CONCLUSION ON PESTICIDE PEER REVIEW

Conclusion regarding the peer review of the pesticide risk assessment of the active substance tebuconazole

Issued on 25 September 2008

SUMMARY

Tebuconazole is one of the 84 substances of the third stage Part B of the review programme covered by Commission Regulation (EC) No 1490/2002[1]. This Regulation requires the European Food Safety Authority (EFSA) to organise upon request a peer review of the initial evaluation, i.e. the draft assessment report (DAR), provided by the designated rapporteur Member State and to provide within six months a conclusion on the risk assessment to the EU-Commission.

Denmark being the designated rapporteur Member State submitted the DAR on tebuconazole in accordance with the provisions of Article 10(1) of the Regulation (EC) No 1490/2002, which was received by the EFSA on 5 March 2007. The peer review was initiated on 4 October 2007 by dispatching the DAR for consultation of the Member States and the applicants Bayer CropScience AG and Makhteshim Agan ICC. 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 to identify the remaining issues. The identified issues as well as further information made available by the applicant upon request were evaluated in a series of scientific meetings with Member State experts in May - June 2008.

A final discussion of the outcome of the consultation of experts took place during a written procedure with the Member States in August - September 2008 leading to the conclusions as laid down in this report.

The conclusion was reached on the basis of the evaluation of the representative uses as a fungicide as proposed by the notifiers. Full details of the GAPs can be found in the attached list of end points.

The representative formulated products for the evaluation were “Folicur EW 250”, an emulsion, oil in water (EW) containing 250 g/L tebuconazole and “Raxil S FS 040” a flowable concentrate for seed treatment (FS) containing 20 g/L tebuconazole and 20 g/L triazoxide.

[1] 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)

As the specifications for the technical materials are currently regarded as provisional, it was not possible to conclude on the equivalence of the different sources.

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. Adequate methods are available to monitor all compounds given in the respective residue definitions.

Mammalian toxicology of tebuconazole was assessed in a series of investigations. Tebuconazole is absorbed rapidly and completely. It is widely distributed and has no potential for accumulation. It is rapidly and extensively excreted and extensively metabolised. Tebuconazole is of moderate acute toxicity by the oral and of low toxicity by the dermal and inhalation route. It is neither a skin nor an eye irritant and is not a skin sensitizer. Based on the available data on acute toxicity a classification as **Xn; R22 "Harmful; Harmful if swallowed"** is proposed. Short term toxicity tests have been carried out with rats, rabbits and dogs and the lowest relevant NOAEL of 3 mg/kg bw/d has been derived from findings of hypertrophy in the adrenals in a 1-year dog study. Tebuconazole is not genotoxic. A 2-year rat study and two 21-month mouse carcinogenicity studies are reported. No tumours were observed in the rat. The liver tumours that were detected in one of the mouse studies were considered not relevant for humans. Tebuconazole did not cause effects on reproduction in a two-generation study. Developmental toxicity of tebuconazole was assessed in a series of tests with rats, mice and rabbits and based on the effects observed through species (malformations, post implantation loss, resorptions) and the absence of overt maternal toxicity, a classification as **Xn; Repr. Cat. 3 R63 "Harmful; Possible risk of harm to the unborn child" was proposed.** The acceptable daily intake (ADI), the acceptable operator exposure level (AOEL) and the acute reference dose (ARfD) were set at 0.03 mg/kg bw/(d). When applying Folicur EW 250, exposures estimated in the German model amounted to 138% and 17% (tractor mounted ground boom application on cereals), to 70% and 13% (tractor mounted air blast application on grapes) and to 154% and 13% (spraying upwards with hand held equipment on grapes) of the AOEL without and with personal protective equipment (PPE) respectively. Exposure estimates in the UK POEM exceeded the AOEL in all scenarios. Exposure of re-entry workers after application of Folicur EW 250 using PPE is 52% of the AOEL. Bystander exposure was estimated to account for a maximum of 0.5% of the AOEL. Operator exposure to tebuconazole after application of Raxil S FS 040 was estimated using the SeedTROPEX model and accounted for 52% and to 33% of the AOEL due to seed treatment and loading/sowing respectively. Neither worker nor bystander exposure is expected to occur.

Metabolism in plants has been investigated using foliar applications on wheat, peanut and grape and seed application on wheat. Apart from wheat grains and peanut kernels, in all other plant parts investigated unchanged tebuconazole was identified as the main compound and metabolised in a very

low extent to the hydroxylated metabolites hydroxy-tebuconazole[2] and tebuconazole-m-hydroxy[3]. At the opposite, in grain and kernels, tebuconazole was extensively metabolised to the triazole derivative metabolites (TDMs) (1,2,4-triazole[4], triazole alanine[5], triazole lactic acid[6] and triazole acetic acid[7].) Considering the recommendations of the PRAPeR experts' meeting 14 on toxicology, concluding that toxicological end points and reference values should be adopted for TDMs, the meeting of experts agreed that separate risk assessments have to be performed for the parent compound and the TDMs respectively and consequently, separate residue definitions have to be to set, one for the parent tebuconazole and the second covering the TDMs (1,2,4-triazole, triazole alanine, triazole acetic acid and triazole lactic acid). Therefore, residue definitions for tebuconazole for monitoring and risk assessment for plant products were provisionally proposed as tebuconazole only. The plant residue definition for TDMs should be reconsidered when a general approach on triazole compounds and their triazole derivative metabolites is defined.

Supervised residue trials were submitted for the representative uses on cereals and grape where only tebuconazole was analysed for residues. A sufficient number of trials were available to propose MRLs for wheat, rye, barley and oat. Additional data supporting the use on grape in northern EU submitted during the peer review process 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. 1095/2007. Therefore the MRL for grape was proposed to cover the southern GAP only. Tebuconazole was shown to be stable under standard hydrolytic conditions. Processing studies on barley showed no concentration for most processed fractions and sufficient information was provided to derive transfer factors for white and red wine. The uptake by rotational crops was not expected to lead to tebuconazole residues above the LOQ. In contrast, a significant uptake of TDMs was observed. The residue situation in rotational crops should be reconsidered with regard to a global approach on TDMs.

Metabolism studies in goats and hens were conducted using tebuconazole only. **Therefore, the possible contribution of TDMs metabolites present in animal feed has not been considered**. The main metabolic pathway consists in hydroxylation of tebuconazole to hydroxy-tebuconazole and further oxidation to tebuconazole carboxylic acid[8] followed by conjugations. Provisionally, the residue definition for animal products for monitoring and risk assessment was defined as "sum of tebuconazole, hydroxy-tebuconazole and their conjugates expressed as tebuconazole". As for plants, the inclusion of the TDMs in the animal residue definitions will need to be reconsidered at a later

[2] hydroxy-tebuconazole: 5-(4-chlorophenyl)-2,2-dimethyl-3-(1*H*-1,2,4-triazol-1-ylmethyl)pentane-1,3-diol
[3] tebuconazole-m-hydroxy: 2-chloro-5-[4-hydroxy-5,5-dimethyl-3-(1*H*-1,2,4-triazol-1-yl)hexyl]phenol
[4] 1,2,4-triazole: 1 *H*-1,2,4-triazole
[5] triazole alanine: (*R*,*S*)-2-amino-3-(1*H*-1,2,4-triazol-1-yl)propanoic acid, or 3-(1*H*-1,2,4-triazol-1-yl)-D,L-alanine
[6] triazole lactic acid: 2-hydroxy-3-(1*H*-1,2,4-triazol-1-yl)propanoic acid
[7] triazole acetic acid: 1*H*-1,2,4-triazol-1-ylacetic acid
[8] tebuconazole-carboxylic acid: 5-(4-chlorophenyl)-3-hydroxy-2,2-dimethyl-3-(1*H*-1,2,4-triazol-1-ylmethyl)pentanoic acid

stage when a global EU approach on TDMs is defined. Considering the potential livestock exposure to tebuconazole residues through consumption of treated feed items (cereal grains and straw, grape pomaces being excluded), feeding studies indicate that no measurable residues may be present above the LOQ in the different animals products. Thus MRLs for animal products were proposed at LOQ values.

The consumer risk assessment has been performed through the residues of tebuconazole only and according to the residue definitions proposed for plant and animal products. **The contribution of the TDMs residues in primary crops, rotational crops and products of animal origin resulting from the use of tebuconazole has not been evaluated and not been taken into account in the consumer risk assessment** awaiting the definition of a global EU approach concerning these metabolites which are common for all active substances of the triazole chemical class. Moreover toxicological end points have been set for some of these TDMs but not for triazole lactic acid observed at harvest in peanut kernels. Taking into account the above considerations, the chronic and acute consumer exposures, performed using the proposed MRL for cereals, grape and animal products were found to be below the toxicological values set for tebuconazole. Nevertheless it was concluded that a robust risk assessment related to the compounds of the triazole chemical class needs to take into account the TDMs.

In soil under aerobic conditions tebuconazole exhibits moderate to medium persistence forming the soil metabolite 1,2,4-triazole (accounting for up to 9% of applied radioactivity (AR)) which exhibits low to moderate persistence. Mineralisation of both the chlorophenyl and triazole rings to carbon dioxide was very limited accounting for <0.1-0.4% AR after 58-112 days. The formation of unextractable residues was a sink, accounting for 14-16 % AR after 58-112 days. Tebuconazole exhibits high to low mobility in soil, 1,2,4-triazole exhibits very high to high mobility in soil. It was concluded that it was unlikely that adsorption of tebuconazole was pH dependent. The adsorption of 1,2,4-triazole was not pH dependent

In dark laboratory natural sediment water systems tebuconazole exhibited very high persistence. The terminal metabolite, CO_2, was a sink in the material balance accounting for a maximum of 10-20 % AR at 365 days (study end, chlorophenyl ring radiolabel). Unextracted sediment residues were also a sink for this radiolabel representing 14-19 % AR at study end.
In laboratory natural light exposed indirect photolysis studies the metabolites HWG 1608-lactone[9] and HWG 1608-pentanoic acid[10] were identified as accounting for up to 47% AR (sum of both metabolites that are in a pH dependent equilibrium) with 1,2,4 triazole accounting for up to 14%AR. In outdoor mesocosm and other pond studies (light exposed) where indirect photolysis had the potential to contribute to the breakdown of tebuconazole, it exhibited very high persistence or

[9] HWG 1608-lactone: 5-*tert*-butyl-5-(1*H*-1,2,4-triazol-1-ylmethyl)dihydrofuran-2(3*H*)-one
[10] HWG 1608-pentanoic acid: 4-hydroxy-5,5-dimethyl-4-(1*H*-1,2,4-triazol-1-ylmethyl)hexanoic acid

moderate persistence. The necessary surface water and sediment exposure assessments were appropriately carried out using the agreed FOCUS scenarios approach for tebuconazole at steps 1-4, with spray drift mitigation being applied at step 4. For the metabolites HWG 1608-lactone, HWG 1608-pentanoic acid and 1,2,4-triazole appropriate FOCUS step 1 and 2 calculations were carried out. These values are the basis for the risk assessment discussed in this conclusion.

The potential for groundwater exposure from the applied for intended uses by tebuconazole and 1,2,4-triazole above the parametric drinking water limit of 0.1 µg/L, was concluded to be low in geoclimatic situations that are represented by all 9 FOCUS groundwater scenarios. There is an issue that the rate of degradation of tebuconazole under field conditions was significantly more rapid than in the available (radiolabelled laboratory) experiments where the route of degradation could be investigated. Therefore there is more uncertainty that all potential metabolites that may leach have been assessed, than is usually the case for a substance where the field behaviour of the active substance was not so divergent from the available laboratory study where sufficient samples were taken to identify all potential metabolites. The atmospheric half life estimated for tebuconazole (2.6 days) gives an indication that it may have the potential to be subject to long range transport to areas where it has not been used, via the atmosphere.

The acute and short-term TERs for the spray applications in cereals and grapes were greater than the Annex VI trigger of 10 for birds but the long-term risk assessment needed further refinement. The refined risk assessment for herbivorous birds was based on measured residues. Based on the agreed time weighted average factor f(twa) of 0.42 the long-term risk to herbivorous birds was sufficiently addressed. The suggested PT values to refine the risk assessment for insectivorous birds were not agreed by the experts since no supporting data were submitted (no radio-tracking studies) and a data gap was identified for further refinement of the long-term risk assessment for insectivorous birds for the uses in cereals and grapes. The first-tier acute TER for granivorous birds was 7.4. An avoidance study was submitted which gives some indication of avoidance of treated seeds. It was accepted by the experts that under more realistic exposure conditions the acute risk to granivorous birds would be lower than indicated in the first tier risk assessment. However, the submitted data did not allow a reliable quantitative refinement of the risk assessment and a data gap for further supporting data was identified by the experts. The short-term risk to granivorous birds was assessed as low but the long-term risk assessment needed refinement. The quantitative use of the avoidance factor was rejected by the experts. It was agreed that the reproductive risk to birds for the autumn/winter sown cereals is likely to be low since it is applied outside of the breeding season and exposure will be transient due to germination of seeds but a data gap was identified for spring sown cereals.
The first-tier acute and long-term TERs for the standard risk assessment scenarios for mammals were above the trigger of 10 for the spray application uses except for herbivorous mammals in grapes. The refinement of the f(twa) of 0.42 was accepted but the measured residues in cereals to refine the RUD value for grass/weeds in grape were not accepted and a data gap was identified in the expert meeting for further refinement of the risk assessment for herbivorous mammals in grapes. The long-term risk

assessment for granivorous mammals needed refinement. The suggested refinements of PT, avoidance and dehusking factor were rejected by the experts and a data gap was identified.
The risk from secondary poisoning and from contaminated drinking water was assessed as low. The risk to birds and mammals from uptake of residues in plants for the seed treatment use was assessed as low. No risk assessment was conducted for the second active substance triazoxide in the seed treatment. The risk to herbivorous birds and mammals from the formulation containing a second active substance needs to be addressed further.
The risk to aquatic organisms was assessed as low for the use as a seed treatment. Risk mitigation measures were required for the spray uses in cereals and grapes. A 5 m no-spray buffer zone was sufficient in most FOCUS step 4 scenarios for the spray application in cereals and in half of the scenarios for the application in grapes. Risk mitigation comparable to a 5 m no-spray buffer zone was not sufficient for environmental conditions represented by the run-off scenarios R1(stream), R3 and R4 for the spray application in cereals and R1(stream), R2, R3, R4 for the use in grapes. The risk from the metabolites HWG 1608-pentanoic acid, HWG 1608-lactone, 1,2,4-triazole to aquatic organisms was assessed as low.
The risk to non-target arthropods was assessed as low for the seed-treatment use. However uncertainty remains with regard to reproductive effects on predatory mite species for the spray application uses and a data gap was identified in the experts´ meeting.
The risk to bees, soil non-target macro- and micro-organisms, non-target plants and biological methods of sewage treatment were assessed as low.

Key words: tebuconazole, peer review, risk assessment, pesticide, fungicide

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BACKGROUND

Commission Regulation (EC) No 1490/2002 laying 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 and amending Regulation (EC) No 451/2000 as amended by Commission Regulation (EC) No 1095/2007, regulates for the European Food Safety Authority (EFSA) the procedure of evaluation of the draft assessment reports provided by the designated rapporteur Member State. Tebuconazole is one of the 84 substances of the third stage, part B, covered by the Regulation (EC) No 1490/2002 designating Denmark as rapporteur Member State.

In accordance with the provisions of Article 10(1) of the Regulation (EC) No 1490/2002, Denmark submitted the report of its initial evaluation of the dossier on tebuconazole, hereafter referred to as the draft assessment report, received by the EFSA on 5 March 2007. Following an administrative evaluation, the draft assessment report was distributed for consultation in accordance with Article 11(2) of the Regulation (EC) No 1095/2007 on 15 October 2007 to the Member States and on 4 October 2007 to the applicants Bayer CropScience AG and Makhteshim Agan ICC as identified by the rapporteur Member State.

The comments received on the draft assessment report were evaluated and addressed by the rapporteur Member State. Based on this evaluation, 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 May – June 2008. 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 August – September 2008 leading to the conclusions as laid down in this report.

During the peer review of the draft assessment report and the consultation of technical experts no critical issues were identified for consultation of the Scientific Panel on Plant Protection Products and their Residues (PPR).

In accordance with Article 11c(1) of the amended Regulation (EC) No 1490/2002, 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 1.

The documentation developed during the peer review was compiled as a **peer review report** 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 (rev 1-1 of 28 February 2008)

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,
- the evaluation table (rev 2-1 of 19 September 2008).

Given the importance of the draft assessment report including its addendum (compiled version of September 2008 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.

By the time of the presentation of this conclusion to the EU-Commission, the rapporteur Member State has made available amended parts of the draft assessment report which take into account mostly editorial changes. Since these revised documents still contain confidential information, the documents cannot be made publicly available. However, the information given can be found in the original draft assessment report together with the peer review report, both of which are publicly available.

THE ACTIVE SUBSTANCE AND THE FORMULATED PRODUCT

Tebuconazole is the ISO common name for (*RS*)-1-*p*-chlorophenyl-4,4-dimethyl-3-(1*H*-1,2,4-triazol-1-ylmethyl)pentan-3-ol (IUPAC).

Tebuconazole belongs to the class of conazole fungicides alternatively classified as N-substituted triazole fungicides. It is a systemic fungicide, it penetrates into plant tissues and active concentrations of this compound are translocated acropetally. It acts by inhibition of the demethylation at the C14 position in the fungal sterol biosynthesis. Tebuconazole is used in agriculture and viticulture to control a range of fungal diseases.

The representative formulated products for the evaluation were "Folicur EW 250", an emulsion, oil in water (EW) containing 250 g/L tebuconazole and "Raxil S FS 040" a flowable concentrate for seed treatment (FS) containing 20 g/L tebuconazole and 20 g/L triazoxide, registered under different trade names in Europe.

The representative uses evaluated comprise:

-foliar spraying against foliar fungi in cereals, up to growth stage of BBCH 69, in all EU countries, up to a maximum of two applications at a maximum individual application rate per spray of 250 g a.s./ha, with an interval of 21 days between applications;

-foliar spraying against foliar fungi in table and wine grapes, up to growth stage of BBCH 81, all EU countries, up to a maximum of 3 applications at a maximum application rate per treatment of 100 g a.s./ha, with an interval of 14 days between applications; and

-seed treatment against bunt and smut in barley in Northern Europe, at maximum application rate per treatment of 3 g a.s./100 kg seed (6 g tebuconazole/ha at the theoretical highest sowing rate of 200 kg seed/ha).

SPECIFIC CONCLUSIONS OF THE EVALUATION

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

The minimum purity of tebuconazole is 950 g/kg (BCS source), which is meeting the requirements of the FAO specification AGP:CP/369 (2000) of minimum 905 g/kg. The technical material is a racemate. The minimum purity of the Makhteshim source is still open.

A combined specification was proposed in the DAR for the two sources from Bayer CropScience. The experts at the PRAPeR 46 meeting (May 2008) did not accept the specification for some impurities and requested more information (e.g. QC data) to clarify the proposed specified values for the respective impurities.

Makhteshim Agan has submitted specifications for two production sites which were considered non-equivalent. From the date of submission the manufacturing process was modified, however for the amended process only QC data were available. Because of the major change in the manufacturing process, the experts at the PRAPeR 46 meeting agreed that it is not possible to set specification based only on QC data and set a data gap for 5 batch analysis for the amended manufacturing process.

As the specifications for the technical materials are not finalized, it is not possible to conclude on the equivalence of the different sources and the specification for the technical material as a whole should be regarded as provisional for the moment.

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 tebuconazole or the respective formulations.

The main data regarding the identity of tebuconazole and its physical and chemical properties are given in appendix 1.

Adequate analytical methods are available for the determination of tebuconazole in the technical material (CIPAC 494/TC/M/3) and in the representative formulations (GC-FID, CIPAC 494/EW/M/3 and HPLC-UV) as well as for the determination of the respective impurities in the technical material (GC-FID, HPLC-UV).
Sufficient test 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.

Adequate methods are available to monitor tebuconazole residues in food/feed of plant origin and environmental matrices.
The German modular multi-method DFG S19 with GC-MSD determination was validated for the determination of residues of tebuconazole in cereals and grapes with LOQ of 0.02 mg/kg.
The residue definition for food of animal origin was set to the sum of tebuconazole and hydroxy-tebuconazole[11] and their conjugates expressed as tebuconazole.
GC-NPD method is available to monitor residues of tebuconazole and hydroxy-tebuconazole with LOQ of 0.05 mg/kg in tissues and eggs and with LOQ of 0.01 mg/kg in milk for each individual compound.
Because of the change in the residue definition the German modular multi-method DFG S19 with GC-MSD determination validated for residues of tebuconazole in food of animal origin (meat, milk and egg) with LOQ of 0.02 mg/kg, is not applicable to monitor all compounds in the residue definition.
Residues of tebuconazole in soil can be monitored by GC-NPD with LOQ of 0.01 mg/kg and by HPLC-MS-MS with LOQ of 0.005 mg/kg.
Adequate methods are available to monitor tebuconazole in water by HPLC-MS/MS with LOQ of 0.1 µg/L and by GC-MS with LOQ of 0.05µg/L.
Residues of tebuconazole in air can be monitored by GC-NPD with LOQ of 11 µg/m^3
Since tebuconazole is not classified as acute toxic or very toxic, analytical methods for the determination of residues of tebuconazole in body fluids and/or tissues are not required.

2. Mammalian toxicology

Tebuconazole was discussed at the meetings of experts in mammalian toxicology in June 2008 (PRAPeR, 49, round 10 subgroup 1).

2.1. Absorption, Distribution, Excretion and Metabolism (Toxicokinetics)

Tebuconazole is absorbed orally rapidly (within 48 hours) to an extent of more than 98%, based on urinary (7.4%) and biliary (90.9%) excretion. It is widely distributed, the highest residue concentrations are found in kidneys and liver. It has no potential for accumulation. It is rapidly and

[11] hydroxy-tebuconazole: 5-(4-chlorophenyl)-2,2-dimethyl-3-(1*H*-1,2,4-triazol-1-ylmethyl)pentane-1,3-diol

extensively excreted, 65 - 80% via the faeces and 16 - 35% via the urine. It is extensively metabolised by phase I oxidation and phase II conjugation reactions.

2.2. ACUTE TOXICITY

Tebuconazole is of moderate acute oral (LD_{50} = 1700 mg/kg bw) and of low dermal (LD_{50} > 2000 mg/kg bw) and inhalation (LC_{50} > 5.093 mg/L) toxicity in the rat. It is neither a skin nor an eye irritant and was negative in a skin sensitisation test (Magnusson & Kligman). Based on the available data on acute toxicity a classification as **Xn; R22 "Harmful; Harmful if swallowed"** is proposed.

2.3. SHORT TERM TOXICITY

With rats, a 90-day oral and a 21-day inhalation study were carried out. With dogs a 90-day and two 1-year oral studies were performed. With rabbits a 21-day dermal study was presented. The NOAEL in the rat 90-day oral study was set at 9 mg/kg bw/d based on liver enzyme induction, growth retardation and histopathology in the adrenals. In the inhalation study with rats a NOAEL of 0.0106 mg/L was obtained based on observations of induction of liver enzymes and slight clinical symptoms. From the 90-day dog study a NOAEL of 8.3 mg/kg bw/d was derived based on body weight effects and clinical changes at the next higher dose while an overall NOAEL of 3 mg/kg bw/d was derived from the two 1-year studies based on findings of hypertrophy in *zona fasciculata* cells of the adrenals. No adverse effects were seen in the dermal study in rabbits up to the highest dose of 1000 mg/kg bw/d.

2.4. GENOTOXICITY

No evidence for genotoxicity could be observed in an adequate test battery.

2.5. LONG TERM TOXICITY

A 2-year rat study and two 21-month mouse studies are reported in the DAR. In the chronic rat study a systemic NOAEL of 55.0 mg/kg bw/d was derived based on liver effects (pigment deposits in Kupffer cells). No tumours were observed up to the top dose.
From the two mouse carcinogenicity studies (employing the same strain) an overall systemic NOAEL of 5.9 mg/kg bw/d was derived from liver effects (changes in clinical chemistry and vacuolisation). The experts concluded that the liver tumours occurring in the second study should be considered as not relevant for human risk assessment since the strain used was highly susceptible and the tumours occurred only at a dose exceeding the maximum tolerated dose (i.e. at the highest dose of 280 mg/kg bw/d).

