ENVIRONMENTAL CHEMISTRY METHOD REVIEW

Data Requirement: EPA Guideline: 835.6100
OECD Data Point: IIA 4.4

Test materials:

Common name	Chemical name
Thiacloprid	(*Z*)-3-(6-chloro-3-pyridylmethyl-1,3-thiazolidin-2-ylidenecyanamide
Thiacloprid-amide	(*Z*)-[3-[(6-chloro-3-pyridinyl)methyl]-2-thiazolidinylidene]urea
Thiacloprid-sulfonic acid	2-[[[(aminocarbonyl)amino]carbonyl][(6-chloro-3-pyridinyl)methyl]amino]ethanesulfonate

Primary Reviewer: Greg Orrick **Date:** 7-10-12
Greg Orrick, Environmental Scientist, U.S. EPA

Secondary Reviewer: R David Jones **Date:** 7/10/2012
R. David Jones, Ph.D., Senior Agronomist, U.S. EPA

ANALYTICAL METHOD: MRID 44927906. Lam, C. K., C. I. Nuessle, and W. M. Leimkuehler. 1997. Analytical Method for the Determination of YRC 2894 and Two Metabolites in Soil by High Performance Liquid-Chromatography Electrospray Tandem Mass Spectrometry (LC-ESI/MS/MS). Lab. study no. Y4112101; Bayer report no. 107809. Unpublished report prepared by Bayer Corporation, Stilwell, Kansas and submitted by Bayer Corporation, Kansas City, Missouri. Oct. 29, 1997. 42 pp.

INDEPENDENT LABORATORY VALIDATION: MRID 44927912. Wiedmann. 1998. Independent Laboratory Validation of Bayer Report Number 107809 for the Determination of YRC 2894 and Two Metabolites in Soil. Lab. study no. Y4112102; Bayer report no. 108120. Unpublished report prepared by Ricerca, Inc., Painesville, Ohio and submitted by Bayer Corporation, Kansas City, Missouri. Mar. 2, 1998. 145 pp.

EXECUTIVE SUMMARY

This method is designed for the quantitative determination of residues of thiacloprid, thiacloprid-amide, and thiacloprid-sulfonic acid in soil. The method was created by Bayer Corporation in accordance with EPA's Good Laboratory Practice Standards (40 CFR Part 160). An independent laboratory validation performed by Ricerca, Inc. was submitted with this method. The Agency finds that this method meets the criteria for a scientifically valid method and is **acceptable** for all three analytes.

Method Summary: Soil is extracted using methanol:5% acetic acid in water (4:1, v:v) for 10 minutes in an ASE extractor at 90°C. Deuterated internal standards of thiacloprid, its amide, and its sulfonic acid are added to the soil extract. The extract is concentrated and centrifuged prior to analysis by electrospray HPLC/MS/MS. The limit of quantitation (LOQ) for thiacloprid, thiacloprid-amide, and thiacloprid-sulfonic acid was validated at 10 µg/kg for each analyte; respective limits of detection (LOD) were 0.598 µg/kg, 0.992 µg/kg, and 1.31 µg/kg (LODs were not independently validated).

METHOD ACCEPTABILITY/DEFICIENCIES/CLARIFICATIONS

This method was validated by both registrant and independent laboratory validations. The LOQ, however, was arbitrarily set at the lowest concentration evaluated. Also, the ILV report offers suggestions for method clarity on page 22.

The soil matrix was not characterized, which is a deficiency with respect to OCSPP (OPPTS) Guideline 850.6100.

COMPLIANCE

Signed and dated GLP, Confidentiality, Quality Assurance, and Authenticity statements were included in the method report. The method meets FIFRA GLP requirements.

A. BACKGROUND INFORMATION

This analytical method is a modification of Bayer methods 440, MR-368/96, and MR-21/97 to include use of accelerated solvent extraction (ASE). Analytes include thiacloprid, thiacloprid-amide, and thiacloprid-sulfonic acid (chemical names and structures are provided in Attachment 1).

B. MATERIALS AND METHODS

B.1. Principle of Method

Soil is extracted using methanol:5% acetic acid in water (4:1, v:v) for 10 minutes in an ASE extractor at 90°C. Deuterated internal standards of thiacloprid, its amide, and its sulfonic acid are added to the soil extract. Then, the extract is concentrated and centrifuged prior to analysis by electrospray HPLC/MS/MS with a Purospher RP 18 endcapped column.

