European Food Safety Authority

EFSA Journal 2015;13(8):4210

CONCLUSION ON PESTICIDE PEER REVIEW

Conclusion on the peer review of the pesticide risk assessment for bees for the active substance clothianidin considering all uses other than seed treatments and granules[1]

European Food Safety Authority[2]

European Food Safety Authority (EFSA), Parma, Italy

ABSTRACT

The European Food Safety Authority (EFSA) was asked by the European Commission to perform a risk assessment of neonicotinoids, including clothianidin, as regards the risk to bees, as a follow up of previous mandates received from the European Commission on neonicotinoids. In this context the conclusions of EFSA concerning the risk assessment for bees for the active substance clothianidin are reported. The context of the evaluation was that required by the European Commission in accordance with Article 21 of Regulation (EC) No 1107/2009 to review the approval of active substances in light of new scientific and technical knowledge and monitoring data. The conclusions were reached on the basis of the evaluation of all authorised uses of clothianidin other than seed treatments and granules in Europe (including the foliar spray uses as referred to in recital 7 of Commission Implementing Regulation (EU) No 485/2013). The reliable endpoints concluded as being appropriate for use in regulatory risk assessment, derived from the submitted studies and literature data as well as any other relevant data available at national level and made available to EFSA, are presented. Missing information identified as being required to allow for a complete risk assessment is listed. Concerns are identified.

KEY WORDS

clothianidin, peer review, risk assessment, pesticide, insecticide

[1] On request from the European Commission, Question No EFSA-Q-2013-00636, approved on 30 July 2015.

[2] Correspondence: pesticides.peerreview@efsa.europa.eu

Suggested citation: EFSA (European Food Safety Authority), 2015. Conclusion on the peer review of the pesticide risk assessment for bees for the active substance clothianidin considering all uses other than seed treatments and granules. EFSA Journal 2015;13(8):4210, 77 pp. doi:10.2903/j.efsa.2015.4210

Available online: www.efsa.europa.eu/efsajournal

SUMMARY

Clothianidin was included in Annex I to Directive 91/414/EEC on 1 August 2006 by Commission Directive 2006/41/EC, and has been deemed to be approved under Regulation (EC) No 1107/2009, in accordance with Commission Implementing Regulation (EU) No 540/2011, as amended by Commission Implementing Regulations (EU) No 541/2011 and 1136/2013. A specific conclusion was issued by EFSA on 19 December 2012 on the risk assessment for bees as regards the authorised uses applied as seed treatments and granules (EFSA Journal 2013;11(1):3066).

The specific provisions of the approval were amended by Commission Implementing Regulation (EU) No 485/2013, to restrict the uses of clothianidin, thiamethoxam and imidacloprid, to provide for specific risk mitigation measures for the protection of bees and to limit the use of the plant protection products containing these active substances to professional users. In particular, the uses as seed treatment and soil treatment of plant protection products containing clothianidin, thiamethoxam or imidacloprid have been prohibited for crops attractive to bees and for cereals except for uses in greenhouses and for winter cereals. Foliar treatments with plant protection products containing these active substances have been prohibited for crops attractive to bees and for cereals with the exception of uses in greenhouses and uses after flowering.

With reference to Article 31 of Regulation (EC) No 178/2002 and in accordance with Article 21 of Regulation (EC) No 1107/2009 to review the approval of active substances in light of new scientific and technical knowledge and monitoring data, in June 2013 the European Commission requested EFSA to provide conclusions concerning an updated risk assessment for bees for the three neonicotinoids (namely clothianidin, imidacloprid and thiamethoxam), taking into account all uses other than seed treatments and granules, including foliar spray uses as mentioned in recital 7 of Commission Implementing Regulation (EU) No 485/2013 (i.e. including the uses that may have been withdrawn due to the restrictions of Regulation (EU) No 485/2013). This mandate is a follow up of previous mandates received from the European Commission on neonicotinoids to perform an evaluation with regard to the acute and chronic effects on colony survival and development, taking into account effects on bee larvae and bee behaviour, and the effects of sublethal doses on bee survival and behaviour.

The conclusions laid down in this report were reached on the basis of the evaluation of the existing data submitted for the approval of the active substance at EU level and for the authorisation of plant protection products containing clothianidin at Member State level, taking into account the uses other than seed treatments and granules. In addition, any other relevant data available at national level and made available to EFSA were taken into account and, where relevant, the results of a systematic literature review awarded by EFSA and conducted by the Food and Environmental Research Agency (FERA) on clothianidin, thiamethoxam and imidacloprid and the risk to bees (EFSA supporting publication 2015:EN-756). The EFSA guidance document on the risk assessment of plant protection products on bees (EFSA Journal 2013;11(7):3295) was used for the current evaluation.

For all the authorised uses high risks were identified or could not be excluded, or the risk assessment could not be finalised.

TABLE OF CONTENTS

BACKGROUND

Clothianidin was included in Annex I to Directive 91/414/EEC[3] on 1 August 2006 by Commission Directive 2006/41/EC[4], and has been deemed to be approved under Regulation (EC) No 1107/2009[5], in accordance with Commission Implementing Regulation (EU) No 540/2011[6], as amended by Commission Implementing Regulations (EU) No 541/2011[7] and 1136/2013[8]. The peer review leading to the approval of this active substance was finalised in 2006, however EFSA was not involved in this evaluation. For the request of the European Commission, a specific conclusion was issued by EFSA on 19 December 2012 on the risk assessment for bees as regards the authorised uses applied as seed treatments and granules (EFSA, 2013a).

The specific provisions of the approval were amended by Commission Implementing Regulation (EU) No 485/2013[9], to restrict the uses of clothianidin, thiamethoxam and imidacloprid, to provide for specific risk mitigation measures for the protection of bees and to limit the use of the plant protection products containing these active substances to professional users. In particular, the uses as seed treatment and soil treatment of plant protection products containing clothianidin, thiamethoxam or imidacloprid have been prohibited for crops attractive to bees and for cereals except for uses in greenhouses and for winter cereals. Foliar treatments with plant protection products containing these active substances have been prohibited for crops attractive to bees and for cereals with the exception of uses in greenhouses and uses after flowering.

With reference to Article 31 of Regulation (EC) No 178/2002[10] and in accordance with Article 21 of Regulation (EC) No 1107/2009 to review the approval of active substances in light of new scientific and technical knowledge and monitoring data, and as a follow up of previous mandates on neonicotinoids, on 21 June 2013 the European Commission requested EFSA to provide conclusions concerning an updated risk assessment for bees for the three neonicotinoids (namely clothianidin, imidacloprid and thiamethoxam), in particular with regard to the acute and chronic effects on colony survival and development, taking into account effects on bee larvae and bee behaviour, and the effects of sublethal doses on bee survival and behaviour. With reference to the pending evaluation by EFSA of the foliar uses of these three neonicotinoids, as referred to in recital 7 of Commission Implementing Regulation (EU) No 485/2013, with this follow up mandate the European Commission requested EFSA to undertake a review of all uses other than seed treatments and granules, including the uses that may have been withdrawn due to the restrictions of Regulation (EU) No 485/2013, for the above mentioned three neonicotinoids, including clothianidin.

[3] Council Directive 91/414/EEC of 15 July 1991 concerning the placing of plant protection products on the market. OJ L 230, 19.8.1991, p. 1-32, as last amended.

[4] Commission Directive 2006/41/EC of 7 July 2006 amending Council Directive 91/414/EEC to include clothianidin and pethoxamid as active substances. OJ L 187, 8.7.2006, p. 24-27.

[5] Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC. OJ No L 309, 24.11.2009, p. 1-50.

[6] Commission Implementing Regulation (EU) No 540/2011 of 25 May 2011 implementing Regulation (EC) No 1107/2009 of the European Parliament and of the Council as regards the list of approved active substances. OJ L 153, 11.6.2011, p. 1-186.

[7] Commission Implementing Regulation (EU) No 541/2011 of 1 June 2011 amending Implementing Regulation (EU) No 540/2011 implementing Regulation (EC) No 1107/2009 of the European Parliament and of the Council as regards the list of approved active substances. OJ L 153, 11.6.2011, p. 187-188.

[8] Commission Implementing Regulation (EU) No 1136/2013 of 12 November 2013 amending Implementing Regulation (EU) No 540/2011 as regards the extension of the approval periods of the active substances clothianidin, dimoxystrobin, oxamyl and pethoxamid. OJ L 302, 13.11.2013, p. 34-35.

[9] Commission Implementing Regulation (EU) No 485/2013 of 24 May 2013 amending Implementing Regulation (EU) No 540/2011, as regards the conditions of approval of the active substances clothianidin, thiamethoxam and imidacloprid, and prohibiting the use and sale of seeds treated with plant protection products containing those active substances. OJ L 139, 25.5.2013, p. 12-26.

[10] Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety. OJ L 31, 1.2.2002, p. 1-24.

A consultation on the evaluation and preliminary conclusions of EFSA on the risk assessment for bees was conducted with Member States via a written procedure in February - March 2015. The draft conclusions drawn by EFSA, together with the points that required further consideration in the assessment, as well as the specific issues raised by Member States following the consultation were discussed at the Pesticides Peer Review Experts' Meeting 129 on ecotoxicology in March 2015. Details of the issues discussed, together with the outcome of these discussions were recorded in the meeting report. A further consultation on the final conclusions arising from the peer review of the risk assessment for bees took place with Member States via a written procedure in June 2015.

The conclusions laid down in this report were reached on the basis of the evaluation of the existing data submitted for the approval of the active substance at EU level and for the authorisation of plant protection products containing clothianidin at Member State level, taking into account the uses other than seed treatments and granules. In addition, any other relevant data available at national level and made available to EFSA were taken into account. Where relevant, the results of a systematic literature review conducted by the Food and Environmental Research Agency (FERA) on clothianidin, thiamethoxam and imidacloprid and the risk to bees (Fryday et al., 2015) were considered. This systematic literature review was awarded by EFSA to FERA (contract RC/EFSA/PRAS/2013/03 implementing Framework contract OC/EFSA/SAS/2012 – LOT5 – FWC 2). The overall objective of the systematic literature search was to contribute to producing the evidence base for risk assessment of the three neonicotinoids thiamethoxam, clothianidin and imidacloprid for bees (including honeybees, bumble bees, solitary bees), by performing two systematic reviews to inform exposure assessment and adverse effect characterisation.

The EFSA guidance document on the risk assessment of plant protection products on bees (EFSA, 2013b) was used for the current evaluation.

A key supporting document to this conclusion is the Peer Review Report, which is a compilation of the documentation developed to evaluate and address all issues raised in the peer review. The Peer Review Report (EFSA, 2015) comprises the following documents, in which all views expressed during the course of the peer review, including minority views where applicable, can be found:

- the study evaluation notes[11],
- the report of the scientific consultation with Member State experts,
- the comments received on the draft EFSA conclusion.

[11] As no Draft Assessment Report was available in the context of this peer review, the studies and available data submitted by the applicant(s) and/or made available by the Member States were evaluated by EFSA and summarised in a document titled 'study evaluation notes'.

CONCLUSIONS OF THE EVALUATION

1. Introduction

1.1. Authorised uses

Clothianidin was authorised in Member States as foliar spray applications on orchards, potatoes and ornamentals; as tuber spray treatment on potatoes and as 'pour plant' application (assumed by EFSA to be a drench application) on kohlrabi and cabbage. A complete GAP table is reported in Appendix A of this Conclusion (Tables 10 and 11). It is noted that one of the authorised uses reported was a granular formulation and was not covered by this mandate.

The approaches to perform a risk assessment according to EFSA, 2013b for the authorised uses were discussed and agreed at the Pesticides Peer Review Experts' Meeting 129 (March 2015).

1.1.1. Foliar spray uses

According to EFSA, 2013b, the risk assessment for foliar spray applications should cover the acute contact exposure and the oral exposure (acute for adult bees, chronic for adult bees and larvae). These assessments should be performed for honeybees, bumble bees and solitary bees by calculating Hazard Quotient (HQ) and Exposure Toxicity Ratio (ETR) values for the contact and oral risk assessments, respectively. For honeybees, the oral risk assessment should cover also sublethal effects on development of the hypopharyngeal glands (HPG).

Furthermore, the following risk assessments should be considered: 1) risk for accumulative effects (for honeybees only); 2) risk from exposure to contaminated water (by calculating ETRs, for honeybees only) and 3) risk from the metabolites in pollen and nectar.

The contact and the oral risk assessments should be carried out by considering the exposure from the treated and surrounding area. Therefore, depending on the use under evaluation, different exposure scenarios should be considered, i.e. exposure from: the treated crop, weeds within the field, the field margin, the adjacent crops and succeeding crops (including succeeding permanent flowering plants/trees).

According to EFSA, 2013b, where a first-tier risk assessment indicates a high risk, then there are several options for performing a higher tier risk assessment, either by refining the exposure estimate (tier 2) or by the use of higher tier effect studies (tier 3). An overview of the risk assessment scheme according to EFSA, 2013b is provided in Table 1 below.

Table 1: Overview of the risk assessment scheme according to EFSA, 2013b

	Honeybee (exposure scenarios)	**Bumble bee (exposure scenarios)**	**Solitary bee (exposure scenarios)**
First-tier contact risk assessment[3]	Treated crop Weeds in the field Field margin[2]	Treated crop Weeds in the field Field margin[2]	Treated crop Weeds in the field Field margin[2]
First-tier acute oral risk assessment[3]	Treated crop Weeds in the field Field margin Adjacent crop Succeeding crop[5]	Treated crop Weeds in the field Field margin Adjacent crop Succeeding crop[5]	Treated crop Weeds in the field Field margin Adjacent crop Succeeding crop[5]
First-tier chronic oral risk[4] assessment			
First-tier larvae risk assessment[4]			
First-tier risk assessment for effects on the HPG (sublethal effect)		Not applicable	Not applicable
Assessment of accumulative effects	Required	Not required[1]	Not required[1]
Risk assessment for exposure from residues in guttation fluid	Required	Not required[1]	Not required[1]
Risk assessment for exposure from residues in surface water	Required	Not required[1]	Not required[1]
Risk assessment for exposure from residues in puddles	Required	Not required[1]	Not required[1]
Risk assessment for exposure from metabolites	Required for pollen and nectar consumption	Required for pollen and nectar consumption	Required for pollen and nectar consumption
Higher tier risk assessment using refined exposure (tier 2)	Required if lower tier fails	Required if lower tier fails	Required if lower tier fails
Higher tier risk assessment using effects field studies (tier 3)	Required if lower tier fails	Required if lower tier fails	Required if lower tier fails
Uncertainty analysis for higher tier risk assessments	Required	Required	Required

[1] Assumed to be covered by the assessment for honeybees.
[2] Field margin risk assessment for contact exposure also covers the adjacent crop.
[3] Risk assessments for formulated products are required depending on whether exposure will occur and where the toxicity cannot be predicted on the basis of the active substance.
[4] Chronic risk assessment for formulated products (adult and larvae) is only required when the product is more acutely toxic and in cases where exposure will occur.
[5] The 'succeeding crop scenario' includes residues occurring in flowering permanent crops in the successive year.

It is noted that the EFSA, 2013b does not include a risk assessment scheme to cover exposure routes such as residues in wax or honeydew. As acknowledged in the EFSA, 2013b, this could underestimate the risk for certain circumstances (e.g. honeydew).

Several of the authorised uses were on crops/plants for which there is no clear crop categorisation in EFSA, 2013b (e.g. ornamental plants, tuber treatments). The tuber treatments were considered in this Conclusion as foliar spray at BBCH < 10, as a worst-case. Regarding the ornamentals, the experts at the Pesticides Peer Review Experts' Meeting 129 discussed the appropriate parameters to be used in the first-tier risk assessment. The agreements reached have been reflected in the risk assessments performed as part of this Conclusion (see Section 3). Full details of the discussions can be found in Appendix 2 of the meeting report (EFSA, 2015) and a short summary is provided in Appendix C of this Conclusion.

1.1.2. Other application techniques

The risk assessment approach provided in EFSA, 2013b is applicable to all application techniques, i.e. each aspect provided in Table 1 should be considered in the first tier and, where a first-tier risk assessment does not demonstrate a low risk, then a tier 2 and/or tier 3 risk assessment should be performed. However, there is no specific tier 1 risk assessment scheme given in EFSA, 2013b for application techniques other than foliar sprays, seed treatments or granules. Therefore, the approach to

the risk assessment for uses as drenches, drip irrigation and dips and soil incorporation (of liquid) was discussed at the experts' meeting. The experts provided clarifications and definitions for a number of the application techniques. On the basis of the agreed definitions, the potential for exposure to bees via different routes was discussed. Full details of the discussions can be found in Appendix 3 of the meeting report (EFSA, 2015). The only authorised use for clothianidin, which was assumed to belong to this type of uses, was the 'pour plant' application (assumed by EFSA to be a drench use) on kohlrabi and cabbage (see Section 4).

1.1.3. Uses made in protected structures

Some of the authorised uses of clothianidin were on protected crops/plants. The experts at the meeting discussed the exposure to bees from the protected uses. In order to perform a risk assessment for bees it was necessary to clearly define what is meant by protected uses. For this purpose, it was agreed to use the definitions given in the 'EFSA Guidance Document on clustering and ranking of emissions of active substances of plant protection products and transformation products of these active substances from open-protected crops (greenhouses and crops grown under cover) to relevant environmental compartments' (EFSA, 2014a). Full details of the discussions can be found in Appendix 4 of the meeting report (EFSA, 2015).

For the purposes of clarity, in this Conclusion the following terminology is used:

Uses in open-protected structures:	Crops/plants grown in low mini tunnels, plastic shelters, net shelter/shade house and walk-in tunnels. For all these uses exposure to bees may be equivalent to non-protected uses.
Uses in permanent greenhouses:	Crops/plants grown in a permanent walk-in, static, closed place for crop production with a non-permeable translucent outer shell. For all these uses exposure to bees is limited.
Outdoor field uses:	Crops/plants grown in the open field without any form of protection (includes orchards, hops, arable field crops etc.).

Overall, it was agreed that for uses in **open-protected structures** exposure to bees may not differ from that of an outdoor field use (i.e. non-protected uses) as these types of protected structures can be open to the environment. Therefore, a risk assessment should be performed using the same parameters as for outdoor field uses.

It was agreed that, with the exception of the risk to honeybees via consumption of surface water, no risk assessment for **permanent greenhouse** uses is required. It has to be noted that, when the applications are made to plants or seedlings, with subsequent movement of the plants or seedlings outside, then exposure to bees will only occur once the plants or seedlings are transplanted to the outdoor field (refer to Appendices 3 and 4 of the meeting report for further details; EFSA, 2015).

It should be noted that the experts considered that exposure to bees from foliar spray applications and soil treatments made in permanent greenhouses could not be completely excluded (e.g. bees entering the permanent greenhouse through open vents), but it was agreed that, in most circumstances, exposure to bee populations via this route is likely to be low. The experts considered that this may not be an appropriate assumption in the case of areas with large scale greenhouse production.

The experts noted that it could not be excluded that pollinators would be introduced as part of Integrated Pest Management practices (IPM) in all types of protected crop structures. Therefore it was agreed, where a high risk is indicated for an equivalent field use, it cannot be excluded that there is also a high risk to IPM pollinators, if used.

Member States were requested to provide feedback on whether the authorised uses to protected crops were restricted to permanent greenhouses only. For the uses of clothianidin on protected crops/plants,

no information was available in the GAP table, therefore it was assumed that the authorised use could be made to crops/plants grown under any type of protected crop structure (i.e. used in open-protected structures) and therefore a risk assessment has been performed using the same parameters as for outdoor field uses.

1.2. Formulated products

In accordance with EFSA, 2013b, a consideration of the need for a specific risk assessment for the formulated product is required. Therefore a consideration has been provided in Section 2.5.

1.3. Risk mitigation measures for the authorised uses

Where risk mitigation measures were considered to potentially address the risk identified, these have been highlighted. It is noted that the authorised uses in a number of Member States already included risk mitigation measures designed to protect bees. These mitigation measures are considered to potentially reduce the risk to bees, for example preventing applications during and just before flowering, or preventing applications when flowering weeds are present in the field. The risk assessment included in this Conclusion considers only risk mitigation measures which are included in EFSA, 2013b. It should be acknowledged that further mitigation may be possible in individual Member States.

