Update on Worm (Lepidoptera) Management in California Tomatoes

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Making a Difference for California

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Main worm pests in California tomatoes

- Beet armyworm
- Tomato fruitworm
- Western yellowstripe a
- Tomato pinworm
- Loopers
- Hornworms & cutworms

Beet Armyworm

Spodptera exigua

Eggs laid in clusters.

Pupate in soil.

3 - 5 generations per year.

Damage


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Control

- Biological control: parasitic wasps (esp. Hyposoter), minute pirate bugs, nuclear polyhedrosis (virus).
- Insecticides based on monitoring
  - Processing
  - Fresh Market

Control

- Processing tomatoes:
  - Leaf sampling: factor in parasitized eggs.
  - Sample at least 100 fruit at random, green, not too small, 6 weeks before harvest.
  - 3.25% damage threshold before treating (5 - 10 larvae per plant).
  - Treat based on total worm damage (other species contribute).

Control

- Fresh market tomatoes
  - No fruit sampling thresholds established.
  - Leaf sample instead, after flowering.
  - 5 minute timed search: treat if > 1 larvae or egg masses.

Beet armyworm

- Avaunt (indoxacarb)
- Intrepid (methoxyfenozide)
- Success/Entrust (spinosad)
- Bt (Dipel, Xentari)
- Lannate (methomyl)
- Asana (esfenvalerate)
- Danitol (fenpropathrin)
- Coragen (chlorantrniliprole)
- Synapse (Flubendiamide)
- Radiant (spinetoram)

Proclaim, Rimon

Tomato Fruitworm

Helicoverpa (Heliothis) zea


G314-14


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Eggs laid singly.
Pupate in soil.
About 3 - 4 generations per year.


Damage

Control

- Biological: parasitic wasts (esp. Trichogramma), minute pirate bugs, nuclear polyhedrosis virus.
- Processing tomatoes vs fresh market

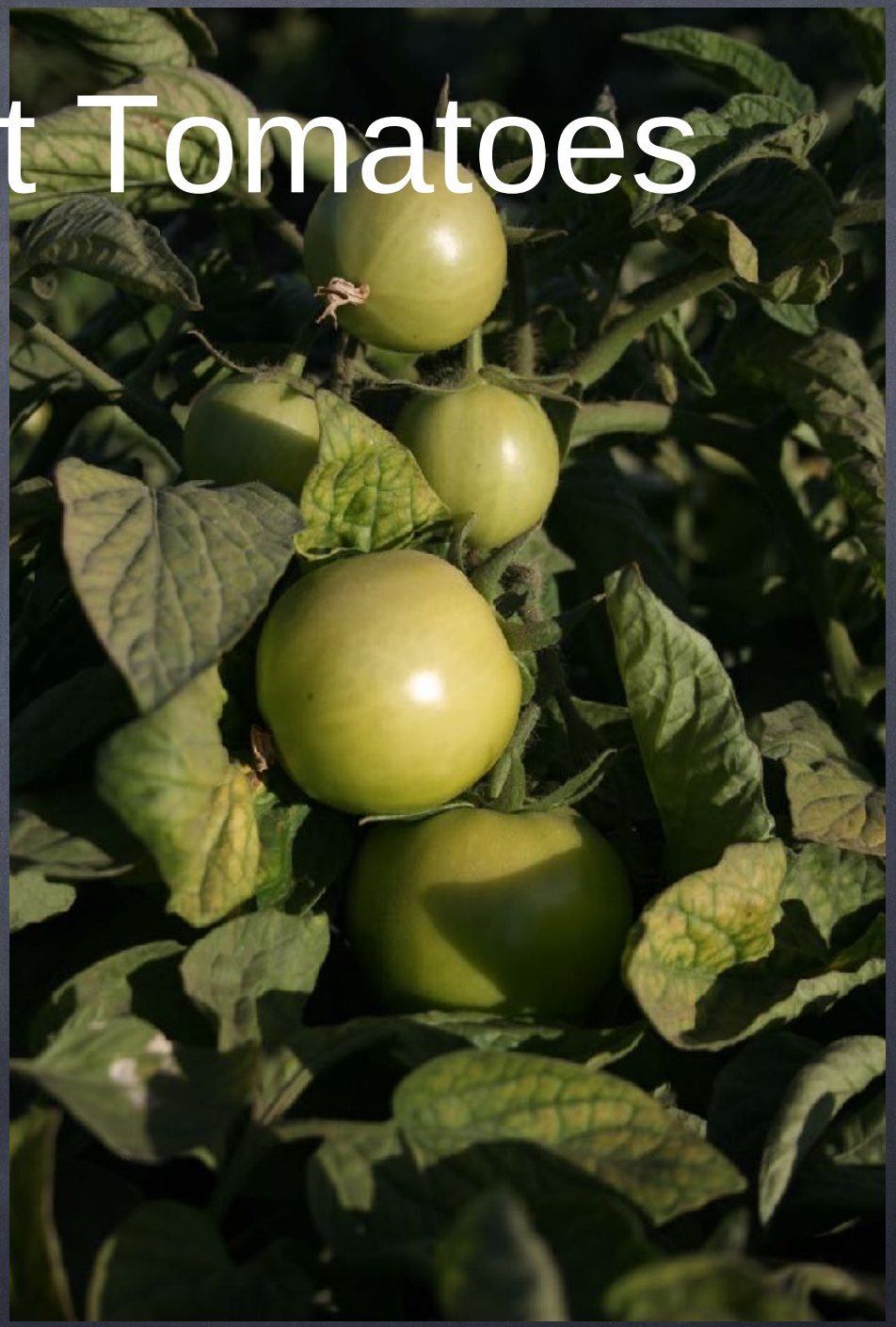
Control

- Processing tomatoes:
  - Leaf sampling begins at 1” fruit.
  - 30 random plants in field, select leaf below highest open flower.
  - treat when > 5 white eggs per 30 leaf samples
  - Factor in parasitized eggs. A black/white egg chart has been developed.
  - Treat based on total worm damage.

LEAF SAMPLING

# black eggs	Number of white eggs					
	4 to 8	9	10	11	12	13
0	T	T	T	T	T	T
1		T	T	T	T	T
2			T	T	T	T
3					T	T
4						T
5						T
6						T

Fresh Market Tomatoes



- Traps may help to determine first flight in July.
- 968 degree days
- Treat when 5 minute leaf sample has > 1 egg.

Scouting for tomato fruitworm

- This is a major pest. Mark the location with flag & mark your calendars!
- Use pheromone traps for monitoring flight
- ET = scout intensely for eggs/larvae if 7 adults per trap
- Scout for larvae during fruit set.
- ET = one larva per plant or one fresh injury per plant
- Improve scouting technique with experience

ALABAMA COOPERATIVE Extension SYSTEM
Your Experts for Life

UC IPM Guidelines

- Bt (40% - 60% control)
- Success (spinosad)
- Intrepid
- Asana
- Avaunt
- Dannitol
- Lannate
- Monitor (methamidophos)
- Sevin (carbaryl)
- Pyrethrins (PyGanic)
- Trichogramma pretiosum

many of the newly registered materials listed later in this presentation are not yet on the website.

Western Yellowstripe Armyworm

Spodopera praefica

WYSA

- Many years can become very damaging in certain fields and certain times (late summer).
- Migrate out of alfalfa, beans, other crops.
- Strip treatments can be effective.
- Bt, Success not that effective. Lannate may cause leafminers to flare.
- Intrepid, Proclaim, Avaunt, Confirm all effective.