2.6. REPRODUCTIVE TOXICITY

In this section a two-generation study and a series of studies (in total 14) assessing the developmental effects of tebuconazole in rats, mice and rabbits are presented.

Two generation study

The experts agreed to set both the parental and the developmental NOAEL at 21.6 mg/kg bw/d based on decreased body weight gain both in parental animals and pups and to set the reproductive NOAEL at the highest dose of 72.3 mg/kg bw/d since no relevant effects were observed.

The experts agreed also that a classification proposal for effects on fertility was not warranted.

Developmental studies

For rats the experts concluded to set the relevant maternal NOAEL at 10 mg/kg bw/d based on reduced body weight gain and liver effects while the relevant developmental NOAEL was set at 30 mg/kg bw/d based on increased incidences of malformations and resorptions at doses already toxic to the dams.

In the rabbit the relevant maternal NOAEL was set at 30 mg/kg bw/d on basis of reduced body weight seen in the dams while the relevant developmental NOAEL was set at 10 mg/kg bw/d based on increased post-implantation loss and the occurrence of malformations in the absence of overt maternal toxicity.

In the mouse, the experts concluded to set a LOAEL of 10 mg/kg bw/d while the relevant maternal NOAEL was set at the highest dose tested (100 mg/kg bw/d) based on the lack of adverse effects observed.

The experts agreed to propose based on the effects observed through species in the developmental studies a classification as **Xn; Repr. Cat. 3 R63 "Harmful; Possible risk of harm to the unborn child".** Some experts noted that, based on the severity of effects already seen at a low dose in the mouse pups (open eye, runts, cleft palate), that those were not paralleled by maternal toxicity, alternatively even a classification as T; Repr. Cat. 2 R61 "Toxic; May cause harm to the unborn child" might be considered.

EFSA Note: With an addendum to the DAR (July, 2008) the RMS provided a critical evaluation of two studies[12,13] on the endocrine disrupting properties of different azole fungicides and concluded that although tebuconazole may have some endocrine disrupting properties that did not change the outcome of the overall evaluation of tebuconazole. The *in vivo* effects seen were in terms of dose levels far above the NOAEL used for the setting of the AOEL. Moreover, tebuconazole was already proposed for a classification as Xn; Repr. Cat. 3 R63 "Harmful; Possible risk of harm to the unborn child". Neither the studies nor the RMS' evaluation have been peer reviewed.

[12]Birkhoj Kjaerstad M, Andersen HR, Taxvig C, Hass U, Axelstad M, Metzdorff and Vinggaard AM (2007) Effects of azole fungicides on the function of sex and thyroid hormones. Pesticides Research No 111.

[13]Taxvig C, Hass U, Axelstad M, Dalgaard M, Bober J, Andersen HR and Vinggaard AM (2007) Endocrine disrupting activities *in vivo* of the fungicides tebuconazole and epoxiconazole. Toxicological Sciences 2007 100(2):464-473.

2.7. NEUROTOXICITY

Neither in a developmental neurotoxicity, nor in an acute or in a 90-day neurotoxicity study have specific neurobehavioral or neuropathological effects been observed after administration of tebuconazole.

2.8. FURTHER STUDIES

A series of studies on the tebuconazole soil metabolite 1,2,4-triazole[14] has been presented in the DAR. For 1,2,4-triazole and the tebuconazole plant metabolites triazole alanine[15] and triazole acetic acid[16] reference values have been already set at PRAPeR 14, January 2007 and are listed in the table below.

	1,2,4-triazole	triazole alanine	triazole acetic acid
Acceptable daily intake (ADI)	0.02 mg/kg bw/d	0.1 mg/kg bw/d	0.02 mg/kg bw/d
Acute reference dose (ARfD)	0.06 mg/kg bw	0.1 mg/kg bw	0.06 mg/kg bw

EFSA Note: Another tebuconazole plant metabolite, triazole lactic acid[17], was identified at the meeting of experts for residues in June 2008 (PRAPeR 50) but not assessed when tebuconazole was discussed at the meeting of experts for mammalian toxicology (June 2008, PRAPer 49 subgroup 1). The metabolite was considered however, by the experts for mammalian toxicology in the discussions on the active substance penconazole (PRAPeR 49 subgroup 2) since triazole lactic acid is a metabolite common to both active substances.

There the experts agreed that triazole lactic acid had to be considered as a toxicologically relevant metabolite since its toxicity profile was similar to that of penconazole and that the reference values of penconazole should be used in the absence of reproductive and developmental toxicity results (which seem to be the critical end point for triazole compounds). Notably, that approach was not in line with what was agreed in January 2007 for triazole acetic acid (which is structurally closely related to triazole lactic acid).

Overall, the toxicological profiles of tebuconazole and penconazole appear to be rather similar with regard to the proposed classifications (Xn; R22-63 was proposed for both active substances) and the reference values set (an identical ADI of 0.03 mg/kg bw/d was set for both substances, an ARfD of 0.03 mg/kg bw was set for tebuconazole while that for penconazole was fixed at 0.5 mg/kg bw).

[14] 1,2,4-triazole: 1*H*-1,2,4-triazole
[15] triazole alanine: (*R,S*)-2-amino-3-(1*H*-1,2,4-triazol-1-yl)propanoic acid or 3-(1*H*-1,2,4-triazol-1-yl)-D,L-alanine
[16] triazole acetic acid: 1*H*-1,2,4-triazol-1-ylacetic acid
[17] triazole lactic acid: 2-hydroxy-3-(1*H*-1,2,4-triazol-1-yl)propanoic acid

2.9. MEDICAL DATA

In surveillance programs of plant manufacturing personnel there are no reports of health effects attributable to exposure to tebuconazole.

2.10. ACCEPTABLE DAILY INTAKE (ADI), ACCEPTABLE OPERATOR EXPOSURE LEVEL (AOEL) AND ACUTE REFERENCE DOSE (ARFD)

The experts agreed to set **the ADI and the AOEL at 0.03 mg/kg bw/d** based on the NOAEL of 3 mg/kg bw/d obtained in the two 1-year dog studies that was supported by the LOAEL obtained in the developmental mouse study, applying a safety factor of 100.

The experts agreed to set the **ARfD at 0.03 mg/kg bw** based on the developmental LOAEL of 10 mg/kg bw/d obtained in the mouse teratogenicity study applying a safety factor of 300.

2.11. DERMAL ABSORPTION

The experts agreed that the value for dermal absorption of 13% that was obtained in an *in vivo* monkey skin penetration study with the formulation Folicur EW 250 could be applied for concentrate and dilutions of both formulations seeking approval (Folicur EW 250 and Raxil S FS 040) since the quantitative uptake of active substance by application of the EW formulation was expected to be at least equal or higher than that of the FS formulation.

2.12. EXPOSURE TO OPERATORS, WORKERS AND BYSTANDERS

1. Folicur EW 250

Folicur EW 250 is an oil in water emulsion containing 250 g/L tebuconazole. It is a fungicide for foliar application on cereals (tractor mounted ground boom application) and grapes (tractor mounted air blast application or spraying upwards with hand held application equipment). Its maximum application rate is 250 g/ha (of the active substance tebuconazole) and the minimum spray volume is 100 L/ha. The maximal application rate is 3 per season.

Operator exposure to tebuconazole when using Folicur EW 250 has been assessed employing the German model and the UK POEM. The values in the tables below give the exposure levels in percentages of the systemic AOEL (0.03 mg/kg bw/d).

German model

Application of Folicur EW 250	Without PPE	With PPE*
Tractor mounted ground boom application on cereals	138%	17%
Tractor mounted air blast application on grapes	70%	13%
Spraying upwards with hand held equipment on grapes	154%	13%

*PPE (personal protective equipment): Gloves, standard protective garment and sturdy footwear during mixing and loading and standard protective garment and sturdy footwear during application.

UK POEM

The experts agreed that for the UK POEM 10 L containers instead of 5 L containers should be used and therefore revised calculations have been provided with an addendum to the DAR (July, 2008)

Application of Folicur EW 250	Without PPE	With PPE*
Tractor mounted ground boom application on cereals	1667%	217%
Tractor mounted air blast application on grapes	1067%	667%

*PPE (personal protective equipment): Gloves during mixing and loading and during application.

Worker exposure has been assessed according to Krebs et al. 2000[18] for the application of Folicur EW 250 on grapes which was considered to be a worst case scenario. The experts agreed that a transfer coefficient of 30.000 instead of 4500 cm^2/person/h (used in the initial assessment) was applicable. The revised calculations have been provided with an addendum to the DAR and exposures of re-entry workers amount to 520% without and 52% with PPE (gloves) respectively.

Bystander exposure has been assessed according to Ganzelmeier et al. 1995[19] and the exposure of a bystander to Folicur EW 250 when applied on grapes (considered as worst case scenario) amounts to 0.5% of the systemic AOEL of 0.03 mg/kg bw/d.

2. Raxil S FS 040

EFSA note: Raxil S FS 040 is a formulation containing two active substances (tebuconazole and triazoxide). The contribution of triazoxide to the toxicological profile of the formulation has to be considered at Member State level as the risk assessment presented considers only the active substance tebuconazole and is therefore inconclusive.

Raxil S FS 040 is a flowable concentrate for seed treatment containing 20 g/L tebuconazole and 20 g/L triazoxide. It is applied to barley seed at a maximum application rate of 150 ml per 100 kg seed. Only automated seed treatment is covered by the risk assessment.

[18] Krebs B, Maasfeld W, Schrader J, Wolf R, Hoernicke E, Nolting HG, Backhaus GF, Westphal D (2000) Einheitliche Grundsätze zur Sicherung des Gesundheitsschutzes für Beschäftigte beim Wiederbetreten behandelter Kulturen nach Applikation von Pflanzenschutzmitteln (Uniform principles for safeguarding the health of workers re-entering crop growing areas after application of plant protection products). *Nachrichtenblatt des Deutschen Pflanzenschutzdienstes Germany, 2000, 52 (1) 5-9.*

[19] Ganzelmeier H, Rautmann D, Spangenberg R, Streloke M, Herrmann M, Wenzelburger H-J, Walter HF (1995) Studies on the spray drift of plant protection products. *Mitteilungen aus der Biologischen Bundensanstalt für Land- und Forstwirtschaft Berlin-Dahlem. Heft 305, 1995.*

Operator exposure has been calculated employing the SeedTROPEX[20] model and calculated exposures of operators to tebuconazole amount to 52% of the systemic AOEL of 0.03 mg/kg bw/d during seed treatment and to 33% during loading/sowing.

Worker exposure was not assessed since no re-entry scenario is given after seed dressing or loading/sowing operations with Raxil S FS 040.

Bystander exposure was not assessed since neither during seed dressing nor during loading and sowing of Raxil S FS 040 seed is bystander exposure expected to occur.

3. Residues

Tebuconazole was discussed at the PRAPeR experts' meeting for residues (PRAPeR 50, subgroup 1, round 10) in June 2008.

3.1. NATURE AND MAGNITUDE OF RESIDUES IN PLANT

3.1.1. PRIMARY CROPS

The fate of tebuconazole in plants was investigated using foliar applications on wheat, peanut and grape and seed application on wheat. Both ^{14}C-triazole and ^{14}C-phenyl labels were used in the peanut study whereas only one label was investigated on wheat (^{14}C-triazole) and on grape (^{14}C-phenyl). For wheat and grape, study designs were representative of the supported uses, whereas no intended uses have been submitted for peanuts.

Apart from wheat grains and peanut kernels, in all other plant parts investigated unchanged tebuconazole was identified as the main compound and metabolised in a very low extent to the hydroxylated metabolites hydroxy-tebuconazole and tebuconazole-m-hydroxy[21]. No bond cleavage of the molecule was observed. At the opposite in grain and kernels, tebuconazole was extensively metabolised to the triazole alanine as major metabolite. The metabolic pathway involved the following steps; cleavage of bindings in tebuconazole leading to 1,2,4-triazole, conjugation with alanine to form triazole alanine, hydroxylation of the alanine NH_2-group leading to triazole lactic acid and dehydroxylation to triazole acetic acid.

At harvest and following foliar application unchanged tebuconazole was the major compound identified in wheat straw and chaff (95% and 70% TRR respectively) and in peanut foliage and shell (60-64% and 14-17%TRR). Hydroxy-tebuconazole was additionally observed at lower levels in peanut leaves (15% TRR) and shells (3% TRR) but after acidic reflux indicating that it was present as

[20] SeedTROPEX: Worker exposure during seed treatment and sowing of treated seed in the UK and France: An overview; *Report No. TMF 4896, 1996)*
[21] tebuconazole-m-hydroxy: 2-chloro-5-[4-hydroxy-5,5-dimethyl-3-(1*H*-1,2,4-triazol-1-yl)hexyl]phenol

conjugates in these two matrices. The parent and its hydroxy metabolite were also the main compounds observed in straw samples collected in the seed treatment study. At the opposite unchanged tebuconazole was not identified in peanuts kernels and was only observed at low levels in wheat grains (0.03 mg/kg, 6% TRR). In grain and kernel, the major compounds identified at harvest were the triazole derivative metabolites (TDMs). Triazole alanine accounted in both matrices for 80% TRR (0.40 mg equiv./kg) and 54% TRR (0.64 mg equiv./kg). In addition, triazole acetic acid was also identified in wheat grain (13% TRR, 0.07 mg equiv./kg) and triazole lactic acid and 1,2,4-triazole in peanut kernels (c.a. 10%TRR, 0.12 mg equiv./kg).

In grapes following a single application of ^{14}C-phenyl tebuconazole, most of the radioactivity was recovered in the surface rinses and the only compound identified in the samples collected 0 to 28 days after application was the unchanged tebuconazole accounting for 92% to 99% of the TRR. No metabolite was identified in grape, possibly due to the short harvest intervals between application and harvest.

Taking into account the April 2008 addendum provided by the RMS and summarising the different metabolic studies, the meeting discussed the possible plant residue definitions with special regard to the TDMs. It was reminded that the PRAPeR experts meeting 14 on toxicology in January 2007 concluded that toxicological end points and reference values should be adopted for TDMs, as a result of their effect on reproduction and development. This conclusion applied to 1,2,4-triazole, triazole alanine and triazole acetic acid. For triazole lactic acid no information was available on the toxicity and hence no conclusion could be drawn.

The meeting recognised that TDMs are not specific to tebuconazole and that there is currently no EU approach on how to consider these common triazole metabolites in the risk assessment. Monitoring data on these compounds could help to clarify the residue situation due to the uses of active substances of the triazole chemical class over several years in a large amount of crops. Therefore, regarding tebuconazole, the meeting of experts agreed that separate risk assessments have to be performed for the parent compound and the TDMs respectively, and consequently separate residue definitions have to be set, one for the parent tebuconazole only and the second one covering the TDMs (1,2,4-triazole, triazole alanine, triazole acetic acid and triazole lactic acid). Therefore, for tebuconazole, residue definitions for monitoring and risk assessment were provisionally proposed as tebuconazole only, pending finalisation of the risk assessment on triazole compounds and their triazole derivative metabolites. The plant residue definition for TDMs should be reconsidered when a general approach on triazole compounds and their triazole derivative metabolites is defined.

Supervised residue trials were submitted for the representative uses on cereals and grape (foliar applications) and on barley (seed treatment). Only tebuconazole residues were analysed and the data were therefore assessed with regard to tebuconazole residues only in view of MRL setting. However, in the April 2008 addendum, the RMS presented information on triazole alanine residues in cereals.

These residue trials, performed in Germany in 1991/1992, were initially submitted as part of the dossier but not included in the DAR since TDMs were considered as non relevant metabolites at that time. Results were partially discussed during the meeting of experts and it was particularly noted that triazole alanine residues were even detected at harvest in cereal grain samples from most of the control plots (10 out of 12 trials), in significant levels up to 1.9 mg/kg and sometimes in higher levels than in the treated samples. This observation reinforced the conclusion of the meeting on the need of monitoring data in order to clarify the TDMs residue situation.

In this addendum the RMS provided also detailed information on analytical methods and growth stages at last application used to select the residue trials. The meeting concluded that a sufficient number of trials were submitted to propose a MRL on cereals and that those analytical methods were sufficiently validated. Additional data supporting the use on grape in northern EU submitted during the peer review process 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. 1095/2007. Therefore the MRL for grape was proposed to cover the southern GAP only. The data gap for northern Europe remains open.

The storage stability of tebuconazole has been investigated in several commodities stored and kept frozen at -10°C to -24°C (typically -20°C) and covering all kind of commodity types. Tebuconazole residues were stable in water-, oil- and starch-containing materials up to 30 months and in wheat flour, peanut oil and raisin up to 24 months. These results validate the residue values from the field trials where samples were analysed within 20 months for cereals and 10 months for grape.

Tebuconazole was shown to be stable under standard hydrolytic conditions in buffer solutions simulating pasteurization, boiling and sterilisation. Processing studies on barley showed no concentration for most processed fractions (transfer factor <1). As requested, wine processes were detailed in the addendum of April 2008. Taking into account the large amount of data available, the meeting agreed that sufficient information was provided to derive transfer factors for white and red wine.

3.1.2. SUCCEEDING AND ROTATIONAL CROPS

The potential uptake, translocation and metabolism of soil residues by rotational crops were investigated using tebuconazole labelled either in the triazole or in the phenyl ring. The ^{14}C-triazole study was performed using two applications at a rate of 500 g/ha (1X cereals GAP), the first one as a foliar application on wheat used as a primary crop and the second one, after the wheat harvest as a soil application. Only one application on bare soil at a dose rate of 560 g/ha was performed with the ^{14}C-phenyl label. In both studies, spring wheat, red table beet and kale were planted as rotational crops. The ^{14}C-triazole study showed the triazole derivative metabolites as major components in succeeding crops. Triazole alanine was the major compound in wheat grain, beet roots and kale (>55% TRR), triazole lactic acid was observed up to 52% TRR in wheat straw and beet tops and

triazole acetic acid was 51 % of the TRR in wheat forage. Unchanged tebuconazole and hydroxy-tebuconazole metabolite were measured in small amounts (below 5% TRR), except for kale where the parent accounts for 15% TRR (0.05 mg/kg). However, tebuconazole was degraded to a lower extent in the ^{14}C-phenyl study where the unchanged parent accounted for 35% and 45% of the TRR in beet root and kale (<0.05 mg/kg).

In addition four field rotational crop studies were conducted with unlabelled tebuconazole and demonstrated that residues of the parent tebuconazole above LOQ (0.05 mg/kg) are unlikely to occur in rotational wheat after use according to intended practices. No information was provided on TDMs residues in these studies.

Based on these studies, it was concluded that the identified metabolites in rotational crops are in accordance with the metabolic profile observed in primary crops, which support the residue definition in plants. Metabolism in primary and rotational crops are similar, however the situation in rotational crops should be reconsidered since rather high amounts of TDMs metabolites were found in rotational crops.

3.2. NATURE AND MAGNITUDE OF RESIDUES IN LIVESTOCK

Metabolism studies in goats and hens were conducted using tebuconazole only. Therefore, **the possible contribution of the TDMs metabolites present in animal feed has not been considered**. The main metabolic pathway consists of hydroxylation of tebuconazole to hydroxy-tebuconazole and further oxidation to tebuconazole carboxylic acid[22] followed by conjugations. The metabolic pathway in goat, hen and rat was considered as being similar since globally the same metabolic steps were involved and the same metabolites were found.

In goat metabolism studies, tebuconazole parent compound was generally observed in low proportions (<15%) in milk and all tissues, the main metabolites being the conjugates (glucuronide) of tebuconazole and of hydroxy-tebuconazole, both accounting for more than 50% of the TRR. In the laying hen studies, the parent tebuconazole was observed in higher amounts accounting for more than 35% of the TRR in muscle, fat and egg. Tebuconazole was more extensively metabolised in kidney and liver where hydroxy-tebuconazole, tebuconazole-carboxylic acid and hydroxy-tebuconazole-sulphate[23] were found in higher proportions (up to 19%, 24% and 67% respectively). The metabolite 1,2,4-triazole was found in low proportion in hen muscle (11% TRR) and eggs (14% TRR) but these proportions have to be reconsidered on the basis of animals fed with the parent tebuconazole only.

[22] tebuconazole-carboxylic acid: 5-(4-chlorophenyl)-3-hydroxy-2,2-dimethyl-3-(1*H*-1,2,4-triazol-1-ylmethyl)pentanoic acid
[23] hydroxy-tebuconazole-sulphate: sodium 5-(4-chlorophenyl)-3-hydroxy-2,2-dimethyl-3-(1*H*-1,2,4-triazol-1-ylmethyl)pentyl sulfate

As for plants, the meeting discussed the residue definition for animal products with special regard to the TDMs. The experts agreed that there is a general data gap for the TDMs which are common for several active substances. Awaiting a concerted EU approach on how to consider these metabolites in the risk assessment, it was concluded to set separate residue definitions for tebuconazole and for the TDMs metabolites. Based on these conclusions, the following residue definition was proposed for tebuconazole for animal products for both monitoring and risk assessment: Tebuconazole + hydroxy-tebuconazole and their conjugates expressed as tebuconazole.

The residue definitions for TDMs should be reconsidered when a general approach on triazole compounds and their triazole derivative metabolites is defined.

Taking into account this residue definition, the meeting discussed if the analytical methods used in the different studies were validated for conjugates, in particular if the hydrolysis step (acid treatment) involved in the metabolism studies was comparable to the one used in the feeding studies. It was finally agreed that these analytical methods should be considered as similar. In addition, considering the proposed residue definition and the information provided by the RMS in the addendum of April 2008, it was concluded that the LOQs for monitoring have to be set at a value of 0.02* mg/kg for milk and 0.10* mg/kg for the other animal products.

Considering the potential livestock exposure to tebuconazole residues through consumption of treated feed items (cereal grains and straw, grape pomaces being excluded), feeding studies indicate that no measurable residues are present above the LOQ in the different animals products. Therefore the MRLs were proposed at LOQs values.

3.3. CONSUMER RISK ASSESSMENT

It was pointed out that at the moment, consumer risk assessment was only performed through the residues of the parent tebuconazole and according to the residue definitions proposed for plant and animal products. **The contribution of the TDMs metabolites** (1,2,4-triazole, triazole alanine, triazole acetic acid and triazole lactic acid) **to consumer exposure was not assessed since data on their actual occurrence in primary crops, animal commodities and rotational crops are lacking**. In addition the assessment of their potential to act toxicologically in a cumulative way with the parent compound needs to be assessed once an agreed methodology is available. It must be noted that this lack of data is a generic issue and concerns all active substances of the triazole chemical class whose degradation pathway in primary crops, soil and livestock involves a cleavage of the binding to the triazole ring.

In addition, the risk assessment was performed disregarding the possible impact of a change of the enantiomer ratio due to plant or livestock metabolism as this was not investigated by the notifier and not discussed during the meeting.

Taking into account the above considerations and based on the EFSA model and the uses on cereals and grape, no chronic or acute concerns were observed, the highest TMDI being 15% of the ADI (UK infant and French toddler) and the highest NESTI 44% of the ARfD for grape (German child). Nevertheless it was pointed out that a robust consumer risk assessment related to the compounds of the triazole chemical class needs to take into account the TDMs.

