FLORIDA DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES

DIVISION OF AGRICULTURAL ENVIRONMENTAL SERVICES

BUREAU OF PESTICIDES

SCIENTIFIC EVALUATION SECTION

EVALUATION OF DIFLUBENZURON BAIT IN THE PREVENTION OF TERMITE INFESTATION IN NEW CONSTRUCTION

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This review is a summary of the most current technical information available on a product or active ingredient in an attempt to address present or future issues surrounding its effectiveness. Conclusions drawn in this review are based on current research supplied by the registrant. The Scientific Evaluation Section welcomes comments and discussion of these issues.

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Termiticide Efficacy Review

Diflubenzuron in ADVANCE Compressed Termite Bait

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Introduction

Under the Termiticide Efficacy Rule 5E-2.0311 Florida Administrative Code (F.A.C.), any registrant wishing to register a termiticide product for use as a preventive treatment against subterranean termite infestation in new construction is required to submit data, as defined in the Rule, demonstrating the effectiveness of their product. Registrants must provide data demonstrating that their product can effectively prevent subterranean termite infestation of new construction for a period of no less than five years. Bait systems are allowed to demonstrate efficacy for shorter periods, because these are "maintained" or "serviced" control systems through regular pest control operator monitoring. BASF has submitted efficacy data to the Scientific Evaluation Section (SES) for review under the guidelines set forth in 5E-2.0311 Florida Administrative Code (F.A.C.). This report is a summary and evaluation of the efficacy data. The product evaluated is listed below.

ADVANCE Compressed Termite Bait (0.25% diflubenzuron) EPA Reg. No. 499-488

Label Information

ADVANCE Compressed Termite Bait (ACTB) is to be applied in BASF's ADVANCE Termite Bait System (ATBS) to protect structures from infestation by subterranean termites. The active ingredient in ACTB is 0.25% diflubenzuron. The ACTB label prescribes that the ATBS stations be installed around the perimeter of the structure at intervals of no greater than 20 feet. Upon installation, pieces of wood or other cellulosic material is placed in the stations. The stations are then inspected quarterly for signs of termite feeding. Upon finding active termites or evidence of termite feeding, the cellulosic material is replaced with the ACTB, which is a cellulose matrix containing diflubenzuron. Following the installation of the ACTB, the stations are monitored quarterly to assess termite activity in the area and the potential need to replace the bait matrix due to tampering, termite feeding, moisture, or fungal degradation.

Submitted Data

Because this product was actively registered at the time of rule adoption, the need to submit field data was waived and BASF was allowed to gather and submit data from structural trials.

BASF has submitted the efficacy data to FDACS as a document entitled "**Evaluation of Advance Compressed Termite Bait Containing Diflubenzuron, Used in Conjunction with the Advance Termite Bait System for the Control and Prevention of Termites In and Around Structures in the State of Florida**". Included in the submission were efficacy data from building tests conducted on 26 buildings. All structures were inspected prior to the installation of the product to classify them as "infested" or "non-infested". Of the 26 structures, only one had an active subterranean termite infestation at the time of study onset. As detailed in the Rule, both infested and uninfested structures can be used in these efficacy trials. However, the performance measures for each type are different. Further discussion on the performance measure is provided later in this review. The ATBS stations were installed and monitored quarterly at each structure, and the bait cartridges administered and replaced according to the label. In addition, independent monitors (IM) were also installed and monitored quarterly. IMs are ATBS tubes and were monitored quarterly, but were never to be baited, regardless of the level of activity.

The BASF report provided (1) a narrative for each structure with respect to inspection

results and termite activity, (2) a schematic of each structure identifying where bait stations and IMs were installed and where termite activity was observed, (3) a summary of the inspection and maintenance of the bait stations and IMs, and 4) summary of the structural inspections. In cases where, greater detail was needed, the raw inspection forms were provided upon request.

Evaluation Procedure

To evaluate whether the efficacy data meets the requirements of the Rule, FDACS reviewed the data to answer the following questions:

1. Do the data demonstrate the required reduction in termite activity around the structure within the stipulated time-frame? FDACS' evaluation against this criterion was restricted to the performance of ACTB on a single termite colony present at the study initiation.
2. For infested structures, do the data demonstrate the elimination of termite activity from within or on the structure within the required time-frame?
3. For both infested and non-infested structures, do the data demonstrate the maintenance of "no infestation" of the structure for the required time-frame?

