SAFETY DATA SHEET

Updated on 26/09/2024

1. Material Identification

Product Name : 2,4-D, salts and esters
Catalog Number : io-2091
CAS Number : 94-75-7
Identified uses : Laboratory chemicals, manufacture of chemical compounds
Company : Ionz

>> R&D Use only

2. Hazards Identification

GHS Classification:

Flammable liquid (category 2)
Acute toxicity, oral (Category 3)
Acute toxicity, dermal (Category 3)
Acute toxicity, inhalation (Category 3)
Specific target organ toxicity, single exposure (Category 1)

Pictogram(s)

GHS Hazard Statements

>> H302+H312 (14.6%): Harmful if swallowed or in contact with skin [Warning Acute toxicity, oral; acute toxicity, dermal]

>> H302 (100%): Harmful if swallowed [Warning Acute toxicity, oral]

>> H312 (15.4%): Harmful in contact with skin [Warning Acute toxicity, dermal]

>> H317 (100%): May cause an allergic skin reaction [Warning Sensitization, Skin]

>> H318 (100%): Causes serious eye damage [Danger Serious eye damage/eye irritation]

>> H334 (14.6%): May cause allergy or asthma symptoms or breathing difficulties if inhaled [Danger Sensitization, respiratory]

>> H335 (100%): May cause respiratory irritation [Warning Specific target organ toxicity, single exposure; Respiratory tract irritation]

>> H400 (25.8%): Very toxic to aquatic life [Warning Hazardous to the aquatic environment, acute hazard]

>> H410 (25.8%): Very toxic to aquatic life with long lasting effects [Warning Hazardous to the aquatic environment, long-term hazard]

>> H412 (99.2%): Harmful to aquatic life with long lasting effects [Hazardous to the aquatic environment, long-term hazard]

Precautionary Statement Codes

>> P233, P260, P261, P264, P264+P265, P270, P271, P272, P273, P280, P284, P301+P317, P302+P352, P304+P340, P305+P354+P338, P317, P319, P321, P330, P333+P317, P342+P316, P362+P364, P391, P403, P403+P233, P405, and P501

Health Hazards:

>> Dust may irritate eyes. Ingestion causes gastroentric distress, diarrhea, mild central nervous system depression, dysphagia, and possible transient liver and kidney injury. (USCG, 1999)

>> Special Hazards of Combustion Products: Toxic and irritating hydrogen chloride or phosgene gases may form. (USCG, 1999)

>> Not combustible. Liquid formulations containing organic solvents may be flammable. Gives off irritating or toxic fumes (or gases) in a fire.

3. Composition/Information On Ingredients

Chemical name : 2,4-D, salts and esters
CAS Number : 94-75-7
Molecular Formula : C8H6Cl2O3
Molecular Weight : 221.0300 g/mol

4. First Aid Measures

First Aid:

>> EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop.

>> SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment.

>> INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. IMMEDIATELY call a physician and be prepared to transport the victim to a hospital even if no symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing.

>> INGESTION: DO NOT INDUCE VOMITING. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and IMMEDIATELY call a hospital or poison control center. Be prepared to transport the victim to a hospital if advised by a physician. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the head lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital.

>> OTHER: Since this chemical is a known or suspected carcinogen you should contact a physician for advice regarding the possible long term health effects and potential recommendation for medical monitoring. Recommendations from the physician will depend upon the specific compound, its chemical, physical and toxicity properties, the exposure level, length of exposure, and the route of exposure. (NTP, 1992)

First Aid Measures

Inhalation First Aid

>> Fresh air, rest. Refer for medical attention.

Skin First Aid

>> Remove contaminated clothes. Rinse and then wash skin with water and soap.

Eye First Aid

>> First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.

Ingestion First Aid

>> Rinse mouth. Give a slurry of activated charcoal in water to drink. Refer for medical attention .

5. Fire Fighting Measures

>> Special hazards arising from the substance or mixture: Carbon oxides, hydrogen chloride gas.

>> Fire Extinguishing Agents: Water, foam (USCG, 1999)

>> In case of fire in the surroundings, use appropriate extinguishing media.

6. Accidental Release Measures

Isolation and Evacuation:

Isolation and evacuation measures to take when a large amount of this chemical is accidentally released in an emergency.

>> Excerpt from ERG Guide 171 [Substances (Low to Moderate Hazard)]:

>> IMMEDIATE PRECAUTIONARY MEASURE: Isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.

