

Test Material: Rimsulfuron

MRID: 49389201

Title: Analytical Method for the Determination of Rimsulfuron (DPX-E9636) and its Metabolites in Soil and Water Using HPLC/ESI-MS/MS

MRID: 49389202

Title: Independent Laboratory Validation of DuPont-38604, "Analytical Method for the Determination of Rimsulfuron (DPX-E9636) and Its Metabolites in Soil and Water Using HPLC/ESI-MS/MS"

EPA PC Code: 129009

OCSPP Guideline: 850.6100

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Analytical method for rimsulfuron and its transformation products, IN-70941, IN-70942 and IN-E9260, in soil and water

Reports: ECM: EPA MRID No. 49839201. Pentz, A.M., M.E.Y. Cabusas. 2014. Analytical Method for the Determination of Rimsulfuron (DPX-E9636) and its Metabolites in Soil and Water Using HPLC/ESI-MS/MS. DuPont Study No.: DuPont-38604. Report prepared by E.I. du Pont de Nemours and Company, Newark, Delaware; sponsored and submitted by E.I. du Pont de Nemours and Company, Wilmington, Delaware; 94 pages. Final report issued May 14, 2014.
ILV: EPA MRID No. 49839202. Fiorito, B. 2014. Independent Laboratory Validation of DuPont-38604, "Analytical Method for the Determination of Rimsulfuron (DPX-E9636) and Its Metabolites in Soil and Water Using HPLC/ESI-MS/MS". DuPont Study Project ID: DuPont-38605. Report prepared by Alliance Pharma, Malvern, Pennsylvania; sponsored and submitted by E.I. du Pont de Nemours and Company, Wilmington, Delaware; 116 pages. Final report issued May 9, 2014.

Document No.: MRIDs 49839201 & 49839202


Guideline: 850.6100

Statements: ECM: The study was conducted in a GLP compliant facility but not with the restriction of compliance with USEPA FIFRA GLP standards, 40 CFR, Part 160, and OECD GLP (p. 3 of MRID 49839201). Signed and dated Data Confidentiality, No Data Confidentiality, GLP, and Certification of Authenticity statements were provided (pp. 2-4). A Quality Assurance statement was not provided.
ILV: The study was conducted in accordance with the USEPA FIFRA Good Laboratory Practice (GLP) standards (40 CFR Part 160) and OECD GLP (p. 3 of MRID 49839202). Signed and dated Data Confidentiality, No Data Confidentiality, GLP, Quality Assurance and Certification of Authenticity statements were provided (pp. 2-5).

Classification: This analytical method is classified as Supplemental. The ILV successfully duplicated the method. The LOQ is less than the most current lowest toxicological level of concern in water. However, the LOQ is slightly greater than the most current lowest toxicological level of concern in soil. Chromatograms were not provided for all analytes/matrices in the ECM.

PC Code: 129009

Reviewer: Patricia Engel, Physical Scientist

Signature: 

Date: 8/14/2018

Executive Summary

This analytical method, Laboratory Project ID: DuPont-38604, is designed for the quantitative determination of rimsulfuron (DPX-E9636) and its transformation products, IN-70941, IN-70942 and IN-E9260, in soil and water using LC/MS/MS. For the soil validation, the ECM laboratory used two foreign soils: silt loam (organic matter 2.6%) and loam (organic matter 1.6%) soils, while the ILV laboratory used one domestic soil: clay loam soil (organic matter 5.9%). The method is quantitative for all analytes in soil at the stated LOQ of 0.20 µg/kg. The LOQ is greater than the most current lowest toxicological level of concern in soil [0.015 ug/kg]. For the water validation, the ECM laboratory used drinking (tap) water, surface (pond) water and ground (well) water, while the ILV laboratory used only surface (pond) water. The method is quantitative for all analytes in water at the stated LOQ of 0.10 µg/L. The LOQ is less than the most current lowest toxicological level of concern in water [11.6 ppb]. No major issues were discovered by the independent laboratory; the method was validated with the first trial for all analytes in both water and soil. The LOD was not reported.

Table 1. Analytical Method Summary

Analyte(s) by Pesticide	MRID		EPA Review	Matrix	Method Date	Registrant	Analysis	Limit of Quantitation (LOQ)
	Environmental Chemistry Method	Independent Laboratory Validation						
Rimsulfuron, IN-70941, IN-70942 and IN-E9260	49389201	49389202	8/14/18	Soil	5/14/2014	E.I. du Pont de Nemours and Company	LC/MS/MS	0.20 µg/kg
				Water				0.10 µg/L

I. Principle of the Method

Soil Processing

Samples (5.0 ± 0.5 g) were measured into 50-mL centrifuge tubes (pp. 9, 15, 20-22 of MRID 49389201). After fortification, as necessary, samples were extracted twice with 25 mL of methanol:0.1M aqueous ammonium acetate (1:9, v:v) via shaking vigorously (wrist action shaker set to maximum deflection) for 30 minutes, then centrifuging (3000-4000 rpm for 5-10 minutes) at 4°C. An alternative for the wrist action shaker is a Geno-Grinder (5/16 metal ball, 1100 strokes per minute for 10 minutes). The combined supernatants were diluted to 50 mL using of methanol:0.1M aqueous ammonium acetate (1:9, v:v). The soil extracts were purified using solid phase extraction (SPE) with an Oasis HLB cartridge preconditioned with 6-10 mL of methanol:0.1M aqueous ammonium acetate (1:9, v:v). Exactly 25 mL of the extract (measured into a sample tube - A) was passed through the SPE cartridge using gravity flow (flow rate 2-5 mL/min). The cartridge was rinsed sequentially with HPLC-grade water, 10mM aqueous ammonium acetate and ultrapure water (10 mL each). Using a vacuum, the cartridge was brought to dryness for at least 2 minutes. The sample tube – A was rinsed with acetone, then placed under the SPE column to collect the analytes. The analytes were eluted from the column using gravity flow with acetonitrile (10 mL) then acetonitrile:0.5M ammonium hydroxide (9:1, v:v; 5 mL). After all solution has passed through the column, vacuum is applied for 10-15 seconds. Immediately, the eluate was mixed with 1 mL of

