SL 262

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Soils and Fertilizers for Master Gardeners: Tackling Soil Salinity Problems in the Home Landscape[1]

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Introduction

In Florida, the homeowner or gardener may have to deal with salt affected soils. High soil salinity may be a naturally occurring problem in coastal areas; however, increased soil salinity could also be a result of poor management practices. For example, salts can accumulate in soils when irrigation water is of poor quality or if fertilizers are applied excessively. The purpose of this publication is to provide information about diagnosing and dealing with salinity problems in the home landscape or garden.

The Effects of Soil Salinity on the Soil and Landscape Plants

One problem caused by high soil salinity in Florida is the decreased availability of potassium (K) and magnesium (Mg). This can lead to nutritional problems and wilting in plants grown in salty soils. Also, excessive salts can actually destroy soil structure; however, this is not a major consequence in Florida because the dominant sandy soils are typically structureless. High salt levels in the soil can also affect plants by causing roots to dry out. This can lead to situations where plants exhibit signs of wilt even when water is plentiful. Excessive salts can also cause sodium (Na) or chloride (Cl) to accumulate in plant tissues. When levels get high enough, this may result in toxicity with symptoms ranging from leaf burn to necrosis. Other plant symptoms of a salinity problem include plant leaves that are bluish-green and darker than normal, stunted growth, stems with short internodes, and chlorosis. Salts in irrigation water and sea spray can also cause foliar damage to plants.

How Do I Know if I Have a Soil Salinity Problem?

The soil can be tested for electrical conductivity (EC) if you suspect a salinity problem. It is also possible to test irrigation water if the water is the suspected source of the salinity. This may be an issue when irrigating with reclaimed water or well water in coastal regions. The EC test measures the ability of a solution to conduct electricity, so the higher the EC value, the more salt there is in the solution. This is straight forward for irrigation water, since the test can be run directly on that solution. In order to test the EC

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of soils, the soil must first be mixed with water and then the EC of the water is measured. It is important to note that the EC test will provide information about how much salt is in the sample, not which salts are present. Results of the EC test can be presented in several units, including deciSiemens per meter (dS/m) and or millimhos per centimeter (mmho/cm), which are units read directly from the testing instrument.

Alternatively, salinity may be reported as milligrams per L (mg/L) or parts per million (ppm) of total dissolved salts based on a mathematical relationship. Conversion factors for the EC and salinity units are located in Table 1. The EC categories for soils and irrigation water are listed for all units in Tables 2 and 3, respectively.

Dealing with Soil Salinity

Once you have diagnosed a soil salinity problem, the only way to get rid of it is to leach the salt out of the root zone. This can be done using copious amounts of irrigation water or can occur naturally when rainfall is plentiful. The amount of water needed to remove excess salts from the soil will depend on the salt tolerance of the plants that will be grown and the EC of the irrigation water. Since the landscape irrigation of many Floridians is subject to restrictions by the water management districts, leaching salts using irrigation water may not be feasible. If the soil salinity problem is a result of the irrigation water, it is best to locate and utilize a new source of water. If the landscape is prone to salt problems or there is no available alternative to salty irrigation water, it may be best to choose plants that will tolerate saline conditions. For more information about choosing salt-tolerant plants, see the EDIS publication *Salt-Tolerant Plants for Florida* (http://edis.ifas.ufl.edu/EP012).

Summary

Salinity can be an issue in coastal areas or in cases where saline irrigation water or excessive fertilization is used. Excess salts in soils and irrigation water can lead to serious plant problems including wilt and nutrient toxicity. Salts can also reduce the availability of K and Mg to plants, interfere with normal water uptake and destroy soil structure. Soils and irrigation water can be tested for EC to determine salinity issues. Choose salt-tolerant plants for areas were irrigation water is saline or soils are prone to salt buildup. This will reduce the need for soil salts to be leached. In addition, these plants are more tolerant of foliar salts that may accumulate due to overhead irrigation or sea sprays.

References

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Table 1. Conversion factors for EC and Salinity test results.

To convert from this EC or Salinity Unit	Conversion Factor	Result is this EC or Salinity Unit
1 mg/L	x 1	1 ppm
1 dS/m	x 1	1 mmho/cm
1 mmho/cm	x 1000	1 ìmho/cm
1 dS/m or 1 mmho/cm	x 700	1 mg/L or 1 ppm (TDS)
1 dS/m	x 8	Salt Index

Table 2. Relationship between plant salinity tolerance and soil EC or salinity measurements for sandy soils

Plant Tolerance	Electrical Conductivity dS/m or mmho/cm	Salinity mg/L or ppm
Sensitive	<3	<2100
Moderately Sensitive	3-6	2100 – 4200
Moderately Tolerant	6-8	4200 – 5600
Tolerant	8-10	5600 – 7000
Highly Tolerant	>10	>7000

Table 3. Interpreting EC (or salinity) measurements of irrigation water

Class of Water	Electrical Conductivity dS/m or mmho/cm	Salinity mg/L or ppm
Excellent	<0.25	<175
Good	0.25 – 0.75	175 – 525
Permissible	0.75 – 2.00	525 – 1,400
Doubtful	2.00 – 3.00	1,400 – 2,100
Unsuitable	>3	>2,100