



# ***Phyllom BioProducts***

Target the Pest, Not the Rest!®

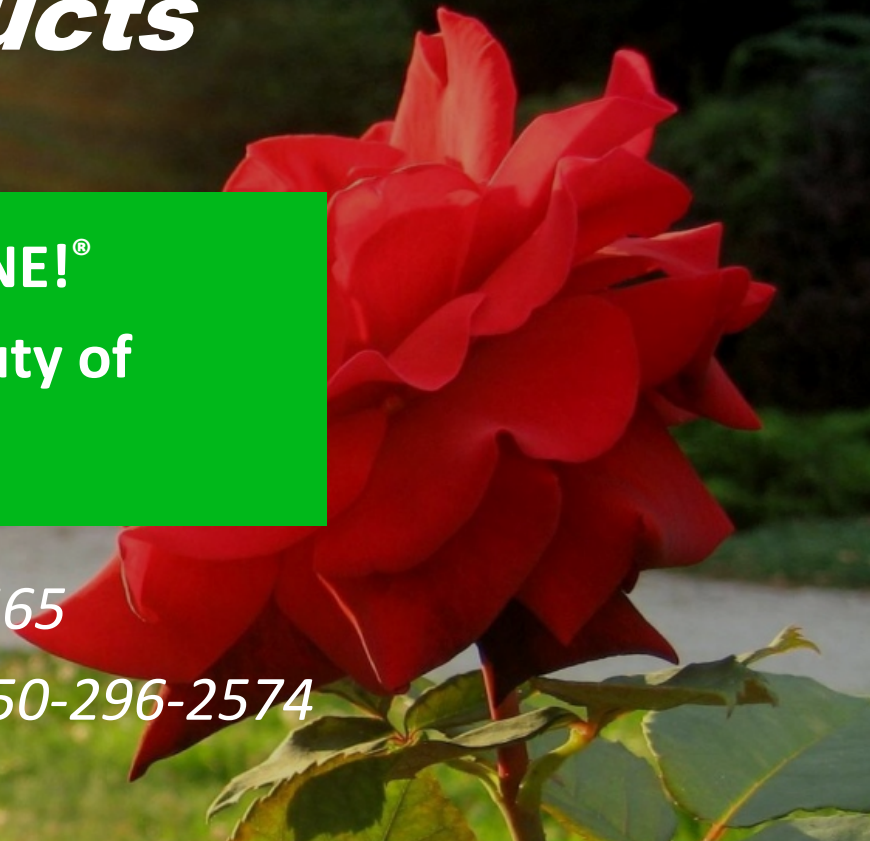
**grubGONE!® beetleGONE!® & boreGONE!®**

**Protecting the Health, Value and Beauty of  
Farms, Forests and Landscapes**

*Mike Ross, Plant Products, 905-536-4565*

*John Libs, CEO Phyllom BioProducts, 650-296-2574*

*January 6, 2020*



# *Pro Channel Partnership*



**PLANT**PRODUCTS®



***Phyllom BioProducts***

*Protecting Forests, Farms and Landscapes®*



# Pro Channel Canada: New Granule Product



**BIO  
Insecticide**

**grubGONE!.G**



**PLANTPRODUCTS**



**grubGONE!® G**

A new bio-insecticide available from **Plant Products** that helps protect the quality and value of landscape, recreational turf grasses and ornamental plants with the novel active ingredient: *Bacillus thuringiensis galleriae*.

- Targets all important grub species

**Key benefits**

Granular formulation makes it as easy as spreading fertilizer

- Protects the value of turf landscapes and ornamental plants by effectively controlling susceptible white grubs in the season of application
- Wide application window, can be used curatively and preventively
- Helps manage resistance to chemistries with a new mode of action for IPM programs
- No label restrictions for bees or flowering plants
- grubGONE! bio-insecticide provides a positive public perception
- Shelf life is greater than 17 months when stored as directed

**Grubs controlled by grubGONE!**

Common Name	Latin Name
Japanese beetle	<i>Popillia japonica</i>
Oriental beetle	<i>Anomala orientalis</i>
Asiatic Garden Beetle	<i>Meloidera castanea</i>
European Chafer	<i>Rhizotrogus majalis</i>
Cupreous Chafer	<i>Anomala cuprea</i>
N. Masked Chafer	<i>Cyclocephala borealis</i>
S. Masked Chafer	<i>Cyclocephala lurida</i>
June beetle	<i>Cotinis nitida</i>



# Pro Channel Canada: New Sprayable Product



# New Value Proposition



Japanese Beetle



Darkling Beetle



Emerald Ash Borer



Goldspotted Oak Borer



Alfalfa Weevil



White Grub



**ORGANIC**

*Safe for You, Your  
Kids, Pets &  
Pollinators*

**HIGH**

**PERFORMING**  
*vs #1 pest problems*

**FILLS VACUUM**

*Billions*



# The Solution: Our BioControls



**beetle** ***GONE!*** **tlc**

**grub** ***GONE!*** **G**

**bore** ***GONE!***

**beetle** ***GONE!*** **ag**

- Non-chemical
- Safest
- Targeted
- Potent
- Proven
- Novel
- beeSAFE!
- USDA National Organic Program (NOP)



