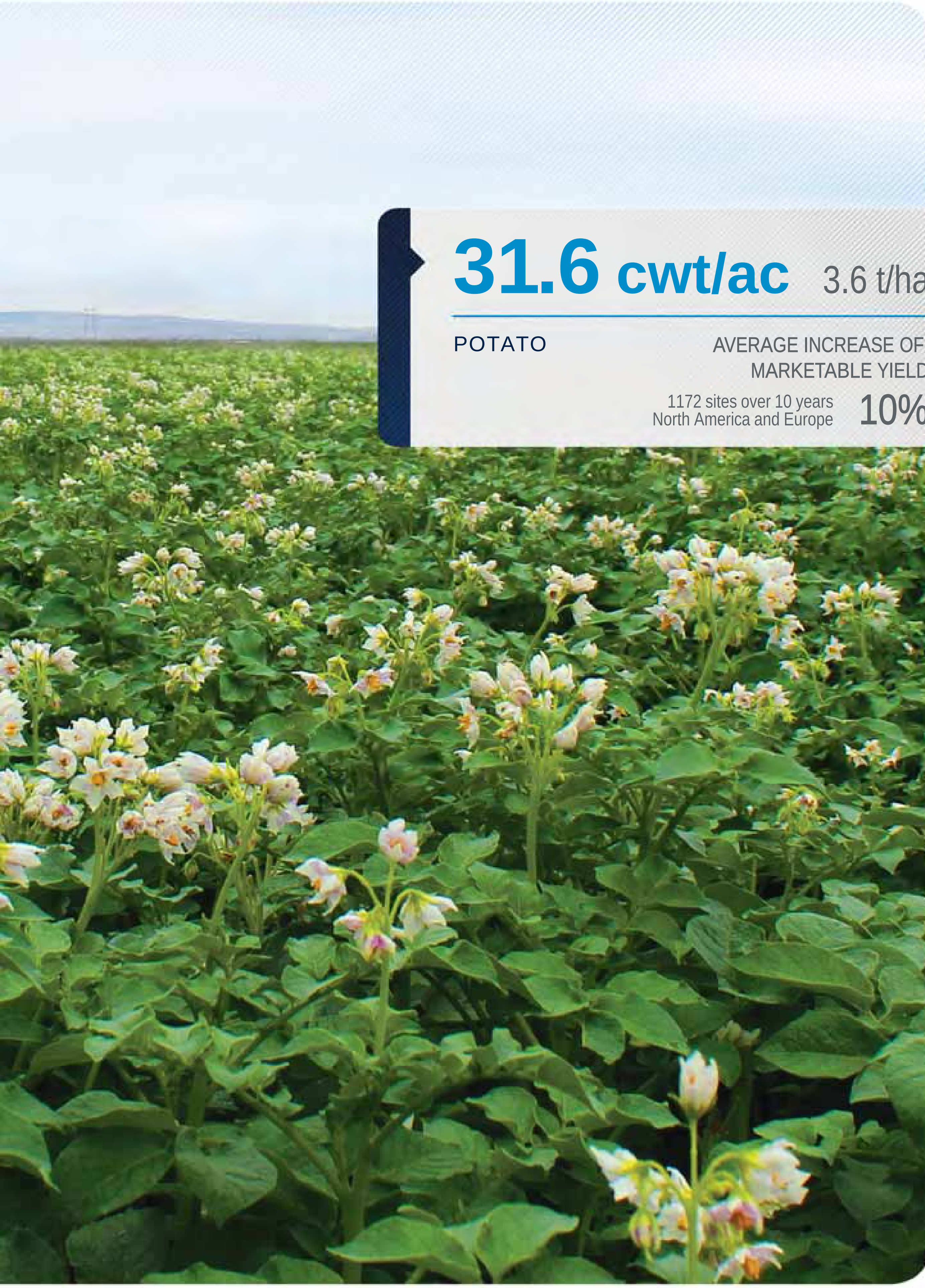
2022

AGTIV®

EFFICACY REPORT

POTATO

PREMIER TECH



31.6 cwt/ac 3.6 t/ha

POTATO

AVERAGE INCREASE OF
MARKETABLE YIELD

1172 sites over 10 years
North America and Europe

10%

Potato split field with AGTIV® POTATO vs untreated.
Faster plant development and larger plants on the right,
and row closure occurs sooner with AGTIV®.

Increased tuber count per plant and marketable yield on AGTIV® side.

► GROWER SPLIT FIELDS AND TRIALS

Table 1. **Average increase of marketable yield* with AGTIV® POTATO • Liquid for different territories (2011 to 2021).**

Territory	Number of sites	Yield increase (t/ha)	Yield increase (cwt/ac)	Yield increase (%)
Canada	581	3.1	27.7	10.0
United States	67	3.3	29.8	10.8
Mexico	4	2.3	20.0	8.6
France & Switzerland	496	4.1	36.3	9.9
Germany	24	4.2	37.5	10.3
Total	**1172 sites**	**3.6 t/ha**	**31.6 cwt/ac****	**10.0 %**

Table 2. **Average increase of marketable yield* with AGTIV® POTATO • Liquid for different years (2011-2021).**

Year	Number of sites	Yield increase (t/ha)	Yield increase (cwt/ac)	Yield increase (%)
2011	32	2.6	23.3	6.6
2012	33	3.2	28.5	9.0
2013	70	3.6	31.9	11.2
2014	116	4.5	40.3	12.8
2015	145	4.0	35.3	10.7
2016	243	3.9	34.8	10.5
2017	213	2.7	24.0	7.7
2018	113	3.4	30.2	11.2
2019	117	3.5	31.1	8.6
2020	49	2.9	25.6	9.8
2021	41	4.1	36.4	10.2
Total	**1172 sites**	**3.6 t/ha**	**31.6 cwt/ac****	**10.0 %**

* Statistically significant at p<0.001 following a T test.

**cwt/ac = 100 lb/ac

EFFICACY REPORT

2021 – MYCORRHIZAL AND BACILLUS INOCULANT

POTATOES

► PLOT TRIAL

Research partner: Progest inc.

Research site: Sainte-Croix de Lotbinière, QC

Treatments: a) Untreated Check
b) AGTIV® POTATO • L*
c) AGTIV® POTATO • L + PTB185 (*Bacillus subtilis*)*

* Liquid inoculant applied according to manufacturer's recommended rate

Experimental design: Latin Square, 6 repetitions, 22 m^2 plots

Variety: Norland

Previous crop: Oat

Seeding details: Seeded on June 3, 2021, at a rate of 36 400 seeds/ha

Table 1. **Summary of marketable yields per treatment.**

Treatment	Yield (cwt/ac)	Yield increase (%)
Untreated Check	313.1	-
AGTIV® POTATO • L	320.3	2.2
AGTIV® POTATO • L + PTB185 (*Bacillus subtilis*)	326.6	4.3

Plot operational notes and rain fall.

- Fertilizers:
  - Fertilization at seeding of 1333 kg/ha of 12-12-15
- Pesticides:
  - June 4, 25 and July 5, Quadris
  - June 4, Titann
  - June 9 Lorox
  - June 24, Select and Amigo
  - June 25, July 5 and August 13, Manzate
  - July 15 and 29, Coragen
  - July 23, Delegate
  - July 29 and August 13, Agrovia Top
  - August 23 and September 10, Reglone (dessicant)
- Harvested on September 23, 2021

Month	Precipitation (mm)
June	103.0
July	85.8
August	28.4
September	80.8
TOTAL	**298.0**

PREMIER TECH

2021 – MYCORRHIZAL AND BACILLUS INOCULANT

► PLOT TRIAL

Research partner: New Marc Research

Research site: Saint-Marc-sur-Richelieu, QC

Treatments: a) Untreated Check
b) AGTIV® POTATO • L*
c) AGTIV® POTATO • L + PTB185 (B*acillus subtilis*)*

* Liquid inoculant applied according to manufacturer's recommended rate

Experimental design: Latin Square, 6 repetitions, 22 m^2 plots

Variety: Chieftain

Previous crop: Soybean

Seeding details: Seeded on June 4, 2021, at a rate of 2200 kg/ha

Table 1. **Summary of marketable yields per treatment.**

Treatment	Yield (cwt/ac)	Yield increase (%)
Untreated Check	103.1	-
AGTIV® POTATO • L	107.8	4.5
AGTIV® POTATO • L + PTB185 (B*acillus subtilis*)	116.3	12.8

Plot operational notes and rain fall.

