SOIL CONTAMINATION OF FIELD-GROWN CORN PLANTS

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Chemical analysis of weekly samplings of 1963 field-grown corn plants revealed exceedingly high concentrations of Fe, Mn, SiO₂, and Al in some samples, decreasing concentrations as the plants grew (Table 1). The more than 8-fold decrease, on a percent basis, of SiO₂ suggests that the high concentrations may have been due to soil contamination. Cations present in the seedling-growth rate was directly proportional to soil-moisture stress and was completely inhibited at 8 atmospheres of stress, but the leaves were extremely flaccid, and growth rate essentially ceased.

Corn seedlings were grown in thin layers (1.2 cm wide) whose moisture content was maintained by equilibration of the soil with an osmotic solution of polyethylene glycol (M.W. = 20,000) separated from the soil by a differentially permeable membrane. The seedling-growth rate was directly proportional to soil-moisture stress and was completely inhibited at 8 atmospheres of stress, but the leaves were extremely flaccid, and growth rate essentially ceased.

Growth rate of corn seedlings was determined by measuring the length of the individual leaves daily after the soil had reached equilibrium with the osmotic solution and calculating the average change for each plant growth at a specific soil-moisture stress. Accumulative leaf lengths were correlated to growth rate and linear regression functions calculated for each treatment. The rates of leaf growth, as established by the slopes of the linear regression functions, were statistically compared, using Students 't' test.

The technique employed to maintain continuous soil-moisture stress in these studies is subject to the limitation of rate of moisture flow through the membrane to replenish water taken up by the plant and evapotranspiration from the surface of the soil cells. For low evapotranspiration demands this limitation is reduced to some extent and may not be a great error. The technique is useful for obtaining relatively constant soil-moisture stresses and has shown that growth rate of corn seedlings is directly decreased by increased soil-moisture stress.

The plants used in the contamination study were taken from plots which were part of a 1964 microclimatic study. The more than 8-fold decrease, on a percent basis, of SiO₂ suggests that the high concentrations may have been due to soil contamination.