RINOTEC™ TECHNOLOGY

Technical Bulletin

ProFarm™

Advancing Crop Protection Technology for Today's Growers

Modern agriculture faces several environmental and socio-economic challenges. New regulatory requirements have led to the restriction of key pesticides in classes like carbamates, organophosphates, pyrethroids, and neonicotinoids. This has resulted in over-reliance on remaining modes of action (MoA), accelerating resistance in pest populations. With a dramatic slowdown in the discovery of new modes of action, growers are left with fewer tools to manage destructive pests, all while global regulatory policies and increasing consumer demand for sustainability continue to evolve.

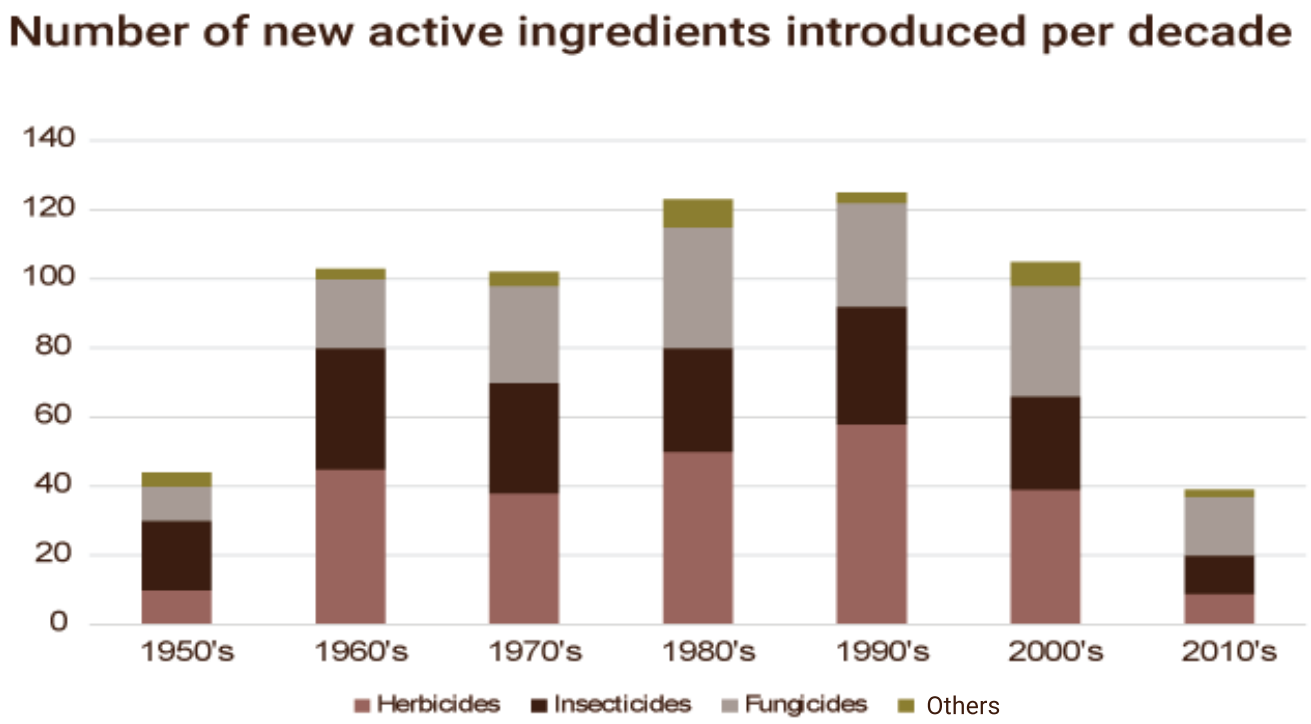


Figure 1. A Phillips McDougall analysis from 2018, there are less than 600 active ingredients globally. The EU's re-registration process has led to the removal of over half of the crop protection active ingredients (293 out of 499) of commercial significance with six of the top 10 products used in 1968 now banned.

Agricultural pests such as insects, mites, and nematodes cause significant damage to crops and threaten food security. The FAO estimates up to 40 percent of global crop production is lost due to plant pests and disease. Invasive pests alone account for tens of billions in U.S. dollars lost annually.

Consumers are pushing for greater transparency, demanding safe, nutritious, and sustainably produced food in the context of climate change, soil degradation, and a rapidly growing global population. Climate change is also exacerbating the challenges for growers by altering pest populations and expanding their geographic range.

The Importance of Resistance Management

The extensive use of a narrow range of insecticide modes of action has contributed to an increase in pesticide resistance. Tolerant and resistant pest populations damage crops, resulting in decreased grower revenue while increasing expenses attributed to the purchase and repeated application of chemistries that no longer work as they once did.

RinoTec™ Technology empowers farmers to meet these challenges by providing an innovative solution for managing soil and foliar pests in integrated pest management (IPM) programs. The technology, when integrated into a robust IPM program, offers comparable efficacy, yields, and crop quality to many of the leading synthetic chemistries available to growers today. It will help growers and food companies align to consumer preference across conventional, organic, and indoor cropping systems by helping them reduce their overall spray program environmental load without compromising on yield, quality, or expense. RinoTec™ Technology gives farmers the flexibility and freedom to farm for generations to come.

Resistance develops more readily when pests are repeatedly exposed to the same modes of action and when treatment exhibits environmental persistence.

MICHIGAN STATE UNIVERSITY ARTHROPOD PESTICIDE RESISTANCE DATABASE

Insect	Number of Cases	Number of Active Ingredients
TwoSpotted Spider Mites	558	96
Western Corn Rootworm	35	13
Wireworm	9	5
Western Flower Thrips	187	32
Vine Mealybug	4	4
Grape Mealybug	1	1
Codling Moth	196	22
Beet Armyworm	693	43
Oblique Banded Leafroller	25	9
Oriental Fruit Moth	4	2
Peach Twig Borer	2	2
Corn Earworm	231	21
Cabbage Looper	71	18
Cotton Bollworm	892	55
Tomato Hornworm	1	1
Diamondback Moth	1,072	101
Citrus Thrips	22	17
Onion Thrips	216	24
Sweet Potato Whitefly	781	69
Rosy Apple Aphid	1	1
Pacific Spider Mite	7	5

Table 1. Michigan State University Arthropod Pesticide Resistance Database tracks an extensive list of crop-damaging pests and documented cases of resistance to active ingredients. For more pests, visit https://www.pesticideresistance.org

RinoTec™ Technology: The Future of IPM

ProFarm Group's mission is to be the recognized leader in sustainable biotechnology solutions for farmers of all crops and geographic regions. The need for easy-to-use, low-toxicity, high-efficacy alternatives to meet farmers' needs is clear.

RinoTec™ Technology emerges as a novel and innovative new technology for the management of insects, mites, and nematodes.

Discovered and developed by ProFarm Group scientists, RinoTec™ Technology encompasses the microorganism, optimized fermentation processes, proprietary processes, patents, and trade secrets. The novel technology is part of the IRAC non-Bt bacterial agent of unknown or uncertain MoA or "UNB" classification scheme[1]. It shows activity against plant-parasitic nematodes, wireworms, whitefly, thrips, mites, and western corn rootworm.

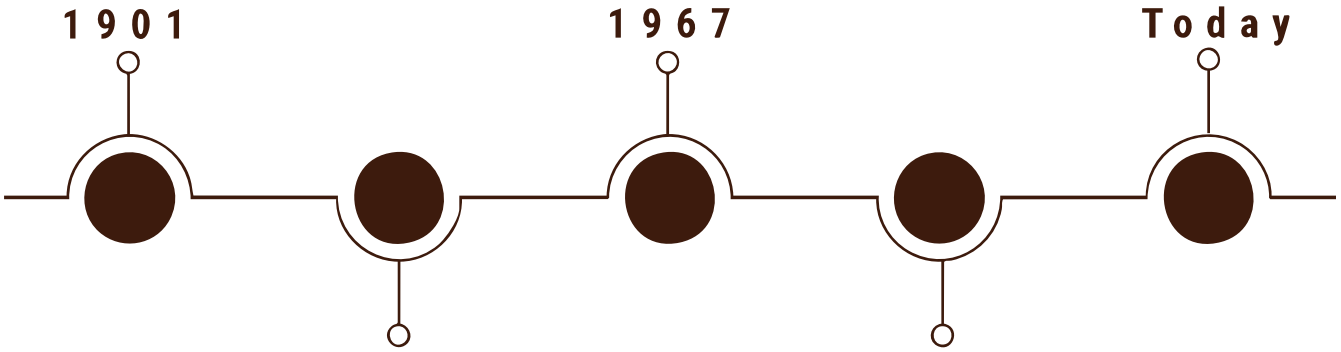
[1]Visit the IRAC website for more information on MoA classifications at www.irac-online.org.

