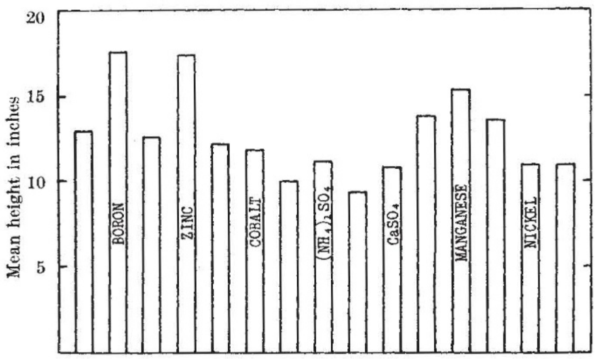
Trace-elements and 'Potato-sickness'

IT is well known that infestation with the potato strain of the eelworm *Heterodera schachtii* Schmidt is not the sole cause of the disease known as 'potato-sickness'. It occurred to me that some nutritional deficiency might be a contributory factor. The disease nearly always occurs on land on which potatoes have been grown continuously for a number of years, and it seemed possible that this might well lead to the soil being exhausted of certain vital elements required by the plant in small quantities and normally neglected in manurial treatments and soil analyses. A small-scale attempt to test this hypothesis was made during 1941 and some promising results obtained. These, however, were of a preliminary nature and a more extensive investigation is planned for the future. A detailed account of this year's work is now in preparation ; in the meantime it was thought advisable to publish the following note in the hope that it might be of use to other workers who may be interested in the problem.



MEAN HEIGHTS OF THE GROUPS OF FIVE PLANTS IN THE MOST DILUTE ZONE SHOWN IN THEIR RELATIVE POSITION IN THE PLOT. UNTREATED ROWS ALTERNATE WITH TREATED ROWS. THE ROW MARKED '$CaSO_4$' RECEIVED A HEAVY DRESSING OF THIS SUBSTANCE IN POWDER FORM IN THE DRILL AT THE TIME OF PLANTING. SIX OTHER ROWS OF PLANTS IN A SEPARATE BLOCK ARE NOT SHOWN IN THIS FIGURE.

A small plot of land, badly infested with *Heterodera schachtii*, was planted with a series of rows of potatoes, each row containing fifteen plants. Some of the rows were watered, at weekly intervals, with dilute solutions each containing a single salt of certain of the trace-elements. The strength of the solution was halved for each successive group of five plants in the row. Three strengths of the various solutions were thus used, and of these, the solution applied to the second five of the fifteen plants was of the same strength as that contained in the solutions used by Arnon in his work on the effect of trace-elements on the growth of lettuce and asparagus seedlings[1]. Treated and untreated rows alternated throughout most of the plot, so that there was, in general, an untreated row on each side of a treated row. Certain of the rows were treated with ammonium salts of similar dilution to act as general controls and also to control any possible effects of the anions of the salts of the various trace-elements used.

The heights of all the plants were measured when flowering began, when it was noticed that all the plants were at the same stage of maturity. The crop was lifted when the last of the tops had died down, and the tubers of each plant weighed.

Weight of crop and height of plant were in general agreement.

The mean height of each group of five plants in the rows varied with the dilution of the solution used, the plants being considerably taller in the zone to which the strongest solutions had been applied, and shortest where the most dilute solutions had been used. The most striking *differences* between treated and untreated plants were shown, however, in the latter zone. For example, the mean height of the plants treated with the most dilute solution of zinc sulphate was 40 per cent greater than the mean height of the untreated plants on each side of them. A similar difference was also found in the case of boric acid, and a smaller, but quite marked, difference in the case of manganese chloride. Yet these treated plants had received extremely minute amounts of the trace-element. For example, *throughout the whole season*, the total quantity of boron supplied to each of the plants treated with boric acid was about 0·5 mgm., while the total quantity of zinc supplied to each plant treated with zinc sulphate was about 0·05 mgm. It is certain that the increases in height were not due to the water supplied, for the differences are just as marked when the treated plants are compared with plants treated with water alone or with those treated with the dilute solutions of the various ammonium salts. Some of these points are clearly shown in the accompanying figure.

The plants treated with the more concentrated solutions showed the same general effects, save that the percentage differences between treated and untreated plants were not so large. It is probable that, under the conditions of the experiment, the treatments spread to the adjacent untreated rows and that this tendency was greater the stronger the solution used. It was also evident that the plot was by no means homogeneous in degree of infestation with eelworm, but although this would help to explain the fact that the tallest plants were all found in the zone to which the strongest solutions had been supplied, it cannot account for the marked differences between the treated plants already referred to and those immediately adjacent to them.

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[1] Arnon, D. I., *Amer. J. Bot.*, **25**, 322 (1938).

Cotton Seed Disinfection in War-time

IN the Sudan cotton seed has to be treated with a mercurial dust for the control of blackarm (*Bacterium malvacearum* E.F.S.), present on the seed as an external infection[1,2].

On the outbreak of war the possibility arose of there being a shortage of mercurial dusts in the country. It therefore became expedient to provide an alternative method for the disinfection of cotton seed in the event of such an emergency.

B. malvacearum in cotton debris is destroyed when cotton fields are flooded for a period of four days with irrigation water[3]. The disappearance of the organism is attributed to the action of a bacteriophage. Experiments were performed to discover whether *B. malvacearum* on cotton seed could be destroyed in a similar manner.

It was found that after steeping cotton seed for forty-eight hours in four times its own weight of irrigation water practically all traces of external infection by *B. malvacearum* had disappeared. In small-scale plant-house experiments on seed which