3.4. PROPOSED MRLS

Based on the submitted residue trials and the livestock feeding study, the following MRLs have been proposed according to the residue definitions proposed for monitoring:

Plant products

- Grape	0.2	mg/kg	Southern EU only (Complete data set is requested for Northern uses)
- Wheat	0.05*	mg/kg	extrapolation to rye
- Barley	2.0	mg/kg	extrapolation to oat

Animal products

- Egg	0.1* mg/kg
- Milk	0.02*mg/kg
- Others	0.1* mg/kg

4. Environmental fate and behaviour

Tebuconazole was discussed at the PRAPeR experts' meeting for environmental fate and behaviour PRAPeR 47 in May 2008. The fate and behaviour characteristics of its soil metabolite 1,2,4-triazole (a metabolite with the potential to be formed by several triazole moiety containing active substances) was also discussed at the PRAPeR experts' meeting for environmental fate and behaviour PRAPeR 12 in January 2007. It should also be noted that the methods of analysis used in all the fate and behaviour studies were not stereoselective. Therefore the regulatory dossier provides no information on the behaviour of each individual tebuconazole enantiomer in the environment. Therefore all residues reported as tebuconazole in this conclusion are for the sum of the 2 enantiomers. It is not known if either isomer is degraded more quickly than the other in the environmental matrices studied.

4.1. FATE AND BEHAVIOUR IN SOIL

4.1.1. ROUTE OF DEGRADATION IN SOIL

Soil experiments (sandy loam soil, pH 4.5, 0.9% organic carbon (OC)) were carried out under aerobic conditions in the laboratory (23°C 75% of 1/3 bar water holding capacity (WHC)) in the dark following EPA guidelines. The formation of residues not extracted by methanol:water followed by methanol (for details see the amended DAR section B.8 (page 7) dated June 2008) were a sink for the applied chlorophenyl ring-^{14}C and 1,2,4-triazole ring-^{14}C radiolabels (16.2 and 14.5% of the applied

radiolabel (AR) after 112 and 58 days respectively). Mineralisation to carbon dioxide of these radiolabels was very low accounting for only 0.4 and <0.1 % AR after 112 and 58 days respectively. No extractable metabolites were identified. No chromatographically resolved component of soil extracts (except tebuconazole) accounted for > 2.6%AR. It should be noted that the rate of degradation in the available field studies (see section 4.1.2) was significantly faster than in this laboratory study so it cannot be excluded that under field conditions metabolites not seen in this study may be formed at levels that would trigger a leaching assessment to be carried out. Consequently the other available information is also discussed here. In a second, non guideline study investigating 2 soils (silt loam and silt) carried out under aerobic conditions in the laboratory (20°C incubation soil moisture not reported) in the dark where only 3 samples were taken at 123, 299 and 433 days, 1,2,4-triazole was present at up to 5.9%AR. Tentatively identified metabolites accounted for up to 4.8% AR (triazole label) and 4.4% AR (chlorophenyl label). In a glasshouse incubation experiment where grass was grown in treated soil, 1,2,4-triazole was present at up to 9%AR in the soil. Tentatively identified metabolites accounted for up to 4.3% AR (triazole label in a sample taken 325 days after treatment) and 7.5% AR (chlorophenyl label in a sample taken 374 days after treatment) proposed to contain several (at least 3) components.

Data on anaerobic laboratory degradation in soil (30 days of anaerobic incubation following 30 days of aerobic incubation) showed no difference in behaviour to that observed in aerobic incubations. I.e tebuconazole is the only significant extractable residue and residues not extracted by methanol:water followed by methanol (for details see the amended DAR section B.8 (page 7) dated June 2008) were a sink accounting for 19.5% AR after 30 days of the anaerobic conditions. In a laboratory soil photolysis study, (natural September sunlight Kansas City USA 39°N), no novel photodegradation products were identified, and degradation of parent tebuconazole was slow.

4.1.2. PERSISTENCE OF THE ACTIVE SUBSTANCE AND THEIR METABOLITES, DEGRADATION OR REACTION PRODUCTS

An indication of the rate of aerobic degradation of tebuconazole under laboratory conditions was obtained from the results of the single study already described in 4.1.1 above (23°C incubation) where the samples taken allowed some assessment of the rate and pattern of decline. This indication was that the DT_{50} was > 1 year.

The degradation product, 1,2,4-triazole when applied as test substance to 3 soils and incubated in the laboratory (aerobic dark 20°C 40%MWHC), resulted in estimates of single first-order DT_{50} values of 6.3-12.3 days. After normalisation to FOCUS reference conditions[24] (20°C and -10kPa soil moisture content) this range of single first order DT_{50} is 5-9.9 days (geometric mean that is appropriate for use in FOCUS modelling 7.4 days (as agreed in PRAPeR 12)).

[24] Using section 2.4.2 of the generic guidance for FOCUS groundwater scenarios, version 1.1 dated April 2002, utilising a Q10 of 2.2 and Walker equation coefficient 0.7.

Field soil dissipation studies (bare soil) were agreed as acceptable by the Member State experts as provided from 7 sites in Europe (3 from Germany, one from northern France and the UK, one from Italy and one from southern France). As indicated on page 36 of the amended DAR section B.8 dated April 2008, which was the basis for the discussion at the meeting of experts, the trial site at Koenigsberg-Koeslau (Germany) that had been excluded as unreliable in the original assessment of the RMS in the original DAR was agreed by the Member State experts as a valid trial that should be used for risk assessment in line with the updated assessment of the RMS in the amended DAR section B.8 dated April 2008. With the exception of this one trial site it was agreed that the other dissipation trials carried out between 1987 and 1993 were not reliable enough for use in exposure assessment for the reasons set out on pages 36 and 37 of the amended DAR section B.8 dated April 2008. Using the residue levels of parent tebuconazole determined over the 0-10cm soil layer, (soils extracted with ethyl acetate:water) for the trials carried out between 1995 and 2001 (6 sites) and the German Koenisb.-Kosleau site, single first order DT_{50} were 19.9 to 91.6 days. The DT_{50} excluding the Koenisb.-Kosleau site were normalised to FOCUS reference conditions (20°C and -10kPa soil moisture content using a Q10 of 2.2 and Walker equation coefficient of 0.7) using the time step normalisation procedure as specified in Chapter 9 of the FOCUS kinetics guidance[25]. At the Koenisb.-Kosleau site, the normalisation was done just to a reference temperature of 20°C (Q10 of 2.2 assumed) using the cruder approach of taking a time weighted average temperature of the whole study duration of 10.5°C (measured temperatures available at the trial site were for ca. monthly or ca. 2 monthly periods). Following these two normalisation approaches the range of single first order DT_{50} becomes 15.4 to 43.6 days (median that is appropriate for use in FOCUS modelling 39.3 days, geomean 31 days). The experts agreed that these field data could be used as the basis for FOCUS scenario modelling, as they felt the single first order DT_{50} calculated probably primarily represented biological degradation processes (leaching to deeper soil layers and photolysis did not appear (using all the available evidence) to be processes that would be significant and have a large impact on the DT_{50} estimated).

The longest available field tebuconazole single first order soil DT_{50} of 91.6 days was agreed by the experts from the Member States as the appropriate value to use in PEC soil calculations.

4.1.3. MOBILITY IN SOIL OF THE ACTIVE SUBSTANCE AND THEIR METABOLITES, DEGRADATION OR REACTION PRODUCTS

The adsorption / desorption of tebuconazole was investigated in 9 soils in satisfactory batch adsorption experiments. Calculated adsorption K_foc values varied from 128.4 to 1249 mL/g, (arithmetic mean 769 mL/g) (1/n 0.71 – 1.2, arithmetic mean 0.84). Batch adsorption values were available in another 2 soils (excluded from the results cited above). The Member State experts agreed

[25] "Guidance Document on Estimating Persistence and Degradation Kinetics from Environmental Fate Studies on Pesticides in EU Registration" Report of the FOCUS Work Group on Degradation Kinetics, EC Document Reference Sanco/10058/2005 version 2.0, 434 pp

it was appropriate to exclude the value from the 'Euro 5' soil as the properties of this soil (in particular low pH at 3.2 and high OC content of 9.25%) were atypical of agricultural soils and were not in the range recommended in study guidelines. They also agreed that it was appropriate to exclude the results from the 'Lufa 2.2' soil due to the low correlation coefficient (0.846) for the fit of the Feundlich isotherm. The experts had an extensive discussion regarding the potential for their being a correlation of adsorption with pH. The applicant made the case that tebuconazole was a very weak base that would require the presence of very strong acids for it to be protonised. They argued that this would mean that a pH dependence of adsorption in the agricultural soil pH range can be ruled out. When considering the results from all 9 studies assessed as reliable, experts considered that they would not exclude the possibility that there might be a correlation between $K_f$oc and pH (though the correlation between K_f (when normalisation against OC is excluded) and pH is very weak). The final outcome of the discussion was that the evidence of pH dependency was not strong and if real, it would not be expected to cause any significant impact on the outcome of leaching assessments for the uses being assessed at the EU level. So it was agreed as appropriate to use the arithmetic mean $K_f$oc and 1/n (769 mL/g and 0.84) in FOCUS scenario leaching and surface water modelling. Some experts indicated that they would wish to investigate the potential pH dependency of adsorption further in national assessments.

The results from adsorption / desorption experiments of 1,2,4-triazole on 4 soils were available from satisfactory batch adsorptions experiments. Calculated adsorption $K_f$oc values were 43-120 mL/g (arithmetic mean 89 mL/g) (1/n 0.83 – 1.02, mean 0.92). There was no indication that adsorption was correlated with soil pH (as agreed in PRAPeR 12).

The results of adsorption estimates for the potentially major indirect aqueous photolysis metabolites HWG 1608-lactone[26] and HWG 1608-pentanoic acid[27] (see section 4.2.1) utilising quantitative structure activity relationship (QSAR) calculations PCKOCWIN[28] were provided by the applicant (as reported on page 153 of the amended DAR section B.8 (April 2008)). These values are 1840 mL/g and 29.6 mL/g respectively. As these are potentially major (> 10% AR) water metabolites (see section 4.2.1), usually guideline batch adsorption studies would be necessary for these compounds. However the experts accepted the argumentation provided by the applicant they would not be able to do these experiments or soil column leaching experiments for these compounds as both structures are in an equilibrium, which is pH dependent. The experts agreed that in this case it was appropriate to finalise the aquatic exposure assessment using the results of these QSAR estimates of adsorption.

[26] HWG 1608-lactone : 5-*tert*-butyl-5-(1*H*-1,2,4-triazol-1-ylmethyl)dihydrofuran-2(3*H*)-one
[27] HWG 1608-pentanoic acid: 4-hydroxy-5,5-dimethyl-4-(1*H*-1,2,4-triazol-1-ylmethyl)hexanoic acid
[28] EPIWINNT version 3.2, US-EPA 2000

4.2. FATE AND BEHAVIOUR IN WATER

4.2.1. SURFACE WATER AND SEDIMENT

Tebuconazole was stable under sterile aqueous hydrolysis conditions at 25°C at pH 5, 7 and 9. Measurement of the UV visible absorption spectrum of aqueous solutions of tebuconazole indicated that direct aqueous photolysis of tebuconazole would not be expected due to the absence of any significant absorption over the relevant wavelengths for sunlight (>290nm). This was confirmed in a sterile aqueous photolysis study carried out under natural sunlight conditions (September sunlight Kansas City USA 39°N). It was demonstrated that indirect aqueous photolysis can have a role in the degradation of tebuconazole in aqueous systems. Using natural (not sterilised) water sampled from a Dutch drainage ditch in a fruit orchard (in some experiments supplemented with sodium nitrate and humic acid) and a Dutch oligotrophic re-cultivated gravel pit (these were the same locations where sampling was done for the dark water-sediment study systems) and incubating at 20°C in the presence of natural sunlight (July to September or February to October at Monheim Germany 51°N) breakdown of tebuconazole was observed with the metabolites HWG 1608-lactone (M17) and HWG 1608-pentanoic acid (M25) (that occur in equilibrium the ratio of the 2 compounds being pH dependent) being formed at up to 46,8% AR after 58 days (M17+M25) in the drainage ditch water and 8.3 % AR after 243 days (M17+M25) in the gravel pit water. In these studies, when the triazole ring radiolabel was used, 1,2,4-triazole was identified as being formed at up to 14% AR.

In guideline laboratory dark water-sediment studies (2 systems studied at 22°C in the laboratory, pH 7.1-7.4, 2.5% OC sediment (drainage ditch) or 0.8% OC sediment (gravel pit)) tebuconazole dissipated more rapidly from the water partitioning to sediment in the drainage ditch system than in the gravel pit system. Degradation in the whole systems was slow with DT_{50} being > 1 year. The terminal metabolite, CO_2, accounted for 10% (drainage ditch) and 21% (gravel pit) of the chlorophenyl ring-^{14}C-radiolabel at study end (365 days). Residues not extracted from sediment by methanol:water, followed by methanol:ethyl acetate represented 19 % AR (drainage ditch) and 14% AR (gravel pit) at study end. Metabolites were not identified. No single resolved chromatographic fraction (excluding tebuconazole) accounted for > 2.5% AR.

In a mesocosm study (Heimbach, 2003) carried out in Germany (Monheim, 51°N) where applications were made in May to a 1m deep water column overlying 15cm of sediment (3.1 % OC), tebuconazole was estimated to dissipate with a whole system single first order DT_{50} of 54.4 days (see page 138 of the amended DAR section B.8 dated April 2008). The sediment in this study was extracted by microwave extraction with acetonitrile:water (for details see the amended DAR section B.8 (pages 140 to 141) dated June 2008). The Member State experts discussed the kinetic fitting and potential impact that the macrophytes present in the study may have had on this whole system single first order DT_{50} calculated. The experts agreed that this single first order DT_{50} could be considered a valid estimation of the whole system degradation rate in this experiment as the levels of macrophytes

present at the beginning of the study was not that great, so had probably not influenced the dissipation that occurred in the study significantly.

In a second outdoor pond study (Guenther and Herrmann, 1989) carried out in Germany (Wedemark, 52°N) where applications were made in July to ponds with a 0.8 to 0.9m water column over an 'earth' (sand / silty sand) sediment bed (4.5-6.6% OC), tebuconazole dissipated by partitioning from water to sediment, where it persisted (no pattern of decline observed from 7 days to 161 days after treatment). The sediment in this study was extracted by shaking with ethyl acetate (for details see the amended DAR section B.8 (page 135) dated June 2008). The experts discussed the overall dataset of experimental results in the available water and water-sediment studies (both laboratory and outdoor) and concluded that in FOCUSsw simulations at steps 3 and 4 it would be appropriate to select a single first order DT_{50} of 1000 days for sediment and single first order DT_{50} of 365 days for water (approximated whole system value from the dark sediment water studies). This conclusion was reached as it was noted that in the Guenther and Herrmann outdoor studies, the behaviour of the parent tebuconazole was comparable to that observed in the dark laboratory water sediment studies even though the water column in the experiments was of a comparable depth to that of the mesocosm study.

The experts agreed that in some natural water bodies indirect photolysis, that might be presumed to have caused at least a proportion of the degradation that occurred in the Heimbach mesocosm study, is likely to occur. Therefore the experts agreed the available FOCUS step 1 and 2 PEC calculations (and consequent aquatic risk assessments, see section 5.2) for the identified indirect photolysis metabolites HWG 1608-lactone and HWG 1608-pentanoic acid were appropriate. The peer review also agreed the available FOCUS step 1 and 2 PEC calculations for 1,2,4-triazole (that may move from soil to surface water and was also formed in the indirect photolysis investigations). These agreed calculations are presented on pages 153-155 and 160 of the amended DAR section B.8 (April 2008) and appendix 1.
Satisfactory FOCUS surface water estimates at steps 3 and 4 that use the substance properties agreed as appropriate by the peer review are available for the active substance tebuconazole[29]. These are evaluated by the RMS in the addendum to the DAR B.8.6.2 dated September 2008 and are included in appendix 1. At step 4 the only mitigation considered was a no spray drift buffer zone of 5m that was implemented following the methods prescribed by FOCUSsw guidance.

[29] A soil DT50 of 34.8 days (rate constant of 0.0198959, as reported in appendix 1, T. Schad and P. Zerbe August 2008) was used in these simulations which is more conservative than the agreed geomean normalised field value of 31 days, but less conservative than the agreed median normalised field value of 39.3 days.

4.2.2. POTENTIAL FOR GROUND WATER CONTAMINATION OF THE ACTIVE SUBSTANCE THEIR METABOLITES, DEGRADATION OR REACTION PRODUCTS

Following FOCUSgw scenarios guidance[30] the most appropriate substance parameters for use in FOCUSgw scenario modelling based on the available (July 2008) data were: tebuconazole single first order soil DT_{50} 39.3 days, K_{foc} 769 mL/g (K_{fom} 446 mL/g), 1/n=0.84 and 1,2,4-triazole single first order soil DT_{50} 7.4 days, formation fraction from tebuconazole 1.0, K_{foc} 89 mL/g (K_{fom} 51.6 mL/g), 1/n=0.92.

The applied for representative uses of spring / early summer (15 march to 26 May) foliar applications to winter cereals, seed treatment to winter cereals (10 September to 25 November) and summer foliar applications to grapevines occurring every year were simulated using FOCUSPEARL using the substance input parameters: tebuconazole single first order soil DT_{50} 29.4 days, K_{foc} 992 mL/g, 1/n=0.75 and 1,2,4-triazole single first order soil DT_{50} 7.0 days, formation fraction from tebuconazole 1.0, K_{foc} 89 mL/g, 1/n=0.92. The results of these simulations were that at all 9 FOCUS groundwater scenarios tebuconazole and 1,2,4-triazole were calculated to be present in leachate leaving the top 1m soil layer at 80th percentile annual average concentrations of <0.001µg/L. These substance input parameters are similar enough to the correct peer reviewed input parameters identified above. If the simulations were rerun for the applied for intended uses using the completely correct substance input parameters, the outcome of the modelling (concentrations <0.001µg/L) would not change.

4.3. FATE AND BEHAVIOUR IN AIR

The vapour pressure of tebuconazole ($1.3x10^{-6}$ Pa at 20°C) means that tebuconazole would be classified under the national scheme of The Netherlands as very slightly volatile, indicating that losses due to volatilisation would not be expected. Calculations using the method of Atkinson for indirect photo oxidation in the atmosphere through reaction with hydroxyl radicals (using the atmospheric oxidation program (AOP) version 1.4 from 1991[31]) resulted in an atmospheric half life estimated at 2.647 days (assuming a 24 hour atmospheric hydroxyl radical concentration of $5x10^5$ radicals cm^{-3} and the calculated rate constant of $6.0618x10^{-12}$ cm^3/molecule-sec). This half life would indicate that the small proportion of applied tebuconazole that may reach the atmosphere, (the process which would primarily be the formation of aerosols at the time of spraying), might be subject to long range atmospheric transport, as this calculated half life exceeds 2 days.

5. Ecotoxicology

Tebuconazole was discussed in the meeting of experts on ecotoxicology, PRAPeR 48 in May 2008 on the basis of the draft assessment report and the revised draft assessment report (B9) from April 2008.

[30] Version 1.1 (April 2002) Generic guidance for FOCUS groundwater scenarios (Q10 2.2, Walker equation coefficient 0.7).
[31] More recent versions of this model are available, that include rate constants for additional functional groups, that would give a more up to date picture of the atmospheric half life than presented here.

The representative uses evaluated are uses as a fungicide in cereals and grapes (spray application) and as a seed dressing in barley. The formulation Raxil S FS 040 used as a seed dressing contains triazoxide as a second active substance. The risk assessment was conducted according to the following guidance documents: Risk Assessment for Birds and Mammals, SANCO/4145/2000 September 2002; Aquatic Ecotoxicology, SANCO/3268/2001 rev.4 final, October 2002; Terrestrial Ecotoxicology, SANCO/10329/2002 rev.2 final, October 2002; Risk Assessment for non-target arthropods, ESCORT 2, March 2000, SETAC. In the environmental risk assessment it was not taken into account that tebuconazole consists of 2 enantiomers. This uncertainty needs to be addressed.

5.1. RISK TO TERRESTRIAL VERTEBRATES

The acute LD_{50} for birds was 1988 mg a.s./kg bw. Reduction of body weight gain was observed in the short-term (dietary) study at all concentration levels (NOEC <54 mg a.s./kg bw/d). No birds died in the short-term study and the relevant LC_{50} was determined as >703 mg a.s./kg bw/d. The long-term (reproductive) NOEC was assessed as 5.8 mg a.s./kg bw/d. The acute and short-term TERs for the spray applications in cereals and grapes were higher than the Annex VI trigger of 10. The first-tier long-term TERs were below the Annex VI trigger of 5 for herbivorous birds (early application) and insectivorous birds in cereals and insectivorous birds in grapes. The risk assessment for herbivorous birds was refined on the basis of measured residues. The experts agreed that the refinement should be based on studies where the interval between the applications was not longer than 21 days taking into consideration the interval between the two applications proposed in the GAP. A refined long-term TER of 5.3 was calculated on the basis of the agreed refined RUD value of 23.9 and f(twa) of 0.42 and MAF of 1.

The RMS provided a refined long-term risk assessment for insectivorous birds based on grey partridge (*Perdix perdix*), common quail (*Coturnix coturnix*), and skylark (*Alauda arvensis*) for the use in cereals and for yellowhammer (*Emberiza citronella*) and blackbird (*Turdus merula*) for the use in grapes. The suggested PT refinements were not agreed by the experts since no supporting data were submitted (no radio-tracking studies). The updated TERs were below the trigger of 5 for all 3 species for the use in cereals. The long-term TERs were 5.2 and 4.1 for yellowhammer and blackbird for the use in grapes. Therefore a data gap remains for further refinement of the long-term risk assessment for insectivorous birds for the uses in cereals and grapes.

No studies with birds were submitted with the seed-treatment formulation (Raxil S FS 040). The combined toxicity of tebuconazole and triazoxide (formula of Finney) was taken into account in the acute risk assessment. The resulting TER of 7.4 was below the trigger of 10. An avoidance study was submitted. The experts considered the avoidance study was not appropriate for a quantitative refinement but agreed that it gives some indication that the birds avoid treated seeds. It was accepted by the experts that under more realistic exposure conditions the risk to granivorous birds would be lower than indicated in the first tier acute risk assessment. However the available information does not allow a reliable quantitative risk assessment and the experts identified a data gap for further information to support the suggested refinements. For the short-term risk assessment the TERs were

calculated for each of the actives separately. The resulting TERs were >61 and 23 for tebuconazole and triazoxide, respectively. Although the combined toxicity was not addressed the margin of safety for the individual TERs for each substance was considered sufficient to conclude on a low risk.
The first-tier long-term TERs for both actives were 0.5 and 1. The experts disagreed with the suggested quantitative refinement of the avoidance factor (see above). However it was agreed that the reproductive risk to birds for the autumn/winter sown cereals is likely to be low since it is applied outside of the breeding season and exposure will be transient due to germination of seeds. The experts identified a data gap to address the long-term risk to granivorous birds further for the use as a seed treatment for spring sown cereals. A new refined risk assessment was presented in the corrigendum from June 2008. The suggested refinements were not peer-reviewed.
The first-tier risk assessment for the uptake of residues in germinated plants resulted in acute and long-term TERs of more than 2 orders of magnitude above the trigger values of 10 and 5 indicating a low risk to herbivorous birds. No risk assessment was conducted for the second active substance triazoxide.

The acute toxicity endpoint for mammals was 1700 mg /kg bw. The long-term NOEL from the rat reproduction study was 21.6 mg a.s./kg bw/d. However the experts in the meeting agreed that the relevant long-term endpoint should be 10 mg a.s./kg bw/d from the developmental studies with rabbits (increased implantation loss).
The first-tier acute and long-term TERs for the standard risk assessment scenarios for mammals were above the trigger of 10 for the spray application uses in cereals and grapes except for herbivorous mammals in grapes. The refinement of the f(twa) of 0.42 was accepted but the measured residues in cereals to refine the RUD value for grass/weeds in grapes were not accepted. The experts noted that a MAF of 1.14 should be applied since the product is applied 3 times in grapes. A data gap was identified in the expert meeting for further refinement of the risk assessment for herbivorous mammals in grapes.
The first-tier acute TERs for granivorous mammals for the use as a seed treatment exceeded the Annex VI trigger. The long-term risk was assessed for each of the active substances in the formulation separately. The first-tier long-term TERs were 1.5 (tebuconazole) and ≥0.32 (triazoxide). The refined long-term risk assessment was based on residue decline, a PT value of 0.4, an avoidance factor of 0.5 and a dehusking factor of 0.15. The experts agreed on the suggested f(twa) value of 0.32. The experts considered the available information as not sufficient to derive a PT value of 0.4 and it was suggested that the PT value needs to be supported by further information. The avoidance factor of 0.5 was rejected since it was derived from a study where house mice had the choice between treated and untreated seeds instead of a no-choice test design with only treated seeds. The experts proposed that such a study can only give some indications that treated seeds are avoided but not a precise estimate of what would happen in a real field situation. Instead of deriving a quantitative factor the experts considered it more appropriate to use the study in a weight of evidence approach if the TER value would be close to the Annex VI trigger. The suggested dehusking factor was not sufficiently supported by data. A new study with wood mice (*Apodemus sylvaticus*) was submitted

but 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, this new study could not be considered in the peer review. A data gap was identified in the meeting to further address the long-term risk to granivorous mammals from the seed treatment application. The first-tier risk assessment for the uptake of residues in germinated plants resulted in acute and long-term TERs of 42500 and 250 indicating a low risk to herbivorous mammals. No risk assessment was conducted for the second active substance triazoxide.

