

Development of root-targeted delivery systems for controlled release of water and agrochemicals for ornamental plants

Researchers from the University of Waterloo's Department of Chemical Engineering are working on a new system to deliver water, fertilizer and crop protection products to greenhouse ornamental plants on demand.

Not only will this ensure plants receive inputs only when they need them, it is also expected to reduce water and fertilizer use by up to 50 per cent.

Dr. Frank Gu, a Canada Research Chair in Nanotechnology Engineering, and his team had previously developed a hydro gel-based delivery system for greenhouse vegetable plants that they are now adapting for use in the ornamental horticulture industry.

The root-targeted delivery vehicle (RTDV) is a gel that is loaded with nutrients that are given to the plant's root system in a slow, controlled release, and degrades in the soil when it's no longer needed.

In vegetable plants like lettuce, tomatoes and peppers, this technology has dramatically reduced fertilizer and water requirements without compromising plant health because the inputs are applied and used only when needed, reducing waste, costs, and environmental impacts.

Gu and his team have developed an RTDV specific to ornamental horticulture called glutaraldehyde cross-linked hydro gel that can be customized for specific soil mixes, fertilizer needs, or plant varieties. It is resistant to soil degradation for up to 12 months, and needs to be re-filled with water only once a week to keep plants hydrated.



Plants grown using Glutaraldehyde.



Roots growing around CMC gel.

They're now working on being able to scale up production, determining the cost of the technology, and evaluating the product's shelf life before use in a real-life setting, which they expect to be approximately two years.

In subsequent years of the project, they will be conducting plant growth trials with kalanchoe, Easter lilies, tulips, bent

grass, and mini roses in a greenhouse at the University of Waterloo. They will also be evaluating how the gel degrades in different soil conditions, and investigating the possibility of expanding its capabilities into delivering disease and pest treatments as well, reducing the potential environmental impacts of those products.

Why is this project important to the ornamental horticulture industry?

This new technology allows water, nutrients and other inputs to be delivered slowly and directly to a plant's roots on demand, resulting in significant decreases in water and nutrient use – but without compromising plant health and growth.



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