

**Environmental Chemistry Method for SYN508210, SYN508211,
CSCC210616, CSCD465008, and CSAA798670 in Water (Method
GRM023.06A)**

Reports: *ECM:* Braid S and Hayward, G. (2010). SYN545192 – Analytical Method for the Determination of Residues of SYN508210 and SYN508211 and the Metabolites CSCC210616, CSCD465008, and CSAA798670 in Water. Syngenta Ltd., Jealott's Hill International Research Centre, Bracknell, United Kingdom. Issued February 2010. Unpublished Method No. GRM023.06A (Syngenta Regulatory Document No. GRM023.06A), EPA MRID No 47473348.

Oppiliart, S. (2010). SYN524464 – Validation of the Analytical Method GRM023.06A for the Determination of Residues of SYN508210 and SYN508211 and the Metabolites CSCC210616, CSCD465008, and CSAA798670 IN Water. Syngenta Ltd., Jealott's Hill International Research Centre, Bracknell, United Kingdom. Issued February 2010. Unpublished Method No. GRM023.06A (Syngenta Regulatory Document No. GRM023.06A), EPA MRID No 47473348.

ILV: None

Document No.: MRIDs 47473348 & 47473349

Guideline: USEPA 850.6100
PMRA 8.2.2.3

Statements: The study was conducted in accordance with USEPA FIFRA Good Laboratory Practice (GLP) Standards, 40 CFR Part 160 (pp. 3, 16). Signed and dated Data Confidentiality, GLP, and Quality Assurance statements were provided (p. 3).

Classification: This analytical method is classified as **Acceptable**. However, there has been no independent laboratory validation submitted accompanying the method. There are two reports provided for the method which appear to convey identical information (MRID Nos. 47473348 and 47473349). Overall mean recoveries for SYN508210 and SYN508211 were less than 90 percent in some instances, but never lower than 83 percent. Overall mean recoveries for CSCC210616 were less than 90 percent in some instances, but never lower than 85 percent. Overall mean recoveries for CSCD465008 were less than 90 percent in some instances, but never lower than 87 percent.

PC Code: 122305

Reviewer: Gabe Rothman
Environmental Scientist

Signature: 
Date: August 29, 2013

Executive Summary

Residues of SYN508210 and, SYN508211 in water may be diluted with methanol and quantified by direct injection by LC-MS/MS, where instrument sensitivity is sufficient. Residues of CSCC210616 in water may be quantified by LC-MS/MS directly without any sample manipulation, where instrument sensitivity is sufficient.

Alternatively, for analysis of SYN508210, SYN508211 and CSCC210616 the water samples are taken through a solid-phase extraction (SPE) procedure using Oasis™ HLB cartridges. The SPE cartridges are washed with water and the analytes are eluted with acetonitrile. The final volume is adjusted to 5 mL with acetonitrile. Aliquots of the eluate are diluted with ultra pure water, as required.

For the analysis of CSCD465008 and CSAA798670, water samples are acidified then taken through a solid-phase extraction (SPE) procedure using Oasis™ HLB cartridges. The SPE cartridges are washed with water and CSCD465008 and CSAA798670 are eluted with acetonitrile. The column eluates are evaporated to remove the acetonitrile and then redissolved in ultra pure water.

For all analytes, final determination is by high performance liquid chromatography with triple quadrupole mass spectrometric detection (LC-MS/MS).

The limit of quantification of the method is 0.05 mg/L for SYN508210, SYN508211, CSCD465008, CSAA798670 and CSCC210616.

I. Recovery Findings***Initial Validation of Method: (Tables 10 -25 from Study Report, MRID No. 47473348)*****Table 10: Recovery Data for SYN508210 (Direct Injection Procedure)
Obtained During Method Validation. Transition m/z 330.2 \rightarrow 131.1**

SYN508210 (Transition m/z 330.2 \rightarrow 131.1)					
Matrix	Fortification Level ($\mu\text{g/L}$)	Recovery (%)	Mean (%)	RSD (%)	Range (%)
Groundwater	0.05	83, 78, 84, 78, 83	81	3	78-84
	0.5	88, 84, 83, 83, 83	84	2	83-88
	<i>Overall</i>		83	3	78-88
Surface water	0.05	93, 96, 90, 96, 93	94	3	90-96
	0.5	94, 93, 93, 93, 93	93	1	93-94
	<i>Overall</i>		93	2	90-96
Drinking water	0.05	86, 78, 89, 86, 89	86	5	78-89
	0.5	87, 86, 86, 86, 85	86	1	85-87
	<i>Overall</i>		86	3	78-89

Limit of quantification is defined by the lowest validated fortification level.

