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

dimethenamid

finalised: 14 December 2005

(revision of 17 January 2006 with minor editorial changes)

SUMMARY

Dimethenamid is one of the 52 substances of the second stage of the review programme covered by Commission Regulation (EC) No 451/2000[1], as amended by Commission Regulation (EC) No 1490/2002[2]. This Regulation requires the European Food Safety Authority (EFSA) to organise 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 one year a conclusion on the risk assessment to the EU-Commission.

Germany being the designated rapporteur Member State submitted the DAR on dimethenamid in accordance with the provisions of Article 8(1) of the amended Regulation (EC) No 451/2000, which was received by the EFSA on 16 October 2003. Following a quality check on the DAR, the peer review was initiated on 31 October 2003 by dispatching the DAR for consultation of the Member States and the sole notifier BASF. Subsequently, the comments received on the DAR were examined by the rapporteur Member State and the need for additional data was agreed in an evaluation meeting in May 2004. Remaining issues as well as further data made available by the notifier upon request were evaluated in a series of scientific meetings with Member State experts in January – March 2005.

A final discussion of the outcome of the consultation of experts took place with representatives from the Member States on 28 September 2005 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 herbicide as proposed by the applicant which comprises broadcast as pre or post emergent herbicide comprise broadcast spraying to control weeds in maize (pre or post) and sugarbeet (post) at an application rate of 1.44 kg dimethenamid per hectare (maize) and up to 1.08 kg per hectare (sugarbeet), respectively. Dimethenamid can be used only as herbicide.

The representative formulated product for the evaluation was "Frontier" ("BAS 656 02 H"), an emulsifiable concentrate (EC).

[1] OJ No L 53, 29.02.2000, p. 25
[2] OJ No L 224, 21.08.2002, p. 25

Adequate methods are available to monitor all compounds given in the respective residue definition for food, surface water and air. For the other matrices (soil and ground/drinking water) the residue definitions are not finalised. Residues in food of plant origin can be determined with a multi-method (The applicability of the German S19 method has been demonstrated, but not down to the LOQ of concern). For the other matrices only single methods are available to determine residues of dimethenamid.
Sufficient analytical method 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.

Dimethenamid was well absorbed and extensively metabolised by rats. Excretion was rapid primarily via bile, over 40 metabolites were detected in excreta. The compound has a moderate acute toxicity orally and low acute toxicity dermally or by inhalation, and produces only mild reversible skin and eye irritation. It is a skin sensitizer in the Maximisation Test. Therefore, the proposed classification is Xn, R22 “Harmful if swallowed”; Xi, R43 “May cause sensitisation by skin contact”. The short term as well as the long term toxicity indicates the liver as the target organ. The available data do not support evidence of genotoxic or carcinogenic properties, and dimethenamid is not harmful to fertility or development.
The reference values are 0.02 mg/kg bw/day for the Acceptable Daily Intake (ADI), 0.04 mg/kg bw/day for the Acceptable Operator Exposure Level (AOEL), and 0.25 mg/kg bw/day for the Acute Reference Dose (ARfD).
The estimated operator exposure is above the AOEL for UK-POEM model even with protective equipment but below the AOEL according to the German model with protective equipment. Worker exposure is low even without protection. Bystander exposure is negligible (below 1% of the AOEL).

Dimethenamid is metabolised in maize and sugar beets through conjugation processes and further chemical reactions leading to polar metabolites. Due to their overall low level and in the absence of any tendency to accumulation, no metabolite is considered of toxicological concern. The residue definition for plant products should be for monitoring and risk assessment purposes dimethenamid, including other mixtures of constituent isomers (sum of isomers) expressed as dimethenamid. Supervised residue trials according to the recommended uses demonstrate that residues are below the LOQ in maize grains and forage, as well as in sugar beet roots and tops. No residue is to be expected in rotational and succeeding crops.
Human and animal exposures to residues of dimethenamid are therefore minimal, and a risk for consumers is not expected resulting from the consumption of plant commodities derived from maize and sugar beets. Similarly, a risk for the consumer resulting from the consumption of drinking water contaminated by metabolites M23 and M27 is not expected. The contribution to the global toxicological burden of 16 other metabolites potentially present in drinking water at levels above 0.1 µg/l and their potential effects on the health of the consumer could not be assessed as their structures were not identified.

Sufficient data were available to demonstrate dimethenamid is moderately persistent in soil degrading via glutathione and or cysteine conjugation and subsequent oxidation forming the major metabolites M23[3] and M27[4]. These metabolites were moderately to highly persistent but were degraded further. Mineralization of the 3-^{14}C-thienyl label accounted for 8-36% of the applied radioactivity in dark aerobic laboratory studies after 120 days. The formation of unextracted residues in the soil organic carbon was another significant sink (accounting for 40-45% of the applied radioactivity at 120 days). Dimethenamid exhibits medium mobility in soil, M23 and M27 have very high mobility. Modelling and a lysimeter study for the representative uses evaluated, indicated dimethenamid is unlikely to contaminate groundwater when used as recommended, but that the metabolites M23, M27 and 16 separate resolved but unidentified fractions could be present in shallow vulnerable groundwater at greater than 0.1µg/L. 12 of the unidentified components and M23 and M27 could be expected to be present in shallow vulnerable groundwater at concentrations greater than 0.75µg/L. Data to address the aquatic risk and pesticidal activity of all these components are available (though some of this data still requires independent evaluation). A risk to consumers is not expected from the consumption of M23 and M27 in drinking water. However mammalian non relevance assessments for the 16 as yet unidentified fractions are not available and cannot be provided until the identity of these fractions is known. It is therefore necessary to identify the nature of these fractions. Under very extreme worst case leaching conditions, Member State experts considered it could not be excluded that M27 could be present in shallow vulnerable groundwater at > 10µg/L.

In natural surface water systems dimethenamid exhibits moderate persistence and in line the K_{foc} there was some partitioning to sediment, however degradation rate in the whole systems and in the water phase were similar. There were no major metabolites in water or sediment. Mineralization of the 3-^{14}C-thienyl label was low accounting for only 2-3% after 105 days. The formation of unextracted residues in the sediment organic carbon was the major sink (accounting for 49-53% of the applied radioactivity at 105 days).

The risk to birds and mammals was considered low in the initial assessment. However, a high first tier risks to insectivorous birds for both representative uses and to medium herbivorous mammals in maize was identified in the assessment according to the current guidance (SANCO/4145/2000). Further data is thus needed to refine the risk assessment for birds and mammals. A high risk was also identified for algae and aquatic macrophytes. Buffer zones of 20 m are required for the proposed application rate in maize. For bees and other non-target arthropods the risk is considered low. Effects were observed in laboratory studies with *A.rhopalosiphi*, however recolonisation is considered to be possible within a reasonable time frame. The acute risk to earthworms from dimethenamid and the soil metabolites M23 and M27 is low. No chronic studies are available for the metabolites that have DT_{90} values longer than 1 year in studies from southern Europe. Although the acute toxicity is low a long-term risk to earthworms cannot be excluded without further testing. Whether studies on other

[3] M23: (1RSaRS)-N-(2,4-dimethyl-3-thienyl)-N-(2methoxy-1-methylethyl)-oxamic acid
[4] M27: (1RSaRS)-N-(2,4-dimethyl-3-thienyl)-N-(2methoxy-1-methylethyl)-2sulfonyl-acetamide

soil macro-organisms are needed can only be concluded after the long-term risk assessment for earthworms has been finalised. The risk to soil micro-organisms is considered low. Risk mitigation measures are necessary to protect non-target plants for the use in maize.

Key words: dimethenamid, peer review, risk assessment, pesticide, herbicide

TABLE OF CONTENTS

BACKGROUND

Commission Regulation (EC) No 451/2000 laying down the detailed rules for the implementation of the second and third stages of the work program referred to in Article 8(2) of Council Directive 91/414/EEC, as amended by Commission Regulation (EC) No 1490/2002, regulates for the European Food Safety Authority (EFSA) the procedure of evaluation of the draft assessment reports provided by the designated rapporteur Member State. Dimethenamid is one of the 52 substances of the second stage covered by the amended Regulation (EC) No 451/2000 designating Germany as rapporteur Member State.

In accordance with the provisions of Article 8(1) of the amended Regulation (EC) No 451/2000, Germany submitted the report of its initial evaluation of the dossier on dimethenamid, hereafter referred to as the draft assessment report, to the EFSA on 16 October 2003. Following an administrative evaluation, the EFSA communicated to the rapporteur Member State some comments regarding the format and/or recommendations for editorial revisions and the rapporteur Member State submitted a revised version of the draft assessment report. In accordance with Article 8(5) of the amended Regulation (EC) No 451/2000 the revised version of the draft assessment report was distributed for consultation on 31 October 2003 to the Member States and the sole notifier BASF 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, representatives from Member States identified and agreed in an evaluation meeting on 25 May 2004 on data requirements to be addressed by the notifier as well as issues for further detailed discussion at expert level. A representative of the notifier was attending this meeting.

Taking into account the information received from the notifier addressing the request for further data, a scientific discussion of the identified data requirements and/or issues took place in expert meetings organised on behalf of the EFSA by the EPCO-Team at the Federal Office for Consumer Protection and Food Safety (BVL) in Braunschweig in January – March 2005. 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 with representatives from Member States on 28 September 2005 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 Health, Plant Protection Products and their Residues (PPR).

In accordance with Article 8(7) of the amended Regulation (EC) No 451/2000, 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. 1-2 of 1 July 2004)
- the consultation report

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 28 September 2005)

Given the importance of the draft assessment report including its addendum (compiled version of June 2005 containing all individually submitted addenda) and the peer review report with respect to the examination of the active substance, both documents are considered respectively as background documents A and B to this conclusion.

THE ACTIVE SUBSTANCE AND THE FORMULATED PRODUCT

Dimethenamid is the ISO common name for (*RS*)-2-chloro-*N*-(2,4-dimethyl-3-thienyl)-*N*-(2-methoxy-1-methylethyl)acetamide (IUPAC).

Dimethenamid belongs to the class of chloroacetamide herbicides such as metazachlor, metolachlor and pethoxamid. It is taken up via roots and controls weeds by reducing cell division and growth.

The representative formulated product for the evaluation was "Frontier" ("BAS 656 02 H"), an emulsifiable concentrate (EC).

The evaluated representative uses as pre or post emergent herbicide comprise broadcast spraying to control weeds in maize (pre or post) and sugarbeet (post) at an application rate of 1.44 kg dimethenamid per hectare (maize) and up to 1.08 kg per hectare (sugarbeet), respectively. Dimethenamid can be used only as herbicide.

SPECIFIC CONCLUSIONS OF THE EVALUATION

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

The minimum purity of dimethenamid as manufactured should not be less than 960 g/kg. At the moment no FAO specification exists.
However, since clarification is required with respect to certain impurities to confirm the proposed maximum levels in the technical material, the specification for the technical material as a whole should be regarded as provisional at the moment.

Beside this, the assessment of the data package revealed no particular area of concern. Some further data concerning explosive and oxidising properties of the active substance are still outstanding.

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

Sufficient test methods and data relating to most of the physical, chemical and technical properties are available (data/clarification with respect to explosive and oxidising properties are outstanding). Also adequate analytical methods are available for the determination of dimethenamid in the technical material and in the representative formulation.
Therefore, enough data 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 definition, i.e. dimethenamid in food of plant and animal origin, surface water and air. However, the applicability of the enforcement method for food of plant origin must be demonstrated by an ILV (independent laboratory validation). For the other matrices (soil and ground/drinking water) the residue definitions are not finalised. However, an analytical method for the determination of the metabolites oxalamide (M23)[5] and sulfonate (M27)[6] was included in the dossier.

The methodologies used are HPLC with UV detection or GC with PND or MS detection. None of them is enantio selective. A multi-residue method like the Dutch MM1 or the German S19 is applicable in food of plant origin (The applicability of the German S19 method has been demonstrated, but not down to the LOQ of concern).
An analytical method for food of animal origin is not required due to the fact that no residue definition is proposed (see 3.2).

The discussion in the expert meeting (EPCO 20, March 2005) on identity, physical and chemical properties and analytical methods was limited to the specification of the technical material, some

[5] M23: (1*RS*a*RS*)-*N*-(2,4-dimethyl-3-thienyl)-*N*-(2-methoxy-1-methylethyl)-oxamic acid
[6] M27: (1*RS*a*RS*)-*N*-(2,4-dimethyl-3-thienyl)-*N*-(2-methoxy-1-methylethyl)-2-sulfonyl-acetamide

outstanding data on physical and chemical properties of dimethenamid and some clarification with respect to analytical methods. For the latter, RMS has stated in the evaluation table (after the expert meeting) that a validated analytical method for "impurity 11" is available in the dossier. However, the method was not peer reviewed by other MS or discussed in an EPCO expert meeting and is not described in the DAR or an addendum.

2. Mammalian toxicology

Dimethenamid was discussed at the EPCO experts' meeting for mammalian toxicology (EPCO 18) in February 2005.

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

Following oral intake, dimethenamid was slowly but nearly completely absorbed from the gastrointestinal tract. The test substance was widely distributed throughout the organism and rapidly eliminated via bile and urine (approx. 90% within 7 days). Only 1-2% of unchanged parent compound were detected in the excreta, over 40 metabolites were detected of which about 20 could be structurally identified. Metabolism occurred primarily via glutathione conjugation pathways. No evidence for accumulating potential.

2.2. Acute toxicity

The acute oral toxicity of dimethenamid in rats is moderate (LD_{50} is 397 mg/kg bw). The results of acute dermal and inhalation toxicity studies show low toxicity, LD_{50} > 2000 mg/kg bw and LC_{50} >5 mg/L, respectively. Dimethenamid is not irritating to the skin, but a mild transient effect was noted in the eye irritation studies, however not classifiable. Skin sensitization properties were demonstrated in the Maximisation Test.

On the basis of these results, the following classification is applied: **Xn, R22 "Harmful if swallowed"; Xi, R43 "May cause sensitisation by skin contact"**.

2.3. Short term toxicity

The short-term toxicity of dimethenamid was investigated in an oral 28-day range-finding study in rats as well as in 3-month studies in rats, mice, and dogs and a 1-year study in dogs. In addition, the short-term toxicity following dermal exposure was determined in two 21-day studies in rabbits.

The signs of toxicity observed in rats, mice and dogs were overall similar and the liver was the target organ (increased weight). The main histological findings were: hepatocellular cytoplasmic swelling or hypertrophy in rats, and hepatocyte vacuolation and sinusoidal dilatation in dogs. In two 3-week dermal toxicity studies in rabbits, no substance-related systemic findings were detected up to the highest dose level tested of 1190 mg/kg bw/day, only a mild skin irritation was observed. The relevant NOAELs are 4.3 mg/kg bw/day and 2 mg/kg bw/day from the 90-day and 1-year dog studies, respectively.

