

Information on inoculants for organic production

Novozymes inoculants

Novozymes BioAg Group manufactures and markets the following microbial inoculants:

- **JumpStart®**, the phosphate inoculant
- **TagTeam®**, the *MultiAction®* phosphate and nitrogen inoculant
- **N-Prove®**, the single-action nitrogen inoculant

None of our inoculants are currently certified by an organic certifying body. However, some of our inoculants may be accepted. We provide this information on our products to help you and your certifier determine the suitability of our inoculants for organic production.

The active ingredients/beneficial microorganisms in our inoculants

All the active ingredients in Novozymes BioAg inoculants are naturally occurring, beneficial microorganisms isolated from the soil. The BioAg Group does not manufacture any inoculants that have been genetically modified. (Note: for products containing the fungus *Penicillium bilaii*, this fungus does not produce the antibiotic penicillin.)

- **JumpStart**, for all wheat, pea, lentil, chickpea, dry bean, soybean, alfalfa, sweetclover, canola, mustard (and corn, sunflower, and sugar beet in the US) contains *Penicillium bilaii* fungi. Sold as a wettable powder
- **TagTeam pea and lentil** contains *Rhizobium leguminosarum* bacteria and *Penicillium bilaii* fungi. Sold in peat, granular, and liquid formulations (TagTeam liquid is only registered for peas in Canada)
- **TagTeam chickpea** contains *Mesorhizobium ciceri* bacteria and *Penicillium bilaii* fungi. Sold in peat and granular formulations
- **TagTeam soybean** contains *Bradyrhizobium japonicum* bacteria and *Penicillium bilaii* fungi. Sold in peat, granular, and liquid formulations
- **TagTeam dry bean** contains *Rhizobium leguminosarum* biovar *phaseoli* and *Penicillium bilaii* fungi. Sold in a peat formulation
- **N-Prove pea and lentil** contains *Rhizobium leguminosarum* bacteria. Sold in peat, granular, and liquid formulations (N-Prove liquid is only registered for peas in Canada)
- **N-Prove soybean** contains *Bradyrhizobium japonicum* bacteria. Sold in a liquid formulation

Our peat products are formulated with sterilized mill peat with natural graphite, calcium carbonate, and a water based medium (containing sucrose and yeast extract).

Corn substrates

Our peat-based inoculants use natural graphite as a sticker. We do not use corn-based stickers in our peat inoculant formulations.

We do, however, use a corn based ingredient in our TagTeam and N-Prove liquid soybean and pea inoculants. These are the only Novozymes inoculants to be sold in 2011 that will contain any type of corn based ingredient. For organically grown soybeans or peas TagTeam peat or granular may be a better choice.

Pre-sterilization

- Natural peat may contain human and plant pathogens. If present, these pathogens can grow and compete with rhizobia, especially when nutrients are added. In order to provide our customers with high performance peat inoculants that are safe to use, our peat is pre-sterilized using gamma and/or electron beam irradiation
- *Penicillium bilaii* (*P. bilaii*), one of the active ingredients in TagTeam as well as the active in JumpStart, is processed using a material that has been sterilized by irradiation but is not present in the final product
- TagTeam and N-Prove granular inoculants are peat based. The granulated peat carrier is not sterilized using gamma irradiation or electron beam methods. TagTeam granular contains *P. bilaii* that is processed using a material that is irradiated
- Liquid formulations are manufactured in a way that does not require irradiation for pre-sterilization. Steam and/or filter-sterilization is used to sterilize liquid formulations. However, the bags that are used to ship/store liquid inoculants are sterilized using irradiation prior to use

In 2001, a major international certifying body made amendments to their standards to allow for the use of inoculants containing gamma irradiated peat. Other certifying bodies have followed suit. Check with your local chapter or certifying body to confirm their position on pre-sterilized inoculants before use.

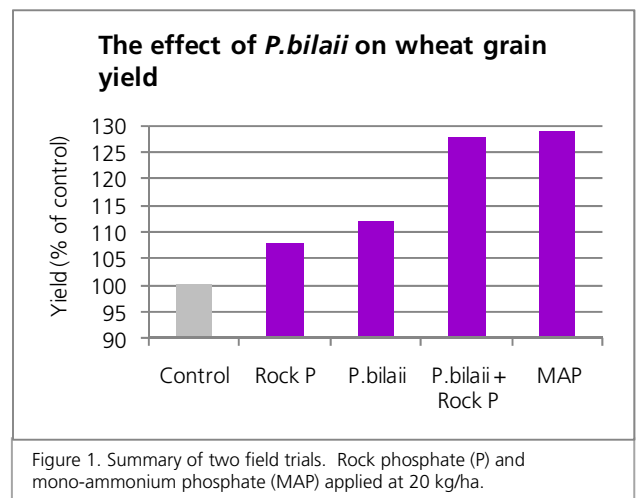
JumpStart® and rock phosphate

JumpStart is a microbial seed inoculant that increases the availability of phosphate to your crops. The active ingredient in JumpStart, a naturally-occurring soil fungus *P. bilaii*, colonizes plant roots and solubilizes mineral forms of less available residual soil phosphate making them immediately available for crop use. This fungus does not produce the antibiotic penicillin.

Dr. Reg Kucey with the Agriculture Canada Research Station in Lethbridge, Alberta, discovered the active ingredient in JumpStart in the early 1980's. Rock phosphate is relatively insoluble and unavailable to plants.

Kucey found that inoculation with *P. bilaii* (JumpStart) solubilized the rock phosphate, making it as available to crops as commercial phosphate fertilizers. The grain yield of wheat inoculated with *P. bilaii* and supplied with rock phosphate equaled that obtained by using mono-ammonium phosphate alone (Figure 1).

This means that a grower could use JumpStart along with rock phosphate and see the same type of yield response as a farmer who uses MAP as their source of phosphate.



For more information please call Novozymes BioAg Group toll-free at 1-888-744-5662 or check out our website at www.bioag.novozymes.com

Novozymes is the world leader in bioinnovation. Together with customers across a broad array of industries we create tomorrow's industrial biosolutions, improving our customers' business and the use of our planet's resources. Read more about Novozymes at www.novozymes.com.

Note: N-Prove granular pea/lentil is not yet registered in Canada but is available in some US states.

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