- Fertilization:
  - June 1, Broadcast of 16.9-22.2-12.7 and hilling
  - `June 5, Broadcast of Urea (46-0-0)
- Pesticides:
  - June 10 and July 22, Coragen (Colorado potato beetle control)
  - August 27, Delegate (Colorado Potato Beetle control)
- Harvested on September 30, 2021

Month	Precipitation (mm)
May	15.9
June	56.3
July	47.4
August	49.2
September	55.0
TOTAL	**223.8**

PREMIER TECH

EFFICACY REPORT

2021 – MYCORRHIZAL AND BACILLUS INOCULANT

POTATOES

► PLOT TRIAL

Research partner: Atlantic Agri Tech

Research site: New Glasgow, IPE

Treatments: a) Untreated Check
b) AGTIV® POTATO • L*
c) AGTIV® POTATO • L + PTB185 (B*acillus subtilis*)*

* Liquid inoculant applied according to manufacturer's recommended rate

Experimental design: Latin Square, 6 repetitions, 16 m^2 plots

Variety: Russet Burbank

Previous crop: Oat

Seeding details: Seeded on May 21, 2021, at a rate of 1900 kg/ha

Table 1. **Summary of marketable yields per treatment.**

Treatment	Yield (cwt/ac)	Yield increase (%)
Untreated Check	236.9	-
AGTIV® POTATO • L	242.4	2.3
AGTIV® POTATO • L + PTB185 (B*acillus subtilis*)	247.4	4.4

Plot operational notes and rain fall.

- Fertilization of 15-15-15-4 (S)-2 (Mg) on May 1, in band
- Pesticides:
    - June 2, Lorox and Sencor (weed control)
    - June 28; July 12 and 28; August 9, Pencozed 75DF (Blight control)
    - July 5, Zampro (Blight control) and Coragen (CPB Control)
    - July 19, Revus (Blight control) and Delegate (CPB control)
    - August 25, Echo (Blight control)
    - September 8, Reglone (top killing)
- Harvested on October 4, 2021

Month	Precipitation (mm)
May	96.8
June	45.8
July	142.4
August	39.2
September	217.2
TOTAL	**541.4**

PREMIER TECH

EFFICACY REPORT
2021 – MYCORRHIZAL AND BACILLUS INOCULANT

POTATOES

► PLOT TRIAL

Research partner: Tall Pines Agricultural Research Ltd.

Research site: Rockwood, ON

Treatments: a) Untreated Check
b) AGTIV® POTATO • L*
c) AGTIV® POTATO • L + PTB185 (B*acillus subtilis*)*

* Liquid inoculant applied according to manufacturer's recommended rate

Experimental design: Latin Square, 6 repetitions, 18 m^2 plots

Variety: Chieftain Red

Previous crop: Fallow

Seeding details: Seeded on May 21, 2021, at a rate of 26 000 seed pieces/ha

Table 1. **Summary of marketable yields per treatment.**

Treatment	Yield (cwt/ac)	Yield increase (%)
Untreated Check	266.7	-
AGTIV® POTATO • L	286.4	7.3
AGTIV® POTATO • L + PTB185 (B*acillus subtilis*)	322.3	20.8

Plot operational notes and rain fall.

- Fertilization 120-60-90 on April 20, in band, at a rate of 590 kg/ha
- Pesticides:
  - May 28, Boundary LQD (weed control)
  - July 15, Bravo Zn (diseases control)
  - July 28, Coragen (CPB control)
- Harvested on November 9, 2021

Month	Precipitation (mm)
May	28
June	95.5
July	128.4
August	28.2
September	142.6
TOTAL	**422.7**

PREMIER TECH

2021 – MYCORRHIZAL AND BACILLUS INOCULANT

► PLOT TRIAL

Research partner: Wellington Agricultural Research Ltd.

Research site: Elmira, ON

Treatments: a) Untreated Check
b) AGTIV® POTATO • L*
c) AGTIV® POTATO • L + PTB185 (B*acillus subtilis*)*

* Liquid inoculant applied according to manufacturer's recommended rate

Experimental design: Latin Square, 6 repetitions, 22 m^2 plots

Variety: Chieftain Red

Previous crop: Canola

Seeding details: Seeded on June 17, 2021, at a rate of 27 778 seed pieces/ha

Table 1. **Summary of marketable yields per treatment.**

Treatment	Yield (cwt/ac)	Yield increase (%)
Untreated Check	298.2	-
AGTIV® POTATO • L	320.7	7.3
AGTIV® POTATO • L + PTB185 (B*acillus subtilis*)	343.9	15.3

Plot operational notes and rain fall.

- Pesticides:
  - July 1, Sencor DF (weed control)
  - July 26, August 5, 7, 13, 19, 23 and september 9, Bravo and Revus (diseases control)
- Harvested on October 9, 2021

Month	Precipitation (mm)
June	136.4
July	79.9
August	49.9
September	177.8
TOTAL	**444**

2019 – MYCORRHIZAL INOCULANT

▶ STRIP TRIAL

Research partner: Willard Waugh & Sons LTD.

Research site: Bedeque (PEI), Canada

Treatments: a) Untreated;
b) AGTIV® POTATO • Liquid*.

Experimental design: 20 acres strip

Potato variety: Prospect

Previous crop: Alfalfa

Seeding details: Seeded May June 7, 2019, at 6 tubers/m with 33 cm row spacing

*Liquid products applied according to manufacturers' recommended rate.

Table 1. **Summary of potato marketable yields per treatment.**

Treatment	Yield (cwt/ac)	Yield (t/ha)
Untreated	359.1	40.2
AGTIV® POTATO • Liquid	405.2	45.4

Plot operational notes and rain fall.

- Conventional tillage
- Pesticides: Titan & Emesto
- Fertilization: 17-16-10 at 392.4 kg/ac
- Harvested on October 10, 2019.

Month	Precipitation (mm)
June	113.0
July	26.6
August	115.1
September	204.9
October	100.0
TOTAL	**559.6**

*cwt/ac = 100 lb/ac

EFFICACY REPORT
2016 – MYCORRHIZAL INOCULANT

► GROWER SPLIT FIELDS

Research partner: EUROCELP

Research site: 75 farms (fields) in France, Europe

Treatments: a) Untreated;
b) AGTIV® mycorrhizal inoculant.

Experimental design: Every data point per field consists in an average of 3 samples each (untreated and AGTIV®).

POTATOES

Table 1. **Marketable potato yields per treatment (all markets)**

Treatment	Yield (cwt/ac)	Yield (t/ha)	Difference (%) AGTIV® vs untreated
Untreated	412.7	45.7	
AGTIV® mycorrhizal inoculant	455.1	50.4	+9.3%*

*Statistically significant at p≤0,05 using T Test analysis for paired samples.

Figure 1. **Marketable potato yields (t/ha) per treatment (all markets)**

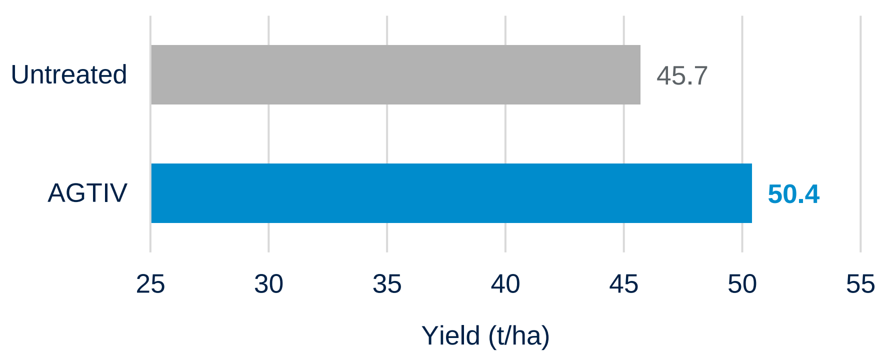
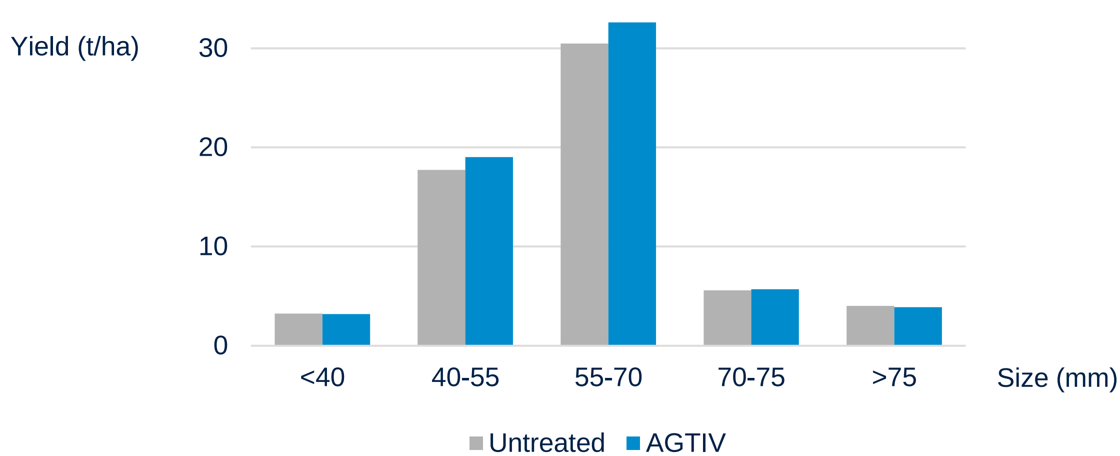


Figure 2. **Potato yield (t/ha) for the tablestock market (32 plots) by marketable size (40/75 mm)**



PREMIER TECH

► PLOT TRIAL

POTATOES

Research partner: Agréco

Research site: Rawdon (Lanaudière, QC), Canada

Treatments: a) Untreated;
b) AGTIV® POTATO • Liquid.

