Modification of the existing maximum residue level for prohexadione (considered variant prohexadione-calcium) in plums

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Abstract
In accordance with Article 6 of Regulation (EC) No 396/2005, the applicant BASF SE submitted a request to the competent national authority in France to modify the existing maximum residue level (MRL) for the active substance prohexadione in plums. The data submitted in support of this MRL application were found to be sufficient to derive a MRL proposal for plums. Adequate analytical methods for enforcement are available to control the residues of prohexadione in plums. Based on the risk assessment results, EFSA concluded that the long-term intake of residues resulting from the use of prohexadione on plums is unlikely to present a risk to consumer health.

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Keywords: prohexadione-calcium, plums, pesticide, MRL, consumer risk assessment

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Summary

In accordance with Article 6 of Regulation (EC) No 396/2005, BASF SE submitted an application to the competent national authority in France (evaluating Member State (EMS)) to modify the existing maximum residue level (MRL) for the active substance prohexadione in plums. 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 2 August 2016. To accommodate for the intended use of prohexadione, the EMS proposed to raise the existing MRL from the limit of quantification (LOQ) at 0.01 to 0.05 mg/kg.

EFSA based its assessment on the evaluation report submitted by the EMS, the draft assessment report (DAR) prepared under Council Directive 91/414/EEC, the additional report to the DAR prepared in the framework of Commission Regulation (EC) No 737/2007, the Commission review report on prohexadione-calcium, the conclusion on the peer review of the pesticide risk assessment of the active substance prohexadione (variant prohexadione-calcium), as well as the conclusions from previous EFSA opinions on prohexadione, including a reasoned opinion on the review of the existing MRLs according to Article 12 of Regulation (EC) No 396/2005 (MRL review).

The metabolism of prohexadione following foliar application was investigated in crops belonging to the groups of fruit crops, cereals/grasses and pulses/oilseeds.

Studies investigating the effect of processing on the nature and the magnitude of prohexadione have not been submitted and are not required, as the total theoretical maximum daily intake (TMDI) is below the trigger value of 10% of the acceptable daily intake (ADI).

As the proposed use of prohexadione is on permanent crops, investigations of residues in rotational crops are not required.

Based on the metabolic pattern identified in metabolism studies and the toxicological significance of metabolites, the residue definitions for plant products were proposed as 'prohexadione and its salts, expressed as prohexadione-calcium' for enforcement and risk assessment. EFSA concluded that for the intended use on plums metabolism of prohexadione in primary crops has been sufficiently 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 in plums according to the enforcement residue definition at the LOQ of 0.01 mg/kg.

The available residue trials are sufficient to derive a MRL proposal of 0.05 mg/kg for plums, based on a more critical northern Europe (NEU) use.

Residues of prohexadione in commodities of animal origin were not assessed since plums or their by-products are normally not fed to livestock.

The toxicological profile of prohexadione-calcium was assessed in the framework of the European Union (EU) pesticides peer review and the data were sufficient to derive an ADI of 0.2 mg/kg bw per day. No acute reference dose (ARfD) was deemed necessary.

The consumer risk assessment was performed with revision 2 of the EFSA Pesticide Residues Intake Model (PRIMo). A comprehensive long-term exposure assessment which was performed under MRL review was now updated with the median residue level (STMR) derived from the residue trials on plums. The exposure assessment included also the crops assessed in the Article 10 reasoned opinions that have been issued after the MRL review. A long-term consumer intake concern was not identified as the highest calculated chronic intake was estimated to be 0.5% of the ADI (DE, child). An acute consumer exposure assessment was not performed, since an ARfD was not established for prohexadione.

EFSA concluded that the proposed use of prohexadione on plums will not result in a consumer exposure exceeding the toxicological reference value and therefore is unlikely to pose a risk to consumers’ health.

EFSA proposes to amend the existing MRL as reported in the summary table below.
| Code\(^{(a)}\) | Commodity | Existing EU MRL (mg/kg) | Proposed EU MRL (mg/kg) | Comment/justification |
|-------------|------------|------------------------|-------------------------|------------------------|
| 0140040     | Plums      | 0.01\(^{*}\)          | 0.05                    | The submitted data are sufficient to derive a MRL proposal which reflects the more critical residue situation of the NEU use. No consumer health risk was identified |

**Enforcement residue definition:** Prohexadione (prohexadione (acid) and its salts expressed as prohexadione-calcium)

MRL: maximum residue level; NEU: northern Europe.

