US Environmental Protection Agency
Office of Pesticide Programs

BIOPESTICIDES REGISTRATION ACTION DOCUMENT

RHAMNOLIPID BIOSURFACTANT (PC Code 110029) □

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U.S. Environmental Protection Agency
Office of Pesticide Programs
Biopesticides and Pollution Prevention Division
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BIOPESTICIDES REGISTRATION ACTION DOCUMENT TEAM

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Biopesticides and Pollution Prevention Division

Biochemical Pesticides Branch

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I. Executive Summary

A. IDENTITY

The technical grade active ingredient (TGAI) is rhamnolipid biosurfactant, a transparent liquid with a light to dark amber tint and a mild, sweet soapy odor. The TGAI is a mixture of two rhamnolipid molecules. The first is designated as R1, which contains a rhamnose ring and a fatty acid tail (decanoic acid, 3-[(6-deoxy-∝-L-mannopyranosyl)oxy]-,1-(carboxymethyl) octyl ester (CAS No. 37134-61-5). The second is designated R2, which contains two rhamnose rings and a fatty acid tail (decanoic acid, 3-[[6-deoxy-2-O-(6-deoxy-∝-L-mannopyranosyl)-∝-L-mannopyranosyl]oxy]-,1-(carboxymethyl) octyl ester (CAS No. 4348-76-9). The TGAI mixture of R1 and R2 is decanoic acid, 3-[[6-deoxy-2-O-(6-deoxy-∝-L-mannopyranosyl)-∝-L-mannopyranosyl]oxy]-, 1-(carboxymethyl)octyl ester, mixture with 1-(carboxymethyl)octyl 3-[(6-deoxy-∝-L-mannopyranosyl)oxy]decanoate (CAS No. 147858-26-2, PC code 110029). The end-use product, Zonix™ Biofungicide, contains 8.5% by weight rhamnolipid biosurfactant, composed of 3.34% R1 and 5.16% R2.

The product chemistry data submitted by the registrant satisfies the requirements for product identity.

B. USE/USAGE

The end-use product, Zonix™ Biofungicide, is to be used to prevent and control pathogenic fungi on horticultural and agricultural crops, including root and tuber vegetables, fruiting vegetables, cucurbit vegetables, citrus fruits, ornamental plants, trees, and shrubs, bedding plants, and turf grasses.

C. RISK ASSESSMENT

No unreasonable adverse effects on humans or the environment are anticipated from aggregate exposure to rhamnolipid biosurfactant. This includes all anticipated exposures for which there is reliable information.

1. Human Health Risk Assessment

a. Toxicological Endpoints

The Agency reviewed information submitted by the registrant to identify toxic endpoints in the following studies: acute oral, acute dermal, acute inhalation, primary eye irritation, and primary dermal irritation. The end-use product was classified in Toxicity Category IV for acute oral,

dermal, and inhalation toxicity; Toxicity Category IV for primary dermal irritation; and Toxicity Category I for eye irritation. A requested waiver for dermal sensitization testing was granted based on the lack of dermal irritation and toxicity, and a lack of reported effects in users of products containing rhamnolipid biosurfactants. A requested waiver for genotoxicity was granted by the Agency based on the fact that rhamnolipid biosurfactant is not related to any known mutagen and is not a member of any chemical class or compounds containing known mutagens. Requested waivers for 90-day oral toxicity, teratogenicity, and immunotoxicity studies were granted based on the physical mode of action of the product, the demonstrated lack of oral, dermal and inhalation toxicity, and the innocuous nature of the potential breakdown products.

b. Human Exposure

The most likely human exposure to rhamnolipid biosurfactant is to agricultural applicators of the end-use product.

c. Risk Assessment

The Agency has considered rhamnolipid biosurfactant in light of the relevant safety factors in the Food Quality Protection Act (FQPA) of 1996 and under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and has not identified any dietary or non-dietary exposure issues that may affect the U.S. population in general, including infants and children. The Agency has thereby determined that there is reasonable certainty that no harm will result from aggregate exposure to rhamnolipid biosurfactant residues, including dietary exposures and all other exposures for which there is reliable information.

