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

OFFICE OF
PREVENTION, PESTICIDES, AND
TOXIC SUBSTANCES

March 30, 2004

MEMORANDUM

SUBJECT: Section 18 Ecological Risk and Drinking Water Exposure Assessment for the Control of Soybean Rust using:
- Propiconazole (122101); DP 296314
- Boscolid (128008); DP 296315
- Pyraclostrobin (099100); DP 296316
- Tetraconazole 120603); DP 296317
- Trifloxystrobin (129112); DP 296318
- Myclobutanil (128857); DP 296319
- Tebuconazole 128997); DP 296320

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The EFED has reviewed the emergency exemption request from the Minnesota and South Dakota Departments of Agriculture to use selected fungicides (boscalid, myclobutanil, propiconazole, pyraclostrobin, tebuconazole, tetraconazole, and trifloxystrobin) for the control of soybean rust. The assessments were based on one of two approaches. In the first approach, previous assessments for crops with equivalent or higher uses and/or exposure scenarios (e.g., use on turf) were used with the assumption that resulting exposures and potential risks would not be higher for the proposed use on soybeans. The second approach, used when the first approach was insufficient, or an assessment of risk had not been conducted, or where risks were identified with the use of previous assessments that could not be mitigated, a soybean specific assessment was performed. The type of assessment is noted in the document for a particular fungicide where appropriate.

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For the drinking water exposure assessment, the crop yielding the highest estimated environmental concentration from all registered uses is presented below. The assessment containing the source information (i.e., pesticide application schedule, fate inputs and scenario) is identified by a DP Barcode number as a footnote to Table 2. The only exceptions to this approach is for tetraconazole, where no registered uses have been granted. In this case, a soybean specific drinking water assessment was performed (**Appendix I**). In addition, propiconazole's existing assessments were conducted using GENEEC as the Tier I drinking water assessment. An updated Tier I assessment was conducted using FIRST (**Appendix II**).

Based on the approach for determining the potential risks to non-target organisms, EFED concludes that, except for myclobutanil, propiconazole, and tebuconazole, the proposed uses may present potential risks to non-target organisms, including Federally-listed endangered and threatened species. Included in this assessment are:

- a summary of potential risks associated with the use of each chemical (**section I**);
- estimated drinking water concentrations (EDWC) for each chemical (**section II**). The EDWCs are based on the highest rates among all existing and proposed uses and the most conservative modeling scenario(s) except for tetraconazole; and
- rates and DP barcodes for this exemption request (**section III**).

Although this risk assessment addresses the specific requests for the states of Minnesota and South Dakota, each chemical's analysis of exposures and potential risks was approached from the perspective of a "national" new use assessment. The assessment of potential ecological risks for a given chemistry is based on use rates, number of applications, and interval between applications outlined in the Minnesota Section 18 request. Higher rates, more frequent applications, or different intervals for Section 18's to control soybean rust from other states are likely to change the conclusions concerning potential risks to terrestrial and aquatic non-target organisms outlined below.

Through the approach taken in assessing potential risks associated with these chemistries, the Registration Division may use these assessments to address requests from other states for emergency exemption to control soybean rust.

I. SUMMARY OF RISKS

Table I - Summary of Risks for the use of selected pesticides to control rust on soybeans

	Acute Risk	Acute Restricted Use	Acute Endangered Species	Chronic Risk	Risk for Plants
Avians			Tetraconazole	Tetraconazole	
Terrestrial Mammals				Pyraclostrobin Boscalid	
Terrestrial Insects					
Terrestrial Plants					
Freshwater Fish		Pyraclostrobin	Pyraclostrobin		
Estuarine/Marine Fish					
Freshwater Invertebrates			Pyraclostrobin		
Estuarine/Marine Invertebrates		Pyraclostrobin	Pyraclostrobin Trifloxystrobin		
Aquatic Plants					
Freshwater Vascular - *Lemna gibba* (Non-endangered)					
Freshwater Vascular - *Lemna gibba* (Endangered)					
Freshwater Non-vascular plants					
Estuarine/marine Non-vascular plants					

[1] Boscalid

The following LOCs are exceeded for use on soybeans:

- Chronic LOC (RQ = 1.1) for terrestrial mammals using two maximum applications of 0.253 lbs a.i./acre. This exceedance could be mitigated by reducing the maximum application rate by 10 percent or by limiting the number of applications to one per year.
- Since the chronic LOC is exceeded, there is potential risk to non-endangered, endangered and threatened mammals. Risk Quotients (RQ) are exceeded for short grass food item based on the maximum values identified in Hoerger and Kenaga (1972) as modified by Fletcher *et al.* (1994). If based on the mean residues, the RQ does not exceed the chronic LOC.

