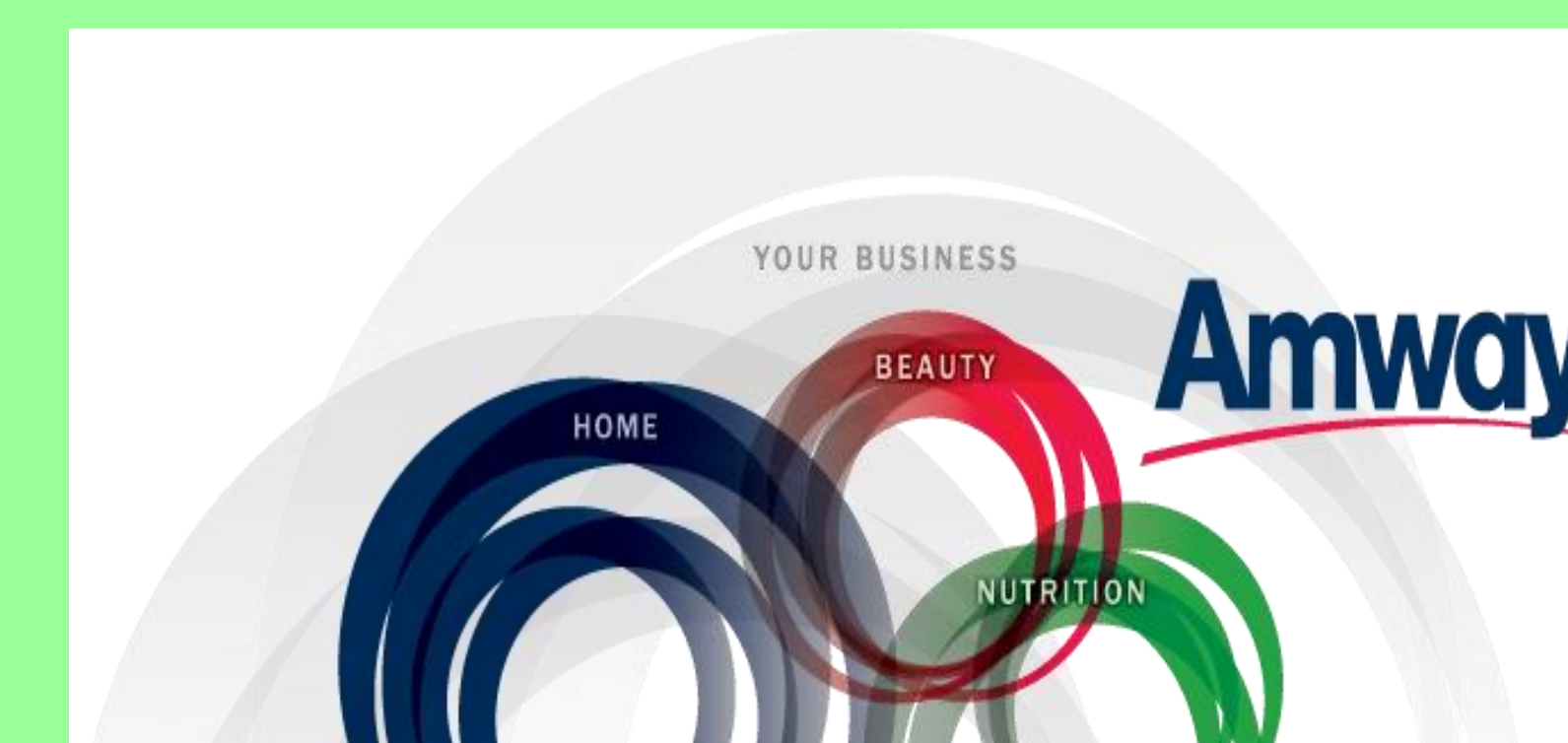


Organic Nitrogen Fertilizer Effect On Growth and Phytonutrients Of Echinacea Purpurea In Eastern Washington

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INTRODUCTION

- Echinacea purpurea is an herbaceous perennial in North America
- Echinacea purpurea contains multiple nutrients, such as polysaccharides, caffeic acid derivatives, alkylamides, and glycoproteins
- Echinacea purpurea can be used for wounds, burns, and insect bites, as well as toothache, body infections.
- Nutriline Trout Lake Farm is the oldest and largest Echinacea producer in the USA
- Trout Lake farm supplies Echinacea purpurea to Amway for products of
 - Nutriline Immunity Echinacea
 - Amway Nutriline Triple Guard Echinacea
 - Echinacea citrus concentrate plus
- In the present study, we investigated the organic nitrogen fertilizer effect on Echinacea purpurea production and quality (phytochemical content).

