United States Environmental Protection Agency

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BIOPESTICIDES REGISTRATION ACTION DOCUMENT

Bacillus firmus I-1582

(PC Code **029072**)

Biopesticide Registration Action Document for
Bacillus firmus I-1582

PC Code 029072

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Biopesticides and Pollution Prevention Division

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I. EXECUTIVE SUMMARY/FACT SHEET

Active Ingredient and Proposed Use

The active ingredient, *Bacillus firmus* isolate 1582 (*B. firmus* I-1582), is a naturally occurring, soil bacterium which possesses nematicidal activity. It is intended to protect roots from nematode infestation, when applied directly to the soil, foliar treatment to turf, and as seed treatments. For these uses, *B. firmus* I-1582 is classified as a biological nematode suppressant. The proposed uses include agricultural and residential outdoor and greenhouse applications to fruit, vegetable, and field crops, including non-food crops such as turf and ornamentals. The isolate has been deposited with the Collection Nationale de Cultures de Microorganismes (CNCM), Institute Pasteur, France, on May 29, 1995 under Accession Number CNCMI-1582.

The Agency's Biopesticides and Pollution Prevention Division (BPPD) reviewed the database submitted to support the registration of *Bacillus firmus* I-1582, and determined that the active ingredient meets the standards for pesticide registration and food use under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), as amended by the Food Quality Protection Act (FQPA) of 1996. Details of the Agency's evaluations of *Bacillus firmus* I-1582 are included in this Biopesticides Registration Action Document (BRAD).

Toxicology, Human Exposure and Risks

Toxicology Assessment

Data from toxicological and pathogenicity studies, and related information from the scientific literature, submitted to the Agency in support of the pesticidal uses for *B. firmus* I-1582 placed the active ingredient in Toxicity Category IV for the acute oral, dermal, intravenous and pulmonary routes of exposure in laboratory mammals (refer to the Human Health Assessment in Chapter II.B**)**. Microbial clearance from all tissues analyzed in these studies was observed. These data demonstrate that *B. firmus* I-1582 is not toxic, infectious or pathogenic to laboratory animals under the study conditions. Based on these data and the anticipated low exposure to humans and the environment from the soil, turf, and seed treatment applications, the Agency granted a request to waive the requirements for primary eye irritation and immune response data. However, Personal Protective Equipment (PPE) is required to mitigate potential eye exposure to agricultural workers and other pesticide handlers. There were no endpoints that triggered Tier II or Tier III data requirements for *B. firmus* I-1582. At such time as additional uses are proposed, the Agency may require additional data to support those uses.

Food Tolerances

Concurrent with the registration of this active ingredient as a pesticide, the Agency is establishing an exemption from the requirement for a tolerance for residues of *B. firmus* I-1582 in or on all food and animal feed commodities, as required under Section 408 of the Federal

Food, Drug, and Cosmetics Act (FFDCA). This exemption will apply only to those situations when the pesticide is applied directly to the soil and as a seed treatment. The final rule establishing the exemption will be published in the Federal Register, and appear in part 180 of Title 40 of the Code of Federal Regulations.

FQPA Considerations

The Agency has assessed the toxicology database for *B. firmus* I-1582 in light of the safety factors listed in FQPA, and has concluded with reasonable certainty that the proposed uses of this microbial insecticide do not pose a dietary risk to the US population in general, and to infants and children in particular (refer to Chapter III.B.3 of this BRAD)**.** Since the microbe is not expected to survive municipal treatment of drinking water, dietary exposure via drinking water is also not expected to pose risks to these populations from the pesticidal uses of this active ingredient (refer to Chapter III.B.5 of this BRAD).

Occupational and Residential Exposure and Risk

The potential for aggregate, non-occupational exposure from agricultural applications is unlikely since it will be applied directly to the soil, turf, or as a seed treatment. However, the potential exists for human exposure to *B. firmus* I-1582 as a result residential and greenhouse uses. Chapter III.B.3 of this BRAD addresses the potential occupational exposure to *Bacillus firmus* I-1582. Should accidental exposure occur, the microbe is not expected to pose any harm to workers and pesticide handlers due to its low toxicity and lack of infectivity and pathogenicity to mammalian species. As required by the Worker Protection Standards (WPS), appropriate Personal Protective Equipment (PPE) are required and a Restricted Entry Interval (REI) has been established for agricultural applications to mitigate potential exposure and risks to agricultural workers and pesticide applicators. The homeowner should wear protective eye equipment when using any products containing the active ingredient as a pesticide. However, since *B. firmus* I-1582 is not toxic, infective or pathogenic to humans and other mammals if exposure were to occur to homeowners and other non-agricultural pesticide applicators, the risk concerns would be negligible to non-existent.

Ecological and Environmental Exposure and Risks

The data from three acceptable studies for toxicity to non-target avian (oral route of exposure), aquatic invertebrate and honeybees were submitted in support of the pesticidal uses of *B. firmus* I-1582. Requests to waive non-target avian (inhalation route of exposure), wild mammals, terrestrial and aquatic plants, insects, and estuarine and marine invertebrates, were submitted with acceptable, scientifically based rationale for waiving these required Tier I studies. The submitted studies, acceptable waivers, and information from publicly available, scientific literature were reviewed by BPPD scientists, who determined that the use of *B. firmus* strain I-1582 as a biological nematode suppressant will not pose incremental risks to non-target organisms or to the environment.

Environmental Justice

EPA seeks to achieve environmental justice - the fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income - in the development, implementation, and enforcement of environmental laws, regulations, and policies. At this time EPA does not believe that the proposed use of *Bacillus firmus* I-1582 as a pesticide will cause harm or a disproportionate impact on at-risk communities. For additional information regarding environmental justice issues, please visit EPA's website at: *http://www.epa.gov/compliance/environmentaljustice/index.html*.

Endangered Species Considerations

Bacillus firmus I-1582 is a bacterium intended to suppress nematodes and to protect roots of plants. The target plant pests are nematodes and there are no Federally-listed endangered nematode species. Plant-parasitic nematodes are not capable of infecting animal hosts. *Bacillus firmus* I-1582 does not pose a risk to Federally-listed plant species of concern. Based on information submitted and publicly available literature, the Agency concluded that treatment of agricultural or residential plants or soils with *Bacillus firmus* I-1582 will have no direct or indirect effect on endangered or threatened fauna or flora. As a result, the Agency has determined that the proposed uses of *Bacillus firmus* I-1582 will have "No Effect" (NE) on endangered or threatened terrestrial or aquatic species as listed by the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Services (NMFS). The Agency does not require labeling or additional data for endangered species for the proposed uses of *Bacillus firmus* I-1582 as a pesticide.

Data Gaps and Requirements/Labeling

The Agency has evaluated all submissions for *Bacillus firmus* I-1582 for the proposed pesticidal uses and has concluded that they are sufficient to support the data requirements for microbial pesticide registration. If in the future more different use patterns are sought (e.g., foliar treatment of other agricultural, terrestrial, or aquatic sites), or if other methods of application are proposed, additional data may be required. Hypersensitivity incidents must be immediately reported to the EPA, as required under FIFRA Section 6(a)(2), 40 CFR Part 158.690(c), and OPPTS data requirement 885.3400, so that the Agency may take appropriate regulatory action to mitigate any potential risk.

II. OVERVIEW

A. Product Overview

Biological Name: *Bacillus firmus* I-1582

Patent Number: US Patent 6406690; Inventors: Peleg; Itzhak (Maccabim, IL), Feldman; Katherina (Jerusalem, IL) Assignee:Minrav Industries Ltd. (Jerusalem, IL)

Culture Deposit: Collection Nationale de Cultures de Microorganismes (CNCM), Institute Pasteur, France, on May 29, 1995 under Accession Number CNCMI-1582.

