

## REASONED OPINION

### Modification of the existing MRLs for metalaxyl-M in lettuce and other salad plants<sup>1</sup>

European Food Safety Authority<sup>2</sup>

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#### SUMMARY

According to Article 6 of the Regulation (EC) No 396/2005, France, herewith referred to as the Evaluating Member State (EMS), received an application from the company Syngenta AGRO S.A.S. to modify the existing MRLs for metalaxyl-M in lettuce, lamb's lettuce, scarole, cress, land cress, rocket/rucola, red mustard, leaves and sprouts of Brassica. In order to accommodate for the intended use of metalaxyl-M on these crops in France, the EMS proposed to raise the existing MRLs to 3 mg/kg. The EMS France drafted an evaluation report according to Article 8 of Regulation (EC) No 396/2005 which was submitted to the European Commission and forwarded to EFSA on 23 June 2011.

EFSA derives the following conclusions based on the submitted evaluation report prepared by France, the Draft Assessment Report (DAR) prepared by the Rapporteur Member State (RMS) Belgium under Directive 91/414/EEC as well as the EFSA reasoned opinion on the review of the existing MRLs for metalaxyl-M according to Article 12 of Regulation (EC) No 396/2005.

The toxicological profile of metalaxyl-M was assessed in the framework of the peer review under Directive 91/414/EEC and the data were sufficient to derive an ADI value of 0.08 mg/kg bw/day and an ARfD of 0.5 mg/kg bw.

In the framework of the peer review the metabolism of metalaxyl was investigated for foliar treatment on fruits and fruiting vegetables (grapes) and root and tuber vegetables (potatoes) and as foliar or soil treatment on leafy vegetables (foliar on lettuce, and soil on tobacco). The metabolism data on metalaxyl can also be applied to metalaxyl-M. The residue definition proposed by the peer review for the risk assessment was metalaxyl-M, whereas the enforcement residue definition was finally set as "metalaxyl and metalaxyl-M (metalaxyl including other mixtures of constituent isomers including metalaxyl-M (sum of isomers))". Metalaxyl and metalaxyl-M have similar toxicity and therefore in the review of the existing MRLs for metalaxyl-M under Article 12 of Regulation (EC) No 396/2005, EFSA proposed the following wording for the risk assessment and enforcement residue definitions: "metalaxyl, including other mixtures of constituent isomers including metalaxyl-M (sum of isomers)".

For the leafy vegetables under consideration EFSA concludes that the metabolism of metalaxyl-M is sufficiently investigated and the same residue definitions apply.

<sup>1</sup> On request from the European Commission, Question No EFSA-Q-2011-00827, issued on 13 January 2012.

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The submitted residue data are sufficient to support the proposed residue data extrapolation from lettuce and to derive the MRL proposal of 3 mg/kg in lettuce, lamb's lettuce, scarole, cress, land cress, rocket/rucola, red mustard, leaves and sprouts of Brassica in support of the intended critical indoor use of metalaxyl-M in France. There are adequate analytical methods available to monitor the metalaxyl (sum of isomers) residues in the crops under consideration at the validated LOQ of 0.02 mg/kg.

Under core processing conditions (sterilisation, pasteurization and baking/brewing/boiling) no degradation of metalaxyl-M occurs and therefore for processed commodities the same residue definition as for raw agricultural commodities is applicable. No specific studies investigating the effect of processing on the magnitude of metalaxyl residues have been submitted in the framework of the current application. Most of the crops, except scarole, are consumed fresh. The contribution of the residues in the crops under consideration to the total consumer exposure is insignificant and therefore processing studies with these crops are currently not required.

The possible occurrence of metalaxyl-M residues in rotational/succeeding crops was also investigated. The nature of metalaxyl-M in rotational crops and primary crops is expected to be similar and therefore the same residue definitions apply. The Member States, before granting an authorization of plant protection products containing metalaxyl-M, are recommended to implement the necessary risk mitigation measures to avoid residues of metalaxyl-M in rotational/succeeding crops.

Residues of metalaxyl-M in commodities of animal origin were not assessed in the framework of this application, since the crops under consideration are normally not fed to livestock.

The consumer risk assessment was performed with revision 2 of the EFSA Pesticide Residues Intake Model (PRIMO). For the calculation of the chronic exposure, EFSA used the median residue value as derived from the indoor residue trials on lettuce. The median residue value for lettuce was used as an input value also for all other crops under consideration. For the remaining commodities of plant and animal origin, the existing MRLs as established in Annexes II and IIIB of Regulation (EC) No 396/2005 were used as input values.

The acute exposure assessment was performed only with regard to the commodities under consideration assuming the consumption of a large portion of the food items as reported in the national food surveys containing residues at the highest level as observed in supervised residue field trials. The estimated exposure was then compared with the toxicological reference values derived for metalaxyl-M.

No long-term consumer intake concerns were identified for any of the European diets incorporated in the EFSA PRIMO. The total calculated intake values ranged from 3.1 to 25.7% of the ADI (DE child). The contribution of residues in the crops under consideration to the total consumer exposure was insignificant, being the highest for lettuce (0.7% of the ADI (ES adult diet)).

No acute consumer risk was identified in relation to the MRL proposals for the crops under consideration. The calculated maximum exposure in percentage of the ARfD was 31.5% for scarole and below 10% of the ARfD for other crops under consideration.

EFSA concludes that the intended use of metalaxyl-M on the crops under consideration will not result in a consumer exposure exceeding the toxicological reference values and therefore will not pose a public health concern.

The recommendations of EFSA are compiled in the table below:

Code number <sup>a</sup>	Commodity	Existing EU MRL (mg/kg)	Proposed EU MRL (mg/kg)	Justification for the proposal
<b>Enforcement residue definition:</b> Metalaxyl, including other mixtures of constituent isomers including metalaxyl-M (sum of isomers)				
02510010	Lamb`s lettuce	0.2	3	The MRL proposals have been sufficiently supported by data and no risk for consumers was identified.
02510020	Lettuce	2	3	
02510030	Scarole (broad-leaf endive)	1	3	
02510040	Cress	0.05*	3	
02510050	Land cress	1	3	
02510060	Rocket, rucola	2	3	
02510070	Red mustard	0.05*	3	
02510080	Leaves and sprouts of Brassica spp., including turnip greens	2	3	

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

<sup>a</sup> according to Annex I of Regulation (EC) No 396/2005

#### KEY WORDS

Metalaxyl-M, metalaxyl, lettuce, lamb`s lettuce, scarole, cress, land cress, rocket/rucola, red mustard, leaves and sprouts of Brassica , MRL application, Regulation (EC) No 396/2005, consumer risk assessment, phenylamide fungicide

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## BACKGROUND

Commission Regulation (EC) No 396/2005<sup>3</sup> establishes the rules governing the setting of pesticide MRLs at Community level. Article 6 of that regulation lays down that a party requesting an authorisation for the use of a plant protection product in accordance with Council Directive 91/414/EEC<sup>4</sup>, shall submit to a Member State, when appropriate, an application to set or modify an MRL in accordance with the provisions of Article 7 of that regulation.

France, hereafter referred to as the evaluating Member State (EMS), received an application from the company Syngenta AGRO S.A.S.<sup>5</sup> to modify the existing MRLs for the active substance metalaxyl-M in lettuce and other salad plants including Brassicaceae (lettuce, lamb's lettuce, scarole, cress, land cress, rocket/rucola, red mustard, leaves and sprouts of Brassica). This application was notified to the European Commission and EFSA and subsequently evaluated by the EMS in accordance with Article 8 of the Regulation.

After completion, the evaluation report of the EMS was submitted to the European Commission who forwarded the application, the evaluation report and the supporting dossier to EFSA on 23 June 2011. The application was included in the EFSA Register of Questions with the reference number EFSA-Q-2011-00827 and the following subject:

*Metalaxyl-M - Application to modify the existing MRLs in lettuce and other salad plants.*

The EMS proposed the MRL of 3 mg/kg for the whole group of lettuce and other salad plants including Brassicaceae.

EFSA then proceeded with the assessment of the application as required by Article 10 of the Regulation.

## TERMS OF REFERENCE

In accordance with Article 10 of Regulation (EC) No 396/2005, EFSA shall, based on the evaluation report provided by the evaluating Member State, provide a reasoned opinion on the risks to the consumer associated with the application.

In accordance with Article 11 of that Regulation, the reasoned opinion shall be provided as soon as possible and at the latest within three months (which may be extended to six months where more detailed evaluations need to be carried out) from the date of receipt of the application. Where EFSA requests supplementary information, the time limit laid down shall be suspended until that information has been provided.

In this particular case the calculated deadline for providing the reasoned opinion is 23 September 2011.

