The Differential in the Chemical Composition of Reproductive and Vegetative Plant Tissues as Influenced by the Relative Energy Properties of the Available Nutrients

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It has been observed by numerous investigators that fertilizer treatments have a very significant effect in determining the chemical composition of the vegetative tissues of crops that are grown on plots receiving different combinations of nutrients. The chemical composition of the seed and other tissues concerned with reproduction, such as fruits, tubers, and roots, is relatively stable and is not generally significantly affected by fertilizer treatments. Many investigators, including Osterhaut (27), Hoagland (20), Cooper and Blink (17), Reed and Haas (29), Collander (4), Snider (31), Beeson (2, 3), Bear (1), Wallace, et al. (32), Lucas and Sarseth (22), Miller (25), Newton (26), Hammar and Hunter (18), Kertesz, et al. (21), Mattson and Koulter-Andersson (23), Powers and Esselen (28), and Mehlich and Reed (24), have reported on this subject.

In a group of papers, Cooper, et al. (5-16) have emphasized the relation between the energy properties of nutrients and the intensity of absorption by plants of the different nutrients. An interpretation of the analytical data on the chemical composition of a large number of crop plants definitely suggests that the relative energy properties of the nutrient compounds are a major factor in determining the intensity of absorption of certain plant nutrients. The average quantities of the different nutrients in a wide variety of plants show a very definite correlation between the relative strength of the different ions and the quantities of the nutrients found in plants. Since there are wide variations in the chemical composition of various crop plants, it is necessary to consider the plant's characteristics in determining the selective absorption and selective exclusion of certain nutrients by some plants.

PHYLOGENETIC AND ONTOTOGENETIC CHARACTERISTICS OF PLANTS

Since most of the important crop plants originated in a habitat supporting largely a grass or herbaceous vegetation, it is desirable to consider some of the optimum physiological growth factors determining the specific nutritional characteristics of the different plants. The native grass vegetation of a region is commonly associated with a relatively low or an unfavorable distribution of essential minerals.

crop plants are usually favorable for the absorption of adequate to excessive quantities of certain nutrients, it seems logical to assume that the phylogenetic characteristics of certain plants are largely based upon some type of tolerance mechanism for excessive quantities of nutrients rather than specific nutrient requirements. Where plants in a habitat were subjected to excessive quantities of certain nutrients such as sodium and calcium, their phylogenetic characteristics such as selective absorption and selective exclusion mechanisms probably protect them from excessive concentrations of certain ions.

TOLERANCE MECHANISM OF SELECTIVE ACCUMULATION IN PLANTS

It is generally recognized that plants of species grown under identical or similar conditions widely in their elemental chemical composition are very probably largely determined by the nutritional characteristics of certain plants. It may be logical to assume that the calcium ion was the original surplus constituent and that plants formed relatively value organic compounds to neutralize the surplus calcium. It is probable that the efficiency of the mechanism for inactivating certain excess ions in a deficiency of some nutrients found in relative concentration in the nutrient medium. In order to achieve optimum production, it is necessary to provide certain quantities of the different nutrients to satisfy the tolerance mechanism in addition to the growth requirements of the plant.