Salt Issues

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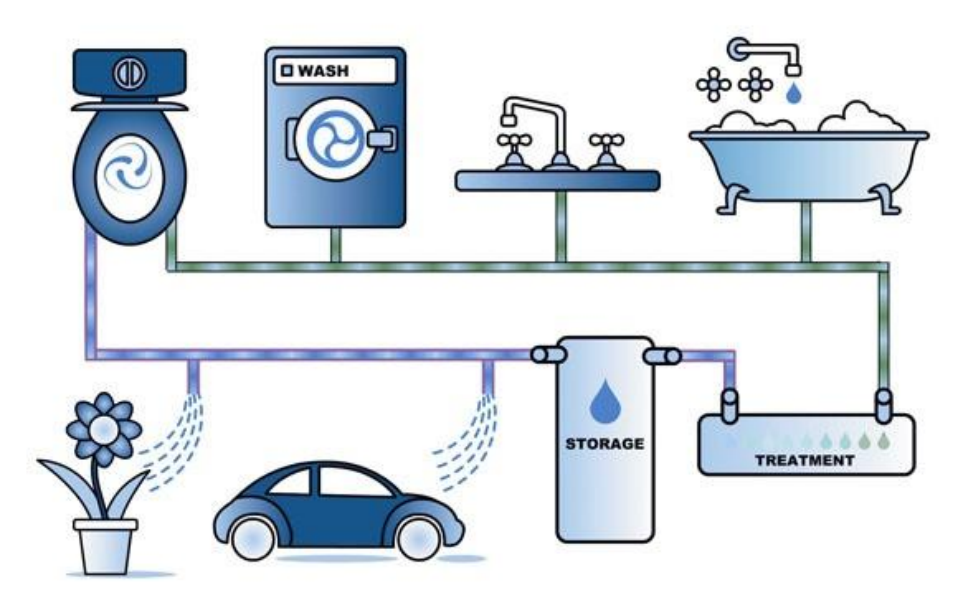
Irrigation water in short supply: recycled, reclaimed, blended, variable quality..



University of California guidelines suggest that strawberry injury and yield reductions can occur at EC=1 dS/m.

Salts in solutions for each EC (g), Each plant received 250 ml of solution during each irrigation

EC	NaCl	$CaCl_2$	K_2SO_4	Na_2SO_4
5	**0.7**	**0.86**	**1.02**	**0.96**
10	**1.43**	**1.91**	**2.78**	**2.32**
15	**2.25**	**3.12**	**4.75**	**4.13**
20	**3.2**	**4.9**	**8.08**	**5.94**

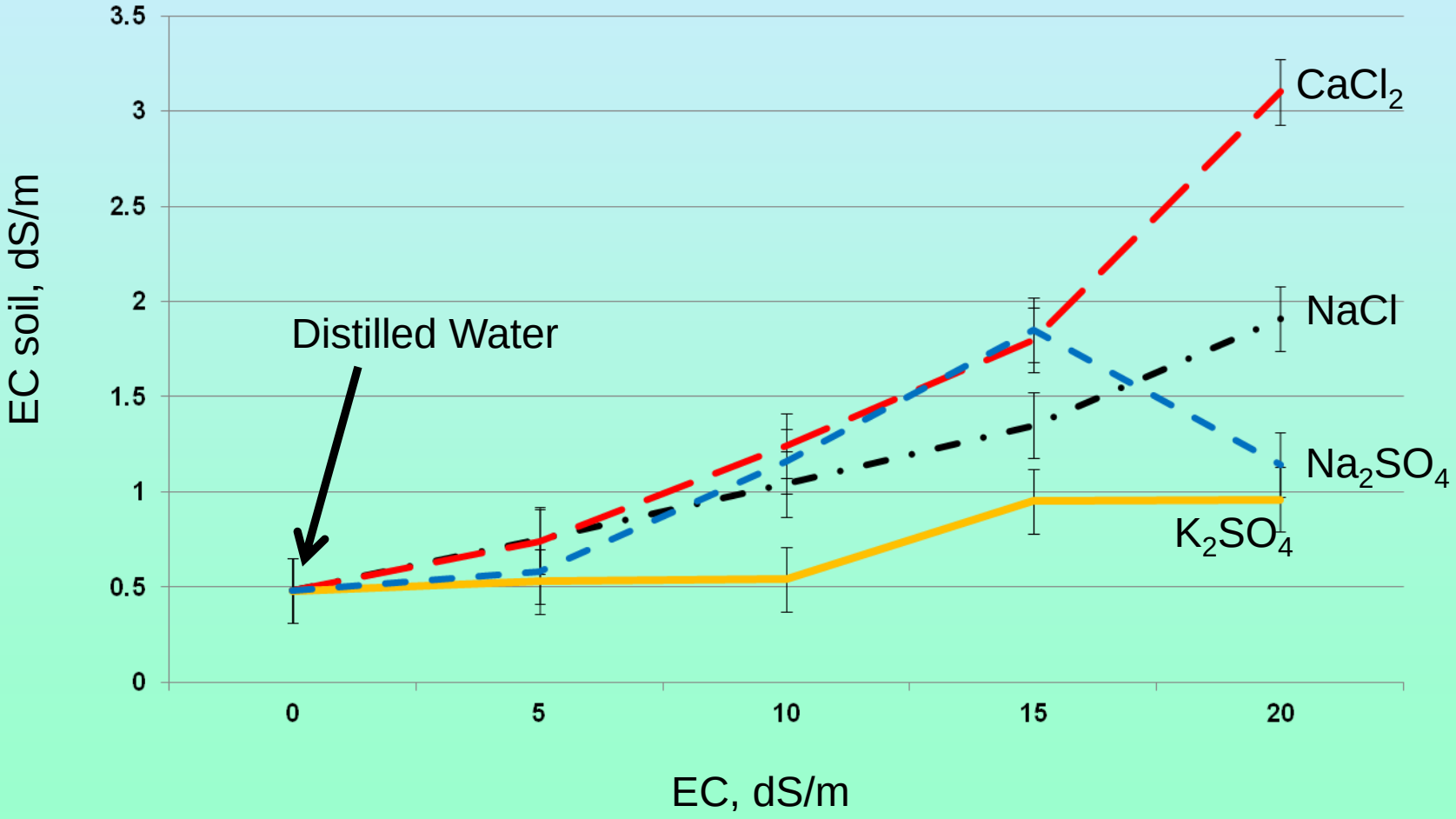
Applied: 07/31, 08/02, 08/04, 08/09, 08/13, 08/16, 08/20*, 08/27*, 08/30*
Switched to drip with EC water = 0.74 on 09/02.