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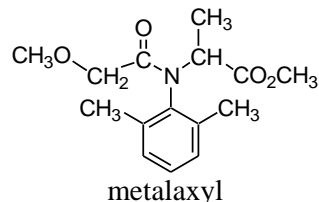
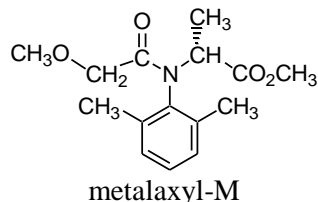
<sup>3</sup> Regulation (EC) No 396/2005 of the European Parliament and of the Council of 23 February 2005. OJ L 70, 16.3.2005, p. 1-16.

<sup>4</sup> Council Directive 91/414/EEC of 15 July 1991, OJ L 230, 19.8.1991, p. 1-32.

<sup>5</sup> Syngenta AGRO S.A.S., Avenue des Prés 1, CS 10537, 78286, GUYANCOURT cedex, France

## THE ACTIVE SUBSTANCE AND ITS USE PATTERN

Metalaxyl-M is the ISO common name for methyl *N*-(methoxyacetyl)-*N*-(2,6-xyllyl)-*D*-alaninate (IUPAC). The racemic mixture of metalaxyl-M and its *S*-enantiomer may also be available on the market, its ISO common name being metalaxyl.



Metalaxyl-M and metalaxyl belong to the group of phenylamide compounds which are used as fungicide for the control of oomycete pathogens. They are systemic compounds which inhibit mycelial growth and spore formation by selectively interfering with the synthesis of ribosomal ribonucleic acid (RNA) in fungi. Metalaxyl-M is considered as the most effective enantiomer.

Metalaxyl-M was evaluated in the framework of Directive 91/414/EEC with Belgium being the designated rapporteur Member State (RMS). The representative uses supported at EU level were outdoor foliar treatment of grapes and various annual crops (potatoes, onions, tomatoes, cucumbers, melons, broccoli, spinach, artichoke and tobacco), and outdoor and indoor treatments of lettuce. Following the peer review, a decision on inclusion of the active substance in Annex I to Directive 91/414/EEC was published by means of Commission Directive 2002/64/EC<sup>6</sup>, entering into force on 1 October 2002. According to Regulation (EU) No 540/2011<sup>7</sup>, metalaxyl-M is approved under Regulation (EC) No 1107/2009<sup>8</sup>. This approval is restricted to uses as fungicide only. As EFSA was not involved in the peer review of metalaxyl-M, a conclusion of EFSA on this active substance is not available.

It is noted that the review of the existing MRLs for metalaxyl-M according to Article 12 of Regulation (EC) No 396/2005 (Article 12 MRL review) has been recently finalized and the reasoned opinion of EFSA has been issued on 6 December 2011 (EFSA, 2011). The conclusions reached in the Article 12 MRL review have been taken into consideration when assessing the current MRL application.

Metalaxyl is a mixture of metalaxyl-M and its *S*-enantiomer, whereas metalaxyl-M is individually used as an active substance. The MRLs of these active substances are therefore closely related. The EU MRLs for metalaxyl and metalaxyl-M are established in Annexes II and IIIB of Regulation (EC) No 396/2005 (Appendix C) according to the residue definition “metalaxyl and metalaxyl-M (metalaxyl including other mixtures of constituent isomers including metalaxyl-M (sum of isomers))”. The existing EU MRLs for the crops under consideration are set as follows: 0.2 mg/kg in lamb’s lettuce, 2 mg/kg in lettuce, rocket/rucola, leaves and sprouts of Brassica, 1 mg/kg in scarole, land cress and 0.05 mg/kg (LOQ) in cress and red mustard.

CXLs for metalaxyl are also established by the Codex Alimentarius Commission for a wide range of commodities, but not for all of the crops under consideration. A CXL of 2 mg/kg is established for head lettuce. These CXLs also refer to metalaxyl including metalaxyl-M.

The intended GAPs in France for which a modification of the existing MRLs is requested are given in Appendix A.

<sup>6</sup> Commission Directive 2002/64/EC of 15 July 2002, OJ L 189, 18.7.2002, p. 27-32.

<sup>7</sup> Regulation (EU) No 540/2011 of 25 May 2011, OJ L 153, 11.6.2011, p1-186.

<sup>8</sup> Regulation (EC) No 1107/2009 of 21 October 2009, OJ 309, 24.11.2009, p1-50.

## ASSESSMENT

EFSA bases its assessment on the evaluation report submitted by the EMS (France, 2011), the EFSA reasoned opinion on the review of the existing MRLs for metalaxyl-M according to Article 12 of Regulation (EC) No 396/2005 (EFSA, 2011), and the Draft Assessment Report (DAR) and its addendum prepared under Council Directive 91/414/EEC (Belgium 1999, 2001). The assessment is performed in accordance with the legal provisions of the Uniform Principles for the Evaluation of the Authorization of Plant Protection Products set out in Regulation (EU) No 546/2011<sup>9</sup> and the currently applicable guidance documents relevant for the consumer risk assessment of pesticide residues (EC, 1996, 1997a, 1997b, 1997c, 1997d, 1997e, 1997f, 1997g, 2000, 2004, 2008, 2010, 2011; OECD, 2011a, 2011b).

### 1. Methods of analysis

#### 1.1. Methods for enforcement of residues in food of plant origin

A detailed overview of the available analytical enforcement methods for the determination of metalaxyl (sum of isomers) in the food of plant origin is provided in the EFSA reasoned opinion on the review of existing MRLs for metalaxyl-M (EFSA, 2011).

It was concluded that residues of metalaxyl (sum of isomers) can be monitored in food of plant origin with an LOQ of 0.02 mg/kg in high water-, high acid- and high oil content commodities as well as in dry commodities (EFSA, 2011).

#### 1.2. Methods for enforcement of residues in food of animal origin

Analytical methods for the determination of metalaxyl-M residues in food of animal origin were not assessed in the current application, since the crops under consideration are normally not fed to livestock.

### 2. Mammalian toxicology

The toxicological assessment of metalaxyl-M was peer reviewed under Directive 91/414/EEC and toxicological reference values were established by the European Commission (EC, 2002). Toxicity studies were conducted with metalaxyl or metalaxyl-M. Metalaxyl (mixture of R and S enantiomers) and metalaxyl-M (R enantiomer) are metabolized at different rates but along the same routes. It was not possible to identify if stereoselectivity occurred. From these studies, the S enantiomer is not expected to have a higher toxicity than the R enantiomer. As a consequence the same toxicological reference values apply to metalaxyl and metalaxyl-M.

These toxicological reference values are summarized in Table 2-1.

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<sup>9</sup> Commission Regulation (EU) No 546/2011 of 10 June 2011, OJ L 155, 11.6.2011, p.127-174

**Table 2-1:** Overview of the toxicological reference values

	Source	Year	Value	Study relied upon	Safety factor
Metalaxyl-M / Metalaxyl					
ADI	EC	2002	0.08 mg/kg bw/d	Dog, 2 yr <sup>a</sup>	100
ARfD	EC	2002	0.5 mg/kg bw	Rat, developmental <sup>b</sup>	100

(a): Study performed with metalaxyl (Belgium, 1999)

(b): Study performed with metalaxyl-M (Belgium, 1999)

### 3. Residues

#### 3.1. Nature and magnitude of residues in plant

##### 3.1.1. Primary crops

###### 3.1.1.1. Nature of residues

In the framework of the peer review the metabolism of metalaxyl was investigated for foliar treatment on fruits and fruiting vegetables (grapes) and root and tuber vegetables (potatoes) and as foliar or soil treatment on leafy vegetables (foliar on lettuce, and soil on tobacco) (Belgium, 1999). All studies have been performed with <sup>14</sup>C labelled metalaxyl and not metalaxyl-M. Metabolism studies are discussed in detail in the EFSA reasoned opinion on the review of the existing MRLs for metalaxyl-M (EFSA, 2011). The metabolism data on metalaxyl can also be applied to metalaxyl-M.

Metalaxyl is taken up very rapidly following root, stem or leaf application. Translocation of the compound is primarily acropetal (via xylem). This upward movement is a gradual and continuous process, thus providing additional fungicide activity and disease control several weeks (or months) after soil treatment or when new plant growth occurs. Several studies showed limited basipetal transport (via phloem) of metalaxyl; this also applies for metalaxyl-M. Absorption and distribution are passive processes which do not differentiate between stereoisomers, however, enzymatic metabolic transformation and protein binding can be stereo selective. A comparative investigation of the metabolism of metalaxyl-M and metalaxyl in lettuce suggested similar degradation rates for both isomers and very little interconversion (EFSA, 2011).

The residue definition for the risk assessment and enforcement was proposed in the framework of the peer review as metalaxyl-M only. However, during the MRL setting the enforcement residue definitions for metalaxyl and metalaxyl-M were combined and established as “metalaxyl and metalaxyl-M (metalaxyl including other mixtures of constituent isomers including metalaxyl-M (sum of isomers))”. Metalaxyl and metalaxyl-M both have similar toxicity and therefore in the framework of the Article 12 MRL review EFSA proposed the following wording for the risk assessment and enforcement residue definitions: “metalaxyl, including other mixtures of constituent isomers including metalaxyl-M (sum of isomers)” (EFSA, 2011). This residue definition in plant commodities corresponds to the one derived by the JMPR (metalaxyl including metalaxyl-M).

