The Ins and Outs of Leaching

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Avocado Café
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8:00 – 10:00 A.M.

Leaching and Avocado

The basics

- Shallow rooted plant
- Salinity tolerance
- Soil texture(basic infiltration rate)
- Irrigation water salinity
- Approximate depth or volume of applied water per year (salt load)
- Topography (flat, slope, etc)
- Other factors

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Not secure | www.ucavo.ucr.edu/Phenology/RootDist.html

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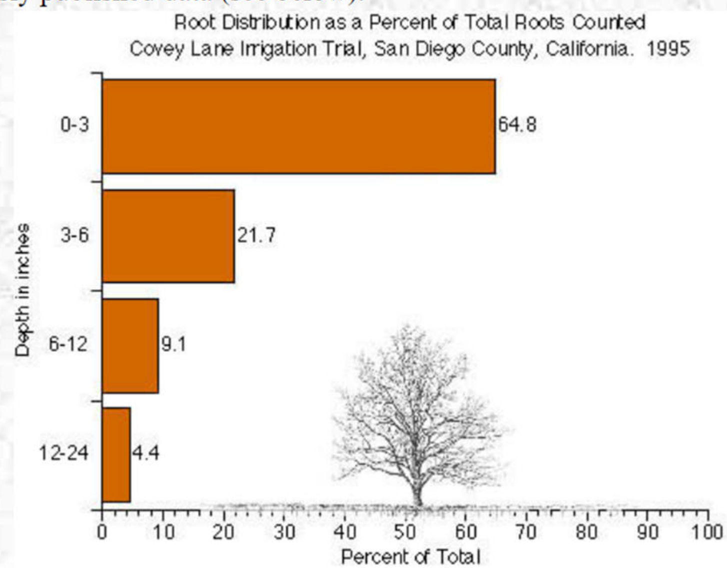
The avocado is a very shallow rooted plant with over 60% of its roots located in the upper 3 inches of soil. This agrees with information gathered at the Corona Foothill irrigation trial in 1991 and with previously published data (see below).

Root Sampling and Analysis Proceedure

Samples were collected at 36 inches from the base of the tree and the emitter. At each depth, the soil auger was emptied into a labeled plastic bag.

Back at the lab, samples were emptied into large white plastic buckets and a forceful stream of water used to separate the roots from the soil.

Most roots are lighter than the soil and can be decanted into a 2.00 mm sieve.



Leaching and Avocado

The basics

- Shallow rooted plant

- Salinity tolerance

  One of the most salt-sensitive crops to salinity

  Rootstock

  Salinity/Cl interaction

  No variety performed satisfactorily when irrigated with an of EC = 1.5 dS·m^{-1} , EC of irrigation water, not soil EC (Suarez et al. 2018)

  1 dS/m ~ 640 ppm or mg/L

  Salinity tolerance ~ 0.75-0.90 dS/m (irrigation water)
  Salinity tolerance commonly expressed in saturated soil extract (EC_e)

- Soil texture(basic infiltration rate)

- Irrigation water salinity

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SALINITY TOLERANCE IN AVOCADO

Author: David Crowley

This project is aimed at evaluation and recommendation of rootstocks that are useful for production of avocado on saline soils. Rootstocks identified as salinity tolerant and that also meet criteria with respect to productivity and Phytophthora resistance from other related projects will be recommended for commercial release. Rootstocks with high salinity tolerance are also being incorporated into the breeding program. Results of this research will allow growers to use irrigation water having a higher salinity content than is currently permissible for avocado production.Salinity Tolerance in Avocado

Salinity-Tolerance-in-Avocado-2004.pdf

RELATED CONTENT

- Salinity-Tolerance-in-Avocado-2004.pdf

RESEARCH LIBRARY TOPICS

- Avocado Lace Bug
- Avocado Pests
- Avocado Seed Moth
- Avocado Thrips
- Branch Canker Disease

HortScience 53(12):1737–1745. 2018. https://doi.org/10.21273/HORTSCI13198-18

Salt Tolerance and Growth of 13 Avocado Rootstocks Related Best to Chloride Uptake

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Additional index words. abiotic stress, Hass, salinity, ion toxicity, irrigation

***Abstract*. Avocado (*Persea americana* Mill.) is one of the most salt-sensitive crops and one of the highest value crops per acre. In the United States, avocados are grown primarily in California, in regions experiencing both scarcity of freshwater and salinization of available water supplies. Thus, our objectives were to evaluate avocado rootstocks for salt tolerance and evaluate the relationship between leaf ion concentrations, trunk diameter, leaf burn, and fruit yield. Our field experiment evaluated the salt tolerance of the Hass scion grafted onto 13 different avocado rootstocks using the Brokaw clonal rootstock technique. The experiment consisted of 156 trees arranged in a randomized complete block design with six replications of each saline [electrical conductivity (EC) = 1.5 dS·m^{-1}, Cl^- = 4.94 mmol·L^{-1}] and nonsaline (EC= 0.65 dS·m^{-1}, Cl^- = 0.73 mmol·L^{-1}) irrigation water treatment. We collected soil samples and leaves, then analyzed them for major ions. The rootstocks R0.06, R0.07, PP14, and R0.17, which had high concentrations of Cl and Na in the leaves, were the least salt tolerant, with 100% mortality in the rows irrigated with saline water for 23 months. The rootstocks R0.05, PP40, R0.18, and Dusa, which had low concentrations of Cl ions in the fully expanded leaves, were least affected by salinity, and these rootstocks exhibited the greatest yields, largest trunk diameters, and greatest survival percentages in the saline treatment. Yield and growth parameters correlated well with leaf Cl concentration, but not Na, indicating that salt damage in avocado is primarily a result of Cl ion toxicity. Under arid inland environments, no variety performed satisfactorily when irrigated with an EC = 1.5 dS·m^{-1} water (Cl^- = 4.94 mmol·L^{-1}). However, the more tolerant varieties survived at soil salinity levels that would apparently be fatal to varieties reported earlier in the literature.**