2. Ecological Risk Assessment

a. Toxicity Endpoints

An aquatic invertebrate acute toxicity study demonstrated that the end use product is slightly toxic to aquatic invertebrates. However, because the end-use product is for terrestrial uses, there will be no exposure to fish or other aquatic organisms, when used in accordance with the label directions. Requested waivers were granted by the Agency for avian acute oral toxicity, avian dietary toxicity, and freshwater fish toxicity testing, based on the demonstrated lack of oral and dermal toxicity in mammals (practically non-toxic via oral and dermal exposures at the tested rates), the non-toxic nature of the active ingredient (rhamnose sugar and a fatty acid), and the low concentration of the active ingredient in the diluted product (resulting in extremely low avian exposure on either acute or dietary bases). Waivers were granted for non-target insect and honeybee testing based on the low application rate of the active ingredient in the diluted product and the mode of action of the active ingredient (membrane disruption of zoosporic plant

pathogen microorganisms). A subsequently received contact honeybee toxicity study, conducted with 8.5% rhamnolipid, indicated that the test material was slightly toxic to honeybees. However, no bee precautionary statements are required on the label. A waiver was granted for an earthworm study since earthworms are exposed naturally to rhamnolipids produced on soil microbial cell surfaces and rhamnolipids are excreted extracellularly by various soil bacteria. A comprehensive literature search by the registrant found no data demonstrating adverse effects of rhamnolipid biosurfactants on soil organisms.

b. Ecological Exposure

Rhamnolipid molecules are simple glycolipids consisting of a rhamnose sugar ring and a fatty acid tail. Both rhamnolipids and biosurfactants are naturally produced or excreted by soil microorganisms. The low concentration of active ingredient in the pesticide product and ready biodegradation of the active ingredient will result in very low to non-existent exposure to non-target organisms and the environment from the pesticidal use of rhamnolipid biosurfactant.

c. Risk Assessment

Risk to the environment and non-target organisms is expected to be minimal due to the low concentration of active ingredient in the diluted product, its non-toxic mode of action, and the ready biodegradability of the active ingredient. Therefore, the Agency believes the use of rhamnolipid biosurfactant as a pesticide should not result in significant adverse effects to wildlife or the environment.

D. DATA GAPS /LABELING RESTRICTIONS

There are no data gaps. Because rhamnolipid biosurfactant is a Toxicity Category I eye irritant, precautionary labeling is required to mitigate risks associated with proposed uses (see Labeling Rationale for details).

II. Overview

A. ACTIVE INGREDIENT OVERVIEW

Common Name: Rhamnolipid Biosurfactant

Chemical Name: Decanoic acid, 3-[[6-deoxy-2-O-(6-deoxy-∝-L-mannopyranosyl)-∝-L-mannopyranosyl]oxy]-, 1-(carboxymethyl)octyl ester, mixture with 1-(carboxymethyl)octyl 3-[(6-deoxy-∝-L-mannopyranosyl)oxy]decanoate

Trade and Other Names: Zonix™ Biofungicide

CAS Registry Number: 147858-26-2

OPP Chemical Code: 110029

Basic Manufacturer: Jeneil Biosurfactant Company
400 N. Dekora Woods Blvd.
Saukville, WI 53080

B. USE PROFILE

Proposed uses and application methods for Zonix™ Biofungicide include the following:

Type of Pesticide: Contact biofungicide

Use Sites: The end-use product Zonix™ Biofungicide will be used to prevent and control zoosporic plant pathogenic fungi in horticultural, turf, and agricultural settings.

Target Pests: Zoosporic plant pathogens

Formulation Types: Liquid

Method and Rates of Application: Zonix™ Biofungicide is applied at a concentration of between 85 and 125 parts per million (ppm) (diluted with water), using conventional spray, fog, or drench equipment; or applied via chemigation or by hydroponics; to saturate the crop or soil/growth medium being treated. The volume of finished

spray/drench applied will vary depending on the plant density and soil conditions. The product can also be used to treat seeds, transplants, bulbs and cuttings.

Use Practice Limitations: For terrestrial use only.

Timing: Application should be made in the early stages of plant growth for initial control, and at five-day intervals thereafter (or, as needed) throughout the growing season, for preventative control.

C. ESTIMATED USAGE

None used yet since this will be the first registered product.