>> SPILL: Increase the immediate precautionary measure distance, in the downwind direction, as necessary.

>> FIRE: If tank, rail tank car or highway tank is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2024)

Spillage Disposal:

Methods for containment and safety measures to protect workers dealing with a spillage of this chemical.

>> Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered plastic containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

7. Handling And Storage

Safe Storage:

>> Store in an area without drain or sewer access. Separated from strong oxidants and food and feedstuffs.

Storage Conditions:

>> Conditions for safe storage, including any incompatibilities: Keep container tightly closed in a dry and well-ventilated place. Keep in a dry place. Light sensitive. Moisture sensitive.

8. Exposure Control/ Personal Protection

REL-TWA (Time Weighted Average)

>> 10 mg/m³

>> TWA 10 mg/m3

>> 10.0 [mg/m3]

PEL-TWA (8-Hour Time Weighted Average)

>> 10 mg/m³

>> 10.0 [mg/m3], inhalable particulate matter

>> (inhalable fraction): 10 mg/m

TLV-TWA (Time Weighted Average)

>> 10 mg/m³ (inhalable particulate matter) [2016]

MAK (Maximale Arbeitsplatz Konzentration)

>> (inhalable fraction): 2 mg/m

Inhalation Risk:

>> A harmful concentration of airborne particles can be reached quickly on spraying or when dispersed, especially if powdered.

Effects of Short Term Exposure:

>> The substance is irritating to the skin, respiratory tract and eyes. Exposure at high levels could cause effects on the nervous system.

Acceptable Daily Intakes:

An estimate of the amount of a chemical in food or drinking water that can be consumed daily over a lifetime without presenting an appreciable risk to health. It is usually expressed as milligrams of the substance per kilogram of body weight per day and applies to chemicals such as food additives, pesticide residues and veterinary drugs.

>> OPP RfD= 0.003 mg/kg; EPA RfD= 0.01 mg/kg; WHO RfD= 0.3 mg/kg

Fire Prevention

>> NO contact with oxidizing agents.

Exposure Prevention

>> STRICT HYGIENE!

Inhalation Prevention

>> Use local exhaust or breathing protection.

Skin Prevention

>> Protective gloves. Protective clothing.

Eye Prevention

>> Wear safety goggles or eye protection in combination with breathing protection.

Ingestion Prevention

>> Do not eat, drink, or smoke during work. Wash hands before eating.

Exposure Control and Personal Protection

Exposure Summary

>> TIH (Toxic Inhalation Hazard) - Term used to describe gases and volatile liquids that are toxic when inhaled. Some are TIH materials themselves, e.g., chlorine, and some release TIH gases when spilled in water, e.g., chlorosilanes. [ERG 2016].

Maximum Allowable Concentration (MAK)

>> 2.0 [mg/m3], inhalable fraction (including salts and esters)[German Research Foundation (DFG)]

9. Physical And Chemical Properties

Molecular Weight:

>> 221.03

Exact Mass:

>> 219.9693994

Physical Description:

>> 2,4-dichlorophenoxyacetic acid is an odorless white to tan solid. Sinks in water. (USCG, 1999)

>> COLOURLESS CRYSTALS OR WHITE POWDER.

Color/Form:

>> White to yellow crystalline powder /SRP: yellow color is phenolic impurities/

Odor:

>> Oodorless

Boiling Point:

>> Decomposes (NTP, 1992)

>> No boiling point at normal pressure; decomposes on heating

Melting Point:

>> 280 °F (NTP, 1992)

>> 140 °C

Solubility:

>> Decomposes (NTP, 1992)

>> Solubility in water, g/100ml at 25 °C: 0.031 (very poor)

Density:

>> 1.563 at 68 °F (USCG, 1999) - Denser than water; will sink

>> Relative density (water = 1): 0.7-0.8

Vapor Density:

>> 7.63 (NTP, 1992) - Heavier than air; will sink (Relative to Air)

Vapor Pressure:

>> 0 mmHg at 68 °F ; 0.4 mmHg at 320 °F (NTP, 1992)

>> Vapor pressure, Pa at 25 °C: 0.01 (negligible)

LogP:

>> log Kow= 2.81

>> 2.81

Stability/Shelf Life:

>> Stable under recommended storage conditions.

Decomposition:

>> When heated to decomposition it emits toxic fumes of /chlorides/.

Corrosivity:

The ability of a chemical to damage or destroy other substances when it comes into contact.