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journal homepage: www.elsevier.com/locate/scihorti

The physiological response of 'Hass' avocado to salinity as influenced by rootstock

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ABSTRACT

With increasing demands on both potable and agricultural water supplies, drought, and extreme temperatures worldwide, agricultural production is challenged with reduced water availability and lower water quality. Salinity, which is associated with low water quality is a critical issue for California avocado growers and, coupled with avocado root rot, threatens the long-term sustainability of the industry since avocados (*Persea americana* Mill.) are known to be extremely salt sensitive. Salt tolerance of the 'Hass' variety, the most commonly grown scion in California, is influenced by rootstock. We investigated 'Hass' scions grafted onto three different avocado rootstocks under control (irrigation using water with EC = 0.65 dS/m) and salinity (irrigation using water with EC = 1.5 dS/m) conditions. Results indicated that, compared to control conditions, the irrigation of avocado trees using water with EC = 1.5 dS/m increased canopy damage by 44%, reduced survival by half of the trees tested, and caused yield losses of more than 63%. Avocado leaves visibly damaged by the salinity treatment (named as partially burned or PB leaves) experienced photoinhibition, and reduction of photosynthetic rate and water-use efficiency, suggesting that the poor performance in carbon assimilation contributed to reductions in yield and increases in mortality. The salinity treatment did not cause water stress and the poor performance of treated trees was attributable to chloride accumulation previously reported. Leaf carbon isotopic composition was affected in trees under salinity treatment by increasing the values of $\delta^{13}C$ however, this affect was nor correlated with water-use efficiency. Overall, 'R0.05', 'PP40' and 'Dusa' performed similarly and, considering the conditions of the experiment and the intrinsic susceptibility of avocado trees to salinity, were superior to all other rootstocks tested. Future screenings for salinity tolerant rootstocks are required to improve yield when poor quality soil or water is used. Overall, our results showed a coordination between the physiological performance, health and productivity of the 'Hass' scion and how these parameters were negatively affected by salinity.

Leaching and Avocado

The basics

- Shallow rooted plant

- Salinity tolerance, expressed here in irrigation water salinity (EC_w)

- EC_w 0.9 dS/m (no reduction in yield)
- EC_w 1.2 dS/m (10% reduction in yield)
- EC_w 1.6 dS/m (25% reduction in yield)

- Salinity tolerance: commonly expressed in saturated soil extract (EC_e)

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Table 2. Fruit and nut crops – water salinity tolerance (ECw)

This table indicates the indicate the salinity concentrations at which various percentage yield reductions will occur when various fruit and nut crops are irrigated with saline water and grown in moderate- to slow-draining soils.

Fruit and nut crop	No reduction (dS/m)	10% reduction (dS/m)	25% reduction (dS/m)
Fig [1]	2.8	2.53	na
Date	2.6	4.6	7.5
Olive [1]	2.6	2.5	na
Peach [2]	2.1	2.5	3.0
Grapefruit	1.2	1.6	2.2
Walnut [3]	1.1	1.6	na
Orange	1.1	1.5	2.2
Apricot	1.1	1.3	1.8
Grape	1.0	1.7	2.7
Almond	1.0	1.4	1.9
Plum	1.0	1.4	1.9
Boysenberry	1.0	1.3	1.7
Avocado	0.9	1.2	1.6
Pear [1]	0.7	1.5	na
Prune	0.7	na	na
Apple	0.7	1.0	1.6
Raspberry [1]	0.7	0.9	na
Strawberry	0.7	0.9	1.2
Lemon [4]	1.0	1.5	2.3

Note: Variety of rootstock may have a bearing on salinity tolerance of some fruit trees.

na = not available.

[1] Figures for 10% reduction for fig, olive, pear, and raspberry are from Table 6 of the crop tolerance tables from WA Department of Agriculture & Food (Neil Lantzke, Tim Calder and John Burt)

[2] Figures provided for peach in Table 6 of the crop tolerance tables from WA Department of Agriculture & Food (Neil Lantzke, Tim Calder and John Burt) are more conservative (1.1 dS/m 'no reduction', 1.3 dS/m '10% reduction', and 1.8 dS/m '25% reduction').

Note: Salinity tolerance values provided by WA DA&F are for loam soils [leaching fraction presumed to be ANZECC & ARMCANZ (2000b; equation 4.1) value for loamy soil of 0.33], rather than values for a moderate- to slow-draining soil generally provided in this table (leaching fraction factor of 0.3).

[3] There is no reference to salinity tolerance for walnut in the ANZECC & ARMCANZ (2000b) guidelines. The value presented in Table 2 for no reduction is consistent with information presented by DeHayr, *et al.* (1997) (Queensland DNR Water Facts W55). The value for 10% reduction is from an unreferenced source and should be considered with caution.

[4] Values for lemon are consistent with Cerda *et al.* (1990) presented in FAO (1999). Value previously presented in Table 2 (0.7 dS/m for no reduction) was based on ANZECC 2000b (ECse for no reduction only). Results may be influenced by rootstock for grafted lemons.

