

Insecticide Resistance

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**Integrated
Crop Protection**
PROTECTING CROPS





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Today



- Pests and Resistance Management
- Examples from our experience
- How resistance occurs
- How to deal with it



Insecticide Resistance



- Survivors of an insecticide spray are the ones to breed
- Pass on the genetic ability to deal with that insecticide
- More exposure = selection pressure maintained
- Insects with short life-cycles
- Often comes at a cost with other traits



Diamondback moth



Diamondback moth



Diamondback moth



Insecticide Resistance



- Diamondback Moth
 - *Plutella xylostella*
- Major pest worldwide
- Develops resistance to insecticides
- In some countries, this includes Group 28 chemicals such as Belt and Coragen and also Bt's (Dipel)



Insecticide Resistance



- Diamondback moth
- First insect pest to develop resistance to DDT
- Java, Indonesia



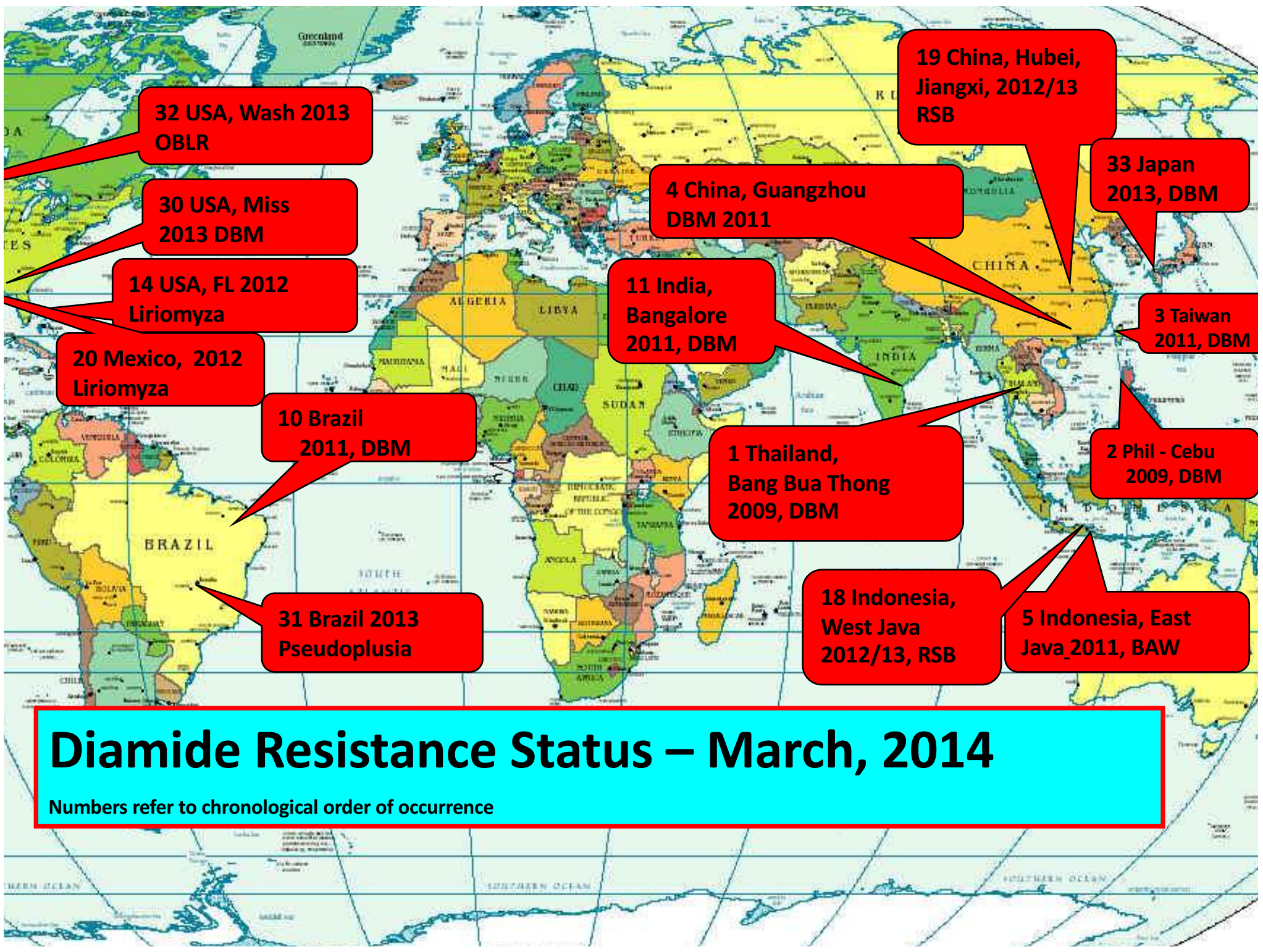
Chemical Control



- Current chemistry works
- **Group 28**
- BELT
- CORAGEN
- (BENEVIA)
- DURIVO

Also MOVENTO, CHESS, (BENEVIA) for Aphids





32 USA, Wash 2013
OBLR

30 USA, Miss
2013 DBM

14 USA, FL 2012
Liriomyza

20 Mexico, 2012
Liriomyza

10 Brazil
2011, DBM

31 Brazil 2013
Pseudoplusia

4 China, Guangzhou
DBM 2011

11 India,
Bangalore
2011, DBM

19 China, Hubei,
Jiangxi, 2012/13
RSB

33 Japan
2013, DBM

3 Taiwan
2011, DBM

1 Thailand,
Bang Bua Thong
2009, DBM

2 Phil - Cebu
2009, DBM

18 Indonesia,
West Java
2012/13, RSB

5 Indonesia, East
Java_2011, BAW

Diamide Resistance Status – March, 2014

Numbers refer to chronological order of occurrence

Shallots – Indonesia 2015 -2016



Shallots – Beet Armyworm



90+ Insecticides in 9 weeks



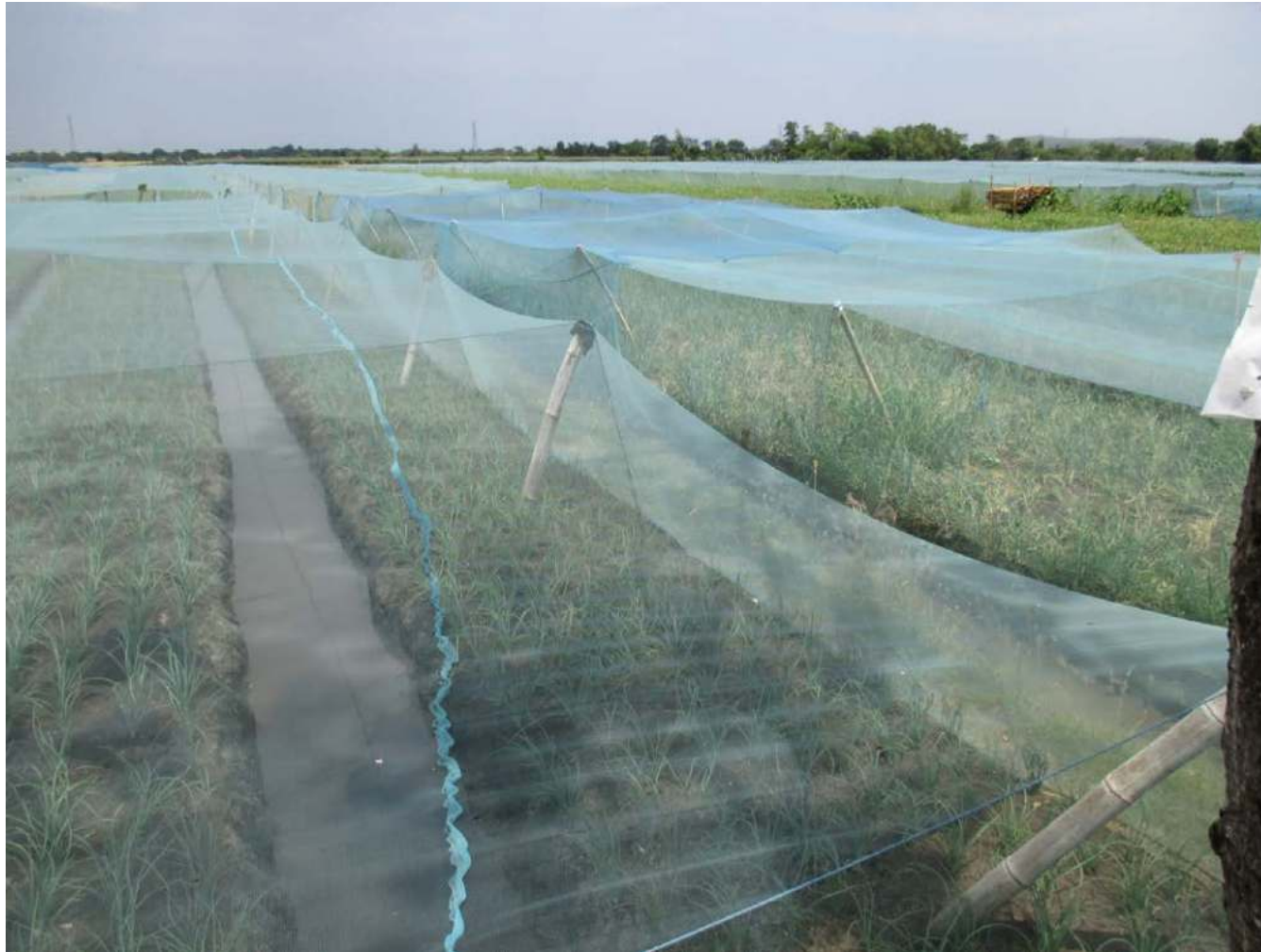
90+ Insecticides in 9 weeks



Hand-picking moth eggs



Nets to exclude moths