>> Forms water-soluble salts with alkali metals and amines

Heat of Combustion:

>> -7700 BTU/lb= -4300 cal/g = -180X10+5 J/kg

pH:

pH is an expression of hydrogen ion concentration in water. Specifically, pH is the negative logarithm of hydrogen ion (H+) concentration (mol/L) in an aqueous solution. The term is used to indicate basicity or acidity of a solution on a scale of 0 to 14, with pH 7 being neutral.

>> 2,4-D is a strong acid

Surface Tension:

>> 66.5 dyne/cm at 25 °C and pH 1.4

Odor Threshold:

>> Detection: 3.13 mg/kg

Dissociation Constants:

Acidic pKa

>> 2.64

>> pKa = 2.73

10. Stability And Reactivity

>> Decomposes rapidly in water.

>> Water-Reactive

11. Toxicological Information

Toxicity Summary:

>> IDENTIFICATION AND USE: 2,4-Dichlorophenoxyacetic acid (2,4-D) is an herbicide. It is a white powder with a slightly phenolic odor. It is soluble in water and the ester products of 2,4-D vary in solubility in water. It is used as a solid alkali salt concentrate or as a salt based water miscible solution or as an ester based emulsifiable concentrate; also used in mixtures with other herbicides. It is a component of Agent Orange, a military defoliant. It is used to control broad leaved weeds in cereals, grain crops, road sides and farm buildings and to increase latex output of old rubber trees. HUMAN EXPOSURE AND USE: 2,4-D may be absorbed from the gastrointestinal tract, by inhalation and to a lesser extent by the intact skin. Observations were made on 220 men exposed from 0.5 to 22 years of 2,4-D in a manufacturing plant. Medical evaluation revealed no difference when compared to a control group of 4600 men. In the exposed group, 10 men were karyotyped. There was no effect on the structural integrity or arrangement of the genetic material of the lymphocyte chromosomes. However, in an in vitro study, 2,4-D both in the presence and in the absence of the metabolic activator caused an increase in chromatid and chromosome breaks, number of micronuclei and number of nuclear buds. Presence of the S9 mix additionally elevated the number of chromatid breaks and micronuclei in treated lymphocytes. Signs and symptoms reported among workers at a plant manufacturing the amine salt and butyl ester included general weakness, rapid fatigue, frequent headache and vertigo. Cases of arterial hypotension were noted. There were possible indications of liver dysfunction which was noted in workers with long exposure to herbicides. In two groups of agricultural workers, 250 and 45 people respectively, excessive fatigue, epigastric pains, anorexia and occasional respiratory tract symptoms, and impaired taste sensitivity were reported. Reported cases of poisoning have been mainly the result of accidental or suicidal ingestion. Peripheral neuropathy has been reported along with contact dermatitis. ANIMAL STUDIES: It may be absorbed by the gastrointestinal tract, by inhalation or through intact skin. Studies in vivo on liver mitochondria have demonstrated that this herbicide uncouples oxidative phosphorylation at low concentrations. Young female rats were given various doses of 2,4-D orally by stomach tube five times a week for up to four weeks. At higher doses animals showed varying degrees of gastrointestinal irritation, slight cloudy swelling of the liver and depressed growth rate. High doses mortality was elevated due to severe gastrointestinal irritation. Accumulation of effect may occur in the form of liver or kidney damage but no clear cut biochemical lesion associated with prolonged exposure. Female rats were fed various levels of 2,4-D in their diet for up to two years. There was no significant difference in mortality between test and control groups. At autopsy of those animals who survived for the two year period there was no difference in body weight and hematological parameters were normal except in the final examination after 22 months revealed a possible tendency to macrocytosis, polychromasia and hypochromasia. Bile duct proliferation, slight hepatitis and nephritis occurred slightly more in test animals rather than controls. 2,4,-D is not considered a carcinogen. In a two year feeding study in rats there was a slight increase in tumor incidence in female rats, however the raw data did not show enough evidence to determine if 2,4-D is carcinogenic. In a number of developmental experiments in which rats, guinea pigs, hamsters and mice received high doses of 2,4-D there appeared to be an increased incidence of minor skeletal abnormalities. 2,4-D was also maternally toxic and embryolethal in rats, and it induced urogenital malformations in rat fetuses. The agent was also teratogenic and embryotoxic in mice. ECOTOXICITY STUDIES: Crayfish was exposed to three sublethal levels of 2,4-D for 96 hr and placed into a Y-maze system with a fish gelatin food source placed randomly in the right or left arm were impaired in their ability to forage effectively. These inabilities to locate and consume adequate amounts of food could result in lower body weights and decreased fitness in populations of crayfish exposed to 2,4-D in natural habitats. A mixture of 2,4-D and monosodium methanearsonate may compromise gill function, increasing the sensitivity of the crawfish to herbicide toxicity.