Residues in duplicate control samples and reagent blanks were less than 30% of the LOQ.

**Table 11: Recovery Data for SYN508210 (Direct Injection Procedure)
Obtained During Method Validation. Transition m/z 330.2 \rightarrow 91.1**

SYN508210 (Transition m/z 330.2 \rightarrow 91.1)					
Matrix	Fortification Level ($\mu\text{g/L}$)	Recovery (%)	Mean (%)	RSD (%)	Range (%)
Groundwater	0.05	83, 78, 78, 81, 87	81	5	78-87
	0.5	87, 83, 83, 81, 85	84	3	81-87
	<i>Overall</i>		83	4	78-87
Surface water	0.05	102, 100, 100, 103, 98	101	2	98-103
	0.5	93, 95, 93, 96, 96	95	2	93-96
	<i>Overall</i>		96	4	93-103
Drinking water	0.05	81, 82, 81, 90, 84	84	5	81-90
	0.5	88, 87, 85, 88, 87	87	2	85-88
	<i>Overall</i>		85	4	81-90

Limit of quantification is defined by the lowest validated fortification level.

Residues in duplicate control samples and reagent blanks were less than 30% of the LOQ.

Table 12: Recovery Data for SYN508210 (SPE Procedure) Obtained During Method Validation. Transition m/z 330.2 \rightarrow 131.1

SYN508210 (Transition m/z 330.2 \rightarrow 131.1)					
Matrix	Fortification Level ($\mu\text{g/L}$)	Recovery (%)	Mean (%)	RSD (%)	Range (%)
Groundwater	0.05	89, 85, 87, 95, 91	89	4	85-95
	0.5	82, 83, 82, 81, 81	82	1	81-83
	<i>Overall</i>		86	6	81-95
Surface water	0.05	87, 84, 83, 86, 85	85	2	83-87
	0.5	92, 88, 87, 89, 88	89	2	87-92
	<i>Overall</i>		87	3	83-92
Drinking water	0.05	93, 87, 90, 92, 91	91	2	87-93
	0.5	88, 82, 86, 85, 81	84	3	81-88
	<i>Overall</i>		87	5	81-93

Limit of quantification is defined by the lowest validated fortification level.

Residues in duplicate control samples and reagent blanks were less than 30% of the LOQ.

Table 13: Recovery Data for SYN508210 (SPE Procedure) Obtained During Method Validation. Transition m/z 330.2 \rightarrow 91.1

SYN508210 (Transition m/z 330.2 \rightarrow 91.1)					
Matrix	Fortification Level ($\mu\text{g/L}$)	Recovery (%)	Mean (%)	RSD (%)	Range (%)
Groundwater	0.05	89, 92, 91, 93, 88	91	2	88-93
	0.5	82, 79, 82, 80, 79	81	2	79-82
	<i>Overall</i>		86	7	79-93
Surface water	0.05	87, 83, 89, 84, 88	86	3	83-89
	0.5	91, 88, 88, 88, 89	89	2	88-91
	<i>Overall</i>		88	3	83-91
Drinking water	0.05	96, 92, 89, 96, 98	94	4	89-98
	0.5	87, 84, 86, 83, 80	84	3	80-87
	<i>Overall</i>		89	7	80-98

Limit of quantification is defined by the lowest validated fortification level.

Residues in duplicate control samples and reagent blanks were less than 30% of the LOQ.

Table 14: Recovery Data for SYN508211 (Direct Injection Procedure) Obtained During Method Validation. Transition m/z 330.2 \rightarrow 131.1

SYN508211 (Transition m/z 330.2 \rightarrow 131.1)					
Matrix	Fortification Level ($\mu\text{g/L}$)	Recovery (%)	Mean (%)	RSD (%)	Range (%)
Groundwater	0.05	81, 83, 76, 86, 83	82	4	76-86
	0.5	85, 87, 83, 83, 84	85	2	83-87
	<i>Overall</i>		83	3	76-87
Surface water	0.05	94, 92, 92, 86, 96	92	4	86-96
	0.5	92, 91, 93, 90, 94	92	2	90-94
	<i>Overall</i>		92	3	86-96
Drinking water	0.05	90, 93, 89, 84, 88	88	4	84-93
	0.5	88, 88, 87, 86, 85	87	1	85-88
	<i>Overall</i>		88	3	84-93

Limit of quantification is defined by the lowest validated fortification level.
Residues in duplicate control samples and reagent blanks were less than 30% of the LOQ.

