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LABORATORY NUMBER: Available to participants from FAPAS SecureWeb

FAPAS® Proficiency Test 1565

Nitrate in Spinach Purée

January - March 2010

Report

Prepared on behalf of FAPAS® by

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0009 PT

SUMMARY

1. The test material for FAPAS® proficiency test 1565 was dispatched in January 2010. Each participant received a spinach purée test material to be analysed for nitrate. In total 89 sets of test material were distributed to participants in 23 countries. Of these, 84 participants, i.e. 94%, returned results within the time-scale demanded by the Scheme.

2. The assigned value for nitrate was calculated from the most appropriate measure of central tendency of participants' results [1, 2].

3. The target standard deviation (σ_p) was calculated using the appropriate form of the Horwitz equation [3] and in conjunction with the assigned value ($\hat{X}$) was used to derive a z-score for participants' results. z-Scores are considered satisfactory if $|z| \leq 2$.

4. Results for this test are summarised as follows:

analyte	assigned value $\hat{X}$ mg/kg	number of satisfactory scores $\|z\| \leq 2$	total number of scores	satisfactory %
nitrate	614	73	84	87

5. Surplus test materials are available for sale, see APPENDIX III.

6. Whereas this report has been produced in good faith and in accordance with best industry practice, neither the Food and Environment Research Agency nor the Secretary of State for Environment, Food and Rural Affairs accepts any liability whatsoever as to the application or use of the information contained therein.

CONTENTS

1. INTRODUCTION

1.1. Proficiency Testing

The demand for independent proof of competence from regulatory bodies and customers means that proficiency testing is relevant to all laboratories testing food and feed for quality and safety in every country. Hence, it is a requirement of accreditation to ISO 17025 [4] that the laboratory takes part in a proficiency testing scheme, if a suitable scheme exists. Further, for laboratories entrusted with the official control of food and feeds, Article 12 of EU Regulation (EC) 882/2004 [5] requires such laboratories to be assessed and accredited in accordance with ISO 17025, i.e. proficiency testing is a legal requirement for these laboratories. Thus, together with the use of validated methods, proficiency testing is an essential element of laboratory quality assurance.

The analysis of an external quality check sample as part of a laboratory's routine procedures provides objective standards for individual laboratories to perform against and permits them to compare their analytical results with those from other laboratories. Such standards and comparisons can go beyond the actual chemical analysis. For example, the ability to report results in specified units and within a given time scale are important aspects of quality. Hence, participants in FAPAS® who submit results after the closing date of a proficiency test are only included in the statistical evaluation if there are extenuating circumstances.

It is important to understand the statistical limitations of this external means of quality assessment when gauging the competence of a laboratory. The results of a typical chemical analysis will be normally distributed. That is to say, the majority of results will be centred on a mean value but, inevitably, some results will lie at the extremes of the distribution. The statistics of a normal distribution mean that about 95% of data points will lie between a z-score of –2 and +2. Performance in a FAPAS® proficiency test, therefore, is considered 'satisfactory' if a participant's z-score lies within this range. It follows that if a participant's z-score lies outside $|z| > 2$ there is about a 1 in 20 chance that their result is in fact an acceptable result from the extreme of the distribution. If a participant's z-score lies outside $|z| > 3$ the chance that their result is actually acceptable is only about 1 in 300.

Full details of the FAPAS® proficiency testing scheme are available via our Protocols [6, 7].

2. TEST MATERIAL

2.1. Preparation

The test materials were prepared by a laboratory contracted to do so by FAPAS®.

13 kg of commercially available frozen whole leaf spinach was purchased. The leaves were cryogenically milled and allowed to vent in a fume cupboard.

The milled spinach was screened and found to contain 611 mg/kg nitrate. The bulk material was placed in a bowl mixer and mixed overnight to produce an homogeneous material.

Individual sub-samples (70 g) were dispensed into plastic screw cap pots and immediately stored at -20°C.

2.2. Homogeneity

Ten randomly selected test materials were analysed in duplicate for nitrate, by a laboratory contracted to do so by FAPAS®. The results, together with their statistical evaluation [8], are given in APPENDIX I. The statistical tests initially check the data for any widely discrepant pairs using Cochran's test. If found, such data are removed. Thereafter the remaining data are subject to analysis of variance (ANOVA) to estimate the sampling and analytical variances.

The test material data show sufficient homogeneity and are not included in the subsequent calculation of the assigned value.