Tomato Pinworm

Keiferia lycopersicella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Pinworms

- Small, burrow into fruit from under the calyx.
- Late summer and fall problem. 7 - 8 generations per year.
- More likely to impact fresh market growers.

Control

- Biological control: parasitic wasps.
- Cultural: discing after harvest.
- Monitoring and pheromone traps. 1 - 2 larvae per 6-ft section of row showing mines or folded leaf shelters.
- Insecticides: abemectin (Agri-Mek), Intrepid, Coragen, Asana, Lannate. Proclaim labeled.

Alfalfa Looper, Cabbage Looper

Trichoplusia ni

Cabbage Looper

- More of a foliage pest.
- In processing tomatoes, levels of 10 per plant without needing to treat.
- Serve as a host for parasites that attack fruit worms and armyworms (wasps and virus).

Hornworms

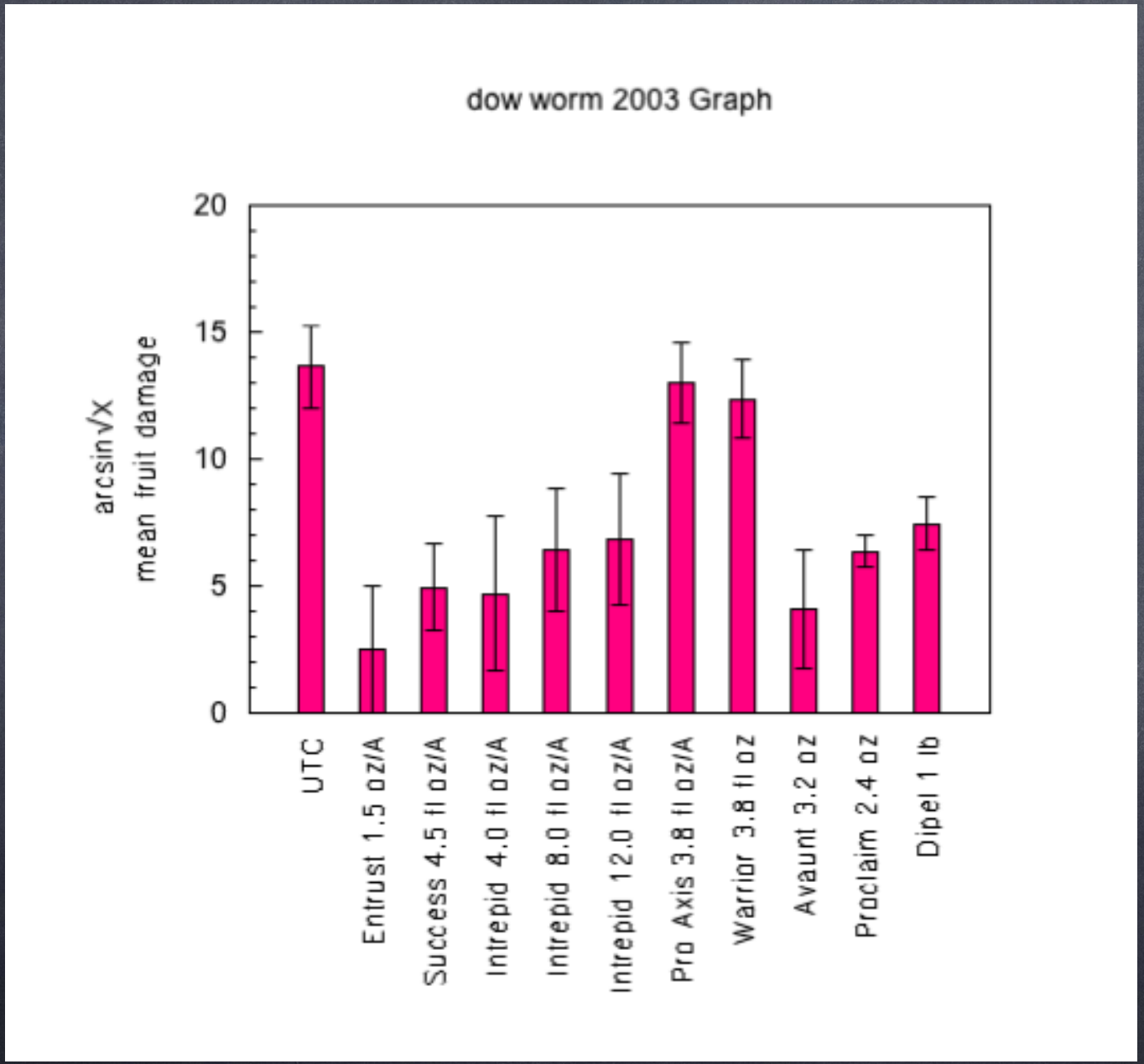
Manduca spp.

