

# **Novozymes BioAg™ 2021 Product Guide**

Canada







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# TagTeam® BioniQ®

Lentil . Pea

## Product Overview

### Five Biological Actives for... Stronger Roots... Faster Nodulation... Better Yields.

TagTeam® BioniQ® increases yield and performance over a wide range of geographic locations and field conditions. TagTeam® BioniQ® is the next generation granular inoculant that combines five biological actives to maximize your pulse crop performance. A specially selected *Rhizobium* strain and the proven performance of LCO (lipochitooligosaccharide) technology are utilized to provide improved nodule formation and increased nitrogen fixation. TagTeam® BioniQ® contains the phosphate-solubilizing benefits of the *Penicillium bilaiae* fungi as well as the addition of the biologicals, *Bacillus amyloliquefaciens* and *Trichoderma virens* for increased availability and uptake of nitrogen, phosphate and potassium. The ability to release nutrients from the soil helps maximize the effectiveness of inputs and improve yield potential.

### Root and Shoot Development

Early-season phosphate availability is difficult when the plant does not have a root mass or the energy to develop a root mass. *Penicillium bilaiae* helps with both of these issues by making phosphate available to the plant to support root and shoot growth.

### Phosphate Is Crucial To Nitrogen Fixation

Research shows that phosphate nutrition has a significant, positive impact on nitrogen fixation.<sup>1</sup> Good phosphate nutrition results in more nodules being formed and more active nitrogen fixation.

- Phosphate helps move the energy from photosynthesis to the roots, where it is needed to fuel nitrogen fixation.
- More extensive root growth provides greater opportunity for the development of nitrogen-fixing nodules.
- Faster development of active nodules results in greater nitrogen fixation.
- Phosphate nutrition increases the number and size of nodules, and the amount of nitrogen fixed by the plant.

Most phosphate fertilizer is also banded away from the seed in pea and lentil crops, resulting in limited early-season availability to the crop. *Penicillium bilaiae* helps overcome this limitation by providing early-season access to soil and starter fertilizer phosphate.

<sup>1</sup> Source: Phosphorus for Agriculture. Potash and Phosphate Institute. 1988. Reprinted from Fall 1988 issue of Better Crops with Plant Food magazine.



## TagTeam® BioniQ®'s 5 Biological Actives

- *Rhizobium leguminosarum*
- LCO (lipochitooligosaccharide) technology
- *Penicillium bilaiae*
- *Bacillus amyloliquefaciens*
- *Trichoderma virens*

### Earlier Nodulation Development

LCO is a molecule involved in the rhizobia–legume nodulation system. LCO is an important component in nodulation as a key driver in the communication between plants and rhizobia.

When the LCO molecule is present at the time of planting, it allows for the nodulation process to begin, independent of variety, soil and environmental conditions. The benefit of earlier nodulation initiation is nitrogen availability to the plant, which supports plant growth such as root and shoot development. The result of this early-season activity is improved plant performance.

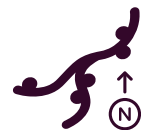
## Features & Benefits



**Increased yield and return on investment - see more at [BATResults.ca](https://www.batresults.ca)**



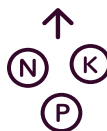
**Performance in a variety of soil conditions and types**



**Improved nodule formation and nitrogen fixation**



**Greater opportunity for earlier nodulation with LCO**



**Improved availability of nitrogen, phosphate and potassium**

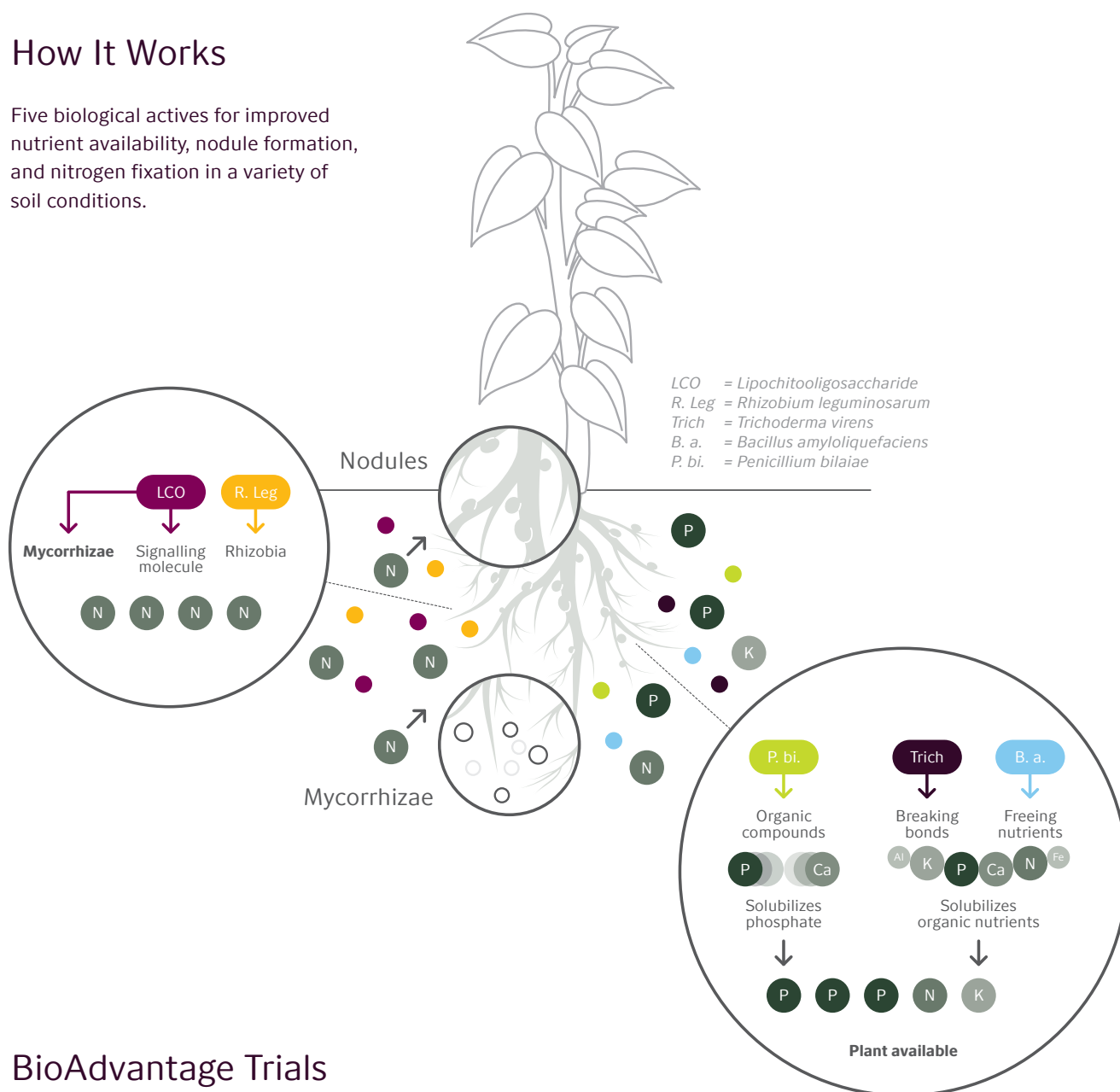


**Earlier, more uniform maturity**



## How It Works

Five biological actives for improved nutrient availability, nodule formation, and nitrogen fixation in a variety of soil conditions.

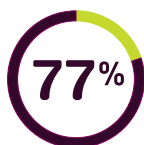


## BioAdvantage Trials

### Pea

Competitor 49.2 (bu/ac)

TagTeam® BioniQ® 52.6 (bu/ac)



Win Rate



Yield Advantage

Source: Results were collected from 26 farmer-conducted, large-scale, side-by-side BioAdvantage Trials conducted in Western Canada from 2017-2020.

### Lentil

TagTeam®LCO 28.2 (bu/ac)

TagTeam® BioniQ® 29.3 (bu/ac)



Win Rate



Yield Advantage

Source: Results were collected from 10 farmer conducted, large-scale, side-by-side BioAdvantage Trials conducted in Western Canada from 2017-2020.



### TagTeam® BioniQ® Is Available In The Following Formulation

CROP	INOCULANT SPECIES	TagTeam® BioniQ® FORMULATIONS AVAILABLE
Pea, Lentil	<i>Penicillium bilaiae</i> + <i>Rhizobium leguminosarum</i> + <i>Bacillus amyloliquefaciens</i> + <i>Trichoderma virens</i> + lipochitooligosaccharide	Granular

## Application

TagTeam® BioniQ® granular should be applied directly with the seed in the seed row using a granular tank for application. Application rates vary according to row spacing (refer to table). Please read the label before application for complete use instructions.





- Pour into tank through a screen.
- Fill the tank to match or slightly exceed seed requirements. Do not overfill the tank to avoid compaction.
- If augering TagTeam® BioniQ® granular, do so at low speeds to avoid damage to the granules.
- Do not mix TagTeam® BioniQ® granular in the same tank with seed or fertilizer.
- Do not leave TagTeam® BioniQ® granular in the tank overnight as condensation can cause lumps to form.

### TagTeam® BioniQ® Application Rates

PACKAGE SIZE	18 KG (39.68 LB) BAG		454 KG (1,001 LB) BAG	
Row spacing	lb/ac	ac/bag	lb/ac	ac/bag
6 in	5.5	7.2	5.5	182.0
7 in	4.7	8.4	4.7	213.0
8 in	4.1	9.7	4.1	244.1
9 in	3.6	11.0	3.6	278.0
10 in	3.3	12.0	3.3	303.3
12 in	2.7	14.7	2.7	370.7
15 in	2.2	18.0	2.2	455.0

Note: The bulk density of TagTeam® BioniQ® granular is approximately 0.6 g/cm<sup>3</sup> (37 lb/ft<sup>3</sup>).

## Product Packaging

All Crops	 Granular	1	x	18 kg	=	
	 Granular	1	x	454 kg	=	



# TagTeam® LCO

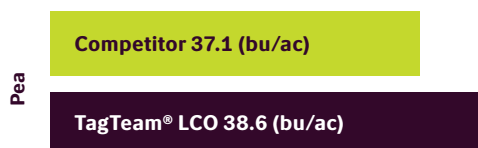
Lentil . Pea

## Product Overview

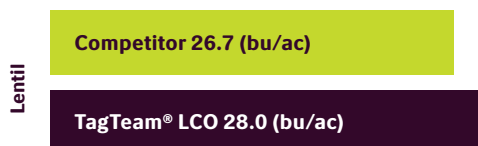
### Three Powerful Technologies Combine To Build A Better Crop

TagTeam® LCO inoculant is a triple-action granular product that combines a specially selected *Rhizobium* strain with the phosphate-solubilizing *Penicillium bilaiae* fungi and the proven performance of LCO (lipochitooligosaccharide) technology for increased nitrogen fixation.

