

University of Stuttgart
Germany



Analytische Qualitätssicherung Baden-Württemberg

Proficiency Test 3/20
- TW S3 – Alkylphenoles in drinking water -
Nonylphenol, Octylphenol, Bisphenol-A

Final report

provided by
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and

IWW Water Center
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Stuttgart, in September 2020

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Version of the report	1	

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1. General

This PT was provided by AQS Baden-Württemberg in cooperation with IWW Water Center in Mülheim an der Ruhr and with the network “NORMAN” (Network of reference laboratories for monitoring of emerging environmental pollutants). In this round following parameters were to be determined:

notation (notation short)	long	parameter or parameter group	CAS-number of the parameter or parameter group
Nonylphenol (NP)		4-Nonylphenol (branched) / isomeres mixture	84852-15-3
Octylphenol (OP)		4-(1,1',3,3'-tetramethylbutyl)- phenol	140-66-9
Bisphenol-A (BPA)		Bisphenol-A	80-05-7

The PT was executed and evaluated according to the requirements of DIN 38402-A45 and ISO/TS 20612.

2. PT design

Each participant received the following samples:

- 3 samples for the determination of Nonylphenol, Octylphenol and Bisphenol A in 1000-ml-ground bottles.

3 different concentration levels/batches were produced. All participants received the same samples.

3. Sample preparation

The samples for the determination of the alkylphenoles were based on a real ground water matrix from the northern part of the region Ruhr in North Rhine-Westphalia. The ground water was used without treatment for the sample preparation.

The ground water was spiked with stock solutions and the concentrations covered drinking and ground water relevant ranges.

4. Sample distribution

The samples were dispatched on 30 June 2020 by express service

5. Analytical methods

The participants were free to choose a suitable method, but following limits of quantification were required.

parameter	limit of quantification [$\mu\text{g/l}$]
Nonylphenol	0,08
Octylphenol	0,02
Bisphenol A	0,02

The participants were informed that the samples had to be analysed in the own laboratory, with own personal and own equipment. Subcontracting of the analysis was not allowed.

The samples had to be analysed in duplicate over the complete method (sample preparation and measurement). The participants were asked to report the results as average values in $\mu\text{g/l}$ with three significant digits.

6. Submission of the results

The deadline for the submission of results was on 24 July 2020.

7. Basic principle of evaluation and assessment

The basic principle of the evaluation and assessment of the PTs from AQS Baden-Württemberg are described in the document „Evaluation of the PTs and information for the report“, which can be downloaded from www.aqsbw.de/pdf/ausw_berichte_v1_en.pdf.

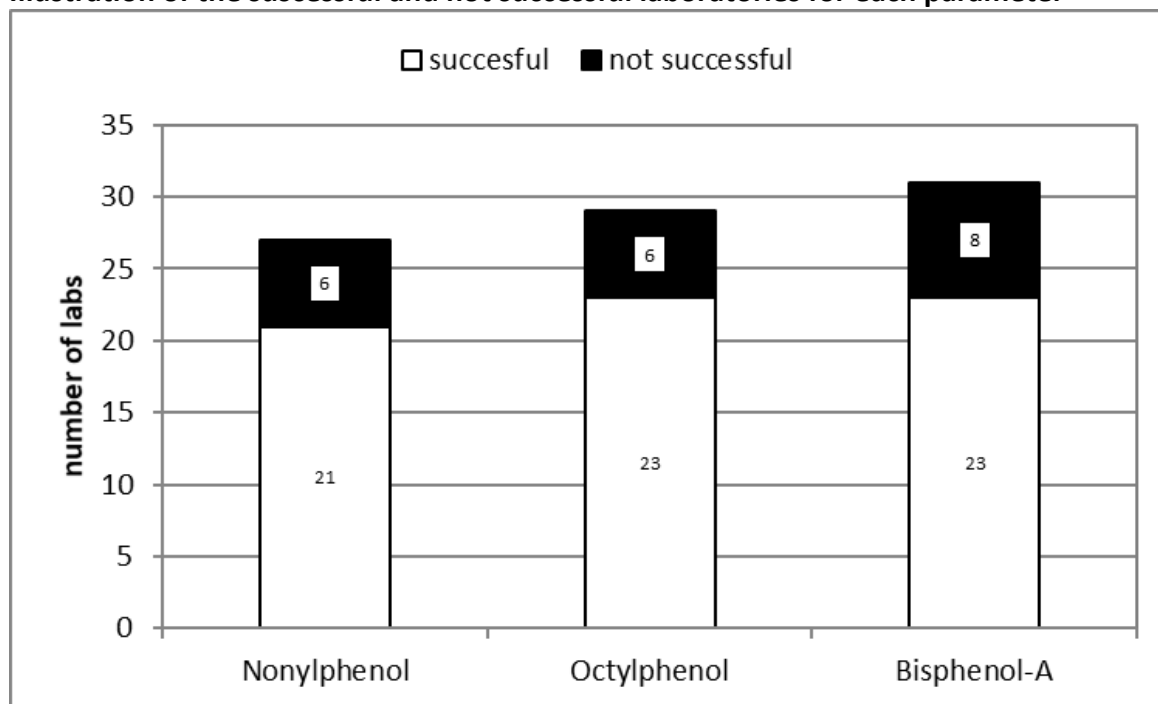
This PT was evaluated as follows:

Assigned value x_{pt}:	Reference value						
Standard deviation for proficiency assessment σ_{pt}:	Q method Variance function						
Upper limit of σ_{pt}:	25 %						
Lower limit of σ_{pt}:	5 %						
Assessment:	z_U -Score						
Classification of the single results:	<table style="border: none; width: 100%;"> <tr> <td style="padding-right: 20px;">$z_u \leq 2,0$</td> <td>successful</td> </tr> <tr> <td>$2,0 < z_u < 3,0$</td> <td>questionable</td> </tr> <tr> <td>$z_u \geq 3,0$</td> <td>unsatisfactory</td> </tr> </table>	$ z_u \leq 2,0$	successful	$2,0 < z_u < 3,0$	questionable	$ z_u \geq 3,0$	unsatisfactory
$ z_u \leq 2,0$	successful						
$2,0 < z_u < 3,0$	questionable						
$ z_u \geq 3,0$	unsatisfactory						
Parameter assessment:	A parameter was assessed as successful, if more than half of the values were correctly determined (2 out of 3 values are within the tolerance limits).						

8. Evaluation

Number of participants:	34 1 laboratory did not report results
Number of reported values	258
Number of accepted values:	201 (77,9%)

Illustration of the successful and not successful laboratories for each parameter



9. Explanation for the appendices

The explanations for the appendices can be found in the document „Evaluation of the PTs and information for the report“, which can be downloaded from www.agsbw.de/pdf/ausw_berichte_v1_en.pdf.

10. Measurement uncertainty

General:

Number of labs with valid values	33
Number of labs with valid values and reported measurement uncertainties	20 (60,6%)
Number of valid values	258
Number of valid values with measurement uncertainties	157 (60,9%)

Measurement uncertainties against the accreditation status

Accreditation status of the values	Number of values	Number of values with measurement uncertainty
accredited	117	84 (71,8%)
not accredited	73	33 (45,2%)
not specified	68	40 (58,8%)

Interpretation of the reported measurement uncertainties:

If measurement uncertainties are underestimated values assessed as “satisfactory” in the PT ($|z_U| \leq 2$), will have a large ζ -score. $|\zeta| > 2$ means that the “own” requirements (defined in terms of estimated uncertainty) are not fulfilled.

Number of values with reported measurement uncertainty having a $z_U \leq 2,0$	118
Number of values with a magnitude of ζ-scores > 2 The own requirements of the laboratory are not fulfilled and the estimation of the measurement uncertainty is too low	34 (28,8%)

11. Traceable reference values

The explanations about traceable reference values can be found in the document „Evaluation of the PTs and information for the report“, which can be downloaded from www.aqsbw.de/pdf/ausw_berichte_v1_en.pdf

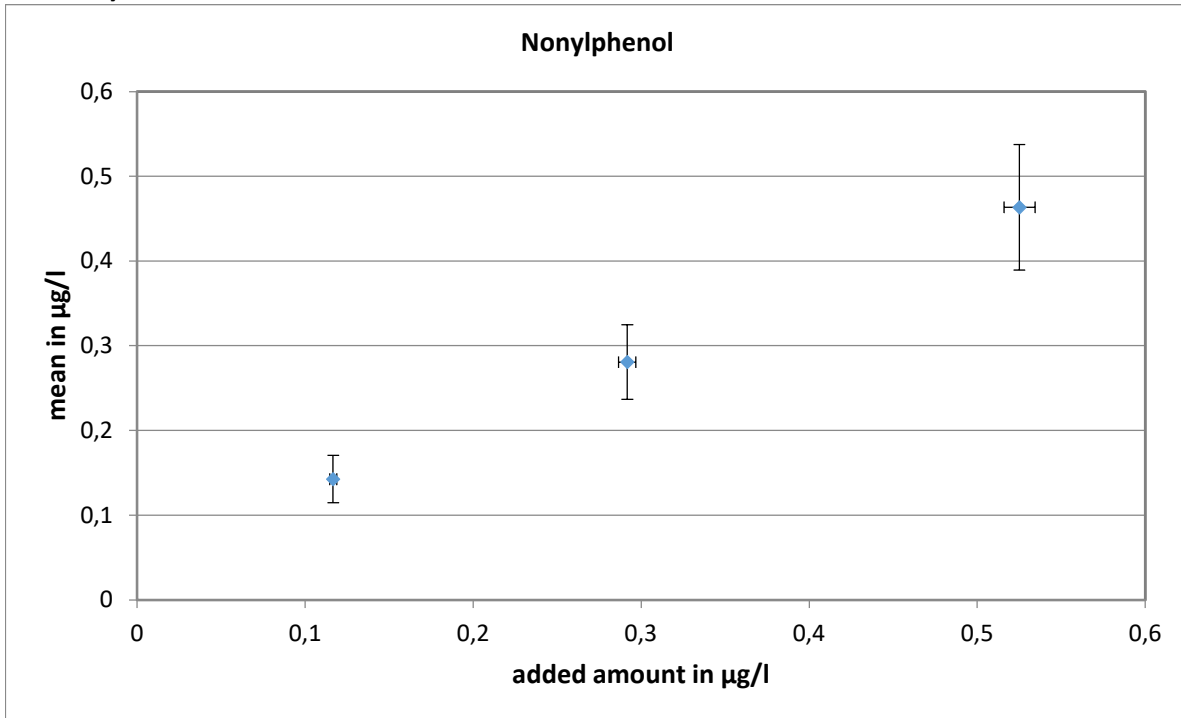
12. Internet

The report is available on the following webpage: http://www.aqsbw/pdf/report_223.pdf

Nonylphenol

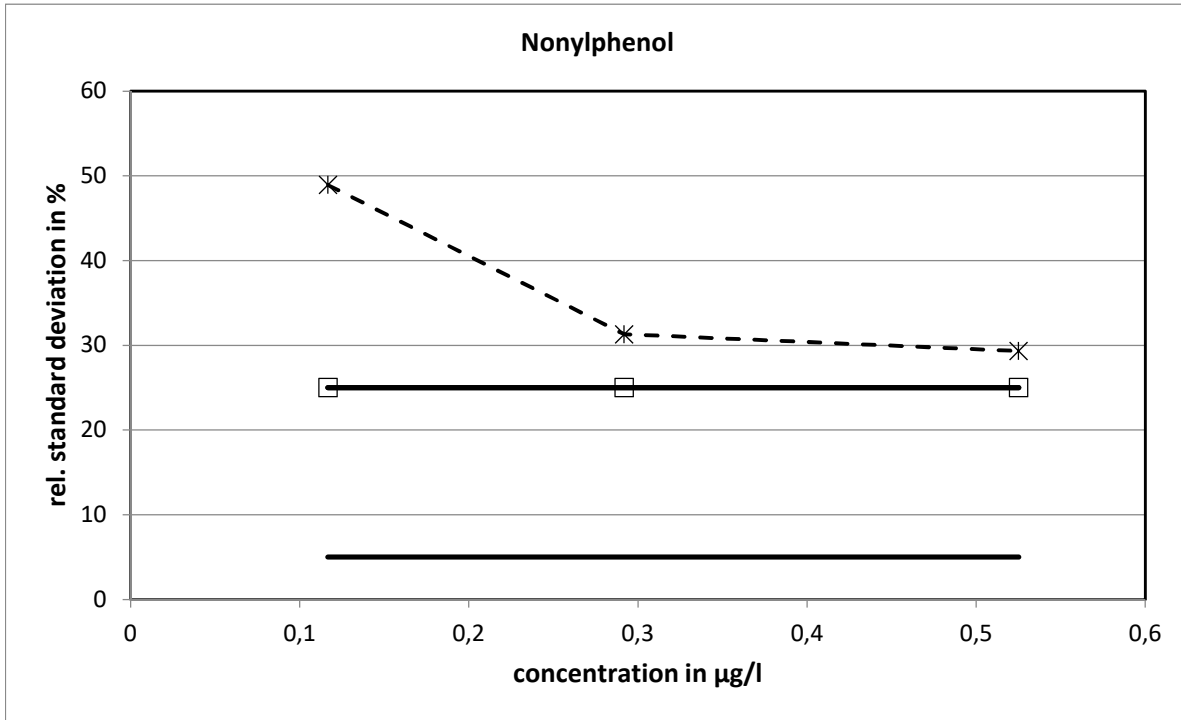
level	assigned value [µg/l]	expanded uncertainty of the assigned value [%]	standard deviation, calculated using robust statistics [µg/l]	standard deviation for proficiency assessment [µg/l]	standard deviation for proficiency assessment [%]	upper tolerance limit [µg/l]	lower tolerance limit [µg/l]	upper tolerance limit [%]	lower tolerance limit [%]	number of results	out below	out above	out [%]
1	0,1167	1,76	0,0571	0,0292	25,00	0,1843	0,0640	57,99	-45,19	26	0	7	26,9
2	0,2917	1,76	0,0913	0,0729	25,00	0,4608	0,1599	57,99	-45,19	27	2	3	18,5
3	0,5251	1,76	0,1540	0,1313	25,00	0,8295	0,2878	57,99	-45,19	27	3	1	14,8
sum										80	5	11	20,0

Recovery

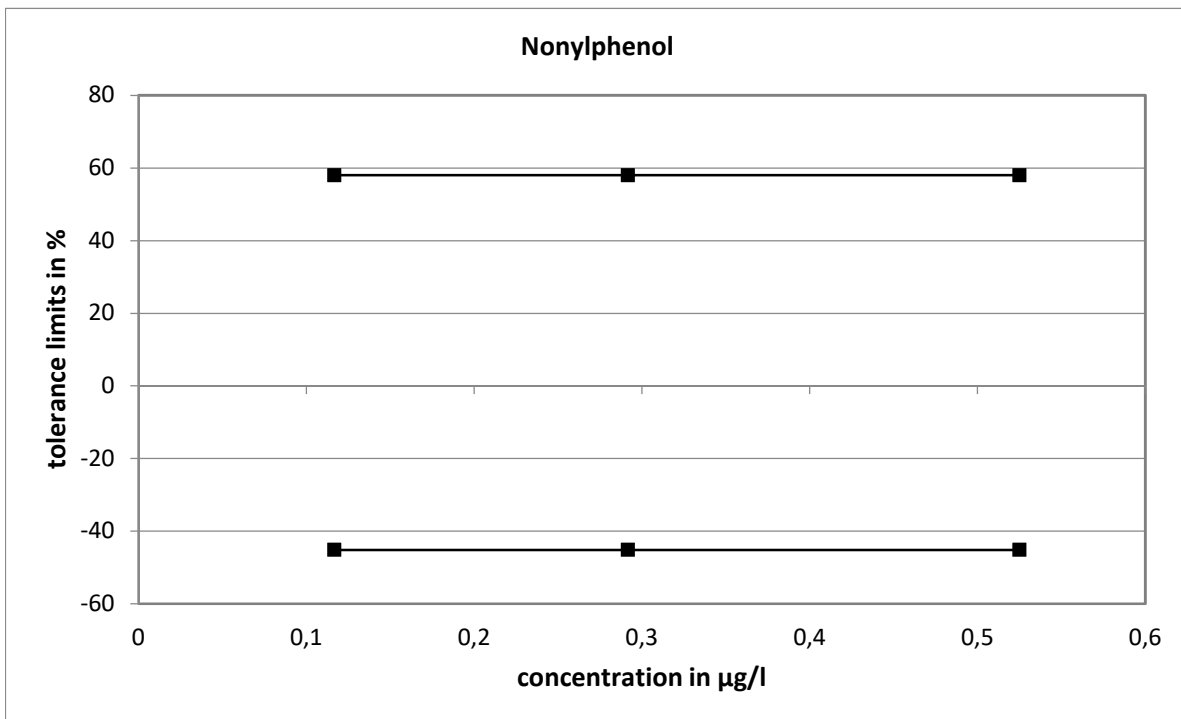


There is no calculation of the recovery rate.

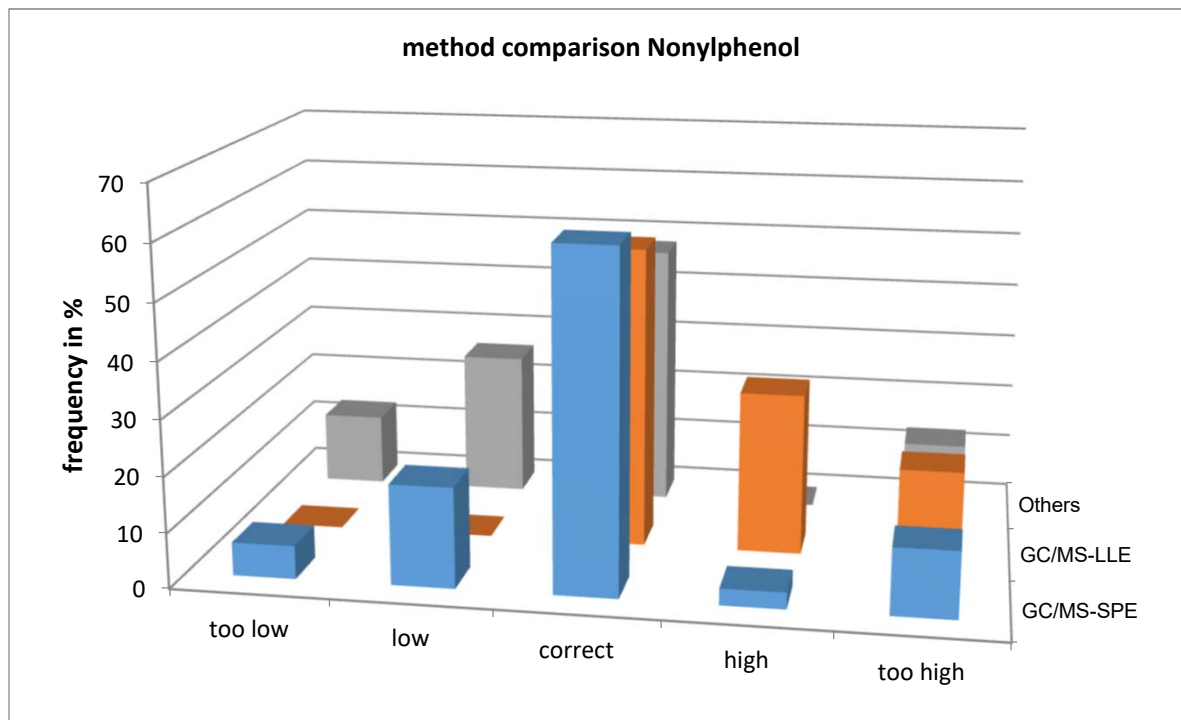
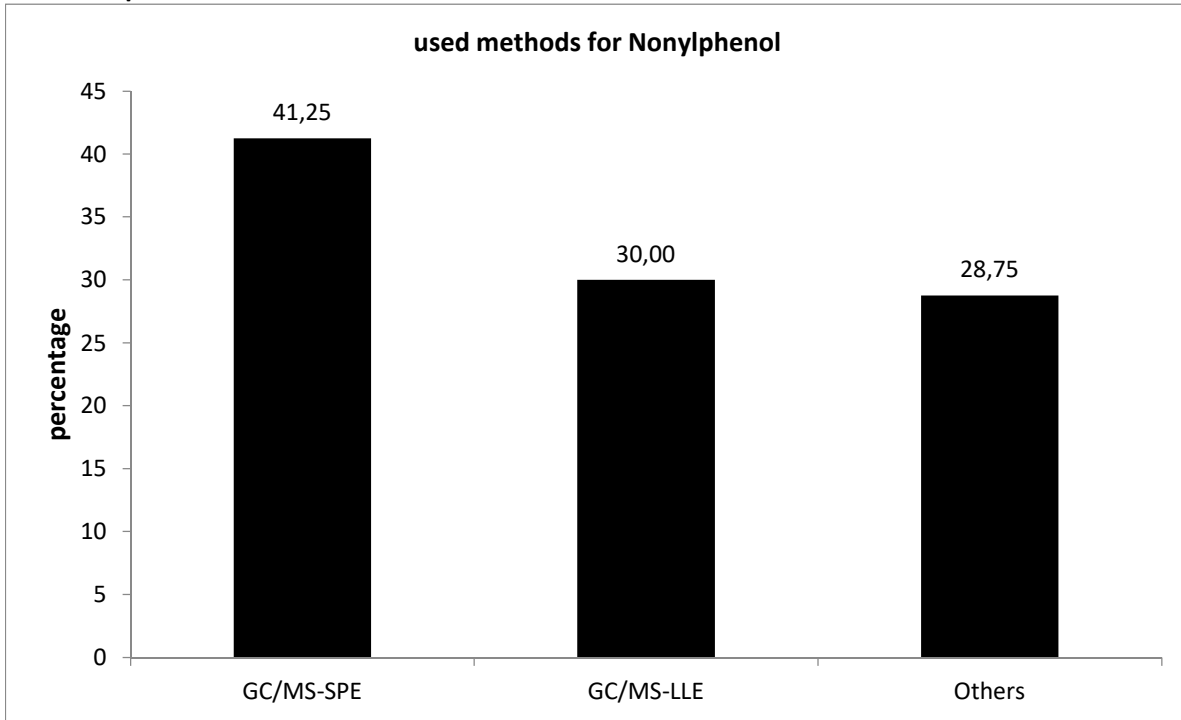
Relative standard deviation and tolerance limits



The relative standard deviations calculated with the Q-method reached the upper limit with all concentration levels.



