Pioneering a multi Technology Solution for Integrated Nematode Management

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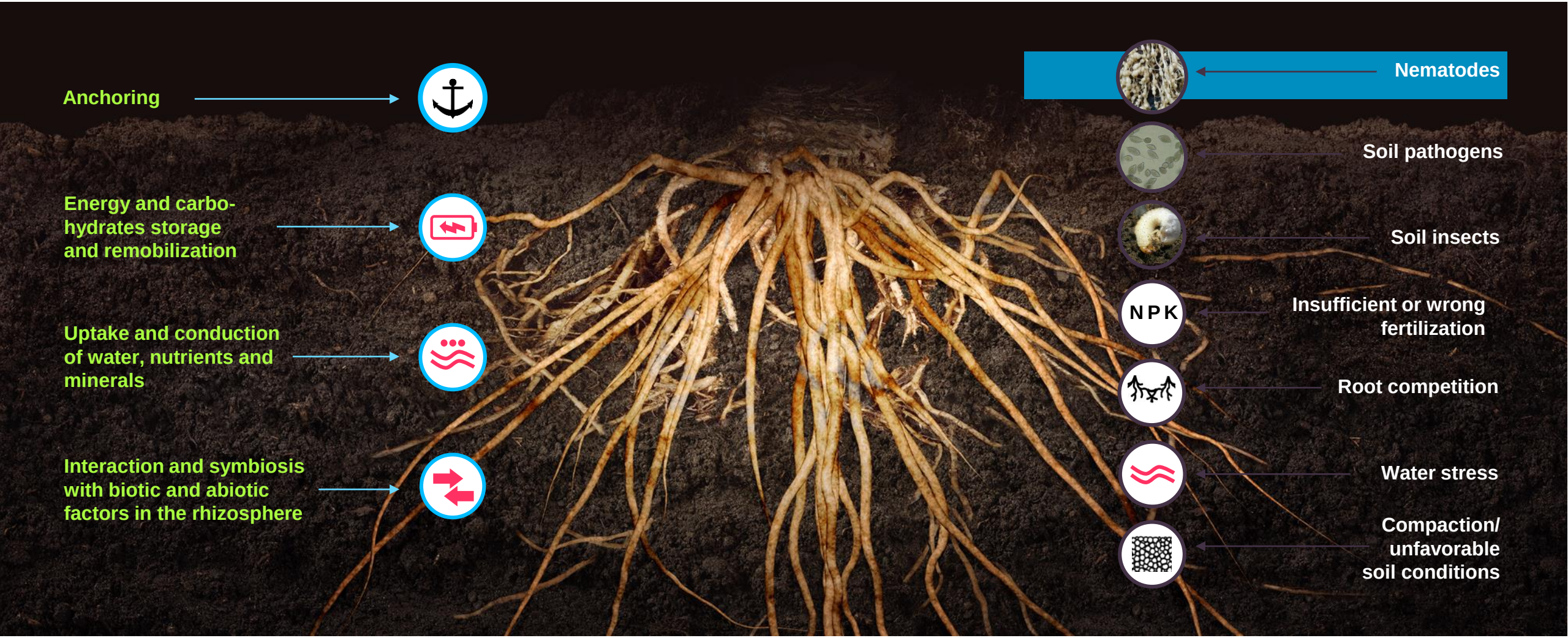
Roots fulfill essential functions but are constantly exposed to stress



Nematodes severely damage crops worldwide

- **The impact of plant parasitic nematodes is very large and real**
- **Several measures exist to reduce nematode pressure in the soil**
  - // Farm hygiene
  - // Field monitoring
  - // Crop rotation
  - // Soil management
  - // Nematode-resistance
  - // Soil solarization
  - // Targeted application
  - // Biological and chemical nematicides

Integration of measures needed to mitigate risk of plant damage and yield loss

Integrated Nematodes Management

The multi Technology Solution consisting of 5 pillars:

1. Tolerant varieties:

De Ruiter™ Sharing your passion. Seeding your success.

Seminis grow forward

2. Cultural practices: Solarization

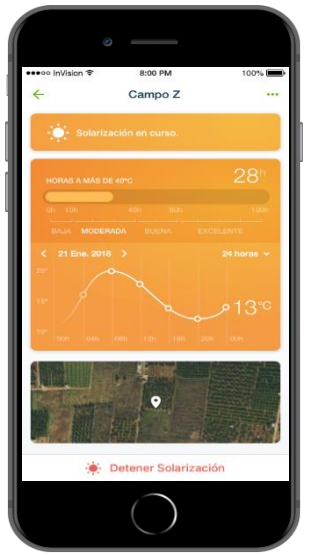
3. Crop Protection:

