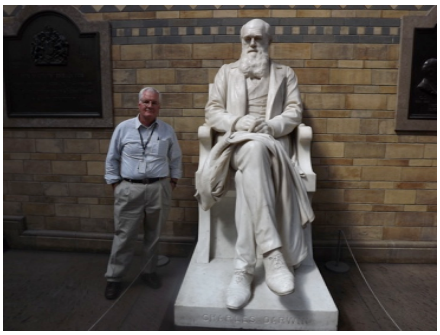
Welcome to the webinar!

- The webinar will start at the top of the hour.
- Find a handout of the slides and a fact sheet at http://www.extension.org/pages/71270
- To type in a question, use the question box on your control panel. We will read the questions aloud after the c. 45 minute presentation.
- The webinar is being recorded and you can find it in our archive in the coming week at http://www.extension.org/pages/25242

IPM of Crucifer Crops: Focus on the Yellow-margined Leaf Beetle

Rammohan Balusu and Ayanava Majumdar, Auburn University. Ron Cave, University of Florida

December 2, 2014



Rammohan Balusu Ron Cave Ayanava Majumdar

IPM in Crucifers: Focus on Yellowmargined Leaf Beetle

Presenters:

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December 2, 2014

(USDA – NIFA Award # 2011-51300-30634)

Presentation Layout

- Introduction
- Research findings from Alabama
- Research findings from Florida
- Combined IPM recommendation
- Extension IPM resources

Topic Relevance

- Organic crucifer production is a challenge in southern U.S.
  - Low number of certified organic acreage (USDA, 2008)
- Major problems with crucifer production:
  - Pests destroy or contaminate produce at critical point of production resulting in yield or quality loss.
  - Insect pests like the Yellowmargined Leaf Beetle (YMLB) are year-round problem in the hot and humid South.
  - Lack of effective organic integrated pest management (IPM) tactics.

OAREI Objectives: YMLB Focus

1. Research objectives (based on NOP standards):
   Level 1: System-based practices: Trap crops and biological control agents

   Level 2: Mechanical and Physical practices

   Level 3: OMRI approved bio-insecticides

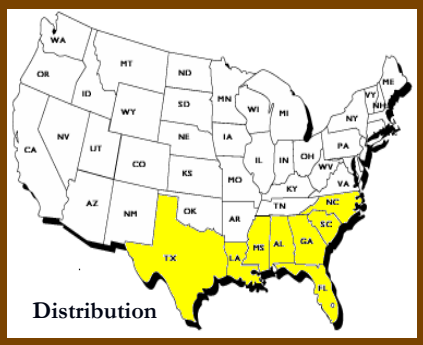
2. Producer training (ongoing)

3. Developing new IPM educational resources (ongoing)

Key pest of organic crucifers in the South

- Yellowmargined leaf beetle or YMLB, *Microtheca ochloroma* (Coleoptera: Chrysomelidae)
- Native to South America
  - First reported in Mobile, AL in 1947