2.3. Distribution

Each participant received an individually numbered spinach purée test material packed with cooling blocks in an insulated box together with a covering letter, electronic submission instructions and the results form for participants with no internet access. The dispatch date was 18 January 2010.

3. RESULTS

Participants were required to report their data for nitrate (as NO_3^-) in mg/kg as received. Results were submitted by 84 participants before the closing date for this proficiency test, 1 March 2010.

Each participant was given a laboratory number, assigned in order of receipt of results. The reported nitrate results are given in Table 1.

The analytical methods used by each participant are summarised in APPENDIX II.

4. STATISTICAL EVALUATION OF RESULTS

The object of the statistical procedure employed is to obtain a simple and transparent result, which the participant and other interested parties can readily appreciate. The procedure follows that recommended in the IUPAC/ISO/AOAC International Harmonised Protocol for the Proficiency Testing of Analytical Chemistry Laboratories [9].

4.1. Calculation of the Assigned Value, $\hat{X}$

The assigned value, $\hat{X}$, i.e. the best estimate of the true concentration of nitrate, was set as the consensus of the results submitted by participants. The procedure used to derive this consensus involved:

Considering the normality (Kolmogorov-Smirnov test), or otherwise, of the distribution of results.

Minimising the influence of outliers by the use of a robust statistical procedure to derive the mean [1].

Assessing the uncertainty (u) of the robust mean:

$$u = \frac{\hat{\sigma}}{\sqrt{n}}$$

where $\hat{\sigma}$ = the robust standard deviation [1]
NB this is NOT the target standard deviation for the test (σ_p)

and n = the number of data points used to calculate the robust mean.

This process was straightforward and the robust mean was considered to be the best estimate of the true value and was therefore used to set the assigned value. This, together with u, n and $\hat{\sigma}$, is shown in Table 2.

4.2. Target Standard Deviation for the Proficiency Test, σ_p

The value of σ_p determines the limits of satisfactory performance in a FAPAS® proficiency test. It is set at a value that reflects best practice for the analyses in question. The standard deviation of reproducibility found in collaborative trials is generally considered an appropriate indicator of the best agreement that can be obtained between laboratories. However, not all analyses have been characterised in this manner. In such cases, the predictive models of the appropriate form of the Horwitz equation [3] are valuable indicators of best practice.

A comparison of methods and an associated collaborative trial have been undertaken [10]. The RSD_R from this study closely agrees with that predicted from the Horwitz equation [3]. Similarly, an EU Regulation [11] recommends that RSD_R is derived from the Horwitz equation. This equation predicts a standard deviation from a given concentration, c, and requires c to be expressed as a dimensionless mass ratio, e.g. 1 ppm ≡ 10^{-6} or % ≡ 10^{-2}. It follows therefore that to express the dimensionless standard deviation predicted by the equation in the original concentration units it must be divided by the relevant mass ratio:

i) for analyte concentrations <120 ppb

$$\sigma_p = \frac{0.22c}{mr}$$

ii) for analyte concentrations 120 ppb and ≤13.8%

$$\sigma_p = \frac{0.02c^{0.8495}}{mr}$$

iii) for analyte concentrations >13.8%

$$\sigma_p = \frac{0.01c^{0.5}}{mr}$$

where, in all three cases, c = concentration, i.e. the assigned value, $\hat{X}$, expressed as a dimensionless mass ratio, e.g. 1 ppm 10^{-6} or % ≡ 10^{-2}

and mr = dimensionless mass ratio, e.g. 1 ppm 10^{-6} or % ≡ 10^{-2}.

The value of $_p$ used to calculate z-scores from the reported results in this proficiency test is given in Table 2.

4.3. Individual z-Scores

Participants' z-scores were calculated as:

$$z = \frac{(x - \hat{X})}{\sigma_p}$$

where x = the participant's reported result,

$\hat{X}$ = the assigned value

and σ_p = the target standard deviation.

Participants' z-scores are given in Table 1 and shown as a histogram in Figure 1.

It is possible for the z-scores published in this report to differ slightly from the z-score that can be calculated using the formula given above. These differences arise from the necessary rounding of the actual assigned value and target standard deviation prior to their publication in Table 2.

The number and percentage of z-scores in the satisfactory range, $|z| \le 2$ is given in Table 3.

