GreenLight Biosciences

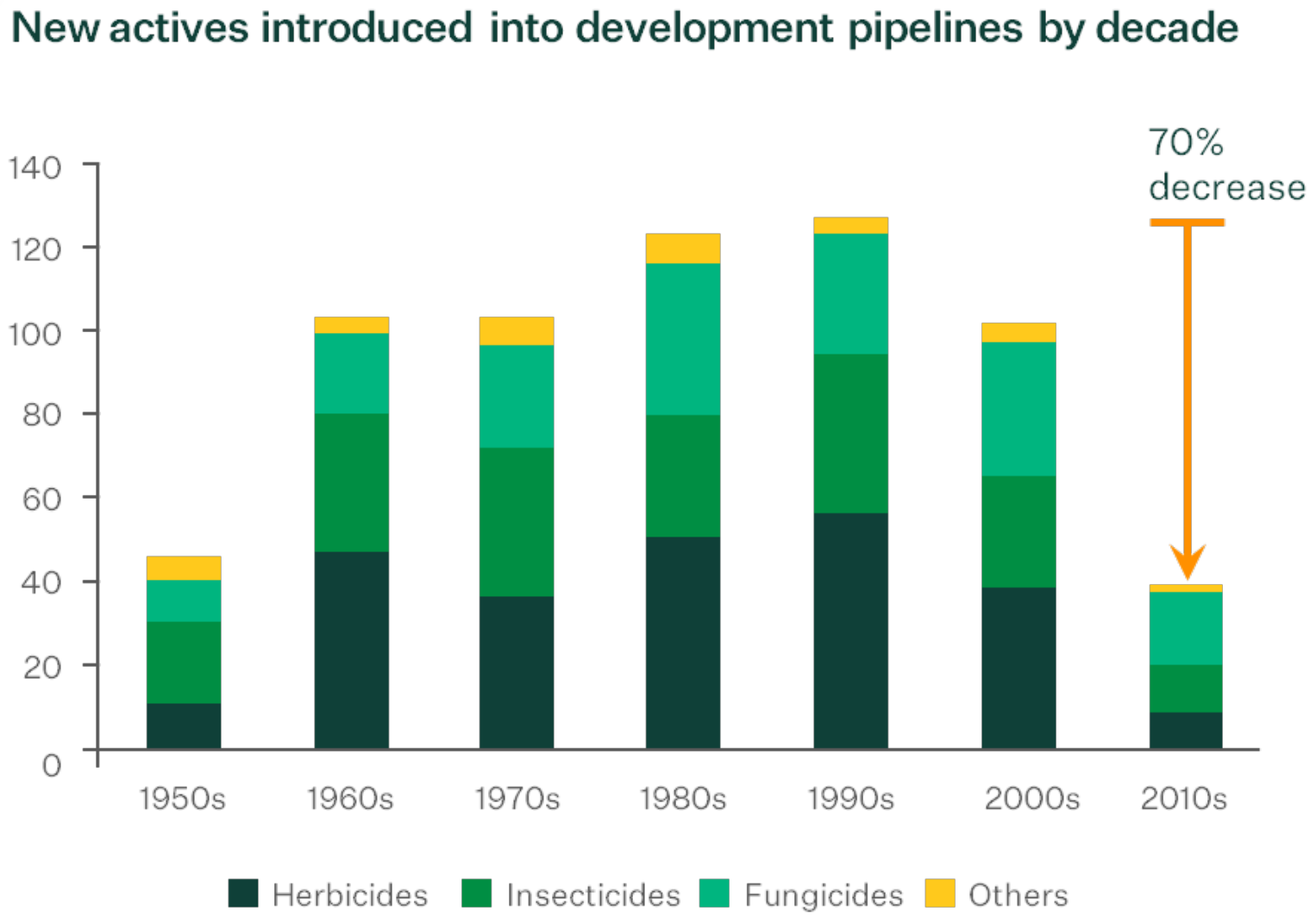
From dsRNA to the field: the transformative role of RNAi in sustainable agriculture

Alexandra Rosenmund, PhD

Director, Global Technical Development

BCPC Congress, Harrogate UK, November 2025

Farmers are losing crop protection tools faster than they are being replaced



The pipelines of major agrochemical companies have declined 90% over the last twenty years

Source(s): Phillips McDougall Database, S&P Global, Canaccord Genuity, Corteva (BMO Farm to Fork 2023 Presentation)

The Challenge of Pesticides: Environment vs. Farmers

Low-risk solutions offer new tools, which degrade rapidly in the environment and against which there is currently no resistance

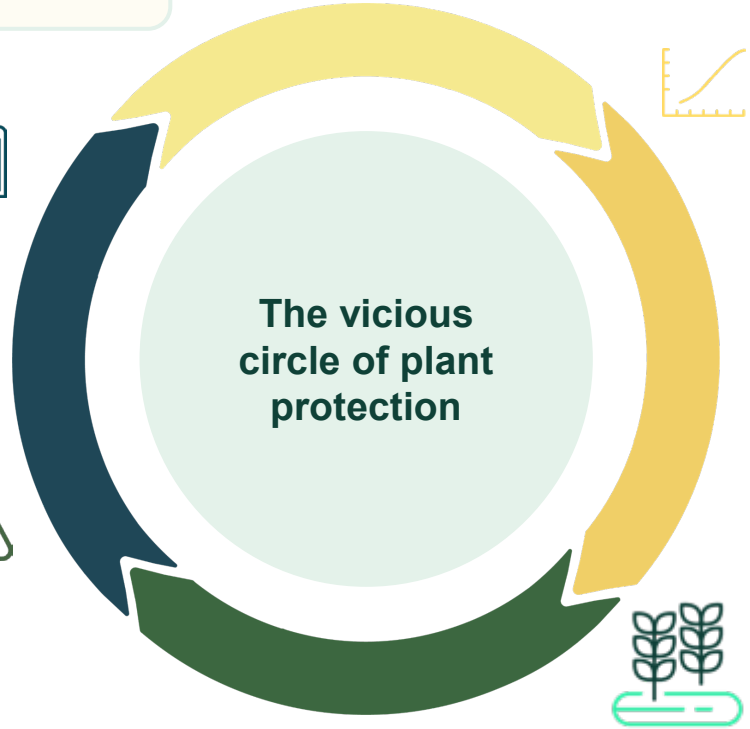
Resistance to synthetic pesticides has increased exponentially in the last century.

Fewer products

Farmers have fewer opportunities to fight off diseases and pests, and innovation has slowed down in recent decades.

Regulations

In response to environmental and consumer concerns, an increasing number of conventional chemical pesticides have been withdrawn from the market, banned or more strictly regulated.



Increased use

Farmers use higher amounts of pesticides to compensate for resistance and lower chances of pest control.

Residues and environmental damage

Many conventional chemical pesticides are still present and continue to be of concern to the environment and consumers.