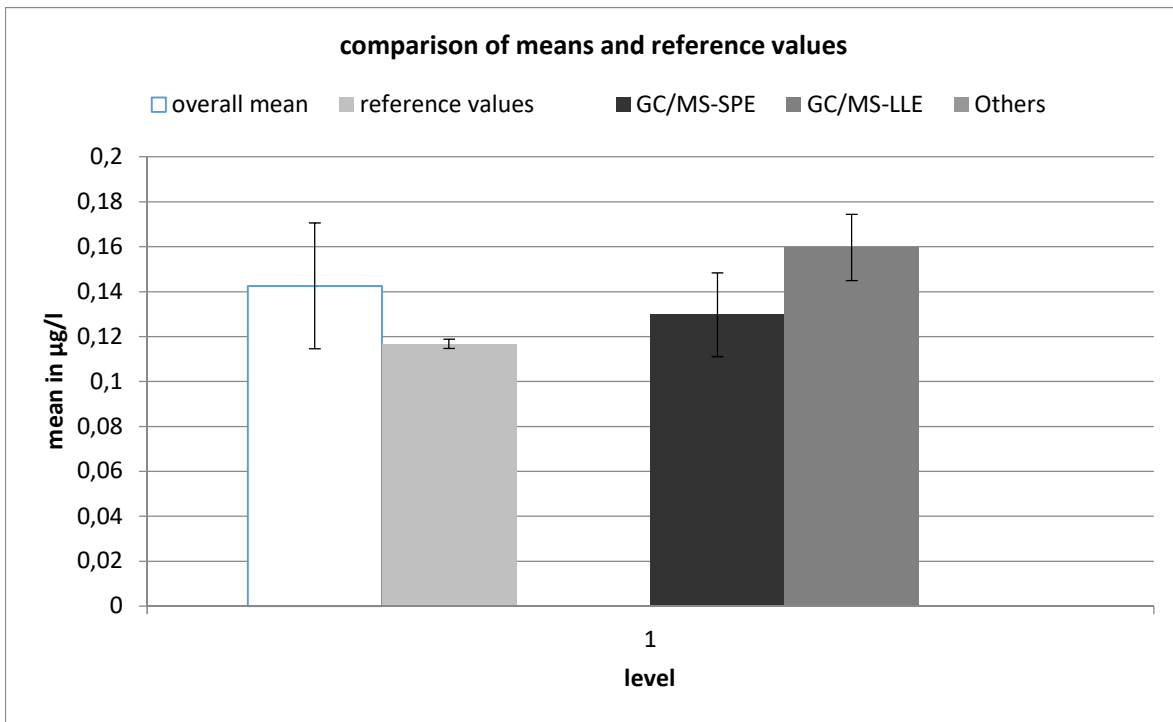
Method specific evaluation

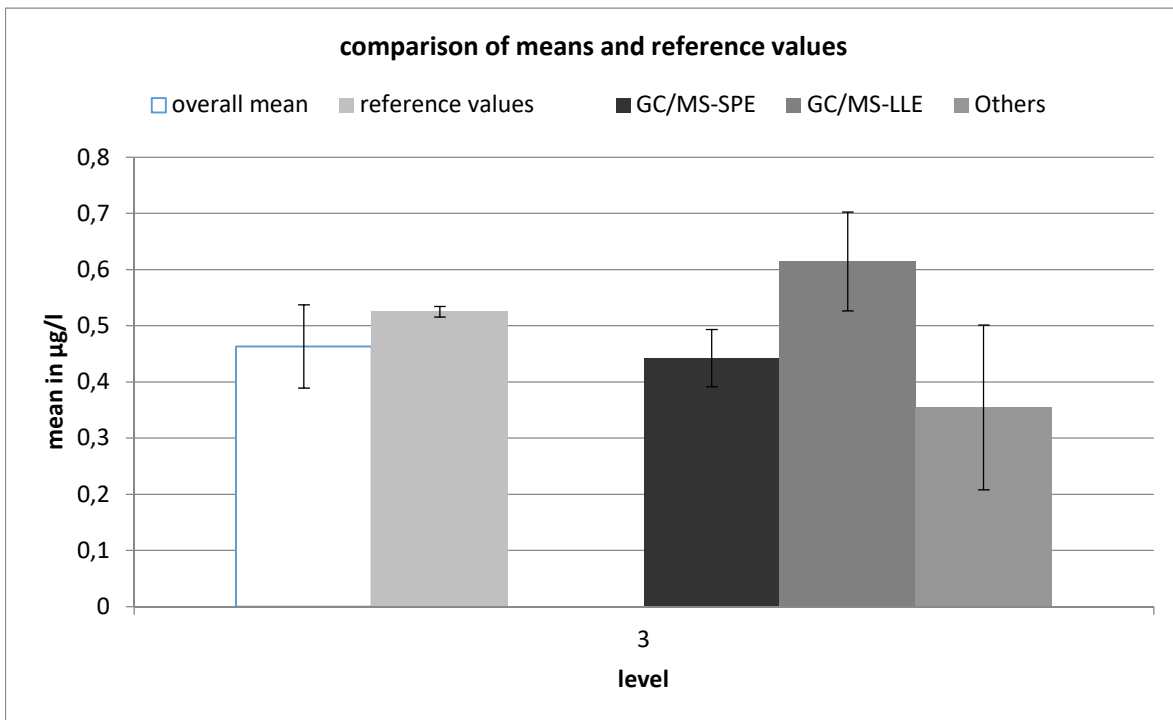
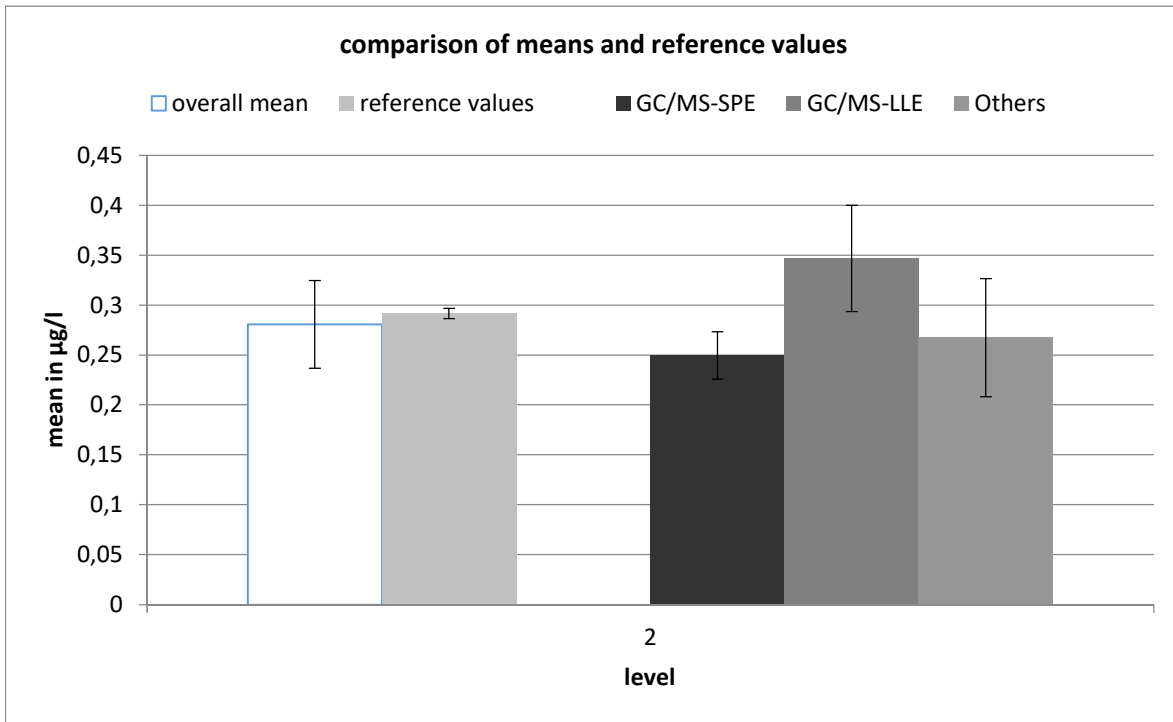


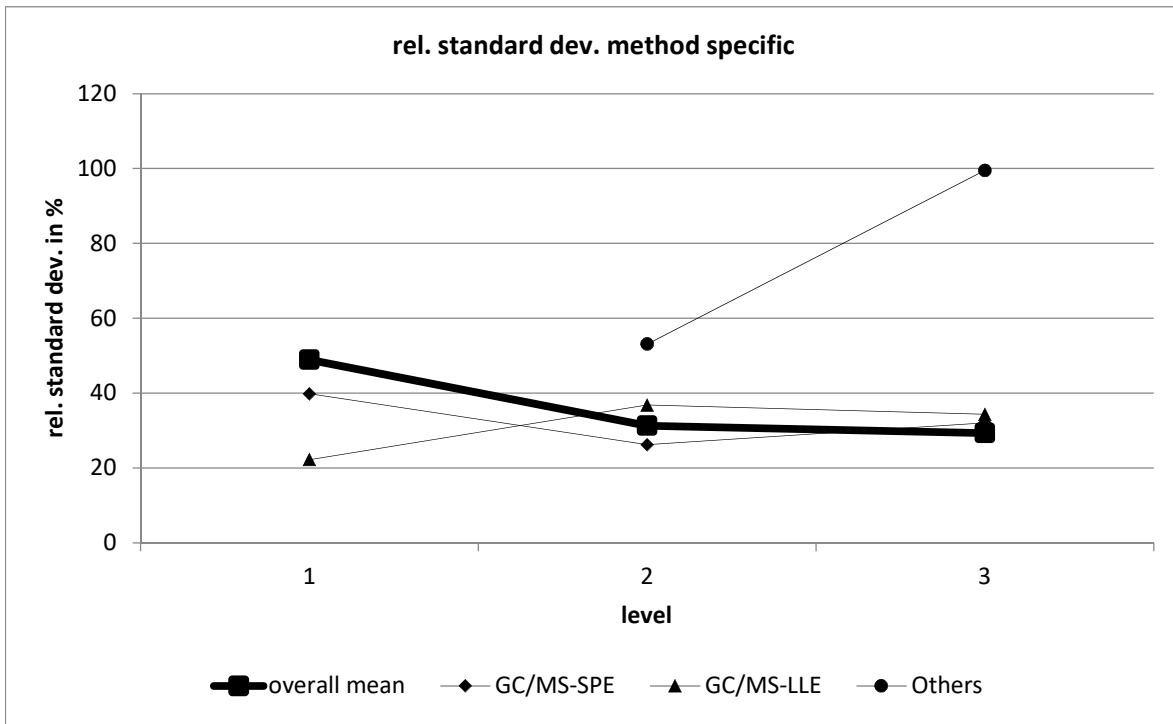
The GC/MS method with liquid extraction lead to rather higher values, whereas the application of the solid phase extraction lead to rather lower values.

Comparison of means and reference values

level	mean [µg/l]	exp. uncertainty [µg/l]	exp. uncertainty [%]	reference value [µg/l]	exp. uncertainty [µg/l]	exp. uncertainty [%]
1	0,1425	0,0280	19,6	0,1167	0,0021	1,8
2	0,2807	0,0439	15,7	0,2917	0,0051	1,8
3	0,4634	0,0741	16,0	0,5251	0,0092	1,8







GC/MS-SPE									
level	robust mean [µg/l]	exp. unc. of the mean [µg/l]	exp. unc. of the mean [%]	robust standard deviation [µg/l]	robust standard deviation [%]	number of results	out below	out above	out [%]
1	0,1296	0,01862	14,36	0,0516	39,797	12	1	2	25
2	0,2497	0,02362	9,46	0,0655	26,217	12	2	1	25
3	0,4424	0,05125	11,58	0,142	32,101	12	2	0	16,67

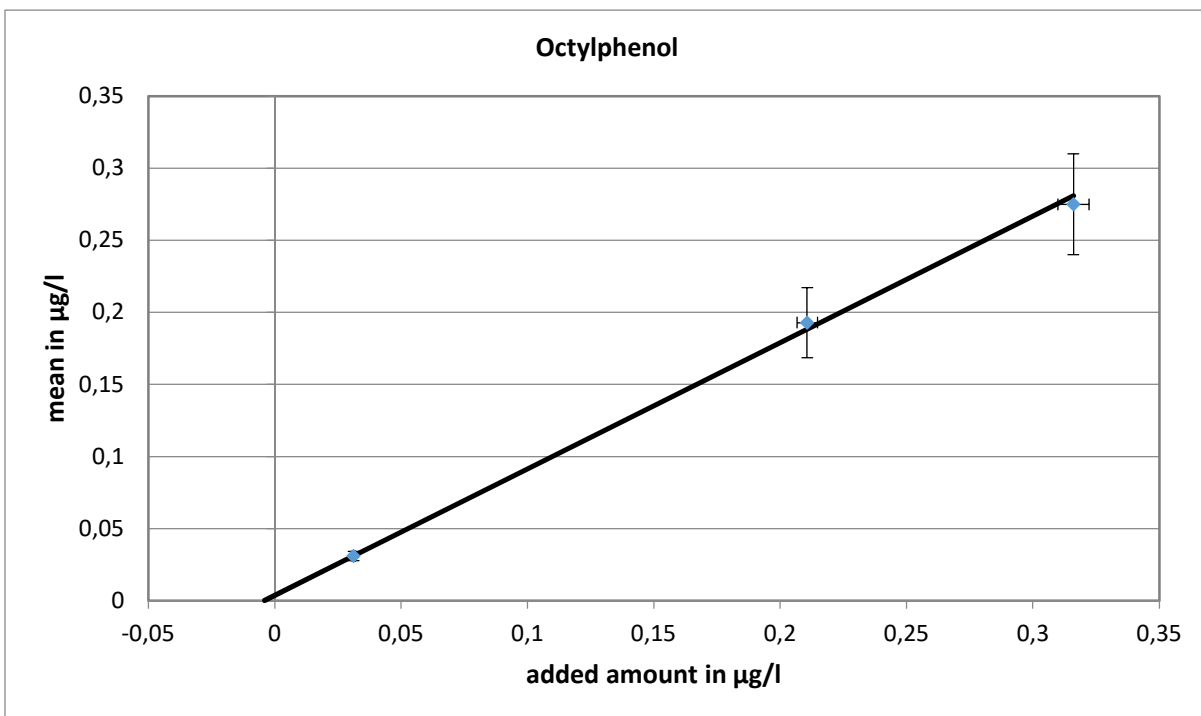
GC/MS-LLE									
level	robust mean [$\mu\text{g/l}$]	exp. unc. of the mean [$\mu\text{g/l}$]	exp. unc. of the mean [%]	robust standard deviation [$\mu\text{g/l}$]	robust standard deviation [%]	number of results	out below	out above	out [%]
1	0,1596	0,01479	9,267	0,0355	22,242	9	0	1	11,11
2	0,3469	0,05321	15,34	0,1277	36,812	9	0	0	0
3	0,6148	0,08803	14,32	0,2113	34,365	9	0	0	0

Others									
level	robust mean [$\mu\text{g/l}$]	exp. unc. of the mean [$\mu\text{g/l}$]	exp. unc. of the mean [%]	robust standard deviation [$\mu\text{g/l}$]	robust standard deviation [%]	number of results	out below	out above	out [%]
2	0,2674	0,05918	22,13	0,142	53,107	9	0	0	0
3	0,3546	0,14702	41,46	0,3528	99,498	9	0	0	0

Octylphenol

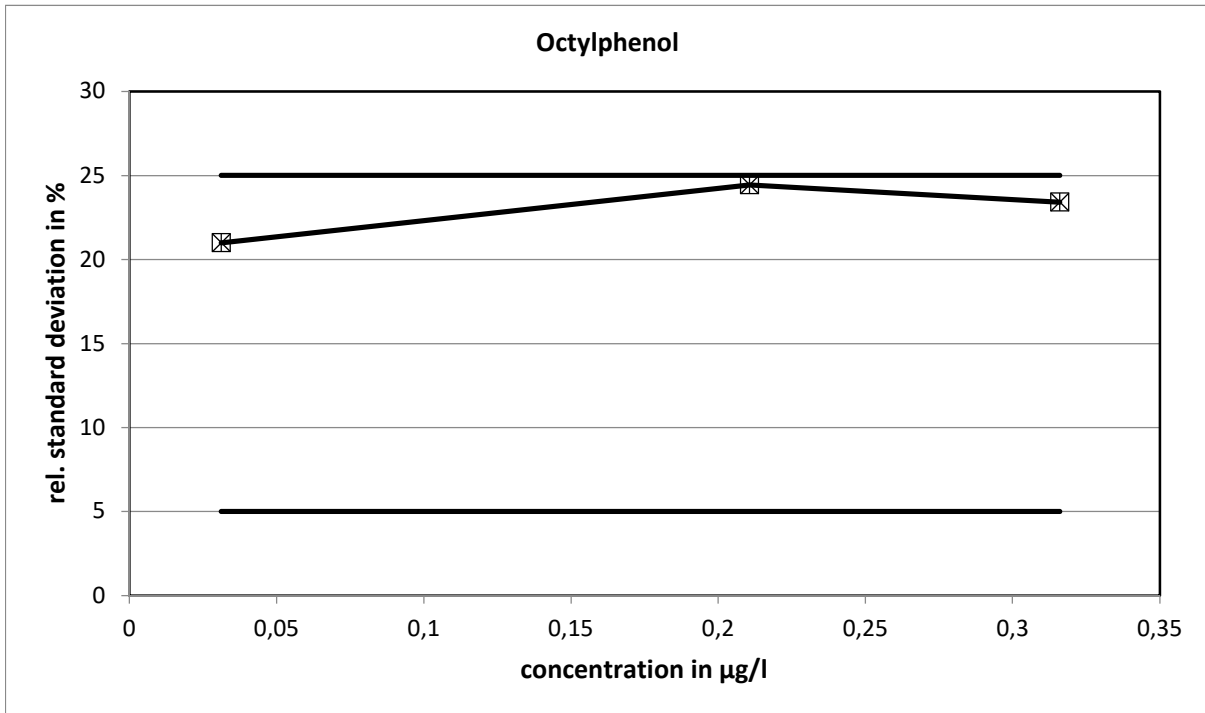
level	assigned value [µg/l]	expanded uncertainty of the assigned value [%]	standard deviation, calculated using robust statistics [µg/l]	standard deviation for proficiency assessment [µg/l]	standard deviation for proficiency assessment [%]	upper tolerance limit [µg/l]	lower tolerance limit [µg/l]	upper tolerance limit [%]	lower tolerance limit [%]	number of results	out below	out above	out [%]
1	0,0312	1,93	0,0066	0,0066	20,99	0,0460	0,0192	47,44	-38,41	27	1	8	32,1
2	0,2107	1,93	0,0515	0,0515	24,44	0,3301	0,1176	56,68	-44,17	28	2	1	10,7
3	0,3160	1,93	0,0740	0,0740	23,41	0,4876	0,1823	54,29	-42,31	28	5	1	20,7
sum										83	8	10	21,7

Recovery

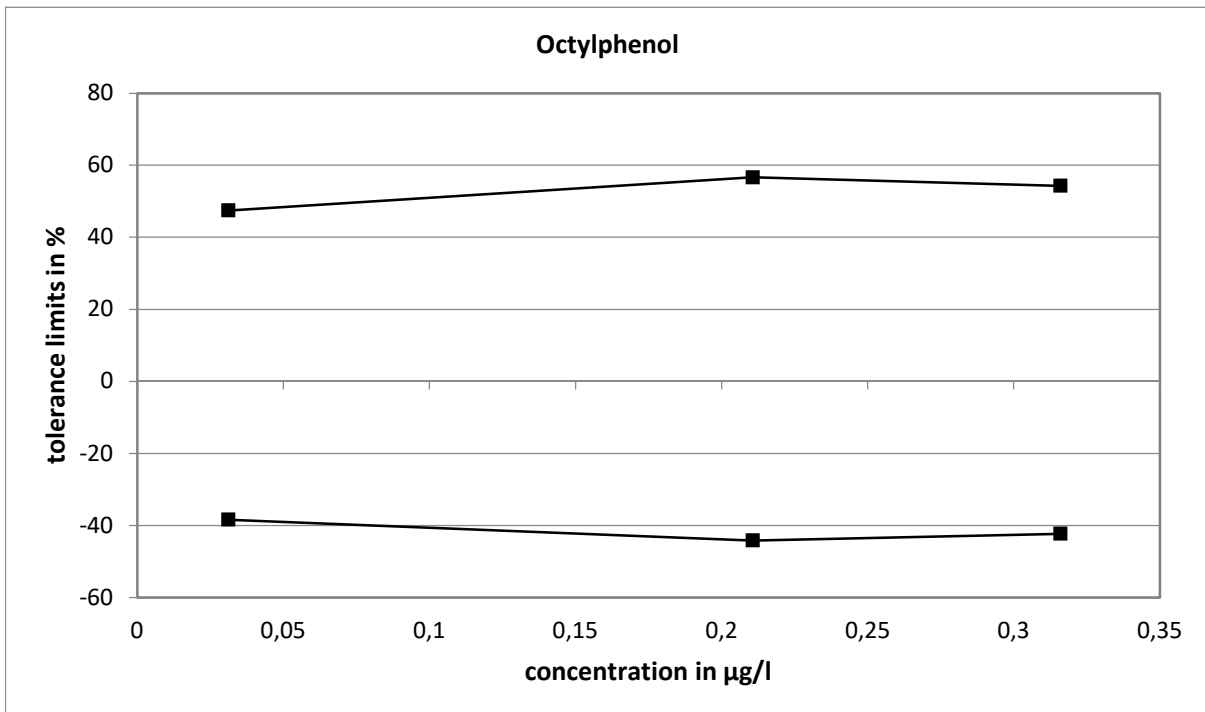


Slope of the regression: 0,877; average recovery: 87,7%

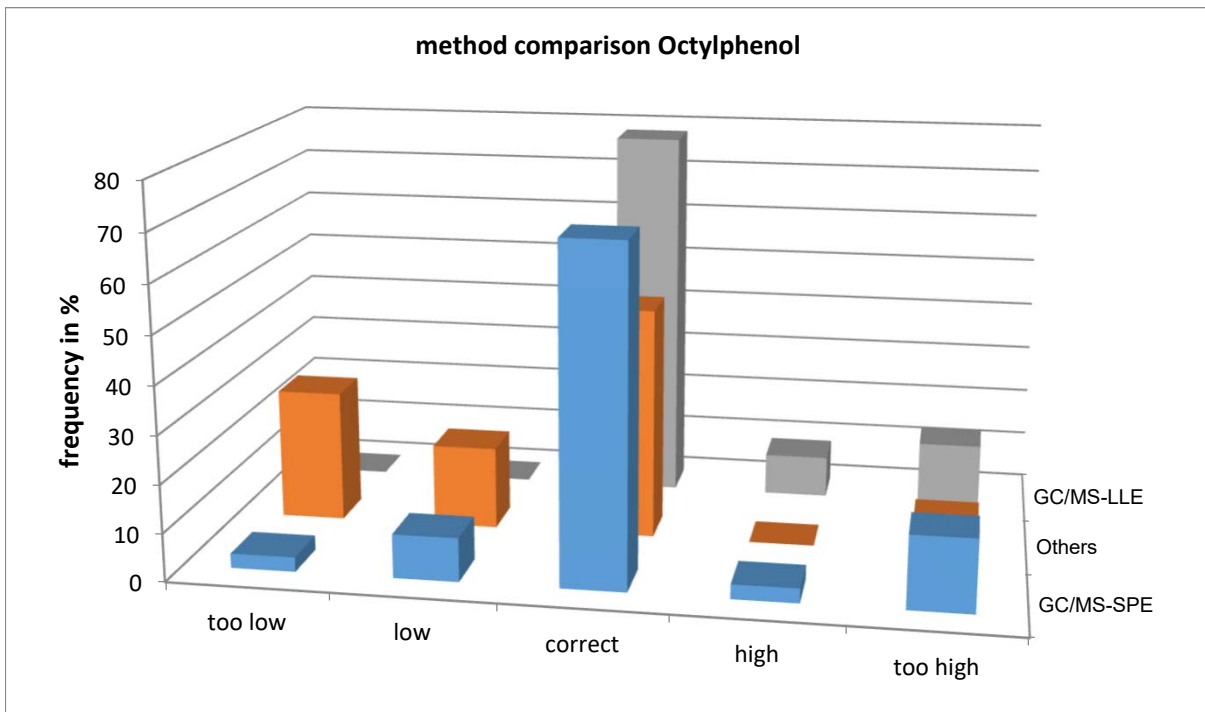
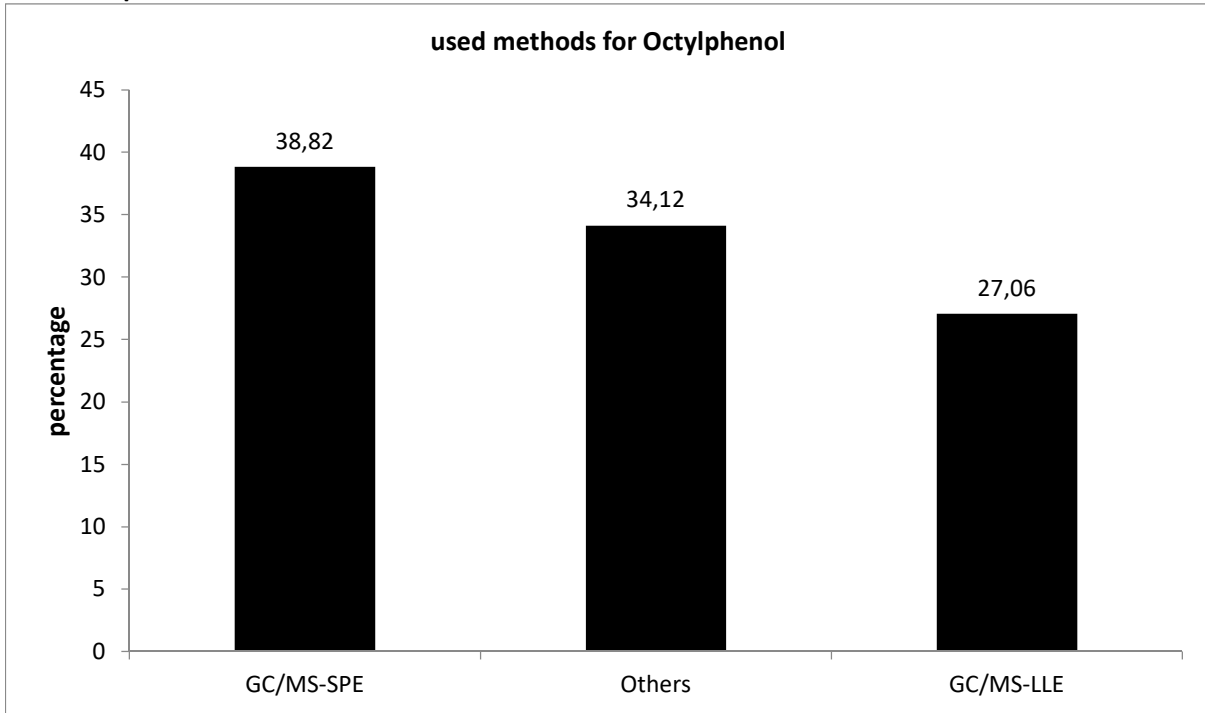
Relative standard deviation and tolerance limits



The relative standard deviations calculated with the Q-method reached not the limits.



