6-21-93

**MEMORANDUM**

**SUBJECT:** Updated Ground Applied EEC, Aerial EEC and Response to DowElanco Rebuttal of Flumetsulam Science Chapter (D189826)

**FROM:** Anthony F. Maciorowski, Chief
Ecological Effects Branch
Environmental Fate and Effects Division (H7507C)

**TO:** Joanne Miller, PM-23
Fungicide-Herbicide Branch
Registration Division (H7505C)

The Ecological Effects Branch has reviewed the DowElanco rebuttal for Flumetsulam Science Chapter. In addition, EEB has provided a plant risk assessment with updated EEC for ground applied flumetsulam based on EFGWB models and has provided a plant risk assessment based on calculated ECC for aerial application. This action is under D189826.

**1.** Registrant has expressed concern that flumetsulam not be compared to sulfonylurea class of herbicides. EEB recognized that flumetsulam is not a sulfonylurea but a sulfonanilide herbicide. The ecological effects assessment will stand solely on the basis of properties and behavior of the flumetsulam molecule.

**2.** Registrant has provided modeling to show that Flumetsulam may not transport with runoff at the rates EEB previously anticipated. That modeling and information on the fate of the chemical was provided to EFGWB for their evaluation. EFGWB's evaluation will be incorporated into the EEB risk assessment below. Calculations of EEC are attached.

**A. Ground applied EEC from models or calculations**

PRZM1-EXAMS: Corn/Soybeans on Mississippi Loring Silt Loam

EEC values based on PRZM1-EXAMS model from EFGWB with an annual exceedence probabilty of 10% over 36 years. Maximum initial 48 hour EEC in 6 ft pond is **14 ppb** (See Fig. A). In 6 inches of water, the EEC = **169 ppb.** EEC of semi-aquatic plants in wetlands would be **0.229508 lb ai/A.**

PRZM1-EXAMS: Corn or Soybeans on Iowa Fayette Silt Loam
EEC values based on PRZM1-EXAMS model from EFGWB with an annual exceedence probabilty of 10% over 36 years. Maximum initial 48 hour EEC in 6 ft pond is **5.5 ppb** (See Fig. B). In 6 inches of water, the EEC = **66.3 ppb.** EEC of semi-aquatic plants in wetlands would be **0.090164 lb ai/A.**

PRZM: Corn or Soybean on Mississippi Loring Silt Loam
Runoff of flumetsulam from soybean or corn ground application will go onto adjacent acreages. The EEC values are based on PRZM model made by EFGWB over 36 year period with an annual exceedence probability of 10%. The loss of flumetsulam in runoff from a single storm is 3% of the total application at the edge of the field (See Fig. C). The EEC for runoff affecting non-target terrestrial plants is **0.0201 lb ai/A**.

PRZM: Corn or Soybean on Iowa Fayette Silt Loam
Runoff of flumetsulam from soybean or corn ground application will go onto adjacent acreages. The EEC values are based on PRZM model made by EFGWB over 36 year period with an annual exceedence probability of 10%. The loss of flumetsulam in runoff from a single storm is 2.1% of the total application at the edge of the field (See Fig. D). The EEC for runoff affecting non-target terrestrial plants is **0.0141 lb ai/A**.

**B. Aerial application EEC calculation:**

If aerial application is labeled at 0.67 lb ai/A;

the EEC from drift alone would be **0.0335 lb ai/A**

the aquatic pond EEC from drift and runoff would be:
**0.04727 lb ai/A or**
**10.4 ppb in 6 ft of water or**
**169 ppb in 6 inches of water**

The drift and runoff as a result of aerial application will go onto adjacent acreages to affect non-target terrestrial plants from one acre to one acre. EEC for runoff and drift affecting non-target terrestrial plants near site of application is **0.04556 lb ai/A**

**C. Plant toxicity values**

Aquatic plant toxicity:
*Selenastrum capricornutum* $EC_{50}$=3.31 ppb
*Lemna gibba* $EC_{50}$= 3.1 ppb



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Terrestrial plant toxicity:

cucumber emergence $EC_{25}$= 0.00159 lb ai/A (from seedling emergence study) for runoff

From the vegetative vigor study for drift only:
onion $EC_{25}$ =0.0004 lb ai/A for shoot weight
radish $EC_{25}$ =0.0003 lb ai/A for shoot length and shoot weight.

