

biottrinsic® X19 Provides Effective Management of Seedling Disease in Corn and Soy



- Effectively manages multiple seedling diseases including *Pythium*, *Rhizoctonia* and *Fusarium* on corn and soy.
- Induces systemic disease resistance and actively colonizes fungal and oomycete hyphae, producing a thick biofilm that physically restricts hyphal growth.
- Field efficacy on par with synthetic fungicides across multiple crops, pathogens, and geographies.
- Formulation: flowable powder with a long shelf-life and on-seed stability.

PRODUCT BACKGROUND

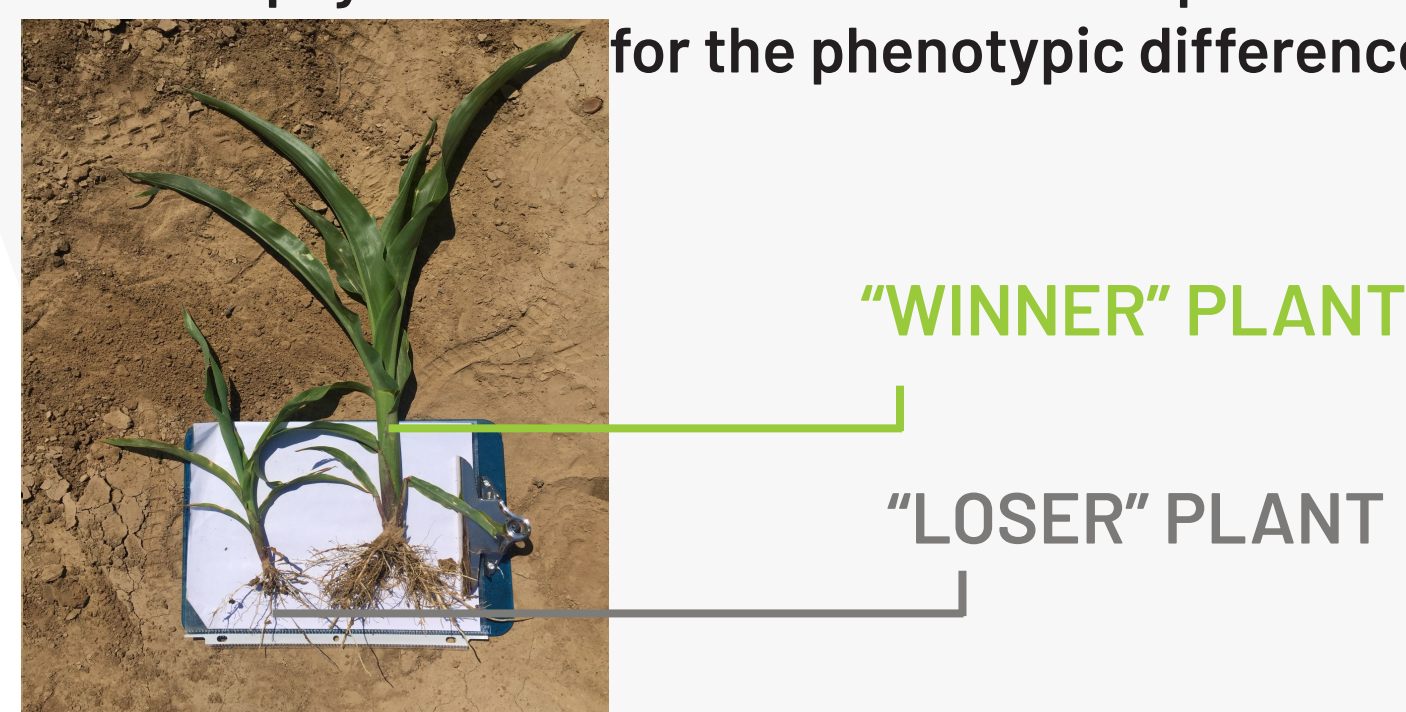
biottrinsic® X19

TAXONOMY	<i>Kosakonia cowanii</i> , a gram-negative bacteria, strain SYM00028