Discovered in Nature, Backed by Science

Bt is discovered and evolves from a 1938 spray product to Cry protein expression in plants today.

Avermectin, naturally produced by *Streptomyces avermitlis*, led the way to **abamectin's** introduction to crops in 1985.

RinoTec™ **Technology,** developed through proprietary processes, is poised to become a new grower standard.



1949

Pyrethrins, extracted from chrysanthemum flowers, provided the foundation for synthetic **pyrethroids**.

1982

Saccharopolyspora spinosa produce a mixture of chemical compounds giving rise to **Spinosad,** formed of Spinosyn A and Spinosyn D.

Figure 2. Many frequently used active ingredients in crop protection today originate from biological origins. RinoTec™ Technology is positioned to be the next generation of biological crop protection.

Discovery of RinoTec™ Technology

Over a decade ago, ProFarm scientists collected soil from across the globe to identify novel microorganisms capable of rivaling the efficacy of conventional chemistry. Leveraging high-throughput processes, a novel bacterial species and strain with multiple active compounds emerged. This bacterial species and the subsequent downstream lab development processes allowed scientists to produce a suite of metabolites with lethal and repellent activity against target pests.

Unique Mode of Action

Known today as RinoTec™ Technology, this technology refers to the organism, whole fermentation solution, processes, patents, and trade secrets. Through extensive research, ProFarm scientists discovered a key metabolite — FR901228, along with its related analogs and conjugate forms — plays a critical role in the RinoTec™ Technology. These compounds provide both nematicidal and insecticidal properties, enhancing the effectiveness of the solution. The presence of FR901228, its conjugates and other analogs, is what drives the technology's powerful performance.

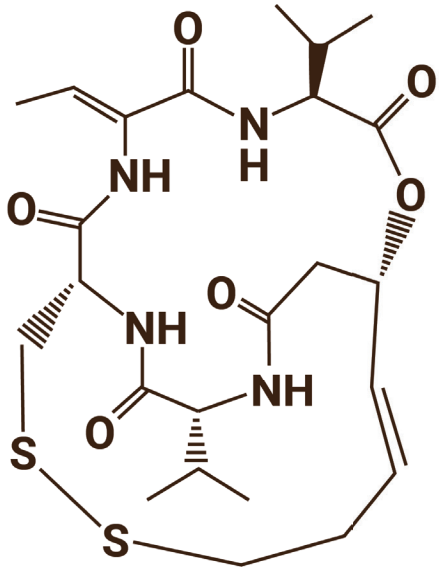


Figure 3. One of the key metabolites in RinoTec™ Technology, FR9001228, is an example of one of the more active compounds that was discovered and isolated by ProFarm scientists.

RinoTec™ Technology offers a unique mode of action demonstrated through extensive lab and field testing. While the exact mode of action at a cellular level is still under investigation*, lab and field studies show that RinoTec™ Technology acts as a stomach poison when ingested, leading to rapid cessation of feeding and eventual death of target insects.

When applied to soil, FR901228 interacts with plant roots where it resides, offering sustained protection against nematodes that threaten crops worldwide. In addition, the interaction of FR901228 with the plant roots elicits a response causing the plant to upregulate peroxidases shown to play a role in strengthening the plant against stress.

**Pending work at third-party research university.*

Key Features of RinoTec™

- Novel technology — new mode of action*
- Effective against 3 pest categories — insects, mites, and nematodes
- 2 different mechanisms of action — ingestion and repellency
- Active on a broad spectrum of soil and foliar pests
- Low impact on pollinators and beneficial insects
- Compatible with other crop protection chemistries and fertilizers
- Easy integration into current IPM programs
- MRL-Tolerance Exempt
- Favorable toxicological and ecotoxicological profile
- Low use rates for flexible applications
- Shelf stable formulation
- Comparable efficacy to current synthetic active ingredients

A Novel Technology for the Control of Soil and Foliar Pests

Product Placement for Soil Pests

Third party testing over the past five years indicates that the ideal placement of RinoTec™ Technology is in-furrow with the seed/seed piece or with transplant water, creating a zone of protection around and within the developing roots. Effective targeted delivery of RinoTec™ Technology in and around the young developing roots can lead to increased root uptake and extend the duration of protective effects.

Soil Mobility and Availability

Upon application, a portion of the product moves into the soil solution with the other portion adsorbing onto soil colloids and organic matter. RinoTec™ Technology is fully miscible in water. The solubility of RinoTec™ Technology in water facilitates its movement into the plant's root system. RinoTec™ Technology is moderately* adsorptive. The product's affinity and binding to clay and organic matter is sufficient to help it resist moderate rainfall and irrigation events while still allowing it to desorb and move into the soil solution for uptake by the root system. The product remains in the soil and soil solution for up to two weeks

**Testing to determine exact values for solubility and adsorption coefficient are currently in progress.*

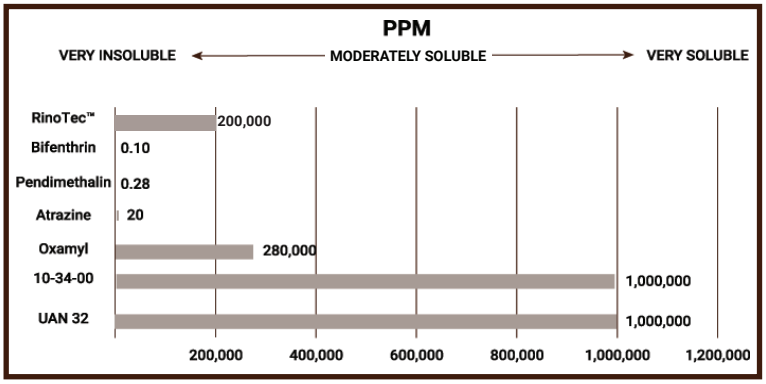


Figure 4. Solubility of RinoTec™ Technology in water compared to commonly used crop protection inputs.

Movement Into and Within Roots

RinoTec™ Technology is most effective when it is gradually taken up by the seed during imbibition, the root radicle, and initial root hairs. The product, being moderately adsorptive, gradually desorbs and enters the soil solution where its taken up by roots. Once in the roots, the product becomes mobile within the xylem of the plant root system. Studies have shown that a very small concentration of RinoTec™ Technology within the roots is effective for both repellency and ingestion.

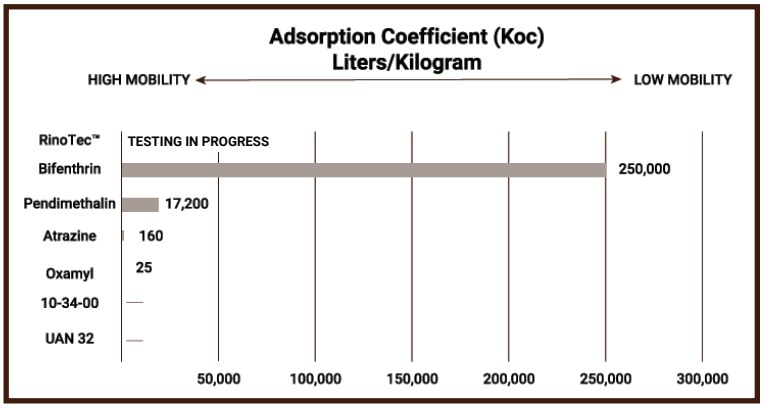


Figure 5. Adsorption Coefficient (Koc) of RinoTec™ Technology compared to commonly used crop protection inputs. A high Koc indicates a chemical is strongly adsorbed to soil and organic matter; it will not move much, thus providing protection at the early critical stages of growth. A low Koc indicates a chemical that is highly mobile in soil. The Koc may vary depending on the soil type and organic matter content.

Plant Parasitic Nematode Susceptibility

RinoTec™ Technology has shown excellent lab and field activity against some of the most economically damaging nematodes.

