

# EarthSol



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# Nanette Simonian's Background

- Bachelor of Science CSU-Fresno – Plant Science / Agronomy '87
- Licensed PCA '87
- Consulted in California, Montana, Wyoming and Florida
- Worked in conventional farming since '71, organic / biological field since 1998. Family farm converted to Organic Production.
- Worked in the Bio Stimulant field since 2007.
- Raised on a Truck Farm operation of Vegetables – Dairy Farm.
- In 1998 we converted to growing Organically – Favored Crop Prunes

# Definition of Bio Stimulant

- European Union (EU) defines a Plant Bio stimulant as a product that stimulates plant nutrition processes without providing fertilizer or plant protection. Bio stimulants are made from natural extracts or microorganisms and can improve a plant's ability to absorb nutrients and tolerate stress.
- Association of American Plant Food Control Officials, INC. defines Plant Bio Stimulant to be a substance or micro-organism that when applied to seeds, plants, or the rhizosphere, stimulate natural processes to enhance or benefit nutrient uptake, nutrient efficiency, tolerance to abiotic stress or crop quality and yield.

# Definition of Bio Stimulant

- USDA 1: A Plant Bio stimulant is naturally –occurring substance, its synthetically derived equivalent, or a microbe that is used for the purpose of stimulating natural processes in plants or in the soil in order to, among other things: improve nutrient and/or water use efficiency by plants growth. The characteristics maybe physical, chemical. And/or biological. The plant bio stimulant may be used either by itself or in combination with other substances or microbes for this purpose.
- USDA 2: A Plant Bio stimulant is a substance(s), microorganism (s), or mixtures thereof, when applied to seeds, plant, the rhizosphere, soil or other growing media, act to support the plant natural nutrient processes independently of the bio stimulant's nutrient content. The plant bio stimulant thereby improves nutrient availability, uptake or use efficiency, tolerance to abiotic stress, and consequent growth development, quality or yield.

# Bio Stimulants Four R's

- Right Source – using the right Bio Stimulant for the right purpose, matches the crop needs.
- Right Rate – more is not always better.
- Right Timing – applying when crop is in right phenological timing to utilize the benefits of the Bio Stimulant.
- Right Application – is it better to Foliar or Drip apply, better to Side Dress or Flood apply which is the right application for the Bio Stimulant.