D. DATA REQUIREMENTS

The data requirements for granting this registration under Section 3(c)(5) of FIFRA have been reviewed by BPPD. The mammalian toxicology and ecological effects data requirements for rhamnolipid biosurfactant have been fulfilled. Product analysis data requirements are adequately satisfied.

E. REGULATORY HISTORY

On April 2, 2001, the Agency received an application for rhamnolipid biosurfactant as a new active ingredient. A notice of receipt of the application for registration of Zonix™ Biofungicide was published in the Federal Register on 7 May, 2003 (68 FR 24456) with a 30-day comment period. No comments were received following this publication. On 9 May, 2003, EPA published a Notice of Filing a Petition to Establish an Exemption from the Requirement of a Tolerance (68 FR 25026) with a 30-day comment period. No comments were received.

F. CLASSIFICATION

On February 25, 1999, the Biochemical Classification Committee determined that rhamnolipid biosurfactant is classified as a biochemical fungicide due to its non-toxic mode of action toward the target pest species.

G. FOOD CLEARANCES/TOLERANCES

An exemption from the requirement of a tolerance was established for residues of rhamnolipid biosurfactant in or on all food commodities on March 31, 2004 (69 FR 16796) (FRL-7347-7).

III. Science Assessment

A. PHYSICAL/CHEMICAL PROPERTIES ASSESSMENT

All product chemistry data requirements for the TGAIs and manufacturing-use products are met.

1. Product Identity and Mode of Action

a. Product Identity:

The active ingredient, rhamnolipid biosurfactant, is a transparent liquid with a light to dark amber tint and a mild, sweet soapy odor. The TGAI is a mixture of two rhamnolipid molecules. The first is designated as R1, which contains a rhamnose ring and a fatty acid tail (decanoic acid, 3-[(6-deoxy-∝-L-mannopyranosyl)oxy]-,1-(carboxymethyl) octyl ester (CAS No. 37134-61-5). The second is designated R2, which contains two rhamnose rings and a fatty acid tail (decanoic acid, 3-[[6-deoxy-2-O-(6-deoxy-∝-L-mannopyranosyl)-∝-L-mannopyranosyl]oxy]-,1-(carboxymethyl) octyl ester (CAS No. 4348-76-9). The TGAI mixture of R1 and R2 is decanoic acid, 3-[[6-deoxy-2-O-(6-deoxy-∝-L-mannopyranosyl)-∝-L-mannopyranosyl]oxy]-, 1-(carboxymethyl)octyl ester, mixture with 1-(carboxymethyl)octyl 3-[(6-deoxy-∝-L-mannopyranosyl)oxy]decanoate (CAS No. 147858-26-2, PC code 110029). The end-use product, Zonix™ Biofungicide, contains 8.5% by weight rhamnolipid biosurfactant, composed of 3.34% R1 and 5.16% R2.

b. Mode of Action:

Rhamnolipid biosurfactant is effective against all zoosporic plant pathogens, including downy mildews, *Pythium*, and *Phytophthora*. The pathogenic zoospores of targeted pest species are vulnerable to rhamnolipid biosurfactant because they lack a protective cell wall. The active ingredient disrupts the cell membranes via a physico-chemical surfactant action, which destroys the permeability and results in loss of motility and rapid lysis of the zoospore.

2. Physical And Chemical Properties Assessment

The physical and chemical characteristics of rhamnolipid biosurfactant were submitted to support the product registration. They are summarized in Table 1.

