

New Insecticidal Seed Treatments for Control of Insect Pests of Rice



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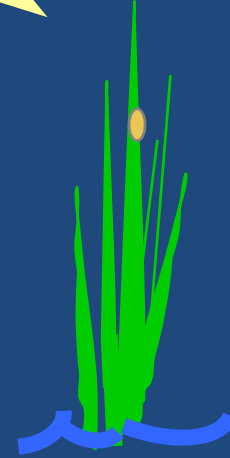
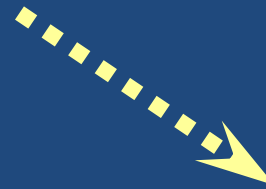
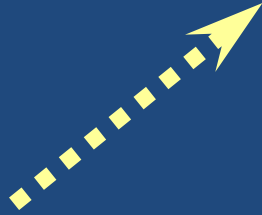
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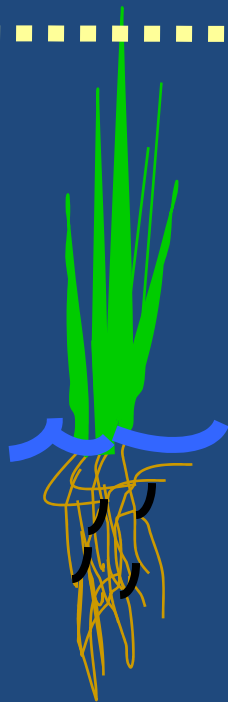
**Adult
overwintering**

**Adult
feeding**



**Larval
feeding**

**Mating and
oviposition**



Losses from rice water weevil

- 5% yield loss
- 6000 lbs/A, \$10.00/100 lbs
- Losses: \$30 per A
- Economic impact: \$12 million