VELUM®

BioAct®

4. Digital tools:

Solarisation model



Optimised application positioning

Nematode model

5 Technology / methodology:

Improved application methods by drip irrigation systems

Nematool - Digital tool

Nematode model is based on soil temperature

- To monitor **solarization success**
- To **identify** and **guide on optimum timing for BioAct® applications**

BioAct ® Prime application timing

Nematode model

Sensor

Model Server

App

GSM technology

DATA transmission

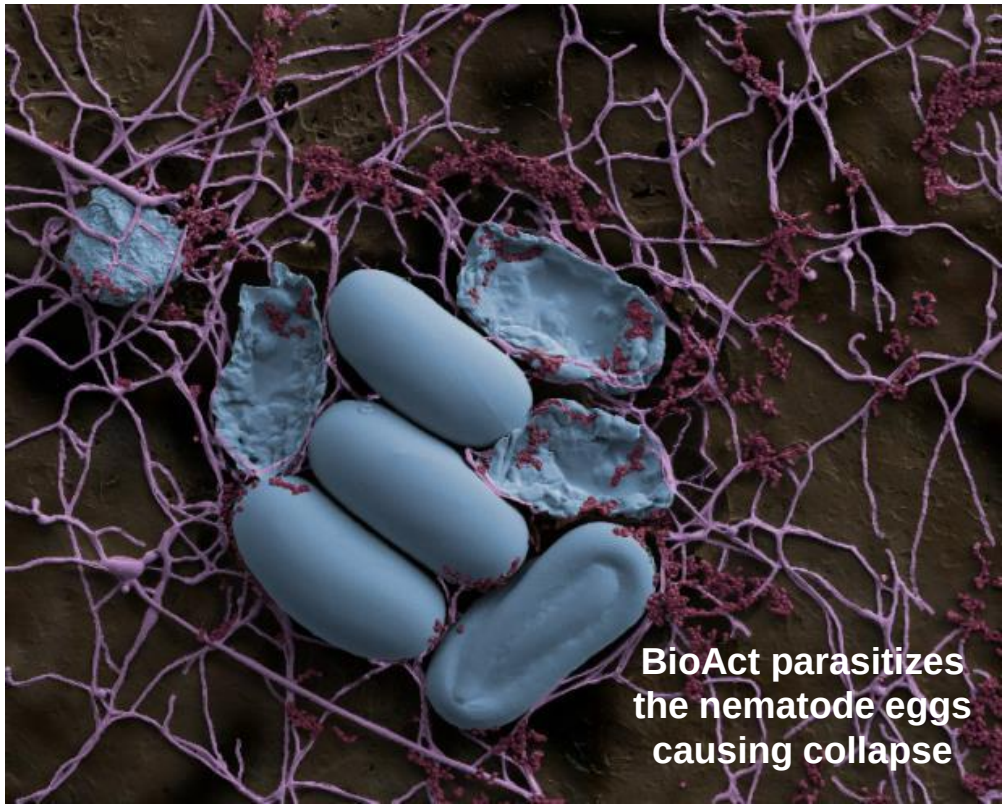
DATA Management & application recommendation

Solarization efficiency monitoring

Solarization model

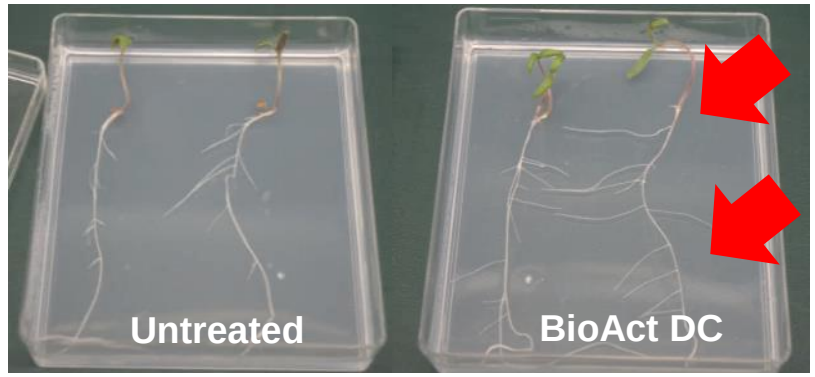
BioAct® (*Purpureocilium lilacinum* strain 251) - a biological nematicide & plant growth promoter