Experimental design: 8 replicated plots per treatment in randomized complete block design

Potato variety: Goldrush

Previous crop: Potato in 2010, Wheat in 2009

Seeding details: Each plot comprised four rows of 20 seed pieces (35.6 cm apart). Inoculant in liquid suspension applied in furrow. Planted May 21, 2011.

Table 1. **Summary of potato yields per treatment.**

Treatment	Marketable Yield (lb/plot)	Marketable Yield (kg/plot)	Average marketable potato weight (g/potato tuber)
Untreated	23.8 [a]	10.8 [a]	123 [a]
AGTIV® POTATO • Liquid	27.3 [b]	12.4 [b]	136.5 [b]

Results followed by different letters are statistically different according to Duncan
(Marketable yield at p≤0.1; Marketable potato weight at p≤0.05)

Plot operational notes.

- Fertilization:
  - 206 kg/ha N;
  - 170 kg/ha P_2O_5 and 270 kg/ha K_2O.
- Pesticides:
  - Titan, Quadris and Actara at planting time;
  - Sencor (June 13), Polyram (June 15),
    Bravo (once a week from end of June until August 12),
    Reason (August 12).
- Planted manually in sandy soil.
- Harvested September 18, 2011.

EFFICACY REPORT

2010 – MYCORRHIZAL INOCULANT

► PLOT TRIAL

POTATOES

Research partner: Agréco

Research site: Lyster (Centre-du-Québec, QC), Canada

Treatments: a) Untreated;
b) AGTIV® POTATO • Liquid.

Experimental design: 6 replicated plots per treatment in randomized complete block design.

Potato variety: Goldrush

Seeding details: Each plot of 6 m (20 feet) long with 15 seed pieces per treatment. Inoculant in liquid suspension applied in furrow. Planted May 26.

Table 1. **Summary of potato yields per treatment.**

Treatment	Yield (lb/plot)	Yield (kg/plot)	Marketable tuber number per plot
Untreated	15.4 [a]	7.0 [a]	34 [a]
AGTIV® POTATO • Liquid	20.5 [b]	9.3 [b]	48 [b]

Results followed by different letters are statistically different according to Duncan *($p \leq 0.1$)*

Plot operational notes and rain fall.

- Fertilized according to recommendations by the host growers.
- Pesticides:
    - Quadris and Actara at planting time.

Month	Precipitation (mm)
May	39.8
June	104.4
July	48.8
August	112.0
September	184.8
TOTAL	**489.8**

Meteorological data from Québec

PREMIER TECH

1999 – MYCORRHIZAL INOCULANT

► PLOT TRIAL

POTATOES

Research partner: Laval University (Qc), Canada

Research site: Lavaltrie (QC), Canada

Treatments: a) Untreated;
b) AGTIV® POTATO • Liquid.

Experimental design: 4 replicated plots per treatment in randomized complete block design

Potato variety: Goldrush

Seeding details: The trial plot consisted of 32 60-meter rows spaced at 0.9 meter.

Table 1. **Summary of potato yields per treatment.**

Treatment	Total Yield		Marketable yield	
	(cwt/ac)	(t/ha)	(cwt/ac)	(t/ha)
Untreated	446.1 [a]	49.4 [a]	417.2 [a]	46.2 [a]
AGTIV® POTATO • Liquid	466.9 [b]	51.7 [b]	442.5 [b]	49.0 [b]

Results followed by different letters are statistically different according to Duncan *($p \leq 0.05$)*

Plot operational notes and rain fall.

- Fertilization:
  - 1800 kg/ha of 10-12-12 (3% Mg, 0.22% B) at planting time;
  - 336 kg/ha of 10-0-15 during the summer.
- Pesticides:
  - Fumigation: Vapam (Previous fall)
  - Insecticides: Cymbush, Admire, Furadan (during growth season)
  - Herbicides: Gramoxone, Lexone, Laroxe (during growth season)
- Irrigated twice: June & July.

Month	Precipitation (mm)
May	33.1
June	103.6
July	58.9
August	73.1
Septembre	123.6
TOTAL	**392.3**

Meteorological data from Trois-Rivières

PREMIER TECH

Making a difference, this is what we are all about at Premier Tech. One team driven by a shared passion to deliver solutions that will better the lives of people, businesses and communities.

At Premier Tech, People and Technologies connect in lasting, transformative ways, giving life to products and services that help feed, protect and improve our world.

We are committed to creating sustainable solutions that help bring beautiful gardens to life, increase crop yields, improve the efficiency of manufacturing facilities, treat and recycle water, and much more as we keep innovating.

We are Premier Tech

PEOPLE AND TECHNOLOGIES MAKING A DIFFERENCE

95 years OF PASSION

DRIVING CHANGES TO MAKE A DIFFERENCE

IN 5 BUSINESSES

HORTICULTURE AND AGRICULTURE
HOME AND GARDEN
WATER AND ENVIRONMENT
SYSTEMS AND AUTOMATION
DIGITAL

OUR BRANDS

AGTIV

PRO-MIX

wilson

C·I·L

ALASKAN

CHRONOS

Ecoflo®

Ecoprocess™

OUR DESIRE TO INNOVATE IS DRIVEN BY THE TECHNOLOGIES WE MASTER

At Premier Tech, innovation is in everything we do. Every day, we invest the time and energy necessary to master the science and technology behind the products we offer. This knowledge allows us to connect our technologies with real market needs, creating products that are relevant today — and for years to come.

Here, we not only seek to create new products, we redefine the very process of innovation to deliver upon our ambitions. It's no longer only about delivering transformative solutions, it's about pushing our technologies forward to bring meaningful solutions to life. Ones that can truly make a difference for our clients.

PREMIERTECH.COM

INNOVATION

AN INTEGRAL PART OF PREMIER TECH COLLECTIVE DNA

At Premier Tech, Innovation goes beyond the concept of research and development. More than a process leading to the creation of new products, it is a **state of mind that is strongly embedded in our corporate DNA**. Always seeking to **create unique and addictive experiences** for our clients, we simply never cease to push the boundaries of our abilities, competencies and technological platforms.

Creativity is a mix of knowledge, expertise and passion for unprecedented efficient solutions. Innovation, Research & Development and biological active ingredients have combined forces to put commercial offers to the agricultural market.

We first structured our Innovation efforts and approach back in 1983, driven by the ambition of developing value-added products derived from peat moss through technological advances. Today, **more than 260 Premier Tech team members** are devoted full-time to mastering the technologies behind the next leading-edge solutions that will make a difference to our clients, helping them stand out in their marketplaces.

Driven by a collective Culture and rooted in Values which revolve around our tradition of Innovation, the entire Premier Tech team holds a restless ambition to shake up the status quo and shift industry paradigms. Through the current innovation program IPSO: Innovation in Products-Processes, Services and commercial Offers, we are **constantly challenging the way we do business and how we can improve everything we do**.

This mindset is key to how we operate on a daily basis. Contributing to the loyalty of our clients around the world, it sets the ground rules for how collaborating with Premier Tech turns out to be a contagious experience they are willing to share with others.

We deeply believe that in order to continue to be sustainable and grow our market share, it is essential to never let our innovative spirit rest — to keep pushing forward and eliminate any barriers on the path to bringing new technologies, products and services to life in the marketplace. With the agility to truly make a difference by tapping into our full potential, **we make a difference for our clients' profitability**, and ultimately ensure our continued relevance as a strategic partner.

CELEBRATING DECADES OF

35 years OF EXPERTISE IN ACTIVE INGREDIENTS

Established manufacturer and marketer, Premier Tech builds on innovation and collaboration with local partners and growers to offer reliable high-quality inoculants. Every day, in our labs, facilities, and in the field, highly experienced scientists, engineers, and specialists from various domains collaborate to maximize the outcomes of research and turn them into effective products making a difference on your bottom line.

