Termiticide Testing

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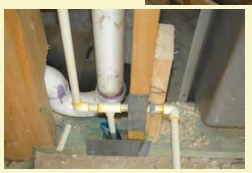
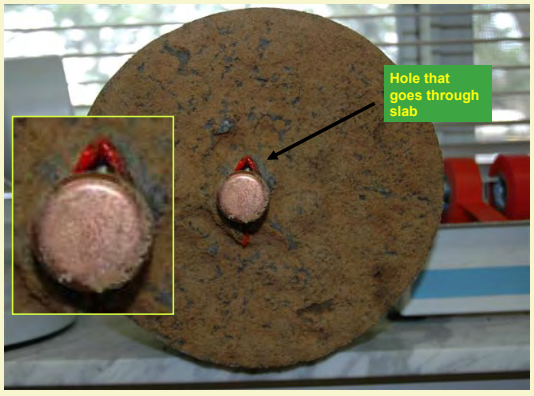
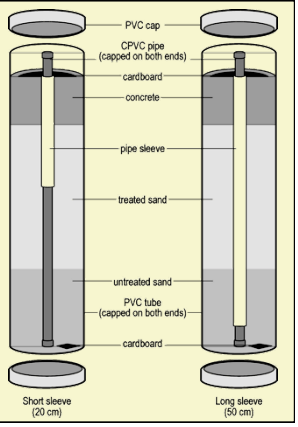
Typical Plumbing Penetrations at Home Sites

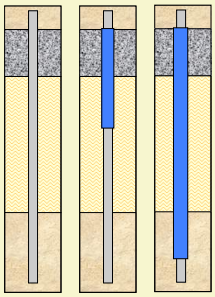




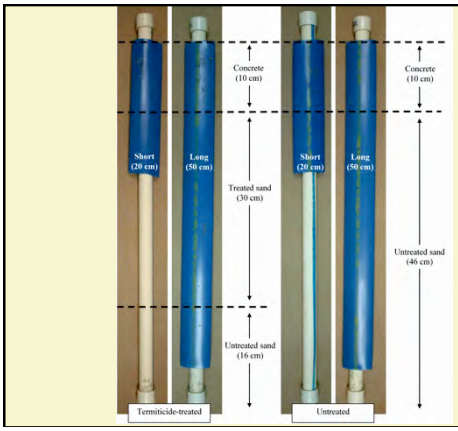
Does Pipe Sleeve Length Affect Termite Control?

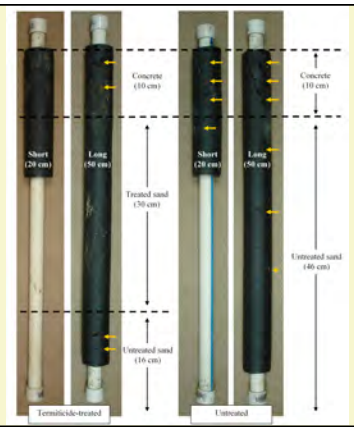


Material & Methods



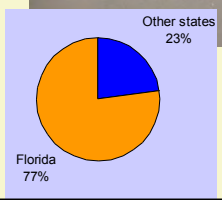
- PVC tube (15 cm diam., 60 cm length)
- Dry builders sand 5 cm
- CPVC pipe treatments n=5
  - Composition
  - length
- Concrete 10 cm
- Soil treatment (10% moisture) n=2
  - Bifenthrin 12% a.i.
  - Control (water)
- Moistened (10%) builders sand
- Cardboard food source (3 cm²)
- Lidded bottom
- Flip tube
- Remove dry builders sand
- Cardboard food source above concrete
- Lidded top
- Flip tube
- Termites to bottom 10 g (~2,500)
- Stored 4 wks