[2] **Pyraclostrobin**

The following LOCs are exceeded for use on soybeans:

- Acute restricted LOCs for freshwater fish (RQ = 0.2) and estuarine/marine invertebrates (RQ = 0.3) based on 2 applications, 7 days apart at 0.196 lbs a.i./acre. Lowering the maximum use rate in half would reduce exposures such that restrictions for use by certified applicators would not be necessary. Results reflect the use Tier II exposure modeling.
- Acute endangered LOCs for most aquatic organisms (freshwater fish, RQ = 0.2; freshwater invertebrates, RQ = 0.08; and estuarine/marine invertebrates, RQ = 0.3) based on same application schedule. Currently there are no Federally listed estuarine/marine endangered invertebrates. For freshwater endangered invertebrates, risk mitigation could be accomplished by reducing the maximum use rate in half. However, for freshwater fish, the likelihood of risk mitigation is low unless the rate reduction is significant (75 percent or more) which may render the chemical ineffective for its intended purpose. Results reflect the use Tier II exposure modeling.
- Chronic LOCs for small and medium-sized herbivorous and insectivorous mammals from one application. The estimated residue concentration in food items from a single application exceeded chronic LOCs for small (RQs = 4.1 to 8.9) and medium-sized (RQs = 2.9 to 6.2) herbivorous and insectivorous mammals. The chronic LOCs for large herbivorous and insectivorous mammals were exceeded only for short grass category (RQ = 1.4).
- Chronic LOCs for small, medium, and large-sized herbivorous and insectivorous mammals from multiple (2) applications (RQs = 1.1 to 16.7) . Potential for mammalian risk mitigation through rate reduction appears limited unless application rates can be reduced by greater than 75% without loss of efficacy.

[3] **Trifloxystrobin**

The following LOCs are exceeded for use on soybeans:

- LOCs for endangered and threatened estuarine/marine invertebrates based on the highest application rates for other uses (01.25 lb ai/A/application, 2 applications per year, 14 days interval). However, there are no Federally listed estuarine/marine invertebrate endangered species, therefore, risks to endangered estuarine/marine invertebrates was not refined.

[4] **Tetraconazole**

- No LCOs exceeded for aquatic non-target organisms based on 2 applications 7 days apart at 0.102 lbs. a.i./acre. LOCs were not exceeded for birds from a single application, however multiple (2) applications of tetraconazole pose a potential acute risk for endangered birds feeding exclusively on short grass. This LOC exceedance could be mitigated for multiple applications with a rate reduction of 15-20%.
- Potential chronic risks are expected for birds feeding on short grass (RQ = 4.6), tall grass (RQ = 2.1), and broadleaf plants and small insects (RQ = 2.6) for multiple (2) applications and for birds feeding on short grass (RQ = 2.45), tall grass (RQ = 1.12), and broadleaf plants and small insects (RQ = 1.38) for a single application. Exceedances of the chronic LOCs can be mitigated with rate reductions of greater than 15% for single applications and greater than 50% for multiple (2) applications based on the rate of 0.102 lbs. a.i./acre.

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Myclobutanil

- No LOCs exceeded based on the currently proposed application rate; 2 applications, 10 days apart at 0.125 lbs. a.i./acre.

Propiconazole

- No LOCs exceeded based on the currently proposed application rate; 2 applications, 10 days apart at 0.225 lbs. a.i./acre.

Tebuconazole

- No LOCs exceeded based on the currently proposed application rate; 2 applications, 10 days apart at 0.112 lbs. a.i./acre.

II - ESTIMATED DRINKING WATER CONCENTRATIONS (EDWC)

Drinking water exposures are based on the highest application rates or the most conservative exposure scenario, as appropriate, for each pesticide with the exception of tetraconazole. Tetraconazole is presently an unregistered compound undergoing review for registration. Exposure estimates are based on the proposed Section 18 use pattern and the use of the Georgia and Mississippi soybean scenarios. Results are reported for the highest exposure scenario, Georgia soybeans. Input parameter are located in Appendix I for tetraconazole. Application scenarios for all other scenarios that formed the basis of the drinking water assessment are provided below along with the most recent action as a reference. The exposure scenarios and environmental fate information for each compound may be found in the most recent registration action referenced for these compounds.

