

# 2,4-Dichlorophenoxy Acetic Acid

sc-205097



The Power is Question

Material Safety Data Sheet

Hazard Alert Code Key:

EXTREME

HIGH

MODERATE

LOW

## Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

### PRODUCT NAME

2,4-Dichlorophenoxy Acetic Acid

### STATEMENT OF HAZARDOUS NATURE

CONSIDERED A HAZARDOUS SUBSTANCE ACCORDING TO OSHA 29 CFR 1910.1200.

### NFPA



### SUPPLIER

Company: Santa Cruz Biotechnology, Inc.

Address:

2145 Delaware Ave

Santa Cruz, CA 95060

Telephone: 800.457.3801 or 831.457.3800

Emergency Tel: CHEMWATCH: From within the US and Canada:  
877-715-9305

Emergency Tel: From outside the US and Canada: +800 2436 2255  
(1-800-CHEMCALL) or call +613 9573 3112

### PRODUCT USE

Used in the formulation of herbicides. It may be used as a selective weed killer and defoliant. It may be used for fruit drop control. It may also be used to increase the latex output of old rubber trees.

### SYNONYMS

C8-H6-Cl2-O3, "2, 4-D acid", "2, 4-D acid", "2, 4-dichloro-phenoxyacetic acid", "2, 4-dichloro-phenoxyacetic acid", "2, 4-dichlorophenoxyacetic acid", "2, 4-dichlorophenoxyacetic acid", "Ded-weed LV-69", Feroxone, Netagrone, "Super D weedone", Aqua-kleen, Dicopur, Feroxone, Pennamine, "Weedone LV4", Agrotect, Dicotox, "Foredex 75", Phenox, Weedar, Amidox, Dinoxol, "Formula 40", Pielik, Weedatul, Amoxone, DMA-4, Hedonal, Planotox, Weed-B-Gon, "BH 2, 4-D", "BH 2, 4-D", Dormone, "Herbicide 'D'", Plantgard, Weed-rhap, Brush-rhap, Envert, Herbidal, Rhodia, Weedtrol, "Chipco turf", Emulsamine, Ipaner, Salvo, Weed-tox, Chloroxone, "Esterone four", Krotoline, Tributon, Weed-control, Crotolin, Estone, Lawn-keep, Transamine, Vergemaster, "Crop rider", Farmco, Macrondray, Trinoxol, Verton, Dacamine, Fernesta, Miracle, Weed-killer, "Vidon 638", Decamine, Fernimine, Monosan, Weedicide, Desormone, Feroxone, Moxone, Weed-Ag-bar, "Esteron 44 weed killer", "Esteron brush killer", "Esteron 99 Concentrate", "Weedez wonder bar"

## Section 2 - HAZARDS IDENTIFICATION

### CANADIAN WHMIS SYMBOLS



# 2,4-Dichlorophenoxy Acetic Acid

sc-205097

Material Safety Data Sheet



The Power is Question

Hazard Alert Code Key: **EXTREME** **HIGH** **MODERATE** **LOW**

## EMERGENCY OVERVIEW

### RISK

Irritating to respiratory system.  
Risk of serious damage to eyes.  
May cause SENSITIZATION by skin contact.  
Limited evidence of a carcinogenic effect.  
Harmful by inhalation, in contact with skin and if swallowed.  
Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

## POTENTIAL HEALTH EFFECTS

### ACUTE HEALTH EFFECTS

#### SWALLOWED

- Accidental ingestion of the material may be harmful; animal experiments indicate that ingestion of less than 150 gram may be fatal or may produce serious damage to the health of the individual.
- Chlorophenoxy compounds irritate the digestive system and cause nausea and vomiting, chest pain, and diarrhea. Taking large doses can result in mineral imbalance, temperature changes, hyperventilation, low blood pressure, dilated blood vessels, damage to the heart and liver with death of white blood cells, and convulsions. Most salts and esters of 2,4-D exhibit similar effects, although the free acid is more toxic. Massive doses can cause ventricular fibrillation followed by death. If death is delayed, there may be a sluggishness followed by spastic changes in muscles and inco-ordination. Severe cases cause apathy, weakness in the legs, regular muscle spasms and coma. Subacute poisonings cause severe nosebleeds, bleeding from the mouth and irritation of the eye and nose. Clinically, poisonings are uncommon, although muscle weakness and nervous symptoms in the extremities are sometimes reported. The substances are not metabolized and are excreted only slowly from the body, in the urine.

#### EYE

- If applied to the eyes, this material causes severe eye damage.
- Corneal injury resulting from 2,4-D exposure may be slow to heal.

#### SKIN

- Skin contact with the material may be harmful; systemic effects may result following absorption.
- Solution of material in moisture on the skin, or perspiration, may increase irritant effects.
- 2,4-D and its derivatives can all be absorbed through the skin of humans. Severe peripheral neuropathy has followed causing limb paralysis and loss of sensation. Fatigue, nausea, vomiting, anorexia, diarrhea and swelling occur, followed by "pins and needles", pain and paralysis. Disability is long-lasting.
- Open cuts, abraded or irritated skin should not be exposed to this material.
- Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.
- The material may cause mild but significant inflammation of the skin either following direct contact or after a delay of some time. Repeated exposure can cause contact dermatitis which is characterized by redness, swelling and blistering.

#### INHALED

- Inhalation of dusts, generated by the material, during the course of normal handling, may be harmful.
- The material can cause respiratory irritation in some persons. The body's response to such irritation can cause further lung damage.
- Persons with impaired respiratory function, airway diseases and conditions such as emphysema or chronic bronchitis, may incur further disability if excessive concentrations of particulate are inhaled.
- Inhalation of chlorophenoxy dusts or mists may result in sore throat, burning sensations in the throat and chest, cough, tears, inflamed nose, dizziness and inco-ordination, as a result of absorption from the lungs.

## CHRONIC HEALTH EFFECTS

- There has been concern that this material can cause cancer or mutations, but there is not enough data to make an assessment. Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems. Skin contact with the material is more likely to cause a sensitization reaction in some persons compared to the general population. Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems. There is some evidence to provide a presumption that human exposure to the material may result in impaired fertility on the basis of: some evidence in animal studies of impaired fertility in the absence of toxic effects, or evidence of impaired fertility occurring at around the same dose levels as other toxic effects but which is not a secondary non-specific consequence of other toxic effects. Long term exposure to high dust concentrations may cause changes in lung function i.e. pneumoconiosis; caused by particles less than 0.5 micron penetrating and remaining in the lung. Prime symptom is breathlessness; lung shadows show on X-ray. Chlorophenoxy herbicides cause an increased risk of cancers of soft tissue, lymph and bronchi. Inflammation of skin can result from long term contact. Chronic exposure to 2,4-D can cause nausea, liver changes, skin eruptions, irritation of the airways and eyes, as well as nervous changes. People with chronic health conditions or who have endocrinological or immune disorders should not be exposed to herbicides.