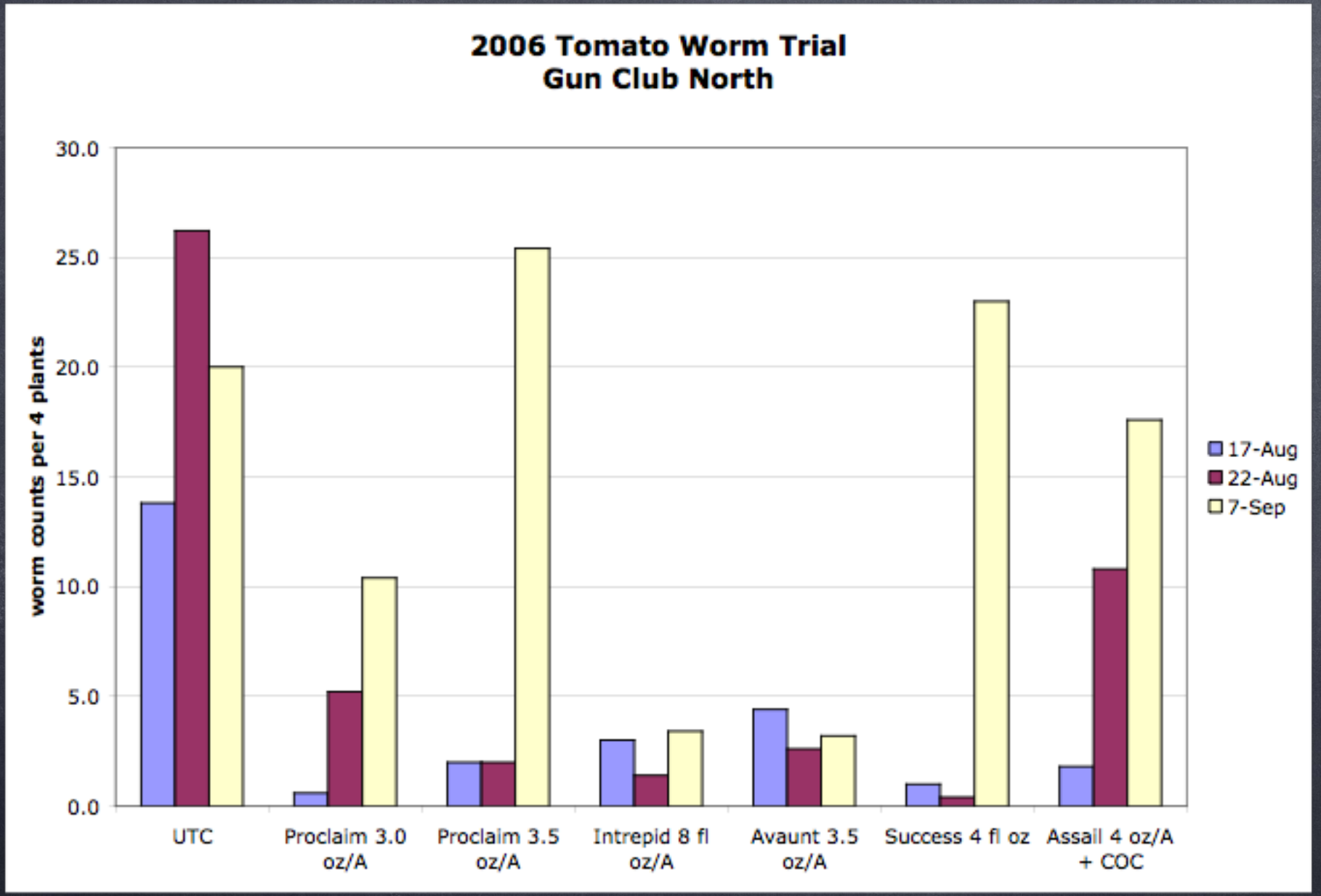
Research Trials

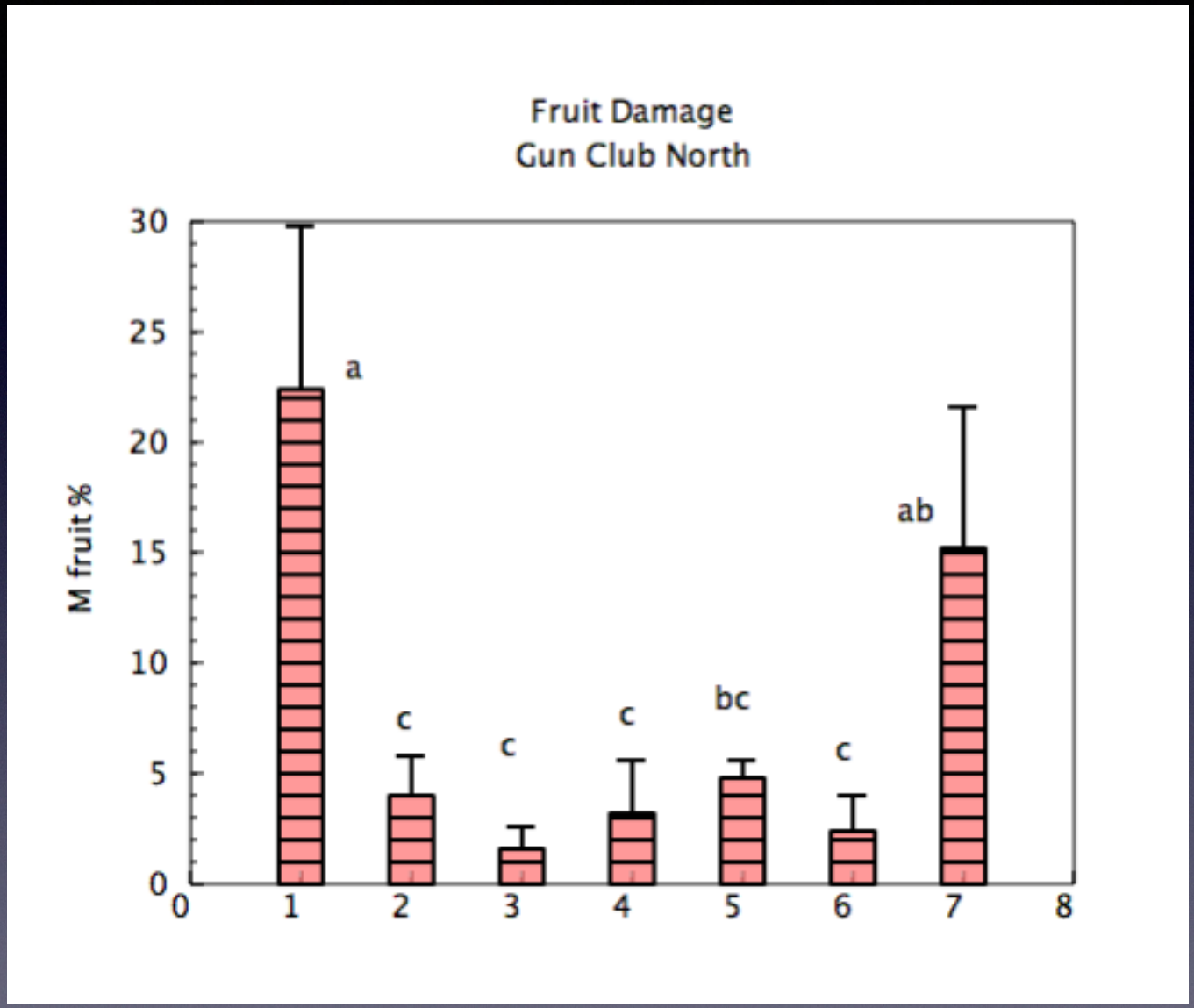
Worm trial in fresh market tomatoes 2003

1. Entrust 1.5 oz/A
2. Success 4.5 fl oz/A
3. Intrepid 4 fl oz/A
4. Intrepid 8 fl oz/A
5. Intrepid 12 fl oz/A
6. Pro Axis 3.8 fl oz/A
7. Warrior 3.8 fl oz/A
8. Avaunt 3.2 oz/A
9. Proclaim 2.4 oz/A
10. Dipel 1 lb/A
11. UTC

