Modification of the existing maximum residue levels for flupyradifurone and DFA in okra/lady’s finger

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Abstract

In accordance with Article 6 of Regulation (EC) No 396/2005, FPS Public Health, Food Chain Safety and Environment on behalf of Belgium (evaluating Member State, EMS) submitted an application to modify the existing maximum residue levels (MRLs) for the active substance flupyradifurone and its metabolite difluoroacetic acid (DFA) in okra/lady’s finger. The data submitted in support of the request were found sufficient to derive MRL proposals for the crop under consideration. The potential contribution of DFA residues in okra/lady’s finger from the soil uptake was also estimated. Adequate analytical methods for enforcement are available to control the relevant residues in the crop under consideration. Based on the risk assessment results, EFSA concluded that the long-term intake of residues of flupyradifurone and of its soil metabolite DFA resulting from the use of flupyradifurone is unlikely to present a risk to consumer health. Due to the lack of proper consumption data of okra/lady’s finger, the acute exposure assessment could not be reliably undertaken but due to this crop being a minor commodity it is unlikely that acute consumer intake concerns will be associated with this crop.

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Keywords: flupyradifurone, okra, pesticide, MRL, consumer risk assessment

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Summary

In accordance with Article 6 of Regulation (EC) No 396/2005, FPS Public Health, Food Chain Safety and Environment on behalf of Belgium (evaluating Member State, EMS) submitted an application to modify the existing maximum residue levels (MRLs) for the active substance flupyradifurone and its metabolite difluoroacetic acid (DFA) in okra/lady’s finger. 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 European Food Safety Authority (EFSA) on 9 December 2020. To accommodate for the intended uses of flupyradifurone, the EMS proposed to raise the existing MRL for flupyradifurone in okra/lady’s finger from the limit of quantification (LOQ) of 0.01 to 0.9 mg/kg and for DFA from 0.15 to 0.4 mg/kg.

EFSA assessed the application and the evaluation report as required by Article 10 of the MRL regulation. During the assessment, EFSA identified points which needed further clarification, which were requested from the EMS. On 22 February 2021, the EMS submitted the revised evaluation report, which replaced the previously submitted evaluation report. The EMS clarified the application rate in the intended GAP and consequently modified the MRL request for DFA, proposing no change of the existing EU MRL of 0.15 mg/kg on the basis that a crop rotation after okra/lady’s finger would not occur.

Based on the conclusions derived by EFSA in the framework of Regulation (EC) No 1107/2009, the data evaluated under previous MRL assessments and the additional data provided by the EMS in the framework of this application, the following conclusions are derived.

The metabolism of flupyradifurone was investigated following foliar applications of the radiolabelled active substance in fruit crops, pulses/oilseeds and cereals/grass, by soil granule/drench applications in fruit crops, root crops and cereals/grass and by seed dressing in root crops. The EU pesticides peer review concluded that in primary crops flupyradifurone was expected to be the major component. Following the soil application, significant proportions of difluoroacetic acid (DFA) were observed; the data from residue trials confirmed that DFA is a relevant plant metabolite of flupyradifurone.

Studies investigating the effect of processing on the nature of flupyradifurone (hydrolysis studies) demonstrated that the active substance is stable. Studies investigating the effect of processing on the nature of DFA are not available. However, considering the structural similarity of DFA with trifluoroacetic acid (TFA), which is very stable under hydrolysis conditions, it is concluded that DFA is unlikely to degrade under standard hydrolytic conditions.

In rotational crops, the major residues identified were flupyradifurone, its metabolites flupyradifurone-hydroxy, 6-CNA and their conjugates and DFA. The presence of DFA is mostly the result of its uptake from soil, where DFA is formed as the major metabolite of flupyradifurone.

Based on the metabolic pattern identified in primary and rotational crop metabolism studies, the results of hydrolysis studies, the toxicological significance of metabolites and the capabilities of enforcement analytical methods, the following residue definitions were agreed by the EU pesticides peer review:

- Residue definition for risk assessment: Sum of flupyradifurone and DFA, expressed as flupyradifurone
- Residue definition for enforcement: (1) Flupyradifurone; (2) DFA, expressed as DFA

The same residue definitions are applicable to rotational crops and processed products. EFSA concluded that for okra/lady’s finger, the metabolism of flupyradifurone in primary and in rotational crops and the possible degradation in processed products has been addressed and that the previously derived residue definitions are applicable.

Sufficiently validated analytical methods based on high-performance liquid chromatography with tandem mass spectrometry (HPLC-MS/MS) are available to quantify residues of flupyradifurone and of DFA in okra/lady’s finger according to enforcement residue definitions.

The submitted residue data on peppers are considered sufficient to derive MRL proposal as well as risk assessment values for flupyradifurone and DFA in okra/lady’s finger in support of the intended EU indoor use. The MRL calculated for DFA in okra/lady’s finger from the primary crop treatment is lower than the existing EU MRL which is set on the basis of residues in rotational crops (i.e. in untreated crop grown in soil containing flupyradifurone residues at plateau levels).

Flupyradifurone exhibits high soil persistency, forming DFA as its soil metabolite. The gradual formation of DFA results in its uptake in rotational crops. The occurrence of flupyradifurone and DFA residues in rotational crops was investigated in the framework of the EU pesticides peer review and in
a previous EFSA assessment. A wide range of rotational crop studies were available, which indicated a significant uptake of metabolite DFA in rotational crops; consequently, MRL proposal has been derived for DFA in okra/lady's finger grown as a succeeding or follow on crop.

The total seasonal application rate in the intended use of flupyradifurone on okra/lady's finger is slightly higher than in the uses of flupyradifurone assessed previously by EFSA. Thus, for the intended use EFSA calculated the long-term soil background plateau concentrations for flupyradifurone and estimated the amount of flupyradifurone that would actually reach the soil (99 g/ha) and be available for the formation of DFA. The estimated soil application rate is significantly lower than the application rates investigated in the available rotational crop field studies, and therefore EFSA concludes, that significant DFA residue levels are unlikely to occur in rotational crops grown in rotation with okra/lady's finger, provided that the active substance is used according to the proposed Good Agricultural Practice (GAP).

However, in cases when untreated okra/lady's finger would be rotated in soil containing flupyradifurone residues at plateau soil concentrations from more critical EU uses as assessed in the previous EFSA reasoned opinion, DFA residues at levels exceeding the existing EU MRL could occur in okra/lady's finger. The available data also indicate that to account for the DFA residues occurring in okra/lady's fingers in the worst-case situation when okra/lady's finger is treated according to the intended indoor GAP and grown in soil containing flupyradifurone residues at EU soil plateau levels, residues of DFA above the existing MRL could not be excluded. Thus, the MRL proposal of 0.4 mg/kg for DFA in okra/lady's finger was derived on the basis of residues that occur after direct treatment of the crop (primary crop treatment), adding contribution of residues that are expected from the soil uptake. Risk management discussions are recommended to examine other risk management options (e.g. plant back restrictions) to reduce the DFA residues in crops that can be grown in crop rotation.

In the framework of the current application, processing studies with okra/lady's finger were not submitted and are not required, considering the low contribution of residues in this crop to the total consumer exposure.

Okra/lady's finger is not used as livestock feed, and therefore, the nature and magnitude of flupyradifurone residues in livestock was not investigated.

The toxicological profile of flupyradifurone was assessed in the framework of the EU pesticides peer review under Regulation (EC) No 1107/2009 and the data were sufficient to derive an acceptable daily intake (ADI) of 0.064 mg/kg body weight (bw) per day and an acute reference dose (ARfD) of 0.15 mg/kg bw. The toxicological reference values are also applicable to metabolite DFA.

The consumer risk assessment was performed with revision 3.1 of the EFSA Pesticide Residues Intake Model (PRIMo). The consumer exposure calculations from previous EFSA outputs were updated. EFSA performed two separate consumer exposure calculation scenarios to estimate the exposure to flupyradifurone and DFA residues from (1) animal commodities and treated primary crops and (2) rotational crops.

The calculated chronic exposure under scenario 1 accounted for a maximum of 53% of the ADI (NL toddler diet). The contribution of residues in okra/lady's finger to the total consumer exposure was low (0.01% of the ADI). The consumer exposure to DFA residues in the crops from the soil uptake (scenario 2) accounted for up to 17% of the ADI (GEMS/Food G06 diet); contribution of residues in okra/lady's finger was low (0.03% of the ADI).

The combined chronic exposure to flupyradifurone and DFA residues from the intake of food commodities following primary crop treatments, from the intake of animal commodities and from the intake of untreated food commodities containing residues due to the uptake via soil accounts for a maximum of 68% of the ADI (NL toddler diet).

The acute consumer exposure to residues from the intake of okra/lady's finger could not be estimated, due to the lack of consumption data for this crop.

EFSA concluded that the proposed use of flupyradifurone on okra/lady's finger will not result in a consumer exposure exceeding the toxicological reference values and therefore is unlikely to pose a risk to consumers’ health.

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

Full details of all endpoints 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                                                                                                                                 |
|------------|------------------------|-------------------------|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| 0231040    | Okra/lady’s finger     | 0.01\(^{*}\)           | 0.9                     | The submitted data are sufficient to derive an MRL proposal for the intended EU indoor use. Risk for consumers unlikely.                             |
|            |                        |                         |                         | **Enforcement residue definition (2): Diﬂuoroacetic acid (DFA)**                                                                                                                                                   |
| 0231040    | Okra/lady’s finger     | 0.15 (ft.1)            | 0.4                     | The MRL proposal for the intended EU indoor use considering direct treatment and potential DFA residues taken up by okra/lady’s finger from soils containing flupyradifurone residues at critical EU soil plateau levels.  
Direct treatment only of the crop with flupyradifurone would require an MRL for DFA of 0.1 mg/kg. Further risk management discussions are recommended on whether MRLs should be established to cover residues in rotational crops or whether other risk management options (e.g. plant back restrictions) would be appropriate to avoid DFA residues in untreated crops. Risk for consumers unlikely. |

**MRL:** 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.

ft.1: The European Food Safety Authority identified some information on rotational crops as unavailable. When re-viewing the MRL, the Commission will take into account the information referred to in the first sentence, if it is submitted by 6 April 2018, or, if that information is not submitted by that date, the lack of it. The confirmatory data were sufficiently addressed in a recent EFSA assessment in 2020 proposing the deletion of the footnote.
# Table of contents

Abstract................................................................................................................................................... 1  
Summary................................................................................................................................................. 3  
Assessment.............................................................................................................................................. 8  
1. Residues in plants .......................................................................................................................... 8  
   1.1. Nature of residues and methods of analysis in plants................................................................. 8  
   1.1.1. Nature of residues in primary crops ................................................................................................. 8  
   1.1.2. Nature of residues in rotational crops .............................................................................................. 8  
   1.1.3. Nature of residues in processed commodities ................................................................................... 9  
   1.1.4. Methods of analysis in plants ........................................................................................................... 9  
   1.1.5. Storage stability of residues in plants............................................................................................... 9  
   1.1.6. Proposed residue definitions........................................................................................................... 9  
   1.2. Magnitude of residues in plants....................................................................................................... 9  
   1.2.1. Magnitude of residues in primary crops............................................................................................ 10  
   1.2.2. Magnitude of residues in rotational crops ......................................................................................... 10  
   1.2.3. Magnitude of residues in processed commodities.............................................................................. 10  
   1.2.4. Proposed MRLs .............................................................................................................................. 11  
2. Residues in livestock ....................................................................................................................... 11  
3. Consumer risk assessment .............................................................................................................. 11  
4. Conclusion and Recommendations ................................................................................................... 12  
References............................................................................................................................................... 12  
Abbreviations ........................................................................................................................................... 13  
Appendix A – Summary of intended GAP triggering the amendment of existing EU MRLs...................... 14  
Appendix B – List of end points ............................................................................................................. 16  
Appendix C – Pesticide Residue Intake Model (PRIMo) ........................................................................ 25  
Appendix D – Input values for the exposure calculations ........................................................................ 29  
Appendix E – Used compound codes.................................................................................................. 37
Assessment

The European Food Safety Authority (EFSA) received an application to modify the existing maximum residue level (MRL) for flupyradifurone and its metabolite difluoroacetic acid (DFA) in okra/lady’s finger. The detailed description of the intended indoor uses of flupyradifurone on okra/lady’s finger, which are the basis for the current MRL application, is reported in Appendix A.

Flupyradifurone is the ISO common name for 4-[(6-chloro-3-pyridylmethyl)(2,2-difluoroethyl)amino] furan-2(5H)-one (IUPAC). The chemical structures of the active substance and its main metabolites are reported in Appendix E.

Flupyradifurone was evaluated in the framework of Regulation (EC) No 1107/2009 with the Netherlands designated as rapporteur Member State (RMS) for the representative uses of foliar applications on hops and lettuce. The Draft Assessment Report (DAR) also included a proposal to set maximum residue levels (MRL application), in accordance with Article 11(2) of the Regulation (EC) 1107/2009. The draft assessment report (DAR) prepared by the RMS has been peer reviewed by EFSA (EFSA, 2015) where some information was identified as unavailable (data gaps) and tentative MRLs were derived for those uses which were not fully supported by data. Flupyradifurone was approved for use as an insecticide on 9 December 2015.

The MRL proposals for both flupyradifurone and its metabolite difluoroacetic acid (DFA), separately, were implemented in the MRL legislation by Commission Regulation (EU) 2016/1902. The data gaps identified by the EU pesticides peer review as well as residues of flupyradifurone and DFA from new uses and authorised uses in third countries were assessed in an EFSA reasoned opinion (EFSA, 2020a). Additional new uses on rapeseeds/canola seeds and mustard seeds were recently assessed by EFSA (EFSA, 2020b). The MRL proposals have not been implemented in the MRL legislation yet, but the conclusions taken therein will be taken into consideration for this assessment.

In accordance with Article 6 of Regulation (EC) No 396/2005, FPS Public Health, Food Chain Safety and Environment on behalf of Belgium (evaluating Member State, EMS) submitted an application to modify the existing maximum residue levels (MRLs) for the active substance flupyradifurone and its metabolite difluoroacetic acid (DFA) in okra/lady’s finger. 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 European Food Safety Authority (EFSA) on 9 December 2020. To accommodate for the intended indoor uses of flupyradifurone, the EMS proposed to raise the existing MRLs for flupyradifurone in okra/lady’s finger from the limit of quantification (LOQ) of 0.01 to 0.9 mg/kg and for DFA from 0.15 to 0.4 mg/kg.

