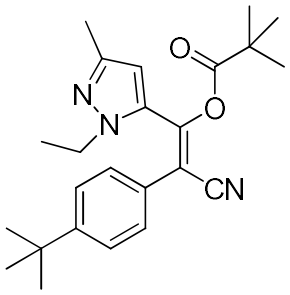
SYRICI

Etpyrafen



CIPAC Collaborative Trial

CIPAC 5192/R, full scale study

CIPAC Collaborative Study of a High Performance Liquid Chromatographic Analysis of Etpyrafen Technical Material and Formulated Products

By
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Pages: 28

Table of Contents

1. List of Participants

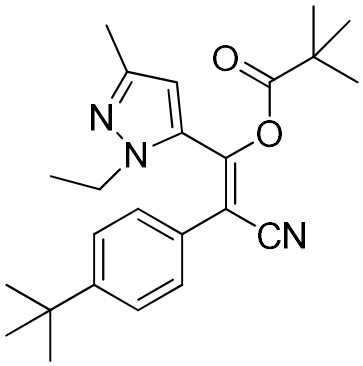
20 laboratories took part in the collaborative study:

NAME	ORGANIZATION	COUNTRY
Kevin King	Clarke Mosquito Control Inc.	U.S.A.
Ulrich Schaller	Agroscope Switzerland	Switzerland
Ahmad Rezvani	Maryland Department of Agriculture, State Chemist Section	U.S.A.
Rachel Joseph	Rotam Research Laboratory	China
Xiangdong Shao	BioGuide	China
ir. Vanessa Lecocq, Laurent Soquette, Régis De Bruyne	Walloon Agricultural Research Centre (CRA-W), Agriculture and Natural Environment Department (D3), Plant Protection Products and Biocides Physico-chemistry and Residues Unit (U10)	Belgium
HIROKA HARADA	Agricultural Chemicals Inspection Station, Food and Agricultural Materials Inspection Center	Japan
Lajos Benke	National Food Chain safety Office, Pesticide Analytical National Reference Laboratory Velence	Hungary
Kasper, Sandra	BASF SE	Germany
Jim Garvey	Pesticides Control Laboratory DAFM	Ireland
MONISSE	ISABELLE	Belgium
Yue Wang	Nutrichem Laboratory Co., Ltd.	China
Ciotea Florentina	National Phytosanitary Authority	Romania
Kaiwei Shi	National Center for Pesticide Quality Supervision and Inspection (Beijing), Institute for the Control of Agrochemicals, Ministry of Agriculture and Rural Affairs , P. R. China	China
Xiaoyan Wang	FMC Corporation	U.S.A
Laiwei Xu Qinjie Zhang	Test Center for Chemical Products of Zhejiang Chemical Industry Research Institute	China
Agus Salim	Laboratorium PT Agricon	Indonesia
Suping Bao	National Supervising & Testing Center for Pesticide(Nanjing)	China
Peter Derevianko	Frandesa Co. Ltd.	Republic of Belarus
Wu Pei	Shandong Academy of Pesticide Sciences Testing Center	China

2. General Information

Etpyrafen

997/TC/M/



ISO Common name	Etpyrafen
Chemical name	(Z)-2-(4-tert-butylphenyl)-2-cyano-1-(1-ethyl-3-methylpyrazol-5-yl)vinyl2,2-dimethylpropionate (IUPAC) (1Z)-2-cyano-2-[4-(1,1-dimethylethyl)phenyl]-1-(1-ethyl-3-methyl-1H-pyrazol-5-yl)ethenyl,2-dimethyl propanoate (CA, 1253429-01-4)
Empirical formula	$C_{24}H_{31}N_3O_2$
RMM	393.53
m.p.	97.2°C~98.6℃
v.p.	8.9×10^{-8} Pa at 20°C
Solubility	In water 0.0890 mg/L at 20°C; In methanol 114~133 g/L, hexane 29~33 g/L. In acetone, dichloromethane, xylene, ethyl acetate >250 g/L
Stability	Stable for 14 d at 54 ℃
Description	The pure material is a white, odorless solid
Formulation	Suspension concentrates (SC)

3. Distribution of Samples

The following samples were provided to the partcipants:

Reference standard of Etpyrafen Lot No. 20171207, purity: 995 g/kg	0.5 g
Etpyrafen technical (TC1) Batch No. 1711380, approx. 980 g/kg	3.0 g
Etpyrafen technical (TC2) Batch No. 1711385, approx. 980 g/kg	3.0 g
Etpyrafen 30% suspension concentrate (SC1) Batch No. 171267A, approx. 300 g/kg	100 mL
Etpyrafen 30% suspension concentrate (SC2) Batch No. 171269A, approx. 300 g/kg	100 mL
Etpyrafen 30% suspension concentrate (SC3) Batch No. 171283A, approx. 300 g/kg	100 mL

4. Procedure

4.1. Outline of Method

Etpyrafen in the test substance is determined by HPLC method with a C_{18}-reverse phase column and UV-detection at 230 nm. The analyte solution contains about 40 mg of etpyrafen in 100 mL solution.

4.2. Program of Work

We requested the collaborators to:

1) conduct duplicate determinations on two different days for each of the five samples;

2) inject each sample solution in duplicate and calculate the mean value;

3) check equilibration of the system before the determination;

4) describe operating conditions in detail; and

5) attach the typical chromatograms for the five samples.

5. Analytical Methods

5.1. Analytical Conditions

Lab	Liquid chromatograph integrator	Column	Mobile phase	Flow rate (mL/min)	Column temp(℃)
Proposed Conditions		Agilent ZORBAX SB-C_{18}, 4.6×150mm, 5µm	acetonitrile - 0.05% Phosphoric acid solution, 800 + 200 (v/v)	1.0	30
1	PerkinElmer Altus	YMC-Pack ODS-AQ 150x4.6mm, 5µm	acetonitrile - 0.05% Phosphoric acid solution, 800 + 200 (v/v)	1.0	30
2	Agilent 1260	Lichrospher 100 RP18, 125 x 4.0 mm, 5µm	acetonitrile - 0.05% Phosphoric acid solution, 800 + 200 (v/v)	0.76	30
3	Waters, Acquity-UPLC	Phenomenex, Kinetex, C_{18}, 250 x 4.6 mm, 5 µm	acetonitrile - 0.05% Phosphoric acid solution, 800 + 200 (v/v)	1.0	30
4	HPLC - UV (PUMP-LC-20AD, OVEN-CTO- 20A)	Agilent Zorbax SB-C_{18}, 150 x 4.6 mm, 3.5 µm	acetonitrile - 0.05% Phosphoric acid solution, 800 + 200 (v/v)	1.0	30
5	Agilent 1100	SilGreen C_{18}, 150 x 4.6 mm, 5 µm	acetonitrile - 0.05% Phosphoric acid solution, 800 + 200 (v/v)	1.0	30
6	Waters Acquity UPLC H-Class Series	Agilent Zorbax SB-C_{18}, 150 x 4.6mm, 5 µm	acetonitrile - 0.05% Phosphoric acid solution, 800 + 200 (v/v)	1.0	30
7	SHIMAZU LC-20A	Agilent Zorbax Eclipse XDB C_{18}, 4.6 mm×150 mm, 5 µm	acetonitrile - 0.05% Phosphoric acid solution, 800 + 200 (v/v)	1.0	30
8	Dionex HPLC system	Agilent Zorbax SB C_{18}, 150 x 4.6mm 5µm,	acetonitrile - 0.05% Phosphoric acid solution, 800 + 200	1.0	30