1.4. Multiple stressors

It is known that there are multiple stressors in the environment which bees are exposed to, as reported in the scientific report of EFSA 'Towards an integrated environmental risk assessment of multiple stressors on bees: review of research projects in Europe, knowledge gaps and recommendations' (EFSA, 2014b). A number of literature papers were provided to EFSA (Aufauvre et al., 2014; Bekele at al., 2015; Betti et al., 2014; Gisder and Genersch, 2015; Goblirsch et al., 2013; Graystock et al., 2014; Khoury et al., 2013; Natsopoulou et al., 2015; Naug, 2014; Perry at al., 2014; Simeunovic et al., 2014; Wolf et al., 2014; Sandrock at al., 2014; Pettis at al., 2012). Data were also available in the systematic literature review report (Fryday et al., 2015), indicating the potential for synergistic effects between neonicotinoid pesticide active substances and honeybee disease. At the experts' meeting it was acknowledged that effects caused by exposure of pesticides can be amplified by other factors impairing the health status of the bees. EFSA, 2014b recommended developing a holistic approach to account for multiple stressors in the environment. This is currently being developed under the umbrella of the EFSA project 'MUST-B' (EU effort towards the development of a holistic approach for the risk assessment on multiple stressors in bees: http://www.efsa.europa.eu/en/topics/topic/beehealth.htm). No risk assessment scheme accounting for multiple stressors was included in EFSA, 2013b as, currently, there is insufficient knowledge to be able to develop a robust scheme. Consequently, this Conclusion focusses on the risk posed by the authorised uses of clothianidin only.

1.5. Systematic literature review

A systematic literature review was conducted by the Food and Environmental Research Agency (FERA) on clothianidin, thiamethoxam and imidacloprid and the risk to bees (Fryday et al., 2015). This systematic literature review was awarded by EFSA to FERA (contract RC/EFSA/PRAS/2013/03 implementing Framework contract OC/EFSA/SAS/2012 – LOT5 – FWC 2). The overall objective of the systematic literature search was to contribute to producing the evidence base for risk assessment of the three neonicotinoids thiamethoxam, clothianidin and imidacloprid for bees (including honeybees, bumble bees, solitary bees), by addressing questions to inform on exposure assessment and adverse effect characterisation.

A large number of studies were selected by the systematic literature search for full assessment. A quality assessment of the papers selected for full assessment was performed by Fryday et al., 2015, according to the criteria agreed with the systematic literature search protocol (i.e. reproducibility, appropriateness of study design, repeatability, internal and external validity/risk of bias, precision, conclusions in support of results, characterisation of uncertainty, chemical analysis, test accuracy,

controls, replicates, statistical analysis, other information). These studies covered effects assessments (e.g. acute, chronic, sublethal, colony parameters etc.) in laboratory, field and greenhouse for several bee species as well as exposure assessment. For this Conclusion, the systematic literature review report was screened for relevant information, in particular:

- Toxicity data (e.g. to check whether there was indication of more adverse effects or to seek for data suitable for tier 1 risk assessment according to EFSA, 2013b when data were missing in the dossiers (e.g. chronic data for honeybees, or toxicity studies on bumble bees and solitary bees)).

- Residue studies which could provide information to perform an exposure assessment and tier 2 risk assessment using refined shortcut values.

For higher tier risk assessment, a further consideration of the data included in the systematic literature review can be performed in the future.

2. Toxicity

Data from the dossiers, the previous EU evaluation of clothianidin (Belgium, 2003; European Commission, 2005; EFSA, 2013a) and the systematic literature search were considered in this section.

2.1. Toxicity endpoints for honeybees from the dossiers

Several toxicity studies (including acute contact and oral toxicity and chronic toxicity) were available for clothianidin on honeybees (adult and larvae). Acute toxicity studies were also available for the formulated product 'TI-435 50 % WDG' and clothianidin metabolites in the dossiers provided by the applicants. These data were evaluated in the previous assessments of clothianidin (European Commission, 2005; Draft Assessment Report (Belgium, 2003) and the study evaluation notes in EFSA 2013a), except the study from C. S. Weyman, 1998, which was evaluated in the study evaluation notes of this Conclusion (EFSA, 2015). These studies were considered acceptable. A summary of the endpoints is reported in Table 12 in Appendix B.

The available chronic oral toxicity data on adults and larvae were re-evaluated in the study evaluation notes of this Conclusion (01_THW-0174, 12_THW-0272; EFSA, 2015) according to EFSA, 2013b. However, the endpoints were not expressed in terms of µg a.s./bee per day (i.e. 10-day LD_{50}) or as µg a.s./larvae per developmental period. These two studies were further considered at the Pesticides Peer Review Experts' Meeting 129.

Regarding the adult chronic oral toxicity study, the study protocol followed was considered broadly in line with what is in the EFSA 2013a, but it was agreed to reanalyse the raw data and recalculate the endpoint in terms of 10-day LDD_{50} (µg a.s./bee per day). This reanalysis was performed by EFSA (01_THW-0174) and the recalculated 10-day LDD_{50} was 0.00138 µg a.s./bee per day.

Regarding the study on honeybee larvae (12_THW-0272), it was agreed to derive from this study a 7-day NOEC of 40 µg a.s./kg diet, which, expressed in terms of µg a.s./larvae, corresponds to a NOEL of 0.00528 µg a.s./larvae (nominal dose). It is acknowledged that the 7-day NOEC was selected by the experts instead of the 22-day NOEC of 10 µg a.s./kg diet (i.e. NOEL of 0.00132 µg a.s./larvae, nominal dose), to be in line with the endpoint used for risk assessment according to EFSA, 2013b. It was agreed that this endpoint should be used only as provisional endpoint for risk assessment because the study is not fully in line with the proposed protocol in EFSA, 2013b (i.e. exposure duration in the study was over 3 days rather than 5 days as recommended by EFSA, 2013b). In addition, the actual food consumption of larvae was not reported; therefore it was only possible to express the endpoint in terms of nominal dose.

No data on the assessment of the development of the hypopharyngeal glands (HPG) or of accumulative effects were available.

2.2. Toxicity endpoints for honeybees from literature data

Data on the effects of clothianidin on bees were available in the systematic literature search report (Fryday et al., 2015).

Acute contact toxicity data on honeybees

A comparative toxicity test on *Apis cerana* from Jeyalakshmi et al., 2011 resulted in a 24-hour LD_{50} of 0.014 µg a.s./bee. A 24-hour contact toxicity study on *Apis mellifera* resulted in a 24-hour LD_{50} of 0.028 µg a.s./bee for clothianidin (Iwasa et al., 2004).

Acute oral toxicity data on honeybees

Laurino et al., 2011 reported a 48-hour LD_{50} of 0.002689 µg a.s./bee for clothianidin on *Apis mellifera* L. Laurino et at., 2013 reported an average 48-hour LD_{50} of 0.00335 µg a.s./bee tested on different honeybee genotypes. The formulated product 'DANTOP' was tested in these studies.

The results of these studies were in line with the endpoints obtained from the data in the dossiers and reported in Table 12 in Appendix B of this Conclusion.

2.3. Toxicity endpoints for bumble bees and solitary bees

No appropriate acute or chronic endpoints for risk assessment were available for bumble bees and solitary bees from the dossiers. No data were available in the systematic literature search report which might be suitable to perform an acute and/or chronic risk assessment to bumble bees and solitary bees according to EFSA, 2013b. The possibility to perform a read-across of data between clothianidin and imidacloprid or thiamethoxam (for which some data on bumble bees were available) was considered. However, this was considered in general as not an appropriate approach for regulatory risk assessment. Furthermore, a paper from the systematic literature review (Scott-Dupree et al., 2009) had shown that clothianidin has a higher toxicity than imidacloprid to two bee species.

According to EFSA, 2013b, for performing a screening risk assessment, it can be assumed that the toxicity endpoints for bumble bees and solitary bees are ten times lower than those for honeybees. On this basis, the acute (contact and oral) and chronic toxicity endpoints for honeybees were divided by ten to derive surrogate endpoints for bumble bees and solitary bees. This approach was however not considered appropriate by the experts for bumble bee and solitary bee larvae, because only a provisional honeybee larvae endpoint was available.

2.4. Sublethal effects and other data

No sublethal endpoints were available for clothianidin in the dossiers, including data on HPG. However, several sublethal effects were reported in the systematic literature search report, including behaviour, locomotion, navigation or orientation (Fryday et al., 2015).

For example, Fischer et al., 2014 reported that clothianidin exposure at 2.5 ng a.s./bee resulted in a significant difference in the flight direction compared to the control group ($p < 0.05$) and significantly longer flight path length and duration compared to the controls ($p < 0.05$).

Di Prisco et al., 2013 demonstrated that clothianidin exposure at sublethal dose (i.e. $\leq$ 21 ng a.s./bee topical exposure and 0.1-10 ppb oral exposure) reduces immune defences and promotes the replication of deformed wing virus. This honeybee immune-suppression is similarly induced by imidacloprid.

A comprehensive review of sublethal effects of pesticides was reported in the EFSA PPR Panel, 2012. However, it has to be noted that EFSA, 2013b identified issues that should be resolved before sublethal effects other than HPG for honeybees can be fully integrated in a risk assessment scheme, such as definition of the protection goal and the interpretation of the sublethal effects in terms of

impact on the colony. EFSA, 2013b provided a proposal for a sublethal risk assessment scheme. However, for the purposes of this Conclusion it was considered premature to apply such proposal.

2.5. Endpoints selected for risk assessment

The endpoints to be used for risk assessments were discussed and agreed at the experts' meeting. It was noted that the difference between oral toxicity for the formulation and the technical was less than a factor of 5 (i.e. based on the ratio between the LD_{50} for the technical and the LD_{50} of the formulation expressed as a.s.). Therefore, it was agreed to use the endpoints for the technical for all the acute risk assessments to honeybees. Surrogate endpoints were agreed for bumble bees and solitary bees, assuming that the honeybee endpoint for the technical is 10 times lower for these species. As agreed by the experts, the chronic endpoint for honeybees was derived by EFSA from the available study as described above. The same endpoint divided by 10 was agreed as a surrogate endpoint for bumble bees and solitary bees. The endpoint available for honeybee larvae was agreed but only as a provisional endpoint. Being a provisional endpoint, it was also agreed at the meeting not to use it as a surrogate for bumble bees and solitary bees.

The endpoints selected for risk assessment are reported in Table 2. The previous EU agreed acute (oral and contact) endpoints for honeybees were maintained.

Table 2: Toxicity endpoints selected for tier 1 risk assessments

Risk assessment type	Endpoint	Honeybees	Bumble bees	Solitary bees
Acute oral	48-hour LD_{50} µg a.s./bee technical	0.00379	0.000379*	0.000379*
Acute contact	48-hour LD_{50} µg a.s./bee technical	0.0275	0.00275*	0.00275*
Chronic	10-day LDD_{50} µg a.s./bee per day (technical)	0.00138	0.000138*	0.000138*
Larvae	7-day NOEL mortality µg a.s./larva per development period (technical)	0.00528 (provisional endpoint because of 3 days exposure and nominal food consumption)	No endpoint available	No endpoint available
Development of hypopharyngeal glands	NOEL (µg a.s./bee/day)	No endpoint available	Not relevant	Not relevant

* Surrogate endpoint by using the honeybee toxicity endpoint divided by a factor of 10

3. Risk assessments for products applied as a foliar spray (outdoor field and open-protected uses)

3.1. Tier 1: risk assessments for honeybees, bumble bees and solitary bees

For contact exposure, Hazard Quotients (HQs) are calculated for the treated crop (during flowering growth stages only), weeds within the treated field and also for the field margin (which covers exposure from residues on the adjacent crop also). The HQ values are then compared to the trigger

values given in EFSA, 2013b, which differ for honeybees, bumble bees and solitary bees and also whether the application is made by a downward spray (from a horizontal boom sprayer) or side- and upwards spray (from a broadcast sprayer).

For oral exposure, Exposure Toxicity Ratios (ETRs) are calculated for the treated crop, weeds within the treated field, plants in the field margin, adjacent crop and also succeeding crops (including flowering permanent crops in the successive year). ETRs are calculated for the acute risk to adult bees, chronic risk to adult bees and chronic risk to bee larvae for honeybees, bumble bees and solitary bees. ETRs represent the estimated exposure divided by the toxicity endpoint (acute adult LD_{50}, chronic adult LDD_{50} and NOEC mortality for larvae). The exposure is calculated by the application rate multiplied by the exposure factors (ef values) and shortcut values (SVs), which are presented in EFSA, 2013b for the different exposure scenarios. The shortcut values account for residue intake for honeybees, bumble bees and solitary bees. Degradation of the residues is accounted for in the chronic assessments using a time-weighted average factor (TWA).

The endpoints used for risk assessment are reported in Table 2; no first-tier risk assessment for HPG effects on honeybees, bumble bee larvae or solitary bee larvae could be performed as no suitable toxicity endpoints were available.

In order to perform a first-tier risk assessment according to the recommendations of EFSA, 2013b, the authorised uses have been grouped into crop categories as presented in Table 3.

Only post-flowering uses are authorised on orchards. The growth stages for uses authorised in potatoes encompassed all the growth stages; in some case the BBCH growth stage was not available or not specified, i.e. 'when infestation appears' or 'after crop cover complete to BBCH 66'. Therefore, it was considered that the authorised uses on potatoes include pre-flowering, during flowering and post-flowering applications. For some ornamental uses, the growth stage was reported to be BBCH 11-70 (which means application pre-/during flowering), or was not defined.

The first-tier risk assessment has been performed using the highest and lowest authorised 'maximum application rate' for each crop category (Table 3). In selecting the crop category, where no growth stage has been included in the GAP table submitted by the applicants and verified by Member States (Appendix A), it has been assumed that the authorised use is for all growth stages after BBCH 10.

Table 3: Summary of the authorised uses of clothianidin grouped according to the categories given in the Appendix Y of EFSA, 2013b (Bee tool v.2)

Crop grouping[1]	Application restricted to post-flowering?	Authorised uses	Spray drift category	Lowest 'maximum application rate' g a.s./ha	Highest 'maximum application rate' g a.s./ha
Orchards group 1	Yes	Apple, Apricot, Peach, Nectarine, Pear	Orchard	50	150
Potatoes	No	Potatoes Potato seed	Arable field crop	17.5	150
Ornamentals	No	African violets, Carnation, Chrysanthemum, Geranium, Gerbera, Hibiscus	Arable field crop (except hibiscus)	120	400

[1] Crop grouping has been performed according to the categories given in the Appendix Y of EFSA, 2013b (Bee tool v.2) for the risk assessment for oral exposure. For some uses (e.g. ornamentals), the grouping was identified and agreed by the experts at the Pesticides Peer Review Experts' Meeting 129.

Orchards are reported in Appendix D of EFSA, 2013b to be attractive to honeybees, bumble bees and solitary bees, for pollen and nectar. Potatoes are reported as not attractive for nectar. They are considered to be likely of low attractiveness to honeybees for pollen collection. However, EFSA, 2013b indicated that pollen collection by honeybees and the attractiveness to bumble bees and solitary bees cannot be excluded. Data were provided by Denmark during the experts' meeting indicating that honeybees collect pollen from potatoes (see study evaluation notes; EFSA, 2015). Therefore, for the risk assessment, it was assumed that potatoes are attractive crops for honeybees, bumble bees and solitary bees.

According to EFSA, 2013b, for post-flowering applications in orchards, the relevant scenarios for first-tier risk assessment are exposure to bees foraging on flowering weeds, field margins and adjacent crops.

For the potato uses, in addition to the above scenarios also the exposure to honeybees foraging in the treated crop should be considered as a relevant exposure scenario for pre-/during flowering applications.

The soil DT_{50} of clothianidin ranges from 143 to 1001 days under laboratory conditions and 13.3 to 305.4 days under field conditions (European Commission, 2005). These values are greater than the triggers for $DegT_{50}$ given in EFSA, 2013b of 2 and 5 days for multiple cropping and single cropping scenarios, respectively. Consequently, a risk assessment for succeeding crops has been included for all the uses.

All the uses on ornamentals are reported as indoor or glasshouse uses. Since in the GAP table (Appendix A) there were no details to understand which type of protected crop structure was authorised for these uses, it was assumed that these uses could be made to crops/plants grown under any type of protected crop structure (i.e. open-protected crop use) (see Section 1.1.3, above).

In particular, for all the ornamental uses indicated in Table 3, the following exposure scenarios were assumed:

- Treated scenarios: they are attractive plants and the treated crop scenario for oilseed rape would be a reasonable surrogate (for both oral and contact risk assessment);
- Weeds within the treated field: when present, the exposure depends on the amount of interception by the ornamental plant (HQs or ETRs were not calculated in this Conclusion, but, considering the application rates, the same outcome as for the other uses can be concluded unless weeds in the field will be prevented from flowering);
- Field margin/Adjacent crop: they are assumed to be smaller than 50 cm (except hibiscus); the spray drift values for standard agricultural 'field crops' (e.g. cereals) were used. For hibiscus, the spray drift values for 'early orchards' were used;
- Succeeding crop/plants: Exposure to bees from residues in nectar and pollen in succeeding plants may occur (ETRs were not specifically calculated, but, considering the application rates, the same outcome as for the other uses can be concluded).

The HQ values, the ETR calculations and the 'limit rates' are reported in Tables 14, 15, 16 and 17 in Appendix B of this Conclusion. The overall summary of the outcome of the first-tier risk assessments is reported in Tables 4 and 5, below.

3.1.1. Treated crop (uses in outdoor field and open-protected structures)

On the basis of the first-tier risk assessment, for the treated crop scenarios related to the uses in **orchards** and **potatoes (post-flowering applications)**, the exposure is not relevant, therefore the risks

(acute oral and contact, chronic and larvae) to honeybees, bumble bees and solitary bees can be considered as low. For the applications in potatoes and ornamentals **pre-/during flowering** periods**,** the risks were indicated as high, with some exceptions as regards the acute contact risk for pre-flowering applications because the contact exposure is not relevant, and the risk to honeybee larvae for potato seed (tuber spray) (see Tables 4, 14 and 15).

3.1.2. Weeds within the treated field (uses in outdoor field and open-protected structures)

High risk (acute oral and contact, chronic and larvae) to honeybees was indicated for all authorised uses and for all growth stages in the weed scenario (Tables 4, 14 and 15). Furthermore, a high acute and chronic risk to bumble bees and solitary bees could not be excluded on the basis of the screening assessment. Risk mitigation measures to prevent the weeds within the treated crop from flowering would result in a low risk. It is important to note that the removal of the flowering weeds would need to be continued for the remainder of the season to prevent residues in pollen and nectar in newly emerged weeds. It has also to be noted that the recommendation 'remove weeds before flowering' is likely to have undesired side effects such as removing a source of nectar and pollen, which in turn may impact on honey bees, solitary bees and bumble bees. Further data would be needed to determine the wider impact of such risk mitigation. Member States may wish to consider the wider implications of this risk mitigation measure before implementation on product labels.

3.1.3. Field margin and adjacent crop (uses in outdoor field and open-protected structures)

High risk (acute oral and contact, chronic and larvae) to honeybees was indicated for all authorised uses and for all growth stages in the field margin and adjacent crop scenarios (Tables 4, 14 and 15), with the exception of the acute (contact and oral) risks to honeybees and the risk to honeybee larvae for the uses in potatoes at the lowest authorised 'maximum application rate' (i.e. 17.5 g a.s./ha). Furthermore, a risk to bumble bees and solitary bees could not be excluded on the basis of the screening assessment.

The risk assessment for the field margin and adjacent crop scenario has also considered the calculation of the 'limit rates' (highest application rate which results in a low risk to bees, rounded down to the nearest whole gram a.s. per hectare). These 'limit rates' are then compared with the authorised spray uses of clothianidin in order to identify the application rates for which, for these exposure scenarios, the risk may be considered as low or may be mitigated (Table 5). EFSA, 2013b indicates that it is possible to mitigate the risk to bees from exposure from residues in the field margin and adjacent crop by the use of spray drift reduction. According to the FOCUS Landscape and Mitigation guidance document (FOCUS, 2007), the maximum possible mitigation for spray drift is 95%, which can be achieved through no spray buffer zones and/or drift reduction technology. The calculation of the 'limit rates' has been performed for two relevant spray-drift scenarios according to the risk assessment scheme in EFSA, 2013b, e.g. 'arable field crops' and 'orchards (early and late growth stages)'. The 'limit rates' have been determined for both the acute (oral and contact) and chronic risk assessments for honeybees, bumble bees and solitary bees and for honeybee larvae.

The 'limit rate' values (with and without mitigation) are reported in Tables 16 and 17 in Appendix B and are summarised in Table 5, below.

On the basis of this assessment, the 'limit rate' within the range of the application rates or greater than the highest application rate indicated that there are aspects of the risk assessment for honeybees for which a low risk can be achieved (with or without mitigation) for the field margin and adjacent crop scenarios. However, it is noted that the risk assessment for honeybees was driven by the chronic endpoint. Therefore, on the basis of the chronic risk assessment, a high risk to honeybees was indicated for these scenarios even with mitigation measures to reduce the drift, except for potatoes where the risk may be mitigated for application rates up to 43 g a.s./ha (field margin) / and up to 60 g a.s./ha (adjacent crop).

No 'limit rates' in the range of the authorised application rates were identified for adult bumble bees and solitary bees on the basis of the screening assessment.

It is noted that the limit rates should not be regarded as conclusive of the level of mitigation required to protect honeybees (due to the lack of HPG assessment).

