BIOCHAR AND COMPOST BLENDS FOR ENHANCING CROP PRODUCTION IN CALIFORNIA

USDA ARS SAN JOAQUIN VALLEY AGRICULTURAL SCIENCE CENTER | PARLIER, CA

USBI 2016

Charborn

INTRODUCTION

- Collaborative Research and Development Agreement between USDA ARS and Charborn, LLC
- Field Trial located in the heart of the San Joaquin Valley, California
- Mediterranean climate: precipitation limited to winter & spring
  - Area in midst of multi-year, record-breaking drought
- Crop: dehydrator onions; a locally relevant commercial crop

OBJECTIVES

- Objectives
  - Test pure biochar (Bio) and two different blended biochar amendments (BC & BCS)
  - Provide three different irrigation regimes: 100% (high), 75% (medium), and 50% (low)
  - Observe onion crop growth curves, yields, and quality

EXPERIMENTAL DESIGN

- 2 acres plot area
- Split-plot design
  - 3 irrigation levels – low, medium, high
  - 4 amendment - soil check, Bio, BC, BCS
  - 3 replications
- 24” beds (40” center-to-center) with 6 seedlines &
  2 driplines per bed; 2 beds per plot
- Amendment Application Rate:
  - 12-13 dry tons/acre (60-65 cy/a)
  - Biochars applied to soil surface and incorporated before bed formation
- Irrigation: sprinklers from germination to 3-4 leaves
  - Differential drip irrigation, controlled/scheduling by real-time soil moisture and matric potential measurements
  - Same frequencies; different run times

RESEARCH PARAMETERS

- Plant Parameters
  - Wet weight & dry weight (roots & shoots)
  - Root & shoot length
  - Leaf count
  - Yields, quality
- Soil Parameters
  - Nitrogen Dynamics
  - Electrical Conductivity and Temperature
  - Mycorrhizae
  - Trace elements
- Other Parameters – Aerial Imaging
  - Optical, Thermal, NDVI, Infrared

SOIL & BIOCHAR CHARACTERISTICS

- Soil: Hanford sandy loam
  - 55% sand
  - 40% silt
  - 5% clay
  - pH: 7.5
- Biochar: softwood gasification char
  - Density: 7.4lb/cu ft
  - Ash: 19.7% w/w
  - H:C: 0.26
  - pH: 10.4

TIMELINE

- Development of CRADA: Spring 2015
- Experimental Design: Summer/Fall 2015
- Planting Date: December 9, 2015
- Harvest: mid August – September 2016

