



**Two analytical methods for tiafenacil (DCC-3825) and its metabolites M-01, M-12, M-13, M-20, M-29, M-30, M-35, M-36, M-53, M-63, M-69, M-72, and M-73 in soil**

- Reports:** ECM: EPA MRID No.: 50493805. Lee, J.K. 2016. Residue Analytical Method of Tiafenacil and Its Metabolites in Soil. Document No.: PC-2018-MDG-004-01. Unpublished study performed by Farm Hannong Co., Ltd., Chungcheongnam-do, Korea; sponsored by Ishihara Sangyo Kaisha, Ltd., Osaka, Japan, and FarmHannong Co., Ltd., Seoul, Korea; and submitted by ISK Biosciences Corporation, Concord, Ohio; 23 pages. Final report issued March 31, 2016.
- ILV: EPA MRID No. 50493806. Schoenau, E.A. 2018. Independent Laboratory Validation of Dongbu Farm Hannong Co., Ltd.'s Residue Analytical Method for the Determination of Tiafenacil and Metabolites in Soil. GPL Study No.: 150608. Report prepared by Golden Pacific Laboratories, LLC (GPL), Fresno, California; sponsored by Ishihara Sangyo Kaisha, Ltd., Osaka, Japan, and FarmHannong Co., Ltd., Seoul, Korea; and submitted by ISK Biosciences Corporation, Concord, Ohio; 596 pages. Final report issued February 1, 2018.
- Document No.:** MRIDs 50493805 & 50493806
- Guideline:** 850.6100
- Statements:** ECM: The study was not conducted in accordance with USEPA FIFRA Good Laboratory Practice (GLP) standards (40 CFR Part 160; p. 1C of MRID 50493805). Signed and dated No Data Confidentiality and GLP statements were provided (pp. 1B-1C). Quality Assurance and Authenticity statements were not included.
- ILV: The study was conducted in accordance with USEPA FIFRA GLP standards, except for reference substance characterization and additional experimentation to explore the reason for M-69 unacceptable recoveries (p. 3 of MRID 50493806). Signed and dated No Data Confidentiality, GLP, Quality Assurance, and Authenticity statements were provided (pp. 2-4).
- Classification:** This analytical method is classified as **supplemental**. The analytical method is sufficient to reliably quantify tiafenacil and the majority of the degradates in soil.
- For the ECM: The Limit of Quantification is not lower than the most sensitive toxicity endpoint. In the ECM the mean recovery for M-69, ranging from 63.4 to 66.9%, was outside the 70% to 120% guideline recommended range and only one set of performance data was submitted for the 10×LOQ fortification level.
- For the ILV: only one set of performance data was submitted; and specificity of the method for M-29 was not supported by ILV representative chromatograms.
- PC Code:** 012311

<b>EFED Final Reviewer:</b>	Joshua Antoline, Ph.D., Chemist	Signature: <b>Antoline, Joshua</b>	Digitally signed by Antoline, Joshua Date: 2020.07.17 13:47:20 -04'00'
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	Joan Gaidos, Ph.D., Environmental Scientist	Signature: 	
		Date: 12/19/2018	
		Date: 12/21/2018	
<b>EPA Reviewer:</b>	Katrina White, Ph.D., Senior Scientist	<b>KATRINA WHITE</b>	Digitally signed by KATRINA WHITE Date: 2020.07.21 11:13:36 -04'00'

*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 methods, **MRID 50493805** (considered the Environmental Chemistry Method, ECM), **FarmHannong Co., Ltd., Document No. PC-2018-MDG-004-01** and **MRID 50493806** (Considered the independent laboratory validation, ILV, study) **Method Bridging Method (GPL Study No. 150608)** are designed for the quantitative determination of tiafenacil (DCC-3825) and its metabolites M-01, M-12, M-13, M-20, M-29, M-30, M-35, M-36, M-53, M-63, M-69, M-72, and M-73 in soil at the Limit of Quantitation (LOQ) of 0.1 and 0.01 mg/kg, respectively, using LC/MS/MS. The LOQ is higher than the most sensitive toxicity endpoint of 0.00004 mg/kg based on a 6-inch soil depth and a soil density of 1.5 g/cm<sup>3</sup> (MRID 50486880).

MRID 50493805 contained the ECM for FarmHannong Co., Ltd., Document No. PC-2018-MDG-004-01 using partially characterized soil. MRID 50493806 contained the ILV for FarmHannong Co., Ltd., Document No. PC-2018-MDG-004-01 and the ECM for Method Bridging Method (GPL Study No. 150608) using characterized soil from a tiafenacil terrestrial field dissipation study. The ILV study (MRID 50493806) validated FarmHannong Co., Ltd., Document No. PC-2018-MDG-004-01 for all analytes after the first trial with insignificant modifications of the filter paper rinsing solvent, analytical parameters and the use of solvent-based standards; however, the ILV recommended that the ECM is updated to include precursor ions in MS parameters, representative chromatograms, and the precaution to evaluate any possible cross-talk of structural similar analytes during validation. All submitted ILV data pertaining to precision, repeatability, reproducibility, linearity, and specificity was acceptable, except that performance data for was not satisfactory for M-69, which had mean recoveries ranging from 63.4 to 66.9%, outside the guideline threshold of 70% to 120% recovery. The following deficiencies were noted in the ECM: no samples were prepared at the 10×LOQ fortification level; an insufficient number of samples was prepared at 0.1 mg/kg; the method LOQ was not stated in the ECM, but was defined as 0.1 mg/kg in the ILV; the linearity was less than 0.995 for M-20; and the particle distribution and USDA soil classification of soil matrix was

not provided. For the Method Bridging Method (GPL Study No. 150608), only one set of performance data was submitted. All submitted quantitation ion data pertaining to precision, repeatability, reproducibility, linearity, and specificity was acceptable, except that the specificity of the method for M-29 was not supported by representative chromatograms in the ILV, based on significant peak shouldering.

**Table 1a. Analytical Method Summary - FarmHannong Co., Ltd., Document No. PC-2018-MDG-004-01 (ECM)**

MRID		EPA Review	Matrix	Method Date (dd/mm/yyyy)	Registrant	Analysis	Limit of Quantitation (LOQ)
Environmental Chemistry Method	Independent Laboratory Validation						
50493805 <sup>1</sup>	50493806 <sup>2</sup>	Supplemental	Soil	31/03/2016	ISK Biosciences Corporation	LC/MS/MS	0.1 mg/kg <sup>3</sup>

- 1 In the ECM, the soil (particle distribution not reported; pH 6.96 in soil:water, 1:5 (w:w); 1.8% organic carbon) obtained in Daejeon, Korea, was used in the study (p. 12 of MRID 50493805). USDA soil classification not reported.
- 2 In the ILV, the soil (Agvise Sample IDs 15-1291 to 15-1296; 63-65% sand, 16-22% silt, 15-21% clay; pH 6.4-8.4; 0.22-1.7% organic carbon) obtained from the tiafenacil terrestrial field dissipation study (Trial ID PSM-15-06-03, GPL Study # 150614) located in Northwood, North Dakota, was used in the study (p. 31 of MRID 50493806). The soil was mainly sandy loam (characterized as such in five of six depths) with one depth characterized as sandy clay loam. Soil characterization based on soil depth collection was performed by Agvise Laboratories, Northwood, North Dakota (see footnote in Table 3 below for soil characterization details). The ILV soil matrix was assumed to be a homogenized sample from all sampling depths, but this was not reported in the study report.
- 3 As reported by the ILV; ECM reported the LOD as the LOQ. (see DER for more details; p. 14 of MRID 50493805; p. 29 of MRID 50493806).

**Table 1b. Analytical Method Summary - Method Bridging Method for all Analytes (GPL Study No. 150608)<sup>1</sup>**

MRID		EPA Review	Matrix	Method Date (dd/mm/yyyy)	Registrant	Analysis	Limit of Quantitation (LOQ)
Environmental Chemistry Method	Independent Laboratory Validation						
50493806 <sup>2</sup>	None submitted	Supplemental	Soil	01/02/2018	ISK Biosciences Corporation	LC/MS/MS	0.01 mg/kg

- 1 The Method Bridging Method was a modification of the ECM to support its use for the analytes of soil dissipation studies (pp. 30-40; Appendices D-E, pp. 183-206 of MRID 50493806). MRID 50493805 could not be considered an ECM for this method since significant sample processing and analytical method modifications were made, including the elimination of the SPE clean-up.
- 2 The soil (Agvise Sample IDs 15-1291 to 15-1296; 63-65% sand, 16-22% silt, 15-21% clay; pH 6.4-8.4; 0.22-1.7% organic carbon) obtained from the tiafenacil terrestrial field dissipation study (Trial ID PSM-15-06-03, GPL Study # 150614) located in Northwood, North Dakota, was used in the study (p. 31 of MRID 50493806). The soil was mainly sandy loam (characterized as such in five of six depths) with one depth characterized as sandy clay loam. Soil characterization based on soil depth collection was performed by Agvise Laboratories, Northwood, North Dakota (see footnote in Table 3 below for soil characterization details). The ILV soil matrix was assumed to be a homogenized sample from all sampling depths, but this was not reported in the study report.

## I. Principle of the Method

ECM, FarmHannong Co., Ltd., Document No. PC-2018-MDG-004-01

Soil samples ( $10 \pm 0.1$  g) were fortified (5.0 mL of 2  $\mu\text{g/mL}$  mixed standard solutions) and extracted twice times with 50 mL of acetonitrile:0.1% formic acid in water (80:20, v:v) via vigorous shaking for 30 minutes (p. 13 of MRD 50493805). After extraction, the sample was filtered through filter paper and rinsed with acetonitrile. The combined extracts were reduced to dryness at 40°C under reduced pressure. The residue was reconstituted in 5 mL of 0.1% formic acid in acetonitrile:0.1% formic acid in water (10:90, v:v) – Solution A. An Oasis HLB (500 mg, 6 cc) solid phase extraction (SPE) column was pre-conditioned with 5 mL each of 0.1% formic acid in acetonitrile then 0.1% formic acid in water. Solution A was applied to and passed through the column. After the column was washed with 5 mL of 0.1% formic acid in acetonitrile:0.1% formic acid in water (20:80, v:v), the analytes were eluted with 10 mL of 0.1% formic acid in acetonitrile:0.1% formic acid in water (60:40, v:v). The eluate was reduced to dryness at 40°C under reduced pressure. The residue was reconstituted in 2 mL of 0.1% formic acid in acetonitrile:0.1% formic acid in water (60:40, v:v).

