

Biologicals for Potatoes: Pipeline, Development, and On-Farm Assessment

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Potatoes New Zealand Agronomy Summit

6 August 2026



What we will cover today

- What are biologicals
- How do they fit into a growing system
 - How they differ from traditional chemistry
 - How they fit into IPM
- Modes of action
- How biologicals are developed
- How you can trial biologicals
- What's happening globally
- Take home messages



What are biological products?



Biological products, or “biologicals”, are a broad group of products derived from living organisms or natural compounds.

They are used to protect plants, manage pests and disease, and improve plant and soil health – as alternatives or complements to conventional chemistry.

- **Microbial inoculants** – beneficial bacteria or fungi applied to seed, soil, or plants to support nutrient uptake and root health.
- **Biostimulants** – substances such as seaweed extracts, humic acids, and metabolites that boost growth, vigour, and stress tolerance.
- **Biopesticides** – naturally derived agents that control insect pests, diseases, or weeds.
- **RNA-based & fermentation-derived products** – emerging tools that target specific pests or deliver active compounds through fermentation.

The Challenge Facing Potato Production

Growers are under increasing pressure from multiple directions



The Challenge Facing Potato Production

We need additional tools to maintain productivity and sustainability

Biologicals are not intended to replace chemistry but are another tool

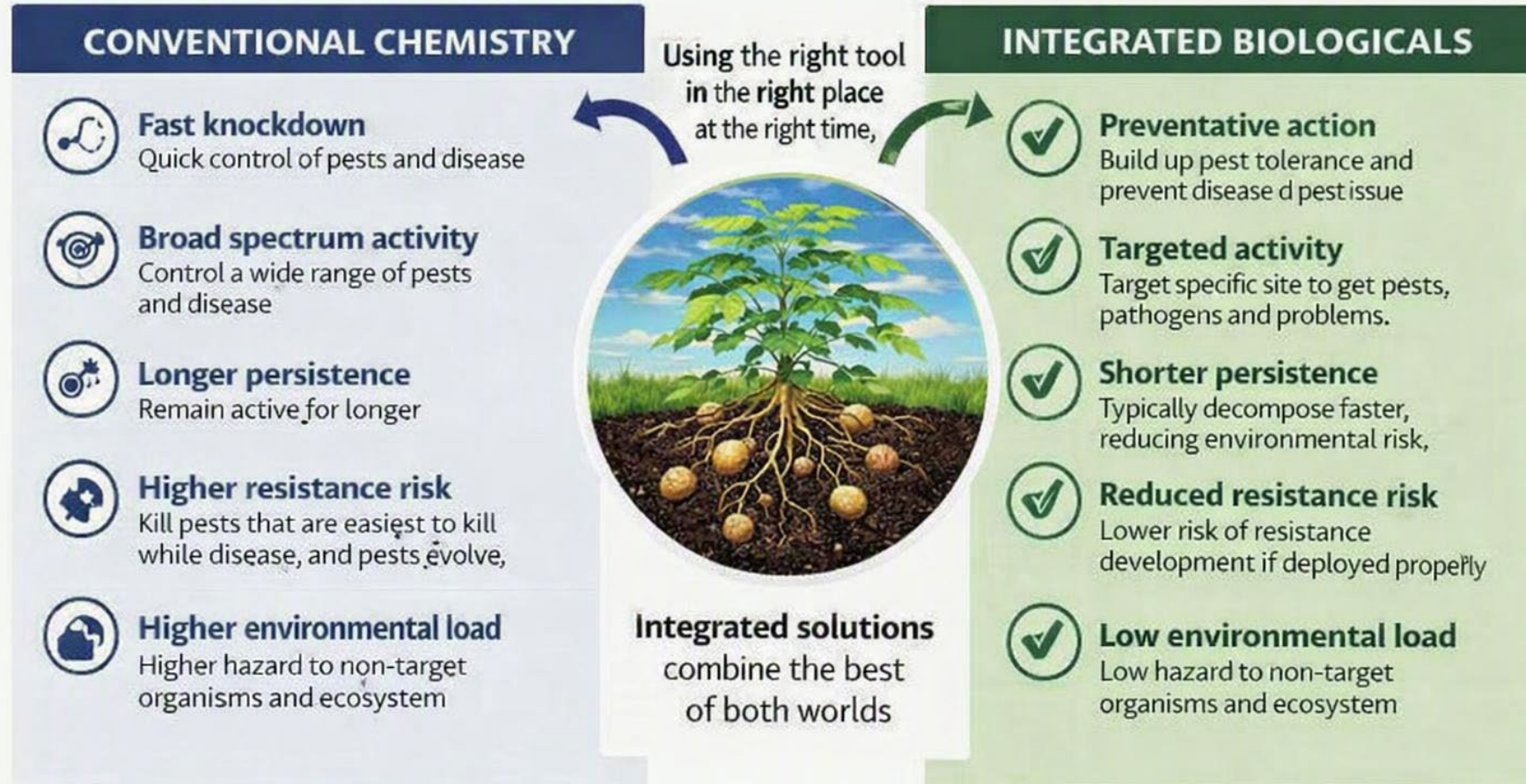
The question is where can they add value within an integrated crop management programme?