Agrow Awards  
Agribusiness intelligence | informa



## *Active Ingredients: Natural Microbial Proteins*



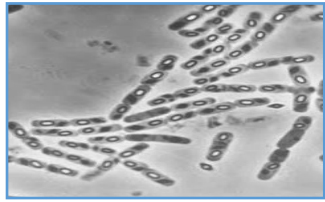
**Very Rare Discovery**



**Aggregation of Protein**



# *Bt galleriae: A New Mode of Action*



Beetle eats  
Btg protein crystals  
on treated foliage  
or in root zone



Crystal protein aggregates  
dissolve & protein toxin is  
activated in the insect mid gut

Binds to one type of gut  
receptor in larvae and 2<sup>nd</sup> type  
in adults



Pore  
formation

Disruption of mid-gut lining

Beetle stops feeding

Septicemia



**DEATH**

Our Active Ingredient (AI) Proteins are effective against not only beetle, weevil and borer larvae but also adults through binding a 2<sup>nd</sup> receptor in adult pests

# *grubGONE!®*, *beetleGONE!®* & *boreGONE!®*

## *delivery options based on pest target & life cycle*

### Delivery Options

- Spread granules on surface
- Spray foliage by ground/air
- Spray soil surface or T band in furrow
- Apply via biogation
- Pre-mix with soil media



# *Controlled by beetleGONE! or grubGONE!*

<b>Scarabaeidae</b>	<b>Asiatic garden beetle</b>	<b>larva</b>
	<b>Japanese beetle</b>	<b>adult/larva</b>
	<b>May/June beetle</b>	<b>larva</b>
	<b>Green June beetle</b>	<b>adult/larva</b>
	<b>Oriental beetle</b>	<b>larva</b>
	<b>European chafer</b>	<b>larva</b>
	<b>N. masked chafer</b>	<b>larva</b>
	<b>S. masked chafer</b>	<b>larva</b>
	<b>Black atenius</b>	
<b>Cuculionidae</b>	<b>Annual bluegrass weevil</b>	<b>larva</b>
	<b>Billbug</b>	<b>larva</b>
	<b>Alfalfa weevil</b>	<b>larva</b>
	<b>Rice water weevil</b>	<b>larva</b>
	<b>Sri Lanka weevil</b>	<b>adult</b>
<b>Buprestidae</b>	<b>Emerald ash borer</b>	<b>adult</b>
	<b>Gold spotted oak borer</b>	<b>adult</b>
<b>Tenebrionidae</b>	<b>Darkling beetle</b>	<b>adult/larva</b>
<b>Chrysomelidae</b>	<b>Cabbage flea beetle</b>	<b>adult</b>

# *History of IPM Program*

**Integrated pest management (IPM):** broad-based approach that integrates practices for economic control of pests. IPM aims to suppress pest populations below the economic injury level (EIL).

**Late 1940's:** Synthetic insecticides widely available.

**Early 1950's:**

- California and US Cotton Belt entomologists developed and advocated the concept of "supervised insect control".
- Alternative to calendar-based programs.
- Supervised control → "integrated/compatible control". Integrated control sought to identify the best mix of chemical and biological controls for a given insect pest. Chemical insecticides were to be used in the manner least disruptive to biological control





**1965:** Landscape Ontario's Integrated Pest Management (IPM) Symposium

**1972:** U.S. adopts IPM as National Policy






# Comparing Valent and Certis BT Businesses to PBCs Potential



Estimated \$200 Million in ex mfg. sales

Market	BT strain	Pest targets
Agriculture Crops	<i>Bt kurstaki</i> <i>Bt azaiwi</i>	
Ornamental Plants	<i>Bt kurstaki</i> <i>Bt azaiwi</i>	
Forestry	<i>Bt kurstaki</i>	
Public Health mosquito	<i>Bt isrealiensis</i>	

Potential \$4 Billion ex mfg. sales

Market	BT strain	Pest targets
Agriculture Crops	<i>Bt galleriae</i>	
Ornamental Plants	<i>Bt galleriae</i>	
Turf grass	<i>Bt galleriae</i>	
Forestry	<i>Bt galleriae</i>	
Poultry	<i>Bt galleriae</i>	



## *IPM Spreadable Granule: grubGONE!*

Like other Bts, grubGONE! product (gG!) is compatible with many insecticides: biologicals and chemicals.

Trials vs JB, Chafers and GJB (Curative Treatment; 19.2 grubs/ft<sup>2</sup>):

- Rates as stand alones = 3 Lbs/1000ft<sup>2</sup>; Rates mixed = 1.5 each.
- gG! mixed with imidacloprid: 3.4 → 1.2 grubs/ft<sup>2</sup>
- gG! mixed with acelepryn: 2.6 → 0.8
- gG! mixed with dylox: 5.6 → 3.2

Threshold of damage in residential/park turf: 7 grubs/ft<sup>2</sup>

# *IPM Sprayable WDP: beetleGONE!*

Customers (Pro & Retail Landscape Care and AG) are mixing beetleGONE! (bG!) with a wide range of products:

- Pyrethrin/Pyganic
- Organic Flowering Fertilizer
- Kaolin Clay



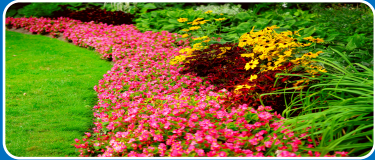
# *grubGONE!® G controls grubs in turf & ornamentals*