Leaching and Avocado

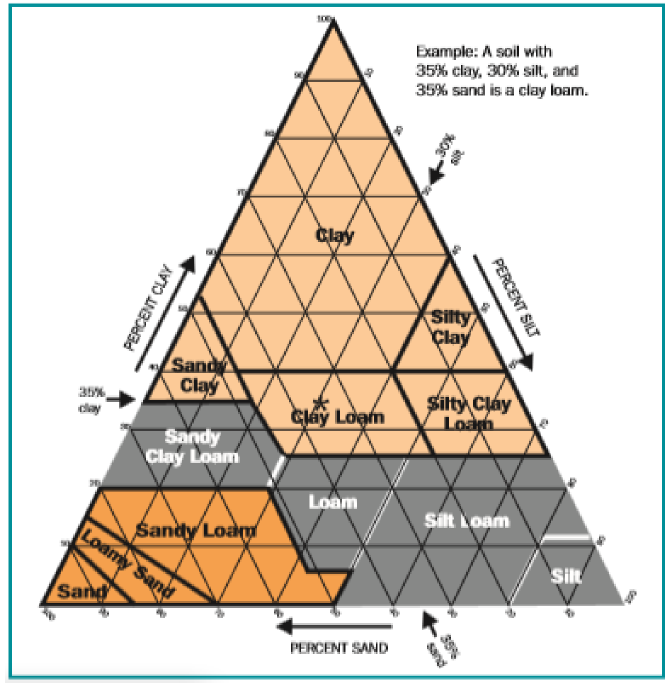
The basics

- Shallow rooted plant

- Salinity tolerance

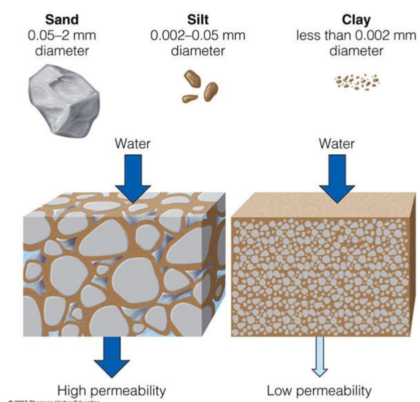
- Soil texture(basic infiltration rate)
- Light to medium soils, typically good drainage and saturated soil extract salinity is close to irrigation water salinity; $EC_e = EC_w$

- Medium to heavy soil, saturated soil extract is typically higher than the salinity of irrigation water; $EC_e > EC_w$



Soil Particle Size

- **Sand**
  - **Largest**
- **Silt**
  - **Medium**
- **Clay**
  - **Smallest**



Leaching and Avocado

The basics

- Shallow rooted plant
- Salinity tolerance
- Soil texture(basic infiltration rate)

- Irrigation water salinity and Cl content
- Approximate depth or volume of applied water per year (salt load)
- Salt load (salinity buildup) depends on soil texture

- Topography (flat, slope, etc)

- Other factors

Leaching and Avocado

The basics

- Shallow rooted plant
- Salinity tolerance
- Soil texture(basic infiltration rate)

- Irrigation water salinity and Cl content
- Approximate depth or volume of applied water per year (salt load)
- Salt load (salinity buildup) depends on soil texture

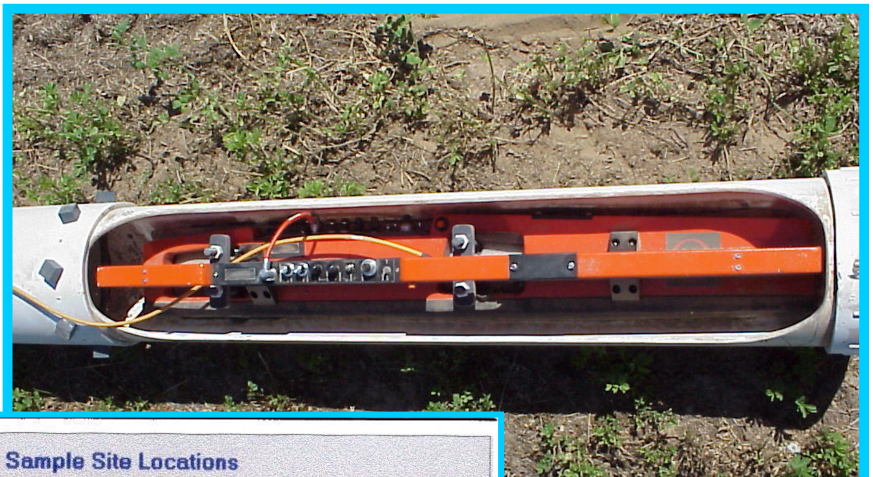
- Topography (flat, slope, etc)

