

Two New Species of Bacteria: MBI-203 (Grandevo™) and MBI-206 Bioinsecticides



Innovative Natural Products
for Pest Management in Agriculture & Water

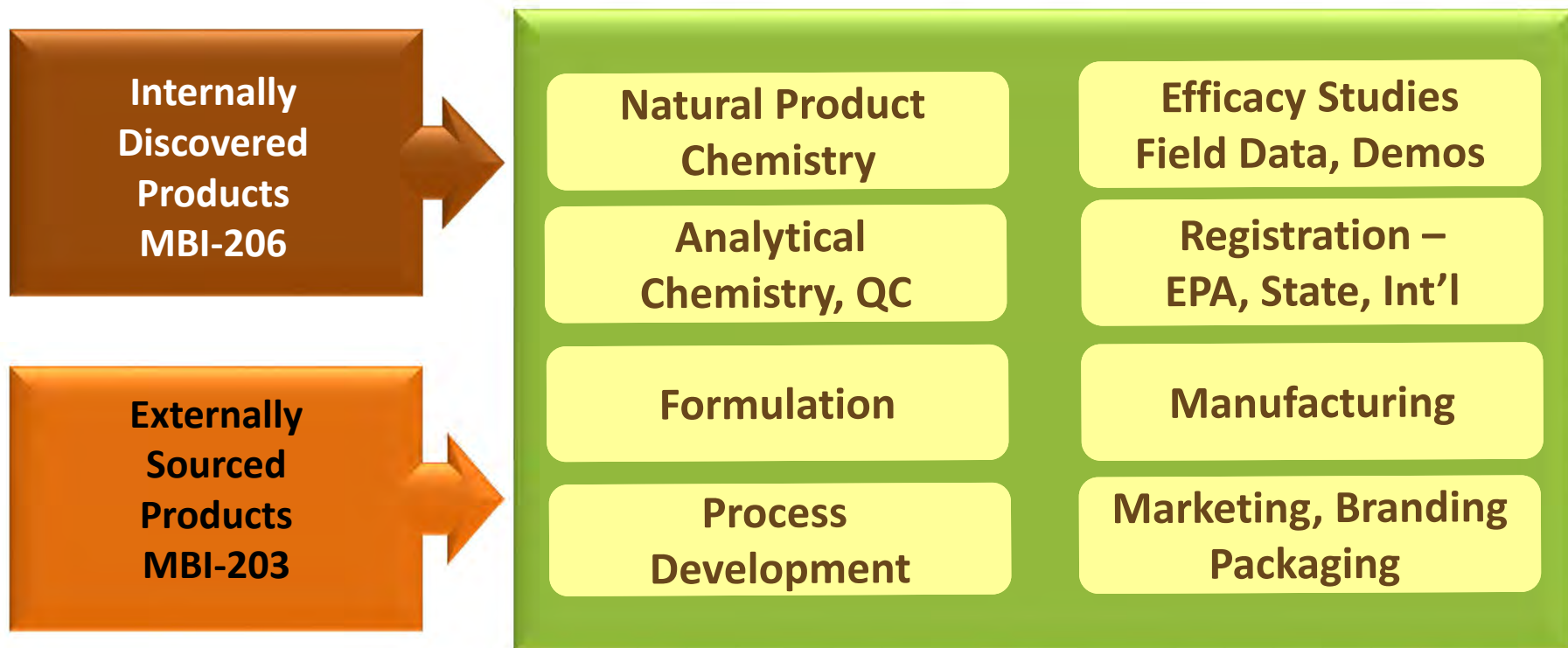
*Marrone Bio Innovations discovers,
develops and markets effective and
environmentally responsible natural
products for pest management in
agriculture and water*



Dual-Sourcing Development Strategy



Develop technology at any stage; add our own IP

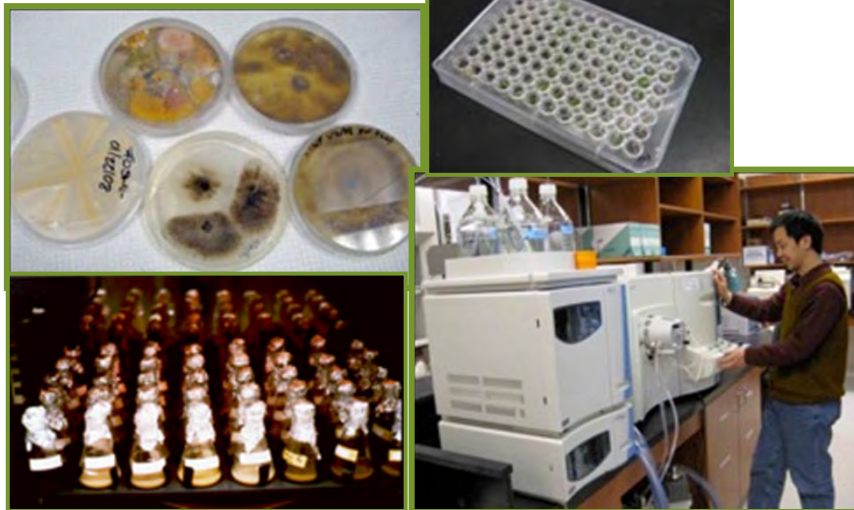


MBI's Screening Process



Discovery

- Collect samples (soil, insects, flowers) from unique habitats & geographies
- Isolate, ferment, test bacteria & fungi (100-200/week) vs. insects, nematodes, plant pathogens, weeds, algae
- Characterize & patent microbes & pesticidal compounds



Product Development

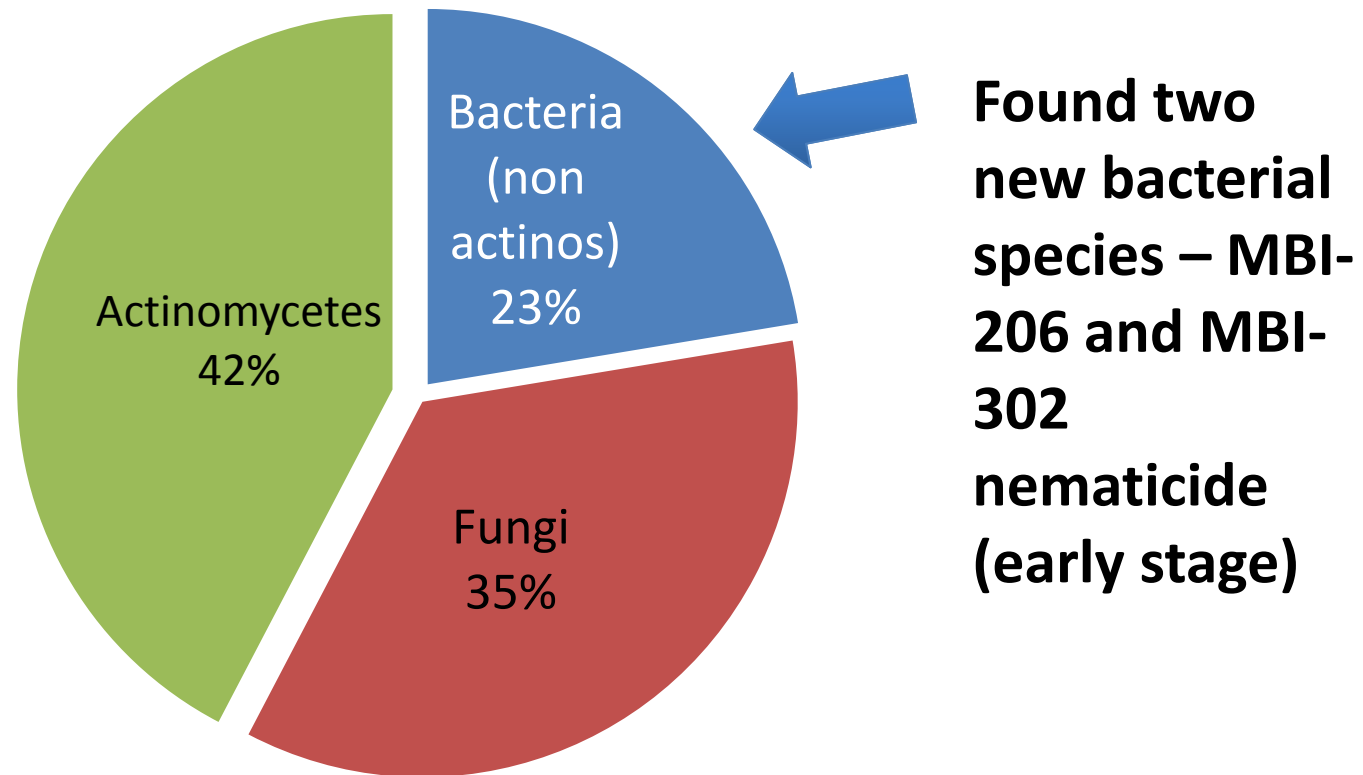
- Process development
- Toxicology/Regulatory
- Formulation
- Quality control
- Field trials
- Manufacturing trials