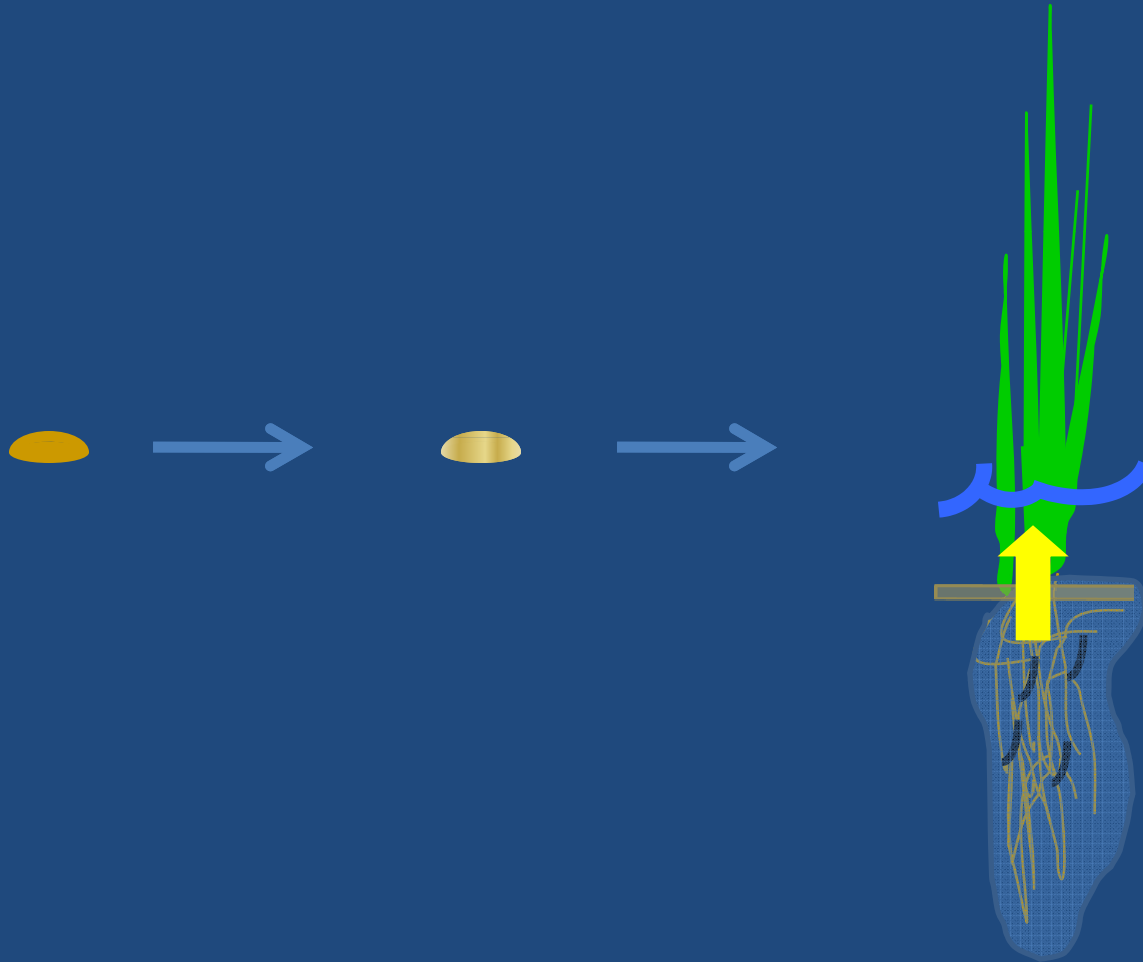


Use of pyrethroids against the rice water weevil



- Optimal timing of applications is difficult
- > 1 application needed when infestations heavy
- Non-target effects (crawfish)

Seed treatment an alternative delivery system



Why use a seed treatment in rice?

Product

Icon

Dermacor

X-100

clothianidin

thiamethoxam

Advantages

- Ease of use
- More effective when infestations are severe
- Control of minor pests

Disadvantages

Why NOT use a seed treatment in rice?

Product

Icon
Dermacor
X-100
clothianidin
thiamethoxam

Advantages

- Ease of use
- More effective when infestations are severe
- Control of minor pests

Disadvantages

- Cost
- Not IPM!
- Water-seeding issues
- Crawfish issues (persistence, tailwater)

Dermacor X-100 (DuPont)

- Active ingredient: chlorantraniliprole (Rynaxypyr)
- New mode of action
- Extremely good Lepidopteran activity
- Small-plot testing in LA, 2005-2009
- Section 18 registration, 2007-2009; Section 3 anticipated 2010
- Major use restriction: dry-seeded rice only

Dermacor X-100 Experiment, 2008: Drill-seeded, conventional vs. hybrid, 3 rates

Treatments (seeds treated at specified rates by DuPont):

- 1. Cocodrie, 100 lbs/A seeding rate, 0.025 mg ai/seed**
- 2. Cocodrie, 100 lbs/A seeding rate, 0.05 mg ai/seed**
- 3. Cocodrie, 100 lbs/A seeding rate, 0.1 mg ai/seed**
- 4. Hybrid, 40 lbs/A seeding rate, 0.025 mg ai/seed**
- 5. Hybrid, 40 lbs/A seeding rate, 0.05 mg ai/seed**
- 6. Hybrid, 40 lbs/A seeding rate, 0.1 mg ai/seed**
- 7. Cocodrie, UTC**
- 8. Hybrid, UTC**

Dermacor X-100 Experiment, 2008: Experimental Narrative

4/25/08: Drill-seed at rates specified. Plots size (4.1' [7 rows at 7" row spacing] by 18')

5/20: Permanent flood (plants at 4-leaf stage)

6/11: 1st core sampling (22 d post-flood), 4 cores per plot

6/18: 2nd core sampling (29 d post-flood), 2 cores per plot

6/27: 3rd core sampling (38 d post-flood), 2 cores per plot

8/15: Harvest (4 rows)

Experimental Design

RCBD, 4 replications

Dermacor X-100 Experiment, 2008: Results

Treatment	Larvae per core sample (\pm S.E.) on:			Total larvae	Yield
	6/11	6/18	6/27		
Coco-UTC	11.1 \pm 1.4	12.0 \pm 2.1	19.0 \pm 4.4	42.1 \pm 7.4	7560 \pm 198
Coco-0.025	0.5 \pm 0.2	1.0 \pm 0.3	3.5 \pm 0.2	5.0 \pm 0.4	8077 \pm 366
Coco-0.05	0.3 \pm 0.1	0.8 \pm 0.4	0.6 \pm 0.4	1.7 \pm 0.6	7872 \pm 192
Coco-0.1	0.6 \pm 0.3	0.0 \pm 0.0	2.8 \pm 1.0	3.3 \pm 1.0	7953 \pm 162
Hyb-UTC	13.4 \pm 1.1	14.3 \pm 2.0	14.3 \pm 3.1	41.9 \pm 3.8	9235 \pm 419
Hyb-0.025	1.9 \pm 0.3	4.3 \pm 0.3	6.5 \pm 1.4	12.6 \pm 1.5	8501 \pm 458
Hyb-0.05	1.5 \pm 0.3	5.5 \pm 1.8	6.0 \pm 1.4	13.0 \pm 3.2	9381 \pm 219
Hyb-0.1	2.0 \pm 1.1	2.9 \pm 2.1	5.8 \pm 1.1	10.6 \pm 2.9	9128 \pm 594