Turf & Ornamental use sites with no geographical restrictions



Controls 1<sup>st</sup>-3<sup>rd</sup> instar scarab, 3-4<sup>th</sup> instar weevil grubs and 2<sup>nd</sup> Gen mixed adult/grubs



Preventative or Curative against 1<sup>st</sup>-3<sup>rd</sup> instar scarab grubs



No adverse risk to all non targets tested.  
REI when dust settles, apply to waters edge



# Our turf product: High Performing ! High Value !



**Chafer Grub**

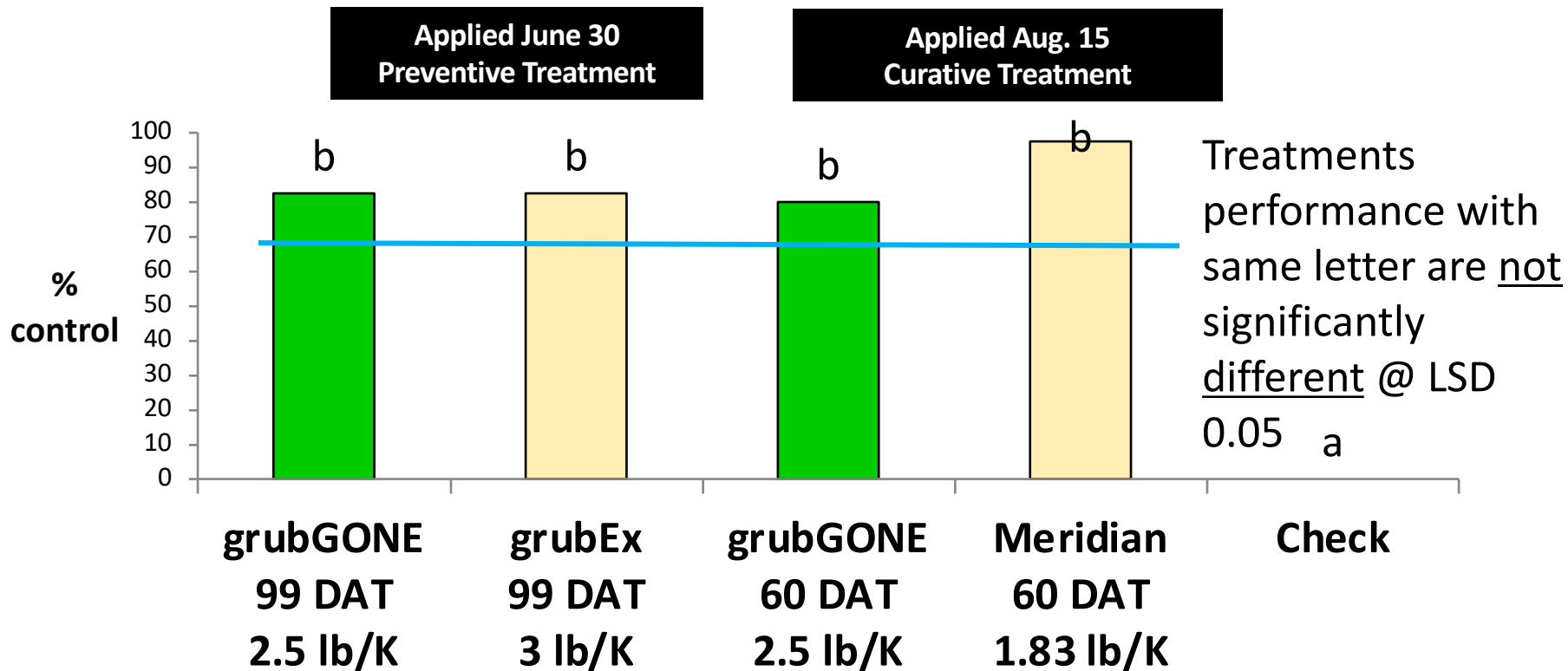


**Adult Chafer**

**grubGONE! G applied at city park in San Jose, CA**

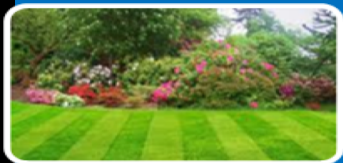


## Turf Trial: Preventive vs Curative Japanese Beetle & Chafer Grub control compared to standard chemicals, OSU, Dr. Shetlar

