FINAL REGISTRATION REPORT

Part B

Section 5

Analytical Methods

Detailed summary of the risk assessment

Product code: **ORKAN 350 SL**

Product names: **ORKAN 350 SL, SPRINTER 350 SL**

Chemical active substance(s):

MCPA, 90 g/L

Glyphosate, 260 g/L

Central

Zonal Rapporteur Member State: POLAND

CORE ASSESSMENT

(renewal of authorisation)

Applicant: **Synthos Agro Sp. z o.o.**

Submission date: **04.2020**

Finalisation date: 09.2020; 11.2021

Version history

When	What
04/2020	Dossier submission date
09/2020	zRMS finalised evaluation
11/2021	Evaluation after commenting period - RR

Table of Contents

5 Analytical methods

5.1 Conclusion and summary of assessment

Sufficiently sensitive and selective analytical methods are available for the relevant impurities in the plant protection product.
Noticed data gaps are: none

Sufficiently sensitive and selective analytical methods are available for all analytes included in the residue definitions.
Noticed data gaps are: none

Commodity/crop	Supported/ Not supported
Fruits	Supported
Nuts	Supported

5.2 Methods used for the generation of pre-authorization data (KCP 5.1)

5.2.1 Analysis of the plant protection product (KCP 5.1.1)

5.2.1.1 Determination of active substance and/or variant in the plant protection product (KCP 5.1.1)

An overview on the acceptable methods and possible data gaps for analysis of glyphosate, MCPA and glyphosate, MCPA in plant protection product is provided as follows:

Comments of zRMS:	The analytical method for analysis of glyphosate and MCPA was assessed during first authorisation of the plant protection product.

Reference:	Gwóźdź, E, Eng., 2009
Report	Method development and validation for determination of the content of active substances of MCPA and Glyphosate in Orkan 350 SL. Analysis No. BA-15/09
Guideline(s):	SANCO/3030/99 rev.4
Deviations:	No
GLP:	Yes
Acceptability:	Yes

Materials and methods

The content of active substance in the examined sample of Orkan 350 SL was determined by high performance liquid chromatography (HPLC).

MCPA was determined by using reversed phase column with UV/VIS detection at wavelength measuring 270 nm and external standard method was used.

Glyphosate was determined with the using of ion exchange column with refractometric detector.

Examined material:

Examined material:	Orkan 350 SL
Date of production:	15.06.2009
Batch number:	4
Manufacturer:	Zakład Doświadczalny "Organika" Sp. z o.o. (currently Synthos Agro Sp. z o.o.)
Code of examined item:	BA-15/09

Reference material:
MCPA, IPO 464, series 2B/08, 99.7%
Glyphosate, IPO 260, series 2B/07, 98.7%

MCPA

Equipment:
- Shimadzu liquid chromatograph equipped with UV/Vis detector
- Grace C18 column (5µm), 150 mm x 4.6 mm
- Analytical balance, accuracy 0.01 mg

Reagents
- Water for HPLC,
- Acetonitrile for HPLC
- Glacial Acetic Acid

Chromatographic conditions
- Column temperature 30 ºC
- Mobile phase: 700 ml acetonitrile : 300 ml water + 4 ml glacial acetic acid
- Flow rate: 1.5 mL/min
- Wavelength λ = 270 nm
- Volume of sample solution injected: 10 µL

Retention time:
- MCPA: 7.6 min

Calculations
The analysed substance content [%] in examined specimen was calculated according to the equation:

$$f = (A_{wz}) / (m_{wz} * P)$$
$$X\ \% = (A_{pr} * 100) / (C_{pr} * f)$$

Where:

f - average calculating factor
A_{pr} – analyte peak area on specimen solution chromatogram
A_{wz} – analyte peak area on standard solution chromatogram
m_{pr} – mass of the examined specimen [mg]
m_{wz} – mass of the standard [mg]
P – purity of standard [%]

Preparation of solutions

Standard solution
About 8 mg of MCPA standard was weighed (with the accuracy of 0.02 mg) into 10 mL flask, 1 ml of acetonitrile was added and then mobile phase solution was added up to the volume. Two standard solutions were made.

Specimen solution
About 100 mg of examined specimen was weighed (with the accuracy of 0.02 mg) into a 10 mL flask 1 mL of acetonitrile and then mobile phase solution was added up to the volume.

Glyphosate

Equipment:
- Shimadzu liquid chromatograph equipped with RID detector
- Partisil column (5 μm), 10 SAX, 250 mm x 4.6 mm
- Analytical balance, accuracy 0.01 mg

Reagents
- Water for HPLC,
- Methanol for HPLC
- H_3PO_4 Conc.
- KH_2PO_4

Chromatographic conditions
- Column temperature 35 ºC
- Mobile phase: 100 ml methanol : 900 ml 0.01 M KH_2PO_4 + 2.5 ml H_3PO_4
- Flow rate: 1.0 mL/min
- Volume of sample solution injected: 50 μL

Retention time:
- Glyphosate: 8.8 min

Calculations
The analysed substance content [%] in examined specimen was calculated according to the equation:

$$f = (A_{wz}) / (m_{wz} * P)$$
$$X\ \% = (A_{pr} * 100) / (C_{pr} * f)$$

Where:
f - average calculating factor
A_{pr} – analyte peak area on specimen solution chromatogram
A_{wz} – analyte peak area on standard solution chromatogram
m_{pr} – mass of the examined specimen [mg]
m_{wz} – mass of the standard [mg]
P – purity of standard [%]

Preparation of solutions

Standard solution
About 23 mg of Glyphosate standard was weighed (with the accuracy of 0.02 mg) into 10 mL flask and mobile phase solution was added up to the volume. Two standard solutions were

made.

Specimen solution
About 100 mg of examined specimen was weighed (with the accuracy of 0.02 mg) into a 10 mL flask and mobile phase solution was added up to the volume. Six samples were prepared for precision analysis.

Validation - Results and discussions

Table 5.2-1: Methods suitable for the determination of active substances MCPA and Glyphosate in plant protection product Orkan 350 SL

	MCPA	**Glyphosate**
Author(s), year	Gwóźdź, E, Eng., 2009	Gwóźdź, E, Eng., 2009
Principle of method	The content of active substance in the examined sample of Orkan 350 SL was determined by high performance liquid chromatography (HPLC). MCPA was determined by using reversed phase column with UV/VIS detection at wavelength measuring 270 nm and external standard method was used.	The content of active substance in the examined sample of Orkan 350 SL was determined by high performance liquid chromatography (HPLC). Glyphosate was determined with the using of ion exchange column with refractometric detector.
Linearity **MCPA** **Linear between** **0.4818 mg/mL and 1.1248 mg/mL, correspond to the following concentration range 39% to 140%** **Correlation coefficient = 0.9999** **Glyphosate** **Linear between** **1.3255 mg/mL and 3.0390 mg/mL, correspond to the following concentration range 59% to 136%** **Correlation coefficient = 0.9989**	The linearity of the detector response was assessed using five standard solutions at the concentration range of terbuthylazine from 0.4818 mg/mL to 1.1248 mg/mL, which corresponds to the concentration range of 39% to 140% of MCPA content in the preparation. The analytical calibration extend over a range appropriate to the lowest and highest nominal concentration of the analyte in relevant analytical matrices by at least 20%. Correlation coefficient r^2 = 0,9999.	The linearity of the detector response was assessed using seven standard solutions at the concentration range of terbuthylazine from 1.3255 mg/mL to 3.0390 mg/mL, which corresponds to the concentration range of 59% to 136% of Glyphosate content in the preparation. The analytical calibration extend over a range appropriate to the lowest and highest nominal concentration of the analyte in relevant analytical matrices by at least 20%. Correlation coefficient r^2 = 0,9989.
Precision – Repeatability Mean **MCPA** **n = 6** **0.34 %RSD** **Glyphosate** **n = 6** **0.76 %RSD**	Repeatability: Relative standard deviation (%RSD) is 0.34%. This result meets the acceptability criteria ($RSD_{MCPA} \leq 1.9\%$). Precision of the chromatographic system: Relative standard deviation (%RSD) is 0.18% for MCPA. This result meets the acceptability criteria (RSD < 1%).	Repeatability: Relative standard deviation (%RSD) is 0.76%. This result meets the acceptability criteria ($RSD_{glyphosat} \leq 1.71\%$). Precision of the chromatographic system: Relative standard deviation (%RSD) is 0.59% for Glyphosate. This result meets the acceptability criteria (RSD < 1%).

	MCPA	Glyphosate
Accuracy **MCPA** **n = 12** **99.45% Recovery** **Glyphosate** **n = 10** **99.63 % Recovery**	Accuracy of MCPA determination in Orkan 350 SL was assessed by recovery value at two levels of concentration. Mean recovery for the active substance at concentration of > 10 % should be 100% ± 2 %. The obtained result of 99.45% is acceptable.	Accuracy of MCPA determination in Orkan 350 SL was assessed by recovery value at two levels of concentration. Mean recovery for the active substance at concentration of > 10 % should be 100% ± 2 %. The obtained result of 99.63% is acceptable.
Interference/ Specificity	The method for determination of MCPA in Orkan 350 SL preparation is specific. There are no interferences between the analyte and other components of the specimen.	The method for determination of Glyphosate in Orkan 350 SL preparation is specific. There are no interferences between the analyte and other components of the specimen.
Comment	The validation parameters (linearity, LOQ, repeatability and accuracy) are within the acceptance range and fulfil EU requirements given in SANCO /3030 /99 rev.4.	The validation parameters (linearity, LOQ, repeatability and accuracy) are within the acceptance range and fulfil EU requirements given in SANCO /3030 /99 rev.4.

Conclusion

It was confirmed that chromatographic method of determination of the active compounds MCPA and Glyphosate is specific. No interference was observed. The validation parameters (linearity, LOQ, repeatability and accuracy) are within the acceptance range and fulfil EU requirements given in SANCO /3030 /99 rev.4.

5.2.1.2 Description of analytical methods for the determination of relevant impurities (KCP 5.1.1)

An overview on the acceptable methods and possible data gaps for analysis of relevant impurities in plant protection product is provided as follows:

Comments of zRMS:	The proposed analytical methods are suitable for the determination of the content of each of the relevant impurity – formaldehyde and N-nitrosoglyphosate - in the plant protection product Orkan 350 SL in the presence of each other, active substances and other components. The proposed analytical methods have been fully validated in terms of the interference, specificity, linearity, accuracy (recovery and repeatability) and LOQ values. Proposed methods fulfil the requirements of SANCO/3030/99 rev. 4 guidance and SANCO/3030/99 rev. 5 guidance. The validation of the analytical methods has been accepted.

Reference: Ewa ~~Joann~~ Jolanta Gwóźdź, Eng

Report	Orkan 350 SL Development and validation of the methods for determination of the relevant impurities (formaldehyde and N-nitrosoglyphosate) in the formulation and after accelerated storage, Ewa ~~Joanna~~ Jolanta Gwóźdź, Eng., 2018, Study code: BA-82/18
Guideline(s):	Yes, SANCO/3030/99 rev.4
Deviations:	No
GLP:	Yes
Acceptability:	Yes

Formaldehyde

Materials and methods

The content of formaldehyde in the examined sample was determined by high performance liquid chromatography (HPLC) using reverse phase column, detector UV wavelength 360 nm after precolumn derivatization with 2,4-dinitrophenylhydrazine and external standard method.

