Peach Orchard Ground Cover Management Mitigates Bug Damage

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Presentation overview

- Present results from replicated studies that demonstrate how peach orchard floor vegetation management influences pest abundance and damage
- Integration of results into commercial peach orchard production practices
- Peach extrafloral nectaries may be a key for enhanced biological control in “simplified” orchard floor management systems
- Other considerations for using groundcover for pest management

Problems associated with poor orchard floor management

- Weedy orchards harbor insect pests,
- Weedy orchards harbor plant nematodes and viruses,
- Weedy orchards precipitate bee kills,
- Weedy orchards can reduce yields
- Vigorous ground cover can reduce yields,
- Bare soil can erode,
- Bare soil facilitates sub-soil compaction,
- Bare soil looses organic matter.

A previous study has shown that weedy ground cover in orchards contribute to insect, disease, and nematode problems and that removal of alternate host plants can reduce arthropod incidence and damage to peach.

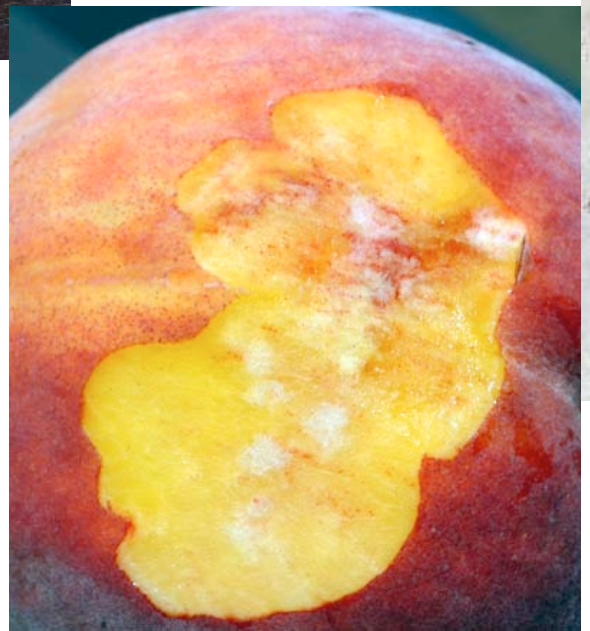
Killian and Meyer. 1984. Effect of orchard weed management on catfacing damage to peaches in North Carolina. JEE. 77: 1596-1600.

Peach Arthropod Pests Associated with Orchard Ground Cover in NJ

- Tarnished plant bug
- Stink bugs
- Green peach aphid
- Tufted apple budmoth
- Two spotted spidermite
- False chinch bug
- Leafhoppers
- Thrips

Tarnished plant bug

- Causes the most damage to NJ peaches
- Season long pest in Mid-Atlantic: Prebloom - harvest



"Cat-facing damage"

Caused by:

- Tarnished plant bug (*Lygus lineolaris*)
- Stink bugs
  - Green stink bug (*Acrosternum hilare*)
  - Brown stink bug (*Euschistus servus*)
  - Dusky stink bug (*E. tristigmus*)

Peach Orchard Ground Cover Management to Reduce Arthropod Damage

P.W. Shearer
Rutgers University

Funded by NE Sustainable Agricultural Research & Education (SARE) Grant

(1997)

Peach orchard ground cover study: Objectives:

1. Determine suitability of selected ground covers for use in integrated crop production strategies for peaches.

2. “Demonstrate” how ground cover management in commercial orchards affects arthropod abundance and damage to peaches.

Tarnished plant bug and orchard floor management

1. Evaluate tarnished plant bug abundance in relation to ground cover management.

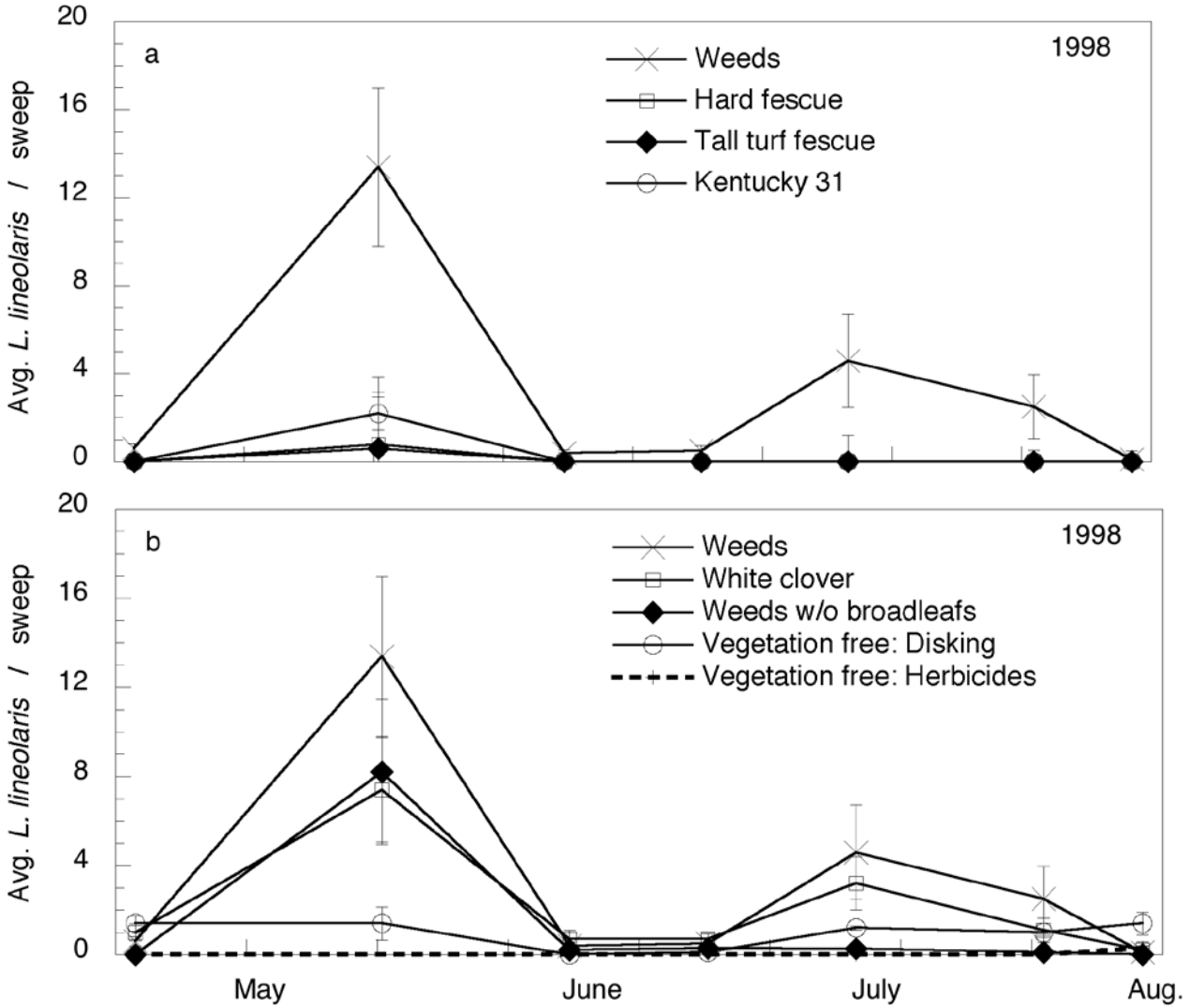
   Treatments (4 replicates)

