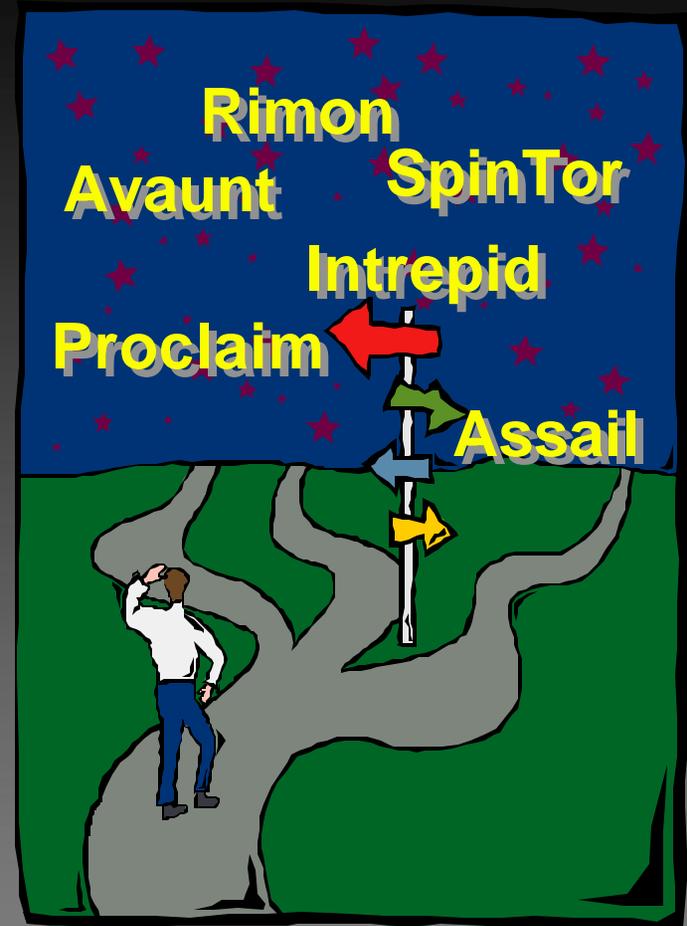


OP Alternatives in Apple Arthropod Management



Art Agnello
Dept. of Entomology,
NYS Agricultural
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Geneva

Azinphosmethyl Scheduled Phase-out Timetable

- Apples, Pears
 - 2008-09: total of 6 lb product/A
 - 2010: total of 4 lb product/A
 - 2011-12: total of 3 lb product/A
- 60-ft buffer from permanent bodies of water & occupied buildings
- Scaled PHI of 33-44 days for Pick-Your-Own, according to rate
- REI is now 14 (apples, pears) or 15 days (cherries)
- Cherries: 2008-09, 3 lb product/A; 2010-12: 1.5 lb product/A
- Peaches, Nectarines, Plums, Apricots - gone

Currently Registered Alternative Materials - OPs

- Imidan 70WS - 3-day REI on all tree fruit crops
- Lorsban 4EC - Dormant/delayed dormant use only
- Lorsban 75WDG - replaces 50WP
 - Dormant/delayed dormant use through Petal Fall
 - Effective against PC
 - Possible use for OBLR overwintered gen; maybe WAA?
 - Supplemental label (both formulations): post-bloom trunk application to apples for borer control
- Dimethoate - Voluntarily withdrawn on apples; pears remain a registered use
- Diazinon - Apples: only SJS (prebloom) or WAA in summer
 - REI now **4 days** for all tree fruit crops
- Malathion - Moderate efficacy; short residual field life

Currently Registered Alternative Materials - Pyrethroids

- Most have similar spectrum of (nominal) activity: plum curculio, apple maggot, internal leps, leafminers, leafhoppers, leafrollers, TPB, aphids, pear psylla, etc.
- Asana (esfenvalerate) - industry standard
- Danitol (fenpropathrin) - also has activity on ERM
- Warrior/Proaxis/Taiga Z (lambda/gamma-cyhalothrin) - microencapsulated
- Baythroid (cyfluthrin)
- Ambush/Pounce (permethrin) - not after PF on apples
- Brigade (bifenthrin) - pears only, BUT not for pear psylla; efficacy on mites

Currently Registered Alternative Materials - “OP Replacements”, etc.

- Actara (neo-nicotinoid) - PC, LH, RAA, psylla
- Assail (neo-nicotinoid) - AM, Aphids, Int Leps, LH, RAA
- Avaunt (oxadiazine) - PC, LH, (AM, Int Leps)
- Calypso (neo-nicotinoid) - PC, AM, Int Leps, Aphids, LH, PPs, STLM
- Rimon (benzoylurea) - Int Leps, OBLR, STLM

Other Chemistries/Uses

- Agri-Mek (microbial) STLM
- B.t. - (microbial) OBLR, other leps
- Provado - (imidacloprid / neo-nicotinoid) - foliar pests
- Intrepid - (insect growth regulator) - OBLR
- Esteem - (insect growth regulator) - SJS
- Spintor - (microbial) - OBLR, STLM
- Proclaim - (microbial) OBLR, STLM

ASSAIL

(Acetamiprid) - UPI



- Neonicotinoid (same class as Provado, Actara, Calypso)
- Rapid leaf absorption
- Translaminar activity
 - Controls pests on the sprayed and unsprayed leaf surface
 - Important for insects that feed on the underside of leaves
- Interrupts insect's nervous system
- Causes restlessness and convulsions
- Inhibits feeding; kills fairly quickly
- Low toxicity to bees; may flare mites
- REI = 12 hrs; PHI = 7 days
- Formulation: 30SG (soluble granule); 70WP is gone

ACTIVITY OF ASSAIL AGAINST KEY ORCHARD PESTS

TARGETED PEST(S)

