Analytical method for dimethenamid-P (BAS 656 H) and its metabolites Reg. No. 360715 (M23), Reg. No. 360714 (M27), and Reg. No. 360712 (M31) in soil and sediment

Reports: ECM: EPA MRID No.: 50362701. Tilting, N., and F. Sopena-Vazquez. 2014. Validation of Analytical Method L0109/02: Determination of Dimethenamid-P (BAS 656 H) and its Metabolites Reg No. 360715 (M23), Reg No. 360714 (M27) and Reg No. 360712 (M31) in Soil and Sediment by HPLC/MS-MS. BASF Study Code: 380201. BASF Registration Document No. 2013/1110235. Report prepared by BASF SE, Crop Protection Ecology and Environmental Analytics, Limburgerhof, Germany, and sponsored and submitted by BASF Corporation, Research Triangle Park, North Carolina; 110 pages. Final report issued February 28, 2014.

ILV: EPA MRID No. 50362706. Wooler, G. 2017. Independent Laboratory Validation of BASF Analytical Method L0109/02, “Determination of Dimethenamid-P and its Metabolites Reg. No. 360715 (M23), Reg. No. 360714 (M27) and Reg. No. 360712 (M31) in Soil and Sediment by HPLC/MS-MS”. BASF Study No.: 822650. CPS Study No.: 107344. BASF Registration Document No. 2017/7015778. Report prepared by Critical Path Services, LLC, Garnet Valley, Pennsylvania, and sponsored and submitted by BASF Crop Protection, Research Triangle Park, North Carolina; 261 pages. Final report issued October 19, 2017.

Document No.: MRIDs 50362701 & 50362706

Guideline: 850.6100

Statements: ECM: The study was conducted in accordance with OECD and German Good Laboratory Practice (GLP) standards; and therefore, USEPA FIFRA and TSCA GLP with the exception of the differences which exist between OECD and USEPA GLP (pp. 3, 5-6 of MRID 50362701). Signed and dated GLP and Quality Assurance statements were provided (pp. 2-3, 5-7). An Authenticity statement was not included.

ILV: The study was conducted in accordance with USEPA FIFRA GLP (40 CFR Part 160) standards (p. 3 of MRID 50362706). Signed and dated No Data Confidentiality, GLP, Quality Assurance, Authenticity statements were provided (pp. 2-5).

Classification: This analytical method is classified as acceptable. There are no major deficiencies.

PC Code: 129051

EFED Final Reviewer: Sheng Lin, Ph.D., Physical Scientist

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CDM/CSS-Dynamac JV Reviewers: Lisa Muto, Environmental Scientist

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Mary Samuel, M.S.,
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This Data Evaluation Record may have been altered by the Environmental Fate and Effects Division subsequent to signing by CDM/CSS-Dynamac JV personnel. The CDM/CSS-Dynamac Joint Venture role does not include establishing Agency policies.

Executive Summary

The analytical method, BASF Analytical Method L0109/02, is designed for the quantitative determination of dimethenamid-P (BAS 656 H) and its metabolites Reg. No. 360715 (M23), Reg. No. 360714 (M27), and Reg. No. 360712 (M31) in soil and sediment at the LOQ of 0.005 mg/kg using LC/MS/MS. The LOQ is less than the lowest toxicological level of concern in soil and sediment for all analytes. The ECM validated the method using two characterized soil matrices and one characterized sediment matrix. The ILV validated the method using one uncharacterized soil matrix and one uncharacterized sediment matrix. It could not be determined if the ILV was provided with the most difficult matrix with which to validate the method and that the ILV soil matrix covered the range of soils used in the terrestrial field dissipation studies. The ILV validated the method for all analytes after the first trial with insignificant modifications of the analytical instruments and the fact that Reg. No. 5886780 (the S-enantiomer of Reg No. 360715) was used as M23. The ILV recommended to filter the extract prior to MS analysis. Using solvent-based calibration standards, all submitted ECM and ILV data pertaining to precision, repeatability, reproducibility, linearity, and specificity was acceptable, except for linearity of two confirmation analyses. ILV performance data and linearity was not satisfactory for analysis of dimethenamid-P in sediment using matrix-matched calibration standards; however, all other submitted ILV data pertaining to precision, repeatability, reproducibility, linearity, and specificity was acceptable for analysis using matrix-matched calibration standards. Matrix-matched calibration standards were not used in the ECM.

Table 1. Analytical Method Summary

Analyte(s) by Pesticide	MRID		EPA Review	Matrix	Method Date (dd/mm/yyyy)	Registrant	Analysis	Limit of Quantitation (LOQ)
	Environmental Chemistry Method	Independent Laboratory Validation						
Dimethenamid-P (BAS 656 H)	50362701[1]	50362706[2]		Soil and Sediment	28/02/2014	BASF Corporation	LC/MS/MS	0.005 mg/kg
Reg. No. 360715 (M23)								
Reg. No. 360714 (M27)								
Reg. No. 360712 (M31)								

1 In ECM, LUFA 2.2 soil [loamy sand; 84.0% sand, 11.4% silt, 4.6% clay; pH 6.3 (water), pH 5.6 ($CaCl_2$), 1.53% total organic carbon] obtained from Germany (Rheinland-Pfalz/Mochtersheim), LUFA 5M soil [sandy loam; 59.2% sand, 28.8% silt, 12.0% clay; pH 7.8 (water), pH 7.1 ($CaCl_2$), 0.98% total organic carbon] obtained from Germany (Rheinland-Pfalz/Mochtersheim), and Berghäuser Altrhein sediment [silty clay loam; 4.5% sand, 66.9% silt, 28.6% clay; pH 8.0 (water), pH 7.3 ($CaCl_2$), 6.70% total organic carbon] obtained from Berghäuser Altrhein were used in the study (USDA Soil texture classification; p. 20; Figures A.74-A.76, pp. 102-106 of MRID 50362701). Soils and sediment were characterized by BioChem (full address not reported).