Major Plant Parasitic Nematodes

Type	Common Name	Genus	Species	RinoTec™ Activity
endoparasitic	Northern Root-Knot	*Meloidogyne*	*hapla*	Yes
endoparasitic	Southern Root-Knot	*Meloidogyne*	*incognita*	U.I.
endoparasitic	Columbia Root-Knot	*Meloidogyne*	*chitwoodi*	Yes
endoparasitic	Javanese Root-Knot	*Meloidogyne*	*javanica*	Yes
endoparasitic	Peanut Root-Knot	*Meloidogyne*	*arenaria*	U.I.
endoparasitic	Lesion	*Pratylenchus*	spp.	Yes
endoparasitic	Sugarbeet Cyst	*Heterodera*	*schachtii*	U.I.
endoparasitic	Potato Cyst	*Globodera*	*rostochiensis*	U.I.
endoparasitic	Soybean Cyst	*Heterodera*	*glycines*	U.I.
semi-endoparasitic	Reniform	*Rotylenchulus*	*reniformis*	No
ectoparasitic	Sting	*Belonolaimus*	*longicaudatus*	U.I.
ectoparasitic	Stubby-Root	*Trichodorus*	spp.	U.I.
ectoparasitic	Ring	*Mesocriconema*	*xenoplax*	U.I.
ectoparasitic	Dagger	*Xiphinema*	spp.	U.I.

(U.I.) Under Investigation

Table 2. RinoTec™ Technology known activity against various endoparasitic, semi-endoparasitic, and ectoparasitic nematodes.

Persistence of RinoTec™ Technology in the Soil and Plant Tissue

Upon application, the uptake of RinoTec™ Technology by plant root tissue is immediate. RinoTec™ Technology can persist in soil and roots for up to 20 days in amounts sufficient to mitigate nematode damage.

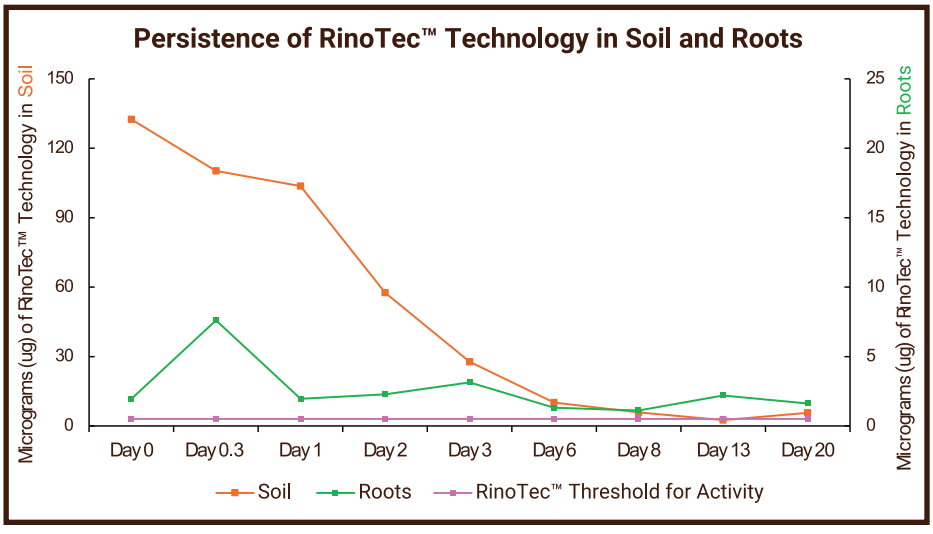


Figure 6. Uptake of RinoTec™ Technology in roots and residual in soil 20 days post treatment.

Mechanisms of Action on Plant Parasitic Nematodes

Plant parasitic nematodes pose a major threat to global food production, causing an estimated $125 billion in economic losses annually. These microscopic pests often go undetected due to their transparency and nonspecific symptoms, such as root damage, wilting, stunted growth, and yield loss. Of the 4,100 known species, endoparasitic nematodes — particularly those from the widely distributed *Meloidogyne* genus — are the most economically damaging due to their extensive host range and adaptability.

RinoTec™ Technology combines a suite of mechanisms against nematodes including:

1. ***Feeding Site Disruption:*** Root-knot nematodes invade plant roots, causing significant crop damage. Juveniles (J2s) penetrate roots and manipulate cells to form feeding sites (giant cells). While these sites nourish the nematodes, they also trigger excessive cell division, leading to galls that disrupt water and nutrient flow. This weakens plants, causing wilting, stunted growth, yellowing leaves, and increased susceptibility to pathogens, ultimately reducing yields.
   RinoTec™ Technology prevents the nematode's ability to create feeding sites, stopping galling and protecting root systems. Studies show its effects are irreversible, providing lasting protection even after periods without additional exposure to RinoTec™ Technology. Field trials confirm reduced nematode damage and higher yields with RinoTec™ Technology.
2. ***Ingestion:*** Unlike endoparasitic nematodes that invade roots, ectoparasitic nematodes stay in the soil, ingesting plant tissue without forming permanent feeding sites. RinoTec™ Technology effectively targets both types by acting in the soil and within roots.
3. ***Repellency:*** After hatching, J2 nematodes must quickly locate roots to survive in the harsh soil environment. RinoTec™ Technology alters root exudates, disrupting the nematodes' ability to detect and migrate toward roots. This repellent effect enhances seedling protection.
4. ***Plant Mediated Response:*** Roots treated with RinoTec™ Technology also show sustained increases in peroxidase activity, providing additional defense against nematodes.

Figure 7. Processing tomato infested with Root-knot Nematode.

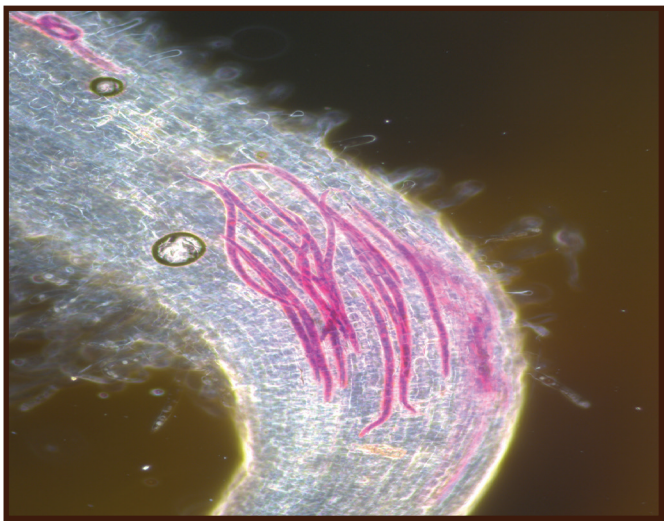


Figure 8. Juvenile Root-knot Nematode (J2s) visualized within a root.

Targeted Control of Foliar Feeding Insects

RinoTec™ Technology is highly effective for the control and suppression of a wide range of target pests while showing a favorable environmental profile and fate. Numerous studies demonstrate that RinoTec™ Technology will not interfere with pollinators, other beneficial insects, or beneficial soil borne organisms that contribute to overall soil health.

Foliar Interactions, Plant Uptake and Residual Activity

RinoTec™ Technology, when applied to plant foliage, is both surface active and trans epidermal mobile (T.E.M.). Trans epidermal mobility allows for movement into the plant tissue, just below the surface, providing a localized reservoir of active material. By remaining localized within the leaf tissue, RinoTec™ Technology offers longer lasting protection. When insects ingest material present on the leaf surface or in the leaf epidermis they rapidly cease feeding and die. Field studies have shown protective activity for 7-10 days after application. Ensure good coverage for maximum protection.

