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Review of the existing maximum residue levels for sulcotrione according to Article 12 of Regulation (EC) No 396/2005

European Food Safety Authority (EFSA)

Abstract

According to Article 12 of Regulation (EC) No 396/2005, the European Food Safety Authority (EFSA) has reviewed the maximum residue levels (MRLs) currently established at European level for the pesticide active substance sulcotrione. In order to assess the occurrence of sulcotrione residues in plants, processed commodities, rotational crops and livestock, EFSA considered the conclusions derived in the framework of Directive 91/414/EEC as well as the European authorisations reported by Member States (incl. the supporting residues data). Based on the assessment of the available data, MRL proposals were derived and a consumer risk assessment was carried out. Although no apparent risk to consumers was identified, some information required by the regulatory framework was missing. Hence, the consumer risk assessment is considered indicative only and some MRL proposals derived by EFSA still require further consideration by risk managers.

Keywords: sulcotrione, MRL review, Regulation (EC) No 396/2005, consumer risk assessment, benzoylcyclohexanedione, herbicide, 2-chloro-4-(methylsulfonyl)benzoic acid (CMBA)

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Summary

Sulcotrione was included in Annex I to Directive 91/414/EEC on 1 September 2009 by Commission Directive 2008/125/EC, and has been deemed to be approved under Regulation (EC) No 1107/2009, in accordance with Commission Implementing Regulation (EU) No 540/2011, as amended by Commission Implementing Regulation (EU) No 541/2011. As the active substance was approved after the entry into force of Regulation (EC) No 396/2005 on 2 September 2008, EFSA is required to provide a reasoned opinion on the review of the existing maximum residue levels (MRLs) for that active substance in compliance with Article 12(1) of the aforementioned Regulation. In order to collect the relevant pesticide residues data, EFSA asked Germany, as the designated rapporteur Member State (RMS), to complete the Pesticide Residues Overview File (PROFile) and to prepare a supporting evaluation report. The PROFile and evaluation report provided by the RMS were made available to the Member States. A request for additional information was addressed to the Member States in the framework of a completeness check period which was initiated by EFSA on 17 April 2015 and finalised on 15 June 2015. After having considered all the information provided, EFSA prepared a completeness check report which was made available to Member States on 17 July 2015.

Based on the conclusions derived by EFSA in the framework of Directive 91/414/EEC and the additional information provided by the RMS and Member States, EFSA prepared in September 2015 a draft reasoned opinion, which was circulated to Member States for consultation via a written procedure. Comments received by 9 October 2015 were considered during the finalisation of this reasoned opinion. The following conclusions are derived.

Primary crop metabolism of sulcotrione has been investigated in maize after post-emergence application and 2-chloro-4-(methylsulfonyl)benzoic acid (CMBA) is the major constituent of the residue in maize forage and grains. As DT90 values of sulcotrione and CMBA are all expected to be well below the trigger value of 100 days, investigation of residues in rotational crops was not required. Furthermore, as quantifiable residues of sulcotrione and CMBA are not expected in the treated food crops, there is also no need to investigate the effect of industrial and/or household processing on the nature of residues. Considering that sulcotrione and CMBA have different toxicological profiles and that different toxicological reference values were derived for these compounds, it is proposed to establish two separate residue definitions for risk assessment (sulcotrione and CMBA, separately). For monitoring purposes, sulcotrione is the most relevant residue definition and a validated analytical method for this compound is available. Monitoring of CMBA is only considered optional because CMBA is of much lower toxicity than the parent compound but in case risk managers wish to establish MRLs for CMBA, further validation of the analytical method would still be required. The proposed residue definitions are only applicable to cereal crops (and grass) and a metabolism study addressing primary crop metabolism of sulcotrione in root and tuber vegetables is still required in order to cover the reported authorisation on salsify.

Regarding the parent compound, available residue trials were considered sufficient to derive MRL proposals as well as risk assessment values for all commodities under evaluation, noting that the MRL proposal for salsify is tentative in the absence of a study addressing primary crop metabolism in root and tuber vegetables. In case risk managers also wish to establish MRLs for CMBA, the available data are considered sufficient to derive MRL proposals as well as risk assessment values for all commodities under evaluation, except for salsify and grass where the available data were insufficient to derive MRL proposals.

Since the calculated dietary burden for the parent compound did not exceed the trigger value of 0.1 mg/kg dry matter (DM) in any group of livestock, further investigation of sulcotrione as well as the setting of MRLs for sulcotrione in commodities of animal origin is unnecessary. For the metabolite CMBA, the dietary burdens calculated for dairy ruminants, meat ruminants and pigs exceed the trigger value of 0.1 mg/kg DM. A metabolism study investigating the behaviour of CMBA in ruminants allowed EFSA to define the residue for both monitoring and risk assessment in ruminants and pigs as CMBA, noting that risk managers might not have the interest to monitor this compound considering its low toxicity compared to the parent compound and the occurrence of the compound generally being low in commodities of animal origin. In case risk managers also wish to establish MRLs for CMBA, the available metabolism was also considered sufficient to establish MRLs in milk, ruminant tissues and swine tissues. Nevertheless, these MRL proposals should still be considered tentative in the absence of

a validated analytical method for monitoring and residue trials on grass investigating levels of CMBA (as the livestock dietary burden may currently be underestimated). For CMBA in poultry products, the setting of MRLs is in any case not required because the calculated dietary burden was found to be below the trigger value of 0.1 mg/kg DM.

Chronic consumer exposure to the parent compound sulcotrione resulting from the authorised uses reported in the framework of this review was calculated using revision 2 of the EFSA PRIMo. The highest chronic exposure represented 31% of the acceptable daily intake (ADI) (WHO cluster diet B). Acute exposure calculations were not carried out because an acute reference dose (ARfD) was not deemed necessary for this active substance.

Also for the metabolite CMBA, chronic exposure calculations were performed using revision 2 of the EFSA PRIMo, and acute exposure calculations were not carried out because an ARfD was not deemed necessary for this metabolite. In this case the highest chronic exposure represented 0.2% of the ADI (UK infants). Although several uncertainties remain for this metabolite and exposure to this metabolite may have been underestimated, the calculations demonstrate that the toxicological burden of metabolite CMBA to European consumers is estimated to be approximately 100 times lower than the toxicological burden resulting from the parent compound. These calculations further support the view that the setting of MRLs for CMBA is only optional and that the data gaps identified for CMBA in the framework of this MRL review are not essential.

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Background

Regulation (EC) No 396/2005[1] establishes the rules governing the setting and the review of pesticide maximum residue levels (MRLs) at European level. Article 12(1) of that regulation stipulates that EFSA shall provide within 12 months from the date of the inclusion or non-inclusion of an active substance in Annex I to Directive 91/414/EEC[2] a reasoned opinion on the review of the existing MRLs for that active substance. As sulcotrione was included in Annex I to Council Directive 91/414/EEC on 1 September 2009 by means of Commission Directive 2008/125/EC,[3] and has been deemed to be approved under Regulation (EC) No 1107/2009,[4] in accordance with Commission Implementing Regulation (EU) No 540/2011,[5] as amended by Commission Implementing Regulation (EU) No 541/2011,[6] EFSA initiated the review of all existing MRLs for that active substance.

According to the legal provisions, EFSA shall base its reasoned opinion in particular on the relevant assessment report prepared under Directive 91/414/EEC. It should be noted, however, that in the framework of Directive 91/414/EEC only a few representative uses are evaluated, while MRLs set out in Regulation (EC) No 396/2005 should accommodate all uses authorised within the EU, and uses authorised in third countries that have a significant impact on international trade. The information included in the assessment report prepared under Directive 91/414/EEC is therefore insufficient for the assessment of all existing MRLs for a given active substance.

In order to gain an overview of the pesticide residues data that have been considered for the setting of the existing MRLs, EFSA developed the Pesticide Residues Overview File (PROFile). The PROFile is an inventory of all pesticide residues data relevant to the risk assessment and MRL setting for a given active substance. This includes data on:

- the nature and magnitude of residues in primary crops;
- the nature and magnitude of residues in processed commodities;
- the nature and magnitude of residues in rotational crops;
- the nature and magnitude of residues in livestock commodities and;
- the analytical methods for enforcement of the proposed MRLs.

Germany, the designated rapporteur Member State (RMS) in the framework of Directive 91/414/EEC, was asked to complete the PROFile for sulcotrione and to prepare a supporting evaluation report (Germany, 2010). The PROFile and the supporting evaluation report were submitted to EFSA on 19 November 2010 and made available to the Member States. A request for additional information was addressed to the Member States in the framework of a completeness check period which was initiated by EFSA on 17 April 2015 and finalised on 15 June 2015. Additional evaluation reports were submitted by Belgium, France, Hungary, Italy, Spain, (Belgium, 2015; France, 2015; Hungary, 2015; Italy, 2015; Spain, 2015) and after having considered all the information provided by RMS and Member States, EFSA prepared a completeness check report which was made available to all Member States on 17 July 2015. No further clarifications were sought from Member States.