2.4. GENOTOXICITY

Dimethenamid has been tested for genotoxic potential in 13 assays using both *in vitro* and *in vivo* techniques. Gene mutation assays in bacteria and mammalian cells were negative. Two *in vivo* mouse micronucleus assays indicated that dimethenamid has no clastogenic activity. A dominant lethal assay resulted in an unusual finding of an increase in late foetal deaths in the first two weeks following treatment. A repeat study failed to reproduce these findings. Four unscheduled DNA synthesis (UDS) assays have been conducted *in vivo* and *in vitro* with a negative outcome.

The experts concluded that, considering all 13 tests with dimethenamid, weight-of-evidence considerations suggest that this compound should not be regarded as genotoxic.

2.5. LONG TERM TOXICITY

Two long-term feeding studies with dimethenamid were performed, one in rats and one in mice.

In the 104-week rat study, the following effects were observed in the high dose group: decreased body weight gain, increased cholesterol and liver weight in females, increased gamma-glutamyl transferase in males. Considering the histological findings, a dose-related increased incidence of bile duct hyperplasia was observed in females. Independently of the historical control, this is considered to be a substance related effect in all dose groups. Dilated bile ducts were observed with an increased incidence in high dose females only. The incidence of epithelial hyperplasia at the limiting ridge of the stomach was increased in males at all dose levels, as for hyperplasia in the parathyroid in high dose males.

The slight increase in benign liver tumours in high dose males does not indicate that dimethenamid is carcinogenic since it was not statistically significant, and within the historical control range, thus most likely due to the considerable increase in survival at that dose (increased spontaneous incidence with age). A slight increase in ovarian tubular adenomas was observed. However, a pathology peer review showed that the incidence at the high dose is within the historical control range and not significantly different from control.

In the carcinogenicity study in mice (94 weeks), decreased body weight gain and increased relative liver weight were observed at the two highest doses. A dose-related increased incidence in hepatocyte enlargement was observed. Also, the incidence of hyperkeratosis of the limiting ridge of the stomach was increased at the high dose. There was no evidence of a treatment-related increase in neoplasms.

In conclusion, the relevant NOAELs in rat and mouse are <5 mg/kg bw/day and 3.8 mg/kg bw/day, respectively. Liver tumours are observed in rats at the highest dose level, but no classification was proposed.

2.6. REPRODUCTIVE TOXICITY

Reproductive function was not affected in the two-generation study in rats, so the NOAEL for reproductive function is the highest dose tested of 133 mg/kg bw/day. The NOAEL for parental

systemic toxicity and pup toxicity is 33.3 mg/kg bw/day. The only effect noted in pups was a decreased body weight gain during lactation at the high dose.

In the rat teratogenicity study using dimethenamid, maternal and developmental toxicity were observed at the two highest doses tested (maternal clinical signs, reduced body weight gain). At the same doses, there was a minor dose-dependent increase in the average percentage of early resorptions. There were no teratogenic effects observed which were considered related to treatment. The NOAEL for both maternal and developmental toxicity was 50 mg/kg bw/day.
In the rabbit teratogenicity study, significant maternal toxicity was observed at the high dose (150 mg/kg bw/day) and less severe effects were noted at the mid dose (75 mg/kg bw/day). Abortions in two high-dose animals were considered treatment-related, but must be seen in conjunction with clear maternal toxicity. The NOAEL for maternal toxicity was 37.5 mg/kg bw/day and the NOAEL for the developmental toxicity was 75 mg/kg bw/day.
In conclusion, the relevant NOAELs were 33.3 mg/kg bw/day for maternal/parental toxicity (2-generation study, rat), and 50 mg/kg bw/day for developmental toxicity (rat teratogenicity study).

2.7. NEUROTOXICITY

All performed studies gave no evidence of a neurotoxic effect. No specific studies were performed.

2.8. FURTHER STUDIES

Metabolites: Two metabolites (M23 and M27) have been found in groundwater in a lysimeter study above 0.75 µg/L. In some of the FOCUS scenarios, even the level of 10 µg/L for M27 was exceeded. Both compounds had lower acute oral toxicity than dimethenamid (LD_{50} >5000 mg/kg bw) and were negative in the Ames and mouse micronucleus assays. Furthermore, they were found in rat metabolism studies. According to that, they were considered as non-relevant by the experts. However, considerations have to be made relating to the amount of the metabolites in groundwater. Thus, a consumer risk assessment was performed in relation with the metabolites in drinking water. The RMS has prepared an addendum with a refined risk assessment for consumers however after the experts´ meeting, only considered by EFSA, for further details see section 3.3 and 4.2.2.

Mechanistic studies: Dimethenamid has been shown to bind to rat haemoglobin, primarily to the globin portion, but this is a species-specific reaction, irrelevant for human blood.
Oral administration of dimethenamid to rats for four days induced several liver enzyme systems with saturation of the glutathione conjugation pathway at the high dose (400 mg/kg bw/day), but there was recovery of the liver changes after cessation of exposure. In a separate study, gavage treatment with dimethenamid for four days produced liver stimulation as evidenced by decreased thiopental sleeping time, increased liver weight and liver pathological changes. Studies to determine the *in vitro* toxicity of dimethenamid on cultured rat hepatocytes demonstrated a dose-related cell survival decrease with EC_{50} values of approximately 17 µg/mL.

2.9. MEDICAL DATA

There were no reported cases of skin irritation, skin sensitisation or other adverse health effects.

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

ADI

The NOAEL of 2 mg/kg bw/day from the 1-year dog study, with a safety factor of 100, results in an ADI of 0.02 mg/kg bw/day.

AOEL

The most sensitive species is the dog. Therefore, the systemic AOEL is based on the NOAEL of the 90-day oral study in dogs (4.3 mg/kg bw/day). With a safety factor of 100, the calculation results in a systemic AOEL of 0.04 mg/kg bw/day.

ARfD

Based on the NOAEL in a 4-day mechanistic study in rats of 25 mg/kg bw/day, and a safety factor of 100, the agreed ARfD is 0.25 mg/kg bw/day.

2.11. DERMAL ABSORPTION

Dermal penetration studies in rats demonstrated, that the *in vivo* dermal penetration of dimethenamid is approximately 26%. Based on *in vitro* results in a recent study (Thornley, 2001), which compared skin penetration between human and rat skin, it can be concluded that the rate of dermal penetration (µg/cm^2/h) through rat skin is at least 4-fold higher than through human skin. Thus, by using a correction factor, the resulting dermal penetration of dimethenamid is predicted to be approximately 6.5 % for both concentrate and dilution.

2.12. EXPOSURE TO OPERATORS, WORKERS AND BYSTANDERS

The representative plant protection product Frontier is an emulsifiable concentrate (EC) containing 900 g dimethenamid/L for use on maize and sugar beet.

Operator

According to the intended uses submitted by the applicant the maximum applied dose is 1.6 L of product/ha (1440 g dimethenamid/ha) and the minimum volume 200 L/ha. The only supported use is vehicle-mounted or drawn boom sprayers with hydraulic nozzles.

The estimated operator exposure for Frontier is below the AOEL according to the German model (work rate 20 ha/day), by using gloves during mixing and loading, and gloves and garment during application. On the basis of UK-POEM calculations, the estimated operator exposure exceeds the AOEL, even if gloves are worn during mixing/loading (m/l) and application (a) (see table beneath).

Estimated exposure presented as % of AOEL (0.04 mg/kg bw/day), according to calculations with the German and UK POEM model. The default for body weight of operator is 70 kg in the German model and 60 kg in the UK-POEM model.

Model	No PPE	With gloves (m/l):	With gloves (m/l+a)	With gloves (m/l+a), coverall (a):
German	298%	140%	nc	13%
UK POEM	1143%	792%	170%	nc

PPE (personal protective equipment): gloves and/or coverall, nc: not calculated

Worker

A German re-entry model[7] was used for the calculations of worker exposure, taking into account a work rate of 2 hours/day which might be an underestimate but in this case it would seem reasonable (scouting only), and a reduced transfer factor of 1000 cm²/person x h[8]. This results in an estimated exposure of 6.7% of the systemic AOEL without protective clothing, and 0.3% of the systemic AOEL with protective clothing.

Bystander

Estimated exposure to bystanders was made according to an UK model[9] for field crop sprayers. Based on the 6.5% dermal absorption and assuming a body weight of 70 kg the estimated acute exposure of a bystander is below 1% of the AOEL.

3. Residues

Dimethenamid was discussed at the EPCO experts' meeting for residues (EPCO 19) in February 2005.

3.1. NATURE AND MAGNITUDE OF RESIDUES IN PLANT

3.1.1. PRIMARY CROPS

Plant metabolism studies with dimethenamid were conducted on maize and sugar beets. The major metabolic pathway is via gluthatione conjugation and further hydrolysis of the glutathione conjugate to cysteine conjugate, both being transient intermediates undergoing rapid oxidation, deamination and/or decarboxylation forming a range of polar metabolites (metabolites M24[10], M25[11], M26[12], M27, M28[13], M29[14], M30[15], M32[16]). In addition, an oxalamide metabolite (metabolite M23) of the parent

[7] Hoenicke *et al.*, 1998. Hinweise in der Gebrauchsanleitung zum Schutz von Personen bei Nachfolgearbeiten in mit Pflantzenschutzmitteln behandelten Kulturen. Nachrichtenbl. Deut. Pflanzenschutzd. 50 (10), p 267.
[8] EPA, Science Advisory Council for Exposure; 1998; Agricultural Default Transfer Coefficients, Policy #1998/11675.
[9] Lloyd and Bell, 1983. Hydraulic nozzles: comparative spray drift study.
[10] M24: S-(-(N'-(2,4-dimethyl-3-thienyl)-N'-(2-methoxy-1-methylethyl)amino-2-oxoethyl)-glutathione
[11] M25: S-(2-(N'-(2,4-dimethyl-3-thienyl)-N'-(2-methoxy-1-methylethyl)-amino-2-oxoethyl)-cysteine
[12] M26: S-(2-(N'-(2,4-dimethyl-3-thienyl)-N'-(2-methoxy-1-methylethyl)-amino-2-oxoethyl)-thiolactic acid
[13] M28: Sulfoxide of M25

compound was identified, resulting from either soil uptake or from a mechanism involving cytochrome P-450.
No parent dimethenamid was found in any food or feed commodity obtained from maize and sugar beet. Identified metabolites were not all present in the rat metabolism, but due to their extremely low level expected in food commodities and in the absence of any indication of a potential for accumulation, none of these metabolites needs to be considered for inclusion in the residue definition. Therefore the residue definition proposed for monitoring as well as for risk assessment is dimethenamid alone, this proposal reflecting a 'no-residue situation' for parent and metabolites in food commodities. This residue definition can include other possible mixtures of the constitutive isomers, in particular dimethenamid-P which is the purified active R-enantiomer, as its specific toxicological effects are basically covered by the ADI and the ARfD established for dimethenamid.

A sufficient number of supervised field residue trials were submitted to support the representative uses in maize and sugar beet. Residues at harvest were always below the LOQ (Limit Of Quantification) of the method of analysis (0.01 mg/kg) in maize grain and silage, as well as in sugar beet top. Only in one sugar beet root sample, measurable residues (0.02 mg/kg) were found, what seems to reflect a contamination rather than to indicate potential residues in sugar beet roots. The reliability of these results is supported by storage stability studies demonstrating that residues of dimethenamid and its oxalamide metabolite are stable in maize matrices under storage at -20°C for at least 21 months.
Generally, these supervised residue trials confirm that the application of dimethenamid according to the representative uses in maize and sugar beets results in a 'no-residue' situation, as foreseen from the metabolism studies.

Since no significant residues are expected in raw agricultural commodities, the effects of industrial processing were not investigated.

3.1.2. SUCCEEDING AND ROTATIONAL CROPS

A confined rotational crop study was carried out reflecting the normal time interval between the installation of a following crop after maize or sugar beets. In these conditions, degradation products were present in winter wheat, spring wheat, lettuce and carrots. Their total amount ranged from 0.013 mg eq dimethenamid/kg in carrots to 0.17 mg eq dimethenamid/kg in winter wheat straw, but all individual compounds were present at levels below 0.01 mg/kg. Three metabolites were identified that were also identified in primary crops. It can be generally considered that the metabolism in rotational crops is similar to that in primary crops. No restriction or MRL seems to be necessary for crops succeeding to treated maize or sugar beets cultivated under normal agricultural and harvesting practices.

[14] M29: N-malonyl conjugate of M25
[15] M30: sulfoxide of M26
[16] M32: N-(2,4-dimethyl-3-thienyl)-N-(2-methoxy-1-methylethyl)-carboxymethylenethionyl-acetamide

3.2. NATURE AND MAGNITUDE OF RESIDUES IN LIVESTOCK

No significant residues are found in treated crops or parts of crops fed to animal. Therefore metabolism studies in livestock do not need to be submitted from a legal point of view. However such studies were carried out in lactating goats and laying hens and were evaluated. Animals were fed with the radiolabelled substance at a dose rate of about 10 mg/kg body weight, which is several orders of magnitude higher than the expected actual exposure level. In these conditions, dimethenamid was extensively metabolized. The parent compound was found unchanged only in poultry fat. Generally, the metabolites identified either in edible organ and tissues or in the excreta reflect a metabolic pathway in livestock which is similar to that of rat.

Given the very low potential exposure of livestock to residues resulting from the use of dimethenamid, its extensive metabolism and the absence of any tendency to accumulation, no residue definition or MRLs for animal products needs to be proposed.

3.3. CONSUMER RISK ASSESSMENT

The chronic dietary risk assessment has been based on the Theoretical maximum Daily Intake (TMDI) calculation model of WHO using the WHO European typical diet and the national German diet (4 to 6 year old girl). Residues in maize grains, sugar beets and their processed commodities were considered to be 0.01 mg/kg, being the level of the LOQ. The calculations made for both diets indicated very low TMDI values (less than 1% of the ADI).

Similarly, no acute risk is expected resulting from the consumption of commodities derived from maize and sugar beets treated with dimethenamid.

Beside this risk assessment on food commodities, the RMS has prepared an addendum after the experts' meeting and only considered by the EFSA addressing the risk for consumers resulting from the consumption of water contaminated with metabolites M23 and M27 (It must be noted that metabolites M23 and M27 were also identified in plant metabolism but at such low levels that they don't need to be considered in the risk assessment resulting from the consumption of the maize and sugar beets derived food commodities). Although considered as not toxicologically relevant these 2 metabolites are expected to be present in groundwater at levels exceeding the Threshold of Toxicological Concern of 0.75 µg/l. They were therefore assessed by the RMS for their potential impact on the consumer. In the absence of a complete toxicological data base for these compounds, they were considered as being characterised by the same ADI as dimethenamid. It was also considered that the consumer could be exposed through drinking water to the highest concentrations in groundwater predicted by FOCUS scenarios. Under these hypotheses, it was concluded that the exposure to metabolites M23 and M27 accounted for not more than 15 % of the dimethenamid ADI for adults and children. As far as the other 12 potentially exceeding 0.75 µg/L and 4 between 0.1 and 0.75 µg/L compounds in ground water nothing can be concluded on the impact on human health as they were not identified.