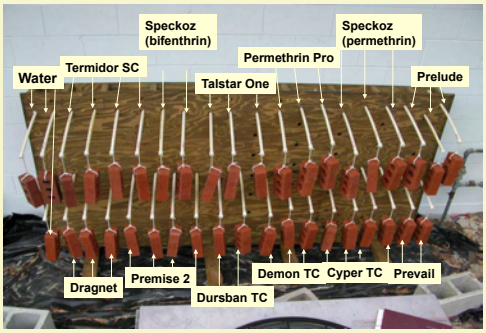
Liquid Termiticide Treatment of CPVC Pipe Causes Failure

- CPVC Failures from termiticides
  - During past 5-7 years
  - Confirmed by pipe manufacturers
  - ~12 failures per 120,000 houses
  - Usually within the 6 months of installation
- 77% of reported failures in Florida
- Litigation
  - Thousands of dollars in damage each claim



Initial Setup

12 registered termiticides



Measured Distance

Some Pipes Failed within 1 day

Conclusions of the studies

- Some termiticide concentrates / spray solutions + stress caused failure of CPVC pipe
- Treated soils + stress did not cause failure of CPVC pipe
- Volatile Organic Chemicals found in termiticides caused CPVC failure within 4 days
- Termiticide + Stress + CPVC Glue caused faster failure of CPVC
  - CPVC glue softens the CPVC
  - Termiticides penetrate and increase cracking

Termiticides for New Construction in Fla

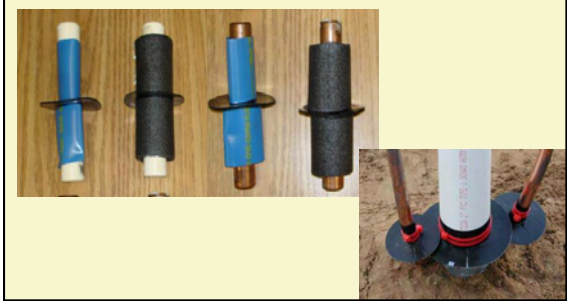
- Not all rates of termiticides worked for 5 years
- Florida rule required re-registration of all termite products
  - 8 products in 2002
- 75 termiticides registered in Florida (8/03/2010)
  - 67 (42 repellent, 25 non-repellent) soil treatment products
    - 27 bifenthrin
    - 22 imidacloprid
    - 6 permethrin
    - 8 cypermethrin
    - 2 fipronil
    - 1 lambda-cyhalothrin
    - 1 chlorfenapyr
    - 1 chlorantraniliprole
  - 5 termite baits
    - 3 Noviflumuron
    - 1 Hexaflumuron
    - 1 Diflubenzuron
  - 3 disodium octaborate tetrathydrate for wood treatment

Non-Chemical Methods of Termite Protection for New Construction

Example
- Termi-Mesh System

- Local building officials may approve these essentially non-chemical methods

Termite protective devices can be installed on pipes passing through concrete or cinder block walls and floors.



Goal of a Soil Termiticide

- Protect the structure and its contents by killing or repelling termites
- In all common soil types
- At label rate
  - Rate is 4 gal per 10 linear feet of 6 inch wide trench per foot of depth
  - Or 1 gal per 10 sq ft
  - These translate into ? ppm or ? inches thickness of treatment for various soils
- For at least 5 years
  - Is there enough ppm left after 5 years of leaching, weathering, and disturbance?

How are termiticides tested ?

How do we know what we know ?

How are termiticides tested?
(How do we know what we know)

- Laboratory
  - Topical application
  - Termite confinement on treated soil
  - Tube tests
  - Arena tests

Laboratory Techniques Topical Application

- Place a known amount of insecticide on termite
- Hold termite for 1-3 days
- Count dead
- Su and Scheffrahn. 1990. Comparison of 11 termiticides against the Formosan and eastern subterranean termite. J. Econ. Entomol. 83: 1918-1924.