EFSA based its assessment on the evaluation report submitted by the EMS (Belgium, 2020), the draft assessment report (DAR) and its addendum/addenda (Netherlands, 2014, 2015) prepared under Regulation (EC) 1107/2009, the Commission review report on flupyradifurone (European Commission, 2015), the conclusion on the peer review of the pesticide risk assessment of the active substance flupyradifurone (EFSA, 2015) as well as the conclusions from previous EFSA opinions on flupyradifurone (EFSA, 2016, 2020a,b).

During the assessment, EFSA identified points which needed further clarification, which were requested from the EMS. On 22 February 2021, the EMS submitted a revised evaluation report, which replaced the previously submitted evaluation report. The EMS clarified the application rate in the

1 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.

2 Commission Implementing Regulation (EU) 2015/2084 of 18 November 2015 approving the active substance flupyradifurone, in accordance with Regulation (EC) No 1107/2009 of the European Parliament and of the Council concerning the placing of plant protection products on the market, and amending the Annex to Commission Implementing Regulation (EU) No 540/2011 OJ L 302, 19.11.2015, p. 89–92.

3 Commission Regulation (EU) 2016/1902 of 27 October 2016 amending Annexes II and III to Regulation (EC) No 396/2005 of the European Parliament and of the Council as regards maximum residue levels for acetamiprid, ametraitad, azoxystrobin, cyfluthrin, difluoroacetic acid, dimethomorph, fenpyrazamine, flonicamid, fluzainam, fludioxonil, flupyradifurone, flutriafol, fluxapyroxad, metconazole, proquinazid, prothioconazole, pyriproxyfen, spiromicin and trifloxystrobin in or on certain products. OJ L 298, 4.11.2016, p. 1–60.

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, 16.3.2005, p. 1–16.
intended GAP and consequently modified the MRL request for DFA, proposing no change of the existing EU MRL of 0.15 mg/kg.

For this application, the data requirements established in Regulation (EU) No 283/2013\(^5\) and the guidance documents applicable at the date of submission of the application to the EMS are applicable (European Commission, 2000, 2010a,b, 2017; OECD, 2007a-h, 2008a,b, 2011, 2016, 2018). 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\(^6\).

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 (Belgium, 2020) 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

Flupyradifurone metabolism in primary crops was investigated in the framework of the EU pesticides peer review (EFSA, 2015) in four crop groups either by foliar applications (apple, cotton, rice), by soil granule/drench applications (tomato, potato, rice) and by seed treatment (potato). Studies were conducted using \(^{14}\)C-flupyradifurone labelled on the pyridinyl and furanone moiety. One study on tomato using soil drench application and a \(^{14}\)C-labelling on the difluoroethyl amino group was also submitted. The metabolism in primary crops was seen to be similar in all plant groups investigated. The peer review concluded that in primary crops flupyradifurone is not extensively degraded.

In tomato fruits, following the soil drench application on crop, significant proportions (87% total radioactive residue (TRR)) and levels (0.17 mg/kg) of difluoroacetic acid (DFA) were observed. Re-analysing samples from radiolabelled studies for non-radiolabelled DFA residues, the measured DFA residues (expressed as DFA equivalent), were in the range of 0.04–0.23 mg/kg in apple fruits, potato tuber, cotton seed and rice grain, irrespective of the mode of application (EFSA, 2015).

For the intended use under consideration, it is concluded that the metabolic behaviour in primary crops is sufficiently addressed.

1.1.2. Nature of residues in rotational crops

The nature of flupyradifurone in rotational crops (turnips, Swiss chard and wheat) was investigated in the framework of the EU pesticides peer review (EFSA, 2015). Flupyradifurone, \(^{14}\)C-labelled at pyridinyl and furanone moiety was applied on bare soil at an application rate of 436 g/ha. Rotational crops were planted 29, 135 and 296 days after the soil treatment. In rotational crops flupyradifurone and its metabolites flupyradifurone-hydroxy, 6-CNA and their conjugates were found to be the major components of the radioactive residues. These radiolabelled studies did not include labelling on the difluoroethyl amino group.

Additional field rotational crop studies indicated that DFA is the major component of the residues in rotational crops. The presence of DFA is mostly due to the uptake of residue from soil (EFSA, 2015).

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\(^5\) Commission Regulation (EU) No 283/2013 of 1 March 2013 setting out the data requirements for active substances, in accordance with Regulation (EC) No 1107/2009 of the European Parliament and of the Council concerning the placing of plant protection products on the market. OJ L 93, 3.4.2013, p. 1–84.

\(^6\) 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.
1.1.3. Nature of residues in processed commodities

The effect of processing on the nature of flupyradifurone was investigated in the framework of the EU pesticides peer review (EFSA, 2015). Standard hydrolysis studies showed that flupyradifurone is hydrolytically stable under conditions of pasteurisation, baking/brewing/boiling and sterilisation.

The effect of processing on the nature of difluoroacetic acid (DFA) has not been investigated. Considering the similarity of the structures between trifluoroacetic acid (TFA) and DFA, the applicant proposed a read-across for both acids. The TFA, due to its stability in environment, has been widely studied and is, due to its structure (complete fluoride ion substitution), very stable and thus has no potential for hydrolytic degradation (EFSA, 2020a,b).

It is therefore concluded that there is sufficient evidence that difluoroacetic acid is stable under standard hydrolysis conditions.

1.1.4. Methods of analysis in plants

The availability of analytical enforcement methods for the determination of flupyradifurone and DFA in plant matrices was investigated in the framework of the EU pesticides peer review (EFSA, 2015). It was concluded that a method using high-performance liquid chromatography with tandem mass spectrometry (HPLC-MS/MS) is sufficiently validated for the determination of flupyradifurone and DFA residues; LOQs achievable with the method were 0.01 and 0.007 mg/kg for flupyradifurone and DFA (expressed as DFA), respectively, in plant matrices with high water (lettuce), high starch (wheat, potato), high acid (oranges) and high oil content (rapeseed). In hops, the validated LOQ for the determination of flupyradifurone was 0.05 mg/kg and for DFA (expressed as DFA) 0.03 mg/kg.

EFSA concludes that a sufficiently validated analytical method is available for the enforcement of flupyradifurone and DFA residues in okra/lady’s finger.

1.1.5. Storage stability of residues in plants

The storage stability of flupyradifurone and DFA has been investigated in the EU pesticides peer review (EFSA, 2015) as well as in the previously issued EFSA reasoned opinion (EFSA, 2020a,b). The freezer storage stability of flupyradifurone and DFA residues is confirmed at −18°C for 52 months in matrices with high water content, high acid content, high oil content, high protein content and high starch content. It was demonstrated that in crop assessed in the framework of this application, residues are stable for at least 52 months when stored at −18°C.

1.1.6. Proposed residue definitions

Based on the metabolic pattern identified in primary and rotational crop metabolism studies, the results of hydrolysis studies, the toxicological significance of metabolites and the capabilities of enforcement analytical methods, the following residue definitions were agreed by the EU pesticides peer review (EFSA, 2015):

- Residue definition for risk assessment: Sum of flupyradifurone and DFA, expressed as flupyradifurone.
- Residue definition for enforcement: (1) Flupyradifurone; (2) DFA, expressed as DFA.

The same residue definitions are applicable to rotational crops and processed products. The residue definitions set in Regulation (EC) No 396/2005 are identical with the above-mentioned residue definitions for enforcement.

EFSA concludes that these residue definitions are appropriate for the crop under consideration and no further information is required.

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7 According to the EMS, the LOQs in the final addendum to the DAR (Netherlands, 2014) and EFSA conclusion (EFSA, 2015) have been inaccurately reported as the inter laboratory validation experiments the DFA was fortified and analysed as DAF, but expressed as flupyradifurone (Netherlands, 2017, 2019). This means that DFA was validated at an LOQ of 0.02 mg/kg in plant matrices and at 0.1 mg/kg in hops, when expressed as flupyradifurone, which would correspond to LOQs of 0.007 mg/kg in plant matrices and 0.03 m/kg in hops, when expressed as DFA.
1.2. Magnitude of residues in plants

1.2.1. Magnitude of residues in primary crops

**Okra/lady’s finger**

Intended indoor GAP: 2 × 225 g a.s./ha (2 × 90 g a.s./ha leaf wall area), interval 10 days, BBCH 12–87, PHI 3 days.

In support of the intended indoor use, the applicant submitted eight GAP compliant residue trials on sweet pepper, which were conducted in France, Spain, Italy, Greece and the Netherlands in 2011. These residue trials have been previously assessed in the framework of the EU pesticides peer review (EFSA, 2015). Residue trials were designed as decline trials with sampling on day 0 and 1, 3, 5, 7, 10 and 14 days following last application. The samples were analysed individually for parent flupyradifurone and its metabolite DFA. Results were expressed according to enforcement and risk assessment residue definitions currently in force in the EU. The analytical methods used to analyse residue trial samples were sufficiently validated and are considered as fit for purpose (Belgium, 2020).

The residues of flupyradifurone in all except two trials reached maximum concentration in the crop within 3–5 days following the last application, whereas residues of DFA had not reached the maximum concentration even at the latest sampling point of 14 days. From decline trials, the highest individual residue value for flupyradifurone and DFA, irrespective of the PHI, was selected to derive the MRL proposals. The details of submitted residue trials are reported in Appendix B.1.2.

The applicant proposed that the residue data from peppers are extrapolated to okra/lady’s finger and according to Guidance document (European Commission, 2017) such an extrapolation is acceptable.

The samples prior to analysis were stored under conditions that ensured the integrity of the residue trial samples (Belgium, 2020). The data indicate that an MRL of 0.9 mg/kg would be required for flupyradifurone and of 0.1 mg/kg for DFA in support of the intended indoor use on okra/lady’s finger.

1.2.2. Magnitude of residues in rotational crops

Okra/lady’s finger can be grown in a crop rotation. A wide range of rotational crop field studies were submitted for the EU pesticides peer review (EFSA, 2015) and in the framework of a previous EFSA assessment (EFSA, 2020a,b). Flupyradifurone was either applied on bare soil or on primary crop lettuce at application rates ranging from 125 to 300 g/ha. Studies indicate a significant uptake of metabolite DFA in rotational crops.

The EU pesticides peer review (EFSA, 2015) derived provisional MRLs for difluoroacetic acid in rotational crops on the basis of rotational crop trials performed with 200 g/ha bare soil at PBI of 30 days. Some deficiencies of these studies were noted (short PBI), resulting in a data gap for new rotational crop studies. These provisional MRLs were further assessed by EFSA in the light of new rotational crop studies which were submitted by the EMS Netherlands for the assessment of Article 12 confirmatory data and for setting of MRLs for flupyradifurone and DFA in the framework of Article 10 (EFSA, 2020a,b). Higher MRL proposals for the DFA were derived to account for residue uptake in rotational crops, but these MRL proposals have so far not been implemented in the EU MRL legislation.

The current MRL for DFA in okra/lady’s finger is set at a level of 0.15 mg/kg as an extrapolation from rotational fruiting vegetables (cucumber) to account for the soil uptake of residues and was derived in the framework of the EU pesticides peer review (EFSA, 2015). This MRL was not revised under the latest EFSA assessments.

The total seasonal application rate in the intended indoor use of flupyradifurone on okra/lady’s finger is slightly higher than in the uses of flupyradifurone assessed previously by EFSA (EFSA, 2020a, b). Thus, for the intended use EFSA calculated the long-term soil plateau concentrations of flupyradifurone and estimated the amount of active substance that would actually reach the soil (99 g/ha) and be available for the formation of DFA. The estimated soil application rate is significantly lower than the application rates investigated in the available rotational crop field studies, and

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8 Application of flupyradifurone on a bare soil at 200 g/ha, highest residues of 0.14 mg/kg of the DFA in cucumber at PBI of 30 days (individual values: 0.09; 0.11; 0.02; 0.14) (EFSA, 2015).
9 The long-term plateau flupyradifurone on okra (indoor use, 2 × 225 g/ha, 80% crop interception) – 0.0029 mg/kg; seasonal maximum concentration of flupyradifurone over 20 cm – 0.03 mg/kg. Total PEC of 0.033 mg/kg, corresponding to application rate of 99 g/ha of flupyradifurone/bare soil.
therefore, EFSA concludes, that in untreated crops that could be grown in rotation with okra/lady’s finger there is no need to review proposed EU MRLs for DFA as estimated in a recent EFSA reasoned opinion (EFSA, 2020a,b). The applicant has also clarified to EFSA that crop rotation in the same substrate after the harvest of okra/lady’s finger is unlikely.

However, in case okra/lady’s finger is not treated as primary crop but is grown as a succeeding or follow-on crop in soil containing flupyradifurone residues at plateau soil concentrations from more critical EU uses, higher DFA residues in okra/lady’s finger could not be excluded. According to the data assessed in a previous EFSA reasoned opinion, where in rotational crop cucumber DFA residues at a maximum level of 0.28 mg/kg were estimated if grown in soil containing flupyradifurone residues at EU soil plateau levels (EFSA, 2020a,b).

The available data also indicate that to account for the DFA residues occurring in okra/lady’s finger in the worst-case situation when okra/lady’s finger is treated according to the intended indoor GAP and grown in soil containing flupyradifurone residues at EU soil plateau levels, residues of DFA above the existing MRL could not be excluded. Thus, the MRL proposal of 0.4 mg/kg for DFA in okra/lady’s finger was derived on the basis of residues that occur after direct treatment of the crop (primary crop treatment), adding contribution of residues that are expected from the soil uptake (see Section 1.2.4).

Risk management discussions are recommended to examine other risk management options (e.g. plant back restrictions) to reduce the DFA residues in crops grown as succeeding or follow-on crops.

1.2.3. Magnitude of residues in processed commodities

In the framework of the current application processing studies with okra/lady’s finger were not submitted and are not required, considering the low contribution of residues in this commodity to the total consumer exposure.

1.2.4. Proposed MRLs

The available data are considered sufficient to derive MRL proposals as well as risk assessment values for flupyradifurone and DFA in okra/lady’s finger in support of the intended EU indoor use.

When estimating the MRL proposal for DFA, consideration shall be given to possible residues that would occur if okra/lady’s finger are both 1) treated as primary crop and 2) grown in soil that contains flupyradifurone residues at EU plateau levels. In order to estimate the MRL for the DFA in okra/lady’s finger, the highest DFA residues estimated in the respective rotational crop (cucumber) at critical EU flupyradifurone soil plateau concentrations (0.28 mg/kg (EFSA, 2020a,b)) were added to the MRL calculated in okra/lady’s finger from the intended use (0.1 mg/kg); the result was then rounded up to the next MRL class.\(^{10}\) That would result in an MRL proposal of 0.4 mg/kg for DFA in okra/lady’s finger.