### Higher yield potential



Results were collected from 7 farmer-conducted, large-scale, side-by-side BioAdvantage Trials conducted in Alberta and Saskatchewan in 2018.



Results were collected from 5 farmer-conducted, large-scale, side-by-side BioAdvantage Trials conducted in Saskatchewan in 2018.

## Root and Shoot Development

Early-season phosphate availability is difficult when the plant does not have a root mass or the energy to develop a root mass. *Penicillium bilaiae* helps with both of these issues by making phosphate available to the plant to support root and shoot growth.

### Phosphate Is Crucial To Nitrogen Fixation

Research shows that phosphate nutrition has a significant, positive impact on nitrogen fixation.<sup>1</sup> Good phosphate nutrition results in more nodules being formed and more active nitrogen fixation.

- Phosphate helps move the energy from photosynthesis to the roots, where it is needed to fuel nitrogen fixation.
- More extensive root growth provides greater opportunity for the development of nitrogen-fixing nodules.
- Faster development of active nodules results in greater nitrogen fixation.
- Phosphate nutrition increases the number and size of nodules, and the amount of nitrogen fixed by the plant.

Most phosphate fertilizer is also banded away from the seed in pea and lentil crops, resulting in limited early-season availability to the crop. *Penicillium bilaiae* helps overcome this limitation by providing early-season access to soil and starter fertilizer phosphate.

<sup>1</sup> Source: Phosphorus for Agriculture. Potash and Phosphate Institute. 1988. Reprinted from Fall 1988 issue of Better Crops with Plant Food magazine.



## Earlier Nodulation Development

LCO is a molecule involved in the rhizobia-legume nodulation system. LCO is an important component in nodulation as a key driver in the communication between plants and rhizobia.

When the LCO molecule is present at the time of planting, it allows for the nodulation process to begin, independent of variety, soil and environmental conditions. The benefit of earlier nodulation initiation is nitrogen availability to the plant, which supports plant growth such as root and shoot development. The result of this early-season activity is improved plant performance.

## Features & Benefits



**Improved  
nodule  
formation**



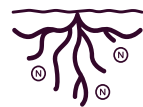
**Improved  
phosphate  
availability**



**Enhanced nutrient  
availability, which  
supports root and  
shoot growth**



**Increased  
nitrogen  
fixation**



**Greater opportunity  
for the development  
of nitrogen-fixing  
nodules with LCO**



# Application

TagTeam® LCO granular should be applied directly with the seed in the seed row using a granular tank for application. Application rates vary according to row spacing (refer to table). Please read the label before application for complete use instructions.

- Pour into tank through a screen.
- Fill the tank to match or slightly exceed seed requirements. Do not overfill the tank to avoid compaction.
- If augering TagTeam® LCO granular, do so at low speeds to avoid damage to the granules.
- Do not mix TagTeam® LCO granular in the same tank with seed or fertilizer.
- Do not leave TagTeam® LCO granular in the tank overnight as condensation can cause lumps to form.

## TagTeam® LCO Granular Application Rates

PACKAGE SIZE		18 KG (39.68 LB) BAG		454 KG (1,001 LB) BAG	
Row spacing		lb/ac	ac/bag	lb/ac	ac/bag
6 in		5.5	7.2	5.5	182.0
7 in		4.7	8.4	4.7	213.0
8 in		4.1	9.7	4.1	244.1
9 in		3.6	11.0	3.6	278.0
10 in		3.3	12.0	3.3	303.3
12 in		2.7	14.7	2.7	370.7
15 in		2.2	18.0	2.2	455.0

Note: The bulk density of TagTeam® LCO granular is approximately 0.6 g/cm3 (37 lb/ft³).

# Product Packaging

Pea/Lentil

 Granular

1

x

18 kg

=



 Granular

1

x

454 kg

=





## How It Works

**Three biological actives for enhanced phosphate availability, nitrogen fixation and earlier nodulation development.**

### Freeing Phosphate

*Penicillium bilaiae* releases bound mineral forms of soil and fertilizer phosphate, making it more available to the plant.

**LCO** = Lipochitooligosaccharide

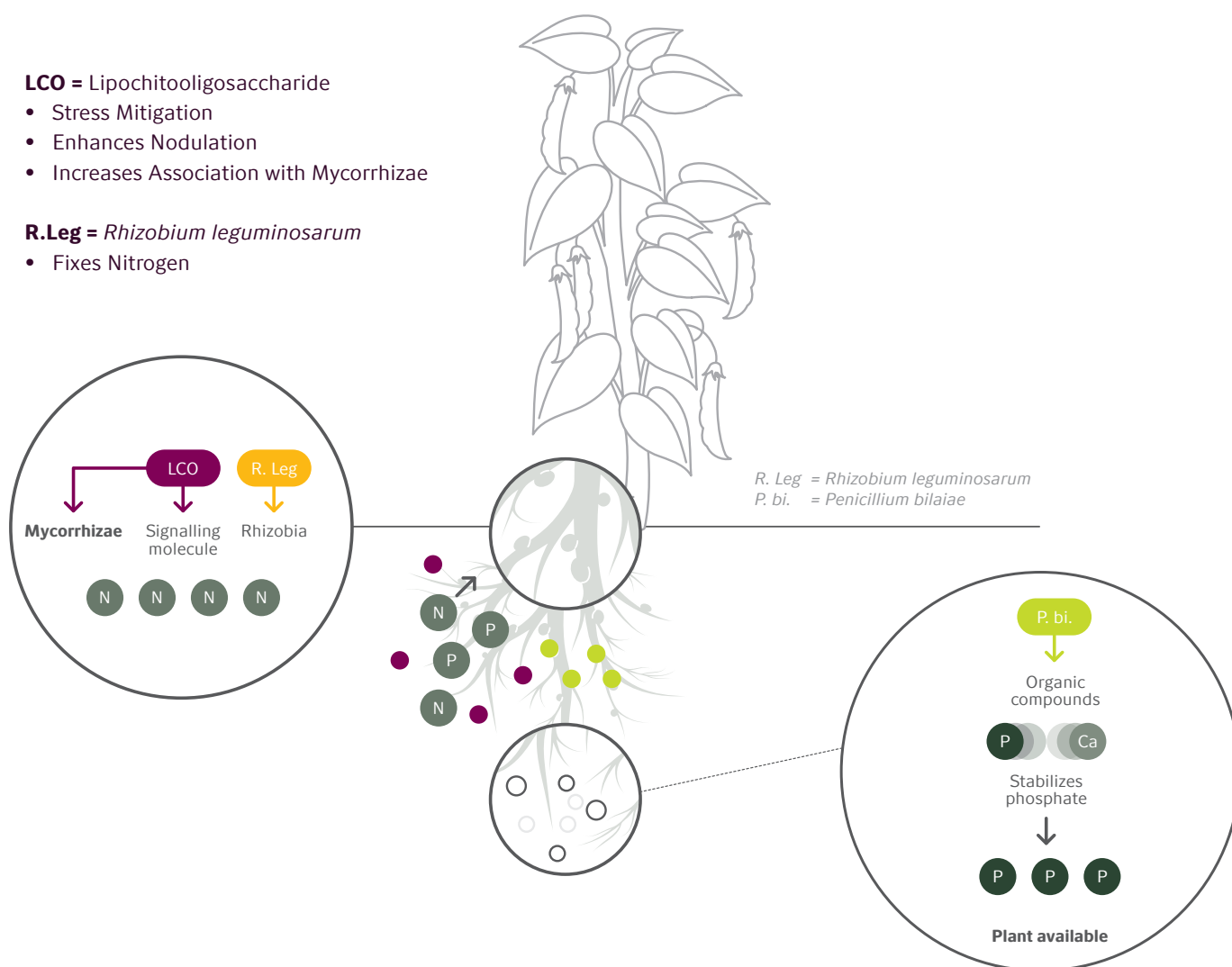
- Stress Mitigation
- Enhances Nodulation
- Increases Association with Mycorrhizae

**R.Leg** = *Rhizobium leguminosarum*

- Fixes Nitrogen

### More Nitrogen

1. Needing nitrogen, the plant releases flavonoids to signal rhizobia.
2. Sensing the flavonoids, the rhizobia signal LCO back to the plant.
3. The plant can respond to the LCO, allowing the rhizobia to infect its roots.
4. This infection can create nodules, which help fix atmospheric nitrogen.



**TagTeam® LCO Is Available In The Following Formulation**

CROP	INOCULANT SPECIES	TagTeam® FORMULATIONS AVAILABLE
Pea, Lentil	<i>Penicillium bilaiae</i> + <i>Rhizobium leguminosarum</i> + lipochitooligosaccharide	Granular



# TagTeam®

Chickpea . Faba bean . Lentil . Pea . Soybean

## Product Overview

### Balanced Nutrition

Balanced nutrition of phosphate and nitrogen is necessary to maximize your crop's yield potential. TagTeam® inoculant provides this balanced nutrition by combining the active ingredient from JumpStart® inoculant with a nitrogen-fixing bacteria to produce a dual-action inoculant.

The active ingredient in JumpStart® is the soil fungus, *Penicillium bilaiae* (*P. bilaiae*). This fungus and the rhizobia in TagTeam® inoculant work together to create a unique value equation.

The soil fungus is the key to the equation. It grows along the plant roots and makes less-available forms of phosphate available to the plant. Phosphate is an important component that drives the needed energy for the nitrogen fixation process.

Early-season phosphate availability is difficult when the plant does not have a root mass or the energy to develop a root mass. *Penicillium bilaiae* helps with both of these issues by making phosphate available to the plant to support root and shoot growth.

## Phosphate Is Crucial To Nitrogen Fixation

Research shows that phosphate nutrition has a significant, positive impact on nitrogen fixation.<sup>1</sup> Good phosphate nutrition results in more nodules being formed and more active nitrogen fixation.

- Phosphate helps move the energy from photosynthesis to the roots, where it is needed to fuel nitrogen fixation.
- More extensive root growth provides greater opportunity for the development of nitrogen-fixing nodules.
- Faster development of active nodules results in greater nitrogen fixation.
- Phosphate nutrition increases the number and size of nodules, and the amount of nitrogen fixed by the plant.

Most phosphate fertilizer is also banded away from the seed in pea and lentil crops, resulting in limited early-season availability to the crop. *Penicillium bilaiae* helps overcome this limitation by providing early-season access to soil and starter fertilizer phosphate.