Examined material:

Examined material:	Orkan 350 SL
Date of production:	042018
Batch number:	07MN
Manufacturer:	Synthos Agro Sp. z o.o.
Code of examined item:	123/BA-82/18

Reference material:

- Standard of formaldehyde , 37.6 %, batch no SZBA 0890

Equipment:

- Shimadzu liquid chromatograph with UV/Vis detector
- HPLC column: Gemini NX , 3 C18, 150 x 4.6 mm
- Analytical balance Mettler Toledo XS205 with readability of 0.01 mg

Reagents

- Formaldehyde 37.6 % solution, Sigma-Aldrich, 33220, lot SZBA0890
- Deionized water (Millipore)
- Acetonitrile for HPLC (POCh)
- Sulfuric acid 96%
- Sulfuric acid 5% solution
- 0,5 g of 2,4-dinitrophenylhydrazine was weighed into a 50 mL volumetric flask, 30 mL of water and 10 mL of sulfuric acid (96%) were added and mixed. The solution was mixed and cooled. Water was added to the mark and mixed. The solution must be stored in amber glass.

Chromatographic conditions

- Column temperature 35 ºC
- Mobile phase: 50 % CH_3CN : 50 % H_2O
- Flow rate: 1.2 mL/min
- Wavelength λ = 360 nm
- Volume of sample solution injected: 20 µL

Retention time:

- derivatized formaldehyde ~ ~~4 min~~. 8.8 min. ± 0.1%

Calculations

The formaldehyde content in the examined sample (X%) were calculated according to the equations:

(1) $y = ax+b$ (calibration curve)
(2) $X_{(\%)} = (A_{pr} – b)* 100*100 / (1000*a* M_{pr})$

A_{pr} - peak area of derivatized formaldehyde on the chromatogram of the examined sample solution
M_{pr} - mass of the sample [mg]

Preparation of solutions

Standard solution
Stock solution: About 28 mg of 37.6% solution of formaldehyde was weighed with accuracy of 0.01 mg into a 10 mL volumetric flask. Water was added up to 10 mL and mixed (C ~1.0 mg/mL). The stock solution was diluted (1/50) with water (C1 about 0.0208 mg/mL). The obtained solution C1 was diluted (1/10 and 1/40) with water (C2 ~ 0.00208 mg/mL, C3 ~ 0.00052 mg/mL) mg/mL).

Calibration curve
Into six 10 mL volumetric flasks it was pipetted:

1	2	3	4	5	6
0.09 mL C3	0.6 mL C3	1.0 mL C3	1.7 mL C3	0.7 mL C2	1.0 mL C2

1 mL of 5% H2SO4, 0.2 mL of 2,4-dinitrophenylhydrazine solution and 5 mL of acetonitrile were added to each flasks. The water was added up to the mark. The solutions were stored in dark place for 15 minutes and then injected into the chromatographic column.

Specimen solution
About 60 mg of the examined sample was weighed with accuracy of 0.01 mg into a 10 mL volumetric flask. Water was added to 10 mL and mixed. The sample was dissolved in the ultrasonic bath for 10 min. 1 mL of the sample solution was pipetted to the 10 mL volumetric flask, 1 mL of 5% H2SO4, 0.2 mL of 2,4-dinitrophenyhydrazine solution and 5 ml of acetonitrile were added. Then water was added up to the mark. The solution were stored in dark place for 15 minutes and next injected into the chromatograph. Five weightings of Orkan 350 SL were prepared to assess the repeatability.

***N*-nitrosoglyphosate (NNG)**

Materials and methods

The content of NNG in the examined sample was determined by high performance liquid chromatography (HPLC) using reverse phase column, UV detection wavelength 244 nm and external standard method.

Examined material:

Examined material:	Orkan 350 SL
Date of production:	042018
Batch number:	07MN
Manufacturer:	Synthos Agro Sp. z o.o.
Code of examined item:	123/BA-82/18

Reference material:

- Standard of N-nitrosoglyphosate aniline salt, 65.4 % IPO batch 5A/15

Equipment:

- Shimadzu liquid chromatograph with UV/Vis detector
- HPLC column: Omega , 5 µ, PS 100A, C18, 250 x 4,6 mm
- Analytical balance Mettler Toledo XS205 with readability of 0.01 mg

Reagents

- N-nitrosoglyphosate – aniline salt, IPO No 09/BA/16, batch 2A/16, 64.5 % of NNG
- Deionized water (Millipore)
- Acetonitrile for HPLC (POCh)
- Tetrabutylammonium hydrogen sulphate

Chromatographic conditions

- Column temperature 40 ºC
- Mobile phase: 96 % 30 mM tetrabutylammonium hydrogen sulphate + 4 % acetonitrile
- Flow rate: 0.4 mL/min
- Wavelength λ = 244 nm
- Volume of sample solution injected: 100 µL

Retention time:

- N-nitrosoglyphosate (NNG) ~ 10 min. 11.2 min. ± 0.2%

Calculations

The ~~formaldehyde~~ NNG content in the examined sample (X%) were calculated according to the equations:

(1) $y = ax+b$ (calibration curve)

(2) $X_{(\%)} = (A_{pr} - b) * 100 * 100 / (1000 * a * M_{pr})$

A_{pr} - peak area of ~~derivatized formaldehyde~~ NNG on the chromatogram of the examined sample solution

M_{pr} - mass of the sample [mg]

Preparation of solutions

Standard solution

About 6 mg of NNG standard was weighed with accuracy of 0.01 mg into a 10 mL volumetric flask. Water was added up to 10 mL and mixed (C ~0,40 mg/mL). The stock solution was diluted 2000-times with water (C1 about 0.00020 mg/mL).

Calibration curve

Into five 10 mL volumetric flasks it was pipetted:

No	1	2	3	4	5
Volume C1	0.10 mL	0.20 mL	0.25 mL	0.5 mL	1.0 mL
[mg/mL]	~0.0000020	~0.0000040	0.0000050	0.0000010	0.0000020

Specimen solution

About 500 mg of the examined sample was weighed with accuracy of 0.01 mg into a 10 mL volumetric flask. Water was added to 10 mL and mixed. The sample was dissolved in the ultrasonic bath for 10 min. The solution was injected into the chromatograph. Six weightings of Orkan 350 SL were prepared to assess the repeatability.

Validation - Results and discussions

Table 5.2-2: Methods suitable for the determination of the relevant impurities in plant protection product (PPP) Orkan 350 SL

	Formaldehyde	**N-nitrosoglyphosate (NNG)**
Author(s), year	Ewa Jolanta Gwóźdź, Eng.	Ewa Jolanta Gwóźdź, Eng.
Principle of method	The content of formaldehyde in the examined sample was determined by high performance liquid chromatography (HPLC) using reverse phase column, detector UV wavelength 360 nm after precolumn derivatization with 2,4-dinitrophenylhydrazine and external standard method.	The content of NNG in the examined sample was determined by high performance liquid chromatography (HPLC) using reverse phase column, UV detection wavelength 244 nm and external standard method.
Linearity - Formaldehyde **Linear between** **0.0000047 mg/mL to 0.000208 mg/mL** **Correlation coefficient = 0.9951** **Linearity – N-nitrosoglyphosate (NNG)** **Linear between** **0.0000020 mg/mL to 0.000020 mg/mL** **Correlation coefficient = 0.9913**	The linearity of applied analytical method was assessed using six standard solutions of derivatized formaldehyde having concentration in the range: from 0.0000047 to 0.000208 mg/mL (from 0.0008 to 0.035 % in the formulation). Each standard solution was injected two times into the column except the first one, which was injected five times. Correlation coefficient should be $r \geq 0.99$. The obtained result is acceptable.	The linearity of applied analytical method was assessed using five standard solutions of NNG having concentration in the range: from 0.0000020 to 0.000020 mg/mL (from 0.000004 to 0.00004 % in formulation). Each standard solution was injected two times except the first one, which was injected six times. Correlation coefficient should be $r \geq 0.99$. The obtained result is acceptable.
Formaldehyde **Precision – Repeatability Mean** **n = 6** **RSD = 4.07% < 7.87 %RSDr Horwitz criterion** **N-nitrosoglyphosate (NNG)** **Precision – Repeatability Mean** **n = 6** **5.94 %RSD < 12.50% RSDr Horwitz criterion**	The repeatability of the method was assessed on the base of five determinations of formaldehyde content in preparation Orkan 350 SL. Acceptable relative standard deviation for impurity (about 0.00078 %) is RSDr 7.87 % (Horwitz criterion). The obtained result is acceptable.	The repeatability of the method was assessed on the base of ~~six~~ five determinations of NNG content in preparation Orkan 350 SL. Acceptable relative standard deviation for analyte (~0,000004%) is RSDr ≤ 12.50%. The obtained result 5.94% is acceptable.
Accuracy **Formaldehyde** **n = 10**	The accuracy of the formaldehyde determination in Orkan 350 SL was estimated by the recovery measurement. Known amounts of	The accuracy of the NNG determination in Orkan 350 SL was estimated by the recovery measurement. Known amounts of NNG standard were added to

	Formaldehyde	N-nitrosoglyphosate (NNG)
92.45 % Recovery **<u>N-nitrosoglyphosate (NNG)</u>** **n = 10** **98.8 % Recovery**	formaldehyde standard were added to ten weightings of the placebo and after derivatization were analyzed. The accuracy was determined by spiking performed at two levels of concentrations of formaldehyde The average recovery value for the impurity (0.0008 %) should be 100 ± 25 %. The obtained result is acceptable.	the ten weightings of the placebo and were analysed. The accuracy was determined by spiking performed at two levels of concentrations of NNG. The average recovery value for the impurity (< 0.000004 %) should be 100 ± 25 %. The obtained result is acceptable.
Interference/ Specificity	Chromatograms of placebo, standard solutions level LOQ, examined sample and sample fortified with formaldehyde were performed and superimposed. On the chromatogram of placebo and mobile phase there were no peaks interfering with the determined compound.	Chromatograms of standard solution, examined sample and placebo fortified with NNG were performed and superimposed.
LOQ	The limits of quantification (LOQ) were defined as the lowest concentration of formaldehyde standard used for calibration curve – 0.0000047 mg/mL (0.00078 % by mass), RSD= 4.47 % .	The limits of quantification (LOQ) were defined as the lowest concentration of NNG standard used for calibration curve – 0.0000020 mg/mL (0.000004 % by mass), RSD= 12.18 % . SANCO criterion 16.83 %.
Comment	The determined validation parameters such as specificity, linearity, limit of quantification (LOQ), repeatability (precision) and accuracy are compliant with EU requirements given in SANCO/3030/99 rev.4.	The determined validation parameters such as specificity, linearity, limit of quantification (LOQ), repeatability (precision) and accuracy are compliant with EU requirements given in SANCO/3030/99 rev.4.

Conclusion

It was confirmed that chromatographic methods of determination of the relevant impurities as Formaldehyde and N-nitrosoglyphosate (NNG) are specific. No interference was observed. The validation parameters (specificity, linearity, limit of quantification (LOQ), repeatability (precision)) are within the acceptance range and fulfil EU requirements given in SANCO /3030 /99 rev.4 and SANCO/3030/99 rev. 5 guidance.

5.2.1.3 Description of analytical methods for the determination of formulants (KCP 5.1.1)

With respect to toxicological, eco-toxicological or environmental aspects Orkan 350 SL does not contain any relevant formulants. Therefore, a special analytical methods and validations are not needed.

