

# iron phosphate

Review Date: 7/21/2009

Type	Molluscide
Controls	A variety of slugs and snails including <i>Deroceras reticulatum</i> , <i>Deroceras laeve</i> , <i>Arion subfuscus</i> , <i>Arion circumscriptus</i> , <i>Arion hortensis</i> , <i>Arion rufus</i> , <i>Arion ater</i> , <i>Limax flavus</i> , <i>Limax tenellus</i> , <i>Ariolimax columbianus</i> , <i>Helix</i> spp., <i>Helicella</i> spp. and <i>Cepaea</i> spp. (Reference 1).
Mode of Action	Iron phosphate interferes with calcium metabolism in the stomach, causing snails and slugs to stop eating almost immediately and die three to six days later.

## Thurston County Review Summary:

Iron phosphate is considered GRAS (generally regarded as safe for food use) by the Food and Drug Administration for use as a flavoring agent and nutrient supplement in foods. No adverse effects to humans are known or expected from the use of snail or slug control products with only iron phosphate as an active ingredient.

Slug and snail control products containing only iron phosphate as an active ingredient are considered low in hazard and pass Thurston County's review criteria.

## MOBILITY

Property	Value	Reference	Rating
Solubility (mg/L)	0.000000002	3	Low
Soil Sorption (Kd=mL/g)	Not found		
Organic Sorption (Koc=mL/g)	Not found		

### Mobility Summary:

Iron phosphate is found everywhere in nature. It is a non-volatile solid that does not readily dissolve in water (which minimizes its potential to move with rain or irrigation water). The result is that the mobility hazard of iron phosphate is considered low.

## PERSISTENCE

Property	Value	Reference	Rating
Vapor Pressure (mm Hg)	Not volatile	4	High
Biotic or Aerobic Half-life (days)	Not found		
Abiotic Half-life (days)	Not found		
Terrestrial Field Test Half-life (days)	Not found		
Hydrolysis Half-life (days)	Not found		
Anaerobic Half-life (days)	Not found		
Aquatic Field Test Half-life (days)	Not found		

### Persistence Summary:

In certain soil types, iron phosphate may produce iron oxides and hydroxides that are no different from those normally found in soils, and which give soils their brown and red colors. Although some bacteria can reduce Iron (III) to the more mobile Iron (II), re-oxidation and re-precipitation to Fe (III) oxides and hydroxides will rapidly immobilize any free Fe (II) that may form (Reference 2). Iron phosphate and its breakdown chemicals are considered persistent but have not been identified as a concern for groundwater contamination.

## BIOACCUMULATION

Property	Value	Reference	Rating
Bioaccumulation Factor	Not found		
Bioconcentration Factor	Not found		
Octanol/Water Partition Coefficient	Not found		

### Bioaccumulation Summary:

"No potential for accumulation under normal physiological conditions." (Reference 4). The hazard for bioaccumulation is considered low.

# ACUTE TOXICITY

Test Subject	Value	Reference	Rating
Mammalian (LD50)	>5000 mg/kg	3	Low
Avian (LD50)	>2,000 mg/kg	3	Low
Honey bee or insect (LD50)	waived		
Annelida -worms (LC50)	10 mg/kg	3	Moderate
Fish (LC50)	>100 mg/L	3	Low
Crustacean (LC50)	>100 mg/L	3	Low
Mollusk (LC50)	Not found		
Amphibian (LD50 or LC50)	Not found		

## Acute Toxicity Summary:

Snails and slugs are more sensitive to the effects of iron phosphate than are other organisms. Single-dose toxicity testing indicates that iron phosphate is low in toxicity to mammals, birds, fish, and crustaceans, but moderate in toxicity to earthworms.

# ACUTE TOXICITY - Risk Assessment

Subject and Scenario	Dose of Concern	Exposure	Margin of Safety	Route	Reference	Rating
Applicator / handler exposure was not evaluated						
Skin exposures to iron phosphate was not evaluated						
Ingestion of iron phosphate was not evaluated						
Combined routes of exposure were not evaluated						

## Acute Toxicity Risk Assessment Summary

No adverse effects to humans are known or expected. Iron phosphate is considered GRAS (generally regarded as safe for food use). The toxicity hazard of iron phosphate is considered low.

# CHRONIC TOXICITY

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	"no evidence"	Not considered a carcinogen	4	Low
Mutagenicity	No evidence	--	1	Low
Neurotoxicity - (NOAEL)	No relevant effects	--	4	Low
Endocrine Disruption	Not found			
Developmental Toxicity (NOAEL)	"No indication"	None	4	Low
Reproductive Toxicity (NOAEL)	"No indication"	None	4	Low
Chronic Toxicity (NOAEL)	300 mg (Fe)/day	Therapeutic dose	4	Low

## Chronic Toxicity Summary:

In a report from the European Commission - Health & Consumer Protection Directorate, iron (ferric) phosphate has no evidence of carcinogenic potential, no indication of developmental or reproductive toxicity, and there are no relevant neurotoxic effects. The US Food and Drug Administration considers iron phosphate - "GRAS" (generally regarded as safe for food use).

# CHRONIC TOXICITY - Risk Assessment

Subject and Scenario	Dose of Concern	Exposure	Margin of Safety	Route	Reference	Rating
Post-application contact exposure was not assessed						
Combined routes of exposure were not evaluated						
Drinking water exposure was not evaluated						
Dietary exposure was not evaluated						

## Chronic Toxicity Risk Assessment Summary:

Dietary exposure of ferric phosphate via food or water exists due to its use as a nutritional supplement and its ubiquitous presence in nature. Residues from use of the biochemical pesticide, ferric phosphate, will not significantly add to the current dietary exposures.

The increased non-dietary exposure of iron phosphate through non-commercial greenhouses, home lawn and garden or ornamental use will be minimal. Inhalation exposures would be non-existent because ferric phosphate is not volatile and the product is in a solid form too large to be inhaled. The potential combined exposure, derived from non-dietary and non-occupational exposure should be minimal.

Because of its low toxicity, low rate of application, and use patterns, the EPA believes that there is no reason to expect any cumulative effects from ferric phosphate products (Reference 1). The toxicity hazard from the use of products containing iron phosphate as the sole active ingredient is considered low.

## Degradation Products:

Iron phosphate may produce iron oxides and hydroxides and some bacteria can reduce Iron (III) to the more mobile Iron (II) (Reference 2).

## Comments:

Iron phosphate is classified by the EPA as category III for primary eye irritation, and category IV for primary dermal irritation.

## References

1. USEPA. Pesticides: Regulating Pesticides. Iron (Ferric) Phosphate (034903) Technical Document. October 1998.
2. USEPA. Office of Prevention, Pesticides and Toxic Substances. Reregistration Eligibility Document (RED) ; Iron Salts. EPA-738-93-002. February 1993.
3. International Union of Pure & Applied Chemistry (IUPAC). Pesticide Properties Database, Ferric phosphate. <http://sitem.herts.ac.uk/aeru/iupac/>
4. European Commission, Health & Consumer Protection Directorate - General. Ferric phosphate. SANCO/3035/99-final. 8 March 2002.