Food and Agriculture Organization
of the United Nations

FAO SPECIFICATIONS AND EVALUATIONS

FOR AGRICULTURAL PESTICIDES

MCPA

[(4-chloro-o-tolyl)oxy]acetic acid

2022

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MCPA

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FAO specifications are developed with the basic objective of promoting, as far as practicable, the manufacture, distribution and use of pesticides that meet basic quality requirements.

Compliance with the specifications does not constitute an endorsement or warranty of the fitness of a particular pesticide for a particular purpose, including its suitability for the control of any given pest, or its suitability for use in a particular area. Owing to the complexity of the problems involved, the suitability of pesticides for a particular purpose and the content of the labelling instructions must be decided at the national or provincial level.

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[1] This disclaimer applies to all specifications published by FAO.

INTRODUCTION

FAO establishes and publishes specifications* for technical material and related formulations of agricultural pesticides, with the objective that these specifications may be used to provide an international point of reference against which products can be judged either for regulatory purposes or in commercial dealings.

From 2002, the development of WHO specifications follows the **New Procedure**, described in the 1st edition of "Manual for Development and Use of FAO and WHO Specifications for Pesticides" (2002) - currently available as 2nd edition (2022), which is available only on the internet through the FAO and WHO web sites.

This **New Procedure** follows a formal and transparent evaluation process. It describes the minimum data package, the procedure and evaluation applied by FAO and the Experts of the FAO/WHO Joint Meeting on Pesticide Specifications (JMPS). [Note: prior to 2002, the Experts were of the FAO Panel of Experts on Pesticide Specifications, Registration Requirements, Application Standards and Prior Informed Consent, which now forms part of the JMPM, rather than the JMPS.]

FAO Specifications now only apply to products for which the technical materials have been evaluated. Consequently from the year 2000 onwards the publication of FAO specifications under the **New Procedure** has changed. Every specification consists now of two parts namely the specifications and the evaluation report(s):

Part One: **The Specification** of the technical material and the related formulations of the pesticide in accordance with chapters 4 to 9 of the "Manual on development and use of FAO and WHO specifications for pesticides".

Part Two: The Evaluation Report(s) of the pesticide, reflecting the evaluation of the data package carried out by FAO and the JMPS. The data are provided by the manufacturer(s) according to the requirements of chapter 3 of the "FAO/WHO Manual on Pesticide Specifications" and supported by other information sources. The Evaluation Report includes the name(s) of the manufacturer(s) whose technical material has been evaluated. Evaluation reports on specifications developed subsequently to the original set of specifications are added in a chronological order to this report.

FAO specifications developed under the **New Procedure** do not necessarily apply to nominally similar products of other manufacturer(s), nor to those where the active ingredient is produced by other routes of manufacture. FAO has the possibility to extend the scope of the specifications to similar products but only when the JMPS has been satisfied that the additional products are equivalent to that which formed the basis of the reference specification.

Specifications bear the date (month and year) of publication of the current version.

* NOTE: PUBLICATIONS ARE AVAILABLE ON THE INTERNET AT (https://www.fao.org/pest-and-pesticide-management/guidelines-standards/faowho-joint-meeting-on-pesticide-specifications-jmps/pesticide-specifications/pesticide-specifications-list/en/

PART ONE

SPECIFICATION

MCPA

MCPA

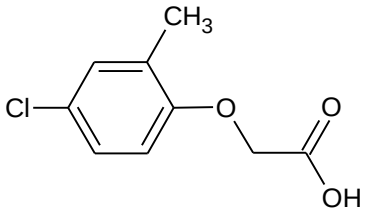
INFORMATION

ISO common name MCPA (ISO 1750, published)

Chemical names
- IUPAC [(4-chloro-o-tolyl)oxy]acetic acid
- CA 2-(4-chloro-2-methylphenoxy)acetic acid

Synonyms MCPA acid

Structural formula



Molecular formula $C_9H_9ClO_3$

Relative molar mass 200.6

CAS Registry number 94-74-6

CIPAC number 2

Identity tests IR, GLC, HPLC

MCPA TECHNICAL MATERIAL

FAO Specification 2 / TC (August 2022*)

This specification, which is PART ONE of this publication, is based on an evaluation of data submitted by the manufacturers whose names are listed in the evaluation report (2/2021). It should be applicable to relevant products of these companies, but it is not an endorsement of those products, nor a guarantee that they comply with the specifications. The specification may not be appropriate for the products of other manufacturers. The evaluation report (2/2021) as PART TWO, forms an integral part of this publication.

1 Description

The material shall consist of MCPA together with related manufacturing impurities, in the form of white to brown crystals, granules, flakes, powder or lumps with faint phenolic odour, and shall be free from visible extraneous matter and added modifying agents.

2 Active ingredient

2.1 **Identity tests** (2/TC/M3/2, CIPAC Handbook 1C, p. 2137, 1985)

The active ingredient shall comply with an identity test and, where the identity remains in doubt, shall comply with at least one additional test.

2.2 **MCPA content** (2/TC/M3/4.4, CIPAC Handbook 1C, p. 2139, 1985)

The MCPA content shall be declared (not less than 930 g/kg) and, when determined, the average measured content shall not be lower than the declared minimum content.

3 Relevant impurities (Notes 1 & 2)

3.1 **Free phenols**, (MT 69.1, CIPAC F, p.197, 1995; MT 155.1, CIPAC F, p. 362, 1995) (Note 3)

Maximum: 10 g/kg, calculated as 4-chloro-2-methylphenol.

Note 1 In addition to the relevant impurities to be controlled in products of the manufacturers identified in this evaluation report, if the content of 4-chlorophenoxy acetic acid and 2-[(4-chloro-*o*-tolyl)oxy]propionic acid occur at ≥ 0.6 g/kg and ≥ 1.0 g/kg respectively in the products of other manufacturers, they may be designated as relevant impurities and clauses may be required to limit their concentrations.

Note 2 In addition to the relevant impurities to be controlled in products of the manufacturers identified in this evaluation report, PCDDs and PCDFs can occur as a result of certain manufacturing processes. If the content of 2,3,7,8-tetrachlorodibenzodioxin (2,3,7,8-TCDD) toxic equivalents occurs at ≥ 10.0 µg/kg (of MCPA) in the products of other manufacturers, it may be designated as a relevant impurity and a clause may be required to limit its concentration

Note 3 When using method MT 155.1, 4-chloro-2-methylphenol standard should be used.

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* Specifications may be revised and/or additional evaluations may be undertaken. Ensure the use of current versions by checking at: https://www.fao.org/pest-and-pesticide-management/guidelines-standards/faowho-joint-meeting-on-pesticide-specifications-jmps/pesticide-specifications/pesticide-specifications-list/en/

PART TWO

EVALUATION REPORTS

MCPA

MCPA

FAO/WHO EVALUATION REPORT 2/2021

Recommendations

The Meeting recommended that:

(i) the specification for MCPA TC, converted from the old procedure specification, proposed by the MCPA Task Force Three and the EU MCPA Renewal Task Force and as amended should be adopted by FAO.

(ii) the FAO specifications for MCPA TC and variants developed under the old procedure should be withdrawn.

Appraisal

MCPA is an auxin type, selective herbicide with systemic activity, causing disruption of plant hormone responses, used for selective control of broadleaf weeds.

MCPA is not under patent.

MCPA was evaluated by the WHO IPCS in 2009 [IPCS, 2009] and by the FAO/WHO JMPR in 2012 [JMPR, 2012].

The "old procedure" FAO specifications for MCPA TC (2/TC/S/F (1992)), alkali metal salts (2.1/TC/S/F (1992)) and esters (2.3/TC/S/F (1992)), respectively, had been developed and published in 1994 [AGP:CP/312].

The data for MCPA TC were evaluated in support of a conversion of the old procedure specification under the new procedure of the existing FAO specifications, based on the draft specification and the supporting data provided by the MCPA Task Force Three and the EU MCPA Renewal Task Force.

The MCPA Task Force Three consists of Nufarm America, Inc. and Albaugh LLC supporting the technical registrations on the active ingredient in the United States and Canada, whereas the EU MCPA Renewal Task Force is made up of Nufarm UK Limited and CIECH Sarzyna S.A., companies supporting technical registrations on the active ingredient in the European Union.

The data submitted were broadly in accordance with the requirements of the Manual on development and use of FAO and WHO specifications for pesticides (2016 3rd revision of the first edition) and supported the proposed specification. [FAO/WHO Manual]

A statement was provided by Chemicals Regulation Division, UK that data on file for the Wyke source of Nufarm for MCPA were considered under application COP 2016/01188 in the UK, but

it is different data to what was submitted to FAO. (The analytical batch data were from batches manufactured in 2015, the specification has less impurities and a minimum MCPA purity of 985 g/kg). [Tessier]. A clarification was given that those batches were in fact a pilot scale 5 batch study submitted by Nufarm in 2015. The production represented batches from an experimental process which produced some very pure batches of material. However, Nufarm continued also to produce material by the original process and so its products are still approved under the original COP 2013/01943 which has a purity specification of 94.6%.

A statement was provided by the Ministry of Agriculture and Rural Development of Poland confirming that the confidential data on the manufacturing process and declaration of composition submitted to the FAO were the same as those submitted to the national regulatory authorities. [Kielek]

Technical MCPA acid is a white to light brown crystalline powder with a melting point of 115.4 °C – 116.8 °C, the octanol/water partition coefficient (log D_{ow}) is 2.7 at pH1, the vapour pressure is 4 x 10^{-4} Pa at 32 °C and 4 x 10^{-3} Pa at 45 °C. MCPA is practically insoluble in water (395 mg/L at 25˚C pH1) and is soluble in a range of organic solvents including methanol (621 g/l), acetone (454.6 g/l), isopropanol (410.4 g/l) and ethyl acetate (258.4 g/l).

