

glufosinate ammonium

Review Date: 05/02/2016

CAS #: 77182-82-2

Type	Contact non-selective terrestrial herbicide
Controls	Non-selective herbicide for total vegetation control and also used as a crop desiccant to aid in harvesting.
Mode of Action	Inhibition of glutamine synthetase leading to a complete breakdown of ammonia metabolism (Reference 1).

Thurston County Review Summary:

Glufosinate ammonium herbicide products are rated high in hazard and fail Thurston County's pesticide review criteria. Glufosinate ammonium is rated high in hazard for producing developmental toxicity (pup mortality) that was not a result of maternal toxicity. There are also potential exposures from specific applications that are rated high in hazard.

MOBILITY

Property	Value	Reference	Value Rating
Water Solubility (mg/L)	13,700,000	1	High
Soil Sorption (Kd=mL/g)	23.4	2	Moderate
Organic Sorption (Koc=mL/g)	9.6 to 1,229 (430 average)	1	High to moderate

Mobility Summary:

Glufosinate ammonium is very soluble in water and adheres poorly to soil with little organic content and moderately as the organic content increases. The hazard for glufosinate ammonium to move off the site of application with rain or irrigation water is rated high.

PERSISTENCE

Property	Value	Reference	Value Rating
Vapor Pressure (mm Hg)	0.000000000009	1	High
Biotic or Aerobic Half-life (days)	8 to 23	3	Moderate
Photolysis Half-life (days)	>300 (in water)	1	High
Terrestrial Field Test Half-life (days)	8 to 16	3	Moderate
Hydrolysis Half-life (days)	>300	1	High
Anaerobic Half-life (days)	37 (415 aquatic)	3	Moderate (high in aquatic settings)
Aquatic Field Test Half-life (days)	3 (in water)	3	Low

Persistence Summary:

Glufosinate ammonium has a low vapor pressure so it is unlikely to dissipate into the air after application and it is not expected to breakdown when it is exposed to sunlight or water. The EPA used 35 days for the foliar half-life (Reference 3). The hazard of chemical persistence is rated moderate in hazard.

BIOACCUMULATION

Property	Value	Reference	Value Rating
Bioaccumulation Factor	Value not found		
Bioconcentration Factor	0.19 (whole fish)	3	Low
Octanol/Water Partition Coefficient	<0.1	1	Low

Bioaccumulation Summary:

Glufosinate ammonium has a very low octanol-water partition coefficient (log Kow <0.1) indicating a low potential for bioaccumulation. In metabolism studies, up to 96% of administered glufosinate ammonium was eliminated from test animals within 24-hours (Reference 4). Bioconcentration studies indicate very little potential for glufosinate ammonium to accumulate in fish (Reference 3). Rapid elimination and very little bioconcentration result in a low hazard rating for bioaccumulation potential.

ACUTE WILDLIFE TOXICITY VALUES and Risk Assessment

Test Subject	Value	Reference	Toxicity Rating
Mammalian (LD50)	3,030 mg/kg	3	Low
Avian (LD50)	>2,000 mg/kg/bw	3	Low
Honey bee or insect (LD50)	>345 ug/bee	5	Low
Annelida -worms (LC50)	>1,000 mg/kg	5	Low
Fish (LC50)	>312 mg/L	3	Low
Crustacean (LC50)	651 mg/L	3	Low
Mollusk (LC50)	7.7 mg/L	3	Moderate
Amphibian (LD50 or LC50)	Value not found		

Acute Toxicity Testing and Ecotoxicity Summary:

The risk to aquatic invertebrates, or fish from potential exposures to non-agricultural applications of glufosinate herbicides is rated low in hazard. Due to lack of a toxic response in single-dose dietary toxicity testing with birds, there was no risk calculated for birds, reptiles and terrestrial-phase amphibians from a single dietary exposure (Reference 3). The EPA's level of concern is exceeded from potential single-dose exposures to mammals eating treated grass after a lawn/garden or non-crop area application and is rated high in hazard. Potential long-term exposures to mammals eating treated vegetation, fruit, seeds, and/or insects are also rated high in hazard for agricultural and non-agricultural applications (Reference 3). The calculated risk from non-agricultural applications includes up to 26 applications in a single year (because the label does not limit the number of applications for non-agricultural applications). The risk to honey bees (and potentially other pollinators) exceeds the EPA's level of concern for potential short-term exposures to glufosinate ammonium after agricultural and non-agricultural applications (Reference 3).

