

# Titan Clopyralid 750 (Titan Clopyralid 750 SG Herbicide)

## Titan Ag

Chemwatch: 37-95892

Version No: 2.1

Safety Data Sheet according to Work Health and Safety Regulations (Hazardous Chemicals) 2023 and ADG requirements

Chemwatch Hazard Alert Code: 2

Initial Date: 11/09/2024

Revision Date: 02/06/2026

Print Date: 09/06/2026

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## SECTION 1 Identification of the substance / mixture and of the company / undertaking

### Product Identifier

|                               |                                                                                          |
|-------------------------------|------------------------------------------------------------------------------------------|
| Product name                  | Titan Clopyralid 750 (Titan Clopyralid 750 SG Herbicide)                                 |
| Chemical Name                 | Not Applicable                                                                           |
| Synonyms                      | Not Available                                                                            |
| Proper shipping name          | ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (contains clopyralid, potassium salt) |
| Chemical formula              | Not Applicable                                                                           |
| Other means of identification | Not Available                                                                            |

### Relevant identified uses of the substance or mixture and uses advised against

|                          |                                                                        |
|--------------------------|------------------------------------------------------------------------|
| Relevant identified uses | Agricultural herbicide.<br>Use according to manufacturer's directions. |
|--------------------------|------------------------------------------------------------------------|

### Details of the manufacturer or importer of the safety data sheet

|                         |                                                                              |
|-------------------------|------------------------------------------------------------------------------|
| Registered company name | Titan Ag                                                                     |
| Address                 | Princes Street Marina, Suite 15/16 Princes Street Newport NSW 2106 Australia |
| Telephone               | +61 2 9999 6655                                                              |
| Fax                     | +61 2 9999 0483                                                              |
| Website                 | <a href="https://www.titanag.com.au/">https://www.titanag.com.au/</a>        |
| Email                   | titanorders@titanag.com.au                                                   |

### Emergency telephone number

|                                     |                         |
|-------------------------------------|-------------------------|
| Association / Organisation          | Titan Ag                |
| Emergency telephone number(s)       | 1800 033 111 (24 hours) |
| Other emergency telephone number(s) | Not Available           |

## SECTION 2 Hazards identification

### Classification of the substance or mixture

|                    |                                                                                                                                                  |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| Poisons Schedule   | S5                                                                                                                                               |
| Classification [1] | Sensitisation (Skin) Category 1, Serious Eye Damage/Eye Irritation Category 2A, Hazardous to the Aquatic Environment Long-Term Hazard Category 2 |
| Legend:            | 1. Classified by Chemwatch; 2. Classification drawn from HCIS; 3. Classification drawn from Regulation (EU) No 1272/2008 - Annex VI              |

### Label elements

|                     |                                                                                     |
|---------------------|-------------------------------------------------------------------------------------|
| Hazard pictogram(s) |  |
| Signal word         | Warning                                                                             |

### Hazard statement(s)

|      |                                                  |
|------|--------------------------------------------------|
| H317 | May cause an allergic skin reaction.             |
| H319 | Causes serious eye irritation.                   |
| H411 | Toxic to aquatic life with long lasting effects. |

### Precautionary statement(s) Prevention

|      |                                                                                  |
|------|----------------------------------------------------------------------------------|
| P280 | Wear protective gloves, protective clothing, eye protection and face protection. |
|------|----------------------------------------------------------------------------------|

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|      |                                                                        |
|------|------------------------------------------------------------------------|
| P261 | Avoid breathing dust/fumes.                                            |
| P273 | Avoid release to the environment.                                      |
| P264 | Wash all exposed external body areas thoroughly after handling.        |
| P272 | Contaminated work clothing should not be allowed out of the workplace. |

Precautionary statement(s) Response

|                |                                                                                                                                  |
|----------------|----------------------------------------------------------------------------------------------------------------------------------|
| P302+P352      | IF ON SKIN: Wash with plenty of water.                                                                                           |
| P305+P351+P338 | IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. |
| P333+P313      | If skin irritation or rash occurs: Get medical advice/attention.                                                                 |
| P337+P313      | If eye irritation persists: Get medical advice/attention.                                                                        |
| P362+P364      | Take off contaminated clothing and wash it before reuse.                                                                         |
| P391           | Collect spillage.                                                                                                                |

Precautionary statement(s) Storage

Not Applicable

Precautionary statement(s) Disposal

|      |                                                                                                                                  |
|------|----------------------------------------------------------------------------------------------------------------------------------|
| P501 | Dispose of contents/container to authorised hazardous or special waste collection point in accordance with any local regulation. |
|------|----------------------------------------------------------------------------------------------------------------------------------|

No further product hazard information.

SECTION 3 Composition / information on ingredients

Substances

See section below for composition of Mixtures

Mixtures

| CAS No     | %[weight]                                                                                                                                                                                    | Name                       |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| 58509-83-4 | 75                                                                                                                                                                                           | clopyralid, potassium salt |
| Legend:    | 1. Classified by Chemwatch; 2. Classification drawn from HCIS; 3. Classification drawn from Regulation (EU) No 1272/2008 - Annex VI; 4. Classification drawn from C&L; * EU IOELVs available |                            |

SECTION 4 First aid measures

Description of first aid measures

|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Eye Contact  | <p>If this product comes in contact with the eyes:</p> <ul style="list-style-type: none"><li>Wash out immediately with fresh running water.</li><li>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.</li><li>Seek medical attention without delay; if pain persists or recurs seek medical attention.</li><li>Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.</li></ul> |
| Skin Contact | <p>If skin contact occurs:</p> <ul style="list-style-type: none"><li>Immediately remove all contaminated clothing, including footwear.</li><li>Flush skin and hair with running water (and soap if available).</li><li>Seek medical attention in event of irritation.</li></ul>                                                                                                                                                                                                                                                |
| Inhalation   | <ul style="list-style-type: none"><li>If dust is inhaled, remove from contaminated area.</li><li>Encourage patient to blow nose to ensure clear passage of breathing.</li><li>If irritation or discomfort persists seek medical attention.</li></ul>                                                                                                                                                                                                                                                                           |
| Ingestion    | <ul style="list-style-type: none"><li>Immediately give a glass of water.</li><li>First aid is not generally required. If in doubt, contact a Poisons Information Centre or a doctor.</li></ul>                                                                                                                                                                                                                                                                                                                                 |

Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5 Firefighting measures

Extinguishing media

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

Special hazards arising from the substrate or mixture

|                      |                                                                                                                                        |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Fire Incompatibility | Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------|

Advice for firefighters

|               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Fire Fighting | <ul style="list-style-type: none"><li>Alert Fire Brigade and tell them location and nature of hazard.</li><li>Wear breathing apparatus plus protective gloves in the event of a fire.</li><li>Prevent, by any means available, spillage from entering drains or water courses.</li><li>Use fire fighting procedures suitable for surrounding area.</li><li>DO NOT approach containers suspected to be hot.</li><li>Cool fire exposed containers with water spray from a protected location.</li><li>If safe to do so, remove containers from path of fire.</li><li>Equipment should be thoroughly decontaminated after use.</li></ul> |
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| Fire/Explosion Hazard | <ul style="list-style-type: none"> <li>▶ Combustible solid which burns but propagates flame with difficulty; it is estimated that most organic dusts are combustible (circa 70%) - according to the circumstances under which the combustion process occurs, such materials may cause fires and / or dust explosions.</li> <li>▶ Organic powders when finely divided over a range of concentrations regardless of particulate size or shape and suspended in air or some other oxidizing medium may form explosive dust-air mixtures and result in a fire or dust explosion (including secondary explosions).</li> <li>▶ 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 (420 micron or less) may burn rapidly and fiercely if ignited - particles exceeding this limit will generally not form flammable dust clouds; once initiated, however, larger particles up to 1400 microns diameter will contribute to the propagation of an explosion.</li> <li>▶ In the same way as gases and vapours, dusts in the form of a cloud are only ignitable over a range of concentrations; in principle, the concepts of lower explosive limit (LEL) and upper explosive limit (UEL) are applicable to dust clouds but only the LEL is of practical use; - this is because of the inherent difficulty of achieving homogeneous dust clouds at high temperatures (for dusts the LEL is often called the "Minimum Explosible Concentration", MEC).</li> <li>▶ When processed with flammable liquids/vapors/mists, ignitable (hybrid) mixtures may be formed with combustible dusts. Ignitable mixtures will increase the rate of explosion pressure rise and the Minimum Ignition Energy (the minimum amount of energy required to ignite dust clouds - MIE) will be lower than the pure dust in air mixture. The Lower Explosive Limit (LEL) of the vapour/dust mixture will be lower than the individual LELs for the vapors/mists or dusts.</li> <li>▶ A dust explosion may release of large quantities of gaseous products; this in turn creates a subsequent pressure rise of explosive force capable of damaging plant and buildings and injuring people.</li> <li>▶ Usually the initial or primary explosion takes place in a confined space such as plant or machinery, and can be of sufficient force to damage or rupture the plant. If the shock wave from the primary explosion enters the surrounding area, it will disturb any settled dust layers, forming a second dust cloud, and often initiate a much larger secondary explosion. All large scale explosions have resulted from chain reactions of this type.</li> <li>▶ Dry dust can be charged electrostatically by turbulence, pneumatic transport, pouring, in exhaust ducts and during transport.</li> <li>▶ Build-up of electrostatic charge may be prevented by bonding and grounding.</li> <li>▶ Powder handling equipment such as dust collectors, dryers and mills may require additional protection measures such as explosion venting.</li> <li>▶ All movable parts coming in contact with this material should have a speed of less than 1-meter/sec.</li> <li>▶ A sudden release of statically charged materials from storage or process equipment, particularly at elevated temperatures and/ or pressure, may result in ignition especially in the absence of an apparent ignition source.</li> <li>▶ One important effect of the particulate nature of powders is that the surface area and surface structure (and often moisture content) can vary widely from sample to sample, depending of how the powder was manufactured and handled; this means that it is virtually impossible to use flammability data published in the literature for dusts (in contrast to that published for gases and vapours).</li> <li>▶ Autoignition temperatures are often quoted for dust clouds (minimum ignition temperature (MIT)) and dust layers (layer ignition temperature (LIT)); LIT generally falls as the thickness of the layer increases.</li> </ul> <p>Combustion products include:</p> <ul style="list-style-type: none"> <li>▶ carbon monoxide (CO)</li> <li>▶ carbon dioxide (CO<sub>2</sub>)</li> </ul> <p>hydrogen chloride<br/>phosgene<br/>nitrogen oxides (NO<sub>x</sub>)</p> <ul style="list-style-type: none"> <li>▶ other pyrolysis products typical of burning organic material.</li> </ul> |
| HAZCHEM               | 22                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