MBI Microbial Collection (Aug 2011)



~12,000 microorganisms categorized in three taxonomic groups



MBI R&D Pipeline

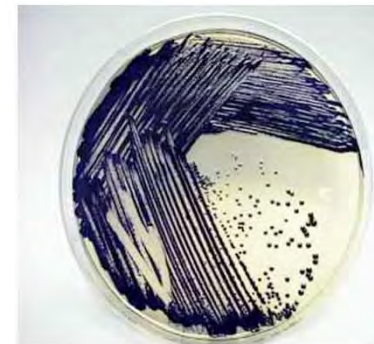


Regalia	Fungicide/Plant Health				
ZEQUANOX™	Invasive Mussel Control				
Grandevo™	Insecticide				
MBI 005	Herbicide				
MBI 206	Insecticide/Nematicide				
MBI 011	Herbicide				
MBI 010	Herbicide				
MBI 205	Insecticide/Nematicide				
Haven™	Anti-transpirant				
MBI 302	Nematicide				
Others	Algaecide, Herbicide, Fungicide, Nematicide, Insecticide, Plant Health				

GRANDEVO™ (MBI-203) Summary Overview



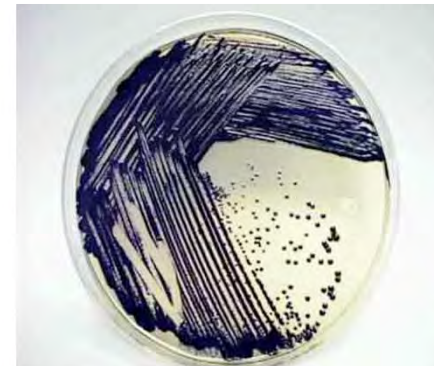
- New species of *Chromobacterium substugae* (Strain PRAA4-1T) discovered by Dr. Phyllis A.W. Martin (USDA-ARS). US Patent issued.
- Isolated from Maryland USA, forest soil under hemlock tree.
- Active by ingestion (potent anti-feedant activity). Death in 2-7 days.
- Activity found from cell-associated compounds produced by the bacteria.
- Broad spectrum control of sucking and chewing insects (Lepidoptera, Coleoptera), and flies.
- LOW RISK to non-target mammals, fish, birds, parasitic wasp, honeybees, lacewings, ladybeetles



Chemistry, Regulatory & Commercial Status



- A novel compound + novel mixtures of known compounds have activity against insects
- EPA approval August 26, 2011 of the first liquid formulation
- Scaled to manufacturing scale (30,000 L) and shipped to targeted Florida (USA) customers
- A dry flowable (with improved shelf and field stability) pending at the EPA; US National launch in 2012 upon approval
- CAL-DPR (California Dept. of Pesticide Regulation) and PMRA (Canada) approvals pending
- Trials beginning in Mexico
- We are looking for development & distribution partners ex-USA



