Setting of import tolerance for quizalofop-P-ethyl in genetically modified maize

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Abstract

In accordance with Article 6 of Regulation (EC) No 396/2005, the applicant Dow AgroSciences submitted a request to the competent national authority in Finland, to set an import tolerance for quizalofop-P-ethyl in grain from genetically modified maize containing aad-1 gene. The data submitted in support of the request were found to be sufficient to derive a maximum residue level (MRL) proposal for quizalofop-P-ethyl maize grain. Adequate analytical methods for enforcement are available to control the residues of quizalofop-P-ethyl in maize grain. Based on the risk assessment results, EFSA concluded that the authorised use of quizalofop-P-ethyl on genetically modified maize containing aad-1 gene and the subsequent import of maize grain in Europe will not result in a consumer exposure exceeding the toxicological reference value and therefore is unlikely to pose a risk to consumers’ health.

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Summary

In accordance with Article 6 of Regulation (EC) No 396/2005, Dow AgroSciences submitted an application to the competent national authority in Finland (evaluating Member State, EMS), to set an import tolerance for the active substance quizalofop-P-ethyl in genetically modified (GM) maize (i.e. maize varieties expressing the AAD-1 protein that conveys resistance to 2,4-D, MCPA and aryloxyphenoxypropionate (AOPP) herbicides (R-isomers of dichlorprop, cyhalofop and quizalofop). The EMS drafted an evaluation report in accordance with Article quizalofop-P-ethyl, 8 of Regulation (EC) No 396/2005, which was submitted to the European Commission and forwarded to the European Food Safety Authority (EFSA) on 25 January 2018. The EMS proposed to establish an maximum residue level (MRL) for GM maize imported from Canada, at the level of 0.02 mg/kg.

EFSA assessed the application and the evaluation report as required by Article 10 of the MRL regulation.

Based on the conclusions derived by EFSA in the framework of Directive 91/414/EEC and the MRL Review under Article 12 of Regulation (EC) No 396/2005, and the new data submitted by the EMS in the MRL application, the following conclusions are derived.

The metabolism of quizalofop-P-ethyl has been investigated following foliar applications in fruit crops, root crops and pulses/oilseeds. In the framework of the current application, a new metabolism study was submitted investigating the nature of quizalofop-P-ethyl in GM maize, containing the aryloxalkanoate dioxygenase (aad-1) gene. At an application rate slightly above the authorised use rate, the total radioactive residue (TRR) in maize grain and cob was very low and thus not further characterised. European Food Safety Authority (EFSA) concludes that the metabolism of quizalofop-P-ethyl in GM maize grain is sufficiently investigated, indicating very low residues in GM maize grain when treated with quizalofop-P-ethyl at the rate tested. Additional metabolism studies are currently not required; this conclusion is valid only for maize grain derived from GM maize expressing aad-1 gene.

Studies investigating the effect of processing on the nature of quizalofop-P-ethyl have not been performed. Hydrolysis studies with quizalofop (acid) demonstrated that the active substance is stable under standard processing conditions. These conclusions are valid also for quizalofop-P-ethyl.

As the proposed use of quizalofop-P-ethyl is on imported crops, investigations of residues in rotational crops are not required.

Based on the metabolic pattern identified in conventional crop metabolism studies with quizalofop-P-ethyl, quizalofop-P-tefuryl and propaquizafop, hydrolysis studies with quizalofop (acid) and the toxicological significance of metabolites, the residue definitions for plant products were proposed by the MRL review as the 'sum of quizalofop, its salts, its esters (including propaquizafop) and its conjugates, expressed as quizalofop (any ratio of constituent isomers)' for enforcement and risk assessment. The enforcement residue definition for quizalofop-P-ethyl in Regulation (EC) No 396/2005 is set as 'quizalofop, including quizalofop-P'. The peer review of quizalofop-P proposed provisional enforcement and risk assessment residue definitions as 'sum of quizalofop esters, quizalofop and quizalofop conjugates expressed as quizalofop (sum of isomers)'. These residue definitions are applicable to primary crops, rotational crops and processed products. EFSA concludes that these residue definitions are appropriate also for grain derived from GM maize containing aad-1 gene and additional information is currently not required.

It is concluded that a sufficiently validated analytical enforcement method is available to determine quizalofop-P-ethyl and quizalofop (acid) residues in GM maize grain at the validated limit of quantification (LOQ) of 0.01 mg/kg.

The available data are considered sufficient to derive a MRL proposal for maize grain accommodating the authorised use of quizalofop-P-ethyl on GM maize in Canada, according to the existing enforcement residue definition. The fact that the analytical method used to analyse residue trial samples did not contain a hydrolysis step, which would be required to quantify quizalofop conjugates, is not considered to affect the validity of the residue data as, according to metabolism studies, the conjugates of quizalofop-P-ethyl are not expected to occur in significant amounts in maize grain. Thus, the MRL proposal is valid also for the residue definitions proposed by the MRL review.

Studies submitted in the framework of the current application on the effects of processing on the magnitude of quizalofop-P-ethyl residues in processed commodities of GM maize grain indicate that residues above LOQs are not expected in raw and processed commodities of maize grain.

Maize grain and by-products can be used for feed purposes. The livestock dietary burden which was calculated by the MRL review according to the OECD methodology and took into consideration the highest residue expected in livestock feed from the authorised uses of quizalofop-P-ethyl, quizalofop-P-
Tefuryl and propaquizafop were now updated with risk assessment values derived for maize grain. The calculated dietary burdens exceed the trigger value of 0.1 mg/kg dry matter (DM) for all livestock species and the intake is mainly driven by residues in potatoes from the existing use of propaquizafop assessed in the MRL review. Residues of quizalofop-P-ethyl in maize grain contribute insignificantly to the livestock exposure and thus would not affect the MRL proposals for animal commodities derived by the MRL review.

The consumer risk assessment was performed with revision 2 of the EFSA Pesticide Residues Intake Model (PRIMo). In the framework of the MRL review, a comprehensive consumer exposure to residues arising in food from the existing European Union (EU) uses of quizalofop-P-ethyl, quizalofop-P-terfuryl and propaquizafop was calculated, considering the lowest acceptable daily intake (ADI) value set for quizalofop-P-ethyl (0.009 mg/kg body weight (bw) day) and the lowest acute reference dose (ARfD) set for quizalofop-P-terfuryl (0.1 mg/kg bw), expressed as quizalofop equivalents. This exposure was now updated with the supervised trial median residue (STMR) values derived for GM maize grain assessed in this application.

The estimated long-term dietary intake was in the range of 5–30% of the ADI. The contribution of quizalofop-P-ethyl residues in maize grain to the overall long-term exposure is insignificant. No short-term intake concerns were identified with regard to residues in maize grain (0.2% of the ARfD).

EFSA concluded that the authorised use of quizalofop-P-ethyl on GM maize expressing aad-1 gene and consequent residues in maize grain will not result in a consumer exposure exceeding the toxicological reference value and therefore is unlikely to pose a risk to consumers’ health.

EFSA proposes to amend the existing MRL as reported in the summary table below.