Table 15: Recovery Data for SYN508211 (Direct Injection Procedure) Obtained During Method Validation. Transition m/z 330.2 \rightarrow 91.1

SYN508211 (Transition m/z 330.2 \rightarrow 91.1)					
Matrix	Fortification Level ($\mu\text{g/L}$)	Recovery (%)	Mean (%)	RSD (%)	Range (%)
Groundwater	0.05	91, 89, 85, 88, 98	90	6	85-98
	0.5	89, 86, 85, 84, 85	86	2	84-89
	<i>Overall</i>		88	5	84-98
Surface water	0.05	96, 105, 91, 91, 97	96	6	91-105
	0.5	90, 90, 89, 93, 90	91	2	89-93
	<i>Overall</i>		93	5	89-105
Drinking water	0.05	92, 90, 86, 91, 100	92	5	86-100
	0.5	87, 89, 90, 88, 89	89	1	87-90
	<i>Overall</i>		90	4	86-100

Limit of quantification is defined by the lowest validated fortification level.
Residues in duplicate control samples and reagent blanks were less than 30% of the LOQ.

Table 16: Recovery Data for SYN508211 (SPE Procedure) Obtained During Method Validation. Transition m/z 330.2 \rightarrow 131.1

SYN508211 (Transition m/z 330.2 \rightarrow 131.1)					
Matrix	Fortification Level ($\mu\text{g/L}$)	Recovery (%)	Mean (%)	RSD (%)	Range (%)
Groundwater	0.05	87, 91, 89, 91, 94	90	3	87-94
	0.5	80, 80, 80, 79, 79	80	1	79-80
	<i>Overall</i>		85	7	79-94
Surface water	0.05	87, 88, 84, 89, 82	86	3	82-89
	0.5	91, 88, 88, 88, 88	89	2	88-91
	<i>Overall</i>		87	3	82-91
Drinking water	0.05	91, 92, 86, 91, 88	90	3	86-92
	0.5	87, 83, 85, 85, 81	84	3	81-87
	<i>Overall</i>		87	4	81-92

Limit of quantification is defined by the lowest validated fortification level.
Residues in duplicate control samples and reagent blanks were less than 30% of the LOQ.

Table 17: Recovery Data for SYN508211 (SPE Procedure) Obtained During Method Validation. Transition m/z 330.2 \rightarrow 91.1

SYN508211 (Transition m/z 330.2 \rightarrow 91.1)					
Matrix	Fortification Level ($\mu\text{g/L}$)	Recovery (%)	Mean (%)	RSD (%)	Range (%)
Groundwater	0.05	94, 93, 91, 93, 88	92	3	88-94
	0.5	82, 81, 81, 80, 78	80	2	78-82
	<i>Overall</i>		86	7	78-94
Surface water	0.05	91, 88, 87, 85, 83	87	3	83-91
	0.5	90, 86, 86, 88, 89	88	2	86-90
	<i>Overall</i>		87	3	83-91
Drinking water	0.05	93, 93, 94, 92, 91	93	1	91-94
	0.5	86, 82, 85, 84, 79	83	3	79-86
	<i>Overall</i>		88	6	79-94

Limit of quantification is defined by the lowest validated fortification level.
Residues in duplicate control samples and reagent blanks were less than 30% of the LOQ.

Table 18: Recovery Data for CSCC210616 (Direct Injection Procedure) Obtained During Method Validation. Transition m/z 176.0 \rightarrow 136.1

CSCC210616 (Transition m/z 176.0 \rightarrow 136.1)					
Matrix	Fortification Level ($\mu\text{g/L}$)	Recovery (%)	Mean (%)	RSD (%)	Range (%)
Groundwater	0.05	103, 113, 102, 97, 102	103	6	97-113
	0.5	107, 103, 61, 91, 91	90	20	61 - 107
	0.5	96, 96, 96, 96, 94	95	1	94-96
	<i>Overall</i>		<i>96</i>	<i>12</i>	<i>61-113</i>
Surface water	0.05	99, 99, 107, 97, 102	101	4	97-107
	0.5	96, 97, 93, 79, 86	90	8	79-97
	<i>Overall</i>		<i>96</i>	<i>8</i>	<i>79-107</i>
Drinking water	0.05	94, 92, 89, 97, 98	94	4	89-98
	0.5	98, 97, 95, 96, 95	96	1	95-98
	<i>Overall</i>		<i>95</i>	<i>3</i>	<i>89-98</i>

