Evaluation Manual for the Authorisation of plant protection products according to Regulation (EC) No 1107/2009

EU part

Plant protection products

Chapter 4 Residues; residue dossier

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Board for the Authorisation of Plant Protection Products and Biocides

Chapter 4 Residues; residue dossier

Category: Plant protection products

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Changes in the Evaluation Manual

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Version	**Date**	**Paragraph**	**Changes**
2.1	October 2016	Whole document	Text from data requirements (grey boxes) deleted from the Evaluation Manual and replace with references as hyperlink to original documents. Short description of data requirements included in the text.
2.2	January 2018	General introduction and par. 1.1	Reference to Regulation (EC) 396/2005 and Annex I of this Regulation has been added.
2.3	February 2018	Appendix LoEP	New version of EFSA Primo model (revision 3) is available from 01.02.2018. Reference to the newest version was added.
2.4	June 2019	Derivation of endpoints and reference values	MRL bijenhoning, paragraph *1.3.8. Residues in honey* was added.
		Appendix 1	Appendix 1 has been updated: newest available version of List of Endpoints was added.
2.5	January 2020	1.	Sentence included on the administrative EFSA guidance
2.6	April 2020	6.3 6.4 6.6 6.9	Typo in link to extrapolation table has been corrected. Link to Animal model 2017 has been updated. Reference to OECD Guidance 97 (rotational crop residue studies) was added. New version of EFSA Primo model (revision 3.1) is available. Reference to the newest version was added.
2.7	January 2021	1.3.2	Reference to the newest version of the extrapolation guidance has been added (repealing and replacing the existing Guidance Document SANCO 7525/VI/95 Rev. 10.3 for all applications submitted after 1 January 2021)
2.8	July 2021	All sections	Check and correction of links
2.9	July 2023	1 1.2 6.2 and 6.5 6.2 6.10 1.3.5 1.3.6 1.3.7	Reference to Administrative Guidance 2021 General remark about newest guidances and guidelines. Corrections related to data requirements Reg. (EU) No 283/2013. Removal of redundant content. Clarification fish guidance. Reference to technical guideline honey Clarification crop classification related to replanting restrictions. Clarification MRL compliance. Clarification residues in honey

3.0	December 2024	6.6	Link to new guidance on residues in rotational crops added.
3.1	August 2025	6.3	Reference to the newest version of the extrapolation guidance (SANTE/2019/12752 - revision2) has been added.
3.2	January 2026	1.2	Reference to Commission Communications 2013/C 95/01 and 2013/C 95/02 replaced by Commission Communications 2023/C 344/02 (chemical active substances) and 2023/C 344/01 (chemical plant protection products).
3.3	October 2026	General introduction	Addition of a note to align this evaluation manual chapter with the effects of Reg. (EU) 2024/1487.

GENERAL INTRODUCTION

This chapter describes the data requirements for the aspect residues and how these are evaluated for the EU framework (§1 - §1.5) under Regulation (EC) No 1107/2009 .

With regard to Maximum Residue Levels (MRLs), Regulation (EC) No 1107/2009 refers to Regulation (EC) No 396/2005.

Note added in the version 2.8 update to align this evaluation manual chapter with the effects of Reg. (EU) 2024/1487 (entry into force on 19 June 2024) defining data requirements for the approval of safeners and synergists and establishing a work programme for the gradual review of safeners and synergists on the market in accordance with Regulation (EC) No 1107/2009:

Data requirements for active substances as described in this chapter likewise apply to safeners and synergists, pursuant to Regulation (EU) 2024/1487 (amended by Regulation (EU) 2025/2274). **For the purposes of this evaluation manual, references to active substance shall be understood as referring collectively to active substances, synergists and safeners.**

In accordance with (EC) No 1107/2009, Art.81(1), a derogation applies for plant protection products that contain yet non-approved safeners and synergists that have been included in the work programme; until 3 December 2030, such products are subject to the data requirements as they were before the entry into force of (EU) 2024/1487.

1. EU FRAMEWORK

In this document, the procedures for the evaluation and re-evaluation of active substances as laid down in the EU are described; the NL procedure for evaluation of a substance is reverted to when no EU procedure has been laid down.

This document aims to give procedures for the approval of active substances and inclusion in Commission Implementing Regulation (EU) No 540/2011.

Notifiers preparing an assessment report for active substances need to comply with the relevant guidance, instructions and format laid down in the EFSA Administrative guidance on submission of dossiers and assessment reports for the peer-review of pesticide active substances.

New provisions in relation to the implementation of the Transparency Regulation, which amended the General Food Law, are reflected in the EFSA "Administrative guidance on submission of dossiers and assessment reports for the peer-review of pesticide active substances and on the MRL application procedure". It is noted that the new provisions apply to all dossiers and assessment reports for the peer-review of pesticide active substances and for MRL applications submitted as of 27 March 2021.

1.1. Introduction

The use of plant protection products may result in residues in foodstuffs. Their use may directly and indirectly lead to exposure to residues via food:

- *Direct exposure via food*
  Residues may remain present after the use of plant protection products on or in crops and stored products. Such crops/products are directly used for human consumption or serve as raw material for food and drink. Furthermore, exposure via drinking water may occur in case of contact with surface water during application or where pesticides or their metabolites leach to the groundwater.