Full details of all end points and the consumer risk assessment can be found in Appendices B–D.

| Code(a) | Commodity | Existing EU MRL (mg/kg) | Proposed EU MRL (mg/kg) | Comment/justification |
|--------|-----------|-------------------------|-------------------------|-----------------------|
| 0500030 | Maize     | 0.05* (0.01* – proposal of the MRL review) | 0.02 | Import tolerance application from Canada is supported by data and no consumer risk has been identified. The GM maize that expresses aad-1 gene has been assessed by EFSA Panel on Genetically Modified Organisms (GMO) and is authorised within the EU for the marketing of food and feed and derived products. |

EU MRL: European Union maximum residue limit.
*: Indicates that the MRL is set at the limit of analytical quantification (LOQ).
(a): Commodity code number according to Annex I of Regulation (EC) No 396/2005.
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Assessment

The detailed description of the authorised use of quizalofop-P-ethyl in Canada, on genetically modified (GM) maize (DAS-40278-9), which is the basis for the current maximum residue level (MRL) application, is reported in Appendix A. The placing on the market of products containing, consisting of, or produced from GM maize DAS-40278-9 has been authorised by the Commission Decision (EU) 2017/12121.

Quizalofop-P-ethyl is the ISO common name for ethyl (2R)-2-[4-(6-chloroquinoxalin-2-yl oxy)phenoxy] propionate (IUPAC). It is an ester variant of quizalofop-P. Quizalofop-P is the ISO common name for (R)-2-[4-(6-chloroquinoxalin-2-yl oxy)phenoxy]propionic acid (IUPAC). The unresolved isomeric mixture of this substance has the common name quizalofop. Quizalofop-P belongs to the class of aryloxypoxypropionic herbicides which are taken up via leaves and hinder the synthesis of fatty acids by inhibition of the enzyme Acetyl-CoA carboxylase (ACCCase). The chemical structures of the active substance and its main metabolites are reported in Appendix E.

Quizalofop-P (considered variants quizalofop-P-ethyl and quizalofop-P-tefuryl) was evaluated in the framework of Directive 91/414/EEC with Finland, designated as rapporteur Member State (RMS) for the representative uses as herbicide on oilseed rape, sugar/fodder beet, potato, pea, beans, linseed and sunflower. The draft assessment report (DAR) prepared by the RMS has been peer reviewed by European Food Safety Authority (EFSA) (EFSA, 2009). Quizalofop-P was approved for the use as herbicide on 1 December 2009. The peer review for the renewal of approval has not yet been initiated.

The review of existing MRLs according to Article 12 of Regulation (EC) No 396/2005 (MRL review) has been recently performed (EFSA, 2017); the proposed modifications have not yet been implemented in the European Union (EU) MRL legislation. The EU MRLs for quizalofop-P-ethyl are currently established in Annex IIIA of Regulation (EC) No 396/2005 according to the enforcement residue definition ‘quizalofop, including quizalofop-P’.

In accordance with Article 6 of Regulation (EC) No 396/2005, Dow AgroSciences submitted an application to the competent national authority in Finland (evaluating Member State, EMS) to set an import tolerance for the active substance quizalofop-P-ethyl in GM maize grain, containing the aryloxalkanoate dioxygenase (aad-1) gene. The EMS drafted an evaluation report in accordance with Article 8 of Regulation (EC) No 396/2005, which was submitted to the European Commission and forwarded to the EFSA on 25 January 2018. The EMS proposed to establish an MRL for maize grain imported from Canada, at the level of 0.02 mg/kg.

EFSA assessed the application and the evaluation report as required by Article 10 of the MRL regulation.

EFSA based its assessment on the evaluation report submitted by the EMS (Finland, 2018), the DAR (and its addenda) (Finland, 2007, 2008) prepared under Council Directive 91/414/EEC, the conclusion on the peer review of the pesticide risk assessment of the active substance quizalofop-P (EFSA, 2009) as well as the conclusions from the MRL review on quizalofop-P-ethyl, quizalofop-P-tefuryl and propaquizafop (EFSA, 2017).

For this application, the data requirements established in Regulation (EU) No 544/2011 and the guidance documents applicable at the date of submission of the application to the EMS are applicable (European Commission, 1997a-g, 2000, 2010a,b, 2017; OECD, 2011, 2013). The assessment is performed in accordance with the legal provisions of the Uniform Principles for the Evaluation and the Authorisation of Plant Protection Products adopted by Commission Regulation (EU) No 546/2011.

1 Commission Implementing Decision (EU) 2017/1212 of 4 July 2017 authorizing the placing on the market of products containing, consisting of, or produced from genetically modified maize DAS-40278-9, pursuant to Regulation (EC) no 1829/2003 of the European Parliament and of the Council on genetically modified food and feed. OJ L 173, 6.7.2017, p. 43-46
2 Council Directive 91/414/EEC of 15 July 1991 concerning the placing of plant protection products on the market. OJ L 230, 19.08.1991, p. 1-32
3 Commission Directive 2009/37/EC of 23 April 2009 amending Council Directive 91/414/EEC to include chlormequat, copper compounds, propaquizafop, quizalofop-P, tefubenzuron and zeta-cypermethrin as active substances. OJ L 104, 24.4.2009, 9. 23-32
4 Regulation (EC) No 396/2005 of the 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, 16.03.2005, p. 1-16.
5 Commission Regulation (EU) No 544/2011 of 10 June 2011 implementing Regulation (EC) No 1107/2009 of the European Parliament and of the Council as regards the data requirements for active substances. OJ L 155, 11.6.2011, p. 1-66.
6 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, 11.6.2011, p. 127-175.
A selected list of end points of the studies assessed by EFSA in the framework of this MRL application, including the end points of relevant studies assessed previously, are presented in Appendix B.

The evaluation report submitted by the EMS (Finland, 2018) and the exposure calculations using the EFSA Pesticide Residues Intake Model (PRIMo) are considered as supporting documents to this reasoned opinion and, thus, are made publicly available as background documents to this reasoned opinion.

1. Residues in plants

1.1. Nature of residues and methods of analysis in plants

1.1.1. Nature of residues in primary crops

The metabolism of quizalofop-P-ethyl in primary conventional crops belonging to the group of fruit crops, root crops and oilseeds following foliar applications has been investigated in the framework of the EU peer review and the MRL review (EFSA, 2009, 2017).

In the framework of the current application, a new metabolism study was submitted investigating the nature of quizalofop-P-ethyl in GM maize, containing the aryloxyalkanoate dioxygenase (aad-1) gene. The aad-1 gene is a herbicide tolerant gene that encodes an enzyme which detoxifies aryloxyphenoxypropionate herbicides via an α-ketoglutarate-dependent dioxygenase reaction. The AAD-1 protein can degrade the R-enantiomers of aryloxyphenoxypropionates (AOPPs) such as quizalofop-P to an inactive phenol. The first major product in the metabolic pathway is quizalofop-P-acid (Wright et al., 2009).