# 2,4-Dichlorophenoxy Acetic Acid

sc-205097



The Power is Question

## Material Safety Data Sheet

Hazard Alert Code Key:

EXTREME

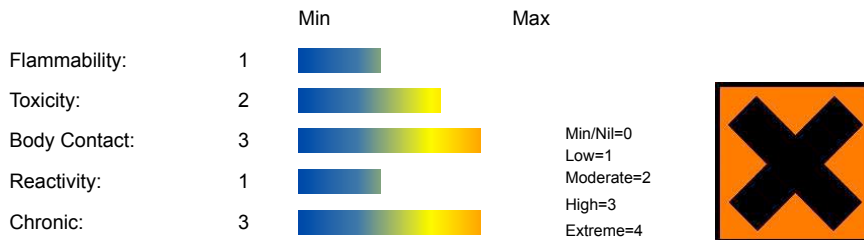
HIGH

MODERATE

LOW

## Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

### HAZARD RATINGS



| NAME                           | CAS RN  | %   |
|--------------------------------|---------|-----|
| 2,4-dichlorophenoxyacetic acid | 94-75-7 | >98 |

## Section 4 - FIRST AID MEASURES

### SWALLOWED

- IF SWALLOWED, REFER FOR MEDICAL ATTENTION, WHERE POSSIBLE, WITHOUT DELAY.
- Where Medical attention is not immediately available or where the patient is more than 15 minutes from a hospital or unless instructed otherwise:
  - For advice, contact a Poisons Information Center or a doctor.
  - Urgent hospital treatment is likely to be needed.
  - If conscious, give water to drink.
  - INDUCE vomiting with fingers down the back of the throat, ONLY IF CONSCIOUS. Lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.

NOTE: Wear a protective glove when inducing vomiting by mechanical means.

- In the mean time, qualified first-aid personnel should treat the patient following observation and employing supportive measures as indicated by the patient's condition.
- If the services of a medical officer or medical doctor are readily available, the patient should be placed in his/her care and a copy of the MSDS should be provided. Further action will be the responsibility of the medical specialist.
- If medical attention is not available on the worksite or surroundings send the patient to a hospital together with a copy of the MSDS.

### EYE

- If this product comes in contact with the eyes:
  - Immediately hold eyelids apart and flush the eye continuously with running water.
  - Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
  - Continue flushing until advised to stop by the Poisons Information Center or a doctor, or for at least 15 minutes.
  - Transport to hospital or doctor without delay.
  - Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

### SKIN

- If skin contact occurs:
  - Immediately remove all contaminated clothing, including footwear
  - Flush skin and hair with running water (and soap if available).
  - Seek medical attention in event of irritation.

### INHALED

- If fumes or combustion products are inhaled remove from contaminated area.
- Lay patient down. Keep warm and rested.
- Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.
- Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary.

# 2,4-Dichlorophenoxy Acetic Acid

sc-205097



The Power is Question

## Material Safety Data Sheet

Hazard Alert Code Key:

**EXTREME**

**HIGH**

**MODERATE**

**LOW**

- Transport to hospital, or doctor, without delay.

### NOTES TO PHYSICIAN

■ Following exposures to chlorophenoxy compounds:

- Acute toxic reactions are rare. The by-product of production, dioxin, may be implicated in subacute features such as hepatic enlargement, chloracne, neuromuscular symptoms and deranged porphyrin metabolism.
- Large intentional overdoses result in coma, metabolic acidosis, myalgias, muscle weakness, elevated serum creatine kinase, myoglobinuria, irritation of the skin, eyes, respiratory tract and gut and mild renal and hepatic dysfunction.
- Several cases of sensorimotor peripheral neuropathies have been associated with chronic dermal exposure to 2,4-D. For acute exposures the usual methods of gut and skin contamination (lavage, charcoal, cathartic) are recommended in the first several hours. Alkalinization of the urine and generous fluid replacement have the added benefit of treating any myoglobinuria present. Monitor metabolic acidosis, hyperthermia, hyperkalemia, myoglobinuria and hepatic/renal dysfunction. for 2,4-dichlorophenoxyacetic acid (2,4-D) and its derivatives
- Gastric lavage if there are no signs of impending convulsions.
- Cautious administration of short-acting anticonvulsant drug if convulsions appear imminent.
- General supportive measures for central nervous system depression.
- If hypotension appears, search vigorously for a contributing cause (e.g. dehydration, electrolyte balance, acidosis, myocardial disturbances and hyperpyrexia).
- As appropriate, treat dehydration, electrolyte disturbances, acidosis, and hyperexia.
- To promote excretion of 2,4-D, initiate alkaline diuresis, as in salicylate poisoning by injecting sodium bicarbonate, intravenously, until the urine pH exceeds 7.5 and then infuse mannitol; renal clearance rises sharply as urine pH rises above 7.5 - above pH 8.0, it is said to be 100-fold greater than pH 6.0.
- If cardiac disturbances are suspected, monitor ECG continuously when possible. Prepare to deliver defibrillating shocks in the event of ventricular fibrillation.
- If hypotension intensifies, a trial with a vasopressor drug may be appropriate. Adrenalin (epinephrine) should be avoided because of possible fibrillation.
- If myotonia appears, a trial with quinidine may be helpful.
- Physiotherapy may be necessary for motion disorders associated with peripheral neuritis, myopathy or brain stem dysfunction.

GOSELIN, SMITH HODGE: Clinical Toxicology of Commercial Products, 5th Ed.

## Section 5 - FIRE FIGHTING MEASURES

|                             |               |
|-----------------------------|---------------|
| Vapour Pressure (mmHG):     | <0.10         |
| Upper Explosive Limit (%):  | Not Available |
| Specific Gravity (water=1): | 1.42 @ 25 C   |
| Lower Explosive Limit (%):  | Not Available |

### EXTINGUISHING MEDIA

- 
- Foam.
- Dry chemical powder.
- BCF (where regulations permit).
- Carbon dioxide.
- Water spray or fog - Large fires only.

### FIRE FIGHTING

- 
- Alert Emergency Responders and tell them location and nature of hazard.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or water course.
- Use water delivered as a fine spray to control fire and cool adjacent area.
- DO NOT approach containers suspected to be hot.
- Cool fire exposed containers with water spray from a protected location.
- If safe to do so, remove containers from path of fire.
- Equipment should be thoroughly decontaminated after use.

### GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS

■

# 2,4-Dichlorophenoxy Acetic Acid

sc-205097

Material Safety Data Sheet



The Power is Question

Hazard Alert Code Key: **EXTREME** **HIGH** **MODERATE** **LOW**

- Combustible solid which burns but propagates flame with difficulty.
- Avoid generating dust, particularly clouds of dust in a confined or unventilated space as dusts may form an explosive mixture with air, and any source of ignition, i.e. flame or spark, will cause fire or explosion. Dust clouds generated by the fine grinding of the solid are a particular hazard; accumulations of fine dust may burn rapidly and fiercely if ignited.
- Dry dust can be charged electrostatically by turbulence, pneumatic transport, pouring, in exhaust ducts and during transport.
- Build-up of electrostatic charge may be prevented by bonding and grounding.
- Powder handling equipment such as dust collectors, dryers and mills may require additional protection measures such as explosion venting.

Combustion products include: carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>), hydrogen chloride, phosgene, other pyrolysis products typical of burning organic material.

May emit poisonous fumes.

May emit corrosive fumes.

## FIRE INCOMPATIBILITY

- Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.

## PERSONAL PROTECTION

Glasses:

Chemical goggles.

Gloves:

Respirator:

Particulate

## Section 6 - ACCIDENTAL RELEASE MEASURES

### MINOR SPILLS

- 
- Clean up waste regularly and abnormal spills immediately.
- Avoid breathing dust and contact with skin and eyes.
- Wear protective clothing, gloves, safety glasses and dust respirator.
- Use dry clean up procedures and avoid generating dust.
- Vacuum up or sweep up. NOTE: Vacuum cleaner must be fitted with an exhaust micro filter (HEPA type) (consider explosion-proof machines designed to be grounded during storage and use).
- Dampen with water to prevent dusting before sweeping.
- Place in suitable containers for disposal.