			(v/v)		
9	Agilent Technologies HPLC 1200	Agilent Zorbax SB C_{18}, 150 x 4.6 mm 5 µm	acetonitrile - 0.05% Phosphoric acid solution, 800 + 200 (v/v)	1.0	30
10	Shimadzu Prominence	Agilent Zorbax Eclipse XDB-C18, 4.6 x 150 mm, 5µm	acetonitrile - 0.05% Phosphoric acid solution, 800 + 200 (v/v)	1.0	30
11	UPLC H-Class Waters	Phenomenex KINETEX EVO C_{18}, 100mm x 2.1mm, 2.6µm	acetonitrile - water, 800 + 200 (v/v)	0.3	30
12	Agilent 1260 HPLC	Agilent ZORBAX Eclipse XDB-C_{18}, 150 x 4.6mm, 5µm	acetonitrile - 0.05% Phosphoric acid solution, 800 + 200 (v/v)	1.0	30
13	Dionex UltiMate 3000	Zorbax BP-ODS GL Sciences, 150 x 4.6 mm, 5µm	acetonitrile - 0.05% Phosphoric acid solution, 800 + 200 (v/v)	1.0	30
14	Agilent 1100	ZORBAX SB-C_{18}, 150 × 4.6 mm, 5µm	acetonitrile - 0.05% Phosphoric acid solution, 800 + 200 (v/v)	1.0	30
15	HPLC, Agilent 1200	Agilent Zorbax, SB-C_{18}, 150 x 4.6 mm, 3.5 µm	acetonitrile - 0.05% Phosphoric acid solution, 800 + 200 (v/v)	1.0	30
16	Type: HPLC; Model: Dionex Ultimate 3000	Agilent ZORBAX SB-C18, 150 x 4.6 mm, 5µm	acetonitrile - 0.05% Phosphoric acid solution, 800 + 200 (v/v)	1.0	30
17	SHIMADZU 20 AT	PT Surya Buana Lestari, 150 x 4.6 mm, 5 µm	acetonitrile - 0.05% Phosphoric acid solution, 800 + 200 (v/v)	0.8	30
18	DIONEX Utimate 3000	PRAZIS Absolute ®C_{18}, 150 x 4.6 mm, 5µm	acetonitrile - 0.05% Phosphoric acid solution, 800 + 200 (v/v)	1.0	30
19	HPLC Agilent 1260 infinity	Agilent Zorbax SB-C_{18}, 150 x 4.6 mm, 5 µm	acetonitrile - 0.05% Phosphoric acid solution, 800 + 200	1.0	30

			(v/v)		
20	SHIMADZU LC-20AT	InertSustain C_{18}, 150 × 4.6 mm, 5µm	acetonitrile - 0.05% Phosphoric acid solution, 800 + 200 (v/v)	1.0	30

5.2. Deviations from the Analytical Method

Lab 1: No deviations except the column that was not the one specified exactly in the method.

Lab 2: Centrifugation instead of filtration of the samples into the vials white glassware instead of brown, flow 0.76 ml/min due to smaller internal diameter of the column, retention time 6.7 min, and the column was Lichrospher 100 RP18, 125 x 4.0 mm, 5µm.

Lab 3: inject 10 µl instead of the recommended 5 µl; Use a 250 mm long C18 column instead of the recommended 150 mm long column.

Lab 4: Column particle size used was 3.5 µm instead of the recommended 5 µm.

Lab 5: A second standard solution was not prepared. And the inject sequence was as follows: SD, SA1-1, SA1-1, SA1-2, SA1-2, SD, ……

Lab 6: No deviations.

Lab 7: No deviations.

Lab 8: No deviations.

Lab 9: No deviations.

Lab 10: No deviations.

Lab 11: Preparation of sample solutions was as follows. Placed the flask in an ultrasonic bath for 10 min, then cooled to ambient temperature, then filled to the mark with acetonitrile. Took an aliquot of 2ml into a volumetric flask of 10ml, filled to the mark with acetonitrile, filtered through a 0,45 µm PTFE.

Lab 12: No deviations.

Lab 13: No deviations.

Lab 14: No deviations.

Lab 15: No deviations.

Lab 16: No deviations.

Lab 17: Flow rate was changed to 0.8 ml/min to adjust the retention time approximately to 8.3 min.

Lab 18: No deviations.

Lab 19: No deviations.

Lab 20: The column was InertSustain C_{18} 150 × 4.6 mm, 5 µm.

5.3. Remarks about the Analytical Method

Lab 1: The method did not perform very great. On both day 1 and day 2 the retention times and areas shifted and increased, respectively. On day 2 it was worse than day 1. Maybe the aqueous mobile phase should be a low pH buffer for acidic condition instead of just acid in water, to help stabilize the pH better. Besides the method performing sub optimally, it was very easy to follow and very straight forward.

Lab 2: No remarks.

Lab 3: The analysis was straight forward and the chromatography performance was great. The method is simple, rugged and robust.

Lab 4: No remarks.

Lab 5: No remarks.

Lab 6: The method appears to be simple and robust. The weight of technical product indicated in the method is maybe too low to ensure good repeatability. A larger weighing followed by a dilution maybe is preferable.

The weight of SC product indicated in the method maybe is too low to ensure a bracketing of the areas of the SC sample solutions by the areas of the calibration solutions. Is it really necessary to prepare the solutions into brown flasks? The extraction wavelength should be more specific at 223 nm.

Lab 7: Calibration solution C_B on Equilibration of the system (Etpyrafen HPLC

method 3 PROCEDURE (b)) was not injected by my apologies. 0.05%(v/v) phosphoric acid solution was made by dilution of 1.079 g of phosphoric acid (analytical grade, 85.0% (mass/mass)) into 1000 ml of water. Retention time of etpyrafen was approximately 9.3 min.

Lab 8: No remarks.

Lab 9: No remarks.

Lab 10: Analysis performed well.

Lab 11: I worked in UPLC, I adapted the sample solution with the additional dilution. No problems encountered.

Lab 12: No remarks.

Lab 13: No remarks.

Lab 14: No remarks.

Lab 15: No remarks.

Lab 16: No remarks.

Lab 17: No remarks.

Lab 18: The performance of the analysis is operable. The method is stable and repetitive.

Lab 19: The powders of standard and TC have an ability to accumulate a static charge on the surface of the particles. It leads to difficulties in dosing in flasks when weighing. I'd recommend: 1. Increase flow rate to 1.5 - 2 ml/m to optimize analysis time. 2. Change the wavelength to 300 nm. If you look at the curve of UV- spectrum of 230nm you'll see descending trend of line from 360 to 310 mAu. When we use HPLC UV matrix detector it can leads to scatter between injections. I recommend choosing wavelength 300 nm. This is the spectrum's plateau when Al has the same activity like 230 nm. Wherein scatter between injections will strive for minimum. Other reason of using the wavelength 300 nm is excellent selectivity.

Lab 20: Etpyrafen was determined by reversed phase high performance liquid chromatography using UV detection at 230 nm. We got a good result after two days’ determinations. This method for the quantitative determination of etpyrafen has the advantage of fast, good stability and good precision.

6. Statistical Evaluation

Samples were sent to 21 laboratories. 20 of them sent back results.

The statistical evaluation of the data was done following DIN ISO 5725 and “Guidelines for CIPAC Collaborative Study Procedure for Assessment of Performance of Analytical Methods”.

There were two outliers for TC1, SC1, SC2, one outlier for SC3 according to Cochran's test, and no outliers or stragglers for the five samples according to Grubbs’ test.