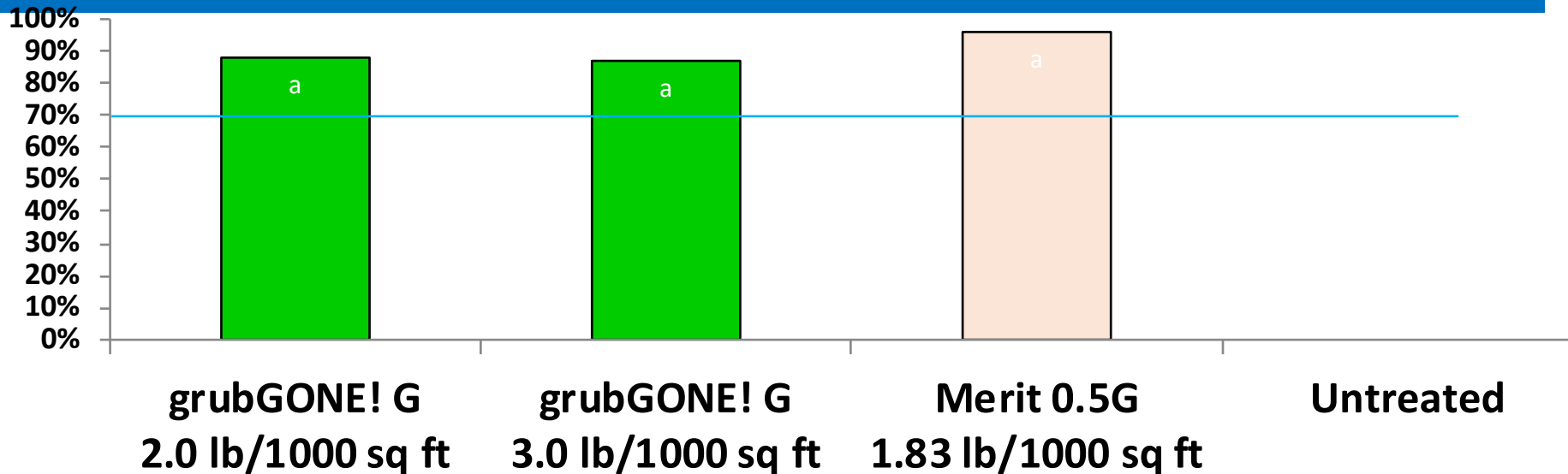


grubEX is a registered trademark of Scotts Co.  
Meridian is a registered trademark of Syngenta.





## Turf Trial: Preventive control of Green June Beetle Grubs, Quail Ridge GC, Sanford, NC, Treated July 8 and assessed Sep. 28, 2015, NCSU, Dr. Brandenburg



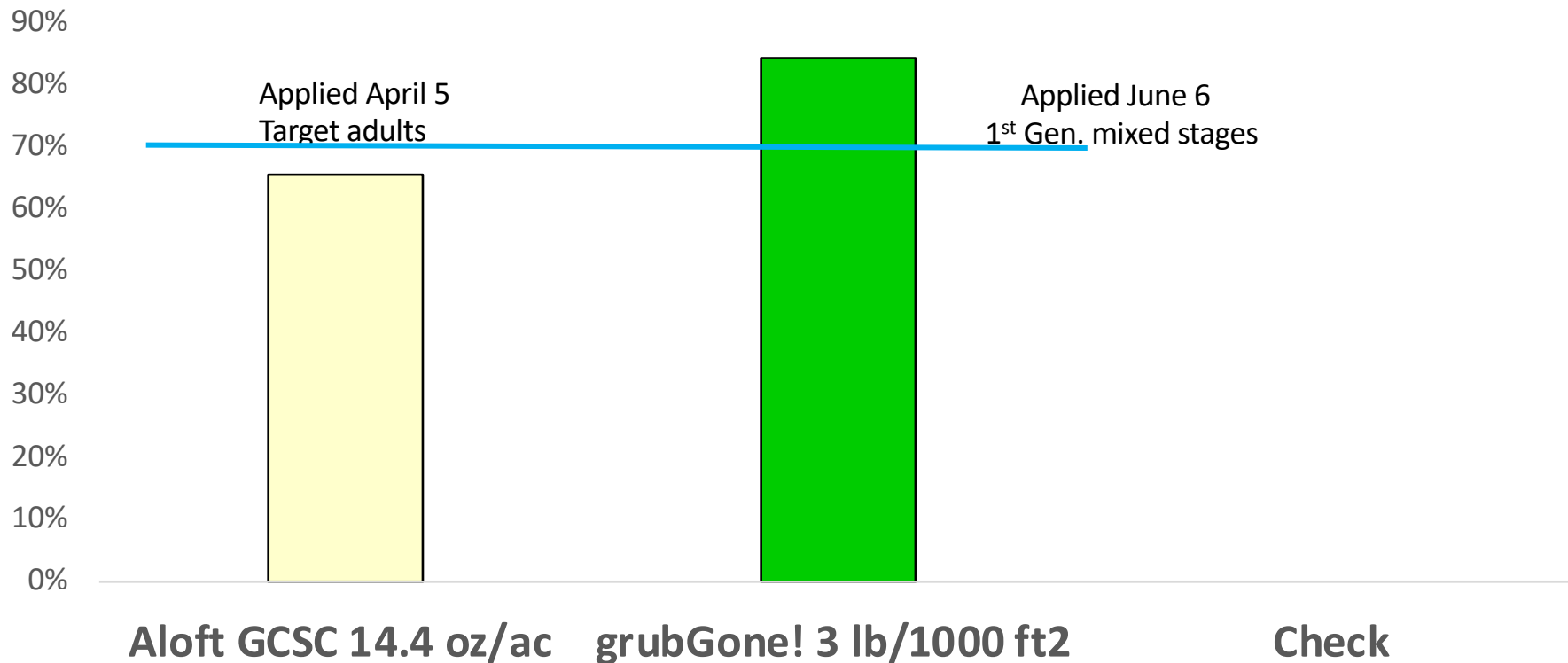
Treatments performance with same letter are not significantly different @ LSD 0.05.

grubGONE! is a registered trademark of Phyllom BioProducts Corp.

