EXPEDITE

Shaughnessy No: 129008

Date Out of EFGWB: MAY 30 1990

TO: Robert J. Taylor/Cynthia Giles
Product Manager #25
Registration Division (H7505C)

FROM: Emil Regelman, Supervisory Chemist
Environmental Chemistry Review Section #2
Environmental Fate and Ground Water Branch, EFED (H7507C)

THRU: Henry M. Jacoby, Chief
Environmental Fate and Ground Water Branch/EFED (H7507C)

Attached, please find the EFGWB review of:

Reg./File #: 352-LGU; 352-LGL

Common Name: Nicosulfuron (Company code: DPX-V9360)

Chemical Name: 3-Pyridinecarboxamide((((4,6-dimethoxypyridin-2-yl)amino-carbonyl)aminosulfonyl))-N,N-dimethyl

Type product: Herbicide

Product Name: ACCENT

Company Name: E.I. du Pont de Nemours and Company

Purpose: Review of Company's responses to EFGWB review dated 2/22/90 (Science Chapter): 161-2; 162-1; 163-1; 164-1; 165-1

Date Received: 3/29/90 EFGWB #: 90-0483; 90-0484

Action Code: 101 Total Reviewing Time (decimal days): 7.0

Deferrals to: _____ _____ Ecological Effects Branch, EFED

_____ Science Integration & Policy Staff, EFED

_____ _____ Non-Dietary Exposure Branch, HED

_____ Dietary Exposure Branch, HED

_____ _____ Toxicology Branch I , HED

_____ Toxicology Branch II, HED

1. CHEMICAL:

Chemical name: 3-Pyridinecarboxamide((((4,6-dimethyl-2-yl)aminocarbonyl)-aminosulfonyl))-N,N-dimethyl

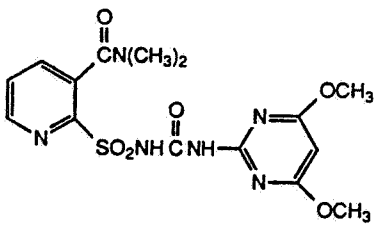
Common name: Nicosulfuron

Company code: "DPX-V9360"

Chemical Abstracts Registry Number: 111991-09-4

Product name: ACCENT

Chemical structure:



Physical/Chemical properties of active ingredient:

Molecular weight: 410.40
Physical characteristics: white solid
Solubility (in buffer solution; 28 C):

pH 5.1 to 5.6	390 ppm
pH 6.3	9000 ppm
pH 7.2	18000 ppm
pH 9.0	> 250,000 ppm

pK_a: 4.3

Vapor pressure: 1.2×10^{-16} Torr
Octanol/water partition coefficient:

pH 5	0.44
pH 7	0.017
pH 9	0.01

2. STUDY/ACTION TYPE:

Review of registrant's response to EFGWB review (Science Chapter) dated 2/22/90.

3. STUDY IDENTIFICATION:

- Transmittal letter of Tony E. Catka, Registration Specialist, Registration & Regulatory Affairs, E.I. du Pont de Nemours and Company; dated 3/28/90.

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Responses were provided for the following studies:

- Photodegradation of [Pyrimidine-2-^{14}C]DPX-V9360 and [Pyridine-2-^{14}C]-DPX-V9360 in Water, M.T. Scott, R.D. McFetridge, MRID No. 410822620, AMR No.1173-88

- Aerobic soil Metabolism of ^{14}C-DPX-V9360 in a Corn Belt Soil, B.C. Rhodes, MRID No. 41082623, AMR-855-87.

- Batch Equilibrium and Mobility Studies of DPX-V9360 and Degradates, T.M. Priester, MRID No. 40924222, AMR-842-87

- Terrestrial Field Soil Dissipation of [Pyridine-2-^{14}C]DPX-V9360 and [Pyrimidine-2-^{14}C]DPX-V9360 in Newark, Delaware; Greenville, Mississippi; and Rochelle, Illinois, T.M. Priester, MRID No. 40082629, AMR-843-87

- Confined Accumulation Study (^{14}C-DPX-V9360), R.F. Dietrich, MRID No. 41082625, AMR-874-87 (T.M. Priester)

Note: MRID Numbers refer to those of the original studies.
No MRID Numbers have been assigned to the responses.

4. REVIEWED BY:

Silvia C. Termes, Chemist
Review Section #2
OPP/EFED/EFGWB

Signature: _____
Date: May 27, 1990

5. APPROVED BY:

Emil Regelman
Supervisory Chemist
Review Section #2
OPP/EFED/EFGWB

Signature: _____
Date: MAY 30 1990

6. CONCLUSIONS:

a. Photodegradation in Water

Data requirements for 161-2 can be considered fulfilled, because acceptable data are available at the pH of maximum hydrolytic stability (pH 9), as required by Subdivision N Guidelines. The study was also conducted at pHs 7 and 5. However, the submitted additional data at pH 5 (requested in the 2/22/90 Science Chapter) suggest that the degradation product "Pyrimidine Amine" may be prone to photodegradation. Therefore, EFGWB is requesting additional information to clarify this observation (see RECOMMENDATIONS section).

