UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
CHEMICAL SAFETY AND
POLLUTION PREVENTION

MEMORANDUM:

JUL 27 2011

To: Samantha Hulkower

From: Clayton Myers, Entomologist **Date**: July 27, 2011

Subject: PRODUCT PERFORMANCE DATA EVALUATION RECORD

DP barcode: 387782
Decision no.: 445745
Submission no: 891044
Action code: R340
Product Name: BoraSol-WP
EPA Reg. No or File Symbol: 69529-2
Formulation Type: 98% Wettable Powder
Ingredients statement from the label with PC codes included: Disodium Octaborate Tetrahydrate, 98%, PC: 011103
Application rate(s) of product and each active ingredient (lbs. or gallons/1000 square feet or per acre as appropriate; and g/m^2 or mg/cm^2 as appropriate): Multiple, as follows:

Dust: 2-12 grams/sq. ft., dependent on target organism

15% Solution: 1.5 lbs product per gallon of solution. 7.5 lbs/1000 sq. ft. (Same for foaming applications)

Bait Solutions: Mixing with 10% sucrose solutions (at rates from 0.2% - 5%) targetting ants

Bait Mixtures: Mixing with dry rodent chow (at rates from 6-50%) targetting cockroaches

I. Action Requested: Data was submitted to support the addition of new pests.

II. Background: The registrant seeks to add a number of public health pest and anti-fungal claims to a registered DOT product label. Fungal/Rot claims are reviewed by the Antimicrobials Division, and this review only addresses insect claims. The registrant submitted a number of studies, including public literature studies, to support the addition of these claims.

III. MRID Summaries: (Primary Reviews attached)

a. **MRID 48394901**
(1) Non-GLP
(2) Studies were conducted to demonstrate the efficacy of the product against Lyctid beetles and subterranean termites when applied as a wood preservative treatment.
(3) Authors conclude that efficacy is supported for these pests.
(4) These pests are already approved and listed on the existing label, therefore this study is considered supplementary

b. MRID 48394902

(1) Non-GLP

(2) A laboratory was conducted to determine the efficacy of DOT (2 application methods) against the West Indian drywood termite. Simulated attic modules (3.75 square ft.) were treated with DOT as either a dust or 15% water solution and evaluated against controls for prevention of infestation when placed in a 5 x 8 m room containing mixed termite colonies infesting doors, structural lumber and furniture collected in south Florida. After 6 months of exposure, modules were disassembled and inspected for nuptial chamber location and contents.

(3) Both rates of the dust application were 100% effective in preventing colonization and 79-89% effective in prevention of nuptial chamber formation. Primary reviewer concludes that claims are supported for the application of dust at 0.7 g/sq. ft. Primary reviewer suggests that the registrant be asked to demonstrate/verify that the tested structures were the size reported, 3.75 sq. ft.

(4) The study is acceptable to support control claims against Drywood termites for a duration not exceeding six months, when applied at a minimum rate of 0.7 g/sq. ft (2.5 oz/100 sq ft.). Claims/directions for application of a 15% aqueous solution are not supported and must be removed from the label.

c. MRID 483949003

X Not supported (on prop label?)

(1) Non-GLP

(2) Anecdotal results are reported to support the use of borates against carpenter ants. No actual test was described.

(3) The study author made no conclusions.

(4) The study is not acceptable to support any specific pest claims, and can only be classified as supplemental with regard to support of carpenter ant claims.

d. MRID 48394904

(1) Non-GLP

(2) Laboratory studies were conducted to evaluate the efficacy of boric acid applied against Argentine Ants when formulated as a bait with sucrose, according to label directions.

(3) Consumption and toxicity of the baits were evaluated over time. The primary reviewer concluded this study was acceptable to support claims against Argentine ants.

(4) The study is supplemental, as efficacy data are not required to support efficacy claims against Argentine ants.

e. MRID 48394905

(1) Non-GLP

(2) Laboratory studies were conducted to evaluate the efficacy of boric acid applied against imported fire ants (*Solenopsis*) when formulated as a bait with sucrose, according to label directions. This included an oral toxicity test, a bait consumption test, and a large (~75,000 workers, 16 week) colony reduction test with replenishment of bait.

(3) Consumption and toxicity of the baits were evaluated over time and all rates were effective in reducing colonies 90% within 4 weeks, with almost total elimination by 16 weeks

(4) The study is acceptable to support claims against imported fire ants for 8-16 weeks after treatment, for applications of the 10% sucrose solution with 0.2% DOT.

f. MRID 48394906

(1) Non-GLP

(2) A field study was conducted to evaluate applications of DOT formulated in a sucrose solution for control of Pharaoh Ants. Pretreatment counts were made and efficacy evaluation was done using post-treatment counts of water/sugar stations. One study was done with a native population, another was done with introduced ants. 3-4 replicates were used in each study.

(3) Significant Ant reduction (also >90% reduction) was observed for 7-8 weeks after treatment. Primary reviewer concludes that the study is adequate to support controls claims against pharaoh ants, for applications of the 10% sucrose solution with 1% DOT.

(4) Control claims against are supported for 8 weeks after treatment using the 1% DOT application rate applied as a bait with 10% sucrose.

g. MRID 48394907

(1) Non-GLP

(2) Laboratory studies (choice and no-choice) were conducted to evaluate DOT against German cockroaches, as a mixture of the product with rodent chow, in various treatments (6-50%). Treatments had 3 replicates of 25 adult cockroaches each.

(3) No-choice tests demonstrated mortality within one week, down to the lowest concentration. Choice tests demonstrated that the treated chow was repellent to cockroaches relative to control, untreated chow. Primary reviewer concludes that DOT in rodent chow was efficacious at the tested concentrations.

(4) The study is acceptable to support claims against German cockroaches for applications where DOT is mixed with a bait/food at a rate of 6-50% concentration of active ingredient mixed with rodent chow.

h. MRID 48394908

(1) Non-GLP

(2) Anecdotal results are reported to support the use of borates against carpenter ants.

(3) The author concludes that borates have long been used for prevention and control of insects.

(4) The study is not acceptable to support any specific pest claims, and can only be classified as supplemental with regard to support of carpenter ant claims.

IV. RECOMMENDATIONS:

(1) Labeling: The section entitled <u>Target Organisms</u> must be modified to include the disclaimers listed below in section (a).

(a) What pests and site/pest combinations may be added as follows to the label based on the submitted or cited data?

a. Drywood Termites (via applications of dust at 0.7g/sq ft). 6 month control duration only
b. Argentine Ants
c. Pharaoh Ants (via sugar bait applications only)
d. Fire Ants (via sugar bait applications only)
e. Ghost Ants, White Footed Ants
f. German Cockroaches (dry bait applications only)
g. Silverfish

(b) What pests and site/pest combinations must be removed from the label?

a. Carpenter Ants—all references must be deleted throughout the label

(c) List changes to the directions for use:

<u>General Insect Control</u>: Delete the entire first paragraph of this section on page 8, beginning ~~"Ants are either replled or killed . . ."~~ Only the second paragraph, which describes application of sugar baits containing BoraSol are acceptable for use directions against Ants. Also, references to ants must be modified to exclude Carpenter Ants.

Also, the second sentence of the 3rd paragraph of this sectio must be deleted, beginning ~~"Cockroaches and silverfish are also controlled by powder applications . . ."~~ The remaining instructions regarding dry baits, mixed with rodent chow are acceptable directions. The last sentence of this section, beginning ~~"Dry powder will kill by contact . . ."~~ must also be deleted.

<u>Preventative Treatment of Wood in Existing Structures</u>: delete the phrase at the end of the first paragraph at the end of page 8 with use directions for drywood termites: ~~"or spraying with a minimum o f1 quart of 15% BoraSol WP solution/200 sq. ft.~~

TASK 2 DATA EVALUATION RECORD

STUDY TYPE: Product Performance

MRID 483949-01. Williams, L.H., and T.L Amburgey. 1987. Integrated Protection Against Lyctid Beetle Infestations. IV. Resistance of Boron-Treated Wood (*Virola* spp.) to Insect and Fungal Attack. Forest Products Journal 37(2):10-17

Premises Treatments (830.3500)

Product Name: BoraSol-WP
EPA Reg. No. or File Symbol: 69529-2
Decision number: 445745
DP number: 387782

Prepared for
Registration Division (7505)
Office of Pesticide Programs
U.S. Environmental Protection Agency
Washington. DC 20460

Prepared by
Summitec Corporation
Task Order No.: 2-01

Primary Reviewer: Eric B. Lewis, M.S.	Signature: Eric B. Lewis Date: 07/06/2011
Secondary Reviewers: Gene Burgess, Ph.D.	Signature: Gene Burgess, AB Date: 07/06/2011
Robert Ross, M.S., Program Manager	Signature: Robert H. Ross Date: 07/06/2011
Quality Assurance: Angela M. Edmonds, B.S.	Signature: Angela M. Edmonds Date: 07/06/2011

RECOMMENDED CLASSIFICATION: Acceptable

Disclaimer

This review may have been altered subsequent to the contractors' signatures above.

DATA EVALUATION RECORD

[Primary Reviewer's Name]

STUDY TYPE:	PRODUCT PERFORMANCE [810.3500]
MRID:	MRID 483949-01. Integrated Protection Against Lyctid Beetle Infestations. IV. Resistance of Boron-Treated Wood (*Virola* spp.) to Insect and Fungal Attack. Williams, L.H., and T.L Amburgey. 1987.
DP BARCODE:	387782
DECISION NO:	445745
SUBMISSION NO:	891044
SPONSOR:	Quality Borate Company
TESTING FACILITY:	USDA Forest Service, Southern Forest Experiment Station, Gulfport, MS
STUDY DIRECTOR:	Not provided
SUBMITTER:	Opaskar, V.; Quality Borate Company
STUDY COMPLETED:	1987 (journal publication date)
CONFIDENTIALITY CLAIMS:	None
GOOD LABORATORY PRACTICE:	The submitter did not sponsor or conduct the study, and does not know if it was conducted in accordance with 40CFR Part 160.
TEST MATERIAL:	PRODUCT NAME: BoraSol-WP EPA REGISTRATION NO: 69529-2 ACTIVE INGREDIENT NAME: Boron sodium oxide ($B_8Na_2O_{13}$) tetrahydrate A.I.%: 98% PC CODE: 011103 CAS NO.: 12880-03-4 FORMULATION TYPE: WP PRODUCT APPLICATION RATE: A one-minute dip in a 25-30% BAE solution of polyborate, to provide a reported

	BAE up to ~0.8 ACTIVE INGREDIENT APPLICATION RATE: Not provided
PROPOSED LABEL MARKETING CLAIMS:	Target Organisms: powderpost beetles: Lyctidae; subterranean termites; wood decay fungi
EPA REQUESTS:	[EPA WILL ADD DIRECTIVES HERE]

STUDY REVIEW

Study Number/Title: (if more than one study is provided in the MRID)

Purpose: A laboratory study was conducted to determine the efficacy of a 25 -30% boric acid equivalent (BAE) solution against lyctid beetles, subterranean termites, brown-rot decay fungi, and soft-rot decay fungi.

MATERIALS AND METHODS

Test Location: Gulfport, MS

Test Material(s): The test material was a 25% to 30% boric acid equivalent solution of polyborate (TIM-BOR®). The product label for BoraSol-WP states that the product contains 98% disodium octaborate tetrahydrate. For dip treatment, the product label recommends immersion in a hot aqueous solution of BoraSol-WP for two to five minutes.

Test Species Name, Life Stage, Sex, and Age: Lyctid beetle (*Lyctus brunneus*), adult, mixed sex; eastern subterranean termite (*Reticulitermes flavipes*), life stage, sex and age not provided; brown rot fungus (*Gloeophyllum trabeum*); soft rot fungi (*Alternaria alternata*; *Aureobasidium pullulans*, *Aspergillus niger*, *Cladosporium* spp., T*richoderma* spp.)

Test containers, chambers and/or apparatus (include site description and location) and how experiment was conducted: Lumber samples (24 in long) were sawn from 60 random newly-sawn banak (*Virola* spp.) boards to serve as untreated controls. The boards were then treated by a one-minute dip in the test material, stored under roof for one week, and kiln-dried for two weeks. A second 24-in sample was sawn from the middle of each treated board, planed to one-half inch thickness, and a 1.5 in wide x 24 in long strip was cut from the center. The 1.5 in strip was then sawn into 4.25 in long blocks for the test. A separate set of boards was treated with the test material as before, dried for 2 weeks, planed, and kiln-dried before shaping into moldings. The boron content of samples from the mid-length of each piece was determined in a separate study (not reported here).