5. REFERENCES

1 Analytical Methods Committee, 1989, Robust Statistics – How not to reject outliers Part 1. Basic Concepts, *Analyst*, **114**, 1693-1697.

2 Lowthian, P.J. and Thompson, M., 2002, Bump-hunting for the proficiency tester – searching for multimodality, *Analyst*, **127**, 1359-1364.

3 Thompson, M., 2000, Recent trends in inter-laboratory precision at ppb and sub-ppb concentrations in relation to fitness for purpose criteria in proficiency testing, *Analyst*, **125**, 385-386.

4 ISO/IEC 17025:2005, General requirements for the competence of testing and calibration laboratories.

5 Regulation (EC) 882/2004 of the European Parliament and of the Council of 29 April 2004 on official controls performed to ensure the verification of compliance with feed and food law, animal health and animal welfare rules, *Official Journal*, **L 165**, 30/04/2004, 0001-0141.

6 FAPAS®, 2009, Protocol for Proficiency Testing Schemes, Part 1 – Common Principles, Revision 2009, Version 1, Issued November 2009.

7 FAPAS®, 2009, Protocol for Proficiency Testing Schemes, Part 2 – FAPAS®, Revision 2009, Version 1, Issued November 2009.

8 Fearn, T. and Thompson, M., 2001, A new test for sufficient homogeneity, *Analyst*, **126**, 1414-1417.

9 Thompson, M., Ellison, S.L.R. and Wood, R., 2006, The International Harmonised Protocol for the Proficiency Testing of Analytical Chemistry Laboratories, *Pure Appl. Chem.*, **78 (1)**, 145-196.

10 Farrington, D., Damant, A.P., Powell, K., Ridsdale, J., Walker, M. and Wood, R., 2006, A Comparison of the Extraction Methods used in the UK Nitrate Residues Monitoring Program, *Journal of the Association of Public Analysts*, **34**, 1-11.

11 Regulation (EC) 1882/2006 of the European Parliament and of the Council of 19 December 2006 laying down methods of sampling and analysis for the official control of the levels of nitrates in certain foodstuffs, *Official Journal*, **L364**, 20.12.2006, 25-31.

Table 1: Results and z-Scores for Spinach Purée Test Material

laboratory number	analyte: nitrate (assigned value 614 mg/kg) result mg/kg	z-score
001	571	-1.1
002	628	0.4
003	590	-0.6
004	492	**-3.3**
005	645.9	0.9
006	625	0.3
007	621	0.2
008	606.9	-0.2
009	610	-0.1
010	561.55	-1.4
011	678	1.7
012▲	627	0.4
013	547	-1.8
014	584	-0.8
015	631	0.5
016	598	-0.4
017	602	-0.3
018	645	0.8
019	629.53	0.4
020	547	-1.8
021	589	-0.7
022	581	-0.9
023	638	0.7
024	568	-1.2
025	652.19	1.0
026	625	0.3
027	603	-0.3
028	549.23	-1.7
029	616	0.1
030	573	-1.1
031	800	**5.0**
032	598.39	-0.4
033	679	1.8
034	555	-1.6
035	620.2	0.2
036	604	-0.3
037	711	**2.6**
038	584	-0.8
039	592	-0.6
040	576	-1.0

z-scores outside the satisfactory range, i.e. |z| >2, are shown in **bold**
results are as submitted by participants
comments submitted by participants:
= alternative determination with IC: 620 mg Nitrate/kg

Table 1 (continued): Results and z-Scores for Spinach Purée Test Material

laboratory number	analyte		laboratory number	analyte	
	nitrate			nitrate	
	assigned value 614	mg/kg		assigned value 614	mg/kg
	result mg/kg	z-score		result mg/kg	z-score
041	597	-0.4	063	627	0.4
042	553	-1.6	064	609.4	-0.1
043	597	-0.4	065	546	-1.8
044	618	0.1	066	635	0.6
045	625	0.3	067	665.6	1.4
046	759	**3.9**	068	621.38	0.2
047	655	1.1	069	606.00	-0.2
048	580	-0.9	070	578	-1.0
049	592	-0.6	071	804	**5.1**
050	520	**-2.5**	072	652	1.0
051	637.8	0.6	073	600.05	-0.4
052	666	1.4	074	660	1.2
053	634	0.5	075	701.27	**2.3**
054	606	-0.2	076	635	0.6
055	715	**2.7**	077	635.99	0.6
056	573	-1.1	078	753	**3.7**
057	634	0.5	079	539	-2.0
058	644	0.8	080	645	0.8
059	596	-0.5	081	685	1.9
060	602.97	-0.3	082	532	**-2.2**
061	589	-0.7	083	552	-1.6
062	709.3	**2.6**	084	590	-0.6

z-scores outside the satisfactory range, i.e. |z| >2, are shown in **bold**
results are as submitted by participants