RNA based crop protection could have significant benefits over conventional chemistry

We believe that RNA has the potential to be an integral component in crop protection

EFFECTIVE

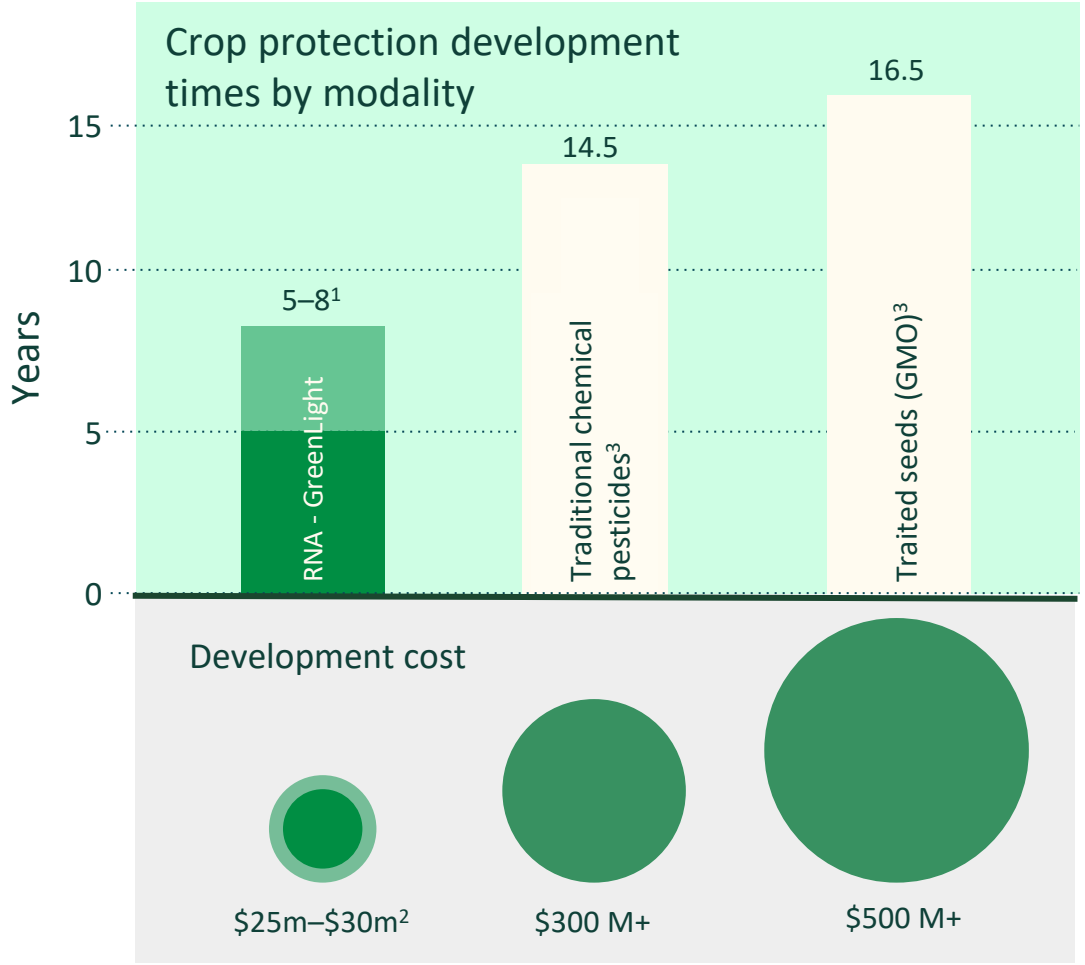
GreenLight's RNA solutions have shown in field efficacy equal or better than conventional standards

ENVIRONMENTAL SAFETY

RNA degrades within days of application and can be designed to target only pest species

RAPID DEVELOPMENT

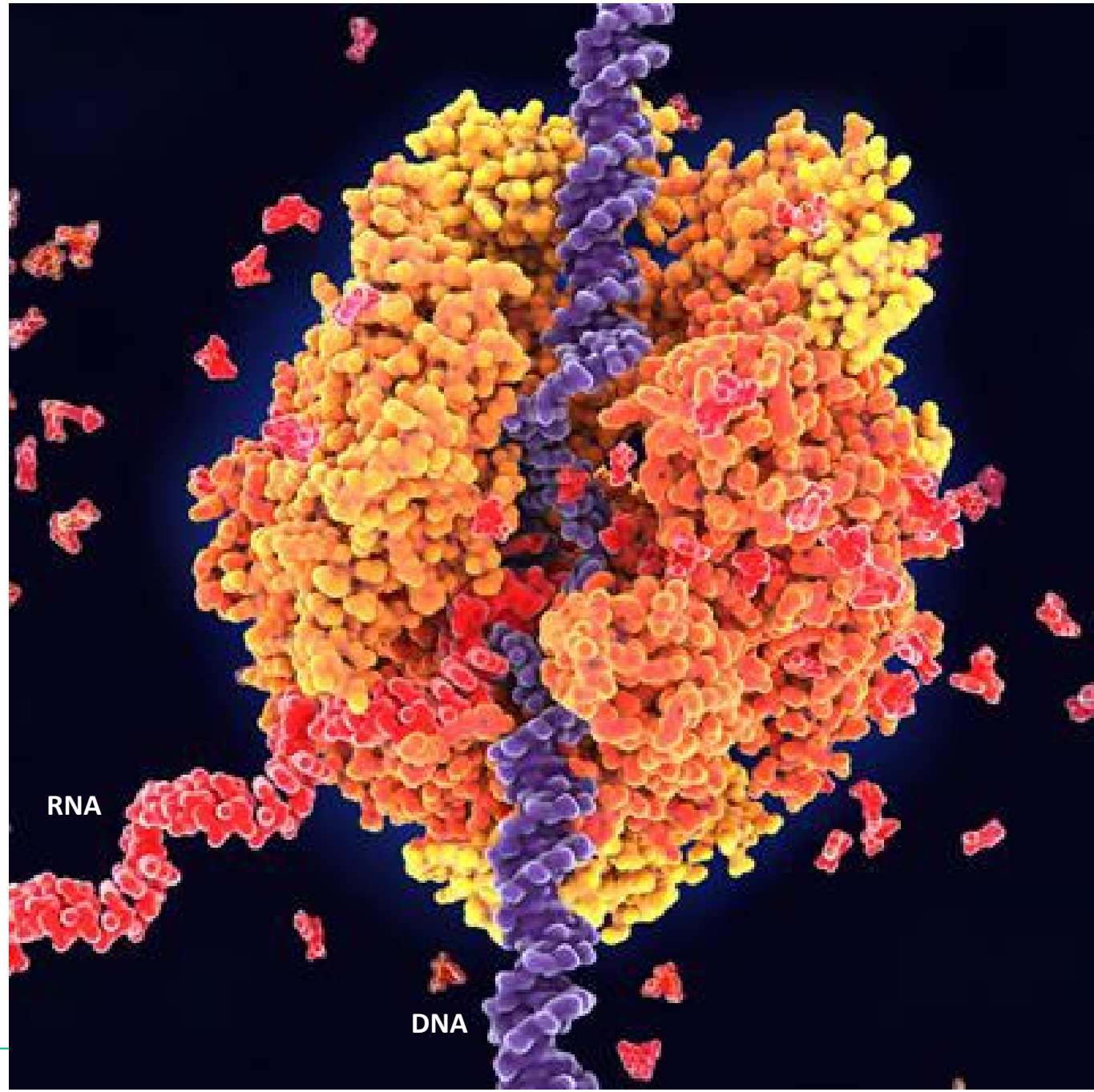
Development of RNA actives can be done rapidly, allowing for nimble responses to emerging threats.



1, 2. Internal GLB Estimates; 3. Sparks et al., 2016, Perspectives on the agrochemical industry and agrochemical discovery; Pest Management Science 73(4)672-677.

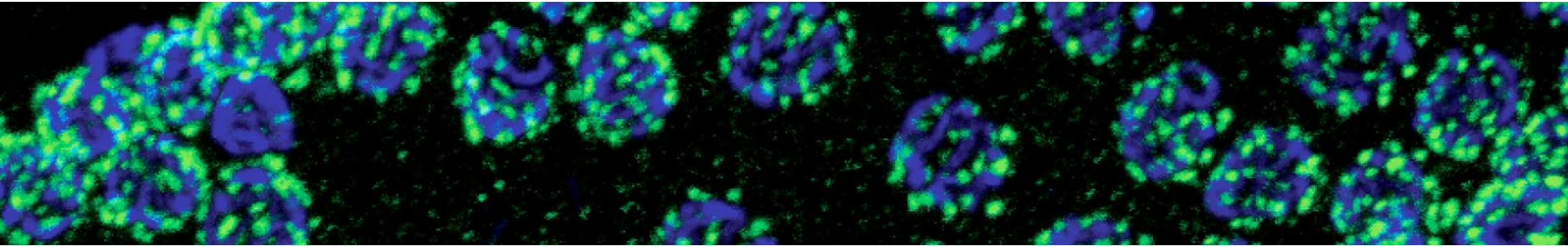
What is RNA?