3 In the ILV, the soil and sediment matrices used in the study were provided by the Sponsor, BASF (pp. 24-26 of MRID 50362706). Soil and sediment classifications were not reported. The source of the soil and sediment was not further described.

I. Principle of the Method

Soil and sediment samples (5 g) in plastic centrifuge tubes were fortified (0.25 mL of 0.1 or 1.0 µg/mL mixed fortification solutions), as necessary (pp. 23-25; Appendix 6.2, Figure A.13, p. 45 of MRID 50362701). The samples were extracted twice with 20 mL of methanol:water (60:40, v:v) via shaking for 30 minutes at 225 rpm. After centrifugation, the extract was decanted into a clean flask. The combined extracts were brought to 50 mL using methanol:water (60:40, v:v). The volume of the extract was further diluted to 100 mL with water. An aliquot of the final extract was transferred to an autosampler vial for LC/MS/MS analysis.

Analytes were identified and quantified by LC/MS/MS using a Sciex Triple Quadrupole API 4000 LC/MS/MS coupled with a PE Sciex API 4000 MS (p. 25 of MRID 50362701). The following conditions were employed: Zorbax Eclipse XDB C18 analytical column (150 mm x 4.6 mm, 5 µm particle size; column temperature 40°C) eluted with a gradient mobile phase of (A) water:formic acid (1000:1, v:v) and (B) methanol:formic acid (1000:1, v:v) [time, percent A:B; time 0.00 min. 80:20, 5.0-10.0 min. 20:80, 10.1-15.0 min. 80:20] using a injection volume of 50.0 µL and Turbo spray ESI ionization MRM scan mode (positive for parent and negative for metabolites). Analytes were identified using two ion transitions (quantitation and confirmation, respectively): *m/z* 276→244 and *m/z* 276→168 for dimethenamid-P (BAS 656 H), *m/z* 270→198 and *m/z* 270→166 for Reg. No. 360715 (M23), *m/z* 320→121 and *m/z* 320→80 for Reg. No. 360714 (M27), and *m/z* 346→240 and *m/z* 346→198 for Reg. No. 360712 (M31). Expected retention times were *ca*. 7.3, 5.6, 6.1, and 5.8 minutes for dimethenamid-P (BAS 656 H), Reg. No. 360715 (M23), Reg. No. 360714 (M27), and Reg. No. 360712 (M31), respectively.

In the ILV, the ECM was performed as written, except for insignificant LC/MS instrument modifications and the fact that Reg. No. 5886780 (the S-enantiomer of Reg No. 360715) was used as M23 (pp. 7, 26-27, 37; Table 28, p. 77 of MRID 50362706). Analytes were identified and quantified by LC/MS/MS using an Agilent 1200 HPLC coupled with a Sciex API 4000 MS. The LC/MS conditions were the same as the ECM; however, the MS temperature was reported as 650°C. Analytes were identified using two ion transitions (quantitation and confirmation); the MS transitions were the same as those of ECM. Expected retention times were *ca*. 7.9, 6.6, 6.1, and 6.4 minutes for dimethenamid-P (BAS 656 H), Reg. No. 360715 (M23), Reg. No. 360714 (M27), and Reg. No. 360712 (M31), respectively. The following recommendation was made by the ILV: to filter the extract through a 0.45 µm syringe filter to reduce contamination of MS cone (p. 40; Appendix A, p. 225).

The Limit of Quantification (LOQ) for dimethenamid-P and its metabolites [Reg. No. 360715 (M23), Reg. No. 360714 (M27), and Reg. No. 360712 (M31)] in soil and sediment was 0.005 mg/kg in the ECM and ILV (pp. 8, 36 of MRID 50362701; pp. 7, 39 of MRID 50362706). The Limit of Determination (LOD) for all analytes in soil and sediment was reported as 0.001 mg/kg (20% of the LOQ) in the ECM and ILV.