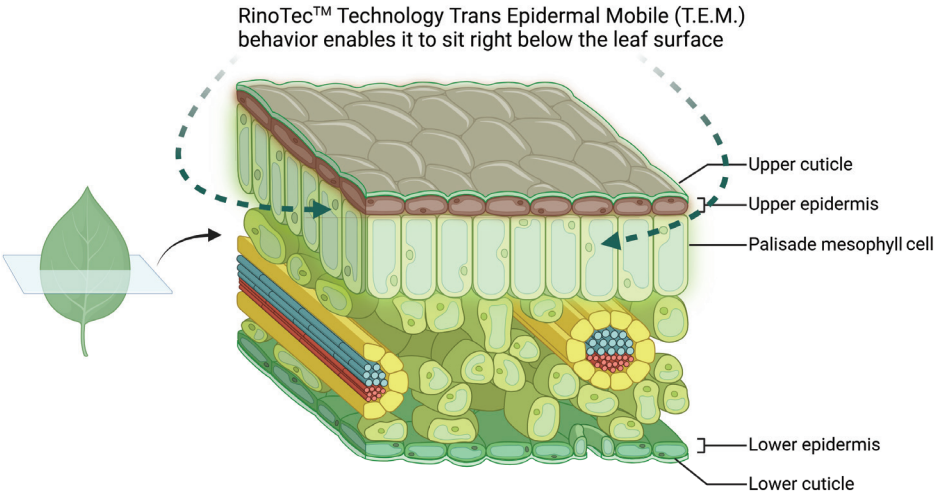


Figure 9. RinoTec™ Technology foliar is active on both the leaf surface just below the surface in the plant tissue.

Optimizing Application for Foliar Pests

Apply RinoTec™ Technology at the first sign of pest activity, targeting early life stages (e.g., nymphs, neonate larvae, first instar). Use sufficient water with a medium droplet size for thorough coverage without runoff. A spreader-sticker may enhance control. Reapply as needed with RinoTec™ Technology or a complementary rotational insecticide to keep pest populations below economic thresholds. Excessive rainfall or irrigation may necessitate re-treatment.

Coverage and Rainfastness of Foliar Application

For optimal effectiveness, apply RinoTec™ Technology with a medium droplet size to ensure even coverage without runoff. It remains active on the leaf surface for seven days. To maintain efficacy, reapply after seven days or following precipitation or irrigation, whichever comes first. A spreader-sticker may improve coverage and rainfastness.

Figure 10. When spraying RinoTec™ Technology, applicators should calibrate spray equipment to use a medium droplet size for maximum efficacy.

Proven Efficacy

RinoTec™ Technology has been tested in a wide range of environments including in-vitro, lab, greenhouse, micro-plot, and field trials. Over 400 replicated field trials have been conducted across major agricultural regions in the United States, Latin America, and Europe. This five year coordinated effort has helped validate the technology's value and fit under diverse pest populations, application methods, growing conditions, and crops.

RinoTec™ Technology was developed with an integrated program approach in mind. It can be used alone, in a rotation, or in a tank mix. When used as part of an integrated pest management (IPM) program where multiple modes of action are used, performance and overall efficacy and results are optimized.

ProFarm scientists have conducted research confirming tank mix compatibilities with commonly used crop protection and nutritional products in the market today. Since RinoTec™ Technology is bio-chemical in nature, it is not susceptible to negative tank mix interactions with fungicides, insecticides, or fertilizers. The product has a shelf stable formulation and storage characteristics similar to other crop protection products.

Additional third-party trials and in-field demonstration plots with growers continue to show RinoTec™ Technology's ability to be used effectively, flexibly, and profitably in large-scale commercial agriculture.

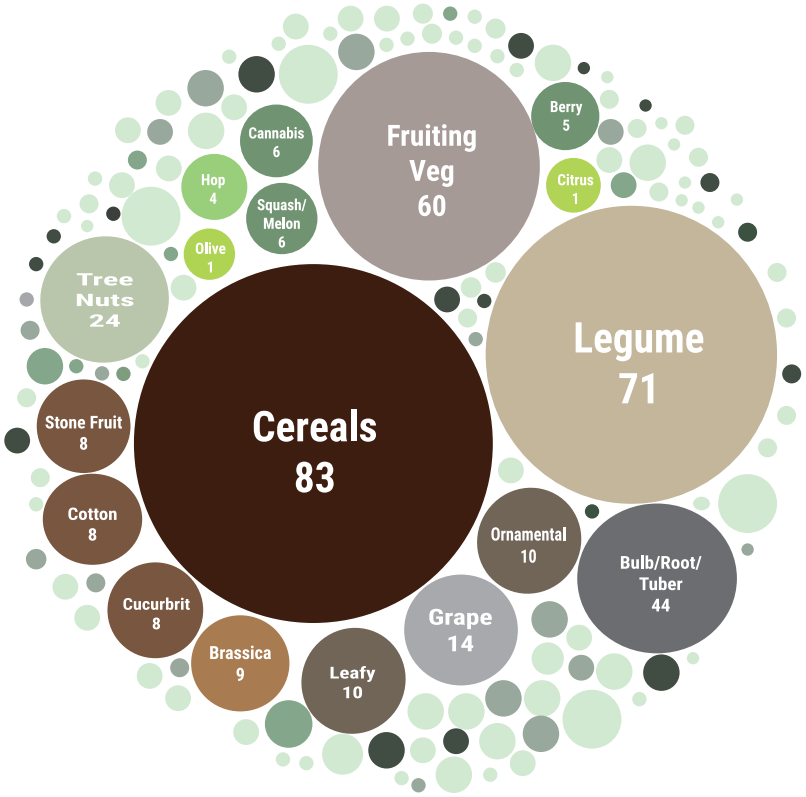


Figure 11. RinoTec™ Technology has been tested world-wide across multiple crops. Represented here are over 400 replicated field trials across major agricultural regions. Over 50% of the trials were on major crops such as cereals (83), legume (71), and fruiting vegetables (60).

"In multi-year field trials on tomatoes, peppers, melons, and more, we have seen RinoTec™ Technology perform best in a rotational program. RinoTec™ shows the strongest efficacy when targeting the nymphal stage of insects and when used in rotation with other active ingredients. RinoTec™ Technology brings improved efficacy to your overall IPM program."

— Brian Mueller, Senior Field Development Manager, ProFarm Group

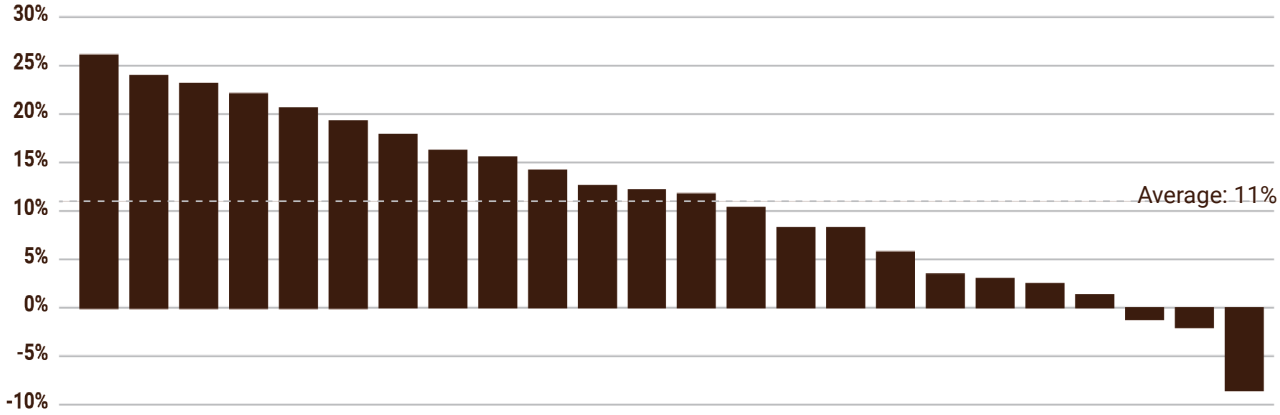
RinoTec™ Yield Performance vs. Grower Standard

RinoTec™ Technology demonstrates yield performance.