It is noted that the OECD guidance document on rotational crops (OECD, 2018) provides several risk management options for active substances that are likely to lead to residues in rotational crops. One option is the setting of MRLs considering the contribution of residues taken up via the roots. However, risk managers should also discuss the appropriateness of other options described in the OECD guidance document (e.g. plant back restrictions could be imposed to avoid or limit residues in succeeding crops).

The appropriateness of the calculated MRL proposals with regard to consumer health risks is assessed in Section 3.

2. Residues in livestock

Okra/lady’s finger is not a livestock feed item, and therefore, the nature and magnitude of flupyradifurone and DFA residues in livestock was not assessed.

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\(^{10}\) The OECD guidance document on rotational crops (OECD, 2018) offers different options for deriving MRL proposals for crops with a primary crop GAP and which may take up soil residues resulting from previous treatments. EFSA followed the approach that was also used by JMPR in its most recent assessment (FAO/WHO, 2020). JMPR noted that the use of statistical methods for the estimation of maximum residue levels is not possible when considering potential carry-over of residues in succeeding crops, since the basis for arising from the additional root uptake cannot be adequately calculated using the OECD calculator.
3. Consumer risk assessment

The consumer risk assessment was performed with revision 3.1 of the EFSA Pesticide Residues Intake Model (PRIMo). This exposure assessment model contains the relevant European food consumption data for different subgroups of the EU population (EFSA, 2018, 2019).

The toxicological reference values for flupyradifurone used in the risk assessment (i.e. acceptable daily intake (ADI) of 0.064 mg/kg body weight (bw) per day and acute reference dose (ARfD) of 0.15 mg/kg bw) were derived in the framework of the EU pesticides peer review (European Commission, 2015). The peer review also assessed toxicological studies submitted for metabolite DFA and concluded that the reference values of parent are applicable to DFA (EFSA, 2015). The risk assessment residue definition refers to the sum of flupyradifurone and DFA, expressed as flupyradifurone.

The most recent consumer exposure assessment (EFSA, 2020b) was updated with risk assessment values for okra/lady's finger as derived from the submitted residue trials.

EFSA performed two separate consumer exposure calculations in order to estimate the exposure from primary crops (including also animal products) and rotational crops, to provide risk managers additional information to decide on risk management options as regards residues in rotational crops, e.g. whether MRLs should be established to cover residues in rotational crops or whether other restrictions would be appropriate to avoid residues in untreated crops. The calculated exposures were then compared with the toxicological reference values derived for flupyradifurone.

Scenario 1: Exposure to residues from treated primary crops and from the intake of animal commodities.

In order to calculate chronic and acute consumer exposure to residues of flupyradifurone and DFA, the median residue (STMR) values as derived for okra/lady’s finger from the submitted supervised residue trials (Table B.1.2.1) were used as input values. For the remaining plant and animal commodities the input values were the MRLs or the risk assessment values as reported in the previous EFSA assessments (EFSA, 2015, 2016, 2020a,b). It is noted that for melons, escarole/broad leaved endives and celery the acute consumer risk could not be excluded for the MRL proposals derived in previous EFSA assessment (EFSA, 2020a,b,0b), and therefore for these commodities, the existing EU MRLs were used as input values.

The calculated chronic exposure accounted for a maximum of 53% of the ADI (NL toddler diet). The contribution of residues in okra/lady’s finger to the total consumer exposure was low: 0.01% of the ADI.

Scenario 2: Exposure to residues of DFA (and of flupyradifurone) from the intake of plant commodities that are grown as rotational crops (untreated).

The exposure assessment as calculated in the previous EFSA outputs (EFSA, 2020a,b) was updated, adding the estimated residues in okra/lady's finger from the uptake as a rotational crop grown in soil that contains flupyradifurone residues at EU plateau levels. The input values for okra/lady's finger were as estimated in a rotational crop cucumber from available rotation crop field trials (EFSA, 2020a,b), and expressed as flupyradifurone, by applying the molecular weight conversion factor. The consumer exposure from the intake of DFA residues taken up by crops from the soil which was previously treated with flupyradifurone accounted for up to 17% of the ADI (GEMS/Food G06 diet). The contribution of residues in untreated okra/lady's finger from the soil uptake of residues was 0.03% of the ADI.

In both scenarios, the acute exposure to residues in okra/lady's finger could not be estimated due to the lack of consumption data for this crop.

An overview of input values for consumer exposure assessment is provided in Appendix D.1. For further details on the exposure calculations, screenshots of the Report sheets of the PRIMo are presented in Appendix C.

The combined chronic exposure to flupyradifurone and DFA residues from the intake of food commodities following primary crop treatments, from the intake of animal commodities and from the intake of untreated food commodities containing residues due to the uptake via soil accounts for a maximum of 68% of the ADI (NL toddler diet).

4. Conclusion and Recommendations

The data submitted in support of this MRL application were found sufficient to derive an MRL proposal of 0.9 mg/kg for flupyradifurone in okra/lady's fingers. The MRL proposal of 0.4 mg/kg was derived for DFA in okra/lady's fingers and reflects residues from the intended indoor use (MRL of...
0.1 mg/kg and if grown in soil containing flupyradifurone residues at critical EU soil plateau concentrations (0.28 mg/kg).

EFSA concluded that the proposed use of flupyradifurone on okra/lady's finger will not result in a consumer exposure exceeding the toxicological reference values and therefore is unlikely to pose a risk to consumers' health.

The MRL recommendations are summarised in Appendix B.4.

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Abbreviations

a.s. active substance
ADI acceptable daily intake
ARfD acute reference dose
BBCH growth stages of mono- and dicotyledonous plants
bw body weight
CAC Codex Alimentarius Commission
CAS Chemical Abstract Service
CF conversion factor for enforcement to risk assessment residue definition
CIRCA (EU) Communication & Information Resource Centre Administrator
CS capsule suspension
CV coefficient of variation (relative standard deviation)
DALA days after last application
DAR draft assessment report
DAT days after treatment
DM dry matter
DP dustable powder
DS powder for dry seed treatment
EC emulsifiable concentrate
EDI estimated daily intake
Modification of the existing maximum residue levels for flupyradifurone and DFA in okra/lady’s finger

EMS evaluating Member State
FAO Food and Agriculture Organization of the United Nations
FID flame ionisation detector
GAP Good Agricultural Practice
GC gas chromatography
GC-FID gas chromatography with flame ionisation detector
GC-MS/MS gas chromatography with tandem mass spectrometry
GS growth stage
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
IEDI international estimated daily intake
IESTI international estimated short-term intake
ISO International Organisation for Standardisation
IUPAC International Union of Pure and Applied Chemistry
JMPR Joint FAO/WHO Meeting on Pesticide Residues
LC liquid chromatography
LOQ limit of quantification
MRL maximum residue level
MS Member States
MS mass spectrometry detector
MS/MS tandem mass spectrometry detector
MW molecular weight
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
RD residue definition
RMS rapporteur Member State
SC suspension concentrate
SEU southern Europe
SL soluble concentrate
SP water-soluble powder
STMR supervised trials median residue
TAR total applied radioactivity
TRR total radioactive residue
UV ultraviolet (detector)
WHO World Health Organization
WP wettable powder
# Appendix A – Summary of intended GAP triggering the amendment of existing EU MRLs

| Crop and/or situation | Preparation | Application | Application rate per treatment | Remarks |
|-----------------------|-------------|-------------|--------------------------------|---------|
|                       | Type(b) | Conc. a.s. | Method kind | Range of growth stages & season(c) | Number min–max | Interval between application (days) min | Water L/ha min–max | Rate Unit | PHI (days)(d) | |
| Okra/lady’s fingers   | SL       | 200 g/L   | Foliar treatment – broadcast spraying | 12–87 | 1–2 | 10 | – | – | 225* (90) g a.s./ha (g a.s./ha leaf wall area (LWA)) | 3 | *The application rate in the GAP specified by the EMS Belgium in an updated Evaluation Report (Belgium, 2020). Conversion factor for leaf wall area in Belgium is 2.5 (Belgium, 2020). |

NEU: northern European Union; SEU: southern European Union; MS: Member State; a.s.: active substance; SL: soluble concentrate; GAP: Good Agricultural Practice; EMS: Evaluating Member State.

(a): Outdoor or field use (F), greenhouse application (G) or indoor application (I).

(b): FAO/WHO Joint Meeting on Pesticide Specifications (JMPS). Manual on development and use of FAO and WHO Specifications for Pesticides, First Edition-Third revision, 2016. Appendix E.

(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 (available studies) | Crop groups | Crops | Application(s) | Sampling | Comment/Source |
|----------------------------------|-------------|-------|----------------|----------|----------------|
| Fruit crops                      | Apple       | Foliar | a) 1 × 86 g/ha/meter canopy height (CH); BBCH 69  
b) 2 × 86 g/ha/m CH; BBCH 69 | a) 89 DAT  
b) 14 DALA | Radiolabelled active substance: [furanone-4-14C], [pyridinylmethyl-14C] flupyradifurone (Netherlands, 2014; EFSA, 2015) |
|                                  | Tomato      | Soil drench, 2 × 300 g/ha, BBCH 14–15, interval 14 days | 56–73 DALA | Radiolabelled active substance: [furanone-4-14C], [pyridinylmethyl-14C] and [ethyl-1-14C] flupyradifurone (Netherlands, 2014; EFSA, 2015) |
|                                  | Potato      | In furrow, 1 × 626 g/ha, BBCH 03 | 97 DAT | Radiolabelled active substance: [furanone-4-14C] and [pyridinylmethyl-14C] flupyradifurone (Netherlands, 2014; EFSA, 2015) |
|                                  |             | Seed treatment, 1 × 254 g/ha, BBCH 03 | 97 DAT |  |
| Cereals/ grass                   | Rice        | Foliar, 175 g/ha, BBCH 13/15 + 240 g/ha, BBCH 87–89 | 29 DALA | Radiolabelled active substance: [furanone-4-14C] and [pyridinylmethyl-14C] flupyradifurone (Netherlands, 2014; EFSA, 2015) |
|                                  |             | Soil (granules) at planting, 1 × 409–434 g/ha, BBCH 13/15 | 127 DAT | Radiolabelled active substance: [furanone-4-14C] and [pyridinylmethyl-14C] flupyradifurone (Netherlands, 2014; EFSA, 2015) |
| Pulses/oilseeds                 | Cotton      | Foliar | a) 1 × 210 g/ha, BBCH 15–18  
b) 210 + 175 g/ha, BBCH 15–18 | a) 169 DAT  
b) 14–15 DALA | Radiolabelled active substance: [furanone-4-14C] and [pyridinylmethyl-14C] flupyradifurone (Netherlands, 2014; EFSA, 2015) |
| Rotational crops (available studies) | Crop groups | Crop(s) | Application(s) | PBI (DAT) | Comment/Source |
| Root/tuber crops                | Turnips     | Soil, 436 g/ha | 29, 135 and 296 | Radiolabelled active substance: [furanone-4-14C] and [pyridinylmethyl-14C] flupyradifurone (Netherlands, 2014; EFSA, 2015) |
| Leafy crops                    | Swiss chard |  |  |  |
| Cereal (small grain)            | Wheat       |  |  |  |
### Processed commodities (hydrolysis study)

| Conditions                        | Stable?                                      | Comment/Source                                                                 |
|-----------------------------------|----------------------------------------------|--------------------------------------------------------------------------------|
| Pasteurisation (20 min, 90°C, pH 4) | Flupyradifurone: yes DFA: not investigated, but considered stable | EFSA (2015) Considering the similarity of the structures between trifluoroacetic acid (TFA) and DFA, a read-across for both acids was applied. The TFA, due to its stability in environment, has been widely studied and is, due to its structure, very stable and thus has no potential for hydrolytic degradation. The same was concluded for DFA (EFSA, 2020a, b) |
| Baking, brewing and boiling (60 min, 100°C, pH 5) | Flupyradifurone: yes DFA: not investigated, but considered stable | |
| Sterilisation (20 min, 120°C, pH 6) | Flupyradifurone: yes DFA: not investigated, but considered stable | |
| Other processing conditions       | —                                            | —                                                                              |

### Can a general residue definition be proposed for primary crops?
- Yes [EFSA (2015)]

### Rotational crop and primary crop metabolism similar?
- Yes [EFSA (2015)]

### Residue pattern in processed commodities similar to residue pattern in raw commodities?
- Yes [EFSA (2015)]

### Plant residue definition for monitoring (RD-Mo)
- Two separate residue definitions (EFSA, 2015):
  1. Flupyradifurone
  2. Difluoroacetic acid (DFA), expressed as DFA

### Plant residue definition for risk assessment (RD-RA)
- Sum of flupyradifurone and DFA, expressed as flupyradifurone (EFSA, 2015)

### Methods of analysis for monitoring of residues (analytical technique, crop groups, LOQs)
- Flupyradifurone. Matrices with high water content (lettuce), high starch content (wheat, potato), high acid content (oranges), high oil content (rapeseed): HPLC-MS/MS, LOQ 0.01 mg/kg. Hops: 0.05 mg/kg.
- DFA, expressed as DFA. Matrices with high water content (lettuce), high starch content (wheat, potatoes), high acid content (oranges), high oil content (rape seed): HPLC-MS/MS, LOQ 0.007 mg/kg. Hops: 0.03 mg/kg.