**D. Plant Risk Assessment**

a. Aerial application

EEC calculations indicate that **non-target aquatic and semi-aquatic plants (including endangered plants) in 6 feet or 6 inches of water (wetlands) are expected to be adversely affected from runoff and drift on soils that range from Iowa Fayette Silt Loam to Mississippi Loring Silt Loam.**

**EEC calculations indicate that non-target terrestrial plants (including endangered plants) are expected to be adversely affected from drift by a factor of a hundred and ten.**

b. Ground application

EFGWB EEC models indicate that **aquatic and semi-aquatic (wetland) non-target plants (including endangered plants) are expected to be adversely affected from proposed labeled use of flumetsulam on soils that range from Iowa Fayette Silt Loam to Mississippi Loring Silt Loam in a 6 ft or 6 inch deep pond.**

EEC calculations indicate that **non-target terrestrial plants are expected to be adversely affected from runoff from proposed labeled use on adjacent sites.**

c. Irrigation concerns

EFGWB has described flumetsulam in 3/2/93 review as being **persistent** in soil and water with terrestrial field dissipation $t_{1/2}$= 1.5 to 3 months on sandy loam and silt loam soils, aerobic soils metabolism $t_{1/2}$=22 to 130 days, hydrolysis= stable, and anaerobic aquatic metabolism $t_{1/2}$=183 days. In addition, flumetsulam is **mobile** in soils as a leacher. There is concern for surface or groundwater contamination in EFGWB review. EEB has concerns that contaminated surface or groundwater used for irrigation may adversely affect non-target plants. **Data from EFGWB are insufficient** to make a valid assesment at this time on phytotoxicity from irrigation of contaminated water on non-target plants.

**3.** Registrant has provided much analysis in trying to show that endangered species of plants will not be adversely affected from runoff or drift based on their runoff model. A perception is created that tolerant species in one family should suffice for entire family and that perennial plants will not be affected. This perception does not have a scientific basis supported by valid data. Experience has shown that there are species in one family that more tolerant to the herbicide and another species in the same family are very susceptible to the herbicide. We cannot be certain that the use of the herbicide will not adversely affect endangered species. The only possible family that may have some considerations as to being not as adversely affected as some species in other families would the grass family (Poaceae). Monocots are affected but the grass species that was used in the plant studies was not affected by flumetsulam and the label indicates that grass may be tolerant of flumetsulam. Yet EBB can not say for certain that all the species in this family will not be susceptible to flumetsulam at the labeled rate. **EEB maintains that endangered species of plants may be adversely affected from the proposed use of flumetsulam for soybean and corn.**

**Conclusions**

EEB has concluded that aquatic, semi-aquatic (wetland), and terrestrial non-target **plants (including endangered species) will be adversely affected by aerial applications** of flumetsulam. Since the $EC_{25}$ and $EC_{50}$ indicate that flumetsulam is extremely toxic to non-grass plants, **EEB recomennds that flumetsulam not be registered for aerial applications** because the distance of drift is expected to be large since only 0.045% of the application rate would adversely affect terrestrial plants.

EEB has concluded that adjacent **non-target aquatic plants will be adversely affected by runoff from ground application of flumetsulam to soybean and corn.** The adverse effects on non-target aquatic plants may also adversely affect other aquatic organisms by food and shelter depletion.

There are insufficient data to conclude adverse effects to non-target terrestrial plants because only two species (cucumber and cabbage) were found to have $EC_{25}$ values from the seedling emergence study. Yet, with the very limited information, it can be seen that flumetsulam **will adversely affect non-target terrestrial plants from runoff.** EEB needs data from additional emergence studies as indicated in the previous

**EEB has concluded that endangered species of plants may be adversely affected by the use of flumetsulam.**

If you have any questions, please do not hesitate to contact Mike Davy at 305-7081.

## EEC Calculations

PRZM1-EXAMS: Corn/Soybeans on Mississippi Loring Silt Loam
14 ppb/61 ppb per 1 lb/A in 6 feet of water= 0.229508 lb ai/A
14 ppb/61 ppb x 735 ppb= 169 ppb in 6 inches of water

PRZM1-EXAMS: Corn or Soybeans on Iowa Fayette Silt Loam
5.5 ppb/61 ppb per 1 lb/A in 6 feet of water= 0.090164 lb ai/A
5.5 ppb/61 ppb x 735 ppb= 66.3 ppb in 6 inches of water

PRZM: Corn or Soybean on Mississippi Loring Silt Loam
0.67 lb ai/A x 3% loss x 1 acre= 0.0201 lb ai/A

PRZM: Corn or Soybean on Iowa Fayette Silt Loam
0.67 lb ai/A x 2.1% loss x 1 acre = 0.0141 lb ai/A

Aerial application EEC calculation:

the EEC from drift alone would be **0.0335 lb ai/A** (5% drift x 0.67 lb ai/A).

the aquatic pond EEC from drift and runoff would be:

[(0.67 lb ai/A x 5% drift) + (0.6 efficiency x PRZM1-EXAMS for Loring soil EEC/61 ppb /10 acre) = 0.04727 lb ai/A (wetlands)

[(0.67 lb ai/A x 5% drift) x 61 ppb] + (0.6 efficiency x PRZM1-EXAMS for Loring soil EEC) =10.4 ppb in 6 ft of water

[(0.67 lb ai/A x 5% drift) x 735 ppb] + (0.6 efficiency x PRZM1-EXAMS for Loring soil EEC/61 ppb x 735 ppb)= 169 ppb in 6 inches of water

Terrestrial EEC drift and runoff for terrestrial plants
(0.67 lb ai/A x 5% drift) + (0.6 efficiency x 3% loss from PRZM [0.0201] x 1 acre)= 0.04556 lb ai/A.