THE USE OF TREATED WATER IN COMMERCIAL GREENHOUSE PRODUCTION

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Summary

The treatment of public water supplies to meet requirements of the Federal Safe Drinking Water Act has raised questions about the suitability for watering plants in greenhouse production as well as in homes and public buildings.

Chemical compounds containing sodium, chlorine, aluminum and calcium are used at water treatment plants for pH control, coagulation and bacteria removal.

Although added in varying amounts, it appears that levels of sodium, chlorine and calcium found in treated water fall within tolerable limits for most greenhouse plants. However, the complex dynamics of nutrients in the soil and plant solution raise a number of questions about the use of treated water. Of particular interest is the possible replacement of sodium for calcium, thereby affecting nutrient uptake, and of chlorine's impact in limiting enzyme activity. There does not appear to be research which clearly demonstrates acceptable long term effects on plant or defines concentrations.

Text

Drinking water contamination has become a major concern of the general public. Demand for improved water quality has prompted government and industry to spend millions of dollars on improved water treatment systems.

Many greenhouse operations in the Northeast rely on public supplies as the sole source of water for irrigating plants. Consequently, the quality of such treated water and its impact on plant development is of prime importance.

Design of most public water treatment systems is guided by provisions of the Federal Safe Drinking Water Act (SDWA) and applicable state regulations which require or recommend that certain standards be met through the removal of various contaminants.

To meet the water quality standards, a number of processes can be employed including filtration, reverse-osmosis and chemical additions. In the Northeast,

the most popular approach with public water treatment systems is the use of chemical additives. Sodium hypochlorite is aded to kill bacteria, sodium aluminate and aluminum sulfate (alum) are used as a coagulant and sodium hexametaphosphate and sodium hydroxide for pH control (5).

There is little information available about possible negative effects of using such chemically treated water in greenhouse plants. However, it appears there are two issues of major interest-the calcium/sodium balance and the chlorine effect.

Calcium is an important essential element for plant growth as it is needed for cell wall development and influences the uptake of other essential elements. Depending upon the treatment process, calcium in the water used by the greenhouse operation can be increased or decreased by the addition of the above mentioned compounds.

Connecticut water supplies are generally very low in calcium. Sodium displaces calcium in the cation exchange complex. Even low levels of sodium, applied at every irrigation, could contribute to calcium insufficiency as well as suppress potassium uptake. Because the concentration of an element in the soil solution normally dictates plant uptake, the addition of higher concentrations of an element can pose potential problems (1). This is an important consideration where sodium may dominate over calcium or potassium in the treated water.

Sodium is not an essential element for plant growth. Although it may be a prime component in the water treatment process, concentrations are not regulated by the SDWA. However, many states, including Connecticut, have established 20 ppm as the acceptable limit. At this concentration sodium ions may replace some calcium ions on the exchangeable surface, but it does not appear to be a major concern. For example, the relative uptake of sodium to potassium will be enhanced in the presence of sodium (3). Detrimental levels of sodium in greenhouse irrigation water have not been established. Any sodium may have an effect if a competition ion such as calcium or potassium is minimally present.

Chlorine is a minor essential element for plant growth. Excessive levels of chlorine can inhibit enzyme activity in the soil and plant systems, a process which is essential for metabolic action (4). In water treated with chlorine to control bacteria, secondary drinking water standards, which are recommended but not federally enforceable, allow up to 0.25 ppm chlorine in the treated water. Information is not

available to indicate if any negative impact to plant growth occurs at 0.25 ppm chlorine or less.

A recent paper by Bridgen (2) indicates that 15 ppm chlorine used at every irrigation, can cause adverse results on zinnia and chrysanthemum. This is far above levels normally found in municipal water supplies.

Soil pH strongly influences the availability and uptake of certain ions. For the most part, water supplies meeting secondary drinking water standards are slightly alkaline due to excessive sodium addition. Negative results are more likely due to additives than to unbuffered acidic water which is normal in parts of Connecticut.

Good water is essential for producing quality greenhouse crops. Have your water tested. A plastic rubbing alcohol bottle makes a good container for sending a sample to the UConn Soil Testing Laboratory (Box U-67, Storrs, CT 06268, $2.00). If the pH is too high and calcium is very low, excess sodium has been added.

References

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