CONCLUSION ON PESTICIDE PEER REVIEW

Conclusion on the peer review of the pesticide risk assessment of the active substance oxadiazon[1]

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SUMMARY

Oxadiazon is one of the 84 substances of the third stage Part B of the review programme covered by Commission Regulation (EC) No 1490/2002[3].
Oxadiazon was included in Annex I to Directive 91/414/EEC on 2 July 2008 pursuant to Article 11b of the Regulation (EC) No 1490/2002 (hereinafter referred to as 'the Regulation'). In accordance with Article 12a of the Regulation the European Food Safety Authority (EFSA) is required to deliver by 31 December 2010 its view on the draft review report submitted by the Commission of the European Communities (hereinafter referred to as 'the Commission') in accordance with Article 12(1) of the Regulation. This review report has been established as a result of the initial evaluation provided by the designated rapporteur Member State in the Draft Assessment Report (DAR). The EFSA therefore organised a peer review of the DAR. The conclusions of the peer review are set out in this report.
Italy being the designated rapporteur Member State submitted the DAR on oxadiazon in accordance with the provisions of Article 10(1) of the Regulation, which was received by the EFSA on 11 September 2006. The peer review was initiated on 29 March 2007 by dispatching the DAR for consultation of the Member States and the sole notifier Bayer CropScience. Subsequently, the comments received on the DAR were examined and responded by the rapporteur Member State in the reporting table. This table was evaluated by EFSA identifying the remaining issues. The identified issues as well as further information made available by the notifier upon request were evaluated in a series of scientific meetings with Member State experts in April –May 2009.
A final discussion of the outcome of the consultation of experts took place during a written procedure with the Member States in July 2009.

The conclusion was reached on the basis of the evaluation of the representative use as a herbicide as proposed by the notifier, which comprises pre-emergence spraying in sunflower for the control of weeds. Full details of the GAP can be found in the list of end points.

1 On request from the European Commission, Question No EFSA-Q-2009-00243, issued on 25 November 2009.
2 Correspondence: praper@efsa.europa.eu
3 OJ No L 224, 21.08.2002, p. 25, as amended by Regulation (EC) No 1095/2007 (OJ L 246, 21.9.2007, p. 19)
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The representative formulated product for the evaluation was 'RONSTAR', an emulsifiable concentrate (EC) containing 250 g/L oxadiazon. The minimum purity and specification of the active substance could not be concluded on. Data gaps for vapor pressure, flash point and surface tension were identified.

Sufficient analytical methods as well as methods and data relating to physical, chemical and technical properties are available to ensure that quality control measurements of the plant protection product are possible.

Oxadiazon residues in food/feed of plant and animal origin can be monitored by the multi-residue method DFG S19. Adequate methods are available to monitor oxadiazon residues in environmental matrices.

A critical area of concern was highlighted based on the lack of information whether the tested material used in the toxicological studies is representative of the product manufactured and commercialised at present.

In the mammalian metabolism studies, oxadiazon was moderately rapidly and almost completely absorbed after oral administration. No potential for accumulation was observed, the majority of the substance being excreted within 48 hours.

The acute toxicity was low, either by the oral, dermal or inhalation route; no eye or skin irritation was observed, and no potential for skin sensitisation was found in a Magnusson and Kligman test.

The main target organs of oxadiazon were the liver and the haematopoietic system consistent with oxadiazon's ability to inhibit protoporphyrinogen oxidase, an enzyme involved in the synthesis of both haem and chlorophyll. The overall short term no-observed-adverse-effect-level (NOAEL) was 18 mg/kg bw/day from the 90-day study in rat.

Oxadiazon itself did not present genotoxic potential, however a positive Ames test suggested the presence of a mutagenic impurity in the batch tested. The notifier should address the apparent presence of a mutagenic impurity in the technical specification (data gap).

Liver tumours were observed in both the rat and mouse species; mechanistic studies confirmed that oxadiazon is a peroxisome proliferator. Although peroxisome proliferators are hepatocarcinogens in rodents, the current scientific opinion is that humans are not responsive to this class of non-genotoxic carcinogens and therefore, oxadiazon is unlikely to present a carcinogenic risk to humans. The relevant long term NOAEL was the dose level of 0.36 mg/kg bw/day from the 2-year rat study.

Effects on the reproduction (increase in gestation length and irregular oestrus cycle) were more prominent in a preliminary dose-range finding study to the multigeneration study where total litter losses were observed at *ca*. 30 mg/kg bw/day, as the main study was conducted with much lower dose levels. On this basis a classification with the risk phrase **R62 "possible risk of impaired fertility"** was proposed. The NOAEL in the main study was 5 mg/kg bw/day for reproduction toxicity while the NOAEL for parental and offspring's toxicity was 15 mg/kg bw/day. In the developmental toxicity studies, the rat presented the more critical (developmental) NOAEL for the risk assessment of 12 mg/kg bw/day.

The acceptable daily intake (ADI) of oxadiazon is 0.0036 mg/kg bw/day based on the long-term rat study and applying a safety factor of 100. The acceptable operator exposure level (AOEL) is 0.05 mg/kg bw/day based on the multigeneration study in rat and applying a safety factor of 100; no correction factor for enteral resorption is needed. The acute reference dose (ARfD) is set at 0.12

mg/kg bw, based on the developmental NOAEL of 12 mg/kg bw/day from the rat developmental toxicity study and a safety factor of 100.

Dermal absorption was determined for the representative formulation, Ronstar® as 2 % for the concentrate and 3% for the in-use spray dilution based on an *in vitro* study performed with human skin. The level of operator exposure for the representative formulation at a maximum dose rate of 750 g oxadiazon/ha in sunflowers was below the AOEL according to the German model without the use of personal protective equipment (PPE) and according to the UK POEM when the use of gloves during mixing/loading and application was considered. Re-entry worker exposure represented 68 % of the AOEL when no specific PPE is worn and bystander exposure to oxadiazon was considered negligible.

Metabolism of oxadiazon was investigated in sunflowers, rice and tomatoes and in rotational crops (spinach, radish and barley). Metabolism was found to be moderate. Besides oxadiazon, its metabolites AE0618785, AE0608021, AE0616182 and AE0618784 were identified. Additionally metabolite AE608033 is possibly present in sunflowers and rotational crops. As AE0608033 is not covered by the rat metabolism nor addressed by other toxicology data on metabolites a data gap was formulated. The notifier should clarify the occurrence of metabolite AE0608033 in primary crops and rotational crops. As parent oxadiazon was the prevalent residue found in metabolism studies on primary and rotational crops, the plant residue definition for monitoring and risk assessment was proposed as oxadiazon alone.

A sufficient number of residue trials on sunflowers supporting the notified GAPs have been submitted to propose an MRL. Based on the residue levels found in the metabolism on rotational crops it was concluded that field trials on rotational crops (root crops and cereals) are necessary. A provisional MRL for root and tuber crops was proposed on the basis of the results of the metabolism study on rotational crops.

No metabolism studies on livestock are available. Provisional dietary burden calculations show an exceedance of the trigger value of 0.1 mg/kg feed (DM) for beef cattle and pigs. Based on this provisional calculation a metabolism study on ruminants is necessary.

Chronic and acute dietary intake calculations showed that an exceedance of ADI or ARfD is not expected for intake of crops after treatment of sunflowers with oxadiazon according to the notified GAPs. The finalisation of the risk assessment is pending the submission of field trials on rotational crops to confirm the estimated residue levels in root and tuber crops.

Oxadiazon exhibits a high to very high persistence in soil under dark aerobic conditions at 20 °C or 25 °C (DT_{50} = 187 – 1238 d). A number of minor or very minor metabolites were found. Mineralization was low (CO_2: max. 6.41 % after 300 d). Unextractable radioactivity reached levels of 5.44 – 35.5 % AR at the later data points (269 – 365 d).

Under dark anaerobic conditions in soil at 20 °C oxadiazon also exhibits a very high persistence (DT_{50} = 841 d), metabolite **AE 0608022** (max. 4.6 % AR after 120 d) is still increasing at the end of the study. Therefore, this metabolite would need to be further addressed with respect to potential ground water contamination in situations for which prolonged anaerobic conditions may be expected to occur.

In the photolysis experiments in soil, the extent of degradation was low and no major metabolites were identified.

The dissipation of oxadiazon under field conditions has been investigated in four sites in EU and two sites in USA. In the field trials performed in Germany oxadiazon exhibits a high persistence in soil (DT_{50} = 262 – 330 d). In the field trials performed in the Southern EU (Spain and S- France) oxadiazon exhibited a medium persistence in soil (DT_{50} = 90 – 95 d). The geometric mean of the normalized (20 °C, pF 2) field half lives ($DT_{50\ norm.\ field\ geomean}$ = 120 d) was agreed to represent degradation of oxadiazon in soil for modelling purposes.

The study performed in USA was considered supplementary information.

The peer review identified a data gap for representative field soil accumulation studies. Potential for accumulation was addressed by PEC soil calculations based on the worst case field non normalized half life.

Two soil batch adsorption desorption studies were performed with oxadiazon. According these studies, oxadiazon is expected to exhibit low mobility in soil (K_{Foc} = 979 – 1527 mL / g).

Oxadiazon was stable to hydrolysis at pH 4, pH 5 and pH 7. At pH 9 oxadiazon hydrolysed (DT_{50} =11.7 d) yielding two major hydrolysis metabolites: AE 0608022 and AE 0592465.

Aqueous photolysis of oxadiazon was fast under the irradiated experimental conditions. Half life in the surface water was calculated for different latitudes (30 °N – 50 °N) and seasons. Three major aqueous photolysis metabolites were identified: AE 0608035 (max. 15 % AR), AE 0608033 (max. 12.2 % AR) and AE 1117150 (max. 10.6 % AR).

Oxadiazon is not readily biodegradable according to the available study.

Dissipation / degradation was investigated in two dark water / sediment systems at 20 °C. Oxadiazon partitions with the sediment and degrades slowly in both systems ($DT_{50\ whole\ system.}$ = 126.4 – 126.6 d).

During the peer review, new FOCUS Step 3 and Step 4 $PEC_{SW\ /\ SED}$ calculations were provided by the notifier. The meeting of experts identified some drawbacks in these calculations. In addendum 2, RMS provided new $PEC_{SW/SED}$ calculations in accordance with the meeting discussions. An estimation of the potential for oxadiazon to accumulate in the sediment was provided in addendum 1. An accumulation factor of 1.96 was derived from the 10 years plateau identified in this calculation.

A generic FOCUS Step 1 and Step 2 $PEC_{SW/SED}$ calculation is available for the photolysis metabolite AE0608022.

Potential contamination of ground water by oxadiazon was assessed with FOCUS GW PEARL and PELMO models. In both cases, annual average concentration of oxadiazon in the leachate was below the regulatory limit of 0.1 µg / L for the 80th percentile concentration at 1 m depth over 20 yr of continuous application in sunflowers.

Oxadiazon may be considered medium to low volatile. A photochemical half life in the atmosphere of 0.22 d has been calculated with Atkinson's method. Oxadiazon is not expected to contaminate remote areas through long range transport.

The Tier I assessment provided TER values above the Annex VI trigger for the acute and short-term risk to medium herbivorous and insectivorous birds. The long-term TER value was above the Annex VI trigger for herbivorous birds, whereas the TER value for insectivorous birds (based on a diet of small insects) failed to meet the trigger. Member State experts considered that insectivorous birds to a certain (sufficient) degree would base their diet on large insects with lower residue levels and therefore the long-term risk to insectivorous birds was considered as low. The acute and long-term risk to mammals was assessed as low, as was the risk to birds and mammals from eating fish and

consumption of contaminated drinking water. Data gaps were identified for the notifier to address the risk to earthworm-eating birds and mammals.

Oxadiazon was considered to be very toxic to aquatic organisms, with algae and fish reproduction as the most sensitive endpoints. The acute risk to fish, invertebrates and higher plants was addressed at FOCUSsw Step 3 without risk mitigation. Only one out of four relevant FOCUSsw scenarios passed the Annex VI trigger for the risk assessment of algae, based on a higher tier algae biomass endpoint and 20m buffer zones to mitigate spray drift and run-off. In order to address the long-term risk to fish further refinements are needed (i.e. data gap), since exposure mitigation was insufficient to address the risk and refinement of the chronic fish toxicity endpoint was not accepted by Member State experts (i.e. adding sediment to the test system). Refinements in line with the recommendation in the PPR-panel opinion on Dimoxystrobin were suggested. The in-field risk assessment to non-target arthropods indicated a high risk to T. pyri, whereas the off-field risk could be considered as low. Laboratory and extended laboratory studies with three species of soil living non-target arthropods indicated that the risk from the intended spraying of bare soil could be considered as low.

The risk to bees, earthworms, non-target plants and biological methods of sewage treatment was assessed as low.

KEY WORDS

oxadiazon, peer review, risk assessment, pesticide, herbicide

TABLE OF CONTENTS

BACKGROUND

Commission Regulation (EC) No 1490/20024 lays down the detailed rules for the implementation of the third stages of the work program referred to in Article 8(2) of Council Directive 91/414/EEC. Tis regulates for the European Food Safety Authority (EFSA) the procedure of evaluation of the Draft Assessment Reports (DAR)provided by the designated rapporteur Member State.

Oxadiazon is one of the 84 substances of the third stage, part B, covered by the Regulation (EC) No 1490/2002.

Oxadiazon was included in Annex I to Directive 91/414/EEC on 2 July 2008 pursuant to Article 11b of the Regulation (EC) No 1490/2002 (hereinafter referred to as 'the Regulation'). In accordance with Article 12a of the Regulation the European Food Safety Authority (EFSA) is required to deliver by 31 December 2010 its view on the draft review report submitted by the Commission of the European Communities (hereinafter referred to as 'the Commission') in accordance with Article 12(1) of the Regulation. This review report has been established as a result of the initial evaluation provided by the designated rapporteur Member State in the DAR. The EFSA therefore organised a peer review of the DAR. The conclusions of the peer review are set out in this report.

In accordance with the provisions of Article 10(1) of the Regulation, Italy submitted the DAR (Italy 2006) on oxadiazon, which was received by the EFSA on 11 September 2006. Following an administrative evaluation, the DAR was distributed for consultation in accordance with Article 11(2) of the Regulation on 29 March 2007 to the Member States and to the sole notifier Bayer CropScience, as identified by the rapporteur Member State.

The comments received on the DAR were evaluated and addressed by the rapporteur Member State. Based on this evaluation, the EFSA identified and agreed on lacking information to be addressed by the notifier as well as issues for further detailed discussion at expert level.

Taking into account the requested information received from the notifier, a scientific discussion took place in expert meetings in April – May 2009. The reports of these meetings have been made available to the Member States electronically.

A final discussion of the outcome of the consultation of experts took place during a written procedure with the Member States in July 2009.

This conclusion summarises the results of the peer review on the active substance and the representative formulation evaluated as finalised at the end of the examination period provided for by the same Article. A list of the relevant end points for the active substance as well as the formulation is provided in appendix A.

The documentation developed during the peer review was compiled as a peer review report (EFSA, 2009) comprising of the documents summarising and addressing the comments received on the initial evaluation provided in the rapporteur Member State's draft assessment report:

- the comments received,
- the resulting reporting table (revision 1-1; 03 March 2009),

as well as the documents summarising the follow-up of the issues identified as finalised at the end of the commenting period:

- the reports of the scientific expert consultation,

[4] OJ L224, 21.08.2002, p.25, as amended by Regulation (EC) No 1095/2007 (OJ L246, 21.9.2007, p.19).

- the evaluation table (revision 2-1; 17 June 2009).

Given the importance of the draft assessment report including its addendum (Italy, 2009; compiled version of June 2009 containing all individually submitted addenda) and the peer review report with respect to the examination of the active substance, both documents are considered respectively as background documents A and B to this conclusion.

THE ACTIVE SUBSTANCE AND THE FORMULATED PRODUCT

Oxadiazon is the ISO common name for 5-tert-butyl-3-(2,4-dichloro-5-isopropoxyphenyl)-1,3,4-oxadiazol-2(3H)-one (IUPAC).

Oxadiazon belongs to the class of oxadiazolone herbicides. It is a pre- and post-emergence contact herbicide stopping the development of the shoots. The penetration of oxadiazon in plants occurs through the shoot. It is used to control annual and perennial seedling weeds in agricultural crops.

The representative formulated product for the evaluation was 'RONSTAR', an emulsifiable concentrate (EC) containing 250 g/L oxadiazon, registered under different trade names in Europe.

The representative use evaluated comprises post sowing, pre-emergence application by spraying to control broad-leaved weeds and grasses in sunflower, in all EU countries, at a single application, at maximum application rate of 750 g a.s./ha.

SPECIFIC CONCLUSIONS OF THE EVALUATION

1. Identity, physical/chemical/technical properties and methods of analysis

The minimum purity of oxadiazon technical could not be concluded on, as a new specification was proposed in line with the new manufacturing process, relying on new 5 batch data, which could not be considered in view of the restrictions concerning the acceptance of new (i.e. newly submitted) studies after the submission of the DAR to EFSA, as laid down in Commission Regulation (EC) No. 1490/2002, amended by Commission Regulation (EC) No. 1095/2007. The new specification was not supported by the old batch data. It should be noted that the new five batch data were already presented in an addendum to Vol. 4 (April 2009), however not peer-reviewed. As a consequence, the expert meeting PRAPeR 66 (April 2009) proposed a new data gap for formal reasons, to provide the supporting batch data for the new technical specification.

No FAO specification is available.

Besides the specification, the assessment of the data package revealed no issues that need to be included as critical areas of concern with respect to the identity, physical, chemical and technical properties of oxadiazon or the respective formulation, however the following data gaps were identified:

- validation data of the method No 87-106 for the determination of possible micro-contaminants
- validation data of the method used for the determination of the impurities in the 5 batch analysis
- determination of the vapor pressure (It should be noted that a new study was submitted, and evaluated, but not peer reviewed in view of the restrictions concerning the acceptance of new studies, as laid down in Commission Regulation (EC) No. 1095/2007.)

- information on flash point of the formulation, based on an equilibrium method,- as the measured value is on the threshold with respect to classification as flammable
- data on the surface tension of the undiluted formulation at 25°C.

The main data regarding the identity of oxadiazon and its physical and chemical properties are given in appendix A (list of end points).

Adequate analytical methods are available for the determination of oxadiazon in the technical material and in the representative formulation (HPLC-UV) as well as for the determination of the impurities in the technical material (HPLC-UV, GC-FID).

Sufficient test methods and data relating to physical, chemical and technical properties are available to ensure that quality control measurements of the plant protection product are possible.

Residues of oxadiazon in food of plant and animal origin can be monitored by the multi-residue enforcement method DFG S19, with GC-ECD (GC-MS or GC-MS/MS for confirmatory purposes) with LOQs of 0.01 mg/kg in sunflower seed, rice grain, orange and apple, and with LOQs of 0.02 mg/kg in egg, fat, muscle and 0.01 mg/kg in milk, respectively.

Adequate GC-MS method is available to monitor residues of oxadiazon in soil with a LOQ of 0.005 mg/kg. GC-MS method is available to monitor residues of oxadiazon in surface water and drinking water with LOQs of 0.01 µg/l.

Residues of oxadiazon in air can be monitored by GC-MS method with a LOQ of 0.9 µg/m3.

Analytical methods for the determination of residues in body fluids and tissues are not required as oxadiazon is not classified as toxic or highly toxic.

2. Mammalian toxicology

Oxadiazon was discussed during the PRAPeR 69 expert meeting on mammalian toxicology in May 2009 on basis of the draft assessment report and the addendum 1 of April 2009.

The experts discussed the impurity profile of the batches used in the toxicological studies. The RMS was requested to provide a comparison of the impurity profile of the batches used in the toxicological studies with the technical specification to address their representativeness. At the end of the peer review this information was not available. Therefore a critical area of concern was highlighted based on the lack of information whether the tested material used in the toxicological studies is representative of the product manufactured and commercialised at present (please refer to point 1 above).

2.1. Absorption, distribution, excretion and metabolism (Toxicokinetics)

Toxicokinetic properties of oxadiazon were evaluated using only one 14C radiolabel on the phenyl ring of the molecule. This approach was considered acceptable by the experts during the PRAPeR 69 meeting considering that no cleavage of the molecule was observed in the metabolism pathway of oxadiazon in the rat and that the percentage of unidentified metabolites was not significant.

Oral absorption of oxadiazon was moderately rapid, and almost complete (80 - 85 %) at the low dose level of 5 mg/kg bw based on urinary and biliary excretion, cage wash and tissue content – excluding GI tract content - within 48 hours. Maximal blood concentration (Cmax) was achieved 4-6 hours post dosing. A lower absorption rate was evident at the higher dose level of 500 mg/kg bw. Highest concentrations of oxadiazon were found in the liver, then in fat and GI tract and contents. No potential for accumulation was observed and > 90 % of the administered radioactivity was excreted

within seven days after single or repeated exposure. Excretion occurred mainly via faeces (ca. 67 % of the dose) in males, while in females, excretion was more balanced between urine (42 %) and faeces (46 %) when treated with the low dose of 5 mg/kg bw; the majority of this elimination occurred within the first 48 hours post dose.

Biotransformation of oxadiazon appears to occur via main phase I enzymatic reactions as hydroxylation of the terminal methyl groups, oxidation of the primary alcohols so formed, and oxidative O-decarboxylation, and phase II type conjugations to sulphate and/or glucuronide conjugates. No parent compound was found in urine samples.

2.2. Acute toxicity

Oxadiazon presented low acute toxicity either by the oral, dermal or inhalation route; no skin or eye irritation was observed and no sensitisation potential was found in a Buehler test challenged with a 10 % w/v concentration or in a Magnusson & Kligman test using 50 % w/v concentration of oxadiazon.

2.3. Short-term toxicity

The short-term toxicity studies with oxadiazon were conducted between 1963 and 2002. An oral 13-week rat study and a two-year study in dogs were run in the early 1970s, therefore they were not performed according to any specific guidelines and were not subjected to GLP inspections and were considered by the RMS as supplementary information (the 2-year dog study is referred under point 2.5, long-term toxicity). All other feeding studies, a 14-day and a 90-day rat study, a 90-day and a one-year dog study, were considered acceptable. Other routes were investigated in a 14-day study in rat by inhalation and in a 21-day and 28-day dermal studies in rabbit and rat respectively, these studies were also accepted by the RMS.