Analytes were identified and quantified by LC/MS using a Waters H-Class UPLC system coupled to a Waters Xevo TQ mass spectrometer (pp. 4, 10-14 of MRID 50493805). The following conditions were employed for Tiafenacil, M-01, M-12, M-13, M-30, M-36, M-53, M-72: Acquity UPLC® BEH C18 column (2.1  $\times$  50 mm, 1.7  $\mu\text{m}$ ; column temperature 40°C) eluted with an isocratic mobile phase of 0.1% formic acid in acetonitrile:0.1% formic acid in water (45:55, v:v); injection volume of 5  $\mu\text{L}$ ; and positive (all analytes, but M-72) or negative (M-72) ESI ionization MRM scan mode at 500°C heater gas temperature. The following conditions were employed for M-20, M-35, and M-63: Acquity UPLC® BEH C18 column (2.1  $\times$  50 mm, 1.7  $\mu\text{m}$ ; column temperature 40°C) eluted with a gradient mobile phase of (A) 0.1% formic acid in acetonitrile and (B) 0.1% formic acid in water [time, percent A:B; 0 min. 25:75, 4 min. 65:35, 6 min. 100:0, 6.1-8.1 min. 25:75]; injection volume of 5  $\mu\text{L}$ ; and positive (M-35 and M-63) or negative (M-20) ESI ionization MRM scan mode at 500°C heater gas temperature. The following conditions were employed for M-29, M-69, and M-73: Acquity UPLC® BEH C18 column (2.1  $\times$  50 mm, 1.7  $\mu\text{m}$ ; column temperature 40°C) eluted with an isocratic mobile phase of 0.1% formic acid in acetonitrile:0.1% formic acid in water (50:50, v:v); injection volume of 5  $\mu\text{L}$ ; and positive (M-29 and M-69) or negative (M-73) ESI ionization MRM scan mode at 500°C heater gas temperature. Analytes were identified using one ion transitions; the product ions were as follows:  $m/z$  381.295 for tiafenacil (DCC-3825),  $m/z$  381.257 for M-01,  $m/z$  152.055 for M-12,  $m/z$  110.069 for M-13,  $m/z$  197.095 for M-20,  $m/z$  111.603 for M-29,  $m/z$  112.053 for M-30,  $m/z$  198.090 for M-35,  $m/z$  218.043 for M-36,  $m/z$  229.097 for M-53,  $m/z$  351.158 for M-63,  $m/z$  144.940 for M-69,  $m/z$  249.874 for M-72, and  $m/z$  186.034 for M-73. Expected retention times were ca. 4.49, 2.73, 4.66, 2.96, 3.06, 0.84, 0.89, 3.85, 2.49, 2.13, 3.58, 0.74, 0.77, and 0.73 minutes for tiafenacil (DCC-3825), M-01, M-12, M-13, M-20, M-29, M-30, M-35, M-36, M-53, M-63, M-69, M-72, and M-73, respectively. Matrix-matched standards were specified for calibration standards (p. 17).

## ILV

The ILV performed the ECM FarmHannong Co., Ltd., Document No. PC-2018-MDG-004-01, as well as a Method Bridging Trial (GPL Study No. 150608) which was a modification of the ECM to support its use for the analytes of soil dissipation studies (pp. 30-40; Appendices D-E, pp. 183-206 of MRID 50493806). Additionally, the ILV separated the analytes into two groups: Tier 1 (tiafenacil (DCC-3825), M-01, M-12, M-13, M-36, and M-53) and Tier 2 (M-20, M-29, M-30, M-35, M-63, M-69, M-72, and M-73).

The ILV performed the ECM, FarmHannong Co., Ltd., Document No. PC-2018-MDG-004-01 as provided, except for the use of a different solvent to rinse the filter paper and minor LC/MS parameter modifications (pp. 30-40; Appendices D-E, pp. 183-206 of MRID 50493806). Additionally, while the original method used matrix matched standards, matrix-matched standards were not used in the ILV at the request of the sponsor representative. This did not affect the results of the study and the method was successfully validated without matrix-matched standards (p. 39 of MRID 504938056). LC/MS/MS #2 was used for Tier 1 analytes: Sciex API4000 LC/MS/MS with Shimadzu LC-20AD LC. LC/MS/MS conditions were the same as the ECM, except that the LC column was reported as Acquity UPLC® BEH C18 column (2.1 × 5 mm, 1.7 μm). LC/MS/MS #3 was used for Tier 2 analytes M-30 and M-72: Sciex API5000 LC/MS/MS with Shimadzu LC-20AD XR LC. LC/MS/MS conditions were the same as the ECM, except that the LC column was reported as Acquity UPLC® BEH C18 column (2.1 × 5 mm, 1.7 μm) and injection volume was 2 μL. LC/MS/MS #3 was used for Tier 2 analytes M-29, M-69 and M-73: Sciex API5000 LC/MS/MS with Shimadzu LC-20AD XR LC. LC/MS/MS conditions were the same as the ECM, except that the LC column was reported as Acquity UPLC® BEH C18 column (2.1 × 5 mm, 1.7 μm). LC/MS/MS #3 was used for Tier 2 analytes M-20, M-35, and M-63: Sciex API5000 LC/MS/MS with Shimadzu LC-20AD XR LC. LC/MS/MS conditions were the same as the ECM, except that the LC column was reported as Acquity UPLC® BEH C18 column (2.1 × 5 mm, 1.7 μm) and injection volume was 10 μL.

Analytes were identified using one to three ion transitions (quantitation only; quantitation and confirmation, respectively; or quantitation, confirmation 1 and confirmation 2, respectively):  $m/z$  513.1→381.1 for tiafenacil (DCC-3825);  $m/z$  499.3→381.1 for M-01;  $m/z$  428.0→152.1 for M-12;  $m/z$  427.0→110.0 for M-13;  $m/z$  305.0→273.9,  $m/z$  305.0→203.9 and  $m/z$  305.0→197.0 for M-20;  $m/z$  463.1→112.0 and  $m/z$  463.1→373.1 for M-29;  $m/z$  497.2→112.1 and  $m/z$  479.2→171.8 for M-30;  $m/z$  459.0→349.0 and  $m/z$  459.0→198.0 for M-35;  $m/z$  444.2→218.0 for M-36;  $m/z$  446.2→229.1 for M-53;  $m/z$  461.0→351.0 and  $m/z$  461.0→111.8 for M-63;  $m/z$  322.9→144.9 for M-69;  $m/z$  400.9→249.8 and  $m/z$  400.9→185.9 for M-72; and  $m/z$  402.9→249.9 and  $m/z$  402.9→185.9 for M-73. The quantitation MS transitions were similar to those of the ECM, except for M-20 and M-35 for which the final confirmation ion transition matched those of the ECM quantitation transition. Only recovery data for the quantitation ion was reported. Expected retention times were not reported.

For the Method Bridging Trial of Tier 1 analytes (GPL Study No. 150608), samples (5 g) were extracted twice with 25 mL of acetonitrile:water:formic acid (80:20:0.02, v:v:v) and shaken on a platform shaker for 30 minutes at *ca.* 200 rpm (pp. 30-40; Appendices D-E, pp. 183-206 of MRID 50493806). After centrifugation (3 minutes at 3000 rpm), the supernatants were

transferred into clean 50-mL centrifuge tubes. The combined extracts were brought to a final volume of 50 mL with extraction solvent. Aliquots (5 mL) of the sample extracts were transferred into 15-mL plastic centrifuge tubes, and the extracts were concentrated down to *ca.* 1 mL under nitrogen using a TurboVap with the water bath set to 40°C. The samples were reconstituted to 10 mL using acetonitrile:water:formic acid (20:80:0.1, v:v:v) and syringe filtered through a 0.45 µm PTFE filter prior to analysis by LC-MS/MS. Additional dilution with acetonitrile:water:formic acid (20:80:0.1, v:v:v) was performed, as necessary. No SPE clean-up was performed. LC/MS/MS #2 was used: Sciex API4000 LC/MS/MS with Shimadzu LC-20AD LC. LC/MS/MS conditions were as follows: Phenomenex Kinetex 2.6 µm C18 100A column (3.0 × 100 mm, 2.6 µm; column temperature 40°C) with SecurityGuard ULTRA Cartridge UHPLC C18 for 3.00 mm guard column eluted with a gradient mobile phase of (A) 0.2% formic acid in acetonitrile and (B) 0.2% formic acid in water [time, percent A:B; 0.0-4.0 min. 55:45, 5.5-6.5 min. 100:0, 6.6-8.0 min. 55:45]; injection volume of 50 µL; and positive ESI ionization MRM scan mode at 500°C heater gas temperature.

Analytes were quantified using two ion transitions (quantitation and confirmation, respectively):  $m/z$  512.0→479.8 and  $m/z$  512→381.2 for tiafenacil (DCC-3825);  $m/z$  498.2→381.0 and  $m/z$  498.2→480.0 for M-01;  $m/z$  426.9→381.2 and  $m/z$  426.9→152.0 for M-12;  $m/z$  425.9→381.0 and  $m/z$  425.9→152.0 for M-13;  $m/z$  443.1→369.0 and  $m/z$  443.1→218.0 for M-36; and  $m/z$  447.1→373.1 and  $m/z$  447.1→218.0 for M-53 (Appendix E, p. 198 of MRID 50493806). Expected retention times were not reported.

For the Method Bridging Trial of Tier 2 analytes (GPL Study No. 150608), samples (5 g) were extracted twice with 25 mL of acetonitrile:water:formic acid (79:20:1, v:v:v) and shaken on a platform shaker for 30 minutes at *ca.* 200 rpm (pp. 30-40; Appendices D-E, pp. 183-206 of MRID 50493806). After centrifugation (3 minutes at 3000 rpm), the supernatants were transferred into clean 50-mL centrifuge tubes. The combined extracts were brought to a final volume of 50 mL with extraction solvent. The samples syringe filtered through a 0.45 µm PTFE filter, and aliquots of the filtered extracts were diluted five-fold using acetonitrile/water/formic (5:95:0.1, v:v:v). Samples were then submitted for analysis by LC-MS/MS. Additional dilution with acetonitrile:water:formic acid (20:80:0.1, v:v:v) was performed, as necessary. No SPE clean-up was performed. LC/MS/MS #3 was used for Tier 2 analytes M-29, M-30, M-35, M-63 and M-69: Sciex API5000 LC/MS/MS with Shimadzu LC-20AD XR LC. LC/MS/MS conditions were as follows: Phenomenex Kinetex 2.6 µm C18 100A column (3.0 × 100 mm, 2.6 µm; column temperature 40°C) with SecurityGuard ULTRA Cartridge UHPLC C18 for 3.00 mm guard column eluted with a gradient mobile phase of (A) 0.2% formic acid in acetonitrile and (B) 0.2% formic acid in water [time, percent A:B; 0.0-3.7 min. 50:50, 5.5-6.5 min. 100:0, 6.6-10.0 min. 50:50]; injection volume of 50 µL; and positive ESI ionization MRM scan mode at 500°C heater gas temperature. LC/MS/MS #3 was used for Tier 2 analytes M-20, M-72 and M-73: Sciex API5000 LC/MS/MS with Shimadzu LC-20AD XR LC. LC/MS/MS conditions were as follows: Phenomenex Kinetex 2.6 µm C18 100A column (3.0 × 100 mm, 2.6 µm; column temperature 40°C) with SecurityGuard ULTRA Cartridge UHPLC C18 for 3.00 mm guard column eluted with a gradient mobile phase of (A) 0.2% formic acid in acetonitrile and (B) 0.2% formic acid in water [time, percent A:B; 0.0-3.8 min. 50:50, 3.9-4.9 min. 100:0, 5.0-8.5 min. 50:50]; injection volume of 10 µL; and negative ESI ionization MRM scan mode at 500°C heater gas temperature.