MICROBE SOURCE	Surface sterilized corn seed
APPLICATION RATE	Corn: 1 vol oz/CWT (0.36 g/kg) Soy: 1 vol oz/CWT (0.36 g/kg)
TARGET PATHOGENS	Multiple soilborne pathogens
FORMULATION	Flowable Powder
IRAC CODE	BM02 (submission in preparation)
PRODUCT SHELF LIFE	12 months at 22 °C
ON-SEED STABILITY	60 days at 22 °C

DISCOVERY

1 DISCOVERING WINNER & LOSER PLANTS ON FARMS

After identifying stress conditions on our partners' farms. We identify "Winner" plants that are doing well under the stress, and "Loser" plants that are not handling the stress well. We hypothesize that differences in the endophyte communities found in each plant are mostly responsible for the phenotypic differences.



2 IDENTIFYING WINNER MICROBE SPECIES AND MICROBE STRAINS

After collection, we sequence thousands of microbes and look for trends across stress types between "Winner" and "Loser" plants. This process helps us identify the beneficial microbe species. We then find strains representing those species in our collection.

3 TESTING THE BEST

Multiple top strains then go through our multi-year testing pipelines where we test in lab, greenhouse and field trials.

4 COMMERCIALIZING THE BEST OF THE BEST

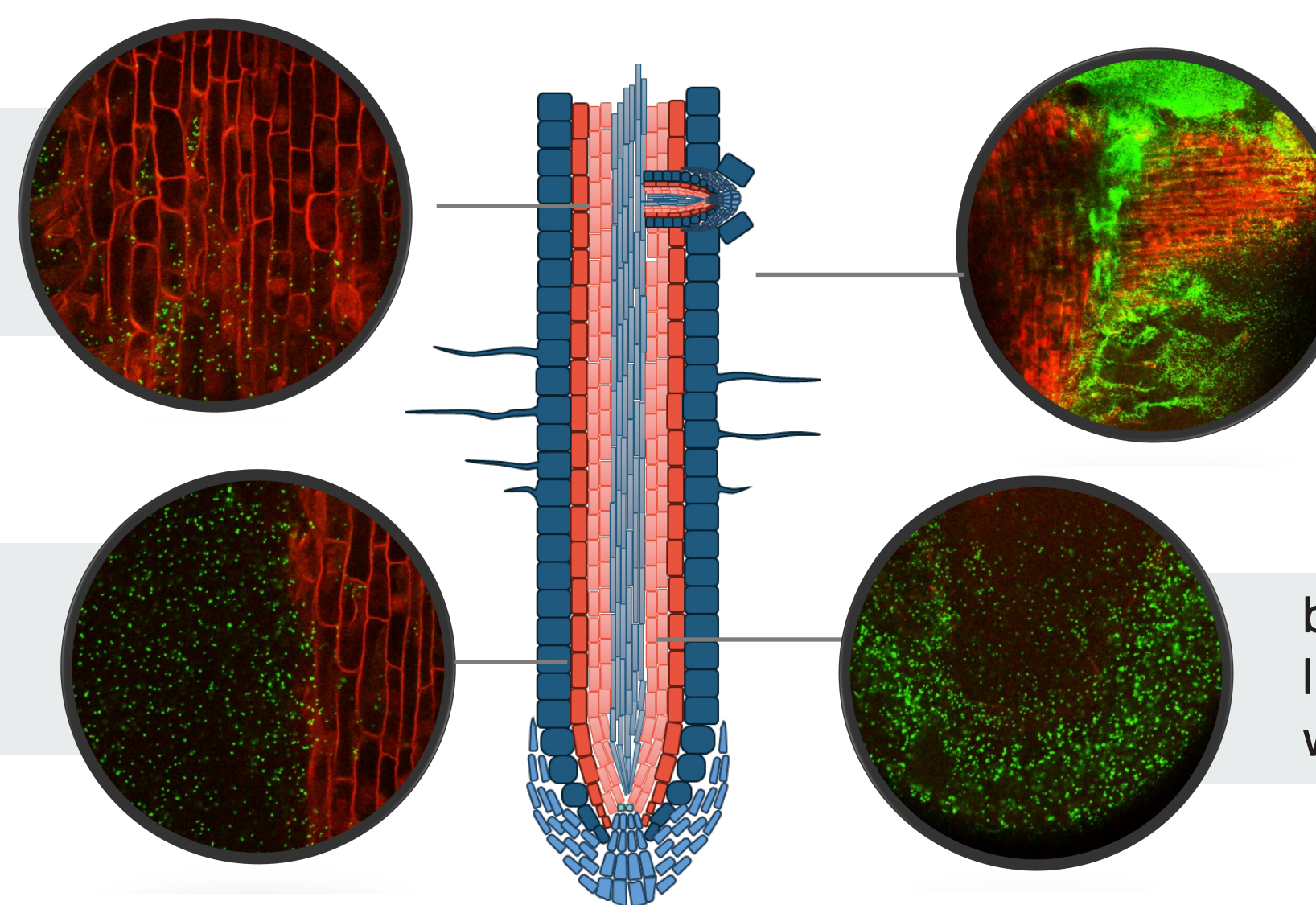
Multiple new biofungicide active ingredients are working their way through Indigo's product pipeline across various markets by 2025.