Summary of data:
At pH 9, photodegradation of DPX-V9360 is not a major degradation pathway. Under natural sunlight (early summer, Wilmington, DE; total cumulative exposure of 207,688 watt-hr/m^2 after 30 days), the estimated half-life of DPX-V9360 was ca. 200 days. At pH 7 the estimated half-life was 200-250 days, but at pH 5 the half-life was ca. 14-15 days. Further details of the results are given in the corresponding DER attached to this review.

b. Aerobic soil metabolism

The submitted additional information was found acceptable. Data requirements for 162-1 are basically fulfilled, but additional information being requested (see RECOMMENDATIONS section).

Summary of data:
The results indicate that biodegradation is an important degradation mechanism for DPX-V9360. Parent pesticide degraded in nonsterile silty clay loam soil with a half-life of 26 days (as compared to 6-months in sterile soil). The degradation pathway involves cleavage of the sulfonyl-urea bridge to form the single-ring products "Pyridine Sulfonamide" and "Pyrimidine Amine"; the concentration of these degradates increase with time (maximum at 180-days, at ca. 90% each), but declines slightly afterwards. However, the "Pyrimidine Amine" degradate appears to be slightly more prone to further degradation than "Pyridine Sulfonamide". Further details of the results are given in the corresponding DER attached to this review.

c. Mobility in soil (batch-equilibrium adsorption/desorption and soil TLC studies)

This study was originally reviewed on 5/1/89 (request for EUP) and the deficiencies noted in the review were addressed by the registrant on 7/5/89. The responses of the registrant were found acceptable and were incorporated in the EFGWB review of 10/20/89. The study was considered to partially fulfill data requirements and the registrant was informed that batch-equilibrium adsorption/desorption with the major degradates/metabolites "Pyridine Sulfonamide" and "Pyrimidine Amine" might be requested at a later day.

Batch-equilibrium adsorption/desorption studies with these degradates were requested by EFGWB on 2/22/90 and therefore, must be conducted and submitted to the Agency.

Summary of data:
The results of the original study indicate that parent DPX-V9360 is very mobile in the sandy loam and silt loam soil soils used in the study (K_{ad}< 2). Data from the soil TLC study indicate that the degradate "Pyridine Sulfonamide" is more mobile than parent DPX-V9360, but that "Pyrimidine Amine" was less mobile than parent DPX-V9360. Further details of the results are given in the attached DER and in the 2/22/90 review.

d. Terrestrial field dissipation studies

The submitted study (with the additional information) can be considered to provide supplemental information only. The study does not fulfill data requirements. No irrigation was done during the course of the study (sites in DE, IL, and MS) and it appears that the study was conducted during a generally dry year (1987-1988). It was also claimed that a mode of dissipation is by degradation to CO_2 (mineralization), but no conclusive evidences have been presented to support this claim. Therefore, the Branch is requesting that a new study (at least two different sites) be conducted and submitted (see RECOMMENDATIONS section).

Summary of data
The reported results indicate that residues containing the pyridine ring alone (Pyridine Sulfonamide, N-Desmethyl Pyridine Sulfonamide, Pyridine Acid Sulfonamide/Pyridine Saccharin Analog) move deeper into the soil profile than parent DPX-V9360 or Pyrimidine Amine. This observation is consistent with the results from soil TLC studies.

e. Accumulation in confined rotational crops

EFGWB is still puzzled as to why Pyrimidine Amine was not extracted from the soil and is asking the registrant to consider the possibility that this compound may have adsorbed onto the walls of the planting pots.

From the additional information provided by the registrant (as requested by EFGWB on 2/22/90), there is indication that seedling stunting and subsequent decline in plant population (ca. 50%) occurred in wheat crops planted at 120- days posttreatment. Therefore, a 120-days rotation interval for wheat may not be recommended. At 120-days the total radioactive residues in soil were 0.008 and 0.013 ppm for the pyrimidine-labeled and the pyridine-labeled materials, respectively. Of this total radioactivity, parent DPX-V9360 was 0.001 ppm (pyrimidine label) and 0.002 ppm (pyridine label). The soil used in the study was a loamy sand (80% sand, 12.8% silt, 6.4% clay; 0.9% OM; 9% nitrogen; pH 6.4; CEC 3.4 meq/100 g; BD of disturbed soil 1.28 g/cm^3). The herbicide was applied at a rate equivalent to the maximum recommended rate of 70 g ai/ha.