5mM aqueous ammonium acetate and evaporated until 1.0 ± 0.1 mL (aqueous) under nitrogen in a water bath (30°C). The residue should not go to dryness. Acetonitrile (0.5 mL) was added with vortex mix. The final volume was adjusted to 5 mL using 5mM aqueous ammonium acetate. The solution was homogenized with vortexing and sonification. An aliquot (*ca.* 1.5 mL) was filtered using a 0.2- μ m Acrodisc PTFE syringe filter into a HPLC vial prior to analysis. Control extracts were filtered in the same way, except that the aliquot was larger (*ca.* 3 mL) and the receptacle vial was a 20-mL glass scintillation vial. The study authors noted that the extracts will be stable for *ca.* 24 hours at 4°C and *ca.* 72 hours at $\leq -10^\circ\text{C}$.

Water Processing

Samples (5.00 ± 0.10 g or 5.0 ± 0.1 mL) were measured into 15-mL polypropylene centrifuge tubes (pp. 9, 15, 22 of MRID 49389201). After fortification, as necessary, the sample was mixed with acetonitrile (500 μ L) and 1M ammonium formate (25 μ L) by shaking vigorously (5mM ammonium acetate was reported in the place 1M ammonium formate on p. 9 and 15 of the study report). An aliquot (*ca.* 2 mL) was transferred to a 2-mL HPLC vial prior to analysis. The study authors noted that the extracts will be stable for *ca.* 24 hours at 4°C and *ca.* 72 hours at $\leq -10^\circ\text{C}$.

HPLC/MS/MS Analysis

Samples were analyzed for analytes using an Agilent Infinity 1290 UHPLC or Shimadzu UHPLC coupled to Applied Biosystems MDS SCIEX API 5000 (a triple quadrupole MS) with an electrospray ion source (ESI; pp. 22-24 of MRID 49389201). The reversed-phase HPLC/MS conditions consisted of a Kinetex C18 column (2.1 x 50 mm, 1.7- μ m dp) or Zorbax Eclipse Plus C18 column (2.1 x 50 mm, 1.8- μ m dp), a mobile phase gradient of (A) 0.01M formic acid and (B) methanol [percent A:B (v:v) at 0.00-0.30 min. 95:5, 0.40 min. 85:15, 4.90 min. 45:55, 5.00-6.00 min. 5:95, 6.10-7.00 min. 95:5] and MS/MS detection in positive ion mode (ESI+) with Multiple Reaction Monitoring (MRM). Two parent-daughter ion transitions (target = T, confirmatory = C) were monitored for each analyte: m/z 432.0 \rightarrow 325.0 \pm 0.1 (C) and m/z 432.0 \rightarrow 182.0 \pm 0.1 (T) for rimsulfuron (DPX-E9636); m/z 368.0 \rightarrow 325.0 \pm 0.1 (T) and m/z 368.0 \rightarrow 231.0 \pm 0.1 (C) for IN-70941; m/z 325.0 \rightarrow 279.0 \pm 0.1 (C) and m/z 325.0 \rightarrow 231.0 \pm 0.1 (T) for IN-70942; and m/z 251.0 \rightarrow 234.0 \pm 0.1 (C) and m/z 251.0 \rightarrow 106.0 \pm 0.1 (T) for IN-E9260. Retention times for the analytes were *ca.* 1.1, *ca.* 3.1, *ca.* 3.8 and *ca.* 4.5 minutes for IN-E9260, IN-70941, IN-70942 and DPX-E9636, respectively. Injection volume was 20-25 μ L.

ILV

In the ILV, the analytes were extracted in the same manner as the ECM (pp. 17-18 of MRID 49389202). For water extraction, 1 M ammonium formate was confirmed as part of the solvent mixture, not 5 mM ammonium acetate. The extracts were analyzed for analytes using a Shimadzu LC-30AD UHPLC coupled to AB SCIEX Triple Quad 5500 (p. 17). Retention times for the analytes with this column were *ca.* 1.0, *ca.* 3.3, *ca.* 4.0 and *ca.* 4.5 minutes for IN-E9360, IN-70941, IN-70942 and DPX-E9636, respectively (p. 19). Injection volume was 20 μ L. The ILV study author also noted that the collision energies (CE) of the analytes were altered for optimization (pp. 18, 20).

LOQ/LOD

In both the ECM and ILV, the LOQ was reported as 0.1 µg/L for water and 0.20 µg/kg for soil (p. 29 of MRID 49389201; p. 25 of MRID 49389202). The LOD was not determined in the ECM and not reported in the ILV.