- *Indirect exposure via food*
  Residues in treated crops, intended for animal feeding, may result in the transmission of residues to animal products that are eventually used for human consumption (such as meat and milk).

Residue data are requested to be able to estimate the nature and level of the residues. Residue data may relate to the following:

- the application of plant protection products on agricultural and horticultural crops, fully or partly intended for consumption;
- the application of plant protection products on crops which may via feeding to livestock lead to residues in animal products;
- the succeeding crops following treated crops on the same field; such consumption - crops are grown after the crop in/on which the plant protection product has been applied;
- the application of plant protection products on crops foraged by bees which may lead to residues in honey
- the application of plant protection products on stored foodstuffs or raw materials for foodstuffs;
- residues in drinking water by drift of pesticides to waterways or leaching to the groundwater.

The products of plant and animal origin to which the maximum residue levels of pesticides (MRLs) set by Regulation (EC) No 396/2005 apply are listed in Annex I to that Regulation. Annex I to the Regulation (EC) No 396/2005 is available at the EU Commission website.

The analytical methods and corresponding validation for the crops or animal products in question, as they are used in residue research, are described in Evaluation Manual, Chapter 2: Physical chemical properties and analytical methods.

1.2. Data requirements

In order to qualify for inclusion of an active substance in Commission Implementing Regulation (EU) No 540/2011, a dossier that meets the provisions laid down in Commission Regulation (EU) No 283/2013 and Commission Regulation (EU) No 284/2013 must be submitted for the active substance as well as for the plant protection product.

Guidance documents, test methods and supporting documents relevant for the risk assessment processes are included in Commission Communication 2023/C 344/02 and 2023/C 344/01 for chemical active substances and plant protection products, respectively.

When, according to the applicant, a certain study is not necessary, a relevant scientific justification can be provided for the non-submission of the particular study.

Tests and analyses shall be conducted under GLP. For derogations, please refer to the data requirements.

The analytical methods and corresponding validation for the crops or animal products in question, as used in the residue studies, must be described in each residue report or reference must be made to a separate report in which the method is described. Such a report must then also be submitted. In addition, an analytical method for enforcement must be submitted (for data requirements and evaluation criteria for these pre- and post-registration analytical methods, see Evaluation Manual: Chapter 2 Analytical methods).

1.2.1. Data requirements active substance

The data requirements regarding residues of the active substance are described in *Commission Regulation (EU) No 283/2013, section 6.*

6. Residues in or on treated products, food and feed (283/2013; 6)

6.1 Storage stability of residues

The specific data requirements on stability of residues are provided in Commission Regulation (EU) No 283/ 2013 in section 6.1.

6.2 Metabolism, distribution and expression of residues

The specific data requirements on metabolism of residues are provided in Commission Regulation (EU) No 283/ 2013 in section 6.2.

Detailed circumstances in which plant metabolism is required are described in section 6.2.1

Metabolism studies must be carried out with representative crops, where test conditions should approach the intended use as much as possible: method of application (soil, seed or crop treatment), description of physical facility (field, glasshouse, chambers), number of applications, application intervals, growth stage at the moment of application and harvest, and the (non)use of a surfactant (see §1.2.2, this document) are relevant.

Metabolism studies are also required to be able to determine whether other metabolites are formed in or on the plant than after intake of the active substance in the animal (see also Evaluation Manual: Chapter 4 Human Toxicology); but which could still be toxicologically relevant for consumers.

Metabolites in plant studies that are part of the extractable fraction and which at harvest form more than 10% of the total amount of recovered radioactive residue or more than 0.05 mg/kg residue in the plant part in question should always be identified. Metabolites exceeding 0.01 mg/kg should be characterised. A scientific justification should show that the toxicology of the metabolite in question is covered by the toxicological profile in laboratory animals, or supplementary toxicological research must be carried out with the metabolite(s) formed on or in the plant in view of possible human exposure. It depends on the results of this research whether the metabolite is considered as toxicologically relevant or non-relevant and whether or not it should be included in the residue definition.

Detailed circumstances in which animal metabolism are required are described in section 6.2.2 (poultry), section 6.2.3 (lactating ruminants), section 6.2.4 (pigs) and section 6.2.5 (fish)

According to the data requirement metabolism studies in animals are required when the residue intake is expected to exceed 0.004 mg/kg bw/day.

Because the behaviour of the active substance in ruminants and poultry may differ significantly from that in the rat, metabolism research must generally be carried out in a lactating ruminant and laying poultry, except where (e.g.) the crop on which the product is applied is not fed to the particular animal group. In cases where metabolic pathways in rodents (typically rats) differ significant from those in ruminants (typically goats), a pig metabolism study might be required.

Where research is required, the nature of the residues in meat, fat, kidney (ruminants and swine only), liver and milk or eggs must be determined.

Metabolites must generally be identified when a metabolite forms more than 10% of the total amount of recovered residue or more than 0.05 mg/kg residue in the animal product in question.