Herbicide tolerant maize containing aad-1 gene was treated with 14C-quizalofop-P-ethyl (labelled in phenyl and quinoxaline moiety) at an application rate of 98 g/ha at the growth stage of six leaves unfolded (ca. BBCH 16). The samples of mature grain, cobs, forage and fodder were taken for analysis. The total radioactive residues (TRR) in grain (0.004–0.005 mg eq/kg) and cobs (0.002 mg eq/kg) were low and therefore not further characterised. Because of very low TRR levels in maize grain, potential quizalofop conjugates, if present, will unlikely be a significant part of the residue and are therefore considered of no relevance for maize grain.

The TRR in forage accounted for 0.007–0.122 mg eq/kg and in the fodder for 0.26–0.35 mg eq/kg. Quizalofop-P-ethyl was identified at low levels in fodder from quinoxaline study (0.4%; 0.001 mg/kg) and in forage from phenyl study (1.4%; 0.004 mg/kg). Quizalofop (acid) was a minor metabolite identified in all fodder and forage samples (0.9–1.4%; 0.003 mg/kg). In total 17–30% of the radioactivity was characterised as polar fractions, accounting for a maximum of 0.043–0.049 mg eq/kg (17–14% TRR) per fraction, depending on retention times. Attempts to further identify the polar unknown fractions were not undertaken, but would be desirable for full elucidation of the metabolic pattern of quizalofop-P-ethyl in maize. The bound residues accounted for up to 33% TRR in forage and for up to 29% TRR in fodder. Quizalofop-P-ethyl andquizalofop (acid) which were identified at very low levels in maize fodder and forage have been present also in the metabolism of quizalofop-P-ethyl in conventional plants.

EFSA concludes that the metabolism of quizalofop-P-ethyl in GM maize grain is sufficiently investigated, indicating very low residues in grain when treated with quizalofop-P-ethyl at the rate tested. Additional metabolism studies are currently not required; this conclusion is valid only for maize grain derived from GM maize expressing aad-1 gene.

1.1.2. Nature of residues in rotational crops

Investigations of residues in rotational crops are not required for imported crops.

1.1.3. Nature of residues in processed commodities

The studies investigating the effect of processing on the nature of quizalofop-P-ethyl have not been performed. However, the hydrolysis study with quizalofop (acid), which was investigated in the framework of the MRL review, is considered sufficient to address the nature of quizalofop-P-ethyl under standard processing conditions (EFSA, 2017). The results of the study demonstrate that quizalofop (acid) is stable under pasteurisation, sterilisation and baking/brewing/boiling.
1.1.4. Methods of analysis in plants

The availability of the analytical enforcement methods for the determination of quizalofop-P-ethyl residues in plant matrices was investigated in the framework of the MRL review (EFSA, 2017).

The common moiety method using liquid chromatography with tandem mass spectrometry (LC-MS/MS) is validated for the determination of quizalofop-P-ethyl and quizalofop (through hydrolysis) in high starch content commodities at a combined limit of quantification (LOQ) of 0.01 mg/kg. The MRL review noted that the extraction efficiency and hydrolysis of conjugates and other ester variants were not demonstrated.

Since in maize grain, according to metabolism studies, conjugates of quizalofop-P-ethyl are not expected to occur in significant amounts, the lack of validation of the extraction efficiency and hydrolysis of conjugates was not considered relevant in the framework of this import tolerance application.

It is concluded that a sufficiently validated analytical enforcement method is available to determine quizalofop-P-ethyl and quizalofop (acid) residues in GM maize grain containing aad-1 gene at the validated LOQ of 0.01 mg/kg.

1.1.5. Stability of residues in plants

The storage stability of quizalofop-P-ethyl and quizalofop-P according to studies reported in the MRL review has been sufficiently demonstrated in high starch content commodities (wheat grain) for 12 months when stored at −18°C (EFSA, 2017).

In the framework of the current application, new studies were submitted investigating the storage stability of quizalofop-P-ethyl and quizalofop (acid) in GM maize grain, fodder, forage, starch, flour and oil when stored at −20°C for 13 months (Finland, 2018). Homogenised samples were spiked with quizalofop-P-ethyl and quizalofop (acid) at 0.1 mg/kg. The results of the study demonstrate degradation of quizalofop-P-ethyl beyond 30% in maize grain, fodder and flour as from 3 months of storage and in maize forage after 1 month of storage. Increased amounts of quizalofop (acid) in all maize fractions during storage indicate hydrolysis of quizalofop-P-ethyl to quizalofop (acid). As both compounds are included in the risk assessment and enforcement residue definition, the freezer storage stability of the sum of quizalofop (acid) and quizalofop-P-ethyl is considered addressed for 13 months in the GM maize containing aad-1 gene.

1.1.6. Proposed residue definitions

Based on the metabolic pattern identified in conventional crop metabolism studies with quizalofop-P-ethyl, quizalofop-P-tefuryl and propaquizafop, the results of hydrolysis studies, the toxicological significance of metabolites and the capabilities of enforcement analytical methods, the following residue definitions were proposed by the MRL review (EFSA, 2017):

- residue definition for risk assessment: sum of quizalofop, its salts, its esters (including propaquizafop) and its conjugates, expressed as quizalofop (any ratio of constituent isomers).
- residue definition for enforcement: sum of quizalofop, its salts, its esters (including propaquizafop) and its conjugates, expressed as quizalofop (any ratio of constituent isomers).

The current enforcement residue definition for quizalofop-P-ethyl in Regulation (EC) No 396/2005 is set as 'quizalofop, including quizalofop-P'.

The peer review of quizalofop-P proposed provisional enforcement and risk assessment residue definitions as 'sum of quizalofop esters, quizalofop and quizalofop conjugates expressed as quizalofop (sum of isomers)' (EFSA, 2009).

EFSA concludes that the previously derived residue definitions are appropriate for GM maize grain containing aad-1 gene.

1.2. Magnitude of residues in plants

1.2.1. Magnitude of residues in primary crops

In support of the authorised use, the applicant submitted in total 25 residue trials where field maize (event DAS-40278-p, expressing AAD-1 protein) was treated with quizalofop-P-ethyl at application rates ranging from 89–99 g/ha. Residue trials were performed in the United States (23 trials) and Canada (two trials) in 2009. Plants were treated at the growth stage of BBCH 16–42. Samples were taken at the preharvest interval (PHI) intervals of 79–144 days. Samples were analysed separately for....
quizalofop (acid) and quizalofop-P-ethyl, and results indicate that, in none of the samples, residues were above the individual LOQs of 0.01 mg/kg. It is noted that 18 of these trials were performed at higher application rates (differing by more than 25% from the application rate defined in the good agricultural practices (GAP)). However, as residues in all trials were below the limit of detection (LOD), residue trials were considered acceptable. Residue data on forage and fodder were not provided and are not relevant for the import tolerance application for maize grain.

Prior to analysis samples were stored frozen for a maximum interval of 376 days; the storage stability of the total quizalofop (acid) and quizalofop-P-ethyl residues has been demonstrated for this storage period.

