Marrone® Bio Innovations

NASDAQ Listed as MBII

Challenges of Developing Natural Product-producing Biopesticides

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CEO & Founder

Innovative Bio-based Products for Pest Management in Agriculture and Water

Safe Harbor Statement

This presentation may include forward-looking statements. These statements reflect the current views of the Company's senior management with respect to future events and financial performance. These statements include forward-looking statements with respect to the Company's business and industry in general, including statements regarding potential market size of Company products, anticipated product development costs, target geographic markets, and future goals. Statements that include the words "expect," "intend," "plan," "believe," "project," "forecast," "estimate," "may," "should," "anticipate", "target", "goals" and similar statements of a future or forward-looking nature identify forward-looking statements for purposes of the federal securities laws or otherwise. Forward-looking statements address matters that involve risks and uncertainties, such as the timing of and costs associated with the launch of products, the difficulty in predicting the timing or outcome of product research and development efforts and regulatory approvals. Accordingly, there are or will be important factors that could cause the Company's actual results to differ materially from those indicated in these statements. The statements made herein speak only as of the date of this presentation.

Marrone Bio Innovations, Inc. Overview

Company Highlights

- Founded April 2006 in Davis, CA
- **3** commercial products, **1** add'l approved, **2** add'l submitted for EPA approval
- Library of **19,000** proprietary microorganisms
- 110+ employees (19 Ph.D.; 67 in R&D)
- Strategic investors: **DSM, Syngenta, Mitsui**
- Building fermentation facility in Bangor, MI
- Doubling revenues 2012 to 2013
- Listed on NASDAQ as MBII August 2, 2013

Commercial Products Today

REGALIA GRANDEVO ZEQUANOX

Marquee Partners / Distributors

syngenta FMC Scotts HELENA CNI CHEM NUT, INC. IAP Simplot Crop Production Services ENGAGE AGRO WILBUR-ELLIS

Robust Pipeline

- Opportune™ bioherbicide EPA approved
- Venerate™ bioinsecticide and MBI-011 bioherbicide submitted for EPA approval
- Nematicides, additional herbicides, and plant health products in development
- More than 200 patents issued and pending

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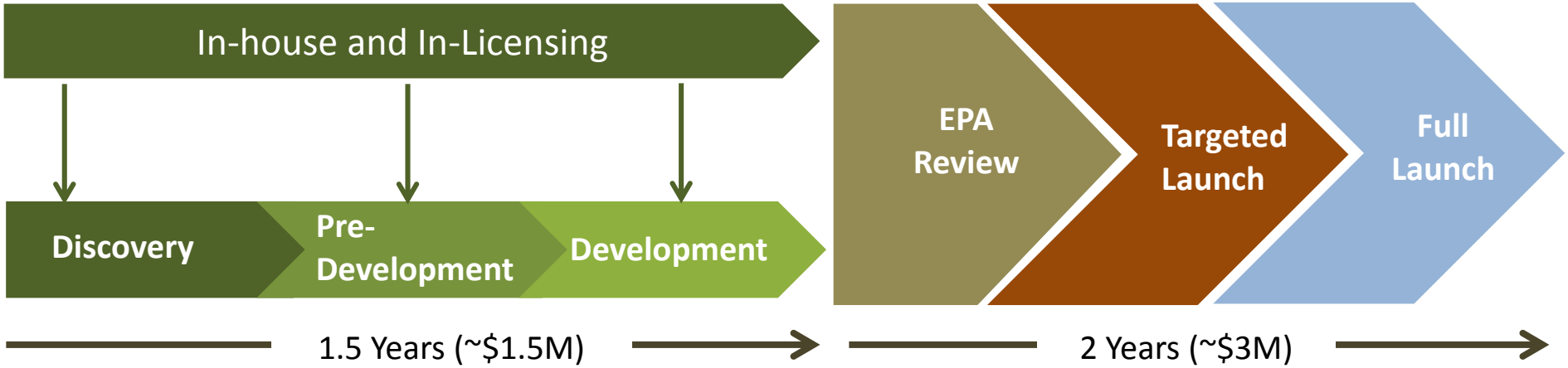
Getting a Product to the U.S. Market