MBI 203 Effect on Leaf beetle – Digestive Disruption



Stops feeding, leaks bodily fluids, dies

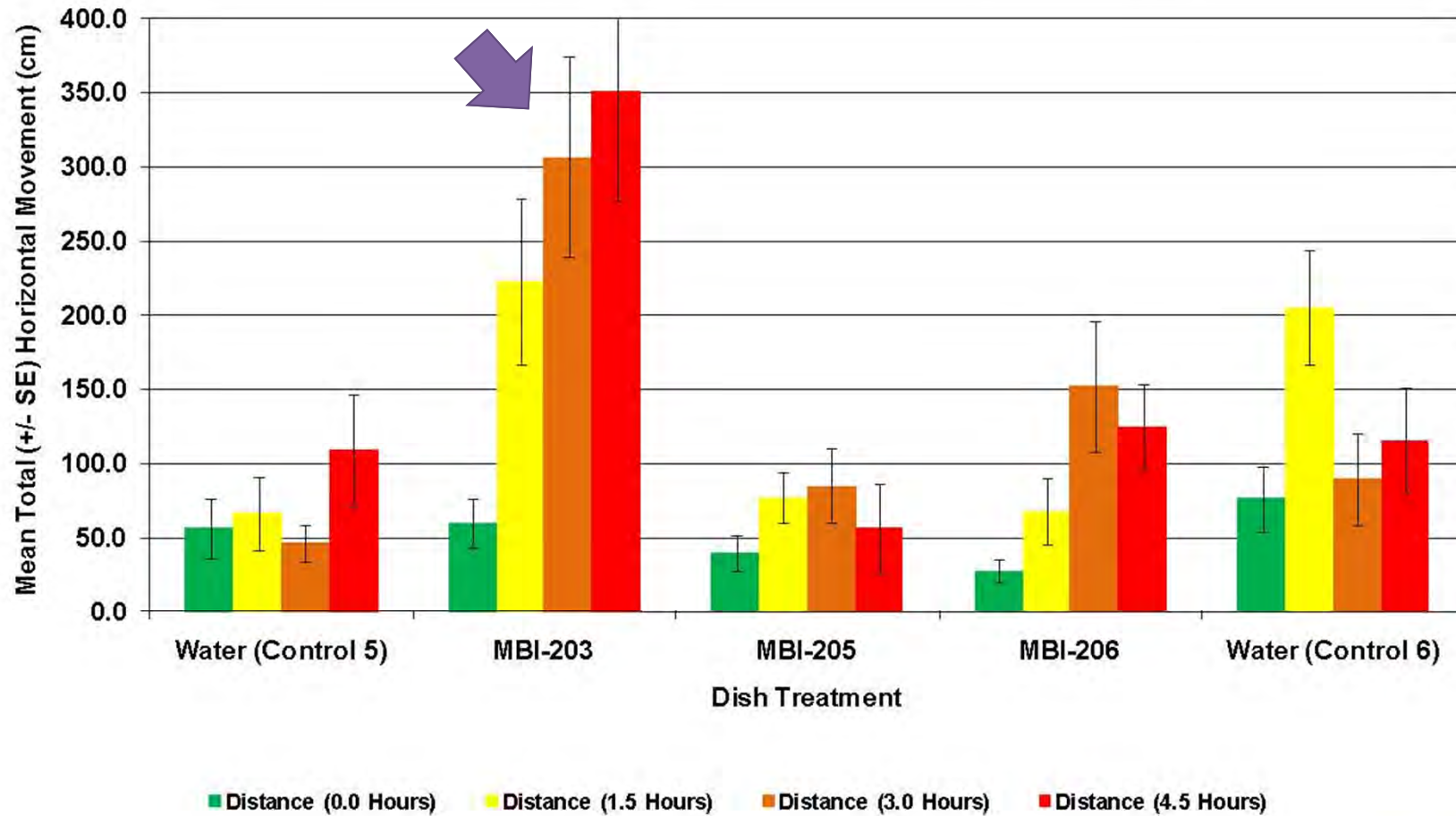




Insects are highly agitated after exposure to MBI 203



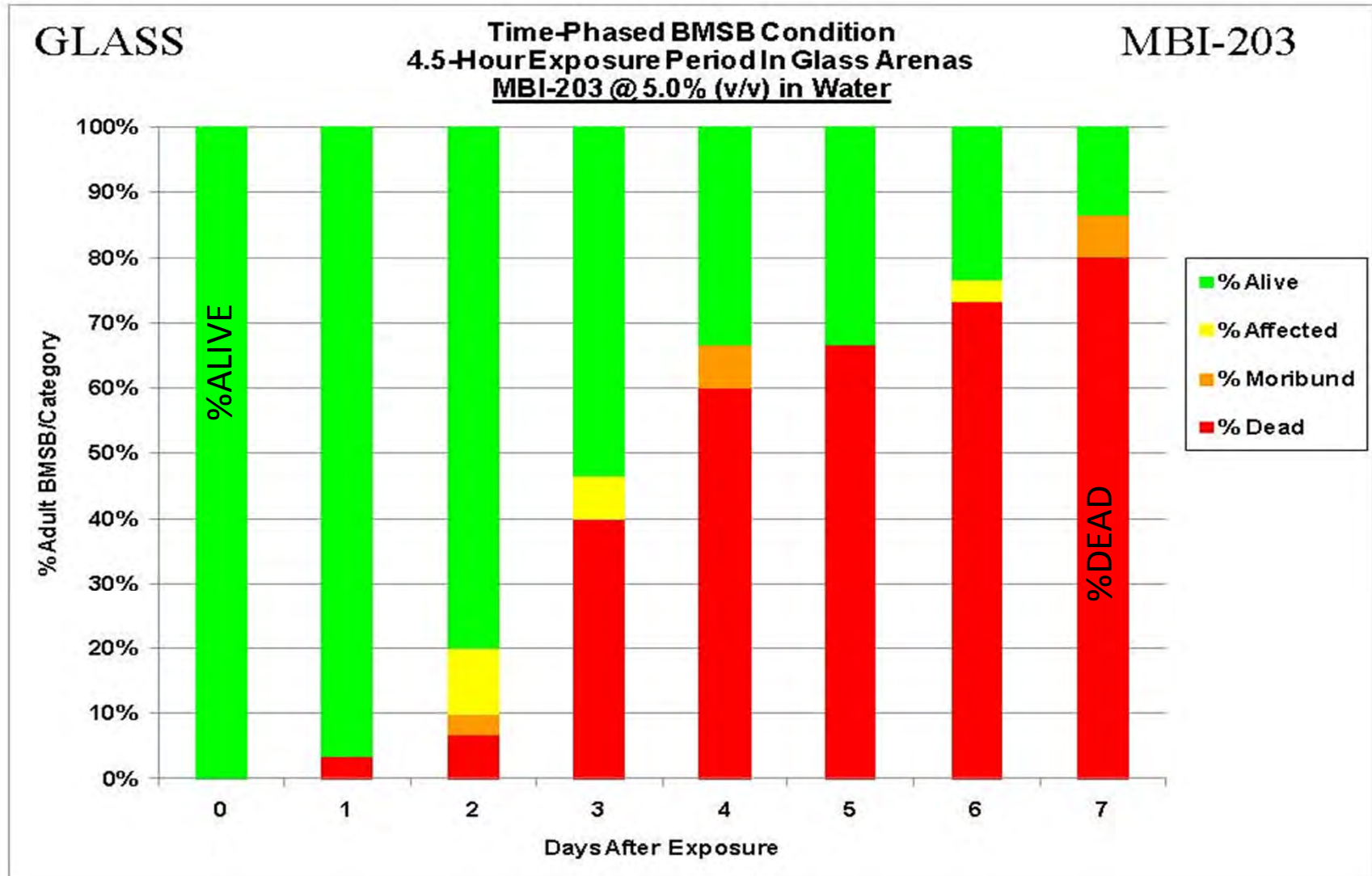
USDA-ARS - Tracy Leskey, et al Horizontal Distance Moved after 0.5 to 4.5 hrs





MBI-203 vs. Brown Marmorated Stink Bug

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



MBI 203 is Active Against Coleoptera



- Colorado Potato Beetle (larvae & adults):
 - 100% adult mortality 3 days after treatment
 - 100% larval mortality 5 days after treatment



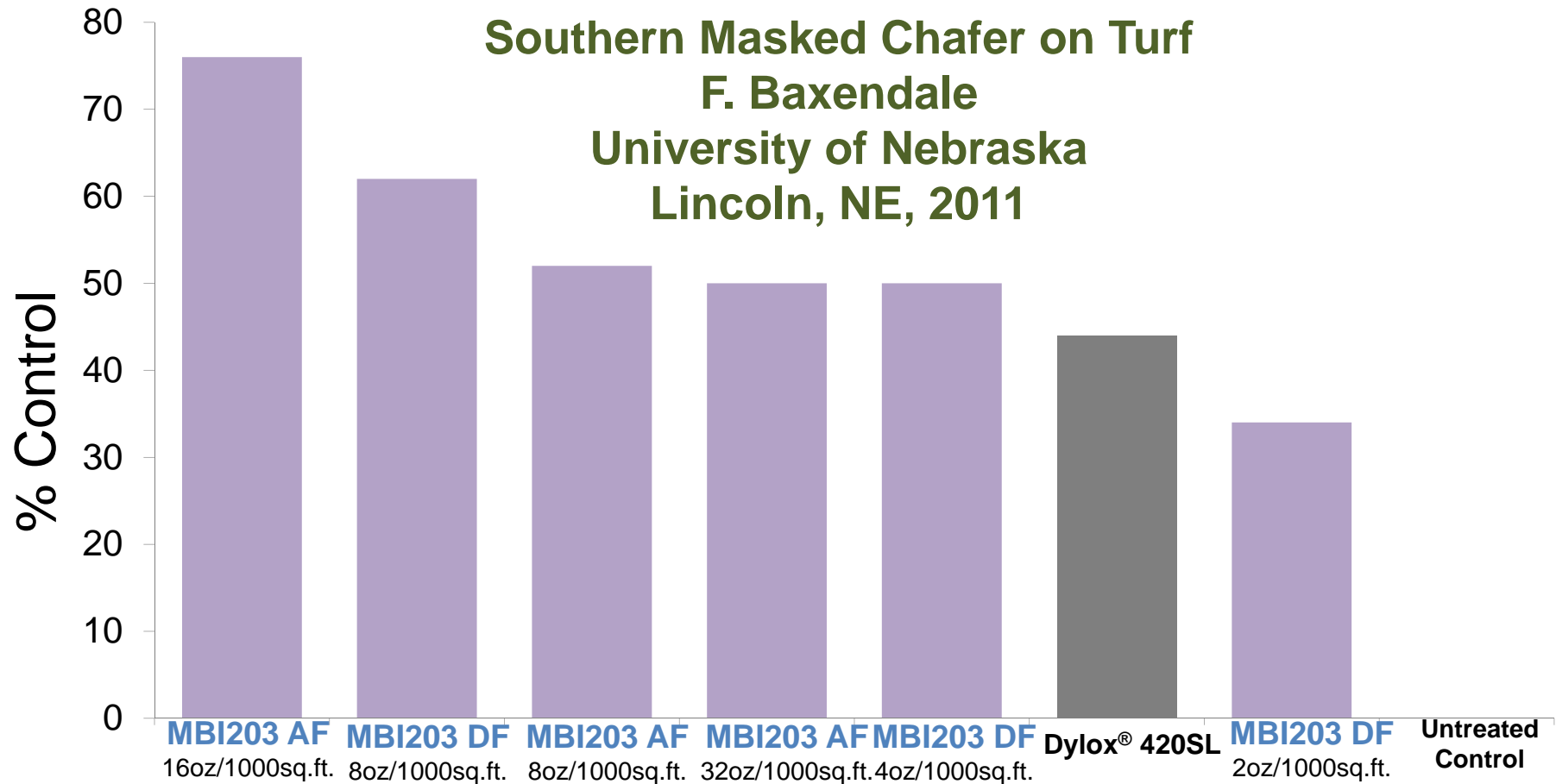
- Southern, Northern, Western Corn Rootworm (*Diabrotica* spp.)
 - 100% larval mortality 3 days after treatment



- Yellow Margined Leaf Beetle
 - 100% mortality on larvae and adults as good or better than spinosad

