long, were harvested from the center of each replicate early in October each year.

In sprinkled plots, mini-sprinklers applied an average depth of 16 mm over the entire plot area in one hour (see table). Water was applied in the sprinkled plots at about twice the expected rate of evapotranspiration (ET) to keep the salinity profile in the root zone as uniform as possible. Sprinkler irrigations were applied weekly except for a few brief periods early in the season when light, frequent irrigations were applied for plant stand establishment.

Irrigation water for the subirrigated plots was blended directly in the pipelines by manually adjusting gate valves, so that all four treatments could be irrigated simultaneously to minimize soil water movement among plots. Each subirrigation plot was irrigated by filling two ditches spaced every 16 rows of corn. In 1980 and 1981, the rate of flow entering and leaving each ditch was monitored with orifice plates.

The subirrigated treatments were similar to irrigation practices of the area. Two or three subirrigations were applied during each season. Each subirrigation continued for several days and ended when the water table rose to within about 15 cm of the soil surface midway between the irrigation ditches.

Results

Statistical analysis of grain yield in relation to soil salinity in the root zone for each treatment during each year showed very little difference between irrigation methods in either threshold or slope (rate of yield reduction at salinity values larger than the threshold) (fig. 2). Based on the results, the salt tolerance of corn harvested as grain has a threshold of 3.7 dS/m and a slope of 14. The threshold is close to the value of 3.4 calculated from previously published tolerance data, but the rate of yield reduction is considerably greater than the value of 6 obtained in other areas. □

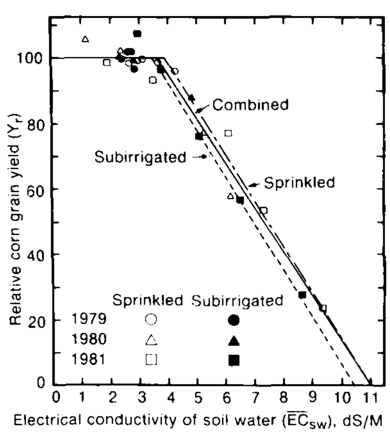

Fig. 2. Salt tolerance as indicated by yield showed little difference between irrigation methods in either threshold or slope.

Relationship of irrigation water salinity and soil water salinity

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Significant concentrations of soluble salts are not normally found in organic soils. Organic soils, differentiated from mineral soils by an organic matter content greater than 20 percent, are formed from partially decayed plant remains that accumulated originally in shallow bodies of fresh water or in poorly drained areas where anaerobic conditions persisted. In contrast, saline soils usually occur in regions where water is lacking. The Sacramento-San Joaquin Delta is an important example of an agricultural area with organic soils that are threatened by salinity.

The objective of this study was to establish the general relation between salinity of the irrigation water and soil water salinity for the organic soils of the Delta, based on results from the three-year field experiment to establish the salt tolerance of corn. An initial step was to standardize procedures of measuring soil salinity in organic soils. Previous work indicated that the method of sample preparation influenced the measurement of electrical conductivity (EC) in organic soils, particularly in subsoil samples.

Salinity measurements

Soil salinity is determined routinely by measuring the electrical conductivity of a soil saturation extract. The soil sample is either dried, ground, and passed through a 2-mm round-hole sieve or passed through a sieve without drying or grinding. Water is then added while mixing until the soil is saturated. The mixture is allowed to stand overnight, and additional water is added if required to saturate the sample. The soil solution extracted by vacuum from the saturated soil is then measured for electrical conductivity.

In September 1979, we took soil samples from each experimental plot and divided them into three subsamples before analysis. One set of subsamples was allowed to dry at room temperature and then ground (dry, ground). A second set was dried at room temperature but was not ground (dry, unground). The third was brought to saturation without drying or grinding (wet, unground).

The influence of sample preparation on the measurement of salinity is illustrated in figure 1 for samples taken from the treatments with applied waters having an electrical conductivity of 2 dS/m (about 1300 ppm) in the two methods tested: subirrigation and mini-sprinklers. Sample preparation had no significant influence on the measurement from samples collected above a depth of

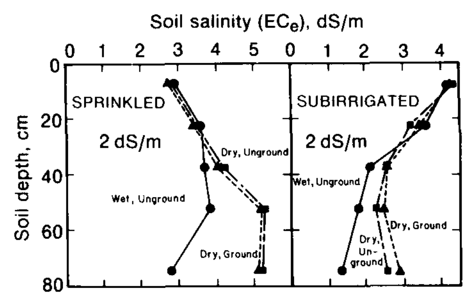

Fig. 1. Sample preparation technique influenced electrical conductivity of soil saturation extract (EC_e) below 30 cm.

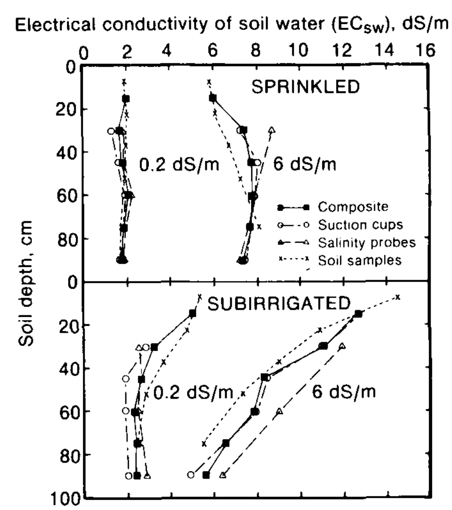

Fig. 2. Measurements (1981) from wet, unground soil samples agree closely with other measures of salinity.