MANGANESE AND ASCORBIC ACID FORMATION

The concept that the rate of ascorbic acid synthesis is accelerated by an increased manganese supply was first developed in biochemical studies of liver tissue, although recent experiments have failed to confirm this conclusion. Subsequently, there have been reports that the ascorbic acid content of tomato fruits is increased when manganese is added to soils deficient in this element.

An experiment has been recently completed at this laboratory which was designed primarily to test the effects of deficiencies of micro-nutrient elements on the vitamin content of tomatoes. Tomato plants were grown to maturity in the greenhouse in a crushed pyrex glass substrate supplied at regular intervals with rigidly purified nutrient solution. The apparatus was specifically designed to minimize contamination of the nutrient solution. The experimental design was that of a Latin square and in addition to the control plants supplied with complete nutrient, one of the seven treatments consisted of manganese-deficient nutrient cultures. The experimental details will be reported elsewhere.

At the conclusion of the experiment, the plants grown in the manganese deficient cultures were 58% as tall, had 66% as many internodes, and the dry weight of aerial vegetative parts was approximately 30% as great as comparable control plants. The total fresh weight of fruit produced in the manganese-deficient treatment was 25% of the control and the number of fruits produced on each plant was materially less. All differences are highly significant when analyzed statistically.

The leaflets of the upper third of deficient plants were dead in all replicates and the growing point was no longer functional at the conclusion of the experiment. Lower leaves were extremely chlorotic. Furthermore, a fruit symptom developed in manganese-deficient cultures which has not previously been described to our knowledge. The fruit produced by these plants remained green in localized areas at the stem end. When the remaining portions of the fruit became a deep red at maturity, these areas turned a yellowish green color with pin points of brown distributed through them at random. The areas never became red. In addition to external symptoms, chemical analyses were made on the second, fourth, and sixth fruits which ripened on each plant. The leaflets from the top, middle, and lower third of each plant were also analyzed. These data are reported in Table I.


Hester, J. B. Manganese and vitamin C. Science, 93:401. 1941.