Based on the conclusions derived by EFSA in the framework of Directive 91/414/EEC, and the additional information provided by the Member States, EFSA prepared in September 2015 a draft

[1] Regulation (EC) No 396/2005 of the European Parliament and of the Council of 23 February 2005 on maximum residue levels of pesticides in or on food and feed of plant and animal origin and amending Council Directive 91/414/EEC. OJ L 70, 16.3.2005, p. 1-16.

[2] Council Directive 91/414/EEC of 15 July 1991 concerning the placing of plant protection products on the market. OJ L 230, 19.8.1991, p. 1-32. Repealed by Regulation (EC) No 1107/2009.

[3] Commission Directive 2008/125/EC of 19 December 2008 amending Council Directive 91/414/EEC to include aluminium phosphide, calcium phosphide, magnesium phosphide, cymoxanil, dodemorph, 2,5-dichlorobenzoic acid methylester, metamitron, sulcotrione, tebuconazole and triadimenol as active substances. OJ L 344, 20.12.2008, p. 78-88.

[4] Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC. OJ L 309, 24.11.2009, p. 1-50.

[5] Commission Implementing Regulation (EU) No 540/2011 of 25 May 2011 implementing Regulation (EC) No 1107/2009 of the European Parliament and of the Council as regards the list of approved active substances. OJ L 153, 11.6.2011, p.1-186.

[6] Commission Implementing Regulation (EU) No 541/2011 of 1 June 2011 amending Implementing Regulation (EU) No 540/2011 implementing Regulation (EC) No 1107/2009 of the European Parliament and of the Council as regards the list of approved active substances. OJ L 153, 11.6.2011, p. 187-188.

reasoned opinion, which was submitted to Member States for commenting via a written procedure. All comments received by 9 October 2015 were considered by EFSA during the finalisation of the reasoned opinion.

The evaluation report submitted by the Germany (Germany, 2010), and the evaluation reports submitted by Member States Belgium, France, Hungary, Italy, Spain, (Belgium, 2015; France, 2015; Hungary, 2015; Italy, 2015; Spain, 2015) are considered as supporting documents to this reasoned opinion and, thus, are made publicly available.

In addition, key supporting documents to this reasoned opinion are the completeness check report (EFSA, 2015a) and the Member States consultation report (EFSA, 2015b). These reports are developed to address all issues raised in the course of the review, from the initial completeness check to the reasoned opinion. Also the chronic exposure calculations for all crops reported in the framework of this review performed using the EFSA Pesticide Residues Intake Model (PRIMo) are key supporting documents and made publicly available.

Considering the importance of the completeness check and consultation report, all documents are considered as background documents to this reasoned opinion and, thus, are made publicly available.

Terms of reference

According to Article 12 of Regulation (EC) No 396/2005, EFSA shall provide a reasoned opinion on:

- the inclusion of the active substance in Annex IV to the Regulation, when appropriate;
- the necessity of setting new MRLs for the active substance or deleting/modifying existing MRLs set out in Annex II or III of the Regulation;
- the inclusion of the recommended MRLs in Annex II or III to the Regulation;
- the setting of specific processing factors as referred to in Article 20(2) of the Regulation.

The active substance and its use pattern

Sulcotrione is the ISO common name for 2-(2-chloro-4-mesylbenzoyl)cyclohexane-1,3-dione (IUPAC).

Sulcotrione belongs to the group of benzoylcyclohexanedione compounds which are used as herbicides. Sulcotrione acts as a hydroxyphenyl pyruvate dioxygenase inhibitor. It is absorbed predominantly by the leaves, but also by the roots. The chemical structure of the active substance and its main metabolites are reported in Appendix E.

Sulcotrione was evaluated in the framework of Directive 91/414/EEC with Germany designated as rapporteur Member State (RMS). The representative use supported for the peer review process was a post-emergence herbicide application on maize. Following the peer review, which was carried out by EFSA, a decision on inclusion of the active substance in Annex I to Directive 91/414/EEC was published by means of Commission Directive 2008/125/EC, which entered into force on 1 September 2009. According to Regulation (EU) No 540/2011, sulcotrione is deemed to have been approved under Regulation (EC) No 1107/2009. This approval is restricted to uses as herbicide only.

The EU MRLs for sulcotrione are established in Annexes IIIA of Regulation (EC) No 396/2005 and CXLs are not available.

For the purpose of this MRL review, the critical uses of sulcotrione currently authorised within the EU have been collected by the RMS and reported in the PROFile. The additional good agricultural practices (GAPs) reported by Member States during the completeness check were also considered. The details of the authorised GAPs for sulcotrione are given in Appendix A. The RMS did not report any use authorised in third countries that might have a significant impact on international trade.

Assessment

EFSA has based its assessment on the PROFile submitted by the RMS, the evaluation report accompanying the PROFile (Germany, 2010), the draft assessment report (DAR) and its addenda prepared under Council Directive 91/414/EEC (Germany, 2006, 2008), the conclusion on the peer review of the pesticide risk assessment of the active substance sulcotrione (EFSA, 2008), as well as

the evaluation reports submitted during the completeness check (Belgium, 2015; France, 2015; Hungary, 2015; Italy, 2015; Spain, 2015). The assessment is performed in accordance with the legal provisions of the uniform principles for evaluation and authorisation of plant protection products as set out in Commission Regulation (EU) No 546/2011[7] and the currently applicable guidance documents relevant for the consumer risk assessment of pesticide residues (European Commission, 1996, 1997a, 1997b, 1997c, 1997d, 1997e, 1997f, 1997g, 2000, 2010a, 2010b, 2011 and OECD, 2011).

More detailed information on the available data and on the conclusions derived by EFSA can be retrieved from the list of end points reported in Appendix B.

1. Residues in plants

1.1. Nature of residues and methods of analysis in plants

1.1.1. Nature of residues in primary crops

In the framework of Directive 91/414/EEC, primary crop metabolism of sulcotrione has been investigated in maize after post-emergence application. 2-chloro-4-(methylsulfonyl)benzoic acid (CMBA) is the major constituent of the residue in maize forage and grains, representing 29 and 53 % of the Total Radioactive Residues (TRR) in these matrices, respectively. Uptake of this compound by the roots, as a result of soil metabolism of sulcotrione, is supposed to contribute to its predominance in the metabolic pattern. The parent compound sulcotrione is only present in trace amounts (less than 1 % of the TRR) in grains and forage, as well as hydroxylated derivatives (less than 5 % of the TRR). It is also postulated from experiments with excised leaves that fragments resulting from the degradation of the cyclohexanedione ring consist in aliphatic carboxylic acids such as glutaric and succinic acids (EFSA, 2008).

The available study is representative of the authorisations on cereal crops and grass reported in the framework of this review but authorisations were also reported for salsify. A metabolism study addressing primary crop metabolism of sulcotrione in root and tuber vegetables is therefore still required.

1.1.2. Nature of residues in rotational crops

Several crops under consideration may be grown in rotation. According to the soil degradation field trials evaluated in the framework of Directive 91/414/EEC, DT_{90} values of sulcotrione and its relevant soil metabolite CMBA are all expected to be lower than 10 days which is far below the trigger value of 100 days (EFSA, 2008). According to the European guidelines on rotational crops (European Commission, 1997b), further investigation of residues in rotational crops is not required and relevant residues in rotational crops are not expected.

1.1.3. Nature of residues in processed commodities

As quantifiable residues of sulcotrione and CMBA are not expected in the treated food crops (see section 1.2.1), there is no need to investigate the effect of industrial and/or household processing on the nature of residues.

1.1.4. Methods of analysis in plants

An analytical method using LC-MS/MS was validated for the monitoring of sulcotrione and CMBA with, for each compound, a limit of quantification (LOQ) of 0.05 mg/kg in dry, acidic, high water content and high oil content commodities (EFSA, 2008). This method is supported by an independent laboratory validation (ILV) and adequate for confirmation of sulcotrione (validated for two mass transitions). Regarding CMBA however, only one mass transition was validated and validation of a second mass transition for confirmation of this compound is in principle still required.

[7] Commission Regulation (EU) No 546/2011 of 10 June 2011 implementing Regulation (EC) No 1107/2009 of the European Parliament and of the Council as regards uniform principles for evaluation and authorisation of plant protection products. OJ L 155, 11.06.2011, p. 127-175.

According to the EURLs a lower LOQ of 0.02 mg/kg might be achieved for sulcotrione in high water content and acidic commodities. This is however not supported by referenceable data.

1.1.5. Stability of residues in plants

Stability of sulcotrione and CMBA was investigated in the framework of Directive 91/414/EEC. Both compounds (investigated separately) were demonstrated to be stable at -18°C for a period of 24 months in dry commodities and high water content commodities (EFSA, 2008). These data cover all crops reported in the framework of this review.

1.1.6. Proposed residue definitions

Based on the above findings, it was proposed during the peer review under Directive 91/414/EEC to define the residue for monitoring as sulcotrione, while for risk assessment the residue definition was proposed as the sum of sulcotrione and CMBA, expressed as sulcotrione (EFSA, 2008). Meanwhile, considering that sulcotrione and CMBA have different toxicological profiles and that different toxicological reference values were derived for these compounds, experience has demonstrated that combining both compounds in the same residue definition for risk assessment may lead to inaccuracies in the risk assessment. EFSA therefore reconsidered its previous position and proposes to establish two separate residue definitions for risk assessment (sulcotrione and CMBA, separately).

