

Phosphate Solubilizing Microbes: Product Headstart

We've characterized 128 spore-forming bacteria that solubilize phosphate *in vitro*. We've identified more than 4,000 additional spore-forming strains with potential for P solubilization through *in silico* analysis.

WORK PERFORMED TO DATE

Target

Solubilizing plant-unavailable phosphate from soil to feed corn, soybean, and other row crops

Mode of action

Root-colonizing microbes that secrete organic acids and / or phosphatases

Key assets

- Comprehensive *in silico* and *in vitro* mode of action assays
- *In planta* assays including root architecture assays and P-deficiency assay in maize
- 16,000 sq-ft greenhouse with *PlantEye* digital phenotyping system

We've characterized more than 100 *Bacillus* strains that combine all the genetic machinery necessary to manufacture and secrete phytases, acid phosphatases, and to regulate phosphate transport within the cell.



Database of Functional gene annotations

Select microbes containing the genetic capacity to **solubilize phosphate**

- Phytases
- Acid Phosphatases
- P Transport
- Regulation

- 36 *Bacillus megaterium*
- 21 *Bacillus subtilis*
- 15 *Bacillus licheniformis*
- 30 *Bacillus velezensis*
- Additional strains spanning 10 other species

HOW GINKGO CAN PARTNER ON A PHOSPHATE SOLUBILIZING MICROBE PROGRAM

Wild type formulation and fermentation process development

Progress *in silico* hits to *in vitro* characterization. Select top performing wild type strains and test prototype formulation that matches your desired product strategy *in planta*.

Optimize phosphate solubilizing efficacy of a root-colonizing strain

Use mutagenesis-based approaches and ultra high throughput screening to improve efficacy and / or stability of wild type phosphate solubilizers.

Engineered root-colonizing strain expressing multiple AIs

Fully engineer phosphate solubilizing activity in desired chassis strain. Optimize expression through mutagenesis or rational engineering approaches.

HOW WE PARTNER

Our IP Philosophy

Each party retains ownership of the Background IP they bring to a collaboration. Ginkgo seeks ownership of the foreground IP and grants the partner the licenses needed to manufacture and sell the product in a given market.

Commercial Structure

Our payment structure reflects our philosophy: we share risk and share in the success. We get paid through a combination of R&D fees and downstream value-share such as royalties, equity or commercial milestones. Through Joint Steering Committees, we work with partners to govern key decisions in project progress.

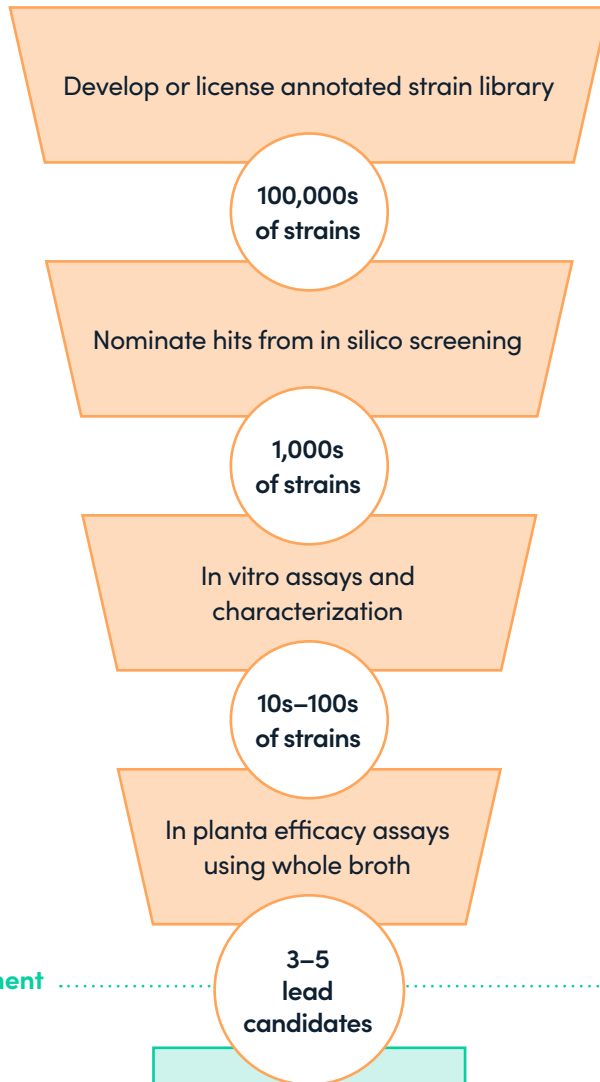
How to start? Speak to our team!
agriculture@ginkgobioworks.com

