HH Summary of Tomatoes Trial with Brackish Water in Ramat-Negev Desert Agro-Research Center, Israel 2021

Date

In this trial, cherry tomato plants were planted on 27 April 2021.

Harvest had several picking cycles between 30 June 2021 and 22 August 2021.

Location

Ramat-Negev Desert Agro-Research Center (RNDARC), Israel.

Crop

Crop Type: Cherry tomatoes.

Variety: 'Shiren' by Hazera ltd (Israel).

Irrigation Type

Drip irrigation with separate lines for each salinity level.

Watering Cycle: 4 times during the day and once at night.

Setup

The trial's goal was to test the impact of Kyminasi Plants – Crop Booster (KPCB) technology on tomato cultivation in the Negev Desert of Israel, under various desert conditions.

The cherry tomatoes were irrigated with water treated with KPCB and compared to control plants that were irrigated with water without this treatment. In both treatments, another comparison was performed between two salinity levels of the irrigation water: full brackish water (EC of 4.5 ds/m), and a mix of brackish and fresh water (EC of 1.5 ds/m).

The cherry tomato plants were planted at high density in a 50-mesh insect-proof net house and grown in sandy soil according to local standard commercial farming protocol.

Setup Correction

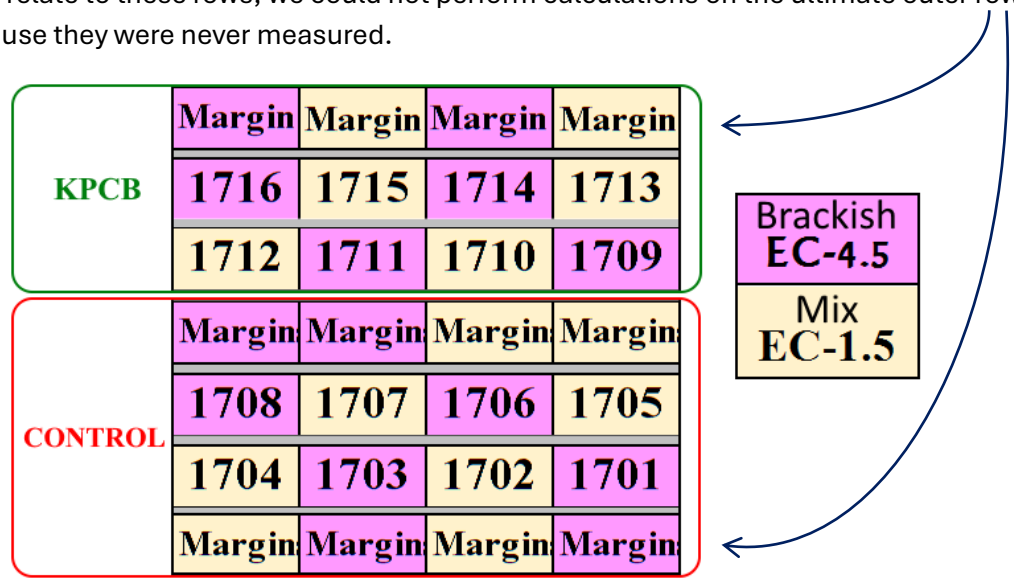
Unfortunately, unknown to us at the time, the setup contained breaches of testing protocol regarding two major points:

1. The aspect of *overwatering* and *overfertilization* was **not** considered in this trial. This aspect relates to the effect of KPCB technology, where we normally see a significant boost in water retention and a boost in nutrient efficiency – both necessitating a reduction of inputs to prevent the negative effects of overwatering and overfertilization.

2. Additionally, no separation zone was created between the treated and untreated plots (see field layout diagram below). Such separation is a mandatory requirement in all of our scientific trials and field trials to prevent leakage of the Kyminasi signals from the treated plots into control plots.

   In the field layout diagram below, there is a zone marked "margin", however due to the combination of sandy soil, very frequent irrigations and high EC, the soil was highly conductive which caused the soil to constantly leak KPCB signals to adjacent control plots. The necessary separation for this set of conditions should have been about 20 times wider.

   Since we have become aware of this setup discrepancy around mid-season, we decided to calculate the results only from the most distant rows, namely 1713 through 1716 for treated plots, versus 1701 through 1704 for Control. The results and analysis provided in the next page relate to these rows; we could not perform calculations on the ultimate outer rows because they were never measured.



Results

The results shown in the tables below use measurements provided by the Ramat-Negev Desert Agro-Research Center, with the only difference being the exclusion of the middle rows, namely 1709-1712 and 1705-1708.