<sup>1</sup> Source: Phosphorus for Agriculture. Potash and Phosphate Institute. 1988. Reprinted from Fall 1988 issue of Better Crops with Plant Food magazine.

## TagTeam® Inoculant Solves Starter Fertilizer Problems

TagTeam® improves phosphate availability, even if starter phosphate fertilizer is used. TagTeam® helps the developing primary roots access phosphate early in the growth stages, even before the root reaches the starter fertilizer band. As the primary root develops, TagTeam® provides greater availability of soil and fertilizer phosphate, allowing the root to better access phosphate nutrition throughout the rooting zone.

### Features & Benefits



**Improved nodule  
formation**



**Improved phosphate  
availability**



**Enhanced nutrient  
availability, which supports  
root and shoot growth**



**Increased  
nitrogen fixation**



# How It Works

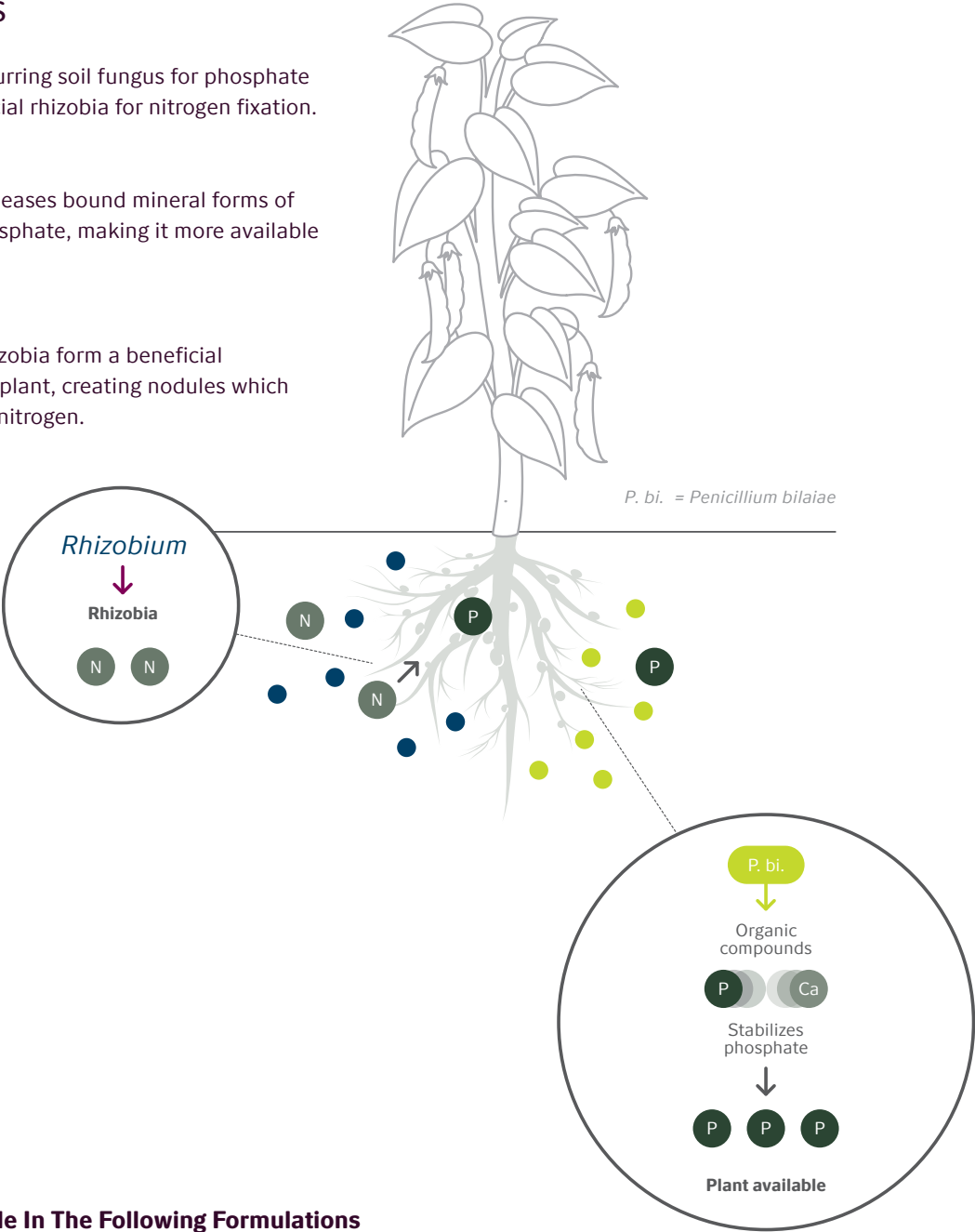
Utilizes a naturally occurring soil fungus for phosphate availability and beneficial rhizobia for nitrogen fixation.

## Freeing Phosphate

1 *Penicillium bilaiae* releases bound mineral forms of soil and fertilizer phosphate, making it more available for the plant to use.

## Beneficial Rhizobia

2 Specially selected rhizobia form a beneficial relationship with the plant, creating nodules which help fix atmospheric nitrogen.



## TagTeam® Is Available In The Following Formulations

CROP	INOCULANT SPECIES	TagTeam® FORMULATIONS AVAILABLE
Chickpea	<i>Penicillium bilaiae</i> + <i>Mesorhizobium ciceri</i>	Granular, peat
Faba bean	<i>Penicillium bilaiae</i> + <i>Rhizobium leguminosarum</i>	Granular
Pea, Lentil	<i>Penicillium bilaiae</i> + <i>Rhizobium leguminosarum</i>	Liquid, peat
Soybean	<i>Penicillium bilaiae</i> + <i>Bradyrhizobium japonicum</i>	Granular, peat

### TagTeam<sup>®</sup> for Soybean

TagTeam<sup>®</sup> for soybean combines the phosphate-solubilizing organism *P. bilaiae* and *Bradyrhizobium japonicum* in one inoculant to help address your soybean crop's phosphate and nitrogen fertility needs.

### Soybean Fertility

Phosphate fertility programs in soybeans must deal with several challenges that may limit phosphate availability and uptake.

- Soybean seed is very sensitive to fertilizer injury from applied phosphate fertilizer. If you are unable to seed-place phosphate effectively, or if you broadcast phosphate before seeding, TagTeam<sup>®</sup> will help make phosphate available to your soybean crop at the critical early-season stage.
- Calcareous soils readily tie up phosphate. The phosphate-solubilizing component of TagTeam<sup>®</sup> will help increase phosphate availability of both residual soil phosphate and incorporated phosphate in these types of soils.

## Application

TagTeam<sup>®</sup> is available in granular, peat and liquid formulations to meet your different crop and equipment needs. Please read the label before application for complete use instructions.

### TagTeam<sup>®</sup> Granular

TagTeam<sup>®</sup> granular should be applied directly with the seed in the seed row using a granular tank for application. Application rates vary according to row spacing (refer to Table 1 below for details).

- Pour into tank through a screen.
- Fill tank to match or slightly exceed seed requirements. Do not overfill tank to avoid compaction.
- If auguring TagTeam<sup>®</sup> granular, do so at low speeds to avoid damage to the granules.
- Do not mix TagTeam<sup>®</sup> in the same tank with seed or fertilizer.
- Do not leave TagTeam<sup>®</sup> granular in the tank overnight as condensation can cause lumps to form.

**Table 1. TagTeam<sup>®</sup> Granular Application Rates**

CROP	CHICKPEA				FABA BEAN		SOYBEAN			
	Package size	18 kg (39.68 lb) bag	454 kg (1,001 lb) bag		18 kg (39.68 lb) bag		18 kg (39.68 lb) bag		454 kg (1,001 lb) bag	
Row spacing	lb/ac	ac/bag	lb/ac	ac/bag	lb/ac	ac/bag	lb/ac	ac/bag	lb/ac	ac/bag
7 in	4.7	8.4	4.7	213.0	4.7	8.4	6.2	6.4	6.2	161.4
8 in	4.1	9.7	4.1	244.1	4.1	9.7	5.4	7.3	5.4	185.4
9 in	3.6	11.0	3.6	278.0	3.6	11.0	4.7	8.4	4.7	213.0
10 in	3.3	12.0	3.3	303.3	3.3	12.0	4.3	9.2	4.3	232.8
12 in	2.7	14.7	2.7	370.7	2.7	14.7	3.6	11.0	3.6	278.0
15 in	2.2	18.0	2.2	455.0	2.2	18.0	2.9	13.7	2.9	345.1
24 in							1.8	22.0	1.8	556.1
30 in							1.4	28.3	1.4	714.9

Note: The bulk density of TagTeam<sup>®</sup> granular is approximately 0.6 g/cm<sup>3</sup> (37 lb/ft<sup>3</sup>).



### TagTeam® Liquid

TagTeam® liquid should be applied directly to the seed at a rate of 2.5 fluid ounces per bushel (75 ml/27 kg) of seed. Once applied to bare seed, plant within 48 hours.

**Table 2. TagTeam® Liquid Application**

TagTeam® LIQUID			
Crop	Size	bu	lb
Pea, Lentil	3.0 litre + 57 g WP	40	2,400

### TagTeam® Peat

TagTeam® peat has its own sticker in the formulation. A separate sticker is not needed.

Apply TagTeam® to pre-moistened seed, or add water while applying TagTeam®, or mix TagTeam® with cool, clean water and apply to seed as a slurry. Please refer to Table 3 for approximate water rates. Once TagTeam® is mixed into water, apply to seed within six hours.

**Table 3. TagTeam® Peat Application**

TagTeam® PEAT		AMOUNT OF SEED TREATED/BAG			WATER RATE <sup>1</sup>
Crop	Bag size	Units	bu	bu	Litres
Chickpea	2.20 kg	–	50	3,000	4.0
Lentil	2.20 kg	-	30	1,800	2.5
Pea	2.20 kg	–	50	3,000	4.0
Soybean	2.20 kg	40	33	2,000	3.0

<sup>1</sup> Approximate water volume for peat slurry application.

TagTeam® can be applied up to 48 hours before seeding, depending on crop, and can be used with many different seed treatments. Visit [novozymes.com/bioag](http://novozymes.com/bioag) for the most up-to-date seed treatment compatibility information.