Lumber test (beetles): The test blocks were exposed to 10 beetles in plastic cages (1 x 2 x 5 in) with loose-fitting lids. The room was maintained at 75 ± 5°F and 70-80% RH. After 6 months, the blocks were X-rayed to determine infestation.

Lumber test (fungus and termites): The tests were conducted, with some modifications, according to ASTM Standards D1413-76 and D3345-74. Test blocks (0.5 inch cubes) were cut from the treated and control samples. Soil for the soft rot test was prepared according to ASTM Standard D1413-76. The test containers were 8 oz French-square bottles. The test blocks were pushed into the soil and the bottle lids were loosened one-quarter turn before the bottles were incubated at 80°F and 70% RH for 10 weeks.

Moulding test (beetles): Samples (4–7 in long) were exposed to beetles under the same conditions used in the lumber test. Samples were then X-rayed after 6, 9, and 12 months to count larvae and monitor their development and survival.

Moulding test (fungus and termites): Samples of moulding with known boron content ranging from 0.0 to 0.78 % BAE were used for fungus and termite tests under the same conditions used in the lumber test.

List the treatments including untreated control (express application rate as g/m^2):

Lumber test (beetles): Treated and untreated blocks (0 - ~1.0% BAE)

Lumber test (fungi and termites): Treated and untreated blocks (0 - ~1.0% BAE)

Moulding test (beetles): Treated and untreated blocks (0 - ~1.0% BAE)

Moulding test (fungi and termites): Treated and untreated blocks (0 - ~1.0% BAE)

Number of replicates per treatment:

Lumber test (beetles): 60 for treated blocks, 59 for controls

Lumber test (fungi and termites): 5

Moulding test (beetles): not reported

Moulding test (fungi and termites): 10 for fungi, 5 for termites

Number of individuals per replicate:

Lumber test (beetles): 10

Lumber test (fungi and termites): not reported

Moulding test (beetles): 10

Moulding test (fungi and termites): 10 for fungi, 5 for termites

Length of exposure to treatment (time in seconds, minutes or hours):

Lumber test (beetles): 6 months

Lumber test (fungi and termites): 10 weeks for fungi, not reported for termites

Moulding test (beetles): 6, 9, 12 months

Moulding test (fungi and termites): not reported

Experimental conditions (state relative humidity, temperature and photoperiod):

Lumber test (beetles): 75°F; 80% RH

Lumber test (fungi and termites): 80°F, 70% RH for fungi, not reported for termites

Moulding test (beetles): 75°F; 80% RH

Moulding test (fungi and termites): 80°F, 70% RH for fungi, not reported for termites

State data or endpoints that were to be collected/recorded:

Lumber test (beetles): larvae counts

Lumber test (fungi and termites): percent weight loss of blocks and visual readings of blocks

Moulding test (beetles): larvae counts and development

Moulding test (fungi and termites): percent weight loss of blocks and visual readings of blocks

Data Analysis:

The termite and fungus data were subjected to simple linear regression analyses with percent BAE as the independent variable and block rating or percent weight loss as the dependent variable. The lyctid beetle results were not suitable for analyses.

RESULTS

Lumber test (beetles): No larvae were detected in 59 of 59 treated samples, whereas 39 of the 60 untreated samples contained a total of 1797 larvae.

Lumber test (termites): Protection from termite damage increased linearly with BAE content of the samples up to about 0.30% BAE (Figure 1). Results based on the block rating (not shown here) were similar. With few exceptions, virtually no termites exposed to samples containing >0.17% BAE survived for four weeks. Weight loss for the untreated samples ranged from 7.2 % to 40.3%.

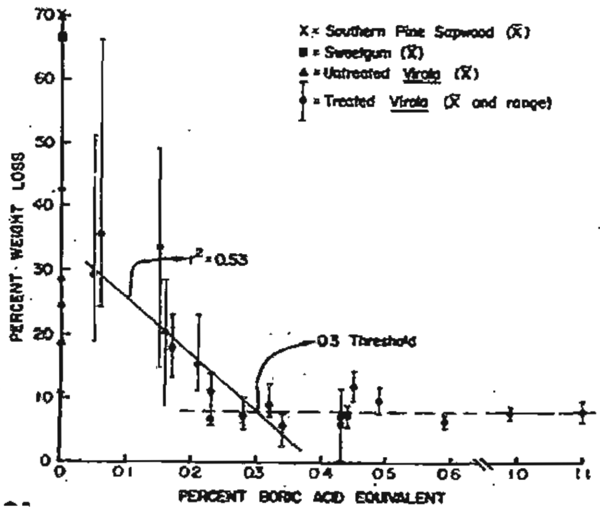

Figure 1. Dosage-response curve for banak treated to various retentions (%BAE) of boron in bioassay with the eastern subterranean termite. Feeding measured by percent weight loss of test blocks.

Lumber test (fungi): Protection from decay by brown-rot fungi increased linearly with BAE content of the samples up to about 0.53% BAE (Figure 2). Results based on the block rating (not shown here) were similar. Untreated blocks had weight losses ranging from 6.8% to 77.7%. Damage from soft-rot fungi was comparable between the treated and untreated samples.

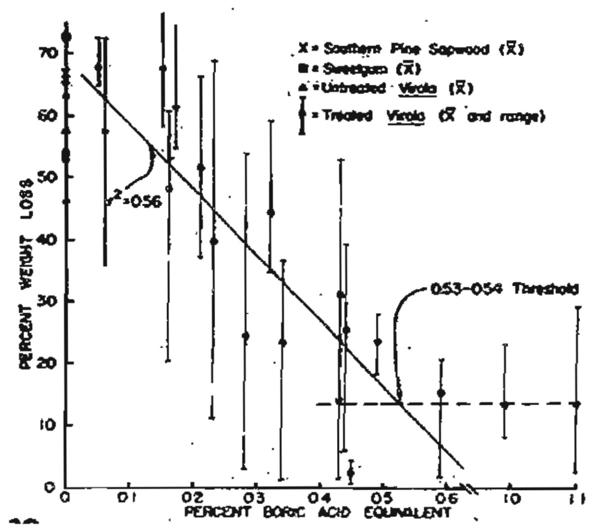

Figure 2. Dosage-response curve for banak treated to various retentions (%BAE) of boron in bioassay with brown rot decay fungus. Damage measured by percent weight loss of test blocks.

Moulding test (beetles): Of 128 treated samples, 28 were attacked by beetles; of 29 untreated samples, 20 were infested (Table 1). The total number of larvae in the treated samples was 375 at 6 months, declining to 66 at 12 months. The untreated samples contained 365 larvae and >131 adults at 6 months.

TABLE 1. — *Status of treated and untreated samples after 12 months' and 6 months' exposure to beetles, respectively.*

	Of 128 total samples	Of 28 damaged samples
	%	%
Treated samples		
External and internal damage	21.9	—
External damage (exit holes)	7.0	32.1
Internal damage (feeding tunnels only)	14.8	67.9
Internally damaged samples with:[a]		
Dead larvae only	7.8	35.7
Larvae probably dying	4.7	21.4
Small, slowly growing larvae	3.1	14.3
Untreated samples		
Of 29 samples, 69% had exit holes and 365 larvae remained in 20 samples.		

[a] Six samples contain 12 larvae, but the majority of larvae once in these samples have died. Four samples contain 27 small larvae that may eventually die.

Moulding test (termites): The threshold value for limiting feeding damage was estimated as 0.25% BAE (Figure 3), somewhat lower than for the treated lumber. Termite feeding on the untreated samples varied widely.

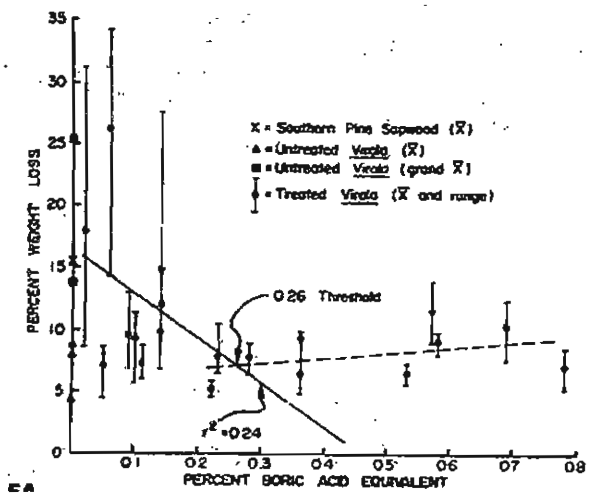

Figure 3. Dosage-response curve for banak mouldings treated to various retentions (%BAE) of boron in bioassay with the eastern subterranean termite. Damage measured by percent weight loss of test blocks.

Moulding test (fungi): The threshold value for limiting damage was estimated as 0.44% BAE (Figure 4), somewhat lower than for the treated lumber.

TASK 2 DATA EVALUATION RECORD

STUDY TYPE: Product Performance

MRID 483949-02. Scheffrahn, R.H., P. Busey, J.K. Edwards, et al. 2001. Chemical Prevention of Colony Foundation by *Cryptotermes brevis* (Isoptera: Kalotermitidae) in Attic Modules. J. Economic Entomology 94(4):915-919.

Premises Treatments (830.3500)

Product Name: BoraSol-WP
EPA Reg. No. or File Symbol: 69529-2
Decision number: 445745
DP number: 387782

Prepared for
Registration Division (7505)
Office of Pesticide Programs
U.S. Environmental Protection Agency
Washington, DC 20460

Prepared by
Summitec Corporation
Task Order No.: 2-01

Primary Reviewer: Eric B. Lewis, M.S.	Signature: Eric B. Lewis Date: 07/06/2011
Secondary Reviewers: Gene Burgess, Ph.D.	Signature: Gene Burgess, AE Date: 07/06/2011
Robert Ross, M.S., Program Manager	Signature: Robert H. Ross Date: 07/06/2011
Quality Assurance: Angela M. Edmonds, B.S.	Signature: Angela M. Edmonds. Date: 07/06/2011

RECOMMENDED CLASSIFICATION: Acceptable, provided that additional information is submitted.

DATA EVALUATION RECORD

[Primary Reviewer's Name]

STUDY TYPE:	PRODUCT PERFORMANCE [810.3500]
MRID:	483949-02. Chemical Prevention of Colony Foundation by *Cryptotermes brevis* (Isoptera: Kalotermitidae) in Attic Modules. Scheffrahn, R.H., P. Busey, J.K. Edwards, et al. 2001.
DP BARCODE:	387782
DECISION NO:	445745
SUBMISSION NO:	891044
SPONSOR:	Quality Borate Company
TESTING FACILITY:	University of Florida, Fort Lauderdale Research and Education Center, Fort Lauderdale, FL
STUDY DIRECTOR:	Not provided
SUBMITTER:	Opaskar, V; Quality Borate Company
STUDY COMPLETED:	August 2001
CONFIDENTIALITY CLAIMS:	None
GOOD LABORATORY PRACTICE:	The submitter did not sponsor or conduct the study, and does not know if it was conducted in accordance with 40CFR Part 160.
TEST MATERIAL:	PRODUCT NAME: BoraSol-WP EPA REGISTRATION NO: 69529-2 ACTIVE INGREDIENT NAME: Boron sodium oxide ($B_8Na_2O_{13}$) tetrahydrate A.I.%: 98% PC CODE: 011103 CAS NO.: 12880-03-4 FORMULATION TYPE: WP PRODUCT APPLICATION RATE: Dust: 0.75 -13.5

	g/attic module; 15% solution: 35 – 100 mL/attic module
	ACTIVE INGREDIENT APPLICATION RATE: Dust: 0.74 – 13.2 g/module; 15% solution: 5.15 – 15.7 g/module
PROPOSED LABEL MARKETING CLAIMS:	Target Organisms: Drywood termites
EPA REQUESTS:	[EPA WILL ADD DIRECTIVES HERE]

STUDY REVIEW

Study Number/Title: (if more than one study is provided in the MRID)

Purpose: A laboratory study was conducted to determine the efficacy of a 150,000 ppm aqueous solution of disodium octaborate tetrahydrate (35 – 100 mL/attic module) or 98% DOT anhydrous dust (0.75 -13.5 g/attic module) against the West Indian drywood termite.