USGS Health-Based Screening Levels for Evaluating Water-Quality:

This section provides the USGS Health-Based Screening Levels for Evaluating Water-Quality data.

Chemical

>> 2,4-D

USGS Parameter Code

>> 68500

MCL (Maximum Contaminant Levels)[µg/L]

>> 70

Benchmark Remarks

>> Value is for 2,4-D + Salts & Esters

Reference

>> Smith, C.D. and Nowell, L.H., 2024. Health-Based Screening Levels for evaluating water-quality data (3rd ed.). DOI:10.5066/F71C1TWP

Evidence for Carcinogenicity:

Evidence that this chemical does or may cause cancer. The information here is collected from various sources by the Hazardous Substances Data Bank (HSDB).

>> Cancer Classification: Group D Not Classifiable as to Human Carcinogenicity

Carcinogen Classification:

This section provides the International Agency for Research on Cancer (IARC) Carcinogenic Classification and related monograph links. In the IARC Carcinogenic classification, chemicals are categorized into four groups: Group 1 (carcinogenic to humans), Group 2A (probably carcinogenic to humans), Group 2B (possibly carcinogenic to humans), and Group 3 (not classifiable as to its carcinogenicity to humans).

IARC Carcinogenic Agent

>> 2,4-D (2,4-dichlorophenoxyacetic acid) (See also Chlorophenoxy herbicides)

IARC Carcinogenic Classes

>> Group 2B: Possibly carcinogenic to humans

IARC Monographs

>> Volume 113: (2018) DDT, Lindane, and 2,4-D

>> 2B, possibly carcinogenic to humans. (L135)

Health Effects:

>> All forms of 2,4-D are considered low in toxicity when absorbed via skin or via inhalation. The acid and salt forms of 2,4-D are highly toxic to eye tissue. Long term chronic exposure to 2,4-D has been linked to non-Hodgkins lymphoma and Parkinson's disease but these are epidemiological associations only. 2,4-D is also reported to have negative effects on the endocrine system (specifically the thyroid and gonads) and immune system. 2,4-D displaces sex hormones from the protein (sex hormone binding globulin) that normally transports these hormones in the blood. 2,4-D reduces the activity of several proteins important to immune system function. Researchers at NIOSH have demonstrated a decreased production of cells responsible for making antibodies in mice bone marrow, in addition to decreased T-cells, produced in the thymus.

Exposure Routes:

>> The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion.

>> inhalation, skin absorption, ingestion, skin and/or eye contact

Inhalation Exposure

>> Headache. Nausea. Weakness. Cough. Sore throat.

Skin Exposure

>> Redness.

Eye Exposure

>> Redness. Pain.

Ingestion Exposure

>> Abdominal pain. Burning sensation. Diarrhoea. Headache. Nausea. Vomiting. Weakness. Unconsciousness.

>> lassitude (weakness, exhaustion), stupor, hyporeflexia, muscle twitching; convulsions; dermatitis; In Animals: liver, kidney injury

Target Organs:

Organs that are affected by exposure to this chemical. Information in this section reflects human data unless otherwise noted.

>> Body Weight, Cardiovascular (Heart and Blood Vessels), Endocrine (Glands and Hormones), Hematological (Blood Forming), Hematological (Blood Forming), Hepatic (Liver), Hepatic (Liver), Neurological (Nervous System), Renal (Urinary System or Kidneys), Respiratory (From the Nose to the Lungs), Respiratory (From the Nose to the Lungs)

>> Hematologic

>> Hepatic

>> Urinary

Adverse Effects:

An adverse effect is an undesired harmful effect resulting from a medical treatment or other intervention.

>> Occupational hepatotoxin - Secondary hepatotoxins: the potential for toxic effect in the occupational setting is based on cases of poisoning by human ingestion or animal experimentation.

>> Nephrotoxin - The chemical is potentially toxic to the kidneys in the occupational setting.