5.2.1.4 Applicability of existing CIPAC methods (KCP 5.1.1)

Glyphosate (284/SL/(M)/3, CIPAC 1C, p.2134)
MCPA (2.1 or 2.4/SL/M2/4.3, GLC method, CIPAC 1C, p.2143, or 2.1 or 2.4/SL/M2/4.4, HPLC as referee method, p.2143)

5.2.2 Methods for the determination of residues (KCP 5.1.2)

An overview on the acceptable methods and possible data gaps for analysis of residues of glyphosate, N-acetyl-glyphosate, AMPA, N-acetyl AMPA, MPCA and MCPB for the generation of pre-authorization data is given in the following table. For the detailed evaluation of new/ additional studies it is referred to Appendix 2.

Table 5.2-3: Validated methods for the generation of pre-authorization data - Glyphosate

Component of residue definition: Glyphosate				
Matrix type	**Method type**	**Method LOQ**	**Principle of method (i.e. GC-MS or HPLC-UV)**	**Author(s), year / missing / EU agreed**
Plants, plant products – Apples and Cherry	Primary	0.01 mg/kg	LC-MS/MS	Tomasz Peda, 2020a Tomasz Peda, 2020b
	Confirmatory (if required)	Primary residue method is specific to the analyte.		
Plants, plant products – plums, limes, corn forage, corn grain, corn stover, corn oil, corn flour, corn grits, corn starch, corn meal, soybean forage, soybean seed, soybean hay, soybean oil, soybean meal, soybean hulls	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007a/ section B.5.2.1 of the DAR
	Confirmatory (if required)	0.05 mg/kg	LC-MS/MS	Klimmek, 2007/ section B.5.2.1 of the DAR Weber, 2012/ section B.5.2.1 of the DAR Klimmek, S., Weber, H., 2008/ section B.5.2.1 of the DAR
Plants, plant products – coffee	Primary	0.05 mg/kg	GC-MS	Anderson and Ely, 2001/ section B.5.2.1 of the DAR
Animal products, food of animal origin – milk, egg, meat.	Primary	0.025 mg/kg	LC-MS/MS,	Pentz and Bramble, 2007b/ section B.5.2.2 of the DAR
	Confirmatory (if required)	0.05 mg/kg	GC-MS	Schneider, 2001a/ section B.5.2.2 of the DAR
Animal products, food of animal origin – fat, kidney and liver.	Primary	0.05 mg/kg	LC-MS/MS,	Pentz and Bramble, 2007b/ section B.5.2.2 of the DAR
Soil	Primary	0.05 mg/kg	GC-MS	Schneider, 2001b/ section B.5.3.1 of the DAR
	Confirmatory (if required)	0.05 mg/kg	GC-MS	Szuter, 1996/ section B.5.3.1 of the DAR

Component of residue definition: Glyphosate				
Matrix type	**Method type**	**Method LOQ**	**Principle of method (i.e. GC-MS or HPLC-UV)**	**Author(s), year / missing / EU agreed**
Drinking water, Surface water	Primary	0.03 µg/L	LC-MS/MS	Knoch, 2010/ section B.5.3.2 of the DAR
	Confirmatory (if required)	0.03 µg/L	LC-MS/MS	Knoch, 2010/ section B.5.3.2 of the DAR
Air	Primary	5 µg/m3,	GC-MS	Schneider, 2001c/ section B.5.3.3 of the DAR

Table 5.2-4: Validated methods for the generation of pre-authorization data - N-acetyl-glyphosate

Component of residue definition: N-acetyl-glyphosate				
Matrix type	**Method type**	**Method LOQ**	**Principle of method (i.e. GC-MS or HPLC-UV)**	**Author(s), year / missing / EU agreed**
Plants, plant products – Apples and Cherry	Primary	0.01 mg/kg	LC-MS/MS	Tomasz Peda, 2020a Tomasz Peda, 2020b
	Confirmatory (if required)	Primary residue method is specific to the analyte.		
Plants, plant products – plums, limes, corn forage, corn grain, corn stover, corn oil, corn flour, corn grits, corn starch, corn meal, soybean forage, soybean seed, soybean hay, soybean oil, soybean meal, soybean hulls	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007a/ section B.5.2.1 of the DAR
Animal products, food of animal origin – milk, egg, meat.	Primary	0.025 mg/kg	LC-MS/MS,	Pentz and Bramble, 2007b/ section B.5.2.2 of the DAR
Animal products, food of animal origin – fat, kidney and liver.	Primary	0.05 mg/kg	LC-MS/MS,	Pentz and Bramble, 2007b/ section B.5.2.2 of the DAR

Table 5.2-5: Validated methods for the generation of pre-authorization data - AMPA

Component of residue definition: AMPA				
Matrix type	**Method type**	**Method LOQ**	**Principle of method (i.e. GC-MS or HPLC-UV)**	**Author(s), year / missing / EU agreed**
Plants, plant products – Apples and Cherry	Primary	0.01 mg/kg	LC-MS/MS	Tomasz Peda, 2020a Tomasz Peda, 2020b
	Confirmatory (if required)	Primary residue method is specific to the analyte.		
Plants, plant products – plums, limes, corn forage, corn grain, corn stover, corn oil, corn flour, corn grits, corn starch, corn meal, soybean forage, soybean seed, soybean hay, soybean oil, soybean meal, soybean hulls	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007a/ section B.5.2.1 of the DAR
	Confirmatory (if required)	0.05 mg/kg	LC-MS/MS	Klimmek, 2007/ section B.5.2.1 of the DAR Weber, 2012/ section B.5.2.1 of the DAR Klimmek, S., Weber, H., 2008/ section B.5.2.1 of the DAR
Animal products, food of animal origin – milk, egg, meat.	Primary	0.025 mg/kg	LC-MS/MS,	Pentz and Bramble, 2007b/ section B.5.2.2 of the DAR
	Confirmatory (if required)	0.05 mg/kg	GC-MS	Schneider, 2001a/ section B.5.2.2 of the DAR
Animal products, food of animal origin – fat, kidney and liver.	Primary	0.05 mg/kg	LC-MS/MS,	Pentz and Bramble, 2007b/ section B.5.2.2 of the DAR
Soil	Primary	0.05 mg/kg	GC-MS	Schneider, 2001b/ section B.5.3.1 of the DAR
	Confirmatory (if required)	0.05 mg/kg	GC-MS	Szuter, 1996/ section B.5.3.1 of the DAR
Drinking water, Surface water	Primary	0.03 µg/L	LC-MS/MS	Knoch, 2010/ section B.5.3.2 of the DAR
	Primary	0.03 µg/L	LC-MS/MS	Knoch, 2010/ section B.5.3.2 of the DAR

Table 5.2-6: Validated methods for the generation of pre-authorization data - N-acetyl AMPA

Component of residue definition: N-acetyl AMPA				
Matrix type	**Method type**	**Method LOQ**	**Principle of method (i.e. GC-MS or HPLC-UV)**	**Author(s), year / missing / EU agreed**
Plants, plant	Primary	0.01 mg/kg	LC-MS/MS	Tomasz Peda, 2020a

Component of residue definition: N-acetyl AMPA				
Matrix type	**Method type**	**Method LOQ**	**Principle of method (i.e. GC-MS or HPLC-UV)**	**Author(s), year / missing / EU agreed**
products – Apples and Cherry				Tomasz Peda, 2020b
	Confirmatory (if required)	Primary residue method is specific to the analyte.		
Plants, plant products – plums, limes, corn forage, corn grain, corn stover, corn oil, soybean forage, soybean seed, soybean hay,	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007a/ section B.5.2.1 of the DAR
Animal products, food of animal origin – milk, egg, meat.	Primary	0.025 mg/kg	LC-MS/MS,	Pentz and Bramble, 2007b/ section B.5.2.2 of the DAR
Animal products, food of animal origin – fat, kidney and liver.	Primary	0.05 mg/kg	LC-MS/MS,	Pentz and Bramble, 2007b/ section B.5.2.2 of the DAR

Table 5.2-6: Validated methods for the generation of pre-authorization data – MCPA

Component of residue definition: MCPA				
Matrix type	**Method type**	**Method LOQ**	**Principle of method (i.e. GC-MS or HPLC-UV)**	**Author(s), year / missing / EU agreed**
Plants, plant products – Apples and Cherry	Primary	0.01 mg/kg	LC-MS/MS	Tomasz Peda, 2020a Tomasz Peda, 2020b
	Confirmatory (if required)	Primary residue method is specific to the analyte.		

Table 5.2-7: Validated methods for the generation of pre-authorization data - MCPB

Component of residue definition: MCPB				
Matrix type	**Method type**	**Method LOQ**	**Principle of method (i.e. GC-MS or HPLC-UV)**	**Author(s), year / missing / EU agreed**
Plants, plant products – Apples and Cherry	Primary	0.01 mg/kg	LC-MS/MS	Tomasz Peda, 2020a Tomasz Peda, 2020b
	Confirmatory (if required)	Primary residue method is specific to the analyte.		

5.3 Methods for post-authorization control and monitoring purposes (KCP 5.2)

5.3.1 Analysis of the plant protection product (KCP 5.2)

Analytical methods for the determination of the active substance and relevant impurities in the plant protection product shall be submitted, unless the applicant shows that these methods already submitted in accordance with the requirements set out in point 5.2.1 can be applied.

5.3.2 Description of analytical methods for the determination of residues of Glyphosate (KCP 5.2)

5.3.2.1 Overview of residue definitions and levels for which compliance is required

Compared to the residue definition proposed in the Draft Assessment Report (incl. its addenda) the current legal residue definition is identical.

Table 5.3-1: Relevant residue definitions for monitoring/enforcement and levels for which compliance is required

Matrix	Residue definition	MRL / limit	Reference for MRL/level Remarks
Plant, high water content	for lentils, oilseed rape, soya beans and maize: sum of glyphosate and N-acetyl-glyphosate, expressed as glyphosate other commodities: glyphosate	0.05 mg/kg	Commission Regulation (EC) No 396/2005 of 23 February July 2005 with further amendments
Plant, high acid content		0.05 mg/kg	
Plant, high protein/high starch content (dry commodities)		0.05 mg/kg	
Plant, high oil content		0.05 mg/kg	
Plant, difficult matrices (hops, spices, tea)		2 mg/kg	
Muscle	sum of glyphosate and Nacetyl-glyphosate, expressed as glyphosate	0.05 mg/kg	
Milk		0.05 mg/kg	
Eggs		0.05 mg/kg	
Fat		0.05 mg/kg	
Liver, kidney		0.05 mg/kg	
Soil (Ecotoxicology)	glyphosate and AMPA	0.05 mg/kg	common limit
Drinking water (Human toxicology)	glyphosate	0.1 µg/L	general limit for drinking water
Surface water (Ecotoxicology)	glyphosate and AMPA	38000 µg/L 12000 µg/L	glyphosate based on the LC50 of Oncorhynchus mykiss; AMPA based on the NOEC of Pimephales promeales;
Air	glyphosate	30 µg/m^3	AOEL 0.1 mg/kg bw/d
Tissue (meat or liver)	glyphosate	Not required	notclassified as T / T+

Matrix	Residue definition	MRL / limit	Reference for MRL/level Remarks
Body fluids		Not required	notclassified as T / T+

5.3.2.2 Description of analytical methods for the determination of residues in plant matrices (KCP 5.2)

An overview on the acceptable methods and possible data gaps for analysis of glyphosate, N-acetyl-glyphosate, AMPA and N-acetyl AMPA in plant matrices is given in the following tables. For the detailed evaluation of new/ additional studies it is referred to Appendix 2.