Regarding the setting of MRLs, EFSA still considers that sulcotrione is the most relevant residue definition for monitoring purposes and a validated analytical method for this compound is available. Since CMBA is of much lower toxicity than the parent compound, monitoring of this residue definition is only considered optional by EFSA. However, in case risk managers wish to establish MRLs for CMBA, further validation of the analytical method would still be required (see section 1.1.4).

It is also highlighted that the proposed residue definitions are only applicable to cereal crops (and grass) and that a general residue definition cannot be derived by EFSA. Meanwhile, in the absence of a representative metabolism study in root and tuber vegetables, the same residue definitions were tentatively applied to salsify.

1.2. Magnitude of residues in plants

1.2.1. Magnitude of residues in primary crops

To assess the magnitude of sulcotrione residues resulting from the reported GAPs, EFSA considered all residue trials reported by the RMS in its evaluation report (Germany, 2010), including residue trials evaluated in the framework of the peer review (EFSA, 2008) and additional data submitted during the completeness check (Belgium, 2015; France, 2015; Hungary, 2015; Italy, 2015; Spain, 2015). All residue trial samples considered in this framework were stored in compliance with the conditions for which storage stability was demonstrated in section 1.1.5. Decline of residues during storage of the trial samples is therefore not expected.

The number of residue trials and extrapolations were evaluated in accordance with the European guidelines on comparability, extrapolation, group tolerances and data requirements for setting MRLs (European Commission, 2011).

For grass and salsify, only northern residue trials are available, while the use on grass was also reported for southern Europe. Furthermore, available data only investigated levels of parent compound and no MRL or risk assessment values could be derived for the metabolite CMBA. Hence the following data gaps were identified by EFSA:

- Salsify: 4 residue trials compliant with the northern outdoor GAP (investigating levels of CMBA) are required.
- Grass: 4 residue trials compliant with the southern outdoor GAP (investigating levels of both sulcotrione and CMBA) and 4 residue trials compliant with the northern outdoor GAP (investigating levels of CMBA) are required.

For all other crops, available residue trials are sufficient to derive MRL and risk assessment values for both sulcotrione and CMBA, taking note however of the following considerations:

- Sweet corn and maize grain: The number of residue trials supporting the critical southern outdoor GAP is not compliant with the data requirements for this crop (3 trials instead of 4 are available for sweet corn and 6 trials instead of 8 are available for maize grain). Nevertheless, the reduced number of residue trials is considered acceptable in this case because all results were below the LOQ (for both compounds) and a large number of residue trials supporting the northern outdoor GAPs confirmed residue levels below LOQ. Further residue trials are therefore not required.

1.2.2. Magnitude of residues in rotational crops

Residues are not expected in rotational crops (see section 1.1.2).

1.2.3. Magnitude of residues in processed commodities

Residue trials on grass investigated levels of sulcotrione in fresh grass and hay. Since residues were below the LOQ in both commodities, a processing factor could not be derived by EFSA but the information was considered adequate to demonstrate that sulcotrione will not concentrate in hay; information regarding the metabolite CMBA was not reported

Nevertheless, as quantifiable residues of sulcotrione and CMBA are not expected in the treated food crops, there is no need to investigate the effect of industrial and/or household processing on the magnitude of residues.

1.2.4. Proposed MRLs

Regarding the parent compound, the available data are considered sufficient to derive MRL proposals as well as risk assessment values for all commodities under evaluation, noting that the MRL proposal for salsify is tentative in the absence of a study addressing primary crop metabolism in root and tuber vegetables (see section 1.1.6). Tentative MRLs were also derived for grass and maize forage in view of the future need to set MRLs in feed items.

In case risk managers also wish to establish MRLs for CMBA, the available data are considered sufficient to derive MRL proposals as well as risk assessment values for all commodities under evaluation, except for salsify and grass where the available data were insufficient to derive MRL proposals. Tentative MRLs were also derived for maize forage in view of the future need to set MRLs in feed items.

2. Residues in livestock

Sulcotrione is authorised for use on several crops that might be fed to livestock. Livestock dietary burdens were therefore calculated for different groups of livestock using the agreed European methodology (European Commission, 1996). These calculations were carried out for sulcotrione and CMBA, separately. The input values for all relevant commodities have been selected according to the recommendations of JMPR (FAO, 2009) and are summarised in Appendix C.

For sulcotrione, although most of the residue trials on maize forage were carried out with an LOQ of 0.05 mg/kg, the LOQ of 0.02 mg/kg was considered more realistic for the livestock dietary burden calculation (also considering the trace amounts of parent compound identified in primary crop metabolism, see section 1.1.1). Since the calculated dietary burden for sulcotrione did not exceed the trigger value of 0.1 mg/kg DM in any group of livestock, further investigation of sulcotrione as well as the setting of MRLs for sulcotrione in commodities of animal origin is unnecessary.

For the metabolite CMBA, the dietary burdens calculated for dairy ruminants, meat ruminants and pigs exceed the trigger value of 0.1 mg/kg DM. Behaviour of CMBA was therefore assessed in these groups of livestock.

2.1. Nature of residues and methods of analysis in livestock

In the framework of Directive 91/414, a metabolism study investigating the behaviour of CMBA in ruminants was reported. This study was conducted with an exposure rate of the animals 3 times higher than the critical dietary burden calculated for ruminants in the framework of this review. Under these conditions the TRR were below 0.005 mg/kg in milk and all edible tissues, with the exception of kidneys showing TRR of 0.04 mg/kg. The nature of residues was determined in kidneys only and consisted essentially of CMBA (80 % of the TRR) (EFSA, 2008). These findings can be extrapolated to pigs and the residue definition for both monitoring and risk assessment in ruminants and pigs could be defined as CMBA, noting that risk managers might not have the interest to monitor this compound considering its low toxicity compared to the parent compound and the occurrence of the compound generally being low in commodities of animal origin.

A validated analytical method for the monitoring of this residue definition is also not available.

2.2. Magnitude of residues in livestock

In case risk managers also wish to establish MRLs for CMBA, the available metabolism study demonstrates that residues in milk, ruminant tissues and swine tissues will be below 0.01 mg/kg, except for ruminant kidney where residue levels up to 0.015 mg/kg cannot be excluded. Considering that CMBA has a low toxicity compared to the parent compound and that measurable residue levels are only expected in ruminant kidneys, this study is considered sufficient to derive MRL proposals on the basis of the above findings. Nevertheless, these MRL proposals should still be considered tentative in the absence of a validated analytical method for monitoring and residue trials on grass investigating levels of CMBA (as the livestock dietary burden may currently be underestimated).

For CMBA in poultry products, the setting of MRLs is in any case not required because the calculated dietary burden was found to be below the trigger value of 0.1 mg/kg DM.

3. Consumer risk assessment

Sulcotrione and its main metabolite CMBA have different toxicological profiles and different toxicological reference values were derived for these two compounds. They were therefore assessed separately with regard to their consumer exposure.

3.1. Consumer risk assessment for sulcotrione

Chronic exposure calculations for sulcotrione were performed using revision 2 of the EFSA Pesticide Residues Intake Model (PRIMo) (EFSA, 2007). All crops reported in the framework of this review were considered and input values for the exposure calculations were derived in compliance with the decision tree reported in Appendix D. Hence, for those commodities where an MRL could be derived by EFSA in the framework of this review, input values were derived according to the internationally agreed methodologies (FAO, 2009). All input values included in the exposure calculations are summarised in Appendix C. Acute exposure calculations were not carried out because an ARfD was not deemed necessary for this active substance.

The exposures calculated were compared with the toxicological reference value for sulcotrione, derived by EFSA (2008) under Directive 91/414/EEC. The highest chronic exposure was calculated for the WHO cluster diet B, representing 31% of the ADI. Although uncertainties remain due to the data gaps identified in the previous sections, this indicative exposure calculation did not indicate a risk to consumers resulting from the residue levels of the parent compound.

3.2. Consumer risk assessment for CMBA

Also for the metabolite CMBA, chronic exposure calculations were performed using revision 2 of the EFSA PRIMo, and acute exposure calculations were not carried out because an ARfD was not deemed necessary for this metabolite. Input values for this exposure calculation were selected in the same way as for the parent compound (see section 3.1) and an overview of these input values is provided in Appendix C. In the case of salsify however no data were available to derive risk assessment values for CMBA and no EU MRLs are currently established for this compound. It was therefore not possible to include this crop in the exposure calculation. Also considering that the livestock dietary burden may

be underestimated (see section 2), a slight underestimation of the consumer exposure to CMBA cannot be excluded.

Nevertheless, the chronic exposure calculations were compared with the toxicological reference value derived for CMBA, also derived by EFSA (2008) under Directive 91/414/EEC, and the highest chronic exposure was calculated for UK infants, representing 0.2% of the ADI. Although several uncertainties remain for this metabolite and exposure to this metabolite may have been underestimated, the calculations demonstrate that the toxicological burden of metabolite CMBA to European consumers is estimated to be approximately 100 times lower than the toxicological burden resulting from the parent compound. These calculations further support the view that the setting of MRLs for CMBA is only optional and that the data gaps identified for CMBA in the framework of this review are not essential.