>> Reproductive Toxin - A chemical that is toxic to the reproductive system, including defects in the progeny and injury to male or female reproductive function. Reproductive toxicity includes developmental effects. See Guidelines for Reproductive Toxicity Risk Assessment.

>> IARC Carcinogen - Class 3: Chemicals are not classifiable by the International Agency for Research on Cancer.

>> ACGIH Carcinogen - Not Classifiable.

Toxicity Data:

>> LC50 (rat) > 1,790 mg/m3

Treatment:

Treatment when exposed to toxin

>> The general treatment of acute chlorophenoxy herbicide poisoning consists of decontamination of the gastrointestinal tract, resuscitation and supportive care. For severe, acute oral poisoning by 2,4-D forced alkaline diuresis appears to be most effective (A7734). Forced alkaline diuresis is often used to increase the excretion of acidic drugs like salicylates and phenobarbitone. For forced alkaline diuresis, a diuretic like furosemide is given intravenously and sodium bicarbonate is added to the infusion fluid to make blood and, in turn, urine alkaline. Potassium replacement becomes of utmost importance during the process because potassium is usually lost in urine. If blood levels of potassium are depleted below normal levels, then hypokalemia occurs, which promotes bicarbonate ion retention and prevents bicarbonate excretion, thus interfering with the alkalinization of the urine.

Interactions:

>> The toxic effects of a widely used herbicide (Dikamin D containing 72% 2,4-D-amine Na as active ingredient) applied alone or in combination with three heavy elements (copper sulphate, cadmium sulphate and lead acetate) modelling the heavy metal load of the environment were studied on chicken embryos with injection treatment. The treatment was done on day 0 of incubation. Solutions and emulsions of different concentrations were made from the test materials and injected in 0.1 mL volume into the air space of eggs. The macroscopical evaluations were done on day 19 of the incubation. Summarizing the findings, it can be established that the individual administration of the 72% 2,4-D containing herbicide formulation was less toxic compared to the control group than the simultaneous administration of the pesticide and heavy elements. As compared with each other the results from the combined administrations of the 72% 2,4-D containing herbicide formulation and heavy elements the simultaneous administration of cadmium and the herbicide caused the highest embryomortality while the incidence of developmental anomalies were the highest in the interaction study of the copper and the pesticide. /Dikamin D/

Antidote and Emergency Treatment:

>> Immediate first aid: Ensure that adequate decontamination has been carried out. If patient is not breathing, start artificial respiration, preferably with a demand-valve resuscitator, bag-valve-mask device, or pocket mask, as trained. Perform CPR as necessary. Immediately flush contaminated eyes with gently flowing water. Do not induce vomiting. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain an open airway and prevent aspiration. Keep patient quiet and maintain normal body temperature. Obtain medical attention. /Chlorophenoxy herbicides and related compounds/

Human Toxicity Excerpts:

>> /HUMAN EXPOSURE STUDIES/ A number of men with malignant lymphoma of the histiocytic type and previous exposure to phenoxy acids or chlorophenols were observed and reported in 1979. A matched case-control study has therefore been performed with cases of malignant lymphoma (Hodgkin's disease and non-Hodgkin's lymphoma). This included 169 cases and 338 controls. The results indicate that exposure to phenoxy acids, chlorophenols, and organic solvents may be a causative factor for malignant lymphoma. Combined exposure of these chemicals seemed to increase the risk. Exposure to various other agents was not obviously different in cases and in controls. /Phenoxy acids and chlorophenols/

Non-Human Toxicity Excerpts:

>> /LABORATORY ANIMALS: Acute Exposure/ In dogs, toxic symptoms were often not present until 6 hr after oral admin of lethal dose of 2,4-d; the animals became ataxic with progressive incr spasm. Death appeared to be due ... to hepatic congestion or ... pneumonia. Pathological changes, limited to the GI tract, lung & liver, followed by development of anorexia, wt loss & myotonia. Dogs exhibited evidence of liver damage more frequently than other animals studied.

Human Toxicity Values:

Quantitative human toxicity values (e.g., lethal dose) for this compound.

>> The mean lethal human dose of 2,4-D is approximately 28 g.

Non-Human Toxicity Values:

>> LD50 Mouse ingestion 521 mg/kg

Populations at Special Risk:

>> /Persons suffering from/ liver disease, kidney disease, cardiovascular disease, skin disease, convulsive disorders or neuropathy are at increased risk from 2,4-D exposure.