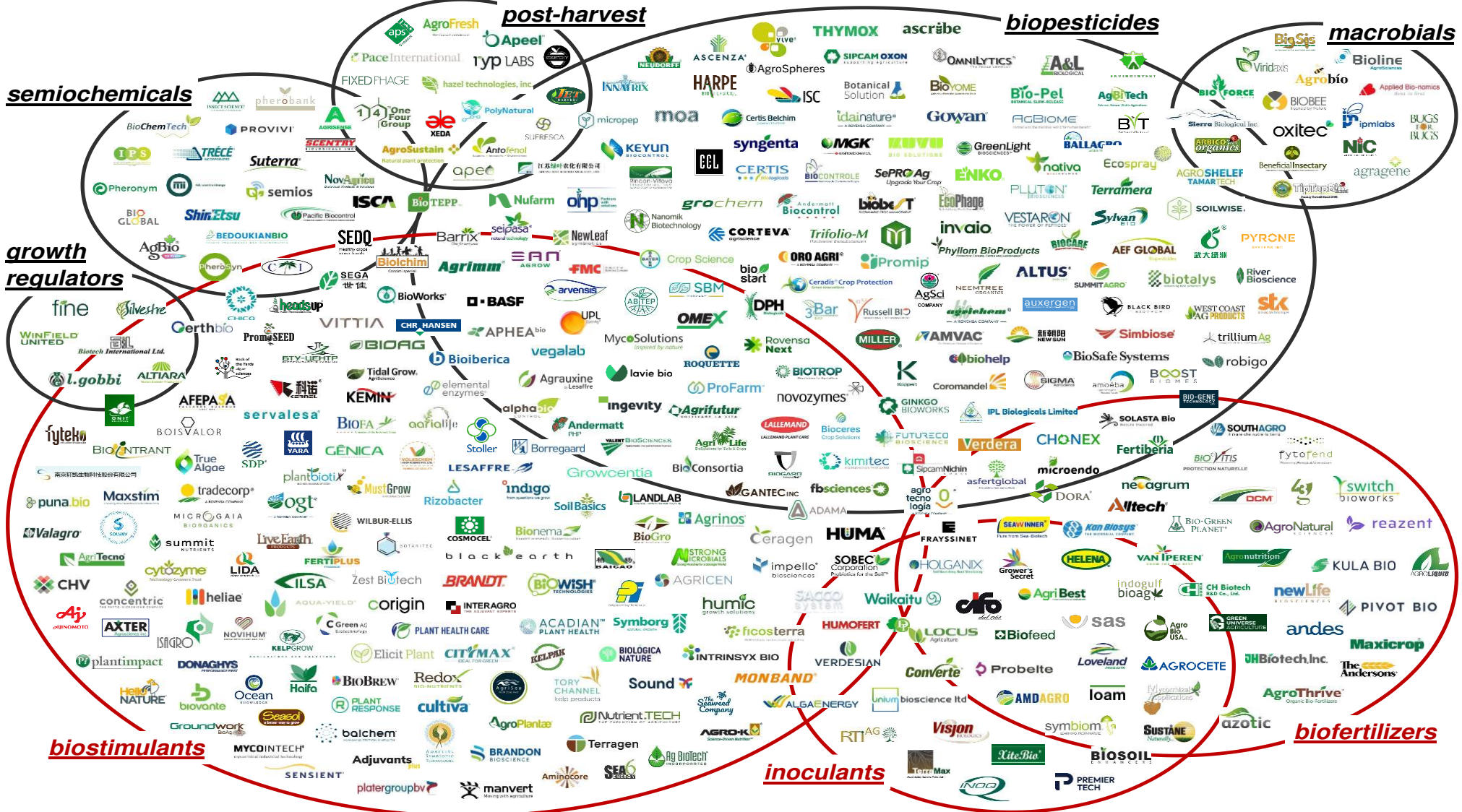
# 2023 AG BIOLOGICALS LANDSCAPE

## BIO-BASED SUBSTANCES

## LIVING ORGANISMS

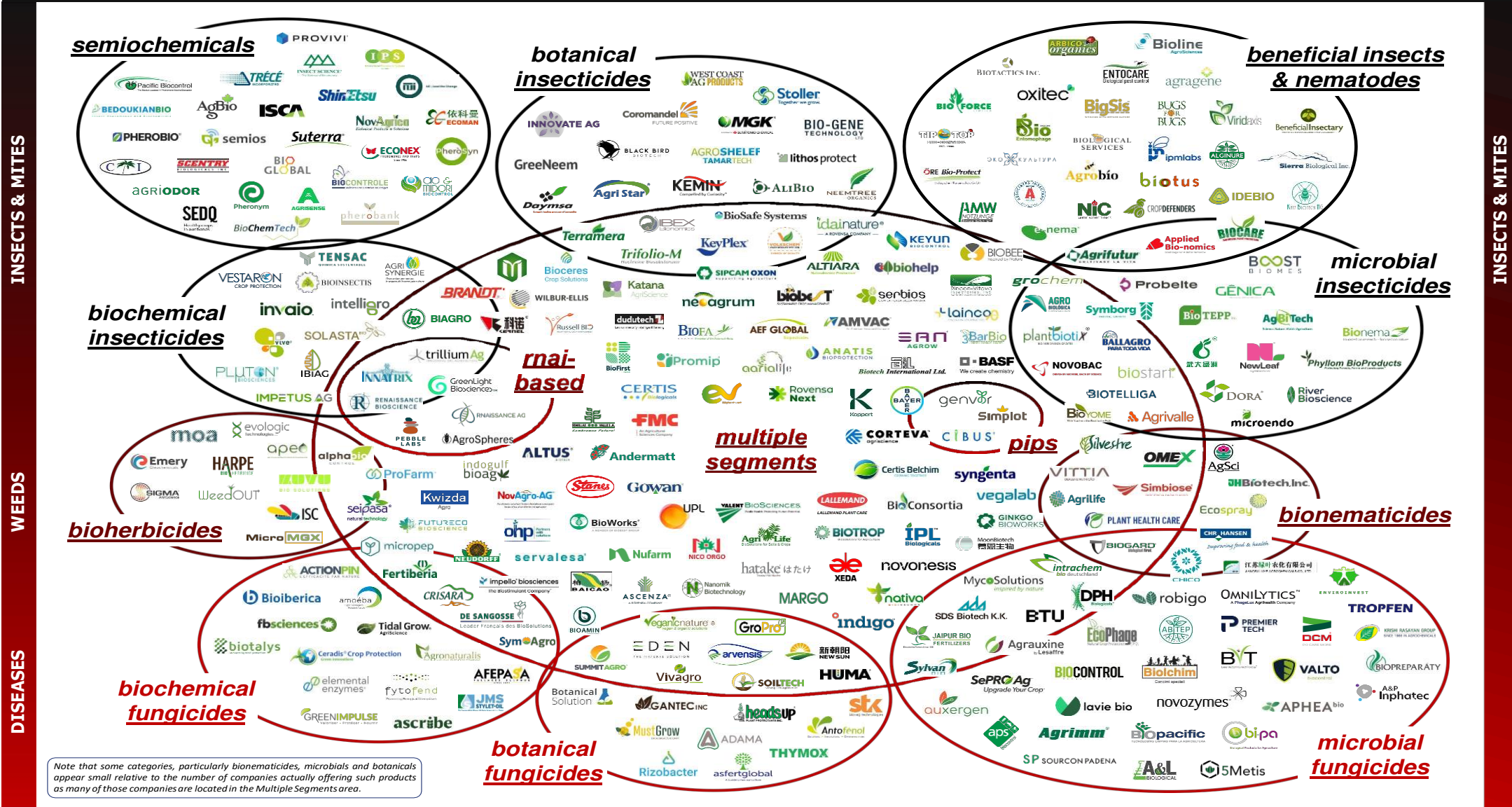
BIOCONTROL

CROP & SOIL HEALTH



# 2024 CROP BIOCONTROL LANDSCAPE

## INSECTS & MITES

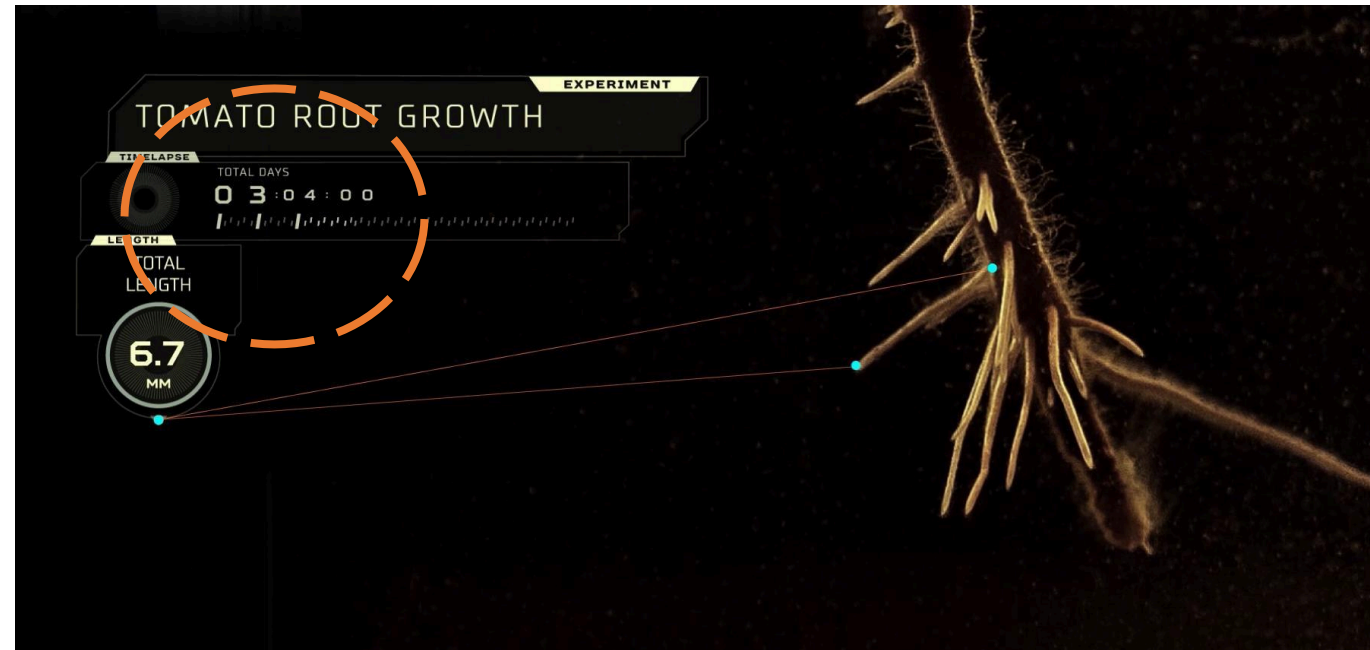


Note that some categories, particularly bionematicides, microbials and botanicals appear small relative to the number of companies actually offering such products as many of those companies are located in the Multiple Segments area.

Note that this landscape is representative, not comprehensive. Also, companies appear on the landscape only once, although some offer products in multiple categories. Most of those companies may be found in the Multiple Segments area.