RESULTS

RESULTS

RESULTS

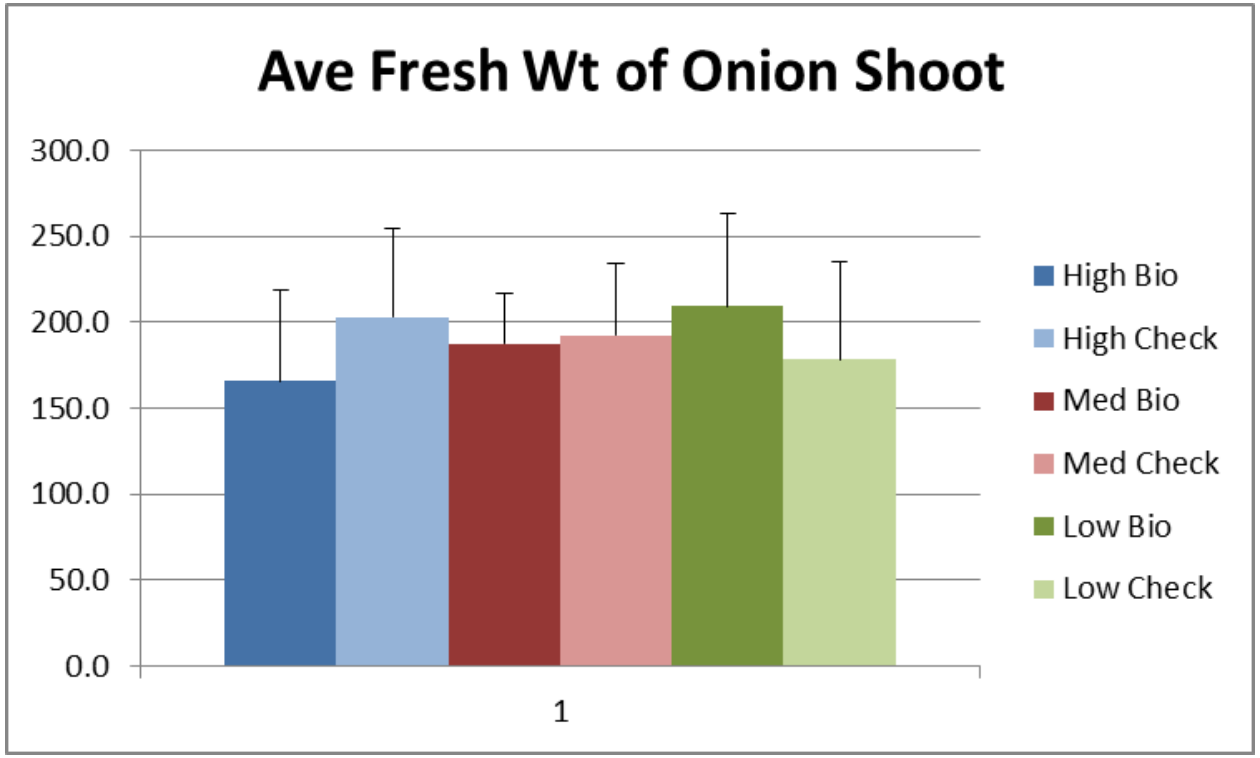
RESULTS

RESULTS

RESULTS

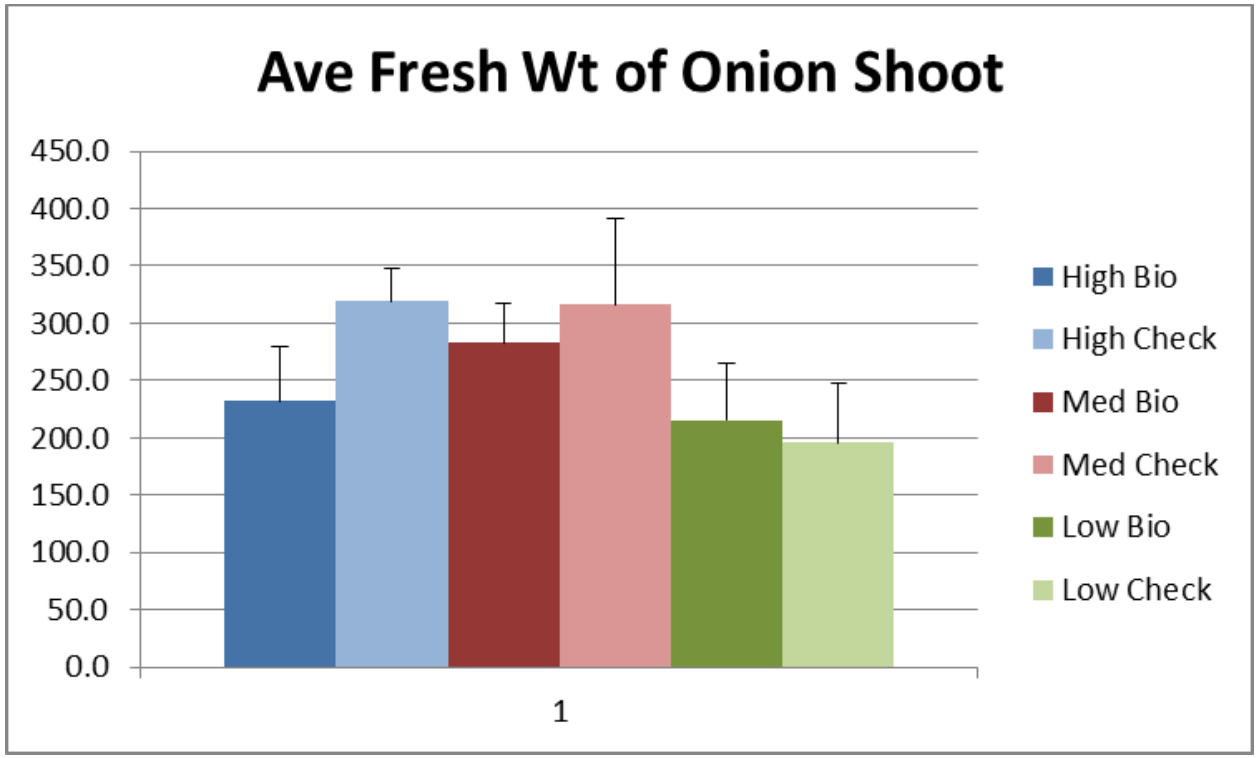
RESULTS

- May 17, 2016



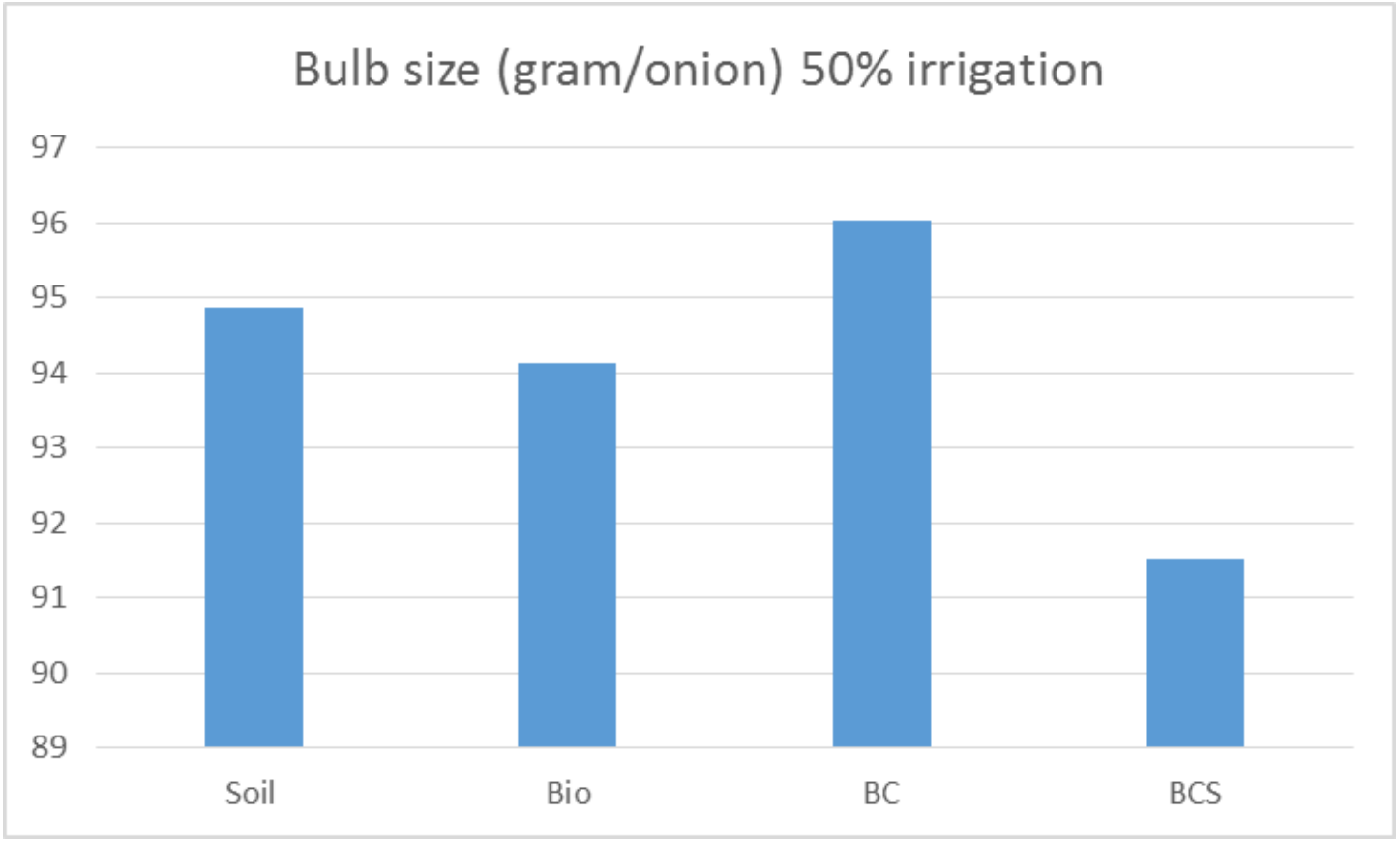
RESULTS

- July 26, 2016

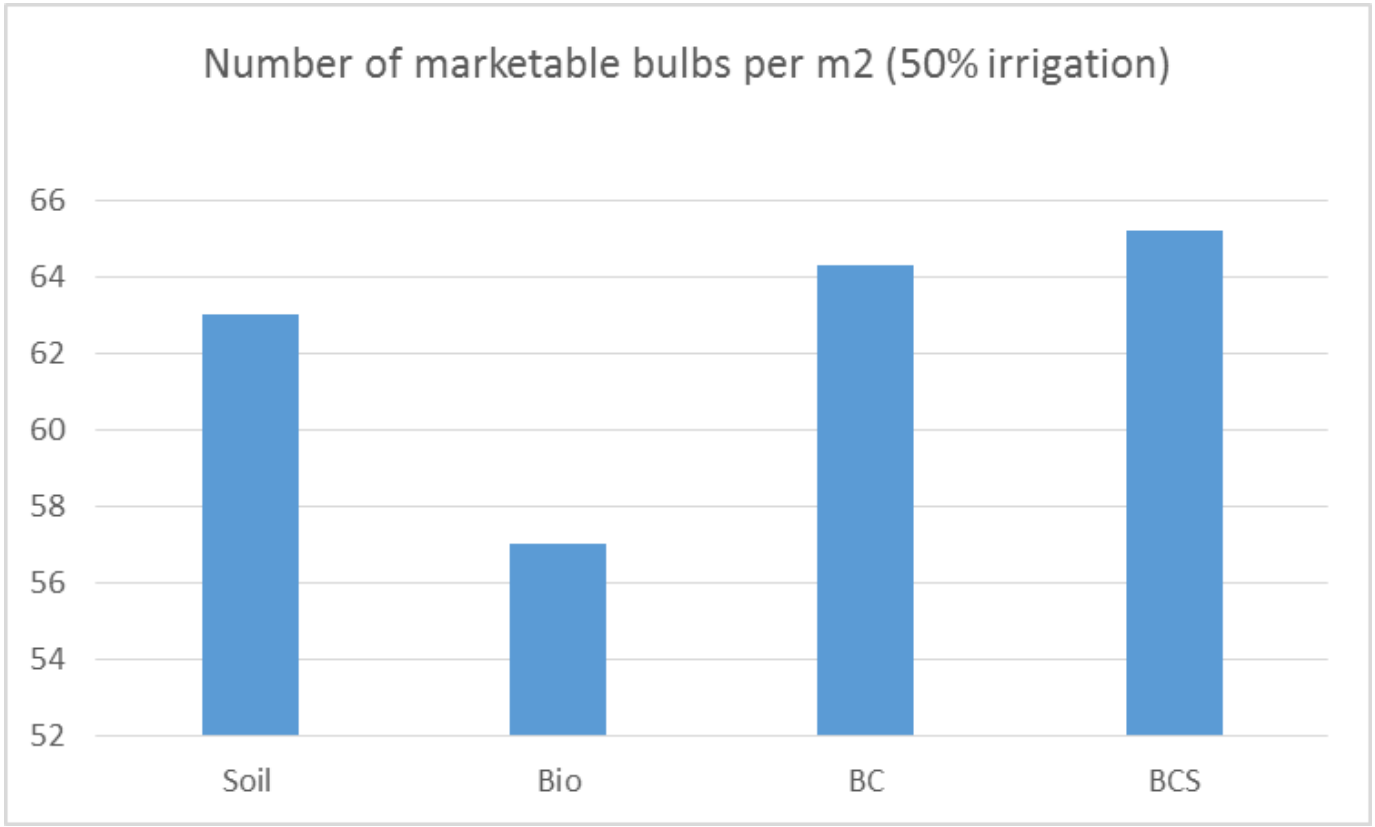


RESULTS

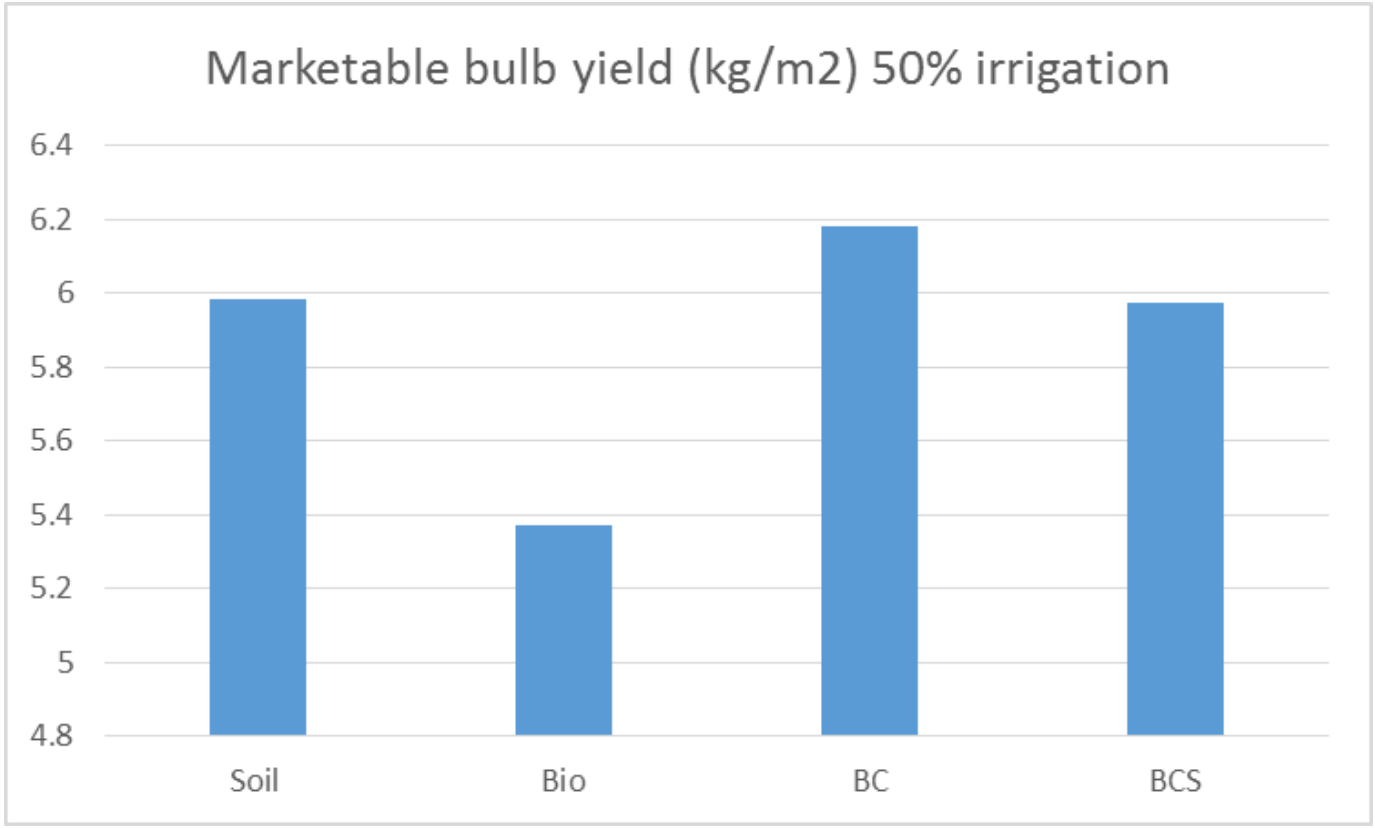
RESULTS


Bulb size (gram/onion) 50% irrigation
97
96
95
94
93
92
91
90
89
Soil
Bio
BC
BCS

RESULTS


Number of marketable bulbs per m2 (50% irrigation)
66
64
62
60
58
56
54
52
Soil
Bio
BC
BCS

RESULTS


Marketable bulb yield (kg/m2) 50% irrigation
6.4
6.2
6
5.8
5.6
5.4
5.2
5
4.8
Soil
Bio
BC
BCS

CONCLUSION AND NEXT STEPS

- Project is ongoing
- Complete harvest for 75% and 100% irrigation plots – happening now
- Data analysis
- Prepare for 2017 field experiment – biochar will still be there ☺

FINAL THOUGHTS

- Serving large-scale agriculture – integrate with cultural practices
  - Consistency & specifications
  - Fertilizer/pH value (blends)
  - Application rates
  - Application techniques & precision agriculture
  - Framing: biochar C is resistant to oxidation and microbial degradation
- Working with ARS – an industry perspective
  - Very positive experience
  - Use this resource: get out there and do field trials!