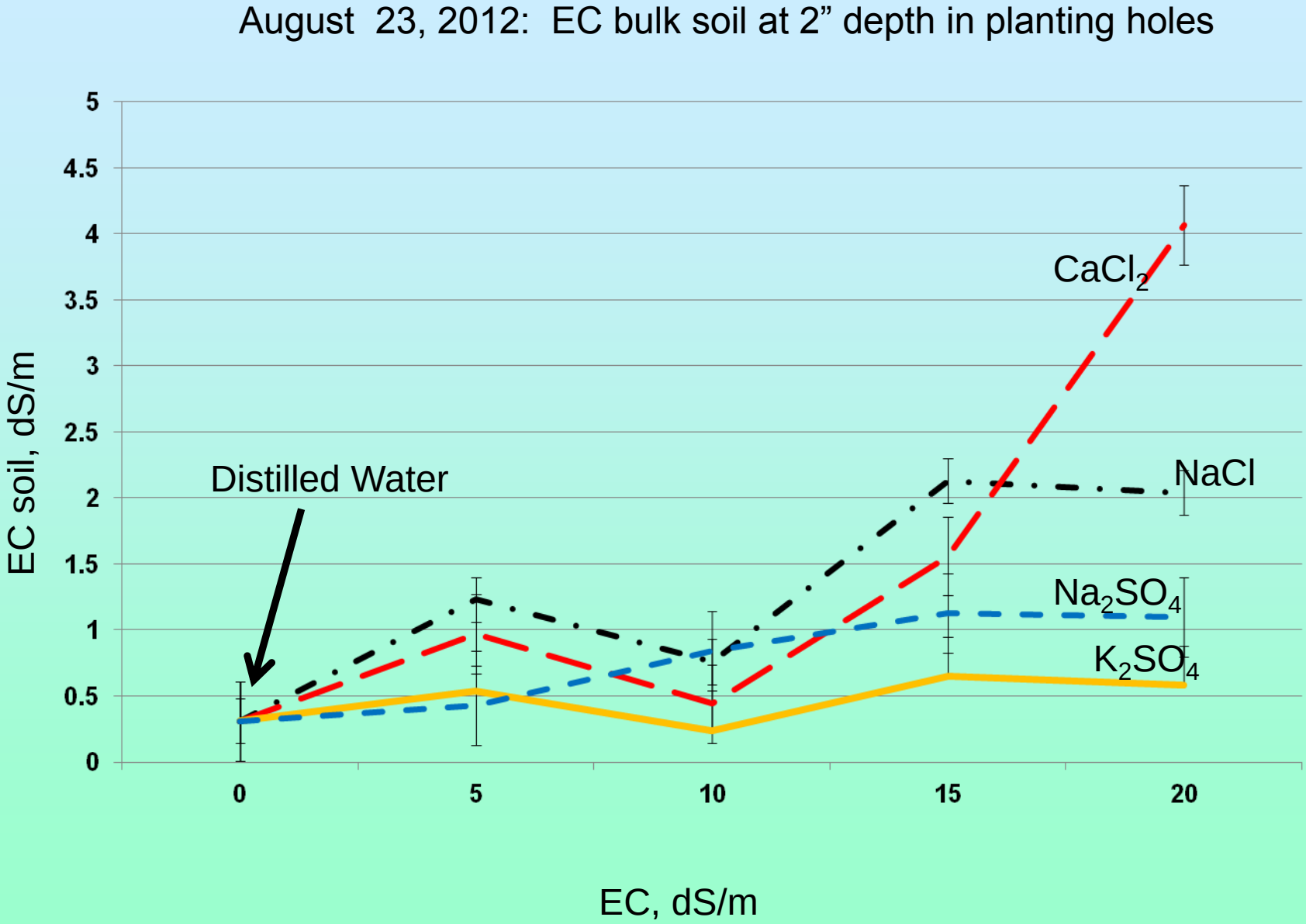
* No application of EC15 and 20 solutions to NaCl and $CaCl_2$ plots due to plant mortality

SUMMER BERRIES

- July-planted ‘frigo’ plants
- Day-neutral common Driscoll’s variety
- Vigorous growth and flowering
- Planted in for fall and winter harvest