Dermacor X-100 Experiment, 2008: Drill-seeded, conventional vs. hybrid, 3 rates

- **Dermacor ST provided 88-96% control of rice water weevil larvae in Cocodrie plots**
- **Control was not as good in Hybrid plots (69-75%)**
- **Yield response in Cocodrie but not Hybrid**

Some questions still remain about use at low seeding rates and/or in hybrids

Dermacor X-100, Water-Seeded Experiment 2008:

**Treatments (unless otherwise specified,
Cocodrie seeds treated with Dermacor at
specified rates by DuPont):**

- 1. UTC**
- 2. Dermacor low rate 0.025 mg ai/seed**
- 3. Dermacor mid rate 0.05 mg ai/seed**
- 4. Dermacor low rate 0.10 mg ai/seed**

DuPont Water-Seeded Experiment 2008: Experimental narrative

5/20/08: Test was water-seeded (140 lbs per A) by casting dry seed into flooded plots. Plot size 5' x 15', no barriers between plots.

5/23: Drain planting flood (rice emerging)

5/28: Permanent flood

6/9: Rice at 4-leaf stage

6/23: 1st core sampling (26 d post-flood), 4 cores per plot

7/7: 2nd core sampling (40 d post-flood), 4 cores per plot

7/14: 3rd core sampling (47 d post-flood)

8/29: Harvest (4 rows)

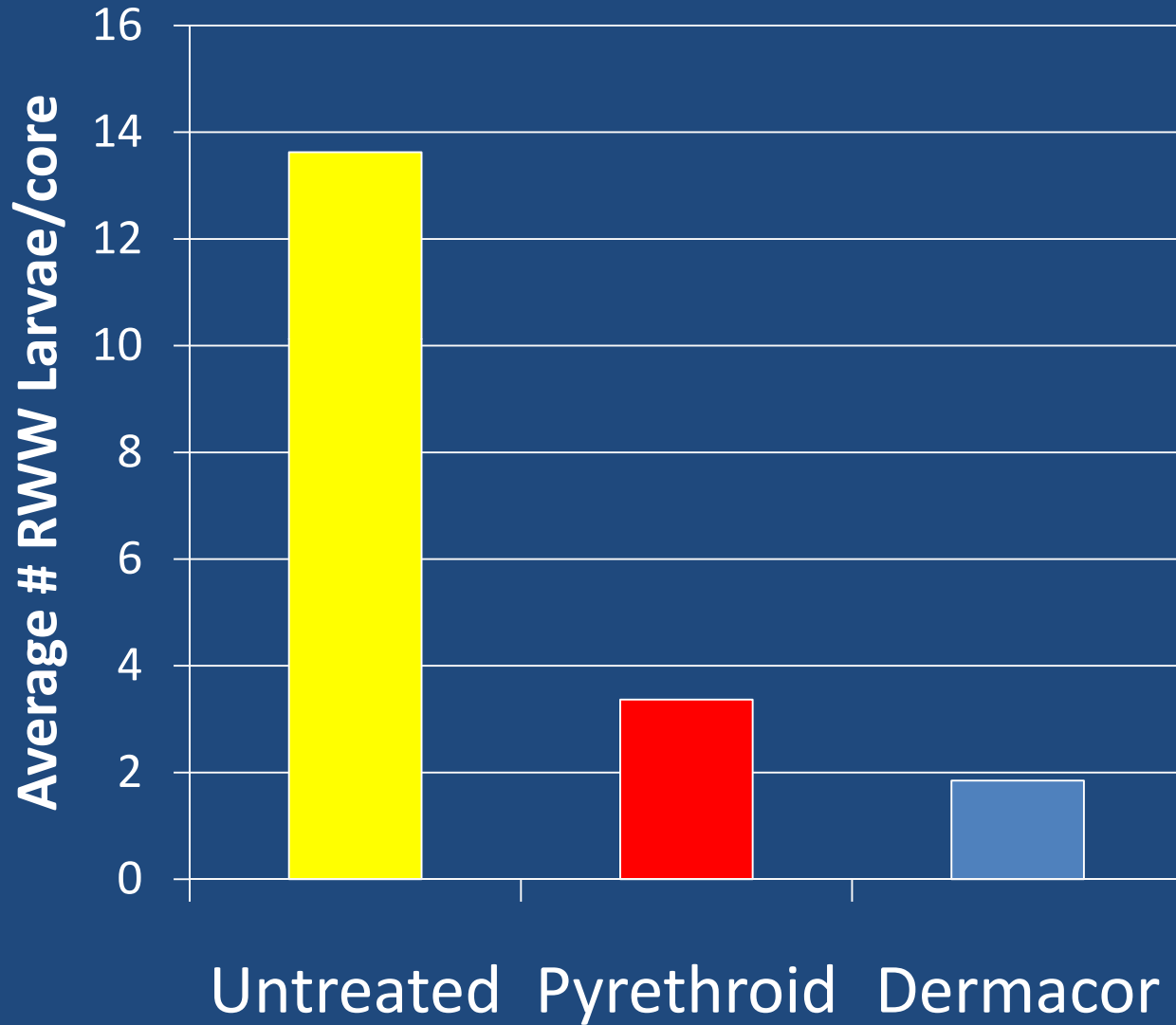
Dermacor Water-seeded Experiment 2008: Results