- The Ribonucleic acid (RNA) is a polymeric molecule essential in various biological roles in coding, decoding, regulation and expression of genes.
- While DNA contains all the instructions for the cell to grow, function and replicate
- RNA carries out these instructions: it copies DNA to make proteins
- In nature RNA exists as rRNA, tRNA, mRNA, dsRNA and siRNA



What is RNA interference?

Natural gene regulation in many eukaryotes



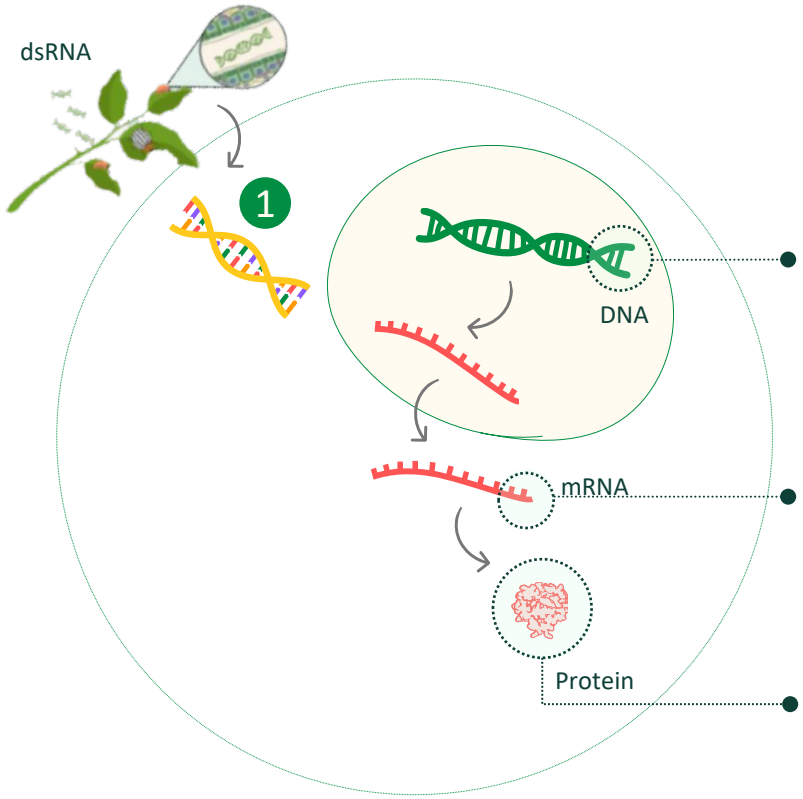
Fire and Mello (Nobel Prize in 2006) discovered that cells have a search engine, known as RNA interference (or RNAi), and that they could harness it to carry out their own searches.

RNAi acts like the cell's own personal google search for genetic data.

How does RNAi work?

In agriculture, dsRNA products inhibit key processes inside target pests or disease

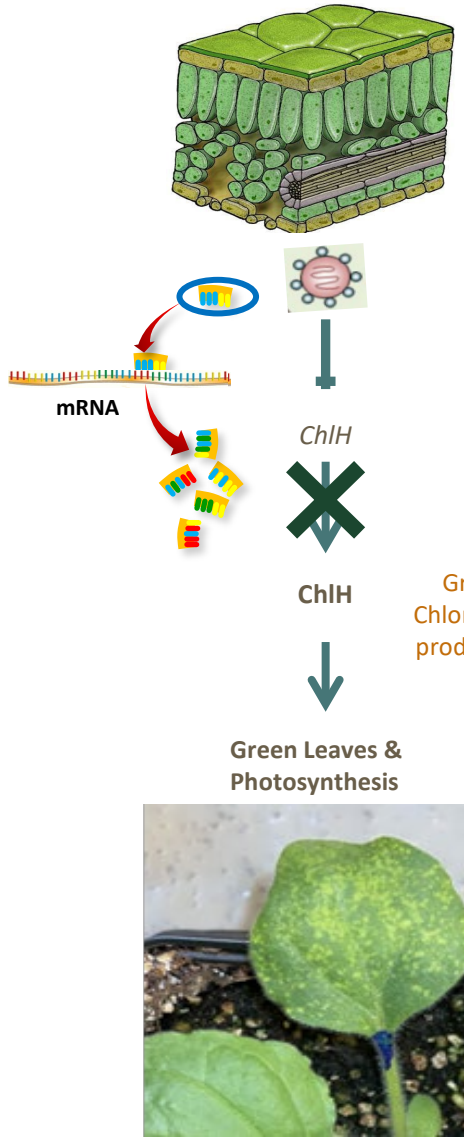
1. The highly specific dsRNA is absorbed by target pest cells upon ingestion.



Inside the nucleus of each cell is the genetic blueprint, encoded in DNA

This information is transcribed (copied) into messenger RNA (mRNA)

Which gets translated by the cell's machinery to make specific proteins



1. Based on GreenLight Biosciences Field Trial Data

RNAi IN AGRICULTURE
Sprayable dsRNA is not GMO

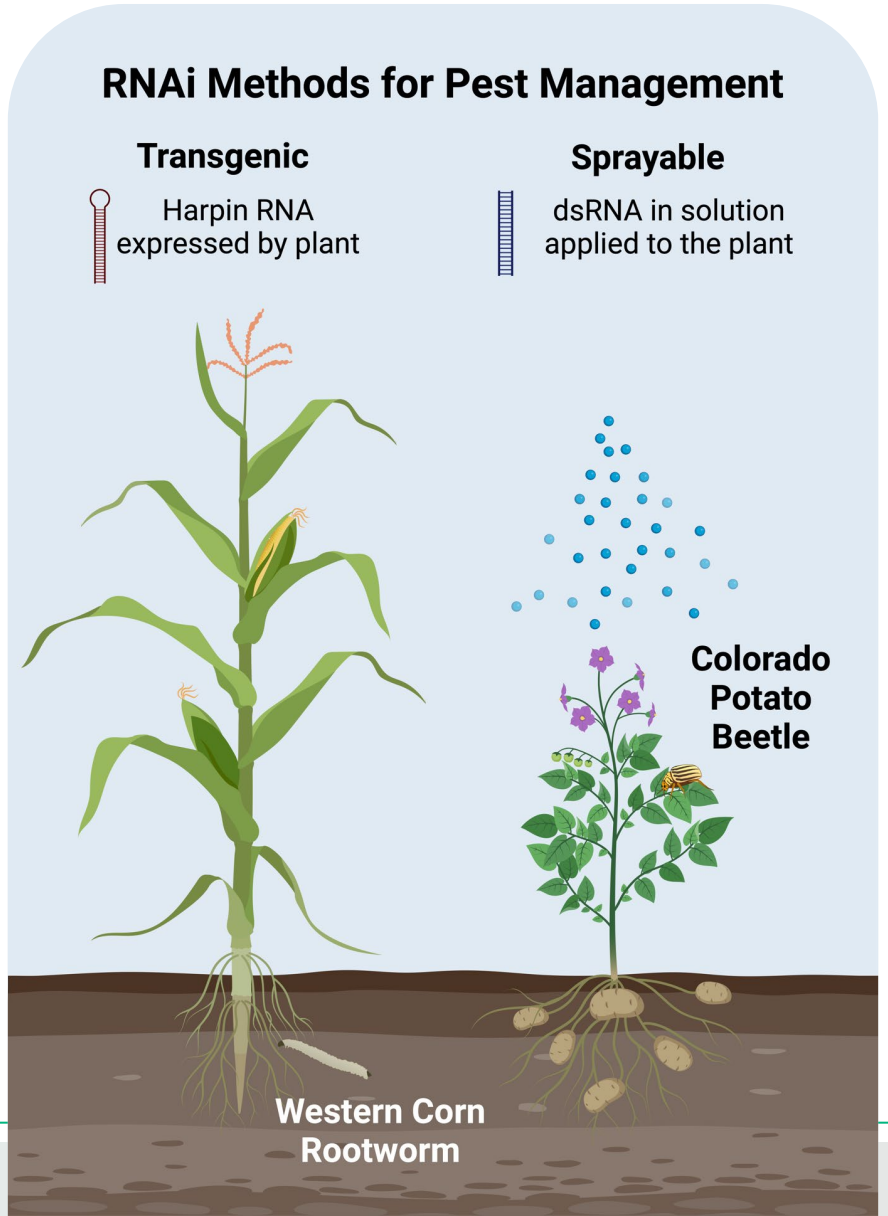
GMO

Host-Induced RNAi

Modify the plant to express dsRNA

Plant Incorporated Protectant (PIP):

e.g. Western Corn Rootworm DvSnf7 in SmartStax® PRO



Non-GMO

GreenLight Biosciences Technology

Spray-Induced RNAi

Externally applied dsRNA

- Calantha™, first sprayable dsRNA registered by US EPA in 2023
- Submitted in Europe 2023, Registered in Ukraine 2024