class	taxonomy	crops	Argentina	Brazil	USA
Bacteria	<i>Kosakonia cowanii</i>	soy, corn, wheat	✓		✓
Fungi	<i>Trichoderma hamatum</i>	soy, wheat		✓	✓
Bacteria	<i>Bacillus aryabhatai</i>	soy, corn	✓	✓	✓
Bacteria	<i>Curtobacterium citreum</i>	wheat			✓

MODE OF ACTION

1 COLONIZATION

biottrinsic® X19 (green) is an endophyte living within plant roots (red)



biottrinsic® X19 forms a biofilm layer along the erupting lateral root

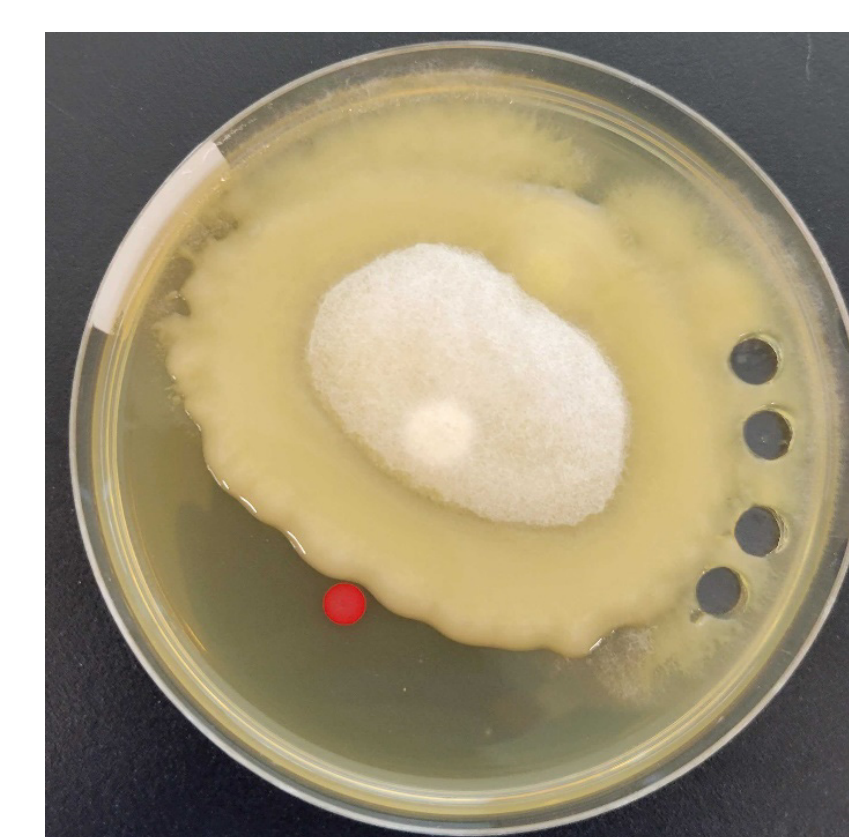
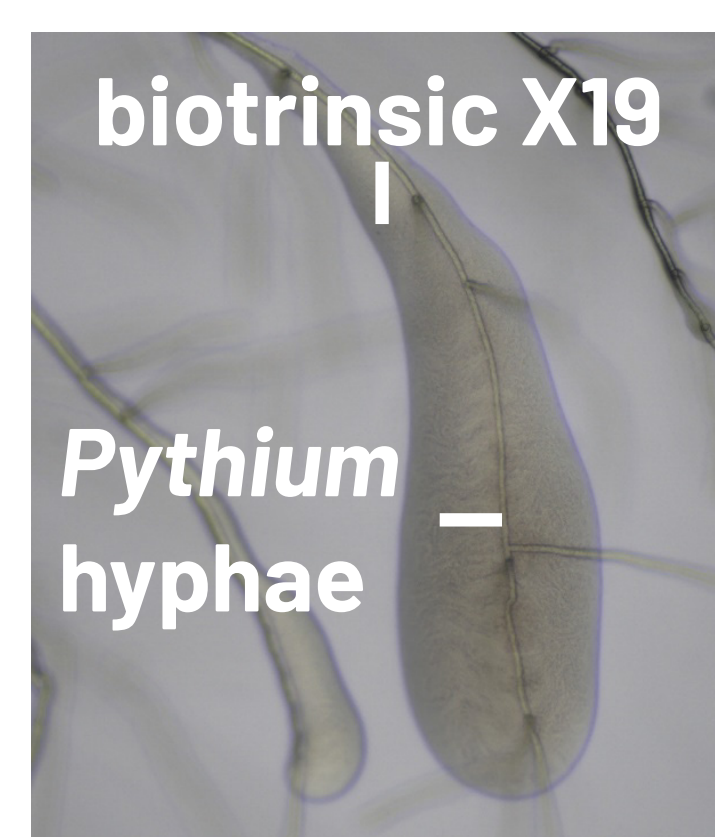
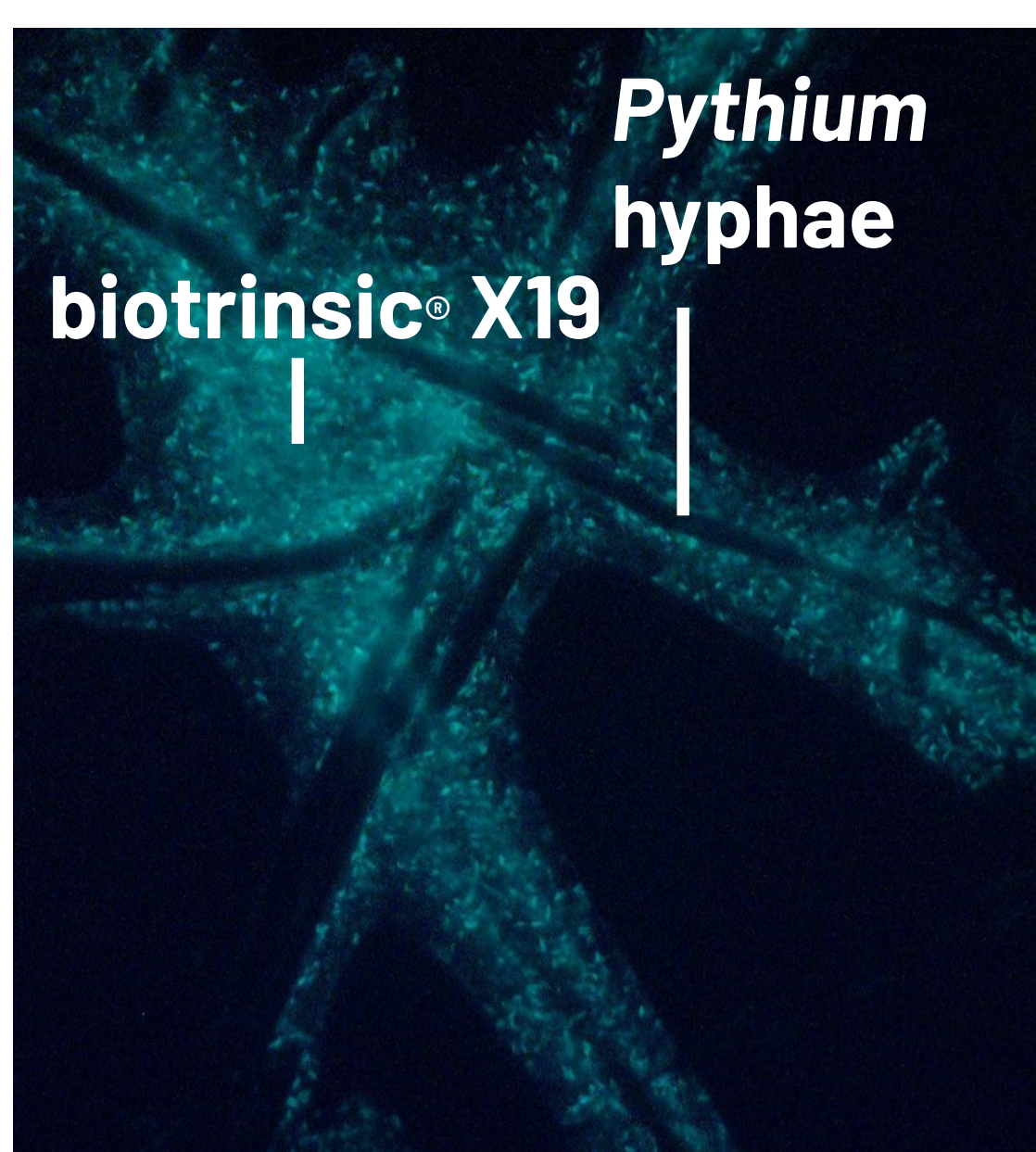
2 INDUCED SYSTEMIC RESISTANCE