Biologicals vs Conventional Chemistry

Different tools, different strengths – both are important in Integrated crop management



Challenges

- Shelf stability/special storage requirements
- Compatibility
- Environmental conditions
- Getting inoculant to the right place – esp subterranean
 - Seed treatment
 - In furrow
 - Foliar spray
- Generally no systemic activity



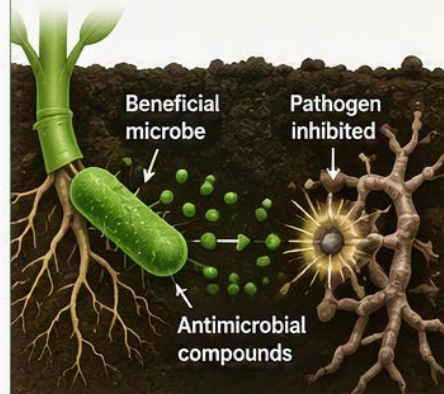
How Biologicals Work: Key Modes of Action

Different biologicals work in different ways to protect plants and improve productivity



1 ANTIBIOSIS

Beneficial microbes produce natural compounds that inhibit or kill pathogens.

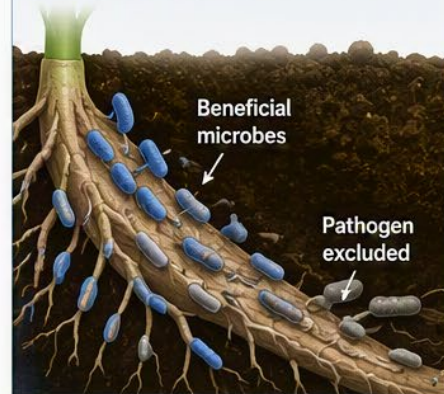


Examples

- Antibiotics, lipopeptides, enzymes and volatile compounds
- Suppress fungal and bacterial pathogens

2 COMPETITION

Beneficial microbes colonise the root or leaf surface and compete with pathogens for space and nutrients.

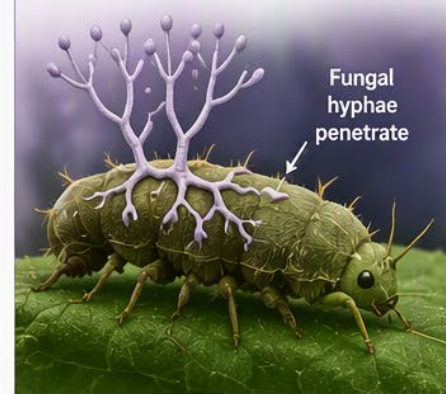


Examples

- Competition for nutrients (e.g. iron)
- Space exclusion on roots and leaves
- Biofilm formation

3 DIRECT ATTACK

Some biologicals directly infect, parasitise or trap pests and pathogens.



