NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE
School of Materials Science and Engineering
College of Engineering

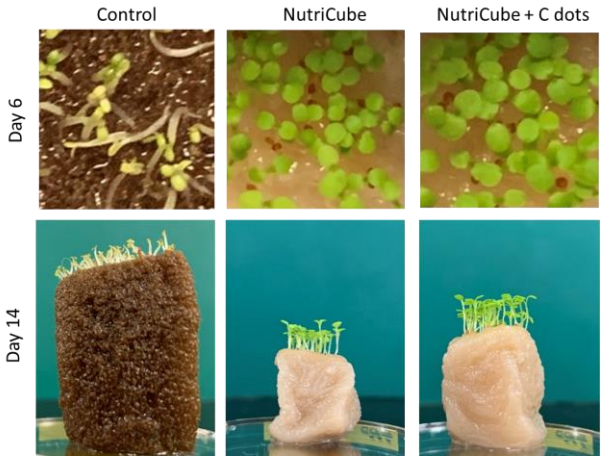
Growth Accelerator for Sustainable Agriculture

TECHNOLOGY OVERVIEW

This technology focuses on the development of nutrients enriched delivery system to promote plant growth. Through the Keratinous Waste-to-Resource Circular Bioeconomy Platform, the nutrient embedded within delivery system builds on unlocking the nutritive value of wastes originated from, but not limited to, feathers and human hair.

Fully natural materials have been used to fabricate the highly porous, interconnected yet resilient structure to withstand the load of growing plants and support both water and nutrients supplies. The materials of choice and fabrication process has been designed to also allow biodegradability and tailorable nutrition and water delivery.

The keratin waste derived growth enhancer is a robust nutrient delivery system that can alleviate the use of harmful fertilizers and improve the environmental footprint while promoting healthy vegetative growth.



Arabidopsis growth demonstration (top)

FEATURES & SPECIFICATIONS

- Versatile process with ability to tailor structure integrity and channel designs for targeted delivery
- Superior water absorbency and nutrients delivery
- Nutrient reservoir with rich source of carbon, nitrogen and sulfur
- Mechanically resilient in water
- Free-from chemicals fertilizer system
- Fully biodegradable eliminating need for laborious maintenance
- Closed-loop end of life option

MARKET TRENDS & OPPORTUNITIES

- The global crop production market was estimated to be valued at $5813.66 billion in 2023 and has been forecast to increase to $8,483.55 billion in 2027 at a CAGR of 9.9%, primarily driven by emergence of new agriculture technologies such as smart lighting systems and agribots.

- Such a trend has led to a corresponding growth in the fertilizer market at a CAGR of 5.93% (2024-2030). With global keratin wastes generated at million tonnes annually, technologies that upcycle keratin waste into value-added biofertilizers has been gaining attention.

POTENTIAL APPLICATIONS

- Agriculture
- Horticulture
- Urban Farming