



TOBACCO INSECTS

Tobacco In-Service Training
Gene Burgess
3-6-09



Black Cutworm

- **First larval stage**
 - Feed briefly on **foliage**, then move &
 - Feed on roots and **crowns** of plants
- **Second and third stage**
 - Feed at the soil surface mostly at night.
- **Wilted & cut plants** are visible indicators
- **Cutworm occurs:**
 - Following sod
 - Winter annual weeds
 - First along weedy margins
 - Damage scattered, rarely have to treat



Tob Field -- Cutworms



- Baits Dylox, Proxol ----- 5 Bait
- SPRAYS
 - Proxol 80SP ----- 20 oz/25 gals
 - Orthene 97PE ----- 1 ½ lb (24 oz) / A
 - Lorsban 4EC, 15G ----- 2-3 qts / A, 13.5-20 lbs / A
 - Warrior 1CS ----- 1.92 – 3.84 fl oz / A
 - Karate 2.08CS ----- 0.96-1.92 oz / A
 - Capture 2EC ----- 2.56-6.4 fl oz / A
- Tray Dr Admire Pro4.6 (suppress) -- 0.8-1.2 oz./1000 plts
- TPW Capture 2EC ----- 4.0-6.4 fl oz / A
- PPI Mocap 15G ----- 13 lbs / A
- Capture 2EC ----- 0.0624 – 0.1 lb ai / A

Insecticides for cutworms

- **Cutworms** (Control = Range from Poor to Good)
 - ***Foliar treatments late in the afternoon:**
 - ***Good:** Orthene, Capture*
 - **Poor-Fair:** Assail
 - **Preplant soil treatments:**
 - **Fair to Good:** Capture*, Lorsban, Lorsban Advanced*, Mocap
 - **Transplant water treatments:**
 - **Fair to Good:** Orthene, Capture*
 - **Poor to fair:** Admire Pro??

Wireworms

- Tobacco wireworm & the southern potato wireworm occur throughout the south
- Major soil insect attacking tobacco
- Most destructive to newly transplanted tobacco
- First sign of problem is
 - stunting and uneven stand



Wireworms



Major soil insect

Occurs in tobacco following sod is damaged

Plants stunt & wilt & die

Cut off underground stems & roots



Wireworm
Larva
Tunneling in
Underground
Part of the
Stem



Wireworms - Tray, Drench, PTPlt

- Platinum 2SC TD/TPW 1.3 fl oz / 1000 plts
- Admire Pro 4.6SC TD/TPW 0.6–1.2 fl oz / 1000 plts
- Capture 2EC TPW/PPI 4.0-6.4 oz/A
- Di-Syston 15 G PPI 13.3-26.7 lbs
- Mocap 10G, 6EC PPI 20 lbs, 1/3 gal
- Lorsban 15G PPI 13.5-20 lbs
- Lorsban 4EC PPI 2qts to 1qt/A
- Lorsban Advanced 3.755 EC PPI 2pts/A

Lorsban 4E / Lorsban Advanced 3.755 EW (Emulsion in Water)

- **Controls** wireworms, cutworms & other soil insects
- **Lorsban Advanced 3.755 EW** (Emulsion in Water) replaced Lorsban 4E as of Jan '09
- **Labeled rate decreased** from 2 quarts/acre to 1 quart/acre
- Used to control pests in same way as Lorsban 4E

Lorsban 4E / Lorsban Advanced 3.755 EW (Emulsion in Water)

■ Lorsban Advanced

- Water-based formulation
- Emits fewer volatile organic compounds (VOC) & has less odor

■ Lorsban 4E

- Emulsifiable concentrate
- Contains a liquid a.i. &
- One or more petroleum-based solvents (which give EC formulations their strong odor)

Insecticides for wireworms

- **Wireworms: (Controls fair to good)**
 - **PPI:**
 - **Fair-Good:** Capture*, Lorsban, Lorsban Advanced*, Mocap
 - **Tray drench treatment:**
 - **Fair to Good:** Admire Pro, Platinum
 - **Transplant water**
 - **Poor to fair:** Orthene
 - **Fair to good:** Admire Pro, Capture*, Platinum

Flea Beetles

■ Larvae

- Feed 4-5 weeks on plant roots
- Cuts off small roots & sometimes tunnel into the stalk

■ Adults

- Attack plants in seed bed
- Feed on plants when set & damage throughout growing season
- Weaken plant, devalue leaf



Flea Beetles / Black Shank Res Data Indicates



- Feeding by adult and larval flea beetles appears to increase plant susceptibility to black shank.
- Wireworms and nematodes are probably also important.
- Admire tray drench treatment
 - alone and in
 - combination with two applications of Ridomil Gold
 - reduced incidence of black shank in susceptible varieties of flue-cured tobacco.

**Plots treated with Admire applied as a tray drench treatment and the untreated check,
130 days after transplanting, 2005.**



Tob Fields – Flea Beetles



EARLY SEASON FB CONTROL

- Platinum 2SC (thiamethoxam, N) 0.8-1.3 fl oz/1000plts **Tray Drench**
- Orthene 97PE (acephate, OP) 1 ½ lb (24 oz) **TPW**
- Admire Pro 4.6 SC (imidacloprid, N) 0.5/0.6 fl oz /1000plts **TD/TPW**
- Capture 2EC (bifenthrin, P) 4.0-6.4 oz/A **PPI / TPW**
- Belay 16 WSG (clothianidin, N) 5-10 oz/A **TPW or TD**
- Vydate 2L 1 ¾ pts/7900 plants/A **TPW**
- **Lorsban 3.755EW Ad. (chlorpyrifos, OP) 2 pt/A **PPI****

Tob Fields – Flea Beetles



DURING SEASON FB TREATMENTS

■ Orthene 97PE (acephate, OP)	1 lb (16 oz)	Foliar
■ Warrior 1CS (lambdacyhalothrin, P)	1.92-3.84 fl oz /A	Foliar
■ Actara -- 25WG (thiamethoxam, N)	2-3 oz/A	Foliar
■ Provado 1.6F (imidacloprid, N)	4 oz/A	Foliar
■ Belay 50 WDG (clothianidin, N)	1.5-2.0oz/A	Foliar
■ Nuprid 1.6F (imidacloprid, N)	4 oz/A	Foliar
■ Capture 2EC (bifenthrin, P)	2.56-6.4 oz/A	Foliar
■ Lannate 90SP (methomyl,)	¼ - 1 ½ pts/A	Foliar
■ Lannate 2.4LV	¾ - 1 ½ pts / A	Foliar
■ Karata 2.08CS (lambda-cyhalothrin)	0.96 – 1.92 fl oz / A	Foliar
■ Sevin 80SP (carbaryl)	1 ¼ - 2 ½ lbs/A	Foliar
■ Sevin , XLR Plus	1/0 – 2..0 qts / A	Foliar
■ Supracide 2EC	2-3 pts/25 gals	Foliar

Flea Beetle Control



■ Spraying Notes

- Large plants – use higher rates
- Thoroughly cover the lower leaves with spray

Insecticide for tobacco flea beetles

■ Seedling tray drench applications

- ★ ■ Good to Excellent: Admire Pro, Platinum

■ Transplant water treatments

- Fair to Good: Admire Pro, Capture, Orthene, Platinum

■ Foliar sprays

- Good: Orthene, Actara, Assail, Provado, Lannate

Tobacco Aphid

Green

Green + Red

Green + Red + Orange



■ ID Characteristics

- Small, soft-bodied, smooth-looking aphid
- Pair of cornicles (tailpipe-like appendages)

■ Red Form -- first occurred on tobacco in 1986

■ Red Form VS Green Form:

- RF more tolerant of high temperatures
- RF more resistant to several insecticides than green form
 - Developing resistance – major concern
- RF reproductive rate faster than green form in hot weather

Orange form of tob aphid 2007



Red form of tobacco aphid



Orange form of tobacco aphid

Appeared in
VA in '98,
'06 & '07

Appeared in
NC

The **orange form** of the tobacco aphid is **more resistant** to Orthene and Lannate than the red and green forms.

Color Morphs of the Tobacco-Adapted Form of the Green Peach Aphid



Orange



Orange Form



Red



Green Form

Tobacco Aphid



- Colonize - Clusters on underside of leaves
- Build up in a short time
- Several generations per year

- Suck plant juices, making the leaves thin and light in weight
- Transmit viruses —
 - Tobacco etch & potato virus Y (PVY)
- Ripens prematurely

Tobacco Aphid



- Deposit honeydew on leaves
 - A sweet, sticky substance
- Black sooty mold, fungus, develop on the honeydew
- Poor quality off color, leaves stick together
- Dead areas at the base of the leaves
- Improper curing results

Black Sooty Mold Started



Tobacco Aphid



Tobacco Aphid



- **With 6 to 8 weeks** of sap removal
 - Tob aphids can reduce yields by 300 to 500 pounds / A
- **Late control applications** – **NO! NO! NO! NO!**
 - Generally produce unsatisfactory results & the yield losses have already occurred
- **Most Effective aphid control**
 - Must begin as small colonies or clusters of aphid are seen on the upper leaves of 10% of the plants in the field

Rating of insecticides applied as greenhouse tray drench, soil, and transplant water treatments for aphid and flea beetle control on flue-cured tobacco. (PSemtner)



<i>Insecticide</i>	<i>Application method</i>	<i>Leaf feeding insects</i>	
		<i>Aphids</i>	<i>Flea beetles</i>
★ <i>Admire</i>	★ <i>TD</i>	★ <i>5</i>	★ <i>4</i>
★ <i>Admire</i>	<i>TW</i>	★ <i>5</i>	<i>2</i>
<i>Temik</i>	<i>Band</i>	<i>3</i>	<i>2</i>
<i>Lorsban</i>	<i>PPI</i>	<i>0</i>	<i>2</i>
<i>Mocap</i>	<i>PPI</i>	<i>0</i>	<i>2</i>
<i>Orthene</i>	<i>TW</i>	<i>2</i>	<i>3</i>
★ <i>Platinum/TMOXX</i>	★ <i>TD</i>	★ <i>5</i>	★ <i>4</i>
★ <i>Platinum/TMOXX</i>	<i>TW</i>	★ <i>5</i>	<i>3</i>

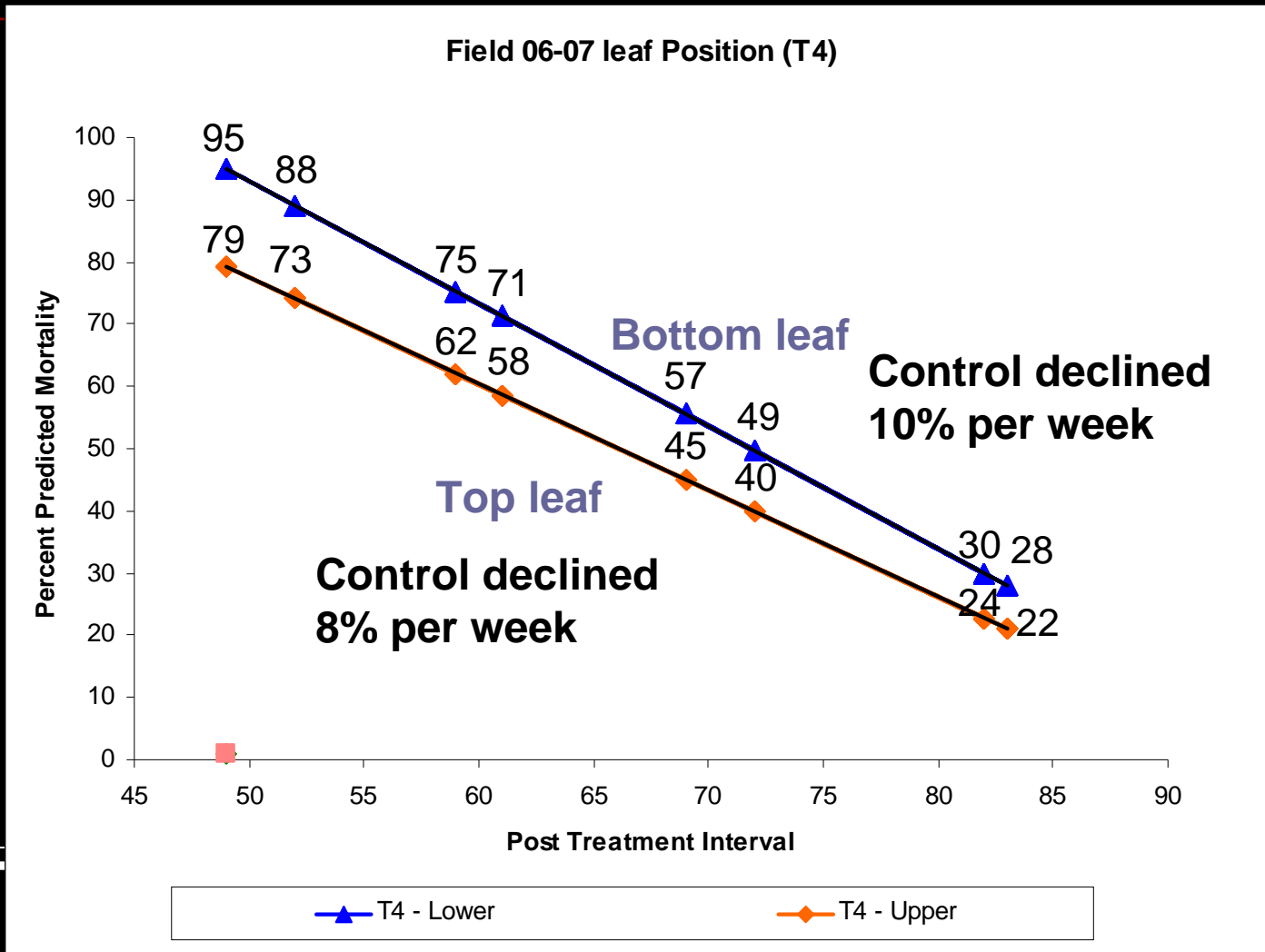
Rating of FOLIAR insecticides for control of aphids, flea beetles and grasshoppers on tobacco.