The major target organ of oxadiazon is the liver in rats and dogs. In rats, the dose level of 62 mg/kg bw/day produced clear signs of hepatotoxicity: increased liver weight associated with enlarged hepatocytes, increased activity of ALT and AST, increased cholesterol, and accumulation of dark pigment in the liver and kidneys. The dark pigment was identified as protoporphyrin IX, an intermediate of haem synthesis. This is consistent with oxadiazon's ability to inhibit protoporphyrinogen oxidase, an enzyme involved in the synthesis of both haem and chlorophyll. The effects of oxadiazon on haem synthesis were also noted by decreased red blood cell count and haemoglobin concentration; increased blood bilirubin levels, and dark urine. Slight effects on thyroid hormones (increased TSH and decreased T_4 levels) and thyroid follicular cell hypertrophy were seen at higher dose levels in the presence of severe liver damage, and these effects – as well as adrenal effects, were considered secondary to hepatotoxicity. The short-term NOAEL in rat is 18 mg/kg bw/day. No sign of neurotoxicity was observed in an additional neurotoxicity assessment conducted on this 90-day study.

In dogs, the overall short-term NOAEL was the dose level of 20 mg/kg bw/day, based on clear evidence of treatment-related hepatotoxicity (increased liver weight associated with changes in biochemical parameters) and decreased body weight in both the 90-day and the one-year studies at dose levels of 60 mg/kg bw/day onward.

When administered for 14 days by inhalation to rats, no treatment-related effects were seen up to 3.95 mg oxadiazon/L air.

Dermal administration of oxadiazon for 28 days to rats caused a dose-related increase in blood cholesterol and liver enzymes activities correlated with increased incidence of hepatocellular hypertrophy in males from the low dose level of 250 mg/kg bw/day onward.
In rabbits, dermal administration of oxadiazon for 21 days did not reveal any sign of skin or systemic toxicity up to 1000 mg/kg bw/day dose level.

2.4. Genotoxicity

Oxadiazon has been evaluated *in vitro* for point mutations in two Ames test with *S. typhimurium* and *E. coli*, for chromosomal aberrations in cultured human peripheral blood lymphocytes, for gene mutations at the thymidine kinase locus of mouse lymphoma L5178Y cells, and forward mutation in the mouse lymphoma assay. This latter assay was considered as additional information, the other tests were accepted by the RMS. A further *in vitro* test for chromosomal aberrations in CHO cells was not accepted due to the lack of information on the test substance. The *in vivo* tests included two mouse micronucleus tests. The RMS considered one as acceptable and one as supplementary. An additional investigation of the potential for covalent binding of oxadiazon to liver DNA in the rat and mouse was included as well in the *in vivo* tests.
There was a positive Ames test in strain TA100 in the presence of metabolic activation system (S9); this response was attributed to the presence of an impurity. It was noted that the *in vivo* micronucleus test (conducted with the same batch) does not address the same endpoint (gene point mutation) to clarify the positive *in vitro* results. The other tests gave all negative results. The experts at the PRAPeR 69 meeting considered that the genotoxicity was not addressed in relation to a possibly mutagenic impurity. Checking the volume 4 of the DAR, references were found on the availability of genotoxicity and acute toxicity studies on impurities. The RMS was requested to assess the information and report these studies in an addendum to volume 4. During the written procedure, the RMS informed that he hadn't received these studies; therefore, a new data gap was set for the notifier to submit them. During the PRAPeR 69 meeting, a data gap was set for the notifier to address the apparent existence of a mutagenic impurity in the proposed technical specification.
The experts agreed that oxadiazon itself has no genotoxic potential.

2.5. Long-term toxicity and carcinogenicity

Long-term toxicity of oxadiazon was examined in a 2-year study in rat and in mouse; both studies were found acceptable by the RMS. The RMS provided further summary tables (incidence of lip lesions in rat and incidence of mouse lymphoma) in the addendum 1 (Italy, 2009), which the experts discussed.
In rats, effects on blood (anaemia), hepatotoxicity, nephrotoxicity and hyperplastic nodules were seen at dose levels of 3.5 mg/kg bw/day onwards, hepatocarcinomas was observed at 39 mg/kg bw/day. The experts concluded that the lip lesions were not of toxicological significance given the distribution in the relevant dose groups. The NOAEL was 0.36 mg/kg bw/day dose level.
Mice treated with 99 mg/kg bw/day presented signs of anaemia and hepatotoxicity; there was a higher incidence of hepatic lesions and hepatocellular adenomas and carcinomas in both sexes and malignant lymphomas in females when compared to control values. The same tendency was observed at 9.3 mg/kg bw/day; the NOAEL was 0.92 mg/kg bw/day dose level. The experts discussed th incidence of lymphoma in females, and they concluded that the historical control data was limited, consisting of

only two studies, but comparing the incidence of malignant lymphoma in the different dose groups, this finding was not considered relevant.

Although the mortality was high in the rat and mouse studies, both studies were considered valid for assessing the carcinogenicity of oxadiazon.

The NOAEL was 1.2 mg/kg bw/day in the supportive 2-year dog study, based on general systemic toxicity as evidenced by reduced body weight gain and reduced serum cholesterol at the next higher dose level of 2.6 mg/kg bw/day.

As oxadiazon is not genotoxic and liver tumours were observed in both species, four mechanistic studies were conducted to investigate the mechanism that induced the liver tumours (refer to point 2.8 ahead). Mechanistic studies confirmed that oxadiazon is a peroxisome proliferator. Although peroxisome proliferators are hepatocarcinogens in rodents, the current scientific opinion is that humans are not responsive to this class of non-genotoxic carcinogens and therefore oxadiazon is unlikely to present a carcinogenic risk to humans.

2.6. Reproductive and developmental toxicity

Reproductive toxicity of oxadiazon was tested in a two-generation reproduction toxicity study in rat, and two developmental toxicity studies, one in rat and one in rabbit. Further summary tables were provided by the RMS in the addendum 1 (Italy, 2009); during the meeting results from both developmental toxicity studies were made available and discussed.

Reproduction toxicity

In a preliminary study included as a dose range finding for the multigeneration study, dose levels of ca. 30 mg/kg bw/day (400 ppm) resulted in pregnant females that either did not produce offspring or delivered non-viable litters. On this basis, the high dose selected for the main study was 15 mg/kg bw/day (200 ppm). In the main study, no significant treatment-related effect was noted in F0 and F1 adult generations, but an increased gestation length and irregular oestrus cycle were seen in the F1 generation at the highest dose of 15 mg/kg bw/day. The reproductive NOAEL was confirmed by the experts to be 5 mg/kg bw/day dose level on this basis; parental and offspring's NOAELs were 15 mg/kg bw/day. As, even in the preliminary study, maternal toxicity was perceived as not significant (although without clear results, as a dose-range finding study) and no mechanistic background data was available to explain the increase in gestation length or irregular oestrus cycle, the experts proposed to classify oxadiazon with the risk phrase R62, "Possible risk of impaired fertility". It was noted that the structurally-related compound oxadiargyl showed the same kind of effects at the same dose levels.

Developmental toxicity

In the developmental toxicity study in rats, the majority of the experts agreed that the slightly reduced body weight at the end of the gestational period was not relevant and the maternal NOAEL was the highest dose tested of 40 mg/kg bw/day, while the developmental NOAEL was 12 mg/kg bw/day, based on reduced foetal weight and increased incidence of runts at 40 mg/kg bw/day.

For the rabbit developmental toxicity study, all experts agreed that both maternal and developmental NOAEL are the dose level of 60 mg/kg bw/day based on marked maternal weight loss and food intake, and reduced foetal weight with increased incidence of small foetuses at 180 mg/kg bw/day.

2.7. Neurotoxicity

For the neurotoxicity no specific study was provided. Oxadiazon does not belong to a chemical group known to induce neurotoxicity, no concern was raised from the standard toxicity studies (including an additional neurotoxicity assessment in the 90-day short-term toxicity study in rats – refer to point 2.3 above), and therefore no study was required.

2.8. Further studies

Mechanism studies

Four mechanistic studies were conducted to investigate the mechanism that induces liver tumours in rodents. A 14-day oral study in rats and a 28-day study in mice showed that biochemical and morphological analysis of livers demonstrate that oxadiazon is a hepatic proliferator. No potential to induce peroxisome proliferation in the liver of dogs was found in a 28-day oral dog study. An in vitro study on rat and human hepatocytes demonstrated that oxadiazon did not exert a peroxisomal inducing effect on human hepatocytes.

Repeated oral exposure to oxadiazon has shown some effects on the haematopoietic system in mammals, provoking mild anaemia (reduction in RBC, haematocrit and/or haemoglobin), urinary excretion of urobilinogen/porphobilinogen and accumulation of protoporphyrin IX. In a dietary study conducted on the most sensitive species (male rat) for 28-day a NOAEL of 25.3 mg/kg bw/day for the haematopoietic effects of oxadiazon was identified.

2.9. Medical data

Medical surveillance at the manufacturing plants did not detect adverse effects on the health of industrial workers as indicated by clinical or laboratory examinations. There were no reports of adverse effects or poisoning under workplace conditions or under conditions of experimental agricultural use of oxadiazon.

2.10. Acceptable daily intake (ADI), acceptable operator exposure level (AOEL) and acute reference dose (ARfD)

ADI

In the draft assessment report (Italy, 2006), the rapporteur Member State proposed an ADI of 0.0036 mg/kg bw/day based on the long-term rat study presenting a NOAEL of 0.36 mg/kg bw/day and applying a safety factor of 100. This approach was agreed by the experts during the meeting. The **ADI** for oxadiazon is established at **0.0036 mg/kg bw/day**

AOEL

Initially in the draft assessment report (Italy, 2006), the rapporteur Member State proposed an AOEL of 0.12 mg/kg bw/day based on the developmental toxicity study in rat with a NOAEL of 12 mg/kg bw/day, a safety factor of 100 and no correction related to oral absorption. During the PRAPeR meeting, a more critical NOAEL for reproduction toxicity was agreed at 5 mg/kg bw/day from the

multigeneration study, therefore the AOEL was revised on this basis with the same safety factor. The **AOEL is 0.05 mg/kg bw/day.**

ARfD

The rapporteur Member State proposed in the addendum 1 to volume 3 of the DAR (Italy, 2009) that no ARfD was necessary for oxadiazon.

During the PRAPeR meeting, the findings of the multigeneration study were discussed whether resulting from an acute or repeated exposure. The majority of the experts considered the results of the main multigeneration study as the result of a repeated exposure, however considering both the preliminary and main multigeneration study, clear foetal toxicity occurred at 400 ppm, and therefore 200 ppm (15 mg/kg bw/day) can be considered as the NOAEL for foetal deaths (relevant for acute exposure). Then the relevant NOAEL for setting the acute reference dose becomes the 12 mg/kg bw/day dose level from the rat developmental toxicity study (developmental NOAEL). The **ARfD** is established at **0.12 mg/kg bw,** applying a safety factor of 100.

2.11. Dermal absorption

An *in vivo* rat dermal absorption study was reported in the DAR (Italy, 2006) using the active substance rather than the representative formulation, an emulsifiable concentrate (EC). Therefore only the comparative *in vitro* dermal absorption study conducted with the representative formulation Ronstar® using human and rat skin was considered for setting the dermal absorption value (as proposed by the RMS in the addendum 1 to the DAR, Italy, 2009). Using the human skin data from this study, the potentially absorbable values (i.e. radioactivity found in the receptor fluid plus that found in both the skin and the stratum corneum excluding the first two tape strips) were 1.62 % for the neat formulation and 2.32 % for the spray dilution. These values were rounded to 2 % and 3 % respectively and agreed by the experts.

2.12. Exposure to operators, workers and bystanders

Estimations of operator, worker and bystander exposure were recalculated in the addendum 2 to volume 3 of the DAR (Italy, 2009) based on the parameters agreed at the PRAPeR expert meeting, which included a new AOEL.

The representative plant protection product RONSTAR® (AE F082671 00 EC25 A2) is an emulsifiable concentrate (EC) formulation containing 250 g oxadiazon/L. The formulation is conditioned in a 1, 5 and 10 L containers. One application per season is proposed in pre-emergence sunflower crops at a maximum rate of 3 L product/ha corresponding to 750 g oxadiazon/ha. The recommended application volume is 300 to 500 L/ha, therefore 300 L/ha (more concentrated spray) is used as the worst case.

Operator exposure

The operator exposure estimates were calculated using both the German and the UK POEM models. For field crop applications, according to the German model, operator body weight is assumed to be 70 kg and 20 ha are treated per day, while according to the UK POEM, operator body weight is 60 kg and 50 ha are treated per day.

Estimated operator exposure presented as % of AOEL (0.05 mg/kg bw/day)

Sunflower crops	No PPE	With PPE* during M/L & application
German model (vehicle mounted – low crops)	47.49	2.74
UK POEM (tractor boom sprayer – 5 L container size)	158.9	26.1
UK POEM (tractor boom sprayer – 1 L container size)	358.9	46.1

* PPE (personal protective equipment) considered in the German model: gloves during mixing/loading (M/L) and application, and protective garment and sturdy footwear during application
PPE in the UK POEM model: gloves during M/L and application

According to the UK POEM, estimated operator exposure was below the AOEL if personal protective equipment (PPE) as gloves during mixing/loading and application were worn. According to the German model, the estimated exposure of operators was below the AOEL without the use of PPE.

Worker exposure

Estimation of worker exposure was performed according to Krebs et al. 2000 (Krebs, 2000). Transfer coefficient of 5000 [cm2/person/h] was considered (field crops); foliar dislodgeable residue default value of 3 [µg oxadiazon/cm2 per kg oxadiazon/ha], 60 kg for worker body weight, and a work rate of 6 hours/day were assumed. No use of specific PPE was considered.
The estimated systemic exposure to oxadiazon during re-entry operations would then be 0.034 mg/kg bw/day corresponding to 68 % of the AOEL. Therefore worker exposure does not exceed the AOEL, when no PPE is worn.

Bystander exposure

Bystander exposure was estimated using drift data from Ganzelmeier *et al.* 1995[5], for a bystander located at the boundary of the field at a distance of five meters from the spray equipment (0.6 % drift) and considering that ordinary clothing is worn, thus the total uncovered body area amounts to 0.4225 m^2. Assuming a 3 % dermal absorption for an average body weight of 60 kg, and a 100 % inhalation absorption, the systemic exposure would then be 0.00033 mg/kg bw/day corresponding to 0.66 % of the AOEL (of 0.05 mg/kg bw/day). Bystander exposure to oxadiazon was thus considered negligible.

3. Residues

The active substance oxadiazon was discussed at the PRAPeR 70 experts meetings for residues, round 14 in May 2009.

[5] Studies on the Spray Drift of Plant Protection Products (Federal Biological Research Centre for Agriculture and Forestry; Berlin; No. 305; 1995)

3.1. Nature and magnitude of residues in plant

3.1.1. Primary crops

To support the notified use on sunflowers, the metabolism was studied with [^{14}C] phenyl ring labelled oxadiazon in sunflower, rice and tomato.

Sunflowers were treated pre-emergence with 650 g a.s./ha (representing 0.9N of the notified application rate). Only low levels of radioactive residues were found in mature crops. TRR was 0.007 mg/kg in seeds, 0.064 mg/kg in leaves and 0.032 mg/kg in stalks. In extracts of stalks and leaves, oxadiazon was found besides AE0616182 and not identified compounds.

In a further study, metabolism was investigated in rice which was sown or transplanted into flooded soil tanks after treatment with oxadiazon at a rate of 560 g a.s./ha and 500 g a.s./ha respectively. TRR found in crop parts were higher than in the sunflower study. Consequently a better rate of identification was obtained. Besides oxadiazon, low levels of the metabolites AE0618785, AE0608021, AE0616182 and AE0618784 were found.

Metabolism in tomatoes was studied after soil treatment at rate of 1470 g a.s./ha and 420 g a.s./ha respectively and additionally after stem or fruit injection. No detectable radioactive residues were found in fruits after soil application. After stem or fruit injection mainly oxadiazon and low concentrations of AE0608021 and 0618785 (only for fruit injection) were found in fruit extracts.

The PRAPeR 70 meeting regarded the information from the metabolism studies on sunflowers, rice and tomatoes and rotational crops (see section 3.1.2) as consistent. The following metabolic pathways were proposed:

- Oxidation of one of the methyl groups of the t-butyl substitution forming the respective hydroxymethyl and carboxy metabolites.
- Degradation of the isopropoxy substitution forming the respective methoxy and hydroxy metabolites.

In the DAR (Italy, 2006), the metabolite AE0608033 was proposed in the metabolic pathway of oxadiazon in sunflowers. AE0608033 is a photolysis product and was possibly also present in the rotational crop metabolism study. From the presentation in the DAR (Italy 2009) it is not clear if this metabolite was identified, characterised or only postulated. AE0608033 is not covered by the rat metabolism nor addressed by other toxicology data on metabolites. Therefore, the PRAPeR 70 meeting formulated a data gap. The notifier should clarify the occurrence of metabolite AE0608033 in primary crops and rotational crops.

The PRAPeR meeting 70 concluded that the available metabolism studies on primary and rotational crops were sufficient to propose residue definitions for the use on sunflowers. However, the rate of identification was limited in the studies due to low total residues. This was a result of low application rates. Therefore, the experts concluded that for further uses not covered by the available metabolism studies further data may become necessary. The following residue definition for plant matrices for monitoring and risk assessment: oxadiazon only.

A total of nine residue trials carried out in Northern Europe and eleven trials carried out in Southern Europe in the years 1986 to 2003 on sunflowers were submitted. In addendum 1 to the DAR (Italy, 2009) the RMS concluded that six trials carried out in Northern Europe and four trials carried out in Southern Europe are acceptable to support the notified use. They were performed according to the

notified GAP. Samples were analysed approximately 9-10 months after the harvest and therefore these trials are covered by the available stability study (see below).

The samples in the residue trials were analysed for oxadiazon. In all trials residue levels above the LOQ (0.01 mg/kg) were not found. Information on whether the analytical methods used in the residue trials were sufficiently validated was missing in addendum 1 to the DAR (Italy, 2009). The PRAPeR 70 experts meeting concluded that the number of available trials is sufficient, provided they are supported by fully validated analytical methods.

In addendum 2 (Italy 2009), which was provided after the PRAPeR 70 meeting, the RMS clarified that the method used in the residue trials deviated from the method reported in Vol.3, B.5 only insofar as GC/MS/MS instead of GC/MS was used for the determination of oxadiazon. Furthermore, a summary of the validation data of the method was provided. EFSA concludes (not peer-reviewed) that the analytical method used is acceptable. Sample extraction and clean-up have been fully validated. Determination with GC/MS/MS provides higher specificity compared to GC/MS.

A storage stability for oxadiazon residues in sunflower seeds, oil and oilseed cake was submitted. The experts discussed the acceptability of the residue levels found in stored samples when compared to the procedural recoveries. It was concluded that oxadiazon residues could be regarded as stable in all investigated commodities for a period of 18 months.

Studies on the effect of processing on the nature and levels of residues are not available. As residues in sunflower seeds were below the LOQ such studies are not required.

For the dietary burden calculation for livestock an input value of 0.01 mg/kg was used for oil press cake. Residues in sunflower seeds were below the LOQ of 0.01 mg/kg. As oxadiazon is fat soluble no concentration is expected in the press cake and residues below LOQ (0.01 mg/kg) are expected.

3.1.2. Succeeding and rotational crops

Confined rotational crop studies are available. [^{14}C] phenyl ring labelled oxadiazon was applied to soil at a rate of 750 g a.s./ha (notified application rate for sunflowers). Spinach, barley and radish were planted after 29, 118 and 364 days of ageing. Due to crop failure of the 29 day spinach, spinach was additionally sown 74 days of the treatment. Translocation of radioactive residues was observed. TRR were maximum 0.039 mg/kg in spinach, 0.053 mg/kg in radish root, 0.015 mg/kg in barley grain and 0.200 mg/kg in barley straw.

Oxadiazon was found in the extracts of all investigated crops besides further radioactive compounds. One of the fractions co-chromatographed with the standards of AE0616182 and AE0608033. In the DAR (Italy, 2006) the RMS argued that AE0616182 is more likely formed as a result of biotransformation (concerning the possible metabolite AE0608033 see also section 3.1.1).

Field trials on rotational crops have not been submitted in the dossier. Based on the residue levels found in the metabolism on rotational crops the PRAPeR 70 expert meeting concluded that significant residues are expected in root crops and cereals grown in rotation after application of oxadiazon. Therefore, a data gap concerning field trials on rotational crops (root crops and cereals) was formulated. The RMS informed the experts that field trials on rotational crops for carrots and sugar beets are available to the notifier. However, in view of the restrictions concerning the acceptance of new (i.e. newly submitted) studies after the submission of the DAR to EFSA, as laid down in Commission Regulation (EC) No 1095/2007, the new studies could not be considered in the peer review.

In the absence of field studies, the PRAPeR meeting 70 proposed a provisional MRL of 0.03 mg/kg for root crops on the basis of the metabolism study. Oxadiazon residues at a level of 0.025 mg/kg were found in radish root after a plant back interval of 118 days. In barley straw residues of oxadiazon of 0.06 mg/kg were found at a plant back interval of 30 days. This interval was not regarded as very likely for crop rotation of sunflower and cereals. Therefore, it was concluded that an appropriate residue level would be 0.03 mg/kg found at the plant back interval of 364 days.

3.2. Nature and magnitude of residues in livestock

Provisional dietary burden calculations for domestic animals were carried out using the following input values: 0.01 mg/kg for oil seed press cake based on the MRL for sunflower seeds (see section 3.1.1) and 0.03 mg/kg for root crops and cereal straw based on the oxadiazon levels found in rotational crops (see section 3.1.2). For dairy cattle, beef cattle, pigs and chicken, theoretical daily intakes of 0.10, 0.19, 0.18 and 0.06 mg/kg feed (DM) were calculated.

Metabolism studies on livestock were not submitted by the notifier. Metabolism studies on animals are required when pesticide use may lead to residues ≥ 0.1 mg/kg in livestock feed. The PRAPeR meeting 70 concluded that based on the provisional dietary burden calculation a ruminant metabolism study is necessary. However, a finalised dietary burden calculation is pending the submission of field trials on rotational crops.

3.3. Consumer risk assessment

The RMS provided a provisional consumer risk assessment for chronic and acute exposure with the EFSA PRIMO rev.2 model in Addendum 2 to the DAR (May 2009, not peer reviewed). It takes into account the intake of sunflower seeds (proposed MRL of 0.01 mg/kg) and root and tuber vegetables (provisionally proposed MRL of 0.03 mg/kg).