3.4. PROPOSED MRLS

Based on the available data base, a MRL of 0.01* mg/kg is proposed for maize grains and sugar beets to cover the representative uses of dimethenamid supported by the notifier on these crops.

4. Environmental fate and behaviour

Issues raised during the peer review, as well as further data made available by the applicant upon request, were discussed in a scientific meeting with Member State experts in January – February 2005 (EPCO 16).

4.1. FATE AND BEHAVIOUR IN SOIL

4.1.1. ROUTE OF DEGRADATION IN SOIL

In a comparative aerobic laboratory soil degradation study (23°C and 75% 1/3 bar soil moisture content) using a clay loam soil, dimethenamid-P and racemic dimethenamid metabolism was the same. Dimethenamid (which includes dimethenamid-P as one of two enantiomers) was shown to be extensively metabolised in laboratory degradation studies on a further 4 soils (1 at 25°C and 75% 1/3 bar soil moisture content, the others at 20°C and 40% maximum water holding capacity). Degradation proceeded via glutathione and/or cysteine conjugation and subsequent oxidation of these moieties. In the aerobic studies CO_2 from the 3-^{14}C-thienyl label was formed at levels of 8 to 36% AR after 120 days. The same metabolites: M23, M27 and M31[17] were identified in all the soils studied. Only M23 and M27 were present in any of the soils investigated at levels greater than 10 % AR (up to *ca*. 13 % AR each). Labelled residues from the 3-^{14}C-thienyl label not extracted by methanol/acidified methanol or methanol/water reached a maximum of 45 % AR after 120 days. The major portion of the unextracted radioactivity was shown to be associated with the humic acid fraction of the soil organic carbon. The route of degradation of dimethenamid-P and dimethenamid were the same.

Under anaerobic conditions, the results were comparable, although the rate of degradation was slower. Under the conditions applied in the soil photolysis studies the degradation under the influence of light was enhanced compared to the dark control, however major (>10%AR) metabolites were not formed.

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

When dimethenamid or dimethenamid-P were incubated in the clay loam soil concurrently under identical conditions, comparable single first order DT_{50} values for both test substances were found (*ca*. 10 days at 23°C and 75% 1/3 bar soil moisture content). Single first order DT_{50} values for dimethenamid from other laboratory degradation studies conducted with four further soils at 20-25°C

[17] M31: (1RSaRS)-3-(S(2-(N-(2,4-dimethyl)-3-thienyl)-N-(2-methoxy-1-methylethyl)-amino)-2-oxoethyl)-sulfinyl)-acetic acid

(40% maximum water holding capacity or 75% 1/3/ bar moisture content) ranged from 8 to 43 days. Laboratory (20°C and 40% maximum water holding capacity) DT_{50} values for M23 and M27 were estimated to range from 24 to 41 days and from 40 to 140 days, respectively (calculated using a 4 compartment model that assumed single first order kinetics between compartments using results from studies on 3 soils where the parent compound was applied as test substance).

In field soil dissipation studies (4 northern and 5 southern European trial sites) residues were generally only detected (limit of quantification 0.01mg/kg, 0.6-1.9% of the parent residue measured immediately after application) in the top 0-10 cm soil layer. The single first order DT_{50} and DT_{90} values calculated (using linear regression) ranged from 3 to 35 days and from 11 to 115 days, respectively. The metabolites M23 and M27 were found at low concentrations, residues of the metabolites at the termination of the studies were at or below the limit of quantification (0.01mg/kg). Single first order DT_{50} and DT_{90} for these metabolites estimated using a multi compartment model were 18-159 and 61-527 days respectively (M23) and 22-137 and 72-454 days respectively (M27). As field DT_{90} for M23 and M27 were shown to be > 365 days, these metabolites have the potential to accumulate in soil when applications are made to the same area of land in consecutive years. Potential accumulated soil concentrations for M23 and M27 have been calculated for the representative use on maize, which is often grown as a monoculture and not as part of a crop rotation.

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

Data on batch adsorption of dimethenamid were available for 9 soils. K_{foc} were in the range 40-203 ml/g (median 114 ml/g), 1/n 0.73-1 (median 0.965). K_{doc} for the metabolites M23 and M27 (6 soils investigated) were 3.5-17ml/g (median 6ml/g) and 0-14ml/g (median 6.9ml/g) respectively. There was no indication that the adsorption of either dimethenamid or its major soil metabolites was affected by variation in soil pH. In laboratory soil column leaching studies and aged soil column leaching studies a large proportion of the applied radioactivity was recovered in leachate.

In a BBA guideline lysimeter study two lysimeters containing undisturbed Borstel sandy soil monoliths (depth 1.2m) were installed at Itingen, Switzerland. Dimethenamid was applied to bare soil in May the day after a maize crop was sown (1 application of 1.44 kg as/ha and 2 applications of 1.44 kg as/ha in successive years on lysimeter 1 and 2, respectively). For these 2 years over the autumn / winter a cereal crop was grown. In the third year a winter rape crop was sown. Annual precipitation per lysimeter was 910-1159 L. Annual leachate volumes collected were 318-533 L. In all individual leachate samples analysed, parent dimethenamid was not detected (< 0.05µg/L). The metabolites M23 and M27 were present in leachate at annual average concentrations of up to 0.98µg/L and 4.66µg/L respectively.

Late in the peer review process after the experts' meetings, the EFSA identified that significant proportions of the radioactivity in the lysimeter leachate had been characterised but not identified. Whilst attempts were made to identify the resolved fractions in the leachate samples, this was not

possible for components for which analytical standards were not available using the technology available at the time the study was carried out (1992-1996, when sensitive hyphenated liquid chromatography spectral techniques were not available).

However the guidance document on the assessment of the relevance of metabolites in groundwater, Sanco/221/2000-rev-10 (25 February 2003) makes it clear that identification is necessary for components where annual average leachate concentrations exceed 0.1µg/L. The dossier should have been updated to satisfy this requirement. This aspect of the guidance had not changed from much earlier drafts of this guidance.

Excluding the polar fraction that remained at the origin of TLC chromatograms (designated U1 but likely to be several compounds) and M23 and M27, 16 further components present in leachate had been resolved by chromatography but not identified. The annual average concentrations in leachate of 4 of these individual unidentified components were between 0.1 and 0.7 µg/L when expressed as parent equivalents. The remaining 12 of these unidentified components had annual average concentrations between 0.8 and 3.9 µg/L when expressed as parent equivalents. Note a risk assessment for these unidentified components is required for aquatic organisms. Data where leachate was tested on fish daphnia and algae were in the dossier but were not evaluated by the RMS in the DAR. More importantly a human health non relevance assessment will be required, once the components have been identified?

4.2. FATE AND BEHAVIOUR IN WATER

4.2.1. SURFACE WATER AND SEDIMENT

Dimethenamid is hydrolytically stable at pH 5, 7 and 9 (25 °C). In aqueous solution dimethenamid photodegraded gradually (continuous irradiation, equivalent to spring midday at 40°N) with single first order DT_{50} values of 23.9 d (dimethenamid) and 25.7 d (dimethenamid-P). None of the degradation products of the direct phototransformation accounted for more than 4.3 % AR.

A study on ready biodegradability was not submitted. In the absence of this study dimethenamid is considered 'not readily biodegradable'. In water/sediment systems (2 systems studied in the laboratory at 20°C in the dark) dimethenamid was degraded to 4.7 % AR (river system) and 11.6 % AR (pond system) within 105 days, resulting in single first order DT_{50} values for dissipation from the water phase of 20 – 28 days and single first order DT_{50} values of 23 – 33 days for the entire system (sinks being degradation / formation of unextracted sediment residues). DT_{90} values were found to range from 67 – 92 days and 78 – 111 days for the water phase and the whole system, respectively. Labelled residues from the 3-^{14}C-thienyl label not extracted from Sediment by acetonitrile followed by acetonitrile/water increased to 49-53 % AR at 105 days; mineralisation of the 3-^{14}C-thienyl label to CO_2 was low (2.1-2.7%AR at 105 days). One main metabolite M3[18] was detected at a maximum of

[18] M3: (1RSaRS)-N-(2,4-dimethyl-3-thienyl)-N-(2methoxy-1-methylethyl)-acetamide

> 10 % AR in the whole system (14 % AR at day 105) but individual portions of M3 in sediment and water phase were < 10 % AR.

Predicted environmental concentrations in surface water due to contamination via spray drift were calculated for parent dimethenamid for a 30 cm deep static water body for the evaluated representative use on maize which encompassed the lower application rate for the representative use on sugar beet. Assessments of exposure to surface water from the runoff and drainage routes of entry have not been considered in the DAR or its addendum. However, because of the soil types and topography typically associated with the representative uses, exposure via these routes of entry is unlikely to be significant for large areas of the EU where these crops are cultivated. However, for uses on other crops, or to cover specific local geoclimatic conditions for maize and sugar beet cultivation, these routes of exposure to surface water should be considered at Member State level and where necessary additional aquatic risk assessments completed. As well as the parent dimethenamid, attention should be paid to potential exposure to the soil metabolites that are more persistent and more mobile than the parent dimethenamid, and therefore have the potential to move from the soil to surface water.

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

Evidence from both FOCUS groundwater modelling (with PELMO, PEARL and MACRO) and a BBA guideline lysimeter study (cropped with maize), indicate that for the representative uses assessed, parent dimethenamid would not be expected to be present in groundwater (even in vulnerable situations) at concentrations above the drinking water limit of 0.1µg/L.

For the major soil metabolites M23 and M27, FOCUS modelling for the FOCUS groundwater scenarios indicated that annual average concentrations in leachate leaving the top 1m soil layer will be up to 4.4 and 26.1µg/L respectively. These concentrations for M27 were calculated to be <10µg/L (parametric value contained in the guidance document Sanco221/2000-rev-10) for M27 at the FOCUS scenarios Porto, Sevilla and Thiva when cropped with maize and Okehampton, Piacenza, Porto, Sevilla and Thiva when cropped with sugar beet. At the remaining scenarios M27 annual average concentrations were predicted to be > 10µg/L at the FOCUS scenarios.

In the maize lysimeter that was considered comparable to the conditions of the FOCUS Hamburg scenario, annual average leachate concentrations leaving the 1.2m deep soil monolith were 0.98µg/L for M23 and 4.66µg/L for M27. For comparison FOCUS PEARL estimated these concentrations at the Hamburg scenario to be 5.64µg/L for M23 and 26.1µg/L for M27 (highest concentrations estimated from all the FOCUS scenarios).

At the Experts' meeting the levels measured in the lysimeter study and FOCUS PEARL predicted concentrations for the Hamburg scenario as set out in detail in addendum 1 to the DAR (dated 7 January 2005) were discussed. It was clear that the environmental conditions of the lysimeter study were broadly comparable but probably more worst case than the FOCUS Hamburg scenario (soil

description, temperature and leachate recharge volumes) and accepted on this basis the FOCUS modelling probably overestimated leachate concentrations of M23 and M27. However they also considered that due to the persistence of M27 in the lysimeter soil, the lysimeter had probably not been run long enough (applications had only been made in two consecutive years) to conclude that groundwater concentrations of M27 would not in practice be > than the 4.66µg/L measured in the lysimeter. They therefore concluded that the possibility that 10µg/L will be exceeded for the M27 metabolite cannot be excluded on the basis of the lysimeter evidence alone.

The EFSA agrees with this conclusion but considers it unlikely that M27 concentrations would in practice exceed 10µg/L for the use patterns assessed except under very worst case conditions. Taking the information on the longest laboratory first order DT_{50} in sandy loam soil (140 days 20°C, 308 days normalised to 10°C) into account to calculate accumulated soil concentrations, the potential additional M27 that would be in soil and available for leaching had the lysimeter study duration been longer, would not have been sufficient to more than double the measured M27 annual average leachate concentration of 4.66µg/L to > 10µg/L.

Non relevance assessments in accordance with Sanco221/2000-rev-10 and an aquatic risk assessment to cover the situation when groundwater becomes surface water have been completed for the metabolites M 23 and M27, see sections 2.8 , 3.3 and 5.2.

As already discussed at 4.1.3 above, there are 16 chromatographically separated but unidentified radiolabelled components in the lysimeter leachate at annual average concentrations >0.1µg/L. 12 of these components had annual average concentrations >0.75µg/L. Whilst tests have been done to with leachate samples to demonstrate lack of effects on aquatic organisms, (see section 5.2), the results of these tests still need to be assessed. (This assessment is available in the DAR for terrestrial plants exposed to lysimeter leachate, effects were not observed). To be in accordance with sanco/221/2000 rev. 10, these components need to be identified and a non relevance assessment (in relation to mammalian toxicology) completed.

4.2.3. FATE AND BEHAVIOUR IN AIR

Henry's law constant of dimethenamid was calculated to be 8.6 • 10-3 Pa m³ mol-1 (25 °C). Dimethenamid was shown to volatilise within 24 h from plant and soil surfaces in amounts of 14.1 % AR and 6.6 % AR, respectively. Thus the potential for the active substance to be re-leased into the atmosphere is shown to be limited. The lifetime of gaseous dimethenamid in the troposphere would be short as the photochemical half-life for reactions with OH-radicals was estimated to be 2.45 h. The calculation of predicted environmental concentrations in air is therefore deemed to be unnecessary.

5. Ecotoxicology

Issues raised during the peer review, as well as further data made available by the applicant upon request, were discussed in a scientific meeting with Member State experts in January – February 2005 (EPCO 17).

5.1. RISK TO TERRESTRIAL VERTEBRATES

The risk to terrestrial vertebrates was assessed based on the use of dimethenamid in maize and sugar beet with applications between pre-emergence of weed/crop and early post-emergence assuming an application rate of 1.08 kg a.s./ha for sugar-beets and 1.44 kg a.s/ha for maize. The estimated theoretical exposure (ETE) was calculated for the standard species for leafy crops in accordance with the Guidance Document on Birds and Mammals (SANCO/4145/2000). This value was then related to the LD_{50} for the acute assessment, to LC_{50} as concentration in food for the short-term assessment for birds and to NOAEL or NOEC based on concentration in food for the long-term assessment to mammals and birds respectively. All TER values obtained were above the Annex VI trigger values indicating a low risk.