Mass-trapping

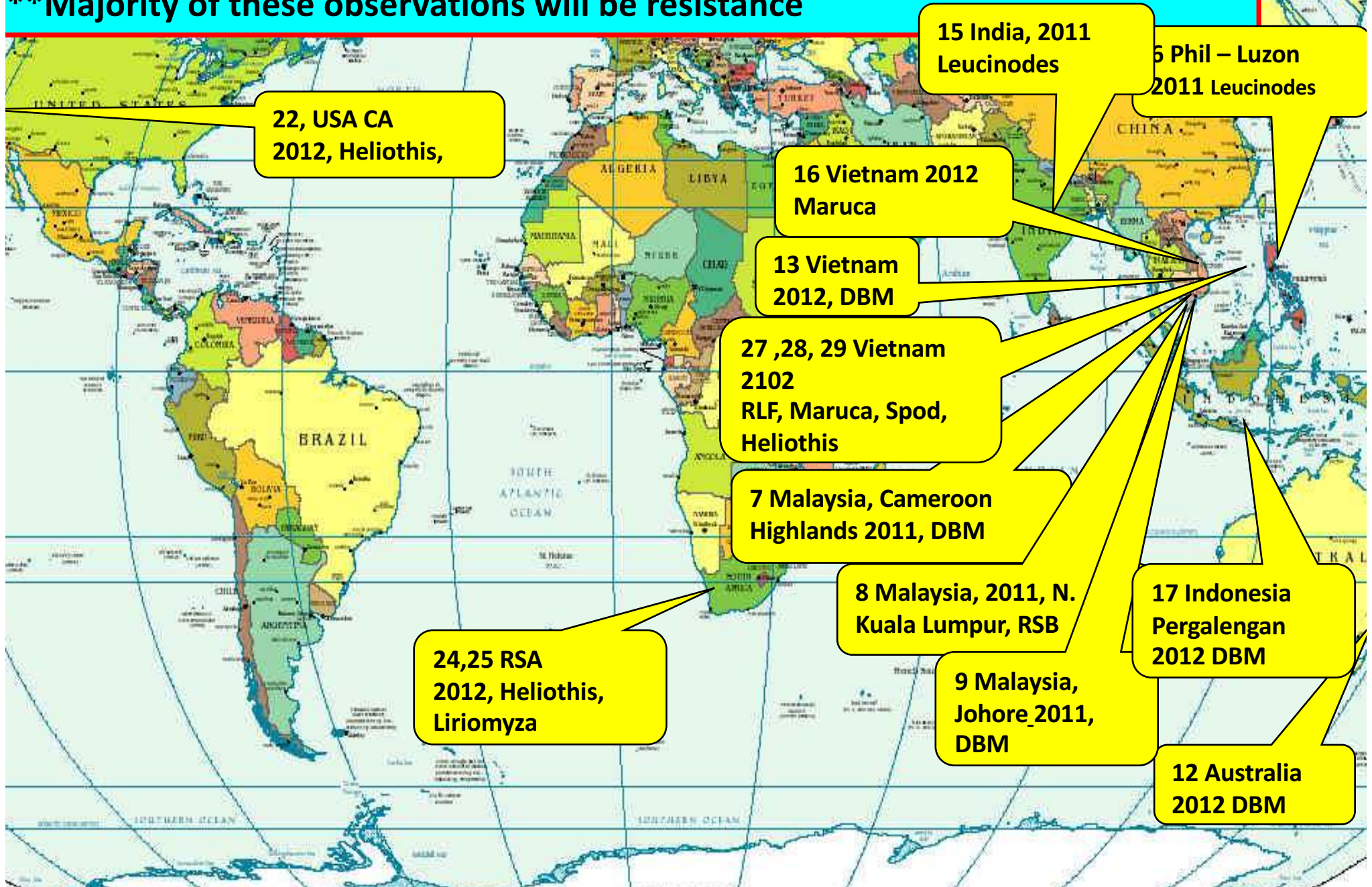


Losses up to 100%



Suspicious Diamide Tolerant Populations – August, 2013

****Majority of these observations will be resistance**



Werribee South



Two-spotted mite



Western flower thrips



Western flower thrips



Virus vectors



Other examples



- Green Peach Aphid
- *Helicoverpa (Heliothis) armigera*
- Greenhouse whitefly
- Silverleaf whitefly



Resistance Management Strategies



- IRM
- Rotate through different chemical groups
 - Chemical groups based on mode of action
 - Cross-resistance
- Reduce the number of times chemicals in each group are used
- Delays resistance; Problem when the pest is already resistant



IPM: Integrated Pest Management



- IPM means using 3 measures:
 - 1. Biological
 - 2. Cultural
 - 3. Chemicals (support)

Plus

- 4. Monitoring





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Eggs of Predators

- Hoverfly



- Brown Lacewing



Diadegma wasps



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Diadegma wasps



- *Diadegma semiclausum*
- Lives inside Plutella caterpillars
- Kills them at the pupal stage
- ie. No moths to lay eggs

- Available from Biological Services in SA



Chemicals and Beneficials work together



- Belt, Dipel, XenTari and Movento safe with Diadegma and other beneficial species
- Other products kill Diadegma and/or other beneficials
 - Includes Success, Proclaim, Avatar, Pirimor
 - Regent, Lorsban, Dominex etc
- New possibilities with latest chemistry



Thank You



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Next steps



Webinar Series on Pest Management:

1. Options for Controlling Pests in Vegetable Crops (22 July 2016) – recording available on website
2. Today – recording available shortly, plus IPM advice hotline
3. Pesticide Effects on Beneficial Insects (25 January 2017)
4. Cultural Controls (27 April 2017)