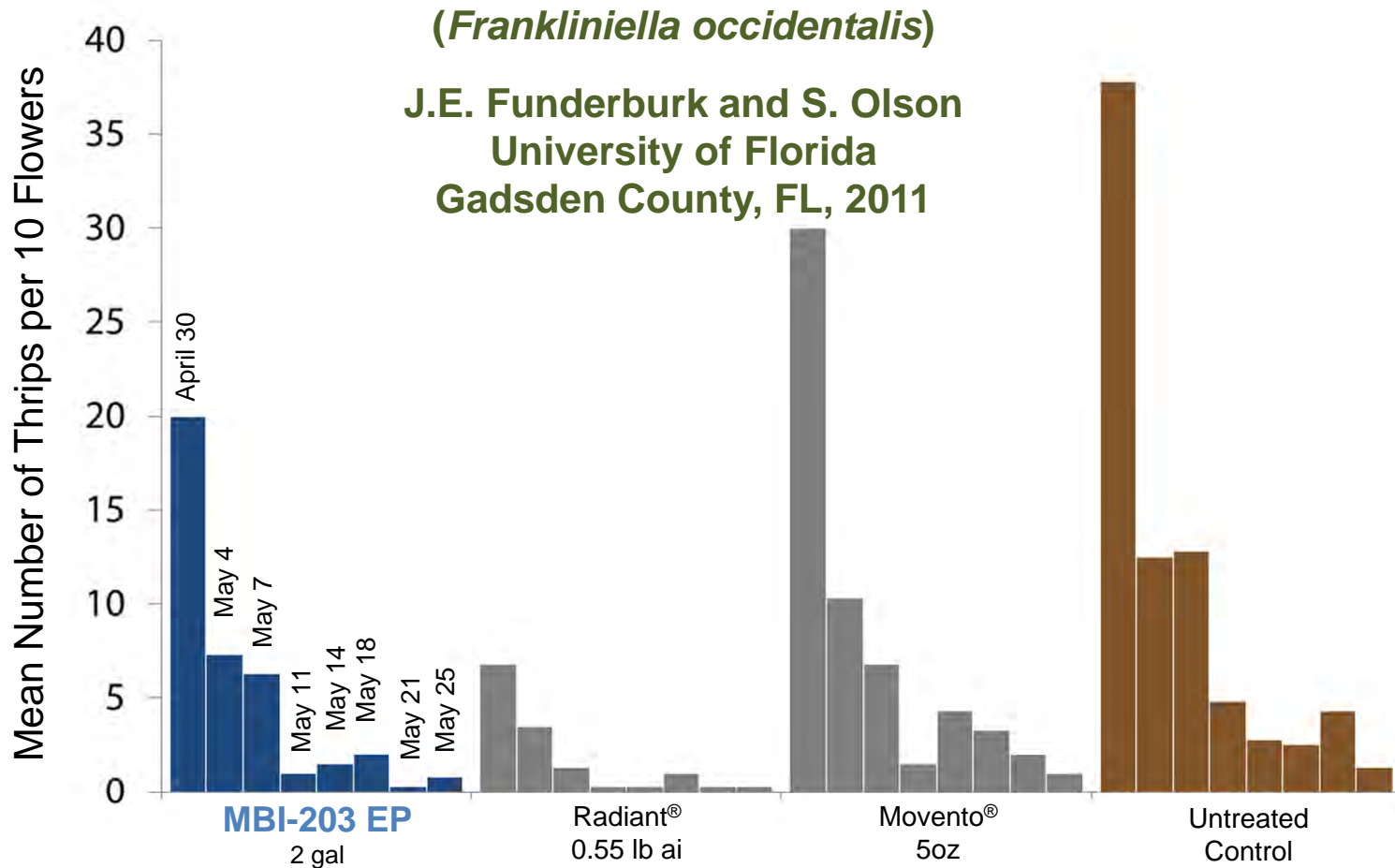


MBI-203 versus White Grub in Turf





MBI-203 vs. Western Flower Thrips, Peppers



- Treatments applied Apr 28, May 5, May 12, May 19.
- Treatments applied at 45 GPA.
- Thrips counted on Apr 30, May 4, May 7, May 11, May 14, May 18, May 21, May 25.



MBI-203 Control of *Bactericera cockerelli* on White Potato

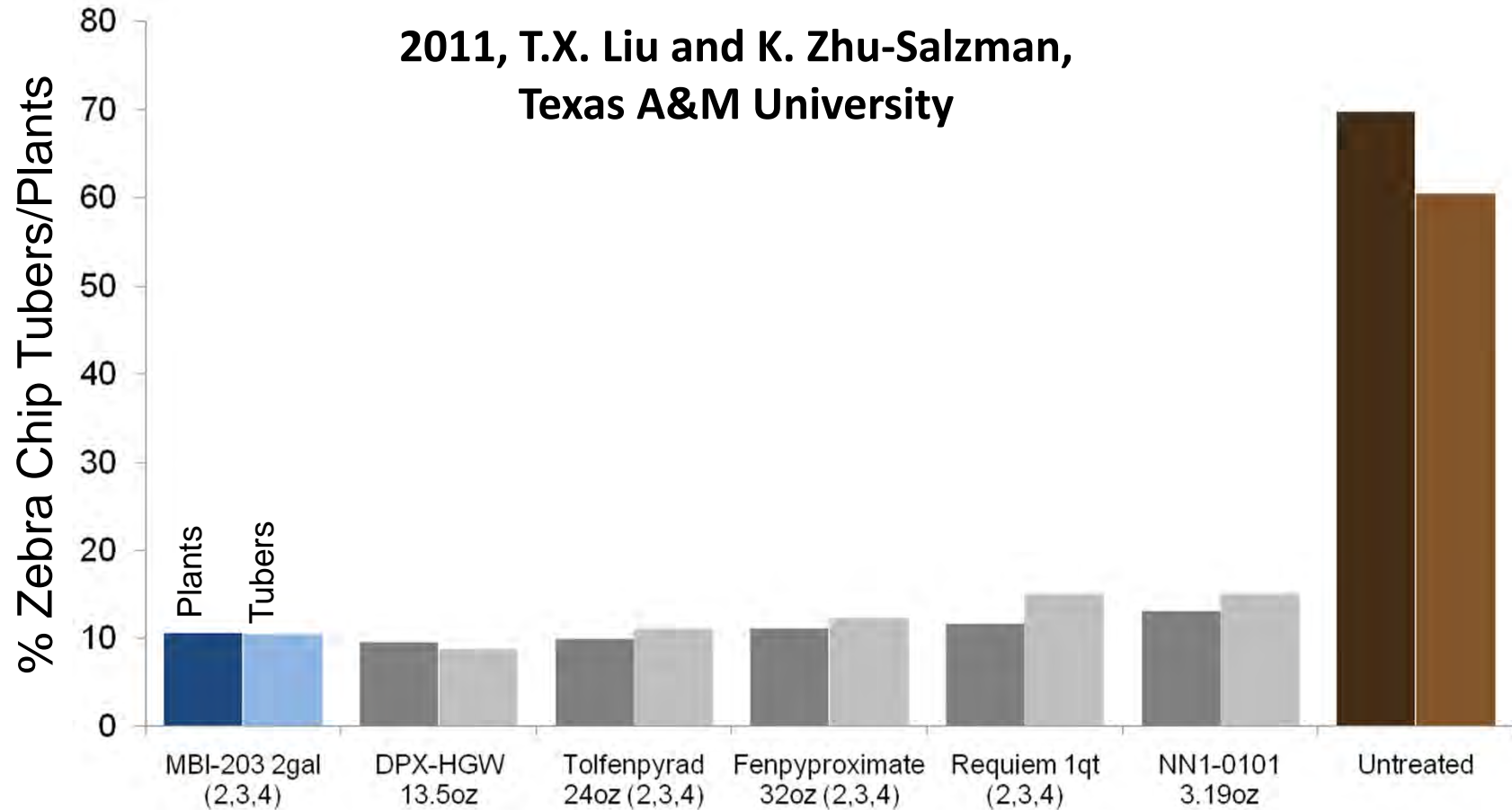
T X Liu and K. Zhu-Salzman,
Texas A&M University, 2010

Treatment	Rate	Total psyllids	Eggs	Nymphs	% reduction
Fenpyproximate	32 oz	0.87	0.58	0.33	86
Tolfenpyrad	24 oz	0.61	0.50	0.15	90
NN1-0101	3.2 oz	0.76	0.54	0.27	88
DPX-HGW	13.5 oz	0.99	0.58	0.42	84
MBI-203	2 gal	0.64	0.44	0.23	90
Requiem®	1 qt	0.6	0.39	0.25	90
Untreated		6.23	2.79	3.56	--