Following comments from Member States a new first tier risk assessment based on toxicity values recalculated to daily doses was provided by the RMS in Addendum 1. In this assessment the non standard crop category ‘early cereals’ (short grass) was also considered to cover the exposure to grass weeds.

For birds the new calculations resulted in TER values above the Annex VI trigger for the acute and short-term assessment indicating a low risk.

The long-term TER values calculated according to the new guidance are 4.5 and 2.5 for a large herbivorous bird and an insectivorous bird respectively in ‘early cereals’ at an application rate of 1.44 kg a.s./ha (maize). In the ‘leafy crop’ scenario the TER value for a medium herbivorous bird is 4.9. For an application rate of 1.08 kg a.s./ha (sugarbeet) the long-term TER value for an insectivorous bird is 3.5. Hence the long-term risk to birds has to be further addressed.

The recalculations to daily doses based on values on mean body weight and feed consumption data were not included in Addendum 1 and have therefore not been peer reviewed. The values were however later reported by the RMS in the evaluation table and were transferred to an EFSA addendum and added to the final addendum for transparency reasons.

For the acute risk to mammals the available studies were reconsidered and the lowest acute oral toxicity value (397 mg a.s./kg bw) was chosen for the revised risk assessment for mammals presented in Addendum 1. Acute and long-term TER values calculated according to the latest guidance document (SANCO/4145/2000) are below the Annex VI trigger for both application rates in the ‘early cereal’ scenario. In the standard scenario ‘leafy crop’, the long-term TER value is 3.9 in the

first tier assessment indicating a high risk at an application rate of 1.44 kg a.s./ha. At an application of 1.08 kg a.s./ha the long-term TER is just above the trigger (TER=5.2).

Since the Annex VI triggers for long-term risk to insectivorous birds at both application rates, and the long-term trigger for medium herbivorous birds at an application rate of 1.44 kg a.s./ha were breached in the assessment according to the standard scenario 'leafy crops' in the guidance document (SANCO/4145/2000), the EFSA proposes a data requirement for the applicant to submit data to refine the assessment for birds. Additionally, a data requirement to refine the long-term risk to herbivorous mammals is proposed, as the TER value is below the Annex VI trigger.

As the logPow is below 3 the risk from secondary poisoning to birds and mammals is considered to be low.

5.2. RISK TO AQUATIC ORGANISMS

Green algae and macrophytes are the most sensitive aquatic organism to technical dimethenamid, with an E_bC_{50} of 62 µg/L for *Scenedesmus subspicatus* and an E_rC_{50} of 28 µg/L for *Lemna gibba* (no value based on biomass is available). The toxicity of the lead formulation Frontier was greater; E_bC_{50} for *Scenedesmus subspicatus* was 10 µg/L and E_bC_{50} for *Lemna* 12 µg/L.

Available toxicity data show that dimethenamid and the enantiomer dimethenamid-P are of similar toxicity to aquatic organisms.

The predicted environmental concentration in surface water was calculated based on 2.77% spray drift to a 30 cm static water body at different distances based on a single applications of 1.44 kg a.s./ha. All first tier TER values were calculated based on initial concentrations. For fish and invertebrates the acute TER values at 1 m distance are above the Annex VI trigger indicating a low risk. The long-term trigger for invertebrates is met (TER = 51) at 1 m distance but is below the trigger for fish (TER = 9.0). The assessment was based on a NOEC from a 90-d flow-through early life stage study and the RMS therefore suggested that a time-weighted average PEC_{sw} could be used to refine the assessment. Not all Member States agreed to this approach since the time to onset of effects was not reported.

For algae and aquatic macrophytes a buffer zone of 5 m is required in order to reach TER values that meet the Annex VI trigger for the active substance, and 15 and 20 m respectively if the calculations are based on the lower toxicity values obtained in studies with the formulation. No calculations are available for sugar beet where a lower application rate is proposed.

Dimethenamid is expected to partition into sediment but since the NOEC for chronic toxicity to *Daphnia magna* is >0.1 mg/L no further testing was warranted according to the Guidance Document on Aquatic Ecotoxicology (SANCO/3269/2001).

No assessment based on exposure due to drain flow and run-off is available. Such assessments should be considered at Member State level to cover specific local geoclimatic conditions for maize and sugar beet cultivation (refer to section 4.2.1)

The metabolites M3, M24 and M27 are all more than an order of magnitude less toxic to fish, invertebrates and algae than the active substance dimethenamid and the risk is therefore considered to be covered by the risk assessment for the parent compound.

Since the metabolites M23 and M27 have the potential to contaminate vulnerable shallow ground water that may become surface water, at concentrations above those calculated for dimethenamid in surface water, a risk assessment was required. This assessment was provided in addendum 1 to the DAR dated 7 January 2005 for the representative uses evaluated. The risk was low even if the higher concentrations in groundwater estimated by FOCUS groundwater modelling are considered in addition to the concentrations measured in the lysimeter study. No studies on the most sensitive species *Lemna gibba* were available, but the results from studies with *S. capricornutum* indicate low toxicity to algae. For the unidentified components resolved in the leachate of the lysimeter study (see 4.1.3 and 4.2.2) a risk assessment is needed before a conclusion on the relevance of these components for aquatic organisms can be drawn.

5.3. RISK TO BEES

The available studies with dimethenamid indicate a low oral and contact toxicity to honeybees and the calculated HQ values were well below the Annex VI trigger indicating a low risk. Additional studies with other formulations than the lead formulation were also available. Calculated HQ values based on the active substance content in these formulations were also below the trigger.

5.4. RISK TO OTHER ARTHROPOD SPECIES

Arthropods are likely to be exposed to formulated dimethenamid mainly by direct spray or by contact to fresh or dry residues. Laboratory studies on toxicity are available for *Aphidius rhopalosiphi* (natural substrate), *Aleochara bilineata* (quartz sand) and *Poecilus cupreus* (quarz sand) with formulations containing dimethenamide (racemic mixture). Additionally studies on *A. rhopalosiphi* (glass plate and natural substrate), *Typhlodromus pyri* (glass plate) and four other species are available for the enantiomere dimethenamid-P.

In the glass plate study with the dimethenamid-P formulation 100% mortality occurred for *A. rhopalosiphi*, and 46% decreased parasitizing rate was observed in the test with natural substrate. No mortality was observed for *A. rhopalosiphi* in the glass plate test with the dimethenamid formulation. Neither was any significant mortality observed for the other species that were tested, and sublethal effects were below 30%.

The risk assessment was discussed at the experts' meeting. The meeting agreed that the dose rate used in the study on *A. rhopalosiphi* with the dimethenamid-P formulation was too low (984 g a.s./ha) to

cover the maximum application rate for maize, but it was not consider necessary to repeat the study since at the correct dose rate effects would probably be above 50%. Nevertheless the meeting agreed that the risk is addressed for the following reasons. No effects were seen on *Pardosa* and *Poecilius cupreus*. Based on available residue data a low DT_{50} is expected for maize crops. Effects in the study with natural substrate were below 50% at a dose rate that is higher than the rate expected from drift at 1 m with the maximum application rate. Hence the meeting was of the opinion that recolonisation would be possible within a reasonable time frame.

Calculation of HQ values according to ESCORT II was only possible for *T. pyri*. The in field value obtained is <1.43 which is below the ESCORT II trigger of 2, hence indicating a low risk.

5.5. RISK TO EARTHWOMS

Studies on the acute toxicity to earthworms from dimethenamid, the metabolites M23 and M27 are available. Additionally, an acute study with the lead formulation is available. All TER values are well above the Annex VI trigger and therefore the acute risk is considered to be low.

The need for reproductive studies with earthworms for the metabolites M23 and M27 was discussed at the experts' meeting since MS stated that there were field DT_{90} values above 1 year in studies from southern Europe. Median DT_{90} values for M23 and M27 from the available studies are 162.5 and 139 days respectively. Since both are below 1 year the meeting agreed that no further studies are needed, unless this is triggered by the FOCUS degradation kinetics report. According to the recommendations in the draft Guidance Document on Estimating Persistence and Degradation Kinetics from Environmental Fate Studies on Pesticides in EU Registration (SANCO/10058/2005, version 1.0, March 2005) the longest DT_{50} value should be used for PEC soil calculations. In cases where data from a large number of studies are available the 90th percentile can be used. Furthermore, in the Guidance Document on Terrestrial Ecotoxicology (SANCO/10329/2002) it is stated that for metabolites that have a DT_{90} of more than a year and are more persistent than the parent compound, additional studies should be conducted regardless of the acute toxicity of the metabolite.

The EFSA therefore proposes a data requirement for chronic tests with earthworms for the metabolites M23 and M27.

5.6. RISK TO OTHER SOIL NON-TARGET ORGANISMS

No data on other soil non-target macro-organisms are available for the parent since DT_{90} <365 days and no adverse effects were observed in the acute tests with earthworms or in the test with soil micro-organisms.

For the persistent metabolites M23 and M27 the EFSA proposes a conditional data requirement to address the risk based on the results from the chronic study with earthworms when these are available.

5.7. RISK TO SOIL NON-TARGET MICRO-ORGANISMS

The effects of technical dimethenamid and an EC formulation of dimethenamid were tested on carbon mineralization. Effects on nitrogen transformation were tested with an EC formulation of dimethenamid. Additionally tests are available with the enantiomer dimethenamid-P.

No deviations of more than 25% after 28 days were observed (i.e. no breaching of Annex VI trigger value) at exaggerated doses and hence the risk to soil micro-organisms is considered to be low.

No studies are available with the major soil metabolites. This was discussed at the experts' meeting and it was concluded that it couldn't be assumed that the metabolites were present in the studies with the parent compound. However, the meeting agreed that no further studies are necessary due to the low presence of the metabolites in the field and low toxicity of the parent compound.

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

A petri dish germination test, a seedling emergence test and a vegetative vigour test on ten different species are available (*Allium cepa*, *Avena sativa*, *Sorghum bicolour*, *Zea mays*, *Cucumis sativus*, *Fagopyrum esculentum*, *Glycine max*, *Lycopersicon esculentum*, *Raphanus sativus*, *Sinapis arvensis*). The lowest endpoint value was the ER_{50} of 56 g/ha for Sorghum bicolour from the germination test. The RMS considered this test a worst case scenario that does not reflect usual field conditions and based the risk assessment on the ER_{50} for Sorghum bicolour from the seedling emergence test (156.9 g a.s./ha).

PEC values were calculated from 2.77% drift for 1 m distance and maximum application rates of 1.44 and 1.08 kg a.s./ha for maize and sugar beet respectively, in a single application. A high risk for non-target plants was identified for maize indicating that risk mitigation measures are needed. With a buffer zone of 5 m a TER value 19.1 for maize is obtained.

5.9. RISK TO BIOLOGICAL METHODS OF SEWAGE TREATMENT

Data from a test with activated sludge are available and indicate that the risk to biological methods of sewage treatment plants is acceptable.

6. Residue definitions

Soil

Definitions for risk assessment: dimethenamid, M23[19], M27[20]

Definitions for monitoring: **Further data on chronic risk soil organisms required before a conclusion can be reached on M23 and M27**

[19] M23 = (1RSaRS)-N-(2,4-dimethyl-3-thienyl)-N-(2methoxy-1-methylethyl)-oxamic acid

[20] M27 = (1RSaRS)-N-(2,4-dimethyl-3-thienyl)-N-(2methoxy-1-methylethyl)-2sulfonyl-acetamide

Water

Ground water

Definitions for exposure assessment: dimethenamid, M23, M27 **and 16 currently unidentified fractions for which further data are needed to reach a conclusion**

Definitions for monitoring: **Further data are needed to reach a conclusion.**

Surface water

Water:

Definitions for risk assessment: dimethenamid + M23 and M27 where groundwater may become surface water

Definitions for monitoring: dimethenamid

Sediment:

Definitions for risk assessment: dimethenamid

Definitions for monitoring: dimethenamid

Air

Definitions for risk assessment: dimethenamid

Definitions for monitoring: dimethenamid

Food of plant origin

Definitions for risk assessment: dimethenamid, including other mixtures of constituent isomers (sum of isomers), expressed as dimethenamid.

Definitions for monitoring: dimethenamid, including other mixtures of constituent isomers (sum of isomers), expressed as dimethenamid.

Food of animal origin

Definitions for risk assessment: no residue definition needed

Definitions for monitoring: no residue definition needed

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

Soil

Compound (name and/or code)	**Persistence**	**Ecotoxicology**
dimethenamid	Low to moderately persistent (first order DT $_{50\ lab}$ 8-43 d, 20-25°C 40% MWHC or 75% 1/3 bar WHC) (first order DT $_{50\ field}$ 3-35 d)	See sections 5.1, 5.5, 5.6
M23	Moderately to highly persistent (first order DT $_{50\ lab}$ 21-41 d, 20°C 40% MWHC) (first order DT $_{50\ field}$ 18-159 d)	Acute toxicity to earthworms is lower than for parent No study on long-term toxicity to earthworms or other soil macro-organisms available
M27	Moderately to highly persistent (first order DT $_{50\ lab}$ 40-140 d, 20°C 40% MWHC) (first order DT $_{50\ field}$ 22-137 d)	Acute toxicity to earthworms is lower than for parent No study on long-term toxicity to earthworms or other soil macro-organisms available

M23: (1RSaRS)-N-(2,4-dimethyl-3-thienyl)-N-(2methoxy-1-methylethyl)-oxamic acid
M27: (1RSaRS)-N-(2,4-dimethyl-3-thienyl)-N-(2methoxy-1-methylethyl)-2sulfonyl-acetamide

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 activity	Ecotoxicological activity
dimethenamid	Very high to medium mobility (K_{foc}=40-233mL/g)	FOCUS modelling and maize lysimeter No	yes	Yes	See section 5.2
M23	Very high mobility (K_{doc}=3.5-17mL/g)	FOCUS all 9 scenarios and maize lysimeter >0.75µg/L, modelling up to 5.6µg/L	No	LD_{50} > 2000 mg/kg bw No genotoxic potential Consumer risk assessment: a risk to consumers is not expected	Not of ecotoxicological relevance
M27	Very high mobility (K_{doc}= 0-14mL/g)	FOCUS all 9 scenarios and maize lysimeter>0.75µg/L, modelling up to 26µg/L	No	LD_{50} > 2000 mg/kg bw No genotoxic potential Consumer risk assessment: a risk to consumers is not expected	Not of ecotoxicological relevance

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 activity	Ecotoxicological activity
16 unidentified resolved components		In lysimeter study that reflects representative use on maize 4 components 0.1- 0.75µg/L 12 components > 0.75µg/L. Maximum single component concentration 3.9µg dimethenamid equivalents/L	No herbicidal activity up to 50 µM Data available, but not evaluated for fish, *Daphnia* and algae	No data available	Data available for fish, *Daphnia* and algae, but not evaluated