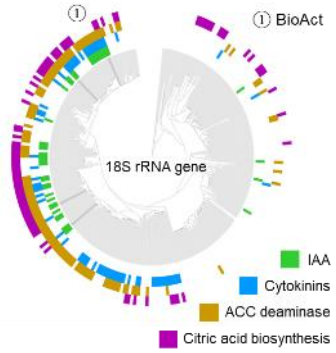
BioAct® parasitizes nematode eggs



BioAct® induces shoot & root growth

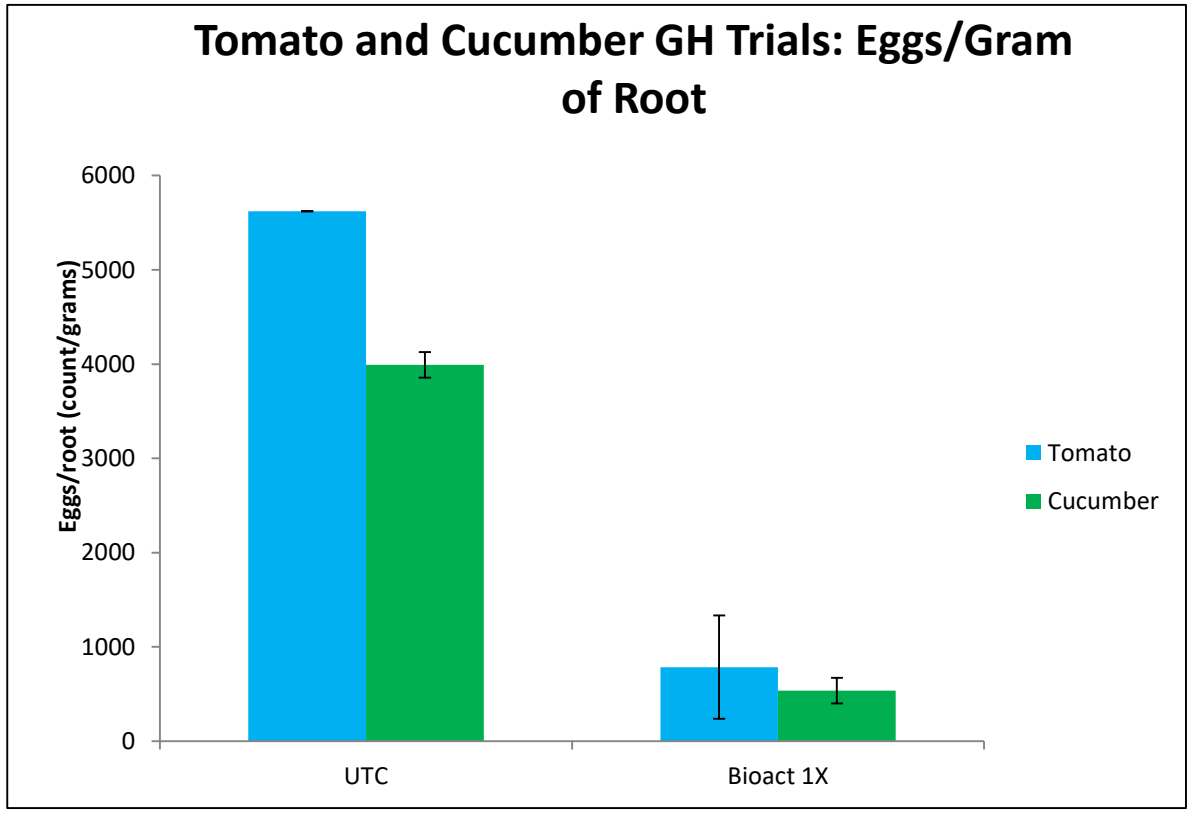
PGP-related gene in *P. lilacinum* strain 251