The calculation for the chronic risk taking into account the ADI of 0.0036 mg/kg bw/day showed the French diets for toddlers and infants as the most critical models (TMDI = 6.7% ADI and 6.0% ADI, respectively).

The acute exposure is not expected to exceed the ARfD of 0.12 mg/kg. NESTIs for consumer/intake combinations are maximal 3.8% of the ARfD (potato intake by children).

The finalisation of the risk assessment is pending the submission of field trials on rotational crops to confirm the estimated residue levels in root and tuber crops and to conclude on residues in animal matrices.

3.4. Proposed MRLs

In accordance with the proposed residue definition for monitoring (oxadiazon alone) the following MRLs are proposed:

- Sunflower (seeds) 0.01* mg/kg
- Root vegetables 0.03 mg/kg (provisionally)

The MRL for root and tuber vegetables is provisionally proposed on the basis of the results of metabolism studies in rotational crops and is pending the submission of field trials for rotational crops (root crops). The necessity to propose MRLs in animal matrices has to be assessed on the basis of the results of the necessary metabolism studies in livestock.

4. Environmental fate and behaviour

Oxadiazon was discussed in the PRAPeR 62 meeting of experts on fate and behaviour into the environment PRAPeR 62 (April 2009) on the basis of the DAR (May 2006) and Addendum 1 (April 2009). After the meeting RMS presented Addendum 2 (May 2009) to address issues identified during the meeting.

4.1. Fate and behaviour in soil

4.1.1. Route of degradation in soil

Route of degradation of oxadiazon in soil under dark aerobic conditions was investigated at 25 °C in one soil (pH 7.8, OC 1.0 %, clay 9 %) and at 20 °C in four soils (pH 6.3 – 8.3, OC 1.3 – 4.1 %, clay 10.8 – 34.4 %). All the experiments lasted for one year (365 d). Only in one of the experiments more than 50 % of oxadiazon was degraded at the end of the study. A number of minor or very minor metabolites were found, five of them were chemically identified by co-chromatography with analytical standards. None of these metabolites reached 5 % AR and were not increasing at the end of the study. Radioactivity collected in the volatile's traps with alkaline trapping solution was assumed to be CO2 (max. 6.41 % after 300 d) produced by mineralization. Unextractable radioactivity reached levels of 5.44 – 35.5 % AR at the later data points (269 – 365 d).

Route of degradation of oxadiazon was also investigated under dark anaerobic conditions in one soil (pH 6.2; OC 2.4 %; clay 11 %) at 20 °C. Under these conditions, metabolite **AE 0608022** (max. 4.6 % AR after 120 d) is still increasing at the end of the study. Therefore, this metabolite would need to be further addressed with respect to potential ground water contamination in situations for which prolonged anaerobic conditions may be expected to occur. The meeting of experts identified the need for information on the degradation of metabolite AE 0608022 under aerobic conditions, however this data gap was not considered essential to finalize the EU risk assessment.

The photolysis of oxadiazon was investigated in one soil (pH 7.5, OM 0.1 %, clay 8 %) under simulated sun light (Xe lamp filtered for $\lambda < 290$ nm). Over the 30 d period of the study some degradation was observed in the irradiated samples (extrapolated DT50 = 119 d) whereas no degradation was observed in the dark experiment. The extent of degradation was low and no major metabolites were identified.

4.1.2. Persistence of the active substance and their metabolites, degradation or reaction products

Rate of degradation of oxadiazon was calculated on basis of the data obtained in the route studies. Oxadiazon exhibits a high to very high persistence in soil under aerobic conditions at 20 °C or 25 °C (DT50 = 187 – 1238 d; as recalculated in Addendum 1). Degradation is slower at 10 °C (DT50 10 °C = 3014 versus a DT50 20 °C = 755 in the same soil).

Under dark anaerobic conditions at 20 °C oxadiazon also exhibits a very high persistence in soil (DT50 = 841 d, as recalculated in Addendum 1).

The dissipation of oxadiazon under field conditions was investigated in four sites in EU (2 sites in DE, ES and Southern FR; pH 5.5 – 7.4, OC 0.66 – 2.6, clay 3.0 – 9) and two sites in USA (California and North Carolina).
In the field trials performed in Germany oxadiazon exhibit high persistence in soil (DT 50 = 262 – 330 d; as recalculated in Addendum 2).
In the field trials performed in the Southern EU (Spain and S- France) oxadiazon exhibited medium persistence in soil (DT 50 = 90 – 95 d). Time step normalization was applied to the EU field dissipation data. The meeting of experts agreed that neither leaching nor photolysis had a significant contribution to the dissipation of oxadiazon in the field studies available. Therefore, the geometric mean of the normalized (20 °C, pF 2) field half lives available (DT50 norm. field geomean = 120 d; as recalculated in Addendum 2) was agreed by the meeting to be used in modelling to represent degradation of oxadiazon in soil.
In the two USA field trials oxadiazon exhibit a high persistence in soil (DT50 = 114. 7 – 144.9 d). The study performed in USA employed a granular formulation that was considered not comparable to the EU representative formulation and, therefore, this study was considered supplementary information.
The peer review identified a data gap for representative field soil accumulation studies. A study running for 5 years (2003 – 2007) was made available to the RMS by the notifier during the peer review. However, in view of the restrictions concerning the acceptance of new (i.e. newly submitted) studies after the submission of the DAR to EFSA, as laid down in Commission Regulation (EC) No 1095/2007, the new studies could not be considered in the peer review and the data gap is maintained.
Potential for acucumulation was addressed by PEC soil calculations based on the worst case field non normalized half life (results based on a half life of 330 d presented in Addendum 2).

4.1.3. Mobility in soil of the active substance and their metabolites, degradation or reaction products

Two soil batch adsorption desorption studies were performed with oxadiazon with a total of eight soils (pH 6.3 – 8.3, OC 1.3 – 4.1 %; clay 10.8 – 34.4 %). The adsorption constants measured indicated that oxadiazon is expected to exhibit low mobility in soil (Kfoc =979 – 1527 mL / g).
A column leaching study in four soil under fresh and aged conditions is available. The study confirms the low mobility of oxadiazon.

4.2. Fate and behaviour in water

4.2.1. Surface water and sediment

Hydrolysis of oxadiazon was investigated in aqueous buffered solutions at pH 4, pH 5, pH 7 and pH 9 at 20 °C. Oxadiazon was stable at pH 4, pH 5 and pH 7. At pH 9 oxadiazon hydrolysed with a half life of 11.7 d. Two major hydrolysis metabolites were identified **AE 0608022** and **AE 0592465** that resulted from the opening of the oxadiazolone ring and the subsequent loss of the trimethylacetohydrazide. Kinetic analysis of the hydrolysis experiment at pH 9 allows to calculate

hydrolysis half lives for both metabolites (AE 0608022: DT50 = 27.4 d; AE 0592465: DT50 = 32.1 d).

Aqueous photolysis of oxadiazon was investigated at pH 5 and 22 °C under simulated sun light (Xe lamp filtered for λ > 290 nm). Degradation was fast in the irradiated experiment. Half life in the surface water was calculated for different latitudes (30 °N – 50 °N) and seasons (DT50 summer 30 °N = 9.3 d ; DT50 winter 50 °N = 4717 d). More than 20 transformation products were identified in the aqueous photolysis experiment. Of these only three major aqueous photolysis metabolites AE 0608035 (max. 15 % AR), AE 0608033 (max. 12.2 % AR) and AE 1117150 (max. 10.6 % AR) were identified. Two additional photolysis studies are available in the dossier. They confirm the relatively rapid photolysis of oxadiazon but metabolites are not fully characterized in these supplemental studies. A multi-compartmental kinetic analysis of the data of the aqueous photolysis study was performed to derive photolysis half lives of the photolysis metabolites. However, the results of this kinetic analysis are highly uncertain for at least two of the metabolites (AE 0608035; AE 1117150) since they reach the maximum at the later sampling dates in the study. Only the half life calculated for AE 0608033 (DT50 = 0.4 d; equivalent to 0.8 summer sunlight days at 40 °N) may be considered acceptable.

Oxadiazon is not readily biodegradable according the available study.

Dissipation / degradation in the aquatic environment were investigated in a study with two dark water / sediment systems (pHwater 6.43 – 6.95; pHsed 7.3 – 8.1, OC 2.7 – 4.0, clay 13.3 – 30.6 %) at 20 °C. Mineralization was practically negligible (CO2 < 1.4 – 1.9 % of volatiles) and unextractable radioactivity reached a maximum at the end of the study in both systems (unextractables = 30.8 – 36.4 % after 97 d). Practically the total amount of extracted radioactivity corresponds to parent oxadiazon. Oxadiazon partitioned with the sediment and degraded slowly in both systems (DT50 whole system. = 126.4 – 126.6 d: as re-evaluated according FOCUS kinetics in Addendum 1).

In the original dossier, a multicompartmental kinetic analysis was performed to derive separated degradation rates for the water and sediment phases. These values were not considered reliable by the peer review. A new kinetic analysis, following FOCUS kinetics guidance, was provided and evaluated by the RMS in addendum 1. No separated degradation half lives were obtained for the water sediment phases.

In a separated study the partition of oxadiazone between water and sediment was investigated in two water sediment systems. This study was considered not reliable by the RMS and has not been used in the risk assessment. Experts in the meeting agreed with the RMS position.

During the peer review, new FOCUS Step 3 and Step 4 PEC SW / SED calculations were provided by the notifier. These new PEC SW / SED were assessed by the RMS in the Addendum 1. The meeting of experts considered that, even not directly demonstrated in the study report, the limits for spray drift and run of mitigation set by FOCUS Landscape and Mitigation guidance had been respected in these calculations. EFSA was requested to highlight the fact that a 90 % run off mitigation may be difficult to achieve in practice since Koc < 2000 mL / g. Furthermore, it was noted that a half life in soil of 108 d has been used in these calculations instead of the agreed value of 118 d. The meeting agreed that this could result in a 5 – 10 % deviation on the calculated values for PEC SW / SED. RMS provided new PECSW/SED calculations using a half life in soil of 120 d. Also the RMS checked the effect of assuming 80 % of mass reduction (instead of 95 %) on the result of Step 4 calculations. Differences were only observed for the PEC SED run off scenarios (increases of

0.28 % for R1, 41 % for R2 and 58 % for R4. An estimation of the potential for oxadiazon to accumulate into sediment was provided in addendum 1. According this calculation concentration into sediment will reach a plateau after 10 years of continous use and an accumulation factor of 1.96 was derived from this calculation.
A generic FOCUS Step 1 and Step 2 PECSW/SED calculation (Koc = 1 mL /g, DT50water = 1000 d) was presented for the photolysis metabolite AE0608022. The meeting agreed the calculation represents a worst case for the PEC SW but not for the PEC SED. New generic FOCUS Step 1 and Step 2 PECSED have been presented by the RMS in addendum 2 based on a worst case Koc = 3000 mL / g.

4.2.2. Potential for ground water contamination of the active substance their metabolites, degradation or reaction products

Potential contamination of ground water by oxadiazon was assessed with FOCUS GW modelling by calculating the 80th percentile concentration of oxadiazon at 1 m depth over 20 yr of continuous application in sunflowers crops. Only two scenarios are relevant for sunflowers in FOCUS: Sevilla and Piacenza. The calculation was performed using only PEARL model. During the peer review the notifier submitted a new calculation with FOCUS GW PELMO 3.3.2. In both cases, 80 th percentile annual average concentration of oxadiazon in the leachate at 1 m depth was below the regulatory limit of 0.1 μg / L.

4.3. Fate and behaviour in air

Oxadiazon may be expected to be medium to low volatile (data gap identified for a vapour pressure study in section 1). A soil and plant volatility study showed that losses of oxadiazon by volatilisation after 24 h were low (6.7 % from soil and 5.1 % form plants). A photochemical half life of 0.22 d was calculated with Atkinson's method for the degradation of oxadiazon in the atmosphere. According this oxadiazon is not expected to contaminate remote areas through long range transport.

5. Ecotoxicology

Oxadiazon was discussed in the PRAPeR 68 meeting on ecotoxicology in May 2009, on the basis of the Draft Assessment Report (Italy, 2006) and Addendum 1 (Italy, 2009). Addendum 2 (Italy, 2009) was submitted after the expert meeting.

Oxadiazon is the active substance in the formulated herbicidal products RONSTAR 25 (EC) and FARVEL EC (250 g/L). The representative field use were pre-mergence in sunflower (1 x 750 g a.s./ha).

Member State experts discussed the compliance of batches used in the environmental toxicity testing. If a new five batches analysis could confirm the high purity of the active substance (97.5 %) Member State experts concluded, that the level of impurities would be of no problem. If the new five batches analysis would not confirm the purity, Member States would have to get confirmation on the coverage of the ecotox test batches with the new composition.
The risk assessment was conducted according to the following guidance documents: Risk Assessment for Birds and Mammals (European Commission, 2002 B): Aquatic Ecotoxicology. (European

Commission, 2000 A), Terrestrial Ecotoxicology (European Commission 2002 C); Risk Assessment for non-target arthropods (ESCORT 2, 2000).

5.1. Risk to terrestrial vertebrates

The acute toxicity of oxadiazon was investigated with bobwhite quail (*Colinus virginianus*) whereas the short-term and long-tem toxicity was investigated with both bobwhite quail and the mallard duck (*Anas platyrhynchos*). The results of these studies indicated a low toxicity to birds. The Tier I assessment provided TER values above the Annex VI trigger for the acute and short-term risk to medium herbivorous and insectivorous birds. The long-term TER value was above the Annex VI trigger for herbivorous birds, whereas the TER value for insectivorous birds (based on a diet of small insects) failed to meet the trigger (TER = 4.02). PT refinements in the DAR based on an Austrian field study on feeding behaviour of birds and mammals in maize and sugar beet fields around time of drilling (Wolf, 2005) was commented during the peer review (e.g. relevance of species, use of mean or 90 percentile PT values). RMS provided a new long-term risk assessment for insectivorous birds in Addendum 1 (April 2009) based on a diet of 100% large insects, as the GAP application is on bare soil. A complete exclusion of small insects in the diet was not supported by Member State experts in the absence of confirming data. However, Member State experts considered it unlikely that insectivorous birds would feed exclusively on a diet of small insects in a bare field where large insects was considered to be more predominant. The Member State experts agreed that insectivorous birds would feed at least to a certain degree on large insects and therefore the risk was considered as low.

The risk from secondary poisoning was assessed, given a $logP_{ow}$ of 5.33. Tier I assessment indicated a low risk to fish eating birds but a high risk to earthworm-eating birds. Refinements in the DAR of PT from the field study by Wolf (2005) and increased soil mixing depth from 5 to 20 cm were questioned in the peer review. A revised risk assessment based on a new study on BCF measurements in earthworms was provided in Addendum 1 (April 2009). The refinements could not be taken in to account as no new studies could be taken in to account at this stage according to Commission regulation 1095/2007. RMS provided a new risk assessment in Addendum 2 (May 2009) as agreed in the expert meeting, taking in to account updated PEC_{soil} values (mixing depth of 5 cm). A TER value of 0.54 in Tier I indicated a high risk to earthworm-eating birds and the RMS provided an additional refined assessment in addendum 2 where the risk was addressed based on skylark (*Alauda arvensis*) as focal species (Wolf, 2005) and PD/PT refinements. EFSA notes that the additional revised risk assessment provided in Addendum 2 was not peer reviewed and addressing the risk to earthworm-eating birds should be considered a data gap.

Endpoints from the acute toxicity study and two-generation reproduction study for rats were used in the mammalian risk assessment. The acute study indicated a low toxicity of oxadiazon to rats. Only insectivorous mammals were considered in the risk assessment, as the pre-emergence application to bare soil was considered to pose a negligible exposure to herbivorous mammals. Acute and long-term TER values were above the Annex VI trigger, indicating a low risk to insectivorous mammals.

Tier I risk assessment of secondary poisoning indicating a low risk to fish-eating mammals. For the earthworm-eating mammals, further refinements were required to address the risk from oxadiazon. The refinements suggested in the DAR, i.e. PT of 0.17 based on limited field observations (Wolf

2005) and an increased mixing depth in soil of 20 cm were questioned during the peer review. The refined risk assessment provided in Addendum 1 (April 2009) based on a new study with measured BCF values in earthworms was not accepted, as for birds (see above). As agreed by Member State experts, RMS provided a Tier I risk assessment for earthworm-eating mammals based on revised PECsoil values in Addendum 2 (May 2009), indicating a high risk to earthworm-eating mammals. A data gap exists to address the risk to earthworm-eating mammals.

A rapid clearance of oxadiazon was observed in mammals (80% within 48 h) and Member State experts agreed that an assessment of bio-magnification was not considered necessary.

The risk from consumption of contaminated drinking water from puddles was assessed for birds and mammals following the recommendations in the new opinion of the PPR panel on the Birds and Mammals Guidance Document[6]. TER values indicated a very low risk to birds and mammals from consumption of contaminated drinking water.

There was no indication of significant increase in toxicity of the formulation compared to the a.s., based on assessment of toxicity data to aquatic organisms, bees, earthworms and rats. Therefore, the risk assessment to birds could be based on the a.s toxicity data. Regarding plant metabolites, no exposure was expected to birds and mammals for the intended use (per-emergence) as oxadiazon was found to be not systemic. For potential uses as a post-emergence herbicide risk to plant metabolites should be addressed further.

5.2. Risk to aquatic organisms

Accepted acute toxicity data were provided for 2 fish species, daphnia and 6 different species of algae. Among the 6 algal species tested, three of them were non standard species, i.e. *Gymnodinium impatiens*, *Xanthonema debile*, *Phaedactylum tricornutum*. The toxicity of oxadiazon towards algae demonstrate that green algae (e.g. *Desmodesmus subspicatus* and *Pseudokirchneriella subcapitata*) were the more sensitive group. The three non standard algae species tested did not belong to the most sensitive algae species. Studies with the two additional algae species *Navicula pelliculosa* and *Closterium comu* were not accepted during peer review due to unreliable growth pattern. Algae species were found to be several orders of magnitude more sensitive to oxadiazon than fish and invertebrates at short-term exposure. Toxicity studies with *Lemna gibba* indicated a similar sensitivity of aquatic plants as for the more sensitive algae species. The acute algae data suggested a classification as very toxic to aquatic organisms. Studies with the formulation did not indicate an increased toxicity to algae based on the content of active substance. From the chronic studies on two fish species and Daphnia, the most sensitive endpoint was identified in a 60 days fish early life stage study (ELS) with *Oncorhynchus mykiss* (NOEC = 0.88 µg a.s./L based on egg hatchability).

Two additional chronic toxicity studies with selected ELS of *O. mykiss* under static conditions in the presence of sediment were provided. Member State experts did however not accept these studies, as there were concerns to what extent these studies would represent realistic worst-case conditions. Dissipation rates of oxadiazon from the water in the static test systems with sediment (DT_{50} 9.2-12.2 days and 6.8-9.6 days respectively) were faster than the dissipation rate seen in the water/sediment degradation test (DT_{50} = 17.9 d).

A study with *Chironimus riparius* tested in a 28 days water spiked test system was provided.

[6] The EFSA Jurnal, 2008, 734: 1-181

Results of algae toxicity studies with the metabolites AE0608033, AE 0608035, AE 0592465, AE 1117150 and AE 0608022 indicated a significant less toxicity (three orders of magnitude) than the parent substance. A risk assessment was considered superfluous. In agreement with Member State experts the results from studies of AE0608033 AE 0608022 were expressed as mean measured in Addendum 2 (May 2009).

The risk assessment for algae was based on the growth rate endpoints in the DAR. The acute risk to fish and invertebrates was addressed at $FOCUS_{sw}$ Step 3 in the four relevant scenarios D5, R1, R3 and R4. The risk to fish (long-term), algae and aquatic plants was address by refining the exposure and effect assessment. Refinements included mitigation of spray drift and run-off, use of TWA PEC values, reducing the assessment factor for algae (PPR panel opinion, 2005a) and use of the higher tier chronic endpoint for fish in the presence of sediment. Comments during the peer review questioned the refined risk assessment, i.e. the use of growth rate as the only valid endpoint for algae, use of TWA PEC values, the validity of reducing the assessment factor for algae and the validity of the chronic fish endpoint determined in presence of sediment. A revised aquatic risk assessment was provided by the RMS in addendum 1 (April 2009) and discussed at PRAPeR 68.

In Addendum 1 (April 2009) the risk to aquatic plants was addressed at $FOCUS_{sw}$ Step 4 based on mitigation of drift and run-off (20m buffer zones), but further refinements was required for fish (long-term) and algae. The chronic risk to fish was addressed by using endpoint from a chronic fish study including sediment, whereas the risk to algae was addressed by applying the third lowest toxicity endpoint from algae studies, following the opinion of the PPR panel on assessment factors (see reference above). Member State experts had concerns regarding the representativness of the chronic fish studies including sediment (see above) and agreed that the endpoint should be removed from the list of endpoints and should not to be used in a refined risk assessment. The Member State experts felt that use of higher tier chronic fish studies including sediment would require further reassurance on the relevance of the exposure, and endpoints from such studies should be used in line with the approach specified in the Dimoxystrobin opinion (PPR-panel Opinion, 2005b). The NOEC of 0.88 µg a.s./L from the ELS without sediment should be used in the risk assessment.

Six algae studies were acceptable, with some constraints on the endpoints derived (see list of endpoints). Derivation of a HC_5 value from a SSD was not possible because not enough values were available (only 6 reliable values, of which 2 ">-values" which cannot be used in SSD). In the 'PPR-ranking method 2' ">-values" are acceptable. Ranking of the 6 values leads to an endpoint of 19.7 µg/L based on the second lower growth rate value, which the Member State expert did considered the more relevant endpoint than biomass when sensitivity of species was compared. However, following recommendations from the Aquatic Guidance Document the lowest endpoint of growth rate and biomass should be used in the risk assessment, and in this case biomass endpoints were lower than growth rate endpoints. Therefore, the proposal of the meeting was to rank the species based on biomass sensitivity and then use the second most sensitive species: *Selenastrum capricornutum* (E_bC_{50} = 8.2 ug a.s./L) in the risk assessment.