### MAJOR SPILLS

- Moderate hazard.
- CAUTION: Advise personnel in area.
- Alert Emergency Responders and tell them location and nature of hazard.
- Control personal contact by wearing protective clothing.
- Prevent, by any means available, spillage from entering drains or water courses.
- Recover product wherever possible.
- IF DRY: Use dry clean up procedures and avoid generating dust. Collect residues and place in sealed plastic bags or other containers for disposal. IF WET: Vacuum/shovel up and place in labelled containers for disposal.
- ALWAYS: Wash area down with large amounts of water and prevent runoff into drains.
- If contamination of drains or waterways occurs, advise emergency services.

### ACUTE EXPOSURE GUIDELINE LEVELS (AEGl) (in ppm)

AEGl 1: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGl 2: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

AEGl 3: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could

# 2,4-Dichlorophenoxy Acetic Acid

sc-205097

Material Safety Data Sheet



The Power is Question

Hazard Alert Code Key: **EXTREME** **HIGH** **MODERATE** **LOW**

experience life-threatening health effects or death.

## Section 7 - HANDLING AND STORAGE

### PROCEDURE FOR HANDLING

- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.
- DO NOT enter confined spaces until atmosphere has been checked.
- DO NOT allow material to contact humans, exposed food or food utensils.
- Avoid contact with incompatible materials.
- When handling, DO NOT eat, drink or smoke.
- Keep containers securely sealed when not in use.
- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.
- Work clothes should be laundered separately.
- Launder contaminated clothing before re-use.
- Use good occupational work practice.
- Observe manufacturer's storing and handling recommendations.
- Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

Empty containers may contain residual dust which has the potential to accumulate following settling. Such dusts may explode in the presence of an appropriate ignition source.

- Do NOT cut, drill, grind or weld such containers.
- In addition ensure such activity is not performed near full, partially empty or empty containers without appropriate workplace safety authorisation or permit.

### RECOMMENDED STORAGE METHODS

- Polyethylene or polypropylene container.
- Check all containers are clearly labelled and free from leaks.

### STORAGE REQUIREMENTS

- Store in original containers.
- Keep containers securely sealed.
- Store in a cool, dry, well-ventilated area.
- Store away from incompatible materials and foodstuff containers.
- Protect containers against physical damage and check regularly for leaks.
- Observe manufacturer's storing and handling recommendations.

### SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS



X: Must not be stored together

O: May be stored together with specific preventions

+: May be stored together

## Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

# 2,4-Dichlorophenoxy Acetic Acid

sc-205097



The Power is Question

**Material Safety Data Sheet**

|                               |                |             |                 |            |
|-------------------------------|----------------|-------------|-----------------|------------|
| <b>Hazard Alert Code Key:</b> | <b>EXTREME</b> | <b>HIGH</b> | <b>MODERATE</b> | <b>LOW</b> |
|-------------------------------|----------------|-------------|-----------------|------------|

**EXPOSURE CONTROLS**

| Source  | Material   | TWA ppm | TWA mg/m³ | STEL ppm | STEL mg/m³ | Peak ppm | Peak mg/m³ | TWA F/CC | Notes  |
|---|--|---------|-----------|----------|------------|----------|------------|----------|--|
| US NIOSH Recommended Exposure Limits (RELs)   | 2,4-dichlorophenoxyacetic acid (2,4-D)                                   |         | 10        |          |            |          |            |          |  |
| Canada - Alberta Occupational Exposure Limits   | 2,4-dichlorophenoxyacetic acid (2,4-D (2,4-Dichlorophenoxyacetic acid))  |         | 10        |          |            |          |            |          |  |
| US ACGIH Threshold Limit Values (TLV)   | 2,4-dichlorophenoxyacetic acid (2,4-D [2,4-Dichlorophenoxyacetic acid])  |         | 10        |          |            |          |            |          | TLV Basis: upper respiratory tract & skin irritation |
| Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)               | 2,4-dichlorophenoxyacetic acid (2,4-D)                                   |         | 10        |          |            |          |            |          |  |
| US OSHA Permissible Exposure Levels (PELs) - Table Z1   | 2,4-dichlorophenoxyacetic acid (2,4-D (Dichlorophenoxyacetic acid))      |         | 10        |          |            |          |            |          |  |
| US - Minnesota Permissible Exposure Limits (PELs)   | 2,4-dichlorophenoxyacetic acid (2,4-D (Dichlorophenoxyacetic acid))      |         | 10        |          |            |          |            |          |  |
| US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants | 2,4-dichlorophenoxyacetic acid (2,4-D (Dichlorophen-oxyacetic acid))     |         | 10        |          |            |          |            |          |  |
| US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants   | 2,4-dichlorophenoxyacetic acid (2,4-D (Dichlorophen-oxyacetic acid))     |         | 10        |          |            |          |            |          |  |
| US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants                     | 2,4-dichlorophenoxyacetic acid (2,4-D (Dichlorophenoxyacetic acid))      |         | 10        |          |            |          |            |          |  |
| US - California Permissible Exposure Limits for Chemical Contaminants                         | 2,4-dichlorophenoxyacetic acid (2,4-D;2,4-dichlorophenoxyacetic acid)    |         | 10        |          |            |          |            |          |  |
| US - Idaho - Limits for Air Contaminants  | 2,4-dichlorophenoxyacetic acid (2,4-D (Dichlorophenoxyacetic acid))      |         | 10        |          |            |          |            |          |  |
| US - Hawaii Air Contaminant Limits  | 2,4-dichlorophenoxyacetic acid (2,4-D (Dichlorophenoxyacetic acid))      |         | 10        |          | 20         |          |            |          |  |
| US - Alaska Limits for Air Contaminants   | 2,4-dichlorophenoxyacetic acid (2,4-D (Dichlorophenoxyacetic acid))      |         | 10        |          |            |          |            |          |  |
| Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits       | 2,4-dichlorophenoxyacetic acid (2,4-D (2,4-Dichlorophenoxy-acetic acid)) |         | 10        |          | 20         |          |            |          |  |
| Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances                 | 2,4-dichlorophenoxyacetic acid (2,4-D (2,4-Diphenoxy-acetic acid))       | -       | 10        | -        | 20         |          |            |          |  |

# 2,4-Dichlorophenoxy Acetic Acid

sc-205097



The Power is Question

**Material Safety Data Sheet**

| Hazard Alert Code Key:   | EXTREME  | HIGH | MODERATE | LOW  |
|--|--|------|----------|--|
| US - Washington<br>Permissible exposure limits of air contaminants               | 2,4-dichlorophenoxyacetic acid (2,4-D (Dichlorophenoxy-acetic acid))     | 10   | 20       |  |
| US - Michigan Exposure Limits for Air Contaminants                               | 2,4-dichlorophenoxyacetic acid (2,4-D (Dichlorophenoxyacetic acid))      | 10   |          |  |
| Canada - Prince Edward Island Occupational Exposure Limits                       | 2,4-dichlorophenoxyacetic acid (2,4-D [2,4-Dichlorophenoxyacetic acid])  | 10   |          | TLV Basis: upper respiratory tract & skin irritation |
| US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants | 2,4-dichlorophenoxyacetic acid (2,4-D (Dichlorophen-oxyacetic acid))     | 10   |          |  |
| Canada - Nova Scotia Occupational Exposure Limits                                | 2,4-dichlorophenoxyacetic acid (2,4-D [2,4-Dichlorophenoxyacetic acid])  | 10   |          | TLV Basis: upper respiratory tract & skin irritation |
| US - Oregon Permissible Exposure Limits (Z1)                                     | 2,4-dichlorophenoxyacetic acid (2,4-D (Dichlorophenoxyacetic acid))      | 10   |          |  |
| Canada - Northwest Territories Occupational Exposure Limits (English)            | 2,4-dichlorophenoxyacetic acid (2,4-D (2,4-Dichlorophenoxy-acetic acid)) | 10   | 20       |  |