MATERIALS AND METHODS

Test Location: Fort Lauderdale, FL

Test Material(s): 1998 test: The test material was an aqueous solution of 150,000 ppm (15%) DOT (35 or 70 mL/attic module) or 98% DOT anhydrous dust (2.7 or 13.5 g/attic module).

1999 test: The test material was an aqueous solution of 150,000 ppm DOT (15%) (100 mL/attic module) or 98% DOT anhydrous dust (0.75 or 1.5 g/attic module).

The product label for BoraSol-WP states that the product contains 98% disodium octaborate tetrahydrate. For prevention of drywood termites in existing structures or structures under construction, the product label recommends application of a 15% solution of the product (1 gal/200 ft^2, for a delivery of 3.08 g/ft^2 of surface) or dusting with a minimum of 2.5 oz/100ft^2 (0.7 g/ft^2).

Test Species Name, Life Stage, Sex, and Age: West Indian drywood termite (*Cryptotermes brevis*), adults, sex not specified.

Describe test containers, chambers and/or apparatus (include site description and location) and how experiment was conducted: Two separate tests were conducted in 1998 and 1999. The test material was applied to wood surfaces of 30 x 30 cm simulated attic modules. The design of the modules is given in Figure 1. The modules were constructed of spruce 2 x 4s and 9.5 mm thick plywood that had been exposed to sun and rain outdoors for 8 weeks prior to module assembly. In some of the modules, strips of paper-backed fiberglass insulation were inserted between the 2 x 4 ribs. The insulation was inserted prior to wood treatment, with the exception of the 1999 DOT solution treatment, in which the insulation was inserted after treatment.

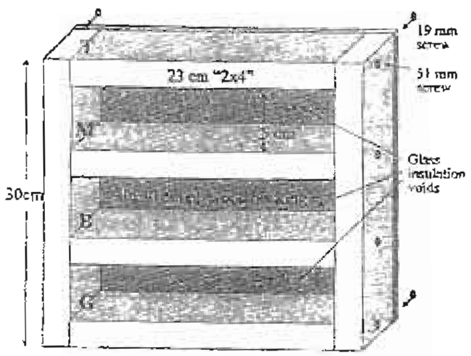

Fig. 1. Design of attic module. Nuptial chamber locations: T, top; M, middle; B, bottom; G, ground.

In 1998, the modules were treated with aqueous DOT or 98% anhydrous DOT dust. The test also included a water control and an untreated air control. A hand sprayer was used to evenly apply the DOT solutions to all exposed upper surfaces of the modules. The DOT dust was applied using a flour sifter onto the top surfaces of the modules.

The treated modules were placed in a windowless 5 x 8 m room containing mixed colonies of *C. brevis* infesting wooden doors, structural lumber and furniture collected in Key West, Miami, and St. Petersburg, FL. Treatments were segregated in randomly arranged metal isolation trays from which dealates could not escape by crawling. The trays were randomly transposed during the test. Continuous illumination was provided by fluorescent lights. A water pan was placed nearby to serve as an alate monitoring trap. Observations showed that once alighted on modules, alates shed their wings and could not fly to neighboring modules.

Six months after the flights, the modules were disassembled and inspected for nuptial chamber location and contents.

List the treatments including untreated control (express application rate as g/m^2):

1998 test: 150,000 ppm aqueous DOT applied at 35 or 70 mL/module; 98% DOT dust applied at 2.7 or 13.5 g/module; water control (70 mL/module); untreated air control.

1999 test: 150,000 ppm aqueous DOT applied at 100 mL/module; 98% DOT dust applied at 0.75 or 1.5 g/module; water control (100 mL/module); untreated air control.

Number of replicates per treatment:

1998 test: 5

1999 test: 5

Number of individuals per replicate: variable

Length of exposure to treatment (time in seconds, minutes or hours): 6 months

Experimental conditions (state relative humidity, temperature and photoperiod): Not provided

State data or endpoints that were to be collected/recorded: Location and number of nuptial chambers; number and gender of dealates per chamber; number and composition of brood (1-3 instar) per chamber

Data Analysis:

Data for 1998 and 1999 were analyzed separately by ANOVA. Variables included number of nuptial chambers, live dealates per chamber, heterosexual pairs per chamber, and number of chambers containing brood. Effects of treatment, insulation, and their interaction were tested based on the residual error mean square. Data were first transformed by the square root of (x = 0.5) where x is an individual sample observation. Significant differences among treatment means were determined using the Waller-Duncan Bayesian k-ratio t-test (k = 100, p = 0.05).

Colonization site preference by dealates within modules was determined from the combined 1998 and 1999 data for the water and air control modules. Only chambers with at least one live dealate were included in the chi-square analysis.

RESULTS

The raw data were not provided. Results of the 1998 test are provided in Table 1. Both application rates of DOT dust were 100% effective in preventing colonization, and reduced chamber construction by 89% compared to the combined controls. The DOT 15% solution significantly reduced the number of chambers and live termites, but was not as effective as the dust.

Table 1. Means ± SE per attic module of *C. brevis* nuptial chambers, dealates in chambers, chambers with at least one male and one female dealate, and chambers with brood in control and chemically treated attic modules infested April–June 1998 and disassembled December 1998

Treatment	g(AI)	No. nuptial chambers	Live dealates in chambers	Chambers containing	
				≥1♂ + 1♀	brood
Control (air)		20.3 ± 1.02b	7.3 ± 1.08a	2.5 ± 0.37a	2.7 ± 0.56a
Control (water)		29.8 ± 3.31a	9.8 ± 2.24a	3.5 ± 0.73a	2.3 ± 0.94ab
DOT solution	5.15	21.1 ± 2.34b	4.3 ± 1.22b	1.4 ± 0.40b	1.1 ± 0.41bc
DOT solution	10.3	22.8 ± 3.08b	3.7 ± 1.40b	1.5 ± 0.54b	1.4 ± 0.62b
DOT dust	2.6	2.5 ± 0.97c	0 ± 0c	0 ± 0c	0 ± 0c
DOT dust	13.2	2.9 ± 1.16c	0 ± 0c	0 ± 0c	0 ± 0c
Imidacloprid dust	0.001	0.4 ± 0.24	0 ± 0	0 ± 0	0 ± 0
Treatment effects statistics:					
F		61.55	19.31	17.33	6.12
df1		5	5	5	5
df2		53	48	48	53
P		0.0001	0.0001	0.0001	0.0002

Means of 10 attic modules (five insulated and five uninsulated) except for imidacloprid dust for which only uninsulated modules were tested. Means within a column followed by the same letter are not significantly different by the Waller-Duncan Bayesian *k*-ratio *t*-test ($k = 100$, $P = 0.05$).

Results of the 1999 test are provided in Table 2. Both application rates of DOT dust were again 100% effective in preventing colonization, and reduced chamber construction by 79% compared to the combined controls, even though the application rates were lower than those used in 1998. The DOT 15% solution significantly reduced the number of nuptial chambers compared to the controls, and reduced the number of live termites in chambers to a level comparable with the dust treatments.

Table 2. Means ± SE per attic module of *C. brevis* nuptial chambers, dealates in chambers, chambers with at least one male and one female dealate, and chambers with brood in control and chemically treated attic modules infested April–June 1999 and disassembled December 1999

Treatment	g(AI)	No. nuptial chambers	Live dealates in chambers	Chambers containing ≥1♂ + ≥1♀	Chambers containing brood
Control (air)		18.9 ± 3.75a	7.0 ± 1.90a	3.1 ± 0.80a	2.0 ± 0.56a
Control (water)		18.6 ± 2.71a	6.8 ± 1.95a	2.9 ± 0.82a	1.1 ± 0.35b
DOT solution[a]	15.7	9.0 ± 2.24b	0.3 ± 0.3b	0.1 ± 0.1b	0 ± 0c
DOT dust	0.74	5.3 ± 1.40c	0 ± 0b	0 ± 0b	0 ± 0c
DOT dust	1.47	2.6 ± 0.73cd	0 ± 0b	0 ± 0b	0 ± 0c
Imidacloprid dust	0.001	1.9 ± 0.91d	0.2 ± 0.20b	0.1 ± 0.10b	0 ± 0c
Imidacloprid dust	0.0005	1.8 ± 0.55d	0.2 ± 0.20b	0.1 ± 0.10b	0.1 ± 0.10c
Silica gel/pyrethrins	0.51	0 ± 0e	0 ± 0b	0 ± 0b	0 ± 0c
Treatment effects statistics					
F		31.46	22.93	21.34	16.56
df1		7	7	7	7
df2		71	64	64	64
P		0.0001	0.0001	0.0001	0.0001

Means of 10 attic modules (five insulated and five uninsulated). Means within a column followed by the same letter are not significantly different by the Waller–Duncan Bayesian *k*-ratio *t*-test ($k = 100$, $P = 0.05$).

[a] Treatment covered all surfaces of module before installing insulation to simulate a construction-phase treatment of exposed wood framing.

Study Authors' Conclusions

The study authors concluded that DOT dust formulations can be used to prevent drywood termite colonization in existing building voids and attics. Where the entire wood framing can be treated during construction, aqueous DOT solution can be as effective as the dust.

Reviewer's Conclusions

The reviewer agrees that the dust formulations of the test material significantly reduced colonization by the West Indian drywood termite in the modules tested. The aqueous solution treatments were not as effective as the dusts. In the 1999 test, the 15% DOT aqueous solution provided comparable control to the dust, but the application rate of the solution was greater than that used in the 1998 test, while the application rate of the dust was less than that used in the 1998 test. Additionally, the DOT solution treatments in the 1999 test were made before the fiberglass insulation was placed in the module cavities, while in 1998 the treatments were made after the insulation had been added.

The study authors provided the application rates used in this study in terms of mL or g per module. Since the actual amount of test material applied per unit area of the module was not provided, the reviewer was not able to determine if the label recommended application rate was exceeded. The registrant states in a note appended to MRID 483949-02 that the treated area of the module was 3.75 ft^2, but did not explain how that figure was derived. The registrant also provided the following information on application rates:

The coverage of each method of application was done by powder dusting or 15% solution spraying. Coverage of the active ingredient, DOT, was 0.0015 lbs/sq.ft. DOT by dust application at its highest test amount, and 0.0030 lbs/sq.ft. DOT by spraying with a 15% DOT solution. (Table 1) (2.6g DOT = 0.0057 lbs/3.75 sq.ft. = 0.0015 lbs/sq.ft. for dust application. For liquid application: 5.15 g AI = 5.15/3.75 sq ft = 1.37 g/sq.ft. = 0.0030 lbs/sq.ft.)

Results from Table 2 for the DOT solution treatment gave sufficient efficacy at 15.7 g of active ingredient. This calculates to 34 ml of 15% DOT solution. to cover 3.75 sq.ft. Making unit conversions, the treatment requires 0.25 gal of 15% BoraSol WP solution/100 sq.ft. (0.009 gal/3.75 sq.ft. (the calculated area of the tested attic module) or 0.0023 gal/sq.ft. or 0.25 gal/100 sq.ft.). AI treatment is 0.23 gal x 8.43 lb/gal x 1.087 sp.gr. x .15 x .25 = 0.34 lb DOT/100 sq.ft. or 5.44 oz of AI, DOT/100 sq.ft. The reason the liquid is almost 8x the amount of DOT/100 sq.ft. (see below), is that the solution with its DOT content will be absorbed into the wood and leave a reduced amount of surface residue. The rate of application is still efficacious per the results in Table 2.

The Table 2 results for DOT dust calculates to an efficacious application rate of 69 g/100 sq.ft. or 2.5 oz of DOT solid (BoraSol WP)/100 sq ft of treated area. (0.74g/3.75 sq.ft. or 0.2 g/sq.ft. or 20 g/100 sq.ft. or 0.7 oz/100 sq.ft. of treated area.

These application rates would fall within the label recommended application rates, provided that the treated area of the modules was actually 3.75 ft^2.

Reviewer Recommendations

This study is acceptable, provided that information is submitted to verify that the area of the treated modules was 3.75 ft^2. If so, the reviewer believes that adequate data have been provided to allow the addition of drywood termites to the pests listed on the BoraSol-WP product label.