A scientific justification should in such cases show that the toxicology of the metabolite in question is covered by the toxicological profile in test animals, or supplementary toxicological research must be carried out with the metabolite(s) in view of possible human exposure.
It then depends on the results of this research whether or not the metabolite is considered as toxicologically relevant; this may have consequences for the residue definition.

To address the data requirements for fish, a working document on the nature of residues in fish was published back in 2013 (SANCO / 11187/2013, 31 January 2013 rev. 3). Since then, first experience has been gained and incorporated into three documents on the Nature of Pesticides Residues in fish (SANTE/10254/2021), on Dietary Burden Calculations (SANTE/10250/2021) and on the Magnitude of Pesticides Residues in fish (SANTE/10252/2021). The documents are available on the website of the European Commission and are recommended to address the data requirements for fish. However, in the absence of agreed test guidelines as published in the respective Commission Communications, the data requirements regarding fish could still be waived.

6.3 Magnitude of residues in plants

The specific data requirement on magnitude of residues in plants are provided in Commission Regulation (EU) No 283/2013 in section 6.3.

Where the requested use concerns a group of comparable crops, determination of the residues in one or more representatives of the crop groups is sometimes sufficient and results may then be extrapolated to related crops.

For crop classification we refer to the extrapolation tables presented in the Technical Guidelines on the data requirements for setting maximum residue levels, comparability of residue trials and extrapolation of residue data on products from plant and animal origin (SANTE/2019/12752).

Not all crops are mentioned in the extrapolation tables. Where crops are not mentioned, this usually means that no data are present and that trails must be carried out with the crop in question.

6.4 Feeding studies

The specific data requirement on livestock feeding studies are provided in Commission Regulation (EU) No 283/2013 in section 6.4.

Livestock feeding studies are conducted to quantify levels of residues in meat, milk, eggs and edible meat by-products. The main purpose of these studies is to provide the basis for establishing maximum residues limits (MRLs) and consequently to conduct dietary intake assessments for consumer safety.

The point under 'circumstances in which required' refers to the amount of residues in the total amount of received dry feed. Where metabolism research in livestock shows that significant amounts of residue (<0.01 mg/kg) cannot occur in animal products, feeding studies are not required unless the metabolism study in livestock shows a potential for significant bioaccumulation of the pesticide in animal .

In case feeding studies are required, these must be carried out in lactating ruminants and laying poultry. If the metabolic pathway in the pig study is different than in the ruminant study, a pig feeding study should be conducted unless the intake by pigs is not significant.

Animals are exposed over a long period in order to reach the constant concentration reached in the course of time in the various tissues: the so-called plateau value.

To establish the speed of elimination from the system, a number of animals from the study can be used to study depuration, where animals are sacrificed some time, e.g. two weeks, after the dosing was ceased.

Fat-soluble characteristic of the residues should be taken into account when planning the feeding studies.

To avoid discrepancies in the MRL setting resulting from the use of different feedstuff tables and animal species, the following approach was agreed during the Standing Committee on plants, animals, food and feed (SCoPAFF) on 11 and 12 June 2015:

- The animal intake triggering the submission of animal studies remains 0.1 mg/kg DM for the active substances falling under Reg. (EU) No 544/2011 and 0.004 mg/kg bw under Reg. (EU) No 283/2013.
- Animal dietary burden and MRL setting calculations are preformed according to feedstuff tables listed in the OECD Guidance series 64/32 and detailed in the OECD Guidance 73.

In order to harmonise and facilitate the MRL setting approach, EFSA has developed an Excel calculator: Animal_model_2017. xls, based on the OECD feedstuff tables and approach detailed in the OECD Guidance 73.

Furthermore, EFSA developed the following guidance which should be considered in risk assessments:

EFSA document: Estimation of animal intakes and HR, STMR and MRL calculations for products of animal origin, contains introduction and instruction how to assess livestock metabolism and feeding studies and to derive MRLs for products of animal origin, when relevant.

6.5 Effect of processing (283/2013; 6.5)
The specific data requirements on effect of processing are provided in Commission Regulation (EU) No 283/2013 in section 6.5.

Processing studies are not required when no significant or no analytically available residues occur in the plant or animal product which would be processed.

The data are required to gain insight in the extent of effect on the nature of the reside and the extent of effect on the magnitude of the residue in the processed product in comparison with the unprocessed product.

Detailed circumstances in which nature of residues is required are described in section 6.5.1.

This research in particular concerns obtaining information about the formation of specific degradation products during processing of the treated product.

Where a product consists of an edible part (flesh, pulp) and an inedible part (peel), data on the distribution of the residue over peel and flesh must be submitted.

Detailed circumstances in which study on distribution of the residue in inedible peel and pulp is required, are described in section 6.5.2 and magnitude of residues in processed commodities are described in section 6.5.3.

If the processed plant products play an important part in the diet, and if the hydrolysis study indicates that a significant transfer of residue into the processed products could occur, then studies in processed commodities to determine residue concentration or dilution factors must be carried out.