The assay results obtained by the collaborators and the statistical evaluation are reported in Tables 1 through 5, and in Figures 1-1 through 5-2. Formulas used are listed in sector 9, page 26.

7. Results

Table 1: Etpyrafen TC1 (Batch No: 1711380)

Lab	Day 1		Day 2		Mean g/kg	Std. Dev.
	A	B	A	B		
1	**993.00**	**984.60**	**967.50**	**965.07**	**977.5**	**13.48**
2	**958.62**	**944.84**	**979.84**	**974.62**	**964.5**	**15.90**
3	985.98	992.69	976.08	981.04	983.9	7.09
4	981.54	980.24	980.54	979.27	980.4	0.93
5	980.71	984.59	985.90	984.05	983.8	2.21
6	987.71	972.78	994.14	997.50	988.0	10.95
7	980.00	985.34	984.27	988.58	984.5	3.54
8	982.28	982.50	981.30	981.78	982.0	0.54
9	982.09	981.53	985.78	983.19	983.1	1.89
10	984.15	995.53	984.73	985.61	987.5	5.39
11	960.52	963.53	966.54	968.38	964.7	3.45
12	981.36	978.55	981.24	981.61	980.7	1.43
13	972.43	969.95	971.43	971.67	971.4	1.04
14	988.68	987.59	985.06	989.21	987.6	1.84
15	977.81	976.33	978.80	977.95	977.7	1.03
16	981.70	981.74	982.67	983.26	982.3	0.76
17	975.89	981.19	975.11	974.65	976.7	3.03
18	969.93	983.66	981.76	979.01	978.6	6.08
19	992.16	995.09	983.22	989.55	990.0	5.06
20	981.41	985.37	987.20	984.93	985.46	2.42

Lab 1 and Lab 2: Outlier according to Cochran’s Test.

