2023

oekotoxzentrum
centre ecotox

Schweizerisches Zentrum für angewandte Ökotoxikologie
Centre Suisse d'écotoxicologie appliquée

EQS - Ecotox Centre proposal for:

Mecoprop-P

First compilation:	10.08.2011 (Status of data research)
	27.01.2012 (Incorporation of the expert opinion)
	29.07.2013 (Revision)
Update:	10.08.2016 (Status of data research)
	20.09.2021 (Status of data research)
	18.07.2023 (Incorporation of the expert opinion)

Imprint

Publisher
Swiss Centre for Applied Ecotoxicology, 8600 Duebendorf/1015 Lausanne

Commissioned by
FOEN, Federal Office of the Environment, Water Quality Section, 3003 Bern

Authors
Alexandra Kroll, Carmen Casado-Martinez, Marion Junghans, Swiss Centre for Applied Ecotoxicology

Scientific Support
Dr Karen Duis, ECT Oekotoxikologie GmbH, Böttgerstr. 2-14, D-65439 Flörsheim/Main, Germany

Please note that the suggested EQS and contents of this dossier do not necessarily reflect the opinion of the external reviewer.

Acknowledgement
We thank Dr Cécile Périllon for kindly providing raw data of the study Perillon *et al.* 2021.

Contact
Alexandra Kroll: Alexandra.kroll@oekotoxzentrum.ch

Marion Junghans: marion.junghans@oekotoxzentrum.ch

Citation Proposal
Alexandra Kroll, Carmen Casado-Martinez, Marion Junghans. 2023. EQS - Vorschlag des Oekotoxzentrums für: Mecoprop-P. Dübendorf (CH): Swiss Centre for Applied Ecotoxicology; 50 pp.

Executive summary

CQC (AA-EQS): 0.80 µg/L (formerly 3.6 µg/L)

AQC (MAC-EQS): 4.69 µg/L (formerly 187 µg/L)

The chronic quality criterion (CQC) and the acute quality criterion (AQC) were derived according to the *TGD for EQS* of the European Commission (EC 2018a). In order to ensure that the dossiers are internationally comparable, the English terminology of the TGD will be used in the remainder of the dossier. The AQC corresponds to the MAC-EQS ("maximum allowable concentration environmental quality standard") and the CQC corresponds to the AA-EQS ("annual average environmental quality standard"). According to the Swiss Water Protection Ordinance (The Swiss Federal Council 2020), the CQC should not be compared with an annual average value but with the averaged concentration over two weeks.

Zusammenfassung

CQC (AA-EQS): 0.80 µg/L (vorher 3.6 µg/L)

AQC (MAC-EQS): 4.69 µg/L (vorher 187 µg/L)

Das chronische Qualitätskriterium (CQK) und das akute Qualitätskriterium (AQK) wurden nach dem *TGD for EQS* der Europäischen Kommission (EC 2018a) hergeleitet. Damit die Dossiers international vergleichbar sind, wird im Weiteren die englische Terminologie des TGD verwendet. Der AQK entspricht dabei dem MAC-EQS ("maximum allowable concentration environmental quality standard") und der CQK entspricht in der Herleitung dem AA-EQS ("annual average environmental quality standard") soll aber gemäss Schweizer Gewässerschutzverordnung (Der Schweizerische Bundesrat 2020) nicht mit einem Jahresmittelwert sondern mit der gemittelten Konzentration über 2 Wochen verglichen werden.

Résumé

CQC (AA-EQS) : **0.80 µg/L** (précédemment 3.6 µg/L)

AQC (MAC-EQS) : **4.69 µg/L** (précédemment 187 µg/L)

Le critère de qualité chronique (CQC) et le critère de qualité aiguë (AQC) ont été dérivés selon le *TGD for EQS* de la Commission européenne (EC 2018a). Afin que les dossiers soient comparables au niveau international, la terminologie anglaise du TGD est utilisée ci dessous. La CQA correspond à la MAC-EQS ("maximum allowable concentration environmental quality standard") ou NQE-CMA ("norme de qualité environnementale de la concentration maximale admissible") et la CQC correspond à la AA-EQS ("annual average environmental quality standard") ou NQE-MA ("norme de qualité environnementale de la moyenne annuelle"). Selon l'ordonnance suisse sur la protection des eaux (Le Conseil fédéral suisse 2020), la CQC ne doit cependant pas être comparée à une valeur moyenne annuelle, mais à la concentration moyenne sur deux semaines.

Sommario

CQC (AA-EQS) : 0.80 µg/L (precedentemente 3.6 µg/L)

CQA (MAC-EQS) : 4.69 µg/L (precedentemente 187 µg/L)

Il criterio di qualità cronica (CQC) e il criterio di qualità acuta (CQA) sono stati derivati secondo il TGD for TGD della Commissione Europea (EC 2018a). Per garantire che i dossier siano comparabili a livello internazionale, viene utilizzata la terminologia inglese del TGD. Il CQA corrisponde al MAC-EQS ("maximum allowable concentration environmental quality standard") oppure SQA-CMA ("standard di qualità ambientale a concentrazione massima ammissibile") e il CQC corrisponde al AA-EQS ("annual average environmental quality standard") oppure SQA-MA ("standard di qualità ambientale medio annuo"). Secondo l'ordinanza svizzera sulla protezione delle acque (Il Consiglio federale svizzero 2020), tuttavia, il CQC non deve essere confrontato con un valore medio annuo, ma con la concentrazione media su due settimane.

Content

Executive summary ... 3

Zusammenfassung ... 3

Résumé ... 4

Sommario ... 4

1 Quality criteria proposals ... 6

2 Physicochemical parameters ... 6

3 General information ... 9

4 Effect data ... 14

5 Grafic representation of the effect data ... 23

5.1 Comparison between marine and freshwater species ... 23

6 Derivation of the EQS ... 24

7 Chronic toxicity ... 24

7.1 AA-EQS derivation with the AF method ... 24

7.2 AA-EQS derivation with the SSD method ... 25

7.3 AA-EQS from micro/mesocosm studies ... 27

8 Acute toxicity ... 28

8.1 MAC-EQS derivation with the AF method ... 28

8.2 MAC-EQS using the SSD method ... 29

8.3 MAC-EQS from micro-/mesocosm studies ... 31

9 Assessment of bioaccumulation potential and secondary poisoning ... 31

10 Toxicity of transformation products ... 32

11 Protection of aquatic organisms ... 34

12 Changes in the version from 10.08.2016 compated tot he version from 29.07.2013 ... 34

13 Changes in the version from 10.08.2023 compared to the version from 10.08.2016 ... 34

14 References ... 36

15 Annex I ... 40

16 Annex II ... 42

17 Annex III 46

1 Quality criteria proposals

CQK (AA-EQS): 0.80 µg/L (new)

AQK (MAC-EQS): 4.69 µg/L (new)

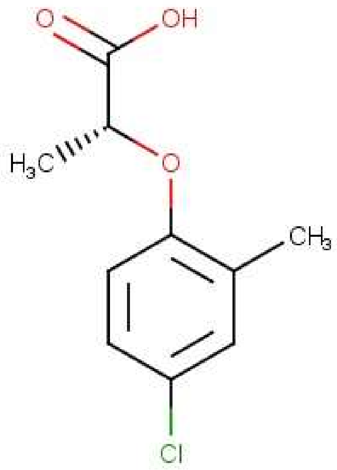
The chronic quality criterion (CQK ≙ AA-EQS) and the acute quality criterion (AQK ≙ MAC-EQS) were originally derived based on the TGD for EQS of the European Commission (EC, 2011) and adapted in 2021 based on the updated TGD for EQS (2018). In order to make the dossiers internationally comparable, the terminology of the TGD is used.

2 Physicochemical parameters

Table 1 gives identity and physicochemical parameters for Mecoprop-P. Where known, (exp.) specifies that these are experimentally collected data, while data marked (est.) are estimated values. If neither of these terms is accompanying the values, no designation was found in the cited literature.
Mecoprop-P is ionisable with a pK_a of 3.2 (geometric mean, Table 1). Mecoprop-P is therefore in ionic form at environmentally relevant pH values. In ECETOC Technical Report No. 123. (ECETOC 2013) it was concluded that standard methods for the determination of acidity constant pK_a, distribution and sorption are not always suitable for ionisable compounds, whereas the methods for determination of hydrolysis and biodegradation can be used without restrictions. The EU Committee for Risk Assessment CLH (harmonised classification and labelling) report cites the surface activity of Mecoprop-P as another possible limitation to the reliability of log K_{ow} / log P_{ow} values (Comb 2000a cited in (EC 2018a).

Table 1 Information required for EQS derivation according to the EU TGD for EQS *(EC 2018b)*.

Characteristics	Values	References
Common name	Mecoprop-P	ECHA (2021a)
IUPAC name	(R)-2-(4-chloro-2-methylphenoxy)propionic acid	ECHA (2021a)
Chemical group	Aryloxyalkanoic acid	

Structural formula		ECHA (2021a)
Molecular formula	C10H11ClO3	ECHA (2021a)
CAS	16484-77-8	EC (2016)
EC Number	240-539-0	ECHA (2021b)
SMILES code	C[C@@H](OC1=C(C)C=C(Cl)C=C1)C(O)=O	ECHA (2021a)
Molecular weight [g/mol]	214,6	
Melting point [°C]	81,5 – 97,5 (exp., EPA OPPTS 830.7200)	ECHA (2021b)
Boiling point [°C]	(1) 283 - 289 (exp., EPA OPPTS 830.7220) (2) ca 280 (exp., EPA OPPTS 830.7220) (3) ca 240 (exp., EPA OPPTS 830.7220)	(1-3) ECHA (2021b)
Vapour pressure [Pa]	0.001 Pa @ 25°C	ECHA (2021a)
Henry's law constant [$Pa \cdot m^3/mol$]	0 @ 20°C	ECHA (2021a)
Water solubility [mg/l]	CIPAC Method 'MT 157/water solubility' (1) 860 (exp., 20°C, pH 7) (2) 760 (exp., 20°C, pH 3) OECD Guideline 105 (Water Solubility) (3) 880 (exp., 20°C, pH not specified) (4) 6500 (exp., 20°C, pH 4) (5) >250000 (exp., 20°C, pH 7 und pH 10) OECD Guideline 105 (Water Solubility) (6) 858.6 (exp., 20°C, pH 2.78 - 3.06) OECD Guideline 105 (Water Solubility) (7) 860 (exp., 20°C, pH 3.1)	(1-7) ECHA (2021b)
Dissociation constant (pK_a)	(1) 3.7 (exp., 25°C) (2) 2.8 (exp., 20°C) (3) 2.5 (exp., 22°C) (4) 3.68 (exp., 20°C) (1-4) exp. OECD Guideline 112 (Dissociation Constants in Water) (5) 3.1	(1-4) ECHA (2021b) (5) geomean (1-4)
Octanol-water partition coefficient (log K_{ow})	(1) log K_{ow} = 2.19 (exp., pH 4) (2) log K_{ow} = 0.64 (exp., pH 7)	(1-6) Comb 2000a cited in ECHA (2021b)

	(3) log K_{ow} = -0.19 (exp., pH 10) (4) log K_{ow} = 2.2 (exp., pH 4, 20°C) (5) log K_{ow} = -0.391 (exp., pH 7, 20°C) (6) log K_{ow} = -0.776 (exp., pH 9, 20°C) (1-6): OECD Guideline 107 (Shake Flask Method)[1] (7) log K_{ow} = 3.13 (8) log K_{ow} = 3.3 (9) log K_{ow} = 3.22	(7) Howard & Meylan 1997, Handbook of physical properties of organic chemicals cited in INERIS (2013) (8) ChemID Plus 2006, cited in UK TAG (2010) (9) geomean (7), (8)
Soil-water partition coefficient (log K_{oc})	(1) 25-41 (exp., soil) (2) 135 (exp., soil: sandy soil, pH 4.3) (3) 139 (exp., soil: sandy soil, pH 4.4) (4) 167 (exp., soil: sandy soil, pH 4.3) (5) 42.9 (exp., soil: sand, pH 5.6) (6) 22.3 (exp., soil: sandy loam), pH 7.6) (7) 29.5 (exp., soil: silty clay loam, pH 6.6) (8) 20.1 (exp., soil: silt loam, pH 6.8) (9) 18 (exp., soil: sandy loam, pH 5.8) (10) 12 (exp., soil: clay loam, pH 7.3) (11) 21 (exp., soil: sandy clay loam, pH 5.7) (12) 34 (exp., soil: loamy sand, pH 5.7) (13) 103.1 (est.) (14) 40.25	(1) Public literature cited in EC (2016) (2-4) Matla & Vonk 1993 cited in EC (2016) Volume 3 – B.8 (AS) (5-8) Obrist 1986e cited in EC (2016) Volume 3 – B.8 (AS) (9-12) Simmonds 2010 cited in EC (2016) Volume 3 – B.8 (AS) (13) eq. $\log K_{OC}=0.47*\log K_{OW}+0.50$ (organic acids) (14) geometric mean (1-13)
Aqueous hydrolysis DT_{50} [d]	Stable to hydrolysis (exp.)	Anon 1982 and Obrist 1986a, 1988, 1990, cited in EC (2016)
Aqueous photolysis DT_{50} [d]	(1) 5.13 (exp., pH 5, artificial light) (2) 7.04 (exp., pH 7, artificial light) (3) 6.38 (exp., pH 9, artificial light) (1-3) EPA Guideline Subdivision N 161-2; artificial light 7.85x10^{-3} Watts/cm^2 (Calculated as average of 4 measurements) (4) 3.39 (exp., pH 5, sunlight) (5) 4.65 (exp., pH 7, sunlight) (6) 4.21 (exp., pH 9, sunlight) (7) 5.13 (exp., pH 5, artificial light) (8) 7.04 (exp., pH 7, artificial light) (9) 6.38 (exp., pH 9, artificial light) (7-9) Recalculated from (1-3)	(1-3) Connor 1996b cited in EC (2016) Volume 3 – B.8, S. 95 (4-9) Hazlerigg & Garratt 2015 cited in EC (2016) Volume 3 – B.8, S. 17
Biodegradation in aqueous environment DT_{50}	stable (aerobic mineralisation in surface water, dark, 58 d, 20 ± 2°C)	Traub 2014 cited in (EC 2016) B.8 (CA) p.106
Biodegradation in water-sediment systems DT_{50} [d]	(1) DT_{50}(whole system) = 59, $DissT_{50}$(water) = 49 (2) DT_{50}(whole system) = 35, $DissT_{50}$(water) = 30 (3) DT_{50}(whole system) = 83.2,	(1,2) Hazlerigg & Garratt 2014 cited in EC (2016) B.7 (AS) p.119 (3,4) Roohi (2015) cited in EC (2016) Volume 3 – B.8, p. 131

	$DissT_{50}$(water) = 72.5 (4) DT_{50}(whole system) = 244, $DissT_{50}$(water) = 171	

[1] K_{ow} values estimated using the HPLC method are indirect estimates of octanol/water partitioning and are not regarded as most reliable (EC 2018a).

3 General information

Identity

Mecoprop-P (also MCPP-P or (R)-MCPP), with CAS number 16484-77-8, is the R-(+)-stereoisomer of mecoprop (MCPP). The racemic mixture of R and S enantiomers (MCPP) has CAS number 93-65-2 (formerly 7085-19-0). Only the (R)-(+) enantiomer acts as a herbicide (Smith *et al.* 1980).

Application

Mecoprop-P is a plant protection active substance according to Regulation (EC) 1107/2009 and is registered as an intermediate under REACH.