If the level of residues is less than 0,1 mg/kg, processing studies shall be carried out if the contribution of the commodity under consideration to the theoretical maximum daily intake (TMDI) is ≥ 10 % of the ADI or if the estimated daily intake is ≥ 10 % of the ARfD for any European consumer group diet.

Processing studies should simulate industrial or domestic practises as closely as possible. A distinction is made in two types of magnitude of residues processing studies; balance studies and follow up studies. In balance studies, the aim of such studies is where possible to determine the distribution of the residues in all intermediate and end products and, where appropriate, the waste products arising from the processing. The basis for the follow-up studies is always dependant on the corresponding balance studies. If as a result of the balance studies the distribution of the residues is known for all intermediate and end products, then more extensive studies can be limited to important end products or intermediate products, i. e. to products which either reach the consumer direct, as an end product, or which are used as the starting product for further processing.

6.6 Residues in succeeding crops.
The specific data requirements on residues in succeeding crops are provided in Commission Regulation (EU) No 283/2013 in section 6.6.

Rotational food or feed crops are also referred to as succeeding or following crops and are defined as any field or aquatic crops, which may be planted after the harvest of a pesticide treated primary crop, replanted crop after failure of the pesticide treated primary crop, application of plant protection product as a soil treatment or before emergence of the crop.

Where it cannot be ruled out that residues will occur in succeeding crops, metabolism studies must be carried out, if necessary followed by field trials. If these data show that residues may occur in succeeding crops, risk assessments must be conducted for these residues, or

residues must be prevented by stipulating label restrictions. Additionally, MRLs can be set for rotational crops.

Detailed circumstances in which metabolism in rotational crops is required are described in section 6.6.1 and for magnitude of residues in rotational crops in section 6.6.2. Additional detailed guidance on rotational crop residue studies are provided in OECD Guidance 97 and the "Guidance on the assessment of pesticide residues in rotational crops" (EFSA Journal 2023;21(11):8225).

6.7 Proposed residue definition and maximum residue levels
The specific data requirements on proposed residue definition and maximum residue levels are provided in Commission Regulation (EU) No 283/2013 in section 6.7.

6.8 Proposed safety intervals
The specific data requirements on proposed safety intervals are provided in Commission Regulation (EU) No 283/2013 in section 6.8.

The pre-harvest interval or PHI is the period between the last application of the plant protection product and harvest, or the period between the treatment of grassland and grazing or feeding of the grass, or the period between the last application of the plant protection product and using or putting the products treated with the plant protection product on the market (in case of post-harvest treatments).

The pre-harvest interval is part of the GAP (Good Agricultural Practice) and should be mentioned in the 'wettelijk gebruiksvoorschrift ' (WG) (Statutory Use Instructions / Directions for Use). The submitted residue trials must be carried out according to GAP and with the proposed pre-harvest interval.

Sometimes the term 'safety interval' refers to the period between the last application and re-entry of the treated crop by man, although the term re-entry interval is more explicit and is preferred (for re-entry of treated crops see Evaluation Manual: Chapter 4 Human toxicology, risk operator (plant protection)).

6.9 Estimation of the potential and actual exposure through diet and other means
The specific data requirements on estimation of exposure are provided in Commission Regulation (EU) No 283/2013 in section 6.9.

The calculation of chronic and acute exposure of the consumer and risk estimation are described in Chapter 5, Residues, Risk for consumers (plant protection products).

For the calculations, EFSA calculation model Pesticide Residue Intake Model "PRIMo" is available online.

6.10 Other studies
The specific data requirements for other studies (residue level in pollen and bee products) are provided in Commission Regulation (EU) No 283/2013 in section 6.10. The technical guidelines for determining the magnitude of pesticide residues in honey and setting Maximum Residue Levels in honey (SANTE/11956/2016) details under which circumstances to consider residues in honey, how to derive likely residues/an appropriate MRL and how to collect those data (including experimental and trial guidance).

1.2.2. Data requirements product

The data requirements regarding residues of the plant protection are described in Commission Regulation (EU) No 284/2013, section 8.

8 Residues in or on treated products, food and feed
Data and information on residues in or on treated products, food and feed in accordance with Section 6 of Part A of the Annex to Regulation (EU) No 283/ 2013 shall be submitted, unless the applicant shows that the data and information already submitted for the active substance can be applied.

Generally, it is possible to refer to the dossier on the active substance for the requirements regarding residues of the plant protection products.

For each requirement, a justification must then be submitted why information on the active substance sufficiently answers the respective question on the plant protection product. Co-formulants that may affect uptake, distribution, life, and degradation route of the active substance, such as surfactants and safeners, require special attention.

Co-formulants that leave toxicologically relevant residues must be investigated as well.

1.3. Derivation of endpoints and reference values

Each study should be summarised and evaluated separately. The final conclusion and the endpoint per data requirement (such as residue definition, MRLs, processing factors and solubility in fat) are presented in a list of endpoints (see Appendix 1).

The required residue data and the toxicological properties of the residue (active substance and/or metabolites) must enable the determination of a maximum residue level, the MRL. In turn, these form the input for exposure estimation (see also Evaluation Manual: Chapter 5 Residues, Risk for consumers (plant protection products).