## Product Packaging

Chickpea		Peat	7	x	2.2 kg bag	=	
		Granular	1	x	18 kg	=	
		Granular	1	x	454 kg	=	
<hr/>							
Faba bean		Granular	1	x	18 kg	=	
<hr/>							
Pea/Lentil		Peat	7	x	2.2 kg bag	=	
		Liquid	4	x	3 L + 57 g WP	=	
<hr/>							
Soybean		Peat	7	x	2.45 kg bag	=	
		Granular	1	x	18 kg	=	
		Granular	1	x	454 kg	=	



# BioniQ®

Barley . Canola . Wheat

## Product Overview

### Three Biological Actives for... Stronger Roots... Greater Nutrient Availability... Better Yields.

BioniQ® is the inoculant for every cereal and canola grower that helps improve nutrient and moisture uptake, phosphate availability, and ultimately helps to increase yield potential. The *Penicillium bilaiae* fungus helps release bound mineral forms of soil and fertilizer phosphate, making it more readily available for the plant to use. The biologicals *Bacillus amyloliquefaciens* and *Trichoderma virens* help increase availability and uptake of nitrogen, phosphate, and potassium, which supports root and shoot growth in cereal and canola crops.

#### BioniQ®'s 3 Biological Actives

- *Penicillium bilaiae*
- *Bacillus amyloliquefaciens*
- *Trichoderma virens*

## BioAdvantage Trials

### Wheat

Untreated      **67.1** (bu/ac)  
BioniQ®      **70.9** (bu/ac)



**Win Rate**



**Yield Advantage**

Source: Results were collected from 36 farmer-conducted, large-scale, side-by-side BioAdvantage Trials conducted in Western Canada from 2017-2020.

### Barley

Untreated      **83.6** (bu/ac)  
BioniQ®      **87.6** (bu/ac)



**Win Rate**

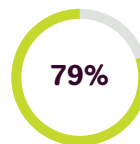


**Yield Advantage**

Source: Results were collected from 12 farmer-conducted, large-scale, side-by-side BioAdvantage Trials conducted in Western Canada from 2017-2020.

### Canola

Untreated      **47.7** (bu/ac)  
BioniQ®      **50.1** (bu/ac)



**Win Rate**



**Yield Advantage**

Source: Results were collected from 69 farmer-conducted, large-scale, side-by-side BioAdvantage Trials conducted in Western Canada from 2017-2020.

## Features & Benefits

The *Bacillus amyloliquefaciens* and *Trichoderma virens* combined with *Penicillium biliae* based treatment helps increase availability and uptake of nitrogen, phosphate and potassium. Its ability to release nutrients from the soil helps maximize the effectiveness of your inputs and improve your yield potential.

BioniQ® increases yield and performance over a wide range of geographic locations and field conditions.

## Features & Benefits



**Increased yield and return  
on investment - see more  
at [BATResults.ca](https://BATResults.ca)**



**Performance in a variety of soil  
conditions and types; active in cool  
soils for enhanced early-season  
vigour**



**Improved availability  
of phosphate for enhanced  
root growth**

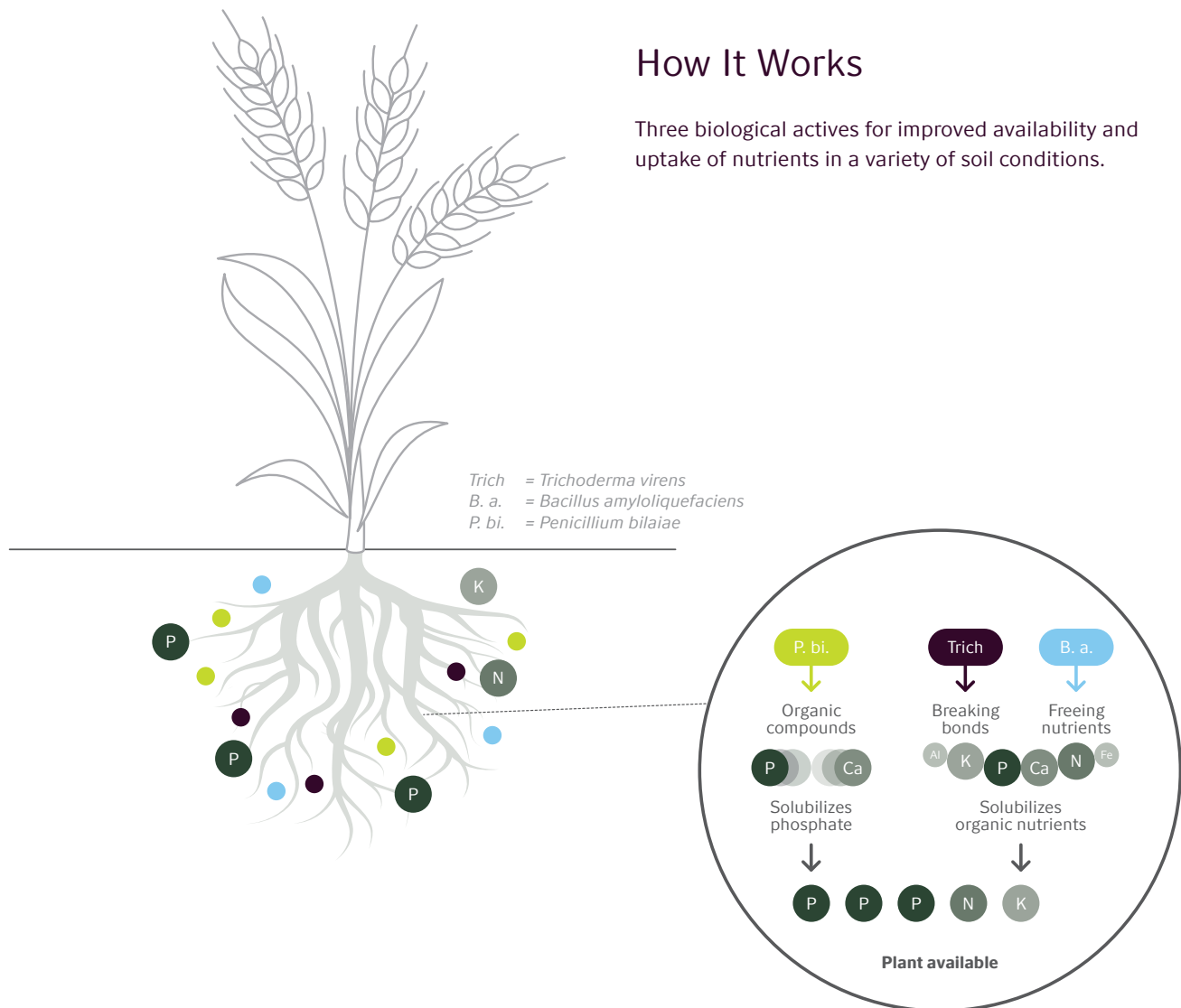


**Earlier, more uniform  
maturity**



**Enhanced nutrient availability,  
which supports root and  
shoot growth**





## BioniQ® On Winter Wheat

When it comes to a successful winter cereal crop, the beginning determines the end. Without good stand establishment in the fall, winter survival suffers and yields decline. Phosphate fertility and other key factors, including seeding date and planting depth, require careful attention to ensure a good start.

For the best winter survival, cereals must germinate uniformly in the fall and develop at least two to three leaves and crown tissue. Then, in the spring, the winter cereal plant re-grows from the crown tissue.

### Development Of Root And Shoot Growth

Proper phosphate fertility helps winter cereals establish quickly and uniformly. Phosphate, which is an essential component of the energy-building process, enhances early plant development and vigorous root and shoot growth.

## How It Works

Three biological actives for improved availability and uptake of nutrients in a variety of soil conditions.

### Better Stand Establishment

Achieving high winter wheat yields requires two critical factors: winter hardiness and rapid spring re-growth. Both factors are directly influenced by the phosphate status in the plant. Adequate phosphate nutrition promotes rapid emergence and establishment in the fall, allowing the plants to achieve optimal root and shoot growth and nutrient uptake prior to dormancy. This promotes winter hardiness and a greater probability of the crop withstanding adverse environmental conditions. A healthy, well-established stand is better able to survive over winter and is better able to exhibit rapid re-growth in the spring to set up yield potential.

## Application

BioniQ® comes in a wettable powder co-pack that is optimally formulated for canola and cereal crops. The product is conveniently packaged for ease of use and can be applied similar to other wettable powder inoculants in the Novozymes BioAg portfolio. Please read the label before application for complete use instructions.

Open package only when ready to use. Use before expiration date. Apply this product only as specified on this label. Reference the specified application rate to determine the proper amount needed for seed.

Inoculate seed on-farm by adding and thoroughly mixing the entire contents of both Active Powder A (333 g) and Active Powder B (450 g) in the appropriate amount of water (refer to Table 1) prior to or during seeding.

- BioniQ® can be applied utilizing commercial on seed application equipment.
- Applicators used previously for pesticides should be triple rinsed before being used for BioniQ® application.
- BioniQ® can be applied up to 60 days prior to seeding (depending on seed type) and can be used with many different seed treatments. Visit [Canada | Novozymes](#) for the most up-to-date information on seed treatment compatibility.

**Table 1: BioniQ® Wettable Powder Application**

783 g co-pack			
Crop	Seed treated/one 783 g co-pack		Water (litres)
Barley	250 bu	12,000 lb	42
Canola/mustard	10 bu	500 lb	5
Oats	250 bu	8,500 lb	42
Rye	250 bu	14,000 lb	42
Wheat	250 bu	15,000 lb	42

## Product Packaging



# JumpStart®

All Crops

## Product Overview

### Phosphate Fertilizer Use Efficiency

Up to 90% of applied phosphate fertilizer goes unused in the year of application as it gets tied (bound) to soil particles and other elements, making it unavailable to the crop. Some of this is used over subsequent years, but at least 25% never becomes available.<sup>1</sup> It is crucial to make the most efficient use of fertilizer phosphate to maximize yield potential.

JumpStart® inoculant contains the naturally occurring soil fungus *Penicillium bilaiae* (*P. bilaiae*), discovered by Agriculture and Agri-Food Canada, which grows along plant roots, releasing phosphate bound in the soil, making it more readily available for the crop to use.

*Penicillium bilaiae*, the active ingredient in JumpStart®, does not eliminate the need for phosphate fertilizer, but provides crops access to more phosphate for higher yield potential.

- JumpStart® results are greatest in soils with lower levels of available phosphate and high to medium levels of bound/unavailable phosphate.
- JumpStart® works at low soil temperatures when phosphate availability is normally limited.
- In independent research, JumpStart® resulted in a 22% increase in the proportion of root that contained root hairs and a 33% increase in the mean root-hair length in field pea.<sup>2</sup>
- JumpStart® can work in soils within a wide pH range. It is the level of available phosphate, not the pH, that determines the benefit of JumpStart®.

1 Source: Better Crops Vol. 86 (2002, No. 4), International Plant Nutrition Institute (formerly: Potash and Phosphate Institute).