Conclusions

Primary crop metabolism of sulcotrione has been investigated in maize after post-emergence application and 2-chloro-4-(methylsulfonyl)benzoic acid (CMBA) is the major constituent of the residue in maize forage and grains. As DT_{90} values of sulcotrione and CMBA are all expected to be well below the trigger value of 100 days, investigation of residues in rotational crops was not required. Furthermore, as quantifiable residues of sulcotrione and CMBA are not expected in the treated food crops, there is also no need to investigate the effect of industrial and/or household processing on the nature of residues. Considering that sulcotrione and CMBA have different toxicological profiles and that different toxicological reference values were derived for these compounds, it is proposed to establish two separate residue definitions for risk assessment (sulcotrione and CMBA, separately). For monitoring purposes, sulcotrione is the most relevant residue definition and a validated analytical method for this compound is available. Monitoring of CMBA is only considered optional because CMBA is of much lower toxicity than the parent compound but in case risk managers wish to establish MRLs for CMBA, further validation of the analytical method would still be required. The proposed residue definitions are only applicable to cereal crops (and grass) and a metabolism study addressing primary crop metabolism of sulcotrione in root and tuber vegetables is still required in order to cover the reported authorisation on salsify.

Regarding the parent compound, available residue trials were considered sufficient to derive MRL proposals as well as risk assessment values for all commodities under evaluation, noting that the MRL proposal for salsify is tentative in the absence of a study addressing primary crop metabolism in root and tuber vegetables. In case risk managers also wish to establish MRLs for CMBA, the available data are considered sufficient to derive MRL proposals as well as risk assessment values for all commodities under evaluation, except for salsify and grass where the available data were insufficient to derive MRL proposals.

Since the calculated dietary burden for the parent compound did not exceed the trigger value of 0.1 mg/kg DM in any group of livestock, further investigation of sulcotrione as well as the setting of MRLs for sulcotrione in commodities of animal origin is unnecessary. For the metabolite CMBA, the dietary burdens calculated for dairy ruminants, meat ruminants and pigs exceed the trigger value of 0.1 mg/kg DM. A metabolism study investigating the behaviour of CMBA in ruminants allowed EFSA to define the residue for both monitoring and risk assessment in ruminants and pigs as CMBA, noting that risk managers might not have the interest to monitor this compound considering its low toxicity compared to the parent compound and the occurrence of the compound generally being low in commodities of animal origin. In case risk managers also wish to establish MRLs for CMBA, the available metabolism was also considered sufficient to establish MRLs in milk, ruminant tissues and swine tissues. Nevertheless, these MRL proposals should still be considered tentative in the absence of a validated analytical method for monitoring and residue trials on grass investigating levels of CMBA (as the livestock dietary burden may currently be underestimated). For CMBA in poultry products, the setting of MRLs is in any case not required because the calculated dietary burden was found to be below the trigger value of 0.1 mg/kg DM.

Chronic consumer exposure to the parent compound sulcotrione resulting from the authorised uses reported in the framework of this review was calculated using revision 2 of the EFSA PRIMo. The highest chronic exposure represented 31% of the ADI (WHO cluster diet B). Acute exposure calculations were not carried out because an ARfD was not deemed necessary for this active substance.

Also for the metabolite CMBA, chronic exposure calculations were performed using revision 2 of the EFSA PRIMo, and acute exposure calculations were not carried out because an ARfD was not deemed necessary for this metabolite. In this case the highest chronic exposure represented 0.2% of the ADI (UK infants). Although several uncertainties remain for this metabolite and exposure to this metabolite may have been underestimated, the calculations demonstrate that the toxicological burden of metabolite CMBA to European consumers is estimated to be approximately 100 times lower than the toxicological burden resulting from the parent compound. These calculations further support the view that the setting of MRLs for CMBA is only optional and that the data gaps identified for CMBA in the framework of this MRL review are not essential.

Recommendations

MRL recommendations for the parent compound sulcotrione were derived in compliance with the decision tree reported in Appendix D of the reasoned opinion (see summary table). The MRL values listed as 'Recommended' in the table are sufficiently supported by data and are therefore proposed for inclusion in Annex II to the Regulation. The remaining MRL value for salsify is not recommended for inclusion in Annex II because it requires further consideration by risk managers (see summary table footnotes for details). In particular, this tentative MRL needs to be confirmed by the following data:

- a representative study investigating primary crop metabolism in root and tuber vegetables.

It is highlighted, however, that some of the MRLs derived result from a GAP in one climatic zone, while other GAPs reported by the RMS were not fully supported by data. EFSA therefore identified the following data gaps which are not expected to impact on the validity of the MRLs derived but which might have an impact on national authorisations:

- residue trials supporting the southern outdoor GAP on grass.

If the above reported data gaps are not addressed in the future, Member States are recommended to withdraw or modify the relevant authorisations at national level.

Based on the above assessment, the setting of MRLs for CMBA is proposed as optional. However, if risk managers also wish to establish MRLs for CMBA, the following additional data gaps would need to be considered:

- validation of a second mass transition for the monitoring of CMBA in plant commodities;
- residue trials supporting the northern outdoor GAPs on salsify and grass;
- a validated analytical method for the monitoring of CMBA in commodities of animal origin.

While the data gaps identified for CMBA in the framework of this MRL review are not expected to have a major impact on the outcome of the risk assessment, EFSA still recommends that any trial or study generated in the future investigates occurrence of both sulcotrione and CMBA.

Table 1: Summary table

Code number (a)	Commodity	Existing EU MRL (mg/kg)	Outcome of the review	
			MRL (mg/kg)	Comment
Enforcement residue definition: sulcotrione				
213090	Salsify	0.05*	0.05*	Further consideration needed (b)
234000	Sweet corn	0.05*	0.05*	Recommended (c)
500030	Maize grain	0.05*	0.05*	Recommended (c)
500080	Sorghum grain	0.05*	0.05*	Recommended (c)
-	Other products of plant and animal origin	See Reg. 149/2008	-	Further consideration needed (d)

Code number (a)	Commodity	Existing EU MRL (mg/kg)	Outcome of the review	
			MRL (mg/kg)	Comment
Additional enforcement residue definition (optional): 2-chloro-4-(methylsulfonyl)benzoic acid (CMBA)				
213090	Salsify	-	-	Further consideration needed(e)
234000	Sweet corn	-	0.05*	Further consideration needed(f)
500030	Maize grain	-	0.05*	Further consideration needed(f)
500080	Sorghum grain	-	0.05*	Further consideration needed(f)
1011010	Swine muscle	-	0.01*	Further consideration needed(f)
1011020	Swine fat (free of lean meat)	-	0.01*	Further consideration needed(f)
1011030	Swine liver	-	0.01*	Further consideration needed(f)
1011040	Swine kidney	-	0.01*	Further consideration needed(f)
1012010	Bovine muscle	-	0.01*	Further consideration needed(f)
1012020	Bovine fat	-	0.01*	Further consideration needed(f)
1012030	Bovine liver	-	0.01*	Further consideration needed(f)
1012040	Bovine kidney	-	0.015	Further consideration needed(f)
1013010	Sheep muscle	-	0.01*	Further consideration needed(f)
1013020	Sheep fat	-	0.01*	Further consideration needed(f)
1013030	Sheep liver	-	0.01*	Further consideration needed(f)
1013040	Sheep kidney	-	0.015	Further consideration needed(f)
1014010	Goat muscle	-	0.01*	Further consideration needed(f)
1014020	Goat fat	-	0.01*	Further consideration needed(f)
1014030	Goat liver	-	0.01*	Further consideration needed(f)
1014040	Goat kidney	-	0.015	Further consideration needed(f)
1020010	Cattle milk	-	0.01*	Further consideration needed(f)
1020020	Sheep milk	-	0.01*	Further consideration needed(f)
1020030	Goat milk	-	0.01*	Further consideration needed(f)
-	Other products of plant and animal origin	-	-	Further consideration needed(g)

* Indicates that the MRL is set/proposed at the limit of quantification.
(a): Commodity code number, as listed in Annex I of Regulation (EC) No 396/2005
(b): Tentative MRL is derived from a GAP evaluated at EU level, which is not fully supported by data but for which no risk to consumers was identified (assuming the existing residue definition); no CXL is available (combination E-I in Appendix D).
(c): MRL is derived from a GAP evaluated at EU level, which is fully supported by data and for which no risk to consumers is identified; no CXL is available (combination G-I in Appendix D).
(d): There are no relevant authorisations or import tolerances reported at EU level; no CXL is available. Either a specific LOQ or the default MRL of 0.01 mg/kg may be considered (combination A-I in Appendix D).
(e): If an MRL for CMBA is considered necessary by risk managers, available data do not allow deriving an MRL proposal, and an EU MRLs or CXL is currently not available. Although the risk assessment cannot be finalised, exposure to CMBA levels is expected to be less critical than the exposure to sulcotrione.
(f): If an MRL for CMBA is considered necessary by risk managers, this tentative value is derived from a GAP evaluated at EU level, which is not fully supported by data but for which no risk to consumers could be identified; no CXL is available.
(g): There are no relevant authorisations or import tolerances reported at EU level; no CXL is available. If an MRL for CMBA is considered necessary by risk managers, either a specific LOQ or the default MRL of 0.01 mg/kg may be considered.