3.1.4. Succeeding crops (uses in outdoor field and open-protected structures)

High risk (acute oral, chronic and larvae) to honeybees was indicated for all authorised uses for the succeeding crop scenario (Table 4). Furthermore, a risk to bumble bees and solitary bees could not be excluded on the basis of the screening assessment.

It should be noted that the risk assessment scheme for the succeeding crop scenario in EFSA, 2013b has been developed to be protective of a number of agricultural practices, e.g. including situations for crops such as lettuce when applications can be made to late growth stages and then succeeding, attractive crop is planted very shortly after harvest. For other situations, such as crops where applications are made only during early growth stages with a long growing season, or permanent crops, it is likely that the risk is overestimated and it may be possible to further refine the parameters used in the risk assessment (e.g. refining the shortcut values in a tier 2 assessment taking into account residue decline in soil).

Table 4: Summary of the outcome of the first-tier risk assessments

Crop and range of authorised application rate		**Treated crop**	**Weeds within the treated field**	**Field margin**	**Adjacent crop**	**Succeeding crops**
Orchards, **50-150 g a.s./ha** **post-flowering**	Acute contact	Not relevant	High risk	High risk		Not relevant
	Acute oral	Not relevant	High risk	High risk		High risk
	Chronic	Not relevant	High risk	High risk		High risk
	Larvae	Not relevant	High risk	High risk		High risk
Potatoes (arable field crops) including potatoes for seed production) **17.5 - 150 g a.s./ha** **pre-flowering, during flowering, post-flowering**	Acute contact	**During flowering:** High risk to honey bees High risk not excluded for bumble bees and solitary bees based on screening assessment. **<u>Pre-/post flowering:</u>** Not relevant	High risk	Low risk for honeybees at 17.5 g a.s./ha High risk at 150 g a.s./ha High risk not excluded for bumble bees and solitary bees.		Not relevant
	Acute oral	**Pre-/during flowering:** BBCH 10-69: High risk for honeybees High risk not excluded for bumble bees and solitary bees based on screening assessment. **Post-flowering** (BBCH >70): Not relevant	High risk	Low risk for honeybees at 17.5 g a.s./ha High risk at 150 g a.s./ha High risk not excluded for bumble bees and solitary bees.		High risk

Crop and range of authorised application rate		Treated crop	Weeds within the treated field	Field margin	Adjacent crop	Succeeding crops
	Chronic	**Pre-/during flowering:** High risk for honeybees High risk not excluded for bumble bees and solitary bees based on screening assessment. **Post-flowering** (BBCH >70): Not relevant	High risk	High risk		High risk
	Larvae	**Pre-/during flowering:** High risk for honeybees No data for bumble bees and solitary bees **Post-flowering** (BBCH >70): Not relevant	High risk	Low risk for honeybees at 17.5 g a.s./ha		High risk
Potatoes seed (tuber spray) **150 g a.s./ha** **BBCH < 10**	Acute contact	Not relevant	High risk	High risk		Not relevant
	Acute oral	High risk to honeybees High risk not excluded to bumble bees and solitary bees.	High risk	High risk		High risk
	Chronic	High risk to honeybees High risk not excluded to bumble bees and solitary bees.	High risk	High risk		High risk
	Larvae	Low risk to honeybees No data for bumble bees and solitary bees	High risk	High risk		High risk
Ornamentals **120-400 g a.s./ha**	Acute contact	Not relevant for applications before or after flowering High risk to honeybees and high risk not excluded to bumble bees and solitary bees for application during the flowering period.	High risk	High risk		Not relevant

Crop and range of authorised application rate		Treated crop	Weeds within the treated field	Field margin	Adjacent crop	Succeeding crops
	Acute oral	High risk to honeybees and high risk not excluded to bumble bees and solitary bees before/during flowering. Not relevant for applications after flowering	High risk	High risk		High risk
	Chronic	High risk to honeybees and high risk not excluded to bumble bees and solitary bees before/during flowering. Not relevant for applications after flowering	High risk	High risk		High risk
	Larvae	High risk to honeybees No data for bumble bees and solitary bees Not relevant for applications after flowering	High risk	High risk		High risk

Table 5: Summary of the outcome of the first-tier risk assessments based on 'limit rate' (highest application rate which results in a low risk to bees) (g a.s./ha)

Crop and range of authorised application rate		Field margin (0 - 95% spray drift reduction)	Adjacent crop (0 - 95% spray drift reduction)
Orchards 50-150 g a.s./ha **Ornamental (Hibiscus)** 200 g a.s./ha	Acute contact	3 - 79 g a.s./ha (early application) for honeybees 7 - 147 g a.s./ha (late application) for honeybees ≤ 2 g a.s./ha for bumble bees and solitary bees (screening assessment).	
	Acute oral	2 - 42 g a.s./ha (early application) for honeybees 3 - 78 g a.s./ha (late application) for honeybees ≤ 2 g a.s./ha for bumble bees and solitary bees (screening assessment).	1 - 30 g a.s./ha (early application) for honeybees 3 - 64 g a.s./ha (late application) for honeybees ≤ 1 g a.s./ha for bumble bees and solitary bees (screening assessment).
	Chronic	0 - 4 g a.s./ha (early application) for honeybees 0 - 7 g a.s./ha (late application) for honeybees	0 - 3 g a.s./ha (early application) for honeybees 0 - 6 g a.s./ha (late application) for honeybees

Crop and range of authorised application rate		Field margin (0 - 95% spray drift reduction)	Adjacent crop (0 - 95% spray drift reduction)
		≤ 1 g a.s./ha for bumble bees and solitary bees even with 95% drift reduction based on screening assessment.	≤ 1 g a.s./ha for bumble bees and solitary bees even with 95% drift reduction based on screening assessment.
	Larvae	5 - 116 g a.s./ha (early application) for honeybees 10 - 217 g a.s./ha (late application) for honeybees	4 - 85 g a.s./ha (early application) for honeybees 9 - 182 g a.s./ha (late application) for honeybees
Arable field crops Potatoes, including potatoes for seed production 17.5 - 150 g a.s./ha Potatoes (tuber spray), 150 g a.s./ha Ornamentals 120- 400 g a.s./ha	Acute contact	41 - 825 g a.s./ha for honeybees 0 - 13 g a.s./ha for bumble bees (screening assessment) 0 - 15 g a.s./ha for solitary bees (screening assessment)	
	Acute Oral	22 - 445 g a.s./ha for honeybees 0 - 4 g a.s./ha for bumble bees (screening assessment) 0 - 14 g a.s./ha for solitary bees (screening assessment)	30 - 604 g a.s./ha for honeybees 0 - 7 g a.s./ha for bumble bees (screening assessment) 0 - 16 g a.s./ha for solitary bees (screening assessment)
	Chronic	2 - 43 g a.s./ha for honeybees < 1 g a.s./ha for bumble bees (screening assessment) < 1 g a.s./ha for solitary bees (screening assessment)	3 - 60 g a.s./ha for honeybees < 1 g a.s./ha for bumble bees (screening assessment) < 1 g a.s./ha for solitary bees (screening assessment)
	Larvae	61 - 1227 g a.s./ha for honeybees	85 - 1711 g a.s./ha for honeybees

3.2. Tier 2: risk assessment (oral) for honeybees, bumble bees and solitary bees

EFSA, 2013b suggests a number of options to refine the tier 1 risk assessments. For these refinements further data are required. For example, valid residue data could potentially be used for refining the default shortcut values (SVs) which are used in the oral risk assessment.

The clothianidin regulatory dossiers included studies reporting residue data on the active substance (i.e. clothianidin) and/or its metabolites. The results from the studies considered relevant for this Conclusion are summarised in Table 6. The residue data are reported in full in Appendix D.

Table 6: Available clothianidin residue data on bee-relevant matrices

Crop/ location	BBCH at application	Type[1]	Application technique	Matrix	Maximum RUD (mg/kg)[2]	Minimum RUD (mg/kg)[2]	DAT[3]
Apple France	71-85	F	Foliar spray	Pollen from forager bees (traps)	2.50	0.027	1
Peach France	69-74	F	Foliar spray	Pollen from forager bees (traps)	0.29	< LOQ (0.014)	1
Apple France	71-72	F	Foliar spray	Pollen from forager bees (traps)	0.01	< LOQ (0.007)	2
Potato UK	39-59	F	Foliar spray	Guttation fluid	17.56	-	1
Maize Germany	42 days before sowing	F	Soil spray and incorporation	Pollen from plants	< LOQ (0.011)	-	-
Maize Germany	55 days before sowing	F	Soil spray and incorporation	Pollen from plants	< LOQ (0.011)	-	-
Summer rape Germany	22 days before sowing	SF	Soil spray and incorporation	Pollen from forager bees	0.044	-	97
Summer rape Germany	22 days before sowing	SF	Soil spray and incorporation	Nectar from forager bees	0.024	-	101
Winter rape Germany	At sowing	SF	Soil application and incorporation	Pollen, nectar	< LOQ (0.011)	-	> 560

[1] Field (F); Semi-field (SF)
[2] Maximum and minimum RUD refer to the same sampling date (usually the first available sampling)
[3] Days After Treatment: interval (days) between treatment and sample collection

Most analysed samples were collected during field studies (Thompson 2012a: **08_THW-0326**, Thompson 2012b: **09_THW-0324;** Thompson 2013: **10_THW-0337**, see study evaluation notes; EFSA, 2015). It should be considered that pollen and nectar transported by foragers to the hives may have partially been collected outside the treated area. However, the influence of dilution on the residue measurements is difficult to be quantified.

In some studies, for analysing pollen and/or nectar from maize and rape, clothianidin was sprayed directly on the soil surface and then incorporated before or at the sowing (EFSA, 2013a). This kind of application is not foreseen in any of the authorised uses evaluated in this Conclusion; the studies may only be considered informative for the succeeding crop scenario.

A dissipation rate was derived from the field study dealing with clothianidin residues in potato plant guttation fluid. The residue data were fitted with a single first-order (SFO) kinetic model, providing a DT_{50} of 1.38 days. The fitting was visually acceptable. However, this dissipation rate should be treated with caution. In fact, as the crop was sprayed the day before the collection of the first sample, the initial measured concentration might be due to residues on the plant surface dissolved in the guttation fluid, rather than being the result of an internal transport process.

Other studies reporting measurements of clothianidin residues were found in the systematic open literature search (Fryday et al., 2015). The outcome of the review was screened using several criteria. Studies were retained only if the application technique was relevant for the uses included in this Conclusion. In addition, the studies were screened retaining only those reporting residues measured in certain bee-relevant matrices (i.e. guttation fluid, nectar, pollen, water). Residues in other bee-relevant matrices (e.g. beebread, dew, honey, propolis, etc.) were not evaluated as these matrices are not considered in the risk assessment methodology described in EFSA, 2013b. The availability of information on the application rate, in order to express residues as RUD, was also a selection criterion.

Only one relevant study was identified at the end of the screening process, reporting residue measurements on nectar (Table 7). It is however acknowledged that the study was carried out in the USA and does not relate to any of the GAPs considered for this Conclusion.

Table 7: Available clothianidin residue data from the systematic open literature review (Fryday et al., 2015)

Reference	Crop/ location	Crop growth stage at application	Type[1]	Application technique	Matrix	Maximum RUD (mg/kg)	Minimum RUD (mg/kg)	DAT[2]
Larson et al., (2013)	Turf intermixed with white clover Kentucky, USA	Flowering (white clover)	F	Spray	Nectar from flowers	0.71	0.20	6

[1]Field (F)
[2]Days After Treatment: interval (days) between treatment and sample collection

In comparison to the variety of crops and geographic location of the authorised uses, the available residue data are limited (see Appendices A and D). Furthermore, the representativeness of the studies in relation to worst-case or 90th percentile exposure is very uncertain (see study evaluation notes; EFSA, 2015a).

According to Appendix G of EFSA, 2013b, to perform a tier 2 assessment it is necessary to have data from at least five representative fields in the area of use of the substance with minimal alternative bee pasture in the landscape. Furthermore, a suitable residue data set would need to be available for each of the authorised uses of clothianidin, taking account of the growth stage of the crop when applications are made. In the Pesticides Peer Review Experts' Meeting 129 all experts agreed that the available residue data are not robust and abundant enough to perform a tier 2 risk assessment refining the exposure levels. The available data for clothianidin are therefore not considered sufficient to perform a robust tier 2 assessment for any of the authorised uses.

3.3. Tier 3: higher tier risk assessment using effects studies for honeybees, bumble bees and solitary bees

Three semi-field and three field studies were available in the dossiers to investigate the effects of clothianidin on honeybees following foliar spray applications. No higher tier studies were available in the dossiers for bumble bees or solitary bees.

The available higher tier effects studies have been evaluated according to the criteria given in EFSA, 2013b. A full evaluation of each study was reported in the study evaluation notes (EFSA, 2015). A brief summary of the observations is given in Appendix B (Table 13).

The fundamental basis for higher tier risk assessment according to EFSA, 2013b is to design higher tier effect studies which are able to address the specific protection goals (SPG) for worst case exposure (90th percentile worst case for the hives at the edge of treated fields in the area of use) and to ensure that the studies are sufficiently sensitive in order to detect biological effects (i.e. cause effect relationship) to meet the SPG for the level of effect (7 % reduction in colony). In order to demonstrate that the studies have achieved the 90th percentile exposure, EFSA, 2013b suggests that an exposure assessment is undertaken by performing residue studies in areas representative of where the active substance will be applied. The level of exposure achieved in the effect field study can then be demonstrated to be representative across a wider area (i.e. if it equates to the 90th percentile exposure level). As discussed in Section 3.2, insufficient residue data were available to perform an exposure

assessment (hence a tier 2 risk assessment) for any of the authorised uses of clothianidin. An alternative approach would be to have a sufficient number of suitable higher tier effects studies, which are also considered to be able to address the exposure SPG. The number of studies required would depend on numerous factors, such as the representative GAP, the area where the active substance will be applied, the quality of the exposure assessment within the studies and the consistency of results. However, the available higher tier effects studies for clothianidin were not suitable to be able to assess whether they met the exposure SPG.

The second critical aspect of the usefulness of higher tier effects studies for a risk assessment in accordance with EFSA, 2013b is to ensure that the studies are sufficiently sensitive in order to detect biological effects to meet the SPG for the level of effect (7% reduction in colony strength). Several criteria are given in the guidance document, which are essential for such an assessment (e.g. an assessment of the power of detection).

EFSA, 2013b also recommended several improvements to the methodology used for higher tier effects studies, e.g. to increase the size of field, to increase the distance between the test fields and the control, to include overwintering success, or improvements to the measurements of mortality and colony strength.

Moreover, EFSA, 2013b indicates that semi-field studies are of limited usefulness in terms of assessment against the protection goals (e.g. due to the small colony size and short study duration). It is suggested that they may provide some information for specific aspects of the risk assessment, such as forager mortality. However, for use in risk assessment it is necessary to demonstrate that the exposure achieved in the study covers the 90th percentile of that expected from the authorised use.

Overall, none of the available studies fulfilled the criteria of EFSA, 2013b. It is acknowledged that all of the studies were performed prior to the publication of EFSA, 2013b. In evaluating these studies, any deficiency in the study design, beyond those identified on the basis of the new elements introduced by EFSA, 2013b, was also highlighted. Several studies had severe limitations which question their reliability for any form of risk assessment (e.g. lack of untreated control).

On the basis of the available data set, as general observation, differences between the treatments and the controls in foraging activity and forager mortality of honeybees were noted at the tested application rates, crops and growth stages.

Semi-field studies

The semi-field studies were performed on *Phacelia tanacetifolia* by applying several test rates in order to establish the application rates that do not cause mortality and effects on foraging activity. In general, shortcomings and limitations were noted in these studies (Bakker 2001a, Bakker 2001b, Thompson 2000, see study evaluation notes; EFSA, 2015). By considering these limitations along with the recommendations of EFSA, 2013b, these studies were not suitable for any risk assessment refinement.

Field studies

Two of the available field studies were performed in France on apple and peach areas (Thompson 2012a: 08_THW-0326, and Thompson 2012b: 09_THW-0324; see study evaluation notes; EFSA, 2015). One study was performed on potatoes in the UK (Thompson 2013: 10_THW-0337, study evaluation notes). The studies conducted in France aimed to investigate the effects on honeybees exposed to residues on flowering weeds from post-flowering applications in orchards. In these studies, application rates of 70 g a.s./ha and 150 g a.s./ha were tested. The study in the UK aimed to investigate the effects on honeybees of spray application on potatoes and the potential exposure to residues in guttation fluids. The test rate was 75 g a.s./ha.

Considering the shortcomings discussed in detail in the study evaluation notes along with the recommendations of EFSA, 2013b, these studies cannot be used in a higher tier risk assessment.

For higher tier risk assessment, a further consideration of the data included in the systematic literature review can be performed in the future.

3.4. Uncertainty analysis

As it is not possible to perform tier 2 or tier 3 refined risk assessments, no uncertainty analysis is required.

4. Risk assessment for the uses other than foliar spray applications

Two types of uses other than foliar spray were reported in the GAP table: tuber spray treatment on potatoes and 'pour plant' use on kohlrabi and cabbage. The tuber spray treatment was considered in Section 3 along with the foliar spray uses on potatoes at BBCH < 10 as the scenarios for potatoes at this growth stage were considered the most suitable for this use.

The risk assessment approach provided in EFSA, 2013b is applicable to all application techniques, however there is no specific scheme given in EFSA, 2013b for application techniques other than foliar sprays, seed treatments or granules (i.e. no exposure factors and shortcut values are available). Therefore, the potential for exposure to bees from the authorised uses applying application methods other than foliar spray was discussed at the Pesticides Peer Review Experts' Meeting 129 (see meeting report; EFSA, 2015). The 'pour plant' use on kohlrabi and cabbage was considered similar to a drench application.

For drench applications in open protected structures it was concluded that exposure to bees cannot be excluded (see Appendix 3 of the meeting report; EFSA, 2015). It is noted that, in the absence of specific shortcut values for drench applications, the shortcut values for 'incorporated granules' could be used as a reasonable surrogate. It is not known whether the use of these shortcut values will under- or overestimate the risk to bees. However, the glasshouse use on kohlrabi and cabbage (young plants), authorised in Germany, lacked sufficient information to be able to perform any form of risk assessment. Therefore the risk assessment for this use was not finalised.

5. Risk assessment for accumulative effects

According to EFSA, 2013b, an assessment of the potential of accumulative effects to honeybees is required. In the case that a substance is demonstrated to have accumulative effects then a higher tier risk assessment is required. No toxicity data investigating accumulative effects were available and therefore no assessment could be performed.

6. Risk assessment from exposure to contaminated water

EFSA, 2013b proposes that the risk to honeybees from exposure to contaminated water, i.e. via guttation fluid, surface water and puddles should be considered. According to the risk assessment scheme a risk assessment for bumble bees and solitary bees is not needed.

6.1. Assessment of the risk from exposure via residues in guttation fluid

EFSA, 2013b proposes a screening assessment to assess the risk to honeybees via guttation fluid on the treated crop. The screening assessment for the authorised uses applied as foliar spray applications is presented in Table 8.

Table 8: Screening risk assessment for honeybees from residues in guttation fluid on the treated crop for the authorised uses

	Step	**Assessment**	
1	Check whether exposure is negligible.	For all uses exposure could occur.	
2	Check whether guttation occurs for < 10% of location/calendar year combinations.	No information available to perform this step.	
3	Calculate ETR based on conservative assumptions:	Water solubility clothianidin = 0.327 g/L (= 0.327 µg/µL) at 20 °C (European Commission, 2005).	
a	ETR_{acute} adult honey bees = W x PEC/LD_{50} LD_{50} = acute oral LD_{50} (µg a.s./bee) W = water uptake of adult honey bees = 11.4 µL/bee PEC = concentration in guttation fluid in µg/µL and is assumed to be: 100 % of the water solubility for acute assessment.	Acute oral LD_{50} = 0.00379 µg a.s./bee PEC = 0.327 µg/µL W = 11.4 µL/bee	**Screening ETR = 983** Which is greater than the trigger of 0.2
b	$ETR_{chronic}$ honey bees = W x PEC/LDD_{50} LDD_{50} = chronic lethal dietary dose (µg a.s./bee per day) W = water uptake of adult honey bees = 11.4 µL/bee PEC = concentration in guttation fluid in µg/µL and is assumed to be: 54% of the water solubility	LDD_{50}: 0.00138 µg a.s./bee PEC = 0.327 µg/µL W = 11.4 µL/bee	**Screening ETR = 2071** Which is greater than the trigger of 0.2
c	ETR_{HPG} honey bees = W x PEC/$NOEL_{HPG}$ $NOEL_{HPG}$ = NOEL based on HPG dose (µg a.s./bee per day) W = water uptake of adult honey bees = 11.4 µL/bee PEC = concentration in guttation fluid in µg/µL and is assumed to be: 54% of the water solubility	No endpoint available for assessment.	
d	ETR_{larvae} honey bees = W x PEC/$NOEL_{larvae}$ $NOEL_{larvae}$ = NOEL for larvae µg a.s./larvae per developmental period W = water uptake of larvae over 5 days = 111 µL/larvae per 5 days PEC = concentration in guttation fluid in µg/µL and is assumed to be: 72% of the water solubility	$NOEL_{larvae}$: 0.00528 µg a.s./larvae PEC = 0.327 µg/µL W = 11.4 µL/bee	**Screening ETR = 706** Which is greater than the trigger of 0.2
4 and 5	Refine exposure calculation Step 4 and 5 of the EFSA, 2013b risk assessment scheme suggests that the exposure estimate could be refined by using 90th percentile measured residues in guttation fluid occurring on the crop. Alternatively, the 90th percentile scenario soil pore water concentrations could also be calculated and used as an approximation of the concentration in guttation fluid.	No data were available for the assessment for the authorised uses of clothianidin.	

