Chapter 13

Physiology of Plant Tolerance to Salinity

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INTRODUCTION

All soils contain a mixture of soluble salts, some of which are essential for growth. But salinity, defined simply as the presence of excessive concentrations of soluble salts (U.S. Salinity Laboratory Staff, 1954), suppresses plant growth. The suppression increases as the salt concentration increases (Bernstein & Hayward, 1958; Gauch & Eaton, 1942; Hayward & Long, 1941), until the plant dies. Tolerance to salinity varies among species. This has led to the division of species into physiological groups: glycophytes that tolerate only low concentrations of salt and halophytes that tolerate relatively high concentrations. But these groups are not discrete. Crop plants cover the spectrum from sensitive to fairly tolerant (Maas & Hoffman, 1977). We do not understand the fundamental plant differences that cause some plants to be more tolerant than others; and we will not until we discover how salinity suppresses growth and how tolerant plants prevent this effect.

The ion species present in excess in saline soils have specific effects on some plants. For example, certain injury signs can be attributed to Na or Cl toxicity, to Na or SO₄-induced Ca deficiency, or to Na or Ca-induced K deficiency (Bernstein, 1964, 1975). But such specific ion effects seem limited to certain susceptible plant species or varieties and rarely are a major cause of growth suppression. For most species studied, growth suppression seems to be a nonspecific salt effect, depending more on the total concentration of soluble salts than on specific ions. Growth often decreases linearly with the

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1 Salinity is not to be confused with sodicity. Saline soils are not deficient in Ca, whereas for most crops, nonsaline-sodic soils are Ca deficient (U.S. Salinity Laboratory Staff, 1954).