- Collection/ isolation
- Fermentation proprietary media
- Testing/ screening

- Natural product chemistry
- Initial toxicology
- Microbial ID
- File patent
- Gene sequencing

- Processes
- Formulation
- Field test
- Toxicology
- More patents
- 5-batch analysis
- Analytical methods

- EPA submission
- International field trials
- Process & Formulation Optimization
- Mfg scale-up
- QC methods

- Manufacturing
- Packaging
- Labels
- Marketing
- Targeted launch

- National launch
- International expansion
- Crop and target expansion

Add 2-5 years for other countries and additional $2-5 million USD

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Case Study: REGALIA® Biofungicide

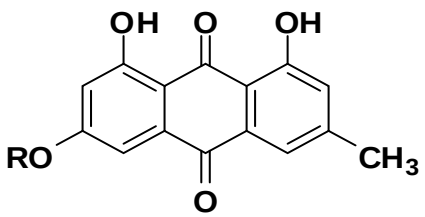
- Extract of giant knotweed, foliar or soil applied
- Ethanol extraction of several compounds containing plant material provides formulation challenges (separation is not a viable path)
- Knotweed supply chain development was difficult and took years to work out
- Regulatory agencies ex-USA required additional compound characterization & toxicology
- Analytical methods required for detection and quantification of several compounds

REGALIA® BIOFUNGICIDE

Giant knotweed

R=H Emodin

$R=CH_3O$ Physcion



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Case Study - GRANDEVO® Bioinsecticide

- *Chromobacterium subtsugae* (USDA discovery)
- Filed patents on insecticidal compounds produced by the bacteria – different chemical classes each have different mode of action
- NO contact activity (will not kill insects if applied to the cuticle)
- Repellency, feeding cessation, effects on reproduction – huge challenge for assessing efficacy and for development into a product

GRANDEVO®
BIOINSECTICIDE

Photos courtesy of: *Lygus* Entomart; *Beet armyworm* Clemson Univ. USDA Cooperative Extension Slide Series Bugwood.org; *Western flower thrip* Frank Peairs, CO St. Univ. Bugwood.org; *citrus leaf miner* Center for Invasive Species Research, UC Riverside; : *cabbage Looper* RJ Reynolds Tobacco Company, Bugwood.org; *twospotted spider mite* Clemson EDU

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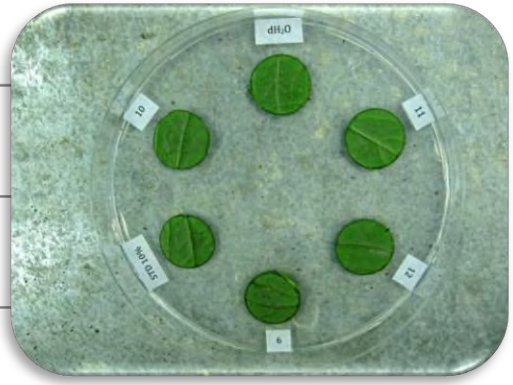
Mean Number of Aphid Progeny on Treated Leaf Discs