II. Recovery Findings

ECM (MRID 49389201): Mean recoveries and relative standard deviations (RSD) were within guidelines (mean 70-120%; RSD ≤20%) for analysis of rimsulfuron (DPX-E9636) and its transformation products, IN-70941, IN-70942 and IN-E9260, in silt loam soil, loam soil, tap (drinking) water, surface (pond) water and ground (well) water at the LOQ and 10xLOQ, except for the confirmatory ion analysis of IN-E9260 in the loam soil at the LOQ (mean, 61%; Table 1A-E, pp. 33-52). Two parent-daughter ion transitions were monitored for each analyte. Quantitative ion and confirmatory ion results were comparable, except for IN-E9260 in the loam soil at the LOQ. The soils were obtained from the field soil dissipation studies of rimsulfuron which were in progress (p. 32). The sources of the soils were specified as the country of origin; both soils were foreign: silt loam soil from North France and loam soil from Italy (p. 19). The soils were fully characterized by Harris Environmental Technologies, Lincoln, Nebraska. Drinking water was obtained as tap water from Stine-Haskell Research Center, Newark, Delaware. Ground water was obtained from a well in Kemblesville, Pennsylvania. Surface water was obtained from Lums Pond, Lums Pond State Park, Bear, Delaware. The waters were fully characterized by Agvise Laboratories, Northwood, North Dakota. Sampling dates were not reported.

ILV (MRID 49389202): Mean recoveries and RSDs were within guidelines for analysis of rimsulfuron (DPX-E9636) and its transformation products, IN-70941, IN-70942 and IN-E9260, in clay loam soil and surface (pond) water at the LOQ and 10xLOQ (pp. 23-24). The method was validated with the first trial (p. 22). Two parent-daughter ion transitions were monitored for each analyte (pp. 23-24). Quantitative ion and confirmatory ion results were comparable. The soil was described as Drummer from the U.S.A. (p. 16). The soil was partially characterized; laboratory not reported. The surface water was the same as that of the ECM: Lums Pond, Lums Pond State Park, Bear, Delaware (sampled 01/19/04; p. 16; Appendix 2, pp. 114-116). The water was fully characterized by Agvise Laboratories, Northwood, North Dakota.

Table 2A. Initial Validation Method Recoveries for Rimsulfuron (DPX-E9636) and its transformation products, IN-70941, IN-70942 and IN-E9260, in Soil¹

Analyte	Fortification Level (µg/kg)	Number of Tests	Recovery Range (%)	Mean Recovery (%)	Standard Deviation (%)	Relative Standard Deviation (%)
Silt loam soil (organic matter 2.6%, DuPont-34236; North France)						
Target ion						
Rimsulfuron (DPX-E9636)	0.20 (LOQ)	5	73-89	81	7	9
	2.0	5	79-103	86	10	12
IN-70941	0.20 (LOQ)	5	68-78	72	5	7
	2.0	5	66-91	79	9	12
IN-70942	0.20 (LOQ)	5	71-91	81	7	9
	2.0	5	80-87	84	3	3
IN-E9260	0.20 (LOQ)	5	90-99	94	3	4
	2.0	5	86-95	90	3	4
Confirmatory ion						
Rimsulfuron (DPX-E9636)	0.20 (LOQ)	5	72-87	78	7	8
	2.0	5	77-99	85	8	10
IN-70941	0.20 (LOQ)	5	81-96	87	7	8
	2.0	5	64-91	74	11	14
IN-70942	0.20 (LOQ)	5	72-93	84	8	9
	2.0	5	80-86	83	2	3
IN-E9260	0.20 (LOQ)	5	87-102	94	6	6
	2.0	5	88-98	94	4	4
Loam soil (organic matter 1.6%, DuPont-34237; Italy)						
Target ion						
Rimsulfuron (DPX-E9636)	0.20 (LOQ)	5	68-76	74	3.6	4.8
	2.0	5	78-82	80	1.4	1.8
IN-70941	0.20 (LOQ)	5	74-85	83	4.9	6.0
	2.0	5	86-93	90	2.9	3.3
IN-70942	0.20 (LOQ)	5	85-95	90	4.1	4.5
	2.0	5	86-90	89	1.8	2.1
IN-E9260	0.20 (LOQ)	5	78-92	87	5.5	6.3
	2.0	5	85-92	90	2.9	3.3
Confirmatory ion						
Rimsulfuron (DPX-E9636)	0.20 (LOQ)	5	66-90	78	9.9	12.8
	2.0	5	78-80	79	0.8	1.0
IN-70941	0.20 (LOQ)	5	81-94	88	4.8	5.4
	2.0	5	85-90	87	2.3	2.7
IN-70942	0.20 (LOQ)	5	88-96	91	3.9	4.3
	2.0	5	88-90	89	0.8	0.9
IN-E9260	0.20 (LOQ)	5	51-66	61	6.0	9.9
	2.0	5	84-89	87	2.1	2.4

Data (uncorrected recovery results) were obtained from Table 1A-B, pp. 33-40 of MRID 49389201.

1 The soils were obtained from the field soil dissipation studies of rimsulfuron which were in progress (p. 32). The sources of the soils were not specified more than what is reported in the table (p. 19). The soils were fully characterized by Harris Environmental Technologies, Lincoln, Nebraska.

2 Ion transitions monitored were as follows (target ion and confirmatory ion, respectively): m/z 432.0 → 182.0 ± 0.1 and m/z 432.0 → 325.0 ± 0.1 for rimsulfuron (DPX-E9636); m/z 368.0 → 325.0 ± 0.1 and m/z 368.0 → 231.0 ± 0.1 for IN-70941; m/z 325.0 → 231.0 ± 0.1 and m/z 325.0 → 279.0 ± 0.1 for IN-70942; and m/z 251.0 → 106.0 ± 0.1 and m/z 251.0 → 234.0 ± 0.1 for IN-9260 (p 23).