As indicated in Table 8, the screening step was not sufficient to demonstrate a low risk to honeybees for the authorised outdoor field and open-protected uses.

As acknowledged by EFSA, 2013b, little information exists to understand the potential risk to honeybees from exposure to residues of pesticides in guttation fluid applied as foliar sprays. In the study performed on potatoes in the UK (Thompson 2013: 10_THW-0337; study evaluation notes; EFSA, 2015), residues of clothianidin ranged from 1317 µg/kg one day after the application to 26 µg/kg 13 days after the application by foliar spray. In this study, honeybees were not observed

using guttation fluid as a source of water. However, further knowledge is also needed to understand the extent that honeybees use guttation fluid.

The data available in the systematic literature search report (Fryday et al., 2015) did not reveal any literature data giving measurements of concentrations of thiamethoxam, clothianidin or imidacloprid occurring in guttation fluid following foliar spray applications or drenches.

With the information available, the risk assessment for honeybees exposed to residues of clothianidin occurring in guttation fluid cannot be finalised.

6.2. Assessment of the risk from exposure via residues in surface water

In the absence of an agreed aquatic exposure assessment for the authorised uses, the risk to honeybees consuming residues in surface water could not be assessed.

6.3. Assessment of the risk from exposure via residues in puddles

In the absence of an agreed aquatic exposure assessment for the authorised uses, the risk to honeybees consuming residues in puddles could not be assessed.

7. Risk posed by metabolites

According to EFSA, 2013b each metabolite which exceeds 10% TRR or 0.01 mg/kg identified in the plant metabolism studies should be considered. It is noted that several plant metabolism studies are reported in Volume 3, Section 7 of the original DAR (Belgium, 2003). These studies together with plant metabolism studies available for the authorised uses in Member States should be considered according to the recommendations of EFSA, 2013b to identify all metabolites which exceed 10% TRR or 0.01 mg/kg. However, where data on occurrence of metabolites in pollen and nectar are available, the assessment should focus on these metabolites. On the basis of the available data on occurrence of metabolites in pollen and nectar and toxicity data for honeybees (see Table 12 in Appendix B and Table 20 in Appendix D), a specific risk assessment for these metabolites was not considered needed.

8. Overall conclusions of the risk assessment

Based on the available first-tier risk assessments, the followings are concluded:

- For the uses in **orchards** (post-flowering applications), high risks were identified for honeybees for the scenarios **field margin** and **adjacent crops**, even by applying mitigation measures such as 95% spray drift reduction (the risk was driven by the chronic endpoint). A high risk was identified for the scenario **succeeding crops**. The risk was considered low for the **treated crop** scenario and for the **weeds in the field** if they will be prevented from flowering.

- For the uses in **potatoes** (pre-/during flowering applications), high risks were identified for honeybees for the scenario **treated crop**. The risks for this scenario were considered low for post-flowering applications. High risks were identified for the scenarios **field margin** and **adjacent crops,** except for application rates up to 43 g a.s./ha when 95% drift reduction was considered (the risk was driven by the chronic endpoint). The risk for the scenario **weeds in the field** is low if they will be prevented from flowering. A high risk was identified for the scenario **succeeding crops**.

- For the uses in **ornamentals** (all assumed to be in open-protected structures), high risks were identified for honeybees for the scenario **treated crop**. The risks for this scenario were considered low for post-flowering applications. High risks were identified for the scenarios **field margin** and **adjacent crops,** even when 95% drift reduction was considered (the risk was driven by the chronic endpoint). The risk for the scenario **weeds in the field** is low if they will be prevented from flowering. The risk was considered high for the scenario **succeeding crops**. It has to be noted that, if these ornamentals are grown in permanent greenhouse structures, the above risks may be considered as low.

- For the 'pour plant' use on kohlrabi and cabbage (assumed to be similar to a drench use), insufficient information was available to perform any risk assessment.

The risks to honeybees from exposure via contaminated water (surface water, puddles and guttation fluids) could not be finalised for any of the uses.

Other aspects of the risk assessment could not be finalised due to the lack of data (i.e. risk assessment of accumulative and sublethal effects).

No higher tier risk assessment could be performed as no suitable exposure assessment was available and none of the available higher tier effect studies were considered sufficient in accordance with the EFSA, 2013b guidance document.

High risks could not be excluded for **bumble bees** and **solitary bees** based on a screening assessment for any of the uses, except for post-flowering applications. However, due to the lack of suitable toxicity endpoints, the risk assessment could not be finalised.

9. Monitoring data

Information on monitoring activities was provided by two Member States (Austria and Hungary).

In particular **Austria** informed the experts' meeting regarding the monitoring program in 2012 and 2013 (follow up to 'MELISSA'). Samples from suspected bee poisoning incidents were collected (bees, beebread) and analysed for clothianidin, thiamethoxam, imidacloprid and fipronil (Girsch and Moosbeckhofer, 2012; Moosbeckhofer and Mayr, 2013).

Results spring/summer season 2012: From 69 samples (38 bee samples, 31 beebread samples) collected in spring/summer 2012 from suspected bee poisoning incidents, in 28 samples a contamination with one of the four substances was detected. This is related to 51% of the apiaries where residue analyses were positive (totally around 600 hives). All four substances were detected with clothianidin being the most frequently found active substance. The max. residue of clothianidin in dead bee matrix was 0.0054 mg a.s./kg. The max. residue of imidacloprid in dead bee matrix was 0.0056 mg a.s./kg. The max. residue of thiamethoxam in bee bread was 0.0012 mg a.s./kg.

The source of contamination is not known (spray treatment, biocide use or other).

Results in spring/summer 2013: in 14 out of 74 apiaries (around 1500 hives) with suspected poisoning one of the substances was detected. A total of 107 samples were analysed (41 bee samples, 66 bee bread samples). In 7 samples clothianidin was detected with a max. residue level found of 0.0026 mg/kg. In 3 samples imidacloprid was detected with a max. residue level found of 0.0014 mg/kg. Thiamethoxam was not detected.

The source of contamination is not known (spray treatment, biocide use or other). The samples were also analysed for other pesticides and in several samples pesticide active substances were detected.

Hungary reported that cropped fields, treated (spray or seed dressing) according to the label, were monitored for residues in the flower of the crops (and soil samples for seed dressing) (Jordán László, 2014). The study was conducted by the Hungarian competent authority (Nemzeti Élelmiszerlánc-biztonsági Hivatal) in 5 Hungarian counties in 2013.

Results: Imidacloprid was investigated only in crops associated with seed dressing. For clothianidin and thiamethoxam from over sprayed crops, the following residue levels were reported:

- Thiamethoxam in winter oilseed rape flower (max. values): < 1 – 4.7 µg/kg flower; clothianidin as metabolite of thiamethoxam: < 1 – 3.2 µg/kg flower. The pesticide applications in these fields (5 fields) were done at BBCH 30 with 20 g a.s./ha.

- Clothianidin in apple flower (max. values): 13.9 – 95.4 µg/kg flower when the applications (4 fields) were at BBCH 09 (5 mm leave bud) and 1268 µg/kg when the application (1 field) was at 'red sprout' stage (off-label use). The application rate was 75 g a.s./ha in both cases.

It has to be noted that at the Pesticides Peer Review Experts' Meeting 97 (EFSA, 2013a) the experts discussed the use of monitoring data for risk assessment. It was considered that it can be difficult to use monitoring data directly in risk assessment due to the fact that there are many influential parameters in the monitoring data that cannot be fully understood (pesticide exposure, climatic conditions, presence of disease, farming practices, etc.). Furthermore, it is difficult to link exposure and observed effects in monitoring data (i.e. causality). It was also noted that monitoring data may not provide a complete picture as, in some cases, not all parameters are investigated (e.g. use of veterinary medicines). Overall, it was considered that monitoring data are of limited use for risk assessment but may be useful to provide feedback for risk managers to consider prevention measures.

The issue was not further discussed within the context of this Conclusion. However, EFSA notes that monitoring studies, if specifically designed, could inform on the level of risk or provide feedback on risk assessment methodologies and further developments are expected in future ('MUST-B', EU effort towards the development of a holistic approach for the risk assessment on multiple stressors in bees: http://www.efsa.europa.eu/en/topics/topic/beehealth.htm).

10. List of data gaps identified during the assessment

This is a list of the data gaps identified during this specific peer review process.

- Information to address the risk to honeybees, bumble bees and solitary bees for the pertinent exposure scenarios (contact and/or oral exposure from the treated crop and/or field margin and/or adjacent crop and/or succeeding crop) (relevant for all uses in Appendix A used outdoors and in open-protected structures).

- Information to address the risk to honeybees from exposure to contaminated water (surface water and/or puddles and/or guttation fluid) (relevant for all uses in Appendix A used outdoors, in open-protected structures and in permanent greenhouses).

11. Particular conditions proposed to be taken into account to manage the risk(s) identified

Some aspects of the risk assessment were considered to be addressed by the application of mitigation measures, such as:

- To prevent weeds in the field from flowering (relevant for all bee species and all outdoor field uses and uses in open-protected structures) (see Section 3).

- To reduce the drift in the field margins and adjacent crops (relevant for honeybees and for some uses, see Table 5 in Section 3). It is noted that the limit rates should not be regarded as conclusive of the level of mitigation required to protect honeybees (due to the lack of HPG assessment).

- To reduce the drift in the field margins and adjacent crops (relevant for honeybees and for some uses, see Table 5 in Section 3). It is noted that the level of mitigation should not be regarded as conclusive of that required to protect honeybees (due to the lack of HPG assessment).

12. Concerns

12.1. Issues that could not be finalised

The assessments are considered not finalised when there were no data (i.e. HPG for honeybees, accumulative effects for honeybees) or when only a screening level assessment could be performed (e.g. bumble bees and solitary bees, consumption of contaminated water).

The issues that could not be finalised are marked with an 'X' in the overview table in Section 13. See Table 9.

12.2. Critical areas of concern

The risks identified are marked with an 'R' in the overview table in Section 13. Risks have been identified where any of the parts of the risk assessment for each risk scenario according to EFSA, 2013b indicated a high risk (i.e. honey bee: acute oral adult, acute contact adult, chronic oral adult, oral larvae). See Table 9.

13. Overview of the concerns identified for the uses of clothianidin other than seed treatments and granules

Table 9: Summary of concerns for each scenario according to the risk assessment scheme in EFSA, 2013b, accounting for particular conditions proposed to be taken into account to manage the risks identified

R = High risk identified. [A high risk has been highlighted if any of the parts of the risk assessment for each risk scenario according to EFSA, 2013b indicated a high risk (i.e. **honey bee**: acute oral adult, acute contact adult, chronic oral adult, oral larvae)].

R(1): High risk identified for some of the uses. [A high risk has been highlighted if any of the parts of the risk assessment for each risk scenario according to EFSA, 2013b indicated a high risk (i.e. **honey bee**: acute oral adult, acute contact adult, chronic oral adult, oral larvae)]. A low risk can be concluded for some of the uses (i.e. for the field margin and adjacent crop scenario provided that 95% risk mitigation of spray drift is applied). Refer to Table 5.

X = Risk assessment not finalised due to the lack of data (i.e. HPG for honeybees, accumulative effects for honeybees) or when only a screening level assessment could be performed (e.g. bumble bees and solitary bees, consumption of contaminated water).

The table does not reflect authorised uses where there was insufficient information in the GAP to perform a risk assessment, including where the use was indicated as indoor but it was not clear whether the treated crop/plant would be moved outdoors (kohlrabi, cabbage 'pour plant', assumed to be a drench use).

Categories				Honeybee								Bumble bee					Solitary bee				
Crop/plant	**Outdoor, open-protected or permanent greenhouse use**	**Flowering stage**		**Treated crop scenario**	**Weed scenario with mitigation**	**Field margin with 95% mitigation**	**Adjacent crop with 95% mitigation**	**Succeeding crop[1]**	**Guttation fluid**	**Surface water**	**puddles**	**Treated crop scenario**	**Weed scenario**	**Field margin with 95% mitigation**	**Adjacent crop with 95% mitigation**	**Succeeding crop[1]**	**Treated crop scenario**	**Weed scenario**	**Field margin with 95% mitigation**	**Adjacent crop with 95% mitigation**	**Succeeding crop[1]**
Foliar spray uses																					
Orchards 50-150 g a.s./ha	Outdoor	Post-flowering	Risk identified			R	R	R													
			Assessment not finalised			X	X	X	X	X	X			X	X	X			X	X	X

Categories				Honeybee								Bumble bee					Solitary bee				
Crop/plant	Outdoor, open-protected or permanent greenhouse use	Flowering stage		Treated crop scenario	Weed scenario with mitigation	Field margin with 95% mitigation	Adjacent crop with 95% mitigation	Succeeding crop[1]	Guttation fluid	Surface water	puddles	Treated crop scenario	Weed scenario	Field margin with 95% mitigation	Adjacent crop with 95% mitigation	Succeeding crop[1]	Treated crop scenario	Weed scenario	Field margin with 95% mitigation	Adjacent crop with 95% mitigation	Succeeding crop[1]
Potatoes (Arable field crops) 17.5 - 150 g a.s./ha	Outdoor	Pre-flowering and Flowering	Risk identified	R		R(1)	R(1)	R													
			Assessment not finalised			X	X	X	X	X	X	X		X	X	X	X		X	X	X
		Post-flowering	Risk identified			R(1)	R(1)	R													
			Assessment not finalised			X	X	X	X	X	X			X	X	X			X	X	X
Ornamentals (Arable field crops) 120- 400 g a.s./ha	Open-protected uses	Pre-flowering and Flowering	Risk identified	R		R	R	R													
			Assessment not finalised			X	X	X	X	X	X	X		X	X	X	X		X	X	X
		Post-flowering	Risk identified			R	R	R													
			Assessment not finalised			X	X	X	X	X	X			X	X	X			X	X	X
Other application techniques																					
Potatoes tuber spray (Arable field crops) 150 g a.s./ha	Outdoor	Pre-flowering	Risk identified	R		R	R	R													
			Assessment not finalised			X	X	X	X	X	X	X		X	X	X	X		X	X	X

[1] The 'succeeding crop' scenario includes an assessment from the risk to bees from residues occurring in flowering permanent crops in the successive year.

REFERENCES

Aufauvre J, Misme-Aucouturier B, Viguès, B, Texier C, Delbac F and Blot N, 2014. Transcriptome analyses of the honeybee response to *Nosema ceranae* and insecticides. PLoS ONE 9(3): e91686. doi:10.1371/journal.pone.0091686

Bekele AZ, Mor SK, Phelps NBD, Goyal SM and Armién AG, 2015. A case report of *Nosema ceranae* infection in honey bees in Minnesota, USA. Veterinary Quarterly, doi:10.1080/01652176.2014.981766

Belgium, 2003. Draft Assessment Report (DAR) prepared by the rapporteur Member State Belgium on the active substance clothianidin in the framework of Directive 91/414/EEC. May 2003.

Betti MI, Wahl LM and Zamir M, 2014. Effects of infection on honey bee population dynamics: a Model. PLoS ONE 9(10): e110237. doi:10.1371/journal.pone.0110237

EFSA (European Food Safety Authority), 2013a. Conclusion on the peer review of the pesticide risk assessment for bees for the active substance clothianidin. EFSA Journal 2013;11(1):3066, 58 pp. doi:10.2903/j.efsa.2013.3066

EFSA (European Food Safety Authority), 2013b. EFSA Guidance Document on the risk assessment of plant protection products on bees (*Apis mellifera, Bombus* spp. and solitary bees). EFSA Journal 2013;11(7):3295, 268 pp. doi:10.2903/j.efsa.2013.3295

EFSA (European Food Safety Authority), 2014a. EFSA Guidance Document on clustering and ranking of emissions of active substances of plant protection products and transformation products of these active substances from protected crops (greenhouses and crops grown under cover) to relevant environmental compartments. EFSA Journal 2014;12(3):3615, 43 pp, doi:10.2903/j.efsa.2014.3615

EFSA (European Food Safety Authority), 2014b. Towards an integrated environmental risk assessment of multiple stressors on bees: review of research projects in Europe, knowledge gaps and recommendations. EFSA Journal 2014;12(3):3594, 102 pp. doi:10.2903/j.efsa.2014.3594

EFSA (European Food Safety Authority), 2015. Peer Review Report to the conclusion regarding the peer review of the pesticide risk assessment for bees for the active substance clothianidin, considering all uses other than seed treatments and granules. Available online: www.efsa.europa.eu

EFSA PPR Panel (EFSA Panel on Plant Protection Products and their Residues), 2012. Scientific Opinion on the science behind the development of a risk assessment of Plant Protection Products on bees (*Apis mellifera*, *Bombus spp*. and solitary bees). EFSA Journal 2012;10(5) 2668, 275 pp. doi:10.2903/j.efsa.2012.2668

European Commission, 2005. Review report for the active substance clothianidin. Finalised in the Standing Committee on the Food Chain and Animal Health at its meeting on 27 January 2006 in view of the inclusion of clothianidin in Annex I of Directive 91/414/EEC. SANCO/10533/05 – Final, 18 January 2005.

European Commission, 2006. Review report for the active substance thiamethoxam. Finalised in the Standing Committee on the Food Chain and Animal Health at its meeting on 14 July 2006 in view of the inclusion of thiamethoxam in Annex I of Directive 91/414/EEC. SANCO/10390/2002-rev.final, 14 July 2006.

Fischer J, Mueller T, Spatz A-K, Greggers U, Gruenewald B and Menzel R, 2014. Neonicotinoids Interfere with Specific Components of Navigation in Honeybees. Plos One, 9(3): e91364

FOCUS, 2007. "Landscape and Mitigation Factors in Aquatic Risk Assessment. Volume 1. Extended Summary and Recommendations". Report of the FOCUS Working Group on Landscape and Mitigation Factors in Ecological Risk Assessment, EC Document Reference SANCO/10422/2005 v2.0. 169 pp.

Fryday S, Tiede K and Stein J, 2015. Scientific services to support EFSA systematic reviews: Lot 5 Systematic literature review on the neonicotinoids (namely active substances clothianidin, thiamethoxam and imidacloprid) and the risks to bees. EFSA supporting publication 2015:EN-756, 656 pp. Available online: www.efsa.europa.eu/publications

Girsch and Moosbeckhofer, 2012. Investigations to identify a possible exposure of honeybees to clothianidin, thiamethoxam, imidacloprid and fipronil in areas used for apiculture. Report in German: http://www.ages.at/fileadmin/AGES2015/Themen/Bienen/Monitoringprojekt_Bienen_Abschlussbericht_2012.pdf

Gisder S and Genersch E, 2015. Identification of candidate agents active against *N. ceranae* infection in honey bees: establishment of a medium throughput screening assay based on *N. ceranae* infected cultured cells. PLoS ONE 10(2): e0117200. doi:10.1371/journal.pone.0117200.

Goblirsch M, Huang ZY and Spivak M, 2013. Physiological and behavioral changes in honey bees (*Apis mellifera*) induced by *Nosema ceranae* infection. PLoS ONE 8(3): e58165. doi:10.1371/journal.pone.0058165.

Graystock P, Goulson D and Hughes OH, 2014. The relationship between managed bees and the prevalence of parasites in bumblebees. PeerJ 2:e522; DOI 10.7717/peerj.522.

Iwasa T, Motoyama N, Ambrose JT and Roe RM, 2004. Mechanism for the differential toxicity of neonicotinoid insecticides in the honey bee, *Apis mellifera*. Crop Protection, 23(5): 371-378.

Jeyalakshmi T, Shanmugasundaram R, Saravanan M, Geetha S, Mohan SS, Goparaju A and Balakrishna Murthy R, 2011. Comparative toxicity of certain insecticides against *Apis cerana indica* under semi field and laboratory conditions. Pestology, 35(12): 23-26.

Jordán László, 2014. Jelentés a 2013. évben virágzó növénykultúrákban végzett rovarölő szermaradék-analitikai vizsgálatokról. Nemzeti Élelmiszerlánc-biztonsági Hivatal Növény-, Talaj- és Agrárkörnyezet-védelmi Igazgatóság (NÉBIH NTAI), 20 March 2014.

