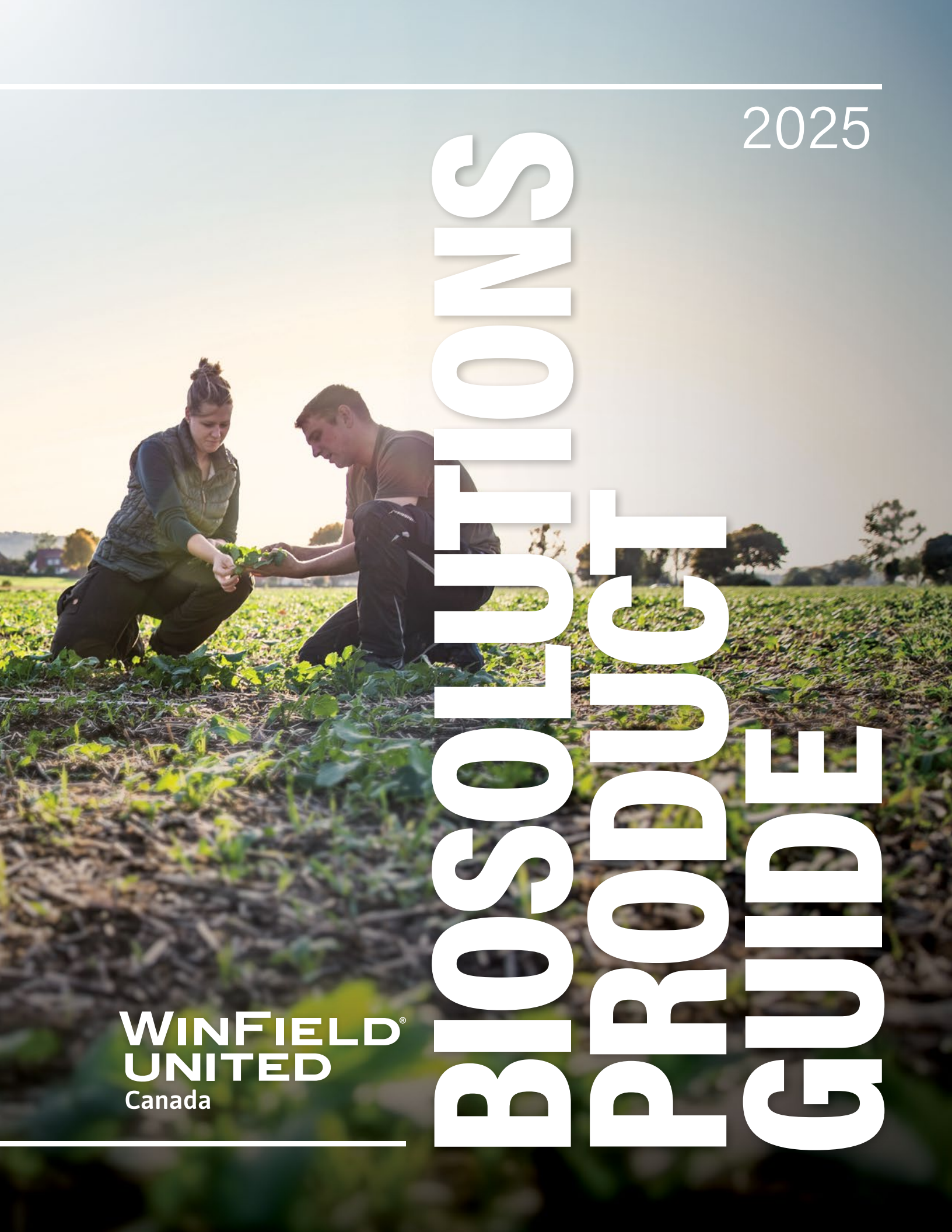
2025

BIOSOLUTIONS PRODUCT GUIDE



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SEARCHING FOR SOLUTIONS IN A CONFUSING BIOLOGICAL SITUATION

THE BIOLOGICALS MARKET IS A CROWDED, AMBIGUOUS SPACE

With so many products and little consensus on how they work, what they do and what to call them, it's difficult to know which products to trust and how to help growers make the right selection. WinField® United Canada is laying the foundation with biosolutions categories, so our retails can navigate this space with confidence. Along with our Answer Plot® approach, we're working with our manufacturers and retail partners to ensure independent retails remain industry leaders.

