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

OFFICE OF
PESTICIDES AND TOXIC
SUBSTANCES

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MEMORANDUM

SUBJECT: Tier I Estimated Environmental Concentrations for Fenbuconazole used on wheat
PC Code: 129011
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## CONCLUSIONS

Our screening models predict that the peak (acute) concentrations of fenbuconazole in surface water are not likely to exceed 1.73 µg/l for aerial spray applications and 1.37 µg/l for ground spray applications on wheat. The 56-day (chronic) concentrations of fenbuconazole in surface water are predicted not likely to exceed 0.93 µg/l for aerial spray applications and 0.75 µg/l for ground spray applications on wheat. The acute and chronic concentrations of fenbuconazole in shallow ground water

are predicted not likely to exceed 0.008 μg/l.

**USAGE DATA**

According to the label (GOVERN 75 WSP EPA Reg. No. 707-239, GOVERN 2F EPA Reg. No. 707-231), fenbuconazole will be applied on wheat by either aerial or ground spray. The maximum allowed rate of application is 0.063 lbs a.i./acre. The instructions allow up to 3 applications with a 14 day interval to produce a maximum annual use rate of 0.189 lbs a.i./acre. This application rate is lower than the presently registered use rate for fenbuconazole on stone fruit and pecans. The label instructions prohibit direct over-spray of aquatic habitats and establish a 75-ft setback from these areas.

**ENVIRONMENTAL FATE**

The principal route of fenbuconazole dissipation appears to be adsorption to soil, with increased adsorption associated with higher soil organic matter content. Mineralization to $CO_2$ of the phenyl moiety and soil photolysis appear to be less important routes of dissipation. The triazole moiety of the molecule appears to be persistent.

Fenbuconazole is moderately persistent to persistent with surface degradation half-lives ranging from 79 days for soil photolysis to 367 days for aerobic soil metabolism. Degradation of fenbuconazole in subsurface soil horizons is expected to occur slowly, as the compound is stable to hydrolysis at pH 5, 7, and 9 and degrades in soil under anaerobic conditions with half-lives of 451-655 days.

Fenbuconazole appears to be slightly mobile to immobile in soil, with $K_d$'s ranging from 5 to 115 and $K_{oc}$'s ranging from 2185 to 9042; adsorption increased with increasing soil organic matter. Aged residues exhibited slight potential to leach in sandy loam columns. Acceptable terrestrial field dissipation data indicate that fenbuconazole will be moderately persistent to persistent in the field (half-lives at four sites were from 157 to 407 days); minimal leaching of parent and degradates was observed.

Because of its adsorption to soil, the potential for fenbuconazole to leach to ground water appears to be slight. However, the potential to contaminate ground water may be greater at vulnerable sites, i.e., where soils are low in organic matter where ground water is relatively close to the surface. The long half-lives of aerobic soil and terrestrial field dissipation indicate that when fenbuconazole is applied over multiple growing seasons, it may result in soil residue accumulation. These residues may be available for rotational crop uptake or may be transported with sediments during runoff events. Fenbuconazole did not bioaccumulate significantly in bluegill sunfish; 95-98% of accumulated residues were eliminated during a 14-day depura-

tion period.

**SURFACE WATER ASSESSMENT:**

**GENEEC**(1)

The GENEEC model was used to estimate surface water concentrations for fenbuconazole from the proposed use on wheat. The input values for GENEEC are listed in Table 1. GENEEC version 1.2 dated May 3, 1995 was used for the calculations.

**Table 1. GENEEC Input Parameters**

| MODEL INPUT VARIABLE | INPUT VALUE | SOURCE |
|---|---|---|
| Chemical Name | Fenbuconazole | EFED One-liner |
| Solubility | 2.7 ppm | EFED One-liner |
| Hydrolysis | $T_{1/2}$ = stable | MRID No. 41031246 |
| Photolysis | $T_{1/2}$ = 87 days | MRID No. 41875023 |
| Aerobic Soil Metabolism | $T_{1/2}$ = 367 | MRID No. 41031247 |
| Aerobic Aquatic Metabolism | N/A | N/A |
| $K_{oc}$ | 2185* | MRID No. 41031249 |
| Application Rate | 0.063 lbs a.i./acre | Label (GOVERN 75 WSP EPA Reg. No. 707-239, GOVERN 2F EPA Reg. No. 707-231) |
| Max. Number of Applications per year | 3** | Label (GOVERN 75 WSP EPA Reg. No. 707-239, GOVERN 2F EPA Reg. No. 707-231) |
| Interval Between Applications | 14 days | Label (GOVERN 75 WSP EPA Reg. No. 707-239, GOVERN 2F EPA Reg. No. 707-231) |

** The smallest $K_{oc}$ value was used in order to produce the highest (most conservative) exposure value.*

*** Three applications, 14 days apart, were used in order to produce the highest(most conservative) exposure value.*

The GENEEC modeling predicts that the peak (acute) concentrations of fenbuconazole in surface water are not likely to exceed 1.73 μg/l for aerial spray applications and 1.37 μg/l for ground spray applications on wheat. The 56-day (chronic) concentrations of fenbuconazole in surface water are predicted not likely to exceed 0.93 μg/l for aerial spray applications and 0.75 μg/l for ground spray applications on wheat (Table 2). These estimates are based on a total annual use rate of 0.189 lbs ai/acre (i.e. 0.063 lbs a.i./acre x 3 applications). The GENEEC values represent upper-bound estimates of the concentrations that might be found in surface water due to fenbuconazole use on wheat.

