

# Bifenox

(Also known as: C11066; MC-4379)



Last updated:  
17/07/2024



## SUMMARY

Bifenox is a herbicide for the control of broad-leaved weeds and some grasses. It has a low aqueous solubility, is volatile and would not be expected to leach to groundwater. It would also not be expected to be persistent in soil or water systems. It has a low mammalian toxicity and no serious health concerns have been identified. Bifenox is moderately toxic to fish, aquatic invertebrates and earthworms but is highly toxic to algae.

## Data alerts

The following alerts are based on the data in the tables below. An absence of an alert does not imply the substance has no implications for human health, biodiversity or the environment but just that we do not have the data to form a judgement.

Environmental fate	Ecotoxicity	Human health

## GENERAL INFORMATION



<b>Description</b>	A diphenyl ether herbicide for the control of broad-leaved weeds and some grasses
<b>Example pests controlled</b>	Brome; Barnyard grass; Nutsedge; Cleavers; Fathen; Sprangletop; Charlock; <i>Kochia scoparia</i> ; <i>Daucus carota</i>
<b>Example applications</b>	Cereals including wheat, barley, corn; Soybeans; Peanuts; Sugarbeet; Rice; Sorghum; OSR; Sunflowers
<b>Efficacy &amp; activity</b>	-
<b>Availability status</b>	Current
<b>Introduction &amp; key dates</b>	2000, introduced

## UK regulatory status

<b>UK COPR regulatory status</b>	Approved
<b>Date COPR inclusion expires</b>	31/12/2029
<b>UK LERAP status</b>	None

## EC Regulation 1107/2009 (repealing 91/414)

<b>EC Regulation 1107/2009 status</b>	Approved
<b>Dossier rapporteur/co-rapporteur</b>	Poland/Belgium
<b>Date EC 1107/2009 inclusion expires</b>	31/03/2027
<b>EU Candidate for substitution (CfS)</b>	No
<b>Listed in EU database</b>	Yes

Approved for use (✓) under EC 1107/2009 in the following EU Member States	<b>AT</b>	<b>BE</b>	<b>BG</b>	<b>CY</b>	<b>CZ</b>	<b>DE</b>	<b>DK</b>	<b>EE</b>	<b>EL</b>
	✓	✓	✓		✓	✓		✓	
	<b>ES</b>	<b>FI</b>	<b>FR</b>	<b>HR</b>	<b>HU</b>	<b>IE</b>	<b>IT</b>	<b>LT</b>	<b>LU</b>
	✓	✓	✓		✓		✓	✓	✓
	<b>LV</b>	<b>MT</b>	<b>NL</b>	<b>PL</b>	<b>PT</b>	<b>RO</b>	<b>SE</b>	<b>SI</b>	<b>SK</b>
✓		✓	✓		✓	✓		✓	
Approved for use (✓) under EC 1107/2009 by Mutual Recognition of Authorisation and/or national regulations in the following EEA countries	<b>IS</b>	<b>NO</b>							

### Additional information

Also used in	-
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### Chemical structure

Isomerism	None
Chemical formula	C <sub>14</sub> H <sub>9</sub> Cl <sub>2</sub> NO <sub>5</sub>
Canonical SMILES	COC(=O)C1=C(C=CC(=C1)OC2=C(C=C(C=C2)Cl)Cl)[N+](=O)[O-]
Isomeric SMILES	No data
International Chemical Identifier key (InChIKey)	SUSRORUBZHMPCO-UHFFFAOYSA-N
International Chemical Identifier (InChI)	InChI=1S/C17H20N2O3/c1-12(2)22-17(20)19-18-15-11-14(9-10-16(15)21-3)13-7-5-4-6-8-13/h4-12,18H,1-3H3,(H,19,20)
2D structure diagram/image available?	<a href="#">Yes</a>