Table 5.3-2: Validated methods for food and feed of plant origin (required for all matrix types, "difficult" matrix only when indicated by intended GAP)

Component of residue definition: glyphosate				
Matrix type	**Method type**	**Method LOQ**	**Principle of method (i.e. GC-MS or HPLC-UV)**	**Author(s), year / missing / EU agreed**
High water content	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007a/ section B.5.2.1 of the RAR
	ILV	0.05 mg/kg	LC-MS/MS	Weber, 2012/ section B.5.2.1 of the RAR
	Confirmatory (if required)	0.05 mg/kg	LC-MS/MS	Seal and Dillon, 2007/ section B.5.2.1 of the RAR
High acid content	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007a/ section B.5.2.1 of the RAR
	ILV	0.05 mg/kg	LC-MS/MS	Seal and Dillon, 2007/ section B.5.2.1 of the RAR
	Confirmatory (if required)	0.05 mg/kg	LC-MS/MS	Klimmek and Weber, 2008/ section B.5.2.1 of the RAR
High oil content	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007a/ section B.5.2.1 of the RAR
	ILV	0.05 mg/kg	LC-MS/MS	Seal and Dillon, 2007/ section B.5.2.1 of the RAR
	Confirmatory (if required)	0.05 mg/kg	LC-MS/MS	Klimmek and Weber, 2008/ section B.5.2.1 of the RAR
High protein/high starch content (dry)	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007a/ section B.5.2.1 of the RAR
	ILV	0.05 mg/kg	LC-MS/MS	Seal and Dillon, 2007/ section B.5.2.1 of the RAR
	Confirmatory (if required)	0.05 mg/kg	LC-MS/MS	Klimmek, 2007/ section B.5.2.1 of the RAR
Difficult (if required, depends on intended use)	Primary	0.05 mg/kg	GC-MS	Anderson and Ely, 2001/ section B.5.2.1 of the RAR
	ILV	not required (no intended use in difficult matrices)		
	Confirmatory			

Component of residue definition: glyphosate				
Matrix type	**Method type**	**Method LOQ**	**Principle of method (i.e. GC-MS or HPLC-UV)**	**Author(s), year / missing / EU agreed**
	(if required)			

Component of residue definition: N-acetyl-glyphosate				
Matrix type	**Method type**	**Method LOQ**	**Principle of method (i.e. GC-MS or HPLC-UV)**	**Author(s), year / missing / EU agreed**
High water content	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007a/ section B.5.2.1 of the RAR
	ILV	0.05 mg/kg	LC-MS/MS	Seal and Dillon, 2007/ section B.5.2.1 of the RAR
High acid content	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007a/ section B.5.2.1 of the RAR
	ILV	0.05 mg/kg	LC-MS/MS	Seal and Dillon, 2007/ section B.5.2.1 of the RAR
High oil content	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007a/ section B.5.2.1 of the RAR
	ILV	0.05 mg/kg	LC-MS/MS	Seal and Dillon, 2007/ section B.5.2.1 of the RAR
High protein/high starch content (dry)	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007a/ section B.5.2.1 of the RAR
	ILV	0.05 mg/kg	LC-MS/MS	Seal and Dillon, 2007/ section B.5.2.1 of the RAR

Component of residue definition: AMPA				
Matrix type	**Method type**	**Method LOQ**	**Principle of method (i.e. GC-MS or HPLC-UV)**	**Author(s), year / missing / EU agreed**
High water content	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007a/ section B.5.2.1 of the RAR
	ILV	0.05 mg/kg	LC-MS/MS	Weber, 2012/ section B.5.2.1 of the RAR
	Confirmatory (if required)	0.05 mg/kg	LC-MS/MS	Seal and Dillon, 2007/ section B.5.2.1 of the RAR
High acid content	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007a/ section B.5.2.1 of the RAR
	ILV	0.05 mg/kg	LC-MS/MS	Seal and Dillon, 2007/ section B.5.2.1 of the RAR
	Confirmatory (if required)	0.05 mg/kg	LC-MS/MS	Klimmek and Weber, 2008/ section B.5.2.1 of the RAR
High oil content	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007a/ section B.5.2.1 of the RAR

Component of residue definition: AMPA				
Matrix type	**Method type**	**Method LOQ**	**Principle of method (i.e. GC-MS or HPLC-UV)**	**Author(s), year / missing / EU agreed**
	ILV	0.05 mg/kg	LC-MS/MS	Seal and Dillon, 2007/ section B.5.2.1 of the RAR
	Confirmatory (if required)	0.05 mg/kg	LC-MS/MS	Klimmek and Weber, 2008/ section B.5.2.1 of the RAR
High protein/high starch content (dry)	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007a/ section B.5.2.1 of the RAR
	ILV	0.05 mg/kg	LC-MS/MS	Seal and Dillon, 2007/ section B.5.2.1 of the RAR
	Confirmatory (if required)	0.05 mg/kg	LC-MS/MS	Klimmek, 2007/ section B.5.2.1 of the RAR

Component of residue definition: N-acetyl AMPA				
Matrix type	**Method type**	**Method LOQ**	**Principle of method (i.e. GC-MS or HPLC-UV)**	**Author(s), year / missing / EU agreed**
High water content	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007a/ section B.5.2.1 of the RAR
	ILV	0.05 mg/kg	LC-MS/MS	Seal and Dillon, 2007/ section B.5.2.1 of the RAR
High acid content	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007a/ section B.5.2.1 of the RAR
	ILV	0.05 mg/kg	LC-MS/MS	Seal and Dillon, 2007/ section B.5.2.1 of the RAR
High oil content	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007a/ section B.5.2.1 of the RAR
	ILV	0.05 mg/kg	LC-MS/MS	Seal and Dillon, 2007/ section B.5.2.1 of the RAR
High protein/high starch content (dry)	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007a/ section B.5.2.1 of the RAR
	ILV	0.05 mg/kg	LC-MS/MS	Seal and Dillon, 2007/ section B.5.2.1 of the RAR

For any special comments or remarkable points concerning the analytical methods for the determination of residues in plant matrices, please refer to Appendix 2.

Table 5.3-3: Statement on extraction efficiency

	Method for products of plant origin
Required, available from:	Goure, 1994 Bleeke, 1997 Mehrsheikh, 2000 George, 1995 Chapleo, McLachlan, 2010 Green, 2007

	Method for products of plant origin
	MacDonald, 2007
Not required, because:	-

5.3.2.3 Description of analytical methods for the determination of residues in animal matrices (KCP 5.2)

An overview on the acceptable methods and possible data gaps for analysis of glyphosate, N-acetyl-glyphosate, AMPA and N-acetyl AMPA in animal matrices is given in the following tables. For the detailed evaluation of new/ additional studies it is referred to Appendix 2.

Table 5.3-4: Validated methods for food and feed of animal origin (if appropriate)

Component of residue definition: glyphosate				
Matrix type	**Method type**	**Method LOQ**	**Principle of method (*i.e.* GC-MS or HPLC-UV)**	**Author(s), year / missing**
Milk	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007b/ section B.5.2.2 of the RAR
	ILV	0.025 mg/kg	LC-MS/MS	Karnik and Dillon, 2007/ section B.5.2.2 of the RAR
	Confirmatory (if required)	0.05 mg/kg	GC-MS	Schneider, 2001a/ section B.5.2.2 of the RAR
Eggs	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007b/ section B.5.2.2 of the RAR
	ILV	0.025 mg/kg	LC-MS/MS	Karnik and Dillon, 2007/ section B.5.2.2 of the RAR
	Confirmatory (if required)	0.05 mg/kg	GC-MS	Schneider, 2001a/ section B.5.2.2 of the RAR
Muscle	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007b/ section B.5.2.2 of the RAR
	ILV	0.025 mg/kg	LC-MS/MS	Karnik and Dillon, 2007/ section B.5.2.2 of the RAR
	Confirmatory (if required)	0.05 mg/kg	GC-MS	Schneider, 2001a/ section B.5.2.2 of the RAR
Fat	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007b/ section B.5.2.2 of the RAR
Kidney, liver	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007b/ section B.5.2.2 of the RAR
	ILV	0.05 mg/kg	LC-MS/MS	Karnik and Dillon, 2007/ section B.5.2.2 of the RAR

Component of residue definition: N-acetyl-glyphosate				
Matrix type	**Method type**	**Method LOQ**	**Principle of method (*i.e.* GC-MS or HPLC-UV)**	**Author(s), year / missing**
Milk	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007b/ section B.5.2.2 of the RAR
	ILV	0.025 mg/kg	LC-MS/MS	Karnik and Dillon, 2007/ section B.5.2.2 of the RAR
Eggs	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007b/ section B.5.2.2 of the RAR
	ILV	0.025 mg/kg	LC-MS/MS	Karnik and Dillon, 2007/ section B.5.2.2 of the RAR
Muscle	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007b/ section B.5.2.2 of the RAR
	ILV	0.025 mg/kg	LC-MS/MS	Karnik and Dillon, 2007/ section B.5.2.2 of the RAR
Fat	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007b/ section B.5.2.2 of the RAR
Kidney, liver	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007b/ section B.5.2.2 of the RAR
	ILV	0.05 mg/kg	LC-MS/MS	Karnik and Dillon, 2007/ section B.5.2.2 of the RAR

Component of residue definition: AMPA				
Matrix type	**Method type**	**Method LOQ**	**Principle of method (*i.e.* GC-MS or HPLC-UV)**	**Author(s), year / missing**
Milk	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007b/ section B.5.2.2 of the RAR
	ILV	0.025 mg/kg	LC-MS/MS	Karnik and Dillon, 2007,
	Confirmatory (if required)	0.05 mg/kg	GC-MS	Schneider, 2001a/ section B.5.2.2 of the RAR
Eggs	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007b/ section B.5.2.2 of the RAR
	ILV	0.025 mg/kg	LC-MS/MS	Karnik and Dillon, 2007/ section B.5.2.2 of the RAR
	Confirmatory (if required)	0.05 mg/kg	GC-MS	Schneider, 2001a/ section B.5.2.2 of the RAR
Muscle	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007b/ section B.5.2.2 of the RAR
	ILV	0.025 mg/kg	LC-MS/MS	Karnik and Dillon, 2007/ section B.5.2.2 of the RAR
	Confirmatory (if required)	0.05 mg/kg	GC-MS	Schneider, 2001a/ section B.5.2.2 of the RAR
Fat	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007b/ section B.5.2.2 of the RAR

Component of residue definition: AMPA				
Matrix type	**Method type**	**Method LOQ**	**Principle of method (*i.e.* GC-MS or HPLC-UV)**	**Author(s), year / missing**
Kidney, liver	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007b/ section B.5.2.2 of the RAR
	ILV	0.05 mg/kg	LC-MS/MS	Karnik and Dillon, 2007/ section B.5.2.2 of the RAR

Component of residue definition: N-acetyl AMPA				
Matrix type	**Method type**	**Method LOQ**	**Principle of method (*i.e.* GC-MS or HPLC-UV)**	**Author(s), year / missing**
Milk	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007b/ section B.5.2.2 of the RAR
	ILV	0.025 mg/kg	LC-MS/MS	Karnik and Dillon, 2007/ section B.5.2.2 of the RAR
Eggs	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007b/ section B.5.2.2 of the RAR
	ILV	0.025 mg/kg	LC-MS/MS	Karnik and Dillon, 2007/ section B.5.2.2 of the RAR
Muscle	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007b/ section B.5.2.2 of the RAR
	ILV	0.025 mg/kg	LC-MS/MS	Karnik and Dillon, 2007/ section B.5.2.2 of the RAR
Fat	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007b/ section B.5.2.2 of the RAR
Kidney, liver	Primary	0.05 mg/kg	LC-MS/MS	Pentz and Bramble, 2007b/ section B.5.2.2 of the RAR
	ILV	0.05 mg/kg	LC-MS/MS	Karnik and Dillon, 2007/ section B.5.2.2 of the RAR

For any special comments or remarkable points concerning the analytical methods for the determination of residues in animal matrices, please refer to Appendix 2.