PTAGTIV.COM/**en/expertise**

PRODUCTION

In 2000, Premier Tech set up a world-first endomycorrhizal inoculum plant, developing a new mycoreactor process for industrial scale production. Backed by more than 35 years of expertise in active ingredients, Premier Tech constantly develops and innovates in terms of production of MYCORRHIZAE, RHIZOBIUM, BACILLUS, SERENDIPITA and other active ingredients:

- **No contamination through a strictly controlled and aseptic environment**
- **Large-scale manufacturing production**
- **Adapted quality control for each step of the production processes, ensuring consistent high-quality inoculum**

INNOVATION AND VALUE

FORMULATION

Premier Tech's know-how makes it possible to adapt formulations with multiple active ingredients, concentrations and carriers tailored to different crops and application methods. Because a quality inoculant makes all the difference, our proven formulations are based on these important elements:

- **Carrier compatible with the active ingredients**
- **Formulations that guarantee active ingredient viability until use**
- **Quality control at several key points ensuring the performance of active ingredients**
- **Various formulations also tailored for organic production**

APPLICATION

Caring about our clients' performance, each recommendation for product use takes into consideration validation by our field experts and by farmers themselves, which ensures:

- **Effective application rates, at the right time and place, with the right inoculant**
- **Products adapted to growers' equipment**
- **Easy integration into farming practices**
- **Validation of compatibility with other agricultural inputs**

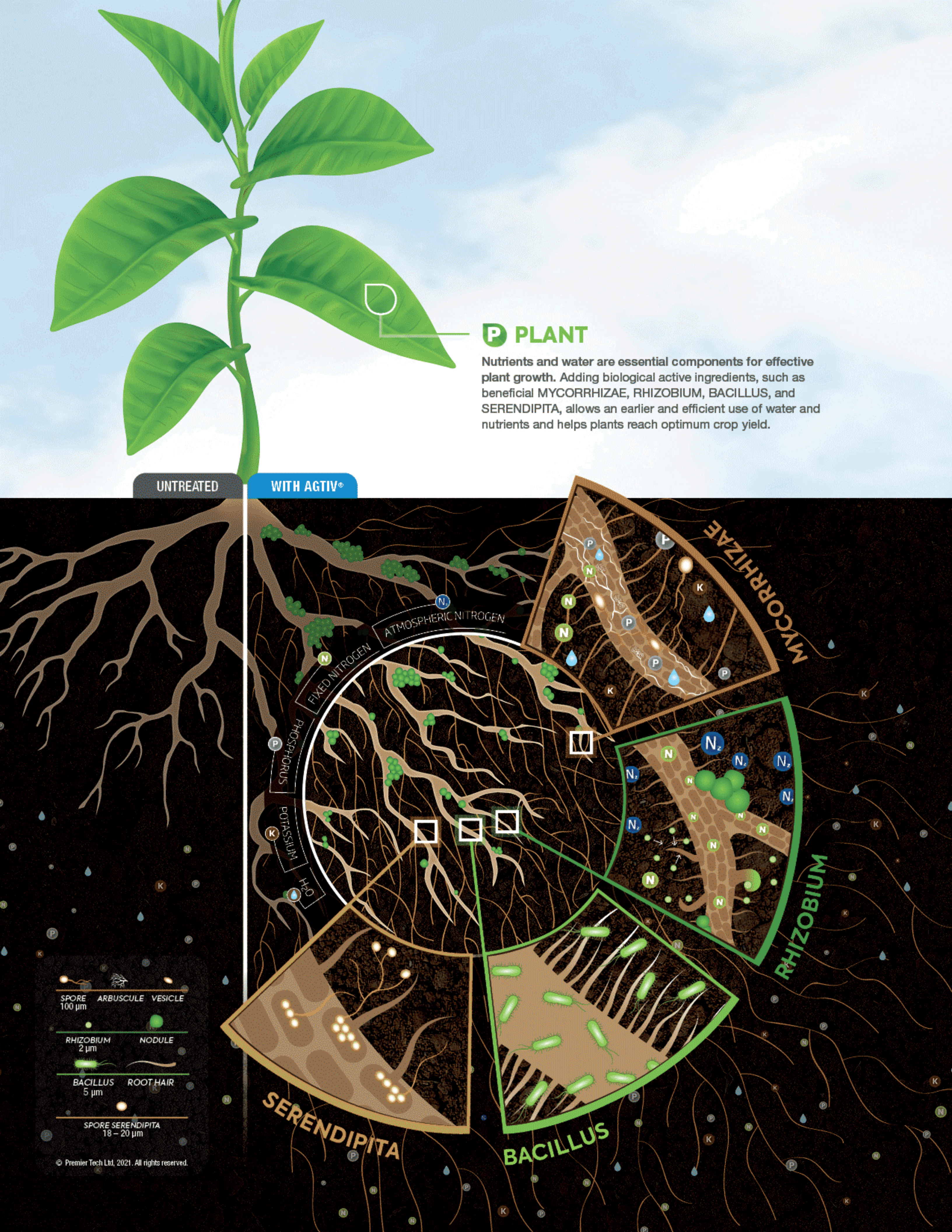
SERVICE

The AGTIV® experience combines highly effective value-added products and the access to a team of field experts dedicated to supporting your growth. From our management team and research project managers to our field specialists, our multidisciplinary team is listening to growers' needs to continuously improve our products and level of service:

- **Technical support for product application, equipment compatibility and field demonstration**
- **Proud promoter of science education and knowledge sharing**
- **Partnership with agriculture retailers throughout Canada, the United States and Europe**

PLANT

Nutrients and water are essential components for effective plant growth. Adding biological active ingredients, such as beneficial MYCORRHIZAE, RHIZOBIUM, BACILLUS, and SERENDIPITA, allows an earlier and efficient use of water and nutrients and helps plants reach optimum crop yield.



BIOLOGICAL ACTIVE INGREDIENTS

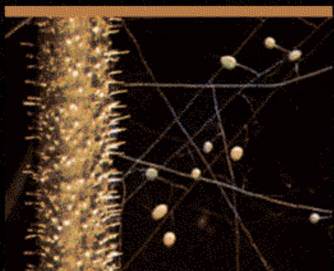
Backed by more than 35 years of expertise in biological active ingredients, Premier Tech masters a unique large-scale manufacturing process that meets the highest quality control standards, allowing you to fully benefit from the highly effective inoculants of our AGTIV® agricultural product line. For stronger growth through better plant resistance to stresses, **higher yields** and superior **crop quality**, you can count on AGTIV®.

M — MYCORRHIZAE

PTB297 Technology, *Glomus intraradices*

Mycorrhizae are beneficial associations between a mycorrhizal fungus and roots. The mycorrhizal spores germinate in the soil and produce filaments (hyphae) which will enter into root cells. This association will allow the formation of an intra and extra-radical network of filaments that will explore the soil and access more nutrients and water, and transfer them to the plant.

- EXPAND ROOT SYSTEM GROWTH
- ENHANCE NUTRIENT & WATER UPTAKE
- INCREASE TOLERANCE TO STRESSES
- IMPROVE SOIL STRUCTURE



R — RHIZOBIUM

PTB160 Technology (pulses), *Rhizobium leguminosarum* biovar *viciae*

PTB162 Technology (soybean), *Bradyrhizobium japonicum* *Mesorhizobium ciceri* (chickpea)

Rhizobium bacteria live and thrive in symbiosis in root nodules produced by the plant. They are responsible for fixing the atmospheric nitrogen and making it available for the plant.

- FIX NITROGEN & MAKE IT AVAILABLE TO THE PLANT

B — BACILLUS

PTB180 Technology, *Bacillus pumilus*

Bacillus stimulates the plant root system by inducing the proliferation of the root hairs, which favors the absorption of the nutrients. We have selected it for its beneficial action of growth stimulation.

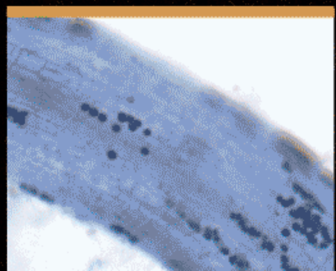
- INCREASES NUMBER OF ROOT HAIRS FOR A BETTER NUTRIENTS' ABSORPTION
- ACCELERATES SEED GERMINATION
- INCREASES PLANT GROWTH