BIOSOLUTIONS

SUPPLEMENT CROP NUTRITION

BIOFERTILIZERS
provide nutrients by:
- Colonizing the plant to fix N from atmosphere
- Solubilizing nutrients from soil
- Bio-based nutrient sources
(eg: Utrisha™ N, SYNTHOS™)

INOCULANTS
Enable biological N fixation through rhizobia bacteria applications to rhizosphere of leguminous plants.
(eg: TagTeam® BioniQ®, Primo GX2)

IMPROVE GROWTH & RESILIENCY

BIOSTIMULANTS
Stimulate natural processes within plants, independent of nutrient content, allowing for:
- Improved tolerance of abiotic stress
- Improved nutrient uptake and efficiency
- Promotion of root or shoot growth
- Enhanced soil or plant health
- Increased crop quality
(eg: WAVE™, Yalos™, Fortified Stimulate® Yield Enhancer, B Sure®)

MODIFY CROP PHYSIOLOGY

PLANT GROWTH REGULATORS
Modify growth and development of plants through the addition of specific compounds that are active at low concentrations. These compounds can be:
- Natural hormones extracted from plant tissue
- Synthetic hormones which can mimic naturally occurring plant hormones
(eg: Manipulator®)

PROTECT CROPS AGAINST PESTS

BIOCONTROLS
Manage biotic stresses caused by weeds, insects or diseases through:
- Induced resistance from pre-conditioning plant defenses
- Pheromones used for mass trapping or mating disruption
- Population reduction through competition, antagonism or parasitism
(eg: Heads Up®)

Products that **enhance** crop or microbe growth are registered by the **CFIA**

Products that **suppress** crops or pests are registered by the **PMRA**

FOCUS ON THE PRODUCT SOLUTION

Many biosolution ingredients perform more than one function and may belong to multiple categories. Consider its agronomic impact and how it is registered.

NOT ALL BIOSOLUTIONS ARE BIOLOGICAL

Biological products contain living ingredients. The term is often used to broadly define any product derived from natural origin, but knowing if a bio-based ingredient is alive (biological) or dead (bioproduct) provides important insights:

- Shelf life and stability
- Ease of handling
- Tank-mix compatibility
- Environmental response
- Registration requirements

BIOSOLUTIONS PORTFOLIO OVERVIEW

AGRONOMIC SOLUTION	BIOSOLUTIONS CATEGORY	BRAND	SUPPLIER	SHELF-LIFE (YEARS)
Supplement Crop Nutrition	Biofertilizers	iNvigorate®	AMVAC	3
		Utrisha™ N	Corteva	1
		SYNTHOS™	Koch	2 (on unopened bag)
		BioniQ®	FMC	1
		JumpStart®	FMC	1
		QuickRoots®	FMC	1
		Accolade®	Verdesian	1
	Inoculants	Cell-Tech®	FMC	1
		TagTeam®	FMC	1
		TagTeam® BioniQ®	FMC	1
		Optimize®	FMC	1
		N-Charge®	Verdesian	1
		N-Dure®	Verdesian	1
		N-Row®	Verdesian	1
		N-Take™	Verdesian	1
		Preside® Ultra	Verdesian	1
		Primo	Verdesian	1
		Primo GX2	Verdesian	1
		LIFT-kit™ Pulse	Verdesian	1
Improve Growth & Resiliency	Biostimulants	B Sure®	AMVAC	3
		Action 5%™	Corteva	2
		Bio-Forge® Premier	Corteva	2
		Fortified Stimulate® Yield Enhancer	Corteva	2
		Sugar Mover® Premier	Corteva	2
		X-Cyte™	Corteva	2
		PhycoTerra®	Heliae	2
		Yalos™	Lavie Bio	1.5
		Alexys™	NCS	1
		WAVE™	UPL	2
		Primacy ALPHA®	Verdesian	3
Modify Crop Physiology	Plant Growth Regulators	Manipulator®	Belchim	5
Protect Crops Against Pests	Biocontrols	Heads Up®	Heads Up Plant Protectant	10

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SUPPLEMENT
CROP NUTRITION
BIOFERTILIZERS

Biofertilizers provide crops with nutrients in a variety of ways including colonizing the plant to help fix nitrogen from the atmosphere, solubilizing nutrients from the soil to make them more available for plant uptake or providing nutrition directly from a bio-based source.

Farmers who are looking for innovative ways to enhance crop fertility and drive yield may be interested in using biofertilizers to complement synthetic fertilizer sources. Products in this category play important roles in improved nutrient use efficiency and can help reduce or avoid emissions and off-site impacts to soil, water and atmosphere associated with nutrient losses to the environment.