The TER values for earthworm- and fish-eating birds and mammals exceeded the trigger of 5 for all representative uses evaluated. The TERs for the two active substances in the seed treatment formulation were calculated separately. Therefore some uncertainty remains with regard to the combined toxicity of the two actives. However there is a large margin of safety since the TERs of both actives were more than 2 orders of magnitude above the trigger of 5.

The first-tier acute TERs for the uptake of contaminated drinking water were above the trigger of 10 for all representative uses. No major plant metabolites were observed and hence no risk assessment was triggered.

5.2. RISK TO AQUATIC ORGANISMS

The lowest endpoints driving the aquatic risk assessment were observed in tests with *Mysidopsis bahia* (EC_{50} = 0.46 mg a.s./L) on the acute time scale and with *Daphnia magna* on the long-term time scale with a NOEC of 0.01 mg a.s./L. The sensitivity of rainbow trout (*Oncorhynchus mykiss*) was similar with a NOEC of 0.012 mg a.s./L. Tebuconazole belongs to the group of triazole fungicides which are suspected to have endocrine disrupting properties. A fish full life cycle study was made available. However some key parameters with regard to endocrine disruption were not investigated in the study (e.g. sex ratio, histopathology). The experts agreed that further information is needed. The applicant had submitted a fish sexual development study. 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. Therefore a data gap remains to address the potential endocrine disruption in fish.

The acute TERs were above the trigger values for all groups of organisms for all FOCUS step3 scenarios but the TERs for chronic risk to fish and aquatic invertebrates were below the trigger values for some scenarios. A FOCUSstep 4 PEC calculation with a no-spray buffer zone of 5 m was provided to refine the long-term risk assessment. The trigger of 10 was exceeded for the spray application in cereals in all drainage scenarios (D1, D2, D3, D4, D5, D6) and the run-off part scenario R1 pond but was less than 10 in R1 (stream), R3 and R4. For the spray application in grapes the TERs were greater than 10 in the full scenarios D6 and R4 and the part scenario R1 (pond) but not in the scenarios R2, R3 and R1(stream). The TERs were above the Annex VI trigger values for the seed treatment use with FOCUS step 3 PECsw values.

The metabolites HWG 1608-pentanoic acid, HWG 1608-lactone, 1,2,4-triazole were significantly less toxic to aquatic organisms compared to tebuconazole. The TERs for the metabolites were several orders of magnitude above the Annex VI trigger values based on FOCUS step2 PEC_{sw} values.

Overall it is concluded that the risk to aquatic organisms was low for the use as a seed treatment. Risk mitigation measures were required for the spray uses in cereals and grapes. A 5 m no-spray buffer zone was sufficient in the FOCUS step 4 drainage scenarios for the spray application in cereals and in half of the scenarios for the application in grapes. A 5 m no-spray buffer zone is not sufficient for environmental conditions represented by the run-off scenarios R1(stream), R3 and R4 for the spray application in cereals and R1(stream), R2, R3 for the use in grapes.

5.3. RISK TO BEES

The oral and contact toxicity of technical and formulated tebuconazole was low. The acute oral and contact HQ values for the spray applications were significantly below the trigger of 50 indicating a low risk to bees. For the seed treatment use it was assumed that bees would be exposed to the same amount of active substance as if it would have been applied as a spray solution. The resulting TERs were more than 2 orders of magnitude below the trigger of 50. The risk to bees is considered to be low for the representative uses evaluated.

5.4. RISK TO OTHER ARTHROPOD SPECIES

Standard laboratory tests with the formulation Folicur EW 250 were made available for the indicator species *Aphidius rhopalosiphi* and *Typhlodromus pyri*, the ground dwelling species *Poecilus cupreus*, *Aleochara bilineata* and the foliage dwelling species *Coccinella septempunctata* and *Syrphus corolla*. The off-field HQ values were below the trigger of 2 but the in-field HQ of 2 was exceeded for both indicator species. Both species were exposed to fresh residues in extended laboratory studies. The results indicated that *A. rhopalosiphi* is more sensitive than *T. pyri* with regard to mortality but lower reproductive endpoints were observed for *T. pyri*. Effects >50% on mortality (*A. rhopalosiphi*) and reproduction (*T. pyri*) were observed at application rates lower than the calculated in-field rate. The risk assessment was further refined with a semi-field test with A. rhopalosiphi where no effects >50 % were observed at an application rate of 375 g a.s./ha which is higher than the calculated maximum in-field rate of 281.5 g a.s./ha. The experts agreed that the risk to *A. rhopalosiphi* is sufficiently addressed but a data gap was identified to address also the risk to *T. pyri* since it was more sensitive with regard to reproduction than *A. rhopalosiphi* and is therefore not covered by the endpoints from the higher tier study with *A. rhopalosiphi*. Mortality rates of 72% and 100% were observed in the standard laboratory studies with *S. corollae* and *C. septempunctata* at an application rate of 375 g a.s./ha. *C. septempunctata* was considered as more sensitive and further testing was conducted. The LR_{50} value was calculated as 158 g a.s./ha suggesting a lower sensitivity to tebuconazole compared to *A. rhopalosiphi*. In a higher-tier (semi-field) test with *C. septempunctata* effects on reproduction and

mortality were <50% at an application rate of 375 g a.s./ha. Effects on the tested ground dwelling species were <50% in the standard laboratory studies at an application rate of 375 g a.s./ha.
The toxicity of the seed treatment formulation Raxil S FS 040 was tested with the ground dwelling species *P. cupreus*, *A. bilineata* and *Pardosa spp*. The arthropods were exposed to the treated seeds. No effects >50% were observed at a nominal drilling rate of 190 to 245 kg seeds/ha (seeds dressed with 150 mL Raxil S FS 040/dt seed) indicating a low risk.

Overall it is concluded that the risk to non-target arthropods is low for the seed treatment use but the risk to predatory mites (*T. pyri*) needs to be addressed further for the spray application use.

5.5. RISK TO EARTHWORMS

The acute toxicity of technical tebuconazole and the formulations Folicur EW 250 and Raxil S FS 040 to earthworms was low. The chronic NOECs were significantly lower ranging from 10 mg a.s./kg soil to <1.5 mg a.s./kg soil (EW 250) and 1.9 mg Raxil S FS 040/kg soil. The initial PECsoil of 0.183 mg a.s./kg soil was used in the TER calculations for the spray applications. The acute TERs were several orders of magnitude above the trigger of 10. The chronic TER was 55 for technical tebuconazole and <4.1 for the formulation Folicur EW 250. No adverse effects were observed in the submitted field studies. Therefore the experts agreed that the long-term risk to earthworms can be considered as low.
The acute and long-term TERs for the seed-treatment application exceeded the trigger values of 10 and 5 by more than two orders of magnitude based on the initial PECsoil of 0.01 mg a.s./kg soil.

The acute and long-term TERs for the metabolite 1,2,4-triazole exceeded the trigger values of 10 and 5 by more than two orders of magnitude based on the initial PECsoil of 0.003 mg 1,2,4-triazole/kg soil (spray applications) and <0.0005 mg 1,2,4-triazole/kg soil (seed treatment use).

The risk to earthworms was assessed as low for all representative uses evaluated.

5.6. RISK TO OTHER SOIL NON-TARGET MACRO-ORGANISMS

NOECs of 250 mg a.s./kg soil and 50 mg a.s./kg soil were observed in tests with technical tebuconazole and collembola (*Folsomia candida*) and mites (*Hypoaspis aculeifer*). The preparation Folicur EW 250 (spray) was tested with *H. aculeifer* and the seed treatment preparation Raxil S FS 040 was tested with *F. candida*. The observed NOECs were 2500 mg Raxil S FS 040/kg soil and 56.2 mg a.s./kg soil for the preparation Folicur EW 250. The risk assessment was conducted with initial PECsoil values of 0.183 mg a.s./kg soil (spray applications) and 0.01 mg a.s./kg soil (seed treatment use). The TERs exceeded the trigger of 5 by more than 2 orders of magnitude.
The TERs for the metabolite 1,2,4-triazole exceeded the trigger by several orders of magnitude based on initial PECsoil values of 0.003 mg 1,2,4-triazole/kg soil (spray applications) and <0.0005 mg 1,2,4-triazole/kg soil (seed treatment use).

Although not triggered, litter-bag studies were submitted for both formulations. No effects were observed in the litter-bag studies at a plateau concentration of 0.008 mg a.s./kg soil plus 2 applications of 250 g a.s./ha (spray applications) and at measured soil concentrations of 0.00718 mg tebuconazole/kg soil and 0.0037 mg triazoxide/kg soil (seed treatment use).

Overall it is concluded that the risk to soil non-target macro-organisms and organic matter breakdown was assessed as low.

5.7. RISK TO SOIL NON-TARGET MICRO-ORGANISMS

No effects >25% on soil respiration and nitrification were observed at application rates of up to 6.25 kg a.s./ha (about 25 times the recommended spray application rate) and at a 5 fold higher application rate of the seed-treatment formulation Raxil S FS 040. No effects >25 % were observed in the tests with the metabolite 1,2,3-triazole up to the highest tested concentration of 0.353 mg/kg soil. Therefore it is concluded that the risk to soil micro-organisms is low for the representative uses evaluated.

5.8. RISK TO OTHER NON-TARGET-ORGANISMS (FLORA AND FAUNA)

Several phytotoxicity screening studies on monocotyledon and dicotyledon plant species were submitted. No herbicidal effects were observed in post-emergence applications of 250 g a.s./ha. However seedling emergence was affected if tebuconazole was applied pre-emergence. The ER_{50} values were 10.5 kg a.s./ha and 750 g a.s/ha for vegetative vigour and seedling emergence. Exposure of non-target plants in the off-field area was considered as relevant only for the spray applications. The observed endpoints are more than 5 times greater than the off-field spray drift rates. Therefore the risk to non-target plants in the off-field area is considered to be low.

5.9. RISK TO BIOLOGICAL METHODS OF SEWAGE TREATMENT

The EC_{50} values for effects on respiration of activated sewage sludge was >10 g a.s./L. It is considered unlikely that tebuconazole would enter sewage treatment plants in concentrations exceeding 10 g a.s./L. Therefore the risk to biological methods of sewage treatment was considered to be low for the representative uses evaluated.

6. Residue definitions

Soil

Definition for risk assessment:	sum of enantiomers contained in tebuconazole
Definition for monitoring:	sum of enantiomers contained in tebuconazole

Water

Ground water

Definition for exposure assessment:	sum of enantiomers contained in tebuconazole and 1,2,4 triazole
Definition for monitoring:	sum of enantiomers contained in tebuconazole

Surface water

Definition for risk assessment:	water: sum of enantiomers contained in tebuconazole, 1,2,4 triazole, HWG 1608-lactone and HWG 1608-pentanoic acid Sediment: sum of enantiomers contained in tebuconazole
Definition for monitoring:	sum of enantiomers contained in tebuconazole

Air

Definition for risk assessment:	sum of enantiomers contained in tebuconazole
Definitions for monitoring:	sum of enantiomers contained in tebuconazole

Food of plant origin

Definition for risk assessment:	Provisionally sum of enantiomers contained in tebuconazole. An additional residue definition is needed for triazole derivative metabolites (triazole, triazole alanine, triazole acetic acid and triazole lactic acid), harmonised for all active substances of the triazole chemical class.
Definition for monitoring:	sum of enantiomers contained in tebuconazole (provisional pending outcome of global risk assessment on TDMs)

Food of animal origin

Definition for risk assessment:	provisionally tebuconazole + hydroxy-tebuconazole and their conjugates (sum of enantiomers) expressed as tebuconazole. An additional residue definition is needed for TDMs, harmonised for all active substances of the triazole chemical class.
Definition for monitoring:	tebuconazole + hydroxy-tebuconazole and their conjugates (sum of enantiomers) expressed as tebuconazole (provisional pending outcome of global risk assessment on TDMs)

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

Soil

Compound (name and/or code)	Persistence	Ecotoxicology
Tebuconazole (sum of enantiomers)	Moderate to medium persistence Single first order DT_{50} 19.9-91.6 days (European field studies)	The risk to soil dwelling organisms was assessed as low.

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
Tebuconazole (sum of enantiomers)	high to low mobility K_{foc} 128-1249 mL/g	No	Yes	Yes	Yes
1,2,4 triazole	Very high to high mobility K_{foc} 43-120 mL/g	No	No data submitted. No assessment triggered.	Yes (Classified as Xn; Repr. Cat. 3 R63)	No The risk to aquatic organisms was assessed as low.

Surface water and sediment

Compound (name and/or code)	Ecotoxicology
Tebuconazole (sum of enantiomers)	Very toxic to aquatic organisms (acute EC_{50} for Mysidopsis bahia = 0.46 mg a.s./L). Risk assessment not finalised.
1,2,4 triazole	Lower toxicity to aquatic organisms compared to tebuconazole. The risk to aquatic organisms was assessed as low.
HWG 1608-lactone	Lower toxicity to aquatic organisms compared to tebuconazole. The risk to aquatic organisms was assessed as low.
HWG 1608-pentanoic acid	Lower toxicity to aquatic organisms compared to tebuconazole. The risk to aquatic organisms was assessed as low.

Air

Compound (name and/or code)	Toxicology
Tebuconazole (sum of enantiomers)	Low acute toxicity by inhalation (LC_{50} > 5.093 mg/L)

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

- Information (e.g. QC data) to clarify the proposed specified values for the impurities coded 01 and 09 of the technical material. (relevant for Bayer CropScience for all representative uses evaluated, data gap identified by PRAPeR 46 meeting (May 2008), date of submission unknown; refer to chapter 1)
- 5 batch analysis for the amended manufacturing process (relevant for Makhteshim Agan for all representative uses evaluated, data gap identified in the PRAPeR 46 meeting (May 2008), date of submission unknown; refer to chapter 1)
- Birkhoj Kjaerstad M, Andersen HR, Taxvig C, Hass U, Axelstad M, Metzdorff and Vinggaard AM (2007) Effects of azole fungicides on the function of sex and thyroid hormones. Pesticides Research No 111. (refer to chapter 2)
- Taxvig C, Hass U, Axelstad M, Dalgaard M, Bober J, Andersen HR and Vinggaard AM (2007) Endocrine disrupting activities in vivo of the fungicides tebuconazole and epoxiconazole. Toxicological Sciences 2007 100(2):464-473. (refer to chapter 2)
- The risk to operators from the second active substance (triazoxide) in the seed treatment formulation Raxil S FS 040 needs to be addressed (refer to chapter 2)
- A complete northern residue trial database on grape in order to support the uses in Northern EU (relevant for the representative use on grape; studies submitted by the applicant and evaluated by the RMS in the addendum from April 2008; however according to Regulation (EC) No 1095/2007 the new data were not taken into consideration in the peer review; refer to point 3.1.1).
- Information allowing the setting of a residue definition for triazole metabolite derivatives and allowing the assessment of consumer exposure to primary crops, rotational crops and products of animal origin (relevant for all uses evaluated; no submission date proposed by the applicant; refer to chapter 3)
- A comparison of the mode of action of tebuconazole and the triazole metabolite derivatives is required in order to assess possible cumulative toxicity resulting of the combined exposure to these compounds (relevant for all uses evaluated, data gap identified by EFSA after the expert meetings; refer to chapter 3.3).
- Impact of different isomer ratios on the consumer risk assessment of tebuconazole needs to be addressed (relevant for all applied for intended uses; data gap identified by EFSA after the experts' meeting; no submission date proposed; refer to chapter 3.3).
- The long-term risk to insectivorous birds needs to be refined further (relevant for the spray uses in cereals and grapes; data gap identified in the meeting of experts PRAPeR 48 in May 2008; no submission date proposed by the applicant; refer to point 5.1)
- The long-term risk to granivorous birds needs to be refined further for the use as a seed treatment for spring sown cereals (relevant for the use as a seed treatment; data gap identified

in the meeting of experts PRAPeR 48 in May 2008; a new refined risk assessment was presented in the corrigendum of the DAR from June 2008; refer to point 5.1)

- The long-term risk to herbivorous mammals needs to be refined further (relevant for the use in grapes; data gap identified in the meeting of experts PRAPeR 48 in May 2008; no submission date proposed by the applicant; refer to point 5.1)
- The long-term risk to granivorous mammals needs to be refined further (relevant for the seed-treatment use; data gap identified in the meeting of experts PRAPeR 48 in May 2008; no submission date proposed by the applicant; refer to point 5.1)
- The risk to herbivorous birds and mammals from the second active substance (triazoxide) in the seed treatment formulation Raxil S FS 040 needs to be addressed. (relevant for the seed-treatment use; data gap identified by EFSA after the meeting of experts PRAPeR 48 in May 2008; no submission date proposed by the applicant; refer to point 5.1)
- The risk to fish from endocrine disruption needs to be addressed. (relevant for all uses evaluated; data gap identified in the meeting of experts PRAPeR 48 in May 2008, a fish sexual development study was submitted by the applicant and included in the revised DAR but was not peer-reviewed; refer to point 5.2)
- The risk to predatory mites (*T. pyri*) needs to be addressed further. (relevant for the spray uses; data gap identified in the meeting of experts PRAPeR 48 in May 2008; no submission date proposed by the applicant; refer to point 5.4.)
- Tebuconazole consists of 2 enantiomers. This needs to be taken into account in the environmental risk assessment. Information on the toxicity and/or on the degradation of the 2 enantiomers in the environment is needed. (relevant for all representative uses evaluated; no submission date proposed by the applicant; refer to sections 4 and 5).

CONCLUSIONS AND RECOMMENDATIONS

Overall conclusions

The conclusion was reached on the basis of the evaluation of the representative uses proposed by the applicants as a fungicide on cereals, and table and wine grapes, and as a seed treatment on barley, against several agriculturally important phytopathogens. For full details of the GAP please refer to the attached list of end points.

The representative formulated products for the evaluation were “Folicur EW 250”, an emulsion, oil in water (EW) containing 250 g/L tebuconazole and “Raxil S FS 040” a flowable concentrate for seed treatment (FS) containing 20 g/L tebuconazole and 20 g/L triazoxide, registered under different trade names in Europe.

As the specifications for the technical materials are currently regarded as provisional, it was not possible to conclude on the equivalence of the different sources.

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.
Tebuconazole residues in plants can be determined with a multi-residue method (DFG S19).
Adequate methods are available to monitor all compounds given in the respective residue definitions in food of animal origin and environmental matrices.

Tebuconazole is absorbed rapidly and completely. It is widely distributed and has no potential for accumulation. It is rapidly and extensively excreted and extensively metabolised. Tebuconazole is of moderate acute toxicity by the oral and of low toxicity by the dermal and inhalation route. It is neither a skin nor an eye irritant and not a skin sensitizer. Based on the available data on acute toxicity a classification as **Xn; R22 "Harmful; Harmful if swallowed"** is proposed. Short term toxicity tests have been carried out with rats, rabbits and dogs and the lowest relevant NOAEL of 3 mg/kg bw/d has been derived from findings of hypertrophy in adrenals in a 1-year dog study. Tebuconazole is not genotoxic. A 2-year rat study and two 21-month mouse carcinogenicity studies are reported. No tumours were observed in the rat. The liver tumours that were detected in one of the mouse studies were considered as not relevant for humans. Tebuconazole did not cause effects on reproduction in a two-generation study. Developmental toxicity of tebuconazole was assessed in a series of tests with rats, mice and rabbits and based on the effects observed through species (malformations, post implantation loss, resorptions) and the absence of overt maternal toxicity, a classification as **Xn; Repr. Cat. 3 R63 "Harmful; Possible risk of harm to the unborn child"** was proposed. The acceptable daily intake (ADI) and the acceptable operator exposure level (AOEL) and the acute reference dose (ARfD) were set at 0.03 mg/kg bw/(d). When applying Folicur EW 250, exposures estimated in the German model amounted to 138% and 17% (tractor mounted ground boom application on cereals), to 70% and 13% (tractor mounted air blast application on grapes) and to 154% and 13% (spraying upwards with hand held equipment on grapes) of the AOEL without and with personal protective equipment (PPE) respectively. Exposure estimates in the UK POEM exceeded the AOEL in all scenarios. Exposure of re-entry workers after application of Folicur EW 250 using PPE is 52% of the AOEL. Bystander exposure was estimated to account for a maximum of 0.5% of the AOEL. Operator exposure to tebuconazole after application of Raxil S FS 040 was estimated using the SeedTROPEX model and accounted to 52% and to 33% of the AOEL due to seed treatment and loading/sowing respectively. Neither worker nor bystander exposure is expected to occur.

Metabolism in plants has been investigated using foliar applications on wheat, peanut and grape and seed application on wheat. Apart from wheat grains and peanut kernels, in all other plant parts investigated, unchanged tebuconazole was identified as the main compound and metabolised in a very low extent to the hydroxylated metabolites hydroxy-tebuconazole and tebuconazole-m-hydroxy. At the opposite, in grain and kernels, tebuconazole was extensively metabolised to the triazole derivative

metabolites (TDMs) (1,2,4-triazole, triazole alanine, triazole lactic acid and triazole acetic acid). Considering the recommendations of the PRAPeR experts' meeting 14 on toxicology concluding that toxicological end points and reference values should be adopted for TDMs, the meeting of experts agreed that separate risk assessments have to be performed for the parent compound and the TDMs respectively and consequently, separate residue definitions have to be set, one for the parent tebuconazole and the second covering the TDMs (1,2,4-triazole, triazole alanine, triazole acetic acid and triazole lactic acid). Therefore, residue definitions for tebuconazole for monitoring and risk assessment for plant products were provisionally proposed as tebuconazole only. The plant residue definition for TMDs should be reconsidered when a general approach on triazole compounds and their triazole derivative metabolites is defined.

Supervised residue trials were submitted for the representative uses on cereals and grape where only tebuconazole was analysed for residues. A sufficient number of trials were available to propose MRLs for wheat, rye, barley and oat. Additional data supporting the use on grape in northern EU submitted during the peer review process 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. 1095/2007. Therefore the MRL for grape was proposed to cover the southern GAP only. Tebuconazole was shown to be stable under standard hydrolytic conditions. Processing studies on barley showed no concentration for most processed fractions and sufficient information was provided to derive transfer factors for white and red wine. The uptake by rotational crops was not expected to lead to tebuconazole residues above the LOQ. In contrast, a significant uptake of TDMs was observed. The residue situation in rotational crops should be reconsidered with regard to a global approach on TMDs.

Metabolism studies in goats and hens were conducted using tebuconazole only. **Therefore, the possible contribution of TDMs metabolites present in animal feed has not been considered**. The main metabolic pathway consists of hydroxylation of tebuconazole to hydroxy-tebuconazole and further oxidation to tebuconazole-carboxylic acid followed by conjugations. Provisionally, the residue definition for animal products for monitoring and risk assessment was defined as "sum of tebuconazole, hydroxy-tebuconazole and their conjugates expressed as tebuconazole". As for plants, the inclusion of the TDMs in the animal residue definitions will need to be reconsidered at a later stage when a global EU approach on TDMs is defined. Considering the potential livestock exposure to tebuconazole residues through consumption of treated feed items (cereal grains and straw, and grape pomaces being excluded), feeding studies indicate that no measurable residues may be present above the LOQ in the different animals products. Thus MRLs for animal products were proposed at LOQ values.