<u>Insecticide</u>	<u>Aphids</u>	<u>Flea beetles</u>	<u>Grasshoppers</u>
Actara (thiamethoxam, N)	★4	3	0
Assail (acetamiprid, N)	★4	2	0
Fulfill (pymetrozine)	3	0	0
Lannate (methomyl, C)	2	3	0
Orthene (acephate, OP)	★4	3	★4
Provado/Nuprid/ (Pasada (imidacloprid, N)	★4	3	0
Sevin (carbaryl, C)	0	3	3
Tracer (spinosad, SB)	0	2	0
Thiodan (endosulfan, CH)	3	3	0
Warrior (lambda-chyalthrin, P)	1	★4	3

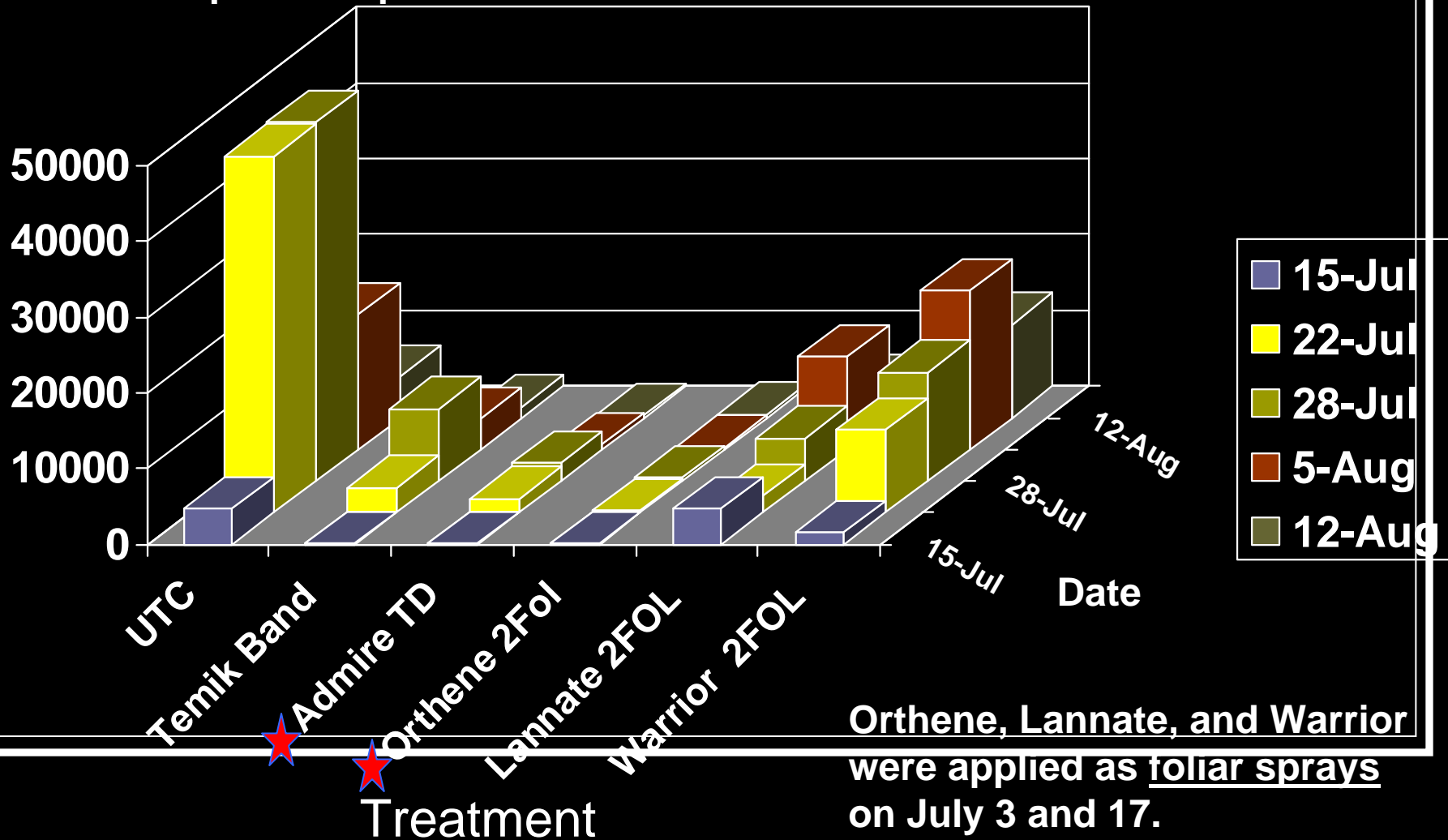
0 = not labeled or no control; 5 = excellent control

Mortality over time for tobacco aphids reared on leaf disks from field grown flue-cured tobacco treated with Admire 2F applied as a tray drench at 1.4 fl oz/1,000 plants.



APHID control on flue cured tobacco with various insecticides, 2008

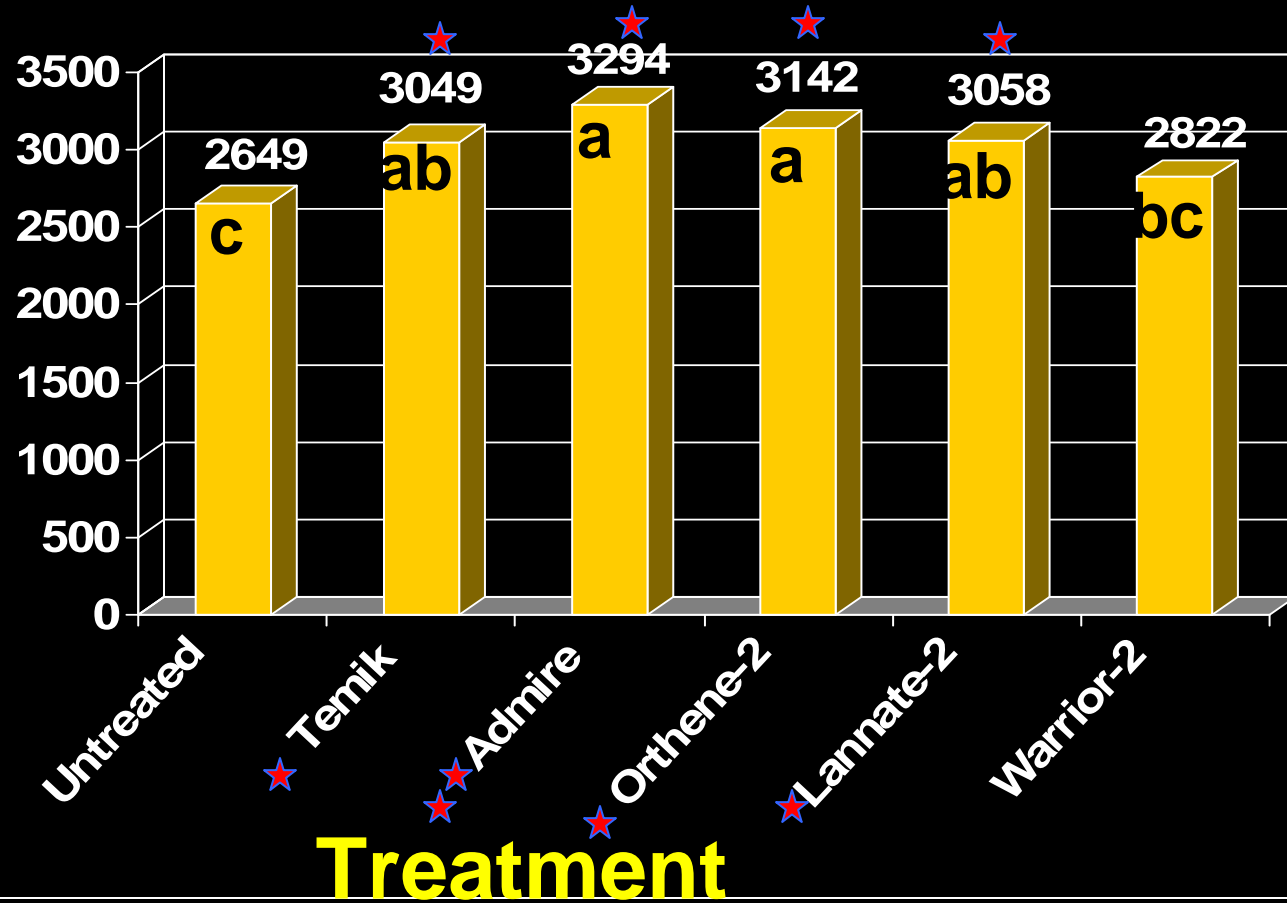
Aphids/10 plants



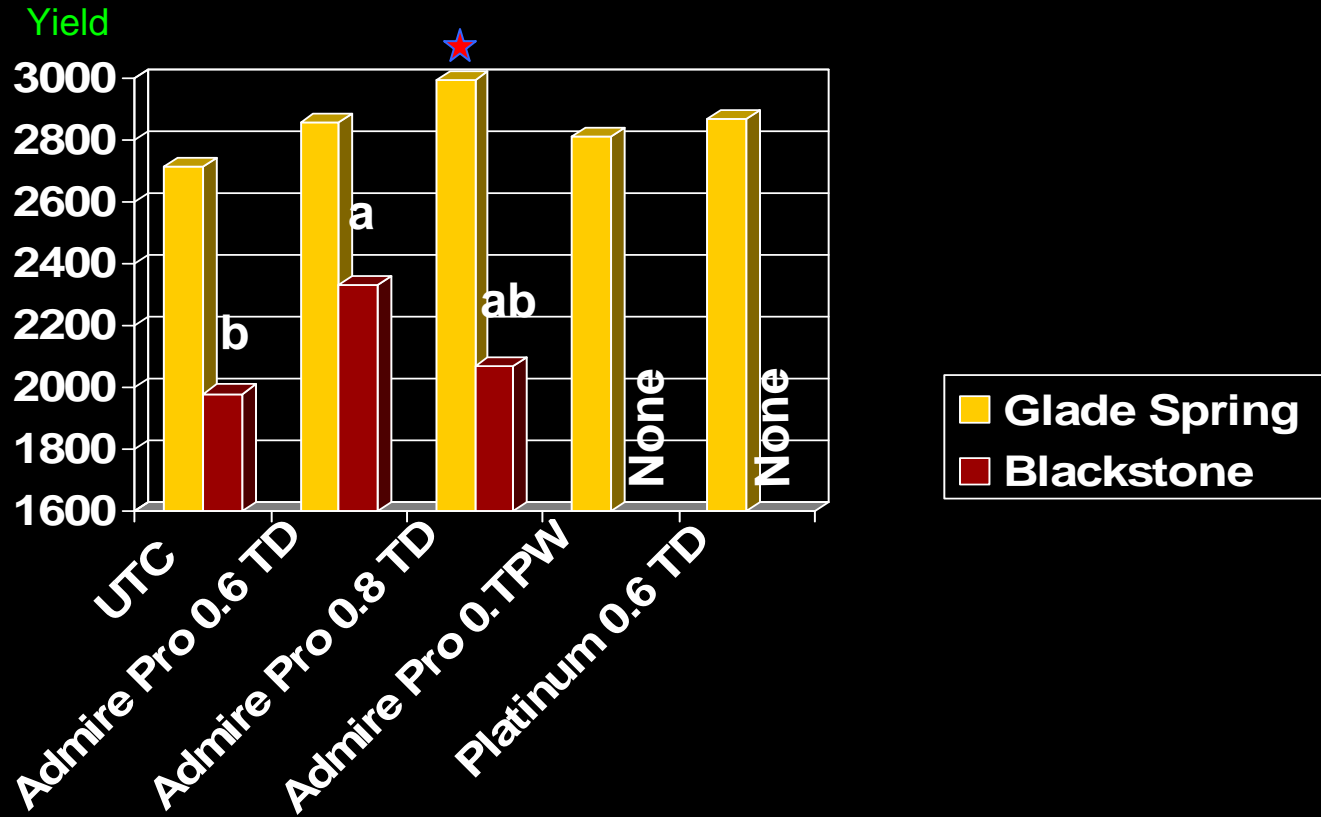
Orthene, Lannate, and Warrior were applied as foliar sprays on July 3 and 17.

