Nitrogen or Water Stress: Their Interrelationships

Nitrogen stress in crop plants can result from either a deficiency or an excess. Deficiency symptoms are exhibited as pale green color and stunted growth. However, other elements such as S and Mo may show similar effects. A reduced number of kernel rows has been observed in sweet corn (Zea mays L.) as a result of N deficiency (Viets, 1965). Stress symptoms for excessive N include excessive height due to self competition for light, lodging, and delayed flowering (Viets, 1965). Nitrogen stress in crop plants may not be visually evident, but show up in reduced yield.

Shaw and Laing (1966) state: “Moisture stress is the result of an imbalance between the supply furnished by the soil-water and the amount needed by the plant as determined by the atmosphere, assuming a complete crop cover.” Water stress is observed as wilting of leaves and loss of turgor. However, the plant experiences water stress long before wilting occurs because the leaf water potential becomes considerably negative near midday with full sunlight, even when soil-water level is high (Slatyer, 1969). Wilting of leaves is an expression of degree of water stress, not just an indication of stress vs. no stress. Crop plants can be stressed under flooded conditions, but the stress is most likely due to lack of O₂ rather than excessive water.

Interrelationships between N stress and water stress are extensively documented, but only a limited number of references can be cited here. The influence of N stress and water stress on crop yield will be treated separately, and then their interrelationships will be examined.