Table 2: Assigned Value and Target Standard Deviation

analyte	assigned value mg/kg				target standard deviation	
	data points, n	robust mean, $\hat{X}$	robust standard deviation, $\hat{\sigma}$	uncertainty, u	derived from	σ_p
nitrate	84	614	47.6	5.20	Horwitz*	37.4

* see page 6 for the appropriate form of the Horwitz equation

Table 3: Number and Percentage of Satisfactory z-Scores

analyte	number of satisfactory scores $\|z\| \le 2$	total number of results	satisfactory %
nitrate	73	84	87

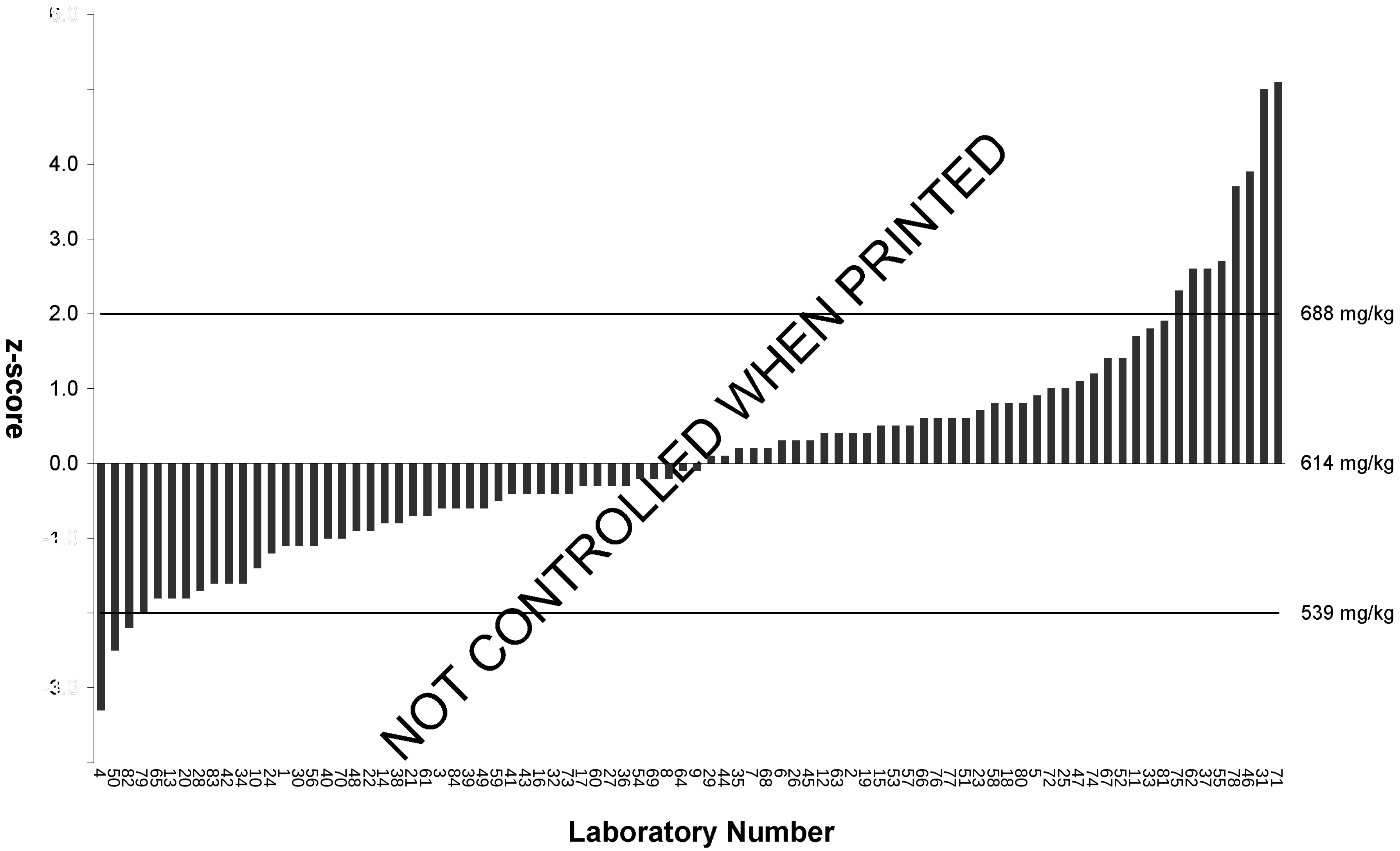

Figure 1: z-Scores for Nitrate (614 mg/kg) in Spinach Purée Test Material

APPENDIX I: Homogeneity Data for Spinach Purée Test Material

sample i.d.	analyte nitrate mg/kg	
	replicate 1	replicate 2
1	612	613
2	620	627
3	607	638
4	611	611
5	621	622
6	622	615
7	617	617
8	615	611
9	604	620
10	610	620
mean, n	617	20
origin of target sd (σ_p)	Horwitz*	original
abs. target sd (σ_p) & RSD_R%	37.51	6.083
s_{an}	8.465	
s_{sam}^2	0.000	
σ_{all}^2	126.6	
critical	310.5	
s_{sam}^2<*critical*?	**ACCEPT**	

* see page 6 for the appropriate form of the Horwitz equation

APPENDIX II: Analytical Methods Used by Participants

Notes:

1. Participants' methods are tabulated according to the information supplied electronically, but some responses may have been combined or edited for clarity.

ACCREDITATION AND REFERENCE

Accredited Method Used	laboratory number
yes	002 003 004 005 006 007 008 009 010 011 012 013 015 016 017 018 019 021 026 028 029 030 033 036 038 040 041 042 043 044 045 048 049 050 051 052 053 054 057 058 059 060 061 062 063 064 065 067 068 069 072 073 074 077 078 079 080 082 083
no	001 020 023 024 025 032 034 035 047 055 071 075 076

Reference	laboratory number
AFNOR 1997	042
AFNOR 2006	053
Analyst 1985 110 131-133	071
Analytical Chemistry	006
Analytical Chemistry 1998	028
