INTRODUCTION

Modern methods of greenhouse vegetable culture have introduced new techniques which have been effective in raising average yields through improved feeding control and have also helped to reduce labor costs. Most commercial greenhouse tomato growers in southwestern Ontario, which is the location of the highest concentration of this industry in Canada, fertilize their crops by metering a liquid fertilizer concentrate into a mechanical watering system of which there are numerous commercial modifications. The intensive feeding of the crop in this fashion is continued throughout almost the whole of the normal six month growth period. This operation is a unique feature in agricultural practice and while it sometimes results in yields as high as 75 tons per acre, it also raises a number of special problems of plant nutrition. The current use of high-analysis, single-salt fertilizer materials, for example, makes it particularly easy for a grower to upset the normal nutritional balance necessary for optimum fruit production.

Although greenhouse tomatoes have been grown successfully for many years in many parts of the world, there is still much uncertainty amongst commercial producers about the details of feeding the crop. There is no accurate formula or recipe for the amounts or sources of the nutrients that must be applied or for the proper times of application. A grower judges the current nutrient status and requirements of his crop by visual observation of its growth habit and to some extent from periodic soil tests. There is, accordingly, a wide variation in fertilizer practice, particularly in
the amounts of nutrients applied in producing a crop. Most growers tend to over-feed their crops and numerous nutritional difficulties arise from this cause.

The existence of these problems and the fact that no single universal feeding formula can be recommended has led to an investigation of the whole subject of greenhouse tomato nutrition commencing with the growth analysis study reported in this paper.

Nutritional investigations in many places have been aimed at making greenhouse culture a more accurate procedure. An elaborate factorial experiment is being conducted by Winsor et al.\(^5\)\(^6\) at the Greenhouse Crops Research Institute. Porte\(^1\) gives detailed instructions for feeding greenhouse tomatoes based apparently on common commercial practice. Wiebe\(^4\) and Wittwer and Teubner\(^7\) give similar sets of instructions, each with particular modifications to suit specific local conditions. The object of the study reported in this paper was to obtain a clear picture of the mineral status of the growing tomato plant and to determine the amounts of mineral nutrients actually required for normal growth in the soil and climate of southwestern Ontario.

**MATERIALS AND METHODS**

Tomato plants of the F\(_1\) hybrid Michigan-Ohio were grown in an experimental greenhouse under conditions closely approximating those found in a commercial greenhouse. The seed was sterilized in 10% trisodium phosphate solution to eliminate tobacco mosaic virus from the seed coat, planted in sterilized soil in flats on December 4th, 1961, transplanted to 4-inch pots on December 19th, subjected to a cold treatment for two weeks, transplanted to steamed ground beds on February 5th. The rate of planting was two rows per plot, ten plants per row spaced fifteen inches apart with rows in the plot eighteen inches apart and forty-five inches between plots. This spacing gives a planting density of 11,050 plants per acre or 3.96 square feet per plant. All the normal cultural treatments were applied including a regular spray program for pest control.

Before the seedlings were set in the ground beds, the soil was treated with granular 0–20–20 fertilizer mixture at the rate of 2000 pounds per acre and magnesium sulphate at 200 pounds per acre. During growth the plants were fed at appropriate times with 10–52–17 starter solution, potassium nitrate, ammonium nitrate, and calcium nitrate as required, all applied in solution. The schedule was regulated by reference to weekly standardized tissue tests developed for this purpose\(^3\) and to periodic soil tests. Watering was accurately measured and recorded, the application being regulated by reference to daily readings on porous-cup tensiometers in accordance with standard