2 Source: *Penicillium bilaiae* inoculation increases root-hair production in field pea. Robert H. Gulden and J. Kevin Vessey. May 17, 2000.

3 Source: Phosphorous for Agriculture, International Plant Nutrition Institute (formerly: Potash and Phosphate Institute).

## Factors Affecting Phosphate Availability<sup>3</sup>

### Phosphate Is Less Available

- In soils containing high levels of cations, such as calcium, magnesium, iron or aluminum.
- In soils with high clay content.
- At colder soil temperatures.
- To crops with a tap root system.
- In dry soils.



## Features & Benefits

### Benefits To Better Phosphate

#### Uptake With JumpStart®

JumpStart® inoculant promotes greater phosphate availability, which results in early vigour, greater stress tolerance and earlier, more even maturity. JumpStart® improves phosphate availability to plants at the most vulnerable stages and reduces the need to seed-place high rates of phosphate fertilizer with sensitive seed like canola, pea, lentil and soybean.

#### Early Vigour

Cool soils, common under direct seeding or early seeding conditions, mean phosphate is less available to plants.

If early-season phosphate availability is limited, it can reduce early-season growth and, ultimately, crop yield.

Early spring conditions, including cool soils, are difficult on plants, especially when phosphate is not available.

Because JumpStart® is active under these conditions, phosphate availability is improved when the plant needs it.

#### Greater Stress Tolerance

Plants with larger healthy root systems have the ability to better withstand a variety of stresses such as drought and weed pressure. Healthy root systems help plants access moisture and nutrients more efficiently.

JumpStart® increases phosphate availability in all areas of the soil that the root explores, not just around the fertilizer band, which helps promote more root growth.



**Improved phosphate  
availability**



**Active in cool soil temps  
helping to enhance  
early-season vigour**



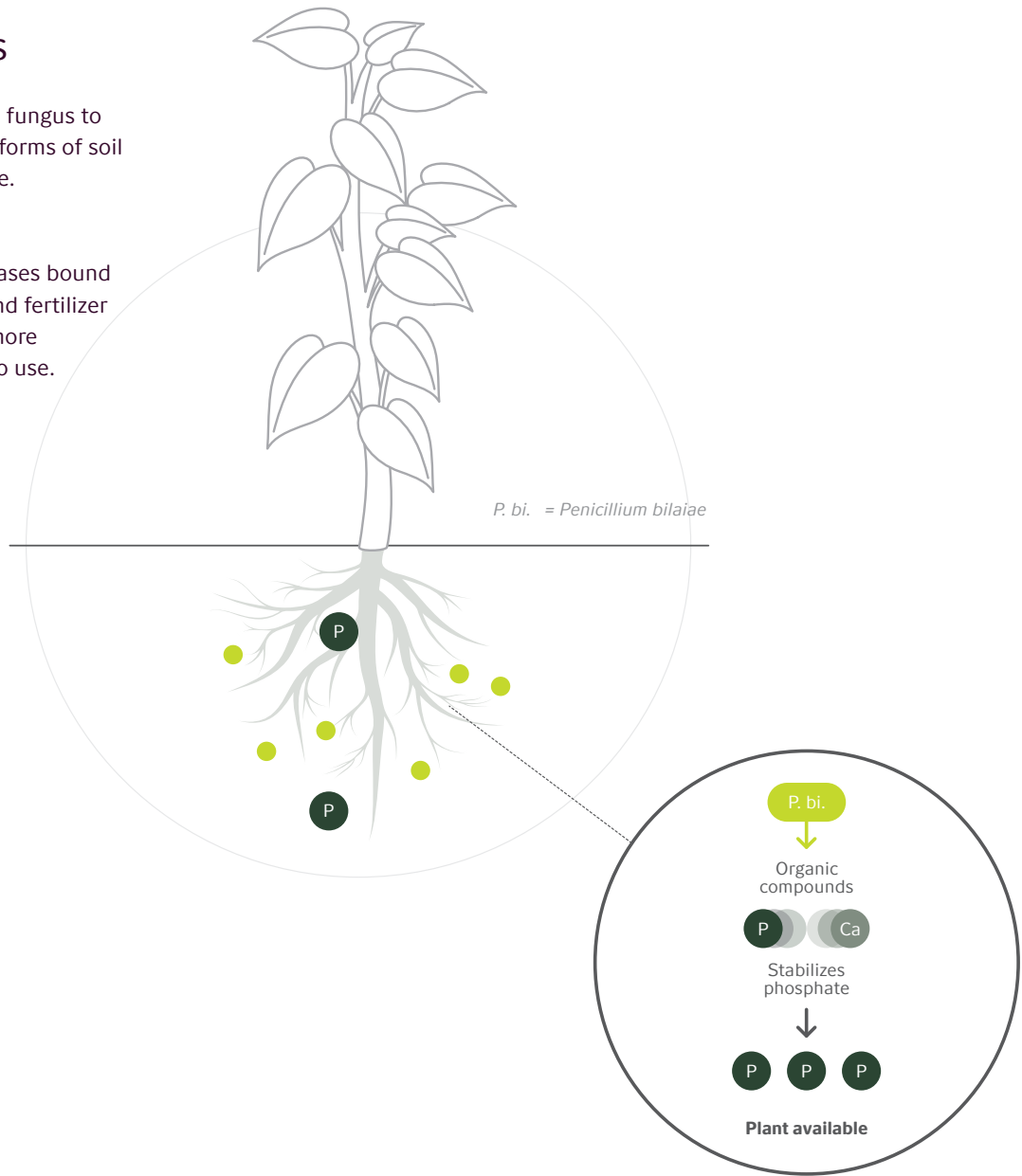
**Earlier, more uniform  
maturity**

## How It Works

Naturally occurring soil fungus to release bound mineral forms of soil and fertilizer phosphate.

### Freeing Phosphate

*Penicillium bilaiae* releases bound mineral forms of soil and fertilizer phosphate, making it more available to the plant to use.

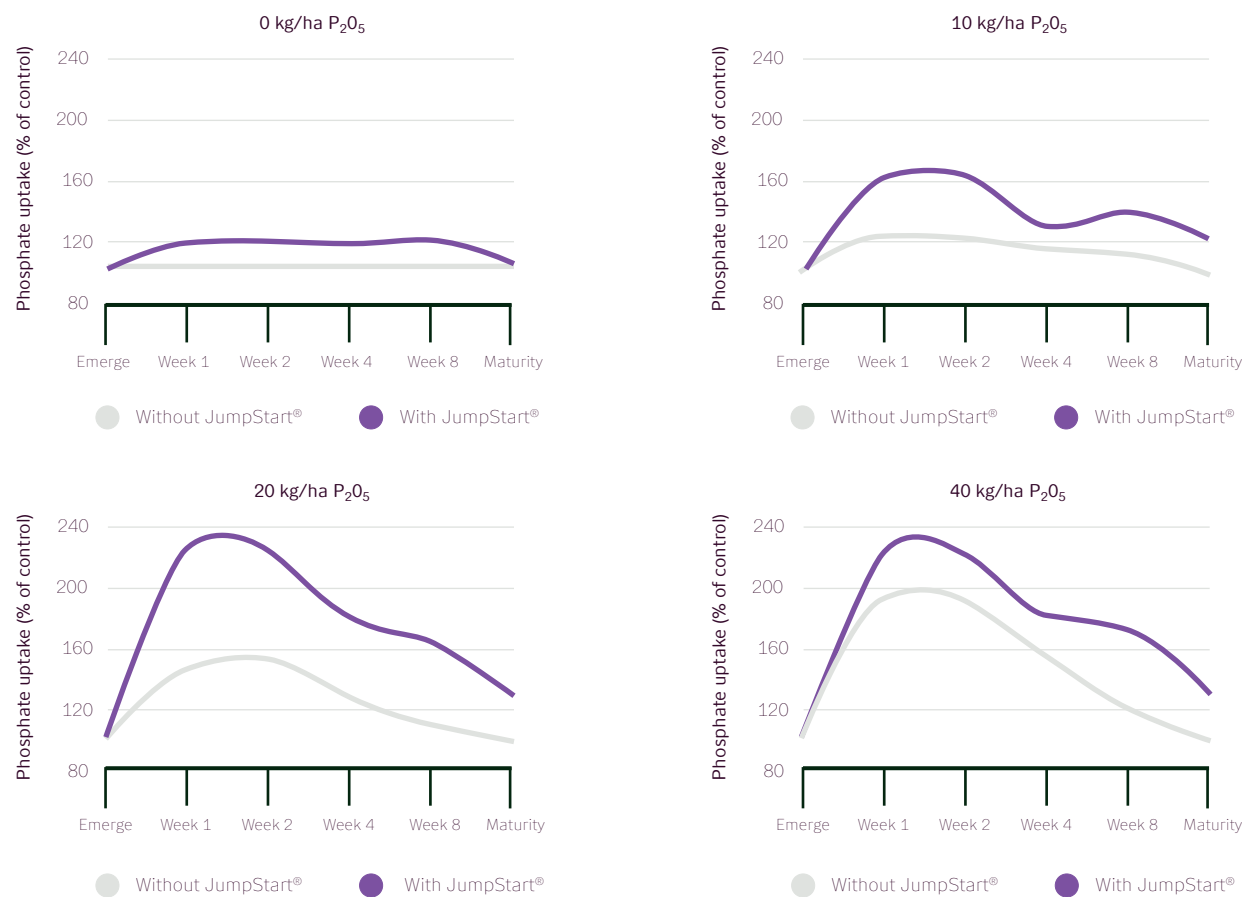


## Get The Most From JumpStart®

- **Seeding into cold soils:** JumpStart® is active in cool soil temperatures making soil phosphate available to the plant, helping to enhance early-season vigour.
- **Seed-placed phosphate is applied more than 1.5 inches from the seed:** Phosphate fertilizer is not close enough to the seed for early-stage growth. JumpStart® makes the phosphate in the soil around the seed plant available and gives the crop that pop-up effect.
- **Maturity concerns:** An adequate early-season supply of phosphate shows up at harvest time as even maturity, and a more uniform seed set. JumpStart® helps ensure phosphate is available to meet early-season needs.

**JumpStart® increases the availability of phosphate, resulting in increased uptake by the plant**

The following graphs (from University of Manitoba research), show the increase in uptake of phosphate throughout the growing season when using JumpStart® on wheat.



Source: J. Chambers and J. Yeoman, MB Soc. of Soil Sci. Mfg on wheat. Six field trials on wheat, 1989-1990, University of Manitoba.