GreenLight Biosciences Technology – Regulatory

GLB RNA solutions meet the diverse needs of regulators, farmers, and consumers

GLB dsRNA is registered, under review, or in discussion with regulators around the world

What regulators, growers and consumers are looking for:

RNA	Characteristics
✓	Specificity of action – not broad spectrum
✓	Minimal toxicity – humans and Non-Target Organisms
✓	Degrades rapidly in the environment
✓	Low to no residue
✓	Low dose rate
✓	Use in Integrated Pest Management (IPM) programs
✓	Non-GMO
✓	Compatibility with current Agricultural Practices
✓	Maintains Non-Target Organism diversity post-application
✓	New Mode of Action

RNA challenge: Translation of tech results from Lab/GH to Commercial Performance in the Field

GreenLight Biosciences is bringing innovative crop protection around the world

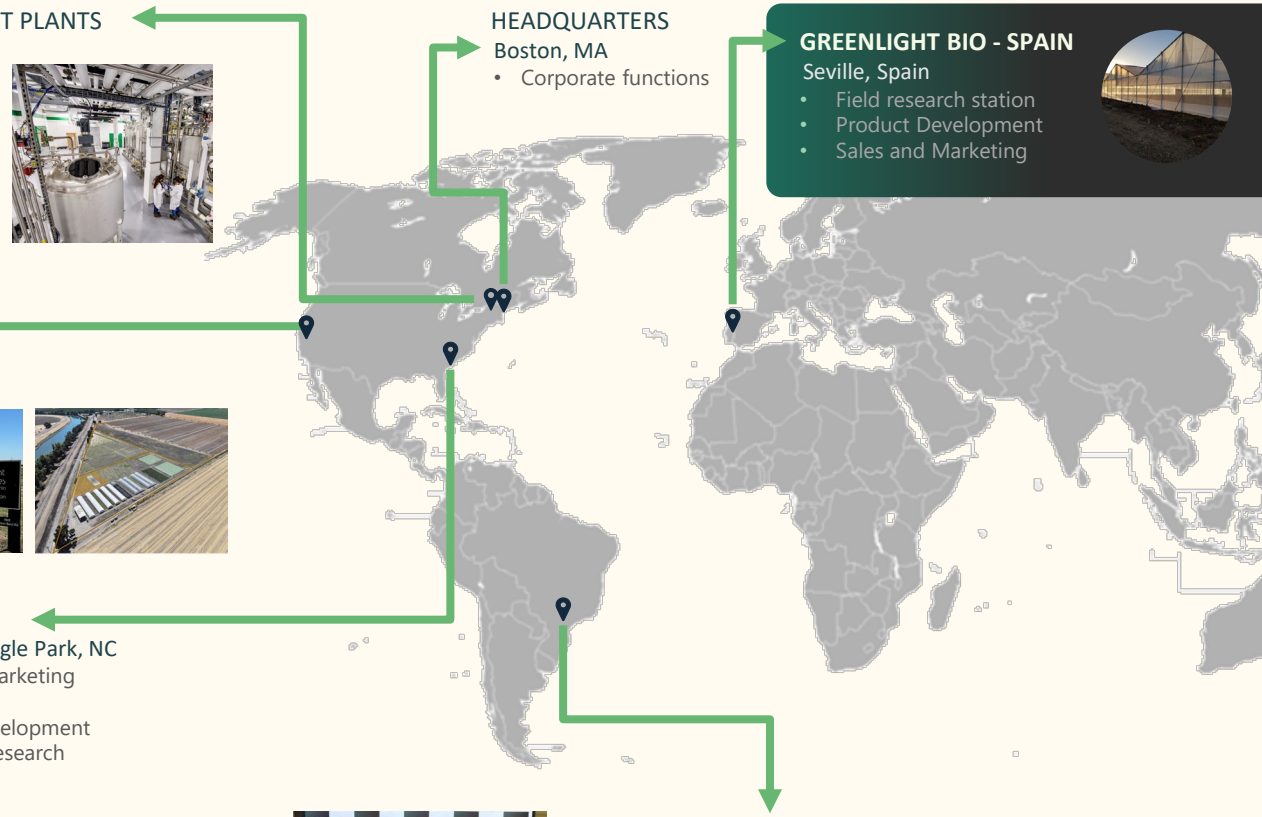
A privately owned Public Benefit Corporation developing and commercializing the next generation of effective and sustainable crop inputs

Company Overview: GreenLight Biosciences is a privately owned Public Benefit Corporation

Industry Achievements:
- Leader in RNA-based agricultural products
- First to develop and commercialize a sprayed RNA-based biocontrol

Capabilities: Fully integrated with in-house Research, Product Development, Biomanufacturing, Regulatory, and Commercial capabilities

Team: Over 150 employees, primarily scientists and engineers



MANUFACTURING AND PILOT PLANTS
Rochester, NY
- RNA Manufacturing Plant
- Pilot Plant

HEADQUARTERS
Boston, MA
- Corporate functions

GREENLIGHT BIO - SPAIN
Seville, Spain
- Field research station
- Product Development
- Sales and Marketing

FIELD RESEARCH STATION
Woodland, CA
- Field research station
- Product Development

OPERATIONS
Research Triangle Park, NC
- Sales and Marketing
- Regulatory
- Product Development
- Discovery Research

GREENLIGHT BIO – BRAZIL
Piracicaba, Brazil
- Product Development
- Sales and Marketing
- Regulatory
- Finance

GreenLight Biosciences is uniquely positioned to deliver global crop protection solutions for a sustainable future

RNA at Scale

GreenLight Biosciences

Demonstrated in-field efficacy in over +1250 field trials across several countries

Industry-leading pipeline with several solutions in Phase II/III trials representing $9.38B in addressable market potential.

Discovery engine capable of taking lead to field in 90 days, with significant cost advantages over conventional chemistry.

Proprietary, proven scalable manufacturing that enables affordable production with attractive margins.

Expertise in RNA formulations that unlocks usage across insecticides, fungicides, acaricides, and herbicides.

Strong intellectual global product portfolio spanning +140 patents and applications.

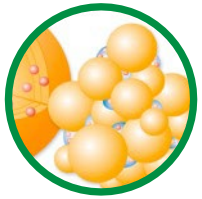
Top-tier team with deep industry experience in management, R&D, commercial, sales and marketing.