Summary of 24 Midwest trials

■ **RinoTec™ Technology provides, on average, an 11% increase in yield over the untreated control.**

Summary of 24 Midwest Trials



Corn Yields - Whitewater, WI 2022

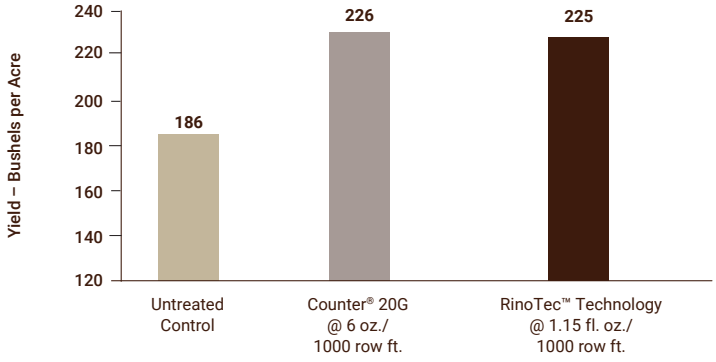


Figure 12A. Trial conducted by Agri-Tech Consulting compared RinoTec™ Technology to Counter® 20G

Corn Yields - Bryant, SD 2023

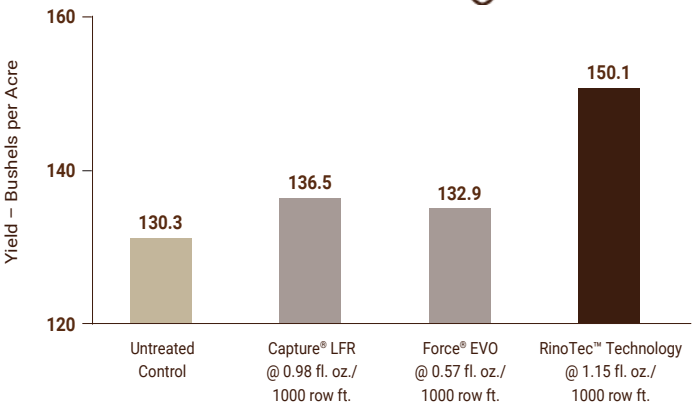


Figure 12C. Trial conducted by South Dakota State University compared RinoTec™ Technology to Force® EVO and Capture® LFR

Corn Yields - Whitewater, WI 2023

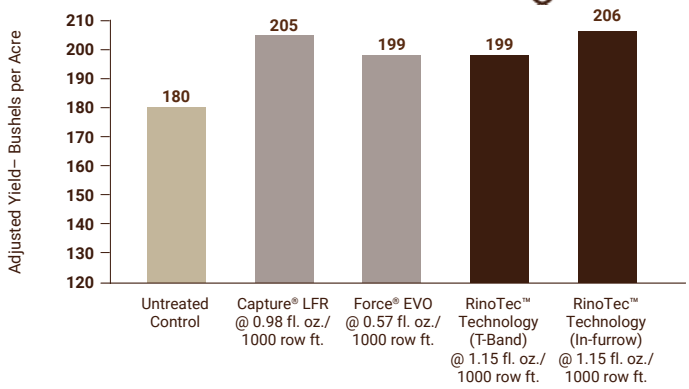
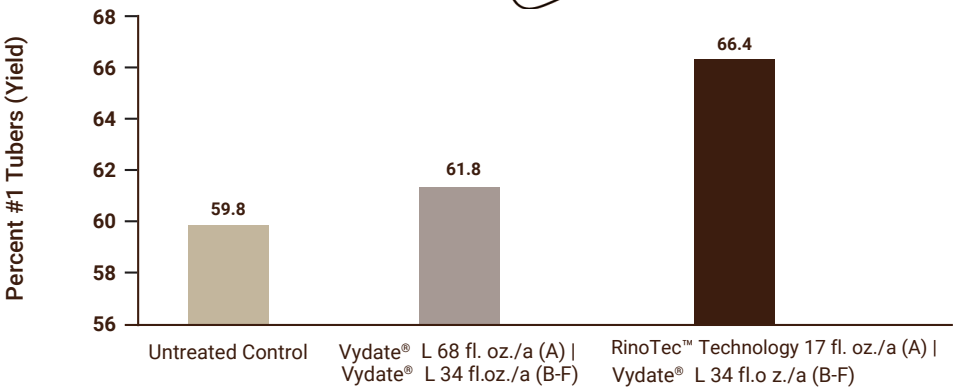


Figure 12B. Trial conducted by Agri-Tech Consulting compared RinoTec™ Technology (T-band and In-furrow applications) to Capture® LFR and Force® EVO

RinoTec™ Yield Performance vs. Grower Standard - Continued

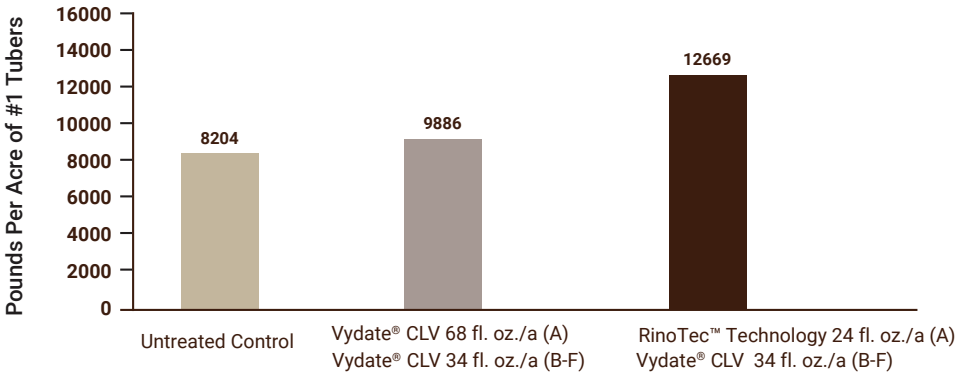
Potato Yields - Connell, WA 2020



- **7% more #1 tubers with RinoTec™ Technology than Vydate® alone.**

Figure 13A. Trial conducted by Hubbard Ag. Science compared RinoTec™ Technology in program with Vydate® to Vydate® alone. Planting date: 4/23/2020. Treatments: (A) 4/23/2020, (B) 7/10/2020, (C) 7/27/2020, (D) 8/13/2020, (E) 8/27/2020, (F) 9/10/2020

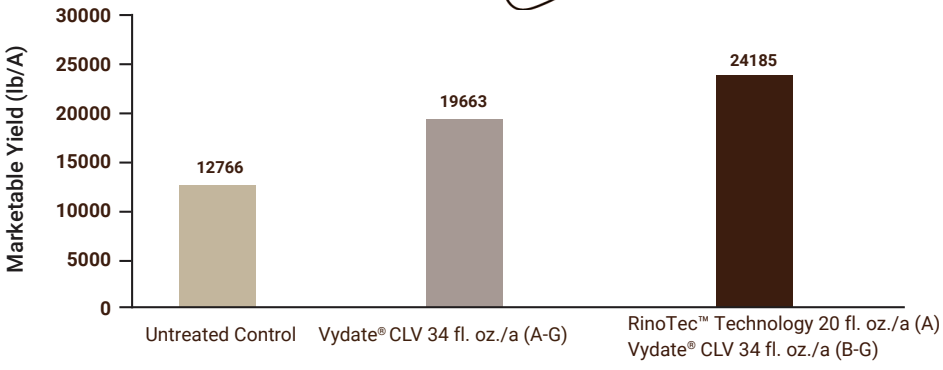
Potato Yields with Columbia Root-Knot Nematode Control - Eltopia, WA 2021



- **28% higher yield with RinoTec™ Technology for CRKN control than Vydate® alone.**

Figure 13B. Trial conducted by Ag. Development Group compared RinoTec™ in program with Vydate® to Vydate® alone. Planting date: 5/2/2021. Treatment dates: (A) 5/3/2021, (B) 5/28/2021, (C) 7/13/2021, (D) 7/27/2021, (E) 8/10/2021, (F) 8/24/2021

Potato Yields - Eltopia, WA 2022



- **4,522 pounds more tubers per acre with RinoTec™ Technology than Vydate® alone.**

Figure 13C. Trial conducted by Ag. Development Group compared RinoTec™ Technology in program with Vydate® to Vydate® alone. Treatment dates: (A) 4/27/2022, (B) 5/27/2022, (C) 7/26/2022, (D) 8/9/2022, (E) 8/23/2022, (F) 9/26/202, (G) 9/20/2022

RinoTec™ Performance Against Soil Pests vs. Grower Standard

Trials* across a range of geographies and crops support that RinoTec™ Technology provides effective control for growers looking to add to their IPM programs.