PGP=Plant growth promoting effects

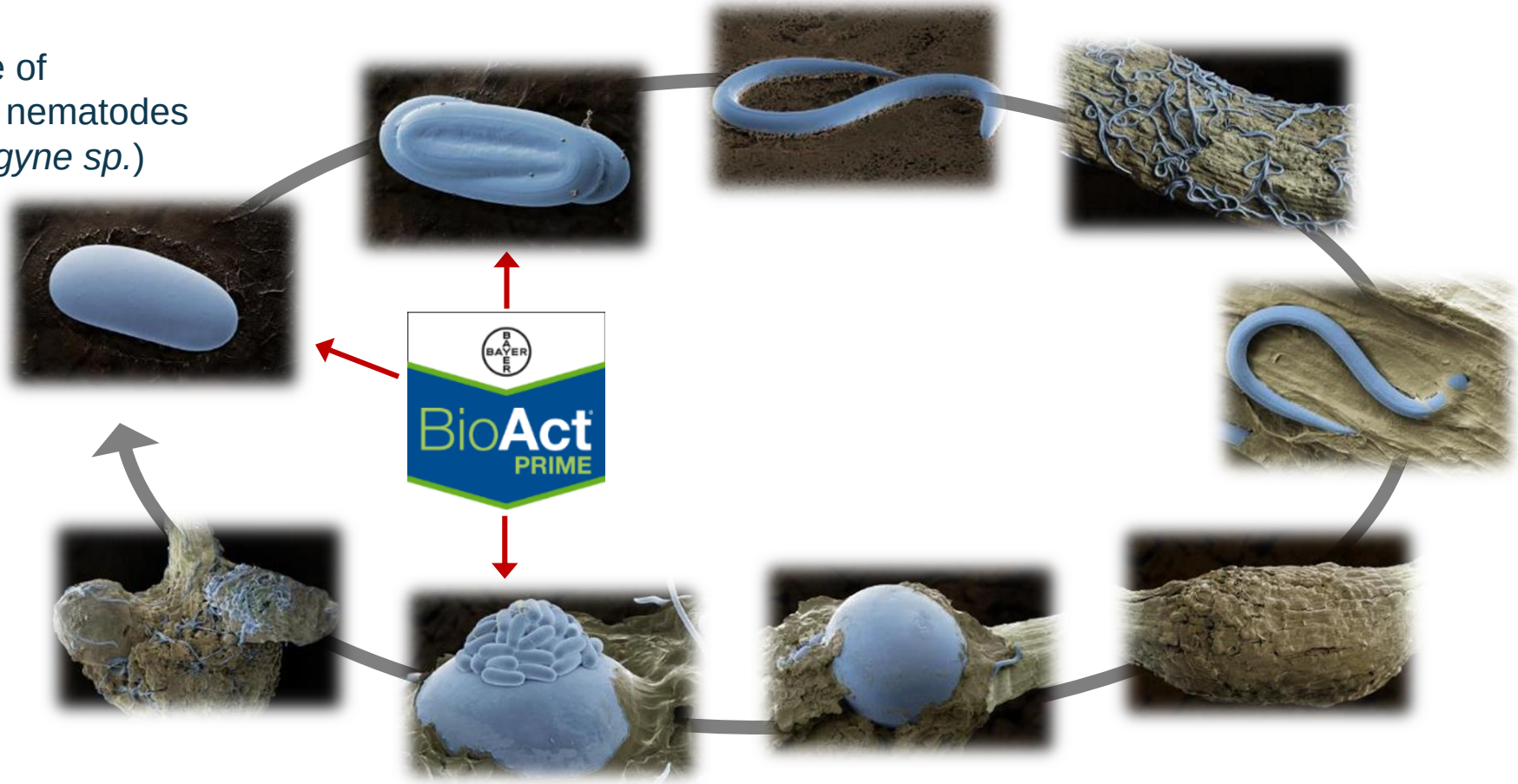
BioAct® reduces nematode eggs in cucumber and tomato greenhouse trials



GH pot studies, (0.75 L/ha), *M.javanica*, 25°C

BioAct® affects immobile egg stages

Life cycle of
root knot nematodes
(*Meloidogyne sp.*)



VELUM® offers a new mode of action against nematodes

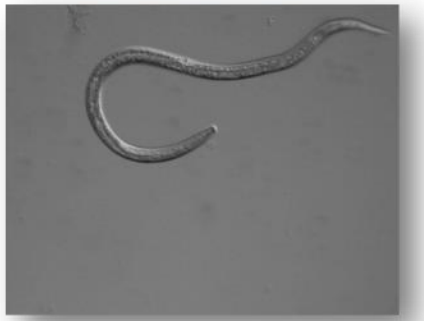
Most established nematicides are AChE inhibitors

Organophosphates	Cadusafos
	Terbufos
	Fenamiphos
	Ethoprophos
Carbamates	Aldicarb
	Carbofuran
	Oxamyl

VELUM® as SDH inhibitor causes nematodes to show needle shape and become immobile

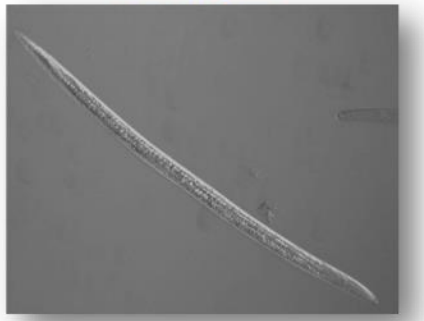
- First symptoms ca. 30 min after appl.
- Complete paralysis after 1-2 h

Untreated control



Incubation with solvent for 2 h

Fluopyram



Incub. with 20 ppm Fluopyram for 2 h

VELUM® interrupts the energy supply from the mitochondria, the cellular power plants

