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COLORADO STATE UNIVERSITY EXTENSION SERVICE

Crop tolerance to soil salinity

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Quick Facts

- Proper plant selection is one way to moderate yield reductions caused by excessive soil salinity.
- The stage of plant growth has a direct bearing on salt tolerance.
- Generally, the more mature the plant the more tolerant it is to salt.
- Most fruit trees are more sensitive to salt than are vegetable, field and forage crops.
- Generally, vegetable crops are more sensitive to salt than are field and forage crops.

Excessive soil salinity (salt) causes reduced yields of many agronomic crop plants. Yield reductions may range from a slight loss to complete crop failure, depending on the particular crop and the severity of the salinity problem. A number of treatments and management practices can be used to reduce the salt level in the soil. However, there are some situations where it is either not possible or not practical in terms of economic considerations to attain desirably low soil salinity levels. In the latter case, choice of a suitable salt-tolerant crop represents a way to minimize crop loss caused by salinity.

Table 1 shows the relative salt tolerance of field, forage, vegetable and fruit crops. The data were excerpted from R. S. Ayers and D. W. Westcot, 1976, "Water Quality for Agriculture, Irrigation and Drainage Paper 29," FAO, Rome. Crop salt tolerance data in the table were developed, almost entirely, by the U.S. Salinity Laboratory, Riverside, Calif.

The tables indicate the approximate soil salt concentration, expressed as electrical conductivity of saturated paste extract (ECe) in mmhos/cm at 25° C, at which 0, 10, 25 and 50 percent yield decreases may be expected. The 0 yield decrement values represent expected threshold values at which salinity begins to affect crop yields. The data are based upon yield averages of representative crop varieties over a period of time. Actual yield reductions may vary depending upon the specific crop variety planted and climatic conditions during the growing season.

Fruit crops may show greater yield variation due to salinity because a large number of rootstocks and varieties are available. Also, stage of plant growth has a bearing on salt tolerance. Seedlings usually are most sensitive to salt during the emergence and early seedling stages. Plant salt tolerance usually increases as the crop develops through the growing season. This is fortunate since many of Colorado's irrigation waters increase in salt concentration during the latter part of the irrigation season.

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Table 1: Salt tolerance of crops.*

Field crops

	Relative yield decrease—%			
	0	10	25	50
	mmhos/cm			
Barley	8	10	13	18
Cotton	7.7	9.6	13	17
Sugarbeet	7.0	8.7	11	15
Wheat	6.0	7.4	9.5	13
Safflower	5.3	6.2	7.6	9.9
Sorghum	4.0	5.1	7.2	11
Soybean	5.0	5.5	6.2	7.5
Rice	3.0	3.8	5.1	7.2
Broadbean	1.6	2.6	4.2	6.8
Corn	1.7	2.5	3.8	5.9
Flax	1.7	2.5	3.8	5.9
Peanut	3.2	3.5	4.1	4.9
Cowpea	1.3	2.0	3.1	4.9
Fieldbean	1.0	1.5	2.3	3.6

Forage crops

	Relative yield decrease—%			
	0	10	25	50
	mmhos/cm			
Tall wheatgrass	7.5	9.9	13.3	19.4
Wheatgrass	7.5	9.0	11	15
Crested wheatgrass	3.5	6.0	9.8	16
Barley hay	6.0	7.4	9.5	13
Perennial ryegrass	5.6	6.9	8.9	12.2
Tall fescue	3.9	5.8	8.6	13.3
Beardless wildrye	2.7	4.4	6.9	11.0
Sweet clover	1.5	3.2	5.9	10.3
Orchardgrass	1.5	3.1	5.5	9.6
Vetch	3.0	3.9	5.3	7.6
Alfalfa	2.0	3.4	5.4	8.8
Corn fodder	1.8	3.2	5.2	8.6
Lovegrass	2.0	3.2	5.0	8.0
Meadow foxtail	1.5	2.5	4.1	6.7
Clover—alsike, red, ladino, strawberry	1.5	2.3	3.6	5.7

Vegetable crops

	Relative yield decrease—%			
	0	10	25	50
	mmhos/cm			
Beets	4.0	5.1	6.8	9.6
Broccoli	2.8	3.9	5.5	8.2
Tomato	2.5	3.5	5.0	7.6
Cucumber	2.5	3.3	4.4	6.3
Cantaloupe	2.2	3.6	5.7	9.1
Spinach	2.0	3.3	5.3	8.6
Cabbage	1.8	2.8	4.4	7.0
Potato	1.7	2.5	3.8	5.9
Sweet Corn	1.7	2.5	3.8	5.9
Pepper	1.5	2.2	3.3	5.1
Lettuce	1.3	2.1	3.2	5.2
Radish	1.2	2.0	3.1	5.0
Onion	1.2	1.8	2.8	4.3
Carrott	1.0	1.7	2.8	4.6
Beans	1.0	1.5	2.3	3.6

Fruit crops

	Relative yield decrease—%			
	0	10	25	50
	mmhos/cm			
Date palm	4.0	6.8	10.9	17.9
Fig, Olive	2.7	3.8	5.5	8.4
Grape	1.5	2.5	4.1	6.7
Grapefruit	1.8	2.4	3.4	4.9
Orange	1.7	2.3	3.2	4.8
Lemon, Apple	1.7	2.3	3.3	4.8
Pear, Walnut	1.7	2.3	3.3	4.8
Plum	1.5	2.1	2.9	4.3
Peach	1.7	2.2	2.9	4.1
Almond	1.5	2.0	2.8	4.1
Apricot	1.6	2.0	2.6	3.7
Blackberry	1.5	2.0	2.6	3.8
Boysenberry	1.5	2.0	2.6	3.8
Raspberry	1.0	1.4	2.1	3.2
Strawberry	1.0	1.3	1.8	2.5

**The salt tolerance values apply only from the late seedling stage through maturity, during the period of most rapid plant growth. Crops in each class are ranked in order of decreasing salt tolerance insofar as possible.*