DP Barcode : D228667
PC Code No : 128810
EEB Out :

To: Cynthia Giles-Parker/John Bazuin
Product Manager 22
Registration Division (7505C)

8/07/1997

From: Daniel Rieder, Acting Chief
Ecological Effects Branch/EFED (7507C)

Attached, please find the EEB review of...

Reg./File # : 10182-UNI
Chemical Name : Azoxystrobin
Type Product : Fungicide
Product Name : ICIA5504 50WG Fungicide
Company Name : Zeneca Ag Products
Purpose : New Chemical - proposed use on bananas, grapes, peaches, peanuts, pecans, tomatoes, and wheat
Action Code : 115 Date Due : 03/03/97
Reviewer : William Erickson Date In : 08/09/96

EEB Guideline/MRID Summary Table: The review in this package contains an evaluation of the following:

Gdln No.	MRID No.	Cat.	Gdln No.	MRID No.	Cat.	Gdln No.	MRID No.	Cat.
71-1(a)			72-2(a)			72-7(a)		
71-1(b)			72-2(b)			72-7(b)		
71-2(a)			72-3(a)			122-1(a)		
71-2(b)			72-3(b)			122-1(b)		
71-3			72-3(c)			122-2		
71-4(a)			72-3(d)			123-1(a)		
71-4(b)			72-3(e)			123-1(b)		
71-5(a)			72-3(f)			123-2		
71-5(b)			72-4(a)			124-1		
72-1(a)			72-4(b)			124-2		
72-1(b)			72-5			141-1		
72-1(c)			72-6			141-2		
72-1(d)						141-5		

Y=Acceptable (Study satisfied Guideline)/Concur
P=Partial (Study partially fulfilled Guideline but additional information is needed
S=Supplemental (Study provided useful information but Guideline was not satisfied)
N=Unacceptable (Study was rejected)/Nonconcur

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

MEMORANDUM

SUBJECT: Azoxystrobin: new chemical review for use on grapes, peaches, pecans, bananas, tomatoes, and wheat

FROM: Daniel Rieder, Acting Chief 3/17/97
EEB/EFED

TO: Mary Powell
SACS/EFED

Attached are the new chemical review for the proposed use of azoxystrobin on grapes, peanut peaches, pecans, bananas, tomatoes, and wheat and the table of data requirements for these uses. Two studies are outstanding: (1) a bobwhite quail reproduction study (71-4a) to replace an invalid study; and (2) a mysid shrimp chronic toxicity study (72-4b) triggered by acute toxicity and estimated aquatic exposure levels. Because the acute bobwhite and mallard data and the mallard reproductive data indicate no adverse acute or chronic effects to birds, the value of this study is "low". The value of the mysid shrimp chronic toxicity study is also considered "low". Although peanuts, tomatoes, and pecans are grown in coastal counties and applications to these crops may contaminate the estuarine/marine waters, acreages of these crops are low in coastal areas. Therefore, EEB recommends that both the bobwhite quail reproductive study and the mysid chronic toxicity study be submitted as a condition of registration.

Contact Bill Erickson at 305-6212 or Harry Craven at 305-5320 if you have any questions about this matter.

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AZOXYSTROBIN
NEW CHEMICAL REVIEW

EXECUTIVE SUMMARY

Proposed Uses:

Azoxystrobin is a broad-spectrum fungicide proposed for control of major diseases of grapes, peanuts, pecans, peaches, bananas, tomatoes, and wheat. It was recently registered for use on turf. Product is diluted with water and applied as a foliar ground spray. Maximum single application rates range from 0.1 lb ai/acre for tomatoes to 0.25 lb ai/acre for grapes. The number of applications and the interval between applications varies by use site. The maximum amount of azoxystrobin that can be applied per year ranges from 0.4 lb ai/acre for wheat to 1.5 lb ai/acre for grapes.

Toxicity Summary:

The available acute toxicity data on the TGAI indicate that azoxystrobin is practically nontoxic to birds (LD50 >2000 mg/kg; LC50s >5200 ppm), mammals (LD50 >5000 mg/kg), and bees (LD50 = >200 µg/bee). Azoxystrobin is very highly toxic to estuarine/marine invertebrates (EC50 = 56 ppb). It is highly toxic to freshwater fish (LC50 = 470 ppb), freshwater invertebrates (EC50 = 259 ppb), and estuarine/marine fish (LC50 = 670 ppb). Plant studies indicated that the most sensitive terrestrial species was carrot (EC25 = 0.59 lb ai/acre) and the most sensitive aquatic species was an algae (EC50 = 0.1 ppm).

The few toxicity data available for the degradates indicate that R234886 is practically nontoxic to rainbow trout (LC50 >150 ppm) and daphnids (EC50 >190 ppm). Degradates R402173 and 401553 may be slightly toxic to daphnids (EC50s >50 ppm, the only concentration tested).

Chronic studies with the TGAI established NOEC and LOEC values of 300 and 1500 ppm for small mammals (reduced pup weights), 1200 and 3000 ppm for mallards (egg production), and 44 and 84 ppb for freshwater invertebrates (no. young produced). An MATC of 168 ppb was established for freshwater fish, based on adverse effects on larvae length.

Outstanding data requirements include an avian reproduction test with the bobwhite quail (71-4a) and a chronic toxicity test with the mysid shrimp (72-4b) to support use of azoxystrobin on peanuts, tomatoes, and pecans. The value of the mysid shrimp study is low, however, because of the low acreage of these crops in coastal counties.

Risk Assessment Summary:

Birds: Minimal acute and chronic risks are expected. However, because valid bobwhite quail reproduction data have not been submitted, the chronic risk assessment cannot be completed. Acute risk LOCs are not exceeded for any use when the maximum number of applications and maximum EECs are assumed. The avian chronic LOC is not exceeded for either single or multiple applications, based on maximum EEC values and the mallard duck NOEC value.

Small mammals: Minimal acute and chronic risks are expected. Small mammal acute and chronic LOCs are not exceeded when the maximum number of applications and maximum EEC on short grass are assumed.

Freshwater fish and invertebrates: The acute high risk and chronic LOCs are not exceeded for any use site for single or multiple applications. Based on aquatic EECs derived from GENEEC, however, the restricted use acute LOC for invertebrates is exceeded for multiple applications on grapes, pecans, peaches, and bananas when EECs are derived from GENEEC. The endangered species LOC also is equalled or exceeded for multiple applications on all use sites and for a single application on peanuts. For fish, the endangered species LOC is equalled or exceeded for multiple applications on all use sites except wheat. Based on PRZM2/EXAM II, however, refined EECs resulting from applications on peanuts and grapes are actually only about 15-20% of the values derived from GENEEC. EFED believes that GENEEC-derived EECs for other use sites are likely to be overestimated in a similar manner. Therefore, the risk assessment will be based on the refined exposure. Based on the refined exposure, no acute or chronic LOCs are exceeded for either fish or invertebrates.

Estuarine/marine fish and invertebrates: No LOCs are exceeded for fish. Restricted use and endangered species LOCs for invertebrates are exceeded for peanuts and tomatoes when exposure is based on preliminary EECs and for peanuts when exposure is based on refined EECs. Much uncertainty exists for these exposure estimates, however, because both the preliminary (GENEEC) and refined (PRZM2/EXAM II) exposure models are based on runoff and drift into a 1-ha freshwater pond and may not be as applicable to estuarine/marine waters. Chronic risk cannot be assessed until chronic toxicity data are submitted for the mysid shrimp.

Plants: Plant tests are not required for the proposed uses of azoxystrobin, which is a fungicide. However, data were submitted and reviewed and risk assessed. LOCs are not exceeded for either terrestrial or aquatic plants.

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USE PROFILE

Azoxystrobin is a broad-spectrum fungicide proposed for control of major diseases of grapes, peanuts, pecans, peaches, bananas, tomatoes, and wheat. Azoxystrobin has recently been registered for use on turf (golf courses and commercial sod farms). The proposed formulation is a wettable granule (50WG) that is diluted with water and applied as a foliar spray by conventional ground-spray equipment. Azoxystrobin is recommended as a stand-alone fungicide to be used in alternating spray programs with other fungicides. Tank mixing with other fungicides is recommended when diseases not controlled by azoxystrobin are present.

Grapes: Target diseases are powdery mildew, black rot, downy mildew, and Phomopsis cane and leafspot. Product should be applied prior to disease infection. Application rates range from 0.11 to 0.25 lb ai/acre, with no more than six applications (1.5 lb ai/acre) per year. Applications begin at budbreak and continue throughout the season at 10 to 14-day intervals, alternating with other fungicides having a different mode of action.

Pecans: Azoxystrobin will be applied either early season or as a cover spray for control of scab. Early season applications begin at budbreak and continue on a 2-week schedule through pollination. Cover spray applications begin 3 weeks after the final early season application and continue on a 3-week schedule for the remainder of the season. Alternatively, azoxystrobin can be applied in a block spray program for scab control. Blocks of no more than two azoxystrobin sprays are applied in alternation with other fungicides. Anthracnose (Glomerella shuck and kernel rot) is controlled with early season applications made as for scab but applied on a 3-week schedule. The application rate is 0.1 to 0.2 lb ai/acre, and no more than six applications (1.2 lb ai/acre) per year.