EFSA concludes that for the leafy vegetables under consideration the metabolism of metalaxyl-M is sufficiently investigated and the same residue definitions apply.



### 3.1.1.2. Magnitude of residues

*GAP: indoor, 1-3 x 0.135 kg a.s./ha, 10 d PHI*

The applicant submitted in total 8 residue trials on lettuce which have been performed in Switzerland and France in 1999 and 2000. According to the clarification received from the EMS, all residue trials were performed on an open leaf lettuce variety. One residue trial was performed with 4 instead of 3 applications but that was not having an impact on the final residue levels in the crop and therefore EFSA accepted the residue trial. The applicant proposes to extrapolate the residue data from lettuce to all other crops under consideration. Such an extrapolation is sufficiently supported by residue data and is acceptable according to EU Guidance document (EC, 2011).

*GAP NEU/SEU: outdoor 3 x 0.135 kg a.s./ha, 10 d PHI*

The applicant submitted 6 GAP compliant trials on lettuce representing the northern use and 7 GAP compliant residue trials on lettuce representing southern use. Residue trials have been performed in northern France and Switzerland (NEU trials) and in Spain and Italy (SEU trials) in 1998 and 1999. The applicant proposes to extrapolate the residue data from lettuce to all other crops under consideration. According to EU guidance document at least 8 GAP compliant residue trials representing northern use and 8 GAP compliant residue trials representing southern use are required to derive the MRL proposal for lettuce; to support the proposed extrapolation these trials have to be performed on an open leaf lettuce variety (EC, 2011). Due to residue levels being within a similar range from both uses, the residue data could be combined and therefore the number of trials would be sufficient to support both uses. However, some of the trials had been performed on a head forming lettuce variety whereas in most of the trials the lettuce variety could not be identified. Lacking this information the extrapolation of residue data from lettuce to all other crops under consideration is not acceptable and the MRL proposals and risk assessment values could be derived for lettuce only.

The indoor use is sufficiently supported by data and is more critical and was therefore used to derive the MRL proposal and risk assessment values which are compiled in Table 3-1.

According to the Article 12 MRL review, storage stability of metalaxyl-M was demonstrated for a period of 30 months at -20°C in commodities with high water and high acid content and for a period of 24 months in high oil content commodities and dry commodities (EFSA, 2011). The supervised residue trial samples were stored frozen for a maximum of 14 months indicating that the residue data are valid with regard to storage stability.

The analytical method (HPLC-MS/MS) used in analysing residue field trial samples did not use chiral column and therefore covered all isomers present. Finally the residues were expressed as metalaxyl-M. The validated LOQ (sum of isomers) was 0.02 mg/kg. The method is considered as sufficiently validated and fit for purpose (France, 2011).

EFSA concludes that an MRL of 3 mg/kg would be required to support the intended critical indoor use of metalaxyl-M in France on lettuce, lamb's lettuce, scarole, cress, land cress, rocket/rucola, red mustard, leaves and sprouts of Brassica.

**Table 3-1:** Overview of the available residues trials data

Commodity	Region (a)	Outdoor /Indoor	Individual trial results (mg/kg)		Median residue (mg/kg) <sup>(b)</sup>	Highest residue (mg/kg) <sup>(c)</sup>	MRL proposal (mg/kg)	Median CF <sup>(d)</sup>	Comments
			Enforcement	Risk assessment					
<b>Enforcement and risk assessment residue definition:</b> Metalaxyl, including other mixtures of constituent isomers including metalaxyl-M (sum of isomers)									
Lettuce → lamb's lettuce, scarole, cress, land cress, rocket/rucola, red mustard, leaves and sprouts of Brassica	EU	Indoor	0.19; 0.2; 0.72; 1.0; 3 x 1.1; 1.8	0.19; 0.2; 0.72; 1.0; 3 x 1.1; 1.8	<b>1.05</b>	<b>1.8</b>	<b>3</b>	<b>1</b>	R <sub>ber</sub> =2.2 R <sub>max</sub> =2.59 OECD MRL <sup>e</sup> =3
Lettuce	NEU	Outdoor	2 x <0.02; 2 x 0.02; 2 x 0.03	2 x <0.02; 2 x 0.02; 2 x 0.03	0.02	0.03	0.06	1	The extrapolation to the whole group of lettuce and other salad plants is not supported according to EU guidance document (EC, 2011). The indoor use is sufficiently supported by data and is more critical and was therefore used to derive risk assessment values and MRL proposal. R <sub>ber NEU</sub> =0.06 R <sub>max NEU</sub> =0.04 R <sub>ber SEU</sub> =0.16 R <sub>max SEU</sub> =0.16
	SEU	Outdoor	2 x <0.02; 2 x 0.02; 2 x 0.08; 0.09	2 x <0.02; 2 x 0.02; 2 x 0.08; 0.09	0.02	0.09	0.2	1	

(a): NEU, SEU, EU or Import (country code). In the case of indoor uses there is no necessity to differentiate between NEU and SEU.

(b): Median value of the individual trial results according to the enforcement residue definition.

(c): Highest value of the individual trial results according to the enforcement residue definition.

(d): The median conversion factor for enforcement to risk assessment is obtained by calculating the median of the individual conversion factors for each residues trial.

(e): The MRL calculated using the OECD MRL calculator (OECD, 2011b)

### 3.1.1.3. Effect of industrial processing and/or household preparation

The effect of processing on the nature of metalaxyl-M has been investigated under representative hydrolytic conditions for pasteurisation, boiling/brewing/baking and sterilisation. This study demonstrates that metalaxyl-M is hydrolytically stable under these conditions and therefore for processed commodities the same residue definition as for raw agricultural commodities is applicable (EFSA, 2011).

No specific studies investigating the effect of processing on the magnitude of metalaxyl residues have been submitted in the framework of the current application. Most of the crops, except scarole, are consumed fresh. The residues in the crops under consideration contribute insignificantly to the total consumer exposure and therefore processing studies with these crops are currently not required.

## 3.1.2. Rotational crops

### 3.1.2.1. Preliminary considerations

All crops under consideration can be grown in rotation with other plants. The degradation rate of metalaxyl-M in soil is slow with  $DT_{90}$  values exceeding the trigger value of 100 days (EFSA, 2011). Thus, further studies investigating the nature and magnitude of metalaxyl-M in rotational/succeeding crops are required.

### 3.1.2.2. Nature of residues

The metabolism of metalaxyl-M in rotational crops was assessed in the framework of the peer review with  $^{14}C$ -labelled metalaxyl and a detailed overview of the available studies is provided in the recently issued EFSA reasoned opinion on the review of existing MRLs for metalaxyl-M (EFSA, 2011).

The peer review concluded that the metabolic pathway of metalaxyl in rotational crops is similar to that in primary crops but with a greater proportion of sugar conjugates. The same risk assessment and enforcement residue definitions as in primary crops are applicable (see section 3.1.1.1.).

### 3.1.2.3. Magnitude of residues

The applicant within the framework of the current application as well as for the Article 12 MRL review submitted three rotational crops studies where metalaxyl-M was applied on potatoes at 1 x 0.7-1 kg a.s./ha and the magnitude of residues was investigated on several succeeding crops (carrot, lettuce, cauliflower/broccoli, wheat/barley) sown at a plant-back interval of 27-30 days following the application of the active substance (France, 2011).

In two of the trials no residues at or above the LOQ (0.02 mg/kg) were found in any of the succeeding crops. In the third trial, residues in the mature crops were all below the LOQ. In immature broccoli (BBCH 16-19) and in immature lettuce (BBCH 17-43) residues of 0.11 mg/kg and 0.03-0.04 mg/kg were found, respectively.

The intended application rate is less critical than the application rate used in the rotational crop field studies and therefore it is unlikely that significant residues of metalaxyl-M will occur in mature rotational/succeeding crops following the intended use. However, as the crops under consideration can be grown more than once per year within the same plot, the Member States before granting an authorization of plant protection products containing metalaxyl-M are recommended to implement the necessary risk mitigation measures to avoid residues in rotational/succeeding crops.

### 3.2. Nature and magnitude of residues in livestock

Since the crops under consideration are normally not fed to livestock, the nature and magnitude of metalaxyl-M residues in livestock was not assessed in the framework of this application.

## 4. Consumer risk assessment

The consumer risk assessment was performed with revision 2 of the EFSA Pesticide Residues Intake Model (PRIMo). This exposure assessment model contains the relevant European food consumption data for different sub-groups of the EU population<sup>10</sup> (EFSA, 2007).