**BBCH**: growth stages of mono- and dicotyledonous plants; **DAT**: days after treatment; **DALA**: days after last application; **PBI**: plant-back interval; **DFA**: difluoroacetic acid; **LOQ**: limit of quantification; **HPLC–MS/MS**: high performance liquid chromatography with tandem mass spectrometry.
### B.1.1.2. Stability of residues in plants

| Plant products (available studies) | Category                | Commodity                | T (°C) | Stability period Value | Stability period Unit | Compounds covered                  | Comment/Source                        |
|-----------------------------------|-------------------------|--------------------------|--------|------------------------|-----------------------|-------------------------------------|---------------------------------------|
|                                   | High water content      | Spinach, sugar cane, tomato | –18    | 52                     | Months                | Flupyradifurone, DFA                | EFSA (2015, 2020a)                    |
|                                   | High oil content        | Soybean seed             | –18    | 52                     | Months                | Flupyradifurone, DFA                |                                       |
|                                   | High protein content    | Bean seed                | –18    | 52                     | Months                | Flupyradifurone, DFA                |                                       |
|                                   | Dry/High starch         | Wheat grain              | –18    | 52                     | Months                | Flupyradifurone, DFA                |                                       |
|                                   | High acid content       | Oranges                  | –18    | 52                     | Months                | Flupyradifurone, DFA                |                                       |
|                                   | Other                   | Coffee bean              | –18    | 52                     | Months                | Flupyradifurone, DFA                |                                       |
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) |
|--------------------|------------------|------------------------------------------------------------------|---------------------------------------------------------------------------------|------------------------|--------------|-----------------|
| Enforcement residue definition (Mo): |                   |                                                                  |                                                                                  |                        |              |                 |
| MRL: maximum residue level; GAP: Good Agricultural Practice; Mo: residue levels expressed according to the monitoring residue definition; RA: residue levels expressed according to risk assessment residue definition; F: flupyradifurone; DFA: difluoroacetic acid. |                        |                        |                                      |                        |              |                 |
| Risk assessment residue definition (RA): |                   |                                                                  |                                                                                  |                        |              |                 |
| Sum of flupyradifurone and DFA, expressed as flupyradifurone |                        |                        |                                      |                        |              |                 |
| Peppers Indoor |                | Moh:                                                            | Residue trials on sweet pepper compliant with the intended indoor GAP. Extrapolation to okra/lady’s finger possible. |                        |              |                 |
| 1) 0.088; 0.12; 0.14(f); 0.15; 0.20(e); 0.24; 0.31; 0.57(b) |                        |                        |                                      |                        |              |                 |
| 2) 0.011(f); 0.012(f); 0.013(f); 0.018(f); 0.029(f); 0.034(f); 0.047(f); 0.054(f) |                        |                        |                                      | 1) 0.9       | RA: 0.60      | RA: 0.26       |
| RA: 0.108; 0.173(f); 0.19(f); 0.25(f); 0.26; 0.263(e); 0.39(f); 0.60(f) |                        |                        |                                      | 2) 0.1       | Mo: F: 0.57  | DFA: 0.054 |
|                                                                 |                        |                        |                                      |                        |              |                 |
| (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): Residue trial value higher at a longer PHI of 5 days. |                        |                        |                                      |                        |              |                 |
| (e): Residue trial value higher at a longer PHI of 10 days. |                        |                        |                                      |                        |              |                 |
| (f): Residue trial value higher at a longer PHI of 14 days. |                        |                        |                                      |                        |              |                 |
B.1.2.2. Residues in rotational crops

| Yes | EFSA (2015) |
|-----|-------------|
| Yes, of the metabolite DFA | a) field rotational crop studies in NEU/SEU at 200 g/ha on bare soil (25–30 days PBI) or on lettuce as primary crop (61–145 and 266–329 days PBI) indicate residues of flupyradifurone in edible matrices at ≤ 0.01 mg/kg, except in lettuce head (0.03 mg/kg (one sample)) and in barley straw (two samples 0.02 and 0.04 mg/kg). Metabolite DFA was present at significant levels, requiring setting of MRLs for this compound in rotational crops (EFSA, 2015). The residues of DFA, expressed as DFA (mg/kg), were as follows:

**25 to 30 days PBI**
- Carrot/turnip root: 0.01; 0.02; 0.02; 0.03
- Lettuce: < 0.01; 0.01; 0.02; 0.04
- Barley grain: 0.03; 0.11; 0.21
- Barley straw: < 0.02; 0.02; 0.04; 0.11

**65 to 145 days PBI:**
- Carrot/turnip root: < 0.01; 3 × 0.01
- Lettuce: 3 × < 0.01; 0.03
- Barley grain: 0.01; 0.03; 0.03; 0.09
- Barley straw: 3 × < 0.02; 0.03

**266 to 329 days PBI**
- Carrot/turnip root: < 0.01; 3 × 0.01
- Lettuce: 3 × < 0.01; 0.02
- Barley grain: 0.02; 0.03; 0.03; 0.12
- Barley straw: 3 × < 0.02; 0.06

b) field rotational crop trials in NEU and SEU at 2 × 125 g/ha on bare soil at 30-day PBI. Flupyradifurone < 0.01 mg/kg in all plant matrices (EFSA, 2015). The residues of DFA, expressed as DFA (mg/kg), were as follows:
- Potato: 0.01; 0.01; 0.06; 0.08
- Leek: 0.01; 0.01; 0.03; 0.08
- Cucumber: 0.02; 0.09; 0.11; 0.14
- Onion: 0.01; 0.02; 0.02; 0.05
- Beans with pods: 0.09; 0.13; 0.19; 0.37
- Peas (pulses): 0.22; 0.33; 0.70; 0.77
- Rape seeds: 0.02; 0.02; 0.03; 0.05

c) field rotational crop studies, performed at 300 g/ha on bare soil (21–30, 107–204 and 273–365 days PBI) or at 175–185 g/ha on bare soil (107–204 and 273–365 d PBI) (EFSA, 2020a). Residues of flupyradifurone were < LOQ of 0.01 mg/kg in all crops at all plant back intervals, except in one sample of barley grain (0.01 mg/kg, 2nd rotation) and in barley straw (0.02 and 0.03 mg/kg 2nd rotation and 0.02 mg/kg 3rd rotation). The residues of DFA, expressed as DFA (mg/kg), were as follows:
B.1.2.3. Processing factors

No processing studies were submitted in the framework of the present MRL application.

B.2. Residues in livestock

Not relevant.

B.3. Consumer risk assessment

| ARFD | 0.15 mg/kg bw (European Commission, 2015) |
|------|----------------------------------------|
| Highest IESTI, according to EFSA PRiMo |

Scenario 1) Exposure from residues in animal commodities and treated primary crops

Contribution of crops under consideration:
okra/lady’s fingers: not assessed/no consumption data available

Scenario 2) Exposure from residues in rotational crops (no treatment)

Contribution of crops under consideration:
okra/lady’s fingers: not assessed/no consumption data available

Assumptions made for the calculations

The exposure assessment was performed only for residues in okra/lady’s fingers.

In scenario 1 the input value was the HR value as derived from the residue trials.

The input value in scenario 2 was the HR as estimated in rotational crop cucumber if grown in soil containing flupyradifurone residues at EU soil plateau concentrations (EFSA, 2020a).
ADI

Highest IEDI, according to EFSA PRIMO

Calculations were performed with PRIMO revision 3.1. 0.064 mg/kg bw per day (European Commission, 2015)

Scenario 1) Exposure from residues in animal commodities and treated primary crops (expressed as % of ADI):
53%  (NL toddler diet)
Contribution of residues in okra/lady’s fingers: 0.01% of the ADI (GEMS/Food G06 diet)

Scenario 2) Exposure from residues in rotational crops (no treatment)
17%  (GEMS Food G06 diet)
15%  (NL toddler diet)
Contribution of residues in okra/lady’s fingers: 0.03% of the ADI (GEMS/Food G06 diet)

Combined scenario 1 and scenario 2 chronic exposure:
68%  (NL Toddler diet)

Assumptions made for the calculations

Scenario 1) The calculation is based on the median residue levels expected in plant commodities from primary crop treatment only and as estimated in animal commodities in the recent EFSA assessment (EFSA, 2020a). For okra/lady’s finger the input values were the STMR values as derived from the submitted residue trials. For remaining commodities of plant and animal origin the input values were the existing MRLs or the STMR values as reported in EFSA assessments (EFSA, 2015, 2016, 2020a,b). It is noted that for melons, escarole/broad leaved endives and celery the acute consumer risk could not be excluded for the MRL proposals derived in previous EFSA assessment (EFSA, 2020a) and therefore for these commodities the existing EU MRLs were used as input values.

Scenario 2) The calculation is based on DFA and flupyradifurone residues (STMR) taken up via roots by annual crops grown in soil containing flupyradifurone residues at the EU soil plateau concentrations. The perennial crops and animal commodities were excluded from the exposure calculation. For okra/lady’s finger the input value was the STMR as estimated in rotational crop cucumber if grown in soil containing flupyradifurone residues at EU soil plateau concentrations (EFSA, 2020a). For remaining commodities, the input values were as reported in recent EFSA assessments (EFSA, 2020a,b).

Combined long-term exposure assessment was calculated by summing up exposure for individual diets from residues in primary crops and animal commodities and from residues in rotational crop (sum of scenario 1 and scenario 2).

All calculations were performed with PRIMO rev. 3.1.

ARfD: acute reference dose; bw: body weight; IESTI: international estimated short-term intake; PRIMO: (EFSA) Pesticide Residues Intake Model; HR: highest residue; ADI: acceptable daily intake; IEDI: international estimated daily intake; MRL: maximum residue level; STMR: supervised trials median residue.
## B.4. Recommended MRLs

| Code<sup>(a)</sup> | Commodity          | Existing EU MRL (mg/kg) | Proposed EU MRL (mg/kg) | Comment/justification                                                                 |
|-------------------|--------------------|-------------------------|-------------------------|--------------------------------------------------------------------------------------|
| 0231040           | Okra/lady’s finger | 0.01*                   | 0.9                     | The submitted data are sufficient to derive an MRL proposal for the intended EU indoor use. Risk for consumers unlikely. |

### Enforcement residue definition (1): Flupyradifurone

- **0231040** Okra/lady’s finger: 0.01* mg/kg

### Enforcement residue definition (2): Difluoroacetic acid (DFA)

- **0231040** Okra/lady’s finger: 0.15 (ft.1) mg/kg

The MRL proposal for the intended EU indoor use considering direct treatment and potential DFA residues taken up by okra/lady’s finger from soils containing flupyradifurone residues at critical EU soil plateau levels.

Direct treatment only of the crop with flupyradifurone would require an MRL for DFA of 0.1 mg/kg. Further risk management discussions are therefore recommended on whether MRLs should be established to cover residues in rotational crops or whether other risk management options (e.g. plant back restrictions) would be appropriate to avoid DFA residues in untreated crops. Risk for consumers unlikely.

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MRL: 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.

ft.1: The European Food Safety Authority identified some information on rotational crops as unavailable. When re-viewing the MRL, the Commission will take into account the information referred to in the first sentence, if it is submitted by 6 April 2018, or, if that information is not submitted by that date, the lack of it. The confirmatory data were sufficiently addressed in the recent EFSA assessment proposing the deletion of the footnote (EFSA, 2020a,b).
Appendix C – Pesticide Residue Intake Model (PRIMO)

- Scenario 1 (Exposure to flupyradifurone and DFA residues (expressed as flupyradifurone) from the intake of primary crops and commodities of animal origin.)

**Flupyradifurone**

| Country | Commodity | ADI (mg/kg bw/day) | Source of ADI | ARfD (mg/kg bw) | Source of ARfD |
|---------|-----------|--------------------|---------------|----------------|---------------|
| EC      |           | 0.15              | EC            | 0.15           | EC            |

Flupyradifurone

**Chronic risk assessment:** JMPR methodology (IEDI/TMDI)

- No of diets exceeding the ADI: ---
- Exposure resulting from commodities not under assessment: ---
- Highest contributor to exposure: ---
- 2nd contributor to exposure: ---
- 3rd contributor to exposure: ---

**Calculation**

The estimated long-term dietary intake (TMDI/NEDI/IEDI) was below the ADI. The long-term intake of residues of flupyradifurone is unlikely to present a public health concern.

**Disclaimer:** Dietary data from the UK were included in PRIMO when the UK was a member of the European Union.
The acute risk assessment is based on the ARID. DISCLAIMER: Dietary data from the UK were included in PRIMO when the UK was a member of the European Union.

The calculation is based on the large portion of the most critical consumer group.

### Unprocessed commodities

| Highest % of ARfD/ADI | Commodities                  | MRL/input for RA (mg/kg) | Exposure (µg/kg bw) | Highest % of ARfD/ADI | Commodities                  | MRL/input for RA (mg/kg) | Exposure (µg/kg bw) |
|-----------------------|------------------------------|--------------------------|---------------------|-----------------------|------------------------------|--------------------------|---------------------|
| 95%                   | Table grapes                | 3.1/3.95                 | 142                 | 44%                   | Table grapes                | 3.1/3.95                 | 66                  |
| 81%                   | Lettuces                    | 0.9/1.65                 | 98                  | 40%                   | Chards/beet leaves          | 6.3/2                    | 60                  |
| 78%                   | Oranges                     | 0.7/1.8                  | 105                 | 32%                   | Aubergines/egg plants       | 1.1/8                    | 49                  |
| 70%                   | Tomatoes                    | 0.9/1.85                 | 98                  | 31%                   | Wine grapes                 | 0.7/1.8                  | 46                  |
| 65%                   | Sweet peppers/bell peppers | 0.6/0.82                 | 69                  | 19%                   | Tomatoes                    | 0.7/1.8                  | 29                  |
| 65%                   | Kales                       | 5.2/2                    | 97                  | 26%                   | Lettuces                    | 6.3/2                    | 39                  |
| 64%                   | Pears                       | 6.0/6.69                 | 74                  | 18%                   | Oranges                     | 3.0/8.8                  | 27                  |
| 50%                   | Apples                      | 6.0/6.69                 | 74                  | 18%                   | Sweet peppers/bell peppers | 0.9/1.65                 | 27                  |
| 48%                   | Spinaches                   | 6.3/2                    | 72                  | 16%                   | Blueberries                 | 4.2/5.9                  | 24                  |
| 33%                   | Chards/beet leaves          | 6.3/2                    | 50                  | 15%                   | Sweeds/utabagis             | 5.0/6.8                  | 23                  |
| 32%                   | Cauliflowers                | 0.6/0.82                 | 48                  | 14%                   | Pears                       | 0.6/0.69                 | 21                  |
| 46%                   | Grapefruits                 | 3.0/8.8                  | 69                  | 13%                   | Broccoli                    | 0.6/0.82                 | 20                  |
| 32%                   | Cauliflowers                | 0.6/0.82                 | 48                  | 13%                   | Apples                      | 0.6/0.69                 | 19                  |
| 29%                   | Cucumbers                   | 0.6/0.66                 | 43                  | 13%                   | Cauliflowers                | 0.6/0.62                 | 19                  |
| 23%                   | Spinaches/frozen; boiled    | 6/3.2                    | 45                  | 12%                   | Beetroots                   | 0.9/0.68                 | 26                  |
| 23%                   | Kales/boiled                | 5.2/2                    | 61                  | 16%                   | Spinaches/frozen; boiled    | 6.3/2                    | 26                  |
| 20%                   | Cauliflowers/boiled         | 0.6/0.82                 | 57                  | 18%                   | Beetroots/boiled            | 0.9/0.68                 | 26                  |
| 16%                   | Spinaches/frozen; boiled    | 6/3.2                    | 45                  | 13%                   | Broccoli/boiled             | 0.6/0.82                 | 20                  |
| 16%                   | Parsnips/boiled             | 0.01/0.68                | 34                  | 12%                   | Wine grapes/wine            | 3.1/9.5                  | 18                  |
| 10%                   | Beetroots/boiled            | 0.9/0.88                 | 30                  | 10%                   | Parsnips/boiled             | 0.01/0.68                | 14                  |
| 12%                   | Cauliflowers/boiled         | 0.6/0.66                 | 23                  | 9%                    | Turnips/boiled              | 0.01/0.68                | 13                  |
| 12%                   | Oranges/boiled              | 3.0/1.8                  | 18                  | 9%                    | Wine grapes/boiled          | 3.0/6.2                  | 13                  |
| 12%                   | Jersey salmon/boiled        | 0.11/0.88                | 65                  | 7%                    | Barley/beer                 | 3.0/6.2                  | 12                  |
| 10%                   | Broccoli/pickled            | 0.6/0.66                 | 15                  | 6%                    | Apples/fruit                | 0.6/2.8                  | 9.3                 |
| 10%                   | Parsnips/boiled             | 0.6/0.28                 | 15                  | 4%                    | Barley/beer                 | 3.0/16                  | 5.8                 |