Khoury DS, Barron AB and Myerscough MR, 2013. Modelling food and population dynamics in honey bee colonies. Plos One 8(5): e59084. doi:10.1371/journal.pone.0059084

Larson JL, Redmond CT and Potter DA, 2013. Assessing Insecticide Hazard to Bumble Bees Foraging on Flowering Weeds in Treated Lawns. Plos One, 8(6): e66375

Laurino D, Porporato M, Patetta A and Manino A, 2011. Toxicity of neonicotinoid insecticides to honey bees: laboratory tests. Bulletin of Insectology, 64(1): 107-113.

Laurino D, Manino A, Patetta A and Porporato M, 2013. Toxicity of neonicotinoid insecticides on different honey bee genotypes. Bulletin of Insectology, 66(1): 119-126.

Moosbeckhofer and Mayr, 2013. Investigations to identify a possible exposure of honeybees to clothianidin, thiamethoxam, imidacloprid and fipronil in the field. Report in German: http://www.ages.at/fileadmin/_migrated/content_uploads/v2-final_Abschlussbericht_Bienenexposition-Ueberwachungsprogramm_2013__Bienexpo_13_.pdf

Natsopoulou ME, McMahon DP, Doublet V, Bryden J and Paxton RJ, 2015. Interspecific competition in honeybee intracellular gut parasites is asymmetric and favours the spread of an emerging infectious disease. Proc. R. Soc. B 282: 20141896. http://dx.doi.org/10.1098/rspb.2014.1896.

Naug D, 2014. Infected honeybee foragers incur a higher loss in efficiency than in the rate of energetic gain. Biol. Lett. 10: 20140731. http://dx.doi.org/10.1098/rsbl.2014.0731.

Perry CJ, Søvika E, Myerscoughd MR and Barron AB, 2014. Rapid behavioral maturation accelerates failure of stressed honey bee colonies. PNAS 112(11): 3427–3432, doi: 10.1073/pnas.1422089112.

Pettis JS, van Engelsdorp D, Johnson J and Dively G, 2012. Pesticide exposure in honey bees results in increased levels of the gut pathogen Nosema. Naturwissenschaften (2012) 99:153–158 DOI 10.1007/s00114-011-0881-1

Di Prisco G, Cavaliere V, Annoscia D, Varricchio P, Caprio E, Nazzi F, Gargiulo G, Pennacchio F, 2013. Neonicotinoid clothianidin adversely affects insect immunity and promotes replication of a viral pathogen in honey bees. Proceedings of the National Academy of Sciences of the United States of America, 110(46): 18466-18471

Sandrock C, Tanadini M, Tanadini LG, Fauser-Misslin A, Potts SG, et al., 2014. Impact of chronic neonicotinoid exposure on honeybee colony performance and queen supersedure. PLoS ONE 9(8): e103592. doi:10.1371/journal.pone.0103592

Scott-Dupree CD, Conroy L and Harris CR, 2009. Impact of Currently Used or Potentially Useful Insecticides for Canola Agroecosystems on *Bombus impatiens* (Hymenoptera: Apidae), *Megachile rotundata* (Hymentoptera: Megachilidae), and *Osmia lignaria* (Hymenoptera: Megachilidae). Journal of Economic Entomology, 102(1): 177-182

Simeunovic P, Stevanovic J, Cirkovic D, Radojicic S, Lakic N, Stanisic L and Stanimirovic Z, 2014. *Nosema ceranae* and queen age influence the reproduction and productivity of the honey bee. Journal of Apicultural Research 53(5): 545-554.

Wolf S, McMahon DP, Lim KS, Pull CD, Clark SJ, Paxton RJ and Osborne JL, 2014. So near and yet so far: harmonic radar reveals reduced homing ability of Nosema infected Honeybees. PLoS ONE 9(8): e103989. doi:10.1371/journal.pone.0103989.

APPENDICES

APPENDIX A – CLOTHIANIDIN: SUMMARY OF AUTHORISED USES OTHER THAN SEED TREATMENTS AND GRANULES IN THE EU, INCLUDING USES REFERRED TO IN RECITAL 7 OF COMMISSION IMPLEMENTING REGULATION (EU) NO 485/2013 (THAT MAY ALSO INCLUDE USES WHICH MAY HAVE BEEN WITHDRAWN AND/OR NO LONGER AUTHORISED IN THE MEMBER STATES DUE TO THE RESTRICTIONS OF REGULATION (EU) NO 485/2013)

The GAP table below has been prepared based on data submitted by applicants in September 2013 followed by verification by Member State competent authorities. The below list therefore represents the submitted data taking into account the feedback received from Member States during the course of the peer review and their validity or reliability are beyond the control of EFSA.

Table 10: Summary of uses applied as foliar spray applications

Crop/situation	Product name	Member State	F/G	Method of application	Nr of applications	Growth stage	Minimum application rate: g a.s./ha	Maximum application rate: g a.s./ha	Remarks
Apple	DANTOP 50WG	Bulgaria	F	foliar spray	1	71 - 77	75	75	
Apple & pear & Quinces & Nashi	DANTOP 50WG	France	F	foliar spray	1	71 - 85	75	75	Application: 1 year out of 2, do not apply other neonicotinoids the same year. Harmful to bees, do not apply in the presence of bees or if the neighbouring area are flowering. Cover the inter-rows with graminacea
Apple	DANTOP 50WG	Greece	F	foliar spray	1	After flowering till fruit about 70% final size	75	75	
Apple	APACS 50WG	Hungary	F	foliar spray	2	71 - 84	50	75	
Apple	APACS 50WG	Hungary	F	foliar spray	1	71 - 83	only maximum application rate is registered because of efficiency	150	

Crop/situation	Product name	Member State	F/G	Method of application	Nr of applications	Growth stage	Minimum application rate: g a.s./ha	Maximum application rate: g a.s./ha	Remarks
Apple	DANTOP 50WG	Italy	F	foliar spray	1	71 - 77	75	112.5	
Apple	APACZ 50WG	Poland	F	foliar spray	1	72 - 76	n/a	50	In case of the product Apacz 50 WG registered in PL for all uses the mitigation measures are as follows: "To protect bees and other pollinating insects do not apply on flowering crop. Do not use where bees are actively foraging. Do not apply when flowering weeds are present in sprayed crop. Do apply only in the evening, when bees and other pollinating insects are not actively foraging. Do not use in case of loads of aphid or other insects producing honeydew" (SPe8). "To protect non-target arthropods respect an unsprayed buffer zone of 40 m to non-agricultural land "(SPe3)
Apple	APACZ 50WG	Poland	F	foliar spray	2	72 - 76	n/a	75	In case of the product Apacz 50 WG registered in PL for all uses the mitigation measures are as follows: "To protect bees and other pollinating insects do not apply on flowering crop. Do not

Crop/situation	Product name	Member State	F/G	Method of application	Nr of applications	Growth stage	Minimum application rate: g a.s./ha	Maximum application rate: g a.s./ha	Remarks
									use where bees are actively foraging. Do not apply when flowering weeds are present in sprayed crop. Do apply only in the evening, when bees and other pollinating insects are not actively foraging. Do not use in case of loads of aphid or other insects producing honeydew" (SPe8). "To protect non-target arthropods respect an unsprayed buffer zone of 40 m to non-agricultural land "(SPe3)
Apple	DANTOP 50WG	Portugal	F	foliar spray	1	after flowering 71 - 77	75	75	Water volume: 1000L/ha
Apple	DANTOP 50WG	Romania	F	foliar spray	1	71 - 85	?	112.5	
Apple	DANTOP 50WG	Romania	F	foliar spray	1	71 - 85	?	112.5 (*150*)	The maximum dose rate of 150 g/ha will be reduced to 112.5 g/ha to maintain this use to an acceptable level of risk to bees according to the requirements of the new EFSA bee guidance document
Apple	DANTOP 50WG	Spain	F	foliar spray	1	71 - 77	75	112.5	
Apricot	DANTOP 50WG	Italy	F	foliar spray	1	69 - 74	40	85	

Crop/situation	Product name	Member State	F/G	Method of application	Nr of applications	Growth stage	Minimum application rate: g a.s./ha	Maximum application rate: g a.s./ha	Remarks
African violets	APACS 50WG	Hungary	I	foliar spray	2	not defined	not defined	0.04 % (120-200 g a.s./ha)	Water volume: 600 - 1000L/ha
African violets	APACZ 50WG	Poland	G	foliar spray	not specified	11 - 70	200	400	In case of the product Apacz 50 WG registered in PL for all uses the mitigation measures are as follows: "To protect bees and other pollinating insects do not apply on flowering crop. Do not use where bees are actively foraging. Do not apply when flowering weeds are present in sprayed crop. Do apply only in the evening, when bees and other pollinating insects are not actively foraging. Do not use in case of loads of aphid or other insects producing honeydew" (SPe8).
Carnation	APACS 50WG	Hungary	I	foliar spray	2	not defined	not defined	0.04% (120-200 g a.s./ha)	Water volume: 600 - 1000L/ha
Chrysanthemum	APACS 50WG	Hungary	I	foliar spray	2	not defined	not defined	0.04% (120-200 g a.s./ha)	Water volume: 600 - 1000L/ha
Geranium	APACS 50WG	Hungary	I	foliar spray	2	not defined	not defined	0.04% (120-200 g a.s./ha)	Water volume: 600 - 1000L/ha
Gerbera	APACS 50WG	Hungary	I	foliar spray	2	not defined	not defined	0.04% (120-200 g a.s./ha)	Water volume: 600 - 1000L/ha

Crop/situation	Product name	Member State	F/G	Method of application	Nr of applications	Growth stage	Minimum application rate: g a.s./ha	Maximum application rate: g a.s./ha	Remarks
Gerbera	APACZ 50WG	Poland	G	foliar spray	not specified	11 - 70	200	400	In case of the product Apacz 50 WG registered in PL for all uses the mitigation measures are as follows: "To protect bees and other pollinating insects do not apply on flowering crop. Do not use where bees are actively foraging. Do not apply when flowering weeds are present in sprayed crop. Do apply only in the evening, when bees and other pollinating insects are not actively foraging. Do not use in case of loads of aphid or other insects producing honeydew" (SPe8).
Hibiscus	APACS 50WG	Hungary	I	foliar spray	2	not defined	not defined	0.04% (120-200 g a.s./ha)	Water volume: 600 - 1000L/ha
Nectarine	DANTOP 50WG	Bulgaria	F	foliar spray	1	71 - 77	40	60	
Nectarine	DANTOP 50WG	Greece	F	foliar spray	1	After flowering when infestation appears	40	70	
Nectarine	DANTOP 50WG	Italy	F	foliar spray	1	69 - 74	40	85	
Nectarine	DANTOP 50WG	Portugal	F	foliar spray	1	after flowering 71 - 74	40	70	Water volume: 1000L/ha

Crop/situation	Product name	Member State	F/G	Method of application	Nr of applications	Growth stage	Minimum application rate: g a.s./ha	Maximum application rate: g a.s./ha	Remarks
Nectarine	DANTOP 50WG	Spain	F	foliar spray	1	BBCH > 69		70	
Ornamentals	DANTOP	Germany	G	foliar spray	2	after infestation	150 g/ha in max. 1000 L water/ha	300	limited to plants with maximum height 50 cm
Peach	DANTOP 50WG	Bulgaria	F	foliar spray	1	71 - 77	40	60	
Peach & Apricot & Nectarines	DANTOP 50WG	France	F	foliar spray	2	71 - 85	70	70	Application: 1 year out of 2, do not apply other neonicotinoids the same year. Harmful to bees, do not apply in the presence of bees or if the neighbouring area are flowering. Cover the inter-rows with graminacea
Peach	DANTOP 50WG	Greece	F	foliar spray	1	After flowering when infestation appears	40	70	
Peach	APACS 50WG	Hungary	F	foliar spray	2	71 - 81	50	70	
Peach	DANTOP 50WG	Italy	F	foliar spray	1	69 - 74	40	85	
Peach	DANTOP 50WG	Portugal	F	foliar spray	1	after flowering 71 - 74	40	70	Water volume: 1000L/ha
Peach	DANTOP 50WG	Spain	F	foliar spray	1	BBCH > 69		70	
Pear	DANTOP 50WG	Bulgaria	F	foliar spray	1	71 - 77	75	75	
Pear	DANTOP 50WG	Greece	F	foliar spray	1	After flowering till fruit about 70% final size	75	75	

Crop/situation	Product name	Member State	F/G	Method of application	Nr of applications	Growth stage	Minimum application rate: g a.s./ha	Maximum application rate: g a.s./ha	Remarks
Pear	APACS 50WG	Hungary	F	foliar spray	2	71 - 84	50	75	
Pear	APACS 50WG	Hungary	F	foliar spray	1	71 - 83	only maximum application rate is registered because of efficiency	150	
Pear	DANTOP 50WG	Italy	F	foliar spray	1	71 - 77	75	112.5	
Pear	APACZ 50WG	Poland	F	foliar spray	2	72 - 76	n/a	75	In case of the product Apacz 50 WG registered in PL for all uses the mitigation measures are as follows: "To protect bees and other pollinating insects do not apply on flowering crop. Do not use where bees are actively foraging. Do not apply when flowering weeds are present in sprayed crop. Do apply only in the evening, when bees and other pollinating insects are not actively foraging. Do not use in case of loads of aphid or other insects producing honeydew" (SPe8).
Pear	DANTOP 50WG	Portugal	F	foliar spray	1	after flowering 71 - 74	75	75	Water volume: 1000L/ha
Pear	DANTOP 50WG	Spain	F	foliar spray	1	71 - 77		112.5	

Crop/situation	Product name	Member State	F/G	Method of application	Nr of applications	Growth stage	Minimum application rate: g a.s./ha	Maximum application rate: g a.s./ha	Remarks
Potato (seeds)	DANTOP	Austria	F	foliar spray	1-2	after infestation	75	150	
Potato (seeds)	DANTOP	Austria	F	foliar spray	1-2	after infestation	17.5	35	
Potato (seeds)	DANTOP	Germany	F	foliar spray	1-2	after infestation	75	75	
Potato (seeds)	DANTOP	Germany	F	foliar spray	1-2	after infestation	17.5	17.5	
Potato	APACS 50WG	Hungary	F	foliar spray	2	11 - 79	20	25	
Potato	DANTOP 50WG	Bulgaria	F	foliar spray	2	n/a	20	30	
Potato	DANTOP 50WG	France	F	foliar spray	2	not specified	25	70	do not plant a crop attractive to bees in case of early destruction of the potatoes
Potato	DANTOP 50WG	Greece	F	foliar spray	2	when infestation appears after crop cover complete	20	30	
Potato	DANTOP 50WG	Italy	F	foliar spray	2	38 - 66	20	30	
Potato	APACZ 50WG	Poland	F	foliar spray	2	11 - 59	n/a	20	In case of the product Apacz 50 WG registered in PL for all uses the mitigation measures are as follows: "To protect bees and other pollinating insects do not apply on flowering crop. Do not use where bees are actively foraging. Do not apply when flowering

Crop/situation	Product name	Member State	F/G	Method of application	Nr of applications	Growth stage	Minimum application rate: g a.s./ha	Maximum application rate: g a.s./ha	Remarks
									weeds are present in sprayed crop. Do apply only in the evening, when bees and other pollinating insects are not actively foraging. Do not use in case of loads of aphid or other insects producing honeydew" (SPe8). "To protect non-target arthropods respect an unsprayed buffer zone of 5 m to non-agricultural land "(SPe3)
Potato	DANTOP 50WG	Portugal	F	foliar spray	2	38 - 66	20	30	Water volume: 1000L/ha
Potato	DANTOP 50WG	Romania	F	foliar spray	2	11 - 80	?	17.5	
Potato	APACHE 50WG	Slovakia	F	foliar spray	2	11 - 59	20	22.5	water volume: 300 - 500 L/ha; PHI 7 days; interval between applications 14 days
Potato	DANTOP 50WG	Spain	F	foliar spray	2	BBCH > 39	20	30	

n/a: not applicable

Table 11: Summary of all uses other than foliar spray applications

Crop/situation	Product name	Member State	F/G	Method of application	Nr of applications	Growth stage	Minimum application rate: g a.s./ha	Maximum application rate: g a.s./ha	Remarks
Kohlrabi, cabbage (young plants)	DANTOP	Germany	G	pour plants	1	> 12	2.4 g/1000 plants in 3 L water/m²	2.4 g/1000 plants in 3 L water/m²	
Maize	SANTANA*	Slovakia	F	soil application	1 in 4 years	Application when seeds are sown	110	110	The product was withdrawn after the Regulation 485/2013 had been issued
Potato (seeds)	DANTOP	Austria	F	tuber spray	1	01 - 03 (at planting)	150	*150*	This is a tuber treatment that is not going to be supported in the future
Potato (seeds)	DANTOP	Germany	F	tuber spray	1	01 - 03 (at planting)	150	*150*	This is a tuber treatment that is not going to be supported in the future

* granular formulation not considered under the current mandate

APPENDIX B – SUMMARY OF THE TOXICITY DATA, HIGHER TIER DATA, HAZARD QUOTIENTS, EXPOSURE TOXICITY RATIOS AND LIMIT RATES

Table 12: Overview the toxicity endpoints available in the dossiers

	Test substance	Toxicity endpoint	Species	Reference
Acute oral toxicity 48-hour LD_{50} µg a.s./bee	Technical	**0.00379** µg a.s/bee	*Apis mellifera*	European Commission, 2005
Acute oral toxicity 48-hour LD_{50} µg a.s/bee	Formulation: TI-435 50 %WDG	0.0018 µg a.s./bee	*Apis mellifera*	C.S. Weyman, 1998 (study evaluation notes; EFSA, 2015: 04_THW-0103)
Acute contact toxicity 48-hour LD_{50} µg a.s./bee	Formulation: TI-435 50 %WDG	0.176 µg a.s./bee	*Apis mellifera*	C.S. Weyman, 1998 (study evaluation notes; EFSA, 2015: 04_THW-0103)
Acute contact toxicity 48-hour LD_{50} µg a.s./bee	Technical	0.04426 µg a.s./bee **0.0275** µg a.s./bee	*Apis mellifera*	European Commission, 2005 European Commission, 2006
Chronic toxicity 10-day LDD_{50}	Technical	**0.00138** µg a.s./bee per day	*Apis mellifera*	Kling, A., 2005 study evaluation notes; EFSA, 2015
Honey bee larvae 7-day NOEL	Technical	**0.00528** µg a.s./larvae per day	*Apis mellifera*	Maus, Ch., 2009 study evaluation notes; EFSA, 2015
Acute oral toxicity 48-hour LD_{50} (NOEL) µg met/bee	Metabolite TZNG	3.9 µg met/bee	*Apis mellifera*	European Commission, 2005
Acute oral toxicity 48-hour LD_{50} µg met/bee	Metabolite TMG	>151 µg met/bee	*Apis mellifera*	DAR (Belgium, 2003) (reported also in the study evaluation notes; EFSA, 2015, because the DAR is not publicly available)
Acute oral toxicity 48-hour LD_{50} (NOEL) µg met/bee	Metabolite TZMU	>113 µg met/bee	*Apis mellifera*	DAR (Belgium, 2003) (reported also in the study evaluation notes; EFSA, 2015, because the DAR is not publicly available)
Acute oral toxicity 48-hour LD_{50} (NOEL) µg met/bee	Metabolite MNG	>153 µg met/bee	*Apis mellifera*	DAR (Belgium, 2003) (reported also in the study evaluation notes; EFSA, 2015, because the DAR is not publicly available)

Value in **bold** used for risk assessment

Table 13: Summary of observations in the available higher tier effects studies

Application rate g a.s./ha	Crop	Semi-field/field; method of application	Key observations/Remark
Actual rates: 12.4 6.18 4.5 2.52 0.49	*Phacelia tanacetifolia*	Semi-field **Bakker, 2001a (study evaluation notes: 05_THW-0106)**	Foraging activity was reduced in all the treatment groups except the lowest i.e. 0.49 g a.s./ha Mortality was also statistically different 1 day after the application for the 3 highest test rates, the second day only for the highest test rate, and was not statistically different the last 2 days after the application. NOER of 0.49 g a.s./ha for acute effects on foraging activity and mortality for situations where bees are exposed to clothianidin applied as spray. **Remark** Not compliant with EFSA, 2013b
Nominal rates tested at day -1: 4.5, 6.2, 12.4, 37. Nominal rates tested at day -2: 37.5 Nominal rates tested at day 0: 37.	*Phacelia tanacetifolia*	Semi-field **Bakker, 2001b (study evaluation notes: 06_THW-0107)**	Effects on foraging activity and mortality for situations where bees are exposed to aged clothianidin applied as spray before the bee foraging activity were not excluded at 37.5 g a.s./ha. **Remark** Not compliant with EFSA, 2013b Furthermore, due to the limitations with the water control the study cannot be considered reliable
Nominal applications rates: 6.25 12.5 45 g -Run 1, 45 -Run 2, 6.25 and 12.5	*Phacelia tanacetifolia*	Tunnel test **Thompson, 2000 (study evaluation notes: 07_THW-0134**	Mortality, foraging activity, behaviour were affected even at the lowest test rate (i.e. 6.25 g a.s./ha). **Remark** No replicates were used. Not compliant with EFSA, 2013b
Peach trials: 70 g a.s./ha Apple trials: 70 g a.s./ha 150 g a.s./ha Evening application	Peach Apple Post-flowering	Field **Thompson, 2012a (study evaluation notes: 08_THW-0326**	Mortality increased after the application in apples. Mortality was also observed increasing in orchards after day 10. Mortality was low were there was no foraging activity. Residues found in pollen trap samples showed that the initial residues were related to the application with residue decline over 2 weeks. High residue levels were also detected in dead bees immediately post-application. The colony losses were linked to disease or poor *Varroa* control in most of the cases. The % of total area of flowering weeds ranged from < 0.1% to 30-75%. **Remark** Not compliant with EFSA, 2013b Other shortcomings noted
150 g a.s./ha	Apple Post-flowering	Field **Thompson, 2012b (study evaluation notes: 09_THW-0324)**	Mortality increased after the application. Mortality was also observed increasing in orchards between the day 6-8 after the application. It was noted that in coincidence with the highest peak of mortality apples were irrigated. There was a short-term reduction in brood development, pollen and nectar stores in the 1-2 weeks. Residues were found in **pollen trap** samples, in **pollen from the hive**.