Yellowmargined leaf beetle

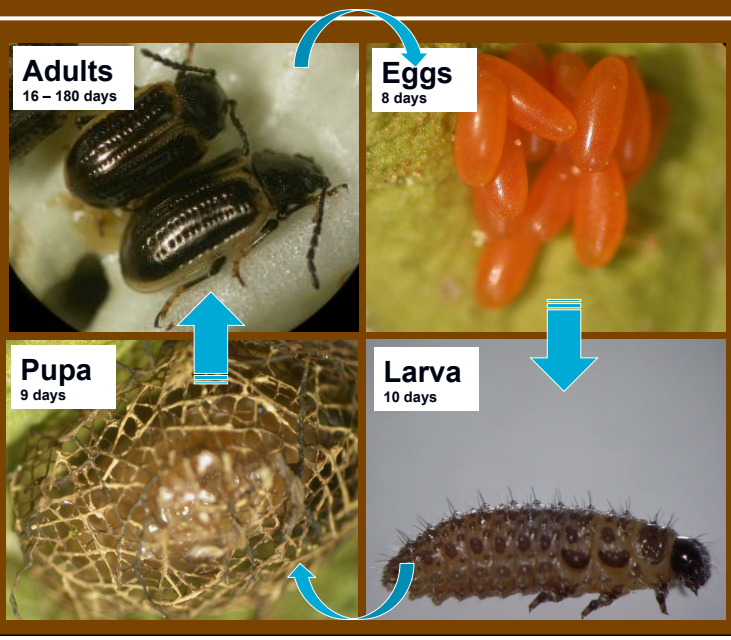


Distribution

YMLB Biology

Multiple generations

~30 days to complete life cycle at 22°C



YMLB Damage

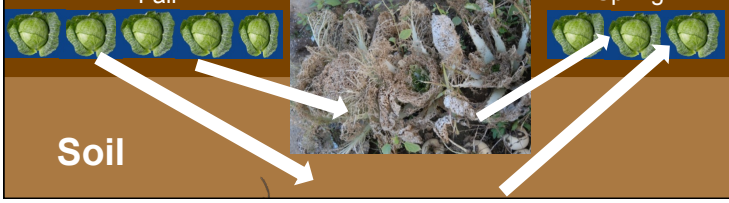
Larvae on turnips

Adults on napa cabbage

Behavior & Ecology



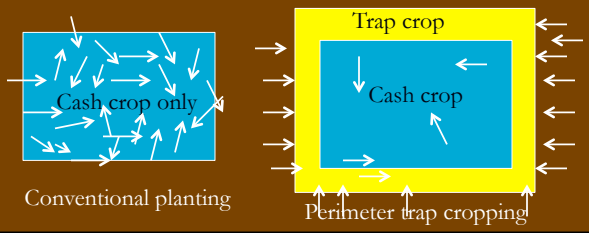
Fall (early-Oct to Dec) → Fall (Dec to mid-March) → Spring (mid-March to later May) → Summer (June to Sept)



"Organically-managed" crucifer field in south Alabama damaged by YMLB

Level 1: System-based practices
Trap cropping for YMLB

- Perimeter trap cropping - planting a more attractive crop on field borders to protect the main cash crop.
  - Intercepts and concentrates the pest population in the border.
- YMLB is a good candidate for trap crop management
  - ✓ Show host preference
  - ✓ Migrate into the field
  - ✓ Exhibit strong edge effect
  - ✓ Limited mobility



Methods

- Could we use turnip as trap crop to manage YMLB?
- Trap crop: Turnip
- Cash crops: Cabbage/ Mustard/ Napa cabbage
- Data collection
  - Larvae
  - Adult
  - Damage rating at harvest

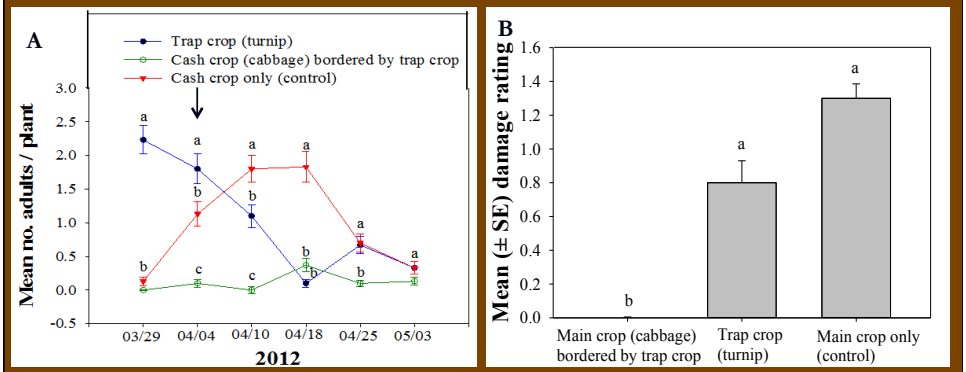
Damage rating scale
1 = very light defoliation (< 10%)
2 = light defoliation (10-30%)
3 = moderate defoliation (30-50%)
4 = heavy defoliation (50-70%)
5 = very heavy defoliation (70-90%)
6 = complete defoliation (> 90%)

Field layout

- Turnip trap crop was planted two weeks ahead of cabbage cash crop

Is turnip an effective trap crop for YMLB?

Results



- Perimeter trap cropping with turnip attracted beetles away from cabbage cash crop.

Summary

- Turnip is highly attractive trap crop for YMLB in organic cabbage production system
- Perimeter planting of turnip in the border of cabbage field limit YMLB infestation on the border.
- Trap crop management is necessary – single application of insecticide on turnip trap crop effectively reduced YMLB damage on cabbage cash crop.