A revised aquatic risk assessment based on the refined algae biomass endpoint (Addendum 2, May 2009) and mitigation of drift and run-off (20m buffer zone) indicated TER values above the Annex VI trigger in only one $FOCUS_{sw}$ scenario (D5 stream and pond). TER values were below the trigger

in steams for the additional three FOCUS scenarios. Furthermore, the applied mitigation measures were insufficient to address the long-term risk to fish, based on the agreed NOEC endpoint of 0.88 µg a.s./L (TER = 0.4-7 for the four relevant $FOCUS_{sw}$ scenarios). The meeting of experts suggested further refinements of the long-term risk assessment to fish in line with the Dimoxystrobin opinion.
The risk to sediment dwellers were assessed in the DAR based on water concentrations. TER values at $FOCUS_{sw}$ Step 2 indicated a low risk to sediment dwellers. In addition a TER value based on sediment concentrations was calculated in Addendum 2, indicating a low risk to sediment dwellers also from predicted sediment exposure.
A $logP_{ow}$ value of 5.33 triggered a bioaccumulation study. A bioaccumulation study with bluegill sunfish (*Lepomis macrochirus*) gave BCF values of 243 based on measured oxadiazon residues in fish. 90 percent clearance was observed after 8.3 days.
In conclusion the acute risk to fish and invertebrates was considered as low from the intended use of oxadiazon, as was the risk to aquatic plants and sediment dwellers. Algae toxicity and long-term fish toxicity was driving the risk assessment, and mitigation measures of exposure were required (20 m buffer zones for drift and run-off). Risk has been addressed for algae in one (D5) of four scenarios, based on a higher tier biomass endpoint for algae. The long-term risk to fish needs to be addressed further for all relevant scenarios.

5.3. Risk to bees

Oral and contact toxicity studies were provided for the active substance and the formulation RUNSTAR. The Hazard Quotients (HQ) were well below the Annex VI trigger indicating a negligible risk from the intended use in sunflower.

5.4. Risk to other arthropod species

Glass plate studies with the two indicator species, *Aphidius rhopalosiphi* and *Typhlodromus pyri* conducted with RONSTAR provided LR_{50} values of 875 and 149 g a.s./ha respectively. Sublethal reproductive effects were clearly below 50% effects in *T. pyri*, while *A. rhopalosiphi* was significantly affected at 375 g a.s./ha and 750 g a.s./ha. Additional laboratory studies were provided for *Poecilus cupreus* and *Chrysoperla carnea,* indicating no effects on mortality at 750 g a.s/ha, but significant effects were observed on fecundity for *C.carnea* at this application rate.
In-field HQ values were lower than the Annex VI trigger of two for *A. rhopalosiphi* but higher than the trigger for *T. pyri,* indicating possible effects on mortality within the treated area. The off-field HQ values however were lower than the trigger, indicating a low risk to the off-crop area.

Additional extended laboratory studies with *T. pyri*, *Aleochara bilineata* and *Hypoaspis aculeifer* indicated that significant mortality might occur only for *T. pyri* within the treated area (in-field). The three extended laboratory studies confirm that the risk to non-target arthropods in the off-field area was very low. Considering that RONSTAR is used on bare soil and three representative species for the soil non-target arthropods, *A. bilineata, P. cupreus* and *H. aculeifer* did not show any adverse effects at the intended application rate (750 g a.s./ha) the in-field risk to non-target arthropods was considered as low.

5.5. Risk to earthworms

Acute and long-term reproductive studies on earthworms were provided for oxadiazon and RONSTAR, indicating a higher toxicity of the formulation. A revised risk assessment to earthworms was provided in Addendum 1 (April 2009), based on updated PEC_{soil} considering accumulation. Toxicity values were corrected (log P_{ow} > 2) in all studies except the long-tem study with the formulation. The latter study was conducted with only 5% peat content. The acute and long-term risk assessment indicated a low risk to earthworms form the intended use of oxadiazon.
A risk assessment on metabolites was not needed as no metabolites were detected under aerobic conditions.

5.6. Risk to other soil non-target macro-organisms

Given the field dissipation rates (DT_{50f} > 356 days), a litter bag study was provided. The results of this study (effect on decomposition of < 10 % for 750g a.s./ha and medium positive effect for 3500 g a.s./ha), indicated no effects of RONSTAR on organic matter breakdown after 6 1/2 months of exposure. Moreover, a chronic toxicity study (14-day reproduction) on the soil mite *Hypoaspis aculeifer* had been conducted with RONSTAR. TER calculation based on these results indicated that the risk to non-target soil mesofauna was low.

5.7. Risk to soil non-target micro-organisms

RONSTAR at a concentration of 2-fold the maximum anticipated field application rate had no substantial effect (<25%) on short-term respiration or nitrogen turnover in soil after 28 days. Therefore, the risk to soil micro-flora was considered as low for the intended use of RONSTAR as a pre-emergence herbicide in sunflower.

5.8. Risk to other non-target-organisms (flora and fauna)

Bioassays on terrestrial plants with the formulated product RONSTAR were conducted (Tier 2 given the herbicidal use) to determine the effects on seedling emergence, growth and vegetative vigour. The studies comprised ten dicotyledonous plants (soybean, cucumber, tomato, sugar beet, oilseed rape, radish, sunflower, cabbage, carrot and lettuce) and four monocotyledonous plants (corn, onion, oat and ryegrass). The most sensitive endpoint was on vegetative vigour of tomato with an EC50 = 15.2 g a.s./ha. TER = 0.73, at a distance of 1 meter from the field edge indicated a need for refinements, whereas a non-spray buffer zone of 10m would provide a TER value above the Annex VI trigger. Additionally a probabilistic approach was provided. Based on the EC50 values of ten plant species a HC5 value of 63.7 g a.s./ha for seedling emergence and a HC5 value of 20.9 g a.s./ha for vegetative vigor have been calculated respectively. These HC5 values were above the exposure level of 20.8 g a.s./ha resulting from spray drift at a distance of 1 m. Therefore, the probabilistic risk assessment comprising ten species indicated a low risk for non-target plants, directly at field margin.

5.9. Risk to biological methods of sewage treatment

Based on the results that the maximum effect of oxadiazon on activated sludge corresponds to 6% inhibition of the respiration at the tested concentrations of 1000 mg/L, the risk for the biological methods of sewage treatment was considered to be low.

6. Residue definitions

6.1. Soil

Definition for risk assessment: oxadiazon, AE0608022 (anaerobic conditions only).

Definition for monitoring: oxadiazon

6.2. Water

6.2.1. Ground water

Definition for exposure assessment: oxadiazon, AE0608022 (anaerobic conditions only).

Definition for monitoring: oxadiazon

6.2.2. Surface water

Definition for risk assessment

in surface water: oxadiazon, AE0608022 (hydrolysis metabolite under alkaline pH).

in sediment: oxadiazon, AE0608022 (hydrolysis metabolite under alkaline pH).

Definition for monitoring: oxadiazon

6.3. Air

Definition for risk assessment: oxadiazon

Definition for monitoring: oxadiazon

6.4. Food of plant origin

Definition for risk assessment: oxadiazon

Definition for monitoring: oxadiazon

6.5. Food of animal origin

Definition for risk assessment: no metabolism studies on livestock available (data gap)

Definition for monitoring: no metabolism studies on livestock available (data gap)

6.6. Overview of the risk assessment of compounds listed in residue definitions for the environmental compartments

6.6.1. Soil

Compound (name and/or code)	Persistence	Ecotoxicology
oxadiazon	high to very high (DT_{50} = 187 – 1238 d)	The risk to earthworms, non-target soil micro-organisms, organic matter breakdown was assessed as low.
AE0608022 (anaerobic conditions only)	No data available. Not required to finalize the EU risk assessment.	No data available. Not required to finalize the EU risk assessment.

6.6.2. Ground water

Compound (name and/or code)	Mobility in soil	> 0.1 µg / L 1m depth for the representative uses (at least one FOCUS scenario or relevant lysimeter)	Pesticidal activity	Toxicological relevance	Ecotoxicological activity
oxadiazon	low mobility in soil (K_{foc} = 1386 – 3268 mL / g).	FOCUS GW (PEARL and PELMO): No	Yes	Yes	Yes
AE0608022 (anaerobic conditions only)	No data available. Not required to finalize the EU risk assessment.	No data available. Not required to finalize the EU risk assessment.	No data available. Not required to finalize the EU risk assessment.	No data available. Not required to finalize the EU risk assessment.	No data available. Not required to finalize the EU risk assessment.

6.6.3. Surface water and sediment

Compound (name and/or code)	Ecotoxicology
oxadiazon	Oxadiazon is very toxic to aquatic organisms. The long-term risk to fish has not been addressed for the intended use. Only one out of four relevant scenarios passed the Annex VI trigger for the risk assessment of algae, based on higher tier algae biomass endpoint and 20m buffer zones to mitigate spray drift and run-off.
AE0608022	Low risk to aquatic organisms

6.6.4. Air

Compound (name and/or code)	Toxicology
oxadiazon	Rat LC_{50} inhalation > 2.77 mg/L air/4 h, whole-body, as a dust exposure, no classification proposed

LIST OF STUDIES TO BE GENERATED, STILL ONGOING OR AVAILABLE BUT NOT PEER REVIEWED

- 5 batch data supporting the new technical specification (relevant for all representative uses evaluated, data gap identified by PRAPeR 66 meeting (April 2009), data already submitted and evaluated in an addendum to Vol. 4 (April 2009), however not peer-reviewed in view of the restrictions concerning the acceptance of new studies after the submission of the DAR to EFSA, as laid down in Commission Regulation (EC) No. 1095/2007, refer to chapter 1)
- validation data of the method No 87-106 for the determination of possible micro-contaminants (relevant for all representative uses evaluated, data gap identified by PRAPeR 66 meeting (April 2009), date of submission unknown, refer to chapter 1)
- validation data of the method used for the determination of the impurities in the 5 batch analysis (relevant for all representative uses evaluated, data gap identified by PRAPeR 66 meeting (April 2009), date of submission unknown, refer to chapter 1)
- determination of the vapour pressure (relevant for all representative uses evaluated, data gap identified by PRAPeR 66 meeting (April 2009), study already submitted and evaluated, but not peer reviewed in view of the restrictions concerning the acceptance of new studies, as laid down in Commission Regulation (EC) No. 1095/2007, refer to chapter 1)
- information on flash point of the formulation, based on an equilibrium method (relevant for all representative uses evaluated, data gap identified by PRAPeR 66 meeting (April 2009), date of submission unknown, refer to chapter 1)
- data on the surface tension of the undiluted formulation at 25°C (relevant for all representative uses evaluated, data gap identified by PRAPeR 66 meeting (April 2009), date of submission unknown, refer to chapter 1)
- a comparison of the impurity profile of the batches used in the toxicological studies with the technical specification to address their toxicological representativeness (relevant for all representative uses evaluated, open point identified by PRAPeR meeting (May 2009); refer to section 2)
- notifier to submit the studies referenced in addendum 1 to volume 4 (acute toxicity and genotoxicity) on impurities (relevant for all representative uses evaluated, data gap identified during the written procedure (June 2009); refer to section 2.4)
- notifier to address the apparent existence of a mutagenic impurity in the proposed technical specification (relevant for all representative uses evaluated, data gap identified during PRAPeR 69 meeting (May 2009); submission date proposed by the notifier: unknown; refer to section 2.4)
- clarification of the occurrence of metabolite AE0608033: The notifier should clarify if this metabolite was characterised, identified or just postulated (relevant for all uses; data gap identified by PRAPeR 70 meeting in May 2009, no submission date proposed by the notifier; refer to section 3.1.1).
- field trials on rotational crops for root crops and cereals (relevant for all uses; data gap identified by PRAPeR 70 meeting in May 2009, no submission date proposed by the notifier; refer to section 3.1.2).

- a ruminant metabolism study: necessary if provisional dietary calculation is confirmed by the necessary field trials on rotational crops (relevant for all uses; data gap identified by PRAPeR 70 meeting in May 2009, no submission date proposed by the notifier; refer to section 3.2).
- information on the degradation of the anaerobic metabolite AE 0608022 under aerobic conditions (data gap not considered essential to finalize the EU risk assessment; no submission date proposed by the notifier)
- a data gap for representative field soil accumulation studies was identified during the peer review (relevant for all representative uses evaluated; a five years study is already available to the notifier; however, in view of the restrictions concerning the acceptance of new (i.e. newly submitted) studies after the submission of the DAR to EFSA, as laid down in Commission Regulation (EC) No 1095/2007, the new studies could not be considered in the peer review)
- confirmation of the coverage of the ecotox test batches with the new composition, if a new five batches analysis could not confirm the high purity of the active substance (97.5 %) (relevant for all representative uses evaluated, open point identified by PRAPeR meeting (May 2009); refer to section 5)
- data to address the risk to earthworm-eating birds and mammals. (relevant for all representative uses evaluated; agreed at the meeting of Member State experts (PRAPeR 68); proposed submission date unknown; RMS has provided a refined assessment based on a new study of measured BCF in earthworms in Addendum 1 (April 2009). The refined assessment was not peer reviewed due to the regulation EEC/1095/2007; refer to point 5.1)
- data to address the long-term risk to fish(relevant for all representative uses evaluated; agreed at the meeting of Member State experts (PRAPeR 68); proposed submission date unknown; refer to point 5.1)

CONCLUSIONS AND RECOMMENDATIONS

Overall conclusions

The conclusion was reached on the basis of the evaluation of the representative use as a herbicide as proposed by the notifier which comprises post sowing, pre-emergence application by spraying to control broad-leaved weeds and grasses in sunflower, in all EU countries, at a single application, at maximum application rate of 750 g a.s./ha.

The representative formulated product for the evaluation was 'RONSTAR', an emulsifiable concentrate (EC) containing 250 g/L oxadiazon, registered under different trade names in Europe. The minimum purity and specification of the active substance could not be concluded on .

Sufficient analytical methods as well as methods and data relating to physical, chemical and technical properties are available to ensure that quality control measurements of the plant protection products are possible, however data gaps were identified for the determination of the surface tension, flash-point of the undiluted formulation and determination of the vapour pressure.

Adequate analytical methods are available for the determination of oxadiazon in the technical material and in the representative formulation as well as for the determination of the impurities in the technical material.
Oxadiazon residues in food/feed of plant and animal origin can be monitored by the multi-residue method DFG S19. Adequate methods are available to monitor oxadiazon residues in environmental matrices.

In the mammalian toxicology chapter, oxadiazon presented low acute toxicity, either by the oral, dermal or inhalation route; no eye or skin irritation was observed, and no potential for skin sensitisation was found. The main target organs of oxadiazon were the liver and the haematopoietic system consistent with oxadiazon's ability to inhibit protoporphyrinogen oxidase, an enzyme involved in the synthesis of both haem and chlorophyll. The overall short-term NOAEL was 18 mg/kg bw/day from the 90-day study in rat.
Oxadiazon itself did not present genotoxic potential, however a positive Ames test suggested the presence of a mutagenic impurity in the batch tested. The notifier should address the apparent existence of a mutagenic impurity in the technical specification.
Liver tumours, observed in both rat and mouse species were not considered relevant for humans according to mechanistic studies on peroxisome proliferation. The relevant long-term NOAEL was the dose level of 0.36 mg/kg bw/day from the 2-year rat study.
Effects on the reproduction (increase in gestation length and irregular oestrus cycle) were more prominent in a preliminary dose-range finding study to the multigeneration study where total litter losses were observed at *ca*. 30 mg/kg bw/day. On this basis a classification with the risk phrase **R62 "possible risk of impaired fertility"** was proposed by the experts. The NOAEL in the main study was 5 mg/kg bw/day for reproduction toxicity. In the developmental toxicity studies, the rat presented the more critical (developmental) NOAEL for the risk assessment of 12 mg/kg bw/day.
The ADI of oxadiazon is 0.0036 mg/kg bw/day, the AOEL is 0.05 mg/kg bw/day and the ARfD is set at 0.12 mg/kg bw. No concern was raised from the risk assessment of operator, worker and bystander exposure.
Metabolism of oxadiazon was investigated in sunflowers, rice and tomatoes and in rotational crops (spinach, radish and barley). Metabolism was found to be moderate. Besides oxadiazon, its metabolites AE0618785[7], AE0608021[8], AE0616182[9] and AE0618784[10] were identified. Additionally metabolite AE0608033 is possibly formed in sunflowers and rotational crops. As AE0608033 is not covered by the rat metabolism nor addressed by other toxicology data on metabolites a data gap was formulated. The notifier should clarify the occurrence of metabolite AE0608033 in primary crops and rotational crops. As parent oxadiazon was the prevalent residue found in metabolism studies on primary and rotational crops, the plant residue definition for monitoring and risk assessment was proposed as oxadiazon alone.

[7] AE 0618785: 3-[2,4-dichloro-5-(propan-2-yloxy)phenyl]-5-(1-hydroxy-2-methylpropan-2-yl)-1,3,4-oxadiazol-2(3*H*)-one
[8] AE 0608021: 5-*tert*-butyl-3-(2,4-dichloro-5-hydroxyphenyl)-1,3,4-oxadiazol-2(3*H*)-one
[9] AE 0616182: 2-{4-[2,4-dichloro-5-(propan-2-yloxy)phenyl]-5-oxo-4,5-dihydro-1,3,4-oxadiazol-2-yl}-2-methylpropanoic acid
[10] AE 0618784: 5-*tert*-butyl-3-(2,4-dichloro-5-methoxyphenyl)-1,3,4-oxadiazol-2(3*H*)-one

A sufficient number of residue trials on sunflowers supporting the notified GAPs have been submitted to propose an MRL. Based on the residue levels found in the metabolism on rotational crops it was concluded that field trials on rotational crops (root crops and cereals) are necessary. A provisional MRL for root and tuber crops was proposed on the basis of the results of the metabolism study on rotational crops.

No metabolism studies on livestock are available. Provisional dietary burden calculations show an exceedance of the trigger value of 0.1 mg/kg feed (DM) for beef cattle and pigs. Based on this provisional calculation a metabolism study on ruminants is necessary.

Chronic and acute dietary intake calculations showed that an exceedance of ADI or ARfD is not expected for intake of crops after treatment of sunflowers with oxadiazon according to the notified GAPs. The finalisation of the risk assessment is pending the submission of field trials on rotational crops to confirm the estimated residue levels in root and tuber crops.

Oxadiazon exhibits a high to very high persistence in soil under dark aerobic conditions at 20 °C or 25 °C (DT_{50} = 187 – 1238 d). A number of minor or very minor metabolites were found. Mineralization was low (CO_2: max. 6.41 % after 300 d). Unextractable radioactivity reached levels of 5.44 – 35.5 % AR at the later data points (269 – 365 d).

Under dark anaerobic conditions in soil at 20 °C oxadiazon also exhibits a very high persistence (DT_{50} = 841 d), metabolite **AE 0608022** (max. 4.6 % AR after 120 d) is still increasing at the end of the study. Therefore, this metabolite would need to be further addressed with respect to potential ground water contamination in situations for which prolonged anaerobic conditions may be expected to occur.

In the photolysis experiments in soil, the extent of degradation was low and no major metabolites were identified.

The dissipation of oxadiazon under field conditions has been investigated in four sites in EU and two sites in USA. In the field trials performed in Germany oxadiazon exhibits a high persistence in soil (DT_{50} = 262 – 330 d). In the field trials performed in the Southern EU (Spain and S- France) oxadiazon exhibited a medium persistence in soil (DT_{50} = 90 – 95 d). The geometric mean of the normalized (20 °C, pF 2) field half lives ($DT_{50\ norm.\ field\ geomean}$ = 120 d) was agreed to represent degradation of oxadiazon in soil for modelling purposes.

The study performed in USA was considered supplementary information.

The peer review identified a data gap for representative field soil accumulation studies. Potential for accumulation was addressed by PEC soil calculations based on the worst case field non normalized half life.

Two soil batch adsorption desorption studies were performed with oxadiazon. According this study, oxadiazon is expected to exhibit low mobility in soil (K_{Foc} = 979 – 1527 mL / g).

Oxadiazon was stable to hydrolysis at pH 4, pH 5 and pH 7. At pH 9 oxadiazon hydrolysed (DT_{50} =11.7 d) yielding two major hydrolysis metabolites: AE 0608022 and AE 0592465[11].

Aqueous photolysis of oxadiazon was fast under the irradiated experimental conditions. Half life in the surface water was calculated for different latitudes (30 °N – 50 °N) and seasons. Three major

[11] AE 0592465: 2,4-dichloro-1-(propan-2-yloxy)benzene

aqueous photolysis metabolites were identified: AE 0608035 (max. 15 % AR), AE 0608033 (max. 12.2 % AR) and AE 1117150 (max. 10.6 % AR).
Oxadiazon is not readily biodegradable according the available study.
Dissipation / degradation was investigated in two dark water / sediment systems at 20 °C. Oxadiazon partitions with the sediment and degrades slowly in both systems ($DT_{50\ whole\ system.}$ = 126.4 – 126.6 d).
During the peer review, new FOCUS Step 3 and Step 4 PEC $_{SW\ /\ SED}$ calculations were provided by the notifier. The meeting of experts identified some drawbacks in these calculations. In addendum 2, RMS provided new $PEC_{SW/SED}$ calculations in accordance with the meeting discussions. An estimation of the potential for oxadiazon to accumulate in the sediment was provided in addendum 1. An accumulation factor of 1.96 was derived from the 10 years plateau identified in this calculation.
A generic FOCUS Step 1 and Step 2 $PEC_{SW/SED}$ calculation is available for the photolysis metabolite AE0608022.
Potential contamination of ground water by oxadiazon was assessed with FOCUS GW PEARL and PELMO models. In both cases, annual average concentration of oxadiazon in the leachate was below the regulatory limit of 0.1 µg / L for the 80th percentile concentration at 1 m depth over 20 yr of continuous application in sunflowers.
Oxadiazon may be considered medium to low volatile. A photochemical half life in the atmosphere of 0.22 d has been calculated with Atkinson's method. Oxadiazon is not expected to contaminate remote areas through long range transport.

