United States
Environmental Protection
Agency

Office of Prevention, Pesticides
and Toxic Substances
(7501C)

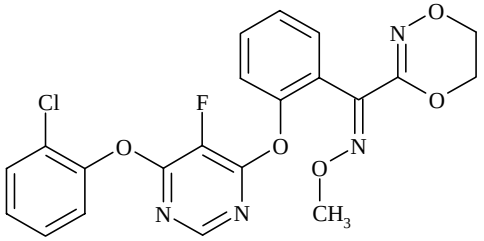
Pesticide Fact Sheet

Name of Chemical: **Fluoxastrobin**
Reason for Issuance: **New Chemical**
Date Issued: **NOVEMBER 2005**

1. DESCRIPTION OF CHEMICAL

Generic Name:	Fluoxastrobin ((2*E*)-(2-[6-(2-chlorophenoxy)-5-fluoro-4-pyrimidinyl]oxy phenyl)-(5,6-dihydro-1,4,2-dioxazin-3-yl)methanone *O*-methyloxime)
Common Name:	Fluoxastrobin
Trade Name:	HEC 480 SC
Chemical Class:	strobilurins, methoxyacrylates
EPA Chemical Code:	028869
Chemical Abstracts Service (CAS) Number:	361377-29-9
Year of Initial Registration:	2005
Pesticide Type:	Fungicide
U.S. Producer:	Bayer CropScience

Chemical Structure:



2. USE PATTERN AND FORMULATIONS

Pests/Application Sites:	Fluoxastrobin is a new strobilurin-type fungicidal active ingredient (a.i.) for the control of fungal diseases such as early blight, late blight, leaf spots, leaf rust, and *Rhizoctonia solani*. Fluoxastrobin has been registered for foliar use on peanuts, tuberous and corm vegetables, leaf petiole vegetables, fruiting vegetables, and turf, as well as seed treatment for potato, peanut and turf. Turf applications are labeled for professional pest control operators only, not for homeowners.
Types of Formulations:	Fluoxastrobin will be marketed in its technical form (94.8% a.i., a white crystalline solid) for use in formulations, and as the formulation HEC 480 SC Fungicide (40.3% a.i., an off- white suspension concentrate).
Types and Methods:	HEC 480 SC Fungicide can be applied by chemigation or by ground or aerial spray, post-emergence. For seed treatment it is applied by slurry or mist type equipment.
Application Rates:	For foliar treatment of agricultural crops, HEC 480 SC fungicide can be applied up to 4 - 6 times per season at rates of 0.12 to 0.18 lb a.i./A , 7- to 14-day application intervals, and a maximum seasonal application rate of 0.72 lb a.i./A (including seed treatment use); PHIs range from 3 to 14 days. For turf, HEC 480 SC fungicide is applied up to 4 times per season at application rates of 0.27 to 0.55 lb a.i./A, a minimum 21-day application interval, and a maximum seasonal application rate of 2.2 lb a.i./A. For seed treatment on peanuts and potato seed pieces, HEC 480 SC is applied using slurry or mist-type equipment at a rate of up to 0.010 lb a.i./CWT.
Carrier:	Water

3. SCIENCE FINDINGS

Fluoxastrobin is a broad-spectrum strobilurin fungicide that has been proposed for use on peanuts, tuberous (potato) and corm vegetables, leaf petiole vegetables, fruiting vegetables, turf, and for seed treatment of potato, peanut and turf. The HEC 480 SC Fungicide label suggests rotating, alternating, or tank-mixing with products having different modes of action and/or limiting the total number of applications per season in an effort to delay the development of resistance in plant pathogen populations.

PHYSICAL AND CHEMICAL PROPERTIES

Technical fluoxastrobin is a white, crystalline solid. It is essentially insoluble in water (solubility of 0.0023 g/L in water at pH 7), but is highly soluble in dichloromethane, polyethylene glycol 400, acetone, ethyl acetate, acetonitrile, and dimethylsulfoxide. Technical fluoxastrobin has a melting point of 103-105° C, and a log P_{ow} of 2.85 at 20° C. It does not dissociate in water at pH 4 to 9 and has a vapor pressure of $5.63x10^{-10}$ Pa at 20° C.

HAZARD CHARACTERIZATION

Acute Toxicity

Fluoxastrobin technical has a low order of acute toxicity based on its classification in Toxicity Category III (LD_{50} > 2000 mg/kg) via the oral and dermal routes, and Toxicity Category IV by the inhalation route of exposure. Fluoxastrobin is a moderate eye irritant (Toxicity Category III), but is neither a dermal irritant nor a sensitizer.

The end use product HEC 480 SC Fungicide is an emulsifiable concentrate. This product has a very low order of acute toxicity based on its classification in Acute Toxicity Category IV for all exposure routes. This product is presently classified as a dermal sensitizer but not due to the active ingredient.

Subchronic and Chronic Toxicity

Fluoxastrobin has a mild or low toxicity following repeated administration in the rat and mouse but higher toxicity in the dog. In both the 90-day and one-year oral feeding dog studies, there was liver toxicity in the form of cholestasis as evidenced by hepatocytomegaly and cytoplasmic granular changes associated with increased liver weight and increased serum liver alkaline phospatase (ALP). The no observed adverse effect level (NOAEL) of 1.5 mg/kg/day in the one year dog study was used for setting the chronic reference Dose (RfD).

In the 90-day oral toxicity study in rats, the urinary system in males was a target organ ~~as~~ evidenced by increased kidney weight and histopathology findings in kidneys, urinary bladder, and urethra including the presence of calculi in the urethra and kidneys. The adrenal glands seem

to be another target organ in males of the 90-day rat study where vacuolation was seen in the zona fasciculate of the adrenal cortex. The adrenal changes are not likely to be endocrine related effects.

In the 90-day oral toxicity in mice, increases in liver and kidney weights were observed.

Developmental and Reproductive Toxicity

In the rat and rabbit developmental toxicity studies and the two-generation reproduction rat study, there was no increased susceptibility to prenatal or postnatal exposure to fluoxastrobin and no effects on reproduction.

Neurotoxicity

Fluoxastrobin is not acutely neurotoxic in rats up to a single high dose of 2000 mg/kg/day or by repeated dietary feeding in the rat subchronic neurotoxicity screening study where the top dose was nearly half the limit dose of 1000 mg/kg/day. There were no treatment-related neurotoxicity findings in dogs.

Immune System Toxicity

Fluoxastrobin is not immunotoxic based on repeated dosing studies in rats and mice.