GreenLight Biosciences is the leader in RNA for crop protection

A proven pipeline of natural and effective molecules that spans insecticides, miticides, bio adjuvants, fungicides, herbicides and others

Calantha™

- Description: dsRNA product for potato beetle. Calantha™ is the first foliar-applied RNA product registered by the EPA
- Target pest: Colorado potato beetle (1st and 2nd generation)
- Approved: December 2023

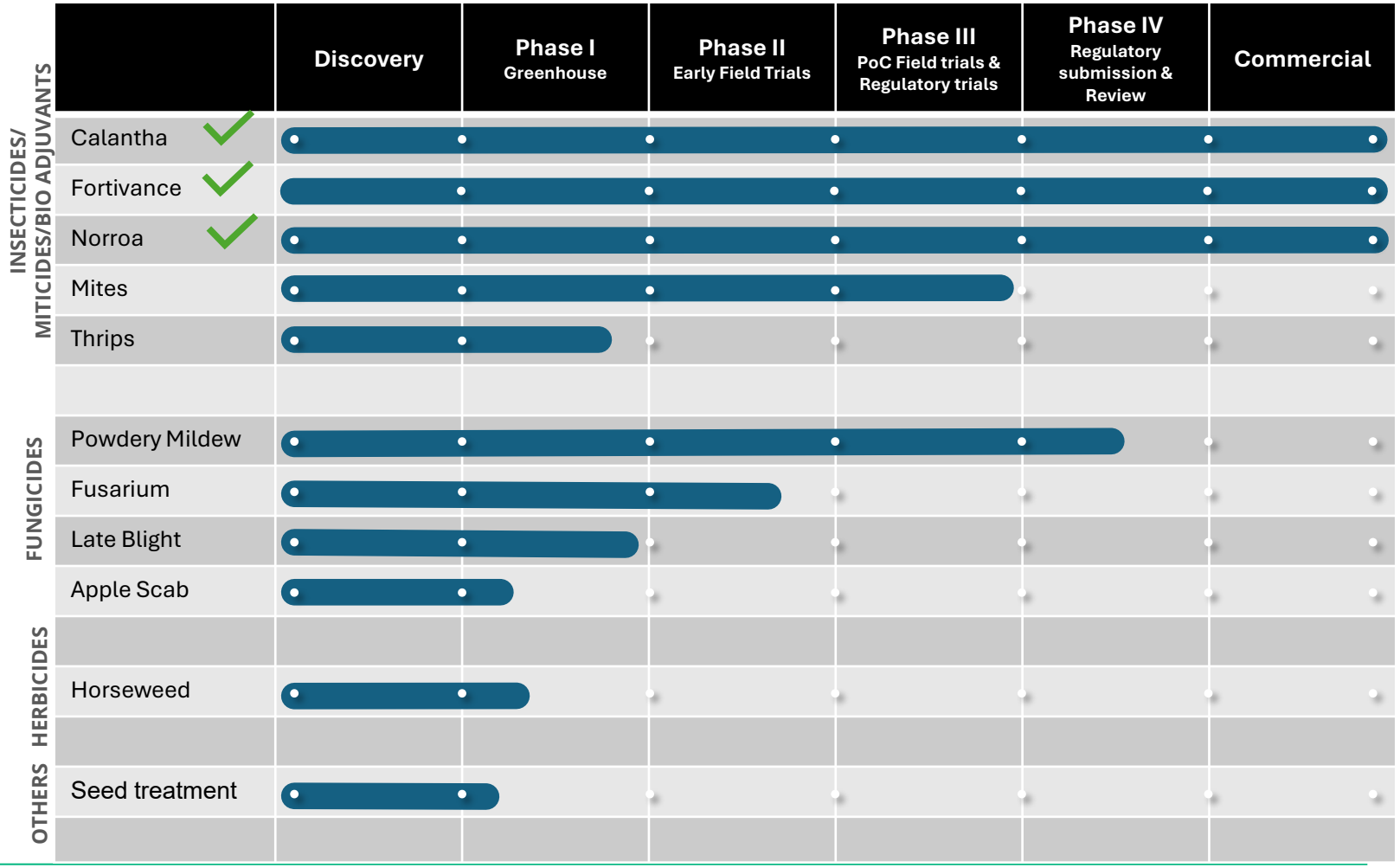


Benchpress™
Fortivance™

- Description: Bio-adjuvant that maximizes the performance of tank-mixed insecticides by increasing the bioavailability of the active ingredient in the digestive tract of chewing or sucking insect
- Target pest: Chewing & Sucking pests
- Approved and Expected approval: 2025 (WA & CA)

Norroa™

- Description: dsRNA product for mite control for bees. Designed to help address colony collapse syndrome by preventing proliferation of varroa mites
- Target pest: Varroa destructor mites
- Approved: September 2025



Calantha™, the first sprayable RNA-based pesticide in the world

Calantha™

Calantha

Competitive Cost for Premium Solutions

Compatible with farmers' standard operating

Controls and protects against defoliation

Low risk for operators and consumers

No detectable residue

Leptinotarsa decemlineata – Colorado potato beetle

New tool, new mode of action

Calantha™

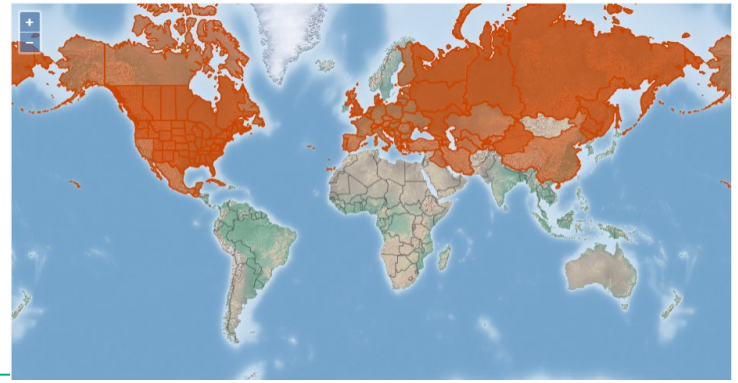
Calantha is composed of ledprona, belonging to a new class of RNA-based insecticides;

Offers a new mode of action (IRAC Group 35);

Classified as a bioinsecticide;

Recommended at low rates per hectare

DISTRIBUTION MAP



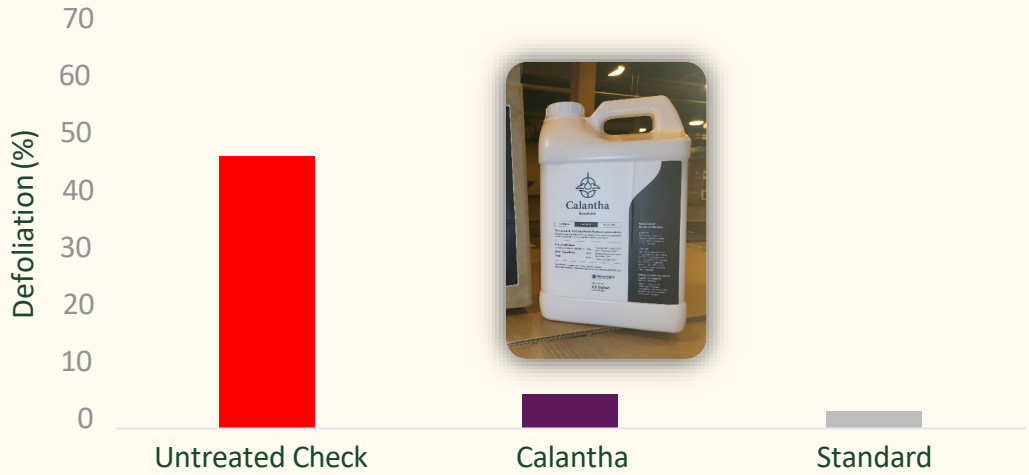
FONTE: CABI/EPPO

Calantha™ the world's first applied RNA pesticide

Approved by the EPA in 2023

USA data

Defoliation protection in high infestation conditions



- Trial summary across 40 trials with >15% defoliation from 2019-22

- Maine (10), Michigan (2), Minnesota (2), New York (8), North Dakota (4), Oregon (1), Virginia (1), Washington (5), Wisconsin (7)
- 2-3 foliar applications applied every 7 days; data taken ~3 weeks after first foliar application
- Industry standard insecticides included Spinosad, chlorantraniliprole, abamectin and lambda-cyhalothrin