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Abbreviations

a.s.	active substance
ADI	acceptable daily intake
AR	applied radioactivity
ARfD	acute reference dose
BBCH	growth stages of mono- and dicotyledonous plants
BVL	Bundesamt für Verbraucherschutz und Lebensmittelsicherheit, Germany
bw	body weight
CAC	Codex Alimentarius Commission
CAS	Chemical Abstract Service
CCPR	Codex Committee on Pesticide Residues
CEN	European Committee for Standardization (Comité Européen de Normalisation)
CF	conversion factor for enforcement residue definition to risk assessment residue definition
CIRCA	(EU) Communication & Information Resource Centre Administrator
CIPAC	Collaborative International Pesticide Analytical Council
CS	capsule suspension
CV	coefficient of variation (RSD)
CXL	codex maximum residue limit
d	day
DAR	Draft Assessment Report (prepared under Council Directive 91/414/EEC)
DAT	days after treatment
DB	dietary burden
DM	dry matter
DP	dustable powder
DT_{90}	period required for 90 per cent dissipation (define method of estimation)
DTU	Danish Technical University
dw	dry weight
EC	European Commission
EC	emulsifiable concentrate
EDI	estimated daily intake
EMA	European Medicines Agency (former EMEA)
eq	residue expressed as a.s. equivalent
EURLs	EU Reference Laboratories (former CRLs)
FAO	Food and Agriculture Organisation of the United Nations

GAP	good agricultural practice
GC-ECD	gas chromatography with electron capture detector
GC-FID	gas chromatography with flame ionisation detector
GC-FPD	gas chromatography with flame photometric detector
GC-MS	gas chromatography with mass spectrometry
GC-MS/MS	gas chromatography with tandem mass spectrometry
GC-NPD	gas chromatography with nitrogen/phosphorous detector
GLP	Good Laboratory Practice
GR	granule
GS	growth stage
HPLC-MS	high performance liquid chromatography with mass spectrometry
HPLC-MS/MS	high performance liquid chromatography with tandem mass spectrometry
HPLC-UVD	high performance liquid chromatography with ultra-violet detector
IEDI	international estimated daily intake
IESTI	international estimate of short-term intake
ILV	independent laboratory validation
IPCS	International Programme of Chemical Science
ISO	International Organisation for Standardization
IUPAC	International Union of Pure and Applied Chemistry
JMPR	Joint FAO/WHO Meeting on Pesticide Residues
K_{oc}	organic carbon adsorption coefficient
LC	liquid chromatography
LOAEL	lowest observed adverse effect level
LOD	limit of detection
LOQ	limit of quantification
MRL	maximum residue level
MS	Member States
nAChR	nicotinic acetylcholine receptors
NEU	northern European Union
NOAEL	no observed adverse effect level
OECD	Organisation for Economic Co-operation and Development
PAFF	Standing Committee on Plants, Animals, Food and Feed
PF	processing factor
PHI	pre-harvest interval
ppm	parts per million (10^{-6})
P_{ow}	octanol water partition coefficient

PRIMo	(EFSA) Pesticide Residues Intake Model
PROFile	(EFSA) Pesticide Residues Overview File
R_{ber}	statistical calculation of the MRL by using a non-parametric method
R_{max}	statistical calculation of the MRL by using a parametric method
RA	risk assessment
RAC	raw agricultural commodity
RD	residue definition
RMS	rapporteur Member State
RSD	relative standard deviation
SBI	sterol biosynthesis inhibitors
SC	suspension concentrate
SEU	southern European Union
SG	water soluble granule
SL	soluble concentrate
SP	water soluble powder
TAR	total applied radioactivity
TMDI	theoretical maximum daily intake
TRR	total radioactive residue
tMRL	temporary MRL
WG	water dispersible granule
WHO	World Health Organization
wks	weeks
WP	wettable powder
yr	year

Appendix A – Summary of authorised uses considered for the review of MRLs

Critical outdoor GAPs for Northern Europe

Crop		Region	Outdoor/ Indoor	Member state or country	Pest controlled	Formulation			Application										PHI or waiting period (days)	Comments (max. 250 characters)
Common name	Scientific name					Type	Content		Method	Growth stage		Number		Interval (days)		Rate				
							Conc.	Unit		From BBCH	Until BBCH	Min.	Max.	Min.	Max.	Min.	Max.	Unit		
Salsify	Tragopogon porrifolius	NEU	Outdoor	BE	weeds	SC	300.0	g/L	Foliar treatment - spraying	11	12	1	1				150.00	g a.i./ha	n.a.	
Sweet corn	Zea mays var. sacharata	NEU	Outdoor	HU	weeds	SC	300.0	g/L	Foliar treatment - spraying	0	17	1	1			450.00	600.00	g a.i./ha	n.a.	
Maize	Zea mays	NEU	Outdoor	HU	weeds	SC	300.0	g/L	Foliar treatment - spraying	0	17	1	1			450.00	600.00	g a.i./ha	n.a.	
Grass	not specified	NEU	Outdoor	FR	weeds	SC	300.0	g/L	Foliar treatment - spraying	12	18	1	1				225.00	g a.i./ha	n.a.	
Maize (for forage)	Zea mays	NEU	Outdoor	FR	weeds	SC	300.0	g/L	Foliar treatment - spraying	0	19	1	1				450.00	g a.i./ha	n.a.	

Critical outdoor GAPs for Southern Europe

Crop		Region	Outdoor/ Indoor	Member state or country	Pest controlled	Formulation			Application										PHI or waiting period (days)	Comments (max. 250 characters)
Common name	Scientific name					Type	Content		Method	Growth stage		Number		Interval (days)		Rate				
							Conc.	Unit		From BBCH	Until BBCH	Min.	Max.	Min.	Max.	Min.	Max.	Unit		
Sweet corn	*Zea mays var. sacharata*	SEU	Outdoor	FR	weeds	SC	300.0	g/L	Foliar treatment - spraying	0	19	1	1			300.00	300.00	g a.i./ha	n.a.	A minimum PHI of 42 days is defined in FR
Maize	*Zea mays*	SEU	Outdoor	ES	weeds	SC	300.0	g/L	Foliar treatment - spraying	0	19	1	1			375.00	750.00	g a.i./ha	n.a.	
Sorghum	*Sorghum bicolor*	SEU	Outdoor	FR	weeds	SC	300.0	g/L	Foliar treatment - spraying	0	19	1	1				600.00	g a.i./ha	n.a.	A minimum PHI of 90 days is defined in FR
Grass	*not specified*	SEU	Outdoor	FR	weeds	SC	300.0	g/L	Foliar treatment - spraying	12	18	1	1				225.00	g a.i./ha	n.a.	
Maize (for forage)	*Zea mays*	SEU	Outdoor	PT	weeds	SC	300.0	g/L	Foliar treatment - spraying	0	19	1	1			300.00	600.00	g a.i./ha	n.a.	

Appendix B – List of end points

B.1. Residues in plants

B.1.1. Nature of residues and methods of analysis in plants

B.1.1.1. Metabolism studies, methods of analysis and residue definitions in plants

Primary crops (available studies)	**Crop groups**	**Crop(s)**	**Application(s)**	**Sampling** (DAT)
	Cereals/grass crops	Maize	Foliar, 1 x 1.1 kg a.s./ha	14, 56, 118
	Source: Germany, 2006.			
Rotational crops (available studies)	**Crop groups**	**Crop(s)**	**Application(s)**	**PBI** (DAT)
	Not available and not required ($DT_{90,\ field}$ values for both sulcotrione and CMBA are well below 100 days).			

Processed commodities (hydrolysis study)	**Conditions**	**Investigated?**
	Pasteurisation (20 min, 90°C, pH 4)	No
	Baking, brewing and boiling (60 min, 100°C, pH 5)	No
	Sterilisation (20 min, 120°C, pH 6)	No
	Not available and not required.	

Can a general residue definition be proposed for primary crops?	No
Rotational crop and primary crop metabolism similar?	Not applicable.
Residue pattern in processed commodities similar to residue pattern in raw commodities?	Not applicable.
Plant residue definition for monitoring (RD-Mo)	Two separate residue definitions (for cereals only): 1. Sulcotrione 2. 2-chloro-4-(methylsulfonyl)benzoic acid (CMBA)
Plant residue definition for risk assessment (RD-RA)	Two separate residue definitions (for cereals only): 1. Sulcotrione 2. 2-chloro-4-(methylsulfonyl)benzoic acid (CMBA)
Conversion factor (monitoring to risk assessment)	Not applicable.
Methods of analysis for monitoring of residues (analytical technique, crop groups, LOQs)	Acidic, dry, high water content and high oil content: • HPLC-MS/MS, 0.05 mg/kg, validated for both sulcotrione and CMBA separately (incl. ILV) • Specificity was only demonstrated for sulcotrione (validated for two mass transitions) • Source: Germany, 2006.