The analytical method used in the residue trials did not include hydrolysis step and samples were analysed separately for quizalofop (acid) and quizalofop-P-ethyl. As quizalofop-P-ethyl conjugates were not identified in maize grain according to metabolism studies, the omission of hydrolysis step of the analytical method is not considered to affect the validity of residue data. The analytical method is thus considered sufficiently validated and fit for the purpose. It is noted that to comply with the enforcement residue definition proposed by the MRL review, residues shall be expressed as quizalofop (acid). Also, the existing enforcement residue definition in Regulation (EC) No 396/2005 refers to quizalofop (acid). As residues in all trials were below the LOD, in this case, conversions are irrelevant.

Residue data are considered sufficient to derive a MRL proposal of 0.02 mg/kg for the sum of quizalofop-P-ethyl and quizalofop, expressed as quizalofop, in GM maize grain. The MRL proposal refers to the sum of LOQs of quizalofop-P-ethyl and quizalofop (acid). EFSA notes that enforcement method is a common moiety method for which an LOQ of 0.01 mg/kg (for total residues) is validated. As residues in all trials were below the LOD (0.003 mg/kg) for each compound, it would be more appropriate to propose the MRL at the enforcement LOQ of 0.01 mg/kg. However, as the MRL proposal of 0.02 mg/kg corresponds to the tolerance set for quizalofop-P-ethyl in Canada,7 EFSA considered it acceptable.

1.2.2. Magnitude of residues in rotational crops

Investigation of residues in rotational crops is not relevant for the import tolerance application.

1.2.3. Magnitude of residues in processed commodities

In the framework of the current application, studies investigating the effect of processing on the magnitude of quizalofop-P-ethyl and quizalofop residues in processed maize commodities were submitted (Finland, 2018). In two field trials, GM maize containing aad-1 gene was treated with quizalofop-P-ethyl at an application rate of 184 g/ha. Grains were first cleaned by aspiration and screening and then processed by dry or wet milling into flour, meal, refined oil, starch and aspirated grain fraction. Residues of quizalofop-P-ethyl and quizalofop were below the individual LOQs of 0.01 mg/kg both in raw commodities and in all processed fractions. Processing factors were thus not derived.

1.2.4. Proposed MRLs

The available data are considered sufficient to derive MRL proposal as well as risk assessment values for quizalofop-P-ethyl GM maize grain (see Appendix B.1.2). The MRL proposal accommodates the residue definitions proposed by the MRL review and peer review.

In Section B.3., EFSA assessed whether residues on maize grain resulting from the uses authorised in Canada are likely to pose a consumer health risk.

2. Residues in livestock

Maize grain and by-products can be used for feed purposes. Hence, it was necessary to update the livestock dietary burden calculated in the framework of the MRL review (EFSA, 2017) to estimate whether the import of GM maize grain would have an impact on the livestock exposure and residues in the food of animal origin.

The livestock dietary burden in the MRL review was calculated according to the OECD methodology (OECD, 2013) and took into consideration the highest residue expected in livestock feed from the authorised uses of quizalofop-P-ethyl, quizalofop-P-tefuryl and propaquizafop. The livestock dietary burden was now updated with risk assessment values derived for maize grain and various grain

7 https://www.canada.ca/en/health-canada/services/consumer-product-safety/pesticides-pest-management/public/consultations/proposed-maximum-residue-limit/2015/quizalofop-ethyl-2/document.html?_=undefined&wbdisable=true#tablea1
by-products according to the current assessment. The data on residues in maize stover were not provided and are not considered relevant for the import tolerance request.

The calculated dietary burdens exceed the trigger value of 0.1 mg/kg dry matter (DM) for all livestock species and the intake is mainly driven by residues in potatoes from the existing use of quizalofop-P-tefuryl assessed in the MRL review. Residues of quizalofop-P-ethyl in maize grain contribute insignificantly to the existing livestock exposure and thus would not affect the MRL proposals derived for commodities of animal origin in the framework of the MRL review of quizalofop-P-ethyl, quizalofop-P-tefuryl and propaquizafop.

3. Consumer risk assessment

EFSA performed a dietary risk assessment using revision 2 of the EFSA PRIMo (EFSA, 2007). This exposure assessment model contains food consumption data for different subgroups of the EU population and allows the acute and chronic exposure assessment to be performed in accordance with the internationally agreed methodology for pesticide residues (FAO, 2016).

In the framework of the MRL review, a comprehensive consumer exposure to residues arising in food from the existing EU uses of quizalofop-P-ethyl, quizalofop-P-tefuryl and propaquizafop was calculated, considering the lowest acceptable daily intake (ADI) value set for quizalofop-P-ethyl (0.009 mg/kg body weight (bw) per day) and the lowest acute reference dose (ARfD) set for quizalofop-P-tefuryl (0.1 mg/kg bw), expressed as quizalofop equivalents (EFSA, 2017). This exposure was now updated with the supervised trial median residue (STMR) values derived for quizalofop-P-ethyl GM maize grain assessed in this application.

The estimated long-term dietary intake was in the range of 5–30% of the ADI. The contribution of residues expected in maize grain to the overall long-term exposure is insignificant and is presented in more detail in Appendix B.3. No short-term intake concerns were identified with regard to residues in maize grain (0.2% of the ARfD).

EFSA concluded that the long-term and short-term intake of residues occurring in food from the existing uses of quizalofop-P-ethyl, quizalofop-P-tefuryl and propaquizafop and from the authorised use of quizalofop-P-ethyl on GM maize in Canada, is unlikely to present a risk to consumer health.

4. Conclusion and Recommendations

The data submitted in support of this MRL application were found to be sufficient to derive an MRL proposal in maize grain accommodating the authorised use of quizalofop-P-ethyl in Canada on GM maize.

EFSA concluded that residues of quizalofop-P-ethyl in maize grain will not result in a consumer exposure exceeding the toxicological reference values and therefore is unlikely to pose a risk to consumers’ health.

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Abbreviations

a.s. active substance
ADI acceptable daily intake
AOPP aryloxyphenoxypropionate
ARfD acute reference dose
BBCH growth stages of mono- and dicotyledonous plants
bw body weight
CF conversion factor for enforcement to risk assessment residue definition
DAR draft assessment report
DAT days after treatment
DM dry matter
EMS evaluating Member State
eq residue expressed as a.s. equivalent
FAO Food and Agriculture Organization of the United Nations
GAP Good Agricultural Practice
GM genetically modified
HPLC high-performance liquid chromatography
HPLC-MS high-performance liquid chromatography with mass spectrometry
HPLC-MS/MS high performance liquid chromatography with tandem mass spectrometry
HR highest residue
IEDI international estimated daily intake
IESTI international estimated short-term intake
ILV independent laboratory validation
ISO International Organisation for Standardisation
IUPAC International Union of Pure and Applied Chemistry
(LC-MS/MS) liquid chromatography with tandem mass spectrometry
LOD limit of detection
| Acronym | Definition |
|---------|------------|
| LOQ     | limit of quantification |
| MRL     | maximum residue level |
| MS      | Member States |
| MS/MS   | tandem mass spectrometry detector |
| NEU     | northern Europe |
| OECD    | Organisation for Economic Co-operation and Development |
| PBI     | plant back interval |
| PF      | processing factor |
| PHI     | preharvest interval |
| PRIMO   | (EFSA) Pesticide Residues Intake Model |
| RA      | risk assessment |
| RAC     | raw agricultural commodity |
| RD      | residue definition |
| RMS     | rapporteur Member State |
| SANCO   | Directorate-General for Health and Consumers |
| SEU     | southern Europe |
| SMILES  | simplified molecular-input line-entry system |
| SP      | water-soluble powder |
| STMR    | supervised trials median residue |
| TRR     | total radioactive residue |
| WHO     | World Health Organization |
Appendix A – Summary of authorised GAP in exporting country triggering the amendment of existing EU MRLs

