

Type	Neoniconitoid insecticide - systemic with contact and stomach action (Reference 1).
Controls	Controls aphids, whiteflies, thrips, leafhopper, leafminer, sawfly, mole cricket, white grubs, lacebugs, pillbugs, beetles, mealybugs, sawfly larvae, and cockroaches.
Mode of Action	Effects the nicotinic acetylcholine receptor within the nervous system.

Thurston County Review Summary:

Dinotefuran fails Thurston County 's pesticide review criteria. Pesticide products containing the active ingredient dinotefuran are rated high in hazard for their potential risk to bees. There are also potential exposures to occupational workers entering treated areas that are rated high in hazard (but are not applicable to exposures that would be incurred by County staff or from residential uses). Dinotefuran is rated high in hazard for mobility and persistence but is not expected to accumulate in fish or animal tissue. The combination of chemical mobility and persistence causes the review rating to be conditional (if it does not fail for another reason). In toxicity testing, dinotefuran caused dose-related effects to the endocrine system (which does not cause it to fail the review but is a concern that also requires a conditional or fail rating).

Risk to non-target beneficial insects (including bees) is rated high in hazard for lethal and sub-lethal effects from exposures to neonicotinoid insecticides. In 2013, Thurston County Commissioners sent a letter to the Washington State Department of Agriculture (WSDA) requesting that they restrict the distribution, sale, purchase and application of the neonicotinoid class of insecticides, for ornamental use, to persons or entities with a valid WSDA pesticide applicator license.

MOBILITY

Property	Value	Reference	Value Rating
Water Solubility (mg/L)	39,830	1	High
Soil Sorption (Kd=mL/g)	0.22	2	High
Organic Sorption (Koc=mL/g)	26	1	High

Mobility Summary:

Dinotefuran is very soluble in water and adheres poorly to all soil types. The hazard for dinotefuran 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)	0.000000013	1	High
Biotic or Aerobic Half-life (days)	82	1	High
Photolysis Half-life (days)	Not found		
Terrestrial Field Test Half-life (days)	75	1	High
Hydrolysis Half-life (days)	Stable	1	High
Anaerobic Half-life (days)	Not found		
Aquatic Field Test Half-life (days)	80.8	2	High

Persistence Summary:

Dinotefuran is not expected to dissipate into the air and is likely to take more than 60 days to break down to half of the applied concentration. The hazard for persistence is rated high.

BIOACCUMULATION

Property	Value	Reference	Value Rating
Bioaccumulation Factor	Not found		
Bioconcentration Factor	Not found		
Octanol/Water Partition Coefficient	log Kow = -0.549	1	Low

Bioaccumulation Summary:

Dinotefuran has a very low octanol / water partition coefficient which indicates that it is not likely to accumulate in fish or animal tissue. In rat metabolism studies, dinotefuran was quickly absorbed and then rapidly eliminated in the urine. More than half of the dose was eliminated within 15 hours and total elimination occurred within 168 hours. The hazard for bioaccumulation is rated low.

ACUTE WILDLIFE TOXICITY VALUES and Risk Assessment

Test Subject	Value	Reference	Toxicity Rating
Mammalian (LD50)	>2000 mg/kg	1	Low
Avian (LD50)	2000 mg/kg	1	Low
Honey bee or insect (LD50)	0.023 ug/bee	1	Very high
Annelida -worms (LC50)	Not found		
Fish (LC50)	100 mg/L	1	Low
Crustacean (LC50)	1,000 mg/L	1	Low
Mollusk (LC50)	>141 ppm	2	Low
Amphibian (LD50 or LC50)	Not found		

Acute Toxicity Testing and Ecotoxicity Summary:

"Proposed uses of dinotefuran do not trigger acute or chronic risks to non-endangered or endangered aquatic and terrestrial organisms (e.g., mammals, birds, fish, invertebrates, and plants)" (Reference 2). It should be noted that neonicotinoid insecticides have been implicated with the effects associated with colony collapse in bee communities, although these effects have not been specifically identified with dinotefuran use.

ACUTE HUMAN TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Risk Rating
Short-term exposures were not calculated						
Short-term exposures were not calculated						
Short-term exposures were not calculated						
Short-term exposures were not calculated						

Acute Toxicity Risk Assessment Summary:

Short-term (1 to 30 days) dermal (skin) toxicity testing with dinotefuran did not produce toxicity to test animals so there were no risk assessments for short-term skin exposures. However, dermal toxicity testing did produce toxicity in an intermediate time frame (1 to 6 months in duration). So, residential exposures were evaluated using intermediate exposure scenarios (found in the chronic risk assessment). Other short-term risk assessments included food sources (which are not included in Thurston County's reviews).