Application rate g a.s./ha	Crop	Semi-field/field; method of application	Key observations/Remark
			Residues in **nectar from the hive** were not detected. Residues **in wax** from the hive were detected at day 5. Residues in **larvae** from the hive were detected at day 5. Residues in **dead bees** collected from the hive were detected in the control. **Remark** Not compliant with EFSA, 2013b Other shortcomings noted
75 g a.s./ha	potatoes	Field Guttation **Thompson, 2013 (study evaluation notes: 10_THW-0337**	Residues of clothianidin and its metabolites in guttation were detected at high level after the application. No bees were observed to use guttation droplets as drinking water source. **Remark** Not compliant with EFSA, 2013b Other shortcomings noted

Table 14: Hazard Quotients (**HQs**) for honeybees, bumble bees and solitary bees

Application type*	Crop Category	BBCH	Scenario	Low rate (g a.s./ha)	High rate (g a.s./ha)	Honeybees HQ			Bumble bees HQ			Solitary bees HQ		
						Lowest rate	Highest rate	trigger	Lowest rate	Highest rate	trigger	Lowest rate	Highest rate	trigger
spray SUW	Orchards 1	≥ 40	weeds	50	150	545.5	1636.4	42	5454.5	16363.6	7	5454.5	16363.6	8
spray SUW	Orchards 1	≥ 40	field margin (adjacent crop)	50	150	530.9	1592.7	42	5309.1	15927.3	7	5309.1	15927.3	8
spray DW	Potato seeds (tuber treatment)	< 40	weeds	150	150	5454.5	5454.5	42	54545.5	54545.5	7	54545.5	54545.5	8
spray DW	Potato seeds (tuber treatment)	< 40	field margin (adjacent crop)	150	150	152.7	152.7	42	1527.3	1527.3	7	1527.3	1527.3	8
spray DW	Potatoes	≥ 40	treated crop	17.5	150	636.4	5454.5	42	6363.6	54545.5	7	6363.6	54545.5	8
spray DW	Potatoes	< 40	weeds	17.5	150	636.4	5454.5	42	6363.6	54545.5	7	6363.6	54545.5	8
spray DW	Potatoes	≥ 40	weeds	17.5	150	190.9	1636.4	42	1909.1	16363.6	7	1909.1	16363.6	8
spray DW	Potatoes	all	field margin (adjacent crop)	17.5	150	**17.8**	152.7	42	178.2	1527.3	7	178.2	1527.3	8
spray DW	Ornamentals	≥ 40	treated crop	120	400	4363.6	14545.5	42	43636.4	145454.5	7	43636.4	145454.5	8
spray DW	Ornamentals	all	field margin (adjacent crop)	120	400	122.2	407.3	42	1221.8	4072.7	7	1221.8	4072.7	8

*SUW: sideward spray; DW: downward spray
Values in **bold** indicate low risk
Low rate: lowest authorised 'maximum application rate'
High rate: highest authorised 'maximum application rate'

Table 15: Exposure/Toxicity ratios (**ETRs**) for honeybees, bumble bees and solitary bees (acute, chronic, larvae)

Crop	Application type*	Low rate (g a.s./ha)	High rate (g a.s./ha)	BBCH	Category	Scenario	Honeybees ETRs			Bumble bees ETRs			Solitary bees ETRs		
							Lowest rate	Highest rate	trigger	Lowest rate	Highest rate	trigger	Lowest rate	Highest rate	trigger
Potato seeds (tuber treatment)	spray DW	150	150	< 10	acute	treated crop	0.47	0.47	0.20	11.873	11.873	0.036	3.958	3.958	0.04
Potato seeds (tuber treatment)	spray DW	150	150	< 10	acute	weeds	146.44	146.44	0.20	2572.559	2572.559	0.036	910.290	910.290	0.04
Potato seeds (tuber treatment)	spray DW	150	150	< 10	acute	field margin	1.35	1.35	0.20	23.668	23.668	0.036	8.375	8.375	0.04
Potato seeds (tuber treatment)	spray DW	150	150	< 10	acute	adjacent crop	0.99	0.99	0.20	14.628	14.628	0.036	7.445	7.445	0.04
Potato seeds (tuber treatment)	spray DW	150	150	< 10	acute	next crop	27.70	27.70	0.20	356.201	356.201	0.036	193.931	193.931	0.04
Potato seeds (tuber treatment)	spray DW	150	150	< 10	chronic	treated crop	0.94	0.94	0.03	23.478	23.478	0.0048	7.826	7.826	0.0054

Crop	Application type*	Low rate (g a.s./ha)	High rate (g a.s./ha)	BBCH	Category	Scenario	Honeybees ETRs			Bumble bees ETRs			Solitary bees ETRs		
							Lowest rate	Highest rate	trigger	Lowest rate	Highest rate	trigger	Lowest rate	Highest rate	trigger
Potato seeds (tuber treatment)	spray DW	150	150	< 10	chronic	weeds	226.96	226.96	0.03	4617.391	4617.391	0.0048	1800.000	1800.000	0.0054
Potato seeds (tuber treatment)	spray DW	150	150	< 10	chronic	field margin	2.09	2.09	0.03	42.480	42.480	0.0048	16.560	16.560	0.0054
Potato seeds (tuber treatment)	spray DW	150	150	< 10	chronic	adjacent crop	1.50	1.50	0.03	25.568	25.568	0.0048	14.721	14.721	0.0054
Potato seeds (tuber treatment)	spray DW	150	150	< 10	chronic	next crop	42.26	42.26	0.03	610.435	610.435	0.0048	383.478	383.478	0.0054
Potato seeds (tuber treatment)	spray DW	150	150	< 10	larva	treated crop	**0.05**	**0.05**	0.20	N/A	N/A	0.2	N/A	N/A	0.2
Potato seeds (tuber treatment)	spray DW	150	150	< 10	larva	weeds	53.13	53.13	0.20	N/A	N/A	0.2	N/A	N/A	0.2
Potato seeds (tuber treatment)	spray DW	150	150	< 10	larva	field margin	0.49	0.49	0.20	N/A	N/A	0.2	N/A	N/A	0.2
Potato seeds (tuber treatment)	spray DW	150	150	< 10	larva	adjacent crop	0.35	0.35	0.20	N/A	N/A	0.2	N/A	N/A	0.2
Potato seeds (tuber treatment)	spray DW	150	150	< 10	larva	next crop	9.66	9.66	0.20	N/A	N/A	0.2	N/A	N/A	0.2
Potato seeds (tuber treatment)	spray DW	150	150	< 10	HPG	treated crop	N/A	N/A	1.00	-	-	-	-	-	-
Potato seeds (tuber treatment)	spray DW	150	150	< 10	HPG	weeds	N/A	N/A	1.00	-	-	-	-	-	-
Potato seeds (tuber treatment)	spray DW	150	150	< 10	HPG	field margin	N/A	N/A	1.00	-	-	-	-	-	-
Potato seeds (tuber treatment)	spray DW	150	150	< 10	HPG	adjacent crop	N/A	N/A	1.00	-	-	-	-	-	-
Potato seeds (tuber treatment)	spray DW	150	150	< 10	HPG	next crop	N/A	N/A	1.00	-	-	-	-	-	-
Potatoes	spray DW	17.5	150	10 - 39	acute	treated crop	4.25	36.41	0.20	106.201	910.290	0.036	36.016	308.707	0.04
Potatoes	spray DW	17.5	150	40 - 69	acute	treated crop	4.25	36.41	0.20	106.201	910.290	0.036	36.016	308.707	0.04
Potatoes	spray DW	17.5	150	10 - 39	acute	weeds	17.08	146.44	0.20	300.132	2572.559	0.036	106.201	910.290	0.04
Potatoes	spray DW	17.5	150	40 - 69	acute	weeds	5.13	43.93	0.20	90.040	771.768	0.036	31.860	273.087	0.04
Potatoes	spray DW	17.5	150	≥ 70	acute	weeds	5.13	43.93	0.20	90.040	771.768	0.036	31.860	273.087	0.04
Potatoes	spray DW	17.5	150	10 - 39	acute	field margin	**0.16**	1.35	0.20	2.761	23.668	0.036	0.977	8.375	0.04
Potatoes	spray DW	17.5	150	40 - 69	acute	field margin	**0.16**	1.35	0.20	2.761	23.668	0.036	0.977	8.375	0.04
Potatoes	spray DW	17.5	150	≥ 70	acute	field margin	**0.16**	1.35	0.20	2.761	23.668	0.036	0.977	8.375	0.04

Crop	Application type*	Low rate (g a.s./ha)	High rate (g a.s./ha)	BBCH	Category	Scenario	Honeybees ETRs			Bumble bees ETRs			Solitary bees ETRs		
							Lowest rate	Highest rate	trigger	Lowest rate	Highest rate	trigger	Lowest rate	Highest rate	trigger
Potatoes	spray DW	17.5	150	10 - 39	acute	adjacent crop	**0.12**	0.99	0.20	1.707	14.628	0.036	0.869	7.445	0.04
Potatoes	spray DW	17.5	150	40 - 69	acute	adjacent crop	**0.12**	0.99	0.20	1.707	14.628	0.036	0.869	7.445	0.04
Potatoes	spray DW	17.5	150	≥ 70	acute	adjacent crop	**0.12**	0.99	0.20	1.707	14.628	0.036	0.869	7.445	0.04
Potatoes	spray DW	17.5	150	< 10	acute	next crop	3.23	27.70	0.20	41.557	356.201	0.036	22.625	193.931	0.04
Potatoes	spray DW	17.5	150	10 - 39	acute	next crop	3.23	27.70	0.20	41.557	356.201	0.036	22.625	193.931	0.04
Potatoes	spray DW	17.5	150	40 - 69	acute	next crop	3.23	27.70	0.20	41.557	356.201	0.036	22.625	193.931	0.04
Potatoes	spray DW	17.5	150	≥ 70	acute	next crop	3.23	27.70	0.20	41.557	356.201	0.036	22.625	193.931	0.04
Potatoes	spray DW	17.5	150	10 - 39	chronic	treated crop	8.40	72.00	0.03	210.000	1800.000	0.0048	71.217	610.435	0.0054
Potatoes	spray DW	17.5	150	40 - 69	chronic	treated crop	8.40	72.00	0.03	210.000	1800.000	0.0048	71.217	610.435	0.0054
Potatoes	spray DW	17.5	150	10 - 39	chronic	weeds	26.48	226.96	0.03	538.696	4617.391	0.0048	210.000	1800.000	0.0054
Potatoes	spray DW	17.5	150	40 - 69	chronic	weeds	7.94	68.09	0.03	161.609	1385.217	0.0048	63.000	540.000	0.0054
Potatoes	spray DW	17.5	150	≥ 70	chronic	weeds	7.94	68.09	0.03	161.609	1385.217	0.0048	63.000	540.000	0.0054
Potatoes	spray DW	17.5	150	10 - 39	chronic	field margin	0.24	2.09	0.03	4.956	42.480	0.0048	1.932	16.560	0.0054
Potatoes	spray DW	17.5	150	40 - 69	chronic	field margin	0.24	2.09	0.03	4.956	42.480	0.0048	1.932	16.560	0.0054
Potatoes	spray DW	17.5	150	≥ 70	chronic	field margin	0.24	2.09	0.03	4.956	42.480	0.0048	1.932	16.560	0.0054
Potatoes	spray DW	17.5	150	10 - 39	chronic	adjacent crop	0.17	1.50	0.03	2.983	25.568	0.0048	1.717	14.721	0.0054
Potatoes	spray DW	17.5	150	40 - 69	chronic	adjacent crop	0.17	1.50	0.03	2.983	25.568	0.0048	1.717	14.721	0.0054
Potatoes	spray DW	17.5	150	≥ 70	chronic	adjacent crop	0.17	1.50	0.03	2.983	25.568	0.0048	1.717	14.721	0.0054
Potatoes	spray DW	17.5	150	10 - 39	chronic	next crop	4.93	42.26	0.03	71.217	610.435	0.0048	44.739	383.478	0.0054
Potatoes	spray DW	17.5	150	40 - 69	chronic	next crop	4.93	42.26	0.03	71.217	610.435	0.0048	44.739	383.478	0.0054
Potatoes	spray DW	17.5	150	≥ 70	chronic	next crop	4.93	42.26	0.03	71.217	610.435	0.0048	44.739	383.478	0.0054
Potatoes	spray DW	17.5	150	10 - 39	larva	treated crop	0.42	3.62	0.20	N/A	N/A	0.2	N/A	N/A	0.2
Potatoes	spray DW	17.5	150	40 - 69	larva	treated crop	0.42	3.62	0.20	N/A	N/A	0.2	N/A	N/A	0.2
Potatoes	spray DW	17.5	150	10 - 39	larva	weeds	6.20	53.13	0.20	N/A	N/A	0.2	N/A	N/A	0.2
Potatoes	spray DW	17.5	150	40 - 69	larva	weeds	1.86	15.94	0.20	N/A	N/A	0.2	N/A	N/A	0.2

Crop	Application type*	Low rate (g a.s./ha)	High rate (g a.s./ha)	BBCH	Category	Scenario	Honeybees ETRs			Bumble bees ETRs			Solitary bees ETRs		
							Lowest rate	Highest rate	trigger	Lowest rate	Highest rate	trigger	Lowest rate	Highest rate	trigger
Potatoes	spray DW	17.5	150	≥ 70	larva	weeds	1.86	15.94	0.20	N/A	N/A	0.2	N/A	N/A	0.2
Potatoes	spray DW	17.5	150	10 - 39	larva	field margin	**0.06**	0.49	0.20	N/A	N/A	0.2	N/A	N/A	0.2
Potatoes	spray DW	17.5	150	40 - 69	larva	field margin	**0.06**	0.49	0.20	N/A	N/A	0.2	N/A	N/A	0.2
Potatoes	spray DW	17.5	150	≥ 70	larva	field margin	**0.06**	0.49	0.20	N/A	N/A	0.2	N/A	N/A	0.2
Potatoes	spray DW	17.5	150	10 - 39	larva	adjacent crop	**0.04**	0.35	0.20	N/A	N/A	0.2	N/A	N/A	0.2
Potatoes	spray DW	17.5	150	40 - 69	larva	adjacent crop	**0.04**	0.35	0.20	N/A	N/A	0.2	N/A	N/A	0.2
Potatoes	spray DW	17.5	150	≥ 70	larva	adjacent crop	**0.04**	0.35	0.20	N/A	N/A	0.2	N/A	N/A	0.2
Potatoes	spray DW	17.5	150	10 - 39	larva	next crop	1.13	9.66	0.20	N/A	N/A	0.2	N/A	N/A	0.2
Potatoes	spray DW	17.5	150	40 - 69	larva	next crop	1.13	9.66	0.20	N/A	N/A	0.2	N/A	N/A	0.2
Potatoes	spray DW	17.5	150	≥ 70	larva	next crop	1.13	9.66	0.20	N/A	N/A	0.2	N/A	N/A	0.2
Potatoes	spray DW	17.5	150	10 - 39	HPG	treated crop	N/A	N/A	1.00	-	-	-	-	-	-
Potatoes	spray DW	17.5	150	40 - 69	HPG	treated crop	N/A	N/A	1.00	-	-	-	-	-	-
Potatoes	spray DW	17.5	150	10 - 39	HPG	weeds	N/A	N/A	1.00	-	-	-	-	-	-
Potatoes	spray DW	17.5	150	40 - 69	HPG	weeds	N/A	N/A	1.00	-	-	-	-	-	-
Potatoes	spray DW	17.5	150	≥ 70	HPG	weeds	N/A	N/A	1.00	-	-	-	-	-	-
Potatoes	spray DW	17.5	150	10 - 39	HPG	field margin	N/A	N/A	1.00	-	-	-	-	-	-
Potatoes	spray DW	17.5	150	40 - 69	HPG	field margin	N/A	N/A	1.00	-	-	-	-	-	-
Potatoes	spray DW	17.5	150	≥ 70	HPG	field margin	N/A	N/A	1.00	-	-	-	-	-	-
Potatoes	spray DW	17.5	150	10 - 39	HPG	adjacent crop	N/A	N/A	1.00	-	-	-	-	-	-
Potatoes	spray DW	17.5	150	40 - 69	HPG	adjacent crop	N/A	N/A	1.00	-	-	-	-	-	-
Potatoes	spray DW	17.5	150	≥ 70	HPG	adjacent crop	N/A	N/A	1.00	-	-	-	-	-	-
Potatoes	spray DW	17.5	150	10 - 39	HPG	next crop	N/A	N/A	1.00	-	-	-	-	-	-
Potatoes	spray DW	17.5	150	40 - 69	HPG	next crop	N/A	N/A	1.00	-	-	-	-	-	-
Potatoes	spray DW	17.5	150	≥ 70	HPG	next crop	N/A	N/A	1.00	-	-	-	-	-	-
Orchards 1	spray SUW	50	150	≥ 70	acute	weeds	14.64	43.93	0.20	257.256	771.768	0.036	91.029	273.087	0.04

Crop	Application type*	Low rate (g a.s./ha)	High rate (g a.s./ha)	BBCH	Category	Scenario	Honeybees ETRs			Bumble bees ETRs			Solitary bees ETRs		
							Lowest rate	Highest rate	trigger	Lowest rate	Highest rate	trigger	Lowest rate	Highest rate	trigger
Orchards 1	spray SUW	50	150	≥ 70	acute	field margin	4.73	14.20	0.20	83.179	249.538	0.036	29.433	88.298	0.04
Orchards 1	spray SUW	50	150	≥ 70	acute	adjacent crop	6.62	19.85	0.20	97.520	292.559	0.036	49.631	148.892	0.04
Orchards 1	spray SUW	50	150	≥ 70	acute	next crop	9.23	27.70	0.20	118.734	356.201	0.036	64.644	193.931	0.04
Orchards 1	spray SUW	50	150	≥ 70	chronic	weeds	22.70	68.09	0.03	461.739	1385.217	0.0048	180.000	540.000	0.0054
Orchards 1	spray SUW	50	150	≥ 70	chronic	field margin	7.34	22.01	0.03	149.296	447.887	0.0048	58.200	174.600	0.0054
Orchards 1	spray SUW	50	150	≥ 70	chronic	adjacent crop	9.99	29.96	0.03	170.452	511.357	0.0048	98.139	294.417	0.0054
Orchards 1	spray SUW	50	150	≥ 70	chronic	next crop	14.09	42.26	0.03	203.478	610.435	0.0048	127.826	383.478	0.0054
Orchards 1	spray SUW	50	150	≥ 70	larva	weeds	5.31	15.94	0.20	N/A	N/A	0.2	N/A	N/A	0.2
Orchards 1	spray SUW	50	150	≥ 70	larva	field margin	1.72	5.15	0.20	N/A	N/A	0.2	N/A	N/A	0.2
Orchards 1	spray SUW	50	150	≥ 70	larva	adjacent crop	2.34	7.01	0.20	N/A	N/A	0.2	N/A	N/A	0.2
Orchards 1	spray SUW	50	150	≥ 70	larva	next crop	3.22	9.66	0.20	N/A	N/A	0.2	N/A	N/A	0.2
Orchards 1	spray SUW	50	150	≥ 70	HPG	weeds	N/A	N/A	1.00	-	-	-	-	-	-
Orchards 1	spray SUW	50	150	≥ 70	HPG	field margin	N/A	N/A	1.00	-	-	-	-	-	-
Orchards 1	spray SUW	50	150	≥ 70	HPG	adjacent crop	N/A	N/A	1.00	-	-	-	-	-	-
Orchards 1	spray SUW	50	150	≥ 70	HPG	next crop	N/A	N/A	1.00	-	-	-	-	-	-
Ornamentals	spray DW	120	400	10 - 29	acute	treated crop	240.63	802.11	0.20	3546.17	11820.58	0.036	1804.74	6015.83	0.04
Ornamentals	spray DW	120	400	30 - 39	acute	treated crop	240.63	802.11	0.20	3546.17	11820.58	0.036	1804.74	6015.83	0.04
Ornamentals	spray DW	120	400	40 - 69	acute	treated crop	240.63	802.11	0.20	3546.17	11820.58	0.036	1804.74	6015.83	0.04
Ornamentals	spray DW	120	400	10 - 29	chronic	treated crop	363.13	1210.43	0.03	6198.261	20660.87	0.0048	3568.69	11895.65	0.0054
Ornamentals	spray DW	120	400	30 - 39	chronic	treated crop	363.13	1210.43	0.03	6198.261	20660.87	0.0048	3568.69	11895.65	0.0054
Ornamentals	spray DW	120	400	40 - 69	chronic	treated crop	363.13	1210.43	0.03	6198.261	20660.87	0.0048	3568.69	11895.65	0.0054
Ornamentals	spray DW	120	400	10 - 29	larva	treated crop	85.00	283.33	0.20	N/A	N/A	0.2	N/A	N/A	0.2
Ornamentals	spray DW	120	400	30 - 39	larva	treated crop	85.00	283.33	0.20	N/A	N/A	0.2	N/A	N/A	0.2