Trade/Other Names: Chancellor

OPP Chemical Code: 029072

Basic Manufacturer: AgroGreen, Biological Division
Minrav Infrastructures (1993) Ltd.
3 Habossem Str, P.O. Box 153
Ashdod 77101, Israel.

Current US representative:
SciReg, Inc.
12733 Director's Loop
Woodbridge, VA 22192, USA.

B. Use Profile

Type of Pesticide: Nematode suppressant

Use Sites: (1) for vegetables, fruits, cotton, herbs, spices, and tree nuts, the product will be incorporated into soil via drenching, placement in the furrow, or drip irrigation;
(2) for container-grown seedlings, trees and shrubs, field ornamentals and bulbs, and greenhouse ornamentals, the product will be applied by drench or drip irrigation;
(3) for bare root seedlings, the product will be applied as a root dip;
(4) for seeds, the product will be applied as a coating prior to planting; and
(5) for turf , as a foliar spray or fertigation treatment. Other use sites and applications include: compost and other soil-

	less mixes treatments and residential outdoor terrestrial uses, for application(s) via a watering can, pressure sprayer, or hose-end sprayer. Soil and seed treatments to agricultural and home and residential outdoor and greenhouse applications to fruit, vegetable, and field crops, as well as non-food crops such as turf, and ornamentals.
Target Pests:	Plant-parasitic nematodes
Formulation Types:	Liquid formulation containing 0.66% w/w *Bacillus firmus* (*Bf*) strain I-1582 (a minimum of 4 x 10^8 cfu/g)
Method of Application /Rate:	For use at labeled rates by drip irrigation, application to soil, foliar application to turf; seed treatments

C. Estimated Usage

This is the new pesticidal active ingredient, so usage has not been reported.

D. Data Requirements

The data and related information concerning the toxicity of *B. firmus* I-1582, submitted under Section 3(c)(5) of FIFRA in support of an unconditional pesticide registration, have been reviewed by BPPD. All of the Tier I data requirements for this microbial pesticide have been adequately addressed.

E. Regulatory History

1. Experimental Use Permit and Temporary Tolerance Exemption

No Experimental Use Permit (EUP) or temporary tolerance exemption is associated with this active ingredient.

2. Registration and Exemption from Tolerance

On March 7, 2007, the Agency published a notice in the Federal Register (72 FR 10210-10211) announcing that RegWest Company, LLC (RegWest), 30856 Rocky Road, Greeley, CO 80631-9375, USA, submitted an application to register a pesticide on behalf of AgroGreen Biological Division, Minrav Infrastructures (1993) Ltd., 3 Habossem Str, P.O. Box 153, Ashdod 77101, Israel. The EP is proposed to contain 0.66 percent of the active ingredient, *Bacillus firmus* I-1582. On behalf of the applicant, RegWest also filed a petition to establish an exemption from the requirement of a tolerance for residues of *Bacillus firmus* I-1582 in or on all

food /animal feed commodities as published in the FR on March 21, 2007 (72 FR 13277-13279). However, RegWest no longer represents AgroGreen, whose current US representative as of March, 2008 is SciReg, Inc., 12733 Director's Loop, Woodbridge, VA 22192, USA.

Data supporting both the pesticide application and the petition for the exemption from tolerance were reviewed and found to meet the safety standards for pesticide registration and food/feed use under FIFRA and FFDCA, as amended by FQPA 1996. Consequently, the Agency will publish a final rule in the Federal Register to establish an exemption from the requirement of a tolerance on all food/feed commodities for *Bacillus firmus* I-1582 when applied to soil or as a seed treatment to suppress plant-parasitic soil nematodes.

3. Registration Review

The Food Quality Protection Act of 1996 mandated the continuous review of existing, registered pesticides. All pesticides distributed or sold in the United States must generally be registered by EPA, based on scientific data showing that they will not cause unreasonable risks to human health, workers, or the environment when used as directed on product labeling. The scientific database for every active ingredient and pesticide product is reviewed every 15 years, as new scientific methods are continuously being developed. This new active ingredient will be assigned a case number at the end of this 2008 Fiscal Year, and will be subject to registration review, along with any registered products containing the active ingredient, at an appropriately scheduled time in the15 year cycle.

III. RISK ASSESSMENT

On October 26, 2007, the Agency issued a Final Rule in the Federal Register (FR) on the data requirements to support registration of biochemical and microbial pesticides and updated definitions for both biochemical and microbial pesticides (72 FR 61002). This rule became effective on December 26, 2007. The data from studies conducted in laboratory animals and related information evaluated for the registration of *B. firmus* I-1582 were considered in light of these recently published microbial pesticide data requirements.

The studies submitted to the Agency were issued Master Record Identification numbers (MRIDs) and reviewed by BPPD. The following summaries of the product identity and manufacturing process for *B. firmus* I-1582 are based on BPPD's reviews, or Data Evaluation Records (DERs), dated March 05, 2008.

A. Physical and Chemical Properties Assessment

1. Product Identity and Mode of Action (MRID #s in Table 1; OPPTS 885.1100, 885.1200, 885.1300, 885.1400, 885.1500, 151-10)

The taxonomy of the active ingredient is as follows: superkingdom, Bacteria; class, *Bacilli*; family, *Bacillaceae*; phylum, *firmicutes*; order, *Bacillales*; and genus, *Bacillus*; species, *firmus*. Bacterial spores of *Bacillus firmus* isolate I-1582 definitive species identification was performed by molecular analysis 16S rRNA sequence and DNA hybridization by DSM laboratories. CNCM at Institute Pasteur assigned the accession number I-1582 to the isolate (strain). *Bf* has been isolated chiefly from soil; pigmented strains are isolated mostly from salt marshes. The species is genetically heterogeneous and several DNA homology groups have been described. The spores are ellipsoid and there is no swelling of the sporangium.

The maximum temperature for growth is 40-45°C and the minimum temperature is 5-10°C. The position of *Bf* spores in the cell is excentral, sporangium is not widened, and the spores are oval in shape with a smooth surface. *Bf* I-1582 has species-unique biochemical activities and has some anomalies from the species norm. These activities make it possible to develop a methodology for precise identification of the *Bf* I-1582 isolate. The definitive test for the characterization, isolation, and identification of *Bf* I-1582 are presented in detail in MRID 46933001.

Table 1: Product identity and manufacturing process for *Bacillus firmus* I-1582

TGAI				EP	
Data Requirement	**Test**	**Classification**	**MRID #**	**Classification**	**MRID #**
885.1100* 151-20**	Product identity	Acceptable	46933006	Acceptable	46933001 46933006
885.1200 151-21	Manufacturing process	Acceptable		Acceptable	46933002
885.1300 151-22	Discussion of formation of unintentional ingredients	Acceptable	47024801	Acceptable	46933003 47024802
885.1400 151-23	Analysis of samples	Acceptable	47024804 47024803	Acceptable	46933005
885.1500 151-25	Certification of limits	Acceptable	46933004	Acceptable	46933004
830.1800 151-25	Enforcement analytical method	Acceptable		Acceptable	46933003 47024802 46933005

*OPPTS 800 series Microbial pesticide test guidelines
**Microbial pesticide test guidelines identified in the code of federal regulations (40 CFR).

Analytical enforcement methods exist to maintain Quality Assurance and Quality Control (QA/QC) of the pesticide products containing *Bacillus firmus* I-1582. Fungal, bacterial or any other contamination of toxicological concern must meet Agency requirements for safety to allow use of the pesticide. All batches containing unintentional ingredients of toxicological concern must be destroyed. No further data are required for product identity at this time for the labeled uses of this *Bacillus firmus* I-1582 pesticide product. Additional product chemistry data may be required for requested amendments on a case-by-case basis.