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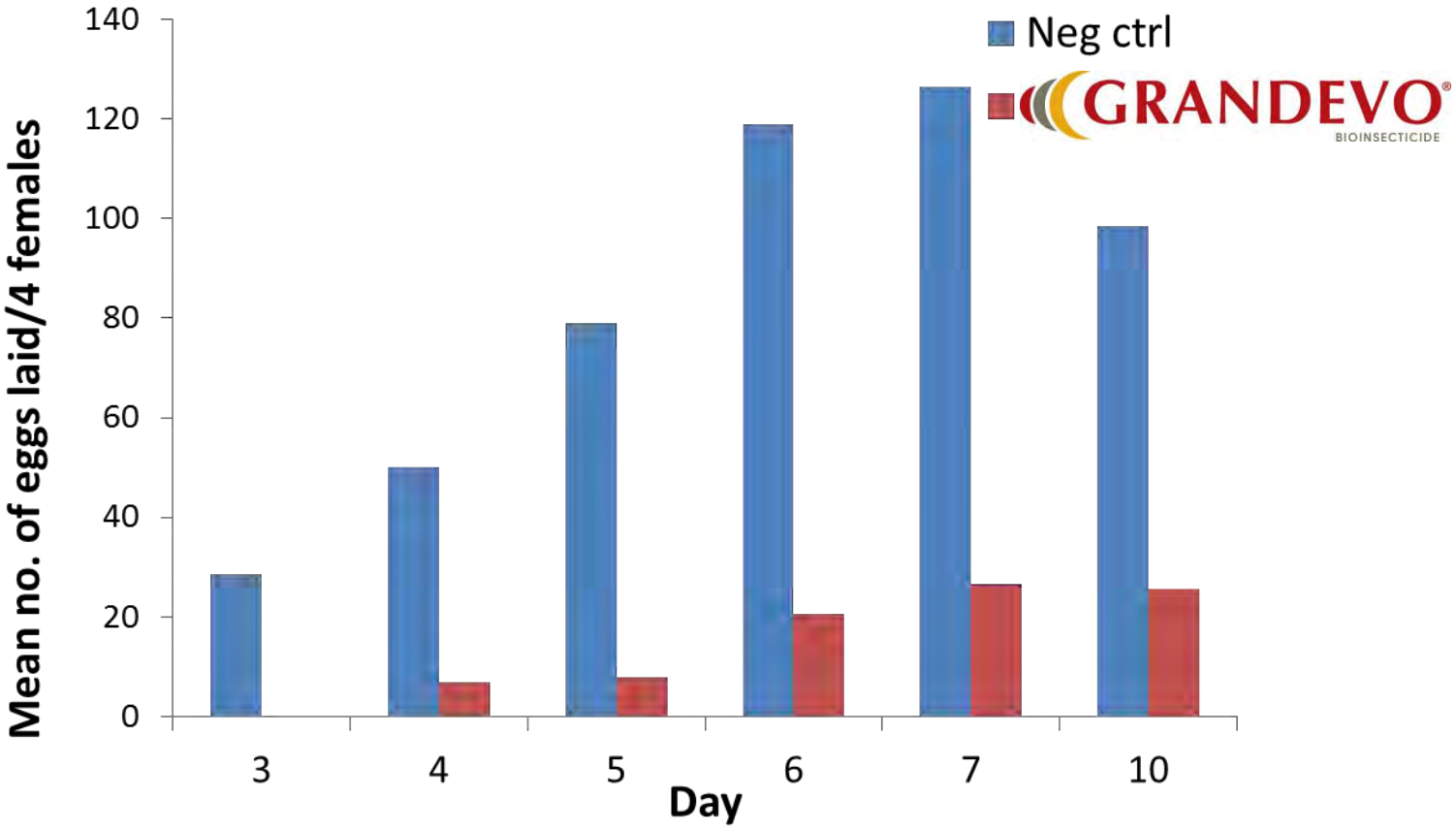
Effect of Grandevo® (MBI-203) on Potato Psyllid Egg Laying