ACUTE HUMAN TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Risk Rating
Woman applying with hose-end sprayer (0.5 acres)	Inhalation	0.014 mg/kg/day	0.00021 mg/kg/day	61	7	Low
Woman applying with hose-end sprayer (0.5 acres)	Dermal	0.014 mg/kg/day	0.0133 mg/kg/day	1.1	7	High
Mix/apply 40 gallons (1.7 oz/gal) backpack spray	Dermal (with or without gloves)	0.014 mg/kg/day	0.0133 mg/kg/day	1.1	6	High
Other non-agricultural exposures were not found						

Acute Toxicity Risk Assessment Summary:

Risk from potential short-term dermal (skin) exposures were evaluated using a dose of concern based on a Lowest Observable Adverse Effect Level (LOAEL) of 14 mg/kg/day and a safety factor of 1,000 resulting in a dose of concern of 0.014 mg/kg/day.

Potential exposures from mixing and applying 40 gallons of glufosinate ammonium herbicide with a backpack sprayer at 1.7 fluid ounces per gallon (0.031 lb ai/gal) was more than half of the EPA's level of concern and is rated high in hazard. Risk to a woman applying herbicide with a hose-end sprayer to residential turf at maximum rate (1.5 lb ai/acre) was evaluated for both inhalation and dermal exposures. Inhalation exposures were rated low in hazard although dermal exposures are potentially more than half of the EPA's level of concern and are rated high in hazard by Thurston County's review criteria.

The EPA determined that residential post-application exposures are expected to be minimal because treatments to lawns and turf are limited to spot treatments. Risk from potential post-application exposures from residential applications were not evaluated by the EPA, and are likely to be low in hazard due to the small amounts expected to be applied.

CHRONIC HUMAN TOXICITY HAZARDS

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	Not likely to be carcinogenic to humans	- -	1	Low
Mutagenicity	Value not reported	No mutagenic effects observed	1	Low
Neurotoxicity - (NOAEL)	14 mg/kg/day	Brain morphometric changes	3	High
Endocrine Disruption	Value not found			
Developmental Toxicity (NOAEL)	20 mg/kg/day	Increased mortality	3	High
Reproductive Toxicity (NOAEL)	Highest dose tested	Pup mortality	3	High
Chronic Toxicity (NOAEL)	14 mg/kg/day	Brain morphometric changes	3	Check risk

Chronic Toxicity Hazard Summary:

The EPA classified glufosinate ammonium as "Not likely to be carcinogenic to humans" (Reference 1). In developmental toxicity testing there was an increase in rabbit fetus mortality at 20 mg/kg/day and only mild effects to the parent at the same dose. In reproductive toxicity testing there was an increase in pup mortality without toxicity observed in the parent (Reference 3). Developmental or reproductive toxicity that is not produced (or suspected of being produced) by toxicity to the parent animal is rated high in hazard by Thurston County's pesticide review criteria. Developmental neurotoxicity was also observed without maternal toxicity (Reference 3).

CHRONIC HUMAN TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Risk Rating
Long-term risk was not evaluated						
Long-term risk was not evaluated						
Long-term risk was not evaluated						
Long-term risk was not evaluated						

Chronic Toxicity Risk Assessment Summary:

Non-agricultural uses of glufosinate ammonium herbicides in residential settings or for potential County uses (rights-of-way, landscapes, etc.) are not expected to be on-going and long-term exposures are not expected. Risk from long-term exposures to glufosinate ammonium herbicides from non-agricultural uses is not rated.

Metabolites and Degradation Products:

In soil glufosinate ammonium breaks down to 3-methylphosphinyl-propionic acid and 2-methylphosphinyl-acetic acid and ultimately to carbon dioxide (Reference 1).

Comments:

Glufosinate ammonium is not considered a skin sensitizer (Reference 4). Glufosinate ammonium is considered a mild eye irritant but not a skin irritant (Reference 6).

References

1. National Library of Medicine, TOXNET. Hazardous Substance Databank. Glufosinate Ammonium. Last Revision Date: 9/12/2003.
2. Claudio Screpanti, Cesare Accinelli, Alberto Vicari, Pietro Catizone. Glyphosate and glufosinate-ammonium runoff from a corn-growing area in Italy. Agronomy for Sustainable Development, Springer Verlag/EDP Sciences/INRA, 2005, 25 (3), pp.407-412
3. USEPA. Environmental Fate and Ecological Risk Assessment for the Registration Review of Glufosinate. January 29, 2013.
4. Wolterink, G., Mahieu, C.M., and Davies, L. World Health Organization. Glufosinate-Ammonium. Joint Meeting on Pesticide Residues. 2012.
5. International Union of Pure & Applied Chemistry (IUPAC). Pesticide Properties Database. Glufosinate-ammonium (Ref: HOE 039866). 19 March 2016.
6. USEPA. Office of Chemical Safety and Pollution Prevention. Memorandum, Subject: Glufosinate Ammonium. Human Health Risk Assessment for Registration Review. January 24, 2013.
7. USEPA. Office of Chemical Safety and Pollution Prevention. Memorandum, Subject: Glufosinate Ammonium. Response to Comments on the Human Health Risk Assessment for Registration Review. October 29, 2013.