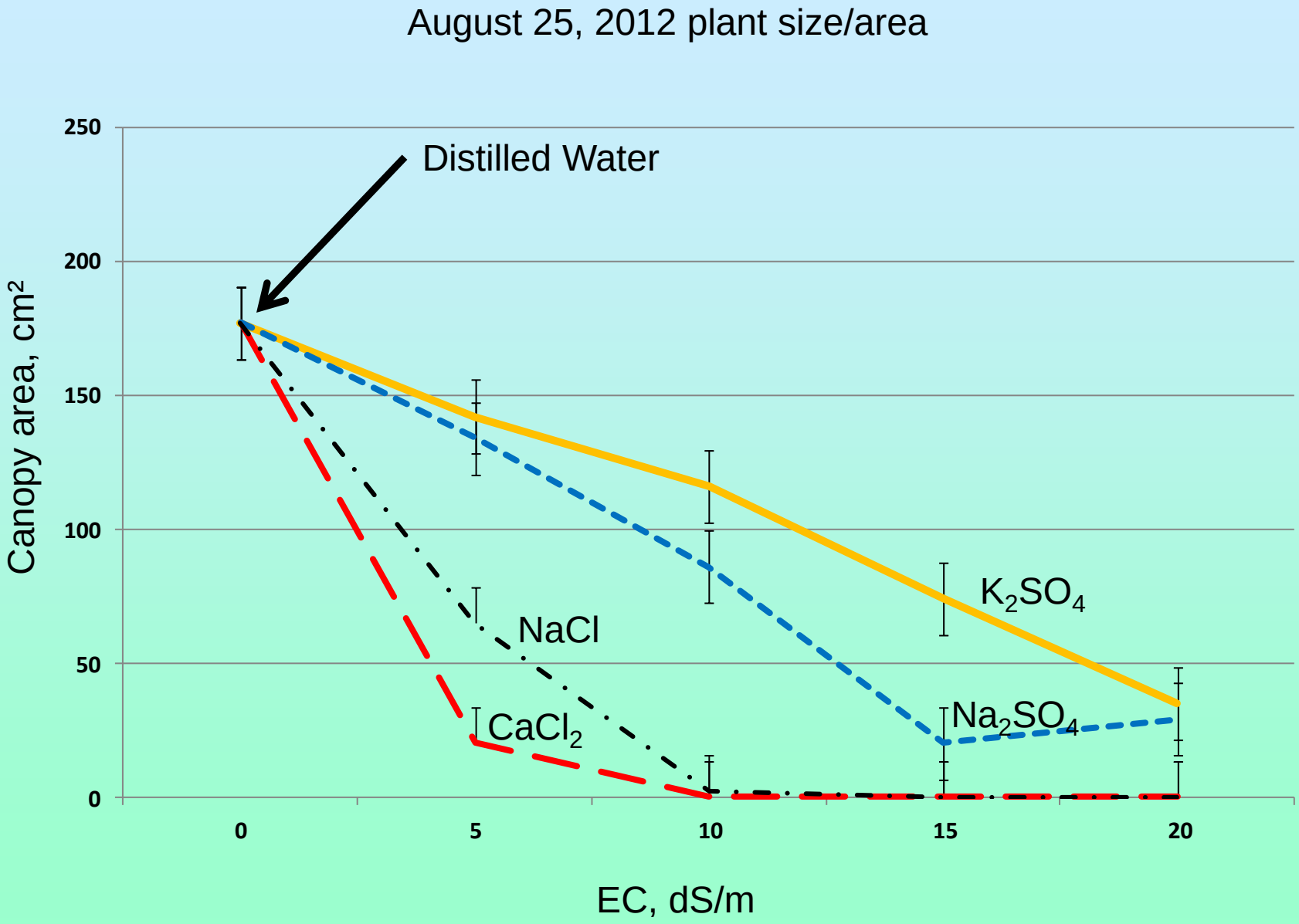
August 10, 2012: EC bulk soil at 2” depth in planting holes




August 23, 2012: EC bulk soil at 2” depth in planting holes
EC soil, dS/m
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
0
5
10
15
20
EC, dS/m
Distilled Water
CaCl2
NaCl
Na2SO4
K2SO4

Is $CaCl_2$ more harmful than NaCl?

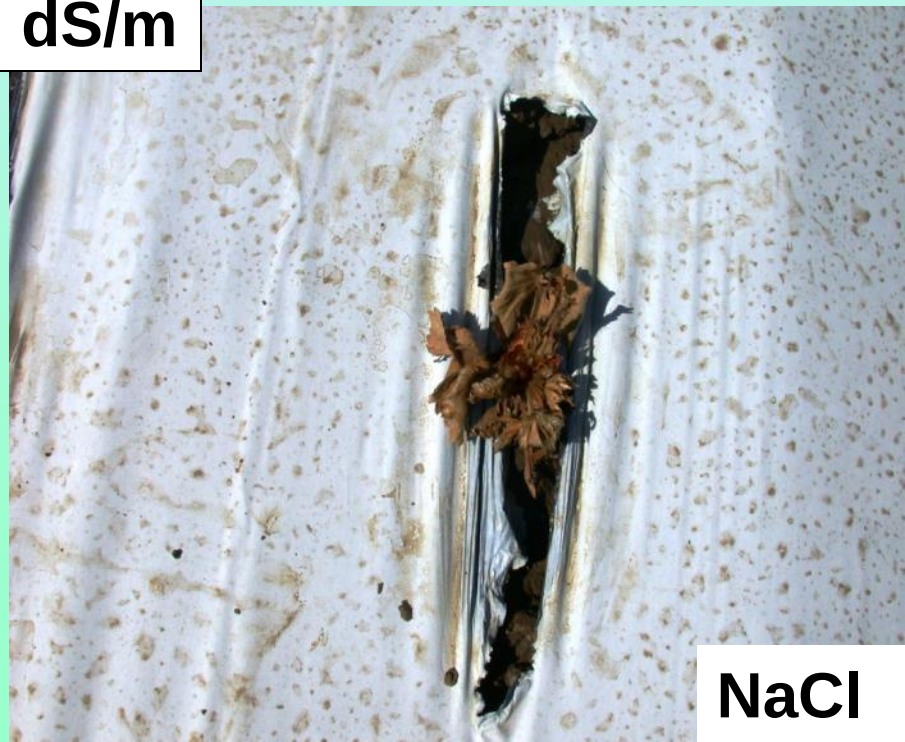
	NaCl	$CaCl_2$
Solubility in water	360 g/kg	75g/kg (doesn't leach as fast and accumulates)
Molar Mass of Cl in salt	58 g/mol	71 g/mol