1.3.1. Metabolism plant and animal

A residue definition for plant products is derived from the data from the plant metabolism studies. Residue definitions for animal products are derived from metabolism studies in livestock. The residue definitions for plant and animal products do not always correspond. The residue definition is established by taking the principles points into account:

- the residue definition for enforcement must be suitable for routine monitoring by the Food and Consumer Product Safety Authority (Nederlandse Voedsel- en Warenautoriteit (NVWA));
- the residue definition for risk assessment should include the toxicologically relevant metabolite(s) and the components that constitute the largest part of the residue to which consumers are exposed.

The extent of comparability between the metabolism in plant and animal determines whether separate toxicological research with a specific plant and/or animal metabolite is required.

The residue definition laid down for monitoring may differ from the definition laid down for risk assessment. This is the case if a suitable (routine) analytical method for a toxicologically relevant component of the residue is not available. A conversion factor is used to convert the analysed marker residue into the residue components that are relevant from a health point of view. These conversion factors may differ per product and per pre-harvest interval and are included in the list of endpoints (see Appendix 1).

1.3.2. Residue trials

The crop residue trials that serve for derivation of MRLs in plant products must be carried out in accordance with the requested directions for use and in accordance with the most critical GAP where several directions for use are concerned It is also a requirement that the relevant residue components are analysed at the time of harvest. Where the products contain residues above the limit of quantification, consisting of an edible and a non-edible part, these must be analysed separately to be able to derive a processing factor.

1.3.3. Feeding studies

Feeding studies form the basis for the derivation of MRLs in animal products and they may also yield supplementary information for the establishment of the residue definition for animal products.

Here, it is important that the constant concentration for milk and eggs reached in the course of time (the plateau concentration) is analysed in the different matrices while giving the corresponding interval so that the MRL calculation for animal products is based on the most appropriate situation (see §1.3.7).

1.3.4. Effects industrial processing or household preparations

Evaluation of possible effect of industrial processing should be performed to established whether or not residues and/or reaction products arise from residues in raw agricultural commodities during processing. When relevant, this process may require a separate risk assessment.

1.3.5. Residues in succeeding crops

Studies on residues in rotational crops should be performed to allow determination of nature and extent of potential residue accumulation in rotational crops from soil uptake and under realistic field conditions. When drawing up any replanting restrictions, the Dutch crop definition list (Definitielijst Toepassingsgebieden Gewasbeschermingsmiddelen; DTG-lijst) should be taken as a starting point for defining the crops and crop groups to which the restrictions apply.

1.3.6. Calculation MRL, STMR and HR for plant products

Three mathematical values: STMR (Supervised Trial Median Residue); HR (Highest Residue) and MRL (Maximum Residue Level) can be derived from the residue trials, which can be used for risk assessment. All those values can be used for chronic and/or acute diet calculations for consumers and for calculation of the residue intake by livestock.

Where no residues at all are found above the LOQ (Limit of Quantification), the STMR (Supervised Trial Median Residue), HR (Highest Residue) and MRL are based on the LOQ. Where there are indications that residue levels are really zero (because the residue levels in the overdosed trials are also < LOQ) the STMR and HR are set at 0 and the MRL at the LOQ

No MRLs are currently set for crops that are only used for animal feeding, e.g. grass.

The EFSA document “Management of MRL applications submitted for active substances under Art. 8 of Reg (EC) No 1107/2009 and Art. 10 Reg. of (EC) No 396/2005” includes recommendations how to set the residue trials and calculate MRLs to dossiers submitted according to the “old data requirements” (Reg. (EU) No 544/2011, EU guidelines in 1607/VI/97 rev.2) and to dossiers submitted according to the “new data requirements” (Reg. (EU) No 283/2013, EU Notice 2013/C 95/01, OECD guidelines).

To calculate the MRLs, the Member States agreed to use the OECD MRL calculator. To check for MRL-compliance in the context of product assessments, the MRL calculation as reported in EU guideline 7039/VI/95 may still be considered in cases where the existing MRL is based on this MRL calculation method.

1.3.7. Calculation MRL for animal products

EFSA's document Estimation of animal intakes and HR, STMR and MRL calculations for products of animal origin contains an introduction and instruction how to assess livestock metabolism and feeding studies and to derive MRLs for product of animal origin (see also: 6.4 Feeding studies (this document)).

1.3.8. Residues in honey

Honey can potentially contain residues from PPPs and residues can sometimes be detected in honey during residue monitoring. It is therefore appropriate to establish safe Maximum Residue Limits (MRLs) for honey. The MRLs for honey have been set at a default level of 0.05 mg/kg. The European data requirements (Regulation (EU) No 283/2013, Annex 6.10) require studies on residues in pollen and bee products for human consumption: Technical guidelines for determining the magnitude of pesticide residues in honey and setting Maximum Residue Levels in honey (SANTE/11956/2016 rev. 9).

The Guidelines is implemented by 1 January 2020. From 1 January 2020 the MRL honey guidelines will be applicable for all applications where use can lead to possible residues in honey.