Fig.1-1: Etpyrafen TC1 (Batch No: 1711380) All labs

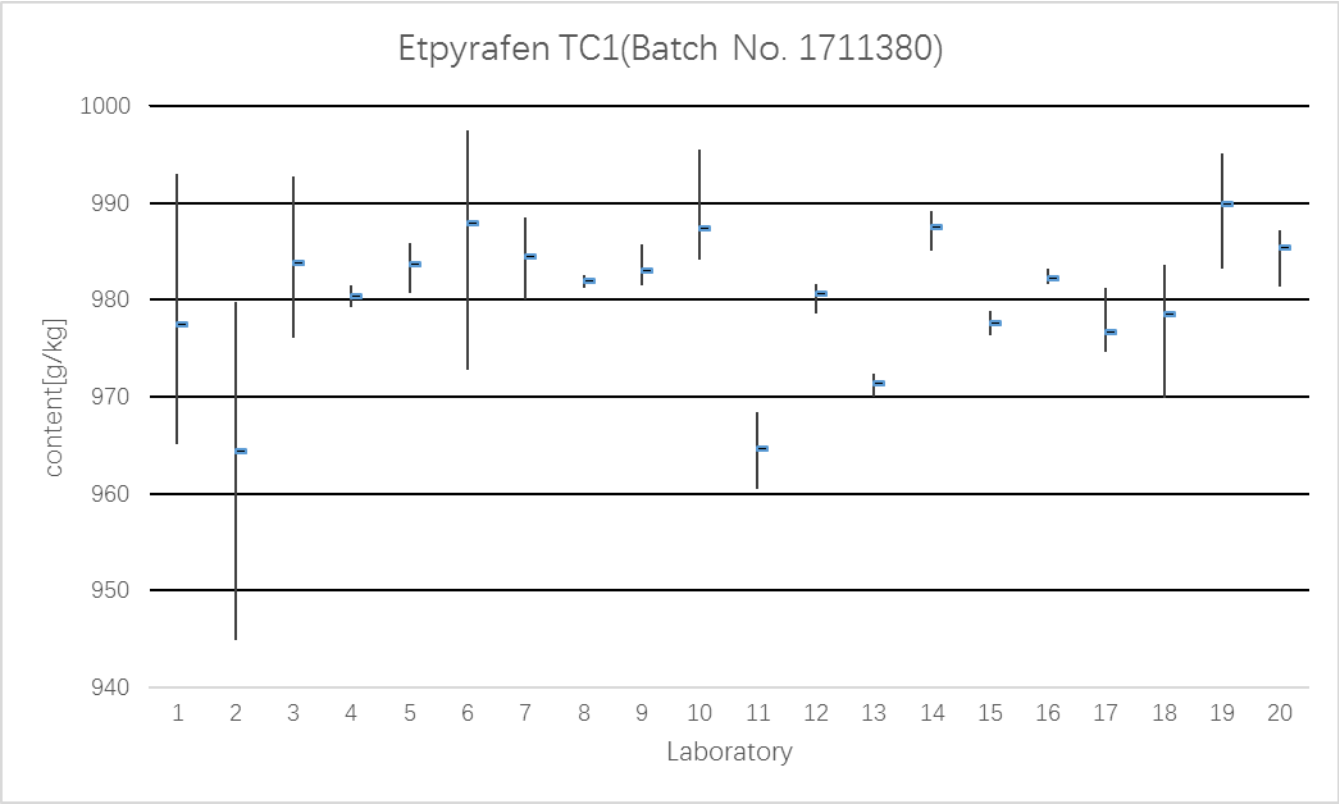


Fig.1-2: Etpyrafen TC1 (Batch No: 1711380) Labs 1 and 2 excluded

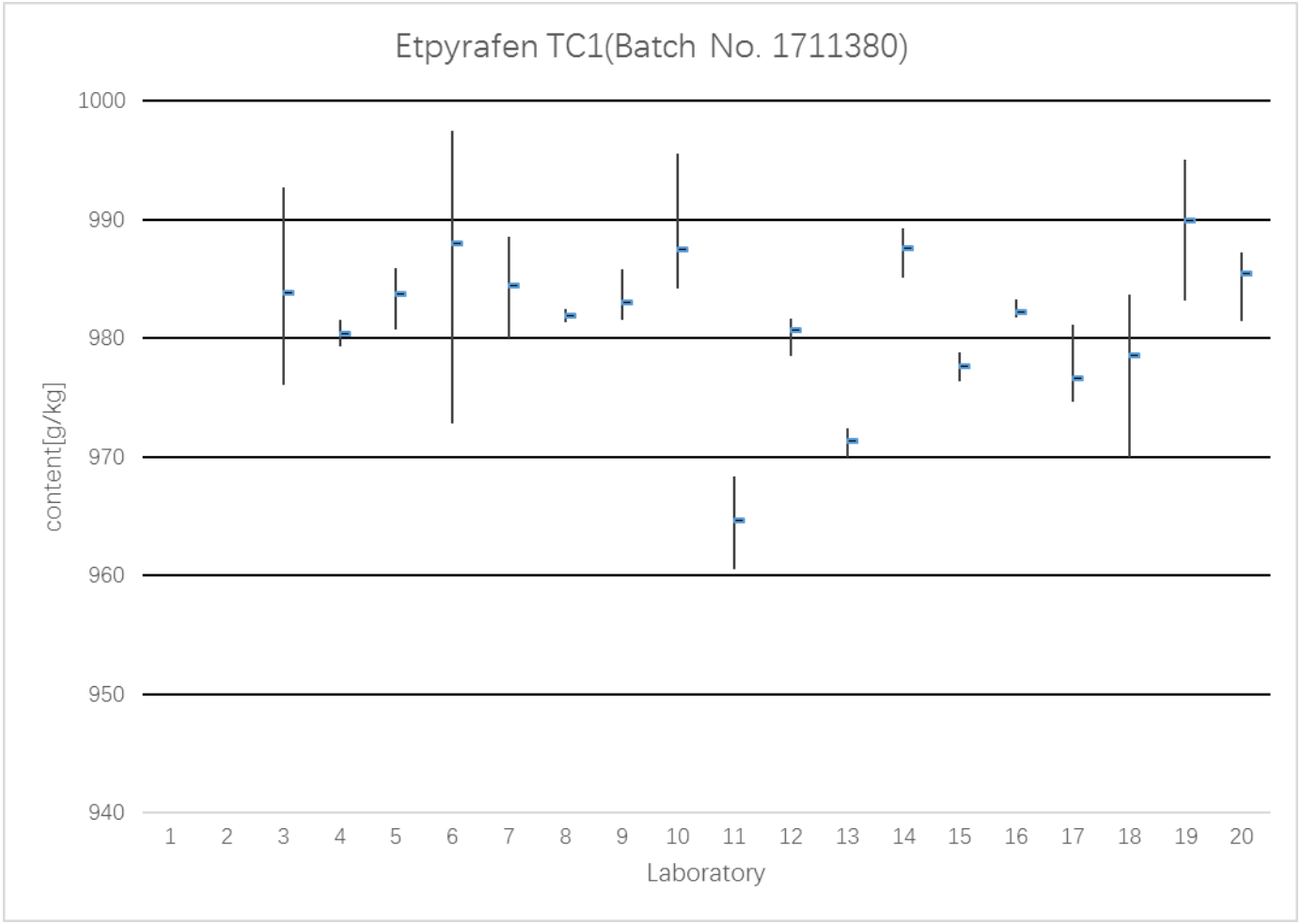


Table 2: Etpyrafen TC2 (Batch No: 1711385)

Lab	Day 1		Day 2		Mean	Std. Dev.
	A	B	A	B	g/kg	
1	976.28	982.15	991.51	994.40	986.1	8.37
2	974.99	975.49	958.16	975.34	971.0	8.56
3	984.06	989.82	989.45	993.93	989.3	4.05
4	984.65	984.04	983.85	983.90	984.1	0.37
5	985.96	983.57	987.36	984.23	985.3	1.71
6	986.17	975.83	981.56	974.36	979.5	5.43
7	978.91	986.70	976.17	984.67	981.6	4.90
8	977.45	980.54	978.43	969.94	976.6	4.62
9	975.39	982.72	984.62	984.18	981.7	4.30
10	990.88	994.54	983.78	980.01	987.3	6.60
11	978.80	976.02	961.56	963.20	969.9	8.78
12	976.48	981.20	981.88	978.24	979.5	2.53
13	970.37	967.92	968.65	969.33	969.1	1.04
14	981.31	982.84	985.00	983.60	983.2	1.54
15	980.35	976.96	975.90	977.06	977.6	1.92
16	983.41	983.98	983.15	982.56	983.3	0.59
17	979.62	977.63	979.88	982.57	979.9	2.03
18	984.15	973.17	981.23	985.76	981.1	5.59
19	991.68	990.14	978.49	981.52	985.5	5.099
20	986.42	985.50	984.61	983.24	984.9	5.740

No outliers or stragglers.

Fig.2-1: Etpyrafen TC2 (Batch No: 1711385) All labs (No outliers or stragglers were found.)

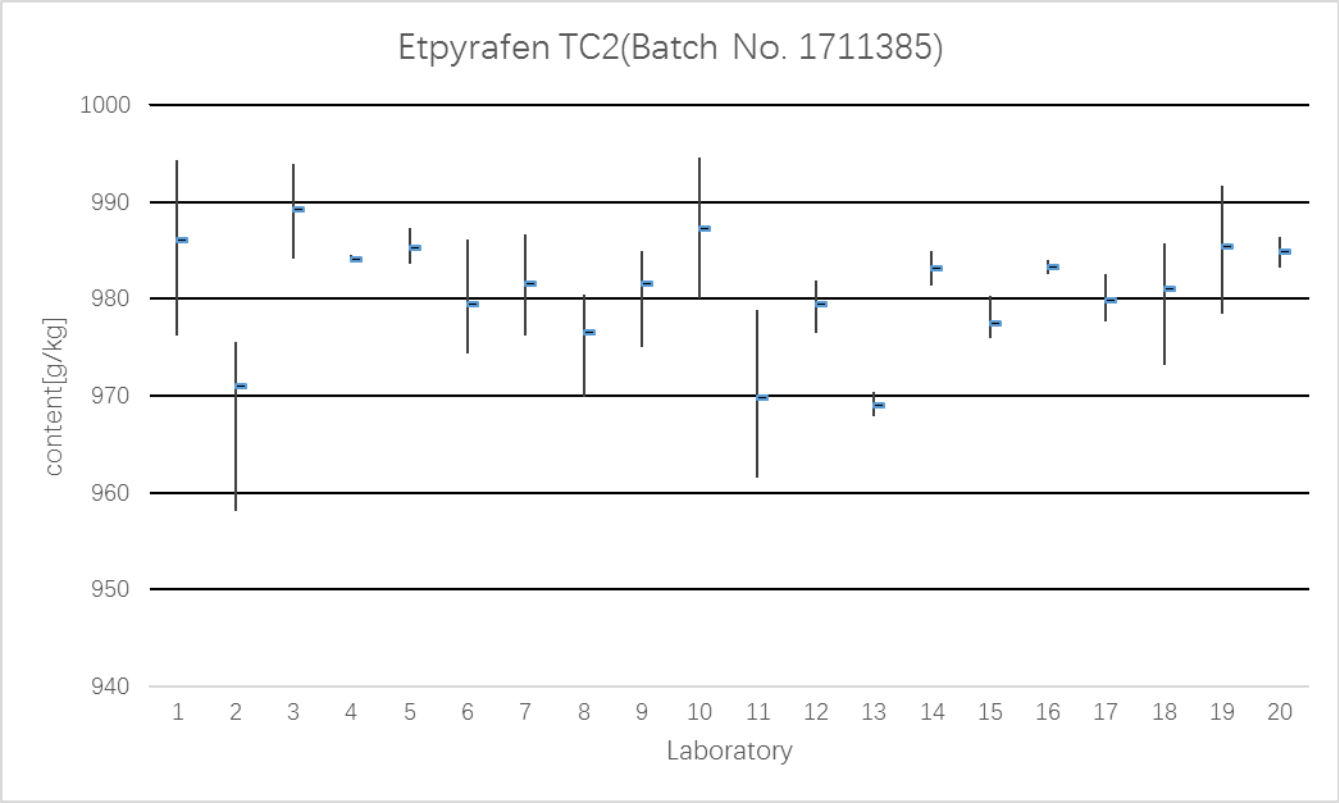


Table 3: Etpyrafen SC1 (Batch No: 171267A)

Lab	Day 1		Day 2		Mean	Std. Dev.
	A	B	A	B	g/kg	
1	301.98	304.72	304.22	302.52	303.4	1.32
2	304.04	298.25	302.62	300.18	301.3	2.57
3	**322.18**	**305.06**	**299.11**	**298.10**	**306.1**	**11.14**
4	302.84	302.21	302.12	301.44	302.2	0.57
5	303.62	306.46	301.47	302.84	303.6	2.10
6	302.10	303.58	305.68	308.16	304.9	2.63
7	304.14	307.15	305.67	308.61	306.4	1.92
8	300.26	296.29	300.06	299.02	298.9	1.83
9	304.97	303.85	304.49	305.63	304.7	0.75
10	311.96	313.74	303.94	304.20	308.5	5.12
11	**287.08**	**305.43**	**295.61**	**300.70**	**297.2**	**7.85**
12	301.55	303.18	301.00	296.73	300.6	2.75
13	302.69	303.39	302.09	302.82	302.7	0.53
14	302.07	301.37	305.97	306.08	303.9	2.50
15	301.72	298.10	299.96	302.50	300.6	1.96
16	301.46	301.46	302.07	301.60	301.6	0.29
17	305.13	305.43	304.80	306.08	305.4	0.54
18	304.68	304.96	303.12	303.88	304.2	0.83
19	309.74	312.77	307.45	309.05	309.8	2.23
20	308.95	310.59	309.54	309.34	309.6	0.70

Lab 3 and Lab 11: Outlier according to Cochran’s Test.