2. Physical and Chemical Properties Assessment (MRIDs 46933006 (EP) and 47024805 (TGAI); OPPTS 830.6302, 830.6303, 830.7000, 830.7300, 830.6320, 830.6317, 151-17)

Reviews of data from MRID #s 46933006, 47187201 (EP) and 47024805 (TGAI) regarding the Physical and Chemical properties of the pesticides are reported in Table 2 (BPPD DER March 05, 2008).

TABLE 2. Physical and Chemical Properties for the TGAI *Bacillus firmus* and the EP[a] Chancellor™

		Description of results		
Data Requirement	**Test**	**EP**	**TGAI**	**Methods**
830.6302	Color	Dark brown, almost black at 22°C	Brown	ASTM D1539-89
830.6303	Physical State	Liquid at 20°C	Powder	Visual inspection
830.6304	Odor	Slight odor of fertilizer or used cooking oil at 22°C	Yeast extract-like	Olfactory inspection
830.6313	Stability	Mean concentration unchanged after 3 months[b].	Not addressed	
830.6314	Oxidation/Reduction: Chemical Incompatibility	Compatible with water, carbon dioxide, powdered elemental iron (reducing agent), gasoline, with a range of -1.6 to +0.4°C, except sodium hypochlorite oxidizer with a temperature change of +5.4°C.	Not required for TGAI	Federal Register Vol. 44, No. 53, p. 16267
830.6317	Storage Stability	Mean concentration unchanged after 3 months[b]. MRID 47187201	Not addressed	Counts of diluted stored EP – must submit protocol and description of method
830.6320	Corrosion Characteristics	No evidence of corrosion[b] MRID 47187201	Not required for TGAI	Must submit protocol and description of method
830.7000	pH	6.57 (1% w/v in distilled water); 8 as per CSF	8.65 (1% suspension)	EP: ASTM E 70-90; Fisher Accumet AB15 pH meter using a pH/ATC combination electrode with Ag/AgCl reference; TGAI: Orion research pH meter
830.7050	UV/Visible absorption	Not required for EP.	Not addressed	
830.7100	Viscosity	The viscosity of *Bf* spores could not be determined as the spores clogged the viscometer, stopping the flow. The test was rerun after removing the spores. The viscosity of the carrier fluid was 2.18 cSt at 20°C and 1.59 cSt at 40°C.	Not required for TGAI	Cannon-Fenske viscometer
830.7300	Specific Gravity/Bulk Density	1.11 (20°C/20°C); 9.25 lb/gal as per CSF	Density: 0.55-0.65 g/mL	EP: Using Hubbard-Carmick specific gravity bottle TGAI: By weighing a graduated cylinder filled with the test substance
830.7520	Particle Size/Distribution	Not applicable	2.3 % weight > 125µ	TGAI: Using a pre-weighed standard testing sieve (Gilson Co.)

[a] Data from MRID 46933006 (EP) and 47024805 (TGAI). [b] Data from MRID 47187201 (EP)

Data requirements (40 CFR Part §158.740(a)) for UV/Visible absorption corrosion characteristics, melting point, boiling point, solubility, vapor pressure, dissociation constant,

octanol/water partition coefficient, stability, oxidizing or reducing potential, flammability/flash point, explodability, viscosity, miscibility, and dielectric breakdown voltage were not required for the TGAI due to the microbial nature of the pesticide.

Except for the need for reports noted regarding protocols and methods used to arrive at results of storage stability and corrosion effects, all Physical and Chemical Properties data are acceptable. The EP appears to be stable for three months MRID 47187201. In order to establish an expiration date that is longer than three months, additional storage stability data will be required.

B. Human Health Assessment

Submitted mammalian toxicology studies are sufficient to support the proposed registration of *Bacillus firmus* I-1582.

1. Toxicological Hazard Assessment

Tier I studies- TGAI

Agency review of the toxicity studies (BPPD DER 03/05/2008) classified the acute oral, acute pulmonary and acute intravenous toxicity pathogenicity tests as acceptable for supporting an unconditional registration of the active ingredient as a pesticide. The active ingredient is considered Toxicity Category IV, and is not infectious or pathogenic to laboratory rats by the oral, dermal, pulmonary and intravenous routes of exposure. A request to waive the data requirements for the primary dermal irritation and primary eye irritation was granted, based on the low toxicity/lack of infectivity and pathogenicity of the active ingredient. However, appropriate Personal Protective Equipment (PPE) to mitigate any potential risks to the pesticide will be needed if the use could result in skin and/or eye exposure to agricultural workers and other pesticide handlers. The data are summarized in Table 3.

Table 3: Tier I – Acute mammalian toxicology data requirements for *Bacillus firmus* I-1582 - TGAI

Data Requirement	Test	Toxicity Category & Classification	Test Material	Results Summary	MRID #
*885.3050 **152-30	Acute oral toxicity	IV Acceptable	*Bacillus firmus* spores at 10^{10} cfu/g by oral gavage	Clearance from the blood by day 7 and from all other organs by day 14. No signs of treatment-related toxicity. Not toxic, infective or pathogenic.	46933007
885.3100 152-31	Acute dermal toxicity	IV Acceptable	5050 mg/kg body weight	LD50 greater than 5050 mg/kg. Very slight to well defined erythema on day 1 with clearance by day 4 in treated rabbits.	46933008
885.3150 152-32	Acute pulmonary toxicity/ pathogenicity	IV Acceptable	10^{10} cfu/g by intratracheal instillation	Clearance from the blood, kidneys, and liver by day 7 and from all other organs by day 14.	46933009
885.3400 152-32	Acute inhalation toxicity	N/A	N/A	Not required for non-volatile pesticide. Acceptable pulmonary test, not infective or pathogenic; low application rates; low inhalation exposure	46933009 and inerts
885.3200 152-33	Acute Intravenous injection toxicity/ pathogenicity	Not toxic or pathogenic Acceptable	Greater than 10^7 cfu/animal.	Clearance from cecum and liver by day 14 and from brain, blood, kidneys, lymph nodes, and spleen established by day 21.	46933010
870.2500 152-34	Primary dermal irritation	N/A Acceptable DW rationale	N/A	Rationale: acceptable acute dermal test with Toxicity Category IV; low exposure from application methods; appropriate PPE.	N/A
870.2400 152-35	Acute eye irritation	N/A Acceptable DW rationale	N/A	Rationale: acceptable acute dermal test with Toxicity Category IV; low exposure from application methods. Confirmatory test required.	N/A
885.3500	Cell culture	N/A – test not required	N/A	Not required: active ingredient is not a virus.	N/A
Tier III data requirements					
870.2500 152-38	Immune response Tier III TGAI	N/A Acceptable DW rationale	N/A	Based on acceptable toxicity tests, immune systems cleared microbe. Immune response test is not required.	46933007 46933008 46933009 46933010

*OPPTS 800 series Microbial pesticide test guidelines

**Microbial pesticide test guidelines identified in the code of federal regulations (40 CFR).

a. Acute Oral Toxicity and Pathogenicity (MRID 46933007; OPPTS 885.3050, 40 CFR ref. # 152-30)

Nineteen male and 19 female Sprague-Dawley rats were each treated by a single oral gavage dose of 0.1 mL per animal (>10^8 cfu/animal) of *Bacillus firmus* I-1582 spores. The presented data showed no clinical signs and no weight loss related to test substance in rats. *Bacillus firmus* I-1582was detected in brain, blood, cecum content, kidneys, lungs, lymph nodes, and spleen of the treated animals with clearance from the blood by day 7 and from all other organs by day 14. Necropsy was not conducted. Based on the presented/submitted data, *Bacillus firmus* I-1582 does not appear to be toxic, infective, and/or pathogenic in rats, when dosed orally at > 10^8 cfu/animal. This study was classified as ACCEPTABLE and the pesticide considered Toxicity Category IV for acute oral effects**.** No further data are required at this time for this data requirement for the proposed uses.

b. Acute Dermal Toxicity (MRID 46933008; OPPTS 870.1200, CFR ref. # 152-31)

Five male and five female New Zealand White rabbits were each treated with 5050 mg/kg body weight Bacillus firmus I-1582 spore suspension applied to the clipped dorsal trunk in an area of approximately 10% of the body surface in a dermal occlusion test according to standard laboratory procedures. Animals were observed for dermal irritation 60 minutes after patch removal. The test animals were observed for mortality and clinical signs of toxicity at least three times on the day of treatment and once daily thereafter for 14 days. The rabbits were euthanized on day 14 and necropsies were performed.