Percent Columbia Root-Knot Nematode Incidence

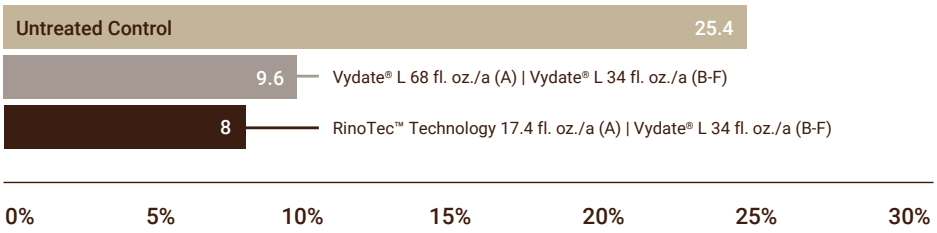


Figure 14A. Trials conducted by Hubbard Ag, Science in Connell, WA, 2020 on potato - Ranger Russet variety. Planting date 4/23/2020. Treatment dates: (A) 4/23/2020, (B) 7/10/2020, (C) 7/27/2020, (D) 8/13/2020, (E) 8/27/2020, (F) 9/10/2020

■ **RinoTec™ Technology resulted in 17% less CRKN incidence than Vydate® alone.**

Percent Incidence of Tuber Damage by Columbia Root-Knot Nematode

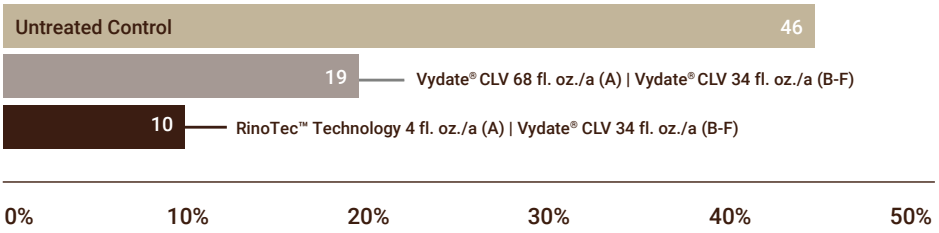


Figure 14B. Trials conducted by Ag. Development Group in Eltopia, WA, 2021 on potato - Clearwater Russet variety. Planting date 5/3/2021. Treatment dates: (A) 5/3/2021, (B) 5/28/2021, (C) 7/13/2021, (D) 7/27/2021, (E) 8/10/2021, (F) 8/24/2021

■ **RinoTec™ Technology resulted in 47% less CRKN damage than Vydate® alone.**

Percent Severity in Stings per Tuber by Columbia Root-Knot Nematode

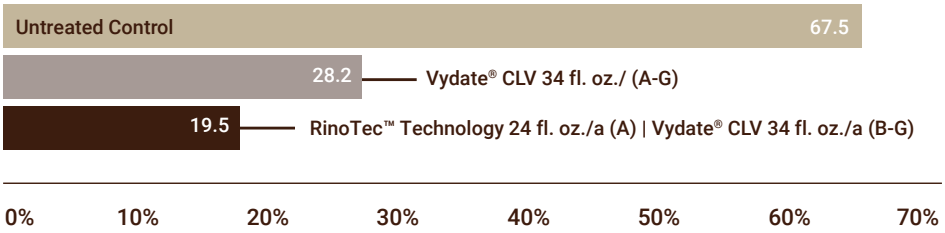
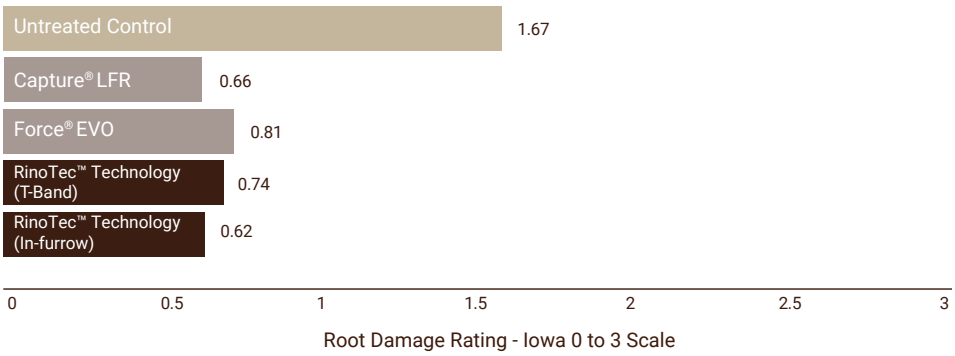


Figure 14C. Trials conducted by Ag. Development Group in Eltopia, WA, 2022 on potato - Russet Burbank variety. Planting date 4/27/2022. Treatment dates: (A) 4/27/2022, (B) 5/27/2022 (C) 7/26/2022, (D) 8/9/2022, (E) 8/23/2022, (F) 9/6/2022, (G) 9/20/2022

■ **RinoTec™ Technology resulted in 31% less severity than Vydate® alone.**

**Data on file. For more information or specific trial information, please contact your ProFarm Group representative.*

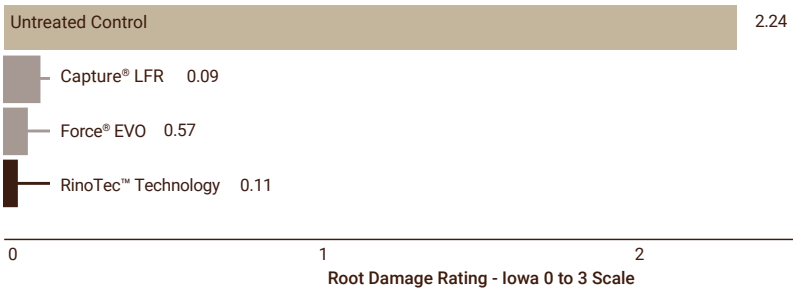
Root Damage from Corn Rootworm - Whitewater, WI 2023



- **RinoTec™ Technology comparable to grower standards in reducing root damage by corn rootworm.**

Figure 15A. Trials conducted by Agri-Tech Consulting comparing RinoTec™ Technology (T-band and in-furrow) to grower standards. Application rates: Capture® LFR 0.98 fl oz./1000 row ft; Force® EVO 0.57 fl oz./1000 row ft; RinoTec™ Technology (T-Band) 1.15 fl oz/1000 row ft; RinoTec™ Technology (In-furrow) 1.15 fl oz/1000 row ft.

Root Damage from Corn Rootworm - Bryant, SD 2023



- **RinoTec™ Technology reduces root damage from corn rootworm comparable to grower standard**

Figure 15B. Trials conducted by South Dakota University comparing RinoTec™ Technology to grower standards. Application rates: RinoTec™ Technology 1.15 fl. oz./1000 row ft; RinoTec™ Technology 0.98 fl. oz./1000 row ft; Capture® LFR 0.57 fl. oz./1000 row ft; Force® EVO 0.57 fl oz./1000 row ft.

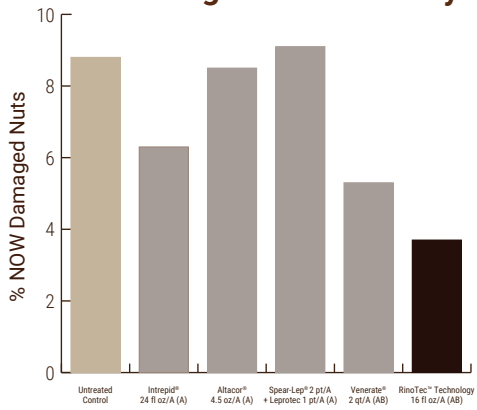
Lesion Nematode Control - Whitewater, WI 2022

- **RinoTec™ Technology reduces lesion nematode comparable to grower standard**

Figure 15C. Trials conducted by Agri-Tech Consulting comparing RinoTec™ Technology to grower standard. Application rates: Counter® 20G 6.0 oz./1000 row ft; RinoTec™ Technology 1.15 fl oz./1000 row ft.