Analytes were quantified using two ion transitions (quantitation and confirmation, respectively):  $m/z$  305.0→273.9 and  $m/z$  305.0→203.9 for M-20;  $m/z$  463.1→373.1 and  $m/z$  463.1→112.0 for M-29;  $m/z$  497.2→112.1 and  $m/z$  479.2→198.0 for M-30;  $m/z$  459.0→349.0 and  $m/z$  459.0→441.1 for M-35;  $m/z$  461.0→111.8 and  $m/z$  461.0→351.0 for M-63;  $m/z$  322.9→200.1 and  $m/z$  322.9→144.9 for M-69;  $m/z$  400.9→249.8 and  $m/z$  400.9→185.9 for M-72; and  $m/z$  402.9→249.9 and  $m/z$  402.9→185.9 for M-73. Expected retention times were not reported.

## LOQ/LOD

For FarmHannong Co., Ltd., Document No. PC-2018-MDG-004-01 (ECM), the Limit of Quantification (LOQ) was 0.1 mg/kg in the ILV (p. 29 of MRID 50493806). In the ILV, the Limit of Detection (LOD) was 0.01 mg/kg for the Tier 1 analytes and 0.002 mg/kg for the Tier 2 analytes. In the ECM, the minimum detectable amount was reported as 0.05 ng for all analytes; based on that value, the LOQ was calculated as 0.002 mg/kg (p. 14 of MRID 50493805). However, the 0.002 mg/kg value was an equivalence of the 0.05 ng minimum detectable amount and was an LOD value misnamed as an LOQ value. Although fortifications were only performed at 0.1 mg/kg, this was not reported as the method LOQ in the ECM. For the Method Bridging Method (GPL Study No. 150608) performed by the ILV, the LOQ and LOD for all analytes were 0.01 mg/kg and 0.005 mg/kg, respectively (p. 30 of MRID 50493806).

## **II. Recovery Findings**

ECM (MRID 50493805): Mean recoveries and relative standard deviations (RSDs) for FarmHannong Co., Ltd., Document No. PC-2018-MDG-004-01 were within guideline requirements (mean 70-120%; RSD ≤20%) for analysis of tiafenacil (DCC-3825), M-01, M-12, M-13, M-20, M-29, M-30, M-35, M-36, M-53, M-63, M-69, M-72, and M-73 at the fortification level of 0.1 mg/kg in one soil matrix (pp. 19-20; DER Attachment 2). The method LOQ was not reported; the LOQ was misnamed as the LOD in the study (0.002 mg/kg). An insufficient number of samples was prepared for all analytes,  $n = 3$ . All analytes were quantified using one ion transition; a confirmation method is not usually required when LC/MS or GC/MS is used as the primary method to generate study data. The soil (particle distribution not reported; pH 6.96 in soil:water, 1:5 (w:w); 1.8% organic carbon) obtained in Daejeon, Korea, was used in the study (p. 12). USDA soil classification not reported. The Method Bridging Method (GPL Study No. 150608) was not performed.

ILV (MRID 50493806): Mean recoveries and RSDs for FarmHannong Co., Ltd., Document No. PC-2018-MDG-004-01 were within guideline requirements for analysis of tiafenacil (DCC-3825), M-01, M-12, M-13, M-20, M-29, M-30, M-35, M-36, M-53, M-63, M-69, M-72, and M-73 at fortification levels of 0.1 mg/kg (LOQ) and 1.0 mg/kg (10×LOQ) in one soil matrix, except for mean recoveries of M-69 [66.9% (LOQ) and 63.4% (10×LOQ); Tables 1-42, pp. 60-102]. The ILV LOQ for the method differed from that of the ECM. All analytes were quantified using one ion transition; a confirmation method is not usually required when LC/MS or GC/MS is used as the primary method to generate study data. Mean recoveries and RSDs for Method Bridging Method (GPL Study No. 150608) were within guideline requirements for analysis of tiafenacil (DCC-3825), M-01, M-12, M-13, M-20, M-29, M-30, M-35, M-36, M-53, M-63, M-69, M-72,

and M-73 at fortification levels of 0.01 mg/kg (LOQ), 0.1 mg/kg (10×LOQ), and 1.0 mg/kg (100×LOQ) in one soil matrix, except for the confirmation ion RSD of M-53 at the LOQ, 27.4%. All analytes were identified using two ion transitions; performance data (recovery results) for the quantitation and confirmation ion analyses were comparable, except for M-53 at the LOQ. Also, recoveries in the confirmation ion tended to be higher than those of the quantitation ion. The performance data deviation of M-53 at the LOQ did not affect the validity of the method since a confirmation method is not usually required when LC/MS or GC/MS is used as the primary method to generate study data. The soil (Agvise Sample IDs 15-1291 to 15-1296; 63-65% sand, 16-22% silt, 15-21% clay; pH 6.4-8.4; 0.22-1.7% organic carbon) obtained from the tiafenacil terrestrial field dissipation study (Trial ID PSM-15-06-03, GPL Study # 150614) located in Northwood, North Dakota, was used in the study (p. 31). The soil was mainly sandy loam (characterized as such in five of six depths) with one depth characterized as sandy clay loam. Soil characterization based on soil depth collection was performed by Agvise Laboratories, Northwood, North Dakota (see footnote in Table 3 below for soil characterization details). The ILV soil matrix was assumed to be a homogenized sample from all sampling depths, but this was not reported in the study report. For the ECM FarmHannong Co., Ltd., Document No. PC-2018-MDG-004-01, the method was validated for all analytes after the first trial with insignificant modifications of the filter paper rinsing solvent, analytical parameters and the use of solvent-based standards (pp. 30-40, 44, 56; Appendices D-E, pp. 183-206). The ILV recommended that the ECM is updated to include 1) precursor ions in MS parameters to avoid confusion as to whether the method was completed using MSD or MS/MS; 2) representative chromatograms since none were provided in the ECM; and 3) the precaution to evaluate any possible cross-talk of structural similar analytes during validation. An updated ECM should be submitted with ILV recommendations.



**Table 2. Initial Validation Method Recoveries for Tiafenacil (DCC-3825) and its Metabolites M-01, M-12, M-13, M-20, M-29, M-30, M-35, M-36, M-53, M-63, M-69, M-72, and M-73 in Soil<sup>1,2</sup>**

Analyte	Fortification Level (mg/kg)	Number of Tests	Recovery Range (%)	Mean Recovery (%)	Standard Deviation (%) <sup>3</sup>	Relative Standard Deviation (%)
<b>Soil – ECM Method<sup>4</sup></b>						
Tiafenacil (DCC-3825)	0.1	<b>3</b>	97.8-101.7	99.8	2.0	2.0
M-01	0.1	<b>3</b>	97.2-103.9	100.8	3.4	3.4
M-12	0.1	<b>3</b>	96.6-103.0	99.7	3.2	3.2
M-13	0.1	<b>3</b>	85.7-96.4	91.9	6.1	6.1
M-20	0.1	<b>3</b>	88.9-99.0	94.9	5.6	5.6
M-29	0.1	<b>3</b>	77.3-98.7	90.8	11.8	13.0
M-30	0.1	<b>3</b>	93.2-101.0	97.9	4.2	4.2
M-35	0.1	<b>3</b>	81.0-95.3	86.8	7.5	5.6
M-36	0.1	<b>3</b>	95.5-102.2	98.9	3.4	3.4
M-53	0.1	<b>3</b>	94.2-96.4	95.5	1.1	1.2
M-63	0.1	<b>3</b>	86.2-98.6	93.1	6.3	6.8
M-69	0.1	<b>3</b>	86.8-99.8	92.6	6.6	7.1
M-72	0.1	<b>3</b>	95.2-99.3	97.7	2.2	2.2
M-73	0.1	<b>3</b>	89.8-96.5	92.6	3.5	3.7
<b>Soil – Method Bridging Method<sup>5</sup></b>						
Tiafenacil (DCC-3825)	0.1 (LOQ)	-- <sup>6</sup>	--	--	--	--
M-01	0.1 (LOQ)	--	--	--	--	--
M-12	0.1 (LOQ)	--	--	--	--	--
M-13	0.1 (LOQ)	--	--	--	--	--
M-20	0.1 (LOQ)	--	--	--	--	--
M-29	0.1 (LOQ)	--	--	--	--	--
M-30	0.1 (LOQ)	--	--	--	--	--
M-35	0.1 (LOQ)	--	--	--	--	--
M-36	0.1 (LOQ)	--	--	--	--	--
M-53	0.1 (LOQ)	--	--	--	--	--
M-63	0.1 (LOQ)	--	--	--	--	--
M-69	0.1 (LOQ)	--	--	--	--	--
M-72	0.1 (LOQ)	--	--	--	--	--
M-73	0.1 (LOQ)	--	--	--	--	--

Data (not reported if recovery results were corrected for residues quantified in the controls, pp. 19-20) were obtained from pp. 19-20 of MRID 50493805 and DER Attachment 2.

1 The soil (particle distribution not reported; pH 6.96 in soil:water, 1:5 (w:w); 1.8% organic carbon) obtained in Daejeon, Korea, was used in the study (p. 12). USDA soil classification not reported.

2 Analytes were identified using one ion transitions; the product ions were as follows: *m/z* 381.295 for tiafenacil (DCC-3825), *m/z* 381.257 for M-01, *m/z* 152.055 for M-12, *m/z* 110.069 for M-13, *m/z* 197.095 for M-20, *m/z* 111.603 for M-29, *m/z* 112.053 for M-30, *m/z* 198.090 for M-35, *m/z* 218.043 for M-36, *m/z* 229.097 for M-53, *m/z* 351.158 for M-63, *m/z* 144.940 for M-69, *m/z* 249.874 for M-72, and *m/z* 186.034 for M-73.

3 Standard deviations were reviewer-calculated since these values were not reported in the study report. Rules of significant figures were followed.