Level 3: Biorational insecticides: Biopesticides for *YMLB*

- Biopesticides and botanical insecticides were tested as last resort therapeutic tools for control of YMLB
  - PyGanic®
  - Entrust®
  - NOFLY™
  - Grandevo™

PyGanic®

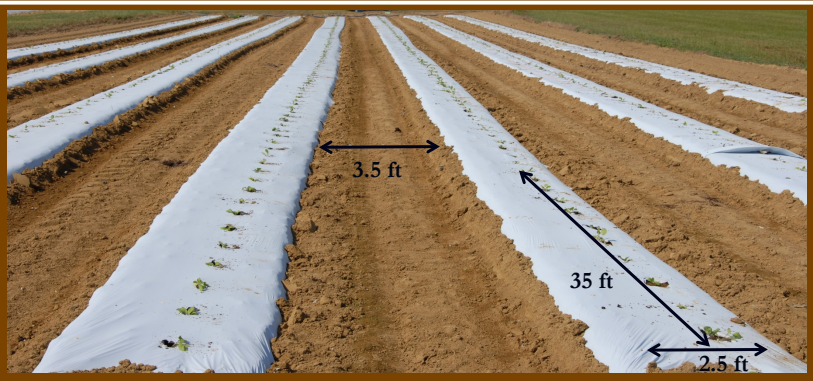
Enstrust®

NOFLY™

Grandevo™

  - Entrust® alternated with NOFLY™
  - Entrust® alternated with PyGanic®
  - Control

Field layout



- Data collection:
  - Larvae
  - Adult
  - Damage rating at harvest

Damage rating scale
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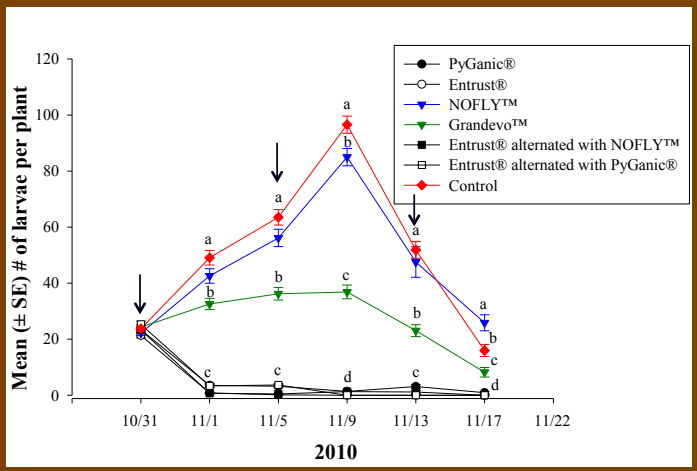
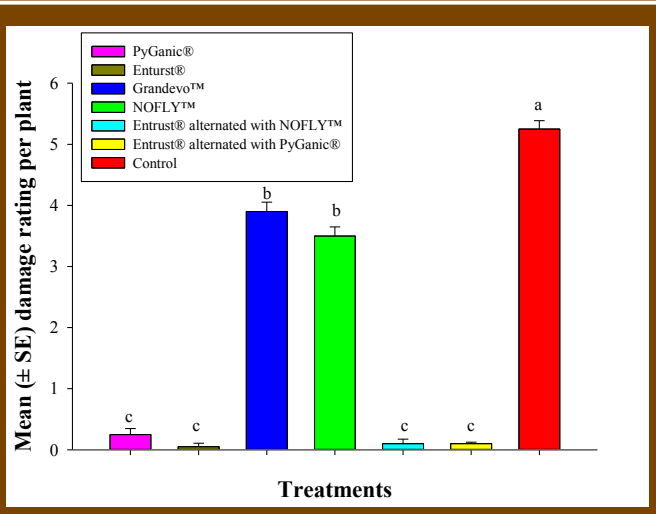
Results

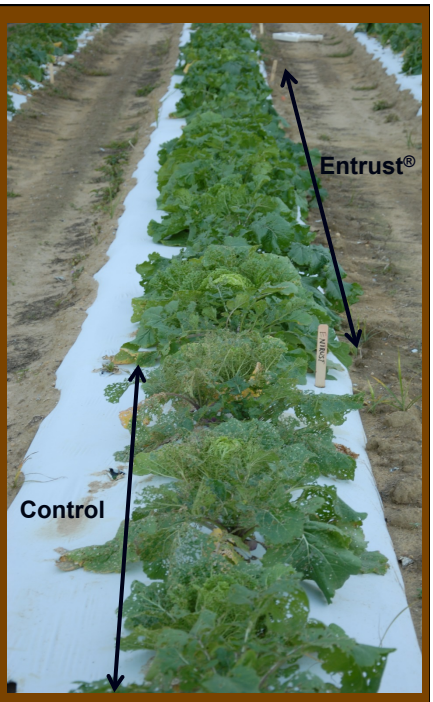


Enstrust®, PyGanic®>Grandevo™ >NOFLY™

Results



Entrust® Vs Control



Summary

- Entrust® and PyGanic® consistently performed well in suppressing YMLB adults, larvae and crop damage
- Grandevo™ was effective against larvae
- Entrust® can be applied in rotation with NOFLY™ and PyGanic®