Table 5.3-5: Statement on extraction efficiency

	Method for products of animal origin
Required, available from:	Pantanella and Feng, 1988 Powles, 1994 Lowrie, 2007
Not required, because:	-

5.3.2.4 Description of methods for the analysis of soil (KCP 5.2)

An overview on the acceptable methods and possible data gaps for analysis of glyphosate and AMPA in soil is given in the following tables. For the detailed evaluation of new/ additional studies it is referred to

Appendix 2.

Table 5.3-6: Validated methods for soil (if appropriate)

Component of residue definition: glyphosate			
Method type	**Method LOQ**	**Principle of method (*i.e.* GC-MS or HPLC-UV)**	**Author(s), year / missing**
Primary	0.05 mg/kg	GC-MS	Schneider, 2001b/ section B.5.3.1 of the DAR
Confirmatory	0.05 mg/kg	GC-MS	Szuter, 1996/ section B.5.3.1 of the DAR

Component of residue definition: AMPA			
Method type	**Method LOQ**	**Principle of method (*i.e.* GC-MS or HPLC-UV)**	**Author(s), year / missing**
Primary	0.05 mg/kg	GC-MS	Schneider, 2001b/ section B.5.3.1 of the DAR
Confirmatory	0.05 mg/kg	GC-MS	Szuter, 1996/ section B.5.3.1 of the DAR

For any special comments or remarkable points concerning the analytical methods for soil please refer to Appendix 2.

5.3.2.5 Description of methods for the analysis of water (KCP 5.2)

An overview on the acceptable methods and possible data gaps for analysis of glyphosate and AMPA in surface and drinking water is given in the following tables. For the detailed valuation of new/ additional studies it is referred to Appendix 2.

Table 5.3-7: Validated methods for water (if appropriate)

Component of residue definition: glyphosate				
Matrix type	**Method type**	**Method LOQ**	**Principle of method (i.e. GC-MS or HPLC-UV)**	**Author(s), year / missing**
Drinking water	Primary	0.03 µg/L	LC-MS/MS	Knoch, 2010/ section B.5.3.2 of the DAR
	ILV	0.03 µg/L	LC-MS/MS	Geschke, S., 2011 / section B.5.3.2 of the DAR
	Confirmatory	0.03 µg/L	LC-MS/MS	Knoch, 2010/ section B.5.3.2 of the DAR
Surface water	Primary	0.03 µg/L	LC-MS/MS	Knoch, 2010/ section B.5.3.2 of the DAR
	Confirmatory	0.03 µg/L	LC-MS/MS	Knoch, 2010/ section B.5.3.2 of the DAR

Component of residue definition: AMPA				
Matrix type	**Method type**	**Method LOQ**	**Principle of method (i.e. GC-MS or HPLC-UV)**	**Author(s), year / missing**
Drinking water	Primary	0.03 µg/L	LC-MS/MS	Knoch, 2010/ section B.5.3.2 of the DAR
	ILV	0.03 µg/L	LC-MS/MS	Geschke, S., 2011/ section B.5.3.2 of the DAR
	Confirmatory	0.03 µg/L	LC-MS/MS	Knoch, 2010/ section B.5.3.2 of the DAR
Surface water	Primary	0.03 µg/L	LC-MS/MS	Knoch, 2010/ section B.5.3.2 of the DAR
	Confirmatory	0.03 µg/L	LC-MS/MS	Knoch, 2010/ section B.5.3.2 of the DAR

For any special comments or remarkable points concerning the analytical methods for water please refer to Appendix 2.

5.3.2.6 Description of methods for the analysis of air (KCP 5.2)

An overview on the acceptable methods and possible data gaps for analysis of glyphosate in air is given in the following tables. For the detailed evaluation of new/ additional studies please refer to Appendix 2.

Table 5.3-8: Validated methods for air (if appropriate)

Component of residue definition: Glyphosate			
Method type	**Method LOQ**	**Principle of method (i.e. GC-MS or HPLC-UV)**	**Author(s), year / missing**
Primary	5 µg/m3,	GC-MS	Schneider, 2001c/ section B.5.3.3 of the DAR

For any special comments or remarkable points concerning the analytical methods for air it is referred to Appendix 2.

5.3.2.7 Description of methods for the analysis of body fluids and tissues (KCP 5.2)

An overview on the acceptable methods and possible data gaps for analysis of glyphosate in body fluids and tissues is given in the following table. For the detailed evaluation of new/ additional studies it is referred to Appendix 2.

Table 5.3-9: Methods for body fluids and tissues (if appropriate)

Component of residue definition: Glyphosate			
Method type	**Method LOQ**	**Principle of method (i.e. GC-MS or HPLC-UV)**	**Author(s), year / missing**
Primary	Methods for body fluids and tissues are not required, because glyphosate is not considered to be toxic or very toxic (T / T+) nor is it classified according to GHS as follows: Acute toxicity (cat. 1 - 3), CMR (cat. 1) or STOT (cat. 1).		
Confirmatory			

For any special comments or remarkable points concerning the analytical methods for body fluids and tissues please refer to Appendix 2.

5.3.2.8 Other studies/ information

No other studies or information.

5.3.3 Description of analytical methods for the determination of residues of MCPA (KCP 5.2)

5.3.3.1 Overview of residue definitions and levels for which compliance is required

Compared to the residue definition proposed in the Draft Assessment Report (incl. its addenda) the current legal residue definition is identical.

Table 5.3-10: Relevant residue definitions for monitoring/enforcement and levels for which compliance is required

Matrix	Residue definition	MRL / limit	Reference for MRL/level Remarks
Plant, high water content	MCPA, MCPB including their salts, esters and conjugates expressed as MCPA	0.05 mg/kg	Regulation (EC) No 491/2014, annex II, annex III part B
Plant, high acid content		0.05 mg/kg	Regulation (EC) No 491/2014, annex II, annex III part B
Plant, high protein/high starch content (dry commodities)		0.05 mg/kg	Regulation (EC) No 491/2014, annex II, annex III part B
Plant, high oil content		0.05 mg/kg	Regulation (EC) No 491/2014, annex II, annex III part B
Muscle	MCPA, MCPB and MCPA thioethyl expressed as MCPA	0.1 mg/kg	Regulation (EC) No 491/2014, annex II, annex III part B
Milk		0.05 mg/kg	Regulation (EC) No 491/2014, annex II, annex III part B
Eggs		0.05 mg/kg	Regulation (EC) No 491/2014, annex II, annex III part B
Fat		0.1 mg/kg	Regulation (EC) No 491/2014, annex II, annex III part B
Liver, kidney		0.1 mg/kg	Regulation (EC) No 491/2014, annex II, annex III part B
Soil	MCPA, potentially rele-	0.05 mg/kg	common limit

Matrix	Residue definition	MRL / limit	Reference for MRL/level Remarks
(Ecotoxicology)	vant: 2-methyl-4-chlorphenol		
Drinking water	MCPA	0.1 µg/L	general limit for drinking water
Surface water (Ecotoxicology)	MCPA	152 µg/L	IC_{50} *Lemna gibba*, Review Report, SANCO/4062/2001-final, 2008-07-11
Air	MCPA	12 µg/m^3	AOEL sys: 0.04 mg/kg bw/d Review Report, SAN-CO/4062/2001-final, 2008-07-11
Tissue (meat or liver)	Not residue relevant	Not required	notclassified as T / T+
Body fluids		Not required	notclassified as T / T+

5.3.3.2 Description of analytical methods for the determination of residues in plant matrices (KCP 5.2)

An overview on the acceptable methods and possible data gaps for analysis of MCPA in plant matrices is given in the following tables.

Table 5.3-11: Validated methods for food and feed of plant origin (required for all matrix types, "difficult" matrix only when indicated by intended GAP)

Component of residue definition: MCPA				
Matrix type	**Method type**	**Method LOQ**	**Principle of method (i.e. GC-MS or HPLC-UV)**	**Author(s), year / missing / EU agreed**
High water content	Primary	-	-	-
	ILV	-	-	-
	Confirmatory (if required)	-	-	-
High acid content	Primary	-	-	-
	ILV	-	-	-
	Confirmatory (if required)	-	-	-
High oil content	Primary	-	-	-
	ILV	-	-	-
	Confirmatory (if required)	-	-	-
High protein/high starch content (dry)	Primary	0.05 mg/kg (cereals) 0.05 mg/kg (cereals, maize)	GC-MS GC-MSD	Pfarl C, 1994, MCPA monograph+addendum Wasser C., 2001, MCPA monograph+addendum

Component of residue definition: MCPA				
Matrix type	**Method type**	**Method LOQ**	**Principle of method (i.e. GC-MS or HPLC-UV)**	**Author(s), year / missing / EU agreed**
	ILV	-	-	-
	Confirmatory (if required)	-	-	-
Difficult (if required, depends on intended use)	Primary	-	-	-
	ILV	-	-	-
	Confirmatory (if required)	-	-	-

Table 5.3-12: Statement on extraction efficiency

	Method for products of plant origin
Required, available from:	-
Not required, because:	Not provided during the EU review of MCPA

5.3.3.3 Description of analytical methods for the determination of residues in animal matrices (KCP 5.2)

An overview on the acceptable methods and possible data gaps for analysis of MCPA in animal matrices is given in the following tables.

Table 5.3-13: Validated methods for food and feed of animal origin (if appropriate)

Component of residue definition: MCPA				
Matrix type	**Method type**	**Method LOQ**	**Principle of method (*i.e.* GC-MS or HPLC-UV)**	**Author(s), year / missing**
Milk	Primary	0.01 mg/kg 0.01 mg/kg	GC-MSD LC/MS	Koch, DA, 2007, FAO 2012* Johnson, T, and King, DL, 2001, FAO 2012
	ILV	-	-	-
	Confirmatory (if required)	-	-	-
Eggs	Primary	-	-	-
	ILV	-	-	-
	Confirmatory (if required)	-	-	-
Muscle	Primary	0.05 mg/kg 0.05 mg/kg	GC-MSD LC/MS	Koch, DA, 2007, FAO 2012* Johnson, T, and King, DL, 2001, FAO 2012
	ILV	-	-	-
	Confirmatory (if required)	-	-	-

Component of residue definition: MCPA				
Matrix type	**Method type**	**Method LOQ**	**Principle of method (*i.e.* GC-MS or HPLC-UV)**	**Author(s), year / missing**
Fat	Primary	0.05 mg/kg 0.05 mg/kg	GC-MSD LC/MS	Koch, DA, 2007, FAO 2012* Johnson, T, and King, DL, 2001, FAO 2012
	ILV	-	-	-
	Confirmatory (if required)	-	-	-
Kidney, liver	Primary	0.05 mg/kg 0.05 mg/kg	GC-MSD LC/MS	Koch, DA, 2007, FAO 2012* Johnson, T, and King, DL, 2001, FAO 2012
	ILV	-	-	-
	Confirmatory (if required)	-	-	-

* according to list of studies in AIR III Task Force, FAO isn't claimed by data protection

Table 5.3-14: Statement on extraction efficiency

	Method for products of animal origin
Required, available from:	-
Not required, because:	Not provided during the EU review of MCPA

5.3.3.4 Description of methods for the analysis of soil (KCP 5.2)

An overview on the acceptable methods and possible data gaps for analysis of MCPA in soil is given in the following tables.