4 FarmHannong Co., Ltd., Document No. PC-2018-MDG-004-01.

5 GPL Study No. 150608.

6 Not performed.

**Table 3. Independent Validation Method Recoveries for Tiafenacil (DCC-3825) and its Metabolites M-01, M-12, M-13, M-20, M-29, M-30, M-35, M-36, M-53, M-63, M-69, M-72, and M-73 in Soil<sup>1</sup>**

Analyte	Fortification Level (mg/kg)	Number of Tests	Recovery Range (%)	Mean Recovery (%)	Standard Deviation (%)	Relative Standard Deviation (%)
<b>Soil – ECM Method<sup>2,3</sup></b>						
Tiafenacil (DCC-3825)	0.1 (LOQ)	5	81.8-85.3	83.5	1.32	1.58
	1.0	5	74.4-85.0	79.8	4.16	5.21
M-01	0.1 (LOQ)	5	78.3-81.6	79.8	1.29	1.62
	1.0	5	72.6-81.4	77.5	3.50	4.52
M-12	0.1 (LOQ)	5	72.5-82.0	76.7	3.50	4.56
	1.0	5	74.5-85.1	79.5	4.52	5.69
M-13	0.1 (LOQ)	5	77.8-80.8	79.3	1.32	1.66
	1.0	5	70.4-83.0	77.6	5.12	6.60
M-20	0.1 (LOQ)	5	72.7-79.0	74.6	2.73	3.66
	1.0	5	65.8-83.1	75.3	6.82	9.06
M-29	0.1 (LOQ)	5	72.1-77.2	74.1	2.15	2.90
	1.0	5	63.9-81.1	73.1	6.51	8.91
M-30	0.1 (LOQ)	5	83.3-90.1	86.1	2.63	3.05
	1.0	5	73.0-89.2	83.1	6.59	7.93
M-35	0.1 (LOQ)	5	77.2-84.8	81.9	3.01	3.68
	1.0	5	74.8-92.0	85.9	7.44	8.66
M-36	0.1 (LOQ)	5	73.1-75.0	74.2	0.684	0.922
	1.0	5	74.0-85.0	80.1	4.03	5.03
M-53	0.1 (LOQ)	5	68.0-75.4	72.3	3.17	4.38
	1.0	5	74.6-80.4	77.1	2.27	2.94
M-63	0.1 (LOQ)	5	80.4-85.8	83.0	2.17	2.61
	1.0	5	74.2-89.8	83.4	6.27	7.52
M-69	0.1 (LOQ)	5	65.3-69.4	<b>66.9</b>	1.95	2.91
	1.0	5	56.0-70.5	<b>63.4</b>	5.38	8.49
M-72	0.1 (LOQ)	5	87.8-91.8	89.6	1.47	1.64
	1.0	5	74.8-93.0	85.6	7.00	8.18
M-73	0.1 (LOQ)	5	85.0-87.7	86.4	0.966	1.12
	1.0	5	74.8-93.2	85.8	7.26	8.46
<b>Soil – Method Bridging Method<sup>4,5</sup></b>						
Quantitation Ion Transition						
Tiafenacil (DCC-3825)	0.01 (LOQ)	5	81.8-85.8	84.3	1.60	1.90
	0.1	5	95.5-109	101	5.15	5.10
	1.0	v	95.4-110	104	5.91	5.68
M-01	0.01 (LOQ)	5	85.4-95.0	91.7	4.02	4.38
	0.1	5	89.7-101	96.9	4.34	4.48
	1.0	5 <sup>6</sup>	86.0-94.8	91.7	3.53	3.85
M-12	0.01 (LOQ)	5	90.3-97.2	92.2	2.94	3.19
	0.1	5	87.6-94.5	91.4	3.10	3.39
	1.0	5 <sup>6</sup>	86.1-100	93.6	5.13	5.48

Analyte	Fortification Level (mg/kg)	Number of Tests	Recovery Range (%)	Mean Recovery (%)	Standard Deviation (%)	Relative Standard Deviation (%)
M-13	0.01 (LOQ)	5	85.8-90.8	89.4	2.03	2.27
	0.1	5	92.9-99.4	95.6	2.59	2.71
	1.0	5 <sup>6</sup>	96.0-106	102	3.78	3.71
M-20	0.01 (LOQ)	5	93.2-97.5	94.9	1.88	1.98
	0.1	5	90.4-93.0	92.1	1.00	1.09
	1.0	5	95.3-100	97.6	2.05	2.10
M-29	0.01 (LOQ)	5	83.9-91.7	86.9	2.96	3.41
	0.1	5	85.9-88.7	87.4	1.11	1.27
	1.0	5	96.2-101	99.1	2.20	2.22
M-30	0.01 (LOQ)	5	92.8-98.2	94.5	2.21	2.34
	0.1	5	90.1-95.1	92.1	1.86	2.02
	1.0	5	98.6-104	102	2.09	2.05
M-35	0.01 (LOQ)	5	99.2-117	108	7.32	6.78
	0.1	5	87.0-97.0	91.2	3.79	4.16
	1.0	5	90.4-108	99.7	7.66	7.68
M-36	0.01 (LOQ)	5	85.8-96.4	92.1	4.69	5.09
	0.1	5	93.7-98.3	95.7	2.00	2.09
	1.0	5 <sup>6</sup>	85.3-93.3	89.9	3.31	3.68
M-53	0.01 (LOQ)	5	92.2-97.6	94.4	2.50	2.65
	0.1	5	91.9-96.4	93.6	1.69	1.81
	1.0	5 <sup>6</sup>	79.8-94.6	88.7	5.57	6.28
M-63	0.01 (LOQ)	5	88.3-104	96.4	5.96	6.18
	0.1	5	90.6-95.6	92.7	2.05	2.21
	1.0	5	96.7-105	100	3.65	3.65
M-69	0.01 (LOQ)	5	72.2-80.1	75.6	3.50	4.63
	0.1	5	76.3-79.1	77.8	1.28	1.65
	1.0	5	86.3-96.0	91.2	4.01	4.40
M-72	0.01 (LOQ)	5	93.8-101	95.9	3.01	3.14
	0.1	5	92.7-97.2	95.4	2.31	2.42
	1.0	5	96.9-102	99.8	1.96	1.96
M-73	0.01 (LOQ)	5	92.8-100	97.1	3.02	3.11
	0.1	5	90.0-96.3	93.4	2.24	2.40
	1.0	5	97.5-103	99.6	2.29	2.30
Confirmation Ion Transition						
Tiafenacil (DCC-3825)	0.01 (LOQ)	5	83.4-89.4	85.5	2.68	3.13
	0.1	5	95.1-104	97.6	3.65	3.74
	1.0	5 <sup>6</sup>	100-111	107	4.44	4.15
M-01	0.01 (LOQ)	5	90.7-99.8	95.4	3.49	3.66
	0.1	5	94.3-101	97.3	2.40	2.47
	1.0	5 <sup>6</sup>	84.3-95.3	90.7	3.97	4.38
M-12	0.01 (LOQ)	5	86.0-101	93.4	5.70	6.10
	0.1	5	92.2-97.8	94.8	2.44	2.57
	1.0	5 <sup>6</sup>	84.0-95.4	91.5	4.49	4.91

Analyte	Fortification Level (mg/kg)	Number of Tests	Recovery Range (%)	Mean Recovery (%)	Standard Deviation (%)	Relative Standard Deviation (%)
M-13	0.01 (LOQ)	5	88.8-99.0	92.9	4.37	4.70
	0.1	5	94.4-99.5	96.5	2.61	2.70
	1.0	5 <sup>6</sup>	96.4-111	103	5.96	5.79
M-20	0.01 (LOQ)	5	82.7-99.2	88.7	6.24	7.03
	0.1	5	89.0-93.0	91.1	1.69	1.86
	1.0	5	91.7-101	97.1	4.17	4.29
M-29	0.01 (LOQ)	5	81.4-91.8	88.5	4.59	5.19
	0.1	5	82.5-86.3	84.5	1.55	1.83
	1.0	5	95.2-99.0	96.2	1.60	1.66
M-30	0.01 (LOQ)	5	92.3-102	98.6	3.87	3.92
	0.1	5	88.5-90.4	89.4	0.779	0.871
	1.0	5	94.8-110	101	6.16	6.10
M-35	0.01 (LOQ)	5	97.7-119	108	9.10	8.43
	0.1	5	89.9-107	100	6.80	6.80
	1.0	5	93.7-114	105	7.44	7.09
M-36	0.01 (LOQ)	5	81.4-95.0	90.7	5.60	6.17
	0.1	5	92.5-95.9	94.3	1.48	1.57
	1.0	5 <sup>6</sup>	88.5-94.8	91.8	2.32	2.53
M-53	0.01 (LOQ)	5	66.0-130	95.4	26.1	27.4
	0.1	5	98.1-103	100	2.40	2.40
	1.0	5 <sup>6</sup>	82.3-89.2	87.1	2.83	3.25
M-63	0.01 (LOQ)	5	98.6-115	106	8.44	7.96
	0.1	5	86.1-94.7	89.5	3.62	4.04
	1.0	5	91.1-103	97.1	5.57	5.74
M-69	0.01 (LOQ)	5	68.2-77.6	71.6	4.28	5.98
	0.1	5	71.5-77.6	73.9	2.33	3.15
	1.0	5	84.3-92.7	88.1	3.79	4.30
M-72	0.01 (LOQ)	5	98.0-109	103	4.22	4.10
	0.1	5	90.6-96.2	94.2	2.12	2.25
	1.0	5	95.8-103	100	3.04	3.04
M-73	0.01 (LOQ)	5	89.3-104	96.7	6.42	6.64
	0.1	5	86.9-96.0	91.3	3.46	3.79
	1.0	5	97.5-106	101	3.41	3.38

Data (uncorrected recovery results, pp. 41-44) were obtained from Tables 1-42, pp. 60-102 of MRID 50493806.

1 The soil (Agvise Sample IDs 15-1291 to 15-1296; 63-65% sand, 16-22% silt, 15-21% clay; pH 6.4-8.4; 0.22-1.7% organic carbon) obtained from the tiafenacil terrestrial field dissipation study (Trial ID PSM-15-06-03, GPL Study # 150614) located in Northwood, North Dakota, was used in the study (p. 31). The soil was mainly sandy loam (characterized as such in five of six depths) with one depth characterized as sandy clay loam. Soil characterization was performed by Agvise Laboratories, Northwood, North Dakota. The ILV soil matrix was assumed to be a homogenized sample from all sampling depths, but this was not reported in the study report. The soil characterization based on soil depth collection is provided below:

AGVISE Sample ID	Depth	Texture	Sand (%)	Silt (%)	Clay (%)	OC (%)	pH	CEC	WHC 1/3 Bar (%)	Bulk Density (g/cc)
<b>Northwood, ND (Trial ID PSM-15-06-03, GPL Study # 150614)</b>										
15-1291	0-6"	Sandy Loam	63	18	19	1.7	6.4	15.6	22.4	1.10
15-1292	6-12"	Sandy Loam	63	20	17	1.3	6.9	14.9	23.1	1.09
15-1293	12-18"	Sandy Loam	65	18	17	0.42	7.6	13.7	21.5	1.08
15-1294	18-24"	Sandy Clay Loam	63	16	21	0.42	8.1	14.2	21.7	0.99
15-1295	24-30"	Sandy Loam	65	16	19	0.22	8.4	14.5	19.6	1.07
15-1296	30-36"	Sandy Loam	63	22	15	0.22	8.4	14.0	20.0	1.11

2 Only recovery data for the quantitation ion was reported. Analytes were identified using one to three ion transitions (quantitation only; quantitation and confirmation, respectively; or quantitation, confirmation 1 and confirmation 2, respectively):  $m/z$  513.1→381.1 for tiafenacil (DCC-3825);  $m/z$  499.3→381.1 for M-01;  $m/z$  428.0→152.1 for M-12;  $m/z$  427.0→110.0 for M-13;  $m/z$  305.0→273.9,  $m/z$  305.0→203.9 and  $m/z$  305.0→197.0 for M-20;  $m/z$  463.1→112.0 and  $m/z$  463.1→373.1 for M-29;  $m/z$  497.2→112.1 and  $m/z$  479.2→171.8 for M-30;  $m/z$  459.0→349.0 and  $m/z$  459.0→198.0 for M-35;  $m/z$  444.2→218.0 for M-36;  $m/z$  446.2→229.1 for M-53;  $m/z$  461.0→351.0 and  $m/z$  461.0→111.8 for M-63;  $m/z$  322.9→144.9 for M-69;  $m/z$  400.9→249.8 and  $m/z$  400.9→185.9 for M-72; and  $m/z$  402.9→249.9 and  $m/z$  402.9→185.9 for M-73. The quantitation MS transitions were similar to those of the ECM, except for M-20 and M-35 for which the final confirmation ion transition matched those of the ECM quantitation transition.