BIOLOGICAL CONTROL OF THE YELLOWMARGINED LEAF BEETLE

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UNIVERSITY OF FLORIDA-IFAS

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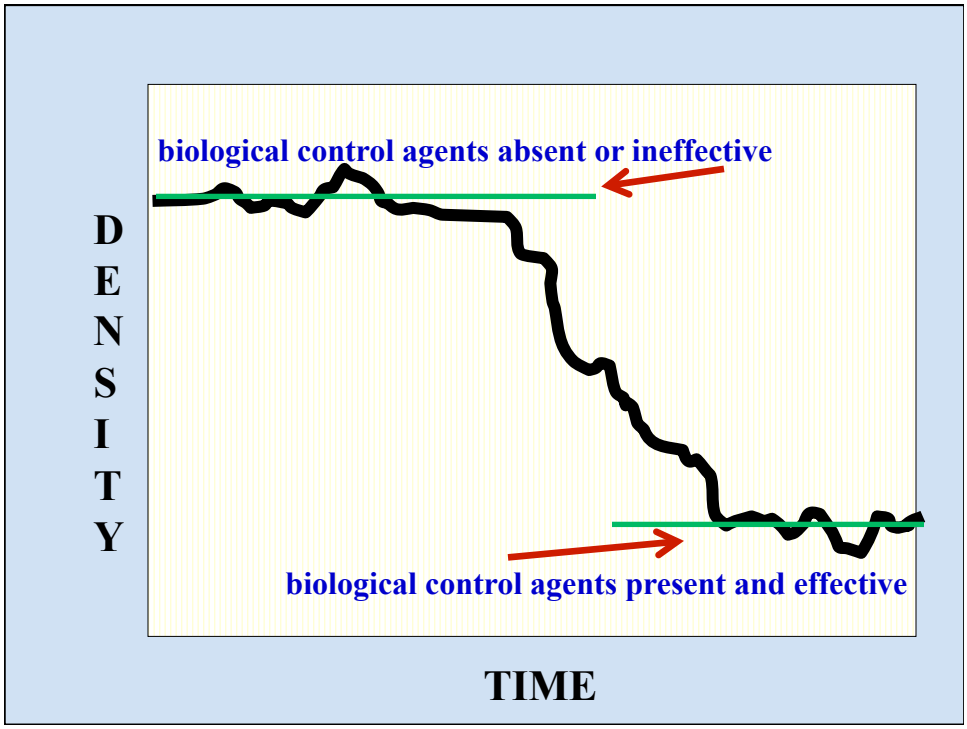
BIOLOGICAL CONTROL:

the direct action of parasites, predators, and pathogens ("natural enemies") that maintain and regulate an organism's population density at an average level lower than would exist in their absence



APPLIED BIOLOGICAL CONTROL TACTICS

1. classical biological control
2. conservation biological
3. augmentation biological control

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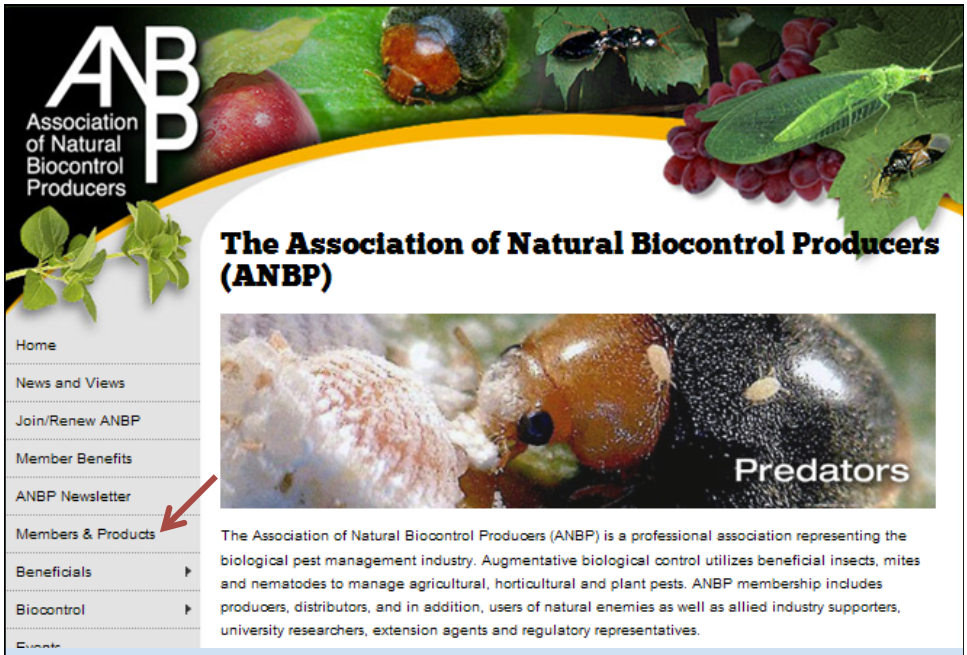
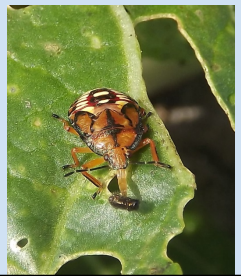