**EMERGENCY EXPOSURE LIMITS**

| Material                       | Revised IDLH Value (mg/m3) | Revised IDLH Value (ppm) |
|--------------------------------|----------------------------|--------------------------|
| 2,4-dichlorophenoxyacetic acid | 100                        |                          |

**MATERIAL DATA**

**2,4-DICHLOROPHENOXYACETIC ACID:**

■ For 2,4-dichlorophenoxyacetic acid (2,4-D):

Evidence for skin absorption and chronic feeding studies in rats and mice necessitate a review of the recommended TLV-TWA:

Occupational exposure will occur for workers involved in the handling, transfer, mixing and spraying of the substance. At a spraying rate of 315-630 g/ha (water-soluble formulation), the calculated inhalation exposure of applicators accounted for less than 2% (median dose 0.2 ug/kg body weight) of the potential cumulative exposure while deposition on the hands accounted for 80-90% (median dose of 120 ug/kg body weight) of the cumulative exposure.

Workers using 2,4-D (the acid) may, on average, absorb 0.1 mg 2,4-D/kg body weight per day. A statistical estimate by NIOSH showed that field spraymen are exposed to air concentrations of 0.001 mg/m3 (TWA). Urinalysis of six volunteer workers (wearing full line protective clothing) involved in mixing and loading 2,4-D ester solutions into aircraft and in guiding the spray aircraft showed a maximum excretion level of 22.2 ug/kg body weight/day. Analyses of the breathing zone air of pilots and ground crew during a three day aerial spray operation showed a mean 2,4-D concentration of 0.002-0.1 mg/m3.

The urinary excretion rate of 2,4-D in 45 commercial lawn care specialists who had been spraying the herbicide for a period of at least 3 weeks ranged from 0.4-6.3 ug/kg body weight/day. Thirty nine children of 197 children living near or away from possible source of contamination had detectable levels of 2,4-D (detection limit 1 ppb) in their urine at a maximum concentration of 9 ppb.

Established occupational exposure limits frequently do not take into consideration reproductive end points that are clearly below the thresholds for other toxic effects. Occupational reproductive guidelines (ORGs) have been suggested as an additional standard. These have been established after a literature search for reproductive no-observed-adverse effect-level (NOAEL) and the lowest-observed-adverse-effect-level (LOAEL). In addition the US EPA's procedures for risk assessment for hazard identification and dose-response assessment as applied by NIOSH were used in the creation of such limits. Uncertainty factors (UFs) have also been incorporated.

**PERSONAL PROTECTION**





# 2,4-Dichlorophenoxy Acetic Acid

sc-205097



The Power is Question

**Material Safety Data Sheet**

**Hazard Alert Code Key:** EXTREME HIGH MODERATE LOW

Consult your EHS staff for recommendations

**EYE**

- 
- Safety glasses with side shields.
- Chemical goggles.
- Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them. DO NOT wear contact lenses.

**HANDS/FEET**

■ NOTE: The material may produce skin sensitization in predisposed individuals. Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact.

Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include: such as:

- frequency and duration of contact,
- chemical resistance of glove material,
- glove thickness and
- dexterity

Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739).

- When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374) is recommended.
- When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374) is recommended.
- Contaminated gloves should be replaced.

Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended.

Experience indicates that the following polymers are suitable as glove materials for protection against undissolved, dry solids, where abrasive particles are not present.

- polychloroprene
- nitrile rubber
- butyl rubber
- fluorocautchouc
- polyvinyl chloride

Gloves should be examined for wear and/ or degradation constantly.

**OTHER**

- 
- Overalls.
- P.V.C. apron.
- Barrier cream.
- Skin cleansing cream.
- Eye wash unit.
- 
- Respirators may be necessary when engineering and administrative controls do not adequately prevent exposures.
- The decision to use respiratory protection should be based on professional judgment that takes into account toxicity information, exposure measurement data, and frequency and likelihood of the worker's exposure - ensure users are not subject to high thermal loads which may result in heat stress or distress due to personal protective equipment (powered, positive flow, full face apparatus may be an option).
- Published occupational exposure limits, where they exist, will assist in determining the adequacy of the selected respiratory . These may be government mandated or vendor recommended.
- Certified respirators will be useful for protecting workers from inhalation of particulates when properly selected and fit tested as part of a complete respiratory protection program.
- Use approved positive flow mask if significant quantities of dust becomes airborne.
- Try to avoid creating dust conditions.

**RESPIRATOR**

| Protection Factor | Half-Face Respirator | Full-Face Respirator | Powered Air Respirator |
|-------------------|----------------------|----------------------|------------------------|
| 10 x PEL          | P1                   | -                    | PAPR-P1                |
|                   | Air-line*            | -                    | -                      |
| 50 x PEL          | Air-line**           | P2                   | PAPR-P2                |
| 100 x PEL         | -                    | P3                   | -                      |
|                   | -                    | Air-line*            | -                      |
| 100+ x PEL        | -                    | Air-line**           | PAPR-P3                |

# 2,4-Dichlorophenoxy Acetic Acid

sc-205097



The Power is Question

**Material Safety Data Sheet**

|                               |                |             |                 |            |
|-------------------------------|----------------|-------------|-----------------|------------|
| <b>Hazard Alert Code Key:</b> | <b>EXTREME</b> | <b>HIGH</b> | <b>MODERATE</b> | <b>LOW</b> |
|-------------------------------|----------------|-------------|-----------------|------------|

\* - Negative pressure demand \*\* - Continuous flow

Explanation of Respirator Codes:

Class 1 low to medium absorption capacity filters.

Class 2 medium absorption capacity filters.

Class 3 high absorption capacity filters.

PAPR Powered Air Purifying Respirator (positive pressure) cartridge.

Type A for use against certain organic gases and vapors.

Type AX for use against low boiling point organic compounds (less than 65°C).

Type B for use against certain inorganic gases and other acid gases and vapors.

Type E for use against sulfur dioxide and other acid gases and vapors.

Type K for use against ammonia and organic ammonia derivatives

Class P1 intended for use against mechanically generated particulates of sizes most commonly encountered in industry, e.g. asbestos, silica.

Class P2 intended for use against both mechanically and thermally generated particulates, e.g. metal fume.

Class P3 intended for use against all particulates containing highly toxic materials, e.g. beryllium.

The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required.

Use appropriate NIOSH-certified respirator based on informed professional judgement. In conditions where no reasonable estimate of exposure can be made, assume the exposure is in a concentration IDLH and use NIOSH-certified full face pressure demand SCBA with a minimum service life of 30 minutes, or a combination full facepiece pressure demand SAR with auxiliary self-contained air supply. Respirators provided only for escape from IDLH atmospheres shall be NIOSH-certified for escape from the atmosphere in which they will be used.

## ENGINEERING CONTROLS

- Local exhaust ventilation is required where solids are handled as powders or crystals; even when particulates are relatively large, a certain proportion will be powdered by mutual friction.
- Exhaust ventilation should be designed to prevent accumulation and recirculation of particulates in the workplace.
- If in spite of local exhaust an adverse concentration of the substance in air could occur, respiratory protection should be considered. Such protection might consist of:

(a): particle dust respirators, if necessary, combined with an absorption cartridge;

(b): filter respirators with absorption cartridge or canister of the right type;

(c): fresh-air hoods or masks

- Build-up of electrostatic charge on the dust particle, may be prevented by bonding and grounding.
- Powder handling equipment such as dust collectors, dryers and mills may require additional protection measures such as explosion venting.