Bananas: Azoxystrobin is applied along with other fungicides in an alternating block spray program to control black and yellow sigatoka. Applications begin prior to disease development and continue at 10 to 14-day intervals, with no more than two consecutive sprays of azoxystrobin. The application rate is 0.09 to 0.135 lb ai/acre, with no more than eight applications (1.08 lb ai/acre) applied per year.

Peanuts: Azoxystrobin is applied at approximately 60 and 90 days after planting to control soil borne diseases (early and late leafspot, Rhizoctonia peg and pod rot, and stem rot). The application rate is 0.1 to 0.4 lb ai/acre.

Peaches: Azoxystrobin is applied at rates of 0.07 to 0.15 lb ai/acre for control of blossom blight, fruit brown rot, and scab. Only one application is made for brown rot. Scab control begins at petal fall and continues on 12 to 14-day intervals. Applications for control of blossom blight begin at early bloom and continue through petal fall; no application interval is specified on the product labels. No more than eight applications (1.2 lb ai/acre) can be made for peaches.

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Tomatoes: For control of anthracnose, early blight, and Septoria leafspot, product is applied at a rate of 0.025 to 0.10 lb ai/acre at 7 to 21-day intervals. No more than four sequential applications are made, before alternating with other fungicides. For late blight, product is applied at a rate of 0.05 to 0.10 lb ai/acre at 5 to 10-day intervals. No more than eight applications (0.8 lb ai/acre) are made per year on tomatoes.

Wheat: Target diseases are leaf rust, stripe rust, stem rust, Septoria leaf blotch, Septoria glume blotch, tan spot, and powdery mildew. Product is applied at 0.07 to 0.2 lb ai/acre in the early stages of disease development. No more than two applications are made per year; an application interval is not specified.

ECOLOGICAL TOXICITY DATA

Toxicity to Terrestrial Animals

Birds, Acute and Subacute

An acute oral toxicity study using the technical grade of the active ingredient (TGAI) is required to establish the toxicity of azoxystrobin to birds. The preferred test species is either mallard duck (a waterfowl) or bobwhite quail (an upland gamebird). Results of this test are tabulated below.

Avian Acute Oral Toxicity

Species	% ai	LD50 (mg/kg)	Toxicity Category	MRID No. (Author/Year)	Study Classification
Northern bobwhite quail *(Colinus virginianus)*	96.2	>2000[1]	practically nontoxic	436781-08 (Hakin et al. 1992)	core
Mallard duck *(Anas platyrhynchos)*	96.2	>250[2]	not determined	436781-09 (Hakin et al. 1992)	supplemental[3]

[1] no mortality
[2] one mortality occurred at 2000 mg/kg
[3] because several test birds vomited food containing the test substance, an LD50 could not be determined

Because the core study established an LD50 >2000 mg/kg, azoxystrobin is considered practically nontoxic to avian species on an acute oral basis. The guideline (71-1) is fulfilled (MRID 436781-08).

Two subacute dietary studies using the TGAI are required to establish the toxicity of a pesticide to birds. The preferred test species are mallard duck and bobwhite quail. Results of these tests are tabulated below.

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Avian Subacute Dietary Toxicity

Species	% ai	LC50 (ppm)	Toxicity Category	MRID No. (Author/Year)	Study Classification
Northern bobwhite quail *(Colinus virginianus)*	96.2	>5200[1]	practically nontoxic	436781-10 (Hakin et al., 1992)	core
Mallard duck *(Anas platyrhynchos)*	96.2	>5200[2]	practically nontoxic	436781-11 (Hakin et al., 1992)	core

[1] one mortality occurred at 650 ppm but was not considered to be treatment-related
[2] no mortality

Because the LC50 values exceed 5000 ppm, azoxystrobin is considered practically nontoxic to avian species on a subacute dietary basis. The guideline (71-2) is fulfilled (MRIDs 436781-10, 436781-11).

Birds, Chronic

Avian reproduction studies using the TGAI are required for azoxystrobin because the following conditions are met: (1) birds may be subject to repeated or continuous exposure to azoxystrobin, especially preceding or during the breeding season, because multiple applications are allowed on all use sites; and (2) azoxystrobin is stable in the environment (soil aerobic metabolism half-life = 164 days) to the extent that potentially toxic amounts may persist in animal feed. The preferred test species are mallard duck and bobwhite quail. Results of these tests are tabulated below.

Avian Reproduction Findings

Species	% ai	NOEC/LOEC (ppm)	Affected Endpoints	MRID No. (Author/Year)	Study Classification
Mallard duck *(Anas platyrhynchos)*	96.2	NOEC = 1200 LOEC = 3000	number of eggs laid	436781-13 (Cameron et al. 1994)	core
Northern bobwhite quail *(Colinus virginianus)*	96.2	not determined	not determined	436781-12 (Cameron et al. 1994)	invalid[1]

[1] excessively high mortality occurred in control pens

The results indicate an NOEC of 1200 ppm and an LOEC of 3000 ppm, based on a significant reduction in the number of eggs laid by the mallard duck. Valid data have not been submitted for the bobwhite quail. The guideline (71-4) is fulfilled for the mallard (MRID 436781-13) but not for the bobwhite quail.

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Mammals, Acute and Chronic

Wild mammal testing is required on a case-by-case basis, depending on the results of lower tier laboratory mammalian studies, intended use pattern and pertinent environmental fate characteristics. In most cases, laboratory rat or mouse toxicity values obtained from the Agency's Health Effects Division (HED) substitute for wild mammal testing. The available data for azoxystrobin are tabulated below.

Mammalian Acute and Chronic Toxicity

Species	% ai	Toxicity Results	Toxicity Category	MRID No.
Laboratory rat *(Rattus norvegicus)*	95.2	LD50 > 5000 mg/kg	practically nontoxic	436781-22
		NOEC = 300 ppm[1] LOEC = 1500 ppm	n/a	436781-44
Rabbit		NOEC = 16,500 ppm[2] LOEC = >16,500 ppm	n/a	440587-01

[1] based on decreased pup body weights of first and second generation pups, reduced food consumption and increased adjusted liver weights in females, histopathologically observed cholangitis, and increased weanling liver weights for both generations

[2] no fetal toxicity occurred at 16,500 ppm, the highest dose tested

The data indicate that azoxystrobin is practically nontoxic to small mammals on an acute oral basis. Chronic reproductive and systemic toxicity was observed at a test level of 1500 ppm in a two-generation reproductive toxicity study with laboratory rats. No fetal toxicity occurred in rabbits tested up to 16,500 ppm.

Insects

A honey bee acute contact study using the TGAI is required for azoxystrobin because its use on crops may result in honey bee exposure. Formulation testing is not required for azoxystrobin, but a study was submitted and reviewed. Results of these tests are tabulated below.

Nontarget Insect Acute Contact Toxicity

Species	% ai	LD50 (µg/bee)	Toxicity Category	MRID No. (Author/Year)	Study Classification
Honey bee *(Apis mellifera)*	96.2	>200	practically nontoxic	436781-66 (Gough et al. 1993)	core
Honey bee *(Apis mellifera)*	51.6	>200	practically nontoxic	436781-67 (Gough et al. 1994)	core

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The results indicate that azoxystrobin is practically nontoxic to bees on an acute contact basis. The guideline (141-1) is fulfilled (MRID 436781-66).

Other invertebrates

The studies summarized below were not required but were submitted and reviewed.

Toxicity to earthworms, beetles, and flies

Species	% ai	Toxicity	MRID No. (Author/Year)	Study Classification
Earthworm *(Eisenia foetida)*	96.2	LC50 = 278 mg ai/kg	436781-68 (Fleming et al. 1993)	supplemental[1]
Hoverfly *(Episyrphus balteatus)*	25	no. larvae produced was significantly adversely affected at a test concentration of 0.22 lb ai/acre, the only concentration tested	436781-70 (Coulson et al. 1994)	supplemental[1]
Carabid beetle *(Poecilus cupreus)*	23.7	no adverse affects at test concentration of 0.22 lb ai/acre, the only concentration tested	436781-69 (Yearsdon and Farrelly 1994)	supplemental[1]

[1] not a guideline requirement

The studies are not guideline requirements but provide supplemental information on the toxicity of azoxystrobin to earthworms, flies, and beetles.

Toxicity to Freshwater Aquatic Animals

Freshwater Fish, Acute

Two freshwater fish toxicity studies using the TGAI are required to establish the toxicity of azoxystrobin to fish. The preferred test species are rainbow trout (a coldwater fish) and bluegill sunfish (a warmwater fish). Results of these tests are tabulated below.