Table II - Estimated Drinking Water Concentrations for Soybean Rust Section 18

	Surface Water (PRZM/EXAMS) (ppb)			Surface Water (FIRST) (ppb)		Ground Water (SCI-GROW) (ppb)
	Peak	1 in 10 Year Annual Average	30-year Annual Average	Peak	Annual Average	Peak/ Average
Myclobutanil[1]				333	86	3.2
Propiconazole[2]				264	80	1.5
Boscolid[3]				87.5	25.8	0.63
Tebuconazole[4]	39	23	19			0.4
Pyraclostrobin[5]	23	1.9	1.2			0.02
Trifloxystrobin[6]				90	50	2.4
Trifloxystrobin[7]				140	140	2.4
Tetraconazole[8]	5.0	1.0	0.6	16	4.5	0.5

[1] **Myclobutanil**: based on 15 applications per year, 0.65 lb ai/A per application at 14-day interval: DP 289700, 290167
[2] **Propiconazole**: based on 8 applications per year, 0.885 lb ai/A per application at 14-day interval: Appendix II
[3] **Boscolid:** based on 6 applications to turf per year, 0.35 lb ai/A per application at 14-day interval: DP 293435, 293436
[4] **Tebuconazole**: based on 6 applications per year, 0.225 lb ai/A per application at 7-day interval: DP 269918
[5] **Pyraclostrobin**: based on 6 applications per year, 0.5 lb ai/A per application at 14-day interval: DP 269625, 275457, 277844, 269603, 274092, 275038
[6] **Trifloxystrobin:** based on 3 applications year on turf, 0.359 lb ai/A per application at 14-day interval. These values represent parent trifloxystrobin and its degradates: DP 275178
[7] **Trifloxystrobin:** based on 2 applications year on rice, 0.153 lb ai/A per application at 14-day interval. These values represent parent trifloxystrobin and its degradates: DP 275178. Note that these EDWCs were calculated by applying the total annual application to the paddy and partitioning the pesticide between the water and the paddy sediment according to the K_d partitioning coefficient of the pesticide. No degradation process of the chemical and no dilution with uncontaminated water outside of the paddy were taking into account. Therefore these calculated EDWCs are expected to vastly exceed the "true" values found in the environment, especially since parent trifloxystrobin degrades fairly rapidly in water and soil.
[8] **Tetraconazole**: based on 2 applications per year, 0.102 lb ai/A per application at 7-day interval: Appendix I

The above reported EDWCs were based on the highest use rates for each chemical and/or on the most conservative chemical-specific DW assessment modeling scenario(s) currently available. Therefore, EFED does not expect that the uses of these chemicals for soybean rust (as described in the MN Department of Agriculture Section 18 request) would result in DW residues greater than those reported.

III - PROPOSED USES ON SOYBEANS

Propiconazole: 0.112 - 0.225 lb ai/A (Tilt, PropiMax EC, and Bumper - 41.8% Propiconazole)
0.044 - 0.081 lb ai/A (Stratego - 11.4% Propiconazole, 11.4% Trifloxystrobin)
DP 296314

Boscalid: 0.124 - 0.253 lb ai/A (Pristine - 25.2 % Boscalid, 12.8% Pyraclostrobin)
DP 296315

Pyraclostrobin: 0.100 - 0.194 lb ai/A (Headline - 23.6% Pyraclostrobin)
0.063 - 0.128 lb ai/A (Pristine - 12.8% Pyraclostrobin, 25.2 % Boscalid)
DP 296316

Tetraconazole: 0.077 - 0.1 lb ai/A (Domark, 11.6% Tetraconazole) -
DP 296317

Trifloxystrobin: 0.044 - 0.081 lb ai/A (Stratego, 11.4% Trifloxystrobin, 11.4% Propiconazole)
DP 296318

Myclobutanil: 0.062 - 0.125 lb ai/A (Laredo EC, 25% Myclobutanil)
DP 296319

Tebuconazole: 0.081 - 0.112 ai/A (Folicur, 38.7% Tebuconazole)
DP 296320

Method of Application: Ground or Aerial
Frequency of Application: Not to exceed 2 applications per year
Application Intervals: 10-14 days for Myclobutanil; 10 days was assumed for Propiconazole and Tebuconazole; 7 days for others.