Carcinogenicity

The carcinogenic potential of fluoxastrobin was adequately tested in rats and mice of both sexes. There was no evidence of carcinogenicity in rats or mice.

Mutagenicity

Fluoxastrobin and its major metabolites gave negative results in a battery of genotoxicity tests.

DOSE RESPONSE ASSESSMENT AND FOOD QUALITY PROTECTION ACT (FQPA) CONSIDERATION

Dose Response Assessment

Based on submitted data, the Agency determination of the acute and chronic Reference Doses (RfDs), toxicological endpoint selections, and appropriate margins of exposure (MOEs) for use as appropriate in occupational/residential exposure risk assessments, is summarized below:

Acute Dietary Reference Dose (aRfD): No acute toxicity endpoint was identified for either females age 13-49 years or the general population. There was no endpoint noted in the database from a single dose exposure that could be used for risk assessment. This included the acute neurotoxicity (tested to the limit dose) and developmental studies as well as the other short- and long-term studies.

Chronic Dietary Reference Dose (cRfD): Fluoxastrobin has a mild or low toxicity following repeated administration in all tested species other than the dog. The dog appears to be the most sensitive species. For all populations, the dose and endpoint for establishing a cRfD is a LOAEL of 7.7 mg/kg/day (NOAEL for females) from the one year toxicity study in dogs. The NOAEL is 1.5 mg/kg/day (NOAEL for females) based on body weight reductions and liver toxicity (cholestasis) in both sexes. An uncertainty factor (UF) of 100 was selected (10x inter-species extrapolation, 10x intra-species variability) and the cRfD is 0.015mg/kg/day.

Incidental Oral Short-Term (1-30 Days) Exposure: The dose and endpoint chosen is the NOAEL of 3.0 mg/kg/day from the 90-day oral toxicity study in the dog. The UF is 100.

Incidental Oral Intermediate-Term (1-6 Months) Exposure: The dose and endpoint chosen is the NOAEL of 3.0 mg/kg/day based on 90 day-oral toxicity studies in the dog. The UF is 100.

Dermal Absorption Factor: A dermal absorption factor of 2.3% was chosen by the Agency based on a study which was conducted using five male rhesus monkeys.

Dermal Short-Term (1-30 Days) Exposure: There was no systemic or localized hazard noted in a 28-day dermal toxicity study in the rat and there are no developmental or reproductive toxicity concerns, therefore this risk assessment is not necessary.

Dermal Intermediate-Term (1-6 Months) Exposure: The dose and endpoint chosen is the NOAEL of 3.0 mg/kg/day based on 90-day oral toxicity tests in the dog..

Dermal Long-Term (>6 Months) Exposure: The dose and endpoint chosen is the NOAEL of 1.5 mg/kg/day based on a chronic oral toxicity study in the dog.

Inhalation Short- (1-30 Days) & Intermediate-Term (1-6 Months) Exposure: The dose and endpoint chosen is the NOAEL of 3.0 mg/kg/day based on 90-day oral toxicity studies in the dog.

Inhalation Long-Term (>6 Months) Exposure: The dose and endpoint chosen is the NOAEL of 1.5 mg/kg/day based on a chronic oral toxicity study in the dog.

Margins of Exposure: Table 1 presents a summary of target Margins of Exposure (MOEs) for risk assessment. MOE's less than 100 are considered to be of concern.

Table 1 Summary of the Margins of Exposure That Are Used in Risk Assessment			
Route / Duration	**Short-Term (1-30 Days)**	**Intermediate-Term (1 - 6 Months)**	**Long-Term (> 6 Months)**
Occupational (Worker) Exposure			
Dermal	N/A	100	100
Inhalation	100	100	100
Residential (Non-Dietary) Exposure			
Oral	100	100	N/A
Dermal	N/A	100	100
Inhalation	100	100	100

The MOEs for occupational and residential exposures are based on the conventional uncertainty factor of 100X (10X for intraspecies variation and 10X for interspecies extrapolation.)

FQPA Decisions

Special FQPA Safety Factor

The toxicology database for fluoxastrobin is adequate to support the reduction of the special FQPA SF to 1X because there are no/low concerns and no residual uncertainties with regard to pre- and/or postnatal toxicity.

Endocrine disruption

In the available toxicity studies on fluoxastrobin, there was no estrogen, androgen, and/or thyroid mediated toxicity. The findings of increased incidences of uterine adenocarcinoma and thyroid follicular cell adenoma in the rat chronic toxicity/carcinogenicity study were determined to be unrelated to treatment. These observations, which were found within random occurrence in this strain of rats, are not treatment-related and, henceforth, are not indicative of possible endocrine disruption. When additional appropriate screening and/or testing protocols being considered under the Agency's EDSP have been developed, fluoxastrobin may be subjected to further screening and/or testing to better characterize effects related to endocrine disruption.

4. HUMAN HEALTH EXPOSURE AND RISK ASSESSMENT

Residue Profile

Following multiple foliar applications, detectable combined residues of fluoxastrobin and its Z-isomer are likely to be present in/on tomato, pepper, and trimmed celery at up to 0.6 ppm. Residues on peanut hay are likely to be much higher (up to 17 ppm), but non-detectable (<0.01 ppm) in peanut nutmeats and tuberous and corm vegetables. The residue of concern in/on primary and rotated plant commodities for tolerance setting and risk assessment purposes are fluoxastrobin and its Z-isomer. The residues of concern for livestock for tolerance setting and risk assessment purposes are fluoxastrobin, its Z-isomer, and the phenoxy-hydroxypyrimidine metabolite. Based upon the results of the poultry metabolism study, EPA concludes that the proposed uses do not require tolerances for poultry commodities because there is no reasonable expectation of finite residues in poultry commodities.

Dietary Exposure and Risk

The dietary exposure and risk estimates for fluoxastrobin are summarized in Table 2.

Table 2 Chronic Dietary Exposure and Risk Estimates for Fluoxastrobin.

Population Subgroup	cPAD, mg/kg/day	DEEM-FCID		Lifeline	
		Exposure, mg/kg/day	% cPAD	Exposure, mg/kg/day	% cPAD
U.S. Population	0.015	0.0015	10%	0.0014	9.5%
All infants (< 1 yr)	0.015	0.00091	6.0%	0.00085	5.6%
Children 1-2 yrs	0.015	0.0037	25%	0.0033	22%
Children 3-5 yrs	0.015	0.0031	20%	0.0027	18%
Children 6-12 yrs	0.015	0.0021	14%	0.0018	12%
Youth 13-19 yrs	0.015	0.0014	9.2%	0.0013	8.4%
Adults 20-49 yrs	0.015	0.0013	8.7%	0.0013	8.6%
Adults 50+ yrs	0.015	0.0013	8.7%	0.0013	8.5%
Females 13-49 yrs	0.015	0.0012	8.3%	0.0014	9.6%

* cPAD = chronic PAD, is reported to 2 significant figures, and % cPAD = (Exposure ÷ cPAD) x 100%.
**The values for the population with the highest risk for each type of risk assessment are bolded.