| Crop and/or situation | Preparation | Application | Application rate per treatment | PHI (days) | Remarks |
|-----------------------|-------------|-------------|--------------------------------|------------|---------|
| Genetically modified maize expressing AAD-1 protein (event DAS-40278-9) | EC 96 Spray | 2-8 leaf stage 1 | 190–770 93–374 72 g/ha | PHI for forage and grazing: 30 days |

NEU: northern European Union; SEU: southern European Union; MS: Member State; EC: emulsifiable concentrate.
(a): Outdoor or field use (F), greenhouse application (G) or indoor application (I).
(b): CropLife International Technical Monograph no 2, 6th Edition. Revised May 2008. Catalogue of pesticide formulation types and international coding system.
(c): Growth stage range from first to last treatment (BBCH Monograph, Growth Stages of Plants, 1997, Blackwell, ISBN 3-8263-3152-4), including, where relevant, information on season at time of application.
(d): PHI: minimum preharvest interval.
### 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                  | Quizalofop-P-ethyl | Rotational crops | Quizalofop-P-ethyl | Processed commodities | Quizalofop-P-ethyl |
|-------------------------------|--------------------|------------------|--------------------|-----------------------|--------------------|
| **Crop groups**               | **Crop(s)**        | **Application(s)** | **Sampling**<sup>(a)</sup> | **Crop groups**       | **Crop(s)**        | **Application(s)** | **PBI**<sup>(a)</sup> | **Conditions** | **Investigated?** |
| Fruit crops                   | Tomatoes<sup>(b)</sup> | Foliar, 1 × 167–173 g a.s./ha | 0, 12 and 105     | Root/tuber crops      | Sugar beets<sup>(e)</sup> | Bare soil, 308 g a.s./ha | 30, 60              | Pasteurisation (20 min, 90°C, pH 4) | No                |
| Root crops                    | Sugar beets<sup>(b)</sup> | Foliar, 1 × 280 g a.s./ha | 31, 60 and 90     | Leafy crops           | Lettuce<sup>(e)</sup> | Bare soil, 308 g a.s./ha | 30, 60              | Baking, brewing and boiling (60 min, 100°C, pH 5) | No                |
|                               | Sugar beets<sup>(c)</sup> | Foliar, 1 × 6 g a.s./ha | 28                | Pulses and oilseeds   | Cotton seeds<sup>(e)</sup> | Bare soil, 308 g a.s./ha | 30, 60              | Sterilisation (20 min, 120°C, pH 6) | No                |
|                               | Potatoes<sup>(c)</sup> | Foliar, 1 × 6 g a.s./ha | 14                |                       | Peanuts<sup>(e)</sup> | Bare soil, 308 g a.s./ha | 30, 60              |                        |                    |
|                               | Sugar beets<sup>(d)</sup> | Foliar, 1 × 316 g a.s./ha | 31                | Cereal (small grain)  | Wheat<sup>(e)</sup> | Bare soil, 308 g a.s./ha | 30, 60              |                        |                    |
| Pulses/oilseeds               | Cotton<sup>(e)</sup> | Foliar, 1 × 260 g a.s./ha | 0, 7, 21 and 42   |                       |                   |                           |                      |                        |                    |
|                               | Soyabeans<sup>(e)</sup> | Foliar, 1 × 273–287 g a.s./ha | 0, 7, 21 and 42  |                       |                   |                           |                      |                        |                    |
|                               | Soyabeans<sup>(f)</sup> | Foliar, 1 × 280 g a.s./ha | 0, 7, 14, 29 and 63 |                       |                   |                           |                      |                        |                    |
|                               | Soyabeans<sup>(g)</sup> | Foliar, 1 × 340 g a.s./ha (R/S); 1 × 160 g a.s./ha (R+S) | 1, 14 and 105 |                       |                   |                           |                      |                        |                    |
| Cereals                       | GM maize<sup>(b)</sup> (aad-1 gene) | 1 × 98 g a.s./ha | 48 (forage); 72 (grain, cobs, stover/fodder) |                       |                   |                           |                      |                        |                    |

Sources: EFSA, 2017 and Finland, 2018 (for a study in GM maize)

(a): DAT: days after treatment.
(b): Phenyl- and quinoxaline-labelled quizalofop-P-ethyl (R-enantiomer).
(c): Phenyl- labelled quizalofop-ethyl (Racemate (R/S)). Study results used for information only considering the low application rate.
(d): Phenyl-labelled quizalofop-P-ethyl (R-enantiomer). Residues analysed in foliage only.
(e): Phenyl- and quinoxaline-labelled quizalofop-ethyl (racemate (R/S)).
(f): Phenyl- and quinoxaline-labelled quizalofop-ethyl (racemate (R/S) and R-enantiomer).
(g): Quinoxaline-labelled quizalofop-ethyl (racemate (R/S) and R- and S-enantiomer).
Can a general residue definition be proposed for primary crops? | Yes
---|---
Rotational crop and primary crop metabolism similar? | Yes
Residue pattern in processed commodities similar to residue pattern in raw commodities? | Yes
Plant residue definition for monitoring (RD-Mo) | Reg. (EC) No 396/2005: quizalofop, including quizalofop-P MRL review (EFSA, 2017): sum of quizalofop, its salts, its esters (including propaquizafop) and its conjugates, expressed as quizalofop (any ratio of constituent isomers)
Plant residue definition for risk assessment (RD-RA) | MRL review (EFSA, 2017): sum of quizalofop, its salts, its esters (including propaquizafop) and its conjugates, expressed as quizalofop (any ratio of constituent isomers)
Conversion factor (monitoring to risk assessment) | Not applicable
Methods of analysis for monitoring of residues (analytical technique, crop groups, LOQs) | LC-MS/MS, high water, high acid, high oil content and high protein/high starch content commodities: LOQ 0.01 mg/kg; ILV available. Extraction efficiency and hydrolysis step need to be demonstrated at least in one crop/matrix. An LOQ of 0.01 mg/kg is achievable during routine analysis. Fully validated analytical method in complex matrices still required (relevant for the authorisations of quizalofop-P-ethyl on herbal infusions and spices). (EFSA, 2017)

