Interactions of Potassium with Plant Disease

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Mineral fertilizers are applied to maintain the yield, nutritional quality, and aesthetic value of crops; however, diseases are a major factor reducing the efficient use of fertilizers by reducing crop yield, quality, and aesthetic value (Huber, 1978). In turn, the nutrition of a plant may determine its resistance or susceptibility to disease, its histological or morphological structure or properties, the function of tissues to hasten or slow pathogenesis, and the apparent virulence and ability of pathogens to survive. The complex problem of mineral nutrition of plants can no longer be considered in isolation of their effects on disease (Huber, 1980). Thus, although disease resistance is genetically controlled, it is mediated through physiological and biochemical processes interrelated with the nutritional status of the plant or pathogen. Highly resistant plants are less affected by alterations in nutrition than plants tolerant to disease, and highly susceptible plants may remain susceptible with nutrient conditions that greatly increase the resistance of intermediate or tolerant plants.

The interrelationship of plant nutrition and disease frequently makes it difficult to clearly delineate parasitic (infectious) from nonparasitic diseases. This is especially true for those parasitic diseases in which nutrient uptake, translocation, or utilization is impaired (Huber, 1978). Difficulty in diagnosing nutrient deficiency may occur because the expression of end products of a host-pathogen interaction may resemble symptoms induced by a particular nutrient deficiency. Infectious plant diseases are the result of a combination of host, pathogen, and environmental factors over time. Thus, the influence of nutrition on infectious plant diseases must be considered on an individual disease basis, with variables such as host, environment, and pathogen taken into consideration. A disease can seldom be eliminated by the application of a given type of fertilizer element, but the severity of many diseases is reduced by specific forms or levels of nutrients. The “balance,” or ratio, of all nutrients also may be as important as the level of any specific nutrient.

Inorganic nutrients appear to influence disease potential more than inoculum potential, and some nutrients may decrease disease even though the population of a pathogen is increased (Huber & Watson, 1970). Thus, the intricate relationship of plant pathogens with other microorganisms, environmental factors, and the host...