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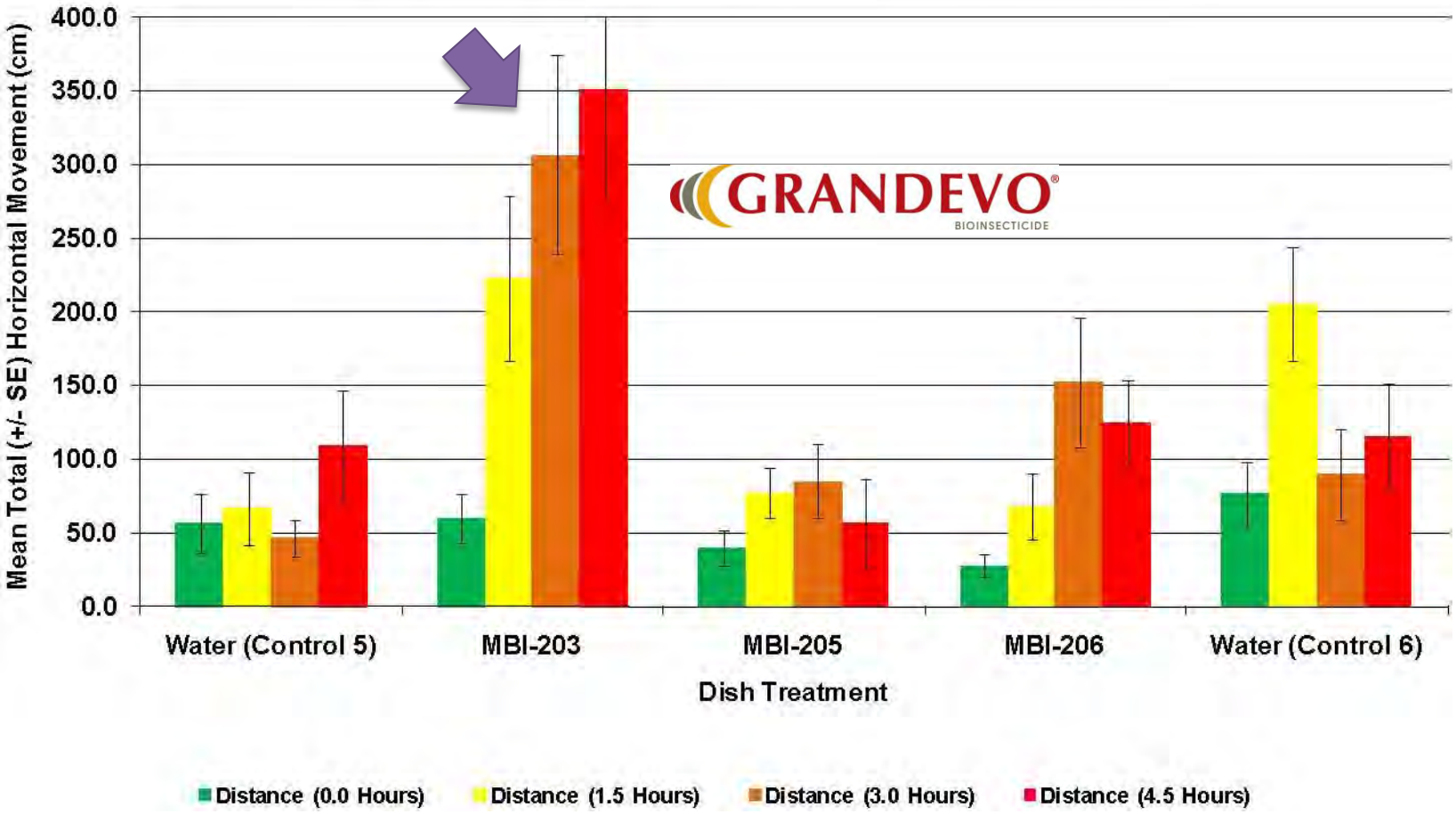
Insects are highly agitated after exposure to GRANDEVO®