Three foliar applications – 14 to 19 day interval



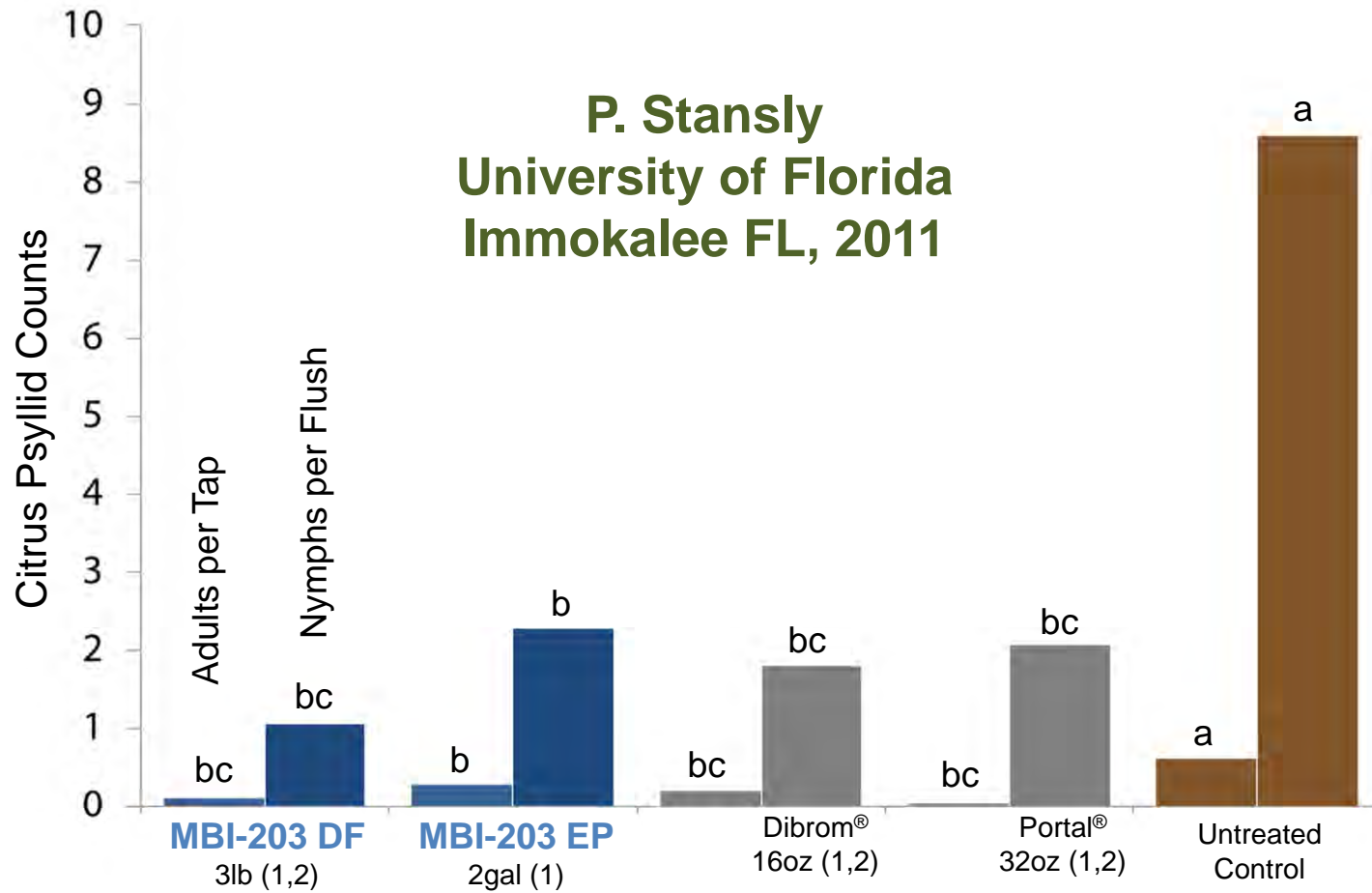
MBI-203 Reduces Zebra Chip on White Potato



- Treatments applied on Feb 18 (foliar), Mar 9 (foliar), Mar 23 (foliar)
- Insects evaluated on Feb 8, Feb 17, Mar 8, Mar 17, Mar 22, Apr 12



MBI-203 vs. Citrus Psyllid

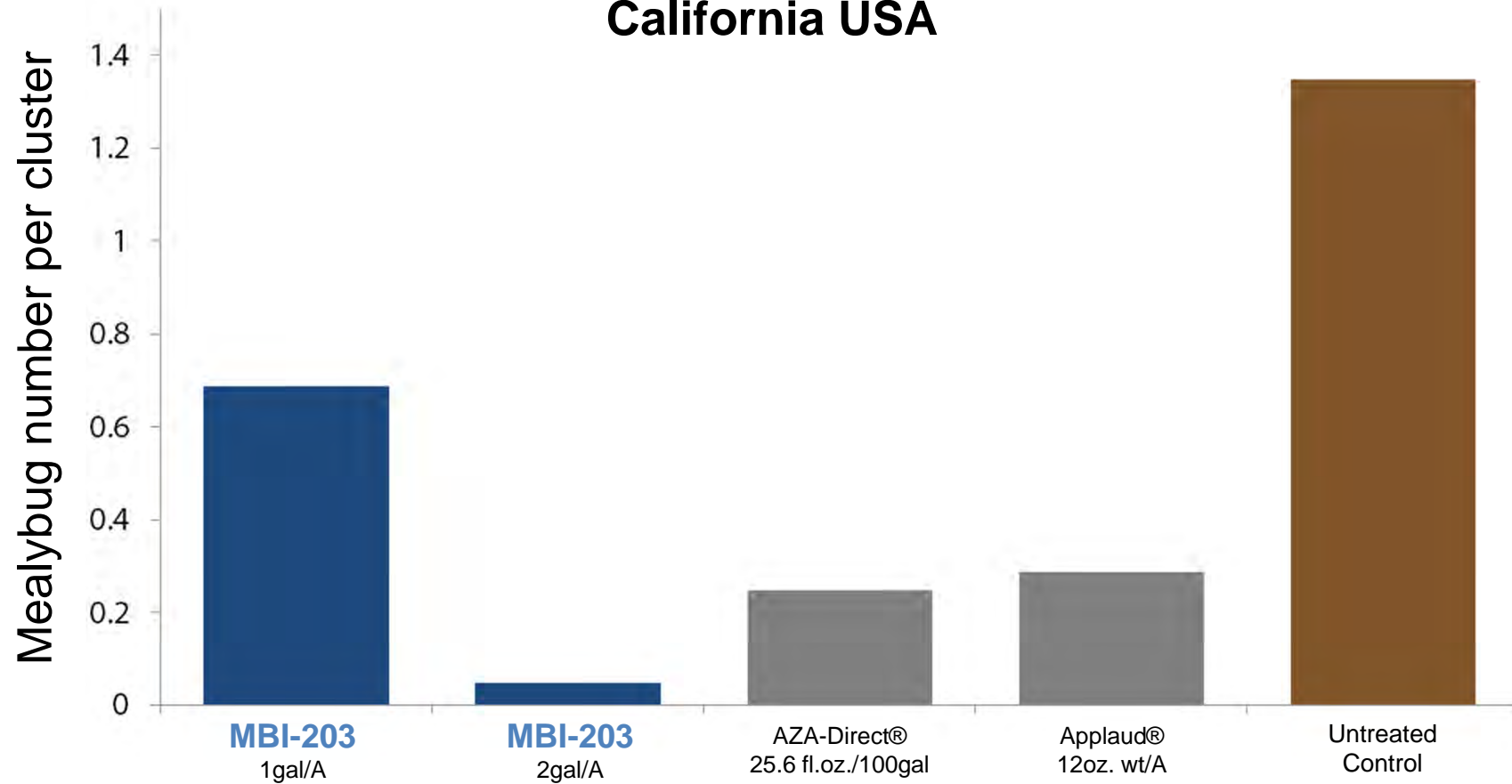


- Treatments applied 1= Aug 22 and 2= Sep 5.
- Treatments evaluated on Sep 8.