### Cambridge Crystallographic Data Centre diagrams



Common Name	Relationship	Link
bifenox	-	

### General status

Pesticide type	Herbicide
Substance groups	Nitrophenol ether herbicide
Minimum active substance purity	970 g kg <sup>-1</sup>
Known relevant impurities	EU dossier - 2,4-dichlorophenol < 3 g kg <sup>-1</sup> , 2,4-dichloroanisole < 6 g kg <sup>-1</sup>
Substance origin	Synthetic
Mode of action	Selective, absorbed by foliage, new shoots and roots to inhibit protoporphyrinogen oxidase
CAS RN	42576-02-3
EC number	255-894-7
CIPAC number	413

US EPA chemical code	104301
PubChem CID	39230
CLP index number	No data found
Molecular mass	342.1
PIN (Preferred Identification Name)	methyl 5-(2,4-dichlorophenoxy)-2-nitrobenzoate
IUPAC name	methyl 5-(2,4-dichlorophenoxy)-2-nitrobenzoate
CAS name	methyl 5-(2,4-dichlorophenoxy)-2-nitrobenzoate
Other status information	OSPAR soc
Relevant Environmental Water Quality Standards	-
Herbicide Resistance Class (HRAC MoA class)	E
Herbicide Resistance Class (WSSA MoA class)	14
Insecticide Resistance Class (IRAC MoA class)	Not applicable
Fungicide Resistance Class (FRAC MOA class)	Not applicable
Examples of recorded resistance	-
Physical state	Pale yellow crystals

## Formulations

Property	Value
Example manufacturers & suppliers of products using this active now or historically	<ul style="list-style-type: none"> <li>• Adama</li> <li>• Makhteshim-Agan</li> <li>• Rhone-Poulenc</li> </ul>
Example products using this active	<ul style="list-style-type: none"> <li>• Fox</li> <li>• Sabine</li> <li>• Modown</li> <li>• Alibi</li> <li>• Chipco Ronstar Plus</li> </ul>
Formulation and application details	Often supplied as a soluble concentrate or wettable powder which were mixed with water and applied as a spray

## ENVIRONMENTAL FATE



Property	Value	Source; quality score; and other information	Interpretation
Solubility - In water at 20 °C (mg l <sup>-1</sup> )	0.1	A5	Low
Solubility - In organic solvents at 20 °C (mg l <sup>-1</sup> )	261000	C4 Xylene	-
	23000	A5 Methanol	-
	1000000	A3 Dichloromethane	-

Property		Value	Source; quality score; and other information	Interpretation
		320000	A5 Toluene	-
Melting point (°C)		87	A5	-
Boiling point (°C)		Decomposes before boiling	A5	-
Degradation point (°C)		398.6	A5	-
Flashpoint (°C)		-	-	-
Octanol-water partition coefficient at pH 7, 20 °C	P	4.37 X 10 <sup>03</sup>	Calculated	-
	Log P	3.64	A5	High
Fat solubility of residues	Solubility	Soluble	A5	-
	Data type	Regulatory data - observed in metabolism and farm animal feeding studies	A5	-
Density (g ml <sup>-1</sup> )		0.65	L3	-
Dissociation constant pKa) at 25 °C		Not applicable	A5	-
		No dissociation		
Vapour pressure at 20 °C (mPa)		4.74 X 10 <sup>-05</sup>	A5	Low volatility
Henry's law constant at 25 °C (Pa m <sup>3</sup> mol <sup>-1</sup> )		1.62 X 10 <sup>-04</sup>	A5	Non-volatile
Volatilisation as max % of applied dose lost	From plant surface	1.3	A5 24 hr	Volatilisation is not considered critical for air pollution
	From soil surface	1.0	A5 24 hr	Volatilisation is not considered critical for air pollution
Maximum UV-vis absorption L mol <sup>-1</sup> cm <sup>-1</sup>		In methanol: 284.5nm = 8980, 436nm = 174 17.6% methanol in water: 301.5nm = 8633, 437nm = 290	A5	-
Surface tension (mN m <sup>-1</sup> )		-	-	-