It is noted that residues of metalaxyl-M may also be generated from the use of metalaxyl, which is the mixture of metalaxyl-M and its S-enantiomer. In the framework of Article 12 of Regulation (EC) No 396/2005 EFSA has not received information on the uses of metalaxyl and therefore it is not known which EU MRLs have been derived supporting the use of metalaxyl. However, the residue behaviour for metalaxyl and metalaxyl-M is expected to be the same. Thus for the calculation of the chronic exposure, EFSA used the median residue value as derived from the indoor residue trials on lettuce (Table 3-1). The median residue value for lettuce was used as an input value also for all other crops under consideration. For the remaining commodities of plant and animal origin, the existing MRLs as established in Annexes II and IIIB of Regulation (EC) No 396/2005 were used as input values. The model assumptions for the long-term exposure assessment are considered to be rather conservative, assuming that all food items consumed have been treated with the active substance under consideration. In reality, it is not likely that all food consumed will contain residues at the MRL or at levels of the median residue values identified in supervised field trials. However, if this first tier exposure assessment does not exceed the toxicological reference value for long-term exposure (i.e. the ADI), a consumer health risk can be excluded with a high probability.

The acute exposure assessment was performed only with regard to the commodities under consideration assuming the consumption of a large portion of the food items as reported in the national food surveys containing residues at the highest level as observed in supervised field trials.

The input values used for the dietary exposure calculation are summarized in Table 4-1.

**Table 4-1:** Input values for the consumer dietary exposure assessment

Commodity	Chronic exposure assessment		Acute exposure assessment	
	Input value (mg/kg)	Comment	Input value (mg/kg)	Comment
<b>Risk assessment residue definition:</b> Metalaxyl, including other mixtures of constituent isomers including metalaxyl-M (sum of isomers)				
Lettuce	1.05	Median residue (indoor use)	1.8	Highest residue (indoor use)
Lamb's lettuce, scarole, cress, land cress, red mustard, rocket/rucola, leaves and sprouts of Brassica	1.05	Median residue (indoor use on lettuce)	1.8	Highest residue (indoor use on lettuce)

<sup>10</sup> The calculation of the long-term exposure (chronic exposure) is based on the mean consumption data representative for 22 national diets collected from MS surveys plus 1 regional and 4 cluster diets from the WHO GEMS Food database; for the acute exposure assessment the most critical large portion consumption data from 19 national diets collected from MS surveys is used. The complete list of diets incorporated in EFSA PRIMo is given in its reference section (EFSA, 2007).

Commodity	Chronic exposure assessment		Acute exposure assessment	
	Input value (mg/kg)	Comment	Input value (mg/kg)	Comment
Other commodities of food and animal origin	MRL	See Appendix C	Acute risk assessment was undertaken only with regard to the crops under consideration.	

The estimated exposure was then compared with the toxicological reference values derived for metalaxyl-M (see Table 2-1). The results of the intake calculation are presented in Appendix B to this reasoned opinion.

No long-term consumer intake concerns were identified for any of the European diets incorporated in the EFSA PRIMo. The total calculated intake values ranged from 3.1 to 25.7% of the ADI (DE child). The contribution of residues in the crops under consideration to the total consumer exposure was insignificant, being the highest for lettuce (0.7% of the ADI (ES adult diet)).

No acute consumer risk was identified in relation to the MRL proposals for the crops under consideration. The calculated maximum exposure in percentage of the ARfD was 31.5 % for scarole and below 10% of the ARfD for other crops under consideration.

EFSA concludes that the intended use of metalaxyl-M on the crops under consideration will not result in a consumer exposure exceeding the toxicological reference values and therefore will not pose a public health concern.

## CONCLUSIONS AND RECOMMENDATIONS

### CONCLUSIONS

The toxicological profile of metalaxyl-M was assessed in the framework of the peer review under Directive 91/414/EEC and the data were sufficient to derive an ADI value of 0.08 mg/kg bw/day and an ARfD of 0.5 mg/kg bw.

In the framework of the peer review the metabolism of metalaxyl was investigated for foliar treatment on fruits and fruiting vegetables (grapes) and root and tuber vegetables (potatoes) and as foliar or soil treatment on leafy vegetables (foliar on lettuce, and soil on tobacco). The metabolism data on metalaxyl can also be applied to metalaxyl-M. The residue definition proposed by the peer review for the risk assessment was metalaxyl-M, whereas the enforcement residue definition was finally set as “metalaxyl and metalaxyl-M (metalaxyl including other mixtures of constituent isomers including metalaxyl-M (sum of isomers))”. Metalaxyl and metalaxyl-M have similar toxicity and therefore in the review of the existing MRLs for metalaxyl-M under Article 12 of Regulation (EC) No 396/2005, EFSA proposed the following wording for the risk assessment and enforcement residue definitions: “metalaxyl, including other mixtures of constituent isomers including metalaxyl-M (sum of isomers)”.

For the leafy vegetables under consideration EFSA concludes that the metabolism of metalaxyl-M is sufficiently investigated and the same residue definitions apply.

The submitted residue data are sufficient to support the proposed residue data extrapolation from lettuce and to derive the MRL proposal of 3 mg/kg in lettuce, lamb's lettuce, scarole, cress, land cress, rocket/rucola, red mustard, leaves and sprouts of Brassica in support of the intended critical indoor use of metalaxyl-M in France. There are adequate analytical methods available to monitor the metalaxyl (sum of isomers) residues in the crops under consideration at the validated LOQ of 0.02 mg/kg.

Under core processing conditions (sterilisation, pasteurization and baking/brewing/boiling) no degradation of metalaxyl-M occurs and therefore for processed commodities the same residue definition as for raw agricultural commodities is applicable. No specific studies investigating the effect of processing on the magnitude of metalaxyl residues have been submitted in the framework of the current application. Most of the crops, except scarole, are consumed fresh. The contribution of the residues in the crops under consideration to the total consumer exposure is insignificant and therefore processing studies with these crops are currently not required.

The possible occurrence of metalaxyl-M residues in rotational/succeeding crops was also investigated. The nature of metalaxyl-M in rotational crops and primary crops is expected to be similar and therefore the same residue definitions apply. The Member States, before granting an authorization of plant protection products containing metalaxyl-M, are recommended to implement the necessary risk mitigation measures to avoid residues of metalaxyl-M in rotational/succeeding crops.

Residues of metalaxyl-M in commodities of animal origin were not assessed in the framework of this application, since the crops under consideration are normally not fed to livestock.

The consumer risk assessment was performed with revision 2 of the EFSA Pesticide Residues Intake Model (PRIMO). For the calculation of the chronic exposure, EFSA used the median residue value as derived from the indoor residue trials on lettuce. The median residue value for lettuce was used as an input value also for all other crops under consideration. For the remaining commodities of plant and animal origin, the existing MRLs as established in Annexes II and IIIB of Regulation (EC) No 396/2005 were used as input values.

The acute exposure assessment was performed only with regard to the commodities under consideration assuming the consumption of a large portion of the food items as reported in the national food surveys containing residues at the highest level as observed in supervised residue field trials. The estimated exposure was then compared with the toxicological reference values derived for metalaxyl-M.

No long-term consumer intake concerns were identified for any of the European diets incorporated in the EFSA PRIMo. The total calculated intake values ranged from 3.1 to 25.7% of the ADI (DE child). The contribution of residues in the crops under consideration to the total consumer exposure was insignificant, being the highest for lettuce (0.7% of the ADI (ES adult diet)).

No acute consumer risk was identified in relation to the MRL proposals for the crops under consideration. The calculated maximum exposure in percentage of the ARfD was 31.5% for scarole and below 10% of the ARfD for other crops under consideration.

EFSA concludes that the intended use of metalaxyl-M on the crops under consideration will not result in a consumer exposure exceeding the toxicological reference values and therefore will not pose a public health concern.

## RECOMMENDATIONS

Code number <sup>a</sup>	Commodity	Existing EU MRL (mg/kg)	Proposed EU MRL (mg/kg)	Justification for the proposal
<b>Enforcement residue definition:</b> Metalaxyl, including other mixtures of constituent isomers including metalaxyl-M (sum of isomers)				
02510010	Lamb`s lettuce	0.2	3	The MRL proposals have been sufficiently supported by data and no risk for consumers was identified.
02510020	Lettuce	2	3	
02510030	Scarole (broad-leaf endive)	1	3	
02510040	Cress	0.05*	3	
02510050	Land cress	1	3	
02510060	Rocket, rucola	2	3	
02510070	Red mustard	0.05*	3	
02510080	Leaves and sprouts of Brassica spp., including turnip greens	2	3	

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

<sup>a</sup> according to Annex I of Regulation (EC) No 396/2005.

