Reports: **ECM**: EPA MRID No.: 45360706. Oberding, E.L. 2001. Method Validation Report for the Determination of XDE-795 (Quinoxyfen) and the 3-Hydroxy Metabolite Residues in Soil using Dow AgroSciences Method ERC 94.27. Dow AgroSciences Laboratory Study ID: GH-C 5193. Performing laboratory: Dow AgroSciences Europe, Letcombe Laboratory, Letcombe Regis, Wantage, Oxon. OX12 9JT. Submitting laboratory: Global Environmental Chemistry Laboratory - lndianapolis Lab Dow AgroSciences LLC 9330 Zionsville Road Indianapolis, Indiana 46268-1054. Report completed on February 23, 2001.

ILV: EPA MRID No. 45360704. Fomenko, J. 2001. Summary of the Determination of Terrestrial Dissipation of Quinoxyfen in California Samples Collected in Association with Protocol 990025. Report prepared and study conducted by Maxim Technologies, Inc. Middleport, New York 14105; 53 pages. Maxim Study ID: A020.004. Report completed on February 1, 2001.

Document No.: MRIDs 45360704 & 45360706

Guideline: 850.6100

Statements: ECM: Signed and dated data confidentiality and Quality Assurance statements were provided (pp. 2-4, and p. 38 in Appendix A of MRID 45360706). A signed and dated statement attesting to Good Laboratory Practice (GLP) compliance was also provided on p. 39 of Appendix A of MRID 45360704.
ILV: A signed and dated Quality Assurance statement was provided (p. 79 in Appendix F of MRID 48822503).

Classification: This analytical method is classified as **supplemental**. Sufficient information was provided to demonstrate that peaks can be accurately quantified in spiked samples. Determinations of the LOQ and LOD were based on different procedures in the ECM and ILV studies without a supporting rationale, and their scientific validities are therefore uncertain. Soils were not characterized.

PC Code: 055459

Reviewer: James N. Carleton, Ph.D., Senior Fate Scientist Date: 11/30/15
U.S. EPA

JAMES CARLETON

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Executive Summary

This analytical method, Dow AgroSciences Method ERC 94.27, is designed for the quantitative determination of quinoxyfen and 3-OH-quinoxyfen in soil using GC/MS. The method is quantitative for quinoxyfen at the LOQ of 0.010 mg/kg, and for 3-OH-quinoxyfen at 0.021 mg/kg. A toxicological level of concern in soil has not at this time been established. The study reports do not address whether the method is intended to be applicable to sediment as well as to soil. Insufficient information was provided to determine whether any major modifications were made to the ECM by the laboratory that performed the independent validation.

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						
Quinoxyfen	45360706	45360704	EFED/ OPP	Soil	ECM:02/23/01 ILV:02/01/01	Dow AgroSciences	GC/MS	0.010 mg/kg
3-OH-Quinoxyfen	45360706	45360704	EFED/ OPP	Soil	ECM:02/23/01 ILV:02/01/01	Dow AgroSciences	GC/MS	0.010 mg/kg (ECM) 0.021 mg/kg (ILV)

I. Principle of the Method

Samples (5 g) of soil in 8 dram vials are extracted with 10 mL of hexane:0.12 M HCl (80:20, v:v) by being shaken for 15 minutes on a reciprocating shaker, then centrifuged at 2000 rpm for 5 minutes, after which the supernatant is transferred to a 4 oz. jar (Appendix A, p. 22 of MRID 45360706). The extraction process is repeated two more times, and the supernatants from each extraction are combined. To the combined supernatant, 60 mL of 5% (w/v) sodium bicarbonate solution are added, plus 20 mL of hexane. This mixture is shaken for 15 minutes then centrifuged for 5 minutes at 2000 rpm, after which the hexane layer is transferred into an 8 dram vial. The supernatant extraction process is repeated using an additional 20 mL of hexane, and the extracts are combined. The vial is then heated at 40°C in a heating block, while the hexane is evaporated to dryness under a stream of N_2 gas.

Samples are methylated by adding 250 µL of 0.1 M tetrabutyl ammonium hydroxide, 250 µL of "ammonia solution" (concentration not specified), 1 mL of toluene, and 250 µL of iodomethane. Sample vials are capped and vortexed at 1400 rpm for 90 minutes, then 10 mL of water and 10 mL of methyl tert-butyl ether are added, and the mixture is shaken for 5 minutes and centrifuged at 2000 rpm for 2 minutes. The process is repeated with an additional 10 mL of "ether" (presumably methyl tert-butyl), then the extracts are combined, transferred to an 8 dram vial and heated at 40°C in a heating block, while the ether is evaporated to dryness under a stream of N_2 gas.