II. Recovery Findings

ECM (MRID 50362701): Mean recoveries and RSDs were within guideline requirements [means between 70% and 120% and relative standard deviations (RSD) ≤20%] for analysis of dimethenamid-P (BAS 656 H), Reg. No. 360715 (M23), Reg. No. 360714 (M27), and Reg. No. 360712 (M31) at fortification levels of 0.005 mg/kg (LOQ) and 0.05 mg/kg (10×LOQ) in two soil matrices and one sediment matrix (Tables 16-19, pp. 33-35; Appendix 6.4, p. 74, Tables A.1-A.24, pp. 75-86). All analytes were identified using two ion transitions; performance data (recovery results) for the quantitation and confirmation ion analyses were comparable. LUFA 2.2 soil [loamy sand; 84.0% sand, 11.4% silt, 4.6% clay, ; pH 6.3 (water) pH 5.6 ($CaCl_2$), 1.53% total organic carbon] obtained from Germany (Rheinland-Pfalz/Mochtersheim), LUFA 5M soil [sandy loam; 59.2% sand, 28.8% silt, 12.0% clay; pH 7.8 (water), pH 7.1 ($CaCl_2$), 0.98% total organic carbon] obtained from Germany (Rheinland-Pfalz/Mochtersheim), and Berghäuser Altrhein sediment [silty clay loam; 4.5% sand, 66.9% silt, 28.6% clay; pH 8.0 (water), pH 7.3 ($CaCl_2$), 6.70% total organic carbon] obtained from Berghäuser Altrhein were used in the study (USDA Soil texture classification; p. 20; Figures A.74-A.76, pp. 102-106 of MRID 50362701). Soils and sediment were characterized by BioChem (full address not reported).

ILV (MRID 50362706): Mean recoveries and RSDs were within guideline requirements for analysis of dimethenamid-P (BAS 656 H), Reg. No. 360715 (M23), Reg. No. 360714 (M27), and Reg. No. 360712 (M31) at fortification levels of 0.005 mg/kg (LOQ) and 0.05 mg/kg (10×LOQ) in one soil matrix (Tables 1-24, pp. 43-66). The soil analysis was performed using solvent-based calibration standards; the sediment analyses were performed with calibration standards in matrix, as well as solvent. Mean recoveries and RSDs were within guideline requirements for analysis of dimethenamid-P (BAS 656 H) at fortification levels of 0.005 mg/kg (LOQ) and 0.05 mg/kg (10×LOQ) in one sediment matrix using solvent-based calibration standards; mean recoveries were not acceptable for dimethenamid-P (BAS 656 H) at the LOQ (mean 67.4-67.6%) and 10×LOQ (mean 67.4-68.2%) in one sediment matrix using matrix-based standards. Mean recoveries and RSDs were within guideline requirements for analysis of Reg. No. 360715 (M23), Reg. No. 360714 (M27), and Reg. No. 360712 (M31) at fortification levels of 0.005 mg/kg (LOQ) and 0.05 mg/kg (10×LOQ) in one sediment matrix using solvent-based calibration standards and matrix-based standards. All analytes were identified using two ion transitions; performance data (recovery results) for the quantitation and confirmation ion analyses were comparable. The soil and sediment matrices used in the study were provided by the Sponsor, BASF (pp. 24-26). Soil and sediment classifications were not reported. The source of the soil and sediment was not further described. For all analytes, the method was validated after the first trial with insignificant modifications of the analytical instruments and the fact that Reg. No. 5886780 (the S-enantiomer of Reg No. 360715) was used as M23 (pp. 7, 26-27, 37, 40; Table 28, p. 77). The only recommendation which was made by the ILV was to filter the extract through a 0.45 µm syringe filter to reduce contamination of MS cone (p. 40; Appendix A, p. 225).

Table 2. Initial Validation Method Recoveries for Dimethenamid-P (BAS 656 H) and its Metabolites Reg. No. 360715 (M23), Reg. No. 360714 (M27), and Reg. No. 360712 (M31) in Soil and Sediment[1,2]

Analyte	Fortification Level (mg/kg)	Number of Tests	Recovery Range (%)	Mean Recovery (%)	Standard Deviation (%)	Relative Standard Deviation (%)
	LUFA 2.2 Soil					
	Quantitation Ion Transition					
Dimethenamid-P (BAS 656 H)	0.005 (LOQ)	5	96.0-99.6	98.2	1.4	1.4
	0.05	5	96.8-100.8	99.4	1.6	1.6
Reg. No. 360715 (M23)	0.005 (LOQ)	5	93.2-99.6	96.6	2.6	2.7
	0.05	5	94.4-101.6	97.4	3.0	3.1
Reg. No. 360714 (M27)	0.005 (LOQ)	5	92.0-99.2	95.9	2.9	3.1
	0.05	5	91.6-99.6	96.5	3.0	3.1
Reg. No. 360712 (M31)	0.005 (LOQ)	5	90.0-105.6	97.9	6.0	6.1
	0.05	5	96.8-103.2	99.5	2.6	2.7
	Confirmation Ion Transition					
Dimethenamid-P (BAS 656 H)	0.005 (LOQ)	5	96.4-100.0	98.7	1.4	1.4
	0.05	5	95.6-98.4	97.3	1.1	1.1
Reg. No. 360715 (M23)	0.005 (LOQ)	5	97.2-105.6	101.5	3.5	3.4
	0.05	5	86.0-95.6	91.4	4.0	4.4
Reg. No. 360714 (M27)	0.005 (LOQ)	5	94.8-99.6	97.1	2.0	2.1
	0.05	5	92.8-98.4	96.2	2.3	2.4
Reg. No. 360712 (M31)	0.005 (LOQ)	5	91.6-103.6	96.2	4.9	5.1
	0.05	5	90.8-102.4	98.1	4.9	5.0
	LUFA 5M Soil					
	Quantitation Ion Transition					
Dimethenamid-P (BAS 656 H)	0.005 (LOQ)	5	98.0-102.4	99.9	1.8	1.8
	0.05	5	105.2-107.6	106.2	1.0	1.0
Reg. No. 360715 (M23)	0.005 (LOQ)	5	98.0-104.4	100.7	2.7	2.7
	0.05	5	99.2-107.6	104.2	3.5	3.4
Reg. No. 360714 (M27)	0.005 (LOQ)	5	95.6-105.2	101.0	3.9	3.9
	0.05	5	99.2-104.8	101.9	2.6	2.6
Reg. No. 360712 (M31)	0.005 (LOQ)	5	93.6-102.8	99.0	4.7	4.8
	0.05	5	90.0-106.8	95.3	7.3	7.7
	Confirmation Ion Transition					
Dimethenamid-P (BAS 656 H)	0.005 (LOQ)	5	97.6-102.4	99.8	2.1	2.1
	0.05	5	104.4-108.4	106.4	1.5	1.4
Reg. No. 360715 (M23)	0.005 (LOQ)	5	88.4-111.6	96.4	9.3	9.7
	0.05	5	83.6-106.8	100.1	9.5	9.5
Reg. No. 360714 (M27)	0.005 (LOQ)	5	96.4-101.6	99.4	1.9	1.9
	0.05	5	94.0-101.2	98.2	2.6	2.7
Reg. No. 360712 (M31)	0.005 (LOQ)	5	89.2-100.4	97.0	4.9	5.1
	0.05	5	92.0-104.0	96.8	5.2	5.4
	Sediment					
	Quantitation Ion Transition					
Dimethenamid-P (BAS 656 H)	0.005 (LOQ)	5	98.8-101.6	99.8	1.2	1.2
	0.05	5	100.4-107.2	102.6	2.8	2.8