Get a Headstart on Discovery

Access Ginkgo's diverse strain library to accelerate your next biological product

WILD TYPE MICROBIAL PRODUCT DISCOVERY TO DEVELOPMENT

Early to late discovery

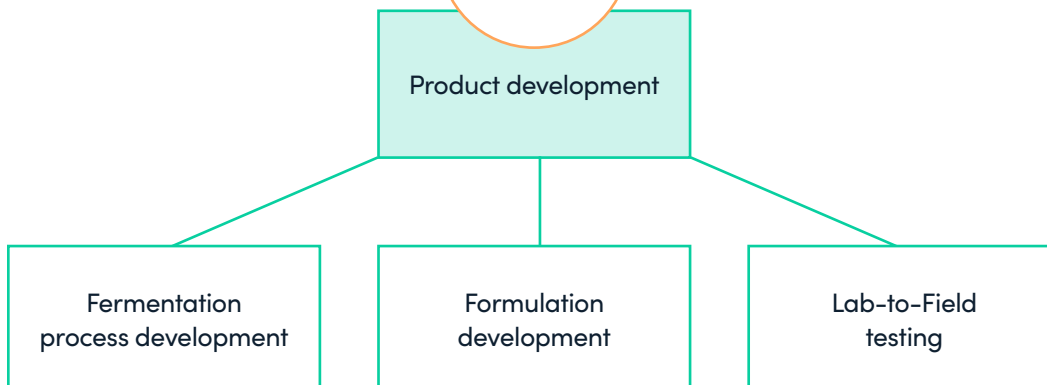


Shave years off of Discovery with our lead candidate strains

Lead candidate strains emerging from *in silico* screening, *in vitro* testing and *in planta* assays address multiple product applications across crop protection and nutrient use efficiency.

Access our world-class 200,000+ member strain library, sourced from diverse soil and plant-associated environments, to nominate additional candidates for *in vitro* and *in planta* characterization.

Product development



PRODUCT DISCOVERY HEADSTARTS

	Application	Lead Candidate Type	Discovery Stage		
			<i>In silico</i> hits	<i>In vitro</i> leads	<i>In planta</i> leads
Crop Protection	Bionematicides	Novel active ingredient	✓	✓	✓
	Biofungicides - Row Crops	Novel strains	✓	✓	✓
	Biofungicides - Specialty Crops	Novel strains	✓	✓	Not tested
	Bioinsecticides	Novel strains	✓	✓	✓
Crop Nutrition	Nitrogen fixation	Novel strains	✓	Not tested	Not tested
	Phosphate solubilization	Novel strains	✓	Not tested	Not tested
	Plant growth regulators	Novel strains	✓	Not tested	Not tested
	Carbon sequestration	Novel strains	✓	Not tested	Not tested

OUR PLATFORM

Leverage our end-to-end platform to progress candidates through product development

Achieve target COGS with our Fermentation Process Development services

- Optimize process requirements for manufacturing with predictive fermentation tools (e.g., Sartorius Ambr250 ml reactors)
- Test at scale with 3000L pilot plant facility

Improve product efficacy and stability with our Formulation Development services

- Industry leading formulation expertise across a range of product concepts - liquid suspensions, dry format formulations, foliar and seed treatment formulations, and adjuvants to enhance bioactives

Go to field trials with confidence with our Lab-to-Field Testing services

- 175k ft² plant science facility with growth chambers, greenhouses, micro plots and rapid phenotyping (multispectral 3D imaging) capabilities
- Robust platform of efficacy and stability assays to validate biological products in formulation

Learn more about accessing our lead candidate strains - Schedule a meeting today!

agriculture@ginkgobioworks.com