CHRONIC HUMAN TOXICITY HAZARDS

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	--	"Not likely to be carcinogenic to humans"	2	Low
Mutagenicity	--	"No concern for mutagenicity"	2	Low
Neurotoxicity - (NOAEL)	33/40 [M/F] mg/kg/day	Increased motor activity	2	Check risk
Endocrine Disruption	4 mg/kg/day	Increased ovarian weight	2	Check risk
Developmental Toxicity (NOAEL)	241/268 [M/F] mg/kg/day	Decreased spleen and thymus weights	2	Check risk
Reproductive Toxicity (NOAEL)	241/268 [M/F] mg/kg/day	Altered estrous cycling, lowered sperm count, etc.	2	Check risk
Chronic Toxicity (NOAEL)	3/4 [M/F] mg/kg/day	Low spleen weight, increased ovarian weight	2	Check risk

Chronic Toxicity Hazard Summary:

Developmental toxicity effects were observed at maternally toxic doses and reproductive toxicity was observed after maternal toxicity (Reference 2). In reproductive toxicity testing there were several effects that indicate endocrine toxicity - which is a moderate hazard (because it was dose-related and can be included in the risk assessment). The EPA has classified dinotefuran as "not likely to be carcinogenic to humans." The EPA believes that there is no concern for mutagenicity from exposure to dinotefuran (Reference 2).

CHRONIC HUMAN TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Risk Rating
Child contacting treated turf	Incidental oral + dermal	0.22 mg/kg/day	0.037 mg/kg/day	5.9	2	Moderate
Residential applicator that works in treated area	Dermal and inhalation	0.22 mg/kg/day	0.03 mg/kg/day	7	2	Moderate
Child drinking contaminated water	Ingestion	0.22 mg/kg/day	0.021 mg/kg/day	10	2	Low
Long-term dietary exposure not evaluated						

Chronic Toxicity Risk Assessment Summary:

Risk of toxicity from post-application exposures to dinotefuran was assessed for intermediate exposures (1 to 6 months in duration) to children playing in treated turf and to residential applicators who also work in treated turf. The potential exposures to children and adult applicators are rated moderate in hazard.

Since there is a potential for dinotefuran to reach drinking water (surface water or groundwater), risk to people drinking contaminated water was assessed. The worst-case drinking water scenario calculated the risk to children or adults as being low in hazard (potential exposures are at least 10 times less than the calculated dose of concern).

Risk to workers that enter treated areas (ornamental, turf and agricultural - leafy vegetable applications) was assessed for intermediate dermal exposures. A Margin of Exposure (MOE) approach was used by the EPA where the MOE is a numerical value and calculated exposure values that are greater than the EPA's MOE are not of concern and exposure values below the MOE are of concern. The EPA stated that: "All major post-application activities reach the target MOE of 100 on the day of treatment." Thurston County rates these potential post-application occupational exposures high in hazard (because Thurston County requires that potential exposures have at least a two-times safety factor from the EPA's dose of concern - which is their MOE value). Since the EPA set the MOE value at 100, Thurston County would rate exposure values between 100 and 199 as high in hazard, values of 200 to 999 are rated moderate in hazard, and >1,000 are low in hazard.

Metabolites and Degradation Products:

Degradation and metabolites of dinotefuran include DN (1-methyl-3-(tetrahydro-3-furylmethyl)guanidine), DN-phosphate, UF (1-methyl-3-(tetrahydro-3-furylmethyl)urea), PHP (6-hydroxy-5-(2-hydroxyethyl)-methyl-1,3-diazinane-2-ylidene-N-nitroamine), FNG (2-nitro-1-(tetrahydro-3-furylmethyl)guanidine), and MNG (1-methyl-2-nitroguanidine) (Reference 2).

Comments:

Dinotefuran is considered an eye irritant (EPA toxicity category II) but is not a skin sensitizer or skin irritant (EPA toxicity category IV) (Reference 1).

References

1. International Union of Pure & Applied Chemistry. Pesticide Properties Database. dinotefuran (Ref: MTI 446). Accessed 6/22/11. <http://sitem.herts.ac.uk/aeru/iupac/>
2. USEPA. Office of Prevention, Pesticides, and Toxic Substances. Pesticide Fact Sheet: Dinotefuran. Conditional Registration. September 2004.