Oriental fruit moth



Codling moth



Lesser appleworm

OTHER PESTS CONTROLLED



WALH



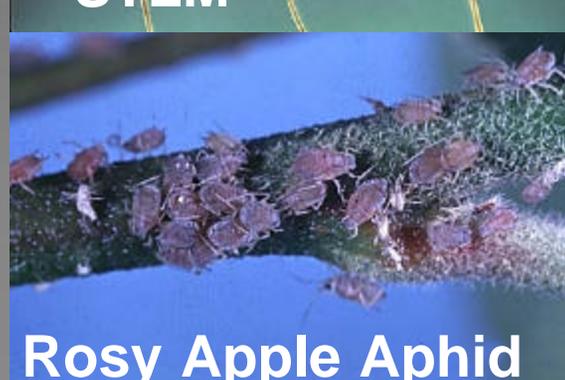
Apple maggot



European Apple Sawfly



STLM



Rosy Apple Aphid



Pear Psylla

INSECT PESTS NOT CONTROLLED BY ASSAIL



Plum curculio



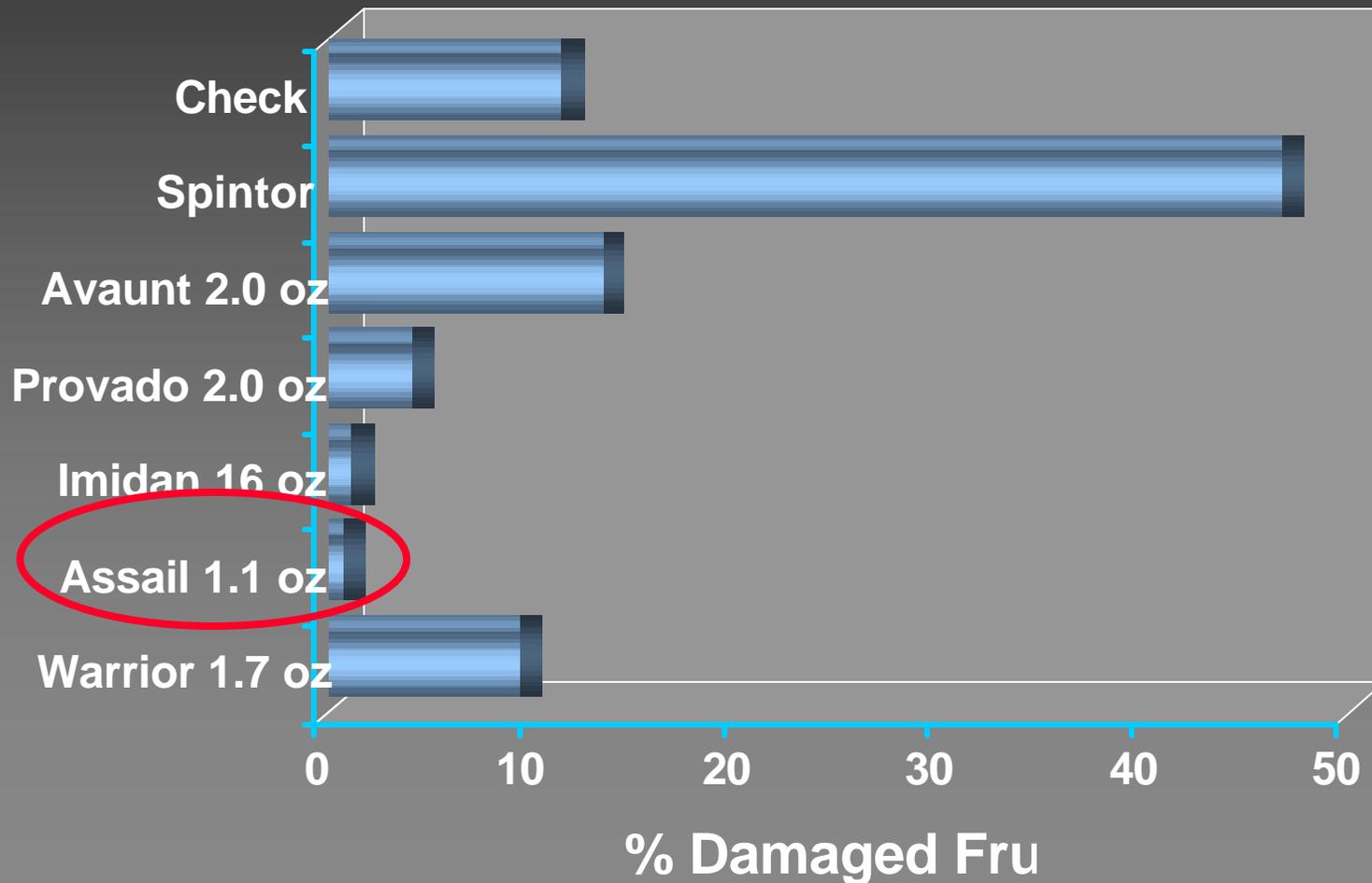
Obliquebanded
leafroller

Comparison of % Oriental Fruit Moth damage at different sampling times

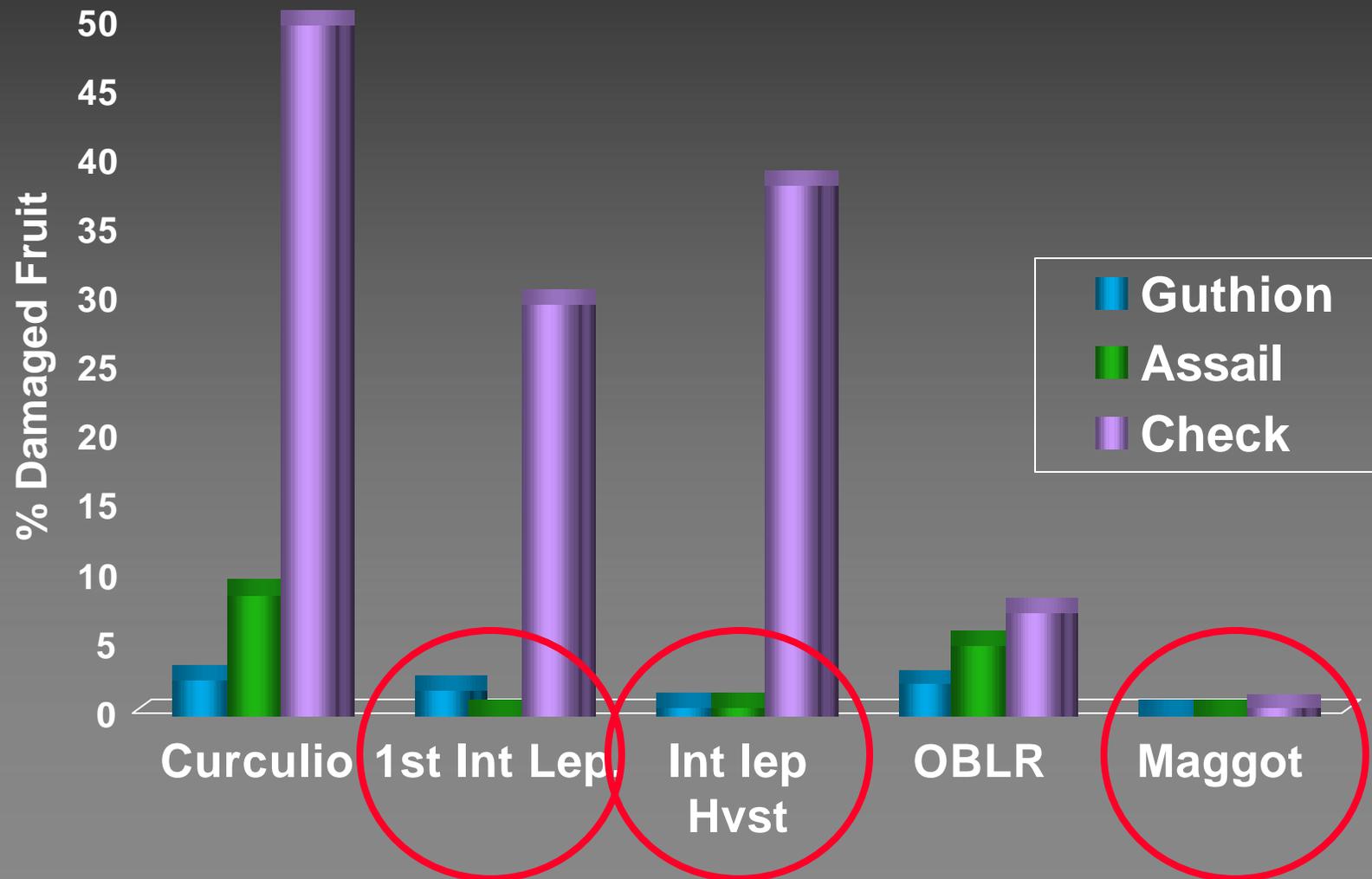
| Material | Sep. 10 | Oct. 14 |
|-------------------|---------|----------|
| Diamond | 9.4 ab | 12.3 bc |
| Calypso | 11.6 ab | 17.3 bc |
| Avaunt 30WG | 16.1 bc | 22.6 cde |
| Esteem 35WP | 31.8 d | 44.4 fg |
| Intrepid 2F | 15.7 bc | 29.7 de |
| Warrior 1CS | 8.7 ab | 10.6 ab |
| Assail 70WP | 4.0 a | 3.5 a |
| Guthion 50W | 6.1 a | 16.3 bcd |
| Imidan 70W | 8.9 ab | 15.7 bc |
| Deliver | 24.0 cd | 35.0 ef |
| Untreated Control | 49.7 e | 59.4 g |

Means within a column followed by the same letter are not significantly different (Fisher's Protected LSD Test, $P < 0.05$).

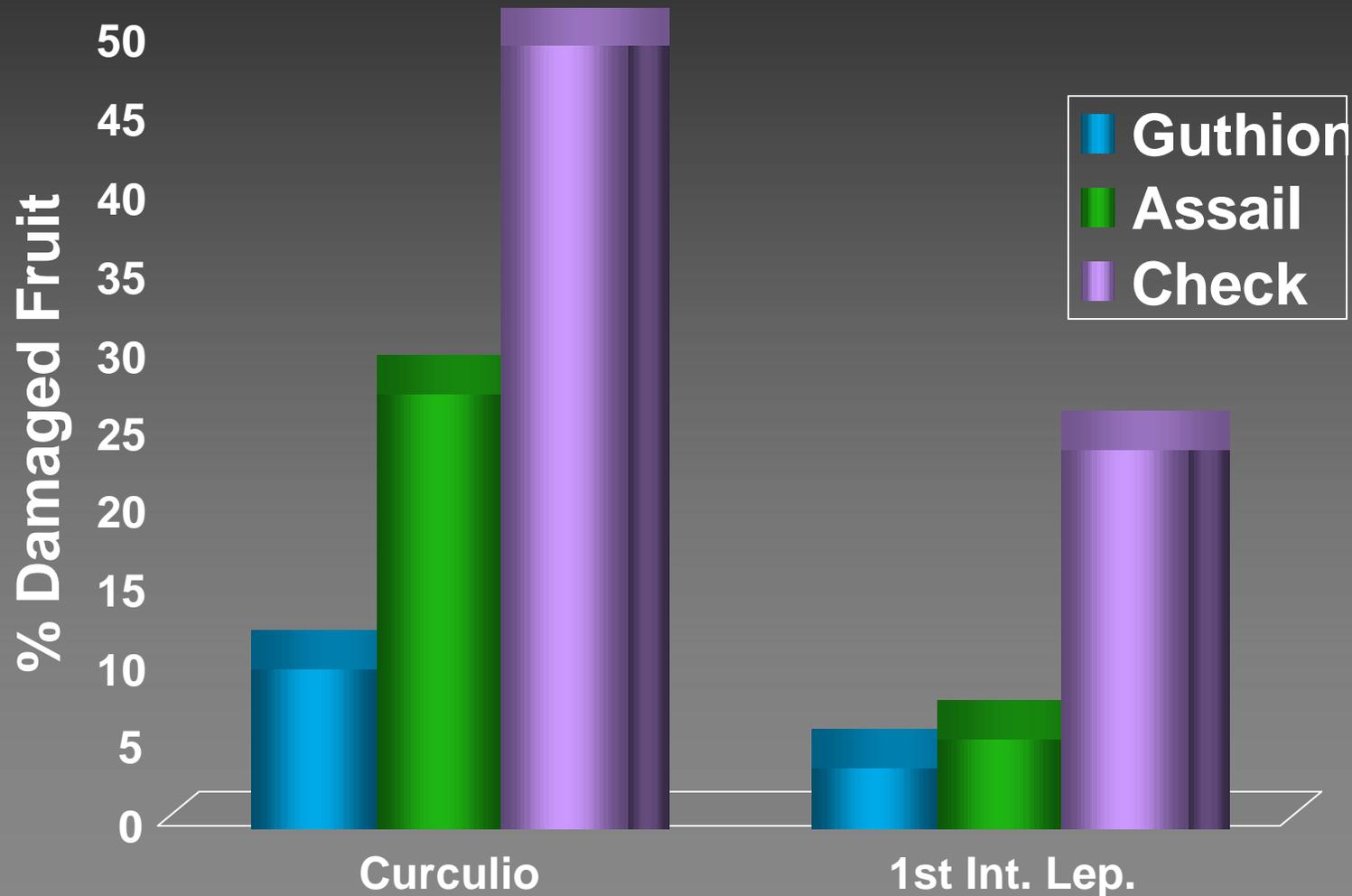
Comparison of Assail and Other Insecticides Against Apple Maggot Hudson Valley, NY, 2004