USDA-ARS - Tracy Leskey, et al

Horizontal Distance Moved after 0.5 to 4.5 hrs



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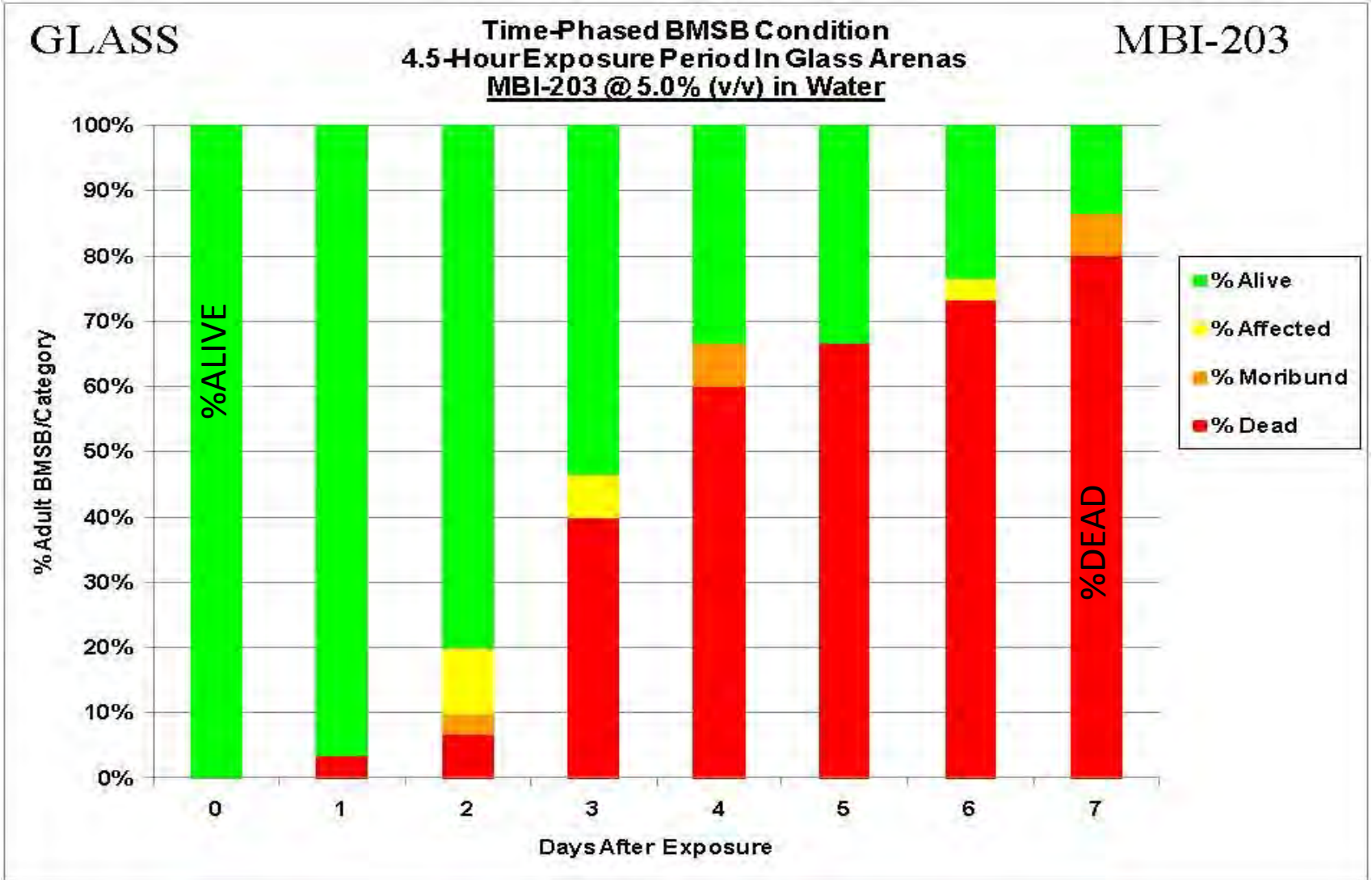
GRANDEVO® vs. Brown Marmorated Stink Bug