TABLE B.1. Summary Parameters for the Analytical Method in Soil	
Parameter	**Value**
Method ID	107809
Analyte(s)	Thiacloprid, thiacloprid-amide, thiacloprid-sulfonic acid
Extraction solvent/technique	Extract with methanol:5% acetic acid in water (4:1, v:v) using ASE at 90°C for 10 min. Then, add deuterated internal standards of the analytes.
Cleanup strategies	Concentrate and centrifuge the extract.
Instrument/Detector	Analyze by electrospray HPLC/MS/MS.

C. RESULTS AND DISCUSSION

C.1. Recovery Results Summary

TABLE C.1. Recovery Results from Method Validation of [*Matrix*]			
Analyte	**Spiking Level (µg/kg)**	**Mean Recoveries Obtained (%)**	**Relative Standard Deviation (%)**
Thiacloprid	10	105.4	1.8
Thiacloprid	100	95.4	1.4
Thiacloprid-amide	10	110.6	2.9
Thiacloprid-amide	100	91.8	3.0
Thiacloprid-sulfonic acid	10	106.1	3.9
Thiacloprid-sulfonic acid	100	100.5	2.2

C.1.1. Method Characteristics

TABLE C.2. Method Characteristics			
	Thiacloprid	Thiacloprid-amide	Thiacloprid-sulfonic acid
Limit of Quantitation (LOQ)	10 µg/kg	10 µg/kg	10 µg/kg
Limit of Detection (LOD)	0.598 µg/kg	0.992 µg/kg	1.31 µg/kg
Accuracy/Precision at LOQ	Accurate/precise	Accurate/precise	Accurate/precise
Reliability of the Method	The ILV validated the ECM.		
Linearity (r^2)	0.9975	0.9980	0.9978
Specificity	No interferences were noted.		

C.2. Independent Laboratory Validation (ILV)

The ILV was conducted in accordance with OCSPP Guideline 850.6100.

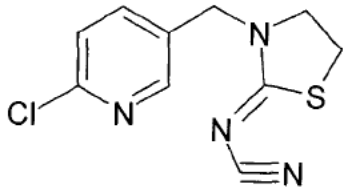
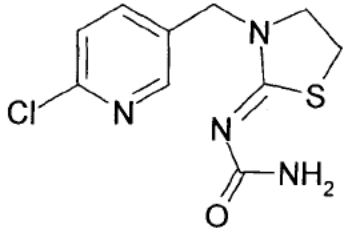
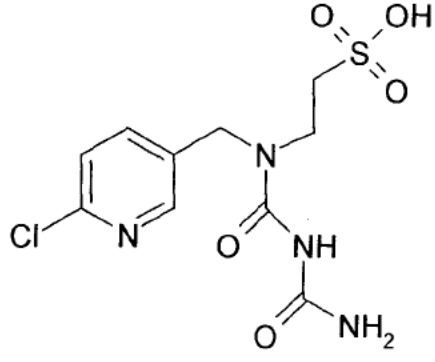
TABLE C.3. Recovery Results of the Method Obtained by an Independent Laboratory Validation

Analyte	Spiking Level (µg/kg)	Mean Recoveries Obtained (%)	Relative Standard Deviation (%)
Thiacloprid	10	93.4	3.4
Thiacloprid	100	99.0	6.3
Thiacloprid-amide	10	100.4	6.7
Thiacloprid-amide	100	102.6	0.87
Thiacloprid-sulfonic acid	10	90.4	8.2
Thiacloprid-sulfonic acid	100	104.2	2.7

D. CONCLUSION

This method is designed for the quantitative determination of residues of thiacloprid, thiacloprid-amide, and thiacloprid-sulfonic acid in soil. The Agency finds that this method meets the criteria for a scientifically valid method and is **acceptable** for all three analytes. However, the spiked soil was not characterized and the LOQ for each analyte was arbitrarily set at the lowest concentration evaluated.

