N-octyl bicycloheptene dicarboximide

Review Date: 08/16/2012
CAS #: 113-48-4

Type	Synergist in insecticides
Controls	N-octyl bicycloheptene dicarboximide does not control insects but is added to insecticides to increase the effectiveness of other insecticide active ingredients.
Mode of Action	Increases toxicity and stabilizes other insecticide active ingredients by inhibiting the breakdown of these chemicals (Reference 1).

Thurston County Review Summary:

N-octyl bicycloheptene dicarboximide also known as MKG-264 is a pesticide active ingredient that works as a chemical synergist (makes other active ingredients more toxic to insects). N-octyl bicycloheptene dicarboximide is rated high in hazard and pesticide products containing it fail Thurston County's pesticide review criteria.

N-octyl bicycloheptene dicarboximide is rated high in hazard because it is classified as a possible human carcinogen by the EPA. There are also many potential exposures to N-octyl bicycloheptene dicarboximide (that have been calculated by the EPA that range from low hazard to high hazard) either for the applicator or for people exposed to the applied product.

MOBILITY

Property	Value	Reference	Value Rating
Water Solubility (mg/L)	<1	1	Low
Soil Sorption (Kd=mL/g)	1.6 to 33	2	Low to moderate
Organic Sorption (Koc=mL/g)	899	1	Moderate

Mobility Summary:

N-octyl bicycloheptene dicarboximide is not very soluble in water but is expected to bind moderately to all soil types [Koc = 636 in sand, Koc = 3,106 clay, Koc = 899 EPA used in drinking water risk assessment (Reference 1)]. The hazard for N-octyl bicycloheptene dicarboximide to move off the site of application with rain or irrigation water is moderate.

PERSISTENCE

Property	Value	Reference	Value Rating
Vapor Pressure (mm Hg)	0.0000184	1	Moderate
Biotic or Aerobic Half-life (days)	341 (mean)	1	High
Abiotic Half-life (days)	Value not found		
Terrestrial Field Test Half-life (days)	Value not found		
Hydrolysis Half-life (days)	Stable	1	High
Anaerobic Half-life (days)	>60	2	High
Aquatic Field Test Half-life (days)	Value not found		

Persistence Summary:

In the air, N-octyl bicycloheptene dicarboximide is expected to degrade rapidly by reacting with ozone and other air chemicals (Reference 2). Microbial degradation of N-octyl bicycloheptene dicarboximide in soil is expected to be very slow and it is expected to be stable to hydrolysis (breakdown with interaction with water) in soil or in aquatic settings (Reference 1). The hazard for chemical persistence in the environment is rated high.

BIOACCUMULATION

Property	Value	Reference	Value Rating
Bioaccumulation Factor	Value not found		
Bioconcentration Factor	130	2	Moderate - low
Octanol/Water Partition Coefficient	Log Kow = 3.6	1	Moderate

Bioaccumulation Summary:

The octanol/water partition coefficient and the calculated bioconcentration factor indicates that N-octyl bicycloheptene dicarboximide has a moderate potential to accumulate in fish or animal tissue. Since there hass not been an evaluation of animal metabolism or the potential for fish to depurate N-octyl bicycloheptene dicarboximide (eliminate the chemical from their body when moved to clean water), the hazard for bioaccumulation is rated moderate.

ACUTE WILDLIFE TOXICITY VALUES and Risk Assessment

Test Subject	Value	Reference	Value Rating
Mammalian (LD50)	>20,000 mg/kg-bw	2	Low
Avian (LD50)	>2,250 mg/kg-bw	2	Low
Honey bee or insect (LD50)	Data gap		
Annelida -worms (LC50)	Value not found		
Fish (LC50)	1.4 ppm	2	Moderate
Crustacean (LC50)	2.3 ppm (non-lethal)	2	Moderate
Mollusk (LC50)	Data gap		
Amphibian (LD50 or LC50)	Value not found		

Acute Toxicity Testing and Ecotoxicity Summary:

Ecological risk assessments evaluated by the EPA lacked many data points (bird long-term toxicity, bee toxicity, marine organism toxicity, etc.) that could be used to more accurately evaluate risk to wildlife. Also, there are no restrictions on the number of applications that can be applied to the same residential area with the various types of products that contain N-octyl bicycloheptene dicarboximide. So, when the EPA evaluated risk to non-target wildlife it used toxicity data for animals and determined that 20 applications per season, to the same area, exceeds the level of concern (assuming that the bird or animal eats its entire diet from the treated area). If the number of applications is reduced to 10 or less, the level of concern is not exceeded. Risk to birds is assumed to be high based of the risk evaluation for animals (Reference 2). The risk to birds and small animals that eat their entire diet from areas that have been treated throughout the growing season is rated high in hazard (although the risk is rated low for a single application).

The highest concentrations of runoff into surface water is expected from uses on turf and ornamental plants (Reference 2). Risk to fish due to N-octyl bicycloheptene dicarboximide runoff from turf or ornamental plant applications is low in hazard for 10 or less applications in a single season - the risk is moderate when there are 20 applications in a single season.