PRODUCT	BIO INGREDIENTS	DESCRIPTION	APPLICATION
AMVAC			
iNvigorate®	**Bacteria** *Azotobacter vinelandii, Clostridium pasteurianum* Created from a diverse bacterial consortium containing multiple strains of aerobic and anaerobic bacteria	Produced by a fermentation process utilizing a consortium of microbes that creates a highly productive microbial system in the soil. Enhances nutrient uptake, increases fertilizer efficiency and promotes absorption of nitrogen and critical minerals to increase the level of bioavailable nutrients to the crop root system.	**Soil Applied, In-Furrow** 1 L/acre
Corteva Biologicals			
Utrisha™ N	**Bacteria** *Methylobacterium symbioticum*	Maximizes crop potential – utilizing natural bacteria to capture and supply nitrogen to plants when they need it most.	**Foliar** 135 g/acre (40 acre/bag) **Canola, cereals, corn:** 4 leaf to pre-senescence **Soybeans:** 3 leaf to pre-senescence **Potatoes:** During active growth. For best results, apply early in the morning when leaf stomata are open.
Koch Agronomic Services			
SYNTHOS™	**Bacteria** *Bacillus subtilis, Bacillus methylotrophicus, Bacillus amyloliquefaciens, Bacillus megaterium, Bacillus licheniformis*	Phosphate-solubilizing plant growth-promoting rhizobacteria (PGPR) optimize crop growth by producing enzymes and organic acids that improve solubilization and release bound nutrients.	**Phosphate Fertilizer Impregnation** Coat fertilizer with a required volume to maintain an effective application rate of 75 mL/acre
Biologicals by FMC			
BioniQ®	**Bacteria** *Bacillus amyloliquefaciens* **Fungi** *Penicillium bilaiae, Trichoderma virens*	Three biological actives for improved availability and uptake of nutrients in a variety of soil conditions: *Penicillium bilaiae* fungus helps release bound mineral forms of soil and fertilizer phosphate, making it more readily available for the plant to use. *Bacillus amyloliquefaciens* and *Trichoderma virens* help increase availability and uptake of nitrogen, phosphate and potassium.	**Seed Applied** 783 g **Canola/Mustard:** dissolved in 5 L of water treats 500 lbs seed **Cereals:** dissolved in 24 L (oats), 34 L (barley), 39 L (rye) or 42 L (wheat) of water treats 250 bu seed
JumpStart®	**Fungi** *Penicillium bilaiae*	Improves the efficiency of soil and fertilizer phosphorous uptake. *Penicillium bilaiae* colonizes plant roots and makes less available phosphate available for crop use.	**Seed Applied** 400 g wettable powder **Canola/Mustard:** dissolved in 10 L of water treats 1,000 lbs **Pulses:** dissolved in 25 L treats 18,000 lbs (lentil, soybean, dry bean), 40 L treats 30,000 lbs (pea), 30 L treats 24,000 lbs (chickpea) **Wheat:** dissolved in 50 L treats 18,000 lbs **In-Furrow** **Granular:** 18 kg bag 3.3 lbs/acre (10″ rows) 2.7 lbs/acre (12″ rows)
QuickRoots®	**Bacteria** *Bacillus amyloliquefaciens* **Fungi** *Trichoderma virens*	By growing directly on plant roots, the *Bacillus amyloliquefaciens* and *Trichoderma virens* based treatment improves availability and uptake of nitrogen, phosphate and potassium and helps release them from the soil.	**Seed Applied** 200 g wettable powder dissolved in water **Soybean:** 50 units **Pea:** 1 g/60,000 seeds **Lentil:** 1 g/110,000 seeds **Chickpea:** 1 g/35,000 seeds
Verdesian Life Sciences			
Accolade®	**Bacteria** *Azospirillum brasilense*	Contains the free-living, nitrogen-fixing rhizobacteria, *Azospirillum brasilense*, that promotes plant growth. Through increased root development and secondary lateral root systems, crops have better water and nutrient uptake and efficiency.	**Seed Applied** Per 50 lbs of seed **Canola/Mustard/Flax:** 454 mL **Cereals/Pulses:** 74 mL **In-Furrow** 201.0 mL/acre (10″ rows) 173.3 mL/acre (12″ rows)

SUPPLEMENT
LEGUME NUTRITION
INOCULANTS

WHEN YOU HEAR INOCULANT, THINK RHIZOBIUM!