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

\(^{(a)}\): Commodity code number according to Annex I of Regulation (EC) No 396/2005.
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Background

Regulation (EC) No 396/20051 (hereinafter referred to as 'the MRL regulation') establishes the rules governing the setting of pesticide maximum residue levels (MRLs) at European Union (EU) level. Article 6 of the MRL regulation lays down that any party having a legitimate interest or requesting an authorisation for the use of a plant protection product in accordance with Council Directive 91/414/EEC2, repealed by Regulation (EC) No 1107/20093, shall submit an application to a Member State to modify a MRL in accordance with the provisions of Article 7 of the MRL regulation.

The applicant BASF SE4 submitted an application to the competent national authority in France, hereafter referred to as the evaluating Member State (EMS), to modify the existing MRL for the active substance prohexadione in plums. This application was notified to the European Commission and the European Food Safety Authority (EFSA) and was subsequently evaluated by the EMS in accordance with Article 8 of the MRL regulation.

The EMS summarised the data provided by the applicant in an evaluation report which was submitted to the European Commission and forwarded to EFSA on 2 August 2016. The application was included in the EFSA Register of Questions with the reference number EFSA-Q-2016-00499 and the following subject:

Prohexadione-calcium – MRLs in plums

France proposed to raise the existing MRL of prohexadione in plums from the limit of quantification (LOQ) of 0.01 to 0.05 mg/kg.

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

Terms of Reference

In accordance with Article 10 of Regulation (EC) No 396/2005, EFSA shall assess the application and the evaluation report and give a reasoned opinion on the risks to the consumer and where relevant to animals associated with the setting of the requested MRLs. The opinion shall include:

- an assessment of whether the analytical method for routine monitoring proposed in the application is appropriate for the intended control purposes;
- the anticipated LOQ for the pesticide/product combination;
- an assessment of the risks of the acceptable daily intake (ADI) and acute reference dose (ARfD) being exceeded as a result of the modification of the MRL;
- The contribution to the intake due to the residues in the product for which the MRLs was requested;
- Any other element relevant to the risk assessment.

In accordance with Article 11 of the MRL regulation, EFSA shall give its reasoned opinion as soon as possible and at the latest within three months from the date of receipt of the application.

The evaluation report submitted by the EMS (France, 2016) 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. Furthermore, a screenshot of the Report sheet of the PRIMo is presented in Appendix C.

The active substance and its use pattern

The detailed description of the intended use of prohexadione in plums, which is the basis for the current MRL application, is reported in Appendix A.

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1 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.
2 Council Directive 91/414/EEC of 15 July 1991 concerning the placing of plant protection products on the market. OJ L 230, 19.8.1991, p. 1–32.
3 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.
4 BASF SE, Speyerer Strasse 2, 67117 Limburgerhof, Germany.
Prohexadione is the ISO common name for 3,5-dioxo-4-propionylcyclohexanecarboxylic acid (IUPAC). The chemical structures of the active substance and its main metabolites are reported in Appendix E.

Prohexadione (considered variant prohexadione-calcium) was evaluated in the framework of Directive 91/414/EEC with France designated as rapporteur Member State (RMS). It was included in Annex I of this Directive by Directive 2000/50/EC which entered into force on 1 October 2000 for use as plant growth regulator only. The renewal of the approval of prohexadione in the framework of Regulation (EC) No 737/2007 was performed by France and Slovakia as designated rapporteur and co-rapporteur member states, respectively. The representative uses supported during the peer review for the renewal of the authorisation were foliar spraying on apples and cereals. The additional report to the draft assessment report (DAR) has been peer reviewed by EFSA (EFSA, 2010). The approval of the active substance under Regulation (EC) No 1107/2009 was renewed until 31 December 2021 by means of Commission Regulation (EU) No 702/2011, which entered into force on 1 January 2012. The approval is restricted to uses as a plant growth regulator.

The EU MRLs for prohexadione are established in Annex II of Regulation (EC) No 396/2005. The review of existing MRLs according to Article 12 of Regulation (EC) No 396/2005 (MRL review) has been performed (EFSA, 2013) and the proposed modifications have been implemented in the MRL legislation. After completion of the MRL review, EFSA has issued two reasoned opinions on the modification of MRLs for prohexadione in cherries and strawberries (EFSA, 2015, 2016). The proposals from these reasoned opinions have been considered in recent regulation for EU MRL legislation.

