QUANTITIES OF BORON AND ZINC FOUND IN SALTS USED IN THE PREPARATION OF CULTURE SOLUTIONS

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In setting up sand cultures on a relatively large scale, the use of technical and fertilizer grades of salts is often an economic necessity. These salts usually contain impurities such as boron and metals, principally zinc, and if present in sufficient quantities they may limit plant growth. The danger of reduced growth or toxicity resulting from an excessive amount of these impurities may not be great in ordinary culture solutions. However, if the solutions are made to contain high concentrations of one or more constituents, in addition to the ions commonly present in nutrient solutions of the Hoagland type, for example 100 to 200 milliequivalents per liter of chlorides or sulfates, then the danger of obtaining toxic concentrations of boron and metal impurities becomes much greater. In order to guard against such a possibility, a number of samples of the various salts to be used were tested for boron and metal impurities before the stock salts were purchased. Data on the range in amounts of these impurities found in fertilizer and technical grades of a group of common salts are presented in this paper.

The dithizone test used for metal impurities was that outlined by Stout and Arnon (3), based on results obtained by Hibbard (2). The reddish purple color obtained in the chloroform layer was compared with standards containing known amounts of zinc and the results are reported as parts per million of zinc. If copper or some other metal, such as nickel, cobalt, lead, mercury, cadmium, thallium, or bismuth reacts with the dithizone, the reddish purple color characteristic of zinc will be altered. Such color interferences were almost entirely lacking in these analyses and thus zinc was assumed to be the dominant metal impurity in these salts. Furthermore, it is believed that salts are more likely to be contaminated with zinc in the manufacturing process than with the other metals mentioned. Boron was determined by the electrometric titration method (1) with modifications to care for the type of salt being analyzed; or by the distillation procedure (4).

Boron impurities run highest in those salts which are obtained from natural sources high in borax. The stocks of salts in the western United States are shown in Table 1.

Borax samples Nos. 28, 29, and 30 are examples of this. At least one of these stocks of salts in the western United States are shown in Table 1.

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