ABSTRACT

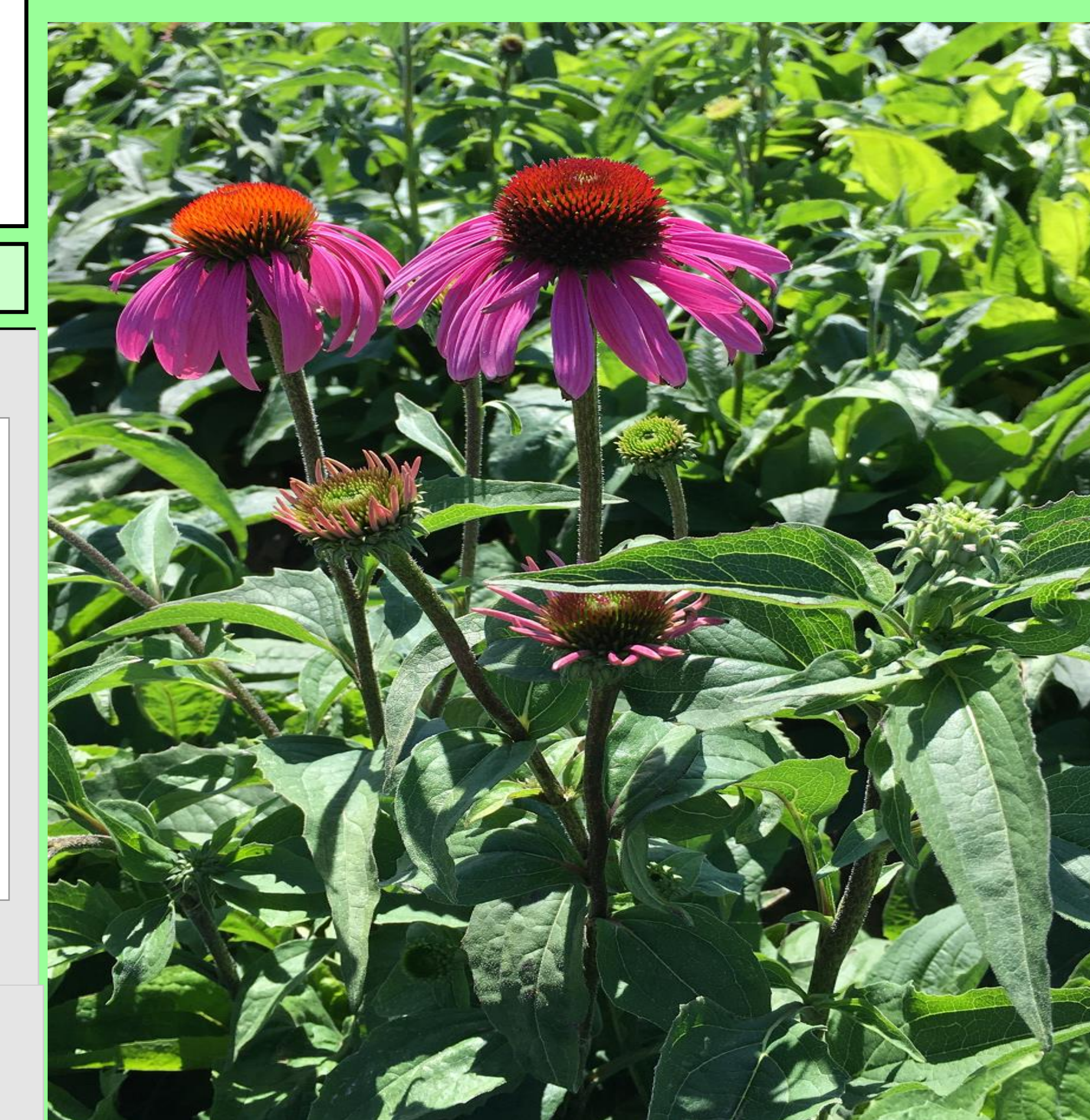
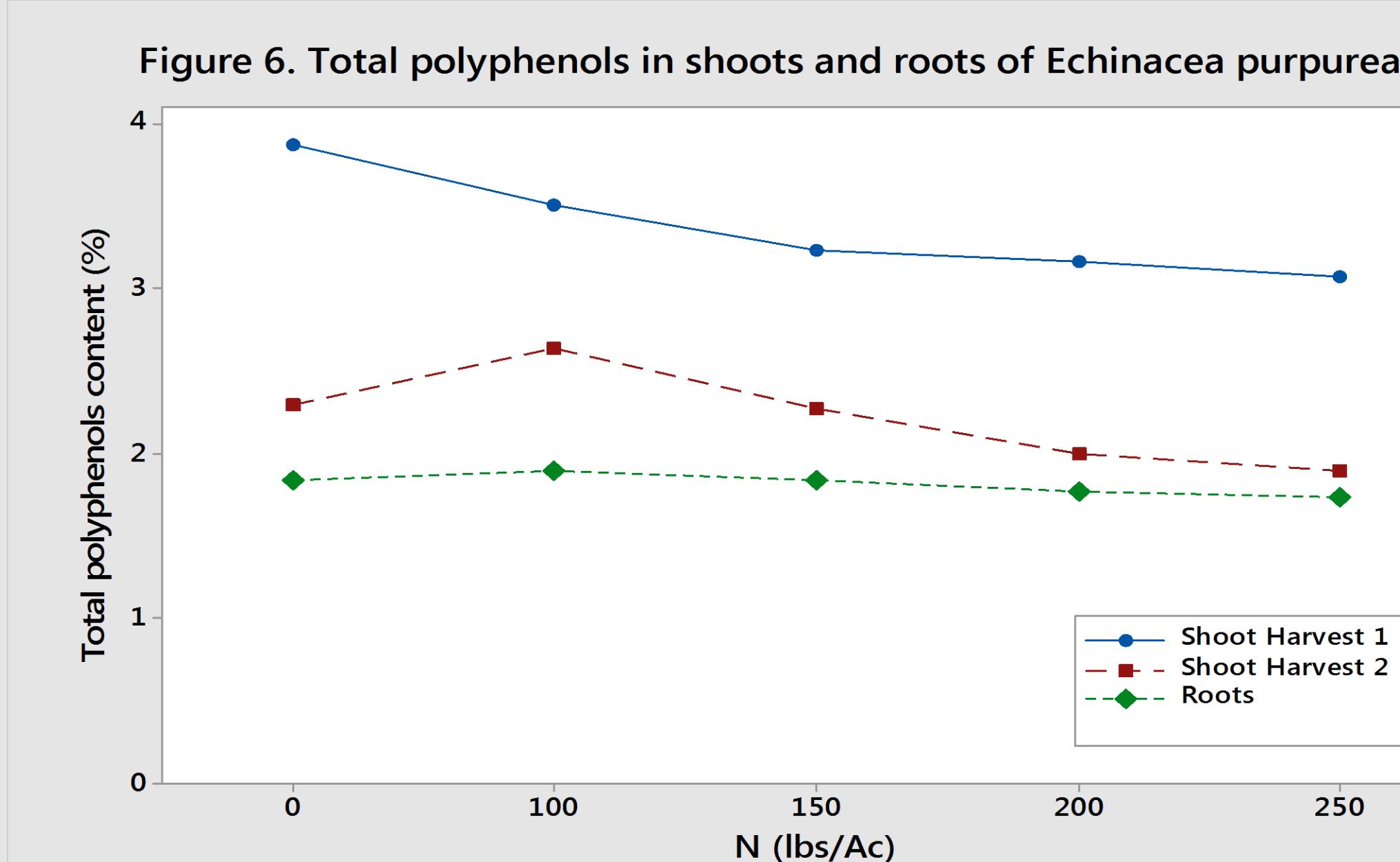
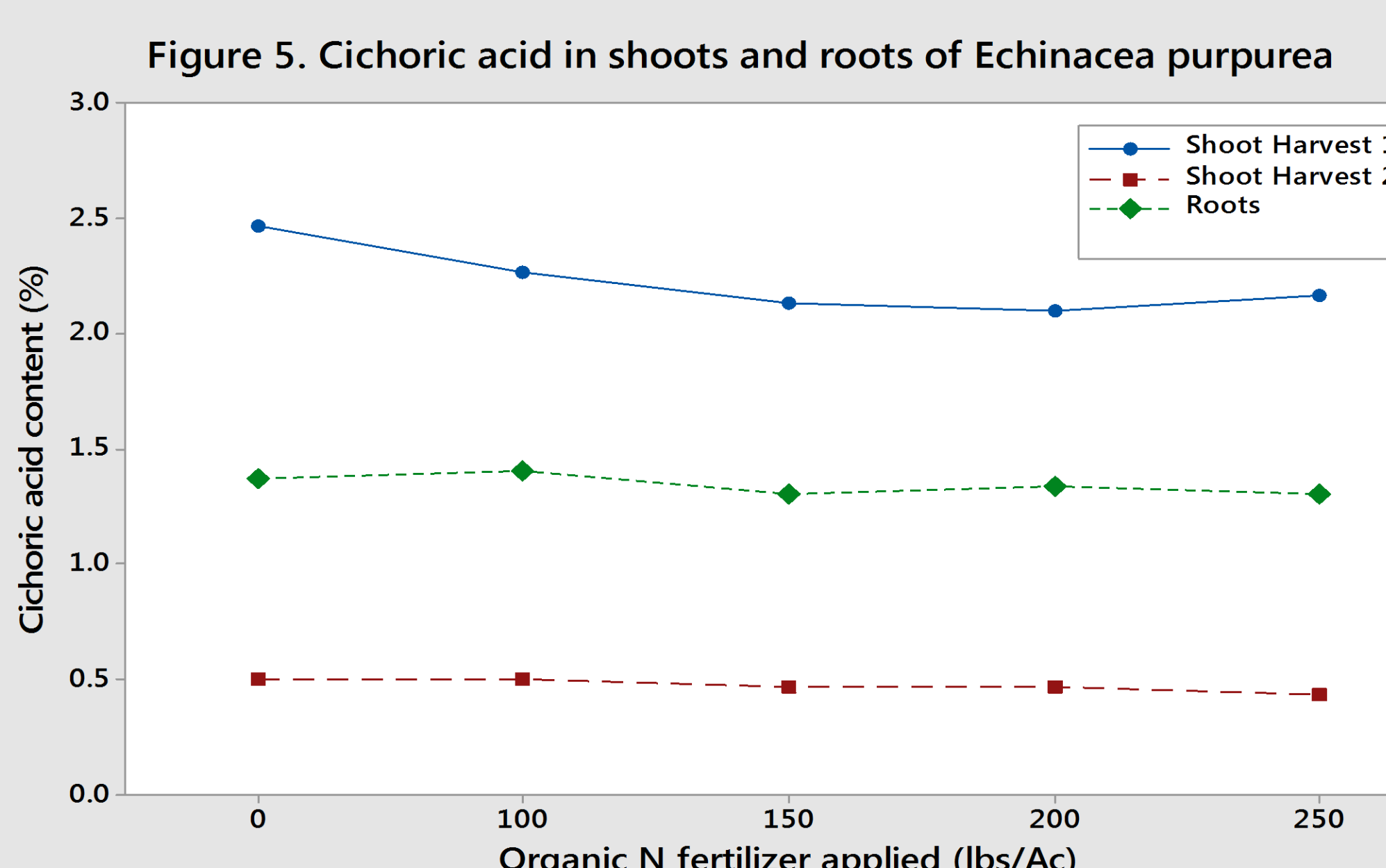
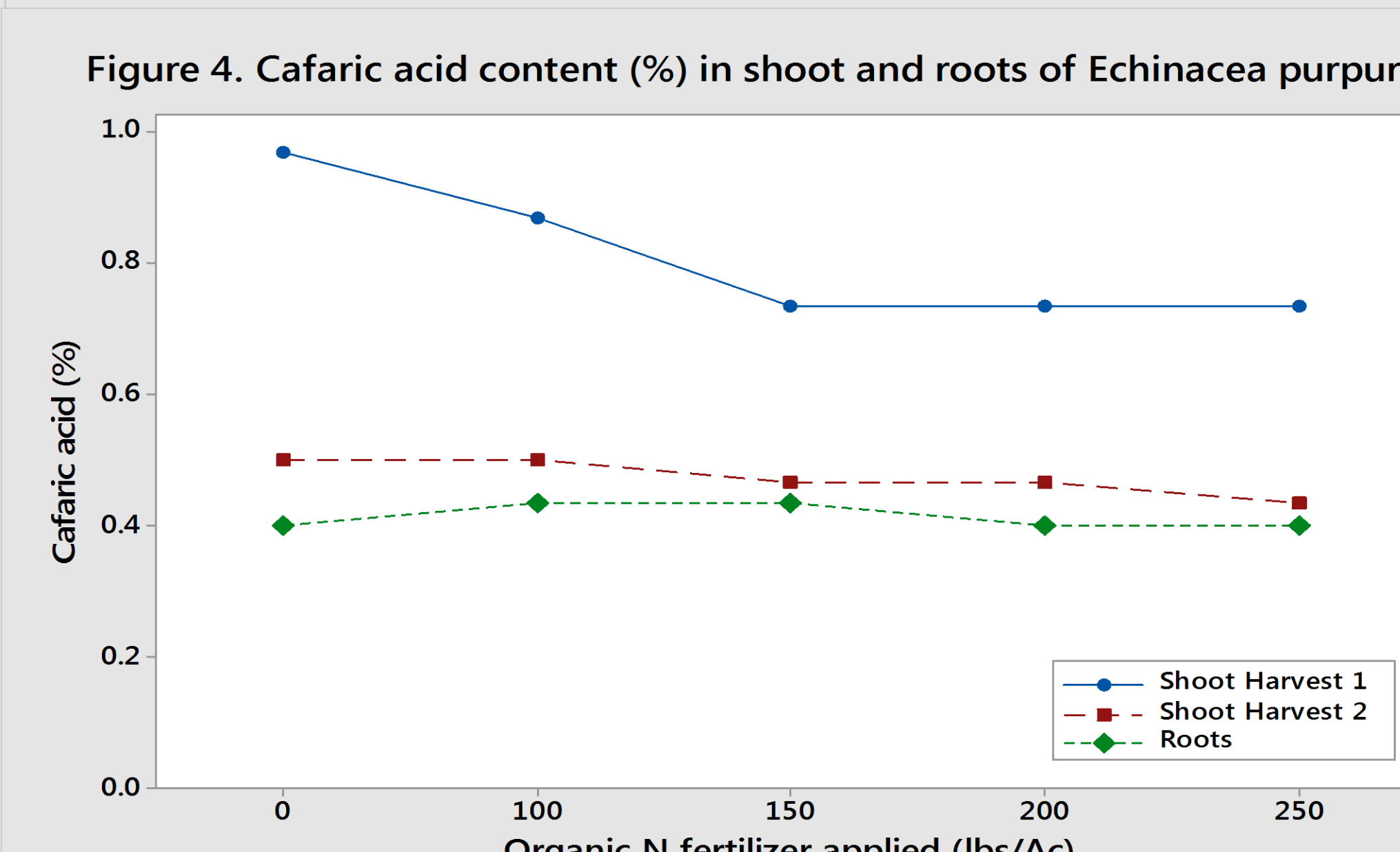
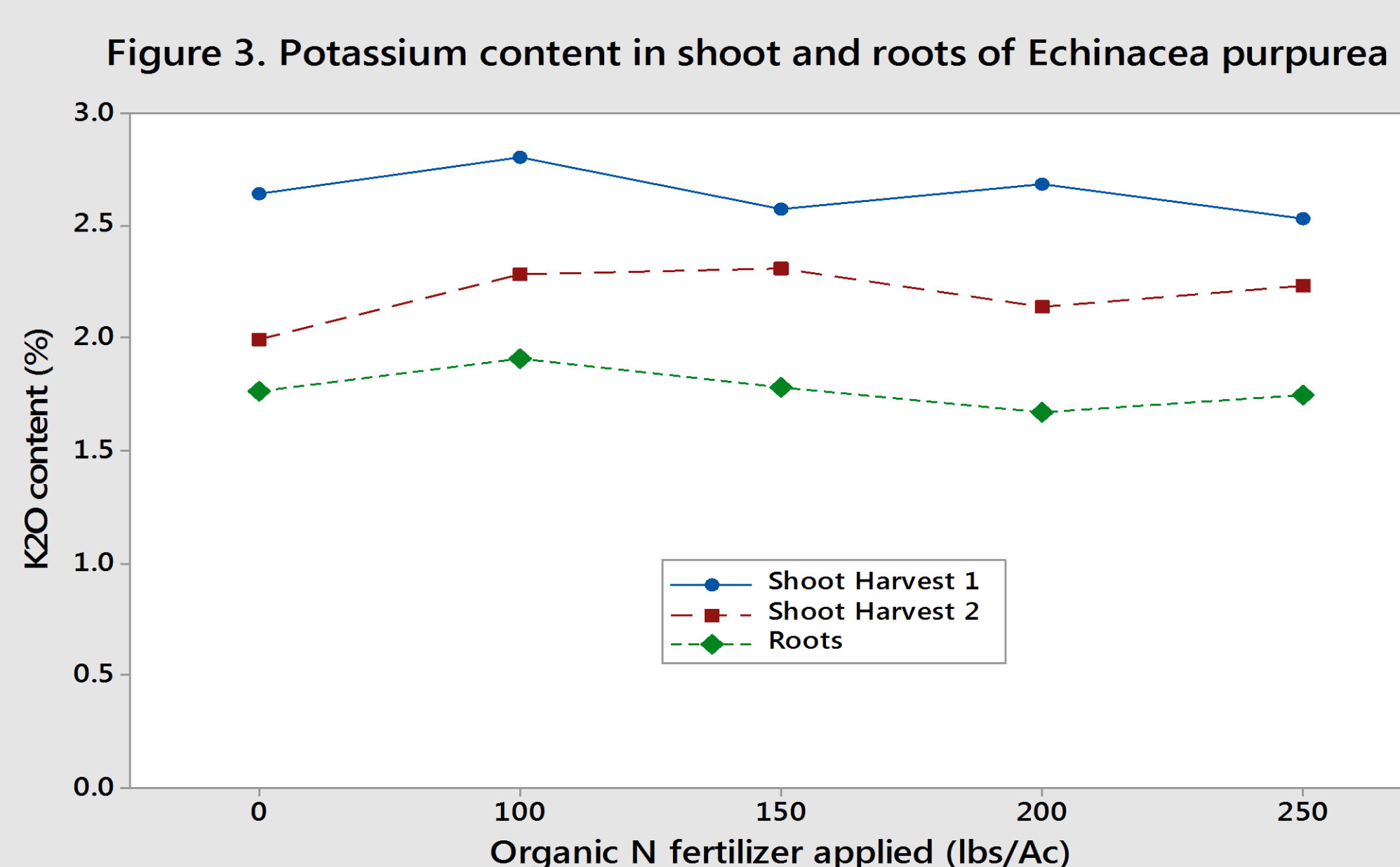
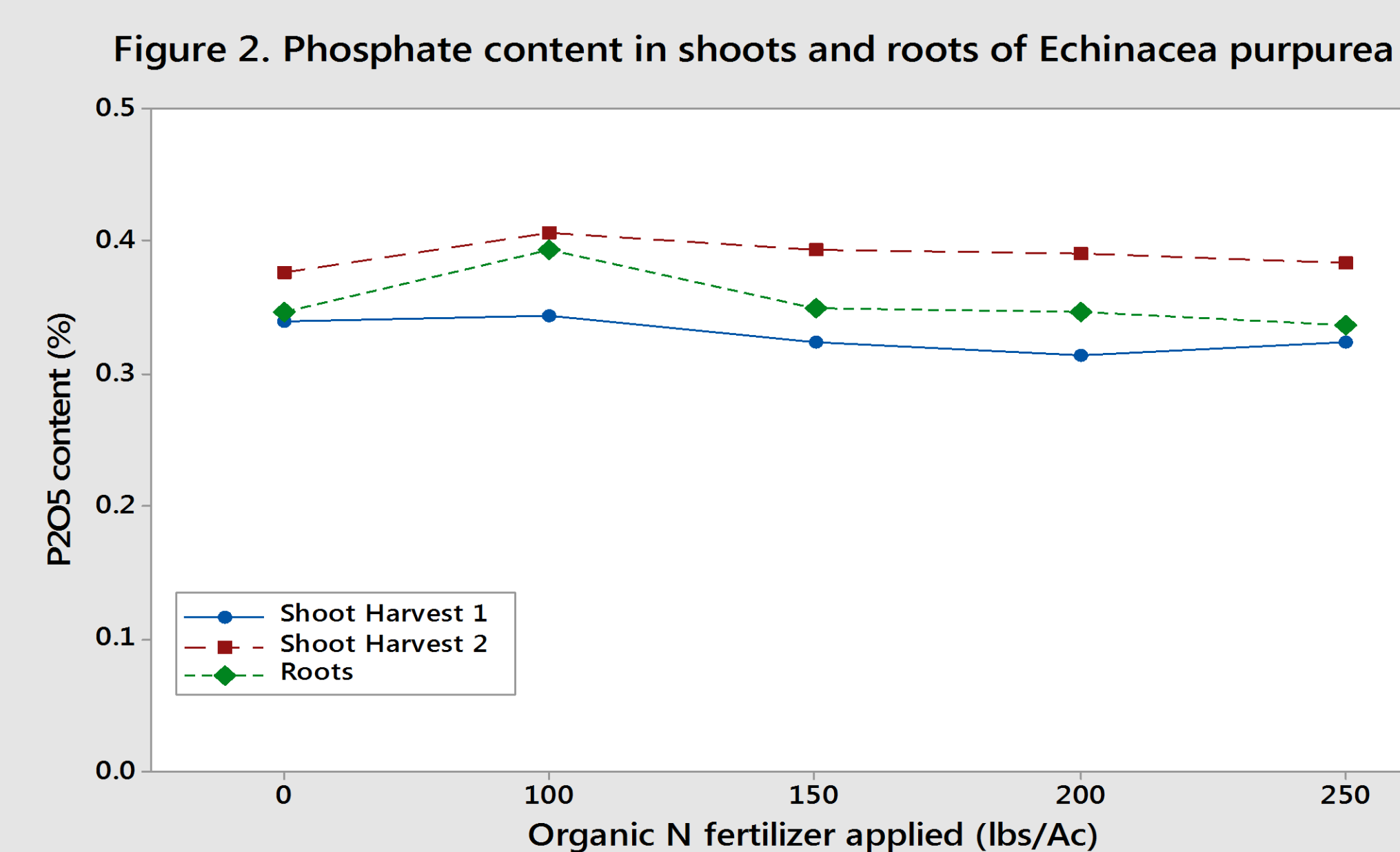
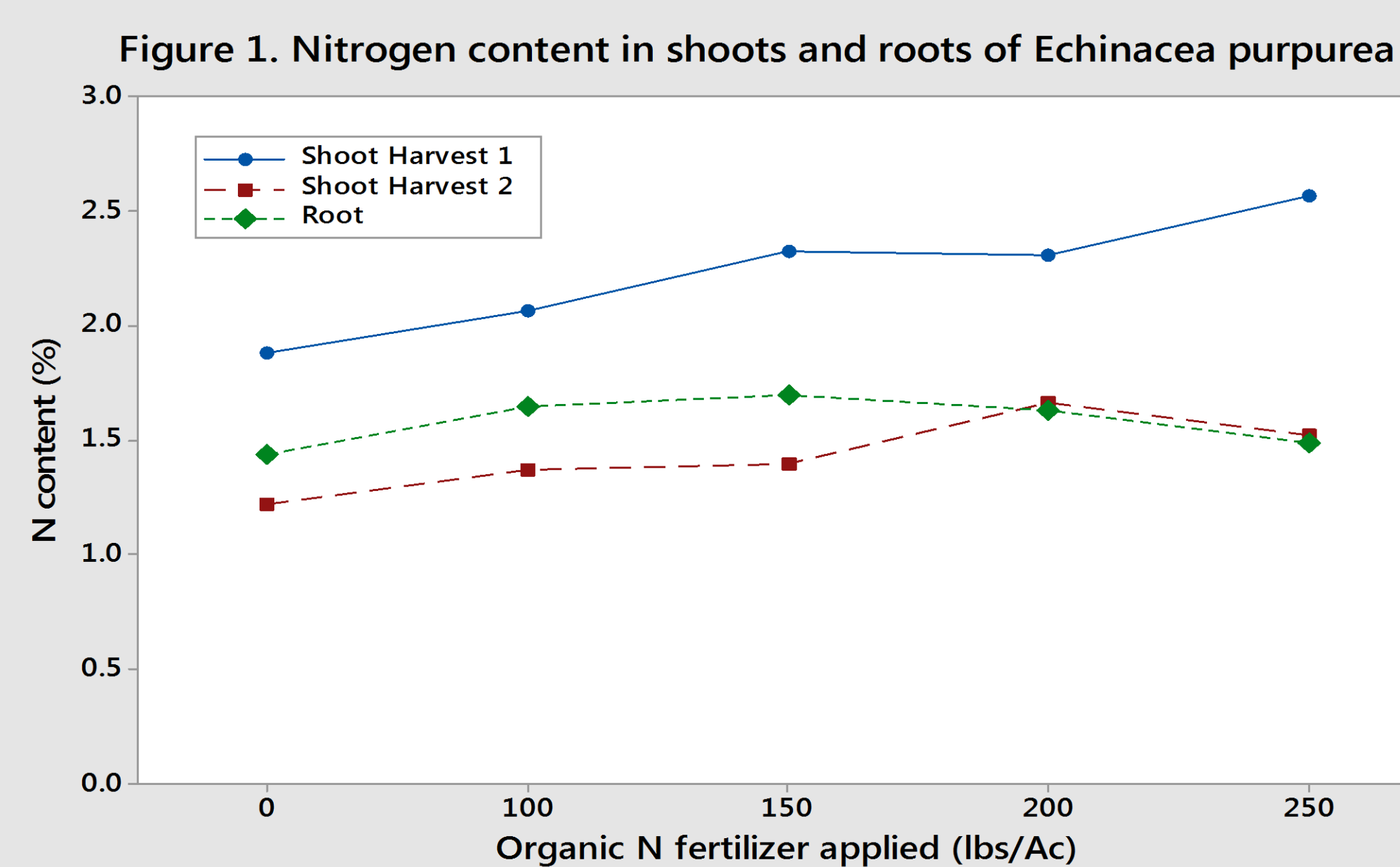
Echinacea Purpurea or purple coneflower is a traditional herbal medicinal for American Indian and now used to stimulate immune system. However, there are different report on its response to nitrogen fertilizer. In 2015, a nitrogen benchmarking study was conducted to investigate the growth, phytonutrient