Influence of insecticide treatment for aphid control on the YIELD of flue-cured tobacco, 2008

Yield (lb/acre)



Yield of Burley Tobacco treated with Admire Pro and Plantinum for aphid and flea beetle control, 2008



Tobacco Field -- Aphids



- **Platinum 2SC** (thiamethoxam, N) 0.5-1.3 fl oz / 1000 plts **Tray Drench/TPW**
- **Admire Pro 4.6SC** (imidacloprid, N) 0.5/0.6 fl oz / 1000 plts **Tray Drench/TPW**
- **Orthene 97PE** (acephate, OP) Burley 1½ lb (2 Cans) **TPW, Foliar**
- **Belay 16 WSG** (clothianidin, N) 10 oz/A **TPW, TD**

- **Di-Syston 15G** (disulfoton, OP) 3.3-26.7 lbs **Soil Incorporate Pre-Transplant**

Tobacco Field -- Aphids

■ Fulfill 50WDG (pymetrozine)	2.75 oz / A	Foliar
■ Warrior 1CS (lambda-cyhalothrin, P)	1.92-3.84 fl oz / A	Suppression Only! Foliar
■ Assail 70WP (acetamiprid, N)	0.6-1.7 oz/A	Foliar
■ Assail 30SG (acetamiprid, N)	1.5-4.0 oz/A	Foliar
■ Nuprid 1.6F (imidacloprid, N)	2-4 oz/A	Foliar
■ Capture 2EC (bifenthrin, P)	2.56-6.4 oz/A	Foliar
■ Belay 50WDG (Clothianidin, N)	1.5-2 oz/A	Foliar
■ Actara 25WDG (thiamethoxam, N)	2.0 – 3.0 oz / A	Foliar
■ Lannate 90SP, 2.4LV (methomyl)	½ lb / A, 1 ½ pt / A	Foliar
■ Provado 1.6F (imidacloprid)	2.0 – 4.0 fl oz / A	Foliar
■ Karate 2.08CS (lambda-cyhalothrin)	0.96 – 1.92 fl oz / A	Foliar
■ Malathion 57EC	2/3-1 1/3 qts/25 gals	Foliar

Generic brands of imidacloprid and thiamethoxam

- **Imidacloprid (Admire 2F)**-Several generic brands may be available
 - Alias 2F-Makhteshim Agan
 - Pasada 1.6F-Foliar treatment
 - Couraze 2F-Chemainova
 - Nuprid 2.0F and 1.6F foliar-NuFarm Americas
 - Others?
- **Thiamethoxam (Platinum 2SC)**
 - Platinum-rates similar to Admire Pro
 - TMOXX-rates similar to Admire Pro
 - Actara 25 WSG-Foliar treatment

Insecticide for tobacco aphids

■ Seedling tray drench applications

- Good to Excellent: Admire Pro, Platinum

■ Transplant water treatments

- Good to Excellent: Admire Pro, Platinum

■ Foliar sprays

- ★ ■ Excellent: Orthene, Actara, Assail, Provado
- Good: Fulfill
- Fair: Lannate

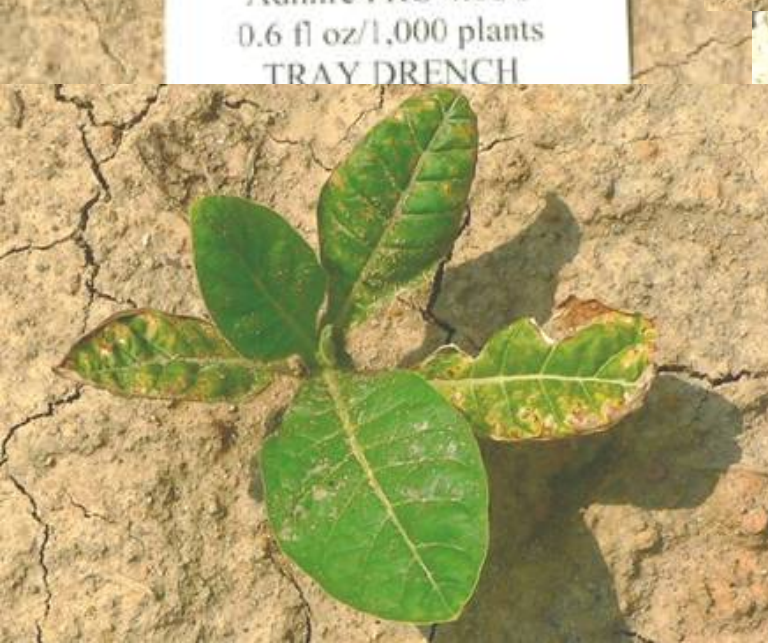
Phytotoxicity to tobacco treated with Admire Pro and other neonicotinoids



Admire PRO 4.6SC
0.6 fl oz/1,000 plants
TRAY DRENCH



Admire PRO 4.6SC
0.8 fl oz/1,000 plants
TRAY DRENCH



Causes of Admire Phytotoxicity

- Application rate
 - Too high, uneven distribution
- Application with other chemicals:
 - Actigard (fungicide) and others. Apply Admire Pro first, then apply the other chemicals.
- Waiting too long after tray drench application to transplant
 - The problem becomes worse over time in the trays.
- Bad weather
 - Hot, dry, windy conditions, very dry soils
- Transplant water treatment
 - May settle out.

Admire enhances maturity, tobacco grown on fumigated land, SPAREC, 2006.



Tobacco Budworm

Tobacco
Budworm
Eggs

White
Or
Cream
Color

Subspherical
With
A
Flattened
Base



Tobacco Budworm

Feeding in bud
Fecal pellets



Tunneling In Stalk
Will Also Tunnel In
Midrib Of Leaf



Tobacco Budworm

- Eggs laid near bud
- Larvae begin feeding in the unfolded leaflets
- *Leaves -- ragged or distorted
- *Bud may be destroyed
 - *Early sucker growth occurs
 - May cause plant stunting and greater difficulty in controlling suckers
 - Hard to control in bud

Tobacco Filed -- Budworms

■ Orthene 97PE (Acephate, OP)	$\frac{3}{4}$ lb/25 gals	Foliar
■ Denim 0.16EC (emamectin benzoate, SB)	8-12 fl oz / A	
■ Tracer (spinosad, SB)	1.4-2.9 oz/A	
■ Warrior (lambda-cyhalothrin, P) Suppression Only	1.92-3.84 fl oz / A	
■ Dylox 80SP (trichlorfon, OP)	20 oz/25 gals	
■ Dipel (Bt) 2XWP	10 – 25 lbs / A of bait	
■ Sevin 80SP (carbaryl, C)	1 $\frac{1}{4}$ - 2 $\frac{1}{4}$ lbs/25gals	
■ Lannate 2.4LV (methomyl, C)	$\frac{1}{2}$ lb/25 gals	
■ Belay 50WDG (clothianidin, N)	2 oz/A (suppression)	
■ Karata 2.08CS (lambda-cyhalothrin)	0.96 – 1.92 fl oz / A	
■ *Assail 30SG (acetamiprid)	1.5 – 2.5 oz / A	
■ *Assail 70WP	1.1 oz / A	
■ * Ovicide, Adulticide, Larvicide		

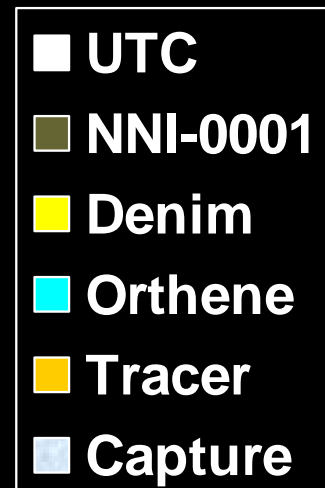
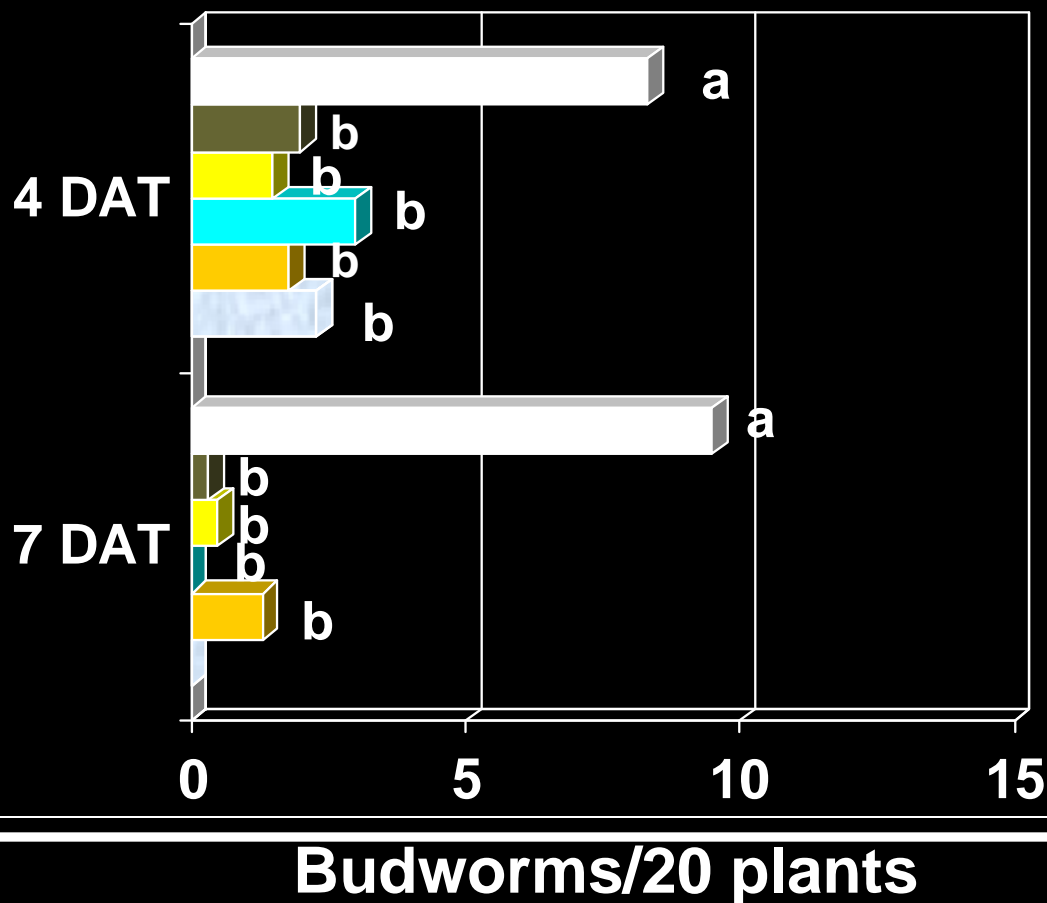
Tobacco Filed -- Budworms

■ New Labels

- **Belt 4SC** (flubendiamide)
 - 2.0 – 3.0 fl oz / A
 - 12 hrs REI
 - 14 dys PHI
- **Coragen 1.67 SC** (chlorantraniliprole)
 - Suspension Concentrate
 - 5.0 fl oz / A
 - 4 hrs REI
 - 1 dy PHI

Budworm control on flue-cured tobacco treated with various foliar insecticides, 2007 (PSemtner)

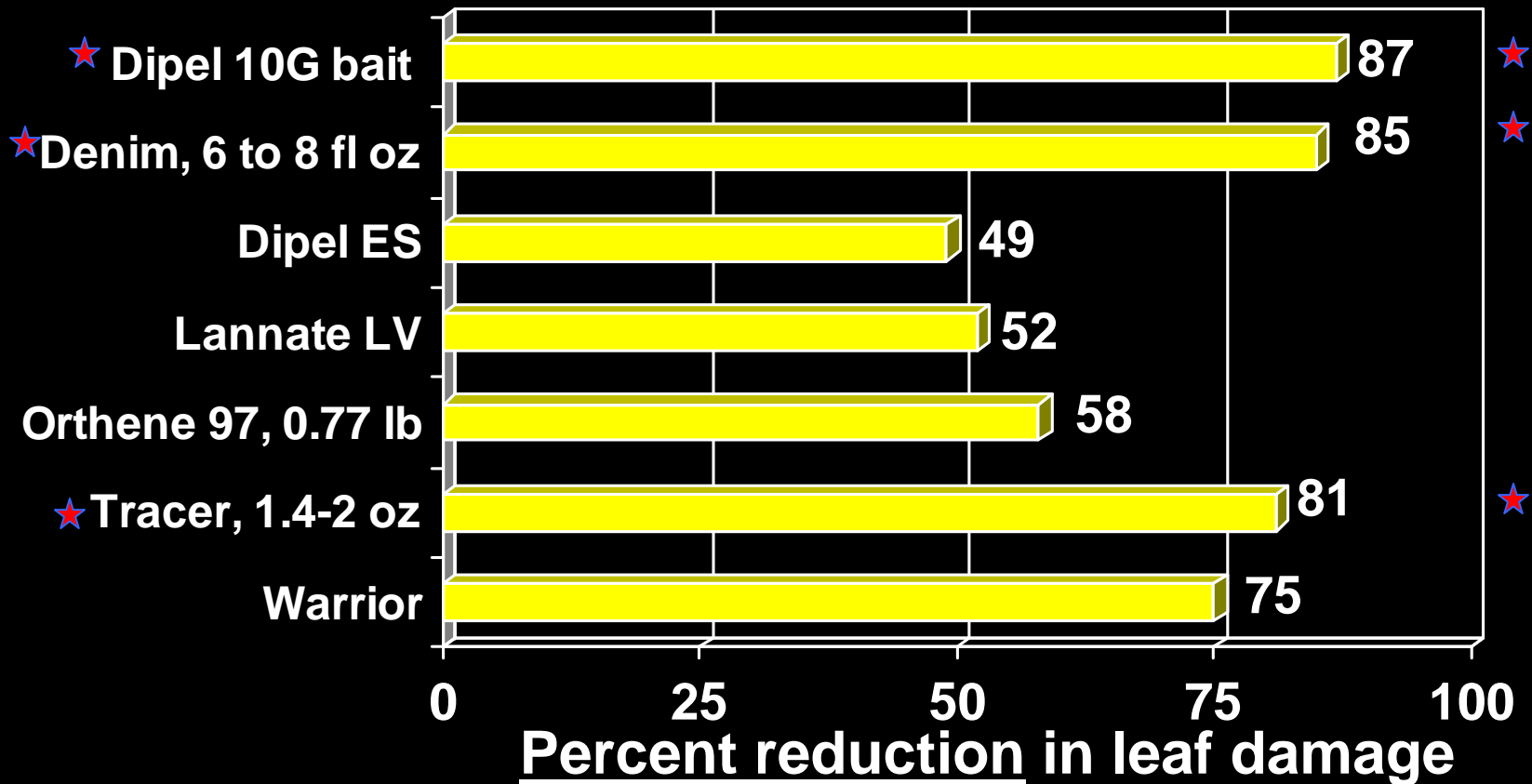
Treatments and days after treatment



All gave Significant Control

Reduction in leaf consumption by tobacco budworm, North Carolina, 1998-2004.