AOAC Official Methods 1996	034
CICC	061
EN 12014 1997	054
EN 12014-1 1998 1-14	075
EN 12014-2 1997	019(1999) 023 026(1998) 063 072 080
EN 12014-4 2002	002 024
EN 12014-7 1998	011 015
EN 2000	064
EN 2008	056
Enzymatic BioAnalysis	077
Food Additives and Contaminants, modified 1998 15/7 753-758	029
ISO	004 010 057 073
ISO 1998	016 068
ISO 2004	030

REFERENCE CONTINUED

Reference continued	laboratory number
J. Assoc. Off. Anal. Chem. 1978 61	020
J. AOAC Int. 2005 88(6) 1793-1796	079
LMBG Method	008 067
LMBG Method 1990 07.00 12	050
LMBG Method 1990 08.00 14	074
LMBG Method 2001	036 038 082
LMBG Method 2001 07	041
LMBG Method 2001 L 26.00-1	040 083
Manufacturer's Instructions	013 065 069
NMKL 2000	032
NMKL 2000 165	014
R-Biopharm	035 043 058
Roche	058
SLMB	044

SAMPLE PREPARATION

Sample Weight (g)	laboratory number
<1	034
1 - <2	005 028 050 062
≥2 - <5	003 009 012 020 021 023 032 035 043 048 069 082
5 - <10	002 006 007 010 011 013 016 029 036 045 049 052 053 054 056 058 059 064 065 067 068 071 074 078 079 083
≥10 - <25	001 008 017 019 024 030 033 038 040 041 042 044 047 061 063 075 076 077 080
≥25 - <50	004 015 018 026 057
≥50	051 072

SAMPLE PREPARATION CONTINUED

Extraction Procedure	laboratory number
add Na_2CO_3	068
blend / homogenise with solvent	014 021
cold borax	006
cold water extraction	004 010 012 015 021 032 033 052 060
heat	071
hot borax	003 007 009 017 045 049 071
hot water extraction	001 002 005 008 011 013 014 016 017 018 019 020 023 024 025 026 029 030 031 034 035 036 038 040 041 042 043 044 048 050 051 053 054 055 056 057 058 059 061 062 063 064 065 067 069 072 073 074 075 076 077 078 079 080 082 083
hot water extraction with ion stabilisation agent	047
maceration / homogenisation	057 082
shaking	043 074 082
sonicate/ultrasonic bath	051
Ultra Turrax	021 033 040
ultrasonic extraction	040 069
vortex mix	032