The Meeting was provided with commercially confidential information on the manufacturing processes and batch analysis data on all impurities present below or above 1 g/kg and their manufacturing limits in the TCs. Mass balances were 99.17-100.06% in the 5-batch data.

The Meeting considered the necessity of establishing two slightly different reference profiles of MCPA or if a common reference specification could be defined and the individual specifications should be considered equivalent on the basis of the toxicological data on their impurities. The sources have different manufacturing processes leading to different minimum content of the active ingredient and different impurity profiles. The Meeting concluded that one specification should be developed covering all sources. As the minimum active substance content of the technical materials is 946 g/kg, based on batch data from all the manufacturers involved in the task forces, the evaluator proposed to update the minimum purity of the FAO specification to this value, considering also that the vast majority of the batches used in the toxicological studies were more representative to this higher value.

The intention of the proposers was to apply for a FAO specification of min. 930 g/kg, identical with the existing specification, arguing that the specification may not be as high as the current regulatory specifications, but it allows consistency and is supported by the hazard (toxicology and ecotoxicology) summaries submitted.

The companies suggested in agreement with the old procedure specification, that free phenols, water and sulphated ash should be considered as relevant impurities.

The Meeting re-considered the relevance of these impurities and concluded to consider only free phenols as relevant from the old specification. Free phenols, consisting of 4-chloro-2-methylphenol (PCOC) and 4,5-dichloro-2-methylphenol, are expressed as 4-chloro-2-methylphenol.

Based on a comparison of the 28 day (PCOC) and the 13 week (MCPA) rat studies it would appear that PCOC is not a relevant impurity. However, there are other endpoints, namely the corrosive properties, respiratory tract irritation and acute inhalation toxicity, which justify to consider PCOC a relevant impurity in MCPA. Considering that this current MCPA specification actually represents the reference specification on which the toxicology database also considered by JMPR was derived, the limit could be set at the specified limit for the material which was used in the toxicological evaluation of MCPA (10 g/kg).

(4-Chlorophenoxy) acetic acid was considered as a potentially relevant impurity, as in its 1997 reregistration eligibility decision, the US EPA lists a RfD of 0.006 mg/kg bw/day, lower than the ADI set by JMPR for MCPA which is 0.1 mg/kg bw/day. Based on the RfD of MCPA and (4-chlorophenoxy) acetic acid and according to the JMPS Manual appendix H, the maximum acceptable concentration for (4-chlorophenoxy) acetic acid is 6 g/kg. At concentrations ≥ 0.6 g/kg (4-chlorophenoxy) acetic acid has to be considered a relevant impurity. Taking into account all batches, where (4-chlorophenoxy) acetic acid was found, it was proposed to consider this impurity as not relevant for the materials of the present evaluation.

2-[(4-Chloro-*o*-tolyl)oxy]propionic acid (mecoprop) was considered as a potentially relevant impurity, as the acute oral LD_{50} listed for mecoprop in open literature is lower than the one for MCPA and health based guidance values have been set in Australia: ADI = 0.01, ARfD 0.5. Based on the ADI of MCPA and mecoprop and according to the JMPS Manual appendix H, the maximum acceptable concentration for mecoprop is 10 g/kg. At concentrations ≥ 1 g/kg mecoprop has to be considered a relevant impurity. Taking into account all batches, where (4-chlorophenoxy) acetic acid was found, it was proposed to consider this impurity as not relevant for the materials of the present evaluation.

The formation of tetra- to octa-chlorinated dioxins and -furans (PCDDs and PCDFs) cannot be *a priori* excluded. PCDDs and PCDFs can occur as a result of certain manufacturing processes. Analyses of MCPA technical products demonstrate that PCDDs and PCDFs are rarely detected, and if detected, occur at very low levels in the technical materials subject of this evaluation. The TCs produced by all members of the task forces comply with the EU limit of PCDDs and PCDFs expressed as 2,3,7,8-TCDD toxic equivalents (TEQ) of max 10 µg/kg (ppb). The Meeting considered PCDDs and PCDFs as relevant impurities in MCPA, if formed, and concluded to include a note in the specification. If the content of 2,3,7,8-tetrachlorodibenzodioxin (2,3,7,8-TCDD) toxic equivalents would occur at ≥ 10.0 µg/kg (of MCPA) in the products of other

manufacturers, it may be designated as a relevant impurity and a clause may be required to limit its concentration.

The active ingredient and impurities were quantified using validated high performance liquid chromatography with UV detection. The HPLC methods used for the 5-batch analysis were not identical with the method proposed in the specification, using different reversed phase C18 columns, different eluent composition, however identical detection wavelength. Identity of the active ingredient MCPA in the technical batches was confirmed by IR, MS and NMR.

The LOQs for impurities were in the range of 0.15-0.25 g/kg, the limit of detection for phenols was 0.1 g/kg.

Identity of all impurities was confirmed by UV and retention time using certified reference standards. Residual water was analyzed by Karl-Fischer titration. [CIPAC, F] Sulphated ash was determined according to CIPAC MT 29. [CIPAC, J]

Five newer representative batches of technical MCPA were analysed for all notifiers for content of pure active substance using the existing AOAC/CIPAC method of analysis for MCPA (2/TC/M3/4.4, HPLC as referee method) to demonstrate that the current method was still satisfactory in analysing the MCPA content of all Task Force members' technical material. [CIPAC 1C]

The total dioxins and furans were determined by high resolution gas chromatography/HRMS and the total content in the test substance was expressed as the impurity 2,3,7,8-TCDD (2,3,7,8-tetrachlorodibenzo-*p*-dioxin).

The proposed specification for TC was essentially in accordance with the requirements of the FAO/WHO Manual, however it was proposed to update the description concerning the odour and to remove water and sulphated ash from the list of relevant impurities. It was agreed to add a note concerning the possible content of the relevant impurities dioxins and furans, (4-chlorophenoxy) acetic acid and 2-[(4-chloro-*o*-tolyl)oxy]propionic acid.

SUPPORTING INFORMATION
FOR
EVALUATION REPORT 2/2021

USES

MCPA is an herbicide used for selective control of broadleafed weeds. Agricultural uses include crops such as barley, flax, grasses grown for seed, oats, pastureland, peas, rye, and wheat. Non-agricultural use sites include non-agricultural areas, uncultivated fields, ornamental lawns, and turf (including residential turf)

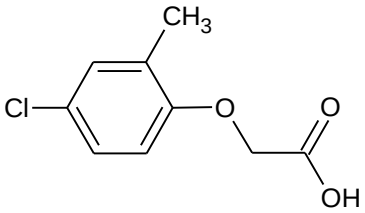
IDENTITY

ISO common name MCPA (ISO 1750, published)

Chemical names
- IUPAC [(4-chloro-o-tolyl)oxy]acetic acid
- CA 2-(4-chloro-2-methylphenoxy)acetic acid

Synonyms MCPA acid

Structural formula



Molecular formula $C_9H_9ClO_3$

Relative molar mass 200.6

CAS Registry number 94-74-6

CIPAC number 2

Identity tests IR, GLC, HPLC

Table 1. Physico-chemical properties of pure MCPA

Parameter	Value(s) and conditions	Purity %	Method reference	Study number
Vapour pressure	4 x 10^{-4} Pa (3 x 10^{-6} mm Hg) at 32 °C 4 x 10^{-3} Pa (3 x 10^{-5} mm Hg) at 45 °C	99.4	EPA 63-9	Dow ML-AL-85-40005 Chakrabarti 1985
Melting point	The melting point of pure MCPA was found to be in range 115.4 °C – 116.8 °C	99.5	OECD 102, not internal report	Roberts, 1993
Temperature of decomposition	290°C [with no indication of boiling up to that temperature]	99.9	OECD 102"	Türk, 1994
Solubility in water	0.395 g/L (±9.1) @ 25˚C pH1 26.2 g/L (±1.4) @ 25˚C pH5 293.9 g/L (± 5.2) @ 25˚C pH7 320.1 g/L (± 5.9) @ 25˚C pH9	99.4	EPA 63-8 Shake flask method	Dow ES-DR-0004-9672-3 Hopkins 1987
Octanol/water partition coefficient	Initial 0.01 M Solution: log D_{ow} = 2.70 at pH 1 log D_{ow} = 0.28 at pH 5 log D_{ow} = -0.81 at pH 7 log D_{ow} = -1.07 at pH 9 Initial 0.001 M Solution: log D_{ow} = 2.80 at pH 1 log D_{ow} = 0.59 at pH 5 log D_{ow} = -0.71 at pH 7 Log D_{ow} = -0.88 at pH 9	99.4	EPA 63-11	Dow ES-DR-0004-9672-4 Bailey 1987
Hydrolysis characteristics	^{14}C MCPA was stable to hydrolytic degradation at pH 5, 7 and 9 at 25˚C for 30 days.	98.5% radiopurity 93.0% chemical purity	EPA 161-1	Battelle SC910160 Lai 1993
Photolysis characteristics	Half-life = 25.4 days at pH 5	99.8	EPA 161-2	PTRL West 410W-1 Concha 1993
Dissociation characteristics	pKa = 3.73 at 25°C	99.8	OECD 112	Redeker, 1998
Solubility in organic solvents	Solvent	Solubility (g/L) at 20 C, 97%	EC A6	Al Amin, 2005a
	methanol	621.0		
	acetone	454.6		
	propan-2-ol	410.4		
	ethyl acetate	258.4		
	octan-1-ol	205.0		

	1,2-dichloroethane	30.6		
	xylene	15.8		
	heptane	0.23		

Table 2. Chemical composition and properties of MCPA technical materials (TC)

Manufacturing process, maximum limits for impurities ≥ 1 g/kg, 5 batch analysis data	Confidential information supplied and held on file by FAO. Mass balances were 99.8 – 100.2 % and percentages of unknowns were 0 %.			
Declared minimum MCPA content	930 g/kg			
Relevant impurities ≥ 1 g/kg and maximum limits for them	Free phenols. maximum 10 g/kg			
Relevant impurities **<** 1 g/kg and maximum limits for them:	None			
Stabilisers or other additives and maximum limits for them:	None			
Parameter	Value and conditions	Purity %	Method reference	Study number
Melting temperature range of the TC and/or TK	115.4 °C – 116.8 °C No evidence of decomposition or gas evolution	99.5	OECD 102	Roberts 1993

FORMULATIONS

The main formulation types available are soluble concentrate (SL), water soluble powder (SP). MCPA may be co-formulated with other herbicides often of the phenoxy herbicide chemical group.
These formulations are registered and sold in many countries throughout the world.