Tier I assessment provided TER values above the Annex VI trigger for the acute and short-term risk to medium herbivorous and insectivorous birds. The long-term TER value was above the Annex VI trigger for herbivorous birds, whereas the TER value for insectivorous birds (based on a diet of small insects) failed to meet the trigger. Member State experts considered that insectivorous birds to a certain (sufficient) degree would base their diet on large insects with lower residue levels and therefore the long-term risk to insectivorous birds was considered as low. The acute and long-term risk to mammals was assessed as low, as was the risk to birds and mammals from eating fish and consumption of contaminated drinking water. Data gaps were identified for the notifier to address the risk to earthworm-eating birds and mammals.
Oxadiazon was considered to be very toxic to aquatic organisms, with algae and fish reproduction as the most sensitive endpoints. The acute risk to fish, invertebrates and higher plants was addressed at $FOCUS_{sw}$ Step 3 without risk mitigation. Only one out of four relevant $FOCUS_{sw}$ scenarios passed the Annex VI trigger for the risk assessment of algae, based on a higher tier algae biomass endpoint and 20m buffer zones to mitigate spray drift and run-off. The long-term risk to fish needed further refinements to be addressed (i.e. data gap), as exposure mitigation was insufficient to address the risk and refinement of the chronic fish toxicity endpoint was not accepted by Member State experts (i.e. adding sediment to the test system). Refinements in line with the recommendation in the PPR-panel opinion in Dimoxystrobin were suggested. The in-field risk assessment to non-target arthropods indicated a high risk to *T. pyri*, whereas the off-field risk could be considered as low. Laboratory and extended laboratory studies with three species of soil living non-target arthropods indicated that the risk from the intended spraying of bare soil could be considered as low.
The risk to bees, earthworms, non-target plants and biological methods of sewage treatment was assessed as low.

PARTICULAR CONDITIONS PROPOSED TO BE TAKEN INTO ACCOUNT TO MANAGE THE RISK(S) IDENTIFIED

- As long as livestock metabolism study is not available cereal straw and root crops from succeeding crops should not be fed to animals
- Only for field use comparable to the D5 scenarios could the risk to algae be addressed by VFS of 20 m (see section 5.2)

ISSUES THAT COULD NOT BE FINALIZED

- The finalisation of the risk assessment is pending the submission of field trials on rotational crops to confirm the estimated residue levels in root and tuber crops.

CRITICAL AREAS OF CONCERN

- No agreed specification and no comparison of the specification with the batches used in the toxicological and ecotoxicological studies, therefore no information whether the manufactured material is represented by this evaluation (see section 2 and 5).
- The long-term risk to fish has not been addressed in the aquatic risk assessment.
- The risk to earthworm-eating birds and mammals has not been addressed. (A new study was provide to address the risk, but was not peer reviewed due to Commission Regulation (EC) No 1095/2007).

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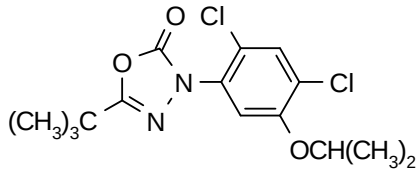
APPENDICES

Appendix A List of end points

Chapter 2.1: Identity, Physical and Chemical Properties, Details of Uses, Further Information, and Proposed Classification and Labelling

Active substance (ISO Common Name) ‡	Oxadiazon
Function (*e.g.* fungicide)	Herbicide
Rapporteur Member State	Italy

Identity (Annex IIA, point 1)

Chemical name (IUPAC) ‡	5-tert-butyl-3-(2,4-dichloro-5-isopropoxyphenyl)-1,3,4-oxadiazol-2(3*H*)-one
Chemical name (CA) ‡	1,3,4-oxadiazol-2(3*H*)-one, 3[2,4-dichloro-5-(1-methylethoxy)phenyl]-5-(1,1-dimethylethyl)-
CIPAC No ‡	213
CAS No ‡	19666-30-9
EC No (EINECS or ELINCS) ‡	243-215-7
FAO Specification (including year of publication) ‡	n/a
Minimum purity of the active substance as manufactured ‡	open
Identity of relevant impurities (of toxicological, ecotoxicological and/or environmental concern) in the active substance as manufactured	None
Molecular formula ‡	$C_{15}H_{18}Cl_2N_2O_3$
Molecular mass ‡	345.2 g/mol
Structural formula ‡	

Physical and chemical properties (Annex IIA, point 2)

Melting point (state purity) ‡	88.5°C (998g/kg)
Boiling point (state purity) ‡	282.1°C (998g/kg)
Temperature of decomposition (state purity)	Not relevant as boiling point determined
Appearance (state purity) ‡	Pure material: White crystalline powder (998g/kg)
	Technical material: Light brown irregular flaky solid (959g/kg)

Vapour pressure (state temperature, state purity) ‡	Open
Henry's law constant ‡	Open
Solubility in water (state temperature, state purity and pH) ‡	0.57 mg/L at 20°C (998g/kg)
	no effect of pH in the range pH 5 - 9:
Solubility in organic solvents ‡ (state temperature, state purity)	Solubility at 25 °C in g/L (998g/kg) n-heptane: 92.3 g/L, toluene: > 350 g/L, 1,2-dichloroethane: > 350 g/L, methanol: 122.4 g/L, n-Octanol: 77.3 g/L, acetone: > 350 g/L, ethyl acetate: > 350 g/L, acetonitrile: >350 g/L
Surface tension ‡ (state concentration and temperature, state purity)	70.4 mN/m at 20 °C (90 % saturated solution of oxadiazon in water) (959 g/kg)
Partition co-efficient ‡ (state temperature, pH and purity)	log $P_{O/W}$ = 5.33 at 20°C (998 g/kg)
	Effect of pH was not investigated since there is no dissociation in water in the environmentally relevant pH-range

Dissociation constant (state purity) ‡	Not relevant - there are no acidic or basic functions in the molecule which could be dissociated in acidic, neutral or basic water.
UV/VIS absorption (max.) incl. ε ‡ (state purity, pH)	Molar extinction coefficients (determined in aqueous/methanol 10/90 v/v media) of the UV/VIS absorption maxima (998 g/kg): Acid medium: ε = 34776 $L.mol^{-1}.cm^{-1}$ (λ = 208.5 nm) ε = 3216 $L.mol^{-1}.cm^{-1}$ (λ = 292.5 nm) Neutral medium: ε = 35843 $L.mol^{-1}.cm^{-1}$ (λ = 208.5 nm) ε = 3283 $L.mol^{-1}.cm^{-1}$ (λ = 292.0 nm) Basic medium: ε = 20718 $L.mol^{-1}.cm^{-1}$ (λ = 218.0 nm) ε = 4286 $L.mol^{-1}.cm^{-1}$ (λ = 293.0 nm) Molar extinction coefficient at a wavelength above 290 nm: ε = 0 $L.mol^{-1}.cm^{-1}$ $\lambda \geq 310$ nm in neutral medium
Flammability ‡ (state purity)	Not highly flammable (959 g/kg) Technical grade oxadiazon melted at about 81 °C. No auto inflammation occurred under the conditions of the test.
Explosive properties ‡ (state purity)	Not explosive (959 g/kg)
Oxidising properties ‡ (state purity)	Not oxidising (959 g/kg)

Summary of representative uses (Oxadiazon)

Crop and/or situation	Member State or Country	Product name	F G or I	Pests or Group of pests controlled	Formulation		Application				Application rate per treatment			PHI (days)	Remarks:
(a)			(b)	(c)	Type (d-f)	Conc. of as (i)	method kind (f-h)	growth stage & season (j)	number min max (k)	interval between applications (min)	kg as/hL min max	water L/ha min max	kg as/ha min max	(l)	(m)
Sunflower	EU	RONSTAR®	F	weeds	EC	250 g/L	spray	Pre-emergence	1	Not relevant	0.125-0.250	300-500	0.625-0.750	Not relevant	[I]

[I] Based on the data available it was not possible to address the long-term risk to fish for the intended use in sunflower.

(a) For crops, the EU and Codex classifications (both) should be used; where relevant, the use situation should be described (e.g. fumigation of a structure)
(b) Outdoor or field use (F), glasshouse application (G) or indoor application (I)
(c) e.g. biting and sucking insects, soil born insects, foliar fungi, weeds
(d) e.g. wettable powder (WP), emulsifiable concentrate (EC), granule (GR)
(e) GCPF Codes - GIFAP Technical Monograph No 2, 1989
(f) All abbreviations used must be explained
(g) Method, e.g. high volume spraying, low volume spraying, spreading, dusting, drench
(h) Kind, e.g. overall, broadcast, aerial spraying, row, individual plant, between the plant - type of equipment used must be indicated
(i) g/kg or g/L
(j) Growth stage at last treatment (BBCH Monograph, Growth Stages of Plants, 1997, Blackwell, ISBN 3-8263-3152-4), including where relevant, information on season at time of application
(k) Indicate the minimum and maximum number of application possible under practical conditions of use
(l) PHI - minimum pre-harvest interval
(m) Remarks may include: Extent of use/economic importance/restrictions

Analytical methods for the active substance (Annex IIA, point 4.1)

Technical as (analytical technique)	The recommended method for the determination of Oxadiazon in technical a.s. makes use of isocratic reversed phase High Performance Liquid Chromatography with Ultra Violet detection at 230 nm (RP-HPLC/UV) and external standard calibration.
Impurities in technical as (analytical technique)	A combination of two methods are proposed for the determination of organic impurities in technical a.s.: Isocratic RP-HPLC/UV with external standard calibration. Gas Chromatography with flame ionisation detection. (GC/FID) using a pyrex glass column and external standard calibration. Open, validation data required
Plant protection product (analytical technique)	Oxadiazon is determined with isocratic RP-HPLC/UV, with UV absorption at 230 nm.

Analytical methods for residues (Annex IIA, point 4.2)

Residue definitions for monitoring purposes

Food of plant origin		Oxadiazon
Food of animal origin		To be proposed when metabolism study is available
Soil		Oxadiazon
Water	surface	Oxadiazon
	drinking/ground	Oxadiazon
Air		Oxadiazon

Monitoring/Enforcement methods

Food/feed of plant origin (analytical technique and LOQ for methods for monitoring purposes)	Multi-residue enforcement method DFG S19 : - extraction with acetone / water (2:1, v/v) followed by partitioning into ethyl acetate / cyclohexane (1:1, v/v) for plant matrices with a high water content. Dry plant matrices are extracted as above except that the samples are soaked in water from 30 minutes before extraction. - acidic matrices are pH adjusted to 7 by adding sodium hydrogen carbonate or sodium hydroxide. - oily matrices are extracted with acetonitrile / acetone (9:1, v/v) in the presence of Celite and Calflo E, evaporated and dissolved in ethyl acetate / cyclohexane (1:1, v/v). - GPC clean-up, - silica gel fractionation, - analysis of the final extracts by GC/ECD (GC/MS, GC/MS2 for confirmatory purposes). LOQ in apple: 0.01 mg/kg LOQ in orange: 0.01 mg/kg LOQ in rice grain: 0.01 mg/kg LOQ in sunflower seed: 0.01 mg/kg
Food/feed of animal origin (analytical technique and LOQ for methods for monitoring purposes)	Multi-residue enforcement method DFG S19 : - extraction with acetone / water (2:1, v/v) followed by partitioning into ethyl acetate / cyclohexane (1:1, v/v) for milk, egg, and muscle; - dissolving directly into ethyl acetate / cyclohexane (1:1, v/v) for beef fat and lard, - GPC clean-up, - silica gel fractionation, - analysis of the final extracts by GC/ECD (GC/MS or GC/MS2 for confirmatory purposes). LOQ in milk : 0.01 mg/kg LOQ in egg : 0.02 mg/kg LOQ in muscle : 0.02 mg/kg LOQ in fat : 0.02 mg/kg
Soil (analytical technique and LOQ)	In-house method AR 283-01: - extraction by shaking the soil samples with acetone, - clean-up on a copolymer solid phase extraction cartridge, - analysis of the final extracts GC/MS using the fragment ion of m/z 175 for quantification (GC/MS using the fragment ion m/z 258 and 177 for confirmatory purposes). LOQ : 0.005 mg/kg
Water (analytical technique and LOQ)	In-house method AR 257-00: - extraction by solvent partitioning of the water samples into hexane, - analysis of the hexane extract by GC/MS using the fragment ions m/z 175, 177 and 258 (GC/MS with three fragment ions of m/z >100 for confirmatory purposes). LOQ (drinking water) : 0.01 µg/L LOQ (surface water) : 0.01 µg/L

Air (analytical technique and LOQ)	In-house method EMF 01/01-0: - trapping of residues by passing the air through commercial monitoring cartridges pre-packed with XAD adsorbent, - extraction of the residues from the adsorbent with ethyl acetate, - analysis of the final extracts by GC/MS using the fragment ion m/z 175 for quantification. LOQ (mild air) : 0.9µg/m³
Body fluids and tissues (analytical technique and LOQ)	No analytical method has been developed for the specific determination of residues in human fluids and tissues, since oxadiazon and its metabolites are not thought to present a high acute toxicity.

Classification and proposed labelling with regard to physical and chemical data (Annex IIA, point 10)

	RMS/peer review proposal
Active substance	Not classified

Impact on Human and Animal Health

Absorption, distribution, excretion, and metabolism (toxicokinetics) (Annex IIA, point 5.1)

Rate and extent of oral absorption ‡	80 - 85 % oral absorption in rats for females and males respectively (based on urinary + cage wash, biliary and tissues - excluding GI content) within 48 h
Distribution ‡	168 h post dosing, tissue radioactivity level was between 0.15 %-0.84 %; highest mean tissue residues were found in liver, fat and GIT
Potential for accumulation ‡	No potential for accumulation in repeated oral compared to single oral dose administration
Rate and extent of excretion ‡	Rapidly excreted (about 80 %) in rats within 48 hours; the major route is faeces for males (67 %) while in females elimination is more balanced between urine and faeces (42 % urine, 46 % faeces)
Metabolism in animals ‡	By hydroxylation, oxydation and O-decarboxylation, and conjugation to sulphate and/or glucuronide conjugates
Toxicologically relevant compounds ‡ (animals and plants)	Parent compound
Toxicologically relevant compounds ‡ (environment)	Parent compound

Acute toxicity (Annex IIA, point 5.2)

Rat LD_{50} oral ‡	> 5000 mg/kg bw	
Rat LD_{50} dermal ‡	>2000 mg/kg bw	
Rat LC_{50} inhalation ‡	> 2.77 mg/L/4 h, whole body exposure	
Skin irritation ‡	Non-irritant	
Eye irritation ‡	Non-irritant	
Skin sensitisation ‡	Not a skin sensitizer (Buehler and M&M tests)	

Short-term toxicity (Annex IIA, point 5.3)

Target / critical effect ‡	Rat: Liver (increase liver weight, hepatocytic vacuolation, increase serum AST, protoporphyrin IX accumulation), anaemia	
Relevant oral NOAEL ‡	Rat 90-day: 18 mg/kg bw/day Dog 90-day: 25 mg/kg bw/day Dog 1-year: 20 mg/kg bw/day	
Relevant dermal NOAEL ‡	< 250 mg/kg bw/day (28-day rat) 1000 mg/kg bw/day (21-day rabbit)	

Relevant inhalation NOAEL ‡	3.95 mg/L air (14-day rat)	

Genotoxicity ‡ (Annex IIA, point 5.4)

No evidence of genotoxic potential	

Long-term toxicity and carcinogenicity (Annex IIA, point 5.5)

Target/critical effect ‡	Rat: Liver (increase liver weight, hepatocyte vacuolation), anemia. Hepatoneoplasms in rodents
Relevant NOAEL ‡	0.36 mg/kg bw/day (2-year rat) 0.92 mg/kg bw/day (2-year mouse) 1.2 mg/kg bw/day (2-year dog)
Carcinogenicity ‡	Two studies on rat and mouse show increase in tumour incidence (hepatocellular adenomas and carcinomas), while the study in dogs does not show carcinogenic effects. Non-genotoxic MOA induced by peroxisome activation in rodents (as shown by mechanistic studies) is considered not relevant to humans.

Reproductive toxicity (Annex IIA, point 5.6)

Reproduction toxicity

Reproduction target / critical effect ‡	Increased length of gestation, irregular oestrus cycle (rat)	**Xn, R62**
Relevant parental NOAEL ‡	15 mg/kg bw/day	
Relevant reproductive NOAEL ‡	5 mg/kg bw/day	
Relevant offspring NOAEL ‡	15 mg/kg bw/day	

Developmental toxicity

Developmental target / critical effect ‡	Maternal Rat: slighlty reduced body weight during the end of the gestation period Rabbit: reduced body weight Foetal: Rat: reduced mean foetal weight, increased incidence of runts Rabbit: reduced foetal weight, increased incidence of small foetuses	
Relevant maternal NOAEL ‡	Rat: 40 mg/kg bw/day Rabbit: 60 mg/kg bw/day	

Relevant developmental NOAEL ‡	Rat: 12 mg/kg bw/day Rabbit: 60 mg/kg bw/day	

Neurotoxicity (Annex IIA, point 5.7)

Acute neurotoxicity ‡	No data, not required	
Repeated neurotoxicity ‡	No neurotoxic potential in an additional assessment in the 90-day short-term rat study, no further study -required	
Delayed neurotoxicity ‡	No data, not required	

Other toxicological studies (Annex IIA, point 5.8)

Mechanism studies ‡	<u>Mechanistic studies to elucidate liver tumours MOA</u> Two oral (gavage) studies on rats and mice (14-day and 28-day respectively) show that oxadiazon is a peroxisome activator while no peroxisome activation is seen in a 28-day study in dogs. An *in vitro* study on rat and human hepatocytes demonstrates that oxadiazon does not induce peroxisome activation in human hepatocytes. <u>Evaluation of protoporphyrin IX accumulation</u> 28-day dietary study in rats: Accumulation of protoporphyrin IX in the liver is observed from day 15 of the study and still observed after 2 weeks recovery period. NOAEL for haematopoietic effects = 25.3 mg/kg bw/day.
Studies performed on metabolites or impurities ‡	No data, assessment of a possibly mutagenic impurity required

Medical data (Annex IIA, point 5.9)

No effects reported in manufacturing workers or applicators; no case of intoxication or allergic reaction to the product reported

Summary (Annex IIA, point 5.10)	Value	Study	Safety factor
ADI ‡	0.0036 mg/kg bw/day	Rat, 2-year study	100
AOEL ‡	0.05 mg/kg bw/day	Rat multigeneration study	100
ARfD ‡	0.12 mg/kg bw	Rat	100

	developmental toxicity study	

Dermal absorption (Annex IIIA, point 7.3)

Formulation (Ronstar®, EC formulation containing 250 g oxadiazon/L)	Concentrate: 2 % Spray dilutions: 3 % Based on *in vitro* dermal absorption study using human skin.

Acceptable exposure scenarios (including method of calculation)

Operator	The estimated exposure for Ronstar®, application rate 0.75 kg a.s./ha Tractor mounted equipment:	
	German Model	% of AOEL
	Without PPE:	47,49 %
	PPE (gloves during M/L and application and coverall during application):	2,74 %
	UK POEM Model	% of AOEL
	A) 5L container size:	
	Without PPE:	158.9 %
	PPE (gloves during M/L & application):	26.1 %
	B) 1L container size:	
	Without PPE:	358,9 %
	PPE (gloves during M/L & application):	46,1 %
Workers	Worker exposure according to Krebs (2000)	% of AOEL
	without PPE	68 %
Bystanders	Bystander exposure according to Ganzellmeier (1995) considered to be negligible (0.66 % of AOEL)	

Classification and proposed labeling

	RMS/peer review proposal	
oxadiazon	Xn	Harmful
	R62	"Possible risk of impaired fertility"

Metabolism in plants (Annex IIA, point 6.1 and 6.7, Annex IIIA, point 8.1 and 8.6)

Plant groups covered	Oilseeds (Sunflower), Fruit crops (Tomato) and Cereals (Rice) after soil treatment by spray application. (In addition, stem and fruit injection for tomato)
Rotational crops	Root vegetable (radish), leafy crops (spinach), cereals (barley)
Metabolism in rotational crops similar to metabolism in primary crops?	The metabolism in rotational crops was similar to metabolism in tomato, sunflower and rice.
Processed commodities	Not required since no significant analytically determinable residues occur in raw commodity.
Residue pattern in processed commodities similar to residue pattern in raw commodities?	Not applicable
Plant residue definition for monitoring	Oxadiazon
Plant residue definition for risk assessment	Oxadiazon
Conversion factor (monitoring to risk assessment)	None

Metabolism in livestock (Annex IIA, point 6.2 and 6.7, Annex IIIA, point 8.1 and 8.6)

Animals covered	Data gap: Ruminant metabolism study requested (necessary if provisional animal dietary calculation is confirmed by field trials requested on rotational crops).
Time needed to reach a plateau concentration in milk and eggs	To be proposed when metabolism study is available
Animal residue definition for monitoring	To be proposed when metabolism study is available
Animal residue definition for risk assessment	To be proposed when metabolism study is available
Conversion factor (monitoring to risk assessment)	To be proposed when metabolism study is available
Metabolism in rat and ruminant similar (yes/no)	No data on ruminants available - Data gap
Fat soluble residue: (yes/no)	To be proposed when metabolism study is available

Residues in succeeding crops (Annex IIA, point 6.6, Annex IIIA, point 8.5)

On the basis of residue levels of oxadiazon in the rotational crop metabolism study significant residues in root crops (for human consumption and animal feeding) and cereals (animal feeding) are expected. Field rotation studies in cereals and root crops required. A provisional MRL of 0.03 mg/kg for root crops was proposed. For cereal straw a realistic residue level would be 0.03 mg/kg found at the plant back interval of 364 days.

