

Nitrogen-Fixing Microbes for Cereal Crops: Product Headstart

We've identified more than 1,600 candidate nitrogen-fixing (N-fixing) bacterial strains *in silico*. Our team is in the process of characterizing their activity *in vitro* and has validated a robust platform of *in planta* assays.

WORK PERFORMED TO DATE

Target

Nutrient use efficiency: atmospheric nitrogen for row crops

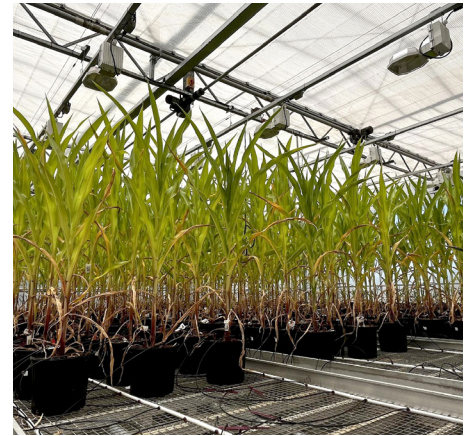
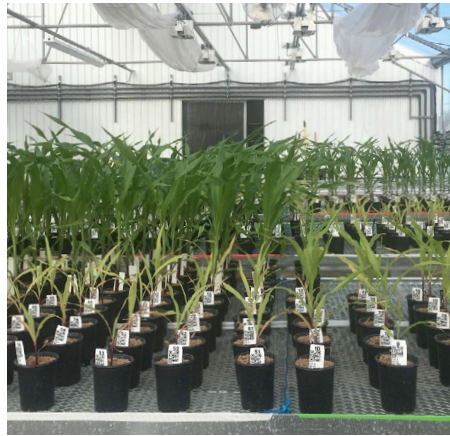
Mode of action

Plant-colonizing microbes producing nitrogenase

Key assets

- 1,600+ strains with N-fixing genes
- High throughput *in vitro* nitrogen fixation assays
- Early response growth chamber and V4, V6, V10 N-stress greenhouse assays
- N rate studies in microplots

- Over 4,000 strains across all taxa selected from *in silico* screening using *nifH*, *nifD*, and *nifK* as "hook" genes for analysis
- Robust greenhouse assay platform to evaluate emergence, dry biomass, growth rate, chlorophyll content, plant colonization



HOW GINKGO CAN PARTNER ON A NITROGEN-FIXING MICROBE PROGRAM

Wild type formulation and fermentation process development

Test wild type nitrogen-fixing microbes *in planta* and develop a formulation that matches your desired product strategy and remains stable on the shelf.

Optimize nitrogen fixation in a plant-colonizing strain

Start with a wild type plant-colonizing microbe and optimize regulation of N-fixing gene expression through mutagenesis or rational engineering approaches to increase ammonia secretion.

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.

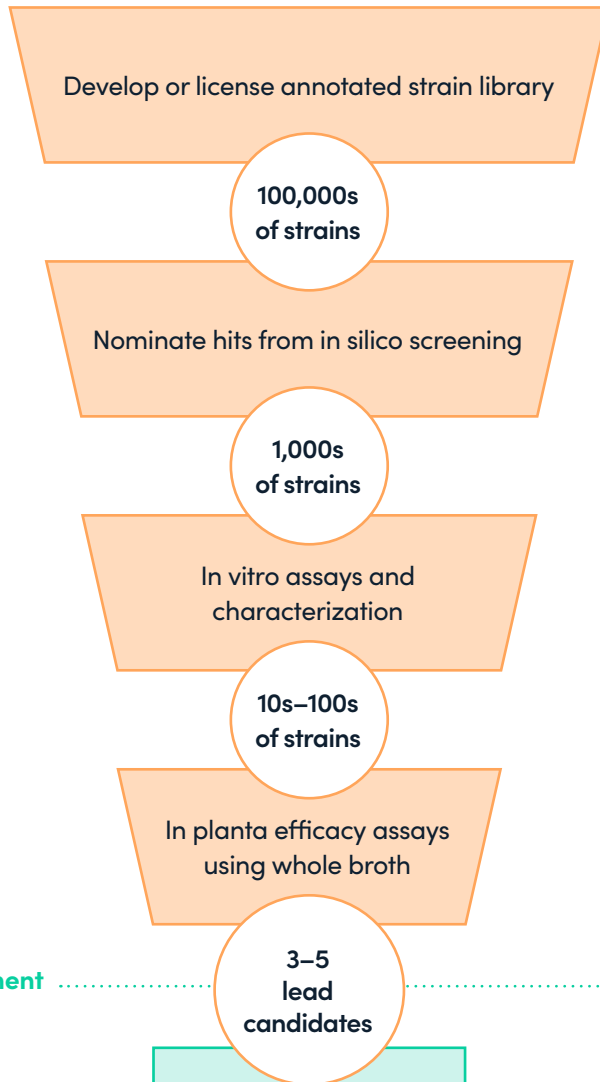
How to start? Speak to our team!
agriculture@ginkgobioworks.com

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

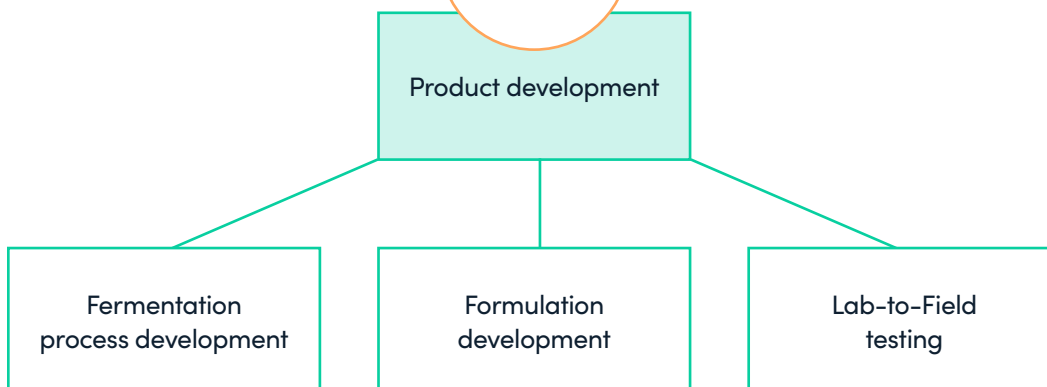


Shave years off of Discovery with our lead candidate strains

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!

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