12. Ecological Information

Resident Soil (mg/kg)

>> 7.00e+02

Industrial Soil (mg/kg)

>> 9.60e+03

Tapwater (ug/L)

>> 1.70e+02

MCL (ug/L)

>> 7.00e+01

Risk-based SSL (mg/kg)

>> 4.50e-02

MCL-based SSL (mg/kg)

>> 1.80e-02

Chronic Oral Reference Dose (mg/kg-day)

>> 1.00e-02

Volatile

>> Volatile

Mutagen

>> Mutagen

Fraction of Contaminant Absorbed in Gastrointestinal Tract

>> 1

Fraction of Contaminant Absorbed Dermally from Soil

>> 0.05

ICSC Environmental Data:

>> The substance is harmful to aquatic organisms. This substance does enter the environment under normal use. Great care, however, should be taken to avoid any additional release, for example through inappropriate disposal.

Sediment/Soil Concentrations:

Concentrations of this compound in sediment/soil.

>> SEDIMENT: 2,4-D was detected but not quantified in sediments of the Detroit River and Lake Huron(1). The herbicide was detected in over 50% of sediment samples collected from 1994 to 2000 from Lakes Ontario, Erie, Huron and Superior; maximum concentrations were 1.04, 0.74, 0.28 and 0.8 ug/L, respectively(2).

Fish/Seafood Concentrations:

Concentrations of this compound in fish or seafood.

>> Levels of 2,4-D acid equivalents in 8 species of freshwater fish from the Guntersville Reservoir (Tennessee Valley Authority) after application of 20-40 lb/acre acid equivalent did not rise above the pretreatment level of <0.10 mg/kg except for gizzard shad (0.34 mg/kg at 28 days, <0.10 mg/kg (60 days), 0.22 mg/kg (120 days), <0.10 mg/kg (180 days) (1,2). Authorized use of 2,4-D by cottage owners in Buckhorn Lake, Ontario, Canada for the years 1977 to 1980 ranged from 124 to 280 kg of active ingredient, annually. This would give predicted average water concentrations of 2 to 4 ug/L

during the June-July period. Twelve percent of fish caught during the pre-treatment period (i.e., May) had detectable residues of 2,4-D (<5 to 30 ug/kg). In the early, post-treatment period (i.e., July), 69% of fish caught had mean residues ranging from <5 to 136 ug/kg. In the late post-treatment period (i.e., October), 19% of fish caught had detectable residues of 2,4-D (<5 to 60 ug/kg)(2). Following application of 4.48 kg/ha acid equivalent to the Hillsboro Canal, Loxahatchee National Wildlife Refuge, FL, 60 samples of fish were analyzed; 3 had levels >0.10 mg/kg, 16 species had levels <0.10 mg/kg, 41 had levels of not detected during a 5 month sampling period(3).

Animal Concentrations:

Concentrations of this compound in animals.

>> The concentration of 2,4-D in Florida gallinules (Gallinula chloropus) from the Loxahatchee National Wildlife Refuge, FL following the application to over 7000 acres of 4.48 kg acid equivalent/ha for control of water hyacinth (Eichornia crassipes) in 1971 were as follows: liver - 0.3 mg/kg, breast - 0.675 mg/kg/day; residues not detected 4 days later(1).

Average Daily Intake:

The average amount of the compound taken into the body through eating, drinking, or breathing.

>> The total contribution from air, food, and water is estimated to be 0.3-2 ug/kg body weight per day(1). As part of an FDA Total Diet Study, the mean daily intake per unit body weight of 2,4-D between 1986-1991 was determined to be <0.0001 ug/kg body wt/day for ages 6 mo to 65 yrs(2).

13. Disposal Considerations

Spillage Disposal

>> Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered plastic containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

Disposal Methods

>> Generators of waste (equal to or greater than 100 kg/mo) containing this contaminant, EPA hazardous waste numbers D016 and U240, must conform with USEPA regulations in storage, transportation, treatment and disposal of waste.