Analyte	Fortification Level (mg/kg)	Number of Tests	Recovery Range (%)	Mean Recovery (%)	Standard Deviation (%)	Relative Standard Deviation (%)
Reg. No. 360715 (M23)	0.005 (LOQ)	5	92.4-105.6	99.0	4.7	4.7
	0.05	5	99.2-109.2	104.1	3.6	3.4
Reg. No. 360714 (M27)	0.005 (LOQ)	5	96.4-103.6	101.5	3.0	2.9
	0.05	5	96.0-105.6	102.4	4.3	4.2
Reg. No. 360712 (M31)	0.005 (LOQ)	5	95.2-99.6	97.1	1.7	1.8
	0.05	5	87.2-103.2	95.4	6.2	6.5
	Confirmation Ion Transition					
Dimethenamid-P (BAS 656 H)	0.005 (LOQ)	5	98.8-102.0	100.5	1.3	1.3
	0.05	5	98.0-106.0	101.0	3.3	3.3
Reg. No. 360715 (M23)	0.005 (LOQ)	5	94.0-104.4	99.0	4.4	4.5
	0.05	5	97.2-107.6	102.6	3.9	3.8
Reg. No. 360714 (M27)	0.005 (LOQ)	5	95.6-100.8	99.0	2.1	2.1
	0.05	5	97.2-103.6	100.3	2.6	2.6
Reg. No. 360712 (M31)	0.005 (LOQ)	5	97.2-104.0	100.2	3.5	3.5
	0.05	5	91.6-107.2	100.3	6.8	6.8

Data (recovery results were corrected when residues were quantified in the controls, p. 26) were obtained from Tables 16-19, pp. 33-35; Appendix 6.4, Tables A.1-A.24, pp. 78-89 of MRID 50362701.

1 LUFA 2.2 soil [loamy sand; 84.0% sand, 11.4% silt, 4.6% clay; pH 6.3 (water), pH 5.6 ($CaCl_2$), 1.53% total organic carbon] obtained from Germany (Rheinland-Pfalz/Mochtersheim), LUFA 5M soil [sandy loam; 59.2% sand, 28.8% silt, 12.0% clay; pH 7.8 (water), pH 7.1 ($CaCl_2$), 0.98% total organic carbon] obtained from Germany (Rheinland-Pfalz/Mochtersheim), and Berghäuser Altrhein sediment [silty clay loam; 4.5% sand, 66.9% silt, 28.6% clay; pH 8.0 (water), pH 7.3 ($CaCl_2$), 6.70% total organic carbon] obtained from Berghäuser Altrhein were used in the study (USDA Soil texture classification; p. 20; Figures A.74-A.76, pp. 102-106). Soils and sediment were characterized by BioChem (full address not reported).

2 Analytes were identified using two ion transitions (quantitation and confirmation, respectively): *m/z* 276→244 and *m/z* 276→168 for dimethenamid-P (BAS 656 H), *m/z* 270→198 and *m/z* 270→166 for Reg. No. 360715 (M23), *m/z* 320→121 and *m/z* 320→80 for Reg. No. 360714 (M27), and *m/z* 346→240 and *m/z* 346→198 for Reg. No. 360712 (M31).