The consumer risk assessment has been performed through the residues of tebuconazole only and according to the residue definitions proposed for plant and animal products. **The contribution of the**

TDMs residues in primary crops, rotational crops and products of animal origin resulting from the use of tebuconazole has not been evaluated and not been taken into account in the consumer risk assessment awaiting the definition of a global EU approach concerning these metabolites, which are common for all active substance of the triazole chemical class. Moreover toxicological end points have been set for some of these TDMs but not for triazole lactic acid observed at harvest in peanut kernels. Taking into account the above considerations, the chronic and acute consumer exposures, performed using the proposed MRL for cereals, grape and animal products, were found to be below the toxicological values set for tebuconazole. Nevertheless it was concluded that a robust risk assessment related to the compounds of the triazole chemical class needs to take into account the TDMs.

The information available on the fate and behaviour in the environment was considered sufficient to carry out an appropriate environmental exposure assessment at the EU level when following agreed assessment practices. For the applied for intended uses, the potential for groundwater exposure by tebuconazole and its identified soil metabolite 1,2,4-triazole above the parametric drinking water limit of 0.1 µg/L, is low. However there is an issue that the rate of degradation of tebuconazole in soil under field conditions and in some laboratory investigations was significantly more rapid than in the available experiments where the route of degradation could be adequately investigated (laboratory studies with radiolabelled test substance with appropriate sampling intervals). Therefore there is more uncertainty that all potential metabolites that may leach have been assessed, than is usually the case for a substance where the field behaviour and behaviour in adequate laboratory route of degradation studies of the active substance are not so divergent. The available estimated atmospheric half life for tebuconazole (2.6 days) gives an indication that it could have the potential to be subject to long range transport to areas where it has not been used, via the atmosphere.

The risk assessment for herbivorous birds needed refinement for the spray applications. The risk was sufficiently addressed on the basis of measured residues and the time weighted average factor f(twa) of 0.42 agreed in the expert meeting. The suggested PT values to refine the risk assessment for insectivorous birds were not agreed since no supporting data were submitted (no radio-tracking studies) and a data gap was identified for further refinement of the long-term risk assessment for insectivorous birds for the uses in cereals and grapes. The first-tier acute TER for granivorous birds was 7.4. An avoidance study was submitted which gives some indication of avoidance of treated seeds. It was accepted by the experts that under more realistic exposure conditions the risk to granivorous birds would be lower than indicated in the first tier acute risk assessment. However the available information does not allow a reliable quantitative risk assessment and the experts identified a data gap for further information to support the suggested refinements. The short-term risk to granivorous birds was assessed as low but the long-term risk assessment needed refinement. The quantitative use of the avoidance factor was rejected. It was agreed that the reproductive risk to birds

for the autumn/winter sown cereals is likely to be low since it is applied outside of the breeding season but a data gap was identified for spring sown cereals.
The first-tier acute and long-term TERs for the standard risk assessment scenarios for mammals were above the trigger of 10 for the spray application uses except for herbivorous mammals in grapes. The refinement of the f(twa) of 0.42 was accepted but the measured residues in cereals to refine the RUD value for grass/weeds in grape were not accepted and a data gap was identified in the expert meeting for further refinement of the risk assessment for herbivorous mammals in grapes. The long-term risk assessment for granivorous mammals needed refinement. The suggested refinements of PT, avoidance and dehusking factor were rejected by the experts and a data gap was identified.
No risk assessment was conducted for the second active substance triazoxide in the seed treatment. The risk to herbivorous birds and mammals from the formulation containing a second active substance needs to be addressed further.
The risk to aquatic organisms was assessed as low for the use as a seed treatment. Risk mitigation measures were required for the spray uses in cereals and grapes. A 5 m no-spray buffer zone was sufficient in most FOCUS step 4 drainage scenarios for the spray application in cereals and in half of the scenarios for the application in grapes. Risk mitigation comparable to a 5 m no-spray buffer zone was not sufficient for environmental conditions represented by the run-off scenarios R1(stream), R3 and R4 for the spray application in cereals and R1(stream), R2, R3 for the use in grapes. The risk from the metabolites HWG 1608-pentanoic acid, HWG 1608-lactone, 1,2,4-triazole to aquatic organisms was assessed as low.
The risk to non-target arthropods was assessed as low for the seed-treatment use. However uncertainty remains with regard to reproductive effects on predatory mite species for the spray application uses and a data gap was identified in the experts´ meeting.
The risk to bees, soil non-target macro- and micro-organisms, non-target plants and biological methods of sewage treatment were assessed as low.

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

- For operators and workers (application of Folicur EW 250) and for operators (application of Raxil S FS 040) personal protective equipment is needed.
- A no-spray buffer zone of at least 5 m is required to mitigate the risk to aquatic organisms for the spray uses in cereals and grapes. Additional risk mitigation is required for environmental conditions represented by the run-off scenarios R1(stream), R3 and R4 for the spray application in cereals and R1(stream) R2 and R3 for the use in grapes. (refer to point 5.2).

Critical areas of concern

- A final consumer risk assessment covering the toxicological burden of the triazole derivative metabolites is at this stage not possible due to lacking data on their occurrence in primary crops, rotational crops and products of animal origin.

- The long-term risk to granivorous birds for the seed treatment use.
- The long-term risk to herbivorous mammals for the use in grapes, and to granivorous mammals for the use as a seed treatment.

APPENDIX 1 – LIST OF ENDPOINTS FOR THE ACTIVE SUBSTANCE AND THE REPRESENTATIVE FORMULATION

Identity, Physical and Chemical Properties, Details of Uses, Further Information

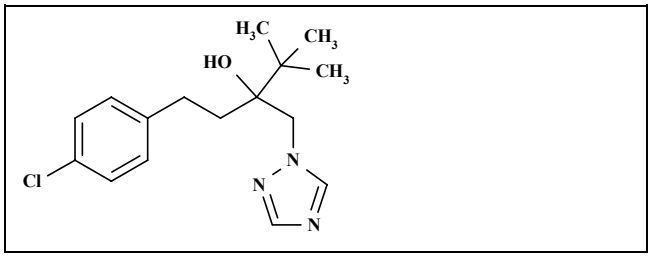
Active substance (ISO Common Name) ‡	Tebuconazole
Function (*e.g.* fungicide)	fungicide
Rapporteur Member State	Denmark
Co-rapporteur Member State	

Identity (Annex IIA, point 1)

Chemical name (IUPAC) ‡	(*RS*)-1-p-chlorophenyl-4,4-dimethyl-3-(1*H*-1,2,4-triazol-1-ylmethyl)- pentan-3-ol
Chemical name (CA) ‡	(±)-α-[2-(4-chlorophenyl)ethyl]-α-(1,1-dimethylethyl)-1*H*-1,2,4-triazole-1-ethanol
CIPAC No ‡	494
CAS No ‡	107534-96-3
EC No (EINECS or ELINCS) ‡	403-640-2
FAO Specification (including year of publication) ‡	minimum 905 g/kg (AGP:CP/ 369, 2000)
Minimum purity of the active substance as manufactured ‡	≥ 950 g/kg (Bayer) Open (Makhteshim I) Open (Makhteshim II) (racemic mixture 1:1)
Identity of relevant impurities (of toxicological, ecotoxicological and/or environmental concern) in the active substance as manufactured	none
Molecular formula ‡	$C_{16}H_{22}ClN_3O$
Molecular mass ‡	307.8 g/mol

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

Structural formula ‡	

Physical and chemical properties (Annex IIA, point 2)

Melting point (purity) ‡	105 °C (99.9%)
Boiling point (purity) ‡	Thermal decomposition is reached before boiling point.
Temperature of decomposition (purity)	DTA-measurement: Exothermal reaction above 350 °C. TGA-measurement: A weight loss was observed above 165 °C. (99.5%)
Appearance (purity) ‡	Pure material: colourless crystals (99.5%)
	Technical material: yellowish crystalline powder (purity not specified)
Vapour pressure (state temperature, state purity) ‡	Purity: 99.1% 1.3×10^{-6} Pa at 20 °C (extrapolated) 3.1×10^{-6} Pa at 25 °C (extrapolated)
Henry's law constant ‡	1×10^{-5} Pa . m³ / mol at 20 °C (calculated)
Solubility in water (state temperature, state purity and pH) ‡	Temperature: 20 °C. Purity: 99.5% 38 mg/L at pH 5.3 36 mg/L at pH 7.2 36 mg/L at pH 9.4

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

Solubility in organic solvents ‡ (state temperature, state purity)	Temperature: 25°C. Purity: 99.9% n-hexane 0.08 g/L polyethylene glycol (PEG) 46 g/L toluene 57 g/L acetonitrile 89 g/L 1-octanol 96 g/L 2-propanol 99 g/L PEG + ethanol 1:1 140 g/L acetone > 200 g/L dichloromethane > 200 g/L dimethylformamide > 200 g/L dimethylsulfoxide > 200 g/L
Surface tension ‡ (state concentration and temperature, state purity)	64.26 mN/m at 20 °C and 28.8 mg/L (technical)
Octanol/water partition coefficient ‡ (state temperature, pH and purity)	log P_{OW} = 3.7 at 20 °C, pH 7 (purity 99.1 %)
	Effect of pH was not investigated since there is no dissociation in water in the environmentally relevant pH range
Dissociation constant (state purity) ‡	Temperature: not stated. Purity: not stated pKa: Tebuconazole is a very weak base which can only be completely protonised in non-aqueous systems in the presence of very strong acids. It is not possible to specify a pK value for water
UV/VIS absorption (max.) incl. ε ‡ (state purity, pH)	Purity: 99.5% Solution / Wavelength [nm] / Molar extinction coefficient [L.mol^{-1}.cm^{-1}] neutral 221.4 11980 neutral 262.0 304 neutral 268.5 408 neutral 276.5 368 neutral 290.0 <10 Acidification and alkalinisation did not influence the absorption.
Flammability ‡ (state purity)	Not highly flammable (purity 98.1%)

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

Explosive properties ‡ (state purity)	No explosive properties (purity 97.6%)
Oxidising properties ‡ (state purity)	No oxidising properties (purity 98.1%)

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

Summary of representative uses evaluated (tebuconazole)*

Crop and/ or situation (a)	Member State or Country	Product name	F G or I (b)	Pests or Group of pests controlled (c)	Preparation		Application				Application rate per treatment (for explanation see the text in front of this section)			PHI (days) (m)	Remarks
					Type (d-f)	Conc. of as (i)	Method kind (f-h)	Growth stage & season (j)	Number min/ max (k)	Interval between applications (min)	g as/hL min – max (l)	water L/ha min – max	g as/ha min – max (l)		
Cereals (wheat, barley, oat, rye)	EU north	Folicur	F	Foliar fungi	EW	250 g/L	Spray	BBCH 69, summer	1 - 2	21 days	50-250	100-500	Max. 250	35	
Cereals (wheat, barley, oat, rye)	EU south	Folicur	F	Foliar fungi	EW	250 g/L	Spray	BBCH 69, summer	1 - 2	21 days	50-250	100-500	Max. 250	28	
Grape (wine and table)	EU north and south	Folicur	F	Foliar fungi	EW	250 g/L	Spray	BBCH 81, summer	1 - 3	14 days	10-20	500-1000	Max. 100	14	
Barley	EU north	Raxil S	F	Bunt and smut	FS	20 g/L (tebu conaz	Seed dressing	Seed, winter and spring	1	Not applicable	Not appli cable	Not appli cable	Max 6 (3 g as/dt seed)	Not appli cable	Raxil S is a mixture with triazoxide

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

Crop and/ or situation (a)	Member State or Country	Product name	F G or I (b)	Pests or Group of pests controlled (c)	Preparation		Application				Application rate per treatment (for explanation see the text in front of this section)			PHI (days) (m)	Remarks
					Type (d-f)	Conc. of as (i)	Method kind (f-h)	Growth stage & season (j)	Number min/ max (k)	Interval between applications (min)	g as/hL min – max (l)	water L/ha min – max	g as/ha min – max (l)		
						ole)							(tebuconazole)		

* For uses where the column "Remarks" is marked in grey further consideration is necessary. Uses should be crossed out when the notifier no longer supports this use(s).
(a) For crops, the EU and Codex classifications (both) should be taken into account; where relevant, the use situation should be described (e.g. fumigation of a structure)
(b) Outdoor or field use (F), greenhouse application (G) or indoor application (I)
(c) *e.g.* biting and suckling insects, soil born insects, foliar fungi, weeds
(d) *e.g.* wettable powder (WP), emulsifiable concentrate (EC), granule (GR)
(e) GCPF 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. Normally the rate should be given for the active substance (according to ISO) and not for the variant in order to compare the rate for same active substances used in different variants (e.g. fluoroxypyr). **In certain cases, where only one variant is synthesised, it is more appropriate to give the rate for the variant (e.g. benthiavalicarb-isopropyl).**
(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) The values should be given in g or kg whatever gives the more manageable number (e.g. 200 kg/ha instead of 200 000 g/ha or 12.5 g/ha instead of 0.0125 kg/ha
(m) PHI - minimum pre-harvest interval

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

Methods of Analysis

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

Technical as (analytical technique)	IR GC-FID
Impurities in technical as (analytical technique)	HPLC-UV GC-FID
Plant protection product (analytical technique)	HPLC-UV GC-FID

Analytical methods for residues (Annex IIA, point 4.2)

Residue definitions for monitoring purposes

Food of plant origin		Tebuconazole
Food of animal origin		Tebuconazole, hydroxy-tebuconazole as well as conjugates expressed as tebuconazole
Soil		Tebuconazole
Water	surface	Tebuconazole
	drinking/ground	Tebuconazole
Air		Tebuconazole

Monitoring/Enforcement methods

Food/feed of plant origin (analytical technique and LOQ for methods for monitoring purposes)	Multi method DFG-S19 GC-MSD: 0.02 mg/kg (cereals and other dry crops; commodities with high water content)
Food/feed of animal origin (analytical technique and LOQ for methods for monitoring purposes)	GC-NPD: 0.05 mg/kg in tissues and eggs, 0.01 mg/kg in milk, (individually for tebuconazole and hydroxy-tebuconazole) DFG S19 with GC-MSD with LOQ of 0.02 mg/kg (tebuconazole only)
Soil (analytical technique and LOQ)	GC-NPD(MS) (LOQ: 0.01 mg/kg) HPLC-MS-MS (LOQ: 0.005 mg/kg)

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

Water (analytical technique and LOQ)	Surface water: HPLC-MS-MS (LOQ: 0.1 µg/L) GC-MS (LOQ: 0.05 µg/L)
Air (analytical technique and LOQ)	GC-NPD(MS) (LOQ: 11 µg a.s./m^3)
Body fluids and tissues (analytical technique and LOQ)	Not relevant

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

	RMS/peer review proposal
Active substance	None

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

Impact on Human and Animal Health

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

Rate and extent of oral absorption ‡	> 98% (based on urinary (7.4%) and biliary (90.9%) excretion within 48 hours)
Distribution ‡	Widely distributed, highest concentrations in kidney and liver
Potential for accumulation ‡	No potential
Rate and extent of excretion ‡	Rapid and extensively. 65-80% via faeces and 16-35% via urine
Metabolism in animals ‡	Extensively metabolised by phase-1 oxidation and phase-2 conjugation
Toxicologically relevant compounds ‡ (animals and plants)	Parent and triazole metabolites
Toxicologically relevant compounds ‡ (environment)	Parent and triazole metabolites

Acute toxicity (Annex IIA, point 5.2)

Rat LD_{50} oral ‡	1700 mg/kg bw (f)	R22
Rat LD_{50} dermal ‡	> 2000 mg/kg bw	
Rat LC_{50} inhalation ‡	> 5.093 mg/L (nose only, 4 h)	
Skin irritation ‡	Non-irritant	
Eye irritation ‡	Non-irritant	
Skin sensitisation ‡	Non-sensitiser (M & K test)	

Short term toxicity (Annex IIA, point 5.3)

Target / critical effect ‡	Adrenals/hypertrophy of *zona fasciculate* cells (dogs) Liver blood system and adrenals (rats)	
Relevant oral NOAEL ‡	3 mg/kg bw/day (1 year dog) 9 mg/kg bw/day (90 day rat)	
Relevant dermal NOAEL ‡	1000 mg/kg bw/day (3 weeks rabbit)	

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

Relevant inhalation NOAEL ‡	0.0106 mg/L (3 weeks rat)	

Genotoxicity ‡ (Annex IIA, point 5.4)

No evidence for genotoxic potential	

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

Target/critical effect ‡	Liver toxicity (rat and mouse)	
Relevant NOAEL ‡	5.9 mg/kg bw/day (21 month mice) 55 mg/kg bw/day (24 month rat)	
Carcinogenicity ‡	Liver tumours in sensitive mice strain. Not relevant for humans	

Reproductive toxicity (Annex IIA, point 5.6)

Reproduction toxicity

Reproduction target / critical effect ‡	Decreased body weight gain for parent and pups. No reproductive effects.	
Relevant parental NOAEL ‡	300 ppm (21.6 mg/kg bw/day)	
Relevant reproductive NOAEL ‡	1000 ppm (72.3 mg/kg bw/day)	
Relevant offspring NOAEL ‡	300 ppm (21.6 mg/kg bw/day)	

Developmental toxicity

Developmental target / critical effect ‡	**Rat:** Maternal**:** reduced body weight gain and liver effects Developmental**:** increased incidence of malformations and increased number of resorptions at maternal toxic dose **Rabbit**: Maternal: Reduced body weight	R63 (R61 ?)

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

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	Developmental: increased post-implantation loss and malformations without maternal toxicity **Mouse:** Maternal: no adverse findings Developmental: increased post-implantation loss and malformations without maternal toxicity	
Relevant maternal NOAEL ‡	10 mg/kg bw/day (rat) 30 mg/kg bw/day (rabbit) 100 mg/kg bw/day (mouse)	
Relevant developmental NOAEL ‡	30 mg/kg bw/day (rat) 10 mg/kg bw/day (rabbit) LOAEL = 10 mg/kg bw/day (mouse)	

Neurotoxicity (Annex IIA, point 5.7)

Acute neurotoxicity ‡	No signs of neurotoxicity(acute oral rat) NOAEL 50 mg/kg bw	
Repeated neurotoxicity ‡	No signs of neurotoxicity (90 day rat) NOAEL 29.2 mg/kg bw/day	
Delayed neurotoxicity ‡	No data available – not required	

Other toxicological studies (Annex IIA, point 5.8)

Mechanism studies ‡	No data available – not required
Studies performed on metabolites or impurities ‡	Reference values for triazole metabolites established at PRAPeR 14, 2007.

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

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Medical data ‡ (Annex IIA, point 5.9)

No adverse effects on health in manufacturing personnel. No cases of poisoning have been reported. No epidemiological studies available.

Summary (Annex IIA, point 5.10)	Value	Study	Safety factor
ADI ‡	0.03 mg/kg bw/day	1-year dog supported by developmental mouse study (LOAEL)	100 300
AOEL ‡	0.03 mg/kg bw/day	1-year dog supported by developmental mouse study (LOAEL)	100 300
ARfD ‡	0.03 mg/kg bw	Developmental mouse study (LOAEL)	300

Dermal absorption ‡ (Annex IIIA, point 7.3)

Formulation (Folicur EW 250)	13% both mixing/loading and application based on *in vivo* monkey study

Exposure scenarios (Annex IIIA, point 7.2)

Operator	Folicur EW 250 Acceptable for proposed use in the German model with PPE (17% of AOEL for low crops and 13% for hand-held and tractor-mounted high crop application). Without PPE: 138% for low crops, 70% for high crops with tractor-mounted application and 154% for high crops with hand-held application.

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

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	Not acceptable for low level application in the UK-model with PPE (217% of AOEL). Without PPE: 1667%. Not acceptable in UK model for high level application. With PPE 667% and without PPE 1067% Raxil S FS 040 Acceptable according to SeedTROPEX 52% of AOEL during seed treatment 33% during loading /sowing
Workers	Folicur EW 250 German model (Krebs et al, 2000) Acceptable (52% of AOEL with PPE and 520% without PPE) Raxil S FS 040 Not relevant for seed treatment
Bystanders	Folicur EW 250 According to Ganzelmeier et al. 1995): Acceptable (0.5% of AOEL) Raxil S FS 040 Not relevant for seed treatment

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

	According to proposal of PRAPeR 49
Substance classified (tebuconazole)	Xn, "Harmful" R22 Harmful if swallowed R63 Possible risk of harm to unborn child Alternative proposal: (R61 May cause harm to the unborn child)

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

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

Plant groups covered	Foliar treatment: Cereals (wheat), oilseed (peanut), fruit (grape) Seed treatment: ceraels (wheat)
Rotational crops	Kale, wheat, beet root
Metabolism in rotational crops similar to metabolism in primary crops?	Yes, the metabolites identified in primary crops and rotational crops are in a high degree the same. Metabolites found in rotational crops but not in the primary crop are only found in minor amounts and evaluated to be of no toxicological significance.
Processed commodities	Baking, brewing and boiling (100 ºC at pH 5 for 60 min.), sterilisation (120 ºC at pH 6 for 20 min.) and pasteurisation (90 ºC at pH 4 for 20 min.).
Residue pattern in processed commodities similar to residue pattern in raw commodities?	The study has been performed with radioactive labelled tebuconazole only parent compound was found.
Plant residue definition for monitoring	Sum of enantiomers contained in tebuconazole (Provisional, pending outcome of a global risk assessment on TDMs) for both primary and rotational crops
Plant residue definition for risk assessment	Sum of enantiomers contained in tebuconazole (for both primary and rotational crops) An additionnal residue definition is needed for TDMs (triazole, triazole alanine, triazole acetic acid and triazole lactic acid) harmonised for all active substances of the triazole chemical class
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	Lactating goat, laying hens
Time needed to reach a plateau concentration in milk and eggs	Residues were low throughout the studies and only few data are measured. In eggs it look likes a plateau is reached 2 days after the first dose.

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

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Animal residue definition for monitoring	Tebuconazole + hydroxy-tebuconazole and their conjugates (sum of enantiomers) expressed as tebuconazole (Provisional, pending the outcome of a global risk assessment on TDMs)
Animal residue definition for risk assessment	Tebuconazole + hydroxy-tebuconazole and their conjugates (sum of enantiomers) expressed as tebuconazole (Provisional) An additionnal residue definition is needed for TDMs, harmonised for all active substances of the triazole chemical class.
Conversion factor (monitoring to risk assessment)	None
Metabolism in rat and ruminant similar (yes/no)	Yes.
Fat soluble residue: (yes/no)	Yes

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

Grape is a permanent crop and studies concerning residues in succeeding crops are not necessary. The metabolism in primary and rotational crops are similar. However, the situation in rotational crops should be reconsidered as it seems that rather high amounts of triazole metabolites can be found in rotational crops.