Comparison of Seasonal (PF-7C) Activity of Assail and Guthion, NY 2003



Comparison of Early Season (PF-1C) Activity of Assail and Guthion, NY 2002



CALYPSO

(Thiacloprid) - Bayer

- **Neonicotinoid (same class as Provado, Actara, Assail)**
- **Rapid leaf absorption**
- **Systemic/Translaminar activity**
 - **Controls chewing and sucking insects**
- **Long residual activity (10-14 days)**
- **Safe to birds, bees, fish; toxic to aquatic invertebrates**
- **REI = 12 hrs; PHI = 30 days**
- **Formulation: 4F**

ACTIVITY OF CALYPSO AGAINST KEY ORCHARD PESTS

TARGETED PESTS

Oriental fruit moth



Codling moth



Lesser appleworm



OTHER PESTS CONTROLLED

Plum curculio



Apple maggot

Eur. Apple Sawfly



WALH



STLM



Pear Psylla



INSECT PESTS NOT CONTROLLED BY CALYPSO

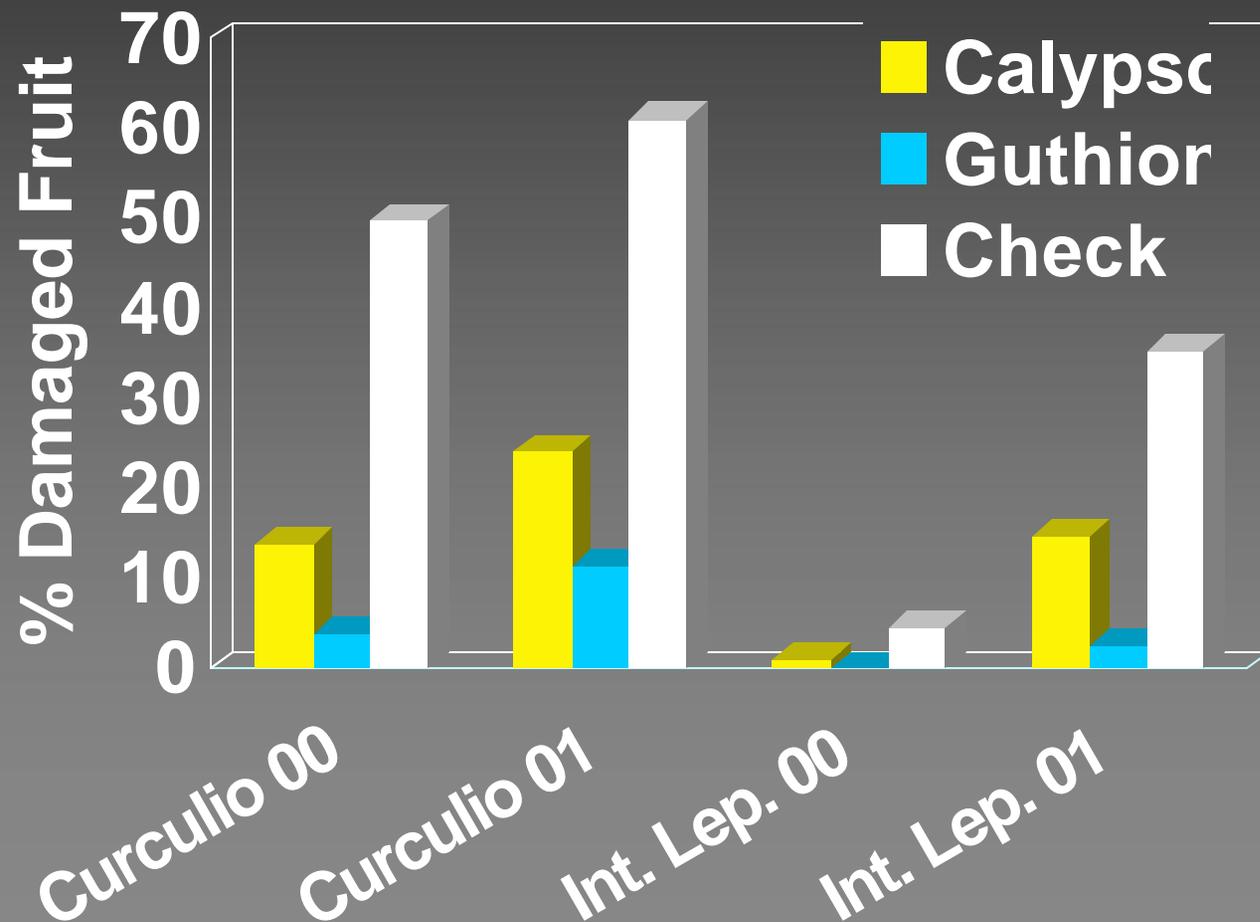


Rosy apple
aphid

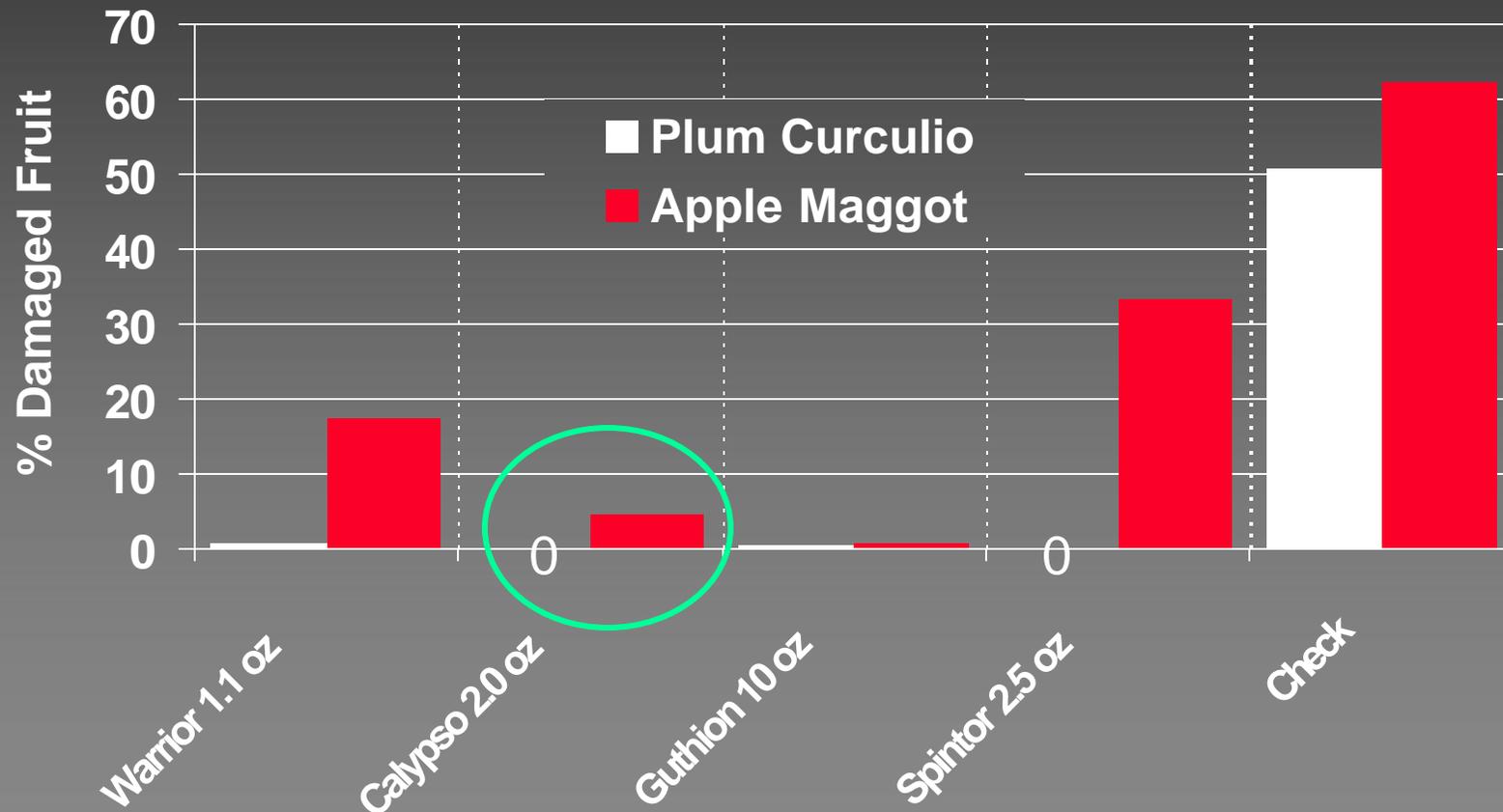


Obliquebanded
leafroller

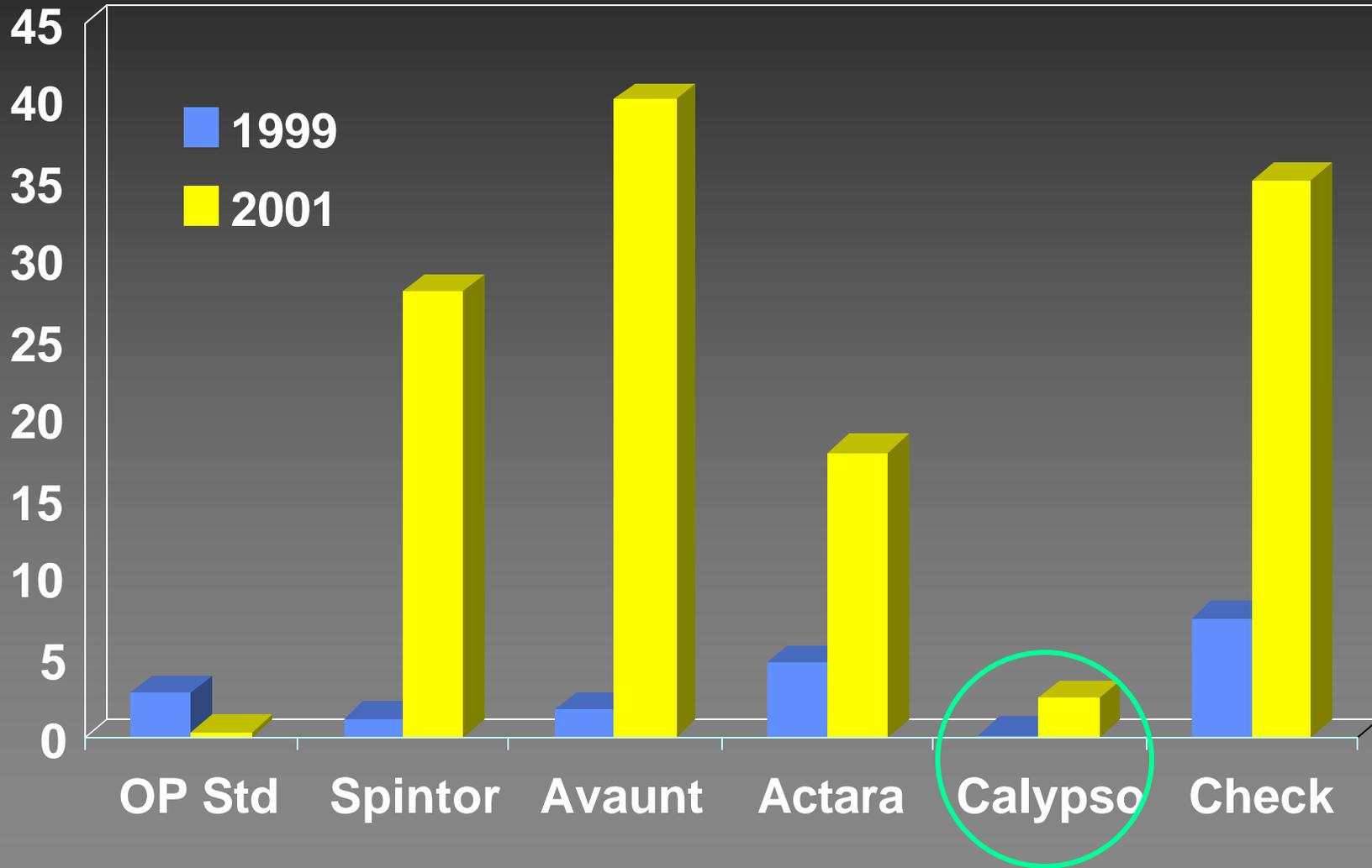