With the exception of one female that lost weight during the first week, all animals had normal body weight gain. All rabbits appeared normal during the study and all survived the study. Very slight to well defined erythema was observed on day 1 with clearance by day 4. No observable abnormalities were noted at necropsy. The dermal LD_{50} for males, females, and combined was greater than 5050 mg/kg. Thus, *Bacillus firmus* I-1582 is not toxic, infective, or pathogenic via the dermal route of exposure, and the active ingredient is placed in Toxicity Category IV for acute dermal effects. No further acute dermal toxicity data are required at this time for the proposed uses.

c. Acute Pulmonary Toxicity/Pathogenicity (MRID 46933009; OPPTS 885.3150, 40CFR ref. # 152-32)

Thirty male and 30 female Sprague-Dawley rats received 0.1 mL per animal (>10^8 cfu/animal) *Bacillus firmus* I-1582 by intratracheal instillation. The presented data show no adverse abnormal clinical signs in rats. No test organisms were detected in any sample from the control rats. All six animals sacrificed on day 3 had significant cfus (686 to 30731 cfu/g) in their lungs. The test organism was detected in brain, blood, cecum content, kidneys, lungs, lymph nodes, and spleen of the treated animals. Clearance was observed from the blood, kidneys, and liver by day 7 and from all other organs by day 14. Necropsy studies were not conducted. Based

on the presented/submitted data, the test organisms were not toxic, infective and/or pathogenic to rats and the active ingredient was placed in Toxicity Category IV for acute pulmonary effects. No further data are required at this time for this data requirement for the proposed uses.

d. Acute Intravenous Injection Toxicity/Pathogenicity (MRID 46933010; OPPTS 885.3200, CFR ref. # 152-33)

Twenty six male and 26 female Sprague-Dawley rats each received a dose of 0.1 mL per animal (>10^7 cfu/animal), by injection into the tail vein. The presented data showed no observable clinical signs in treated rats. No test organisms were recovered in any samples from the control rats. The test organism was detected in the blood, kidneys, liver, lungs, lymph nodes, and spleen of the treated rats. Clearance from the brain, blood, kidneys, lymph nodes, and spleen was established by day 21 after dosing. Clearance from the cecum and liver was established by day 14 after dosing. Necropsy studies showed no abnormal findings. *Bacillus firmus* spores did not appear to be toxic, infective, and/or pathogenic in rats, when dosed at >10^7 cfu/animal. The submission is classified as acceptable.

e. Hypersensitivity Incidents OPPTS 885.3400)

The applicant did not report any adverse hypersensitivity incidents regarding this active ingredient, *Bacillus firmus* I-1582. Reports of incidents of adverse effects to humans or domestic animals are required under FIFRA, Section 6(a)(2) and incidents of hypersensitivity under 40 CFR Part 158.690(c), and OPPTS data requirement 885.3400).

f. Cell Culture (OPPTS 885.3500)

Since *Bacillus firmus* I-1582 is not a virus, this study is not required.

Tier I studies - End-Use Product - Waiver Requests

The following tests are generally required for Manufacturing (MP) or End-Use Products (EP) containing the Microbial Pesticide Control agents (MPCAs).

870.1100 Acute oral toxicity
870.1200 Acute dermal toxicity
870.1300 Acute inhalation toxicity
870.2400 Acute eye irritation
870.2500 Primary dermal irritation

For the EP containing Bacillus firmus I-1582, the applicant requested that these tests be waived based on the following rationales:

- The submitted studies conducted with the TGAI, (MRIDs 46933007, 46933008, 46933009, and 46933010 discussed in III.B.1 and Table 3 above), did not show pathogenicity to animals treated by oral gavage, dermal application, pulmonary instillation, or intravenous injection.
- The active ingredient, *Bacillus firmus* strain I-1582, is a naturally occurring microorganism.
- No reports of adverse effects of *Bacillus firmus* or its metabolites to humans or mammals were found in literature searches.
- The proposed drip irrigation and soil application uses of the proposed End-use Product are not expected to result in increased exposure or adverse effects to humans or mammals.
- The bacteria count falls to ineffective levels in the environment within 90 days of treatment.

An acute inhalation toxicity study is not required for this non-volatile EP. The Agency, nevertheless, considered the following:

- Lack of acute toxicity, infectivity, and pathogenicity in the pulmonary study (III.B.1, Table 3);
- The nature of the inert ingredients;
- The requirements for Personal Protective Equipment;
- The potential low exposure associated with the proposed drip irrigation and soil application methods.

These led to the conclusion that acute inhalation effects are not likely to cause harm to workers or to the non-occupationally exposed population. (OPPTS 870.1300; MRID 46933009)

Tier II and Tier III studies

Waiver Requests for Tier II and Tier III data (OPPTS 885.3550; MRIDs 46933011; 47024806)

In the following discussion, the Agency evaluated rationales in support of the waivers for these data requirements in the light of the new December 2007 microbial pesticide data requirements (72 FR 61002). To address all data requirements during the submission of the application, the applicant requested that the Agency waive the requirement for submission of data to support the following Tier II and Tier III studies for the TGAI: Immune Response (152-38), Immune Response (152-46); Reproductive/Fertility Effects (Virulence Enhancement) (152-48), Reproductive/Fertility Effects (Mammalian Mutagenicity)(152-49). These data waiver requests, though supported by the rationales submitted, are not required because the Agency

concluded that there are no toxicological end points in the Tier I data which trigger the requirement for Tier II or Tier III toxicological data.

g. Immune Response- *Waiver Granted or Agency Assessment* **(OPPTS Old 880.3800, New Tier III OPPTS 870.7800, CFR ref. # 152-38)**

The following rationale supports the request to waive this Tier III data requirement. As expected from a non-pathogenic microorganism, the submitted toxicity/pathogenicity studies in the rodent (required for microbial pesticides) indicate that following several routes of exposure (III.B.1; Table 3), the immune system is still intact and able to process and clear the active ingredient. Therefore, no adverse effects to immune systems are known or expected. The Agency has also evaluated the Tier I data submitted and concluded that there are no toxicological end points which trigger the requirement for Tier II or Tier III toxicological data.

h. Subchronic, Chronic Toxicity and Oncogenicity

In terms of the new 2007 microbial pesticide Tier II and Tier III data requirements are:

(a) Tier II tests for acute toxicology (OPPTS 885.3550) and subchronic toxicity/pathogenicity (OPPTS 885.3600); and

(b) Tier III tests for reproductive fertility effects (OPPTS 885.3650), carcinogenicity (OPPTS 870.4200), immunotoxicity (OPPTS 870.7800) and infectivity/pathogenicity analysis (OPPTS 885.3000).