A drinking water assessment for fluoxastrobin was conducted for fluoxastrobin used according to proposed labeling for HEC 480 SC Fungicide. The results from the use of these models are summarized in Table 3.

Table 3 Summary of Estimated Surface Water and Groundwater Concentrations of Fluoxastrobin		
Exposure Duration	**Fluoxastrobin and its Z-isomer**	
	Surface Water Conc., ppb [a]	**Ground Water Conc., ppb [b]**
Acute (peak)	28	<1
Chronic (average of yearly means)	14	

[a] From the Tier 2 PRZM-EXAMS - Index Reservoir model. Input parameters are based on the turf use (4 ground applications of 0.55 lbs ai/A per application with a 21-day interval), which generates the highest EDWCs
[b] From the Tier 1 SCIGROW model, also based on turf use (4 ground applications of 0.55 lbs ai/A per application with a 21-day interval)

Residential Exposure Estimates

Proposed use of fluoxastrobin on turf may result in individuals of varying ages potentially being exposed from activities in areas that have been treated. Potential routes of exposure include dermal (adults and children) and incidental oral ingestion (toddlers only). While it is assumed that most residential use will result in short-term (1 to 30 days) postapplication exposures, it is also believed that intermediate-term exposures (> 30 days to 180 days) are possible, albeit unlikely. Recreational exposures to turf are expected to be similar to, or in many cases less than those evaluated for Home Uses, so they were not evaluated separately. The resulting risks for children, which are lower than those for adults, are presented in Table 4.

Table 4 Children's Residential Combined Risk from Turf Treated with Fluoxastrobin					
Scenario	Duration	Route	Daily Dose (mg/kg/day)	MOE	Total MOE[1]
High Contact Activities (HCA)	Intermediate-Term	Dermal	0.00246	1200	235
Hand-to-Mouth (HTM)	Short-Term	Oral	0.00821	365	
Object-to-Mouth (OTM)	Short-/Intermediate-Term	Oral	0.00205	1500	
Soil Ingestion (SI)	Short-/Intermediate-Term	Oral	0.000028	110000	

[1] Total MOE = $1 / (1/MOE_{HCA} + 1/MOE_{HTM} + 1/MOE_{OTM} + 1/MOE_{SI})$

The total MOE for children's combined risk from activities on treated turf is larger than 100, and therefore does not exceed EPA's level of concern.

Other (Spray Drift, etc.)

Fluoxastrobin can be directly applied to residential turf by non-resident professional applicators, and does not result in exposures of concern. Based on this assessment, EPA believes that it is unlikely there is a higher potential for risk of exposure to spray drift from residential uses versus agricultural uses of this chemical.

Aggregate Risk

As per FQPA, 1996, when there are potential residential exposures to the pesticide, aggregate risk assessment must consider exposures from three major sources: oral, dermal and inhalation exposures. The toxicity endpoints selected for these routes of exposure may be aggregated as follows:

For short-term aggregate exposure assessment, incidental oral and inhalation cannot be combined due to differences in the endpoint, i.e. neurotoxicity for incidental oral and decreases in body weight for inhalation. No quantification of dermal risk is required.

For intermediate-term aggregate exposure, oral and dermal and inhalation endpoints can be aggregated because of the use of a common endpoint (decreased body weight gain).

For long-term aggregate exposure, incidental oral and dermal and inhalation endpoints can be aggregated because of the use of oral equivalents and a common endpoint (decreased thymus weight).

Short and Intermediate-Term Aggregate Risk

There is potential short- and intermediate-term exposure to fluoxastrobin via the dietary (which is considered background exposure) and residential (which is considered primary) pathways. For adults, these pathways lead to exposure via the oral (background) and dermal (primary) routes. For children these pathways lead to exposure via the oral (background), and incidental oral and dermal (primary) routes.

Chronic Aggregate Risk Assessment (Food and Drinking Water)

There is potential chronic exposure to fluoxastrobin via food and drinking water, *i.e.*, the dietary route. DWLOCs were calculated to determine if aggregate chronic risks are of concern. The chronic DWLOCs are much greater than the EDWCs; thus, chronic aggregate risks do not trigger the Agency's concern.

Cumulative Risk Characterization/Assessment

EPA has not made a common mechanism of toxicity finding as to fluoxastrobin and any other substances, and fluoxastrobin does not appear to produce a toxic metabolite produced by other substances. For the purposes of this tolerance action, therefore, EPA has not assumed that fluoxastrobin has a common mechanism of toxicity with other substances.

Occupational Exposure/Risk Pathway

There is potential for occupational handler exposure from the application of fluoxastrobin on both food and non-food use sites resulting from handling fluoxastrobin products (*i.e.*,

mixer/loaders and applicators); and there is potential for occupational postapplication exposure resulting from entering areas previously treated with fluoxastrobin.

Occupational handlers may be exposed by the dermal route and by the inhalation route during mixing, loading and application of fluoxastrobin for both short- and intermediate-term durations.

Only one occupational handler scenario related to seed treatment triggered the agency's concern. Although the combined MOE (accounting for both dermal and inhalation exposures) was below 100, the risk estimate is probably not a real risk concern, for the following reasons: First, the inhalation component of the risk estimate is driving the low MOE, but this component was calculated using surrogate data from a dust formulation, and fluoxastrobin is a liquid formulation, which is less prone to be available in the air (if the fluoxastrobin liquid formulation is aerosolized, then inhalation exposure could be a concern). Additionally, at the chemical level, fluoxastrobin is not volatile. Also, the dermal component of the combined MOE is also a conservative screening level estimate, because it is an intermediate-term estimate, while actual exposures are short- and intermediate term in duration (a short term dermal endpoint was not identified).

Short-/Intermediate-Term Postapplication Risk

Fluoxastrobin has been proposed for both food (*i.e.*, agricultural) and non-food (*i.e.*, residential and commercial) use sites. Agricultural postapplication exposures may occur from a variety of activities following treatment of peanut, leafy vegetable, fruiting vegetable and potato and tuber vegetable crops. Use sites with potential residential exposures include golf course turf, turf farms, recreational turf, and residential lawns.