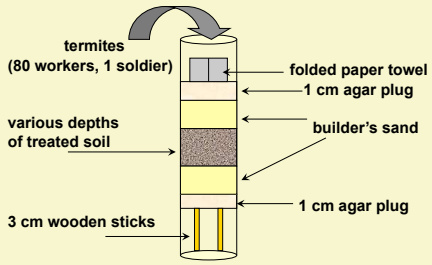
Amount Needed to Kill 50% of treated EST workers

	Insecticide	ug per g	
Less toxic	Chlordane	20.10	2000 times more toxic
	Chlorpyrifos	1.74	
	Permethrin	0.62	
More toxic	Cypermethrin	0.13	
	Deltamethrin	0.01	

Laboratory Techniques Tube Test

- Treat soil
- Place in tube (hold with agar plug)
- Hold for 7 days
- Measure penetration
- Count dead
- Gahlhoff & Koehler 2001. Penetration of the eastern subterranean termite into soil treated at various thicknesses and concentrations of Dursban TC and Premise 75. J. Econ. Entomol 92: 1133-1137.

Bioassay design showing location of termiticide-treated soil sandwiched between two layers of untreated builder's sand.



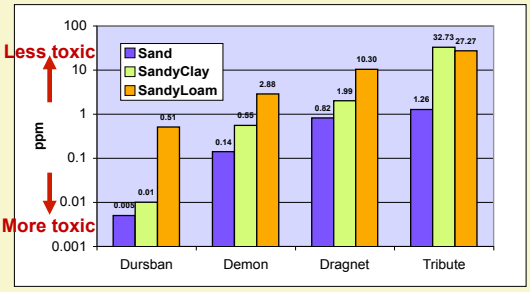
Full Label Rate

- Repellent: Dragnet, Talstar
  - No penetration
  - 8-34% mortality
- Non-Repellent: Premise, Termidor, Phantom, Altriset
  - Penetration
  - 100% mortality for Dursban, Premise, and Termidor

Laboratory Techniques
Termite Confinement on Treated Soil

- Treat soils of different types with various concentrations of termiticides
- Place in cup with termites
- Hold for appropriate time
- Count dead
- Forschler & Townsend. 1996 Mortality of eastern subterranean termites exposed to four soils treated with termiticides. J. Econ. Entomol 89: 678-681.

LC-50 of Termiticides in Confined on Treated Soil



Laboratory Techniques Arena Test

- Treat soil
- Place 5 cm treated band in arena
- Gaps
- Hold for 28 days
- Record days to find gap or 100% mortality
- Gahlhoff & Koehler 1999. To kill or not to kill. Pest Control Tech. 28 (3) 21-24.

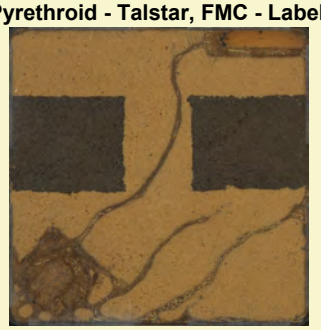
Tunneling of *R. flavipes* in arena treated with repellent termiticide

Pyrethroid - Talstar, FMC - Label Rate

Termites found gap in 3 days and survived indefinitely

Tunneling of *R. flavipes* in arena treated with repellent termiticide

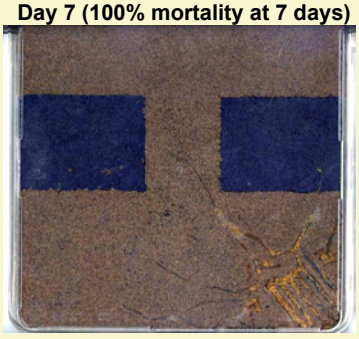
Pyrethroid - Talstar, FMC - Label Rate



102 days after release

Premise 75 WP Low Label Rate (50 ppm)

Day 7 (100% mortality at 7 days)



Enlargement

Tunneling of *R. flavipes* in arena treated with non-repellent termiticide

Fipronil – Termidor 80 WG - Label Rate

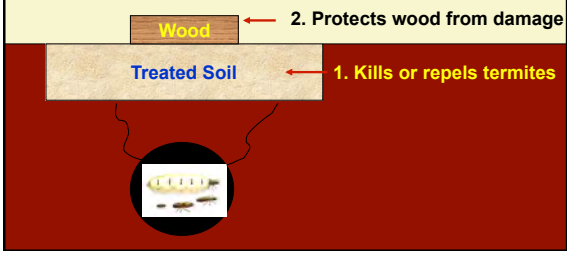
1 day after release

4 days after release
100 % mortality

FDACS Requirements for Registration of Soil Applied Residual Treatments

- Requires
  - Field plot tests
- Methods
  - Gulfport tests
  - Tamashiro soil plug bioassay
  - Experimental house treatment

