



Classical Biological Control: Status of Host Range Tests with Asian Egg Parasitoids

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Host Range Evaluations– A team effort to fast-track the evaluation process

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Collaborators:

USDA-ARS (Newark, DE & EBCL, France)

University of Delaware (D. Tallamy)

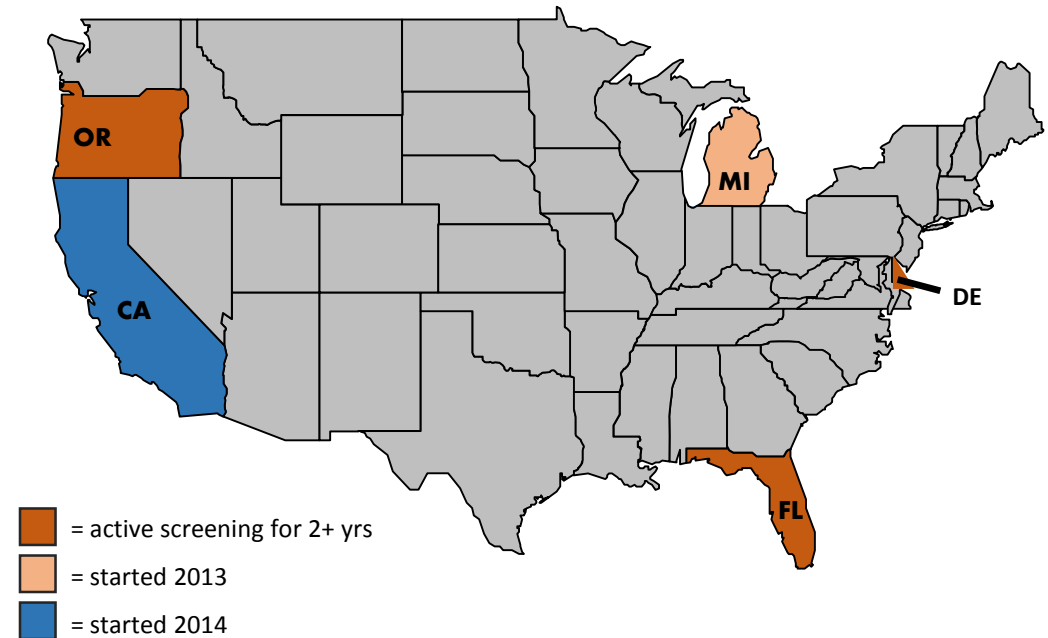
Florida Dept. Agriculture & Consumer Services, Division of Plant Industry (T. Smith)

MSU – Michigan State University – Department of Entomology (E. Delfosse)

Oregon Department of Agriculture (H. Rogg)

Oregon State University – Department of Horticulture (V. Walton, P. Shearer)

University of California, Riverside & CDFA (M. Hoddle, C. Pickett)





Asian *Trissolcus* spp.



30+ parasitoid populations at USDA-ARS BIIR maintained for host range and efficacy testing

China: ***Trissolcus japonicus (halyomorphae)***

(Beijing 2007, Beijing 2009, Nanjing 2009)

Japan: ***Trissolcus mitsukurii*** (Tsukuba 2007)

Trissolcus japonicus (plautiae) (Tsukuba 2007, 2012)

Trissolcus cultratus (near flavipes) (Tsukuba 2007, 2012)

Trissolcus itoi (Tsukuba 2012)

S. Korea: ***Trissolcus japonicus (plautiae)*** (Seoul 2009, 2010)

The potential biological control agent - *Trissolcus japonicus*

Quarantine population tested: Originally recovered from the Beijing area from *Halyomorpha halys* egg masses

- **Solitary egg parasitoid** of Pentatomidae
- **Short development time**
- **~ 10 generations/year**
- **Female-biased sex ratio**
- **High parasitism rates in *Trissolcus japonicus* compared to other *Trissolcus* spp. reported in Asia**

Disclaimer: The Data Presented in this slide are Preliminary Data !