Table 1. Product Chemistry Data Requirements

GUIDELINE NO.	STUDY	RESULTS	MRID NO.
151B-10 151B-11 151B-12	Product identity; Manufacturing process; Discussion of formation of unintentional ingredients	The product is 8.50% by weight decanoic acid, 3-[[6-deoxy-2-O-(6-deoxy-∝-L-mannopyranosyl)-∝-L-mannopyranosyl]oxy]-, 1-(carboxymethyl)octyl ester, mixture with 1-(carboxymethyl)octyl 3-[(6-deoxy-∝-L-mannopyranosyl)oxy]decanoate, a.i.)	453767-01
151B-13	Analysis of samples	Acceptable data submitted to the Agency	453767-01
151B-15	Certification of limits	Acceptable limits submitted to the Agency	453767-01
151B-16	Analytical Methods	Acceptable methods submitted to the Agency	453767-01
151B-17	PHYSICAL/CHEMICAL PROPERTIES OF RHAMNOLIPID BIOSURFACTANT		
151B-17(a)	Color	Transparent with a light to dark amber tint	453767-01
151B-17(b)	Physical State	Liquid	453767-01
151B-17(c)	Odor	Mild, sweet soapy @ room temperature	453767-01
151B-17(d)	Melting Point	N/A, not a solid	453767-01
151B-17(e)	Boiling Point	99.0°C	None*
151B-17(f)	Density/Specific gravity	Specific gravity = 8.514 (end-use product = 8.345)	453767-01
151B-17(g)	Solubility	Soluble in water	453767-01
151B-17(h)	Vapor pressure	31 K pa	None*
151B-17(i)	pH	6.8	453767-01
151B-17(j)	Stability	Stable at normal and elevated temperatures; stable in the presence of metals and metal ions.	453767-01
151B-17(k)	Flammability	Not applicable; end-use product contains no combustible liquids	453767-01
151B-17(l)	Storage Stability	Stable for 1 year	453767-01
151B-17(m)	Viscosity	1.0 mPas	None*
151B-17(n)	Miscibility	Not required; end-use product is not intended to be diluted with petroleum solvents	453767-01
151B-17(o)	Corrosion Characteristics	Not corrosive	453767-01
151B-17(p)	Octanol/water partition coefficient	Not applicable; not organic and non-polar	None*

*Information submitted via correspondence, dated March 6, 2003.

B. HUMAN HEALTH ASSESSMENT

The submitted mammalian toxicity studies and the requested waivers to support the registration application and tolerance exemption petition for rhamnolipid biosurfactant adequately satisfy the requirements to register a new biochemical pesticide intended for use on food commodities.

1. Toxicology Assessment

Adequate mammalian toxicology data are available and support registration of the product containing the active ingredient rhamnolipid biosurfactant. Rhamnolipid molecules are simple glycolipids consisting of a rhamnose sugar ring and a fatty acid tail. Individually, these molecules are not toxic. Rhamnose is a comparatively rare sugar that is approved by the FDA as a food additive, and fatty acids are ubiquitous in animals and plants and are a major energy source in the body. Consequently, the breakdown products of rhamnolipids are not of toxicological concern. Rhamnolipid biosurfactants products are currently in use as emulsifiers, dispersants, wetting agents, and agricultural adjuvants, and there are no reports of adverse effects from any of these uses.

The acute toxicity studies (Table 2), in conjunction with other data and information obtained from the open literature, demonstrate that no risks to human health are expected from the fungicidal use of rhamnolipid biosurfactant.

a. Acute Toxicology

i. Acute oral toxicity (OPPTS 870.1100; 152-10; MRID 45376702). Male and female rats (5 per sex) were dosed once with 5000 mg/kg of end-use product at 9.5% concentration of rhamnolipid biosurfactant in water. Anogenital staining and diarrhea were noted from all animals 3-5 hours after dosing with recovery by day 1. No deaths occurred during the study. The acute oral LD_{50} was >5000 mg/kg. The study was acceptable and placed the test material in Toxicity Category IV.

ii. Acute dermal toxicity (OPPTS 870.1200; 152.11; MRID 45376703). Male and female rats (5 per sex) were dosed for 24 hours with 5000 mg/kg of end-use product at 9.5% concentration of rhamnolipid biosurfactant in water. No deaths occurred during the study. The acute dermal LD_{50} was >5000 mg/kg. The study was acceptable and placed the test material in Toxicity Category IV.

iii. Primary eye irritation (OPPTS 870.2400; 152-13, MRID 45376705). Male and female rabbits (3 per sex) were dosed with 0.1 mL of 17% w/w rhamnolipid biosurfactant in water in the right eye. Corneal opacity was noted on all treated eyes at 24 hours through day 7 after test material instillation. One rabbit still had corneal opacity on day 21. Iritis was noted on 5/6 rabbits by 24 hours and all rabbits by 48 hours, with resolution by day 17. Positive conjunctival irritation was noted on all rabbits one hour through 72 hours after instillation, with resolution on

all rabbits by day 21. The study was acceptable and placed the test material in Toxicity Category I.