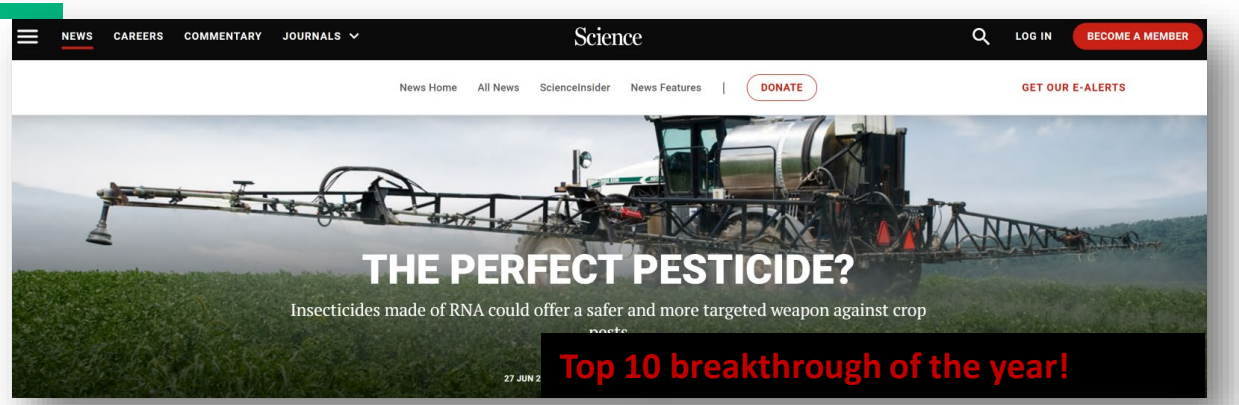
Calantha ™

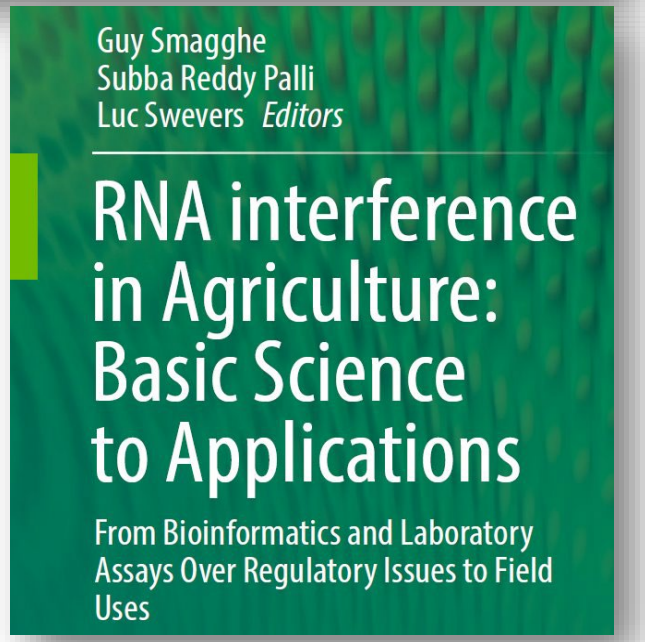
- Cost competitive to premium solutions
- Compatible with farmers' standard operating procedures
- Protects against defoliation
- Low risk for operators and consumers
- Low to no detectable residue

Sources: 1. Science Daily, 2020; 2. Alyokhin, A et al. 2008a. Colorado potato beetle resistance to insecticides. Am. J. Potato Res; 3. Whalon M. 2013. Arthropod pesticide resistance database

Calantha™: Honored among the world's top innovations in 2024

Recognized by *Science*, *Popular Science*, and profiled in a landmark book chapter

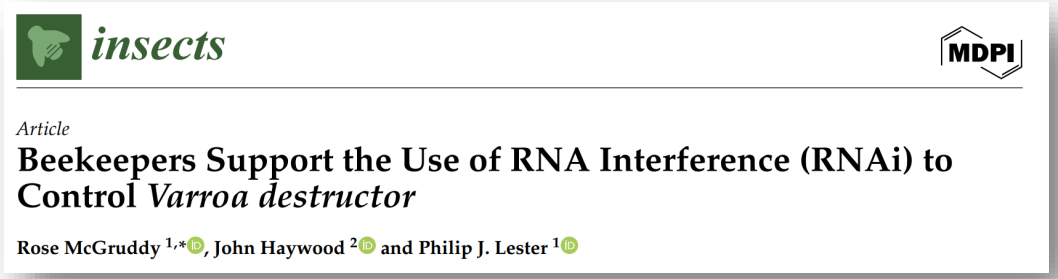




Norroa™ – A new solution for controlling Varroa mites in honeybees

What is Norroa™?

- Norroa™ is a new solution for controlling the Varroa mite (*Varroa destructor*) in honeybees.
- Its active ingredient, vadescana, is a dsRNA.
- It offers a new mode of action (IRAC Group 35) for pest control.
- Vadescana is formulated in a sucrose-based solution and packaged in a sachet with perforated holes on the top.


insects

MDPI

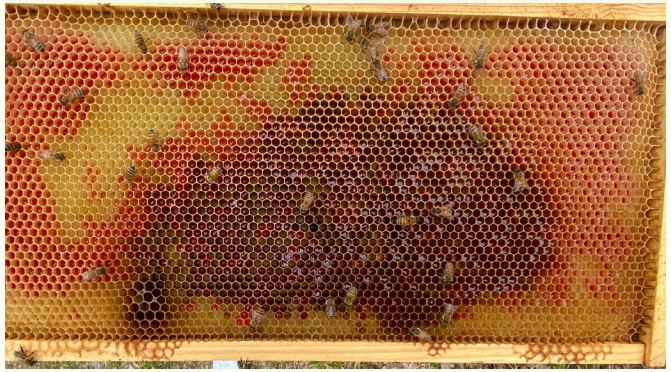
Article

Beekeepers Support the Use of RNA Interference (RNAi) to Control *Varroa destructor*

Rose McGruddy [1,*], John Haywood [2] and Philip J. Lester [1]

Norroa™ A new and effective treatment against Varroa mite infestation

Red dye added to the treatment bag



Bees: egg to adult = 21-24 days

Mite: reproduction = 12-15 days

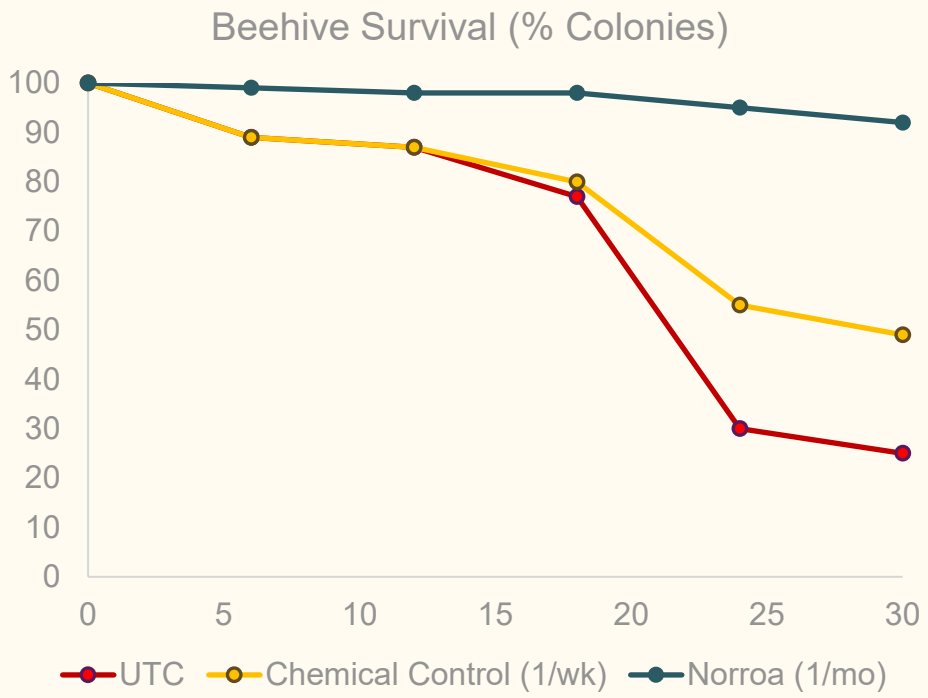
Treated with Norroa

Norroa™ a new and effective treatment against varroa mite infestation

Approved by EPA in Sep. 2025

USA data

Prevention of colony collapse in affected beehives



- 2023 trials across Southern USA, California
- Single Vadescana application of 4 g/l compared to four standard chemical control interventions over a 28 day period