Assessment

EFSA has based its assessment on the evaluation report submitted by the EMS (France, 2016), the DAR prepared under Directive 91/414/EEC (France, 1998), the additional report to the DAR prepared in the framework of Commission Regulation (EC) No 737/2007 (France, 2009), the Commission review report on prohexadione-calcium (European Commission, 2011), the conclusion on the peer review of the pesticide risk assessment of the active substance prohexadione (variant prohexadione-calcium) (EFSA, 2010) as well as the conclusions from previous EFSA opinions on prohexadione (EFSA, 2012, 2015, 2016), including a reasoned opinion on the review of the existing MRLs according to Article 12 of Regulation (EC) No 396/2005 (EFSA, 2013).

For this application, the data requirements established in Regulation (EU) No 544/2011 and the guidance documents applicable at the date of submission of the application to the EMS are applicable (European Commission, 1997a-g, 2000, 2010a,b, 2016; OECD, 2011). 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.

5 Commission Directive 2000/50/EC of 26 July 2000 including an active substance (prohexadione-calcium) in Annex I to Council Directive 91/414/EEC concerning the placing of plant protection products on the market, OJ L 198, 4.8.2000, p. 39–40.
6 Commission Regulation (EC) No 737/2007 of 27 June 2007 on laying down the procedure for the renewal of the inclusion of a first group of active substances in Annex I to Council Directive 91/414/EEC and establishing the list of those substances. OJ L 169, 29.6.2007, p. 10–18.
7 Commission Implementing Regulation (EU) No 702/2011 of 20 July 2011 approving the active substance prohexadione, 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 190, 21.7.2011, p. 28–32.
8 Commission Regulation (EU) 2015/552 of 7 April 2015 amending Annexes II, III and V to Regulation (EC) No 396/2005 of the European Parliament and of the Council as regards maximum residue levels for 1,3-dichloropropene, bifenox, dimethenamid-P, prohexadione, tolylfluanid and trifluralin in or on certain products. OJ L 92, 8.4.2015, p. 20–85.
9 Commission Regulation (EU) 2016/1003 of 17 June 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 abamectin, acequinocyl, acetamiprid, benzoquinone, bromoxynil, flocidomycetin, fosetyl, mequinol, proquinazid, propamocarb, prohexadione and tebuconazole in or on certain products. OJ L 167, 24.6.2016, p. 46–103.
10 Commission Regulation (EU) 2017/171 of 30 January 2017 amending Annexes II, III and IV to Regulation (EC) No 396/2005 of the European Parliament and of the Council as regards maximum residue levels for aminopyralid, azoxystrobin, cyantraniliprole, cyflufenamid, cyproconazole, diethofencarb, dithiocarbamates, fluazifop-P, flupyradex, haloxefop, isofetamid, metalaxyl, prohexadione, propaquizafop, pyrimethanil, Trichoderma atroviride strain SC1 and zoxamide in or on certain products. OJ L 30, 3.2.2017, p. 45–111.
11 Commission Regulation (EU) No 544/2011 of 10 June 2011 implementing Regulation (EC) No 1107/2009 of the European Parliament and of the Council as regards the data requirements for active substances. OJ L 155, 11.6.2011, p. 1–66.
12 Commission Regulation (EU) No 546/2011 of 10 June 2011 implementing Regulation (EC) No 1107/2009 of the European Parliament and of the Council as regards uniform principles for evaluation and authorisation of plant protection products. OJ L 155, 11.6.2011, p. 127–175.
A selected list of end points of the studies assessed by EFSA in the framework of the MRL review, including the end points of studies submitted in support of the current MRL application, are presented in Appendix B.

1. Residues in plants

1.1. Nature of residues and methods of analysis in plants

1.1.1. Nature of residues in primary crops

The metabolism of prohexadione in primary crops belonging to the group of fruits, cereals/grass and pulses/oilseeds has been investigated in the framework of the renewal of the approval under Regulation (EC) No 737/2007 and the MRL review (EFSA, 2010, 2013).

In all crops investigated, only three metabolites were encountered in amounts exceeding 10% total radioactive residue (TRR): prohexadione (peanuts), tricarballylic acid (peanut hay, hull and barley straw) and the methoxymethyl metabolite (apples). The peer review concluded that as tricarballylic acid is a ruminant metabolite of a trans-aconitic acid that is naturally occurring in grass, further toxicological assessment is not required. The methoxymethyl metabolite was identified only in apples and additional residue trials on apples performed at exaggerated application rates indicated that under practical conditions this metabolite is not present at significant levels. Thus, the peer review and the MRL review concluded that parent prohexadione is the main residue in primary crops.