   White clover
   Kentucky 31 tall fescue
   SR3100 Hard fescue
   SR Tall turf fescue
   Naturalized vegetation
   Naturalized vegetation w/o broadleaf's
   Bare soil: disk
   Bare soil: herbicides

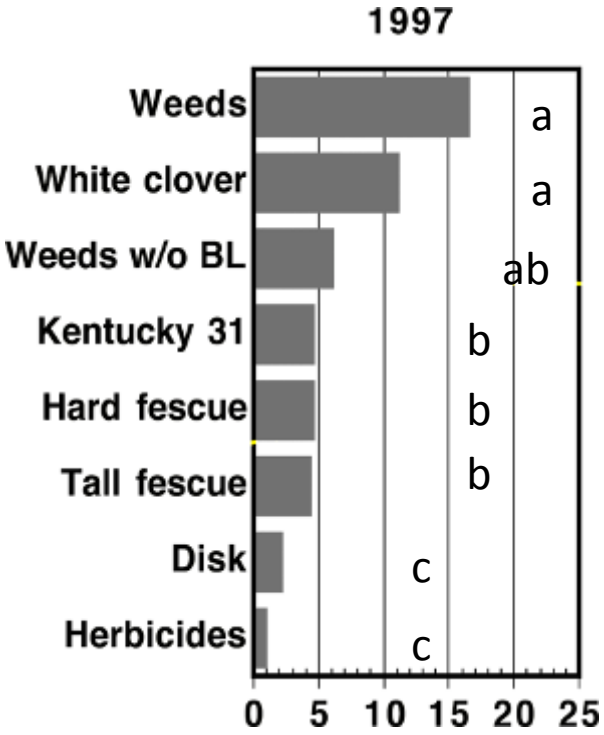
2. Evaluate and demonstrate effects of ground cover management on commercial scale.

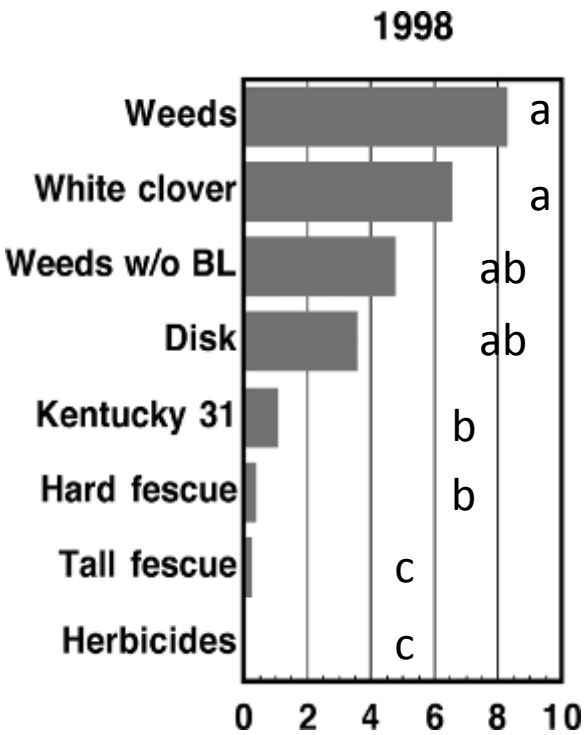
   Treatments (4 replicates)
   Hard fescue: mow
   Naturalized vegetation: mow
   Clean cultivation: disk

Seasonal occurrence of *Lygus* in various peach orchard ground covers

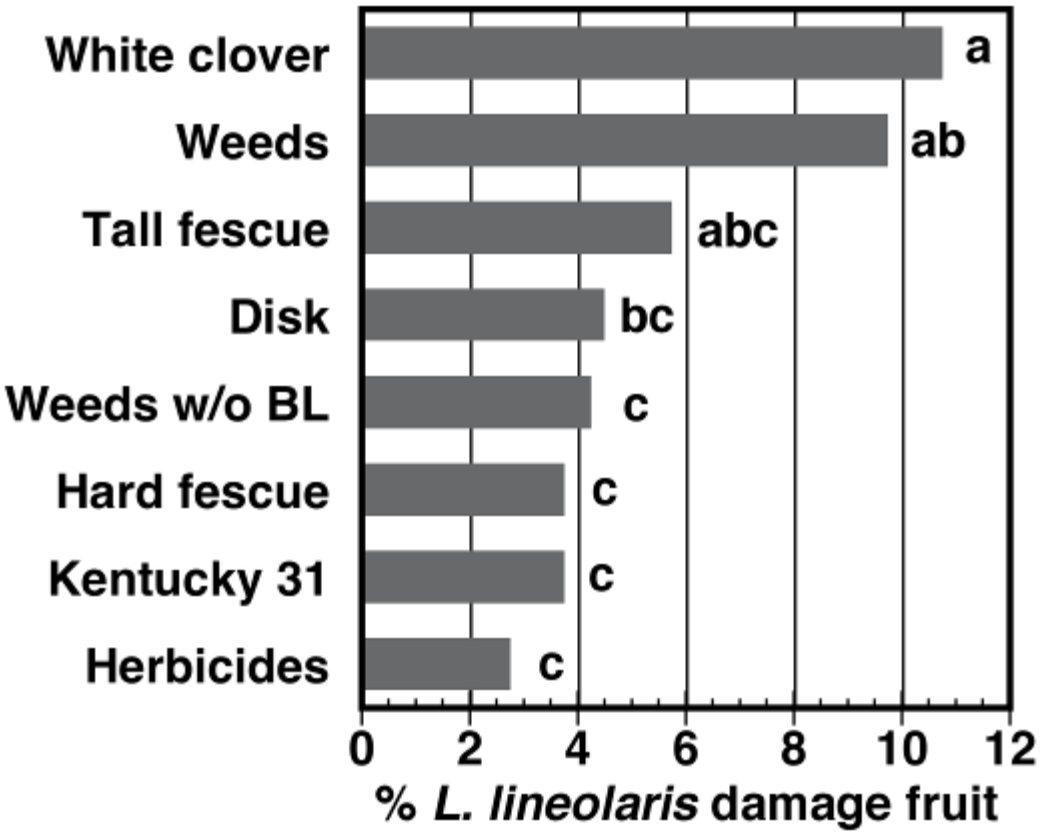


Orchard floor management impacts lygus abundance in the absence of insecticides





Tarnished plant bug damage to peach fruit grown with different ground covers and no insecticides: 1998



Tarnished plant bug and orchard floor management

1. Evaluate tarnished plant bug abundance in relation to ground cover management.

   Treatments (8 replicates)

   White clover
   Kentucky 31 tall fescue
   SR3100 Hard fescue
   SR Tall turf fescue
   Naturalized vegetation
   Naturalized vegetation w/o broadleaf's
   Bare soil: disk
   Bare soil: herbicides

2. Evaluate and demonstrate effects of ground cover management on commercial scale.

   Treatments (4 replicates)
   Hard fescue: mow
   Naturalized vegetation: mow
   Clean cultivation: disk

Impact of orchard floor management on catfacing insect abundance and damage to commercially grown peach: 1997-8

- 4 commercial peach blocks (10-20 acres)
- Growers worked up orchard floor
  - Planted sod
  - Mowed sod and weeds
  - Cultivated the disk plots
- Trees treated the same