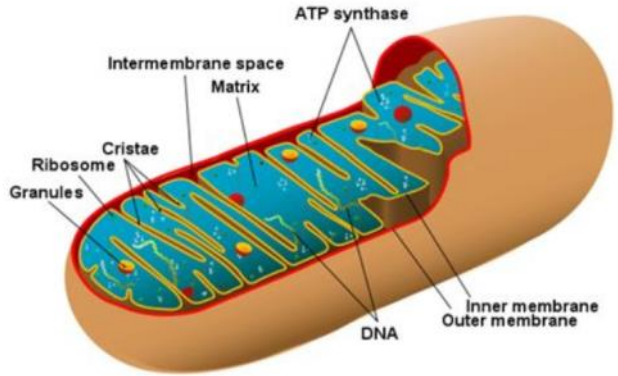
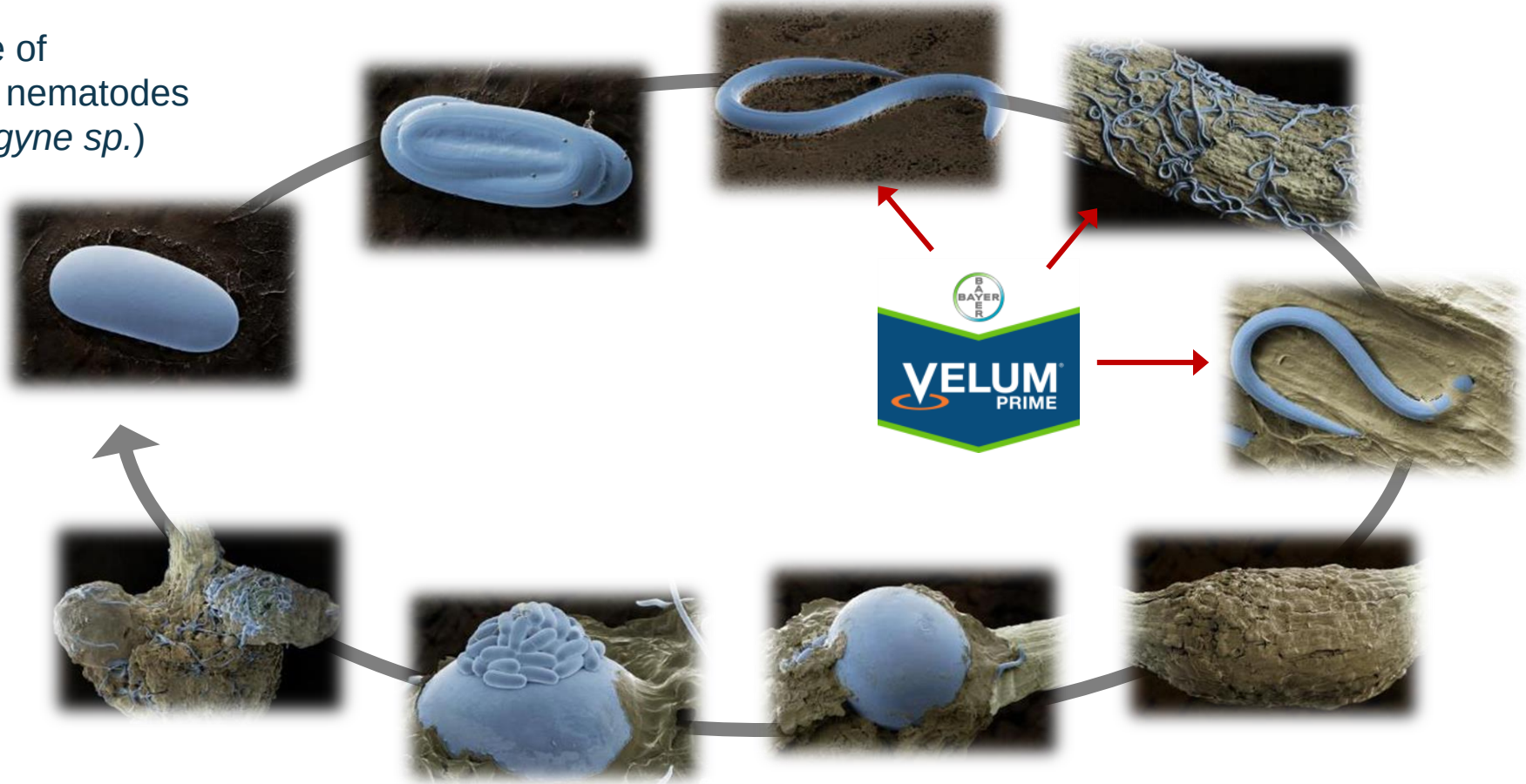