Freshwater Fish Acute Toxicity

Species	% ai	Test Conditions	96-h LC50 (ppm)	Toxicity Category	MRID No. (Author/Year)	Study Classification
Rainbow trout *(Oncorhynchus mykiss)*	96.2	flow-through (measured)	0.47	highly toxic	436781-15 (Craig et al. 1992)	core
Bluegill sunfish *(Lepomis macrochirus)*	96.2	flow-through (measured)	1.1	moderately toxic	436781-14 (Sankey et al. 1992)	core

Because the LC50 values are in the range of 0.1 to 10 ppm, azoxystrobin is considered highly to moderately toxic to freshwater fish on an acute basis. The guideline (72-1) is fulfilled (MRIDs 436781-14, 436781-15).

Freshwater Fish, Chronic

A freshwater fish early life-stage test using the TGAI is required for azoxystrobin, because active ingredient may be transported to water from the intended use sites and because the rainbow trout acute LC50 (0.47 ppm) is less than 1 mg/l. The preferred test species is the rainbow trout. Results of this testing are tabulated below.

Freshwater Fish Early Life-Stage Toxicity Under Flow-through Conditions

Species	% ai	Test Conditions	NOEC/LOEC (ppb)	MATC[1] (ppb)	Endpoints Affected	MRID No. (Author/Year)	Study Classification
Fathead minnow *(Pimephales promelas)*	96.2	flow-through (measured)	NOEC = 147 LOEC = 193	168	length	436781-20 (Rhodes et al. 1994)	core

[1] defined as the geometric mean of the NOEC and LOEC

The results indicate an MATC of 168 ppb, based on an NOEC of 147 ppb and an LOEC of 193 ppb for significant adverse effects on length of newly hatched fathead minnows. The guideline (72-4a) is fulfilled (MRID 436781-20).

Freshwater Invertebrates, Acute

A freshwater aquatic invertebrate toxicity test using the TGAI ingredient is required to establish the toxicity of azoxystrobin to invertebrates. The preferred test species is *Daphnia magna*. Results of this test are tabulated below.

Freshwater Invertebrate Acute Toxicity

Species	% ai	Test Conditions	48-h EC50 (ppb)	Toxicity Category	MRID No. (Author/Year)	Study Classification
Waterflea *(Daphnia magna)*	96.2	static (measured)	259	highly toxic	436781-16 (Rapley et al. 1994)	core

Because the EC50 is between 0.1 to 1 ppm, azoxystrobin is considered highly toxic to aquatic invertebrates on an acute basis. The guideline (72-2) is fulfilled (MRID 436781-16).

Freshwater Invertebrate, Chronic

A freshwater aquatic invertebrate life-cycle test using the TGAI is required for azoxystrobin, because active ingredient is expected to be transported to water from the intended use site and because the daphnid acute EC50 (0.259 ppm) is less than 1 mg/l. The preferred test species is *Daphnia magna*. Results of testing with azoxystrobin are tabulated below.

Freshwater Aquatic Invertebrate Life-Cycle Toxicity

Species	% ai	Test Conditions	21-day NOEC/LOEC (ppb)	MATC[1] (ppb)	Endpoint Affected	MRID No. (Author/Year)	Study Classification
Waterflea *(Daphnia magna)*	96.2	static renewal (measured)	NOEC = 44 LOEC = 84.	61	no. young produced	436781-21 (Rapley et al. 1994)	core

[1] defined as the geometric mean of the NOEC and LOEC

The results indicate an NOEC of 44 ppb and an LOEC of 84 ppb, based on the number of young produced by daphnids exposed to azoxystrobin. The guideline (72-4b) is fulfilled (MRID 436781-21).

Toxicity to Estuarine and Marine Animals

Estuarine and Marine Fish, Acute

Acute toxicity testing with estuarine/marine fish using the TGAI is required for azoxystrobin because the active ingredient may be transported to this environment from its proposed use on peanuts, tomatoes, and pecans in coastal counties. The preferred test species is sheepshead minnow. Results of this testing is tabulated below.

Estuarine/Marine Fish Acute Toxicity

Species	% ai	Test Conditions	96-h LC50 (ppm)	Toxicity Category	MRID No. (Author/Year)	Study Classification
Sheepshead minnow *(Cyprinodon variegatus)*	96.2	flow-through (measured)	0.67	highly toxic	436781-17 (Sankey et al. 1992)	core

Because the LC50 is between 0.1 to 1 ppm, azoxystrobin is considered highly toxic to estuarine/marine fish on an acute basis. The guideline (72-3a) is fulfilled (MRID 436781-17).

Estuarine and Marine Invertebrates, Acute

Acute toxicity testing with estuarine/marine invertebrates using the TGAI is required for azoxystrobin because the active ingredient may be transported to the estuarine/marine environment because of its proposed use on peanuts, tomatoes, and pecans in coastal counties. The preferred test species are mysid shrimp and eastern oyster. Results of these tests are tabulated below.

Estuarine/Marine Invertebrate Acute Toxicity

Species	% ai.	Test Conditions	96-h EC50/ LC50 (ppb)	Toxicity Category	MRID No. (Author/Year)	Study Classification
Mysid shrimp *(Americamysis bahia)*	96.2	static (measured)	56	very highly toxic	436781-18 (Kent et al. 1993)	core
Pacific oyster (larvae) *(Crassostrea gigas)*	96.2	static (nominal)	1300	moderately toxic	436781-19 (Kent et al. 1993)	core

Because the EC50 and LC50 values are between <0.1 and 10 ppm, azoxystrobin is considered very highly toxic to moderately toxic to estuarine/marine invertebrates on an acute basis. The guideline (72-3b and 72-3c) is fulfilled (MRID 436781-18, 436781-19).

Estuarine and Marine Invertebrates, Chronic

An estuarine/marine invertebrate life-cycle test using the TGAI is required for azoxystrobin, because active ingredient may be transported to estuarine/marine waters from its proposed use on peanuts, tomatoes, and pecans in coastal counties; because the mysid shrimp acute EC50 (56 ppb) is less than 1 mg/l; and because the aquatic EEC of 7.2 ppb is greater than 0.01 of the mysid shrimp acte EC50 (0.01 X 56 ppb = 0.56 ppb). The preferred test species is the mysid shrimp. The requirement (74-2b) is not fulfilled.

Toxicity to Plants

Terrestrial

Currently, terrestrial plant testing is not required for pesticides other than herbicides except on a case-by-case basis (e.g., labeling bears phytotoxicity warnings incident data or literature that demonstrate phytotoxicity). Data are not required for azoxystrobin, but Tier I data for the TEP were submitted and reviewed. Results of the Tier 1 testing, which compares the response of plants treated at the maximum application rate to that of untreated plants, are tabulated below.

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Nontarget Terrestrial Plant Seedling Emergence Toxicity (Tier I)[1]

Species	Endpoint Affected[2]	% Inhibition	MRID No. (Author/Year)	Study Classification
Monocots:				
Corn *(Zea mays)*	dry weight	14.4	436781-56 Canning et al. 1994	core
Meadow fescue *(Festuca pratensis)*	damage	8.6		
Purple nutsedge *(Cyperus rotundus)*	dry weight	5.3		
Winter wheat *(Triticum aestivum)*	dry weight	24.6		
Dicots:				
Carrot *(Daucus carota)*	**damage**	**33.2**		
Soybean *(Glycine max)*	damage	10.2		
Cocklebur *(Xanthium strumarium)*	damage	16.1		
Morning glory *(Ipomoea hederacea)*	dry weight	10.1		
Rape *(Brassica napus)*	dry weight	27.2		
Sugar beet *(Beta vulgaris)*	**dry weight**	**11.2**		
Velvetleaf *(Abutilon theophrasti)*	dry weight	14.8		

[1] TEP (51.6%) testing at 1 lb ai/A, the maximum application rate

[2] only the most sensitive endpoint has been tabulated for each species

For Tier I seedling emergence, carrot damage is the most sensitive dicot endpoint and wheat dry weight is the most sensitive monocot endpoint.

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Nontarget Terrestrial Vegetative Vigor Toxicity (Tier I)[1]

Species	Endpoint Affected[2]	% Inhibition	MRID No. (Author Year)	Study Classification
Monocots:				
Corn *(Zea mays)*	dry weight	8.7	436781-58 (Canning et al. 1994)	core
Purple nutsedge *(Cyperus rotundus)*	dry weight	2.9		
Winter wheat *(Triticum aestivum)*	dry weight	4.9		
Wild oat *(Avena fatua)*	dry weight	11.4		
Dicots:				
Soybean *(Glycine max)*	damage	0.3		
Cocklebur *(Xanthium strumarium)*	damage	0.3		
Morning glory *(Ipomoea hederacea)*	damage	0		
Rape *(Brassica napus)*	dry weight	6.7		
Sugar beet *(Beta vulgaris)*	damage	1.3		
Velvetleaf *(Abutilon theophrasti)*	damage	0.7		

[1] TEP (51.6%) testing at 1 lb ai/A, the maximum label rate

[2] only the most sensitive endpoint has been tabulated for each species

For Tier I vegetative vigor, rape dry weight is the most sensitive dicot endpoint and wild oat dry weight is the most sensitive monocot endpoint.