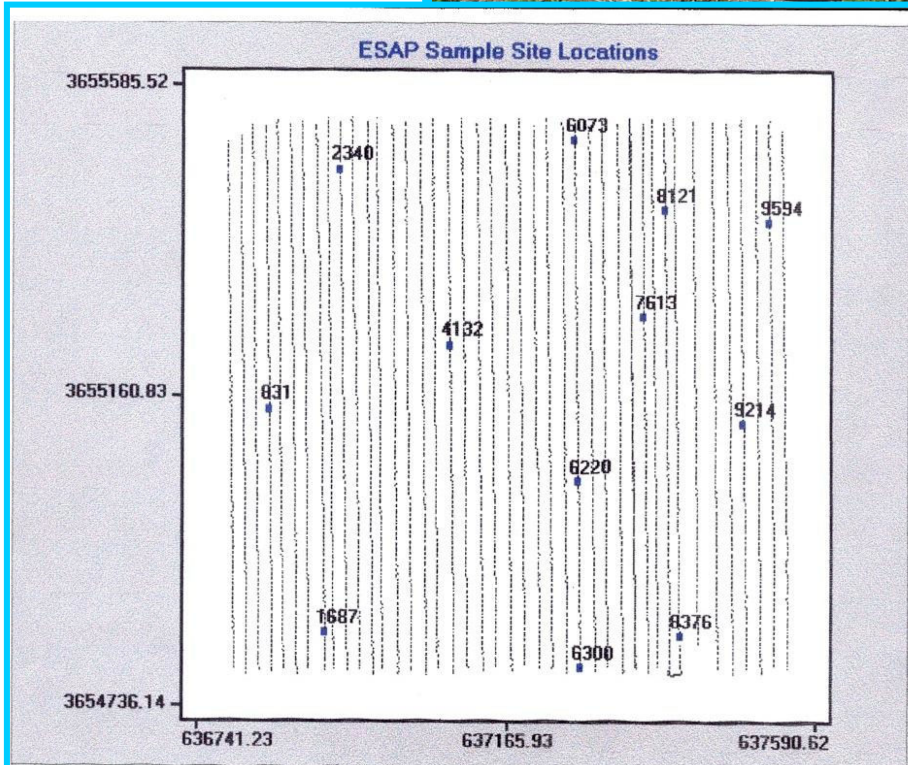
- Other factors

Leaching and Avocado

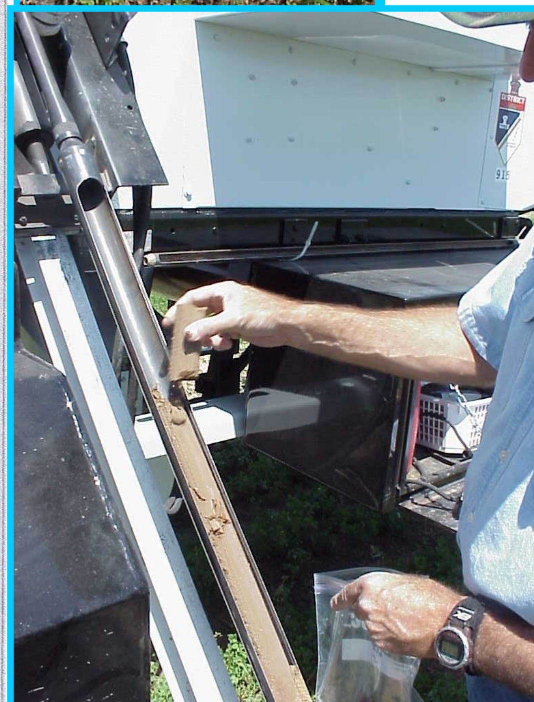
The basics

- Shallow rooted plant
- Salinity tolerance
- Soil texture(basic infiltration rate)
- Irrigation water salinity
- Approximate depth or volume of applied water per year (salt load)
- Topography (flat, slope, etc)
  Leaching and runoff
- Other factors to consider (specific ion toxicity)
- Soil salinity
    - Samples or scanning of entire field

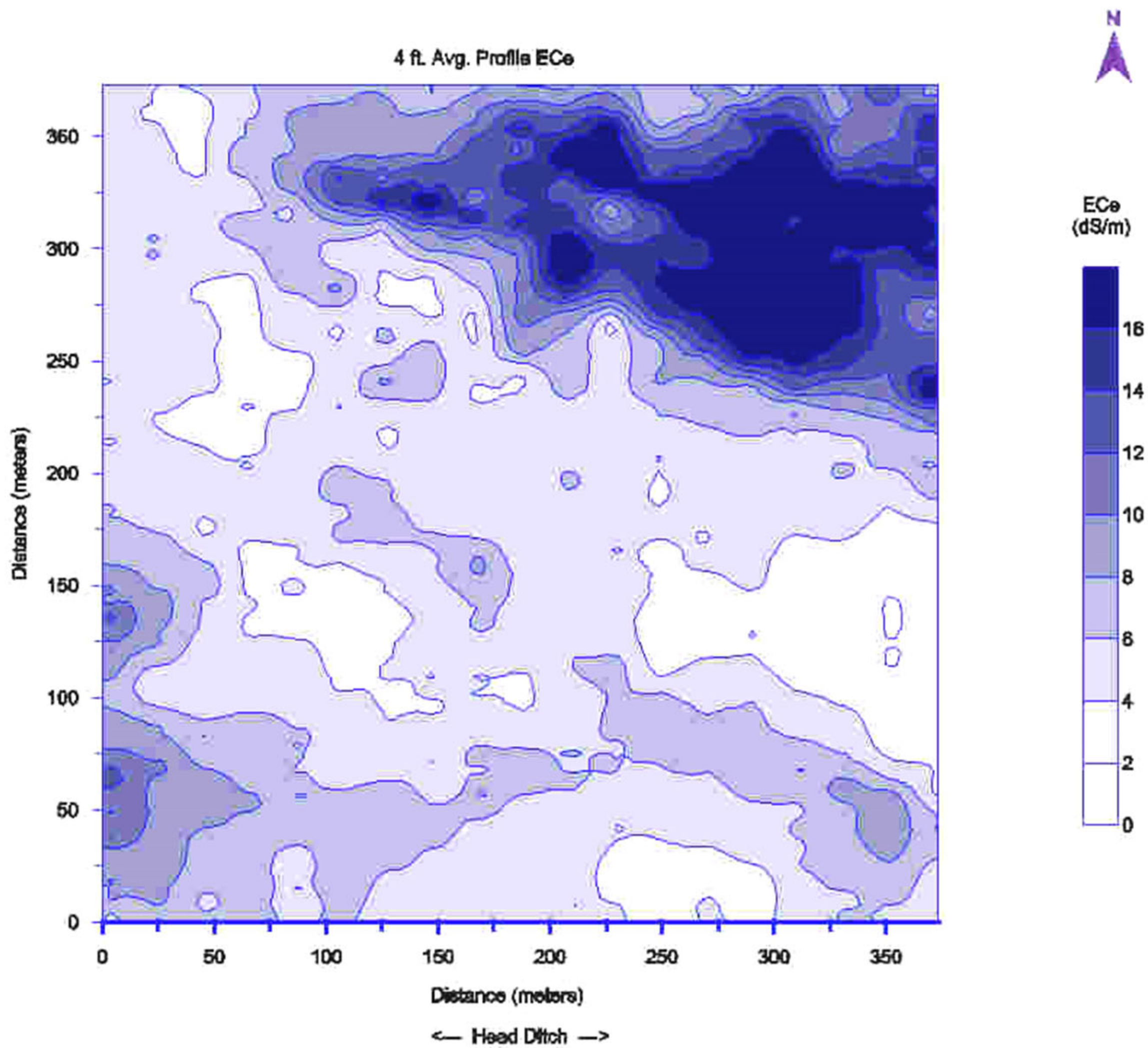




ESAP Sample Site Locations
3655585.52
3655160.83
3654736.14
636741.23
637165.93
637590.62
6073
2340
8121
9594
7613
4132
831
9214
6220
1687
8376
6300



Shields



Prepared by Steve Burch - Imperial Irrigation District - Salinity Assessment Vehicle Project