## SECTION 6 Accidental release measures

## Personal precautions, protective equipment and emergency procedures

See section 8

## Environmental precautions

See section 12

## Methods and material for containment and cleaning up

|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Minor Spills | <p>Environmental hazard - contain spillage.</p> <ul style="list-style-type: none"> <li>▶ Clean up all spills immediately.</li> <li>▶ Avoid contact with skin and eyes.</li> <li>▶ Wear impervious gloves and safety glasses.</li> <li>▶ Use dry clean up procedures and avoid generating dust.</li> <li>▶ Vacuum up (consider explosion-proof machines designed to be grounded during storage and use).</li> <li>▶ Do NOT use air hoses for cleaning</li> <li>▶ Place spilled material in clean, dry, sealable, labelled container.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                   |
| Major Spills | <p>Environmental hazard - contain spillage.<br/>Moderate hazard.</p> <ul style="list-style-type: none"> <li>▶ <b>CAUTION:</b> Advise personnel in area.</li> <li>▶ Alert Emergency Services and tell them location and nature of hazard.</li> <li>▶ Control personal contact by wearing protective clothing.</li> <li>▶ Prevent, by any means available, spillage from entering drains or water courses.</li> <li>▶ Recover product wherever possible.</li> <li>▶ <b>IF DRY:</b> Use dry clean up procedures and avoid generating dust. Collect residues and place in sealed plastic bags or other containers for disposal. <b>IF WET:</b> Vacuum/shovel up and place in labelled containers for disposal.</li> <li>▶ <b>ALWAYS:</b> Wash area down with large amounts of water and prevent runoff into drains.</li> <li>▶ If contamination of drains or waterways occurs, advise Emergency Services.</li> </ul> |

Personal Protective Equipment advice is contained in Section 8 of the SDS.

## SECTION 7 Handling and storage

## Precautions for safe handling

|               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Safe handling | <ul style="list-style-type: none"> <li>▶ Avoid skin contact, including inhalation.</li> <li>▶ Wear protective clothing when risk of exposure occurs.</li> <li>▶ Use in a well-ventilated area.</li> <li>▶ Prevent concentration in hollows and sumps.</li> <li>▶ <b>DO NOT enter confined spaces until atmosphere has been checked.</b></li> <li>▶ <b>DO NOT</b> allow material to come in direct contact with human skin or eyes.</li> <li>▶ <b>DO NOT</b> allow material to come in contact with exposed food or food contact surfaces.</li> <li>▶ Suitable PPE must be worn at all times.</li> </ul> |
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Continued...

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|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                   | <ul style="list-style-type: none"><li>▶ Avoid contact with incompatible materials.</li><li>▶ <b>When handling, DO NOT eat, drink or smoke.</b></li><li>▶ Keep containers securely sealed when not in use.</li><li>▶ Avoid physical damage to containers.</li><li>▶ Always wash hands with soap and water after handling.</li><li>▶ Work clothes should be laundered separately. Launder contaminated clothing before re-use.</li><li>▶ Use good occupational work practice.</li><li>▶ Observe manufacturer's storage and handling recommendations contained within this SDS.</li><li>▶ Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.</li><li>▶ Organic powders when finely divided over a range of concentrations regardless of particulate size or shape and suspended in air or some other oxidizing medium may form explosive dust-air mixtures and result in a fire or dust explosion (including secondary explosions)</li><li>▶ Minimise airborne dust and eliminate all ignition sources. Keep away from heat, hot surfaces, sparks, and flame.</li><li>▶ Establish good housekeeping practices.</li><li>▶ Remove dust accumulations on a regular basis by vacuuming or gentle sweeping to avoid creating dust clouds.</li><li>▶ Use continuous suction at points of dust generation to capture and minimise the accumulation of dusts. Particular attention should be given to overhead and hidden horizontal surfaces to minimise the probability of a "secondary" explosion. According to NFPA Standard 654, dust layers 1/32 in.(0.8 mm) thick can be sufficient to warrant immediate cleaning of the area.</li><li>▶ Do not use air hoses for cleaning.</li><li>▶ Minimise dry sweeping to avoid generation of dust clouds. Vacuum dust-accumulating surfaces and remove to a chemical disposal area. Vacuums with explosion-proof motors should be used.</li><li>▶ Control sources of static electricity. Dusts or their packages may accumulate static charges, and static discharge can be a source of ignition.</li><li>▶ Solids handling systems must be designed in accordance with applicable standards (e.g. NFPA including 654 and 77) and other national guidance.</li><li>▶ Do not empty directly into flammable solvents or in the presence of flammable vapors.</li><li>▶ The operator, the packaging container and all equipment must be grounded with electrical bonding and grounding systems. Plastic bags and plastics cannot be grounded, and antistatic bags do not completely protect against development of static charges.</li></ul> <p>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.</p> <ul style="list-style-type: none"><li>▶ <b>Do NOT cut, drill, grind or weld such containers.</b></li><li>▶ In addition ensure such activity is not performed near full, partially empty or empty containers without appropriate workplace safety authorisation or permit.</li></ul> |
| Other information | <ul style="list-style-type: none"><li>▶ Store in original containers.</li><li>▶ Keep containers securely sealed.</li><li>▶ Store in a cool, dry area protected from environmental extremes.</li><li>▶ Store away from incompatible materials and foodstuff containers.</li><li>▶ Protect containers against physical damage and check regularly for leaks.</li><li>▶ Observe manufacturer's storage and handling recommendations contained within this SDS.</li></ul> <p>For major quantities:</p> <ul style="list-style-type: none"><li>▶ Consider storage in banded areas - ensure storage areas are isolated from sources of community water (including stormwater, ground water, lakes and streams).</li><li>▶ Ensure that accidental discharge to air or water is the subject of a contingency disaster management plan; this may require consultation with local authorities.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