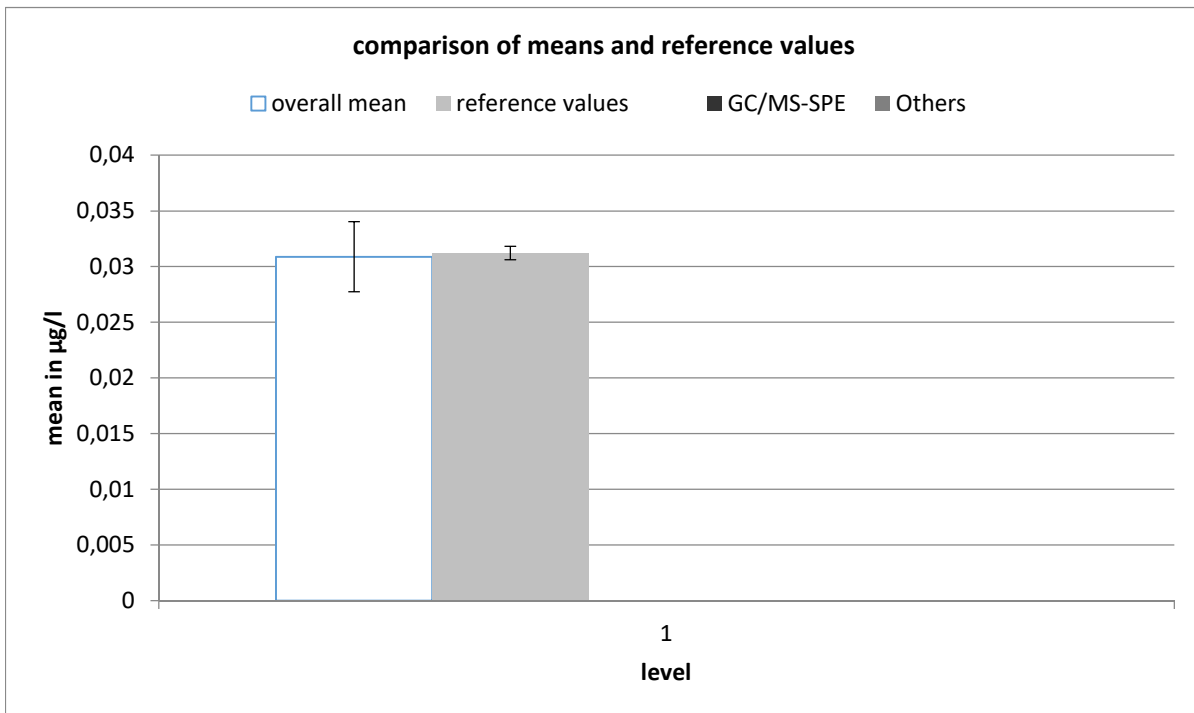
Method specific evaluation

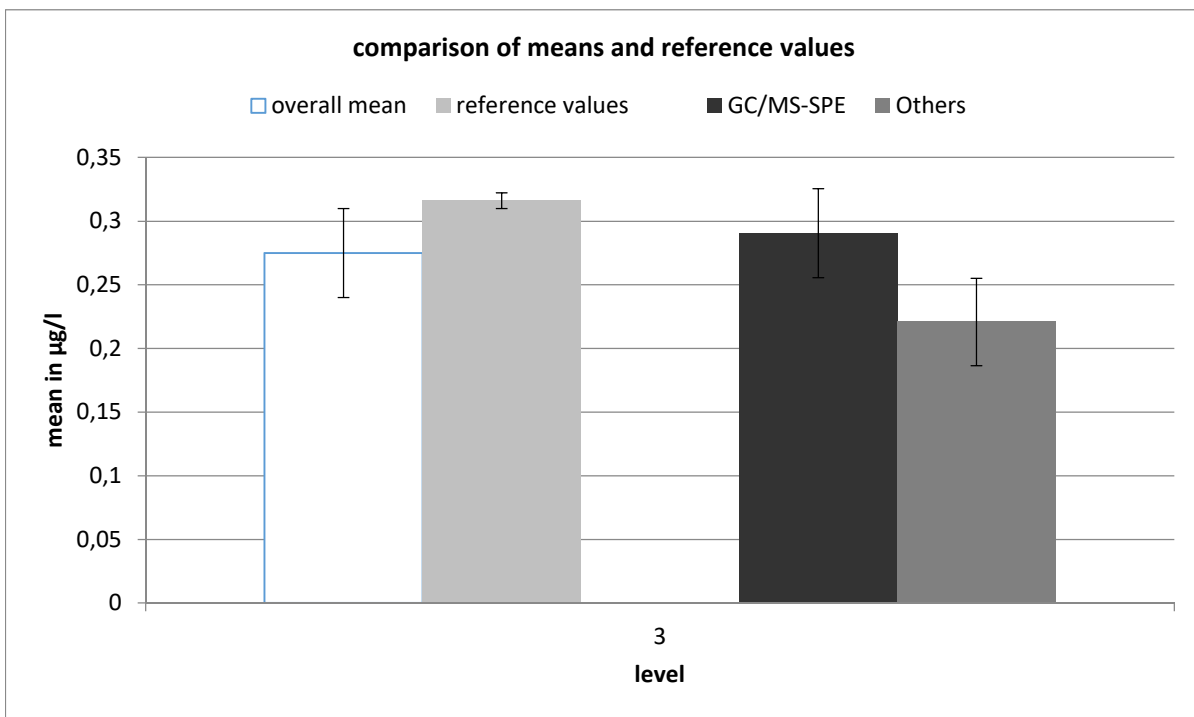
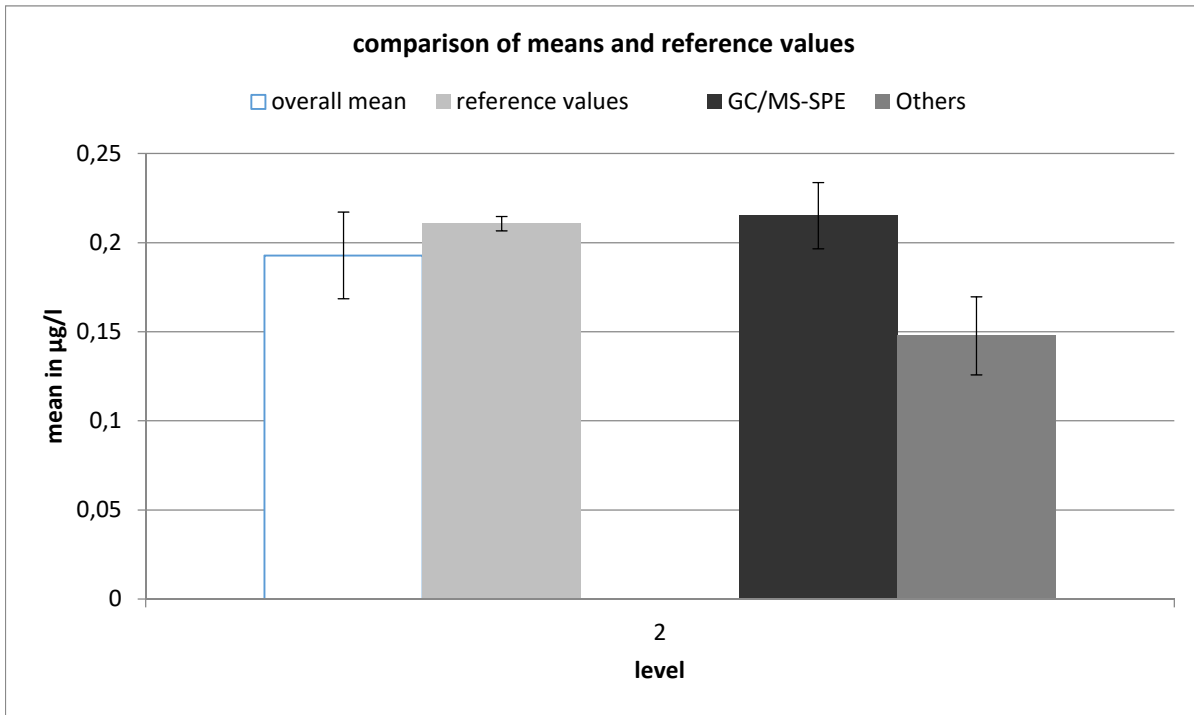


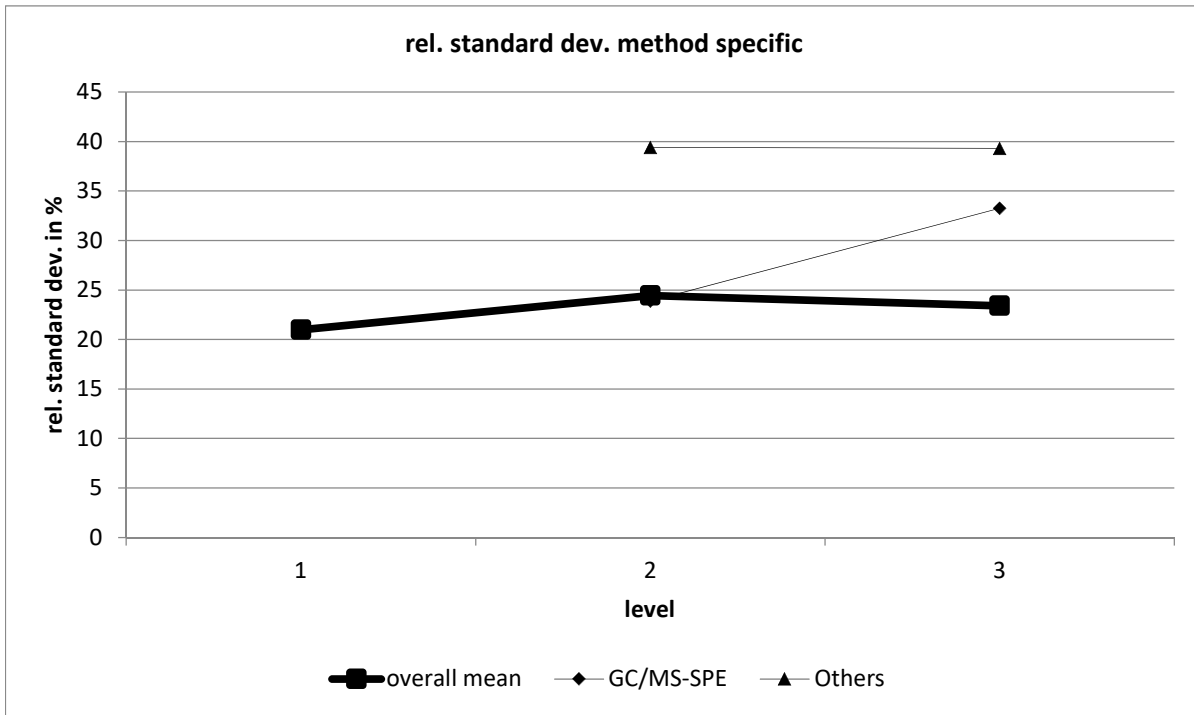
The differences between the GC-methods were not significant.

Comparison of means and reference values

level	Experimental Data			Reference Data		
	mean [$\mu\text{g/l}$]	exp. uncertainty [$\mu\text{g/l}$]	exp. uncertainty [%]	reference value [$\mu\text{g/l}$]	exp. uncertainty [$\mu\text{g/l}$]	exp. uncertainty [%]
1	0,0309	0,0032	10,2	0,0312	0,0006	1,9
2	0,1929	0,0243	12,6	0,2107	0,0041	1,9
3	0,2750	0,0349	12,7	0,3160	0,0061	1,9







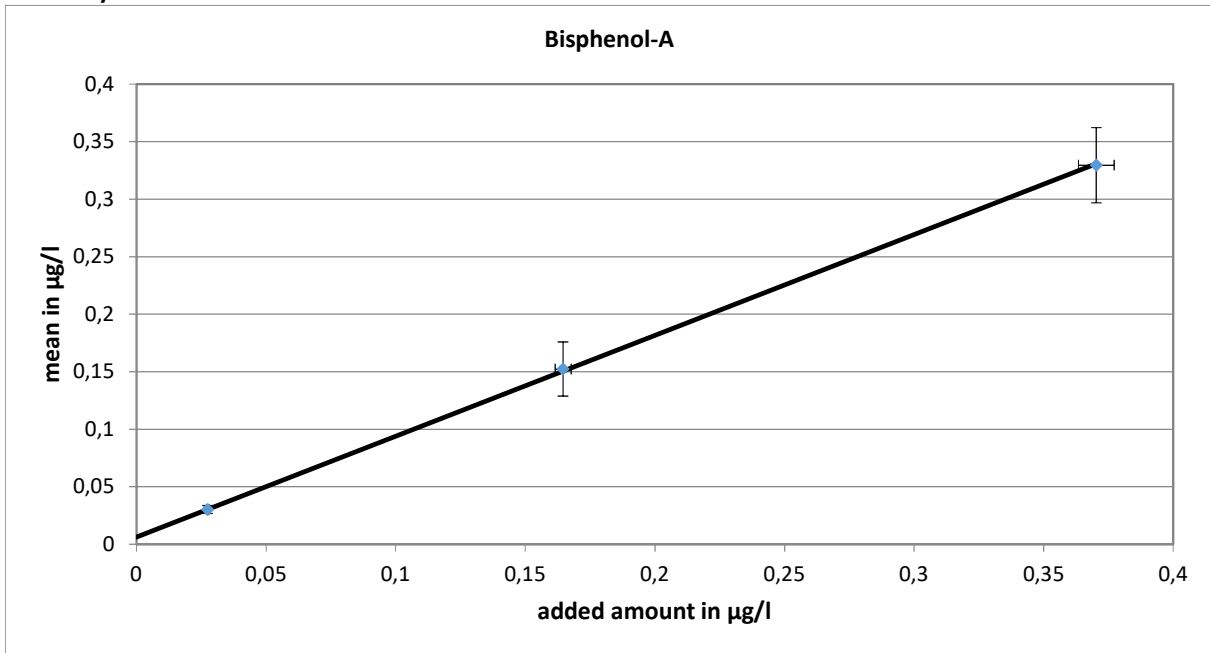
GC/MS-SPE									
level	robust mean [µg/l]	exp. unc. of the mean [µg/l]	exp. unc. of the mean [%]	robust standard deviation [µg/l]	robust standard deviation [%]	number of results	out below	out above	out [%]
2	0,21513	0,01854	8,617	0,0514	23,8804	12	1	0	8,333
3	0,29052	0,03486	12	0,0966	33,2554	12	2	0	16,67

Others									
level	robust mean [µg/l]	exp. unc. of the mean [µg/l]	exp. unc. of the mean [%]	robust standard deviation [µg/l]	robust standard deviation [%]	number of results	out below	out above	out [%]
2	0,14776	0,02193	14,84	0,0582	39,3873	11	1	1	18,18
3	0,2208	0,0343	15,53	0,0868	39,2973	10	0	0	0

Bisphenol-A

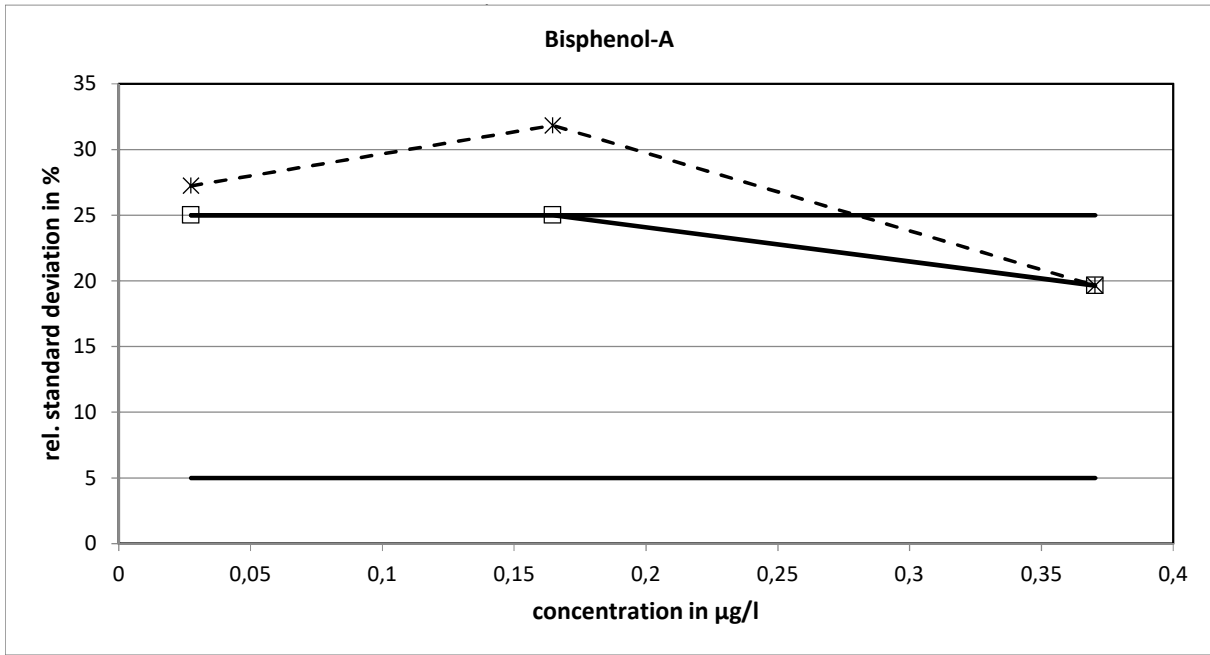
level	assigned value [µg/l]	expanded uncertainty of the assigned value [%]	standard deviation, calculated using robust statistics [µg/l]	standard deviation for proficiency assessment [µg/l]	standard deviation for proficiency assessment [%]	upper tolerance limit [µg/l]	lower tolerance limit [µg/l]	upper tolerance limit [%]	lower tolerance limit [%]	number of results	out below	out above	out [%]
1	0,0274	1,86	0,0075	0,0069	25,00	0,0433	0,0150	57,86	-45,23	30	0	8	25,8
2	0,1646	1,86	0,0524	0,0411	25,00	0,2600	0,0902	57,99	-45,19	31	3	4	22,6
3	0,3703	1,86	0,0727	0,0727	19,64	0,5357	0,2376	44,67	-35,85	31	6	2	25,8
sum										92	9	14	25,0

Recovery

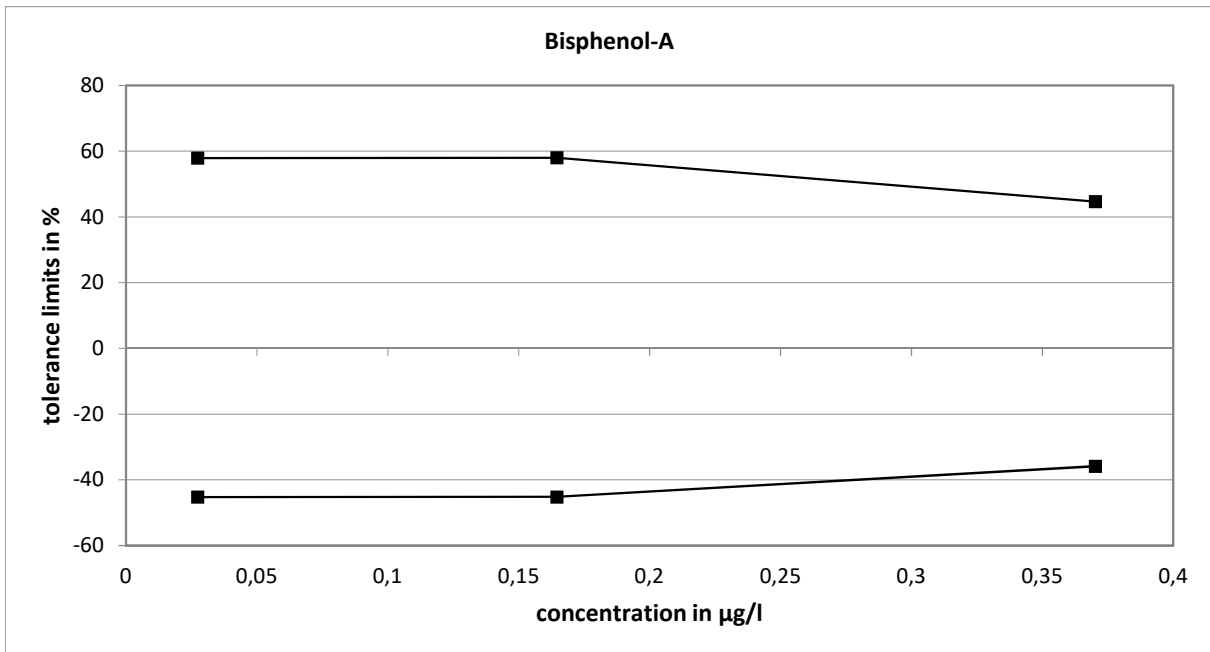


Slope of the regression: 0,877; average recovery: 87,7%

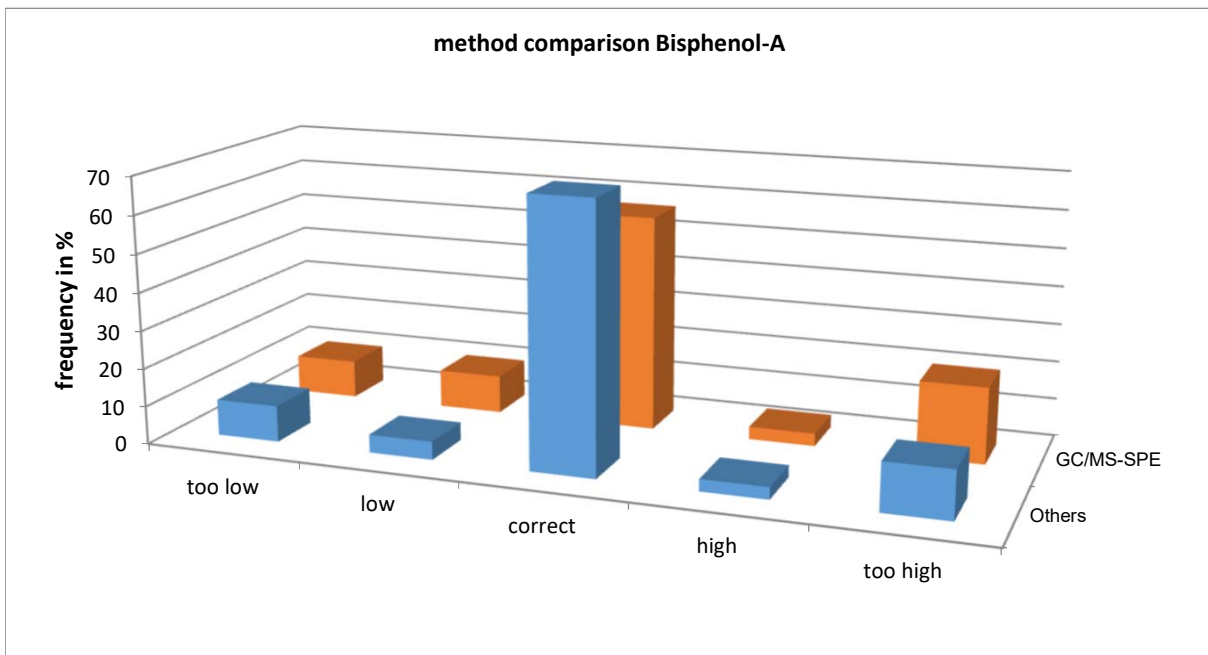
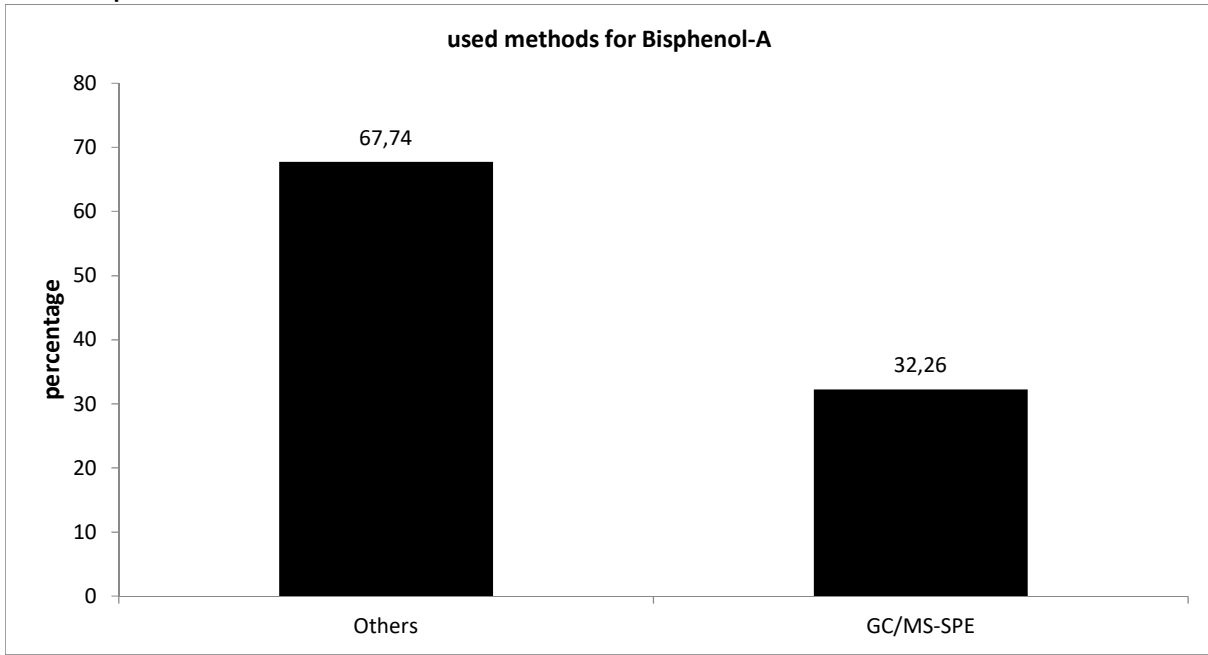
Relative standard deviation and tolerance limits



The relative standard deviations calculated with the Q-method reached the upper limit with two concentration levels.