Tier II tests measure the response of treated plants (≥5 test concentrations) to that of untreated (i.e., control) plants. For azoxystrobin, Tier II testing is not required but seedling emergence testing was conducted for carrot and rape. Those results are tabulated below.

Nontarget Terrestrial Plant Seedling Emergence Toxicity (Tier II)

Species	% ai	Endpoint Affected[1]	EC25 (lb ai/A)	EC05 (lb ai/A)	MRID No. (Author/Year)	Study Classification
Dicots:						
Carrot *(Daucus carota)*	51.6	dry weight	0.59	0.17	436781-60 (Everett et al. 1995)	core
Rape *(Brassica napus)*	51.6	emergence	3.2	0.55		

[1] only the most sensitive endpoint is tabulated

For Tier II seedling emergence, carrot dry weight is the most sensitive endpoint for the two species tested.

Aquatic Plants

Aquatic plant testing is required for any fungicide that has outdoor non-residential terrestrial uses and that may move off-site by runoff (solubility >10 ppm in water), and/or by drift (aerial or irrigation) or that is applied directly to aquatic use sites (except residential). These conditions do not apply to azoxystrobin but data have been submitted and reviewed. Results of Tier II toxicity testing on the TGAI are tabulated below.

Nontarget Aquatic Plant Toxicity (Tier II)

Species	EC50 (ppm)	NOEC (ppm)	MRID No. (Author/Year)	Study Classification
Vascular Plants:				
Duckweed *(Lemna gibba)*	3.4	0.8	436781-65 (Smyth et al. 1993)	core
Nonvascular Plants:				
Green algae *(Kirchneria subcapitata)*	0.1	0.02[2]	436781-61 (Smyth et al. 1994)	core
Marine diatom *(Skeletonema costatum)*	0.5	0.1	436781-63 (Smyth et al. 1993)	core
Freshwater diatom *(Navicula pelliculosa)*	0.5	0.02	436781-64 (Smyth et al. 1994)	core
Blue-green algae *(Anabaena flos-aquae)*	13	9	436781-62. (Smyth et al. 1993)	core

[1] the test material was 96.2% ai

[2] the EC05 value is tabulated, because an NOEC was not determined

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The Tier II results indicate that *Kirchneria subcapitata* is the most sensitive non-vascular aquatic plant. The guideline (123-2) is fulfilled (MRIDs 436781-61, 436781-62, 436781-63, 436781-64, 436781-65).

EXPOSURE AND RISK CHARACTERIZATION

Risk characterization integrates the results of the exposure and ecotoxicity data to evaluate the likelihood of adverse ecological effects. The means of integrating the results of exposure and ecotoxicity data is called the quotient method. For this method, risk quotients (RQs) are calculated by dividing exposure estimates by ecotoxicity values, both acute and chronic.

RQ = EXPOSURE/TOXICITY

RQs are then compared to OPP's levels of concern (LOCs). These LOCs are criteria used by OPP to indicate potential risk to nontarget organisms and the need to consider regulatory action. The criteria indicate that a pesticide used as directed has the potential to cause adverse effects on nontarget organisms. LOCs currently address the following risk presumption categories: (1) acute high - potential for acute risk is high regulatory action may be warranted in addition to restricted use classification (2) acute restricted use - the potential for acute risk is high, but this may be mitigated through restricted use classification (3) acute endangered species - the potential for acute risk to endangered species is high regulatory action may be warranted, and (4) chronic risk - the potential for chronic risk is high regulatory action may be warranted. Currently, EFED does not perform assessments for chronic risk to plants, acute or chronic risks to nontarget insects, or chronic risk from granular/bait formulations to mammalian or avian species.

The ecotoxicity test values (i.e., measurement endpoints) used in the acute and chronic risk quotients are derived from the results of required studies. Examples of ecotoxicity values derived from the results of short-term laboratory studies that assess acute effects are: (1) LC50 (fish and birds) (2) LD50 (birds and mammals (3) EC50 (aquatic plants and aquatic invertebrates) and (4) EC25 (terrestrial plants). Examples of toxicity test effect levels derived from the results of long-term laboratory studies that assess chronic effects are: (1) LOEC (birds, fish, and aquatic invertebrates) (2) NOEC (birds, fish and aquatic invertebrates) and (3) MATC (fish and aquatic invertebrates). For birds and mammals, the NOEC value is used as the ecotoxicity test value in assessing chronic effects. Other values may be used when justified. Generally, the MATC (defined as the geometric mean of the NOEC and LOEC) is used as the ecotoxicity test value in assessing chronic effects to fish and aquatic invertebrates. However, the NOEC is used if the measurement end point is production of offspring or survival.

Risk presumptions and corresponding RQs and LOCs are tabulated below.

Risk Presumptions for Terrestrial Animals

Risk Presumption	RQ	LOC
Birds		
Acute High Risk	EEC[1]/LC50 or LD50/sqft[2] or LD50/day[3]	0.5
Acute Restricted Use	EEC/LC50 or LD50/sqft or LD50/day (or LD50 < 50 mg/kg)	0.2
Acute Endangered Species	EEC/LC50 or LD50/sqft or LD50/day	0.1
Chronic Risk	EEC/NOEC	1
Wild Mammals		
Acute High Risk	EEC/LC50 or LD50/sqft or LD50/day	0.5
Acute Restricted Use	EEC/LC50 or LD50/sqft or LD50/day (or LD50 < 50 mg/kg)	0.2
Acute Endangered Species	EEC/LC50 or LD50/sqft or LD50/day	0.1
Chronic Risk	EEC/NOEC	1

[1] EEC = Estimated Environmental Concentration (ppm) on avian and mammalian food items
[2] mg toxicant/ft² ÷ [LD50 * bird wt (kg)]
[3] mg toxicant consumed/day ÷ [LD50 * bird wt (kg)]

Risk Presumptions for Aquatic Animals

Risk Presumption	RQ	LOC
Acute High Risk	EEC[1]/LC50 or EC50	0.5
Acute Restricted Use	EEC/LC50 or EC50	0.1
Acute Endangered Species	EEC/LC50 or EC50	0.05
Chronic Risk	EEC/MATC or NOEC	1

[1] EEC = Estimated Environmental Concentration (ppm or ppb) in water

Risk Presumptions for Plants

Risk Presumption	RQ	LOC
	Terrestrial and Semi-Aquatic Plants	
Acute High Risk	EEC[1]/EC25	1
Acute Endangered Species	EEC/EC05 or NOEC	1
	Aquatic Plants	
Acute High Risk	EEC[1]/EC50	1
Acute Endangered Species	EEC/EC05 or NOEC	1

[1] EEC = Estimated Environmental Concentration (lb ai/A)
[2] EEC = Estimated Environmental Concentration (ppb/ppm) in water

Exposure and Risk to Nontarget Terrestrial Animals

For foliar applications, the estimated environmental concentrations (EECs) on food items following pesticide application are compared to LC50 values to assess risk. The predicted 0-day maximum and mean EECs expected on selected avian or mammalian food items immediately following a direct single application at 1 lb ai/A are tabulated below.

Estimated Environmental Concentrations on Avian and Mammalian Food Items (ppm) Following a Single Application at 1 lb ai/A[1]

Food Items	EEC (ppm) Predicted Maximum Residue	EEC (ppm) Predicted Mean Residue
Short grass	240	85
Tall grass	110	36
Broadleaf plants and small insects	135	45
Fruits, pods, seeds, and large insects	15	7

[1] predicted maximum and mean EECs for a 1 lb ai/A application rate are based on Hoerger and Kenaga (1972) as modified by Fletcher et al. (1994); EECs for other application rates are presumed to increase or decrease proportionally with an increase or decrease in the application rate

EECs resulting from multiple applications are estimated from EFED's "FATE" program and are based on the maximum application rate, maximum number of applications, minimum application interval, and the degradation rate of the pesticide. For azoxystrobin, the degradation rate is assumed to be 164 days, based on aerobic soil metabolism data submitted to the Agency. Acute exposure EECs for multiple applications are the highest one-day value, whereas chronic exposure EECs are averages based on the number of applications and the application interval.

Birds

Acute and chronic RQs for broadcast applications of azoxystrobin are tabulated below for the uses having the highest exposure scenarios.

Avian Acute Risk Quotients for a Single Application, Based on Mallard and Bobwhite Quail LC50 Values of >5200 ppm

Site[1]	Appl. Rate (lbs ai/A)	Food Item	Maximum EEC (ppm)	Acute RQ (EEC/LC50)
Peanuts	0.4	Short grass	96	<0.02
		Tall grass	44	<0.01
		Broadleaf plants/Insects	54	0.01
		Seeds	6	<0.01
Grapes	0.25	Short grass	60	<0.01
		Tall grass	28	<0.01
		Broadleaf plants/Insects	34	<0.01
		Seeds	4	<0.01

[1] only the two use sites with the highest single maximum application rates are tabulated

Acute risk LOCs are not exceeded for a single broadcast application of azoxystrobin on peanuts or grapes when maximum EECs are assumed. RQs calculated from mean EEC values would be even lower. Because single maximum application rates for peaches, pecans, tomatoes, bananas, and wheat are lower than for peanuts and grapes, no LOCs would be exceeded for those use sites.