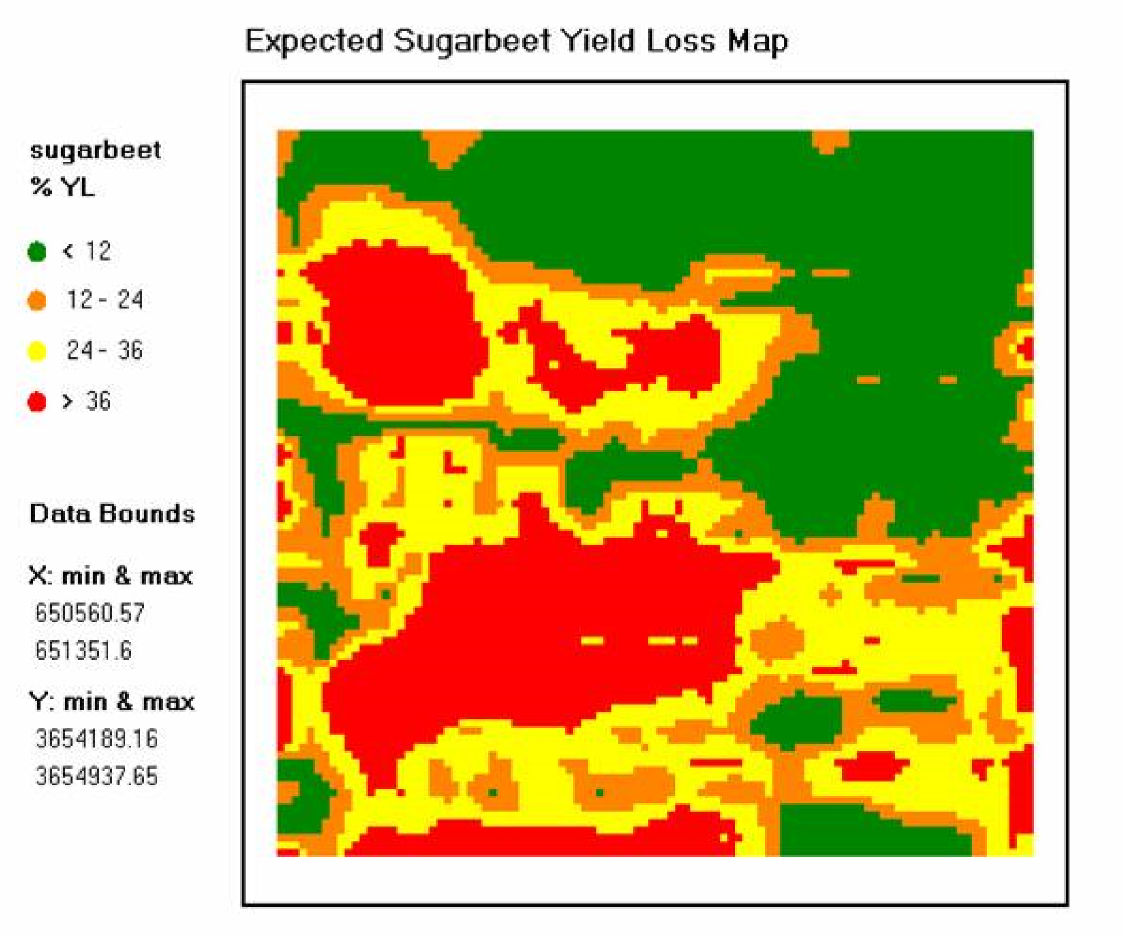
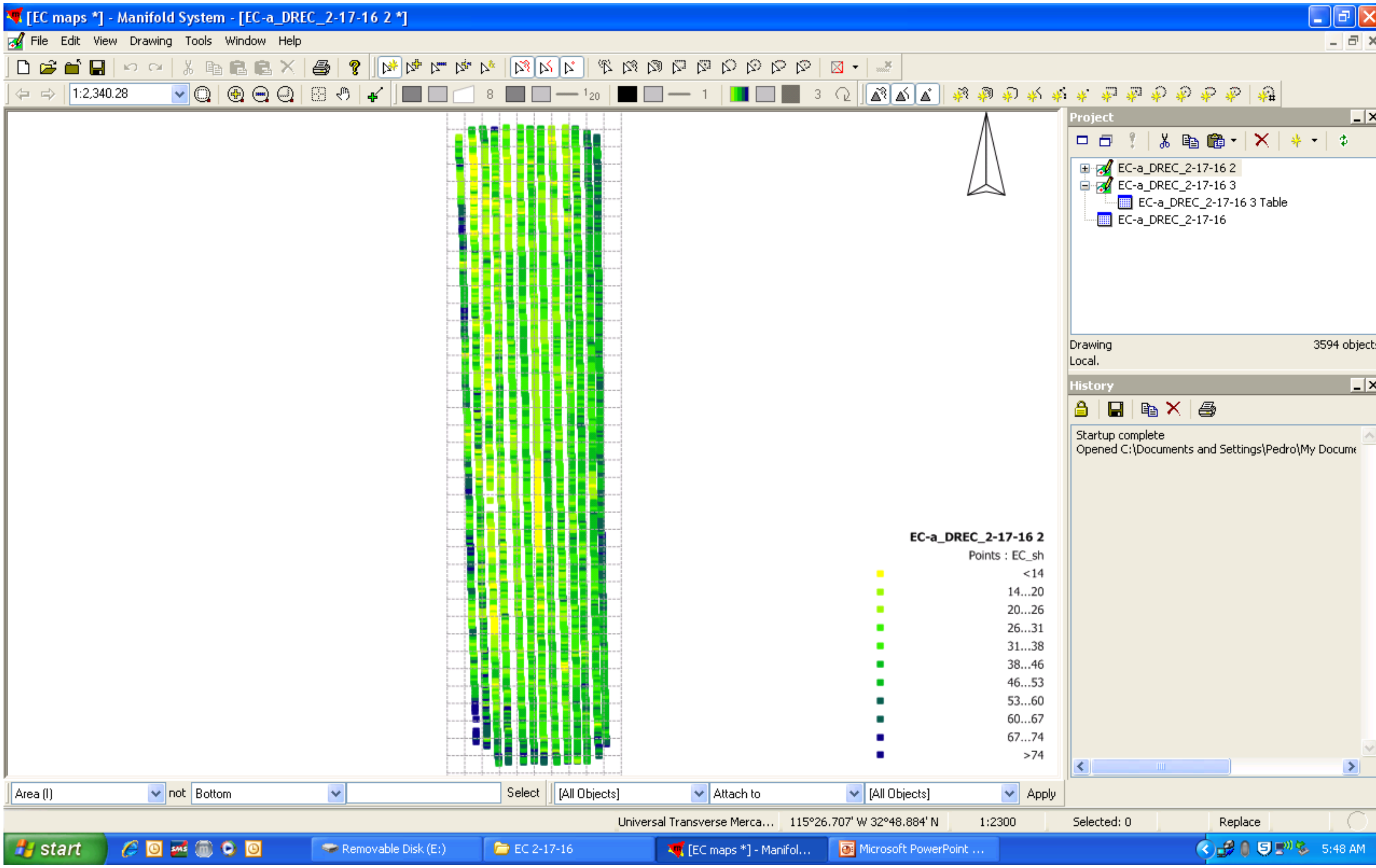