Host Range Evaluations: Progress

62 non-target host species have been tested nationwide so far



22 species
completed

40 species in progress

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A. M. Colavecchio

No-choice Screening

Pentatomidae

Genus	Species
<i>Alcaeorhynchus</i>	<i>grandis</i>
<i>Brochymena</i>	<i>quadripustulata</i>
<i>Coenus</i>	<i>delius</i>
<i>Cosmopepla</i>	<i>lintrneriana</i>
<i>Edessa</i>	<i>bifida</i>
<i>Euschistus</i>	<i>ictericus</i>
<i>Euschistus</i>	<i>quadrator</i>
<i>Homaemus</i>	<i>proteus</i>
<i>Loxa</i>	<i>viridis</i>
<i>Mormidea</i>	<i>lugens</i>
<i>Mormidea</i>	<i>pama</i>
<i>Nezara</i>	<i>viridula</i>
<i>Oebalus</i>	<i>pugnax</i>
<i>Perillus</i>	<i>strigipes</i>
<i>Piezodorus</i>	<i>guildinii</i>
<i>Proxys</i>	<i>punctulatus</i>

Non-Pentatomidae

Genus	Species	Family
<i>Corimelaena</i>	<i>lateralis</i>	Thyreocoridae
<i>Corimelaena</i>	<i>pulicaria</i>	Thyreocoridae
<i>Eurygaster</i>	<i>alternata</i>	Scutelleridae
<i>Homaemus</i>	<i>proteus</i>	Scutelleridae
<i>Megacopta</i>	<i>cribraria</i>	Plataspidae
<i>Sehirus</i>	<i>cinctus</i>	Cydnidae

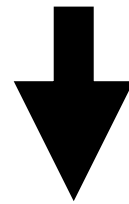
Single egg mass of non-target species:



Followed by a BMSB control for an additional 24 hours:



no attack of non-target



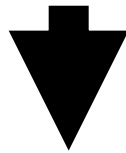
no further testing required

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Choice Screening

When attack of
non-target hosts
observed



One egg mass each of target
and non-target species together



Pentatomidae

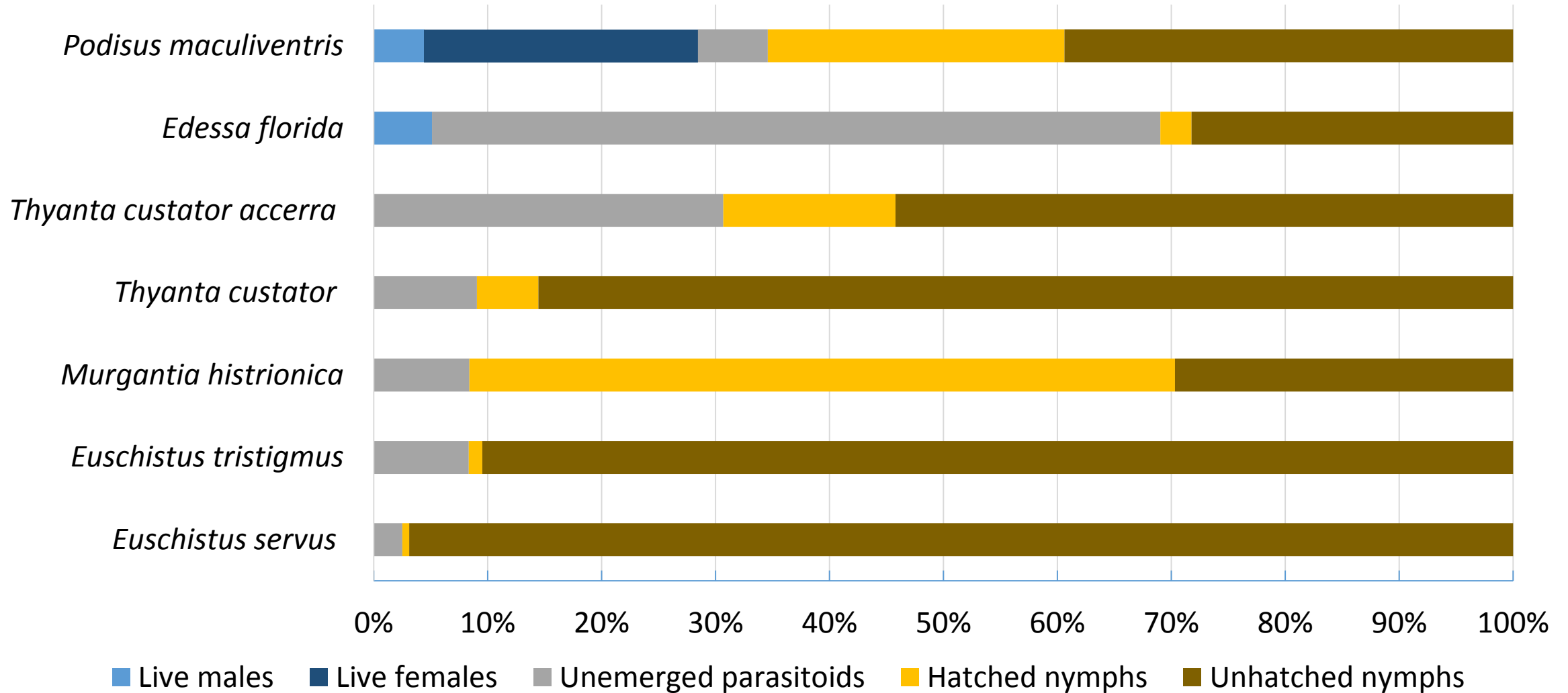
Genus	Species
<i>Amaurochrous</i>	<i>cinctipes</i>
<i>Banasa</i>	<i>euchlora</i>
<i>Banasa</i>	<i>dimiata</i>
<i>Chinavia</i>	<i>hilaris</i>
<i>Chinavia</i>	<i>marginata</i>
<i>Chlorochroa</i>	<i>ligata</i>
<i>Chlorochroa</i>	<i>uhleri</i>
<i>Edessa</i>	<i>florida</i>
<i>Euschistus</i>	<i>conspersus</i>
<i>Euschistus</i>	<i>servus</i>
<i>Euschistus</i>	<i>tristigmus</i>
<i>Euschistus</i>	<i>variolarius</i>
<i>Euthyrhynchus</i>	<i>floridanus</i>
<i>Holcostethus</i>	<i>abbreviatus</i>
<i>Holcostethus</i>	<i>limbolarius</i>
<i>Loxa</i>	<i>flavicollis</i>
<i>Murgantia</i>	<i>histrionica</i>
<i>Neottiglossa</i>	<i>undata</i>
<i>Perillus</i>	<i>bioculatus</i>
<i>Podisus</i>	<i>maculiventris</i>
<i>Stiretrus</i>	<i>anchorago</i>
<i>Thyanta</i>	<i>custator</i>

