

IrrigAid Gold™ Soil Surfactant Effect on Soil Nutrient and Water Management Interactions in the Root Zone of Crisp Head and Romaine Lettuce Grown in California.

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Abstract: Adjuvants that increase the ability of soil to retain precious water resources in the root zone, reduce stress related to excessive salt concentrations (EC) in the root zone, and prevent leeching of soil nutrients (N) are of great importance for agricultural production worldwide. Here we test the efficacy of soil surfactant marketed as IrrigAid Gold at 2 qt/a applied via drip tape injection at planting and after thinning in crisp head lettuce grown in a conventional growing system (2 plant lines 12 inches apart on a 40-inch raised bed with two shallow drip tapes, off-centered on each plant line) in Salinas, CA. A local commercial grower nitrogen program for that site and one that had the post thinning application of nitrogen reduced by 25% was used. Remission spectroscopy of canopy greenness and vegetative biomass was measured with a RapidSCAN remote sensing device which records an objective measure of leaf chlorophyll content. Nutrient accumulation, water infiltration and irrigation efficiency were measured by assessments of soil and plant sap fertility instruments, crop vitality and head formation. Numeric and statistically significant improvements in rate of plant growth, yields and gross returns were observed in plots treated with the soil amendments.

Tomato data was unavailable at time of poster development.

Plot Description:

Summer crops of 'Green Forest' variety Romaine (2014) and 'Telluride' variety crisp head (2015) lettuce was seeded and thinned to 10.5" apart on 40" beds and plots were randomized with four replicates in sandy loam soil (pH 7.3, CEC 12.6 meq/100g soil, and 1.5% OM). Irrigation water has consistently had concentrations of NO₃ below 10 ppm and pH between 6.8-7.5.

Romaine Treatments (Summer 2014):

For Romaine, all treatments included 350 lb/a of 1-5-30 dry fertilizer preplant, and post thinning drip applied 40 gal/a of 7-7-0-7 and 10 gal/a of N-Phuric 15/49. With all receiving 100% grower managed irrigation program.

- 20-0-0 (100% Grower) – 10 gal/a (ABCDE)
- 20-0-0 (80% Grower) – 8 gal/a (ABCDE)
- 20-0-0 (80% Grower) – 8 gal/a (ABCDE) + IrrigAid Gold– 1 qt/a (AC)

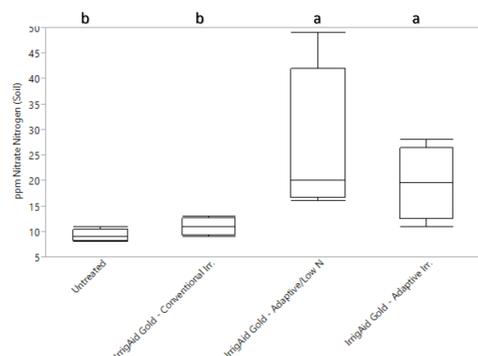
Head Lettuce Treatments (Summer 2015):

Dry fertilizer preplant applied 5-25-25 dry fertilizer at 300 lbs/acre. Conventional water application was 100% ETo level applied through drip irrigation and Adaptive irrigation was 70-80% ETo. Treatments 1-3 had full nitrogen regimes while treatment 4 received a 75% program. Irrigation was maintained at 100% ETo until just prior to thinning for all treatments

- Untreated Check (Conventional Irrigation) + AN 20% - 10 gal/a (B-G)
- IrrigAid Gold (Conventional Irrigation) – 2 qt/a (AB) + AN 20% - 10 gal/a (A-G)
- IrrigAid Gold (Adaptive Irrigation) – 2 qt/a (AB) + AN 20% - 10 gal/a (A-G)
- IrrigAid Gold (Adaptive Irrigation) – 2 qt/a (AB) + AN 20% - 7.5 gal/a (A-G)

Soil Nitrate Nitrogen (ppm)

Figure 4. Nitrogen content of top 12 inches of soil mid-bed measured in ppm within 2 weeks before harvest.



Log transformation of X+1, p=0.029.

References:

Fitzgerald, Rodriguez and O'Leary. 2010. Measuring and predicting canopy nitrogen nutrition in wheat using a spectral index—the canopy chlorophyll content index (CCCI). Field Crops Research.116 (3).

IrrigAid Gold is a patented technology that enhances uniform movement of irrigation water and rainfall in agricultural soil.