Fig.3-1: Etpyrafen SC1 (Batch No: 171267A) All labs

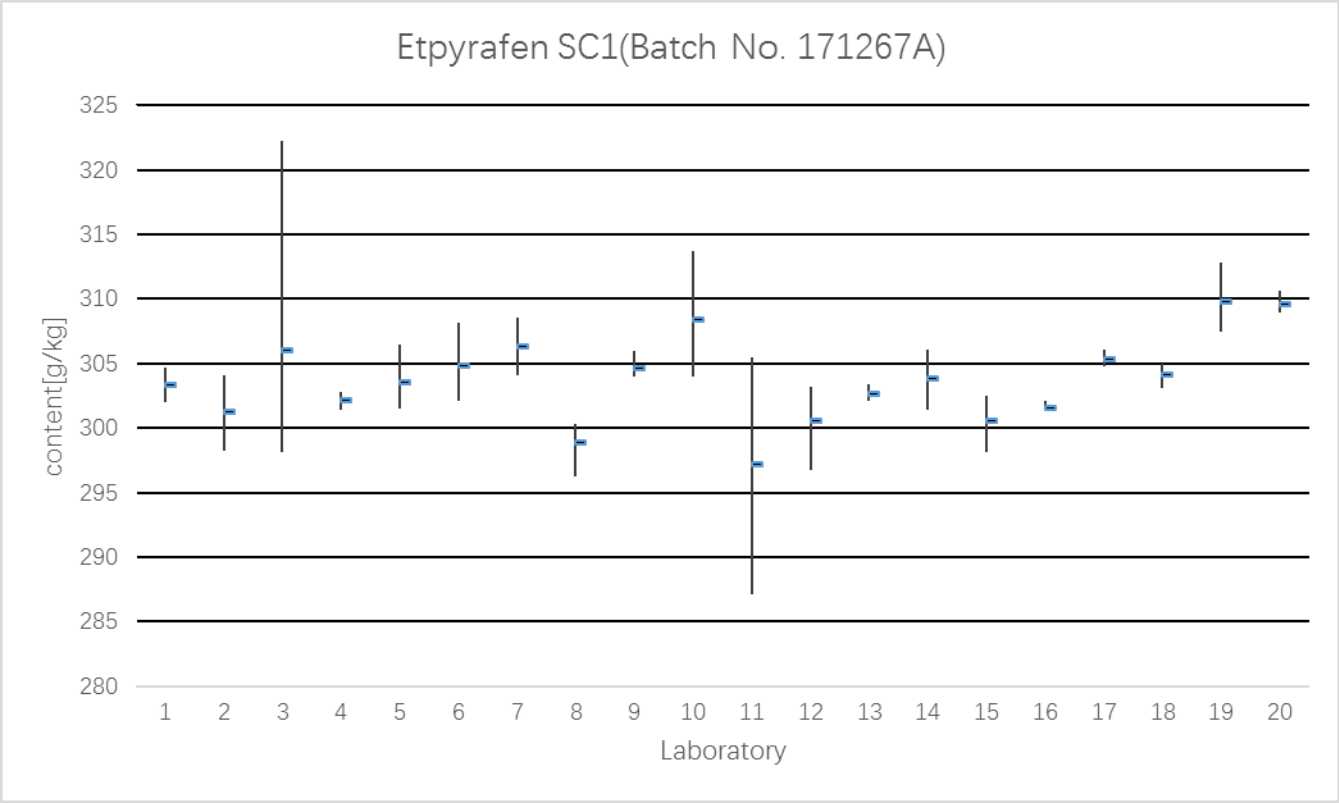


Fig.3-2: Etpyrafen SC1 (Batch No: 171267A) Labs 3 and 11 excluded

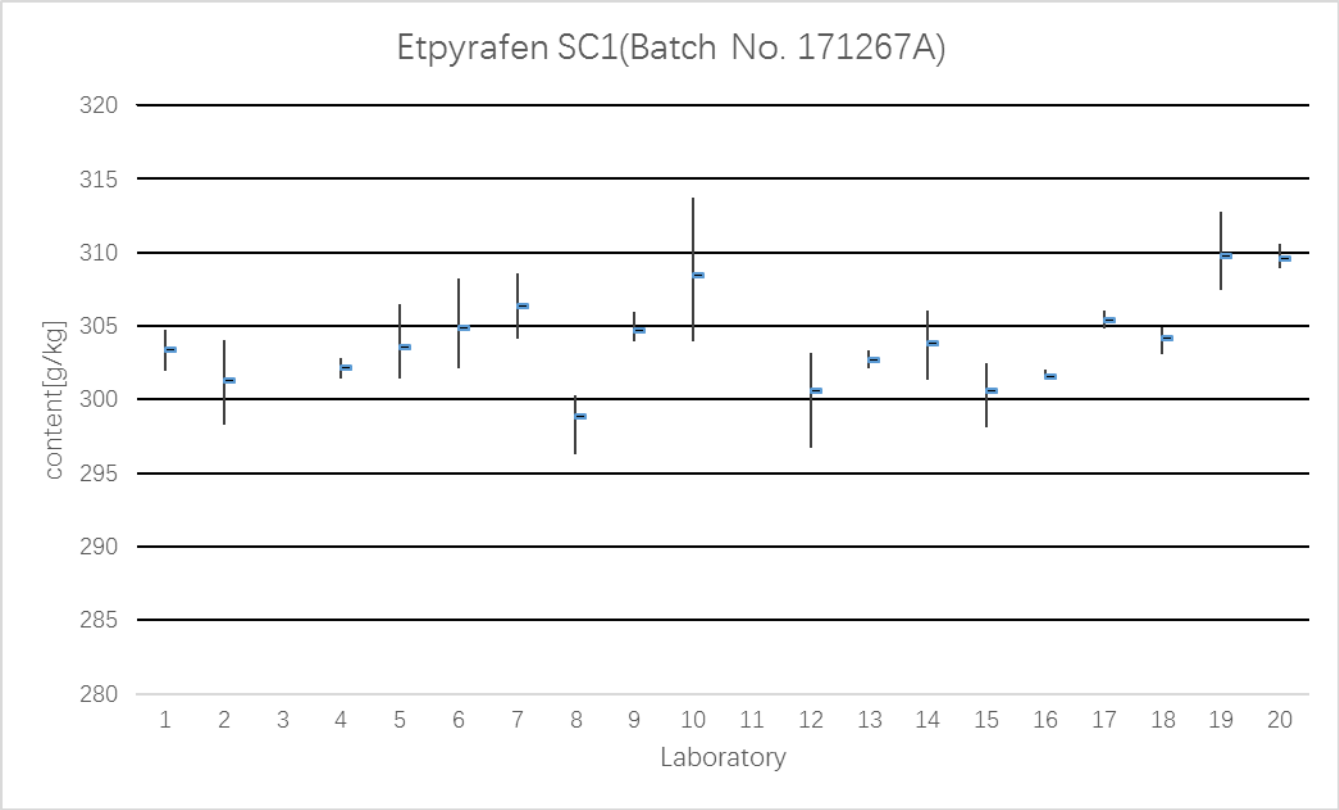


Table 4: Etpyrafen SC2 (Batch No: 171269A)