### Degradation

Property		Value	Source; quality score; and other information	Interpretation
General biodegradability		-		
Soil degradation (days) (aerobic)	DT <sub>50</sub> (typical)	6	H4	Non-persistent
	DT <sub>50</sub> (lab at 20 °C)	8.3	A5	Non-persistent
	DT <sub>50</sub> (field)	17.3	A4	Non-persistent
	DT <sub>90</sub> (lab at 20 °C)	36.6	A5	Moderately persistent

Property		Value	Source; quality score; and other information	Interpretation
	DT <sub>90</sub> (field)	57.6	A5	-
	DT <sub>50</sub> modelling endpoint	-	-	-
	Note	EU dossier lab studies DT <sub>50</sub> range 4-18 days, DT <sub>90</sub> range 13.3-59.8 days; field studies DT <sub>50</sub> range 8.3-32.1 days, USA, DT <sub>90</sub> range 27.7-106.6 days		
Dissipation rate RL <sub>50</sub> (days) on plant matrix	Value	-	-	-
	Note	-		
Dissipation rate RL <sub>50</sub> (days) on and in plant matrix	Value	-	-	-
	Note	-		
Aqueous photolysis DT <sub>50</sub> (days) at pH 7	Value	2.2	A5	Moderately fast
	Note	-		
Aqueous hydrolysis DT <sub>50</sub> (days) at 20 °C and pH 7	Value	265	A5	Persistent
	Note	Stable pH 4 to pH 7, DT <sub>50</sub> 4 days at pH 9		
Water-sediment DT <sub>50</sub> (days)		0.11	A5	Fast
Water phase only DT <sub>50</sub> (days)		-	-	-
Air degradation		As this parameter is not normally measured directly, a surrogate measure is used: 'Photochemical oxidative DT <sub>50</sub> '. Where data is available, this can be found in the Fate Indices section below.		
Decay in stored produce DT <sub>50</sub>		-		

### Soil adsorption and mobility

Property		Value	Source; quality score; and other information	Interpretation
Linear	K <sub>d</sub> (mL g <sup>-1</sup> )	-	-	-
	K <sub>oc</sub> (mL g <sup>-1</sup> )	-	-	-
	Notes and range	-		
Freundlich	K <sub>f</sub> (mL g <sup>-1</sup> )	69.2	A5	Non-mobile
	K <sub>foc</sub> (mL g <sup>-1</sup> )	6475		
	1/n	0.967		
	Notes and range	EU dossier kf range 0.93-169 mL g <sup>-1</sup> , K <sub>foc</sub> range 500-23000 mL g <sup>-1</sup> , 1/n range 0.766-1.117, Soils=8		
pH sensitivity		No		

### Fate indices

Property	Value	Source; quality score; and other information	Interpretation
GUS leaching potential index	0.23	Calculated	Low leachability
SCI-GROW groundwater index ( $\mu\text{g l}^{-1}$ ) for a 1 kg ha <sup>-1</sup> or 1 l ha <sup>-1</sup> application rate	Value 6.83 X 10 <sup>-03</sup>  Note -	Calculated	-
Potential for particle bound transport index	Medium	Calculated	-
Potential for loss via drain flow	Non-mobile	Calculated	-
Photochemical oxidative DT <sub>50</sub> (hrs) as indicator of long-range air transport risk	12	A4 Calculated using the Atkinson method. Assumed 5.0E+05 OH/cm <sup>3</sup>	Below the level of concern for long-range air transport
Bio-concentration factor	BCF (l kg <sup>-1</sup> ) 1500 CT <sub>50</sub> (days) 1.4	A5	Threshold for concern -