Table 3. Independent Validation Method Recoveries for Dimethenamid-P (BAS 656 H) and its Metabolites Reg. No. 360715 (M23), Reg. No. 360714 (M27), and Reg. No. 360712 (M31) in Soil and Sediment[1,2]

Analyte	Fortification Level (mg/kg)	Number of Tests	Recovery Range (%)	Mean Recovery (%)	Standard Deviation (%)	Relative Standard Deviation (%)
	Soil – Standards in Solvent					
	Quantitation Ion Transition					
Dimethenamid-P (BAS 656 H)	0.005 (LOQ)	5	107-122	113	6.3	5.6
	0.05	5	109-120	114	4.5	3.9
Reg. No. 360715 (M23)	0.005 (LOQ)	5	90.2-101	97.9	4.8	4.9
	0.05	5	78.8-96.2	88.6	6.8	7.7
Reg. No. 360714 (M27)	0.005 (LOQ)	5	87.4-98.2	92.3	4.4	4.8
	0.05	5	81.2-94.2	87.4	4.7	5.4
Reg. No. 360712 (M31)	0.005 (LOQ)	5	85.4-95.4	91.0	4.4	4.8
	0.05	5	76.8-93.4	84.8	6.5	7.7
	Confirmation Ion Transition					
Dimethenamid-P (BAS 656 H)	0.005 (LOQ)	5	104-119	111	7.3	6.6
	0.05	5	108-116	112	3.0	2.7
Reg. No. 360715 (M23)	0.005 (LOQ)	5	94.2-101	96.6	2.7	2.8
	0.05	5	82.0-92.2	87.5	4.4	5.0
Reg. No. 360714 (M27)	0.005 (LOQ)	5	94.8-103	100	3.1	3.1
	0.05	5	80.8-94.6	87.1	5.7	6.5
Reg. No. 360712 (M31)	0.005 (LOQ)	5	94.2-104	98.7	4.1	4.2
	0.05	5	77.6-96.2	85.2	7.6	8.9
	Sediment – Standards in Matrix					
	Quantitation Ion Transition					
Dimethenamid-P (BAS 656 H)	0.005 (LOQ)	5	63.6-74.4	**67.6**	4.9	7.2
	0.05	5	65.8-70.2	**67.4**	1.8	2.7
Reg. No. 360715 (M23)	0.005 (LOQ)	5	99.6-116	108	6.8	6.3
	0.05	5	96.8-116	102	7.7	7.5
Reg. No. 360714 (M27)	0.005 (LOQ)	5	97.6-110	103	5.0	4.9
	0.05	5	89.2-106	98.9	7.3	7.4
Reg. No. 360712 (M31)	0.005 (LOQ)	5	92.0-106	100	6.2	6.2
	0.05	5	88.6-112	99.0	9.1	9.2
	Confirmation Ion Transition					
Dimethenamid-P (BAS 656 H)	0.005 (LOQ)	5	64.0-72.0	**67.4**	3.7	5.5
	0.05	5	66.6-69.8	**68.2**	1.5	2.2
Reg. No. 360715 (M23)	0.005 (LOQ)	5	92.4-109	102	6.3	6.2
	0.05	5	92.4-109	98.2	6.5	6.6
Reg. No. 360714 (M27)	0.005 (LOQ)	5	92.0-105	100	6.3	6.3
	0.05	5	91.2-112	98.8	8.5	8.6
Reg. No. 360712 (M31)	0.005 (LOQ)	5	95.6-110	101	5.5	5.4
	0.05	5	96.8-108	100	4.6	4.6
	Sediment – Standards in Solvent					
	Quantitation Ion Transition					
Dimethenamid-P (BAS 656 H)	0.005 (LOQ)	5	99.6-110	106	4.9	4.6
	0.05	5	106-121	111	5.8	5.2

Analyte	Fortification Level (mg/kg)	Number of Tests	Recovery Range (%)	Mean Recovery (%)	Standard Deviation (%)	Relative Standard Deviation (%)
Reg. No. 360715 (M23)	0.005 (LOQ)	5	92.0-113	107	8.9	8.3
	0.05	5	93.6-106	100	4.6	4.6
Reg. No. 360714 (M27)	0.005 (LOQ)	5	97.8-102	100	1.5	1.5
	0.05	5	89.2-103	95.4	5.5	5.8
Reg. No. 360712 (M31)	0.005 (LOQ)	5	90.0-105	98.4	5.7	5.8
	0.05	5	83.2-98.4	93.8	6.1	6.5
	Confirmation Ion Transition					
Dimethenamid-P (BAS 656 H)	0.005 (LOQ)	5	99.4-109	106	4.1	3.9
	0.05	5	104-124	111	7.9	7.1
Reg. No. 360715 (M23)	0.005 (LOQ)	5	91.6-112	100	7.5	7.5
	0.05	5	90.8-111	98.8	7.6	7.7
Reg. No. 360714 (M27)	0.005 (LOQ)	5	97.0-112	106	5.9	5.9
	0.05	5	91.2-106	97.6	5.5	5.6
Reg. No. 360712 (M31)	0.005 (LOQ)	5	91.2-108	99.2	7.0	7.1
	0.05	5	85.2-103	94.6	6.5	6.9

Data (recovery results were corrected when residues were quantified in the controls, Figure 61, p. 223) were obtained from Tables 1-24, pp. 43-66 of MRID 50362706.

1 The soil and sediment matrices used in the study were provided by the Sponsor, BASF (pp. 24-26). Soil and sediment classifications were not reported. The source of the soil and sediment was not further described.