Lab	Day 1		Day 2		Mean	Std. Dev.
	A	B	A	B	g/kg	
1	**301.80**	**310.78**	**287.74**	**282.74**	**295.8**	**12.86**
2	305.28	307.23	304.68	304.82	305.5	1.18
3	306.13	304.16	298.66	298.40	301.8	3.90
4	303.58	302.45	302.32	302.49	302.7	0.59
5	307.71	308.19	306.31	309.07	307.8	1.15
6	305.80	306.30	307.32	303.67	305.8	1.54
7	300.43	303.37	303.08	306.43	303.3	2.46
8	300.25	298.47	299.32	299.90	299.5	0.78
9	303.51	304.01	306.08	306.76	305.1	1.57
10	314.35	314.49	306.26	307.58	310.7	4.36
11	**302.88**	**305.01**	**288.41**	**294.79**	**297.8**	**7.64**
12	295.82	304.82	297.47	297.48	298.9	4.03
13	304.05	297.79	305.14	296.18	300.8	4.47
14	307.18	306.38	303.62	307.11	306.1	1.67
15	300.09	301.89	302.85	302.43	301.8	1.21
16	303.25	302.36	302.29	301.78	302.4	0.61
17	306.34	308.91	303.73	302.31	305.3	2.92
18	304.92	306.22	303.68	305.17	305.0	1.04
19	309.98	313.30	310.88	308.84	310.7	1.89
20	311.79	312.02	312.56	313.63	312.5	0.82

Lab 1 and Lab 11: Outlier according to Cochran Test.