Protein Precipitation	laboratory number
yes	020 074
acetonitrile	032
Carrez I & II	003 006 007 009 010 011 017 021 024 029 030 031 034 038 040 043 045 049 050 054 059 062 063 064 067 069 071 073 076 077 078
centrifugation	021
no	001 002 004 005 008 012 013 014 015 016 018 023 025 026 033 035 036 041 042 044 051 052 053 055 056 057 058 060 061 065 072 075 079 080 082 083

SAMPLE PREPARATION CONTINUED

Extraction pH	laboratory number
<6.0	024 056
6.0 - <7.0	007 008 014 025 026 038 050 052 061 075 079 083
>7.0 - <8.0	004 021 035 045 054 058 063 074 082
≥8.0 - <9.0	019 067 068 078
≥9.0 - <10.0	011 059

Filtration Procedure	laboratory number
0.2um nylon	024
45 mm 0.45 micron filter	016
centrifugation	074 082
glass fibre	004 054 079
membrane	005 006 009 021 029 031 032 036 041 044 048 051 052 056 057 064 068 072
nitrate free paper	001 002 007 008 014 018 019 020 023 029 030 033 034 038 043 049 050 055 058 059 060 063 071 073
paper	003 010 011 012 013 015 017 025 026 035 040 042 045 053 061 062 064 065 067 069 075 076 077 078 080 083
PVDF 0.20 micron	061

METHODOLOGY

Methodology	laboratory number
colorimetric method	012 015 020 021 030 033 034 038 050 059 060 062 073 077
enzymatic method	013 035 043 058 065 067 074 077 078
HPLC	002 003 004 005 006 007 008 009 011 017 019 029 031 032 040 041 045 048 049 052 055 057 069 071 072 076 080 082
Ion Chromatography (IC)	001 008 010 014 016 018 023 024 025 026 036 042 044 051 053 054 056 061 063 064 068 075 079 083
Ion selective electrode	047

HPLC / IC METHOD

Clean-up Prior to HPLC/IC	laboratory number
0.45 micron filter	023
AS14	004
C18 Sep-Pak	007 026 045 049 056 061 072
filtros HV	002
IC-RP	008
membrane filter	080
solid phase C18	003 017 019 031

Column Packing	laboratory number
C18	004 029 032 040 048
endcapped	040
IC anion	007 064
Ion Exchange	001 002 003 005 006 008 014 017 023 024 026 031 042 044 045 049 051 053 055 057 061 063 068 071 072 075 079 080 082 083
Ion Exclusion	069
NH_2	009 011 019 041 052 076

Column Temperature (°C)	laboratory number
ambient	002 003 004 005 006 016 017 019 023 024 026 029 040 042 044 045 049 051 053 061 063 068 069 075 080 082 083
>ambient - <50	001 007 008 009 011 014 032 036 041 052 055 057 071 072 076 079
≥50	031

Guard Column Used	laboratory number
yes	001 004 005 006 007 008 014 016 017 023 024 025 026 036 040 042 044 045 049 051 052 053 055 061 063 068 069 071 072 076 079 080 082 083
no	002 003 009 011 029 032 041 057 075

HPLC / IC METHOD CONTINUED

Mobile Phase Components	laboratory number
10mm NH_4ClO_4	072
acetone	051 063
acetonitrile	032 048 072 076 080
ammonium dihydrogen phosphate buffer	009
borate gluconate buffer	024 080
carbonate buffer	004 008 023 025 026 031 036 042 051 056 057 061 064 068 075 082
ion pair agent	040
lithium borate gluconate buffer solution	014
methanol	029 041
Na_2CO_3	016
$NaHCO_3$	001 016
octylamine	029
perchloric acid	069
phosphate	002 003 006 007 011 017 045 049 052 055 071 076
phthalic acid	044
potassium hydroxide	053 079
sodium hydroxide	005
sodium perchlorate	069
sodium dihydrogen phosphate	019
water	014 041 051 053 055 057 063 080 083

Mobile Phase pH	laboratory number
<6.0	009 011 019 044 048 052 055 056 063 069 071 076
6.0 - <7.0	002 006 007 017 024 029 032 040 041 045 049
>7.0 - <8.0	003 014
8.0 - <9.0	004 008 080
>9.0 - <10.0	023 061 068
≥10	005 036 075 079 082