METHODS OF ANALYSIS AND TESTING

The analytical method for the active ingredient (including identity tests) are:
the AOAC/CIPAC method of analysis (1983), which uses reversed-phase HPLC with UV detection at 280 nm and internal standard. Infrared spectroscopy (IR) has been used to identify the active ingredient. The 5-batch MCPA content results, quantified against the MCPA reference standard, have been performed at EPP Limited, EPP00398, GLP, Unpublished. The MCPA related impurities content were determined by HLPC methods with UV detection and the use of internal standard. The impurities were quantified against prepared calibration standards for

each impurity. Related impurities content and method validation are reported in Nufarm Limited, Bradford, UK, 14/0906, GLP, Unpublished.

Water content has been determined by Karl Fischer titration following MT30.5. For sulphated ash, CIPAC MT29, has been used
Test methods for determination of physico-chemical properties of the technical active ingredient were OECD, EPA or EC as indicated.

CONTAINERS AND PACKAGING

No special requirements for containers and packaging have been identified.

EXPRESSION OF THE ACTIVE INGREDIENT

The content of MCPA is expressed as [(4-chloro-*o*-tolyl)oxy]acetic acid.

ANNEX 1

HAZARD SUMMARY PROVIDED BY THE PROPOSER

Notes.

(i) The proposers confirmed that the toxicological and ecotoxicological data included in the summary below were derived from MCPA having impurity profiles similar to those referred to in the table above, or from the testing of a salt of MCPA (eg the DMA salt). It has been demonstrated and widely accepted that in the environment MCPA readily dissociates into ionic form and that this is equitoxic with the acid. In some cases, particularly aquatic environments, the testing of a salt is preferable since this is the form the molecule will reach the test organism.

(ii) The conclusions expressed in the summary below are those of the proposers, unless otherwise specified.

(iii) The toxicological and ecotoxicological data relate to MCPA and to its salts. (quantitative parity is achieved when the result is expressed as the acid equivalent a.e.). The results are not necessarily representative of ester forms of MCPA.

Table 3. Toxicology profile of the MCPA technical material, based on acute toxicity, irritation and sensitization

Species	Test	Purity %	Guideline, duration, doses and conditions	Result [MCPA unless otherwise stated]	Study number
Albino Rat M&F	Acute oral	92.33	OPPTS 870.1100 Duration: Single dose 14 days observation Doses: 200, 336, 565, 951, 1600 mg/kg Conditions: oral administration	LD_{50} = 653 mg/kg	Study #200-241
Sprague Dawley Rat F	Acute oral	96	OPPTS 870.1100 / OECD 423 Duration: Single dose 14 days observation Doses: 300, 2000 mg/kg Conditions: oral gavage	LD_{50} = 500 mg/kg	Study #2060/0025
Rat M&F	Acute oral	Technical	none claimed but consistent with EPA 81-1 and OECD 401 Duration: 14 days Doses: 464, 825, 1470 and 2150 mg/kg Conditions:	LD_{50} ~ 1470 mg/kg b.w.(males) LD_{50} ~ 962 mg/kg b.w.(females) LD_{50} = 1160 mg/kg b.w. (males and females)	Study #83/108A
Rat M&F	Acute oral	97.82	OECD 401 Duration:14 days Doses:330. 600, 1100 and 2000 mg.kg Conditions: oral gavage in olive oil	LD_{50} 797 mg/kg b.w.	Study #14/2/1995
Rat F	Acute oral	97.0	OECD 420 / EU Method B.1.Bis Duration:14 days Doses:500 and 2000 mg/kg Conditions: oral gavage in CMC	LD_{50} greater than 500 mg/kg b.w.	Study #OS-3/05
Wistar Rat M&F	Acute dermal	Technical	none claimed but consistent with EPA 81-2 and OECD 402Duration: 24 hr exposure 14 days observation Doses: 2000, 4000 mg/kg Conditions: dermal application	LD_{50} > 4000 mg/kg b.w.	Study #83/167
Albino rabbits M&F	Acute dermal	92.33	OPPTS 870.1200 Duration: 24 hr exposure 14 days observation Doses: 2.0 g/kg	LD_{50} > 2000 mg/kg b.w.	Study #200-242

Species	Test	Purity %	Guideline, duration, doses and conditions	Result [MCPA unless otherwise stated]	Study number
			Conditions: dermal application		
Rat	Acute dermal	97.82	OECD 402 Duration:14 days Doses:2000 mg/kg Conditions: dermal application	LD_{50} greater than 2000 mg/kg b.w.	Study #14/02/1995
Sprague Dawley Rat M&F	Acute inhalation	94.8	OPPTS 870.1300 Duration: 4hr exposure 14 days observation Doses: 1, 6 and 36 mg/l Conditions: inhalation	LC_{50} > 6.3 mg/L	Study #13I0046/83
Wistar Rat M&F	Acute inhalation	97.2	OPPTS 870.1300 / OECD 403 Duration: 4hr exposure 14 days observation Doses: 5 mg/l Conditions: nose only	LC_{50} > 5 mg/L	Study #06/163-004P
Wistar Rat M&F	Acute inhalation	97.2	OPPTS 870.1300 / OECD 403 Duration: 4 hr exposure 14 days observation Doses: 5 mg/l Conditions: nose only	LC_{50} > 5 mg/L (rat)	Study ##06/163-
New Zealand White Rabbit	Eye irritation	Technical	OPPTS 870.2400 Duration: 72 hrs Doses: 0.1 ml Conditions: application to eye	Severe irritant	Study #83/198
New Zealand White Rabbit	Eye irritation	92.3	OPPTS 870.2400 Duration: 21 days Doses: 100 mg Conditions: application to eye	Severe irritant	Study #200-2
Rabbit	Eye irritation	97.82	OECD 405 Method B.5. Duration: 7 days Doses: 0.1 g Conditions: application to eye	Irritant	Study #07/02/1995
New Zealand White Rabbit	Skin irritation	94.22	OPPTS 870.2500 Duration: 4 hr exposure 4 days observation Doses: 0.5 g Conditions: dermal application	Non-irritant	Study #920423D/JEL 22/SE

Species	Test	Purity %	Guideline, duration, doses and conditions	Result [MCPA unless otherwise stated]	Study number
Albino rabbits	Skin irritation	92.33	OPPTS 870.2500 Duration: 4 hr exposure 4 days observation Doses: 0.5 g Conditions: dermal application	Non-irritant	Study #200-243
New Zealand White Rabbit	Skin irritation	97.5	GDLN: OPPTS 870.2500 Duration: 4 hr exposure 72 hr observation Doses: 0.5 g Conditions: dermal application	Non-irritant	Study #2416/0001
White Vienna rabbits	Skin irritation	Technical	OPPTS 870.2500 Duration: 4 hr exposure 72 hr observation Doses: 0.5 g Conditions: dermal application	Slight irritant	Study #83/196
Rabbit	Skin irritation	97.82	OECD 404 Duration:72 hr Doses:0.5g Conditions: dermal application	Non irritating	Study #07/02/1995
Guinea pig F	Skin sensitization	94.8	OPPTS 870.2600 Duration: 72 hours Doses: 0, 1.5%, 5.0%, 15%, 50% Conditions: dermal application (OET)	Not sensitising No indications of a sensitizing potential were given.	Study #31H46/83
Guinea pig	Skin sensitization	94.8	OPPTS 870.2600 Duration: 28 days Conditions: intradermal application	Not sensitising	Study #30H46/83-1
Guinea pigs	Skin sensitization	95.4	OECD 406 Duration:25 days, observations for skin reactions at 24, 48 and 72 h after treatment Doses: 0.1 mL (induction injections); 0.5 mL of 15% water suspension of the test material Conditions: intradermal application	Skin sensitizer	Study #AL-7/98
Mouse	Skin sensitization	98.6	none in force at the time but Kimber *et al* (1994), Duration:18 days Doses: 1 – 10 % Conditions: LLNA	Not sensitising	Study #CTL/P/6212

Table 4. Toxicology profile of the technical material based on repeated administration (subacute to chronic)