The use of this phenoxyalkanoic acid herbicide is widespread. It is used in post-emergence on wheat, oats, fodder crop seeds, cereal grassland, fruit trees and vines in autumn and spring (Rodríguez-Cruz *et al.* 2010; Tomlin 2006). Only Mecoprop-P is currently approved as an active ingredient in plant protection products in Switzerland (until 31/01/2022). As of 02/09/2021, plant protection products containing mecoprop-P in combination with carfentrazone-ethyl, dicamba, 2,4-D and diflufenican are approved under 57 registration numbers. No product authorised contains only mecoprop-P. Mecoprop-P may be present as a free carboxylic acid or formulated as a dimethylamine salt (CAS: 66423-09-4). In water, the salt dissociates directly to carboxylic acid and amine. In order to make the effect data of the salt formulation comparable with those of the acid, these were converted to the acid equivalent. Information for the racemate mecoprop (MCPP) was not used, as this report is intended exclusively to derive quality standards for the stereoisomer mecoprop-P, as well as formulation data.

Mecoprop-P and partly the racemic mixture Mecoprop are used in residential areas in "root-resistant" bituminous membranes as a root penetration protection product. Leaching through rainfall events leads to a medium load of precipitation water (≥ 0.1 µg/L, BAFU (2017). As a result, the sources of mecoprop-P remain constant throughout the year. The FOEN recommends that, in the case of infiltration or discharge into a surface water body, the precipitation water should be treated by a microbially active soil layer suitable for substance retention or by a substrate with an equivalent purification effect.

Mechanism of action

Mecoprop-P is a selective, systemic, plant hormone-like herbicide that is absorbed through the leaves and then translocated into the roots.

In vivo tracking of radiolabelled substance has shown more effective uptake and translocation of mecoprop-P compared to the S-(-)-enantiomer in *Arabidopsis thaliana* (Guo *et al.* 2021).
Mecoprop-P acts specifically on dicotyledonous plants by mimicking the plant hormone auxin. Interaction studies have shown the binding of mecoprop-P to the TIR1-IAA7 (Transport Inhibitor Response1- Auxin-Responsive Protein IAA7) (Guo *et al.* 2021). For another auxin herbicide (dichlorophenoxyacetic acid: 2,4-D) it could be shown that dicot aquatic plants react more sensitively than monocot aquatic plants (Oekotoxzentrum 2011).
Mecoprop-P causes declines in root and shoot growth, epinasty of stems and leaves, severe chloroplast damage leading to leaf chlorosis, altered stomatal function, reduced water consumption, photosynthesis inhibition, altered CO_2 assimilation, changes in vascular tissue, disruption of membrane integrity, tissue collapse and decay.

Endocrine activity

No specific studies evaluating the endocrine potential were submitted for re-authorisation as a plant protection active substance (EFSA 2017). The EFSA Conclusion (EFSA (2017) states that the reproduction studies cannot be used for the assessment. However, no effects were observed in the repeated-dose studies or in the public literature that could be linked to an endocrine disrupting mechanism of action.
It is assessed as unlikely that mecoprop-P is an endocrine disruptor in mammals. However, no clear conclusion can be drawn with regard to fish and birds. Mecoprop shows anti-estrogenic activity in the YES (yeast estrogenic screen) test and anti-androgenic activity in the YAS (yeast androgenic screen) test (Westlund & Yargeau 2017).

Analytics

The EFSA Conclusion lists an LC-MS/MS method for the determination of mecoprop-P in surface waters with a LOQ of 0.02 µg/L. EFSA (2017). The method is not enantioselective, so that it is not possible to distinguish between the enantiomers of mecoprop. The lack of a monitoring method that specifically detects mecoprop-P was identified as a data gap.
Jin et al. (2011) provide detailed information for the separation of enantiomers and enantioselective analysis of mecoprop. Eight commercially available herbicides, including mecoprop-P, can be completely resolved by HPLC combined with a photodiode-array (PDA) detector and a circular dichroism (CD) detector on a normal phase Chiralpak AD-H column (Saito *et al*. 2008 cited in Jin *et al*. 2011).

Hydrolytic stability

In the DAR for the original marketing authorisation (1998), aqueous hydrolysis studies were rated as acceptable according to RAR 2016 (Anon 1982 and Obrist 1986a, 1988, 1990; EC (2016) Volume 3 - B.8 (AS) p 92). The studies were conducted with racemic mecoprop, but differences in hydrolysis between mecoprop and mecoprop-P are not expected. Mecoprop proved to be hydrolytically stable at 70°C for 8 days as well as at 25°C for 31 days. The tests were conducted at pH 5, 7 and 9 and not at the recommended pH 4, 7 and 9. Since no degradation was observed at any pH, it can be assumed that this difference in pH does not significantly affect the overall result (pK_a 3.7). The dark controls of the aqueous photolysis study (Connor 1996b cited in EC 2016) confirm the assessment.

<u>Photolytic stability</u>

The aqueous phototransformation of radiolabelled Mecoprop-P was studied at pH 5, 7 and 9 under artificial light (xenon arc) with a 12-hour light/dark cycle for 30 days at 25ºC (Connor 1996b cited in EC 2016). The CO_2 production accounted for ~10% of the radioactivity, while volatile organic compounds accounted for 11%. According to re-evaluation by the RMS, aqueous photolysis of mecoprop-P is relatively rapid (DT_{50} 3.39 to 4.65 days in natural sunlight at 42°N), forming o-cresol as the major metabolite with a maximum of 30.4%. The degradation of mecoprop-P was not observed in the dark control samples (Connor 1996b cited in EC 2016).

Calculation of the photostability of o-cresol gave a DT_{50} of 63.5 d and a DT_{90} of 211 d in artificial light at pH 7, and a DT_{50} of 41.91 d and a DT_{90} of 139.26 d in sunlight at pH 7.

<u>Biodegradability</u>

Ready biodegradability

A study on the ready biodegradability of mecoprop-P was performed in a manometric respirometry test over 28 days according to OECD Guideline 301 F (Feil 2010 cited in EC (2016) Volume 3 - B.8 (AS) p. 103). Mecoprop-P was 85% biodegraded under the test conditions. The limit value for ready biodegradability (biodegradation ≥60% of the chemical oxygen demand [COD] of the test substance in a 10-day window within the 28-day test period) was achieved. Mecoprop-P can therefore be classified as readily biodegradable under the test conditions.

Surface water

The degradation of ^{14}C-mecoprop-P was tested in water samples from a German surface water with DOC 8.6 mg/L and BOD5 <3 mg/L (Traub 2014 cited in EC (2016) B.7 (AS) p. 107). The test ran for 58 days in the dark at 20 ± 2°C with constant flushing with air. The mineralisation rate was negligible at both concentrations tested (1 and 10 µg/L). The amounts of CO_2 and organic volatiles (<1%) were also negligible (<2% of the measured radioactivity AR). For both concentrations, no metabolites were formed during the incubation period in the water system.

Water-sediment system

The degradation of ^{14}C-mecoprop-P was carried out in two aquatic sediment systems (from a stream in Manningtree and from the River Roding in Ongar (Essex, UK)) in accordance with the requirements of the BBA Guidance, Part IV, Section 5-1, 1990 (Cooper & Unsworth 1996 cited in (EC 2016) Volume 3 - B.8 (AS) p. 113). After 100 days, the radioactivity in the water phase in the Manningtree system was 15.4% and in the Ongar system 1.8% of the applied amount. At the same time, the radioactivity in the sediments increased to about 30% in both systems. The main fraction of recovered radioactivity in the water and from the sediments was mecoprop-P. Only minor fractions of 3 unknown degradation products were observed. Only metabolite 1 was above 5% in the water column on day 61 in the Manningtree system with 5.46% of the applied radioactivity; and 8.40 and 7.04% of the applied radioactivityAR on day 30 and 61 in the Ongar system, respectively. Degradation to CO_2 increased to 55% in the Manningtree system and 58% in the Ongar system. The non-extractable residues in the sediment increased to 24-28% of the applied radioactivity. However, it was observed that mineralisation increased sharply in the Ongar system as early as day 30, but not until day 60 in the Manningtree system. The half-lives of the mineralisation were not calculated, but based on the tabulated values they appear to be about 90 days in the Manningtree system and 30 days in the Ongar system.

In Hazlerigg & Garratt 2014 cited in EC (2016) B.7 (AS) p.119, data from Cooper & Unsworth (1996) were re-analysed in accordance with FOCUS guidance using Kingui2 v2.2012.320.1629. The updated kinetics from the study author for both modelling and persistence endpoints are DT_{50}(whole system) 59 days, $DissT_{50}$(water) 49 and $DissT_{50}$(sediment) 130 for the Manningtree-System and DT_{50}(whole system) 35 days, $DissT_{50}$(water) 30 days and DissT50(sediment) 12 (40 from modelling) days for the Ongar-System. The study author notes that values for sediment were poorly supported by the data with large errors in all models used. A reevaluation of the data in EC (2016) B.7 (AS) p.131 reported DT50(whole system) 59 days and $DissT_{50}$(water) 51.4 days (83 days from modelling for the slow phase) for Manningtree-System and DT_{50}(whole system) 23 days and $DissT_{50}$(water) 23 days for the Ongar-System (DT_{50}(whole system) of 163 and DissT50(water) of 86 days from modelling for the slow phase).

In a second study, the rate of degradation of ^{14}C-mecoprop-P was investigated under aerobic conditions at 20 ± 2 °C in two water/sediment systems (Calwich Abbey, Swiss Lake) in the dark according to OECD 308 (Roohi 2015 cited in EC (2016) B.7 (AS) p. 131). Mecoprop-P was degraded, with no degradation product exceeding 5% of the applied radioactivity. Some distribution in the sediment was observed (max. 22.73% AR and 14.91% AR in the Calwich Abbey and Swiss Lake systems, respectively). Dissipation of mecoprop-P from the water phase and degradation in the whole system were assessed according to FOCUS guidelines (2006). In the Calwich Abbey system, ^{14}C-mecoprop-P was rapidly degraded in the water phase after an initial lag phase, with a best fit $DissT_{50}$ of 72.5 days (HS model). In the Swiss lake system, degradation from the water phase was slower with a $DissT_{50}$ of 171 days (SFO). Degradation in the total water/sediment systems again showed differences between the two systems with DT_{50} values of 83.2 (HS model, total, Calwich Abbey) and 244 days (SFO, Swiss Lake).

The re-authorisation process summarised that ^{14}C-mecoprop-P is ultimately degraded in natural water/sediment systems to carbon dioxide and non-extractable sediment-bound residues.

Sorption

Two studies were assessed and considered acceptable for the original approval of mecoprop-P. Matla & Vonk (1993) (EC 2016 B.8 (AS) p. 56) tested the adsorption of mecoprop-P to soil particles in three sandy soils with low pHs (4.3-4.4) and relatively high organic matter content (3.6-5.6%) and found K_{oc} of 135-167. Obrist (1986e) (EC 2016 B.8 (AS) p. 57) tested racemic mecoprop in four soil types with higher pH range of 5.6-7.6 and organic matter (0.8-5.9%) and reported K_{oc} of 20.1-42.9. One additional study, Simmonds (2010), was submitted for renewal under Regulation 844/2012. The study assessed sorption of mecoprop-P in three soils of similar pH(H2O) (5.7 and 5.8) and only one with a higher pH (7.3), all with relatively similar organic matter content (5.—6.4%). The K_{oc} values ranged from 12 to 34, with $K_{oc,des}$ ranging from 24 to 54. These studies indicate that mecoprop has a low adsorption ability and high mobility potential. According to results from Obrist (1986e) and Simmonds (2010), the adsorption process is not stereoselective.
Surdyk et al. (2008) (cited in EC 2016 B.8 (AS) p. 64) reported a large data set of Kd values obtained from batch equilibrium studies similar to OECD TG 106 over a comprehensive range of pHs (3.87 to 7.78) and OM contents (3.68 to 82.9 g/kg), with Koc values for mecoprop-P ranging from 12 to 169. Although the reliability of the study did not allow to to derive endpoints for regulation, it showed some correlation in Kd with OC for mecoprop-P and a general decraase in sorption with increasing pH.

Regulatory context

Mecoprop-P is listed in Annex VI (May 2020) of the EU CLP Regulation[a] with hazard levels Acute Tox. 4, Skin Irrit. 2, Eye Dam. 1, Aquatic Acute 1 and Aquatic Chronic 1.

Table 2 Existing and preliminary EQS for mecoprop-P/mecoprop.

Country or entity	***AA-EQS [µg/L]***	***MAC-EQS [µg/L]***	***Reference***
France	20	60	INERIS 2013 (Mecoprop)
United Kingdom of Great Britain and Northern Ireland (UK)	18	187	UK DAY 2010
International Commission for the Protection of the Rhine (ICPR)	18	160	ICPR 2009 (Mecoprop)
EU	3.6	187	JRC 2015 (draft)

[a] https://echa.europa.eu/de/information-on-chemicals/annex-vi-to-clp

4 Effect data

The main part of the underlying literature was taken from the DAR and the RAR of the European Commission (EC 1998, 2016). Furthermore, the reports of the European Commission (EC 2018) and the Environmental Agency (UK TAG 2007, 2010) were also considered. Values accepted in these references were adopted as "face value" according to the TGD for EQS and assigned a Klimisch value of 1. In several cases, the reliability of studies classified as valid in the DAR could not be evaluated for the RAR. In these cases, the reliability classification was taken from the DAR.

For mecoprop (racemate CAS: 7085-19-0 and mecoprop-P CAS: 16484-77-8), the EU Joint Research Centre (JRC) was working on an updated dossier, but this was not finalised as the substance was not selected as a priority substance under the Water Framework Directive. The last working document was dated 12.05.2016 (JRC 2016). The studies as well as the assessments of the endpoints from this document were also adopted as "face value".

In addition, a literature search with the substance name and CAS number was carried out on 16.09.2021 in the databases scopus[b] , ECOTOX[c] and ETOX[d].

In general, only reliable and relevant data should be used for EQS derivation (EC 2011). These data are often also referred to as "valid". Various approaches exist for the assessment and classification of (eco)toxicological data (e.g. Klimisch *et al.* (1997), Moermond *et al.* (2016). Based on the established methodology of Klimisch et al. (1997), four validity classes are assigned: (1) reliable, (2) reliable with restrictions, (3) not reliable, (4) not assessable. The CRED method[e] additionally provides a comparable classification for the relevance of test results for the derivation of environmental quality criteria.

In almost all studies from the European Commission (EC 1998), the nominal concentrations were re-assessed. No deviations of more than 20 % were found. This confirms the assumption of stability of mecoprop-p. For all short-term exposures (up to 96 h) and for all tests in which the test solutions were regularly renewed (semi-static test and flow-through systems), it can therefore be assumed that the test concentrations were stable. The analytical validation of the test concentrations is therefore not to be regarded as a mandatory criterion for the validity of an acute study for such test approaches and all values based on nominal concentrations are considered. In case of clear differences between toxicity values based on nominal concentrations and analytically validated values, the analytically validated ones are preferred.

---

[b] http://www.scopus.com/

[c] US Environmental Protection Agency (EPA), ECOTOX; https://cfpub.epa.gov/ecotox/search.cfm

[d] Federal Environment Agency Germany (UBA), ETOX;

https://webetox.uba.de/webETOX/public/search/test/open.do

[e]According to Moermond *et al.* (2016), validity is divided into reliability (R) and relevance (C), whereby the classes to be assigned (1-4) correspond to the climatic classes. In the present dossier, an evaluation of reliability was not performed if a study was rated as not relevant (C3). The studies assessed according to Klimisch are not marked with a letter.

For algal tests, the endpoint growth rate was preferred over biomass as recommended in the TGD for EQS (EC 2018a). If effect concentrations are available for different test durations (e.g. 72 and 96 h), the lowest value was taken forward.