Air contaminants generated in the workplace possess varying "escape" velocities which, in turn, determine the "capture velocities" of fresh circulating air required to efficiently remove the contaminant.

| Type of Contaminant:   | Air Speed:                       |
|--|----------------------------------|
| direct spray, spray painting in shallow booths, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion) | 1-2.5 m/s (200-500 f/min.)       |
| grinding, abrasive blasting, tumbling, high speed wheel generated dusts (released at high initial velocity into zone of very high rapid air motion).           | 2.5-10 m/s (500-2000 f/min.)     |
| Within each range the appropriate value depends on:  |                                  |
| Lower end of the range   | Upper end of the range           |
| 1: Room air currents minimal or favorable to capture   | 1: Disturbing room air currents  |
| 2: Contaminants of low toxicity or of nuisance value only  | 2: Contaminants of high toxicity |
| 3: Intermittent, low production.   | 3: High production, heavy use    |
| 4: Large hood or large air mass in motion  | 4: Small hood-local control only |

Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases with the square of distance from the extraction point (in simple cases). Therefore the air speed at the extraction point should be adjusted, accordingly, after reference to distance from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 4-10 m/s (800-2000 f/min) for extraction of crusher dusts generated 2 meters distant from the extraction point. Other mechanical considerations, producing performance deficits within the extraction apparatus, make it essential that theoretical air velocities are multiplied by factors of 10 or more when extraction systems are installed or used.

## Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

# 2,4-Dichlorophenoxy Acetic Acid

sc-205097



The Power is Question

## Material Safety Data Sheet

Hazard Alert Code Key: **EXTREME** **HIGH** **MODERATE** **LOW**

### PHYSICAL PROPERTIES

Solid.  
Does not mix with water.  
Sinks in water.

|                           |                  |                                |                 |
|---------------------------|------------------|--------------------------------|-----------------|
| State                     | Divided solid    | Molecular Weight               | 221.04          |
| Melting Range (°F)        | 273.2- 280.4     | Viscosity                      | Not Applicable  |
| Boiling Range (°F)        | 320 (decomposes) | Solubility in water (g/L)      | Partly miscible |
| Flash Point (°F)          | Not Available    | pH (1% solution)               | Not applicable. |
| Decomposition Temp (°F)   | Not Available    | pH (as supplied)               | Not applicable  |
| Autoignition Temp (°F)    | >356             | Vapour Pressure (mmHG)         | <0.10           |
| Upper Explosive Limit (%) | Not Available    | Specific Gravity (water=1)     | 1.42 @ 25 C     |
| Lower Explosive Limit (%) | Not Available    | Relative Vapor Density (air=1) | 7.0-7.63        |
| Volatile Component (%vol) | Not established  | Evaporation Rate               | Not available   |

### APPEARANCE

White to yellow crystalline powder, phenolic odour. Practically insoluble in water (<0.1%) and oils. Soluble in organic solvents. Highly volatile. Decomposes in the soil 1-2 months after application.

## Section 10 - CHEMICAL STABILITY

### CONDITIONS CONTRIBUTING TO INSTABILITY

- 
- Presence of incompatible materials.
- Product is considered stable.
- Hazardous polymerization will not occur.

### STORAGE INCOMPATIBILITY

- - Avoid strong bases.
- Avoid reaction with oxidizing agents.

For incompatible materials - refer to Section 7 - Handling and Storage.

## Section 11 - TOXICOLOGICAL INFORMATION

2,4-dichlorophenoxyacetic acid

### TOXICITY AND IRRITATION

■ unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

| TOXICITY                         | IRRITATION                         |
|----------------------------------|------------------------------------|
| Oral (human) LDLo: 80 mg/kg      | Skin (rabbit): 500 mg/24h - Mild   |
| Oral (man) LDLo: 93 mg/kg        | Eye (rabbit): 0.75 mg/24h - SEVERE |
| Oral (rat) LD50: 375 mg/kg       |                                    |
| Dermal (rat) LD50: 1500 mg/kg    |                                    |
| Dermal (rabbit) LD50: 1400 mg/kg |                                    |

■ Contact allergies quickly manifest themselves as contact eczema, more rarely as urticaria or Quincke's edema. The pathogenesis of contact eczema involves a cell-mediated (T lymphocytes) immune reaction of the delayed type. Other allergic skin reactions, e.g. contact urticaria, involve antibody-mediated immune reactions. The significance of the contact allergen is not simply determined by its sensitization potential: the distribution of the substance and the opportunities for contact with it are equally important. A weakly sensitizing substance which is widely distributed can be a more important allergen than one with stronger sensitizing potential with which few individuals come into contact. From a clinical point of view, substances are noteworthy if they produce an allergic test reaction in more than 1% of the persons tested.

# 2,4-Dichlorophenoxy Acetic Acid

sc-205097



The Power is Question

## Material Safety Data Sheet

|                               |                |             |                 |            |
|-------------------------------|----------------|-------------|-----------------|------------|
| <b>Hazard Alert Code Key:</b> | <b>EXTREME</b> | <b>HIGH</b> | <b>MODERATE</b> | <b>LOW</b> |
|-------------------------------|----------------|-------------|-----------------|------------|

Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS. RADS (or asthma) following an irritating inhalation is an infrequent disorder with rates related to the concentration of and duration of exposure to the irritating substance. Industrial bronchitis, on the other hand, is a disorder that occurs as result of exposure due to high concentrations of irritating substance (often particulate in nature) and is completely reversible after exposure ceases. The disorder is characterised by dyspnea, cough and mucus production.

For chlorophenoxy pesticides:

WARNING: This substance has been classified by the IARC as Group 2B: Possibly Carcinogenic to Humans.

Side-reactions during manufacture of the parent compound may result in the production of trace amounts of polyhalogenated aromatic hydrocarbon(s). Halogenated phenols, and especially their alkali salts, can condense above 300 deg. C. to form polyphenoxyphenols or, in a very specific reaction, to form dibenzo-p-dioxins.

Polyhalogenated aromatic hydrocarbons (PHAHs) can cause effects on hormones and mimic thyroid hormone. Acne, discharge in the eye, eyelid swellings and visual disturbances may occur. Babies born to exposed mothers can also exhibit these effects. There is an increased risk of liver cancer among those who have taken PHAHs.

The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

The material may cause skin irritation after prolonged or repeated exposure and may produce on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin.