Species	Test	Purity %	Guideline, duration, doses and conditions	Result [MCPA unless otherwise stated]	Study number
Albino rats M&F	Subchronic Oral	100	OPPTS 870.3100 Duration: 90 days Doses: 4.0, 8.0, 16.0 mg/kg/day Conditions: dietary administration	Administration of MCPA to rats, under the conditions of the present study, did not result in significant bodyweight, organ weight or signs of clinical toxicity, and did not result in significant clinical, pathological of histopathological changes. There were no consistent changes in organ histopathology.	Study #517-106
Wistar rats M & F	Subchronic Oral	94.8	OPPTS 870.3100 Duration: 90 days Doses: 0, 50, 150 or 450 ppm (equivalent to 0, 3.6, 10.9, or 32.6 mg/kg/day for males and 0, 4.0, 12.1, or 35.8 mg/kg/day for females) Conditions: dietary administration	NOAEL = 10.9 mg/kg bw/d LOEL =32.6 mg/kg bw/d	Study #31S0046/8302
Wistar rats M&F	Subchronic Oral	94.2	OPPTS 870.3100 Duration: 3 months Doses: 0, 50, 500, 2500 ppm Conditions: dietary administration	NOAEL = 50 ppm (about 4 mg/kg bw/d)	Study #50C0374/91133
B6C3F1/CR IBR mice M&F	Subchronic Oral (RANGE FINDING STUDY)	94.8	OPPTS 870.3100 Duration: 4 weeks Doses: 100, 300, 900 and 2700 ppm Conditions: dietary administration	NOAEL = 300 ppm	Study #85/087
Beagle dogs M&F	Subchronic	94.8	GDLN: OPPTS 870.3100 Duration: 12 months Doses: 0, 6, 30, 150 ppm (0, 0.2, 1.02, or 5.32 mg/kg/day for males and 0,	NOAEL = 0.2 mg/kg bw/d LOAEL = 1.02 mg/kg bw/d	Study #33D0046/8341 Hellwig J 1986

Species	Test	Purity %	Guideline, duration, doses and conditions	Result [MCPA unless otherwise stated]	Study number
			0.21, 1.02, or 5.12 mg/kg/day for females) Conditions: dietary administration		
Beagle dogs M&F	Subchronic Oral	100	OPPTS 870.3150 Duration: 13 weeks Doses: 160, 320, 640 ppm Conditions: dietary administration	NOEL = 320 ppm	Study #517-107
Beagle dogs M&F	Subchronic Oral	98.4	OPPTS 870.3150 Duration: 13 weeks Doses: 0, 0.3, 1.0, 12, 48 mg/kg bw/day Conditions: dietary administration	NOEL = 1 mg/kg bw/day	Study #R6478
Beagle dogs	Subchronic oral	97.0	OECD 409 Duration: 90-days Doses: 0, 1, 5 15 mg/kg bw/day Conditions: capsule dosing	NOEL < 1 mg/kg/day LOEL = 1 mg/kg/day	Study #9533 204
Rabbit M&F	Subchronic Dermal	94.22	OPPTS 870.3200 Duration: 21 days Doses: 10, 100 or 1000 mg/kg/day Conditions: dermal application	Systemic toxicity NOAEL = 100 mg/kg/day LOAEL = 1000 mg/kg/day (limit dose) Topical effects NOAEL = 10 mg/kg/day LOAEL = 100 mg/kg/day	Study #JEL 23/921253
Rat	Subchronic Dermal	95.3%	OECD 410 Duration: 21 days Doses: 1000 mg/kg Conditions: dermal application	NOEL > 1000 mg/kg/day	Study #PDO-5/99S
Wistar rats M&F	Subacute inhalation	96.9	OPPTS 870.3465 Duration: 28 days Doses: 50, 200, 1000 mg/m^3 Conditions: head-nose exposure to respirable dust aerosol	NOAEC = 0.02 mg/L	Study #46I0256/021002

Species	Test	Purity %	Guideline, duration, doses and conditions	Result [MCPA unless otherwise stated]	Study number
Albino Rats M&F	Reproduction and Fertility Effects	97.4	OPPTS 870.3800 Duration: - 2 generations Doses: 0, 50, 150, or 450 ppm (equivalent to 0, 2.5, 7.5 and 22.5 mg/kg/day, respectively, for both sexes based on 1 ppm = 0.05 mg/kg/day Conditions: dietary administration, 2 generation	Parental systemic toxicity NOAEL = 7.5 mg/kg/day LOAEL = 22.5 mg/kg/day Offspring toxicity NOAEL = 7.5 mg/kg/day LOAEL = 22.5 mg/kg/day Reproductive toxicity NOAEL = > 22.5 mg/kg/day	Study #6148-100
Wistar rats M&F	Reproduction and Fertility Effects	97.4	OPPTS 870.3700 Duration: 1 generation (5 months) Doses: 0, 450, 750, 1000 ppm Conditions: oral administration, 1 generation	No effects on reproductive performance or pup survival.	Study #RR1007
Wistar Rats	Reproduction and Fertility Effects	95.3	OECD 415 Duration: 28 days Doses: 0, 100, 1000, 2000 ppm Conditions: oral administration, 2 generation	Parental NOEL 1000 ppm (82 mg/kg/day) Offspring NOEL 100 ppm Reproductive NOAEL 1000 ppm (82 mg/kg/day)	Study #TGR-3-99
Wistar rats F	Prenatal Development	94.22	OPPTS 870.3700 Duration: 21 days Doses: 15, 60, and 120 mg/kg/day Conditions: oral administration	Maternal toxicity NOAEL = 60 mg/kg/day LOAEL = 120 mg/kg/day Developmental toxicity NOAEL = 60 mg/kg/day LOAEL = 120 mg/kg/day	Study #30R0374/91096
Sprague Dawley rats M&F	Prenatal development	Technical	OPPTS 830.3700 Duration: 7 weeks Doses: 100 and 25 mg/kg/day Conditions: gavage	There was no treatment related effect on the incidence of major or minor congenital defects.	Study #678R-277/6
Sprague Dawley rat M&F	Prenatal Development	Technical	OPPTS 870.3700 Duration: 73 days Doses: 20, 50 and 125 mg/kg Conditions: oral administration	MCPA showed no evidence of teratogenicity	Study #1996-277/7b

Species	Test	Purity %	Guideline, duration, doses and conditions	Result [MCPA unless otherwise stated]	Study number
Himalayan rabbits F	Prenatal Development	94.22	OPPTS 870.3700 Duration: 21 days Doses: 15, 30 and 60 mg/kg/day Conditions: oral administration	Maternal toxicity NOAEL – 30 mg/kg/day LOAEL = 60 mg/kg/day Developmental toxicity NOAEL > 60 mg/kg/day (HDT) LOAEL = not a developmental toxicant	Study #40R0374/91095
Wistar Rat	Prenatal development	Dosed as MCPA Sodium/ potassium salt formulation	OECD 414; Method B.31 Duration: 20 days Doses: 0.5, 5, 50 mg/kg/day Conditions: oral gavage	Maternal NOAEL 50 mg/kg/day Developmental NOAEL 50 mg/kg/day (results expressed as acid equivalent)	Study # not applicable
Rabbit	Prenatal development	97.0	OECD 414 Duration: 28 days Doses: 0, 5, 10, 25 mg/kg/day Conditions: oral gavage	Maternal NOAEL 25 mg/kg/day Developmental NOAEL 25 mg/kg/day	Study #9533 202
Wistar rats M&F	Chronic / Carcinogenicity	94.8	OPPTS 870.4300 Duration: 24 months Doses: 0, 20, 80, or 320 ppm (0, 1.1, 4.4, or 17.6 mg/kg/day in males and 1.4, 5.7, or 23 mg/kg/day in females) Conditions: dietary administration	NOAEL = 4.4 mg/kg day LOAEL = 17.6 mg/kg/day No evidence of carcinogenicity	Study #71S0045/8345
Wistar Rats	Chronic / Carcinogenicity	Dosed as MCPA Sodium/ potassium salt formulation	OECD 453 Duration: 105 weeks Doses: 0, 50, 350, 2000 or 3500 mg/kg/day Conditions: dietary administration	NOAEL 350 ppm (approx. 17.5 mg/kg/day) No evidence of carcinogenicity	Study #Ch/K – 4 / 91
B6C3F1 mice M&F	Chronic / Carcinogenicity	94.8	OPPTS 870.4300 Duration: 2 years	Males NOAEL = 15.7 mg/kg/day LOAEL = 79.5 mg/kg/day Females	Study #80S0046/8358

Species	Test	Purity %	Guideline, duration, doses and conditions	Result [MCPA unless otherwise stated]	Study number
			Doses: 0, 20, 100, or 500 ppm (0, 3.2, 15.7, or 79.5 in males and 0, 3.9, 19.5, or 97.2 mg/kg/day) Conditions: dietary administration	NOAEL = 3.9 mg/kg/day LOAEL = 19.5 mg/kg/day No evidence of carcinogenicity	
Mice	Carcinogenicity	97.0	OECD 451, EU B.32 Duration: 18 months Doses: 0, 50, 200 or 800 mg/kg/day Conditions: dietary administration	NOEL 50 ppm (approx. 7.5 mg/kg/day) No evidence of carcinogenicity	Study #K-10/04 Kita K 2006
Wistar rats M&F	Acute Neurotoxicity	94.2	OPPTS 870.6200 Duration:14 days Doses: 0, 200, 400 and 800 mg/kg bw (males); 0, 150, 300 and 600 mg/kg bw (females) Conditions: oral administration	NOAEL = 200 mg/kg bw (males); 150 mg/kg bw (females) No evidence of acute neurotoxicity	Study #20C0374/91106
Wistar rats M&F	Subacute Neurotoxicity	94.2	OPPTS 870.6200 Duration: 3 months Doses: 0, 50, 500, and 2500 ppm (equivalent to 0, 3, 34, or 177 mg/kg/day for males and 0, 4, 42, or 188 mg/kg/day for females) Conditions: dietary administration	NOAEL = 34 mg/kg/day LOAEL = 177 mg/kg/day No evidence of subacute neurotoxicity	Study #50C0374/91133
Wistar Rat	Oral Toxicity Study and Neurotoxicity	97.0	OECD 408 and OECD 424 Duration: 90-days Doses: 0, 200, 700, 2450 ppm Conditions: dietary administration	NOAEL 200 ppm (~20 mg/kg/day) No evidence of neurotoxicity	Study #S-48/05

Table 5. Mutagenicity profile of the technical material based on *in vitro* and *in vivo* tests