The study performed by Périllon et al. (2021) tested ten aquatic macrophyte species (nine of them submerged) simultaneously. The macrophytes were planted in pots filled with quartz sand and pond soil. These pots (10 pots per species) were placed in 2 m^3 vessels. The experiment included 7 mecoprop-P concentrations (one vessel per concentration) and a control (2 vessels). The study was classified by the authors as microcosm test and might also be classified as multispecies test (see e.g. Campbell et al. 1999). Thus, it should be noted that the experimental design deviated strongly from the standard test with dicotyledonous macrophytes used to derive EQS values for the water column, i.e. the sediment-free *Myriophyllum spicatum* toxicity test. Périllon et al. (2021) calculated NOECs and EC10s for several species and endpoints. EC10 values were considered not robust for EQS derivation when the coefficient of variation in control plants was higher than the estimated level, i.e. the coefficient of variation was > 10% (OECD 2014) or when no confidence limits were reported. NOECs ranged from <8 - 256 µg/L. For the species *Hygrophila polysperma, Myriophyllum spicatum* and *Ranunculus aquatilis,* no NOEC could be determined for at least one of the respective documented endpoints, as the lowest test concentration caused an effect. The raw data from the study were provided by the authors but EC10s could not be calculated with either log-normal, log-logistic or Weibull modeling (Annex I). In these cases, a NOEC of <8 µg/L is therefore listed in Table 4 as "supporting data".

Table 3 Effect data collection for mecoprop-P. Effect data on mecoprop (racemate) were not used. The effect value always refers to the active substance and is given in µg/L. An assessment of the relevance and reliability was carried out according to the Klimisch criteria (Klimisch et al. 1997) or according to the CRED criteria for studies used in the course of the update (Moermond et al. 2015). The studies listed before the update were not reassessed. Literature data shown in grey do not meet the data requirements of the TGD for EQS, but should be provided as additional information. Effect data from tests with formulations are also not used to derive EQS and are rated as not relevant (C3) by default, since additives in formulations can have an effect on the toxicity of the active substance. Values from studies accepted by UK TAG (2007, 2010) were adopted as "face value" according to TGD for EQS. Values from the EU DAR and RAR for approval as an active ingredient in plant protection products were also taken over as “face value” and given a Klimisch rating of 1. Additional information on the purity of the test substance, analysis and test parameters is only provided for studies that were added as part of the update. The selected data for EQS derivation is underlined.

EFFECT DATA											
Substance (Purity in %)	**Taxonomic group**	**Organism**	**Endpoint**	**Duration**	**Dimension**	**Parameter**	**Operator**	**Value (µg/L)**	**Note**	**Relevance/ Reliability**	**Reference**
acute effect data (marine data marked)											
MCPP-p DMA[f]	Cyanobacteria	*Anabaena flos-aquae*	Biomass	72	h	EC50	=	16200	f, ana, S	1	Armstrong 2000, cited in EFSA (2016) Volume 3, B.9, p.39
MCPP-p DMA	Cyanobacteria	*Anabaena flos-aquae*	Growth rate	72	h	EC50	=	<u>23900</u>	f, ana, S	1	Armstrong 2000, cited in EFSA (2016) Volume 3, B.9, p.39
MCPP-p DMA	Algae	*Navicula pelliculosa*	Population density	120	h	EC50	=	240	f	3	Hoberg 1992a, cited in Annex B of EC (1998); not included in EC (2016)
MCPP-p DMA	Algae	*Navicula pelliculosa*	Growth rate	72	h	EC50	=	<u>105000</u>	f, ana, S	1	Jenkins 2007, cited in UK TAG (2010) and EFSA (2016) Volume 3, B.9, p.52
Marks Optica MPn (602 g acid/L)	Algae	*Raphidocelis subcapitata (Pseudokirchneriella subcapitata)*	Biomass	72	h	EC50	=	122000	Form.	1/C3	Memmert & Knoch 1993c, cited in Annex B of EC (1998); not included in EC (2016)
Marks Optica MPn (602 g acid/L)	Algae	*Raphidocelis subcapitata (Pseudokirchneriella subcapitata)*	Growth rate	72	h	EC50	>	355000	Form.	1/C3	Memmert & Knoch 1993c, cited in Annex B of EC (1998); not included in EC (2016)
MCPP-p	Algae	*Raphidocelis subcapitata (Pseudokirchneriella subcapitata)*	Growth rate	72	h	EC50	>	729000	f, n-ana, S	1	Dohmen 1993b, cited in EFSA (2016) Volume 3, B.9, p.37
MCPP-p	Algae	*Raphidocelis subcapitata (Pseudokirchneriella subcapitata)*	Biomass	72	h	EC50	=	<u>270000</u>	f, n-ana, S	1	Dohmen 1993b, cited in EFSA (2016) Volume 3, B.9, p.37

[f] DMA: dimethylamine salt; it dissociates to the MCPP-p acid.

EFFECT DATA

Substance (Purity in %)	Taxonomic group	Organism	Endpoint	Duration	Dimension	Parameter	Operator	Value (µg/L)	Note	Relevance/ Reliability	Reference
MCPP-p	Algae	*Raphidocelis subcapitata (Pseudokirchneriella subcapitata)*	Population density	120	h	EC50	=	2800	f	4	Office of Pesticides Programs 2000, cited in UK TAG (2007)
MCPP-p DMA	Algae	*Raphidocelis subcapitata (Pseudokirchneriella subcapitata)*	Population density	120	h	EC50	=	340	f	3	Hoberg 1992b, cited in UK TAG (2007)
MCPP-p	Algae	*Skeletonema costatum (marine)*	Growth inhibition	120	h	EC50	=	18	f	4	Original source confidencial, cited in Lewis *et al.* 1996, cited in UK TAG (2007)
MCPP-p DMA	Algae	*Skeletonema costatum (marine)*	Growth inhibition	120	h	EC50	=	17	f	3	Hoberg 1992c, cited in UK TAG (2007)
MCPP-p DMA	Algae	*Skeletonema costatum (marine)*	Biomass	72	h	EC50	=	84000	f, ana, S	1	Burke 2007, cited in UK TAG (2010) and in EFSA (2016) Volume 3, B.9, p.45
MCPP-p DMA	Algae	*Skeletonema costatum (marine)*	Growth rate	72	h	EC50	=	<u>102000</u>	f, ana, S	1	Burke 2007, cited in UK TAG (2010) and in EFSA (2016) Volume 3, B.9, p.45
MCPP-p DMA	Monocotyledone Water plants	*Lemna minor*	Biomass	7	d	EC50	=	<u>18700</u>	f, n-ana, S	1 (2002) 4 (2016)	Caley & Kelly 1999, cited in EFSA (2016) Volume 3, B.9, p.50
MCPP-p DMA	Monocotyledone Water plants	*Lemna minor*	Growth rate	7	d	EC50	>	56000	f, n-ana, S	1 (2002) 4 (2016)	Caley & Kelly 1999, cited in EFSA (2016) Volume 3, B.9, p.50
MCPP-p DMA	Monocotyledone Water plants	*Lemna minor*	Frond Biomass	7	d	EC50	=	29200	f, n-ana, S	1 (2002) 4 (2016)	Caley & Kelly 1999, cited in EFSA (2016) Volume 3, B.9, p.50
MCPP-p DMA	Monocotyledone Water plants	*Lemna gibba*	Reduction of frond number	14	d	EC50	=	1600	f, n-ana, S	3	Hoberg, 1992a, cited in EFSA (2016) Volume 3, B.9, p.52
MCPP-P	Dicotyledone Water plants	*Callitriche palustris*	Mean growth rate_dry weight	21	d	EC50	=	<u>221.3</u>	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plants	*Ceratophyllum demersum*	Mean growth rate_dry weight	22	d	EC50	=	<u>172.2</u>	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plants	*Ceratophyllum demersum*	Mean growth rate_main shoot length	22	d	EC50	=	64	S, n-ana	R3/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plants	*Hottonia palustris*	Number of side shoots	21	d	EC50	=	83.9	S, n-ana	R3/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plants	*Hottonia palustris*	Mean growth rate_total shoot length	21	d	EC50	=	<u>277.1</u>	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plants	*Hydrocotyle leucocephala*	Mean growth rate_number of leaves	22	d	EC50	=	<u>196.9</u>	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plants	*Hygrophila polysperma*	Number of site shoots	22	d	EC50	=	39.1	S, n-ana	R3/C1	Périllon *et al.* (2021)

EFFECT DATA											
Substance (Purity in %)	**Taxonomic group**	**Organism**	**Endpoint**	**Duration**	**Dimension**	**Parameter**	**Operator**	**Value (µg/L)**	**Note**	**Relevance/ Reliability**	**Reference**
MCPP-P	Dicotyledone Water plants	*Hygrophila polysperma*	Mean growth rate_main shoot length	22	d	EC50	=	144	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plants	*Hygrophila polysperma*	Mean growth rate_number of leaves	22	d	EC50	=	63	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plants	*Ludwigia repens*	Mean growth rate_number of leaves	21	d	EC50	=	656.4	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plants	*Myriophyllum spicatum*	Mean growth rate_dry weight	22	d	EC50	=	75.1	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plants	*Myriophyllum spicatum*	Mean growth rate_main shoot length	22	d	EC50	=	53.5	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plants	*Myriophyllum spicatum*	Mean growth rate_number of leaves	22	d	EC50	=	432.4	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plants	*Myriophyllum spicatum*	Mean growth rate_ number of leaves/whorls on main shoot	22	d	EC50	=	212.5	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plants	*Nymphoides peltata*	Total shoot length	21	d	EC50	>	512	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plants	*Ranunculus aquatilis*	Number of site shoots	22	d	EC50	=	27.1	S, n-ana	R3/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plants	*Ranunculus aquatilis*	Mean growth rate_dry weight	22	d	EC50	=	49.6	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plants	*Ranunculus aquatilis*	Mean growth rate_main shoot length	22	d	EC50	=	48.1	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plants	*Ranunculus aquatilis*	Mean growth rate_number of leaves	22	d	EC50	=	629.2	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plants	*Ranunculus aquatilis*	Mean growth rate_number of leaves/whorls on main shoot	22	d	EC50	=	137.8	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plants	*Ranunculus aquatilis*	Mean growth rate_total shoot length	22	d	EC50	=	46.9	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plants	*Veronica beccabunga*	Mean growth rate_number of leaves	21	d	EC50	>	512	S, n-ana	R2/C2	Périllon *et al.* (2021)
MCPP-p	Crustacean	*Daphnia magna*	Immobilisation	48	h	EC50	>	91000	f, S, n-ana	1	Bell 1994, cited in EFSA (2016) Volume 3, B.9, p.34
MCPP-p	Crustacean	*Daphnia magna*	Immobilisation	48	h	EC50	>	100000	f, S, n-ana	1	Elendt-Schneider 1991,cited in EFSA (2016) Volume 3, B.9, p.35
Duplosan KV (600 g acid/L)	Crustacean	*Daphnia magna*	Immobilisation	48	h	EC50	>	531000	Form.	2/C3	Bias 1988, cited in Annex B of (EC 1998); not included in EC (2016)
Marks Optica MPn (602 g acid/L)	Crustacean	*Daphnia magna*	Immobilisation	48	h	EC50	=	147000	Form.	1/C3	Memmert & Knoch 1993b, cited in Annex B of EC (1998); not included in EC (2016)

EFFECT DATA											
Substance (Purity in %)	**Taxonomic group**	**Organism**	**Endpoint**	**Duration**	**Dimension**	**Parameter**	**Operator**	**Value (µg/L)**	**Note**	**Relevance/ Reliability**	**Reference**
MCPP-p (99%)	Mollusk	*Crassostrea gigas (marine)*	Embryotoxicity (development to Veliger D-dorm)	36	h	EC50	=	80951	n-ana, S	R2/C2	Mottier *et al.* (2014)
MCPP-p (99%)	Mollusk	*Crassostrea gigas (marine)*	Metamorphosys of Preveliger larvae (21 days old)	24	h	EC50	>	100000	n-ana, S	R2/C2	Mottier *et al.* (2014)
MCPP-p	Fish	*Lepomis macrochirus*	Mortality	96	h	LC50	>	100000	f	1	Munk 1989, cited in EFSA (2016) Volume 3, B.9, p.25
MCPP-p DMA (617 g acid/L)	Fish	*Oncorhynchus mykiss*	Mortality	96	h	LC50	>	93000	Form.	1/C3	Kirsch & Munk 1992a, cited in EFSA (2016) Volume 3, B.9, p.27
Marks Optica MPn (602 g acid/L)	Fish	*Oncorhynchus mykiss*	Mortality	96	h	LC50	=	76000	Form	1/C3	Memmert & Knoch 1993a, cited in Annex B of EC (1998); not included in EC (2016)
MCPP-p DMA (617 g acid/L)	Fish	*Lepomis macrochirus*	Mortality	96	h	LC50	>	93000	Form.	1/C3	Kirsch & Munk, 1992b, cited in EFSA (2016) Volume 3, B.9, p.27
MCPP-p	Fish	*Oncorhynchus mykiss*	Mortality	96[g]	h	LC50	=	171000[h]		R4/C4	Munk 1984, cited in EFSA (2016) Volume 3, B.9, p.24
subchronic and chronic data (marine data marked)											
MCPP-p DMA	Cyanobacteria	*Anabaena flos-aquae*	Growth rate	72	h	NOEC	=	5956	f, ana, S	1	Armstrong 2000, cited in EFSA (2016) Volume 3, B.9, p.39
MCPP-p DMA	Cyanobacteria	*Anabaena flos-aquae*	Biomass	72	h	NOEC	=	5956	f, ana, S	1	Armstrong 2000, cited in EFSA (2016) Volume 3, B.9, p.39
MCPP-p DMA	Algae	*Navicula pelliculosa*	Growth inhibition	120	h	EC10	=	55	f	3	Hoberg 1992a, cited in UK TAG (2007)
MCPP-p DMA	Algae	*Navicula pelliculosa*	Growth inhibition	96	h	NOEC	=	41800	f, ana, S	1	Jenkins 2007, cited in UK TAG (2010)
MCPP-p	Algae	*Raphidocelis subcapitata (Pseudokirchneriella subcapitata)*	Biomass	72	h	NOEC	=	27000	f, n-ana	1	Dohmen 1993b, cited in EFSA (2016) Volume 3, B.9, p.37
Marks Optica MPn (602 g acid/L)	Algae	*Raphidocelis subcapitata (Pseudokirchneriella subcapitata)*	Biomass	72	h	NOEC	=	17000	Form.	C3	Memmert & Knoch 1993c, cited in Annex B of EC (1998); not included in EC (2016)
MCPP-p DMA	Algae	*Raphidocelis subcapitata (Pseudokirchneriella subcapitata)*	Growth inhibition	120	h	NOEC	<	55		R4/C4	Hoberg 1992a, cited in UK TAG (2007)

[g] Not explicitely stated in the RAR 2016 but study was conducted according to OECD 203