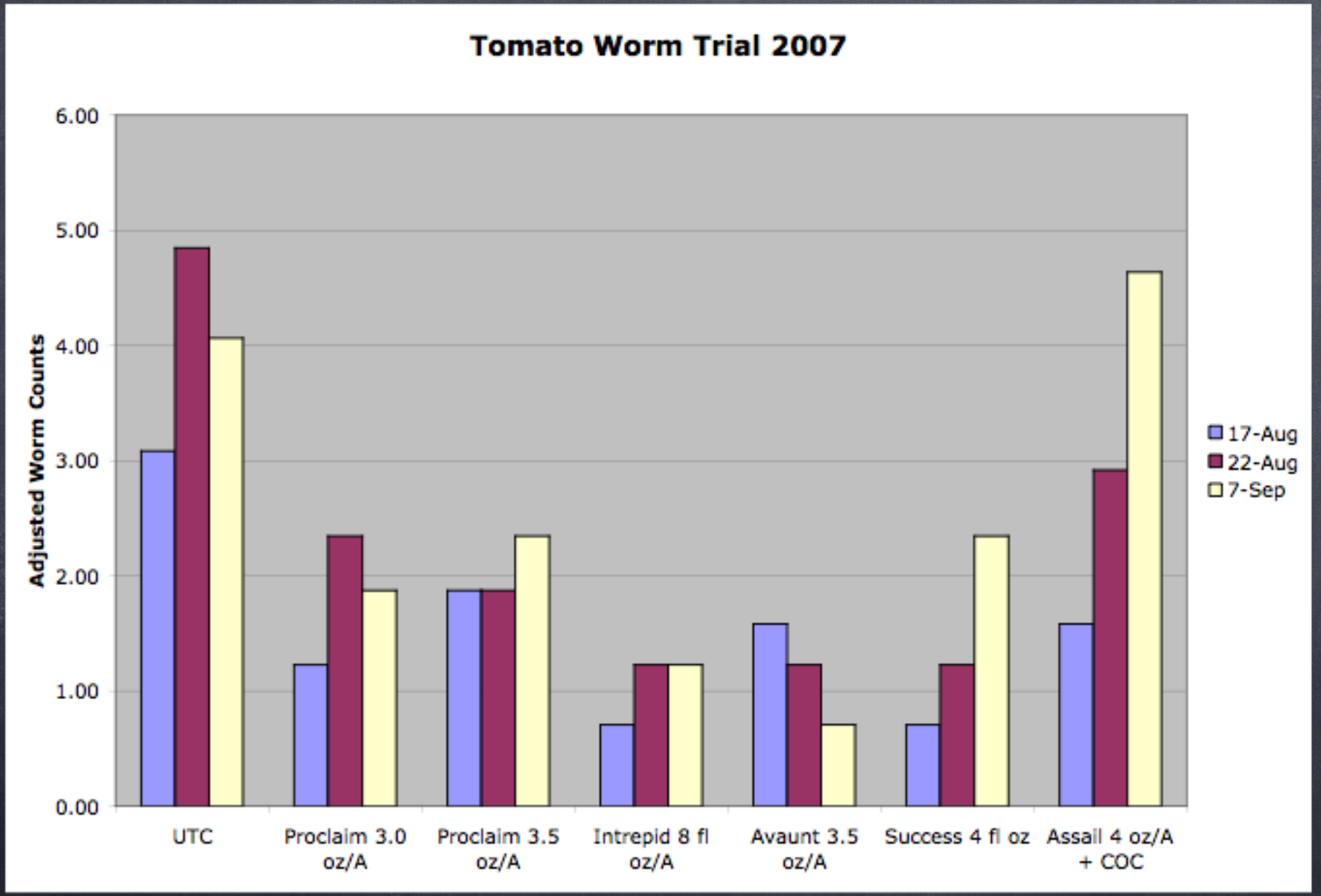
2003


dow worm 2003 Graph
arcsin√X
mean fruit damage
20
15
10
5
0
UTC
Entrust 1.5 oz/A
Success 4.5 fl oz/A
Intrepid 4.0 fl oz/A
Intrepid 8.0 fl oz/A
Intrepid 12.0 fl oz/A
Pro Axis 3.8 fl oz/A
Warrior 3.8 fl oz
Avaunt 3.2 oz
Proclaim 2.4 oz
Dipel 1 lb

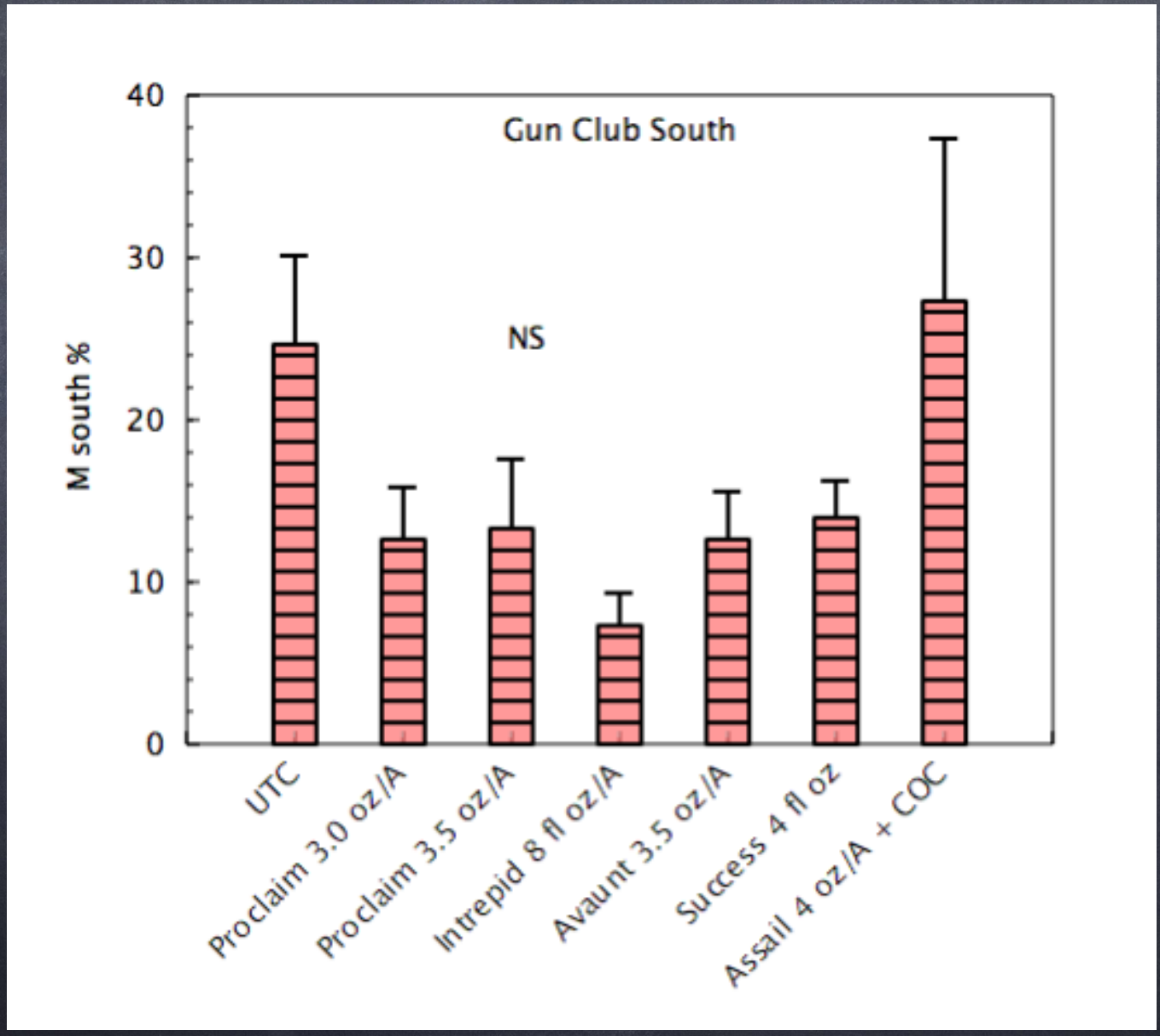

2006 Tomato Worm Trial
Gun Club North
worm counts per 4 plants
30.0
25.0
20.0
15.0
10.0
5.0
0.0
UTC
Proclaim 3.0 oz/A
Proclaim 3.5 oz/A
Intrepid 8 fl oz/A
Avaunt 3.5 oz/A
Success 4 fl oz
Assail 4 oz/A + COC
17-Aug
22-Aug
7-Sep


Fruit Damage
Gun Club North
M fruit %
30
25
20
15
10
5
0
0
1
2
3
4
5
6
7
8
a
c
c
c
bc
c
ab