ACUTE HUMAN TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Value Rating
Adult spraying 16 oz aerosol can	Inhalation	0.0019 mg/kg/day	0.00061 mg/kg/day	3	1	Moderate
Child / Adult contacting treated turf	Dermal (skin)	0.061 mg/kg/day	0.012 to 0.008mg/kg/day	5 to 7	1	Moderate
Child playing on treated turf	Oral - hand to mouth + object to mouth	0.061 mg/kg/day	0.0055 mg/kg/day	11	1	Low
Applying pet collar	Dermal	0.061 mg/kg/day	0.034 mg/kg/day	1.8	1	High

Acute Toxicity Risk Assessment Summary:

The EPA evaluated fourteen different potential residential applicator exposures for uses indoors (4), outside (4), and on pets (6). Three of the outdoor application exposure scenarios are rated low in hazard (hose-end sprayer, low pressure hand wand, and Ready-To-Use trigger pump sprayers) and exposures from spraying one 16 ounce aerosol can was calculated to be moderate in hazard.

For all of the inhalation exposures of concern (either moderate or high hazard), use of a 80% or 90% air-purifying respirator drops the risk to low hazard. For all dermal exposures of concern, use of chemically resistent gloves drops the risk to low hazard (Reference 1).

CHRONIC HUMAN TOXICITY HAZARDS

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	Group C	Possible Human Carcinogen	1	High
Mutagenicity	Non-mutagen	- -	4	Low
Neurotoxicity - (NOAEL)	Value not found			
Endocrine Disruption	Value not found	Possible altering of thyroid hormone metabolism	1	Moderate
Developmental Toxicity (NOAEL)	<300 mg/kg/day	Maternal death, abortions	1	Moderate
Reproductive Toxicity (NOAEL)	LOAEL= 61 mg/kg/day	Decreased pup weight	1	High
Chronic Toxicity (NOAEL)	125 mg/kg/bw	Increased liver weight	3	Check risk

Chronic Toxicity Hazard Summary:

The EPA place N-octyl bicycloheptene dicarboximide in cancer classification Group C as a possible human carcinogen, which is rated high in hazard by Thurston County's review criteria (Reference 1). There was no estrogen or androgen toxicity observed in animal testing although there were increased thyroid tumors that could potentially alter thyroid hormone metabolism. The EPA's Health Effects Division concluded that N-octyl bicycloheptene dicarboximide shows no evidence of endocrine disruption (Reference 2). Reproductive toxicity testing produced toxicity to lactating pups at the lowest dose tested without maternal toxicity (which is rated high in hazard). Developmental toxicity in the form of resorptions, stillbirths, and no viable fetuses were observed at doses that also produced maternal toxicity.

CHRONIC HUMAN TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Value Rating
Applying 6 x 6oz fogger cans	Dermal	0.061 mg/kg/day	0.012 mg/kg/day	5	1	Moderate
Applying 2 x 16oz aerosol cans	Dermal	0.061 mg/kg/day	0.011 mg/kg/day	5	1	Moderate
Mixing/loading/applying liquid product for sprayer	Dermal	0.061 mg/kg/day	0.09 mg/kg/day	<1	1	High
Mixing/loading/applying liquid product for sprayer	Inhalation	0.0019 mg/kg/day	0.00024 mg/kg/day	8	1	Moderate

Chronic Toxicity Risk Assessment Summary:

This section is being used to evaluate potential occupational exposures (not just long-term exposures).

The EPA evaluated 28 potential occupational exposures for risk assessment. Two of the assessments were for exposures from head lice treatments, another two were specific for pet treatments and another six were for livestock treatments. This review does not include a rating for these applications (except that they are all low hazard if the applicator uses chemically resistent gloves and an 80% air purifying respirator).

Mixing, loading and applying liquid products (to one acre outdoors or 11,200 square feet indoors) with either a low-pressure hand wand, backpack sprayer, handgun or high-pressure hand wand are considered a moderate potential hazard from potential skin exposures. These potential exposures are low hazard if the mixer/applicator wears chemically resistent gloves.

Potential inhalation exposures from applying aerosol sprays (2 x 16 ounce cans), foggers (3 x 6 ounce cans or more), or applying dusts; are rated moderate in hazard (without use of a respirator). These hazards are all considered low if the applicator wears a 80% or 90% air purifying respirator).

Metabolites and Degradation Products:

Degradation chemicals and metabolites of N-octyl bicycloheptene dicarboximide could not be found.

Comments:

N-octyl bicycloheptene dicarboximide is considered an eye irritant, EPA Toxicity Category III, but only a mild skin irritant, EPA Toxicity Category IV (Reference 1).

References

1. USEPA. Office of Prevention, Pesticides and Toxic Substances. Reregistration Eligibility Decision (RED) Document for N-Octyl bicycloheptene dicarboximide (MGK-264). June 26, 2006.
2. USEPA. Office of Prevention, Pesticides and Toxic Substances. Revised Screening Ecological Risk Assessment for the Reregistration of MGK-264 Insecticide Synergist. July 14, 2006.
3. California Environmental Protection Agency/Department of Pesticide Regulation; Summary of Toxicology Data on Octyl-bicycloheptene-dicarboximide (MGK 264) p.2 (1997).
4. National Library of Medicine HSDB Database. TOXNET, Toxicology Data Network. MGK 264. Reviewed by SRP on 5/12/2011.