Species	Test	Purity %	Guideline, duration, doses and conditions	Result [MCPA unless otherwise stated]	Study number
Salmonella typhimurium strains TA98, TA100, TA1535, TA1537, TA1538	Ames reverse gene mutation (*in vitro*)	94.22	OPPTS 870.5265 Doses: 50, 150, 500, 1500, 5000 µg/plate	No evidence of mutagenic activity in this bacterial system.	Study #JEL 26/920957
Chinese Hamster Ovary (CHO/HGPRT)	Gene mutation (*in vitro*)	94.22	OPPTS 870.5300 Doses: 100, 200, 400, 600 and 800 µg/ml in Test 1; 300, 400, 500, 600, and 700 µg/ml in Test 2	MCPA acid did not demonstrate mutagenic potential in this *in vitro* gene mutation assay.	Study #JEL 29/921115
Human lymphocytes	Cytogenetic assay (*in vitro*)	94.22	OPPTS 870.5375 Doses: S9-activated doses of 1200-2000 µg/mL (13 hr cell harvest) that approached the solubility limit	The test was positive. The non-activated test material was cytotoxic (>500 ug/mL-21 hr cell harvest), but not clastogenic.	Study #JEL 32/921190
Chinese Hamsters M&F	*In vivo* mammalian cytogenetics – Chromosomal aberration	94.8	OPPTS 870.5385 Doses: 0, 33, 200 or 1200 mg/kg body weight Conditions: oral administration	MCPA is considered to have no chromosome-damaging effect under the experimental condition of the study.	Study #10M0046/8367
Chinese Hamster M&F	*In vivo* mammalian cytogenetics – Sister Chromatid Exchange Assay	94.8	OPPTS 870.5915 Dose: 1200 mg/kg Conditions: oral administration	MCPA has a very weak SCE-inducing activity in bone marrow chromosomes of Chinese hamsters in vivo under the experimental conditions of the study.	Study #16M0046/8356
Salmonella typhimurium strains TA100, TA98, TA97, TA 102, TA1535	Ames	97.0	OECD 471 Duration: 48-72 h Doses: 1, 10, 100, 500 and 750 µg/plate Conditions: bacterial *in vitro* system	Negative, not mutagenic	Study #953 3 201
Mouse	Local Lymph Node assay	98.6	non claimed, but Kimber et al (1994) Duration: 18 days Doses: 1 – 10%	Non sensitizing	Study #CTL/P/6212

Species	Test	Purity %	Guideline, duration, doses and conditions	Result [MCPA unless otherwise stated]	Study number
			Conditions: LLNA		
Chinese hamster cells (*In vitro*)	Chromosomal aberration	97.0	OECD 471 Duration: over a week Doses: 600, 800 and 10000 µg/ml Conditions: cytogenetic analysis	Positive in the absence of S9 fraction In the presence of metabolic activation, MCPA had no clastogenic activity.	Study #953 3 201
ICRSPF Mice	Chromosomal aberration (*In vivo*)	97.0	OECD 475 Duration: 24 h Doses: 12.5, 25, 100 mg/kg/bw Conditions: cytogenetic analysis	No evidence of chromosome damaging activity	Study #953 3 201

Table 6. Ecotoxicology profile of MCPA technical material

Species	Test	Purity %	Guideline, duration, doses and conditions	Result [MCPA unless otherwise stated]	Study number
Bobwhite quail	Acute oral	94.6	OPPTS 850.2100 Duration: 14 days Doses: 292, 486, 810, 1350 and 2250 mg/kg Conditions: oral administration	LD_{50} = 377 mg/kg NOAEC < 292 mg/kg-bw	Study #222-101
Japanese quail	Acute oral	97.0	850.2100 Duration: 14 days Doses: 0, 305, 488, 781, 1250, 2000 mg/kg bw Conditions: oral gavage	LD_{50} = 1581.1 mg/kg	Study #G/26/04
Japanese quail	Acute dietary	97.0	OECD 205 Duration: 5 days exposure, 3 days observation Dose: 5000 ppm Conditions: dietary administration	LC_{50} > 5000 ppm (>1150 mg/kg bw/day)	Study # G/25/04 (amended in 2006)
Zebra finch M&F	Sub-Acute dietary	97.06	OPPTS 850.2200 Duration: 8 days Duration of dosing: 5 days Doses: 0, 350, 700, 1400, 2800 and 5600 ppm a.i. Conditions: dietary administration	LC_{50} > 5600 ppm a.i. NOEC 700 ppm a.i.	Study #364B-106A
Mallard M&F	Reproduction toxicity	97.06	OPPTS 850.2300 Duration of dosing: 21 weeks Doses: 0, 160, 400, and 1000 ppm a.i. Conditions: dietary administration	NOEC = 400 ppm a.i. (51.9 mg a.i./kg/day)	Study #364B-108 Pagano 2017
Bobwhite quail M&F	Reproduction toxicity	94.22	OPPTS 850.2300 Duration: 20 weeks Doses: 0, 250, 500 or 1000 ppm Conditions: dietary administration	NOAEC = 1000 mg/kg-diet LOAEC > 1000 mg/kg-diet	Study # 364-102
Japanese quail	Reproduction toxicity	97.2	OECD 206 Duration: 20 weeks Doses: 0, 40, 200, 1000 ppm	NOEC = 1000 ppm (104.4 mg/kg/day)	Study #G/29/06

Species	Test	Purity %	Guideline, duration, doses and conditions	Result [MCPA unless otherwise stated]	Study number
			Conditions: dietary administration		
Japanese quail	Dietary toxicity test	97.0	OECD 205 Duration: 8 days Doses: 5000 ppm MCPA acid (corresponding to 1150 mg ae/kg bw/d) Conditions: dietary administration	LC_{50} > 5000 ppm ae LDD_{50} >1154 mg ae/kg bw/d	Study #G/25/04
Japanese quail	Acute oral toxicity	97.0	OPPTS 850.2100 Duration: 14 days Doses: 0, 305, 488, 781, 1250 and 2000 mg ae/kg bw Conditions: dietary administration	LD_{50} >1250 mg ae/kg bw	Study #G/26/04
Japanese quail	Reproduction toxicity test	97.2	OECD 206 Duration: 14 days Doses: 0, 40, 200 and 1000 ppm MCPA acid (corresponding to 4.3, 20.5, 104.4 mg ae/kg bw/d)	NOEC ≥1000 ppm NOEL ≥104.4 mg ae/kg bw/d	Study #G/29/06
Common carp	Acute toxicity	97	OECD 203 Duration: 96 hours Doses: 10, 22, 56, 100 mg a.e./L	LC_{50} > 100 mg/L	Study #W-03-04
Atlantic silverside	Acute toxicity	94.6	OPPTS 850.1075 Duration: 96 hours Doses: <3, 48, 66, 78, 142 and 232 mg/l	96-hour LC_{50} = 133 mg/l	Study #D0786
Bluegill sunfish	Static acute toxicity	56.4% DMA salt	OPPTS 850.1075 Duration: 96 hours Doses: <3, 61, 93, 140, 245, and 384 mg/l MCPA DMA	96-hour LC_{50} = 306 mg/l MCPA DMA	Study #D1186
Rainbow trout	Acute toxicity	56.4% MCPA DMA salt	OPPTS 850.1075 Duration: 96 hours Doses: <3, 89, 126, 217, 501 and 556 mg/l MCPA DMA	96-hour LC_{50} = 117 mg/l MCPA DMA	Study #D1386
Sheepshead minnow	Acute toxicity	77.7% MCPADMA salt	OPPTS 850.1075 Duration: 96 hours	96-hr LC_{50} = 630 mg a.i/l MCPA DMA; 520 mg a.i./l MCPA acid	Study #93-7-4859

Species	Test	Purity %	Guideline, duration, doses and conditions	Result [MCPA unless otherwise stated]	Study number
		63.4% MCPA Acid	Doses: 130, 220, 370, 610, 1000 and 1700 mg a.i./l as MCPA DMA; 110, 180, 300, 500, 830 and 1400 mg a.i./l as MCPA acid	NOEC = 350 mg a.i./l MCPA DMA; 280 mg a.i./l MCPA acid	
Fathead minnow	Chronic early-life	80.2% MCPA DMA salt	OPPTS 850.1400 Duration: 32 days Doses: 7.4, 15, 29, 44, 58 and 116 mg a.i./l	LC_{50} = 78 mg a.i./l NOEC (survival) = 44 mg a.i./l LOEC = 29 mg a.i./l NOEC 15 mg a.i./l MATC – 21 mg a.i./l	Study #364A-102
Zebra fish	Chronic early-life	97.0	OECD 210 Duration: 30 days Doses: 0.1, 0.32, 1.0, 3.2 and 10 mg/L	NOEC > 10 mg a.e./L	Study #W-04-04
Daphnid	Acute toxicity	63.42 % MCPA DMA salt 51.8 % MCPA	OPPTS 850.1300 Duration: 48 hours Doses: 200, 120, 72, 43 and 26 mg a.i./l	48 hr EC_{50} > 230 mg/L a.i. (>187 mg/L a.e.) NOAEC = 38 mg/L a.i. (31 mg/L a.e.)	Study #92-4-4235
Daphnid	Acute toxicity	97.0	OECD 202 Duration: 48 hours Doses: 32, 56, 100, 180, 320 mg/L	EC_{50} >92.7 mg/L NOEC > 92.7 mg/L	W-06-04
Daphnid	Chronic life-cycle	80.2% MCPA DMA salt	OPPTS 850.1500 Duration: 21 days Doses: 7.1, 13, 27, 42, 58 and 126 mg a.i./l	EC_{50} > 126 mg a.i./l NOEC (survival) = 42 mg a.i./l LOEC = 27 mg a.i./l NOEC = 13 mg a.i./l MATC = 19 mg a.i./l	Study #364A-101
Daphnid	Chronic life-cycle	97.0	OECD 211 Duration: 21 days Doses: 0, 10, 18, 32, 56, 100 mg/L	NOEC = 100 mg a.e./L	Study #W-07-04
Eastern Oyster – larvae/embryo	Acute toxicity	94.6	OPPTS 850.1055 Duration: 48 hours Doses: <3, 58, 84, 115, 209, and 346 mg/l	48-hour EC_{50} = 155 mg/l	Study #D0186
Pink shrimp	Acute toxicity	94.6	OPPTS 850.1045 Duration: 96 hours	96-hour LC_{50} = 321 mg/l	Study #D0486