Image Source: Wikimedia Commons 2018

VELUM® Efficacy on Nematode Stages

VELUM® acts on Juvenile stage 2 larvae by direct contact

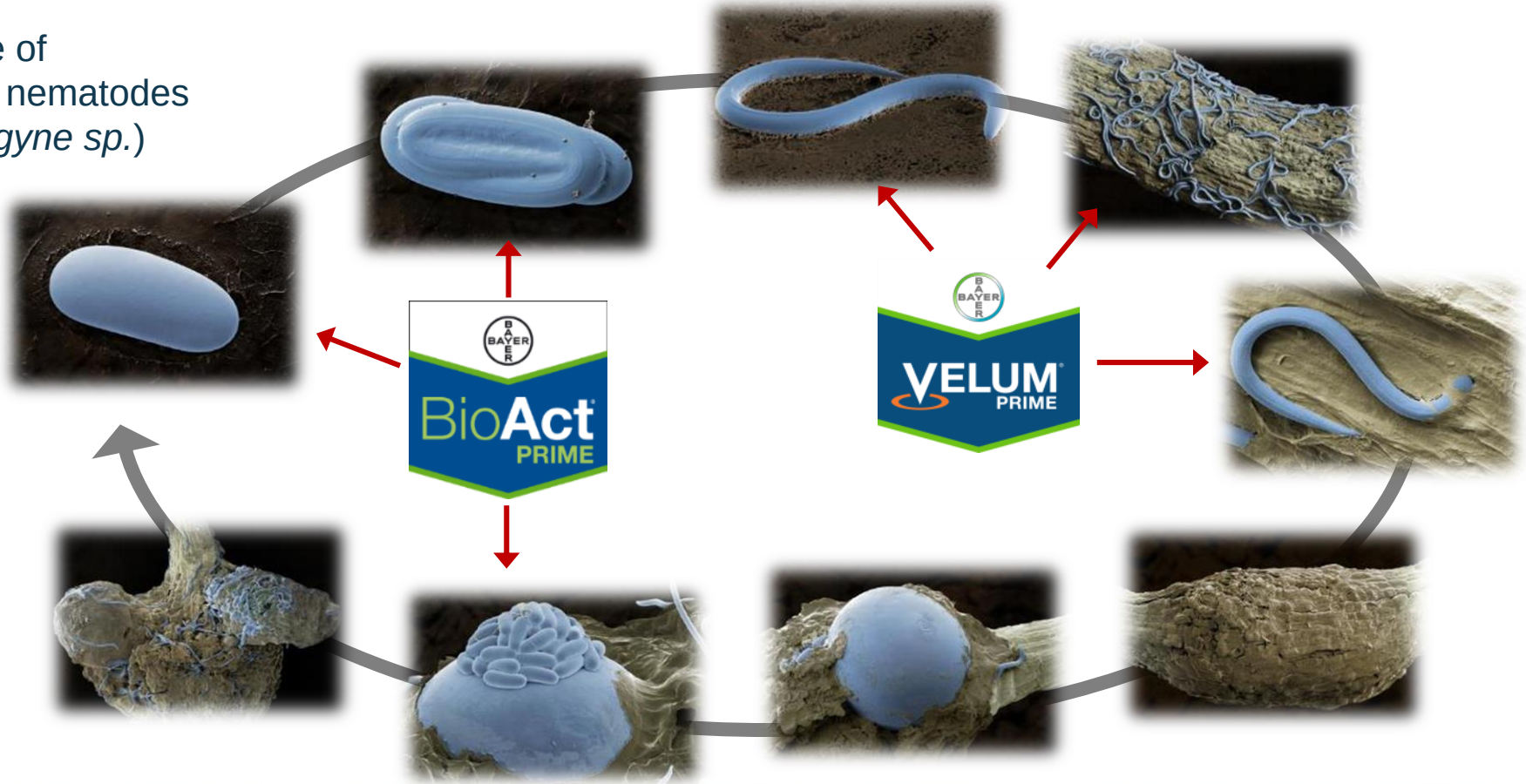
Life cycle of
root knot nematodes
(*Meloidogyne sp.*)



Combining biological and chemical nematode control tools

BioAct + VELUM have complementary Modes of Action

Life cycle of
root knot nematodes
(*Meloidogyne sp.*)

