Fertilizer placement affects nutrient leaching patterns

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Controlled-release fertilizers (CRFs) are a widely used method of delivering nutrients to nursery container crops. The fertilizers contain encapsulated solid mineral nutrients that dissolve slowly in water, and are then released into substrates over an extended period of time. Although the use of CRFs is an accepted practice, growers and researchers are always looking for ways to decrease fertilizer and irrigation expenses and reduce the impact of nutrient leaching into the environment. A new study contains recommendations for CRF placement methods that can address these issues.

The study focused on determining how dissolved nutrients move through a substrate while water is being applied during irrigation—a process the authors say is important to predicting nutrient leaching. James Owen, Jr., lead author of the study published in *HortScience*, explained. "The use of CRFs has been demonstrated to be effective in reducing nitrogen and phosphorus runoff when compared with systems where dissolved nutrients are applied through irrigation water. However, the movement of dissolved nutrients through a soilless substrate during the application of water (i.e., during irrigation) has received little attention." Owen and fellow Virginia Tech researchers Tyler Hoskins and Alex Niemiera designed experiments to determine how the nutrient release rate is affected by the CRF placement in containers. "We hypothesized that nutrient distribution throughout a substrate profile is affected by the placement of CRF in the container and that this distribution affects the pattern in which nutrients are leached from the container during individual irrigation events," the scientists wrote.

The experiments involved a control treatment of a pine bark:sand (9:1, by volume) substrate in nursery containers treated with topdressed, incorporated, and dibbled controlled-release fertilizer for the control. The control was compared with containers that did not receive CRF. The scientists evaluated the nutrient leaching patterns at 3, 9, and 15 weeks after potting. Analyses showed that the concentration of ions in container effluent changed throughout the irrigation event and were affected by the CRF application method. "Incorporated and topdressed CRF produced the highest effluent nutrient concentrations in the first 50-mL volume of effluent collected before steadily diminishing with increasing effluent volume," the authors said. Dibbled CRF peaked after the first 150-mL of effluent had been collected, and resulted in a variable load of leached nutrients based on CRF placement and leachate volume.

The authors said their research indicates that incorporated and dibbled CRF placement methods have potential to produce the greatest quantity of leachable nutrients, compared with the topdressed method. They noted that a benefit of the dibbled method is that less of the leachable nutrients may leave the container when effluent volumes are kept low, leaving more residual nutrients in the substrate that are available for plant growth. "This suggests that the dibble method may be an advantageous CRF placement method that allows for the conservation of expensive fertilizer resources and mitigates non-point source nutrient contributions by reducing undesired nutrient leaching during irrigation."

The authors noted that the effect of fertilizer placement and effluent volume can also be incorporated into other models that predict nutrient leaching.

More information: The complete study and abstract are available on the ASHS *HortScience* electronic journal web site: hortsci.ashspublications.org/c … /49/10/1341.abstract