Treatment and rate



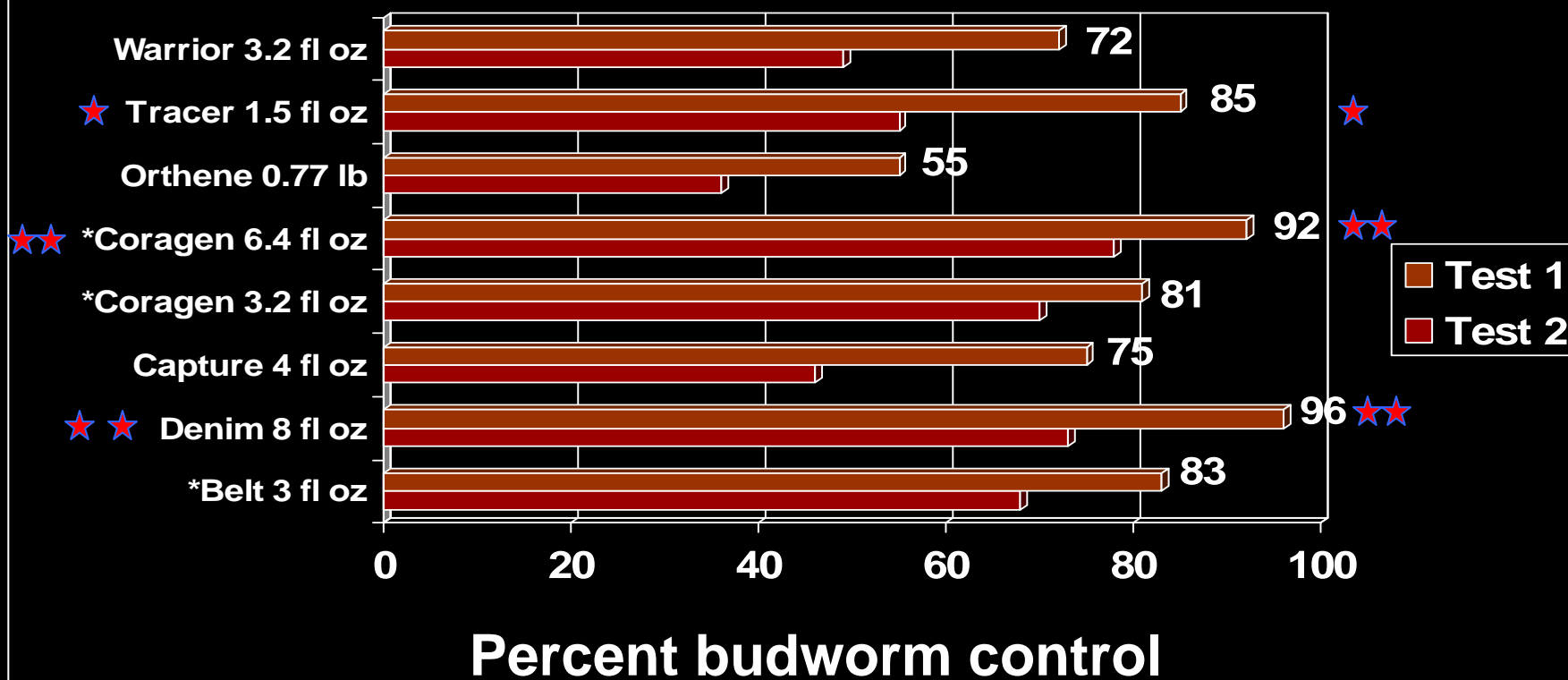
Rating of foliar insecticides for control of budworm, hornworm and cutworm control on tobacco. (PSemtner)

<i>Insecticide</i>	<i>Budworm</i>	<i>Hornworm</i>	<i>Cutworm</i>
Belay, Assail	1-2	2-3	0
Bt (Dipel, etc)	2	★5	0
Denim	★4	★5	0
Lannate	3	★5	0
Orthene	3	★5	★4
Sevin	2	4	3
Capture	3	★5	3
Tracer	★4	★5	0
Warrior	3	★5	3

0 = not labeled or no control; 5 = excellent control

Tobacco budworm control on flue-cured tobacco, Blackstone, Virginia, 2008

Insecticide



Belt 4SC: Flubendiamide

- **Company: Bayer CropSciences**
- **Chemical class: benzene dicarboxamides (phthalic acid diamide)**
- **Labeled for tobacco: August 2008**
- **Controls budworms and hornworms**
- **Unique mode of action**
 - Paralyzes insects' muscles
 - Insects stop feeding immediately
 - Ovi-larvicidal activity
- **Labeled rates: 2.0 to 3.0 fl oz per acre**



Belt 4SC: Flubendiamide

- **Excellent residual control**
 - 21-day residual control of tobacco hornworms, similar to Capture
- **Budworm control similar to Tracer**
- **12-hour reentry interval**
- **14 day preharvest interval**
- **Excellent worker safety**
- **Limited impact on beneficial arthropods**

Coragen/Rynaxypyr Chlorantraniliprole

- **DuPont 24C label in TN**
- **Chem Class – Anthranilic diamide**
- **Application Rate: 5 fl oz/A**
- **Insects controlled: Hornworms & budworms**
- **Similar mode of action as belt (muscle paralysis)**
- **Long-lasting control**
- **REI: 4 hours**
- **PHI: 1 day**
- **Control caterpillars when injected through drip irrigation systems**

Insecticides for budworm control

- ★ ■ Very Good: Belt*, Denim, Tracer, Coragen*
- **Fair:** Lannate, Orthene, Bt
- **Poor:** Assail

Tobacco Hornworm

Tomato Hornworm

Curved red horn



Straight black horn



Tobacco Hornworm Fecal Pellets, Larva & Damage



Tobacco Hornworm

- Generations -- 2 ½ gen / year
- Early generations
 - Potentially damaging to marketable tobacco (June & Aug)
- Later generations
 - Feed after harvest on noncommercial suckers
- Last generation important – produce OW pupae
- Pupae enter diapause after 2nd wk of Aug
- Turn up soil after harvest – destroys pupae

Hornworms on burley tobacco in the curing barn



1. Very high populations of hornworms can develop on burley tobacco in the curing barn.
2. Check tobacco before harvesting for both hornworm and hornworm eggs.
3. If exceed one worm, an inch or longer per 10 plants, apply Dipel or another Bt to control them.

Tobacco Field -- Hornworms

■ Orthene 97PE	½ lb / A	Spray
■ Denim .16 EC	8-12 fl oz / A	Spray
■ Warrior	1.92-3.84 fl oz / A	Spray
■ Tracer	1.4-2.9 oz/A	Spray
■ Dylox	2 oz/25 gals	Spray
■ Dipel (Bt)		Spray
■ Belay 50WDG (clothianidin) (Suppression)	1.5-2oz/A	Spray
■ Karata 2.08CS	0.96 – 1.92 fl oz / A	Spray
■ Lannate 90SP	¼ - ½ lb / A	Spray
■ Lannate 2.4 LV	¾ - 1 ½ pt / A	Spray
■ Belt 4SC (flubendiamide)	2.0 – 3.0 fl oz / A	Spray
■ Coragen 1.65SC(chlorantraniliprole)	5.0 fl oz / A	Spray

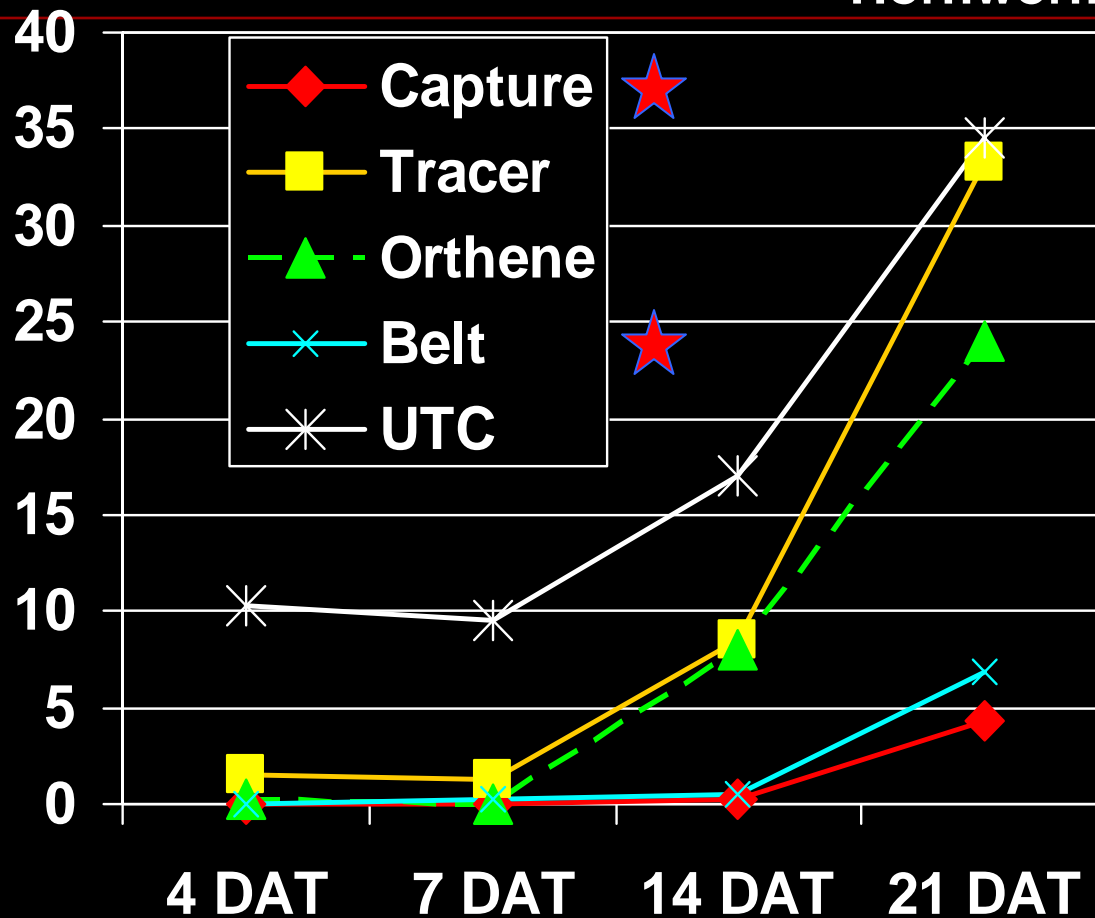
Rating of foliar insecticides for control of budworm, hornworm, and cutworm control on tobacco. (PSemtner)

Insecticide	Budworm	Hornworm	Cutworm
Bt (Dipel, etc)	2	★ 5	0
Denim _(emamectin benzoate)	★ 4	★ 5	0
Lannate	3	★ 5	0
Orthene/A97UP	3	★ 5	★ 4
Sevin	3	4	3
Thiodan	3	★ 5	0
Tracer	★ 4	★ 5	0
Warrior	3	★ 5	3

0 = not labeled or no control; 1=poor, 2=fair, 3=good, 4=very good, 5 = excellent control

Hornworm control on tobacco with various foliar insecticides, 2007

Hornworms/20 plants



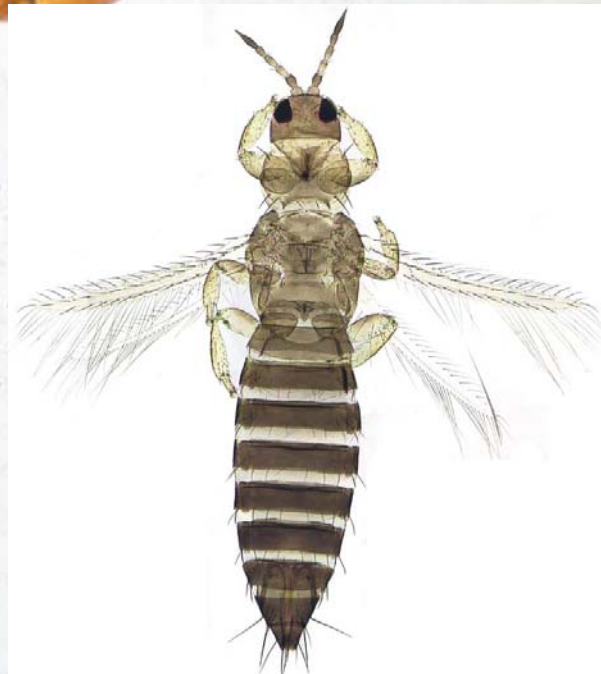
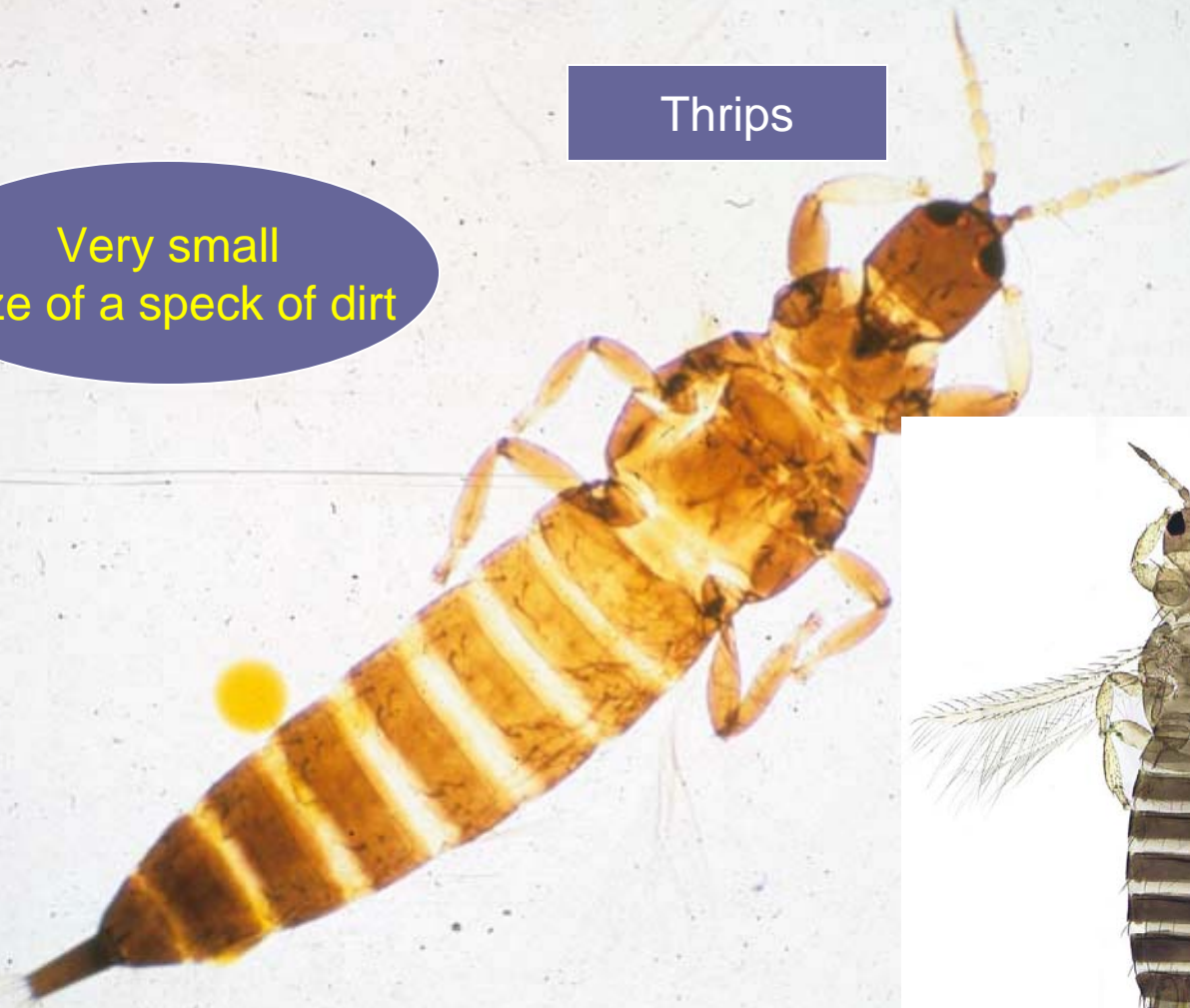
Days after transplanting