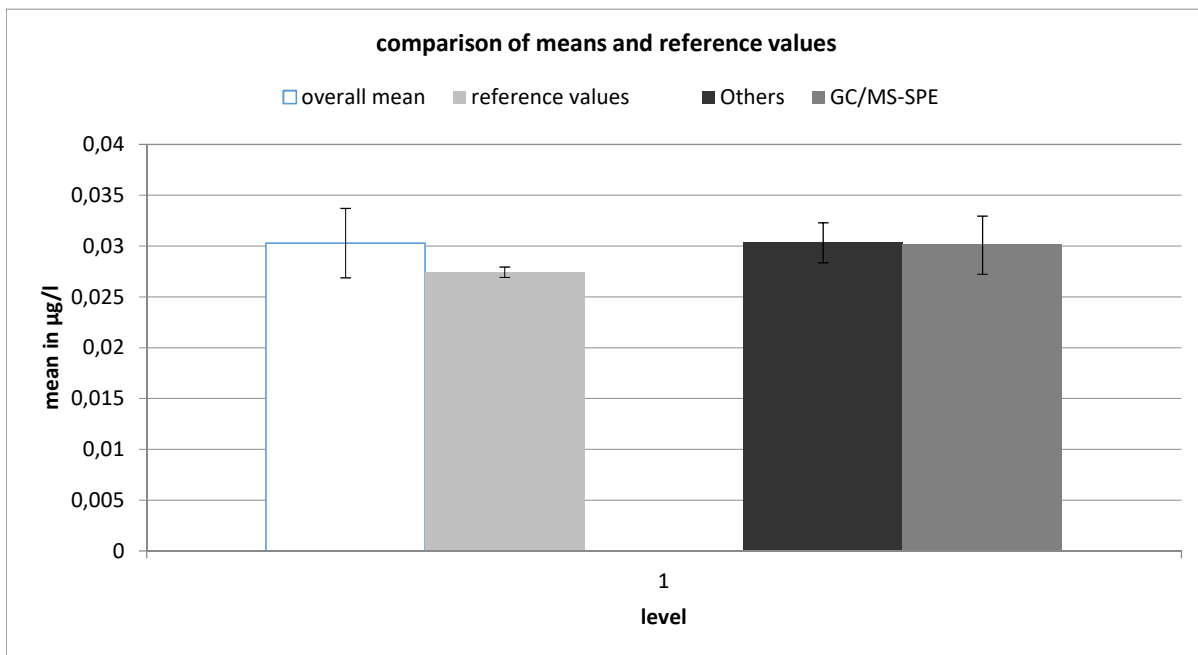
Method specific evaluation

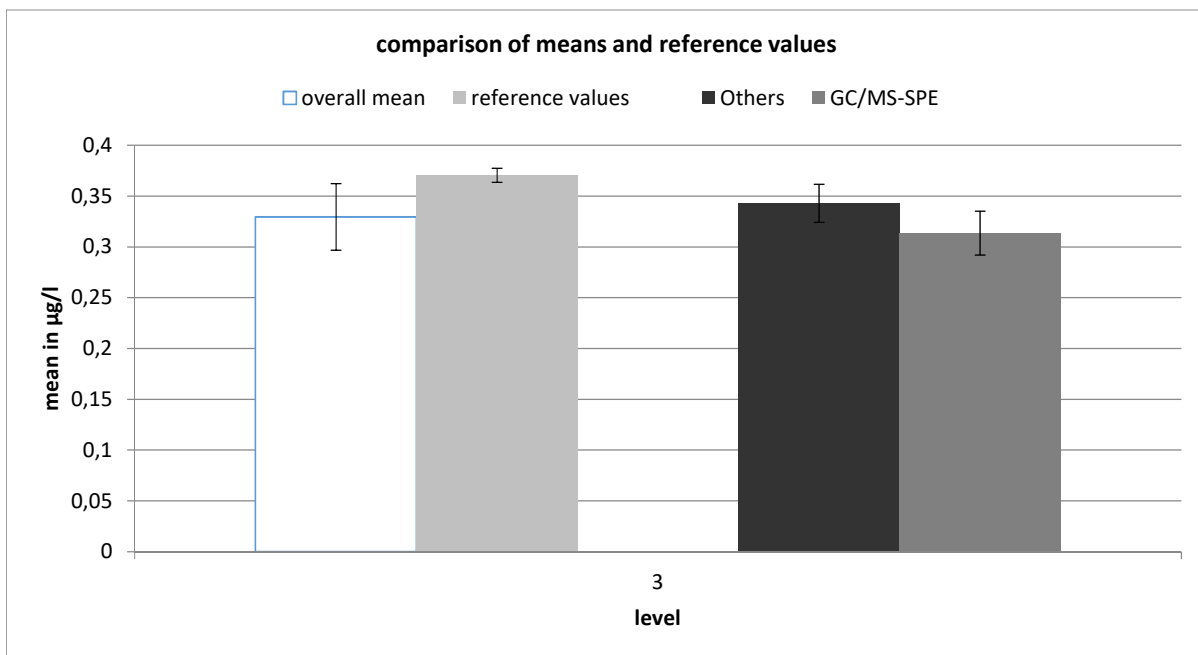
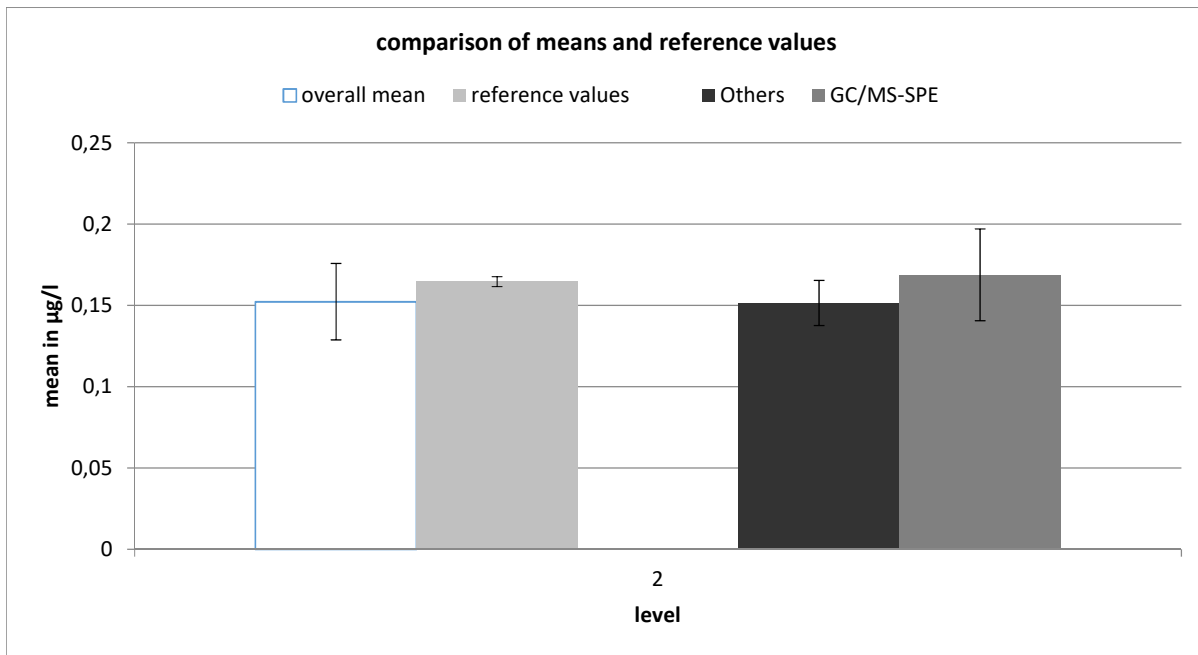


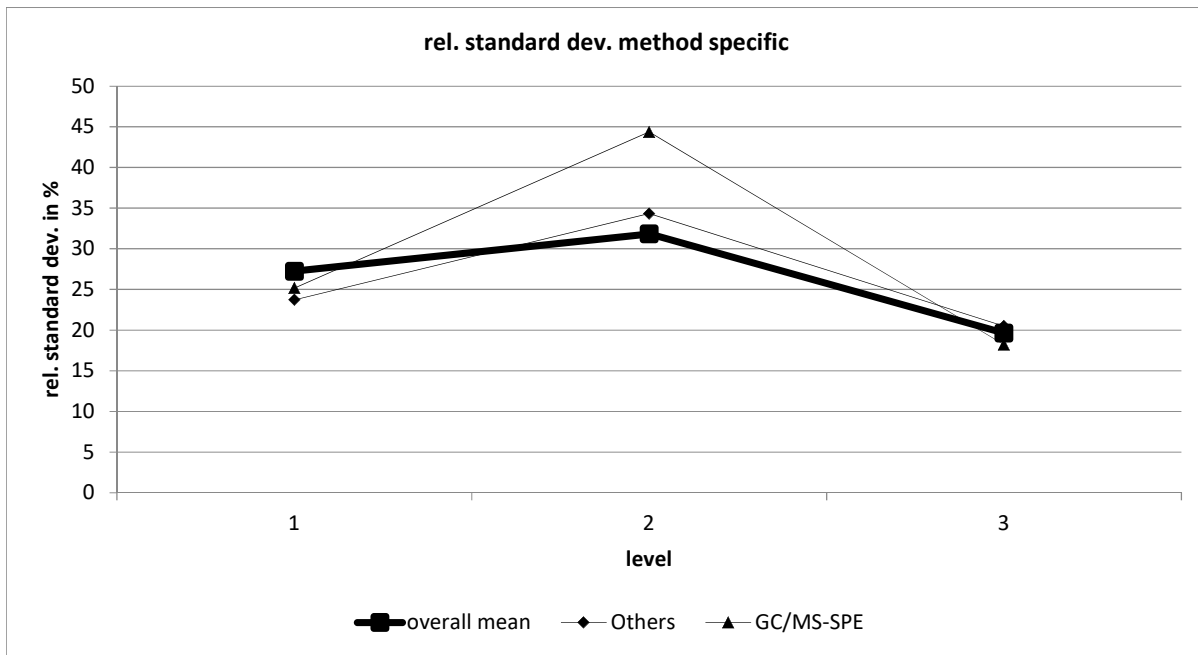
The differences between the methods were not significant.

Comparison of means and reference values

level	mean [µg/l]	exp. uncertainty [µg/l]	exp. uncertainty [%]	reference value [µg/l]	exp. uncertainty [µg/l]	exp. uncertainty [%]
1	0,0303	0,0034	11,3	0,0274	0,0005	1,9
2	0,1523	0,0235	15,4	0,1646	0,0031	1,9
3	0,3295	0,0327	9,9	0,3703	0,0069	1,9

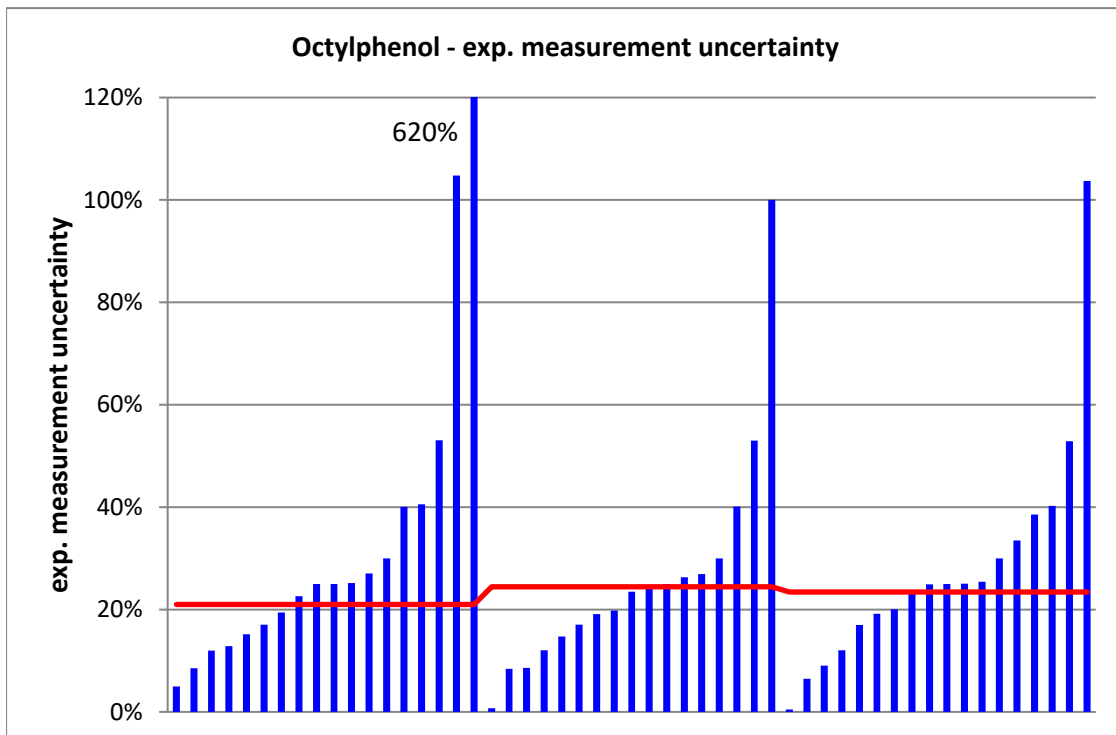
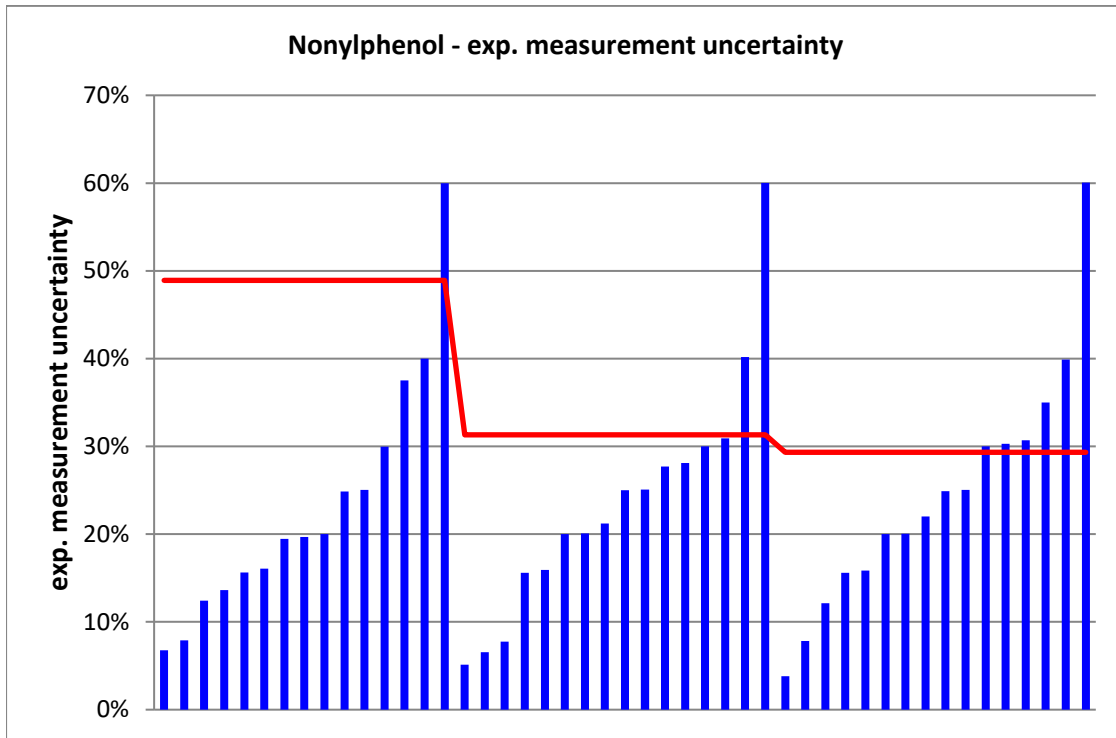


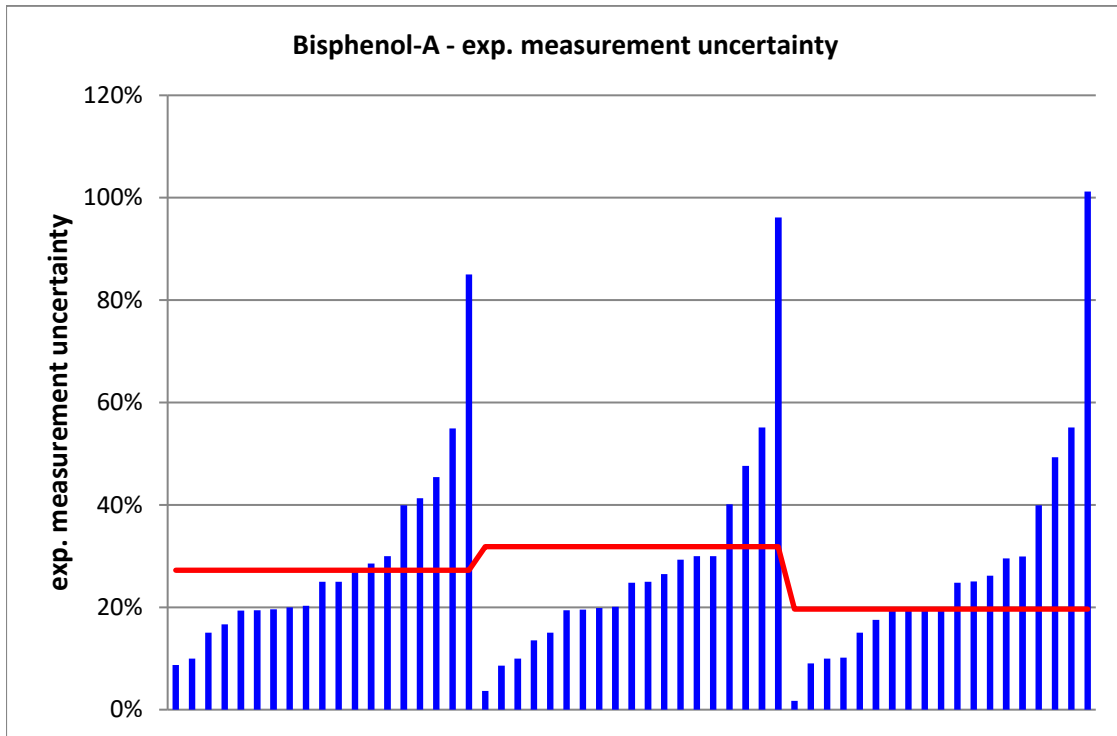




Others									
level	robust mean [$\mu\text{g/l}$]	exp. unc. of the mean [$\mu\text{g/l}$]	exp. unc. of the mean [%]	robust standard deviation [$\mu\text{g/l}$]	robust standard deviation [%]	number of results	out below	out above	out [%]
1	0,03032	0,002	6,47063	0,00719	23,722	21	1	2	14,286
2	0,15151	0,014	9,15276	0,05203	34,344	22	2	2	18,182
3	0,34287	0,019	5,46208	0,07027	20,496	22	4	2	27,273

GC/MS-SPE									
level	robust mean [$\mu\text{g}/\text{l}$]	exp. unc. of the mean [$\mu\text{g}/\text{l}$]	exp. unc. of the mean [%]	robust standard deviation [$\mu\text{g}/\text{l}$]	robust standard deviation [%]	number of results	out below	out above	out [%]
1	0,03009	0,003	9,48934	0,00758	25,178	11	0	3	27,273
2	0,16875	0,028	16,7271	0,0749	44,382	11	0	1	9,0909
3	0,31355	0,022	6,86862	0,05714	18,225	11	1	1	18,182

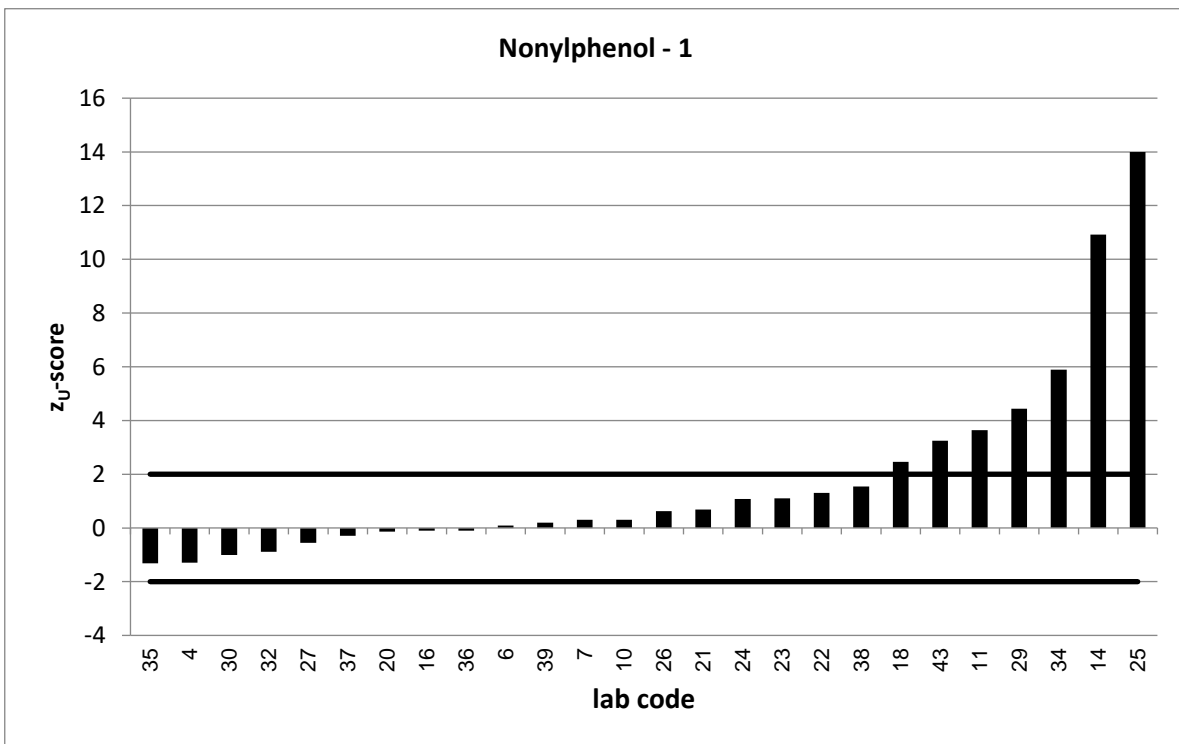
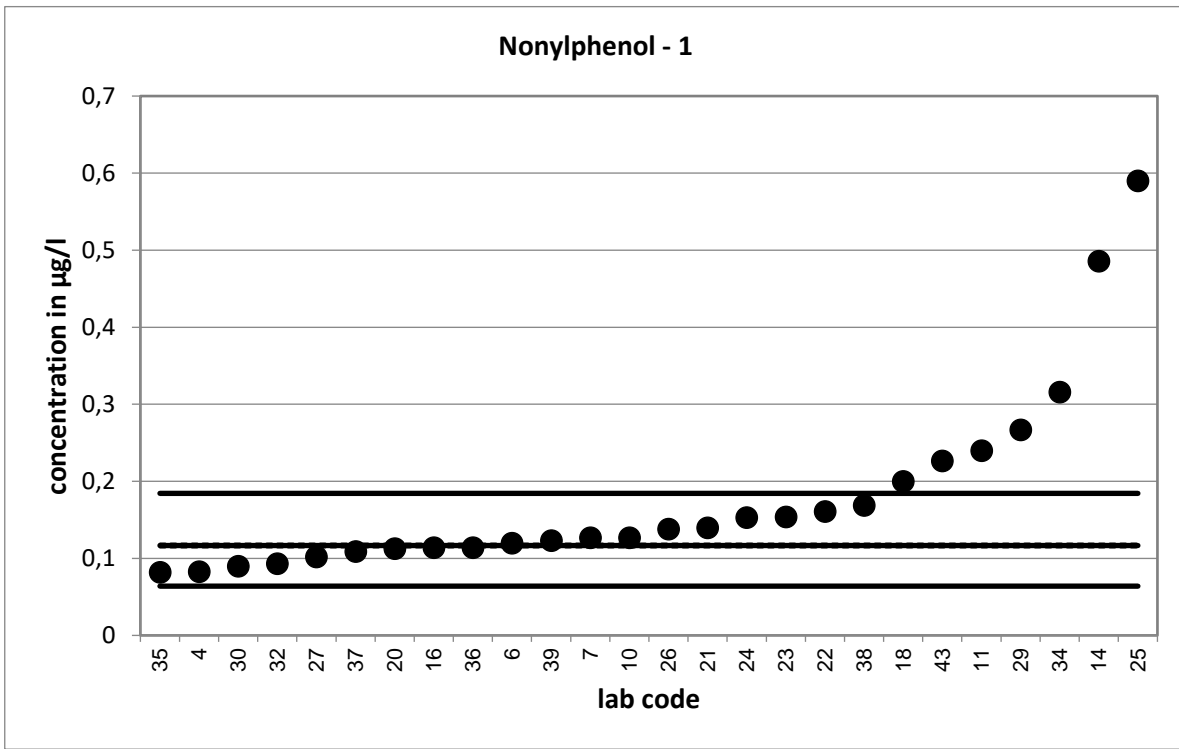