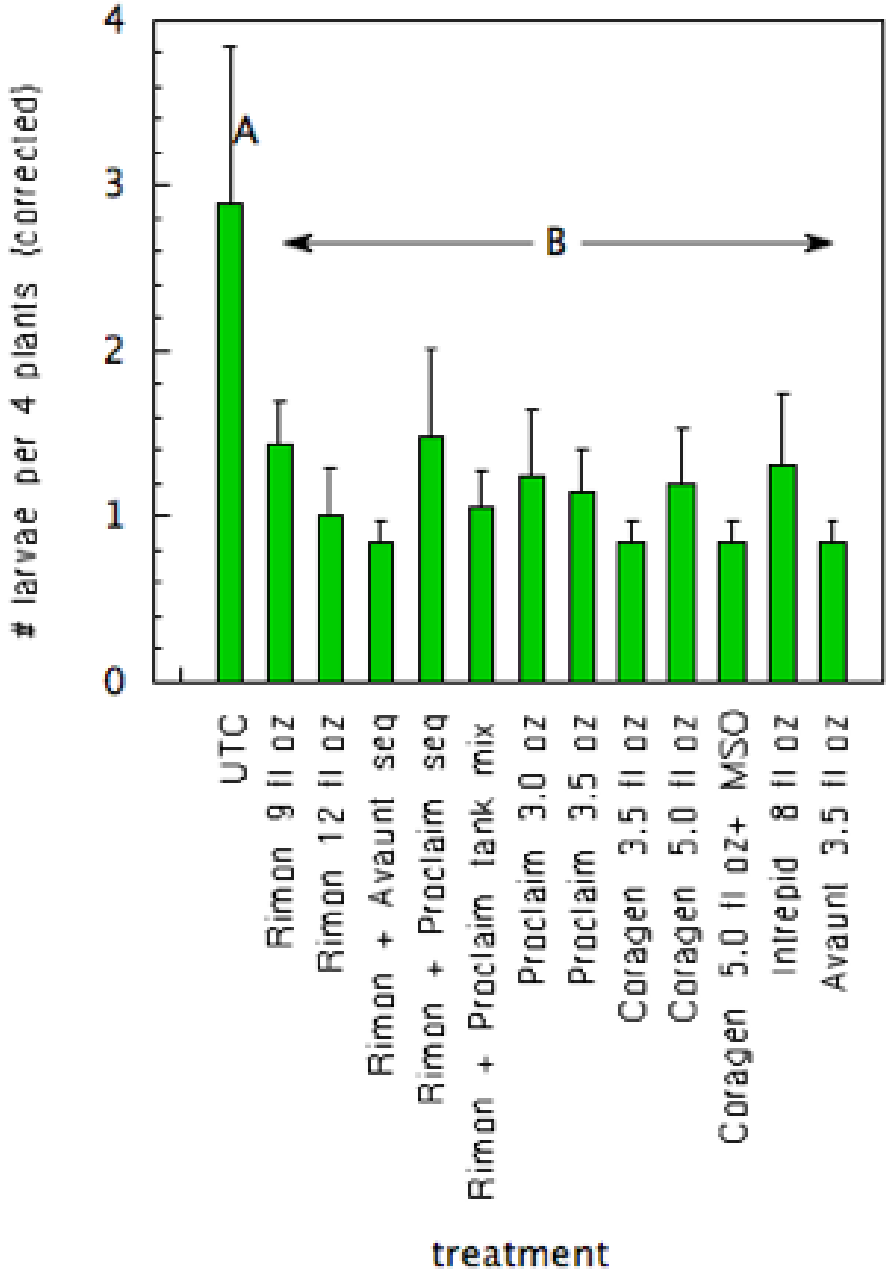
2006

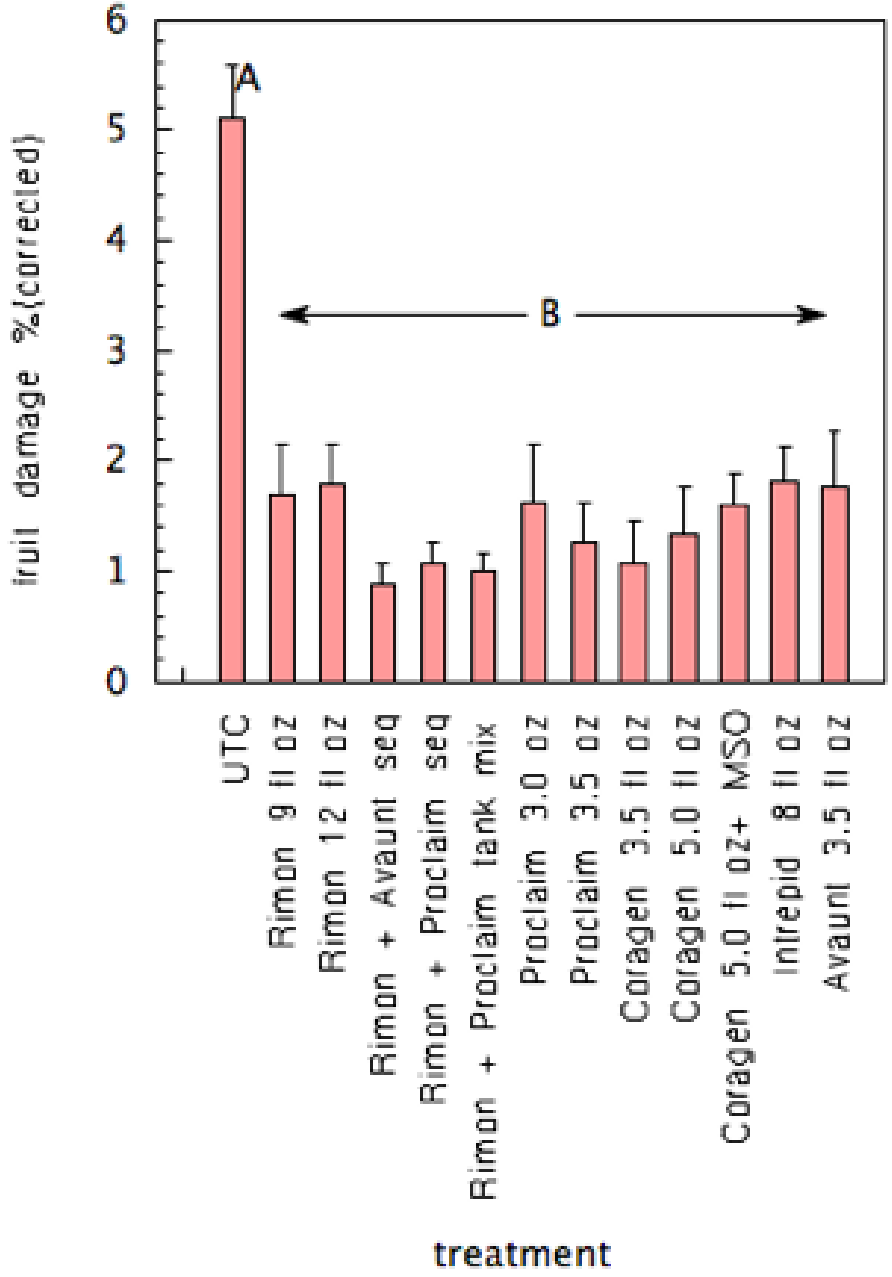

Tomato Worm Trial 2007
Adjusted Worm Counts
6.00
5.00
4.00
3.00
2.00
1.00
0.00
UTC
Proclaim 3.0 oz/A
Proclaim 3.5 oz/A
Intrepid 8 fl oz/A
Avaunt 3.5 oz/A
Success 4 fl oz
Assail 4 oz/A + COC
17-Aug
22-Aug
7-Sep