Inoculants are a sub-category of biofertilizers as they also help provide nutrition but, more specifically, they enable biological nitrogen fixation through applications of rhizobia bacteria to the seed or rhizosphere of leguminous plants.

PRODUCT	BIO INGREDIENTS	CROP(S)	FORMULATION			APPLICATION
			Granular	Peat	Liquid	
Biologicals by FMC						
Cell-Tech®	**Bacteria** *Rhizobium leguminosarum*	Pea, Lentil	X	X	X	**In-Furrow** **Granular:** 18 kg bag 4.6 lbs/acre (10″ rows) 3.8 lbs/acre (12″ rows) **Seed Applied** **Peat:** 40 g (pea), 67 g (lentil) /55 lbs seed **Liquid:** 75 mL/60 lbs seed
	Bacteria *Bradyrhizobium japonicum*	Soybean	X	X	X	**In-Furrow** **Granular:** 18 kg bag 4.3 lbs/acre (10″ rows) 3.6 lbs/acre (12″ rows) **Seed Applied** **Peat:** 5.1 lbs/30 units **Liquid:** 1.77 L/80 units
TagTeam®	**Bacteria** *Rhizobium leguminosarum* **Fungi** *Penicillium bilaiae*	Pea, Lentil		X	X	**Seed Applied** **Peat:** 44 g (pea), 73 g (lentil) /60 lbs seed **Liquid:** 75 mL/60 lbs seed
	Bacteria *Bradyrhizobium japonicum* **Fungi** *Penicillium bilaiae*	Soybean	X			**In-Furrow** **Granular:** 16.5 kg bag 4.3 lbs/acre (10″ rows) 3.6 lbs/acre (12″ rows)
	Bacteria *Mesorhizobium ciceri* **Fungi** *Penicillium bilaiae*	Chickpea		X		**Seed Applied** 44 g/60 lbs seed
TagTeam® BioniQ®	**Bacteria** *Rhizobium leguminosarum* *Bacillus amyloliquefaciens* **Fungi** *Penicillium bilaiae* *Trichoderma virens*	Pea, Lentil	X			**In-Furrow** **Granular:** 16.5 kg bag 3.3 lbs/acre (10″ rows) 2.7 lbs/acre (12″ rows)
	Bacteria *Mesorhizobium ciceri* *Bacillus amyloliquefaciens* **Fungi** *Penicillium bilaiae* *Trichoderma virens*	Chickpea	X			**In-Furrow** **Granular:** 16.5 kg bag 3.3 lbs/acre (10″ rows) 2.7 lbs/acre (12″ rows)
	Bacteria *Rhizobium leguminosarum* *Bacillus amyloliquefaciens* **Fungi** *Penicillium bilaiae* *Trichoderma virens*	Faba Bean	X			**In-Furrow** **Granular:** 16.5 kg bag 3.3 lbs/acre (10″ rows) 2.7 lbs/acre (12″ rows)
Optimize® LV	**Bacteria** *Bradyrhizobium japonicum* **Signaling Molecule** lipo-chitooligosaccharide	Soybean			X	**Seed Applied** 1.77 L/80 units