Table 2B. Initial Validation Method Recoveries for Rimsulfuron (DPX-E9636) and its transformation products, IN-70941, IN-70942 and IN-E9260, in Water¹

Analyte	Fortification Level (µg/L)	Number of Tests	Recovery Range (%)	Mean Recovery (%)	Standard Deviation (%)	Relative Standard Deviation (%)
Surface Water (Lums Pond, Delaware)						
Target ion						
Rimsulfuron (DPX-E9636)	0.10 (LOQ)	5	78-104	89	13	14
	1.0	5	81-92	86	4	5
IN-70941	0.10 (LOQ)	5	88-115	102	11	11
	1.0	5	87-95	91	3	3
IN-70942	0.10 (LOQ)	5	83-109	97	10	11
	1.0	5	83-95	87	5	6
IN-E9260	0.10 (LOQ)	5	101-119	106	7	7
	1.0	5	87-97	92	4	5
Confirmatory ion						
Rimsulfuron (DPX-E9636)	0.10 (LOQ)	5	72-102	88	12	14
	1.0	5	83-93	87	4	4
IN-70941	0.10 (LOQ)	5	87-118	103	15	15
	1.0	5	83-97	90	6	6
IN-70942	0.10 (LOQ)	5	78-111	98	14	14
	1.0	5	83-97	88	6	6
IN-E9260	0.10 (LOQ)	5	98-119	108	8	8
	1.0	5	93-105	97	5	5
Ground Water (Kemblesville, Pennsylvania)						
Target ion						
Rimsulfuron (DPX-E9636)	0.10 (LOQ)	5	86-101	92	7	7
	1.0	5	98-113	105	5	5
IN-70941	0.10 (LOQ)	5	96-109	102	5	5
	1.0	5	100-114	106	6	5
IN-70942	0.10 (LOQ)	5	96-111	103	5	5
	1.0	5	104-122	110	7	7
IN-E9260	0.10 (LOQ)	5	104-115	109	4	4
	1.0	5	101-121	111	7	6
Confirmatory ion						
Rimsulfuron (DPX-E9636)	0.10 (LOQ)	5	83-105	93	10	10
	1.0	5	103-116	107	5	5
IN-70941	0.10 (LOQ)	5	101-112	106	4	4
	1.0	5	100-112	106	5	5
IN-70942	0.10 (LOQ)	5	97-109	101	6	6
	1.0	5	101-117	107	6	6
IN-E9260	0.10 (LOQ)	5	83-107	100	9	10
	1.0	5	100-109	107	4	4

Analyte	Fortification Level (µg/L)	Number of Tests	Recovery Range (%)	Mean Recovery (%)	Standard Deviation (%)	Relative Standard Deviation (%)
Tap Water (Newark, Delaware)						
Target ion						
Rimsulfuron (DPX-E9636)	0.10 (LOQ)	5	85-101	94	7	7
	1.0	5	96-111	102	7	7
IN-70941	0.10 (LOQ)	5	94-114	105	9	8
	1.0	5	98-114	106	8	7
IN-70942	0.10 (LOQ)	5	96-107	103	5	5
	1.0	5	100-110	106	5	5
IN-E9260	0.10 (LOQ)	5	95-120	107	10	9
	1.0	5	93-118	107	10	9
Confirmatory ion						
Rimsulfuron (DPX-E9636)	0.10 (LOQ)	5	90-101	96	5	6
	1.0	5	89-108	99	7	8
IN-70941	0.10 (LOQ)	5	91-116	101	10	10
	1.0	5	94-116	102	9	9
IN-70942	0.10 (LOQ)	5	95-106	101	5	5
	1.0	5	100-112	105	5	5
IN-E9260	0.10 (LOQ)	5	94-129	111	13	12
	1.0	5	96-116	107	8	7

Data (uncorrected recovery results) were obtained from Table 1C-E, pp. 41-52 of MRID 49389201.

1 Drinking water was obtained as tap water from Stine-Haskell Research Center, Newark, Delaware (p. 19). Ground water was obtained from a well in Kemblesville, Pennsylvania. Surface water was obtained from Lums Pond, Lums Pond State Park, Bear, Delaware. The waters were fully characterized by Agvise Laboratories, Northwood, North Dakota. Sampling dates were not reported.

2 Ion transitions monitored were as follows (target ion and confirmatory ion, respectively): m/z 432.0 \rightarrow 182.0 \pm 0.1 and m/z 432.0 \rightarrow 325.0 \pm 0.1 for rimsulfuron (DPX-E9636); m/z 368.0 \rightarrow 325.0 \pm 0.1 and m/z 368.0 \rightarrow 231.0 \pm 0.1 for IN-70941; m/z 325.0 \rightarrow 231.0 \pm 0.1 and m/z 325.0 \rightarrow 279.0 \pm 0.1 for IN-70942; and m/z 251.0 \rightarrow 106.0 \pm 0.1 and m/z 251.0 \rightarrow 234.0 \pm 0.1 for IN-E9260 (p 23).