Species	Test	Purity %	Guideline, duration, doses and conditions	Result [MCPA unless otherwise stated]	Study number
			Doses: < 3, 54, 93, 162, 314, and 413 mg/l		
Anabaena flos-aquae	Acute toxicity	94.2	OPPTS 850.5400 Duration: 5 days Doses:0.030, 0.078, 0.18, 0.48, 1.2 and 3.0 mg a.i./l	EC_{50} = 6.7 mg a.i./l NOAEC = 0.47 mg a.i./l	Study #93-9-4918
Navicula pelliculosa	Acute toxicity	94.2	OPPTS 850.5400 Duration: 5 days Doses: 0.0072, 0.024, 0.081, 0.27, 0.90 and 3.0 mg a.i./l	EC_{50} = 0.63) mg a.i./l NOAEC = 0.0086 mg a.i./l	Study #93-8-4914
Navicula pelliculosa	Acute	80.2% MCPA DMA Salt	OPPTS 850.5400 / OECD 201 Duration: 120 hours Doses: 10, 20, 40 80, 160 mg a.s./L nominal (mean measured equivalents aid/L 8.44, 46.4, 73.1, 66.0, 132 mg a.e./L)	72-hour E_rC_{50} = 117 mg a.e./L 72-hour NOEC = 8.44 mg a.e./L 96-hour E_rC_{50} = 90.7 mg a.e./L 96-hour NOEC = 8.44 mg a.e./L	Study #364A-106A
Selenastrum capricornutum	Acute toxicity	94.2	OPPTS 850.5400 Duration: 14 days Doses: 0.0072, 0.24, 0.081, 0.27, 0.90, and 3.0 a.i./l	EC_{50} = 0.95 mg a.i./l NOAEC = 0.009 mg/L a.i./l	Study #93-8-4897
Selenastrum capricornutum	Acute toxicity	80.2% MCPA DMA Salt	OPPTS 850.5400 / OECD 201 Duration: 120 hours Doses: 12.5, 25.1, 50.1, 100, 201, 401 mg a.s./L (mean measured equivalents acid/L 10.3, 19.8, 40.8, 79.4, 162, 320 mg a.e./L measured)	72-hour E_rC_{50} > 320 mg a.e./L 72-hour NOEC = 10.3 mg a.e./L 120-hour E_rC_{50} > 320 mg a.e./L 120-hour NOEC = 10.3 mg a.e./L	Study #364A-104
Skeletonema costatum	Acute toxicity	94.2	OPPTS 850.5400 Duration: 5 days Doses: 0.015, 0.045, 0.12, 0.36, 1.2 and 3.0 mg a.i./l	EC_{50} = 0.30 mg a.i./l NOAEC = 0.015 mg a.i./l	Study #93-10-4985
Skeletonema costatum		80.2% MCPA DMA Salt	OPPTS 850.5400 / OECD 201 Duration: 120 hours	120-hour E_rC_{50} = 37.3 mg a.e./L 120-hour NOEC = 9.49 mg a.e./L	Study #364A-107

Species	Test	Purity %	Guideline, duration, doses and conditions	Result [MCPA unless otherwise stated]	Study number
			Doses: 3, 6, 12, 24, 48 mg a.s./L nominal (mean measured 2.39, 4.83, 9.49, 18.8, 37.7 mg a.e./L)		
Duckweed (*Lemna gibba)*	Semi-static renewal test	95.9	OPPTS 850.4400 Duration: 7 days Doses: 0.0032, 0.01, 0.032, 0.1, 0.32, 1.0, 3.2 and 10 mg/l^{-1}	EC_{50} = 2.6 mg/l^{-1} NOEC = 0.32 mg/l^{-1} LOEC = 1.0 mg/l^{-1}	Study #BL6837/B
Lemna gibba	Acute toxicity	99.4	OPPTS 850.4400 Duration: 14 days Doses: 0.016, 0.031, 0.063, 0.13, 0.25 and 0.50 mg a.i./l	EC_{50} = 0.53 mg a.i./l NOEC = 0.13 mg a.i./l	Study #93-11-5052
Lemna	Acute toxicity	80.2% MCPA DMA Salt	850.4400 Duration: 14 days Doses: 16, 31, 63, 130, 250, 500 ug a.s/L (mean measured 13.3, 26.4, 49.3, 107, 194, 378 ug a.e./L)	14-day IC_{50} = 152 ug a.s./L (124 ug a.e./L) 14-day NOEC = 16.2 ug a.s./L (13.2 ug a.e./L)	Study # 364A-103
Lemna	Acute toxicity	779.3 g/L MCPA DMA Salt (as acid)	OECD 221 Duration: 14 days Doses: 0.380, 0.759, 1.52, 3.04, 6.08, 12.2 mg a.s./L (equivalent to 0.25, 0.5, 1.0, 2.0, 4.0, 8.0 mg a.e./L)	14-day E_rC_{50} = 6.3 mg a.e./L 14-day E_yC_{50} = 1.52 mg a.e./L NOEC < 0.253 mg a.e./L	Study #TFT 0006/062180 Jenkins 2006
Cyprinus carpio	Acute toxicity	97.0	OECD 203 Duration: 96 h Doses: 10, 32, 56 and 100 mg ae/L (nominal)	LC_{50} >100 mg ae/L	Study #W/03/04
Zebra fish (*Brachydanio rerio*)	Early-life stage toxicity test	97.0	OECD 210 Duration: 96 h Doses: 0.10, 0.32, 1.0, 3.2 and 10.0 mg ae/L	30-day NOEC ≥10.0 mg ae/L (nominal)	Study #W/04/04
Daphnia magna	Acute immobilization test	97.0	OECD 202 Duration: 48 h Doses: 32, 56, 100, 180 and 320 (nominal)	EC_{50} (48 h)=183 mg ae/L	Study #W/06/04

Species	Test	Purity %	Guideline, duration, doses and conditions	Result [MCPA unless otherwise stated]	Study number
			38.1, 55.3, 92.7, 206.7 and 349.6 mg ae/L (mean measured)		
Daphnia magna	Chronic toxicity reproduction test	97.0	OECD 211 Duration: 21 days Doses: 10.0, 18.0, 32.0, 56.0 and 100.0 mg ae/L (nominal)	$NOEC_{reproduction}$ = 56.0 mg ae/L (nominal)	Study #W/07/04
Rainbow trout (*Oncorhynchus mykiss*)	Bioconcentration in fish	97.0	OECD 305 Duration: Uptake phase: 5 weeks; depuration phase: 2 weeks Doses: 0.1 and 1.0 mg ae/L	MCPA acid is not bio-accumulated in rainbow trout	Study #W/05/04
Lemna minor	Acute toxicity	97.0	OECD 221 Duration: 7 days Doses: 0.1, 0.32, 1.0, 3.2, 10.0, 32, 100 mg a.e./L	7-day E_rC_{50} = 7.13 mg a.e./L 7-day E_yC_{50} = 6.53 mg a.e./L	Study #W-09-04
Myriophyllum spicatum	Growth inhibition	95.9%	OECD 239 Duration: 14 days Doses: 0.00954, 0.0305, 0.0977, 0.313, 1.0 and 3.20 mg/L	Total shoot length: E_rC_{50} = 0.440 mg/L E_yC_{50} = 1.74 mg/L NOEC = 0.0305 mg/L Fresh weight: E_rC_{50} = 0.243 mg/L E_yC_{50} = 0.202 mg/L NOEC = 0.0977 mg/L Dry Weight: E_rC_{50} = 0.608 mg/L E_yC_{50} = 0.529 mg/L NOEC = 0.0977 mg/L	Study #S15-00286 Gonsior 2015
Honeybee larvae	Acute toxicity	98.8	OECD 237 Duration: 72 hours Doses: 87.2, 43.6, 21.8, 10.9 and 5.4 ug a.s./larva Conditions: dietary administration	LD_{50} = 35.6/ 19.8/ 14.5 ug a.s./larva NOED = 5.4 ug a.s./larva NOEC = 0.165 g a.s./kg food	Study #15 10 48 161B
Honeybee larvae	Chronic toxicity	97.06	OECD 239 Duration: 8days	EC_{20} = 0.193 mg a.i./mL ED_{20} = 26.97 ug a.i./bee EC_{50} = 0.553 mg a.i./mL	Study #364H-102

Species	Test	Purity %	Guideline, duration, doses and conditions	Result [MCPA unless otherwise stated]	Study number
			Doses: 6.25, 12.5, 25, 50 and 100 ug a.i./bee Conditions: dietary administration	ED_{50} = 77.48 ug a.i./bee NOEC = 0.179 mg a.i./mL NOED = 25 ug a.i./bee LOEC = 0.357 mg a.i./mL LOED = 50 ug a.i./bee	
Honeybee - adult	Acute contact and oral toxicity	96.9	OPPTS 850.3020 Duration: 48 hours Doses: Contact – 200 ug/bee; Oral – 200 ug/bee Conditions: Contact – application to thorax; Oral = administered in sucrose solution	Contact LD_{50} > 200 ug/bee Contact NOEC = 200 ug/bee Oral LD_{50} > 200 ug/bee Oral NOEC = 200 ug/bee	Study #398984
Earthworm	Acute	97.0	OECD 207 Duration:14 days Doses: 0, 62.5, 125, 250, 500, 1000 mg a.e./kg	LC_{50} > 1000 mg a.e./kg NOEC $\underline{\geq}$ 1000 mg a.e./kg	Study #G-27-3
Earthworm	Acute	97.0	OECD 207 Duration:14 days Doses: 0, 62.5, 125, 250, 500, 1000 mg a.e./kg	LC_{50} > 1000 mg a.e./kg NOEC $\underline{\geq}$ 1000 mg a.e./kg	Study #G-27-3

