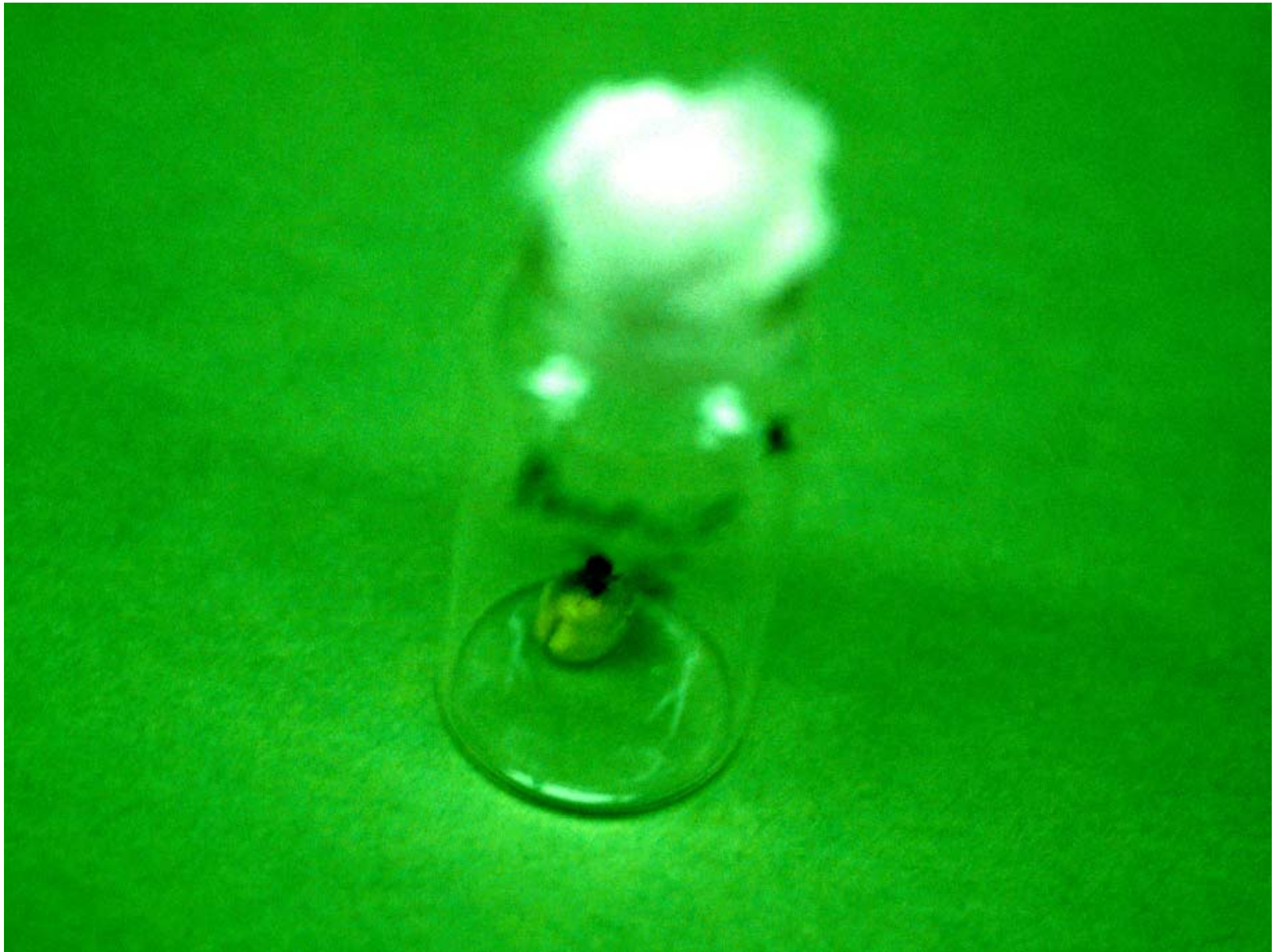
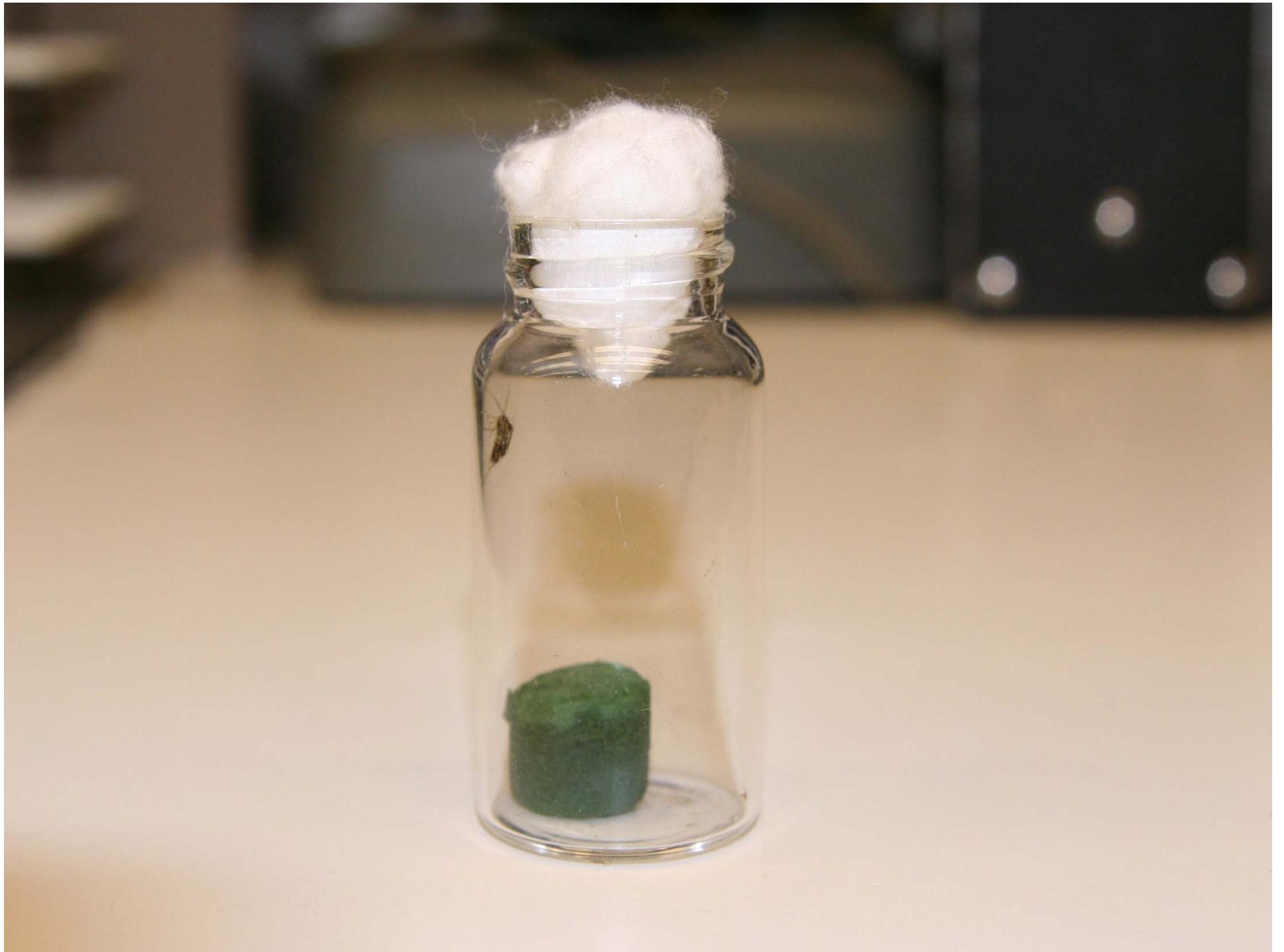