## REFERENCES

- Belgium, 1999. Draft assessment report on the active substance metalaxyl-M prepared by the rapporteur Member State Belgium in the framework of Council Directive 91/414/EEC, July 1999.
- Belgium, 2001. Addendum to the draft assessment report on the active substance metalaxyl-M prepared by the rapporteur Member State Belgium in the framework of Council Directive 91/414/EEC, September 2001.
- EC (European Commission), 1996. Appendix G. Livestock Feeding Studies. 7031/VI/95 rev.4. Available from: [http://ec.europa.eu/food/plant/protection/resources/publications\\_en.htm](http://ec.europa.eu/food/plant/protection/resources/publications_en.htm).

- EC (European Commission), 1997a. Appendix A. Metabolism and distribution in plants. 7028/IV/95-rev.3. Available from: [http://ec.europa.eu/food/plant/protection/resources/publications\\_en.htm](http://ec.europa.eu/food/plant/protection/resources/publications_en.htm)
- EC (European Commission), 1997b. Appendix B. General recommendations for the design, preparation and realization of residue trials. Annex 2. Classification of (minor) crops not listed in the Appendix of Council Directive 90/642/EEC. 7029/VI/95-rev.6. Available from: [http://ec.europa.eu/food/plant/protection/resources/publications\\_en.htm](http://ec.europa.eu/food/plant/protection/resources/publications_en.htm)
- EC (European Commission), 1997c. Appendix C. Testing of plant protection products in rotational crops. 7524/VI/95-rev.2. Available from: [http://ec.europa.eu/food/plant/protection/resources/publications\\_en.htm](http://ec.europa.eu/food/plant/protection/resources/publications_en.htm)
- EC (European Commission), 1997d. Appendix E. Processing studies. 7035/VI/95-rev.5. Available from: [http://ec.europa.eu/food/plant/protection/resources/publications\\_en.htm](http://ec.europa.eu/food/plant/protection/resources/publications_en.htm)
- EC (European Commission), 1997e. Appendix F. Metabolism and distribution in domestic animals. 7030/VI/95-rev. 3. Available from: [http://ec.europa.eu/food/plant/protection/resources/publications\\_en.htm](http://ec.europa.eu/food/plant/protection/resources/publications_en.htm)
- EC (European Commission), 1997f. Appendix H. Storage stability of residue samples. 7032/VI/95-rev.5. Available from: [http://ec.europa.eu/food/plant/protection/resources/publications\\_en.htm](http://ec.europa.eu/food/plant/protection/resources/publications_en.htm)
- EC (European Commission), 1997g. Appendix I. Calculation of maximum residue level and safety intervals. 7039/VI/95. As amended by the document: classes to be used for the setting of EU pesticide maximum residue levels (MRLs). SANCO 10634/2010. Available from: [http://ec.europa.eu/food/plant/protection/resources/publications\\_en.htm](http://ec.europa.eu/food/plant/protection/resources/publications_en.htm)
- EC (European Commission), 2000. Residue analytical methods. For pre-registration data requirement for Annex II (part A, section 4) and Annex III (part A, section 5 of Directive 91/414. SANCO/3029/99-rev.4. Available from: [http://ec.europa.eu/food/plant/protection/resources/publications\\_en.htm](http://ec.europa.eu/food/plant/protection/resources/publications_en.htm)
- EC (European Commission), 2004. Residue analytical methods. For post-registration control. SANCO/825/00-rev.7. Available from: [http://ec.europa.eu/food/plant/protection/resources/publications\\_en.htm](http://ec.europa.eu/food/plant/protection/resources/publications_en.htm)
- EC (European Commission), 2008. Appendix D. Guidelines on comparability, extrapolation, group tolerances and data requirements for setting MRLs. 7525/VI/95-rev.8. Available from: [http://ec.europa.eu/food/plant/protection/resources/publications\\_en.htm](http://ec.europa.eu/food/plant/protection/resources/publications_en.htm)
- EC (European Commission), 2010. Classes to be used for the setting of EU pesticide Maximum Residue Levels (MRLs). SANCO 10634/2010 Rev. 0, finalized in the Standing Committee on the Food Chain and Animal Health at its meeting of 23-24 March 2010.
- EC (European Commission), 2011. Appendix D. Guidelines on comparability, extrapolation, group tolerances and data requirements for setting MRLs. 7525/VI/95-rev.9. Available from: [http://ec.europa.eu/food/plant/protection/resources/publications\\_en.htm](http://ec.europa.eu/food/plant/protection/resources/publications_en.htm)
- EC (European Commission), 2002. Review report for the active substance metalaxyl-M, Finalised in the Standing Committee on the Food Chain and Animal Health at its meeting on 19 April 2002 in view of the inclusion of metalaxyl-M in Annex I of Council Directive 91/414/EEC.
- EFSA (European Food Safety Authority), 2007. Pesticide Residues Intake Model for assessment of acute and chronic consumer exposure to pesticide residues-rev.2. Available from <http://www.efsa.europa.eu/en/mrls/mrlteam.htm>
- EFSA (European Food Safety Authority), 2011. Reasoned opinion on the review of the existing maximum residue levels (MRLs) for metalaxyl-M according to Article 12 of Regulation (EC) No 396/2005. EFSA Journal 2011; 9(12):2494, 74 pp.
- France, 2011. Evaluation report on the modification of MRLs for metalaxyl-M in lettuce and other salads prepared by the evaluating Member State France under Article 8 of Regulation (EC) No 396/2005, 15 June 2011, 76 pp.



Meier U, 2001. Growth Stages of mono- and dicotyledonous plants. BBCH Monograph, 2<sup>nd</sup> Ed., Federal Biological Research Centre of Agriculture and Forest. Braunschweig, Germany. Available from: [http://www.jki.bund.de/fileadmin/dam\\_uploads/\\_veroeff/bbch/BBCH-Skala\\_englisch.pdf](http://www.jki.bund.de/fileadmin/dam_uploads/_veroeff/bbch/BBCH-Skala_englisch.pdf)

OECD (Organization for Economic Co-operation and Development), 2011a. OECD MRL Calculator: User Guide. Series of pesticides No. 56, ENV/JM/MONO(2011)2, 1 March 2011. In: Pesticide Publications/Publications on Pesticide Residues. Available from: <http://www.oecd.org/env/pesticides>

OECD (Organization for Economic Co-operation and Development), 2011b. OECD MRL Calculator: spreadsheet for single data set and spreadsheet for multiple data set, 2 March 2011. In: Pesticide Publications/Publications on Pesticide Residues. Available from: <http://www.oecd.org/env/pesticides>

### Appendix A. GOOD AGRICULTURAL PRACTICES (GAPS)

Crop and/or situation (a)	Member State or Country	F G or I (b)	Pest or group of pests controlled (c)	Formulation		Application				Application rate per treatment			PHI (days) (l)	Remarks (m)
				type (d - f)	conc. of a.s. (i)	method kind (f - h)	growth stage & season (j)	number min max (k)	interval min max	kg as/hL min max	water L/ha min max	kg a.s./ha min max		
Lettuce and similar (including lambs lettuce, scarole, etc.) <sup>11</sup>	FRANCE	F G/I	Downy mildew ( <i>Bremia lactucae</i> )	WG	387.6 g/kg	Foliar spray	Preventive application BBCH 18-43	1-3*	10 days		500-1000	0.135	10	0.35 kg product/ha * 1 to 3 applications maximum per cycle (3 under high infestation of downy mildew), with a total of 6 applications maximum per year on the same site.

- Remarks:
- (a) For crops, EU or other classifications, e.g. Codex, should be used; where relevant, the use situation should be described (e.g. fumigation of a structure)
  - (b) Outdoor or field use (F), glasshouse application (G) or indoor application (I)
  - (c) e.g. biting and suckling insects, soil born insects, foliar fungi, weeds
  - (d) e.g. wettable powder (WP), emulsifiable concentrate (EC), granule (GR)
  - (e) GCPF Technical Monograph No 2, 4<sup>th</sup> Ed., 1999 or other codes, e.g. OECD/CIPAC, should be used
  - (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 - type of equipment used must be indicated
  - (i) g/kg or g/l
  - (j) Growth stage at last treatment (Growth stages of mono- and dicotyledonous plants. BBCH Monograph, 2<sup>nd</sup> Ed., 2001), including where relevant, information on season at time of application
  - (k) The minimum and maximum number of application possible under practical conditions of use must be provided
  - (l) PHI - minimum pre-harvest interval
  - (m) Remarks may include: Extent of use/economic importance/restrictions (i.e. feeding, grazing)

<sup>11</sup> 0251000: Lettuce and other salad plants including Brassicaceae: lamb's lettuce, lettuce, scarole, cress, land cress, rocket/rucola, red mustard, leaves and sprouts of Brassica (classification according to Regulation (EU) No 600/2010)