The applicant had submitted requests to waive Tier II and Tier III data. However, those requests, even though reviewed and found acceptable, are not necessary. Based on the data lack of toxicity endpoints of concern in the data generated to satisfy Tier I data requirements, the Agency does not require Tier II and Tier III test data for the proposed uses.

i. Effects on the Endocrine System

EPA is required under section 408(p) of the FFDCA, as amended by FQPA, to develop a screening program to determine whether certain substances (including all pesticide active and other ingredients) "may have an effect in humans that is similar to an effect produced by a naturally-occurring estrogen, or other such endocrine effects as the Administrator may designate." Following the recommendations of its Endocrine Disruptor Screening and Testing Advisory Committee (EDSTAC), EPA determined that there was a scientific basis for including, as part of the program, androgen and thyroid hormone systems, in addition to the estrogen hormone system. EPA also adopted EDSTAC's recommendation that it include evaluations of potential effects in wildlife.

The Agency has no knowledge of *Bacillus firmus* I-1582 being an endocrine disruptor, nor if this microbe is related to any class of known endocrine disruptors. Consequently, endocrine-related concerns did not impact the Agency's safety finding for these Bacillus firmus

I-1582 strains. Additional data specifically on the endocrine effects of this microbial pesticide are not required at this time. When the appropriate screening and/or testing protocols being considered under the Agency's Endocrine Disrupter Screening Program (EDSP) have been developed and implemented, *Bacillus firmus* I-1582 may be subject to additional screening and/or testing to better characterize effects related to endocrine disruption.

2. FQPA Considerations

Dietary Exposure and Risk Assessment

a. Food Clearances/Tolerances

An exemption from the requirement of a tolerance for residues of *Bacillus firmus* I-1582 is being established for soil applications and seed treatments concomitant with the unconditional registration of the pesticide. Data supporting the exemption from tolerance were reviewed and found to meet the safety standards of the Food Quality Protection Act (FQPA) of 1996 and current FIFRA pesticide registration data requirements. The exemption applies when *Bacillus firmus* I-1582 is applied as a nematode suppressant at approved label rates and on sites as described on the approved label.

b. Dietary Exposure and Risk Characterization

Dietary exposure to *B. firmus* I-1582 as a result of pesticide treatment is highly unlikely, but could occur. However, the lack of acute oral toxicity/pathogenicity observed in laboratory animals supports the exemption from the requirement of a tolerance for this active ingredient. The pesticide is intended to be applied to the soil or to be used as seed treatments, mainly for control of nematodes and to protect the roots of agricultural crops. Thus, dietary exposure by direct contact with food is not expected. The acute oral study described in Unit III indicates that the active ingredient is not toxic, infective or pathogenic when administered to mammals (rats) via the oral route of exposure. Other toxicology studies indicated that the microbe cleared all organs within the time allotted for the studies.

There is no post-harvest treatment of food commodities with *Bacillus firmus* I-1582. Thus, detectable residues of *Bacillus firmus* I-1582 are not expected in or on food commodities or animal feed as a result of the proposed use of this active ingredient. Moreover, washing, peeling and processing of any treated food or feed commodities before consumption would further mitigate dietary exposure to the microorganism.

c. Drinking Water Risk Characterization

Bacillus firmus I-1582 is a natural soil organism. Percolation through soil and municipal treatment of drinking water would reduce the potential exposure to *Bacillus firmus* I-1582 through drinking water from its use as a pesticide. However, even if negligible oral exposure

should occur through drinking water, the Agency concludes that such exposure would present no risk due to the lack of acute oral mammalian toxicity.

d. Acute and Chronic Dietary Exposure and Risks for Sensitive Subpopulations Particularly Infants and Children

There is a reasonable certainty that no harm to the U.S. population, including infants and children, will result from aggregate exposure to residues of *Bacillus firmus* I-1582 due to its use as a pesticide. This includes all anticipated dietary exposures and all other exposures for which there is reliable information. *Bacillus firmus* I-1582 is not toxic, pathogenic, or infectious to laboratory mammals.

e. Determination of Safety for U.S. Population, Infants and Children

See Chapter III.B**.** above for acute toxicological evaluations of *Bacillus firmus* I-1582. The FFDCA section 408(b)(2)(C) provides that EPA shall apply an additional tenfold margin of exposure (safety) for infants and children in the case of threshold effects to account for prenatal and postnatal toxicity and the completeness of the database on toxicity and exposure, unless EPA determines that a different margin of exposure (safety) will be safe for infants and children. Margins of exposure, which often are referred to as uncertainty factors, are incorporated into EPA's risk assessment either directly or through the use of a margin of exposure analysis or by using uncertainty (safety) factors in calculating a dose level that poses no appreciable risk. Actual exposures to adults and children through diet are expected to be several orders of magnitude less than the doses used in the toxicity and pathogenicity tests referenced in Chapter III above. Thus, the Agency has determined that an additional margin of safety for infants and children is unnecessary.

f. Aggregate Exposure from Multiple Routes Including Dermal, Oral, and Inhalation

In considering aggregate exposure, section 408 of FFDCA directs EPA to examine the available information concerning human exposures to the active ingredient from non-occupational oral, dermal, and inhalation exposures, including drinking water from ground water or surface water from its use in gardens or buildings or on lawns (residential and other indoor uses).

(i). *Oral exposure* would occur primarily from eating treated food commodities. However, negligible risk is expected, because *Bacillus firmus* I-1582 demonstrated no pathogenicity or toxicity potential at the maximum doses tested. Based on the acute oral toxicity study, the pesticide is classified as Toxicity Category IV for oral exposure (see Chapter III.B.2 above).

(ii). *Dermal exposure*. As discussed in III.B, *Bacillus firmus* I-1582 is not toxic, infective, or pathogenic via the dermal route of exposure, and the active ingredient is placed in Toxicity Category IV for acute dermal effects. The pesticide is proposed for use as soil and seed treatments to agricultural crops. For these exposure scenarios, non-occupational dermal exposure is not expected. The potential for non-occupational exposure exists for residential and home and garden use. However, low application rates, soil applications and the low toxicity potential of the active ingredient indicate that non-occupational exposure through these uses is not likely to cause harm to the exposed population if the pesticide is used as labeled.

(*iii). Inhalation exposure.* A similar rationale supports the Agency's conclusion that non-occupational inhalation exposure is not likely to cause harm to the exposed population if the pesticide is used as labeled. The active ingredient is placed in Toxicity Category IV on the basis of the acute pulmonary study (see III.B.).

g. Cumulative Effects

Section 408(b)(2)(D)(v) of the FFDCA requires the Agency to consider the cumulative effect of exposure to *Bacillus firmus* I-1582 and to other substances that have a common mechanism of toxicity. These considerations include the possible cumulative effects of such residues on infants and children. *Bacillus firmus* I-1582 is not toxic or pathogenic to mammals via several routes of exposure (Chapter III.B). There is no other *Bacillus firmus* strain registered. Consequently, no cumulative effects from the residues of this product with other related microbial pesticides are anticipated (see Chapter III.B.1 above).