Examples

- Entomopathogenic fungi
- Nematode-trapping fungi
- Predatory microbes and bacteria

4 INDUCED RESISTANCE

Biologicals trigger the plant's own defence systems, helping it resist future attacks.



Examples

- Activation of plant defence pathways
- Systemic Acquired Resistance (SAR)
- Induced Systemic Resistance (ISR)



Why multiple modes matter



Reduces risk of resistance development



Targets pests and pathogens in different ways



Supports plant health and resilience



Works together with other tools in integrated programs



Key Take-Home Message

Biologicals use a variety of natural mechanisms to protect crops and improve plant health. Understanding how they work helps us use them more effectively.

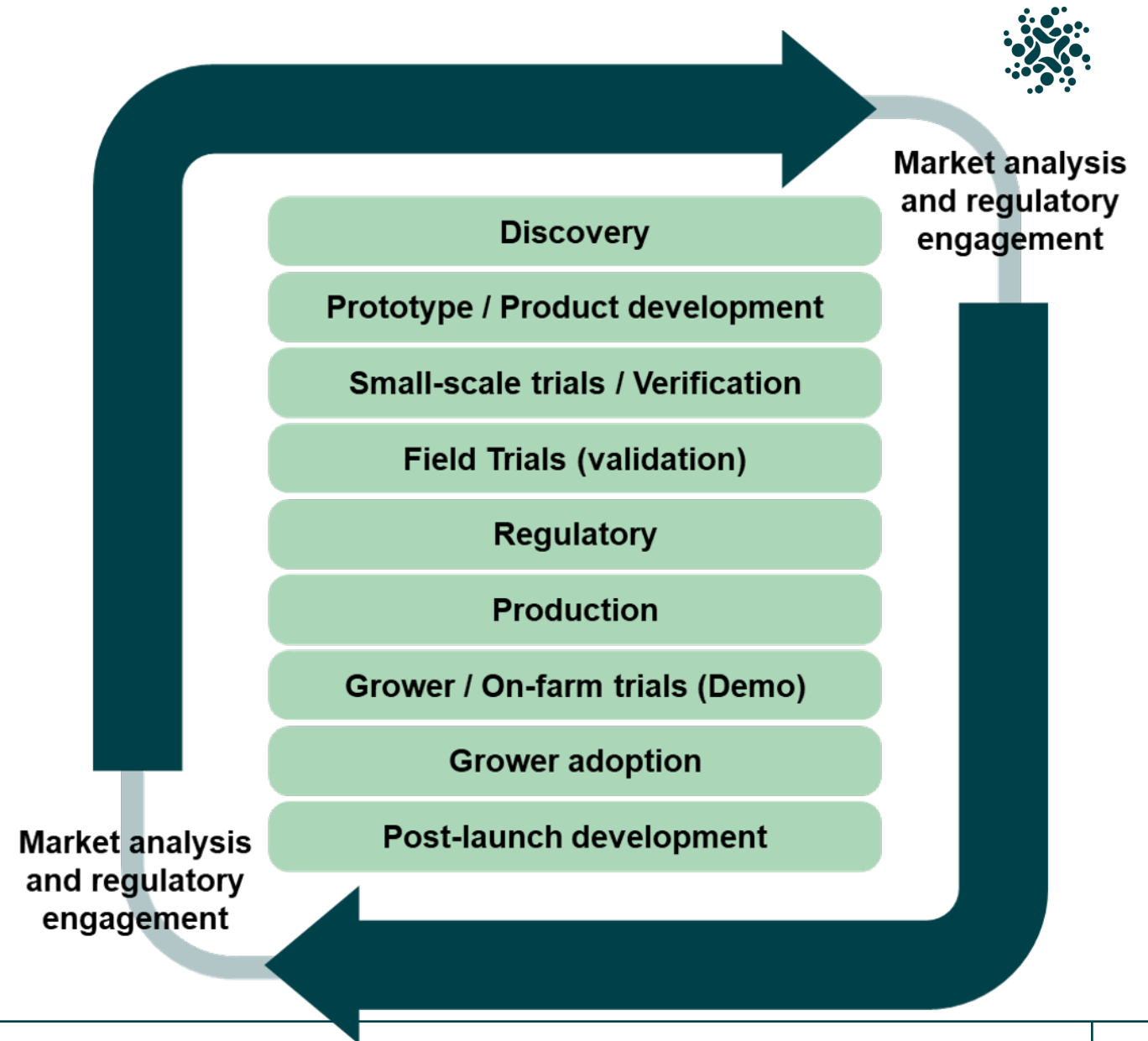


Biologicals are not a single solution – they are a toolbox of different strategies working with nature. Understanding their mode of action is key to successful use in potato production.



How are biologicals developed - The R&D pipeline