MBI-203 Control of Vine Mealybug on Grape

**Bio Research, 2010
California USA**



- Treatments applied on Aug 12 and Aug 17.
- Insects evaluated on Aug 28

MBI-203 vs. Green Peach Aphid, *Myzus persicae*



Impatiens

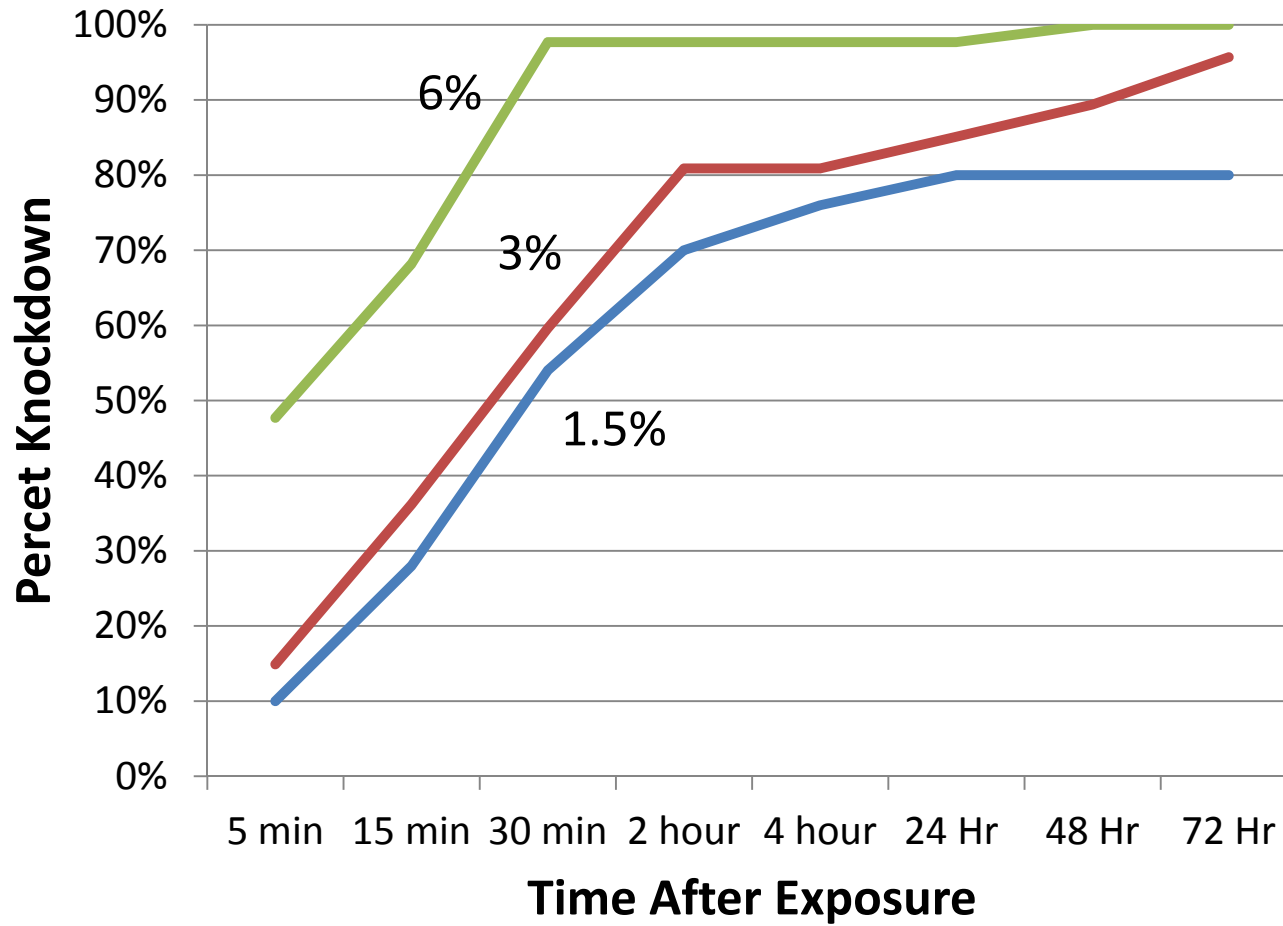
L. Chen – Louisiana State University, 2010

Treatment	Rate	Total aphids
Water		22.2 a
Conserve	6 oz/100 gal	2.3 b
MBI 203	5% v/v	4.7 b
MBI 203	2.5% v/v	6.8 b

Single application



MBI-203 vs. Housefly



MBI-206 Bioinsecticide, *Burkholderia* sp. nov.

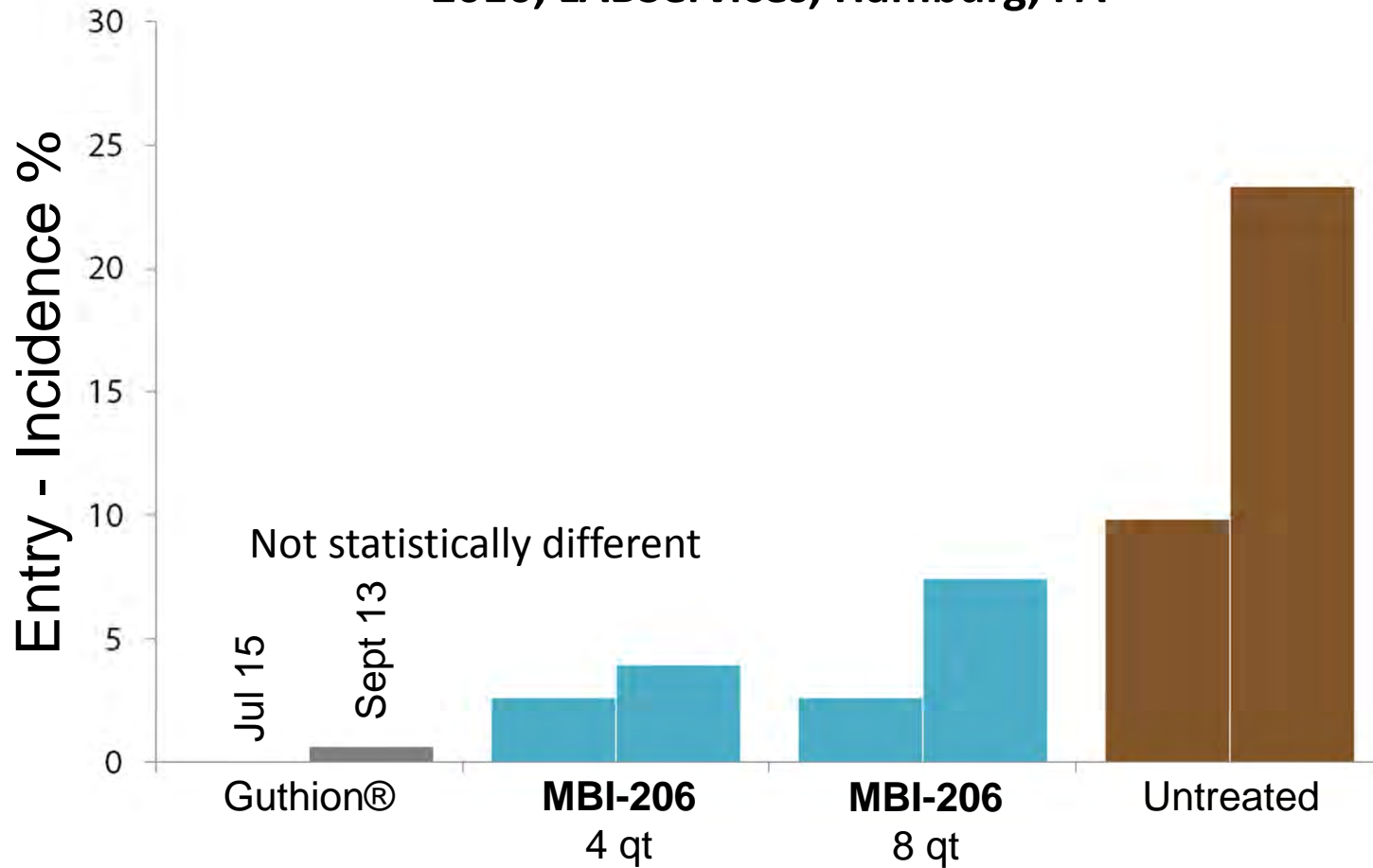


- Discovered in MBI's discovery screen
- Isolated from soil collected by MBI employee
- New bacterial species of *Burkholderia*. No relationship to pathogenic *Burkholderia* species
- Several active compounds, different chemical classes, some novel, found in the whole cell broth
- Active on contact and by ingestion – broad spectrum – sucking and chewing insects and flies
- Tox and ecotox – non toxic and non pathogenic to rats, fish, birds, and beneficial insects
- Submission as a microbial to the EPA/PMRA, expect registration 2012