GRANDEVO® BIOINSECTICIDE

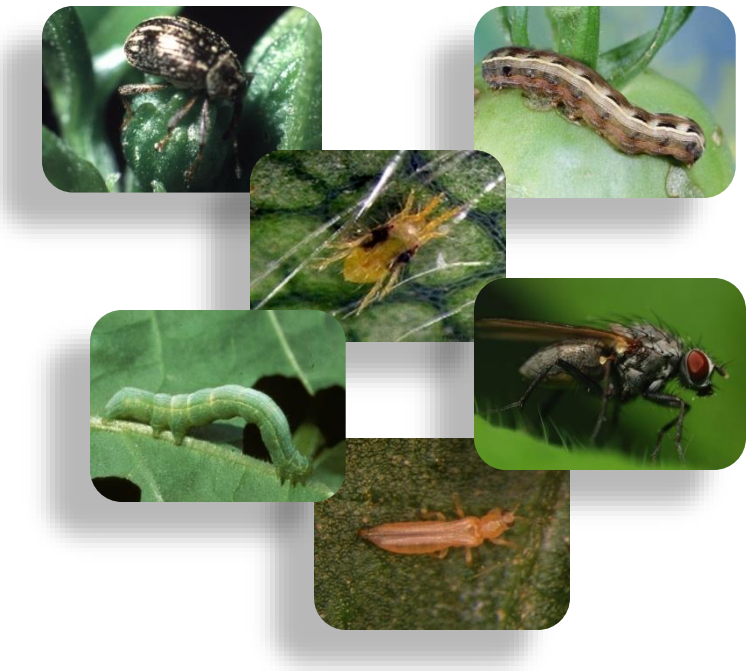
Lethality – Tarsal Contact
USDA-ARS - Tracy Leskey, et al



Case Study - VENERATE™ Bioinsecticide

- New patent pending bacterial species of *Burkholderia rinojensis sp. nov.,*
  - No relationship to pathogenic *Burkholderia* species
  - Discovered in MBI's discovery screen; isolated from soil collected by MBI employee
- Several patent pending active compounds, different chemical classes, some novel, produced by the bacteria
- Active on contact and by ingestion; broad spectrum—sucking and chewing insects, mites, and flies
- Nontoxic and nonpathogenic to all non-target organisms; slight activity on predatory mites in the lab
- Submission as a microbial to the US EPA

VENERATE™
BIOINSECTICIDE



Photos courtesy of: *Pepper weevil* Alton N Sparks, Univ of GA, Boxwood.org; *Beet armyworm* Clemson Univ. USDA Cooperative Extension Slide Series Bugwood.org; *Western flower thrip* Frank Peairs, CO St. Univ. Bugwood.org; *Cabbage Looper* RJ Reynolds Tobacco Company, Bugwood.org; *Twospotted spider mite* Clemson EDU

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Contact Efficacy Against Lepidoptera Larvae

22 Photographs illustrating the effects of AIS50 treatments of BTNW: (A) Stunted larva compare
23 normally developing larva; (B) Larva with incomplete fracs; (C) Larva with molting problems,
Larva with molting problems (left) compared to control larva.

24

25

Appears to affect molting and melanization of the cuticle; also will kill by ingestion