Attachment 1. Chemical Names and Structures of Thiacloprid, Thiacloprid-amide, and Thiacloprid-sulfonic Acid

Code Name/Synonym	Chemical Name	Chemical Structure
Thiacloprid **YRC 2894**	**IUPAC:** (*Z*)-3-(6-chloro-3-pyridylmethyl-1,3-thiazolidin-2-ylidenecyanamide **CAS:** (*Z*)-[3 -[(6-chloro-3-pyridinyl)methyl]-2-thiazolidinylidene]cyanamide **CAS No.:** 111988-49-9 **Formula:** $C_{10}H_9ClN_4S$ **MW:** 252.73 g/mol **SMILES:** ClC1=NC=C(CN2CCSC2=NC#N)C=C1	
Thiacloprid-amide **YRC 2894 amide** **KKO 2254**	(*Z*)-[3-[(6-chloro-3-pyridinyl)methyl]-2-thiazolidinylidene]urea **Formula:** $C_{10}H_{11}ClN_4OS$ **MW:** 270.74 g/mol **SMILES:** NC(=O)N=C1SCCN1CC2=CN=C(Cl)C=C2	
Thiacloprid-sulfonic acid **YRC 2894 sulfonic acid** **WAK 6999 (sodium salt)**	2-[[[(aminocarbonyl)amino]carbonyl][(6-chloro-3-pyridinyl)methyl]amino]ethanesulfonate **Formula:** $C_{10}H_{12}ClN_4O_5S$ **MW:** 335.75 g/mol **SMILES:** NC(=O)NC(=O)N(CC[S](O)(=O)=O)CC1=CN=C(Cl)C=C1	

Attachment 2. ECM Review Checklist

ENVIRONMENTAL CHEMISTRY METHOD (ECM) CHECKLIST: BACKGROUND AND INITIAL REVIEW INFORMATION

I. Background Information

A.	**Title of Method**	Bayer Report No. 107809
B.	**ECM No.**	
C.	**MRID No.**	44927906
D.	**Matrix**	Soil
E.	**Analyte(s) detected**	Thiacloprid, thiacloprid-amide, and thiacloprid-sulfonic acid (see Attachment 1 for chemical structures and names)

II. Information about the Laboratory

A.	**Name**	Bayer Corporation, Agriculture Division
B.	**Address**	17745 South Metcalf, Stilwell, KS 66085
C.	**Telephone No.**	913-433-5309
D.	**Name of the Study Director**	C. K. Lam, Ph.D.
E.	**Name of the Lead Chemist**	Not reported
F.	**Laboratory Validation:**	Yes

III. Method Summary Information for Analyte(s): Thiacloprid, thiacloprid-amide, and thiacloprid-sulfonic acid

A.	**Statement of Data Confidentiality**	Yes
1.	**Is the Method Classified or Confidential?**	No

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2.	**Submitted Prior to 2008 with a Non-Standard Claim of Confidentiality?**	No		
B.	**Sample Preparation**	None		
C.	**Sample Extraction**	Weigh 25 g of soil; extract with methanol:5% acetic acid (4:1 v:v) using Accelerated Solvent Extraction for 10 min. at 90°C.		
D.	**Sample Cleanup**	Add a deuterated internal standard; concentrate to 10 mL; rinse into a centrifuge tube and dilute to 10 mL with HPLC-grade water; centrifuge at 2000 rpm for ~7 min.; take a 2-mL aliquot for analysis.		
E.	**Sample Derivatization (if applicable)**	None		
F.	**Sample Analysis**	Analyze with HPLC-MS/MS.		
1.	**Instrumentation**	Accelerated Solvent Extractor		
2.	**Primary Column**	HPLC		
3.	**Confirmatory Column (If Any)**	None		
4.	**Detector**	MS-MS		
5.	**Other Confirmatory Techniques (If Any)**	None		
6.	**Other Relevant Information**	None		
G.	**Detection and Quantitation Limits**			
1.	**Limit of Quantitation (LOQ)**			
	Claimed in Method	10 µg/kg	**Estimated**	Yes
2.	**Limit of Detection (LOD)**			
	Claimed in Method	0.598 µg/kg (thiacloprid) 0.992 µg/kg (-amide) 1.31 µg/kg (-sulfonic acid)	**Estimated**	No

H.	**Recovery (Accuracy) / Precision of Data (Mean ± SD)** Thiacloprid (10 µg/kg): 105.4% ± 1.9% (RSD = 1.8%) Thiacloprid (100 µg/kg): 95.4% ± 1.3% (RSD = 1.4%) Thiacloprid-amide (10 µg/kg): 110.6% ± 3.2% (RSD = 2.9%) Thiacloprid-amide (100 µg/kg): 91.8% ± 2.8% (RSD = 3.0%) Thiacloprid-sulfonic acid (10 µg/kg): 106.1% ± 4.2% (RSD = 3.9%) Thiacloprid-sulfonic acid (100 µg/kg): 100.5% ± 2.2% (RSD = 2.2%)