Surface water and sediment

Compound (name and/or code)	Ecotoxicology
dimethenamid	See section 5.2
M23 when groundwater becomes surface water	See above groundwater
M27 when groundwater becomes surface water	See above groundwater

Air

Compound (name and/or code)	**Toxicology**
dimethenamid	Not toxic during acute exposure

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

- Clarification with respect to the proposed maximum levels for certain impurities in the technical material (date of submission unknown, data requirement identified by RMS in the DAR. The submitted new specification was not accepted by RMS and the experts' meeting; refer to chapter 1)
- Data on the explosive and oxidising properties of dimethenamid (date of submission unknown. The submitted data were not accepted by RMS and the expert meeting; refer to chapter 1)
- An ILV of the analytical method for the determination of residues in food of plant origin (date of submission unknown. The submitted data were not accepted by RMS and the experts' meeting; refer to chapter 1)
- Study/justification to address the explosive properties of dimethenamid as manufactured according to Directive 94/37/EC (date of submission unknown, data gap identified at evaluation meeting. The submitted new study was not accepted by RMS and the experts' meeting; refer to chapter 1)
- Study/justification to address the oxidising properties of dimethenamid as manufactured according to Directive 94/37/EC (date of submission unknown, data gap identified at evaluation meeting. The submitted new study was not accepted by RMS and the experts' meeting; refer to chapter 1)
- A high risks to insectivorous birds for both representative uses and to medium herbivorous mammals in maize was identified in the first tier assessment according to the current guidance (SANCO/4145/2000). Further data is thus needed to refine the risk assessment for birds and mammals (refer to point 5.1).
- The EFSA proposes a data requirement for lysimeter leachate components to be identified, toxicological relevance assessed and a consumer risk assessment from the consumption of drinking water for the combined exposure of M23, M27 and the 16 other potential groundwater components to be provided (refer to points 2.8, 3.3, 4.1.3 and 4.2.2).
- The studies on fish, *Daphnia* and algae with the lysimeter leachate need to be evaluated to complete the risk assessment (refer to points 4.2.2 and 5.2).
- The EFSA proposes a data requirement for chronic tests with earthworms for the metabolites M23 and M27 (refer to point 5.5).
- The EFSA proposes a conditional data requirement to address the risk to other soil macro-organism from exposure to the persistent metabolites M23 and M27 depending on the results of the outstanding earthworm study (refer to point 5.6).

CONCLUSIONS AND RECOMMENDATIONS

Overall conclusions

The conclusion was reached on the basis of the evaluation of the representative uses as herbicide as proposed by the applicant which comprises broadcast as pre or post emergent herbicide comprise broadcast spraying to control weeds in maize (pre or post) and sugarbeet (post) at an application rate of 1.44 kg dimethenamid per hectare (maize) and up to 1.08 kg per hectare (sugarbeet), respectively. Dimethenamid can be used only as herbicide.

The representative formulated product for the evaluation was "Frontier" ("BAS 656 02 H"), an emulsifiable concentrate (EC).

Adequate methods are available to monitor all compounds given in the respective residue definition for food, surface water and air. For the other matrices (soil and ground/drinking water) the residue definitions are not finalised. Residues in food of plant origin can be determined with a multi-method (The applicability of the German S19 method has been demonstrated, but not down to the LOQ of concern). For the other matrices only single methods are available to determine residues of dimethenamid.

Sufficient analytical method 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.

Dimethenamid is almost completely absorbed and extensively metabolised; over 40 metabolites were detected in excreta. The acute toxicity is moderate by oral exposure, but low by dermal or inhalatory exposure. Mild skin and eye irritant (not classified), it is a skin sensitizer. **The proposal for classification is Xn, R22 "Harmful if swallowed"; Xi, R43 "May cause sensitisation by skin contact".** After short term exposure, the liver was the target organ, and the relevant NOAELs are 4.3 and 2 mg/kg bw/day from the 90-day and 1-year dog studies.

Dimethenamid is not considered genotoxic. No carcinogenic potential was demonstrated, even if, in long term studies, a non toxicologically relevant increase in rat liver tumours was observed. In this study, the NOAEL is lower than 5 mg/kg bw/day. There were no observed effects on reproductive performance of fertility, the parental and pup NOAEL was 33.3 mg/kg bw/day, and the NOAEL for reproduction was 133 mg/kg bw/day. Dimethenamid did not induce teratogenic of foetotoxic effects at non-maternally toxic doses. The NOAELs for maternal and foetal/developmental effects are 37.5 and 75 mg/kg bw/day respectively.

All performed studies gave no evidence of a neurotoxic effect.

Two metabolites (M23 and M27) have the potential to be present in groundwater above 0.75 µg/L and possibly 10 µg/L for M27 under very worst case conditions. Both were found in rat metabolism studies, had a low acute oral toxicity, and were not genotoxic. They were not considered relevant from the toxicological point of view. However, due to the potential levels, a risk assessment to consumers was completed.

The ADI of 0.02 mg/kg bw/day is based on the NOAEL from the 1-year dog study, the AOEL is 0.04 mg/kg bw/day, based on the 90-day dog study, and the ARfD is 0.25 mg/kg bw/day, from a 4-day mechanistic study in rats. The three values were calculated with a safety factor of 100. The dermal penetration of dimethenamid is predicted to be 6.5 % for both concentrate and dilution. The estimated operator exposure according to the German model is below the AOEL with PPE. Based on the UK-POEM, it is above the AOEL even with PPE. Estimations based on a German re-entry model gives a worker exposure below the AOEL, and the bystander exposure is below 1% of the AOEL.

Dimethenamid is metabolised in maize and sugar beets through conjugation processes and further chemical reactions leading to polar metabolites. Due to their overall low level and in the absence of any tendency to accumulation, no metabolite is considered of toxicological concern. The residue definition for plant products should be for monitoring and risk assessment purposes dimethenamid, including other mixtures of constituent isomers (sum of isomers) expressed as dimethenamid. Supervised residue trials according to the recommended uses demonstrate that residues are below the LOQ in maize grains and forage, as well as in sugar beet roots and tops. No residue is to be expected in rotational and succeeding crops.
Human and animal exposures to residues of dimethenamid are therefore minimal, and a risk for consumers is not expected resulting from the consumption of plant commodities derived from maize and sugar beets. Similarly, a risk for the consumer resulting from the consumption of drinking water contaminated by metabolites M23 and M27 is not expected. The contribution to the global toxicological burden of 16 other metabolites potentially present in drinking water at levels above 0.1 µg/l and their potential effects on the health of the consumer could not be assessed as their structures were not identified.

Sufficient data are available to assess the route and rate of degradation of dimethenamid in soil, surface water and associated sediment and air.

For the representative uses parent dimethenamid would not be expected to leach to groundwater above 0.1µg/l. Whilst the identified metabolites M23 and M27 would be expected to be above this trigger in vulnerable groundwater situations, data are available to conclude they are ‘non-relevant’ and a risk to consumers from there consumption is not expected. In an appropriate lysimeter study representing the representative use evaluated on maize, there were 16 unidentified but resolved components in lysimeter leachate with annual average concentrations > 0.1µg/l. These components need to be identified, subsequently non-relevance assessments are needed regarding their potential mammalian toxicology and a consumer risk assessment for their combined intake in drinking water including the identified metabolites M23 and M27. The exotoxicology studies done with the lysimeter leachate still need to be evaluated.

The risk to birds and mammals was considered low in the initial assessment. However, a high first tier risks to insectivorous birds for both representative uses and to medium herbivorous mammals in

maize was identified in the assessment according to the current guidance (SANCO/4145/2000). Further data is thus needed to refine the risk assessment for birds and mammals. A high risk was also identified for algae and aquatic macrophytes. Buffer zones of 20 m are required for the proposed application rate in maize. For bees and other non-target arthropods the risk is considered low. Effects were observed in laboratory studies with *A. rhopalosiphi*, however recolonisation is considered to be possible within a reasonable time frame. The acute risk to earthworms from dimethenamid and the soil metabolites M23 and M27 is low. No chronic studies are available for the metabolites that have DT_{90} values longer than 1 year in studies from southern Europe. Although the acute toxicity is low a long-term risk to earthworms cannot be excluded without further testing. Whether studies on other soil macro-organisms are needed can only be concluded after the long-term risk assessment for earthworms has been finalised. The risk to soil micro-organisms is considered low. Risk mitigation measures are necessary to protect non-target plants for the use in maize.

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

- Risk mitigation measures comparable to 20 m buffer zones are necessary to mitigate the risk to aquatic macrophytes (refer to point 5.2).
- Risk mitigation comparable to a 5 m buffer zone is required for the use in maize to protect non-target plants (refer to point 5.8).
- Appropriate PPE is needed in order to have an estimated operator exposure below the AOEL (refer to 2.12).

Critical areas of concern

- At the moment a final specification for the max content of non-relevant impurities cannot be set.
- In a lysimeter study appropriate to a representative use there are 16 unidentified chromatographically resolved components with annual average leachate concentrations >0.1µg/L. 12 of these unidentified components were >0.75 µg/L. These components need to be identified and relevance assessments completed as required by Sanco/221/2000-rev-10, to demonstrate these breakdown products that have the potential to contaminate vulnerable groundwater aquifers are ‘not-relevant’.
- Under very worst case leaching conditions it cannot be excluded that the identified breakdown product M27 (concluded as a ‘non-relevant metabolite’ with a risk to consumers not expected) might be present in groundwater at concentrations exceeding a concentration of 10µg/L.
- A final assessment of the risk for the consumer resulting from the presence of all metabolites (M23, M27 and 16 unknown metabolites) potentially present in drinking water (as a consequence of potentially being present in groundwater) cannot be performed with the available data.

- A high risks to insectivorous birds and to herbivorous birds in maize have been identified in the first tier assessment according to SANCO 4145/2000. Further data is necessary to address the risk.
- A high risk to algae and aquatic macrophytes was identified. Risk mitigation measures, e.g. buffer zones of 20 m, are required.
- A chronic risk to earthworms from the metabolites M23 and M27 cannot be excluded without further testing.
- A high risk was identified for non-target plants for the use in maize. Risk mitigation comparable to a 5 m buffer zone is required.

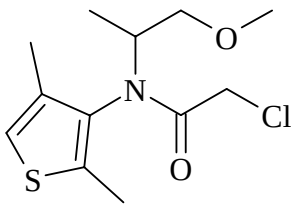
APPENDIX 1 – LIST OF ENDPOINTS FOR THE ACTIVE SUBSTANCE AND THE REPRESENTATIVE FORMULATION

(Abbreviations used in this list are explained in appendix 2)

Appendix 1.1: Identity, Physical and Chemical Properties, Details of Uses, Further Information

Active substance (ISO Common Name) ‡	dimethenamid
Function (e.g. fungicide)	herbicide
Rapporteur Member State	Federal Republic of Germany
Co-rapporteur Member State	--

Identity (Annex IIA, point 1)

Chemical name (IUPAC) ‡	(*RS*)-2-chloro-*N*-(2,4-dimethyl-3-thienyl)-*N*-(2-methoxy-1-methylethyl)-acetamide
Chemical name (CA) ‡	2-chloro-N-(2,4-dimethyl-3-thienyl)-N-(2-methoxy-1-methylethyl)-acetamide
CIPAC No ‡	654
CAS No ‡	87674-68-8
EEC No (EINECS or ELINCS) ‡	-
FAO Specification ‡ (including year of publication)	-
Minimum purity of the active substance as manufactured ‡ (g/kg)	960
Identity of relevant impurities (of toxicological, environmental and/or other significance) in the active substance as manufactured (g/kg)	none
Molecular formula ‡	$C_{12}H_{18}ClNO_2S$
Molecular mass ‡	275.79 g/mol
Structural formula ‡	

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

Physical-chemical properties (Annex IIA, point 2)

Melting point (state purity) ‡	hardens at –29 °C, no crystallisation > -50 °C (99.04 %)
Boiling point (state purity) ‡	no bp up to 400 °C (94 % S-Enantiomer + 4% R-Enantiomer)
Temperature of decomposition	weak endothermic process starting at 100 °C
Appearance (state purity) ‡	odourless liquid at room temperature (99.8%)
Relative density (state purity) ‡	1.2 (99.4%), 20 °C
Surface tension	54.0 mN/m at 0.1% (w/w) (99.2%)
Vapour pressure (in Pa, state temperature) ‡	$3.7 \cdot 10^{-2}$ Pa (25 °C, 99.2 % purity)
Henry's law constant (Pa m^3 mol^{-1}) ‡	$8.6 \cdot 10^{-3}$ Pa m^3 mol^{-1} (25 °C)
Solubility in water ‡ (g/l or mg/l, state temperature)	*ca* 1.4 g/L at 20 °C (pH 5 – 9) (99.8%)
Solubility in organic solvents ‡ (in g/l or mg/l, state temperature)	soluble in all proportions in carbon disulfide, hexane, toluene, dichloromethane, ethyl acetate, acetone, methanol, acetonitrile and dimethyl sulfoxide at 22 to 24 °C.
Partition co-efficient (log POW) ‡ (state pH and temperature)	2.2 (25 °C) (>98%)
Hydrolytic stability (DT_{50}) ‡ (state pH and temperature)	stable at pH 5, 7 and 9 (25 °C, 30 d)
Dissociation constant ‡	no dissociation at pH 1 – 11
UV/VIS absorption (max.) ‡ (if absorption > 290 nm state ε at wavelength)	236 nm (ε 8027)
Photostability (DT_{50}) ‡ (aqueous, sunlight, state pH)	DT_{50} = 16.4 d (pH 7, continuous irradiation, Xe-lamp, λ > 290 nm)
Quantum yield of direct phototransformation in water at Σ > 290 nm ‡	0.0074 (pH 7, 313 nm)
Flammability ‡	Dimethenamid does not evolve highly flammable gases. The flash point is 91 °C and the auto-ignition temperature is 395 °C.
Explosive properties ‡	open point

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

List of representative uses evaluated*

Crop and/or situation (a)	Member State or Country	Product name	F G or I (b)	Pests or Group of pests controlled (c)	Formulation		Application				Application rate per treatment			PHI (days) (l)	Remarks: (m)
					Type (d-f)	Conc. of a.s. (i)	method kind (f-h)	growth stage & season (j)	number min max (k)	interval between applications (min)	kg as/hl min max	water l/ha min max	kg as/ha min max		
Maize	Northern and Southern Europe	Frontier	F	Echinochloa crus-galli Setaria species Digitaria species Dicotyledonous weeds	EC	900 g/L	Spraying overall	Pre-em or post-em latest crop BBCH=16	1 1		0.36 – 0.72	200 - 400	1.44	F	*RMS: use supported by available data* [1]
Sugarbeet	Belgium Netherlands	Frontier	F	Dicotyledonous weeds	EC	900 g/L	Spraying overall	Post-em latest crop BBCH=19	1 3		0.16 - 0.54	Approx. 200	0.32 1.08	-	*RMS: use supported by available data* Splitting application (3x0.32 kg as/ha) is possible, however, no more than 1.08 kg as/ha will be used within one season as the whole. [1]