Crop	Application type*	Low rate (g a.s./ha)	High rate (g a.s./ha)	BBCH	Category	Scenario	Honeybees ETRs			Bumble bees ETRs			Solitary bees ETRs		
							Lowest rate	Highest rate	trigger	Lowest rate	Highest rate	trigger	Lowest rate	Highest rate	trigger
Ornamentals	spray DW	120	400	40 - 69	larva	treated crop	85.00	283.33	0.20	N/A	N/A	0.2	N/A	N/A	0.2
Ornamentals	spray DW	120	400	10 - 29	HPG	treated crop	N/A	N/A	1.00	-	-	-	-	-	-
Ornamentals	spray DW	120	400	30 - 39	HPG	treated crop	N/A	N/A	1.00	-	-	-	-	-	-
Ornamentals	spray DW	120	400	40 - 69	HPG	treated crop	N/A	N/A	1.00	-	-	-	-	-	-
Ornamentals	spray DW	120	400	10 - 29	acute	field margin[1]	1.08	3.59	0.2	18.934	63.113	0.036	6.700	22.332	0.04
Ornamentals	spray DW	120	400	30 - 39	acute	field margin[1]	1.08	3.59	0.2	18.934	63.113	0.036	6.700	22.332	0.04
Ornamentals	spray DW	120	400	40 - 69	acute	field margin[1]	1.08	3.59	0.2	18.934	63.113	0.036	6.700	22.332	0.04
Ornamentals	spray DW	120	400	≥ 70	acute	field margin[1]	1.08	3.59	0.2	18.934	63.113	0.036	6.700	22.332	0.04
Ornamentals	spray DW	120	400	10 - 29	chronic	adjacent crop[1]	1.67	5.57	0.03	33.984	113.280	0.0048	13.248	44.160	0.0054
Ornamentals	spray DW	120	400	30 - 39	chronic	adjacent crop[1]	1.67	5.57	0.03	33.984	113.280	0.0048	13.248	44.160	0.0054
Ornamentals	spray DW	120	400	40 - 69	chronic	adjacent crop[1]	1.67	5.57	0.03	33.984	113.280	0.0048	13.248	44.160	0.0054
Ornamentals	spray DW	120	400	≥ 70	chronic	adjacent crop[1]	1.67	5.57	0.03	33.984	113.280	0.0048	13.248	44.160	0.0054
Ornamentals	spray DW	120	400	10 - 29	larva	field margin[1]	0.39	1.30	0.2	N/A	N/A	0.2	N/A	N/A	0.2
Ornamentals	spray DW	120	400	30 - 39	larva	field margin[1]	0.39	1.30	0.2	N/A	N/A	0.2	N/A	N/A	0.2
Ornamentals	spray DW	120	400	40 - 69	larva	field margin[1]	0.39	1.30	0.2	N/A	N/A	0.2	N/A	N/A	0.2
Ornamentals	spray DW	120	400	≥ 70	larva	field margin[1]	0.39	1.30	0.2	N/A	N/A	0.2	N/A	N/A	0.2
Ornamentals	spray DW	120	400	10 - 29	larva	adjacent crop[1]	0.28	0.94	0.2	N/A	N/A	0.2	N/A	N/A	0.2
Ornamentals	spray DW	120	400	30 - 39	larva	adjacent crop[1]	0.28	0.94	0.2	N/A	N/A	0.2	N/A	N/A	0.2
Ornamentals	spray DW	120	400	40 - 69	larva	adjacent crop[1]	0.28	0.94	0.2	N/A	N/A	0.2	N/A	N/A	0.2
Ornamentals	spray DW	120	400	≥ 70	larva	adjacent crop[1]	0.28	0.94	0.2	N/A	N/A	0.2	N/A	N/A	0.2

*SUW: sideward spray; DW: downward spray
[1]the drift rate for arable field crops of 2.77 % was used
Values in **bold** indicate low risk. Low rate: lowest authorised 'maximum application rate' High rate: highest authorised 'maximum application rate'

Table 16: '**Limit rate**' for honeybees, bumble bees and solitary bees (acute contact)

Crop Category	BBCH	Scenario	Honeybee Limit dose [g a.s./ha]	Honeybee Limit dose [g/ha] – 95% mitigation	Bumble bee Limit dose [g a.s./ha]	Bumble bee Limit dose [g/ha] – 95% mitigation	Solitary bee Limit dose [g a.s./ha]	Solitary bee Limit dose [g/ha] – 95% mitigation
Arable field crops (Potatoes)	n/a	field margin/adjacent crop	41	825	0	13	0	15
Orchards 1	early	field margin/adjacent crop	3	79	0	1	0	1
Orchards 1	late	field margin/adjacent crop	7	147	0	2	0	2

Table 17: '**Limit rate**' for honeybees, bumble bees and solitary bees (acute oral, chronic, honeybee larvae)

Endpoint	Crop	BBCH	Scenario	Honeybee Limit dose [g/ha]	Honeybee Limit dose [g/ha] - 95% mitigation	Bumble bee Limit dose [g/ha]	Bumble bee Limit dose [g/ha] - 95% mitigation	Solitary bee Limit dose [g/ha]	Solitary bee Limit dose [g/ha] - 95% mitigation
Acute	Arable field crops (Potatoes, ornamentals)	n/a	field margin	22	445	0	4	0	14
Acute	Arable field crops (Potatoes, ornamentals)	n/a	adjacent crop	30	604	0	7	0	16
Chronic	Arable field crops (Potatoes, ornamentals)	n/a	field margin	2	43	0	0	0	0
Chronic	Arable field crops (Potatoes, ornamentals)	n/a	adjacent crop	3	60	0	0	0	1
Larvae	Arable field crops (Potatoes, ornamentals)	n/a	field margin	61	1227	N/A	N/A	N/A	N/A
Larvae	Arable field crops (Potatoes, ornamentals)	n/a	adjacent crop	85	1711	N/A	N/A	N/A	N/A
HPG	Arable field crops (Potatoes, ornamentals)	n/a	field margin	N/A	N/A	-	-	-	-
HPG	Arable field crops (Potatoes, ornamentals)	n/a	adjacent crop	N/A	N/A	-	-	-	-
Acute	Orchards 1	early	field margin	2	42	0	0	0	1
Acute	Orchards 1	early	adjacent crop	1	30	0	0	0	0
Acute	Orchards 1	late	field margin	3	78	0	0	0	2
Acute	Orchards 1	late	adjacent crop	3	64	0	0	0	1
Chronic	Orchards 1	early	field margin	0	4	0	0	0	0
Chronic	Orchards 1	early	adjacent crop	0	3	0	0	0	0
Chronic	Orchards 1	late	field margin	0	7	0	0	0	0

Endpoint	Crop	BBCH	Scenario	Honeybee Limit dose [g/ha]	Honeybee Limit dose [g/ha] - 95% mitigation	Bumble bee Limit dose [g/ha]	Bumble bee Limit dose [g/ha] - 95% mitigation	Solitary bee Limit dose [g/ha]	Solitary bee Limit dose [g/ha] - 95% mitigation
Chronic	Orchards 1	late	adjacent crop	0	6	0	0	0	0
Larvae	Orchards 1	early	field margin	5	116	N/A	N/A	N/A	N/A
Larvae	Orchards 1	early	adjacent crop	4	85	N/A	N/A	N/A	N/A
Larvae	Orchards 1	late	field margin	10	217	N/A	N/A	N/A	N/A
Larvae	Orchards 1	late	adjacent crop	9	182	N/A	N/A	N/A	N/A
HPG	Orchards 1	early	field margin	N/A	N/A	-	-	-	-
HPG	Orchards 1	early	adjacent crop	N/A	N/A	-	-	-	-
HPG	Orchards 1	late	field margin	N/A	N/A	-	-	-	-
HPG	Orchards 1	late	adjacent crop	N/A	N/A	-	-	-	-

N/A: not available

APPENDIX C – SUMMARY OF THE APPROACH TO THE RISK ASSESSMENT FOR ORNAMENTALS

The risk assessment for bees from the authorised uses on ornamentals, ornamental trees and non-orchard trees was discussed at the Pesticides Peer Review Experts' Meeting 129 (March 2015). It was noted that the authorised uses to ornamentals can be to a large variation of types of ornamental plants but, for the purposes of the current risk assessment, the approach summarised in Table 18 was agreed.

Table 18: Approach to risk assessment for authorised foliar spray uses on ornamental plants and ornamental trees and non-orchard trees

Scenario	Risk assessment
Treated crop	Exposure depends on whether the plants or trees are attractive and applications are made pre- or during the flowering period. If the type of ornamental plant or tree is not stated then it should be assumed that they are attractive to bees for pollen and nectar collection. For attractive ornamental small plants, the use of the treated crop scenario for oilseed rape would be a reasonable surrogate (for both oral and contact risk assessment). For non-attractive ornamental plants and applications made post-flowering, no risk assessment for the treated crop scenario is required (for both oral and contact risk assessment). For attractive trees, the early orchard scenario can be used. For the assessment of clothianidin, the authorised uses to ornamentals were assumed to be small plants (except hibiscus), therefore the scenarios for oilseed rape were used.
Weeds within the treated field	Exposure depends on the amount of interception by the ornamental plant or tree. If the ornamental plant growth stage is not specified then it should be assumed that applications can be made to small/young ornamental plants which provide little or no interception. If the growth stage for trees is not specified then it should be assumed that applications can be early orchards.
Field margin Adjacent crop	Exposure depends on the application method and the size of the plants or trees. <u>Ornamentals:</u> If applications are restricted to growth stages with plants smaller than 50 cm then the spray drift values for standard agricultural field crops (e.g. cereals) should be used. For ornamental plants greater than 50 cm in height the spray drift values late vines should be used. If the application method and type of ornamental plant is not stated in the GAP then it is assumed that all types of application methods can be used and applications can be made to all types of plants including ornamental trees. In these cases, the spray drift values early orchards should be used. <u>Non-orchard trees</u> For small trees, the late grape scenario should be used. For larger trees, the early orchard scenario is used. If the size of the tree is not specified then it assumed that applications can be made to large trees. For the assessment of clothianidin, for the majority of the authorised uses to ornamentals, the size of the plants to which applications would be made was not specified. Considering the type of the plants, it was assumed that they are smaller than 50 cm (except hibiscus).
Succeeding crop/plants	Exposure to bees from residues in nectar and pollen in succeeding ornamental plants may occur. For trees exposure in the succeeding year depends on whether the tree is attractive to bees (in line with the treated crop scenario).

Scenario	Risk assessment
Guttation fluid	Exposure to bees from residues in guttation fluid from plants or trees may occur if the plants or trees produce guttation fluid.
Surface water	Exposure to bees from residues in surface water may occur.
Puddles	Exposure to bees from residues in puddles may occur.

APPENDIX D – RESIDUE DATA

Table 19: Residue data on clothianidin available in the dossiers

Formulation	Rate [g a.s./ha]	Application type	Crop	Country	Matrix	Application/ Collection interval [days]	RUD (mg/kg)	Residue value [mg a.s./kg]	Author	Study year	Study ID and/or reference
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	1	0.120	0.009	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	1	0.280	0.021	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	1	0.147	0.011	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	1	0.080	0.006	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.133	0.01	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.027	0.002	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.053	0.004	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.053	0.004	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.027	0.002	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.040	0.003	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.040	0.003	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.107	0.008	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	1	1.187	0.089	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	1	0.160	0.012	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	1	0.067	0.005	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	1	0.347	0.026	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.507	0.038	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.027	0.002	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.027	0.002	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.013	0.001	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.120	0.009	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.013	0.001	Thompson	2012a	V7XW1001-(THW-0326)*

Formulation	Rate [g a.s./ha]	Application type	Crop	Country	Matrix	Application/ Collection interval [days]	RUD (mg/kg)	Residue value [mg a.s./kg]	Author	Study year	Study ID and/or reference
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.013	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.013	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	1	0.173	0.013	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	1	2.093	0.157	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	1	0.147	0.011	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	1	0.080	0.006	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.027	0.002	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.040	0.003	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.147	0.011	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.027	0.002	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.040	0.003	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.027	0.002	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.027	0.002	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.013	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	1	0.227	0.034	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	1	2.500	0.375	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	1	0.287	0.043	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	1	0.267	0.04	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.060	0.009	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.067	0.01	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.047	0.007	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.040	0.006	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.033	0.005	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.007	0.001	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.033	0.005	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.040	0.006	Thompson	2012a	V7XW1001-(THW-0326)*

Formulation	Rate [g a.s./ha]	Application type	Crop	Country	Matrix	Application/ Collection interval [days]	RUD (mg/kg)	Residue value [mg a.s./kg]	Author	Study year	Study ID and/or reference
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	1	0.033	0.005	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	1	0.040	0.006	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	1	0.027	0.004	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	1	0.073	0.011	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.002	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.002	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.073	0.011	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.033	0.005	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.007	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.002	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.002	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.040	0.006	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	1	0.393	0.059	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	1	0.300	0.045	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	1	0.193	0.029	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	1	0.120	0.018	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.027	0.004	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.007	0.001	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.013	0.002	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.007	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.007	0.001	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.013	0.002	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.007	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.007	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	70	Foliar spray	Peach	France	Pollen (from foragers)	1	0.286	0.02	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	70	Foliar spray	Peach	France	Pollen (from foragers)	1	0.057	0.004	Thompson	2012a	V7XW1001-(THW-0326)*

Formulation	Rate [g a.s./ha]	Application type	Crop	Country	Matrix	Application/ Collection interval [days]	RUD (mg/kg)	Residue value [mg a.s./kg]	Author	Study year	Study ID and/or reference
Dantop 50 WG	70	Foliar spray	Peach	France	Pollen (from foragers)	1	0.043	0.003	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	70	Foliar spray	Peach	France	Pollen (from foragers)	1	0.014	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	70	Foliar spray	Peach	France	Pollen (from foragers)	7	0.014	0.001	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	70	Foliar spray	Peach	France	Pollen (from foragers)	7	0.057	0.004	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	70	Foliar spray	Peach	France	Pollen (from foragers)	7	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	70	Foliar spray	Peach	France	Pollen (from foragers)	7	0.014	0.001	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	70	Foliar spray	Peach	France	Pollen (from foragers)	14	0.014	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	70	Foliar spray	Peach	France	Pollen (from foragers)	14	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	70	Foliar spray	Peach	France	Pollen (from foragers)	14	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	70	Foliar spray	Peach	France	Pollen (from foragers)	14	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	70	Foliar spray	Peach	France	Pollen (from foragers)	1	0.157	0.011	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	70	Foliar spray	Peach	France	Pollen (from foragers)	1	0.043	0.003	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	70	Foliar spray	Peach	France	Pollen (from foragers)	1	0.029	0.002	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	70	Foliar spray	Peach	France	Pollen (from foragers)	7	0.014	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	70	Foliar spray	Peach	France	Pollen (from foragers)	7	0.200	0.014	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	70	Foliar spray	Peach	France	Pollen (from foragers)	7	0.014	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	70	Foliar spray	Peach	France	Pollen (from foragers)	7	0.014	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	70	Foliar spray	Peach	France	Pollen (from foragers)	14	0.029	0.002	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	70	Foliar spray	Peach	France	Pollen (from foragers)	14	0.014	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	70	Foliar spray	Peach	France	Pollen (from foragers)	14	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	70	Foliar spray	Peach	France	Pollen (from foragers)	14	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	2	0.007	<0.001	Thompson	2012b	V7XW1002-(THW-0324)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	2	0.013	0.002	Thompson	2012b	V7XW1002-(THW-0324)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	2	0.013	0.002	Thompson	2012b	V7XW1002-(THW-0324)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	2	0.013	0.002	Thompson	2012b	V7XW1002-(THW-0324)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	9	0.007	<0.001	Thompson	2012b	V7XW1002-(THW-0324)*

Formulation	Rate [g a.s./ha]	Application type	Crop	Country	Matrix	Application/ Collection interval [days]	RUD (mg/kg)	Residue value [mg a.s./kg]	Author	Study year	Study ID and/or reference
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	9	0.007	<0.001	Thompson	2012b	V7XW1002-(THW-0324)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	9	0.007	<0.001	Thompson	2012b	V7XW1002-(THW-0324)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from foragers)	9	0.020	0.003	Thompson	2012b	V7XW1002-(THW-0324)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from combs)	5	0.013	0.002	Thompson	2012b	V7XW1002-(THW-0324)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from combs)	5	0.002	<0.0003	Thompson	2012b	V7XW1002-(THW-0324)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from combs)	5	0.060	0.009	Thompson	2012b	V7XW1002-(THW-0324)*
Dantop 50 WG	150	Foliar spray	Apple	France	Pollen (from combs)	5	0.002	<0.0003	Thompson	2012b	V7XW1002-(THW-0324)*
Dantop 50 WG	150	Foliar spray	Apple	France	Nectar (from combs)	5	0.002	<0.0003	Thompson	2012b	V7XW1002-(THW-0324)*
Dantop 50 WG	150	Foliar spray	Apple	France	Nectar (from combs)	5	0.002	<0.0003	Thompson	2012b	V7XW1002-(THW-0324)*
Dantop 50 WG	150	Foliar spray	Apple	France	Nectar (from combs)	5	0.002	<0.0003	Thompson	2012b	V7XW1002-(THW-0324)*
Dantop 50 WG	150	Foliar spray	Apple	France	Nectar (from combs)	5	0.002	<0.0003	Thompson	2012b	V7XW1002-(THW-0324)*
Dantop 50 WG	150	Foliar spray	Apple	France	Wax (from combs)	5	0.020	0.003	Thompson	2012b	V7XW1002-(THW-0324)*
Dantop 50 WG	150	Foliar spray	Apple	France	Wax (from combs)	5	0.007	<0.001	Thompson	2012b	V7XW1002-(THW-0324)*
Dantop 50 WG	150	Foliar spray	Apple	France	Wax (from combs)	5	0.007	<0.001	Thompson	2012b	V7XW1002-(THW-0324)*
Dantop 50 WG	150	Foliar spray	Apple	France	Wax (from combs)	5	0.002	<0.0003	Thompson	2012b	V7XW1002-(THW-0324)*
Dantop 50 WG	75	Foliar spray	Potato	UK	Guttation	1	17.560	1.317	Thompson	2013	V7XW1004-(THW-0337)*
Dantop 50 WG	75	Foliar spray	Potato	UK	Guttation	3	6.880	0.516	Thompson	2013	V7XW1004-(THW-0337)*
Dantop 50 WG	75	Foliar spray	Potato	UK	Guttation	6	0.573	0.043	Thompson	2013	V7XW1004-(THW-0337)*
Dantop 50 WG	75	Foliar spray	Potato	UK	Guttation	8	0.587	0.044	Thompson	2013	V7XW1004-(THW-0337)*
Dantop 50 WG	75	Foliar spray	Potato	UK	Guttation	10	0.480	0.036	Thompson	2013	V7XW1004-(THW-0337)*
Dantop 50 WG	75	Foliar spray	Potato	UK	Guttation	11	0.360	0.027	Thompson	2013	V7XW1004-(THW-0337)*
Dantop 50 WG	75	Foliar spray	Potato	UK	Guttation	13	0.347	0.026	Thompson	2013	V7XW1004-(THW-0337)*
Clothianidin FS 600	90[1]	Soil spray+incorporation (15 cm depth)	Maize	Germany	Pollen (from plants)	N/A	0.011	<0.001	Ch. Maus	2005	E 319 2902-6 (EFSA, 2013a)