# How do Bio Stimulants Work? ....

## How fast does the plant respond?



➔ The plant molecular response systems must happen sooner than 3 days

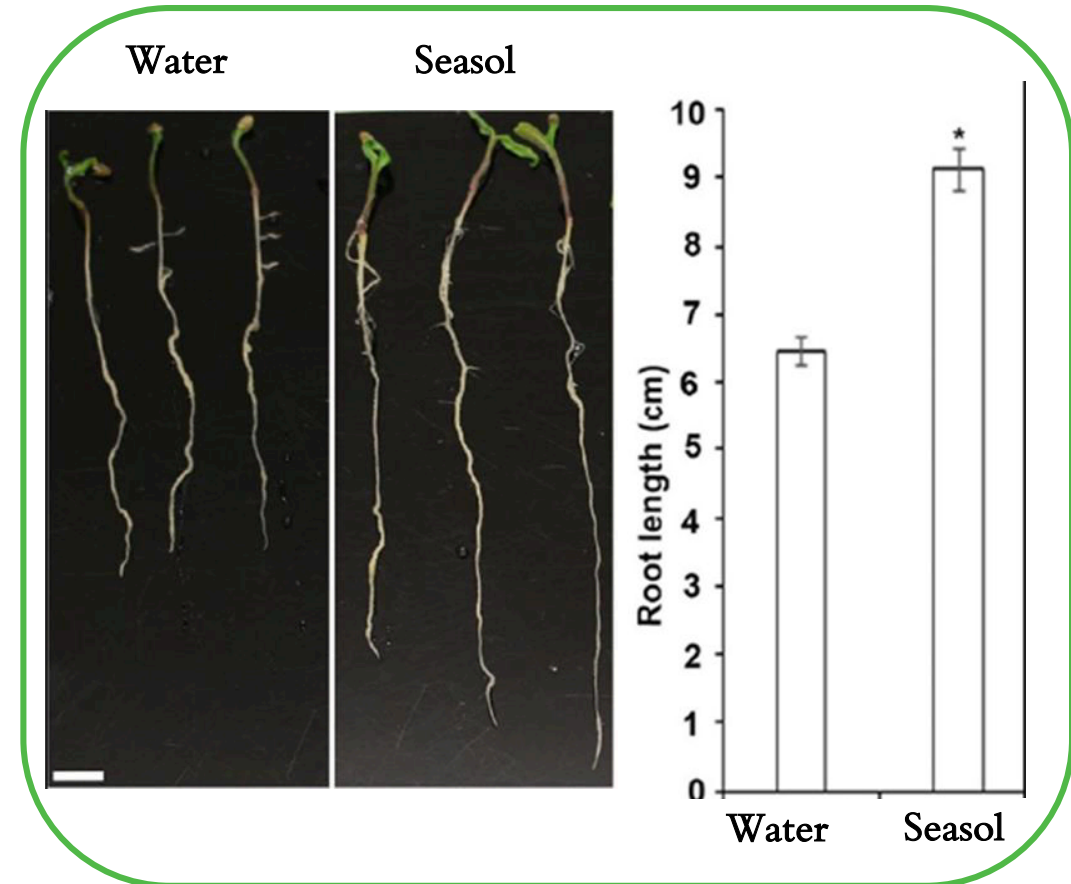
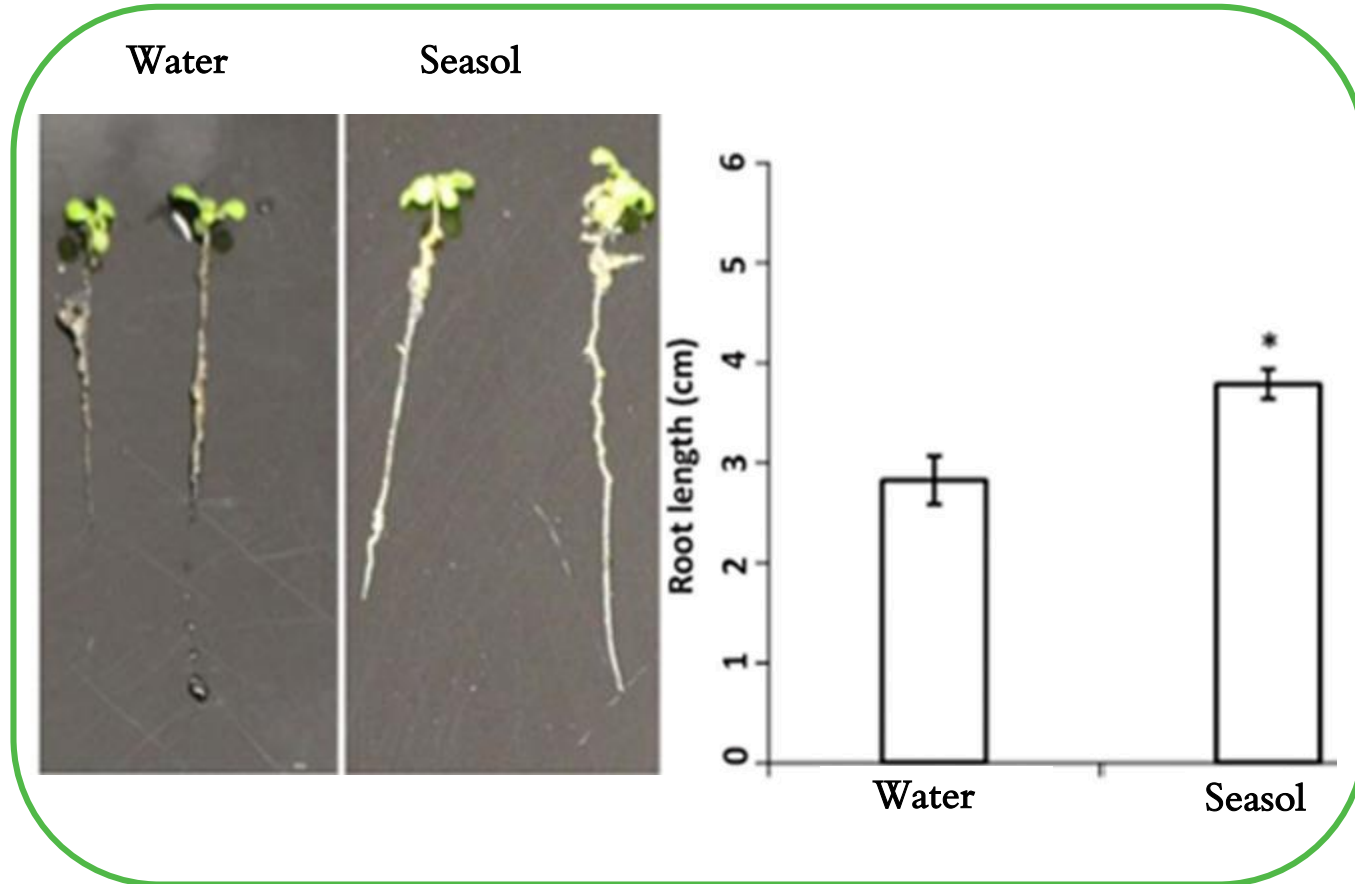
# Bio Stimulants

- Opening up the Genetic Expression with the plant
- Releasing the Genetic capability of the plant to fight off Abiotic stresses:
  - Drought
  - Salinity
  - Heat
  - Disease
  - Pest
  - Etc.