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

Remarks:	*	Uses for which risk assessment could not been concluded due to lack of essential data are marked grey	(h)	Kind, *e.g.* overall, broadcast, aerial spraying, row, individual plant, between the plants - type of equipment used must be indicated
	(a)	For crops, the EU and Codex classifications (both) should be used; where relevant, the use situation should be described (*e.g.* fumigation of a structure)	(i)	g/kg or g/L
	(b)	Outdoor or field use (F), glasshouse application (G) or indoor application (I)	(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
	(c)	*e.g.* biting and suckling insects, soil born insects, foliar fungi, weeds		
	(d)	*e.g.* wettable powder (WP), emulsifiable concentrate (EC), granule (GR)	(k)	The minimum and maximum number of application possible under practical conditions of use must be provided
	(e)	GCPF Codes - GIFAP Technical Monograph No 2, 1989		
	(f)	Method, *e.g.* high volume spraying, low volume spraying, spreading, dusting, drench	(l)	PHI - minimum pre-harvest interval
	(g)	All abbreviations used must be explained	(m)	Remarks may include: Extent of use/economic importance/restrictions

[1] Data gaps identified in sections 2, 3, 4 and 5

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

Appendix 1.2: Methods of Analysis

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

Technical as (principle of method)	HPLC-UV; GC-FID
Impurities in technical as (principle of method)	GC-FID
Plant protection product (principle of method)	GC-FID

Analytical methods for residues (Annex IIA, point 4.2)

Food/feed of plant origin (principle of method and LOQ for methods for monitoring purposes)	GC-MSD 0.01 mg/kg for tomato, lemon and wheat grain, sugar beets and maize 0.02 mg/kg for rapeseed An ILV is missing
Food/feed of animal origin (principle of method and LOQ for methods for monitoring purposes)	not relevant, because no residue definition is proposed
Soil (principle of method and LOQ)	GC-TSD 0.01 mg/kg HPLC-UV 0.01 mg/kg
Water (principle of method and LOQ)	GC-PND 0.05 µg/L GC-MSD 0.05 µg/L for surface/drinking water
Air (principle of method and LOQ)	GC-PND 1.4 µg/m^3
Body fluids and tissues (principle of method and LOQ)	not relevant, not classified as toxic or very toxic

Classification and proposed labelling (Annex IIA, point 10)

with regard to physical/chemical data	none

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

Appendix 1.3: Impact on Human and Animal Health

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

Rate and extent of absorption ‡	> 90% oral absorption (based on excretion in bile and urine).
Distribution ‡	Widely distributed (highest residues in rat erythrocytes due to species-specific binding to haemoglobin).
Potential for accumulation ‡	No evidence for accumulation potential (binding to rat haemoglobin but not to human haemoglobin).
Rate and extent of excretion ‡	Rapid, 35–47% in urine, 48–58% in faeces (low dose); 90% excreted by 168 h.
Metabolism in animals ‡	Extensively metabolised (> 40 metabolites; only 1–2% excreted as parent compound), primarily via glutathione conjugation.
Toxicologically significant compounds ‡ (animals, plants and environment)	Dimethenamid and plant metabolites M23 and M27.

Acute toxicity (Annex IIA, point 5.2)

Rat LD50 oral ‡	397 mg/kg bw **R22**
Rat LD50 dermal ‡	> 2000 mg/kg bw
Rat LC50 inhalation ‡	> 4.99 mg/L (4-h, nose-only)
Skin irritation ‡	Non-irritant
Eye irritation ‡	Non-irritant
Skin sensitization ‡ (test method used and result)	Skin sensitiser (Magnusson-Kligman test) **R43**

Short term toxicity (Annex IIA, point 5.3)

Target / critical effect ‡	Liver (biochemical and histopathological changes), decreased body weight gain.
Lowest relevant oral NOAEL / NOEL ‡	4.3 mg/kg bw/day, 90-day dog 2 mg/kg bw/day, 1-year dog
Lowest relevant dermal NOAEL / NOELr‡	1190 mg/kg bw/d (systemic toxicity), 21-day, rabbit
Lowest relevant inhalation NOAEL / NOEL ‡	No studies submitted, not required.

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

Genotoxicity ‡ (Annex IIA, point 5.4)

.....	Weight of evidence suggests no genotoxic concern.

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

Target/critical effect ‡	Liver (biochemical and histopathological changes), decreased body weight.
Lowest relevant NOAEL / NOEL ‡	<5 mg/kg bw/day, 104-week, rat 3.8 mg/kg bw/day, 94-week, mouse
Carcinogenicity ‡	Liver tumours in rats marginally increased at HDT, no classification required.

Reproductive toxicity (Annex IIA, point 5.6)

Reproduction target / critical effect ‡	Pup body weight gain reduced during lactation at parental toxic dose level.
Lowest relevant reproductive NOAEL / NOEL ‡	Parental toxicity: 33.3 mg/kg bw/day. Reproductive toxicity: >133 mg/kg bw/day (highest dose tested).
Developmental target / critical effect ‡	Fetal body weight slightly decreased at maternal toxic dose level, early resorptions increased at maternal toxic dose level in the rat.
Lowest relevant developmental NOAEL / NOEL ‡	Maternal and developmental toxicity: 50 mg/kg bw/day.

Neurotoxicity / Delayed neurotoxicity ‡ (Annex IIA, point 5.7)

.....	No data submitted; no concern from other studies.

Other toxicological studies ‡ (Annex IIA, point 5.8)

Toxicity studies of plant metabolites M23 and M 27	LD_{50} of both metabolites > 5000 mg/kg bw. No evidence of mutagenic potential in vitro and in vivo.
Binding of dimethenamid to blood components and effects on methaemoglobin	- No methemoglobin production in rats. - Binding of dimethenamid to rat haemoglobin, but practically no binding to human haemoglobin.

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

Effects of Dimethenamid on liver enzymes	Induction of P450 dependent liver enzymes in rats; 4-d, rat: NOAEL = 25 mg/kg bw/d.

Medical data ‡ (Annex IIA, point 5.9)

.....	New product; no adverse health effects during research and experimental use of dimethenamid and its formulations.

Summary (Annex IIA, point 5.10)	Value	Study	Safety factor
ADI ‡	0.02 mg/kg bw	1-year, dog	100
AOEL ‡	0.04 mg/kg bw/d	90-day, dog	100
ARfD ‡ (acute reference dose)	0.25 mg/kg bw	4-day mechanistic study, rat	100

Dermal absorption (Annex IIIA, point 7.3)

Emulsifiable concentrate (EC): 900g/L	6.5 % for both concentrate and dilution based on *in vivo* dermal penetration in rat (26 %) and correction made by *in vitro* comparison of penetration through human and rat skin (ratio 1:4).

Acceptable exposure scenarios (including method of calculation)

Operator	The estimated operator exposure is below the AOEL for the German model with PPE, but above according to the UK-POEM even with PPE. The maximum applied dose is 1.44 kg/ha and the use is tractor monted boom sprayer with hydraulic nozzles.

	Without PPE	with PPE
German	298%	13%
UK-POEM	1143%	170%

Workers	The estimated worker exposure is below the AOEL (approximately < 7%).
Bystanders	The estimated bystander exposure is below the AOEL (>1%).

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

Classification and proposed labelling (Annex IIA, point 10)

with regard to toxicological data	Xn; Irritating, R22 Harmful if swallowed, R43 May cause sensitisation by skin contact

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

Appendix 1.4: Residues

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

Plant groups covered	Cereals (maize), root vegetable (sugar beet)
Rotational crops	wheat, lettuce, carrot
Plant residue definition for monitoring	dimethenamid, including other mixtures of constituent isomers (sum of isomers), expressed as dimethenamid
Plant residue definition for risk assessment	dimethenamid, including other mixtures of constituent isomers (sum of isomers), expressed as dimethenamid
Conversion factor (monitoring to risk assessment)	-

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

Animals covered	goat, hen
Animal residue definition for monitoring	None (study not required)
Animal residue definition for risk assessment	None (study not required)
Conversion factor (monitoring to risk assessment)	None (study not required)
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)

.....	Uptake of metabolites from treated soil at exaggerated rate of 1.68 kg as/ha occurs totalling to up to 0.17 mg/kg TRR (wheat straw). TRR in edible crop parts at normal harvest are 0.01 mg/kg (carrot root), 0.04 mg/kg (lettuce), and 0.03 mg/kg (wheat grain). Identified and unidentified components are all $\leq$0.01 mg/kg TRR.

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

.....	Storage stability of racemic dimethenamid in maize matrices (forage, silage, straw, grain) at -20°C is proven over the period of up to 21 months. At -18°C to -22°C stored samples of treated crops have been analysed within this period of time.

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

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)	No	No	No
Potential for accumulation (yes/no):	No	No	No
Metabolism studies indicate potential level of residues ≥ 0.01 mg/kg in edible tissues (yes/no)	No	No	No
	Feeding studies (Specify the feeding rate in cattle and poultry studies considered as relevant) Residue levels in matrices : Mean (max) mg/kg		
Muscle Liver Kidney Fat Milk Eggs	No studies conducted / required since no residues (<0.01 mg/kg) were detected in any crops of concern intended for feeding of domestic animals.		

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

Summary of critical residues data (Annex IIA, point 6.3, Annex IIIA, point 8.2) (Food and feedingstuffs)

Crop	Northern or Mediterranean Region	Trials results relevant to the representative uses (a)	Recommendation/comments	MRL estimated from trials according to the representative use	HR (c)	STMR (b)
Maize grain/cobs	Northern region	20 x < 0.01 mg/kg		0.01* mg/kg	< 0.01 mg/kg	< 0.01 mg/kg
Maize forage	Northern region	21 x < 0.01 mg/kg			< 0.01 mg/kg	< 0.01 mg/kg
Maize grain	Southern region	21 x < 0.01 mg/kg		0.01* mg/kg	< 0.01 mg/kg	< 0.01 mg/kg
Maize forage	Southern region	14 x < 0.01 mg/kg			< 0.01 mg/kg	< 0.01 mg/kg
Sugar beet roots	Northern region	21 x < 0.01, 1 x 0.02[#] mg/kg	# this single value of 0.02 mg/kg is recognized as an artefact and therefore not considered for MRL proposal	0.01* mg/kg	< 0.01 mg/kg	< 0.01 mg/kg
Sugar beet tops	Northern region	22 x < 0.01 mg/kg			< 0.01 mg/kg	< 0.01 mg/kg

(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

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

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

ADI	0.02 mg/kg bw
TMDI (European Diet) (% ADI)	0.00002 mg/kg bw (< 1%)
TMDI (German Diet, 4 to 6 year old girl) (% ADI)	0.000002 mg/kg bw (< 1%)
Contribution of metabolites present in groundwater to the ADI exhaustion	Max 15 % for highest ground water concentration of metabolites M23 and M27 predicted by FOCUS modelling; No assessment possible for not identified metabolites in ground water
NEDI (% ADI)	Not calculated
Factors included in NEDI	Not applicable
ARfD	0.25 mg/kg bw
Acute exposure (% ARfD)	no acute risk is expected

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

Crop/processed crop	Number of studies	Transfer factor	% Transference*
No study conducted / required.			

* Calculated on the basis of distribution in the different portions, parts or products as determined through balance studies

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

maize	0.01* mg/kg
sugar beet	0.01* mg/kg

* indicates that the MRL is set at the limit of quantification of the method of analysis

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

Appendix 1.5: Fate and Behaviour in the Environment

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

Mineralization after 100 days ‡	8 - 36 % AR after 119 - 120 d, [^{14}C-thienyl]-label (n = 4)
Non-extractable residues after 100 days ‡	40 - 45 % AR after 119 - 120 d, [^{14}C-thienyl]-label (n = 6)
Relevant metabolites - name and/or code, % of applied ‡ (range and maximum)	major metabolites oxalamide (M23) - max. 12.4 % AR after 90 d sulfonate (M27) - max. 12.7 % AR after 42 d

M23: (1*RS*a*RS*)-*N*-(2,4-dimethyl-3-thienyl)-*N*-(2-methoxy-1-methylethyl)-oxamic acid
M27: (1*RS*a*RS*)-*N*-(2,4-dimethyl-3-thienyl)-*N*-(2-methoxy-1-methylethyl)-2-sulfonyl-acetamide

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

Anaerobic degradation ‡	34 % dimethenamid (parent) after 30 d aerobic and 63 d anaerobic incubation Mineralisation - 3.2 % AR after 30 d aerobic and 63 d anaerobic incubation Non-extractable residues 36 % AR after 30 d aerobic and 63 d anaerobic incubation Metabolites: M23 max. 10.2 % (28 d), M27 max. 12.7 % (42 d)
Soil photolysis ‡	58 - 64 % dimethenamid (parent) after 23 d Mineralisation 10 - 12 % AR after 23 d Non-extractable residues 8.4 - 9.3 % AR after 23 d Metabolites: no major metabolites > 10 % AR

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

Method of calculation	1st order compartment model; 1st order according to Timme et al.