For the intended use on plums, the metabolic behaviour in primary crops is sufficiently addressed.

1.1.2. Nature of residues in rotational crops

As the proposed use of prohexadione is on permanent crops, investigations of residues in rotational crops are not required.

1.1.3. Nature of residues in processed commodities

Standard hydrolysis studies are not available regarding the stability of prohexadione under conditions representative for pasteurisation, boiling/cooking and sterilisation. Considering that the total calculated theoretical maximum daily intake (TMDI) is below the trigger value of 10% of the ADI, such studies are not necessary.

1.1.4. Methods of analysis in plants

Analytical methods for the determination of prohexadione residues were assessed during the EU pesticides peer review and the MRL review, where it was concluded that analytical method using high-performance liquid chromatography with tandem mass spectrometry (HPLC-MS/MS) is sufficiently validated for the determination of prohexadione and its salts at the LOQ of 0.01 mg/kg in plant matrices with high water content (apple), high oil content (oilseed rape), high acid content (lemon) and in dry/high starch content commodities (cereal grain and straw) (EFSA, 2010, 2013).

The methods are sufficiently validated for the determination of prohexadione residues in plums (high water content matrix) at the LOQ of 0.01 mg/kg.

1.1.5. Stability of residues in plants

The storage stability of prohexadione in apples and cereals stored under frozen conditions was investigated in the framework of the EU pesticides peer review (EFSA, 2010). Another storage stability study with peanuts has been assessed in the framework of a previous reasoned opinion (EFSA, 2012). It was demonstrated that in high water content matrix, relevant for the current application, residues are stable for at least 24 months when stored at −5°C.

1.1.6. Proposed residue definitions

Based on the metabolic pattern identified in metabolism studies, the toxicological significance of metabolites and the capabilities of enforcement analytical methods, the following residue definitions were proposed by the peer review and confirmed by the MRL review:
• Residue definition for risk assessment: prohexadione and its salts, expressed as prohexadione-calcium.
• Residue definition for enforcement: prohexadione and its salts, expressed as prohexadione-calcium.

The residue definition for enforcement set in Regulation (EC) No 396/2005 is identical with the above-mentioned residue definition.

EFSA concludes that these residue definitions are appropriate for the current assessment and no further information is required.

1.2. Magnitude of residues in plants

1.2.1. Magnitude of residues in primary crops

In support of the MRL application the applicant submitted residue trials on plums. The samples were analysed for prohexadione and the results were expressed as prohexadione-calcium, according to the risk assessment and enforcement residue definition. According to the assessment of the EMS, the analytical methods used were sufficiently validated and fit for purpose. The samples of these residue trials were stored under conditions for which integrity of the samples has been demonstrated.

In total, 16 residue trials on plums were submitted being performed in southern Europe (8 trials) and northern Europe (8 trials) in 2011 and 2013. Trials were designed in a way that one plot of the trial received two applications at 150 g/ha and the second plot received one application at 250 g/ha. The residue data provided for the second plot were not considered fully valid since the application was made at an earlier growth stage than indicated in the Good Agricultural Practice (GAP) and the total application rate was below the seasonal maximum of 300 g/ha.

The treatment pattern of plot 1 was considered GAP compliant. Plum samples were taken at various preharvest intervals (PHI)/growth stages and only the ones which provide information on residues in mature fruit at growth stages of mono- and dicotyledonous plants (BBCH) 87–89 were selected for the residue data set. The northern Europe (NEU) use results in a more critical residue situation and was therefore selected to derive a MRL proposal of 0.05 mg/kg for prohexadione in plums.

1.2.2. Magnitude of residues in rotational crops

Not relevant for the current application.

1.2.3. Magnitude of residues in processed commodities

New processing studies for plums have not been submitted and are not necessary as the TMDI is below the trigger value of 10% of the ADI.

1.2.4. Proposed MRLs

The available data are considered sufficient to derive MRL proposals as well as risk assessment values for plums (see Appendix B.1.2.1). In Section 3, EFSA assessed whether residues on these crops resulting from the intended uses are likely to pose a consumer health risk.

2. Residues in livestock

Not relevant as plums are not used for livestock feed purposes.

