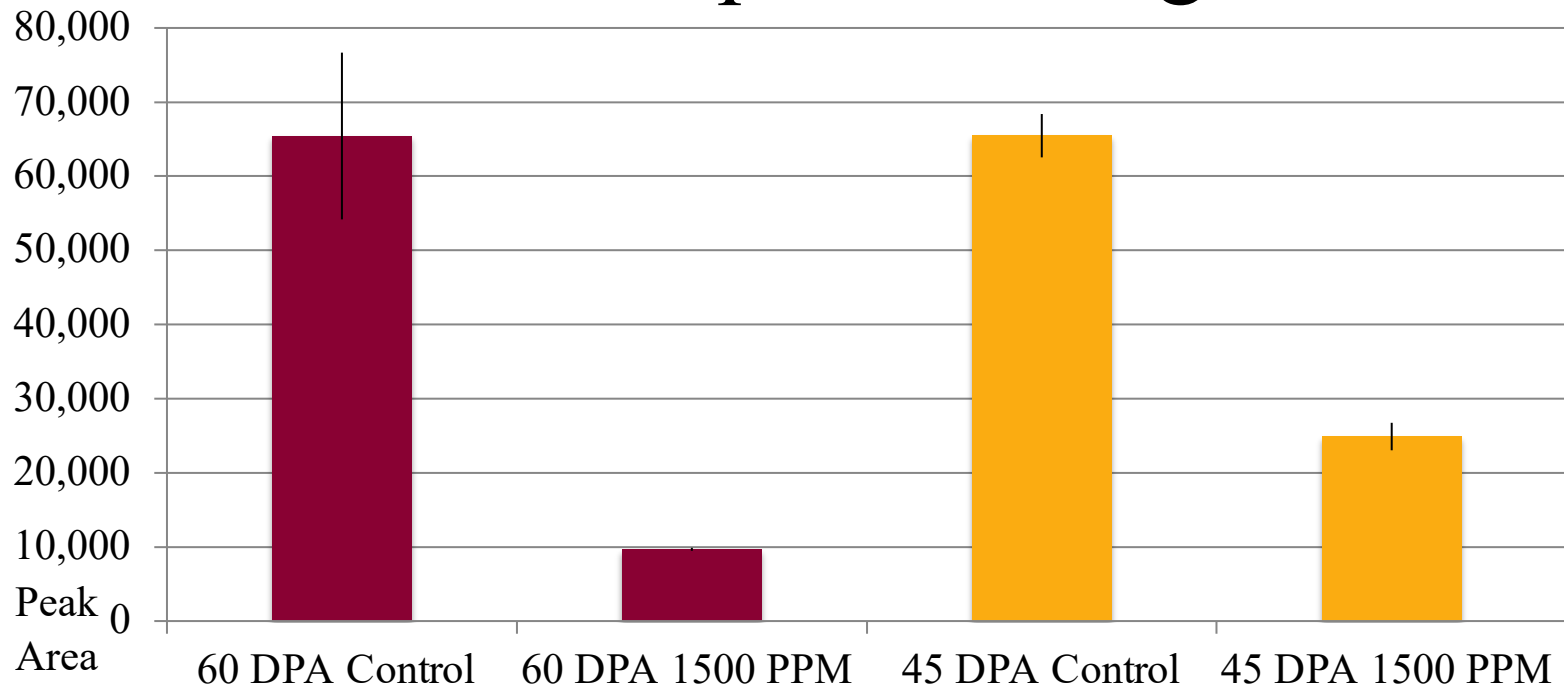
Accumulation of capsaicinoids in the fruit of Takanotsume