## JumpStart® On Winter Wheat

When it comes to a successful winter cereal crop, the beginning determines the end. Without good stand establishment in the fall, winter survival suffers and yields decline. Phosphate fertility and other key factors, including seeding date and planting depth, require careful attention to ensure a good start.

For the best winter survival, cereals must germinate uniformly in the fall and develop at least two to three leaves and crown tissue. Then, in the spring, the winter cereal plant re-grows from the crown tissue.

### **Development Of Root And Shoot Growth**

Proper phosphate fertility helps winter cereals establish quickly and uniformly. Phosphate, which is an essential component of the energy-building process, enhances early plant development and vigorous root and shoot growth.

### **Better Stand Establishment**

Achieving high winter wheat yields requires two critical factors: winter hardiness and rapid spring re-growth. Both factors are directly influenced by the phosphate status in the plant. Adequate phosphate nutrition promotes rapid emergence and establishment in the fall, allowing the plants to achieve optimal root and shoot growth and nutrient uptake prior to dormancy. This promotes winter hardiness and a greater probability of the crop withstanding adverse environmental conditions. A healthy, well-established stand is better able to survive over winter and is better able to exhibit rapid re-growth in the spring to set up yield potential.



## JumpStart® On Canola

### Phosphate Fertility In Canola

Ensuring phosphate is available to the plant throughout the growing season is important for high-yielding canola crops. Canola seedlings require phosphate to advance from germination through to the three and four leaf stage, as a consequence of their small seed size phosphate content in the seed can only support seedling growth for approximately one week.

### Factors Limiting Phosphate Availability In Canola

- Phosphate is relatively immobile in the soil. This means phosphate must be placed within or near the seed row to be available for emerging seedlings.
- Canola is sensitive to seed-placed fertilizer. With good to excellent soil moisture, no more than 20 to 25 pounds of  $P_2O_5$  per acre should be seed-placed.<sup>1</sup>

## Benefits Of JumpStart® On Canola

### Increased Availability Of Soil And Fertilizer Phosphate

Enhanced phosphate availability results in increased root growth and increased leaf surface area. As a result, canola inoculated with JumpStart® may flower earlier, have an increased number of pods and pod-bearing branches, and have earlier, more uniform maturity. Ultimately, you can help your canola crop reach its full potential.

### More Even Supply Of Phosphate To Improve Crop Uniformity

A healthy uniform canola crop has more potential to withstand weed, insect and disease pressures. Timing of pesticide applications, swathing and crop dry-down are easier to assess with a uniformly developed canola crop.

### Earlier Access To More Phosphate With Sensitive Seed

Top-yielding canola varieties require significant amounts of nitrogen and phosphate fertilizer to achieve their yield potential. Inoculating canola with JumpStart® will help address phosphate needs with sensitive seed.

<sup>1</sup> Source: Guidelines for Safe Rates of Fertilizer Placed with Seed, Saskatchewan Ministry of Agriculture.



# Application

JumpStart® is not crop specific. JumpStart® colonizes (grows along) the root system rather than infecting the root, so you do not have to purchase a specific type of JumpStart® for a specific crop. Please see Table 2 on page 28 for a list of registered crops and their application rates. Please read the label before application for complete use instructions.

## JumpStart® Granular

JumpStart® is available in a granular formulation for canola, barley, flax, mustard, oat, pea, lentil, soybean, wheat and canary seed. Application rates will vary according to row spacing; please refer to Table 1 for details.

Table 1. JumpStart® Granular Application Rates

PACKAGE SIZE 18 KG (39.68 LB) BAG		
Row spacing	lb/ac	ac/bag
6 in	5.5	7.2
8 in	4.1	9.7
9 in	3.6	11.0
10 in	3.3	12.0
12 in	2.7	14.7

## JumpStart® Wettable Powder

JumpStart® is available as a wettable powder that is mixed into water and applied to the seed as a liquid. Once JumpStart® is mixed into the water, apply to the seed within 24 hours.

Water volume rates vary according to the type of seed treated. These water volumes can be adjusted according to your application methods, as long as the correct amount of JumpStart® is applied to the seed. Please see Table 2 for approximate water volume rates. When tank mixing a seed treatment with JumpStart®, the total liquid volume should equal the water volume listed in the table. Example: if you are using JumpStart® on wheat, the total water volume required is 10 litres. If you are tank mixing with a seed treatment with an application rate of 5 litres per 60 bushels of wheat, then you only need to add another 5 litres of water for a total liquid volume of 10 litres per every 60 bushels of wheat treated.

Apply the JumpStart® suspension to seed when transferring seed from the bin or bag to the truck, or from the truck to the tank or seed cart. Applicators used previously for pesticides should be triple rinsed before being used for JumpStart® application. To improve coverage on small-seeded crops like canola, mustard, alfalfa and sweetclover, we recommend using a batch-treating system or purchasing pre-treated seed where available. JumpStart® can be applied to bare seed up to 60 days prior to seeding (depending on seed type) and can be used with many different seed treatments.

Visit **Canada | Novozymes** for the most up-to-date information on seed treatment compatibility.

Note: The bulk density of JumpStart® granular is approximately 0.6 g/cm3 (37 lb/ft3).

**Table 2. JumpStart® Wettable Powder Application**

CONTAINER SIZE	400 G CONTAINER			80 G CONTAINER		
	Seed treated/container		Water (litres)	Seed treated/container		Water (litres)
Crop	bu	lb		bu	lb	
Alfalfa/sweetclover	–	1,100	10	–	220	2
Canola/mustard	–	1,100	10	–	200	2
Chickpea	400	24,000	30	80	4,800	6
Corn	70 bags* (5,600,000 kernels)		19.6	14 bags* (1,120,000 kernels)		3.92
Dry bean	300	18,000	25	60	3,600	5
Lentil	300	18,000	25	60	3,600	5
Pea	500	30,000	40	100	6,000	8
Soybean	300	18,000	25	60	3,600	5
Wheat	300	18,000	50	60	3,600	10

80,000 kernels per bag

**Table 3. JumpStart® Wettable Powder Application**

57 G (2.0 OZ) CONTAINER		
Crop	Seed treated/container	Approximate water volume
Soybean	50 units (1,135 kg, 2,500 lb, 42 bu)	3.5 litres (3.9 US quarts)

## Product Packaging

All Crops		Wettable Powder	1	x	400 g bottle	=	
		Wettable Powder	4	x	80 g bottle	=	
		Granular	1	x	18 kg	=	
Soybean		Wettable Powder	4	x	57 g bottle	=	



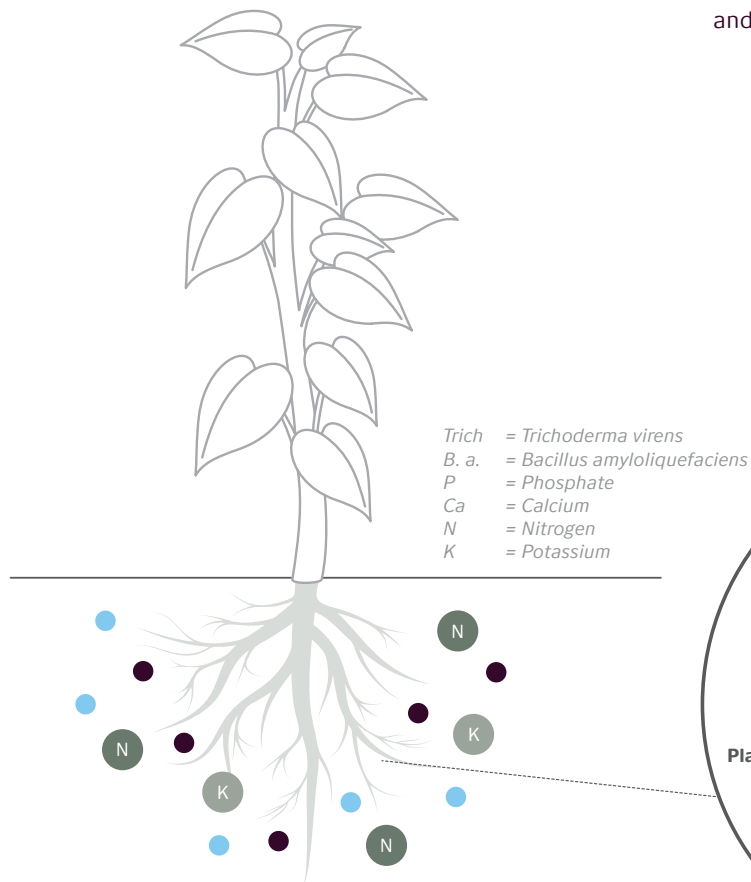
# QuickRoots®

Canola . Corn . Field Pea . Lentil . Small Grains . Soybean

## Product Overview

QuickRoots® inoculant can improve nutrient availability and uptake. The microbial seed inoculant is available for canola, corn, field pea, lentil, small grains and soybean.

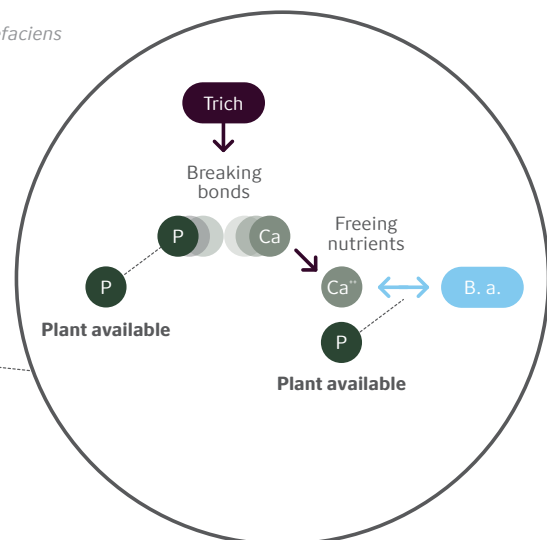
The *Bacillus amyloliquefaciens* and *Trichoderma virens* based treatment helps increase availability and uptake of nitrogen, phosphate and potassium. Its ability to release nutrients from the soil helps maximize the effectiveness of your inputs and improve your yield potential.



## How It Works

**Two biological actives to increase availability and uptake of nitrogen, phosphate and potassium.**

- 1 The biologicals *Bacillus amyloliquefaciens* and *Trichoderma virens* have the ability to release phosphate in the soil not readily available to the plant.
- 2 Improved phosphate availability can lead to expanded root volume, which enhances nitrogen and potassium uptake.
- 3 This ultimately can enable optimal plant growth and increased yield potential.