For groundwater, a second series was performed only for the recoveries at 10 LOQ as the first one was invalidated for the transition m/z 176.0 \rightarrow 156.1. Therefore there are two sets of data for CSCC210616 at 10 LOQ for the transition m/z 176.0 \rightarrow 136.1.

Limit of quantification is defined by the lowest validated fortification level.

Residues in duplicate control samples and reagent blanks were less than 30% of the LOQ.

Table 19: Recovery Data for CSCC210616 (Direct Injection Procedure) Obtained During Method Validation. Transition m/z 176.0 \rightarrow 156.1

CSCC210616 (Transition m/z 176.0 \rightarrow 156.1)					
Matrix	Fortification Level ($\mu\text{g/L}$)	Recovery (%)	Mean (%)	RSD (%)	Range (%)
Groundwater	0.05	107, 111, 100, 103, 95	103	6	95-111
	0.5	94, 100, 99, 97, 97	98	2	94-100
	<i>Overall</i>		<i>100</i>	<i>5</i>	<i>94-111</i>
Surface water	0.05	101, 108, 96, 99, 107	102	5	96-108
	0.5	96, 97, 96, 80, 87	91	8	80-97
	<i>Overall</i>		<i>97</i>	<i>9</i>	<i>80-108</i>
Drinking water	0.05	97, 97, 89, 92, 96	94	4	89-97
	0.5	96, 97, 98, 97, 96	97	1	96-98
	<i>Overall</i>		<i>95</i>	<i>3</i>	<i>89-98</i>

Limit of quantification is defined by the lowest validated fortification level.

Residues in duplicate control samples and reagent blanks were less than 30% of the LOQ.

Table 20: Recovery Data for CSCC210616 (SPE Procedure) Obtained During Method Validation. Transition m/z 176.0 \rightarrow 136.1

CSCC210616 (Transition m/z 176.0 \rightarrow 136.1)					
Matrix	Fortification Level ($\mu\text{g/L}$)	Recovery (%)	Mean (%)	RSD (%)	Range (%)
Groundwater	0.05	91, 75, 76, 73, 69	77	11	69-91
	0.5	94, 88, 91, 97, 92	92	4	88-97
	<i>Overall</i>		<i>85</i>	<i>12</i>	<i>69-97</i>
Surface water	0.05	106, 100, 99, 95, 94	99	5	94-106
	0.5	93, 82, 80, 75, 78	82	9	75-93
	<i>Overall</i>		<i>90</i>	<i>12</i>	<i>75-106</i>
Drinking water	0.05	102, 91, 97, 99, 102	98	5	91-102
	0.5	93, 99, 95, 101, 98	97	3	93-101
	<i>Overall</i>		<i>98</i>	<i>4</i>	<i>91-102</i>

Limit of quantification is defined by the lowest validated fortification level.
Residues in duplicate control samples and reagent blanks were less than 30% of the LOQ.

Table 21: Recovery Data for CSCC210616 (SPE Procedure) Obtained During Method Validation. Transition m/z 176.0 \rightarrow 156.1

CSCC210616 (Transition m/z 176.0 \rightarrow 156.1)					
Matrix	Fortification Level ($\mu\text{g/L}$)	Recovery (%)	Mean (%)	RSD (%)	Range (%)
Groundwater	0.05	104, 99, 96, 104, 113	103	6	96-113
	0.5	87, 93, 90, 94, 92	91	3	87-94
	<i>Overall</i>		<i>97</i>	<i>8</i>	<i>87-113</i>
Surface water	0.05	105, 106, 85, 76, 101	95	14	76-106
	0.5	83, 79, 77, 64, 80	77	10	64-83
	<i>Overall</i>		<i>86</i>	<i>16</i>	<i>64-106</i>
Drinking water	0.05	95, 118, 99, 103, 91	101	10	91-118
	0.5	89, 101, 96, 102, 100	98	6	89-102
	<i>Overall</i>		<i>99</i>	<i>8</i>	<i>89-118</i>

Limit of quantification is defined by the lowest validated fortification level.
Residues in duplicate control samples and reagent blanks were less than 30% of the LOQ.