PRODUCT	BIO INGREDIENTS	CROP(S)	FORMULATION			APPLICATION
			Granular	Peat	Liquid	
Verdesian Life Sciences						
N-Charge®	**Bacteria** *Rhizobium leguminosarium*	Pea, Lentil, Faba Bean		X		**Seed Applied** 70.8 g/50 lbs seed
	Bacteria *Bradyrhizobium japonicum*	Soybean		X		**Seed Applied** 70.8 g/50 lbs seed
	Bacteria *Mesorhizobium ciceri*	Chickpea		X		**Seed Applied** 70.8 g/50 lbs seed
N-Dure®	**Bacteria** *Rhizobium leguminosarium*	Pea, Lentil, Faba Bean		X		**Seed Applied** 70.8 g/50 lbs seed
	Bacteria *Bradyrhizobium japonicum*	Soybean		X		**Seed Applied** 70.8 g/50 lbs seed
	Bacteria *Mesorhizobium ciceri*	Chickpea		X		**Seed Applied** 70.8 g/50 lbs seed
N-Row®	**Bacteria** *Rhizobium leguminosarium*	Pea, Lentil, Faba Bean	X			**In-Furrow** 4.3 lbs/acre (10″ rows) 3.6 lbs/acre (12″ rows)
	Bacteria *Bradyrhizobium japonicum*	Soybean	X			**Seed Applied** 61.8 mL/60 lbs seed
N-Take™	**Bacteria** *Rhizobium leguminosarium*	Pea, Lentil			X	**Seed Applied** 61.8 mL/60 lbs seed
	Bacteria *Bradyrhizobium japonicum*	Soybean			X	**Seed Applied** 61.8 mL/60 lbs seed
Preside® Ultra	**Bacteria** *Bradyrhizobium japonicum* **Amino Acids, Organic Acids** Take-Off®	Soybean			X	**Seed Applied** 22.2 mL/unit
Primo	**Bacteria** *Mesorhizobium ciceri* also contains Extender (carbohydrates and amino acids) for improved survivability	Chickpea			X	**Seed Applied** 62.3 mL/60 lbs **In-Furrow** 173 mL/acre
Primo GX2	**Bacteria** *Rhizobium leguminosarum* *Mesorhizobium ciceri* *Azospirillum brasilense*	Pea, Lentil, Chickpea, Faba Bean	X			**In-Furrow** 5.3 lbs/acre (10″ rows) 4.4 lbs/acre (12″ rows)
	Bacteria *Bradyrhizobium japonicum* *Azospirillum brasilense*	Soybean	X			**In-Furrow** 4.4 lbs/acre (12″ rows) 3.5 lbs/acre (15″ rows)
LIFT-kit™ Pulse	**Bacteria** *Rhizobium leguminosarum* *Azospirillum brasilense* **Amino Acids, Organic Acids** Take-Off®	Pea, Lentil			X	**In-Furrow** 257.0 mL/acre (10″ rows) 236.7 mL/acre (12″ rows)

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HANDLING HIGHLIGHTS FOR LIVING BIOLOGICALS

Biosolutions containing living organisms require specific storage conditions and handling considerations to ensure viability and product performance. Check out our top five tips for handling products containing living biologicals and don't forget to follow the product label and manufacturer recommendations for handling and storage!

1 STORE UNDER OPTIMAL CONDITIONS

Living biologicals can be sensitive to storage conditions so it's particularly important to consider temperature, sunlight and humidity. Specific recommendations differ by individual organism and formulation, but consider these general guidelines:

- Minimize temperature fluctuations
- Store in cool conditions (less than 20°C)
- Do not freeze or expose to high or direct heat
- Keep out of direct sunlight
- Store in dry conditions and do not expose to high humidity

2 USE IT OR LOSE IT

Efficacy and ease-of-handling of biosolutions are also guided by its shelf-life. Before sending a product out to farm, be sure to check its expiration date. Providing the product is unopened and properly stored, the expiration date is the point that the manufacturer guarantees that the concentration of active ingredient matches the label specifications. Biosolutions that are stored beyond their shelf-life risk reduced viability of live organisms, degradation of active ingredient or product settling and separation.

3 CONSIDER COMPATIBILITY

Pesticides, seed treatments and fertilizer may be harmful to the viability of living organisms if they come in direct contact and special care should be taken to ensure product combinations do not compromise efficacy. Always consult the manufacturer prior to making an application plan. Compatibility is unique to each biological product formulation, but here are a few considerations to keep in mind:

- **Products that mix aren't always compatible.**

  Physical compatibility is key to ensuring a good application experience, but it doesn't paint the complete picture of product viability.

- **Focus on formulation when considering compatibility.**

  Not all products with the same active ingredient are made the same and this can have significant consequences on the biological product's viability. Living organisms can be sensitive to the inert material in products just as much or even more so than the active ingredient itself. For example, two brands of glufosinate may have very different compatibility effects on the same biological product.

- **Compatibility comes with conditions.**

  Living biologicals are only compatible with other ag inputs when used according to manufacturer handling recommendations. This means abiding by guidelines for sequential, simultaneous or tank-mix applications, and ensuring that once products are combined, they are applied within the label allotted time.

4 WATCH YOUR WATER QUALITY

We are aware of how water quality, including high cation levels, affects traditional pesticide performance. However, with living biologicals, chloride is typically the water parameter of greatest concern. Avoid application or mixing of products containing living biologicals with:

- Chlorinated products
- Water containing greater than 1 ppm of chloride
- Tank-mix additives containing free chloride ions

Certain biosolutions may also be sensitive to the pH level of water. This is not consistent across all organisms, so it is best to check with manufacturer recommendations for optimal water pH ranges when applying as part of a solution.