Status of Insect Resistance: Tarnished Plant Bug

Gordon Snodgrass
USDA-ARS-SIMRU







LC₅₀ VALUES

Amount of insecticide (in micrograms) needed to kill 50% of the plant bugs exposed to it. Requires 150 - 300 adults and a 24 h exposure period. Allows for comparison of populations in different locations and in time. Used to compute resistance ratios (RR):

$$\text{RR} = \frac{\text{LC}_{50} \text{ of test population}}{\text{LC}_{50} \text{ of a susceptible population}}$$

The higher the RR the greater the amount of resistance. The RR at which control problems occur must be estimated with field or spray table tests.

DISCRIMINATING-DOSE

Amount of insecticide (in micrograms) that will kill 90% or > of the susceptible bugs exposed to it in a short (2 or 3 h) period of time. Requires a minimum of 50 bugs.

Results are in % mortality and mortalities less than 90% indicate tolerance or resistance is present. The % mortality at which control problems occur must be estimated with field or spray table tests.

DISCRIMINATING-DOSE TESTS FOR PLANT BUGS

Pyrethroids - 15 ug of permethrin for 3 h

COLLECTION LOCATIONS

Delta, MS

Avon
Greenville
Rolling Fork
Clarksdale
Minter City
Ruleville
Marks
Tunica
Indianola
Grady
Vicksburg
Winterville
Thornton
Greenwood