TASK 2 DATA EVALUATION RECORD

STUDY TYPE: Product Performance

MRID 483949-03. Wegner, G.S. Undated. A New Liquid Bait and Delivery System for Carpenter Ants

Premises Treatments (830.3500)

Product Name: BoraSol-WP
EPA Reg. No. or File Symbol: 69529-2
Decision number: 445745
DP number: 387782

Prepared for
Registration Division (7505)
Office of Pesticide Programs
U.S. Environmental Protection Agency
Washington, DC 20460

Prepared by
Summitec Corporation
Task Order No.: 2-01

Primary Reviewer: Eric B. Lewis, M.S.	Signature: Eric B. Lewis Date: 07/06/2011
Secondary Reviewers: Gene Burgess, Ph.D.	Signature: Gene Burgess, AE Date: 07/06/2011
Robert Ross, M.S., Program Manager	Signature: Robert H. Ross Date: 07/06/2011
Quality Assurance: Angela M. Edmonds, B.S.	Signature: Angela M. Edmonds Date: 07/06/2011

RECOMMENDED CLASSIFICATION: Unacceptable

Disclaimer

This review may have been altered subsequent to the contractors' signatures above.

DATA EVALUATION RECORD

[Primary Reviewer's Name]

STUDY TYPE:	PRODUCT PERFORMANCE [810.3500]
MRID:	MRID 483949-03. A New Liquid Bait and Delivery System for Carpenter Ants. Wegner, G.S. Undated.
DP BARCODE:	387782
DECISION NO:	445745
SUBMISSION NO:	891044
SPONSOR:	Quality Borate Company
TESTING FACILITY:	Varment Guard Environmental Services, Inc., Columbus OH
STUDY DIRECTOR:	Not provided
SUBMITTER:	Opaskar, V.; Quality Borate Company
STUDY COMPLETED:	September, 1997
CONFIDENTIALITY CLAIMS:	None
GOOD LABORATORY PRACTICE:	The submitter did not sponsor or conduct the study, and does not know if it was conducted in accordance with 40CFR Part 160.
TEST MATERIAL:	PRODUCT NAME: BoraSol-WP EPA REGISTRATION NO: 69529-2 ACTIVE INGREDIENT NAME: Boron sodium oxide ($B_8Na_2O_{13}$) tetrabydrate A.I.%: 98% PC CODE: 011103 CAS NO.: 12880-03-4 FORMULATION TYPE: WP PRODUCT APPLICATION RATE: Not provided ACTIVE INGREDIENT APPLICATION RATE: Not provided

PROPOSED LABEL MARKETING CLAIMS: Target Organisms: Carpenter ants

EPA REQUESTS: [EPA WILL ADD DIRECTIVES HERE]

STUDY REVIEW

Study Number/Title: (if more than one study is provided in the MRID)

Purpose: Anecdotal results are reported to support the use of 1% disodium octaborate tetrahydrate in a liquid bait against the carpenter ant.

MATERIALS AND METHODS

Test Location: Not provided

Test Material(s): The test material was reported to be 1% disodium octaborate tetrahydrate in a liquid bait formulation. The product label for BoraSol-WP states that the product contains 98% disodium octaborate tetrahydrate. To control ants, the product label recommends application of the product at a rate of 3.2 oz/100 ft^2, or as a 1% solution in a 10% sugar bait solution.

Test Species Name, Life Stage, Sex, and Age: Carpenter ant (*Camponotus* spp.), life stage, sex, and age not reported.

Describe test containers, chambers and/or apparatus (include site description and location) and how experiment was conducted: No actual test was described. The study author reports that his test container design consists of an empty plastic 35-mm film container with single holes punched on opposite sides under the upper lip. After the bait is added, the container is capped and inverted on a paper towel. The bait consists of 1% disodium octaborate tetrahydrate in a solution of 83% reconstituted apple juice and 16% honey by weight. Approximately two-thirds of an ounce of bait solution is loaded into the test container.

List the treatments including untreated control (express application rate as g/m^2): Not reported

Number of replicates per treatment: Not reported

Number of individuals per replicate: Not reported

Length of exposure to treatment (time in seconds, minutes or hours): Not reported

Experimental conditions (state relative humidity, temperature and photoperiod): Not reported

State data or endpoints that were to be collected/recorded: Not reported

Data Analysis: Not reported

RESULTS

No data were provided. The study author states that he has found the liquid bait described above to be "an effective tool in controlling three species of structure infesting carpenter ants (*C. pennsylvanicus*, *C. ferrugineus* (Fab.), *C. nearcticus* Emery)" in Ohio.

Study Author's Conclusions

The study author made no conclusions.

Reviewer's Conclusions

The bait described contains 1% disodium octaborate tetrahydrate in a sweet liquid solution. The BoraSol-WP label recommends an application rate of a 1% BoraSol-WP (a.i., 98% disodium octaborate tetrahydrate) solution in a 10% sugar solution. While the study author reports anecdotal evidence that this solution is efficacious against three species of carpenter ants, no actual test was described and no data provided.

Reviewer Recommendations

This study is not acceptable. Insufficient information was provided to allow the addition of the carpenter ant to the pests listed on the BoraSol-WP product label.

TASK 2 DATA EVALUATION RECORD

STUDY TYPE: Product Performance

MRID 483949-04. Klotz, J.H., C. Amrhein, S. McDaniel, et al. 2002. Assimilation and Toxicity of Boron in the Argentine Ant (Hymenoptera:Formicidae). J. Entomol. Sci. 37(2):193-199.

Premises Treatments (830.3500)

Product Name: BoraSol-WP
EPA Reg. No. or File Symbol: 69529-2
Decision number: 445745
DP number: 387782

Prepared for
Registration Division (7505)
Office of Pesticide Programs
U.S. Environmental Protection Agency
Washington, DC 20460

Prepared by
Summitec Corporation
Task Order No.: 2-01

Primary Reviewer: Eric B. Lewis, M.S.	Signature: Eric B. Lewis Date: 07/06/2011
Secondary Reviewers: Gene Burgess, Ph.D.	Signature: Gene Burgess, AE Date: 07/06/2011
Robert Ross, M.S., Program Manager	Signature: Robert H. Ross Date: 07/06/2011
Quality Assurance: Angela M. Edmonds, B.S.	Signature: Angela M. Edmonds Date: 07/06/2011

RECOMMENDED CLASSIFICATION: Acceptable

Disclaimer

This review may have been altered subsequent to the contractors' signatures above.

DATA EVALUATION RECORD

[Primary Reviewer's Name]

STUDY TYPE:	PRODUCT PERFORMANCE [810.3500]
MRID:	483949-04. Assimilation and Toxicity of Boron in the Argentine Ant (Hymenoptera:Formicidae). Klotz et al, 2002.
DP BARCODE:	387782
DECISION NO:	445745
SUBMISSION NO:	891044
SPONSOR:	Quality Borate Company
TESTING FACILITY:	University of California Riverside, Riverside, CA
STUDY DIRECTOR:	Klotz, J.H.
SUBMITTER:	Opaskar, Vincent; Quality Borate Company
STUDY COMPLETED:	April 2, 2002
CONFIDENTIALITY CLAIMS:	None
GOOD LABORATORY PRACTICE:	The submitter did not sponsor or conduct the study, and does not know if it was conducted in accordance with 40CFR Part 160.
TEST MATERIAL:	PRODUCT NAME: BoraSol-WP EPA REGISTRATION NO: 69529-2 ACTIVE INGREDIENT NAME: Boron sodium oxide ($B_8Na_2O_{13}$) tetrahydrate A.I.%: 98% PC CODE: 011103 CAS NO.: 12880-03-4 FORMULATION TYPE: WP PRODUCT APPLICATION RATE: 0.5% - 1% boric acid in a 25% w/v sucrose/deionized water solution. ACTIVE INGREDIENT APPLICATION RATE: 0.495%

– 0.99% boric acid in a 25% w/v sucrose/deionized water solution.

PROPOSED LABEL MARKETING CLAIMS: Target Organisms: Ants: Argentine

EPA REQUESTS: [EPA WILL ADD DIRECTIVES HERE]

STUDY REVIEW

Study Number/Title: (if more than one study is provided in the MRID)

Purpose: A laboratory study was conducted to determine the efficacy of 0.5 and 1.0% boric acid-sucrose water bait against the Argentine ant.

MATERIALS AND METHODS

Test Location: Riverside, CA

Test Material(s): The test material was 0.5% - 1% boric acid in a 25% w/v sucrose/deionized water solution. The product label for BoraSol-WP states that the product contains 98% disodium octaborate tetrahydrate. To control ants, the product label recommends application of the product at a rate of 3.2 oz/100 ft^2, or as a 1% solution in a 10% sugar bait solution.

Test Species Name, Life Stage, Sex, and Age: Argentine ant (*Linepithema humile*), workers.

Describe test containers, chambers and/or apparatus (include site description and location) and how experiment was conducted: Four tests were conducted:

Oral toxicity test: Ants from laboratory colonies were provided water, but not food, for 2 days prior to the test, then provided 0.5% or 1.0% boric acid in 25% w/v sucrose/deionized water solution. Additionally, sorbitol and boric acid were dissolved in 25% sucrose solution to provide two concentrations of sorbitol (10% and 20%) in 0.5% boric acid. Another set of 1.0% boric acid in sucrose solutions was prepared and adjusted to pH 4, 5, 6, 7, 8, 9, or 10 with HCl or NaOH. All bait solutions were added to cotton plugs inside petri dishes (50 mm x 9 mm) that contained 10 ants each. Controls received 25% sucrose solution only. The bait solutions were available continuously until all ants died.

Preference test: Binary choice field tests were conducted to determine consumption of sucrose water solutions with and without sorbitol. Two side-by-side feeding stations were attached to the trunk of each of 10 trees. The stations consisted of 50-mL capped centrifuge tubes with a permeable material underneath a hole drilled in the cap. One tube contained 25% sucrose solution, and the other contained 25% sucrose solution + 10% sorbitol. The stations were left in place for 24 hours, after which solution consumption was determined gravimetrically.

Boron load analysis: The boron concentration in dead ants from the oral toxicity test was determined using a colorimetric procedure developed for plant tissue and soils (John et al., 1975. Anal. Lett. 8:559-568). Groups of dead ants were air dried, weighed in ceramic crucibles, and ashed in a 500°C muffle furnace. The cooled residue was dissolved in 5.0 mL of 1M HCl and analyzed using a spectrophotometer. Results were compared to those for standard solutions of 0 – 3 mg B/L prepared in the acid. The detection limit was better than 10 mg/kg (dry weight of ants).

Electron microscopy: Argentine ants collected from a citrus grove in Riverside CA were provided water, but no food, for one day prior to exposure to bait solutions of 0.5% boric acid in 25% sucrose water or 25% sucrose water only (controls). After 24 hours the ant midguts were dissected, fixed and washed in appropriate buffers, dehydrated in a graded ethanol series, and embedded in spurr resin. Sections were cut on a microtome, stained with uranyl acetate and lead citrate, and subjected to electron microscopy. Ten control and 15 treated ants were sectioned and viewed.

List the treatments including untreated control (express application rate as g/m^2):

Oral toxicity test: Boric acid (0.5% or 1.0%) in 25% w/v sucrose/deionized water solution. Controls received 25% sucrose/deionized water solution only. Additionally, sorbitol and boric acid were dissolved in 25% sucrose solution to provide two concentrations of sorbitol (10% and 20%) in 0.5% boric acid. Also, 1.0% boric acid sucrose solutions were prepared and adjusted to pH 4, 5, 6, 7, 8, 9. or 10 with HCl or NaOH.

Preference test: 25% sucrose water or 25% sucrose water with 10% sorbitol

Number of replicates per treatment: 10

Number of individuals per replicate: 10

Length of exposure to treatment (time in seconds, minutes or hours): ~8 days

Experimental conditions (state relative humidity, temperature and photoperiod): Not provided

Data or endpoints that were to be collected/recorded: Cumulative mortality

Data Analysis:

Mortality were corrected using Abbott's formula and analyzed using probit analysis to determine the median lethal time (LT_{50}) for each concentration. Binary choice tests to determine feeding preference for different solutions were analyzed using a paired t-test.

RESULTS

The raw data were not provided. In the oral toxicity test, the bait solution containing 1.0% boric acid alone produced a lower LT_{50} (~2 days) than the solution containing 0.5% boric acid alone (~3 days) (Figure 1). The LT_{50} for ants fed bait solution containing boric acid + sorbitol was greater than for ants fed bait solution containing boric acid alone, and the higher sorbitol concentration solution produced the highest LT_{50}. The study authors speculated that sorbitol complexes the boron, making it less available for absorption from the digestive tract, and it is excreted.