Image courtesy of
Stephen Kaffka
University of California – Davis
Extension Agronomist

Predicted sugarbeet yield loss = 22.5 %
Actual yield loss = 18.5%

UCDREC- Sunflower

Soil apparent electrical conductivity (EC_a) of 0-0.3m depth, 10m grid on true North



Resources

UC ANR publications:

Drought Tip 8550	Managing Salts by Leaching
Drought Tip 8554	Use of Saline Water for Crop Production
Drought Tip 8562	Crop Salt Tolerance

Soil Salinity and Leaching

University of California
Agriculture and Natural Resources

ANR Publication 8550 | November 2015
http://anrcatalog.ucanr.edu
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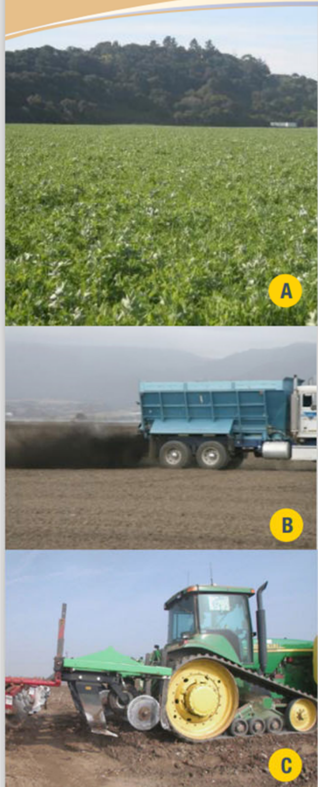

Figure 1. Drainage can be improved using cover crops (A), compost amendments (B), and deep tillage (C) to increase the macropore structure of soils *Photos: M. Cahn, A and B; J. Mitchell, C.*

DROUGHT TIP

Managing Salts by Leaching

Leaching for Salt Management

MICHAEL CAHN, University of California Cooperative Extension Irrigation and Water Resources Farm Advisor, Monterey, Santa Cruz and San Benito Counties; and KHALED BALI, University of California Cooperative Extension Water Management Farm Advisor and County Director, Imperial County

Irrigating crops can often cause salts to build up in the soil profile. Irrigation water applied to crops may contain a significant amount of dissolved salts. For example, applying 1 acre-foot of water with a total dissolved salt concentration of about 735 ppm, or an electrical conductivity (EC) of 1.15 dS/m, would potentially add 1 ton of salt to 1 acre of cropped land. Salts accumulate in the soil because crop roots take up water during transpiration but exclude most salts. Salt also accumulates near or at the soil surface because water evaporating from the soil leaves behind dissolved salt. These accumulated salts can damage crops if they are not leached below the root zone.

Leaching is the process of percolating water through the soil profile to move salts below the root zone, the region of the soil where crop roots normally grow. During the growing season, leaching can be accomplished by applying extra water so that the amount exceeds the evapotranspiration requirement of the crop. Leaching can also be done by irrigating a field before planting a crop or by irrigating before permanent crops leaf out in the spring. Salts can also be leached after harvest or by winter rainfall if sufficient.

Leaching is beneficial for removing salts only if the soil has adequate drainage. Compacted layers that impede water movement can prevent leached salts from moving below the root zone. Practices such as deep tillage, incorporation of soil amendments such as compost or gypsum, and rotating with deep-rooted cover crops such as cereals can increase the volume of macropores in the soil and improve drainage (fig. 1). Subsurface drainage systems are also commonly used to improve drainage from fields with shallow or perched water tables.

Soil Salinity and Leaching

University *of* California
Agriculture and Natural Resources

ANR Publication 8554 | October 2015
http://anrcatalog.ucanr.edu
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Soil and Water Salinity

Salinity refers to the presence of salts in water and soil. The salts include more than simply sodium or chloride, the two elements of common table salt: magnesium, calcium, bicarbonate, nitrate, and sulfate can also contribute to salinity. The suitability of water for drinking, irrigation, or wildlife depends on the type and concentration of salts dissolved in water. The salinity of water is usually expressed in terms of an easily measured parameter called electrical conductivity (EC) that reflects the total dissolved salt (TDS) concentration of the water or soil-water. Typically, EC is expressed as decisiemens per meter(dS/m), where 1 dS/m represents a TDS concentration of about 640 mg/L salt (see Hanson 2006). This conversion factor depends on the concentration and composition of the salts in solution. Safe drinking water limits for salinity are generally considered to be <1 dS/m. This publication uses this threshold to label saline waters as those with a salinity >1 dS/m. Saline soils are generally characterized as having soil-water salinity >4 dS/m, but this particular definition is often crop dependent, as many crops do not tolerate such high salinity.