RinoTec™ Technology Performance in the Field - Foliar Pests

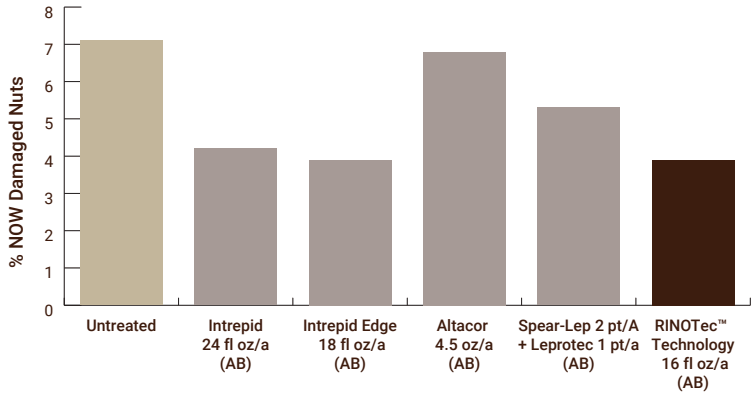
Percent Damage on Almonds by Navel Orangeworm



- **41-59% less navel orangeworm damage with RinoTec™ Technology vs the current grower program.**

Figure 16A. Trial conducted by D. Haviland, PhD University of California Extension, Shafter, CA 2021 on variety Nonpareil. Treatment timings (A) Hull split 7/6/2021, (B) Hull split + 14 days 7/19/2021

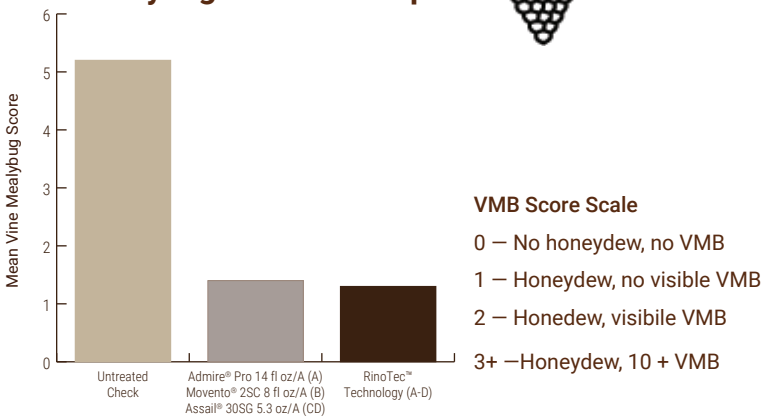
Reduced Navel Orangeworm Damaged Nuts



- **7-43%% less navel orangeworm damaged nuts with RinoTec™ Technology vs the current grower program.**

Figure 16B. Trial conducted by D. Haviland, PhD University of California Extension, Shafter, CA 2021 on variety Nonpareil. Treatment timings (A) 6/2/2022

Vine Mealybug Score on Grape



- **7% lower vine mealybug score than current grower program.**

Figure 16C. Trial conducted by R. Van Steenwyk, PhD, University of California Extension, Berkeley, 2022 on variety chardonnay. Treatment timings: (A) Delayed Dormant 3/21/2021, (B) Post-bloom 5/25/2022, (C) 1-3 mm fruit 7/26/2022, (D) Pre-harvest 8/18/2022

RinoTec™ Technology Performance in the Field - Mites

Reduction in Twospotted Spider Mite on Strawberry

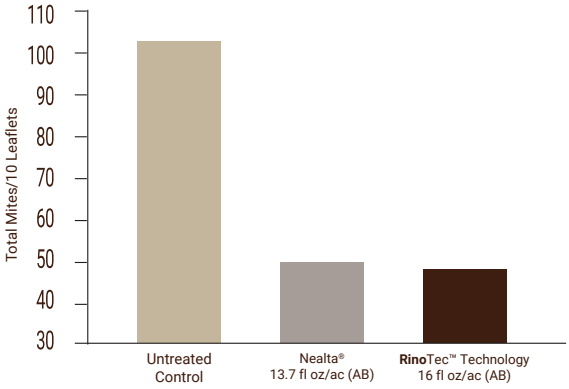


Figure 17A. Trial conducted by Apex AG Research, Santa Maria, CA 2021. Treatment dates: (A) 5/13/2021, (B) 5/27/2021

- **54% reduction in twospotted spider mite population with RinoTec™ Technology.**

Control of Whitefly Nymphs with Tank Mix on Tomato

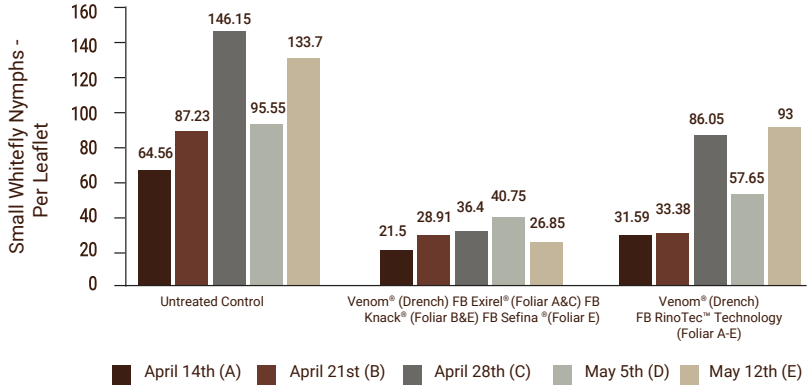


Figure 17B. Trial conducted by AJ Quereshi, Ph.D, University of Florida, Immokolee, FL. Foliar treatments made on April 8th, 15th, 22nd, 29th, and May 6th at 40 GPA.

- **RinoTec™ Technology program showed activity that was superior to the untreated control for whitefly nymphs.**

Control of Whitefly Nymphs with Tank Mix on Tomato

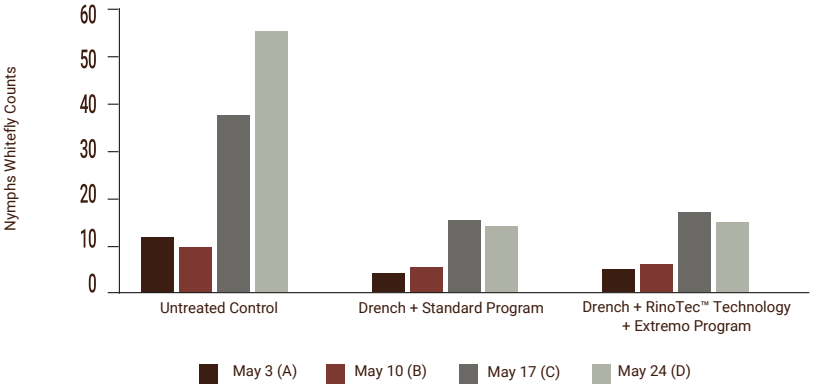


Figure 17C. Trial compared the standard program: Sivanto Prime® (A)(D), PQZ® (B)(E), Exirel® (C)(F) to RinoTec™ Technology program: Sivanto Prime® (A)(D), RinoTec™Technology (B)(E), Exirel® (C)(F).

- **RinoTec™ Technology program is comparable to the standard program for whitefly nymphs control.**

Mammalian and Environmental Fate

Rigorous testing demonstrates the favorable environmental and toxicological profile of RinoTec™ Technology.

Avian and Mammalian	
Mammalian Chronic feeding	NOAEL: 900 (mg/kg/day)
Mammalian Acute oral	>5000 LD50 (mg/kg)
Mammalian Acute dermal	>5000 LD50 (mg/kg)
Mammalian Acute inhalation	>5.12 LC50 (mg/L)
Mammalian Acute dermal irritation	Slightly Irritating
Mammalian Acute eye irritation	Minimally Irritating
Mammalian Skin sensitization	Not a contact sensitizer
Avian Acute oral	LD50: >2000 mg a.i./kg bw
Algae and Aquatic Plants	
Algae	96-Hour Yield EC50: 32
Cyanobacteria	96-Hour Yield EC50: 255
Aquatic plant	7-Day Yield NOEC: 64, LOEC: 160
Aquatic Fish and Invertebrates	
Acute freshwater invertebrate	EC50: 37 mg/L
Acute freshwater fish	96 hour LC50 value: >100 mg/L
Terrestrial Invertebrates	
Ladybird Beetle	LC50: 1.3X field rate (equal to 757.1 mL Prod/Ac)
Rove Beetle	LC50: 42X MFAR or (equal to 24913 mL Prod/Ac)
Green Lacewing	LC50: >12.8X MFAR (equal to 7569.6 mL Prod/Ac)
Acute oral honey bee	48-hour LD50: >100 µg a.i./bee
Acute contact honey bee	48-hour LD50: >100 µg a.i./bee
Soil	
Soil microorganisms, carbon	No long-term influence on carbon transformation in soils
Soil microorganisms, nitrogen	No long-term influence on nitrogen transformation in soils
Ready biodegradation	Readily biodegradable

Table 3. Testing of RinoTec™ Technology conducted using regulatory guidelines for pesticides and toxic substances. Due to route of exposure which is ingestion, the risk to terrestrial invertebrates is expected to be negligible.