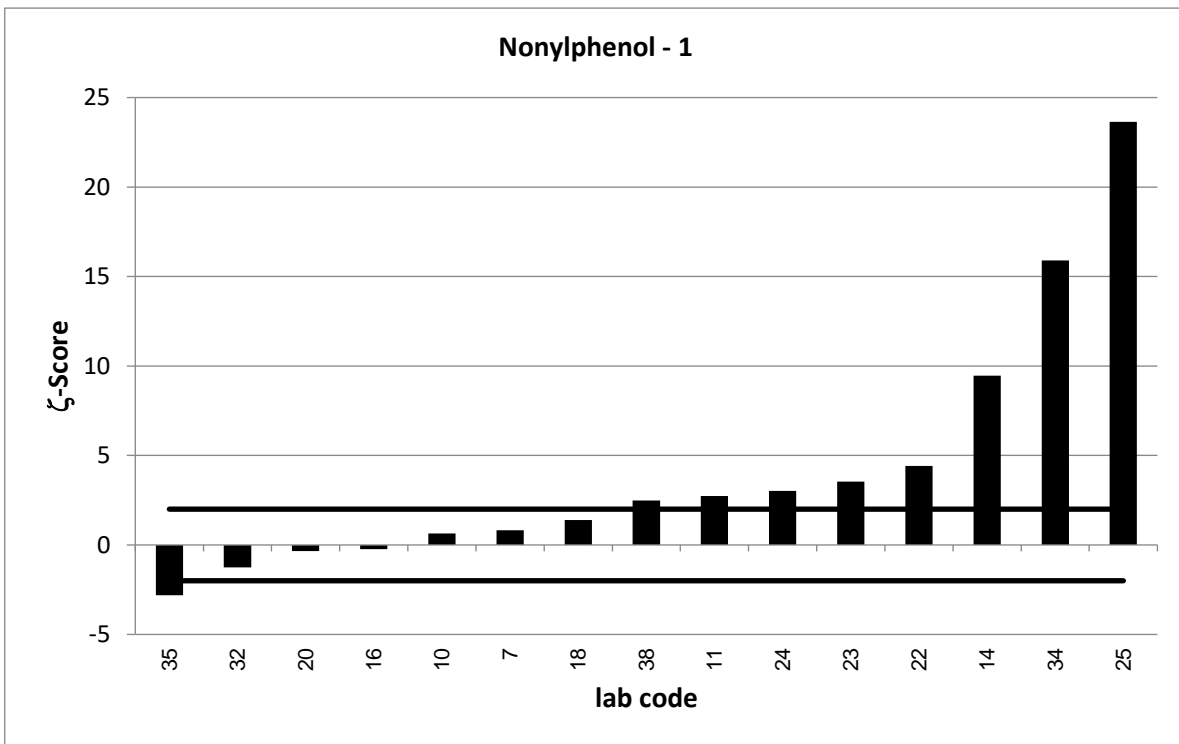
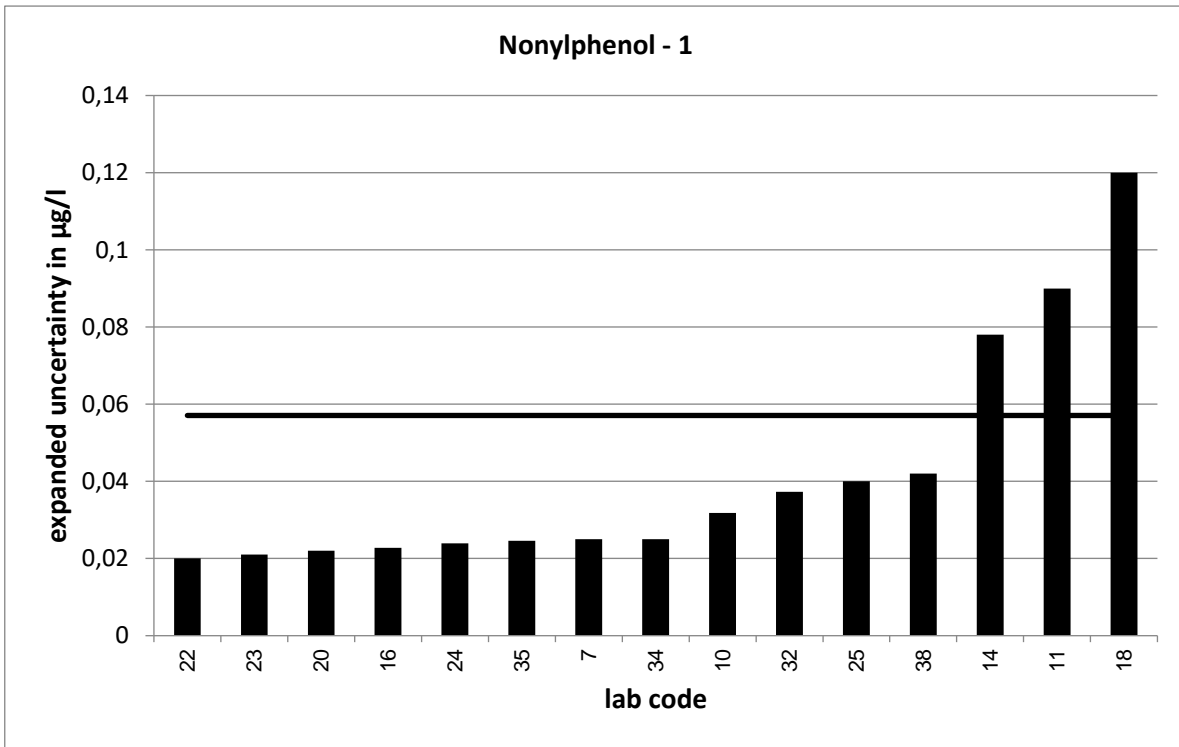


PT 3/20 TW S3		Nonylphenol - 1			
assigned value [$\mu\text{g/l}$]*		0,1167 \pm 0,0021			
upper tolerance limit [$\mu\text{g/l}$]		0,1843			
lower tolerance limit [$\mu\text{g/l}$]		0,06396			
lab code	result [$\mu\text{g/l}$]	\pm	ζ -score	z_U -score	assessm. **
4	0,0827			-1,3	s
6	0,1198			0,1	s
7	0,127	0,025	0,8	0,3	s
10	0,127	0,0318	0,6	0,3	s
11	0,24	0,09	2,7	3,6	u
14	0,486	0,078	9,5	10,9	u
16	0,114	0,0228	-0,2	-0,1	s
18	0,2	0,12	1,4	2,5	q
20	0,113	0,022	-0,3	-0,1	s
21	0,14			0,7	s
22	0,161	0,02	4,4	1,3	s
23	0,154	0,021	3,5	1,1	s
24	0,153	0,0239	3,0	1,1	s
25	0,59	0,04	23,6	14,0	u
26	0,138			0,6	s
27	0,102			-0,6	s
29	0,267			4,4	u
30	0,09			-1,0	s
32	0,0933	0,0373	-1,3	-0,9	s
34	0,316	0,025	15,9	5,9	u
35	0,0821	0,0246	-2,8	-1,3	s
36	0,114			-0,1	s
37	0,109			-0,3	s
38	0,169	0,042	2,5	1,5	s
39	0,1233			0,2	s
43	0,2266			3,2	u

* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor $k=2$ corresponding to a confidence level of about 95%

** s = satisfactory, q = questionable, u = unsatisfactory

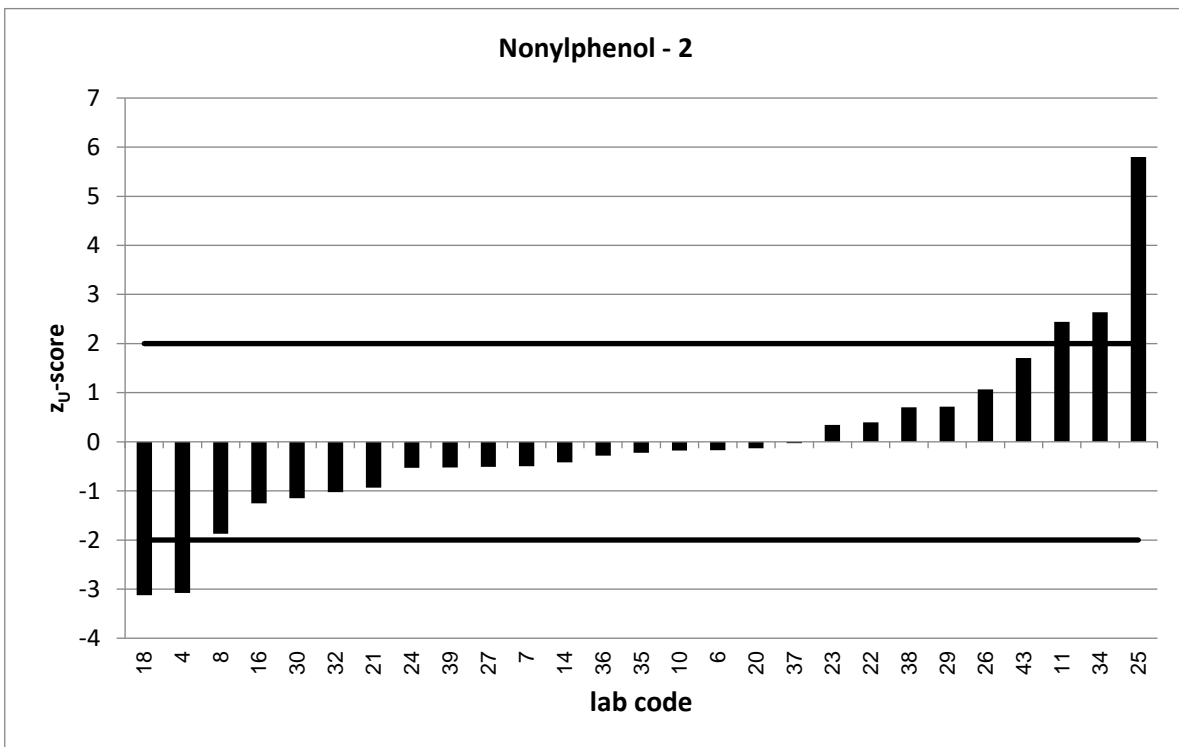
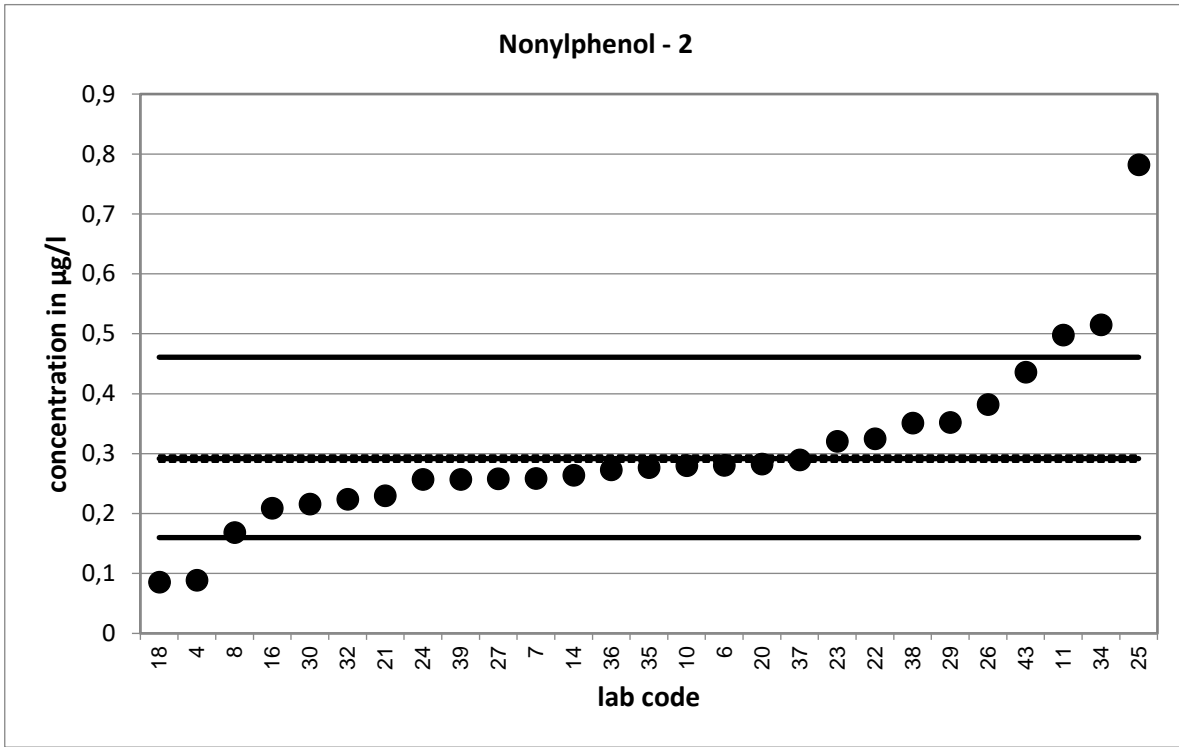


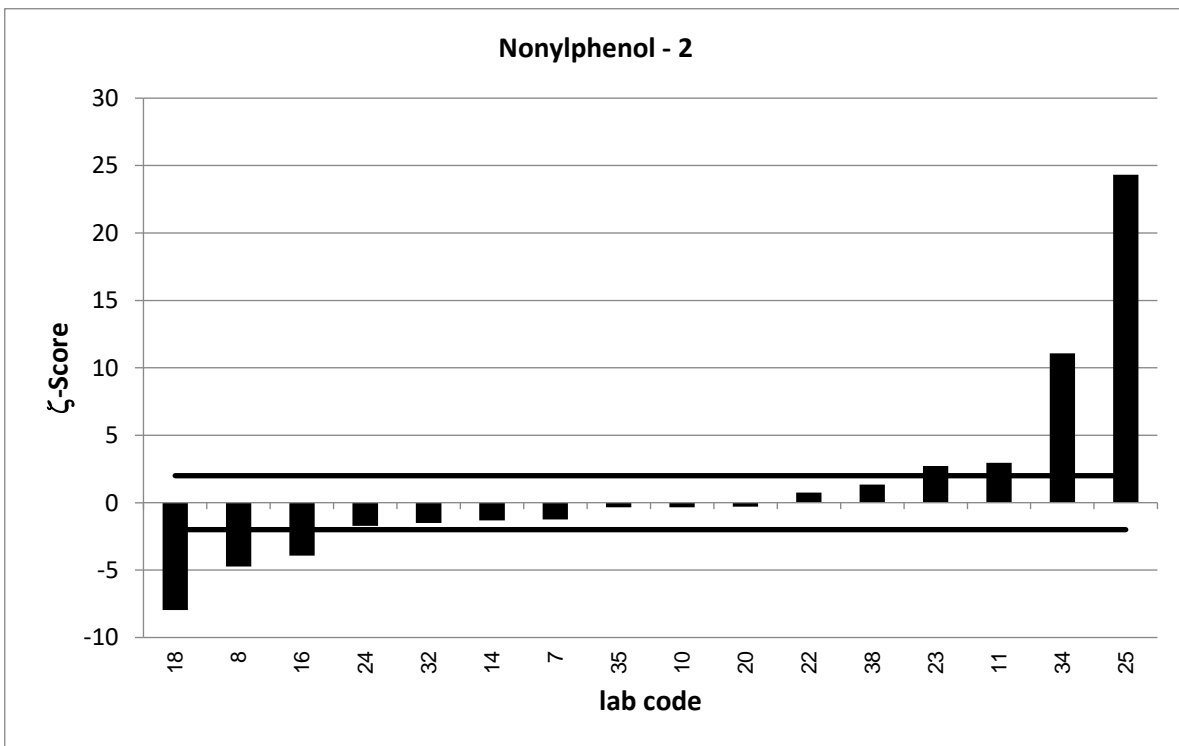
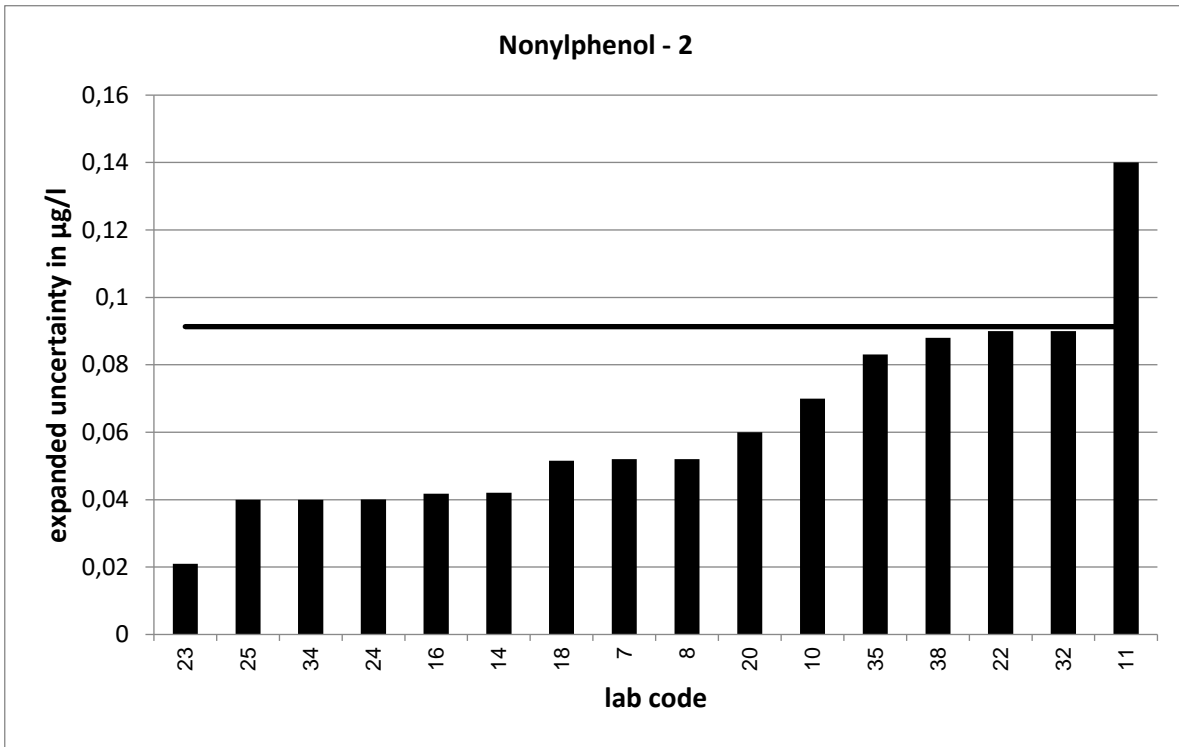


PT 3/20 TW S3		Nonylphenol - 2			
assigned value [$\mu\text{g/l}$]*		0,2917 \pm 0,0051			
upper tolerance limit [$\mu\text{g/l}$]		0,4608			
lower tolerance limit [$\mu\text{g/l}$]		0,1599			
lab code	result [$\mu\text{g/l}$]	\pm	ζ -score	z_U -score	assessm. **
4	0,0887			-3,1	u
6	0,2805			-0,2	s
7	0,259	0,052	-1,3	-0,5	s
8	0,1683	0,052	-4,7	-1,9	s
10	0,28	0,07	-0,3	-0,2	s
11	0,498	0,14	2,9	2,4	q
14	0,264	0,042	-1,3	-0,4	s
16	0,209	0,0418	-3,9	-1,3	s
18	0,0858	0,0515	-8,0	-3,1	u
20	0,283	0,06	-0,3	-0,1	s
21	0,23			-0,9	s
22	0,325	0,09	0,7	0,4	s
23	0,321	0,021	2,7	0,3	s
24	0,257	0,0401	-1,7	-0,5	s
25	0,782	0,04	24,3	5,8	u
26	0,382			1,1	s
27	0,258			-0,5	s
29	0,352			0,7	s
30	0,216			-1,1	s
32	0,224	0,09	-1,5	-1,0	s
34	0,515	0,04	11,1	2,6	q
35	0,277	0,0831	-0,4	-0,2	s
36	0,273			-0,3	s
37	0,29			0,0	s
38	0,351	0,088	1,3	0,7	s
39	0,2573			-0,5	s
43	0,4361			1,7	s

* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor $k=2$ corresponding to a confidence level of about 95%

** s = satisfactory, q = questionable, u = unsatisfactory

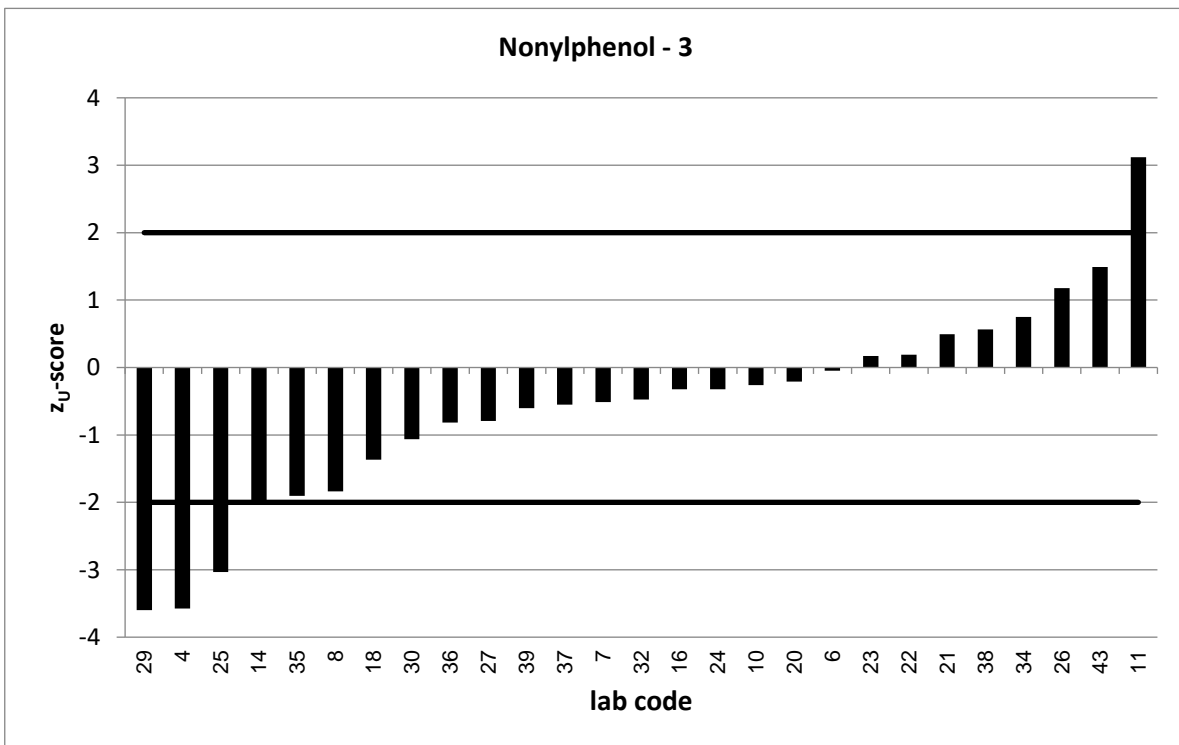
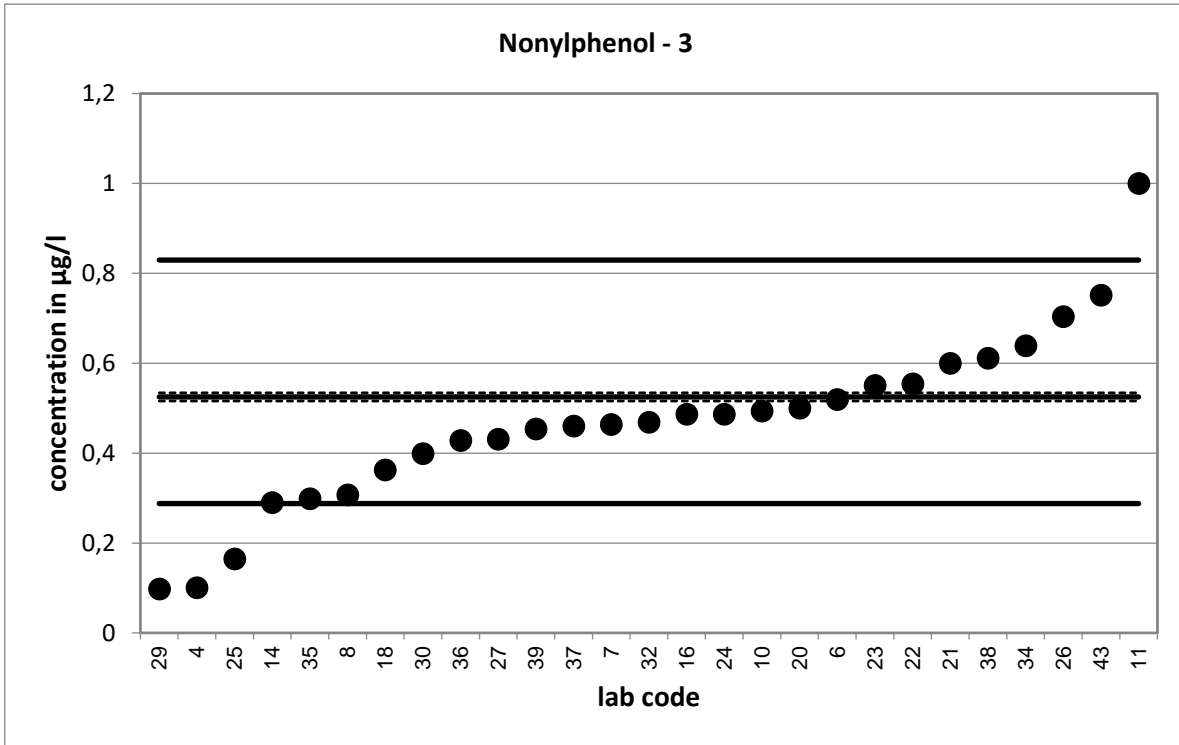