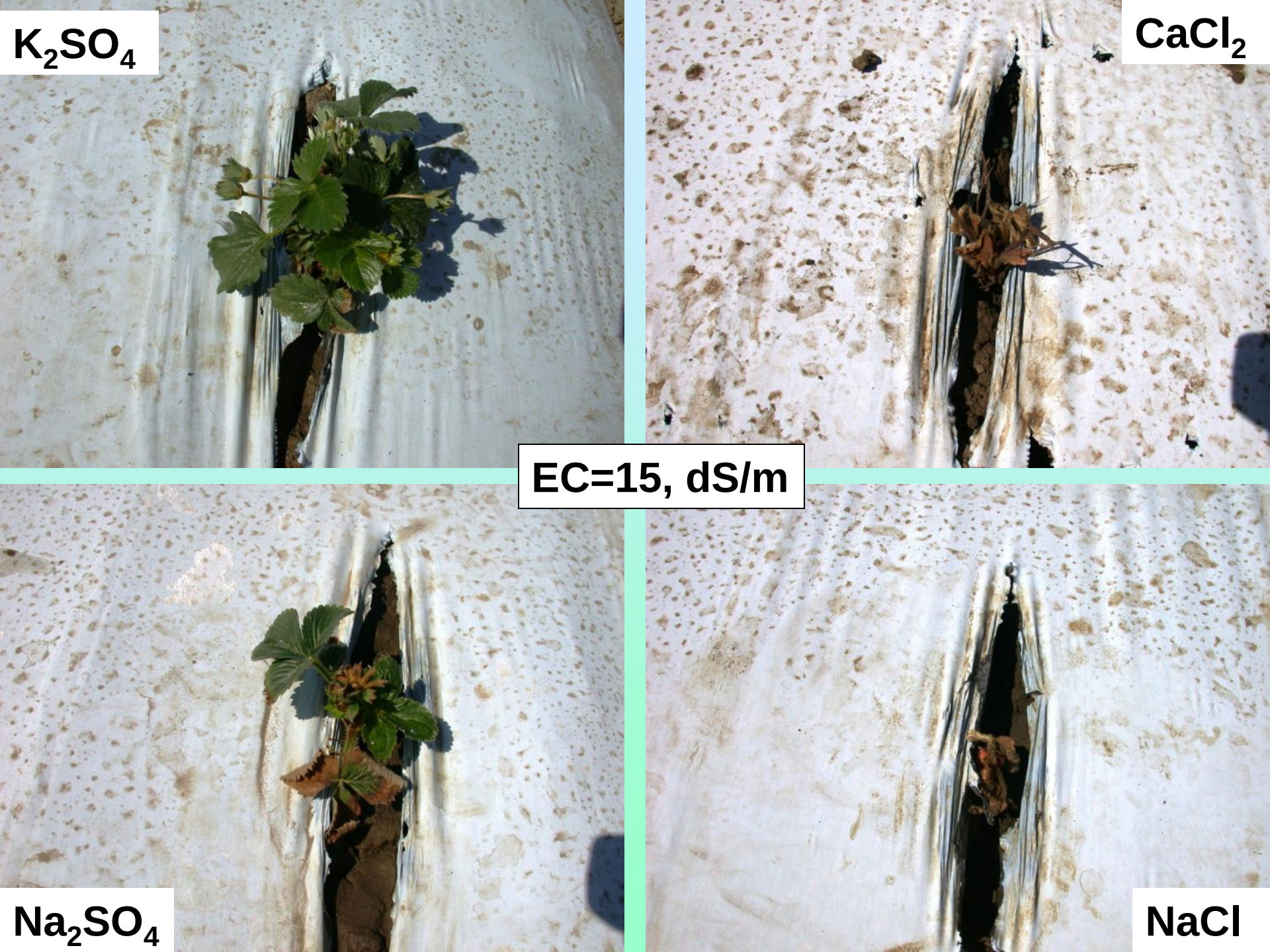

August 25, 2012 plant size/area
Distilled Water
Canopy area, cm²
250
200
150
100
50
0
0
5
10
15
20
EC, dS/m
K2SO4
NaCl
Na2SO4
CaCl2