Impact of orchard floor management on catfacing insect damage to peach: 1997-8

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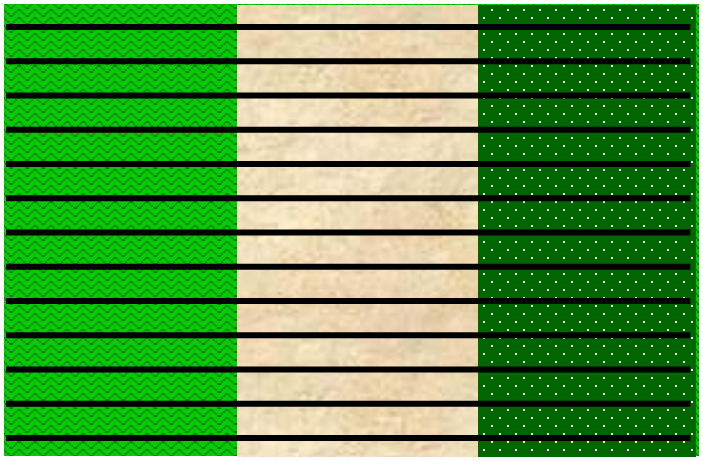
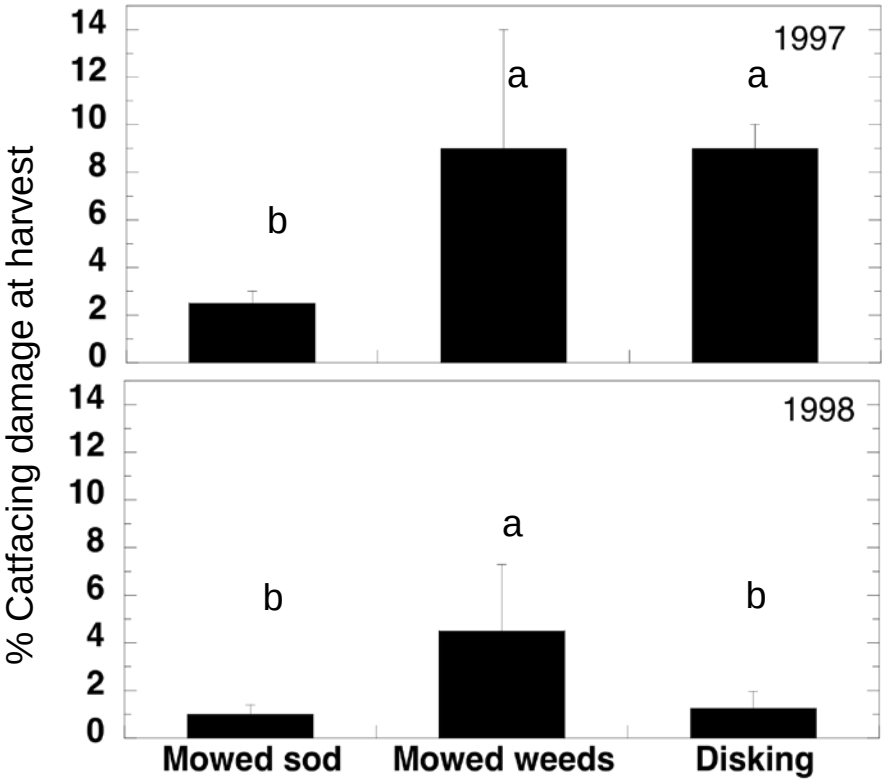
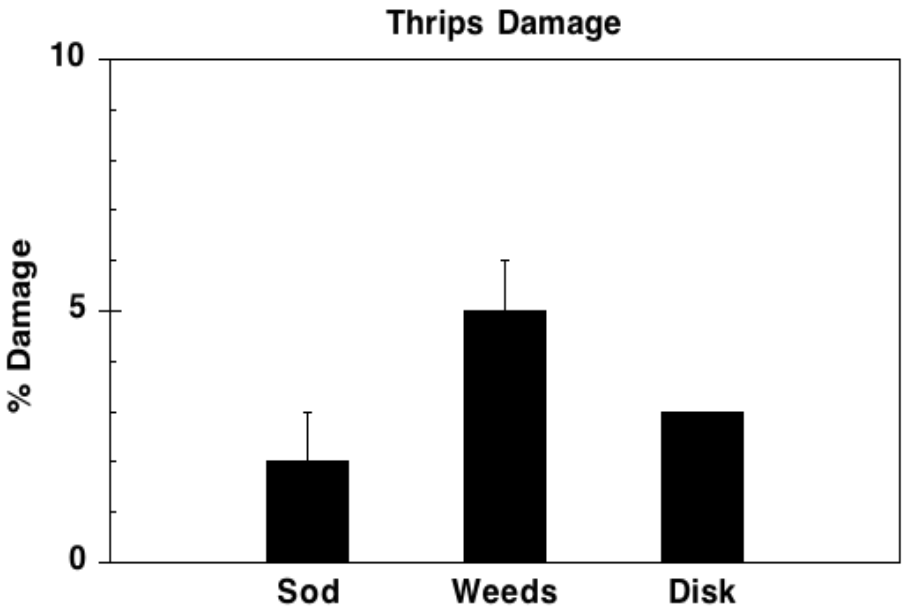
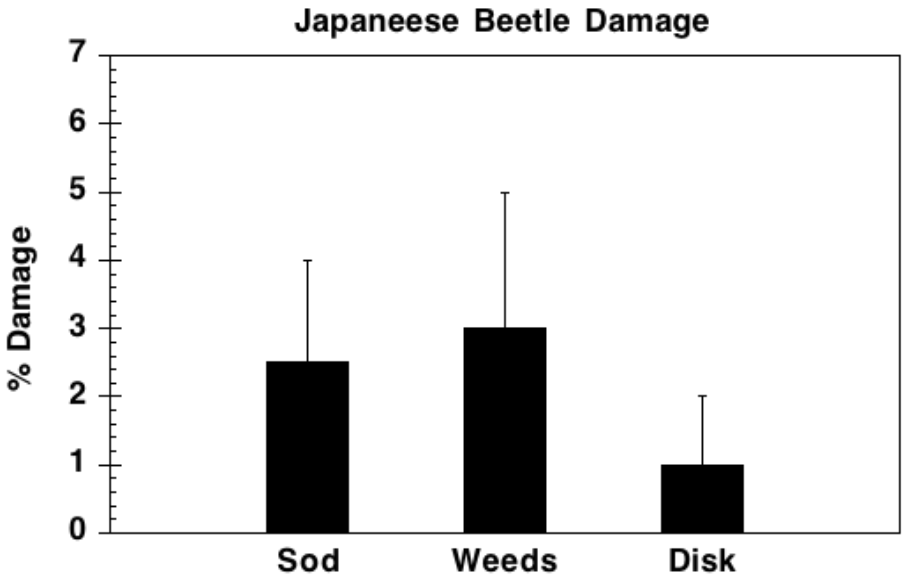