[h] Recalculated by RMS in RAR 2016, originally 147-215 mg/L

EFFECT DATA											
Substance (Purity in %)	**Taxonomic group**	**Organism**	**Endpoint**	**Duration**	**Dimension**	**Parameter**	**Operator**	**Value (µg/L)**	**Note**	**Relevance/ Reliability**	**Reference**
MCPP-p	Algae	*Raphidocelis subcapitata (Pseudokirchneriella subcapitata)*	Growth inhibition	72	h	NOEC	=	9000	f	4	Original source confidential, cited in Lewis *et al.* (1996), cited in UK TAG (2007)
MCPP-p	Algae	*Raphidocelis subcapitata (Pseudokirchneriella subcapitata)*	Growth inhibition	120	h	EC10	=	55		R4/C4	Hoberg 1992b, cited in UK TAG (2007)
MCPP-p	Algae	*Skeletonema costatum*	Growth inhibition	120	h	LOEC	=	9	f	4	Original source confidential, cited in Lewis *et al.* (1996), cited in UK TAG (2007)
MCPP-P	Algae	*Skeletonema costatum*	Growth inhibition	120	h	NOEC	=	3	f	4	Original source confidential, cited in Lewis *et al.* (1996), cited in UK TAG (2007)
MCPP-p DMA	Algae	*Skeletonema costatum (marine)*	Growth rate	72	h	NOEC	=	47000	f salinity = 36‰, 19-25ºC; ana, S	1	Burke 2007, cited in UK TAG (2010) and in EFSA (2016) Volume 3, B.9, p.45
MCPP-p	Monocotyledone Water plant	*Lemna minor*	Reduction of the frond number	14	d	LOEC	=	440		3	Hoberg & Witting 1992, cited in Addendum III of EC (1998); not included in EC (2016)
MCPP-p DMA	Monocotyledone Water plant	*Lemna minor*	Growth rate	7	d	NOEC	=	180	f, n-ana, S	1 (2002) 4 (2016)	Caley & Kell 1999, cited in EFSA (2016) Volume 3, B.9, p.50
MCPP-p DMA	Monocotyledone Water plant	*Lemna minor*	Biomass	7	d	NOEC	=	180	f, n-ana, S	1 (2002) 4 (2016)	Caley & Kelly 1999, cited in EFSA (2016) Volume 3, B.9, p.50
MCPP-p DMA	Monocotyledone Water plant	*Lemna minor*	Frond biomass	7	d	NOEC	=	5600	f, n-ana, S	1 (2002) 4 (2016)	Caley & Kelly 1999, cited in EFSA (2016) Volume 3, B.9, p.50
MCPP-P	Dicotyledone Water plant	*Callitriche palustris*	Mean growth rate_dry weight	21	d	NOEC	=	128	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plant	*Ceratophyllum demersum*	Mean growth rate_dry weight	22	d	NOEC	=	64	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plant	*Ceratophyllum demersum*	Mean growth rate_main shoot length	22	d	NOEC	=	64	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plant	*Hottonia palustris*	Number of side shoots	21	d	NOEC	=	32	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plant	*Hottonia palustris*	Mean growth rate_total shoot length	21	d	NOEC	=	128	S, n-ana	R2/C1	Périllon *et al.* (2021)

EFFECT DATA											
Substance (Purity in %)	**Taxonomic group**	**Organism**	**Endpoint**	**Duration**	**Dimension**	**Parameter**	**Operator**	**Value (µg/L)**	**Note**	**Relevance/ Reliability**	**Reference**
MCPP-P	Dicotyledone Water plant	*Hydrocotyle leucocephala*	Mean growth rate_number of leaves	22	d	NOEC	=	32	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plant	*Hygrophila polysperma*	Number of side shoots	22	d	NOEC	=	8	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plant	*Hygrophila polysperma*	Mean growth rate_main shoot length	22	d	NOEC	=	8	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plant	*Hygrophila polysperma*	Mean growth rate_number of leaves	22	d	NOEC	<	8	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plant	*Hygrophila polysperma*	Mean growth rate_number of leaves	22	d	EC10	<	8	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plant	*Ludwigia repens*	Mean growth rate_number of leaves	21	d	NOEC	=	256	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plant	*Myriophyllum spicatum*	Mean growth rate_dry weight	22	d	NOEC	<	8	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plant	*Myriophyllum spicatum*	Mean growth rate_dry weight	22	d	EC10	=	3.7	S, n-ana	R3/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plant	*Myriophyllum spicatum*	Mean growth rate_main shoot length	22	d	NOEC	<	8	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plant	*Myriophyllum spicatum*	Mean growth rate_main shoot length	22	d	EC10	=	8.1	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plant	*Myriophyllum spicatum*	Mean growth rate_number of leaves	22	d	NOEC	=	8	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plant	*Myriophyllum spicatum*	Mean growth rate_ number of leaves/whorls on main shoot	22	d	NOEC	=	16	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plant	*Nymphoides peltata*	Mean growth rate_total shoot length	21	d	NOEC	=	256	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plant	*Ranunculus aquatilis*	Number of site shoots	22	d	NOEC	=	8	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plant	*Ranunculus aquatilis*	Mean growth rate_dry weight	22	d	NOEC	<	8	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plant	*Ranunculus aquatilis*	Mean growth rate_dry weight	22	d	EC10	=	7.5	S, n-ana	R3/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plant	*Ranunculus aquatilis*	Mean growth rate_main shoot length	22	d	NOEC	=	8	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plant	*Ranunculus aquatilis*	Mean growth rate_number of leaves	22	d	NOEC	=	8	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plant	*Ranunculus aquatilis*	Mean growth rate_ number of leaves/whorls on main shoot	22	d	NOEC	=	32	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plant	*Ranunculus aquatilis*	Mean growth rate_total shoot length	22	d	NOEC	<	8	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plant	*Ranunculus aquatilis*	Mean growth rate_total shoot length	22	d	EC10	=	8.15	S, n-ana	R2/C1	Périllon *et al.* (2021)
MCPP-P	Dicotyledone Water plant	*Veronica beccabunga*	Mean growth rate_number of leaves	21	d	NOEC	=	256	S, n-ana	R2/C2	Périllon *et al.* (2021)
MCPP-p (99%)	Mollusk	*Crassostrea gigas (marine)*	Embryotoxicity (development of Veliger D-form)	36	h	EC10	=	51361	n-ana, S	R2/C2	Mottier *et al.* (2014)

EFFECT DATA											
Substance (Purity in %)	**Taxonomic group**	**Organism**	**Endpoint**	**Duration**	**Dimension**	**Parameter**	**Operator**	**Value (µg/L)**	**Note**	**Relevance/ Reliability**	**Reference**
MCPP-p (99%)	Mollusk	*Crassostrea gigas (marine)*	Metamorphosis of Preveliger larvae (21 days old)	24	h	EC10	>	100000	n-ana, S	R2/C2	Mottier *et al.* (2014)
MCPP-p	Crustacean	*Daphnia magna*	Reproduction	21	d	NOEC	=	<u>50000</u>	n-ana,	1	Dohmen 1993a, cited in EFSA (2016) Volume 3, B.9, p.35
MCCP-p	Fish	*Lepomis macrochirus*	Mortality	28	d	NOEC	=	<u>50000</u>		1	Munk 1989, cited in Annex B of EC (1998); not included in EC (2016)
MCCP-p (92.7%)	Fish	*Oncorhynchus mykiss*	Mortality	28	d	NOEC	=	50000	16ºC; pH 8.4; ana, F	3[i]	Munk 1993, cited in EC (2016) B.9 (AS) p.29
MCCP-p (94.62%)	Fish	*Oncorhynchus mykiss*	Hatch rate	56	d	NOEC	≥	11100	pH 7.8-8.1	1	Anonymous 2015, cited in EFSA (2016) Volume 3, B.9, p.29
MCCP-p (94.62%)	Fish	*Oncorhynchus mykiss*	Development	56	d	NOEC	≥	11100	pH 7.8-8.1	1	Anonymous, 2015, zitiert zitiert in EFSA (2016) Volume 3, B.9, S.29
MCCP-p (94.62%)	Fish	*Oncorhynchus mykiss*	Survival rate	56	d	NOEC	≥	11100	pH 7.8-8.1	1	Anonymous 2015, cited in EFSA (2016) Volume 3, B.9, p.29
MCCP-p (94.62%)	Fish	*Oncorhynchus mykiss*	Length	56	d	NOEC	≥	11100	pH 7.8-8.1	1	Anonymous 2015, cited in EFSA (2016) Volume 3, B.9, p.29
MCCP-p (94.62%)	Fish	*Oncorhynchus mykiss*	Weight	56	d	NOEC	≥	11100	pH 7.8-8.1	1	Anonymous 2015, cited in EFSA (2016) Volume 3, B.9, p.29

<u>Note:</u>

k.A. = not specified; **F** = flow through; **R** = semi-static; **S** = static; **n** = nominal; **ana** = analytical determined concentration; **n-ana** = Based on nominal concentration, recovery was measured and ranged from 80-120 %; **Form.** = formulation was tested and study rated as C3 (not relevant).

[i] Rated «1» in EC (1998); EC (2016) B.9 (AS) S. 29: It should be noted that this study design is no longer considered suitable to detect true sub-lethal effects on fish (see section 8.2.2 of EU 283/2013).

5 Grafic representation of the effect data

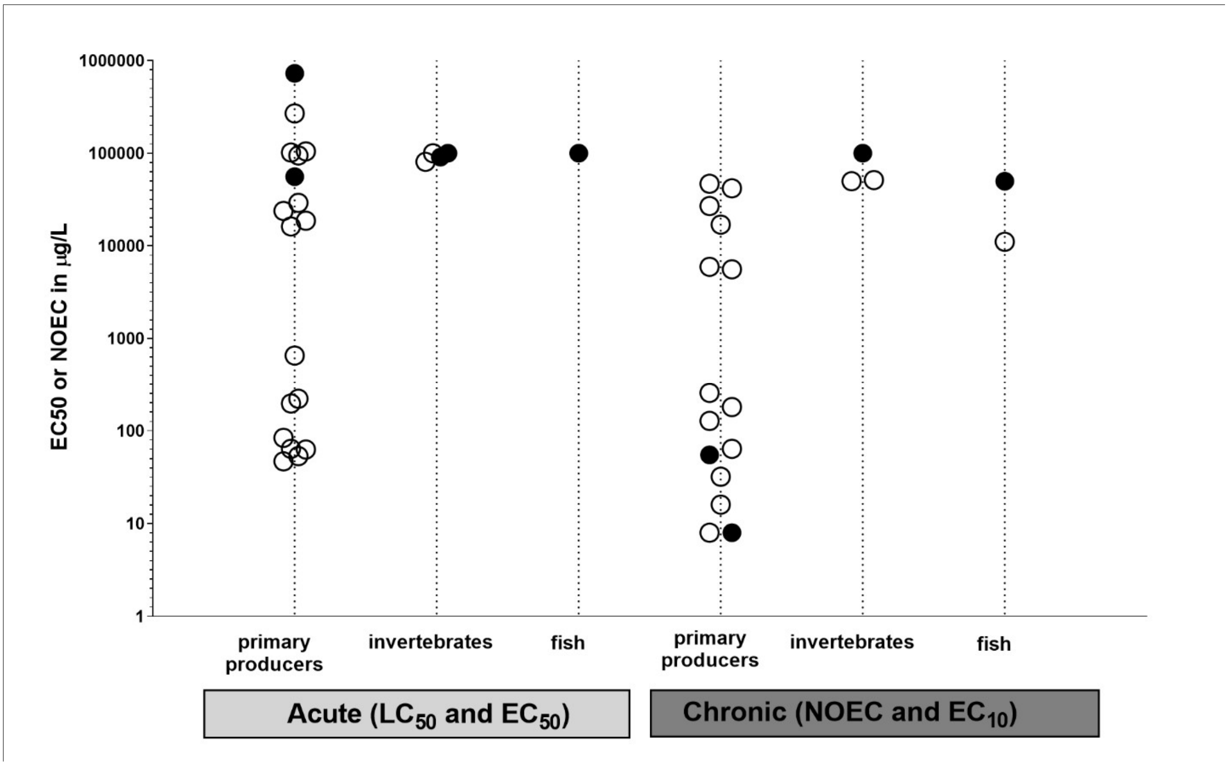


Figure 1 Graphical representation of all valid short-term and long-term effect data from Table 2 for *Mecoprop-P*. Filled symbols: unlimited values (>,≥/<,≤).

Figure 1 illustrates that primary producers are the most sensitive organisms to mecoprop-P in the data set. The highest effect concentrations for primary producers are in the same range as those for invertebrates and fish. The acute and chronic effect values for dicotyledonous water plants are several orders of magnitude below the effect values for algae, invertebrates and fish. This observation is in line with expectations due to the specific mode of action of mecoprop-P.

5.1 Comparison between marine and freshwater species

Due to the limited number of valid effect data for marine organisms (two species each in the acute and chronic datasets), a statistical comparison of the sensitivities of limnetic and marine organisms is not possible. Both data sets are merged for the following EQS derivation.

6 Derivation of the EQS

In order to derive chronic and acute quality criteria, the assessment factor method (AF method) can be used on the data basis of short-term and long-term effect data. This involves using the lowest chronic data point to derive an AA-EQS (Annual-Average-Environmental-Quality-Standard) and the lowest acute data point to derive a MAC-EQS (Maximum-Acceptable-Concentration-Environmental-Quality-Standard). If the data set is comprehensive enough, these EQS can additionally be determined using a species sensitivity distribution (SSD). Valid micro/mesocosm studies serve on the one hand to refine the AF derived by an SSD. On the other hand, they can also be used directly to determine an EQS.

7 Chronic toxicity

7.1 AA-EQS derivation with the AF method

Reliable chronic effect data are available for primary producers, daphnids and fish (Table).

Table 4 Overview of critical toxicity values for aquatic organisms from long-term studies for mecoprop-P .

Group	Species	Value	Conc. in µg/L	Reference
Basic data set				
Primary producer	*Ranunculus aquatilis, Myriophyllum spicatum, Hydrophila polysperma*	NOEC	8	(Périllon *et al.* 2021)
Crustacean	*Daphnia magna*	NOEC	50000	Dohmen 1993a, cited in Annex B of EC (1998)
Fish	*Lepomis macrochirus*	NOEC	50000	Munk 1989, cited in Annex B of EC (1998)
Supporting data				
Primary producer	*Hygrophila polysperma*	NOEC	<8	Périllon *et al.* (2021)

There are representatives of three taxonomic groups. According to the TGD for EQS (EC 2018a), a safety factor of 10 can thus be selected for deriving the AA-EQS. However, this only applies if the data set also contains a representative of the most sensitive taxonomic group. As has been shown for other auxin herbicides (see Introduction), dicotyledonous macrophytes are the most sensitive group of organisms. A study published in 2021 comprehensively tested the effect of mecoprop-P on 10 dicotyledonous macrophytes. We propose an AF of 10:

$$\textbf{AA-EQS (AF)} = 8\ \mu g/L / 10 = \mathbf{0.8\ \mu g/L}$$

7.2 AA-EQS derivation with the SSD method

According to the TGD for EQS, at least 10, preferably more than 15 valid data for a total of eight taxonomic groups must be available for the creation of an SSD. The chronic dataset does not meet these requirements (Table 5), as the 18 data come from only 6 organism groups.

Table 5 Lowest chronic effect data per species based on the effect data collection in Table 3.