26

27

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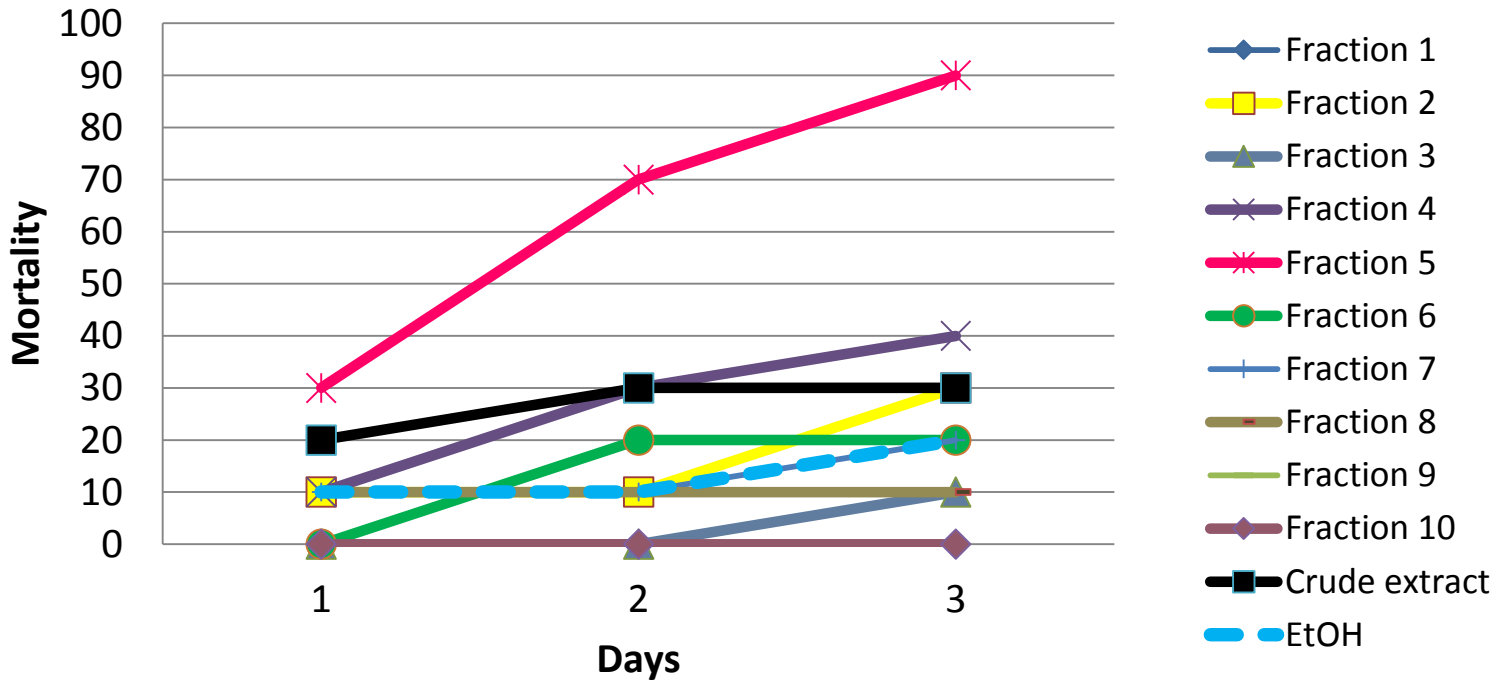
Contact Efficacy Against Cabbage Looper

- Contact assay: using fractions obtained from the fractionation of crude extract
- Place 1 uL of sample on thorax of 3rd instar larvae

VENERATE™ BIOINSECTICIDE

Mortality, CL contact assay with fractions



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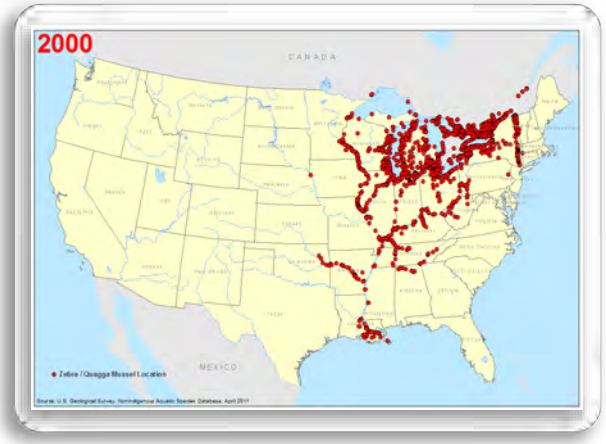
Case Study - VENERATE™ vs. Grandevo® Bioinsecticide