The significance of residues in/on non-target plants and the possible relevance for transfer to honey may particularly need further consideration in cases where the intentionally treated crops are not melliferous. However, this does not necessarily mean that additional residue trials need to be submitted. An appropriate justification from the applicant is needed for cases where trials were not carried out.

1.4. Approval

The permissibility of an active substance or a plant protection product follows from the risk assessment for consumers, which has been elaborated in Chapter 5 Risk for consumers.

1.5. Developments

The requirements for the residue dossier may change in accordance with the developments in scientific and risk assessment field. These may lead to new research questions or amendments to of study guidelines that are already part of the residue dossier.

Developments are expected in areas such as:

- Cumulative risk assessment

2. APPENDICES

Appendix 1 List of endpoints residues.....15

Appendix 1 List of endpoints residues

Residues in or on treated products food and feed

Metabolism studies, methods of analysis and residue definitions in plants

Primary crops (available studies)	**Crop groups**	**Crop(s)**	**Application(s)**	**Sampling** (DAT)	**Comment/Source**
	Fruit crops				Radiolabelled active substance: phenyl-UL-^{14}C-a.s.:
	Root crops				
	Leafy crops				
	Cereals/grass				
	Pulses/oilseeds				
	Miscellaneous				
Rotational crops (available studies)	**Crop groups**	**Crop(s)**	**Application(s)**	**PBI** (DAT)	**Comment/Source**
	Root/tuber crops				
	Leafy crops				
	Cereal (small grain)				

	other		

Processed commodities (hydrolysis study)	**Conditions**	**Stable?**	**Comment/Source**
	Pasteurisation (20 min, 90°C, pH 4)	yes/no/inconclusive/not triggered	
	Baking, brewing and boiling (60 min, 100°C, pH 5)	yes/no/inconclusive/not triggered	
	Sterilisation (20 min, 120°C, pH 6)	yes/no/inconclusive/not triggered	
	Other processing conditions		

Can a general residue definition be proposed for primary crops?	yes/no/inconclusive	comment
Rotational crop and primary crop metabolism similar?	yes/no/inconclusive/not applicable	comment
Residue pattern in processed commodities similar to residue pattern in raw commodities?	yes/no/inconclusive/not applicable	comment
Plant residue definition for monitoring (RD-Mo)	<RD> (tentative) [metabolism group]: <RD> [metabolism group 1]: <RD> [metabolism group 2]: <RD> [processed commodities]: <RD> [honey and bee products]: <RD>	
Plant residue definition for risk assessment (RD-RA)	<RD> (tentative) [metabolism group]: <RD> [metabolism group 1]: <RD> [metabolism group 2]: <RD>	

	[rotational crops]: <RD> [processed commodities]: <RD> [honey and bee products]: <RD>
Methods of analysis for monitoring of residues (analytical technique, matrix groups, LOQs)	Matrices with high water content, high oil content, high acid content and dry matrices: GC-ECD, LOQ 0.02 mg/kg Confirmatory method available/missing for xxxx. ILV available/missing for xxx. (Reference)

Stability of residues in plants

Plant products (available studies)	**Category**	**Commodity**	**T** (°C)	**Stability period**		**Compounds covered**	**Comment/Source**
				Value	**Unit**		
	High water content						
	High oil content						
	High protein content						
	High starch content						
	High acid content						
	Processed products						
	Others						

Magnitude of residues in plants

Summary of residues data from the supervised residue trials – Primary crops

Commodity	**Region/ Indoor** [(a)]	**Residue levels observed in the supervised residue trials** (mg/kg)	**Comments/Source**	**Calculated MRL** (mg/kg)	**HR** [(b)] (mg/kg)	**STMR** [(c)] (mg/kg)	**CF** [(d)]
Representative uses							
	NEU	**Mo: -** **RA:** -	Residue trials on <crop> compliant with GAP. Extrapolation to <crop> possible.		**Mo: -** **RA:** -	**Mo: -** **RA:** -	

Commodity	Region/ Indoor (a)	Residue levels observed in the supervised residue trials (mg/kg)	Comments/Source	Calculated MRL (mg/kg)	HR (b) (mg/kg)	STMR (c) (mg/kg)	CF (d)
Intended uses in MRL application							
	NEU	**Mo: -** **RA: -**	Residue trials on <crop> compliant with GAP. Reduced number of trials is sufficient since, also considering metabolism studie(s), a zero residue situation is expected.				
	NEU	**Mo: -** **RA: -**					
Summary of data on residues in pollen and bee products (Regulation (EU) No 283/2013, Annex Part A, point 6.10.1)							
	NEU	**Mo: -** **RA: -**					

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

Mo: residue levels expressed according to the monitoring residue definition; RA: residue levels expressed according to risk assessment residue definition.

(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 (RA) refers to the whole commodity and not to the edible portion.

(c): Supervised trials median residue. The median residue for risk assessment (RA) refers to the whole commodity and not to the edible portion.

(d): Conversion factor to recalculate residues according to the residue definition for monitoring to the residue definition for risk assessment.