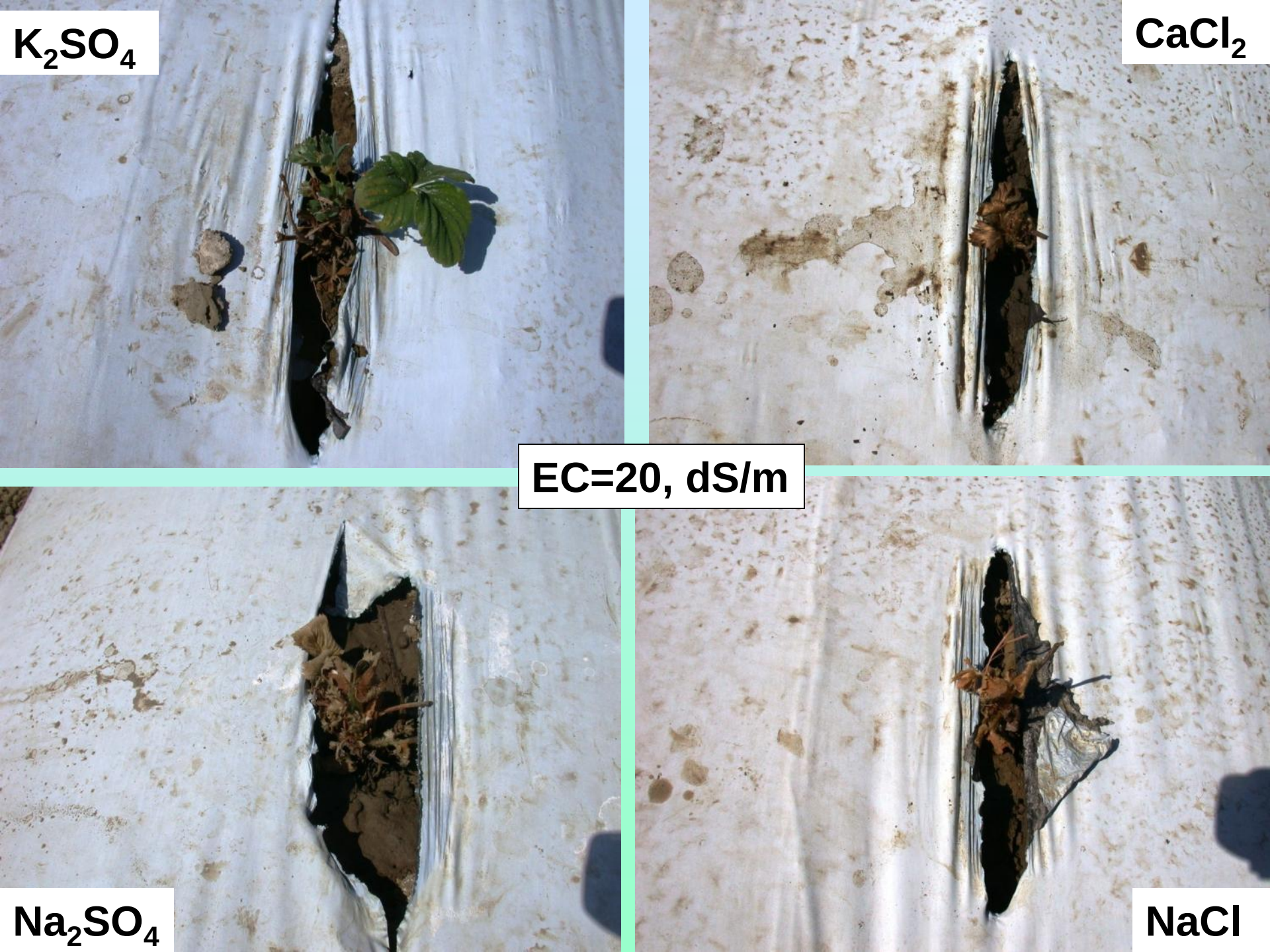
Distilled Water, EC=0 dS/m

EC=5, dS/m

EC=10, dS/m

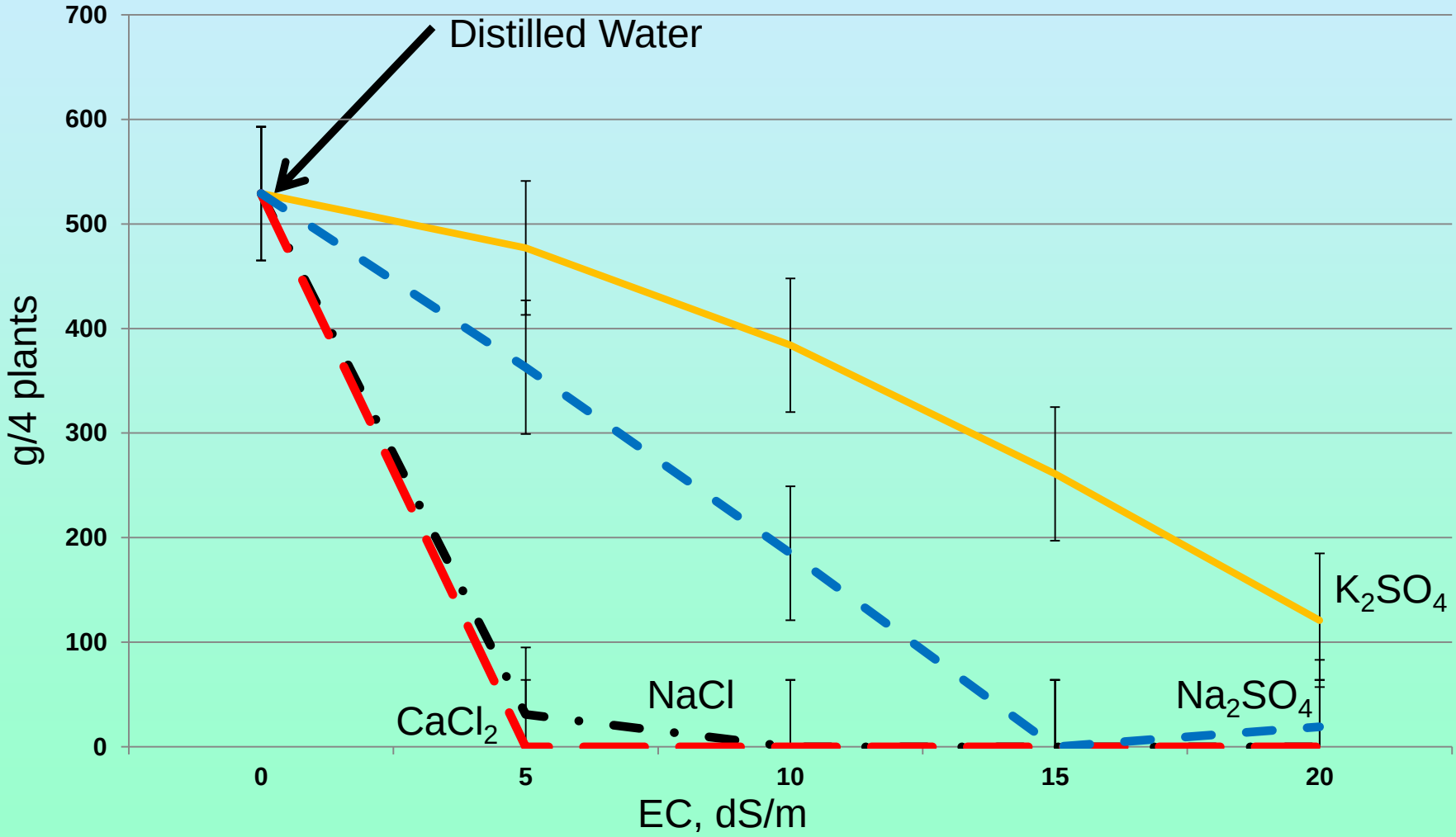



K_2SO_4
$CaCl_2$
EC=15, dS/m
Na_2SO_4
NaCl


K_2SO_4
$CaCl_2$
EC=20, dS/m
Na_2SO_4
NaCl

SUMMER BERRIES:

Early fruit yield Sept 28-Nov 2, 2012

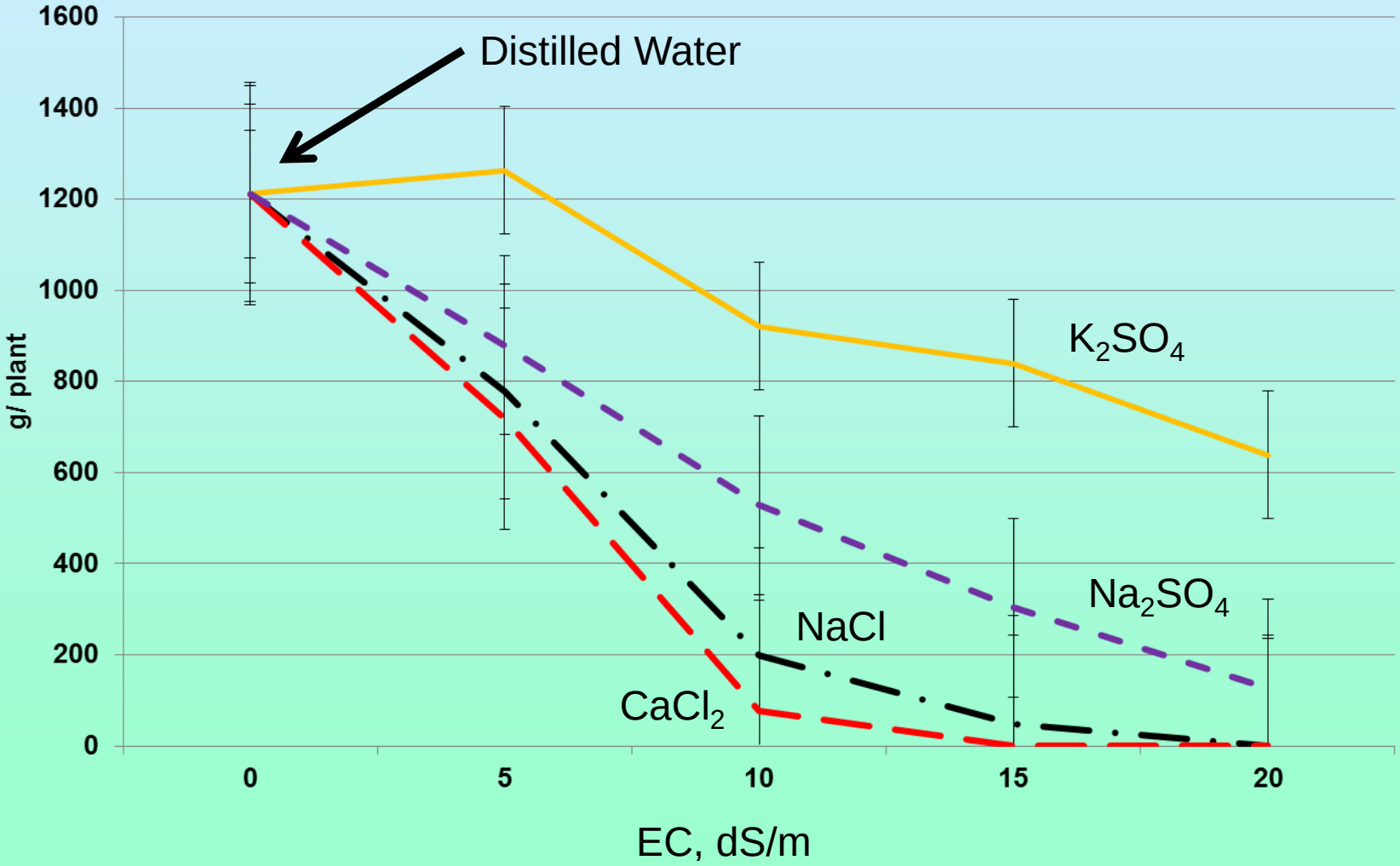


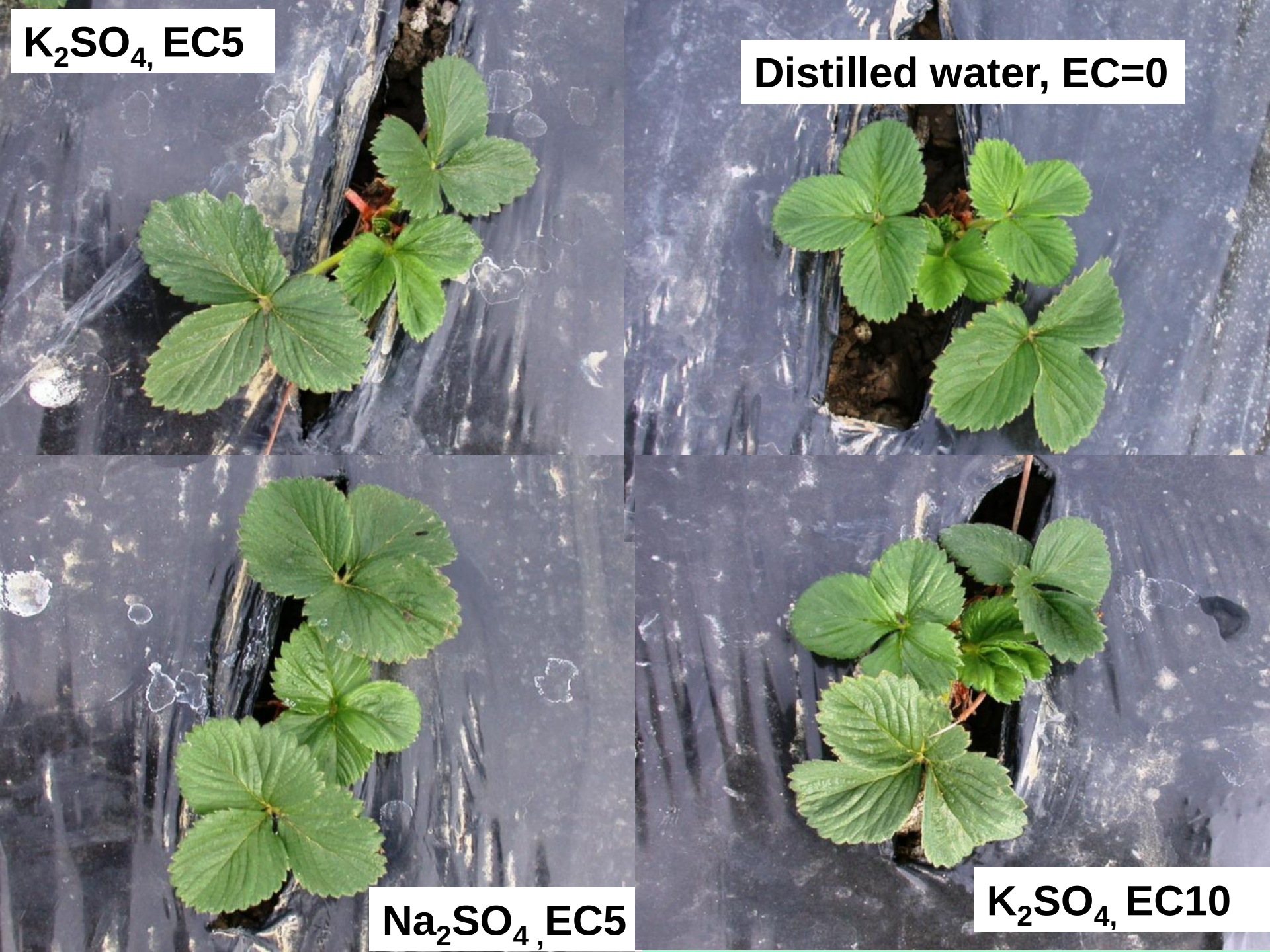
WINTER BERRIES

- Bare-root plants (from high elevation nursery) for short-day (‘Benicia’)

WINTER BERRIES:

Marketable fruit yield, Benicia, January-April, 2013




K_2SO_4, EC5
Distilled water, EC=0
Na_2SO_4, EC5
K_2SO_4, EC10

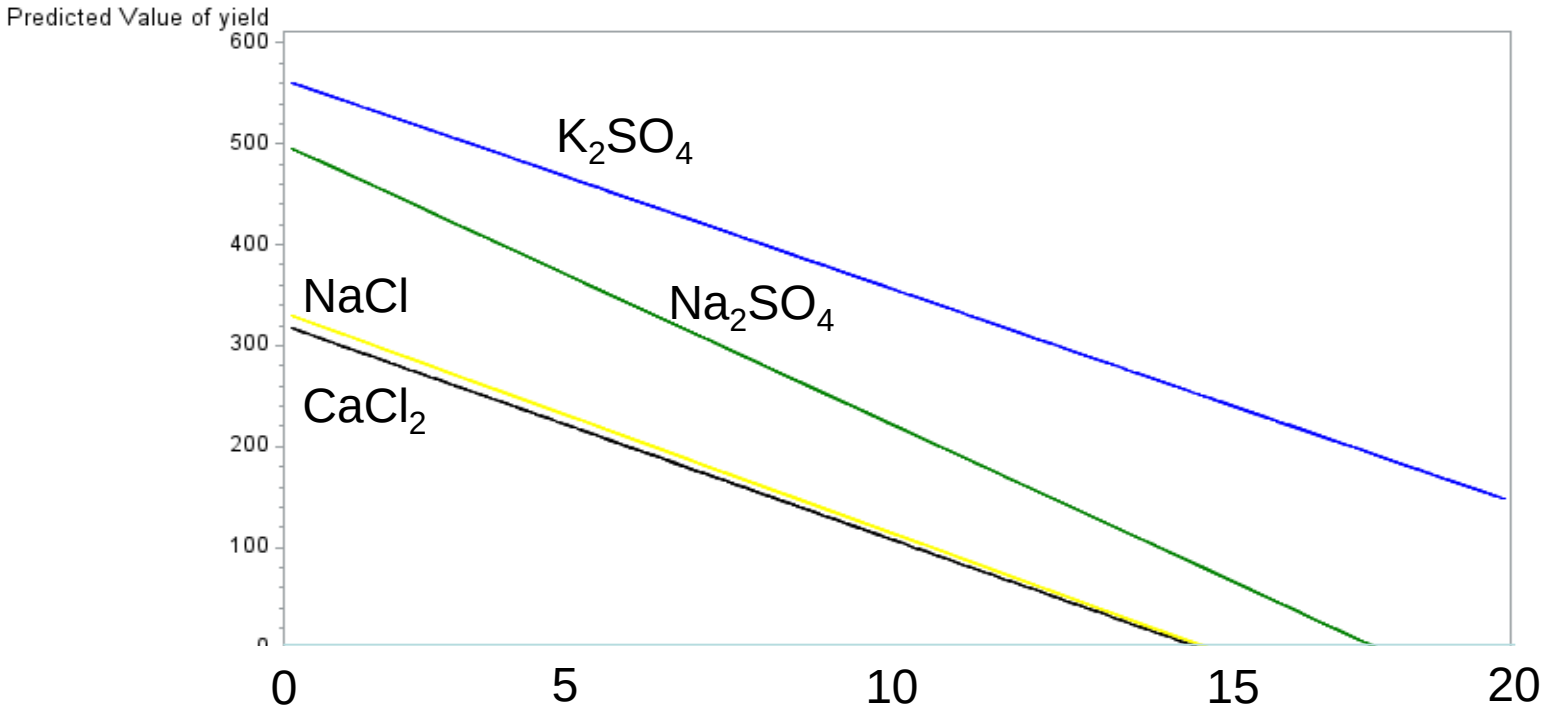

K_2SO_4
$CaCl_2$
EC=5 dS/m, Nov 15
Na_2SO_4
NaCl


K_2SO_4
$CaCl_2$
EC=10 dS/m, Nov 15
Na_2SO_4
NaCl


K_2SO_4
$CaCl_2$
EC=15 dS/m, Nov 15
Na_2SO_4
NaCl

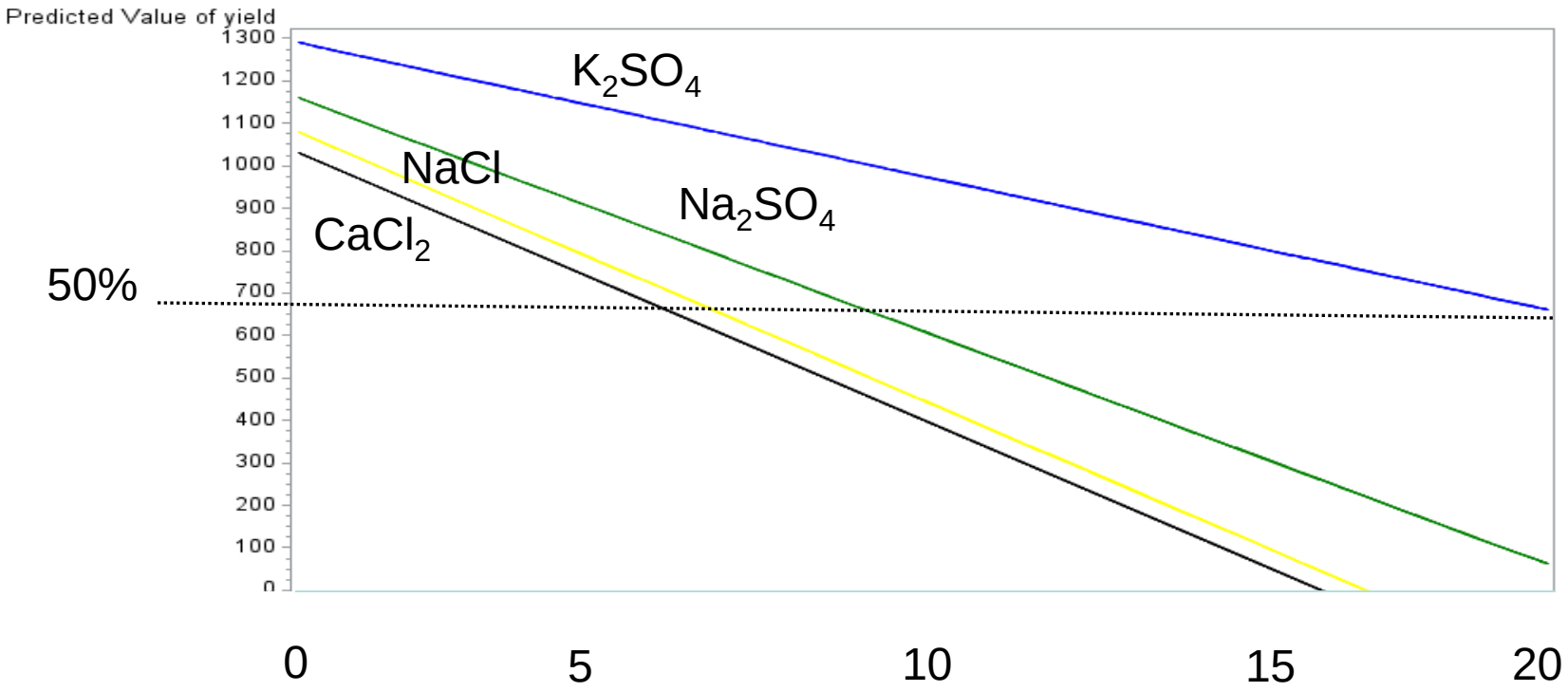

K_2SO_4
$CaCl_2$
EC=20 dS/m, Nov 15
Na_2SO_4
NaCl

Summer-planted strawberry **PREDICTED** yield (g/plant),
Sept 28-Nov 2



NaCl: 330-22 EC; R^2=0.46
$CaCl_2$: 317-21 EC; R^2=0.42
Na_2SO_4: 496-28 EC; R^2=0.65
K_2SO_4: 561-21 EC; R^2=0.44

Fall-planted strawberry **PREDICTED** yield (g/plant) January-April



NaCl: 1079-63 EC; R^2=0.78
$CaCl_2$: 1030-63 EC; R^2=0.79
Na_2SO_4: 1159-55 EC; R^2=0.74
K_2SO_4: 1289-31 EC; R^2=0.33

Summary

- Specific ions in salts are more important than EC
- Chlorides are detrimental to strawberry at low concentrations
- Sodium is less harmful than chloride but not as safe as potassium or sulfate
- At high concentrations, any salt can be harmful
- Summer-planted strawberry more susceptible to salt injury than fall planted