Conditions for safe storage, including any incompatibilities

|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Suitable container      | <ul style="list-style-type: none"><li>▶ Polyethylene or polypropylene container.</li><li>▶ Check all containers are clearly labelled and free from leaks.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Storage incompatibility | <p>Contains a six-membered heterocyclic ring.</p> <p>Six-membered heterocycles can be described as pi--deficient. Substitution by electronegative groups or additional nitrogen atoms in the ring significantly increase the pi-deficiency. These effects also decrease the basicity.</p> <p>Electrophilic aromatic substitution is more difficult while nucleophilic aromatic substitution is facilitated.</p> <p>for pyridines:</p> <ul style="list-style-type: none"><li>· Because of the electronegative nitrogen in the pyridine ring, the molecule is relatively electron deficient. It, therefore, enters less readily electrophilic aromatic substitution reactions, which are characteristic of benzene derivatives; even more so if the reaction mix doesn't scavenge protons released by the reaction (protonated pyridine is even more electron-deficient). However, unlike benzene and its derivatives, pyridine is more prone to nucleophilic substitution and metalation of the ring by strong organometallic bases.</li><li>· The nitrogen center of pyridine features a basic lone pair of electrons. Because this lone pair is not part of the aromatic ring, pyridine is a base, having chemical properties similar to those of tertiary amines. Pyridine can act as Lewis base, donating its pair of electrons to a Lewis acid.</li><li>· Pyridine is protonated by reaction with acids and forms a positively charged aromatic polyatomic ion called pyridinium</li></ul> <p>The reactivity of pyridine can be distinguished for three chemical groups.</p> <ul style="list-style-type: none"><li>· With electrophiles, electrophilic substitution takes place where pyridine expresses aromatic properties.</li><li>· With nucleophiles, pyridine reacts at positions 2 and 4 and thus behaves similar to imines and carbonyls.</li><li>· The reaction with many Lewis acids results in the addition to the nitrogen atom of pyridine, which is similar to the reactivity of tertiary amines. The ability of pyridine and its derivatives to oxidize, forming amine oxides (N-oxides), is also a feature of tertiary amines</li></ul> <p>Secondary amines form salts with strong acids and can be oxidized to the corresponding nitron using hydrogen peroxide, catalyzed by selenium dioxide</p> <ul style="list-style-type: none"><li>▶ Avoid reaction with oxidising agents</li></ul> |

SECTION 8 Exposure controls / personal protection

Control parameters

Occupational Exposure Limits (OEL)

INGREDIENT DATA

Not Available

MATERIAL DATA

Exposure controls

|                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Appropriate engineering controls | <p>Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection.</p> <p>The basic types of engineering controls are:</p> <p>Process controls which involve changing the way a job activity or process is done to reduce the risk.</p> <p>Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment. Ventilation can remove or dilute an air contaminant if designed properly. The</p> |
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design of a ventilation system must match the particular process and chemical or contaminant in use. Employers may need to use multiple types of controls to prevent employee overexposure.

- ▶ 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.
- ▶ 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.

Air contaminants generated in the workplace possess varying "escape" velocities which, in turn, determine the "capture velocities" of fresh circulating air required to effectively 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 favourable 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 metres 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.

#### Individual protection measures, such as personal protective equipment



#### Eye and face protection

- ▶ Safety glasses with side shields.
- ▶ Chemical goggles.[AS/NZS 1337.1, EN166 or national equivalent]
- ▶ Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59].

#### Skin protection

See Hand protection below

#### Hands/feet protection

##### NOTE:

- ▶ The material may produce skin sensitisation in predisposed individuals. Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact.
- ▶ Contaminated leather items, such as shoes, belts and watch-bands should be removed and destroyed.

The selection of suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application.

The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and has to be observed when making a final choice.

Personal hygiene is a key element of effective hand care. 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.

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

- 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, AS/NZS 2161.1 or national equivalent).

- 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, AS/NZS 2161.10.1 or national equivalent) 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, AS/NZS 2161.10.1 or national equivalent) is recommended.

- Some glove polymer types are less affected by movement and this should be taken into account when considering gloves for long-term use.

- Contaminated gloves should be replaced.

As defined in ASTM F-739-96 in any application, gloves are rated as:

- Excellent when breakthrough time > 480 min
- Good when breakthrough time > 20 min
- Fair when breakthrough time < 20 min
- Poor when glove material degrades

For general applications, gloves with a thickness typically greater than 0.35 mm, are recommended.

It should be emphasised that glove thickness is not necessarily a good predictor of glove resistance to a specific chemical, as the permeation efficiency of the glove will be dependent on the exact composition of the glove material. Therefore, glove selection should also be based on consideration of the task requirements and knowledge of breakthrough times.

Glove thickness may also vary depending on the glove manufacturer, the glove type and the glove model. Therefore, the manufacturers technical data should always be taken into account to ensure selection of the most appropriate glove for the task.

Note: Depending on the activity being conducted, gloves of varying thickness may be required for specific tasks. For example:

- Thinner gloves (down to 0.1 mm or less) may be required where a high degree of manual dexterity is needed. However, these gloves are only likely to give short duration protection and would normally be just for single use applications, then disposed of.
- Thicker gloves (up to 3 mm or more) may be required where there is a mechanical (as well as a chemical) risk i.e. where there is abrasion or puncture potential

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.

Continued...

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                  | Experience indicates that the following polymers are suitable as glove materials for protection against undissolved, dry solids, where abrasive particles are not present. <ul style="list-style-type: none"><li>▶ polychloroprene.</li><li>▶ nitrile rubber.</li><li>▶ butyl rubber.</li><li>▶ fluorocautchouc.</li><li>▶ polyvinyl chloride.</li></ul> Gloves should be examined for wear and/ or degradation constantly. |
| Body protection  | See Other protection below                                                                                                                                                                                                                                                                                                                                                                                                  |
| Other protection | <ul style="list-style-type: none"><li>▶ Overalls.</li><li>▶ P.V.C apron.</li><li>▶ Barrier cream.</li><li>▶ Skin cleansing cream.</li><li>▶ Eye wash unit.</li></ul>                                                                                                                                                                                                                                                        |

Respiratory protection

Type -P Filter of sufficient capacity. (AS/NZS 1716 & 1715, EN 143:2000 & 149:2001, ANSI Z88 or national equivalent)

| Required Minimum Protection Factor | Half-Face Respirator | Full-Face Respirator | Powered Air Respirator |
|------------------------------------|----------------------|----------------------|------------------------|
| up to 10 x ES                      | P1<br>Air-line*      | -<br>-               | PAPR-P1<br>-           |
| up to 50 x ES                      | Air-line**           | P2                   | PAPR-P2                |
| up to 100 x ES                     | -                    | P3                   | -                      |
|                                    |                      | Air-line*            | -                      |
| 100+ x ES                          | -                    | Air-line**           | PAPR-P3                |

\* - Negative pressure demand \*\* - Continuous flow  
A(All classes) = Organic vapours, B AUS or B1 = Acid gasses, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO2), G = Agricultural chemicals, K = Ammonia(NH3), Hg = Mercury, NO = Oxides of nitrogen, MB = Methyl bromide, AX = Low boiling point organic compounds(below 65 degC)

- 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 protection. 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.
- Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU)
- Use approved positive flow mask if significant quantities of dust becomes airborne.
- Try to avoid creating dust conditions.

Class P2 particulate filters are used for protection against mechanically and thermally generated particulates or both.  
P2 is a respiratory filter rating under various international standards, Filters at least 94% of airborne particles  
Suitable for:

- Relatively small particles generated by mechanical processes eg. grinding, cutting, sanding, drilling, sawing.
- Sub-micron thermally generated particles e.g. welding fumes, fertilizer and bushfire smoke.
- Biologically active airborne particles under specified infection control applications e.g. viruses, bacteria, COVID-19, SARS

SECTION 9 Physical and chemical properties

Information on basic physical and chemical properties

|                                                |                                                  |                                                     |                |
|------------------------------------------------|--------------------------------------------------|-----------------------------------------------------|----------------|
| Appearance                                     | Off white solid with no odour; mixes with water. |                                                     |                |
| Physical state                                 | Divided Solid                                    | Relative density (Water = 1)                        | 0.79           |
| Odour                                          | No Odour                                         | Partition coefficient n-octanol / water             | Not Available  |
| Odour threshold                                | Not Available                                    | Auto-ignition temperature (°C)                      | Not Applicable |
| pH (as supplied)                               | Not Available                                    | Decomposition temperature (°C)                      | 280-290        |
| Melting point / freezing point (°C)            | Not Available                                    | Viscosity (cSt)                                     | Not Applicable |
| Initial boiling point and boiling range (°C)   | Not Available                                    | Molecular weight (g/mol)                            | Not Applicable |
| Flash point (°C)                               | Not Applicable                                   | Taste                                               | Not Available  |
| Evaporation rate                               | Not Available                                    | Explosive properties                                | Not Available  |
| Flammability                                   | Not Applicable                                   | Oxidising properties                                | Not Available  |
| Upper Explosive Limit (%)                      | Not Applicable                                   | Surface Tension (dyn/cm or mN/m)                    | Not Applicable |
| Lower Explosive Limit (%)                      | Not Applicable                                   | Volatile Component (%vol)                           | Not Available  |
| Vapour pressure (kPa)                          | Not Applicable                                   | Gas group                                           | Not Available  |
| Solubility in water                            | Miscible                                         | pH as a solution (1%)                               | 6.9            |
| Vapour density (Air = 1)                       | Not Available                                    | VOC g/L                                             | Not Available  |
| Heat of Combustion (kJ/g)                      | Not Available                                    | Ignition Distance (cm)                              | Not Available  |
| Flame Height (cm)                              | Not Available                                    | Flame Duration (s)                                  | Not Available  |
| Enclosed Space Ignition Time Equivalent (s/m3) | Not Available                                    | Enclosed Space Ignition Deflagration Density (g/m3) | Not Available  |