The MOEs for all occupational/agricultural postapplication activities exceed 100 on the day of treatment (*i.e.*, day 0) for all reentry tasks for all proposed use sites, and therefore, do not exceed the Agency's level of concern.

The reentry interval (REI) of 12 hours appearing on the proposed fluoxastrobin end use label is acceptable.

Non-occupational Off-Target Exposure

Based on this assessment and required label restrictions, the Agency believes it is unlikely that there is higher potential for risk of exposure to spray drift from residential uses of this chemical than have been assessed for direct agricultural applications.

5. ENVIRONMENTAL EXPOSURE AND RISK

The slow biodegradation, compounded with low mobility in soils, low water solubility, and a relatively low octanol/water partition coefficient suggest that fluoxastrobin may have limited potential for runoff and low bioaccumulation. The low vapor pressure and low Henry's Law Constant suggest that this compound is not expected to volatilize from water or soils in natural environments. Fluoxastrobin's soil degradates, HEC 5725-E-des-chlorophenyl (HEC 7155) and HEC5725-carboxylic acid (HEC 7180) have higher mobilities than does fluoxastrobin.

Environmental Fate Characteristics

Biodegradation under aerobic conditions could take several months to several years, depending on the soil texture (half life of 29.4 days in sandy loam to 393 days in loamy sand; average half-life of 141 days).

Fluoxastrobin is expected to have low to medium mobility, as it absorbs strongly to all tested soils. Fluoxastrobin could persist for several months in non-sand soils to several years in sandy type soils. Under field conditions of intended use areas in the US, fluoxastrobin was shown to persist for over a year but did not seem to leach underground.

Fluoxastrobin (*E* + *Z* isomers, 98:2 isomer ratio) is stable toward abiotic hydrolysis in sterile buffered solutions at pH 4, 7, and 9 at 50° C. In contrast, direct aqueous photodegradation under laboratory conditions is rapid, with an average half life of 4.1 days (24 hour irradiation) and formation of HEC5725-oxazepine. This laboratory half-life corresponds to a predicted environmental half life of 20.1 summer sunlight in Phoenix, Arizona (33° N) and 28.3 days in Edmondton, Alberta, Canada (53°N). However, aqueous photolysis with the formation of HEC5725-oxazepine was not observed under field conditions since photodegradation in turbid and/or deeper waters may be limited by the attenuation of sunlight due to unfavorable conditions. Photodegradation on soils is much slower at a predicted environmental rate of 146 days.

Ecological Effects and Risk

Terrestrial Animals

Toxicity

Based on submitted acute and reproduction data using bobwhite quail, rats, honeybees, and earthworms, fluoxastrobin is classified as practically non-toxic to terrestrial animals.

Exposure

The calculated mean residue EECs ranged up to 170 ppm for short turf grass.

Birds and mammals in the field may be exposed to seed treated with pesticides by ingesting material directly with the diet. They also may be exposed by other routes, such as

incidental ingestion of contaminated soil, dermal contact with treated seed surfaces and soil during activities in the treated areas, preening activities, and ingestion of drinking water contaminated with pesticide.

Risk

Birds

Fluoxastrobin is classified as practically non-toxic to birds on an acute exposure basis. All calculated avian acute and chronic RQs using bobwhite quail were less than LOCs, with acute values ranging from <0.002 to <0.06 and chronic values ranging from 0.02 to 0.68 respectively.

Mammals

All calculated mammalian acute RQs were less than LOCs with the exception of small mammal (15-g) consumption of predicted maximum residue levels of fluoxastrobin on short grass following the maximum application rate for turf (i.e., 4 times per year). The RQ value for a 15-g mammal, based on consumption of short grass at the maximum residue level (314 mg/kg diet) following the maximum application rate for turf, is <0.15. A definitive LD_{50} was not established for laboratory rats because the available acute toxicity data show no mortality at the highest doses tested. The RQ value of <0.15 is based on an acute mammalian LD_{50} value of >2000 mg/kg.

Although the acute endangered LOC is exceeded for the 15-g mammal (based on maximum short grass residue and maximum application rates for turf), there is uncertainty associated with the RQ value because it based on the highest dose tested where no mortality was observed. In addition, RQ values for the 15-g mammal do not exceed the acute endangered species LOC of 0.1, based on consumption of mean residue levels of short grass (RQ <0.08) or reduction in the application rate of turf from 4 to 2 times per year (RQ < 0.10). Furthermore, use of the >5000 mg/kg LD_{50} value for the TEP (40.5% fluoxastrobin) results in RQ values well below acute LOCs. Therefore, acute mammalian risks associated with exposure to fluoxastrobin on short grass are unlikely.

All calculated mammalian chronic RQs were less than LOCs, with chronic values ranging from 0.01 to 0.31. Mammalian RQ values based on exposure to treated seeds were also well below levels of concern.

Non-Target Insects

An appropriate label statement is required to protect foraging honeybees if the LD_{50} is < 11 µg/bee. Based on the acute contact toxicity study to honeybees, the LD_{50} for fluoxastrobin is >200 µg/bee. Therefore, the label statement is not required. Fluoxastrobin is classified as practically non-toxic to honeybees.

Earthworms

Earthworm exposures to fluoxastrobin and its degradates in soil are not expected to be an exposure route of concern because acute and subchronic LC_{50} toxicity values for both the parent and fluoxastrobin degradates are relatively high at >1000 mg/kg, and no significant mortality and/or sublethal effects were observed in any of the treatment groups.

Terrestrial Plants

Toxicity

Fluoxastrobin is not likely to cause adverse effects to non-target terrestrial plants, based on data from emergence and vegetative vigor tests on 10 different species of plants, after application of the formulated product at a single concentration of 0.54 lbs ai/A. This concentration is equal to the maximum application rate for fluoxastrobin. In both the seedling emergence and vegetative vigor tests, no monocot or dicot species were significantly affected by the treatment, and no reductions exceeded 25%. The respective NOAEC and EC_{25} values were 0.54 and >0.54 lbs ai/A for all test species.

Exposure

At the maximum label application rate for fluoxastrobin, no non-target monocot or dicot species were significantly affected by the treatment, and no growth reductions exceeded 25%. If use directions for approved uses are followed, non-target exposures are expected to be minimal.

Risk

All acute non-endangered and endangered RQs for non-target terrestrial and semi-aquatic plants are less than LOCs, with acute non-endangered values ranging from <0.04 to <0.45 and acute endangered species values ranging from 0.04 to 0.45, respectively.