www.anbp.org/

BIOLOGICAL CONTROL OF THE YELLOWMARGINED LEAF BEETLE

1. No known specific parasitoids or predators.
2. Insufficient information on ecology of resident natural enemies.
3. Generalist predators are in the marketplace.



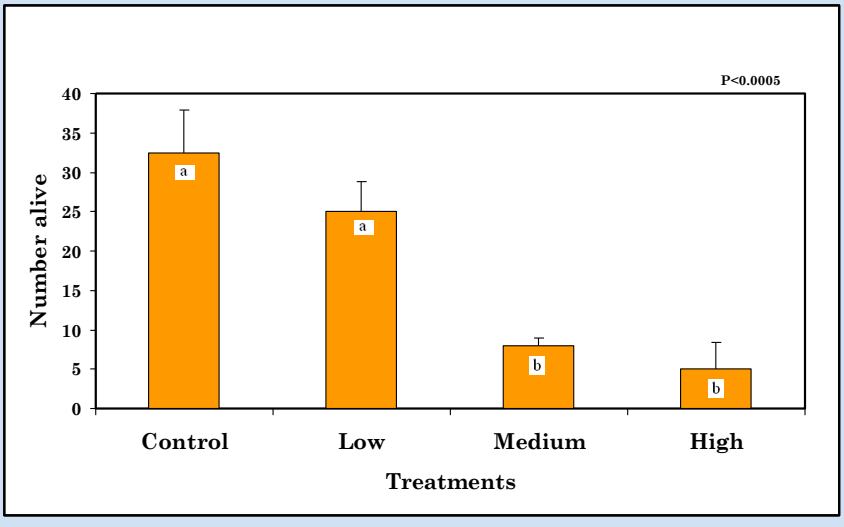
spined soldier bug

Native North American species

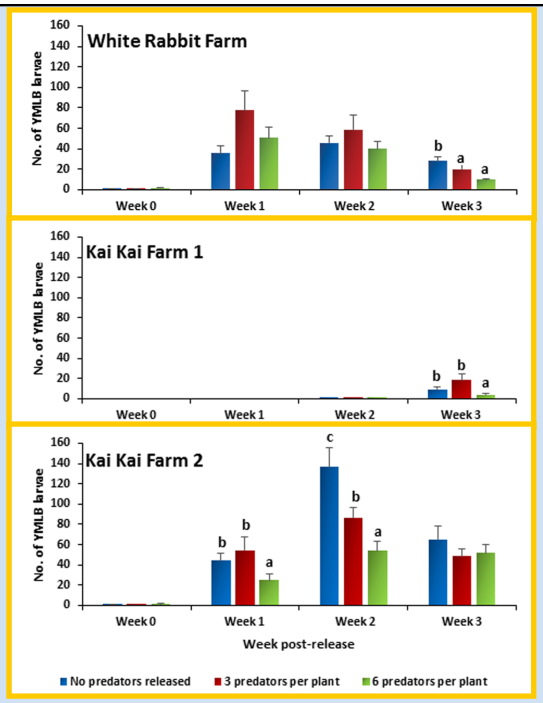
Spined Soldier Bug Killing Rates

Nymphs:	Adults:
1-7 YMLB larvae / day	5-6 YMLB larvae / day
59 YMLB larvae total	13 YMLB larvae / 10 days