Impacts on other pests





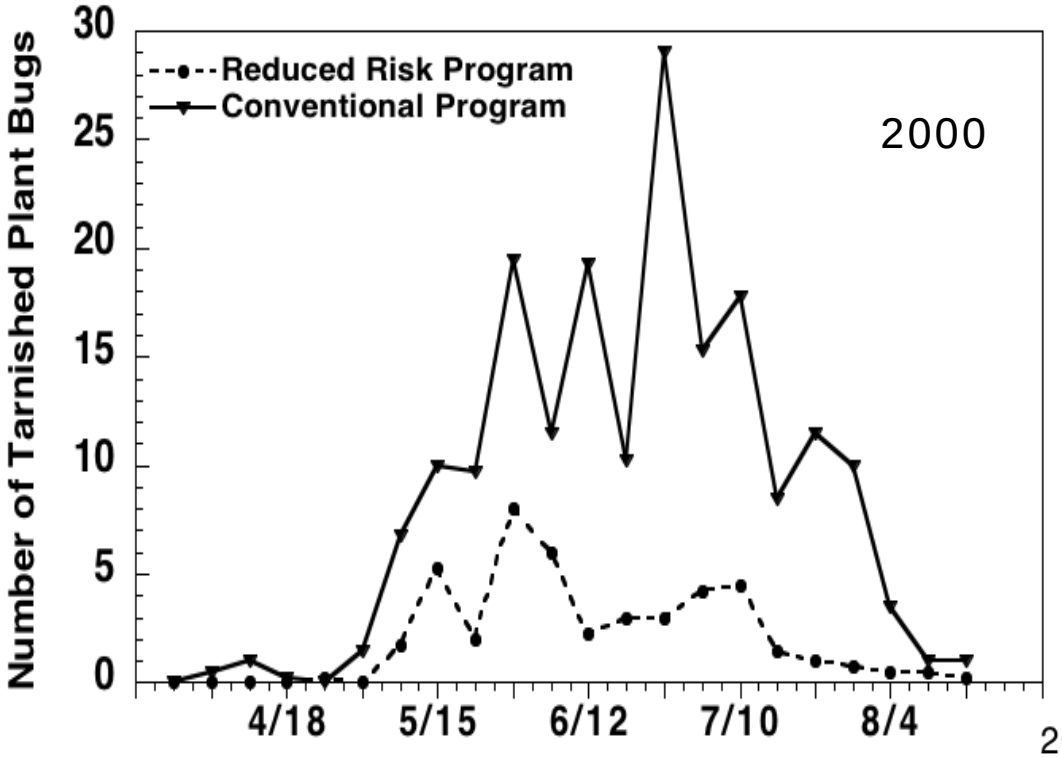
Conclusions

- Removing broadleaf weeds from orchard floor reduces tarnished plant bug abundance and damage.
- Some evidence that different groundcovers impact other pests

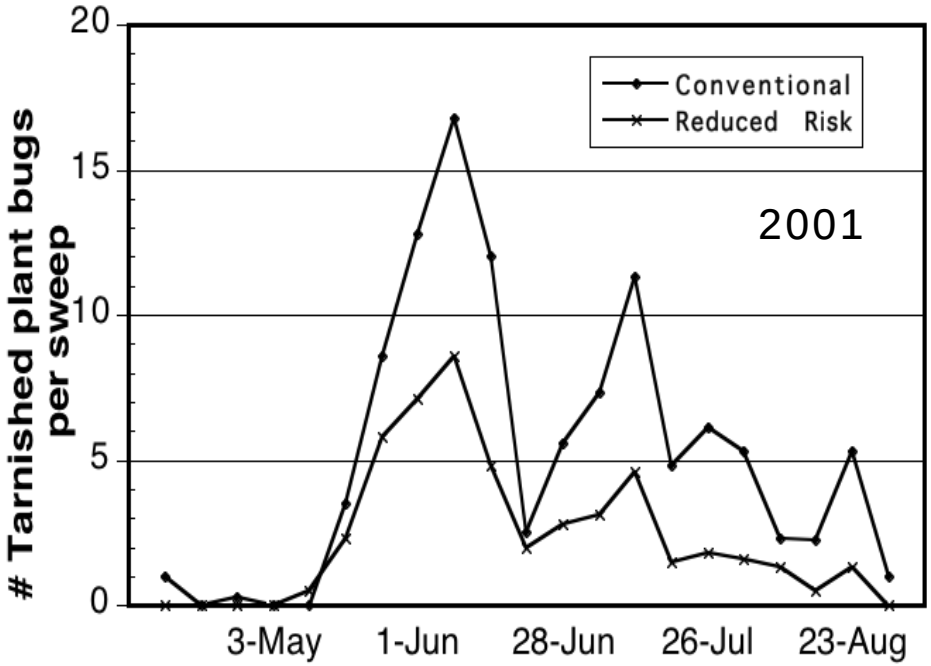
Comparison of a Reduced Risk vs. conventional peach arthropod management program: NJ

Experimental design

- 4 study sites; cultivar ‘Encore’.
- Each block was divided in half and designated as Reduced Risk or conventional.
- The Reduced Risk blocks utilized OFM mating disruption and managed sod in the drive rows.
- The conventional blocks received standard grower spray programs and had weedy drive rows.

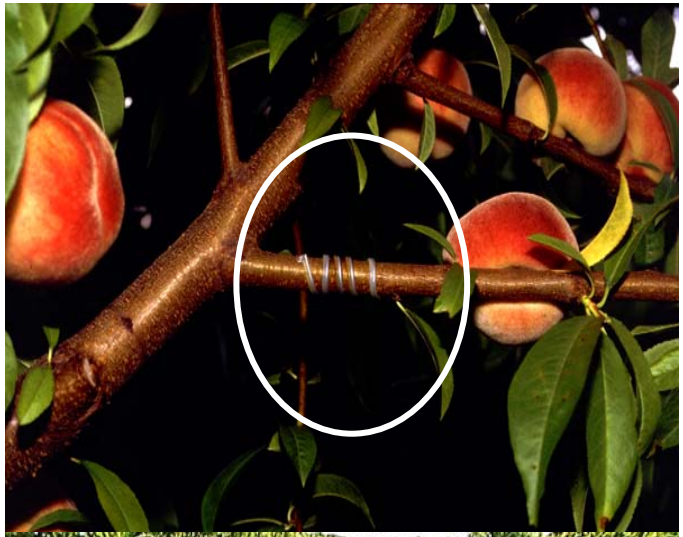


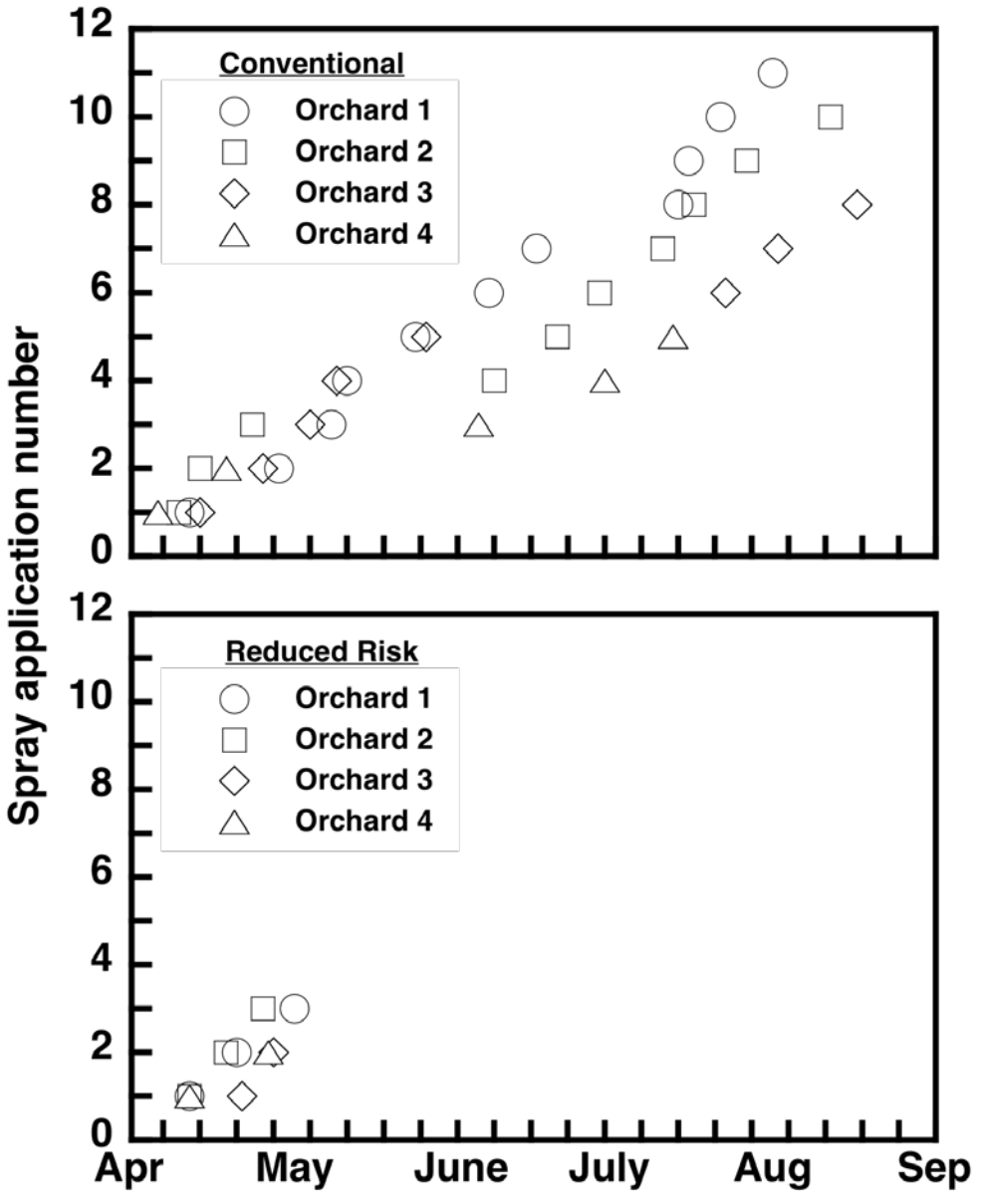
Weed-free sod ground cover delays detection of *Lygus* in the orchard by a month