Aquatic Animals

Toxicity

On an acute basis, Fluoxastrobin is moderately toxic to estuarine/marine fish; highly toxic to freshwater fish and invertebrates; and very highly toxic to estuarine/marine invertebrates. Chronic LOCs are also exceeded for estuarine/marine invertebrates and mollusks. Chronic effects for estuarine/marine invertebrates include reduced survival and reductions in wet weight of surviving adults following a 28-day exposure duration. No data were available to assess the chronic toxicity of fluoxastrobin to estuarine/marine mollusks. Therefore, the NOAEC value was estimated based on the acute-to-chronic ratio for mysid shrimp.

Exposure

Surface water concentrations ranging from 4.3 to 32.9 ppb resulting from fluoxastrobin application to selected crops were predicted with the Tier II models PRZM-EXAMS. Peak EECs were then compared to acute toxicity endpoints to derive acute RQs. The 60-day EECs were compared to chronic toxicity endpoints (NOAEC values) to derive chronic RQs for freshwater and estuarine/marine fish, and 21-day EECs were compared to chronic toxicity endpoints for freshwater and estuarine/marine invertebrates.

Risk

The ecological risks to fish and invertebrates are considered conservative estimates because they are based on worst case exposure and use scenarios. Nonetheless, because of the potential for exposure and possible adverse effects of fluoxastrobin to endangered and non-endangered fish and invertebrates, the registrant is required to provide information on the proximity of Federally listed freshwater fish and invertebrates to the fluoxastrobin use sites. This requirement may be satisfied in one of three ways: 1) having membership in the FIFRA Endangered Species Task Force (Pesticide Registration [PR] Notice 2000-2); 2) citing FIFRA Endangered Species Task Force data; or 3) independently producing these data, provided the information is of sufficient quality to meet FIFRA requirements. The information will be used by the OPP Endangered Species Protection Program to develop recommendations to avoid and mitigate adverse effects to listed species.

Risk quotients (RQs) were calculated from the ratio of estimated environmental concentrations (EECs) to ecotoxicity values. Peak EECs were compared to acute ecotoxicity endpoints to derive acute RQs for aquatic animals. Chronic RQs were derived by comparing 60-day EECs to NOAEC values (chronic toxicity endpoints) for freshwater organisms and 21-day EECs to NOAEC values for estuarine/marine organisms. The RQs are then compared to the Agency's levels of concern (LOCs) to indicate when a pesticide's use as directed on the label has the potential to cause adverse effects on non-target organisms. These LOCs are part of the Agency's interpretive policy and are used to analyze potential risk to non-target organisms and the need to consider regulatory action.

Acute and chronic RQs for freshwater organisms are summarized in Table 15. Estimates of benthic sediment exposure to pesticides can be provided by PRZM/EXAMS but this assessment was not performed for fluoxastrobin because toxicity data related to sediment exposure are not available. Therefore, acute (10-day) and chronic (28-day) sediment toxicity testing, as described in the OPPTS 850.1735 and 850.1740 protocols, are required in order to reduce uncertainties and evaluate risks to freshwater and estuarine/marine sediment-dwelling organisms.

Table 5	**Acute and Chronic Risk Quotients for Freshwater Fish and Invertebrates Exposed to Fluoxastrobin.**				
Crop Application Rate (State - application type) [# of apps.]	**EECs**	**Acute Risk Quotients**		**Chronic Risk Quotients**	
	Peak / 21-day Average/ 60-day Average (µg/L)	**Freshwater Fish [a] LC_{50} = 435 µg/L**	**Freshwater Invertebrate[b] LC_{50} = 120 µg/L**	**Freshwater Fish [a] NOAEC = 55.7 µg/L**	**Freshwater Invertebrate[c] NOAEC = 180 µg/L**
Potatoes (ID - aerial) 0.12 [6]	8.8 8.6 8.4	0.02 – --	0.07[f] – --	-- -- 0.15	– 0.05 --
Potatoes (ID - ground) 0.12 [6]	4.3 4.1 3.9	0.01 – --	0.04 – --	-- -- 0.07	– 0.02 --
Potatoes (ME - aerial) 0.12 [6]	32.9 31.9 30.8	0.08[f] – --	0.27[e] – --	-- -- 0.55	– 0.18 --
Potatoes (ME - ground) 0.12 [6]	28.7 27.8 26.7	0.07[f] – --	0.24[e] – --	-- -- 0.48	– 0.02 --
Tomatoes (CA) 0.18 [4]	8.4 8.0 7.6	0.02 – --	0.07[f] – --	– -- 0.14	– 0.04 --
Tomatoes (FL) 0.18 [4]	21.0 20.0 18.3	0.05[f] – --	0.18[e] – --	– -- 0.33	– 0.11 --
Peppers 0.18 [4]	25.2 23.6 18.5	0.06[f] – --	0.21[e] – --	– -- 0.33	– 0.13 --
Peppers 0.18 [4] no drift	24.6 22.9 17.9	0.06[f] – --	0.21[e] – --	– -- 0.32	– 0.13 --
Cabbage 0.18 [4]	12.8 12.3 11.1	0.03 – --	0.11[e] – --	– -- 0.20	– 0.07 --
Peanuts 0.18 [4]	19.7 19.2 18.5	0.05[f] – --	0.16[e] – --	– -- 0.33	– 0.11 --

Crop Application Rate (State - application type) [# of apps.]	EECs	Acute Risk Quotients		Chronic Risk Quotients	
	Peak / 21-day Average/ 60-day Average (µg/L)	Freshwater Fish [a] LC_{50} = 435 µg/L	Freshwater Invertebrate[b] LC_{50} = 120 µg/L	Freshwater Fish [a] NOAEC = 55.7 µg/L	Freshwater Invertebrate[c] NOAEC = 180 µg/L
Turf (FL) 0.55 [4]	20.9 19.6 18.5	0.05[f] – --	0.17[e] – --	-- -- 0.33	-- 0.11 --
Turf (FL) 0.55 [2]	9.4 8.9 8.4	0.02 – --	0.08[f] – --	-- -- 0.15	-- 0.05 --
Turf (PA) 0.55 [4]	21.5 20.7 19.8	0.05[f] – --	0.18[e] – --	-- -- 0.36	-- 0.12 --
Turf (PA) 0.55 [2]	10.4 10.0 9.6	0.02 – --	0.09[f] – --	-- -- 0.17	-- 0.06 --

[a] Rainbow trout (*Oncorhynchus mykiss*)
[b] Amphipod (*Gammarus pulex*)
[c] Water flea (*Daphnia magna*)
[d] exceeds acute high risk (RQ ≥ 0.5), restricted use (RQ ≥ 0.1)1 and endangered species level of concern (RQ ≥0.05)
[e] exceeds acute restricted use (RQ ≥ 0.1) and endangered species level of concern (RQ ≥0.05)
[f] exceeds acute endangered species level of concern (RQ ≥0.05)
[g] exceeds chronic level of concern (RQ ≥1.0)

For the current application rates modeled on major crops where fluoxastrobin is applied, acute endangered species LOCs are exceeded for freshwater fish (in Maine potatoes, Florida tomatoes, peppers, peanuts, and turf at the maximum application rate of 4x/year) and freshwater invertebrates (in all crops with the exception of ground application of potatoes in Idaho). Acute RQ values range from 0.01 to 0.08 for freshwater fish, and from 0.04 to 0.27 for freshwater invertebrates. Chronic RQs for freshwater fish (0.07 to 0.55) and invertebrates (0.02 to 0.18) are less than chronic LOCs.