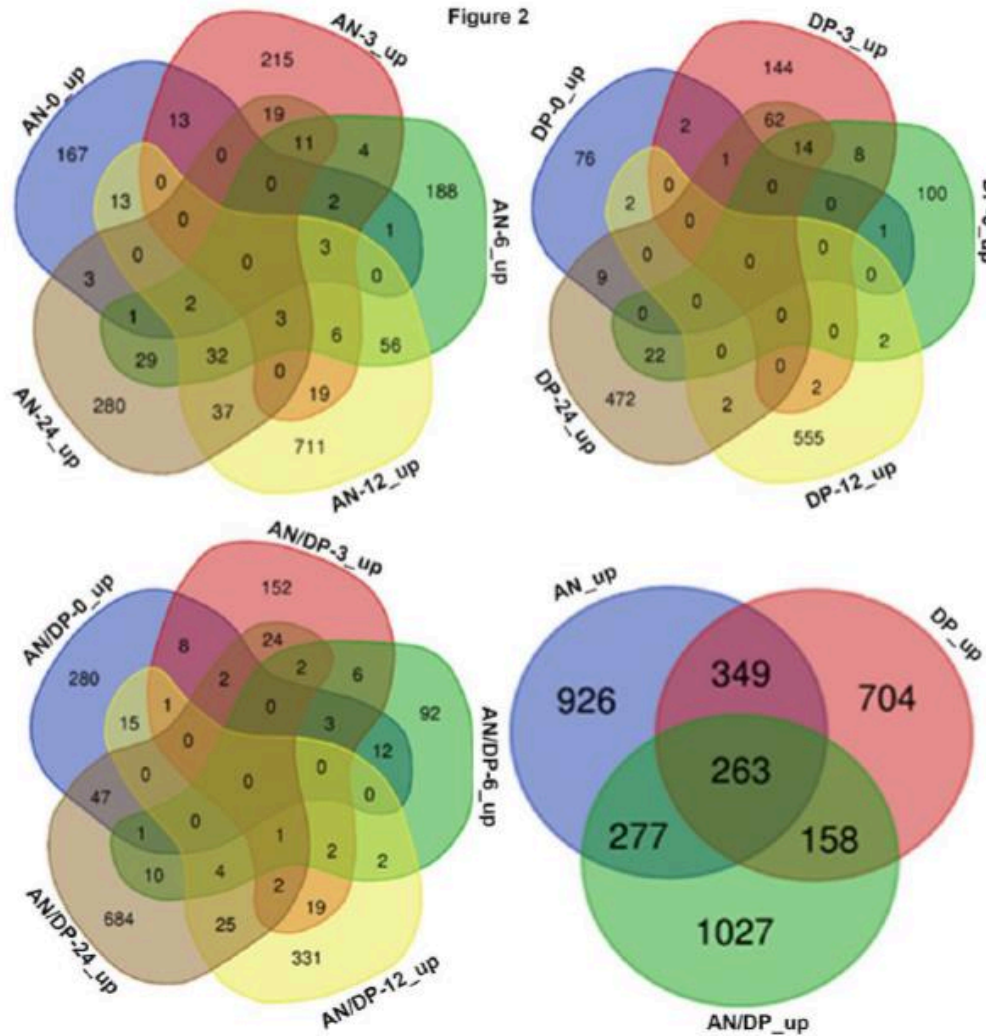
# Seasol stimulates plant growth

Arabidopsis (Mustard) – model plant system  
7 days after Seasol application

Tomato – commercially relevant plant  
5 days after Seasol application



# Transcriptomics - Comparing Seasol for their effect on