Insecticides for hornworm control

- ★ ■ **Excellent**
 - **Early to Late:** Belt, Bt (Dipel & others), Coragen, Lannate, Orthene
 - **Within 2 weeks of harvest to prevent infestations in the curing barn:** Bt, Orthene, Coragen (if labeled), Tracer
- ★ ■ **Very good:** Denim
- **Good:** Tracer, Sevin
- **Poor-Fair:** Assail

Thrips

Very small
Size of a speck of dirt



Thrips Damage

(Thripidae: *Frankliniella fusca* (Hinds))



Feeding usually follows minor veins
Silvery outlines around veins peppered
with minute black spots underside
Similar in appearance to etch
Heavy feeding gives leaves a shiny
or silvery appearance
Suck sap
Transmits TSWV
No practical control



Thrips

- LC (egg to adult) – 16 dys (NC)
- Gen. -- 5 overlapping generations
- Control
 - Heavy rainfall -- most effective natural control
 - Predaceous insects -- some value
 - Systemic insecticides applied at planting time controls

Thrips Control

- Platinum 2SC 1.3 oz/1000 Plts TD/TWS
- Capture 2EC 2.56-6.4 oz/A Foliar
- Warrior 1CS 1.92 – 3.84 fl ozs / A Fol
- Karate 2.08CS 0.96 – 1.92 fl oz / A Fol

Grasshopper Damage



Grasshopper Control

- Malathion 57EC 1qt/s5 gals/A Foliar
- Orthene 97PE (acephate) 1/4-1/2 lb/25 gals Foliar
- Warrior 1CS (lambda-cyhalothrin) 1.92-3.84 oz/A Foliar
(Suppression)
- Capture 2EC (bifenthrin) 2.56-6.4 oz/A Foliar

Resistance management for the tobacco aphid on tobacco

- Scout fields and use thresholds
 - To ensure insecticides are applied only when necessary.
- Use
 - The correct label rates and application procedures.
- Alternate
 - Between insecticide groups.
- Suspect control failures
 - Treat crop with an insecticide from a different chemical group.

Resistance management for the tobacco aphid on tobacco

(Insecticide Resistance Action Committee, IRAC)

Insecticide Class	IRAC Grouping	Brand Name
Carbamate	1A Acetylcholine esterase inhibitors	Sevin, Lannate, Temik
Organophosphate	1B Acetylcholine esterase inhibitors	Orthene, Acephate, Di-Syston, Dylox, Lorsban, Malathion, Mocap, Supracide
Neonicotinoid	4A Nicotinic Acetylcholine receptor agonists/antagonists	Admire, Platinum, Belay, Assail, Nuprid, Actara, Provado
Feeding blocker	9A Unknown or non-specific mode of action	Fulfill (Pymetrozine)
Pyrethroids Pyrethrin	3 Sodium channel modulators 3	Warrior, Capture Pyganic

Avoid using more than one insecticide in the same class in back-to-back treatments.

Resistance management for the tobacco aphid on tobacco

(Insecticide Resistance Action Committee, IRAC)

Insecticide Class	IRAC Grouping	Brand Name
Biological or bacteria	11A2	Bt, Ketch
Soil bacterium		Denim
Aerobic fermentation of soil bacterium		Tracer (spinosad)
Phthalic acid diamide	28 Disrupts calcium balance in muscle. Muscle paralysis	Belt
Carboxamide	28 Muscle paralysis	Coragen

Control Summary Before Transplanting

■ Wireworms

- *Systemics: Platinum or Admire –
 - Wireworms, early season FB, Aphids & Thrips
- Contacts: Lorsban, Mocap –
 - Wireworms. Use only if high risk of pests

■ Cutworms

- Scattered, rarely damage enough to treat
 - Orthene, Dylox, Lorsban, Warrior

Examples of rotations for managing the tobacco aphid on tobacco

- **Pretreatment with Admire** (4A Neonicotinoid)
 - Follow up treatment with Orthene (1B OP) or Fulfill (9A Feeding Blocker)
- **Foliar treatment with Orthene** (1B OP)
 - Rotate with Fulfill (9A Feeding Blocker), or a 4A neonicotinoid (Actara, Assail, or Provado) and then Orthene (OP) again, if necessary.

Suggestions for managing insects on burley tobacco

- 1. Apply foliar insecticides at economic thresholds

- 2. Control early season aphid infestations with
 - AdmirePro, or Platinum (4A Neonicotinoid)Control late season aphid infestations with
 - Orthene (1B OP) or Fulfill (9A Feeding Blocker).Control Budworm and hornworm with
 - Orthene (1B OP), Tracer (Bact.), Belt (28 Phthalic acid diamide)
 - or Denim (Soil Bacterium)

- 3. Control flea beetles with
 - Orthene in the transplant water.Manage late season aphid infestations with
 - Orthene or Fulfill and hornwormControl budworm infestations with
 - Belt, Bt, Tracer, or Denim

Maintaining low insecticide residues on tobacco

- Do not use Thiodan or other brands of endosulfan.
- Observe preharvest intervals for all insecticides
 - Be careful when you apply the pyrethroids.
 - PHI for Warrior is 40 days and Capture should not be applied after layby
 - Orthene PHI is 3 days, but wait longer.
 - Late applications of Tracer, Dipel and other Bts for hornworms is a safe option.

Conclusions

- Lorsban 4E labeled rate on tobacco reduced from 2 quarts/acre to 1 quart per acre.
- Lorsban Advanced EW has been introduced
- Belt is registered to control Lepidoptera (hornworms and budworms) on tobacco
- Coragen will be available for hornworm and budworm control in 2009. DuPont has applied for a State 24c special local needs label.
- If aphids or other insects become persistent problems, do not continue to apply the same insecticide, but rotate among insecticide classes.
- Follow practices that minimize insecticide residues.



TOBACCO INSECTS

THE END



Gene Burgess
2-08



Control Summary -- Aphids

■ Tray or TPW

- Platinum or Platinum + Orthene – Tray / TPW
- Admire – Tray / TPW
- Orthene – TPW

- PAO – Wireworms, Aphids, early season flea beetles
- P -- Thrips

Control Summary

- Practice IPM – Scout and spray at economic threshold only!
 - Reduces unnecessary sprays
 - Helps control resistance
 - Conserves beneficials
 - Minimizes cost and increases profits

Control Summary -- Aphids

Foliar – Spray at ET Level

- ET -- Before Topping:
 - 10% plts wi 50 aphids on any upper leaf.
- ET -- After Topping:
 - 20% or more of plants are infested with 50 aphids on any upper leaf
- Chemicals:
 - Orthene -- 3 dy PHI Malathion --
 - Actara – 14 dy PHI Lannate – 14 dy PHI
 - *Warrior – 40 dy PHI*

Control Summary -- Budworms

- **ET** -- Foliar – (5 infested plants/50 plants (10%))
 - Orthene -- 3 dy PHI
 - Dipel -- 0 dy PHI
 - Tracer -- 0 dy PHI
 - Denim – 14 dy PHI
 - Warrior – **40 dy PHI** Suppression only!
 - Dylox – 3 dy PHI
 - Lannate – 14 dy PHI

Control Summary -- Hornworms

Foliar – Spray at ET Level

- ET -- 1" length – 5 worms/50 plants (10%)
- ET -- Parasitized – 25 worms/50 plts (50%)

- Chemical
 - Orthene – 3 dy PHI
 - Bt – 0 dy PHI
 - Dylox – 3 dy PHI
 - Denim – 14 dy PHI
 - Warrior – 40 dy PHI
 - Tracer – 0 dy PHI

TOBACCO BENEFICIAL INSECTS



**Ground Beetle –
Calosoma Sp -- Caterpillar Hunters**



Wasps – Feed on Caterpillars



2 Tachinid Fly Species

- Lays Eggs On:
 - Hornworms
 - Budworms
 - Cutworms
- Kill HW pupae



Tobacco Hornworm



Braconid Wasp

(*Apanteles congregatus*)

Parasitizes 1st & 2nd instar
hornworms

Larvae develops inside worm

Emerge from 4th & 5th instar

Larvae spins cocoons on
back

Adult emerges from cocoon
& searches for another
hornworm.

Lacewing Adult – Larvae Feeds on Aphids



Campoletis sonorensis Wasp Parasite of Budworm



- Adult Wasp, *Campoletis sonorensis*, Lays Eggs Beneath Skin of Small Budworm
- Egg hatches & the Larva Develops Inside the Budworm
- When Development is Complete, the Parasitic Larva Emerges & Pupates Outside
- The Silken Cocoon is White, Oblong, About ¼ Inch Long & Attached to the Skin Of the Budworm

Stilt Bug



**Feed on Hornworm & Budworm Eggs &
Aphids**

Syrphid Fly Larvae



Feed on Aphids

Syrphid Fly Larvae



Feed on Aphids

Syrphid Fly Adult

Hover Over Plants



Lady Beetle Eggs & Aphids



Spotted Lady Beetle



Feeds on Aphids

Lady Beetle Larva



Feeding on an Aphid

Lady Beetle Eggs



Convergent Lady Beetle

Feeding on Aphids



THE END

ANY QUESTIONS



Apanteles congregatus
Braconid Wasp Parasite



Tobacco Budworm

(Noctuidae: *Heliothis virescens* (Fabricius))



Tobacco Budworm

Pale green with several
Longitudinal pale stripes
Brown head



Tobacco Budworm



Light olive to
brownish-olive
3 slanted, dark
olive or
brown bands

Corn Earworm



Light
Yellowish-olive
Single
dark spot
near
center
of
each
forewing

Corn Earworm



Tobacco Hornworm



Richard Vogt

Tobacco Hornworm



Greenish
White bars on the sides
Slender reddish curved horn
Hard to detect
Blends in with leaf



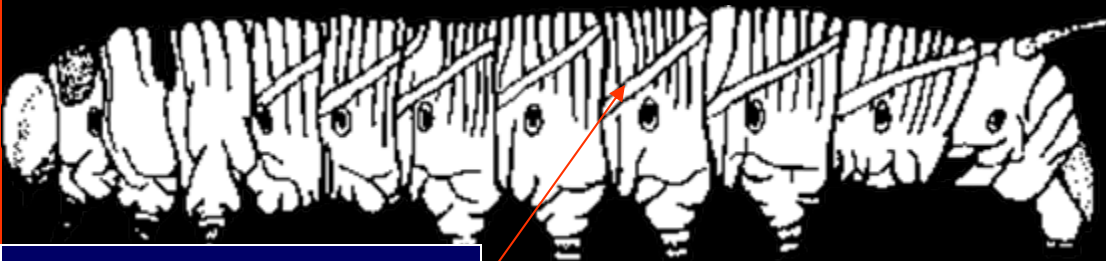
Tob Hornworm Damage

Hornworm Damage

Tobacco & Tomato Hornworms

Tobacco Hornworm

Curved red horn



7 Diagonal white lines
Edged with black
8 V-shape marks

Tomato Hornworm

Straighter blue-black horn



Thrips

- LC (egg to adult) – 16 dys (NC)
- Spring adults migrate to host (NC)
- FL:
 - Shortwinged adults OW
 - Longwinged forms usually appear in late spring
- NC:
 - OW as adult females under ground litter
- SC:



Flea Beetles

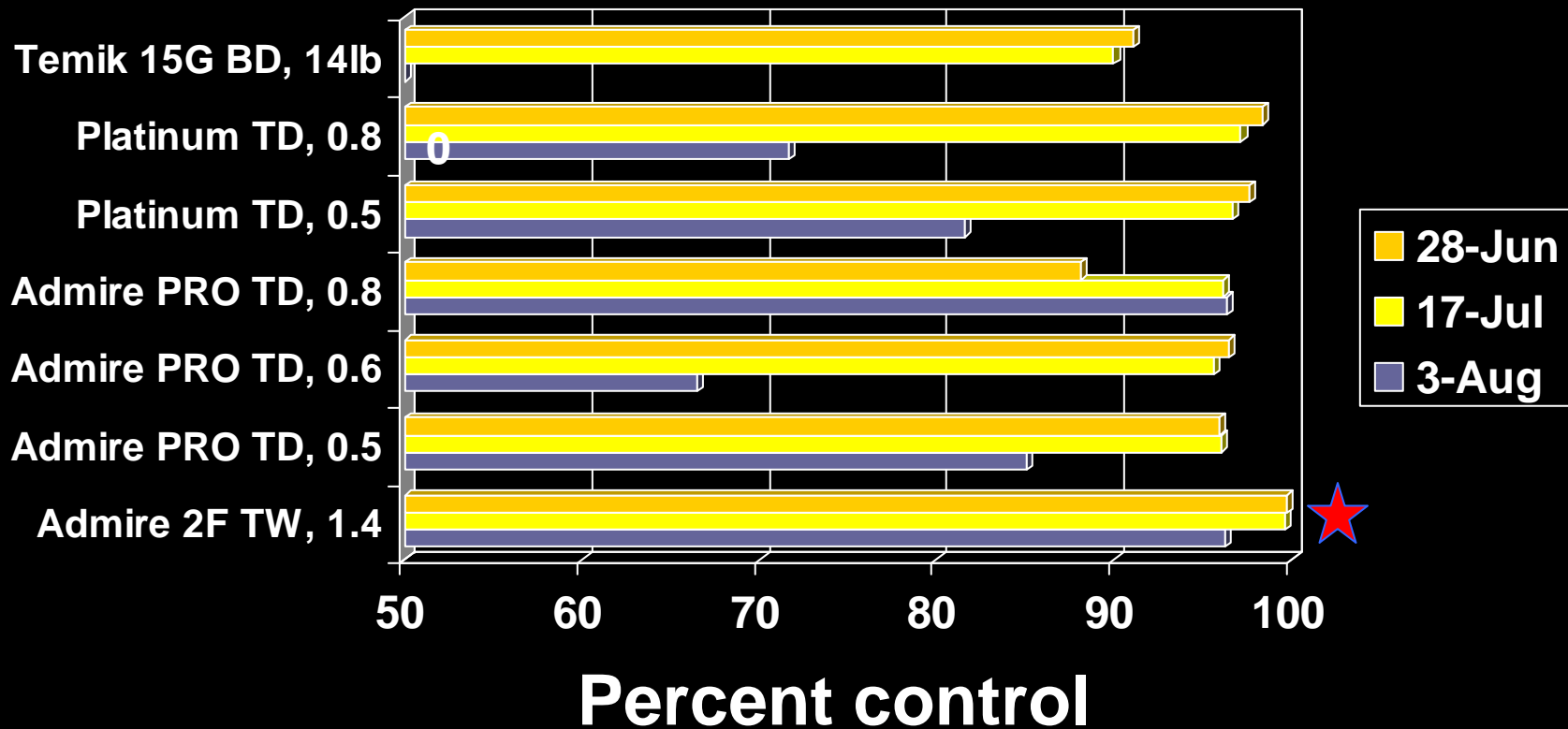


- O.W. – As adults in litter & plant debris around fields
- Early spring lay eggs on soil surface near host plants
- Eggs hatch in about a week
- Larvae feed 4 – 5 weeks on plant roots & pupate in soil
- Generations - Approx. 4 gen.

Aphid control on flue-cured tobacco treated with various rates of **Admire 2F, Admire PRO, Platinum, and Temik, SPAREC, 2006** (PSemtner)



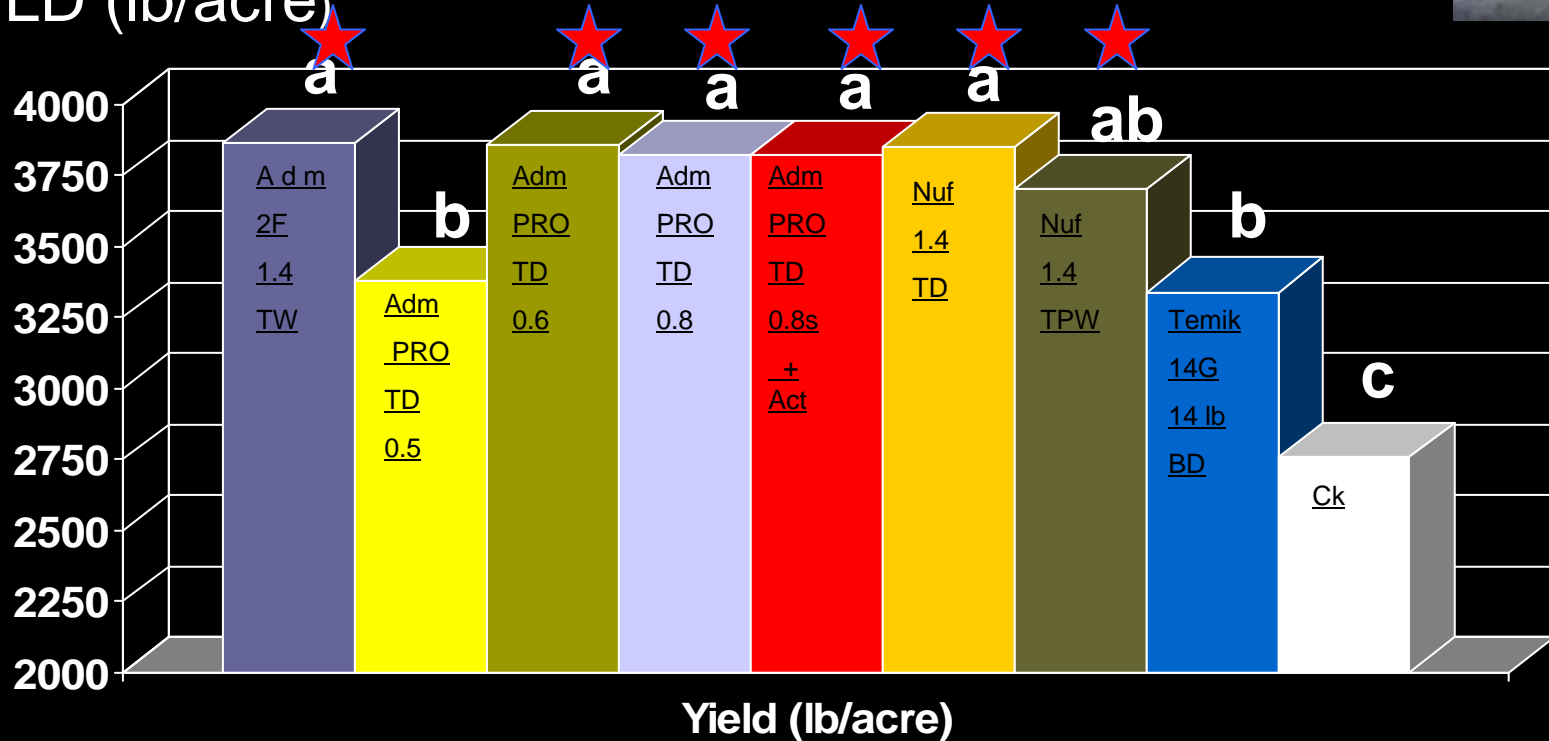
Treatment



Yield of flue-cured tobacco treated with various insecticides applied as tray drench transplant water, and band treatments, SPAREC, 2006 (PSemtner)



YIELD (lb/acre)

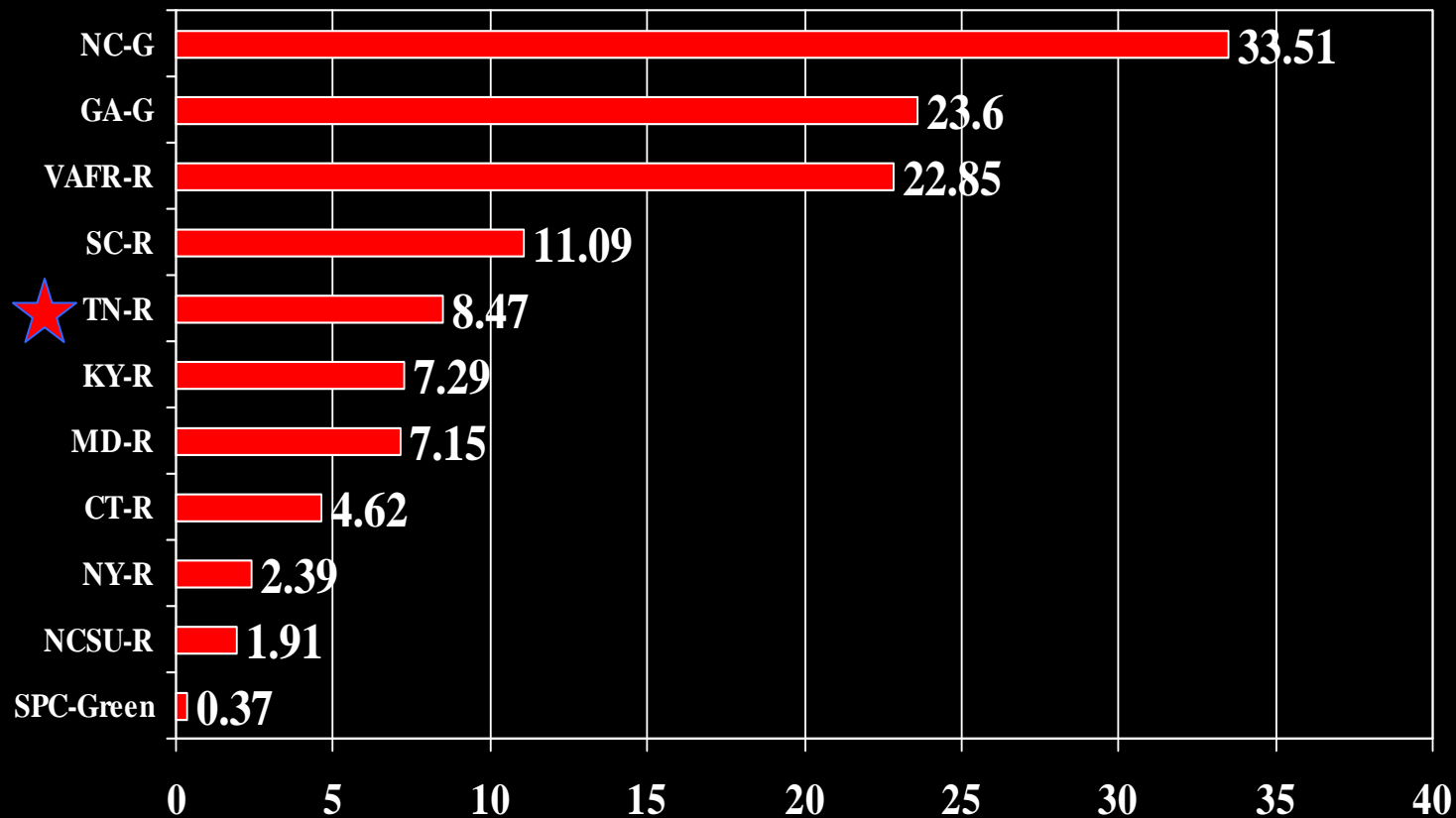


- Admire 2F, 1.4TW
- Admire PRO TD, 0.5
- Adm PRO TD, 0.6
- Admire Pro TD 0.8
- Admire Pro TD 0.8 + Act
- Nufarm 06024 1.4 TD
- Nufarm 06024 1.4 TPW
- Temik 14G 14 lb BD
- Untreated check

Highest Toxicities of Admire to tobacco aphids from various tobacco producing states, 2004-2007.



Location



LC50 (PPM)

(PSemtner)



Admire Pro 4.6SC

- 2.3 times more product per gallon than Admire 2F



Assail (acetamiprid) 30SG & 70WP (foliar)

- Neonicotinoid class
- Disrupts nerve transmission
- Anti-feeding effect which prevents pest damage to host plants well before death
- Broad-spectrum control
- Reduced-risk product & kinder to beneficials

Assail (acetamiprid)

- Eliminates both chewing & sucking insects
- Great rainfastness & Residual activity – 2-3 weeks
- Systemic & translaminar activity, gets pest where they feed & breed
- Absorbed into the plant tissue & moves through the leaf to protect tender new shoots
- Rapidly degrades in the soil
- No concerns about carryover
- Excellent tool for IPM

Generic Brands of Imidacloprid

- **Imidacloprid (Admire 2F)**-Several generic brands may be available
 - Alias 2F-Makhteshim Agan
 - Pasada 1.6F-Foliar treatment
 - Couraze 2F-Chemainova
 - Nuprid 2.0F and 1.6F foliar-NuFarm Americas
 - Others?

Admire Pro – Advantages

Low Viscosity / Thixotropic

- At rest, the product sets up like a gel. This allows for better suspension of the product versus other SC formulations that typically settle out. Slight agitation, it quickly returns to a viscous liquid state – called **thixotropy** (more liquid when agitated)
- Leaves less residue in container.
- Rinses easily.