Other Considerations

3. Occupational and Non-occupational Residential Risk Characterization

a. Non-occupational Residential, School and Day Care Exposure, and Risk Characterization

Bacillus firmus I-1582 will be applied to agricultural and greenhouse sites, turf and other approved sites as previously discussed in this BRAD (see Chapter II). Although some applications may be made near residential areas, no harm would be expected to result from exposure to *Bacillus firmus* I-1582 due to its low toxicity classification (see Chapter III.B.1 above). The Agency expects non-occupational dermal and inhalation exposure to pose no harm if the pesticide is used as labeled. The pesticide is intended to be mainly used commercially for seed and soil treatments of agricultural crops. Other homeowner and residential uses are also for soil applications outdoors at very low rates. No indoor residential, school, or daycare uses are currently permitted for this active ingredient. Even if there is non-occupational residential, school or day care exposure from the proposed uses of *Bacillus firmus* I-1582, the risk posed by this low toxicity microbe is likely to be minimal.

b. Occupational Exposure and Risk

Potential worker and pesticide handler exposure to *Bacillus firmus* I-1582 is not expected to pose any harm to workers. The primary routes of exposure for mixer/loaders and applicators would be dermal and/or inhalation exposure. The acute dermal and pulmonary toxicity/pathogenicity studies submitted in support of the registration demonstrated that *Bacillus firmus* I-1582 is not toxic or infective and is non-pathogenic to mammals (Chapter III.B.1 above). As such, the risks anticipated for occupational exposure are considered minimal to non-existent. Appropriate Personal Protective Equipment (PPE) and Restricted Entry Intervals (REI) are required to mitigate any potential risks to workers and pesticide handlers. PPE for workers and handlers consists of long-sleeved shirt, long pants, shoes, socks, goggles, waterproof gloves, and a dust/mist filtering respirator with NIOSH prefix N-95, P-95 or R-95. To perform post-application activities, early entry workers must wear coveralls in addition to the PPE described above.

C. Environmental Assessment

1. Ecological Effects Hazard Assessment

Below is a summary of the ecological effects database evaluated in support of this action (Table 4). A determination of reasonable certainty that no incremental adverse effects to wild mammals, avian species, insects including beneficial insects, freshwater fish, aquatic invertebrates, estuarine and marine animals or to plant species will result from labeled applications to agricultural crops or horticultural plants. The proposed use sites and respective applications include: (1) for vegetables, fruits, cotton, herbs, spices, and tree nuts, the product will be incorporated into soil via drenching, placement in the furrow, or drip irrigation; (2) for container-grown seedlings, trees and shrubs, field ornamentals and bulbs, and greenhouse ornamentals, the product will be applied by drench or drip irrigation; (3) for bare root seedlings, the product will be applied as a root dip; (4) for seeds, the product will be applied as a coating prior to planting; and (5) for turf , as a foliar spray or fertigation treatment. Other use sites and applications include: compost and other soil-less mixes treatments and residential outdoor terrestrial uses, for application(s) via a watering can, pressure sprayer, or hose-end sprayer.

The database consists of submitted data and acceptable waiver requests supported by scientific rationale that support the conclusion that there are no incremental risks to nontarget organisms as a result of intended uses of *B. firmus* strain I-1582 as a biological nematode suppressant. Table 4 summarizes the results of the data and information reviewed in support of the ecological effects of *Bacillus firmus* Strain I-1582.

Table 4. Tier I – Microbial pesticides nontarget organism data requirements for *Bacillus firmus* Strain I-1582.

Data Requirement	Test	Classification	MRID Nos.
154-16* 885.4050**	Avian oral	Acceptable study.	46933012
154-17 885.4100	Avian injection	Acceptable Waiver Rationale	46933013
154-18 885.4150	Wild mammal	Acceptable Waiver Rationale	46933013
154-19 885.4200	Freshwater fish	Acceptable Waiver Rationale	46933013
54-20 1 885.4240	Freshwater aquatic invertebrate	Acceptable study.	46933014
154-21 885.4280	Estuarine and marine animal	Acceptable Waiver Rationale	46933015
154-22 885.4300	Nontarget plant	Acceptable Waiver Rationale	46933015
154-23* 885.4340**	Nontarget insect testing	Acceptable Waiver Rationale	46933015
154-24 885.4380	Honey bee testing	Acceptable study.	46933016
Tier II ecological effects data requirements			
155A-10 885.5200	Expression in a terrestrial Environment	Acceptable Waiver Rationale	46933017
155A-11 885.5300	Expression in a freshwater Environment	Acceptable Waiver Rationale	46933017
155A-12 885.5400	Expression in a marine or estuarine environment	Acceptable Waiver Rationale	46933017

*Microbial Pesticide Guidelines Reference No. (40CFR 158.740)

**OPPTS Microbial Pesticide Test Guidelines – 885 series.

a. Avian Oral - (MRID 46933012; CFR ref. # 154-16; OPPTS 885.4050

Fourteen-day-old northern bobwhite (*Colinus virginianus*) received a daily oral gavage of *Bacillus firmus* at a dose of 2.5 x 108 spores/kg of body weight for five days. Additional groups of bobwhite were given a heat-attenuated *B. firmus* control or a reverse-osmosis water negative control. The birds were then observed for an additional 26 days. No treatment-related mortality

or clinical signs of toxicity were seen in any group. Gross necropsy showed no evidence of pathogenicity in birds receiving *B. firmus*. Body weight and feed consumption were comparable among all groups. The no-observed-effect dosage of *B. firmus* administered to northern bobwhite in this study was approximately 2.5 x 10^8 spores/kg body weight/day for five days. The study was acceptable and the results indicate that no avian hazard is expected from proposed uses of *B. firmus* I-1582 as a biological nematode suppressant.

b. Avian Injection- *Waiver Request Granted* (MRID 46933013 ; 40 CFR ref. # 154-17; OPPTS 885.4100)
c. Wild Mammal- *Waiver Request Granted* (MRID 46933013; 40 CFR ref. # 154-18; OPPTS 885.4150)
d. Freshwater Fish *Waiver Request Granted* (MRID 46933013; 40 CFR ref. # 154-19; OPPTS 885.4200) (MRIDs 46933007, 46933008, 46933009, 46933010 and 46933013)

Waiver Rationale for data requirements annotated above as b. through d.

Bacillus firmus Strain I-1582 is a naturally occurring strain of *Bacillus firmus* and is a gram-positive, nonpathogenic bacterium that is ubiquitous in nature and considered harmless. It has been isolated from ocean water (Siefert et al., 2000) and soils (Aslim et al., 2002) where it has been found at concentrations greater than 10^5 to 10^6/gram dry weight of sandy loam (Vardavakis, 1993). It occurs on the roots of rice (Datta and Banik, 1997), soybeans, and locust beans (Sarkar et al., 2002). *B. firmus* has also been found in bee gut and pollen (Cano et al., 1994; Inglis et al., 1993).

The applicant's literature search of the Agricola, Toxline, Biological Abstracts, Life Sciences 1990-1998, PubMed, and OCLC databases found no evidence of pathogenicity or other adverse effects produced by *B. firmus* to these fauna. The organism does not appear on any authoritative list of pathogens. There have been no reports of interaction of *B. firmus* with birds, wild mammals, or freshwater fish, and it has been found to be non-pathogenic in laboratory mammal testing (MRIDs 46933007, 46933008, 46933009, and 46933010). Furthermore, natural populations of *B. firmus* or its metabolites have not been associated with adverse effects in avian, wild mammal, or freshwater fish species.

Metabolites in culture filtrates of *B. firmus* include citric, lactic, acetic, oxalic and propionic acids at concentrations of 10 to 30 µg/mL. Phenol and *p*-hydroxyl benzoic acid are produced at concentrations of 0.1 to 30 µg/mL (Zlotnikov et al., 2001). These compounds are produced in healthy plants growing under normal conditions. There is no known production of genotoxic, carcinogenic, allergenic, mutagenic, or toxic metabolites or antibiotics.