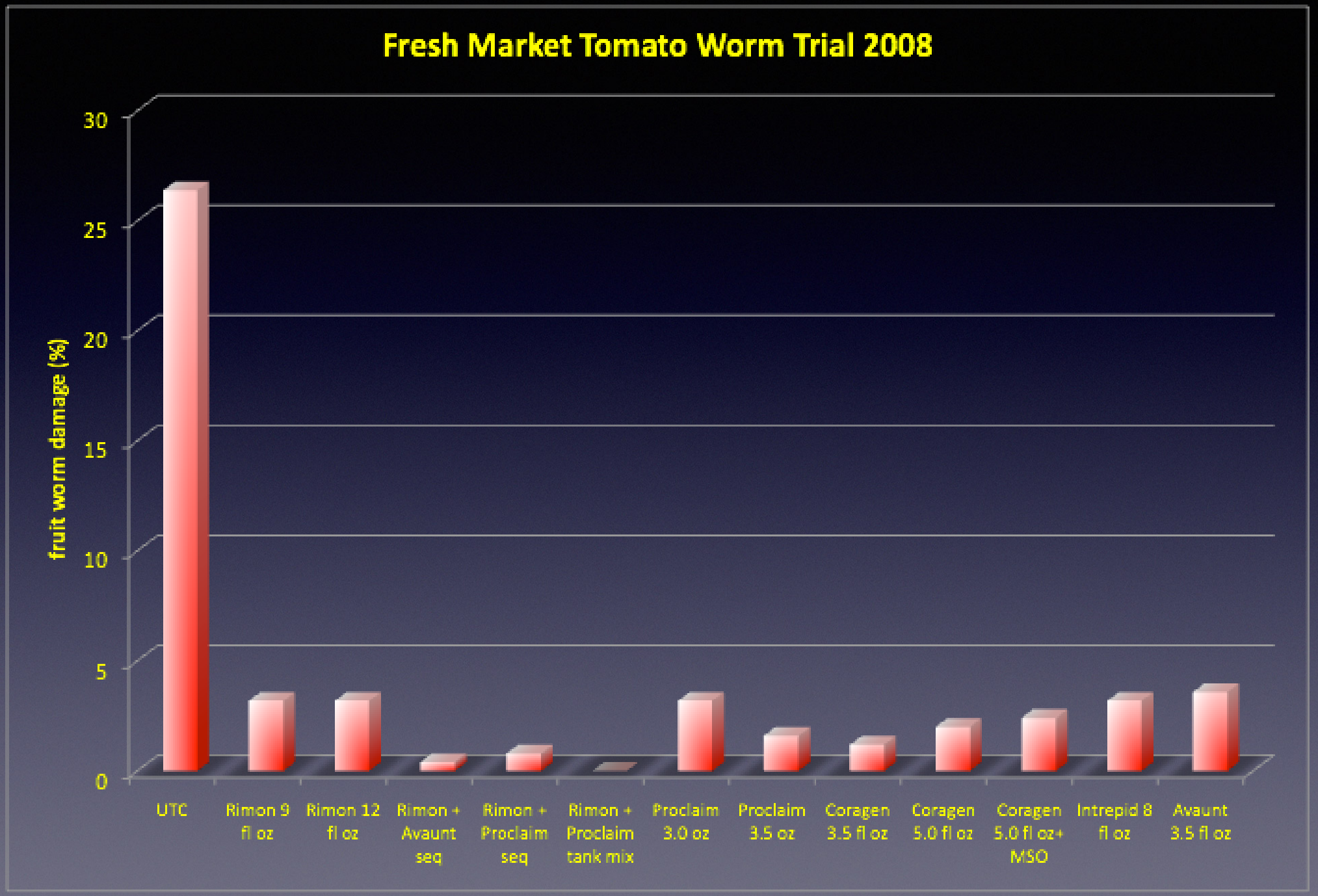
2007


Gun Club South
NS
M south %
40
30
20
10
0
UTC
Proclaim 3.0 oz/A
Proclaim 3.5 oz/A
Intrepid 8 fl oz/A
Avaunt 3.5 oz/A
Success 4 fl oz
Assail 4 oz/A + COC

