

Inclusion of Vikane® gas fumigant in an Area-Wide Eradication Program for
Nasutitermes costalis in Southeast Florida
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Abstract

On April 23, 2003, two boats in dry storage and two office trailers containing aerial colonies of *Nasutitermes costalis* were fumigated with Vikane® gas fumigant. The fumigations were conducted as part of the eradication program for *N. costalis* in Dania Beach, FL, as coordinated by the Tree Termite Task Force. All structures were tarped and had soil underseals. Vikane was introduced at a non-monitored, drywood termite rate (1x). Vikane concentrations were measured remotely during the fumigation using a Fumiscope. The Half Loss Times (HLTs) for all structures ranged from 4.4 – 15.8 hr and were better than estimated. The accumulated dosages ranged from 93 – 142 oz-hr. As a result of the improved HLT's and using a non-monitored rate, the dosages accumulated at all structures were greater than the 82 oz-hr drywood termite dosage rate required at 75°F, the soil underseal temperature.

Introduction

Nasutitermes Dudley is a tropicopolitan genus of wood-feeding higher termites (Termitidae) which typically nest in a carton matrix located at or above ground level. The first discovery of established *Nasutitermes* populations, *N. costalis* (Holmgren), in the continental United States was reported by Scheffrahn et al (2002) at a single family residence located at 2275 SW 45th St, Dania Beach, in Broward County, FL. That residence was subsequently treated in June, 2001, with a standard subslab and perimeter termiticide application using Premise termiticide (Bayer Corporation, Kansas City, MO) followed by a structural fumigation with an accumulated dosage of 115 oz-hr of Vikane® gas fumigant (Thoms and Scheffrahn 2001). The structural infestation of *N. costalis* was eliminated using these treatments, although *N. costalis* continued to be abundant in the landscape surrounding this residence and eventually reinfested the home.

Infestations of *Nasutitermes* species on recreational boats in Florida have been successfully eradicated using Vikane gas fumigant. In July 1996, a wooden sailboat docked in Ft. Lauderdale, Florida and previously docked in Cancun, Mexico, had an active infestation of *N. nigriceps* (Scheffrahn et al. 1996). This boat was fumigated using Vikane applied at 16 oz/1000 ft³. No land infestation of *N. nigriceps* was subsequently found. In August, 2002, *N. acajutlae* were identified infesting the Loan Star yacht, which had been recently brought to Ft. Lauderdale from St. Thomas, USVI. The carton nest(s) could not be located, but abundant foraging tubes were located throughout the boat. This infestation was eliminated by fumigation with an accumulated dosage of 197 oz-hr of Vikane (Thoms and Scheffrahn 2002).

Since the initial identification of *N. costalis* in Broward County, surveys by University of Florida, supervised by R. H. Scheffrahn, determined that this termite infested ca. 50 acres in Dania Beach west of the Ft. Lauderdale International Airport. The Tree Termite

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Eradication Task Force was formed in 2002 to coordinate affected state and local agencies and to provide for dissemination of accurate information to the public on research and control. Organizations represented on the committee of the Department of Agriculture and Consumer Services (DACCS), University of Florida Institute of Food and Agricultural Sciences (IFAS), Ft. Lauderdale Research and Education Center (FLREC), Broward County Cooperative Extension Service, Certified Pest Control Operators of Florida (CPCO), Florida Pest Management Association (FPMA), and the Florida Fumigation Advisory Council (Dwinell 2003).

On April 23, 2003, the first coordinated area-wide treatments were conducted to eradicate *N. costalis*. The infested 50-acre zone was subdivided into ten treatment sectors. Ten volunteer certified operators (CO's) selected by CPCO and FPMA provided equipment and labor. Each CO was assigned a treatment area, and was accompanied by a DACS staff member who recorded the amount of insecticide applied, and a FLREC staff member who identified termite infestations for treatment. Two termiticide dilutions; Premise 2 (0.1% imidacloprid) and Termidor SC (0.125% fipronil 0.125%); were applied, each to five separate treatment sectors, under an EUP label (Dwinell 2003). A commercial blue dye (Tracker, Lesco Corp.) was added to the termiticide mixtures to temporarily mark treated areas. A total of 380 gallons of Premise and 450 gallons of Termidor were applied.

On April 23, 2003, two boats in dry storage and two office trailers containing aerial colonies of *N. costalis* in areas inaccessible for residual termiticide treatment were fumigated by a volunteer fumigation crew from Dead Bug Edwards, representing the Fumigation Advisory Council. This report describes these fumigations conducted as part of the *N. costalis* eradication program.

Materials and Methods

Treatment sites: Two boats and one office trailer were located at Bent Tree Boatyard on Ravenswood Road in Dania Beach. The second office trailer was located nearby at Banyan Bay Marina on 45 St. The Banyan Bay trailer was previously used as an office by the marina, but is currently used for storage. The boats were in dry dock, mounted on trailers and wooden blocks. Inspection of these sites prior to fumigation found mud tubes containing live termites on exterior hulls of both boats and in the interior of the Banyan Bay trailer. Although no live *N. costalis* termites were found in the trailer at Bent Tree boatyard prior to fumigation, this structure had extensive previous Nasute damage and sagging ceilings in the bathroom and office indicating locations of possible, hidden Nasute nests. Prior to fumigation preparation, all areas of soil contact for the boat trailers, wood blocks, and support piers and wood steps for the office trailers were treated with Termidor.