Stability of residues (Annex IIA, point 6 introduction, Annex IIIA, point 8 Introduction)

The residues are considered stable in all oilseed commodities (seeds, oil and press cake) for a period of 18 month at -20°C

Residues from livestock feeding studies (Annex IIA, point 6.4, Annex IIIA, point 8.3)

	Ruminant:	**Poultry:**	**Pig:**
	Conditions of requirement of feeding studies		
Expected intakes by livestock ≥ 0.1 mg/kg diet (dry weight basis) (yes/no - If yes, specify the level)	Yes* Dairy cattle: 0.10 Beef cattle : 0.19 (mg/kg feed DM)	No	Yes*** 0.18 (mg/kg feed DM)
Potential for accumulation (yes/no):	**	-	**
Metabolism studies indicate potential level of residues ≥ 0.01 mg/kg in edible tissues (yes/no)	*No data data required*	No	No
	Feeding studies (Specify the feeding rate in cattle and poultry studies considered as relevant)		
Muscle	No data****	No data not required	No data****
Liver	No data****	No data not required	No data****
Kidney	No data****	No data not required	No data****
Fat	No data****	No data not required	No data****
Milk	No data****		
Eggs		No data not required	

* Using the MRLs of 0.03 mg/kg proposed for rotated root crops and cereal straw and moreover using 0.01 mg/kg for oilseed press cake (primary crop)
** To be evaluated on the basis of the required metabolism study on ruminants
*** Metabolism study on pigs required if metabolism in ruminants is different from rats
**** Necessity of feeding study to be decided on the basis of the results of the required metabolism study on ruminants

Summary of residues data according to the representative uses on raw agricultural commodities and feedingstuffs (Annex IIA, point 6.3, Annex IIIA, point 8.2)

Crop	Northern or Mediterranean Region, field or glasshouse, and any other useful information	Trials results relevant to the representative uses (a)	Recommendation/comments	MRL estimated from trials according to the representative use	HR (c)	STMR (b)
Sunflower	N	6 x <0.01	MRL can be set	0.01* mg/kg	0.01*	0.01*
Sunflower	S	4 x <0.01	MRL can be set	0.01* mg/kg	0.01*	0.01*

(a) Numbers of trials in which particular residue levels were reported *e.g.* 3 x <0.01, 1 x 0.01, 6 x 0.02, 1 x 0.04, 1 x 0.08, 2 x 0.1, 2 x 0.15, 1 x 0.17
(b) Supervised Trials Median Residue *i.e.* the median residue level estimated on the basis of supervised trials relating to the representative use
(c) Highest residue

Consumer risk assessment (Annex IIA, point 6.9, Annex IIIA, point 8.8)

ADI	0.0036 mg/kg bw/day
TMDI (% ADI) according to EFSA PRIMO model	Range (minimum-maximum): 1%-7%
TMDI (% ADI) according to national diets	-
IEDI (WHO European Diet) (% ADI)	Not required since TMDI is below 100%
NEDI (specify diet) (% ADI)	Not required since TMDI is below 100%
Factors included in IEDI and NEDI	Not applicable since IEDI/NEDI not required
ARfD	0.12 mg/kg bw
IESTI (% ARfD)	EFSA PRIMO model: Children: Max 3.8% ARfD (Potatoes) Adults: Max 0.7% ARfD (Potatoes)
NESTI (% ARfD) according to national (to be specified) large portion consumption data	-
Factors included in IESTI and NESTI	-

Processing factors (Annex IIA, point 6.5, Annex IIIA, point 8.4)

Crop/ process/ processed product	Number of studies	Processing factors		Amount transferred (%) (Optional)
		Transfer factor	Yield factor	
No data - Not required	Not applicable	Not applicable	Not applicable	Not applicable

Proposed MRLs (Annex IIA, point 6.7, Annex IIIA, point 8.6)

Sunflower seed	0.01* mg/kg
Root crops	0.03 mg/kg

When the MRL is proposed at the LOQ, this should be annotated by an asterisk after the figure.

Route of degradation (aerobic) in soil (Annex IIA, point 7.1.1.1.1)

Mineralization after 100 days ‡	<1% - 5.2% after 129 days (<1% - 6.4% after 300 days) at 20°C, 45% MHC n = 4 <1% (120 days), 2.95% (365 days) at 25°C, 75% 1/3 Bar MHC n = 1
Non-extractable residues after 100 days ‡	5.52% - 20.46% (129 days) at 20°C, 45% MHC n = 4 10.35% - 35.46%, (365 days) at 20°C, 45% MHC n = 4 2.78% (120 days), 4.82% (365 days) at 25°C, 75% 1/3 Bar MHC n = 1
Metabolites requiring further consideration ‡ - name and/or code, % of applied (range and maximum)	No major metabolites No relevant metabolites

Route of degradation in soil - Supplemental studies (Annex IIA, point 7.1.1.1.2)

Anaerobic degradation ‡

Mineralization after 100 days	<1% after 120 days
Non-extractable residues after 100 days	Non-extractable residues 3.7% (90 days), 3% (120 days)
Metabolites that may require further consideration for risk assessment - name and/or code, % of applied (range and maximum)	AE 0608022 (only under anaerobic conditons)

Soil photolysis ‡

Metabolites that may require further consideration for risk assessment - name and/or code, % of applied (range and maximum)	Xenon lamp (filter to remove wavelength < 290 nm) Irradiance: 514.2 Watts/m^2 comparable to 40° latitude N Mineralisation 3.3% after 30 days Non-extractable residues 5.8% after 30 days No metabolites ≥5% DT_{50} 119 days

Rate of degradation in soil (Annex IIA, point 7.1.1.2, Annex IIIA, point 9.1.1)

Laboratory studies ‡

Parent	Aerobic conditions						
Soil type	X [12]	pH	t. °C / % MWHC	DT_{50} /DT_{90} (d)	DT_{50} (d) 20°C pF2/10kPa	χ^2-error (%)[j]	Method of calculation
Clay Loam (01-01)		7.3 (w) 6.7 (Ca)	20 °C / 45 %	1238 / n.c. [a)]	777	4.6	SFO
Clay Loam (01-02)		8.3 (w) 7.1 (Ca)	20 °C / 45 %	187 / n.c	118	6.5	SFO
Sandy Loam (01-03)		6.6 (w) 4.7 (Ca)	20 °C / 45 %	1050 / n.c.	768	2.7	SFO
Sandy Loam		6.3 (w) 6.2 (Ca)	20 °C / 45 %	755 / n.c.	552	3.4	SFO
Sandy Loam		7.8(w)	25°C / 75% of 1/3 Bar WHC	803 / n.c.	825	2.3	SFO
Geometric mean				***681.8***	***502.6***		

[a)] Not calculated

Field studies ‡

Parent	Aerobic conditions								
Soil type	Location (country or USA state).	X[1]	pH	Depth (cm)	DT_{50} (d) Actual	DT_{90}(d) actual	St. (r^2)	DT_{50} (d) Norm.	Method of calculation
Silty sand (bare soil)	Dollern, North Germany		6.3 (W) 5.5 (Ca)	30	262	869	0.676	96	SFO
Silt (bare soil)	Remseck, South Germany		Not measured (W) 6.3 (Ca)	30	330	1085.3	26.8*	184	SFO
Loamy sand (bare soil)	Ayora, Spain		8.3 (W) 7.4 (Ca)	30	95	314	0.977	110	SFO
Loamy silt (bare soil)	Elne, France		7.9 (W) 7 (Ca)	30	90	298	0.892	107	SFO
Geometric mean					**164.9**	**545**		**120**	

* χ^2 error

pH dependence ‡ (yes / no) (if yes type of dependence)	No

[12] X This column is reserved for any other property that is considered to have a particular impact on the degradation rate.

Soil accumulation and plateau concentration ‡	Data gap identified for field accumulation study.

Laboratory studies ‡

Parent	Anaerobic conditions						
Soil type	X[13]	pH	t. °C / % MWHC	DT_{50} /DT_{90} (d)	DT_{50} (d) 20°C pF2/10kPa	St. (r^2)	Method of calculation
Sandy loam		6.2	20 °C / n.a.	841 > 1000	2794 > 1000	0.41 0.91	SFO EEM*
Geometric mean/median							

* EEM = extended exponential model

Soil adsorption/desorption (Annex IIA, point 7.1.2)

Parent ‡							
Soil Type	OC %	Soil pH	Kd (mL/g)	Koc (mL/g)	Kf (mL/g)	K_{Foc} (mL/g)	1/n
Clay loam (01/01)	2.0	7.3 (w) 6.7 (Ca)			30.54	1527	0.925
Clay loam (01/02)	4.1	8.3 (w) 7.1 (Ca)			62.15	1516	0.958
Sandy loam (01/03)	1.3	6.6 (w) 4.7 (Ca)			12.73	979	0.855
Sandy loam (01/06)	3.3	6.3 (w) 6.2 (Ca)			38.03	1152	0.882
Arithmetic mean					35.9	1294	0.905
pH dependence, Yes or No			No				

Mobility in soil (Annex IIA, point 7.1.3, Annex IIIA, point 9.1.2)

Column leaching ‡	Elution (mm): not available Time period (d): not available
	Leachate: <1% total residues/radioactivity in leachate <0.2 % active substance, >85% total residues/radioactivity retained in top 6 cm
Aged residues leaching ‡	Aged for (d): 30 d Time period (d): not available Elution (mm): not available

[13] X This column is reserved for any other property that is considered to have a particular impact on the degradation rate.

	Analysis of soil residues post ageing (soil residues pre-leaching): not available
	Leachate: <1% total residues/radioactivity in leachate 0.2 % active substance, >90% total residues/radioactivity retained in top 6 cm

Lysimeter/ field leaching studies ‡	Not required

PEC (soil) (Annex IIIA, point 9.1.3)

Parent Method of calculation	DT_{50} (d) for PEC accumulation: 330 days (worst case field half-life – recalculated from Remseck site, South Germany) Kinetics: SFO First order kinetics
Application data	Crop: sunflowers Depth of soil layer: 5 cm Soil bulk density: 1.5 g/cm^3 % plant interception: Pre-emergence therefore no crop interception Number of applications: 1 Application rate(s): 750 g as/ha

$PEC_{(s)}$ (mg/kg)		Single application Actual	Single application Time weighted average	Multiple application Actual	Multiple application Time weighted average
Initial		1.00		x	
Short term	24h	0.998	0.999	x	x
	2d	0.996	0.998	x	x
	4d	0.992	0.996	x	x
Long term	7d	0.985	0.993	x	x
	28d	0.943	0.971	x	x
	50d	0.900	0.949	x	x
	100d	0.811	0.902	x	x

Plateau concentration	0.867 mg/kg after 10 yr Maximum PEC soil after 10 yr 1.87 mg / kg

Route and rate of degradation in water (Annex IIA, point 7.2.1)

Hydrolytic degradation of the active substance and metabolites > 10 % ‡	pH 4: Stable 31 days at 25°C
	pH 7: Stable 31 days at 25°C
	pH 9: DT_{50} 11.7 days at 20°C (r^2 0.997) Major products AE 0608022 (56.9%) (DT_{50} 27.4 days) AE 0592465 (25.1%) (DT_{50} 32.1 days)
Photolytic degradation of active substance and metabolites above 10 % ‡	DT_{50} : 26.3 h (Sterile Buffer pH 9) Natural light, 40°N; DT_{50} 5.93 days Sterile buffer pH 9 DT_{50} 26.3 hours (xenon source); 5.93 days equivalent at latitude 40°N Sterile natural pond water DT_{50} 2.2 days (xenon source), 12.09 days latitude 35°N (Tokyo). Degradates >10%; AE 0608035: 15% AR (5.3 days estimated DT_{50} at 40°N) AE 0608033: 12% AR (0.8 days, estimated DT_{50} at 40°N AE 1117150: 10.6% AR (2.7 days, estimated DT_{50} at 40°N) Degradates >10%, CO_2
Quantum yield of direct phototransformation in water at Σ > 290 nm	2.32×10^{-1} molecules degraded. photon $^{-1}$
Readily biodegradable ‡ (yes/no)	No.

Degradation in water / sediment

Parent	Distribution (max in water 100-102% at day 0. Max. sed 54.5% at day 14-Chattswork system and 63% at day 57-Ongar system)									
Water / sediment system	pH water phase	pH sed	t. °C	DT_{50}-DT_{90} whole sys.	St. (χ^2)	DT_{50}-DT_{90} water	St. (r^2)	DT_{50}- DT_{90} Sed	St. (r^2)	Method of calculation
Emperor Lake, Chatsworth, Derbyshire, UK	6.43 (W)	7.3 (W) 6.6 (Ca)	17.4	126.6 [b] / 420.3	6 [b] /	18 [b]		271.7	0.99	SFO [b] /
Boarded Barns Farm, Ongar, Essex, UK	6.95 (W)	8.1 (W) 7.7 (Ca)	17	126.4 [b] / 419.6	6.3 [b] / -0.99 [C]	17.7 [b]		150-7	0.95	SFO [b] /
Geometric mean				126.5 [b] /		17.9 [b]		211.2		

[b] DT_{50} calculated according to FOCUS Kinetic Guidance. The goodness of fit is indicated with $\chi 2$ – error statistic (%).

Mineralization and non extractable residues					
Water / sediment system	pH water phase	pH sed	Mineralization x % after n d. (end of the study).	Non-extractable residues in sed. Max x % after n d	Non-extractable residues in sed. Max x % after n d (end of the study)
Emperor Lake, Chatsworth, Derbyshire, UK	6.43 (W)	7.3 (W) 6.6 (Ca)	1.9%, after 97 days	31.6% after 42 days	30.83% after 97 days
Boarded Barns Farm, Ongar, Essex, UK	6.95 (W)	8.1 (W) 7.7 (Ca)	1.37% after 97 days	36.43% after 97 days	36.43% after 97 days

PEC (surface water) and PEC sediment (Annex IIIA, point 9.2.3)

Parent Parameters used in FOCUSsw step 1 and 2	Version control no. of FOCUS calculator: STEP1 and STEP 2 version 1.1 Molecular weight (g/mol): 345.2 Water solubility (mg/L): 0.57 K_{OC}/K_{OM} (L/kg): 1294 DT_{50} soil (d): 120 days (geometric mean – field studies) DT_{50} water/sediment system (d): 127 DT_{50} water (d): 127 DT_{50} sediment (d): 999 Crop interception (%): 0
Application rate	Crop: sunflowers Crop interception: 0% Number of applications: 1 Application rate(s): 750 g as/ha Application window: pre-emergence

FOCUS STEP 1 Scenario	Day after overall maximum	PEC_{SW} (µg/L)		PEC_{SED} (µg/kg)	
		Actual	TWA	Actual	TWA
	0 h	98.63		1190.00	
	24 h	93.75	96.19	1210.00	1200.00

FOCUS STEP 1 Scenario	Day after overall maximum	PEC_{SW} (µg/L)		PEC_{SED} (µg/kg)	
		Actual	TWA	Actual	TWA
	2 d	93.24	94.84	1210.00	1200.00
	4 d	92.23	93.79	1190.00	1200.00
	7 d	90.73	92.80	1170.00	1190.00
	14 d	87.33	90.91	1130.00	1170.00
	21 d	84.06	89.17	1090.00	1150.00
	28 d	80.90	87.49	1050.00	1130.00
	42 d	74.95	84.29	969.89	1090.00

FOCUS STEP 2 Scenario	Day after overall maximum	PEC_{SW} (µg/L)		PEC_{SED} (µg/kg)	
		Actual	TWA	Actual	TWA
Northern EU	0 h	21.09	---	264.15	---
	24 h	20.32	20.70	263.50	263.82
	2 d	20.27	20.50	262.86	263.50
	4 d	20.17	20.36	261.58	262.86
	7 d	20.02	20.24	259.67	261.90
	14 d	19.68	20.05	255.28	259.69
	21 d	19.35	19.87	250.96	257.49
	28 d	19.02	19.70	246.71	255.33
	42 d	18.38	19.37	238.42	251.07
Southern EU	0 h	39.02	---	495.96	---
	24 h	38.15	38.58	494.76	495.36
	2 d	38.05	38.34	493.55	494.76
	4 d	37.87	38.15	491.15	493.55
	7 d	37.59	37.97	487.57	491.75
	14 d	36.96	37.62	479.31	487.59
	21 d	36.33	37.29	471.20	483.48
	28 d	35.71	36.98	463.22	479.41
	42 d	34.52	36.35	447.67	471.41

Parent Parameters used in FOCUSsw step 3 -4	Version control no. of FOCUS calculator: SWASH 2.1, including MACRO 4.3b, PRZM 3.21b connected to PRZM in FOCUS 1.5.6, and TOXSWA 2.1.2

	Molecular weight (g/mol): 345.2 Water solubility (mg/L): 0.57 (20°C) Vapour Pressure (Pa): 1.035×10^{-4} (25°C) K_{OC} (L/kg): 1294 mL/g (mean value) DT_{50} soil (d): 120 days (geometric mean in field studies, normalised pF2 and 20°C) $^{1}/n$=0.905 (mean value) DT_{50} water (d): 127 days (whole system geometric mean) DT_{50} sediment (d): 999 days (worst case assumption) Main routes of entry: Drift, Runoff, Drainage depending on scenario.
Application rate	Crop: sunflowers Number of applications: 1 Application rate(s): 750 g as/ha Application window: pre-emergence

FOCUS STEP 3 Scenario	Water body	Day after overall maximum	PEC_{SW} (µg/L)		PEC_{SED} (µg/kg)	
			Actual	TWA	Actual	TWA
D5	pond	0 h	0.252		2.824	
		24 h	0.246	0.249	N.C.	2.824
		2 d	0.24	0.246	N.C.	2.824
		4 d	0.232	0.241	N.C.	2.823
		7 d	0.222	0.235	N.C.	2.822
		14 d	0.205	0.224	N.C.	2.818
		21d	0.189	0.215	N.C.	2.812
		28 d	0.175	0.207	N.C.	2.803
		42 d	0.148	0.191	N.C.	2.774
D5	stream	0 h	3.24		0.603	
		24 h	0.0103	0.241	0.595	0.602
		2 d	0.00963	0.203	0.577	0.6
		4 d	0.00862	0.159	0.538	0.592
		7 d	0.00724	0.132	0.495	0.574
		14 d	0.00708	0.0978	0.439	0.532
		21 d	0.0055	0.0736	0.401	0.501
		28 d	0.00483	0.0598	0.373	0.477
		42 d	0.00489	0.0483	0.439	0.448
R1	pond	0 h	0.556		5.696	
		24 h	0.544	0.55	5.696	5.696
		2 d	0.533	0.545	5.696	5.696
		4 d	0.515	0.535	5.693	5.696
		7 d	0.491	0.522	5.687	5.695
		14 d	0.441	0.495	5.667	5.692
		21 d	0.398	0.471	N.C.	5.687
		28 d	0.378	0.458	N.C.	5.681
		42 d	0.356	0.456	N.C.	5.653

NC – not calculated

FOCUS STEP 3 Scenario	Water body	Day after overall maximum	PEC_{SW} (µg/L)		PEC_{SED} (µg/kg)	
			Actual	TWA	Actual	TWA
R1	stream	0 h	4.068	-	3.642	-
		24 h	0.00419	2.052	3.294	3.51
		2 d	0.00278	1.028	3.042	3.367
		4 d	0.33	0.515	3.082	3.149
		7 d	0.00312	0.518	2.649	3.036
		14 d	0.254	0.382	2.244	2.765
		21d	0.000994	0.293	2.04	2.606
		28 d	0.000522	0.257	2.528	2.6
		42 d	0.000744	0.193	2.07	2.52
R3	stream	0 h	6.584	-	6.397	-
		24 h	0.0363	4.137	5.817	6.256
		2 d	0.0127	2.216	5.351	6.01
		4 d	0.00643	1.118	4.788	5.602
		7 d	0.023	0.642	4.34	5.189
		14 d	0.00224	0.431	3.833	4.649
		21 d	0.0179	0.415	3.546	4.337
		28 d	0.00355	0.354	4.341	4.292
		42 d	0.0225	0.24	4.051	4.311
R4	stream	0 h	8.366	-	24.698	
		24 h	0.0334	5.544	23.653	24.355
		2 d	0.0191	3.164	22.853	23.914
		4 d	0.0193	2.121	21.834	23.299
		7 d	0.0086	1.233	20.783	22.991
		14 d	0.0028	0.775	19.287	21.846
		21 d	0.00195	0.534	18.257	20.972
		28 d	3.793	0.475	19.945	20.415
		42 d	0.0017	0.411	17.357	19.973

NC – not calculated

FOCUS STEP 4 Scenario **drift and runoff mitigation–20 m VFS**	Water body	Day after overall maximum	PEC_{SW} (µg/L)		PEC_{SED} (µg/kg)	
			Actual	TWA	Actual	TWA
D5	pond	0	0.226	.	2.522	-
		24	0.224	0.226	N.C.	2.521
		2d	0.221	0.225	N.C.	2.521
		4d	0.215	0.223	N.C.	2.519
		7d	0.207	0.22	N.C.	2.518
		14d	0.192	0.212	N.C.	2.512
		21d	0.179	0.205	N.C.	2.504
		28d	0.168	0.198	N.C.	2.492
		42d	0.153	0.187	N.C.	2.46
D5	stream	0 h	0.496	-	0.6	-
		24 h	0.221	0.241	0.592	0.599
		2 d	0.06	0.203	0.573	0.597
		4 d	0.177	0.159	0.535	0.588
		7 d	0.0336	0.132	0.492	0.571
		14 d	0.0426	0.0978	0.436	0.529
		21 d	0.0229	0.0736	0.398	0.498
		28 d	0.0451	0.0598	0.37	0.474
		42 d	0.0205	0.0483	0.436	0.445
R1	pond	0 h	0.127	-	1.39	-
		24 h	0.125	0.126	1.39	1.39
		2 d	0.122	0.125	1.39	1.39
		4 d	0.118	0.123	1.389	1.39
		7 d	0.113	0.12	1.388	1.39
		14 d	0.101	0.113	1.383	1.389
		21 d	0.0914	0.108	N.C.	1.388
		28 d	0.0864	0.109	N.C.	1.386
		42 d	0.0806	0.107	N.C.	1.378

NC – not calculated

FOCUS STEP 4 Scenario **drift and runoff mitigation 20 m VFS**	Water body	Day after overall maximum	PEC_{SW} (µg/L)		PEC_{SED} (µg/kg)	
			Actual	TWA	Actual	TWA
R1	stream	0	0.965	-	0.63	-
		24	0.000858	0.487	0.555	0.601
		2d	0.000594	0.244	0.499	0.571
		4d	0.0586	0.122	0.503	0.522
		7d	0.000665	0.121	0.408	0.496
		14d	0.0397	0.0897	0.319	0.447
		21d	0.000218	0.0678	0.278	0.415
		28d	0.000106	0.0589	0.392	0.402
		42d	0.000168	0.0452	0.291	0.391
R3	stream	0 h	1.577	--	1.018	-
		24 h	0.00492	1.000	0.893	0.986
		2 d	0.00245	0.539	0.79	0.935
		4 d	0.00129	0.271	0.662	0.847
		7 d	0.00312	0.156	0.561	0.755
		14 d	0.000437	0.101	0.455	0.641
		21 d	0.00382	0.0987	0.402	0.619
		28 d	0.000743	0.0791	0.613	0.593
		42 d	0.00254	0.0566	0.571	0.585
R4	stream	0 h	2.004	-	2.156	-
		24 h	0.00581	1.342	1.966	2.093
		2 d	0.00304	0.753	1.825	2.016
		4 d	0.00342	0.513	1.656	1.92
		7 d	0.00139	0.297	1.498	1.863
		14 d	0.000326	0.184	1.317	1.679
		21 d	0.000185	0.124	1.216	1.557
		28 d	0.893	0.114	1.704	1.506
		42 d	0.000218	0.0975	1.29	1.52

NC – not calculated

Generic worst case metabolite (e.g. AE0608022) Parameters used in FOCUSsw step 2	Koc (L/kg): 1 DT_{50} soil (d): 999 days (worst case assumption) DT_{50} water/sediment system (d): 999 (representative worst case) DT_{50} water (d): 999 DT_{50} sediment (d): 999 Crop interception (%):0 Maximum fraction in soil (% molar basis with respect to the parent): 100 Maximum fraction in water (% molar basis with respect to the parent): 100
Application rate	Crop: sunflowers Number of applications: 1 Application rate(s): 750 g as/ha Application window: March - May

FOCUS STEP 2 Scenario	Day after overall maximum	PEC_{SW} (µg/L)		PEC_{SED} (µg/kg dry)	
		Actual	TWA	Actual	TWA
Northern EU	0 h	56.7	—	0.57	—
	24 h	56.6	56.6	0.57	0.57
	2 d	56.6	56.6	0.57	0.57
	4 d	56.5	56.6	0.56	0.57
	7 d	56.4	56.5	0.56	0.56
	14 d	56.1	56.4	0.56	0.56
	21 d	55.8	56.3	0.56	0.56
	28 d	55.6	56.1	0.56	0.56
	42 d	55.0	55.8	0.55	0.56
Southern EU	0 h	106.5	—	1.06	—
	24 h	106.4	106.4	1.06	1.06
	2 d	106.3	106.4	1.06	1.06
	4 d	106.2	106.3	1.06	1.06
	7 d	105.9	106.2	1.06	1.06
	14 d	105.4	105.9	1.05	1.06
	21 d	104.9	105.7	1.05	1.06
	28 d	104.4	105.4	1.04	1.05
	42 d	103.4	104.9	1.03	1.05

EFSA NOTE: RMS please chek PEC sediment. The results of the new calculations presented by the RMS 80% (mass reduction) are not considered here. Also the potential for accumulation into the sediment should be considered here. If a accumulation factor of 1,96 is applied to the max PEC sed calculated by the RMS an overall maximum PEC SED to be used for Tier 1 risk assessment would be: 10.17 µg / kg.