Plots without KPCB

Plot	Harvest Date	Treatment	Salinity	Cluster Output	Singles Output	# of Singles Output	Green	Cracked	Avg. Fruit Weight	Crop Weight (kg/10m^2)
1702	6/30/2021	Control	1.5	5.045	0.055	3	0.195	0.000	18.33	
1702	8/2/2021	Control	1.5	6.115	0.455	25	0.730	0.375	18.20	
1702	8/22/2021	Control	1.5	2.060	0.280	19	0.750	0.545	14.74	
1702	8/22/2021	Control	1.5	1.410	0.420	30	0.875	0.910	14.00	9.2265
1704	6/30/2021	Control	1.5	3.830	0.060	4	0.145	0.000	15.00	
1704	6/30/2021	Control	1.5	3.585	0.015	1	0.035	0.000	15.00	
1704	8/2/2021	Control	1.5	4.640	0.060	2	0.480	0.190	30.00	
1704	8/2/2021	Control	1.5	5.385	0.230	16	0.915	0.660	14.38	
1704	8/22/2021	Control	1.5	1.325	0.295	24	0.695	0.460	12.29	
1704	8/22/2021	Control	1.5	0.580	0.335	26	0.285	0.270	12.88	6.8695
1.5 salinity AVERAGE		Control	1.5	3.398	0.221	15.0	0.511	0.341	16.48	8.0480
1701	6/30/2021	Control	4.5	3.505	0.050	3	0.160	0.000	16.67	
1701	7/18/2021	Control	4.5	6.435	0.105	7	0.415	0.025	15.00	
1701	8/2/2021	Control	4.5	5.245	0.115	7	0.810	0.000	16.43	
1701	8/22/2021	Control	4.5	1.745	0.160	13	0.375	0.095	12.31	
1701	8/22/2021	Control	4.5	2.675	0.175	18	0.445	0.070	9.72	6.9640
1703	6/30/2021	Control	4.5	3.335	0.055	4	0.170	0.000	13.75	
1703	8/22/2021	Control	4.5	1.355	0.355	35	0.590	0.315	10.14	
1703	8/22/2021	Control	4.5	0.690	0.245	20	0.365	0.375	12.25	5.7240
4.5 salinity AVERAGE		Control	4.5	3.123	0.158	13.4	0.416	0.110	13.28	6.3440
Total AVERAGE		**Control**		**3.276**	**0.193**	**14.28**	**0.469**	**0.238**	**15.06**	**7.1960**

Plots with KPCB

Plot	Harvest Date	Treatment	Salinity	Cluster Output	Singles Output	# of Singles Output	Green	Cracked	Avg. Fruit Weight	Crop Weight (kg/10m^2)
1713	6/30/2021	KPCB	1.5	4.645	0.035	2	0.180	0.000	17.50	
1713	8/2/2021	KPCB	1.5	4.875	0.310	20	0.450	0.330	15.50	
1713	8/22/2021	KPCB	1.5	2.610	0.820	56	0.855	0.820	14.64	7.8290
1715	6/30/2021	KPCB	1.5	5.680	0.130	7	0.340	0.000	18.57	
1715	8/2/2021	KPCB	1.5	6.055	0.390	23	0.695	0.555	16.96	
1715	8/2/2021	KPCB	1.5	6.165	0.780	48	0.790	0.760	16.25	
1715	8/22/2021	KPCB	1.5	2.420	0.400	28	1.025	1.040	14.29	
1715	8/22/2021	KPCB	1.5	2.360	0.245	18	0.800	0.935	13.61	10.0525
1.5 salinity AVERAGE		KPCB		4.351	0.389	25.25	0.642	0.555	15.91	8.9408
1714	8/2/2021	KPCB	4.5	5.065	0.315	21	0.915	0.115	15.00	
1714	8/22/2021	KPCB	4.5	1.815	0.230	21	0.585	0.595	10.95	
1714	8/22/2021	KPCB	4.5	1.880	0.195	15	0.755	0.325	13.00	7.0920
1716	6/30/2021	KPCB	4.5	4.565	0.140	8	0.375	0.000	17.50	
1716	6/30/2021	KPCB	4.5	5.100	0.105	6	0.480	0.000	17.50	
1716	8/22/2021	KPCB	4.5	2.605	0.310	27	0.670	0.325	11.48	
1716	8/22/2021	KPCB	4.5	1.940	0.185	15	0.635	0.130	12.33	7.3165
4.5 salinity AVERAGE		KPCB		3.281	0.211	16.14	0.631	0.213	13.97	7.2043
Total AVERAGE		KPCB		**3.852**	**0.306**	**21.00**	**0.637**	**0.395**	**15.01**	**8.0725**