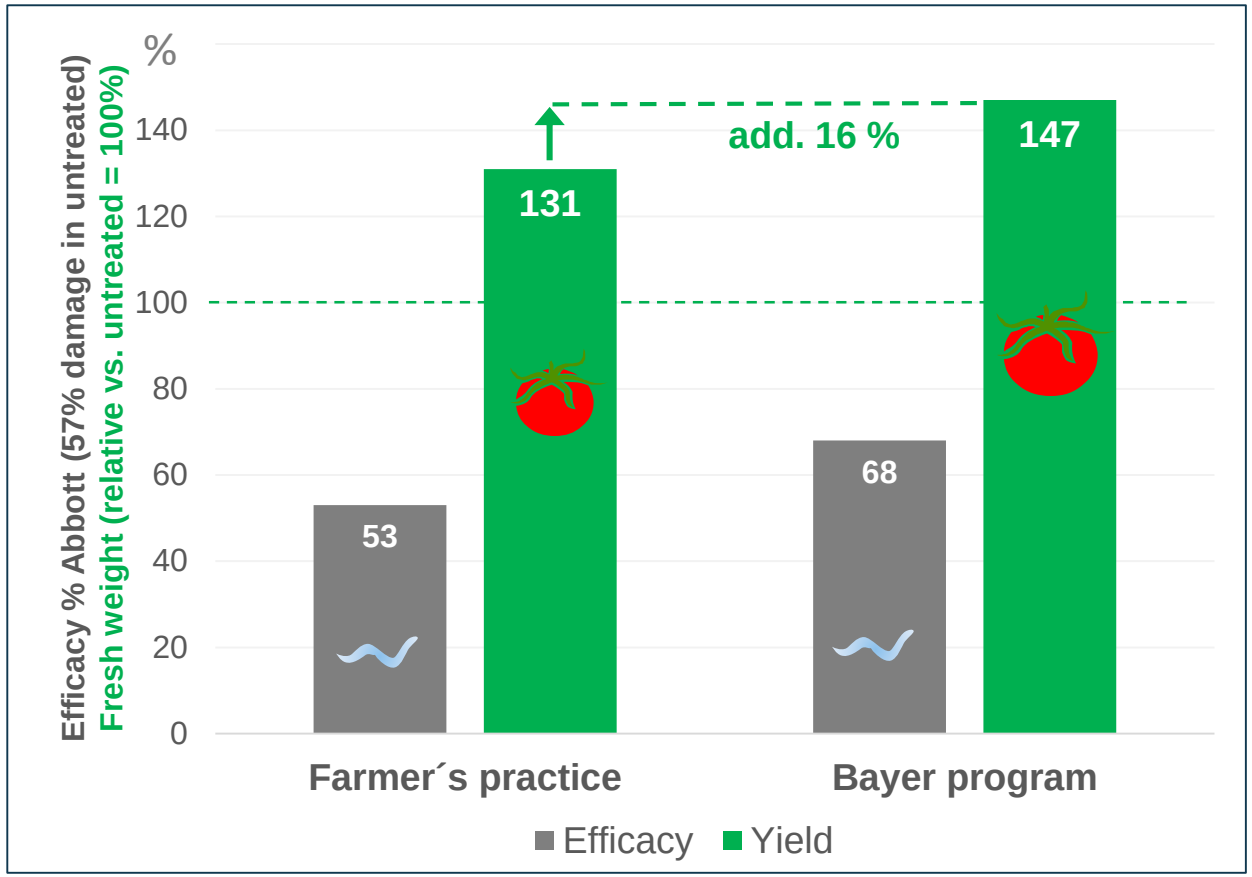


VELUM® & BioAct® improves yield with multi year use

Multi Year Trials Italy 2017-2019 (4 sites / 4-5 crops per trial site)

	Products
Farmer´s practice	**Fenamiphos** **Oxamyl** **2x**
Bayer program	**Velum** **BioAct** **2x** (-4x)

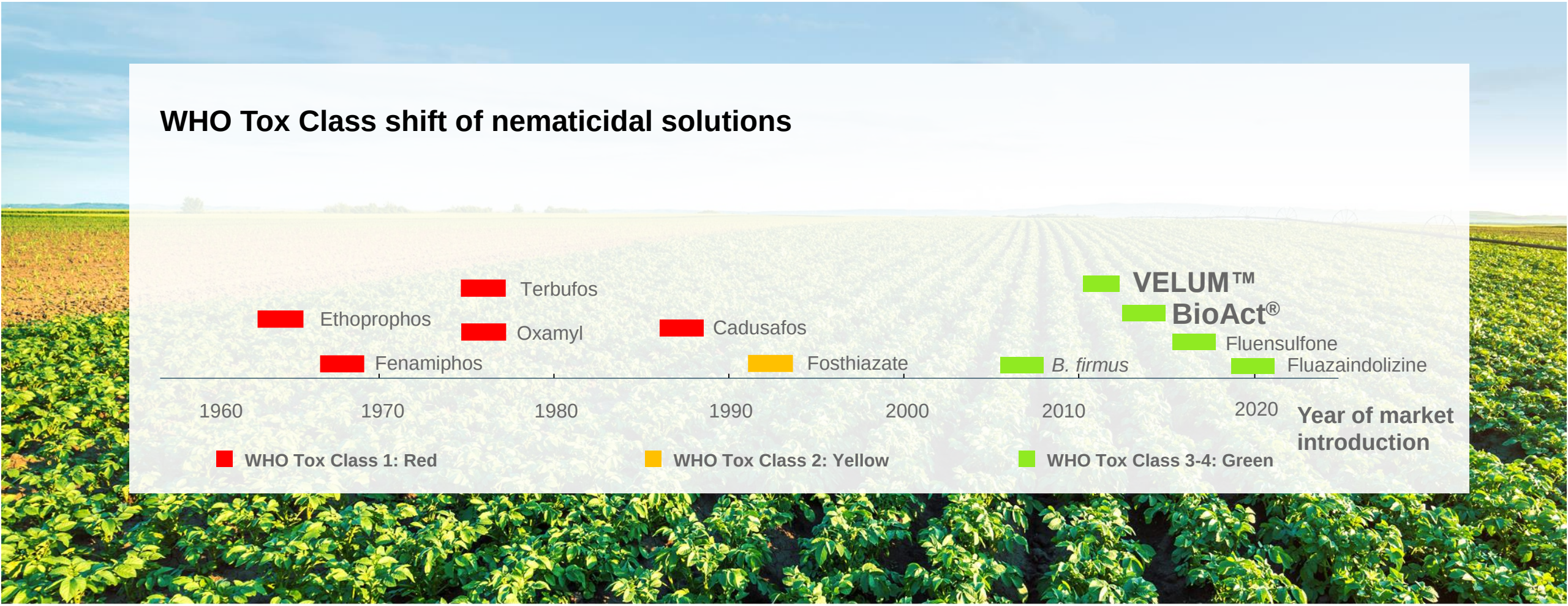
Trial series conducted without fumigation or solarisation: high damage in untreated (57%)



