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HS903

Controlled-Release Fertilizers for Vegetable Crops Grown in Florida in the BMP Era[1]

Eric Simonne and George Hochmuth[2]

This publication is one of a series entitled Fertilizer and Irrigation Management in the BMP Era. This series is divided into nine principles described in the Introduction Chapter (HOS-897). This publication is part of Principle 2, "Soil Test and Follow the Recommendations." BMP implementation requires a global approach to production management. However, for presentation purposes, each aspect of vegetable production is described in a separate publication.

Controlled-release fertilizers (CRF) are an alternative to conventional soluble fertilizers where nutrient release into the environment is of concern (especially nitrate nitrogen). In theory, CRFs allow the grower to better synchronize nutrient release with the crops nutritional requirement, thereby reducing the risk of leaching between time of application and plant uptake. Most CRFs are in the granular form (prills), but some liquid formulations are now available.

Due to high manufacturing costs, CRFs have been mainly used with high-value ornamental crops. Recently, CRFs have been included in the citrus BMPs for Florida. The renewed interest in CRFs for vegetable production has stimulated on-going research efforts which should increase the amount of available information and grower use.

Working Definition

Granulated CRFs are sphere-like prills made of a water-soluble fertilizer covered by a degradable coating, which degrades based on soil temperature and/or moisture. The time of release is determined by coating composition and thickness as well as the soil condition (mainly temperature).

Planning - Things to Do

- Test the soil for nutrient availability before using CRFs.
- Know your CRF: grade, form of N once released (urea, ammonium, nitrate) and factors influencing time of release (usually soil temperature).
- Match the CRF release time with the crop nutrient needs. Consider blending soluble fertilizers and CRFs, and/or several CRFs together to ensure adequate and continuous nutrient supply to the crop.

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2. Eric Simonne, assistant professor, George Hochmuth, center director, NFREC-Quincy, Horticultural Sciences Department, Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, 32611.

- Match the release temperature with the actual soil temperature for temperature-based release CRFs by using soil temperature records.
- Incorporate or band CRFs in the soil.
- Monitor crop nutritional status using leaf analysis, sap testing, or both.

Application - Things to Do

- Apply CRFs as other fertilizers would be applied: with a fertilizer spreader for granulated formulations, by banding (knifing-in), or in the irrigation water for liquid formulations.
- Consider using rates lower than the recommended rate for soluble fertilizers since the same production results may be achieved as the CRFs are slowly released. Extrapolation from other crops suggest that under appropriate release time, 60 to 75 lbs of N from a CRF will have the same effect on the crop as the 100 lbs of N from a soluble fertilizer (urea, ammonium nitrate, 10-10-10).

Things to Avoid: Potential Pitfalls

- Do not exceed the soil test-based recommended rate.
- Do not place CRFs on the soil surface.

Other Considerations

- CRFs with a 1:1:1 ratio provide equal amounts of N, P_2O_5 and K_2O. The application rate of a 1:1:1 fertilizer should be made based on the element (among N, P and K) that is the least required according to soil test results – otherwise, excessive application rates will occur.
- Most coatings and technology of CRF manufacturing are proprietary. Hence, users must rely on and follow the product label. The most common materials are sulfur-coated urea (SCU), polymer-coated ureas, isobutylidene diurea (IDBU) and crotonyldiene diurea (CDU).
- Stay updated on CRF-related issues (formulation, cost, recommendations, and other breakthroughs) as new information is likely to become available in the near future.
- Plant a cover crop following the cash crop to help trap residual fertilizer.

Additional Readings

Slow-release Fertilizer, Virginia Coop. Ext., Dept. of Horticulture, Virginia State Univ. http://www.ext.vt.edu/departments/envirohort/articles/misc/slowrels.html

Controlled Release Fertilizer-properties and Utilization, S. Shoji (Ed.), 1999, Konno Printing Co., Sendai, Japan.