Use of the Chancellor™ end use product containing *B. firmus* I-1582 is not expected to significantly increase the environmental exposure of birds, wild mammals, or freshwater fish to *B. firmus.* The bacterial counts in treated soil fell to background levels 90 days after treatment. The direct and targeted nature of EP applications minimizes exposures to birds, wild mammals, and

freshwater fish. Since application of Chancellor™ is not expected to produce *B. firmus* counts above those already found in healthy, productive soils, runoff from treated areas is not expected to produce any effects not seen from natural populations of *B. firmus.*

e. Freshwater Aquatic Invertebrate-(MRID 46933014; 40 CFR ref. # 154-20; OPPTS 885.4240

In a 21-day static renewal limit test, *Daphnia magna* were exposed to a target concentration of 1 x 10^6 cfu/mL *Bacillus firmus* in water. An untreated control group was exposed to water only. At test end, there were no statistically significant differences in the length, weight, percent survival, or number of neonates produced in the control and test material groups. The study is Acceptable and the results indicate that no aquatic invertebrate hazard is expected from proposed uses of *B. firmus* I-1582 as a biological nematode suppressant.

f. Estuarine/Marine Organisms- *Waiver Request Granted* (MRID 46933015; 40 CFR ref. # 154-21; OPPTS 885.4280)
g. Nontarget Plant - *Waiver Request Granted* (MRID 46933015; 40 CFR ref. # 154-22; OPPTS 885.4300)
h. Nontarget Insects- *Waiver Request Granted* (MRID 6933015; 40 CFR ref. # 154-23; OPPTS 885.4340)

Waiver Rationale for data requirements annotated above as f. through h.

Bacillus firmus is a gram-positive, nonpathogenic bacterium that is ubiquitous in nature and considered harmless. It has been isolated from ocean water (Siefert et al., 2000) and soils (Aslim et al., 2002) where it has been found at concentrations greater than 10^5 to 10^6 bacteria/gram dry weight of sandy loam (Vardavakis, 1993).

The applicant conducted a literature search of several databases, including Agricola, Toxline, Biological Abstracts, Life Sciences 1990-1998, PubMed for adverse effects produced by *B. firmus*. The organism does not appear on any authoritative list of pathogens. There have been no reports of interaction of *B. firmus* with estuarine and marine animals. The interaction of *B. firmus* with plants has been reported to be beneficial and/or symbiotic. It occurs on the roots of rice (Datta and Banik, 1997), soybeans, and locust beans (Sarkar et al., 2002). *B. firmus* has not been named as, or is not suspected to be a plant pathogen. No adverse effects on plants, including non-target plants, were seen in efficacy trials using the Chancellor™ end use product on vegetables, fruits, and turf. In those trials, the quality and yield of plants treated with Chancellor™ were equivalent to or greater than those treated with conventional chemicals.

The interaction of *B. firmus* with insects has been reported to be harmless and non-pathogenic, with the exception of one report from India which indicated *B. firmus* pathogenicity

to a lepidopteran tree pest (Varma and Mohamed Ali, 1986). *B. firmus* has also been found in bee gut and pollen (Cano et al., 1994; Inglis et al., 1993).

Applications of Chancellor™ which contains 0.66% *Bacillus firmus* I-1582 are not expected to produce *B. firmus* counts above those already found in healthy, productive soils. Moreover the bacterial counts in treated soil fell to background levels 90 days after treatment (Markov, 2006). Runoff from treated areas is not expected to produce any effects not seen from natural populations of *B. firmus*.

Metabolites in culture filtrates of *B. firmus* include citric, lactic, acetic, oxalic and propionic acids at concentrations of 10 to 30 µg/mL. Phenol and p-hydroxyl benzoic acid are produced at concentrations of 0.1 to 30 µg/mL (Zlotnikov, et al., 2001). These compounds are produced in healthy plants growing under normal conditions. There is no known production of genotoxic, carcinogenic, allergenic, mutagenic, or toxic metabolites or antibiotics. No natural populations of *B. firmus* or its metabolites have been associated with adverse effects in estuarine and marine animals, nontarget plants or nontarget insects.

The above rationale is acceptable to justify waiving Tier I estuarine and marine animal, nontarget plant and nontarget insect guideline testing and indicate that no risks are expected to these non-target populations, and to the majority of insect populations from the intended nematode suppressant uses of *B. firmus* I-1582. In the unlikely event that some non-target organisms are affected during the commercial application of this product, such incidents should be immediately reported to the EPA as required under FIFRA Section 6(a)(2) so that the Agency may take appropriate action. This EP is intended for outdoor terrestrial applications as a seed dressing, a pre-plant soil or soak, irrigation, or overhead spray or root drench, or as directed targeted applications to foliage for residential home-owner sites.

i. Honeybees- (MRID 4633016; 40 CFR ref. # 154-24; OPPTS 885.4380)

In a laboratory bioassay, adult honeybees (*Apis mellifera*) were fed a 30%sucrose solution diet containing 1 x 10^7 spores of *Bacillus firmus*/mL for 24 days. The study also included a 30% sucrose solution-only assay control and a potassium arsenate reference control. At test end, there was no statistically significant difference in the mean mortality of bees in the untreated and test material groups. The potassium arsenate positive control produced 100% mortality on day 1. The no-observed-effect concentration for *B. firmus* in this study was determined to be at least 1 x 10^7 spores/mL of diet.

The results of the scientifically valid study are consistent with current OPPTS 885.4380; and indicate no honeybee hazard is expected from proposed uses of *B. firmus* I-1582 (CNCM). The study is Acceptable to fulfill the data requirement with the assumption that the test *B. firmus* strain is substantially equivalent to *B. firmus* I-1582 (CNCM).

Tier II ecological effects data requirements

The applicant provided rationales for waiving Tier II ecological effects data requirements. However, there were no endpoints in evaluations of Tier I ecotoxicological effects data which trigger Tier II data requirements. The Agency had already evaluated the data waiver requests and found that the rationales further supported the requests to not require Tier II ecological and environmental effects data. See BRAD Chapters III.C.1. b-d and f-h above for waiver justifications (MRID 46933017).

2. Environmental Fate, Ecological Exposure, and Environmental Expression Risk Characterization.

The Tier I ecological data (as summarized in Chapter III.C.1 above) and waiver rationale support a conclusion that no incremental risks to nontarget organisms or to the environment are expected as a result of intended uses of *Bacillus firmus Strain* I-1582 (Chancellor™). These data and information support labeled terrestrial uses in agricultural, horticultural and residential environments. Accordingly, OPPTS Tier II, III and IV testing for ecological effects or environmental expression is not required.

3. Endangered Species Assessment

Bacillus firmus I-1582 is a bacterium intended to suppress nematodes and to protect roots of plants. The target plant pests are plant-parasitic nematodes and there are no Federally-listed endangered nematode species. Plant-parasitic nematodes are not capable of infecting animal hosts. *Bacillus firmus* I-1582 is a naturally-occurring strain of *Bacillus firmus* whose level in the environment will fall to background environmental levels within 90 days of treatment. Based on information submitted and publicly available literature, the Agency concluded that treatment of agricultural or residential plants or soils with *Bacillus firmus* I-1582 will have no direct or indirect effect on endangered or threatened fauna or flora (BPPD Review –December 10, 2007).

As a result, the Agency has determined that the proposed uses of *Bacillus firmus* I-1582 will have "No Effect" (NE) on endangered or threatened terrestrial or aquatic species as listed by the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Services (NMFS). The Agency does not require labeling or additional data for endangered species for the proposed uses of *Bacillus firmus* I-1582 as a pesticide

4. State Water Quality Concerns (CWA 303D)

The Agency has determined that dietary exposure to *Bacillus firmus* I-1582 via drinking water meets the FQPA 1996 safety standard. Moreover, the pesticide active ingredient is not likely to percolate through the soil or survive municipal treatment of drinking water.

Bacillus firmus I-1582 is not listed as the cause of impairment for any water bodies under section 303(d) of the Clean Water Act, based on information provided at: *http://oaspub.epa.gov/tmdl/waters_list.impairments*? p_impid=3.