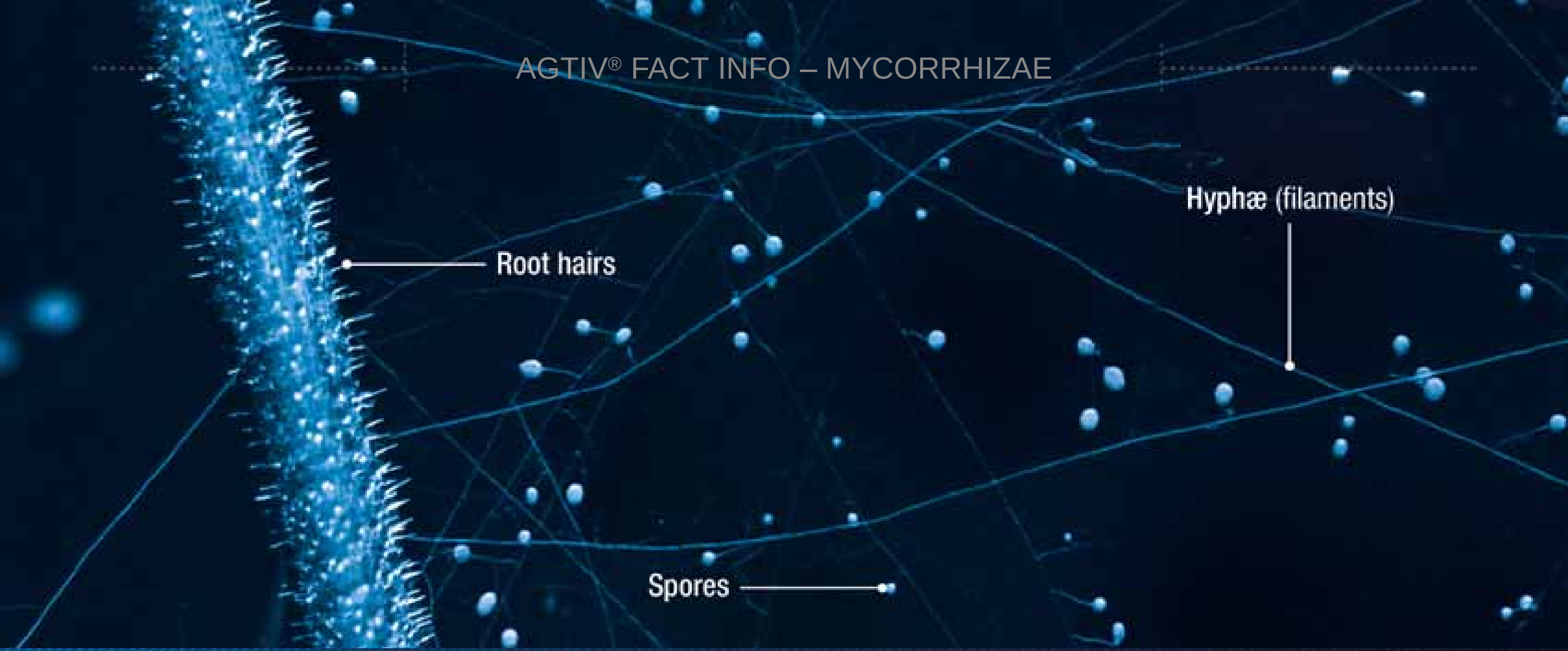
S — SERENDIPITA

PTB299 Technology, *Serendipita indica* (formerly known as *Piriformospora indica)*

The beneficial fungus *Serendipita indica*, a natural microorganism, forms an association with roots of plants from the Brassicacea family, such as canola. It induces some of the plant gene expression and promotes phytohormone production.

- PROMOTES EARLY SEED GERMINATION
- INCREASES CHLOROPHYLL CONTENT
- BETTER PLANT ESTABLISHMENT, GROWTH AND YIELD





MYCORRHIZAE

EFFICACY – VERSATILITY – COLLABORATION

Why use Premier Tech's mycorrhizae?

Mycorrhizal fungi have existed since the first plants appeared on dry land more than 450 million years ago. AM (Arbuscular Mycorrhizae) symbiosis applies to over 80% of all plants and plays a major role in plant nutrition and productivity. "Over the last 35 years, numerous scientific studies have clearly highlighted the fundamental role that mycorrhizal fungi play in natural eco-systems, and in those managed by man." [A]

How does the technology work? Mycorrhizae develop a network that explores the soil and accesses more nutrients and water to transfer to the plant. The beneficial alliance between mycorrhizal fungi and roots accelerates root development and stimulates plant growth.

Absorption capacity

Premier Tech's mycorrhizal technology makes P more available in the soil, and actively absorbs and transfers it via its filament network (hyphae) directly to the root. The filaments in the soil also have the ability to absorb water and elements such as Cu, Zn, B, Fe, Mn which are important in nodule formation and grain filling.

Mycorrhizae have been shown to improve soil structure by releasing a "biological glue" called glomalin and to increase the presence of other beneficial micro-organisms in the root environment.

"Although mycorrhizal fungi do not fix nitrogen, they transfer energy, in the form of liquid carbon to associative nitrogen fixers." [B]

"Mycorrhiza deliver sunlight energy packaged as liquid carbon to a vast array of soil microbes involved in plant nutrition and disease suppression." [C]

"The absorptive area of mycorrhizal hyphae is approximately 10 times more efficient than that of root hairs and about 100 times more efficient than that of roots." [D]

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Efficient P uptake and transfer

Thonar et al. (2010)[E] compared three species of AMF and observed "*Glomus intraradices*, *Glomus claroideum* and *Gigaspora margarita* were able to take up and deliver P to the plants from maximal distances of 10, 6 and 1 cm from the roots, respectively. *Glomus intraradices* most rapidly colonized the available substrate and transported significant amounts of P towards the roots."

Cavagnaro et al. (2005)[F] found that "*Glomus intraradices* was found to be one of the arbuscular mycorrhizal fungi that was able to control nutrient uptake amounts by individual hyphae depending on differing phosphorus levels in the surrounding soils."

Collaborating Species

The mycorrhizal species used in Premier Tech products (*Glomus intraradices*) is among the most 'collaborative' species in various articles.

"According to the article by Kiers et al. (2011)[G], it has been shown that the different species of mycorrhizae are not equally effective when it comes to transferring nutrients from the soil to the plant. Under controlled conditions, certain species of mycorrhizae have been shown to be more 'cooperative' and to transfer most of the phosphorus absorbed from the soil to the root, while other mycorrhizae species use it or store it as reserve.

"[…] Moreover, when host plants were colonized with three AM fungal species, the RNA of the cooperative species (*G. intraradices*) was again significantly more present than that of the two less-cooperative species (*G. aggregatum* and *G. custos*)" [B]. "This illustrates key differences in fungal strategies, with *G. intraradices* being a 'collaborator' and *G. aggregatum* a less-cooperative 'hoarder'." [G]

Glomus intraradices' versatility in different conditions

There are more than 200 species of AMF (Arbuscular Mycorrhizae Fungi) and Premier Tech offers a versatile species. Selected more than 35 years ago, it has been tested continuously under various conditions and has performed well in a range of soil pH from 5.2 to 8.1.

"*G. intraradices* has turned out to be a "great fungus" in several surveys, and field trials so far has shown it to be equal or superior to mixtures of other fungi." [H]

Indigenous Populations

Some articles demonstrate that mycorrhizal populations in agricultural soils are highly heterogeneous or not sufficient to have the desired beneficial effect.

A survey conducted by Hamel et al. (2008)[I] reported low biodiversity and occurrence of AM fungi in cultivated soils of Saskatchewan. The survey was conducted for 3 years. Dai, M. et al. (2013)[J] noticed that the relative abundance as well as diversity of AM fungal communities is lower in cropland soils of the prairies compared to the roadsides environments which favors diversity.

The recommendation of Premier Tech, approved by Agriculture Canada, to add a mycorrhizal inoculant at the time of seeding stands on 4 points:

- ✓ **The right mycorrhizae for the plant**
  at least 80% of plants can be colonized with *Glomus intraradices*, a collaborative species
- ✓ **Available in the right place**
  on or close to the seed in order to trigger the symbiosis quickly
- ✓ **In the right quantity**
  the proven and registered mycorrhizal rate
- ✓ **At the right time**
  at seeding time to trigger the symbiosis quickly after seed germination

Quick colonizer

It has been shown that plants favour certain species according to their effectiveness.

"We show that order of arrival can influence the abundance of AMF species colonizing a host. These priority effect can have important implications for AMF ecology and the use of fungal inoculant in sustainable agriculture." [K]

Duan et al. (2011)[L] using our *Glomus intraradices* isolate (DAOM181602) with *G. margarita* (WFVAM 21), wrote "Furthermore, *G. margarita* developed slowly compared with G. intraradices when they were inoculated separately and it seems likely that the latter fungus dominated the symbiosis with medic when both fungi were inoculated together." He adds "The positive effect of *G. intraradices* was probably enhanced by its ability to colonize quickly and it may well have contributed a much larger fraction of fungal biomass than *G. margarita*, when both were inoculated together". In conclusion, he writes "When inoculated together *G. intraradices* may have dominated the activity of symbiosis, both in terms of rapidity of early colonization and functionality, including tolerance to disturbance."

Drought resistance

Mycorrhizae increase tolerance to various environmental stresses (diseases, drought, compaction, salinity, etc.), and play a major role in the soil particle aggregation process and contribute to improving soil structure which leads to better water penetration, better aeration, less erosion and leaching.