Norroa ™

- Devastating year for beekepers with up to 75% colony loss
- Single Norroa application significantly outperformed continuous chemical control
- Beekeepers extremely satisfied with prevention of colony loss, minimization of viable mite populations, convenience and ease of use

What’s next in the pipeline

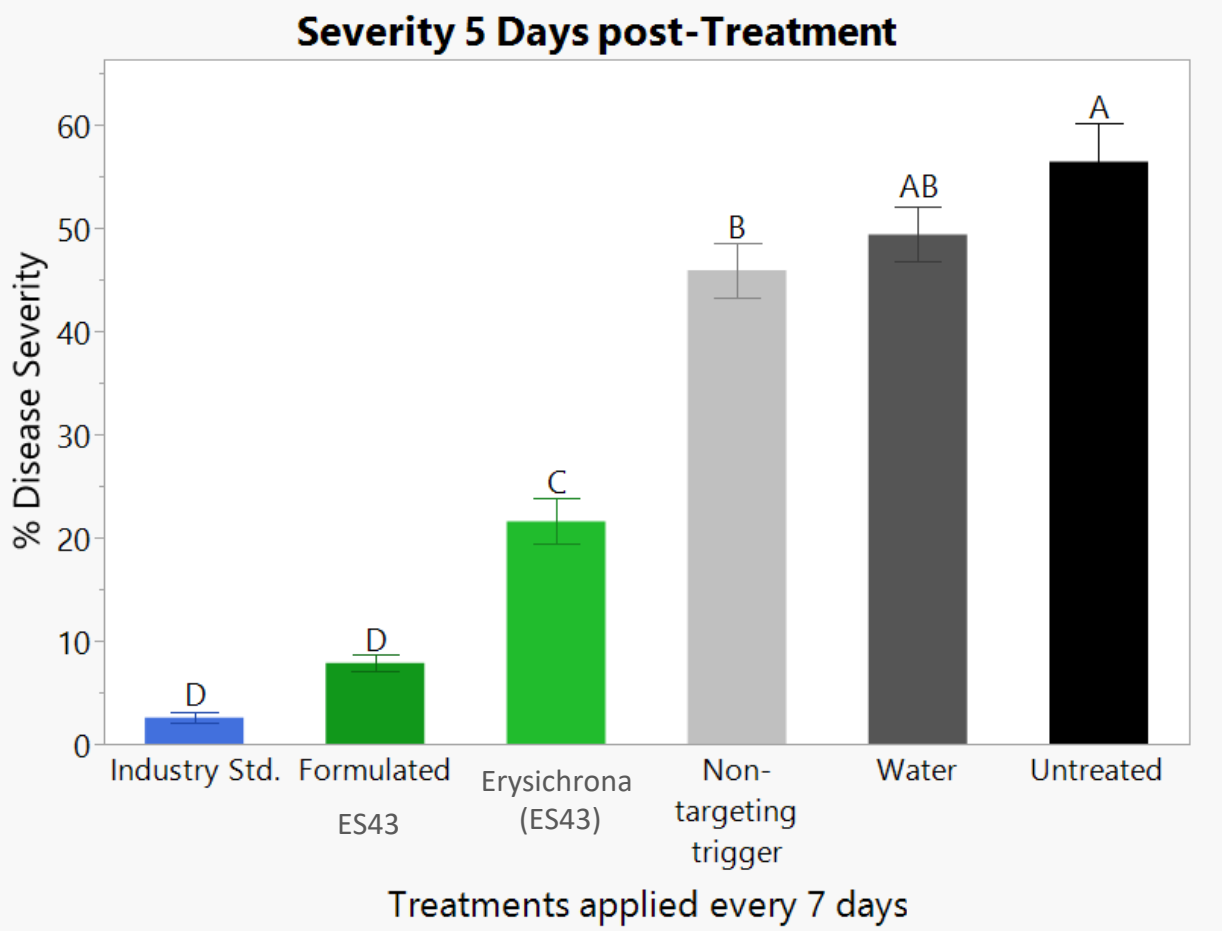
GreenLight Bio dsRNA triggers have shown consistent control of Grape Powdery Mildew across years from the GH to global scale

Water Treatment	Erysichrona (targeting dsRNA trigger)

Foliar symptoms five days after treatment application

Greenhouse testing of erysichrona (ES43) on grape vines

Grape vines were inoculated, then treated weekly for 5 consecutive weeks. Data presented is 5 days post the final application.



Error bars created using std error, letters of separation between treatments analyzed using Tukey's HSD, p=0.05

Take aways

Selected molecule shows activity as a standalone

No activity with non-targeting dsRNA control

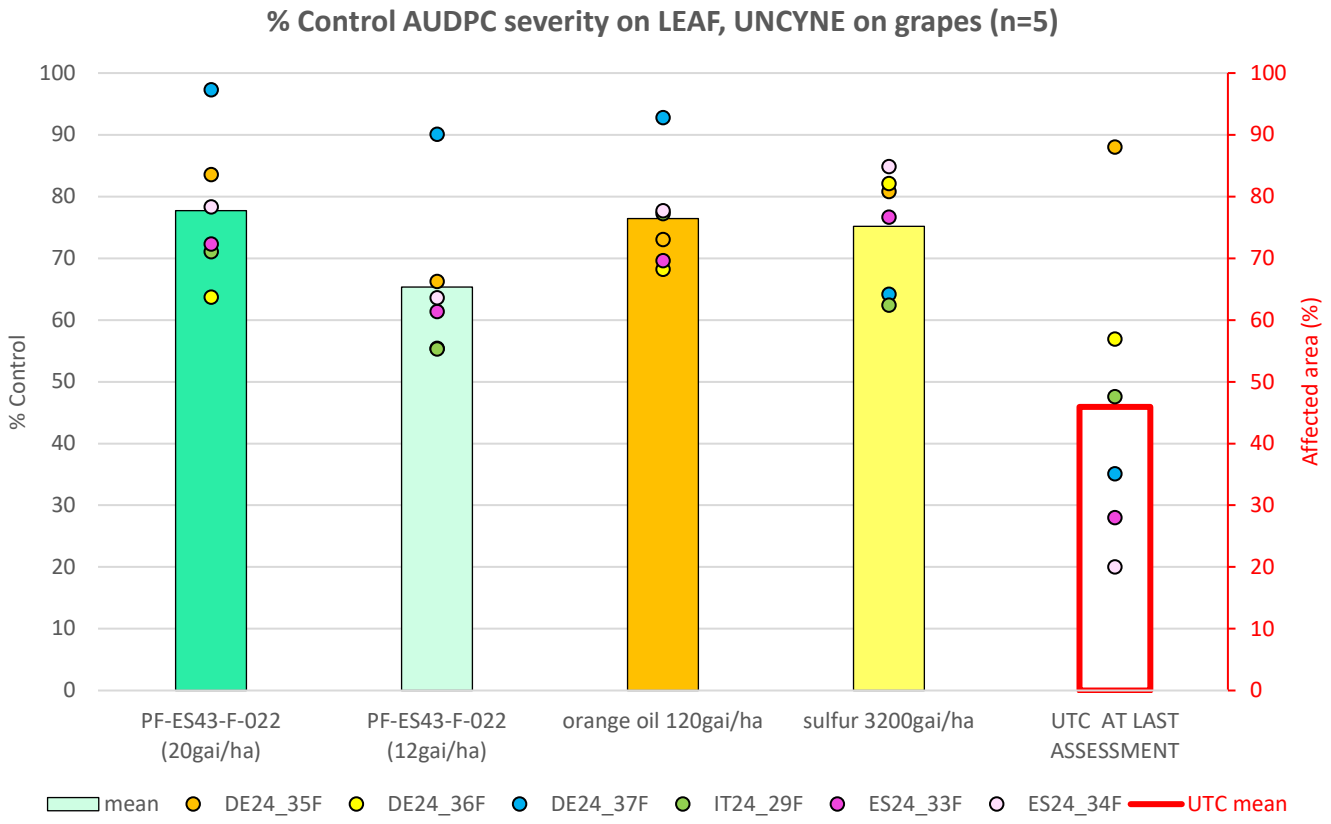
Formulation components have additional activity against the pathogen