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

Peaches, prunes, grapes, apples, cherries:	30 months
Wheat, grain, straw and forage (cereals):	30 months
Peanut nutmeat (oil seed):	30 months
Wheat flour and bran (cereals):	24 months
Peanut oil (oil seeds):	24 months
Raisin (fruit):	24 months
Cattle, liver, muscle, kidney, fat, milk:	23 weeks
Chicken, liver, muscle, fat, egg:	23 weeks

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

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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: 5.45 beef cattle: 8.7 (mg/kg dry matter)	Yes. 1.6 mg/kg dry matter	Not calculated
Potential for accumulation (yes/no):	No	No	No
Metabolism studies indicate potential level of residues ≥ 0.01 mg/kg in edible tissues (yes/no)	Not at expected intake levels for dairy and beef cattle	Not at expected intake levels for poultry	Not at expected intake levels by pigs
	Feeding studies (Specify the feeding rate in cattle and poultry studies considered as relevant) Residue levels in matrices : Mean (max) mg/kg		
Muscle	25, 75 and 250 mg/kg dry matter: <0.05	2, 6 and 20 mg/kg dry matter: <0.05	Not required
Liver	25 mg/kg dry matter: <0.06 (0.07) 75 mg/kg dry matter: 0.08 (0.12) 250 mg/kg dry matter: 0.14 (0.20)	2 and 6 mg/kg dry matter: < 0.05 20 mg/kg dry matter: 0.05	Not required
Kidney	25, 75 and 250 mg/kg dry matter: <0.05	2 mg/kg dry matter: < 0.05	Not required
Fat	25, 75 and 250 mg/kg dry matter: <0.05	2, 6 and 20 mg/kg dry matter: <0.05	Not required
Milk	25, 75 and 250 mg/kg dry matter: <0.01		
Eggs		2, 6 and 20 mg/kg dry matter: <0.025	

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

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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 (mg/kg) (c)	STMR (mg/kg) (b)
Barley	Northern Region Field trials	6x <0.05, 3x 0.06, 0.08, 0.13, 0.21	MRL of 2.0 mg/kg for Barley based on the southern residue trials (Rmax: 1.8, Rber: 1.9)	2	0.21	0.055
	Mediterranean Region Field trials	<0.05, 0.05, 0.10, 0.31, 0.38, 0.85, 0.93, 0.96, 1.0			1.0	0.38
Rye	Northern Region Field trials	2x <0.05	MRL for rye extrapolated from wheat	0.05*	<0.05	
Wheat	Northern Region Field trials	11x <0.05		0.05*	<0.05	<0.05
	Mediterranean Region Field trials	7x <0.05, 0.06			0.06	<0.05
Grapes	Mediterranean Region Field trials	0.03, 0.04, 0.05, 0.06, 2x 0.07, 0.08, 0.10		0.2	0.10	0.065

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

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(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

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

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

ADI	0.03 mg/kg bw/day
TMDI (% ADI) according to WHO European diet	
TMDI (% ADI) according to national (to be specified) diets	EFSA model used and include grape, grain and animal products UK, infant: 15.3 % French toddler: 14.7 % NL, child: 13.3 %
IEDI (WHO European Diet) (% ADI)	Not calculated
NEDI (specify diet) (% ADI)	Not calculated
Factors included in IEDI and NEDI	None
ARfD	0.03
IESTI (% ARfD)	Not calculated
NESTI (% ARfD) according to national (to be specified) large portion consumption data	Highest according to EFSA model Grapes, German, child: 43.7%
Factors included in IESTI and NESTI	None

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	
Grapes to must	10	0.36 (0.1, 0.11, 0.15, 0.17, 0.34, 0.36, 0.44, 0.57, 0.65)		
Grapes to wine	10	0.26 (0.09, 0.11, 2 x 0.12, 0.16, 0.24, 0.29, 0.41, 0.43, 0.67)		
Barley grain to pearl barley	4	0.27 (0.2, 0.22, 2 x 0.32)		
Barley grain to beer	4	0.03 (2 x 0.02, 2 x 0.03)		

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

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

Barley	2 mg/kg
Wheat	0.05* mg/kg
Rye	0.05* mg/kg (extrapolation from wheat)
Oat	2 mg/kg (extrapolation from barley)
Table and wine grapes.	0.2 mg/kg, (Southern EU only)
Birds* and eggs	0.1* mg/kg
Meat, preparations of meat, blood, animal fat	0.1* mg/kg
Milk and cream	0.02* mg/kg

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

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

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

Mineralization after 100 days ‡	0.4 % after 112 d, [^{14}C-phenyl]-label (n[32]= 1) <0.1 % after 58 d, [^{14}C-triazole]-label (n= 1)
Non-extractable residues after 100 days ‡	16.2 % after 112 d, [^{14}C-phenyl]-label (n= 1) 14.5 % after 58 d, [^{14}C-triazole]-label (n= 1)
Metabolites requiring further consideration ‡ - name and/or code, % of applied (range and maximum)	1,2,4-triazole (*M26*), 0.9-9 % at 318-378 d (n= 1) [^{14}C-triazole] label

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

Anaerobic degradation ‡

Mineralization after 100 days	<0.1 % after 30 d, [^{14}C-phenyl]-label (n= 1)
Non-extractable residues after 100 days	19.5 % after 30 d, [^{14}C-phenyl]-label (n= 1)
Metabolites that may require further consideration for risk assessment - name and/or code, % of applied (range and maximum)	No new metabolite not already occurring under aerobic conditions

Soil photolysis ‡

	Negligible soil photolysis
Metabolites that may require further consideration for risk assessment - name and/or code, % of applied (range and maximum)	None

[32] n corresponds to the number of soils.

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

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

Laboratory studies ‡

Tebuconazole	Aerobic conditions						
Soil type	X[33]	pH	t. °C / % MWHC	DT_{50} /DT_{90} (d)	DT_{50} (d) 20 °C pF2/10kPa	St. (r^2)	Method of calculation
Sandy loam		4.5	23 ºC / 75 %	>1 year *	-	-	Not possible
Geometric mean/median							

*: Recovery of a.s. was 67.4% after 365 d (cf. table B.8.1.1.1-1)

Met.: **1,2,4-triazole**	Aerobic conditions							
Soil type	X[1]	pH	t. °C / % MWHC	DT_{50} (d)	DT_{90} (d)	DT_{50} (d) 20 °C [2)] pF2/10kPa	St. (r^2)	Method of calculation
Silt loam		6.4	20ºC/40%	6.3 d	21 d	5.0	0.75	SFO
Silt loam		5.8	20ºC/40%	9.9 d	33 d	9.9	0.81	SFO
Silt loam		6.7	20ºC/40%	12.3 d	41 d	8.2	0.95	SFO
Geometric mean/median						7.4		

[1)]: Values normalised to 20 ºC. [2)]: Values normalised to 20 ºC and moisture.

Field studies ‡

Tebuconazole	Aerobic conditions								
Soil type (indicate if bare or cropped soil was used).	Location (country or USA state).	Ave - rage ºC[1]	pH	Depth (cm)	DT_{50} (d) actual	DT_{90}(d) actual	St. (r^2)	DT_{50} (d) Norm.	Method of calculation
Loamy sand	Germany (NE)	10.5	6.7	0-10	**91.6**	304	0.64	43.6	SFO
Sandy clay loam	UK (NE)	11	7.6	0-10	77	256	0.88	39.3	SFO
Silt loam	France (NE)	9	7.0	0-10	57	189	0.96	39.5	SFO
Silt loam	Germany (NE)	11	6.4	0-10	35	116	0.93	20.3	SFO

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

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

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Field studies ‡

Tebuconazole	Aerobic conditions								
Soil type (indicate if bare or cropped soil was used).	Location (country or USA state).	Ave - rage °C[1]	pH	Depth (cm)	DT_{50} (d) actual	DT_{90}(d) actual	St. (r^2)	DT_{50} (d) Norm.	Method of calculation
Sandy loam	Germany (NE)	13	6.5	0-10	58	193	0.82	31.9	SFO
Loamy sand	Italy, (SE)	17	7.7	0-10	34.5	115	0.92	41.4	SFO
Loamy silt	France (SE)	17	7.7	0-10	19.9	66	0.97	15.4	SFO
Geometric mean								31	
Median								39.3	

(NE): Northern Europe. (SE): Southern Europe.

pH dependence ‡ (yes / no) (if yes type of dependence)	No
Soil accumulation and plateau concentration ‡	Plateau concentration of 0.02, 0.05 and 0.1 mg/kg reached after 3 years application of 250, 500, and750 g a.s./ha per annum, respectively, in field studies. Accumulation factor: 2-3.

Laboratory studies ‡

Tebuconazole	Anaerobic conditions						
Soil type	X[34]	pH	t. °C / % MWHC	DT_{50} / DT_{90} (d)	DT_{50} (d) 20 °C pF2/10kPa	St. (r^2)	Method of calculation
Sandy loam		4.5	20 / 100% (flooded)	> 365 d *	-	-	Not possible

*: 1.5% degradation in 30 days

Met.: 1,2,4-triazole	Anaerobic conditions							
Soil type	X[1]	pH	t. °C / % MWHC	DT_{50}/ DT_{90} (d)	f. f. k_{dp}/k_f	DT_{50} (d) 20°C pF2/10kPa	St. (r^2)	Method of calculation

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

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

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Silt loam		7.3	20°/40%	81 / 269	-	-	-	SFO

Soil adsorption/desorption (Annex IIA, point 7.1.2)

Tebuconazole ‡							
Soil Type	OC %	Soil pH	Kd (mL/g)	Koc (mL/g)	Kf (mL/g)	Kfoc (mL/g)	1/n
Silt loam Euro soil 2	3.7	7.4			9.86	266	1.179
Loamy sand Lufa 2.2	2.19	5.6			12.59	575	0.747
Sandy loam Lufa 2.3	1.18	6.6			1.52	128	1.204
Sandy loam, Kansas, USA	1.40	5.2	-	-	12.69	906	0.739
Silt, Burscheid, D	1.80	5.3	-	-	16.39	910	0.721
Sand, Jockgrim, D	0.75	5.6	-	-	7.67	102.3	0.711
Sandy loam, Monheim, D	1.27	5.2	-	-	15.86	1249	0.738
Silty sand, Borstel, D	1.20	5.7	-	-	12.69	1057	0.805
Silty sand, Laacher Hof, D	1.35	6.4	-	-	10.84	803	0.763
Arithmetic mean						769	0.84
pH dependence, Yes or No			No				

Metabolite 1 ‡: 1,2,4-triazole							
Soil Type	OC %	Soil pH	Kd (mL/g)	Koc (mL/g)	Kf (mL/g)	Kfoc (mL/g)	1/n
Silty clay, Alpaugh, USA	0.70	8.8	-	-	0.833	120	0.897
Clay loam, Hollister, USA	1.74	6.9	-	-	0.748	43	0.827
Silty clay loam, Lawrenceville, USA	0.70	7.0	-	-	0.722	104	0.922
Sandy loam, Pachappa, USA	0.81	6.9	-	-	0.720	89	1.016
Arithmetic mean					0.756	89	0.916
pH dependence (yes or no)			No				

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

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

Column leaching ‡	Not included
Aged residues leaching ‡	Aged for (d): 30 and 90 d Time period (d): 2 d (48 h) Elution (mm): 200 mm
	Analysis of soil residues post ageing (soil residues pre-leaching): 82.5 % active substance, 1.2 % 1,2,4-triazole and 84.8 % total residues/radioactivity
	Leachate: 0.3 % total residues/radioactivity in leachate. 93-98 % total radioactivity retained in top third of column, approx 9 cm.
Lysimeter/ field leaching studies ‡	No lysimeter study performed. Long term field dissipation studies and adsorption/desorption characteristics indicate a low leaching potential

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

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PEC (soil) (Annex IIIA, point 9.1.3)

Parent Method of calculation	DT_{50} (d): 91.6 days Kinetics: SFO (FOCUS: PEARL) Field or Lab: representative worst case from field studies
Application data	Crop: cereals and vine Depth of soil layer: 5 cm Soil bulk density: 1.5g/cm^3 % plant interception: (cereals) interception at BBCH 31 set to 70 %, (vine) interception at BBCH 53 set to 60 % for 1st application and 70 % for later applications Number of applications: (cereals) 2, (vine) 3 Interval (d): (cereals) 21 d, (vine) 14 d Application rate(s): Spray application, Folicur EW 250: (cereals) 2 × 250 g/ha; (vine) 3 × 100 g/ha Seed treatment, Raxil S FS 040: (cereals) 6 g / ha (calculations performed with 7.5 g/ha)

Maximum PEC_{soil}

$PEC_{(s)}$ (mg/kg)		Spray application in winter cereals		Spray application in grapevines		Seed treatment in winter cereals	
		$PEC_{soil, max}$ (mg/kg)	TWAsoil (mg/kg)	$PEC_{soil, max}$ (mg/kg)	TWAsoil (mg/kg)	$PEC_{soil, max}$ (mg/kg)	TWAsoil (mg/kg)
Initial		0.185		0.119		0.010	
Short term	24 h	0.184	0.185	0.118	0.119	0.010	0.010
	2 d	0.183	0.184	0.117	0.118	0.010	0.010
	4 d	0.180	0.183	0.116	0.117	0.010	0.010
Long term	7 d	0.176	0.180	0.113	0.116	0.009	0.010
	21 d	0.158	0.171	0.102	0.110	0.009	0.009
	28 d	0.150	0.167	0.096	0.107	0.008	0.009
	50 d	0.127	0.154	0.082	0.099	0.007	0.008
	100 d	0.087	0.130	0.056	0.084	0.005	0.007

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

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Metabolite: 1,2,4-triazole Method of calculation	Molecular weight relative to the parent: 0.225 DT_{50} (d): 12.3 days Kinetics: SFO (FOCUS: PEARL) Field or Lab: Representative worst case from laboratory studies.
Application data	Application rate assumed: Spray application, Folicur EW 250: (cereals) 2 × 250 g/ha; (vine) 3 × 100 g/ha Seed treatment, Raxil S FS 040: (cereals) 6 g / ha (calculations performed with 7.5 g/ha) (assumed 1,2,4-triazole is formed at a maximum of 9 % of the applied dose)

$PEC_{(s)}$ (mg/kg)		Spray application in winter cereals		Spray application in grapevines		Seed treatment in winter cereals	
		$PEC_{soil, max}$ (mg/kg)	TWAsoil (mg/kg)	$PEC_{soil, max}$ (mg/kg)	TWAsoil (mg/kg)	$PEC_{soil, max}$ (mg/kg)	TWAsoil (mg/kg)
Initial		0.003		0.001		<0.0005	
Short term	24 h	0.003	0.003	0.001	0.001	<0.0005	<0.0005
	2 d	0.002	0.003	0.001	0.001	<0.0005	<0.0005
	4 d	0.002	0.002	0.001	0.001	<0.0005	<0.0005
Long term	7 d	0.002	0.002	0.001	0.001	<0.0005	<0.0005
	21 d	0.001	0.002	<0.0005	0.001	<0.0005	<0.0005
	28 d	0.001	0.001	<0.0005	0.001	<0.0005	<0.0005
	50 d	0.000	0.001	<0.0005	<0.0005	<0.0005	<0.0005
	100 d	0.000	0.001	<0.0005	<0.0005	<0.0005	<0.0005

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

Hydrolytic degradation of the active substance and metabolites > 10 % ‡	pH 5: a.s. Stable at 25 °C (28 d) Met.: 1,2,4-triazole: Stable at 25 °C (28 d)
	pH 7: a.s. Stable at 25 °C (28 d) Met.: 1,2,4-triazole: Stable at 25 °C (28 d)
	pH 9: a.s. Stable at 25 °C (28 d) Met.: 1,2,4-triazole: Stable at 25 °C (28 d)

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

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Photolytic degradation of active substance and metabolites above 10 % ‡	DT_{50} : 590 days in sterile water at pH 7 irradiated by sunlight for 30 days at 22 ºC i.e. No significant photolytic degradation:
Quantum yield of direct phototransformation in water at Σ > 290 nm	Aqueous solution of tebuconazole do not show an absorbance of UV-light at wavelengths above 290 nm
Readily biodegradable ‡ (yes/no)	No data submitted, substance considered not ready biodegradable.

Degradation in water / sediment

Tebuconazole	Distribution (eg max in water *x* after *n* d. Max. sed x % after *n* d)									
Water / sediment system	pH water phase	pH sed	t. °C	DT_{50} whole sys. (d)	St. (r^2)	DT_{50} water (d)	St. (r^2)	DT_{50} Sed (d)	St. (r^2)	Method of calculation
Lienden	7.4		22	> 1 year	-	-	-	-	-	-
Ijzendoorn	7.1		22	> 1 year	-	-	-	-	-	-
Outdoor microcosm Germany 51°N	8.0		11-25	54.4		42.6		*Ca.* 1 year		SFO
Outdoor pond studies Germany 52°N		7.3-8.3						No decline observed		
Geometric mean/median										SFO
Values agreed PEC_{SW} and PEC sediment calculation at EU level				365 d				1000 d		

Metabolite 1	Distribution: no major metabolites formed									
Water / sediment system	pH water phase	pH sed	t. °C	DT_{50}-DT_{90} whole sys.	St. (r^2)	DT_{50}-DT_{90} water	r^2	DT_{50}-DT_{90} sed	St. (r^2)	Method of calculation
Geometric mean/median										

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

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)
Lienden	7.4		10.0 % after 365 d	-	14% after 365 days
Ijzendoorn	7.1		20.9 % after 365 d	-	19% after 365 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: STEPS1&2 in FOCUS 1.1, The available calculations did not use the agreed input paramenters, but approproate step 3 and step 4 simulations are available
Parameters used in FOCUSsw step 3 & 4 (if performed)	Version control No. of FOCUS calculator: STEPS 3&4 in FOCUS 1.1, FOCUS SWASH 1.1 K_{OC} (L/kg): 769 DT_{50} soil (d): 34.8 days[35] DT_{50} water (d): 365 d from sediment /water total system in laboratory DT_{50} sediment (d): 1000 days (default value) Koc: 769 L/kg 1/n: 0.84 (Freundlich exponent general or for soil)
Application rate	Crop: Cereals and grapevine Crop interception: (cereals) interception at BBCH 31 set to 70 %, (vine) interception at BBCH 53 set to 60 % for 1st application and 70 % for 2 later applications Number of applications: (cereals) 2, (vine) 3 Interval (d): (cereals) 21 d, (vine) 14 d Application rate(s): Spray application, Folicur EW 250: (cereals) 2 × 250 g/ha; (vine) 3 × 100 g/ha Seed treatment, Raxil S FS 040: (cereals) 6 g / ha (calculations performed with 7.5 g/ha) Application window: Cereals early (March to May)

[35] note median of the normalised field trial DT50 is 39.3 days, the geomean is 31 days this value of 34.8 days falls between these two.

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

Seeds; late (Oct. to November)

Maximum PEC_{sw} and $PEC_{sw,\ twa}$ (21 days) of tebuconazole from **spray application** to **winter cereals** for different scenarios, FOCUS STEP 3.

Scenario	Water body	$PEC_{sw,\ max}$ [µg/L]	$PEC_{sw,\ twa}$ [µg/L]	$PEC_{sed,\ max}$ [µg/kg]	$PEC_{sed,twa}$ [µg/kg]
D1 Lanna	ditch	1.599	1.112	7.209	7.162
"	stream	1.220	0.084	1.356	1.332
D2 Brimstone	ditch	1.483	1.034	7.427	7.376
"	stream	1.274	0.868	5.278	5.249
D3 Vreedepeel	ditch	1.384	0.079	1.094	0.628
D4 Skousbo	pond	0.071	0.061	0.772	0.771
"	stream	1.165	0.012	0.172	0.089
D5 La Jalliere	pond	0.077	0.067	0.747	0.747
"	stream	1.223	0.007	0.127	0.063
D6 Thiva	ditch	1.396	0.446	2.940	2.427
R1 Weiherbach	pond	0.224	0.198	2.231	2.229
"	stream	1.670	0.121	1.581	1.201
R3 Bologna	stream	1.815	0.133	1.810	1.520
R4 Roujan	stream	3.043	0.379	4.060	2.647

Maximum $PEC_{sw\ max}$ and $PEC_{sw,twa}$ (21 days) of tebuconazole from **spray application** to **grapevine** for different scenarios, FOCUS STEP 3.

FOCUS STEP 3 Scenario	Water body	PECsw, max [µg/L]	PECsw, twa [µg/L]	PECsed, max [µg/kg]	PECsed twa [µg/kg]
D6 Thiva	ditch	1.632	0.908	5.712	4.930
R1 Weiherbach	pond	0.124	0.114	1.071	1.070
"	stream	1.131	0.053	0.874	0.474
R2 Porto	stream	1.431	0.030	0.760	0.585
R3 Bologna	stream	1.510	0.055	0.559	0.311
R4 Roujan,	stream	1.071	0.023	0.528	0.335

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

Maximum PEC_{sw} and PEC_{sed} of tebuconazole from application to winter cereals as a seed treatment **for different scenarios.**

< 0.0005 µg/L in water and < 0.0005 µg/kg in sediment in all pertinent scenarios (D!, D2, D3, D4, D5, D6, R1, R3 and R4)

STEP 4 PEC concentrations

In terms of mitigation for spray application with tebuconazole, drift is the major source of a.s. input into the water bodies: Therefore, the most suitable initial mitigation factor is a buffer zone. The initial buffer zone width used in the STEP 3 calculations is, by default, 1.0 m for the ditch, 3.5 m for the pond, and 1.5 m for the stream for cereals, and 3.5 m for the ditch, 6.0 m for the pond, and 4.0 m for the stream for vines. This was increased to 5 m using values derrived from the SWASH drift calculator and taking into account the additional upstream component for stream scenarios that assumes 20% of the catchment is treated.

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

Maximum PEC_{sw} and $PEC_{sw, twa}$ (21 and 7 days) tebuconazole values from STEP 4 for **spray application** to **winter cereals** with drift mitigation by increasing width of buffer strip to 5 meters (drift mitigation only)

FOCUS STEP 4 Scenario	Water body	PECsw, max [µg a.s./L]	PECsw, twa [µg a.s./L]	
		initial	TWA 21 d	TWA 7 d
D1 Lanna	ditch	0.468	0.324	0.390
"	stream	0.461	0.084	0.088
D2 Brimstone	ditch	0.413	0.287	0.339
"	stream	0.462	0.312	0.375
D3 Vreedepeel	ditch	0.359	0.020	0.060
D4 Skousbo	pond	0.061	0.052	0.057
"	stream	0.411	0.012	0.019
D5 La Jalliere	pond	0.067	0.058	0.063
"	stream	0.432	0.003	0.008
D6 Thiva	ditch	0.362	0.114	0.251
R1 Weiherbach	pond	0.219	0.193	0.209
"	stream	1.670	0.121	0.205
R3 Bologna	stream	1.815	0.133	0.241
R4 Roujan	stream	3.043	0.379	0.905

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

Maximum PECsed and PECsed, twa (21 days) tebuconazole values from STEP 4 for **spray application** to **winter cereals** with drift mitigation by increasing width of buffer strip to 5 meters (drift mitigation only)

FOCUS STEP 4 Scenario	Water body	PECsed, max [µg/kg]	PECsed, twa [µg/kg]
		initial	TWA 21 d
D1 Lanna	ditch	2.857	2.836
"	stream	1.325	1.302
D2 Brimstone	ditch	2.533	2.528
"	stream	2.219	2.207
D3 Vreedepeel	ditch	0.301	0.181
D4 Skousbo	pond	0.694	0.694
"	stream	0.091	0.078
D5 La Jalliere	pond	0.652	0.652
"	stream	0.049	0.027
D6 Thiva	ditch	0.832	0.692
R1 Weiherbach	pond	2.166	2.165
"	stream	1.558	1.178
R3 Bologna	stream	1.748	1.465
R4 Roujan	stream	4.026	2.620

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

Maximum PECsw and PECsw, twa (21 and 7 days) and maximum PECsed and PECsed, twa (21 days) tebuconazole values from STEP 4 for **spray application** to **grapevine** with drift mitigation by increasing width of buffer strip to 5 meters (drift mitigation only).

