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Optimizing nitrogen production in root-associated, diazotrophic bacteria

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Abstract

While synthetic fertilizers have accelerated crop yields worldwide, most synthetic nitrogen farmers apply is never absorbed by the crops they produce; instead, the nitrogen evaporates into the atmosphere and is washed into nearby waterways that become polluted or become the greenhouse gas nitrous oxide.

Biological nitrogen fixation (BNF) by plant-associated bacteria has the potential to provide a sustainable and efficient source of nitrogen for non-legume crops. However, the abundance of fertilizer and residual nitrogen in agricultural soils has repressed BNF in most rhizosphere microbes. By rewiring the regulatory circuits that control nitrogen fixation and ammonium assimilation, we have developed and commercialized diazotrophic strains that can replace up to 40 pounds of synthetic nitrogen in agricultural corn production.