Table 5.3-15: Validated methods for soil (if appropriate)

Component of residue definition: MCPA			
Method type	**Method LOQ**	**Principle of method (*i.e.* GC-MS or HPLC-UV)**	**Author(s), year / missing**
Primary	50 mg/kg	GC-EC	Sattar M A and J Paasivirta, 1979, MCPA monograph+addendum
Confirmatory	-	-	-

5.3.3.5 Description of methods for the analysis of water (KCP 5.2)

An overview on the acceptable methods and possible data gaps for analysis of MCPA in surface and drinking water is given in the following tables.

Table 5.3-8: Validated methods for water (if appropriate)

Component of residue definition: MCPA				
Matrix type	**Method type**	**Method LOQ**	**Principle of method (i.e. GC-MS or HPLC-UV)**	**Author(s), year / missing**
Drinking water	Primary	0.1 µg/L	GC-MS	HMSO Publication, 1997
	-	-	-	-
	Confirmatory	0.1 µg/L	GC-MS	HMSO Publication, 1997
Surface water	Primary	0.1 µg/L	GC-MS	HMSO Publication, 1997
	Confirmatory	0.1 µg/L	GC-MS	HMSO Publication, 1997

5.3.3.6 Description of methods for the analysis of air (KCP 5.2)

An overview on the acceptable methods and possible data gaps for analysis of MCPA in air is given in the following tables.

Table 5.3-9: Validated methods for air (if appropriate)

Component of residue definition: MCPA			
Method type	**Method LOQ**	**Principle of method (i.e. GC-MS or HPLC-UV)**	**Author(s), year / missing**
Primary	0.24 µg/m^3 (air) 0.6 µg/m^3 (air)	HPLC/UV HPLC	Reichert N, 1994, MCPA monograph+addendum Werrer Zangmeister, 1995, MCPA monograph+addendum
Confirmatory	-	-	-

5.3.3.7 Description of methods for the analysis of body fluids and tissues (KCP 5.2)

Not required since MCPA is not classified as toxic or highly toxic.

5.3.3.8 Other studies/ information

Not relevant, not required.

Appendix 1 Lists of data considered in support of the evaluation

List of data submitted by the applicant and relied on

Data point	Author(s)	Year	Title Company Report No. Source (where different from company) GLP or GEP status Published or not	Vertebrate study Y/N	Owner
KCP 5.1.1	Gwóźdź, E, Eng.	2009	Method development and validation for determination of the content of active substances of MCPA and Glyphosate in Orkan 350 SL. Institute of Industrial Organic Chemistry; Analysis No. BA-15/09 GLP Unpublished	N	Synthos Agro Sp. z o.o.
KCP 5.1.1	Gwóźdź, E, Eng.	2018	Orkan 350 SL Development and validation of the methods for determination of the relevant impurities (formaldehyde and N-nitrosoglyphosate) in the formulation and after accelerated storage. Institute of Industrial Organic Chemistry; Code of study: BA – 82/18 GLP Unpublished	N	Synthos Agro Sp. z o.o.
KCP 5.1.2	Tomasz Peda	2020a	Magnitude of the residue of MCPA, MCPB and glyphosate in apple (Raw Agricultural Commodity) after one application of Orkan 350 SL – three harvest trials in Poland – 2019. SGS Polska Sp. z o.o. Study code: 19SGS21 GLP Unpublished	N	Synthos Agro Sp. z o.o.
KCP 5.1.2	Tomasz Peda	2020a	Magnitude of the residue of MCPA, MCPB and glyphosate in cherry (Raw Agricultural Commodity) after one application of Orkan 350 SL – three harvest trials in Poland - 2019 SGS Polska Sp. z o.o. Study code: 19SGS22	N	Synthos Agro Sp. z o.o.

Data point	Author(s)	Year	Title Company Report No. Source (where different from company) GLP or GEP status Published or not	Vertebrate study Y/N	Owner
			GLP Unpublished		

List of data submitted or referred to by the applicant and relied on, but already evaluated at EU peer review

Data point	Author(s)	Year	Title Company Report No. Source (where different from company) GLP or GEP status Published or not	Vertebrate study Y/N	Owner
KCP 5.1.2	Pentz, A.M., Bramble, F.Q.	2007a	Analytical method for the determination of glyphosate and degradate residues in various crop matrices using LC/MS/MS DuPont-15444 Revision-1 BVL-1748765, ASB2008-2635 No GLP Unpublished	N	DuPont de Nemours
KCP 5.1.2	Klimmek	2007	Validation of the analytical method DFG Method 405 for determination of residues of Glyphosate and its Metabolite AMPA in various plant materials 0FC00014427 ! FCS-0703V BVL-2309041, ASB2008-5606 GLP Unpublished	N	European Glyphosate Task Force AIR 2
KCP 5.1.2	Weber	2012	Validation of an analytical method for thedetermination of Glyphosate and AMPA in Raw Agricultural Commodities using LC/MS/MS S11-03331 BVL-2309045, ASB2012-12489 GLP	N	European Glyphosate Task Force AIR 2

Data point	Author(s)	Year	**Title** **Company Report No.** **Source (where different from company)** **GLP or GEP status** **Published or not**	**Vertebrate study Y/N**	**Owner**
			Unpublished		
KCP 5.1.2	Klimmek, S., Weber, H.	2008	First Amendment to final report - Validation of the analytical method DFG Method 405 for the determination of residues of Glyphosate and its metabolite AMPA in various plant materials FCS-0703V BVL-2309043, ASB2008-5607 GLP Unpublished	N	European Glyphosate Task Force AIR 2
KCP 5.1.2	Anderson and Ely	2001	N-(phosphonomethyl)glycine (PMG) and Aminomethyl Phosphonic acid (AMPA) validation of a residue analytical method for the determination of the residues in various cRrJo3p1s1 9B BVL-2309035, ASB2012-12364 GLP Unpublished	N	European Glyphosate Task Force AIR 2
KCP 5.1.2	Pentz, A.M., Bramble, F.Q.	2007b	Analytical method for the determination of Nacetylglyphosate and other analytes in various animal matrices using LC/MS/MS DuPont-20009 BVL-1748766, ASB2008-2636 No GLP Unpublished	N	DuPont de Nemours
KCP 5.1.2	Schneider	2001a	Validation of an analytical method for the determination of Glyphosate in foodstuff of animal origin (meet, eggs, milk) (Monitoring method) PR01/005 BVL-2309057, MET2005-367 GLP Unpublished	N	European Glyphosate Task Force AIR 2
KCP 5.1.2	Schneider	2001b	Validation of an analytical method for the determination of Glyphosate in soil PR01/006 BVL-2309063, MET2005-371 GLP Unpublished	N	European Glyphosate Task Force AIR 2

Data point	Author(s)	Year	**Title** **Company Report No.** **Source (where different from company)** **GLP or GEP status** **Published or not**	**Vertebrate study Y/N**	Owner
KCP 5.1.2	Schneider	2001c	Validation of an analytical method for the determination of Glyphosate in air PR01/007 BVL-2309069, MET2005-368 GLP Unpublished	N	European Glyphosate Task Force AIR 2
KCP 5.1.2	Szuter	1996	Glyphosate Acid: Independent laboratory lalidation of the method for determining residues of N-(Phosphonomethyl)glycine and (Aminomethyl)phosphonic acid in soil (WRC-96-082) (WINO 23013) Study number ZPMG-96-MT-01, Report number RR 96-059B not published, MET2000-699 GLP Unpublished	N	Monsanto Europe S.A./N.V.
KCP 5.1.2	Knoch	2010	Validation of an analytical method: Determination of Glyphosate and AMPA in water matrices using FMOC derivatization, manual SPE cleanup and LC-MS/MS quantitation IF-10/01618859 BVL-2309065, ASB2012-12445 GLP Unpublished	N	European Glyphosate Task Force AIR 2
KCP 5.2	Pentz and Bramble	2007a	Analytical method for the determination of glyphosate and degradate residues in various crop matrices using LC/MS/MS DuPont-15444 Revision-1 BVL-1748765, ASB2008-2635 No GLP Unpublished	N	DuPont de Nemours
KCP 5.2	Seal and Dillon	2007	Independent laboratory validation of DuPont-15444, "Analytical method for the determination of glyphosate and relevant metabolite residues in various crop matrices using LC/MS/MS" DuPont-21313, Pyxant Labs Project no. 1763 BVL-1748767, ASB2008-2637 GLP Unpublished	N	DuPont de Nemours

Data point	Author(s)	Year	**Title** **Company Report No.** **Source (where different from company)** **GLP or GEP status** **Published or not**	**Vertebrate study Y/N**	Owner
KCP 5.2	Weber	2012	Validation of an analytical method for the determination of Glyphosate and AMPA in Raw Agricultural Commodities using LC/MS/MS S11-03331 BVL-2309045, ASB2012-12489 GLP Unpublished	N	European Glyphosate Task Force AIR 2
KCP 5.2	Klimmek, S., Weber, H.	2008	First Amendment to final report - Validation of the analytical method DFG Method 405 for the determination of residues of Glyphosate and its metabolite AMPA in various plant materials FCS-0703V BVL-2309043, ASB2008-5607 GLP Unpublished	N	European Glyphosate Task Force AIR 2
KCP 5.2	Klimmek	2007	Validation of the analytical method DFG Method 405 for determination of residues of Glyphosate and its Metabolite AMPA in various plant materials 0FC00014427 ! FCS-0703V BVL-2309041, ASB2008-5606 GLP Unpublished	N	European Glyphosate Task Force AIR 2
KCP 5.2	Anderson and Ely	2001	N-(phosphonomethyl)glycine (PMG) and Aminomethyl Phosphonic acid (AMPA) validation of a residue analytical method for the determination of the residues in various cRrJo3p1s1 9B BVL-2309035, ASB2012-12364 GLP Unpublished	N	European Glyphosate Task Force AIR 2
KCP 5.1.2	Pentz and Bramble	2007b	Analytical method for the determination of Nacetylglyphosate and other analytes in various animal matrices using LC/MS/MS DuPont-20009 BVL-1748766, ASB2008-2636 No GLP Unpublished	N	DuPont de Nemours

Data point	Author(s)	Year	Title Company Report No. Source (where different from company) GLP or GEP status Published or not	Vertebrate study Y/N	Owner
KCP 5.2	Karnik and Dillon	2007	Independent laboratory validation of DuPont-20009, "Analytical method for the determination of N-acetalglyphosate and other analytes in various animal matrices using LC/MS/MS" DuPont-21372, Pyxant Labs Inc. ID: 1806 BVL-1748764, ASB2008-2634 GLP Unpublished	N	DuPont de Nemours
KCP 5.1.2	Schneider	2001a	Validation of an analytical method for the determination of Glyphosate in foodstuff of animal origin (meet, eggs, milk) (Monitoring method) PR01/005 BVL-2309057, MET2005-367 GLP Unpublished	N	European Glyphosate Task Force AIR 2
KCP 5.1.2	Schneider	2001b	Validation of an analytical method for the determination of Glyphosate in soil PR01/006 BVL-2309063, MET2005-371 GLP Unpublished	N	European Glyphosate Task Force AIR 2
KCP 5.1.2	Schneider	2001c	Validation of an analytical method for the determination of Glyphosate in air PR01/007 BVL-2309069, MET2005-368 GLP Unpublished	N	European Glyphosate Task Force AIR 2
KCP 5.2	Szuter	1996	Glyphosate Acid: Independent laboratory validation of the method for determining residues of N-(Phosphonomethyl)glycine and (Aminomethyl)phosphonic acid in soil (WRC-96-082) (WINO 23013) Study number ZPMG-96-MT-01, Report number RR 96-059B MET2000-699 GLP Unpublished	N	Monsanto Europe S.A./N.V.