### Processed commodities

| Highest % of ARfD/ADI | Processed commodities                  | MRL/input for RA (mg/kg) | Exposure (µg/kg bw) | Highest % of ARfD/ADI | Processed commodities                  | MRL/input for RA (mg/kg) | Exposure (µg/kg bw) |
|-----------------------|----------------------------------------|--------------------------|---------------------|-----------------------|----------------------------------------|--------------------------|---------------------|
| 66%                   | Chards/beet leaves/boiled              | 6.3/2                    | 100                 | 27%                   | Chards/beet leaves/boiled              | 6.3/2                    | 40                  |
| 43%                   | Broccoli/boiled                        | 0.6/0.82                 | 65                  | 23%                   | Cauliflowers/boiled                   | 0.6/0.82                 | 34                  |
| 40%                   | Kales/boiled                           | 0.9/1.85                 | 98                  | 18%                   | Spinaches/frozen; boiled              | 6.3/2                    | 26                  |
| 38%                   | Cauliflowers/boiled                    | 0.6/0.82                 | 57                  | 16%                   | Beetroots/boiled                      | 0.9/0.68                 | 26                  |
| 30%                   | Spinaches/frozen; boiled               | 6/3.2                    | 45                  | 13%                   | Broccoli/boiled                      | 0.6/0.82                 | 20                  |
| 23%                   | Turnips/boiled                         | 0.01/0.68                | 34                  | 12%                   | Wine grapes/wine                      | 3.1/9.5                  | 18                  |
| 23%                   | Parsnips/boiled                        | 0.01/0.68                | 34                  | 10%                   | Cauliflowers/boiled                  | 0.6/0.66                 | 15                  |
| 20%                   | Beetroots/boiled                       | 0.9/0.88                 | 30                  | 10%                   | Parsnips/boiled                      | 0.01/0.68                | 14                  |
| 16%                   | Wine grapes/boiled                     | 3.0/6.2                  | 27                  | 9%                    | Parsnipes/boiled                     | 6.3/2                    | 13                  |
| 16%                   | Turnips/boiled                         | 0.6/0.66                 | 23                  | 9%                    | Turnips/boiled                       | 0.01/0.68                | 13                  |
| 12%                   | Oranges/boiled                         | 3.0/6.2                  | 18                  | 9%                    | Wine grapes/boiled                   | 3.0/6.2                  | 13                  |
| 12%                   | Salsifies/boiled                       | 0.01/0.68                | 18                  | 8%                    | Celarina/boiled                      | 0.01/0.68                | 12                  |
| 12%                   | Jerusalem artichokes/boiled            | 0.01/0.68                | 17                  | 7%                    | Table grapes/raisins                 | 3/9.17                   | 11                  |
| 10%                   | Gherkins/pickled                       | 0.6/0.66                 | 15                  | 6%                    | Apples/fruit                         | 0.6/2.8                  | 9.3                 |
| 10%                   | Apples/fruit                           | 0.6/0.28                 | 15                  | 4%                    | Barley/beer                          | 3/0.16                   | 5.8                 |

**Conclusion:**

No exceedance of the toxicological reference value was identified for any unprocessed commodity. A short-term intake of residues of Flupyradifurone is unlikely to present a public health risk. For processed commodities, no exceedance of the ARID was identified.
### Scenario 2 (Exposure to flupyradifurone and DFA residues (expressed as flupyradifurone) from rotational crops.)

LOQs (mg/kg) range from: 0.01 to: 0.05

ADI (mg/kg bw per day): 0.064

ARfD (mg/kg bw): 0.15

Source of ADI: EC

Source of ARfD: EC

EFSA PRIMo revision 3.1; 2021/01/06

Year of evaluation: 2015

No of diets exceeding the ADI: ---

#### Calculated exposure (% of ADI)

| Commodity/group of commodities | Highest contributor to MS diet (in % of ADI) | 2nd contributor to MS diet (in % of ADI) | 3rd contributor to MS diet (in % of ADI) |
|-------------------------------|------------------------------------------|----------------------------------------|----------------------------------------|
| Watermelons                   | 17%                                      | 10.89                                  | 5%                                      |
| Potatoes                      | 15%                                      | 9.76                                   | 5%                                      |
| Cucumbers                     | 11%                                      | 7.14                                   | 4%                                      |
| Sweet potatoes                | 11%                                      | 7.06                                   | 4%                                      |
| Potatoes                      | 11%                                      | 6.83                                   | 3%                                      |
| Tomatoes                      | 10%                                      | 6.69                                   | 3%                                      |
| Tomatoes                      | 10%                                      | 6.57                                   | 3%                                      |
| Tomatoes                      | 10%                                      | 6.46                                   | 3%                                      |
| Tomatoes                      | 10%                                      | 6.16                                   | 3%                                      |
| Beans                         | 10%                                      | 5.89                                   | 4%                                      |
| Other cereals                 | 9%                                       | 5.72                                   | 3%                                      |
| Tomatoes                      | 9%                                       | 5.65                                   | 3%                                      |
| Tomatoes                      | 9%                                       | 5.61                                   | 3%                                      |
| Lentils                       | 8%                                       | 5.28                                   | 2%                                      |
| Potatoes                      | 8%                                       | 5.26                                   | 2%                                      |
| Tomatoes                      | 8%                                       | 5.24                                   | 2%                                      |
| Wheat                         | 8%                                       | 5.07                                   | 2%                                      |
| Potatoes                      | 7%                                       | 4.78                                   | 2%                                      |
| Tomatoes                      | 7%                                       | 4.60                                   | 2%                                      |
| Wheat                         | 7%                                       | 4.39                                   | 2%                                      |
| Wheat                         | 6%                                       | 3.77                                   | 2%                                      |
| Wheat                         | 5%                                       | 3.00                                   | 2%                                      |
| Beans                         | 5%                                       | 2.50                                   | 2%                                      |
| Wheat                         | 4%                                       | 1.98                                   | 2%                                      |
| Wheat                         | 3%                                       | 1.45                                   | 2%                                      |
| Wheat                         | 3%                                       | 1.10                                   | 2%                                      |
| Beans (with pods)             | 3%                                       | 0.91                                   | 2%                                      |
| Wheat                         | 3%                                       | 0.65                                   | 2%                                      |
| Wheat                         | 3%                                       | 0.50                                   | 2%                                      |
| Wheat                         | 3%                                       | 0.39                                   | 2%                                      |
| Wheat                         | 3%                                       | 0.28                                   | 2%                                      |
| Wheat                         | 3%                                       | 0.19                                   | 2%                                      |
| Wheat                         | 3%                                       | 0.10                                   | 2%                                      |
| Beans                         | 3%                                       | 0.08                                   | 2%                                      |
| Wheat                         | 2%                                       | 0.06                                   | 2%                                      |
| Wheat                         | 2%                                       | 0.04                                   | 2%                                      |
| Wheat                         | 2%                                       | 0.03                                   | 2%                                      |
| Wheat                         | 2%                                       | 0.02                                   | 2%                                      |

#### Conclusion

The estimated long-term dietary intake (TMDI/NEDI/IEDI) was below the ADI. The long-term intake of residues of Flupyradifurone is unlikely to present a public health concern.

DISCLAIMER: Dietary data from the UK were included in PRIMO when the UK was a member of the European Union.
### Unprocessed commodities

| Highest % of ARfD/ADI | Commodities        | MRL/Input for RA (mg/kg) | Exposure (µg/kg bw) | Highest % of ARfD/ADI | Commodities        | MRL/Input for RA (mg/kg) | Exposure (µg/kg bw) |
|-----------------------|--------------------|--------------------------|---------------------|-----------------------|--------------------|--------------------------|---------------------|
| 86%                   | Melons             | 0.0/0.85                 | 128                 | 23%                   | Watermelons        | 0.0/0.85                 | 23                   |
| 69%                   | Watermelons        | 0.0/0.85                 | 104                 | 22%                   | Melons             | 0.0/0.85                 | 33                   |
| 55%                   | Potatoes           | 0.0/0.54                 | 83                  | 16%                   | Cucumbers          | 0.0/0.85                 | 24                   |
| 39%                   | Beans              | 0.0/0.19                 | 58                  | 15%                   | Aubergines/egg plants | 0.0/0.85               | 23                   |
| 37%                   | Cucumbers          | 0.0/0.85                 | 56                  | 14%                   | Beans              | 0.0/0.39                 | 21                   |
| 34%                   | Sweet peppers/bell peppers | 0.0/0.85        | 51                  | 13%                   | Courgettes         | 0.0/0.85                 | 20                   |
| 33%                   | Tomatoes           | 0.0/0.85                 | 49                  | 13%                   | Lentils            | 0.0/0.19                 | 20                   |
| 26%                   | Courgettes         | 0.0/0.85                 | 40                  | 12%                   | Beans (with pods)  | 0.0/0.27                 | 18                   |
| 18%                   | Leeks              | 0.0/0.47                 | 28                  | 11%                   | Head cabbages      | 0.0/0.4                 | 17                   |
| 17%                   | Beans (with pods)  | 0.0/0.27                 | 26                  | 11%                   | Potatoes           | 0.0/0.54                 | 16                   |
| 15%                   | Cauliflowers       | 0.0/0.4                  | 23                  | 10%                   | Yams               | 0.0/0.54                 | 15                   |
| 15%                   | Pumpkins           | 0.0/0.85                 | 23                  | 9%                    | Sweet peppers/bell peppers | 0.0/0.85               | 14                   |
| 14%                   | Beans (with pods)  | 0.0/0.19                 | 21                  | 9%                    | Tomatoes           | 0.0/0.85                 | 13                   |
| 14%                   | Aubergines/egg plants | 0.0/0.85             | 21                  | 8%                    | Pumpkins           | 0.0/0.85                 | 12                   |
| 14%                   | Peas               | 0.0/0.19                 | 21                  | 8%                    | Peas (without pods) | 0.0/0.27                 | 12                   |

### Processed commodities

| Highest % of ARfD/ADI | Processed commodities | MRL/Input for RA (mg/kg) | Exposure (µg/kg bw) | Highest % of ARfD/ADI | Processed commodities | MRL/Input for RA (mg/kg) | Exposure (µg/kg bw) |
|-----------------------|-----------------------|--------------------------|---------------------|-----------------------|-----------------------|--------------------------|---------------------|
| 50%                   | Pumpkins/boiled                           | 0.0/0.85                 | 75                  | 31%                   | Pumpkins/boiled          | 0.0/0.85                 | 47                   |
| 34%                   | Potatoes/fried                           | 0.0/0.54                 | 50                  | 15%                   | Beans/canned             | 0.0/0.19                 | 23                   |
| 21%                   | Broccoli/boiled                         | 0.0/0.4                  | 32                  | 13%                   | Courgettes/boiled       | 0.0/0.85                 | 19                   |
| 20%                   | Courgettes/boiled                       | 0.0/0.85                 | 30                  | 11%                   | Cauliflowers/boiled      | 0.0/0.4                 | 17                   |
| 19%                   | Beans (with pods)/boiled                  | 0.0/2.27                 | 28                  | 11%                   | Celeries/boiled         | 0.0/0.47                 | 16                   |
| 18%                   | Cauliflowers/boiled                      | 0.0/0.4                  | 28                  | 8%                    | Beans (without pods)/     | 0.0/0.27                 | 12                   |
| 18%                   | Sweet potatoes/boiled                    | 0.0/0.54                 | 27                  | 7%                    | Cassava roots/boiled    | 0.0/0.54                 | 10                   |
| 18%                   | Leeks/boiled                            | 0.0/0.47                 | 27                  | 6%                    | Broccoli/boiled         | 0.0/0.4                 | 9.6                  |
| 17%                   | Willow/boiled                           | 0.0/0.29                 | 26                  | 6%                    | Kohlrabies/boiled       | 0.0/0.4                 | 8.5                  |
| 15%                   | Peas/canned                             | 0.0/2.18                 | 23                  | 6%                    | Peas/canned             | 0.0/0.18                 | 8.5                  |
| 14%                   | Florence fennel/boiled                   | 0.0/0.47                 | 21                  | 6%                    | Sweet potatoes/boiled    | 0.0/0.54                 | 8.3                  |
| 13%                   | Ginger/pickled                          | 0.0/0.85                 | 20                  | 5%                    | Leeks/boiled            | 0.0/0.47                 | 8.2                  |
| 13%                   | Escarole/broad-leaved end                | 0.0/0.29                 | 19                  | 5%                    | Beetroot/boiled         | 0.0/0.21                 | 8.2                  |
| 12%                   | Rhubarbs/taurie/puree                    | 0.0/0.47                 | 18                  | 5%                    | Peas (with pods)/        | 0.0/0.27                 | 7.8                  |

### Conclusion:

No exceedance of the toxicological reference value was identified for any unprocessed commodity.

A short term intake of residues of Flupyradifurone is unlikely to present a public health risk.