B.1.1.2. Stability of residues in plants

Plant products (available studies)	**Category**	**Commodity**	**T** (°C)	**Stability** (Months/years)
	High water content	Maize forage	-18	24 months
	Dry / High starch	Maize grain	-18	24 months
	Storage stability was demonstrated for sulcotrione and CMBA separately. Source: Germany, 2006.			

B.1.2. Magnitude of residues in plants

B.1.2.1. Summary of residues data from the supervised residue trials

Crop	Region/ Indoor (a)	Residue levels observed in the supervised residue trials relevant to the supported GAPs (mg/kg)	Recommendations/comments (OECD calculations)	MRL proposals (mg/kg)	HR (mg/kg) (b)	STMR (mg/kg) (c)
Sulcotrione						
Salsify	NEU	4 x <0.05	Trials compliant with GAP (Belgium, 2015).	0.05*(a) (tentative)	0.05	0.05
Sweet corn	NEU	7 x <0.05	Trials on sweet corn compliant with GAP (450-600 g a.s./ha; Germany, 2010).	0.05*	0.05	0.05
	SEU	3 x <0.05	Overdosed trials on sweet corn (450 g a.s./ha at BBCH 55-85) considered adequate since residues were all <0.05 mg/kg (Germany, 2010).	0.05*	0.05	0.05
Maize grain Sorghum grain	NEU	10 x <0.05; 2 x <0.02	Trials on maize compliant with GAP (450-600 g a.s./ha) and with sampling at dry grain stage (Germany, 2010; France, 2015); not authorised for use on sorghum in NEU.	0.05*	0.05	0.05
	SEU	6 x <0.05	Trials on maize compliant with GAP or higher application rate (600-1000 g a.s./ha), all with sampling at dry grain stage (Germany, 2010); extrapolation to sorghum possible.	0.05*	0.05	0.05
Grass	NEU	4 x <0.02	Trials on rye grass compliant with GAP (France, 2015).	0.05*	0.02	0.02
	SEU	-	GAP compliant residue trials are not available.	-	-	-
Maize forage	NEU	14 x <0.05; 2 x <0.02	Trials on maize compliant with GAP (450-600 g a.s./ha) and with sampling at forage stage (Germany, 2010; France, 2015).	0.05*	0.05	0.05
	SEU	5 x <0.05; 2 x <0.02	Trials on maize slightly underdosed (450 g a.s./ha instead of 600) and with sampling at forage stage (Germany, 2010; France, 2015).	0.05*	0.05	0.05

Crop	Region/ Indoor (a)	Residue levels observed in the supervised residue trials relevant to the supported GAPs (mg/kg)	Recommendations/comments (OECD calculations)	MRL proposals (mg/kg)	HR (mg/kg) (b)	STMR (mg/kg) (c)
CMBA						
Salsify	NEU	-	Available trials did not investigate levels of CMBA (Belgium, 2015).	-	-	-
Sweet corn	NEU	7 x <0.05	Trials on sweet corn compliant with GAP (450-600 g a.s./ha; Germany, 2010).	0.05* (b) (tentative)	0.05	0.05
	SEU	3 x <0.05	Overdosed trials on sweet corn (450 g a.s./ha at BBCH 55-85) considered adequate since residues were all <0.05 mg/kg (Germany, 2010).	0.05* (b) (tentative)	0.05	0.05
Maize grain Sorghum grain	NEU	10 x <0.05	Trials on maize compliant with GAP (450-600 g a.s./ha) and with sampling at dry grain stage (Germany, 2010); not authorised for use on sorghum in NEU.	0.05* (b) (tentative)	0.05	0.05
	SEU	6 x <0.05	Trials on maize compliant with GAP or higher application rate (600-1000 g a.s./ha), all with sampling at dry grain stage (Germany, 2010); extrapolation to sorghum possible.	0.05* (b) (tentative)	0.05	0.05
Grass	NEU	-	Available trials did not investigate levels of CMBA (Belgium, 2015).	-	-	-
	SEU	-	GAP compliant residue trials are not available.	-	-	-
Maize forage	NEU	8 x <0.05; 0.06; 0.1; 0.1; 0.11; 0.16; 0.6	Trials on maize compliant with GAP (450-600 g a.s./ha) and with sampling at forage stage (Germany, 2010). R_{ber} = 0.2 R_{max} = 0.49 MRL_{OECD} = 0.69	0.70 (b) (tentative)	0.60	0.05
	SEU	3 x <0.05; 0.11; 0.16	Trials on maize slightly underdosed (450 g a.s./ha instead of 600) and with sampling at forage stage (Germany, 2010). R_{ber} = 0.27 R_{max} = 0.29 MRL_{OECD} = 0.28	0.30 (b) (tentative)	0.16	0.05

* Indicates that the MRL is proposed at the limit of quantification.
(a): MRL proposal is tentative in the absence of a study addressing primary crop metabolism in root and tuber vegetables.
(b): MRL proposal is tentative in the absence of a fully validated analytical method for the monitoring of CMBA in plant commodities.
NEU: Outdoor trials conducted in northern Europe; SEU: Outdoor trials conducted in southern Europe; HR: highest residue; STMR: supervised trials median residue.

B.1.2.2. Residues in succeeding crops

Confined rotational crop study (quantitative aspect)	Not available and not required ($DT_{90, field}$ values for both sulcotrione and CMBA are well below 100 days).
Field rotational crop study	Not applicable.

B.1.2.3. Processing factors

Processed commodity	**Number of studies**	**Processing Factor** (PF)	
		Individual values	Median PF
Not available and not required.			

B.2. Residues in livestock

	Median dietary burden (mg/kg bw per d)	**Maximum dietary burden** (mg/kg bw per d)	**Highest contributing commodity**[a]	**Max dietary burden** (mg/kg DM)	**Trigger exceeded** (Y/N)
Sulcotrione					
Dairy ruminants	0.004	0.004	Grass (fresh)	0.10	N
Meat ruminants	0.004	0.004	Grass (fresh)	0.10	N
Poultry	0.003	0.003	Maize grain	0.04	N
Pigs	0.002	0.002	Maize grain	0.04	N
CMBA					
Dairy ruminants	0.009	0.109	Maize silage	3.03	Y
Meat ruminants	0.011	0.129	Maize silage	2.99	Y
Poultry	0.003	0.003	Maize grain	0.04	N
Pigs	0.002	0.019	Maize silage	0.47	Y

(a): Calculated for the maximum dietary burden

B.2.1. Nature of residues and methods of analysis in livestock

B.2.1.1. Metabolism studies, methods of analysis and residue definitions in livestock

Livestock (available studies)	**Animal**	**Dose** (mg/kg bw/d)	**Duration** (days)	**N rate/comment**
	Lactating goat	0.33	7	3.0 N/dairy ruminants 2.6 N/meat ruminants
	Study with CMBA, study with sulcotrione is not available and not required. Source: Germany, 2006			

Time needed to reach a plateau concentration in milk and eggs (days)	Not reported, excretion through milk was negligible
Metabolism in rat and ruminant similar (Yes/No)	Yes
Animal residue definition for monitoring (RD-Mo)	2-chloro-4-(methylsulfonyl)benzoic acid (CMBA)
Animal residue definition for risk assessment (RD-RA)	2-chloro-4-(methylsulfonyl)benzoic acid (CMBA)
Conversion factor (monitoring to risk assessment)	Not applicable
Fat soluble residues (Yes/No)	No
Methods of analysis for monitoring of residues (analytical technique, crop groups, LOQs)	Not available

B.2.1.2. Stability of residues in livestock

Animal products (available studies)	**Animal**	**Commodity**	**T** (°C)	**Stability** (Months/years)
	Not available and not required.			

B.2.2. Magnitude of residues in livestock

B.2.2.1. Summary of the residue data from livestock feeding studies

Note: in the absence of a feeding study, quantitative data from the metabolism study on goats were used.