**Appendix B. PESTICIDE RESIDUES INTAKE MODEL (PRIMO)**

Metalaxyl-M									
Status of the active substance:		Included		Code no.		Prepare workbook for refined calculations			
LOQ (mg/kg bw):				proposed LOQ:					
Toxicological end points									
ADI (mg/kg bw/day):		0.08		ARfD (mg/kg bw):		0.5			
Source of ADI:		EC		Source of ARfD:		EC			
Year of evaluation:		2002		Year of evaluation:		2002			
Chronic risk assessment - refined calculations									
TMDI (range) in % of ADI minimum - maximum									
3                      26									
No of diets exceeding ADI:                      ---									
Highest 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)	
25.7	DE child	15.1	Apples	3.2	Table grapes	2.4	Oranges		
18.1	NL child	7.9	Apples	1.9	Oranges	1.9	Table grapes		
11.2	WHO Cluster diet B	2.2	Wine grapes	1.3	Apples	0.9	Table grapes		
10.6	FR toddler	3.3	Apples	2.5	Milk and cream,	1.3	Oranges		
10.2	UK Toddler	2.9	Sugar beet (root)	2.1	Apples	1.3	Milk and cream,		
9.0	IE adult	1.6	Wine grapes	1.0	Apples	0.8	Pears		
8.5	DK child	2.9	Apples	1.0	Cucumbers	0.8	Pears		
8.4	UK Infant	2.4	Milk and cream,	2.0	Apples	1.3	Sugar beet (root)		
8.2	FR all population	5.0	Wine grapes	0.6	Apples	0.3	Table grapes		
7.7	PT General population	3.1	Wine grapes	1.3	Apples	0.7	Table grapes		
7.6	FR infant	3.1	Apples	1.6	Milk and cream,	0.6	Oranges		
7.2	WHO cluster diet E	2.0	Wine grapes	1.1	Apples	0.4	Table grapes		
6.7	ES child	1.4	Apples	1.4	Oranges	0.8	Milk and cream,		
6.5	NL general	1.5	Apples	0.9	Oranges	0.8	Wine grapes		
6.2	SE general population 90th percentile	1.3	Apples	0.8	Head cabbage	0.8	Milk and cream,		
5.7	WHO regional European diet	0.8	Apples	0.5	Lettuce	0.5	Head cabbage		
5.4	WHO Cluster diet F	0.8	Apples	0.7	Wine grapes	0.5	Oranges		
5.2	PL general population	2.6	Apples	0.8	Table grapes	0.5	Head cabbage		
5.2	ES adult	1.0	Apples	0.8	Oranges	0.7	Lettuce		
5.1	WHO cluster diet D	0.8	Apples	0.5	Table grapes	0.5	Wine grapes		
4.8	DK adult	1.7	Wine grapes	1.0	Apples	0.3	Milk and cream,		
4.7	UK vegetarian	1.0	Wine grapes	0.7	Apples	0.5	Oranges		
4.4	LT adult	2.3	Apples	0.5	Head cabbage	0.2	Milk and cream,		
4.3	IT kids/toddler	1.1	Apples	0.4	Pears	0.4	Wheat		
4.2	UK Adult	1.4	Wine grapes	0.5	Apples	0.5	Sugar beet (root)		
3.9	IT adult	1.0	Apples	0.5	Lettuce	0.3	Table grapes		
3.1	FI adult	0.6	Oranges	0.5	Apples	0.4	Wine grapes		
<b>Conclusion:</b>									
The estimated Theoretical Maximum Daily Intakes (TMDI), based on pTMRLs were below the ADI. A long-term intake of residues of Metalaxyl-M is unlikely to present a public health concern.									

Acute risk assessment /children - refined calculations						Acute risk assessment / adults / general population - refined calculations						
The acute risk assessment is based on the ARfD.												
For each commodity the calculation is based on the highest reported MS consumption per kg bw and the corresponding unit weight from the MS with the critical consumption. If no data on the unit weight was available from that MS an average European unit weight was used for the IESTI calculation.												
In the IESTI 1 calculation, the variability factors were 10, 7 or 5 (according to JMPR manual 2002), for lettuce a variability factor of 5 was used.												
In the IESTI 2 calculations, the variability factors of 10 and 7 were replaced by 5. For lettuce the calculation was performed with a variability factor of 3.												
<b>Threshold MRL</b> is the calculated residue level which would leads to an exposure equivalent to 100 % of the ARfD.												
Unprocessed commodities	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 *)		**)	IESTI 1 *)		**)	IESTI 2 *)		**)
	Highest % of ARfD/ADI	Commodities	pTMRL/ threshold MRL (mg/kg)	Highest % of ARfD/ADI	Commodities	pTMRL/ threshold MRL (mg/kg)	Highest % of ARfD/ADI	Commodities	pTMRL/ threshold MRL (mg/kg)	Highest % of ARfD/ADI	Commodities	pTMRL/ threshold MRL (mg/kg)
	31.5	Scarole (broad-leaf)	1.8 / -	31.5	Scarole (broad-leaf)	1.8 / -	4.0	Lettuce	1.8 / -	3.2	Scarole (broad-leaf endive)	1.8 / -
	9.7	Lettuce	1.8 / -	5.8	Lettuce	1.8 / -	3.2	Scarole (broad-leaf)	1.8 / -	2.4	Lettuce	1.8 / -
	1.1	Rocket, Rucola	1.8 / -	1.1	Rocket, Rucola	1.8 / -	0.7	Lamb's lettuce	1.8 / -	0.7	Lamb's lettuce	1.8 / -
1.0	Lamb's lettuce	1.8 / -	1.0	Lamb's lettuce	1.8 / -	0.1	Cress	1.8 / -	0.1	Cress	1.8 / -	
0.1	Cress	1.8 / -	0.1	Cress	1.8 / -							
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:			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) ***)	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												
***) pTMRL: provisional temporary MRL for unprocessed commodity												
<b>Conclusion:</b>												
For Metalaxyl-M IESTI 1 and IESTI 2 were calculated for food commodities for which pTMRLs were submitted and for which consumption data are available.												
No exceedance of the ARfD/ADI was identified for any unprocessed commodity.												
For processed commodities, no exceedance of the ARfD/ADI was identified.												

## Appendix C. EXISTING EU MAXIMUM RESIDUE LIMITS (MRLs)

(Pesticides - Web Version - EU MRLs  
(File created on 14/12/2011 09:46))

Code number	Groups and examples of individual products to which the MRLs apply (a)	Metalaxyl and metalaxyl-M (metalaxyl including other mixtures of constituent isomers including metalaxyl-M (sum of isomers))
100000	1. FRUIT FRESH OR FROZEN; NUTS	
110000	(i) Citrus fruit	0,5
110010	Grapefruit (Shaddocks, pomelos, sweeties, tangelo (except mineola), ugli and other hybrids)	0,5
110020	Oranges (Bergamot, bitter orange, chinotto and other hybrids)	0,5
110030	Lemons (Citron, lemon)	0,5
110040	Limes	0,5
110050	Mandarins (Clementine, tangerine, mineola and other hybrids)	0,5
110990	Others	0,5
120000	(ii) Tree nuts (shelled or unshelled)	0,05*
120010	Almonds	0,05*
120020	Brazil nuts	0,05*
120030	Cashew nuts	0,05*
120040	Chestnuts	0,05*
120050	Cocanuts	0,05*
120060	Hazelnuts (Filbert)	0,05*
120070	Macadamia	0,05*
120080	Pecans	0,05*
120090	Pine nuts	0,05*
120100	Pistachios	0,05*
120110	Walnuts	0,05*
120990	Others	0,05*
130000	(iii) Pome fruit	1
130010	Apples (Crab apple)	1

130020	Pears (Oriental pear)	1
130030	Quinces	1
130040	Medlar	1
130050	Loquat	1
130990	Others	1
140000	(iv) Stone fruit	0,05*
140010	Apricots	0,05*
140020	Cherries (sweet cherries, sour cherries)	0,05*
140030	Peaches (Nectarines and similar hybrids)	0,05*
140040	Plums (Damson, greengage, mirabelle, sloe)	0,05*
140990	Others	0,05*
150000	(v) Berries & small fruit	
151000	(a) Table and wine grapes	
151010	Table grapes	2
151020	Wine grapes	1
152000	(b) Strawberries	0,5
153000	(c) Cane fruit	0,05*
153010	Blackberries	0,05*
153020	Dewberries (Loganberries, boysenberries, and cloudberrries)	0,05*
153030	Raspberries (Wineberries, arctic bramble/raspberry, (Rubus arcticus), nectar raspberries (Rubus arcticus x idaeus))	0,05*
153990	Others	0,05*
154000	(d) Other small fruit & berries	0,05*
154010	Blueberries (Bilberries)	0,05*
154020	Cranberries (Cowberries (red bilberries))	0,05*
154030	Currants (red, black and white)	0,05*
154040	Gooseberries (Including hybrids with other ribes species)	0,05*
154050	Rose hips	0,05*
154060	Mulberries (arbutus berry)	0,05*
154070	Azarole (mediteranean medlar) (Kiwiberry (Actinidia arguta))	0,05*
154080	Elderberries (Black chokeberry (appleberry), mountain ash, buckthorn (sea salallowthorn), hawthorn, service berries, and other treeberries)	0,05*
154990	Others	0,05*
160000	(vi) Miscellaneous fruit	0,05*
161000	(a) Edible peel	0,05*