**Table 2. GENEEC CONCENTRATIONS FOR FENBUCONAZOLE USE ON WHEAT**

| APPLICATION METHOD | GENEEC Peak EEC (μg/l) | GENEEC 56 Day EEC (μg/l) |
|---|---|---|
| Aerial Spray | 1.73 | 0.93 |
| Ground Spray | 1.37 | 0.75 |

GENEEC is a screening model designed by the Environmental Fate and Effects Division (EFED) to estimate the concentrations found in surface water for use in ecological risk assessment. As such, it provides upper-bound values on the concentrations that might be found in ecologically sensitive environments because of the use of a pesticide. It was designed to be simple to use and to only require data which is typically available early in the pesticide registration process. GENEEC is a single event model (one runoff event), but can account for spray-drift from multiple applications. GENEEC is hardwired to represent a 10-hectare field immediately adjacent to a 1-hectare pond that is 2 meters deep with no outlet. The pond receives a spray drift event from each application plus one runoff event. The runoff event moves a maximum of 10% of the applied pesticide into the pond. This amount can be reduced due to degradation on the field and the effects of soil binding in the field. Spray drift is equal to 1 and 5% of the applied rate for ground and aerial spray application, respectively.

GENEEC is not an ideal tool for drinking water risk

assessments. Surface-water-sourced drinking water tends to come from bodies of water that are substantially larger than a 1-hectare pond. Furthermore, GENEEC assumes that essentially the whole basin receives an application of the chemical. In virtually all cases, basins large enough to support a drinking water facility will contain a substantial fraction of area that does not receive the chemical. Furthermore, there is always at least some flow (in a river) or turn over (in a reservoir or lake) of the water so the persistence of the chemical near the drinking water facility is usually over estimated by GENEEC. Given all this, GENEEC should provide an upper bound on the concentration of pesticide that could be found in drinking water and therefore can be appropriately used in screening calculations. If a risk assessment performed using GENEEC output does not exceed the level of concern, then one can be reasonably confident that the risk will also be below the level of concern. However, since GENEEC can substantially overestimate true drinking water concentrations, it will be necessary to refine the GENEEC estimate if the level of concern is exceeded.

**GROUND WATER ASSESSMENT**

The ground water assessment is based solely on SCI-GROW[2] modeling because ground-water monitoring data is not available for fenbuconazole[3]. SCI-GROW is a screening level model developed by Michael Barrett to estimate the maximum groundwater concentration from the application of a pesticide to crops. The input values for SCI-GROW are listed in Table 3. SCI-GROW version 1.0 dated May 22, 1997 was used for the calculations.

**Table 3. SCI-GROW Input Parameters**

| MODEL INPUT VARIABLE | INPUT VALUE | SOURCE |
|---|---|---|
| Chemical Name | Fenbuconazole | EFED one-liner |
| Aerobic Soil Metabolism | $T_{1/2}$ = 367 | MRID No. 41031247 |
| $K_{oc}$ | 2844* | MRID No. 41031249 |
| Application rate | 0.063 lbs a.i./acre | Label (GOVERN 75 WSP EPA Reg. No. 707-239, GOVERN 2F EPA Reg. No. 707-231) |
| Max. Number of Applications/Year | 3 | Label (GOVERN 75 WSP EPA Reg. No. 707-239, GOVERN 2F EPA Reg. No. 707-231) |

** Median Value*

SCI-GROW Modeling predicts that the concentration of fenbuconazole in drinking water from ground sources is not likely to exceed 0.008 $\mu$g/l (Table 4).

**Table 4. SCI-GROW CONCENTRATION FOR FENBUCONAZOLE USE ON WHEAT**

| APPLICATION METHOD | Total Annual Use Rate* (lbs a.i./acre) | SCI-GROW Acute and Chronic EEC ($\mu$g/l) |
|---|---|---|
| Aerial Spray Or Ground Spray | 0.189 | 0.008 |

** The total annual use rate is equal to the application rate times the maximum number of applications allowed per year (i.e. 0.063 lbs/acre × 3 applications = 0.189 lbs/acre).*

SCI-GROW is based on the fate properties of the pesticide, the application rate, and the existing body of data from small-scale groundwater monitoring studies[3]. The model assumes that the pesticide is applied at its maximum rate in areas where the groundwater is particularly vulnerable to contamination. In most cases , a considerable portion of any use area will have ground water that is less vulnerable to contamination than the areas used to derive the SCI-GROW estimates.

EFED notes that the wheat growing region has small areas with high ground water vulnerability index[4]. These areas are located in the Platte River Basin in Nebraska and the Arkansas River Basin in Kansas.