Soil Termiticide Mode of Action

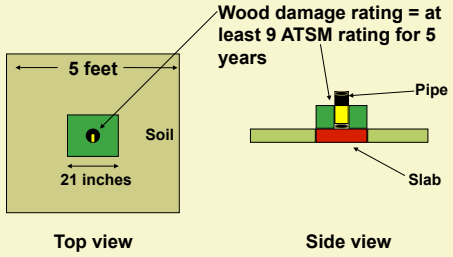


Soil Applied Residual Treatments Performance Standards

Field plot tests

- **Wood damage ratings** by subterranean termites
  - 9 or higher (NO MORE THAN SURFACE SCARRING) on ASTM D1758-96 standard, or
  - = 1 on USDA Forest Service scale
  - in 90% of test samples
  - For a minimum of 5 years
- **Wood protection** in field plots meets the requirement that the product protects the structure and its contents

Gulfport Termiticide Testing Concrete Slab Procedure



Gulfport Tests

- ≥9 for ASTM wood damage
- In 90% of plots
- 5 years

Gulfport Tests with FL Standard

Bifenthrin (Est. 1986)

- 0.062% concrete slab test
  - 16 years = Arizona
  - 21 years = Florida
  - 7 years = Mississippi
  - 16 years = South Carolina
- 0.125% concrete slab test
  - 15 years = Arizona
  - 21 years = Florida
  - 7 years = Mississippi
  - 21 years = South Carolina
- Control plots
  - 69% hits in Florida

2008 USDA report

Gulfport Tests with FL Standard
Fipronil (Termidor 80) (Est. 1994)

- 0.06% concrete slab test
  - 13 years = Arizona
  - 13 years = Florida
  - 13 years = Mississippi
  - 13 years = South Carolina
- 0.125% concrete slab test
  - 13 years = Arizona
  - 13 years = Florida
  - 13 years = Mississippi
  - 13 years = South Carolina
- Control plots
  - 6-20% hits in Florida: KILLED TERMITES IN CONTROL PLOTS

TERMIDOR®
IF YOU'RE NOT ASKING FOR TERMIDOR, YOU'RE ASKING FOR TROUBLE.

2008 USDA report

Gulfport Tests with FL Standard
Fipronil (Termidor SC) (Est. 1999)

- 0.06% concrete slab test
  - 8 years = Arizona
  - 7.5 years = Florida
  - 8 years = Mississippi
  - 8 years = South Carolina
- 0.125% concrete slab test
  - 8 years = Arizona
  - 8 years = Florida
  - 8 years = Mississippi
  - 8 years = South Carolina
- Control plots
  - 58% hits in Florida

2008 USDA report

Tamashiro Soil Plug Bioassay

- Test plots are cleared and a 26 inch square in the center is treated with termiticide
- Plots are covered with a vapor barrier and the concrete slab is poured
- At set times after treatment, slab is drilled or lifted.
- Soil plugs are removed and a PVC spacer is put into ground
- In lab, plugs are placed in tube test bioassay
- Grace, Yates, Tamashiro, and Yamamoto. 1993. Persistence of organochlorine insecticides for Formosan termite control in Hawaii. J. Econ. Entomol. 86: 761-766.