The acute and chronic RQs for estuarine and marine animals are summarized in Table 16.

Table 6 Acute and Chronic Risk Quotients for Estuarine/Marine Fish and Invertebrates Exposed to Fluoxastrobin.

Crop Application Rate (State - application type) [# of apps]	EECs	Acute Risk Quotients		Chronic Risk Quotients	
	Peak / 21-day Average/ 60-day Average (µg/L)	Estuarine/ Marine Fish [a] LC_{50} = >1374 µg/L	Estuarine/ Marine Invertebrate[b] LC_{50} = 51.6 µg/L	Estuarine/ Marine Fish [c] NOAEC = 176 µg/L	Estuarine/ Marine Invertebrate[b] NOAEC = 0.61 µg/L
Potatoes (ID - aerial) 0.12 [6]	8.8 8.6 8.4	<0.01 – --	0.17[e] – --	-- -- 0.05	– 14[g] --
Potatoes (ID - ground) 0.12 [6]	4.3 4.1 3.9	<0.003 – --	0.08[f] – --	-- -- 0.02	– 6.7[g] --
Potatoes (ME - aerial) 0.12 [6]	32.9 31.9 30.8	<0.02 – --	0.64[d] – --	-- -- 0.18	– 52[g] --
Potatoes (ME - ground) 0.12 [6]	28.7 27.8 26.7	<0.02 – --	0.56[d] – --	-- -- 0.15	– 46[g] --
Tomatoes (CA) 0.18 [4]	8.4 8.0 7.6	<0.01 – --	0.16[e] – --	– -- 0.04	– 13[g] --
Tomatoes (FL) 0.18 [4]	21.0 20.0 18.3	<0.02 – --	0.41[e] – --	– -- 0.10	– 33[g] --
Peppers 0.18 [4]	25.2 23.6 18.5	<0.02 – --	0.49[e] – --	– -- 0.11	– 39[g] --
Peppers 0.18 [4] no drift	24.6 22.9 17.9	<0.02 – --	0.48[e] – --	– -- 0.10	– 38[g] --
Cabbage 0.18 [4]	12.8 12.3 11.1	<0.01 – --	0.25[e] – --	– -- 0.06	– 20[g] --
Peanuts 0.18 [4]	19.7 19.2 18.5	<0.01 – --	0.38[e] – --	– -- 0.11	– 31[g] --

Crop Application Rate (State - application type) [# of apps]	EECs	Acute Risk Quotients		Chronic Risk Quotients	
	Peak / 21-day Average/ 60-day Average (µg/L)	Estuarine/ Marine Fish [a] LC_{50} = >1374 µg/L	Estuarine/ Marine Invertebrate[b] LC_{50} = 51.6 µg/L	Estuarine/ Marine Fish [c] NOAEC = 176 µg/L	Estuarine/ Marine Invertebrate[b] NOAEC = 0.61 µg/L
Turf (FL) 0.55 [4]	20.9 19.6 18.5	<0.02 – --	0.41[e] – --	-- -- 0.11	-- 32[g] --
Turf (FL) 0.55 [2]	9.4 8.9 8.4	<0.01 – --	0.18[e] – --	-- -- 0.05	-- 15[g] --
Turf (PA) 0.55 [4]	21.5 20.7 19.8	<0.02 – --	0.42[e] – --	-- -- 0.11	-- 34[g] --
Turf (PA) 0.55 [2]	10.4 10.0 9.6	<0.01 – --	0.20[e] – --	-- -- 0.05	-- 16[g] --

[a] Sheepshead minnow (Cyprinodon variegatus)
[b] Mysid shrimp (*Mysidopsis bahia*)
[c] Estimated on the assumption that acute to chronic ratio for estuarine/marine fish is the same as freshwater fish
[d] exceeds acute high risk (RQ ≥ 0.5), restricted use (RQ ≥ 0.1) and endangered species level of concern (RQ ≥0.05)
[e] exceeds acute restricted use (RQ ≥ 0.1) and endangered species level of concern (RQ ≥0.05)
[f] exceeds acute endangered species level of concern (RQ ≥0.05)
[g] exceeds chronic level of concern (RQ ≥1.0)

Acute LOCs for estuarine/marine fish are not exceeded; peak EECs for all major crops are well below the NOAEC value (RQ range: <0.003 to <0.02). No estuarine/marine chronic fish data were submitted, so a NOAEC value was estimated based on the assumption that the acute-to-chronic NOAEC ratio for estuarine/marine fish is the same as for freshwater fish. Based on the estimated NOAEC value, chronic RQ values for estuarine/marine fish, ranging from 0.02 to 0.18, are less than the chronic LOCs. Acute and chronic LOCs for estuarine/marine invertebrates are exceeded for all major crops modeled (acute RQ range: 0.08 to 0.64; chronic RQ range: 6.7 to 52). Estuarine/marine invertebrates appear to be much more sensitive to fluoxastrobin, with acute and chronic RQs approximately two and 290 times higher than their freshwater counterparts.

Aquatic Plants

Toxicity

Based on data using duckweed, and freshwater green algae, fluoxastrobin and its degradates are classified as practically non-toxic to non-target aquatic plants.

All acute non-endangered and endangered species RQs are less than LOCs for both vascular and non-vascular plants. The range of RQ values for both vascular and non-vascular aquatic plants is 0.004 to 0.43.

Exposure

The exposure data that were used for aquatic animals were also used for aquatic plants.

Risk

Aquatic plant risk to non-vascular plants was evaluated based on marine diatom (*S. capricornatum*) toxicity studies using fluoxastrobin and its degradates HEC 7155 and HEC 7180. Vascular plant risk was based on duckweed (*L. gibba*) toxicity studies performed using fluoxastrobin technical only. For aquatic vascular and non-vascular plants, peak EECs were compared to acute EC_{50} and NOAEC toxicity endpoints to derive acute non-endangered and endangered species RQs, respectively.