Delta, AR

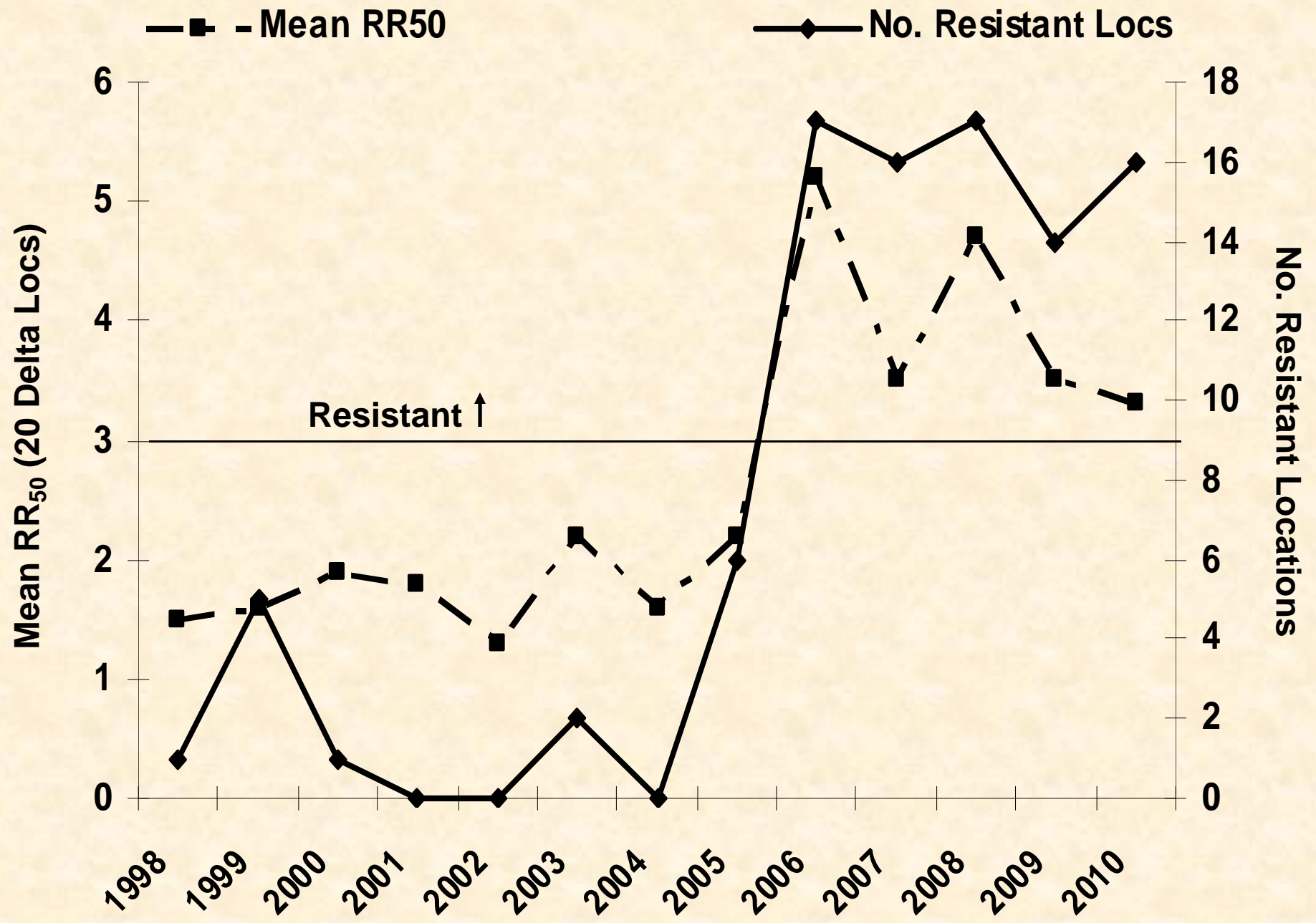
Lake Village
Grady
Gould
Parkdale

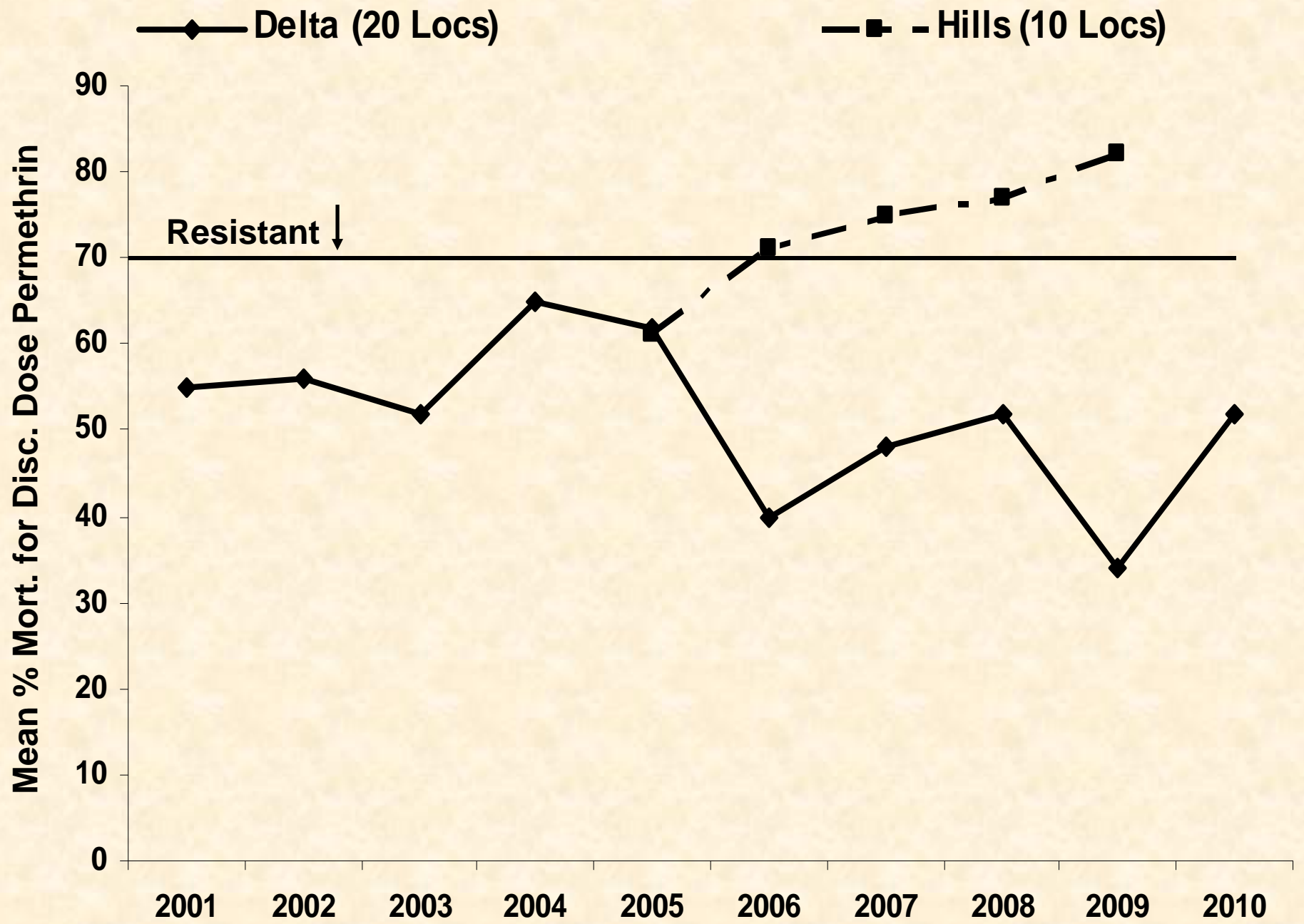
Delta, LA

Lake Providence
Transylvania

Hills, MS

Bruce
Winona
Elliott
Gore Springs
Bradford
Coffeeville
Oxford
Charleston
Water Valley
Batesville





Orthene Resistance in the Hills of Mississippi (10 Locations Each Year)