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

D.1. Consumer risk assessment

**Scenario 1:** Exposure to flupyradifurone and DFA residues (expressed as flupyradifurone) from the intake of primary crops and commodities of animal origin.

| Commodity          | Existing MRL/Proposed MRL (mg/kg) | Source/type of MRL | Chronic risk assessment | Acute risk assessment(b) |
|--------------------|-----------------------------------|--------------------|-------------------------|--------------------------|
| Commodity          | Existing MRL/Proposed MRL (mg/kg) | Source/type of MRL | Input value (mg/kg)     | Comment                  | Input value (mg/kg) | Comment                  |
| **Risk assessment residue definition:** Sum of flupyradifurone and DFA, expressed as flupyradifurone |
| Grapefruits        | 3(a) EFSA (2020a)                 | 0.136              | STMR x eF               | 0.88                     | HR x PeF             |
| Oranges            | 3(a) EFSA (2020a)                 | 0.136              | STMR x PeF              | 0.88                     | HR x PeF             |
| Lemons             | 1.5(a) EFSA (2020a)               | 0.14               | STMR x PeF              | 0.292                    | HR x PeF             |
| Limes              | 1.5(a) EFSA (2020a)               | 0.14               | STMR x PeF              | 0.292                    | HR x PeF             |
| Mandarins          | 1.5(a) EFSA (2020a)               | 0.2                | STMR x PeF              | 0.396                    | HR x PeF             |
| Almonds            | 0.02(a) EFSA (2020a)              | 0.06               | STMR                    | 0.11                     | HR                   |
| Brazil nuts        | 0.02(a) EFSA (2020a)              | 0.06               | STMR                    | 0.11                     | HR                   |
| Cashew nuts        | 0.02(a) EFSA (2020a)              | 0.06               | STMR                    | 0.11                     | HR                   |
| Chestnuts          | 0.02(a) EFSA (2020a)              | 0.06               | STMR                    | 0.11                     | HR                   |
| Coconuts           | 0.02(a) EFSA (2020a)              | 0.06               | STMR                    | 0.11                     | HR                   |
| Hazelnuts/cobnuts  | 0.02(a) EFSA (2020a)              | 0.06               | STMR                    | 0.11                     | HR                   |
| Macadamia          | 0.02(a) EFSA (2020a)              | 0.06               | STMR                    | 0.11                     | HR                   |
| Pecans             | 0.02(a) EFSA (2020a)              | 0.06               | STMR                    | 0.11                     | HR                   |
| Pine nut kernels   | 0.02(a) EFSA (2020a)              | 0.06               | STMR                    | 0.11                     | HR                   |
| Pistachios         | 0.02(a) EFSA (2020a)              | 0.06               | STMR                    | 0.11                     | HR                   |
| Walnuts            | 0.02(a) EFSA (2020a)              | 0.06               | STMR                    | 0.11                     | HR                   |
| Other tree nuts    | 0.02(a) EFSA (2020a)              | 0.06               | STMR                    | 0.11                     | HR                   |
| Apples             | 0.6(a) EFSA (2020a)               | 0.28               | STMR                    | 0.69                     | HR                   |
| Pears              | 0.6(a) EFSA (2020a)               | 0.28               | STMR                    | 0.69                     | HR                   |
| Quinces            | 0.6(a) EFSA (2020a)               | 0.28               | STMR                    | 0.69                     | HR                   |
| Medlar             | 0.6(a) EFSA (2020a)               | 0.28               | STMR                    | 0.69                     | HR                   |
| Loquats/Japanese medlars | 0.6(a) EFSA (2020a) | 0.28           | STMR                    | 0.69                     | HR                   |
| Other pome fruit   | 0.6(a) EFSA (2020a)               | 0.28               | STMR                    | 0.69                     | HR                   |
| Table grapes       | 3(a) EFSA (2020a)                 | 0.62               | STMR                    | 1.95                     | HR                   |
| Wine grapes        | 3(a) EFSA (2020a)                 | 0.62               | STMR                    | 1.95                     | HR                   |
| Strawberries       | 0.4 EFSA (2016)                   | 0.15               | STMR                    | 0.22                     | HR                   |
| Blackberries       | 1.5 EFSA (2016)                   | 0.39               | STMR                    | 0.66                     | HR                   |
| Raspberries (red and yellow) | 1.5 EFSA (2016) | 0.39           | STMR                    | 0.66                     | HR                   |
| Blueberries        | 4(a) EFSA (2020a)                 | 0.86               | STMR                    | 2.59                     | HR                   |
| Table olives       | 5(a) EFSA (2020a)                 | 0.5                | STMR                    | 3.3                      | HR                   |
| Potatoes           | 0.05(a) EFSA (2020a)              | 0.06               | STMR                    | 0.1                      | HR                   |
| Cassava roots/manioc | 0.05(a) EFSA (2020a)              | 0.06               | STMR                    | 0.1                      | HR                   |
| Sweet potatoes     | 0.05(a) EFSA (2020a)              | 0.06               | STMR                    | 0.1                      | HR                   |
| Yams               | 0.05(a) EFSA (2020a)              | 0.06               | STMR                    | 0.1                      | HR                   |
| Arrowroots         | 0.05(a) EFSA (2020a)              | 0.06               | STMR                    | 0.1                      | HR                   |
| Commodity                              | Existing MRL/Proposed MRL (mg/kg) | Source/type of MRL | Chronic risk assessment | Acute risk assessment(b) |
|---------------------------------------|-----------------------------------|--------------------|-------------------------|--------------------------|
|                                       |                                   |                    | Input value (mg/kg)     | Comment                  | Input value (mg/kg) | Comment |
| Other tropical root and tuber vegetables | 0.05(a)                           | EFSA (2020a)       | 0.06                    | STMR                     |                       |         |
| Beetroots                             | 0.9(a)                            | EFSA (2020a)       | 0.15                    | STMR                     | 0.68                 | HR       |
| Carrots                               | 0.01(a)                           | EFSA (2020a)       | 0.15                    | STMR                     | 0.68                 | HR       |
| Celeriacs/turnip-rooted celeries      | 0.01(a)                           | EFSA (2020a)       | 0.15                    | STMR                     | 0.68                 | HR       |
| Horseradishes                         | 0.01(a)                           | EFSA (2020a)       | 0.15                    | STMR                     | 0.68                 | HR       |
| Jerusalem artichokes                  | 0.01(a)                           | EFSA (2020a)       | 0.15                    | STMR                     | 0.68                 | HR       |
| Parsnips                              | 0.01(a)                           | EFSA (2020a)       | 0.15                    | STMR                     | 0.68                 | HR       |
| Parsley roots/Hamburg roots parsley   | 0.01(a)                           | EFSA (2020a)       | 0.15                    | STMR                     | 0.68                 | HR       |
| Radishes                              | 0.01(a)                           | EFSA (2020a)       | 0.15                    | STMR                     | 0.68                 | HR       |
| Salsifies                             | 0.01(a)                           | EFSA (2020a)       | 0.15                    | STMR                     | 0.68                 | HR       |
| Swedes/rutabagas                      | 0.01(a)                           | EFSA (2020a)       | 0.15                    | STMR                     | 0.68                 | HR       |
| Turnips                               | 0.01(a)                           | EFSA (2020a)       | 0.15                    | STMR                     | 0.68                 | HR       |
| Other root and tuber vegetables       | 0.01(a)                           | EFSA (2020a)       | 0.15                    | STMR                     |                       |         |
| Tomatoes                              | 0.7(a)                            | EFSA (2020a)       | 0.2                     | STMR                     | 1.8                  | HR       |
| Sweet peppers/bell peppers           | 0.9(a)                            | EFSA (2020a)       | 0.24                    | STMR                     | 1.65                 | HR       |
| Aubergines/egg plants                 | 1(a)                              | EFSA (2020a)       | 0.2                     | STMR                     | 1.8                  | HR       |
| Okra/lady’s fingers                   | 0.9                               | Proposed MRL       | 0.26                    | STMR                     | 0.6                  | HR       |
|                                       |                                   |                     | (Table B.1.2.1)         |                          | (Table B.1.2.1)      |          |
| Cucumbers                             | 0.6                               | EFSA (2015)        | 0.13                    | STMR                     | 0.66                 | HR       |
| Gherkins                              | 0.6                               | EFSA (2015)        | 0.13                    | STMR                     | 0.66                 | HR       |
| Courgettes                            | 0.6                               | EFSA (2015)        | 0.13                    | STMR                     | 0.66                 | HR       |
| Melons                                | 0.01(a)                           | EFSA (2020a)       | 0.01                    | MRL                      | 0.01                 | MRL      |
| Watermelons                           | 0.15                              | EFSA (2015)        | 0.065                   | STMR                     | 0.19                 | HR       |
| Sweet corn                            | 0.05(a)                           | EFSA (2020a)       | 0.13                    | STMR                     | 0.25                 | HR       |
| Broccoli                              | 0.6(a)                            | EFSA (2020a)       | 0.27                    | STMR                     | 0.82                 | HR       |
| Cauliflowers                          | 0.6(a)                            | EFSA (2020a)       | 0.27                    | STMR                     | 0.82                 | HR       |
| Other flowering brassica             | 0.6(a)                            | EFSA (2020a)       | 0.27                    | STMR                     |                       |         |
| Brussels sprouts                      | 0.09(a)                           | EFSA (2020a)       | 0.16                    | STMR                     | 0.31                 | HR       |
| Head cabbages                         | 0.3(a)                            | EFSA (2020a)       | 0.21                    | STMR                     | 0.29                 | HR       |
| Kales                                 | 5(a)                              | EFSA (2020a)       | 0.97                    | STMR                     | 2.2                  | HR       |
| Kohlrabies                            | 0.09(a)                           | EFSA (2020a)       | 0.19                    | STMR                     | 0.25                 | HR       |
| Lamb’s lettuce/corn salads           | 6(a)                              | EFSA (2020a)       | 1.36                    | STMR                     | 3.2                  | HR       |
| Lettuces                              | 5(a)                              | EFSA (2020a)       | 1.12                    | STMR                     | 3.2                  | HR       |
| Escaroles/broad-leaved endives        | 0.03(a)                           | EFSA (2020a)       | 0.03                    | MRL                      | 0.03                 | MRL      |
| Commodity                                         | Existing MRL/Proposed MRL (mg/kg) | Source/type of MRL | Chronic risk assessment | Acute risk assessment<sup>(b)</sup> |
|--------------------------------------------------|-----------------------------------|--------------------|------------------------|-------------------------------------|
|                                                  |                                   |                    | Input value (mg/kg)     | Comment                             |
|                                                  |                                   |                    |                        |                                     |
| Cress and other sprouts and shoots               | 6<sup>(a)</sup>                   | EFSA (2020a)       | 1.36                   | STMR                               |
|                                                  |                                   |                    |                        |                                     |
|                                                  |                                   |                    |                        |                                     |
| Land cress                                       | 6<sup>(a)</sup>                   | EFSA (2020a)       | 1.36                   | STMR                               |
|                                                  |                                   |                    |                        |                                     |
| Roman rocket/rucola                              | 6<sup>(a)</sup>                   | EFSA (2020a)       | 1.36                   | STMR                               |
|                                                  |                                   |                    |                        |                                     |
| Red mustards                                     | 6<sup>(a)</sup>                   | EFSA (2020a)       | 1.36                   | STMR                               |
|                                                  |                                   |                    |                        |                                     |
| Baby leaf crops (including brassica species)     | 6<sup>(a)</sup>                   | EFSA (2020a)       | 1.36                   | STMR                               |
|                                                  |                                   |                    |                        |                                     |
| Other lettuce and other salad plants             | 6<sup>(a)</sup>                   | EFSA (2020a)       | 1.36                   | STMR                               |
|                                                  |                                   |                    |                        |                                     |
| Spinaches                                        | 6<sup>(a)</sup>                   | EFSA (2020a)       | 1.36                   | STMR                               |
| Purslanes                                        | 6<sup>(a)</sup>                   | EFSA (2020a)       | 1.36                   | STMR                               |
| Chards/beet leaves                               | 6<sup>(a)</sup>                   | EFSA (2020a)       | 1.36                   | STMR                               |
| Other spinach and similar                        | 6<sup>(a)</sup>                   | EFSA (2020a)       | 1.36                   | STMR                               |
|                                                  |                                   |                    |                        |                                     |
| Watercress                                       | 0.07<sup>(a)</sup>                | EFSA (2020a)       | 0.01                   | STMR                               |
|                                                  |                                   |                    |                        |                                     |
| Chervil                                          | 6<sup>(a)</sup>                   | EFSA (2020a)       | 1.36                   | STMR                               |
| Chives                                           | 6<sup>(a)</sup>                   | EFSA (2020a)       | 1.36                   | STMR                               |
| Celery leaves                                    | 6<sup>(a)</sup>                   | EFSA (2020a)       | 1.36                   | STMR                               |
| Parsley                                          | 6<sup>(a)</sup>                   | EFSA (2020a)       | 1.36                   | STMR                               |
| Sage                                             | 6<sup>(a)</sup>                   | EFSA (2020a)       | 1.36                   | STMR                               |
| Rosemary                                         | 6<sup>(a)</sup>                   | EFSA (2020a)       | 1.36                   | STMR                               |
| Thyme                                            | 6<sup>(a)</sup>                   | EFSA (2020a)       | 1.36                   | STMR                               |
| Basil and edible flowers                         | 6<sup>(a)</sup>                   | EFSA (2020a)       | 1.36                   | STMR                               |
| Laurel/bay leaves                                | 6<sup>(a)</sup>                   | EFSA (2020a)       | 1.36                   | STMR                               |
| Tarragon                                         | 6<sup>(a)</sup>                   | EFSA (2020a)       | 1.36                   | STMR                               |
| Other herbs                                      | 6<sup>(a)</sup>                   | EFSA (2020a)       | 1.36                   | STMR                               |
| Beans (with pods)                                | 0.5<sup>(a)</sup>                 | EFSA (2020a)       | 0.19                   | STMR                               |
| Beans (without pods)                             | 0.4<sup>(a)</sup>                 | EFSA (2020a)       | 0.16                   | STMR                               |
| Peas (with pods)                                 | 0.5<sup>(a)</sup>                 | EFSA (2020a)       | 0.19                   | STMR                               |
| Peas (without pods)                              | 0.4<sup>(a)</sup>                 | EFSA (2020a)       | 0.16                   | STMR                               |
| Lentils (fresh)                                  | 0.4<sup>(a)</sup>                 | EFSA (2020a)       | 0.16                   | STMR                               |
| Celeries                                         | 0.01<sup>(a)</sup>                | EFSA (2020a)       | 0.01                   | MRL                               |
| Beans                                            | 3<sup>(a)</sup>                   | EFSA (2020a)       | 0.79                   | STMR                               |
| Lentils                                          | 3<sup>(a)</sup>                   | EFSA (2020a)       | 0.79                   | STMR                               |
| Peas                                             | 3<sup>(a)</sup>                   | EFSA (2020a)       | 0.79                   | STMR                               |
| Lupins/lupini beans                              | 3<sup>(a)</sup>                   | EFSA (2020a)       | 0.79                   | STMR                               |
| Other pulses                                     | 3<sup>(a)</sup>                   | EFSA (2020a)       | 0.79                   | STMR                               |