Admire Pro – Fertilizers

- Increased compatibility with wide range of fertilizers. Enter & maintains suspension. No need to create a pre-mix slurry or dilute soln prior to adding. Does not tend to clabber & does not settle out



Admire Pro 4.6SC

- Compared with Admire 2F, Admire Pro 4.6SC has
 - 2.3 times more product per gallon
 - Increased dispersion, easier to mix, less settling out in the tank and in storage (**still settles out**)
 - No foaming
 - Blue color instead of beige (**blue hands?**)
 - Easier to rinse out of containers and to clean up, does not stick to containers

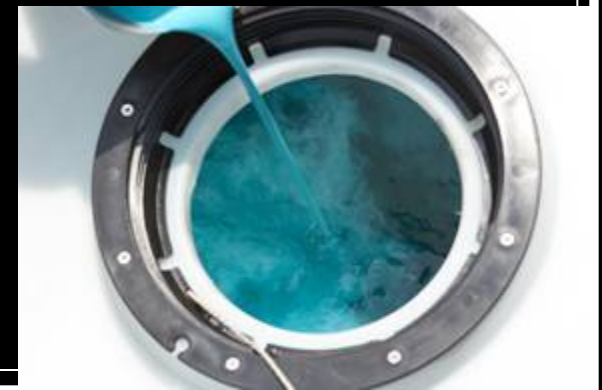




Thixotropy –Formulation sets up into a, gel-like state to suspend higher load of active ingredient.



Normal shaking of the container thins the formulation to a very liquid state similar to water.



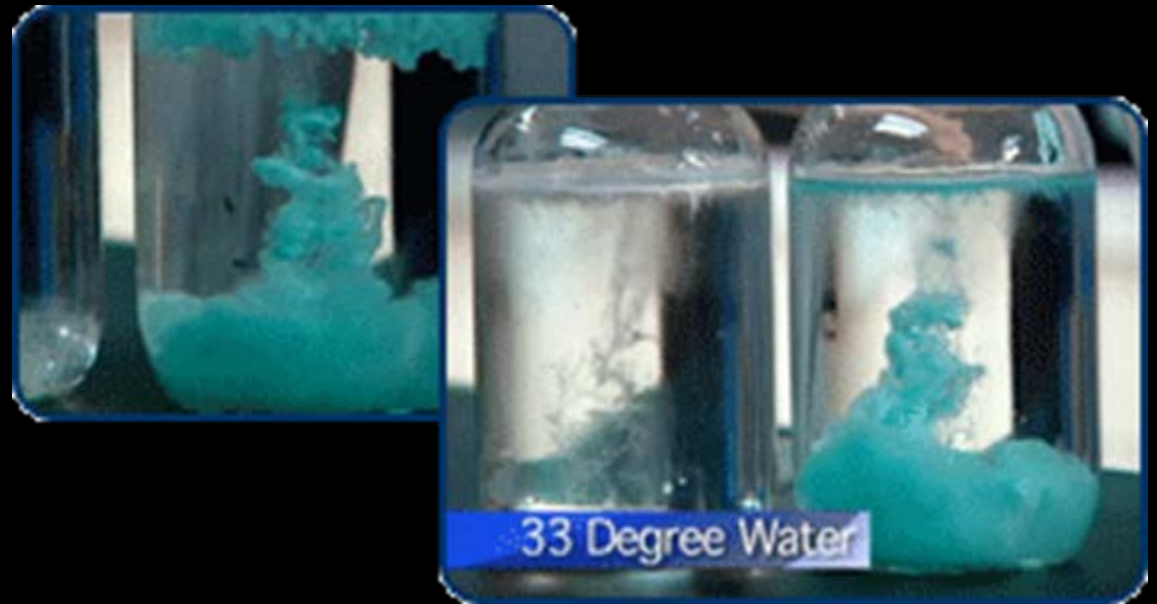
Admire Pro – Enhanced Color & Packaging

- **Makes product more visible** when measuring & spills much easier to see.
- **Spills dry & turn into a chalky blue substance** that's easy to clean



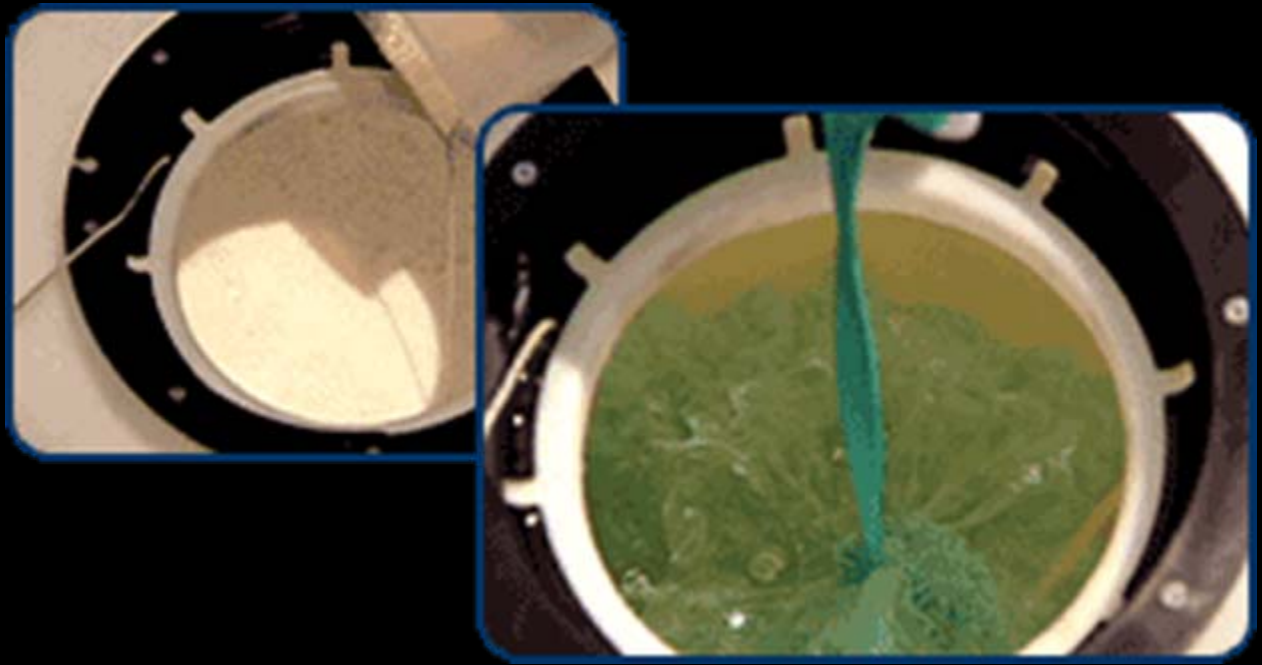
Admire Pro - Mixing Properties

- Blooms quickly & disperses thoroughly in water, easily creating a more homogenous solution. Stays in soln. longer with less settling & fewer precipitates



Admire Pro – No Foaming

- Does not foam when combined with water. Makes measuring & mixing easier.

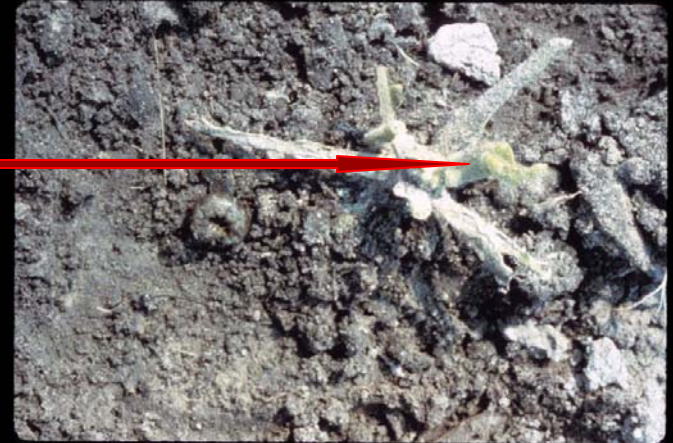


Cutworms



■ Second and Third Larval Stage:

- **Feed** – Night & cloudy days
- **Daytime** – Hide under clods of dirt
- **Most Damage** – Newly set plants
- **Plants** – Cut off at the ground level



Cutworms



- Foliar applications of insecticides reduce populations of young larvae because early stage larvae that feed near the soil surface will feed on treated foliage at night

Tobacco Wireworm



- 1 gen. per year. Ave LC = 348 dys.
- Lay eggs on or beneath soil surface in summer (10 dys)
- Larvae hatch & feed on roots of tobacco, corn or other plants
- OW in larval stage

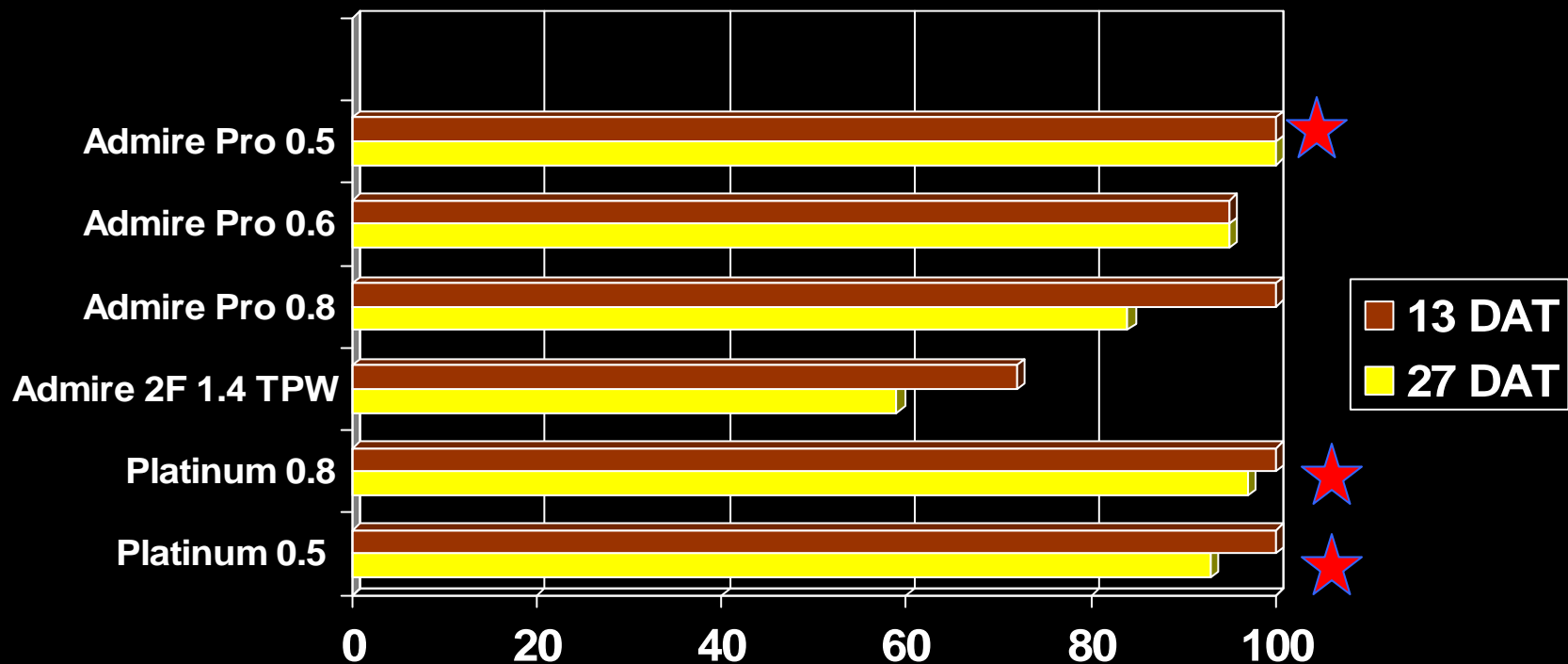
Flea Beetle Damage



“Shot hole” appearance

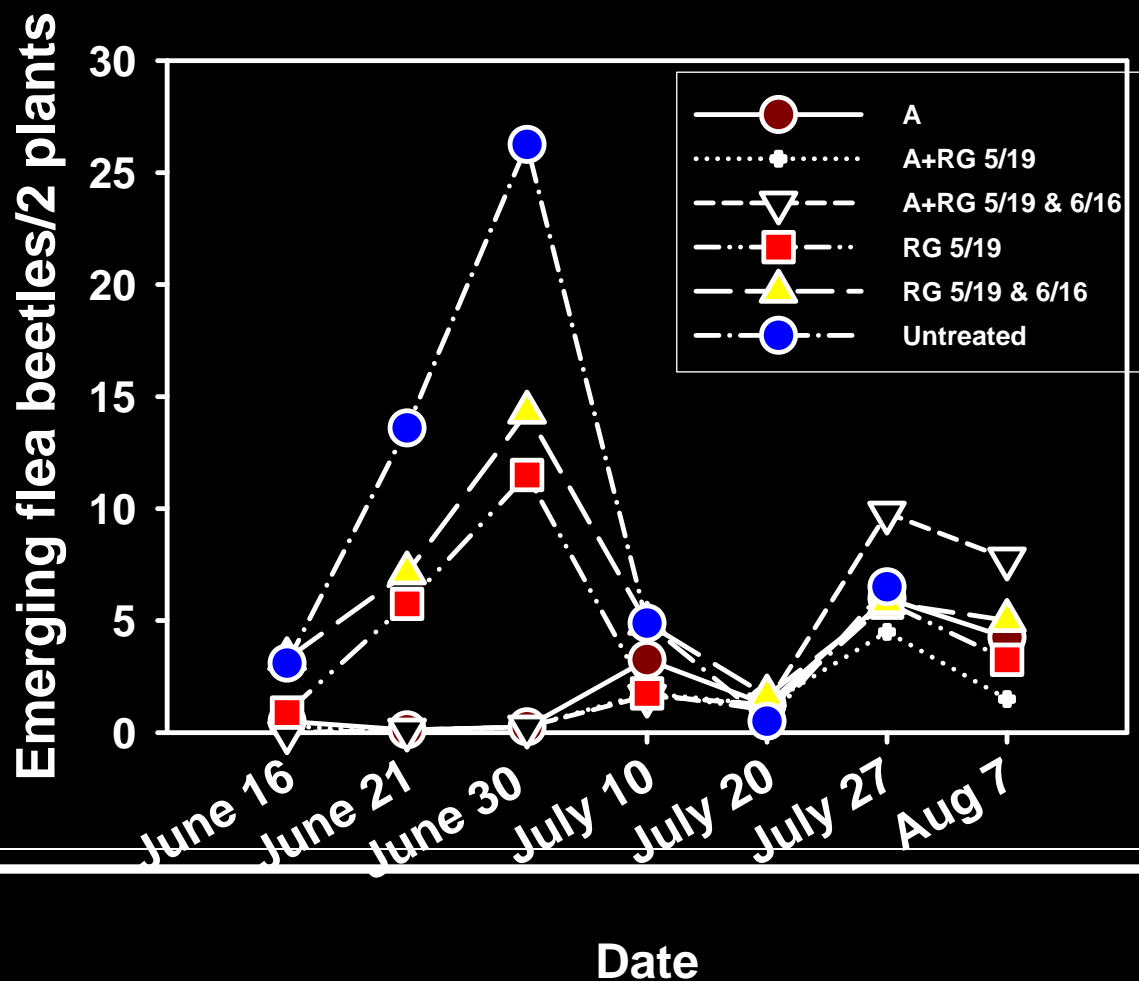
Percent tobacco flea beetle control on flue-cured tobacco treated with various insecticides applied as soil or tray drench treatments, 2006 (PSemtner)