biottrinsic® X19 bacteria trigger a defense signal throughout the plant. This signal induces biochemical and biophysical changes within the plant, strengthening its natural immune system and optimizing its defenses against attack from seedling diseases.



3 CREATES BIOFILM THAT DISRUPTS FUNGAL GROWTH

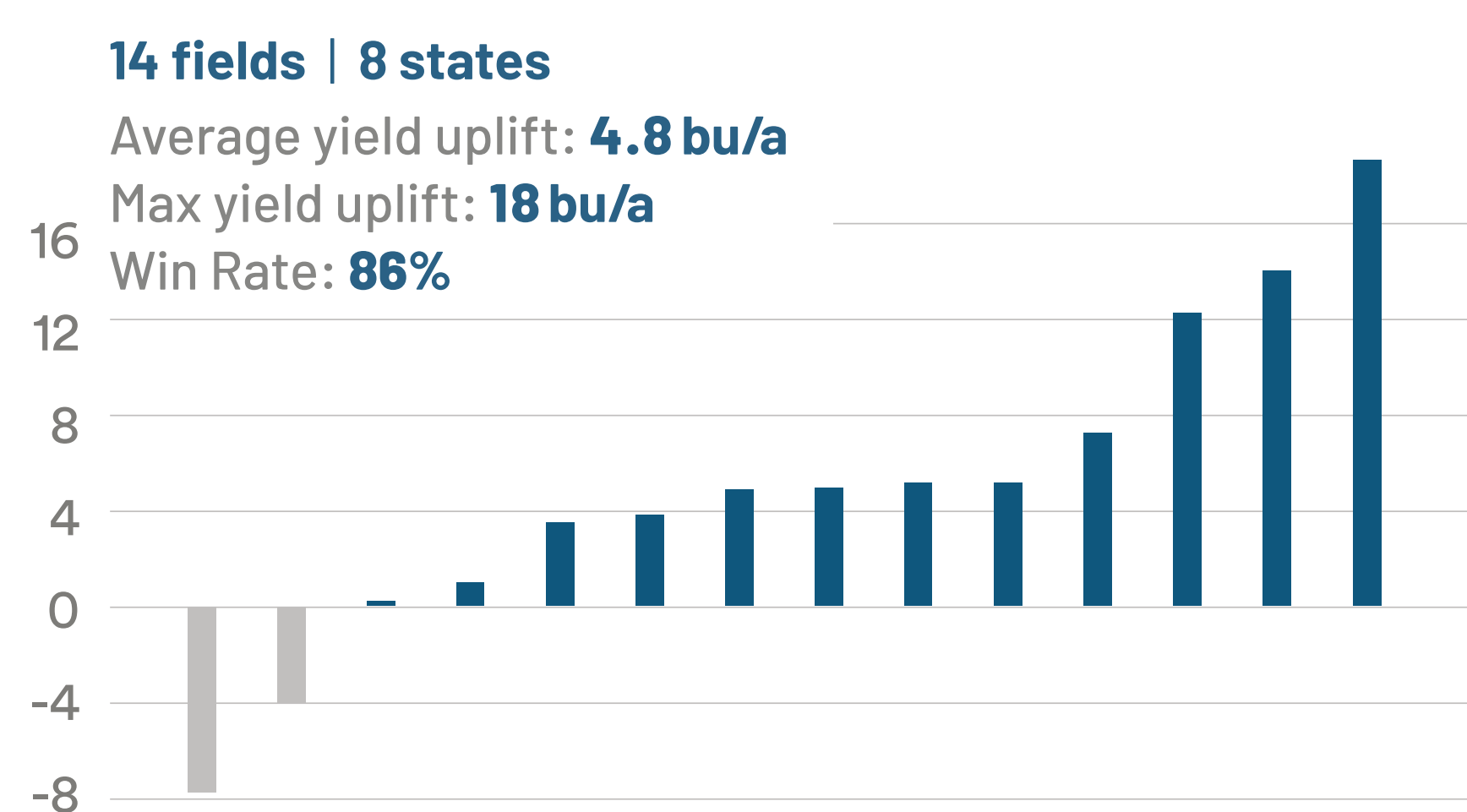
When a pathogen attacks, the microbes in biottrinsic® X19 rapidly replicate and surround the mycelium of the disease pathogen. They then create a thick film of extracellular polysaccharides, a biofilm that acts as a physical barrier to fungal growth.



Dual culture assay of biottrinsic® X19 and *Pythium ultimum*, showing inhibition of colony growth. Red dot is a metconazole control.