COMPARISON OF SEASONAL PROGRAMS OF CALYPSO & GUTHION AGAINST PC & INT. LEP. 2000-01, NY



COMPARISON OF EFFECTIVENESS OF CALYPSO & OTHER INSECTICIDES FOR APPLE MAGGOT AND PLUM CURCULIO, HV, 2002



% Damage at Harvest - Apple Maggot



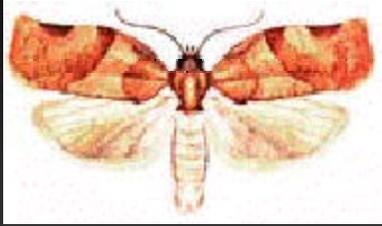
Delegate 25WG



Active Ingredient: Spinetoram

- New spinosyn, related to spinosad ('next generation')
- Translaminar activity
- Mode of action: contact and ingestion
- Affects insect nervous system, but works at a binding site not known to be shared by other insecticides
- Primary targets: **OBLR, Codling Moth, Oriental Fruit Moth**, Leafminers, European corn borer
- Secondary targets: Apple Maggot, Cherry Fruit Fly, Thrips, Pear Psylla (exception to sap-feeder inactivity)
- Labeled on apples & pears (7d PHI), stone fruit (1-14d PHI)
- EPA Reduced-Risk product, REI 4 hr
 - low impact on beneficial insects
 - does not flare mites or secondary pests
 - toxic to honey bees when sprayed directly, but 3-hr residues non-toxic