Table 3A. Independent Validation Method Recoveries for Rimsulfuron (DPX-E9636) and its transformation products, IN-70941, IN-70942 and IN-E9260, in Soil¹

Analyte	Fortification Level (µg/kg)	Number of Tests	Recovery Range (%)	Mean Recovery (%)	Standard Deviation (%)	Relative Standard Deviation (%)
Clay loam soil (organic matter 5.9%, Drummer, U.S.A.)						
Target ion						
Rimsulfuron (DPX-E9636)	0.2 (LOQ)	5	109-119	114	4.2	4
	2	5	109-113	111	1.6	1
IN-70941	0.2 (LOQ)	5	96-103	100	2.5	2
	2	5	92-97	94	2.0	2
IN-70942	0.2 (LOQ)	5	88-96	92	3.5	4
	2	5	72-77	75	2.2	3
IN-E9260	0.2 (LOQ)	5	96-103	101	2.9	3
	2	5	95-99	97	1.3	1
Confirmatory ion						
Rimsulfuron (DPX-E9636)	0.2 (LOQ)	5	106-119	114	5.7	5
	2	5	108-111	109	1.3	1
IN-70941	0.2 (LOQ)	5	99-109	104	4.6	4
	2	5	96-102	98	2.6	3
IN-70942	0.2 (LOQ)	5	91-93	92	0.8	1
	2	5	75-80	77	1.9	2
IN-E9260	0.2 (LOQ)	5	91-104	99	5.0	5
	2	5	95-98	97	1.1	1

Data (uncorrected recovery results) were obtained from pp. 23-24 of MRID 49389202.

1 The source of the soil was not specified more than what is reported in the table (p. 16). The soil was partially characterized; laboratory not reported.

2 Ion transitions monitored were as follows (target ion and confirmatory ion, respectively): m/z 432.1 \rightarrow 182.0 and m/z 432.0 \rightarrow 325.0 for rimsulfuron (DPX-E9636); m/z 368.1 \rightarrow 325.0 and m/z 368.1 \rightarrow 231.0 for IN-70941; m/z 325.1 \rightarrow 2310 and m/z 325.1 \rightarrow 279.0 for IN-70942; and m/z 251.1 \rightarrow 106.0 and m/z 251.1 \rightarrow 234.0 for IN-E9260 (p 20).

Table 3B. Independent Validation Method Recoveries for Rimsulfuron (DPX-E9636) and its transformation products, IN-70941, IN-70942 and IN-E9260, in Water¹

Analyte	Fortification Level (µg/L)	Number of Tests	Recovery Range (%)	Mean Recovery (%)	Standard Deviation (%)	Relative Standard Deviation (%)
Surface Water (Lums Pond, Delaware)						
Target ion						
Rimsulfuron (DPX-E9636)	0.1 (LOQ)	5	106-108	107	0.8	1
	1	5	102-105	104	1.6	2
IN-70941	0.1 (LOQ)	5	116-119	117	1.1	1
	1	5	109-115	111	2.2	2
IN-70942	0.1 (LOQ)	5	103-106	105	1.5	1
	1	5	99-107	102	3.8	4
IN-E9260	0.1 (LOQ)	5	114-119	118	2.1	2
	1	5	114-119	117	2.4	2
Confirmatory ion						
Rimsulfuron (DPX-E9636)	0.1 (LOQ)	5	104-115	110	4.1	4
	1	5	103-107	105	2.1	2
IN-70941	0.1 (LOQ)	5	113-118	116	2.3	2
	1	5	112-119	115	2.8	2
IN-70942	0.1 (LOQ)	5	98-109	102	4.3	4
	1	5	99-104	102	1.7	2
IN-E9260	0.1 (LOQ)	5	114-120	117	2.2	2
	1	5	114-118	116	1.5	1

Data (uncorrected recovery results) were obtained from pp. 23-24 of MRID 49389202.

1 Surface water was obtained from Lums Pond, Lums Pond State Park, Bear, Delaware (sampled 01/19/04; p. 16; Appendix 2, pp. 114-116). The water was fully characterized by Agvise Laboratories, Northwood, North Dakota.

2 Ion transitions monitored were as follows (target ion and confirmatory ion, respectively): m/z 432.1 \rightarrow 182.0 and m/z 432.1 \rightarrow 325.0 for rimsulfuron (DPX-E9636); m/z 368.1 \rightarrow 325.0 and m/z 368.1 \rightarrow 231.0 for IN-70941; m/z 325.1 \rightarrow 231.0 and m/z 325.1 \rightarrow 279.0 for IN-70942; and m/z 251.1 \rightarrow 106.0 and m/z 251.1 \rightarrow 234.0 for IN-E9260 (p 20).

III. Method Characteristics

In both the ECM and ILV, the LOQ was reported as 0.1 µg/L for water and 0.20 µg/kg for soil (p. 29 of MRID 49389201; p. 25 of MRID 49389202). In the ECM, the LOQ was defined as the lowest fortification level which obtained average recoveries of 70-110% and a RSD <20%.

The LOD was not determined experimentally; however, it was reported as approximately three times the background around the retention time of the peak of interest. In the ILV, the LOQ was reported from the ECM, and no justification was provided. The LOD was not reported.

Table 4A. Method Characteristics - Soil

	Rimsulfuron (DPX-E9636)	IN-70941	IN-70942	IN-E9260
Limit of Quantitation (LOQ)	0.20 µg/kg			
Limit of Detection (LOD)	Not reported			
Linearity (calibration curve r^2 and concentration range) ^{1,2}	$r^2 = 1$ (T) $r^2 = 0.9997$ (C)	$r^2 = 0.9998$ (T) $r^2 = 0.9998$ (C)	$r^2 = 0.9999$ (T) $r^2 = 0.9997$ (C)	$r^2 = 1$ (T) $r^2 = 0.9999$ (C)
	(0.050-5.0 ng/mL)			
Repeatable	Yes ³			Yes ^{3,4}
Reproducible	Yes ⁵			
Specific ^{6,7}	Yes			

Data were obtained from p. 29; Table 1A-B, pp. 33-40; Figure 1, p. 53; Appendix 1, pp. 59-73 of MRID 49389201; and pp. 23-24 of MRID 49389202. (T) = target ion; (C) = confirmatory ion.