<sup>(a)</sup> EFSA (2020a) 1.36 STMR 3.2 HR

<sup>(b)</sup> Input value (mg/kg) Comment

<sup>(c)</sup> Input value (mg/kg) Comment

<sup>(d)</sup> www.efsa.europa.eu/efsajournal 31 EFSA Journal 2021;19(5):6581
| Commodity                           | Existing MRL/Proposed MRL (mg/kg) | Source/type of MRL | Chronic risk assessment | Acute risk assessment<sup>(b)</sup> | Comment | Input value (mg/kg) | Comment |
|------------------------------------|-----------------------------------|--------------------|-------------------------|-------------------------------------|---------|--------------------|---------|
| Peanuts/groundnuts                 | 0.04<sup>(a)</sup> EFSA (2020a)    |                    | 0.06 STMR               | 0.06 STMR                           |         |                    |         |
| Rapeseeds/canola seeds             | 0.3<sup>(a)</sup> EFSA (2020b)     |                    | 0.23 STMR               | 0.23 STMR                           |         |                    |         |
| Soyabean                           | 1.5<sup>(a)</sup> EFSA (2020a)     |                    | 0.15 STMR               | 0.15 STMR                           |         |                    |         |
| Mustard seeds                      | 0.3<sup>a</sup> EFSA (2020b)       |                    | 0.23 STMR               | 0.23 STMR                           |         |                    |         |
| Cotton seeds                       | 0.8<sup>a</sup> EFSA (2020a)       |                    | 0.17 STMR               | 0.17 STMR                           |         |                    |         |
| Olives for oil production          | 5<sup>a</sup> EFSA (2020a)         |                    | 0.5 STMR                | 0.5 STMR                            |         |                    |         |
| Barley                             | 3<sup>a</sup> EFSA (2020a)         |                    | 0.81 STMR               | 0.81 STMR                           |         |                    |         |
| Maize/corn                         | 0.02<sup>a</sup> EFSA (2020a)      |                    | 0.06 STMR               | 0.06 STMR                           |         |                    |         |
| Sorghum                            | 3<sup>a</sup> EFSA (2020a)         |                    | 0.64 STMR               | 0.64 STMR                           |         |                    |         |
| Wheat                              | 1<sup>a</sup> EFSA (2020a)         |                    | 0.65 STMR               | 0.65 STMR                           |         |                    |         |
| Coffee beans                       | 1<sup>a</sup> EFSA (2020a)         |                    | 0.24 STMR               | 0.24 STMR                           |         |                    |         |
| Cocoa beans                        | 0.05<sup>a</sup> EFSA (2020a)      |                    | 0.07 STMR               | 0.11 HR                            |         |                    |         |
| HOPS (dried)                       | 4                                 |                    | 1.08 STMR               | 2.3 HR                              |         |                    |         |
| Swine: Muscle/meat                 | 0.03<sup>a</sup> EFSA (2020a)      |                    | 0.16 STMR               | 0.38 HR                             |         |                    |         |
| Swine: Fat tissue                  | 0.015<sup>a</sup> EFSA (2020a)     |                    | 0.14 STMR               | 0.31 HR                             |         |                    |         |
| Swine: Liver                       | 0.08<sup>a</sup> EFSA (2020a)      |                    | 0.14 STMR               | 0.35 HR                             |         |                    |         |
| Swine: Kidney                      | 0.09<sup>a</sup> EFSA (2020a)      |                    | 0.23 STMR               | 0.57 HR                             |         |                    |         |
| Swine: Edible offals (other than liver and kidney) | 0.09<sup>a</sup> EFSA (2020a) |                    | 0.23 STMR               | 0.57 HR                             |         |                    |         |
| Bovine: Muscle/meat                | 0.3<sup>a</sup> EFSA (2020a)       |                    | 1.1 STMR                | 1.22 HR                             |         |                    |         |
| Bovine: Fat tissue                 | 0.2<sup>a</sup> EFSA (2020a)       |                    | 1.03 STMR               | 1.48 HR                             |         |                    |         |
| Bovine: Liver                      | 1<sup>a</sup> EFSA (2020a)         |                    | 1.74 STMR               | 1.91 HR                             |         |                    |         |
| Bovine: Kidney                     | 1<sup>a</sup> EFSA (2020a)         |                    | 2.24 STMR               | 2.39 HR                             |         |                    |         |
| Bovine: Edible offals (other than liver and kidney) | 1<sup>a</sup> EFSA (2020a) |                    | 2.24 STMR               | 2.39 HR                             |         |                    |         |
| Sheep: Muscle/meat                 | 0.3<sup>a</sup> EFSA (2020a)       |                    | 0.54 STMR               | 0.84 HR                             |         |                    |         |
| Sheep: Fat tissue                  | 0.2<sup>a</sup> EFSA (2020a)       |                    | 0.38 STMR               | 0.65 HR                             |         |                    |         |
| Sheep: Liver                       | 1<sup>a</sup> EFSA (2020a)         |                    | 1.21 STMR               | 1.39 HR                             |         |                    |         |
| Sheep: Kidney                      | 1<sup>a</sup> EFSA (2020a)         |                    | 1.39 STMR               | 1.72 HR                             |         |                    |         |
| Sheep: Edible offals (other than liver and kidney) | 1<sup>a</sup> EFSA (2020a) |                    | 1.39 STMR               | 1.72 HR                             |         |                    |         |
| Goat: Muscle/meat                  | 0.3<sup>a</sup> EFSA (2020a)       |                    | 0.54 STMR               | 0.84 HR                             |         |                    |         |
| Goat: Fat tissue                   | 0.2<sup>a</sup> EFSA (2020a)       |                    | 0.38 STMR               | 0.65 HR                             |         |                    |         |
| Goat: Liver                        | 1<sup>a</sup> EFSA (2020a)         |                    | 1.21 STMR               | 1.39 HR                             |         |                    |         |
### Commodity List

| Commodity                                      | Existing MRL/Proposed MRL (mg/kg) | Source/type of MRL | Chronic risk assessment | Acute risk assessment(b) |
|------------------------------------------------|----------------------------------|--------------------|-------------------------|--------------------------|
| Goat: Kidney                                    | 1(a)                             | EFSA (2020a)       | 1.39 STMR               | 1.72 HR                  |
| Goat: Edible offals (other than liver and kidney) | 1(a)                             | EFSA (2020a)       | 1.39 STMR               | 1.72 HR                  |
| Equine: Muscle/meat                            | 0.3(a)                           | EFSA (2020a)       | 1.1 STMR                | 1.22 HR                  |
| Equine: Fat tissue                             | 0.2(a)                           | EFSA (2020a)       | 1.03 STMR               | 1.48 HR                  |
| Equine: Liver                                  | 1(a)                             | EFSA (2020a)       | 1.74 STMR               | 1.91 HR                  |
| Equine: Kidney                                 | 1(a)                             | EFSA (2020a)       | 2.24 STMR               | 2.39 HR                  |
| Equine: Edible offals (other than liver and kidney) | 1(a)                             | EFSA (2020a)       | 2.24 STMR               | 2.39 HR                  |
| Poultry: Muscle/meat                           | 0.01(a)                          | EFSA (2020a)       | 0.32 STMR               | 0.38 HR                  |
| Poultry: Fat tissue                            | 0.01(a)                          | EFSA (2020a)       | 0.09 STMR               | 0.09 HR                  |
| Poultry: Liver                                 | 0.01(a)                          | EFSA (2020a)       | 0.68 STMR               | 0.69 HR                  |
| Poultry: Kidney                                | 0.01(a)                          | EFSA (2020a)       | 0.68 STMR               | 0.69 HR                  |
| Poultry: Edible offals (other than liver and kidney) | 0.01(a)                          | EFSA (2020a)       | 0.68 STMR               | 0.69 HR                  |
| Milk: Cattle                                   | 0.15(a)                          | EFSA (2020a)       | 0.34 STMR               | 0.34 STMR                |
| Milk: Sheep                                    | 0.15(a)                          | EFSA (2020a)       | 0.18 STMR               | 0.18 STMR                |
| Milk: Goat                                     | 0.15(a)                          | EFSA (2020a)       | 0.18 STMR               | 0.18 STMR                |
| Milk: Horse                                    | 0.15(a)                          | EFSA (2020a)       | 0.34 STMR               | 0.34 STMR                |
| Eggs: Chicken                                  | 0.01(a)                          | EFSA (2020a)       | 0.25 STMR               | 0.31 HR                  |
| Eggs: Duck                                     | 0.01(a)                          | EFSA (2020a)       | 0.25 STMR               | 0.31 HR                  |
| Eggs: Goose                                    | 0.01(a)                          | EFSA (2020a)       | 0.25 STMR               | 0.31 HR                  |
| Eggs: Quail                                    | 0.01(a)                          | EFSA (2020a)       | 0.25 STMR               | 0.31 HR                  |
| Eggs: Others                                   | 0.01(a)                          | EFSA (2020a)       | 0.25 STMR               | 0.31 HR                  |

STMR: supervised trials median residue; HR: highest residue; PeF: Peeling factor; MRL: maximum residue level.

(a): The proposed EU MRLs for flupyradifurone according to recent reasoned opinions (EFSA, 2020a,b); Not implemented in MRL legislation yet.

(b): Input values for the commodities which are not under consideration for the acute risk assessment are reported in grey.

### Scenario 2: Exposure to flupyradifurone and DFA residues (expressed as flupyradifurone) from rotational crops.

| Commodity          | Chronic risk assessment | Acute risk assessment(b) |
|--------------------|-------------------------|--------------------------|
|                    | Input value (mg/kg)     | Comment(a)               | Input value (mg/kg)     | Comment(a),(b)            |