#### Known soil metabolites

Metabolite	Major/Minor fraction	Estimated maximum occurrence fraction	Notes
<a href="#">bifenox acid</a>	Major fraction	0.787	Adama verified
5-(2,4-dichlorophenoxy)-2-aminobenzoic acid methyl ester	-	-	-
<a href="#">2,4-dichlorophenol</a>	-	-	-
5-(2,4-dichlorophenoxy)-2-anthranilate acid	-	-	-

#### Known groundwater metabolites

Metabolite	EC SANCO/221/2000 relevancy	ADI (mg kg <sup>-1</sup> bodyweight day <sup>-1</sup> )	WHO drinking water guidance value ( $\mu\text{g L}^{-1}$ day <sup>-1</sup> )
<a href="#">bifenox acid</a>	Not relevant	-	-

#### Other known metabolites

Metabolite name and reference	Aliases	Formation medium / Rate	Estimated maximum occurrence fraction
5-(2,4-dichlorophenoxy)-2-aminobenzoic acid methyl ester	aminobifenox	Sediment; Animal (faeces)	-
<a href="#">2,4-dichlorophenol</a>	-	Sediment	-
5-(2,4-dichloro-5-hydroxy-phenoxy)-2-nitrobenzoic acid	5-hydroxybifenox acid	Plant	-
5-(2,4-dichloro-?-hydroxy-phenoxy)-2-nitrobenzoic acid (Ref: LS-825055)	hydroxybifenox acid	Plant	-

Metabolite name and reference	Aliases	Formation medium / Rate	Estimated maximum occurrence fraction
5-(2,4-dichlorophenoxy)-2-anthranilate acid	aminobifenox acid	Water	-
<a href="#">bifenox acid</a>	bifenox acid	Rat (urine)	-

## ECOTOXICOLOGY



### Terrestrial ecotoxicology

Property	Value	Source; quality score; and other information	Interpretation
Mammals - Acute oral LD <sub>50</sub> (mg kg <sup>-1</sup> )	> 5000	A5 Rat	Low
Mammals - Short term dietary NOEL (mg kg <sup>-1</sup> ) (ppm diet)	> 80 -	L2 Rat 2 yr	High -
Mammals - Chronic 21d NOAEL (mg kg <sup>-1</sup> bw d <sup>-1</sup> )	44.5	A5 Rat Reproductive NOAEL	Moderate
Birds - Acute LD <sub>50</sub> (mg kg <sup>-1</sup> )	> 2000	A5 <i>Colinus virginianus</i>	Low
Birds - Short term dietary (LC <sub>50</sub> /LD <sub>50</sub> )	> 677 mg kg bw <sup>-1</sup> day <sup>-1</sup>	A5 <i>Colinus virginianus</i>	-
Birds - Chronic 21d NOEL (mg kg <sup>-1</sup> bw d <sup>-1</sup> )	290	A5 <i>Coturnix japonica</i> NOEC	Low
Earthworms - Acute 14 day LC <sub>50</sub> (mg kg <sup>-1</sup> )	> 500	A5 <i>Eisenia foetida</i> corr	Moderate
Earthworms - Chronic NOEC, reproduction (mg kg <sup>-1</sup> )	> 2.55	A4 <i>Eisenia foetida</i> corr	Moderate
Soil micro-organisms	Nitrogen mineralisation: Up to -21.9% Carbon mineralisation: No significant adverse effect	A5 Dose: 3.1 mg kg <sup>-1</sup> soil 28 Day	-
Collembola	Acute LC <sub>50</sub> (mg kg <sup>-1</sup> ) Chronic NOEC (mg kg <sup>-1</sup> )	- -	- -
Non-target plants	- -	- -	- -
Honeybees ( <i>Apis</i> spp.)	Contact acute LD <sub>50</sub> (worst case from 24, 48 and 72 hour values - µg bee <sup>-1</sup> )	> 200 A5 <i>Apis mellifera</i>	Low