3. Consumer risk assessment

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

The ADI value for prohexadione-calcium used in the long-term risk assessment was derived in the framework of the EU pesticides peer review (EFSA, 2010). The EU pesticides peer review also concluded that the setting of an acute reference dose (ARfD) is not necessary and therefore the short-term dietary risk assessment does not need to be performed.
In the framework of the MRL review, a comprehensive long-term exposure assessment was performed, taking into account the existing uses of prohexadione at EU level (EFSA, 2013). After the MRL review, two additional Article 10 EFSA reasoned opinions have been issued and the exposure calculation performed in the latest opinion on the modification of MRLs in strawberries (EFSA, 2016) was now updated with the median residue level (STMR) on plums derived from the residue trials submitted in support of this MRL application. The input values used in the exposure calculations are summarised in Appendix D.

The estimated long-term dietary exposure accounted for a maximum of 0.5% of the ADI. The contribution of residues in plums to the overall long-term exposure is insignificant and is presented in more detail in Appendix B.3.

EFSA concludes that the long-term intake of residues of prohexadione resulting from the existing uses and the intended use on plums is unlikely to present a risk to consumer health.

Conclusions and recommendations

The data submitted in support of this MRL application were found to be sufficient to derive a MRL proposal for plums.

Adequate analytical methods for enforcement are available to control the residues of prohexadione in the plant matrix under consideration.

Based on the risk assessment results, EFSA concluded that the long-term intake of residues resulting from the use of prohexadione on plums is unlikely to present a risk to consumer 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
- **DAR** draft assessment report
- **DAT** days after treatment
- **DE** Germany
- **EMS** evaluating Member State
- **FAO** Food and Agriculture Organization of the United Nations
- **GAP** good agricultural practice
- **HPLC-MS/MS** high-performance liquid chromatography with tandem mass spectrometry
- **HR** highest residue
- **IEDI** international estimated daily intake
- **IESTI** international estimated short-term intake
- **ILV** independent laboratory validation
- **ISO** International Organisation for Standardisation
- **IUPAC** International Union of Pure and Applied Chemistry
- **LOQ** limit of quantification
- **MRL** maximum residue level
- **MW** molecular weight
- **NEU** northern Europe
- **OECD** Organisation for Economic Co-operation and Development
- **PBI** plant back interval
- **PHI** preharvest interval
- **PRIMo** (EFSA) Pesticide Residues Intake Model
- **RD** residue definition
- **RMS** rapporteur Member State
- **SEU** southern Europe
- **STMR** supervised trials median residue
- **TMDI** theoretical maximum daily intake
- **TRR** total radioactive residue
- **WG** water-dispersible granule
### Appendix A – Summary of intended GAP triggering the amendment of existing EU MRLs

| Crop | NEU, SEU, MS or country | F, G or I(b) | Pests or group of pests controlled(c) | Preparation | Application | Application rate per treatment | PHI (days)(k) | Remarks(l) |
|------|------------------------|-------------|--------------------------------------|-------------|-------------|--------------------------------|--------------|------------|
|      |                        |             |                                      | Type(d,f)   | Conc. a.s.(i) | Method kind(f-h) | Range of growth stages and season(j) | Number min-max | Interval between application (min) | Water L/ha min-max | g a.s./ha min-max | Covered by the time remaining between application and harvest | Do not exceed 2.5 kg plant protection product/ha in the first app. window and 1.5 kg/ha in the second app. window Maximum total dose = 3.0 kg product/ha |
| Plums | France (NEU/SEU) | F | Plant growth regulator | WG | 100 | Foliar spray | 1st application window: BBCH 60-69 2nd application window: BBCH 71-75 | (2 – see remarks) | 200–1500 | 50–250 (max total 300) | Covered by the time remaining between application and harvest | Do not exceed 2.5 kg plant protection product/ha in the first app. window and 1.5 kg/ha in the second app. window Maximum total dose = 3.0 kg product/ha |

**GAP:** good agricultural practice; **MRL:** maximum residue level; **NEU:** northern Europe; **SEU:** southern Europe; **WG:** water-dispersible granule; **a.s.:** active substance.