Benjamin Jayne and Martin Quigley of the University of Denver mentioned that "[…] our meta-analysis reveals a quantifiable corroboration of the commonly held view that, under water-deficit conditions, plants colonized by mycorrhizal fungi have better growth and reproductive response than those that are not." [K] "Most measures of growth are augmented by the symbiosis when plants are subjected to water stress; […]." [M]

It has been found that plants with AMF association display greater hydraulic conductivity in roots and reduced transpiration rate under drought stress. This may be due to their capacity to regulate their ABA levels (abscisic acid – a plant hormone) better and faster than non-AM plants. This establishes a greater balance between leaf transpiration and root water movement in drought situations and drought recovery.[N]

A. Fortin J. A, 2009. Mycorrhizae The new green revolution. Ed. MultiMondes. pp.140.
B. Jones, C. E. 2009. Mycorrhizal fungi -powerhouse of the soil. Evergreen Farming 8:4-5.
C. Jones, C. E. 2014. Nitrogen: the double-edge sword. Amazing Carbon. pp. 8.
D. Jones, C. E. 2009. *loc. cit*.
E. Thonar, C. et al. 2011. Traits related to differences in function among three arbuscular mycorrhizal fungi. Plant Soil. 339: 231 – 245.
F. Cavagnaro, T et al. 2005. Functional diversity in arbuscular mycorrhizas: exploitation of soil patches with different phosphate enrichment differs among fungal species. Plant, Cell and Environment 28: 642 – 650.
G. Kiers et al. 2011. Reciprocal Rewards Stabilize Cooperation in the Mycorrhizal Symbiosis. Science 333:80-882.
H. Trivedi et al. 2007. Organic farming and mycorrhizae in agriculture.I.K. International Publishing House Ltd. New Delhi, pp.290.
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J. Dai, M. et al. 2013. Impact of Land Use on Arbuscular Mycorrhizal Fungal Communities in Rural Canada. Applied and Environmental Microbiology 79 (21):6719-6729.
K. Gisjbert et al. 2014. Order of arrival structures arbuscular mycorrhizal colonization of plants. New Phytologist. pp. 10.
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M. Jayne B., Quigley M. 2013. Influence of arbuscular mycorrhiza on growth and reproductive response of plants under water deficit: a meta-analysis. Mycorrhiza 2014. 24:109-119.
N. Aroca et al. 2008. Mycorrhizal and non-mycorrhizal Lactuca sativa plants exhibit contrasting responses to exogenous ABA during drought stress and recovery. Journal of Experimental Botany, Vol. 59, No. 8, pp. 2029-2041. In: Raviv M. 2010. The use of mycorrhiza in organically-grown crops under semi arid conditions: a review of benefits, constraints and future challenges. Symbiosis 2010. 52-65-74.

RHIZOBIUM

FERTILITY – PRODUCTIVITY – COLLABORATION

Why is rhizobium important?

Peas, lentils and soybeans play a big role in a crop rotation by promoting nitrogen fixation (the conversion of nitrogen gas to plant-available ammonium) and returning some nitrogen to the soil. However, these crops can't take all the credit: because it's only possible thanks to a symbiotic relationship between select legumes and rhizobium bacteria.

These bacteria can't fix nitrogen on their own. To do so, they need to colonize the root of a host plant. As in all symbiotic relationships, both the rhizobium and the pulse or soybean plant get something of value from the relationship. For the legume, it is a readily available form of nitrogen (ammonium) as well as important amino acids. The rhizobium get three things in return:

1. **A Home** – the bacteria inhabit the nodules formed by the plant
2. **Food / energy** – provided in the form carbohydrates (heterotrophic bacteria cannot create their own food through photosynthesis)
3. **Oxygen** – which is necessary for respiration

Roots of the rhizobium relationship

Approximately 20%[A] of all legumes form mutualistic relationships with rhizobium. Soybean, peas, clover, lentils and faba beans are among them. Interestingly, Rhizobium species are very plant specific. Pulses form relationships with a rhizobium called *Rhizobium leguminosarum*, while soybeans engage with another member of the family called *Bradyrhizobium japonicum*.

When a rhizobium and a host legume are present, the plant makes the rhizobium aware of its presence by sending out a chemical signal (via flavonoids and isoflavonoids) from the root. This attracts the rhizobium bacteria, which responds by sending out signals of its own, known as Nod factors.[B]

How does the technology work? Rhizobium are a bacteria that live and thrive in symbiosis in root nodules produced by the plant. These nodules house the bacteria responsible for fixing the atmospheric nitrogen and makes it available for the plant.

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Nodule formation & nitrogen fixation

The bacteria start the "invasion process" by penetrating the root-hair wall and enter the plant cells. This primes a gene within the plant that initiates the root nodulation. Within these nodules, the rhizobium differentiate into a non-motile form, which go to work fixing the raw atmospheric nitrogen (N_2) into plant accessible ammonium. They achieve this by producing nitrogenase enzyme, which starts the conversion process, consuming a great deal of energy. Maximum N-fixation is reached when the plant is sufficiently nodulated.

Ammonium absorption / exchange of services

After the nodule formation, the plant converts the ammonium into amino acids which are exported throughout the plant. At this point, the plant releases the simple sugars and O_2 to the rhizobium bacteria, fulfilling its end of the bargain.

This last step is important, as the presence of free oxygen can stop nitrogen fixation, preventing ammonium (NH_3) synthesis and transfer to the plant. Fortunately, the rhizobium take the oxygen and bind it using a protein called leghemoglobin (was first discovered in legumes and is very similar to the hemoglobin found in human blood). Like blood, leghemoglobins appear red in the nodules, due to the presence of iron molecules.

Legume plants are known to have a lower phosphorus use efficiency. This is a problem, because the process of nitrogen fixation is very energy-intensive for pulse and soybean plants. For this reason, they consume more phosphorus (P) than other plants.

The increased demand can be alleviated thanks to another symbiotic association, the mycorrhizal symbiosis. Mycorrhizae are symbiotic fungi that colonize the roots of most plants, and dramatically improve the plant's ability to absorb phosphorus. The plant will photosynthesize 51%[C] more and grow faster, and the rhizobium will fix more nitrogen if more phosphorus is available. For this reason, having a healthy mycorrhizal association is of particular benefit to pulses and soybeans.

What modulates / influences nodulation?

- Successful infection depends on the competitiveness, specificity, infectivity and effectiveness of the rhizobia.[D]
- Infection rate & effectiveness of rhizobia are influenced by soil low N status and is a necessary requisite to trigger symbiosis.[E]
- Successful infection requires the bacteria to actively colonize root-hair tips (motility) and reach the Quorum sensing of the rhizobium.[F]
- N fixation relies on a cascade of effector molecules – events in multi-steps series of reactions and depend on effector availability, concentration and localization, synchronization, host specificity and environmental factors.

A. Sprent, J. I., 2007. Evolving ideas of legume evolution and diversity: A taxonomic perspective on the occurrence of nodulation. New Phytol. 174:11-25.
B. Giller, K. E., 2001. Nitrogen Fixation in Tropical Cropping Systems 2nd ed. CABI.
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D. Peix A et al. 2010. Key Molecules Involved in Beneficial Infection Process in Rhizobia–Legume Symbiosis. In: Microbes for Legume Improvement, Chapter 3:55-80.
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THE TRIPARTITE SYMBIOSIS

HELPS YOU GET BIGGER YIELD

How can the tripartite symbiosis improve crop productivity?

Each phase of the plant growth requires a lot of nutrients and energy to obtain higher yield. *" […] the tripartite interactions between legumes, AMF* [Arbuscular Mycorrhizal Fungi] *and rhizobia cause increases in legume productivity, and the N:P:C supply ratio as influenced by the tripartite symbiotic associations plays a fundamental role in controlling the legume's photosynthetic rate and biomass productivity."* [A]

How do the technologies work? Mycorrhizae develop a network that explores the soil and accesses more nutrients and water to transfer to the plant; rhizobium fixes nitrogen and makes it available to the plant. By working together, they influence positively the plant for increased yield.

A Koele et al. 2014. VFRC Report 2014/1, pp. 1-57.
B Kaschuk et al. 2009. Soil Biol. Biochem. 41:1233-1244.
C Shinde et al. 2016. Int. J. Bioassays. 5:4954-4957.

Help feed the plant

N and P are major nutrients for the plant. *"Tripartite associations of host plants with both rhizobia and AMF* [Arbuscular Mycorrhizal Fungi] *benefit the host plant by increased P uptake through the mycorrhizal association balancing the high input of N through rhizobial N-fixation."* [A] In addition, mycorrhizae reach more water and nutrients needed by legumes such as B, Ca, Cu, Fe, K, Mn, Mo and Zn, key components for energy production.

Higher photosynthesis

When used in combination, mycorrhizae and rhizobium increase the photosynthetic rate by 51%[B]. *"The rate of photosynthesis increased substantially more than the C* [Carbon] *costs of the rhizobial and AM* [Arbuscular Mycorrhizal] *symbioses."* [B] The total increased sugar production by the plant far outweighs the cost to "house" the partners.