Data point	Author(s)	Year	**Title** **Company Report No.** **Source (where different from company)** **GLP or GEP status** **Published or not**	**Vertebrate study Y/N**	Owner
KCP 5.2	Knoch	2010	Validation of an analytical method: Determination of Glyphosate and AMPA in water matrices using FMOC derivatization, manual SPE cleanup and LC-MS/MS quantitation IF-10/01618859 BVL-2309065, ASB2012-12445 GLP Unpublished	N	European Glyphosate Task Force AIR 2
KCP 5.2	Geschke, S.	2011	Independent laboratory validation of an analytical method for the determination of residues of Glyphosate and AMPA in drinking water S10-02882 BVL-2309067, ASB2012-12426 GLP Unpublished	N	European Glyphosate Task Force AIR 2
KCP 5.2	Goure	1994	Nature of Glyphosate residues in soybeans tolerant to Roundup herbicide Report No. MSL-13520 RIP9800117 GLP Unpublished	N	Monsanto Europe S.A./N.V.
KCP 5.2	Bleeke	1997	Nature of Glyphosate residues in cotton plants tolerant to Roundup herbicide. Report No. MSL-14113 RIP9700619 GLP Unpublished	N	Monsanto Europe S.A./N.V.
KCP 5.2	Mehrsheikh	2000	Metabolism of Glyphosate in Roundup Ready Sugarbeet Report No. MSL-16247 RIP2001-906 GLP Unpublished	N	Monsanto Europe S.A./N.V.
KCP 5.2	George	1995	Nature of Glyphosate residues in corn plants which are tolerant to Roundup herbicide Report No. MSL-14018 RIP9700618	N	Monsanto Europe S.A./N.V.

Data point	Author(s)	Year	**Title** **Company Report No.** **Source (where different from company)** **GLP or GEP status** **Published or not**	**Vertebrate study Y/N**	**Owner**
			GLP Unpublished		
KCP 5.2	Chapleo, McLachlan	2010	The metabolism of [14C]Glyphosate in 0827 canola Sponsor Study No: DuPont-26109 BVL-2200198, ASB2011-13744 GLP Unpublished	N	DuPont de Nemours
KCP 5.2	Green	2007	The metabolism of [14C]Glyphosate in Optimum GAT (Event DP-Ø9814Ø-6) field corn DuPont-19529 BVL-1748787, ASB2008-2657	N	DuPont de Nemours
KCP 5.2	MacDonald	2007	The metabolism of [14C]Glyphosate in GAT/GM-HRA (DP-356Ø43-5, PHP20163a) soybeans DuPont-19530 BVL-1748788, ASB2008-2658	N	DuPont de Nemours
KCP 5.2	Pantanella and Feng,	1988	Metabolism study of synthetic $^{13}C/^{14}C$-labeled Glyphosate and Aminomethylphosphonic acid in lactating goats. Part II Report: MSL-7458 RIP9501204 GLP Unpublished	N	Monsanto Europe S.A./N.V.
KCP 5.2	Powles	1994	(^{14}C-Glyphosate): Absorption, distribution, metabolism and excretion following repeated oral administration to the dairy goat Report No. 676/9-1011 RIP9501207 GLP Unpublished	N	Monsanto Europe S.A./N.V.
KCP 5.2	Lowrie	2007	Metabolism of [^{14}C]-N-Acetylglyphosate (INMCX20) in the lactating goat Report No.: DuPont-19796 BVL-1748790, ASB2008-2660 GLP	N	DuPont de Nemours

Data point	Author(s)	Year	Title Company Report No. Source (where different from company) GLP or GEP status Published or not	Vertebrate study Y/N	Owner
			Unpublished		
KCP 5.2	Sattar, M A Paasivirta, J	1979	Simultaneous determination of MCPA and its metabolites in soil by Gas chromatography Generated by: Published literature Submitted by: MCPA Dossier Preparation Working Group	N	MCPA TASK FORCE
KCP 5.2	Reichert, N	1994	Development and validation of a method for the dtermination of 2, 4-D MCPA. Dichloroprop-P and Mecoprop-P in air Submitted by: MCPA Dossier Preparation Working Group File No: RCC 439705	N	MCPA TASK FORCE
KCP 5.2	Pfarl C	1994	Validation of an analytical method for determination of residues of MCPA in cereals. Generated by: Agrolinz Mclamin GmbH Submitted by: MCPA Dossier Preparation Working Group File No: 1172a	N	MCPA TASK FORCE
KCP 5.2	Wasser, C	2001	MCPA: Validation of Analysis for MCPA, MCPB and HMCPA Residues in Maize. ANADIAG, Report No. R9112, Ref No.: MCPA-R047, GLP; Unpublished, 22.11.2001.	N	-
KCP 5.2	Koch, DA	2007	MCPA: Magnitude of Residues of MCPA in Dairy Cow Milk and Tissues. ABC Laboratories, Inc., Report No. 49737, Ref No.: MCPA-R137, GLP; Unpublished, 09.02.2007	N	-
KCP 5.2	Johnson, T and King, D	2001	MCPA: Validated Analytical Method for the Determination of 4-Chloro-2-Methylphenoxy acetic Acid (MCPA), MCPA Glycine Conjugate, 4-Chloro-2-hydroxymethylphenoxy-acetic acid (HMCPA) and HMCPA glucose conjugate in Beef Tissues, Milk and Cream. PTRL East, Inc., Report No. 2117, Ref No.: MCPA-R054, GLP; Unpublished, 27.07.2001.	N	-
KCP 5.2	Werrer Zangmeister	1995	MCPA DAR addendum	N	-
KCP 5.2	-	1997	HMSO Publication	N	-

Appendix 2 Detailed evaluation of submitted analytical methods

A 2.1 Analytical methods for glyphosate

A 2.1.1 Methods used for the generation of pre-authorization data (KCP 5.1)

A 2.1.1.1 Description of analytical methods for the determination of residues in plant matrices (KCP 5.1)

A 2.1.1.1.1 Analytical method 1

A 2.1.1.1.1.1 Method validation

Evaluator comment:
Study is accepted

Reference:	Validation included in the following reports: 1) Tomasz Peda, 2020a 2) Tomasz Peda, 2020b
Reports	1) Magnitude of the residue of MCPA, MCPB and glyphosate in apple (Raw Agricultural Commodity) after one application of Orkan 350 SL – three harvest trials in Poland - 2019, Tomasz Peda, 2020a, Study code: 19SGS21 2) Magnitude of the residue of MCPA, MCPB and glyphosate in cherry (Raw Agricultural Commodity) after one application of Orkan 350 SL – three harvest trials in Poland - 2019, Tomasz Peda, 2020b, Study code: 19SGS22
Guideline(s):	SANCO/3029/99 rev.4 SANCO/825/00 rev. 8.1
Deviations:	No
GLP:	Yes
Acceptability:	Yes

Materials and methods

LC-MS/MS method was used during the study. One mass transitions were evaluated and used for quantification (the rest of transitions were used as qualifiers purposes).

Reference materials:

- Glyphosate, Industrial Organic Chemistry (IPO) with certified information concerning identity, purity and expiration date
- Glyphosate 1,2-13C2 15N, HPC Standards GmbH with certified information concerning identity, purity and expiration date

- AMPA, HPC Standards GmbH with certified information concerning identity, purity and expiration date
- N-acetyl AMPA, HPC Standards GmbH with certified information concerning identity, purity and expiration date
- N-acetyl glyphosate, HPC Standards GmbH with certified information concerning identity, purity and expiration date

Apparatus:

- Electronic balance Class I
- Electronic balance Class II
- Freezer – storage of:
  - Analytical standards
  - Analytical samples before the analytical part
  - Analytical samples extracts until the end of the instrumental analysis
  - Archived analytical samples
- Cutter (knife grinder)
- Cereal grinder
- Centrifuge (about 3000 rpm)
- Polypropylene centrifuge tubes, with screw caps, 50 ml
- Plastic cups (stackable), 25 and 100 ml, for the storage of buffer-salt mixture portions and archived samples
- Volumetric flasks, 5 and 10 ml (class A)
- Automatic pipettes, 10 ml
- Laboratory syringes 10 µl, 50 µl, 100 µl, 250 µl, 500 µl and 1000 µl
- Vials with screw caps, amber glass, 10 ml
- Injection vials, 2,5 ml, amber glass, screw caps with septa butyl/PTFE
- Liquid Chromatography Instrument LC-MSMS Shimadzu 8050

Reagents and materials:

- Deionized Water
- Acetonitrile, CH_3CN, for GC applications (pesticide residues analysis)
- Methanol, CH_3OH, HPLC grade
- Formic acid, HCOOH, 98 – 100%, for analysis
- Magnesium sulfate, $MgSO_4$, anhydrous
- Sodium chloride, NaCl
- Disodium hydrogencitrate sesquihydrate, $C_6H_6Na_2O_7 \bullet 1{,}5H_2O$
- Trisodium citrate dihydrate, $C_5H_5Na_3O_7 \bullet 2H_2O$
- Buffer salt mixture containing:
  - 4g ± 0,2 g anhydrous magnesium sulfate
  - 1g ± 0,05 g sodium chloride
  - 1g ± 0,05 g trisodium citrate dehydrate
  - 0,50g ± 0,03 g disodium hydrogencitrate sesquihydrate

Instrument settings

Liquid Chromatograph LCMS-8050 Schimadzu consists of:
Degazer DGU-20AXR
Two pumps LC-20ADXR (Nexera)
Autosampler SIL-20ACXR
Column oven CTO-20AC
Compressor, generator PEAK Genius 1051
HPLC Column – Hypercarb, 100 x 2.1 mm, 5 µm (Thermo Scientific)

Pumps

Mode – Binary gradient
Total Flow – 0.2 ml/min
Mobile Phase A – 1% acetic acid in deionized water +5% of methanol
Mobile Phase B – 1% acetic acid in methanol
A Conc – 100%
B Conc – 0%

Glyphosate
Acquisition Mode: MRM
Polarity: Negative
Start time: 0.00 min
End time: 13.00 min
Retention Time: 1.94 min

Glyphosate 1,2-13C2 15N – internal standard
Acquisition Mode: MRM
Polarity: Negative
Start time: 0.00 min
End time: 13.00 min
Retention Time: 1.92 min

AMPA
Acquisition Mode: MRM
Polarity: Negative
Start time: 0.00 min
End time: 13.00 min
Retention Time: 1.09 min

N-acetyl glyphosate
Acquisition Mode: MRM
Polarity: Negative
Start time: 0.00 min
End time: 13.00 min
Retention Time: 5.01 min

Results and discussions

Table A 1: Recovery results from method validation of glyphosate and its metabolites using the analytical method