Final Analysis

	Cluster Output	Singles Output	# of Singles Output	Green	Cracked	Avg. Fruit Weight	Crop Weight (kg/10m²)
KPCB GAIN: 1.5 salinity (mix)	28%	76%	68%	26%	63%	-3.4%	11.1%
KPCB GAIN: 4.5 salinity (full)	5%	34%	21%	52%	94%	5.1%	13.6%
KPCB GAIN: total average	17%	55%	45%	39%	78%	0.9%	12.3%

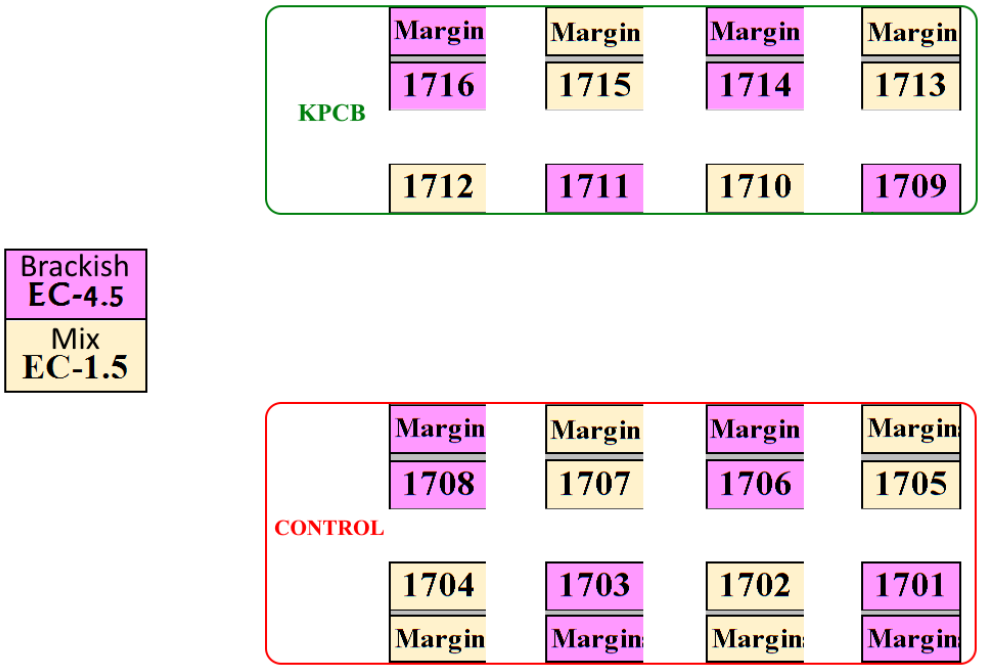
The comparison between said plots treated with KPCB vs. Control, indicate the following results:

- Significant gains of KPCB results over Control in the measurements taken for Cluster Output, Singles Output, and Number of Singles Output, which were 18%, 59% and 47% higher outputs, respectively.
- Interestingly, the Average Fruit Weight and Crop (total yield, in kg) were higher in the full salinity bracket, namely 5.1% and 13.6% higher, respectively.
- Since the trial was meticulously measured, we evaluated the strongly negative results in the numbers measured for Green/Cracked fruits, as well as the relatively low numbers in Average Fruit Weight and Crop (total yield). Our analysis is as follows:
  - ❖ Green tomatoes seem to indicate overwatering (per various tomato growers), and excessive nitrogen (Yara North America).
    Likewise, cracked tomatoes seem to indicate overwatering (North Carolina State University, and University of Massachusetts), as well as excessive nitrogen (tomato experts and growers).
  - ❖ The lower crop yield and low gains in fruit size seem to indicate overfertilization: ***"Overfertilization of mature [tomato] plants can result in lush green plants that never flower and therefore will not produce tomatoes."*** (University of Georgia).
  - ❖ Our evaluation is based on numerous other trials where the greater water retention and nutrient efficiency caused by KPCB have brought about a necessity to REDUCE INPUTS in order to prevent the negative effects of excessive inputs.

Conclusions

We encourage scientists, especially those who grow veggies in high salinity environments, to redo this trial with adherence to protocol. The following diagram outlines a *suggested* layout of the same experiment, having two types of separation zones:

- A wide separation between treated and control fields,
- Separations between brackish and mix water plots.



Additionally, the aspect of overwatering and overfertilization can be dealt with by designing a retrial where gradient reductions of inputs are laid out and measured scientifically. This has already been done in our extensive scientific trials in India and Morocco, as well as our highly detailed commercial trial in Australia; those were all proven successful, so we can consult any institute interested in re-trialing with tomatoes or any other crop to see if its salinity tolerance can be extended with our technology.

We expect that doing so would bring higher yields as well as significant savings in water and fertilizer costs. It would also extend the viability of more desert lands, high salinity lands, and high salinity water farming sources.