3 FarmHannong Co., Ltd., Document No. PC-2018-MDG-004-01.

4 Analytes were quantified using two ion transitions (quantitation and confirmation, respectively): [Tier 1]  $m/z$  512.0→479.8 and  $m/z$  512→381.2 for tiafenacil (DCC-3825);  $m/z$  498.2→381.0 and  $m/z$  498.2→480.0 for M-01;  $m/z$  426.9→381.2 and  $m/z$  426.9→152.0 for M-12;  $m/z$  425.9→381.0 and  $m/z$  425.9→152.0 for M-13;  $m/z$  443.1→369.0 and  $m/z$  443.1→218.0 for M-36; and  $m/z$  447.1→373.1 and  $m/z$  447.1→218.0 for M-53; and [Tier 2]  $m/z$  305.0→273.9 and  $m/z$  305.0→203.9 for M-20;  $m/z$  463.1→373.1 and  $m/z$  463.1→112.0 for M-29;  $m/z$  497.2→112.1 and  $m/z$  479.2→198.0 for M-30;  $m/z$  459.0→349.0 and  $m/z$  459.0→441.1 for M-35;  $m/z$  461.0→111.8 and  $m/z$  461.0→351.0 for M-63;  $m/z$  322.9→200.1 and  $m/z$  322.9→144.9 for M-69;  $m/z$  400.9→249.8 and  $m/z$  400.9→185.9 for M-72; and  $m/z$  402.9→249.9 and  $m/z$  402.9→185.9 for M-73.

5 GPL Study No. 150608.

6 Recovery data from re-injection of re-diluted samples (p. 50). Initial recoveries were all generally >120% due to sample preparation error (Tables 15-26, pp. 74-86).

### III. Method Characteristics

For FarmHannong Co., Ltd., Document No. PC-2018-MDG-004-01 (ECM), the Limit of Quantification (LOQ) was 0.1 mg/kg in the ILV (pp. 29, 46-47 of MRID 50493806). The ILV justified the LOQ as the lowest fortification level for samples in the reference method. In the ILV, the Limit of Detection (LOD) was 0.01 mg/kg for the Tier 1 analytes and 0.002 mg/kg for the Tier 2 analytes. The ILV determined the LOD based on the reference method; however, due to loss of sensitivity, the lowest calibration standard for the Tier 1 analytes was adjusted to 0.01 mg/kg. The LOD in the ILV was set based on the lowest calibration standard. No calculations for the LOQ and LOD were provided in the ILV. In the ECM, the minimum detectable amount was reported as 0.05 ng for all analytes (p. 14 of MRID 50493805). The ECM LOQ was reported as 0.002 mg/kg; however, this value was calculated from the minimum detectable amount using the following equation:

$$0.05 \text{ ng} \times (2 \text{ mL}/5 \text{ } \mu\text{L}) \times (1/10 \text{ g}) = 0.002 \text{ mg/kg.}$$

The equation was not explained in the ECM, but it appeared to be a conversion of the minimum detectable amount to fortification level. This value may be a mislabeled LOD or a 10x LOD used to indicate the LOQ, but the exact nature of this value is uncertain.

For the Method Bridging Method (GPL Study No. 150608) performed by the ILV, the LOQ and LOD for all analytes were 0.01 mg/kg and 0.005 mg/kg, respectively (pp. 30, 53 of MRID 50493806). The ILV justified the LOQ as the lowest fortification level for samples. The LOD in the ILV was set based on the lowest calibration standard. The ILV also compared these values to those of the reference method [FarmHannong Co., Ltd., Document No. PC-2018-MDG-004-01 (ECM)]. No calculations for the LOQ and LOD were provided in the ILV.

**Table 4a. Method Characteristics - FarmHannong Co., Ltd., Document No. PC-2018-MDG-004-01**

Analyte		Tiafenacil (DCC-3825)	M-01	M-12	M-13	M-20	M-29	M-30
Limit of Quantitation (LOQ)	ECM	<b>Not reported<sup>1</sup></b>						
	ILV	0.1 mg/kg						
Limit of Detection (LOD)	ECM	0.002 mg/kg						
	ILV	0.01 mg/kg				0.002 mg/kg		
Linearity (calibration curve $r^2$ and concentration range)	ECM	$r^2 = 0.9984$	$r^2 = 1.0000$	$r^2 = 0.9996$	$r^2 = 0.9990$	$r^2 = 0.9909$	$r^2 = 0.9999$	$r^2 = 0.9992$
		0.05 ng to 5 ng						
	ILV	$r^2 = 0.9972$ (LOQ)	$r^2 = 1.0000$ (LOQ)	$r^2 = 0.9982$ (LOQ)	$r^2 = 0.9994$ (LOQ & 10×LOQ)	$r^2 = 0.9994$ (LOQ)	$r^2 = 0.9998$ (LOQ & 10×LOQ)	$r^2 = 1.0000$ (LOQ)
		$r^2 = 0.9984$ (10×LOQ)	$r^2 = 0.9998$ (10×LOQ)	$r^2 = 0.9978$ (10×LOQ)		$r^2 = 0.9998$ (10×LOQ)		$r^2 = 0.9998$ (10×LOQ)
<i>ca. 0.05 to 1 µg/mL</i>					<i>ca. 1 to 100 ng/mL</i>			
Repeatable	ECM <sup>2</sup>	Yes at 0.1 mg/kg, but n = 3 (partially characterized soil matrix). <b>No</b> other fortifications prepared.						
	ILV <sup>3,4</sup>	Yes at LOQ and 10×LOQ (characterized soil matrix).						
Reproducible		Yes at LOQ. <b>No</b> at 10×LOQ; only one set of performance data provided.						
Specificity	ECM	<b>Could not be determined</b> because <b>No</b> representative chromatograms were provided.						
	ILV	Yes, no matrix interferences were observed.	Yes, no matrix interferences were observed. Persistent contaminant at RT – 1.1 min of analyte was observed in all chromatograms <sup>5</sup> .	Yes, no matrix interferences were observed. Persistent contaminant at RT + 1.1 min of analyte was observed in all chromatograms <sup>5</sup> .	Yes, no matrix interferences were observed.	Yes, matrix interferences were <1% of the LOQ (based on peak height). Elevated baseline noise was noted around the analyte peak.	Yes, no matrix interferences were observed. Minor baseline noise was noted.	

Data were obtained from p. 14 (LOQ/LOD); pp. 19-20 (recovery data); pp. 15-19 (calibration curve) of MRID 50493805; pp. 29, 46-47 (LOQ/LOD); Tables 1-42, pp. 60-102 (recovery data); Appendix F, Figures 1-140, pp. 207-365 (calibration curves & chromatograms); Appendix G, pp. 528-556 (raw data) of MRID 50493806; DER Attachment 2.

- 1 In the ECM, the minimum detectable amount was reported as 0.05 ng for all analytes; based on that value, the LOQ was calculated as 0.002 mg/kg (p. 14 of MRID 50493805). However, the 0.002 mg/kg value was an equivalence of the 0.05 ng minimum detectable amount and was an LOD value misnamed as an LOQ value.
  - 2 In the ECM, the soil (particle distribution not reported; pH 6.96 in soil:water, 1:5 (w:w); 1.8% organic carbon) obtained in Daejeon, Korea, was used in the study (p. 12 of MRID 50493805). USDA soil classification not reported.
  - 3 In the ILV, the soil (Agvise Sample IDs 15-1291 to 15-1296; 63-65% sand, 16-22% silt, 15-21% clay; pH 6.4-8.4; 0.22-1.7% organic carbon) obtained from the tiafenacil terrestrial field dissipation study (Trial ID PSM-15-06-03, GPL Study # 150614) located in Northwood, North Dakota, was used in the study (p. 31 of MRID 50493806). The soil was mainly sandy loam (characterized as such in five of six depths) with one depth characterized as sandy clay loam. Soil characterization based on soil depth collection was performed by Agvise Laboratories, Northwood, North Dakota (see footnote in Table 3 below for soil characterization details). The ILV soil matrix was assumed to be a homogenized sample from all sampling depths, but this was not reported in the study report.
  - 4 The ILV validated the method for all analytes after the first trial with insignificant modifications of the filter paper rinsing solvent, analytical parameters and the use of solvent-based standards (pp. 30-40, 44, 56; Appendices D-E, pp. 183-206 of MRID 50493806). The ILV recommended that the ECM is updated to include 1) precursor ions in MS parameters to avoid confusion as to whether the method was completed using MSD or MS/MS; 2) representative chromatograms since none were provided in the ECM; and 3) the precaution to evaluate any possible cross-talk of structural similar analytes during validation. An updated ECM should be submitted with ILV recommendations.
  - 5 The reviewer noted that M-12 and M-13 appeared to be present in each other's chromatograms, based on Appendix F, Figures 21-40, pp. 246-265 of MRID 50493806.
- Linearity is satisfactory when  $r^2 \geq 0.995$ .