- Only a small proportion of candidates make it through a long development pipeline
- Biologicals are quicker and cheaper to market than traditional chemistry
 - We will see more
 - We need to know how to effectively use them.



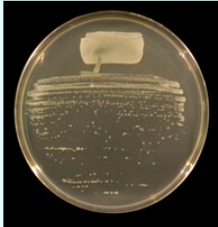
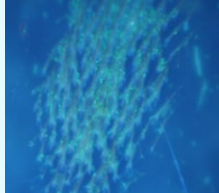
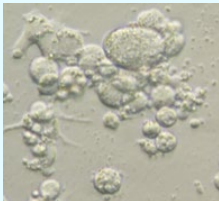
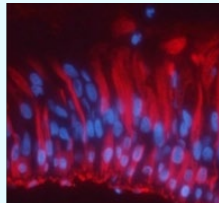
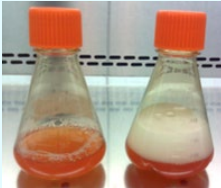
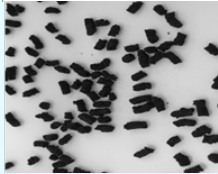
DEVELOPMENT STEPS



Pest / Pathogen
Control



Plant growth
promoting

	Strain Isolation and Identification	Toxin ID / Mode of Action	Pilot Scale Fermentation	Prototype Formulation	Glasshouse / Pot trials	
					Regulatory	Field Trials
	  	   	 	    	  	 

Soil Fungal Disease Pipeline

FY25 and FY26



TRL1

DISCOVERY

121 + 153 -
isolates selected
(literature & plo
data)



TRL2

IN VITRO SCREENING

274 isolates
Screened
(Petri dish assays)
Rhizoctonia, *Pyffu*
Fusarium



TRL3

IN PLANTA VALIDATION

16 isolates
tested
(*Rhizoctonia solani*)