Leveling the site

Leveling form boards

Adding correct soil type

Treating the soil

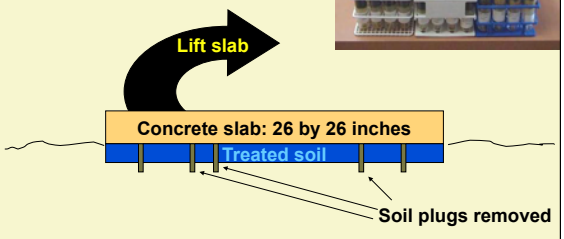
Pouring concrete

Removing concrete form

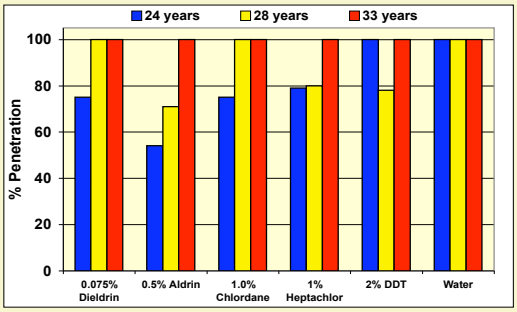
Finished slab lifted for soil sampling

Taking core sample and evaluating termites control

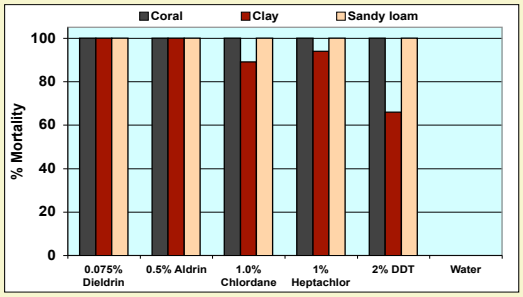
Tube Bioassay of Soil Plugs



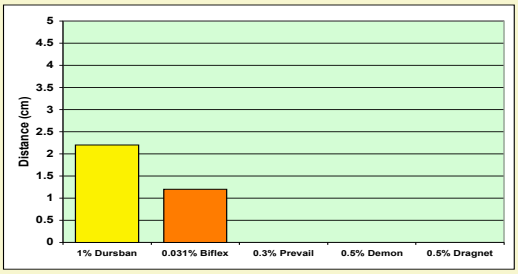
Penetration of Formosan termites into soil plugs weathered 24-33 yr



20 year mortality of Formosan termites exposed to soil plugs from 1958 treatment

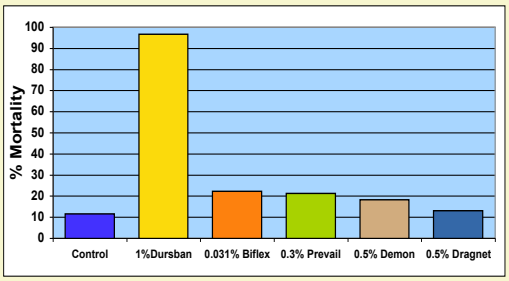


Distance EST penetrated into soil plugs in tube tests after 1 yr of aging



Su, Scheffrahn, and Ban. 1993. Barrier efficacy of pyrethroid and organophosphate formulations against subterranean termites J. Econ. Entomol. 86: 772-776

% Mortality of EST in Soil Plug Tests after 1 yr of Aging



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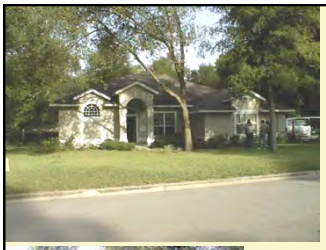
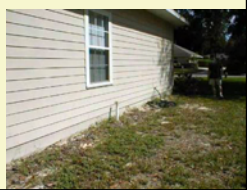
Experimental House Treatment

- Infested houses
- Pest control company
- Inspection at various intervals after treatment





House Treated with Experimental Termiticide

Subterranean termite infestation

Treat the House

Corner infestation (3 months after treatment)

Corner infestation (6 months after treatment)

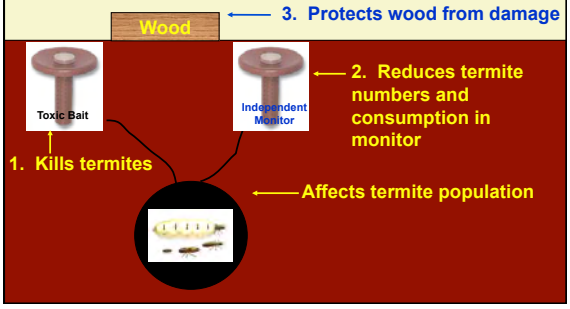
Summary of Soil Termiticide Evaluation Techniques