5 ONCE MIXED, GET IT OUT QUICK!

Remember, living biologicals are very sensitive to their environment. Microorganisms can start to die off or degrade if exposed to unfavourable conditions for too long of time, this includes excessive time spent in solution in a spray tank or seed treatment slurry. Not all microbes can tolerate saturation or oxygen deprivation for extended periods of time, so it is best to **apply as soon as possible upon mixing.** The less time the better and certainly within a couple hours.

This principle also applies to biologicals that are applied to seed. Often, they will have a longer viability on the seed compared to if left in a slurry, but that doesn't mean the timeframe for planting is unlimited. It is important to understand both compatibility guidelines and planting windows when selecting a biological product.

IMPROVE GROWTH & RESILIENCY BIOSTIMULANTS

Biostimulants help improve crop growth and resiliency by stimulating natural processes within plants or microbes. This biosolutions category is very diverse as biostimulants contain a wide range of living and non-living ingredients with a multitude of claims and modes-of-action. Claims that are often associated with biostimulants include improved nutrient uptake and efficiency, increased root or shoot growth, enhanced crop quality, soil or plant health, and **improved tolerance to abiotic stress.**

Abiotic stresses are the environmental factors that negatively impact crop growth and production. Although biostimulants alone are no match for Mother Nature, they are an important tool in the toolbox to help improve or maintain crop growth and resiliency when exposed to challenging environmental conditions such as limited moisture, flooding, excessive heat or prolonged periods of cold.

PRODUCT	BIO INGREDIENTS	DESCRIPTION	APPLICATION
AMVAC			
B Sure®	**Amino Acids, Polypeptides** Shrimp protein hydrolysate derived from microbial fermentation	A microbially fermented protein hydrolysate that is a source of bioavailable nutrients and enhances crop tolerance to environmental and physiological stresses and improves photosynthesis and plant metabolism in all crops.	**Foliar** 1 L/acre **Pulses/Canola:** Early vegetation through beginning of seed development **Cereals:** Early vegetation to full head emergence
Corteva Biologicals			
Action 5%™ co-packed with Stimulate Plus Yield Enhancer	**Plant Hormones** Gibberellic Acid, Cytokinin, Auxin (Indole-3-butyric acid or IBA)	Protects seedlings from soil salinity – enhancing germination by promoting uniform emergence and improving root development resulting in healthier, more resilient plants.	**Seed Applied** 125 mL/100 lbs seed
Bio-Forge® Premier	**Plant Hormones** Cytokinin **Co-formulated with:** Nitrogen Soluble Potash Cobalt Molybdenum	Enhances plant resilience and protects yield potential by employing three distinct modes of action to support physical stress recovery.	**Foliar** 250 mL to 500 mL/acre **Timing:** Herbicide timing Physical damage – for best results apply 24-72 hours after physical damage
Fortified Stimulate® Yield Enhancer	**Plant Hormones** Gibberellic Acid, Cytokinin, Auxin (IAA), Auxin (IBA)	Contains a combination of critical plant growth hormones, strategically formulated to enhance root development, boost plant growth, and maximize yields.	**Seed Applied** 65mL/100 lbs seed **Foliar** 125-200 mL/acre at herbicide timing
Sugar Mover® Premier	**Plant Hormones** Cytokinin **Co-formulated with:** Copper Boron Molybdenum	Improves sugar distribution within the plant – promoting larger, more robust seeds and boosting flower production for increased yield potential.	**Foliar** 500 mL to 1 L/acre applied at fungicide timing

