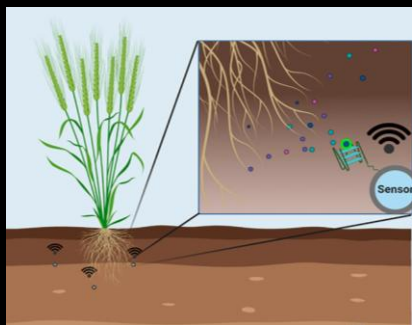


Root Exudate-Activated System for Agrochemical Delivery



Mastronardi et al, 2021. J. Agric. Food Chem. 69(14): 4294-4306. DOI: 10.1021/acs.jafc.0c06796

Background

Sustainable delivery of agrochemicals (fertilizers, nutrient) to crops adheres to the 4R's of Nutrient Stewardship (Right Source @ Right Rate, Right Time, Right Place). Strategies that can detect signals, such as various root exudates, released from plants during periods of increased nutrient uptake enable such sustainable agricultural practices. Moreover, combining such a biosensor with automated delivery of crop nutrients enables synchronizing nutrient supply and demand more precisely.

Description of the Invention

The Inventors have developed novel DNA aptamers (single stranded DNA molecules) that bind to a signal molecule in the root exudates of wheat and canola, under typical soil conditions. When incorporated into a coating mixture and applied to an agrochemical, the DNA aptamers bind to the specific signal molecule and control the permeability of the coating to trigger the release of the agrochemical.

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Development Stage:

Prototype Validation

Protection Status:

US patent 12,065,392 (Aug 2024)
CA patent 3,112,597 (Jun 2024)
AU patent 2019337776 (Feb 2024)

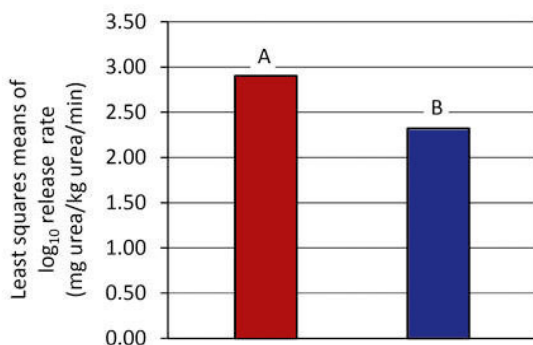
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Ex. Urea release from aptamer-coated pellets the absence of signal molecule (Blue/B) and in the presence signal molecule (Red/A).

Key Benefits

- **On-demand delivery:** agrochemical release from coated particles is synchronized with uptake of nutrients during active growth
- **Performance:** more efficient uptake and utilization of release nutrient or agrochemical, improved crop productivity
- **Agronomics:** minimize losses of applied agrochemical and environmental impacts

Applications

- Right-place, right-time delivery of agrochemicals
- Detect and treat nutrient deficiencies or pest infestations sooner to minimize losses.