## Titan Clopyralid 750 (Titan Clopyralid 750 SG Herbicide)

## SECTION 10 Stability and reactivity

|                                           |                                                                                                                                                                                                      |
|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Reactivity</b>                         | See section 7                                                                                                                                                                                        |
| <b>Chemical stability</b>                 | <ul style="list-style-type: none"> <li>▶ Unstable in the presence of incompatible materials.</li> <li>▶ Product is considered stable.</li> <li>▶ Hazardous polymerisation will not occur.</li> </ul> |
| <b>Possibility of hazardous reactions</b> | See section 7                                                                                                                                                                                        |
| <b>Conditions to avoid</b>                | See section 7                                                                                                                                                                                        |
| <b>Incompatible materials</b>             | See section 7                                                                                                                                                                                        |
| <b>Hazardous decomposition products</b>   | See section 5                                                                                                                                                                                        |

## SECTION 11 Toxicological information

## Information on toxicological effects

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>a) Acute Toxicity</b>                    | Based on available data, the classification criteria are not met.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>b) Skin Irritation/Corrosion</b>         | Based on available data, the classification criteria are not met.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>c) Serious Eye Damage/Irritation</b>     | There is sufficient evidence to classify this material as eye damaging or irritating                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>d) Respiratory or Skin sensitisation</b> | There is sufficient evidence to classify this material as sensitising to skin or the respiratory system                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>e) Mutagenicity</b>                      | Based on available data, the classification criteria are not met.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>f) Carcinogenicity</b>                   | Based on available data, the classification criteria are not met.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>g) Reproductivity</b>                    | Based on available data, the classification criteria are not met.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>h) STOT - Single Exposure</b>            | Based on available data, the classification criteria are not met.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>i) STOT - Repeated Exposure</b>          | Based on available data, the classification criteria are not met.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>j) Aspiration Hazard</b>                 | Based on available data, the classification criteria are not met.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Inhaled</b>                              | <p>The material is not thought to produce adverse health effects or irritation of the respiratory tract (as classified by EC Directives using animal models). Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable control measures be used in an occupational setting.</p> <p>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.</p> <p>If prior damage to the circulatory or nervous systems has occurred or if kidney damage has been sustained, proper screenings should be conducted on individuals who may be exposed to further risk if handling and use of the material result in excessive exposures.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Ingestion</b>                            | <p>The material has <b>NOT</b> been classified by EC Directives or other classification systems as "harmful by ingestion". This is because of the lack of corroborating animal or human evidence. The material may still be damaging to the health of the individual, following ingestion, especially where pre-existing organ (e.g liver, kidney) damage is evident. Present definitions of harmful or toxic substances are generally based on doses producing mortality rather than those producing morbidity (disease, ill-health). Gastrointestinal tract discomfort may produce nausea and vomiting. In an occupational setting however, ingestion of insignificant quantities is not thought to be cause for concern.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Skin Contact</b>                         | <p>Skin contact is not thought to have harmful health effects (as classified under EC Directives); the material may still produce health damage following entry through wounds, lesions or abrasions.</p> <p>The material may produce mild skin irritation; limited evidence or practical experience suggests, that the material either:</p> <ul style="list-style-type: none"> <li>▶ produces mild inflammation of the skin in a substantial number of individuals following direct contact, and/or</li> <li>▶ produces significant, but mild, inflammation when applied to the healthy intact skin of animals (for up to four hours), such inflammation being present twenty-four hours or more after the end of the exposure period.</li> </ul> <p>Skin irritation may also be present after prolonged or repeated exposure; this may result in a form of contact dermatitis (non allergic). The dermatitis is often characterised by skin redness (erythema) and swelling (oedema) which may progress to blistering (vesiculation), scaling and thickening of the epidermis. At the microscopic level there may be intercellular oedema of the spongy layer of the skin (spongiosis) and intracellular oedema of the epidermis.</p> <p>Brief skin contact with clopyralid is unlikely to result in irritation. Prolonged or repeated contact may cause irritation and the material may rarely cause an allergic skin response. A single prolonged exposure is not likely to result in the material being absorbed through the skin in harmful amounts.</p> <p>Open cuts, abraded or irritated skin should not be exposed to this material</p> <p>Entry into the blood-stream through, for example, cuts, abrasions, puncture wounds 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.</p> <p>Pyridine, its derivatives and homologues, may produce local irritation on contact with the skin. Absorption may produce systemic effects similar to those produced following inhalation.</p> |
| <b>Eye</b>                                  | <p>Evidence exists, or practical experience predicts, that the material may cause severe eye irritation in a substantial number of individuals and/or may produce significant ocular lesions which are present twenty-four hours or more after instillation into the eye(s) of experimental animals. Eye contact may cause significant inflammation with pain. Corneal injury may occur; permanent impairment of vision may result unless treatment is prompt and adequate. Repeated or prolonged exposure to irritants may cause inflammation characterised by a temporary redness (similar to windburn) of the conjunctiva (conjunctivitis); temporary impairment of vision and/or other transient eye damage/ulceration may occur.</p> <p>Pyridine, its derivatives and homologues, may produce local irritation on contact with the cornea.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Chronic</b>                              | <p>Practical experience shows that skin contact with the material is capable either of inducing a sensitisation reaction in a substantial number of individuals, and/or of producing a positive response in experimental animals.</p> <p>Substances that can cause occupational asthma (also known as asthmagens and respiratory sensitisers) can induce a state of specific airway hyper-responsiveness via an immunological, irritant or other mechanism. Once the airways have become hyper-responsive, further exposure to the substance, sometimes even to tiny quantities, may cause respiratory symptoms. These symptoms can range in severity from a runny nose to asthma. Not all workers who are exposed to a sensitiser will become hyper-responsive and it is impossible to identify in advance who are likely to become hyper-responsive.</p> <p>Substances that can cause occupational asthma should be distinguished from substances which may trigger the symptoms of asthma in people with pre-existing air-way hyper-responsiveness. The latter substances are not classified as asthmagens or respiratory sensitisers. Wherever it is reasonably practicable, exposure to substances that can cause occupational asthma should be prevented. Where this is not possible the primary aim is to apply adequate standards of control to prevent workers from becoming hyper-responsive.</p> <p>Activities giving rise to short-term peak concentrations should receive particular attention when risk management is being considered. Health surveillance is appropriate for all employees exposed or liable to be exposed to a substance which may cause occupational asthma and</p>                                                                                                                                                                                                                                                                                                                                                                                                                  |

Continued...

there should be appropriate consultation with an occupational health professional over the degree of risk and level of surveillance. On the basis, primarily, of animal experiments, concern has been expressed by at least one classification body that the material may produce carcinogenic or mutagenic effects; in respect of the available information, however, there presently exists inadequate data for making a satisfactory assessment.

Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems.

Repeated ingestion of large doses of clopyralid produces liver and kidney damage in rats. Feeding studies with rats showed 150 mg/kg/day produced decreased mean body weights in females. Hyperplasia and thickening of the limiting ridge of the stomach also occurred. Reproductive effects have also been reported in some animal studies

Clinical symptoms and signs of intoxication following occupational exposure to pyridine, its homologues and derivatives include gastrointestinal disturbance with diarrhoea, abdominal pain and nausea, weakness, headache, insomnia and nervousness..Data indicate that piperidine, pyridine, methyl and alkyl derivatives of pyridine (picolines, lutidines collidines), nicotinonitrile and picolinonitrile are slightly to moderately toxic following acute exposures

The available data support the conclusion that the pyridines possess similar human health-related data, and in particular, target organs appear to be the liver and the male reproductive tract.,

The weight-of-evidence suggests that Pyridine and Pyridine Derivatives Category chemicals are not mutagenic. This conclusion is supported by a number of in vivo mutagenicity assays and carcinogenicity studies with negative results for pyridine.

Reproductive screening evaluations using several repeated dose toxicity studies indicates that piperidine, pyridine and nicotinonitrile may be male reproductive toxicants.