Dates and applications of OP and carbamate sprays, 2000

- OFM MD and sod ground cover allowed growers to spray fewer times





Percent Damaged Fruit at Harvest

	Catfacing damage		Oriental fruit moth	
Program	1999	2000	1999	2000
Reduced Risk	0.8 b	3.4 ns	0.2 ns	0.3 ns
Conventional	1.6 a	3.9	0.2	0.1

In 2001, we expanded the program to 12 orchards with side-by-side comparisons

- We went from research mode to Extension Outreach
- Conventional: Standard OP and carbamate program

  -versus-
- Reduced Risk: OFM mating disruption and sod ground cover
  - We observed similar pest control and insecticide reductions in Reduced Risk peach orchards

Funded by USDA Pest Management Alternatives Program
and EPA Environmental Stewardship program

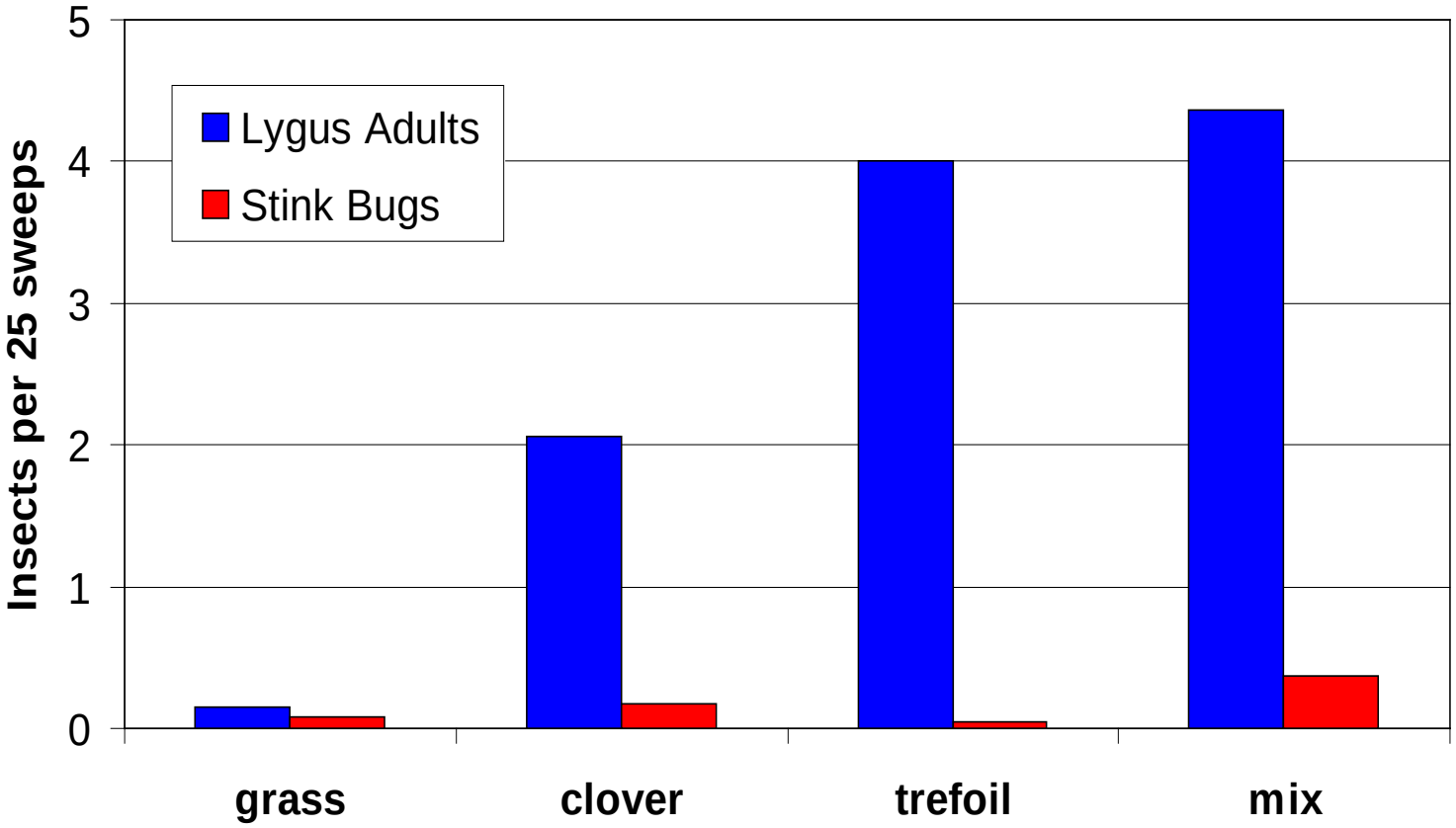
Total mean seasonal catfacing insects per 50 sweeps - all varieties

Polk, et al.