iv. Primary eye irritation (OPPTS 870.2400; 152-13, MRID 45376706). Male and female rabbits (3 per sex) were dosed with 0.1 mL of 9.5% w/w rhamnolipid biosurfactant in water in the right eye. Corneal opacity was noted on all treated eyes 24 hours through day 4 after test material instillation, and remained on two rabbits on day 21. Iritis was noted on all rabbits by 24 hours with resolution by day 7. Positive conjunctival irritation was noted on all rabbits one hour through 72 hours after instillation, with resolution on all rabbits by day 14. The study was acceptable and placed the test material in Toxicity Category I.

v. Primary eye irritation (OPPTS 870.2400; 152-13, MRID 45376707). One male and two female rabbits were dosed with 0.1 mL of 1.0% w/w rhamnolipid biosurfactant in water in the right eye. Neither corneal opacity nor iritis were observed on any rabbit. Positive conjunctival irritation was noted on all rabbits one hour after test material instillation, with resolution on all rabbits by 48 hours. The study was acceptable and placed the test material in Toxicity Category III.

vi. Primary dermal irritation (OPPTS 870.2500; 152-14; MRID 45376708). Male and female rabbits (3 per sex) were dosed with 0.5 mL of 9.5% rhamnolipid biosurfactant in water on clipped skin for four hours. Very slight to well-defined erythema with very slight edema were noted on all rabbits one hour after patch removal and persisted or reduced to very slight erythema through 48 hours, with clearance by 72 hours. The study was acceptable and placed the test material in Toxicity Category IV.

vii. Dermal sensitization (OPPTS 870.2600; 152-15). A waiver was requested and granted by the Agency based on submitted information indicating the active ingredient is not dermally irritating or toxic, along with a lack of reported effects by users of the surfactant in a variety of products including emulsifiers, dispersants, and wetting agents.

viii. Acute inhalation toxicity (OPPTS 870.1300; 152-12, MRID 45376704). Male and female rats (5 per sex) were exposed whole-body to a gravimetric concentration of 2.05 mg/L 9.5% rhamnolipid biosurfactant in water for four hours. Ocular and nasal discharge, irregular respiration, hunched posture, and hypoactivity were noted during exposure, and all but ocular and nasal discharge persisted through one hour post-exposure. All rats were active and healthy 15 hours post-exposure. The LC_{50} was >2.05 mg product/L (0.20 mg a.i./L). The study was acceptable and placed the test material in Toxicity Category IV.

b. Mutagenicity and Developmental Toxicity

The requested waiver was granted by the Agency based on the fact that rhamnolipid biosurfactant is not related to any known mutagens and does not belong to a chemical class of compounds containing known mutagens.

c. Subchronic Toxicity, Immunotoxicity

Requested waivers for 90-day oral toxicity and immunotoxicity were granted by the Agency based on the lack of acute oral, dermal, and inhalation toxicity, widespread use, and the innocuous nature of the potential breakdown products of rhamnolipid biosurfactants, the ubiquity of these compounds in nature, and the very low anticipated exposure from the use of the active ingredient as a biochemical fungicide.

d. Chronic Exposure and Oncogenicity Assessment

Repeated dose studies are conditionally required if the potential for adverse chronic effects are indicated based on 1) the effect levels established in Tier I subchronic oral, inhalation, or dermal studies, 2) the pesticide use pattern, or 3) the frequency and the level of repeated human exposure that is expected. Oncogenicity studies are required only if the active ingredient or any of its metabolites, degradation products, or impurities produce in Tier I studies any morphologic effects in any organ that potentially could lead to neoplastic changes. None of the results of the submitted studies or public literature triggered the need for chronic exposure or oncogenicity testing.