The IPCS hazard classification of MCPA is: Slightly hazardous (Class III.) [WHO/PCS/01.5]

According to UN GHS Criteria:

Harmful if swallowed or if inhaled
Causes skin irritation
Causes serious eye damage
May cause respiratory irritation
Very toxic to aquatic life with long lasting effects
Transportation
UN Classification
UN Hazard Class: 9; UN Pack Group: III

ANNEX 2
REFERENCES

Study number	Author(s)	Year	Study title. Study identification number. Report identification number. GLP [if GLP]. Company conducting the study.
IPCS, 2009		2009	http://www.inchem.org/documents/icsc/icsc/eics0054.htm
JMPR, 2012		2012	http://www.fao.org/fileadmin/templates/agphome/documents/Pests_Pesticides/JMPR/Report12/MCPA.pdf
RED, 2004		2004	https://www3.epa.gov/pesticides/chem_search/reg_actions/reregistration/red_PC-030501_30-Sep-04.pdf
EU, 2005		2005	https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32005L0057
AGP:CP/312		1994	http://www.fao.org/fileadmin/templates/agphome/documents/Pests_Pesticides/Specs/Old_specs/Mcpx.pdf
FAO/WHO Manual		2016	http://www.fao.org/3/a-i5713e.pdf
Tessier		2020	E-mail from Sonia Tessier, sent on 2 April 2020 9:13 [From: Sonia.Tessier@hse.gov.uk to laszlo.bura@efsa.europa.eu]
Kielek		2020	E-mail from Przemyslaw Kielek, sent on 13 July 2019 9:13 [From: przemyslaw.kielek@minrol.gov.pl to laszlo.bura@efsa.europa.eu]
CIPAC, F	Martijn A and Dobrat W	1995	CIPAC Handbook Volume F. Physico-chemical Methods for Technical and Formulated Pesticides
CIPAC, J	Martijn A and Dobrat W	2000	CIPAC Handbook Volume J. Analysis of Technical and Formulated Pesticides
CIPAC, 1C	Henriet J, Martijn A and Povlsen H.H	1985	CIPAC Handbook Volume 1C. Analysis of Technical and Formulated Pesticides, p.2139
ML-AL-85-40005	Chakrabarti	1985	Vapor Pressure of MCPA and Two MCPA Esters. Study #ML-AL-85-40005. GLP. The Dow Chemical Company
15	Roberts	1993	Determination of Physico-Chemical Properties of MCPA Technical Acid. Study #15. GLP. Rhone-Poulenc Chemicals Ltd.
PCP03317	Türk	1994	Determination of the appearance, the melting point and thermal conversions of MCPA (Reg. No. 174313) (PAI). Study #PCP03317. GLP. BASF Aktiengesellschaft
ES-DR-0004-9672-3	Hopkins	1987	2-Methyl-4-Chlorophenoxyacetic Acid: Determination of the Water Solubility. Study #ES-DR-9672-3. GLP. The Dow Chemical Company
ES-DR-0004-9672-4	Bailey	1987	2-Methyl-4-Chlorophenoxyacetic Acid: Determination of Octanol/Water Partition Coefficient. Study #ES-DR_0004-9672-4. GLP. The Dow Chemical Company
SC910160	Lai	1993	Hydrolysis of 14C-MCPA Acid in Buffered Aqueous Solutions. Study #SC910160. GLP. Battelle Memorial Institute

410W-1	Concha	1993	Sunlight Photodegradation of 14C MCPA in a Buffered Aqueous Solution at pH5 by Natural Sunlight. Study #410W-1. GLP. PTRL West, Inc.
2515	Redeker	1988	Determination of the pKa Value of MCPA in Water. Study #2515. GLP. BASF Aktiengesellschaft
BF-C/01/04	Al Amin	2005	The study of technical MCPA physico-chemical properties. Study No. BF-C/01/04 Part II.1-II.7. GLP. Institute of Industrial Organic Chemistry.
200-241		1982	Acute Oral Toxicity Study in Rats with 2-Methyl-4-chlorophenoxyacetic Acid (MCPA). Study Number 200-241. GLP. Hazleton Laboratories America, Inc.
2060/0025		2006	MCPA Acid Technical: Acute Oral Toxicity in the Rat – Acute Toxic Class Method. Study Number 2060/0025. GLP.
83/108A		1983	Report on the Study of the Acute Oral Toxicity of MCPA dated June 28, 1983. Study Number 83/108A. GLP.
14/02/1995		1995	Acute oral toxicity study in the rat for MCPA concentrate. Study Number 14/2/1995. GLP.
OS-3/05		2005	MCPA Techn. Acute Oral Toxicity study on rats. Study Number OS-3/05.GLP.
83/167		1983	Report on the study of the Acute Dermal Toxicity in Rats of MCPA dated August 17, 1983. Study Number 83/167. GLP.
200-242		1982	Acute Dermal Toxicity Study in Albino Rabbits with 2-methyl-4-chlorophenoxyacetic acid (MCPA). Study Number 200-242. GLP.
14/2/1995		1995	Acute dermal toxicity study in the rat for the MCPA concentrate. Study Number 14/2/1995, GLP.
13I0046/83		1986	Acute Inhalation Toxicity LC50 4 hours (rat) Dust Aerosol Study of MCPA. Study Number 13I0046/83. GLP.
06/163-004P		2006	Acute Inhalation Toxicity Study (Nose-Only) on MCPA Technical 96 in Rats. Study Number 06/163-004P. GLP.
83/198		1983	Report on the Study of the Irritation to the Eye of the White Rabbit based on Draize of MCPA dated September 19, 1983. Study Number 83/198. GLP.
200-244		1982	Primary Eye Irritation Study in Albino Rats with 2-Methyl-4-Chloropohenoxyacetic Acid (MCPA). Study Number 200-244. GLP.
07/02/1995		1995	Eye irritation to the rabbit: MCPA concentrate. Study Number 07/02/1995. GLP.
920423D/JEL 22/SE		1992	Skin Irritation to the Rabbit of MCPA Acid. Study Number 920423D/JEL 22/SE. GLP.
200-243		1982	Primary Dermal Irritation Study in Albino Rats with 2-Methyl-4-chlorophenoxyacetic acid (MCPA). Study Number 200-243. GLP.

2416/0001		2007	MCPA Acid Technical: Acute Dermal Irritation in the Rabbit. Study Number 2416/0001. GLP.
83/196		1983	Report on the Study of the Irritation to the Intact and Abraded Dorsal Skin of the White Rabbit based on Draize of MCPA dated September 19, 1983. Study Number 83/196. GLP.
07/02/1995		1995	Skin irritation to the rabbit MCPA concentrate. Study Number 07/02/1995. GLP.
31H46/83		1984	Report on the study on the sensitizing effect of MCPA in the guinea pig – Open Epicutaneous Test (OET) dated October 26, 1984. Study Number 31H46/83.
30H46/83-1		1984	Report on the Study on the Sensitizing Effect of MCPA in the Guinea Pig – Maximization Test – dated October 26, 1984. Study Number 30H46/83-1. GLP.
AL-7/98		1998	Skin sensitisation of MCPA Techn. to guinea pigs. Study Number AL-7/98. GLP.
CTL/P/6212		1999	Mouse skin Sensitisation study. Study Number CTL/P/6212. GLP.
517-106		1970	MCPA Three-month dietary administration – Rats MCPA. Study Number 517-106. GLP.
31S0046/8302		1985	Report on the study of the toxicity of MCPA in rats after 3 months' administration in the diet dated April 1, 1985. Study Number 31S0046/8302. GLP.
50C0374/91133		1994	MCPA Acid – Subchronic Oral Toxicity and Neurotoxicity in Wistar Rats. Study Number 50C0374/91133. GLP.
85/087		1985	Report on the Study of the Toxicity of MCPA in Mice after 4 weeks Administration in the Diet (Range-finding study). Study Number 85/087. GLP.
33D0046/8341		1986	Report on the Study of the Toxicity of MCPA in Beagle Dogs after 12-Month Administration in the Diet. 33D0046/8341. GLP.
517-107		1970	13-Week Dietary Administration – Dogs MCPA. Study Number 517-107. GLP.
R6478		1980	Subchronic (13-Week) Oral Toxicity Study of MCPA in Beagle Dogs. Study Number R 6478. GLP.
9533 204		2005	MCPA – 90-day Oral Toxicity Study on Beagle Dogs (OECD 409, EU-B27). Study Number 9533 204. GLP.
JEL 23/921253		1992	Twenty-One Day Dermal Toxicity Study in the Rabbit with MCPA Acid. Study Number JEL 23/921253. GLP.
PDO-5/99 S		1999	MCPA Repeat Dose Dermal Toxicity 21-day study. Study Number PDO-5/99 S. GLP.
46I0256/021002		2011	MCPA Acid: 28-Day Subacute Inhalation Toxicity Study in Wistar Rats – Dust Exposure. Study Number 46I0256/021002. GLP.