plant genes

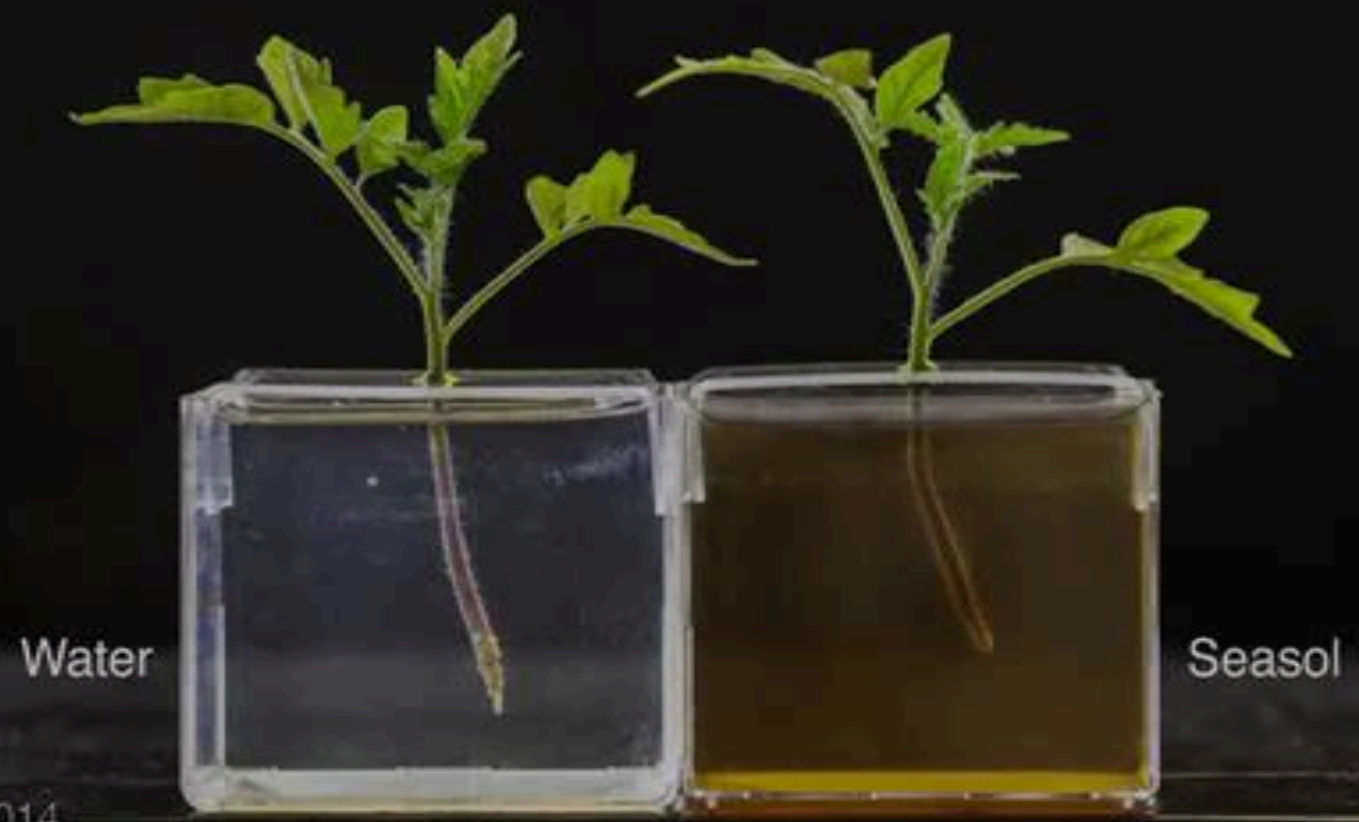


Transcriptomics shows:

→ Seasol activate plant gene responses

→ Seasol is not identical in the activation of plant genes.

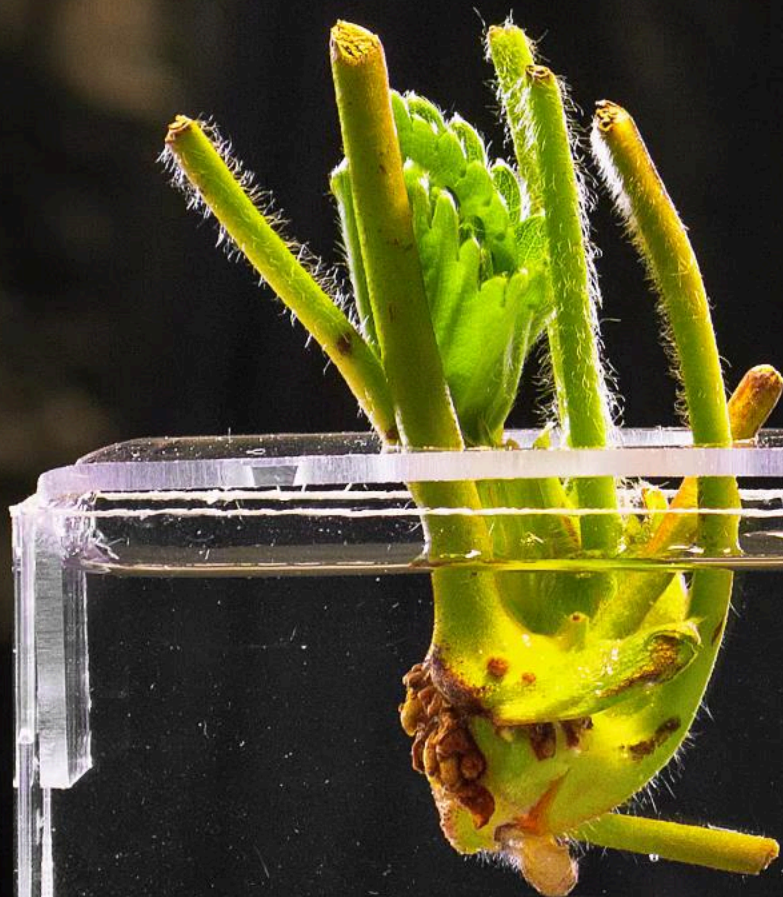
→ Seasol does activate similar plant gene pathway responses.