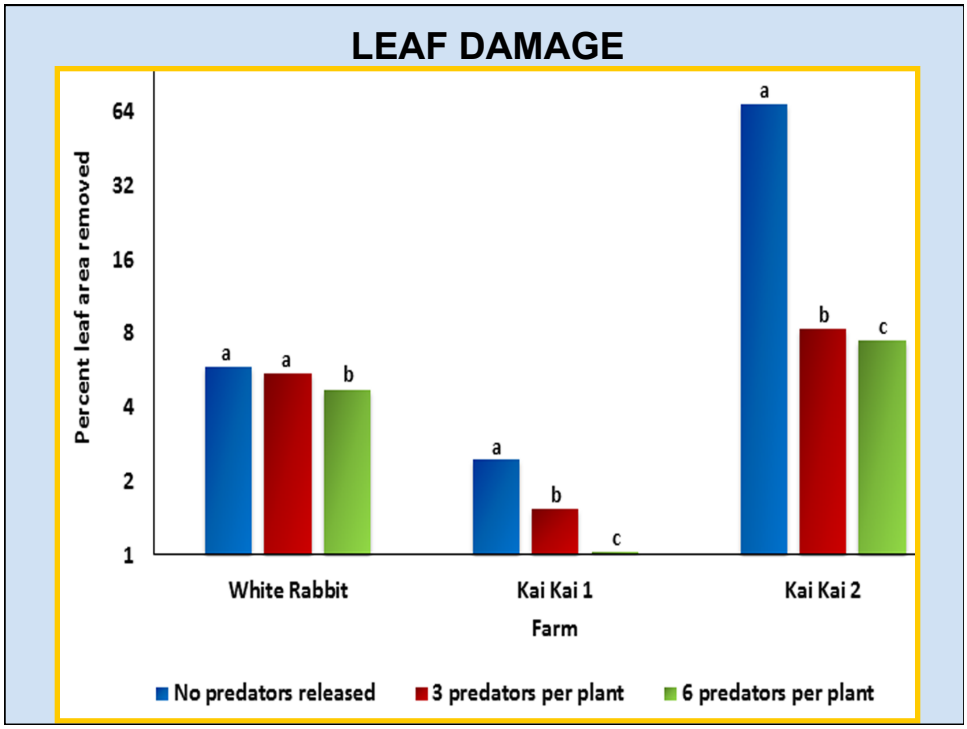
Field-Cage Study

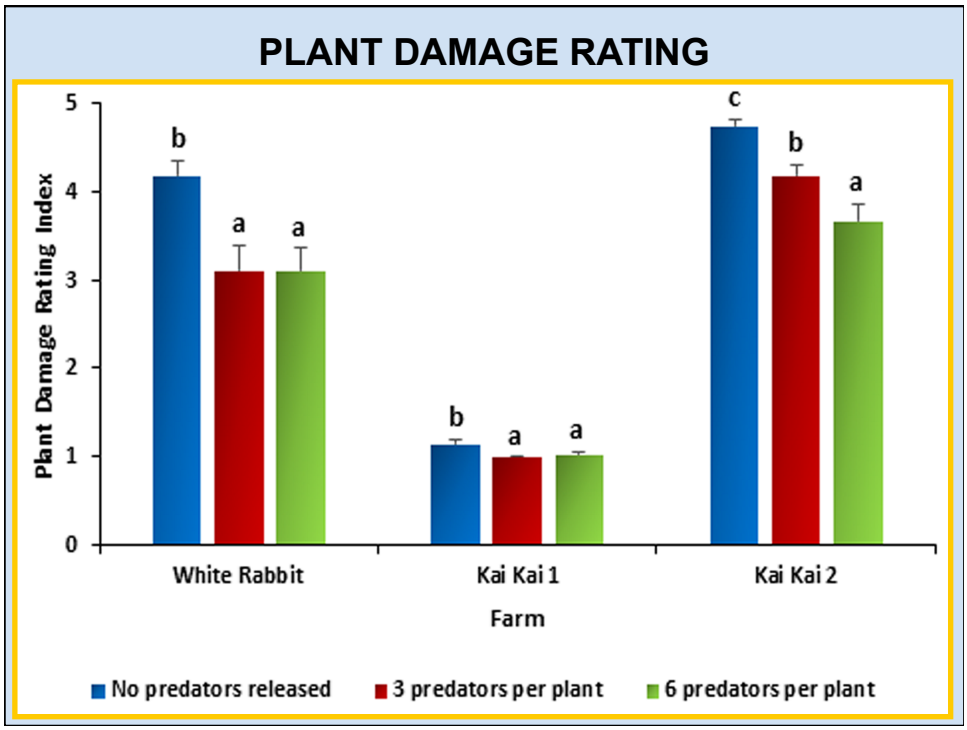


Population of the YMLB was reduced 75% and 84%



Number of YMLB larvae per plant in plots receiving SSB was significantly less in some weeks.