2 Analytes were identified using two ion transitions (quantitation and confirmation, respectively): *m/z* 276→244 and *m/z* 276→168 for dimethenamid-P (BAS 656 H), *m/z* 270→198 and *m/z* 270→166 for Reg. No. 360715 (M23), *m/z* 320→121 and *m/z* 320→80 for Reg. No. 360714 (M27), and *m/z* 346→240 and *m/z* 346→198 for Reg. No. 360712 (M31). These MS transitions were the same as those of the ECM.

III. Method Characteristics

The LOQ for dimethenamid-P and its metabolites [Reg. No. 360715 (M23), Reg. No. 360714 (M27), and Reg. No. 360712 (M31)] in soil and sediment was 0.005 mg/kg in the ECM and ILV (pp. 8, 36 of MRID 50362701; pp. 7, 39 of MRID 50362706). In the ECM, the LOQ was defined as the lowest fortification level successfully tested, corresponding to a concentration of 0.25 ng/mL in the extract. The LOQ was reported in the ILV from the ECM without justification. The LOD for all analytes in soil and sediment was reported as 0.001 mg/kg (20% of the LOQ) in the ECM and ILV. In the ECM, the LOD corresponded to a concentration of 0.05 ng/mL in the extract. In the ILV, the LOD was defined as the absolute amount of analyte injected into the LC/MS/MS using the lowest amount of analyte injected on the column (0.0025 ng) with acceptable signal-to-noise ratios (S/N >3:1) for the least sensitive analyte (M-23, confirmation transition). No calculations for the LOQ and LOD were provided in the ECM and ILV.

Table 4. Method Characteristics

Analyte			**Dimethenamid-P (BAS 656 H)**	**Reg. No. 360715 (M23)**	**Reg. No. 360714 (M27)**	**Reg. No. 360712 (M31)**
Limit of Quantitation (LOQ)			0.005 mg/kg			
Limit of Detection (LOD)			0.001 mg/kg (20% of the LOQ)			
Linearity (calibration curve r^2 and concentration range)[1]	ECM		r^2 = 1.0000 (Q) r^2 = 0.9998 (C)	r^2 = 0.9990 (Q) r^2 = 0.9992 (C)	r^2 = 0.9994 (Q) r^2 = 0.9996 (C)	r^2 = 0.9996 (Q) r^2 = **0.9936** (C)
			0.05-1 ng/mL			
	ILV	Soil	r^2 = 0.9960 (Q) r^2 = 0.9956 (C)	r^2 = 0.9970 (Q) r^2 = 0.9958 (C)	r^2 = 0.9976 (Q) r^2 = 0.9978 (C)	r^2 = 0.9968 (Q) r^2 = 0.9966 (C)
		Sediment (Matrix)	r^2 = **0.9831** (Q)[2] r^2 = **0.9843** (C)[2]	r^2 = 0.9984 (Q) r^2 = 0.9996 (C)	r^2 = 0.9972 (Q) r^2 = 0.9902 (C)	r^2 = 0.9986 (Q) r^2 = 0.9966 (C)
		Sediment (Solvent)	r^2 = 0.9970 (Q) r^2 = 0.9972 (C)	r^2 = 0.9968 (Q) r^2 = **0.9918** (C)	r^2 = 0.9974 (Q & C)	r^2 = 0.9982 (Q) r^2 = 0.9968 (C)
			0.05-10 ng/mL			
Repeatable	ECM[3]		Yes at LOQ and 10×LOQ (two characterized soils and one characterized sediment).			
	ILV[4,5]		Yes at LOQ and 10×LOQ (one uncharacterized soil using solvent-based calibration standards)[6]. Yes at LOQ and 10×LOQ (one uncharacterized sediment using solvent-based calibration standards).			
			No at LOQ (mean **67.4-67.6**%) and 10×LOQ (mean **67.4-68.2**%) - (one uncharacterized sediment using matrix-matched calibration standards).	Yes at LOQ and 10×LOQ (one uncharacterized sediment using matrix-matched calibration standards).		
Reproducible			Yes at LOQ and 10×LOQ.			
Specificity	ECM		**No** 10×LOQ representative chromatograms were provided.			
			Yes, no matrix interferences were observed.	Yes, no matrix interferences were observed. Some baseline noise was noted around the analyte peak at LOQ.	Yes, no matrix interferences were observed.	Yes, no matrix interferences were observed. Some baseline noise was noted around the analyte peak at LOQ with C ion.
	ILV		Yes, matrix interferences were <5% of the LOQ (based on peak area).	Yes, no matrix interferences were observed. Minor peak fronting was observed.	Yes, no matrix interferences were observed. Minor peak splitting was observed.	Yes, no matrix interferences were observed.

Data were obtained from pp. 8, 36 (LOQ/LOD); Tables 16-19, pp. 33-35; Appendix 6.4, Tables A.1-A.24, pp. 78-89 (recovery data); Appendix 6.1, Figures A.5-A.12, pp. 40-44 (calibration curve); Appendix 6.3, Figures A.14-A.69, pp. 47-74 (chromatograms) of MRID 50362701; pp. 7, 39 (LOQ/LOD); Tables 1-24, pp. 43-66 (recovery data); Figures 1-4, pp. 79-82; Figures 21-24, pp. 127-130; Figures 41-44, pp. 175-178 (calibration curves); Figures 5-20, pp. 83-126; Figures 25-40, pp. 131-174; Figures 45-60, pp. 179-221 (chromatograms) of MRID 50362706; DER Attachment 2. Q = Quantitation ion transition; C = Confirmatory ion transition.