Table 2. Toxicity Data Requirements

GUIDELINE NO.	STUDY	RESULTS	MRID NO.
870.1100	Acute oral toxicity in rats	LD_{50}s >5000 mg/kg for males, females, and combined dosed with a 9.5% rhamnolipid concentration. Toxicity Category IV	453767-02
870.1200	Acute dermal toxicity in rats	LD_{50}s >5000 mg/kg for males, females, and combined, dosed with a 9.5% rhamnolipid concentration. Toxicity Category IV	453767-03
870.1300	Acute inhalation toxicity in rats	LC_{50}s >2.05 mg/L for males, females, and combined. Toxicity Category IV	453767-04

GUIDELINE NO.	STUDY	RESULTS	MRID NO.
870.2400	Primary eye irritation in rabbits	17% rhamnolipid concentration was corrosive. Toxicity Category I	453767-05
870.2400	Primary eye irritation in rabbits	9.5% rhamnolipid concentration was corrosive. Toxicity Category I	453767-06
870.2400	Primary eye irritation in rabbits	1% rhamnolipid concentration was minimally irritating. Toxicity Category III	453767-07
870.2500	Primary dermal irritation in rabbits	9.5% rhamnolipid concentration was slightly irritating. Toxicity Category IV	453767-08

e. Effects on the Endocrine System

EPA is required under 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 scientific basis for including, as part of the program, the androgen- and thyroid hormone systems, in addition to the estrogen hormone system. EPA also adopted EDSTAC's recommendation that the Program include evaluations of potential effects in wildlife. For pesticide chemicals, EPA will use FIFRA and, to the extent that effects in wildlife may help determine whether a substance may have an effect in humans, FFDCA authority to require the wildlife evaluations. As the science develops and resources allow, screening of additional hormone systems may be added to the Endocrine Disruptor Screening Program (EDSP).

Based on the weight of the evidence of available data, no endocrine system-related effects have been identified for rhamnolipid biosurfactant, and none is expected since fatty acids are ubiquitous in plants and animals.

2. Dose Response Assessment

No toxicological endpoints were identified; therefore, a dose response assessment was not required.

3. Dietary Exposure and Risk Characterization

Dietary exposure from the use of rhamnolipid biosurfactant, as proposed, is minimal. The use of rhamnolipid biosurfactant involves low levels of the active ingredient applied to growing plants prior to harvest. Residues of rhamnolipid biosurfactant are not expected to be of toxicological concern. The rhamnolipid molecules are simply glycolipids, composed of a rhamnose sugar ring combined with a fatty acid tail, which are common in the diet.

4. Occupational, Residential, School and Day Care Exposure and Risk Characterization

a. Occupational Exposure and Risk Characterization

The possibility for occupational exposure to Zonix™ Biofungicide is mitigated with the use of personal protective equipment and a restricted reentry interval of 48 hours for treated areas.

b. Residential, School and Day Care Exposure and Risk Characterization

No indoor residential, school, or day care uses currently appear on the proposed label. Human exposure to Zonix™ Biofungicide should not occur in these areas. In the absence of any toxicological endpoints, risk from the consumption of residues of rhamnolipid biosurfactant from its pesticidal use is not expected for populations in residential, school and day care, including infants and children.

5. Drinking Water Exposure and Risk Characterization

Rhamnolipid biosurfactant is an extra-cellular substance that is naturally produced by a microorganism known to exist in plant habitats; however, it is not known to grow or thrive in aquatic environments. In addition, there are no aquatic applications for rhamnolipid biosurfactants. Therefore, potential exposure to rhamnolipid biosurfactant in surface and drinking water would be negligible.

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

FFDCA section 408 provides that EPA shall apply an additional tenfold margin of exposure for infants and children, in the case of threshold effects, to account for pre- and post-natal toxicity

and the completeness of the database, unless EPA determines that a different margin of exposure will be safe for infants and children. Margins of exposure are often referred to as uncertainty or safety factors. Based on all the available information, the Agency has concluded that there is reasonable certainty that no harm to infants and children or adults will result from the use of Zonix™ Biofungicide, and since there are no threshold effects, an additional safety factor is not required.

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

There is reasonable certainty that no harm will result from aggregate exposure to residues of Zonix™ Biofungicide to the U.S. population. The Agency has arrived at this conclusion based on the low level of toxicity and the widespread exposure to rhamnose sugar, fatty acids, and rhamnolipid biosurfactants without any adverse effects on human health. The oral, dermal, and inhalation toxicity studies and the dermal irritation study showed no acute toxicity (Toxicity Category IV), and the risks anticipated from these exposures are considered minimal. The risks from aggregate exposure via oral, dermal and inhalation exposure are a compilation of three low risk exposure scenarios and are negligible. Since there are no threshold effects of concern, the provision requiring an additional margin of safety does not apply. Therefore, EPA has not used a margin of exposure approach to assess the safety of rhamnolipid biosurfactant.