### B.1.1.2. Stability of residues in plants

| Plant products (available studies) | **Category** | **Commodity** | **T (°C)** | **Stability (months/years)** |
|---|---|---|---|---|
| | High water content | Snaps beans | –20 | 28 |
| | High oil content | Cotton seeds | –20 | 28 |
| | | Rape seeds | –20 | 28 |
| | Dry | Wheat grain | –18 | 12 |
| | | GM maize grain | –20 | 13<sup>(a)</sup> |
| | High acid content | Oranges | –18 | 12 |
| | Other | GM maize stover | –20 | 13<sup>(a)</sup> |
| | | GM maize forage | –20 | 13<sup>(a)</sup> |
| | Processed | GM maize oil | –20 | 13<sup>(b)</sup> |
| | | GM maize flour | –20 | 13<sup>(a)</sup> |
| | | GM maize starch | –20 | 13<sup>(b)</sup> |

Since conjugates may only degrade to the acid form, the reported storage stability studies are expected to cover all compounds included in the residue definition, including conjugates. Sources: EFSA, 2017, Finland, 2018

GM: genetically modified.
(a): Storage stability refers to the total residues of quizalofop-P-ethyl and quizalofop.
(b): Storage stability demonstrated individually for quizalofop-P-ethyl and quizalofop.
B.1.2. Magnitude of residues in plants

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

| Commodity  | Region/ indoor(a) | Residue levels observed in the supervised residue trials (mg/kg) | Comments/source | Calculated MRL (mg/kg) | HR(b) (mg/kg) | STMR(c) (mg/kg) | CF(d) |
|------------|-------------------|---------------------------------------------------------------|----------------|------------------------|---------------|----------------|-------|
| Maize grain (GM) | USA/CAN (outdoor)  | Mo: 25 × < 0.02 RA: 25 × < 0.02 | Residue trials on genetically modified maize expressing AAD-1 protein (event DAS-40278-9). 18 residue trials overdosed in terms of an application rate (> 25% deviation), but as residues in all grain samples were below the limit of detection, trials were accepted. The residue data do not cover possible conjugates but due to low residues in grain, this deviation is accepted and the residue data are considered valid also for the residue definitions proposed by the MRL review. | 0.02 | < 0.02 | < 0.02 | n.a. |

Existing enforcement residue definition (Regulation (EC) No 396/2005): quizalofop, including quizalofop-P
Risk assessment residue definition (peer review): sum of quizalofop-ester, quizalofop and quizalofop conjugates, expressed as quizalofop (sum of isomers)
Proposed enforcement and risk assessment residue definition (MRL review): sum of quizalofop, its salts, its esters (including propaquizafop) and its conjugates, expressed as quizalofop (any ratio of constituent isomers)

(a): NEU: Outdoor trials conducted in northern Europe, SEU: Outdoor trials conducted in southern Europe, Indoor: indoor EU trials or Country code: if non-EU trials.
(b): Highest residue. The highest residue for risk assessment refers to the whole commodity and not to the edible portion.
(c): Supervised trials median residue. The median residue for risk assessment refers to the whole commodity and not to the edible portion.
(d): Conversion factor to recalculate residues according to the residue definition for monitoring to the residue definition for risk assessment.

n.a.: not applicable.
B.1.2.2. Residues in rotational crops

Not relevant for the import tolerance application.

B.1.2.3. Processing factors

New processing studies were submitted in the framework of the current application. Residues of quizalofop-P-ethyl and quizalofop (acid) were below the LOQ in the raw agricultural commodity (GM maize aad-1) and in all processed commodities derived from maize grain: flour, meal, refined oil, starch and aspirated grain fraction (Finland, 2018).

B.2. Residues in livestock

| Relevant groups (subgroups) | Dietary burden expressed in mg/kg bw per day | Max. DB in MRL review (mg/kg bw/d) (EFSA, 2017) | Most critical subgroup(a) | Most critical commodity(b) | Trigger exceeded (Y/N) |
|-----------------------------|---------------------------------------------|-----------------------------------------------|---------------------------|---------------------------|-----------------------|
| Cattle (all)                | 0.092, 0.109, 3.14(c), 3.54(c)              | 0.109                                         | Dairy cattle              | Potato process waste      | Y                     |
| Cattle (dairy only)         | 0.092, 0.109, 2.40, 2.82                    | 0.109                                         | Dairy cattle              | Potato process waste      | Y                     |
| Sheep (all)                 | 0.103, 0.123, 3.08, 3.70                    | 0.123                                         | Ram/Ewe                   | Potato process waste      | Y                     |
| Sheep (ewe only)            | 0.103, 0.123, 3.08, 3.70                    | 0.123                                         | Ram/Ewe                   | Potato process waste      | Y                     |
| Swine (all)                 | 0.039, 0.044, 1.69, 1.90                    | 0.044                                         | Swine (breeding)          | Potato process waste      | Y                     |
| Poultry (all)               | 0.029, 0.036, 0.41, 0.53                    | 0.036                                         | Poultry broiler           | Potato dried pulp         | Y                     |
| Poultry (layer only)        | 0.025, 0.036, 0.36, 0.53                    | 0.036                                         | Poultry layer             | Potato dried pulp         | Y                     |
| Fish                        | N/A                                         |                                               |                           |                           |                       |

(a): When one group of livestock includes several subgroups (e.g. poultry ‘all’ including broiler, layer and turkey), the result of the most critical subgroup is identified from the maximum dietary burdens expressed as ‘mg/kg bw per day’.
(b): The most critical commodity is the major contributor identified from the maximum dietary burden expressed as ‘mg/kg bw per day’.
(c): The highest dietary burden expressed in mg/kg DM result from dairy cattle.

B.3. Consumer risk assessment

| ARfD                          | 0.08 mg/kg bw |
|-------------------------------|---------------|
|                               | (based on the lowest ARfD of 0.1 mg/kg bw derived for quizalofop-P-tefuryl (EFSA, 2009) and recalculated as quizalofop equivalents) (EFSA, 2017) |

Highest IESTI, according to EFSA PRIMO

Maize grain: 0.2% of the ARfD
Assumptions made for the calculations

The STMR value for maize grain derived from the residue trials submitted in the framework of this application was used as input value.

For the remaining commodities, the input values were as referred to in the MRL review: For each commodity, the median residue levels obtained for quizalofop-P-ethyl, quizalofop-P-terfuryl and propaquizafop were compared and the most critical values were selected for the exposure calculation.

For certain commodities, the available residue trials were not sufficient to derive risk assessment values for the use of all the variants and could not be excluded that those uses not supported by data will result in higher residue levels, in particular when the existing EU MRL is higher than the MRL proposal derived. In these cases, EFSA decided, as a conservative approach, to use the existing EU MRL for an indicative exposure calculation.

Also for those commodities where data were insufficient to derive an MRL for any of the variants, EFSA considered the existing EU MRL for an indicative calculation.

The contributions of other commodities, for which no GAP was reported in the framework of this review, were not included in the calculation.