Performance criteria

Table 1. Performance Measures for Buildings with an Active Infestation at Study Onset

	Target	Performance Measure	Rule Section
1	Activity in bait stations and IMs	A 90% reduction of termite activity in a minimum of 90% of the test buildings within 12 months of initiation of feeding on the bait.	(1)(b)3a
2	Termite activity within structure	Elimination of termite activity within the building at a minimum of 90% of the test buildings within 12 months of initiation of feeding on the bait, as verified by a combination of research and visual, structural inspection techniques.	(1)(b)3b
3	Termite activity within structure	Maintenance of "no infestation" of the structure for the 12 months following the elimination of the structural infestation, as verified by a combination of research and visual, structural inspection techniques, at a minimum of 90% of the structures.	(1)(b)3bii

Table 2. Performance Measures for Buildings Not Infested at Study Onset

	Target	Performance Measure	Rule Section
1	Activity in bait stations and IMs	At 90% reduction in termite activity at a minimum of 90% of the structures within 12 months of initiation of feeding on the bait.	(1)(b)4a
2	Termite activity within structure	No infestation can occur in a minimum of 90% of test buildings within three years of initiation of feeding on baiting system.	(1)(b)4bi
		Or	
3	Termite activity within structure	In cases where DNA analysis was used to identify colonies, no infestation of the structure for the 12 months, following the 100% elimination of the activity in the bait stations and IMs, as verified by a combination of research and visual, structural inspection techniques, at a minimum of 98% of the structures.	(1)(b)4bii

Results

Termite Activity in Independent Monitors and Bait Tubes

For ease of interpretation, the results from the infested and non-infested structures are discussed separately. Rule criteria that must be met are indicated in Tables 1 and 2, while Tables 3 and 4 summarize the performance of the product relative to the performance criteria. A green-shaded column header identifies the criterion that must be met. Red shading of a row means that the performance measure for that particular structure was not met. The time for cessation of termite activity in the baited stations and the IMs was determined from the number of days between the date of the initiation of feeding on the bait (or in most cases, the date of bait installation) and the date of the inspection where the termite activity had ceased, evaluated on a single, original colony. In rare instances, there were reports of termite activity within a baited station but no evidence of actual feeding on the bait. At most of the sites, multiple colonies, as determined using DNA, were identified. In addition, it was common to see new colonies appear in the area, following elimination of an original colony.

Infested structures

Section (1)(b)3a requires at least a 90% reduction of termite activity in at least 90% of buildings within 12 months of initiation of feeding on the bait. For the single infested structure in this study, the activity of the original colony was eliminated in the bait stations and IM's in 159 days from the initiation of bait feeding (Table 3).

Table 3. Impact of ACTB on Termite Activity in IMs/Baited Stations

Site Name	State	Date of First Feeding	Date of Cessation of Activity in IMs and Stations	Days to Cessation of Activity in IMs and Stations	Termite Species
Adamson	FL	6/30/2005	12/6/2005	159	*Rf*

Rf- *Reticulitermes flavipes*

Non-infested Structures

For this subset of data, two separate performance criteria from the Rule are applied. For structures where DNA was not obtained and individual colonies could not be delineated, Section (1)(b)4a is applicable and stipulates that at least a 90% reduction of termite activity in at least 90% of the test buildings within 12 months of initiation of feeding on the bait. For structures where colonies could be identified using DNA, Section (1)(b)4bii is applicable and stipulates a 100% reduction of termite activity must be achieved at a minimum of 90% of buildings within 12 months of initiation of feeding on the bait. BASF was able to provide DNA results for 13 of the 25 structures. These structures can be identified in Table 4 by the presence of a termite species in the right-hand column. Structures not meeting performance criteria are shaded in red.

For the structures where DNA information was not available, termite activity was eliminated at 12/12 (100%) of the structures within 12 months of initiation of feeding on the bait. The time for cessation of activity ranged from 91 to 365 days.

For the structures where DNA was evaluated and colonies delineated, ACTB eliminated termite activity of an original colony within 12 months from the initiation of feeding on the bait at 11 of the 13 structures. The time for cessation of activity ranged from 132 to 358 days.