(a): In case of group of crops, the Codex classification should be used.
(b): Outdoor or field use (F), glasshouse application (G) or indoor application (I).
(c): E.g. biting and sucking insects, soil born insects, foliar fungi.
(d): E.g. wettable powder (WP), emulsifiable concentration (EC), granule (GR).
(e): Use CIPAC/FAO Codes where appropriate.
(f): All abbreviations used must be explained.
(g): Method, e.g. high volume spraying, low volume spraying, spreading, dusting, drench.
(h): Kind, e.g. overall, broadcast, aerial spraying, row, individual plant, between the plants.
(i): g/kg or g/L.
(j): Growth stage at last treatment.
(k): PHE: preharvest interval.
(l): Remarks may include: Extent of use/economic importance/restrictions (e.g. feeding, grazing)/minimal intervals between applications.
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       | Applications                                                                 | Sampling (DAT) |
|----------------------------------|-------------------|-------------|-------------------------------------------------------------------------------|----------------|
| Fruit crops                      | Apples            | Foliar, 2 × 0.98 kg/ha |                                                                          | 45             |
| Cereals/grass                    | Barley            | Foliar, 1 × 0.13–0.14 kg/ha |                                         | 2, 8 and 66 |
|                                  | Rice              | Foliar, 1 × 0.03 or 0.3 kg/ha |                                                  | 50             |
|                                  |                   |             |                                                                              | 25 and 50      |
| Pulses/oilseeds                  | Peanut            | Foliar, 1 × 1.12 kg/ha |                                                                  | 0, 13 and 22   |
| Radiolabelled active substance   |                   |             |                                                                              |                |

| Rotational crops (available studies) | Crop groups | Crop(s) | Application(s) | PBI (DAT) |
|-------------------------------------|-------------|---------|---------------|-----------|
|                                     | Not relevant for the current application |         |               |           |

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

DAT: days after treatment; PBI: plant back interval.

Can a general residue definition be proposed for primary crops? Yes

Rotational crop and primary crop metabolism similar? Yes

Residue pattern in processed commodities similar to residue pattern in raw commodities? Unknown

Plant residue definition for monitoring (RD-Mo) Prohexadione and its salts expressed as prohexadione-calcium

Plant residue definition for risk assessment (RD-RA) Prohexadione and its salts expressed as prohexadione-calcium

Conversion factor (monitoring to risk assessment) Not applicable

Methods of analysis for monitoring of residues (analytical technique, crop groups, LOQs) Matrices with high water content, high oil content, high acid content and dry/high starch content matrices: HPLC-MS/MS, LOQ 0.01 mg/kg (EFSA, 2010)

Independent laboratory validation (ILV) available
### B.1.1.2. Stability of residues in plants

| Plant products (available studies) | Category           | Commodity     | T (°C) | Stability (months/years) |
|----------------------------------|--------------------|---------------|--------|--------------------------|
|                                  | High water content | Apple         | –5     | 24                       |
|                                  | Dry/high starch    | Grain, straw  | –20    | 24                       |
|                                  | High oil content   | Peanuts       | –12    | 1                        |
| EFSA (2010, 2012)                |                    |               |        |                          |
### B.1.2. Magnitude of residues in plants

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

| Crop (supervised trials) | Region/indoor(a) | Residue levels observed in the supervised residue trials (mg/kg) | Comments (OECD calculations) | MRL proposals (mg/kg) | HR<sub>Mo</sub>(b) (mg/kg) | STMR<sub>Mo</sub>(c) (mg/kg) |
|--------------------------|------------------|---------------------------------------------------------------|-----------------------------|----------------------|----------------|----------------|
| Plums                    | NEU              | 5 × < 0.01; 0.013; 0.019; 0.035                                | The NEU use results in a more critical residue situation and therefore used to derive a MRL proposal MRL<sub>OECD</sub> = 0.049 | 0.05                 | 0.04           | 0.01           |
|                          | SEU              | 8 × < 0.01                                                   |                             | 0.01*                | 0.01           | 0.01           |

MRL: maximum residue level; OECD: Organisation for Economic Co-operation and Development.

*: Indicates that the MRL is proposed at the limit of quantification.

(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 according to the residue definition for monitoring.

(c): Supervised trials median residue according to the residue definition for monitoring.
B.1.2.2. Residues in succeeding crops
Not relevant as intended use is on permanent crops.

B.1.2.3. Processing factors
No new processing studies submitted.

B.2. Residues in livestock
Not relevant as plums or their by-products are not fed to livestock.

B.2.1. Nature of residues and methods of analysis in livestock
Not relevant as plums or their by-products are not fed to livestock.

B.2.2. Magnitude of residues in livestock
Not relevant as plums or their by-products are not fed to livestock.