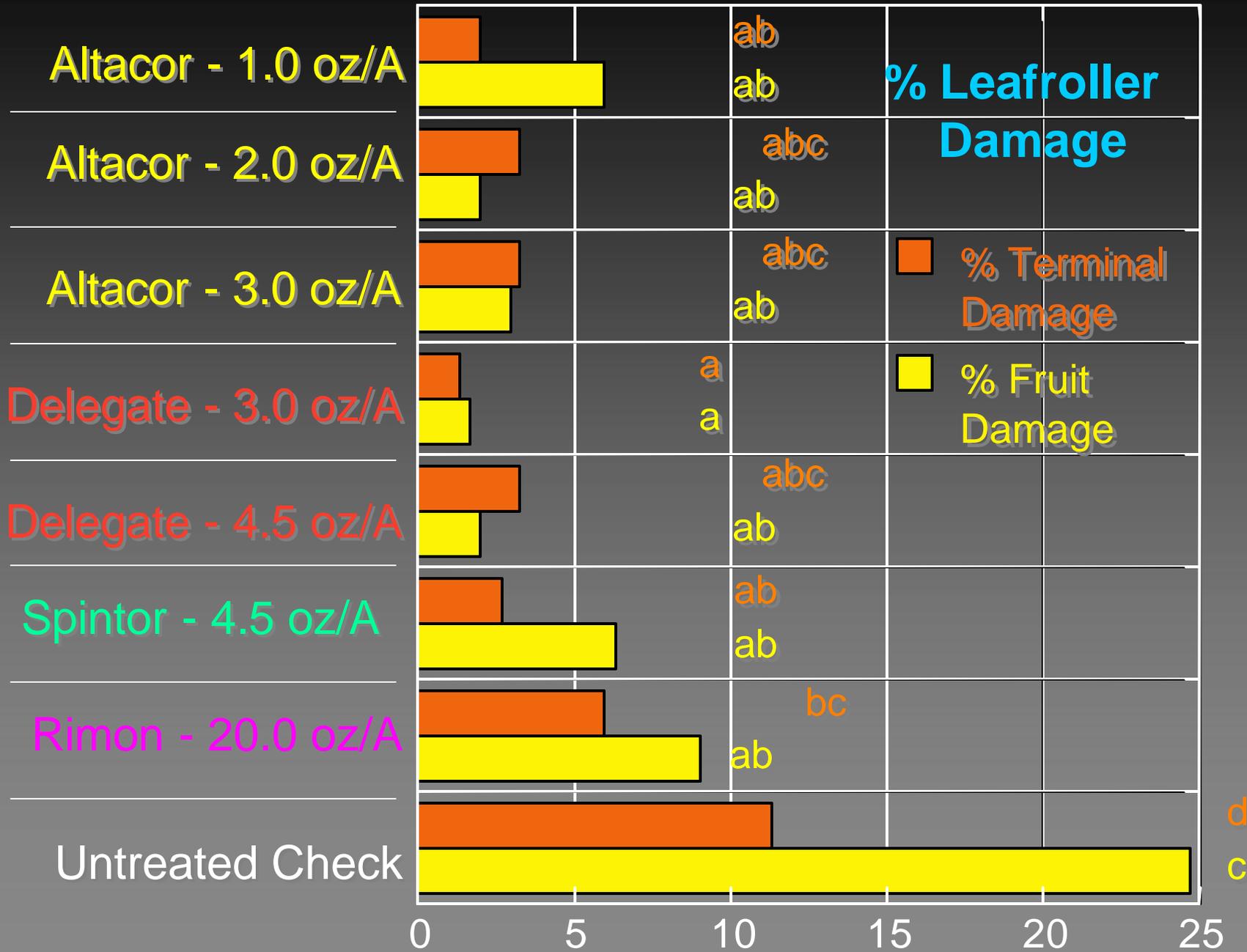




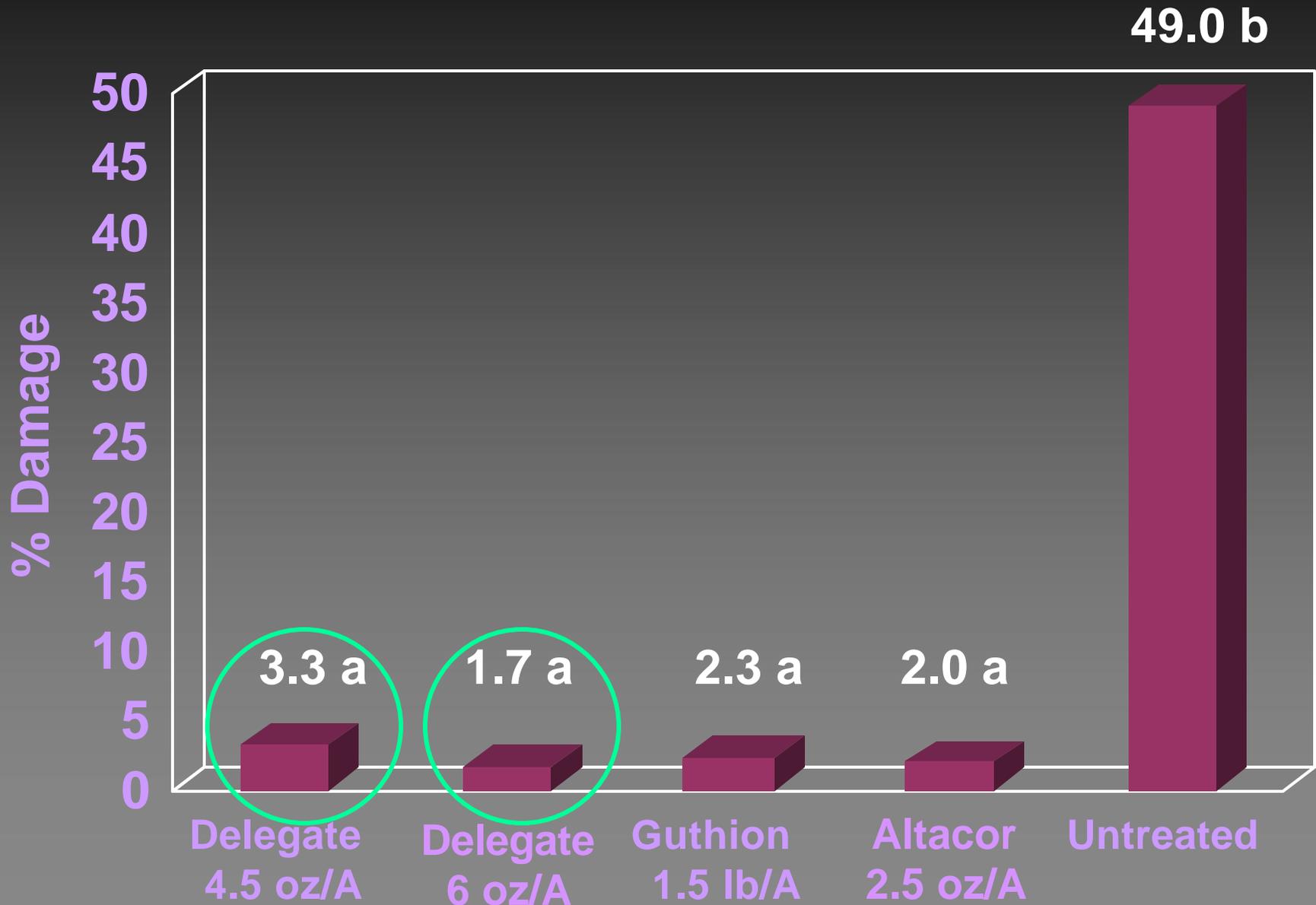
2006 Field Trials Obliquebanded Leafroller Management

(H. Reissig and D. Combs)

- 3-tree handgun treatments
- Cortland commercial orchard with history of high OBLR pressure
- Heavy pyrethroid use in the past
- Three applications: June 21 (1st hatch), July 6 (50% hatch) and July 24 (100% hatch)
- New chemistries tested: Altacor (DuPont), Delegate & Spintor (Dow), and Rimon (Chemtura)



Internal Worm Control With Delegate 25WG, 2007



Altacor 35WG



Active Ingredient: Rynaxypyr

- Novel anthranilic diamide insecticide
- Translaminar activity
- Primary mode of action: ingestion
- Affects insect ryanodine receptors (calcium regulation), causes paralysis
- Primary targets: Lepidoptera - **OBLR, Codling Moth, Oriental Fruit Moth**, European Apple Sawfly, Leafminers
- Registration anticipated on apples & pears April-May 2008, other crops to come
 - Short PHIs and REIs
- Favorable environmental profile
 - low impact on beneficial insects
 - does not flare mites or secondary pests
 - low toxicity to bees, birds, fish and mammals