**Table 4a (con't). Method Characteristics - FarmHannong Co., Ltd., Document No. PC-2018-MDG-004-01**

Analyte		M-35	M-36	M-53	M-63	M-69	M-72	M-73
Limit of Quantitation (LOQ)	ECM	<b>Not reported</b> <sup>1</sup>						
	ILV	0.1 mg/kg						
Limit of Detection (LOD)	ECM	0.002 mg/kg						
	ILV	0.002 mg/kg	0.01 mg/kg		0.002 mg/kg			
Linearity (calibration curve $r^2$ and concentration range)	ECM	$r^2 = 0.9986$	$r^2 = 1.0000$	$r^2 = 0.9999$	$r^2 = 0.9991$	$r^2 = 0.9985$	$r^2 = 0.9997$	$r^2 = 0.9995$
		0.05 ng to 5 ng						
	ILV	$r^2 = 1.0000$ (LOQ) $r^2 = 0.9998$ (10×LOQ)	$r^2 = 0.9990$ (LOQ) $r^2 = 0.9998$ (10×LOQ)	$r^2 = 0.9998$ (LOQ) $r^2 = 0.9994$ (10×LOQ)	$r^2 = 0.9996$ (LOQ & 10×LOQ)	$r^2 = 0.9998$ (LOQ) $r^2 = 1.0000$ (10×LOQ)	$r^2 = 0.9996$ (LOQ) $r^2 = 0.9998$ (10×LOQ)	$r^2 = 0.9998$ (LOQ & 10×LOQ)
	<i>ca.</i> 1 to 100 ng/mL	<i>ca.</i> 0.05 to 1 µg/mL		<i>ca.</i> 1 to 100 ng/mL				
Repeatable	ECM <sup>2</sup>	Yes at 0.1 mg/kg, but $n = 3$ (partially characterized soil matrix). <b>No</b> other fortifications prepared.						
	ILV <sup>3,4</sup>	Yes at LOQ and 10×LOQ (characterized soil matrix).				<b>No</b> at LOQ and 10×LOQ (means <b>63.4-66.9%</b> ) (characterized soil matrix).	Yes at LOQ and 10×LOQ (characterized soil matrix).	
Reproducible		Yes at LOQ. <b>No</b> at 10×LOQ; only one set of performance data provided.				<b>No</b> at LOQ and 10×LOQ; only one set of performance data provided at 10×LOQ.	Yes at LOQ. <b>No</b> at 10×LOQ; only one set of performance data provided.	
Specificity	ECM	<b>Could not be determined.</b> <b>No</b> representative chromatograms were provided.						
	ILV	Yes, matrix interferences were <1% of the LOQ (based on peak height).	Yes, no matrix interferences were observed.	Yes, no matrix interferences were observed. Elevated baseline noise was noted around the	Yes, no matrix interferences were observed. Persistent contaminant at RT – 0.5 min of analyte was	Yes, no matrix interferences were observed.		Yes, matrix interferences were <1% of the LOQ (based on peak height).

				analyte peak at LOQ. Peak splitting noted at LOQ.	observed in all chromatograms.		
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Data were obtained from p. 14 (LOQ/LOD); pp. 19-20 (recovery data); pp. 15-19 (calibration curve) of MRID 50493805; pp. 29, 46-47 (LOQ/LOD); Tables 1-42, pp. 60-102 (recovery data); Appendix F, Figures 1-140, pp. 207-365 (calibration curves & chromatograms); Appendix G, pp. 528-556 (raw data) of MRID 50493806; DER Attachment 2.

- 1 In the ECM, the minimum detectable amount was reported as 0.05 ng for all analytes; based on that value, the LOQ was calculated as 0.002 mg/kg (p. 14 of MRID 50493805). However, the 0.002 mg/kg value was an equivalence of the 0.05 ng minimum detectable amount and was an LOD value misnamed as an LOQ value.
- 2 In the ECM, the soil (particle distribution not reported; pH 6.96 in soil:water, 1:5 (w:w); 1.8% organic carbon) obtained in Daejeon, Korea, was used in the study (p. 12 of MRID 50493805). USDA soil classification not reported.
- 3 In the ILV, the soil (Agvise Sample IDs 15-1291 to 15-1296; 63-65% sand, 16-22% silt, 15-21% clay; pH 6.4-8.4; 0.22-1.7% organic carbon) obtained from the tiafenacil terrestrial field dissipation study (Trial ID PSM-15-06-03, GPL Study # 150614) located in Northwood, North Dakota, was used in the study (p. 31 of MRID 50493806). The soil was mainly sandy loam (characterized as such in five of six depths) with one depth characterized as sandy clay loam. Soil characterization based on soil depth collection was performed by Agvise Laboratories, Northwood, North Dakota (see footnote in Table 3 below for soil characterization details). The ILV soil matrix was assumed to be a homogenized sample from all sampling depths, but this was not reported in the study report.
- 4 The ILV validated the method for all analytes after the first trial with insignificant modifications of the filter paper rinsing solvent, analytical parameters and the use of solvent-based standards (pp. 30-40, 44, 56; Appendices D-E, pp. 183-206 of MRID 50493806). The ILV recommended that the ECM is updated to include 1) precursor ions in MS parameters to avoid confusion as to whether the method was completed using MSD or MS/MS; 2) representative chromatograms since none were provided in the ECM; and 3) the precaution to evaluate any possible cross-talk of structural similar analytes during validation. An updated ECM should be submitted with ILV recommendations.

**Table 4b. Method Characteristics - Method Bridging Method (GPL Study No. 150608)**

Analyte		Tiafenacil (DCC-3825)	M-01	M-12	M-13	M-20	M-29	M-30	
Limit of Quantitation (LOQ)	ECM	<b>Not performed</b> <sup>1</sup>							
	ILV	0.01 mg/kg							
Limit of Detection (LOD)	ECM	<b>Not performed</b>							
	ILV	0.005 mg/kg							
Linearity (calibration curve $r^2$ and concentration range)	ECM	<b>Not performed</b>							
	ILV	First Injection	$r^2 = 0.9976$ (Q) $r^2 = 0.9994$ (C)	$r^2 = 0.9978$ (Q) $r^2 = 0.9982$ (C)	$r^2 = 0.9976$ (Q) $r^2 = 0.9994$ (C)	$r^2 = 0.9986$ (Q) $r^2 = 0.9988$ (C)	$r^2 = 1.0000$ (Q & C)	$r^2 = 0.9998$ (Q) $r^2 = 0.9996$ (C)	$r^2 = 0.9994$ (Q) $r^2 = 0.9986$ (C)
		Re-Injection <sup>2</sup>	$r^2 = 0.9994$ (Q) $r^2 = 0.9982$ (C)	$r^2 = 1.0000$ (Q) $r^2 = 1.0000$ (C)	$r^2 = 1.0000$ (Q) $r^2 = 0.9988$ (C)	$r^2 = 0.9996$ (Q) $r^2 = 0.9994$ (C)	Not performed		
		ca. 0.250 to 5.00 ng/mL							
Repeatable	ECM	<b>Not performed</b>							
	ILV <sup>3</sup>	Yes at LOQ, 10×LOQ, and 100×LOQ (characterized surface and drinking soils).							
Reproducible	<b>No</b> at LOQ and 10×LOQ; only one set of performance data provided.								
Specificity	ECM	<b>Not performed</b>							
	ILV <sup>4</sup>	Yes, no matrix interferences were observed. Minor baseline noise was noted which interfered with peak integration at LOQ.	Yes, no matrix interferences were observed. Minor baseline noise was noted which interfered with peak integration at LOQ. Persistent contaminant at RT – 1.0 min of analyte was observed in all chromatograms.	Yes, no matrix interferences were observed. Minor baseline noise was noted which interfered with peak integration at LOQ.	<b>No</b> , significant peak shouldering was observed <sup>5</sup> ; no matrix interferences were observed.	Yes, no matrix interferences were observed.			

Data were obtained from pp. 30, 53 (LOQ/LOD); Tables 1-42, pp. 60-102 (recovery data); Appendix F, Figures 141-302, pp. 366-527 (calibration curves & chromatograms); Appendix G, pp. 557-596 (raw data) of MRID 50493806. Q = Quantitation ion transition; C = Confirmatory ion transition.

<sup>1</sup> The Method Bridging Method (GPL Study No. 150608) was not performed in ECM MRID 50493805; no ECM of the Method Bridging Method (GPL Study No. 150608) was submitted in ILV MRID 50493806.

- 2 The 100×LOQ samples of the Tier 1 analytes were re-diluted and re-injected (p. 50 of MRID 50493806). Initial recoveries were all generally >120% due to sample preparation error (Tables 15-26, pp. 74-86).
- 3 In the ILV, the soil (Agvise Sample IDs 15-1291 to 15-1296; 63-65% sand, 16-22% silt, 15-21% clay; pH 6.4-8.4; 0.22-1.7% organic carbon) obtained from the tiafenacil terrestrial field dissipation study (Trial ID PSM-15-06-03, GPL Study # 150614) located in Northwood, North Dakota, was used in the study (p. 31 of MRID 50493806). The soil was mainly sandy loam (characterized as such in five of six depths) with one depth characterized as sandy clay loam. Soil characterization based on soil depth collection was performed by Agvise Laboratories, Northwood, North Dakota (see footnote in Table 3 below for soil characterization details). The ILV soil matrix was assumed to be a homogenized sample from all sampling depths, but this was not reported in the study report.
- 4 Chromatographic evaluation was based on the quantitation ion transition; issues which were noted in the quantitation ion transition chromatogram were enhanced in the confirmation ion transition chromatogram.
- 5 Based on Appendix F, Figures 228-230, pp. 453-455 of MRID 50493806.

**Table 4b (con't). Method Characteristics - Method Bridging Method (GPL Study No. 150608)**

Analyte		M-35	M-36	M-53	M-63	M-69	M-72	M-73	
Limit of Quantitation (LOQ)	ECM	<b>Not performed</b> <sup>1</sup>							
	ILV	0.01 mg/kg							
Limit of Detection (LOD)	ECM	0.002 mg/kg							
	ILV	0.005 mg/kg							
Linearity (calibration curve $r^2$ and concentration range)	ECM	<b>Not performed</b>							
	ILV	First Injection	$r^2 = 0.9980$ (Q) $r^2 = 0.9992$ (C)	$r^2 = 0.9988$ (Q) $r^2 = 0.9970$ (C)	$r^2 = 0.9994$ (Q) $r^2 = \mathbf{0.9878}$ (C)	$r^2 = 0.9994$ (Q) $r^2 = 0.9962$ (C)	$r^2 = 0.9996$ (Q) $r^2 = 0.9984$ (C)	$r^2 = 0.9998$ (Q) $r^2 = 0.9996$ (C)	$r^2 = 1.0000$ (Q) $r^2 = 0.9996$ (C)
		Re-Injection <sup>2</sup>	Not performed	$r^2 = 0.9996$ (Q) $r^2 = 0.9998$ (C)	$r^2 = 0.9994$ (Q & C)	Not performed			
	<i>ca.</i> 0.250 to 5.00 ng/mL								
Repeatable	ECM	<b>Not performed</b>							
	ILV <sup>3</sup>	Yes at LOQ, 10×LOQ, and 100×LOQ (characterized surface and drinking soils).		Yes at LOQ, 10×LOQ, and 100×LOQ [mean LOQ <b>27.4%</b> (C) <sup>4</sup> ; characterized surface and drinking soils].	Yes at LOQ, 10×LOQ, and 100×LOQ (characterized surface and drinking soils).				
Reproducible		<b>No</b> at LOQ and 10×LOQ; only one set of performance data provided.							
Specificity	ECM	<b>Not performed</b>							
	ILV <sup>5</sup>	Yes, no matrix interferences were observed. Minor baseline noise was noted which interfered with peak integration at LOQ.	Yes, no matrix interferences were observed; however, baseline noise of 10-15% of the analyte peak interfered with peak integration.	Yes, no matrix interferences were observed. Significant peak splitting was noted. Persistent contaminant at RT ± 0.7 min of analyte was observed in all chromatograms.	Yes, no matrix interferences were observed. Minor baseline noise was noted which interfered with peak integration at LOQ.				

Data were obtained from pp. 30, 53 (LOQ/LOD); Tables 1-42, pp. 60-102 (recovery data); Appendix F, Figures 141-302, pp. 366-527 (calibration curves & chromatograms); Appendix G, pp. 557-596 (raw data) of MRID 50493806. Q = Quantitation ion transition; C = Confirmatory ion transition.