Fig.4-1: Etpyrafen SC2 (Batch No: 171269A) All labs

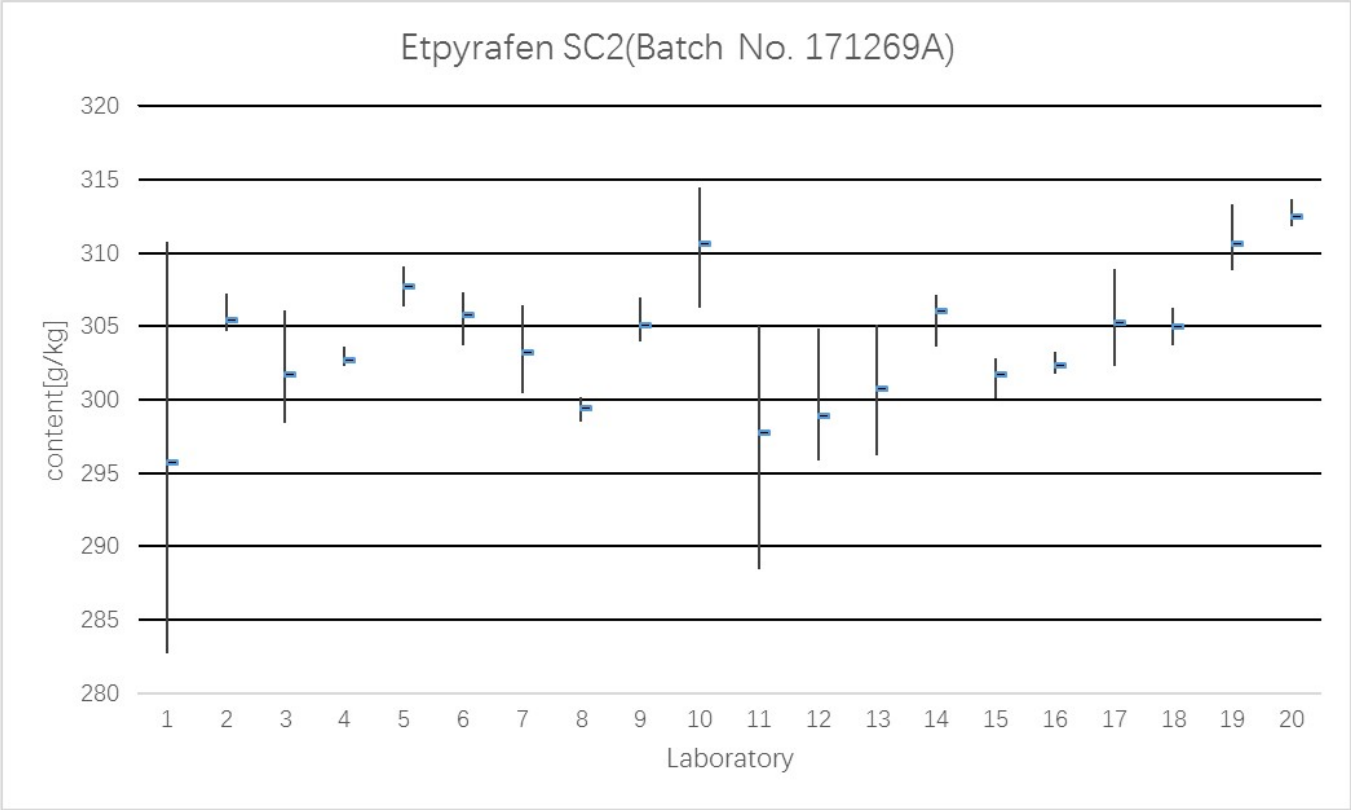


Fig.4-2: Etpyrafen SC2 (Batch No: 171269A) Labs 1, 11 excluded

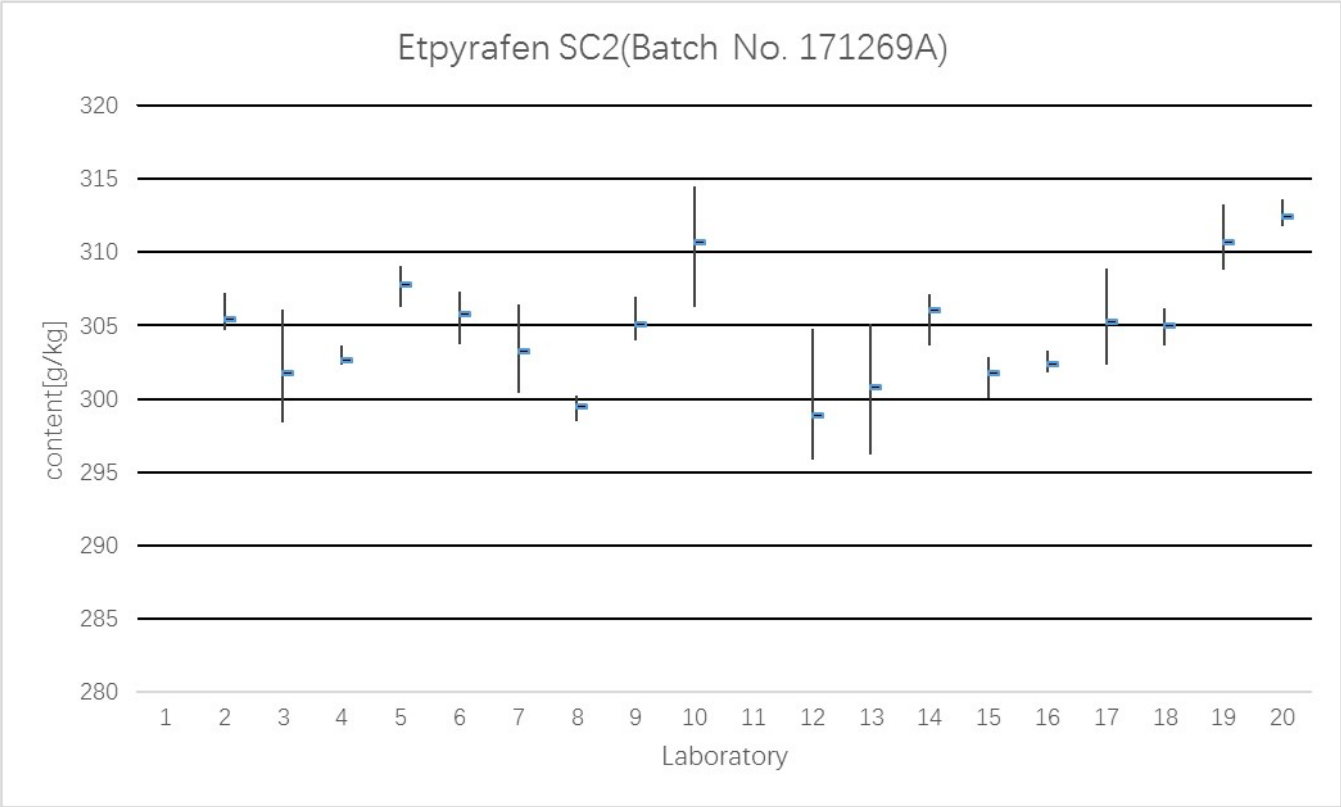


Table 5: Etpyrafen SC3 (Batch No: 171283A)

Lab	Day 1		Day 2		Mean	Std. Dev.
	A	B	A	B	g/kg	
1	**335.31**	**279.61**	**320.38**	**342.04**	**319.3**	**27.99**
2	303.67	294.16	303.97	304.29	301.5	4.91
3	302.96	303.24	300.65	301.18	302.0	1.28
4	299.45	299.30	300.17	299.41	299.6	0.40
5	306.31	309.07	305.16	304.84	306.3	1.92
6	303.79	303.14	305.44	305.91	304.6	1.32
7	304.91	307.05	307.59	306.08	306.4	1.18
8	297.72	299.63	296.55	297.27	297.8	1.32
9	303.21	296.47	304.91	306.74	302.8	4.48
10	305.31	312.45	308.74	303.15	307.4	4.07
11	287.50	296.65	297.69	294.01	294.0	4.58
12	298.81	303.13	298.19	302.84	300.7	2.60
13	302.12	300.23	301.62	301.63	301.4	0.81
14	302.62	303.89	306.19	303.22	304.0	1.57
15	299.73	299.03	301.60	300.83	300.3	1.14
16	300.83	301.30	301.27	300.91	301.1	0.24
17	302.98	300.61	306.49	303.21	303.3	2.41
18	303.94	305.11	303.27	302.28	303.7	1.19
19	310.88	308.84	307.91	306.35	308.5	1.89
20	309.39	310.52	311.43	310.78	310.5	0.85

Lab 1: Outlier according to Cochran’s Test.

Fig.5-1: Etpyrafen SC3 (Batch No: 171283A) All labs

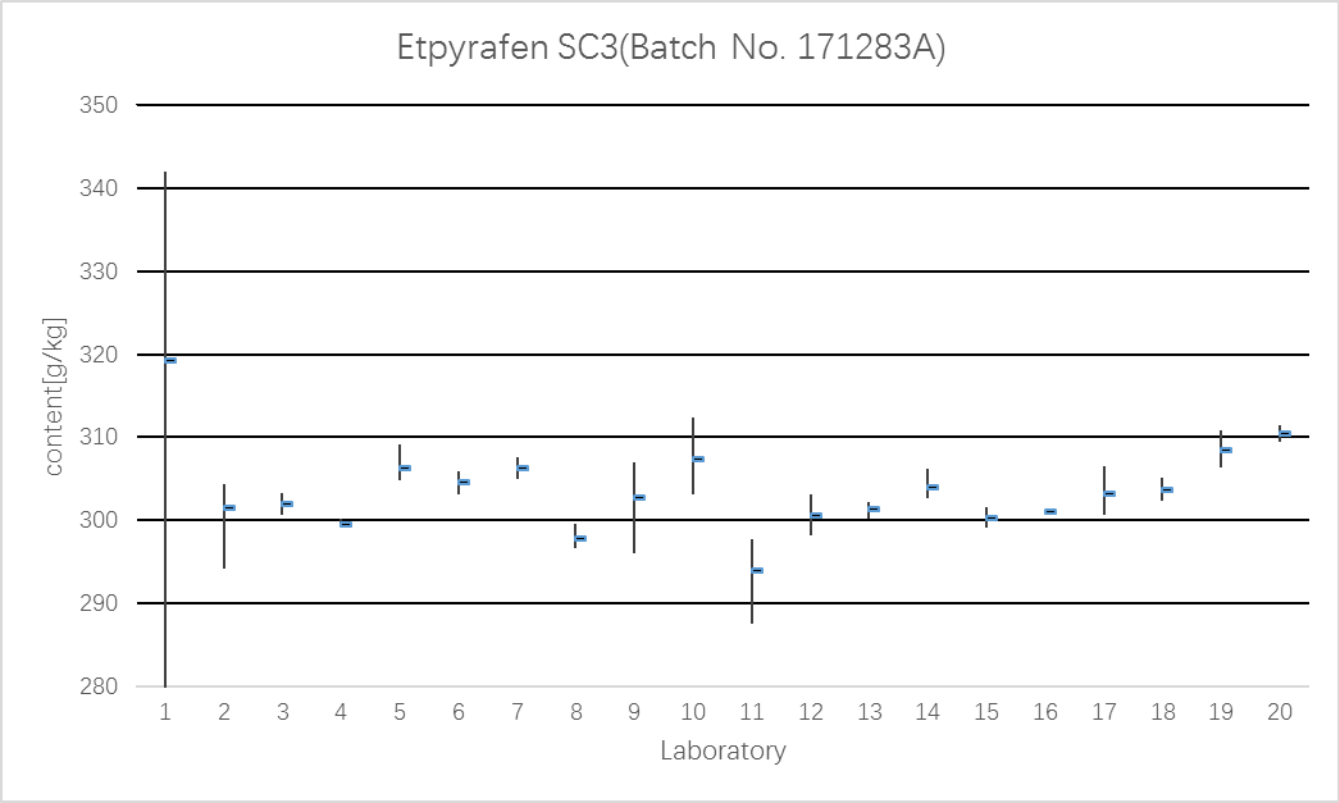
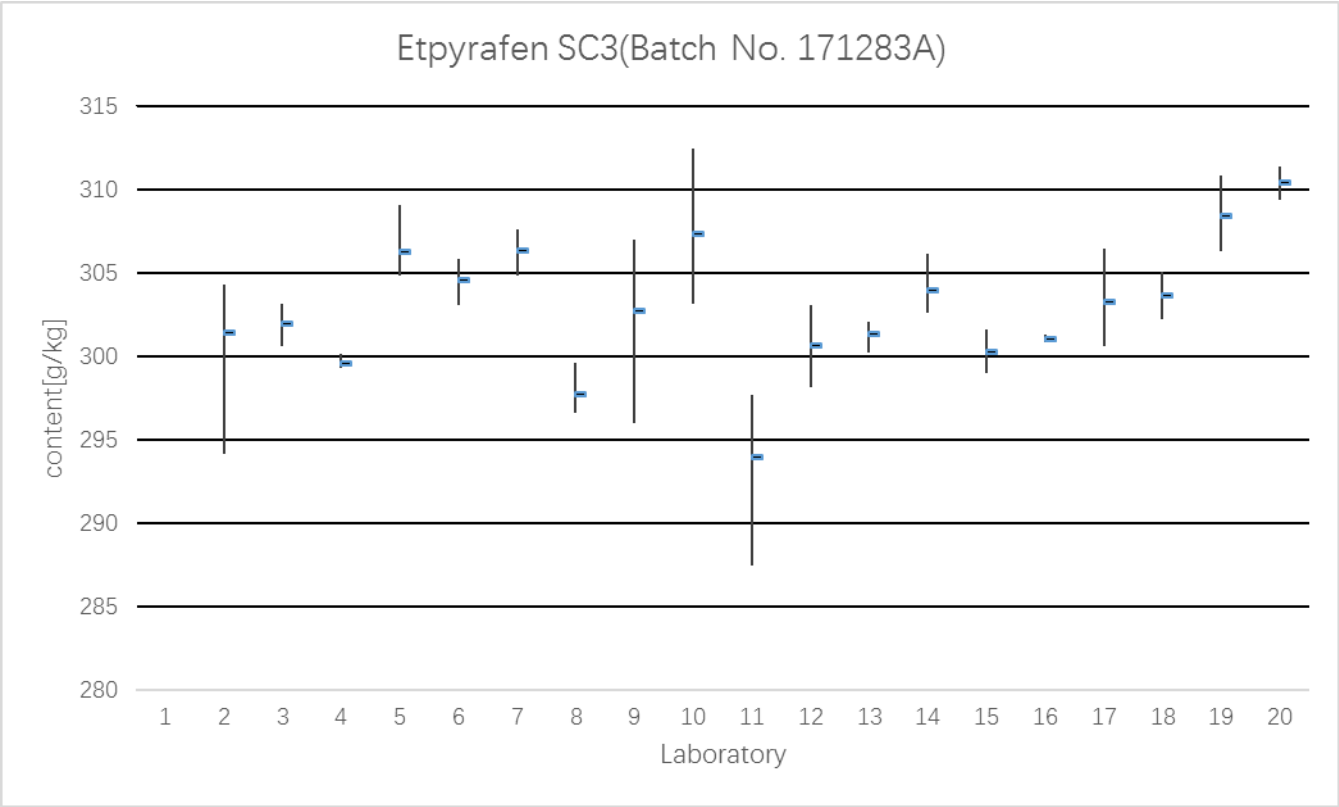