Belt 480SC



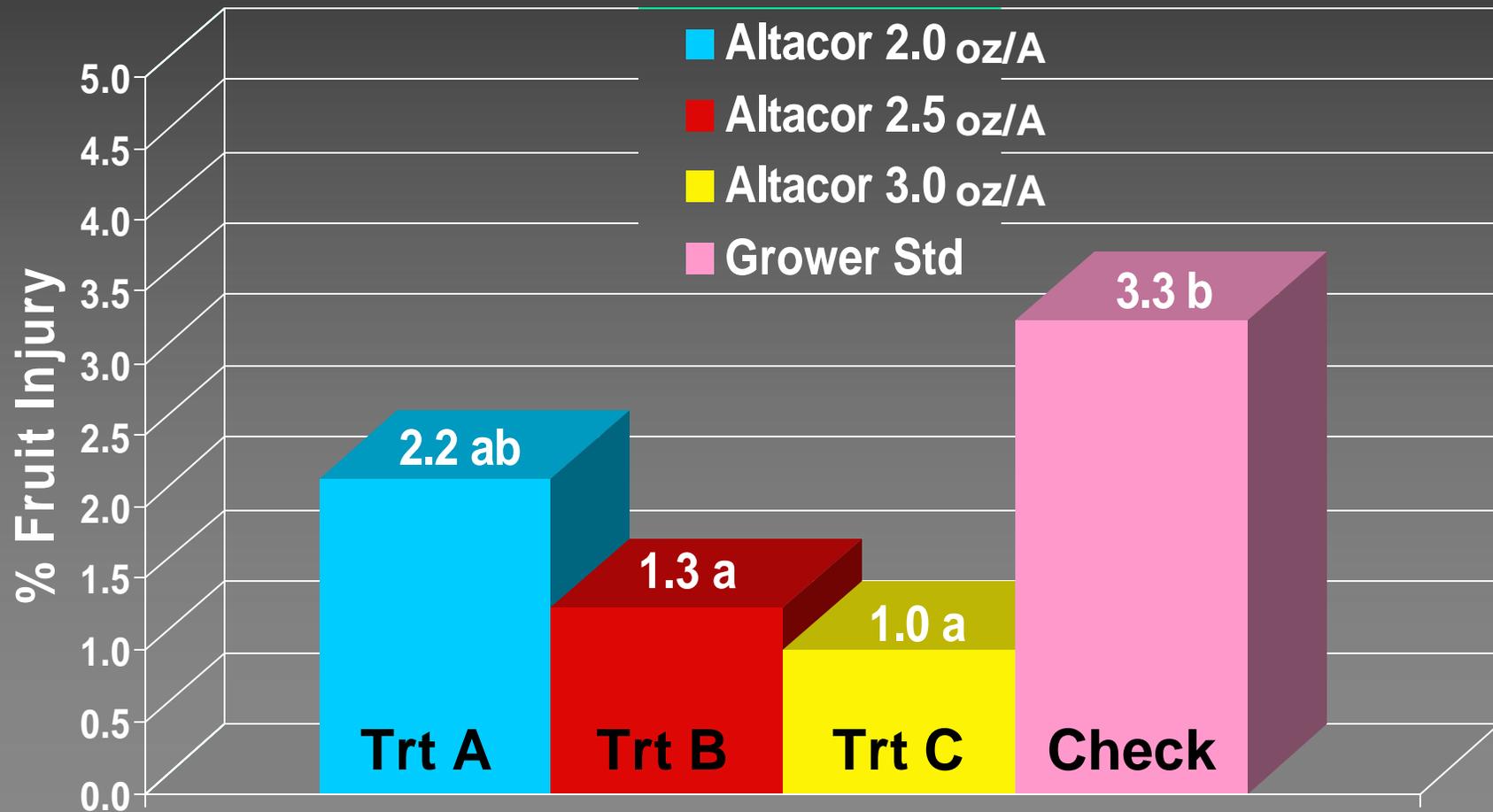
Active Ingredient: Flubendiamide

- Novel phthalic acid diamide insecticide
- Translaminar activity, strong rainfast characteristics
- Primary mode of action: ingestion
- Affects insect ryanodine receptors (calcium regulation), causes cessation of feeding, paralysis
- Primary targets: Lepidoptera - **OBLR, Codling Moth, Oriental Fruit Moth**, Leafminers
- Registration anticipated on apples & pears April-May 2008, other crops to come
 - Short PHIs and REIs
- Favorable environmental profile
 - minimal risk to beneficial insects, honey bees



Internal Lep Damage at Harvest with an Altacor Program, 2007

- Trts A, B, C: 3 Altacor sprays plus 1 Assail
- Check: 3 Calypso sprays plus 1 Assail



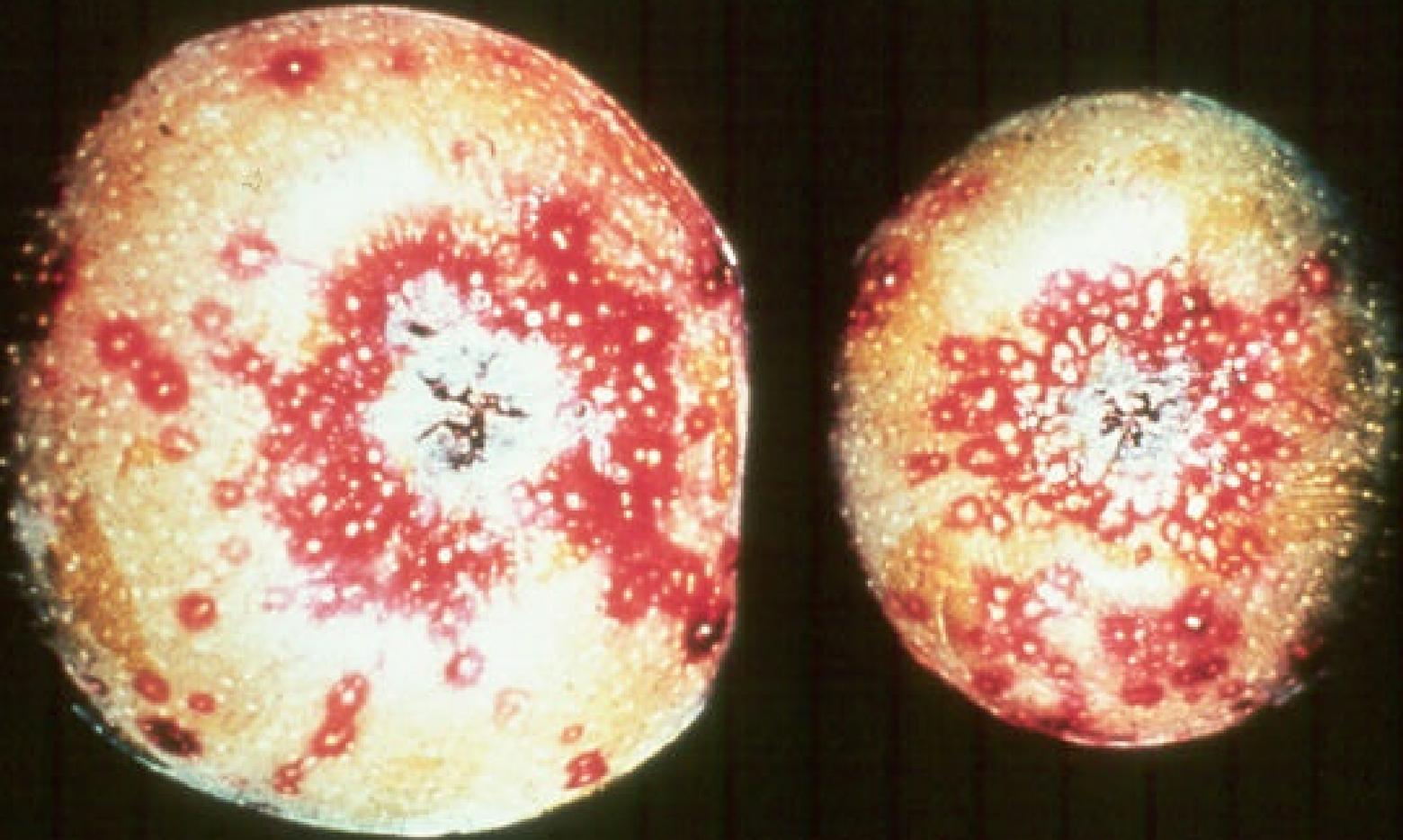
Movement 150SC



Active Ingredient: Spirotetramat

- Tetramic acid insecticide
- 2-way systemic activity, moves to all areas of the plant, including new shoot, leaf and root tissues
- Primary mode of action: ingestion
- Lipid biosynthesis inhibitor active against immatures; also, reduced egg-laying and offspring survival when adults treated
- Primary targets: sucking insect pests - **Scales, Aphids, Pear Psylla, Mealybugs, Thrips**
- Registration anticipated on apples & pears April-May 2008;
 - Short PHIs and REIs
- Favorable environmental profile
 - minimal risk to beneficial insects