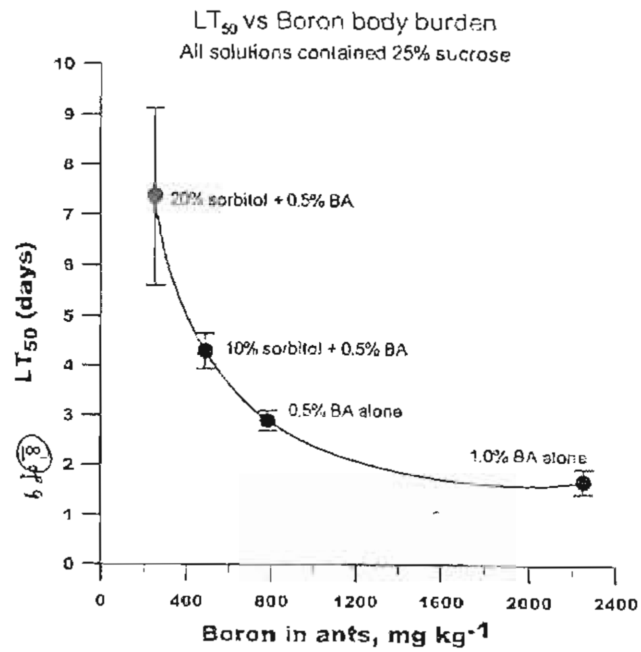

Fig. 1. The relationship between LT_{50} and the concentration of boron in the ants at death for boric acid—sucrose baits containing sorbitol.

In the adjusted-pH test, the percent mortality after 24 hours of exposure decreased with increased solution pH, and dropped significantly at pH 9 and above (Figure 2). The study authors attributed this to conversion of boric acid to borate ion at high pH.

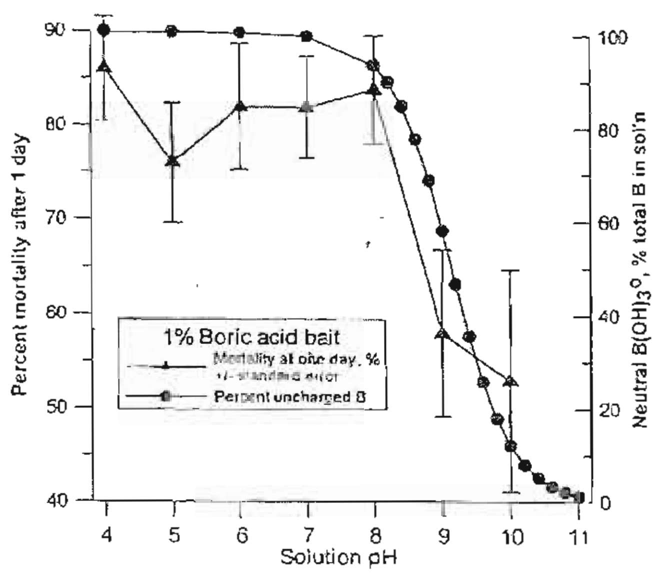

Fig. 2. The effect of pH on the relative toxicity of boric acid bait solutions. Also plotted is the percent of uncharged boric acid species as a function of pH. This curve was calculated using Eq (1) in the text.

In the binary choice tests, there was no significant difference in consumption of the 25% sucrose solutions with or without sorbitol.

Electron microscopy showed that after 24 hours exposure to 0.5% boric acid in 25% sucrose solution, more than 40% of the ants examined had damaged cells in the midgut lining, with some of the epithelial cells completely destroyed. The microvilli of the midgut lining were also grossly affected. The midguts of untreated ants appeared normal.

Study Authors' Conclusions

The study authors concluded that the assimilation of boron by Argentine ants feeding on boric acid-sucrose baits was affected by the addition of sorbitol to the bait solutions, and that 0.5% boric acid caused gross abnormalities in microvilli and destroyed cells lining the midgut.

Reviewer's Conclusions

In the oral toxicity test, bait solution containing 1.0% boric acid alone or 0.5% boric acid alone produced LT_{50}s of ~2 days and ~3 days, respectively. The BoraSol-WP label recommends an application rate of a 1% BoraSol-WP (a.i., 98% disodium octaborate tetrahydrate) solution in a 10% sugar solution. The registrant notes that the use of boric acid as a substitute for disodium octaborate tetrahydrate in this study should be allowed, since the EPA REDs have historically grouped boric acid and its sodium salts together for administrative purposes. Furthermore, the registrant states that both substances have shown an equivalent toxicity to the argentine ant (MRID 469381-03), and that the common active ingredient in all boron oxide-containing chemicals is the boric acid equivalent (BAE), B_2O_3 (borate). The registrant also notes that a 0.5% solution of BoraSol-WP has a pH of less than 8, and will damage the Argentine ant midgut.

Reviewer Recommendations

This study is acceptable. The reviewer believes that adequate data have been provided to allow the addition of the Argentine ant to the pests listed on the BoraSol-WP product label.

TASK 2 DATA EVALUATION RECORD

STUDY TYPE: Product Performance

MRID 483949-05. Klotz, J.H., K.M. Vail, and D.F. Williams. 1997. Toxicity of a Boric Acid-Sucrose Water Bait to *Solenopsis invicta* (Hymenoptera:Formicidae). J. Economic Entomology 90(2):488-491.

Premises Treatments (830.3500)

Product Name: BoraSol-WP
EPA Reg. No. or File Symbol: 69529-2
Decision number: 445745
DP number: 387782

Prepared for
Registration Division (7505)
Office of Pesticide Programs
U.S. Environmental Protection Agency
Washington, DC 20460

Prepared by
Summitec Corporation
Task Order No.: 2-01

Primary Reviewer: Eric B. Lewis, M.S.	Signature: Eric B. Lewis Date: 07/06/2011
Secondary Reviewers: Gene Burgess, Ph.D.	Signature: Gene Burgess, AE Date: 07/06/2011
Robert Ross, M.S., Program Manager	Signature: Robert H. Ross Date: 07/06/2011
Quality Assurance: Angela M. Edmonds, B.S.	Signature: Angela M. Edmonds Date: 07/06/2011

RECOMMENDED CLASSIFICATION: Acceptable

Disclaimer

DATA EVALUATION RECORD

[Primary Reviewer's Name]

STUDY TYPE:	PRODUCT PERFORMANCE [810.3500]
MRID:	483949-05. Toxicity of a Boric Acid-Sucrose Water Bait to *Solenopsis invicta* (Hymenoptera:Formicidae). Klotz et al, 1997.
DP BARCODE:	387782
DECISION NO:	445745
SUBMISSION NO:	891044
SPONSOR:	Quality Borate Company
TESTING FACILITY:	Department of Entomology, University of California, Riverside, CA
STUDY DIRECTOR:	Not provided
SUBMITTER:	Opaskar, V.; Quality Borate Company
STUDY COMPLETED:	June, 2004
CONFIDENTIALITY CLAIMS:	None
GOOD LABORATORY PRACTICE:	The submitter did not sponsor or conduct the study, and does not know if it was conducted in accordance with 40CFR Part 160.
TEST MATERIAL:	PRODUCT NAME: BoraSol-WP EPA REGISTRATION NO: 69529-2 ACTIVE INGREDIENT NAME: Boron sodium oxide ($B_8Na_2O_{13}$) tetrahydrate A.I.%: 98% PC CODE: 011103 CAS NO.: 12880-03-4 FORMULATION TYPE: WP PRODUCT APPLICATION RATE: 0.02% - 5% boric acid ACTIVE INGREDIENT APPLICATION RATE: 0.0198% - 4.95% boric acid

PROPOSED LABEL MARKETING CLAIMS: Target Organisms: Ants: Red Fire

EPA REQUESTS: [EPA WILL ADD DIRECTIVES HERE]

STUDY REVIEW

Study Number/Title: (if more than one study is provided in the MRID)

Purpose: A laboratory study was conducted to determine the efficacy of 0.02% to 1.0% boric acid-sucrose water bait against the Red Fire ant.

MATERIALS AND METHODS

Test Location: Gainesville, FL

Test Material(s): The test material was 0.02% - 5% boric acid in a 10% w/v sucrose/deionized water solution. The product label for BoraSol-WP states that the product contains 98% disodium octaborate tetrahydrate. To control ants, the product label recommends application of the product at a rate of 3.2 oz/100 ft^2, or as a 1% solution in a 10% sugar bait solution.

Test Species Name, Life Stage, Sex, and Age: Red fire ant (*Solenopsis invicta*), adults, sex not specified.

Describe test containers, chambers and/or apparatus (include site description and location) and how experiment was conducted: Three tests were conducted:

Oral toxicity test: Queenright colonies of the test organism were field collected in Gainesville, FL and held in the laboratory for 1 day with access to water but no food. Groups of 10 workers were then distributed to plastic petri dishes (145 x 25 mm) containing a 7 mL, cotton-plugged vial containing one of nine concentrations (0.02-1%) of boric acid in 10% sucrose/deionized water solution. Controls received 10% sucrose/deionized water solution only. The solutions were available to the ants continuously for 10 days.

Bait consumption test: Large laboratory monogyne colonies (50,000 workers) were starved for one day, then provided boric acid concentrations of 0.25%, 1%, or 5% w/v in 10% sucrose/deionized water for 24 hours. Controls were provided 10% sucrose solution only. The solutions (50 mL) were provided in test tubes (150 x 25 mm) plugged with cotton. To correct for evaporative water loss, replicates of each treatment were run concurrently in adjacent nest boxes without ants. The resulting difference was then corrected for evaporative water loss by subtracting the mean of the three evaporative standards.

Colony test: Sucrose solutions with boric acid were prepared as in the oral toxicity and bait consumption tests to provide concentrations of 0.25%, 0.5%, 0.75%, or 1% boric acid. Controls were provided 10% sucrose solution only. The baits (72 mL) were provided in test tubes (200 x 25 mm) plugged with cotton. Laboratory queenright colonies ~10-20 months old with 60,000 – 75,000 workers and 60-70 mL of brood were denied food for one day prior to the test, and were allowed to feed *ad libitum* during the test. The baits were renewed every 2 weeks. Honey-water, crickets, and hard-boiled chicken eggs were also available *ad libitum*. The test was continued until either the queen died or was small in size and not producing eggs, brood was absent, and there was a ≥99% reduction in workers.

List the treatments including untreated control (express application rate as g/m^2):

Oral toxicity test: Nine concentrations (only the low and high concentrations were specified) from 0.02% to 1% boric acid in 10% sucrose/deionized water solution

Bait consumption test: 0.25%, 1%, and 5% boric acid in 10% sucrose/deionized water solution

Colony test: 0.25%, 0.5%, 0.75%, and 1% boric acid in 10% sucrose/deionized water solution

Number of replicates per treatment:

Oral toxicity test: 5

Bait consumption test: 3

Colony test: 3

Number of individuals per replicate:

Oral toxicity test: 10

Bait consumption test: variable

Colony test: variable.

Length of exposure to treatment (time in seconds, minutes or hours):

Oral toxicity test: 10 days

Bait consumption test: 24 hours

Colony test: up to 16 weeks

Experimental conditions (state relative humidity, temperature and photoperiod):

Oral toxicity test: 25°C, ambient humidity

Bait consumption test: not provided

Colony test: not provided

Data or endpoints that were to be collected/recorded:

Oral toxicity test: cumulative mortality

Bait consumption test: bait consumption

Colony test: population index reduction

Data Analysis:

Oral toxicity test: mortality data were corrected using Abbott's formula and analyzed using probit analysis to determine LC_{50} and LC_{90} values for each day.

Bait consumption test: ANOVA with the Scheffe F test $p<0.05$ for mean separation.

Colony test: population index according to $(PI_{wk0} - PI_{wkx}/PI_{wk0})$ x 100%.

RESULTS

The raw data were not provided. In the oral toxicity test, boric acid exhibited the desired delayed toxicity over a 10-fold range of dilution, with a 3-day LC_{50} of 1.27% and an 8-day LC_{50} of 0.11% (Table 1.)