- Venerate™ contact activity makes is easier to evaluate than Grandevo® because most chemicals are contact active.
- Grandevo® is more challenging to evaluate because of its complex, non-contact mode of action
- Venerate™ is not 'better' than Grandevo®, just different modes of action. Field efficacy and spectrum are quite similar.
- Plethora of compounds produced by both microbes provides large challenges in fermentation and formulation development – which compounds are most important to optimize?
- What compounds do you use as 'marker' compounds for QC in manufacturing?
- Tox testing requires that TGAI ("technical grade active ingredient") captures levels of compounds expected in the final product

Case Study - ZEQUANOX®

Rapidly Spreading Invasive Species



Economic & Ecological Destruction

Marrone's Solution (molluscicide)

ZEQUANOX®
Invasive Mussel Control

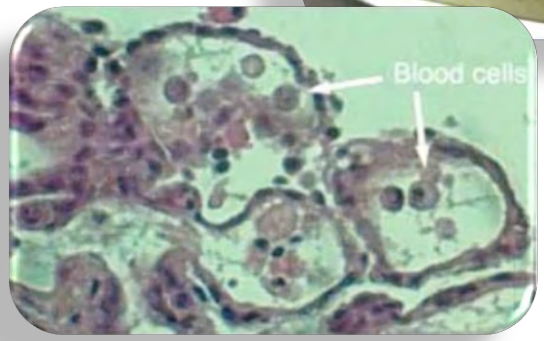
In-Pipe/ Enclosed Systems

Lakes & Recreation

Case Study - ZEQUANOX® for Invasive Mussels

- Derived from soil microbe (*Pseudomonas fluorescens*) discovered by NYSM
  - Composed of 100% dead cells
- Controls mussels in all life stages
  - Perceived as food source—destroys the mussel's digestive system after 6 hour treatment
- Highly selective toward zebra/quagga mussels
- Effective in a broad range of water conditions and temperatures
- Noncorrosive and nonvolatile

NYS M NEW YORK State Museum



ZEQUANOX® Invasive Mussel Control

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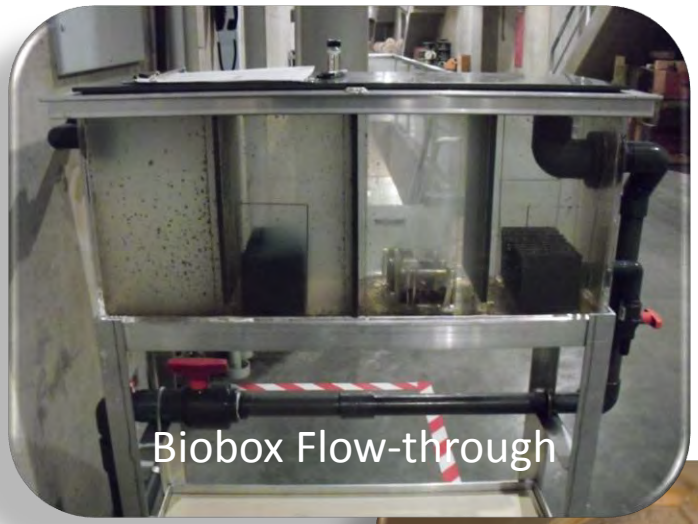
Case Study - ZEQUANOX® for Invasive Mussels



- *Pseudomonas fluorescens* strain has particular, atypical nutritional requirements
- Active mussel-killing compounds are proteins in the cells that rapidly biodegrade after 1 hour of large scale mixing
- Lab jar assays did not mimic in-pipe results
- Using live mussel jar assay for fermentation and formulation development is very slow and difficult

ZEQUANOX® Invasive Mussel Control

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Lessons Learned

- Many very good biopesticides are not selected for development because they do not work in familiar ways like chemical pesticides
- Developing bioassays that address the mode of action is critical
- Consultants and cooperators must use appropriate protocols and take evaluations beyond dead insect counts (plant damage, yields, quality)
- Training of end users in proper timing and use – set expectations, e.g., Grandevo is not a rescue treatment and should not be used alone when there are high insect populations – partner with oil, Oroboost, or other adjuvant

QUESTIONS?

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