Appendix I: Tetraconazole Tier II Drinking Water Input Parameter

Drinking Water Assessment for the Use of Tetraconazole on Soybean

1- Surface Water Modeling

Tier II PRZM-EXAMS modeling was performed using index reservoir (IR) scenarios with percent crop area (PCA) adjustment factors for the use of tetraconazole on soybean. The maximum application rate for soybean is 0.102 lbs ai/acre with 2 applications at 7 days interval. The default PCA factor of 0.41 was used since tetraconazole is not registered for use on any crops other than this emergency exemption for use on soybean. The PCA is a generic watershed-based adjustment factor which is applied to pesticide concentrations estimated for the surface water component of the drinking water exposure assessment using PRZM/EXAMS with the index reservoir scenario. The output generated by the PRZM/EXAMS model is multiplied by the maximum PCA in any watershed (expressed as a decimal) generated for the crop or crops of interest.

Table 1 presents the input parameters used in the drinking water modeling. The estimated concentrations of tetraconazole in surface drinking water are presented in Table 2.

Table 1. PRZM/EXAMS Input Parameters for Tetraconazole Use on Soybean

Parameter	Input Value and Unit	Source
Maximum Application Rate	0.102 lb a.i. $acre^{-1}$	Product label
Maximum Number of Applications	2	Product label
Method of application	aerial and ground spray	Product label
Minimum Interval between Applications	7 days	Product label
Partition Coefficient K_{oc}	461 ml/g	MRID 44367006
Vapor pressure	1.35e-6 mm Hg	Exp VP (EPI Suit)
Henry's law constant	4.24e-9 atm m^3/mole	Exp HLC (EPI Suit)
Solubility in water (pH 7, 20°C)	159 mg/L ppm	MRID 44268104
Hydrolysis	stable	
Aerobic Soil Metabolism	stable	MRID 44367005
Aerobic Aquatic Metabolism $(t_{1/2})^2$	447 days	MRID 44751319
Aquatic Photolysis $t_{1/2}$ (days) [3]	stable	MRID 44367003

Table2. Estimated Concentrations of Tetraconazole in Surface Drinking Water Using IR/PCA PRZM/EXAMS Scenarios			
Crop Scenario	**1 in 10 year Annual Peak (Acute) Conc. (ppb)**	**1 in 10 year Annual Daily Mean (Chronic-Non cancer) Conc. (ppb)**	**30 year Annual Average (Chronic-cancer) Concentration (ppb)**
Mississippi Soybean	2.67	0.93	0.71
Georgia Soybean	4.96	1.03	0.63

2. Ground Water Modeling

The SCI-GROW model version 2.2 was used to estimate the concentration of tetraconazole in ground water. SCI-GROW estimated the concentration of tetraconazole in shallow ground water sources to be **0.51 ppb**. Input parameters for SCI-GROW are presented in Table 3.

Table3. SCI-GROW Input Parameters			
Model Input Parameters	Input Value	Comments	Source
Aerobic Soil Metabolism $t_{1/2}$	stable	1000 days was used	MRID # 41325501
K_{oc}	428 ml/g	Lowest Koc value	MRID # 41101105, 41617201
Application Rate	0.102 lbs ai/acre		Label
Max. Number of Application Per Season	2 application		Label

Appendix II: Propiconazole Tier II Drinking Water Input Parameter

Drinking water assessment for propiconazole is based on the highest registered use rate. The maximum allowed annual use rate on turf and ornamentals is 7.08 lbs a.i./acre. A typical treatment at this rate would be 8 aerial applications at a rate of 0.885 lb a.i./acre with a 14 day interval to produce a maximum annual use rate of 7.08 lbs a.i./acre. Tier I drinking water screening model (First version 1.0) predicts that the peak concentration (acute) of propiconazole in drinking water from surface water sources is not likely to exceed **264.0 ppb**. The annual average concentration (chronic) of propiconazole in drinking water is not likely to exceed **80.0 ppb.** SCI-GROW modeling. Predicts the concentration of propiconazole in drinking water from shallow ground water sources to be **1.46 ppb.**

MODEL INPUT VARIABLE	INPUT VALUE	SOURCE
Chemical Name	Propiconazole	EFED One-liner
Water Solubility	110 ppm	EFED One-liner
Hydrolysis (pH 7)	$T_{1/2}$ = stable	MRID No. 42238201
Photolysis (pH 7)	$T_{1/2}$ = stable	MRID No. 41811901
Aerobic Soil Metabolism	$T_{1/2}$ = 69 days	ACC. No. 244269
Aerobic Aquatic Metabolism	426 days	MRID No. 42347901
K_{oc}	382 ml/g (*smallest K_{oc} value*)	MRID No. 41727001
Application Rate	0.885 lbs a.i./acre	Label (ORBIT EPA Reg. No. 100-702)
Max. Number of Applications per year	8	Label (ORBIT EPA Reg. No. 100-702)
Interval Between Applications	14 days	Label (ORBIT EPA Reg. No. 100-702)