Better productivity

Better nutrient use efficiency and bigger biomass result in higher yield from each legume plant (harvest index). For example, "[…] *it has been found that pea plants coinoculated with Rhizobium leguminosarum and AMF* [Arbuscular Mycorrhizal Fungi] *has shown best results regarding plant height, plant dry mass, nodule fresh weight, number of seeds, seed weight, seed yield, number of root nodules, number of pods per plant, average pod weight and pod length* […]". [C]

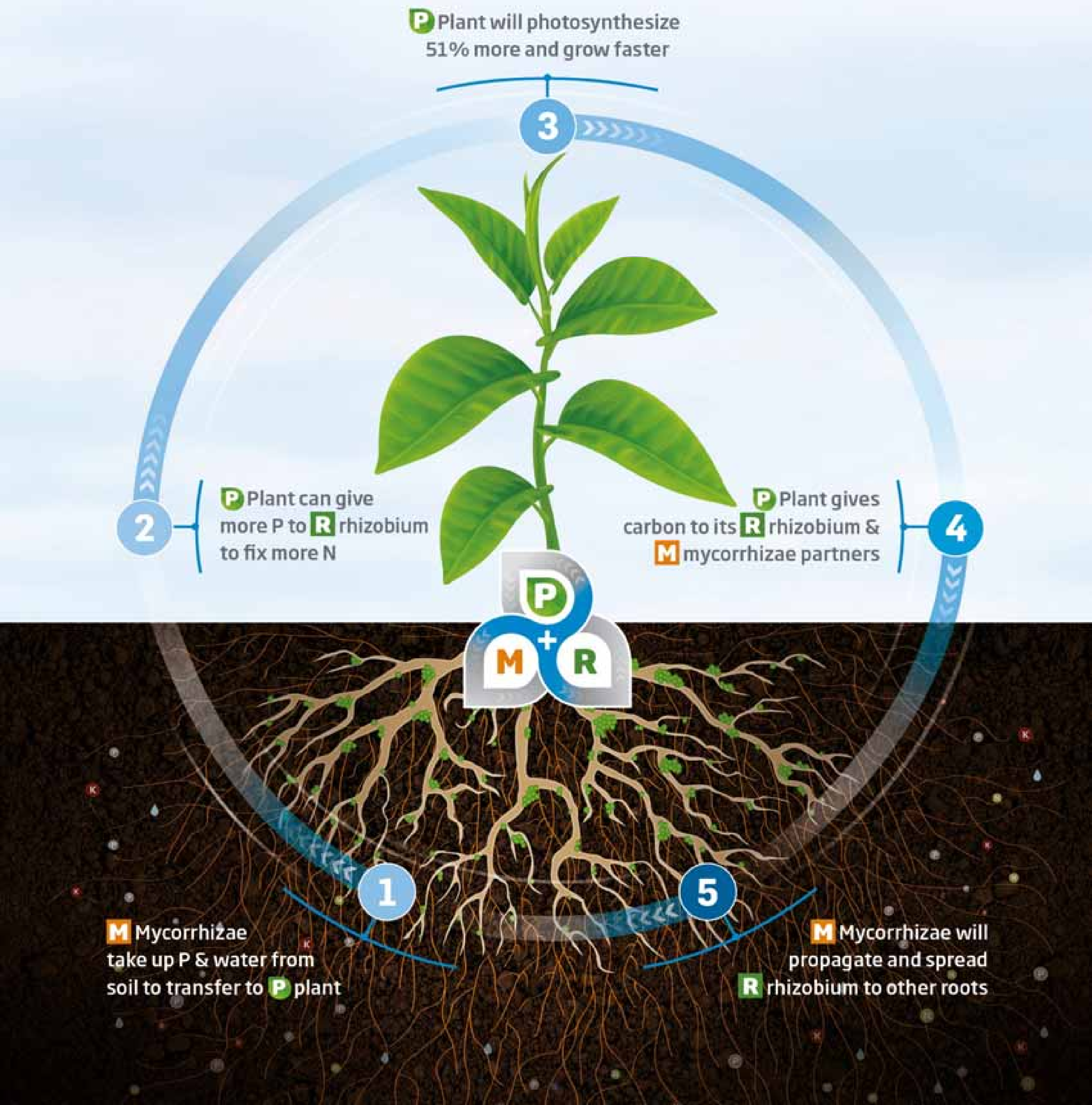
PREMIER TECH

PTAGTIV.COM/en/tripartite

TRIPARTITE SYMBIOSIS

BIOLOGICAL INTERACTIONS BETWEEN MYCORRHIZAE, RHIZOBIUM AND PLANTS

By enhancing root system growth and creating a network of filaments, mycorrhizae help plants to uptake more nutrients, such as phosphorus, and increase the nodulation process for the rhizobium.



THE CANOLA ROTATION INOCULANT

HELPS YOU COUNTER REDUCED YIELD AFTER CANOLA

What affects your soil biology?

Many crop practices (tillage, fallow land, flooding and crop rotation) contribute to decreasing the beneficial biology, such as mycorrhizal fungi population, in your agricultural soils. For example, it is well known that crops following *Brassicaceae* plants (canola and mustard), in a rotation generally tend to demonstrate reduced yield, compared to results when seeded after another crop. It can largely be explained by the relationship (or lack of relationship) between *Brassicaceae* and beneficial microorganisms, such as mycorrhizae[A]. Canola roots exude a toxic compound that reduces populations of those beneficial microorganisms in the soil. Furthermore, the "absence of a mycorrhizal host plant during the fallow period decreases mycorrhizal colonization potential for the succeeding crop and results in P deficiency symptoms in plants that are mycorrhizal dependent, such as corn, soybean, sunflower, and cotton." [B]

A. Gavito, M. E., Miller M. H., 1998. Changes in mycorrhizal development in maize induced by crop management practices. Plant Soil. 198: 185-192.

B. Ellis, J. R., 1998. Plant Nutrition. Post Flood Syndrome and Vesicular-Arbuscular Mycorrhizal Fungi. J. Prod. Agric., Vol. 11, no.2: 200-204.

C. Bagyaraj, D. J. et al. 2015. Phosphorus nutrition of crops through arbuscular mycorrhizal fungi. Current Science, Vol. 108, no. 7: 1288-1293.

D. Jones, C. E. 2009. Mycorrhizal fungi - powerhouse of the soil. Evergreen Farming 8:4-5.

E. Grant, C. A. et al. 2001. The importance of early season phosphorus nutrition. Canadian Journal of Plant Science. 211-224.

Reach more nutrients and water

Sufficient nutrient and water uptake is critical for effective plant growth and ultimately to maximize your yield potential, especially for low mobility nutrients such as P and Zn.[C] By adding a mycorrhizal inoculant, the plant develops a secondary root system (mycorrhizal hyphae) allowing it a larger soil contact surface and thus better to access to nutrients and water. "The absorptive area of mycorrhizal hyphae is approximately 10 times more efficient than that of root hairs and about 100 times more efficient than that of roots." [D]

Ensure early P uptake

"Phosphorus plays a critical role in energy reactions in the plant [such as photosynthesis. Phosphorus is also a key component in building blocs for plant.] Deficits can influence essentially all energy requiring processes in plant metabolism. Phosphorus stress early in the growing season can restrict crop growth, which can carry through to reduce final crop yield." [E] Mycorrhizae make soil phosphorus (P) more available to the plant, and actively absorb and transfer it via the mycorrhizal filament network (hyphae) directly to the root.

Increase your yield potential

By introducing mycorrhizal inoculant close to the seed at seeding, you get the association working early with the full benefits of increased nutrient and water uptake when plants need them. Therefore, get more out of the fertilizer you have already invested into the crop.

PREMIER TECH

PTAGTIV.COM/en/canola

AGTIV® highly effective inoculants make a difference in the field by pushing crops' yield potential and increasing growers' net returns. Lead the way with Premier Tech's expertise for AGTIVated acres.