Exposures less than those which produce overt clinical signs may produce varying levels of liver damage with central lobular fatty degeneration, congestion and cellular infiltration; repeated low level exposures may produce cirrhosis. The kidney is less sensitive to pyridine-induced damage than is the liver. Pyridine, like primidone, phenobarbitol and oxazepam induces liver neoplasms in mice, but not in rats, even though in rats these chemicals cause a spectrum of toxic liver lesions. The mouse, an animal with a high background rate of liver neoplasms, is particularly sensitive to the development of malignant liver neoplasms following chemical exposure. There is equivocal evidence (1) that pyridine is carcinogenic in male F344/N rats (based on an increased incidence of renal tubule neoplasms), in female rats of the same species (based on increases in mononuclear cell leukaemia), in male Wistar rats (based on an increased incidence of mononuclear cell leukaemia), and clear evidence of carcinogenicity (1) in male and female B6C3F1 mice (based on increased incidences of malignant hepatocellular neoplasms). 1: National Toxicology Program Technical Report Series No. 470, March 2000

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. A prime symptom is breathlessness. Lung shadows show on X-ray.

| Titan Clopyralid 750 (Titan Clopyralid 750 SG Herbicide) | TOXICITY      | IRRITATION    |
|----------------------------------------------------------|---------------|---------------|
|                                                          | Not Available | Not Available |
| clopyralid, potassium salt                               | TOXICITY      | IRRITATION    |
|                                                          | Not Available | Not Available |

**Legend:** 1. Value obtained from Europe ECHA Registered Substances - Acute toxicity 2. Value obtained from manufacturer's SDS. Unless otherwise specified data extracted from RTECS - Register of Toxic Effect of chemical Substances

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           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|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------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| CLOPYRALID, POTASSIUM SALT | <p>The following information refers to contact allergens as a group and may not be specific to this product.</p> <p>Contact allergies quickly manifest themselves as contact eczema, more rarely as urticaria or Quincke's oedema. 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 sensitisation potential: the distribution of the substance and the opportunities for contact with it are equally important. A weakly sensitising substance which is widely distributed can be a more important allergen than one with stronger sensitising 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.</p> <p>No significant acute toxicological data identified in literature search.</p> <p>for clopyralid:</p> <p>ADI 0.15 mg/kg *</p> <p>Toxicity Class WHO Table 5; EPA IV *</p> <p>NOEL (2 y) for rats 15, male mice 500, female mice &gt;2000 mg/kg daily *</p> <p>Non-mutagenic, non-teratogenic, and produces no significant toxicological effects on reproductive parameters *</p> <p><b>Acute toxicity:</b> Clopyralid is of low acute toxicity to mammals, is not extensively metabolised and is rapidly excreted in the urine. The dermal absorption of clopyralid is poor. It is a skin irritant, but not a sensitizer, and can cause irreversible ocular damage. In high doses, it can impair liver and kidney function, and cause lethargy, ataxia, tremors, convulsions, and mortality.</p> <p>Severe ocular damage has been found after instillation of clopyralid into the eyes of rabbits and after aerosol inhalation in rats. In three unpublished studies, the ocular damage was still present three weeks after treatment. Salts of clopyralid are not expected to produce eye damage.</p> <p>No systemic effects were found in rabbits after application of 2,000 mg/kg to shaved skin for 24 hours. Erythema and edema found in rabbits with a single application of 5,000 mg/kg to shaved skin for 24 hours was reversible by day ten. In rabbits, erythema and edema were observed after application of 2,000 mg/kg to shaved skin for 24 hours followed by covering with plastic to prevent ingestion. These effects were reversible after three days in all but one animal. In four studies in guinea pigs that included a total of 85 animals, only one had changes suggestive of contact hypersensitivity (allergy, sensitisation), and two had erythema.</p> <p>Labored breathing and color changes in the lungs at necropsy were found in an inhalation study in rats, a result that the authors concluded was unlikely to be a toxic effect of clopyralid. However abnormal atypical foci or nodules in the lungs were found in beagle dogs at the highest dose tested. At high doses, clopyralid can cause lethargy, ataxia, tremors, convulsions, and mortality</p> <p><b>Repeat dose toxicity:</b> The sub-chronic toxicity of clopyralid is also low, and no effects have been found in mammals at low doses (.50 mg/kg-day). At dose &gt;= 100 mg/kg-day, changes have been found in the kidney, liver, and gastrointestinal tract. No carcinogenic effects of clopyralid have been found in the rat, mouse, or dog . No major malformations (teratogenesis) have been found in clopyralid studies in rats, mice and rabbits, and no reproductive or developmental effects at doses that did not also cause maternal toxicity.</p> <p><b>Reproductive and Developmental Toxicity:</b> No major malformations (teratogenesis) have been found related to clopyralid exposure in reproductive and developmental studies in rats, mice and rabbits. No reproductive or developmental effects were found at doses that did not also cause maternal toxicity. In a two-generation rat study, no major malformations or effects on fertility and reproduction were found, but increased liver weights in first and second generation pups were found at the highest dose tested. A second study showed similar findings and also found decreased body weights in parents and pups. In another rat study with moderate maternal toxicity, nonstatistically significant minor foetal skeletal and soft tissue abnormalities were observed. In mice, no adverse effects on reproduction or development were found at any dose. In the rabbit, maternal toxicity was found at the 250 mg/kg dose, at which a decrease in foetal body weight was also observed, while another study at this dose level found no maternal toxicity or effects on the foetus. Other studies at lower doses found no adverse effects</p> <p>No carcinogenic effects of clopyralid have been found in the rat, mouse, or dog. Long-term studies have found decreased body weight and increased relative liver and kidney weights, and changes in the gastric lining at the highest dose tested in rats. The only change found in mice was decreased body weight at the highest dose tested. In the dog, haematological changes, and increases in liver weight were found.</p> <p><b>Genotoxicity:</b> <i>In vitro</i> and <i>in vivo</i> tests in bacteria showed no evidence for induced mutations, no significant increase in chromosome aberrations in bone marrow, and no evidence of unscheduled DNA synthesis.</p> <p>US EPA has classified clopyralid as Not Likely To Be Carcinogenic to Humans, and has set a chronic and intermediate-term RfD of 0.15 mg/kg-day using a NOAEL of 15 mg/kg and a LOAEL of 150 mg/kg from a two year study in rats based on increased epithelial hyperplasia</p> |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------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Titan Clopyralid 750 (Titan Clopyralid 750 SG Herbicide)

and thickening of the limiting ridge of the stomach in males and females

**Metabolic fate:** Clopyralid is highly water soluble (1,000 mg/L), and the data from feeding studies show that it is not extensively metabolized; it is excreted rapidly in the urine. Rats administered 5 mg/kg of 14C-labeled clopyralid intravenously and 50 mg/kg orally excreted a large percentage of the dose (79 to 96 percent) unchanged in the urine within 24 hours with a half-time of three hours. The radioactive residue in the feces was also primarily clopyralid. There were no apparent differences in tissue distribution, elimination patterns, carcass residues, or rate and routes of excretion between the intravenous and orally administered doses in males or females. The excretion of largely unmetabolised clopyralid was also found in studies using hens and goats

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.

|                                   |   |                          |   |
|-----------------------------------|---|--------------------------|---|
| Acute Toxicity                    | ✗ | Carcinogenicity          | ✗ |
| Skin Irritation/Corrosion         | ✗ | Reproductivity           | ✗ |
| Serious Eye Damage/Irritation     | ✓ | STOT - Single Exposure   | ✗ |
| Respiratory or Skin sensitisation | ✓ | STOT - Repeated Exposure | ✗ |
| Mutagenicity                      | ✗ | Aspiration Hazard        | ✗ |

Legend: ✗ – Data either not available or does not fill the criteria for classification  
✓ – Data available to make classification

SECTION 12 Ecological information

Toxicity

| Titan Clopyralid 750 (Titan Clopyralid 750 SG Herbicide)                                                                                                                                                                                                                                                                                | Endpoint      | Test Duration (hr) | Species       | Value         | Source        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------|---------------|---------------|---------------|
|                                                                                                                                                                                                                                                                                                                                         | Not Available | Not Available      | Not Available | Not Available | Not Available |
| clopyralid, potassium salt                                                                                                                                                                                                                                                                                                              | Endpoint      | Test Duration (hr) | Species       | Value         | Source        |
|                                                                                                                                                                                                                                                                                                                                         | Not Available | Not Available      | Not Available | Not Available | Not Available |
| Legend: <i>Extracted from 1. IUCLID Toxicity Data 2. Europe ECHA Registered Substances - Ecotoxicological Information - Aquatic Toxicity 3. US EPA, Ecotox database - Aquatic Toxicity Data 4. ECETOC Aquatic Hazard Assessment Data 5. NITE (Japan) - Bioconcentration Data 6. METI (Japan) - Bioconcentration Data 7. Vendor Data</i> |               |                    |               |               |               |

Toxic 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 clopyralid and its salts:

Kow 1.56 x 10(exp-2) (pH 5), 2.33 x 10(exp-3) (pH 7), 2.8 x 10(exp-3) (pH 9)

DT50 in laboratory studies range from 14-56 days. Field dissipation and lysimeter studies shows the potential to contaminate ground water through leaching is minimal.