Human cell mutagen

Reproductive effector in rats

### CARCINOGEN

|  |   |                     |        |
|--|---|---------------------|--------|
| Chlorophenoxy herbicides               | International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs | Group               | 2B     |
| 2,4-D [2,4-Dichlorophenoxyacetic acid] | US ACGIH Threshold Limit Values (TLV) - Carcinogens   | Carcinogen Category | A4     |
| 2,4-D                                  | US Environmental Defense Scorecard Suspected Carcinogens                                    | Reference(s)        | HAZMAP |
| CHLOROPHENOXY HERBICIDES               | US Environmental Defense Scorecard Suspected Carcinogens                                    | Reference(s)        | IARC   |

## Section 12 - ECOLOGICAL INFORMATION

Refer to data for ingredients, which follows:

2,4-DICHLOROPHENOXYACETIC ACID:

|  |             |
|--|-------------|
| ■ Fish LC50 (96hr.) (mg/l):                        | 45          |
| ■ Daphnia magna EC50 (48hr.) (mg/l):               | 363- 389    |
| ■ log Kow (Prager 1995):                           | 2.81        |
| ■ Hazardous Air Pollutant:                         | Yes         |
| ■ Fish LC50 (96hr.) (mg/l):                        | 26.7- 300.6 |
| ■ log Pow (Verschueren 1983):                      | 2.81        |
| ■ Half- life Soil - High (hours):                  | 1200        |
| ■ Half- life Soil - Low (hours):                   | 240         |
| ■ Half- life Air - High (hours):                   | 18          |
| ■ Half- life Air - Low (hours):                    | 1.8         |
| ■ Half- life Surface water - High (hours):         | 96          |
| ■ Half- life Surface water - Low (hours):          | 48          |
| ■ Half- life Ground water - High (hours):          | 4320        |
| ■ Half- life Ground water - Low (hours):           | 480         |
| ■ Aqueous biodegradation - Aerobic - High (hours): | 1200        |

# 2,4-Dichlorophenoxy Acetic Acid

sc-205097



The Power is Question

## Material Safety Data Sheet

| Hazard Alert Code Key:                                  | EXTREME | HIGH | MODERATE | LOW  |
|---|---------|------|----------|------|
| ■ Aqueous biodegradation - Aerobic - Low (hours):       |         |      |          | 240  |
| ■ Aqueous biodegradation - Anaerobic - High (hours):    |         |      |          | 4320 |
| ■ Aqueous biodegradation - Anaerobic - Low (hours):     |         |      |          | 672  |
| ■ Photolysis maximum light absorption - High (nano- m): |         |      |          | 291  |
| ■ Photolysis maximum light absorption - Low (nano- m):  |         |      |          | 283  |
| ■ Aqueous photolysis half- life - High (hours):         |         |      |          | 96   |
| ■ Aqueous photolysis half- life - Low (hours):          |         |      |          | 48   |
| ■ Photooxidation half- life air - High (hours):         |         |      |          | 18   |
| ■ Photooxidation half- life air - Low (hours):          |         |      |          | 1.8  |

- Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
- Do NOT allow product to come in contact with surface waters or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment wash-waters.

Wastes resulting from use of the product must be disposed of on site or at approved waste sites.

- For 2,4-dichlorophenoxyacetic acid (2,4-D):

2,4-dichlorophenoxyacetic acid is a hydrophilic compound that tends to remain in water and not adsorb onto soil. Volatilisation into air is considered negligible for most formulations except for the high volatile esters. In water, the acid hydrolyses to the 2,4-D anion and is subject to microbial degradation as the major route of degradation with rates increasing in soils that have been previously treated with the herbicide. 2,4-D is not considered persistent in soil since it tends not to adsorb onto soil unless high levels of organic carbon are present. The compound is relatively mobile, but due to rates and types of applications (usually foliar) along with the relatively high rate of microbial degradation 2,4-D is not likely to leach into subsurface flow. 2,4-D has little tendency to bioconcentrate in animal tissue and is usually excreted unmetabolised via urine except for some of the low-volatile esters which will bioaccumulate in the absence of metabolisation. Some formulations, especially the butyl ester, can be highly toxic to fish. In humans, 2,4-D acid is largely excreted unchanged with no evidence of accumulation in tissues or metabolisation to reactive metabolites.

Environmental fate:

**Air** Volatilisation plays only a minor role in the breakdown and dissipation of the 2,4-D acid due to its low vapour pressure of  $1. \times 10^{-7}$  mmHg. Further, there is little movement of 2,4-D acid through the air/water barrier, the barrier between atmosphere and surface water or soil moisture, into air due to a low Henry's Law Constant of  $1.76 \times 10^{-12}$ . If proper application techniques are not used, the high volatile esters may be prone to spray drift causing toxic effects in nearby crops. With the exception of the high volatile ester formulations, the small amount of 2,4-D that gets into the air is subject to photooxidation by reaction with hydroxyl radicals with an estimated half life of 1 day or dissolves into water droplets and is transported back to the earth's surface via wet deposition. The low volatile ester and amine formulations are used in forests so drift from those applications is relatively negligible.

**Water:** In the aqueous environment, 2,4-D is most commonly found as the free anion. The amine salt formulations dissociate to the anion and ester formulations hydrolyze to the anion, usually within one day. The rate of hydrolysis is pH dependent, with the hydrolysis half-life at pH 9 much shorter than the half-life at pH 6. Therefore, the persistence of the 2,4-D anion is of primary concern.

Decomposition of the anion appears to result from microbial or photodegradation, with photolysis playing a minor role if microbial degradation is rapid. Both aerobic and anaerobic degradation are possible, although anaerobic degradation is relatively slow with a half-life of 312 days. In water, 2,4-D will biodegrade at a rate dependent upon the level of nutrients present, temperature, availability of oxygen, and whether or not the water has been previously contaminated with 2,4-D or other phenoxyacetic acids. Microbial degradation is a possible route for the breakdown of 2,4-D, but it is very dependent on the characteristics of the water. Microbial metabolism has been found to be biphasic with the first phase being a lag phase where the microbes acclimate to the test compound and the second phase being rapid metabolism with a total half-life of 15.0 days for both phases. 2-Chlorohydroquinone (1,4-dihydroxy 2-chlorophenol) is the major metabolite and 2,4-dichlorophenol and carbon dioxide as minor metabolites. Anaerobic aquatic metabolism is a minor pathway with a half-life of 312 days. Major metabolites are 2,4-DCP and carbon dioxide, with 4-chlorophenol and 2,4-dichloroanisole (2,4-DCA) as minor metabolites.

2,4-D has an aqueous photolysis half-life of 13.0 days at 25 C at the surface of distilled water. In natural surface waters photodecomposition is not expected to be significant due to weaker ultraviolet radiation of natural sunlight and the presence of suspended and organic matter which reduces the effects of solar radiation. The half-life is expected to increase with depth due to reduction in penetration. The major photodegradation product is 1,2,4-benzenetriol. Additional studies showed that 2,4-D is susceptible to photodegradation resulting in the formation of carbon dioxide, 1,2,4-benzenetriol, 2,4-dichlorophenol and then proceeds to a secondary photolysis forming humic acids.

For high volatile ester formulations of 2,4-D, volatilisation may play a larger role for removal from water than hydrolysis. In neutral and acidic waters conversion from ester to anion via hydrolysis is slower than the potential rate of vapourisation.

**Soil:** Ester hydrolysis decreases with decreasing soil moisture and with increasing molecular weight of the alcohol portion of the ester. Water solubility and the soil adsorption coefficient (Koc) indicate the potential mobility of a chemical in soil. 2,4-D has a moderate persistence in soil with a field dissipation half-life of 59.3 days, aerobic half-life of 66 days, and a hydrolysis half-life of 39 days. It was found that high organic matter and free iron in soils favoured the adsorption of 2,4-D, while high pH, large surface area, and phyllosilicates as essential clay components decreased adsorption. 2,4-D is in nonionic form at pH less than 6 and is in anionic form at pH greater than 6. In slightly acidic soils, 2,4-D will be adsorbed at pH less than 6 but will not be adsorbed as much if in the anionic form because the negative charges of the soil and chemical repel each other.