Table 22: Recovery Data for CSCD465008 (SPE Procedure) Obtained During Method Validation. Transition m/z 161.0 \rightarrow 141.0

CSCD465008 (Transition m/z 161.0 \rightarrow 141.0)					
Matrix	Fortification Level ($\mu\text{g/L}$)	Recovery (%)	Mean (%)	RSD (%)	Range (%)
Groundwater	0.05	91, 91, 90, 87, 98	92	4	87-98
	0.5	94, 94, 93, 96, 103	96	4	93-103
	<i>Overall</i>		94	5	87-103
Surface water	0.05	90, 87, 87, 96, 81	88	6	81-96
	0.5	85, 85, 93, 85, 82	86	5	82-93
	<i>Overall</i>		87	5	81-96
Drinking water	0.05	96, 108, 102, 96, 102	101	5	96-108
	0.5	98, 96, 98, 97, 100	98	1	96-100
	<i>Overall</i>		99	4	96-108

Limit of quantification is defined by the lowest validated fortification level.
Residues in duplicate control samples and reagent blanks were less than 30% of the LOQ.

Table 23: Recovery Data for CSCD465008 (SPE Procedure) Obtained During Method Validation. Transition m/z 161.0 \rightarrow 65.9

CSCD465008 (Transition m/z 161.0 \rightarrow 65.9)					
Matrix	Fortification Level ($\mu\text{g/L}$)	Recovery (%)	Mean (%)	RSD (%)	Range (%)
Groundwater	0.05	73, 74, 89, 81, 101	84	14	73-101
	0.5	93, 91, 92, 95, 99	94	3	91-99
	<i>Overall</i>		89	11	73-101
Surface water	0.05	87, 91, 89, 93, 88	90	3	87-93
	0.5	87, 87, 90, 86, 79	86	5	79-90
	<i>Overall</i>		88	4	79-93
Drinking water	0.05	100, 107, 118, 105, 106	107	6	100-118
	0.5	94, 98, 103, 99, 99	99	3	94-103
	<i>Overall</i>		103	6	94-118

Limit of quantification is defined by the lowest validated fortification level.
Residues in duplicate control samples and reagent blanks were less than 30% of the LOQ.

Table 24: Recovery Data for CSAA798670 (SPE Procedure) Obtained During Method Validation. Transition m/z 175.0 \rightarrow 91.1

CSAA798670 (Transition m/z 175.0 \rightarrow 91.1)					
Matrix	Fortification Level ($\mu\text{g/L}$)	Recovery (%)	Mean (%)	RSD (%)	Range (%)
Groundwater	0.05	83, 83, 84, 88, 90	86	4	83-90
	0.5	93, 94, 91, 98, 102	96	5	91-102
	<i>Overall</i>		91	7	83-102
Surface water	0.05	89, 89, 89, 95, 84	89	4	84-95
	0.5	90, 91, 98, 89, 89	91	4	89-98
	<i>Overall</i>		90	4	84-98
Drinking water	0.05	92, 98, 85, 94, 95	93	5	85-98
	0.5	95, 100, 97, 98, 100	98	2	95-100
	<i>Overall</i>		95	5	85-100

Limit of quantification is defined by the lowest validated fortification level.

Residues in duplicate control samples and reagent blanks were less than 30% of the LOQ.

Table 25: Recovery Data for CSAA798670 (SPE Procedure) Obtained During Method Validation. Transition m/z 175.0 \rightarrow 111.1

CSAA798670 (Transition m/z 175.0 \rightarrow 111.1)					
Matrix	Fortification Level ($\mu\text{g/L}$)	Recovery (%)	Mean (%)	RSD (%)	Range (%)
Groundwater	0.05	79, 83, 83, 89, 81	83	4	79-89
	0.5	95, 99, 100, 102, 106	100	4	95-106
	<i>Overall</i>		92	11	79-106
Surface water	0.05	89, 90, 89, 94, 84	89	4	84-94
	0.5	89, 87, 98, 90, 89	91	4	87-98
	<i>Overall</i>		90	4	84-98
Drinking water	0.05	88, 98, 93, 95, 92	93	4	88-98
	0.5	102, 100, 103, 97, 101	101	2	97-103
	<i>Overall</i>		97	5	88-103

Limit of quantification is defined by the lowest validated fortification level.