Ruminants Closest feeding level[a] 0.33 mg/kg bw 2.6 N rate (beef cattle) 3.0 N rate (dairy cattle)	**Commodity**	**Residues at closest feeding level**		**Estimated value at 1N**		**MRL** (mg/kg)
		Mean (mg/kg)	**Highest** (mg/kg)	**STMR** (mg/kg)[b]	**HR** (mg/kg)[c]	
	Muscle	n.a.	<0.01	0.01	0.01	0.01* [e] (tentative)
	Fat	n.a.	<0.01	0.01	0.01	0.01* [e] (tentative)
	Liver	n.a.	<0.01	0.01	0.01	0.01* [e] (tentative)
	Kidney	n.a.	0.038	0.01	0.015	0.015 [e] (tentative)
	Milk	n.a.	<0.01	0.01	0.01	0.01* [e] (tentative)
Poultry Not available and not required.	**Commodity**	**Residues at closest feeding level**		**Estimated value at 1N**		**MRL** (mg/kg)
		Mean (mg/kg)	**Highest** (mg/kg)	**STMR** (mg/kg)[b]	**HR** (mg/kg)[c]	
	Muscle	-	-	-	-	-
	Fat	-	-	-	-	-
	Liver	-	-	-	-	-
	Kidney	-	-	-	-	-
	Eggs	-	-	-	-	-
Pig[d] Closest feeding level[a] 0.33 mg/kg bw 17 N rate	**Commodity**	**Residues at closest feeding level**		**Estimated value at 1N**		**MRL** (mg/kg)
		Mean (mg/kg)	**Highest** (mg/kg)	**STMR** (mg/kg)[b]	**HR** (mg/kg)[c]	
	Muscle	n.a.	<0.01	0.01	0.01	0.01* [e] (tentative)
	Fat	n.a.	<0.01	0.01	0.01	0.01* [e] (tentative)
	Liver	n.a.	<0.01	0.01	0.01	0.01* [e] (tentative)
	Kidney	n.a.	0.038	0.01	0.01	0.01* [e] (tentative)

* Indicates that the MRL is proposed at the limit of quantification.
n.a. not applicable
(a): Feeding level of the goat metabolism study and N dose rate related to the maximum dietary burden.
(b): Mean residue level, recalculated at the 1N rate for the median dietary burden.
(c): Highest residue level for tissues and eggs and mean residue level for milk, recalculated at the 1N rate for the maximum dietary burden.
(d): Since extrapolation from ruminants to pigs is acceptable, results of the metabolism study on goats were relied upon to derive the MRL and risk assessment values in pigs.
(e): MRL proposal is tentative in the absence of a validated analytical method for monitoring and residue trials on grass investigating levels of CMBA (as the livestock dietary burden may currently be underestimated).

B.3. Consumer risk assessment

B.3.1. Consumer risk assessment for sulcotrione

ADI	0.0004 mg/kg bw per day (EFSA, 2008)
Highest IEDI, according to EFSA PRIMo	31 % ADI (WHO cluster diet B)
Assumptions made for the calculations	The calculation is based on the median residue levels in the raw agricultural commodities. The contributions of commodities where no GAP was reported in the framework of this review, were not included in the calculation.

ARfD	Not necessary (EFSA, 2008)
Highest IESTI, according to EFSA PRIMo	Not applicable
Assumptions made for the calculations	Not applicable

B.3.2. Consumer risk assessment for CMBA

ADI	0.2 mg/kg bw per day (EFSA, 2008)
Highest IEDI, according to EFSA PRIMo	0.2 % ADI (UK infant)
Assumptions made for the calculations	The calculation is based on the median residue levels in the raw agricultural commodities but EFSA was not able to include salsify in the calculation because data for this crop are insufficient to derive an MRL and no EU MRL is currently in place. The contributions of commodities where no GAP was reported in the framework of this review, were not included in the calculation.

ARfD	Not necessary (EFSA, 2008)
Highest IESTI, according to EFSA PRIMo	Not applicable
Assumptions made for the calculations	Not applicable

B.4. Proposed MRLs

Code number (a)	Commodity	Existing EU MRL (mg/kg)	Outcome of the review	
			MRL (mg/kg)	Comment
Enforcement residue definition: sulcotrione				
213090	Salsify	0.05*	0.05*	Further consideration needed [(b)]
234000	Sweet corn	0.05*	0.05*	Recommended [(c)]
500030	Maize grain	0.05*	0.05*	Recommended [(c)]
500080	Sorghum grain	0.05*	0.05*	Recommended [(c)]
-	Other products of plant and animal origin	See Reg. 149/2008	-	Further consideration needed [(d)]

Code number (a)	Commodity	Existing EU MRL (mg/kg)	Outcome of the review	
			MRL (mg/kg)	Comment
Additional enforcement residue definition (optional): 2-chloro-4-(methylsulfonyl)benzoic acid (CMBA)				
213090	Salsify	-	-	Further consideration needed(e)
234000	Sweet corn	-	0.05*	Further consideration needed(f)
500030	Maize grain	-	0.05*	Further consideration needed(f)
500080	Sorghum grain	-	0.05*	Further consideration needed(f)
1011010	Swine muscle	-	0.01*	Further consideration needed(f)
1011020	Swine fat (free of lean meat)	-	0.01*	Further consideration needed(f)
1011030	Swine liver	-	0.01*	Further consideration needed(f)
1011040	Swine kidney	-	0.01*	Further consideration needed(f)
1012010	Bovine muscle	-	0.01*	Further consideration needed(f)
1012020	Bovine fat	-	0.01*	Further consideration needed(f)
1012030	Bovine liver	-	0.01*	Further consideration needed(f)
1012040	Bovine kidney	-	0.015	Further consideration needed(f)
1013010	Sheep muscle	-	0.01*	Further consideration needed(f)
1013020	Sheep fat	-	0.01*	Further consideration needed(f)
1013030	Sheep liver	-	0.01*	Further consideration needed(f)
1013040	Sheep kidney	-	0.015	Further consideration needed(f)
1014010	Goat muscle	-	0.01*	Further consideration needed(f)
1014020	Goat fat	-	0.01*	Further consideration needed(f)
1014030	Goat liver	-	0.01*	Further consideration needed(f)
1014040	Goat kidney	-	0.015	Further consideration needed(f)
1020010	Cattle milk	-	0.01*	Further consideration needed(f)
1020020	Sheep milk	-	0.01*	Further consideration needed(f)
1020030	Goat milk	-	0.01*	Further consideration needed(f)
-	Other products of plant and animal origin	-	-	Further consideration needed(g)

* Indicates that the MRL is set/proposed at the limit of quantification.
(a): Commodity code number, as listed in Annex I of Regulation (EC) No 396/2005
(b): Tentative MRL is derived from a GAP evaluated at EU level, which is not fully supported by data but for which no risk to consumers was identified (assuming the existing residue definition); no CXL is available (combination E-I in Appendix D).
(c): MRL is derived from a GAP evaluated at EU level, which is fully supported by data and for which no risk to consumers is identified; no CXL is available (combination G-I in Appendix D).
(d): There are no relevant authorisations or import tolerances reported at EU level; no CXL is available. Either a specific LOQ or the default MRL of 0.01 mg/kg may be considered (combination A-I in Appendix D).
(e): If an MRL for CMBA is considered necessary by risk managers, available data do not allow deriving an MRL proposal, and an EU MRLs or CXL is currently not available. Although the risk assessment cannot be finalised, exposure to CMBA levels is expected to be less critical than the exposure to sulcotrione.
(f): If an MRL for CMBA is considered necessary by risk managers, this tentative value is derived from a GAP evaluated at EU level, which is not fully supported by data but for which no risk to consumers could be identified; no CXL is available.
(g): There are no relevant authorisations or import tolerances reported at EU level; no CXL is available. If an MRL for CMBA is considered necessary by risk managers, either a specific LOQ or the default MRL of 0.01 mg/kg may be considered.

Appendix C – Input values for the exposure calculations

C.1. Livestock dietary burden calculations

Feed commodity	Median dietary burden		Maximum dietary burden	
	Input value (mg/kg)	Comment	Input value (mg/kg)	Comment
Sulcotrione				
Grass (fresh, silage and hay)	0.02*	STMR[(a)]	0.02*	HR[(a)]
Maize silage	0.02*	Lowest LOQ[(b)]	0.02*	Lowest LOQ[(b)]
Maize grain	0.05*	STMR	0.05*	STMR
CMBA				
Grass (fresh, silage and hay)	-	No data	-	No data
Maize silage	0.05*	STMR	0.60	HR
Maize grain	0.05*	STMR	0.05*	STMR