1 Calibration curves were only provided for the Italian loam soil. The reviewer could not verify the calibration curves provided in the ECM because no raw data was included and chromatograms were only provided for the lowest calibration standard (Appendix 1, pp. 59-73 of MRID 49389201).

2 ILV calibration curves (0.025-5 ng/mL) were provided; however, linear coefficients and equations were not reported (Figure 5, pp. 74-77 of MRID 49389202). These calibration curves were not matrix-specific. Reviewer-calculated ILV calibration curves confirmed linearity: $r^2 = 0.9999-1$ for rimsulfuron; $r^2 = 0.9999$ for IN-70941; $r^2 = 0.9994-0.9995$ for IN-70942; and $r^2 = 1$ for IN-E9260 (calculated from data in Figures 1-4, pp. 42-73; see DER Attachment 2).

3 The ECM was verified using two foreign soils: a silt loam soil (OM 2.6%) and a loam soil (OM 1.6%; p. 19 of MRID 49389201).

4 The mean recovery of the analysis of the confirmatory ion at LOQ of the loam soil did not meet guidelines (61%; Table 1B, p. 40 of MRID 49389201).

5 The ILV employed a domestic soil: a clay loam soil (OM 5.9%; p. 16 of MRID 49389202).

6 Only chromatograms from the Italian loam soil analysis were provided in the study report.

7 Several of the control chromatograms contained a small peak at the retention time of the analyte (Appendix 1, pp. 59-73 of MRID 49389201).

Table 4B. Method Characteristics - Water

		Rimsulfuron (DPX-E9636)	IN-70941	IN-70942	IN-E9260
Limit of Quantitation (LOQ)		0.1 µg/L			
Limit of Detection (LOD)		Not reported			
Linearity (calibration curve r^2 and concentration range) ^{1,2}	Pond water	$r^2 = 1.0000$ (T) $r^2 = 0.9999$ (C)	$r^2 = 0.9999$ (T) $r^2 = 1.0000$ (C)	$r^2 = 0.9999$ (T) $r^2 = 1.0000$ (C)	$r^2 = 1.0000$ (T) $r^2 = 0.9999$ (C)
	Well water ³	$r^2 = 1.0000$ (T) $r^2 = 0.9999$ (C)	$r^2 = 1.0000$ (T) $r^2 = 0.9999$ (C)	$r^2 = 0.9998$ (T) $r^2 = 0.9999$ (C)	$r^2 = 0.9999$ (T) $r^2 = 0.9999$ (C)
	Tap water ³	$r^2 = 1.0000$ (T) $r^2 = 1.0000$ (C)	$r^2 = 1.0000$ (T) $r^2 = 1.0000$ (C)	$r^2 = 0.9998$ (T) $r^2 = 1.0000$ (C)	$r^2 = 0.9999$ (T) $r^2 = 1.0000$ (C)
	Concentration Range	(0.050-5.0 ng/mL)			
Repeatable		Yes ²			
Reproducible		Yes ⁴			
Specific		Yes			

Data were obtained from p. 29; Table 1C-E, pp. 41-52; Figure 1, pp. 54-55; Appendix 1, pp. 74-79 of MRID 49389201; and pp. 23-24 of MRID 49389202. (T) = target ion; (C) = confirmatory ion.

1 Calibration curves were only provided for the pond water in the ECM report. Reviewer-calculated ECM calibration curves confirmed linearity: $r^2 = 0.9999-1$ for all analytes/ions (calculated from data in Appendix 2, pp. 80-83 of MRID 49389201; see DER Attachment 2).

2 ILV calibration curves (0.025-5 ng/mL) were provided; however, a linear coefficient and equation were not reported (Figure 5, pp. 74-77 of MRID 49389202). These calibration curves were not matrix-specific. Reviewer-calculated ILV calibration curves confirmed linearity: $r^2 = 0.9999-1$ for rimsulfuron; $r^2 = 0.9999$ for IN-70941; $r^2 = 0.9994-0.9995$ for IN-70942; and $r^2 = 1$ for IN-E9260 (Figures 1-4, pp. 42-73).

3 Reviewer-calculated based on data obtained from Appendix 2, pp. 84-91 of MRID 49389201.

4 The ILV employed the same surface water as that of the ECM: Lums Pond, Lums Pond State Park, Bear, Delaware (sampled 01/19/04; p. 16; Appendix 2, pp. 114-116 of MRID 49389202).

IV. Method Deficiencies and Reviewer's Comments

1. The LOQ in soil was slightly greater than the lowest toxicological levels of concern in soil. An LOQ above toxicological level of concern results in an unacceptable method classification. However, because the LOQ for water is less than the toxicological level of concern for aquatic organisms, the method was not classified as unacceptable.