## Features & Benefits

By growing directly on your crop's roots, QuickRoots® works to improve nutrient availability and uptake. The microbial inoculant performs in a variety of soil conditions and types (including soils low in phosphate availability). This can enable optimal plant growth and increased yield potential.

# NPK

Improved availability  
of nitrogen, phosphate  
and potassium



Enhanced nutrient  
availability, which  
supports root and  
shoot growth.



Performance in  
a variety of soil  
conditions and types.

## QuickRoots® Products

### QuickRoots® Wettable Powder

PRODUCT NAME	REGISTERED CROPS
Corn multi-crop	Canola, corn, cotton and sorghum
Small grains	Wheat, barley, oats, rye and spelt seed
Soybean multi-crop	Chickpea, dry bean, field pea, lentil,

### QuickRoots® Planter Box

PRODUCT NAME	REGISTERED CROPS
Corn multi-crop	Canola, corn, cotton and sorghum

## Application

Please read the label before application for complete use instructions.

### QuickRoots® Wettable Powder - Canola And Corn Multi-Crop (Canola, Corn, Sorghum)

CROP	PACKAGE SIZE	APPLICATION RATE	SEEDS TREATED/PACKAGE
Canola	180 g pouch	10 g/50 lb seed (bag)	18 bags
Corn	180 g pouch	7.2 g/80,000 seeds (unit)	25 units
Sorghum pouch	180 g pouch	10 g/50 lb seed (bag)	18 bags

### QuickRoots® Wettable Powder - Small Grains (Wheat, Barley, Oats, Rye, Spelt Seed)

SMALL GRAINS	PACKAGE SIZE	APPLICATION RATE	SEEDS TREATED/PACKAGE
Pouch	180 g	3 g/45 kg	2,700 kg
Pail	4.5 kg	3 g/45 kg	67,500 kg

### QuickRoots® Wettable Powder - Pulse And Soybean Multi-Crop (Chickpea, Field Pea, Lentil, Soybean)

CHICKPEA	PACKAGE SIZE	APPLICATION RATE	SEEDS TREATED/PACKAGE
Pouch	200 g	1 g per 35,000 seeds	7 million
Pail	4.8 kg	1 g per 35,000 seeds	168 million
FIELD PEA	PACKAGE SIZE	APPLICATION RATE	SEEDS TREATED/PACKAGE
Pouch	200 g	1 g per 60,000 seeds	12 million
Pail	4.8 kg	1 g per 60,000 seeds	288 million
LENTIL	PACKAGE SIZE	APPLICATION RATE	SEEDS TREATED/PACKAGE
Pouch	200 g	1 g per 110,000 seeds	22 million
Pail	4.8 kg	1 g per 110,000 seeds	528 million
SOYBEAN	PACKAGE SIZE	APPLICATION RATE	SEEDS TREATED/PACKAGE
Pouch	200 g	4 g/unit	50 units*
Pail	4.8 kg	4 g/unit	1,200 units*

\* 1 unit = 140,000 seeds

**QuickRoots® Dry Planter Box - Canola And Corn Multi-Crop (Canola, Corn, Sorghum)**

CANOLA	PACKAGE SIZE	RATE (G/BAG)	BAGS TREATED
Canola	400 g	16 g/bag	25 bags**
Pail	3.2 kg	16 g/bag	200 bags**
CORN	PACKAGE SIZE	RATE (G/UNIT)	UNITS TREATED
Pouch	400 g	16 g/unit	25 units***
Pail	3.2 kg	16 g/unit	200 units***
SORGHUM	PACKAGE SIZE	RATE (G/BAG)	BAGS TREATED
Pouch	400 g	16 g/unit	25 units***
Pail	3.2 kg	16 g/unit	200 units***

\*\*1 bag = 50 lbs of seed \*\*\*1 unit = 80,000 kernels

## Product Packaging

Canola and Corn Multi-Crop		Planter Box	10	x	400 g pouch	=	
		Planter Box	1	x	3.2 kg pail	=	
		Wettable Powder	10	x	180 g pouch	=	
Small Grains		Wettable Powder	10	x	180 g pouch	=	
		Wettable Powder	1	x	4.5 kg pail	=	
Pulses and Soybean Multi-Crop		Wettable Powder	10	x	200 g pouch	=	
		Wettable Powder	1	x	4.8 kg pail	=	



# Optimize® LV | Optimize® ST

Soybean

## Product Overview

### **Breakthrough Performance For Soybeans**

Optimize® LV is a NEW concentrated formulation soybean inoculant. Optimize® LV has the same biological actives, performance and benefits as Optimize® ST, with a new lower application rate of 98 ml/100 kg (1.5 fl oz/100 lb).

Our Optimize products are retailer-applied dual-action products that deliver the benefits of a specially selected *Bradyrhizobium japonicum* inoculant along with LCO (lipochitooligosaccharide) technology – helping to improve your crop's potential by enhancing nutrient availability.

With Optimize, the plant does not need to wait for the LCO signal as it is delivered on the seed, potentially reducing the time required for this process to occur naturally and therefore, accelerating nodulation and nitrogen fixation to the young crop.


## What Is LCO Technology?

LCO is a molecule involved in the rhizobia legume nodulation process. When the LCO molecule is present at the time of planting, it allows for the nodulation process to begin, independent of variety, soil and environmental conditions. The benefit of earlier nodulation initiation is earlier nitrogen availability to the plant, which supports plant growth such as root and shoot development. The result of this early-season activity is better plant performance. LCO is an important component in nodulation as a key driver in the communication between plants and rhizobia.

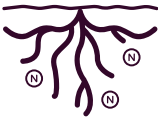
Comparing Optimize® LV and Optimize® ST

	'New' Optimize® LV	Optimize® ST
Actives	<i>Bradyrhizobium japonicum</i> LCO (lipochitooligosaccharide) technology	
Planting Window	220-day on seed stability with additional extender* for key seed treatments, otherwise 120-day on seed stability	
Application Rate	98 ml/100 kg (1.5 fl oz/100 lb)	182 ml/100 kg (2.8 fl oz/100 lb)
Package Size	2 x 0.686 L Optimize® LV liquid, plus 0.4 L Liquid Additive	2 x 1.6 L Optimize® ST liquid, plus 2 x 475 ml Liquid Additive
Seeds Treated	80 units (4,000 lb)	100 units (5,000 lb)
Package Size	6.9 L Optimize® LV liquid, plus 2 L Liquid Additive	12.8 L Optimize® ST liquid, plus 3.8 L Liquid Additive
Seeds Treated	400 units (20,000 lb)	400 units ( 20,000 lb)


Features & Benefits




**Broad seed treatment compatibility with 220-day on seed stability with additional extender for key seed treatments, otherwise 120-day on seed stability**



**Greater opportunity for the development of nitrogen-fixing nodules with LCO**



**Enhanced nutrient capability, which supports root and shoot growth**



**46% lower application rate than Optimize® ST means even more space on seed for other additives**

## How It Works

### Dual-action inoculant to enhance nutrient availability and development of nitrogen-fixing nodules.

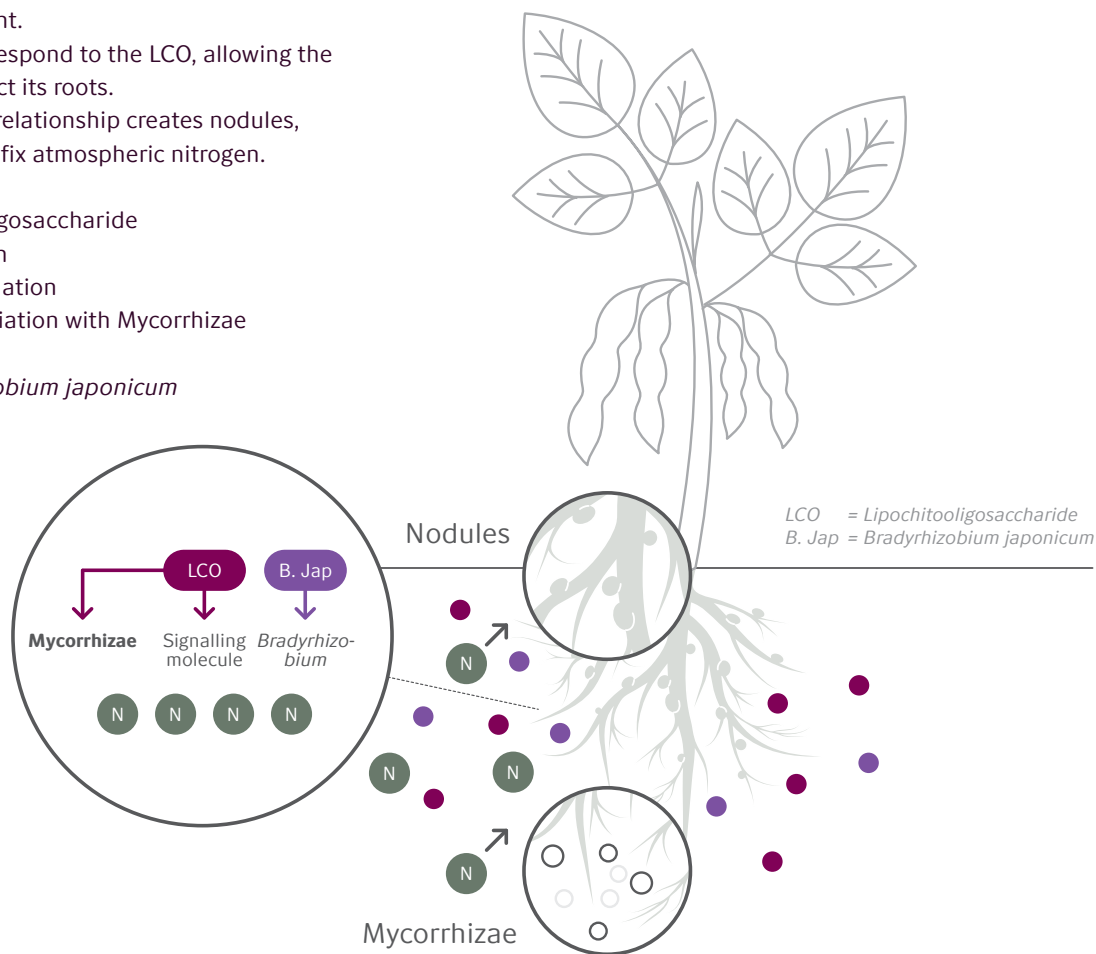
1. Needing nitrogen, the plant releases flavonoids to signal rhizobia.
2. Sensing the flavonoids, the rhizobia signal LCO back to the plant.
3. The plant can respond to the LCO, allowing the rhizobia to infect its roots.
4. This symbiotic relationship creates nodules, which can help fix atmospheric nitrogen.