DROUGHT TIP

Use of Saline Drain Water for Crop Production

MARK E. GRISMER, Professor, Land, Air, and Water Resources, University of California, Davis; and KHALED M. BALI, County Director and Irrigation/Water Management Advisor, University of California Cooperative Extension, Imperial County

Some irrigated regions of California accumulate saline drain water as a result of the leaching needed to maintain crop production, but they have limited options for disposal of this saline water. Reusing saline drain water for irrigation as a means of disposal and augmentation of water supplies has been of interest for decades, especially when other water supplies become scarce during droughts. Using saline drain water (water with salinity >1 dS/m; see sidebar) for irrigation was described for many semiarid locations around the world in a guidance document published by the United Nations (Rhoades et al. 1992). Similarly, the California Department of Water Resources (DWR) considered drain water reuse for irrigation as part of the San Joaquin Valley Drainage Program (Alemi 1999). Under drought conditions, drainage water may be used to supplement regular irrigation to meet crop water demands or possibly to maintain established tree or vine crops if root zone salinity is carefully managed. This publication considers some of the more recent research related to the use of saline water for irrigation of agricultural crops and describes the management of this water to maintain crop production and acceptable root zone soil salinity.

Research Overview

The quality of subsurface drainage water depends on the quality of the applied water and the extent of root zone leaching of salts, applied fertilizers, herbicides, and pesticides during the irrigation season. Collected subsurface drain water can be saline and may have elevated boron (B) concentrations. Public concern over possible food crop contamination, as well as grower concern about possible long-term physical and chemical (e.g. salinization) deterioration of the root zone from regular use of drain water for irrigation, has typically limited its use to moderately salt-tolerant forage and fiber crops, though saline water

Soil Salinity and Leaching

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ANR Publication 8562 | March 2016
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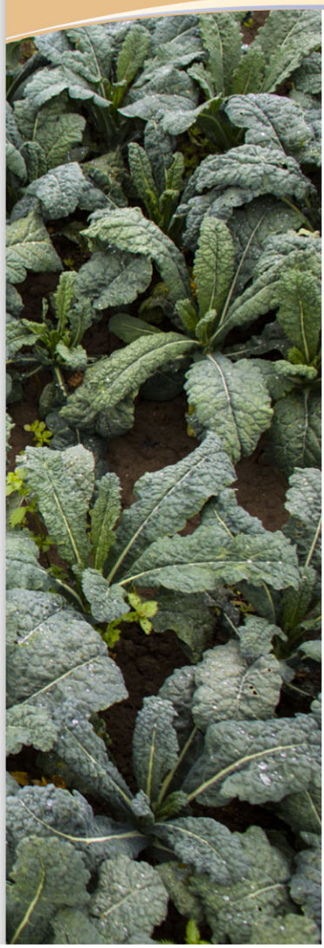

DROUGHT TIP

Crop Salt Tolerance

STEPHEN R. GRATTAN, Cooperative Extension Plant-Water Specialist, University of California, Davis

Soil salinity is an important stress affecting irrigated crops in many areas of California. This stress is often exacerbated during drought years. Over time, salts can accumulate in the soils as crops extract water, leaving the salts behind in the root zone. Without sufficient leaching, accumulated salts will eventually reach a level that will damage crops. Even if irrigation water is low in salinity, salts will eventually build up in the soil to damaging levels without sufficient leaching from rainfall or excess irrigation water.

Under drought conditions, high-quality surface water supplies may not be available in sufficient quantities to meet crop needs and may be supplemented or completely replaced with poorer-quality ground or surface water. Ironically, irrigation water higher in salinity will require more water in order to maintain the same level of soil salinity; that is, poorer-quality water requires more leaching. But regardless of the quality of the water applied, deficit irrigation combined with poor quality water will exaggerate the salinity problem.

All soils and irrigation water contains dissolved salts, but these salts vary in both concentration and composition. The major dissolved salts are the cations sodium (Na^+), calcium (Ca^{2+}), and magnesium (Mg^{2+}), and the anions chloride (Cl^-), sulfate (SO_4^{2-}), and bicarbonate (HCO_3^-). Typically, groundwater has naturally higher concentrations of these constituents, and some soils have higher salinity than others. These dissolved salts can be growth-limiting when concentrations in the root zone exceed critical levels, as described below.

Salinity is best characterized by the electrical conductivity (EC) of the irrigation water (ECw) or the EC of the saturated soil paste (ECe); the higher the dissolved salt concentration, the higher the EC. The units of EC are expressed in dS/m or mmho/cm where 1 dS/m = 1 mmho/cm. For EC values less than 5 dS/m, 1 dS/m = 640 mg/L total dissolved solids (TDS) and 1 dS/m = about 800 mg/L for EC values above 8 dS/m.

Managing salts by leaching

- Leaching: The process of percolating water through the soil profile to move salts below the root zone

- Leaching during the growing season can be accomplished by applying extra water so the amount exceeds the ETc of the crop

- Leaching could be done before crops leaf out

- Leaching could be done by winter rainfall if sufficient

- Leaching is only needed if soil salinity exceeds the salinity threshold level

Managing salts by leaching

- Leaching requirement (LR) is the amount of water that is needed to maintain crop productivity

- LR depends on the salinity of irrigation water, soil salinity, salt crop tolerance, irrigation management, and other factors

- Leaching fraction (LF) is the amount of leaching that has occurred in the field, the fraction of applied water that drains below the root zone

$$LF = D \div AW$$

where D is the depth of water draining below the root zone and AW is the depth of water applied (irrigation plus rainfall) that infiltrates the soil. A high leaching fraction (> 0.5) reduces salt accumulation in the root zone more than does a low leaching fraction (< 0.1).