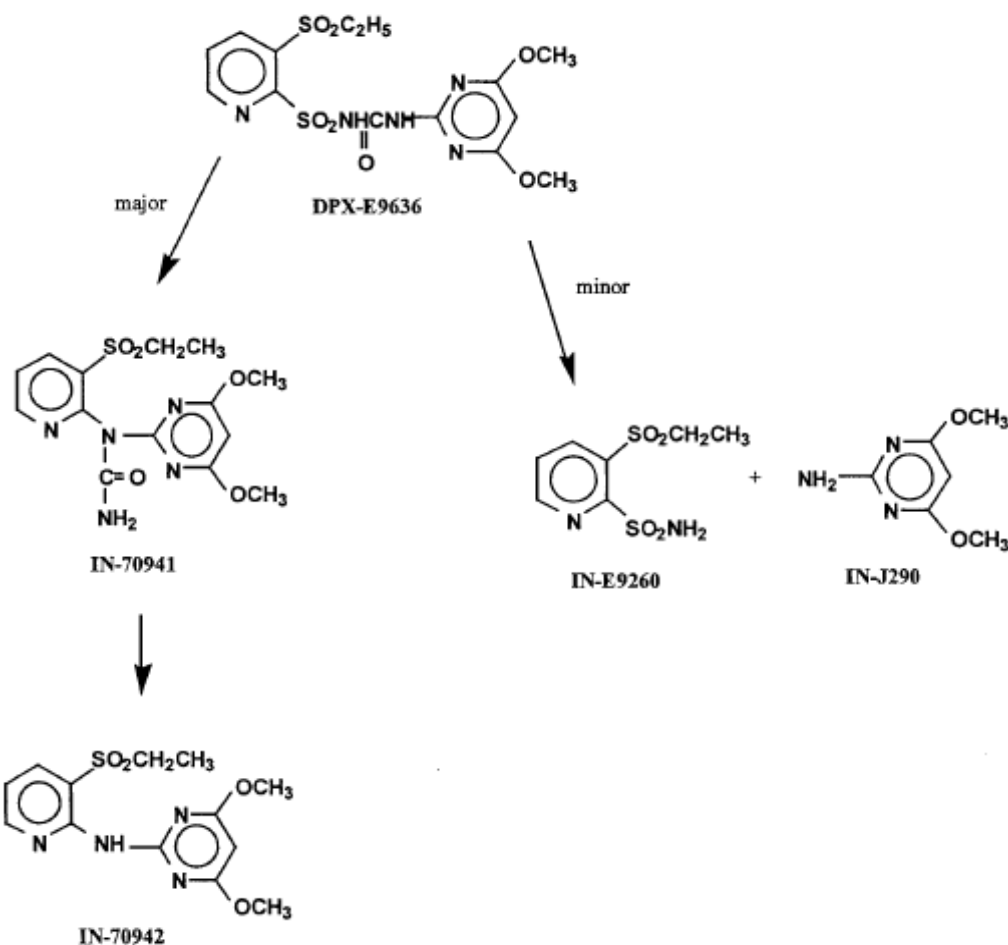
The estimations of the LOQ and LOD in the ECM were not based on scientifically acceptable procedures as defined in 40 CFR Part 136. The LOQ was not adequately supported by calculations or comparison to background levels. It was defined as the lowest fortification level which obtained average recoveries of 70-110% and a RSD <20%. The LOD was not determined experimentally; however, it was reported as approximately three times the background around the retention time of the peak of interest. No calculations were provided. Detection limits should not be based on the arbitrarily selected lowest concentration in the spiked samples

2. In the ECM soil validation, only chromatograms from the Italian loam soil analysis were provided in the study report (Appendix 1, pp. 59-73 of MRID 49389201). The reviewer

- noted that several of the control chromatograms contained a very small peak at the retention time of the respective analyte. For the water validation, a complete set of chromatograms was provided for all water types (Appendix 1, pp. 75-79). The chromatograms of reagent blanks were not included. In the ILV, a complete set of chromatograms, including reagent blanks, was provided for the water and soil validations (Figure 6-13, pp. 78-109 of MRID 49389202). Significant background noise was noted in the confirmatory-ion soil control and LOQ chromatograms of rimsulfuron and IN-E9260; however, this background noise did not affect peak clarity (Figure 7, pp. 82-83; Figure 13, pp. 106-107). The ILV study author reported that interferences were negligible at <30% of the LOQ for all analytes/matrices (p. 24).
3. In the ECM, the recovery results of the confirmatory ion analysis of IN-E9260 in the loam soil were outside of the range specified by the guidelines (mean recovery, 70-120%) at the LOQ (mean, 61%; Table 1A-E, pp. 33-52). However, the ILV confirmatory ion analyses were within guidelines using a clay loam soil with an organic matter content of 5.9% which would be considered the more difficult analytical sample condition, as compared to the ECM loam soil with an organic matter content of 1.6%.
 4. For the ECM evaluation of IN-E9260 in soil, the confirmatory ion chromatograms of the control sample and LOQ contained a significant amount of baseline noise (surrounding the analyte retention time) which was equal to or greater than the analyte peak (Appendix 1, pp. 72-73 of MRID 49389201). For IN-E9260 in water, the chromatograms of the pond/well/tap control samples contained a significant amount of baseline noise; this baseline noise obscured the peak clarity at the LOQ for the confirmatory ion (Appendix 1, pp. 75-79). This background interference was also observed in the 0.05 ng/mL standard chromatogram (Appendix 1, p. 74). For all analytes but IN-70941, the baseline noise was greater in the confirmatory ion spectrum than the target ion spectrum in all water types (Appendix 1, pp. 75-79). The ECM study authors reported that interferences were <10% of the LOQ for all analytes/matrices (p. 27).
 5. The ILV soil was only partially characterized; laboratory not reported (p. 16 of MRID 49389202). The ILV surface water was the same as that of the ECM: Lums Pond, Lums Pond State Park, Bear, Delaware (sampled 01/19/04; p. 16; Appendix 2, pp. 114-116). Since the sampling date of the Lums Pond water was not reported in the ECM, the reviewer could not determine if the ECM and ILV pond water was the same batch.
 6. The ion ratios were calculated as another validation of the method (pp.30-31; Appendix 2, pp. 80-91 of MRID 49389201). All fortified samples yielded ion ratios of $\pm 30\%$ of the average ratio for all calibration standards in a set.
 7. The minor modifications and differences in the ILV method, which were detailed above, were not considered substantial changes to the ECM method (pp. 17-20 of MRID 49389202).
 8. The reviewer noted a typographical error in the titling of the Water Method Validation chromatograms in the ECM, where “Nicosulfuron and Metabolites” was written in the place of “Rimsulfuron and Metabolites” (p. 10; p. 30; Appendix 1, p. 74 of MRID 49389201). The other typographical error which was already discussed in the DER was the replacement of