Treatment	Larvae per core sample (\pm S.E.) on:			Total larvae	Yield
	6/23	7/7	7/14		
UTC	16.6 \pm 0.9	22.1 \pm 2.5	7.6 \pm 2.2	46.3 \pm 2.2	2188 \pm 230
0.025	1.4 \pm 0.7	2.6 \pm 1.1	3.0 \pm 1.4	7.0 \pm 2.6	3611 \pm 383
0.05	0.3 \pm 0.3	1.0 \pm 0.2	1.4 \pm 1.1	2.7 \pm 1.1	3956 \pm 415
0.1	0.2 \pm 0.1	0.9 \pm 0.3	0.5 \pm 0.2	1.6 \pm 0.2	4159 \pm 418

Dermacor Water-Seeded Experiment 2008: Dermacor-treated Cocodrie

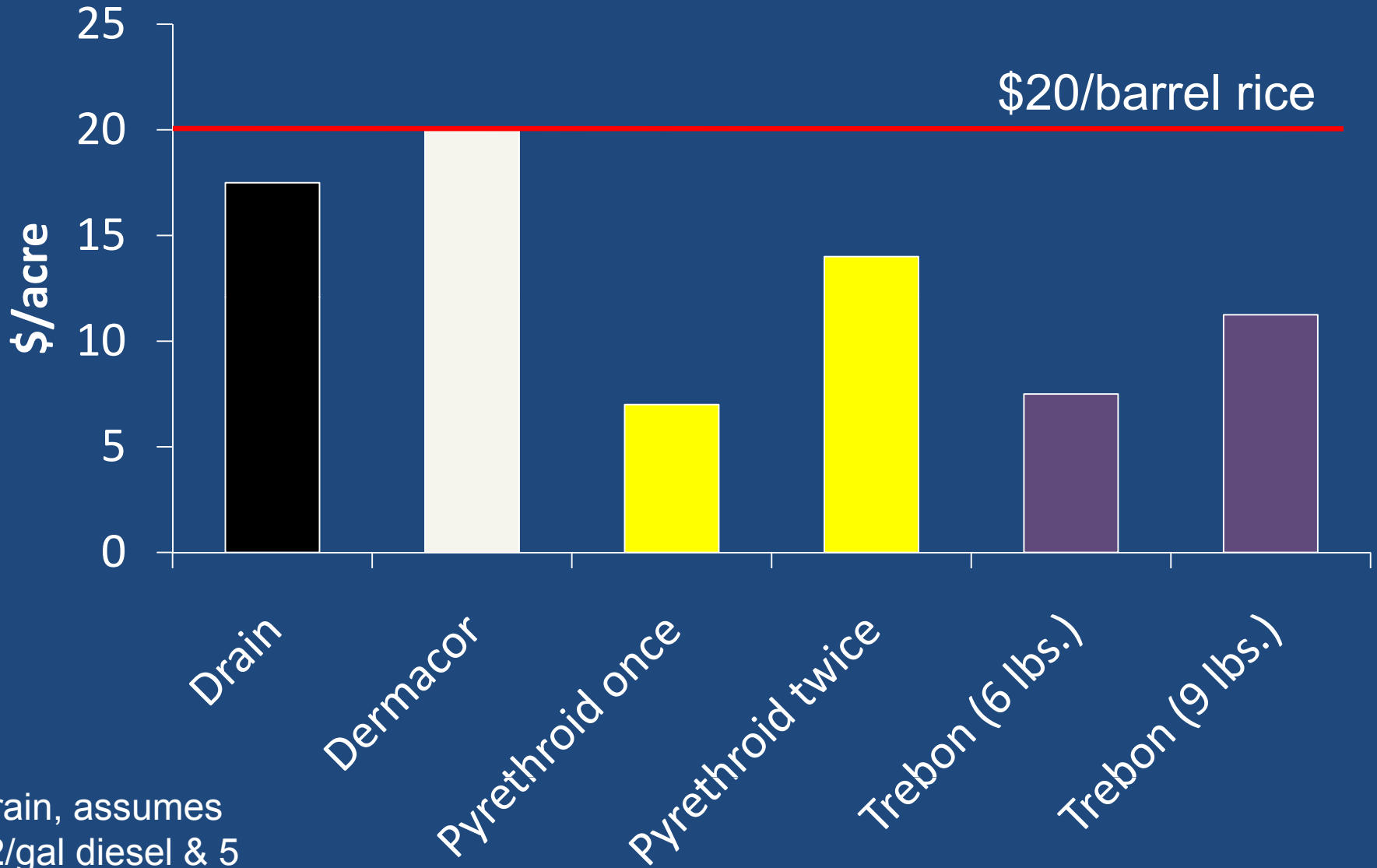
- Dry-broadcasting of treated seed into a flood gave excellent control of rice water weevil larvae
- Dramatic yield response
- **Dermacor not approved for use in water-seeded rice!!!**