Microbial degradation is considered to be the major route in the breakdown of 2,4-D in soil. The rate of microbial degradation is dependent

# 2,4-Dichlorophenoxy Acetic Acid

sc-205097



The Power is Question

## Material Safety Data Sheet

Hazard Alert Code Key: **EXTREME** **HIGH** **MODERATE** **LOW**

upon the water potential, depth and temperature of the soil. Sandy loam soil containing 2,4-D degrading single-celled bacteria, filamentous bacteria (actinomycetes), and fungi, had the lowest degradation rates. Dry soil conditions contribute to the inhibition of 2,4-D mineralisation by restricting solute mobility, reducing the herbicide degrading activity of organisms, and suppressing the 2,4-D degrading microorganism populations. The rate of microbial degradation is also dependent on soil depth and temperature, with rates of degradation decreasing with increased depths and lower temperatures.

Degradation in soil is affected by the rate of adsorption-desorption of 2,4-D onto soil particles which bind the chemical, making it unavailable for microbial degradation. As soil organic carbon content increased to 12 % the rate of adsorption increased correlating to a decreased rate of degradation due to low concentrations of 2,4-D available for microbial degradation. When the organic carbon content was more than 12% there was an increase in the rate of both adsorption and degradation. The enhanced degradation of 2,4-D was attributed to the increased biological activity of the soil and the decreased 2,4-D-induced inhibitory effect on microbial activity.

Photodecomposition on soil surfaces plays a very minor role in the breakdown of 2,4-D and only occurs on the upper surface of the soil. The potential major soil photodegradation products are 2,4-dichlorophenol, 1,2,4-benzenetriol, and 2-chlorohydroquinone.

The high water solubility of 4.46x10+4 ppm and low soil adsorption coefficient of 0.067-1.1 cm<sup>3</sup>/g for the 2,4-D free acid suggest that it has a high potential to leach in soil. The principle means of movement would probably be with percolating water, while diffusion is important only for transport over small distances. The adsorption capacity of a given soil affects the potential for leaching of 2,4-D; in soils that promote adsorption, the leaching potential is lower.

Biota: 2,4-D formulations having high lipid solubility (such as the esters) rapidly penetrate the cuticle. Salt formulations are most readily absorbed through the roots, while esters are more readily absorbed through foliage. Foliar applied 2,4-D is easily translocated in the phloem and carried with material from photosynthesising leaves to growth sites where it accumulates. Translocation of 2,4-D upward by roots takes place primarily in the transpiration stream of the xylem.

2,4-D mimics the effects of auxins (plant growth regulators) and is found to persist in plant tissues longer than the natural hormone. Ester formulations do not function as growth regulators until they are converted to the acid form, usually within ½ hour after application. The immediate cause of plant death is due to abnormal metabolism of nucleic acids.

Bioconcentration and bioaccumulation: The bioconcentration factor (BCF, a ratio of the test substance concentration in fish to the concentration in water) for 2,4-D ranges from an estimated 7 for the acid to an estimated 37,500 for the isooctyl ester to an estimated 0.1 to 0.47 for the dimethylamine salt. 2,4-D when applied as the acid shows little tendency to bioconcentrate in fish while if applied as the isooctyl ester it is expected to bioconcentrate in the absence of metabolisation. In fish, accumulated 2,4-D is rapidly broken down into hydrocarbon fragments which are utilized by the fish for synthesis of normal body tissue and/or eliminated. In trout 72 ± 4% of 2,4-D is excreted via urine as the unchanged acid within 8 hours after exposure with a half-life of 2.4 hours

### Ecotoxicity:

Subacute toxicity tests showed that 2,4-D induced changes in the enzyme activities and morphological changes in the gills, liver, and kidneys of adult fish. A toxicity study done on Salmonids in southeast Alaska showed that the butyl ester was the most toxic of the ester formulations and the isooctyl ester was the least toxic. 100% mortality occurred for pink, chum, and coho fry exposed to 1 ppm 2,4-D butyl ester and sockeye smolts, dolly varden, rainbow and Oregon coho fingerlings exposed to 5 ppm 2,4-D butyl ester. The no-effect level was less than 1 ppm, but not more precisely described. The same study also found the no-effect level for isooctyl ester to range from 1ppm to 10 ppm for all the same fish species except for pink salmon fry and sockeye smolts which showed 40 and 6.7% mortality at 1ppm, respectively. The pure acid form of 2,4-D at 1ppm only showed high mortality in the pink fry.

■ DO NOT discharge into sewer or waterways.

log Kow: 2.81

Koc: 9-109.1

Half-life (hr) air: 24

Half-life (hr) H<sub>2</sub>O surface water: <24-1032

Henry's atm m<sup>3</sup> /mol: 1.37E-10

BCF: 7

Fish LC50 (96 h): 0.5-300.6 mg/L

Oyster LC50 (96 h): oyster 2.0 mg/L

### Ecotoxicity

| Ingredient                     | Persistence:<br>Water/Soil | Persistence: Air | Bioaccumulation | Mobility |
|--------------------------------|----------------------------|------------------|-----------------|----------|
| 2,4-dichlorophenoxyacetic acid | LOW                        | LOW              | LOW             | HIGH     |

## Section 13 - DISPOSAL CONSIDERATIONS

### US EPA Waste Number & Descriptions

#### A. General Product Information

Toxicity characteristic: use EPA hazardous waste number D016 (waste code E) if this substance, in a solid waste, produces an extract containing greater than 10 mg/L of 2,4-D.

#### B. Component Waste Numbers

When 2,4-dichlorophenoxyacetic acid is present as a solid waste as a discarded commercial chemical product, off-specification species, as a container residue, or a spill residue, use EPA waste number U240 (waste code T).

# 2,4-Dichlorophenoxy Acetic Acid

sc-205097



The Power is Question

## Material Safety Data Sheet

Hazard Alert Code Key: **EXTREME** **HIGH** **MODERATE** **LOW**

When 2,4-dichlorophenoxyacetic acid is present as a solid waste as a discarded commercial chemical product, off-specification species, as a container residue, or a spill residue, use EPA waste number U240 (waste code T).

For discarded unused formulations containing 2,4-dichlorophenoxyacetic acid use hazardous waste number F027

When 2,4-dichlorophenoxyacetic acid is present as a solid waste as a discarded commercial chemical product, off-specification species, as a container residue, or a spill residue, use EPA waste number U240 (waste code T).

For discarded unused formulations containing 2,4-dichlorophenoxyacetic acid use hazardous waste number F027

When 2,4-dichlorophenoxyacetic acid is present as a solid waste as a discarded commercial chemical product, off-specification species, as a container residue, or a spill residue, use EPA waste number U240 (waste code T).

For discarded unused formulations containing 2,4-dichlorophenoxyacetic acid use hazardous waste number F027

When 2,4-dichlorophenoxyacetic acid is present as a solid waste as a discarded commercial chemical product, off-specification species, as a container residue, or a spill residue, use EPA waste number U240 (waste code T).

For discarded unused formulations containing 2,4-dichlorophenoxyacetic acid use hazardous waste number F027

When 2,4-dichlorophenoxyacetic acid is present as a solid waste as a discarded commercial chemical product, off-specification species, as a container residue, or a spill residue, use EPA waste number U240 (waste code T).

For discarded unused formulations containing 2,4-dichlorophenoxyacetic acid use hazardous waste number F027

When 2,4-dichlorophenoxyacetic acid is present as a solid waste as a discarded commercial chemical product, off-specification species, as a container residue, or a spill residue, use EPA waste number U240 (waste code T).

For discarded unused formulations containing 2,4-dichlorophenoxyacetic acid use hazardous waste number F027

### Disposal Instructions

All waste must be handled in accordance with local, state and federal regulations.

! Puncture containers to prevent re-use and bury at an authorized landfill.

Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.