MBI-206 Control of Codling Moth, *Cydia pomonella*, on Apple

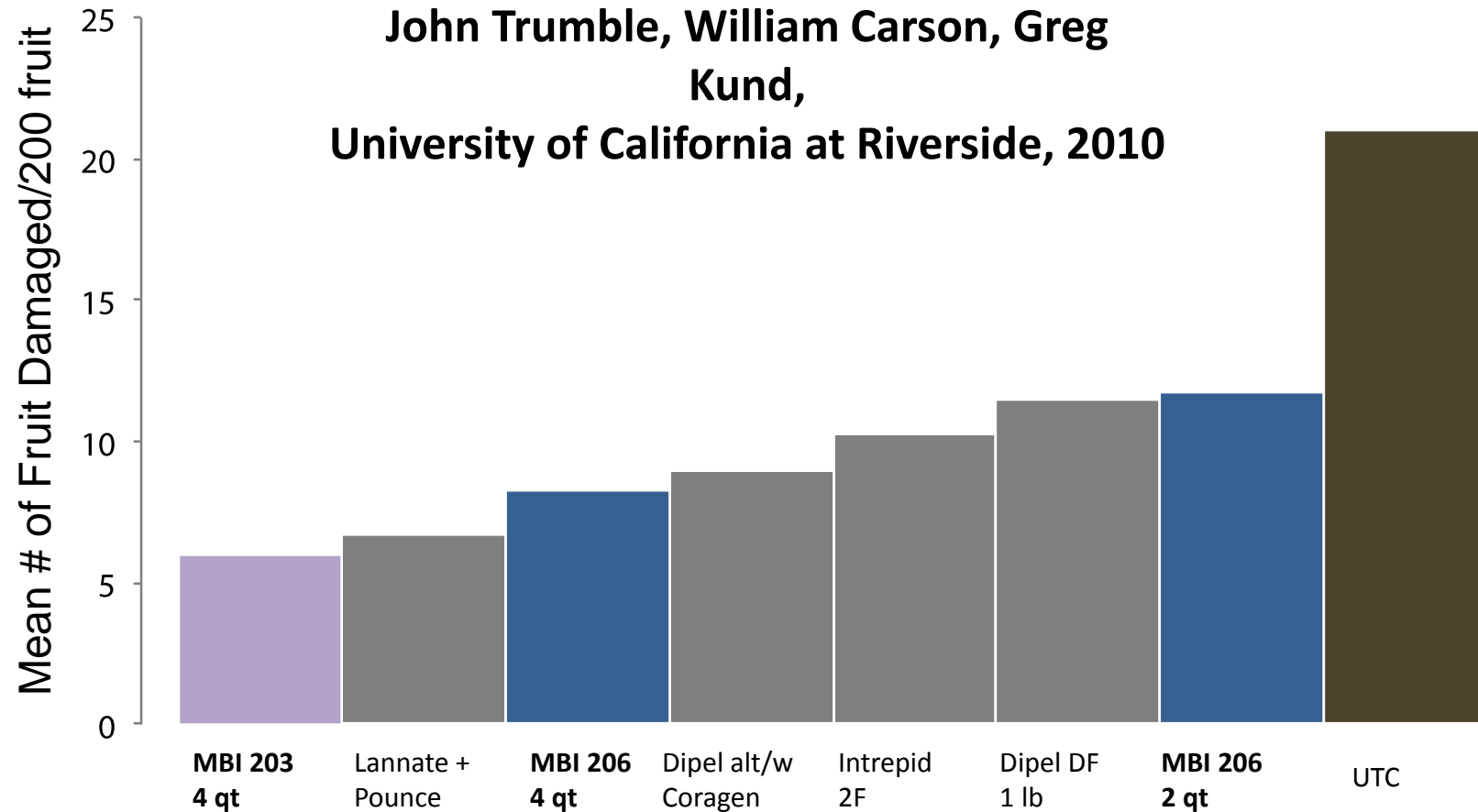
2010, LABServices, Hamburg, PA



- Treatments applied on 1=Jun 11, 2=Jun 23, 3=Jul 2, 4=Jul 12, 5=Jul 19, 6=Jul 26, 7=Aug 2, 8=Aug 9, 9=Aug 17.
- Insect feeding evaluated on Jul 15, Sep 13.



MBI-203 and MBI-206 Control of *Spodoptera exigua* on Tomato



- Treatments applied on 1=May 27, 2=Jun 10, 3=Jun 24, 4=Jul 1, 5=Jul 8, 6=Jul 15, 7=Jul 22, 8=Jul 29, 9=Aug 5, 10=Aug 12



MBI-206 Control of *Plutella xylostella*, on Cabbage

Phil Stansly and Barry Bostyk, Univ. of Florida SWREC,
2010

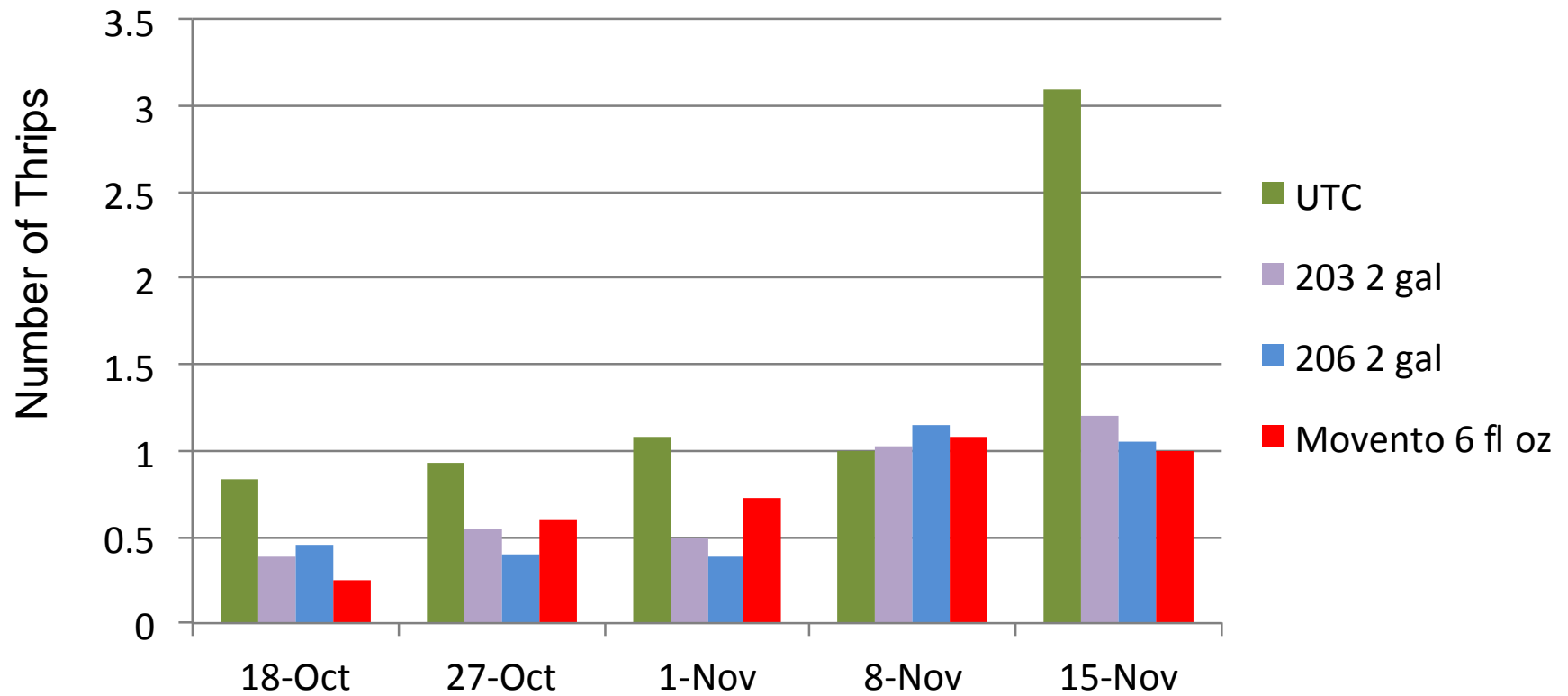
Number of Larvae/pupae per leaf

			13-Apr	20-Apr	27-Apr	4-May
Untreated			0.17 a	0.22 a	0.53 a	4.40 a
Coragen	3.5 oz	Foliar	0.03 bc	0.00 b	0.00 d	0.00 d
Durivo	10.0 oz	Drench	0.00 c	0.00 b	0.03 d	0.12 d
Synapse WG	3.0 oz	Foliar	0.00 c	0.00 b	0.00 d	0.00 d
NAI-2302 EC	21.0 oz	Foliar	0.02 bc	0.00 b	0.00 d	0.00 d
MBI-206	4 qts	Foliar	0.05 bc	0.02 b	0.19 c	1.02 c