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

Laboratory studies ‡ (range or median, with n value, with r^2 value)	parent DT_{50lab} (20 °C, aerobic, in part extrapolated from DT_{50} determined at 23 or 25 °C): 8 - 64 d (n = 5, median 13 d, mean 23 d) M23: DT_{50lab} (20 °C, aerobic): 24 - 41 d (n = 3, median 26 d, mean 30 d) M27: DT_{50lab} (20 °C, aerobic): 40 - 140 d (n = 3, median 60 d, mean 80 d) For FOCUS gw modelling (20°C and -10kPa)– Parent DT_{50lab} (aerobic, 1st order kinetics, median): 13 d M23 DT_{50lab} (aerobic, 1st order kinetics, mean): 20.4 d M27 DT_{50lab} (aerobic, 1st order kinetics, mean): 56 d
	parent DT_{90lab} (20 °C, aerobic): 26 - 44 d (n = 3, median 42 d) parent DT_{90lab} (25 °C, aerobic): 101 d (n = 1)
	DT_{50lab} (10 °C, aerobic): 29 d (calculated from DT_{50}, 23°C = 10 d, Q_{10} = 2,2)
	DT_{50lab} (25 °C, anaerobic): 75 d (n = 1)
	degradation in the saturated zone: no data submitted and no data required.
Field studies ‡ (state location, range or median with n value)	DT_{50} bare soil: <u>parent:</u> Germany, 4.7 and 3.9 d * (n = 2, r^2 = 0.9827 and 0.9499) France N, 3.2 and 34.7 d * (n = 2, r^2 = 0.9544 and 0.9654) France S, 16 and 16.3 d * (n = 2, r^2 = 0.9768 and 0.9912) Italy, 9,8, 8.9 and 15.2 d * (n = 3, r^2 = 0.9721, 0.9759 and 0.9938) For FOCUS gw modelling – data from laboratory studies have to be used, * 1st order according Timme et al. <u>M23:</u> Germany, 45 and 18 d ** (n = 2, r^2 = 0.972 and 0.847) France N, 42 d ** (n = 1, r^2 = 0.968) Italy, 98, 53 and 159 d ** (n = 3, r^2 = 0.9482, 0.9511 and 0.9836)

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

M27: Germany, 76 and 22 d ** (n = 2, r^2 = 0.850 and 0.884) France N, 25 and 42 d ** (n = 2, r^2 = 0.99967 and 0.9773) Italy, 24, 74 and 137 d ** (n = 3, r^2 = 0.9482, 0.9511 and 0.9836) ** 1st order multicompartment model
DT_{90} bare soil: parent: Germany, 15.6 and 12.8 d * (n = 2, r^2 = 0.9827 and 0.9499) France N, 10.7 and 115.2 d * (n = 2, r^2 = 0.9544 and 0.9654) France S, 54.3 and 53.3 d * (n = 2, r^2 = 0.9768 and 0.9912) Italy, 32.6, 29.7 and 50.5 d * (n = 3, r^2 = 0.9721, 0.9759 and 0.9938) * 1 st order according Timme et al. M23: Germany, 150 and 61 d ** (n = 2, r^2 = 0.972 and 0.847) France N, 138 d ** (n = 1, r^2 = 0.968) Italy, 325, 175 and 527 d ** (n = 3, r^2 = 0.9482, 0.9511 and 0.9836) M27: Germany, 253 and 72 d ** (n = 2, r^2 = 0.850 and 0.884) France N, 85 and 139 d ** (n = 2, r^2 = 0.99967 and 0.9773) Italy, 81, 246 and 454 d ** (n = 3, r^2 = 0.9482, 0.9511 and 0.9836) ** 1st order multicompartment model

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

Soil accumulation and plateau concentration ‡	Calculation using 1st order kinetics for M23 and M27 soil depth 5 cm, soil density 1.5 g/cm^3 annual application 1.44 kg as/ha on bare soil M23: DT_{50} 159 d (worst case from field study Argenta), formation fraction 0.124 (highest value observed in lab studies) M27: DT_{50} 137 d (worst case from field study Argenta), formation fraction 0.127 (highest value observed in lab studies) results (considering molecular-mass correction) M23: max 0.294 mg/kg after 4 years plateau immediately before application 0.06 mg/kg M27: max 0.337 mg/kg after 3 years plateau immediately before application 0.053 mg/kg

Soil adsorption/desorption (Annex IIA, point 7.1.2)

K_f /K_{oc} ‡ K_d ‡	Parent: K_f: 0.32 - 3.5, K_{oc}: 40 - 233 (mean 108, median 114, $^1/_n$= 0.73 - 1.00, n = 9) M23: K_d: 0.05 - 0.35, K_{oc}: 3.5 - 17 (mean 7.7, median 6.0, n = 6) M27: K_d: 0.0 - 0.43, K_{oc}: 0.0 - 14 (mean 6.7, median 6.9, n = 6)
pH dependence ‡ (yes / no) (if yes type of dependence)	no *For FOCUS gw modelling – parent: K_{oc} median 114, $^1/_n$= 0.965 M23: K_{oc} median 6.0, $^1/_n$= 1 M27: K_{oc} median 6.9, $^1/_n$= 1

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

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

Column leaching ‡	Guideline: BBA IV 4-2, 5 soils Precipitation (mm): 200 mm Time period (d): 2 d Leachate: 3.3 - 40 % total residues/radioactivity in leachate, < 0.002 - 37 % AR = active substance, 3 - 15 % total residues/radioactivity retained in top 0 - 10 cm
Aged residues leaching ‡	Guideline: BBA IV 4-2, 2 soils Aged for (d): 22 and 31 d Time period (d): 2 d Precipitation (mm): 200 mm leachate: 23 - 24 % total residues/radioactivity in leachate, < 0.1 % AR = active substance, 11 - 17 % AR = M23, 0.7 - 2,4 % AR = M27, 1.0 - 2,3 % AR = M31 18 - 31 % total residues/radioactivity retained in top 0 - 10 cm
Lysimeter/ field leaching studies ‡	Location: Itingen, Switzerland Study type (e.g. lysimeter, field): 3 year lysimeter study with two undisturbed monoliths from Borstel/Germany (1.05 % OC in top 0 - 30 cm) cropped, main crop maize. Number of applications: 1st year / 1st and 2nd year Application rate: 1.44 kg as/ha Average annual rainfall (mm): 910 - 1159 mm Average annual leachate volume (L): 318 - 533 L max. annual average concentration in leachate: parent: not detected (< 0.05 µg/L), M23: 0.3 and 1.0 µg as equ./L M27: 1.7 and 4.0 µg as equ./L NIR: 27 and 40 µg as equ./L(made up of at least 17 fractions)

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

PEC (soil) (Annex IIIA, point 9.1.3)

Parent

Method of calculation	DT_{50} (d): 16.3 days Kinetics: 1st order Field: (90th percentile, representative realistic worst case from field studies)
Application rate	No plant interception: Pre-emergence therefore no crop interception Number of applications: 1 Application rate (s): 1.44 kg as/ha

$PEC_{(s)}$ (mg/kg)		Single application Actual	Single application Time weighted average	Multiple application Actual	Multiple application Time weighted average
Initial		1.92			
Short term	24h	1.84	1.88		
	2d	1,76	1.84		
	4d	1.62	1.77		
Long term	7d	1.43	1.66		
	28d	0.584	1.12		
	50d	0.229	0.795		
	100d	0.027	0.445		

Metabolite M23

Note PEC soil for M23 calculated using the maximum measured formation in field studies are presented in the DAR (EPCO requested lab formation fractions were used for calculation, this is what is presented below).

Method of calculation	Maximum proportion observed in laboratory degradation studies: 12.4 % correction for molecular mass 271/276 including accumulation assuming field DT_{50} 159 days
Application rate	dimethenamid: 1.44 kg as/ha

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

PEC$_{(s)}$ (mg/kg)	Single application Actual	Single application Time weighted average	Multiple application Actual	Multiple application Time weighted average
maximum	0.294			

Metabolite M27

Note PEC soil for M27 calculated using the maximum measured formation in field studies are presented in the DAR (EPCO requested lab formation fractions were used for calculation, this is what is presented below).

Method of calculation	Maximum proportion observed in laboratory degradation studies: 12.7 % correction for molecular mass 321/276 including accumulation assuming field DT$_{50}$ 137 days
Application rate	dimethenamid: 1.44 kg as/ha

PEC$_{(s)}$ (mg/kg)	Single application Actual	Single application Time weighted average	Multiple application Actual	Multiple application Time weighted average
maximum	0.337			

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

Hydrolysis of active substance and relevant metabolites (DT$_{50}$) ‡ (state pH and temperature)	Stable at pH5, 7 and 9 (25 °C, 30 d)
Photolytic degradation of active substance and relevant metabolites ‡	DT$_{50}$ = 23.9 d (pH 7, continuous irradiation, equivalent to spring midday sunlight at 40°N)
Readily biodegradable (yes/no)	No data submitted
Degradation in water/sediment	20.3 and 27.7 d (1st order, river and pond system)
- DT$_{50}$ water ‡	
- DT$_{90}$ water ‡	67.4 and 92.1 d
- DT$_{50}$ whole system ‡	23.4 and 33.4 d
- DT$_{90}$ whole system ‡	77.8 and 111 d
Mineralization	2.1 - 2.7 % AR (after 105 d)

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

Non-extractable residues	49.3 – 53.5 % AR (after 105 d)
Distribution in water / sediment systems (active substance) ‡	River system: max. of 20.1 % AR in sediment at day 7, 2 % AR in sediment at day 105 Pond system: max. of 22.8 % AR in sediment at day 14, 4.6 % AR in sediment at day 105
Distribution in water / sediment systems (metabolites) ‡	Water: M3: max. 9.1 and 8.0 % AR at day 105 Sediment: M3: max. 5.2 and 6.0 % AR at day 105

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

Parent

Method of calculation	DT_{50} : 28 d Kinetics: 1st order Realistic worst case from sediment water studies
Application rate	Number of applications: 1 Application rate(s): 1.44 kg as/ha Depth of water body: 30 cm
Main routes of entry	2.77 % drift from 1 metre

$PEC_{(sw)}$ (µg / L)		Single application Actual	Single application Time weighted average	Multiple application Actual	Multiple application Time weighted average
Initial		13.3			
Short term	24h		13.0	13.1	
	2d		12.7	13.0	
	4d		12.0	12.7	
Long term	7d	11.2	12.2		
	14d	9.4	11.2		
	21d	7.9	10.4		
	28d	6.6	9.6		
	42d	4.7	8.3		

Metabolites (none >10%AR in sediment water studies)

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

PEC (sediment)

Parent

Method of calculation	Entry via spray drift (2.77 % at 1 m distance) initial PEC_{sed} calculated from maximum fraction in the sediment phase (22.7 % AR at day 6), sediment density 1.3 kg/L (wet), sediment depth 2cm
Application rate	Number of applications: 1 Application rate(s): 1.44 kg as/ha

$PEC_{(sed)}$ (µg / kg)	Single application Actual	Single application Time weighted average	Multiple application Actual	Multiple application Time weighted average
Initial	34.8		-	-
Short term	max.: 29.1 at 7 days	max.: 32.1 at 7 days	-	-
Long term	max.: 0.8 at 7 days	max.: 9.4 at 7 days	-	-

Metabolites (none >10%AR in sediment water studies)

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

Method of calculation and type of study (*e.g.* modelling, monitoring, lysimeter)	a) lysimeter studies
Application rate	1.44 kg as/ha

$PEC_{(gw)}$

Maximum concentration	Not required to complete the assessment.
Average annual concentration	dimethenamid: < 0.05 µg/L M23: 1.0 µg/L M27: 4.0 µg/L NIR: 27 and 40 µg as equ./L(made up of at least 17 fractions)

Method of calculation and type of study (*e.g.* modelling, monitoring, lysimeter)	b) Modelling using FOCUS model(s), with appropriate FOCUS gw scenarios, according to FOCUS guidance. Model(s) used: FOCUS-PELMO, FOCUS-PEARL, MACRO

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

	Crop: maize and sugar beet DT_{50}: Parent: 13 d[3] , M23: 20.4 d[4]1036 , M27: 56.0 d[4] K_{oc}: Parent: 114 [1] , M23: 6.0 [2] , M27: 6.9 [2] , $^1/_n$: Parent: 0.965 [1] , M23: 1.0 [5] , M27 : 1.0 [5] , [1] Median, n = 9 [2] Median, n = 6 [3] Median of laboratory studies, n = 5 [4] Mean of laboratory studies, n = 3 [5] linear adsorption
Application rate	Application rate: Maize: 1440 g as/ha. Sugar beet: 1080 g as/ha No. of applications: 1 Time of application (month or season): Maize: spring, 7 days prior to emergence Sugar beet: spring, 7 days after emergence (BBCH: 13 - 14)

$PEC_{(gw)}$

Maximum concentration	Not an output of FOCUS shells, not required.
Average annual concentration	Annual average concentrations (80th percentile) according to FOCUS guidance: active substance: < 0,1 µg/L, M23: 0.001 - 3.50 µg/L, M27: 0.145 - 21.90 µg/L, (See detailed results in table below)

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

PEC(gw) - FOCUS PELMO modelling results

Model /Crop	Scenario	Parent (µg/L)	Metabolite (µg/L)		
			M23	M27	
PELMO / Maize	Chateaudun	< 0.001	0.577	7.560	
	Hamburg	0.001	2.477	19.354	
	Kremsmünster	< 0.001	1.599	14.216	
	Okehampton	< 0.001	2.175	14.831	
	Piacenza	0.012	1.012	8.423	
	Porto	< 0.001	0.153	4.296	
	Sevilla	< 0.001	0.001	0.145	
	Thiva	< 0.001	0.003	0.667	

Model /Crop	Scenario	Parent (µg/L)	Metabolite (µg/L)		
			M23	M27	
PELMO / Sugar beet	Chateaudun	< 0.001	1.268	10.279	
	Hamburg	0.001	1.752	13.290	
	Kremsmünster	< 0.001	1.496	11.086	
	Jokioinen	< 0.001	3.499	21.903	
	Okehampton	< 0.001	1.345	8.790	
	Piacenza	0.008	0.968	6.674	
	Porto	< 0.001	0.142	3.567	
	Sevilla	< 0.001	1.577	9.272	
	Thiva	< 0.001	0.059	2.328	

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

PEC(gw) – FOCUS-PEARL modelling results

Model /Crop	Scenario	Parent (µg/L)	Metabolite (µg/L)		
			M23	M27	
PEARL / Maize	Chateaudun	<0.001	2.40	15.8	
	Hamburg	0.001	5.64	26.1	
	Kremsmünster	0.001	3.04	18.3	
	Okehampton	0.002	3.27	15.2	
	Piacenza	0.006	2.02	11.0	
	Porto	0.001	0.304	5.42	
	Sevilla	<0.001	0.223	3.78	
	Thiva	<0.001	1.54	10.7	

Model /Crop	Scenario	Parent (µg/L)	Metabolite (µg/L)		
			M23	M27	
PEARL / Sugar beet	Chateaudun	0.001	2.45	12.1	
	Hamburg	<0.001	2.98	15.3	
	Kremsmünster	0.001	4.38	21.9	
	Jokioinen	<0.001	1.69	10.2	
	Okehampton	0.001	1.57	8.30	
	Piacenza	0.008	1.57	6.91	
	Porto	<0.001	0.274	3.92	
	Sevilla	0.001	1.59	8.68	
	Thiva	0.001	0.952	6.85	

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

PEC(gw) – MACRO modelling results

Model /Crop	Scenario Maize	Parent (µg/L)	Metabolite (µg/L)		
			M23	M27	
	Chateaudun	0.044	1.86	12.4	

Model /Crop	Scenario Sugar beet	Parent (µg/L)	Metabolite (µg/L)		
			M23	M27	
	Chateaudun	0.014	1.06	7.23	

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	active substance: 0.0074 (ph 7, 313 nm)
Photochemical oxidative degradation in air ‡	DT_{50} of 2.45 hours derived by the Atkinson method of calculation (AOPWIN 1.88; 1.5 x 10^6 OH/cm³)
Volatilization ‡	from plant surfaces (BBA guideline): 14 % in 24 hours (24 °C) from soil (BBA guideline): 6,6 % in 24 hours (21 °C)