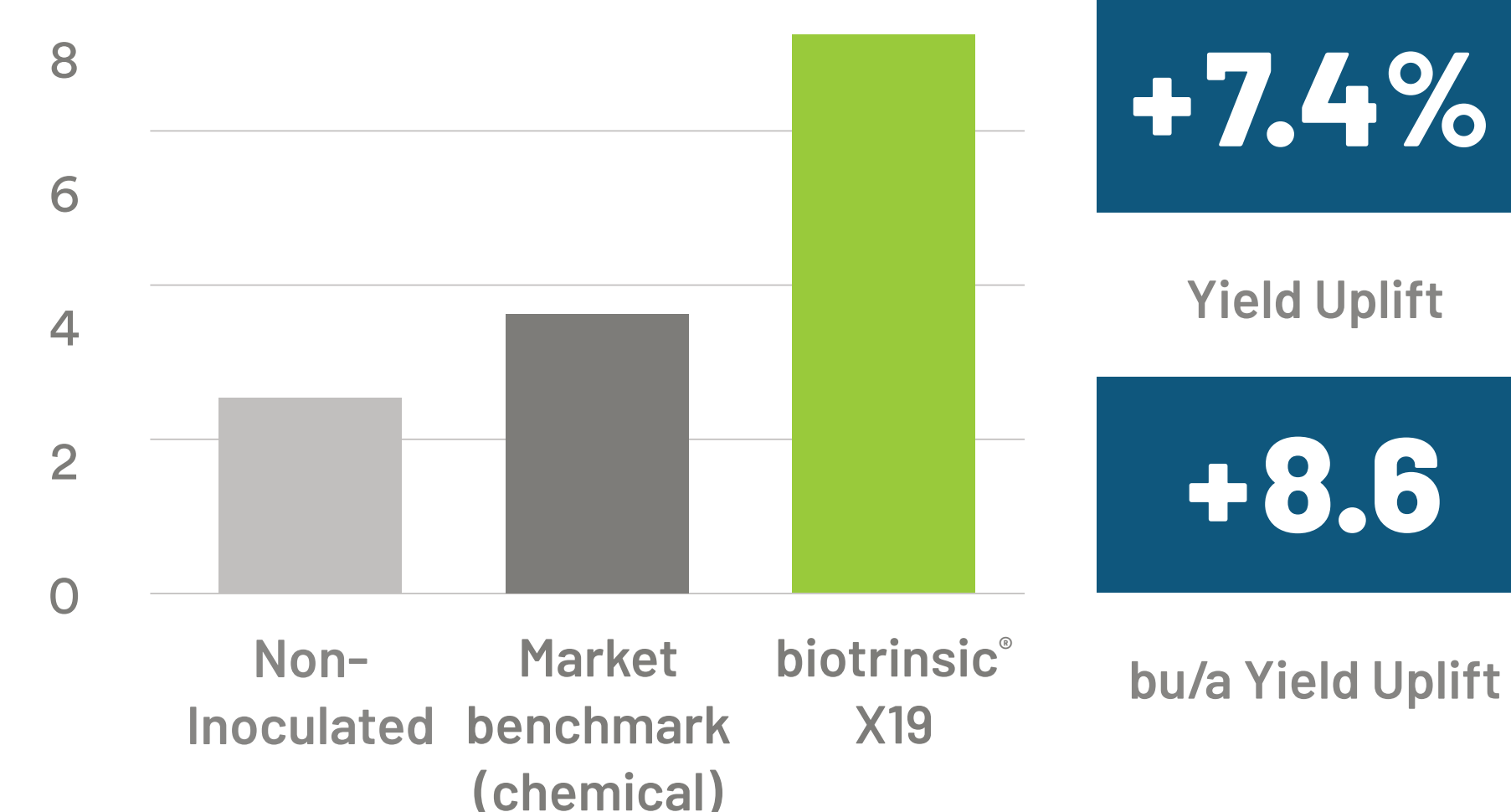
RESULTS

Corn Yield Impact (bu/a)



Large plot trials under "typical" field conditions in 2022 run by early adopters. biottrinsic® X19 was provided and treated over the top of their normal seed treatment, using their standard agronomic practices.

% Difference in Corn Yield vs. untreated control



Field testing on corn using seed inoculated with a complex of *Fusarium* spp., *Pythium* spp., and *Rhizoctonia* spp. - Auburn University Trials, 2019

biottrinsic® X19 out-performed both the non-inoculated and the chemical market benchmark with a yield uplift of 7.4% for an increase of 8.6 bu/a