

Protection of Beneficial Microbes During Spray Drying Using Food, Ag, or Forestry Residues

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ABSTRACT

Researchers at the University of California, Davis have developed a method that uses phenolic-rich agro-industrial residues to protect and stabilize beneficial microbes for improved shelf life and bioactivity.

FULL DESCRIPTION

This technology integrates phenolic-rich food, agricultural, and forestry residues such as pomegranate, olive pomace, and spent coffee grounds with a spray drying encapsulation process to create shelf-stable microcapsules containing human, animal, and plant beneficial microbes. The phenolic compounds form protective metal-phenolic networks (MPNs) around microbes, enhancing their viability through drying stresses and long-term storage. This cost-effective bioformulation improves the survival of sensitive probiotic and microbial biostimulant strains, enabling reliable controlled release and commercialization in diverse markets.

APPLICATIONS

- ▶ Human and animal probiotic dietary supplements.
- ▶ Functional foods enriched with beneficial microbes.
- ▶ Microbial biostimulants for sustainable agriculture and soil health.
- ▶ Seed coatings with nitrogen-fixing or growth-promoting bacteria.
- ▶ Pharmaceutical and nutraceutical formulations requiring stable live cultures.
- ▶ Environmentally friendly bioformulations leveraging agro-industrial byproducts.

FEATURES/BENEFITS

- ▶ Improves shelf stability while preserving the bioactivity of probiotics and biostimulants.
- ▶ Increases microbial survival during spray drying by up to 1000-fold.
- ▶ Replaces costly excipients by using low-cost, sustainable agro-industrial residues.
- ▶ Integrates with commercially scalable spray-drying methods, including crosslinked alginate microencapsulation (CLAMs).
- ▶ Provides broad-spectrum protection using natural phenolic networks without synthetic polymers.
- ▶ Lowers production costs and expands access to spray-dried, viability-sensitive biologics.
- ▶ Decreases reliance on synthetic polymers and chemicals used in typical microencapsulation matrices.

PATENT STATUS

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INVENTORS

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OTHER INFORMATION

KEYWORDS

agriculture, alginate
 microencapsulation,
 biostimulants,
 bioformulation, metal-
 phenolic networks,
 probiotics, phenolic acids,
 spray drying, spent
 coffee grounds,
 sustainable agriculture

CATEGORIZED AS

- ▶ **Agriculture & Animal Science**
- ▶ Nutraceuticals
- ▶ Plant Traits

Patent Pending

▶ Processing and
Packaging

▶ **Biotechnology**

▶ Food

▶ Health

▶ Industrial/ Energy

RELATED CASES

2025-563-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- ▶ [A Spray-Drying Method for Encapsulating Biological Molecules in Cross-linked Alginate Microcapsules](#)
- ▶ [Spray Dry Method for Calcium Cross-linked Alginate Encapsulation of Biological and Chemical Moieties via the Use of Chelating Agents](#)
- ▶ [One Step Process of Forming Complex Coacervation During Spray Drying](#)

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