A Hierarchy of Controls seems to be common - the user should investigate:

- Reduction
- Reuse
- Recycling
- Disposal (if all else fails)

This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate.

DO NOT allow wash water from cleaning equipment to enter drains. Collect all wash water for treatment before disposal.

- Recycle wherever possible.
- Consult manufacturer for recycling options or consult Waste Management Authority for disposal if no suitable treatment or disposal facility can be identified.
- Dispose of by: Burial in a licensed land-fill or Incineration in a licensed apparatus (after admixture with suitable combustible material)
- Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.

## Section 14 - TRANSPORTATION INFORMATION

NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS: DOT, IATA, IMDG

## Section 15 - REGULATORY INFORMATION

### 2,4-dichlorophenoxyacetic acid (CAS: 94-75-7) is found on the following regulatory lists;

"Canada - Alberta Occupational Exposure Limits", "Canada - Northwest Territories Occupational Exposure Limits (English)", "Canada - Nova Scotia Occupational Exposure Limits", "Canada - Prince Edward Island Occupational Exposure Limits", "Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)", "Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits", "Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances", "Canada Domestic Substances List (DSL)", "Canada Environmental Quality Guidelines (EQGs) Water: Aquatic life", "Canada Environmental Quality Guidelines (EQGs) Water: Community", "IMO MARPOL 73/78 (Annex II) - List of Noxious Liquid Substances Carried in Bulk", "OECD Representative List of High Production Volume (HPV) Chemicals", "US - Alaska Limits for Air Contaminants", "US - California Air Toxics ""Hot Spots"" List (Assembly Bill 2588) Substances for which emissions must be quantified", "US - California Code of Regulation; Identification and Listing of Hazardous Waste, Table 1 - Maximum Concentrations for the Toxicity Characteristics", "US - California Environmental Health Standards for the Management of Hazardous Waste - List of Organic Persistent and Bioaccumulative Toxic Substances and Their STLC & TTLC Values", "US - California Occupational Safety and Health Regulations (CAL/OSHA) - Hazardous Substances List", "US - California Permissible Exposure Limits for Chemical Contaminants", "US - Connecticut Hazardous Air Pollutants", "US - Hawaii Air Contaminant Limits", "US - Idaho - Limits for Air Contaminants", "US - Massachusetts Oil & Hazardous Material List", "US - Michigan Exposure Limits for Air Contaminants", "US -

# 2,4-Dichlorophenoxy Acetic Acid

sc-205097

Material Safety Data Sheet



The Power is Question

Hazard Alert Code Key: **EXTREME** **HIGH** **MODERATE** **LOW**

Minnesota Hazardous Substance List,"US - Minnesota Permissible Exposure Limits (PELs),"US - New Jersey Right to Know Hazardous Substances,"US - Oregon Permissible Exposure Limits (Z1),"US - Pennsylvania - Hazardous Substance List,"US - Rhode Island Hazardous Substance List,"US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants,"US - Texas Drinking Water Standards - Maximum Contaminant Levels (MCLs) for synthetic organic contaminants,"US - Vermont Hazardous Constituents,"US - Vermont Hazardous Waste - Maximum Contaminant Concentration for Toxicity,"US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants,"US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants,"US - Washington Dangerous waste constituents list,"US - Washington Permissible exposure limits of air contaminants,"US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants,"US ACGIH Threshold Limit Values (TLV),"US ACGIH Threshold Limit Values (TLV) - Carcinogens,"US CERCLA Priority List of Hazardous Substances,"US CWA (Clean Water Act) - List of Hazardous Substances,"US CWA (Clean Water Act) - Reportable Quantities of Designated Hazardous Substances,"US Department of Transportation (DOT) List of Hazardous Substances and Reportable Quantities - Hazardous Substances Other Than Radionuclides,"US DOE Temporary Emergency Exposure Limits (TEELs),"US EPA High Production Volume Program Chemical List,"US EPCRA Section 313 Chemical List,"US List of Lists - Consolidated List of Chemicals Subject to the Emergency Planning and Community Right-to-Know Act (EPCRA) and Section 112(r) of the Clean Air Act,"US NIOSH Recommended Exposure Limits (RELs),"US OSHA Permissible Exposure Levels (PELs) - Table Z1,"US RCRA (Resource Conservation & Recovery Act) - Appendix IX to Part 264 Ground-Water Monitoring List 1,"US RCRA (Resource Conservation & Recovery Act) - Hazardous Constituents - Appendix VIII to 40 CFR 261,"US RCRA (Resource Conservation & Recovery Act) - List of Hazardous Inorganic and Organic Constituents 1,"US RCRA (Resource Conservation & Recovery Act) - Phase 4 LDR Rule - Universal Treatment Standards,"US Toxic Substances Control Act (TSCA) - Inventory,"US TSCA Section 4 - Multichemical Test Rules / Waste Constituents,"US TSCA Section 4/12 (b) - Sunset Date/Status,"WHO Guidelines for Drinking-water Quality - Guideline values for chemicals that are of health significance in drinking-water"

## Section 16 - OTHER INFORMATION

### LIMITED EVIDENCE

- Cumulative effects may result following exposure\*.
- May produce skin discomfort\*.
- May affect fertility\*.

\* (limited evidence).

### REPRODUCTIVE HEALTH GUIDELINES

■ Established occupational exposure limits frequently do not take into consideration reproductive end points that are clearly below the thresholds for other toxic effects. Occupational reproductive guidelines (ORGs) have been suggested as an additional standard. These have been established after a literature search for reproductive no-observed-adverse effect-level (NOAEL) and the lowest-observed-adverse-effect-level (LOAEL). In addition the US EPA's procedures for risk assessment for hazard identification and dose-response assessment as applied by NIOSH were used in the creation of such limits. Uncertainty factors (UFs) have also been incorporated.

| Ingredient                     | ORG        | UF  | Endpoint | CR | Adeq TLV |
|--------------------------------|------------|-----|----------|----|----------|
| 2,4-dichlorophenoxyacetic acid | 1.50 mg/m3 | 100 | R        | NA | -        |

■ These exposure guidelines have been derived from a screening level of risk assessment and should not be construed as unequivocally safe limits. ORGS represent an 8-hour time-weighted average unless specified otherwise. CR = Cancer Risk/10000; UF = Uncertainty factor: TLV believed to be adequate to protect reproductive health: LOD: Limit of detection Toxic endpoints have also been identified as: D = Developmental; R = Reproductive; TC = Transplacental carcinogen Jankovic J., Drake F.: A Screening Method for Occupational Reproductive Health Risk: American Industrial Hygiene Association Journal 57: 641-649 (1996).

*Reasonable care has been taken in the preparation of this information, but the author makes no warranty of merchantability or any other warranty, expressed or implied, with respect to this information. The author makes no representations and assumes no liability for any direct, incidental or consequential damages resulting from its use. For additional technical information please call our toxicology department on +800 CHEMCALL.*

■ Classification of the mixture and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.

A list of reference resources used to assist the committee may be found at:  
[www.chemwatch.net/references](http://www.chemwatch.net/references).

■ The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

*This document is copyright. Apart from any fair dealing for the purposes of private study, research, review or criticism, as permitted under the Copyright Act, no part may be reproduced by any process without written*



# 2,4-Dichlorophenoxy Acetic Acid

sc-205097

Material Safety Data Sheet



*The Power is Question*

Hazard Alert Code Key:

EXTREME

HIGH

MODERATE

LOW

*permission from CHEMWATCH. TEL (+61 3) 9572 4700.*

Issue Date: Nov-23-2008

Print Date: May-11-2010