Other concerns raised in the 2/22/90 review were acceptably responded by the registrant.

In a separate review (EFGWB # 90-0530/90-0531), the issue concerning rotational crop intervals will be addressed. However, from the study reviewed at EFGWB, there is sufficient evidence indicating that the Pyridine Sulfonamide degradate is more readily uptaken by the rotated crops than parent DPX-V9360 or Pyrimidine Amine. Residues of Pyridine Sulfonamide are much higher than residues of parent DPX-V9360 (See Table; the registrant has provided data on the characterization of Compounds A, B, and C, which is included in the corresponding DER).

It should be noted at this point that DEB has requested residue data for the metabolite Pyridine Sulfonamide and will determine the need

for tolerances for this metabolite after the requested data are reviewed (refer to DEB Science Chapter by J.B. Stokes; no date). The available residue chemistry/ storage stability data adequately support the proposed 0.1 ppm tolerance for parent DPX-V9360 in/on corn, but that additional residue data are required to determine if the requested DPX-V9360 can be decreased to 0.05 ppm.

7. RECOMMENDATIONS:

The registrant should be informed of the following:

a. Photodegradation in water

Further clarification of the data present for the study conducted at pH 5 is being requested,

- Explain the possibility that "Polar Compounds" may be formed via a photodegradative process of the bridge-cleavage product "Pyrimidine Amine". That is, if there is any indication that "Pyrimidine Amine is prone to photodegradation.

- Clarify the percentage of each of the four components of the "Polar Compounds" at days 14, 21, and 30 and indicate if there were further attempts to characterize these components. If attempts were made to identify these components, results should be presented and discussed.

- Discuss the possibility that the "Photoproduct 1" (believed to contain the two rings) is the "Cyclized Ipso Precursor" reported in the additional information submitted for the Aerobic Soil Metabolism Study.

b. Aerobic soil metabolism

The study is acceptable and basically fulfills Subdivision N data requirements (162-1), but further clarification of the following results is being requested,

- Comment on the apparent further degradation of the "Pyrimidine Amine" degradate/metabolite. Is it the result of actual degradation to products that become incorporated to "carbon pool" of the soil (as bound residues) or is it just the result of stronger adsorption onto soil components?

- Indicate conditions favoring the cyclization of the "Ipso Precursor" to the "Cyclized Ipso Precursor" product and comment on the stability of both the "Ipso Precursor" and the "Cyclized Ipso Precursor".

c. Mobility in soil

The study was determined earlier to partially fulfill data requirements for 163-1 (10/20/89 and 2/22/90 reviews). A batch-equilibrium adsorption/ desorption study with the degradates "Pyridine Sulfonamide" and "Pyrimidine

Amine" was requested on 2/22/90. Therefore, acceptable studies with these two degradates must be conducted and submitted to the Agency in order to fulfill 163-1 data requirements. The studies must be conducted with the same soils used for the study with parent DPX-V9360.

d. Terrestrial field dissipation

The study has been considered to provide supplemental information, but not to fulfill data requirements for 164-1. A new study is required (conducted in at least two different sites). Particular attention should be given to precipitation/irrigation, depth of cylinders (at least 90 cm), sampling regime, and provisions made to demonstrate that "some" mineralization ($CO_2/HCO_3/CO_3^{-2}$) actually occurs under field conditions. Refer to Standard Evaluation Procedure for Terrestrial Field Dissipation studies (EPA-540-09/90-073; December 1989).

e. Accumulation in confined rotational crops

The registrant is being asked to further considered the possibilities as to why the Pyrimidine Amine degradate was not identified in the soil. Other additional information requested in the 2//22/90 review were satisfactorily responded by the registrant (characterization of Compounds A, B, and C; health/development of crops during the study; possible interferences).

The issues concerning the acceptability of the study for establishing rotational crop intervals and the rotational crop intervals proposed by the registrant are being discussed separately in another review (EFGWB # 90-0530/90-0531).

f. COPIES OF ALL DERs ATTACHED TO THIS REVIEW SHOULD BE MADE AVAILABLE TO THE REGISTRANT.

g. A summary of the current status of data requirements is attached to the review.

8. BACKGROUND

E.I. du Pont de Nemours is seeking registration of the new sulfonylurea herbicide ACCENT, which contains the active ingredient DPX-V9360 (nicosulfuron). The currently proposed use is on corn. Data for an EUP was reviewed by EFGWB on 5/1/89 (responses to additional data submitted by the registrant appear in 10/20/89 and 11/29/89 reviews). A Science Chapter for nicosulfuron was completed by EFGWB on 2/22/90. The review of the registrant's responses to the 2//22/90 review are included here.