**LCO** = Lipochitooligosaccharide

- Stress Mitigation
- Enhances Nodulation
- Increases Association with Mycorrhizae

**B.Jap** = *Bradyrhizobium japonicum*

- Fixes Nitrogen



## Double Inoculate Your Soil To Help Maximize Yield Potential

Land that has been through less than ideal growing conditions, or has not had soybeans for a few years, requires special attention when it comes to inoculation. Double inoculation can help quickly establish high populations of rhizobia bacteria to help ensure the best possible nodulation and soybean performance. Land with a history of longer soybean rotations, or land with a history of flooding or longer periods of drought, is not conducive to rhizobia survival. It is in these soils that farmers will benefit greatly from the application of two formulations of inoculant.

Seed-applied inoculants tend to form nodules closer to where the seed is located (closer to the primary root); in-furrow applied granular inoculants tend to form nodules on the secondary or lateral roots. Combining the two formulations allows for wider distribution of nodules along the whole root system.

For best results, you may apply Optimize® LV or Optimize® ST with Cell-Tech or TagTeam®. Consult your local Novozymes BioAg representative or local retailer for a customized inoculant approach.

## Application

Optimize is applied to soybean seed by retailers. Please contact your seed retailer to order. Please read the label before application for complete use instructions.









**Table 1. Optimize® LV Liquid Application**

PACKAGE SIZE AND CONTENTS	AMOUNT OF SEED TREATED /INDIVIDUAL CASE	
2 x 0.686 Optimize® LV liquid, plus 1 x 0.4 L Liquid Additive	80 units	4,000 lb
6.9 L Optimize® LV liquid, plus 2 L Liquid Additive	400 units	20,000 lb

**Table 2. Optimize® ST Liquid Application**

PACKAGE SIZE AND CONTENTS	AMOUNT OF SEED TREATED /INDIVIDUAL CASE	
2 x 1.6 L Optimize® ST liquid, plus 2 x 475 ml Liquid Additive	100 units	5,000 lb
12.8 L Optimize® ST liquid, plus 3.8 L Liquid Additive	400 units	20,000 lb

## Product Packaging

Optimize® LV Soybean		Liquid	1	x	6.9 L pouch + 2 L jug (liquid additive)	=	
		Liquid	5	x	2 x 0.686 L pouches + 1 x 0.4 L jugs (liquid additive)	=	
Optimize® ST Soybean		Liquid	1	x	12.8 L pouch + 3.8 L jug (liquid additive)	=	
		Liquid	4	x	2 x 1.6 L pouches + 2 x 475 ml jugs (liquid additive)	=	

# Cell-Tech®

Lentil . Pea . Soybean

## Product Overview

### Nitrogen-Fixing Inoculant

Cell-Tech inoculant is a single-action product that contains specially selected rhizobia that can provide effective nodulation to enhance nitrogen-fixation, even in cooler soils – increasing yield potential as planting conditions change.

If phosphate is limited, Cell-Tech can be applied at the same time as JumpStart®, for improved phosphate uptake.

### Cell-Tech Is Available In The Following Formulations

CROP	INOCULANT SPECIES	CELL-TECH FORMULATIONS AVAILABLE
Pea, Lentil	<i>Rhizobium leguminosarum</i>	Liquid, peat, non-sterile peat and granular
Soybean	<i>Bradyrhizobium japonicum</i>	Liquid, peat, and granular

## Application

Please read the label before application for complete use instructions.

### Cell-Tech Pea/Lentil liquid

Cell-Tech liquid should be applied directly to pea or lentil seed at a rate of 2.5 fluid ounces per bushel (60 lb) of seed (75 ml/27 kg) or 2.1 fluid ounces per 50 pounds (63 ml/23 kg). The planting window for Cell-Tech liquid on bare pea or lentil seed is 48 hours.

### Cell-Tech Soybean Liquid

Cell-Tech liquid should be applied directly to soybean seed at a rate of 2.5 fluid ounces per bushel (60 lb) of seed (75 ml/27 kg) or 2.1 fluid ounces per 50 pounds (63 ml/23 kg) of seed. The planting window for Cell-Tech liquid on bare soybean seed is four days. Cell-Tech liquid can be applied with other seed treatments, but the planting window may be reduced.

Visit [novozymes.com/bioag](http://novozymes.com/bioag) for more details.



**Table 1. Cell-Tech Liquid Application**

CELL-TECH LIQUID	BAG SIZE	ONE BAG INOCULATES		
Crop	Litres	Units	bu	lb
Pea, Lentil	3.0	-	40.0	2,400
	9.8	-	130.0	7,840
Soybean	3.1	50	41.7	2,502
	12.5	200	167.0	10,000

**Cell-Tech Peat**

Cell-Tech peat has its own sticker in the formulation so no additional stickers are required. Apply Cell-Tech dry to pre-moistened seed, or add water while applying Cell-Tech, or mix with cool, clean water and apply to seed as a slurry (refer to Table 2). Make sure that inoculated seed is evenly coated. Inoculate bare seed with Cell-Tech peat up to 48 hours before seeding.

**Table 2. Cell-Tech Peat Application**

CELL-TECH PEAT		ONE 2.2 KG (4.8 LB) BAG INOCULATES			WATER
Crop	Unit	bu	lb		litres
Pea	-	50	3,000		4.0
Lentil	-	30	1,800		2.5
CELL-TECH PEAT		ONE 2.32 KG (5.1 LB) BAG INOCULATES			WATER
Crop	Unit	bu	lb		litres
Soybean	30	25	1,500		N/A

### Cell-Tech NS (Non-Sterile) Peat

Cell-Tech NS peat has its own sticker in the formulation. A separate sticker is not needed. Apply Cell-Tech NS onto seed in the drill box and mix thoroughly until uniformly coated. Layering seed and inoculant while mixing will provide thorough coating of all seeds. Inoculate bare seed with Cell-Tech NS peat up to 48 hours prior to seeding.

**Table 3. Cell-Tech NS (Non-Sterile) Peat Application**

CELL-TECH PEAT		ONE 2.83 KG (6.2 LB) BAG INOCULATES	
Crop		bu	lb
Pea		25	1,500
Lentil		25	1,500

Cell-Tech and Cell-Tech NS peat can be used with different seed treatments, but planting windows vary according to type of seed treated and seed treatment used. Visit [novozymes.com/bioag](http://novozymes.com/bioag) for the most up-to-date seed treatment compatibility information.

### Cell-Tech Granular

Cell-Tech granular should be applied directly with the seed in the seed row using a granular tank for application. Application rates vary according to row spacing (refer to Table 4 below).

- Fill tank to match or slightly exceed seed requirements.
- Do not overfill tank to avoid compaction.
- Pour into tank through a screen.
- If augering, please do so at low speeds to avoid damage to Cell-Tech granular.
- Do not mix Cell-Tech granular in the same tank with seed or fertilizer.
- Do not leave Cell-Tech granular in the tank overnight as condensation can cause lumps to form.

**Table 4. Cell-Tech Granular Application Rates**

CELL-TECH PEA/LENTIL				CELL-TECH SOYBEAN		
Package size	Application rate 18.0 kg bag 454 kg bag			Application rate 18.0 kg bag 454 kg bag		
Row spacing	lb/ac	ac/bag	ac/bag	lb/ac	ac/bag	ac/bag
7 in	6.6	6.1	151.7	6.2	6.5	161.5
8 in	5.8	6.9	172.6	5.4	7.3	185.4
9 in	5.1	7.8	196.3	4.7	8.4	213.0
10 in	4.6	8.7	217.6	4.3	9.3	232.8
12 in	3.8	10.5	263.4	3.6	11.0	278.1
15 in	3.1	13.3	333.7	2.9	13.8	345.2
24 in	-	-	-	1.8	22.2	556.1
30 in	-	-	-	1.4	28.6	715.0

Note: The bulk density of Cell-Tech granular is approximately 0.6 g/cm<sup>3</sup> (37 lb/ft<sup>3</sup>).

## Product Packaging

Pea/Lentil		Peat	7	x	2.2 kg bag	=	
		Non-sterile peat	4	x	2.83 kg bag	=	
		Granular	1	x	18 kg	=	
		Granular	1	x	454 kg	=	
		Liquid	4	x	3 L	=	
		Liquid	1	x	9.8 L	=	
<hr/>							
Soybean		Peat	7	x	2.32 kg bag	=	
		Granular	1	x	18 kg	=	
		Granular	1	x	454 kg	=	
		Liquid	4	x	3.1 L	=	
		Liquid	1	x	12.5 L	=	

# Nitragin® Gold

Alfalfa . Clover . Sweetclover

## Product Overview

Nitragin® Gold inoculant was developed for bulk treatment by the seed processor. It is a one-step system that provides a convenient and economical inoculant for your customers.

Order your alfalfa, sweetclover or clover seed pre-treated with Nitragin® Gold.



Nitragin® Gold alfalfa/sweetclover is OMRI Listed for organic use. It does not contain any genetically modified organisms, sludge or waste-derived products.

Note: Nitragin® Gold clover is not OMRI Listed.

## Benefits Of Nitragin® Gold Inoculant

- **Yield:** Specially selected natural rhizobia strains result in high levels of nitrogen fixation for maximum yield potential.
- **Super seed adhesion:** Micron-sized particles provide optimal seed adhesion and minimal “dusting off”.
- **Quality assurance:** Drying system assures customers of high rhizobia levels on the seed.
- **Apron® XL /Allegiance® FL compatible:** Compatibility with Nitragin® Gold alfalfa/sweetclover and Apron XL and Allegiance FL seed treatments will allow the combined benefits of an inoculant and a fungicide where required.

Note: Nitragin® Gold clover is not compatible.

Time on seed for alfalfa and sweetclover is 24 months and 12 months on clover. If you need more information or have questions about Nitragin® Gold, visit [novozymes.com/bioag](http://novozymes.com/bioag)

## Product Packaging

Alfalfa/ Sweetclover		Clay Powder	1	x	19 kg	=	
Clover		Clay Powder	1	x	19 kg	=	









To learn more visit us at [Novozymes.com/bioag](https://www.novozymes.com/bioag) or call your Novozymes BioAg sales representative.

#### About Novozymes

Novozymes is the world leader in biological solutions. Together with customers, partners and the global community, we improve industrial performance while preserving the planet's resources and helping to build better lives. As the world's largest provider of enzyme and microbial technologies, our bioinnovation enables higher agricultural yields, low-temperature washing, energy-efficient production, renewable fuel and many other benefits that we rely on today and in the future. We call it Rethink Tomorrow.

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