Focus on Plant Nutrition

Dennis R. Hoagland, who was Professor of Plant Nutrition at the University of California at Berkeley from 1927 until his death in 1949, is generally acknowledged as the father of modern plant nutrition research. In 1942 he was invited to deliver the prestigious series of John M. Prather Lectures at Harvard University. These lectures, which encapsulated the fruits of a lifetime’s dedication to unraveling the complexities of plant-soil interactions, were later published in a volume titled “Lectures on the Inorganic Nutrition of Plants” (Hoagland, 1944). It is the 60th anniversary of this landmark publication that we are pleased to celebrate with this Focus Issue on Plant Nutrition.

Hoagland’s contributions to plant nutrition research were fundamental and varied. Among many practical innovations that greatly stimulated the development of the field, he and his colleagues established the importance of trace elements for plant nutrition and formulated a complete inorganic nutrient medium (Hoagland solution) that is still widely used for culturing plants hydroponically. He was also an early pioneer of the use of model systems and chose to focus on giant cells of the fresh water alga Nitella clavata (from which he could recover vacuolar sap largely uncontaminated by other cellular components) to investigate the processes of nutrient absorption. These studies were to lead to the ground-breaking conclusion that ion uptake by living cells is an energy-dependent process and that, in Nitella at least, the ultimate source of this energy is light (Hoagland and Davis, 1929).

Since Hoagland’s time, the field of plant nutrition has evolved and expanded to encompass issues such as tolerance to salinity and heavy metals, phytoremediation of toxic metals, and crop improvements for agriculture and human health. It was with this broad definition in mind that we solicited articles for this Focus Issue. In doing so, we had little idea of the enthusiasm with which our colleagues would embrace the project. As we received and accepted many more articles than we are able to publish in this Focus Issue, a temporary Plant Nutrition subsection in the journal will be created in subsequent issues to publish articles that are not included here. For the Focus Issue we have chosen to highlight the application of molecular genetics or genomics approaches to address problems in plant nutrition. Given Hoagland’s early championing of model systems, it is fitting that each of these research articles has used Arabidopsis as their experimental organism. We have also been fortunate in obtaining six Updates from leading authorities, covering diverse plant nutrition-related topics, including utilization and metabolism of essential mineral elements, plant responses to toxic metals, and global analysis of plant mineral ion transport processes. We have no doubt that the collection of papers devoted to Plant Nutrition, represent a fitting tribute to Hoagland’s pioneering work.

LITERATURE CITED

Hoagland DR, Davis AR (1929) The intake and accumulation of electrolytes by plant cells. Protoplasma 6: 610–626