Property		Value	Source; quality score; and other information	Interpretation
	Oral acute LD <sub>50</sub> (worst case from 24, 48 and 72 hour values - µg bee <sup>-1</sup> )	> 200	A5 <i>Apis mellifera</i>	Low
	Unknown mode acute LD <sub>50</sub> (worst case from 24, 48 and 72 hour values - µg bee <sup>-1</sup> )	-	-	-
	Chronic	-	-	-
Bumblebees ( <i>Bombus</i> spp.)	Contact acute LD <sub>50</sub> (worst case from 24, 48 and 72 hour values - µg bee <sup>-1</sup> )	-	-	-
		-		
	Oral acute LD <sub>50</sub> (worst case from 24, 48 and 72 hour values - µg bee <sup>-1</sup> )	-	-	-
		-		
Mason bees ( <i>Osmia</i> spp.)	Contact acute LD <sub>50</sub> (worst case from 24, 48 and 72 hour values - µg bee <sup>-1</sup> )	-	-	-
	Oral acute LD <sub>50</sub> (worst case from 24, 48 and 72 hour values - µg bee <sup>-1</sup> )	-	-	-
Other bee species (1)	Acute LD <sub>50</sub> (worst case from 24, 48 and 72 hour values - µg insect <sup>-1</sup> )	-	-	-
	Mode of exposure	-		
Other bee species (2)	Acute LD <sub>50</sub> (worst case from 24, 48 and 72 hour values - µg insect <sup>-1</sup> )	-	-	-
	Mode of exposure	-		
Beneficial insects (Ladybirds)		-	-	-



Property	Value	Source; quality score; and other information	Interpretation
Beneficial insects (Lacewings) as % Mortality at dose 0.786 kg ha <sup>-1</sup>	12.5	A4 <i>Chrysoperla carnea</i> Larva corr	-
Beneficial insects (Parasitic wasps) as % Mortality at dose 0.69 kg ha <sup>-1</sup>	0	A4 <i>Aphidius rhopalosiphi</i> Adult corr	-
Beneficial insects (Predatory mites) as Mortality LR <sub>50</sub> g ha <sup>-1</sup>	24.0	A5 <i>Typhlodromus pyri</i> Protonymph	-
Beneficial insects (Ground beetles)	-	-	-

### Aquatic ecotoxicology

Property	Value	Source; quality score; and other information	Interpretation
Temperate Freshwater Fish - Acute 96 hour LC <sub>50</sub> (mg l <sup>-1</sup> )	0.67	A5 <i>Oncorhynchus mykiss</i>	Moderate
Temperate Freshwater Fish - Chronic 21 day NOEC (mg l <sup>-1</sup> )	0.009	A5 <i>Oncorhynchus mykiss</i>	High
Tropical Freshwater Fish - Acute 96 hour LC <sub>50</sub> (mg l <sup>-1</sup> )	-	-	-
Temperate Freshwater Aquatic invertebrates - Acute 48 hour EC <sub>50</sub> (mg l <sup>-1</sup> )	0.66	A5 <i>Daphnia magna</i>	Moderate
Temperate Freshwater Aquatic invertebrates - Chronic 21 day NOEC (mg l <sup>-1</sup> )	0.00015	A5 <i>Daphnia magna</i>	High
Tropical Freshwater Aquatic invertebrates - Acute 48 hour EC <sub>50</sub> (mg l <sup>-1</sup> )	-	-	-
Aquatic crustaceans - Acute 96 hour LC <sub>50</sub> (mg l <sup>-1</sup> )	0.033	F3 <i>Americamysis bahia</i>	High
Sediment dwelling organisms - Acute 96 hour LC <sub>50</sub> (mg l <sup>-1</sup> )	-	-	-
Sediment dwelling organisms - Chronic 28 day NOEC, static, water (mg l <sup>-1</sup> )	0.015	A5 <i>Chironomus riparius</i>	Moderate
Sediment dwelling organisms - Chronic 28 day NOEC, sediment (mg kg <sup>-1</sup> )	-	-	-
Aquatic plants - Acute 7 day EC <sub>50</sub> , biomass (mg l <sup>-1</sup> )	0.0021	A5 <i>Lemna gibba</i>	High
Algae - Acute 72 hour EC <sub>50</sub> , growth (mg l <sup>-1</sup> )	0.00018	C4 <i>Scenedesmus subspicatus</i>	High
Algae - Chronic 96 hour NOEC, growth (mg l <sup>-1</sup> )	0.000175	A5 <i>Desmodesmus subspicatus</i>	High
Mesocosm study data	NOEAEC mg l <sup>-1</sup>	-	-
	NOEAEC mg l <sup>-1</sup>	-	-