Koc range from 0.4 in clay loam to 12.9 in sand with Kd ranging from 0.0094 to 0.0935 (mean values for four soils Koc 4.64 and Kd 0.0412)

**Environmental fate:**

Clopyralid is a weak organic acid, with pKa of 2.0. In a dilute solution of clopyralid, the acid is almost completely dissociated to form the clopyralid anion and acid (H3O+). The pH of a 10 mg/L solution of clopyralid is 4.28 and that of a 1.0 mg/L solution is 5.28. When dissolved in water, the MEA salt produces a slightly basic solution due to the buffering activity of the salt.

**Water Solubility and Soil Binding:**

Clopyralid acid is a solid at room temperature and has high water solubility (143,000 mg/L at pH 7 and 25 C). The MEA salt of triclopyr is more soluble than the acid (>300,000 mg/L at 25 C). The octanol-water partition coefficient, log Kow, for clopyralid is 2.34 x 10-2 indicating high solubility in water relative to organic solvents and little potential for bioaccumulation.

The average organic-carbon-adjusted soil adsorption coefficient (Koc) of clopyralid is 5 ml/g, a value that indicates that, in a mix of soil and water, most clopyralid remains dissolved in water rather than bound to organic matter in soil. This property makes clopyralid mobile in soils. The range of Koc values for clopyralid is 0.4-29.8 ml/g, and increased soil sorption is observed over time

**In soil and water,** clopyralid is degraded primarily by microbial metabolism. It is resistant to degradation by sunlight, hydrolysis, or other chemical degradation. It is water-soluble, does not bind strongly with soils, and has the potential to be highly mobile in soils, especially sandy soils. Clopyralid is not highly volatile.

In soil microbial degradation occurs; slow degradation occurs in sterile soil. Carbon dioxide is the major metabolite; only traces of other metabolites have been reported.

**Soil:** Clopyralid is moderately persistent in soils. Because it is degraded entirely by soil microbes, soil conditions that maximize microbial activity (warm and moist) will facilitate clopyralid degradation. The average half-life of clopyralid in soils is one to two months but can range from one week to one year depending on the soil type, temperature, and rates of application.

**Water:** Clopyralid is highly water-soluble and will not bind with suspended particles in the water column. Degradation is almost entirely through microbial metabolism in aquatic sediments, but because clopyralid does not bind with sediments readily, it can be persistent in an aquatic environment. The half-life of clopyralid in water ranges from 8 to 40 days. When clopyralid enters the soil through direct spray, runoff from plant foliage, or translocation from the roots of treated plants, it rapidly disassociates to the anion form. The negatively charged anion form is highly water-soluble and has a very low capacity to adsorb to soil particles. Consequently, clopyralid has the potential to be highly mobile in the environment. Clopyralid's chemical characteristics suggest it has a high potential for movement, but most field studies found that it is not as mobile expected. Where clopyralid leaches to lower soil depths, it persists longer than it does at the surface because the microbial populations generally decrease with soil depth.

**Persistence:** Clopyralid can be quite persistent in the environment. It is stable to both hydrolysis and photolysis in aqueous systems In soils, microbial activity is the primary degradation process, with an aerobic half-life of 152 days Carbon dioxide is the only metabolite that has been identified. Soil half-life ranges from 8-250 days and is shorter in warm, moist soils and at lower application rates. Clopyralid is stable under anaerobic conditions, with no significant degradation occurring in either water or soil. Field dissipation half-lives are shorter, with an average aqueous half-life of 9-22 days in freshwater lakes and 8-66 days in soils. In the summer when soils are dry, degradation of clopyralid is likely to be slow.

Clopyralid residues remain in treated plants over the growing season and in residues from treated plants such as compost. Clopyralid's persistence in composted grass clippings resulted in restrictions on its use in both California and Washington, with bans placed on the use of clopyralid products on lawns and turf in these states to prevent contamination of compost. In Washington, the purchase of clopyralid products for use on wheat, other cereal grains, and grass grown for hay is now limited to licensed pesticide applicators. Dow (a vendor) noted that composting conditions were important for complete degradation of clopyralid in compost, but also commented that clopyralid residues in one crop could have negative effects on a sensitive crop planted after the treated crop.

Clopyralid can be transported away from an application site or degrade in soil, water and air through a number of different chemical or biological processes. The most important processes for dissipation of clopyralid are microbial biodegradation, runoff into surface waters, and uptake by plants.

**Microbial Degradation:** Microbial transformation of clopyralid is the primary means of degradation in the environment. The only significant transformation product appears to be CO2. A single hydrolysis product accounted for < 3% of the applied clopyralid in an aerobic soil metabolism study, but the compound was not identified. Microbial activity increases with higher temperatures and moisture levels and decreases under cold, dry or anaerobic conditions.

**Transport by Air:** Air transport of clopyralid away from the application site can occur through spray drift during

## Titan Clopyralid 750 (Titan Clopyralid 750 SG Herbicide)

and for a short time after an application. Spray drift can contaminate soil and surface waters, damage non-target plants, and expose humans and wildlife through inhalation and dermal exposure. Post-application volatilization drift is not a significant source of off-site transport for clopyralid MEA because of its low vapor pressure ( $2.0 \times 10^{-7}$  mm Hg at 25 °C). When dissolved in water, clopyralid does not appreciably escape to the air, as indicated by its very low Henry's law constant of  $3.55 \times 10^{-8}$  atm-m<sup>3</sup>/mol.

**Transport by Water:** Clopyralid is considered to be mobile in soils because of its low K<sub>oc</sub> value and high water solubility. In lysimeter studies of soil leaching, clopyralid was observed to move to a depth of 6-18 inches, with 0.1-0.6% of the applied herbicide lost through leaching. There are conditions where substantial leaching of clopyralid to groundwater occurs in the presence of fractured soils that provide preferential pathways for transport. Herbicide concentrations were measured in water samples from suction lysimeters and tile drain effluent during and after a leaching irrigation. Clopyralid was found throughout the soil profile within 20 days of application and was detected in the first water flowing in the tile drains. Approximately 1.5% of the applied clopyralid was lost in the tile drain effluent. Higher concentrations of clopyralid were found in the tile drain samples at 2 m depth than in lysimeter samples taken from 1.5 and 1.8 m. This observation was attributed to movement of the water through preferential flow paths that allowed leachate to flow directly to drain water and not through the soil matrix.

As with most herbicides, runoff of clopyralid is most likely to occur as a result of heavy rainfall immediately after application.

**Ecotoxicity:**

Birds: Acute oral LD50 for mallard ducks 1465, bobwhite quail >2000 mg/kg

Five-day dietary LC50: for mallard ducks and bobwhite quail >4640 mg/kg diet

Fish LC50 (96 h): trout 104 mg/l; bluegill 125 mg/l

Clopyralid MEA is substantially less toxic than the acid, with LC50 values ranging from 1,500- 3,500 mg/l (or 2,000-4,700 mg /l).<sup>14, 102</sup> Since clopyralid has a pK<sub>a</sub> of about 2 it is likely that the apparently higher toxicity of clopyralid acid is due to the fact that it significantly lowers solution pH.

Daphnia EC50 (48 h): 225 mg/l; EC50 (21 d) immobilisation 69, reproduction 80 mg/l; NOEC 17 mg/l

Unlike fish, invertebrates are not more sensitive to clopyralid acid compared to the MEA salt. The MEA salt is only marginally less toxic to *Daphnia magna*, with an LC50 value of 350 mg /l

Aquatic plants EC50 duckweed 89 mg/l

Algae EC50 (96 h): *Selenastrum capricornutum* 6.9 mg/l (cell count), 7.3 mg/l (cell volume)

Other aquatic spp EC50 (14 d): *Lemna gibba* 89 mg/l

Aquatic plants are more sensitive to clopyralid than fish or aquatic invertebrates.

Bees: Non-toxic. LD50 (48 h, oral and contact) >100 ug/bee

Other beneficial spp. LC50 (14 d) for earthworms >1000 mg/kg soil.

No effects on nitrification, nitrogen fixation or degradation of cellulose, starch, protein and leaf material at 1-10 ppm.

Acute and chronic clopyralid toxicity to mammals is low, with no effects observed in laboratory studies at doses less than 50 mg/kg. Clopyralid is not acutely to slightly toxic to birds, not acutely to slightly toxic to insects, and not toxic to soil microbes like mycorrhizal fungi. There is some evidence of sub-lethal central nervous system effects in birds.

Clopyralid is classified as not acutely toxic to fish and aquatic invertebrates and not acutely to slightly toxic to aquatic plants. Toxicity varies by chemical, with the MEA salt of clopyralid less toxic than clopyralid acid.

Clopyralid residues are highly toxic to non-target broadleaf plants. Clopyralid is also relatively long-lived in soil and leaf litter, indicating that rainfall or irrigation water runoff may have adverse effects on non-target plants. Clopyralid works by mimicking a plant's auxins, or growth hormones, causing a proliferation of abnormal growth that interferes with nutrient transport. At sufficient doses this results in gross signs of damage and the death of the affected plant. At the biochemical level, clopyralid has been shown to inhibit glutamine synthetase and NADPH reductase in pea and oat chloroplasts and disrupt normal carbohydrate balance in honey mesquite. Although clopyralid can be absorbed from both leaves and roots, foliar absorption predominates, with 97% absorption within 24 hours of application. Clopyralid is preferentially toxic to broad-leaf weeds and relatively non-toxic to grasses.