1 Reported correlation coefficients were reviewer-calculated from r values reported in the study report (p. 26; Appendix 6.1, Figures A.5-A.12, pp. 40-44 of MRID 50362701; p. 8; Figures 1-4, pp. 79-82; Figures 21-24, pp.

127-130; Figures 41-44, pp. 175-178 of MRID 50362706; DER Attachment 2). Significant figures of r^2 were limited to four.

2 Quadratic equations were used.

3 In ECM, LUFA 2.2 soil [loamy sand; 84.0% sand, 11.4% silt, 4.6% clay; pH 6.3 (water), pH 5.6 ($CaCl_2$), 1.53% total organic carbon] obtained from Germany (Rheinland-Pfalz/Mochtersheim), LUFA 5M soil [sandy loam; 59.2% sand, 28.8% silt, 12.0% clay; pH 7.8 (water), pH 7.1 ($CaCl_2$), 0.98% total organic carbon] obtained from Germany (Rheinland-Pfalz/Mochtersheim), and Berghäuser Altrhein sediment [silty clay loam; 4.5% sand, 66.9% silt, 28.6% clay; pH 8.0 (water), pH 7.3 ($CaCl_2$), 6.70% total organic carbon] obtained from Berghäuser Altrhein were used in the study (USDA Soil texture classification; p. 20; Figures A.74-A.76, pp. 102-106 of MRID 50362701). Soils and sediment were characterized by BioChem (full address not reported).

4 In the ILV, the soil and sediment matrices used in the study were provided by the Sponsor, BASF (pp. 24-26 of MRID 50362706). Soil and sediment classifications were not reported. The source of the soil and sediment was not further described.

5 For all analytes, the method was validated after the first trial with insignificant modifications of the analytical instruments and the fact that Reg. No. 5886780 (the S-enantiomer of Reg No. 360715) was used as M23 (pp. 7, 26-27, 37, 40; Table 28, p. 77 of MRID 50362706). The only recommendation which was made by the ILV was to filter the extract through a 0.45 µm syringe filter to reduce contamination of MS cone (p. 40; Appendix A, p. 225).

6 Only solvent-based standards were used for soil analyses.

Linearity is satisfactory when $r^2 \geq 0.995$.

IV. Method Deficiencies

1. ILV performance data was not satisfactory for analysis of dimethenamid-P in sediment using matrix-matched calibration standards at the LOQ (mean 67.4-67.6%) and 10×LOQ (mean 67.4-68.2%; combined ion transitions; Tables 1-24, pp. 43-66 of MRID 50362706). OCSPP Guideline 850.6100 criteria for precision and accuracy is reported as mean recoveries for replicates at each spiking level between 70% and 120% and relative standard deviations (RSD) ≤20%) at the stated LOQ and at higher concentrations.

2. For the ILV, linearity was not satisfactory for dimethenamid-P in sediment using matrix-matched calibration standards: $r^2 = 0.9831$ (Q) and 0.9843 (C; Figures 21-24, pp. 127-130; Figures 41-44, pp. 175-178 of MRID 50362706; DER Attachment 2). Quadratic equations were used to describe the calibration trends of dimethenamid-P in sediment using matrix-matched calibration standards. Linearity was also not satisfactory for the confirmation ion analysis of M23 using solvent-based standards: $r^2 = 0.9918$. The reviewer noted that a confirmatory method is not usually required when GC/MS and LC/MS are used as the primary method to generate study data; therefore, the linearity deviation of M23 did not affect study validity.

   For the ECM, linearity was not satisfactory for the confirmation ion analysis of M31 using solvent-based standards: $r^2 = 0.9936$ (Appendix 6.1, Figures A.5-A.12, pp. 40-44 of MRID 50362701; DER Attachment 2). The reviewer noted that a confirmatory method is not usually required when GC/MS and LC/MS are used as the primary method to generate study data; therefore, the linearity deviation of M31 did not affect study validity.

   Linearity is satisfactory when $r^2 \geq 0.995$.

3. It could not be determined if the ILV was provided with the most difficult matrix with which to validate the method and that the ILV soil matrix covered the range of soils used in the terrestrial field dissipation studies. The soil and sediment matrices used in the study were provided by the Sponsor, BASF (pp. 24-26 of MRID 50362706). Soil and sediment classifications were not reported. The source of the soil and sediment was not further described. No dimethenamid-P terrestrial field dissipation studies were referenced or described.

4. In the ECM, no representative chromatograms of 10×LOQ fortification were provided for review. Representative chromatograms from all fortification levels should be provided to be able to fully determine the specificity of the method.

5. The estimation of LOQ and LOD in the ECM and ILV was not based on scientifically acceptable procedures as defined in 40 CFR Part 136 (pp. 8, 36 of MRID 50362701; pp. 7, 39 of MRID 50362706). In the ECM, the LOQ was defined as the lowest fortification level successfully tested, corresponding to a concentration of 0.25 ng/mL in the extract. The LOQ was reported in the ILV from the ECM without justification. In the ECM, the LOD corresponded to a concentration of 0.05 ng/mL in the extract. In the ILV, the LOD was defined as the absolute amount of analyte injected into the LC/MS/MS using the lowest amount of analyte injected on the column (0.0025 ng) with acceptable signal-to-noise ratios (S/N >3:1) for the least sensitive analyte (M-23, confirmation transition). No calculations for the LOQ and LOD were provided in the ECM and ILV. Detection limits should not be based on arbitrary values.