For Control of San Jose Scale Ultror 150 SC



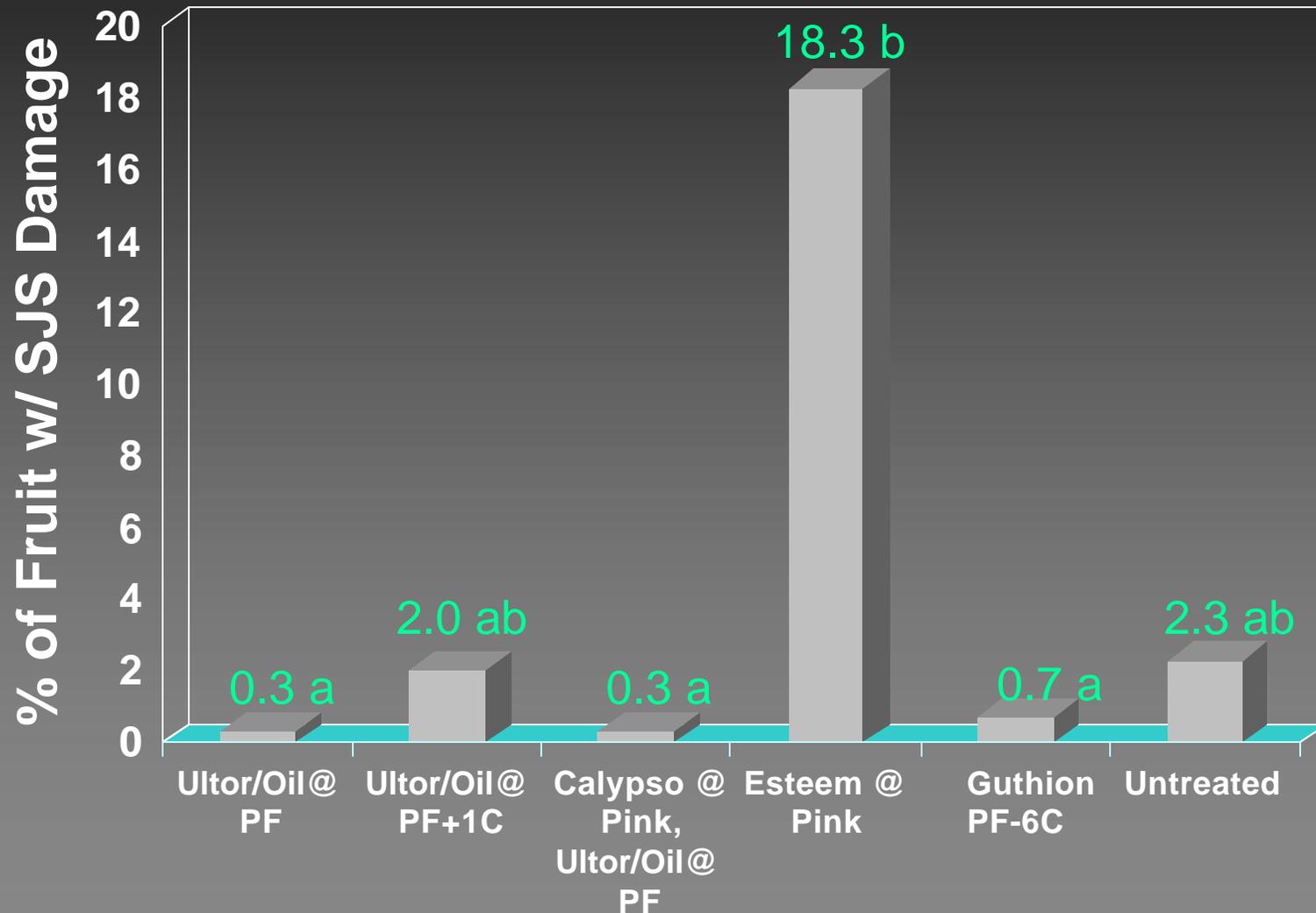
D. Combs & W.H. Reissig
NYSAES, Geneva



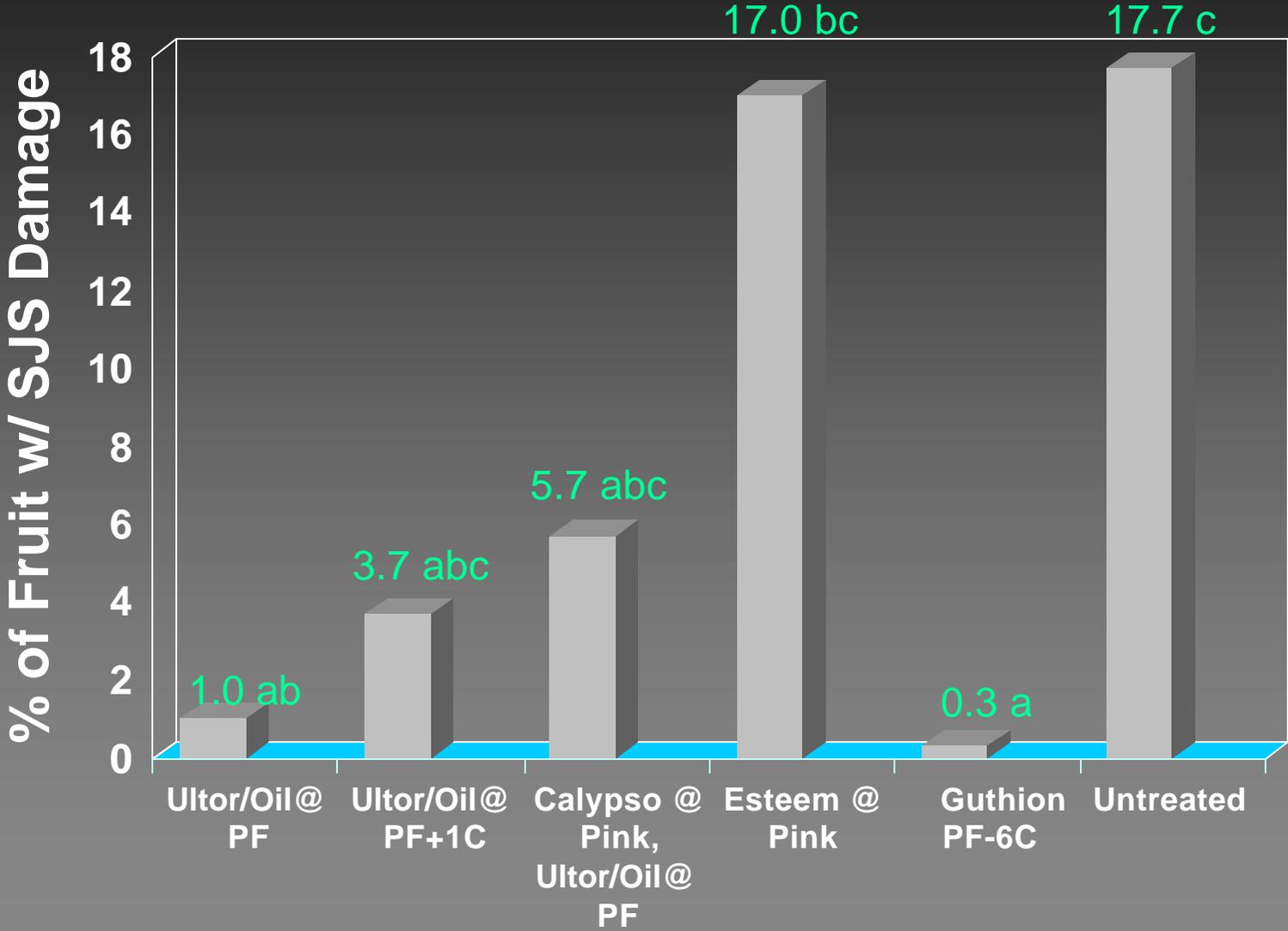
Treatments

1. Ultor 150SC 14.0 oz/A + 1.0% Oil @ Petal Fall
Belt 480 SC @ 2C-6C
2. Ultor 150SC 14.0 oz/A + 1.0% Oil @ Petal Fall + 1C
Belt 480 SC @ 2C-6C
3. Calypso 4F 3.0 oz/A @ Pink
Ultor 150SC 14.0 oz/A + 1.0% Oil @ Petal Fall
Belt 480 SC @ 2C-6C
4. Esteem 35WP 5.0 oz/A @ Pink
Belt 480 SC @ 2C-6C
5. Guthion 50WSP 1.5 lb/A @ Petal Fall-6C
6. Untreated Check