At sufficiently high-soil concentrations, clopyralid can cause significant damage by root absorption. Root uptake is greater at low pH, suggesting that the acid form of clopyralid is more readily absorbed than the anionic form.

Clopyralid is far more toxic to dicots than monocots or conifers.

**Plant Metabolism** – Clopyralid passes rapidly into leaves and roots of plants and is rain-fast within two hours. Once inside the plant, clopyralid is converted to the anion form and transported throughout the plant. It is not readily degraded by the plant and can be persistent, even in non-susceptible species.

**Animal Metabolism** – The manufacturer reports that studies found that the majority of clopyralid ingested by mammals was excreted unmetabolised in their urine within 24 hours. Some clopyralid, however, was retained in their livers and kidneys

A persistent herbicide (or contains the herbicide)

Certain herbicides can persist on vegetation and in the soil for months or years and these products are called "persistent herbicides". Persistent herbicides are a narrow range of herbicides used to kill broad leaf weeds and thistle that compete with grasses and grain crops. They are "persistent" because they will not be killed by the high temperatures in thermophilic composting and may take over 2 years or more to fully decay

The class of herbicides from the picolinic acid family is of the greatest concern. These chemicals are marketed for use in hayfields, horse pastures, golf courses, roadways, grain crops, and lawns, to kill unwanted broad-leaf weeds. These herbicides do not normally impact grasses and plants like corn, wheat, and oats.

Herbicides vary in their potential to persist in soil. Herbicide families that have persistent members include triazines, uracils, phenylureas, sulfonyleureas, dinitroanilines, isoxazolidiones, imidazolinones, and certain plant growth regulators belonging to the pyridine family.

The length of time a herbicide remains active in soil is called "soil persistence," or "soil residual life". For some herbicides, there may be a fine line between controlling weeds for the entire growing season and then planting a sensitive rotation crop. Anything that affects the disappearance or breakdown of herbicides affects persistence.

Persistent herbicides are generally colourless and odorless. Scientific studies reveal that pass unaltered during animal digestion (including microbial digestion) when used at labelled rates. In fact, animal digestion tends to strengthen the impact of these chemicals through concentration because the animal processes the food but passes most of the chemical as a waste.

Persistent herbicide may kill a tomato plant at a concentration of one part per billion, and impact many other garden plants as well. Plant families sensitive to persistent herbicides include:

- The nitrogen-fixing, legume family of plants such as peas, beans, lentils, and clover
- The nightshade, solanaceous family of plants such as tomatoes and potatoes
- The sunflower, composites family of plants such as sunflower, petunias, daisies, lettuce, and asters
- The cucumber, cucurbit family of plants such as cucumber, squash, pumpkin, and watermelon

Damaged plants may show on or more of the following symptoms:

- Stunted growth: the main growth tip stops growing and the lateral buds begin to grow
- Reduced fruit set
- Cupping of leaves
- Failure of secondary leaves to grow after the seed leaves emerge
- In legumes, compound leaves stay single

Depending on the type of herbicide and the level of concentration in the soil, persistent herbicides can last anywhere from several months to three or more years before completely breaking down into inert compounds. The length of time depends upon a variety of factors, including the type and moisture content of the soil.

The most common feed stocks with persistent herbicide contamination are manures and bedding, but grass clippings and many food items can be contaminated.

Persistent pesticides do not break-down in the composting process. At its most fundamental level, composting is digestion by microorganisms, regardless of whether it is an aerated static pile, anaerobic digestion, etc. Simple composting math demonstrates that one ton of feedstock reduces to approximately half that amount as finished compost.

Persistent herbicides break down much more slowly than the materials in compost, and therefore, most of the chemicals pass into the finished compost. Low toxicity to animals is one often cited benefit of persistent herbicides.

According to the USEPA, persistent herbicides are not harmful to people or animals when these products are used at labelled rates.

Pyridine and its derivatives:

**Environmental fate:**

The atmospheric photodegradation estimates for the Pyridine and Pyridine Derivatives Category chemicals indicate that piperidine which is the lower molecular weight, non-aromatic and unsubstituted chemical in the category, would be expected to degrade rapidly ( $t_{1/2} < 1$  day) when exposed to UV light in the atmosphere. Pyridine and the three methyl derivatives of pyridine (picolines) which are the higher molecular weight, aromatic and substituted chemicals in the category, would be expected to photodegrade more slowly ( $t_{1/2}$  . 30 or 10 days, respectively). Lutidines, and collidines are expected to photodegrade even more slowly. The nitriles derivatives of pyridine are also predicted to photodegrade more slowly ( $t_{1/2}$  . 164 days). However, the nitrile derivatives of pyridine were predicted to partition to air much less favorably than to soil and water. As molecular weight and substitution increase in the category, greater distribution to water and soil and less to air is predicted. This trend is consistent with the vapor pressure data.

Pyridines are not expected to hydrolysis in the environment because they lack a potentially hydrolysable functional group.

There are adequate measured data across the pyridine group to allow the conclusion that these chemicals are biodegradable in the presence of adequate oxygen and bacteria; however, they are relatively stable under anaerobic and/or sterile environments.

Depending upon the environmental conditions, different types of bacteria, fungi, and enzymes are involved in the degradation process of these compounds. Different organisms are using different pathways to biotransform a substrate. The transformation rate of the pyridine derivatives is dependent on the substituents. For example, pyridine carboxylic acids have the highest transformation rate followed by mono-hydroxypyridines, methylpyridines, aminopyridines, and halogenated pyridines

**Ecotoxicity:**

Measured values for acute aquatic toxicity indicate that the Pyridine and Pyridine Derivatives Category chemicals are slightly to moderately toxic to fish, invertebrates and algae.

Modeled data for acute aquatic toxicity were generally consistent with the reliable measured values in cases for which both existed.

DO NOT discharge into sewer or waterways.

Persistence and degradability

| Ingredient | Persistence: Water/Soil               | Persistence: Air                      |
|------------|---------------------------------------|---------------------------------------|
|            | No Data available for all ingredients | No Data available for all ingredients |

Bioaccumulative potential

| Ingredient | Bioaccumulation                       |
|------------|---------------------------------------|
|            | No Data available for all ingredients |

Mobility in soil

| Ingredient | Mobility                              |
|------------|---------------------------------------|
|            | No Data available for all ingredients |

SECTION 13 Disposal considerations

Waste treatment methods

|                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product / Packaging disposal | <ul style="list-style-type: none"><li>Containers may still present a chemical hazard/ danger when empty.</li><li>Return to supplier for reuse/ recycling if possible.</li></ul> Otherwise: <ul style="list-style-type: none"><li>If container can not be cleaned sufficiently well to ensure that residuals do not remain or if the container cannot be used to store the same product, then puncture containers, to prevent re-use, and bury at an authorised landfill.</li><li>Where possible retain label warnings and SDS and observe all notices pertaining to the product.</li></ul> 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.<br>A Hierarchy of Controls seems to be common - the user should investigate: <ul style="list-style-type: none"><li>Reduction</li><li>Reuse</li><li>Recycling</li><li>Disposal (if all else fails)</li></ul> 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. In most instances the supplier of the material should be consulted. <ul style="list-style-type: none"><li>DO NOT allow wash water from cleaning or process equipment to enter drains.</li><li>It may be necessary to collect all wash water for treatment before disposal.</li><li>In all cases disposal to sewer may be subject to local laws and regulations and these should be considered first.</li><li>Where in doubt contact the responsible authority.</li></ul> |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

SECTION 14 Transport information

Labels Required

|                  |    |
|------------------|----|
|                  |    |
| Marine Pollutant |    |
| HAZCHEM          | 2Z |

Land transport (ADG)

|                                    |                                                                                                                                 |                    |                      |                   |                |
|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|--------------------|----------------------|-------------------|----------------|
| 14.1. UN number or ID number       | 3077                                                                                                                            |                    |                      |                   |                |
| 14.2. UN proper shipping name      | ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (contains clopyralid, potassium salt)                                        |                    |                      |                   |                |
| 14.3. Transport hazard class(es)   | <table><tr><td>Class</td><td>9</td></tr><tr><td>Subsidiary Hazard</td><td>Not Applicable</td></tr></table>                      | Class              | 9                    | Subsidiary Hazard | Not Applicable |
| Class                              | 9                                                                                                                               |                    |                      |                   |                |
| Subsidiary Hazard                  | Not Applicable                                                                                                                  |                    |                      |                   |                |
| 14.4. Packing group                | III                                                                                                                             |                    |                      |                   |                |
| 14.5. Environmental hazard         | Environmentally hazardous                                                                                                       |                    |                      |                   |                |
| 14.6. Special precautions for user | <table><tr><td>Special provisions</td><td>274 331 335 375 AU01</td></tr><tr><td>Limited quantity</td><td>5 kg</td></tr></table> | Special provisions | 274 331 335 375 AU01 | Limited quantity  | 5 kg           |
| Special provisions                 | 274 331 335 375 AU01                                                                                                            |                    |                      |                   |                |
| Limited quantity                   | 5 kg                                                                                                                            |                    |                      |                   |                |

Environmentally Hazardous Substances meeting the descriptions of UN 3077 or UN 3082 are not subject to this Code when transported by road or rail in;

(a) packagings;

(b) IBCs; or

(c) any other receptacle not exceeding 500 kg(L).

