Salt Tolerance of Walnut Rootstocks

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Tri-County Walnut Day, Visalia

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How does salt effect walnuts?

- Total Salinity
  - EC (dS/m)
- Specific ion toxicity
  - Sodium (Na)
  - Chloride (Cl)
  - Boron (B)

How does salt effect walnuts?

- Total salinity
  - High salt restricts osmotic flow
  - Water stress symptoms
    - Less growth
    - Lower yields
    - Sunburn
    - Marginal burn

How does salt effect walnuts?

	Salt (EC) Effects (dS/m)		
	None	Increasing	Severe
Soil	<1.5	1.5-4.8	>4.8
Water	<1.1	1.1-3.2	>3.2

- What does “Increasing Effect” mean
  - Every 1 dS/m over 1.5 reduces growth by 20%
    - 2.5 = 20% reduction
    - 3.5 = 40 % reduction
    - 4.5 = 60% reduction

How does salt effect walnuts?

Specific Ion Toxicity

(Na, Cl, B)

- Normal plant nutrients
- Accumulate in the wood & leaves
  - Interfere with normal cellular processes
  - Reduced photosynthesis
- Roots can regulate uptake
- Rootstocks vary in regulation ability

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Anderson orchard
Brentwood, CA

- Chandler
  - Black
  - Paradox
  - English
- 20 replicates

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Leaf Analysis

	B (ppm)	Cl (%)	Na (ppm)
Black	479.9 b	0.68 c	55.7 b
English	704.3 a	2.06 a	124.9 a
Paradox	667.3 a	1.82 b	87.2 b
Excess Level	300	.30	100

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Bark Cores		
	Boron (ppm)	
	Rootstock	Scion
Black	28.0 a	13.3 b
English	27.9 a	19.1 a
Paradox	23.9 a	15.3 b

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Soil Analysis			
Depth	EC (dS/m)	Cl (meq/L)	B (mg/L)
1’	0.91 a	3.19 a	0.50 a
2’	0.90 a	3.53 a	0.42 b
3’	1.06 b	4.47 b	0.38 c
4’	1.24 c	5.04 c	0.35 c
increasing	1.5-4.8	5.0-10	0.5-3.0
severe	>4.8	>10.0	>3.0

Salinity Management

- Leaching
  - Need good quality water
  - Need deep well drained soils
  - Easiest in winter
    - Full soil profile
    - Dry between small irrigations or rain
- More frequent in-season irrigations
  - Need good quality water!

Salinity Management

Rootstock	July Leaf Analysis			
	Boron (ppm)		Chloride (ppm)	
	Year 1	Year 2	Year 1	Year 2
Black	480 b	200 c	0.7 c	0.2 c
English	704 a	368 a	2.1 a	0.7 a
Paradox	667 a	326 b	1.8 b	0.5 b
Excess	300		0.30	

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