Merit is a registered trademark of Bayer Crop Science.



# Turf Trial: % control of Annual Bluegrass Weevil Assessed 6/24, The Country Club, Pepper Pike, OH



# *beetleGONE!® tlc for Tree & Landscape Care*



For Trees/Shrubs/Annuals/Edibles/Turf



Active against Scarab/Weevil/Buprestid adults or grubs



No adverse risk to any non targets tested. Re-enter field when sprays dry



For Organic Production

beetleGONE! JB 3<sup>rd</sup> instar grub control & health effect 2oz./gal. H<sub>2</sub>O (upper pots) vs Dylox 420SL .7 fl.oz./gal. (lower pots) applied as drench to pine bark soil media +10-10-10 NPK mix to all pots then over seeded with tall fescue / perennial rye & assessed ~150 DAT

**Seeded pine bark media drenched with Phyllom beetleGONE!® tlc not only controls 3<sup>rd</sup> instar grubs but has a positive health effect !**

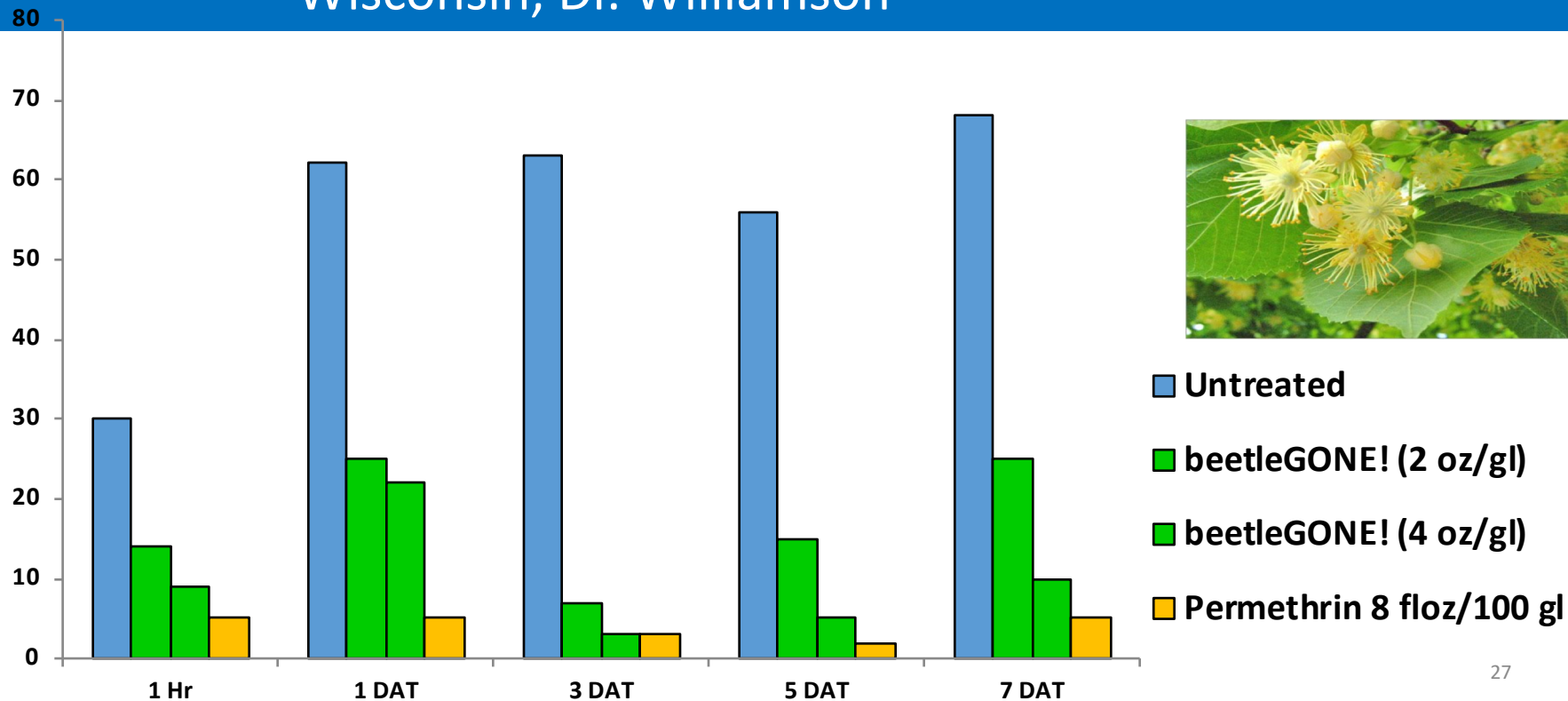


**Seeded pine bark media drenched with curative chemical standard**





# Tree Trial: Mean % Little Leaf Linden foliage skeletonized by Japanese Beetle Adult after 72 hour exposure to beetleGONE! & assessed at 2 day intervals, Univ. Wisconsin, Dr. Williamson