8. Cumulative Effects

When used as an agricultural fungicide, rhamnolipid biosurfactant is applied at a very low use rate, and is not expected to result in residues that are of toxicological concern. The information submitted indicates there is already widespread exposure to rhamnolipid biosurfactants, rhamnose sugar, and fatty acids without any reported adverse effects to human health. Therefore, no cumulative effects are anticipated.

9. Risk Characterization

The Agency has considered human exposure to the fungicide, rhamnolipid biosurfactant, in light of the relevant safety factors in FQPA and FIFRA. A determination has been made that no unreasonable adverse effects to the U.S. population in general, and to infants and children in particular, will result from this use.

C. ENVIRONMENTAL ASSESSMENT

1. Ecological Effects Hazard Assessment

The registrant has requested waivers for avian oral toxicity, avian dietary toxicity, freshwater fish toxicity, nontarget insect toxicity, and honeybee toxicity data requirements. The Agency has granted waivers of these data requirements based on the demonstrated lack of oral and dermal toxicity in mammals, the non-toxic mode of action of the active ingredient, and the low concentration of the active ingredient in the diluted product.

2. Environmental Fate and Ground Water Data

The need for environmental fate and groundwater data (Tier II, (40 CFR Section 158.690(d)(2)(vii through xv)) was not triggered because the acute toxicity studies did not trigger any additional Tier I studies. Risk is minimal due to the lack of exposure, low toxicity, use pattern, application methods, and ready biodegradability of the product.

3. Ecological Exposure and Risk Characterization

The potential for exposure to nontarget wildlife is minimal due to the low application rate of the active ingredient in the diluted product (0.1% in water) and its ready biodegradability. The environmental risk may be characterized as minimal when the product is used according to label directions.

D. EFFICACY DATA

No efficacy data are required to be submitted for review by the Agency, because no public health uses are involved.

IV. Risk Management Decision

A. DETERMINATION OF ELIGIBILITY FOR REGISTRATION

Section 3(c)(5) of FIFRA provides for the registration of new active ingredients 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, rhamnolipid biosurfactant 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 new pesticidal active ingredient will not cause any unreasonable adverse effects and will help to control zoosporic plant pathogenic fungi, satisfying Criterion "C". Criterion "D" is satisfied by the data submitted and the low exposure to the product when used according to the label directions.

Therefore, rhamnolipid biosurfactant is eligible for registration. The uses are listed in Table 3, Appendix A.

B. REGULATORY POSITION

1. Unconditional Registration

Based on data submitted, the Agency recommends that rhamnolipid biosurfactant is eligible for unconditional registration under Section 3(c)(5) of FIFRA. The Agency foresees no adverse effects to human health or the environment from the use of this active ingredient in accordance with the label directions.

2. CODEX Harmonization

There are no CODEX maximum residue levels for rhamnolipid biosurfactant.

3. Nonfood Registrations

There are no non-food issues at this time.

4. Risk Mitigation

There are no significant risk issues relating to dietary risk, residential risk, or ground and surface water contamination and, as such, mitigation measures for them are not required. Although tested concentrations of rhamnolipid biosurfactant were found slightly toxic to aquatic invertebrates and honeybees, the study results do not trigger the imposition of label precautions to mitigate risk to nontarget organisms. Occupational risk will be mitigated by appropriate label precautions concerning ocular exposure.

5. Endangered Species Statement

Currently, the Agency is developing a program (The Endangered Species Protection Program) to identify all pesticides whose use may cause potential adverse impacts on endangered and threatened species and their habitats. To aid in the identification of threatened and endangered species and their habitats, several companies have formed an Endangered Species Task Force (EST) under the direction of the Crop Life America. Moreover, the EST will assist in providing species location information at the subcounty level, and particularly if an endangered species occurs in areas where pesticides would be used. This information will be useful once the Endangered Species Protection Program has been implemented.

The Agency has no evidence to believe that any endangered or threatened species will be adversely affected by products containing rhamnolipid biosurfactant, when used as labeled. In this regard, label language specific for endangered or threatened species is not imposed at this time for such products.

C. LABELING RATIONALE

It is the Agency's position that the labeling of Zonix™ Biofungicide complies with current pesticide labeling requirements.