The formulated active ingredient targeting ergosterol biosynthesis has comparable activity compared to the industry standard

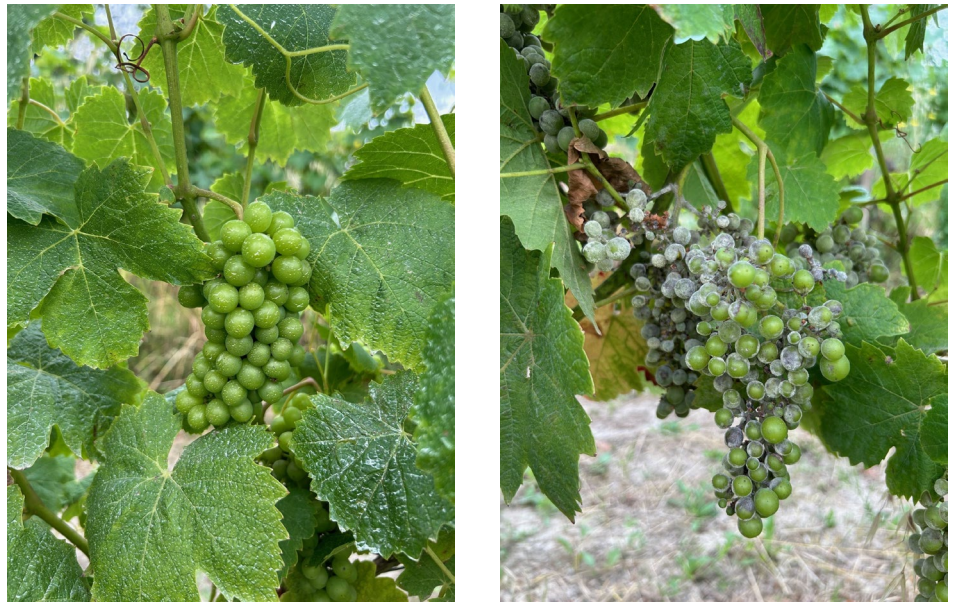
Efficacy observed even under high disease pressure

ES43: average results of Powdery Mildew control across EU

LEAVES AUDPC SEVERITY



- In average 70% control in leaves and bunches was achieved
- Efficacy (20 gai/ha) like orange oil and better than sulfur (25% trials with stat significant differences)



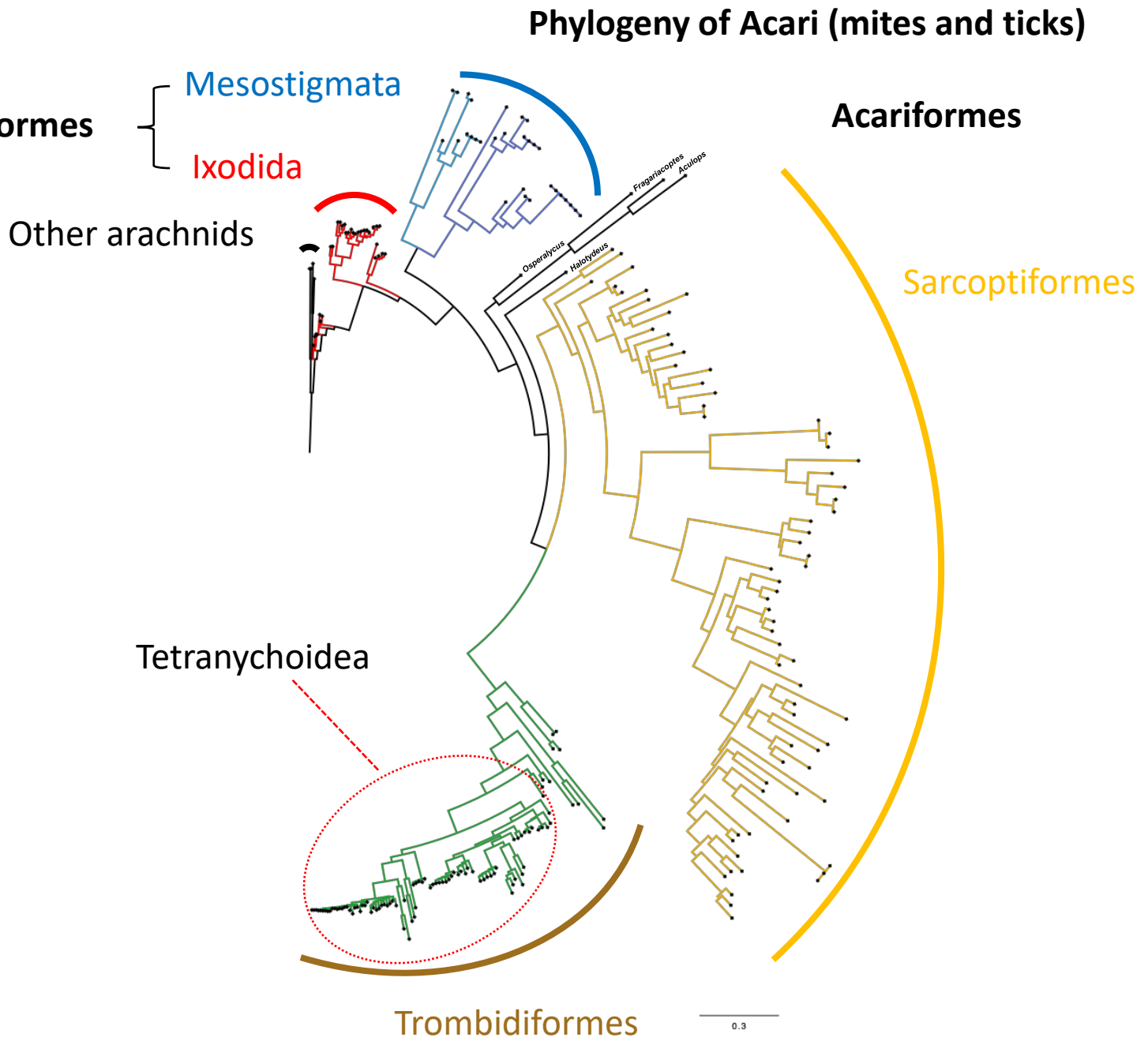
Untreated (right) and formulated ES43 20g a.s./ha (left) along the season

Efficacy trials in Brazil - *Erysiphe necator* control on table grapes

Table grapes – Vale do São Francisco Region

Multispecies dsRNA for mite pests

- Acari includes many medically and agriculturally important pests but also ecologically important species including predatory mites used in biological control of other mite pests.
- We developed a dsRNA design to broadly but specifically target an important gene in various herbivorous mite pests in the spider mite superfamily Tetranychoidea, which includes more than 100 species of agricultural pests.
- Unlike traditional chemical pesticides, our dsRNA-based product can be used in combination with biocontrol solutions involving predatory mites without adverse affects.



Maximum-likelihood phylogeny based on target gene homologs from 175 mite and tick species

dsRNA protects against citrus mite (*Panonychus citri*) feeding damage

UTC

dsRNA commercial field rate

Abamectin

Summary

Industry Achievements:

- Leader in RNA-based agricultural products
- First to develop and commercialize a sprayed RNA-based biocontrol

Capabilities: Fully integrated with in-house Research, Product Development, Biomanufacturing, Regulatory, and Commercial capabilities

- *New effective solutions against several targets*
- *Powered by brand new technology and mode of action*
- *New tool for resistance management*
- *Efficacy and crop protection matching level of current premium chemical solutions*
- *Cost competitive to other premium solutions*
- *Fully compatible with farmers' standard practices*
- *Minimal handling restrictions for applicators*
- *No preharvest interval*
- *No detectable residues*
- *Excellent selectivity to beneficials and pollinators tested*

Thank You

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GreenLight™ Biosciences