>> Incineration and landfill: 2,4-D /2,4-dichlorophenoxyacetic acid/ is known to be readily detoxified by soil microorganisms and at low dosages is normally decomposed in one to four weeks. The detection of 2,4-dichlorophenol, 4-chlorocatechol, chloromuconic and succinic acids from either soil or pure culture studies suggests a sequence of reactions involving ring hydroxylation and cleavage and further metabolism of the open chain structure to carbon dioxide. The non-persistence and detoxification of 2,4-D in soil indicate that burial in non-crop areas away from water supplies would be an acceptable method for the disposal of small quantities of 2,4-D. Incineration at high temperatures with sufficient residence time leads to complete detoxification of 2,4-D and is the most environmentally acceptable method for 2,4-D disposal. For the decontamination of 2,4-D containers-drums: triple rinse and drain procedure ("triple rinse" means the flushing of containers three times of the normal diluent equal to approximately 10% of the container's capacity and adding the rinse liquid to the spray mixture or disposing of it by the method prescribed for disposing of the pesticide). Small containers should be punched full of holes, crushed and taken to a landfill.

>> Chemical treatment: Detoxification requires treatment with chloride of lime or sodium carbonate. Rinse containers with a 5% soln of caustic soda. Farms are allowed to destroy if necessary up to 10 kg of the pesticide. Removal of 17% of 2,4-D /(2,4-dichlorophenoxy)acetic acid/ from water is achieved by coagulation and complete water treatment by ozonation; the use of activated charcoal is an effective treatment technique.

>> Herbicide orange /was incinerated/ by the use of two identical refractory lined furnaces on board the Mt Vulcanus while at sea. The average wall temperature was 1273 °C and average flame was 1500 °C. A residence time of 1.0 second was used. Combustion efficiency was > 99.98%. Destruction efficiency was: 2,4-D > 99.9%; 2,4,5-T > 99.9%; Total hydrocarbon 99.982 to 99.992%; Herbicide orange > 99.999%; 2,3,7,8-tetrachlorodibenzo-p-dioxin > 99.93 to > 99.99%; Chlorinated hydrocarbons > 99.999%. /From table/

>> For more Disposal Methods (Complete) data for 2,4-D (6 total), please visit the HSDB record page.

14. Transport Information

DOT

2,4-D, salts and esters
9
UN Pack Group: III
Reportable Quantity of 100 lb or 45

IATA

2,4-D, salts and esters
9,
UN Pack Group: III

15. Regulatory Information

Federal Drinking Water Standards:

Federal drinking water standards (e.g. maximum containment level (MCL)) for this chemical. These standards are legally enforceable.

>> Maximum contaminant levels (MCL) for synthetic organic contaminants apply to community water systems and non-transient, non-community water systems: 2,4-D, MCL 0.07 mg/L.

Federal Drinking Water Guidelines:

Federal drinking water guidelines (e.g. maximum containment level (MCL)) for this chemical. In general, these guidelines are recommendations and not legally enforceable.

>> Maximum contaminant level goal (MCLG) for organic contaminants: 2,4-D, MCLG 0.07 mg/L.

State Drinking Water Standards:

State drinking water standards (e.g. maximum containment level (MCL)) for this chemical. These standards are legally enforceable.

>> (IL) ILLINOIS 10 ug/L

Clean Water Act Requirements:

The Clean Water Act (CWA) of 1972 establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. Under CWA, the U.S. Environmental Protection Agency (EPA) developed the Toxic Pollutant List (40 CFR Part 401.15) and the Priority Pollutant List (40 CFR Part 423, Appendix A). These lists are to be used by EPA and States to develop the Effluent Guidelines regulations and ensure water quality criteria and standards.

>> 2,4-D acid is designated as a hazardous substance under section 311(b)(2)(A) of the Federal Water Pollution Control Act and further regulated by the Clean Water Act Amendments of 1977 and 1978. These regulations apply to discharges of this substance. This designation includes any isomers and hydrates, as well as any solutions and mixtures containing this substance.

Regulatory Information

New Zealand EPA Inventory of Chemical Status

>> 2,4-D: HSNO Approval: HSR002834 Approved with controls

16. Other Information

Toxic Combustion Products:

Toxic products (e.g., gases and vapors) produced from the combustion of this chemical.

>> Toxic gases and vapors (such as hydrogen chloride and carbon monoxide) may be released in a fire involving 2,4-D. lo

Other Safety Information

Chemical Assessment

>> IMAP assessments - Acetic acid, (2,4-dichlorophenoxy)-: Human health tier I assessment

>> IMAP assessments - Acetic acid, (2,4-dichlorophenoxy)-: Environment tier I assessment

"The information provided is believed to be accurate but is not comprehensive and should be used as a reference. It reflects our current knowledge and is intended for safety guidance related to the product. This document does not constitute a warranty of the product's properties. Ionz is not responsible for any damages resulting from handling or contact with the product incorrectly."