Non-Pentatomidae

Genus	Species	Family
<i>Orsilochides</i>	<i>guttata</i>	Scutelleridae

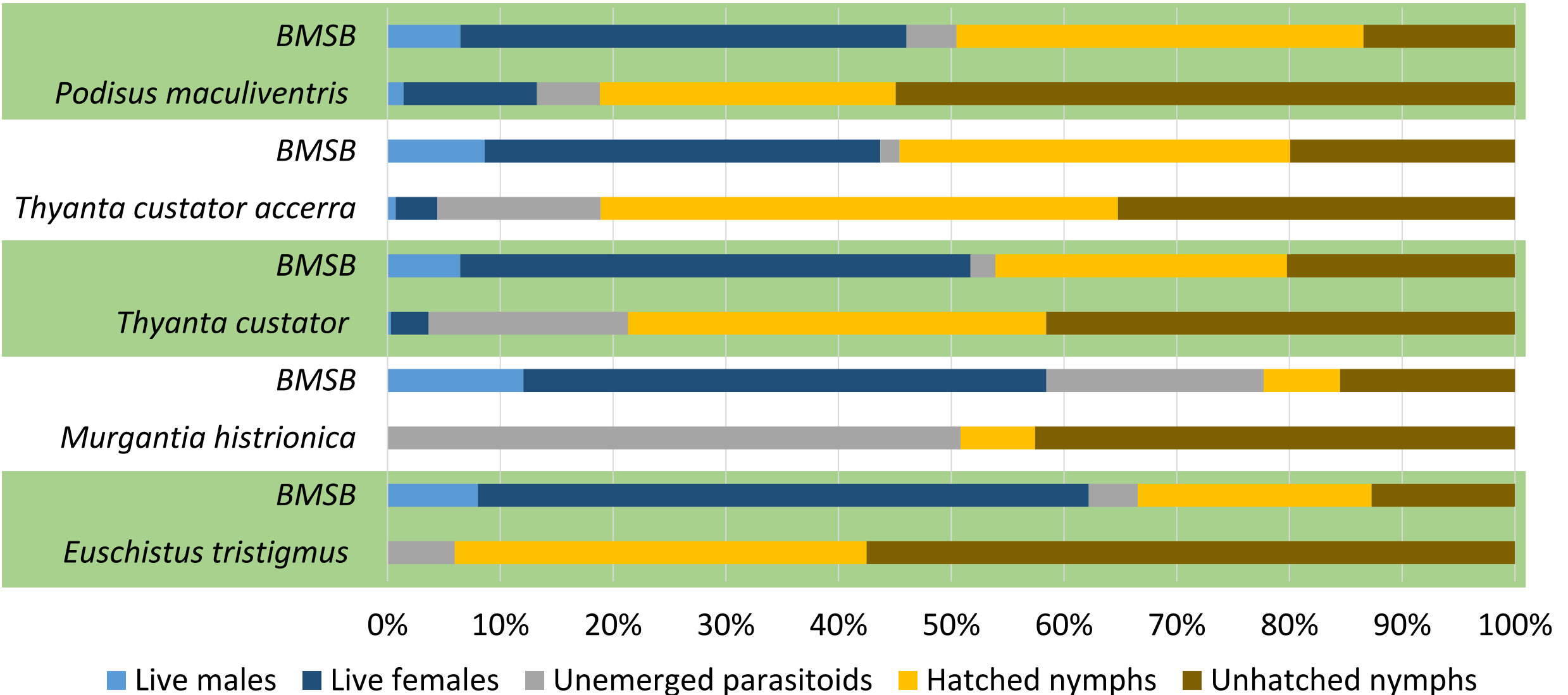
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No Choice - Fate of Non-target Egg Mass after Exposure to *T. japonicus*