- Australian Special Provisions (SP AU01) - ADG Code 7th Ed.

Air transport (ICAO-IATA / DGR)

|                 |      |
|-----------------|------|
| 14.1. UN number | 3077 |
|-----------------|------|

|                                    |                                                                                          |                         |  |
|------------------------------------|------------------------------------------------------------------------------------------|-------------------------|--|
| 14.2. UN proper shipping name      | Environmentally hazardous substance, solid, n.o.s. (contains clopyralid, potassium salt) |                         |  |
| 14.3. Transport hazard class(es)   | ICAO/IATA Class                                                                          | 9                       |  |
|                                    | ICAO / IATA Subsidiary Hazard                                                            | Not Applicable          |  |
|                                    | ERG Code                                                                                 | 9L                      |  |
| 14.4. Packing group                | III                                                                                      |                         |  |
| 14.5. Environmental hazard         | Environmentally hazardous                                                                |                         |  |
| 14.6. Special precautions for user | Special provisions                                                                       | A97 A158 A179 A197 A215 |  |
|                                    | Cargo Only Packing Instructions                                                          | 956                     |  |
|                                    | Cargo Only Maximum Qty / Pack                                                            | 400 kg                  |  |
|                                    | Passenger and Cargo Packing Instructions                                                 | 956                     |  |
|                                    | Passenger and Cargo Maximum Qty / Pack                                                   | 400 kg                  |  |
|                                    | Passenger and Cargo Limited Quantity Packing Instructions                                | Y956                    |  |
|                                    | Passenger and Cargo Limited Maximum Qty / Pack                                           | 30 kg G                 |  |

Sea transport (IMDG-Code / GGVSee)

|                                    |                                                                                          |                         |  |
|------------------------------------|------------------------------------------------------------------------------------------|-------------------------|--|
| 14.1. UN number                    | 3077                                                                                     |                         |  |
| 14.2. UN proper shipping name      | ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (contains clopyralid, potassium salt) |                         |  |
| 14.3. Transport hazard class(es)   | IMDG Class                                                                               | 9                       |  |
|                                    | IMDG Subsidiary Hazard                                                                   | Not Applicable          |  |
| 14.4. Packing group                | III                                                                                      |                         |  |
| 14.5. Environmental hazard         | Marine Pollutant                                                                         |                         |  |
| 14.6. Special precautions for user | EMS Number                                                                               | F-A, S-F                |  |
|                                    | Special provisions                                                                       | 274 335 375 966 967 969 |  |
|                                    | Limited Quantities                                                                       | 5 kg                    |  |

14.7. Maritime transport in bulk according to IMO instruments

14.7.1. Transport in bulk according to Annex II of MARPOL and the IBC code

Not Applicable

14.7.2. Transport in bulk in accordance with MARPOL Annex V and the IMSBC Code

| Product name               | Group          |
|----------------------------|----------------|
| clopyralid, potassium salt | Not Applicable |

14.7.3. Transport in bulk in accordance with the IGC Code

| Product name               | Ship Type      |
|----------------------------|----------------|
| clopyralid, potassium salt | Not Applicable |

SECTION 15 Regulatory information

Safety, health and environmental regulations / legislation specific for the substance or mixture

clopyralid, potassium salt is found on the following regulatory lists

Not Applicable

Additional Regulatory Information

Not Applicable

National Inventory Status

| National Inventory                              | Status                          |
|-------------------------------------------------|---------------------------------|
| Australia - AIIC / Australia Non-Industrial Use | No (clopyralid, potassium salt) |
| Canada - DSL                                    | No (clopyralid, potassium salt) |
| Canada - NDSL                                   | No (clopyralid, potassium salt) |
| China - IECSC                                   | No (clopyralid, potassium salt) |
| Europe - EINEC / ELINCS / NLP                   | Yes                             |
| Japan - ENCS                                    | No (clopyralid, potassium salt) |
| Korea - KECI                                    | No (clopyralid, potassium salt) |
| New Zealand - NZIoC                             | No (clopyralid, potassium salt) |
| Philippines - PICCS                             | No (clopyralid, potassium salt) |
| USA - TSCA                                      | No (clopyralid, potassium salt) |

Titan Clopyralid 750 (Titan Clopyralid 750 SG Herbicide)

| National Inventory                                | Status                                                                                                                                                                                                          |
|---------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Taiwan - TCSI                                     | No (clopyralid, potassium salt)                                                                                                                                                                                 |
| Mexico - INSQ                                     | No (clopyralid, potassium salt)                                                                                                                                                                                 |
| Vietnam - NCI                                     | No (clopyralid, potassium salt)                                                                                                                                                                                 |
| Russia - FBEPH                                    | No (clopyralid, potassium salt)                                                                                                                                                                                 |
| UAE - Control List (Banned/Restricted Substances) | No (clopyralid, potassium salt)                                                                                                                                                                                 |
| Legend:                                           | <b>Yes = All CAS declared ingredients are on the inventory</b><br><b>No = One or more of the CAS listed ingredients are not on the inventory. These ingredients may be exempt or will require registration.</b> |

SECTION 16 Other information

|               |            |
|---------------|------------|
| Revision Date | 02/06/2026 |
| Initial Date  | 11/09/2024 |

SDS Version Summary

| Version | Date of Update | Sections Updated                                                                                                                |
|---------|----------------|---------------------------------------------------------------------------------------------------------------------------------|
| 2.1     | 02/06/2026     | Physical and chemical properties - Appearance, Identification of the substance / mixture and of the company / undertaking - Use |

Other information

Classification of the preparation 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.

The 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.

Definitions and abbreviations

- ▶ PC – TWA: Permissible Concentration-Time Weighted Average
- ▶ PC – STEL: Permissible Concentration-Short Term Exposure Limit
- ▶ IARC: International Agency for Research on Cancer
- ▶ ACGIH: American Conference of Governmental Industrial Hygienists
- ▶ STEL: Short Term Exposure Limit
- ▶ TEEL: Temporary Emergency Exposure Limit,
- ▶ IDLH: Immediately Dangerous to Life or Health Concentrations
- ▶ ES: Exposure Standard
- ▶ OSF: Odour Safety Factor
- ▶ NOAEL: No Observed Adverse Effect Level
- ▶ LOAEL: Lowest Observed Adverse Effect Level
- ▶ TLV: Threshold Limit Value
- ▶ LOD: Limit Of Detection
- ▶ OTV: Odour Threshold Value
- ▶ BCF: BioConcentration Factors
- ▶ BEI: Biological Exposure Index
- ▶ DNEL: Derived No-Effect Level
- ▶ PNEC: Predicted no-effect concentration
- ▶ MARPOL: International Convention for the Prevention of Pollution from Ships
- ▶ IMSBC: International Maritime Solid Bulk Cargoes Code
- ▶ IGC: International Gas Carrier Code
- ▶ IBC: International Bulk Chemical Code
- ▶ AIIC: Australian Inventory of Industrial Chemicals
- ▶ DSL: Domestic Substances List
- ▶ NDSL: Non-Domestic Substances List
- ▶ IECSC: Inventory of Existing Chemical Substance in China
- ▶ EINECS: European INventory of Existing Commercial chemical Substances
- ▶ ELINCS: European List of Notified Chemical Substances
- ▶ NLP: No-Longer Polymers
- ▶ ENCS: Existing and New Chemical Substances Inventory
- ▶ KECI: Korea Existing Chemicals Inventory
- ▶ NZIoC: New Zealand Inventory of Chemicals
- ▶ PICCS: Philippine Inventory of Chemicals and Chemical Substances
- ▶ TSCA: Toxic Substances Control Act
- ▶ TCSI: Taiwan Chemical Substance Inventory
- ▶ INSQ: Inventario Nacional de Sustancias Químicas
- ▶ NCI: National Chemical Inventory
- ▶ FBEPH: Russian Register of Potentially Hazardous Chemical and Biological Substances

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