V. Reviewer's Comments

1. Matrix effects were studied in the ILV and determined to be insignificant for all analytes; however, low recoveries for dimethenamid-P were noted using matrix-matched calibration standards for sediment analysis (pp. 27-31, 40 of MRID 50362706). Acceptable results were found using solvent-based calibrations for analysis of all analytes.

2. Storage stability was studied in the ECM, and it was determined that all fortification and calibration solutions were stable for up to 4 weeks of refrigerated storage (storage conditions not reported; pp. 27, 30; Tables 1-12, pp. 28-31 of MRID 50362701). Sample extracts were were stable for up to 7 days of refrigerated storage. In the ILV, it was reported that sample extracts were stored in a refrigerator and used within 7 days (p. 39 of MRID 50362706).

3. The ILV reported that no communication between the ILV Study Director and Study Monitor occurred during the study, and the sponsors did not visit the testing facility during the study (p. 40 of MRID 50362706). The Study Monitor was notified of the successful completion of the first trial.

4. In the ILV, the study author stated that the validated LOQ for the residues of dimethenamid-P and its metabolites in soil for each analyte, 0.005 mg/kg, is lower than the lowest relevant endpoint in the soil ecotoxicology (p. 7 of MRID 50362706).

5. In the ILV, the time required to complete the extraction of one set of 13 samples required ca. 8 hours of work, including calculation of results (p. 39 of MRID 50362706).

VI. References

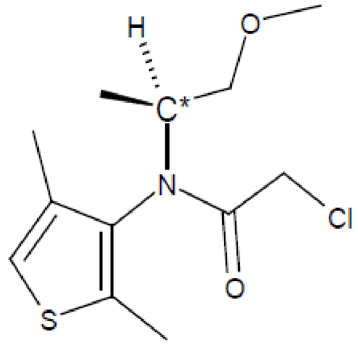
U.S. Environmental Protection Agency. 2012. Ecological Effects Test Guidelines, OCSPP 850.6100, Environmental Chemistry Methods and Associated Independent Laboratory Validation. Office of Chemical Safety and Pollution Prevention, Washington, DC. EPA 712-C-001.

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

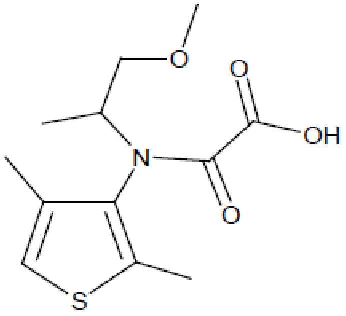
Dimethenamid-P (BAS 656 H; Reg. No. 363851)

IUPAC Name:	(S)-2-chloro-N-(2,4-dimethyl-3-thienyl)-N-(2-methoxy-1-methylethyl)acetamide
CAS Name:	Not reported
CAS Number:	163515-14-8
SMILES String:	Not found



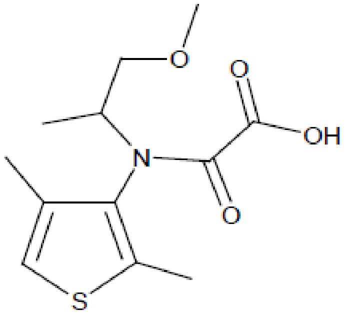
Reg. No. 360715 (M23)

IUPAC Name:	N-(2,4-dimethyl-thiophen-3-yl)-N-(2-methoxy-1-methyl-ethyl)-oxalamic acid
CAS Name:	Not reported
CAS Number:	Not reported
SMILES String:	Not found



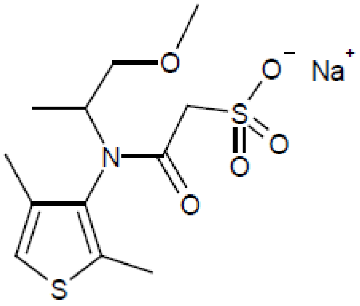
Reg. No. 5886780 (M23; S-enantiomer of Reg No. 360715)

IUPAC Name:	{(2,4-dimethylthiophen-3-yl)[(2S)-1-methoxypropan-2-yl]amino}(oxo)acetic acid
CAS Name:	Not reported
CAS Number:	Not reported
SMILES String:	Not found



Reg. No. 360714 (M27)

IUPAC Name:	Sodium [(2,4-dimethyl-thiophen-3-yl)-(2-methoxy-1-methyl-ethyl)-carbamoyl]-methanesulfonate
CAS Name:	Not reported
CAS Number:	Not reported
SMILES String:	Not found



Reg. No. 360712 (M31)

IUPAC Name:	[[(2,4-Dimethyl-thiophen-3-yl)-(2-methoxy-1-methyl-ethyl)-carbamoyl]-methanesulfinyl]-acetic acid
CAS Name:	Not reported
CAS Number:	Not reported
SMILES String:	Not found