NOEC/EC10 [µg/L]	Species	Group
8	*Myriophyllum spicatum*	Aquatic plant (Dicot)
8	*Ranunculus aquatilis*	Aquatic plant (Dicot)
8	*Hygrophila polysperma*	Aquatic plant (Dicot)
32	*Hottonia palustris*	Aquatic plant (Dicot)
32	*Hydrocotyle leucocephala*	Aquatic plant (Dicot)
64	*Ceratophyllum demersum*	Aquatic plant (Dicot)
128	*Callitriche palustris*	Aquatic plant (Dicot)
180	*Lemna minor*	Aquatic plant (Monocot)
256	*Ludwigia repens*	Aquatic plant (Dicot)
256	*Nymphoides peltata*	Aquatic plant (Dicot)
256	*Veronica beccabunga*	Aquatic plant (Dicot)
5’956	*Anabaena flos-aquae*	Cyanobacteria
27’000	*Raphidocelis subcapitata (Pseudokirchneriella subcapitata)*	Algae (Green algae)
41’800	*Navicula pelliculosa*	Algae (Diatom)
47’000	*Skeletonema costatum*	Algae (Green algae)
50’000	*Daphnia magna*	Invertebrate (Crustacean)
50’000	*Lepomis macrochirus*	Fish
50’000	*Oncorhynchus mykiss*	Fish
51’361	*Crassostrea gigas* (marin)	Invertebrate (Mollusk)

An SSD for all organisms listed in Table 5 as well as for dicot aquatic plants was produced for comparison with the AA-EQS derived in 7.1 (Fig. 2, Fig. 3). The data are not normally distributed (Annex II). The grouping of data points in Fig. 2 illustrates the specific sensitivity of water plants. An SSD for sensitive organism groups for a specific mode of action can be generated with at least 10 data points. This requirement is fulfilled, which is why a specific SSD for aquatic plants was created to derive an AA-EQS$_{SSD}$ (Fig. 3).

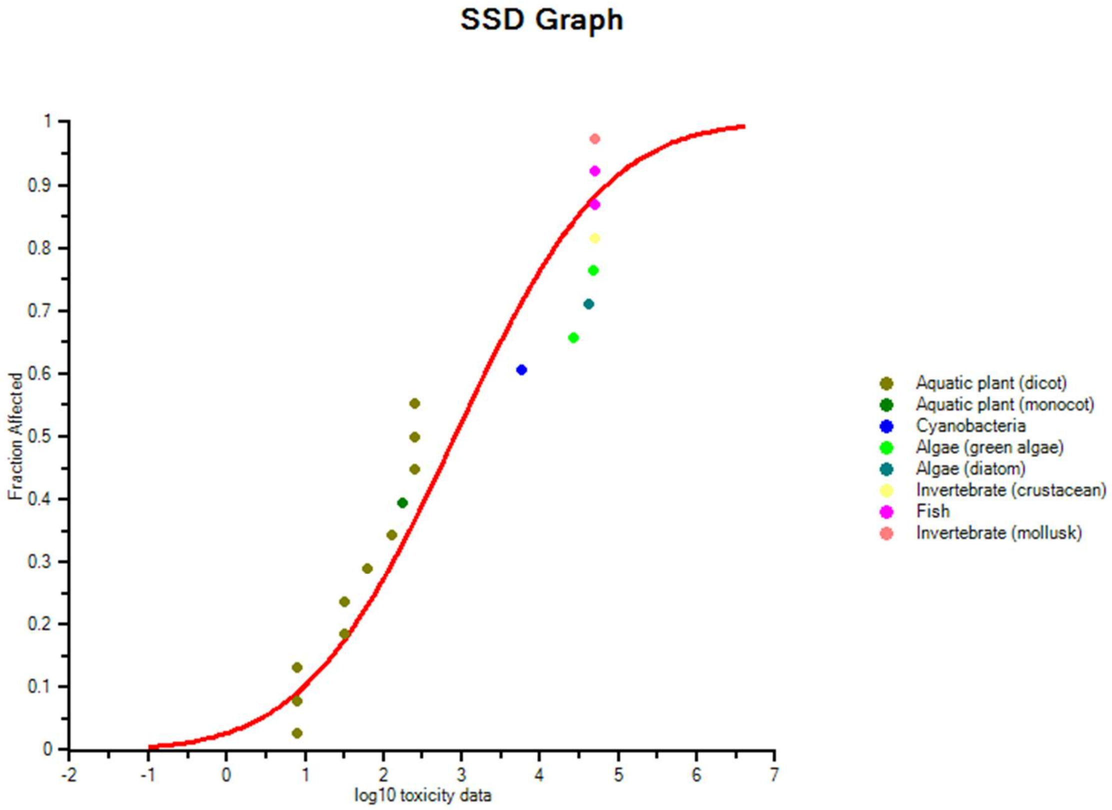


Figure 2 SSD based on chronic effect data from Table 5.

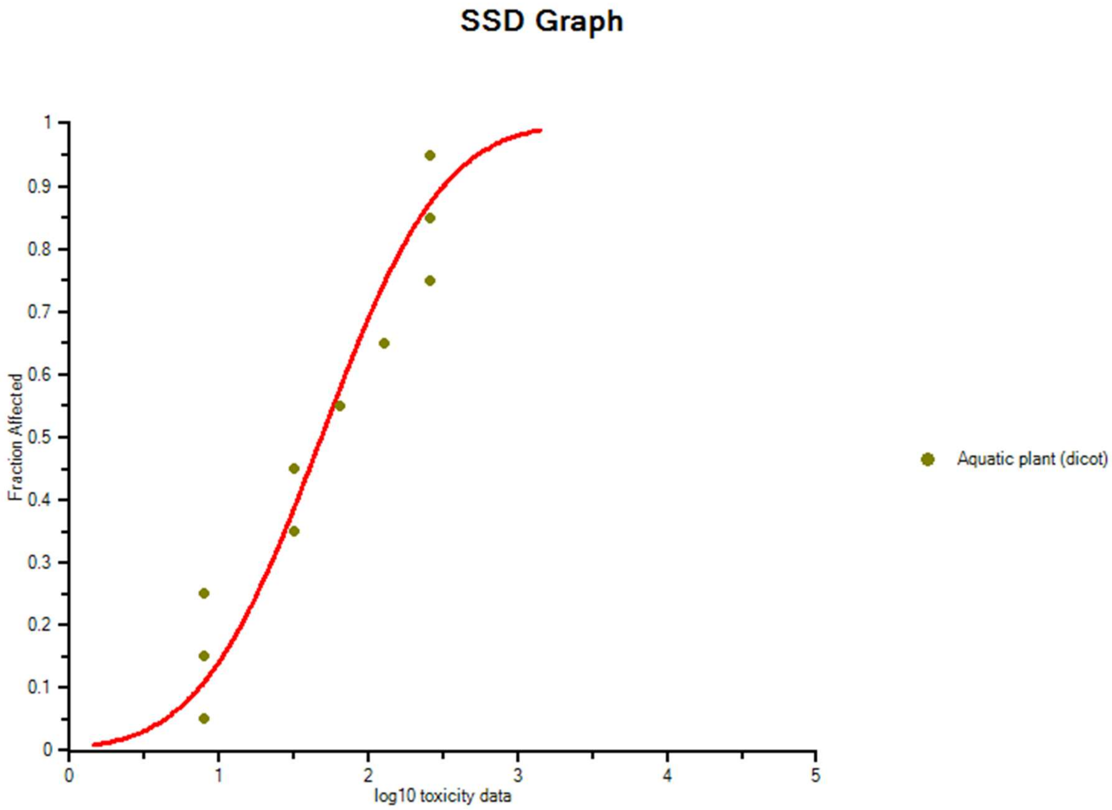


Figure 3 SSD based on chronic effect data for dicot aquatic plants from Table 5.

The data are normally distributed (Annex II). The resulting HC5 is 3.99 µg/L with a confidence interval of 0.67-10.89 µg/L and thus in the same order of magnitude as the critical chronic effect concentration of 8 µg/L identified in Section 7.1. The standard safety factor of 5 for SSD-based EQS is used to calculate the AA-EQS:

AA-EQS (SSD) = 3.99 µg/L / 5 = **0.798 µg/L**

7.3 AA-EQS from micro/mesocosm studies

No micro- or mesocosm studies with Mecoprop-P could be identified.

8 Acute toxicity

8.1 MAC-EQS derivation with the AF method

Valid EC50 values are available for the organism groups algae, monocot and dicot aquatic plants, daphnia and fish (Table).

Table 6 Overview of critical acute toxicity values for aquatic organisms for mecoprop-P.

Group	Species	Value	Conc (µg/L)	Reference
Basic data set				
Primary producers	*Ranunculus aquatilis*	EC50	46.9	(Périllon *et al.* 2021)
Crustaceans	*Daphnia magna*	EC50	>91‘000	Elendt-Schneider 1991, cited in Annex B of EC (1998)
Fish	*Lepomis macrochirus*	LC50	>100‘000	Munk 1989, cited in Annex B of EC (1998)

The lowest valid effect concentration of 27.1 µg/L has been reported for the dicot aquatic plant *Ranunculus aquatilis.* Mecoprop-P thus falls into risk class 1 (very toxic; Table 7).

Table 7 Acute aquatic toxicity risk classification based on lowest measured EC50 values (UN 2015).

Risk class	Lowest EC50 value	Achieved value
Not classified	>100 mg/L	
3 (harmful)	<100 mg/L; >10 mg/L	
2 (toxic)	<10 mg/L; >1mg/L	
1 (very toxic)	<1 mg/L	x

To derive short-term quality criteria (MAC-EQS), the AF method can be used on the data basis of acute toxicity data. If three valid EC50 short-term test results from representatives of the three trophic levels (fish, crustaceans, algae) are available, an assessment factor (AF) of 100 can be applied to the EC50 of the most sensitive study. The AF can be reduced to 10 according to the TGD for EQS (EC 2011) if the mechanism of action is known and a representative of the most sensitive taxonomic group is included in the effect data set. As shown for other auxin herbicides (see Introduction), the most sensitive species are dicot aquatic plants. Ten representatives of dicot aquatic plants are present in the data set. Therefore, the AF can be reduced to 10.

MAC-EQS (AF) = 46.9 µg/L / 10 = **4.69 µg/L**

8.2 MAC-EQS using the SSD method

According to the TGD for EQS, at least 10, preferably more than 15 valid data for a total of eight taxonomic groups must be available for the creation of an SSD. The acute data set does not meet these requirements (Table 8), as the 14 data come from 4 organism groups.

Table 8 Lowest acute effect data per species based on the effect data collection in Table 3.

NOEC/EC10 [µg/L]	Species	Group
46.9	***Ranunculus aquatilis***	Aquatic plant (Dicot)
53.5	*Myriophyllum spicatum*	Aquatic plant (Dicot)
63	*Hygrophila polysperma*	Aquatic plant (Dicot)
172.2	*Ceratophyllum demersum*	Aquatic plant (Dicot)
196.9	*Hydrocotyle leucocephala*	Aquatic plant (Dicot)
221.3	*Callitriche palustris*	Aquatic plant (Dicot)
277.1	*Hottonia palustris*	Aquatic plant (Dicot)
656.4	*Ludwigia repens*	Aquatic plant (Dicot)
18’700	*Lemna minor*	Aquatic plant (Monocot)
19’600	*Anabaena flos-aquae*	Cyanobacteria
80’951	*Crassostrea gigas* (marin)	Invertebrate (Mollusk)
95’000	*Skeletonema costatum*	Algae (Green algae)
152’000	*Navicula pelliculosa*	Algae (Diatom)
270’000	*Raphidocelis subcapitata (Pseudokirchneriella subcapitata)*	Algae (Green algae)

An SSD for all organisms listed in Table 8 as well as for dicot aquatic plants was created for comparison with the MAC-EQS derived in 8.1 (Fig. 4, Fig. 5). The grouping of data points in Fig. 4 illustrates the specific sensitivity of the dicot aquatic plants. The lowest endpoint for the monocot aquatic plant *Lemna minor* is almost 700 times higher than the lowest endpoint for dicot aquatic plants. There are not enough data for a specific SSD (<10).

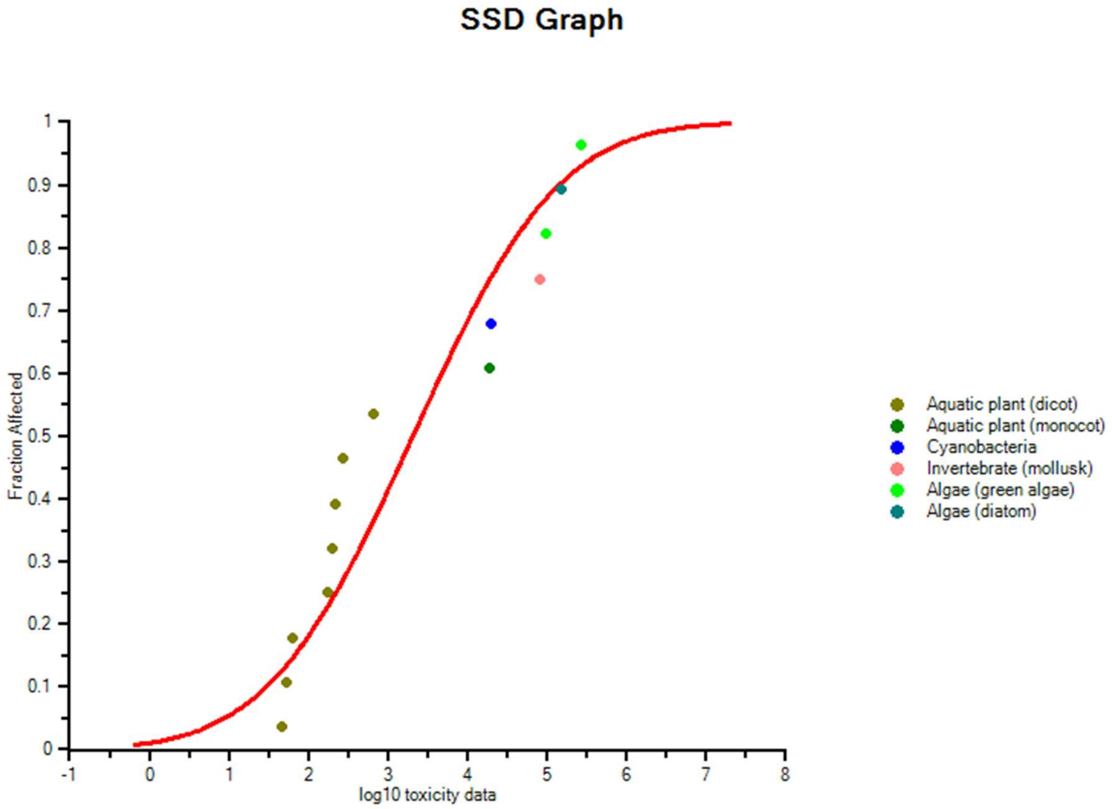


Figure 4 SSD based on acute data from Table 8.