“1 M ammonium formate” with “5 mM ammonium acetate” as the water extraction solvent on p. 9 and 15 of the ECM study report (corrected reported on p. 22).

9. It was reported for the ILV that a single analyst completed two sample sets consisting of 12 samples in an 8-hour workday (p. 24 of MRID 49389202). The ECM reported that a single analyst could complete 12-20 water samples in 1.2 working days (p. 10 of MRID 49389201).
10. The ECM study authors provided the proposed metabolic pathway for rimsulfuron (shown below; p. 56 of MRID 49389201).



V. References

U.S. Environmental Protection Agency. 2012. Ecological Effects Test Guidelines, OCSPP 850.6100, Environmental Chemistry Methods and Associated Independent Laboratory Validation. Office of Chemical Safety and Pollution Prevention, Washington, DC. EPA 712-C-001.

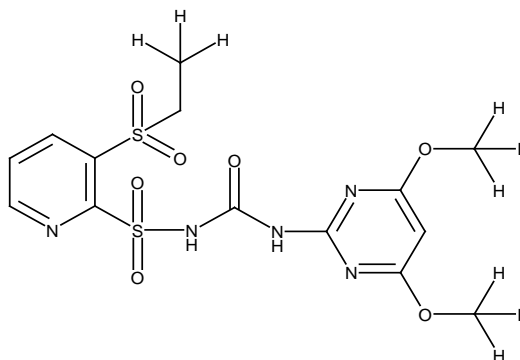
40 CFR Part 136. Appendix B. Definition and Procedure for the Determination of the Method

Detection Limit-Revision 1.11, pp. 317-319.

Attachment 1: Chemical Names and Structures

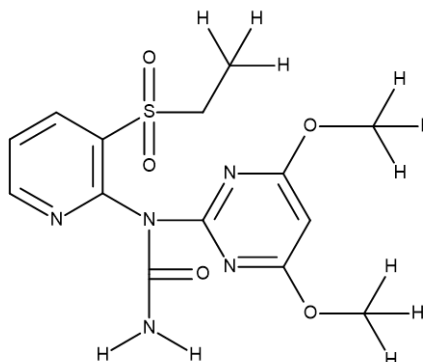
Rimsulfuron; DPX-E9636

IUPAC Name: 1-(4,6-Dimethoxypyrimidin-2-yl)-3-(3-ethylsulfonyl-2-pyridylsulfonyl)urea
CAS Name: N-[[[4,6-Dimethoxy-2-pyrimidinyl)amino]carbonyl]-3-(ethylsulfonyl)-2-pyridinesulfonamide
CAS Number: 122931-48-0
SMILES String: CCS(=O)(=O)c1ccnc1S(=O)(=O)NC(=O)Nc2nc(OC)cc(OC)n2 (EpiSuite 4.0).



IN-70941

IUPAC Name: 1-(4,6-Dimethoxypyrimidin-2-yl)-1-(3-ethylsulfonyl-2-pyridyl)urea (IUPAC Name Add-In for Accelrys Draw 4.0).
CAS Name: N-(4,6-Dimethoxy-2-pyrimidinyl)-N-((3-ethylsulfonyl)-2-pyridinyl)urea
CAS Number: 138724-53-5
SMILES String: Not reported



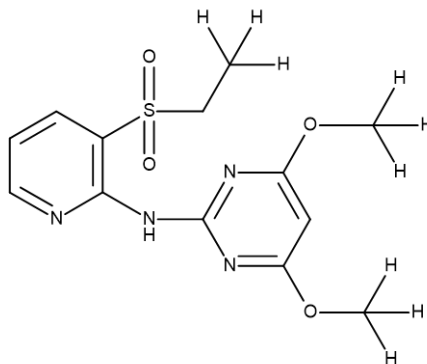
IN-70942

IUPAC Name: N-(3-Ethylsulfonyl-2-pyridyl)-4,6-dimethoxy-pyrimidin-2-amine (IUPAC Name Add-In for Accelrys Draw 4.0).

CAS Name: N-((3-Ethylsulfonyl)-2-pyridinyl)-4,6-dimethoxy-2-pyrimidinamine

CAS Number: 151331-80-5

SMILES String: Not reported

**IN-E9260 (Pyridine sulfonamide)**

IUPAC Name: 3-Ethylsulfonylpyridine-2-sulfonamide (IUPAC Name Add-In for Accelrys Draw 4.0).

CAS Name: 3-(Ethylsulfonyl)-2-pyridinesulfonamide

CAS Number: 117671-01-9

SMILES String: Not reported