Table 4. Impact of ACTB on Termite Activity in IMs/Baited Stations

Site Name	State	Date of First Feeding	Date of Cessation of Activity in IMs and Stations	Days to Cessation of Activity in IMs and Stations	Termite Species
Pope	FL	6/30/2005	3/7/2006	250	*Rf*
Baker	FL	6/30/2005	12/6/2005	159	---
Butera	FL	6/30/2005	12/6/2005	159	---
Bass	FL	7/7/2005	1/17/2006	194	---
Michaud	FL	7/7/2005	1/24/2006	201	---
Snell	FL	7/18/2006	7/11/2007	358	*Rf*
Hoyer	FL	7/14/2005	10/26/2005	104	---
Cerruzi	FL	10/12/2005	2/21/2006	132	*Rf*
Price	FL	8/10/2005	8/23/2006	378	*Rf*
Austin	FL	8/10/2005	2/15/2006	189	*Rf*
Jones I	FL	8/16/2005	5/10/2007	632	*Rf*
Smith	FL	8/16/2005	8/16/2006	365	---
Altenbach	FL	9/6/2005	6/14/2006	281	---
Dague	FL	9/20/2005	12/21/2005	92	---
Ganas	FL	9/27/2005	9/20/2006	358	*Rf*
DePierro	FL	9/27/2005	12/20/2006	449	*Rf*
Mula	FL	9/27/2005	6/28/2006	274	*Rf*
Jones II	FL	10/6/2005	7/18/2006	285	*Rf*
Williams	FL	10/6/2005	4/5/2006	181	---
Gross	FL	4/5/2006	1/17/2007	287	*Rf*
Hart	FL	4/12/2006	10/18/2006	189	*Rf*
Scott	FL	7/18/2006	10/18/2006	92	---
Wright	FL	7/26/2006	10/25/2006	91	---
Downer	FL	5/29/2007	11/28/2007	183	*Rf*
Hickman	FL	2/28/2007	8/29/2007	182	---

Red shading indicates that the structure has not satisfied the performance criteria of the Rule.

When the data from all structures are evaluated in terms of the percent of structures that meet the respective, rule performance criteria, 23 of 25 of the structures have satisfied this performance criterion. This translates to a 92% success rate. Although the time to elimination at the Price structure exceeded the rule time-frame (elimination within 365 days), FDACS believes this is more of a product of the monitoring every 90 days, rather than a persistence of the activity for an additional 90 days between inspections. Had the inspection been done on day 365, FDACS is confident the activity would have been found to have been eliminated.

Termite Activity in the Structures

For ease of interpretation, the results from the infested and non-infested structures are discussed separately. Tables 3 through 4 summarize the performance of the product

relative to the performance criteria. A green-shaded column header identifies the criteria that must be met.

Infested structures

Section (1)(b)3 of the Rule requires that the infestation be eliminated within 12 months at a minimum of 90% of the structures. In addition, the Rule stipulates that the structure must remain free of infestation for the 12 months following clearance of the original infestation. Inspections at the only structure infested at study onset, demonstrated that the termite activity within or on the structure had been eliminated within 12 months (<365 days) of the initiation of baiting (Table 5). This structure was also maintained free of infestation for the required 12 month period following elimination. The maintenance of "no reinfestation" is equal to the difference between the date of the inspection showing no infestation and the date of the final inspection. Product performance at this structure satisfies the performance standard for infested structures.

Table 5. Impact of ACTB on Termite Activity within the Infested Structures

Site Name	State	Date of First Feeding	Inspection Date Showing No Infestation in Structure	Days to Eliminate Infestation	Final Structural Inspection Date	Structure Infested?	Days of No Structural Infestation
Adamson	FL	6/30/2005	9/27/2005	89	9/13/2007	No	716

Non-infested structures

Section (1)(b)4 of the Rule requires that the structure be maintained free of infestation for at least 12 months following complete cessation of termite activity in the IMs around the structure, of maintained free of infestation for 3 years (1095 days) following elimination of activity in the IMs. The maintenance of "no infestation" is equal to the number days from the date of cessation of termite activity around the structure and the date of the final inspection. As Table 6 shows, all structures (22 of 22) were maintained free of subterranean termite infestation for the rule-required duration, 12 or 36 months, depending on the availability of DNA data and colony delineation. It should be noted, three of the structures, shaded in blue, could not be evaluated against this criterion because the final structural inspection was not conducted far enough out from the date of elimination of activity in the IMs. These structures cannot be considered "failing" the performance criterion, but rather that the conduct of the study did not allow for a comparison to it.