Bayer program Velum+BioAct delivers 16 % higher yield over farmer‘s practice application program

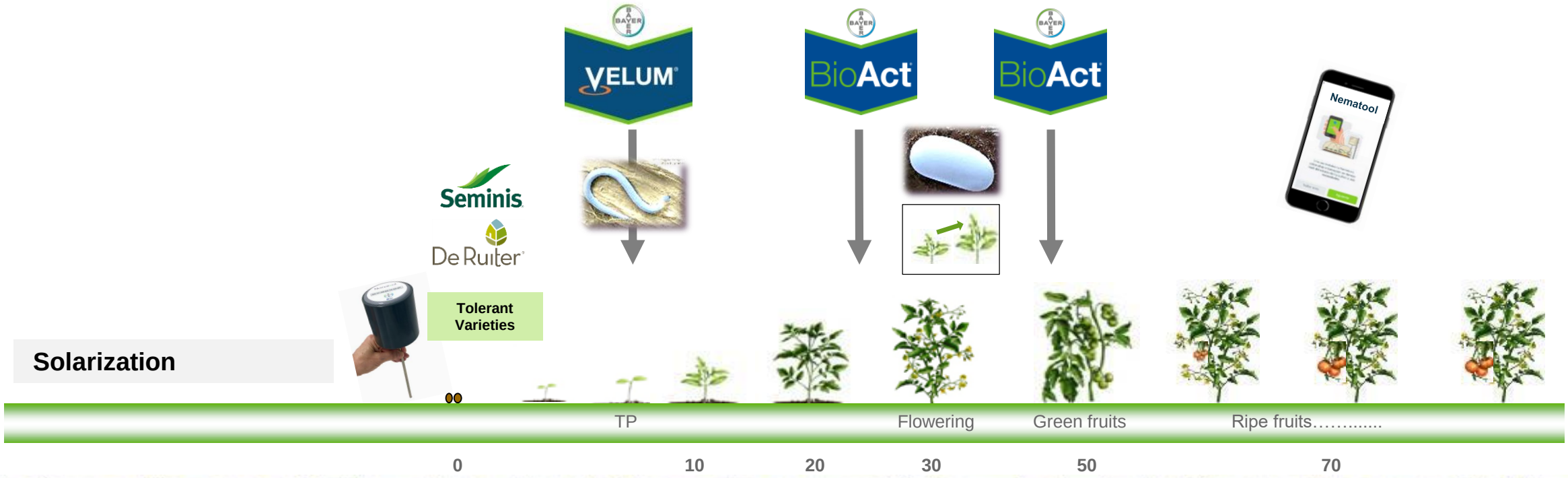
New nematicides are setting new safety standards

Excellent toxicological and ecotoxicological profiles



Biologicals Integrated into a **Nematode Management Concept** alongside use of solarization, safer chemicals and digital tools

- **Good agricultural practices** prior planting is basis for **successful nematode management**
- **Optimum positioning** of chemicals and biologicals according to their properties, supported by **digital**
- **Modern Integrated nematode control** provides a **safer & sustainable solution**



Biologicals are increasingly becoming an essential part of integrated agronomic solutions

- An **innovative** tool in agriculture benefitting consumers, environment and farmers
- **Positive attitude** among **farmers**, main barriers are “efficacy” and “reliability”
- **Digital farming can** support optimal application and increased performance of Biologicals
- Biologicals must be increasingly used in **Integrated Pest Management (IPM)**

Thank you for your attention!

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