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A review of common nitrogen biological products for corn

Biological products that stake claim on increasing nitrogen use or fixing atmospheric nitrogen for non-legume grain crops have increased in popularity in the past few years. While inoculating legumes like alfalfa and soybeans with symbiotic rhizobia bacteria is a way to facilitate the process of converting atmospheric nitrogen into a plant-usable form, not all biological and inoculant products that claim to supply nitrogen to crops are created equal. Below, we will share some information about a few of the nitrogen biological products gaining interest in Wisconsin:

ProveN/PROVEN 40 **Envita** **Utrisha-N**

This resource is intended as a quick reference; these products need more testing in Wisconsin, and University of Wisconsin-Madison neither officially supports or discourages their use in cropping systems.

For more data on studies conducted across the Midwest, refer to *SF2080: Performance of Selected Commercially Available Symbiotic N-fixing Products in the North Central Region* from NDSU Extension (see link in **References**).

University of Wisconsin-Madison is conducting active research into some of these products, and new data will be available soon.

Always read, follow, and understand the product's label and any included instructions.

Whenever trying new products for the first time on your farm, it can be helpful to start on a small scale across a few different areas, leaving untreated strips. This way, you can measure if there was an actual yield difference and whether it is a return on investment (ROI) justifies its continued use.

One of the most proven, efficient ways to reduce fertility inputs is through soil testing and the use of Nutrient Management Plans. To make one for your farm, contact the county conservation office or NPM specialist serving your area.

ProveN/ PROVEN 40

PIVOT BIO PROVEN

Active ingredients	*Kosakonia sacchari* and *Klebsiella variicola*
Intended function	Bacteria is inoculated on the seed or applied in-furrow to adhere to the plant root. It converts atmospheric nitrogen to ammonia, a nitrogen form available for plant uptake.
Rate	12.8 ounces per acre in furrow Seed treatment is available
Application cautions	Must be used within 24 hours of opening container Preferred to add PROVEN 40 last when filling tanks Use within 4 hours if mixed with 10-34-0 or micronutrients Do not use 7-21-7, ATS, or UAN as a carrier Use a non-chlorinated water source
Labeled crops	Grain and silage corn
Note	Gene-edited bacteria are not Organic Materials Review Institute (OMRI) approved.

Company provided information:

Pivot Bio Research Reports (2024)
https://www.pivotbio.com/research-reports
Product Stewardship & Use (2022):
https://www.pivotbio.com/using-pivot-bio

Product claims:

- Provides 40 lb N/A
- In plant nitrogen ~11% higher than untreated
- Plants have 4.2% more biomass than untreated
- 0.91 more tons of corn silage compared to farmer standard N practice, enhanced feed quality

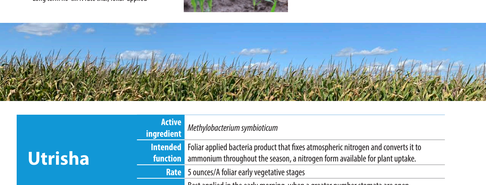
NO RESPONSE

- **University of Wisconsin-Madison**
  5-site years N rate trial with and without ProveN 40
- **University of Missouri**
  3-year study of 100 lb N/A rate with and without PROVEN 40
- **Michigan State University**
  Base rate of 60 lb N/A, then sidedress to 110 and 180 lb N/A, PROVEN 40 in furrow
- **Kansas State University**
  N rate trial with and without ProveN
- **Nebraska State University**
  11-site years N rate trial with and without ProveN or PROVEN 40
- **University of Illinois**
  Seed Treatment: Strip trial with base rate of 160 lb N/A and trial with 150 and 200 lb N/A rates. All trials yielded no significant difference, regardless of whether ProveN was on the seed treatment or not.

Current research (2019-2023)

RESPONSE

- **University of Illinois**
  N rate trial for one site year treated with 140 and 180 lb N/A with and without PROVEN 40. Treatments with PROVEN 40 had the benefit of ~11 additional bu/A
- **University of Minnesota**
  N rate trials for 4-site years
  Waseca location: treated with 125 lb N/A rate and PROVEN 40 had the benefit of 9 additional bushels, equivalent to yield with 145 lb N/A without PROVEN 40
  No yield response at other three locations



Envita

envita

Active ingredient	*Gluconacetobacter diazotrophicus*
Intended function	Bacteria applied in-furrow or foliar that supplies nitrogen by forming a symbiotic relationship with the host plant to provide nitrogen to the plant and will colonize itself within the plant to supply atmospheric nitrogen to the plant all season.
Rate	0.8-1 ounce per acre in furrow 0.5-2.5 ounces per acre foliar early vegetative stages
Application cautions	**Foliar:** Preferred timing is with a post herbicide application Apply with a minimum of 10 gallons of water/A Add last, agitate and spray **In-furrow:** Apply with a minimum of 2.5 gallons of water/A Can be mixed with an in-furrow fertilizer, adding Envita last Only mix what will be used within a day Do not freeze, store in a cool dry and ventilated building away from foodstuffs and animal feed. Keep out of direct sunlight. Do not open product container until ready to use
Labeled crops	**Foliar:** corn, soybeans, cereals, alfalfa, potatoes **In-furrow:** corn, soybeans, potatoes
Note	Organic Materials Review Institute (OMRI) approved

Company provided information:

Envita Results (2024)
https://www.azotic.com/corn/
https://www.azotic.com/soybeans/
https://www.azotic.com/potatoes/
Envita Microbial Inoculant Label (2023)
https://www.azotic.com/wp-content/uploads/2023/12/Envita-SC-Label-USA.pdf
Envita Best Management Practices
https://www.azotic.com/usa-best-management-practices/