161010	Dates	0,05*
161020	Figs	0,05*
161030	Table olives	0,05*
161040	Kumquats (Marumi kumquats, nagami kumquats, limequats (Citrus aurantifolia x Fortunella spp.))	0,05*
161050	Carambola (Bilimbi)	0,05*
161060	Persimmon	0,05*
161070	Jambolan (java plum) (Java apple (water apple), pomereac, rose apple, Brazilian cherry Surinam cherry (grumichama Eugenia uniflora), )	0,05*
161990	Others	0,05*
162000	(b) Inedible peel, small	0,05*
162010	Kiwi	0,05*
162020	Lychee (Litchi) (Pulasan, rambutan (hairy litchi), mangosteen)	0,05*
162030	Passion fruit	0,05*
162040	Prickly pear (cactus fruit)	0,05*
162050	Star apple	0,05*
162060	American persimmon (Virginia kaki) (Black sapote, white sapote, green sapote, canistel (yellow sapote), and mammy sapote)	0,05*
162990	Others	0,05*
163000	(c) Inedible peel, large	0,05*
163010	Avocados	0,05*
163020	Bananas (Dwarf banana, plantain, apple banana)	0,05*
163030	Mangoes	0,05*
163040	Papaya	0,05*
163050	Pomegranate	0,05*
163060	Cherimoya (Custard apple, sugar apple (sweetsop), Ilama and other medium sized Annonaceae)	0,05*
163070	Guava (Red pitaya or dragon fruit (Hylocereus undatus))	0,05*
163080	Pineapples	0,05*
163090	Bread fruit (Jackfruit)	0,05*
163100	Durian	0,05*
163110	Soursop (guanabana)	0,05*
163990	Others	0,05*
200000	2. VEGETABLES FRESH OR FROZEN	
210000	(i) Root and tuber vegetables	

211000	(a) Potatoes	0,05*
212000	(b) Tropical root and tuber vegetables	0,05*
212010	Cassava (Dasheen, eddoe (Japanese taro), tannia)	0,05*
212020	Sweet potatoes	0,05*
212030	Yams (Potato bean (yam bean), Mexican yam bean)	0,05*
212040	Arrowroot	0,05*
212990	Others	0,05*
213000	(c) Other root and tuber vegetables except sugar beet	
213010	Beetroot	0,05*
213020	Carrots	0,1
213030	Celeriac	0,05*
213040	Horseradish (Angelica roots, lovage roots, gentiana roots, )	0,1
213050	Jerusalem artichokes	0,05*
213060	Parsnips	0,1
213070	Parsley root	0,05*
213080	Radishes (Black radish, Japanese radish, small radish and similar varieties, tiger nut (Cyperus esculentus))	0,1
213090	Salsify (Scorzonera, Spanish salsify (Spanish oysterplant))	0,05*
213100	Swedes	0,05*
213110	Tumips	0,05*
213990	Others	0,05*
220000	(ii) Bulb vegetables	
220010	Garlic	0,5
220020	Onions (Silverskin onions)	0,5
220030	Shallots	0,5
220040	Spring onions (Welsh onion and similar varieties)	0,2
220990	Others	0,05*
230000	(iii) Fruiting vegetables	
231000	(a) Solanacea	
231010	Tomatoes (Cherry tomatoes, tree tomato, Physalis, gojiberry, wolfberry (Lycium barbarum and L. chinense))	0,2
231020	Peppers (Chilli peppers)	0,5
231030	Aubergines (egg plants) (Pepino)	0,05*
231040	Okra, lady's fingers	0,05*
231990	Others	0,05*
232000	(b) Cucurbits - edible peel	
232010	Cucumbers	0,5
232020	Gherkins	0,05*
232030	Courgettes (Summer squash, marrow (patisson))	0,05*

232990	Others	0,05*
233000	(c) Cucurbits-inedible peel	
233010	Melons (Kiwano )	0,2
233020	Pumpkins (Winter squash)	0,05*
233030	Watermelons	0,2
233990	Others	0,05*
234000	(d) Sweet com	0,05*
239000	(e) Other fruiting vegetables	0,05*
240000	(iv) Brassica vegetables	
241000	(a) Flowering brassica	0,2
241010	Broccoli (Calabrese, Chinese broccoli, broccoli raab )	0,2
241020	Cauliflower	0,2
241990	Others	0,2
242000	(b) Head brassica	
242010	Brussels sprouts	0,05*
242020	Head cabbage (Pointed head cabbage, red cabbage, savoy cabbage, white cabbage)	1
242990	Others	0,05*
243000	(c) Leafy brassica	
243010	Chinese cabbage (Indian (Chinese) mustard, pak choi, Chinese flat cabbage (tai goo choi), choi sum, peking cabbage (pe-tsai), )	0,05*
243020	Kale (Borecole (curly kale), collards, Portuguese Kale, Portuguese cabbage, cow cabbage)	0,2
243990	Others	0,05*
244000	(d) Kohlrabi	0,05*
250000	(v) Leaf vegetables & fresh herbs	
251000	(a) Lettuce and other salad plants including Brassicacea	
251010	Lamb 's lettuce (Italian comsalad)	0,2
251020	Lettuce (Head lettuce, lollo rosso (cutting lettuce), iceberg lettuce, romaine (cos) lettuce)	2
251030	Scarole (broad-leaf endive) (Wild chicory, red-leaved chicory, radicchio, curd leaf endive, sugar loaf)	1
251040	Cress	0,05*
251050	Land cress	1
251060	Rocket, Rucola (Wild rocket)	2
251070	Red mustard	0,05*

251080	Leaves and sprouts of Brassica spp (Mizuna, leaves of peas and radish and other babyleaf brassica crops (crops harvested up to 8 true leaf stage))	2*
251990	Others	0,05*
252000	(b) Spinach & similar (leaves)	
252010	Spinach (New Zealand spinach, amaranthus spinach)	0,05*
252020	Purslane (Winter purslane (miner's lettuce), garden purslane, common purslane, sorrel, glasswort, Agretti (Salsola soda))	1
252030	Beet leaves (chard) (Leaves of beetroot)	0,05*
252990	Others	0,05*
253000	(c) Vine leaves (grape leaves)	0,05*
254000	(d) Water cress	0,05*
255000	(e) Witloof	0,3
256000	(f) Herbs	2
256010	Chervil	2
256020	Chives	2
256030	Celery leaves (Fennel leaves, Coriander leaves, dill leaves, Caraway leaves, lovage, angelica, sweet cicely and other Apiacea leaves)	2
256040	Parsley	2
256050	Sage (Winter savory, summer savory, )	2
256060	Rosemary	2
256070	Thyme (Marjoram, oregano)	2
256080	Basil (Balm leaves, mint, peppermint)	2
256090	Bay leaves (laurel)	2
256100	Tarragon (Hyssop)	2
256990	Others (Edible flowers )	2
260000	(vi) Legume vegetables (fresh)	0,05*
260010	Beans (with pods) (Green bean (french beans, snap beans), scarlet runner bean, slicing bean, yardlong beans)	0,05*
260020	Beans (without pods) (Broad beans, Flageolet, jack bean, lima bean, cowpea)	0,05*
260030	Peas (with pods) (Mangetout (sugar peas, snow peas))	0,05*
260040	Peas (without pods) (Garden pea, green pea, chickpea)	0,05*

260050	Lentils	0,05*
260990	Others	0,05*
270000	(vii) Stem vegetables (fresh)	
270010	Asparagus	0,05*
270020	Cardoons	0,05*
270030	Celery	0,05*
270040	Fennel	0,05*
270050	Globe artichokes	0,05*
270060	Leek	0,2
270070	Rhubarb	0,05*
270080	Bamboo shoots	0,05*
270090	Palm hearts	0,05*
270990	Others	0,05*
280000	(viii) Fungi	0,05*
280010	Cultivated (Common mushroom, Oyster mushroom, Shi-take)	0,05*
280020	Wild (Chanterelle, Truffle, Morel, Cep)	0,05*
280990	Others	0,05*
290000	(ix) Sea weeds	
300000	3. PULSEES, DRY	0,05*
300010	Beans (Broad beans, navy beans, flageolet, jack beans, lima beans, field beans, cowpeas)	0,05*
300020	Lentils	0,05*
300030	Peas (Chickpeas, field peas, chickling vetch)	0,05*
300040	Lupins	0,05*
300990	Others	0,05*
400000	4. OILSEEDS AND OILFRUITS	
401000	(i) Oilseeds	0,1*
401010	Linseed	0,1*
401020	Peanuts	0,1*
401030	Poppy seed	0,1*
401040	Sesame seed	0,1*
401050	Sunflower seed	0,1*
401060	Rape seed (Bird rapeseed, turnip rape)	0,1*
401070	Soya bean	0,1*
401080	Mustard seed	0,1*
401090	Cotton seed	0,1*
401100	Pumpkin seeds (Other seeds of cucurbitacea)	0,1*
401110	Safflower	0,1*
401120	Borage	0,1*
401130	Gold of pleasure	0,1*
401140	Hempseed	0,1*
401150	Castor bean	0,1*