Table 1. LC_{50}s and LC_{90}s of *S. invicta* workers fed boric acid bait

Day	LC_{50} (95% CL) % (wt:vol)	LC_{90} (95% CL) % (wt:vol)	Slope ± SE	No. ants	χ^2	P
3	1.27 (1.05–3.88)	2.23 (1.48–34.87)	5.22 ± 1.42	50	0.52	0.47
4	0.77 (0.71–0.84)	1.24 (1.08– 1.59)	6.25 ± 1.54	50	4.53	0.10
5	0.44 (0.38–0.50)	0.98 (0.83– 1.24)	3.67 ± 0.46	50	4.24	0.24
6	0.22 (0.19–0.26)	0.57 (0.47– 0.72)	3.18 ± 0.32	50	4.67	0.46
7	0.14 (0.11–0.17)	0.32 (0.24– 0.53)	3.42 ± 0.51	50	2.04	0.36
8	0.11 (0.09–0.13)	0.26 (0.20– 0.41)	3.24 ± 0.45	50	1.95	0.58

In the bait consumption test, consumption was significantly reduced at the 5% boric acid concentration only, compared to the control. In the colony test, exposure to all four concentrations (0.25% to 1%) of boric acid reduced the colony size by 90% after 6 weeks (Figure 1). By week 12, the queens were dead in 25% of the colonies, and by week 16, there was a 99% reduction in workers, no brood, and the remaining queens were small and not producing eggs.

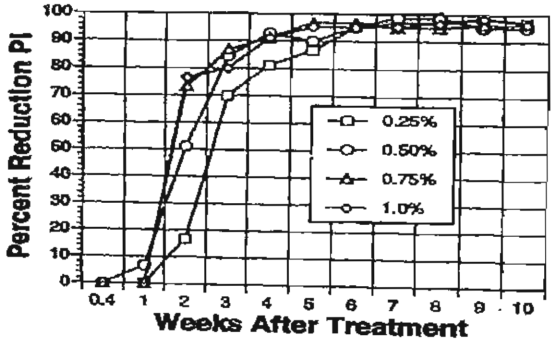

Fig. 1. Mean percentage of reduction of population index (PI) in *S. invicta* colonies exposed for 10 wk to various concentrations of boric acid in 10% sugar water. The population index is a combined value of worker number and brood quantity. Each point represents the mean of 3 colonies of fire ants, each with 1 queen and >50,000 ants at the beginning of the test. The 3 control colonies (not shown on graph) grew in size.

Study Authors' Conclusions

The study authors concluded that if boric acid is used at the test concentrations, it has great potential for control of *S. invicta* due to the delayed toxicity and low repellency.

Reviewer's Conclusions

The reviewer agrees that in the oral toxicity test, boric acid showed toxicity to the Red fire ant over a 10-fold range of dilutions. In the bait consumption test, boric acid significantly reduced consumption of the bait containing 5% boric acid, but not the bait containing 1% boric acid, indicating the higher concentration was repellent. The BoraSol-WP label recommends an application rate of a 1% BoraSol-WP (a.i., 98% disodium octaborate tetrahydrate) solution in a 10% sugar solution. The registrant notes that the use of boric acid as a substitute for disodium octaborate tetrahydrate in this study should be allowed, since the EPA REDs have historically grouped boric acid and its sodium salts together for administrative purposes. Furthermore, the registrant states that both substances have shown an equivalent toxicity to the argentine ant (MRID 469381-03), and that the common active ingredient in all boron oxide-containing chemicals is the boric acid equivalent (BAE), B_2O_3 (borate). The registrant also notes that BoraSol-WP is more concentrated in boron than boric acid (21% boron vs 17% boron, respectively) and will provide the same efficacy as boric acid at a lower concentration. The registrant notes that a 1% solution does not produce repellency to the ants, and is carried back to the nest. The product label recommends a treatment time of 2 to 3 months.

Reviewer's Recommendations

This study is acceptable. The reviewer believes that adequate data have been provided to allow the addition of the Red fire ant to the pests listed on the BoraSol-WP product label.

TASK 2 DATA EVALUATION RECORD

STUDY TYPE: Product Performance

MRID 483949-06. Klotz, J.H., K.M. Vail, and D.F. Williams. 1997. Liquid Boric Acid Bait for Control of Structural Infestations of Pharaoh Ants (Hymenoptera:Formicidae). J. Economic Entomology 90(2):523-526.

Premises Treatments (830.3500)

Product Name: BoraSol-WP
EPA Reg. No. or File Symbol: 69529-2
Decision number: 445745
DP number: 387782

Prepared for
Registration Division (7505)
Office of Pesticide Programs
U.S. Environmental Protection Agency
Washington, DC 20460

Prepared by
Summitec Corporation
Task Order No.: 2-01

Primary Reviewer: Eric B. Lewis, M.S.	Signature: Eric B. Lewis Date: 07/06/2011
Secondary Reviewers: Gene Burgess, Ph.D.	Signature: Gene Burgess, AE Date: 07/06/2011
Robert Ross, M.S., Program Manager	Signature: Robert H. Ross Date: 07/06/2011
Quality Assurance: Angela M. Edmonds, B.S.	Signature: Angela M. Edmonds Date: 07/06/2011

RECOMMENDED CLASSIFICATION: Acceptable

Disclaimer

DATA EVALUATION RECORD

[Primary Reviewer's Name]

STUDY TYPE:	PRODUCT PERFORMANCE [810.3500]
MRID:	483949-06. Liquid Boric Acid Bait for Control of Structural Infestations of Pharaoh Ants (Hymenoptera:Formicidae). Klotz et al, 1997.
DP BARCODE:	387782
DECISION NO:	445745
SUBMISSION NO:	891044
SPONSOR:	Quality Borate Company
TESTING FACILITY:	Center for Medical, Agricultural, and Veterinary Entomology, UDSA-ARS, Gainesville, FL
STUDY DIRECTOR:	Klotz, J.H.
SUBMITTER:	Opaskar, V.; Quality Borate Company
STUDY COMPLETED:	April, 1997
CONFIDENTIALITY CLAIMS:	None
GOOD LABORATORY PRACTICE:	The submitter did not sponsor or conduct the study, and does not know if it was conducted in accordance with 40CFR Part 160.
TEST MATERIAL:	PRODUCT NAME: BoraSol-WP EPA REGISTRATION NO: 69529-2 ACTIVE INGREDIENT NAME: Boron sodium oxide ($B_8Na_2O_{13}$) tetrahydrate A.I.%: 98% PC CODE: 011103 CAS NO.: 12880-03-4 FORMULATION TYPE: WP PRODUCT APPLICATION RATE: 1% boric acid in 10% sucrose solution ACTIVE INGREDIENT APPLICATION RATE: 0.99%

boric acid in sucrose solution

PROPOSED LABEL MARKETING CLAIMS:	Target Organisms: Ants: Pharaoh
EPA REQUESTS:	[EPA WILL ADD DIRECTIVES HERE]

STUDY REVIEW

Study Number/Title: (if more than one study is provided in the MRID)

Purpose: A laboratory study was conducted to determine the efficacy of a 1% boric acid-sucrose water bait against the Pharaoh ant.

MATERIALS AND METHODS

Test Location: Gainesville, FL

Test Material(s): The test material was a 1% boric acid-sucrose water bait. The product label for BoraSol-WP states that the product contains 98% disodium octaborate tetrahydrate. To control ants, the product label recommends application of the product at a rate of 3.2 oz/100 ft^2, or as a 1% solution in a 10% sugar bait solution.

Test Species Name, Life Stage, Sex, and Age: Pharaoh ant (*Monomorium pharaonis*), adults, sex not specified.

Describe test containers, chambers and/or apparatus (include site description and location) and how experiment was conducted: The test was conducted at two sites. Site 1 was an apartment complex of six, one-story buildings, each consisting of four one-bedroom apartments. Site 2 was a small building complex constructed specifically for Pharaoh ant research that consisted of nine (only eight were used in the test) wooden buildings (2.4 m wide x 3.0 m long x 2.4 m high) on concrete slabs.

The pre-test Pharaoh ant population at Site 1 was estimated from counts on honey-baited white index cards placed at six locations inside and six locations outside each of six apartments and left in place for 2 hours. After the counts, the ants on the cards were shaken onto bait stations adjacent to the cards, and new honey-baited cards were placed. The stations consisted of petri dishes (50 mm diameter, 9 mm high) supplied with a cotton wad soaked in 7 mL of either 1% crystallized boric acid dissolved in 10% w/v sucrose-deionized water solution (3 apartments) or 10% sucrose water solution alone (3 apartments). Lids containing 9 holes (~3 mm diameter) were placed on the dishes to allow ant entry and prevent evaporation of the solution. After the ant counts and card replacement, the bait stations were replaced each week for three weeks with fresh bait stations. Any live ants in the old bait station were removed and released at the station site. After 3 weeks, the stations were removed and the post-treatment ant population continued to be monitored weekly for one month and every other week for an additional month using honey baited cards at the previous station sites.

At Site 2, Pharaoh ant colonies consisting of 100-200 queens, ~10 g of brood, and 10,000-15,000 workers were introduced into each of the 8 units. The boric acid bait was placed in four units, and the control bait was placed in the remaining four units. The boric acid and control baits were evaluated simultaneously with those at Site 1. Additionally, water was provided via test tubes with cotton plugs, and a food cup containing crickets and cotton wicks saturated with a 25% v/v honey-water solution was provided once a week. The Pharaoh ant population was estimated on the same dates and using the same procedure as described for Site 1, except that only 4 locations inside and 4 locations outside each unit were monitored.

List the treatments including untreated control (express application rate as g/m^2): 1% boric acid in 10% w/v sucrose/deionized water

Number of replicates per treatment: Site 1: 3; Site 2: 4

Number of individuals per replicate: variable

Length of exposure to treatment (time in seconds, minutes or hours): 3 weeks

Experimental conditions (state relative humidity, temperature and photoperiod): Not provided for Site 1; "optimal conditions" were maintained at Site 2

State data or endpoints that were to be collected/recorded: Number of ants/card

Data Analysis:

The mean number of ants/card was evaluated using the general linear model (GLM) procedures (SAS Institute 1993) for each sampling date. Means were transformed with the log(x+1) to reduce variation and to generate a more normal distribution.

RESULTS

The raw data were not provided. At both sites, the 1% boric acid bait significantly reduced the number of Pharaoh ants during each week of the study, compared to the control bait, except for week 8 at Site 1 (Tables 1 and 2). In the treated buildings at both sites, very light foraging activity continued during the test; the test material suppressed, but did not eliminate, the ants. Ant activity was affected by outdoor temperature at Site 1, where there was almost no activity in either the treated or control buildings when the outdoor afternoon temperature was 19.0°C. When the outdoor afternoon temperature rose to 24.0°C, foraging increased to the previous levels.

Table 1. Number of Pharaoh ants per honey-baited card obtained inside and outside apartment buildings (site 1), 1–8 wk following placement of bait stations (boric acid–sucrose water solution)

Treatment	Mean no. (± SEM) ants per card						
	Wk 0[a]	Wk 1	Wk 2	Wk 3	Wk 4[b]	Wk 6	Wk 8
1% boric acid	19.24 ± 10.40	0.80 ± 0.21*	0.05 ± 0.03*	0.08 ± 0.03*	0.01 ± 0.01*	0.82 ± 0.22*	2.16 ± 0.86
Control	28.53 ± 11.73	74.96 ± 26.58	28.73 ± 12.64	21.07 ± 11.34	6.65 ± 3.82	32.22 ± 2.29	24.64 ± 14.78
P	0.6281	0.0217	0.0478	0.0401	0.0189	0.0044	0.0538
df; F	1, 4; 0.27	1, 4; 13.35	1, 4; 7.95	1, 4; 8.98	1, 4; 14.56	1, 4; 33.45	1, 4; 7.32

Means followed by an asterisk in each column are significantly different ($P < 0.05$) from the control by using GLM on $\log_{10}(x + 1)$ transformed data. Untransformed means are presented.
[a] Pretreatment survey to determine size of foraging ant populations.
[b] Boric acid bait removed.