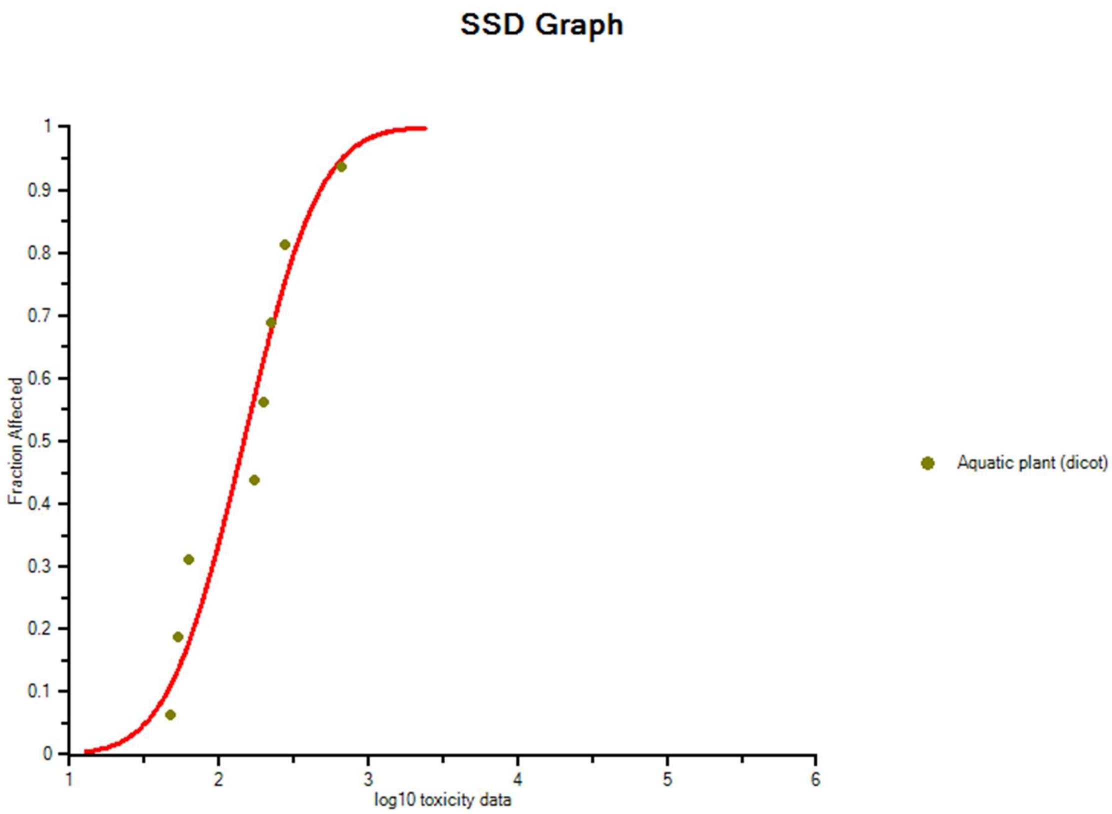


Figure 5 SSD based on acute effect data for dicot aquatic plants in Table 8.

The data are normally distributed (Annex III). The resulting HC5 is 30.05 µg/L with a confidence interval of 7.75-60.63 µg/L and thus in the same order of magnitude as the critical acute effect concentration of 46.9 µg/L identified in section 8.1.

8.3 MAC-EQS from micro-/mesocosm studies

No micro- or mesocosm studies with Mecoprop-P could be identified.

9 Assessment of bioaccumulation potential and secondary poisoning

According to the the TGD for EQS (EC 2018b) the bioaccumulation potential of a substance should first be determined to assess the risk of secondary poisoning. A measured biomagnification factor (BMF) of >1 or a bioconcentration factor (BCF) >100 provides an indication of a bioaccumulation potential. If no reliable

BMF or BCF data are available, the log K_{OW} can be used for estimation instead, which indicates a bioaccumulation potential from a value of >3. The highest log K_{OW} of mecoprop-P from Table 1 is 3.22 (geometric mean, Table 1), measured at a pH of 2.4. However, the log K_{OW} of mecoprop-P is pH-dependent, and decreases with increasing pH. At pH 7, reported log K_{OW} values are 0.64 and -0.391 (Table 1). This is due to the ionisability of mecoprop-P, which has a pK_a value of 3.2 (geometric mean, Table 1). This means that at environmentally relevant pH values the substance occurs in charged form and thus very likely remains dissolved in the water phase and does not accumulate in the food chain, as would otherwise be expected with a log K_{OW} of 3. This is also reflected in the bioconcentration factors. With a BCF of 3 (Ellgehausen, 1986), Mecoprop-P shows only weak bioaccumulation (BCF 1-10: weakly bioaccumulative). More recent data could not be identified. The bioaccumulation potential and the risk of secondary intoxication can therefore be classified as low.

10 Toxicity of transformation products

According to the registration dossier ((ECHA 2021b), List of Endpoints)), O-cresol (2-methylphenol, CAS 95-48-7) is the residue requiring further assessment. O-cresol originates from aqueous photodegradation with a maximum of 30.4 % applied radioactivity within 30 d.

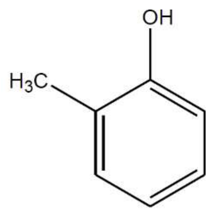


Figure 6 Molecular structure of o-cresol

O-cresol also occurs naturally (e.g. in asparagus, beans, buckwheat, and cardamom) (Api *et al.* 2021)[j].
Cresols are released via automobile exhaust in densely populated large cities because of high traffic and many gas stations, as well as combustion of coal, wood, and municipal solid waste (Badanthadka & Mehendale 2014). O-cresol is also used as preservative (mixed with other cresols) and in fragrances (Pepe et al. 2002 cited in (Andersen 2006)) with the calculated 95th percentile concentration in fine fragrances being 0.00011% (RIFM 2016, cited in (Api *et al.* 2021)). A REACH registration dossier is available for o-cresol for a production volume of ≥ 10 000 to < 100 000 tonnes (ECHA 2021b). In Switzerland, cresol (mix

[j] Citing VCF (Volatile Compounds in Food): Database/Nijssen, L.M.; Ingen-Visscher, C.A. van; Donders, J.J.H. (eds). – Version 15.1 – Zeist (The Netherlands): TNO Triskelion, 1963–2014. A continually updated database containing information on published volatile compounds that have been found in natural (processed) food products. Includes FEMA GRAS and EU-Flavis data.

of all three isomers; o-, m-, p-cresol) and amylmetacresol are authorised as human medicines for disinfection[k].

Aquatic toxicity data of o-cresol as presented in the RAR 2016 (EC 2016) were taken from the REACH registration dossier[l] and are listed in Table 9. The RAR 2016 also includes estimated values (Table 9).

Table 9 Aquatic toxicity data of o-cresol as presented in the RAR 2016 (EC 2016), taken from the REACH registration dossier.

Species	Exposure Duration	Endpoint	Effect Concentration	Reference
Salmo trutta	96 h	Mortality, LC50	6.2 mg/L	(EC 2016), Volume 3 CA-B9, p.56 (ECHA 2021b)
Oncorhynchus mykiss	96 h	Mortality, LC50	7 mg/L	(EC 2016), Volume 3 CA-B9, p.56 (ECHA 2021b)
Salvelinus fontinalis	96 h	Mortality, LC50	7.2 mg/L	(EC 2016), Volume 3 CA-B9, p.56 (ECHA 2021b)
Fish	"chronic"	NOEC	1.7 mg/L (estimated)	(EC 2016), Volume 3 CA-B9, p.56
Daphnia magna	48 h	Immobilisation, EC50	15.7 mg/L	(EC 2016), Volume 3 CA-B9, p.56 (ECHA 2021b)
Daphnia pulex	48 h	Immobilisation, EC50	9.6 mg/L	(EC 2016), Volume 3 CA-B9, p.56 (ECHA 2021b)
Daphnia cucullata	48 h	Immobilisation, EC50	16.4 mg/L	(EC 2016), Volume 3 CA-B9, p.56 (ECHA 2021b)
Daphnia.magna	"chronic"	NOEC	1 mg/L (estimated)	(EC 2016), Volume 3 CA-B9, p.56
Green algae	96 h	EC50	23.9 mg/L (estimated)	(EC 2016), Volume 3 CA-B9, p.56
Microcystis aeruginosa (Cyanaophyceae)	8 d	NOEC/EC3	6.8 mg/L	(ECHA 2021b)
Selenastrum sp.	96 h	EC50	100 mg/L	(ECHA 2021b)
Lemna spp.	7 d	EC50	11.9 mg/L (estimated)	(EC 2016), Volume 3 CA-B9, p.56

According to the REACH registration dossier (EC 2016), no reliable data on chronic toxicity towards fish and aquatic invertebrates are available for o-cresol. A literature search did likewise not yield any new data. For the related compound p-cresol, an Early-Life Stage Toxicity Test equivalent to OECD Guideline 210 for *Pimephales promelas* is available with a 32d NOEC of 1.35 mg/L (ECHA 2021b). The German Umweltbundesamt conducted a semi-static test on aquatic invertebrates according to the preliminary guideline proposal of 1984 which yielded a 21 d NOEC of 1 mg/l (ECHA 2021b).

The lowest endpoint from the above datasets per organism group was used in the aquatic risk assessment to provide quantitative assessment of the potential risk from the metabolite in the aquatic environment in EC (2016, Vol. 3 CP-B9). No effect data were available for *Myriophyllum* sp., either measured or predicted,

[k] https://www.swissmedic.ch/swissmedic/de/home/services/listen_neu.html#-894146586

[l] https://echa.europa.eu/de/registration-dossier/-/registered-dossier/14924

but according to the absence of the toxophore responsible for the herbicidal activity of the active substance mecoprop-P (Simmons 2015, cited in EC (2016)), it was concluded that the critical endpoint for the parent mecoprop-P was appropriate to assess the ecotoxicologicl relevance of the metabolite O-cresol instead of generating new data. According to the above, it could be concluded that the metabolite O-cresol is not of ecotoxicological relevance, being of lower risk to aquatic life than the active substance.

11 Protection of aquatic organisms

The effect data set for mecoprop-P includes all 3 trophic levels in the short-term and long-term toxicities. In the short-term effect studies as well as in the long-term effect studies, dicot aquatic plants were the most sensitive taxonomic group.

The MAC-EQS was derived based on the AF method, while the AF method as well as the SSD method could be applied for the AA-EQS. An SSD-based EQS should usually be preferred (EC 2018), which is why the AA-EQS (SSD) is proposed for mecoprop-P.

The proposed MAC-EQS and AA-EQS of 4.69 µg/L and 0.80 µg/L should provide sufficient protection for aquatic organisms of different trophic levels according to the state of knowledge. Both values are based on new data that could not be considered in the 2010 and 2015 reports.

12 Changes in the version from 10.08.2016 compated tot he version from 29.07.2013

In the course of the update, only one recent study with reliable and relevant effect data for a marine bivalve (*Crassostrea gigas*) could be researched (Mottier *et al.* 2014). Effect data from tests with formulations were classified as not relevant (C3), as in the other dossiers. However, the lowest effect values are still available for the monocot aquatic plant *Lemna minor* (Caley & Kelly 1999, cited in Addendum II of EC 1998). Effect data on dicot aquatic plants could not be researched, so the increased assessment factors still cannot be reduced. The proposed AA-EQS and MAC-EQS therefore remain unchanged.

13 Changes in the version from 10.08.2023 compared to the version from 10.08.2016

- Inclusion of studies Anonymous 2015, cited in RAR Mecoprop-P Volume 3 - B.9, p.25 (EC 2016) and Perillon et al. (2021).
- Update of the AA-EQS and the MAC-EQS based on new data (Perillon et al. 2021)
- Adjustment of the face value values (RAR 2016)
- Update of the chapter on bioaccumulation

- Updating of registration information and general information
- Updating the information on physicochemical properties
- Inserting an imprint

14 References

Armstrong K (2000) Mecroprop-P dimethylamine salt, Alga, growth inhibition test (72h EC50). Unveröffentlicht. [Zitiert in EC (1998) Addendum II].

Bell (1994) Mecoprop-p: acute toxicity to *Daphnia magna.* Unveröffentlicht. [Zitiert EC (1998) Annex B].

Bias R (1988) Determination of the acute toxicity of Duplosan KV (BAS 037 29 H) to the waterflea *Daphnia magna* Straus. BASF Report 1/0492/2/88-492/88, May 26, 1988. Task Force KIII 10.8: Reg. Doc. No. BASF 88/10037. [Zitiert in EC (1998) Annex B].

Bucheli TD, Müller SR, *et al.* (1998) Occurrence and behavior of pesticides in rainwater, roof runoff, and artificial stormwater infiltration. Environmental science & technology 32(22): 3457-3464

Burke J (2007) Mecoprop-p (DMA salt) Algal Growth Inhibition Assay Skeletonema. HLS Report ZZF0002/063525, Mecoprop-P Task Force. Proprietary Information. The data owners will supply a copy of the studies on request. Please address requests by e-mail to dgminc@bellsouth.net

Caley C. and Kelly C. (1999) Mecoprop-P dimethylamine salt. Lemna spp., growth inhibition test. Inveresk Report no. 17861. Mecoprop-p Task Force, BASF Doc ID 1999/1003117. [Zitiert in EC (1998) Addendum II].

de Vries R. and Gomez F. (1994c) Determination of the partition coefficient (n-octanol/water) of mecoprop-P (flask-shaking method) at 3 pH values. NOTOX, Hertogenbosch, The Netherlands Rhône-Poulenc Study no. 94-78. Task Force KII 2.13: Reg. Doc. No. BASF 94/11757. [Zitiert in EC (1998) Annex B].

DG SANCO (2003) Review report for the active substance mecoprop-p. Finalised in the Standing Committee on Plant Health at its meeting on 15 April 2003 in view of the inclusion of mecoprop in Annexe I of Directive 91/414/EEC. SANCO/3065/99-Final. European Commission Directorate-General Health and Consumer Protection

Dohmen GP (1993a) Effects of mecoprop-P on the reproduction of *Daphnia magna* Straus in a chronic toxicity test. BASF Report 3728. Unveröffentlicht. [Zitiert in EC (1998) Annex B].

Dohmen GP (1993b) Effect of mecoprop-p on the growth of the green alga *Pseudokirchneriella subcapitata* using the 72-hour growth inhibition test according to OECD 201. BASF Report No. 88/420. Unveröffentlicht. [Zitiert in EC (1998) Annex B].

EC (1998) European Commission (EC), Mecoprop-p Monograph Volume 1. Report and Proposed Decision. Draft of the EU Review Programme on active substances in Plant Protection Products. This monograph on the review of mecoprop-P has been prepared for submission to the Standing Committee on Plant Health to enable a decision to be made on the listing of the existing active substance mecoprop-P on Annex I of the Directive 91/414/EEC, according to Commission Regulations (EEC) No 3600/92 and 993/94.

EC (2011) Technical Guidance For Deriving Environmental Quality Standards. Common Implementation Strategy for the Water Framework Directive (2000/60/EC), Guidance Document No. 27.

Elendt-Schneider B (1991) Determination of acute toxicity of mecoprop-P (Reg. No. 154 241) to the water flea *Daphnia magna* Straus. BASF Project No. 1/89/0280/50/1. April 4, 1991. Task Force KII 8.8: Reg. Doc. No. BASF 91/10114. Task Force KIII 10.10: Reg. Doc. No. BASF 91/10114. [Zitiert in EC (1998) Annex B].

Ellgehausen H (1986) Accumulation and elimination of ^{14}C-mecoprop by Bluegill sunfish in a dynamic flow-through system. RCC Umweltchemie Project 076522 Report. Unpublished. [Zitiert in UK TAG 2007].

EPI (2011) Version 4.10 .The EPI (Estimation Programs Interface) Suite™ . A Windows®-based suite of physical/chemical property and environmental fate estimation programs developed by the EPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC).

Gomez F and Duverney-Pret P (1994) Mecoprop-P. Determination of the vapour pressure. Rhône-Poulenc study No. 94-27 Task Force KII 2.5: Reg. Doc. No. BASF 94/11754. [Zitiert in EC (1998) Annex B].

Gückel (1988) Determination of the vapour presure of mecoprop-P. BASF, Febr. 2, 1988 Task Force KII 2.4: Reg. Doc. No. BASF 88/10266. [Zitiert in EC (1998) Annex B].

Hoberg J (1992a) MCPP-p-DMAS: toxicity to the freshwater diatom, *Navicula pelliculosa*. Final Report – Laboratory Project Number 92-10-4463, 10566.1191.6211.440. Unpublished study prepared by Springborn Laboratories. [Zitiert in UK TAG 2007].

Hoberg J (1992b) MCPP-p-DMAS: toxicity to the freshwater green alga, *Selenastrum capricornutum*. Final Report – Laboratory Project Number 92-2-4113, 10566.1191.6211.430 574.0 . Unpublished study prepared by Springborn Laboratories. [Zitiert in UK TAG 2007].