levels in Echinacea purpurea shoots and roots in response to nitrogen rates. Nitrogen feathermeal (13-0-0) was applied to Echinacea purpurea in April at the rate of 0, 100, 150, 200, or 250 pounds Nitrogen/Acre (lbs. N/Ac). Shoots were harvested at early July and end of the October, respectively. Roots were harvested at the end of October. In the July harvest, organic nitrogen fertilizer increased Echinacea shoot biomass with the highest production at 150 lbs. N/Ac. In the October harvest, organic fertilizer increased the biomass of both shoots and roots with the highest production at 200 lbs. N/Ac. 100 to 200 lbs./Ac Nitrogen fertilizer also increased nitrogen levels in shoots in July harvest and shoots and roots in October harvest. In July harvest, nitrogen fertilizer decreased the content of cafaric acid, cichoric acid, and total polyphenols in Echinacea purpurea shoots, in a dose response manner. In October harvest, nitrogen fertilizer did not significantly affect shoot cafaric acid content. However, high dose nitrogen fertilizer (200 and 250 lbs. N/Ac) increased shoot cichoric acid, total Polyphenols content. Furthermore, nitrogen fertilizer decreased the contents of total alkamides, caftaric acid, cichoric acid and total polyphenols in the roots of Echinacea purpurea. In conclusion, a low dose of nitrogen fertilizer (100 – 200 lbs. N/Ac) can be applied to maintain the balance of growth and quality to Echinacea purpurea

Key words: Echinacea purpurea, organic nitrogen fertilizer, biomass, caftaric acid, cichoric acid, total polyphenols

Materials and Methods

- Plant materials
 - Species: Echinacea purpurea
 - Plants were established in the field for multiple years.
- Experiment Design
 - A Randomized Complete Block design
 - Five treatments (Five N rates)