LEAF DAMAGE
Percent leaf area removed
64
32
16
8
4
2
1
a
a
b
a
b
c
a
b
c
White Rabbit
Kai Kai 1
Kai Kai 2
Farm
No predators released
3 predators per plant
6 predators per plant


PLANT DAMAGE RATING
Plant Damage Rating Index
5
4
3
2
1
0
b
a
a
b
a
a
c
b
a
White Rabbit
Kai Kai 1
Kai Kai 2
Farm
No predators released
3 predators per plant
6 predators per plant

Green Lacewing Larvae Killing Rates

YMLB eggs:

3-67 / day

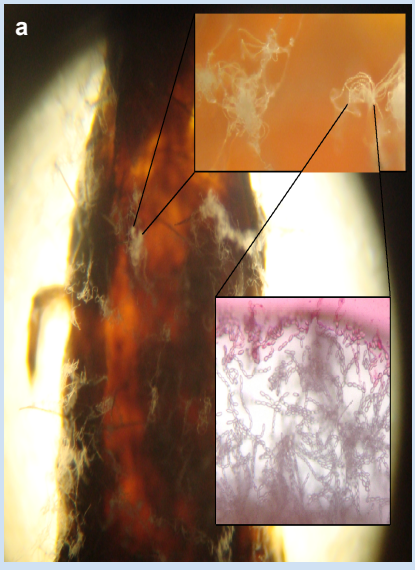
500-600 / larva

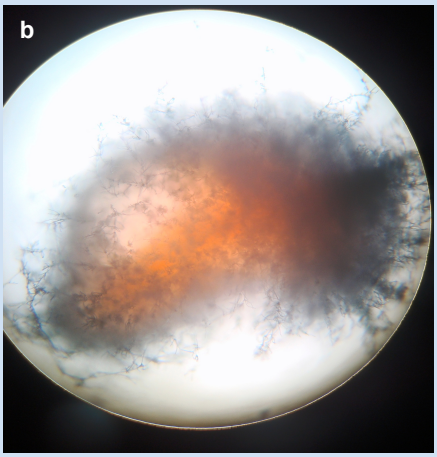
YMLB 1st instars:

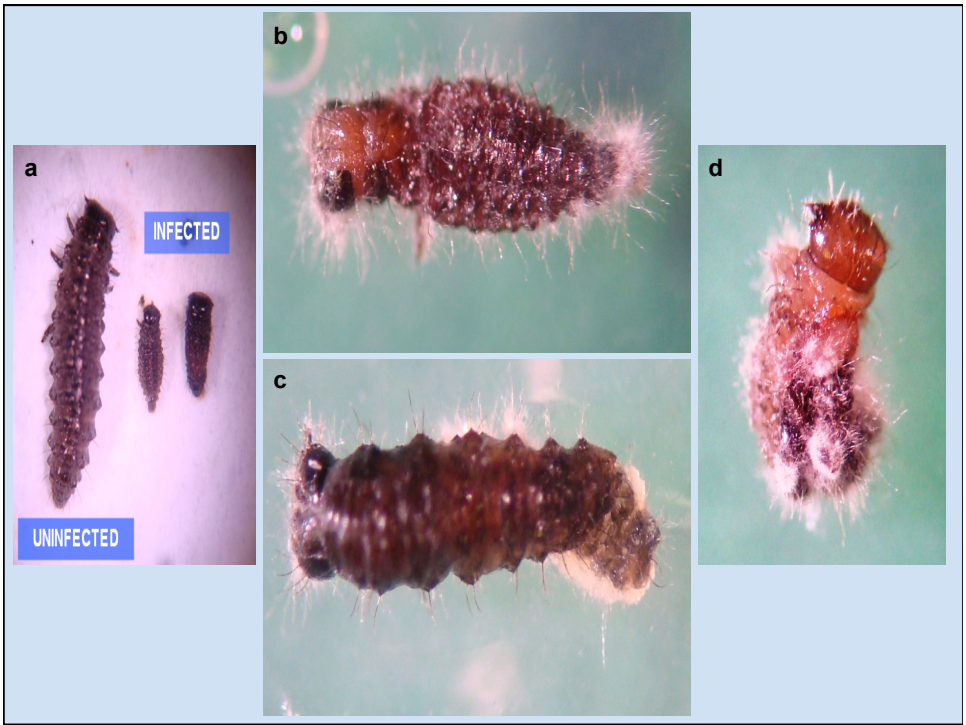
2-42 / day

220-225 / larva

Entomopathogenic Fungus *Isaria fumosorosea*







CONCLUSIONES

1. Exploration in Argentina is needed.

2. Ecology of resident natural enemies needs to be studied.

3. Releases of spined soldier bugs and green lacewing larvae (maybe) show potential, but more trials and economic analysis are necessary.