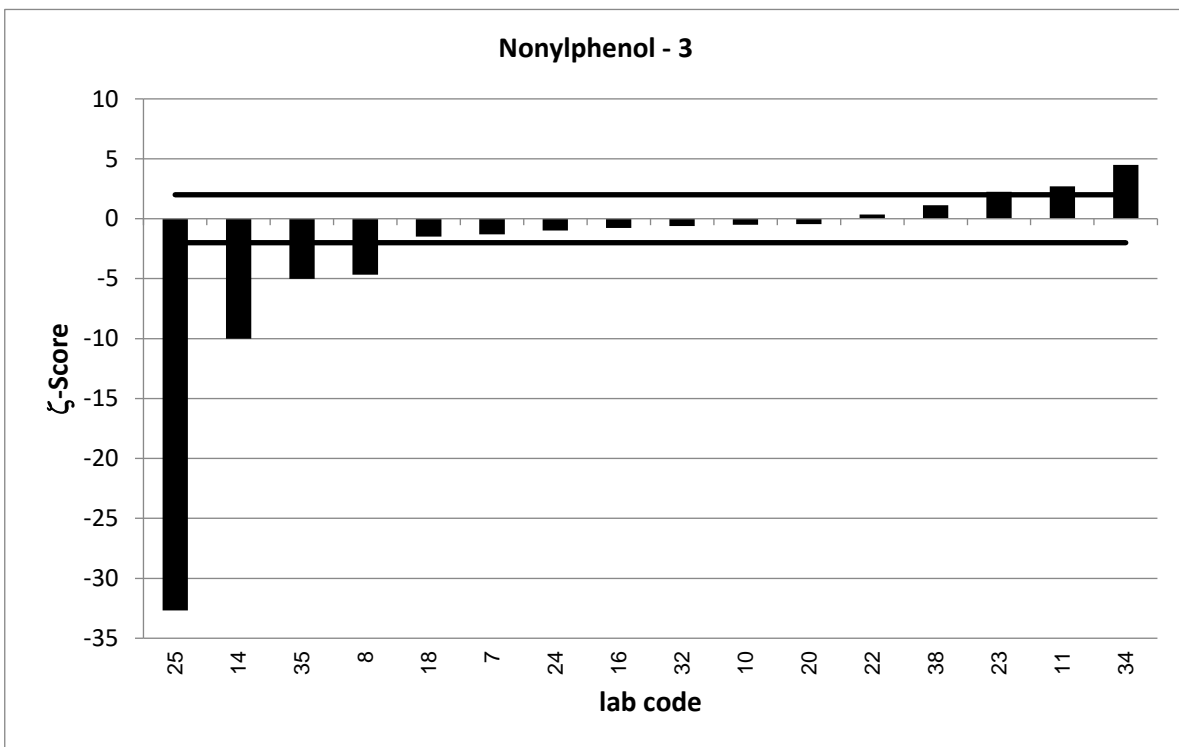
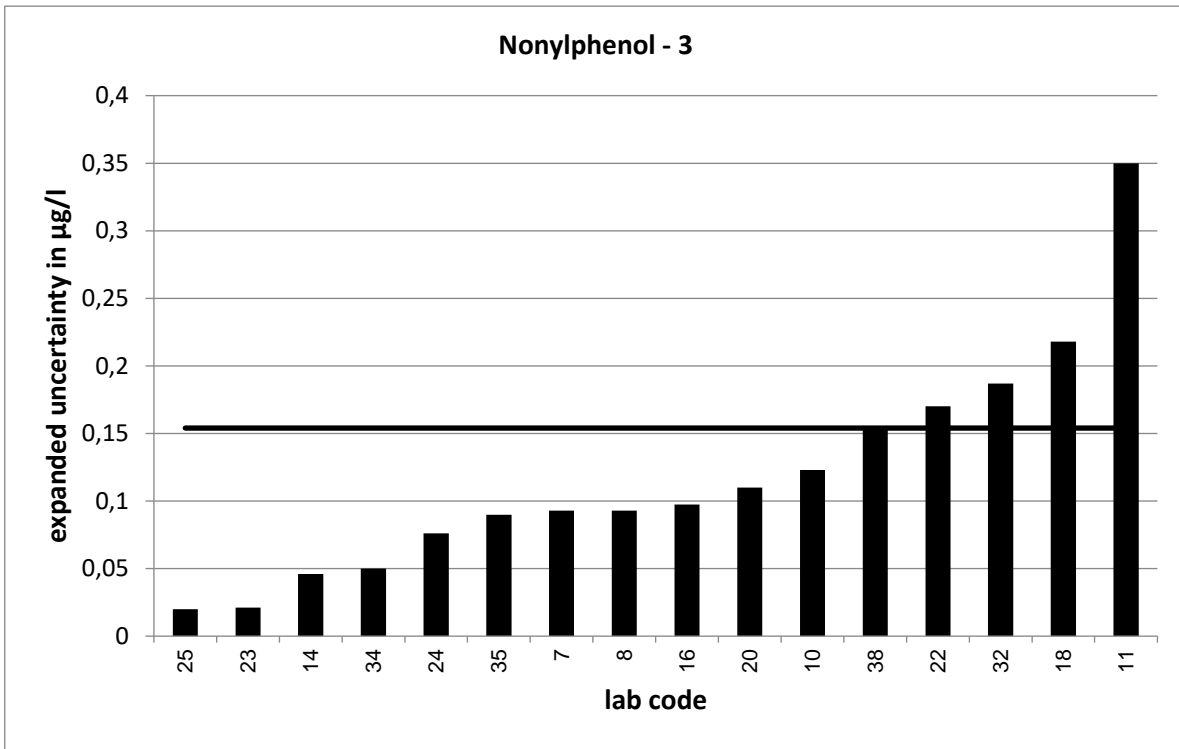


PT 3/20 TW S3		Nonylphenol - 3			
assigned value [$\mu\text{g/l}$]*		0,5251 \pm 0,0092			
upper tolerance limit [$\mu\text{g/l}$]		0,8295			
lower tolerance limit [$\mu\text{g/l}$]		0,2878			
lab code	result [$\mu\text{g/l}$]	\pm	ζ -score	z_U -score	assessm. **
4	0,101			-3,6	u
6	0,5193			0,0	s
7	0,464	0,093	-1,3	-0,5	s
8	0,307	0,093	-4,7	-1,8	s
10	0,494	0,123	-0,5	-0,3	s
11	1	0,35	2,7	3,1	u
14	0,29	0,046	-10,0	-2,0	s
16	0,487	0,0974	-0,8	-0,3	s
18	0,363	0,218	-1,5	-1,4	s
20	0,5	0,11	-0,5	-0,2	s
21	0,6			0,5	s
22	0,554	0,17	0,3	0,2	s
23	0,551	0,021	2,3	0,2	s
24	0,487	0,076	-1,0	-0,3	s
25	0,165	0,02	-32,7	-3,0	u
26	0,704			1,2	s
27	0,431			-0,8	s
29	0,098			-3,6	u
30	0,399			-1,1	s
32	0,469	0,187	-0,6	-0,5	s
34	0,639	0,05	4,5	0,7	s
35	0,299	0,0897	-5,0	-1,9	s
36	0,428			-0,8	s
37	0,46			-0,5	s
38	0,611	0,153	1,1	0,6	s
39	0,4536			-0,6	s
43	0,7518			1,5	s

* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor $k=2$ corresponding to a confidence level of about 95%

** s = satisfactory, q = questionable, u = unsatisfactory

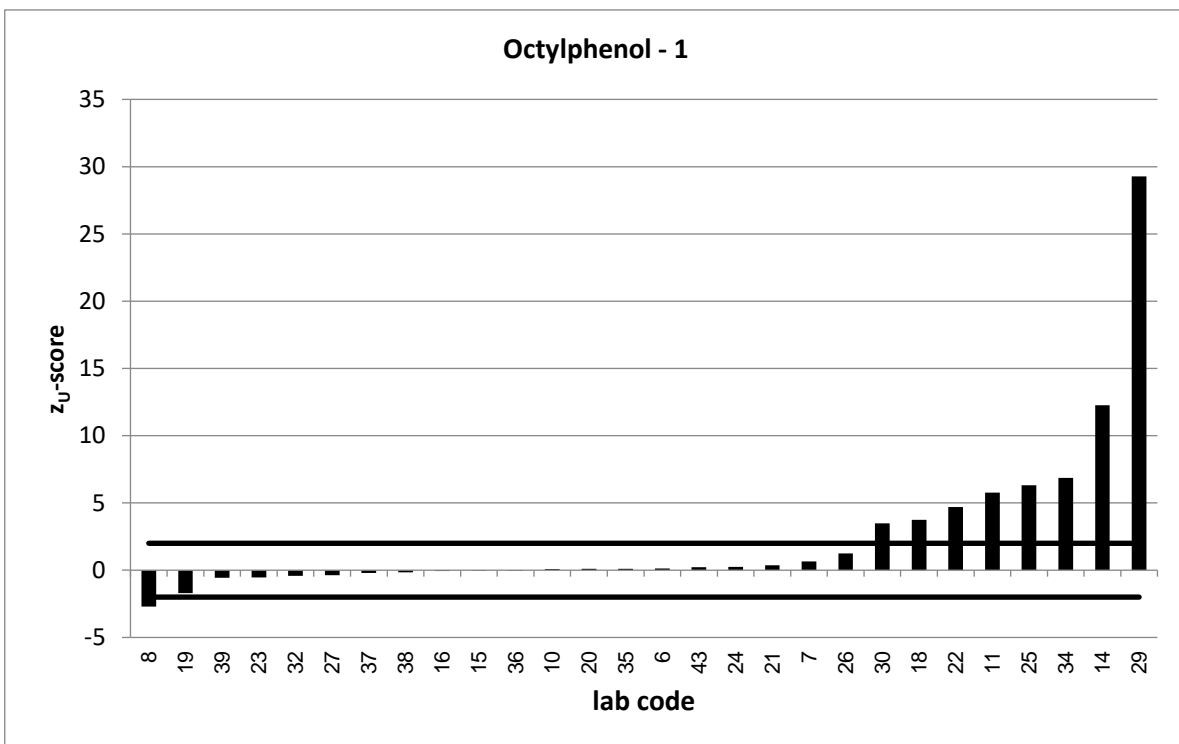
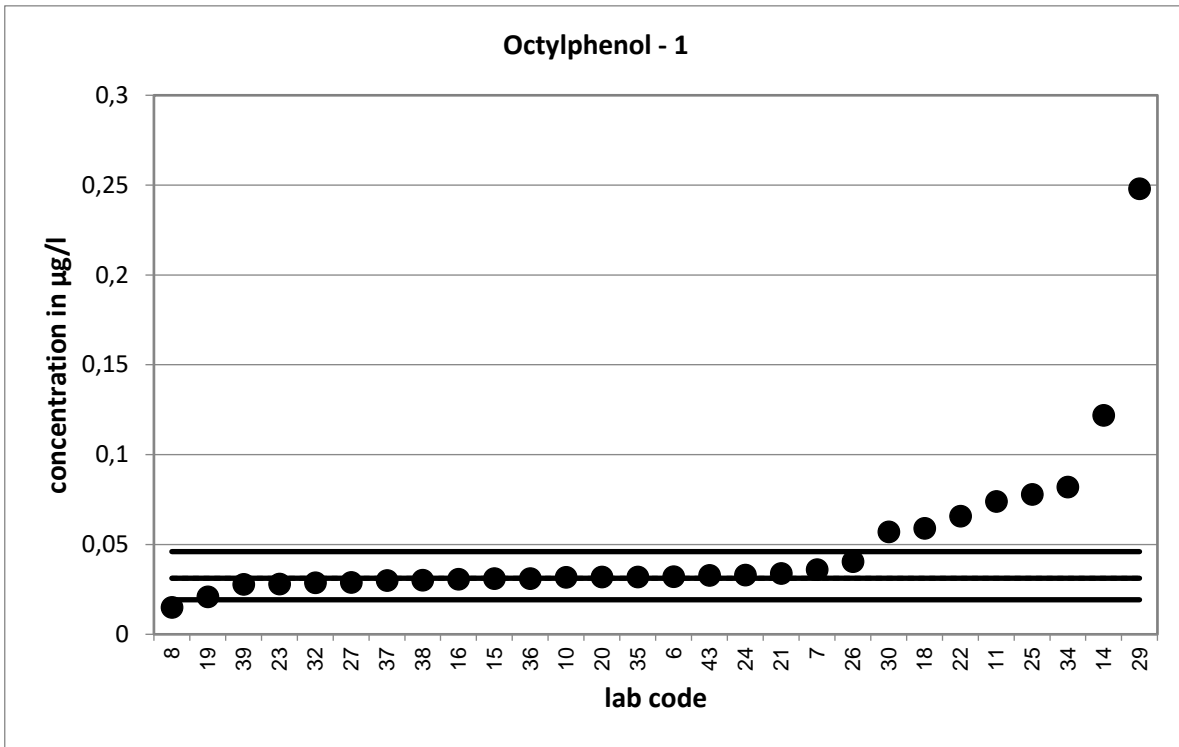


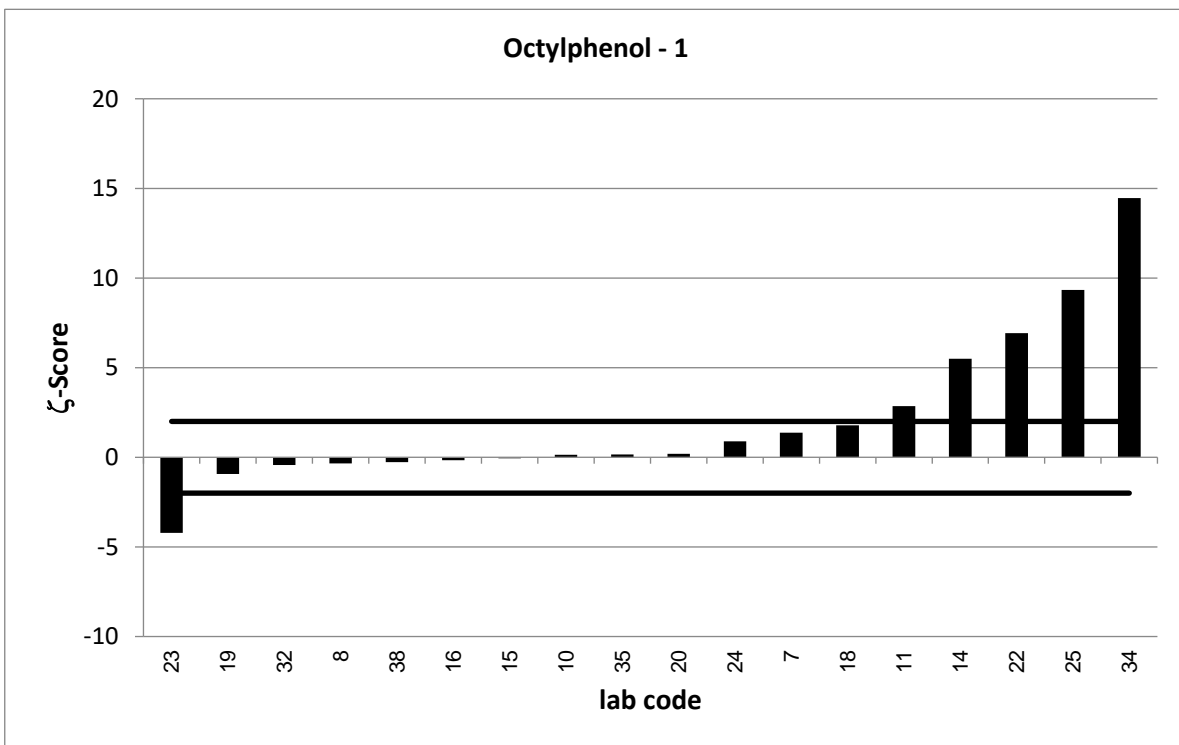
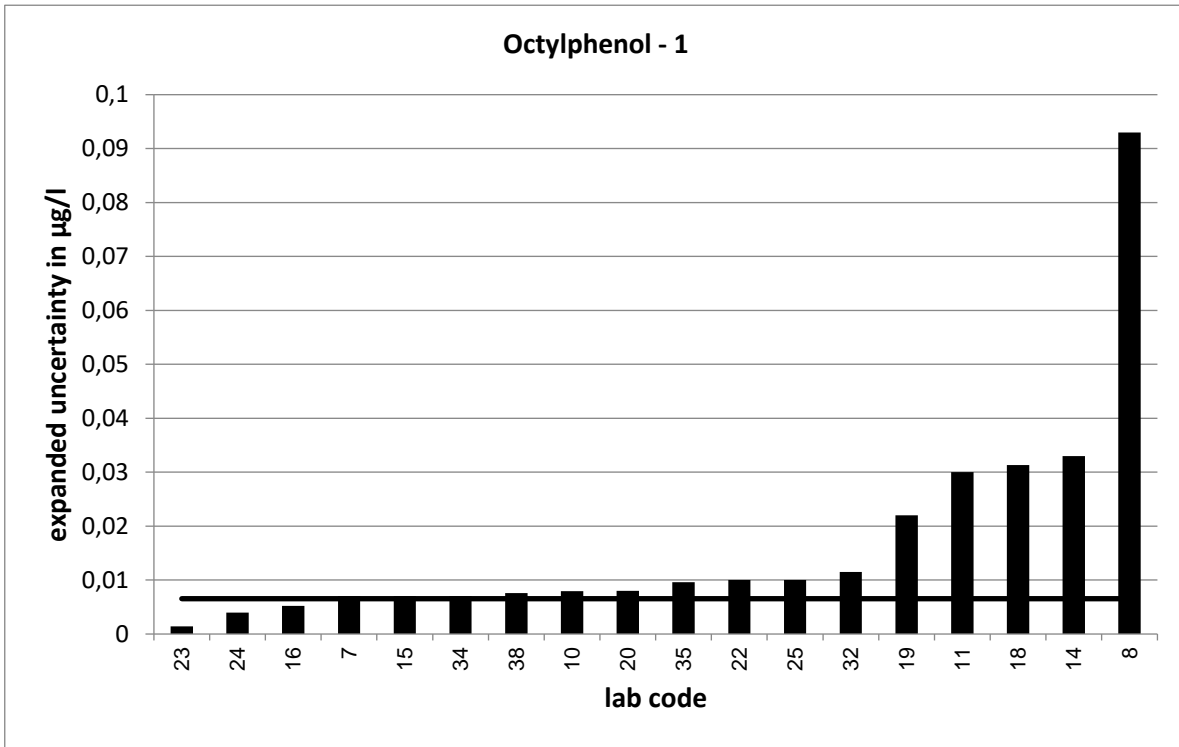


PT 3/20 TW S3		Octylphenol - 1			
assigned value [$\mu\text{g/l}$]*		0,03121 \pm 0,0006			
upper tolerance limit [$\mu\text{g/l}$]		0,04602			
lower tolerance limit [$\mu\text{g/l}$]		0,01922			
lab code	result [$\mu\text{g/l}$]	\pm	ζ -score	z_U -score	assessm. **
6	0,0321			0,1	s
7	0,036	0,007	1,4	0,6	s
8	0,015	0,093	-0,3	-2,7	q
10	0,0318	0,00794	0,1	0,1	s
11	0,074	0,03	2,9	5,8	u
14	0,122	0,033	5,5	12,3	u
15	0,031	0,007	-0,1	0,0	s
16	0,0308	0,00524	-0,2	-0,1	s
18	0,059	0,0313	1,8	3,8	u
19	0,021	0,022	-0,9	-1,7	s
20	0,032	0,008	0,2	0,1	s
21	0,034			0,4	s
22	0,0659	0,01	6,9	4,7	u
23	0,028	0,0014	-4,2	-0,5	s
24	0,033	0,00396	0,9	0,2	s
25	0,078	0,01	9,3	6,3	u
26	0,0405			1,3	s
27	0,029			-0,4	s
29	0,248			29,3	u
30	0,057			3,5	u
32	0,0287	0,0115	-0,4	-0,4	s
34	0,082	0,007	14,5	6,9	u
35	0,032	0,0096	0,2	0,1	s
36	0,031			0,0	s
37	0,03			-0,2	s
38	0,0302	0,0076	-0,3	-0,2	s
39	0,0279			-0,6	s
43	0,0329			0,2	s

* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor $k=2$ corresponding to a confidence level of about 95%

** s = satisfactory, q = questionable, u = unsatisfactory

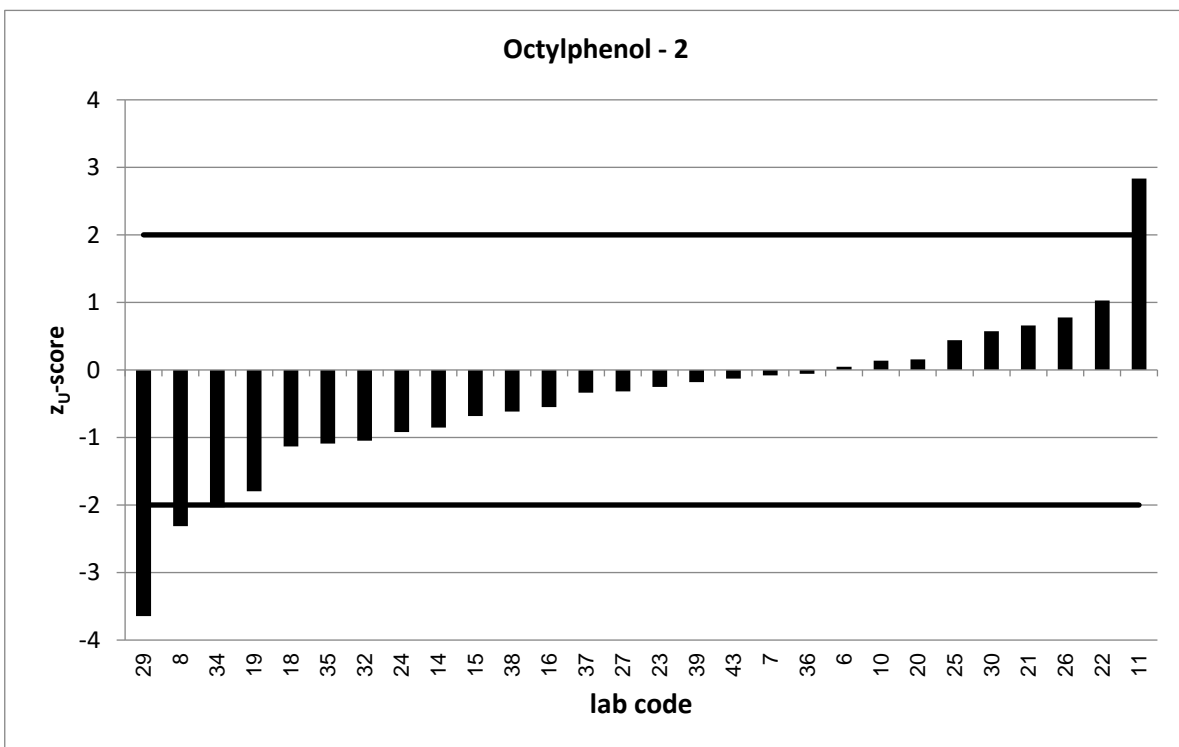
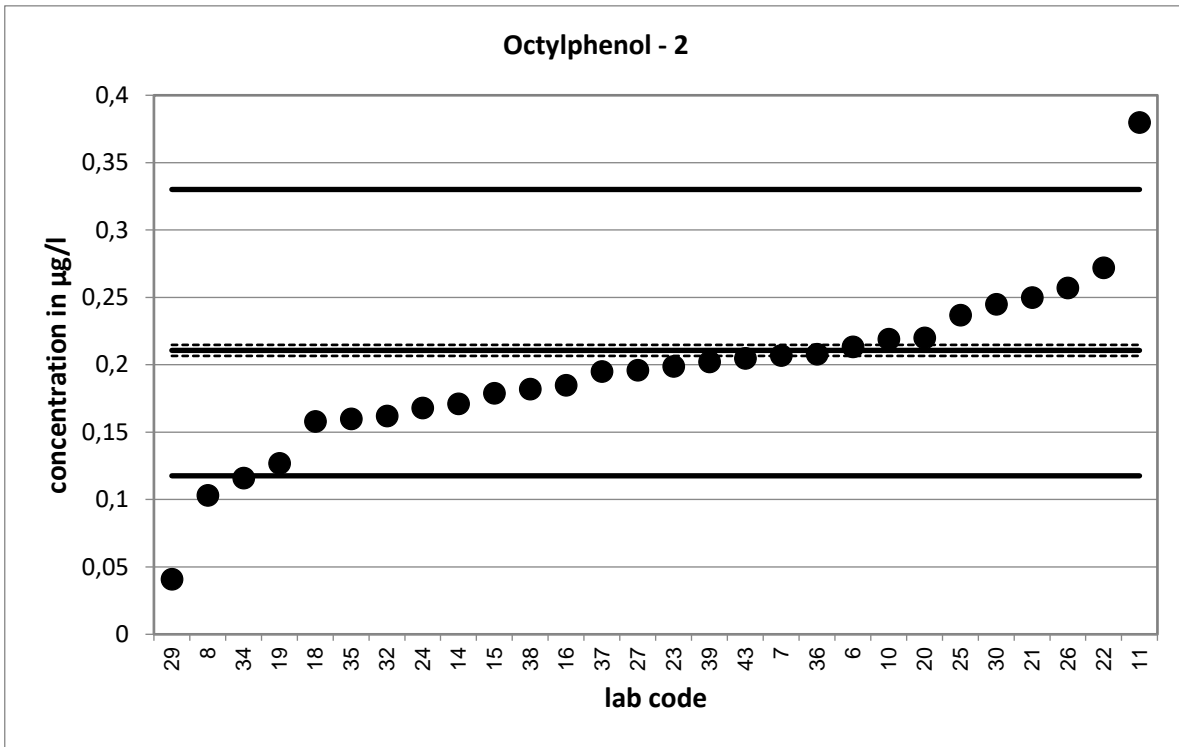