Dermacor X-100 Demonstration Trial, 2008



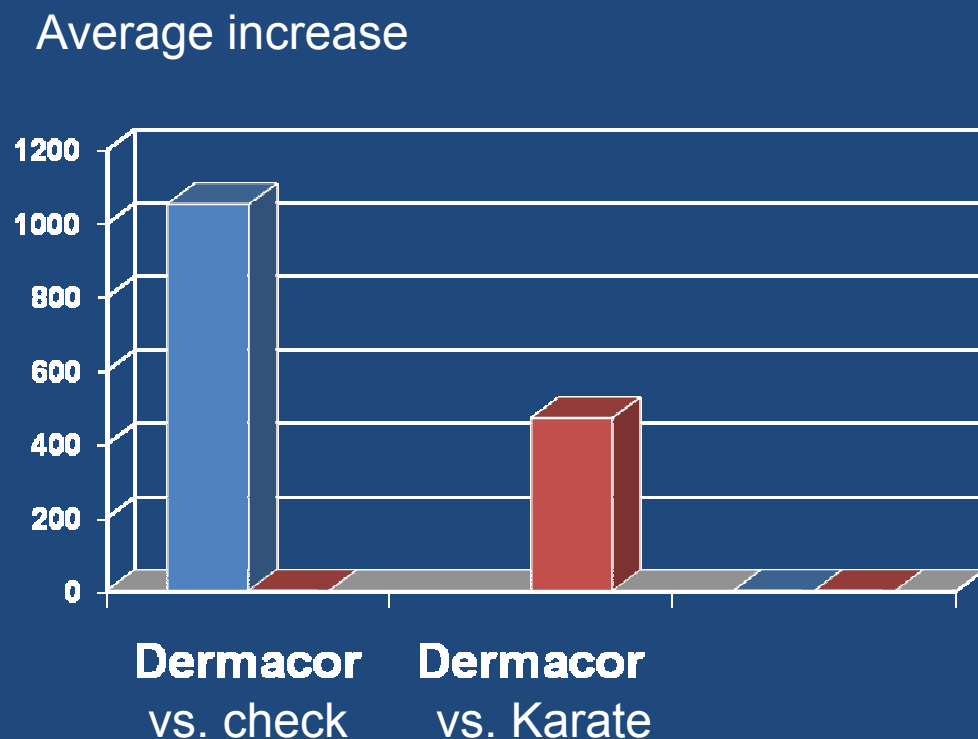
9 Untreated
2 Pyrethroid
8 Dermacor

RWW Control Costs



Drain, assumes
\$2/gal diesel & 5
inch flood

*2008 DuPont™ Dermacor™ X-100 Seed Treatment for Control of Rice Water Weevil – Large Plot Demo. LA.
Plant Health Study*



- \$180/acre profit
- Based on 18.5 cents per lb for rough rice.
- Minus \$20/acre Dermacor™ X-100