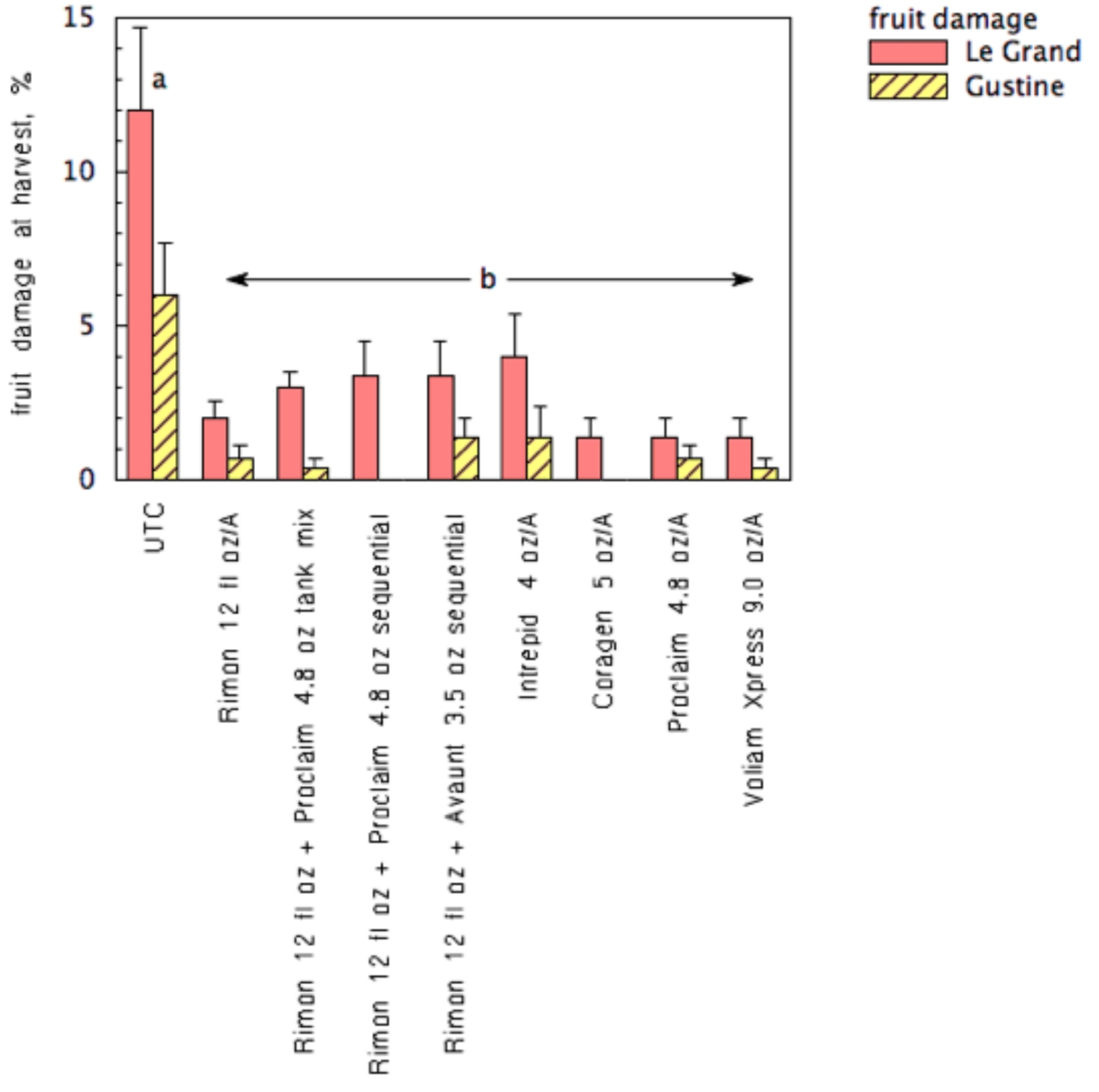
2008

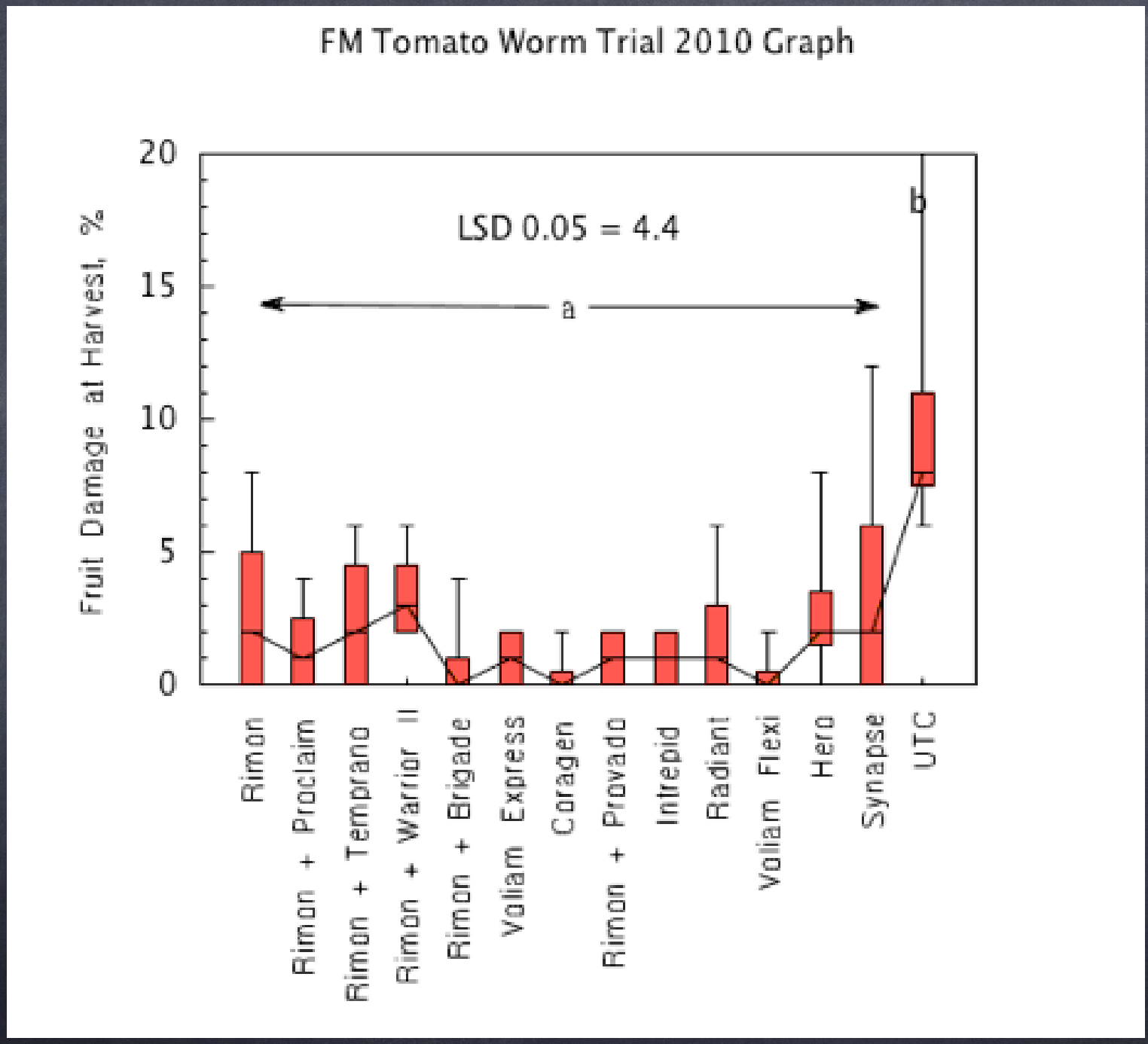

larvae per 4 plants (corrected)
0
1
2
3
4
A
B
UTC
Rimon 9 fl oz
Rimon 12 fl oz
Rimon + Avaunt seq
Rimon + Proclaim seq
Rimon + Proclaim tank mix
Proclaim 3.0 oz
Proclaim 3.5 oz
Coragen 3.5 fl oz
Coragen 5.0 fl oz
Coragen 5.0 fl oz+ MSO
Intrepid 8 fl oz
Avaunt 3.5 fl oz
treatment


fruit damage %(corrected)
0
1
2
3
4
5
6
A
B
UTC
Rimon 9 fl oz
Rimon 12 fl oz
Rimon + Avaunt seq
Rimon + Proclaim seq
Rimon + Proclaim tank mix
Proclaim 3.0 oz
Proclaim 3.5 oz
Coragen 3.5 fl oz
Coragen 5.0 fl oz
Coragen 5.0 fl oz+ MSO
Intrepid 8 fl oz
Avaunt 3.5 fl oz
treatment