Avian Acute and Chronic Risk Quotients for Multiple Applications, Based on Mallard and Bobwhite Quail LC50 Values of >5200 ppm and a Mallard NOEC of 1200 ppm

Site[1]	Appl. Rate (lbs ai/A)	No. Appl.	Food Item	Max. EEC (ppm)	Max. Avg. EEC (ppm)	Acute RQ (EEC/LC50)	Chronic RQ (EEC/NOEC)
Grapes	0.25	6	Short grass	325	210	<0.06	0.2
			Tall grass	149	96	<0.03	0.1
			Broadleaf plants/Insects	183	118	<0.04	0.1
			Seeds	20	13	<0.01	<0.1
Peaches, Pecans	0.15, 0.2	8, 6	Short grass	250		<0.05	
			Tall grass	115		<0.02	
			Broadleaf plants/Insects	141		<0.03	
			Seeds	16		<0.01	

[1] only the three use sites with the highest EECs resulting from multiple applications are tabulated

Acute risk LOCs are not exceeded for grapes, peaches, or pecans when the maximum number of applications and maximum EECs are assumed. Because LOCs have not been exceeded for grapes, peaches, and pecans, the use sites with the highest EEC values resulting from multiple applications, no exceedances would occur for bananas, peanuts, tomatoes, and wheat.

The chronic LOC is not exceeded for any use site, based on the NOEC value determined from reproductive testing with the mallard duck. However, because bobwhite quail reproduction data have not been submitted, the chronic risk assessment cannot be completed.

Mammals

EFED's 1995 draft SOP for mammalian risk assessments and residue estimates based on Hoerger and Kenaga (1972) as modified by Fletcher et al. (1994) are used to estimate potential adverse effects of azoxystrobin to wild mammals. The concentration of azoxystrobin in the diet that is expected to be acutely lethal to 50% of the test population (LC50) is determined by dividing the small mammal LD50 value by the % (expressed as a decimal) body weight consumed. An acute RQ is then determined by dividing the EEC by the derived LC50 value. The chronic RQ is determined by dividing the EEC by the NOEC value determined from the two-generation rat reproductive toxicity test. RQs are calculated for three separate weight classes of mammals (15, 35, and 1000 g). Acute and chronic RQs are tabulated below for the use having the highest exposure scenario.

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Mammalian (Herbivore) Acute RQs for Multiple Applications, Based on a Lab. Rat LD50 of >5000 mg/kg and the Maximum EEC on Short Grass

Site[1]	Appl. Rate (lb ai/A)	No. Appl.	Body Wt (g)	% Body Weight Consumed	Max. EEC (ppm)	Acute RQ[2]
Grapes	0.25	6	15	95	325	<0.06
			35	66	325	<0.04
			1000	15	325	<0.01

[1] only the use site with the highest EEC resulting from multiple applications is tabulated

[2] RQ = EEC (ppm) ÷ [LD50 (mg/kg)/ % Body Weight Consumed]

Acute risk LOCs are not exceeded for small herbivorous mammals when the maximum number of applications and maximum EEC on short grass are assumed for the initial application on grapes. EECs and RQs would be even lower for insectivores and for other use sites.

Mammalian (Herbivore/Insectivore) Chronic RQs for Multiple Applications, Based on the Lab. Rat NOEC of 300 ppm

Site	Appl. Rate (lb ai/A)	No. Appl.	Food Item	Max. EEC (ppm)	Max. Chronic RQ (EEC/NOEC)
Grapes	0.25	6	Short grass	210	0.7
		6	Small insects	118	0.4

The chronic risk LOC for small herbivores and insectivores is not exceeded from multiple applications when the maximum number of applications and maximum EEC for the initial application are assumed. RQs for peanuts, peaches, pecans, bananas, tomatoes, and wheat use sites would be even lower than those for grapes.

Insects

Currently, EFED does not assess risk to nontarget insects. Results of acceptable studies are used for recommending appropriate label precautions.

Exposure and Risk to Nontarget Aquatic Animals

EFED calculates preliminary EECs using the Generic Expected Environmental Concentration Program (GENEEC). The resultant EECs are used for screening acute and chronic risks to aquatic organisms. Acute risk assessments are performed using either 0-day

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EEC values for a single application or peak EEC values for multiple applications. Chronic risk assessments are performed using the 21-day-average EECs for invertebrates and 56-day-average EECs for fish.

The GENEEC program uses basic environmental fate values and pesticide label application information to estimate of the expected environmental concentrations following treatment of 10 hectares. The screening model calculates the concentration of pesticide in a one-hectare, two-meter deep pond, taking into account the following: (1) adsorption to soil or sediment (2) soil incorporation (3) degradation in soil before washoff to a water body and (4) degradation within the water body. The model also accounts for direct deposition of spray drift into the water body (assumed to be 1% and 5% of the application rate for ground and aerial applications, respectively). The maximum application rate, maximum number of applications, and the minimum interval between applications are used in the calculations. The environmental fate parameters used in the model for this pesticide are: soil K_{oc} = 210, solubility = 6.7 ppm, aerobic soil metabolism half-life = 164 days, the hydrolytic half-life is stable (i.e., >30 days), and water photolytic half-life = 14 days.

When LOCs are exceeded based on EECs derived from GENEEC, EFED uses environmental fate and transport computer models to calculate refined EECs. The Pesticide Root Zone Model (PRZM2) simulates pesticides in field runoff. The Exposure Analysis Modeling System (EXAM II) simulates pesticide fate and transport in an aquatic environment (one hectare body of water, two meters deep). Because peanuts and grapes are use sites likely to have high exposure scenarios for aquatic environments, these two sites were chosen to estimate refined EECs for azoxystrobin.

Aquatic EECs for single and multiple applications of azoxystrobin are tabulated below.

Estimated Environmental Concentrations (EECs) For Aquatic Exposure

Site	Application Rate (lbs ai/A)	No. Applications	Application Interval (days)	Initial EEC (ppb)	21-day-avg. EEC (ppb)	56-or 60-day-avg. EEC (ppb)
PRZM2/EXAM II						
Grapes	0.25	6	14	9.2	8.0	7.1
Peanuts	0.4	2	30	7.2	6.5	5.6
GENEEC						
Grapes	0.25	1	n/a	8	8	7
		6	10	43	42	39
Peanuts	0.4	1	n/a	13	12	11
		2	30	24	23	22
Pecans	0.2	1	n/a	6	6	6
		6	14	33	32	30
Peaches	0.15	1	n/a	5	5	4
		8	10	33	32	30
Bananas	0.135	1	n/a	4	4	4
		8	12	29	28	26
Tomatoes	0.1	1	n/a	3	3	3
		8	5	24	23	22
Wheat	0.2	1	n/a	6	6	6
		2	10	13	12	11

A comparison of EECs for grapes and peanuts indicates that refined EECs derived from PRZM2/EXAM II are 70-80% less than the preliminary EECs derived from GENEEC. It is likely that refined EECs for the other use sites also would be less than those predicted by GENEEC. EFED will base the risk assessment on the refined exposure.

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Freshwater Fish

Acute and chronic RQs are tabulated below for single and multiple applications.

Risk Quotients for Freshwater Fish, Based On a Rainbow Trout LC50 of 470 ppb and a Fathead Minnow MATC of 168 ppb

Site	Appl. Rate (lbs ai/A)	No. Applications	Initial EEC (ppb)	56- or 60-day-avg. EEC (ppb)	Acute RQ (EEC/LC50)	Chronic RQ (EEC/MATC)
PRZM2/EXAM II						
Grapes	0.25	6	9.2	7.1	0.02	<0.1
Peanuts	0.4	2	7.2	5.6	0.02	<0.1
GENEEC						
Grapes	0.25	1	8	7	0.02	<0.1
		6	43	39	0.09*	0.2
Peanuts	0.4	1	13	11	0.03	<0.1
		2	24	22	0.05*	0.1
Pecans	0.2	1	6	6	0.01	<0.1
		6	33	30	0.07*	0.2
Peaches	0.15	1	5	4	0.01	<0.1
		8	33	30	0.07*	0.2
Bananas	0.135	1	4	4	<0.01	<0.1
		8	29	26	0.06*	0.2
Tomatoes	0.1	1	3	3	<0.01	<0.1
		8	24	22	0.05*	0.1
Wheat	0.2	1	6	6	0.01	<0.1
		2	13	11	0.03	<0.1

* the endangered species LOC (0.05) is equalled or exceeded, based on GENEEC-derived EECs

Acute high risk and restricted use LOCs are not exceeded for any use site. The endangered species LOC is equalled or exceeded for multiple applications on all use sites except wheat when exposure is based on preliminary EECs. For grapes and peanuts, however. LOCs are not exceeded when exposure is based on refined EECs. If refined EECs are assumed to be reduced 70-80% for the other use sites as well, no LOCs are exceeded for any use site. The chronic risk LOC is not exceeded for any scenario.