MBI-203 & 206 Control of Western Flower Thrips, *Frankliniella occidentalis*, on Strawberry

2010, Pacific Agricultural Research

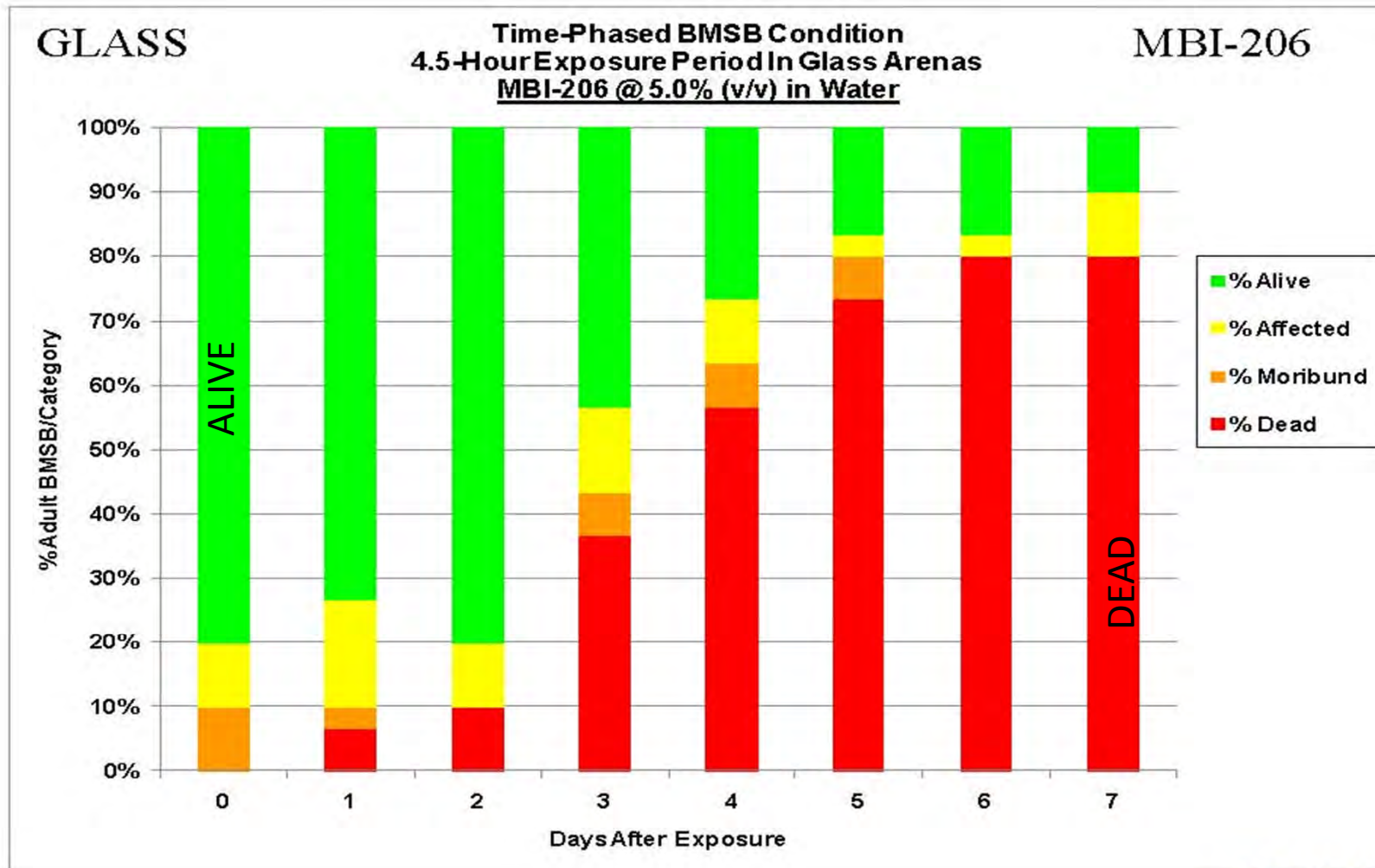


Number of thrips per 10 leaves. Four applications included Silwet L-77 at 0.25% v/v.
Trial conducted by



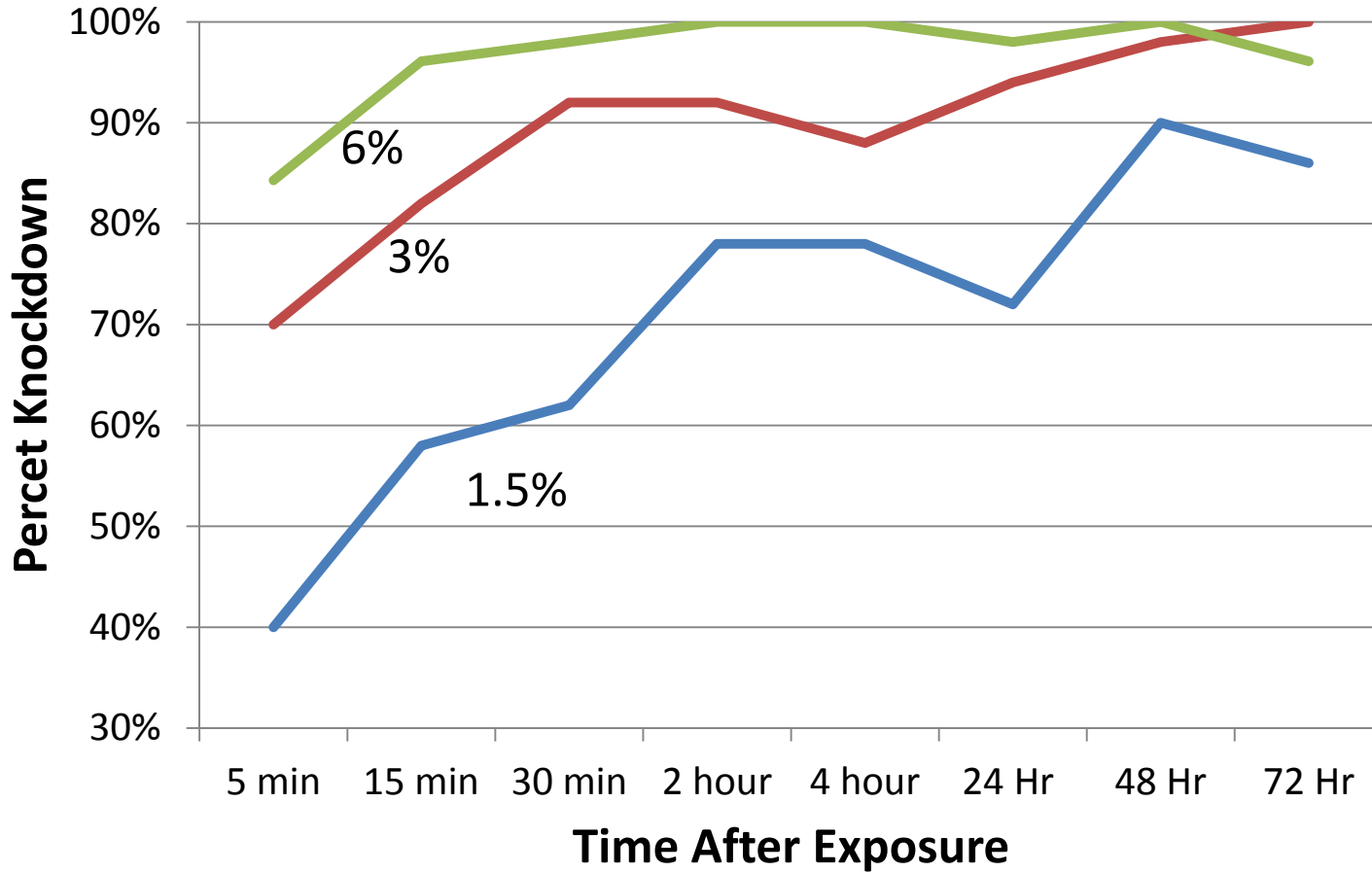
MBI-206 Brown Marmorated Stinkbug Lethality

USDA-ARS, Leskey, et al; Lethality index 48.4 (similar to cyfluthrin and oxamyl)





MBI-206 vs. Housefly



Questions?

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