Relative Acute Oral Toxicity of Known Substances vs. RinoTec™ Technology

Substance	Acute Oral Toxicity	Lethal Dose LD50 (mg/kg)* smaller number = greater toxicity
Water	Relatively Non-Toxic	90,000
Sucrose	Relatively Non-Toxic	30,000
Citric Acid	Relatively Non-Toxic	12,000
Ethanol (alcohol)	Relatively Non-Toxic	7,000
Glyphosate	Relatively Non-Toxic	5,600
RinoTec™ Technology	Relatively Non-Toxic	>5000
Spinosad	Relatively Non-Toxic	>5000
Bacillus thuringiensis	Slightly Toxic	5,000
Sodium Bicarbonate	Slightly Toxic	4,220
Fructose	Slightly Toxic	4,000
Sodium Chloride (table salt)	Slightly Toxic	3,000
Acetaminophen	Slightly Toxic	2,400
Hydrogen Peroxide	Slightly Toxic	1,000
Abamectin	Slightly Toxic	650
Copper Sulfate	Moderately Toxic	472
Imidacloprid	Moderately Toxic	450
Caffeine	Moderately Toxic	190
DDT	Moderately Toxic	100
Vitamin D3	Highly Toxic	37
Counter® 20G Lock'N Load	Highly Toxic	29
Thimet®	Highly Toxic	5
Cyanide	Highly Toxic	4
Nicotine	Highly Toxic	3

Table 4. RinoTec™ Technology in comparison to common household products and to other crop protection products used by growers today.

Physical & Chemical Properties of RinoTec™ Technology

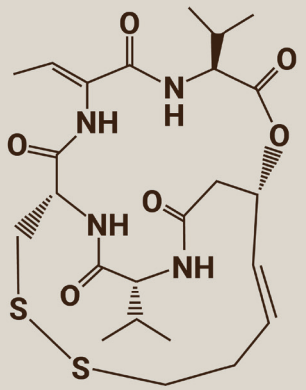
Active Technology	RinoTec™ Technology
Active Ingredient	Inactivated *Burkholderia rinojensis* A396 cells and spent fermentation media, contains not less than 330 µg of (1S,4S,7Z,10S,16E,21R)-7-ethylidene-4,21-di(propan-2-yl)-2-oxa-12,13-dithia-5,8,20,23-tetrazabicyclo[8.7.6] tricos-16-ene-3,6,9,19,22-pentone per mL of RinoTec™. (1S,4S,7Z,10S,16E,21R)-7-ethylidene-4,21-di(propan-2-yl)-2-oxa-12,13-dithia-5,8,20,23-tetrazabicyclo[8.7.6]tricos-16-ene-3,6,9,19,22-pentone
IRAC Classification	UNB - Bacterial Agents (Non-Bt) of Unknown or Uncertain MOA
% WT of Active in Formulation	94.46%
Other Ingredients	Inert, non, reactive 5.54%
Analytical Marker	FR901228 (1S,4S,7Z,10S,16E,21R)-7-ethylidene-4,21-di(propan-2-yl)-2-oxa-12,13-dithia-5,8,20,23-tetrazabicyclo[8.7.6]tricos-16-ene-3,6,9,19,22-pentone
Analytical Marker CAS:	128517-07-7
Analytical Marker Concentration:	>330 µg per ml
Chemical Structure of Analytical Marker	
Density	1 g/ml
Physical State:	Liquid
Color	Pale yellow to seafoam
pH:	3.5-6.0
Solubility in Water/Adsorptive Coefficient	200,000 ppm/Testing in progress
Flammability	0, Not highly flammable
Exposure Limits	None established
Stability	Stable
Incompatibility (Material to Avoid)	None known

Table 5. The physical and chemical properties of RinoTec™ Technology. Refer to individual SDS and pending EPA registration label for more information.

Managing Resistance

Agricultural pest resistance threatens crop productivity, making proactive management essential. To combat resistance, farmers should integrate multiple pest control strategies and avoid overusing single modes of action. Effective approaches include habitat manipulation, crop rotation, crop-free periods, soil solarization, tolerant varieties, and targeted chemical and biological controls. Incorporating a novel mode of action into an integrated pest management (IPM) program helps preserve the effectiveness of conventional products, ensuring long-term control and sustainability.

Formulations, Worker Safety, and Regulatory Information

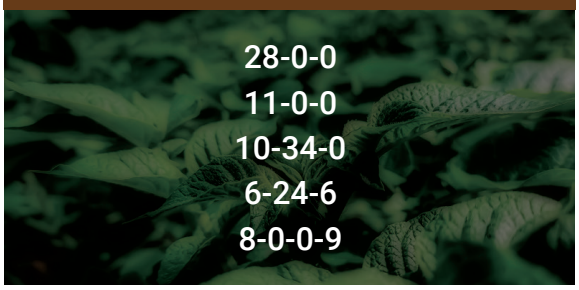
RinoTec™ Technology can be tank mixed with a wide range of fertilizers and crop protection products*, and delivers optimal performance when integrated into a comprehensive pest management program.

Based on the low toxicological profile of RinoTec™ Technology, a "CAUTION" signal word is expected to be assigned by the EPA[1].

Refer to country-specific labels for information about application and handling, personal protective equipment (PPE), restricted-entry intervals (REI), and preharvest intervals (PHI).

Data on file. [1]Pending EPA Registration.

RinoTec™ Technology Fertilizer Compatibility



The EPA Green Chemistry Challenge Awards

The EPA Office of Chemical Safety and Pollution Prevention along with the American Chemical Society Green Chemistry Institute® recognized the favorable toxicological profile of RinoTec™ Technology.

The ProFarm Group remains committed to developing crop protection solutions that allow growers the freedom to farm today and for future generations.

"**RINO**Tec™ **Technology** makes synthetic chemistry work better."

Cited and Recommended References

- Phillips McDougall (2018). Evolution of the Crop Protection Industry since 1960. https://croplife.org/wp-content/uploads/2018/11/Phillips-McDougall-Evolution-of-the-Crop-Protection-Industry-since-1960-FINAL.pdf
- Michigan State University Arthropod Pesticide Resistance Database: https://www.pesticideresistance.org/
- Abbas, M.S.T. Genetically engineered (modified) crops (Bacillus thuringiensis crops) and the world controversy on their safety. Egypt J Biol Pest Control 28, 52 (2018). https://doi.org/10.1186/s41938-018-0051-2
- Vincent L. Salgado, Resistant Target Sites and Insecticide Discovery, Pesticide Chemistry and Bioscience, Woodhead Publishing (1999), Pages 236-246, ISBN 9781855738102, https://doi.org/10.1533/9781845698416.5.236
- Matsuo N. (2019). Discovery and development of pyrethroid insecticides. Proceedings of the Japan Academy. Series B, Physical and biological sciences, 95(7), 378–400. https://doi.org/10.2183/pjab.95.027
- United States Environmental Protection Agency. (2017). Pyrethrins and Pyrethroids. https://19january2017snapshot.epa.gov/ingredients-used-pesticide-products/pyrethrins-and-pyrethroids_.html
- Skendžić, S., Zovko, M., Živković, I. P., Lešić, V., & Lemić, D. (2021). The Impact of Climate Change on Agricultural Insect Pests. Insects, 12(5), 440. https://doi.org/10.3390/insects12050440
- Léonard Schneider, Martine Rebetez, Sergio Rasmann (2022). The effect of climate change on invasive crop pests across biomes. Current Opinion in Insect Science, Volume 50, 100895, ISSN 2214-5745. https://doi.org/10.1016/j.cois.2022.100895
- Bacci, L., Lupi, D., Savoldelli, S., & Rossaro, B. (2016). A review of Spinosyns, a derivative of biological acting substances as a class of insecticides with a broad range of action against many insect pests. Journal of Entomological and Acarological Research, 48(1), 40–52. https://doi.org/10.4081/jear.2016.5653
- EPA Green Chemistry Award: https://www.epa.gov/newsreleases/epa-announces-winners-2024-green-chemistry-challenge-awards

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