Freshwater Invertebrates

The acute and chronic RQs are tabulated below for single and multiple applications.

Risk Quotients for Freshwater Invertebrates, Based On the Waterflea EC50 of 259 ppb and NOEC of 44 ppb

Site	Appl. Rate (lb ai/A)	No. Applications	Initial EEC (ppb)	21-day-avg. EEC (ppb)	Acute RQ (EEC/LC50)	Chronic RQ (EEC/NOEC)
PRZM2/EXAM II						
Grapes	0.25	6	9.2	8.0	0.04	0.2
Peanuts	0.4	2	7.2	6.5	0.03	0.1
GENEEC						
Grapes	0.25	1	8	8	0.03	0.2
		6	43	40	0.16**	0.9
Peanuts	0.4	1	13	12	0.05*	0.3
		2	24	23	0.09*	0.5
Pecans	0.2	1	6	6	0.02	0.1
		6	33	32	0.13**	0.7
Peaches	0.15	1	5	5	0.02	0.1
		8	33	32	0.13**	0.7
Bananas	0.135	1	4	4	0.02	0.1
		8	29	28	0.11**	0.6
Tomatoes	0.1	1	3	3	0.01	0.1
		8	24	23	0.09*	0.5
Wheat	0.2	1	6	6	0.02	0.1
		2	13	12	0.05*	0.3

** restricted use and endangered species LOCs (0.1 and 0.05, respectively) are exceeded

* the endangered species LOC is equalled or exceeded

The acute high risk LOC is not exceeded for any use site, even when exposure is based on preliminary EECs, but the restricted use LOC is exceeded for multiple applications on grapes, pecans, peaches, and bananas. The endangered species LOC also is equalled or exceeded for multiple applications on all use sites and for a single application on peanuts. For grapes and peanuts, however, LOCs are not exceeded when exposure is based on refined EECs. If refined EECs are assumed to be reduced 70-80% for the other use sites as well, no LOCs are exceeded for any use site. The chronic LOC is not exceeded for any use site.

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Estuarine/Marine Fish

Acute RQs are tabulated below for single and multiple applications on peanuts and tomatoes. two use sites that might contaminate the estuarine/marine environment.

Acute Risk Quotients for Estuarine/Marine Fish, Based on a Sheepshead Minnow LC50 of 670 ppb

Site	Appl. Rate (lb ai/A)	No. Applications	Initial EEC (ppb)	Acute RQ (EEC/LC50)
PRZM2/EXAM II				
Peanuts	0.4	2	7.2	0.01
GENEEC				
Peanuts	0.4	1	13	0.02
		2	24	0.04
Tomatoes	0.1	1	3	<0.01
		8	24	0.04

Acute risk LOCs are not exceeded for either single or multiple applications on peanuts or tomatoes when exposure is based on either preliminary or refined EECs.

Estuarine/Marine Invertebrates

Acute RQs are tabulated below for single and multiple applications on peanuts and tomatoes, two use sites that might contaminate the estuarine/marine environment..

Acute Risk Quotients for Estuarine/Marine Aquatic Invertebrates, Based on a Mysid Shrimp LC50 of 56 ppb

Site	Appl. Rate (lb ai/A)	No. Applications	Initial EEC (ppb)	Acute RQ (EEC/LC50)
PRZM2/EXAM II				
Peanuts	0.4	2	7.2	0.13**
GENEEC				
Peanuts	0.4	1	13	0.23**
		2	24	0.43**
Tomatoes	0.1	1	3	0.05*
		8	24	0.43**

** restricted use and endangered species LOCs are exceeded
* the endangered species LOC is equalled or exceeded

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Restricted use and endangered species LOCs are exceeded for peanuts and tomatoes when exposure is based on preliminary EECs. Restricted use and endangered species LOCs also are exceeded for peanuts when exposure is based on refined EECs. Much uncertainty exists for these exposure estimates, however, because both the preliminary (GENEEC) and refined (PRZM2/EXAM II) exposure models are based on runoff and drift into a 1-ha freshwater pond and may not be as applicable to estuarine/marine waters.

Chronic risk cannot be assessed until chronic toxicity data are submitted.

Exposure and Risk to Nontarget Plants

Terrestrial and Semi-aquatic Plants

Terrestrial plants may be exposed to azoxystrobin from runoff, spray drift or volatilization. EFED's exposure scenario is: (1) based on a pesticide's water solubility and the amount of pesticide present on the soil surface and top one inch; (2) characterized as "sheet runoff" (one treated acre to an adjacent untreated acre) for plants inhabiting dry areas; (3) characterized as "channelized runoff" (10 treated acres to a distant untreated low-lying acre) for plants inhabiting semi-aquatic areas (i.e., low-lying wet areas that may be dry at certain times of the year); and (4) based on % runoff values of 0.01, 0.02, and 0.05 for water solubility of <10 ppm, 10-100 ppm, and >100 ppm, respectively. Spray drift exposure from ground application is assumed to be 1% of the application rate. Formulae for calculating EECs for terrestrial plants are provided in Attachment B.

EECs and RQs for non-endangered and endangered terrestrial plants (dry and semi-aquatic areas) based on a single application are tabulated below.

Acute High Risk Quotients for a Single Application, Based On a Carrot Seedling Emergence EC25 of 0.59 lb ai/A and an EC05 of 0.17 lb ai/A

Site[1]	Appl. rate (lb ai/A)	Total Loading to Adjacent Dry Area (Sheet Runoff+ Drift) (lb ai/A)	Total Loading to Semi-aquatic Area (Channelized Runoff+ Drift) (lb ai/A)	Terrestrial Plant RQs		Semi-Aquatic Plant RQs	
				Non-endang. species	Endangered species	Non-endang. species	Endangered species
Peanuts	0.4	0.008	0.0440	0.01	0.05	0.07	0.26
Grapes	0.25	0.005	0.0275	0.01	0.03	0.05	0.16

[1] only the two use sites with the highest single maximum application rates are tabulated

The results indicate that no plant acute LOCs are exceeded for terrestrial and semi-aquatic plants for a single application of azoxystrobin at maximum labeled rates for peanuts and grapes. Risk from drift alone is presumed to be negligible, because the 10 species in Tier I vegetative vigor testing were all inhibited less than 25%. Because single maximum

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application rates are less for pecans, peaches, bananas, tomatoes, and wheat, LOCs would not be exceeded for those use sites.

EECs and RQs for non-endangered and endangered terrestrial plants (dry and semi-aquatic areas) for multiple applications are tabulated below.

Acute High Risk Quotients for Multiple Applications, Based On a Carrot Seedling Emergence EC25 of 0.59 lb ai/A and an EC05 of 0.17 lb ai/A

Site[1]	Appl. rate (lb ai/A)	Total Loading to Adjacent Dry Area (Sheet Runoff+ Drift) (lb ai/A)	Total Loading to Semi-aquatic Area (Channelized Runoff+ Drift) (lb ai/A)	Terrestrial Plant RQs		Semi-Aquatic Plant RQs	
				Non-endang. species	Endangered species	Non-endang. species	Endangered species
Grapes	0.25 (6 appl.)	0.026	0.143	0.04	0.15	0.24	0.84
Pecans	0.20 (6 appl.)	0.021	0.114	0.03	0.12	0.19	0.67
Peanuts	0.4 (2 appl.)	0.015	0.083	0.02	0.09	0.14	0.49

[1] only the three use sites with the highest loading values are tabulate

The results indicate that multiple applications of azoxystrobin at maximum labeled rates would not exceed the LOC for either non-endangered or endangered terrestrial plants.

Aquatic Plants

Exposure to nontarget aquatic plants may occur through runoff and/or spray drift from treated sites. The acute toxicity value for duckweed *(Lemna gibba)* is used to assess risk to aquatic vascular plants. Acute risk to nonvascular aquatic plants is assessed using the most sensitive toxicity value from an algae or diatom species. An aquatic plant risk assessment for acute endangered species is usually made for aquatic vascular plants from the surrogate duckweed. To date there are no known nonvascular plant species on the endangered species list. Runoff and drift exposure is computed from GENEEC. The RQ is calculated by dividing the pesticide's peak concentration in water by the plant EC50 value for acute high risk and by the NOEC value for risk to endangered species.

RQs for vascular and nonvascular plants for single and multiple applications of azoxystrobin are tabulated below.

Acute and Endangered Species Risk Quotients for Aquatic Plants based upon a duckweed (*Lemna gibba*) EC50 of 3.4 ppm and an NOEC of 0.8 ppm and a nonvascular plant (*Kirchneria subcapitata*) EC50 of 0.1 ppm

Site[1]	Application rate (lb ai/A)	Maximum No. Applications	Test Species	Peak EC50 (ppb)	Acute RQ (EEC/EC50)	Endangered Species RQ (EEC/NOEC)
Grapes	0.25	1	duckweed	8	<0.1	<0.1
		1	algae	8	<0.1	n/a
		6	duckweed	43	<0.1	<0.1
		6	algae	43	0.4	n/a
Pecans	0.2	1	duckweed	5	<0.1	<0.1
		1	algae	5	<0.1	n/a
		6	duckweed	33	<0.1	<0.1
		6	algae	33	0.3	n/a

[1] only the two use sites with the highest aquatic preliminary EECs are tabulated

The acute high risk LOC is not exceeded for either vascular or nonvascular aquatic plants even when aquatic EECs are derived from GENEEC.