HPLC / IC METHOD CONTINUED

Mobile Phase Mode	laboratory number
isocratic	002 003 004 005 007 008 009 011 014 016 017 019 023 024 025 026 029 032 036 040 041 042 044 045 048 049 051 052 055 057 063 064 068 069 071 072 075 076 080 082 083
gradient	001 006 053 056 061 079

Mobile Phase Flow Rate (mL/min)	laboratory number
<0.25	031
0.25 - <0.75	001 009 016 023 048 051 064 069 075 082 083
>0.75 - <1.25	002 003 004 005 006 008 011 019 024 025 029 032 036 040 041 045 049 053 055 056 061 068 071 072 076 079 080
1.25 - <1.75	007 017 026 042 057
>1.75 - <2.25	014 044 063
≥2.25	052

Injection Volume (µL)	laboratory number
≥5 - <10	048 052 083
10 - <25	001 002 003 005 006 007 008 016 023 029 032 036 040 045 049 051 055 061 064 069 071 072 075 076 082
≥25 - <50	004 009 017 019 025 042 079
50 - <100	011 014 024 041 044 053 057
>100 - <150	026 080
≥150	063 068

Detector Type	laboratory number
conductivity	001 008 016 023 025 026 036 042 044 051 053 061 063 064 068 075 079 080 082 083
Diode Array Detector	002 003 004 007 009 014 017 019 032 040 045 048 049 076
UV	011 029 031 041 055 057 071
UV/Vis	005 006 024 052 069 072

HPLC / IC METHOD CONTINUED

Wavelength (nm)	laboratory number
<210	009 011 014 032 041 048 052 057 072 080
210 - <214	004 006 055 061 069 071
>214 - <220	002 003 005 007 017 019 024 029 040 045 049 076
≥220	031

COLORIMETRIC OR ENZYMATIC METHOD

Reduction Procedure	laboratory number
cadmium column	012 020 021 030 034 050 059 060 062
enzymatic method	013 035 043 052 058 067 074
hydrazine	015
hydrazine sulfate	038

Enzymatic Method Details	laboratory number
reduction of nitrate to nitrite by nitrate-reductase	058
reduction of NO_3 to NO_2 in presence of NADPH. Amount of NADPH used is measured at 340 nm.	013
Testkit Nitrate, r-biopharm	067

Colour Reagents	laboratory number
N-(1-naphthyl)ethylenediamine dihydrochloride	012 015 020 021 028 030 033 034 038 043 059 060 062 073
sulfanilamide	012 020 021 028 030 033 034 038 043 050 062 073
NADP	035
NADPH	058 065

Detector Type	laboratory number
spectrophotometric	012 013 015 020 021 028 030 033 034 035 038 043 050 052 058 059 060 062 065 067 073 074 077

COLORIMETRIC OR ENZYMATIC METHOD CONTINUED

Colorimetric / Enzymatic Wavelength (nm)	laboratory number
<400	013 035 058 065 067 074 077 078
500 - <520	050
>520 - <540	015 020 028 030 033 034 038 052 060 073
≥540 - <560	012 021 059 062

APPENDIX III: FAPAS® SecureWeb, Reports and Protocol

1. FAPAS® SECUREWEB

Access to the secure area of our web site is only available to participants in our proficiency tests. Please contact us if you require a UserID and Password. FAPAS® SecureWeb allows participants to:

- Obtain their laboratory numbers for the proficiency tests in which they have participated.
- View the results they submitted in past and current proficiency tests.
- Submit their results and methods for current tests.
- Review future tests they have ordered.
- Order proficiency tests and quality control materials, *including surplus test materials from the batch used in this proficiency test*.
- Freely download copies of reports, in Acrobat PDF format, of proficiency tests in which they have participated.

2. REPORTS

The Acrobat PDF version of this report is available to all participants as a free download from FAPAS® SecureWeb.

A printed and bound version of this report is priced £35 if ordered at the same time as the proficiency test or £50 if ordered subsequently.

3. PROTOCOL

The Protocols [6, 7] set out how FAPAS® is organised and how the scheme is run. Copies can be downloaded from our website.

4. CONTACT DETAILS

Participants with any comments or concerns about this proficiency test should contact:

FAPAS®

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The Food and Environment Research Agency is an ISO 9001 certified organisation.