Water

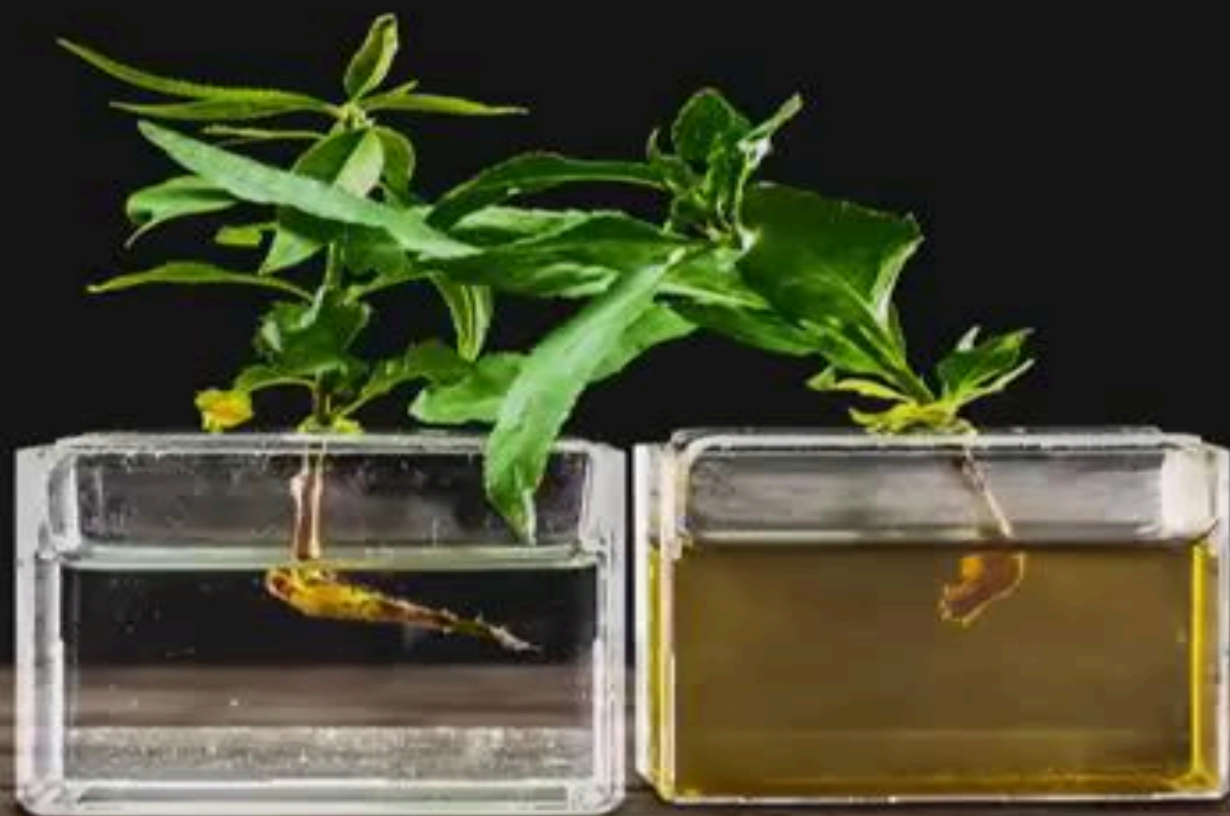
Seasol

Water



Seasol

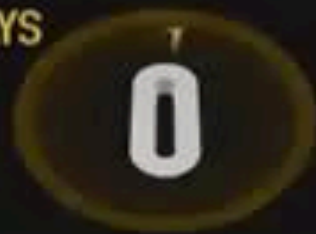




**WATER**

**SEASOL**

**DAYS**



**EXPERIMENT**

**Almond Plant  
WATER vs SEASOL**

**DURATION**

**16 DAYS**



# Seasol Advanced Root Boost

## Lodi – 2 treatments @ 2 qts / acre

- Variety Petit Verdot – wine
- First treatment was at peppercorn stage at 2 qts per acre.
- Second treatment was just before version
- Field is nematode infested, we saw new growth on treated areas.