Fumigation Preparation: The boats and trailers were covered with vinyl coated tarpaulins that sealed to the soil using overlapping sand-filled "snakes." At Bent Tree Boatyard, the

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gravel substrate was raked back to expose the soil to improve the ground seal prior to placement of tarps and sand snakes. The two boats were side-by-side and were tarped as one fumigation unit. Within each fumigated structure/unit, Vikane was introduced at one release location through 100 ft, 1/8-inch ID braided PVC hose was attached to a high velocity 2.6 amp metal cage fan (Patton, Hampton Bay, or ProStandard). A chloropicrin release tray was placed in front of the fumigant introduction fan. Additional fans were used for fumigant circulation.

One hose, 100-ft length, ½ inch OD, was installed in each fumigated structure to measure Vikane concentrations during fumigation. The monitoring hoses were connected to a vacuum pump manifold to draw gas samples into a Fumiscope D unit equipped with a drying tube (Key Chemical and Equipment Co., Clearwater, FL). The Fumiscope was calibrated on each day of use using Vikane diluted in air to a known concentration of 16.9 oz/1000 ft³. Calibration gas in the compressed air cylinder was prepared and analyzed by Scott-Marrin, Riverside, CA.

Fumigant Introduction: Using the Fumiguide™ electronic calculator, the half loss time (HLT) for Vikane for the boats and trailers were estimated (Table 1). An ECG digital thermometer (model DT-205) was used to measure soil temperature under the boat trailers and office trailers. A drywood termite (1X) non-monitored rate was selected to fumigate the structures. The office trailer and boats at Bent Tree Boat yard were fumigated for a 6 hr exposure to allow overnight aeration and reoccupation of the office the following business day. The storage trailer at Banyan Bay was fumigated for a 20 hr exposure. During introduction, Vikane was measured gravimetrically using a hanging, digital scale. The fumigator in charge was Jeff Edwards of Dead Bug Edwards.

Table 1. Calculations using the Fumiguide™ Calculator for fumigating two boats and two trailers, Dania Beach, FL, April 23, 2003, for control of *Nasutitermes costalis*.

	Bent Tree Boatyard		Banyan Bay Marina
Location	Office Trailer	Combined Boats	Storage Trailer
Size	12,000 cubic feet	5,000 cubic ft	14,000 cubic ft
Soil Temperature	75°F	75°F	75°F
Tarp Condition	Good	Good	Good
Seal Condition	Good	Medium	Good
Underseal	Sandy Loam	Sandy Loam	Loam
Wind	7 mph	7 mph	7 mph
Hours Exposure	6	6	20
Estimated HLT	6.3	4.3	6.7
Calculated Oz Vikane/1000 ft ³	25.2	28.9	13.1
Actual # Vikane Introduce	19	10	10 (1.2) ¹
Oz chloropicrin	1	1	1

APPENDIX A to the
Supplement to the May 14, 2003 Progress Report

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Time of Intro.	9:25-9:30 am	9:57-10:00 am	11:27-11:30 am
Aeration Initiated	3:30 pm	4:00 pm	8:30 am, 4/24/03

¹1.2 pounds of Vikane added 4:45 pm, 5.25 hr after initial introduction.

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Results

Fumigant Monitoring: A total of 40.2 pounds of Vikane was used to fumigate all four structures (Table 1). Additional fumigant, 1.2 pounds, was introduced into the Banyan Bay storage trailer 5.45 hr after the first introduction because the initial Half Loss Time (HLT, 4.5 hr) during the first 5 hr of the fumigation was greater than initially estimated (6.7, Table 1). Equilibrium between the two monitoring locations within the tarped boats was not achieved during the 6 hr exposure period (Table 2).

The actual HLTs were calculated using a HLT calculator (T. Wontner-Smith, Central Science Laboratory, England, Table 3). The HLTs for all structures were better than estimated. As a result of the improved HLTs and using a non-monitored rate, the dosages accumulated at all structures were greater than the 82 oz-hr drywood termite dosage rate required at 75°F (Table 3, CT calculator, L. Keeler, Dow AgroSciences, Indianapolis, IN).

After fumigation, no live *N. costalis* were found in mud tubes that contained live termites prior to fumigation. The two boats and two trailers will continue to be periodically inspected after fumigation to check for new damage or foraging tubes by *N. costalis*. Previous research has demonstrated that Vikane is an effective treatment for eradicating aerial infestations of *Nasutitermes* species from structures, including boats.

Table 2. Measuring concentration (oz/1000 ft³)¹ of Vikane using a Fumiscope during fumigation two boats and two trailers in Dania Beach, FL, April 23, 2003, for control of *Nasutitermes costalis*.

Hr After Introduction	Bent Tree Boatyard			Banyan Bay Marina		
	Sailboat	Boat 2	Hr After Introduction	Office Trailer	Hr After Introduction	Storage Trailer
1	43.3	27.3	1.5	26	0.5	12
1.5	32.7	27.3	2	27.5	5	6
2	30.2	23.3	2.5	23.3	6 ²	7
3	27.5	23.3	3.5	22	7	7
3.5	26	22	4	20.5	21	6
4	22	19.3	4.5	19.3		
5.25	22	17.8	5.75	19.3		

¹Corrected readings based on calibration fumigant.

²1.2 pounds of Vikane added 4:45 pm, 5.25 hr after initial introduction.

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Table 3. Actual Half Loss Time (HLT) and accumulated dosage (oz-hr) of Vikane during fumigation two boats and two trailers in Dania Beach, FL, April 23, 2003, for control of *Nasutitermes costalis*.

Location	Actual HLT	Dosage Accumulation (oz Vikane – hr/1000 cubic feet) ¹
Bent Tree Sailboat	4.4 hr	117
Bent Tree Boat 2	6.9 hr	94
Bent Tree Office Trailer	9.9 hr	93
Banyan Bay Storage Trailer	15.8 hr	142

¹Dosage accumulation during monitored interval. Total accumulation was slightly higher due to dosage accumulated from last monitoring reading to tarpaulin removal.

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