PRODUCT	BIO INGREDIENTS	DESCRIPTION	APPLICATION
Corteva Biologicals continued...			
X-Cyte™	**Plant Hormones** Cytokinin	Designed to increase plant resilience and safeguard yield by proactively protecting crops from heat blast – reducing flower/kernel abortion and pod loss caused by heat stress.	**Foliar** 500 mL/acre **Timing** Prior to the onset of a heat event, and: **Canola:** 10-30% flowering **Corn:** VT to R1 staging It can be applied with or without fungicide but when applied as a standalone application a surfactant is recommended
Heliae Agriculture			
PhycoTerra® Soil Amendment	**Microalgae** *Chlorella vulgaris*	PhycoTerra® Soil Amendment activates the soil microbiome to improve soil structure and quality, enhance water holding capacity, optimize nutrient uptake, and support post-harvest residue management – improving crop yield and ROI.	**Soil Applied, In-Furrow** 1 L/acre to 4 L/acre
PhycoTerra® ST Seed Treatment	**Microalgae** *Chlorella vulgaris*	PhycoTerra® Seed Treatment feeds microbes on and around germinating seeds. This feeding increases stand establishment and seedling vigor.	**Seed Applied** 130 mL to 260 mL/100 kg seed
Lavie Bio			
Yalos™	**Bacteria** *Arthrobacter globiformis, Erwinia gerundensis*	Enhances microbial activity in the rhizosphere of cereal crops to improve nutrient availability and uptake, root development, early plant growth, plant defense and stress tolerance.	**Seed Applied** **Cereals:** 10 g/100 lbs seed
NCS			
Alexys™	**Fungi** *Trichoderma harzianum* (consortia)	Confers stress tolerance to crops providing protection from extreme environmental conditions such as drought, heat, cold and salinity. Alexys resides entirely inside the plant and does not establish in the soil or compete with other microorganisms.	**Foliar** 3 mL/acre
UPL			
WAVE™	**Seaweed Extract** *Ascophyllum nodosum*	A highly concentrated liquid seaweed extract used to increase yield through improved nutrient use and plant growth by enhancing plant vigor and overall plant health. Applications affect molecular and physiological processes within the plant to affect root and shoot growth and improve the plant's ability to withstand abiotic stress.	**Foliar** 60 mL/acre **Canola:** Apply during the vegetative stage prior to bolting (herbicide timing) **Pulses:** Apply during flower (fungicide timing)
Verdesian Life Sciences			
Primacy ALPHA®	**Amino Acids, Organic Acids** Contains Take-Off® and PLUS technology	Improves vegetative and reproductive growth, supporting increased yield, quality and plant health. Enhances nitrogen assimilation, plant metabolism and overall nutrient uptake and use efficiency.	**Foliar** 473 mL/acre

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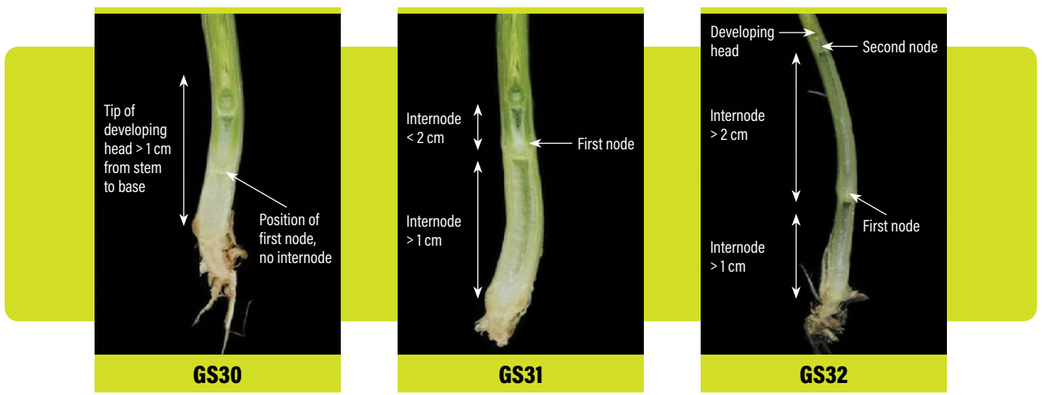
MODIFY CROP PHYSIOLOGY PLANT GROWTH REGULATORS

Plant growth regulators (PGR) modify growth and development of plants through the addition of specific compounds that are active at low concentrations. These compounds may be natural hormones that are extracted from plant tissue or synthetic hormones that are not biologically derived but mimic actions of naturally occurring plant hormones.

Products categorized as a PGR are distinguished from biostimulants that may contain plant growth promoting hormones by their registration stream and effect on the crop. PGR products are registered through the Pest Management Regulatory Agency (PMRA) under the *Pest Control Products Act* because they suppress growth or maturity.