 - Three replicates
 - Total 15 plots
 - Four rows (68 inches in width) and 10 feet in length in each plot
 - 5 feet apart each replicate
- Treatments
 - Spread 13-0-0 feathermeal on each plot at June 14, 2015
- Harvest
 - First harvest at June 29, 2015 for above ground shoots.
 - Second harvest at October 27, 2015 for shoots and roots
 - Only harvested plants in two central rows.
 - Samples were cleaned and dried at ambient temperature
- Measurements:
 - Biomass of shoots and roots
 - Nutrient Content (N, P, K, Ca, Mg, etc.) in shoots and roots
 - Conducted at A&L Laboratory
 - Phytochemical (Cafaric acid, Cichoric acid, Total Polyphenols, Chlorogenic Acid, Cynarin, Echinacoside and Total Alkamides) content in shoots and roots
 - Measured internally at Analytical Sciences Group in Ada, MI.

Summary Of Results – Statistical Analysis



CONCLUSIONS

- One time application of organic nitrogen fertilizer (Feathermeal) increased Echinacea purpurea leaf and root biomass (data not shown)
- N fertilizer increased shoot N content at June shoot harvest.
- N fertilizer did not affect phosphate and potassium content in shoots and roots of Echinacea purpurea.
- N fertilizer decreased the content of Cafaric acid, Cichoric acid and Total Polyphenols in Echinacea purpurea shoots during June harvest.
- N fertilizer did not affect content of Cafaric acid, Cichoric acid and Total Polyphenols in shoots and roots of Echinacea in October harvest.
- For the production of Echinacea purpurea at central Washington State, Spring application of Organic N fertilizer can only improved the shoot yield in a shoot period.
- 150 – 200 lbs/Ac N fertilizer application could be highest rates for Echinacea purpurea.

Statistics

- Run One Way ANOVA Test with Minitab 17 for all data