PEC (air)

Method of calculation	Not required due to limited volatilisation and rapid photochemical oxidative degradation

$PEC_{(a)}$

Maximum concentration	Negligible

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

Definition of the Residue (Annex IIA, point 7.3)

Relevant to the environment	Soil: above trigger value: dimethenamid, M23, M27 residue definition: further ecotoxicology data required to reach a conclusion Surface water: above trigger value: dimethenamid residue definition: dimethenamid Sediment: above trigger value: dimethenamid residue definition: dimethenamid Ground water: above trigger value: M23, M27 (according to FOCUS modelling, concentrations of M27 in groundwater might exceed 10 µg/L) residue definition: further fate and behaviour and toxicology data required to reach a conclusion Air: above trigger value: n.a. residue definition: dimethenamid (default)

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

Soil (indicate location and type of study)	Switzerland: Field dissipation and mobility, no residues (< 0.01 mg/kg) of dimethenamid, metabolites M23 and M27 in soil 5 months after application (May) of 1.44 kg as/ha. France: Field dissipation and mobility, no residues (< 0.01 mg/kg) of dimethenamid, metabolites M23 and M27 in soil 3 months after application (April) of 1.44 kg as/ha.
Surface water (indicate location and type of study)	No data

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

Ground water (indicate location and type of study)	Switzerland: Field dissipation and mobility, no residues (< 0.1 µg/L) of dimethenamid in ground water (suction cups at 1 - 1.2 m and 2.6 - 3 m depth). France: Field dissipation and mobility, no residues (< 0.05 µg/L) of dimethenamid in ground water (piezometer, well). Metabolites M23 and M27 have not been addressed in these studies.
Air (indicate location and type of study)	No data

Classification and proposed labelling (Annex IIA, point 10)

with regard to fate and behaviour data	N;	Dangerous to the environment
	R50/53	Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

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

Appendix 1.6: Effects on non-target Species

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

Acute toxicity to mammals ‡	rat: LD_{50}397 mg as/kg bw (oral)
Long-term toxicity to mammals ‡	rat: NOAEL = 500 mg as/kg food (2-generation-study) equiv. to 33.3 mg/kg bw/d
Acute toxicity to birds ‡	bobwhite quail: LD_{50} = 1908 mg as/kg bw
Dietary toxicity to birds ‡	bobwhite quail: LD_{50} = 1202 mg as/kg bw (LC_{50} = 5620 ppm)
Reproductive toxicity to birds ‡	bobwhite quail: NOEL = 114 mg as/kg bw/d NOEC = 900 ppm

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

Application rate (kg as/ha)	Crop	Category (*e.g.* insectivorous bird)	Time-scale	TER	Annex VI Trigger
Old assessment scheme – mammals					
1.44	maize	herbivorous mammals	acute	11	10
			long-term	8.7	5
		insectivorous mammals	acute	31	10
			long-term	33	5
Old assessment scheme – birds					
1.44	maize	herbivorous birds	acute	20	10
			short-term	> 98	5
			long-term	15.6	5
		insectivorous birds	acute	24	10
			short-term	> 134	5
			long-term	21	5
EU Guidance Document SANCO 4145/2000-final – mammals					
1.44	early cereals	small herbivorous mammal	acute	1.4	10
			long-term	0.4	5
1.44	leafy crops	medium herbivorous mammal	acute	11.3	10
			long-term	3.9	5

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

Application rate (kg as/ha)	Crop	Category (*e.g.* insectivorous bird)	Time-scale	TER	Annex VI Trigger
1.08	leafy crops	medium herbivorous mammal	acute	15	10
			long-term	5.2	5
EU Guidance Document SANCO 4145/2000-final – birds					
1.44	early cereals	large herbivorous bird	acute	21.2	10
			short-term	24.9	10
			long-term	4.5	5
		insectivorous bird	acute	24.5	10
			short-term	27.7	10
			long-term	2.6	5
1.44	leafy crops	medium herbivorous bird	acute	20	10
			short-term	27.4	10
			long-term	4.9	5
1.08	leafy crops	medium herbivorous bird	acute	26.7	10
			short-term	36.6	10
			long-term	6.6	5
		insectivorous bird	acute	32.7	10
			short-term	36.9	10
			long-term	3.5	5

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	Endpoint	Toxicity (mg/L)
Laboratory tests				
O.mykiss	Dimethenamid	4 d, stat	LC_{50}	2.6
O.mykiss	Dimethenamid	90 d, fl.-through (ELS-test)	NOEC (growth)	0.12
D.magna	Dimethenamid-P	2 d, fl.-through	LC_{50}	12
D.magna	Dimethenamid	21 d, semist.	NOEC	0.68
S.subspicatus	Dimethenamid	3 d, stat.	EbC_{50}	0.062

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

Group	Test substance	Time-scale	Endpoint	Toxicity (mg/L)
L.gibba	Dimethenamid	14 d, semistat.	ErC_{50}	0.028
O.mykiss	Metabolite M 23	4 d, stat.	LC_{50}	> 87
D.magna	Metabolite M 23	2 d, stat.	LC_{50}	> 95
S.capricornutum	Metabolite M 23	3 d, stat.	EbC_{50}	> 94
O.mykiss	Metabolite M 27	4 d, stat.	LC_{50}	> 100
D.magna	Metabolite M 27	2 d, stat.	LC_{50}	> 100
S.capricornutum	Metabolite M 27	4 d, stat.	EbC_{50}	> 208
O.mykiss	Metabolite M 3	4 d, stat.	LC_{50}	60.8
D.magna	Metabolite M 3	2 d, stat.	LC_{50}	>101.6
S.subspicatus	Metabolite M 3	3 d, stat.	EbC_{50}	68.5
O.mykiss	Dimethenamid EC form. 900 g/L	4 d, stat.	LC_{50}	2.54
D. magna	Dimethenamid EC form. 900 g/L	2 d, stat.	LC_{50}	5.8
S.capricornutum	Dimethenamid EC form. 900 g/L	5 d, stat.	EbC_{50}	0.01
L.gibba	Dimethenamid EC form. 900 g/L	7 d, stat.	EbC_{50}	0.012

Microcosm or mesocosm tests
Not available

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

Application rate (kg as/ha)	Crop	Organism	Time-scale	Distance (m)	TER	Annex VI Trigger
1.44	maize	*O. mykiss*	acute	1	195	100
		O. mykiss	chronic	1	9.0*	10
		D. magna	acute	1	902	100
		D. magna	chronic	1	51	10
		S. subspicatus		5	23	10
		L. gibba		5	10	10

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

dimethenamid EC form. 900 g/L						
1.6 kg prod./ha	maize	*O. mykiss*	acute	1	172	100
		D. magna	acute	1	393	100
		D. magna	chronic	1	158	10
		S.capricornutum		20	13	10
		L.gibba		15	11	10

* calculated with $PEC_{sw,ini}$, although 90-d flow-through test, TER based on $PEC_{sw,twa}$ not calculated, but would surpass Annex VI trigger

Bioconcentration

Bioconcentration factor (BCF) ‡	Log Pow below relevant trigger
Annex VI Trigger:for the bioconcentration factor	not relevant (log Pow < 3)
Clearance time (CT_{50}) (CT_{90})	not relevant
Level of residues (%) in organisms after the 14 day depuration phase	not relevant

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

Acute oral toxicity ‡	LD_{50} = 1000 µg as/bee (active substance SAN 582 H) LD_{50} = 126 µg as/bee (formulation BAS 65607 H) LD_{50} = 50 µg as/bee (formulation: SAN 582 H720 EC) LD_{50} = 50 µg as/bee (formulation: SAN 582 H 540 EW)
Acute contact toxicity ‡	LD_{50} = 94 µg as/bee (active substance SAN 582 H) LD_{50} = 126 µg as/bee (formulation BAS 65607 H) LD_{50} = 50 µg as/bee (formulation: SAN 582 H720 EC) LD_{50} = 50 µg as/bee (formulation: SAN 582 H 540 EW)

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

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

Application rate (kg as/ha)	Crop	Route	Hazard quotient	Annex VI Trigger
Laboratory tests (active substance SAN 582 H)				
1.44	maize	oral	1.44	50
1.44	maize	contact	15.3	50
Laboratory tests (formulation BAS 655607 H)				
1.44	maize	oral	11.5	50
1.44	maize	contact	11.5	50
Laboratory tests (formulation: SAN 582 H720 EC)				
1.44	maize	oral	28.8	50
1.44	maize	contact	28.8	50
Laboratory tests (formulation SAN 582 H540 EW				
1.44	maize	oral	28.8	50
1.44	maize	contact	28.8	50

Field or semi-field tests
Not required.

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

Species	Stage/ substrate	Test Substance	Dose (kg as/ha)	Endpoint	Effect [%]	Annex VI Trigger
Laboratory tests						
A. rhopalosiphi	Imago/ nat.	BAS 656 02 H	1.44	Mortality parasitation	0 62	30
A. bilineata	Imago/ inert	SAN 582 H 900 EC	1.44 2.88	Mortality mortality	8 0	30
P. cupreus	Imago/ inert	SAN 582 H 900 EC	1.44 2.88	Mortality food uptake mortality food uptake	0 11 3 0	30

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

Species	Stage/ substrate	Test Substance	Dose (kg as/ha)	Endpoint	Effect [%]	Annex VI Trigger
T. pyri	Protonymph/ inert	BAS 656 07 H	0.006 0.101 1.008	Mortality fertility overall mortality fertility overall mortality fertility overall	0 11 11 1 23 24 11 27 35	30
A. rhopalosiphi	Imago/ inert	BAS 656 07 H	1.008	Mortality	100	30
A. rhopalosiphi	Imago/ nat.	BAS 656 07 H	0.101 1.008	Mortality parasitation mortality parasitation	0 23 0 46	30
C. carnea	Larvae/ inert	BAS 656 07 H	1.008	Mortality fertility	5 0	30
A. bilineata	Imago/ inert	BAS 656 07 H	1.051	Overall	3	30
Pardosa spp.	Adults and subadults/ inert	BAS 656 07 H	1.008	Mortality food uptake	0 0	30
P. cupreus	Imago/ inert	BAS 656 07 H	1.066	Mortality food uptake	0 11	30

Field or semi-field tests
Not required.

BAS 656 02 H, SAN 582 H 900 EC: 900 g/L dimethenamid; BAS 656 07 H 720 g/L dimethenamid-P

Effects on earthworms (Annex IIA, point 8.4, Annex IIIA, point 10.6)

Acute toxicity ‡	SAN 582 H (active substance): LC_{50} 294.4 mg/kg (corr. to 147.2 mg as/kg) SAN 582 H 900 EC: LC_{50} 550 mg/kg (corr. to 495 mg as/kg) M23: LC_{50} > 1264 mg/kg (corr. to > 632 mg as/kg) M27: LC_{50} > 1264 mg/kg (corr. to > 632 mg as/kg)
Reproductive toxicity ‡	-

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

Toxicity/exposure ratios for earthworms (Annex IIIA, point 10.6)

Application rate (kg as/ha)	Crop	Time-scale	TER	Annex VI Trigger
Dimethenamid				
1.44	maize	acute	77.5	10
M23 (considering laboratory formation fraction of 12.4 %				
1.44 (dimethenamid)	maize	acute	> 2150	10
M27 (considering laboratory formation fraction of 12.7 %				
1.44 (dimethenamid)	maize	acute	> 1875	10

Effects on soil micro-organisms (Annex IIA, point 8.5, Annex IIIA, point 10.7)

Nitrogen mineralization ‡	no effects > 25 % at following tested concentrations dimethenamid 900 EC: 1.26 and 6.3 kg as/ha BAS 656 07 H: 1.008 and 5.040 kg as/ha
Carbon mineralization ‡	no effects > 25 % at following tested concentrations dimethenamid: 1.8 and 9.0 kg as/ha dimethenamid 900 EC: 1.26 and 6.3 kg as/ha BAS 656 07 H: 1.008 and 5.040 kg as/ha

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

Germination test	*Avena sativa, Fagopyrum esulentum, Raphanus sativus, Sinapis arvensis* (most sensitive species) ED_{50} 56 g as/ha.
Seedling emergence test	*Sorghum bicolor* (most sensitive species) ED_{50} 156.9 g as/ha. Relevant endpoint for risk assessment
Vegetative vigour test	*Avena sativa* (most sensitive species) ED_{25} 257.8 g as/ha.

Toxicity/exposure ratios for terrestrial non-target plants (Annex IIIA, point 10.8)

Distance from treated area (m)	Drift (%)	Amount of drift (g as/ha)	TER (*Sorghum bicolor*, ED_{50} 156.9 g/ha)
Maize, 1440 g as/ha			
1	2.77	39.9	3.9
5	0.57	8.2	19.1

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

Sugar beet, 1080 g as/ha			
1	2.77	29.9	5.2
5	0.57	6.2	25.3

Classification and proposed labelling (Annex IIA, point 10)

with regard to ecotoxicological data	N; Dangerous to the environment R50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

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

APPENDIX 2 – ABBREVIATIONS USED IN THE LIST OF ENDPOINTS

ADI	acceptable daily intake
AOEL	acceptable operator exposure level
ARfD	acute reference dose
a.s.	active substance
bw	body weight
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)
ε	decadic molar extinction coefficient
EC_{50}	effective concentration
EEC	European Economic Community
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
GAP	good agricultural practice
GCPF	Global Crop Protection Federation (formerly known as GIFAP)
GS	growth stage
h	hour(s)
ha	hectare
hL	hectolitre
HPLC	high pressure liquid chromatography or high performance liquid chromatography
ISO	International Organisation for Standardisation
IUPAC	International Union of Pure and Applied Chemistry
K_{oc}	organic carbon adsorption coefficient
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)
µg	microgram
mN	milli-Newton
MRL	maximum residue limit or level
MS	mass spectrometry
NESTI	national estimated short term intake
NIR	near-infrared-(spectroscopy)
nm	nanometer
NOAEL	no observed adverse effect level
NOEC	no observed effect concentration
NOEL	no observed effect level
PEC	predicted environmental concentration
PEC_A	predicted environmental concentration in air
PEC_S	predicted environmental concentration in soil
PEC_{SW}	predicted environmental concentration in surface water
PEC_{GW}	predicted environmental concentration in ground water
PHI	pre-harvest interval
pK_a	negative logarithm (to the base 10) of the dissociation constant
PPE	personal protective equipment
ppm	parts per million (10^{-6})
ppp	plant protection product
r^2	coefficient of determination
RPE	respiratory protective equipment
STMR	supervised trials median residue
TER	toxicity exposure ratio
TMDI	theoretical maximum daily intake
UV	ultraviolet
WHO	World Health Organisation
WG	water dispersible granule
yr	year