Table 6. Impact of ACTB on Termite Activity within the Non-infested Structures

Site Name	State	Date of First Feeding	Date of Cessation of Termite Activity in IM and Stations	Final Inspection Date	Structure Infested at Inspection?	Days of "No Infestation" Since Elimination of IM Activity or first feeding**
Pope	FL	6/30/2005	3/7/2006	9/5/2007	No	547
Baker*	FL	6/30/2005	12/6/2005	8/2/2006	No	398
Butera*	FL	6/30/2005	12/6/2005	6/17/2009	No	1448
Bass*	FL	7/7/2005	1/17/2006	7/8/2009	No	1462
Michaud*	FL	7/7/2005	1/24/2006	7/29/2009	No	1483

Site Name	State	Date of First Feeding	Date of Cessation of Termite Activity in IM and Stations	Final Inspection Date	Structure Infested at Inspection?	Days of "No Infestation" Since Elimination of IM Activity or first feeding**
Snell	FL	7/18/2006	7/11/2007	4/9/2008	No	273
Hoyer*	FL	7/14/2005	10/26/2005	7/18/2009	No	1465
Cerruzi	FL	10/12/2005	2/21/2006	5/7/2008	No	806
Price	FL	8/10/2005	8/23/2006	5/14/2008	No	630
Austin	FL	8/10/2005	2/15/2006	5/14/2008	No	819
Jones I	FL	8/16/2005	5/10/2007	5/7/2008	No	363
Smith*	FL	8/16/2005	8/16/2006	5/14/2009	No	1367
Altenbach*	FL	9/6/2005	6/14/2006	6/19/2009	No	1382
Dague*	FL	9/20/2005	12/21/2005	6/17/2009	No	1366
Ganas	FL	9/27/2005	9/20/2006	1/16/2008	No	483
DePierro	FL	9/27/2005	12/20/2006	1/16/2008	No	392
Mula	FL	9/27/2005	6/28/2006	12/13/2007	No	533
Jones II	FL	10/6/2005	1/17/2007	4/23/2008	No	462
Williams*	FL	10/6/2005	4/5/2006	7/8/2009	No	1371
Gross	FL	4/5/2006	1/17/2007	4/16/2008	No	455
Hart	FL	4/12/2006	10/18/2006	4/16/2008	No	546
Scott*	FL	7/18/2006	10/18/2006	7/29/2009	No	1107
Wright*	FL	7/26/2006	10/25/2006	7/29/2009	No	1099
Downer	FL	5/29/2007	11/28/2007	11/25/2009	No	728
Hickman*	FL	2/28/2007	8/29/2007	11/25/2009	No	1001

* - DNA was not analyzed. Evaluation was based on Section (1)(b)4bi- No infestation can occur in a minimum of 90% of test buildings within three years of initiation of feeding on the bait
** - 12 months = 365 days; 36 months = 1095 days

When the data from all the non-infested structures are evaluated in terms of the percent of structures that meet the rule-stipulated criteria, 22 of 22 of the structures have satisfied this performance criterion. This equates to a 100% success rate.

Data Summary

In order to satisfy the rule, for each structure, all respective criteria presented on page 5 must be met. In addition, since the criteria are slightly different for infested and non-infested structures those, infested and non-infested are considered separately and compared to the rule criteria.

Infested Structure

At the single structure that was actively infested at study onset, the data demonstrates that ACTB was able to clear the infestation within the stipulated time-frame (12 months) and sufficiently impact termite active around the structure within 12 months. In addition, ACTB was able to maintain this structure free from subsequent infestations even

though termite activity returned to the area surrounding the structure.

Non- Infested Structures

Of the 25 structures that did not have an infestation at the outset of the study, two failed to meet the rule criterion with respect to impacting termite activity in the IMs/bait stations within 12 months. This translates to a success rate of 92% which satisfies the rule. Regarding structural protection, of the 22 structures where a "complete" data set was compiled, all were maintained free of termite activity for the stipulated time frame (12 or 36 months), even though activity returned to the area around many of the structures.

Conclusions

The data has demonstrated that ADVANCE Compressed Termite Bait containing 0.25% diflubenzuron and monitored quarterly has satisfied the Performance Standards of FDACS' Termiticide Efficacy Rule. Specifically, ACTB applied according to the label (1) sufficiently affected termite activity around an acceptable number structures within the required time-frame, (2) eliminated existing structural infestations, if present, within the required time-frame, and (3) maintained the structures free of infestation for the required time period at an acceptable number structures. Therefore, the efficacy data submitted for ACTB is complete and satisfies the requirements of the Termiticide Efficacy Rule.