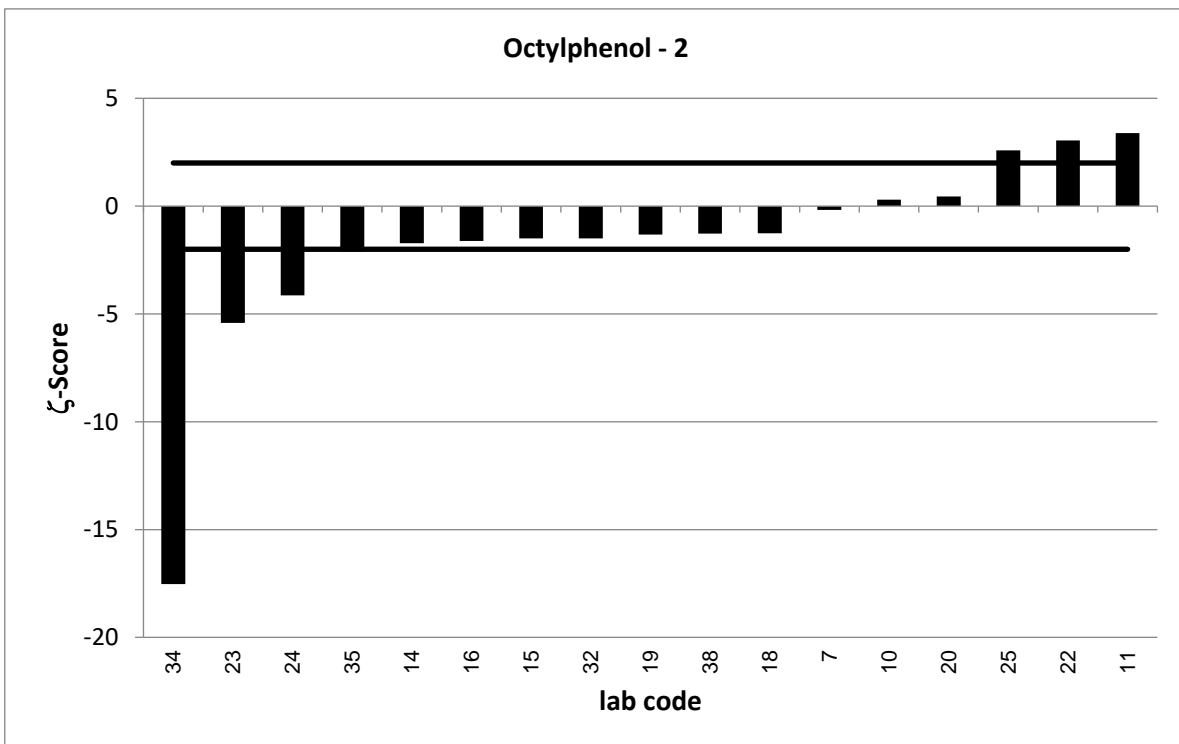
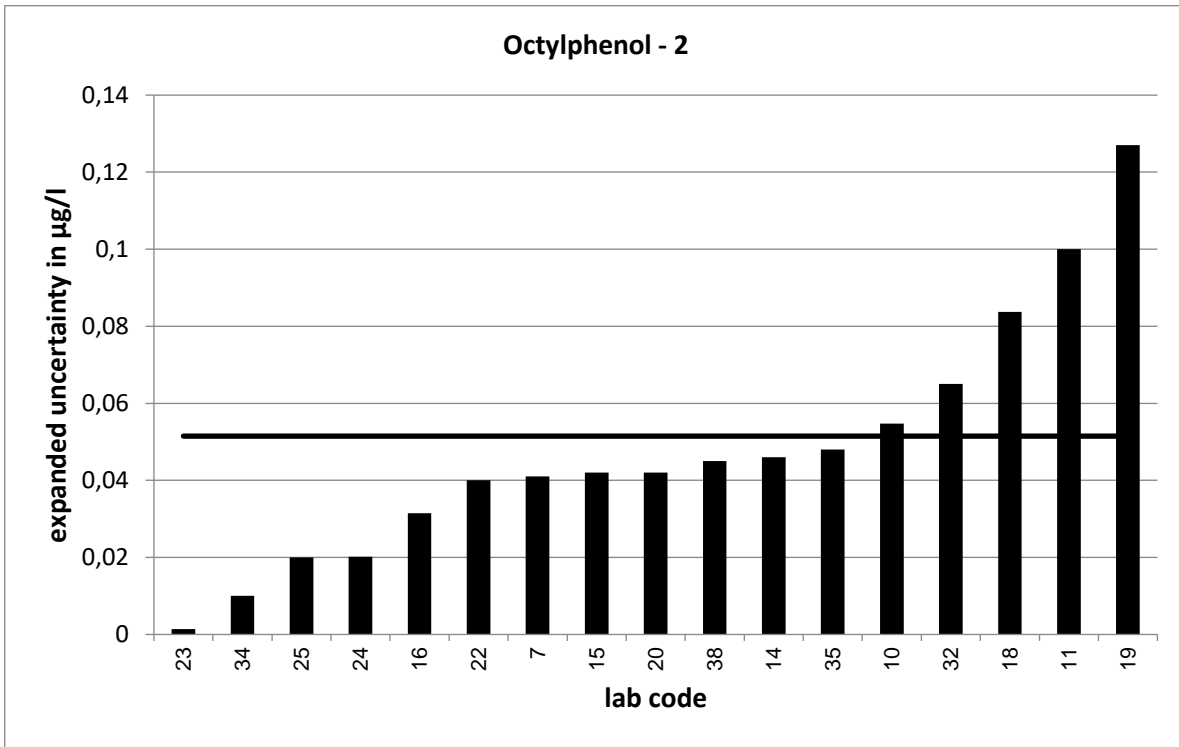


PT 3/20 TW S3		Octylphenol - 2			
assigned value [$\mu\text{g/l}$]*		0,2107 \pm 0,0041			
upper tolerance limit [$\mu\text{g/l}$]		0,3301			
lower tolerance limit [$\mu\text{g/l}$]		0,1176			
lab code	result [$\mu\text{g/l}$]	\pm	ζ -score	z_U -score	assessm. **
6	0,2134			0,0	s
7	0,207	0,041	-0,2	-0,1	s
8	0,1031			-2,3	q
10	0,219	0,0547	0,3	0,1	s
11	0,38	0,1	3,4	2,8	q
14	0,171	0,046	-1,7	-0,9	s
15	0,179	0,042	-1,5	-0,7	s
16	0,185	0,0315	-1,6	-0,6	s
18	0,158	0,0837	-1,3	-1,1	s
19	0,127	0,127	-1,3	-1,8	s
20	0,22	0,042	0,4	0,2	s
21	0,25			0,7	s
22	0,272	0,04	3,1	1,0	s
23	0,199	0,0014	-5,4	-0,3	s
24	0,168	0,0202	-4,1	-0,9	s
25	0,237	0,02	2,6	0,4	s
26	0,257			0,8	s
27	0,196			-0,3	s
29	0,041			-3,6	u
30	0,245			0,6	s
32	0,162	0,065	-1,5	-1,0	s
34	0,116	0,01	-17,5	-2,0	s
35	0,16	0,048	-2,1	-1,1	s
36	0,208			-0,1	s
37	0,195			-0,3	s
38	0,182	0,045	-1,3	-0,6	s
39	0,2022			-0,2	s
43	0,2048			-0,1	s

* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor $k=2$ corresponding to a confidence level of about 95%

** s = satisfactory, q = questionable, u = unsatisfactory

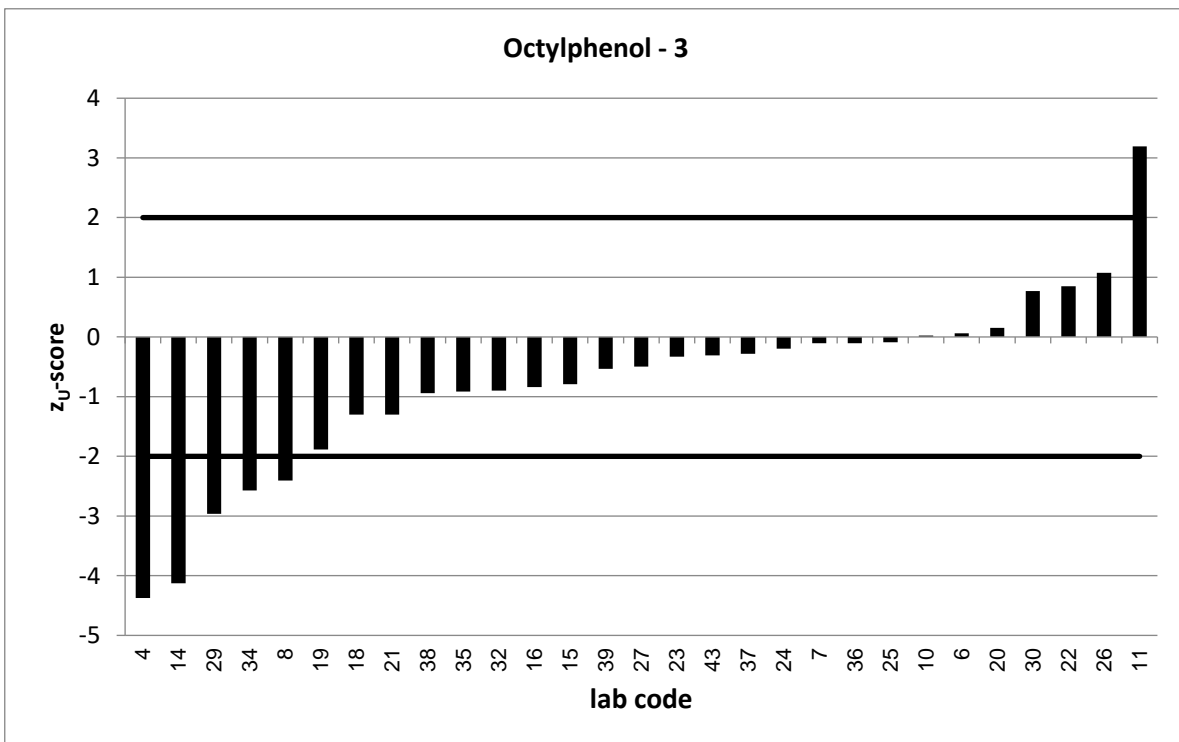
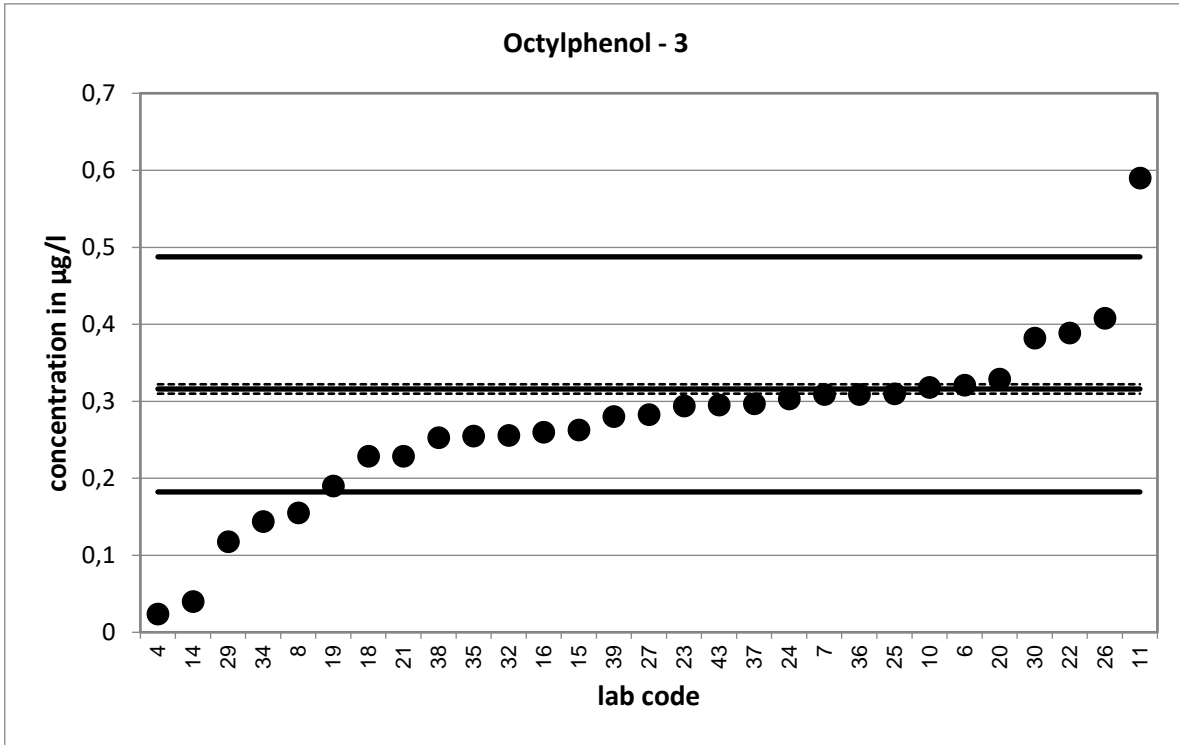


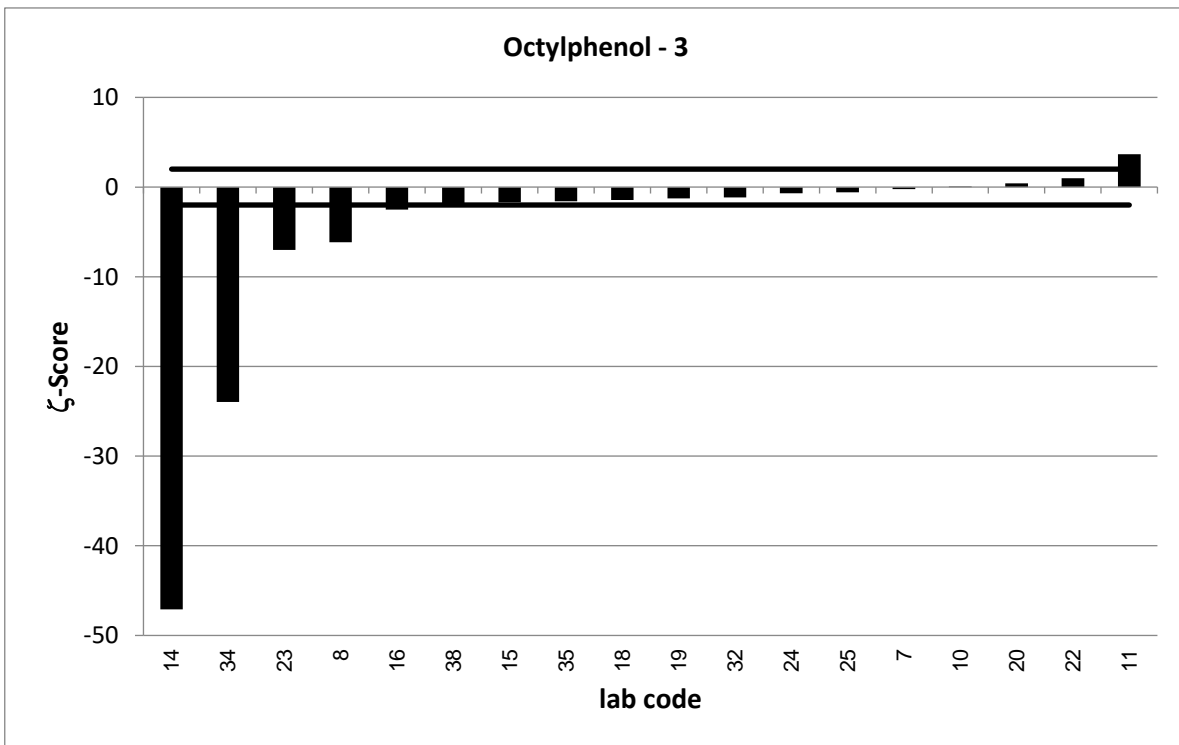
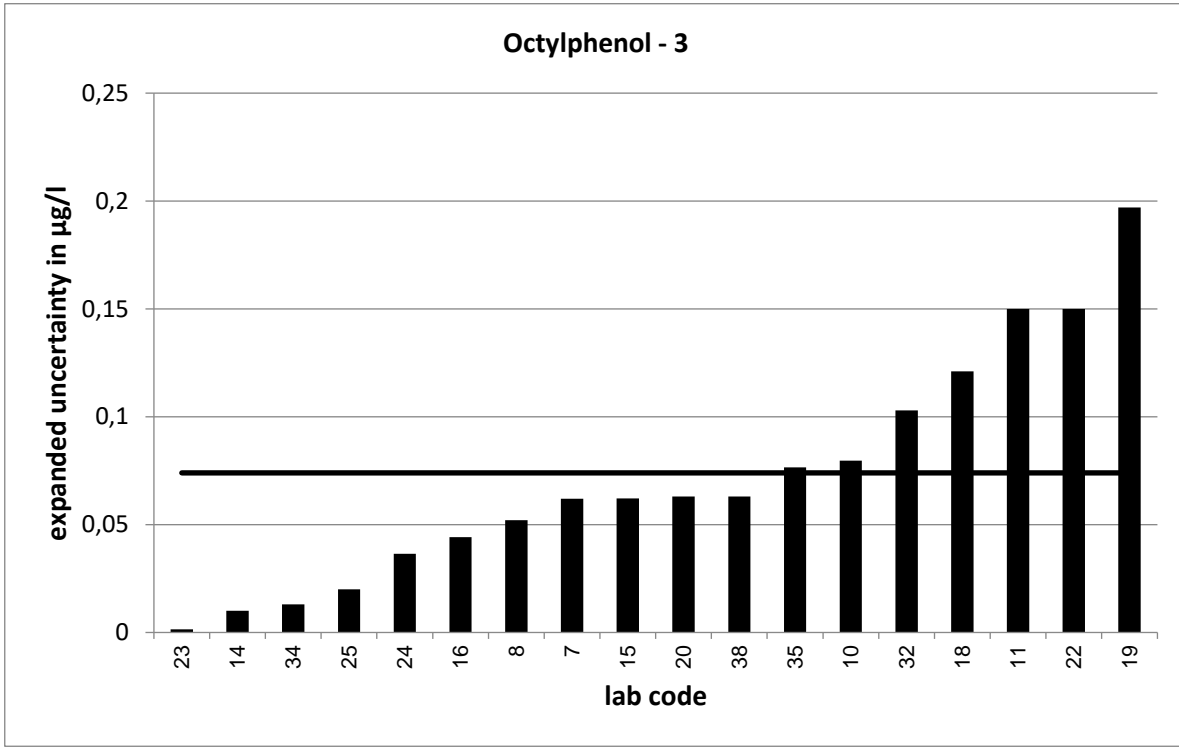


PT 3/20 TW S3		Octylphenol - 3			
assigned value [$\mu\text{g/l}$]*		0,316 \pm 0,0061			
upper tolerance limit [$\mu\text{g/l}$]		0,4876			
lower tolerance limit [$\mu\text{g/l}$]		0,1823			
lab code	result [$\mu\text{g/l}$]	\pm	ζ -score	z_U -score	assessm. **
4	0,0237			-4,4	u
6	0,3211			0,1	s
7	0,309	0,062	-0,2	-0,1	s
8	0,1552	0,052	-6,1	-2,4	q
10	0,318	0,0796	0,0	0,0	s
11	0,59	0,15	3,7	3,2	u
14	0,04	0,01	-47,1	-4,1	u
15	0,263	0,0622	-1,7	-0,8	s
16	0,26	0,0442	-2,5	-0,8	s
18	0,229	0,121	-1,4	-1,3	s
19	0,19	0,197	-1,3	-1,9	s
20	0,329	0,063	0,4	0,2	s
21	0,229			-1,3	s
22	0,389	0,15	1,0	0,9	s
23	0,294	0,0014	-7,0	-0,3	s
24	0,303	0,0364	-0,7	-0,2	s
25	0,31	0,02	-0,6	-0,1	s
26	0,408			1,1	s
27	0,283			-0,5	s
29	0,118			-3,0	u
30	0,382			0,8	s
32	0,256	0,103	-1,2	-0,9	s
34	0,144	0,013	-23,9	-2,6	q
35	0,255	0,0765	-1,6	-0,9	s
36	0,309			-0,1	s
37	0,297			-0,3	s
38	0,253	0,063	-2,0	-0,9	s
39	0,2802			-0,5	s
43	0,2953			-0,3	s

* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor $k=2$ corresponding to a confidence level of about 95%

** s = satisfactory, q = questionable, u = unsatisfactory

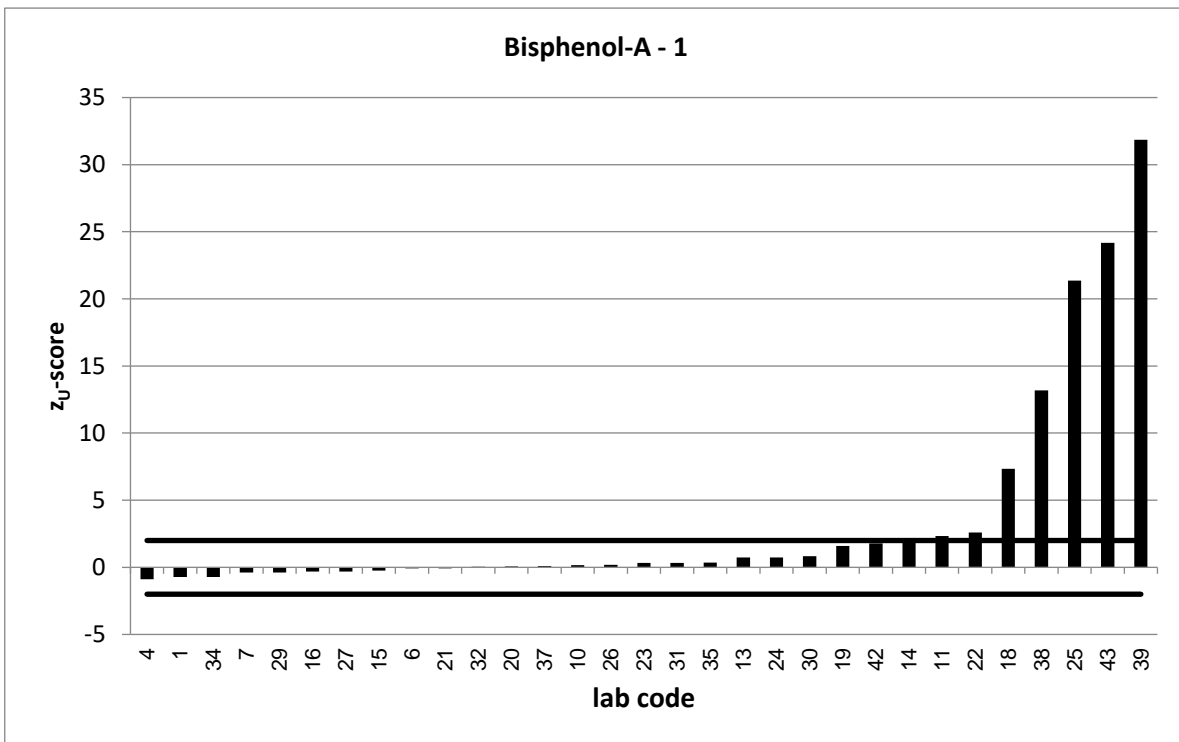
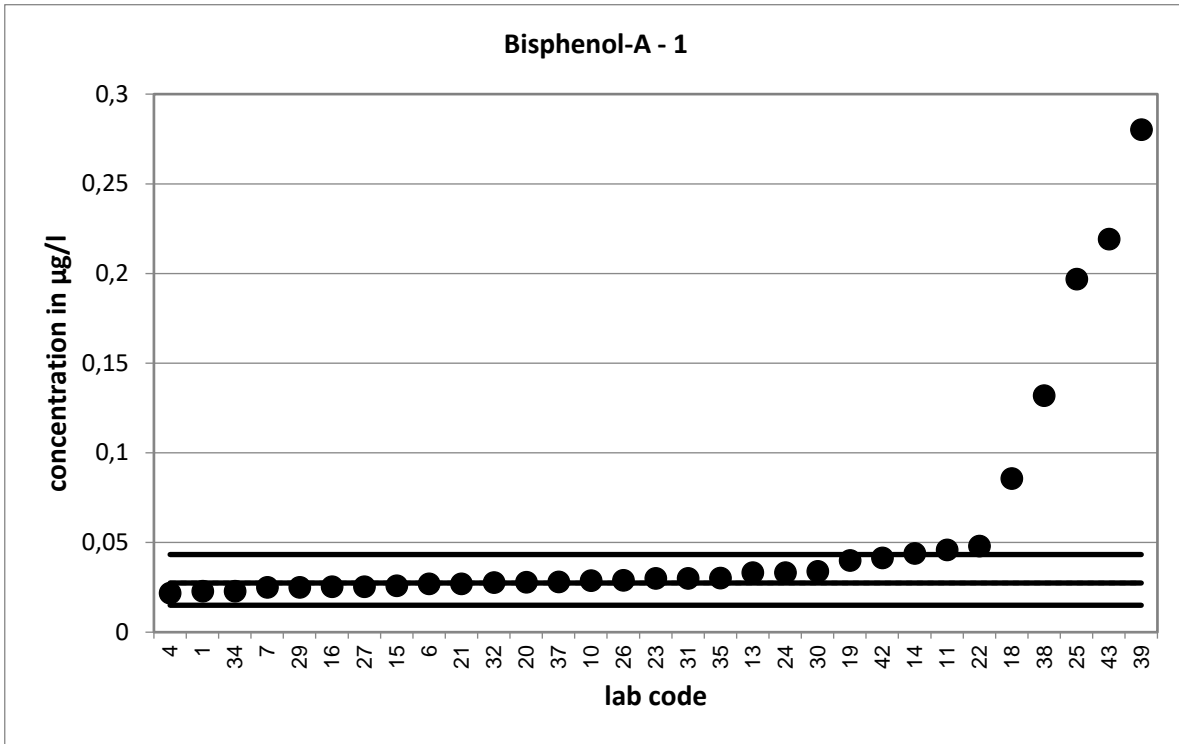