## HUMAN HEALTH AND PROTECTION

### General

Property	Value	Source; quality score; and other information	Interpretation
Threshold of Toxicological Concern (Cramer Class)	High (class III)	-	-
Mammals - Acute oral LD <sub>50</sub> (mg kg <sup>-1</sup> )	> 5000	A5 Rat	Low
Mammals - Dermal LD <sub>50</sub> (mg kg <sup>-1</sup> body weight)	2000	A5 Rat	-
Mammals - Inhalation LC <sub>50</sub> (mg l <sup>-1</sup> )	0.91	A5 Rat 4 hr	-
Other Mammal toxicity endpoints	-	-	-
ADI - Acceptable Daily Intake (mg kg <sup>-1</sup> bw day <sup>-1</sup> )	0.3	A5 Mouse SF=100	-
ARfD - Acute Reference Dose (mg kg <sup>-1</sup> bw day <sup>-1</sup> )	0.5	A5 Rabbit SF=100	-
AAOEL - Acute Acceptable Operator Exposure Level (mg kg <sup>-1</sup> bw day <sup>-1</sup> )	-	-	-
AOEL - Acceptable Operator Exposure Level - Systemic (mg kg <sup>-1</sup> bw day <sup>-1</sup> )	0.125	A5 Rabbit SF=400	-
Dermal penetration studies (%)	1-4	A5	-
Dangerous Substances Directive 76/464	-	-	-
Exposure Routes	Public	Negligible risk to bystanders	
	Occupational	Possible risk to operators - PPE advised Low risk to other farm workers	
MRLs	European	EU MRL pesticide database	
	Great Britain	GB MRL Register	
	Notes	-	
Drinking Water Standards	-	-	-
Drinking Water MAC (µg l <sup>-1</sup> )	-	-	-
Mammalian dose elimination route and rate	-	-	-

### Health issues

<b>Specific human health issues</b>	<b>Carcinogen</b>	<b>Genotoxic</b>	<b>Endocrine disruptor</b>
	No data found	A3; B3; C3; D0; E3	No data found
	<b>Reproduction / development effects</b>	<b>Acetyl cholinesterase inhibitor</b>	<b>Neurotoxicant</b>
	No data found	X	No data found
	<b>Respiratory tract irritant</b>	<b>Skin irritant</b>	<b>Skin sensitiser</b>
	No data found	No data found	No data found
	<b>Eye irritant</b>	<b>Phototoxicant</b>	
	No data found	No data found	
<b>General human health issues</b>	Moderately toxic		

### Handling issues

Property	Value and interpretation
<b>General</b>	Not explosive or oxidising IMDG Transport Hazard Class 9 Not expected to auto-ignite; Not highly flammable
<b>CLP classification 2013</b>	Environment: H410
<b>WHO Classification</b>	U (Unlikely to present an acute hazard)
<b>UN Number</b>	UN3077
<b>Waste disposal &amp; packaging</b>	Packaging Group III (minor danger)
<b>Shelf-life, storage, stability and reactivity</b>	-

### TRANSLATIONS



Language	Name
English	bifenox
French	bifenox
German	Bifenox
Danish	bifenox
Italian	bifenox
Spanish	bifenox
Greek	-
Polish	bifenoks
Swedish	bifenox
Hungarian	bifenox
Dutch	-
Norwegian	-

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