Hoberg J (1992c) MCPP-p-DMAS: toxicity to the marine diatom, *Skeletonema costatum*. Final Report – Laboratory Project Number 92-3-4170, 10566.1191.6211.450, 574.0. Unpublished study prepared by Springborn Laboratories. [Zitiert in UK TAG 2007].

Hoberg J and Witting R (1992) MCPP-P DMAS – Toxicity to the duckweed *Lemna gibba*. Springborn Laboratories, Inc. SLI Report # 92-3-4174. Mecoprop-p Task Force, BASF Doc # 92/5217. [Zitiert in EC (1998) Addendum III).

HSDB (2003) Toxicology Data Network (TOXNET®): Hazardous Substances Data Bank (HSDB®) [online]. Bethesda, MD: Division of Specialized Information Services (SIS) of the US National Library of Medicine (NLM). http://toxnet.nlm.nih.gov/ [Letzte Abfrage 10.08.2011]

IKSR (2009) Ableitung von Umweltqualitätsnormen für die Rhein-relevanten Stoffe. Bericht Nr. 164 Kaiserin-Augusta-Anlagen 15, D 56068 Koblenz.

INERIS (2013) VALEUR GUIDE ENVIRONNEMENTALE - MECOPROP – n° CAS : 93-65-2. Validation groupe d'experts : Avril 2013, Version 2 : 07/08/2013.

Jenkins CR (2007) Mecoprop-p (DMA salt) Algal Growth Inhibition Assay Navicula. HLS Report ZZF0001/063120, Mecoprop-P Task Force. Proprietary Information. The data owners will supply a copy of the studies on request. Please address requests by e-mail to dgminc@bellsouth.net

JRC (2016) Mecoprop Dossier (Nicht-öffentlicher Entwurf), Stand: 12/05/2016. Joint Research Centre (JRC), Ispra, Italy

Kästel R (1994) Physical and chemical properties report for mecoprop-P (technical) BASF, Lab study Code PCP01246, January 1994 Task Force KII 2.7: Reg. Doc. No. BASF 94/10181. [Zitiert in EC (1998) Annex B].

Kirkwood RC (1983) The relationship of metabolism studies to the modes of action of herbicides. Pesticide Science 14: 453-460. Task Force KII 3.3: Reg.Doc. No. BASF 83/10509. [Zitiert in UK TAG 2007].

Kirsch P and Munk R (1992a) Study report. Acute toxicity study on the Bluegill (*Lepomis macrochirus* RAF) of mecoprop-P DMA salt in a static system (96 hours). Unpublished. [Zitiert in EC (1998) Annex B].

Kirsch P and Munk R (1992b) Report on the study of the acute toxicity of mecoprop-p DMA salt on rainbow trout (*Oncorhynchus mykiss*). Unpublished. [Zitiert in EC (1998) Annex B].

Klimisch HJ, Andreae M and Tillmann U (1997) A systematic approach for evaluating the quality of experimental toxicological and ecotoxicological data. Regulatory Toxicology and Pharmacology 25(1): 1-5

Kröhl T (1994a) Physical and chemical properties report for mecoprop-P (154 241) BASF, Lab. study PCF 01409 Task Force KII 2.2: Reg. Doc. No. BASF 94/10790. [Zitiert in EC (1998) Annex B].

Lewis S, Murgatroy C and Gardiner J (1996) Proposed Environmental Quality Standards for 2,4-D and mecoprop in water. Environment Agency R&D Note 502. Bristol: Environment Agency.

Memmert U and Knoch E (1993a) Acute toxicity of Marks Optica MPn to rainbow trout (*Oncorhynchus mykiss*) in a flow-through test (96 hours). RCC Umweltchemie. RCC 409116, Aug.25, 1993. Task Force KIII 10.3: Reg. Doc. No. BASF 93/11626. [Cited in EC (1998) Annex B].

Memmert U and Knoch E (1993b) Acute toxicity of Marks Optica MP n to *Daphnia magna* (48-hour immobilization test). RCC Umweltchemie. RCC 409138, Aug.25, 1993. Task Force KIII 10.9: Reg. Doc. No. BASF 93/11635. [Zitiert in EC (1998) Annex B].

Memmert U and Knoch E (1993c) Toxicity of Marks Optica MP n to *Pseudokirchneriella subcapitat*a (algae growth inhibition test). RCC Umweltchemie. Study RCC 409151, Aug.25, 1993. Task Force KIII 10.12: Reg. Doc. No. BASF 93/11627. [Zitiert in EC (1998) Annex B].

Moermond C, Kase R, Korkaric M, Ågerstrand M (2016) CRED: Criteria for reporting and evaluating ecotoxicity data. Environmental Toxicology and Chemistry 35, 1297-1309.

Mottier A, Kientz-Bouchart V, Dubreule C, Serpentini A, Lebel J M, Costil K (2014) Effects of acute exposures to mecoprop, mecoprop-p and their biodegradation product (2-MCP) on the larval stages of the Pacific oyster, Crassostrea gigas. Aquatic Toxicology 146, 165-175.

Munk R (1984) Report on the study of the acute toxicity of CMPP (Mecoprop) - D-form (test substance 84/173) to Rainbow trout (*Salmo gairdneri Rich*). BASF, Dec. 20, 1984. Task Force KII 8.4: Reg. Doc. No. BASF 84/10031, Task Force KIII 10.5: Reg.Doc. No. BASF 84/10031. [Zitiert in EC (1998) Annex B].

Munk R (1989) Report on the study of the acute toxicity of mecoprop-p. Bluegill (*Lepomis macrochirus*). Unveröffentlicht. [Zitiert in EC (1998) Annex B].

Obrist J (1986) Photodegradation and hydrolysis of mecoprop in aqueous buffer. azleton Lab. Am, HLA 6015-320. Sept. 8, 1986 ask Force KII 2.15: Reg. Doc. No. BASF 86/0484.ufarm Task Force KII: 2.9.1/01. [Zitiert in EC (1998) Annex B].

Oekotoxzentrum (2011) EQS-Vorschlag des Ökotoxzentrums für: 2,4-Dichlorphenoxyessigsäure (2,4-D)

Office of Pesticides Programs (2000) Pesticide Ecotoxicity Database. Washington, DC: US EPA Environmental Fate Division. [Zitiert in UK TAG 2007].

Ohnsorge U (1994) Henry's Law Constant for mecoprop-P. BASF, Apr. 27, 1994 Task Force KII 2.6: Reg. Doc. No. BASF 94/10259. [Zitiert in EC (1998) Annex B].

Pawliczek (1987) Determination of the solubility of mecoprop-P in water at different pH values. BASF, Lab. report No 2443 Task Force KII2.9: Reg. Doc. No. BASF 87/0516. [Zitiert in EC (1998) Annex B].

Redeker J (1991a) Determination of the Octanol/water-partition coefficient of mecoprop-P by HPLC. BASF, Lab. Report 3218, Sept 1991. Task Force KII 2.12: Reg. Doc. No. BASF 91/10903. [Zitiert in EC (1998) Annex B].

Redeker J (1991b) Determination of the pKa of mecoprop-P in water at 20oC. BASF, Lab. Report 3220, August 1991. Task Force KII 2.18: Reg. Doc. No. BASF 91/10721. [Zitiert in EC (1998) Annex B].

Rodríguez-Cruz MS, Bælum J, *et al.* (2010) Biodegradation of the herbicide mecoprop-p with soil depth and its relationship with class III tfdA genes. Soil Biology and Biochemistry 42(1): 32-39

Tomlin CDS (2006) The Pesticide Manual.

Türk W (1994) Determination of the appearance, the melting point and thermal conversions of mecoprop-P (Reg.No. 154241)(PAI). BASF, Lab. Study PCP 03318. Task Force KII 2.1: Reg. Doc. No. BASF 94/11698. [Zitiert in EC (1998) Annex B].

UK TAG (2007) Proposed EQS for Water Framework Directive Annex VIII substances: mecoprop (Science Report – HOEP670085/SR19).

UK TAG (2010) Proposed EQS for Water Framework Directive Annex VIII substances: mecoprop (Technical report – SCHO1110BTEO-E-E). ISBN: 978-1-84911-207-9.

UN (2015) Globally Harmonized System of Classification and Labelling of Chemicals (GHS), 6th revised edition ed. United Nations, New York.

References to the update in 2022

Andersen, A. (2006) Final report on the safety assessment of sodium p-chloro-m-cresol, p-chloro-m-cresol, chlorothymol, mixed cresols, m-cresol, o-cresol, p-cresol, isopropyl cresols, thymol, o-cymen-5-ol, and carvacrol. Int J Toxicol 25 Suppl 1, 29-127.

Api, A.M., Belsito, D., Biserta, S., Botelho, D., Bruze, M., Burton, G.A., Buschmann, J., Cancellieri, M.A., Dagli, M.L., Date, M., Dekant, W., Deodhar, C., Fryer, A.D., Gadhia, S., Jones, L., Joshi, K., Kumar, M., Lapczynski, A., Lavelle, M., Lee, I., Liebler, D.C., Moustakas, H., Na, M., Penning, T.M., Ritacco, G., Romine, J., Sadekar, N., Schultz, T.W., Selechnik, D., Siddiqi, F., Sipes, I.G., Sullivan, G., Thakkar, Y. and Tokura, Y. (2021) RIFM fragrance ingredient safety assessment, o-cresol, CAS Registry Number 95-48-7. Food and Chemical Toxicology 149, 112112.

Badanthadka, M. and Mehendale, H.M. (2014) Encyclopedia of Toxicology (Third Edition). Wexler, P. (ed), pp. 1061-1065, Academic Press, Oxford.

BAFU (2017) Information über chemische Durchwurzelungsschutzmittel in Bitumenbahnen - Stand 2017.

Der Schweizerische Bundesrat (2020) Gewässerschutzverordnung (GSchV) vom 28. Oktober 1998 (Stand am 1. April 2020).

EC (2016) Renewal Assessment Report prepared according to the Commission REgulation (EU) No 1107/2009 MECOPROP-P.

EC (2018a) CLH report Proposal for Harmonised Classification and Labelling Based on Regulation (EC) No 1272/2008 (CLP Regulation), Annex VI, Part 2 International Chemical Identification: mecoprop-P (ISO) [1] and its salts; (R)-2-(4-chloro-2-methylphenoxy)propionic acid [1] and its salts.

EC (2018b) Technical Guidance for Deriving Environmental Quality Standards Environment, Guidance Document No. 27, Updated version 2018, Document endorsed by EU Water Directors at their meeting in Sofia on 11-12 June 2018.

ECETOC (2013) Environmental exposure assessment of ionisable organic compounds. Technical report 123.

ECHA (2021a) Substance Infocard mecoprop-P (ISO); (R)-2-(4-chloro-2-methylphenoxy)propionic acid https://echa.europa.eu/de/substance-information/-/substanceinfo/100.036.838

ECHA (2021b) mecoprop-P (ISO); (R)-2-(4-chloro-2-methylphenoxy)propionic acid REACH registration dossier https://echa.europa.eu/de/registration-dossier/-/registered-dossier/16233/1/1

EFSA (2016) Mecoprop-P Renewal Assessment Report prepared according to the Commission Regulation (EU) No 1107/2009.

EFSA (2017) Peer review of the pesticide risk assessment of the active substance mecoprop-P. EFSA Journal 15(5), e04832.

Guo, W., Wang, W., Zhang, W., Li, W., Wang, Y., Zhang, S., Chang, J., Ye, Q. and Gan, J. (2021) Mechanisms of the enantioselective effects of phenoxyalkanoic acid herbicides DCPP and MCPP. Science of the Total Environment 788.

Il Consiglio federale svizzero (2020) Ordinanza sulla protezione delle acque (OPAc) del 28 ottobre 1998 (Stato 1° aprile 2020).

Klimisch, H.J., Andreae, M. and Tillmann, U. (1997) A systematic approach for evaluating the quality of experimental toxicological and ecotoxicological data. Regulatory Toxicology and Pharmacology 25, 1-5.

Le Conseil fédéral suisse (2020) Ordonnance sur la protection des eaux (OEaux) du 28 octobre 1998 (Etat le 1er avril 2020).

Moermond, C.T.A., Kase, R., Korkaric, M. and Ågerstrand, M. (2016) CRED: Criteria for reporting and evaluating ecotoxicity data. Environmental Toxicology and Chemistry 35(5), 1297-1309.

Périllon, C., Feibicke, M., Sahm, R., Kusebauch, B., Hönemann, L. and Mohr, S. (2021) The auxin herbicide mecoprop-P in new light: Filling the data gap for dicotyledonous macrophytes. Environmental Pollution 272.

Smith, G., Kennard, C.H.L., White, A.H. and Hodgson, P.G. (1980) (+-)-2-(4-Chloro-2-methylphenoxy)propionic acid (mecoprop). Acta Crystallographica Section B 36(4), 992-994.

The Swiss Federal Council (2020) Waters Protection Ordinance (WPO) of 28 October 1998 (Status as of 1 April 2020).

Westlund, P. and Yargeau, V. (2017) Investigation of the presence and endocrine activities of pesticides found in wastewater effluent using yeast-based bioassays. Science of the Total Environment 607-608, 744-751.

15 Annex I

Table A1 Averaged relative growth rates in terms of number of leaves (RGR-NL) in *Hygrophila polysperma* based on the raw data provided by the authors of the study Perillon *et al. (*2021).

log concentration [µg/L]	mean RGR-NL	standard devation	number of values
0.90	0.79	0.08	10
1.20	0.54	0.05	10
1.51	0.65	0.10	10
1.81	0.50	0.12	10
2.11	0.35	0.05	10
2.41	0.22	0.05	10
2.71	0.22	0.04	10

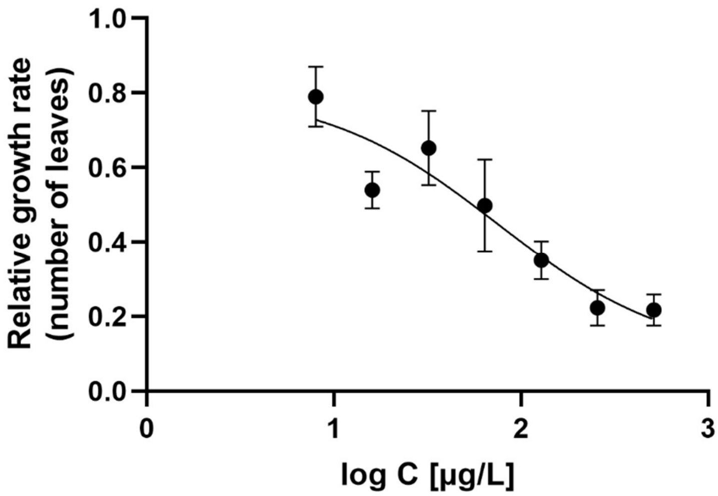


Figure A1 Relative growth rate of *Hygrophila polysperma* with respect to the number of leaves (RGR-NL, N=10) and the corresponding lon-linear fit (log-normal, GraphPad Prism 9.1.1 (225)).