The residuum is reconstituted in 5 mL of hexane, sonicated for 1 minute, and passed through an aminopropyl solid phase extraction (SPE) cartridge, which is then washed with 5 mL of hexane and eluted with 6 mL of 5% v/v acetone/hexane. The eluate, in an 8 dram vial, is then heated at 40°C in a heating block and evaporated to dryness under a stream of N_2 gas. The resulting residuum is reconstituted in 1 mL of 0.1% corn oil in trimethylpentane containing 0.2 µg/mL 1,4-dibromonaphthalene as an internal standard, and sonicated for 1 minute.

Samples are analyzed by GC/MSD using a 12.5 m x 0.2 mm i.d. x 0.3 µm film thickness HP-Ultra 2 (5% phenyl methyl silicone stationary phase) GC column, and Helium at 50 kPa head pressure as the carrier gas. The temperature profile is as follows: 60°C for 1 minute, then 20°C/min ramp to 220°C, and hold at 220°C for 2 minutes. The injection volume is 2 µL, and injection mode is splitless.

The LOQs for quinoxyfen in the ECM (MRID 45360706) and ILV (MRID 45360704) were 0.010 and 0.0103 mg/kg respectively, while the LODs were 0.002 and 0.0031 in the same (Appendix A, p. 25 of 45360706; Appendix F, p. 87 of 45360704). The LOQs for 3-OH-quinoxyfen in the ECM and ILV were 0.010 and 0.0209 respectively, while the LODs were 0.002 and 0.0063 mg/kg in the same (Appendix A, p. 25 of 45360706; Appendix F, p. 87 of 45360704).

II. Recovery Findings

ECM (MRID 45360706): Mean recoveries and relative standard deviations (RSDs) were within guideline requirements (mean 70-120%; RSD ≤20%) for analysis of quinoxyfen and 3-OH-quinoxyfen in an unspecified soil (p. 11). Fortifications with both analytes were performed at 0.01, 0.05, 0.1, 0.5, and1 mg/kg (Table 1). The soil was not identified or characterized.

ILV (MRID 4882503): Mean recoveries and RSDs were within guideline requirements for analysis of quinoxyfen and 3-OH-quinoxyfen in an unspecified soil (pp. 97-100; Tables 4, 5). Fortifications were performed at 0.01, 0.02, 0.05, 0.1, 0.3, 0.5, 1, 5, and 10 mg/kg (Table 2). The numbers of replicates were 17, 2, 11, 13, 1, 5, 7, 1 and 1 at these levels, respectively.

Table 1. Initial Validation Method Recoveries for Quinoxyfen and 3-OH-Quinoxyfen in Soil

Analyte	Fortification Level (mg/kg)	Number of Reps	Recovery Range (%)	Mean Recovery (%)	Standard Deviation (%)	Relative Standard Deviation (%)
Quinoxyfen	0.010	6	79-97	86.5	8.38	9.7
	0.050	2	96-98	97	1.41	1.46
	0.100	2	87-89	88	1.41	1.61
	0.500	2	87-91	89	2.83	3.18
	1.000	2	99-101	100	1.41	1.41
3-OH-Quinoxyfen	0.010	6	82-93	88.2	4.0	4.5
	0.050	2	93-96	94.5	2.12	2.24
	0.100	2	90-93	91.5	2.12	2.32
	0.500	2	91-93	92	1.41	1.54
	1.000	2	89-107	98	12.73	12.99

Data were obtained from Table 2, p. 28 of Appendix A, MRID 45360706

Table 3. Independent Validation Method Recoveries for Quinoxyfen and 3-OH-Quinoxyfen in Soil

Analyte	Fortification Level (mg/kg)	Number of Reps	Recovery Range (%)	Mean Recovery (%)	Standard Deviation (%)	Relative Standard Deviation (%)
Quinoxyfen	0.010	17	75.1-118	100.6	9.87	9.81
	0.020	2	94.8-95.4	95.1	0.42	0.45
	0.050	11	74.1-91.5	83.1	5.50	6.63
	0.100	13	73.3-91	82.9	5.92	7.14
	0.300	1	89.9	89.9	NA	NA
	0.500	5	84.9-90.9	86.6	2.53	2.93
	1.000	7	78.5-89.1	84.5	3.74	4.43
	5.000	1	92.5	92.5	NA	NA
	10.000	1	91.7	91.7	NA	NA
3-OH-Quinoxyfen	0.010	17	74.7-136	103.5	19.6	18.94
	0.020	2	81.3-105	93.2	16.76	17.99
	0.050	11	67.3-111	88.9	15.02	16.89
	0.100	13	72.9-113	91.4	12.63	13.81
	0.300	1	99.8	99.8	NA	NA
	0.500	5	68.5-94.9	84.0	10.74	12.78
	1.000	7	70.8-103	88.8	11.35	12.78
	5.000	1	92.4	92.4	NA	NA
	10.000	1	81.5	81.5	NA	NA