- 1 The Method Bridging Method (GPL Study No. 150608) was not performed in ECM MRID 50493805; no ECM of the Method Bridging Method (GPL Study No. 150608) was submitted in ILV MRID 50493806.
- 2 The 100×LOQ samples of the Tier 1 analytes were re-diluted and re-injected (p. 50 of MRID 50493806). Initial recoveries were all generally >120% due to sample preparation error (Tables 15-26, pp. 74-86).
- 3 In the ILV, the soil (Agvise Sample IDs 15-1291 to 15-1296; 63-65% sand, 16-22% silt, 15-21% clay; pH 6.4-8.4; 0.22-1.7% organic carbon) obtained from the tiafenacil terrestrial field dissipation study (Trial ID PSM-15-06-03, GPL Study # 150614) located in Northwood, North Dakota, was used in the study (p. 31 of MRID 50493806). The soil was mainly sandy loam (characterized as such in five of six depths) with one depth characterized as sandy clay loam. Soil characterization based on soil depth collection was performed by Agvise Laboratories, Northwood, North Dakota (see footnote in Table 3 below for soil characterization details). The ILV soil matrix was assumed to be a homogenized sample from all sampling depths, but this was not reported in the study report.
- 4 The performance data deviation of M-53 at the LOQ did not affect the validity of the method since a confirmation method is not usually required when LC/MS or GC/MS is used as the primary method to generate study data.
- 5 Chromatographic evaluation was based on the quantitation ion transition; issues which were noted in the quantitation ion transition chromatogram were enhanced in the confirmation ion transition chromatogram.

#### IV. Method Deficiencies and Reviewer's Comments

1. The following additional deficiencies were noted for FarmHannong Co., Ltd., Document No. PC-2018-MDG-004-01:

Recovery of M-69 % (means 63.4-66.9%; Tables 1-42, pp. 60-102 of MRID 50493806) in the ILV at the LOQ or 10×LOQ was outside of the recommended range of 70- to 120%. In the communications, the ILV Study Director (Elisabeth Schoenau, ILV study author) noted that a pH issue was most likely responsible for the low recoveries of M-69 (p. 56 of MRID 50493806). M-69 is a carboxylic acid, which could affect the behavior of the compound during extraction and analysis.

Only one set of performance data was submitted for the 10×LOQ fortification level. OCSPP guidelines state that a minimally complete sample set includes a reagent blank, two matrix blanks, five samples spiked at the LOQ, and five samples spiked at 10× LOQ for each matrix.

Only 3 samples instead of the recommended 5 sample were evaluated at 0.1 mg/kg in the ECM (pp. 19-20 of MRID 50493805).

The ECM soil matrix was only partially characterized; soil particle distribution and texture classification were not reported (p. 12 of MRID 50493805).

The reported a LOQ of 0.002 mg/kg calculated based on the minimum detectable amount (p. 14 of MRID 50493805); however, the equation used to calculate the LOQ is unclear and does not clearly indicate whether it calculates the LOD or the 10x LOD. In the ILV the reported LOD was 0.005 mg/kg, indicating that the 0.002 mg/kg value reported in the ECM was more likely the LOD than the LOQ.

2. The Method Bridging Method (GPL Study No. 150608) which was provided in the ILV MRID 50493806 was a modification of FarmHannong Co., Ltd., Document No. PC-2018-MDG-004-01 to support its use for the analytes of soil dissipation studies (pp. 30-40; Appendices D-E, pp. 183-206 of MRID 50493806). ECM MRID 50493805 could not be considered an ECM for this method since significant sample processing and analytical method modifications were made, including the elimination of the SPE clean-up.
3. For the Method Bridging Method (GPL Study No. 150608), only one set of performance data was submitted. The Method Bridging Method (GPL Study No. 150608) was not performed in ECM MRID 50493805; no ECM or ILV of the Method Bridging Method (GPL Study No. 150608) was submitted in ILV MRID 50493806. An independent laboratory validation of the Method Bridging Method (GPL Study No. 150608) should be submitted.
4. The following additional deficiencies were noted for the Method Bridging Method (GPL Study No. 150608):

The specificity of the method for M-29 was not supported by ILV representative chromatograms because significant peak shouldering was observed at all fortification levels (Appendix F, Figures 228-230, pp. 453-455 of MRID 50493806). The LC parameters should be modified to enhance the resolution of M-29 and the separation of M-29 from the contaminants.

ILV linearity was not satisfactory for the confirmation ion transition of M-53 ( $r^2 = 0.9878$ ; Appendix G, pp. 557-596 of MRID 50493806). Linearity is satisfactory when  $r^2 \geq 0.995$ . The reviewer noted that linearity deviations in the confirmation ion analyses do not affect the validity of the method since a confirmation method is not usually required when LC/MS or GC/MS is used as the primary method to generate study data.

5. The ILV soil matrix was assumed to be a homogenized sample from all sampling depths obtained at the tiafenacil terrestrial field dissipation study (Trial ID PSM-15-06-03, GPL Study # 150614) located in Northwood, North Dakota, but homogenization was not reported in the study report (p. 31 of MRID 50493806).
6. The reviewer noted that M-12 and M-13 appeared to be present in each other's chromatograms in the ILV validation of FarmHannong Co., Ltd., Document No. PC-2018-MDG-004-01 (Appendix F, Figures 21-40, pp. 246-265 of MRID 50493806).
7. Persistent contaminants at RT – 0.5 min of M-63 were observed in all M-63 chromatograms in the ILV validation of FarmHannong Co., Ltd., Document No. PC-2018-MDG-004-01 (Appendix F, Figures 101-110, pp. 326-335 of MRID 50493806). The study author did not address these contaminants. The reviewer noted that the chemical purity of M-63 was 93.1% in the ILV (p. 23 of MRID 50493806).
8. In the Method Bridging Trial of Tier 1 analytes, at 1 ppm, the Tier 1 analyte mean recoveries were all greater than 120% (p. 50; Tables 15-26, pp. 74-86 of MRID 50493806). As a result, these samples were re-diluted and re-analyzed resulting in acceptable recoveries. Since the results from 608MV01 (not reported M+2 Q1 results) show that the 1 ppm recoveries are acceptable, there was likely an error in the preparation of the dilution for the 608MV01A analysis set. The 1 ppm samples were diluted on three separate occasions and were analyzed in 608MV01, 608MV01A, and 608MV01B. The 608MV01 and 608MV01B results agree, while the recoveries for the 1 ppm samples for 608MV01A were high (i.e., some results were > 120%). For 608MV01B, only the 1 ppm samples were analyzed. However, since the results from 608MV01 and 608MV01B agree, this is most likely due to a dilution error and not extract degradation. Both sets of results are reported in Tables 15 through 26. However, the summary statistics are not included for the 608MV01A 1 ppm data.
9. The chemical purity of M-29 used as a reference compound in the ECM was 86.5% (p. 6 of MRID 50493805). The chemical purity of M-73 used as a reference compound in the ILV was 86.7% (p. 23 of MRID 50493806).



10. The estimation of LOQ and LOD in the ILV was not based on scientifically acceptable procedures as defined in 40 CFR Part 136 (pp. 29-30, 46-47, 53 of MRID 50493806). The ILV justified the LOQ as the lowest fortification level for samples in the reference method. The ILV determined the LOD based on the reference method and the lowest calibration standard. No calculations for the LOQ and LOD were provided in the ILV. The estimation of LOD in the ECM was not based on scientifically acceptable procedures as defined in 40 CFR Part 136 (p. 14 of MRID 50493805). The value was calculated from the minimum detectable amount, but the equation was not defined. Detection limits should not be based on arbitrary values.
11. The ILV briefly reported the communication between the ILV Study Director (Elisabeth Schoenau, ILV study author) and Sponsor Representative (Jason A. McDonald or Mark D. Gelin; see Protocol Amendment 6; pp. 53-57 of MRID 50493806). Communication involved protocol and method exchange and updates, as well as ILV result exchange and approval. No technical assistance was provided by the Sponsor Representative.
12. In the ILV, the matrix effects on recoveries was investigated (p. 40 of MRID 50493806). It was determined that the soil type may have an effect on recoveries if the soil type affects the pH of the extract.
13. In the ILV, the time required to complete the extraction and analysis of one set of 8 samples required two calendar days, including calculation of results, for FarmHannong Co., Ltd., Document No. PC-2018-MDG-004-01 (pp. 36-37 of MRID 50493806). The time required to complete the extraction and analysis of one set of 13 samples required two calendar days, including calculation of results, for the Method Bridging Method (GPL Study No. 150608).

## 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

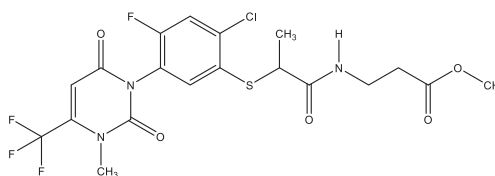
## Tiafenacil (DCC-3825)

**IUPAC Name:** Methyl 3-[(2RS)-2-{2-chloro-4-fluoro-5-[1,2,3,6-tetrahydro-3-methyl-2,6-dioxo-4-(trifluoromethyl)pyrimidin-1(6H)-yl]phenylthio}propionamido]propionate

**CAS Name:** Methyl N-[2-[[2-chloro-5-[3,6-dihydro-3-methyl-2,6-dioxo-4-(trifluoromethyl)-1(2H)-pyrimidinyl]-4-fluorophenyl]thio]-1-oxopropyl]-β-alaninate

**CAS Number:** 1220411-29-9

**SMILES String:** O=C(C=C(C(F)(F)F)N1C)N(C2=C(F)C=C(Cl)C(SC(C)C(N([H])CCC(O)C)=O)=O)=C2)C1=O



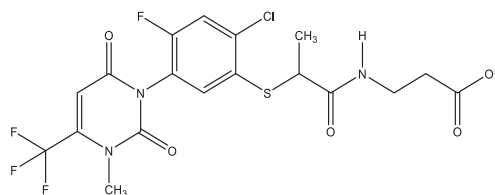
## M-01 (DCC-3825-M-01)

**IUPAC Name:** 3-(2-((2-Chloro-4-fluoro-5-(3-methyl-2,6-dioxo-4-(trifluoromethyl)-3,6-dihydropyrimidin-1(2H)-yl)phenyl)thio)propanamido)propanoic acid

**CAS Name:** Not reported

**CAS Number:** Not reported

**SMILES String:** O=C(C=C(C(F)(F)F)N1C)N(C2=C(F)C=C(Cl)C(SC(C)C(N([H])CCC(O)O)=O)=O)=C2)C1=O



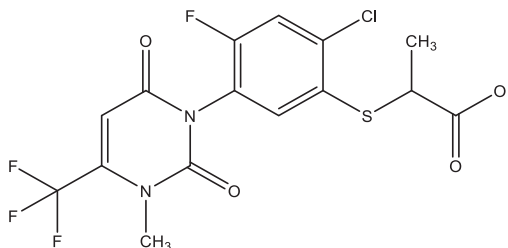
**M-12 (DCC-3825-M-12)**

**IUPAC Name:** 2-((2-Chloro-4-fluoro-5-(3-methyl-2,6-dioxo-4-(trifluoromethyl)-3,6-dihydropyrimidin-1(2H)-yl)phenyl)thio)propanoic acid