Endangered Species

When exposure estimates are based on refined EECs, endangered species acute LOCs are exceeded only for estuarine/marine invertebrates. However, this concern does not need to be addressed, because there are no federally listed endangered estuarine or marine invertebrates.

LABELING

End-use product: "This pesticide is toxic to freshwater and estuarine/marine fish and aquatic invertebrates. Do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high-water mark. Drift and runoff may be hazardous to aquatic organisms in neighboring areas. Do not contaminate water when disposing of equipment washwater or rinsate."

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ATTACHMENT A: AQUATIC PRELIMINARY EECS (GENEEC) FOR SINGLE AND MULTIPLE APPLICATIONS

Grapes (single application):

INPUT VALUES

RATE (#/AC) ONE(MULT)	APPLICATIONS NO.-INTERVAL	SOIL KOC	SOLUBILITY (PPM)	% SPRAY DRIFT	INCORP DEPTH(IN)
.250(.250)	1 1	210.0	6.7	1.0	.0

FIELD AND STANDARD POND HALFLIFE VALUES (DAYS)

METABOLIC (FIELD)	DAYS UNTIL RAIN/RUNOFF	HYDROLYSIS (POND)	PHOTOLYSIS (POND-EFF)	METABOLIC (POND)	COMBINED (POND)
164.00	2	N/A	14.00- 1717.80	.00	1717.80

GENERIC EECs (IN PPB)

PEAK GEEC	AVERAGE 4 DAY GEEC	AVERAGE 21 DAY GEEC	AVERAGE 56 DAY GEEC
7.94	7.88	7.60	7.16

Grapes (multiple applications):

INPUT VALUES

RATE (#/AC) ONE(MULT)	APPLICATIONS NO.-INTERVAL	SOIL KOC	SOLUBILITY (PPM)	% SPRAY DRIFT	INCORP DEPTH(IN)
.250(1.300)	6 14	210.0	6.7	1.0	.0

FIELD AND STANDARD POND HALFLIFE VALUES (DAYS)

METABOLIC (FIELD)	DAYS UNTIL RAIN/RUNOFF	HYDROLYSIS (POND)	PHOTOLYSIS (POND-EFF)	METABOLIC (POND)	COMBINED (POND)
164.00	0	N/A	14.00- 1717.80	.00	1717.80

GENERIC EECs (IN PPB)

PEAK GEEC	AVERAGE 4 DAY GEEC	AVERAGE 21 DAY GEEC	AVERAGE 56 DAY GEEC
41.75	41.46	39.98	37.67

31

Peaches (multiple applications):

INPUT VALUES

RATE (#/AC) ONE(MULT)	APPLICATIONS NO.-INTERVAL	SOIL KOC	SOLUBILITY (PPM)	% SPRAY DRIFT	INCORP DEPTH(IN)
.150(1.040)	8 10	210.0	6.7	1.0	.0

FIELD AND STANDARD POND HALFLIFE VALUES (DAYS)

METABOLIC (FIELD)	DAYS UNTIL RAIN/RUNOFF	HYDROLYSIS (POND)	PHOTOLYSIS (POND-EFF)	METABOLIC (POND)	COMBINED (POND)
164.00	0	N/A	14.00- 1717.80	.00	1717.80

GENERIC EECs (IN PPB)

PEAK GEEC	AVERAGE 4 DAY GEEC	AVERAGE 21 DAY GEEC	AVERAGE 56 DAY GEEC
33.39	33.16	31.97	30.12

Bananas (multiple applications):

INPUT VALUES

RATE (#/AC) ONE(MULT)	APPLICATIONS NO.-INTERVAL	SOIL KOC	SOLUBILITY (PPM)	% SPRAY DRIFT	INCORP DEPTH(IN)
.135(.910)	8 12	210.0	6.7	1.0	.0

FIELD AND STANDARD POND HALFLIFE VALUES (DAYS)

METABOLIC (FIELD)	DAYS UNTIL RAIN/RUNOFF	HYDROLYSIS (POND)	PHOTOLYSIS (POND-EFF)	METABOLIC (POND)	COMBINED (POND)
164.00	0	N/A	14.00- 1717.80	.00	1717.80

GENERIC EECs (IN PPB)

PEAK GEEC	AVERAGE 4 DAY GEEC	AVERAGE 21 DAY GEEC	AVERAGE 56 DAY GEEC
29.25	29.04	28.01	26.39

NOTE: EECs for peanuts, pecans, tomatoes, and wheat were determined similarily

ATTACHMENT B: PLANT EEC FORMULAE AND CALCULATIONS FOR A SINGLE APPLICATION TO GRAPES

Terrestrial plants inhabiting dry areas receiving sheet runoff

Runoff = 0.25 lb ai/A (maximum application rate) x 0.01 (runoff value)
= 0.0025 lb ai/A

Drift = 0.25 lb ai/A (max. appl. rate) x 1% (drift from ground appl.)
= 0.0025 lb ai/A

Total Loading = runoff + drift
= 0.005 lb ai/A

Terrestrial plants inhabiting semi-aquatic areas receiving channelized runoff

Runoff = 0.25 lb ai/A (max. appl. rate) x 0.01 (runoff value) x 10 (drainage basin acreage)
= 0.025 lb ai/A

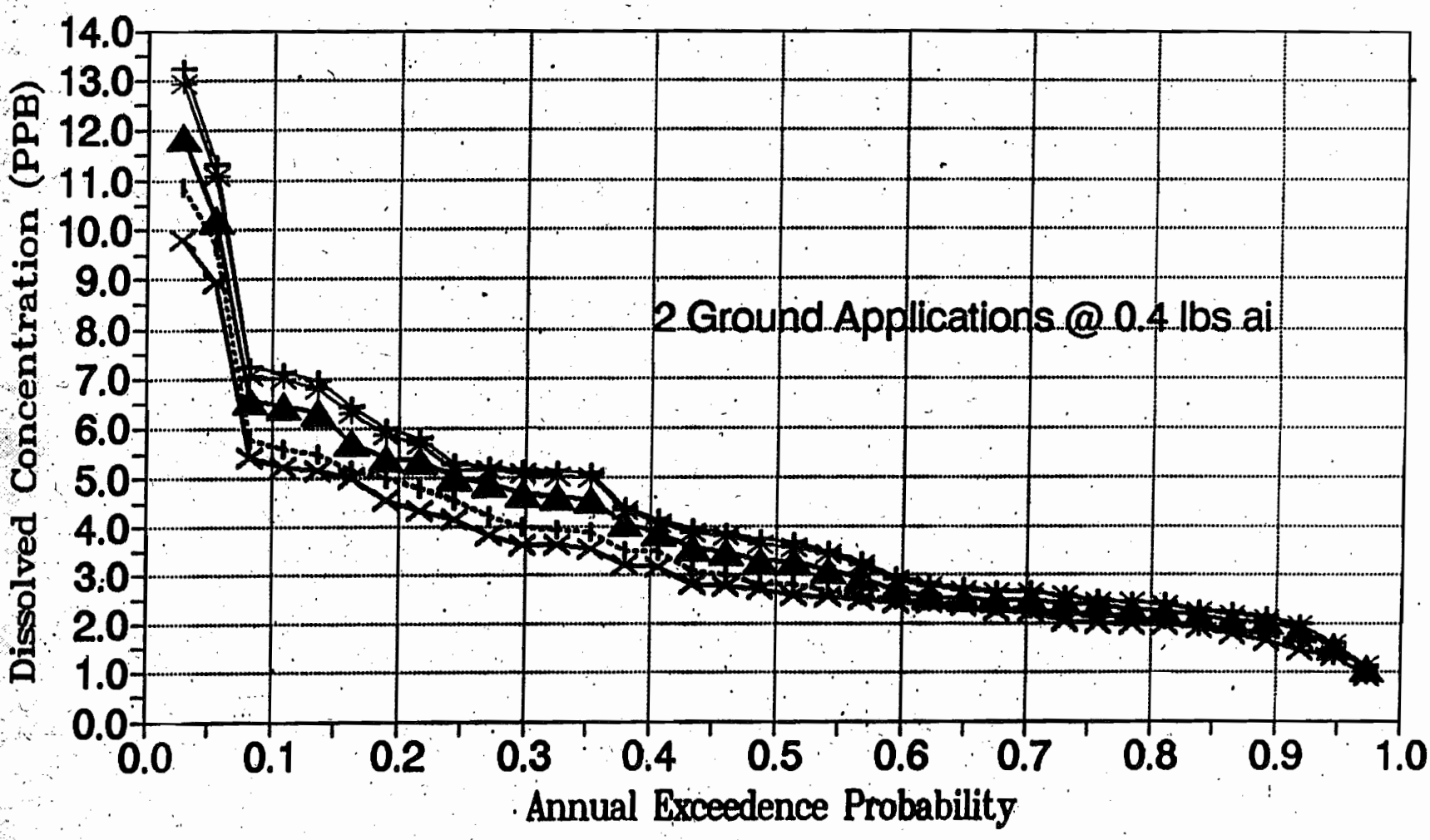
Drift = 0.25 (max. appl. rate) x 1% (drift from ground appl.)
= 0.0025 lb ai/A

Total Loading = runoff + drift
= 0.0275 lb ai/A

[1] Total loading for multiple applications is estimated from EFED's FATE program and is based on the estimated runoff or drift (lb ai/acre) from one application, the maximum number of applications allowed, the minimum interval (days) between applications, and the half-life (days) of the active ingredient. Runoff and drift values are determined separately and total loading estimated by combining the two values.