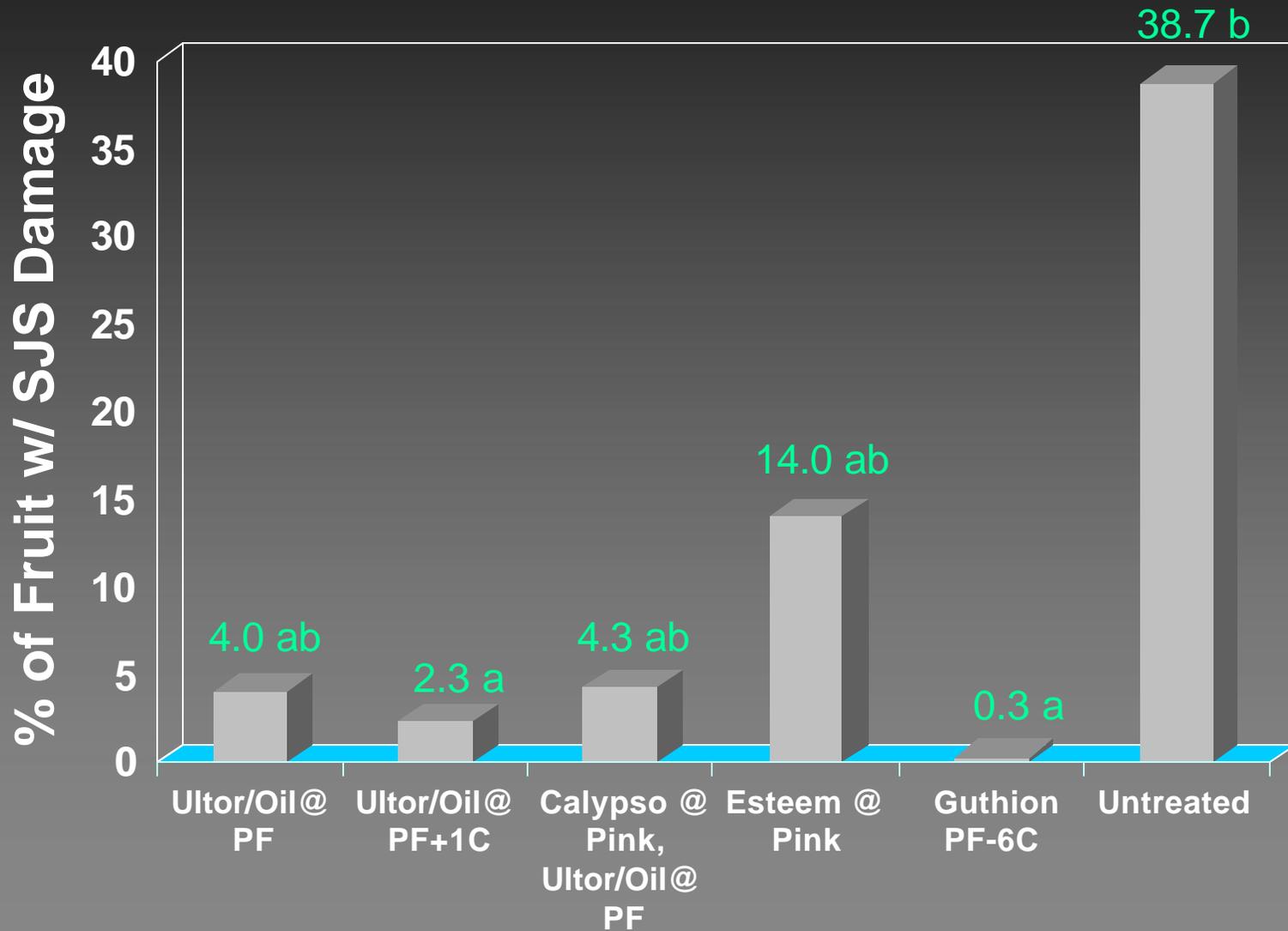
Damage from Over-Wintering SJS



Damage from SJS 1st Summer Gen



Damage from SJS at Harvest



Where is Ultor on the 'Scale Scale'?

- Heavy SJS pressure in test block: 2006 - trace levels, 2007 - uniform
- Ultor applied at PF or PF+1C, both with oil, provided excellent season long SJS control
- The addition of Calypso at pink did not improve efficacy against SJS
- No significant difference found between the 1 vs. 2 application programs on any of the sample dates
- Single applications of Ultor at PF out-performed the single application of Esteem at pink
- Damage counts are cumulative from previous generations; fruit drop and thinning accountable for #'s decreasing at harvest
- 7 applications of Guthion not typical
- No further applications made specifically against SJS for remainder of season

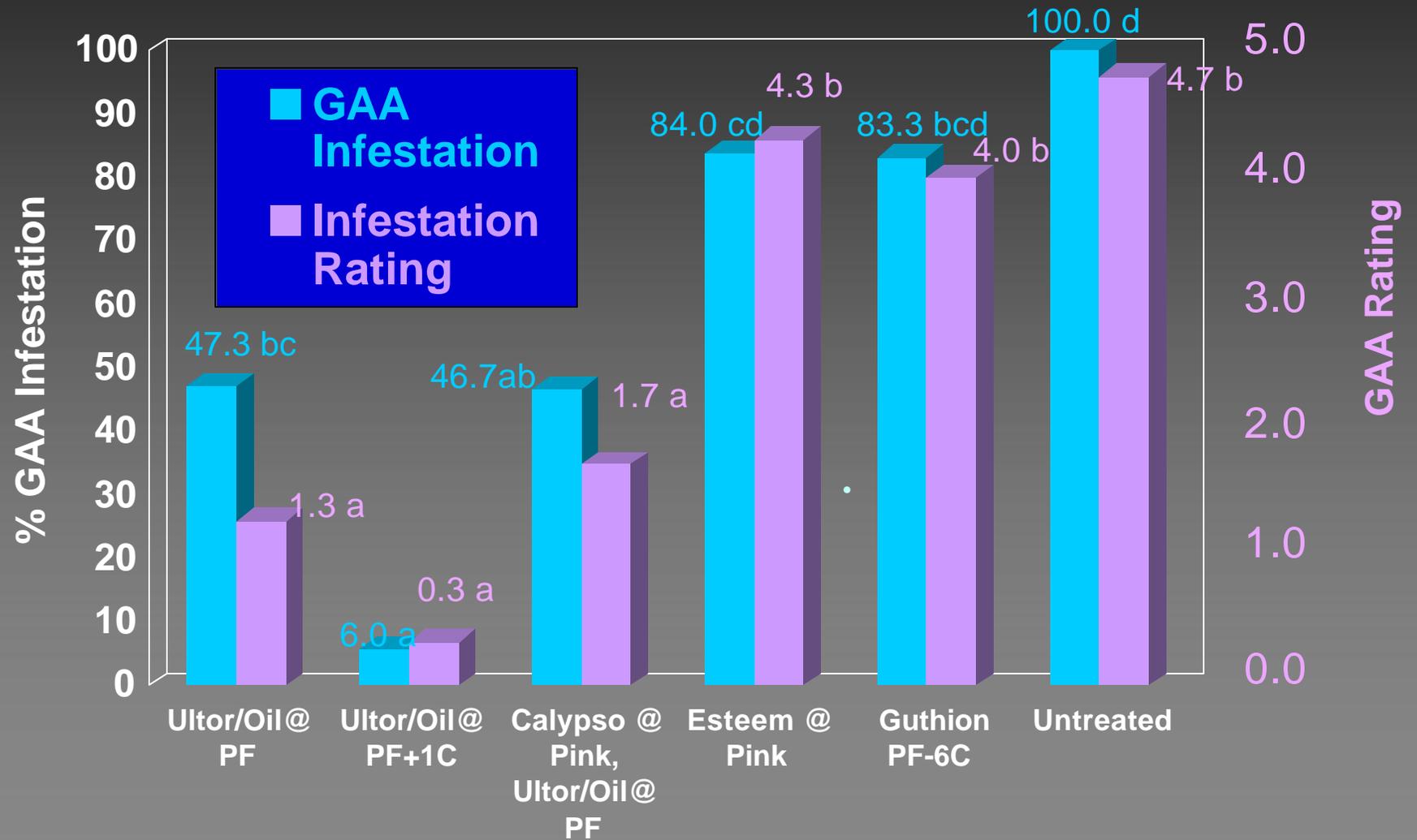
Ultor 150SC Against Green Apple Aphid

- Sporadic GAA infestation in test block over last several years; in 2007, uniformly high pressure throughout orchard
- GAA counted and rated on 29 Jun
 - 1 - % Terminal Infestation
 - 2 - Infestation Rating (# of GAA/terminal)
- Rating Key:

| | |
|-----------|-------------------|
| 0.0 | = 0/terminal |
| 1.0 - 1.9 | = 1-25/terminal |
| 2.0 - 2.9 | = 25-50/terminal |
| 3.0 - 3.9 | = 50-75/terminal |
| 4.0 - 4.9 | = 75-100/terminal |
| 5.0 | = 100+/terminal |



Green Apple Aphid Infestation and Rating



Utor 150SC Against Green Apple Aphid

- **Single applications of Utor+Oil reduced GAA colonies by half from the number found in the Esteem, Guthion and UTC plots**
- **2 applications of Utor+Oil had even better control and almost completely kept colonies from forming**
- **Infestations in all Utor plots were below 25 aphids/colony while the others were 75-100 aphids/colony**
- **No other materials were applied for GAA control**

Potential Seasonal Programs Using Reduced-Risk or OP-Replacement Products

Pink



- **Rosy Apple Aphid:** Actara, Assail, Calypso, (Movento)
- **Leafminers:** Actara, Altacor, Assail, Calypso

Petal Fall



- **Plum Curculio:** Actara, Avaunt, Calypso
- **Internal Leps:** Assail, Avaunt, Calypso, Delegate, Intrepid, Rimon, (Altacor, Belt)
- **OBLR:** B.t., Delegate, Intrepid, Proclaim, Rimon, (Altacor, Belt)
- **European Apple Sawfly:** Actara, Assail, Avaunt, Calypso, (Altacor)

Summer



- **Leafminers, Leafhoppers, Aphids:** Assail, Avaunt, Calypso, Provado, (Movento)
- **Internal Leps:** same as Petal Fall
- **OBLR:** same as Petal Fall
- **Apple Maggot:** Assail, Calypso, Delegate