Residues in rotational crops

Overall summary

Residues in rotational and succeeding crops expected based on confined rotational crop study?	yes/no/inconclusive/not triggered	comment
Residues in rotational and succeeding crops expected based on field rotational crop study?	yes/no/inconclusive/not triggered	Comment/source

Summary of residues data from the rotational crops residue trials (if relevant, e.g. MRL, STMR, HR derived from rotational crops)

Commodity	Region/ Indoor (a)	PBI (days) (b)	Residue levels observed in the supervised residue trials (mg/kg)	Comments/Source	Calculated MRL (mg/kg)	HR (c) (mg/kg)	STMR(d) (mg/kg)	CF (e)
	NEU	30	**Mo: -** **RA: -**	Rotational crops field trials conducted at a dose rate of application covering the max PECsoil for parent (or metabolite).		**Mo: -** **RA: -**	**Mo: -** **RA: -**	
		120						
		365						
	SEU	30						
		120						
		365						

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

Mo: residue levels expressed according to the monitoring residue definition; RA: residue levels expressed according to risk assessment residue definition.

(a): NEU: Outdoor trials conducted in northern Europe, SEU: Outdoor trials conducted in southern Europe, Country code: if non-EU trials.

(b): Plant-back interval: The interval (days, months, years) between the final application of a pesticide product to a primary crop and the planting of a rotational crop.

(c): Highest residue. The highest residue for risk assessment (RA) refers to the whole commodity and not to the edible portion.

(d): Supervised trials median residue. The median residue for risk assessment (RA) refers to the whole commodity and not to the edible portion.

(e): Conversion factor to recalculate residues according to the residue definition for monitoring to the residue definition for risk assessment.

Processing factors

Processed commodity	Number of valid studies[a]	Processing Factor (PF)		CF_P[b]	Comment/ Source
		Individual values	Median PF		
Apples, juice					Tentative[c]

PF: Processing factor (=Residue level in processed commodity expressed according to RD-Mo/ Residue level in raw commodity expressed according to RD-Mo);
CF_p: Conversion factor for risk assessment in processed commodity (=Residue level in processed commodity expressed according to RD-RA / Residue level in processed commodity expressed according to RD-Mo)
(a): Studies with residues in the RAC at or close to the LOQ were disregarded (unless concentration may occur)
(b): Median of the individual conversion factors for each processing residues trial.
(c): A tentative PF is derived based on a limited dataset.

Residues in livestock

Not relevant or

Relevant groups (subgroups)	Dietary burden expressed in				Most critical subgroup (a)	Most critical commodity (b)	Trigger exceeded (Y/N)	Comments
	mg/kg bw per day		mg/kg DM					
	Median	Maximum	Median	Maximum				
Cattle (all)								
Cattle (dairy only)								
Sheep (all)								
Sheep (ewe only)								
Swine (all)								
Poultry (all)								
Poultry (layer only)								
Fish			N/A					

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

Nature of residues and methods of analysis in livestock

Metabolism studies, methods of analysis and residue definitions in livestock

Livestock (available studies)	**Animal**	**Dose** (mg/kg bw/d)	**Duration** (days)	**Comment/Source**
	Laying hen			
	Lactating ruminants			e.g. Goat, cow, sheep
	Pig			
	Fish			

Time needed to reach a plateau concentration in milk and eggs (days)	Milk:	Comment
	Eggs:	Comment
Metabolism in rat and ruminant similar	yes/no/inconclusive/not triggered	Comment
Can a general residue definition be proposed for animals?	yes/no/inconclusive/not triggered	Comment
Animal residue definition for monitoring (RD-Mo)	<RD> (tentative) [metabolism group 1/tissue]: <RD> [metabolism group 2/tissue]: <RD>	
Animal residue definition for risk assessment (RD-RA)	<RD> (tentative) [metabolism group 1/tissue]: <RD> [metabolism group 2/tissue]: <RD>	
Fat soluble residues	Yes/No	Comment
Methods of analysis for monitoring of residues (analytical technique, matrix groups, LOQs)	Milk,	

Eggs,
Muscle,
Fat,
Liver
Kidney:
HPLC-MS/MS , LOQ 0.02 mg/kg.
Confirmatory method available/missing for xxxx.
ILV available/missing for xxx
(Reference)

Stability of residues in livestock

Animal products (available studies)	**Animal**	**Commodity**	**T** (°C)	**Stability period**		**Compounds covered**	**Comment/ Source**
				Value	**Unit**		
		Muscle				Parent	
		Muscle				Metabolite XX	
		Fat					
		Liver				Sum of parent and metabolite X	
		Kidney					
		Milk					
		Eggs					