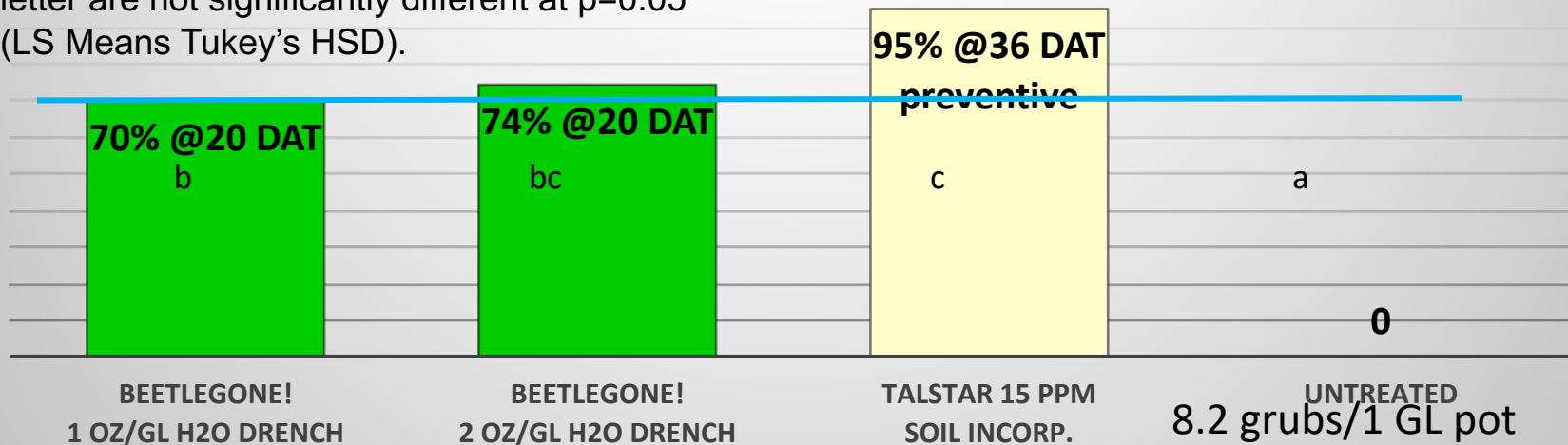






## Potting Soil Trial: beetleGONE!® % Curative control 3rd instar Oriental beetle in potting media<sup>1</sup>, Cornell L. I. Research Center, Gilrein 2015

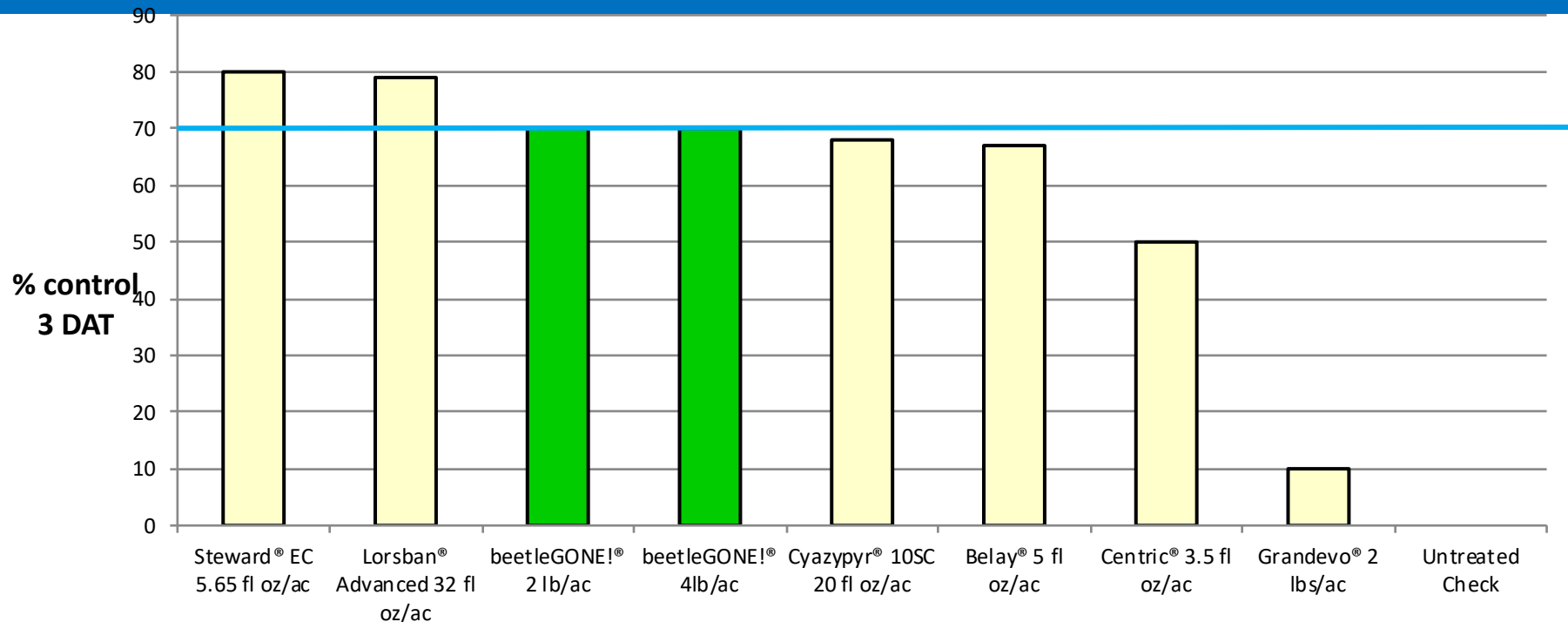
Means within columns followed by the same letter are not significantly different at  $p=0.05$  (LS Means Tukey's HSD).