Table 2. Number of Pharaoh ants per honey-baited card obtained inside and outside research units (site 2), 1–8 wk following placement of bait stations (boric acid–sucrose water solution)

Treatment	Mean (± SEM) no. ants per card						
	Wk 0[a]	Wk 1	Wk 2	Wk 3	Wk 4[b]	Wk 6	Wk 8
1% boric acid	33.00 ± 9.83	0.88 ± 0.31*	0.28 ± 0.16*	0.06 ± 0.06*	0.06 ± 0.04*	0.25 ± 0.09*	0.19 ± 0.06*
Control	30.00 ± 13.20	9.06 ± 1.11	7.22 ± 2.08	31.91 ± 8.86	129.06 ± 16.19	194.69 ± 23.37	100.09 ± 16.53
P	0.7722	0.0002	0.0001	0.0004	0.0002	0.0001	0.0001
df; F	1, 6; 0.09	1, 6; 61.99	1, 6; 138.02	1, 6; 51.49	1, 6; 61.36	1, 6; 335.62	1, 6; 82.20

Means followed by an asterisk in each column are significantly different ($P < 0.05$) from the control by using GLM on $\log_{10}(x + 1)$ transformed data. Untransformed means are presented.
[a] Pretreatment survey to determine size of foraging ant populations.
[b] Boric acid bait removed.

Study Authors' Conclusions

The study authors concluded that the number of foraging ants at both sites was significantly reduced at one week after treatment, and continued to be significantly reduced through week 7 at Site 1 and through week 8 at Site 2.

Reviewer's Conclusions

The reviewer agrees that the test material significantly reduced the Pharaoh ant population up to seven weeks post-treatment. The 1% boric acid concentration used in this study agrees with the BoraSol-WP label recommended rate of a 1% BoraSol-WP (a.i., 98% disodium octaborate tetrahydrate) solution in a 10% sugar solution. The registrant notes that the use of boric acid as a substitute for disodium octaborate tetrahydrate in this study should be allowed, since the EPA REDs have historically grouped boric acid and its sodium salts together for administrative purposes. Furthermore, the registrant states that both substances have shown an equivalent toxicity to the argentine ant (MRID 469381-03), and that the common active ingredient in all boron oxide-containing chemicals is the boric acid equivalent (BAE), B_2O_3 (borate). The registrant notes that a 1% solution does not produce repellency to the ants, and is carried back to the nest. The product label recommends a treatment time of 2 to 3 months.

Reviewer's Recommendations

This study is acceptable. The reviewer believes that adequate data have been provided to allow the addition of the Pharaoh ant to the pests listed on the BoraSol-WP product label.

TASK 2 DATA EVALUATION RECORD

STUDY TYPE: Product Performance

MRID 483949-07. Strong, C.A., P.G. Koehlet, and R.S. Patterson. 1993. Oral Toxicity and Repellency of Borates to German Cockroaches (Dictyoptera:Blattellidae). J. Economic Entomology 86(5):1458-1463.

Premises Treatments (830.3500)

Product Name: BoraSol-WP
EPA Reg. No. or File Symbol: 69529-2
Decision number: 445745
DP number: 387782

Prepared for
Registration Division (7505)
Office of Pesticide Programs
U.S. Environmental Protection Agency
Washington, DC 20460

Prepared by
Summitec Corporation
Task Order No.: 2-01

Primary Reviewer: Eric B. Lewis, M.S.	Signature: Eric B. Lewis Date: 07/06/2011
Secondary Reviewers: Gene Burgess, Ph.D.	Signature: Gene Burgess, AE Date: 07/06/2011
Robert Ross, M.S., Program Manager	Signature: Robert H. Ross Date: 07/06/2011
Quality Assurance: Angela M. Edmonds, B.S.	Signature: Angela M. Edmonds Date: 07/06/2011

RECOMMENDED CLASSIFICATION:
Acceptable

Disclaimer

DATA EVALUATION RECORD

[Primary Reviewer's Name]

STUDY TYPE:	PRODUCT PERFORMANCE [810.3500]
MRID:	483949-07. Oral Toxicity and Repellency of Borates to German Cockroaches (Dictyoptera:Blattellidae). Strong et al, 1993.
DP BARCODE:	387782
DECISION NO:	445745
SUBMISSION NO:	891044
SPONSOR:	Quality Borate Company
TESTING FACILITY:	Medical and Veterinary Entomology Research Laboratory, UDSA-ARS, Gainesville, FL
STUDY DIRECTOR:	Not provided
SUBMITTER:	Opaskar, V.; Quality Borate Company
STUDY COMPLETED:	October 1993
CONFIDENTIALITY CLAIMS:	None
GOOD LABORATORY PRACTICE:	The submitter did not sponsor or conduct the study, and does not know if it was conducted in accordance with 40CFR Part 160.
TEST MATERIAL:	PRODUCT NAME: BoraSol-WP EPA REGISTRATION NO: 69529-2 ACTIVE INGREDIENT NAME: Boron sodium oxide ($B_8Na_2O_{13}$) tetrahydrate A.I.%: 98% PC CODE: 011103 CAS NO.: 12880-03-4 FORMULATION TYPE: WP PRODUCT APPLICATION RATE: 6.25 – 50.00% w/w in commercial rodent chow ACTIVE INGREDIENT APPLICATION RATE: 6.125 –

49.0% w/w in commercial rodent chow (based on label purity of 98%; purity of test material not provided.)

PROPOSED LABEL MARKETING CLAIMS:	Target Organisms: Cockroaches
EPA REQUESTS:	[EPA WILL ADD DIRECTIVES HERE]

STUDY REVIEW

Study Number/Title: (if more than one study is provided in the MRID)

Purpose: A laboratory study was conducted to determine the efficacy of disodium octaborate tetrahydrate against the German cockroach.

MATERIALS AND METHODS

Test Location: Gainesville, FL

Test Material(s): The test materials used were boric acid and disodium octaborate tetrahydrate (DSOBTH) (purity not provided). The product label for BoraSol-WP states that the product contains 98% disodium octaborate tetrahydrate. To control cockroaches, the product label recommends application of the product at a rate of 3.2 oz/100 ft^2, or as a 6% to 50% mixture of the product with commercial rodent chow. The study used test material mixtures of 6.25% to 50.00% w/w with commercial rodent chow, as well as a 0.25% to 4% w/v solution in distilled water.

Test Species Name, Life Stage, Sex, and Age: German cockroach (*Blatella germanica*), adult males.

Describe test containers, chambers and/or apparatus (include site description and location) and how experiment was conducted: Choice and non-choice tests were conducted using dry-mixed, wet-mixed, and water-based solution baits. Dry-mixed baits contained finely-ground laboratory rodent chow mixed with boric acid or DSOBTH (50:50 w/w) and serially diluted to produce test material concentrations of 6.25 - 50.00% w/w. Wet-mixed baits with the same test material concentrations were prepared by adding deionized water (5:7, chow:water) to dry-mixed bait to produce a slurry, which was molded into a bait block and oven-dried. Untreated control baits of rat chow only or rat chow molded with deionized water were also included as appropriate.

For the non-choice dry- and wet-mixed tests, 5 g of the appropriate bait was placed in an uncovered petri dish (60 x 15 mm) inside a jar (3.78 L, 16.5 cm diameter) containing a water source and rolled cardboard harborage (10 cm x 3.5 cm diameter). No control bait was included. The choice tests were conducted under identical conditions, except that an untreated control bait was also included in each test chamber.

The solution tests were conducted under the same conditions as the dry- and wet-mixed tests, but used cotton-stoppered vials containing 15 mL of the appropriate test material solution (0.25- 4% w/v, test material/deionized water). All vials were replaced every other day. Untreated rat chow was available as a food source. The choice solution test also included a vial of deionized water only.

List the treatments including untreated control (express application rate as g/m^2):

Dry-mixed and wet-mixed bait tests: 0, 6.25, 12.5, 25.0, or 50.0% w/w of boric acid or DSOBTH.

Solution test: 0, 0.25, 0.5, 1, 2, 4% w/v of boric acid or DSOBTH in deionized water.

Number of replicates per treatment: 3

Number of individuals per replicate: 25

Length of exposure to treatment (time in seconds, minutes or hours):

Dry-mixed test: 10 days

Wet-mixed test: 21 days

Solution test: 4 days.

Experimental conditions (state relative humidity, temperature and photoperiod): All tests were conducted at 26°C and 50-52% RH. The photoperiod was 12 hrs light:12 hours darkness.

Data or endpoints that were to be collected/recorded:

Dry-mixed tests: Mortality was recorded daily for 10 days; bait consumption was determined gravimetrically on day 1.

Wet-mixed tests: Mortality was recorded daily for 21 days; bait consumption was determined gravimetrically on day 1.

Solution test: Mortality was recorded daily for the first 2 days; then every 6 hours for 2 days thereafter. Solution consumption was determined gravimetrically on day 1.

Data Analysis:

Mortality data were corrected using Abbott's formula. The LD_{50} and LC_{50} were estimated by probit analysis. Significant differences were identified by failure of 95% CIs to overlap. Bait consumption was calculated using the formula CC = (CR – (HC x CR)) – UC, where CC is corrected consumption, CR is the pre-test weight of the bait, UC is the weight of the bait at test end, and HC is the proportion change in moisture (CR – UC). Mean bait consumption was analyzed by Student's t test, with a significance level of 5%.

RESULTS

The raw data were not provided. LT_{50}s and bait consumption for the dry-mixed tests are provided in Tables 1 and 2, respectively. In the dry-mixed, non-choice tests, all cockroaches given either test material died within one week. There was no significant difference in the LT_{50}s for any of the DSOBTH concentrations. In the dry-mixed choice tests, neither test material produced mortality by day 3, indicating repellency. Bait consumption in the choice tests was significantly lower for both test materials except for the 6.25% boric acid concentration, compared to the untreated control.

Table 1. LT_{50}s of dry-mixed boric acid and DSOBTH fed to German cockroaches

Treatment	Concn, %	Test	Slope ± SE	LT_{50} (95% CI)	χ^2
Boric acid	6.25	Nonchoice	13.05 ± 1.88	6.54 (6.28– 6.74)	0.133
		Choice	12.54 ± 1.61	11.85 (11.44–12.45)	0.100
Boric acid	12.5	Nonchoice	9.91 ± 0.71	5.07 (4.87– 5.25)	3.58
		Choice	12.51 ± 0.41	11.73 (11.39–12.31)	0.88
Boric acid	25.0	Nonchoice	11.04 ± 1.01	3.91 (3.76– 4.07)	2.53
		Choice	12.40 ± 0.89	8.22 (8.00– 8.43)	3.00
Boric acid	50.0	Nonchoice	8.48 ± 1.23	2.89 (2.38– 3.32)	8.34
		Choice	10.13 ± 0.97	8.07 (7.76– 8.34)	2.39
DSOBTH	6.25	Nonchoice	11.46 ± 3.15	3.07 (2.10– 3.76)	7.24
		Choice	5.77 ± 0.37	6.58 (6.28– 6.87)	1.63
DSOBTH	12.5	Nonchoice	18.09 ± 2.35	2.66 (2.53– 2.77)	0.06
		Choice	11.19 ± 0.89	5.14 (4.96– 5.31)	4.03
DSOBTH	25.0	Nonchoice	13.63 ± 1.42	2.47 (2.36– 2.59)	0.20
		Choice	3.54 ± 0.75	2.53 (1.75– 2.99)	0.32
DSOBTH	50.0	Nonchoice	12.04 ± 1.30	2.40 (2.29– 2.52)	0.38
		Choice	7.72 ± 0.64	3.87 (3.66– 4.06)	3.62

LT_{50}s are expressed in days; n = 75.

Table 2. Consumption (mg) of dry-mixed boric acid and DSOBTH by German cockroaches in 24 h

Concn, %	Treatment	Treated, mean ± SEM	Control, mean ± SEM
50	Boric acid	28.26 ± 8.104b	53.40 ± 0.501a
	DSOBTH	6.06 ± 3.657b	22.86 ± 4.979a
25	Boric acid	19.12 ± 1.809b	60.65 ± 3.670a
	DSOBTH	8.01 ± 3.059b	53.45 ± 6.261a
12.5	Boric acid	4.05 ± 1.349b	44.12 ± 11.491a
	DSOBTH	5.20 ± 2.485b	34.34 ± 5.994a
6.25	Boric acid	2.21 ± 1.390a	19.38 ± 4.098a
	DSOBTH	7.35 ± 0.953b	34.04 ± 5.998a

Means within a row followed by the same letter are not significantly different (P = 0.05; Students t test [SAS Institute 1988]). n = 300.