PRODUCT	BIO INGREDIENTS	DESCRIPTION	APPLICATION
Belchim			
Manipulator PGR	**N/A** **Synthetic Compound** chlormequat chloride (620 g/L)	Inhibits gibberellic acid production during elongation. This results in shorter plants, stronger stems, more even main and tiller heads and better nutrient allocation. Growers have reported reduced lodging risk and improved harvestability.	**Foliar** Do not apply later than GS 39 (flag leaf visible) **Wheat** **Single app:** 0.7 L/acre between GS 21 (1-tiller) and GS 39 (early flag leaf) **Split app:** Minimum 0.3 L/acre between GS 21 and GS 30 (1-tiller to beginning of stem elongation) followed by a second application between GS 31 and GS 39 (1-node to early flag leaf) Do not exceed 0.7 L/acre per year **Barley/Oats** **Single app:** 0.9 L/acre between GS 21 (1-tiller) and GS 39 (early flag leaf) **Split app:** Minimum of 0.45 L/acre between GS 21 and GS 30 (1-tiller to beginning of stem elongation) followed by a second application between GS 31 and GS 39 (1-node to early flag leaf) Do not exceed 0.9 L/acre per year



Source: Cereal Growth Stages, p. 6-7. 2005 by Grains Research and Development Corporation (GRDC).

PROTECT CROPS AGAINST PESTS WITH BIOCONTROLS

Biocontrols are registered through the PMRA and, like conventional pesticides, they manage biotic stresses caused by weeds, insects or diseases. Modes-of-action for biocontrol products are diverse but generally work by helping pre-condition plant defenses and improving immunity, reducing pest pressure directly through competition, antagonism or parasitism, or serving as pheromones to be used for mass trapping of mating disruption of insect pests.

Conventional pesticides remain an important tool in the agronomic toolbox, but biocontrols may also be used to enhance, reduce or replace some of the applications of pesticides where maximum residue levels are a concern. Integrating biocontrols with synthetic partners could result in improved efficacy, reduced concentrations or applications, and another option for controlling pests and managing resistance.

PRODUCT	BIO INGREDIENTS	DESCRIPTION	APPLICATION
Heads Up Plant Protectants			
Heads Up®	**Plant Extract** Saponins of *Chenopodium quinoa*	Seed treatment for targeted use in soybean and dry bean that provides suppression of rhizoctonia, white mould and sudden death syndrome through **systemic acquired resistance**.	**Seed Applied** 37 mL/100 kg of seed **Soybean:** 50 g/360 units; must be pre-slurried into 3 L of water

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DID YOU KNOW?

SYSTEMIC ACQUIRED RESISTANCE (SAR) is a plant defense mechanism that provides long-lasting protection against a wide range of pathogens. Although this mode-of-action does not directly inhibit the pathogen, it helps protect the plant from disease by increasing its immunity.

When a pathogen infects a portion of the plant, the plant's immune system responds by producing salicylic acid which signals the plant to activate defense genes in non-infected portions of the plant to prepare it for potential future infections. Once SAR is activated, the plant is more resistant to subsequent pathogen attacks and better equipped to fend off disease throughout the entire season.

NAVIGATING THE NOISE OF BIOSOLUTIONS WITH 3Es

With so many new biosolutions flooding the market, it is a struggle to understand which products offer genuine value. Between inconsistent claims, unclear benefits, unfamiliar ingredients and a lack of practical guidance on how they should be applied, it can be tough to know which products to recommend.

WinField United's 3E Strategy addresses this confusion head-on and provides a roadmap to this evolving market segment. The 3E Strategy provides education on what these products are and how to use them, evaluates different biosolutions to better position them, and elevates specific biosolutions by communicating their value proposition at the farm-gate.

3E STRATEGY

EDUCATE

- ✓ Product categorization
- ✓ Modes-of-action
- ✓ Active ingredients & product formulation

EVALUATE

- ✓ Assess innovative technologies
- ✓ Investigate product performance
- ✓ Explore new partnerships

ELEVATE

- ✓ Build product awareness
- ✓ Communicate value & agronomic positioning
- ✓ Support retail sales efforts

2024 HIGHLIGHTS

6 Academy Biosolutions Webinars

5 Small Plot Research Sites

10 Biosolution Products Evaluated

8 Manufacturer Partners

40+ Field Scale Trials

1000s Of Treatment Comparisons & Local Data Points

FINDING THE WHY ALL THE WAY TO IMPROVED PRODUCT POSITIONING

PARTNER ENGAGEMENT → PRODUCT VETTING → ANSWER PLOT & SATELLITE RESEARCH SITES → FARMER FIELD TRIALS → DATA DRIVEN INSIGHTS & RECOMMENDATIONS

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Important: Before use always read and follow label instructions. Crop performance is dependent on several factors, many of which are beyond the control of WinField United, including without limitation, soil type, pest pressures, agronomic practices and weather conditions. Growers are encouraged to consider data from multiple locations, over multiple years and to be mindful of how such agronomic conditions could impact results.

WinField® United

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