<sup>1</sup>Sungro Metromix 510 bark, peat moss, vermiculite, ash & lime



## *AG Crop Trial: Alfalfa weevil *H. brunneipennis* IPM study, UC Davis CA, Dr. Larry Godfrey*

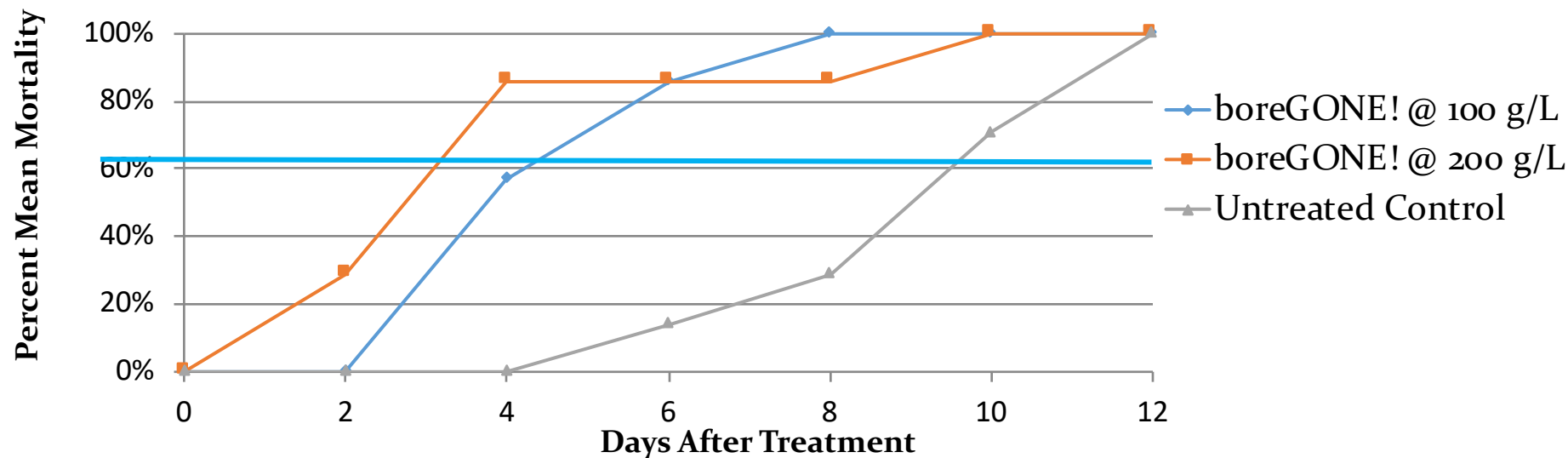


Phyllom's beetleGONE ag @ 70% control versus the current leading biocontrol product Grandevo @ 10% control



# Forestry Trial: Adult Emerald Ash Borer Mortality Post boreGONE!® Treatment

**Adult Emerald Ash borer Mortality post boreGONE! treatment**  
**Morton Arboretum, Lisle, IL, Dr. Miller 2012**



Over 70% mortality = commercially viable. Study conducted by Fredric Miller, PhD.  
Morton Arboretum and Joliet Junior College Dept. of Horticulture



*Pro Landscape Care Customer:* Interview  
with a Product Distributor  
Branford, CT



*Golf Course Customer:*

Interview with a Product Distributor  
Wethersfield, CT

## *Market Trends: Tailwinds for Phyllom's Sales and Biz Dev*



- **Widespread infestations**
- **Top down restrictions and bans**
- **Ground swell of customer demand**
- **Millennials care about the environment**
- **Transfer of wealth to Millennials**
- **Major garden retailers eliminating chems**
- **Chemical pesticides kill pollinators**
- **Insect resistance is widespread**