Azoxystrobin Pond EEC (PRZM2.3-EXAMS)

Peanuts on Tifton Loamy Sand



PEAK	4 DAY	21 DAY	60 DAY	90 DAY	RANK	EX PROB
13.24	12.94	11.88	10.856	9.8059	1	0.027027
11.309	11.08	10.21	9.6917	8.9311	2	0.054054
7.228	7.0789	6.574	5.7722	5.4209	3	0.081081
7.122	6.9939	6.4789	5.5682	5.2078	4	0.108108
6.9639	6.807	6.357	5.4984	5.1651	5	0.135135
6.4479	6.296	5.718	5.1465	5.0015	6	0.162162
6.0029	5.8669	5.387	4.9945	4.5575	7	0.189189
5.828	5.6979	5.355	4.8026	4.334	8	0.216216
5.271	5.1469	5.0169	4.5578	4.1525	9	0.243243
5.2099	5.139	4.891	4.2246	3.8368	10	0.27027
5.1429	5.105	4.684	3.9894	3.6276	11	0.297297
5.1259	5.025	4.612	3.949	3.6257	12	0.324324
5.1039	4.9919	4.574	3.9069	3.5457	13	0.351351
4.404	4.341	4.076	3.5196	3.2281	14	0.378378
4.169	4.0809	3.861	3.5079	3.1903	15	0.405405
3.9739	3.8839	3.5639	3.0704	2.804	16	0.432432
3.879	3.794	3.4819	3.0009	2.7863	17	0.459459
3.7259	3.6399	3.3129	2.8273	2.7153	18	0.486486
3.6569	3.58	3.2789	2.8169	2.6012	19	0.513514
3.5149	3.429	3.1039	2.681	2.5485	20	0.540541
3.2659	3.2099	2.9389	2.5921	2.4715	21	0.567568
2.9739	2.9099	2.684	2.4707	2.428	22	0.594595
2.8509	2.788	2.5469	2.4621	2.4214	23	0.621622
2.736	2.6739	2.5279	2.4116	2.3559	24	0.648649
2.7	2.643	2.4989	2.3457	2.2624	25	0.675676
2.698	2.6399	2.4929	2.298	2.2264	26	0.702703
2.5819	2.5709	2.435	2.2191	2.0259	27	0.72973
2.505	2.47	2.399	2.1746	1.985	28	0.756757
2.452	2.4419	2.305	2.1414	1.9532	29	0.783784
2.4419	2.3919	2.255	2.0489	1.9492	30	0.810811
2.2969	2.25	2.1739	1.9165	1.8855	31	0.837838
2.2449	2.197	2.043	1.879	1.746	32	0.864865
2.1519	2.108	2.0309	1.7647	1.6291	33	0.891892
2.004	1.959	1.8529	1.5838	1.4354	34	0.918919
1.6119	1.5789	1.5059	1.3431	1.3482	35	0.945946
1.1509	1.134	1.0599	0.937	0.9124	36	0.972973
1 in 10 Y EEC's						
7.1538	7.0194	6.5074	5.6294	5.2717		

Date: 03/12/97
Case No: 005533
Chemical No: 128810

NEW CHEMICAL REVIEW
DATA REQUIREMENTS FOR AZOXYSTROBIN
ECOLOGICAL EFFECTS BRANCH

Data Requirement	Composition[1]	Use Pattern[2]	Does EPA Have Data to Satisfy This Requirement? (Yes/No)	Bibliographical Citation	Must Additional Data Be Submitted Under FIFRA 3(c)(2)(B)?
6 Basic Studies in Bold					
71-1(a) Acute Avian Oral, Quail/Mallard	TGAI	A	Yes	436781-08, 436781-09	No
71-1(b) Acute Avian Oral, Quail/Mallard					
71-2(a) Acute Avian Dietary, Quail	TGAI	A	Yes	436781-10	No
71-2(b) Acute Avian Dietary, Mallard	TGAI	A	Yes	436781-11	No
71-3 Wild Mammal Toxicity					
71-4(a) Avian Reproduction, Quail	TGAI	A	No	436781-12[3]	Yes
71-4(b) Avian Reproduction, Mallard	TGAI	A	Yes	436781-13	No
71-5(a) Simulated Terrestrial Field Study					
71-5(b) Actual Terrestrial Field Study					
72-1(a) Acute Fish Toxicity, Bluegill	TGAI	A	Yes	436781-14	No
72-1(b) Acute Fish Toxicity, Bluegill					
72-1(c) Acute Fish Toxicity, Rainbow Trout	TGAI	A	Yes	436781-15	No
72-1(d) Acute Fish Toxicity, Rainbow Trout	DEGR	A	Yes[4]	441588-03	No
72-2(a) Acute Aquatic Invertebrate Toxicity	TGAI	A	Yes	436781-16	No
72-2(b) Acute Aquatic Invertebrate Toxicity	DEGR	A	Yes[4]	441588-01, -02, -04	No
72-3(a) Acute Estu/Marine Toxicity, Fish	TGAI	A	Yes	436781-17	No
72-3(b) Acute Estu/Marine Toxicity, Mollusk	TGAI	A	Yes	436781-18	No
72-3(c) Acute Estu/Marine Toxicity, Shrimp	TGAI	A	Yes	436781-19	No
72-3(d) Acute Estu/Marine Toxicity, Fish					
72-3(e) Acute Estu/Marine Toxicity, Mollusk					

Date: 03/12/97
Case No: 005533
Chemical No: 128810

NEW CHEMICAL REVIEW
DATA REQUIREMENTS FOR AZOXYSTROBIN
ECOLOGICAL EFFECTS BRANCH

Data Requirement	Composition[1]	Use Pattern[2]	Does EPA Have Data to Satisfy This Requirement? (Yes/No)	Bibliographical Citation	Must Additional Data Be Submitted Under FIFRA 3(c)(2)(B)?
72-3(f) Acute Estu/Marine Toxicity, Shrimp					
72-4(a) Early Life-Stage, Fish	TGAI	A	Yes	436781-20	No
72-4(b) Life-Cycle Aquatic Invertebrate	TGAI	A	Partially	436781-21	Yes[5]
72-5 Life-Cycle Fish					
72-6 Aquatic Organism Accumulation					
72-7(a) Simulated Aquatic Field Study					
72-7(b) Acutal Aquatic Field Study					
122-1(a) Seedling Emergence	TGAI or TEP	A	Yes[4]	436781-56	No
122-1(b) Vegetative Vigor	TGAI or TEP	A	Yes[4]	436781-58	No
122-2 Aquatic Plant Growth					
123-1(a) Seedling Emergence	TGAI or TEP	A	Yes[4]	433454-60	No
123-1(b) Vegetative Vigor					
123-2 Aquatic Plant Growth	TGAI or TEP	A	Yes[4]	436781-61, -62, -63 436781-64, -65	No
141-1 Honey Bee Acute Contact	TGAI	A	Yes	436781-66, -67[7]	No
141-2 Honey bee Residue on Foliage					

[1] Composition: TGAI=Technical grade of the active ingredient; PAIRA=Pure active ingredient; TEP=Typical end-use product

[2] Use Patterns: A=Terrestrial Food Crop; B=Terrestrial Feed Crop; C=Terrestrial Non-Food Crop; D=Aquatic Food Crop; E=Aquatic Non-Food Outdoor; F=Aquatic Non-food Industrial; G=Aquatic Non-Food Residential; H=Greenhouse Food Crop; I=Greenhouse Non-Food Crop; J=Forestry; K=Outdoor Residential; L=Indoor Food; M=Indoor Non-Food; N=Indoor Medical; O=Indoor Residential; Z=Use Group for Site 00000

[3] Invalid study

[4] Degradate testing is not required, but studies were submitted and reviewed

[5] A chronic toxicity study with the mysid shrimp is triggered by the acute toxicity (56 ppb), because the expected aquatic EEC of 7.2 ppb is greater than 0.01 of the EC50 (0.01 X 56 ppb = 0.56 ppb), and because contamination of estuarine/marine waters may occur due to use of azoxystrobin on peanuts, tomatoes, and pecans in coastal counties; however, the value of this study is "low", because coastal acreages of these crops is minor