- Improves the availability of water and nutrients to the plant
- Improves infiltration allowing water and nutrients to move into the root zone
- Improves the lateral movement of water
- Improves penetrability of compacted soils
- Improves the distribution and retention of nutrients
- Reduces crusting improving water infiltration, gas exchange and seedling emergence

Canopy greenness and density

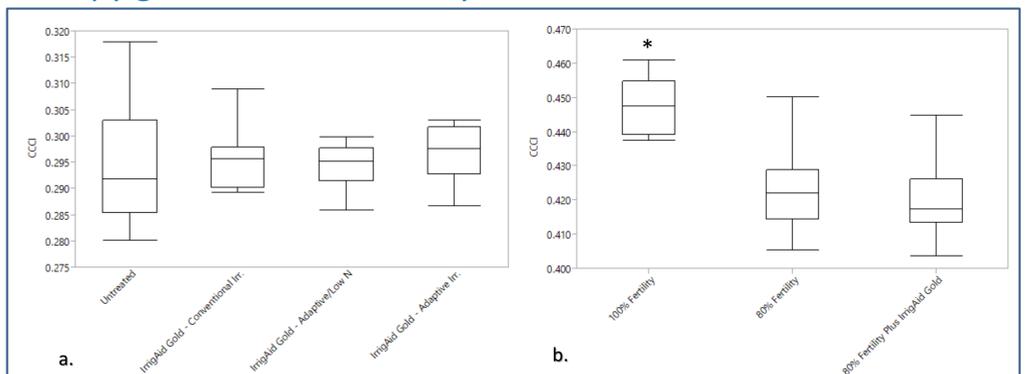
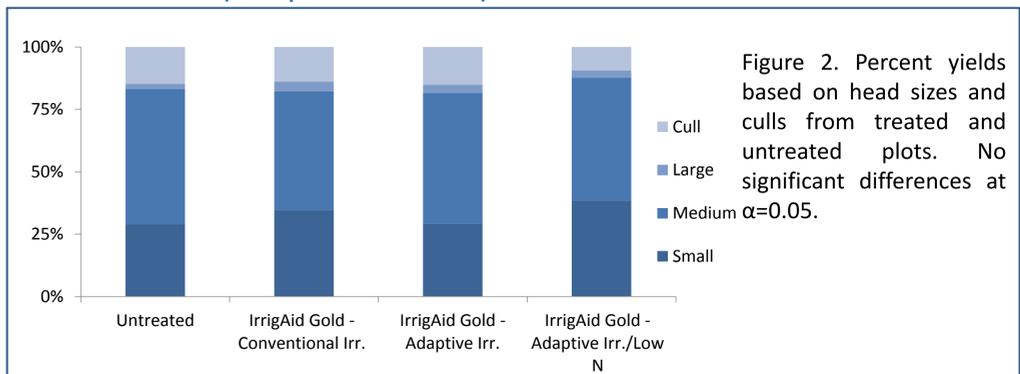


Figure 1. Remote sensing equipment was used to rate canopy coverage and greenness as well as chlorophyll content. A Rapidscan Handheld Crop Sensor (Holland Scientific) was used for measuring reflected light from two rows of the crop canopy (a) 5 DA-E in head lettuce 2015 and (b) 8 DA-E for Romaine 2014 (Normalized Difference Vegetation Index, NDVI, and Normalized Difference Red Edge, NDRE). CCCI is Canopy Chlorophyll Content Index, a function of chlorophyll content within the canopy, measured by greenness (NDRE) divided by green mass per plot (NDVI, canopy density or lushness) (Fitzgerald et al., 2010).

Percent Yield (Crisp Head 2015)



Estimated Gross Returns (\$US/Acre)

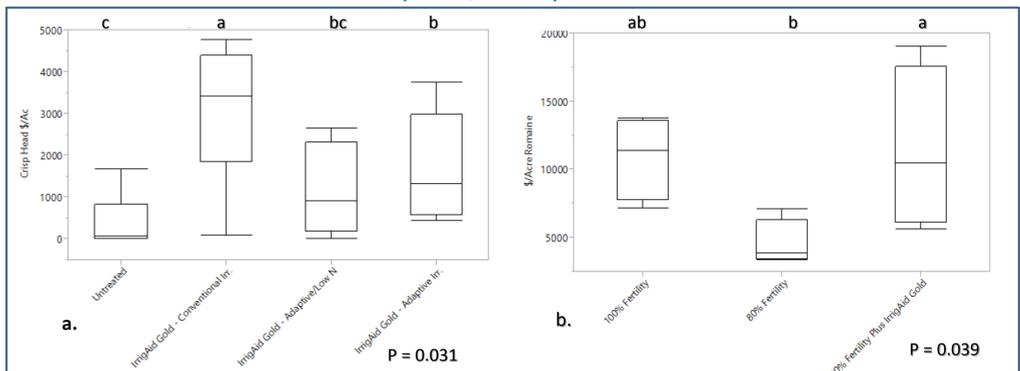


Figure 3. Estimated gross return per acre based on commodity pricing for (a) crisp head 2015 and (b) Romaine 2014 lettuce grown in the Salinas valley.

Conclusions:

- No significant change in color or quality when nitrogen or water was reduced by 25 and ~20%, respectively, after thinning
- No reduction in yield with decreased water and N post-thinning with IrrigAid Gold
- N management on the Central Coast is of interest recently as cultural practices and commercial products are used as tools to meet state requirements without decreasing yields
- Response to N is significant; even 20% reduction results in \$100s of dollars per acre in losses

