Agricultural Biological Products

WHAT YOU’LL LEARN

- Biological products can help improve nutrient uptake, promote growth and yield, and provide insect control and disease protection.
- The following products are available commercially from Monsanto BioAg as a result of the BioAg Alliance between Monsanto and Novozymes.

THE MONSANTO BIOAG ALLIANCE

In 2014, Monsanto broadened its portfolio of products by adding Novozymes microbial solutions. The Monsanto BioAg Alliance leverages Novozymes’ production expertise for microbial products with Monsanto’s ability to field test, register, and commercialize alliance products. Together, Monsanto and Novozymes are developing new microbial products for agriculture to boost productivity and further support the management of natural resources on the farm. These products are now available commercially from Monsanto BioAg.

TYPES OF BIOLOGICAL PRODUCTS

Agricultural biological products are products derived from living organisms that are used in agriculture to enhance plant productivity and fertility or to provide protection from pests and diseases. These products offer tremendous potential to deliver sustainable, cost-effective solutions that can help farmers improve crop health and productivity while limiting environmental impacts.

Biologicals for plant nutrient availability are seed or soil inoculants that grow with or in association with plant roots to improve plant access to and use of nutrients.

- Nitrification-fixing microbial inoculants: Commercial rhizobia inoculants are developed to out-perform indigenous rhizobia in the soil, providing improved nitrogen fixation.
- Phosphate-solubilizing microbial inoculants: Much of the soil and applied phosphate fertilizer particles are tightly bound to the soil, making it unavailable to crops. These inoculants help to release some of the phosphate making it more available for the crop to use.

Some products offer the additional benefit of the LCO (lipo-chitooligosaccharide) molecule. LCO plays an important role in the rhizobia-legume nodulation system. This molecule is involved in the communication between the plant and the nodulating bacteria, rhizobia, to initiate nodule formation. The benefit of improved nodule formation is increased nitrogen availability to the plant, which supports enhanced root and shoot development. In corn, the LCO molecule enables earlier mycorrhizal (beneficial symbiotic fungi) colonization of plant roots. Earlier colonization of mycorrhizal fungi on plant roots can lead to enhanced nutrient availability and/or uptake.

Biologicals for fungal and insect control are microbes that can help protect plants from insects and fungal diseases. Monsanto currently offers biofungicide and bioinsecticide products for nursery and greenhouse crops and is currently developing and testing potential products for use in row crops.

The Monsanto biologicals platform also includes the BioDirect™ technology concepts. BioDirect technology investigates molecules found in nature for their potential use as topically applied crop protection products as well as other products. BioDirect technology may enable specific and effective products with a wide range of applications including weed, insect, and virus control, and bee health.

Figure 1. TagTeam® LCO resulted in improved soybean yields over the control. Results from 34 large strip trials conducted in Midwest soybean growing states.
CURRENT BIOAG PRODUCTS

Biological choices for farmers range from traditional nitrogen-fixing rhizobia inoculants to phosphate-solubilizing microbials and combination biologicals. All of these work to help improve nutrient availability for plant uptake.

Nitrogen fixation and combination products for soybeans and other legume crops:

- **TagTeam® & TagTeam® LCO**: TagTeam is a MultiAction® product for soybean and other legume crops that combines rhizobia strains (for increased nitrogen fixation) with *Penicillium bilaii*, (the active ingredient in the product JumpStart® for improved phosphate availability). TagTeam LCO includes the additional benefit of the LCO molecule for improved nodule formation.

- **Optimize®**: Dual action products for soybean and other legume crops that combine nitrogen-fixing inoculants with the LCO molecule for improved nodule formation.

- **Cell-Tech®**: Single-action nitrogen-fixing inoculant for soybean and other legume crops.

- **Nitragin® Gold**: A seed-applied inoculant for alfalfa and other forage crops for enhanced nitrogen fixation.

Products for enhanced nutrient availability and/or nutrient uptake:

- **JumpStart® & JumpStart® LCO**: JumpStart is a fungal inoculant that grows along the root helping to make more soil-bound phosphate and fertilizer phosphate available to the plant. JumpStart LCO combines this benefit with the LCO molecule for enhanced nutrient availability and/or uptake resulting from the earlier mycorrhizal colonization of the plant roots. JumpStart can be used on many different crops.

- **Torque®**: An LCO technology inoculant for in-furrow application to corn for enhanced nutrient availability and/or uptake.

- **QuickRoots®**: A microbial seed inoculant for multiple crops for improving the availability of nitrogen, phosphorus, and potassium. The biologicals in this product help to release nutrients in the soil making them more available to the plant.

Products for control of insects and diseases:

- **Actinovate® & Actinovate® SP**: A biofungicide for protection from many common foliar and soil-borne diseases. The bacterial active ingredient, *Streptomyces lydicus*, forms a defensive barrier around the plant’s roots or foliage (depending on application method) to disrupt and disable harmful pathogens. Labeled crops include some field crops such as cotton as well as many different fruit, vegetable, root/tuber, turf, and ornamental crops.

- **Met52®**: A bioinsecticide for control of multiple insect pests that occur in greenhouse crops and outdoor fruit, vegetable, and ornamental crops. The fungal active ingredient, *Metarhizium anisopliae*, produces spores that infect and kill insect pests.

![Figure 2. QuickRoots® product performance. Results from 8 years of replicated small plot trials. (17 corn growing states and 15 Midwest soybean growing states).](image-url)