ACCENT Herbicide is a water dispersable granule containing 75% of the active ingredient DPX-V9360 (nicosulfuron) by weight. It is a selective herbicide developed to control annual and perennial grass weeds and selected broadleaf weeds when applied postemergence in field corn. It is not to be used on popcorn, sweet corn, or corn grown for seed production.

Foliar absorption is the primary means of ACCENT uptake by plants. ACCENT should be applied prior to the 10-leaf stage of corn. The application method recommended is by ground spraying. The pesticide should not be applied through any type of irrigation system. Maximum single application rate is 1 oz ai/acre. If split applications are to be made, they should not exceed a total of 1 1/3 oz ai/acre in any crop per year (split applications of 2/3 oz are recommended).

9. DISCUSSION OF INDIVIDUAL STUDIES:

The reviews of the original studies are contained in the EFGWB reviews of 5/1/89 (EUP) and 2/22/90 (Science Chapter). Reviews of additional data requested in the 5/1/89 review appear in the 10/20/89 and 11/29/89 reviews.

The reviews of the additional data requested on 2/22/90 are attached here.

10. COMPLETION OF ONE-LINER:

No new data are being incorporated at this time. One-liner was updated after completion of the 2/22/90 Science Chapter.

11. CBI APPENDIX: No CBI Appendix.

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RESIDUES IN ROTATION CROPS

Crop/Crop Fraction	Soil aging time	Total radioactive residues, ppm[a] Pyr. ^{14}C	Pyrim. ^{14}C	Composition, ppm Parent	Pyr. Sulf.	N-Des.	Others[b]
Soybean forage/hay	30-day	0.221	0.060	0.002	0.080	0.025	A
	120-day	0.191	0.056	0.002	0.071	0.022	B
	10 months	0.075	0.014	nd	0.021	0.002	C
Soybean seed	30-day	0.226	0.043	nd	0.023	0.003	D
	120-day	0.157	0.033	nd	0.015	0.002	E
	10 months	0.069	0.012	nd	0.013	nd	F
Lettuce	120-day	0.050	0.015	0.002	0.019	-	G
	10 months	0.011	0.003	nd	0.004	-	H
Wheat forage/hay	120-day	0.112	0.033	ne	ne	-	I
	10 months	0.043	0.009	0.001	0.008	-	J
Wheat straw/chaff	120-day	0.246	0.099	0.004	0.056	-	K
	10 months	0.185	0.056	0.007	0.038	-	L
Wheat grain	120-day	0.025	0.020	0.005	0.003	-	M
	10 months	0.014	0.006	0.005	0.003	-	N
Radish greens	10 months	0.027	0.004	0.001	0.010	-	O
Radish root	10 months	0.006	0.003	na	na	-	P

[a]Calculated as DPX-V9360 equivalents; nd= not detected; ne= not extracted; na= not analyzed

[b]"Polars", "Bound radioactivity", "Other species resolved by chromatography", "Compounds A, B, and C" (which contain the pyridine ring) and seen in D, E, and F. For details see Tables VII, VII, IX and X. Compounds A, B and C have been identified. Seedling stunting for wheat crop planted at 120-days.

STATUS OF DATA REQUIREMENTS
"DPX-V9360" (Nicosulfuron)
(Terrestrial food crop uses: corn)

Data Requirement	Status
161-1 Hydrolysis	Fulfilled (11/29/89 review)
161-2 Photodegradation in water	Fulfilled for pHs 9 and 7; additional information requested for pH 5. This review.
161-3 Photodegradation on soil	Fulfilled (2/22/90 review)
161-4 Photodegradation in air	Not required based on low vapor pressure (2/22/90 review)
162-1 Soil metabolism- Aerobic	Basically fulfilled, but additional information is being requested in this review.
162-2 Soil metabolism- Anaerobic	Fulfilled (2/22/90 review)
163-1 Mobility in soil	Partially fulfilled. Batch-equilibrium adsorption/desorption studies with the two main degradates have been requested (2/22/90 and this review).
163-2 Volatility (lab.)	Not required based on low vapor pressure.
164-1 Terrestrial field dissipation	Study reviewed on 2/22/90 does not fulfill data requirements (supplemental data only). New study has been requested in this review.
165-1 Accumulation in rotational crops (confined)	Additional information requested in this review.
165-2 Accumulation in rotational crops (field)	Reserved
(NOTE: The issue of rotational crop intervals is being discussed in a separate review [EFGWB # 90-0530/90-0531])	
165-4 Accumulation in fish	Reserved. The study was waived on 10/20/89, but will be required if concerns arise about the potential bioaccumulation of the degradates.
Spray drift 201-1 Droplet size spectrum 202-1 Drift field evaluation	Registrant's response to this requirement is currently being evaluated at the Branch.
Ground water and/or surface water monitoring studies	Reserved.