IV. RISK MANAGEMENT AND REGISTRATION DECISIONS

A. 1. Determination of Eligibility

Section 3(c)(5) of FIFRA provides for the registration of a new active ingredient if it is determined that: a) its composition is such as to warrant the proposed claims for it; b) its labeling and other materials required to be submitted comply with the requirements of FIFRA; c) it will perform its intended function without unreasonable adverse effects on the environment; and d) when used in accordance with widespread and commonly recognized practice, it will not generally cause unreasonable adverse effects on the environment.

To satisfy Criterion "A" above, *Bacillus firmus* I-1582 has well known properties. The Agency has no knowledge that would contradict the claims made on the label of this product and the active ingredient is not expected to cause unreasonable adverse effects when used according to label instructions. Criterion "B" is satisfied by the current label and by the data presented in this document. It is believed that this pesticide active ingredient will not cause any unreasonable adverse effects, and is likely to provide protection as claimed, satisfying Criterion "C". Criterion "D" is satisfied in *Bacillus firmus* I-1582 is not expected to cause unreasonable adverse effects when used according to label instructions. Therefore, *Bacillus firmus* I-1582 is eligible for registration under FIFRA Section 3(c)(5) for the labeled uses provided the protocols and methods for the storage stability tests are submitted within one year of registration. Additional data may be required if the registrant proposes more extensive foliar terrestrial and aquatic applications as registration amendments.

2. Registration Review

The Food Quality Protection Act of 1996 mandated the continuous review of existing pesticides. The new registration review program is intended to make sure that, as the ability to assess risk evolves and as policies and practices change, all registered pesticides continue to meet the statutory standard of no unreasonable adverse effects. Changes in science, public policy, and pesticide use practices will occur over time. Through the new registration review program, the Agency periodically reevaluates pesticides to make sure that as change occurs, products in the marketplace can be used safely.

The Agency has begun to implement the new Registration Review program pursuant to FIFRA Section 3(g) and intends to review each registered pesticide approximately every 15 years to determine whether it continues to meet the FIFRA standard for registration. A registration review decision is the Agency's determination whether a pesticide meets, or does not meet, the standard for registration in FIFRA. This new active ingredient will be included in the schedule for registration review at the end of the Fiscal Year when schedules are updated.

B. Regulatory Position

1. Unconditional Registration

The data requirements are fulfilled for the currently registered sites as of April, 2008. Consequently, BPPD recommends registration under FIFRA Section 3(c)(5) of the EP, Chancellor™, that contains *Bacillus firmus* I-1582 as the active ingredient, provided the protocols and methods for the storage stability and corrosivity tests are submitted within one year of this registration.

Eligible sites

Sites eligible for registration under FIFRA Section 3(c)(5) are listed in the approved draft label and are listed in Chapter II of this BRAD. Upon registration pesticide labels can be seen on the Agency's label database *http://oaspub.epa.gov/pestlabl/ppls.home*. The company number is 82608.

Ineligible sites

Sites not included on the proposed EP label are not eligible for registration under FIFRA Section 3(c)(5). In order to register application methods which are likely to increase environmental exposure over the currently registered sites on the label, registrants should consult with the Agency about data requirements. These applications can be submitted as amendments to currently registered pesticide products, or as new product registrations.

2. Tolerances for Food Uses and /or Exemption

The toxicology database meets the safety standards of FQPA 1996 as long as the pesticide is used as labeled. The final rule granting the exemption from tolerance for residues of *Bacillus firmus* I-1582 on all food commodities will be published in 40 CFR, part 180.

3. CODEX Harmonization

There are no Codex harmonization considerations since there is no Codex Maximum Residue Limits set for food use of this active ingredient.

4. Risk Mitigation

There is minimal or negligible potential risk to non-target organisms (mammals, plants and wildlife), and to ground and surface water contamination through the proposed use of products containing *Bacillus firmus* I-1582 as discussed in this document. No mitigation measures are required at this time for dietary risk, including risk due to exposure via drinking

water. Appropriate PPE and REIs are required for pesticide handlers to mitigate worker exposure for labeled uses (see Labeling, immediately below). The product label will also bear environmental hazards text to mitigate any potential risk as determined by reviewed data and use sites.

C. Labeling

The labels and labeling of all products must comply with EPA's current regulations and requirements as specified in 40 CFR Part 156.10 and other applicable notices, such as, and including the WPS labeling. *Bacillus firmus* I-1582 products with commercial use sites are subject to the Worker Protection Standard. Because of the low toxicity of *Bacillus firmus* I-1582, the Restricted Entry Interval (REI) for greenhouse foliar applications within the scope of WPS is 4 hours. Precautionary statements and personal protective equipment (PPE), as specified below, are required based on the acute toxicity categories of this organism.

Handlers (including mixer/loaders and applicators) applying this product must wear long-sleeved shirt, long pants, goggles, shoes plus socks, and a dust/mist filtering respirator meeting NIOSH standards of at least N-95, R-95, or P-95 (DHHS 1987 and 2004). Post application agricultural workers and early-entry workers must wear coveralls in addition to the PPE above when entering treated areas during the REI period of four hours.

The label for registered EP containing the active ingredient *Bacillus firmus* I-1582 will be available at *http://oaspub.epa.gov/pestlabl/ppls.home*. The PC code for this active ingredient is 029072. The relevant company number is 82608.

V. ACTIONS REQUIRED BY REGISTRANTS

The applicant must submit reports of the protocols and methods used to arrive at the conclusions regarding storage stability within one year of registration of the EP. As required for all pesticides, hypersensitivity incidents must be reported under FIFRA Section 6(a)(2) 40 CFR Part 158.690(c), and OPPTS data requirement 885.3400, so that the Agency may take appropriate regulatory action.

If more extensive use patterns are sought for foliar treatment of other agricultural terrestrial or aquatic sites or crops, or if other methods of application are requested, additional information and data will be required on a case-by-case basis.

Before releasing pesticide products containing *Bacillus firmus* I-1582 for shipment, the applicant is required to provide appropriate labels and meet other EPA requirements. Release of the microbe into the environment and its transport across state lines is the purview of the United States Department of Agriculture (USDA) and other relevant government agencies.

VI. APPPENDICES

APPENDIX A. Studies Submitted in Support of this Registration

Bibliography

Study Information For
Product Registration - Section 3
***82608-R- Bacillus firmus* isolate 1582**

MRID	Citation	Receipt Date
46933000	AgroGreen, Biological Div, Minrav Infrastructures (1993) Ltd (2006) Submission of Product Chemistry, Toxicity and Environmental Fate Data in Support of the Application for Registration of Chancellor. Transmittal of 17 Studies.	12-Sep-2006
46933001	Davis, K. (2006) Product Identity of Cancellor. Project Number: PCD/885/1100. Unpublished study prepared by Regwest. 119 p.	12-Sep-2006
46933002	Davis, K. (2006) Manufacturing Process of Chancellor. Project Number: PCD/885/1200. Unpublished study prepared by Regwest. 13 p.	12-Sep-2006
46933003	Davis, K. (2006) Dicussion of Formation of Unintentional Ingredients of Chancellor. Project Number: PCD/885/1300. Unpublished study prepared by Regwest. 8 p.	12-Sep-2006
46933004	Davis, K. (2006) Certification of Limits of Chancellor. Project Number: PCD/885/1500. Unpublished study prepared by Regwest. 5 p.	12-Sep-2006
46933005	Crutchfield, V. (2006) Preliminary Analysis of a Microbial Pest Control Agent (MPCA) Bacillus firmus Spores (Suspension): Chancellor. Project Number: 7871/03. Unpublished study prepared by Stillmeadow, Inc. 13 p.	12-Sep-2006
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