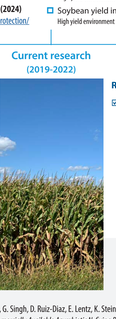
Product claims:

- **Corn:** 6+ bu/A average increase
- **Soybean:** 3.9+ bu/A average increase
- **Potato:** 39 cwt/A average increase

NO RESPONSE

- **North Dakota State University**
  4 trials, treatments of 0 and 80 lb N/A with and without in furrow
  Corn: 150 lb N/A, foliar applied at V2/3 Spring wheat: 150 lb N/A, foliar applied 3-5 leaves, flag leaf, and flowering
- **Michigan State University**
  Base rate of 60 lb N/A, then sidedress to 110 and 180 lb N/A, in-furrow
- **University of Minnesota**
  Base rate of 40 lb N/A, then sidedress to 90 and 160 lb N/A, in-furrow
- **University of Illinois**
  N rate trial, increments of 50 lb N/A, from 0 to 250 lb N/A, with and without in-furrow and a V3 foliar application on a corn/corn and a soy/corn rotation
- **Purdue University**
  Long term no-till N rate trial, foliar-applied

Current research (2019-2022)



RESPONSE

- **University of Missouri**
  3-year study of 100 lb N/A rate, in-furrow 2020, 6 bu/A benefit, equivalent of gains from a 12 lb N/A fertilizer rate

Utrisha

Utrisha™ N

Active ingredient	*Methylobacterium symbioticum*
Intended function	Foliar applied bacteria product that fixes atmospheric nitrogen and converts it to ammonium throughout the season, a nitrogen form available for plant uptake.
Rate	5 ounces/A foliar early vegetative stages
Application cautions	Best applied in the early morning, when a greater number stomata are open Apply in healthy crops unaffected by poor nutrition or other biotic/abiotic stresses Apply with sufficient plant biomass, when the crop presents good soil coverage Mix with water only for best product performance Spray volume between 10 and 25 GPA Water total chlorine content: < 2 ppm Water pH between 5 and 8 **Rain fast:** one hour after application **Wheat only:** to be used within current nitrogen programs
Labeled crops	**Cereals and grains:** corn, soybeans, winter/spring cereals and sorghum **Hay and forages:** alfalfa and pasture **Horticultural:** several vegetable, fruit and nut crops
Note	Organic Materials Review Institute (OMRI) approved

Company provided information:

Utrisha-N Label (2023, February 14)
https://www.corteva.us/products-and-solutions/crop-protection/utrisha-n.html
Utrisha N Nutrient Efficiency Optimizer Resources (2024)
https://www.corteva.us/products-and-solutions/crop-protection/utrisha-n.html#anchor_8

Product claims:

- Corn yield increase (2021 & 2022 studies, Utrisha-N + optimal N application):
  Low yield environment (<179 bu/A, 26 trials): +7.2 bu/A
  Medium yield environment (180-219 bu/A, 118 trials): +5.7 bu/A
  High yield environment (>220 bu/A, 147 trials): +3.3 bu/A
- Soybean yield increase (31 trials):
  High yield environment : +2.5 bu/A

NO RESPONSE

- **North Dakota State University**
  4 trials, applied foliar at V6, treatments of 0 and 80 lb N/A with and without Utrisha
- **Ohio State University**
  N rate trial, increments of 40 lb N/A, 0 to 240 lb N/A with and without Utrisha
- **Michigan State University**
  Base rate of 60 lb N/A, then sidedress to 110 and 180 lb N/A, Utrisha applied at V4-V8
- **University of Missouri**
  3 year study of 100 lb N/A rate and 100 lb N rate with instinct NXTGEN with and without Utrisha

Current research (2019-2022)

RESPONSE

- **University of Kentucky**
  N rate trial on 2 soil types, increments of 50 lb N/A, 0 to 200 lb N/A with & without Utrisha
  Increase 29 bu/A at 50 lb N on well-drained silt loam soil with Utrisha N treatment
  Increase 14 bu/A at 200 lb N on moderately drained silt loam soil, with Utrisha N treatment
  No benefit at other rates

References

Franzen, D., J. Camberato, E. Nafziger, D. Kaiser, K. Nelson, G. Singh, D. Ruiz-Diaz, E. Lentz, K. Steinke, J. Grove, E. Ritchey, L. Bortolon, C. Rosen, B. Maharjan, & L. Thompson (2023, April). *Performance of Selected Commercially Available Asymbiotic N-fixing Products in the North Central Region*. North Dakota Extension Publication SF2080. Retrieved from: https://www.ndsu.edu/agriculture/sites/default/files/2023-04/sf2080.pdf

Rodriguez-Medina, N., H. Barrios-Camacho, J. Duran-Bedolla, & U. Garza-Ramos (2019) Klebsiella variicola: an emerging pathogen in humans. *Emerging Microbes & Infections 8(1)*. Retrieved from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6609320/#

Stacy M. Zuber, Maria B. Villamil (2016) Meta-analysis approach to assess effect of tillage on microbial biomass and enzyme activities, Soil Biology and Biochemistry, Volume 97, Pages 176-187, https://doi.org/10.1016/j.soilbio.2016.03.011. (https://www.sciencedirect.com/science/article/pii/S0038071716300190)

Methods and compositions for improving plant traits (2021, March 2). https://patents.google.com/patent/US11093426B2

Franzen, D., Clair Keene, Szilvia Yuja, Kelly Cooper and Heidi Eslinger. (2023, February) *Nitrogen Fixing Bacteria for Corn: Testing Two Commercial Products*. Retrieved from: https://www.ndsu.edu/agriculture/sites/default/files/2023-02/22%20Nitrogen%20Fixing%20Bacteria%20for%20Corn.pdf