All input values refer to the residues in the raw agricultural commodities.

| ADI          | 0.0083 mg/kg bw per day (based on the lowest ADI of 0.009 mg/kg bw per day derived for quizalofop-P-ethyl (EFSA, 2009) and recalculated as quizalofop equivalents) (EFSA, 2017) |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Highest IEDI, according to EFSA PRiMo | 30% ADI (diet)                                                                                                                            |
| Contribution of crops assessed:       | Maize grain : 0.6% of ADI (WHO Cluster diet B)                                                                                          |
| Assumptions made for the calculations | The STMR value for maize grain derived from the residue trials submitted in the framework of this application was used as input value. For the remaining commodities, the input values were as referred to in the MRL review: For each commodity, the median residue levels obtained for quizalofop-P-ethyl, quizalofop-P-terfuryl and propaquizafop were compared and the most critical values were selected for the exposure calculation. For certain commodities, the available residue trials were not sufficient to derive risk assessment values for the use of all the variants and could not be excluded that those uses not supported by data will result in higher residue levels, in particular when the existing EU MRL is higher than the MRL proposal derived. In these cases, EFSA decided, as a conservative approach, to use the existing EU MRL for an indicative exposure calculation. Also for those commodities where data were insufficient to derive an MRL for any of the variants, EFSA considered the existing EU MRL for an indicative calculation. The contributions of other commodities, for which no GAP was reported in the framework of this review, were not included in the calculation. All input values refer to the residues in the raw agricultural commodities. |
### B.4. Recommended MRLs

| Code (a) | Commodity | Existing EU MRL (mg/kg) | Proposed EU MRL (mg/kg) | Comment/justification |
|----------|-----------|------------------------|-------------------------|-----------------------|
| 0500030  | Maize     | 0.05* (0.01* -proposal of the MRL review) | 0.02                    | Import tolerance application from Canada is supported by data and no consumer risk has been identified. The GM maize that expresses \textit{aad-1} gene has been assessed by EFSA Panel on Genetically Modified Organisms (GMO) and is authorized within the EU for the marketing of food and feed and derived products. |

**Existing enforcement residue definition:** quizalofop, including quizalofop-P

**Proposed enforcement residue definition (MRL review):** sum of quizalofop, its salts, its esters (including propaquizafop) and its conjugates, expressed as quizalofop (any ratio of constituent isomers)

EU MRL: European Union maximum residue level.

*: Indicates that the MRL is set at the limit of analytical quantification (LOQ).

(a): Commodity code number according to Annex I of Regulation (EC) No 396/2005.
### Appendix C – Pesticide Residue Intake Model (PRIMo)

#### Quizalofop-P

| Toxicological end points | ADI (mg/kg bw) | ARfD (mg/kg bw) | Source of ADI | Source of ARfD | Year of evaluation |
|--------------------------|----------------|-----------------|---------------|----------------|-------------------|
| ADI (mg/kg bw per day)   | 0.0083         | 0.08            | EFSA          | EFSA           | 2008              |
| LOQ (mg/kg bw)          | 0.01           |                 |               |                |                   |

#### Status of the active substance: Code no.

- **LOQ (mg/kg bw):** 0.01
- **Proposed LOQ:**
- **ADI (mg/kg bw per day):** 0.0083
- **ARfD (mg/kg bw):** 0.08

- **Source of ADI:** EFSA
- **Source of ARfD:** EFSA

- **Year of evaluation:** 2008

#### Chronic risk assessment – refined calculations

| Commodity/group of commodities | TMDI (range) in % of ADI - minimum – maximum |
|--------------------------------|---------------------------------------------|
| **Beans (with pods)**         | 3.5 Milk and cream                           |
| **Leek**                      | 4.9 Watermelons                              |
| **Milk and cream**            | 2.7 Courgettes                               |
| **Apples**                    | 2.4 Pears                                   |
| **Beets**                     | 2.1 Melons                                  |
| **Potatoes**                  | 1.5 Sugar beet (root)                        |
| **Carrots**                   | 2.4 Beans (with pods)                        |
| **Milk and cream**            | 1.1 Potatoes                                 |
| **Sugar beet (root)**         | 1.7 Milk and cream                           |
| **Milk and cream**            | 0.8 Courgettes                               |
| **Rape seed**                 | 1.2 Beans (with pods)                        |
| **Potatoes**                  | 1.7 Milk and cream                           |
| **Carrots**                   | 0.7 Sugar beet (root)                        |
| **Milk and cream**            | 0.8 Beans (with pods)                        |
| **Scallions**                 | 0.9 Carrots                                  |
| **Potatoes**                  | 0.6 Milk and cream                           |
| **Rape seed**                 | 0.8 Milk and cream                           |
| **Wine grapes**               | 0.5 Beets (with pods)                        |
| **Milk and cream**            | 0.9 Cucumbers                                |
| **Rape seed**                 | 0.9 Beets (with pods)                        |
| **Carrots**                   | 0.6 Milk and cream                           |
| **Potatoes**                  | 0.7 Sugar beet (root)                        |
| **Apples**                    | 0.6 Beets (with pods)                        |
| **Rape seed**                 | 0.7 Milk and cream                           |
| **Wine grapes**               | 0.5 Beets (with pods)                        |
| **Carrots**                   | 0.6 Milk and cream                           |
| **Milk and cream**            | 0.7 Sugar beet (root)                        |
| **Rape seed**                 | 0.7 Beets (with pods)                        |
| **Carrots**                   | 0.6 Milk and cream                           |
| **Milk and cream**            | 0.8 Sugar beet (root)                        |
| **Rape seed**                 | 0.8 Beets (with pods)                        |
| **Milk and cream**            | 0.9 Cucumbers                                |
| **Rape seed**                 | 0.9 Beets (with pods)                        |
| **Carrots**                   | 0.6 Milk and cream                           |
| **Milk and cream**            | 0.7 Sugar beet (root)                        |
| **Rape seed**                 | 0.7 Beets (with pods)                        |
| **Milk and cream**            | 0.8 Sugar beet (root)                        |
| **Rape seed**                 | 0.8 Beets (with pods)                        |
| **Milk and cream**            | 0.9 Cucumbers                                |
| **Rape seed**                 | 0.9 Beets (with pods)                        |
| **Carrots**                   | 0.6 Milk and cream                           |
| **Milk and cream**            | 0.7 Sugar beet (root)                        |
| **Rape seed**                 | 0.7 Beets (with pods)                        |
| **Milk and cream**            | 0.8 Sugar beet (root)                        |
| **Rape seed**                 | 0.8 Beets (with pods)                        |
| **Milk and cream**            | 0.9 Cucumbers                                |
| **Rape seed**                 | 0.9 Beets (with pods)                        |
| **Carrots**                   | 0.6 Milk and cream                           |
| **Milk and cream**            | 0.7 Sugar beet (root)                        |
| **Rape seed**                 | 0.7 Beets (with pods)                        |
| **Milk and cream**            | 0.8 Sugar beet (root)                        |
| **Rape seed**                 | 0.8 Beets (with pods)                        |
| **Milk and cream**            | 0.9 Cucumbers                                |

**Conclusion:**

The estimated Theoretical Maximum Daily Intakes (TMDI), based on pTMRLs were below the ADI. A long-term intake of residues of Quizalofop-P is unlikely to present a public health concern.
The acute risk assessment is based on the ARfD. For each commodity, the calculation is based on the highest reported MS consumption per kg bw and the corresponding unit weight from the MS with the critical consumption. If no data on the unit weight was available from that MS, an average European unit weight was used for the IESTI calculation.