401990	Others	0,1*
402000	(ii) Oilfruits	
402010	Olives for oil production	0,05*
402020	Palm nuts (palmoil kernels)	0,1*
402030	Palmfruit	0,1*
402040	Kapok	0,1*
402990	Others	0,1*
500000	5. CEREALS	0,05*
500010	Barley	0,05*
500020	Buckwheat (Amaranthus, quinoa)	0,05*
500030	Maize	0,05*
500040	Millet (Foxtail millet, teff)	0,05*
500050	Oats	0,05*
500060	Rice	0,05*
500070	Rye	0,05*
500080	Sorghum	0,05*
500090	Wheat (Spelt, triticale )	0,05*
500990	Others	0,05*
600000	6. TEA, COFFEE, HERBAL INFUSIONS AND COCOA	0,1*
610000	(i) Tea (dried leaves and stalks, fermented or otherwise of Camellia sinensis)	0,1
620000	(ii) Coffee beans	0,1*
630000	(iii) Herbal infusions (dried)	0,1*
631000	(a) Flowers	0,1*
631010	Camomille flowers	0,1*
631020	Hybiscus flowers	0,1*
631030	Rose petals	0,1*
631040	Jasmine flowers (Elderflowers (Sambucus nigra) )	0,1*
631050	Lime (linden)	0,1*
631990	Others	0,1*
632000	(b) Leaves	0,1*
632010	Strawberry leaves	0,1*
632020	Rooibos leaves (Ginkgo leaves)	0,1*
632030	Maté	0,1*
632990	Others	0,1*
633000	(c) Roots	0,1*
633010	Valerian root	0,1*
633020	Ginseng root	0,1*
633990	Others	0,1*
639000	(d) Other herbal infusions	0,1*
640000	(iv) Cocoa (fermented beans)	0,1*
650000	(v) Carob (st johns bread)	0,1*

70000	7. HOPS (dried) , including hop pellets and unconcentrated powder	10
800000	8. SPICES	0,1*
810000	(i) Seeds	0,1*
810010	Anise	0,1*
810020	Black caraway	0,1*
810030	Celery seed (Lovage seed)	0,1*
810040	Coriander seed	0,1*
810050	Cumin seed	0,1*
810060	Dill seed	0,1*
810070	Fennel seed	0,1*
810080	Fenugreek	0,1*
810090	Nutmeg	0,1*
810990	Others	0,1*
820000	(ii) Fruits and berries	0,1*
820010	Allspice	0,1*
820020	Anise pepper (Japan pepper)	0,1*
820030	Caraway	0,1*
820040	Cardamom	0,1*
820050	Juniper berries	0,1*
820060	Pepper, black and white (Long pepper, pink pepper)	0,1*
820070	Vanilla pods	0,1*
820080	Tamarind	0,1*
820990	Others	0,1*
830000	(iii) Bark	0,1*
830010	Cinnamon (Cassia )	0,1*
830990	Others	0,1*
840000	(iv) Roots or rhizome	0,1*
840010	Liquorice	0,1*
840020	Ginger	0,1*
840030	Turmeric (Curcuma)	0,1*
840040	Horseradish	0,1*
840990	Others	0,1*
850000	(v) Buds	0,1*
850010	Cloves	0,1*
850020	Capers	0,1*

850990	Others	0,1*
860000	(vi) Flower stigma	0,1*
860010	Saffron	0,1*
860990	Others	0,1*
870000	(vii) Aril	0,1*
870010	Mace	0,1*
870990	Others	0,1*
900000	9. SUGAR PLANTS	
900010	Sugar beet (root)	0,1
900020	Sugar cane	0,05*
900030	Chicory roots	0,05*
900990	Others	0,05*
1000000	10. PRODUCTS OF ANIMAL ORIGIN- TERRESTRIAL ANIMALS	
1010000	(i) Meat, preparations of meat, offals, blood, animal fats fresh chilled or frozen, salted, in brine, dried or smoked or processed as flours or meals other processed products such as sausages and food preparations based on these	0,05*
1011000	(a) Swine	0,05*
1011010	Meat	0,05*
1011020	Fat free of lean meat	0,05*
1011030	Liver	0,05*
1011040	Kidney	0,05*
1011050	Edible offal	0,05*
1011990	Others	0,05*
1012000	(b) Bovine	0,05*
1012010	Meat	0,05*
1012020	Fat	0,05*
1012030	Liver	0,05*
1012040	Kidney	0,05*
1012050	Edible offal	0,05*
1012990	Others	0,05*
1013000	(c) Sheep	0,05*
1013010	Meat	0,05*

1013020	Fat	0,05*
1013030	Liver	0,05*
1013040	Kidney	0,05*
1013050	Edible offal	0,05*
1013990	Others	0,05*
1014000	(d) Goat	0,05*
1014010	Meat	0,05*
1014020	Fat	0,05*
1014030	Liver	0,05*
1014040	Kidney	0,05*
1014050	Edible offal	0,05*
1014990	Others	0,05*
1015000	(e) Horses, asses, mules or hinnies	0,05*
1015010	Meat	0,05*
1015020	Fat	0,05*
1015030	Liver	0,05*
1015040	Kidney	0,05*
1015050	Edible offal	0,05*
1015990	Others	0,05*
1016000	(f) Poultry -chicken, geese, duck, turkey and Guinea fowl-, ostrich, pigeon	0,05*
1016010	Meat	0,05*
1016020	Fat	0,05*
1016030	Liver	0,05*
1016040	Kidney	0,05*
1016050	Edible offal	0,05*
1016990	Others	0,05*
1017000	(g) Other farm animals (Rabbit, Kangaroo)	0,05*
1017010	Meat	0,05*
1017020	Fat	0,05*
1017030	Liver	0,05*
1017040	Kidney	0,05*
1017050	Edible offal	0,05*
1017990	Others	0,05*

1020000	(ii) Milk and cream, not concentrated, nor containing added sugar or sweetening matter, butter and other fats derived from milk, cheese and curd	0,05*
1020010	Cattle	0,05*
1020020	Sheep	0,05*
1020030	Goat	0,05*
1020040	Horse	0,05*
1020990	Others	0,05*
1030000	(iii) Birds' eggs, fresh preserved or cooked Shelled eggs and egg yolks fresh, dried, cooked by steaming or boiling in water, moulded, frozen or otherwise preserved whether or not containing added sugar or sweetening matter	0,05*
1030010	Chicken	0,05*
1030020	Duck	0,05*
1030030	Goose	0,05*
1030040	Quail	0,05*
1030990	Others	0,05*
1040000	(iv) Honey (Royal jelly, pollen)	
1050000	(v) Amphibians and reptiles (Frog legs, crocodiles)	
1060000	(vi) Snails	
1070000	(vii) Other terrestrial animal products	
(*) Indicates lower limit of analytical determination		

## ABBREVIATIONS

ADI	acceptable daily intake
ARfD	acute reference dose
a.s.	active substance
BBCH	growth stages of mono- and dicotyledonous plants
bw	body weight
CAC	Codex Alimentarius Commission
CF	conversion factor for enforcement residue definition to risk assessment residue definition
CV	coefficient of variation
CXL	Codex Maximum Residue Limit (Codex MRL)
d	day
DAR	Draft Assessment Report (prepared under Council Directive 91/414/EEC)
DAT	days after treatment
DE	Germany
DM	dry matter
DT <sub>90</sub>	period required for 90% dissipation
dw	dry weight
EFSA	European Food Safety Authority
EMS	evaluating Member State
ES	Spain
EU	European Union
GAP	good agricultural practice
GS	growth stage
ha	hectare
hL	hectolitre
i.e.	that is (id est, <i>Latin</i> )
ISO	International Organization for Standardization
IUPAC	International Union of Pure and Applied Chemistry
JMPR	Joint FAO/WHO Meeting on Pesticide Residues
kg	kilogram
L	litre
LOAEL	lowest observed adverse effect level
LOQ	limit of quantification (determination)



MRL	maximum residue limit
MS	Member States
NEU	northern European Union
NOAEL	no observed adverse effect level
OECD	Organization for Economic Co-operation and Development
PHI	pre-harvest interval
PRIMo	(EFSA) Pesticide Residues Intake Model
$R_{ber}$	statistical calculation of the MRL by using a non-parametric method
$R_{max}$	statistical calculation of the MRL by using a parametric method
RD	residue definition
RMS	rappporteur Member State
SEU	Southern European Union
WG	water dispersible granule
wk	week
yr	year