Matrix	Analyte	Fortification level (mg/kg) (*n* = x)	Mean recovery (%)	RSD (%)	Comments
Apples	Glyphosate	n = 10 0.010 0.100	 82.3 78.2	 14.1 6.72	Mean recovery on each fortification levels are in the range 70-110% according to SANCO/3029/99 rev.4
Apples	AMPA	n = 10 0.010 0.100	 91.6 81.4	 17.0 11.0	Mean recovery on each fortification levels are in the ideally range 80-100% according to SANCO/3029/99 rev.4

Matrix	Analyte	Fortification level (mg/kg) (*n* = x)	Mean recovery (%)	RSD (%)	Comments
Apples	N-acetyl AMPA	n = 10 0.010 0.100	 115 82.8	 1.98 6.90	Because of very low RSD% mean recovery above 110% should be acceptable
Apples	N-acetyl glyphosate	n = 10 0.010 0.100	 104 99.1	 9.60 9.23	Mean recovery on each fortification levels are in the range 70-110% according to SANCO/3029/99 rev.4

Table A 2: Characteristics for the analytical method used for validation of glyphosate and its metabolites residues in apples

	Glyphosate and Metabolites
Specificity	The specificity of the method was evaluated on the basis of the analysis of chromatograms recorded for the matrix blank samples. No interferences at above 30% of the LOQ were detected at the retention time of active substance in matrix blank samples.
Calibration (type, number of data points)	Glyphosate R^2 was 0.9994752 The curve is described as y = 0.836079x + 0.0102052 AMPA R^2 was 0.9999183 The curve is described as y = 1.32671x + 0.0246213 N-acetyl AMPA R^2 was 0.9999529 The curve is described as y = 19.8677x + 0.387123 N-acetyl Glyphosate R^2 was 0.9996009 The curve is described as y = 17.1837x + 0.0933292
Calibration range	The linearity of the detector response was demonstrated by single determination of matrix-matched calibration standards at six concentration levels ranging from 0.001 to 0.5 mg/kg.
Assessment of matrix effects is presented	Matrix effect on the detection of Glyphosate in extracts of apples was found to be insinificant (≤20%), nevertheless matrix-matched standards were used for quantification for all the samples.
Limit of determination/quantification	The LOQ is the lowest validated fortification level for which an average recovery in the range of 70 – 120% and RSD ≤ 20% is achieved.

	Glyphosate and Metabolites
Specificity	The specificity of the method was evaluated on the basis of the analysis of chromatograms recorded for the matrix blank samples. No interferences at above 30% of the LOQ were detected at the retention time of active substance in matrix blank samples.
	LOQ was successfully established at **0.01 mg/kg** **Limit of detetion (LOD)** was established at **0.003 mg/kg** as ±30% LOQ

Conclusion

The validation parameters (specificity, linearity, accuracy, recovery and precision) are within the acceptance range and fulfil EU requirements given in SANCO /3029/99 rev.4.

A 2.1.2 Methods for post-authorization control and monitoring purposes (KCP 5.2)

A 2.1.2.1 Description of analytical methods for the determination of residues in plant matrices (KCP 5.2)

No new or additional studies have been submitted

A 2.1.2.2 Description of analytical methods for the determination of residues in animal matrices (KCP 5.2)

No new or additional studies have been submitted

A 2.1.2.3 Description of Methods for the Analysis of Soil (KCP 5.2)

No new or additional studies have been submitted

A 2.1.2.4 Description of Methods for the Analysis of Water (KCP 5.2)

No new or additional studies have been submitted

A 2.1.2.5 Description of Methods for the Analysis of Air (KCP 5.2)

No new or additional studies have been submitted

A 2.1.2.6 Description of Methods for the Analysis of Body Fluids and Tissues (KCP 5.2)

No new or additional studies have been submitted

A 2.1.2.7 A.2.A.9 Other Studies/ Information

No new or additional studies have been submitted

A 2.2 Analytical methods for the MCPA

A 2.2.1 Methods used for the generation of pre-authorization data (KCP 5.1)

A 2.2.1.1 Description of analytical methods for the determination of residues in plant matrices (KCP 5.1)

A 2.2.1.1.1 Analytical method 1

A 2.2.1.1.1.1 Method validation

Evaluator comment:
Study is accepted

Reference:	Validation included in the following reports: 3) Tomasz Peda, 2020a 4) Tomasz Peda, 2020b
Reports	3) Magnitude of the residue of MCPA, MCPB and glyphosate in apple (Raw Agricultural Commodity) after one application of Orkan 350 SL – three harvest trials in Poland - 2019, Tomasz Peda, 2020a, Study code: 19SGS21 4) Magnitude of the residue of MCPA, MCPB and glyphosate in cherry (Raw Agricultural Commodity) after one application of Orkan 350 SL – three harvest trials in Poland - 2019, Tomasz Peda, 2020b, Study code: 19SGS22
Guideline(s):	SANCO/3029/99 rev.4 SANCO/825/00 rev. 8.1
Deviations:	No
GLP:	Yes
Acceptability:	Yes

Materials and methods

LC-MS/MS method was used during the study. One mass transitions were evaluated and used for quantification (the rest of transitions were used as qualifiers purposes).

Reference materials:

- MCPA, Dr Ehrenstorfer with certified information concerning identity, purity and expiration date
- MCPA D3, Dr Ehrenstorfer with certified information concerning identity, purity and expiration date
- MCPB, Dr Ehrenstorfer with certified information concerning identity, purity and expiration date
- MCPB D6 (ring D3, methyl D3) Dr Ehrenstorfer with certified information concerning identity,

purity and expiration date

Apparatus:

- Electronic balance Class I
- Electronic balance Class II
- Freezer – storage of:
  - Analytical standards
  - Analytical samples before the analytical part
  - Analytical samples extracts until the end of the instrumental analysis
  - Archived analytical samples
- Cutter (knife grinder)
- Cereal grinder
- Centrifuge (about 3000 rpm)
- Polypropylene centrifuge tubes, with screw caps, 50 ml
- Plastic cups (stackable), 25 and 100 ml, for the storage of buffer-salt mixture portions and archived samples
- Volumetric flasks, 5 and 10 ml (class A)
- Automatic pipettes, 10 ml
- Laboratory syringes 10 µl, 50 µl, 100 µl, 250 µl, 500 µl and 1000 µl
- Vials with screw caps, amber glass, 10 ml
- Injection vials, 2,5 ml, amber glass, screw caps with septa butyl/PTFE
- Liquid Chromatography Instrument LC-MSMS Shimadzu 8050

Reagents and materials:

- Deionized Water
- Acetonitrile, CH_3CN, for GC applications (pesticide residues analysis)
- Methanol, CH_3OH, HPLC grade
- Formic acid, HCOOH, 98 – 100%, for analysis
- Magnesium sulfate, $MgSO_4$, anhydrous
- Sodium chloride, NaCl
- Disodium hydrogencitrate sesquihydrate, $C_6H_6Na_2O_7 \cdot 1{,}5H_2O$
- Trisodium citrate dihydrate, $C_5H_5Na_3O_7 \cdot 2H_2O$
- Buffer salt mixture containing:
  - 4g ± 0,2 g anhydrous magnesium sulfate
  - 1g ± 0,05 g sodium chloride
  - 1g ± 0,05 g trisodium citrate dehydrate
  - 0,50g ± 0,03 g disodium hydrogencitrate sesquihydrate

Instrument settings

Liquid Chromatograph LCMS-8050 Schimadzu consists of:
Degazer DGU-20AXR
Two pumps LC-20ADXR (Nexera)
Autosampler SIL-20ACXR
Column oven CTO-20AC
Compressor, generator PEAK Genius 1051
HPLC Column – Agilent Poroshell 120 EC-C18, 4.6 x 50 mm

Pumps
Mode – Binary gradient
Total Flow – 0.3 ml/min
Mobile Phase A – 0.01% acetic acid in deionized water
Mobile Phase B – 0.01% acetic acid in macetonitrile
A Conc – 100%

B Conc – 0%

MCPA
Acquisition Mode: MRM
Polarity: Negative
Start time: 0.00 min
End time: 13.00 min
Retention Time: 5.35 min

MCPA D3 – internal standard
Acquisition Mode: MRM
Polarity: Negative
Start time: 0.00 min
End time: 13.00 min
Retention Time: 5.34 min

MCPB
Acquisition Mode: MRM
Polarity: Negative
Start time: 0.00 min
End time: 13.00 min
Retention Time: 6.25 min

MCPB D6 – internal standard
Acquisition Mode: MRM
Polarity: Negative
Start time: 0.00 min
End time: 13.00 min
Retention Time: 6.22 min

Results and discussions

Table A 3: Recovery results from method validation of glyphosate and its metabolites using the analytical method

Matrix	Analyte	Fortification level (mg/kg) (*n* = x)	Mean recovery (%)	RSD (%)	Comments
Apples	MCPA	n = 10 0.010 0.100	 104.0 109.4	 1.58 3.61	Mean recovery on each fortification levels are in the range 70-110% according to SANCO/3029/99 rev.4
Apples	MCPB	n = 10 0.010 0.100	 99.4 94.5	 2.76 0.70	Mean recovery on each fortification levels are in the ideally range 80-100% according to SANCO/3029/99 rev.4

Table A 4: Characteristics for the analytical method used for validation of glyphosate and its metabolites residues in apples

	Glyphosate and Metabolites
Specificity	The specificity of the method was evaluated on the basis of the analysis of chromatograms recorded for the matrix blank samples. No interferences at above 30% of the LOQ were detected at the retention time of active substance in matrix blank samples.
Calibration (type, number of data points)	MCPA R^2 was 0.9976787 The curve is described as y = 0.552096x + 0.000277290 MCPB R^2 was 0.9998098 The curve is described as y = 0.343506x + 0.000174329
Calibration range	The linearity of the detector response was demonstrated by single determination of matrix-matched calibration standards at six concentration levels ranging from 0.002 to 0.5 mg/kg.
Assessment of matrix effects is presented	Matrix effect on the detection of Glyphosate in extracts of apples was found to be insinificant (≤20%), nevertheless matrix-matched standards were used for quantification for all the samples.
Limit of determination/quantification	The LOQ is the lowest validated fortification level for which an average recovery in the range of 70 – 120% and RSD ≤ 20% is achieved. **LOQ** was successfully established at **0.01 mg/kg** **Limit of detetion (LOD)** was established at **0.003 mg/kg** as ±30% LOQ

Conclusion

The validation parameters (specificity, linearity, accuracy, recovery and precision) are within the acceptance range and fulfil EU requirements given in SANCO /3029/99 rev.4.

A 2.2.2 Methods for post-authorization control and monitoring purposes (KCP 5.2)

A 2.2.2.1 Description of analytical methods for the determination of residues in plant matrices (KCP 5.2)

No new or additional studies have been submitted

A 2.2.2.2 Description of analytical methods for the determination of residues in animal matrices (KCP 5.2)

No new or additional studies have been submitted

A 2.2.2.3 Description of Methods for the Analysis of Soil (KCP 5.2)

No new or additional studies have been submitted

A 2.2.2.4 Description of Methods for the Analysis of Water (KCP 5.2)

No new or additional studies have been submitted

A 2.2.2.5 Description of Methods for the Analysis of Air (KCP 5.2)

No new or additional studies have been submitted

A 2.2.2.6 Description of Methods for the Analysis of Body Fluids and Tissues (KCP 5.2)

No new or additional studies have been submitted

A 2.2.2.7 A.2.A.9 Other Studies/ Information

No new or additional studies have been submitted