Output parameters GraphPad Prism 9.1.1 (225)

log(inhibitor) vs. response -- Variable slope (four parameters)	
Best-fit values	
Bottom	0.08854
Top	0.8066
LogIC50	1.877
HillSlope	-0.9320
IC50	75.29
Chip	0.7180
95% CI (profile likelihood)	

Bottom	??? to 0.2394
Top	0.6526 to ???
LogIC50	???
HillSlope	-2.836 to ???
IC50	???
Goodness of Fit	
Degrees of Freedom	66
R squared	0.7953
Sum of Squares	0.6473
Sy.x	0.09903
Number of points	
# of X values	70
# Y values analysed	70

Weibull [Y=1-exp(-exp(a+b*log(x)))]

Best-fit values	
a	Unstable
b	Unstable
95% CI (profile likelihood)	
a	(Very wide)
b	(Very wide)
Goodness of Fit	
Degrees of Freedom	68
R squared	-3.000
Sum of Squares	12.65
Sy.x	0.4313
Number of points	
# of X values	70
# Y values analysed	70

16 Annex II

„Goodness of fit“ for the SSD in Fig. 2 – calculated with the Program ETX 2.3 (van Vlaardingen *et al*. 2004):

Anderson-Darling test for normality

Sign. level	Critical	Normal?		
0.1	0.631	Rejected		
0.05	0.752	Rejected	AD Statistic:	1.199898
0.025	0.873	Rejected	n:	19
0.01	1.035	Rejected		

Kolmogorov-Smirnov test for normality

Sign. level	Critical	Normal?		
0.1	0.819	Rejected		
0.05	0.895	Rejected	KS Statistic:	0.958144
0.025	0.995	Accepted	n:	19
0.01	1.035	Accepted		

Cramer von Mises test for normality

Sign. level	Critical	Normal?		
0.1	0.104	Rejected		
0.05	0.126	Rejected	CM Statistic:	0.18101
0.025	0.148	Rejected	n:	19
0.01	0.179	Rejected		

HC5 for the SSD in Fig. 2 – calculated with the Program ETX 2.3 (van Vlaardingen *et al*. 2004).

Parameters of the normal distribution

Name	Value	Description
mean	2.916847	mean of the log toxicity values
s.d.	1.509517	sample standard deviation
n	19	sample size

HC5 results

Name	Value	log10 (Value)
LL HC5	0.181649	-0.74077
HC5	2.46571	0.391942
UL HC5	14.43497	1.159416
sprHC5	79.46645	1.900184

FA At HC5 results

Name	Value	Description
FA lower	1.221	5% confidence limit of the FA at standardised median logHC5
FA median	5	50% confidence limit of the FA at standardised median logHC5
FA upper	14.393	95% confidence limit of the FA at standardised median logHC5

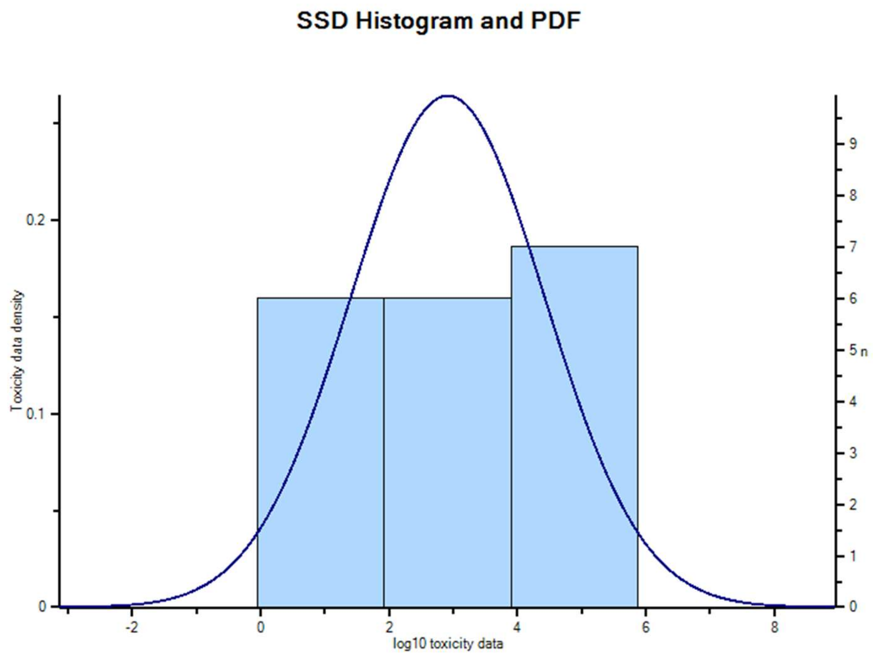
HC50 results

Name	Value	log10 (Value)
LL HC50	207.1707	2.297763
HC50	825.7465	2.941665
UL HC50	3291.282	3.585566
sprHC50	15.88681	1.287803

FA At HC50 results

Name	Value	Description
FA lower	35.29548	5% confidence limit of the FA at standardised median logHC50
FA median	50	50% confidence limit of the FA at standardised median logHC50
FA upper	64.70452	95% confidence limit of the FA at standardised median logHC50

Histogram for the SSD in Fig. 2 – calculated with the Program ETX 2.3 (van Vlaardingen *et al.* 2004).



„Goodness of fit" for the SSD in Fig. 3 – calculated with the Program ETX 2.3 (van Vlaardingen *et al*. 2004):

Anderson-Darling test for normality

Sign. level	Critical	Normal?		
0.1	0.631	Accepted		
0.05	0.752	Accepted	AD Statistic:	0.593622
0.025	0.873	Accepted	n:	10
0.01	1.035	Accepted		

Kolmogorov-Smirnov test for normality

Sign. level	Critical	Normal?		
0.1	0.819	Accepted		
0.05	0.895	Accepted	KS Statistic:	0.650415
0.025	0.995	Accepted	n:	10
0.01	1.035	Accepted		

Cramer von Mises test for normality

Sign. level	Critical	Normal?		
0.1	0.104	Accepted		
0.05	0.126	Accepted	CM Statistic:	0.064283
0.025	0.148	Accepted	n:	10
0.01	0.179	Accepted		

HC5 for the SSD in Fig. 3 – calculated with the Program ETX 2.3 (van Vlaardingen *et al*. 2004).

Parameters of the normal distribution

Name	Value	Description
mean	1.664283	mean of the log toxicity values
s.d.	0.70586	sample standard deviation
n	10	sample size

HC5 results

Name	Value	log10 (Value)	Description
LL HC5	0.674805	0.674805	lower estimate of the HC5
HC5	3.985479	3.985479	median estimate of the HC5
UL HC5	10.88786	10.88786	upper estimate of the HC5
sprHC5	16.13484	16.13484	spread of the HC5 estimate

FA At HC5 results

Name	Value	Description
FA lower	0.612	5% confidence limit of the FA at standardised median logHC5

FA median	5	50% confidence limit of the FA at standardised median logHC5
FA upper	20.036	95% confidence limit of the FA at standardised median logHC5

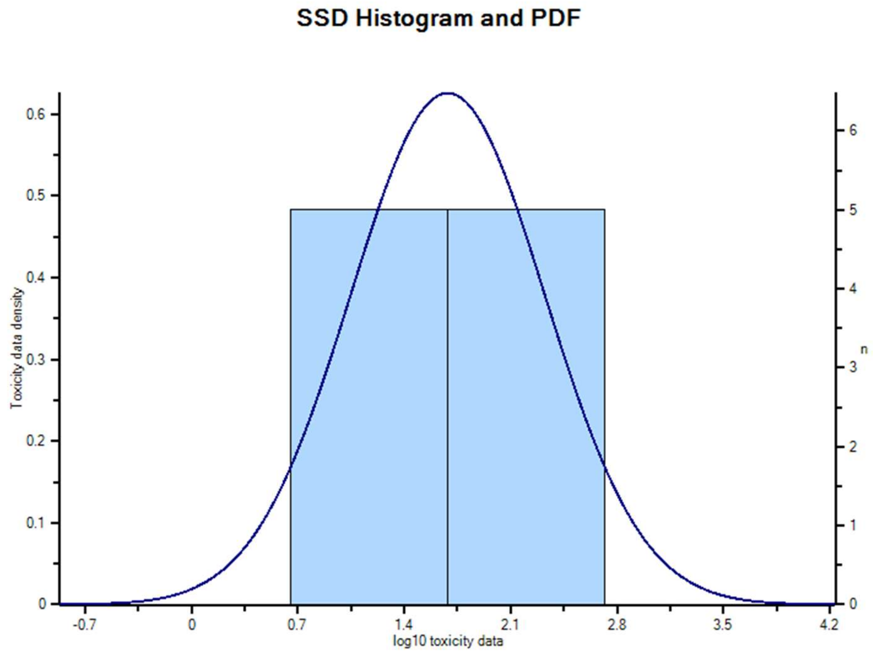
HC50 results

Name	Value	log10 (Value)	Description
LL HC50	20.70388	1.255109	lower estimate of the HC50
HC50	48.50293	1.664283	median estimate of the HC50
UL HC50	113.6277	2.073456	upper estimate of the HC50
sprHC50	5.48823	0.818348	spread of the HC50 estimate

FA At HC50 results

Name	Value	Description
FA lower	30.14801	5% confidence limit of the FA at standardised median logHC50
FA median	50	50% confidence limit of the FA at standardised median logHC50
FA upper	69.85199	95% confidence limit of the FA at standardised median logHC50

Histogram for the SSD in Fig. 3 – calculated with the Program ETX 2.3 (van Vlaardingen *et al*. 2004).



17 Annex III

„Goodness of fit“ for the SSD in Fig. 4 – calculated with the Program ETX 2.3 (van Vlaardingen *et al*. 2004):

Anderson-Darling test for normality

Sign. level	Critical	Normal?		
0.1	0.631	Rejected		
0.05	0.752	Rejected	AD Statistic:	0.92384
0.025	0.873	Rejected	n:	14
0.01	1.035	Accepted		

Kolmogorov-Smirnov test for normality

Sign. level	Critical	Normal?		
0.1	0.819	Rejected		
0.05	0.895	Accepted	KS Statistic:	0.902611
0.025	0.995	Accepted	n:	14
0.01	1.035	Accepted		

Cramer von Mises test for normality

Sign. level Critical Normal?

0.1	0.104	Rejected		
0.05	0.126	Rejected	CM Statistic:	0.152427
0.025	0.148	Accepted	n:	14
0.01	0.179	Accepted		

HC5 for the SSD in Fig. 4 – calculated with the Programm ETX 2.3 (van Vlaardingen *et al*. 2004).

Parameters of the normal distribution

Name	Value	Description
mean	3.314037	mean of the log toxicity values
s.d.	1.436121	sample standard deviation
n	14	sample size

HC5 results

Name	Value	log10 (Value)	Description
LL HC5	0.362571	-0.44061	lower estimate of the HC5
HC5	7.872187	0.896095	median estimate of the HC5
UL HC5	54.51172	1.73649	upper estimate of the HC5
sprHC5	150.3476	2.177097	spread of the HC5 estimate

FA At HC5 results

Name	Value	Description
FA lower	0.92	5% confidence limit of the FA at standardised median logHC5
FA median	5	50% confidence limit of the FA at standardised median logHC5
FA upper	16.633	95% confidence limit of the FA at standardised median logHC5

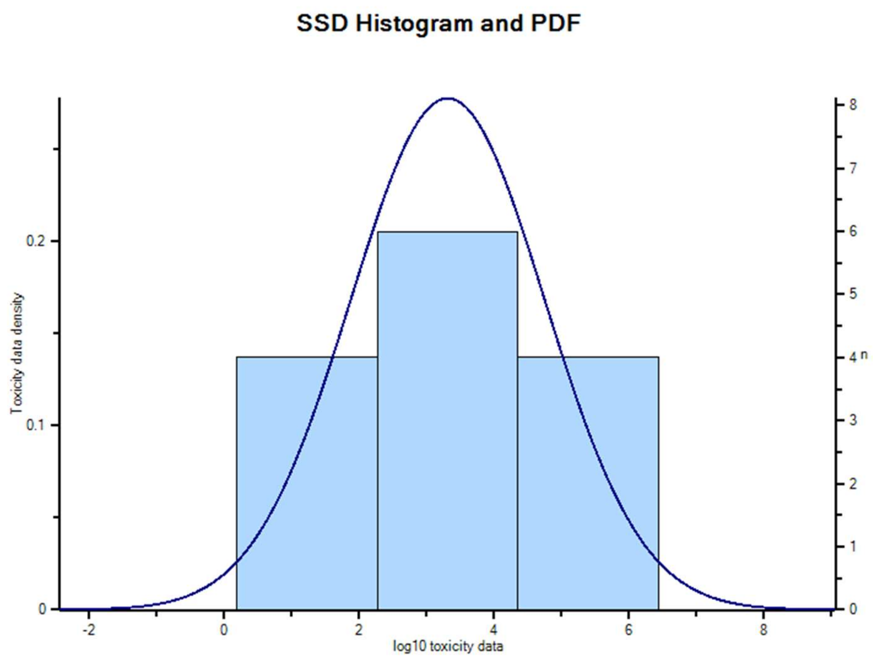
HC50 results

Name	Value	log10 (Value)	Description
LL HC50	430.8425	2.634319	lower estimate of the HC50
HC50	2060.807	3.314037	median estimate of the HC50
UL HC50	9857.252	3.993756	upper estimate of the HC50
sprHC50	22.87901	1.359437	spread of the HC50 estimate

FA At HC50 results

Name	Value	Description
FA lower	33.01114	5% confidence limit of the FA at standardised median logHC50
FA median	50	50% confidence limit of the FA at standardised median logHC50
FA upper	66.98886	95% confidence limit of the FA at standardised median logHC50

Histogramm for the SSD in Fig. 4 – calculated with the Program ETX 2.3 (van Vlaardingen *et al*. 2004).



„Goodness of fit" for the SSD in Fig. 5 – calculated with the Program ETX 2.3 (van Vlaardingen *et al*. 2004):

Anderson-Darling test for normality

Sign. level	Critical	Normal?		
0.1	0.631	Accepted		
0.05	0.752	Accepted	AD Statistic:	0.391423
0.025	0.873	Accepted	n:	8
0.01	1.035	Accepted		

Kolmogorov-Smirnov test for normality

Sign. level	Critical	Normal?		
0.1	0.819	Accepted		
0.05	0.895	Accepted	KS Statistic:	0.609171
0.025	0.995	Accepted	n:	8
0.01	1.035	Accepted		

Cramer von Mises test for normality

Sign. level	Critical	Normal?		
0.1	0.104	Accepted		
0.05	0.126	Accepted	CM Statistic:	0.050017

0.025	0.148	Accepted	n:	8
0.01	0.179	Accepted		

HC5 for the SSD in Fig. 5 – calculated with the Program ETX 2.3 (van Vlaardingen *et al*. 2004).

Parameters of the normal distribution

Name	Value	Description
mean	2.166742	mean of the log toxicity values
s.d.	0.400849	sample standard deviation
n	8	sample size

HC5 results

Name	Value	log10 (Value)	Description
LL HC5	7.746747	0.889119	lower estimate of the HC5
HC5	30.04658	1.477795	median estimate of the HC5
UL HC5	60.63394	1.782716	upper estimate of the HC5
sprHC5	7.827019	0.893596	spread of the HC5 estimate

FA At HC5 results

Name	Value	Description
FA lower	0.435	5% confidence limit of the FA at standardised median logHC5
FA median	5	50% confidence limit of the FA at standardised median logHC5
FA upper	22.949	95% confidence limit of the FA at standardised median logHC5

HC50 results

Name	Value	log10 (Value)	Description
LL HC50	79.11144	1.684697	lower estimate of the HC50
HC50	146.8052	1.99248	median estimate of the HC50
UL HC50	272.4231	2.300262	upper estimate of the HC50
sprHC50	3.443536	0.615565	spread of the HC50 estimate

FA At HC50 results

Name	Value	Description
FA lower	28.0437	5% confidence limit of the FA at standardised median logHC50
FA median	50	50% confidence limit of the FA at standardised median logHC50
FA upper	71.9563	95% confidence limit of the FA at standardised median logHC50

Histogram for the SSD in Fig. 5 – calculated with the Program ETX 2.3 (van Vlaardingen *et al*. 2004).