Dermacor Considerations

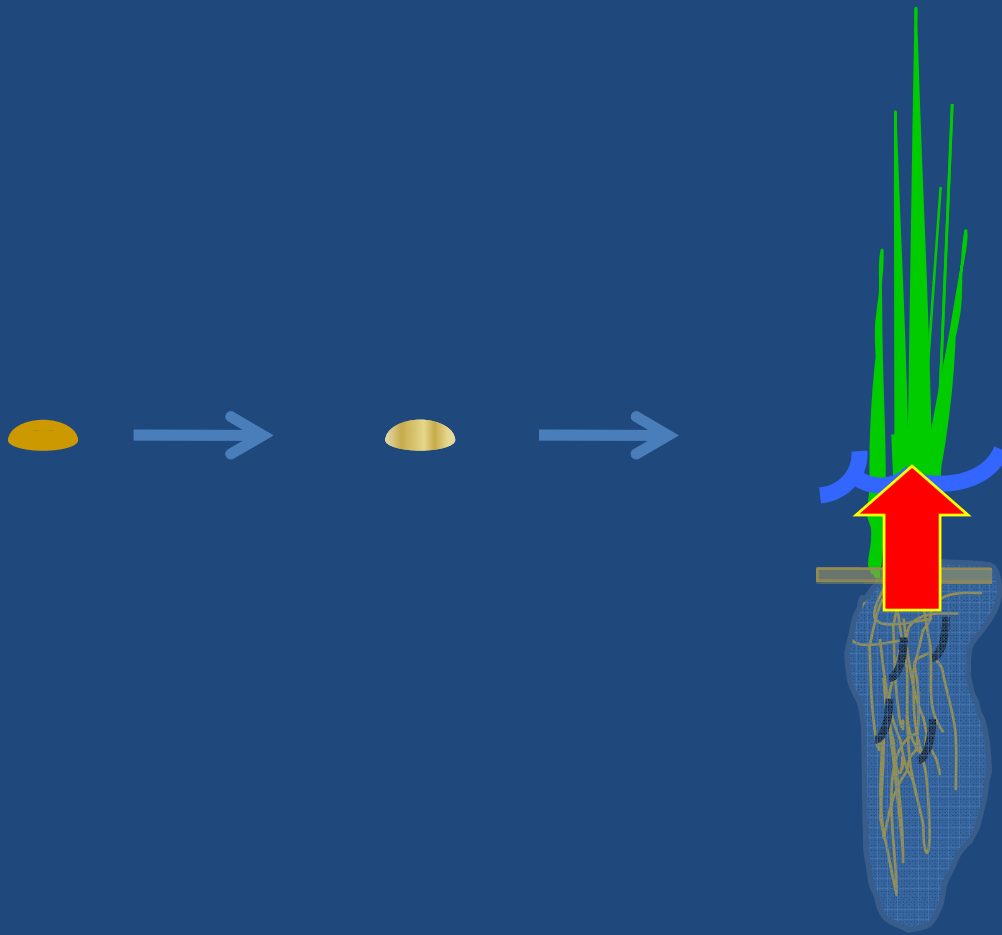
- History of RWW infestation in field
- Drill- or water-seeded?
- Planting date
- Stem-borer problems?

Data from M.O. Way (Texas A&M) indicates that Dermacor X-100 seed treatment suppresses stem borers by 30-80%

Other seed treatments

- Active ingredients: clothianidin and thiomethoxam
- Neonicotinoids
- Registered for use in many crops, several seed treatments
- Small-plot testing in LA over last several years
- No definite time table for registration
- Major use restriction: dry-seeded rice only

Neonicotinoid seed treatments



- More water soluble
- More systemic action
- Lab experiments indicate substantial adult mortality (unlike Dermacor)
- Effective in small-plot tests

Clothianidin small-plot test, 2008

Treatment (gms active ingred. Per 100 kg seed)	Larvae per core sample (\pm S.E.)		Overall % control	Yield (lbs per A, adjusted to 12% moisture)
	6/5/08 (21 d post-flood)	6/13/08 (29 d post-flood)		
UTC	21.3 \pm 1.7	15.9 \pm 2.6	--	7731 \pm 682
25	11.5 \pm 3.5	9.4 \pm 3.1	43%	8102 \pm 595
50	4.4 \pm 1.7	4.2 \pm 1.1	76%	8117 \pm 167
75	3.7 \pm 0.7	2.1 \pm 0.8	84%	8454 \pm 394
100	2.3 \pm 0.8	5.8 \pm 1.1	78%	8069 \pm 496
125	3.1 \pm 1.5	4.3 \pm 2.1	80%	8776 \pm 367
150	2.9 \pm 1.0	2.3 \pm 0.6	86%	9225 \pm 394



**Compatibility with
crawfish production**

Compatibility of seed treatments with crawfish production

- Ongoing laboratory acute toxicity tests indicate that Dermacor and neonicotinoid insecticides are much less toxic than pyrethroids
- Small-plot field tests using caged crawfish mostly confirm this, but results have been inconsistent
- An area of emphasis for 2009

DuPont “Crawfish Toxicity” Test 2008

Experimental design:

Four treatments applied to 12 plots in a RCBD. Entire plot size was ca. 40' x 100'. Each plot contained 16 sub-plots of rice (Cocodrie), each 4.1' x 18'. Treatments applied to all subplots in plot.