Generic worst case metabolite (e.g. AE0608022) Parameters used in FOCUSsw step 2	Koc (L/kg): 3000 DT_{50} soil (d): 999 days (worst case assumption) DT_{50} water/sediment system (d): 999 (representative worst case) DT_{50} water (d): 999 DT_{50} sediment (d): 999 Crop interception (%):0 Maximum fraction in soil (% molar basis with respect to the parent): 100 Maximum fraction in water (% molar basis with respect to the parent): 100
Application rate	Crop: sunflowers Number of applications: 1 Application rate(s): 750 g as/ha Application window: March - May

FOCUS STEP 2 Scenario	Day after overall maximum	PEC_{SW} (µg/L)		PEC_{SED} (µg/kg dry)	
		Actual	TWA	Actual	TWA
Northern EU	0 h	11.87	---	340.20	---
	24 h	11.34	11.61	339.97	340.08
	2 d	11.33	11.47	339.73	339.97
	4 d	11.32	11.40	339.26	339.73
	7 d	11.29	11.36	338.55	339.38
	14 d	11.24	11.31	336.91	338.56
	21 d	11.18	11.28	335.28	337.74
	28 d	11.13	11.25	333.66	336.92
	42 d	11.02	11.19	330.43	335.29
Southern EU	0 h	21.85	---	639.16	---
	24 h	21.31	21.58	638.72	638.94
	2 d	21.29	21.44	638.28	638.72
	4 d	21.26	21.36	637.39	638.28
	7 d	21.22	21.31	636.07	637.61
	14 d	21.11	21.24	632.99	636.07
	21 d	21.01	21.18	629.92	634.53
	28 d	20.91	21.12	626.87	633.00
	42 d	20.71	21.02	620.81	629.94

PEC (ground water) (Annex IIIA, point 9.2.1)

Method of calculation and type of study (*e.g.* modelling, field leaching, lysimeter)	Modelling using FOCUS model(s), with appropriate FOCUSgw scenarios, according to FOCUS guidance. Model(s) used: FOCUS PEARL v. 3.3.3; FOCUS PELMO v. 3.3.2; Scenarios (list of names): Piacenza and Sevilla Crop: sunflowers Geometric mean parent $DT_{50field}$ 108 days (normalisation to 10kPa or pF2, 20 °C with Q10 of 2.2). K_{OC}: parent, arithmetic mean or median 1294 mL/g (men value) K_{OM}: parent, arithmetic mean 750 mL/g $^1/_n$= 0.905 (mean value).
Application rate	Application rate: 750 g as/ha. No. of applications:1 Time of application (month or season): Piacenza 13th April Sevilla 3rd March Crop interception: 0%

PEC(gw) - FOCUS modelling results (80th percentile annual average concentration at 1m)

	Scenario	Parent (µg/L)	Metabolite (µg/L)		
			1	2	3
FOCUS PEARL v.3.3.3/ sunflowers	Piacenza	<0.001	Not relevant		
	Sevilla	<0.001			
	Scenario	Parent (µg/L)	Metabolite (µg/L)		
			1	2	3
FOCUS PELMO v.3.3.2/ sunflowers	Piacenza	<0.001	Not relevant		
	Sevilla	<0.001			

$PEC_{(gw)}$ From lysimeter / field studies

Parent	1st year	2nd year	3rd year
Annual average (µg/L)	Not required		

Fate and behaviour in air (Annex IIA, point 7.2.2, Annex III, point 9.3)

Direct photolysis in air ‡	Not provided.
Quantum yield of direct phototransformation	Not provided.

Photochemical oxidative degradation in air ‡	DT_{50} of 0.220 days derived by the Atkinson model OH (12 or 24 h) concentration assumed = 1.5×10^{-6} OH radicals / cm^3 K_{OH} 24.344 × 10^{-12} cm^3 $molecule^{-1}$ sec^{-1}
Volatilisation ‡	from plant surfaces (BBA guideline): 5.1% after 24 hours
	from soil surfaces (BBA guideline): 6.7% after 24 hours
Metabolites	no

PEC (air)

Method of calculation	

$PEC_{(a)}$

Maximum concentration	Not relevant

Residues requiring further assessment

Environmental occurring metabolite requiring further assessment by other disciplines (toxicology and ecotoxicology).	Soil: Oxadiazon, AE0608022 (anaerobic study) Surface Water: Oxadiazon, AE0608022 (hydrolysis under alkaline conditions) Sediment: Oxadiazon, AE0608022 (hydrolysis under alkaline conditions Ground water: Oxadiazon Air: Oxadiazon

Monitoring data, if available (Annex IIA, point 7.4)

Soil (indicate location and type of study)	No data provided - none requested
Surface water (indicate location and type of study)	No data provided - none requested
Ground water (indicate location and type of study)	No data provided - none requested
Air (indicate location and type of study)	No data provided - none requested

Effects on terrestrial vertebrates (Annex IIA, point 8.1, Annex IIIA, points 10.1 and 10.3)

Species	Test substance	Time scale	End point (mg/kg bw/day)	End point (mg/kg diet)
Birds ‡				
Bobwhite quail	a.s.	Acute	LD_{50} > 2150	-
Bobwhite quail	a.s.	Short-term	LC_{50} > 730	LC_{50} > 5000
Mallard duck	a.s.	Short-term	LC_{50} > 1143	LC_{50} > 5000
Bobwhite quail	a.s.	Long-term	NOEC = 90.8	NOEC = 1000
Mallard duck	a.s.	Long-term	NOEC = 105.6	NOEC = 1000
Mammals ‡				
Rat	a.s.	Acute	LD_{50} > 5000	-
Rat	a.s.	Long-term	NOAEL = 15	NOAEL = 200

Toxicity/exposure ratios for terrestrial vertebrates (Annex IIIA, points 10.1 and 10.3)

Crop and application rate

Indicator species/Category	Time scale	ETE	TER	Annex VI Trigger
Tier 1 (Birds)				
Insectivorous bird	Acute	10.9	>197	10
Herbivorous bird	Acute	49.6	> 43.3	10
Insectivorous bird	Short-term	3.98	>183	10
Herbivorous bird	Short-term	22.8	>32.0	10
Insectivorous bird	Long-term	3.98	4.02*	5
Herbivorous bird	Long-term	12.1	7.50	5
Tier 1– uptake via drinking water (Birds)				
Bobwhite quail	Acute	-	126470	10
Tier 1 – secondary poisoning (Birds)				
Earthworm-eating bird	Long-term	-	0.54	5
Fish-eating bird	Long-term	-	3352	5
Tier 1 (Mammals)				
Insectivorous mammals	Acute	6.61	> 756	10
Insectivorous mammals	Long-term	2.41	6.22	5
Tier 1– uptake via drinking water (Mammals)				

Indicator species/Category	Time scale	ETE	TER	Annex VI Trigger
Rat	Acute	-	544722	10
Tier 1 – secondary poisoning (Mammals)				
Earthworm-eating mammals	Long-term	-	0.07	5
Fish-eating mammals	Long-term	-	894	5

* TER calculation was based on the worst case RUD value for small insects. Insectivorous birds would, however, feed at least to a certain percentage on large insects in the bare fields and therefore the risk was considered as low.

Toxicity data for aquatic species (most sensitive species of each group) (Annex IIA, point 8.2, Annex IIIA, point 10.2)

Group	Test substance	Time-scale (Test type)	End point	Toxicity (mg/L)
Laboratory tests ‡				
Fish				
Lepomis macrochirus	a.s.	96 hr (flow-through)	Mortality, EC_{50}	1.2
Oncorhynchus mykiss	a.s.	96 hr (flow-through)	Mortality, EC_{50}	1.2
Oncorhynchus mykiss	a.s	60 d	ELS NOEC	0.00088
Aquatic invertebrate				
Daphnia magna	a.s.	48 h (flow-through)	Mortality, EC_{50}	> 2.4
Daphnia magna	a.s.	21 d (flow-through)	Reproduction, NOEC	0.03
Sediment dwelling organisms				
Chironomus riparius	a.s.	28 d (static)	NOEC	5.0
Algae				
*Anabaena flos-aquae**	a.s.	120 h (static)	E_rC_{50}	3.7
Selenastrum capricornutum	a.s.	120 h (static)	Biomass: E_bC_{50} Growth rate: E_rC_{50}	0.0082 0.021

Group	Test substance	Time-scale (Test type)	End point	Toxicity (mg/L)
Scenedesmus subspicatus	a.s.	72h (static)	Biomass: E_bC_{50} Growth rate: E_rC_{50}	0.00318 0.00423
Green algae (*Scenedesmus subspicatus*) with sediment	a.s	72h (static)	Biomass: E_bC_{50} Growth rate: E_rC_{50}	0.0096 0.0108
Xanthonema debile[#]		168h	Biomass: E_bC_{50} Growth rate: E_rC_{50}	>0.337 >0.337L
Phaedactylum tricornutum		120h	Biomass: E_bC_{50} Growth rate: E_rC_{50}	>0.819 >0.819
Gymnodinium impatiens		120h	Biomass: E_bC_{50} Growth rate: E_rC_{50}	0.0197 0.0467
Scenedesmus subspicatus	RONSTAR®	72h (static)	Biomass: E_bC_{50} Growth rate: E_rC_{50}	0.0204 (a.s.) 0.080 (product) 0.00714 (a.s.) 0.028 (product)
Scenedesmus subspicatus	AE0608033	72 h (static)	Biomass: E_bC_{50} Growth rate: E_rC_{50} [1]	24 >36.6
Scenedesmus subspicatus	AE 0608035	72 h (static)	Biomass: E_bC_{50} Growth rate: E_rC_{50}	42 > 88
Scenedesmus subspicatus	AE 0592465	72 h (static)	Biomass: E_bC_{50} Growth rate: E_rC_{50}	> 6.9 > 6.9
Scenedesmus subspicatus	AE 1117150	72 h (static)	Biomass: E_bC_{50} Growth rate: E_rC_{50}	>57 >57
Scenedesmus subspicatus	AE 0608022	72 h (static)	Biomass: E_bC_{50} Growth rate: E_rC_{50} [1]	5.1 >9
Higher plant				
Lemna gibba	a.s.	14 d (static)	Growth EC_{50}	0.057

Group	Test substance	Time-scale (Test type)	End point	Toxicity (mg/L)
Lemna gibba	RONSTAR®	7 d (static)	Fronds, EC_{50} Growth, EC_{50}	0.024 (a.s.) 0.092 (product) 0.0094 (a.s.) 0.036 (product)
Microcosm or mesocosm tests				
Not required				

*The variation in the controls test the only valid endpoint is the growth rate.
EC50 for *Xanthonena debile* is the same for 72, 100 and 166 h.
[1] based on mean measured concentrations ($_{mm}$).

Toxicity/exposure ratios for the most sensitive aquatic organisms (Annex IIIA, point 10.2)

FOCUS Step1

Crop: Sunflower;Application rate: 0.75 kg a.i./ha

Test substance	Organism	Toxicity end point (mg/L)	Time scale	PEC_i	PEC_{twa}	TER	Annex VI Trigger[1]
a.s.	Fish	LC_{50} = 1.2	96 hours	0.0986	-	12.17	100
a.s.	Fish	NOEC = 0.00088	60days	0.0986	-	0.01	10
a.s.	Aquatic invertebrates	LC_{50} > 2.4	48 hours	0.0986	-	>24.34	100
a.s.	Aquatic invertebrates	NOEC = 0.03	21days	0.0986	-	0.30	10
a.s.	Algae	EbC50 = 0.00318 ErC50 = 0.00423	72 hours	0.0986	-	0.032 0.043	10
a.s.	Higher plants	ErC_{50} = 0.024	7 days	0.0986	-	0.24	10
a.s.	Sediment-dwelling organisms	NOEC = 5	28 days	0.0986	-	50.71	10

FOCUS Step 2

Crop: Sunflower;Application rate: 0.75 kg a.i./ha

Test substance	N/S[1]	Organism[2]	Toxicity end point (mg/L)	Time scale	PECsw Max[3]	TER	Annex VI Trigger[4]
a.s.	N	Fish	LC_{50} = 1.2	96 hours	0.03902	30.75	100

Test substance	N/S[1]	Organism[2]	Toxicity end point (mg/L)	Time scale	PECsw Max[3]	TER	Annex VI Trigger[4]
		Oncorhynchus mykiss					
a.s.	N	Fish *Oncorhynchus mykiss*	NOEC = 0.00088	ELS 60 days	0.03902	0.023	10
a.s.	N	Aquatic invertebrates *Daphnia magna*	LC_{50} > 2.4	48 hours	0.03902	>61.51	100
a.s.	N	Aquatic invertebrates *Daphnia magna*	NOEC = 0.03	21 days	0.03902	0.77	10
a.s.	N	Algae *Scenedesmus subspicatus*	EbC50 = 0.00318 ErC50 = 0.00423	72 hours	0.03902	0.081 0.11	10
a.s.	N	Sediment-dwelling organisms *Chironomus riparius*	NOEC = 5 31.2 mg a.s./kg sed dry water	28 days	PECsw = 0.03902 PECsed =0.0486 *	128 642	10
RONSTAR®	N	Plants *Lemna gibba*	ErC_{50} = 0.024	7days	0.03902	0.615	10
AE0608033	-	Algae *Scenedesmus subspicatus*	ErC_{50} > 36.6	72 hours	0.107#	>342.1	10
AE0608035	-	Algae *Scenedesmus subspicatus*	ErC50 > 88	72 hours	0.107#	>822	10
AE0592465	-	Algae *Scenedesmus subspicatus*	ErC50 > 6.9	72 hours	0.107#	>64.5	10
AE1117150	-	Algae *Scenedesmus subspicatus*	ErC50 > 57	72 hours	0.107#	>533	10

Test substance	N/S[1]	Organism[2]	Toxicity end point (mg/L)	Time scale	PECsw Max [3]	TER	Annex VI Trigger[4]
AE0608022	-	Algae *Scenedesmus subspicatus*	ErC50 > 9	72 hours	0.107[#]	84.1	10

* maximum PECsed considering accumulation in sediment over 20 years. Worst case value according to Focus Step 3, R4 stream.
[#] generic worst case PECmetabolite

Refined aquatic risk assessment using higher tier FOCUS modelling.

FOCUS Step 3

Crop: Sunflower; Application rate: 0.75 kg a.i/ha

Test substance	Scenario	Water body type	Test organism	Time scale	Toxicity end point (mg/L)	PECsw Max	TER	Annex VI trigger [5]
Acute								
a.s.	D5	La Jaillière Pond & Stream	Fish *Oncorhynchus mykiss*	96 hr flow-through	LC_{50} =1.2	Pond = 0.000252 Stream = 0.003240	4761.9 370.37	100
a.s.	D5	La Jaillière Pond & Stream	Aquatic invertebrates *Daphnia magna*	48 hr flow-through	LC_{50} >2.4	Pond = 0.000252 Stream = 0.003240	>9523.8 >740.74	100
a.s.	R1	Weiherbach Pond & Stream	Fish *Oncorhynchus mykiss*	96 hr flow-through	LC_{50} =1.2	Pond = 0.000556 Stream = 0.004068	2158.27 294.98	100
a.s.	R1	Weiherbach Pond & Stream	Aquatic invertebrates *Daphnia magna*	48 hr flow-through	LC_{50} >2.4	Pond = 0.000556 Stream = 0.004068	>4316.54 >589.97	100
a.s.	R3	Bologna Stream	Fish *Oncorhynchus*	96 hr flow-	LC_{50} =1.2	Stream = 0.006584	182.26	100

Test substance	Scenario	Water body type	Test organism	Time scale	Toxicity end point (mg/L)	PECsw Max	TER	Annex VI trigger [5]
			mykiss	through				
a.s.	R3	Bologna Stream	Aquatic invertebrates *Daphnia magna*	48 hr flow-through	LC_{50} >2.4	Stream = 0.006584	>364.52	100
a.s.	R4	Roujan Stream	Fish *Oncorhynchus mykiss*	96 hr flow-through	LC_{50} =1.2	Stream = 0.008366	143.43	100
a.s.	R4	Roujan Stream	Aquatic invertebrates *Daphnia magna*	48 hr flow-through	LC_{50} >2.4	Stream = 0.008366	>286.87	100
Chronic								
a.s.	D5	La Jaillière Pond & Stream	Fish *Oncorhynchus mykiss*	ELS 60 days	NOEC = 0.00088	Pond = 0.000252 Stream = 0.003240	3.49 0.27	10
a.s.	D5	La Jaillière Pond & Stream	Aquatic invertebrates *Daphnia magna*	21 days	NOEC = 0.03	Pond = 0.000252 Stream = 0.003240	119.04 9.30	10
a.s.	D5	La Jaillière Pond & Stream	Algae *Scenedesmus subspicatus*	72 hours	EbC50 = 0.00318 ErC50 = 0.00423	Pond = 0.000252 Stream = 0.003240	12.62 1.3 16.78 1.31	10
RONSTAR ®	D5	La Jaillière Pond & Stream	Plants *Lemna gibba*	7days	ErC_{50} = 0.024	Pond = 0.000252 Stream = 0.003240	95.24 7.41	10
a.s.	R1	Weiherbach Pond & Stream	Fish *Oncorhynchus mykiss*	ELS 60 days	NOEC = 0.00088	Pond = 0.000556 Stream = 0.004068	1.58 0.22	10

Test substance	Scenario	Water body type	Test organism	Time scale	Toxicity end point (mg/L)	PECsw Max	TER	Annex VI trigger [5]
a.s.	R1	Weiherbach Pond & Stream	Aquatic invertebrates *Daphnia magna*	21 days	NOEC = 0.03	Pond = 0.000556 Stream = 0.004068	54 7.37	10
a.s.	R1	Weiherbach Pond & Stream	Algae *Scenedesmus subspicatus*	72 hours	EbC50 = 0.00318 ErC50 = 0.00423	Pond = 0.000556 Stream = 0.004068	5.72 1.57 7.61 1.04	10
RONSTAR®	R1	Weiherbach Pond & Stream	Plants *Lemna gibba*	7days	ErC_{50} = 0.024	Pond = 0.000556 Stream = 0.004068	43.2 6	10
a.s.	R3	Bologna Stream	Fish *Oncorhynchus mykiss*	ELS 60 days	NOEC = 0.00088	Stream = 0.006584	0.13	10
a.s.	R3	Bologna Stream	Aquatic invertebrates *Daphnia magna*	21 days	NOEC = 0.03	Stream = 0.006584	5	10
a.s.	R3	Bologna Stream	Algae *Scenedesmus subspicatus*	72 hours	EbC50 = 0.00318 ErC50 = 0.00423	Stream = 0.006584	0.48 0.64	10
RONSTAR®	R3	Bologna Stream	Plants *Lemna gibba*	7days	ErC_{50} = 0.024	Stream = 0.006584	3.65	10
a.s.	R4	Roujan Stream	Fish *Oncorhynchus mykiss*	ELS 60 days	NOEC = 0.00088	Stream = 0.008366	0.11	10
a.s.	R4	Roujan Stream	Aquatic invertebrates *Daphnia magna*	21 days	NOEC = 0.03	Stream = 0.008366	3.6	10
a.s.	R4	Roujan Stream	Algae *Scenedesmus subspicatus*	72 hours	EbC50 = 0.00318 ErC50 = 0.00423	Stream = 0.008366	0.38 0.51	10

Test substance	Scenario	Water body type	Test organism	Time scale	Toxicity end point (mg/L)	PECsw Max	TER	Annex VI trigger [5]
RONSTAR ®	R4	Roujan Stream	Plants *Lemna gibba*	7days	ErC_{50} = 0.024	Stream = 0.008366	3	10

FOCUS Step 4

Crop: Sunflower;Application rate: 0.75 kg a.i./ha

Scenario	Water body type[2]	Test organism	Time scale	Toxicity end point	Buffer zone distance	PECsw Max	TER	Annex VI trigger[5]
D5	La Jaillière Pond & Stream	Fish *Oncorhynchus mykiss*	ELS 60 days	NOEC = 0.00088	20m drift and runoff mitigation	Pond = 0.000226 Stream = 0.000496	4 1.8	10
D5	La Jaillière Pond & Stream	Aquatic invertebrates *Daphnia magna*	21 days	NOEC = 0.03	20m drift and runoff mitigation	Pond = 0.000226 Stream = 0.000496	132.7 60.5	10
D5	La Jaillière Pond & Stream	Algae *Scenedesmus subspicatus*	72 hours	EbC50 = 0.00318	20m drift and runoff mitigation	Pond = 0.000226 Stream = 0.000496	14.1 6.41	10
				ErC50 = 0.00423			18.72 8.53	
D5	La Jaillière Pond & Stream	Plants *Lemna gibba*	7days	ErC_{50} = 0.024	20m drift and runoff mitigation	Pond = 0.000226 Stream = 0.000496	106.2 48.4	10
R1	Weiherbach Pond & Stream	Fish *Oncorhynchus mykiss*	ELS 60 days	NOEC = 0.00088	20m drift and runoff mitigation	Pond = 0.000127 Stream = 0.000965	7 0.9	10
R1	Weiherbach Pond & Stream	Aquatic invertebrates *Daphnia magna*	21 days	NOEC = 0.03	20m drift and runoff mitigation	Pond = 0.000127 Stream = 0.000965	236.2 31.1	10

Scenario	Water body type[2]	Test organism	Time scale	Toxicity end point	Buffer zone distance	PECsw Max	TER	Annex VI trigger[5]
R1	Weiherbach Pond & Stream	Algae *Scenedesmus subspicatus*	72 hours	EbC50 = 0.00318 ErC50 = 0.00423	20m drift and runoff mitigation	Pond = 0.000127 Stream = 0.000965	25.04 3.30 33.31 4.38	10
R1	Weiherbach Pond & Stream	Plants *Lemna gibba*	7days	ErC_{50} = 0.024	20m drift and runoff mitigation	Pond = 0.000127 Stream = 0.000965	189 25	10
R3	Bologna Stream	Fish *Oncorhynchus mykiss*	ELS 60 days	NOEC = 0.00088	20m drift and runoff mitigation	Stream = 0.001577	0.6	10
R3	Bologna Stream	Aquatic invertebrates *Daphnia magna*	21 days	NOEC = 0.03	20m drift and runoff mitigation	Stream = 0.001577	19	10
R3	Bologna Stream	Algae *Scenedesmus subspicatus*	72 hours	EbC50 = 0.00318 ErC50 = 0.00423	20m drift and runoff mitigation	Stream = 0.001577	2.02 2.68	10
R3	Bologna Stream	Plants *Lemna gibba*	7days	ErC_{50} = 0.024	20m drift and runoff mitigation	Stream = 0.001577	15.22	10
R4	Roujan Stream	Fish *Oncorhynchus mykiss*	ELS 60 days	NOEC = 0.00088	20m drift and runoff mitigation	Stream = 0.002004	0.44	10
R4	Roujan Stream	Aquatic invertebrates *Daphnia magna*	21 days	NOEC = 0.03	20m drift and runoff mitigation	Stream = 0.002004	15	10
R4	Roujan Stream	Algae *Scenedesmus subspicatus*	72 hours	EbC50 = 0.00318 ErC50 = 0.00423	20m drift and runoff mitigation	Stream = 0.002004	1.6 2.11	10
R4	Roujan Stream	Plants *Lemna gibba*	7days	ErC_{50} = 0.024	20m drift and runoff mitigation	Stream = 0.002004	12	10

Refined TER calculations according to FOCUS Step 4 (20m buffer for drift and runoff mitigation), considering the PECmax and using refined endpoints for algae.