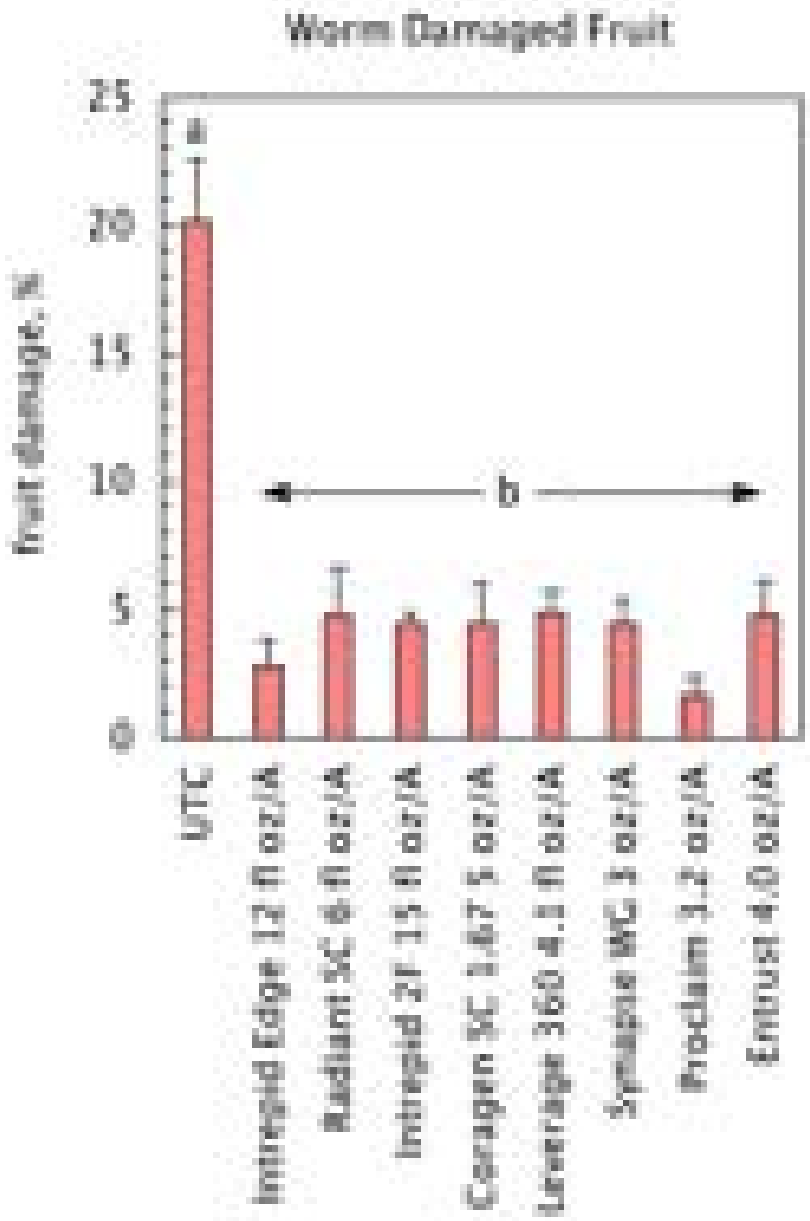

Fresh Market Tomato Worm Trial 2008
fruit worm damage (%)
30
25
20
15
10
5
0
UTC
Rimon 9 fl oz
Rimon 12 fl oz
Rimon + Avaunt seq
Rimon + Proclaim seq
Rimon + Proclaim tank mix
Proclaim 3.0 oz
Proclaim 3.5 oz
Coragen 3.5 fl oz
Coragen 5.0 fl oz
Coragen 5.0 fl oz+ MSO
Intrepid 8 fl oz
Avaunt 3.5 fl oz

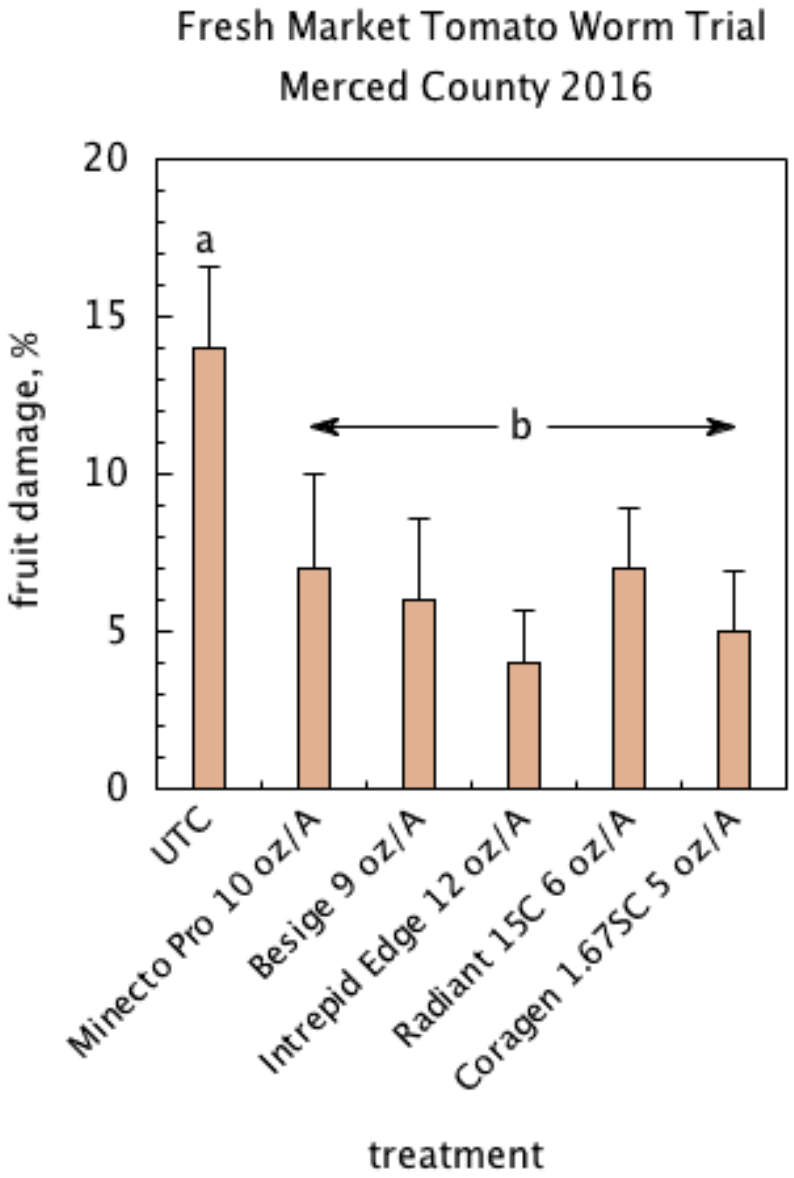
2009


fruit damage
Le Grand
Gustine
fruit damage at harvest, %
15
10
5
0
a
b
UTC
Rimon 12 fl oz/A
Rimon 12 fl oz + Proclaim 4.8 oz tank mix
Rimon 12 fl oz + Proclaim 4.8 oz sequential
Rimon 12 fl oz + Avaunt 3.5 oz sequential
Intrepid 4 oz/A
Coragen 5 oz/A
Proclaim 4.8 oz/A
Voliam Xpress 9.0 oz/A


FM Tomato Worm Trial 2010 Graph
Fruit Damage at Harvest, %
20
15
10
5
0
LSD 0.05 = 4.4
a
b
Rimon
Rimon + Proclaim
Rimon + Temprano
Rimon + Warrior II
Rimon + Brigade
Voliam Express
Coragen
Rimon + Provado
Intrepid
Radiant
Voliam Flexi
Hero
Synapse
UTC

2015 - 16 Trial Results





Conclusions

- New, reduced risk worm control insecticides give excellent control of tomato worm pests typical of central CA.
  - This translates into significantly reduced fruit damage as compared to untreated controls.
- Bt's, Success can also provide very good control, but can be weak on WYSA.
- Warrior, Assail, & similar chemistries did not provide better control than the untreated check plots.
  - knock-down beneficials?

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UC IPM Online

STATEWIDE INTEGRATED PEST MANAGEMENT PROGRAM

UC IPM

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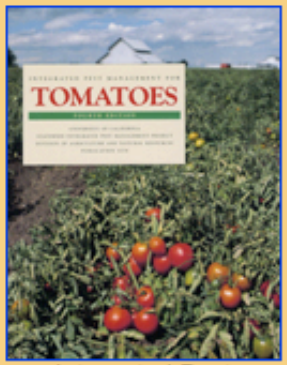
Search

For more information, see this UC IPM book:



Integrated Pest Management for Tomatoes

How to Manage Pests

Tomato

More crops

Year-Round IPM Program—tells you what you should be doing throughout the year in an overall IPM program. Includes Year-Round IPM Program Annual Checklist.

Year-Round IPM Program for Tomato (1/07) New

- Preplanting activities
- Planting activities
- Bloom to early fruit set
- Late fruit set
- First red fruit
- Harvest and postharvest activities

UC IPM Pest Management Guidelines—University of California's official guidelines for pest monitoring techniques, pesticides, and nonpesticide alternatives for managing pests in agriculture, floriculture, and commercial turf. More

| Authors/credits | Index to crops | PDFs to print | Recent updates |

General Information

Insects and Mites