Data were obtained from Tables 4, 5, pp. 97-100 of MRID 45360704.

III. Method Characteristics

In the ECM and ILV, the LOQ values for quinoxyfen in soil were 0.010 and 0.0103 mg/kg respectively, while the LODs were 0.002 and 0.0031 (Appendix A, p. 25 of 45360706; Appendix F, p. 87 of 45360704). In the ECM and ILV, the LOQs for 3-OH-quinoxyfen were 0.010 and 0.0209 respectively, while the LODs were 0.002 and 0.0063 mg/kg (Appendix A, p. 25 of 45360706; Appendix F, p. 87 of 45360704).

In the ECM the LOQ was defined as the "lowest validated level, *i.e.*, 0.01 mg/kg", and the LOD was defined as "20% of the lowest validated level, *i.e.*, 0.002 mg/kg". In the ILV the LOQ and LOD were defined as 10s and 3s respectively, where s is the standard deviation of the residue results from samples fortified at 0.010 mg/kg, which was the "initial target" LOQ.

IV. Method Deficiencies and Reviewer's Comments

1. The soil matrices used in the ECM and ILV were not identified or characterized, *e.g.*, in terms of pH, moisture content, percent sand, silt, clay, organic matter, etc.

2. The LOQ reported for 3-OH-quinoxyfen in the ILV was approximately twice the magnitude of that derived in the ECM. This was likely a function of different

methodologies employed in defining the LOQ in the two studies. An explanation for the use of the different procedures was not provided, and their scientific acceptability is not known.

3. Full chromatograms were not provided, *e.g.*, for matrix blanks, standard curves, or spiked samples. Only "typical" partial chromatograms were provided in the ECM report (Figure 6, pp. 33-36), and for standards and fortified control samples only.

4. Rather than an ILV *per se*, an additional validation of the method was conducted as part of a Terrestrial Field Dissipation study. Method performance was demonstrated via recoveries of quinoxyfen and its 3-OH degradate from control samples fortified with these compounds. Recoveries were generally similar between the two studies.

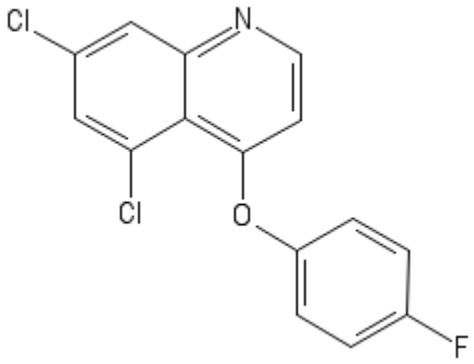
5. According to the ILV report, "no loss of quinoxyfen parent or 3-OH were observed" in field-spiked (at a target rate of 600 g a.i./ha) "European soils after 2.5 years of frozen storage," at temperatures no greater than -14°C. The report provides the following citation for this study:

Gambie, A. (1999) The Stability of XDE-795 and the 3-Hydroxy metabolite in Soil Under Frozen Conditions (30 months). GHE-P-7935. Unpublished report of Dow AgroSciences LLC.

Attachment 1: Chemical Names and Structures

Quinoxyfen

IUPAC Name: 5,7-Dichloro-4-(p-fluorophenoxy)quinoline
CAS Name: 5,7-Dichloro-4-(4-fluorophenoxy)quinoline
CAS Number: 124495-18-7
SMILES String: C2=C(C1=C(C=CN=C1C=C2Cl)OC3=CC=C(C=C3)F)Cl



3-OH-Quinoxyfen

IUPAC Name: 5,7-dichloro-4-(4-fluorophenoxy)quinolin-3-ol
CAS Name: Not reported.
CAS Number: Not reported.
SMILES String: C2=C(C1=C(C(=CN=C1C=C2Cl)O)OC3=CC=C(C=C3)F)Cl.[H]