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Choice Test - Fate of Target and Non-target Egg mass after Exposure to *T. japonicus*



Test Caveat

- Laboratory conditions are artificial & false positives likely
- Field experiments in area of origin and behaviour studies can provide the context for interpretation

non-target attack



1. No-choice test (Petri dish)

2. Choice test (Petri dish) (cage)

3. Choice test (field)

A Closer Look at Host Choice Behavior in *T. japonicus*

Influence of arena



- **Size**
 - 10 dram
 - 100 dram
 - 500 dram
 - 1000 dram
 - 2000 dram
- **Complexity**
 - Choice tests on plants

Role of parasitoid physiology & experience



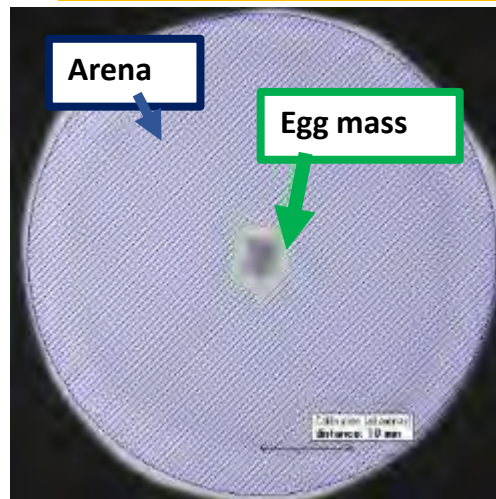
- Parental experience
- Parental physiology
- Effect of host choice on offspring physiology & behavior

Influence of time of exposure



- 1 h
- 4 h
- 6 h
- 24 h

Behavioral observations



- Searching behavior
- Oviposition behavior
- Host choice
- ...

Olfactometer Studies (FL, MI)



www.ars-fla.com

Ecological Host Range of *T. japonicus* in Asia – K.A. Hoelmer





Study the ecological host range of
Trissolcus japonicus in Asia – Tim
Haye (CABI)

Summary

- Classic host range tests:
 - with *T. japonicus* are almost completed
 - tests with additional populations and/or species have begun (DE – 13 populations/species; FL – *T. cultratus*)
 - results show that *T. japonicus* is oligophagous under laboratory conditions AND non-target species are often less-preferred and/or less-suitable than BMSB
- Additional choice test experiments designed to resemble more natural conditions have been initiated (most regional collaborators)
- Field studies in Asia will be continued to determine *Trissolcus*' realized (ecological) host range