Fig.5-2: Etpyrafen SC3 (Batch No: 171283A) Labs 1 excluded



8. Summary of the results

Table 6 Summary of the results of all laboratories

	TC1	TC2	SC1	SC2	SC3
x	980.5	981.7	303.3	302.8	304.7
L	20	20	20	20	20
S_r	6.14	4.85	3.63	4.04	6.70
S_R	8.82	7.06	4.58	5.62	7.85
r	17.37	13.71	10.29	11.45	18.97
R	24.95	19.97	12.97	15.92	22.21
RSD_r	0.63	0.49	1.20	1.34	2.20
RSD_R	0.90	0.72	1.51	1.86	2.58
$RSD_{R(Hor)}$	2.01	2.01	2.39	2.39	2.39
HorRat	0.45	0.36	0.63	0.78	1.08

(values given in units of g/kg)

Table 7 Summary of the results after elimination of outlier values

	TC1	TC2	SC1	SC2	SC3
x	981.5	981.7	304.0	304.8	302.9
L	18	20	18	18	19
S_r	4.21	4.85	2.09	2.40	2.46
S_R	7.20	7.06	3.57	4.37	4.45
r	11.91	13.71	5.90	6.78	6.96
R	20.37	19.97	10.10	12.35	12.60
RSD_r	0.43	0.49	0.69	0.79	0.81
RSD_R	0.73	0.72	1.17	1.43	1.47
$RSD_{R(Hor)}$	2.01	2.01	2.39	2.39	2.39
HorRat	0.36	0.36	0.49	0.60	0.62

(values given in units of g/kg)

Where:

x	= average, in unit of g/kg
L	= number of laboratories
S_r	= repeatability standard deviation
S_R	= reproducibility standard deviation $= \sqrt{(S_r^2 + S_L^2)}$
r	= repeatability ($S_r \cdot 2.8$)
R	= reproducibility ($S_R \cdot 2.8$)
RSD_r	= repeatability relative standard deviation ($100 \cdot S_r/x$)
RSD_R	= reproducibility relative standard deviation ($100 \cdot S_R/x$)
$RSD_R(Hor)$	= Horwitz value calculated from: $2^{(1-0.5\log c)}$
where c	= the concentration of the analyte as a decimal fraction

9. Statistical formulas

Yi = mean of the various laboratories
Si = standard deviation
P = number of laboratories
n = number of measurements (here n=4)

$$T_1 = \sum_{i=1}^{p} Yi$$

$$T_2 = \sum_{i=1}^{p} Yi^2$$

$$T_3 = \sum_{i=1}^{p} Si^2$$

Repeatability and reproducibility were calculated as follows:

$$S_r^2 = \frac{T_3}{P}$$

$$S_L^2 = \frac{PT_2 - T_1^2}{P(P-1)} - \frac{S_r^2}{n}$$

$$S_R^2 = S_r^2 + S_L^2$$

$$r = 2.8 * \sqrt{S_r^2}$$

$$R = 2.8 * \sqrt{S_R^2}$$

10. Discussion

Following the successful outcome of the full scale collaborative study organized by SYRICI, an international CIPAC collaborative study was initiated in October 2018 to test a specific HPLC method for the determination of etpyrafen.

21 laboratories had announced to participate the CIPAC trial and 20 of them sent back results.

The data from each of the laboratories were reviewed to determine if there were any problems with analysis procedure used, chromatography or reporting results, which might affect the analyses results. The changes, deviations, and observations which were noted will not be expected to affect the analyses results significantly.

If the results of 20 laboratories participated in the collaborative trial are taken into account for the statistical evaluation, i.e. all stragglers and outliers according to Cochran test and Grubbs test are left in the evaluation and no data are rejected, the Horwitz criterion will be fulfilled in case of TC1, TC2, SC1, SC2 and not fulfilled in case of SC3. (table 6)

The Horwitz criterion is improved for TC1 after elimination of two outliers according to Cochran's test (Lab 1 and Lab 2).

There were no outliers or stragglers for TC2.

The Horwitz criterion is improved for SC1 after elimination of two outliers according to Cochran's test (Lab 3 and Lab 11).

The Horwitz criterion is improved for for SC2 after elimination of two outliers according to Cochran's test (Lab 1 and Lab 11).

The Horwitz criterion is fulfilled for SC3 after elimination of one outlier according to Cochran's test (Lab 1).

Overview: outliers and stragglers identified and allocated to the participants

Sample No.	Lab ID No. Identification of outliers and stragglers
TC1	1, 2
SC1	3, 11
SC2	1, 11
SC3	1

Conclusion:

We would like to propose the analytical method for etpyrafen to become provisional.

Acknowledgements:

The organizer wishes to thank all laboratories and their staff who participated in this study.