Treatment



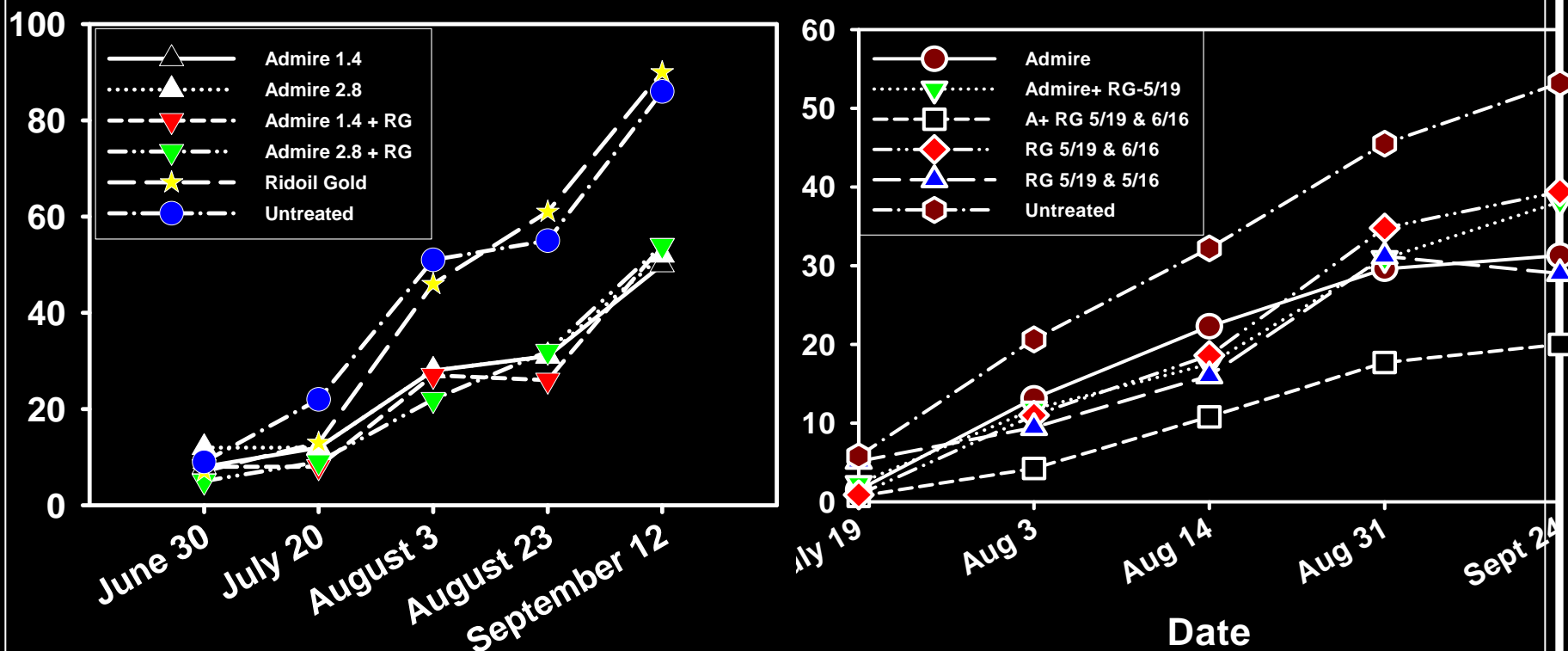
Tobacco flea beetle feeding holes/10 plants

Emergence of adult tobacco flea beetles from tobacco root systems after treatment with Admire and Ridomil Gold, SPAREC, 2006



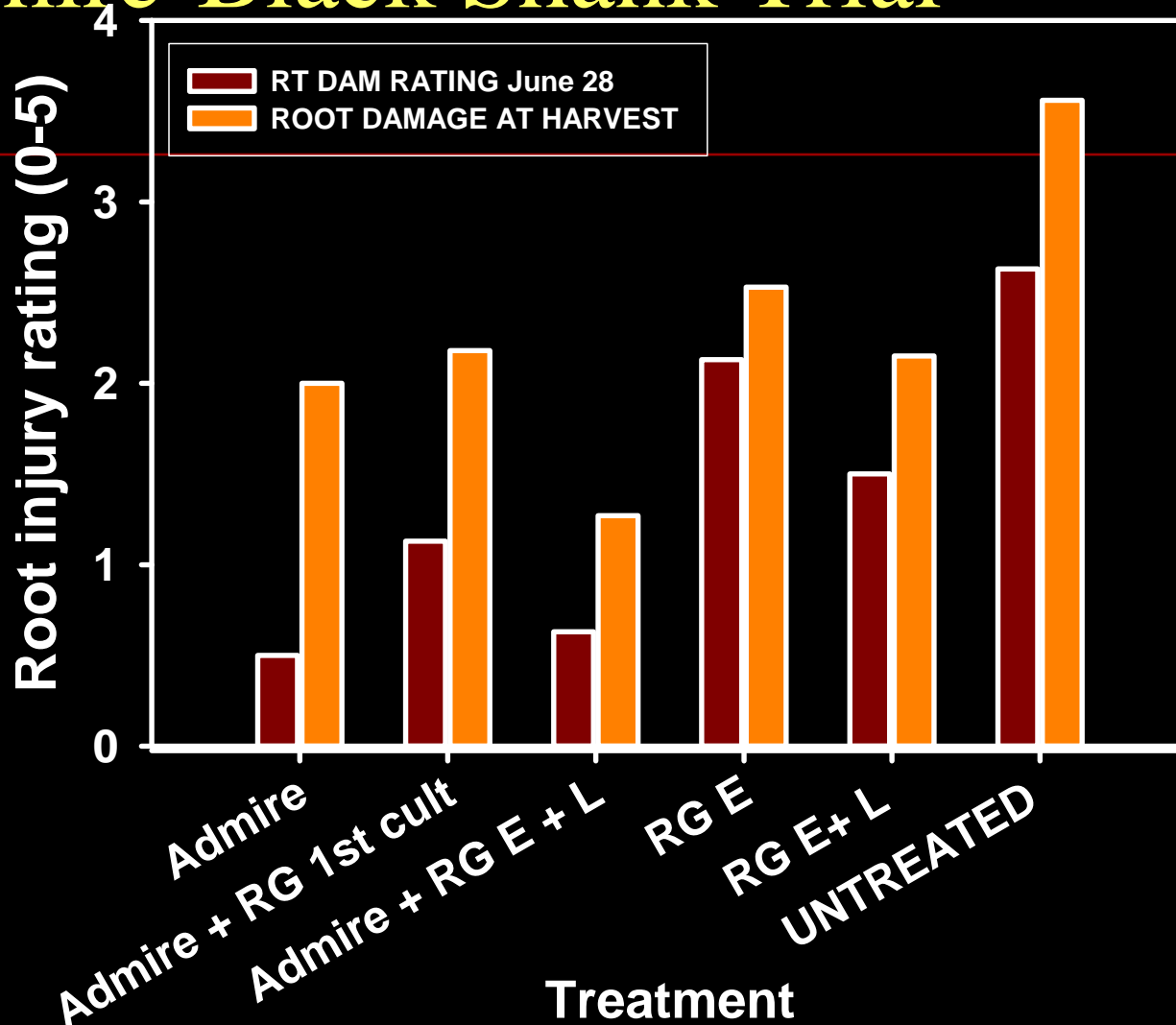
Incidence of black shank symptomatic plants in tobacco plots treated with Admire and Ridomil Gold, 2005.

Black shank symptomatic plants (%)



Root damage ratings

Admire-Black Shank Trial



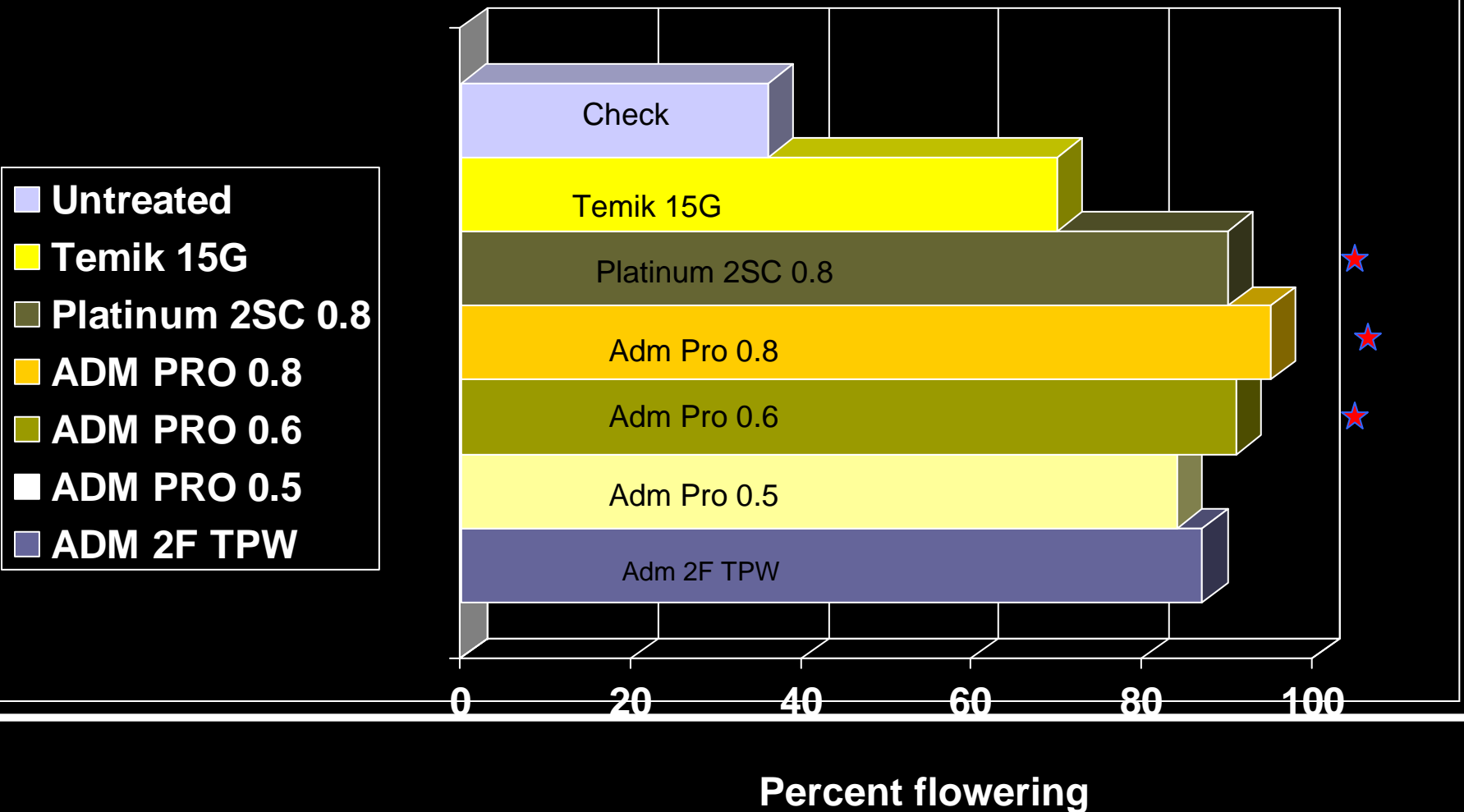
Admire Summary

- Admire Pro 4.6SC – no longer Admire 2F
- In 2006, equivalent rates of Admire Pro (0.6 fl oz/1,000 plants) appeared to be slightly less effective than the old Admire 2F formulation.
- Tray drenches generally give better control of wireworms and flea beetles than transplant water treatments.
- Transplant water treatments provide better late season control of aphids
- Some tobacco aphid tolerance to Admire.



Percent plants flowering, July 15

(P Semtner)



Tobacco Hornworm

- OW – pupae
- Moths emerge in early June – August
- Nocturnal moths in habit
- Hover over plants at dusk
- Deposit eggs at night on underside of leaves
- Larvae emerge in about 4 days

Tobacco Hornworm

- Larvae feed for 3 weeks
- Hornworms burrow into the soil – stay 3 weeks
- New generation of moths emerge
- Heavy egg deposition in August & early September because
 - Peak of OW moths emerging &
 - Second & possibly third brood emerging