FOCUS STEP 4 Scenario	Water body	PECsw, max [µg/L]	PECsw, twa 21 d [µg/L]	PECsw, twa 7 d [µg/L]	PECsed, max [µg/kg]	PECsed, twa [µg/kg]
D6 Thiva	ditch	0.981	0.543	0.711	3.555	3.075
R1 Weiherbach	pond	0.143	0.131	0.135	1.215	1.214
"	stream	1.131	0.050	0.128	0.848	0.455
R2 Porto	stream	1.038	0.026	0.063	0.740	0.567
R3 Bologna	stream	1.096	0.040	0.059	0.411	0.231
R4 Roujan	stream	0.777	0.023	0.068	0.512	0.321

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

Metabolite 1,2,4-triazole Parameters used in FOCUSsw step 1 and 2	Molecular weight: 69.1 Water solubility (mg/L): 730,000 Soil or water metabolite: both Koc (L/kg): 89 DT_{50} soil (d): 7 days (Lab. In accordance with FOCUS SFO) DT_{50} water/sediment system (d): (representative worst case from sediment water studies) 999 (default) DT_{50} water (d): 999 (default) DT_{50} sediment (d): 999 (default) Crop interception (%): 50 Maximum occurrence observed (% molar basis with respect to the parent): 9 % in soil, 14% in water systems
Metabolite HWG 1608-lactone (*M17*) Parameters used in FOCUSsw step 1 and 2	Molecular weight: 223.3 Water solubility (mg/L): 5813 Soil or water metabolite: water Koc (L/kg): 1840 DT_{50} water/sediment system (d): 999 (default) DT_{50} water (d): 999 (default) DT_{50} sediment (d): 999 (default) Maximum occurrence observed (% molar basis with respect to the parent): 21 % in water
Metabolite HWG 1608-pentanoic acid (*M25*) Parameters used in FOCUSsw step 1 and 2	Molecular weight: 241.3 Water solubility (mg/L): 14000 Soil or water metabolite: water Koc (L/kg): 29.6 DT_{50} water/sediment system (d): 999 (default) DT_{50} water (d): 999 (default) DT_{50} sediment (d): 999 (default) Maximum occurrence observed (% molar basis with respect to the parent): 40.2 % in water

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

Application rate	Crop: cereals and vines Number of applications: (cereals) 2, (vine) 3 Interval (d): (cereals) 21 d, (vine) 14 d Application rate(s): Spray application, Folicur EW 250: (cereals) 2 × 250 g/ha; (vine) 3 × 100 g/ha Seed treatment, Raxil S FS 040: (cereals) 6 g / ha (calculations performed with 7.5 g/ha) Depth of water body: 30 cm Application window: Cereals early (March to May) Seeds; late (Oct. to November)
Main routes of entry	Drift and run-off

Spray application in winter cereals, 1,2,4-triazole

FOCUS STEP 2 Scenario	Day after overall maximum	PEC_{SW} (µg/L)		PEC_{SED} (µg/kg)	
		Actual	TWA	Actual	TWA
Northern EU	0 h	1.12		0.97	
	24 h	1.09	1.11	0.97	0.97
	2 d	1.09	1.10	0.97	0.97
	4 d	1.09	1.09	0.97	0.97
	7 d	1.09	1.09	0.97	0.97
	14 d	1.08	1.09	0.96	0.96
	21 d	1.08	1.09	0.96	0.96
	28 d	1.07	1.08	0.95	0.96
	42 d	1.06	1.08	0.94	0.96
Southern EU	0 h	1.06		0.92	
	24 h	1.03	1.05	0.92	0.92
	2 d	1.03	1.04	0.92	0.92
	4 d	1.03	1.04	0.92	0.92
	7 d	1.03	1.03	0.92	0.92
	14 d	1.03	1.03	0.91	0.92
	21 d	1.02	1.03	0.91	0.91
	28 d	1.02	1.03	0.90	0.91

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

FOCUS STEP 2 Scenario	Day after overall maximum	PEC_{SW} (µg/L)		PEC_{SED} (µg/kg)	
		Actual	TWA	Actual	TWA
	42 d	1.01	1.02	0.89	0.91

Spray application in grapes, late application, drift 6.9 % / application, 1,2,4-triazole

FOCUS STEP 2 Scenario	Day after overall maximum	PEC_{SW} (µg/L)		PEC_{SED} (µg/kg)	
		Actual	TWA	Actual	TWA
Northern EU	0 h	1.47		1.26	
	24 h	1.42	1.44	1.26	1.26
	2 d	1.42	1.43	1.26	1.26
	4 d	1.42	1.42	1.26	1.26
	7 d	1.41	1.42	1.26	1.26
	14 d	1.41	1.42	1.25	1.26
	21 d	1.40	1.41	1.25	1.25
	28 d	1.39	1.41	1.24	1.25
	42 d	1.38	1.40	1.23	1.25
Southern EU	0 h	1.52		1.31	
	24 h	1.47	1.50	1.31	1.31
	2 d	1.47	1.49	1.31	1.31
	4 d	1.47	1.48	1.31	1.31
	7 d	1.47	1.47	1.30	1.31
	14 d	1.46	1.47	1.30	1.30
	21 d	1.45	1.46	1.29	1.30
	28 d	1.45	1.46	1.29	1.30
	42 d	1.43	1.45	1.27	1.29

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

FOCUS STEP 2 Scenario: Maximum PEC_{sw} and PEC_{sed}, and 21 DAT time-weighted average (TWA) values for HWG 1608-pentanoic acid (*M25*) and HWG 1608-lactone (*M17*) in STEP 2, for winter cereals (spray application); and for grapevine (spray application), in North and in South Europe

	PEC_{sw} [µg/L]	TWA_{sw} [µg/L]	PEC_{sed} [µg/kg]	TWA_{sed} [µg/kg]
1. Winter cereals spray application				
HWG 1608-pentanoic acid (*M25*) NE	3.1	3.1	0.62	0.61
HWG 1608-pentanoic acid (*M25*) SE	3.1	3.1	0.62	0.61
HWG 1608-lactone (*M17*) NE	2.0	1.1	13.6	13.5
HWG 1608-lactone (*M17*) SE	2.0	1.1	13.6	13.5
2. Grapevine spray application				
HWG 1608-pentanoic acid (*M25*) NE	5.3	5.3	1.0	1.0
HWG 1608-pentanoic acid(*M25*) SE	5.3	5.2	1.0	1.0
HWG 1608-lactone (*M17*) NE	2.9	1.9	23.0	23.0
HWG 1608-lactone (*M17*) SE	2.9	1.9	23.0	23.0

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

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

Method of calculation and type of study (*e.g.* modelling, field leaching, lysimeter)	For FOCUS gw modelling, values used – Modelling using FOCUS model(s), with appropriate FOCUSgw scenarios, according to FOCUS guidance. Model(s) used: (with version control no.(s)): PEARL version 2.0 Scenarios (list of names): all 12 available scenarios Crop: cereals and vine Geometric mean parent $DT_{50\ field}$ 29.4 d (normalisation to 10kPa or pF2, 20 °C with Q10 of 2.2).[36] K_{OC}: parent, arithmetic mean 992, $^1/_n$= 0.75.[37] Metabolite: 1,2,4-triazole Model(s) used: (with version control no.(s)): PEARL version 2.0 Scenarios (list of names): all 12 available scenarios Crop: cereals and vine Geometric mean or median parent $DT_{50\ field}$ 7 d (normalisation to 10kPa or pF2, 20 °C with Q10 of 2.2). K_{OC}: parent, arithmetic mean 89, $^1/_n$= 0.92.
Application rate	Application rate: (cereals) 250 g/ha, (vines) 100 g a.s./ha. No. of applications: (cereals) 2, (vines) 3 Time of application (month or season): for winter cereals spraying in March-May, for grapevines from May to July

[36] The correct agreed peer reviewed value that should have been used was the slightly longer median value of 39.3 days.
[37] The correct agreed peer reviewed values that should have been used were the slightly lower arithmetic mean values of 769 mL/g and 1/n of 0.84.

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

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

	Scenario	Parent (µg/L)	Metabolite (µg/L)		
			1,2,4-triazole	2	3
PEARL ver 2.0 /Cereals, spray	Chateaudun	< 0.0005	< 0.0005	-	-
	Hamburg	< 0.0005	< 0.0005	-	-
	Jokioinen	< 0.0005	< 0.0005	-	-
	Kremsmunster	< 0.0005	< 0.0005	-	-
	Okehampton	< 0.0005	< 0.0005	-	-
	Piacenza	< 0.0005	< 0.0005	-	-
	Porto	< 0.0005	< 0.0005	-	-
	Sevilla	< 0.0005	< 0.0005	-	-
	Thiva	< 0.0005	< 0.0005	-	-

	Scenario	Parent (µg/L)	Metabolite (µg/L)		
			1,2,4-triazole	2	3
PEARL ver 2.0 /Grapevine, spray	Chateaudun	< 0.0005	< 0.0005	-	-
	Hamburg	< 0.0005	< 0.0005	-	-
	Jokioinen	-	-	-	-
	Kremsmunster	< 0.0005	< 0.0005	-	-
	Okehampton	-	-	-	-
	Piacenza	< 0.0005	< 0.0005	-	-
	Porto	< 0.0005	< 0.0005	-	-
	Sevilla	< 0.0005	< 0.0005	-	-
	Thiva	< 0.0005	< 0.0005	-	-

	Scenario	Parent (µg/L)	Metabolite (µg/L)		
			1,2,4-triazole	2	3
PEARL ver 2.0 /Cereals, seed treatment	Chateaudun	< 0.0005	< 0.0005	-	-
	Hamburg	< 0.0005	< 0.0005	-	-
	Jokioinen	< 0.0005	< 0.0005	-	-
	Kremsmunster	< 0.0005	< 0.0005	-	-

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

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	Okehampton	< 0.0005	< 0.0005	-	-
	Piacenza	< 0.0005	< 0.0005	-	-
	Porto	< 0.0005	< 0.0005	-	-
	Sevilla	< 0.0005	< 0.0005	-	-
	Thiva	< 0.0005	< 0.0005	-	-

PEC$_{(gw)}$ From lysimeter / field studies

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

Metabolite X	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 studied - no data requested
Quantum yield of direct phototransformation	Not requested
Photochemical oxidative degradation in air ‡	DT_{50} of 2.6 days derived by the Atkinson model (version 1.4). OH (24 h) concentration assumed = 0.5×10^6 molecules/cm^3
Volatilisation ‡	from plant surfaces (BBA guideline): <x % after x hours
	from soil surfaces (BBA guideline): negligible after x hours
Metabolites	None

PEC (air)

Method of calculation	Expert judgement, based on vapour pressure, dimensionless Henry's Law Constant and information on volatilisation from plants and soil.

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

PEC$_{(a)}$

Maximum concentration	e.g. negligible

Residues requiring further assessment

Environmental occurring metabolite requiring further assessment by other disciplines (toxicology and ecotoxicology) or for which a groundwater exposure assessment is triggered.	Soil: sum of enantiomers contained in tebuconazole Surface Water: sum of enantiomers contained in tebuconazole, M17 (HWG 1608-lactone), M25 (HWG 1608-pentanoic acid, 1,2,4 triazole Sediment: sum of enantiomers contained in tebuconazole Ground water: sum of enantiomers contained in tebuconazole and 1,2,4-triazole Air: sum of enantiomers contained in tebuconazole

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

Soil (indicate location and type of study)	Not submitted – not required
Surface water (indicate location and type of study)	Not submitted – not required
Ground water (indicate location and type of study)	Not submitted – not required
Air (indicate location and type of study)	Not submitted – not required

Points pertinent to the classification and proposed labelling with regard to fate and behaviour data

Not ready biodegradable, log Kow >3 indicating R53 (EU Classification Index No. 603-197-00-7)

‡ End point identified by the EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

Ecotoxicology

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 feed)
Birds ‡				
Colinus virginianus (quail)	a.s.	Acute	LD_{50}: 1988	
Colinus virginianus (quail)	a.s.	Short-term	LC_{50}: > 703	LC_{50}: >5000
Colinus virginianus (quail)	Met.: Triazole alanine.	Short-term	LC_{50}: >1368	LC_{50}: ≥5000
Colinus virginianus (quail)	a.s.	Long-term	NOEL: 5.8	NOEC: 73.5
Colinus virginianus (quail)	a.s.	Long-term	LOEL: 12.4	LOEC: 156
Mammals ‡				
Rat	a.s.	Acute	1700	
Rat	Folicur EW 250	Acute	LD_{50}: > 2000 mg prep./kg	
Rat	Met.: Triazole alanine	Acute	LD_{50}: > 5000	
Rat	a.s.	Long-term	NOEL: 10	NOEC: 300
Rabbit	a.s.	Long-term	NOEL: 10	
Additional higher tier studies ‡				

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

Crop and application rate (Spray: cereals 2 x 0.25 kg as/ha, grapes 3 x 0.1 kg as/ha. Seed dressing: 5.7 g as/ha)

Indicator species/Category[2]	Time scale	ETE	TER[1]	Annex VI Trigger[3]
Tier 1 (Birds)				
Herbivorous birds/grass, cereal	Acute	18.74	106	10

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

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Indicator species/Category[2]	Time scale	ETE	TER[1]	Annex VI Trigger[3]
Insectivorous birds /cereals	Acute	13.52	147	10
Insectivorous birds /grapes	Acute	5.41	368	10
Granivorous birds / seeds	Acute	11.61	171	10
Herbivorous birds/grass, cereal	Short-term	11.7	> 60	10
Insectivorous birds /cereals	Short-term	7.54	> 93	10
Insectivorous birds /grapes	Short-term	3.02	> 233	10
Granivorous birds / seeds	Short-term	11.61	> 61	10
Herbivorous birds/grass, cereal	Long-term	6.2	0.94	5
Insectivorous birds /cereals	Long-term	7.54	0.77	5
Insectivorous birds /grapes	Long-term	3.02	1.92	5
Granivorous birds / seeds	Long-term	11.61	≥ 0.5	5
Higher tier refinement (Birds)				
Herbivorous birds/grass, cereal Refined: RUD	Long-term	1.105	≥ 5.3	5
Insectivorous birds /cereals Refined: RUD	Long-term	1.21 – 3.31	1.75 – 4.8	5
Insectivorous birds /grapes Refined: RUD,	Long-term	1.12 – 1.40	4.1 – 5.2	5
Granivorous birds / seeds Refined: f_{twa},	Long-term	3.71	1.5	5
Tier 1 (Mammals)				
Insectivorous mammals / cereals	Acute	2.2	771	10
Herbivorous mammals / grapes	Acute	15.4	111	10
Granivorous mammals / seed tmt	Acute	6.8	250	10
Insectivorous mammals / cereals	Long-term	0.8	12.5	5
Herbivorous mammals / grapes	Long-term	5.1	2.0	5
Granivorous mammals / seeds	Long-term	6.8	1.5	5
Higher tier refinement (Mammals)				
Herbivorous mammals / grapes Refined: RUD, MAF, f_{twa},	Long-term	3.90	2.6	5

[1] in higher tier refinement provide brief details of any refinements used (e.g., residues, PT, PD or AV)

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

[2] for cereals indicate it is a late crop stage
[3] If the Annex VI Trigger value has been adjusted during the risk assessment of the active substance (e.g. many single species data), it should appear in this column.

Bioaccumulation and food chain behaviour (Birds)	Food chain from earthworm to earthworm-eating birds (TER_{lt} = 11 - 21) and Food chain from fish to fish-eating birds (TER_{lt} = 318 (calculated with worst case FOCUS step3 21-d twa PECsw of 1.112 µg a.s./L from spray application to cereals) indicated a low risk. The potential for bioaccumulation, and hence the potential for biomagnification is considered low.
Bioaccumulation and food chain behaviour (Mammals)	Food chain from earthworm to earthworm-eating mammals (TER_{lt} = 15) and Food chain from fish to fish-eating mammals TER_{lt} = 887 (calculated with worst case FOCUS step3 21-d twa PECsw of 1.112 µg a.s./L from spray application to cereals) indicated a low risk. The potential for bioaccumulation, and hence the potential for biomagnification is considered low.
Exposure via drinking water (Birds)	The risk from exposure via drinking water is considered acceptably low (TER_{acute} = > 14)
Exposure via drinking water (Mammals)	The risk from exposure via drinking water is considered acceptably low (TER > 22).

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[1] (mg/L)
Laboratory tests ‡				
Fish				
Oncorhynchus mykiss	a.s.	96 hr flow-through)	Mortality, EC_{50}	4.4 ($_{mm, as}$)
Oncorhynchus mykiss	a.s.	83 d (flow-through)	Growth NOEC	0.012 ($_{mm, as}$)
Oncorhynchus mykiss	Folicur EW 250	96 hr (static)	Mortality, LC_{50}	2.3 ($_{mm, as}$)
Oncorhynchus mykiss	1,2,4-triazole	96 hr (static)	Mortality, LC_{50}	498 ($_{nom, pm}$)
Oncorhynchus mykiss	1,2,4-triazole	28-day (semi-static)	Behaviour, NOEC	3.2 ($_{nom, pm}$)
Aquatic invertebrate				
Daphnia magna	a.s.	48 h (flow-through)	Mortality, EC_{50}	2.79 ($_{mm, as}$)

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

Group	Test substance	Time-scale (Test type)	End point	Toxicity[1] (mg/L)
Daphnia magna	a.s.	21 d (semi-static)	Reproduction, NOEC	0.010 ($_{nom, as}$)
Daphnia magna	Folicur EW 250	48 h (static)	Mortality, EC_{50}	1.9 ($_{nom, as}$)
Daphnia magna	1,2,4-triazole	48 h (static)	Mortality, EC_{50}	> 100 ($_{nom, pm}$)
Daphnia magna	HWG 1608-pentanoic acid	48 h (static)	Mortality, EC_{50}	> 100 ($_{nom, pm}$)
Daphnia magna	HWG 1608-lactone	48 h (static)	Mortality, EC_{50}	> 100 ($_{nom, pm}$)
Saltwater species				
Crassostrea virginica (Eastern oyster)	a.s.	96 h (flow-through)	Shell deposition, EC_{50}	3.0 ($_{mm, as}$)
Mysidopsis bahia	a.s.	96 h (flow-through)	Mortality, LC_{50}	0.46 ($_{mm, as}$)
Mysidopsis bahia	a.s.	28 d (flow-through)	Reproduction, NOEC	0.035 ($_{mm, as}$)
Sediment dwelling organisms				
Chironomus riparius	a.s.	28 d (static)	EC_{10} EC_{15}	2.45 ($_{mm, as}$) 2.51
Chironomus riparius	HWG 1608-pentanoic acid	28 d (static)	EC_{10} EC_{15}	74.5 ($_{nom, pm}$) 86.9
Chironomus riparius	HWG 1608-lactone	28 d (static)	EC_{10} EC_{15}	47.8 ($_{nom, pm}$) 51.2
Algae				
Scenedesmus subspicatus	a.s.	72 h (static)	Biomass: E_bC_{50} Growth rate: E_rC_{50}	1.96 ($_{nom, as}$) 5.3
Selenastrum capricornutum	a.s.	72 h (static)	Biomass: E_bC_{50} Growth rate: E_rC_{50}	2.83 ($_{mm, as}$) 3.8
Scenedesmus subspicatus	Folicur EW 250	72 h (static)	Biomass: E_bC_{50} Growth rate: E_rC_{50}	3.45 ($_{mm, as}$) 5.83
Selenastrum capricornutum	1,2,4-triazole	72 h (static)	Biomass: E_bC_{50} Growth rate: E_rC_{50}	13 ($_{nom, pm}$) >31
Higher plant				
Lemna gibba	a.s.	14 d (static)	Fronds, EC_{50}	0.144 ($_{mm, as}$)

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

Group	Test substance	Time-scale (Test type)	End point	Toxicity[1] (mg/L)
Microcosm or mesocosm tests				
Indicate if not required: Micro or mesocosm study not required.				

[1] indicate whether based on nominal ($_{nom}$) or mean measured concentrations ($_{mm}$). In the case of preparations indicate whether end points are presented as units of preparation or a.s. (as). In the case of metabolites indicate whether end points are presented as units of preparation or pure metabolite (pm).

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

FOCUS Step 2

Crop and application rate: Spray application to cereals (2 x 0.25 kg as/ha), Northern Europe

Test substance	Organism	Toxicity end point (mg/L)	Time scale	PEC_i max (µg/L)	TER	Annex VI trigger[1]
1,2,4-triazole	*Oncorhynchus mykiss*	498	Acute	1.12	444643	100
1,2,4-triazole	*Oncorhynchus mykiss*	3.2	Chronic	1.12	2857	10

[1]If the Annex VI Trigger value has been adjusted during the risk assessment of the active substance, it should appear in this column.

Crop and application rate: Spray application to grapes (3 x 0.1 kg as/ha), Southern Europe

Test substance	Organism	Toxicity end point (mg/L)	Time scale	PEC_i max (µg/L)	TER	Annex VI trigger[1]
1,2,4-triazole	*Oncorhynchus mykiss*	498	Acute	1.52	327631	100
1,2,4-triazole	*Oncorhynchus mykiss*	3.2	Chronic	1.52	2105	10

[1]If the Annex VI Trigger value has been adjusted during the risk assessment of the active substance, it should appear in this column.

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

FOCUS Step 3

Crop and application rate: Spray application to cereals (2 x 0.25 kg as/ha), worst case PEC from FOCUS step3 (R4 stream)

Test substance	Organism	Toxicity end point (mg/L)	Time scale	PEC_i Max (µg/L)	TER	Annex VI trigger[1]
a.s.	*Oncorhynchus mykiss*	4.4	Acute	3.043	1445.9	100
a.s.	*Oncorhynchus mykiss*	0.012	Chronic	3.043	**3.9**	10
EW 250	*Oncorhynchus mykiss*	2.3	Acute	3.043	755.8	100
a.s.	*Daphnia magna*	2.79	Acute	3.043	916.9	100
a.s.	*Daphnia magna*	0.010	Chronic	3.043	**3.3**	10
EW 250	*Daphnia magna*	1.9	Acute	3.043	624.4	100
a.s.	*Mysidopsis bahia*	0.46	Acute	3.043	151.2	100
a.s.	*Mysidopsis bahia*	0.035	Chronic	3.043	11.5	10
a.s.	*Scenedesmus subspicatus*	1.96	Acute	3.043	644.1	10
a.s.	*Selenastrum capricornutum*	3.8	Acute	3.043	1248.8	10
a.s.	Higher plants[2] *Lemna gibba*	0.144	Acute	3.043	47.3	10
a.s.	Sediment-dwelling organism *Chironomus riparius*	1.33	Chronic	2.469*	538.6	10

[1]If the Annex VI Trigger value has been adjusted during the risk assessment of the active substance, it should appear in this column.
[2] only required for herbicides
*Calculated as a pseudo PECsw from the worst case scenario D2 (ditch) PECsed of 7.427µg a.s./kg and the proportion of the water and sediment (6:1.5) in the water spiked test with Chironomus assuming a sediment density of 1.33 (7.427 * 1.33 *1.5/6)

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

Crop and application rate: Spray application to grapes (3 x 0.1 kg as/ha), Southern Europe, worst case PEC from FOCUS step3 (

Test substance	Organism	Toxicity end point (mg/L)	Time scale	PEC_i Max (µg/L)	TER	Annex VI trigger[1]
a.s.	*Oncorhynchus mykiss*	4.4	Acute	1.632	2696.1	100
a.s.	*Oncorhynchus mykiss*	0.012	Chronic	1.632	**7.4**	10
EW 250	*Oncorhynchus mykiss*	2.3	Acute	1.632	1409.3	100
a.s.	*Daphnia magna*	2.79	Acute	1.632	1709.6	100
a.s.	*Daphnia magna*	0.010	Chronic	1.632	**6.1**	10
EW 250	*Daphnia magna*	1.9	Acute	1.632	1164.2	100
a.s.	*Mysidopsis bahia*	0.46	Acute	1.632	281.9	100
a.s.	*Mysidopsis bahia*	0.035	Chronic	1.632	21.4	10
a.s.	*Scenedesmus subspicatus*	1.96	Acute	1.632	1201.0	10
a.s.	*Selenastrum capricornutum*	3.8	Acute	1.632	2328.4	10
a.s.	*Lemna gibba*	0.144	Acute	1.632	88.2	10
a.s.	*Chironomus riparius*	1.33	Chronic	1.899*	700.3	10

[1]If the Annex VI Trigger value has been adjusted during the risk assessment of the active substance, it should appear in this column.
*Calculated as a pseudo PECsw from the worst case scenario D6 (ditch) PECsed of 5.712 µg a.s./kg and the proportion of the water and sediment (6:1.5) in the water spiked test with Chironomus assuming a sediment density of 1.33 (5.712 * 1.33 *1.5/6)

Crop and application rate: Seed dressing (5.7 g as/ha)

Test substance	Organism	Toxicity end point (mg/L)	Time scale	PEC_i (µg/L)	TER	Annex VI trigger
a.s.	*Oncorhynchus mykiss*	4.4	Acute	< 0.0005	8800×10^3	100
a.s.	*Oncorhynchus mykiss*	0.012	Chronic	< 0.0005	24×10^3	10
EW 250	*Oncorhynchus mykiss*	2.3	Acute	< 0.0005	4600×10^3	100
1,2,4-triazole	*Oncorhynchus mykiss*	498	Acute	< 0.0005	996000×10^3	100
1,2,4-triazole	*Oncorhynchus mykiss*	3.2	Chronic	< 0.0005	6400×10^3	10
a.s.	*Daphnia magna*	2.79	Acute	< 0.0005	5580×10^3	100

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

Test substance	Organism	Toxicity end point (mg/L)	Time scale	PEC_i (µg/L)	TER	Annex VI trigger
a.s.	*Daphnia magna*	0.010	Chronic	< 0.0005	20 x 10^3	10
EW 250	*Daphnia magna*	1.9	Acute	< 0.0005	3800 x 10^3	100
a.s.	*Mysidopsis bahia*	0.46	Acute	< 0.0005	920 x 10^3	100
a.s.	*Mysidopsis bahia*	0.035	Chronic	< 0.0005	70 x 10^3	10
a.s.	*Scenedesmus subspicatus*	1.96	Acute	< 0.0005	3920 x 10^3	10
a.s.	*Selenastrum capricornutum*	3.8	Acute	< 0.0005	7600 x 10^3	10
a.s.	*Lemna gibba*	0.144	Acute	< 0.0005	288 x 10^3	10
a.s.	*Chironomus riparius*	1.33	Chronic	< 0.0005	2660 x 10^3	10

FOCUS Step 4

Crop and application rate: Spray application on cereals (2 x 0.25 kg as/ha)
Organisms: The most sensitive test organisms, *Daphnia magna* with a chronic NOEC 0.010 mg a.s./L is used.

