LETTERS TO THE EDITOR

Comments on Comparing the Growth of Plants in Hoaglund's Nutrient Solution and Sludge Extracts

The Plant Growth and Absorption section in the article by Bradford et al. (1975) shows that plants grow better in Hoaglund's solution than in sludge extracts. This seems like an improper comparison and may lead to the incorrect inference that sewage sludge in soils is harmful to plants.

Attributing the poor plant growth to the soluble trace elements of the sludge ignores the other growth conditions to which the plants were subjected. The saturation extracts of the sludges are much higher in salt content and probably much lower in nutrients, particularly nitrogen and phosphate, than is Hoaglund's solution. The plants may have grown best in extracts of sludge C because that sludge had the lowest salt content (Table 2) and its nutrient concentrations were less diminished by dilution. The poor condition of the plants could be due as much to nitrogen and phosphate deficiencies as to boron and trace metal toxicity.

Bradford et al. (1975) demonstrated the variability of absorption from different sludge sources by growing them in sludge extracts. Plants, grown in such saline, macro-nutrient-deficient solutions and therefore small, should accumulate high concentrations of trace metals and boron due to an inverted dilution effect. Under these poor growth conditions, and in the absence of a strongly adsorptive phase such as soil to compete with plant uptake, trace element uptake is exaggerated particularly when expressed as μg/g. Total uptake per plant might be a more meaningful criterion of absorption.

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LITERATURE CITED


Reply to Comments by Bohn and Johnson

Our paper (Bradford et al., 1975) includes data which attests to the great variability in composition of sewage sludges depending on the source. Recognizing this variability in the trace element composition of sludges, we avoided making any general concluding statements about the effect of sludges on soils; however, of the sludges we used in our sand culture experiment, we did conclude that "all three plant species were more or less severely injured by treatment with extracts from all six sources."

We also stated in the manuscript that "the greenhouse sand culture experiment was not intended to be a controlled nutritional study, but rather an experiment to demonstrate the variability of absorption of different elements from different sludge sources."

Certainly we recognize that there were adverse growth factors other than the variable, but often high concentration of one or more trace elements in the extract treatments; however, the salt content of extracts was not a problem because, as was stated in the manuscript, the extracts were "diluted with deionized water to a conductivity (EC) of 2.0 mmho/cm to avoid salt damage to plants." Total nitrogen in the extracts varied from 600-1,300 ppm and P ranged from 30-130 ppm. These concentrations should have provided an adequate supply of N and P even in the most diluted treatment. Micronutrient deficiencies would hardly be expected from the sludge extract concentrations reported in Table 2. No attempt was made to study the complicated interelement effects. We agree that total uptake per plant might be a more meaningful criterion of absorption.

554 J. Environ. Qual., Vol. 4, no. 4, 1975