**CAS Name:** Not reported

**CAS Number:** Not reported

**SMILES String:** O=C(C=C(C(F)(F)F)N1C)N(C2=C(F)C=C(Cl)C(SC(C)C(O)=O)=C2)C1=O

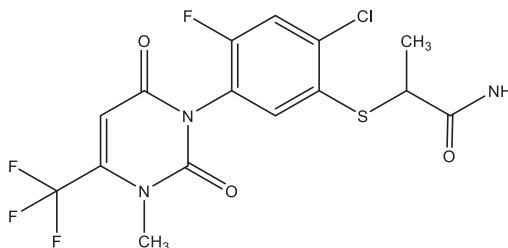
**M-13 (DCC-3825-M-13)**

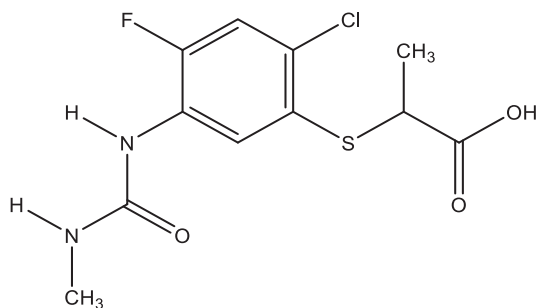
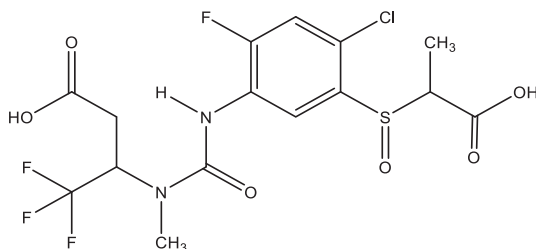
**IUPAC Name:** 2-((2-Chloro-4-fluoro-5-(3-methyl-2,6-dioxo-4-(trifluoromethyl)-3,6-dihydropyrimidin-1(2H)-yl)phenyl)thio)propanamide

**CAS Name:** Not reported

**CAS Number:** Not reported

**SMILES String:** O=C(C=C(C(F)(F)F)N1C)N(C2=C(F)C=C(Cl)C(SC(C)C(N)=O)=C2)C1=O



**M-20 (DCC-3825-M-20)****IUPAC Name:** 2-((2-Chloro-4-fluoro-5-(3-methylureido)phenyl)thio)propanoic acid**CAS Name:** Not reported**CAS Number:** Not reported**SMILES String:** [H]N(C)C(N(C1=CC(SC(C)C(O)=O)=C(Cl)C=C1F)[H])=O**M-29 (DCC-3825-M-29)****IUPAC Name:** 3-(3-(5-((1-Carboxyethyl)sulfinyl)-4-chloro-2-fluorophenyl)-1-methylureido)-4,4,4-trifluorobutanoic acid**CAS Name:** Not reported**CAS Number:** Not reported**SMILES String:** [H]N(C1=C(F)C=C(Cl)C(S(C(C)C(O)=O)=O)=C1)C(N(C)C(C(F)(F)F)C  
C(O)=O)=O

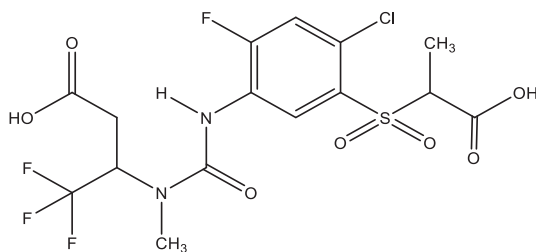
**M-30 (DCC-3825-M-30)**

**IUPAC Name:** 3-(3-(5-((1-Carboxyethyl)sulfonyl)-4-chloro-2-fluorophenyl)-1-methylureido)-4,4,4-trifluorobutanoic acid

**CAS Name:** Not reported

**CAS Number:** Not reported

**SMILES String:** [H]N(C1=C(F)C=C(Cl)C(S(C(C)C(O)=O)(=O)=O)=C1)C(N(C)C(C(F)(F)F)CC(O)=O)=O

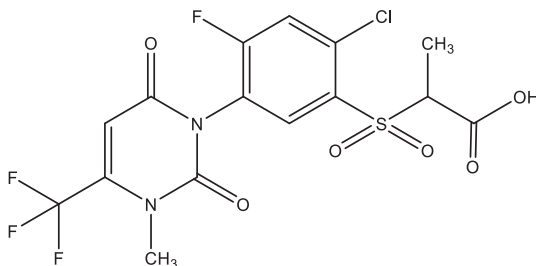
**M-35 (DCC-3825-M-35)**

**IUPAC Name:** 2-((2-Chloro-4-fluoro-5-(3-methyl-2,6-dioxo-4-(trifluoromethyl)-3,6-dihydropyrimidin-1(2H)-yl)phenyl)sulfonyl)propanoic acid

**CAS Name:** Not reported

**CAS Number:** Not reported

**SMILES String:** CN(C(N1C2=C(F)C=C(Cl)C(S(C(C)C(O)=O)(=O)=O)=C2)=O)C(C(F)(F)F)=CC1=O



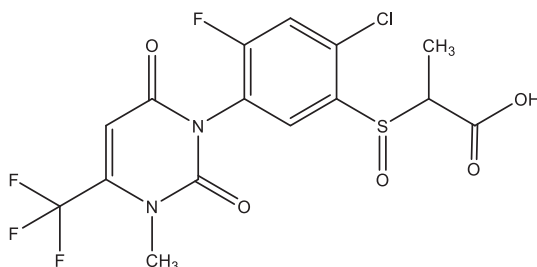
**M-36 (DCC-3825-M-36)**

**IUPAC Name:** 2-((2-Chloro-4-fluoro-5-(3-methyl-2,6-dioxo-4-(trifluoromethyl)-3,6-dihydropyrimidin-1(2H)-yl)phenyl)sulfinyl)propanoic acid

**CAS Name:** Not reported

**CAS Number:** Not reported

**SMILES String:** CN(C(N1C2=C(F)C=C(Cl)C(S(C(C)C(O)=O)=O)=C2)=O)C(C(F)(F)F)=CC1=O

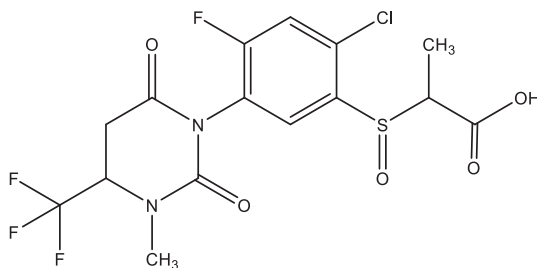
**M-53 (DCC-3825-M-53)**

**IUPAC Name:** 2-((2-Chloro-4-fluoro-5-(3-methyl-2,6-dioxo-4-(trifluoromethyl)tetrahydropyrimidin-1(2H)-yl)phenyl)sulfinyl)propanoic acid

**CAS Name:** Not reported

**CAS Number:** Not reported

**SMILES String:** CN(C(N1C2=C(F)C=C(Cl)C(S(C(C)C(O)=O)=O)=C2)=O)C(C(F)(F)F)C1=O



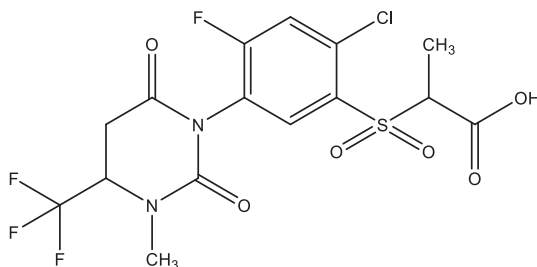
**M-63 (DCC-3825-M-63)**

**IUPAC Name:** 2-((2-Chloro-4-fluoro-5-(3-methyl-2,6-dioxo-4-(trifluoromethyl)tetrahydropyrimidin-1(2H)-yl)phenyl)sulfonyl)propanoic acid

**CAS Name:** Not reported

**CAS Number:** Not reported

**SMILES String:** CN(C(N1C2=C(F)C=C(Cl)C(S(C(C)C(O)=O)(=O)=O)=C2)=O)C(C(F)(F)F)CC1=O

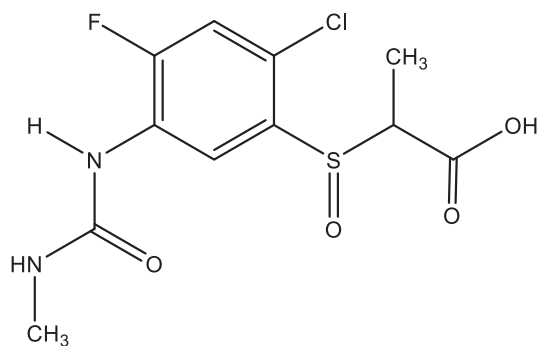
**M-69 (DCC-3825-M-69)**

**IUPAC Name:** 2-((2-Chloro-4-fluoro-5-(3-methylureido)phenyl)sulfinyl)propanoic acid

**CAS Name:** Not reported

**CAS Number:** Not reported

**SMILES String:** CNC(N([H])C1=C(F)C=C(Cl)C(S(C(C)C(O)=O)=O)=C1)=O





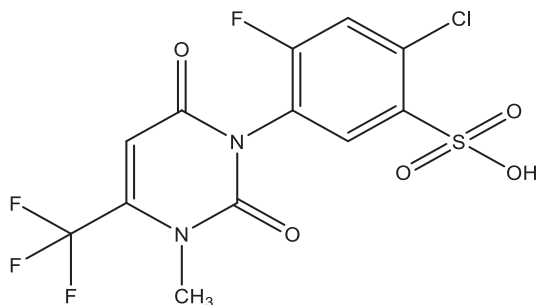
**M-72 (DCC-3825-M-72)**

**IUPAC Name:** 2-Chloro-4-fluoro-5-(3-methyl-2,6-dioxo-4-(trifluoromethyl)-3,6-dihydropyrimidin-1(2H)-yl)benzenesulfonic acid

**CAS Name:** Not reported

**CAS Number:** Not reported

**SMILES String:** CN(C(N1C2=C(F)C=C(Cl)C(S(=O)(O)=O)=C2)=O)C(C(F)(F)F)=CC1=O

**M-73 (DCC-3825-M-73)**

**IUPAC Name:** 2-Chloro-4-fluoro-5-(3-methyl-2,6-dioxo-4-(trifluoromethyl)tetrahydropyrimidin-1(2H)-yl)benzenesulfonic acid

**CAS Name:** Not reported

**CAS Number:** Not reported

**SMILES String:** CN(C(N1C2=C(F)C=C(Cl)C(S(O)(=O)=O)=C2)=O)C(C(F)(F)F)CC1=O