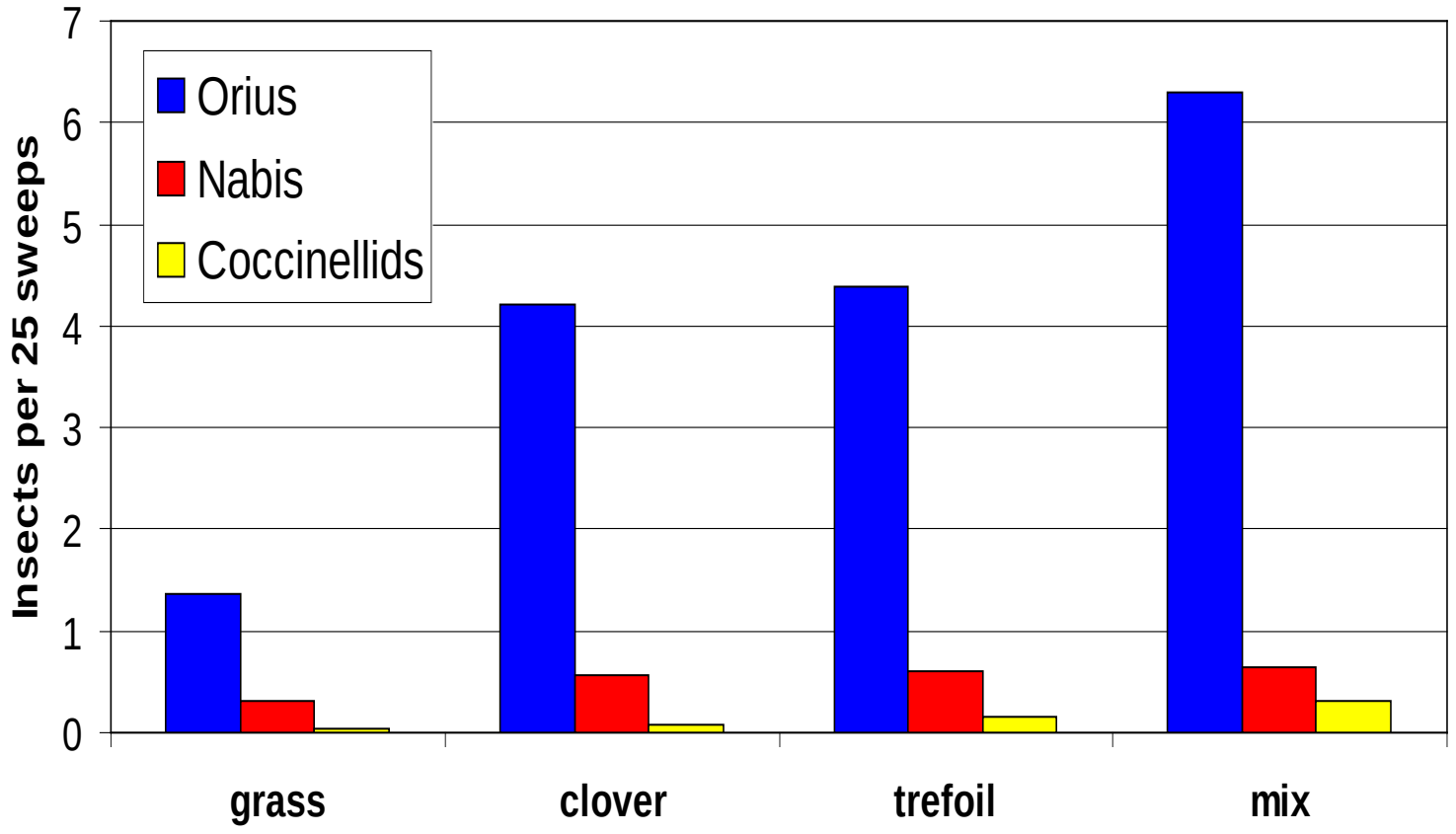
At harvest mean % catfacing damage - encore

Polk, et al.

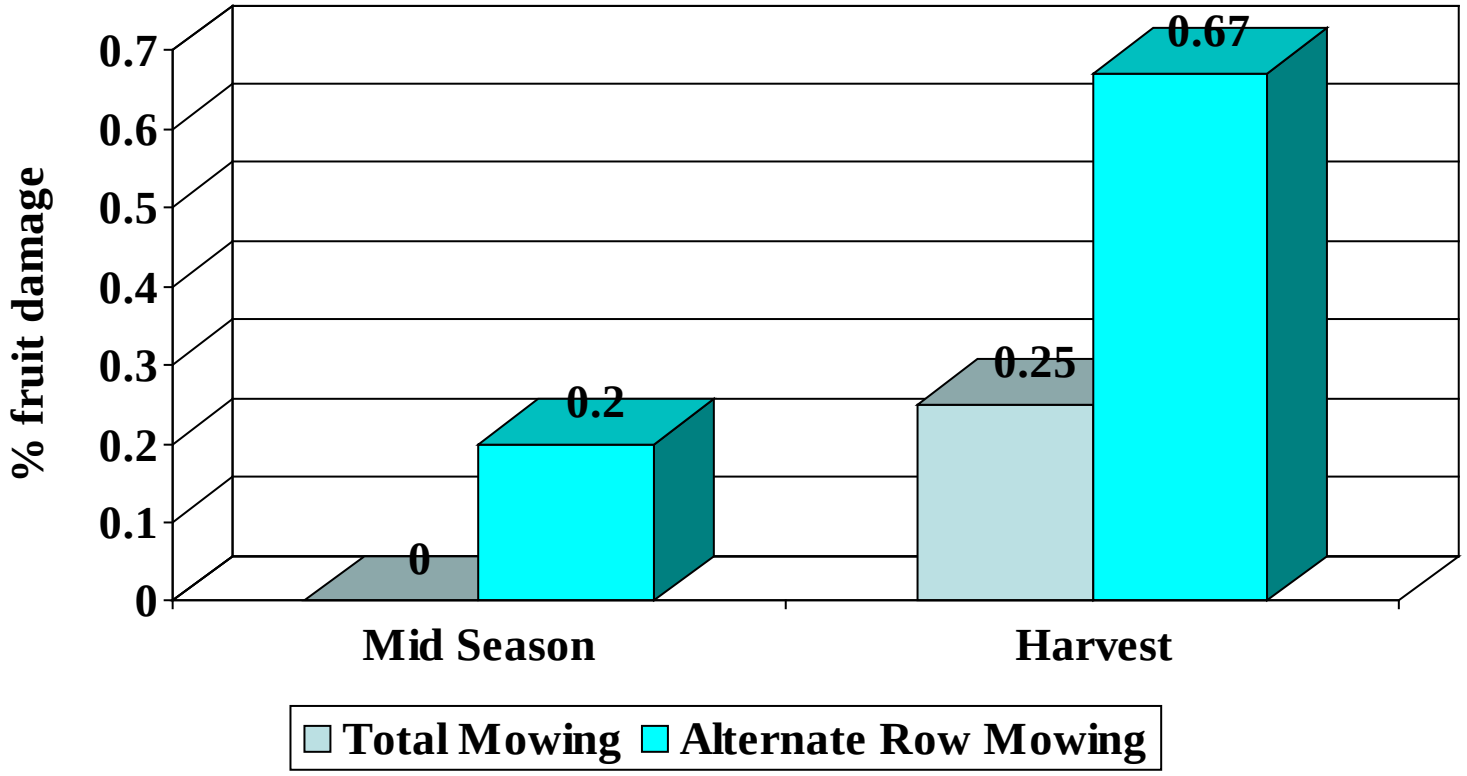
Lygus Adults and Stink Bugs Collected in Sweep Net Samples from Groundcover Plots: Pear 2001



Orius, *Nabis*, and Coccinellid Adults Collected in Sweep Net Samples from Groundcover Plots: Pear 2001