- Laboratory
  - Topical application
  - Termite confinement on treated soil
  - Tube tests
  - Arena tests
- Field
  - Gulfport tests ** 2 star rating
  - Tamashiro soil plug bioassay ***** 5 star rating
  - Experimental house treatment **** 4 star rating

Stand-Alone Bait Systems

- Requires both
  - Field plot tests
  - Building tests

Bait System Mode of Action

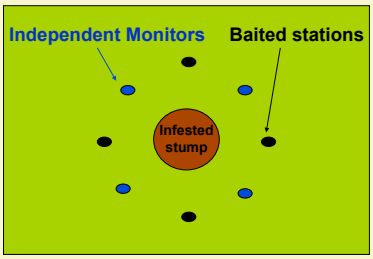


Stand-Alone Bait Systems
Performance Standards
Field plot tests

- Baited termite population reduced by
  - at least 50% in wood consumption or termite numbers
  - in 75% of baited populations
  - within 12 months of initiation of feeding on bait active ingredient
- Reductions maintained for at least 6 months

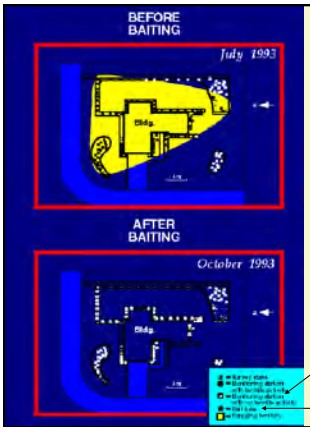
Field plot bait test

50% reduction in termites or food consumption in independent monitors within 12 months and maintained for 6 months



Stand-Alone Bait Systems
Performance Standards
Building tests with existing infestations

- Independent monitors
  - At least 90% reduction in termite activity
  - In at least 90% of test buildings
  - Within 12 months of initiation of feeding on bait active ingredient, and
- Building monitoring
  - Cessation of live termite activity
  - In at least 90% of test buildings
  - Within 12 months after initiation of feeding on the formulated bait
- Reinfestation of Buildings
  - Visual inspection -- No reinfestation within 2 years
  - Research and visual inspection – no reinfestation within 1 year



Results of a Sentricon test

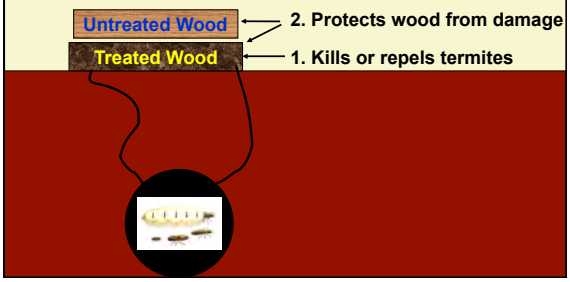
Formosan subterranean termite colony containing 3.9 million foragers eliminated in 3 months

Standard: 90% reduction of termite activity in independent monitors within 12 months
+
Cessation of termite activity in structure within 12 months
+
Control maintained for 1-2 years

Pesticides Applied to Wood

- Requires both
  - Field plot tests
  - Building tests

Wood Treatment Mode of Action



Pesticides Applied to Wood
Performance Standards

- **Field plot tests**
  - Subterranean termite damage to wood
    - 9 or higher (no more than surface scarring) on ASTM D1758-96 standard, or
    - = 1 on USDA Forest Service scale
    - for 90% of test samples
    - For a minimum of 5 years
- **Building tests**
  - No infestation in at least 90% of buildings within 5 years of the treatment

House as Poisonous Bait ?

Can we do better ?

The objective is to prevent termites from eating the house;

NOT necessarily, kill the termites.

But that can be good!

Southeast Pest Management Conference

Reserve the dates
SEPMC 2012
May 6-9, 2012