Managing salts by leaching

- Leaching
- Example; crop ETc= 15 inches
- Additional 3.75 inch of water applied for leaching
- LF= 3.75/(15+3.75)=0.2 or 20%
- AW=15+3.75=18.75

- AW as % of crop ET=18.75/15=125%

Table 1. Applied water, expressed as percentage of crop ET, need to attain a desired leaching fraction

Leaching fraction (%)	Applied water as a percentage of crop ET
5	105
10	111
15	118
20	125
25	133
30	143
35	154
40	167
50	200
60	250

Managing salts by leaching

- Threshold level (Soil Extract ECe)

- Avocado
- Salinity tolerance, expressed here in irrigation water salinity (EC_w)

- EC_w 0.9 dS/m (no reduction in yield)
- EC_w 1.2 dS/m (10% reduction in yield)
- EC_w 1.6 dS/m (25% reduction in yield)

Table 2. Soil salinity thresholds determined from saturated soil paste extracts (ECe) that cause yield loss in agronomic and horticultural crops

Crop	ECe (dS/m)	Salt tolerance
Agronomic crops		
alfalfa	2.0	moderately sensitive
barley	8.0	tolerant
corn	1.7	sensitive
cotton	7.7	tolerant
dry bean	1.0	sensitive
rice	3.0	moderately sensitive
sorghum	6.8	tolerant
wheat	6.0	tolerant
Vegetable crops		
broccoli	2.8	moderately sensitive
cabbage	1.8	moderately sensitive
carrot	1.0	sensitive
celery	1.8	moderately sensitive
garlic	3.0	sensitive
lettuce	1.3	moderately sensitive
onion	1.2	sensitive
pepper	1.5	moderately sensitive
potato	1.7	moderately sensitive
spinach	2.0	moderately sensitive
squash	4.7	moderately tolerant
tomato	2.5	moderately sensitive
Perennial crops		
almond	1.5	sensitive
apricot	1.6	sensitive
blackberry	1.5	sensitive
grape	1.5	tolerant
orange	1.7	tolerant
peach	1.7	tolerant
plum (prune)	1.5	moderately sensitive
strawberry	1.0	sensitive

Source: Ayers and Westcott 1985.

Managing salts by leaching

- Determining the leaching requirements

Determining the Leaching Requirement for a Crop

Using an appropriate leaching requirement when irrigating can prevent salts from building up in the root zone of crops and can minimize loading of nutrients, such as nitrate, and other salts to ground and surface water. A small LR may be used when a crop is tolerant to salts or when the irrigation water has a low salinity content, and a large LR may be needed for a salt-sensitive crop or when the irrigation water is high in salts. To determine the LR, use the following steps.

Step 1. Determine the soil salinity (ECe) threshold that causes yield loss for a crop type (see Ayers and Westcott 1985). These values are published more extensively in ANR Publication 8554, *Use of Saline Drain Water for Crop Production* (Grismer and Bali, in process). Soil salinity thresholds for some common crops are summarized in table 2.

Step 2. Determine the average salinity of the water used to irrigate the crop. Most water suitability tests report salinity concentration either in units of electrical conductivity (dS/m, µS/cm, or mmhos/cm) or in units corresponding to concentration (ppm or mg/L). Salinity values in units of dS/m are needed for calculating the LR in the next step. Conversions to dS/m are:

1 dS/m = 1 mmhos/cm
1 dS/m = 1000 µS/cm
1 dS/m = 640 ppm = 640 mg/L

Step 3. The final step is to use the equation below to estimate the leaching requirement:

$$LR = (ECw \times 100) \div [(ECe \times 5) - ECw]$$

where ECw is the salinity of the irrigation water and ECe is the soil salinity threshold in the root zone above which crop yield is reduced (from table 2). Alternatively, use table 3 to estimate a leaching requirement by finding the intersection of the ECw value of the irrigation water and the ECe threshold of the crop.

Managing salts by leaching

- Determining the leaching requirements

Table 3. Leaching requirement (LR), expressed as percentage, to achieve a desired soil salinity concentration (EC_e) in the crop root zone using irrigation water of varying salinity concentrations (EC_w). The intersection between the EC_w and EC_e values correspond to the appropriate LR.

Soil salinity (ECe), dS/m	Salinity of irrigation water (ECw), dS/m												
	0.2	0.5	0.7	1	1.3	1.5	2	2.5	3	4	5	6	7
0.5	9	25	39	67	108	—	—	—	—	—	—	—	—
1	4	11	16	25	35	43	67	100	—	—	—	—	—
1.5	3	7	10	15	21	25	36	50	67	114	—	—	—
2	2	5	8	11	15	18	25	33	43	67	100	—	—
2.5	2	4	6	9	12	14	19	25	32	47	67	92	—
3	1	3	5	7	9	11	15	20	25	36	50	67	88
3.5	1	3	4	6	8	9	13	17	21	30	40	52	67
4	1	3	4	5	7	8	11	14	18	25	33	43	54
4.5	1	2	3	5	6	7	10	13	15	22	29	36	45
5	1	2	3	4	5	6	9	11	14	19	25	32	39
5.5	1	2	3	4	5	6	8	10	12	17	22	28	34
6	1	2	2	3	5	5	7	9	11	15	20	25	30
6.5	1	2	2	3	4	5	7	8	10	14	18	23	27
7	1	1	2	3	4	4	6	8	9	13	17	21	25

Example: Tomato has a soil salinity threshold of 2.5 dS/m (table 2). If the salinity of the irrigation water is 1.5 dS/m, what is the appropriate leaching requirement (percent)? The answer can be calculated directly using the above equation or by using table 3:

LR = (1.5 dS/m × 100) ÷ [(5 × 2.5 dS/m) – 1.5 dS/m]
LR = 14%

Summary

- Start with threshold level for the rootstock that you have (~1 dS/m for example, check with Mary Lu, Ben Faber)

- Need to know irrigation water salinity

- Need to know the soil salinity in root zone, if below threshold level, no need for leaching, if higher, estimate the leaching needs using ANR publications 8550, 8554, 8562 or other similar publications

- Select the appropriate irrigation system for leaching

Thank You