4. More investigation of entomopathogenic fungi.

Crucifer IPM Recommendations and Educational Resources

IPM Recommendations: Scouting for YMLB

- Look for adult beetles – one adult per plant is a warning!
- Host preference:

Turnip > napa cabbage > mustard > cabbage > collard

- Look for early defoliation on turnips

This is too late!

IPM Recommendations:
Prevent buildup/outbreak!

- **Field sanitation** is important
- **Larvae** are more susceptible to freezing temps.
- Protect or release **natural enemies**

Don't leave them uncontrolled!

IPM Recommendations:
Trap Cropping

- Trap cropping (TC) strongly recommended:
  - Perimeter TC with turnips: Plant TC two-weeks before main crop
  - Control YMLB on trap crop
    - Weekly scouting
    - Treat when numbers exceed 1 adult per plant
    - Biopesticides listed on next slide

IPM Recommendations: Biopesticides

- Effective biopesticides:
  - Spinosad (Entrust ®): Adults, larvae
  - Pyrethrin (PyGanic ®): Larvae
  - *Chromobacterium subtsugae* (Grandevo ®): Larvae
  - Isaria fumosorosea (NoFly ®): Larvae
- PyGanic, Grandevo, and Isaria good for rotation

- On trap crop, one or two appl. of spinosad may be enough…
- Spray main crop as needed - do NOT overspray to protect natural enemies!

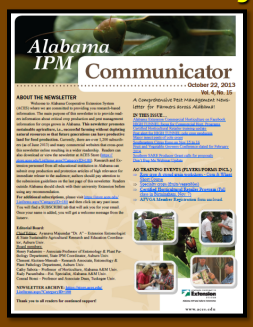
Intensive Producer Training and Rapid Response IPM Campaign

Farmer-to-farmer

Resolving urgent pest issues

50% or more crop saved by timely intervention

Alabama IPM Communicator – a major resource for producers



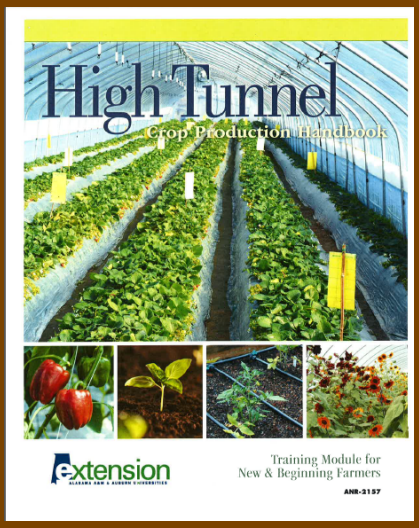
Team publication since 2010

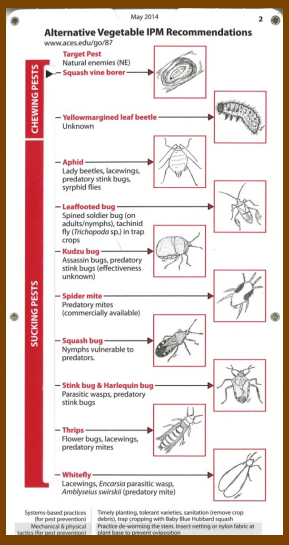
1450 subscribers

Available as PDF (numbered Ext. bulletin) and…

Web-based for **mobile devices!**

New Extension Resources in Alabama





New Producer Handbook and Alternative IPM Slide charts for use by small producers.

For Ext. publications, please email bugdoctor@auburn.edu

Vegetable IPM on Facebook!

Advantages: Rapid pest alerts, interactive, insect ID photos and videos, success stories, IPM contest

Acknowledgments

- ✓ Research funding provided by USDA-NIFA OAREI
- ✓ Grower participants in AL, FL and GA
- ✓ Field research staff at university farms
- ✓ Alabama Vegetable IPM Program Assistant: Ann Chambliss

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- Thank you for coming!

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