Scenario[1]	Water body type[2]	Test organism[3]	Time scale	Toxicity end point	Buffer zone distance	PECsw Max	TER	Annex VI trigger[5]
D5	La Jaillière Pond & Stream	Algae *Selenastrum capricornutum*	120 hr	E_bC_{50} = 0.0082	20m drift and runoff mitigation	Pond = 0.000226 Stream = 0.000496	36.28 16.53	10
R1	Weiherbach Pond & Stream	Algae *Selenastrum capricornutum*	120 hr	E_bC_{50} = 0.0082	20m drift and runoff mitigation	Pond = 0.000127 Stream = 0.000965	64.57 **8.50**	10
R3	Bologna Stream	Algae *Selenastrum capricornutum*	120 hr	E_bC_{50} = 0.0082	20m drift and runoff mitigation	Stream = 0.001577	**5.20**	10
R4	Roujan Stream	Algae *Selenastrum capricornutum*	120 hr	E_bC_{50} = 0.0082	20m drift and runoff mitigation	Stream = 0.002004	**4.09**	10

Scenario[1]	Water body type[2]	Test organism[3]	Time scale	Toxicity end point	Buffer zone distance	PECsw Max	TER	Annex VI trigger[5]
D5	La Jaillière Pond & Stream	Algae *Gymnodinium impatiens*	120 hr	E_rC_{50} = 0.0197	20m drift and runoff mitigation	Pond = 0.000226 Stream = 0.000496	87.2 39.7	10
R1	Weiherbach Pond & Stream	Algae *Gymnodinium impatiens*	120 hr	E_rC_{50} = 0.0197	20m drift and runoff mitigation	Pond = 0.000127 Stream = 0.000965	155.12 20.42	10
R3	Bologna	Algae	120 hr	E_rC_{50} =	20m drift	Stream =	12.5	10

Scenario[1]	Water body type[2]	Test organism[3]	Time scale	Toxicity end point	Buffer zone distance	PECsw Max	TER	Annex VI trigger[5]
	Stream	*Gymnodinium impatiens*		0.0197	and runoff mitigation	0.001577		
R4	Roujan Stream	Algae *Gymnodinium impatiens*	120 hr	ErC_{50} = 0.0197	20m drift and runoff mitigation	Stream = 0.002004	9.83	10

Bioconcentration	
	Active substance
$logP_{O/W}$	5.33
Bioconcentration factor (BCF)‡	243* 1111[#]
Annex VI Trigger for the bioconcentration factor	1000
Clearance time (days) (CT_{50})	2.5
(CT_{90})	8.3
Level and nature of residues (%) in organisms after the 14 day depuration phase	2.5%

* expressed as amount of Oxadiazon residues found in fish in apparent steady state

[#] apparent steady state in whole fish, concentration of total radioactivity corresponding to 9.78 µg equiv/ g fresh weight

Effects on honeybees (Annex IIA, point 8.3.1, Annex IIIA, point 10.4)

Test substance	Acute oral toxicity (LD_{50} µg/bee)	Acute contact toxicity (LD_{50} µg/bee)
a.s. ‡	> 110.5	> 100
RONSTAR®	> 51.5	>100
Field or semi-field tests not required		

Hazard quotients for honey bees (Annex IIIA, point 10.4)

Crop: Sunflower;Application rate: 0.75 kg a.i./ha

Test substance	Route	Hazard quotient	Annex VI Trigger
a.s.	Contact	<7.5	50
a.s.	oral	<6.8	50
RONSTAR®	Contact	<7.5	50
RONSTAR®	oral	<14.6	50

Effects on other arthropod species (Annex IIA, point 8.3.2, Annex IIIA, point 10.5)

Laboratory tests with standard sensitive species

Species	Test Substance	End point	Effect (LR_{50} g/ha)
Typhlodromus pyri ‡	RONSTAR®	Mortality Fecundity	LR_{50} = 150 g a.s./ha Not significant effects in all rate tested
Aphidius rhopalosiphi ‡	RONSTAR®	Mortality Fecundity	LR_{50} = 875 g a.s../ha (3.5 L/ha) 88.5% of effects at 375 g a.s./ha (1.5 L/ha) and 100% at 750 g a.s./ha (3 L/ha)

Crop: Sunflower;Application rate: 0.75 kg a.i./ha

Test substance	Species	Effect (LR_{50} g/ha)	HQ in-field	HQ off-field[1]	Trigger
RONSTAR®	*Typhlodromus pyri*	149 g/ha	**5.03**	0.14	2
RONSTAR®	*Aphidius rhopalosiphi*	875 g/ha	0.86	0.024	2

[1] calculated with 2.77% drift at 1 m

Further laboratory and extended laboratory studies ‡

Species	Life stage	Test substance, substrate and duration	Dose (g/ha)[1]	End point	% effect[2]	Trigger value
Poecilus cupreus	Adults	RONSTAR®	750 g a.s./ha (3 L/ha)	Mortality Feeding activity	No effects No effects	50 %
Chrysoperla carnea	Larvae	RONSTAR®	30 g a.s./ha 750 g a.s./ha	Mortality Fecundity	No effects 49% of effects at 30 g a.s./ha and 56% at 750 g a.s./ha	50 %
Chrysoperla carnea	Larvae	RONSTAR®	7.5 g a.s./ha	Mortality Fecundity	No effects No effects	50 %

Species	Life stage	Test substance, substrate and duration	Dose (g/ha)[1]	End point	% effect[2]	Trigger value
Typhlodromus pyri	Nymphs	RONSTAR®	7.5 g a.s./ha (0.03 L/ha) 30 g a.s./ha (0.12 L/ha) 750 g a.s./ha (3 L/ha)	Mortality Fecundity	5% of effects at 7.5 g a.s./ha (0.03 L/ha), 16% at 30 g a.s./ha (0.12 L/ha) and 45% at 750 g a.s./ha (3 L/ha) 45% at 750 g a.s./ha (3 L/ha), no effects at 30 g a.s./ha (0.12 L/ha) and at 7.5 g a.s./ha (0.03 L/ha)	50 %
Aleochara bilineata	Adults	RONSTAR®	7.5 g a.s./ha (0.03 L/ha) 30 g a.s./ha (0.12 L/ha) 750 g a.s./ha (3 L/ha)	Mortality Fecundity	Not available No significant effects in all rates tested	
Hypoaspis aculeifer	Nymphs	RONSTAR®	750 g a.s./ha (3 L/ha) 1870 g a.s./ha (7.5 L/ha) 4750 g a.s./ha (19 L/ha) 11750 g a.s./ha (47 L/ha)	Mortality Fecundity	No effects No effects at the dose rates of 4750 and 11750 g a.s./ha	

[1] initial residues
[2] positive percentages are related to adverse effects

Field or semi-field tests not required

Effects on earthworms, other soil macro-organisms and soil micro-organisms (Annex IIA points 8.4 and 8.5. Annex IIIA, points, 10.6 and 10.7)

Test organism	Test substance	Time scale	End point[1]
Earthworms			
Eisenia foetida	a.s. ‡	14 days	LC_{50} >500* mg a.s./kg d.w.soil
Eisenia foetida	a.s. ‡	8 weeks	NOEC = 66.5* mg a.s./kg d.w.soil
Eisenia foetida	Oxadiazon EC250	14 days	LC_{50} =109 mg a.s./kg d.w.soil
Eisenia foetida	Oxadiazon EC250	8 weeks	NOEC = 10 mg a.s./kg d.w.soil
Other soil macro-organisms			
Soil mite *Hypoaspis aculeifer*	Oxadiazon EC250	14 days	NOEC = 339 mg a.s./kg d.w.soil
Soil micro-organisms			
Nitrogen mineralisation	Oxadiazon EC250	28 days	<25 % effect at day 28 at 2.0 mg a.s./kg d.w.soil
Carbon mineralisation	Oxadiazon EC250	28 days	<25 % effect at day 28 at 2.0 mg a.s./kg d.w.soil
Field studies not required			

* indicate where end point has been corrected due to log Pow >2.0 (e.g. LC_{50corr})

Toxicity/exposure ratios for soil organisms

Crop and application rate

Test organism	Test substance	Time scale	Soil PEC[1] (mg a.s./kg soil)	TER	Trigger
Earthworms					
Eisenia foetida	a.s. ‡	14 days	1.643	>304	10
Eisenia foetida	a.s. ‡	8 weeks	1.643	40.5	5
Eisenia foetida	Oxadiazon EC250	14 days	1.643	66.3	10
Eisenia foetida	Oxadiazon EC250	8 weeks	1.643	6.1	5
Other soil macro-organisms					
Soil mite *Hypoaspis aculeifer*	Oxadiazon EC250	14 days	1.643	206	5

[1] PEC soil Non Tillage of Oxadiazon in the upper 5 cm including accumulation

Effects on non target plants (Annex IIA, point 8.6, Annex IIIA, point 10.8)

Laboratory dose response tests (Tier 2 - deterministic approach)

Most sensitive species	Test substance	ER_{50} (g/ha)[2] vegetative vigour	ER_{50} (g/ha)[2] emergence	Exposure[1] (g/ha)[2]	TER	Trigger
Ten plants	Oxadiazon	20.2 g a.s./ha (tomato, vegetative vigour 14 d)	39.23 g a.s./ha (cucumber, seedling emergence 14 d)	--	--	--
Ten plants (tomato)	RONSTAR®	15.2 g a.s./ha	--	20.8[1 a] 2.18[1 b]	0.73 6.97	5 5
Ten plants (tomato)	RONSTAR®	--	72.8 g a.s./ha	--	--	--

[1 a] 750 g a.i./ha (application rate) x 2.77% (spray drift rate for a distance of 1 m of the field edge)
[1 b] 750 g a.i./ha (application rate) x 0.29% (spray drift rate for a distance of 10 m of the field edge)
[2] endpoints for preparation are expressed in units of a.s.

Laboratory dose response tests (Tier 2 - probabilistic approach)

Seedling emergence (survival)	HC_5 = 63.7 g a.i./ha	These HC_5 values are above the exposure level of 20.8 g a.i./ha resulting from spray drift at a distance of 1 m. Therefore, the probabilistic risk assessment comprising ten species indicated an acceptable risk for non-target plants, directly at field margin.
Vegetative vigour (shoot weight)	HC_5 = 20.9 g a.i./ha	

Additional studies (e.g. semi-field or field studies)

Not required

Effects on biological methods for sewage treatment (Annex IIA 8.7)

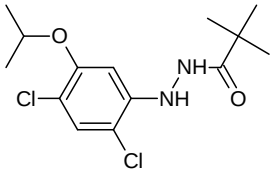
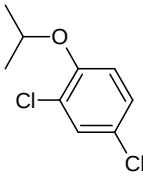
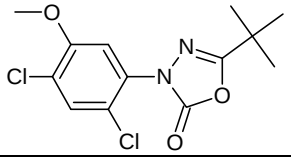
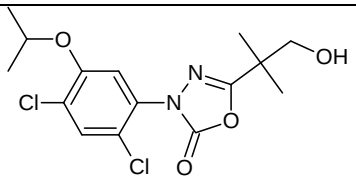
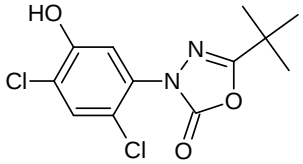
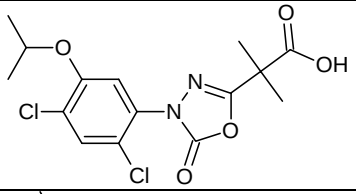
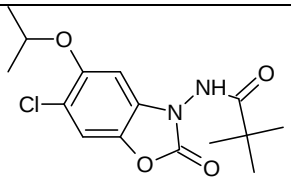
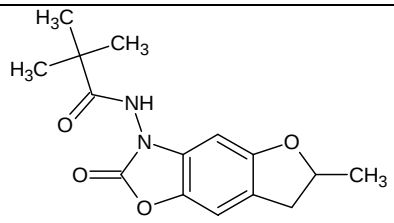
Test type/organism	end point
Activated sludge	EC_{50} > 1000 mg a.s./L (6% inhibition of the respiration at 1000 mg a.s./L)
Pseudomonas sp	--

Classification and proposed labelling with regard to ecotoxicological data (Annex IIA, point 10 and Annex IIIA, point 12.3)

	RMS/peer review proposal
Active substance	N, R50/53

	RMS/peer review proposal
RONSTAR®	N, R50/53

Appendix B– used compound code(s)

Code/Trivial name	Chemical name	Structural formula
AE 0608022 soil (anaerobic) hydrolysis	*N*'-[2,4-dichloro-5-(propan-2-yloxy)phenyl]-2,2-dimethylpropanehydrazide	
AE 0592465	2,4-dichloro-1-(propan-2-yloxy)benzene or 2,4-dichlorophenyl propan-2-yl ether	
AE 0618784	5-*tert*-butyl-3-(2,4-dichloro-5-methoxyphenyl)-1,3,4-oxadiazol-2(3*H*)-one	
AE 0618785	3-[2,4-dichloro-5-(propan-2-yloxy)phenyl]-5-(1-hydroxy-2-methylpropan-2-yl)-1,3,4-oxadiazol-2(3*H*)-one	
AE 0608021	5-*tert*-butyl-3-(2,4-dichloro-5-hydroxyphenyl)-1,3,4-oxadiazol-2(3*H*)-one	
AE 0616182	2-{4-[2,4-dichloro-5-(propan-2-yloxy)phenyl]-5-oxo-4,5-dihydro-1,3,4-oxadiazol-2-yl}-2-methylpropanoic acid	
AE 0608033	*N*-[6-chloro-2-oxo-5-(propan-2-yloxy)-1,3-benzoxazol-3(2*H*)-yl]-2,2-dimethylpropanamide	
AE 1117150	2,2-dimethyl-N-(6-methyl-2-oxo-6,7-dihydrofuro[3',2':4,5]benzo[1,2-d]oxazol-3-yl)propionamide	

ABBREVIATIONS

1/n	slope of Freundlich isotherm
ε	decadic molar extinction coefficient
°C	degree Celsius (centigrade)
µg	microgram
µm	micrometer (micron)
a.s.	active substance
AChE	acetylcholinesterase
ADE	actual dermal exposure
ADI	acceptable daily intake
AF	assessment factor
ALT	alanine amitrotransferase (SGPT)
AOEL	acceptable operator exposure level
AP	alkaline phosphatase
AR	applied radioactivity
ARfD	acute reference dose
AST	aspartate aminotransferase (SGOT)
AV	avoidance factor
BCF	bioconcentration factor
BUN	blood urea nitrogen
bw	body weight
CAS	Chemical Abstract Service
CFU	colony forming units
ChE	cholinesterase
CHO	Chinese Hamster Ovary (cells)
CI	confidence interval
CIPAC	Collaborative International Pesticide Analytical Council Limited
CL	confidence limits
Cmax	maximal blood concentration
d	day
DAA	days after application
DAR	draft assessment report
DAT	days after treatment
DM	dry matter
DNA	deoxyribonucleic acid
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
EbC_{50}	effective concentration (biomass)
EC_{50}	effective concentration
ECHA	European Chemical Agency
EEC	European Economic Community
EINECS	European Inventory of Existing Commercial Chemical Substances
ELINKS	European List of New Chemical Substances
EMDI	estimated maximum daily intake
ER_{50}	emergence rate/effective rate, median
ErC_{50}	effective concentration (growth rate)
EU	European Union
EUROPOEM	European Predictive Operator Exposure Model
f(twa)	time weighted average factor
F_0	parental generation
F_1	filial generation, first
FAO	Food and Agriculture Organisation of the United Nations

FIR	Food intake rate
FOB	functional observation battery
FOCUS	Forum for the Co-ordination of Pesticide Fate Models and their Use
g	gram
GAP	good agricultural practice
GC	gas chromatography
GCPF	Global Crop Protection Federation (formerly known as GIFAP)
GGT	gamma glutamyl transferase
GI	gastro-intestinal
GLP	good laboratory practice
GM	geometric mean
GS	growth stage
GSH	glutathion
h	hour(s)
H	Henry's Law coefficient (calculated as a unitless value) (see also K)
ha	hectare
Hb	haemoglobin
Hct	haematocrit
hL	hectolitre
HPLC	high pressure liquid chromatography or high performance liquid chromatography
HPLC-MS	high pressure liquid chromatography – mass spectrometry
HQ	hazard quotient
IEDI	international estimated daily intake
IESTI	international estimated short-term intake
ISO	International Organisation for Standardisation
IUPAC	International Union of Pure and Applied Chemistry
JMPR	Joint Meeting on the FAO Panel of Experts on Pesticide Residues in Food and the Environment and the WHO Expert Group on Pesticide Residues (Joint Meeting on Pesticide Residues)
K_{doc}	organic carbon linear adsorption coefficient
kg	kilogram
K_{Foc}	Freundlich organic carbon adsorption coefficient
L	litre
LC	liquid chromatography
LC_{50}	lethal concentration, median
LC-MS	liquid chromatography-mass spectrometry
LC-MS-MS	liquid chromatography with tandem mass spectrometry
LD_{50}	lethal dose, median; dosis letalis media
LDH	lactate dehydrogenase
LOAEL	lowest observable adverse effect level
LOD	limit of detection
LOQ	limit of quantification (determination)
m	metre
M/L	mixing and loading
MAF	multiple application factor
MCH	mean corpuscular haemoglobin
MCHC	mean corpuscular haemoglobin concentration
MCV	mean corpuscular volume
mg	milligram
mL	millilitre
mm	millimetre
MOA	mode of action
MRL	maximum residue limit or level

MS	mass spectrometry
MSDS	material safety data sheet
MTD	maximum tolerated dose
MWHC	maximum water holding capacity
NESTI	national estimated short-term intake
ng	nanogram
NOAEC	no observed adverse effect concentration
NOAEL	no observed adverse effect level
NOEC	no observed effect concentration
NOEL	no observed effect level
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
PHED	pesticide handler's exposure data
PHI	pre-harvest interval
PIE	potential inhalation exposure
pK_a	negative logarithm (to the base 10) of the dissociation constant
POEM	Predictive Operator Exposure Model
P_{ow}	partition coefficient between *n*-octanol and water
PPE	personal protective equipment
ppm	parts per million (10^{-6})
ppp	plant protection product
PT	proportion of diet obtained in the treated area
PTT	partial thromboplastin time
QSAR	quantitative structure-activity relationship
r^2	coefficient of determination
RBC	red blood cell
RMS	rapporteur Member State
RPE	respiratory protective equipment
RUD	residue per unit dose
SC	suspension concentrate
SD	standard deviation
SFO	single first-order
SSD	species sensitivity distribution
STMR	supervised trials median residue
$t_{1/2}$	half-life (define method of estimation)
T_4	thyroxine
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
TK	technical concentrate
TLV	threshold limit value
TMDI	theoretical maximum daily intake
TRR	total radioactive residue
TSH	thyroid stimulating hormone (thyrotropin)
TWA	time weighted average

UDS	unscheduled DNA synthesis
UV	ultraviolet
W/S	water/sediment
w/v	weight per volume
w/w	weight per weight
WBC	white blood cell
WG	water dispersible granule
WHO	World Health Organisation
wk	week
yr	year