Formulation	Rate [g a.s./ha]	Application type	Crop	Country	Matrix	Application/ Collection interval [days]	RUD (mg/kg)	Residue value [mg a.s./kg]	Author	Study year	Study ID and/or reference
Clothianidin FS 600	90[1]	Soil spray+incorporation (20 cm depth)	Maize	Germany	Pollen (from plants)	N/A	0.011	<0.001	Ch. Maus	2005	E 319 2903-7 (EFSA, 2013a)
Clothianidin FS 600	90[1]	Soil spray+incorporation (20 cm depth)	Summer rape	Germany	Pollen (from foragers)	90	0.040	0.00356	Ch. Maus	2005	E 319 2811-5 (EFSA, 2013a)
Clothianidin FS 600	90[1]	Soil spray+incorporation (20 cm depth)	Summer rape	Germany	Pollen (from foragers)	92	0.040	0.00359	Ch. Maus	2005	E 319 2811-5 (EFSA, 2013a)
Clothianidin FS 600	90[1]	Soil spray+incorporation (20 cm depth)	Summer rape	Germany	Pollen (from foragers)	97	0.044	0.004	Ch. Maus	2005	E 319 2811-5 (EFSA, 2013a)
Clothianidin FS 600	90[1]	Soil spray+incorporation (20 cm depth)	Summer rape	Germany	Pollen (from foragers)	101	0.031	0.00283	Ch. Maus	2005	E 319 2811-5 (EFSA, 2013a)
Clothianidin FS 600	90[1]	Soil spray+incorporation (20 cm depth)	Summer rape	Germany	Nectar (from foragers)	101	0.024	0.00215	Ch. Maus	2005	E 319 2811-5 (EFSA, 2013a)
Clothianidin FS 250	90[1]	Soil treatment	Winter rape	Germany	pollen	563	0.011	0.001	Ch. Maus	2005	E 319 3027-5 (EFSA, 2013a)
Clothianidin FS 250	90[1]	Soil treatment	Winter rape	Germany	nectar	561	0.011	< LOQ	Ch. Maus	2005	E 319 3027-5 (EFSA, 2013a)
Clothianidin FS 250	90[1]	Soil treatment	Winter rape	Germany	pollen	562	0.011	< LOQ	Ch. Maus	2007	E 319 3028-6 (EFSA, 2013a)
Clothianidin FS 250	90[1]	Soil treatment	Winter rape	Germany	nectar	562	0.011	< LOQ	Ch. Maus	2007	E 319 3028-6 (EFSA, 2013a)

[1] Soil treatment; Residue related to following crop
* EFSA, 2015
N/A: not available

Table 20: Available residue data on clothianidin metabolites TZMU and TZNG

Metabolite	Rate [g a.s/ha]	Application type	Crop	Country	Matrix	Application/ Collection interval [days]	RUD (mg/kg)	Residue value [mg a.s/kg]	Author	Study year	Study ID and/or reference
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	1	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	1	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	1	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	1	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.013	0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.013	0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	1	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	1	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	1	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	1	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.013	0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*

Metabolite	Rate [g a.s/ha]	Application type	Crop	Country	Matrix	Application/ Collection interval [days]	RUD (mg/kg)	Residue value [mg a.s/kg]	Author	Study year	Study ID and/or reference
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	1	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	1	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	1	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	1	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	1	0.002	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	1	0.007	0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	1	0.002	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	1	0.002	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.002	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.002	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.002	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.002	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.002	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.002	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.002	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.002	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	1	0.002	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*

Metabolite	Rate [g a.s/ha]	Application type	Crop	Country	Matrix	Application/ Collection interval [days]	RUD (mg/kg)	Residue value [mg a.s/kg]	Author	Study year	Study ID and/or reference
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	1	0.002	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	1	0.002	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	1	0.002	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.002	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.002	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.002	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.002	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.002	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.002	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.002	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.002	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	1	0.002	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	1	0.002	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	1	0.002	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	1	0.002	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.002	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.002	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.002	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.002	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.002	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.002	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.002	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.002	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	70	Foliar spray	Peach	France	Pollen (from foragers)	1	0.014	0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	70	Foliar spray	Peach	France	Pollen (from foragers)	1	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	70	Foliar spray	Peach	France	Pollen (from foragers)	1	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*

Metabolite	Rate [g a.s/ha]	Application type	Crop	Country	Matrix	Application/ Collection interval [days]	RUD (mg/kg)	Residue value [mg a.s/kg]	Author	Study year	Study ID and/or reference
TZNG	70	Foliar spray	Peach	France	Pollen (from foragers)	1	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	70	Foliar spray	Peach	France	Pollen (from foragers)	7	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	70	Foliar spray	Peach	France	Pollen (from foragers)	7	0.004	0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	70	Foliar spray	Peach	France	Pollen (from foragers)	7	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	70	Foliar spray	Peach	France	Pollen (from foragers)	7	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	70	Foliar spray	Peach	France	Pollen (from foragers)	14	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	70	Foliar spray	Peach	France	Pollen (from foragers)	14	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	70	Foliar spray	Peach	France	Pollen (from foragers)	14	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	70	Foliar spray	Peach	France	Pollen (from foragers)	14	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	70	Foliar spray	Peach	France	Pollen (from foragers)	1	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	70	Foliar spray	Peach	France	Pollen (from foragers)	1	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	70	Foliar spray	Peach	France	Pollen (from foragers)	1	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	70	Foliar spray	Peach	France	Pollen (from foragers)	1	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	70	Foliar spray	Peach	France	Pollen (from foragers)	7	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	70	Foliar spray	Peach	France	Pollen (from foragers)	7	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	70	Foliar spray	Peach	France	Pollen (from foragers)	7	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	70	Foliar spray	Peach	France	Pollen (from foragers)	7	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	70	Foliar spray	Peach	France	Pollen (from foragers)	14	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	70	Foliar spray	Peach	France	Pollen (from foragers)	14	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	70	Foliar spray	Peach	France	Pollen (from foragers)	14	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	70	Foliar spray	Peach	France	Pollen (from foragers)	14	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	1	0.013	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	1	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	1	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	1	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.013	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*

Metabolite	Rate [g a.s/ha]	Application type	Crop	Country	Matrix	Application/ Collection interval [days]	RUD (mg/kg)	Residue value [mg a.s/kg]	Author	Study year	Study ID and/or reference
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.013	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.027	0.002	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.040	0.003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.013	0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.027	0.002	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.027	0.002	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	1	0.013	0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	1	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	1	0.013	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	1	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.013	0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.013	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.013	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.013	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.013	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	1	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	1	0.013	0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	1	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	1	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.013	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.013	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*

Metabolite	Rate [g a.s/ha]	Application type	Crop	Country	Matrix	Application/ Collection interval [days]	RUD (mg/kg)	Residue value [mg a.s/kg]	Author	Study year	Study ID and/or reference
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	7	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.013	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	75	Foliar spray	Apple	France	Pollen (from foragers)	14	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	1	0.007	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	1	0.013	0.002	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	1	0.007	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	1	0.007	0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.007	0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.007	0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.007	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.007	0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.007	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.007	0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.007	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.007	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	1	0.002	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	1	0.002	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	1	0.002	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	1	0.002	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.002	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.002	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.007	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.002	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.007	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*

Metabolite	Rate [g a.s/ha]	Application type	Crop	Country	Matrix	Application/ Collection interval [days]	RUD (mg/kg)	Residue value [mg a.s/kg]	Author	Study year	Study ID and/or reference
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.007	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.007	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.007	0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	1	0.007	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	1	0.007	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	1	0.002	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	1	0.002	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.007	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.007	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.007	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	7	0.002	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.007	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.007	0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.007	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	14	0.002	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	70	Foliar spray	Peach	France	Pollen (from foragers)	1	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	70	Foliar spray	Peach	France	Pollen (from foragers)	1	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	70	Foliar spray	Peach	France	Pollen (from foragers)	1	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	70	Foliar spray	Peach	France	Pollen (from foragers)	1	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	70	Foliar spray	Peach	France	Pollen (from foragers)	7	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	70	Foliar spray	Peach	France	Pollen (from foragers)	7	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	70	Foliar spray	Peach	France	Pollen (from foragers)	7	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	70	Foliar spray	Peach	France	Pollen (from foragers)	7	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	70	Foliar spray	Peach	France	Pollen (from foragers)	14	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	70	Foliar spray	Peach	France	Pollen (from foragers)	14	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	70	Foliar spray	Peach	France	Pollen (from foragers)	14	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*

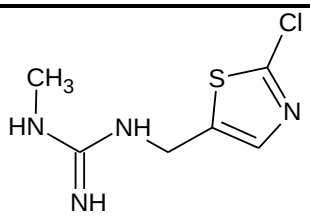
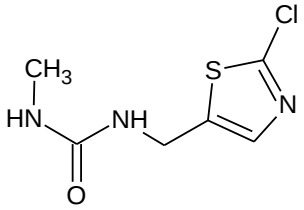
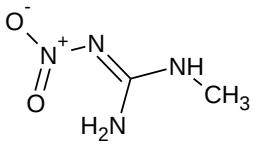
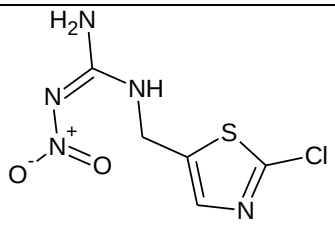
Metabolite	Rate [g a.s/ha]	Application type	Crop	Country	Matrix	Application/ Collection interval [days]	RUD (mg/kg)	Residue value [mg a.s/kg]	Author	Study year	Study ID and/or reference
TZMU	70	Foliar spray	Peach	France	Pollen (from foragers)	14	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	70	Foliar spray	Peach	France	Pollen (from foragers)	1	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	70	Foliar spray	Peach	France	Pollen (from foragers)	1	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	70	Foliar spray	Peach	France	Pollen (from foragers)	1	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	70	Foliar spray	Peach	France	Pollen (from foragers)	1	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	70	Foliar spray	Peach	France	Pollen (from foragers)	7	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	70	Foliar spray	Peach	France	Pollen (from foragers)	7	0.014	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	70	Foliar spray	Peach	France	Pollen (from foragers)	7	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	70	Foliar spray	Peach	France	Pollen (from foragers)	7	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	70	Foliar spray	Peach	France	Pollen (from foragers)	14	0.014	0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	70	Foliar spray	Peach	France	Pollen (from foragers)	14	0.029	0.002	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	70	Foliar spray	Peach	France	Pollen (from foragers)	14	0.014	<0.001	Thompson	2012a	V7XW1001-(THW-0326)*
TZMU	70	Foliar spray	Peach	France	Pollen (from foragers)	14	0.004	<0.0003	Thompson	2012a	V7XW1001-(THW-0326)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	2	0.002	<0.0003	Thompson	2012b	V7XW1002-(THW-0324)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	2	0.002	<0.0003	Thompson	2012b	V7XW1002-(THW-0324)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	2	0.002	<0.0003	Thompson	2012b	V7XW1002-(THW-0324)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	2	0.002	<0.0003	Thompson	2012b	V7XW1002-(THW-0324)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	9	0.002	<0.0003	Thompson	2012b	V7XW1002-(THW-0324)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	9	0.002	<0.0003	Thompson	2012b	V7XW1002-(THW-0324)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	9	0.002	<0.0003	Thompson	2012b	V7XW1002-(THW-0324)*
TZNG	150	Foliar spray	Apple	France	Pollen (from foragers)	9	0.002	<0.0003	Thompson	2012b	V7XW1002-(THW-0324)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	2	0.002	<0.0003	Thompson	2012b	V7XW1002-(THW-0324)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	2	0.002	<0.0003	Thompson	2012b	V7XW1002-(THW-0324)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	2	0.002	<0.0003	Thompson	2012b	V7XW1002-(THW-0324)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	2	0.007	<0.001	Thompson	2012b	V7XW1002-(THW-0324)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	9	0.002	<0.0003	Thompson	2012b	V7XW1002-(THW-0324)*

Metabolite	Rate [g a.s/ha]	Application type	Crop	Country	Matrix	Application/ Collection interval [days]	RUD (mg/kg)	Residue value [mg a.s/kg]	Author	Study year	Study ID and/or reference
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	9	0.002	<0.0003	Thompson	2012b	V7XW1002-(THW-0324)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	9	0.002	<0.0003	Thompson	2012b	V7XW1002-(THW-0324)*
TZMU	150	Foliar spray	Apple	France	Pollen (from foragers)	9	0.007	<0.001	Thompson	2012b	V7XW1002-(THW-0324)*
TZNG	75	Foliar spray	Potato	UK	Guttation	1	0.120	0.009	Thompson	2013	V7XW1004-(THW-0337)*
TZNG	75	Foliar spray	Potato	UK	Guttation	3	0.707	0.053	Thompson	2013	V7XW1004-(THW-0337)*
TZNG	75	Foliar spray	Potato	UK	Guttation	6	0.107	0.008	Thompson	2013	V7XW1004-(THW-0337)*
TZNG	75	Foliar spray	Potato	UK	Guttation	8	0.160	0.012	Thompson	2013	V7XW1004-(THW-0337)*
TZNG	75	Foliar spray	Potato	UK	Guttation	10	0.107	0.008	Thompson	2013	V7XW1004-(THW-0337)*
TZNG	75	Foliar spray	Potato	UK	Guttation	11	0.107	0.008	Thompson	2013	V7XW1004-(THW-0337)*
TZNG	75	Foliar spray	Potato	UK	Guttation	13	0.133	0.01	Thompson	2013	V7XW1004-(THW-0337)*
TZMU	75	Foliar spray	Potato	UK	Guttation	1	0.427	0.032	Thompson	2013	V7XW1004-(THW-0337)*
TZMU	75	Foliar spray	Potato	UK	Guttation	3	0.333	0.025	Thompson	2013	V7XW1004-(THW-0337)*
TZMU	75	Foliar spray	Potato	UK	Guttation	6	0.053	0.004	Thompson	2013	V7XW1004-(THW-0337)*
TZMU	75	Foliar spray	Potato	UK	Guttation	8	0.040	0.003	Thompson	2013	V7XW1004-(THW-0337)*
TZMU	75	Foliar spray	Potato	UK	Guttation	10	0.013	0.001	Thompson	2013	V7XW1004-(THW-0337)*
TZMU	75	Foliar spray	Potato	UK	Guttation	11	0.013	0.001	Thompson	2013	V7XW1004-(THW-0337)*
TZMU	75	Foliar spray	Potato	UK	Guttation	13	0.040	0.003	Thompson	2013	V7XW1004-(THW-0337)*
TZNG	90	Soil spray+incorporation (20 cm depth)	Summer rape	Germany	Pollen (from foragers)	90	0.011	<0.001	Ch. Maus	2005	E 319 2811-5 (EFSA, 2013a)
TZNG	90	Soil spray+incorporation (20 cm depth)	Summer rape	Germany	Pollen (from foragers)	92	0.011	<0.001	Ch. Maus	2005	E 319 2811-5 (EFSA, 2013a)
TZNG	90	Soil spray+incorporation	Summer rape	Germany	Pollen (from foragers)	97	0.011	<0.001	Ch. Maus	2005	E 319 2811-5 (EFSA, 2013a)

Metabolite	Rate [g a.s/ha]	Application type	Crop	Country	Matrix	Application/ Collection interval [days]	RUD (mg/kg)	Residue value [mg a.s/kg]	Author	Study year	Study ID and/or reference
		(20 cm depth)									
TZNG	90	Soil spray+incorporation (20 cm depth)	Summer rape	Germany	Pollen (from foragers)	101	0.011	<0.001	Ch. Maus	2005	E 319 2811-5 (EFSA, 2013a)
TZNG	90	Soil spray+incorporation (20 cm depth)	Summer rape	Germany	Nectar (from foragers)	101	0.011	<0.001	Ch. Maus	2005	E 319 2811-5 (EFSA, 2013a)
TZMU	90	Soil spray+incorporation (20 cm depth)	Summer rape	Germany	Pollen (from foragers)	90	0.011	<0.001	Ch. Maus	2005	E 319 2811-5 (EFSA, 2013a)
TZMU	90	Soil spray+incorporation (20 cm depth)	Summer rape	Germany	Pollen (from foragers)	92	0.011	<0.001	Ch. Maus	2005	E 319 2811-5 (EFSA, 2013a)
TZMU	90	Soil spray+incorporation (20 cm depth)	Summer rape	Germany	Pollen (from foragers)	97	0.011	<0.001	Ch. Maus	2005	E 319 2811-5 (EFSA, 2013a)
TZMU	90	Soil spray+incorporation (20 cm depth)	Summer rape	Germany	Pollen (from foragers)	101	0.011	<0.001	Ch. Maus	2005	E 319 2811-5 (EFSA, 2013a)
TZMU	90	Soil spray+incorporation (20 cm depth)	Summer rape	Germany	Nectar (from foragers)	101	0.011	<0.001	Ch. Maus	2005	E 319 2811-5 (EFSA, 2013a)

*EFSA, 2015

APPENDIX E – USED COMPOUNDS CODES

Code/Trivial name	Chemical name/SMILES notation*	Structural formula*
TMG	1-[(2-chloro-1,3-thiazol-5-yl)methyl]-3-methylguanidine Clc1ncc(CNC(=N)NC)s1	
TZMU	1-[(2-chloro-1,3-thiazol-5-yl)methyl]-3-methylurea Clc1ncc(CNC(=O)NC)s1	
MNG	(*E*,*Z*)-1-methyl-3-nitroguanidine N\C(NC)=N/[N+]([O-])=O	
TZNG	(*E*,*Z*)-1-[(2-chloro-1,3-thiazol-5-yl)methyl]-3-nitroguanidine Clc1ncc(CNC(\N)=N/[N+]([O-])=O)s1	

* ACD/ChemSketch, Advanced Chemistry Development, Inc., ACD/Labs Release: 12.00 Product version: 12.00 (Build 29305, 25 Nov 2008).

ABBREVIATIONS

µg	microgram
a.s.	active substance
AF	assessment factor
AV	avoidance factor
BBCH	Biologische Bundesanstalt, Bundessortenamt und CHemische Industrie
BCF	bioconcentration factor
bw	body weight
CAS	Chemical Abstract Service
COM	European Commission
d	day
DAR	Draft Assessment Report
DAT	day after treatment
DM	dry matter
DT_{50}	period required for 50 percent disappearance (define method of estimation)
DT_{90}	period required for 90 percent disappearance (define method of estimation)
dw	dry weight
EAC	environmentally acceptable concentration
EbC_{50}	effective concentration (biomass)
EC_{50}	effective concentration
EEC	European Economic Community
ef	exposure factors
ER_{50}	emergence rate/effective rate, median
ErC_{50}	effective concentration (growth rate)
ETR	exposure to toxicity ratio
EU	European Union
fdep	deposition factor
FERA	Food and Environmental Research Agency
FIR	Food intake rate
FOCUS	Forum for the Co-ordination of Pesticide Fate Models and their Use
g	gram
GAP	good agricultural practice
GM	geometric mean
GS	growth stage
h	hour(s)
ha	hectare
HPG	hypopharyngeal glands
HQ	hazard quotient
IPM	integrated pest management practices
L	litre
LD_{50}	lethal dose, median; dosis letalis media
LDD_{50}	lethal dietary dose
LOAEL	lowest observable adverse effect level
LOEC	lowest observable effect concentration
LOER	lowest observable effect rate
LOD	limit of detection
LOQ	limit of quantification
m	metre
MAF	multiple application factor
mg	milligram
mL	millilitre
mm	millimetre
MTD	maximum tolerated dose
MWHC	maximum water holding capacity

ng	nanogram
NOAEC	no observed adverse effect concentration
NOAEL	no observed adverse effect level
NOEC	no observed effect concentration
NOEL	no observed effect level
NOER	no observed effect rate
OM	organic matter content
Pa	Pascal
PD	proportion of different food types
PEC	predicted environmental concentration
PEC_{air}	predicted environmental concentration in air
PEC_{gw}	predicted environmental concentration in ground water
PEC_{sed}	predicted environmental concentration in sediment
PEC_{soil}	predicted environmental concentration in soil
PEC_{sw}	predicted environmental concentration in surface water
pH	pH-value
PHI	pre-harvest interval
pK_a	negative logarithm (to the base 10) of the dissociation constant
P_{ow}	partition coefficient between *n*-octanol and water
ppb	parts per billion (10^{-9})
ppm	parts per million (10^{-6})
ppp	plant protection product
PT	proportion of diet obtained in the treated area
r^2	coefficient of determination
RUD	residue per unit dose
SD	standard deviation
SFO	single first-order
SPG	specific protection goals
SSD	species sensitivity distribution
SV	shortcut value
$t_{1/2}$	half-life (define method of estimation)
TER	toxicity exposure ratio
TER_A	toxicity exposure ratio for acute exposure
TER_{LT}	toxicity exposure ratio following chronic exposure
TER_{ST}	toxicity exposure ratio following repeated exposure
TLV	threshold limit value
TRR	total radioactive residue
TWA	time weighted average
UV	ultraviolet
W/S	water/sediment
w/v	weight per volume
w/w	weight per weight
WHO	World Health Organization
wk	week
yr	year