6148-100		1986	Two-Generation Reproduction Study with MCPA in Rats. Study Number 6148-100. GLP.
RR1007		2004	4-Chloro-2-Methyl Phenoxyacetic Acid (MCPA): One Generation Study in the Rat. Study Number RR1007. GLP.
TGR-3-99		1999	Technical MCPA: Two-Generation Reproduction Toxicity Study on Rats. Study Number TGR-3-99. GLP.
30R0374/91096		1993	Study of the Prenatal Toxicity of MCPA Acid in Rats after Oral Administration (Gavage). Study Number 30R0374/91096. GLP. BASF Aktiengesellschaft.
678R-277/6		1978	MCPA oral teratogenicity dose ranging study in rats. Study number 678R-277/6.
1996-277/7b		1980	MCPA oral teratogenicity study in the rat. Study Number 1996-277/7b.
40R0374/91095		1993	Study of the Prenatal Toxicity of MCPA Acid in Rabbits after Oral Administration (Gavage). Study Number 40R0374/91095. GLP.
December 1991		1991	MCPA Teratogenic and Embryotoxic Study. Report No. December 1991. GLP.
9533 202		2005	MCPA – Prenatal developmental toxicity in rabbits (OECD 414). Study Number 9533 202. GLP.
71S0045/8345		1988	Study on the Chronic Toxicity and Oncogenic Potential of MCPA in Rats Administration in the Diet over 24 Months. Study Number 72S0045/8345.
Ch/K – 4 / 91		1994	MCPA Combined Chronic Toxicity / Carcinogenicity Study on Rats. Study Number Ch/K – 4 / 91. GLP. I
80S0046/8358		1988	Study on the Oncogenic Potential of MCPA in Mice – Administration in the Diet over 104 weeks. Study Number 80S0046/8358. GLP.
K-10/04		2006	MCPA Technical Carcinogenicity Test in Mice. Study Number K-10/04. GLP. Institute of Organic Chemistry.
20C0374/91106		1994	MCPA Acid – Acute Neurotoxicity Study in Wistar Rats. Study Number 20C037491106. GLP.
S-48/05		2005	MCPA Technical: Repeated Dose-90-day Oral Toxicity Study and Neurotoxicity Study in Rats. Study Number S-48/05. GLP.
JEL 26/920957		1993	Ames Salmonella Typhimurium Bacterial Reverse Mutation Assay on MCPA Acid. Study Number JEL 26/920957. GLP.
JEL 29/921115		1993	Chinese Hamster Ovary / HGPRT Locus Assay – MCPA Acid. Study Number JEL 29/921115. GLP.
JEL 32/921190		1993	MCPA Acid – Metaphase Chromosome Analysis of Human Lymphocytes Cultured in vitro. Study Number JEL 32/921190. GLP.
10M0046/8367		1986	Cytogenetic Investigations in Chinese Hamsters after a Single Oral Administration of MCPA – Bone Marrow Chromosome Analysis – 2nd study. Study Number 10M0046/8367. GLP.

16M0046/8356		1985	Cytogenetic Investigations in Chinese Hamsters after a Single Oral Administration of MCPA – Sister Chromatid Exchange – Supplementary Study. Study Number 16M0046/8356. GLP.
953 3 201		20 2005	MCPA – Genotoxicity tests. Study Number 953 3 201. GLP.
CTL/P/6212		1999	MCPA (2-methyl-4-chlorophenoxyacetic acid): local lymph node assay. Study Number CTL/P/6212. GLP.
222-101		1986	MCPA Acid – An Acute Oral Toxicity Study with the Bobwhite. Study Number 222-101. GLP.
G-26-04		2004	MCPA technical – acute oral toxicity test with Japanese quail (Coturnix coturnix japonica). Report No.: G/26/04. GLP.
G-25-04		2004	MCPA technical – dietary toxicity test with Japanese quail (*Coturnix coturnix japonica*). Report No. G-25-04. GLP. I
G-25-04		2006	Annex No 1 to report: MCPA technical – dietary toxicity test with Japanese quail (Coturnix coturnix Japonica). Report No.: G/25/04, GLP.
364B-106A		2016	MCPA: A Dietary LC50 Study with the Zebra Finch. Study Number 364B-106A. GLP.
364B-108		2017	MCPA: A Reproduction Study with the Mallard. Study Number 364B-108. GLP.
364-102		1994	MCPA Acid: A One-Generation Reproduction Study with the Northern Bobwhite (*Colinus virginianus*). Study Number 364-102. GLP.
G-29-06		2006	MCPA technical – Avian reproduction toxicity test in the Japanese quail (Coturnix coturnix japonica). Report No.: G/29/06. GLP. I
W-03-04		2004	MCPA techn. – acute toxicity for fish. Report No.: W/03/04. GLP.
D00786		1986	Static Acute Toxicity of MCPA (2-Methyl-4-Chlorophenoxyacetic acid) to the Atlantic Silverside (Menidia menidia). Study Number D0786. GLP.
D1186		1986	Static Acute Toxicity of Technical Dimethylamine salt (2-Methyl-4-Chlorophenoxyacetic Acid, Dimethylamine Salt) to the Bluegill, Lepomis Macrochirus. Study Number D1186. GLP.
D1386		1986	Static Acute Toxicity of Technical MCPA Dimethylamine Salt (2-Methyl-4-Chlorophenoxacetic acid, dimethylamine salt) to the Rainbow Trout (Salmo gairdneri). Study Number D1386. GLP.
93-7-4859		1993	MCPA DMA Salt – Acute Toxicity to Sheepshead Minnow (Cyprinodon variegatus) under Flow-Through Conditions. Study Number 93-7-4859. GLP.
364A-102		1997	MCPA DMAS: An Early Life-Stage Toxicity Test with the Fathead Minnow (Pimephales promelas). Study Number 364A-102. GLP.
W-04-04		2005	MCPA techn. – Fish, early-life stage toxicity test. Report No.: W/04/04. GLP.

92-4-4235		1992	MCPA DMAS – Acute Toxicity to Daphnids (Daphnia magna) under Flow-Through Conditions. Study Number 92-4-4235. GLP.
W-06-04		2004	MCPA techn. – Daphnia magna – acute immobilization test. Report No.: W/06/04. GLP. I
364A-101		1997	MCPA DMAS: A Flow-Through Life-Cycle Toxicity Test with the Cladoceran (Daphnia magna). Study Number 364A-101. GLP.
W-07-04		2004	MCPA tech. – Daphnia magna reproduction test. Report No.: W/07/04. GLP.
D0186		1986	Static Acute Toxicity of Technical MCPA (2-Methyl-4-Chlorophenoxyacetic acid) to Embryos and Larvae of the Eastern Oyster (Crassostrea virginica). Study Number D0186. GLP.
D0486		1986	Static Acute Toxicity of MCPA to the Pink Shrimp. Study Number D0486. GLP.
93-9-4918		1993	MCPA Acid – Toxicity to the Freshwater Blue-Green Alga, Anabaena Flos-Aquae. Study Number 93-9-4918. GLP.
93-8-4914		1993	MCPA Acid – Toxicity to the Freshwater Diatom, Navicula pelliculosa. Study Number 93-8-4914. GLP.
364A-106A		1999	MCPA DMAS: A 5-Day Toxicity Test with the Freshwater Diatom (Navicula pelliculosa). Study Number 364A-106A. GLP.
93-8-4897		1993	MCPA Acid – Toxicity to the Freshwater Green Alga, Selenastrum capricornutum. Study Number 93-8-4897. GLP.
364A-104		1999	MCPA DMAS: A 5-Day Toxicity Test with the Freshwater Alga (Selenastrum capricornutum). Study Number 364A-104. GLP.
93-10-4985		1993	MCPA Acid – Toxicity to the Marine Diatom, Skeletonema costatum. Study Number 93-10-4895. GLP.
364A-107		1999	MCPA DMAS: A 5-Day Toxicity Test with the Marine Diatom (Skeletonema costatum). Study Number 364A-107. GLP.
BL6837/B		2000	MCPA: Toxicity to Duckweed (Lemna gibba). Study Number BL6837/B. GLP.
93-11-5052		1994	MCPA Acid – Toxicity to Duckweed, Lemna gibba. Study Number 93-11-5052. GLP.
364A-103		1999	MCPA DMAS: A 14-Day Toxicity Test with Duckweed (Lemna gibba G3). Study Number 364A-103. GLP.
TFT 0006/062180		2006	MCPA (DMA Salt) Higher Plant (Lemna gibba) Growth Inhibition Test. Study Number TFT 0006/062180. GLP.
W-09-04		2004	MCPA techn. – Toxicity evaluation for duckweed Lemna minor L. UTCC 490. Report No.: W/09/04. GLP. I
S15-00286		2015	MCPA: Growth Inhibition of Myriophyllum spicatum in a Water/Sediment System. Study Number S15-00286. GLP.

15 10 48 161B		2016	Acute toxicity of MCPA TGAI to honeybee larvae (Apis mellifera L) under laboratory conditions (In vitro). Study Number 15 10 48 161 B. GLP.
364H-102		2018	MCPA: A Chronic Larval Toxicity Study with the Honeybee (Apis mellifera). Study Number 364H-102. GLP.
398984		2001	A Laboratory Evaluation of the Acute Toxicity of MCPA to the Honeybee (Apis mellifera): 48-hour Contact and Oral LD50. Study Number 398984. GLP.
G-27-3		2004	MCPA technical – Toxicity evaluation for earthworms (Eisenia fetida Sav.). Report No.: G/27/03. GLP. Institute of Organic Industry,
93-8-4888		1993	MCPA Acid – Determination of Effects on Seed Germination, Seedling Emergence and Vegetative Vigor of Ten Plant Species. Study Number 93-8-4888.
WHO/PCS /01.5	IPCS	2002	The WHO Recommended Classification of Pesticides by Hazard and Guidelines to Classification, 2000-2002. Document Number WHO/PCS/01.5; International Programme on Chemical Safety. https://www.who.int/ipcs/publications/en/pesticides_hazard.pdf