TRL4

POT TRIALS

10 isolates
progressed

KEY OUTCOME

10 broad-spectrum antifungal isolates identified

Practical Take-home Messages for Growers

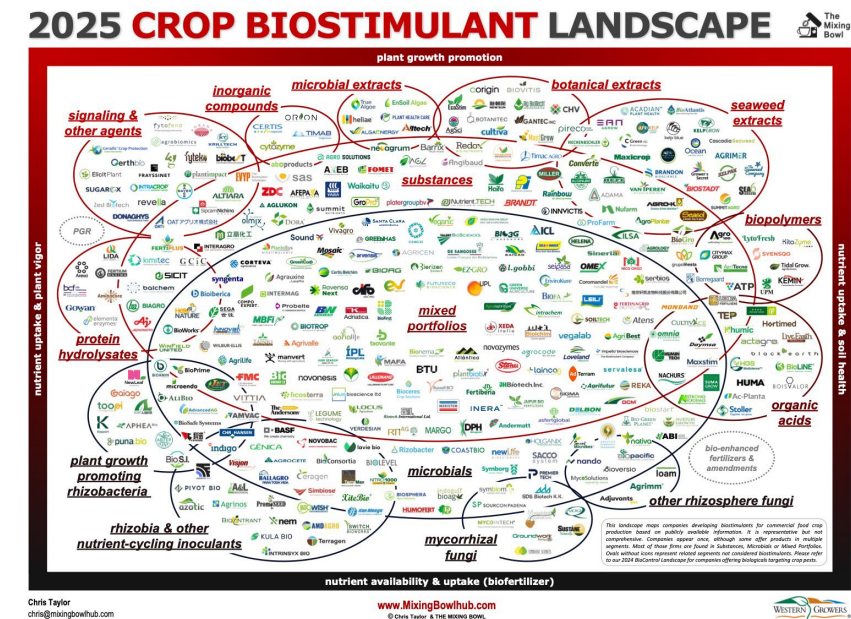
- Does the product have a history of success – is field trial data available?
- Biopesticides should be ACVM registered
- Understand mode of action
- Identify the problem being targeted
- Check compatibility with current programme
- Follow storage and use instructions
- Run simple on farm trials
- Measure outcomes objectively



What's happening globally



- The industry is dynamic and positive but surrounded by economic and political uncertainty
- So while there are many product launches investment is scarce and regulatory timelines (in the US and here) are slow. There are pushes to improve this.
- N-fixing products continue to increase, and fertiliser companies are investing into biological solutions.
- What's hot?
 - AI driven design of pesticidal peptides and proteins
 - Low dose elicitor molecules that trigger plant responses to pathogens and reduce stress
 - Microbial metabolites
 - RNAi with proven methodology and cost effectiveness
 - Abiotic stress mitigation
 - Inputs for regenerative soils
 - Integrated programmes
 - Pesticides enhancers and formulations that stabilise.



Biologicals are no longer a niche market - Major agriculture companies investing because they see long term value

Where is the Industry Heading

- The next generation of biologicals will move beyond individual products toward integrated systems
 - Microbial consortia
 - Predictive ag-tech
 - Crop system integration
 - Microbiome informed breeding

Future isn't chemistry vs biology – its combining biology, chemistry, genetics, agronomy, and digital tools into smarter production systems



Global collaboration and insights



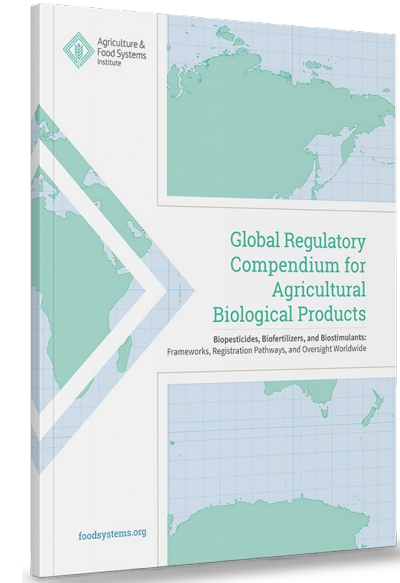
- Biologicals are being assessed internationally and we can learn from each other
- We need consistent validation so we can transfer data and accelerate market entry and adoption



Biopesticides in Horticulture

Guidelines for commercial field trials, grower assessment and industry adoption

Summary from International Biopesticides Research Workshop, June 2025.
Supported by Western Growers and Bioeconomy Science Institute.



Global Regulatory Compendium for Agricultural Biological Products – Agriculture & Food Systems Institute

Guidelines for Biopesticide Validation and Adoption - Western Growers Association BSI

Kia ora

Thanks

Presentation disclaimer



Presentation for

Potatoes New Zealand Agronomy Summit 2026

Publication data:

Miriam Hall, David Wright. July 2026. Biologicals for Potatoes: Pipeline, Development, and On-Farm Assessment. A PowerPoint presentation.

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August 2026

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