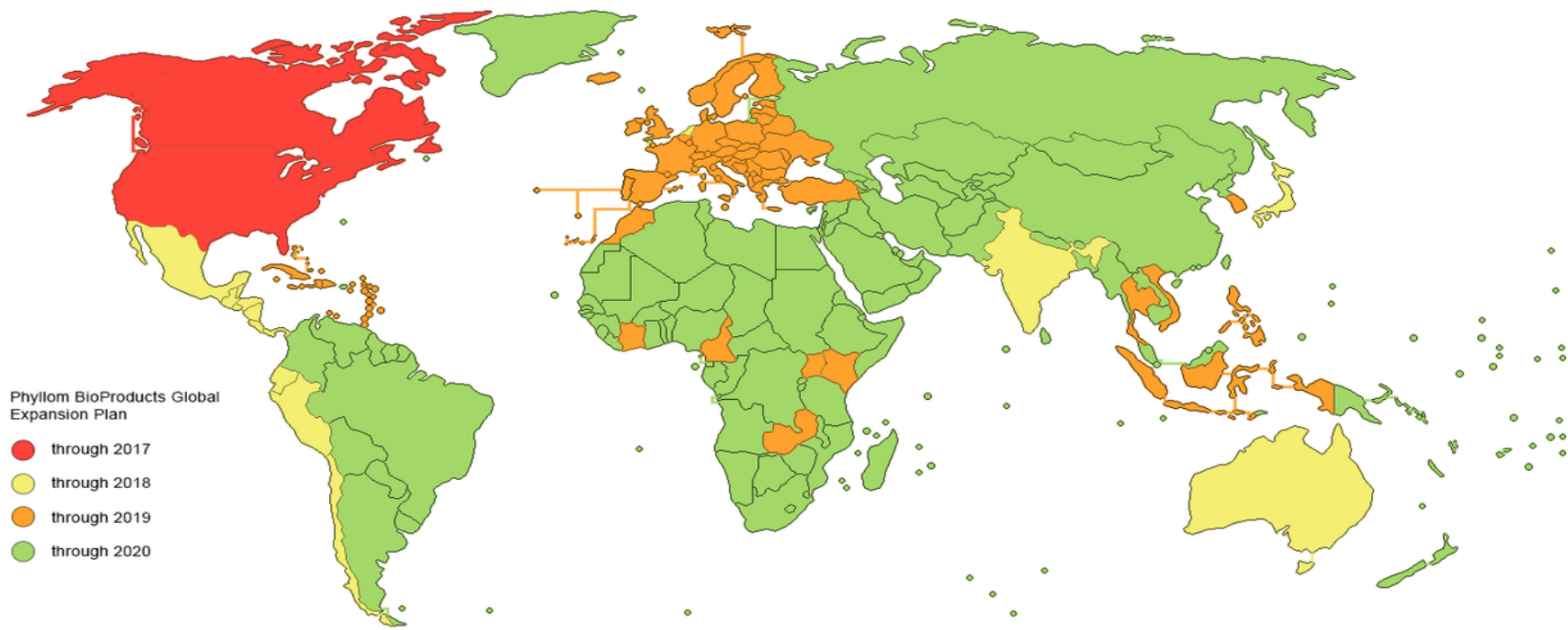
# *Widespread infestations*



*Dead Pines – Yosemite National Forest*

© Don Smith Photography

# *Top down restrictions and bans*



***US, CAN, EU, India, China***



# *Ground swell of customer demand*

## Show Bees Some **LOVE**



TELL HOME DEPOT  
AND LOWE'S TO  
**STOP SELLING BEE  
KILLING PESTICIDES!**

[valentine.beeaction.org](http://valentine.beeaction.org) #beelove

**Join the National Swarm February 10th-16th**



## *Safe for Kids, Pets, Workers & Bees*

# *Millennials love organics + environment*



*Wealth Transfer → Spending Power*

# *Chemical pesticides kill pollinators*



***Pollinators & Beneficials***

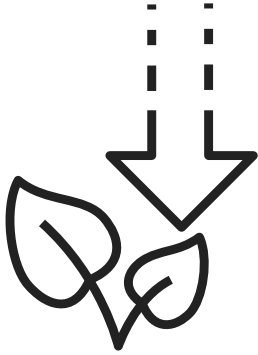


# *Major garden retailers eliminating chems*

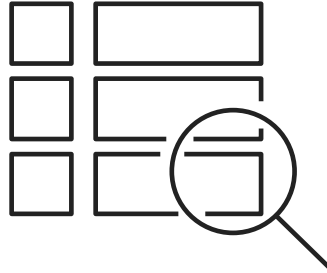


***New Mandate: Chems Gone by 2019***

# *Competitive Landscape: The BioControl Competition*



Use is limited  
because of  
**poor efficacy**

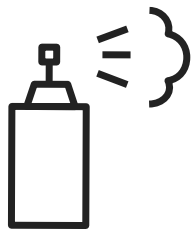


**Difficult  
product  
handling**  
characteristics

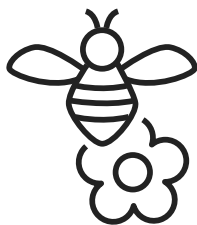


**Expensive**

# Competitive Landscape: The Chemical Competition



Includes  
**neonicotinoids,**  
**organo phosphates,**  
**pyrethroids** and  
**anthranilic diamide**



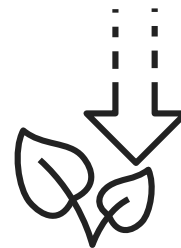
**Toxic** to people,  
animals,  
beneficial  
pollinator insects  
(e.g. honey bees)



**Pollutes**  
**waterways /**  
**riparian areas**



**Growing number**  
**of political use**  
**restrictions / bans**  
because of a range  
of environmentally  
detrimental effects



Growing limitation  
of use because of  
**insect resistance**  
**issues**

# Go-to-Market Strategy



Phyllom  
BioProducts



Partner  
Distributors

✓ Launched  
Pro T&O

✓ Launched  
Consumer  
H&G

✓ Launched  
AG

Poultry  
Health

Forestry

Plant Traits  
(AG)

# *Phase 1+2+3: Early Adopters, Broaden Channels, International Opportunities*

1. >Regional Distributors: Outstanding Service.
  - >Expand Channel → National Brands
  - >Customer Direct Campaign
2. ***The BioPesticide Inside***<sup>®</sup>
3. Launch worldwide