Treatments:

1. Untreated control
2. Dermacor seed treatment, 0.03 mg ai/seed
3. Karate, immediately post-flood, 0.03 lbs ai/A
4. Dinotefuran, 180 gms ai/A, application made by hand 23 day post-flood

Caged crawfish placed in small cages in plots at several time points. Toxicity assessed at several time points after placement.

DuPont “Crawfish Toxicity” Test 2008

Timeline of Experiment:

3/25- Rice (Cocodrie) drill-seeded on 3/25/08, 90 lbs/A

3/31- Plots flushed (deep flush), 1st crawfish placement, water samples taken

4/28-Permanent flood, 2nd crawfish placement, Karate application, water samples taken

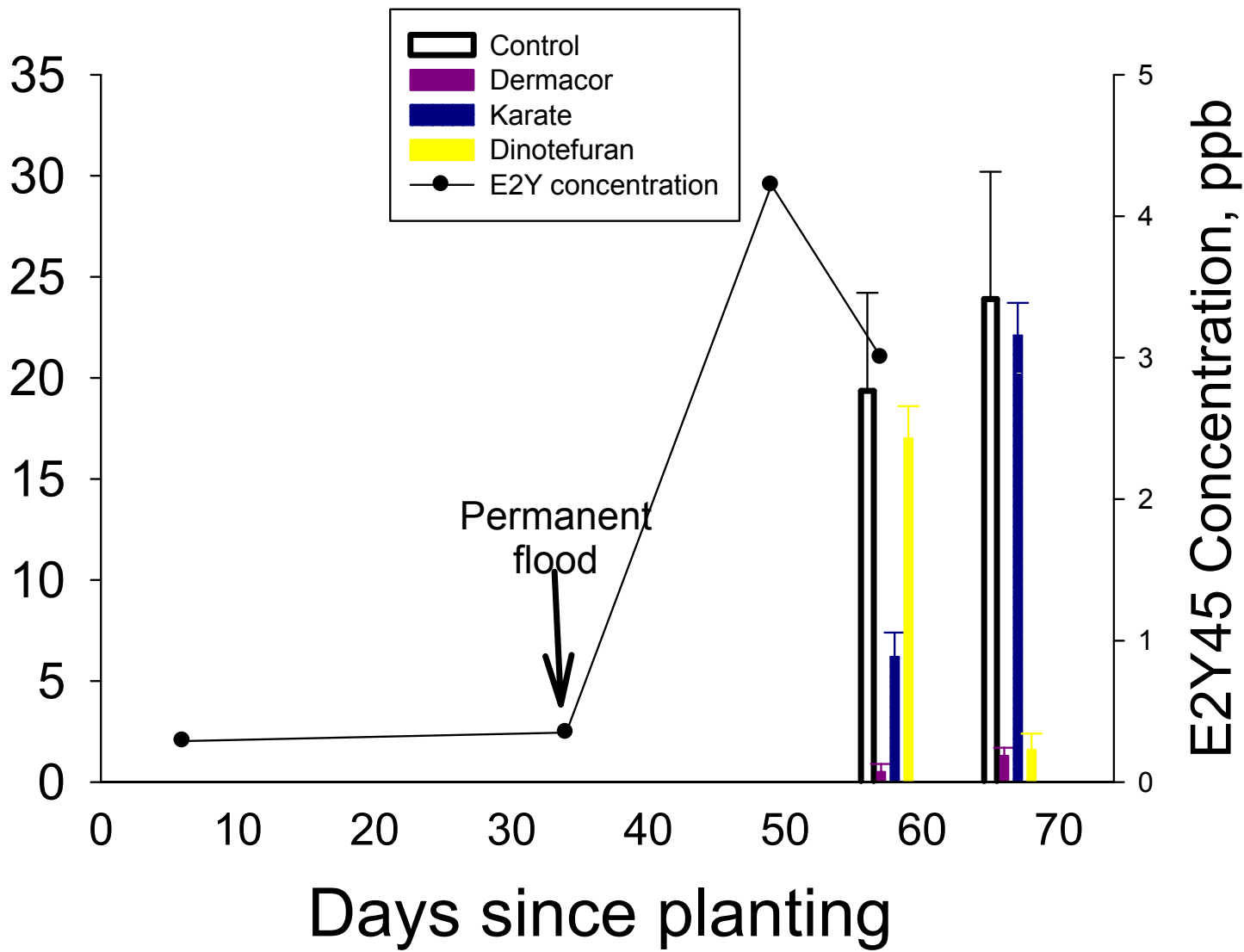
5/13-water samples taken

5/21-1st core sampling, 4 cores/plot. Dinotefuran application made after sampling