Product	Active ingredient		Organic	Application mode: Granular in-furrow	Application mode: Mixing with seeds	Application mode: Liquid in-furrow	Application mode: Liquid on seed	Formulation
PULSES (peas, lentils & faba beans)								
AGTIV® PULSES • Powder **F:** Powder (peat) **S:** 4.7 kg (10.3 lb) pail **C:** Peas & faba beans: **16 ha (40 acres)** – Lentils: **24 ha (60 acres)**	M	R	✓		●			
AGTIV® PULSES • Granular **F:** Granules (peat) **S:** 18.2 kg (40 lb) bag – 364 kg (800 lb) tote bag **C:** Peas, lentils & faba beans: Bag: **4 ha (10 acres)** – Tote bag: **80 ha (200 acres)**	M	R	✓	●				
AGTIV® RHIZO • Granular for PULSES **F:** Granules (peat) **S:** 18.2 kg (40 lb) bag – 364 kg (800 lb) tote bag **C:** Peas, lentils & faba beans: Bag: **4 ha (10 acres)** – Tote bag: **80 ha (200 acres)**		R	✓	●				
AGTIV® RHIZO • Liquid for PULSES **F:** Liquid **S:** 8 L (8 kg) bag-in-box **C:** Peas, lentils & faba beans: **32 ha (80 acres)** or **6530 kg of seeds (240 bu)**	C	R	✓			●	●	
AGTIV® ON SEED™ — RHIZO • Powder for PULSES **F:** Powder (peat) **S:** 4.7 kg (10.3 lb) pail **C:** Peas & faba beans: **16 ha (40 acres)** – Lentils: **24 ha (60 acres)**		R	✓		●			
SOYBEAN								
AGTIV® SOYBEAN • Powder **F:** Powder (peat) **S:** 4.7 kg (10.3 lb) pail **C:** Soybean: **16 ha (40 acres)**	M	R	✓		●			
AGTIV® SOYBEAN • Granular **F:** Granules (peat) **S:** 18.2 kg (40 lb) bag – 364 kg (800 lb) tote bag **C:** Soybean: Bag: **4 ha (10 acres)** – Tote bag: **80 ha (200 acres)**	M	R	*	●				
AGTIV® BRADY • Granular for SOYBEAN **F:** Granules (peat) **S:** 18.2 kg (40 lb) bag – 364 kg (800 lb) tote bag **C:** Soybean: Bag: **4 ha (10 acres)** – Tote bag: **80 ha (200 acres)**		R	*	●				
AGTIV® BRADY • Liquid for SOYBEAN **F:** Liquid **S:** 8 L (8 kg) bag-in-box **C:** Soybean: **16 ha (40 acres)** or **5680 kg of seeds (250 units)**	C	R	✓			●	●	
N **AGTIV® BB COMBO** • Liquid for SOYBEAN **F:** Liquid **S:** 8 L (8 kg) (*Bradyrhizobium*) bag-in-box - 300 ml (*Bacillus*) bottle **C:** Soybean: **16 ha (40 acres)** or **5680 kg of seeds (250 units)**	B	R	✓			●	●	
CANOLA								
N **AGTIV® IGNITE • L** for Brassicaceae **F:** Liquid **S:** 11 L (11 kg) bag-in-box **C:** Canola: **454 kg (1000 lb) of seeds**	S						●	
CHICKPEA								
AGTIV® CHICKPEA • Powder **F:** Powder (peat) **S:** 4.7 kg (10.3 lb) pail **C:** Chickpea: **16 ha (40 acres)**	M	R	✓		●			
AGTIV® CHICKPEA • Granular **F:** Granules (peat) **S:** 18.2 kg (40 lb) bag – 364 kg (800 lb) tote bag **C:** Chickpea: Bag: **3.2 ha (8 acres)** – Tote bag: **64 ha (160 acres)**	M	R	✓	●				
FORAGES								
AGTIV® FORAGES • Powder **F:** Powder (diatomaceous earth) **S:** 1.6 kg (3.5 lb) pail **C:** Alfalfa, mix forages & grass: **8 ha (20 acres)**	M		*		●			

PTAGTIV.COM/**en/products**

	Active ingredient		Organic	Application mode: In-furrow	Seed-piece treatment at the warehouse	Mixing with seeds	Incorporation into growing media	Transplanting	Seed treatment	Formulation
FIELD CROPS (dry beans, cereals & flax)										
AGTIV® FIELD CROPS – O • Powder **F:** Powder (peat) **S:** Case of 4 x 800 g (4 x 1.75 lb) pails **C:** Dry beans, cereals & flax: **32 ha (80 acres)** per case Alfalfa, mix forages & grass: **16 ha (40 acres)** per case	M		✓			●				
AGTIV® FIELD CROPS • Powder **F:** Powder (diatomaceous earth) **S:** 2 kg (4.4 lb) pail **C:** Dry beans, cereals & flax: **16 ha (40 acres)**	M		*			●				
AGTIV® FIELD CROPS • Granular **F:** Granules (zeolite) **S:** 18.2 kg (40 lb) bag – 364 kg (800 lb) tote bag **C:** Dry beans, cereals & flax: Bag: **3.2 ha (8 acres)** – Tote bag: **64 ha (160 acres)**	M		✓	●						
AGTIV® FIELD CROPS • Liquid **F:** Liquid (spores in suspension) **S:** Case of 2 x 950 ml (2 x 32 fl. oz) bottles **C:** Beans, cereals & flax: **16 ha (40 acres)** per case	M	C	✓	●						
POTATO										
AGTIV® POTATO • Liquid **F:** Liquid (spores in suspension) **S:** Case of 2 x 950 ml (2 x 32 fl. oz) bottles **C:** Potato: **8 ha (20 acres)** per case	M		✓	●	●					
GREEN PEAS										
AGTIV® SPECIALTY CROPS — PEA • Powder **F:** Powder (peat) **S:** 2.4 kg (5.3 lb) pail **C:** Green peas: **8 ha (20 acres)**	M	R	✓			●				
SPECIALTY CROPS										
AGTIV® SPECIALTY CROPS • Powder **F:** Powder (diatomaceous earth) **S:** Case of 4 x 500 g (4 x 1.1 lb) pails **C:** Vegetables, berries & garlic	M		**			●	●	●		
AGTIV® SPECIALTY CROPS • Granular **F:** Granules (peat) **S:** 10 kg (22 lb) pail **C:** Vegetables, herbs, berries & fruit trees	M		✓	●			●	●		
AGTIV® ON SEED™ **F:** Treated seeds **C:** Vegetables and fruits Ask your representative for more details.	M	B	*						●	

See last page for complete product recommendations.

F: Formulation
S: Size
C: Crop/Coverage

ACTIVE INGREDIENTS:

- **M MYCORRHIZAE** – PTB297 Technology
- **R RHIZOBIUM** – PTB160 Technology (pulses), PTB162 Technology (soybean), *Mesorhizobium ciceri* (chickpea)
- **B BACILLUS** – PTB180 Technology
- **S SERENDIPITA** – PTB299 Technology (Brassicaceae)

N New product

C Combo available

● Eligible with AGTIV® Extender

ORGANIC:

✓ For organic use

* Non eligible for organic use. Contact us for more details.

GET THE INFO YOU NEED AT PTAGTIV.COM

TOOLS

Premier Tech offers technical support for product application, field demonstration, equipment and input compatibility, and promotes educational agronomic knowledge.

- NEW ON SEED™ packages for Pulses, Soybean and Canola
- Labels, SDS, organic certificates
- Application videos, charts and rate calculators

PTAGTIV.COM**/en/toolbox**

- Pesticide compatibility lists
- Liquid fertilizer compatibility lists

PTAGTIV.COM**/en/compatibility**

- Efficacy report
- Field observations

PTAGTIV.COM**/en/results**

- Agronomic articles
- Case studies

PTAGTIV.COM**/en/blog**

EQUIPMENT & PROGRAMS

To ensure performance through efficient and precise application of its inoculants, Premier Tech recommends the use of approved equipment, supported by pay-back programs on selected AGTIV® products.

LIQUID

EQUIPMENT PROGRAM

The **AGTIV® Liquid Injection Kit**, integrating a Dosatron® Injection System, is easy to install on your existing in-furrow application system, it operates off the main solution flow for precise application of AGTIV® liquid products.

RETAILER FRIDGE PROGRAM

Premier Tech recommends to its retailer network the purchase of a fridge that can effectively store AGTIV® liquid products. Contact your representative to learn more.

PTAGTIV.COM**/en/program**

POWDER

Premier Tech has a list of recommended applicators to use with AGTIV® powder products. Ask your representative to learn more about the applicators and the pay-back program offered.

PTAGTIV.COM**/en/blog**

AVERAGE YIELD INCREASE BY CROP

See all results at PTAGTIV.COM/en/results

LENTILS

2.7 bu/ac

AVERAGE YIELD INCREASE **10.1%**
64 sites over 12 years, Canada

PEAS

3.6 bu/ac

AVERAGE YIELD INCREASE **6.3%**
22 sites over 10 years, Canada

SOYBEAN

3.4 bu/ac

AVERAGE YIELD INCREASE **7.7%**
87 sites over 8 years, Canada and Europe

DRY BEANS

252 lb/ac

AVERAGE YIELD INCREASE **9%**
12 sites over 5 years, Canada

CHICKPEA

1.5 bu/ac

AVERAGE YIELD INCREASE **4%**
2 sites over 1 year, Canada

DURUM WHEAT

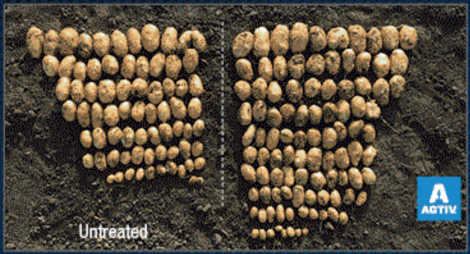
3.8 bu/ac

AVERAGE YIELD INCREASE **6.5%**
12 sites over 7 years, North America

POTATO

31.6 cwt/ac

AVERAGE YIELD INCREASE **10%**
1172 sites over 11 years, North America and Europe



BARLEY

7.3 bu/ac

AVERAGE YIELD INCREASE **10.5%**
28 sites over 6 years, Canada and Europe

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