IV. Detailed Information about the Method

		YES	NO	REVIEW FURTHER
A.	**Does the method require spiking with the analytes(s) of interest?**	X		
B.	**If the method requires explosive or carcinogenic reagents, are proper precautions explained?**	X		
C.	**Is the following information supplied?**			
1.	**Detailed stepwise description of:**			
a.	**The sample preparation procedure?**	X		
b.	**The sample spiking procedure?**	X		
c.	**The extraction procedure?**	X		
d.	**The derivatization procedure?**			Not applicable
e.	**The clean-up procedure?**	X		
f.	**The analysis procedure?**	X		
2.	**Procedures for:**			
a.	**Preparation of standards?**	X		
b.	**Calibration of instrument?**	X		
3.	**List of glassware and chemicals**	X		
a.	**Are sources recommended?**		X	

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		YES	NO	REVIEW FURTHER
b.	**Are they commercially available?**	X		
4.	**Name, model, *etc.*, of the instrument, column, detector, *etc.*, used?**	X		
a.	**Are sources recommended?**		X	
b.	**Are they commercially available?**	X		
5.	**LOD**			
a.	**Is there an explanation of how it was calculated?**	X		
b.	**Is it a scientifically accepted procedure?**	X		
c.	**Is the matrix blank free of interferences(s) at the retention time, wavelength, *etc.*, of the analyte(s) of interest?**		Not reported	
6.	**LOQ**			
a.	**Is there an explanation of how it was calculated?**	X		
b.	**Is it a scientifically accepted procedure?**		No, the LOQ was based on the arbitrarily selected lowest conc. in the spiked samples.	
7.	**Precision and accuracy data**			
a.	**Were there an adequate number of spiked samples analyzed?**	X		
b.	**Are the mean recoveries between 70-120%?**	X		

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		YES	NO	REVIEW FURTHER
c.	**Are the RSDs of the replicates 20% or less at or above the LOQ?**	X		
8.	**Description and/or explanation of:**			
a.	**Areas where problems may be encountered?**	X		
b.	**Steps that are critical?**	X		
c.	**Interferences that may be encountered?**		X	
9.	**Characterization of the Matrix(es)?**		X	

V. Representative Chromatograms

		YES	NO	REVIEW FURTHER
A.	**Are there representative chromatograms for:**			
1.	**Analyte(s) in each matrix at the LOQ and 10 x LOQ?**	X		
2.	**Method blanks?**	X		
3.	**Matrix blanks?**		X	
4.	**Standard curves?**			
a.	**Do the standard curves have acceptable linearity?**	X		
5.	**Standards that can be used to recalculate some of the values for analyte(s) in the sample chromatograms?**	X		

B.	**Can the responses of the analytes(s) in the chromatograms of the lowest spiking level be accurately measured?**	X		

VI. Good Laboratory Practice (GLP) Standards

		YES	NO	REVIEW FURTHER
A.	**Is there a statement of adherence to the FIFRA GLP standards?**	X		

VII. Independent Lab Validation (ILV)

		YES	NO	REVIEW FURTHER
A.	**Was an ILV performed?**	X		
B.	**Was the validation independent?**	X		
C.	**Did the ILV's precision/accuracy data meet the criteria established in OPPTS Guideline 850.6100?**	X		
D.	**Were recommendations of major or minor modifications to the method made by the independent lab performing the ILV? If major modifications were suggested, what were they?**		X	

VIII. Completeness

		YES	NO	REVIEW FURTHER
A.	**Has enough information been supplied to do a proper review?**	X		

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		YES	NO	REVIEW FURTHER
B.	**Has enough information been supplied to do a laboratory evaluation, if requested?**	X		
C.	**Are all steps in the method scientifically sound?**	X		
D.	**Is a confirmatory method or technique provided?**	Not necessary		
E.	**Check the category below which best describes this ECM.**			
1.	**Satisfactory**			
2.	**Major Deficiencies**			
3.	**Minor Deficiencies**	X		

IX. Recommendations

ECM deficiencies include that the soil matrix was not characterized and that the LOQ was arbitrarily set at the lowest concentration evaluated. These are not deficiencies with the method procedure. However, not characterizing the soil matrix is a deficiency with respect to OCSPP (OPPTS) Guideline 850.6100. The deficiencies do not affect the review classification.

Name and Dated Signature of Primary Reviewer:
Greg Orrick, Environmental Scientist (see front page)

Name(s) and Dated Signature(s) of Secondary Reviewer(s):
R. David Jones, Ph.D., Senior Agronomist (see front page)