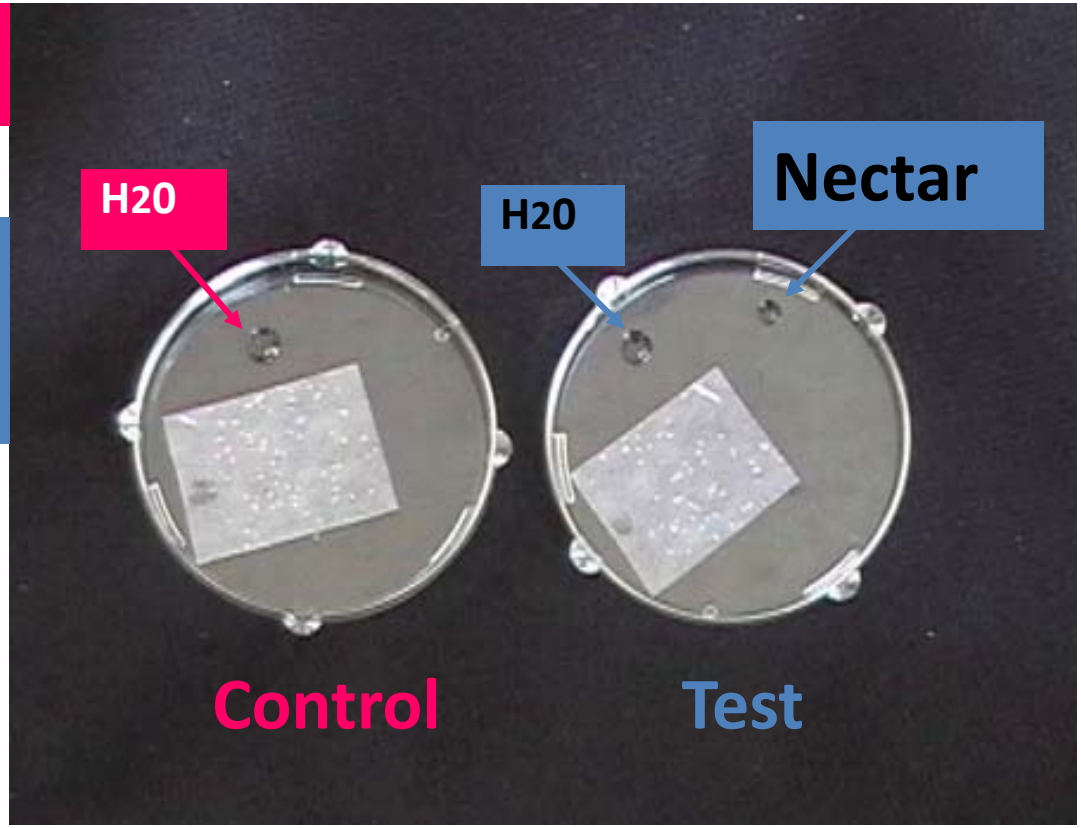
True Bug Damage—Pear: 1998
Total Mowing vs. Alternate Row Mowing



Most of peach varieties, *Prunus persica* (L.) have leaf gland at the base of the leaf blade that are reniform or globose shaped (Okie 1998).

Trichogramma minutum parasitoids were provided with OFM eggs and:

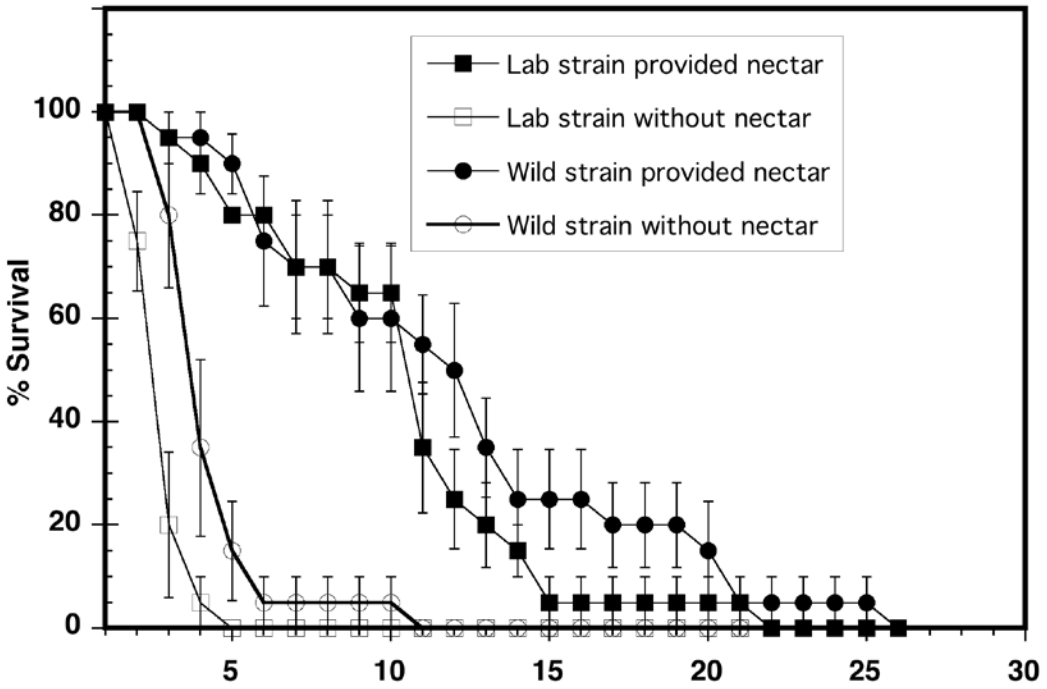
- Water (Control)
- Water and Nectar (Trmt)



Longevity (Mean ± SEM) in Days of *T. minutum*

Trmt	Longevity (days)
Lab strain: with nectar	9.9 ± 0.2a
Lab strain: no nectar	2.0 ± 2.1c
Wild strain: with nectar	11.6 ± 2.5a
Wild strain: no nectar	3.3 ± 2.0b

P < 0.05



Number (Mean ± SEM) of Host Fed Eggs

Trmt	Avg. no. host fed eggs ± SEM[a]
Lab strain: with nectar	6.5 ± 1.5ab
Lab strain: no nectar	1.5 ± 1.7c
Wild strain: with nectar	13.7 ± 2.2a
Wild strain: no nectar	4.5 ± 0.7b

$P < 0.05$

Number (Mean ± SEM) of OFM Parasitized Eggs

Trmt	Avg. no. parasitized eggs ± SEM[a]
Lab strain: with nectar	61.0 ± 21.7b
Lab strain: no nectar	24.4 ± 23.7c
Wild strain: with nectar	105.2 ± 15.1a
Wild strain: no nectar	52.8 ± 7.4bc