# Seasol Advanced Root Boost Lodi – 2 treatments @ 2 qts / acre



# Untreated vs Seasol Treated Photo Taken June 13, 2024

**Untreated**



**Treated 2 qts / ac  
Two Applications**



# Untreated vs. Treated

## Photo taken July 31, 2024

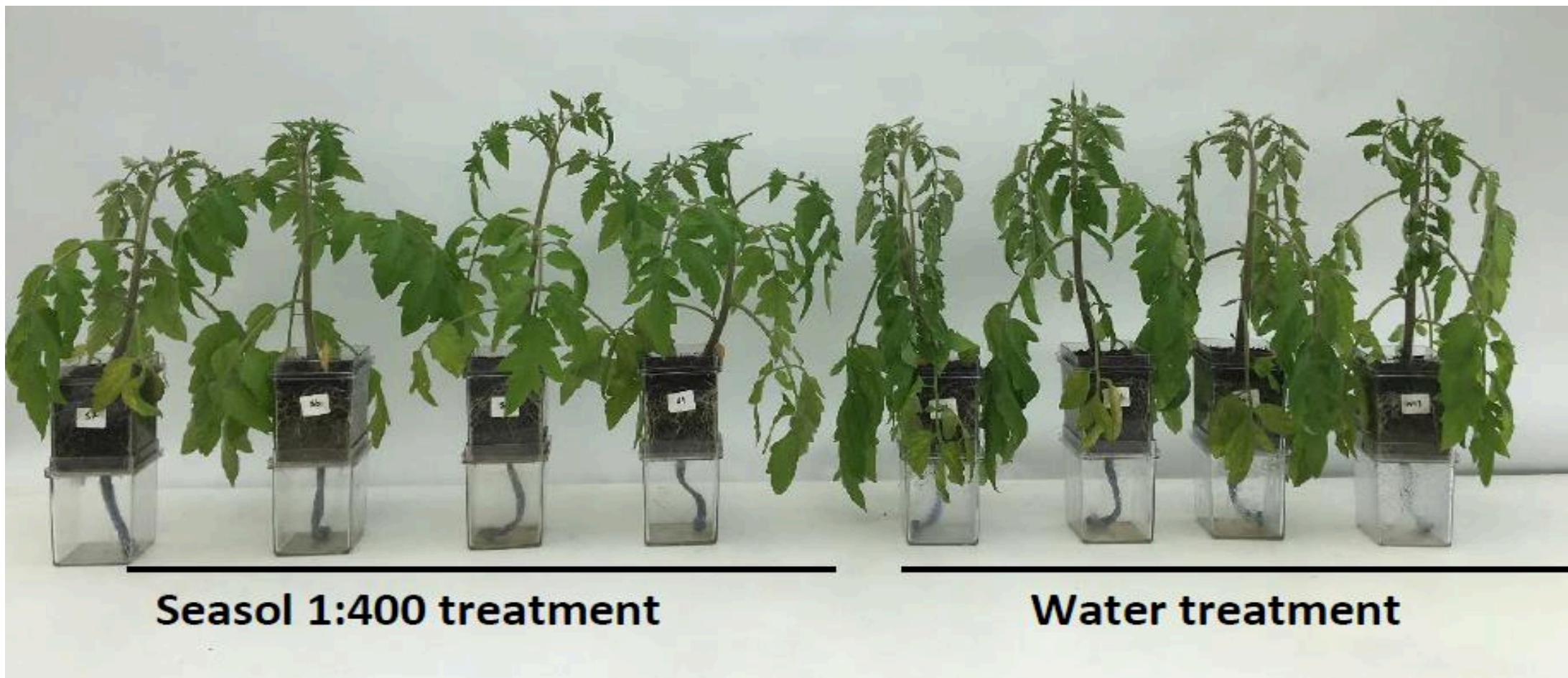
**Untreated**



**Treated 2 qts. Per acre  
Three applications**



# Seasol Advanced Root Boost in Drought Conditions



# Seasol Root Boost in Drought Conditions

**Table 1:**

Proline content (umoles/g leaf Fresh Weight)		
Replicates	Water	Seasol 1:400
1	2.87	1.66
2	1.16	0.57
3	7.23	1.97
4	5.49	2.55
5	3.21	2.58
6	2.75	1.03
7	2.77	3.14
8	1.71	2.19
9	2.55	1.71
10	3.63	1.64
11	1.71	1.51
12	3.57	2.35
Average	3.22b	1.91a

**Table 1:**

- **Proline content in drought stressed tomato leaves**
- The table shows the average proline measurement over twelve replicates for each treatment. Proline content was detected in tomato leaves showing drought stress symptoms. The Seasol Advanced Root Boost (1:400 dilution) treatment shows a lower average proline content, indicating a lower level of drought stress

# Seasol Root Boost in Drought Conditions



# Seasol Root Boost in Saline Conditions



Water

Water+Salt

Seasol+Salt

Seasol

10mM NaCl, Seasol 1:400

**For more information see ISS presentations:**

**Dr Md Tohidul Islam** – Pathways to function: Omics reveals how seaweed-derived biostimulants enhance plant productivity and reduce biotic stress

**Chi Tran** - Untargeted metabolomics analysis reveals different profiles of *Arabidopsis thaliana* following treatment with seaweed extract

**Dr Scott Mattner** – Effect of seaweed biostimulants on reactive oxygen species, disease suppression and higher yields in strawberry

**Dr Tim Sawbridge** - RNASeq analysis of Seasol treatment on growth media on the lettuce seedling root transcriptome

**Dr Marianne Weisser** – Effect of fortified seaweed extract on tomato physiology, productivity, fruit quality and soil properties

**Dr Tony Arioli** – Effect of seaweed extract on avocado root growth, yield and post harvest quality in Queensland Australia

**Thank you for your  
attention**

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**Thank you to all the  
wonderful collaborators  
involved in this research**



# Seasol Root Boost Seaweed.....

*Enhances plant health and fertility,  
and works synergistically with fertilizers*



*IMPROVES  
TOLERANCE  
TO ABIOTIC STRESS*



*IMPROVES NUTRIENT  
USE*



*IMPROVES CROP  
YIELD & QUALITY*

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