Residues in duplicate control samples and reagent blanks were less than 30% of the LOQ.

II. Method Characteristics

Specificity

LC-MS/MS is a highly specific detection technique and therefore a further confirmatory technique is not required. The method includes a primary and a confirmatory MS/MS transition, both of which have been validated for representative water samples.

Linearity

The response of the LC-MS/MS instrument was shown to be linear for:

- SYN508210 and SYN508211 at concentrations ranging from 0.0125 to 0.5 µg/L (equivalent to 0.625 to 25 pg of SYN508210 and SYN508211 injected on to the column, based on a 50 µL injection)
- CSCC210616 at concentrations ranging from 0.025 to 1 µg/L (equivalent to 1.25 to 50 pg of CSCC210616 injected on to the column, based on a 50 µL injection)
- CSCD465008 and CSAA798670 at concentrations ranging from 1.25 to 50 µg/L (equivalent to 12.5 to 500 pg for CSCD465008 and CSAA798670 injected on to the column, based on a 10 µL injection),

Accuracy and Precision

Acceptable mean recoveries of between 70% and 110% with a relative standard deviation less than 20% were found on all matrices tested for each transitions:

- the m/z 330.2 → 131.1 and m/z 330.2 → 91.1 for SYN508210 and SYN508211,
- the m/z 176.0 → 136.1 and m/z 176.0 → 156.1 for CSCC210616,
- the m/z 161.0 → 141.0 and m/z 161.0 → 65.9 for CSCD465008,
- the m/z 175.0 → 91.1 and m/z 175.0 → 111.1 for CSAA798670.

Limit of Quantification

The limit of quantification (LOQ) of the analytical method in water was established at 0.05 µg/L for SYN508210 and SYN508211 and its degradates CSCC210616, CSCD465008 and CSAA798670.

III. Method Deficiencies and Reviewer's Comments

1. There has been no independent laboratory validation submitted accompanying the method. There are two reports provided for the method which appear to convey identical information (MRID Nos. 47473348 and 47473349).

2. Overall mean recoveries of SYN508210 from municipal drinking water and ground water were less than 90 percent in all cases, but always greater than 83 percent in the initial validation of the method. In surface water, overall mean recoveries of SYN508210 were always above 90 percent except for transitions $m/z = 330/131$ and $m/z = 330/91$ for the SPE method. However, overall mean recoveries were always above 87 percent.
3. Overall mean recoveries of SYN508211 from ground water were less than 90 percent in all cases, but always greater than 83 percent in the initial validation of the method. In surface water, overall mean recoveries of SYN508211 were always above 90 percent except for transitions $m/z = 330/131$ and $m/z = 330/91$ for the SPE method. However, overall mean recoveries were always above 87 percent. In drinking water, overall mean recoveries of SYN508211 were always above 90 percent except for transitions $m/z = 330/91$ for the direct injection method. However, overall mean recoveries were always above 87 percent.
4. Overall mean recoveries of CSCC210616 from ground water were always above 90 percent except for transition $m/z = 176/136$ for the SPE method. However, in these instances, overall mean recoveries were always above 87 percent. In drinking water, overall mean recoveries of CSCC210616 were always above 90 percent except for transitions $m/z = 330/91$ for the SPE method. However, overall mean recoveries were always above 85 percent.
5. Overall mean recoveries of CSCD465008 from surface water were less than 90 percent in all cases, but always greater than 87 percent in the initial validation of the method. In ground water, overall mean recoveries of CSCD465008 were always above 90 percent except for transitions $m/z = 161/66$ for the SPE method. However, overall mean recoveries were always above 89 percent.

IV. References

1. Luxon S G (1992): Hazards in the Chemical Laboratory 5th Edition. The Royal Society of Chemistry. Thomas Graham House, The Science Park, Cambridge CB4 4WF, UK. ISBN 0-85186-229-2.
2. Cardone M J, Palermo P J and Sybrand L B (1980): Potential error in single point ratio calculations based on linear calibration curves with a significant intercept. *Anal.Chem.*, 52 pp 1187-1191
3. Oppiliart S. (2009), Eurofins ADME Bioanalyses Validation Report TK0009674-REG SYN524464 - Validation of the Analytical Method GRM023.06A for the Determination of Residues of SYN508210 and SYN508211 and the Metabolites CSCC210616, CSCD465008 and CSAA798670 in Water.