$P<0.05$

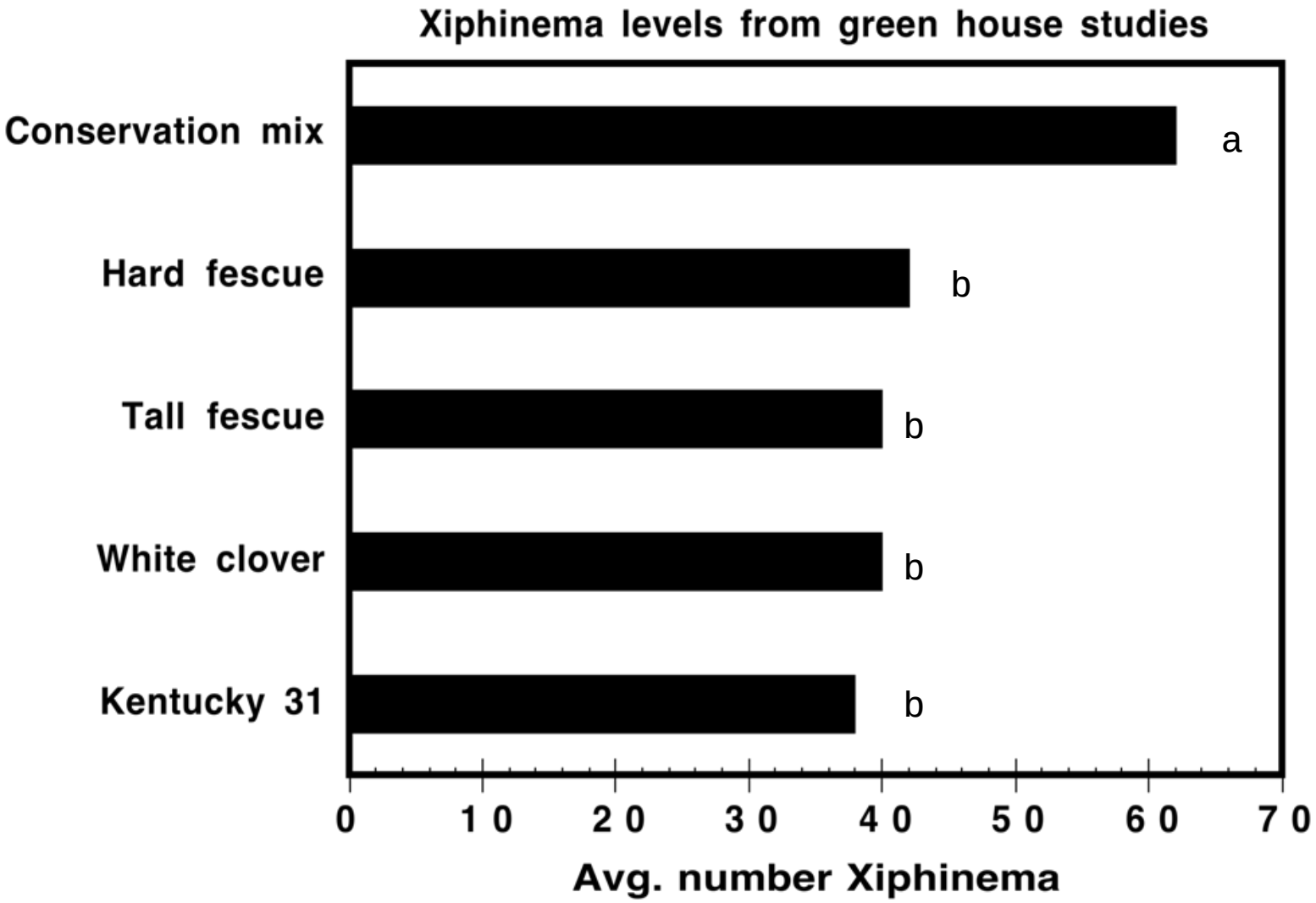
Impact of peach extrafloral nectar on *Grapholita molesta* fecundity

	Mean (± SEM) number of eggs per female		
Treatment	Fertile	Sterile	Total
Provided nectar and water	245.0 ± 21.0 a	10.9 ± 3.9 a	255.9 ± 18.8 a
Provided only water	117.2 ± 17.6 b	2.1 ± 1.1 b	119.3 ± 17.7 b

($P < 0.05$)

Additional considerations

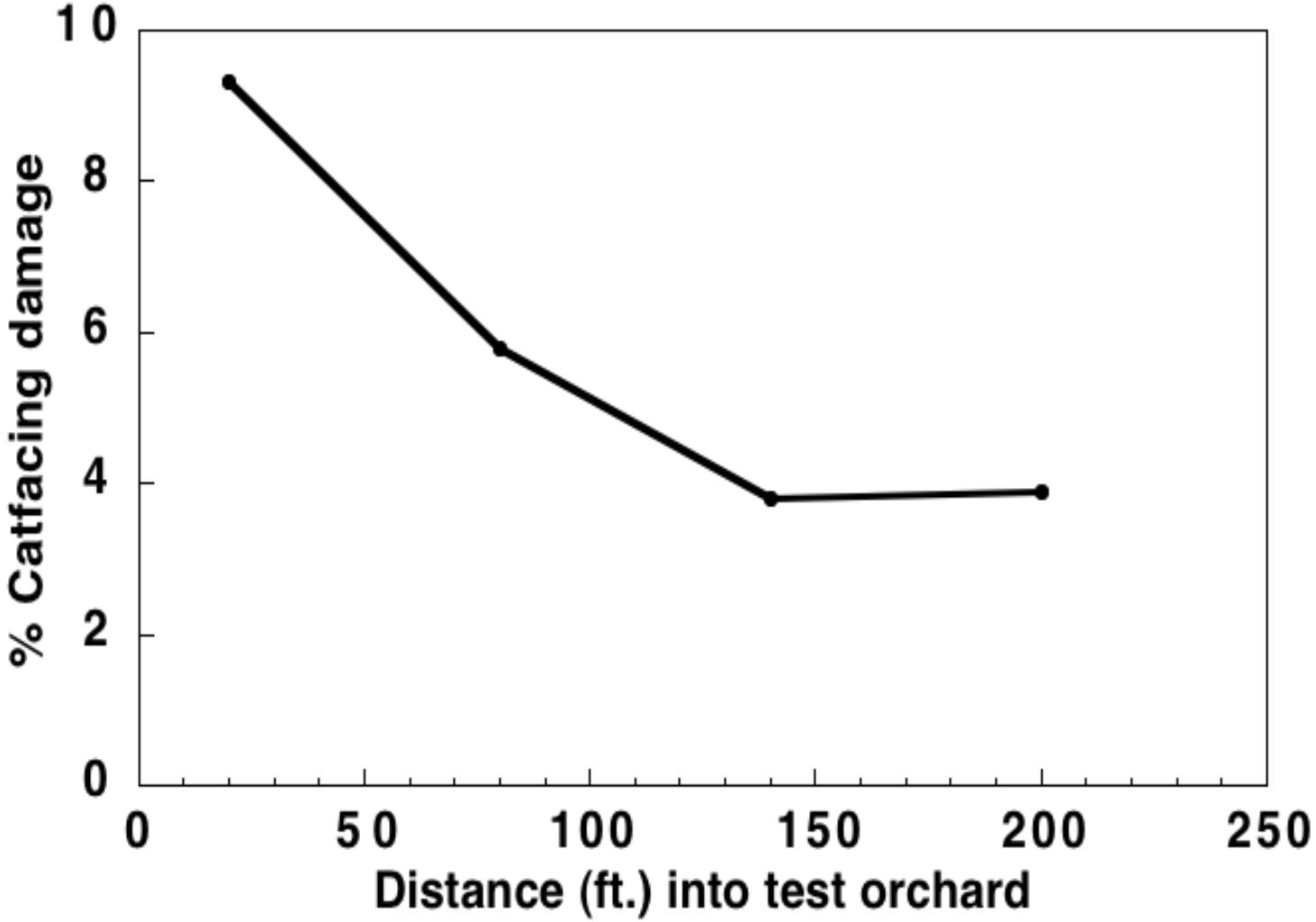
Plant the right groundcover and plant it correctly



Vector of several nepoviruses that affect peaches

Border effect: Catfacing damage

Will border sprays and/or trap crops outside orchard reduce damage even further?



Conclusions:
Orchard floor management

- Research at RAREC and on growers farms demonstrated the importance of removing broad leaf weeds to minimize damage from several key pests.

- Managed sod drive rows and weed-free tree-rows reduces catfacing insect abundance and damage.
  - Rutgers Fruit IPM database has documented a 60% reduction in damage in “clean” orchards.

- Subsequent research in Oregon (pears) and Canada (apples) validates this approach in other crops.

- It should work in organic systems, too.