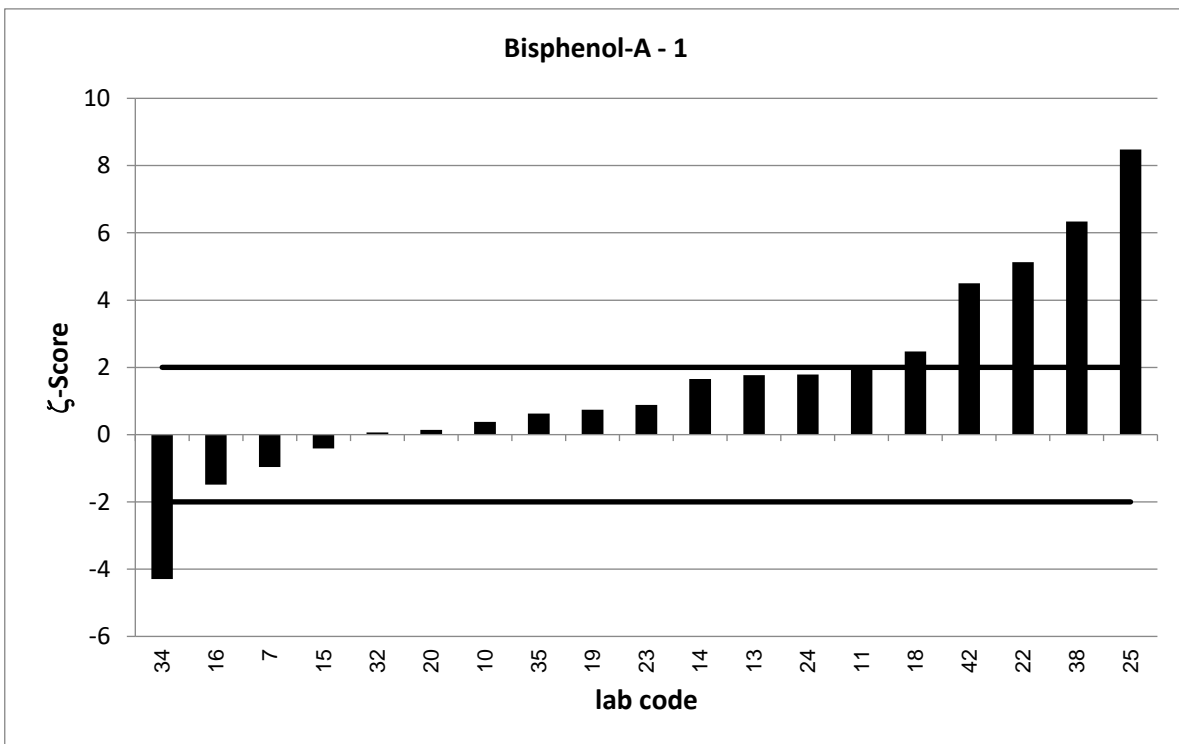
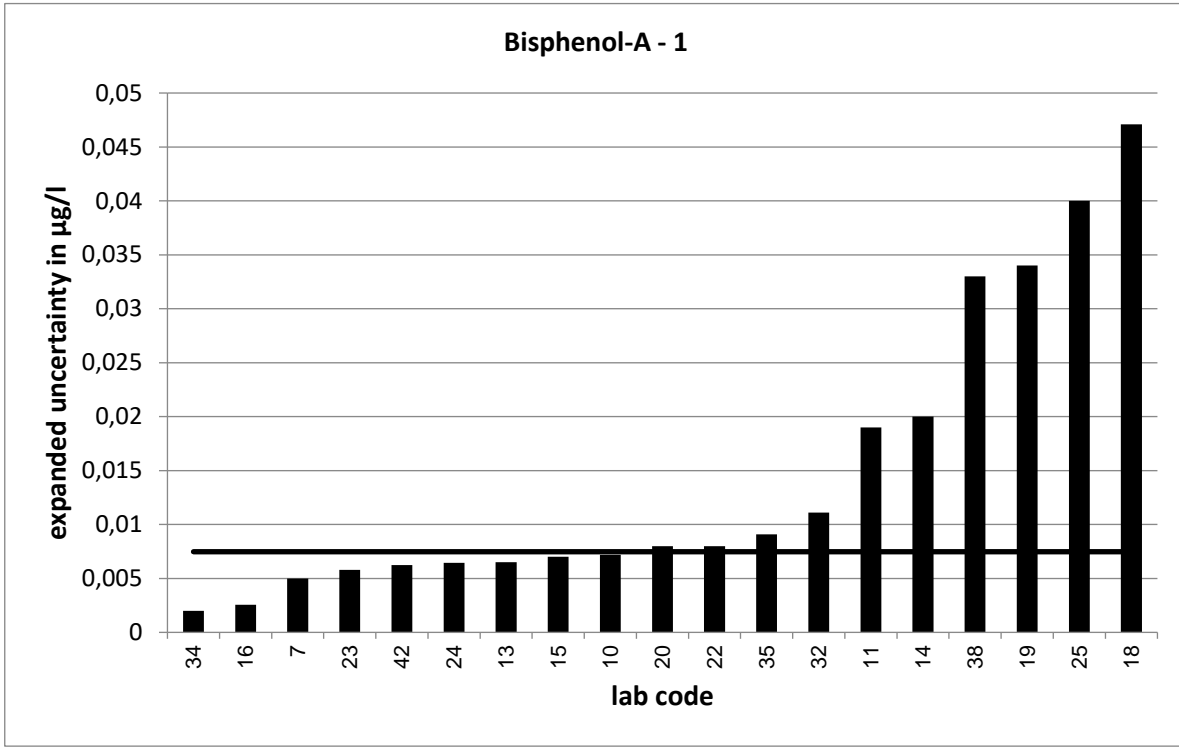


PT 3/20 TW S3		Bisphenol-A - 1			
assigned value [$\mu\text{g/l}$]*		0,02743 \pm 0,00051			
upper tolerance limit [$\mu\text{g/l}$]		0,0433			
lower tolerance limit [$\mu\text{g/l}$]		0,01502			
lab code	result [$\mu\text{g/l}$]	\pm	ζ -score	z_U -score	assessm. **
1	0,023			-0,7	s
4	0,0219			-0,9	s
6	0,027			-0,1	s
7	0,025	0,005	-1,0	-0,4	s
10	0,0288	0,0072	0,4	0,2	s
11	0,046	0,019	2,0	2,3	q
13	0,0332	0,0065	1,8	0,7	s
14	0,044	0,02	1,7	2,1	q
15	0,026	0,007	-0,4	-0,2	s
16	0,0255	0,00255	-1,5	-0,3	s
18	0,0857	0,0471	2,5	7,3	u
19	0,04	0,034	0,7	1,6	s
20	0,028	0,008	0,1	0,1	s
21	0,027			-0,1	s
22	0,048	0,008	5,1	2,6	q
23	0,03	0,0058	0,9	0,3	s
24	0,0332	0,00644	1,8	0,7	s
25	0,197	0,04	8,5	21,4	u
26	0,029			0,2	s
27	0,0255			-0,3	s
29	0,025			-0,4	s
30	0,034			0,8	s
31	0,03			0,3	s
32	0,0278	0,0111	0,1	0,0	s
34	0,023	0,002	-4,3	-0,7	s
35	0,0303	0,00909	0,6	0,4	s
37	0,0281			0,1	s
38	0,132	0,033	6,3	13,2	u
39	0,2802			31,9	u
42	0,0415	0,00623	4,5	1,8	s
43	0,2192			24,2	u

* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor $k=2$ corresponding to a confidence level of about 95%

** s = satisfactory, q = questionable, u = unsatisfactory

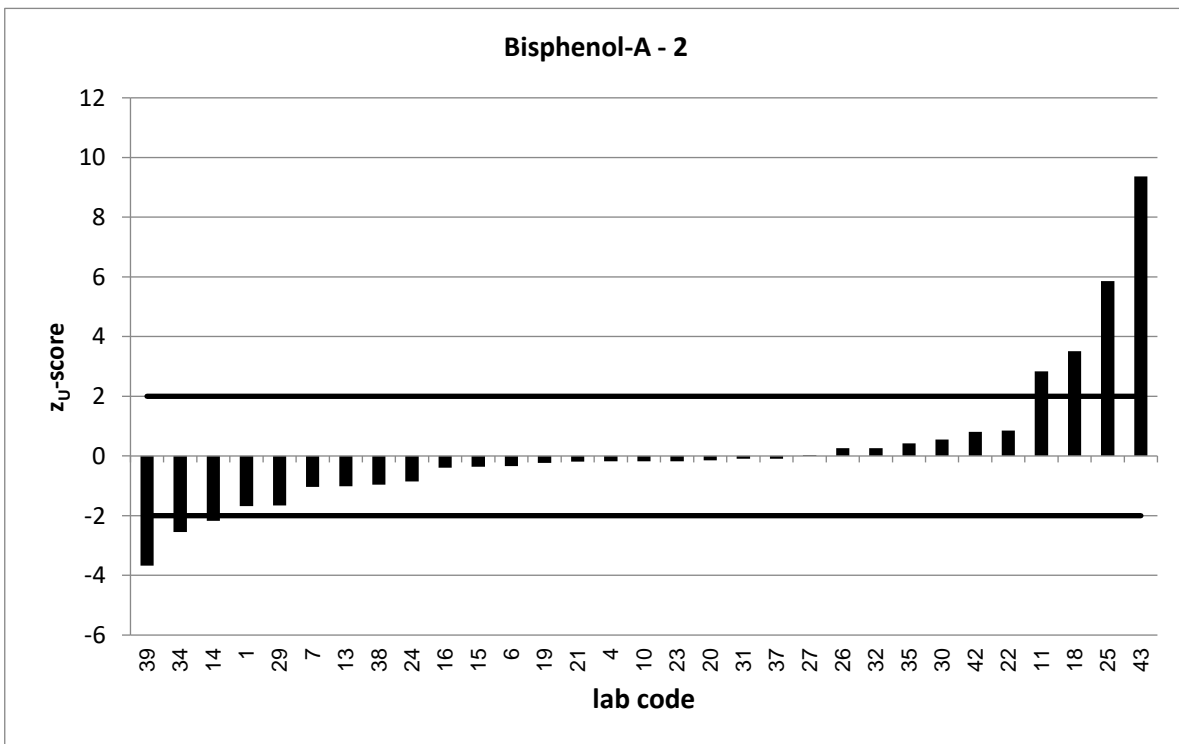
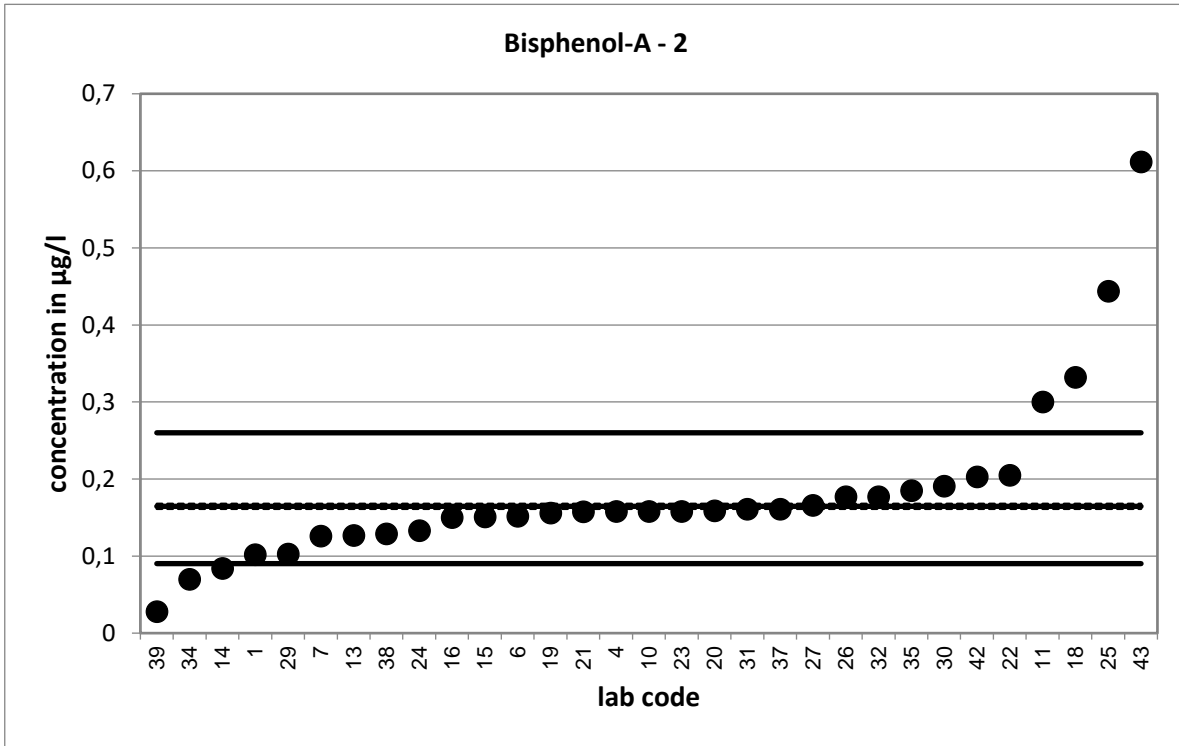


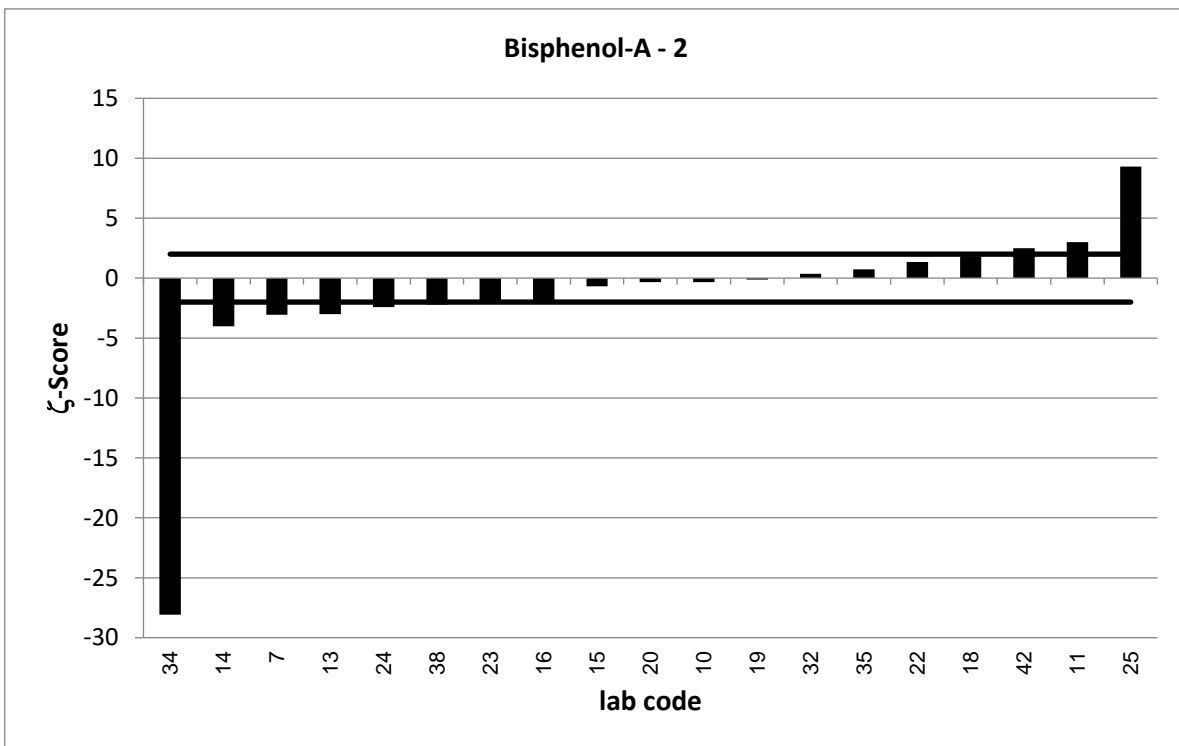
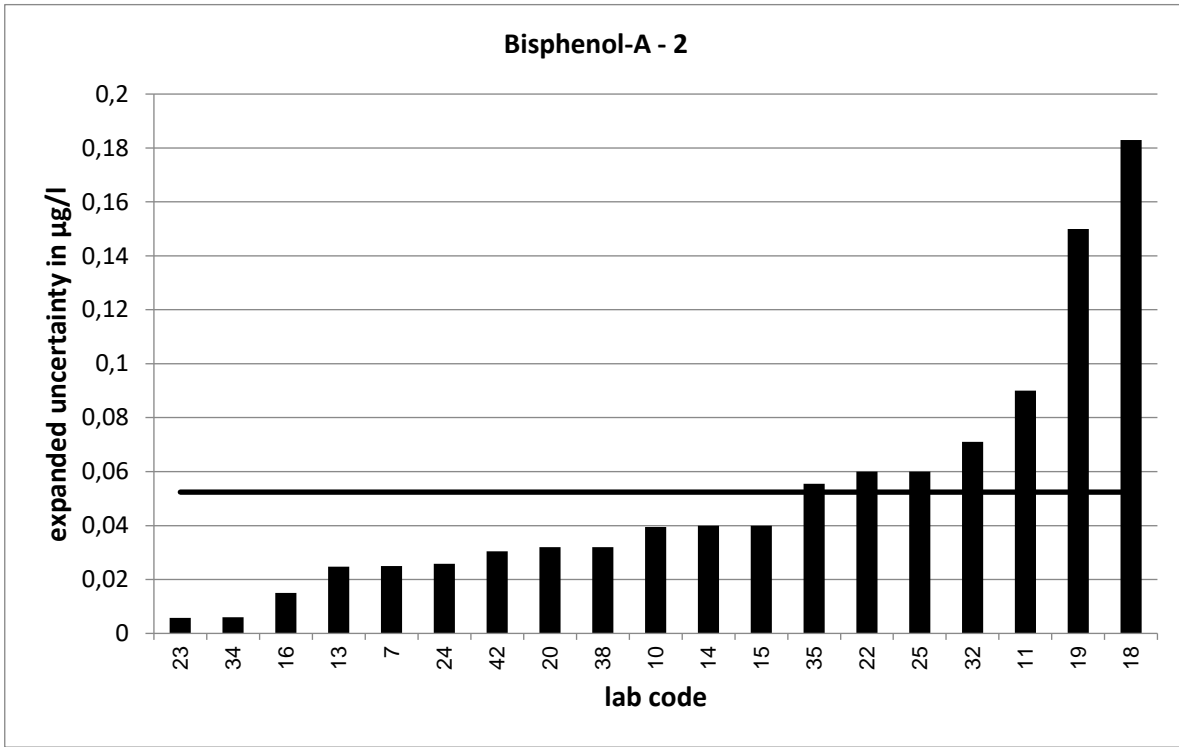


PT 3/20 TW S3		Bisphenol-A - 2			
assigned value [$\mu\text{g/l}$]*		0,1646 \pm 0,0031			
upper tolerance limit [$\mu\text{g/l}$]		0,26			
lower tolerance limit [$\mu\text{g/l}$]		0,09021			
lab code	result [$\mu\text{g/l}$]	\pm	ζ -score	z_U -score	assessm. **
1	0,102			-1,7	s
4	0,158			-0,2	s
6	0,1519			-0,3	s
7	0,126	0,025	-3,1	-1,0	s
10	0,158	0,0395	-0,3	-0,2	s
11	0,3	0,09	3,0	2,8	q
13	0,127	0,0248	-3,0	-1,0	s
14	0,084	0,04	-4,0	-2,2	q
15	0,151	0,04	-0,7	-0,4	s
16	0,15	0,015	-1,9	-0,4	s
18	0,332	0,183	1,8	3,5	u
19	0,156	0,15	-0,1	-0,2	s
20	0,159	0,032	-0,3	-0,2	s
21	0,1577			-0,2	s
22	0,205	0,06	1,3	0,8	s
23	0,158	0,0058	-2,0	-0,2	s
24	0,133	0,0258	-2,4	-0,8	s
25	0,444	0,06	9,3	5,9	u
26	0,177			0,3	s
27	0,166			0,0	s
29	0,103			-1,7	s
30	0,191			0,6	s
31	0,161			-0,1	s
32	0,177	0,071	0,3	0,3	s
34	0,07	0,006	-28,1	-2,5	q
35	0,185	0,0555	0,7	0,4	s
37	0,161			-0,1	s
38	0,129	0,032	-2,2	-1,0	s
39	0,0279			-3,7	u
42	0,203	0,0305	2,5	0,8	s
43	0,6115			9,4	u

* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor $k=2$ corresponding to a confidence level of about 95%

** s = satisfactory, q = questionable, u = unsatisfactory





PT 3/20 TW S3		Bisphenol-A - 3			
assigned value [$\mu\text{g/l}$]*		0,3703 \pm 0,0069			
upper tolerance limit [$\mu\text{g/l}$]		0,5357			
lower tolerance limit [$\mu\text{g/l}$]		0,2376			
lab code	result [$\mu\text{g/l}$]	\pm	ζ -score	z_U -score	assessm. **
1	0,248			-1,8	s
4	0,306			-1,0	s
6	0,3413			-0,4	s
7	0,355	0,071	-0,4	-0,2	s
10	0,36	0,0901	-0,2	-0,2	s
11	0,609	0,18	2,7	2,9	q
13	0,327	0,064	-1,3	-0,7	s
14	0,071	0,035	-16,8	-4,5	u
15	0,344	0,09	-0,6	-0,4	s
16	0,327	0,0327	-2,6	-0,7	s
18	0,254	0,14	-1,7	-1,8	s
19	0,333	0,337	-0,2	-0,6	s
20	0,335	0,067	-1,0	-0,5	s
21	0,3745			0,1	s
22	0,492	0,05	4,8	1,5	s
23	0,342	0,0058	-6,3	-0,4	s
24	0,399	0,0774	0,7	0,3	s
25	0,228	0,04	-7,0	-2,1	q
26	0,374			0,0	s
27	0,351			-0,3	s
29	0,194			-2,7	q
30	0,373			0,0	s
31	0,362			-0,1	s
32	0,348	0,139	-0,3	-0,3	s
34	0,122	0,011	-38,2	-3,7	u
35	0,451	0,135	1,2	1,0	s
37	0,367			0,0	s
38	0,218	0,054	-5,6	-2,3	q
39	0,1233			-3,7	u
42	0,443	0,0665	2,2	0,9	s
43	1,7255			16,4	u

* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor $k=2$ corresponding to a confidence level of about 95%

** s = satisfactory, q = questionable, u = unsatisfactory