B.3. Consumer risk assessment

| ARfD | Highest IESTI, according to EFSA PRIMo | Assumptions made for the calculations |
|------|--------------------------------------|---------------------------------------|
|      | Not deemed necessary (EFSA, 2010)    | Not relevant                          |

| ADI | Highest IEDI, according to EFSA PRIMo |
|-----|---------------------------------------|
| 0.2 mg/kg bw per day (EFSA, 2010) | 0.5% ADI (DE child diet) Contribution of crops assessed: Plums: 0.001% of ADI |

Assumptions made for the calculations
The calculation is based on the median residue levels derived for raw agricultural commodities The contribution of commodities where no GAP was reported in the framework of the MRL review was not considered in the calculation

B.4. Recommended MRLs

| Code(a) | Commodity | Existing EU MRL (mg/kg) | Proposed EU MRL (mg/kg) | Comment/justification |
|---------|-----------|-------------------------|-------------------------|-----------------------|
| 0140040 | Plums     | 0.01*                   | 0.05                    | The submitted data are sufficient to derive a MRL proposal which reflects the more critical residue situation of the NEU use. No consumer health risk was identified |

MRL: maximum residue level; NEU: northern Europe.
* indicates that the MRL is set at the limit of analytical quantification (LOQ).
(a): Commodity code number according to Annex I of Regulation (EC) No 396/2005.
Appendix C – Pesticide Residue Intake Model (PRIMo)

**Prohexadione**

- **Status of the active substance:** Included
- **Code no.:**
- **LOQ (mg/kg bw):** Proposed LOQ

| Toxicological end points |
|--------------------------|
| ADI (mg/kg bw per day): | 0.2 |
| ARfD (mg/kg bw): | n.n. |
| Source of ADI: | EFSA |
| Year of evaluation: | 2010 |
| Source of ARfD: | EFSA |
| Year of evaluation: | 2010 |

**Chronic risk assessment – refined calculations**

| Commodity/group of commodities | TMDI (range) in % of ADI |
|--------------------------------|--------------------------|
|                                | minimum – maximum        |
| Highes calculated TMDI values in % of ADI | MS Diet |
|                                | Highest contributor to MS diet (in % of ADI) | Commodity group of commodities |
|                                | 2nd contributor to MS diet (in % of ADI) | Commodity/group of commodities |
|                                | 3rd contributor to MS diet (in % of ADI) | Commodity/group of commodities |
|                                | pTMRLs at LOQ (in % of ADI) |
| 0.5 DE child | 0.3 | Apple | 0.1 | Wheat | 0.1 | Milk and milk products: Cattle | 0.1 |
| 0.5 NL child | 0.2 | Apple | 0.1 | Milk and milk products: Cattle | 0.1 | Wheat |
| 0.3 DK child | 0.1 | Wheat | 0.1 | Apple | 0.1 | Apple |
| 0.3 WHO Cluster diet B | 0.2 | Wheat | 0.0 | Apple | 0.0 | Milk and milk products: Cattle | 0.0 | Apple |
| 0.2 WHO cluster diet D | 0.2 | Wheat | 0.0 | Milk and milk products: Cattle | 0.0 | Apple |
| 0.2 ES child | 0.1 | Wheat | 0.1 | Milk and milk products: Cattle | 0.0 | Apple |
| 0.2 FR infant | 0.1 | Milk and milk products: Cattle | 0.1 | Apple | 0.0 | Wheat |
| 0.2 IT children | 0.1 | Wheat | 0.0 | Apple | 0.0 | Apple |
| 0.2 WHO cluster diet E | 0.1 | Wheat | 0.0 | Apple | 0.0 | Apple |
| 0.2 SE general population 90th percentile | 0.1 | Wheat | 0.1 | Milk and milk products: Cattle | 0.0 | Apple |
| 0.2 WHO Cluster diet F | 0.1 | Wheat | 0.0 | Milk and milk products: Cattle | 0.0 | Apple |
| 0.2 IE adult | 0.1 | Wheat | 0.0 | Apple | 0.0 | Apple |
| 0.2 PT General population | 0.1 | Wheat | 0.0 | Apple | 0.0 | Apple |
| 0.2 UK Toddler | 0.1 | Wheat | 0.0 | Apple | 0.0 | Apple |
| 0.2 FR toddler | 0.1 | Apple | 0.0 | Apple | 0.0 | Apple |
| 0.1 WHO regional European diet | 0.1 | Wheat | 0.0 | Milk and milk products: Cattle | 0.0 | Apple |
| 0.1 NL general | 0.1 | Wheat | 0.0 | Milk and milk products: Cattle | 0.0 | Apple |
| 0.1 FR all population | 0.1 | Wheat | 0.0 | Milk and milk products: Cattle | 0.0 | Apple |
| 0.1 ES adult | 0.1 | Wheat | 0.0 | Milk and milk products: Cattle | 0.0 | Apple |
| 0.1 LT adult | 0.0 | Apple | 0.0 | Apple | 0.0 | Apple |
| 0.1 IT adult | 0.1 | Wheat | 0.0 | Apple | 0.0 | Apple |
| 0.1 UK infant | 0.1 | Wheat | 0.0 | Apple | 0.0 | Apple |
| 0.1 DK adult | 0.1 | Wheat | 0.0 | Apple | 0.0 | Apple |
| 0.1 UK vegetarian | 0.1 | Wheat | 0.0 | Apple | 0.0 | Apple |
| 0.1 PL general population | 0.1 | Apple | 0.0 | Apple | 0.0 | Apple |
| 0.1 UK adult | 0.1 | Wheat | 0.0 | Apple | 0.0 | Apple |
| 0.1 FI adult | 0.0 | Wheat | 0.0 | Apple | 0.0 | Apple |