5/22-water samples taken

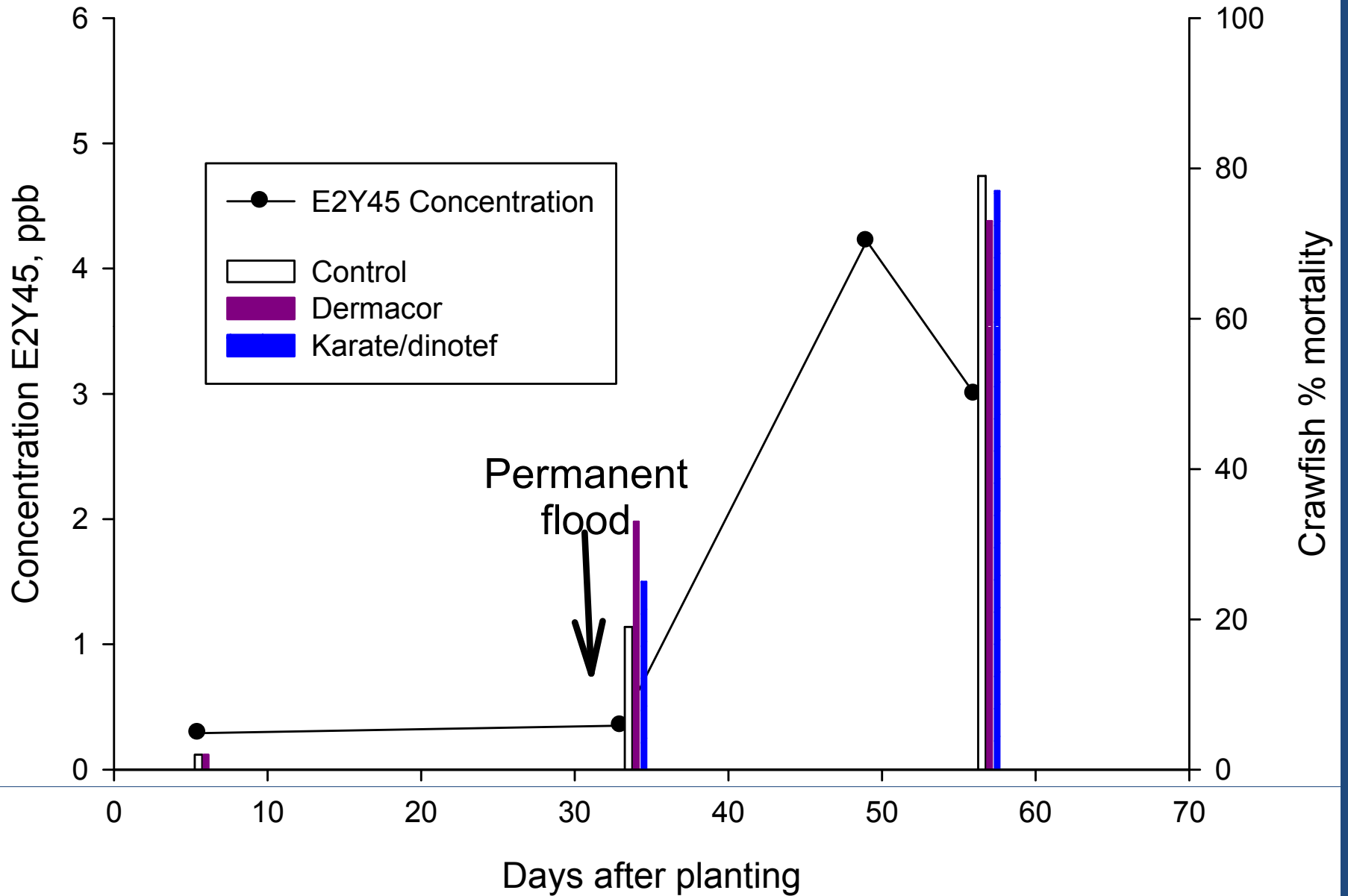
5/29-2nd core sampling

Rice water weevil larvae per core sample



Days since planting

E2Y45 Concentration, ppb



Crawfish Tox field experiment

- Elevated mortality of crawfish when placed into plots immediately after flood (33% vs. 25% [Karate] vs. 19% [utc])?
- Later crawfish placement: high mortality in all treatments
- Highest concentrations in water approx. 2 weeks after permanent flooding

Acknowledgements

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Rice Research
Station