Threshold MRL is the calculated residue level which would lead to an exposure equivalent to 100% of the ARfD.

No exceedance of the ARfD/ADI was identified for any unprocessed commodity.

### Acute risk assessment/children – refined calculations

#### Processed commodities

| Commodity              | pTMRL/MRL (mg/kg) | pTMRL/MRL (mg/kg) | pTMRL/MRL (mg/kg) | pTMRL/MRL (mg/kg) |
|------------------------|-------------------|-------------------|-------------------|-------------------|
| Carrot, juice          | 0.25              | 0.05              | 0.05              | 0.05              |
| Orange juice           | 0.05              | 0.05              | 0.05              | 0.05              |
| Apple juice            | 0.05              | 0.05              | 0.05              | 0.05              |
| Potato puree (flakes)  | 0.08              | 0.05              | 0.05              | 0.05              |

### Acute risk assessment/adults/general population – refined calculations

#### Processed commodities

| Commodity              | pTMRL/MRL (mg/kg) | pTMRL/MRL (mg/kg) | pTMRL/MRL (mg/kg) | pTMRL/MRL (mg/kg) |
|------------------------|-------------------|-------------------|-------------------|-------------------|
| Carrot, juice          | 0.25              | 0.05              | 0.05              | 0.05              |
| Orange juice           | 0.05              | 0.05              | 0.05              | 0.05              |
| Apple juice            | 0.05              | 0.05              | 0.05              | 0.05              |
| Potato puree (flakes)  | 0.08              | 0.05              | 0.05              | 0.05              |

### Conclusion:

For Quizalofop-P, IESTI 1 and IESTI 2 were calculated for food commodities for which pTMRLs were submitted and for which consumption data are available.

In the IESTI 1 calculation, the variability factors were 10, 7 or 5 (according to JMPR manual 2002); for lettuce, a variability factor of 5 was used.

In the IESTI 2 calculations, the variability factors of 10 and 7 were replaced by 5. For lettuce, the calculation was performed with a variability factor of 3.

No exceedance of the ARfD/ADI was identified for any unprocessed commodity.

For processed commodities, no exceedance of the ARfD/ADI was identified.
Appendix D – Input values for the exposure calculations

D.1. Livestock dietary burden calculations

| Feed commodity                                | Median dietary burden | Maximum dietary burden |
|-----------------------------------------------|-----------------------|------------------------|
|                                               | Input value (mg/kg)   | Comment                |
|                                               |                       | Input value (mg/kg)    | Comment                |
|                                               | 0.02                  | STMR                   | 0.02                   | STMR                   |
| Maize grain                                   | 0.02                  | STMR(a)                | 0.02                   | STMR(a)                |
| Field corn, milled by-products                | 0.02                  | STMR(a)                | 0.02                   | STMR(a)                |
| Field corn, hominy meal                      | 0.02                  | STMR(a)                | 0.02                   | STMR(a)                |
| Field corn, gluten feed                      | 0.02                  | STMR(a)                | 0.02                   | STMR(a)                |
| Field corn, gluten meal                      | 0.02                  | STMR(a)                | 0.02                   | STMR(a)                |
| Distillers grain                              | 0.02                  | STMR(a)                | 0.02                   | STMR(a)                |
| Other feed commodities on which uses were    | STMR/HR               | As reported in the EFSA reasoned opinion on the review of the existing MRLs for quizalofop-P-ethyl, quizalofop-P-tefuryl and propaquizafop (EFSA et al., 2017) |
| reported in the MRL review                   |                       |                        |                        |

Risk assessment residue definition: sum of quizalofop, its salts, its esters (including propaquizafop) and its conjugates, expressed as quizalofop (any ratio of constituent isomers)

STMR: supervised trials median residue; HR: highest residue; PF: processing factor.
(a): As residues in the raw commodity (maize grain) were below the LOQ, no concentration of residues is expected in processed commodities and a processing factor was therefore not applied.

D.2. Consumer risk assessment

| Commodity                                      | Chronic risk assessment | Acute risk assessment |
|------------------------------------------------|-------------------------|-----------------------|
|                                               | Input value (mg/kg)     | Comment               | Input value (mg/kg) | Comment               |
| Maize grain                                   | 0.02                    | STMR                  | 0.02                | STMR                  |
| Other commodities of plant and animal origin  | MRL/STMR                | EFSA reasoned opinion on the MRL review (EFSA, 2017) | MRL/HR | EFSA reasoned opinion on the MRL review (EFSA, 2017) |
## Appendix E – Used compound codes

| Code/trivial name       | Chemical name/SMILES notation                                                                 | Structural formula |
|-------------------------|---------------------------------------------------------------------------------------------|-------------------|
| Quizalofop-P-ethyl      | ethyl (2R)-2-[4-(6-chloroquinoxalin-2-yloxy)phenoxy]propionate                             | ![struct1](image1.png) |
|                         | O=C(OCC1CCCO1)[C@@H](C)Oc4ccc(Oc2nc3 cc(Cl)ccc3n2)                                         |                   |
| Quizalofop-ethyl        | ethyl-2-:[4-(6-chloroquinoxalin-2-yloxy]phenoxy]-propanoate                               | ![struct2](image2.png) |
| Quizalofop-P            | (R)-2-[4-(6-chloroquinoxalin-2-yloxy)phenoxy]propionic acid                              | ![struct3](image3.png) |
|                         | O=C(O)[C@@H](C)Oc1ccc(cc1)Oc2nc3 cc(Cl)ccc3n2                                             |                   |
| Quizalofop (acid)       | (RS)-2-[4-(6-chloroquinoxalin-2-yloxy)phenoxy]propionic acid                             | ![struct4](image4.png) |
|                         | O=C(O)(C)Oc1ccc(cc1)Oc2nc3 cc(Cl)ccc3n2                                                    |                   |
| Quizalofop-phenol       | 4-(6-chloroquinoxalin-2-yloxy)phenol                                                       | ![struct5](image5.png) |
|                         | Oc1ccc(cc1)Oc2nc3 cc(Cl)ccc3n2                                                            |                   |
| Propaquizafop           | 2-isopropylideninoxyethyl (R)-2-[4-(6-chloroquinoxalin-2-yloxy)phenoxy]propionate          | ![struct6](image6.png) |
|                         | C(C)=N(OCCOC(-O)[C@@H](C)Oc1ccc(cc1)Oc2nc3 cc(Cl)ccc3n2                                   |                   |
| Quizalofop-P-tefuryl    | (RS)-tetrahydrofururyl (R)-2-[4-(6-chloroquinoxalin-2-yloxy)phenoxy]propionate             | ![struct7](image7.png) |
|                         | O=C(OCC1CCCO1)[C@@H](C)Oc4ccc(Oc2nc3 cc(Cl)ccc3n2)cc4                                    |                   |

SMILES: simplified molecular-input line-entry system.