**Risk assessment residue definition:** Sum of flupyradifurone and DFA, expressed as flupyradifurone

| Commodity          | Input value (mg/kg)     | Comment(a)               | Input value (mg/kg)     | Comment(a),(b)            |
|--------------------|-------------------------|--------------------------|-------------------------|--------------------------|
| Strawberries       | 0.33                    | STMR (EFSA, 2020a)       | 0.74                    | HR (EFSA, 2020a)          |
| Potatoes           | 0.23                    | STMR (EFSA, 2020a)       | 0.54                    | HR (EFSA, 2020a)          |
| Cassava roots/manioc | 0.23                | STMR (EFSA, 2020a)       | 0.54                    | HR (EFSA, 2020a)          |
| Commodity                          | Chronic risk assessment | Acute risk assessment |
|-----------------------------------|-------------------------|-----------------------|
|                                   | Input value (mg/kg)     | Comment(a)            | Input value (mg/kg) | Comment(a),(b) |
| Sweet potatoes                    | 0.23                    | STMR (EFSA, 2020a)    | 0.54                | HR (EFSA, 2020a) |
| Yams                              | 0.23                    | STMR (EFSA, 2020a)    | 0.54                | HR (EFSA, 2020a) |
| Arrowroots                        | 0.23                    | STMR (EFSA, 2020a)    | 0.54                | HR (EFSA, 2020a) |
| Other tropical root and tuber vegetables | 0.23              | STMR (EFSA, 2020a)    | 0.54                | HR (EFSA, 2020a) |
| Beetroots                         | 0.11                    | STMR (EFSA, 2020a)    | 0.21                | HR (EFSA, 2020a) |
| Carrots                           | 0.11                    | STMR (EFSA, 2020a)    | 0.21                | HR (EFSA, 2020a) |
| Celeriacs/turnip rooted celeries  | 0.11                    | STMR (EFSA, 2020a)    | 0.21                | HR (EFSA, 2020a) |
| Horseradishes                     | 0.11                    | STMR (EFSA, 2020a)    | 0.21                | HR (EFSA, 2020a) |
| Jerusalem artichokes              | 0.11                    | STMR (EFSA, 2020a)    | 0.21                | HR (EFSA, 2020a) |
| Parsnips                          | 0.11                    | STMR (EFSA, 2020a)    | 0.21                | HR (EFSA, 2020a) |
| Parsley roots/Hamburg roots parsley | 0.11                | STMR (EFSA, 2020a)    | 0.21                | HR (EFSA, 2020a) |
| Radishes                          | 0.11                    | STMR (EFSA, 2020a)    | 0.21                | HR (EFSA, 2020a) |
| Salsifies                         | 0.11                    | STMR (EFSA, 2020a)    | 0.21                | HR (EFSA, 2020a) |
| Swedes/rutabagas                  | 0.11                    | STMR (EFSA, 2020a)    | 0.21                | HR (EFSA, 2020a) |
| Turnips                           | 0.11                    | STMR (EFSA, 2020a)    | 0.21                | HR (EFSA, 2020a) |
| Other root and tuber vegetables   | 0.11                    | STMR (EFSA, 2020a)    |                     | HR (EFSA, 2020a) |
| Garlic                            | 0.13                    | STMR (EFSA, 2020a)    | 0.33                | HR (EFSA, 2020a) |
| Onions                            | 0.13                    | STMR (EFSA, 2020a)    | 0.33                | HR (EFSA, 2020a) |
| Shallots                          | 0.13                    | STMR (EFSA, 2020a)    | 0.33                | HR (EFSA, 2020a) |
| Spring onions/green onions and Welsh onions | 0.13            | STMR (EFSA, 2020a)    | 0.33                | HR (EFSA, 2020a) |
| Other bulb vegetables             | 0.13                    | STMR (EFSA, 2020a)    | 0.33                | HR (EFSA, 2020a) |
| Tomatoes                          | 0.62                    | STMR (EFSA, 2020a)    | 0.85                | HR (EFSA, 2020a) |
| Sweet peppers/bell peppers        | 0.62                    | STMR (EFSA, 2020a)    | 0.85                | HR (EFSA, 2020a) |
| Aubergines/egg plants             | 0.62                    | STMR (EFSA, 2020a)    | 0.85                | HR (EFSA, 2020a) |
| **Okra/lady’s fingers**           | **0.62**                | **STMR rotational crop cucumber (EFSA, 2020a)** | **0.85**            | **HR rotational crop cucumber (EFSA, 2020a)** |
| Cucumbers                         | 0.62                    | STMR (EFSA, 2020a)    | 0.85                | HR (EFSA, 2020a) |
| Gherkins                          | 0.62                    | STMR (EFSA, 2020a)    | 0.85                | HR (EFSA, 2020a) |
| Courgettes                        | 0.62                    | STMR (EFSA, 2020a)    | 0.85                | HR (EFSA, 2020a) |
| Melons                            | 0.62                    | STMR (EFSA, 2020a)    | 0.85                | HR (EFSA, 2020a) |
| Pumpkins                          | 0.62                    | STMR (EFSA, 2020a)    | 0.85                | HR (EFSA, 2020a) |
| Watermelons                       | 0.62                    | STMR (EFSA, 2020a)    | 0.85                | HR (EFSA, 2020a) |
| Other cucurbits - inedible peel   | 0.62                    | STMR (EFSA, 2020a)    | 0.85                | HR (EFSA, 2020a) |
| Sweet corn                        | 0.17                    | STMR (EFSA, 2020a)    | 0.23                | HR (EFSA, 2020a) |
| Broccoli                          | 0.3                     | STMR (EFSA, 2020a)    | 0.4                 | HR (EFSA, 2020a) |
| Cauliflowers                      | 0.3                     | STMR (EFSA, 2020a)    | 0.4                 | HR (EFSA, 2020a) |
| Other flowering brassica          | 0.3                     | STMR (EFSA, 2020a)    | 0.4                 | HR (EFSA, 2020a) |
| Brussels sprouts                  | 0.3                     | STMR (EFSA, 2020a)    | 0.4                 | HR (EFSA, 2020a) |
| Head cabbages                     | 0.3                     | STMR (EFSA, 2020a)    | 0.4                 | HR (EFSA, 2020a) |
| Other head brassica               | 0.3                     | STMR (EFSA, 2020a)    | 0.4                 | HR (EFSA, 2020a) |
| Commodity                                      | Input value (mg/kg) | Comment(a)          | Input value (mg/kg) | Comment(a),(b) |
|-----------------------------------------------|---------------------|---------------------|---------------------|----------------|
| Chinese cabbages/pe-tsai                      | 0.3                 | STMR (EFSA, 2020a)  | 0.4                 | HR (EFSA, 2020a) |
| Kales                                         | 0.3                 | STMR (EFSA, 2020a)  | 0.4                 | HR (EFSA, 2020a) |
| Other leafy brassica                         | 0.3                 | STMR (EFSA, 2020a)  | 0.4                 | HR (EFSA, 2020a) |
| Kohlrabies                                     | 0.3                 | STMR (EFSA, 2020a)  | 0.4                 | HR (EFSA, 2020a) |
| Lamb’s lettuce/corn salads                    | 0.08                | STMR (EFSA, 2020a)  | 0.29                | HR (EFSA, 2020a) |
| Lettuces                                      | 0.08                | STMR (EFSA, 2020a)  | 0.29                | HR (EFSA, 2020a) |
| Escaroles/broad-leaved endives                | 0.08                | STMR (EFSA, 2020a)  | 0.29                | HR (EFSA, 2020a) |
| Cress and other sprouts and shoots            | 0.08                | STMR (EFSA, 2020a)  | 0.29                | HR (EFSA, 2020a) |
| Land cress                                    | 0.08                | STMR (EFSA, 2020a)  | 0.29                | HR (EFSA, 2020a) |
| Red mustards                                  | 0.08                | STMR (EFSA, 2020a)  | 0.29                | HR (EFSA, 2020a) |
| Baby leaf crops (including brassica species)  | 0.08                | STMR (EFSA, 2020a)  | 0.29                | HR (EFSA, 2020a) |
| Other lettuce and other salad plants          | 0.08                | STMR (EFSA, 2020a)  | 0.29                | HR (EFSA, 2020a) |
| Spinaches                                     | 0.08                | STMR (EFSA, 2020a)  | 0.29                | HR (EFSA, 2020a) |
| Purslanes                                     | 0.08                | STMR (EFSA, 2020a)  | 0.29                | HR (EFSA, 2020a) |
| Chards/beet leaves                            | 0.08                | STMR (EFSA, 2020a)  | 0.29                | HR (EFSA, 2020a) |
| Other spinach and similar                     | 0.08                | STMR (EFSA, 2020a)  | 0.29                | HR (EFSA, 2020a) |
| Grape leaves and similar species              | 0.08                | STMR (EFSA, 2020a)  | 0.29                | HR (EFSA, 2020a) |
| Watercress                                    | 0.08                | STMR (EFSA, 2020a)  | 0.29                | HR (EFSA, 2020a) |
| Witloofs/Belgian endives                      | 0.08                | STMR (EFSA, 2020a)  | 0.29                | HR (EFSA, 2020a) |
| Chervil                                       | 0.08                | STMR (EFSA, 2020a)  | 0.29                | HR (EFSA, 2020a) |
| Chives                                        | 0.08                | STMR (EFSA, 2020a)  | 0.29                | HR (EFSA, 2020a) |
| Celery leaves                                 | 0.08                | STMR (EFSA, 2020a)  | 0.29                | HR (EFSA, 2020a) |
| Parsley                                       | 0.08                | STMR (EFSA, 2020a)  | 0.29                | HR (EFSA, 2020a) |
| Sage                                          | 0.08                | STMR (EFSA, 2020a)  | 0.29                | HR (EFSA, 2020a) |
| Rosemary                                      | 0.08                | STMR (EFSA, 2020a)  | 0.29                | HR (EFSA, 2020a) |
| Thyme                                         | 0.08                | STMR (EFSA, 2020a)  | 0.29                | HR (EFSA, 2020a) |
| Basil and edible flowers                      | 0.08                | STMR (EFSA, 2020a)  | 0.29                | HR (EFSA, 2020a) |
| Laurel/bay leaves                             | 0.08                | STMR (EFSA, 2020a)  | 0.29                | HR (EFSA, 2020a) |
| Tarragon                                      | 0.08                | STMR (EFSA, 2020a)  | 0.29                | HR (EFSA, 2020a) |
| Other herbs                                   | 0.08                | STMR (EFSA, 2020a)  | 0.29                | HR (EFSA, 2020a) |
| Beans (with pods)                             | 0.98                | STMR (EFSA, 2020a)  | 2.27                | HR (EFSA, 2020a) |
| Beans (without pods)                          | 0.98                | STMR (EFSA, 2020a)  | 2.27                | HR (EFSA, 2020a) |
| Peas (with pods)                              | 0.98                | STMR (EFSA, 2020a)  | 2.27                | HR (EFSA, 2020a) |
| Peas (without pods)                           | 0.98                | STMR (EFSA, 2020a)  | 2.27                | HR (EFSA, 2020a) |
| Lentils (fresh)                               | 0.98                | STMR (EFSA, 2020a)  | 2.27                | HR (EFSA, 2020a) |
| Other legume vegetables (fresh)               | 0.98                | STMR (EFSA, 2020a)  | 2.27                | HR (EFSA, 2020a) |
| Asparagus                                     | 0.14                | STMR (EFSA, 2020a)  | 0.47                | HR (EFSA, 2020a) |
| Commodity                  | Chronic risk assessment | Acute risk assessment |
|---------------------------|------------------------|-----------------------|
|                           | Input value (mg/kg)    | Comment(a)            | Input value (mg/kg) | Comment(a),(b) |
| Cardoons                  | 0.14                   | STMR (EFSA, 2020a)    | 0.47                | HR (EFSA, 2020a) |
| Celeries                  | 0.14                   | STMR (EFSA, 2020a)    | 0.47                | HR (EFSA, 2020a) |
| Florence fennels          | 0.14                   | STMR (EFSA, 2020a)    | 0.47                | HR (EFSA, 2020a) |
| Globe artichokes          | 0.14                   | STMR (EFSA, 2020a)    | 0.47                | HR (EFSA, 2020a) |
| Leeks                     | 0.14                   | STMR (EFSA, 2020a)    | 0.47                | HR (EFSA, 2020a) |
| Rhubarbs                  | 0.14                   | STMR (EFSA, 2020a)    | 0.47                | HR (EFSA, 2020a) |
| Bamboo shoots             | 0.14                   | STMR (EFSA, 2020a)    | 0.47                | HR (EFSA, 2020a) |
| Palm hearts               | 0.14                   | STMR (EFSA, 2020a)    | 0.47                | HR (EFSA, 2020a) |
| Other stem vegetables     | 0.14                   | STMR (EFSA, 2020a)    | 0.47                | HR (EFSA, 2020a) |
| Beans                     | 3.19                   | STMR (EFSA, 2020a)    | 3.19                | STMR (EFSA, 2020a) |
| Lentils                   | 3.19                   | STMR (EFSA, 2020a)    | 3.19                | STMR (EFSA, 2020a) |
| Peas                      | 3.19                   | STMR (EFSA, 2020a)    | 3.19                | STMR (EFSA, 2020a) |
| Lupins/lupini beans       | 3.19                   | STMR (EFSA, 2020a)    | 3.19                | STMR (EFSA, 2020a) |
| Other pulses              | 3.19                   | STMR (EFSA, 2020a)    | 3.19                | STMR (EFSA, 2020a) |
| Linseeds                  | 0.09                   | STMR (EFSA, 2020a)    | 0.09                | STMR (EFSA, 2020a) |
| Peanuts/groundnuts        | 0.09                   | STMR (EFSA, 2020a)    | 0.09                | STMR (EFSA, 2020a) |
| Poppy seeds               | 0.09                   | STMR (EFSA, 2020a)    | 0.09                | STMR (EFSA, 2020a) |
| Sesame seeds              | 0.09                   | STMR (EFSA, 2020a)    | 0.09                | STMR (EFSA, 2020a) |
| Sunflower seeds           | 0.09                   | STMR (EFSA, 2020a)    | 0.09                | STMR (EFSA, 2020a) |
| Rapeseeds/canola seeds    | 0.09                   | STMR (EFSA, 2020a)    | 0.09                | STMR (EFSA, 2020a) |
| Soya beans                | 0.09                   | STMR (EFSA, 2020a)    | 0.09                | STMR (EFSA, 2020a) |
| Mustard seeds             | 0.09                   | STMR (EFSA, 2020a)    | 0.09                | STMR (EFSA, 2020a) |
| Cotton seeds              | 0.09                   | STMR (EFSA, 2020a)    | 0.09                | STMR (EFSA, 2020a) |
| Pumpkin seeds             | 0.09                   | STMR (EFSA, 2020a)    | 0.09                | STMR (EFSA, 2020a) |
| Safflower seeds           | 0.09                   | STMR (EFSA, 2020a)    | 0.09                | STMR (EFSA, 2020a) |
| Borage seeds              | 0.09                   | STMR (EFSA, 2020a)    | 0.09                | STMR (EFSA, 2020a) |
| Gold of pleasure seeds    | 0.09                   | STMR (EFSA, 2020a)    | 0.09                | STMR (EFSA, 2020a) |
| Hemp seeds                | 0.09                   | STMR (EFSA, 2020a)    | 0.09                | STMR (EFSA, 2020a) |
| Castor beans              | 0.09                   | STMR (EFSA, 2020a)    | 0.09                | STMR (EFSA, 2020a) |
| Other oilseeds            | 0.09                   | STMR (EFSA et al., 2020a) | 0.09   | STMR (EFSA, 2020a) |
| Barley                    | 0.43                   | STMR (EFSA, 2020a)    | 0.43                | STMR (EFSA, 2020a) |
| Buckwheat and other pseudo-cereals | 0.43 | STMR (EFSA, 2020a) | 0.43 | STMR (EFSA, 2020a) |
| Maize/corn                | 0.43                   | STMR (EFSA, 2020a)    | 0.43                | STMR (EFSA, 2020a) |
| Common millet/proso millet| 0.43                   | STMR (EFSA et al., 2020a) | 0.43   | STMR (EFSA, 2020a) |
| Oat                       | 0.43                   | STMR (EFSA, 2020a)    | 0.43                | STMR (EFSA, 2020a) |
| Rice                      | 0.43                   | STMR (EFSA, 2020a)    | 0.43                | STMR (EFSA, 2020a) |
| Rye                       | 0.43                   | STMR (EFSA, 2020a)    | 0.43                | STMR (EFSA, 2020a) |
| Sorghum                   | 0.43                   | STMR (EFSA, 2020a)    | 0.43                | STMR (EFSA, 2020a) |
| Wheat                     | 0.43                   | STMR (EFSA, 2020a)    | 0.43                | STMR (EFSA, 2020a) |
| Other cereals             | 0.43                   | STMR (EFSA, 2020a)    | 0.43                | STMR (EFSA, 2020a) |
| Other crops/commodities   | –                      | –                     | –                   | –               |

STMR: supervised trials median residue; HR: highest residue.
(a): The input values refer to residues of ‘flupyradifurone and DFA, expressed as flupyradifurone’ as estimated in untreated rotational crops by EFSA (EFSA, 2020a).
(b): Input values for the commodities which are not under consideration for the acute risk assessment are reported in grey.
## Appendix E – Used compound codes

| Code/trivial name<sup>(a)</sup> | IUPAC name/SMILES notation/InChiKey<sup>(b)</sup> | Structural formula<sup>(c)</sup> |
|--------------------------------|-----------------------------------------------|----------------------------------|
| **flupyradifurone**           | 4-[(6-chloro-3-pyridylmethyl)(2,2-difluoroethyl)amino]furan-2(5H)-one | ![Structural formula](image) |
|                              | FC(F)CN(Cc1ccc(Cl)nc1)C1=CC(-O)OC1             |                                  |
|                              | Q0IYTRGOFZNKF-UHFFFAOYSA-N                    |                                  |
| **DFA**                       | Difluoroacetic acid                           | ![Structural formula](image)     |
|                              | FC(F)C(-O)O                                   |                                  |
|                              | PBWZKZYHONABLN-UHFFFAOYSA-N                  |                                  |
| **TFA**                       | Trifluoroacetic acid                          | ![Structural formula](image)     |
|                              | FC(F)(F)C(-O)O                                |                                  |
|                              | DTQVDTLACAAQT-R-UHFFFAOYSA-N                 |                                  |
| **6-CNA**                     | 6-chloronicotinic acid                        | ![Structural formula](image)     |
|                              | OC(-O)c1ncn(Cl)cc1                            |                                  |
|                              | UAWMVMPAYRJWUFX-UHFFFAOYSA-N                 |                                  |
| **flupyradifurone-hydroxy**   | 4-[[6-chloropyridin-3-yl]methyl](2,2-difluoroethyl)amino-5-hydroxyfuran-2(5H)-one | ![Structural formula](image) |
| M8 metabolite                | OC2OC(-O)=C2N(CC(F)F)Cc1ccc(Cl)nc1            |                                  |
|                              | VCISBQOTABLQEA-UHFFFAOYSA-N                   |                                  |

<sup>(a)</sup>: The metabolite name in bold is the name used in the conclusion.

<sup>(b)</sup>: ACD/Name 2018.2.2 ACD/Labs 2018 Release (File version NS0E41, Build 103230, 21 July 2018).

<sup>(c)</sup>: ACD/ChemSketch 2018.2.2 ACD/Labs 2018 Release (File version C60H41, Build 106041, 7 December 2018).