UNIVERSITY OF MINNESOTA
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Engineered bacteria for the synthesis of a biodegradable polymer coating

Genetically modified bacteria for the synthesis of a biodegradable polymer to coat fertilizer pellets, allowing nitrogen to be slowly released over time.

IP Status: US Patent Pending; **Application #:** 18/506,263

Applications

- Slow-release nitrogen fertilizers
- Flocculant agent for wastewater treatment

Key Benefits & Differentiators

- **Fully-biodegradable:** the polymer material gamma polyglutamate is produced by bacteria
- **Potential to scale-up :** the bacterial strain can be grown on simple sugars or other natural carbon compounds
- **Flocculant :** the polymer coating is water soluble and negatively charged

Technology Overview

Using nitrogen fertilizers often results in premature nitrogen loss through groundwater leaching, rain events, or over application. Many companies produce small pellets that entrap fertilizers within a water soluble polymer matrix that slowly dissolves and releases the fertilizer over time, providing long-term application. However, these conventional polymers used in slow-release fertilizer formulations are often not fully biodegradable. Companies are highly interested in replacing conventional polymers with a biodegradable alternative.

Researchers at the University of Minnesota have developed an engineered bacteria to produce a biodegradable polymer coating for fertilizer pellets, allowing nitrogen to be released slowly over time. The polymer material is primarily made of gamma polyglutamate produced by Azotobacter vinelandii through a process that potentially can be scaled-up. Nitrogen is released to the soil from the fertilizer entrapped in the polymer-coated pellet and from the glutamate molecules that are the primary building block of the polymer coating. Thus, resulting in a completely biodegradable product. Lastly, this polymer is water soluble and negatively charged, which allows it to act as a flocculant agent in wastewater treatment. This new technology has great potential to significantly impact agricultural and wastewater treatment industries by providing a sustainable and biodegradable alternative to conventional polymers.

Phase of Development

TRL: 3-4
Proof of concept, polymer has been produced in a lab-scale.

Desired Partnerships

This technology is now available for:

Technology ID
2023-061

Category
Engineering & Physical Sciences/Chemicals
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Researchers

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