USDA-CSREES 2006 National Water Quality Conference

Adding Calcined Clays to Peat-based Substrates Benefits Production of Greenhouse Crops

The U.S. Environmental Protection Agency limits the amount of pollutants in water, including nitrate and phosphate. Yet, nitrogen and phosphorous are nutrients required in relatively large amounts during crop production. The nursery industry is reducing wastewater discharge volumes and nutrient concentrations therein, and new methods are being adopted to reduce water and nutrient inputs and increase their efficiency of use by crops.

Greenhouse container studies conducted during 2002-04 determined the effects of calcined clays used as substrate amendments (5-10% v/v) during production of poinsettias and chrysanthemums. Methods were developed based on best management practices for small scale growers with open irrigation systems. Commercial controlled release fertilizers were topdressed at product label rates in all studies. Containers were irrigated when container capacity dropped to a predetermined level with sufficient volume of tap water to achieve a leaching fraction around 0.2. Leachate was collected from each container at each irrigation and analyzed.

Fuller's earth, an attapulgite-type clay, reduced electrical conductivity (EC) of leachate from poinsettia by up to 39%. Largest reductions were achieved during the first few weeks of crop production. In another study with poinsettia, orthophosphate concentration in leachate was reduced by attapulgite-type clay shortly after potting by 74% and 64% in peat and peat+pine bark, respectively. In a third study, clay reduced the cumulative irrigation volume required to produce 16.5-cm poinsettias by 11%. Clays also reduced EC of leachate from 'Sandusky' chrysanthemum while increasing shoot dry weight, and increased shoot dry weight and height of 'Gainesville' chrysanthemum. Results from these studies suggest that "heavy feeding" greenhouse crops can be produced at relatively low nutrient concentrations when irrigation volumes are controlled, and that calcined clays added to a peat-based substrate can further reduce nutrient concentrations in container leachate and reduce water requirements without negatively affecting crop growth or quality.

Author: Chris Catanzaro
Coauthor(s): Sara Bhatti