LT_{50}s and bait consumption for the wet-mixed tests are provided in Tables 3 and 4, respectively. In the wet-mixed, non-choice tests, most of the cockroaches died in 3 to 6 days, and there was no significant difference in the LT_{50}s for the two test materials at concentrations >6.25%. In the wet-mixed choice tests, all the cockroaches survived for 21 days. Control bait consumption at 24 hours was significantly greater than for the test material baits (except for DSOBTH at 6.25%), indicating repellency of the test materials.

Table 3. LT_{50}s of wet-mixed boric acid and DSOBTH fed to German cockroaches

Treatment	Concn, %	Test	Slope ± SE	LT_{50} (95% CI)[a]	χ^2
Boric acid	6.25	Nonchoice	8.55 ± 1.55	6.14 (5.77–6.84)	1.39
		Choice	—	>21 —	—
Boric acid	12.5	Nonchoice	13.34 ± 1.52	5.01 (4.84–5.18)	3.45
		Choice	—	>21 —	—
Boric acid	25.0	Nonchoice	6.58 ± 0.76	4.05 (3.81–4.28)	0.86
		Choice	—	>21 —	—
Boric acid	50.0	Nonchoice	7.14 ± 0.62	3.34 (3.16–3.53)	6.32
		Choice	—	>21 —	—
DSOBTH	6.25	Nonchoice	10.69 ± 1.48	5.44 (5.23–5.71)	2.43
		Choice	—	>21 —	—
DSOBTH	12.5	Nonchoice	13.16 ± 2.58	4.67 (3.43–6.04)	8.34
		Choice	—	>21 —	—
DSOBTH	25.0	Nonchoice	9.45 ± 1.94	4.26 (2.57–6.09)	9.46
		Choice	—	>21 —	—
DSOBTH	50.0	Nonchoice	5.84 ± 0.61	3.01 (2.89–3.31)	6.00
		Choice	—	>21 —	—

[a] LT_{50}s are expressed in days; n = 75.

Table 4. Consumption (mg) of wet-mixed boric acid and DSOBTH by German cockroaches in 24 h

Concn, %	Treatment	Treated, mean ± SEM	Control, mean ± SEM
50	Boric acid	2.49 ± 0.604b	23.13 ± 4.267a
	DSOBTH	0.0 ± 0.0b	17.80 ± 2.839a
25	Boric acid	2.45 ± 1.020b	9.85 ± 1.873a
	DSOBTH	0.60 ± 0.600b	17.68 ± 1.328a
12.5	Boric acid	0.68 ± 0.307b	31.25 ± 6.190a
	DSOBTH	1.55 ± 0.809b	16.98 ± 3.439a
6.25	Boric acid	4.29 ± 1.524b	18.31 ± 2.640a
	DSOBTH	1.00 ± 0.953a	9.82 ± 4.155a

Means within a row followed by the same letter are not significantly different (P = 0.05; Students t test [SAS Institute 1988]) (n = 300).

LT_{50}s and bait consumption for the solution tests are provided in Tables 5 and 6, respectively. In the solution non-choice tests all cockroaches died by day 5. DSOBTH was significantly more toxic than boric acid at all concentrations except 4.0%. In the solution choice tests, there was no increase in mortality for test material concentrations >1.0%. Based on the 24-hour solution consumption, the test material solutions did not produce repellency.

Table 5. LT_{50}s of boric acid and DSOBTH water solutions fed to German cockroaches

Treatment	Concn, %	Test	Slope ± SE	LT_{50} (95% CI)[a]	χ^2
Boric acid	0.5	Nonchoice	14.71 ± 1.80	2.87 (2.74–2.99)	0.17
		Choice	3.57 ± 0.33	5.92 (5.51–6.38)	0.10
Boric acid	1.0	Nonchoice	16.01 ± 1.19	2.47 (2.39–2.54)	0.03
		Choice	2.01 ± 0.69	2.25 (0.58–3.01)	9.21
Boric acid	2.0	Nonchoice	6.89 ± 0.71	2.01 (1.86–2.14)	0.33
		Choice	9.49 ± 0.91	2.53 (2.39–2.66)	6.32
Boric acid	4.0	Nonchoice	8.23 ± 1.04	2.00 (1.86–2.13)	0.00
		Choice	9.43 ± 1.13	2.26 (2.12–2.38)	1.17
DSOBTH	0.5	Nonchoice	9.38 ± 0.97	2.58 (2.44–2.71)	2.09
		Choice	4.18 ± 0.57	3.34 (2.90–3.67)	0.50
DSOBTH	1.0	Nonchoice	13.67 ± 1.89	2.16 (2.07–2.27)	0.01
		Choice	3.68 ± 0.47	3.30 (2.82–3.69)	3.62
DSOBTH	2.0	Nonchoice	13.63 ± 1.42	2.47 (2.36–2.59)	0.20
		Choice	3.11 ± 0.30	7.60 (7.01–8.37)	8.86
DSOBTH	4.0	Nonchoice	8.51 ± 1.00	2.01 (1.86–2.14)	1.18
		Choice	4.87 ± 0.87	2.86 (2.37–3.19)	4.07

[a] LT_{50}s are expressed in days; n = 75.

Table 6. Consumption (mg) of boric acid and DSOBTH in water solutions by German cockroaches in 24 h

Concn, %	Treatment	Treated, mean ± SEM	Control, mean ± SEM
4	Boric acid	34.96 ± 2.149a	65.19 ± 25.299a
	DSOBTH	18.20 ± 3.182b	89.41 ± 3.654a
2	Boric acid	21.23 ± 20.588a	43.07 ± 13.802a
	DSOBTH	58.54 ± 36.911a	86.75 ± 22.156a
1	Boric acid	43.60 ± 34.943a	36.35 ± 34.943a
	DSOBTH	52.45 ± 16.996a	53.33 ± 6.962a
0.5	Boric acid	56.45 ± 27.106a	77.75 ± 12.925a
	DSOBTH	37.40 ± 24.678a	43.66 ± 21.152a

Means within a row followed by the same letter are not significantly different ($P = 0.05$; Students t test [SAS Institute 1988]). $n = 300$.

The 3-day LC_{50}s for boric acid and DSOBTH are provided in Table 7. In non-choice tests, DSOBTH was significantly more toxic than boric acid (LC_{50}s of 0.59% and 0.72%, respectively). In choice tests, the LC_{50}s for both test materials were significantly lower.

Table 7. LC_{50}s of boric acid and DSOBTH water solutions to German cockroaches after 3 d

Treatment	Test	Slope ± SE	LC_{50} (95% CI)[a]	χ^2	Choice/nonchoice
Boric acid	Nonchoice	7.35 ± 0.19	0.72 (0.69–0.76)	0.18	—
	Choice	4.53 ± 0.14	0.90 (0.82–0.99)	1.72	1.25
DSOBTH	Nonchoice	6.37 ± 0.18	0.59 (0.55–0.63)	0.42	—
	Choice	1.51 ± 0.10	1.29 (0.79–1.99)	0.06	2.19

[a] LC_{50}s are expressed in percentages; $n = 300$.

Study Authors' Conclusions

The study authors concluded that borate baits have considerable potential for German cockroach control in urban structures.

Reviewer's Conclusions

Untreated control mortality was not presented; however, the study authors stated that test material group mortality was corrected using Abbott's formula. The DSOBTH concentrations used in this study (6.25% - 50.00% in rodent chow) were within the label-recommended application rates of 6% to 50% in rodent chow. DSOBTH in rodent chow was efficacious against the test organism at the concentrations tested, particularly in the non-choice tests.

Reviewer Recommendations

This study is acceptable. The reviewer believes that adequate data have been provided to allow the addition of the German cockroach to the pests listed on the BoraSol-WP product label.

TASK 2 DATA EVALUATION RECORD

STUDY TYPE: Product Performance

MRID 483949-08. Rowlett, L.W. Undated. The Use of Diffusible Preservatives for the Prevention and Control of Wood-Boring Beetles, Carpenter Ants, and Decay Fungi

Premises Treatments (830.3500)

Product Name: BoraSol-WP
EPA Reg. No. or File Symbol: 69529-2
Decision number: 445745
DP number: 387782

Prepared for
Registration Division (7505)
Office of Pesticide Programs
U.S. Environmental Protection Agency
Washington, DC 20460

Prepared by
Summitec Corporation
Task Order No.: 2-01

Primary Reviewer: Eric B. Lewis, M.S.	Signature:	Eric B. Lewis
	Date:	07/06/2011
Secondary Reviewers: Gene Burgess, Ph.D.	Signature:	Gene Burgess, AE
	Date:	07/06/2011
Robert Ross, M.S., Program Manager	Signature:	Robert H. Ross
	Date:	07/06/2011
Quality Assurance: Angela M. Edmonds, B.S.	Signature:	Angela M. Edmonds
	Date:	07/06/2011

RECOMMENDED CLASSIFICATION: Unacceptable

Disclaimer

This review may have been altered subsequent to the contractors' signatures above.

Summitec Corporation for the U.S. Environmental Protection Agency under Contract No. EP-W-11-014

DATA EVALUATION RECORD

[Primary Reviewer's Name]

STUDY TYPE:	PRODUCT PERFORMANCE [810.3500]
MRID:	MRID 483949-08. The Use of Diffusible Preservatives for the Prevention and Control of Wood-Boring Beetles, Carpenter Ants, and Decay Fungi. Rowlett, L.W. Undated.
DP BARCODE:	387782
DECISION NO:	445745
SUBMISSION NO:	891044
SPONSOR:	Quality Borate Company
TESTING FACILITY:	Terminix Service, Inc., Columbia, SC
STUDY DIRECTOR:	Not provided
SUBMITTER:	Opaskar, V.; Quality Borate Company
STUDY COMPLETED:	November 28, 1990
CONFIDENTIALITY CLAIMS:	None
GOOD LABORATORY PRACTICE:	The submitter did not sponsor or conduct the study, and does not know if it was conducted in accordance with 40CFR Part 160.
TEST MATERIAL:	PRODUCT NAME: BoraSol-WP EPA REGISTRATION NO: 69529-2 ACTIVE INGREDIENT NAME: Boron sodium oxide ($B_8Na_2O_{13}$) tetrahydrate A.I.%: 98% PC CODE: 011103 CAS NO.: 12880-03-4 FORMULATION TYPE: WP PRODUCT APPLICATION RATE: Not provided ACTIVE INGREDIENT APPLICATION RATE: Not provided

PROPOSED LABEL MARKETING CLAIMS: Target Organisms: Carpenter ants, powderpost beetles, wood decay fungi

EPA REQUESTS: [EPA WILL ADD DIRECTIVES HERE]

STUDY REVIEW

Study Number/Title: (if more than one study is provided in the MRID)

Purpose: Anecdotal results are reported to support the use of borates against the carpenter ant, the powder post beetle, and a wood decay fungus.

MATERIALS AND METHODS

Test Location: Not provided

Test Material(s): Borates

Test Species Name, Life Stage, Sex, and Age: Carpenter ant, cockroach, powder post beetle, wood decay fungus (*Poria incrassata*); life stage, sex, and age not reported.

Test containers, chambers and/or apparatus (include site description and location) and how experiment was conducted: No actual test or test containers were described.

List the treatments including untreated control (express application rate as g/m^2): Not reported

Number of replicates per treatment: Not reported

Number of individuals per replicate: Not reported

Length of exposure to treatment (time in seconds, minutes or hours): Not reported

Experimental conditions (state relative humidity, temperature and photoperiod): Not reported

State data or endpoints that were to be collected/recorded: Not reported

Data Analysis: No data analysis was reported.

RESULTS

No data were provided. Only anecdotal results were reported. The study author states that borates have been used against cockroaches, powder post beetles, carpenter ants and *Poria* spp. fungi.

Study Author's Conclusions

The study author concluded that borates have long been used for prevention and control of insects and fungi, are easy to apply, and have environmental advantages over organosynthesized pesticides. Furthermore, they do not decompose with time, and diffuse deep into wood where they remain for decades.

Reviewer's Conclusions

While the study author provides anecdotal evidence that borates are efficacious against carpenter ants, powderpost beetles, cockroaches, and *Poria* spp. fungi, no actual tests were described and no data provided.

Reviewer's Recommendations

This study is not acceptable. Insufficient information was provided to allow the addition of carpenter ants, powder post beetles, cockroaches, or *Poria* spp. fungi to the pests listed on the BoraSol-WP product label.