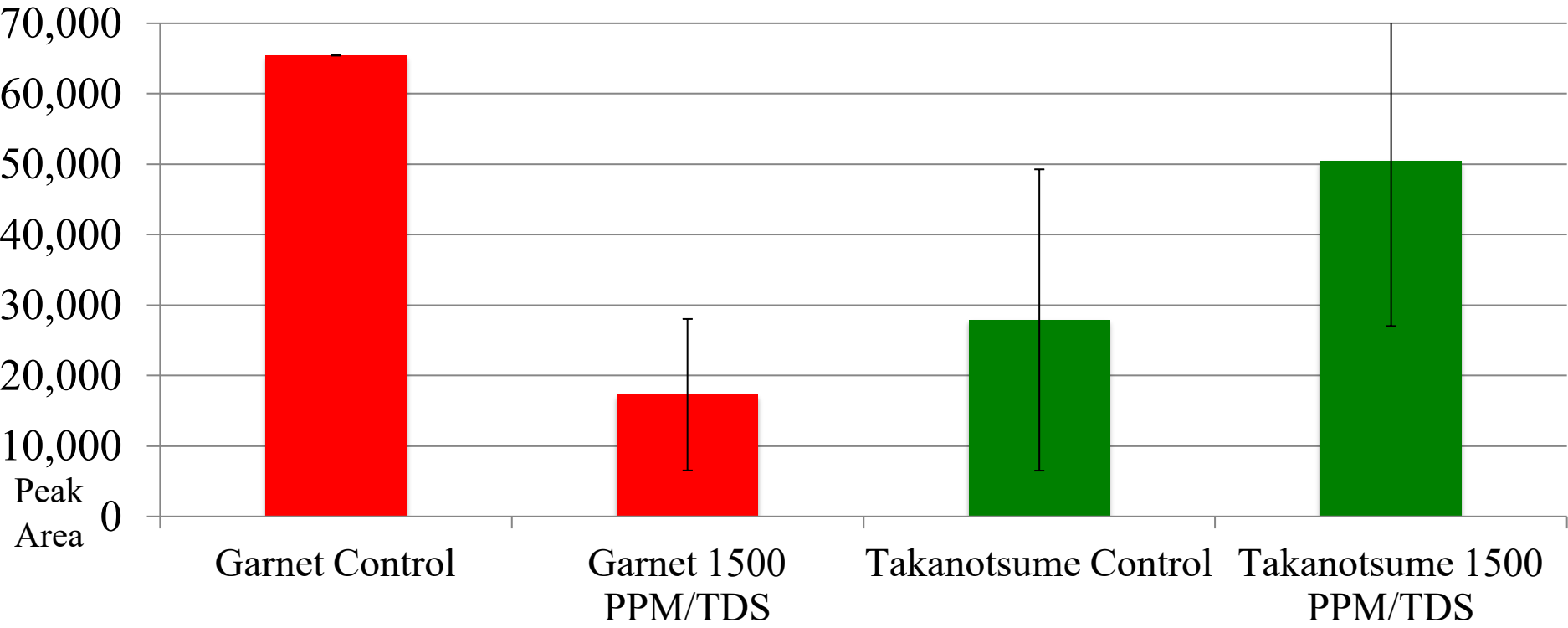
Total carotenoid accumulation in Takanotsume based on developmental stage



Total carotenoid accumulation in Garnet based on developmental stage



Total carotenoid accumulation in Garnet and Takanotsume



Results

- The HPLC and UPLC results show that capsaicinoid content in Early Jalapeno was increased with salt stress.
- There was a neutral effect in both capsaicinoid and carotenoid accumulation in Takanotsume.
- Garnet showed a decrease in carotenoid accumulation with salt stress.

Discussion

- Currently isolating RNA to characterize the gene expression for the capsaicinoid and carotenoid pathways.
- The second replication for this experiment has been harvested and fruit analysis is underway.
- Depending on the results, other cultivars may be tested.
 - Other salt concentrations or salt ratios may be tested.

Acknowledgments

- Dr. O'Connell
- Dr. Rich Richins
- Erin Fitzgerald
- Harvest Crew
- Omar Holguin
- S.W.A.T lab
- Chile Pepper Institute

Reynolds, S.E., 1962, *Twenty-fifth biennial report of the State Engineer of New Mexico for the 49th and 50th fiscal years July 1, 1960, to June 30, 1962: Albuquerque, The Valliant Company, p 193*

Questions?