Magnitude of residues in livestock

Summary of the residue data from livestock feeding studies

Animal commodity	Residues at the closest feeding level (mg/kg)		Estimated value at 1N		MRL proposal (mg/kg)	CF [c]
	Mean	Highest	$STMR_{Mo}$ [a] (mg/kg)	HR_{Mo} [b] (mg/kg)		
Cattle (all) - Closest feeding level (x mg/kg bw; x N rate) [d]						
Muscle						
Fat						
Liver						
Kidney						
Cattle (dairy only) - Closest feeding level (x mg/kg bw; x N rate) [d]						
Milk [e]		n.a.				
Sheep (all) [f] - Closest feeding level (x mg/kg bw; x N rate) [d]						
Muscle						
Fat						
Liver						
Kidney						
Sheep (ewe only) [f] - Closest feeding level (x mg/kg bw; x N rate) [d]						
Milk [e]		n.a.				
Swine (all) [f] - Closest feeding level (x mg/kg bw; x N rate) [d]						
Muscle						
Fat						
Liver						
kidney						
Poultry (all) - Closest feeding level (x mg/kg bw; x N rate) [d]						
Muscle						
Fat						
Liver						
Poultry (layer only) - Closest feeding level (x mg/kg bw; x N rate) [d]						
Eggs [g]						

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

n.a.: not applicable

n.r. : not reported

(a): Median residues expressed according to the residue definition for monitoring, recalculated at the 1N rate for the median dietary burden.

(b): Highest residues expressed according to the residue definition for monitoring, recalculated at the 1N rate for the maximum dietary burden.

(c): Conversion factor to recalculate residues according to the residue definition for monitoring to the residue definition for risk assessment.
(d): Closest feeding level and N dose rate related to the maximum dietary burden.
(e): For milk, mean was derived from samplings performed from day D1 to day D2 (daily mean of X cows).
(f): Since extrapolation from cattle to other ruminants and swine is acceptable, results of the livestock feeding study on ruminants were relied upon to derive the MRL and risk assessment values in sheep and swine.
(g): For eggs, mean and highest residues were derived from samplings performed from day D1 to day D2 (daily mean or daily highest of Y laying hens).

Consumer risk assessment

ARfD	X mg/kg bw (source)
Highest IESTI, according to EFSA PRIMo (rev.x)	**Scenario 1 without risk mitigation measures:** Crop1: x% of ARfD Crop2: x% of ARfD Crop3: x% of ARfD **Scenario 2 with risk mitigation measures:**
NESTI (% ARfD), according to (to be specified)	Highest NESTI: XX% ARfD (commodity)
Assumptions made for the calculations	**Scenario 1 without risk mitigation measures:** The calculation is based on the highest residue levels expected in raw agricultural commodities, except for XXXX were the derived processing factor was applied. The following CF for risk assessment were also applied: XXXX **Scenario 2 with risk mitigation measures:**

Or

Not relevant since no ARfD has been considered necessary.

ADI	X mg/kg bw per day (source)
TMDI according to EFSA PRIMo	Highest TMDI: XX% ADI (MS, diet)
NTMDI, according to (to be specified)	Highest NTMDI: XX% ADI (MS, diet)
Highest IEDI, according to EFSA PRIMo (rev.x)	**Scenario 1 without risk mitigation measures:** xx% ADI (diet) Contribution of crops assessed: Crop1: x% of ADI Crop2: x% of ADI Crop3: x% of ADI **Scenario 2 with risk mitigation measures:** 36% ADI (diet) Contribution of crops assessed: Crop1: x% of ADI Crop2: x% of ADI Crop3: x% of ADI

NEDI (% ADI), according to (to be specified)	Highest NEDI: XX% ADI (MS, diet)
Assumptions made for the calculations	**Scenario 1 without risk mitigation measures:** The calculation is based on the median residue levels derived for raw agricultural commodities, multiplied by the conversion factor for risk assessment, except for XXX where the processing factor for XXXX was also applied. The contributions of commodities where no GAP was reported in the framework of the MRL review were not included in the calculation. **Scenario 2 with risk mitigation measures:**

Consumer exposure assessment through drinking water resulting from groundwater metabolite(s) according to SANCO/221/2000 rev.10 Final (25/02/2003)

Metabolite(s)	
ADI (mg/kg bw per day)	
Intake of groundwater metabolites (% ADI)	

Recommended MRLs

Code[a]	Commodity	Existing EU MRL (mg/kg)	Proposed EU MRL (mg/kg)	Comment/justification
Enforcement residue definition: <RD-Mo>[F]				
Representative uses				
				The submitted data are sufficient to derive a MRL proposal for the NEU/SEU use. Risk for consumers unlikely.
				The MRL proposal reflects the more critical residue situation of the NEU use. Risk for consumers unlikely.
				The submitted data are sufficient to derive an import tolerance (US GAP). Risk for consumers unlikely.
				The MRL proposal reflects the NEU use. For the SEU use the data were not sufficient to derive a MRL proposal. Risk for consumers unlikely.
			No change	The submitted data do not provide evidence that the existing MRL has to be modified.
			Further risk management considerations required	For the NEU use a MRL proposal of 1 mg/kg was calculated.
			No MRL proposal	
MRL application				

Code[(a)]	Commodity	Existing EU MRL (mg/kg)	Proposed EU MRL (mg/kg)	Comment/justification
Enforcement residue definition: 2 (if relevant, e.g. animal RD-Mo ≠ Plant RD-Mo)				

* 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
(F): Fat soluble