The acute non-endangered and endangered species RQs that were calculated for aquatic vascular and non-vascular plants are summarized in Table 18.

Table 7 Acute Non-Endangered and Endangered Species Risk Quotients for Aquatic Vascular and Non-Vascular Plants Exposed to Fluoxastrobin

Crop Application Rate (# of apps)	EECs	Acute Non-Endangered Risk Quotients		Acute Endangered Species Risk Quotients	
	Peak (µg/L)	Vascular plant [a] EC_{50} = 1200 µg/L	Non-vascular Plant[b] EC_{50} = 260 µg/L	Vascular plant [a] NOAEC = 160 µg/L	Non-vascular Plant[b] NOAEC = 76 µg/L
Potatoes (ID - aerial) 0.12 (6)	8.8	0.01	0.03	0.06	0.12
Potatoes (ID - ground) 0.12 (6)	4.3	0.004	0.13	0.03	0.06
Potatoes (ME - aerial) 0.12 (6)	32.9	0.03	0.03	0.21	0.43
Potatoes (ME - ground) 0.12 (6)	28.7	0.02	0.11	0.18	0.38
Tomatoes (CA) 0.18 (4)	8.4	0.01	0.03	0.05	0.11

Crop Application Rate (# of apps)	EECs	Acute Non-Endangered Risk Quotients		Acute Endangered Species Risk Quotients	
	Peak (µg/L)	Vascular plant [a] EC_{50} = 1200 µg/L	Non-vascular Plant[b] EC_{50} = 260 µg/L	Vascular plant [a] NOAEC = 160 µg/L	Non-vascular Plant[b] NOAEC = 76 µg/L
Tomatoes (FL) 0.18 (4)	21	0.02	0.08	0.13	0.28
Peppers 0.18 (4)	25.2	0.02	0.1	0.16	0.33
Peppers 0.18 (4) no drift	24.6	0.02	0.09	0.15	0.32
Cabbage 0.18 (4)	12.8	0.01	0.05	0.08	0.17
Peanuts 0.18 (4)	19.7	0.02	0.08	0.12	0.26
Turf (FL) 0.55 (4)	20.9	0.02	0.08	0.13	0.28
Turf (FL) 0.55 (2)	9.4	0.01	0.04	0.06	0.12
Turf (PA) 0.55 (4)	21.5	0.02	0.08	0.13	0.28
Turf (PA) 0.55 (2)	10.4	0.01	0.04	0.07	0.14

[a] Duckweed (*Lemna gibba*)
[b] Green algae (*Selenastrum capricornutum*)
[c] exceeds acute high risk (RQ ≥ 1.0) and endangered species level of concern (RQ ≥1.0)

All of the fluoxastrobin acute non-endangered or endangered species RQs are less than the LOCs for vascular and non-vascular aquatic plants, so no level of concern is reached. The range of RQ values for both vascular and non-vascular aquatic plants is 0.004 to 0.43. Aquatic EECs for all major crops were well below available toxicity endpoint values for the fluoxastrobin degradates HEC 7155 and HEC 7180, as well. Therefore, fluoxastrobin degradates are not a concern for aquatic organisms and plants.

Risk to Endangered Species

The preliminary risk assessment for endangered species indicates that fluoxastrobin exceeds the endangered species LOCs for the following combinations of analyzed uses and species:

- Use of fluoxastrobin on the following crop scenarios indicate an exceedance of the endangered species LOC for freshwater fish: Maine potatoes (ground and aerial application), Florida tomatoes, peanuts, and turf (at the maximum application rate of 4 times per year).

- Use of fluoxastrobin on Idaho potatoes (aerial application only), Maine potatoes (ground and aerial application), tomatoes, peppers, cabbage, peanuts, and turf (at maximum [4x/year] and reduced [2x/year] application rates) indicate endangered LOC exceedances for endangered freshwater invertebrates.

- Use of fluoxastrobin on Idaho and Maine potatoes (aerial and ground application), tomatoes, peppers, cabbage, peanuts, and turf (at maximum [4x/year] and reduced [2x/year] application rates) indicate endangered acute and chronic LOC exceedances for estuarine/marine invertebrates.

- Use of fluoxastrobin on Maine potatoes (ground and aerial application), Florida tomatoes, peppers, cabbage, peanuts, and turf in Florida (at maximum [4x/year] application rates only) and Pennsylvania (for applications of both 4 and 2x/year) indicate chronic LOC exceedances for estuarine/marine mollusks.

The list of endangered/threatened freshwater fish species where potatoes, tomatoes, peppers, and peanuts are grown is comprised of 84 different species representing 36 States. The three States with the largest number of endangered/threatened freshwater fish species include California, Washington, and Oregon. Within these States, the majority of endangered/threatened fish species are salmon and steel head (*Orcorhynchus* sp.). The predominant endangered fish species in Florida and North Carolina, where tomatoes, peppers, and peanuts are grown, is the sturgeon (*Acipenser* sp.).

The list is of freshwater invertebrates is primarily comprised of bivalves (70% of all listed invertebrates; present in 20 States), crustaceans (i.e., amphipods, crayfish, and shrimp) (~19 of all listed invertebrates; present in 6 States), and snails (~11% of all listed invertebrates; present in 2 States). While the majority of listed freshwater invertebrates are bivalves, the amphipod (*Gammarus acherondytes*) was listed as endangered in Illinois. The identification of an endangered amphipod is a factor because this species was identified as the most sensitive freshwater invertebrate from the available effects data. It appears, however, that the endangered amphipods in Illinois are present only in caves, where pesticides are not likely to be present in water at concentrations that would cause adverse effects.

The Agency's levels of concern for endangered and threatened freshwater fish and invertebrates and estuarine/marine invertebrates and mollusks are exceeded for the use of fluoxastrobin. However, the Agency recognizes that there are no Federally listed estuarine/marine invertebrates/mollusks.

The registrant must provide information on the proximity of Federally listed freshwater fish and invertebrates to the fluoxastrobin use sites. This requirement may be satisfied in one of

three ways: 1) having membership in the FIFRA Endangered Species Task Force (Pesticide Registration [PR] Notice 2000-2); 2) citing FIFRA Endangered Species Task Force data; or 3) independently producing these data, provided the information is of sufficient quality to meet FIFRA requirements. The information will be used by the OPP Endangered Species Protection Program to develop recommendations to avoid adverse effects to listed species. The registrant has satisfied this requirement using option #1 above.