1. Human Health Hazard

a. Worker Protection Standard

Any product whose labeling reasonably permits use in the production of an agricultural plant on any farm, forest, nursery, or greenhouse must comply with the labeling requirements of Pesticide Registration (PR) Notice 93-7, ‘‘Labeling Revisions Required by the Worker Protection Standard (WPS),” and PR Notice 93-11, “Supplemental Guidance for PR Notice 93-7," which reflect the requirements of EPA's labeling regulations for worker protection statements (40 CFR part 156, subpart K). These labeling revisions are necessary to implement the Worker Protection Standard for Agricultural Pesticides (40 CFR part 170). Unless otherwise specifically directed, all statements required by PR Notices 93-7 and 93-11 are to be on the product label exactly as instructed in those Notices.

The labels and labeling of all products must comply with EPA's current regulations and requirements as specified in 40 CFR 156.10 and other applicable notices, such as, and including the WPS labeling.

Most uses of the end-use product containing rhamnolipid biosurfactant are subject to the requirements of WPS, and as such it has the appropriate language as required by the standard. For uses of this product that are covered by the Worker Protection Standard (WPS), worker entry into treated areas is not allowed during the restricted entry interval of 48 hours. The PPE requirement for early entry to treated areas that is permitted under the WPS and that involves contact with anything that has been treated, such as plants, soil, or water, is coveralls, protective eyewear, waterproof gloves, and shoes plus socks.

b. Non-Worker Protection Standard

There are no non-worker (non-mixer/loader/applicator) human health hazard issues.

c. Precautionary Labeling

The Agency has examined the toxicological data base for Zonix™ Biofungicide end-use product and concluded that the proposed precautionary labeling (i.e. Signal Word, Statement of Practical Treatment and other label statements) adequately mitigates risks associated with the proposed uses. The precautionary labeling for the end-use product containing this active ingredient is:

> "**DANGER. Corrosive. Causes irreversible eye damage. Do not get in eyes or on clothing. Wear goggles or face shield. Wash thoroughly with soap and water after handling. Remove and wash contaminated clothing before reuse."**

d. Spray Drift Advisory

A spray drift advisory statement is contained in the DIRECTIONS FOR USE statement: "Do not apply this product in a way that will contact workers or other persons, either directly or through drift." A spray drift advisory statement is also contained in the sprinkler system chemigation text: "Do not apply when wind speed favors drift beyond the area intended for treatment."

2. Environmental Hazards Labeling

The precautionary labeling for end-use products containing rhamnolipid biosurfactant is:

"Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean highwater mark. Do not contaminate water when cleaning equipment or disposing of equipment washwaters."

3. Application Rate

The end-use dilution for all uses and application methods is between 85 and 125 ppm.

D. LABELING

Product name: **Zonix™ Biofungicide**

Active Ingredient:
Decanoic acid, 3-[[6-deoxy-2-O-(6-deoxy-alpha-L-mannopyranosyl)-alpha-L-mannopyranosyl]oxy]-,1-(carboxymethyl)octyl ester, mixture with 1-(carboxymethyl)octyl 3-[(6-deoxy-alpha-L-mannopyranosyl) oxy]decanoate).....8.5%
Other Ingredients..... .....91.5%

Total 100.00%

Signal word is "DANGER" Label text to mitigate eye injury is appropriate.

The product shall contain the following information:
- Product Name
- Ingredient Statement
- Registration Number
- Signal Word (DANGER)

V. Actions Required by Registrants

There are no data requirements, label changes or other responses necessary for the reregistration of the end-use product since the product is being registered after November 1984 and is, therefore, not subject to reregistration. There are also no existing stocks provisions at this time.

VI. Appendix A

Table 3 lists the use sites for the product. The label for the product is also attached.

Table 3. Product Use Sites

Zonix™ Biofungicide Use Sites: Root, tuber, bulb, cane, fruiting, legume, leafy and cucurbit vegetables; citrus fruits; miscellaneous fruits, nuts and vegetables; herbs; small and large grain row crops; oil, forage and fiber crops; ornamental plants, trees, flowers and shrubs; bedding plants; and turf grass (sod, golf course, landscape).	Official date registered: March 23, 2004