**Conclusion:**
The estimated Theoretical Maximum Daily Intakes (TMDI), based on pTMRLs were below the ADI. A long-term intake of residues of Prohexadione is unlikely to present a public health concern.
Acute risk assessment is not necessary.

For each commodity, the calculation is based on the highest reported MS consumption per kg bw and the corresponding unit weight from the MS with the critical consumption. If no data on the unit weight was available from that MS, an average European unit weight was used for the IESTI calculation.

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

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

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

| Unprocessed commodity | No of commodities for which ARfD/ADI is exceeded (IESTI 1): | No of commodities for which ARfD/ADI is exceeded (IESTI 2): | No of commodities for which ARfD/ADI is exceeded (IESTI 1): | No of commodities for which ARfD/ADI is exceeded (IESTI 2): |
|-----------------------|-------------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|
| IESTI 1               | *)                                                         | **)                                                       | IESTI 2                                                      | *)                                                         |
|                      | Highest % of ARfD/ADI Commodity pTMRL/ threshold MRL (mg/kg) | Highest % of ARfD/ADI Commodity pTMRL/ threshold MRL (mg/kg) | Highest % of ARfD/ADI Commodity pTMRL/ threshold MRL (mg/kg) | Highest % of ARfD/ADI Commodity pTMRL/ threshold MRL (mg/kg) |
|                      |                                                             |                                                             |                                                             |                                                             |
| No of critical MRLs (IESTI 1): | | | No of critical MRLs (IESTI 2): | | |

| Processed commodities | No of commodities for which ARfD/ADI is exceeded: | No of commodities for which ARfD/ADI is exceeded: |
|-----------------------|----------------------------------------------------|----------------------------------------------------|
|                       | *)                                                 | **)                                                |
|                      | Highest % of ARfD/ADI Processed commodities pTMRL/ threshold MRL (mg/kg) | Highest % of ARfD/ADI Processed commodities pTMRL/ threshold MRL (mg/kg) |
|                       |                                                     |                                                     |

*) The results of the IESTI calculations are reported for at least 5 commodities. If the ARfD is exceeded for more than 5 commodities, all IESTI values > 90% of ARfD are reported.

**) pTMRL: provisional temporary MRL.

Conclusion:
As no ARfD was considered necessary, it is concluded that the short-term intake of Prohexadione residues is unlikely to present a public health concern.
## Appendix D – Input values for the exposure calculation

### Consumer risk assessment

| Commodity                           | Input value (mg/kg) | Comment                                                                 |
|-------------------------------------|---------------------|-------------------------------------------------------------------------|
| Plums                               | 0.01                | STMR                                                                    |
| Strawberries                        | STMR                | See Table 5 in the Article 10 reasoned opinion (EFSA, 2016)             |
| Cherries                            | STMR                | See Table 5 in the Article 10 reasoned opinion (EFSA, 2015)             |
| Other commodities of plant and animal origin | STMR                | See Table 4-1 in reasoned opinion on MRL review (EFSA, 2013)            |

STMR: supervised trials median residue.
### Appendix E – Used compound codes

| Code/trivial name      | Chemical name/SMILES notation                                                                 | Structural formula |
|------------------------|---------------------------------------------------------------------------------------------|--------------------|
| Prohexadione           | 3,5-Dioxo-4-propionylcyclohexanecarboxylic acid O=C1CC(CC(-O)C1C(-O)CC)(O)=O                   | ![Structural formula for Prohexadione](image) |
| Prohexadione-calcium   | Calcium 3-oxido-5-oxo-4-propionylcyclohex-3-enecarboxylate [Ca+2].O=C1CC(CC([-O])=C1C(-O)CC)=O(=O) | ![Structural formula for Prohexadione-calcium](image) |