Scenario[1]	Water body type[2]	Buffer zone distance	PEC_{SW} (initial) (µg a.s/L)	TER	Annex VI trigger[5]
D1 Lanna	ditch	5 m	0.468	21.4	10
D1 Lanna	stream	5 m	0.461	21.7	10
D2 Brimstone	ditch	5 m	0.413	24.2	10
D2 Brimstone	stream	5 m	0.462	21.6	10
D3 Vreedepeel	ditch	5 m	0.359	27.8	10
D4 Skousbo	pond	5 m	0.061	163.9	10
D4 Skousbo	stream	5 m	0.411	24.3	10
D5 La Jalliere	pond	5 m	0.067	149.2	10
D5 La Jalliere	stream	5 m	0.432	23.1	10
D6 Thiva	ditch	5 m	0.362	27.6	10

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

Scenario[1]	Water body type[2]	Buffer zone distance	PEC_{SW} (initial) (µg a.s/L)	TER	Annex VI trigger[5]
R1 Weiherbach	pond	5 m	0.219	45.7	10
R1 Weiherbach	stream	5 m	1.670	**6.0**	10
R3 Bologna	stream	5 m	1.815	**5.5**	10
R4 Roujan	stream	5 m	3.043	**3.3**	10

[1] drainage (D1-D6) and run-off (R1-R4)
[2] ditch/stream/pond
[3] include critical groups which fail at Step 3.
[4] indicate whether PEC_{sw}, or PEC_{sed} and whether maximum or twa values used
[5] If the Annex VI Trigger value has been adjusted during the risk assessment of the active substance, it should appear in this column.

Crop and application rate: Spray application of grapes (3 x 0.1 kg as/ha)
Organisms: The most sensitive test organisms, *Daphnia magna* with a chronic NOEC 0.010 mg a.s./L is used.

Scenario[1]	Water body type[2]	Buffer zone distance	PEC_{SW} (initial) (µg a.s/L)	TER	Annex VI trigger[5]
D6 Thiva	ditch	5 m	0.981	10.2	10
R1 Weiherbach	pond	5 m	0.143	69.9	10
R1 Weiherbach	stream	5 m	1.131	**8.8**	10
R2 Porto	stream	5 m	1.038	**9.6**	10
R3 Bologna	stream	5 m	1.096	**9.1**	10
R4 Roujan	stream	5 m	0.777	12.9	10

Bioconcentration				
	Active substance Surprenant 1988	Active substance Grau 1988	Metabolites: 1,2,4-triazole (*M26*)	HWG 1608-lactone (*M17*)
$logP_{O/W}$	3.7	3.7	-1.0	1.28
Bioconcentration factor (BCF)[1] ‡	78 *	35 - 59 **	-	-

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

Bioconcentration				
Annex VI Trigger for the bioconcentration factor	100	100	-	-
Clearance time (days) (CT_{50})	1 to 3 days	7.8 – 11.2 h	-	-
(CT_{90})	< 15 d	< 6 d	-	-
Level and nature of residues (%) in organisms after the 14 day depuration phase	< 5 % (whole fish)	-	-	-

[1] only required if log $P_{O/W}$ >3.
* based on total ^{14}C
**: based on specific compound

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. ‡	> 83.05	> 200
Preparation[1] : FolicurEW 250	> 187 µg a.s./bee	LD_{50} (48 h): 143 LD_{50} (72 h): 97
Field or semi-field tests:		
Not required		

[1] for preparations indicate whether end point is expressed in units of a.s. or preparation

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

Spray application: cereals 2 x 0.25 kg as/ha, grapes 3 x 0.1 kg as/ha. Seed dressing: 5.7 g as/ha.

Test substance	Route	Hazard quotient			Annex VI Trigger
		Cereals	Grapes	Seeds	
a.s.	Contact	< 1.3	< 0.5		50
a.s.	Oral	< 3.0	<1.2		50
Preparation: Folicur EW 250	Contact	2.6	1.0		50
Preparation: Folicur EW 250	Oral	< 1.3	< 0.5		50
Preparation: Raxil S FS 040	Contact			<0.02	50
Preparation: Raxil S FS 040	Oral			< 0.07	50

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

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[1])
Typhlodromus pyri ‡	Folicur EW 250	Mortality	58 g a.s./ha
Aphidius rhopalosiphi ‡	Folicur EW 250	Mortality	62.5 g a.s./ha

[1] for preparations indicate whether end point is expressed in units of a.s. or preparation

Crop and application rate
Crop and application rate (Spray: cereals 2 x 0.25 kg as/ha, grapes 3 x 0.1 kg as/ha. Seed dressing: 5.7 g as/ha)

Test substance	Species	Effect (LR_{50} g/ha)	HQ in-field	HQ off-field[1]	Trigger
Folicur EW 250	*Typhlodromus pyri*	58 g a.s./ha	4.85 (cereals) 2.26 (grapes)	0.119 (cereals) 0.156 (grapes)	2
Folicur EW 250	*Aphidius rhopalosiphi*	62.5 g a.s./ha	4.5 (cereals) 2.1 (grapes)	0.11 (cereals) 0.145 (grapes)	2

[1] indicate distance assumed to calculate the drift rate

Further laboratory and extended laboratory studies ‡

Species	Life stage	Test substance, substrate and duration	Dose (g/ha)[1,2]	End point	% effect[3]	Trigger value
Aphidius rhopalosiphi	adults	Folicur EW 250, barley leaves, 48 h	100 g a.s./ha	mortality	93 % (LR_{50}: 36.8 g a.s./ha)	50 %
Aphidius rhopalosiphi	adult	Folicur EW 250, leaves, 48 h	375 g a.s./ha	mortality fecundity	53.8 % -12 %	
Typhlodromus pyri	adults	Folicur EW 250, corn leaves, 7 d	224 g a.s./ha	mortality reproduction (at 100 g/ha)	60 % (LR_{50}: 211 g a.s./ha) 38 %	50 %
Aleochara bilineata	adult	Folicue EW 250, sand, 28 d	500 g a.s./ha	reproduction	-5.5 %	50 %

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

Species	Life stage	Test substance, substrate and duration	Dose (g/ha)[1,2]	End point	% effect[3]	Trigger value
Aleochara bilineata	adult	Folicur EW 250, quartz sand, 61 d	375 g a.s./ha	reproduction	16.6 %	50 %
Aleochara bilineata	adult	Raxil FS 040, seeds in soil, 28 d	6.19 g a.s./ha	hatching reproduction	no effect -20 %	50 %
Poecilius cupreus	adult	Folicur EW 250, sand, 14 d	375 g a.s./ha	mortality reproduction	0 % 0.9 %	50 %
Poecilus cupreus	larvae	Folicur EW 250, soil, 43 d	375 g a.s./ha	development	no effects	50 %
Coccinella septempunctata	larvae	Folicur EW 250, glass plate, 20 d	375 g a.s./ha	mortality	69 % (LR_{50}: 158 g a.s./ha)	50 %
Syrphus corolla	adult	Folicur EW 250, glass plate, 47 d	375 g a.s./ha	mortality reproduction	71.8 % 28 %	50 %

[1] indicate whether initial or aged residues
[2] for preparations indicate whether dose is expressed in units of a.s. or preparation
[3] indicate if positive percentages relate to adverse effects or not

Field or semi-field tests
Semi field; *Aphidius rhopalosiphi*. Adults tested with Folicur EW 250, 375 g a.s./ha. Effect on fecundity on day 0: 39.4 %, on day 1: 0 %, and on day 2 after treatment: -47.5 %.
Semi-field; *Coccinella septempunctata*. A life cycle test performed on bean seedlings using Folicur EW 250 at 375 g a.s./ha. Pre-imaginal mortality was 12.9 % and the reduction of fecundity was –29.8 %.

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 fetida	a.s. ‡	Acute 14 days	LC_{50} 1381 mg a.s./kg d.w. soil *
Eisenia fetida	a.s. ‡	Chronic 8 weeks	NOEC 10 mg a.s./kg d.w. soil
Eisenia fetida	Folicur EW 250	Acute	LC_{50} > 254 mg a.s./kg d.w. soil *

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

Test organism	Test substance	Time scale	End point[1]
Eisenia fetida	Folicur EW 250	Chronic	NOEC < 1.5 mg a.s./kg d.w. soil *
Eisenia fetida	Raxil S FS 040	Acute	LC_{50} > 1000 mg prep/kg d.w. soil *
Eisenia fetida	Raxil S FS 040	Chronic	NOEC 1.9 mg prep/kg d.w. soil
Eisenia fetida	Met.: 1,2,4-triazole	Acute	LC_{50} > 1000 mg p.m./kg d.w. soil
Eisenia fetida	Met.: 1,2,4-triazole	Chronic	NOEC 1.0 mg p.m./kg d.w. soil
Other soil macro-organisms			
Soil mite			
Hypoaspis aculeifer	a.s. ‡	Chronic	NOEC 50 mg a.s./kg dw soil
Hypoaspis aculeifer	Folicur EW 250	Chronic	NOEC 56.2 mg a.s./kg dw soil
Collembola			
Folsomia candida	a.s. ‡	Chronic	NOEC 250 mg a.s./kg d.w. soil
Folsomia candida	Raxil S FS 040	Chronic	NOEC 2500 mg prep/kg d.w. soil
Folsomia candida	Met.: 1,2,4-triazole	Chronic	NOEC 1.8 mg p.m./kg dw soil
Soil micro-organisms			
Nitrogen mineralisation	a.s. ‡		No significant effect (< 10%) at day 28 at 8.3 mg a.s./kg d.w.soil (6.25 kg a.s/ha)
	Folicur EW 250	28 days test	No significant effect (< 10%) at day 28 at 33 mg prep./kg d.w. soil (24.7 kg prep./ha)
	Raxil S FS 040	28 days test	No significant effect (< 10%) at day 28 at 1.9 µL prep./kg dw soil (1.43 L prep./ha)
	Met.: 1,2,4-triazole		No significant effect (< 10%) at day 28 at up to 0.353 mg p.m./kg d.w.soil (100 x max. PEC soil)
Carbon mineralisation	a.s. ‡	28 days test	No significant effect (< 10%) at day 28 at 8.3 mg a.s./kg d.w. soil (6.25 kg a.s/ha)
	Folicur EW 250	28 days test	No significant effect (< 10%) at day 28 at 33 mg prep./kg d.w.

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

Test organism	Test substance	Time scale	End point[1]
			soil (24.7 kg prep./ha)
	Raxil S FS 040	28 days test	No significant effect (< 10%) at day 28 at 1.9 µL prep./kg dw soil (1.43 L prep./ha)
	Met.: 1,2,4-triazole		No significant effect (< 10%) at day 28 at up to 0.353 mg p.m./kg d.w.soil (100 x max. PEC soil)
Field studies[2]			
Field studies were performed on earthworms at 4 locations (two in UK and two in Germany, in the central and southern part of the country). After up to 5 years, no significant effects on earthworm populations were observed at recommended or higher application rates.			

[1] indicate where end point has been corrected due to log Pow >2.0 (e.g. LC_{50corr})
[2] litter bag, field arthropod studies not included at 8.3.2/10.5 above, and earthworm field studies
*: indicate 10% organic matter in test system

Toxicity/exposure ratios for soil organisms

Crop and application rate:
Folicur EW 250 (Spray): cereals 2 x 0.25 kg as/ha, grapes 3 x 0.1 kg as/ha. Raxil (Seed dressing): 5.7 g as/ha)

Test organism	Test substance	Time scale	Soil PEC[2]	TER	Trigger
Earthworms					
Eisenia fetida	a.s. ‡	Acute	0.185	3773 *	10
Eisenia fetida	a.s. ‡	Chronic	0.185	55	5
Eisenia fetida	Folicur EW 250	Acute	0.185	> 693 *	10
Eisenia fetida	Folicur EW 250	Chronic	0.185	< 4.1 *	5
Eisenia fetida	Raxil S FS 040	Acute	0.380	> 1316 *	10
Eisenia fetida	Raxil S FS 040	Chronic	0.010	1000	5
Eisenia fetida	Met.: 1,2,4-triazole	Acute	0.003	333333	10
Eisenia fetida	Met.: 1,2,4-triazole	Chronic	0.003	333	5
Other soil macro-organisms					
Hypoaspis aculeifer	a.s. ‡	Chronic	0.185	273	5

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

Test organism	Test substance	Time scale	Soil PEC[2]	TER	Trigger
Hypoaspis aculeifer	Folicur EW 250	Chronic	0.185	307	5
Folsomia candida	a.s. ‡	Chronic	0.185	683 *	5
Folsomia candida	Raxil S FS 040	Chronic	0.38	3289 *	
Folsomia candida	Met.: 1,2,4-triazole	Chronic	0.003	600	5

[1] to be completed where first Tier triggers are breached
[2] PEC soil was the initial PEC maximum
*: TER value has been divided by 2 to consider that organic matter is 10% and substance log Pow > 2.0

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

Preliminary screening data

Not required for herbicides as ER_{50} tests should be provided

Laboratory dose response tests

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
*Lepidium sativum (*Cress)	Tech. a.s.	(14 mg as/kg dw = 10.5 kg as/ha	100 mg/kg dw soil = 750 kg as/ha	0.5 kg a.s./ha	21	5

[1] explanation of how exposure has been estimated should be provided (e.g. based on Ganzelmeier drift data)
[2] for preparations indicate whether dose is expressed in units of a.s. or preparation

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

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

Test type/organism	end point
Respiration inhibition / Activated sludge	EC_{50} (3 h): > 10000 mg a.s./L (11 % inhibition) NOEC (3 h): 3200 mg a.s./L (8 % inhibition)
Pseudomonas sp	Not required

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1 – list of endpoints

Ecotoxicologically relevant compounds (consider parent and all relevant metabolites requiring further assessment from the fate section)

Compartment	
soil	constituent isomers of tebuconazole
water	constituent isomers of tebuconazole,
sediment	constituent isomers of tebuconazole
groundwater	constituent isomers of tebuconazole

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: Tebuconazole	N; R51/53 (EU Classification Index No. 603-197-00-7)

	RMS/peer review proposal
Preparation: Folicur EW 250 Raxil S FS 040	N: R;51/53 R;52/53

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

APPENDIX 2 – ABBREVIATIONS

ADI	acceptable daily intake
AOEL	acceptable operator exposure level
AP	alkaline phosphatase
approx	approximate
AR	applied radioactivity
ARC	anticipated residue contribution
ARfD	acute reference dose
a.s.	active substance
AV	avoidance factor
BCF	bioconcentration factor
bw	body weight
°C	degree Celsius (centigrade)
CA	Chemical Abstract
CAS	Chemical Abstract Service
CIPAC	Collaborative International Pesticide Analytical Council Limited
d	day
DAR	draft assessment report
DM	dry matter
DT_{50}	period required for 50 percent dissipation (define method of estimation)
DT_{90}	period required for 90 percent dissipation (define method of estimation)
dw	dry weight
ε	decadic molar extinction coefficient
EC_{50}	effective concentration
EINECS	European Inventory of Existing Commercial Chemical Substances
ELINKS	European List of New Chemical Substances
EMDI	estimated maximum daily intake
ER50	emergence rate, median
EU	European Union
FAO	Food and Agriculture Organisation of the United Nations
FOCUS	Forum for the Co-ordination of Pesticide Fate Models and their Use
f(twa)	time weighted average factor
g	gram
GAP	good agricultural practice
GC	gas chromatography
GC-EC	gas chromatography with electron capture detector
GC-FID	gas chromatography with flame ionisation detector

Appendix 2 – abbreviations

GC-MS	gas chromatography-mass spectrometry
GC-MSD	gas chromatography with mass-selective detection
GCPF	Global Crop Protection Federation (formerly known as GIFAP)
GLC	gas liquid chromatography
GLP	good laboratory practice
GS	growth stage
h	hour(s)
H	Henry's Law constant (calculated as a unitless value) (see also K)
ha	hectare
hL	hectolitre
HPLC	high pressure liquid chromatography or high performance liquid chromatography
HPLC-MS	high pressure liquid chromatography – mass spectrometry
HPPLC	high pressure planar liquid chromatography
I_{50}	inhibitory dose, 50 %
IC_{50}	median immobilisation concentration
IEDI	international estimated daily intake
IGR	insect growth regulator
ISO	International Organisation for Standardisation
IUPAC	International Union of Pure and Applied Chemistry
K	Kelvin or Henry's Law constant (in atmospheres per cubic meter per mole) (see also H)13
K_{ads}	adsorption constant
K_{des}	apparent desorption coefficient
K_{oc}	organic carbon adsorption coefficient
K_{om}	organic matter adsorption coefficient
kg	kilogram
L	litre
LC	liquid chromatography
LC-MS	liquid chromatography-mass spectrometry
LC-MS-MS	liquid chromatography with tandem mass spectrometry
LC_{50}	lethal concentration, median
LD_{50}	lethal dose, median; dosis letalis media
LOAEL	lowest observable adverse effect level
LOD	limit of detection
LOQ	limit of quantification (determination)
LR	lethal rate
m	metre

Appendix 2 – abbreviations

M	molar
MAF	multiple application factor
µm	micrometer (micron)
MC	moisture content
MWHC	maximum water holding capacity
µg	microgram
mg	milligram
MHC	moisture holding capacity
min	minute(s)
mL	millilitre
mm	millimetre
mN	milli-Newton
mo	month(s)
mol	Mol
mp	melting point
MRL	maximum residue limit or level
MS	mass spectrometry
MSDS	material safety data sheet
nd	not detected
NEDI	no effect daily intake (mg/kg body wt/day)
NESTI	national estimated short term intake
ng	nanogram
nm	nanometer
NMR	nuclear magnetic resonance
no	number
NOAEC	no observed adverse effect concentration
NOAEL	no observed adverse effect level
NOEC	no observed effect concentration
NOED	no observed effect dose
NOEL	no observed effect level
NPD	nitrogen-phosphorus detector or detection
OC	organic carbon content
OM	organic matter content
Pa	Pascal
PD	proportion of different food types
PEC	predicted environmental concentration
PEC_A	predicted environmental concentration in air
PEC_S	predicted environmental concentration in soil

Appendix 2 – abbreviations

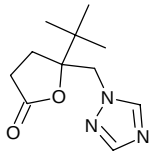
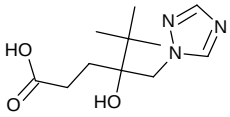
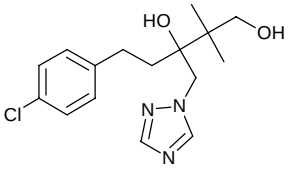
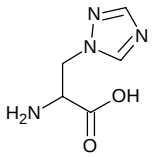
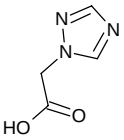
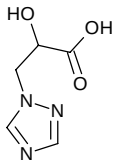
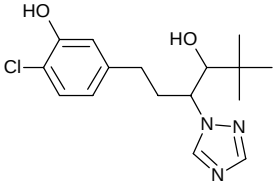
PEC_{SW}	predicted environmental concentration in surface water
PEC_{GW}	predicted environmental concentration in ground water
pH	pH-value
PHED	pesticide handler's exposure data
PHI	pre-harvest interval
pK_a	negative logarithm (to the base 10) of the dissociation constant
PNEC	predicted no effect concentration
P_{ow}	partition coefficient between n-octanol and water
ppb	parts per billion (10^{-9})
PPE	personal protective equipment
ppm	parts per million (10^{-6})
ppp	plant protection product
PT	proportion of diet obtained in the treated area
QC	quality control
QSAR	quantitative structure-activity relationship
r	correlation coefficient
r^2	coefficient of determination
RfD	reference dose
RPE	respiratory protective equipment
RUD	residue per unit dose
s	second
SD	standard deviation
SOP	standard operating procedure
sq	square
STMR	supervised trials median residue
t	tonne (metric ton)
$t_{1/2}$	half-life (define method of estimation)
TDM	triazole derivative metabolites
TER	toxicity exposure ratio
TER_I	toxicity exposure ratio for initial exposure
TER_{ST}	toxicity exposure ratio following repeated exposure
TER_{LT}	toxicity exposure ratio following chronic exposure
TK	technical concentrate
TLC	thin layer chromatography
TLV	threshold limit value
TMDI	theoretical maximum daily intake
TWA	time weighted average
UF	uncertainty factor (safety factor)

Appendix 2 – abbreviations

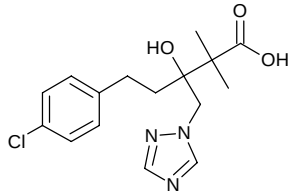
UV	ultraviolet
WHO	World Health Organisation
WG	water dispersible granule
wk	week
wt	weight
yr	year

Appendix 3 – used compound code(s)

APPENDIX 3 – USED COMPOUND CODE(S)

Code/Trivial name	Chemical name	Structural formula
1,2,4-triazole	1*H*-1,2,4-triazole	
HWG 1608-lactone M17	5-*tert*-butyl-5-(1*H*-1,2,4-triazol-1-ylmethyl)dihydrofuran-2(3*H*)-one	
HWG 1608-pentanoic acid M25	4-hydroxy-5,5-dimethyl-4-(1*H*-1,2,4-triazol-1-ylmethyl)hexanoic acid	
hydroxy-tebuconazole M03	5-(4-chlorophenyl)-2,2-dimethyl-3-(1*H*-1,2,4-triazol-1-ylmethyl)pentane-1,3-diol	
triazole alanine TA	(*R*,*S*)-2-amino-3-(1*H*-1,2,4-triazol-1-yl)propanoic acid 3-(1*H*-1,2,4-triazol-1-yl)-D,L-alanine	
triazole acetic acid TAA	1*H*-1,2,4-triazol-1-ylacetic acid	
triazole lactic acid	2-hydroxy-3-(1*H*-1,2,4-triazol-1-yl)propanoic acid	
tebuconazole-m-hydroxy	2-chloro-5-[4-hydroxy-5,5-dimethyl-3-(1*H*-1,2,4-triazol-1-yl)hexyl]phenol	

Appendix 3 – used compound code(s)

Code/Trivial name	Chemical name	Structural formula
tebuconazole-carboxylic acid	5-(4-chlorophenyl)-3-hydroxy-2,2-dimethyl-3-(1*H*-1,2,4-triazol-1-ylmethyl)pentanoic acid	
hydroxy-tebuconazole-sulfate	sodium 5-(4-chlorophenyl)-3-hydroxy-2,2-dimethyl-3-(1*H*-1,2,4-triazol-1-ylmethyl)pentyl sulfate