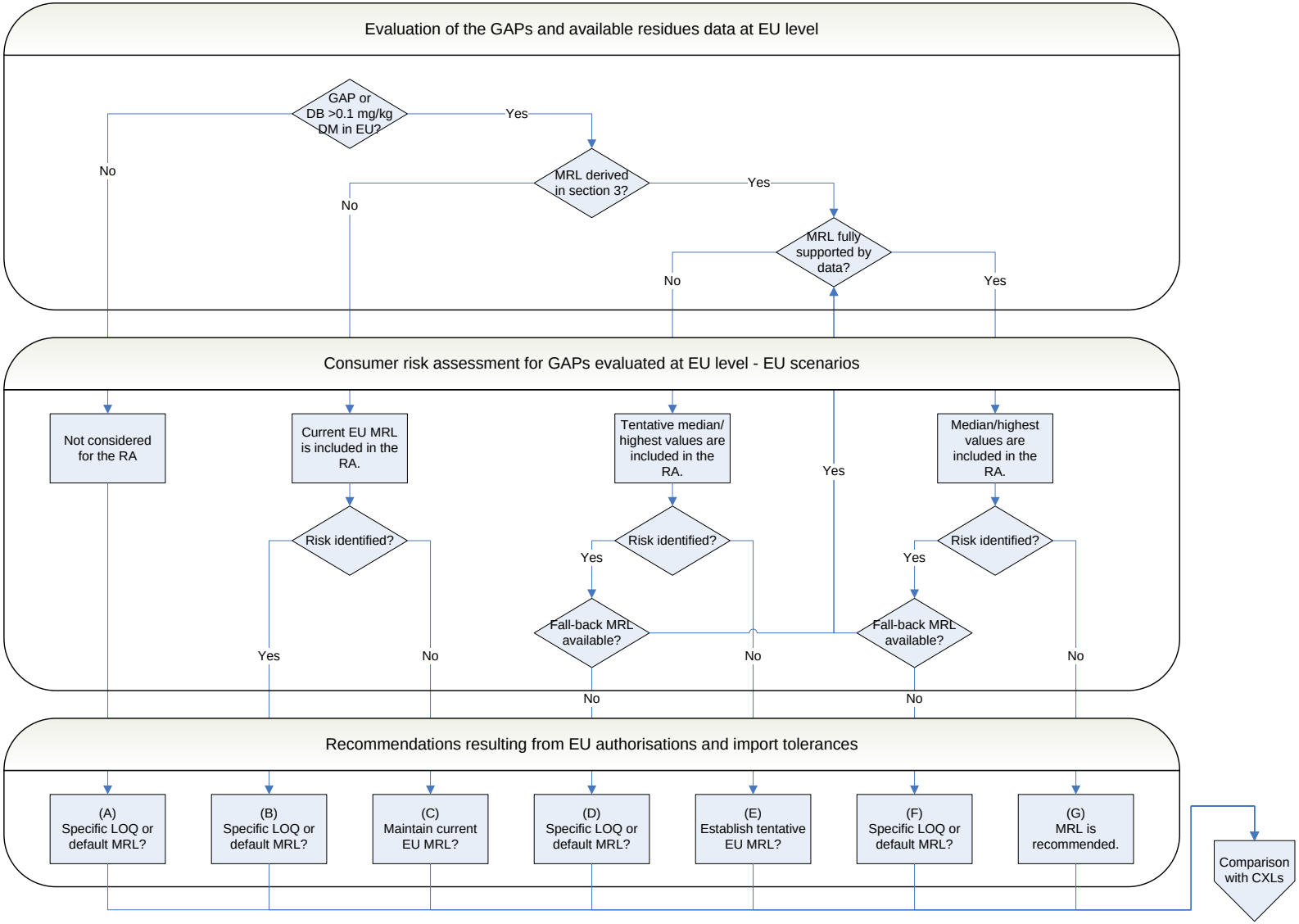
* Indicates that the input value is proposed at the limit of quantification (LOQ).
(a): For hay no default processing factor was applied because sulcotrione is applied early in the growing season and residues are expected to be below the LOQ. Furthermore, residue trials in grass demonstrated that levels of sulcotrione will not concentrate in hay.
(b): All residue trials indicated residue levels below LOQ, but different LOQ values were used in the trials. In order to obtain the most realistic livestock dietary burden calculation, the lowest LOQ used in the residue trials was considered.
STMR: supervised trials median residue; HR: highest residue

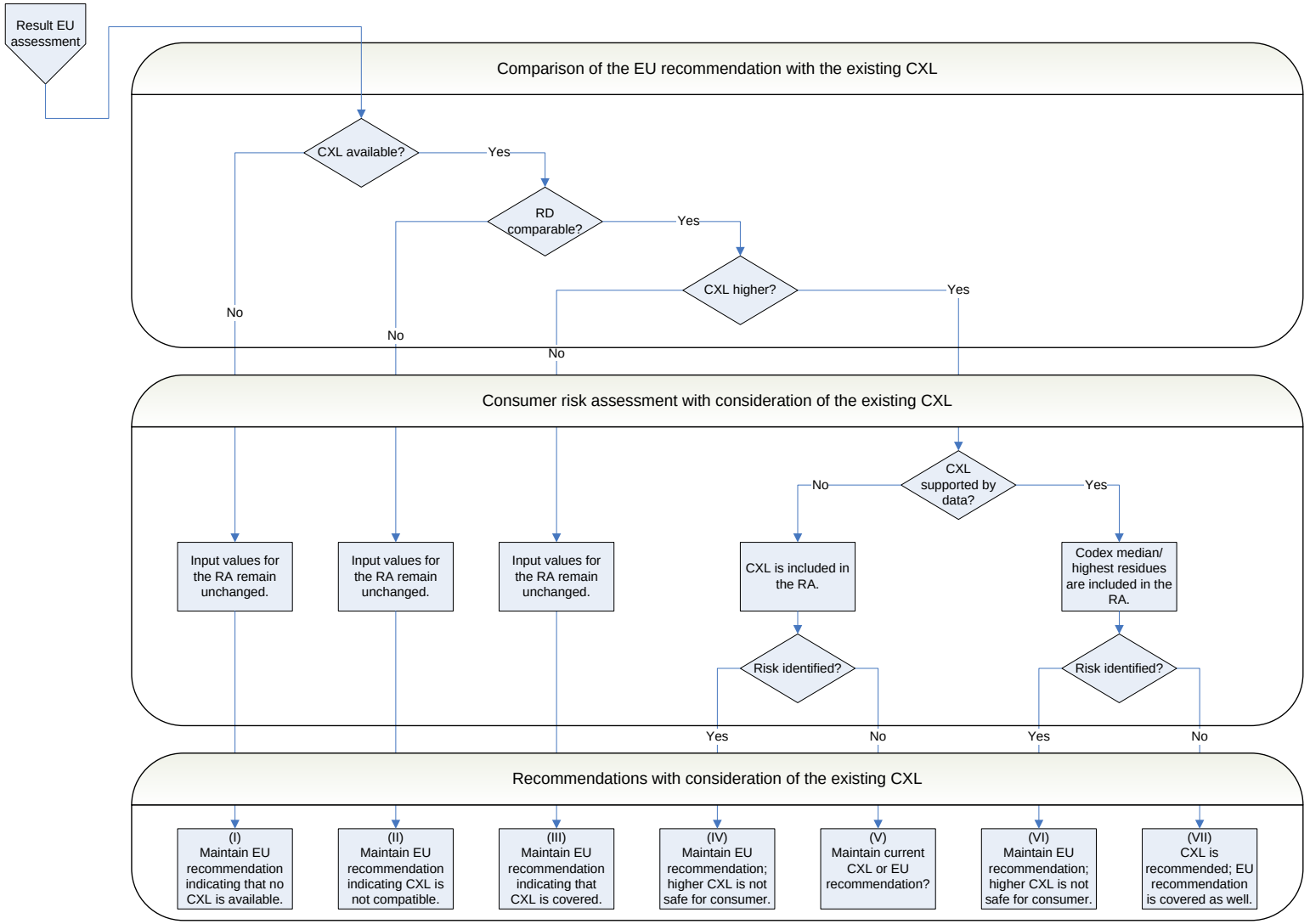
C.2. Consumer risk assessment

Commodity	Chronic risk assessment	
	Input value (mg/kg)	**Comment**
Sulcotrione		
Salsify	0.05*	STMR
Sweet corn	0.05*	STMR
Maize grain	0.05*	STMR
Sorghum grain	0.05*	STMR
CMBA		
Salsify	-	No data/No EU MRL
Sweet corn	0.05*	STMR
Maize grain	0.05*	STMR
Sorghum grain	0.05*	STMR
Swine muscle	0.01*	STMR
Swine fat (free of lean meat)	0.01*	STMR
Swine liver	0.01*	STMR
Swine kidney	0.01*	STMR
Ruminant muscle	0.01*	STMR
Ruminant fat	0.01*	STMR
Ruminant liver	0.01*	STMR
Ruminant kidney	0.01*	STMR
Ruminant milk	0.01*	STMR

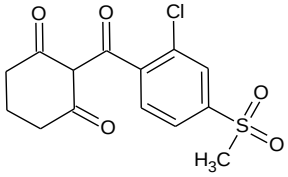
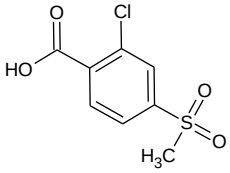
* Indicates that the input value is proposed at the limit of quantification.

Appendix D – Decision tree for deriving MRL recommendations




Result EU assessment
Comparison of the EU recommendation with the existing CXL
CXL available?
Yes
No
RD comparable?
Yes
No
CXL higher?
Yes
No
Consumer risk assessment with consideration of the existing CXL
CXL supported by data?
No
Yes
Input values for the RA remain unchanged.
Input values for the RA remain unchanged.
Input values for the RA remain unchanged.
CXL is included in the RA.
Codex median/ highest residues are included in the RA.
Risk identified?
Risk identified?
Yes
No
Yes
No
Recommendations with consideration of the existing CXL
(I) Maintain EU recommendation indicating that no CXL is available.
(II) Maintain EU recommendation indicating CXL is not compatible.
(III) Maintain EU recommendation indicating that CXL is covered.
(IV) Maintain EU recommendation; higher CXL is not safe for consumer.
(V) Maintain current CXL or EU recommendation?
(VI) Maintain EU recommendation; higher CXL is not safe for consumer.
(VII) CXL is recommended; EU recommendation is covered as well.

Appendix E – Used compound code(s)

Code/trivial name	Chemical name/SMILES notation[a]	Structural formula[a]
Sulcotrione	2-(2-chloro-4-mesylbenzoyl)cyclohexane-1,3-dione	
CMBA	2-chloro-4-(methylsulfonyl)benzoic acid	

(a): (ACD/ChemSketch, Advanced Chemistry Development, Inc., ACD/Labs Release: 12.00 Product version: 12.00 (Build 29305, 25 Nov 2008).