7. SUMMARY OF REGULATORY POSITION AND RATIONALE

Available data provide adequate information to support the conditional registration of fluoxastrobin technical and the proposed end-use product. Fluoxastrobin technical has a relatively low toxicity fungicide, and there is reasonable certainty that no harm will result to the general population or to infants and children from aggregate exposure to the proposed uses on peanuts, tuberous and corm vegetables, leaf petiole vegetables, fruiting vegetables, turf and seed treatment (potato, peanut and turf). The results of the risk assessment suggest the potential for direct effects to endangered freshwater fish, and both endangered and non-endangered freshwater invertebrates, estuarine/marine invertebrates, and mollusks. In addition, in order to reduce the uncertainties associated with the risk assessments, additional studies and data will be required as a condition of registration.

Although fluoxastrobin is a member of the strobilurin group that includes already marketed active ingredients, the Agency believes that growers would benefit from a new active ingredient that can be an effective disease management tool for both curative and preventative purposes. In many cases, the efficacy of fluoxastrobin will be comparable to others currently on the market. However, diverse qualities of strobilurin fungicides suggest that there can be a valuable place for this strobilurin active ingredient for some important diseases. In addition, new chemicals, especially with similar attributes, increase competition and should lower price. Thus, growers will receive benefits through lower production costs which, presumably, would be passed on to the consumer. Therefore, the registration of fluoxastrobin is considered to be in the public interest.

8. SUMMARY OF CONFIRMATORY DATA REQUIREMENTS

Available data provide adequate information to support the conditional registration of fluoxastrobin and establishment of the associated tolerances for residues. However, in order to reduce the uncertainties associated with the risk assessments, the following studies or data will be required as a condition of registration:

- Submit additional information concerning the mouse immunotoxicity subacute feeding study.

- Sediment-bound fluoxastrobin is persistent (half-life = 141 days), and concentrations in suspended or bottom sediments are likely to be higher than those of the sediment interstitial pore water and/or water column. Given the potential risks to freshwater and estuarine/marine invertebrates based on fluoxastrobin concentrations in the water column,

acute (10-day) and chronic (28-day) sediment toxicity testing, as described in the OPPTS 850.1735 and 850.1740 protocols, will be required in order to reduce uncertainties and evaluate risks to freshwater and estuarine/marine sediment dwelling organisms.

860.1300 Nature of the Residue - Livestock – provide comparison of chromatograms for goat metabolism study

860.1340 Residue Analytical Method - Plant and Livestock Commodities – Provide revisions to include instructions for analysis of all crops and specification of the additional ions to be monitored.

860.1380 Storage Stability – Provide raw data and other background parameters.

860.1500 Crop Field Trials – Provide summaries of weather conditions during each trial.

860.1520 Processed Food and Feed – A new peanut study must be submitted.

860.1650 Submittal of Analytical Reference Standards – As is required for all new chemicals.

860.1900 Field Accumulation in Rotational Crops– Provide weather conditions and soil characteristics.

Labeling Restrictions

The Restricted Entry Interval (REI) is 12 hours.

Directions for Use

"Not for use by residential users."

"Do not use in greenhouses."

"Maximum seasonal application rate for turf includes turf seed treatment."

9. CONTACT PERSON AT EPA

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DISCLAIMER: The information presented in this Pesticide Fact Sheet is for informational purposes only and may not be used to fulfill data requirements for pesticide registration and reregistration.

Appendix I

GLOSSARY OF TERMS AND ABBREVIATIONS

ai	Active Ingredient
ARTF	Agricultural Reentry Task Force
CAS	Chemical Abstracts Service
CFR	Code of Federal Regulations
cPAD	Chronic Population Adjusted Dose
CSFII	Continuing Surveys of Food Intakes by Individuals
DEEM-FCID	Dietary Exposure Evaluation Model - Food Consumption Intake Database
DFR	Dislodgeable Foliar Residue
DWLOC	Drinking Water Level of Concern
EC_{50}	Effective Concentration - concentration of chemical in water at which an effect is seen in 50% of the exposed population
EDSP	Endocrine Disruptor Screening Program
EDSTAC	Endocrine Disruptor and Testing Advisory Committee
EDWC	Estimated Drinking Water Concentration
EEC	Estimated Environmental Concentrations
EPA	United States Environmental Protection Agency
FFDCA	Federal Food, Drug and Cosmetic Act
FIFRA	Federal Insecticide, Fungicide and Rodenticide Act
FQPA	Food Quality Protection Act
HED	Health Effects Division, Office of Pesticide Programs
hr	Hour
K_{ow}	Octanol/Water Partition Coefficient
lb	pound
LC_{50}	Median Lethal Concentration. A statistically derived concentration of a substance that can be expected to cause death in 50% of test animals. It is usually expressed as the weight of substance per weight or volume of water, air or feed, e.g., mg/L, mg/kg or ppm.
LD_{50}	Median Lethal Dose. A statistically derived single dose that can be expected to cause death in 50% of the test animals when administered by the route

	indicated (oral, dermal, inhalation.) It is expressed as a weight of substance per unit weight of animal, e.g., mg/kg.
LOAEL	Lowest Observed Adverse Effect Level
LOAEC	Lowest Observed Adverse Effect Concentration
LOC	Level of Concern
m^3	cubic meter
mg/kg/day	milligrams per kilogram (body weight) per day
mg/L	Milligrams per Liter
MOE	Margin of Exposure
MTD	Maximum Tolerated Dose
NA	Not Applicable
NOEC	No Observed Effect Concentration
NOEL	No Observed Effect Level
NOAEL	No Observed Adverse Effect Level
NOAEC	No Observed Adverse Effect Concentration
OPP	EPA Office of Pesticide Programs
OPPTS	EPA Office of Prevention, Pesticides and Toxic Substances
PAD	Population Adjusted Dose
PHED	Pesticide Handler's Exposure Data
PHI	Preharvest Interval
ppb	Parts Per Billion
PPE	Personal Protective Equipment
ppm	Parts Per Million
PRZM/EXAMS	Tier II Surface Water Computer Model
REI	Restricted Entry Interval
RfD	Reference Dose
RQ	Risk Quotient
SCI-GROW	Tier I Ground Water Computer Model
SF	Safety Factor
SOP	Standard Operating Procedure
TC	Transfer Coefficient
TGAI	Technical Grade Active Ingredient
TTR	Turf Transferable Residue
UF	Uncertainty Factor
µg	Micrograms
µg/L	Micrograms per Liter
USDA	United Stated Department of Agriculture
WPS	Worker Protection Standard

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