Year	Mean RR ₅₀	No. Resistant Locations (RR ₅₀ > 3.0)
2005	2.3	4
2006	3.1	5
2007	1.9	1
2008	3.5	7
2009	2.8	3

Orthene and Pyrethroid Resistance in Louisiana

Year	Mean RR ₅₀ (Orthene)	No. Res. Loc. ^b	% Mortality Disc. Dose (15 µg permethrin)	No. Res. Loc. (Mortality > 70%)
2005	3.3	2 (2) ^a	48	2 (2)
2006	5.2	2 (2)	28	2 (2)
2007	2.4	1 (3)	82	1 (7)
2008	3.7	1 (1)	38	1 (1)
2009	4.7	5 (5)	84	0 (5)
2010	4.7	7 (8)	55	6 (8)

^a () = number populations tested.

^b Transylvania, Lake Providence, Oak Grove, Tallulah, Stuart, Winnsboro, Monroe, and Wisner. Bossier, Madison, Concordia, and Tensas Parishes.

Orthene and Pyrethroid Resistance in Southeastern and Northeastern Arkansas

Year	Mean RR ₅₀ (Orthene)	No. Res. Loc. ^b	% Mortality Disc. Dose (15 µg permethrin)	No. Res. Loc. (Mortality > 70%)
Southeastern AR				
2004	1.3	0 (4)^a	82	0 (4)
2005	1.5	0 (4)	87	0 (4)
2006	3.4	3 (4)	48	3 (4)
2007	3.5	3 (4)	44	3 (4)
2008	7.7	4 (4)	41	3 (4)
2009	3.0	4 (6)	34	6 (6)
2010	3.3	6 (6)	54	4 (6)
Northeastern AR				
2007	3.1	4 (5)	88	0 (5)

^a () = number populations tested.

^b SE AR-Lake Village, Parkdale, Portland, Eudora, Grady, and Gould.
NE AR-Mississippi, Lonoke, Crittenden, and Lee Counties.

Orthene and Pyrethroid Resistance in Tennessee

Year	Mean RR₅₀ (Orthene)	No. Res. Loc.^b	% Mortality Disc. Dose (15 µg permethrin)	No. Res. Loc. (Mortality > 70%)
2006	1.6	0 (1)^a	92.3	1 (6)
2007	2.8	3 (5)	94.8	0 (5)

^a () = number populations tested.

^b Haywood, Madison, Dyer, Crocket, Tipton, Lauderdale, and Gipson Counties.

Imidacloprid – Results 2006-2010

	Mean RR ₅₀	Highest RR ₅₀	N
2006	3.2	7.6	19
2007	3.0	5.0	19
2008	2.9	6.5	19
2009	3.1	5.7	21
2010	2.7	5.8	21

Thiamethoxam – Results 2006-2010

	Mean RR ₅₀	Highest RR ₅₀	N
2006	1.0	1.6	9
2007	0.8	1.6	9
2008	0.7	1.2	19
2009	0.9	1.8	23
2010	1.8	9.0*	25

	Highest RR_{50S}
Bifenthrin	33.7
Cypermethrin	16.5
Permethrin	17.8
Dicrotophos	14.0
Methyl Parathion	10.6
Malathion	30.5
Oxamyl	4.7
Acephate	11.3
Methamidophos	3.2

LC₅₀ Values for Novaluron (Diamond)

1st Instar

2.8 µg

2nd Instar

28.8 µg

3rd Instar

32.4 µg

Nymphs exposed to different concentrations of technical grade novaluron for 3 h then held 7 d to determine mortality at each rate tested.

Insecticide Combination Treatments

Test Population: Resistant to acephate ($LC_{50} = 15.8 \mu\text{g}$, $RR_{50} = 5.0$)
Resistant to permethrin ($LC_{50} = 56.2$, $RR_{50} = 16.5$)

Test Methods: Glass vials were treated with 50 μg permethrin to which 5 doses of acephate added (0, 5, 10, 15, and 20 μg). Three replications of 10 adults were tested at each dose.

% Mortality (24 h)				
0 μg acephate	5 μg acephate	10 μg acephate	15 μg acephate	20 μg acephate
30.0	40.0	67.0	80.0	83.0
% Increase in Mortality				
--	10.0	37.0	50.0	53.0

Acephate (Orthene) and Methamidiphos (Monitor)
Parkdale, AR – September 2010

	LC₅₀	RR₅₀
Orthene	17.22	5.6
Monitor	2.15	2.2
